Geotechnical Characterization Report

Balloon Tract
Eureka, California

Prepared for:

Security National Properties
P.O. Box 1028
Eureka, CA 95502

Consulting Engineers & Geologists, Inc.

812 W. Wabash Ave.
Eureka, CA 95501
707/441-8855

March 2006
005265.100

Reference: 005265.100

March 8, 2006

Mr. Randy L. Gans
Service National Properties
P.O. Box 1028
Eureka, CA 95502

Subject: Geotechnical Characterization Report for the Balloon Tract, Eureka, California

Dear Mr. Gans:

The enclosed report documents the results of our subsurface investigation and review of available subsurface data for the characterization and feasibility report for what is referred to as the Balloon Tract at the edge of Humboldt Bay in Eureka, California. SHN Consulting Engineers and Geologists, Inc. (SHN), is not aware of the types of structures proposed for the site at the time of report preparation. This report is not intended to be used for design-level geotechnical recommendations, which should be addressed for the specific type of structures proposed within the property. In the report we discuss geotechnical site characteristics based on both new and old subsurface investigations.

The primary geotechnical site considerations are the presence of uncontrolled fill material, soft organic materials or bay mud, and the presence of loose sand deposits subject to potential liquefaction in the event of strong seismic shaking that may occur at the site. These issues are discussed within the attached report.

Thank you for the opportunity to assist you with this project. If you have any questions, please feel free to call us at (707) 441-8855.

Sincerely,

SHN Consulting Engineers & Geologists, Inc.

Mark Twede, G.E.
Geotechnical Engineer

Enclosure: Geotechnical Characterization Report

Reference: 005265.100

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QA/QC:TAS___

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Abbreviations and Acronyms

C_a and C_v	Seismic Coefficients
CPT	Cone Penetrometer Test
M#	Magnitude#
N_a and N_v	Seismic Source Type, Near-Source Factors
SHN	SHN Consulting Engineers & Geologists, Inc.
UBC	Uniform Building Code
Z	Seismic Zone Factor

1.0 Introduction

This report documents the results of geotechnical investigations conducted by SHN Consulting Engineers & Geologists, Inc. (SHN) during February 2006, and results of a review of available subsurface information from previous subsurface exploration performed at what is referred to as the Balloon Tract located adjacent to the Eureka Boat Basin in Eureka, California. The site location is shown on Figure 1.

We are not aware of the types of structures proposed for the site at the time of report preparation. The purpose of SHN's geotechnical characterization was to provide site information that can be utilized for conceptual development planning.

The characterizations within this report were based upon subsurface conditions encountered by SHN and others within the Balloon Tract property. Some of the previous investigations performed at the site were for environmental purposes only, which provide a general material type encountered during the investigation, but do not provide design-level information.

Our scope of work included the advancement of cone penetrometer tests (CPTs) at six locations within the project area. The information obtained from the CPT was then combined with existing subsurface information from previous investigations to provide a characterization of the subsurface conditions that may be anticipated within the develop areas.

Work was performed in general accordance with our proposal dated October 12, 2005.

2.0 Review of Available Geotechnical Information

The following subsurface data was reviewed to supplement the information obtained from the current SHN subsurface investigation:

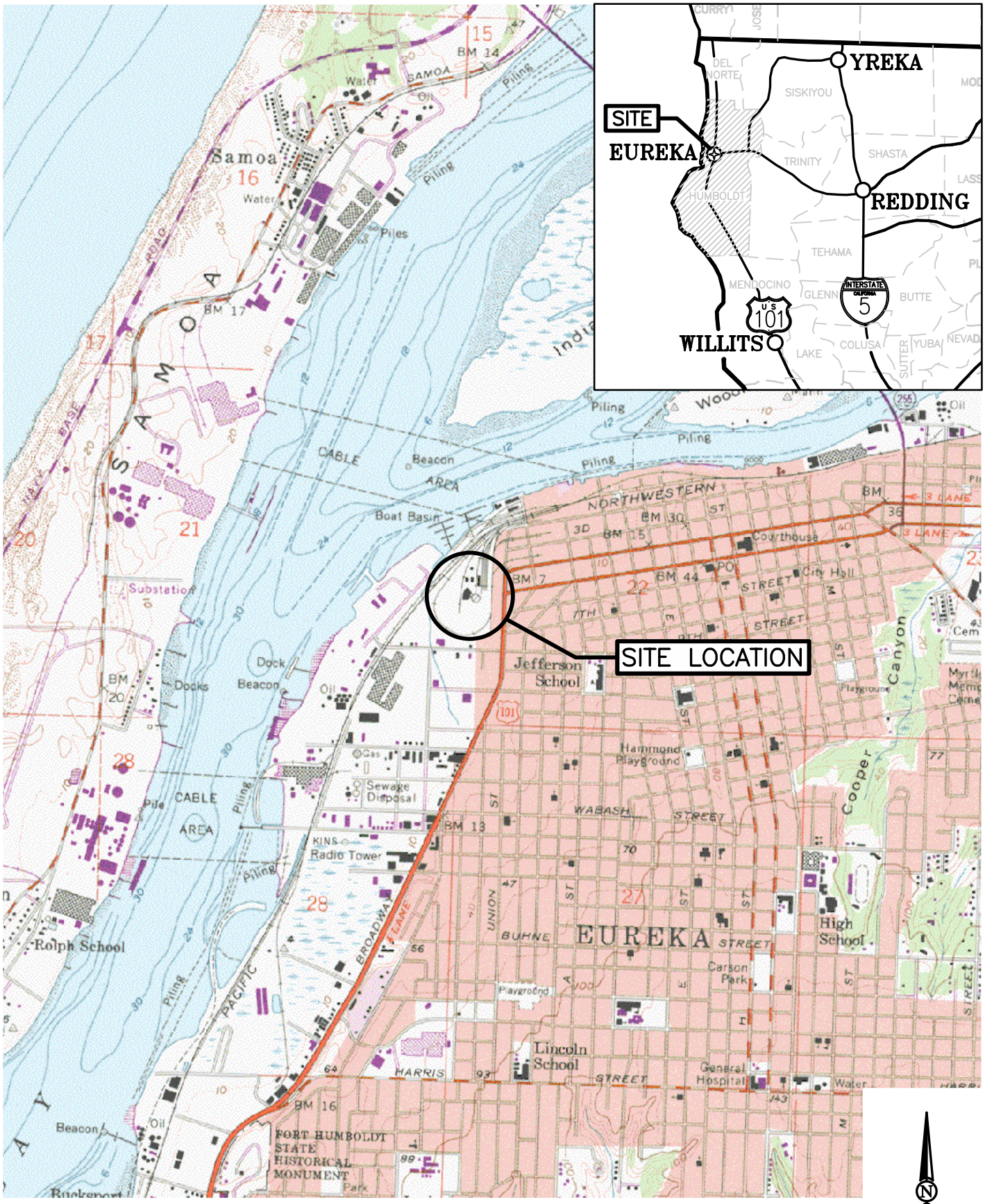
- CPT logs from a subsurface investigation performed in 1990 by Geomatrix for the SPTCo. Eureka Yard Site, Eureka, California.
- Boring Logs from drill holes advanced during a subsurface investigation performed in 1990 by Geomatrix for the SPTCo. Eureka Yard Site, Eureka, California.

Copies of CPT and Borehole logs prepared by others are presented within Appendix B, along with the test hole locations.

3.0 SHN Field Investigation

Our field geotechnical investigation was limited to a site reconnaissance and subsurface exploration through advancement of six cone penetrometer tests (CPT). The cone penetrometer was advanced up to a maximum depth of approximately 50 feet below the existing ground surface.

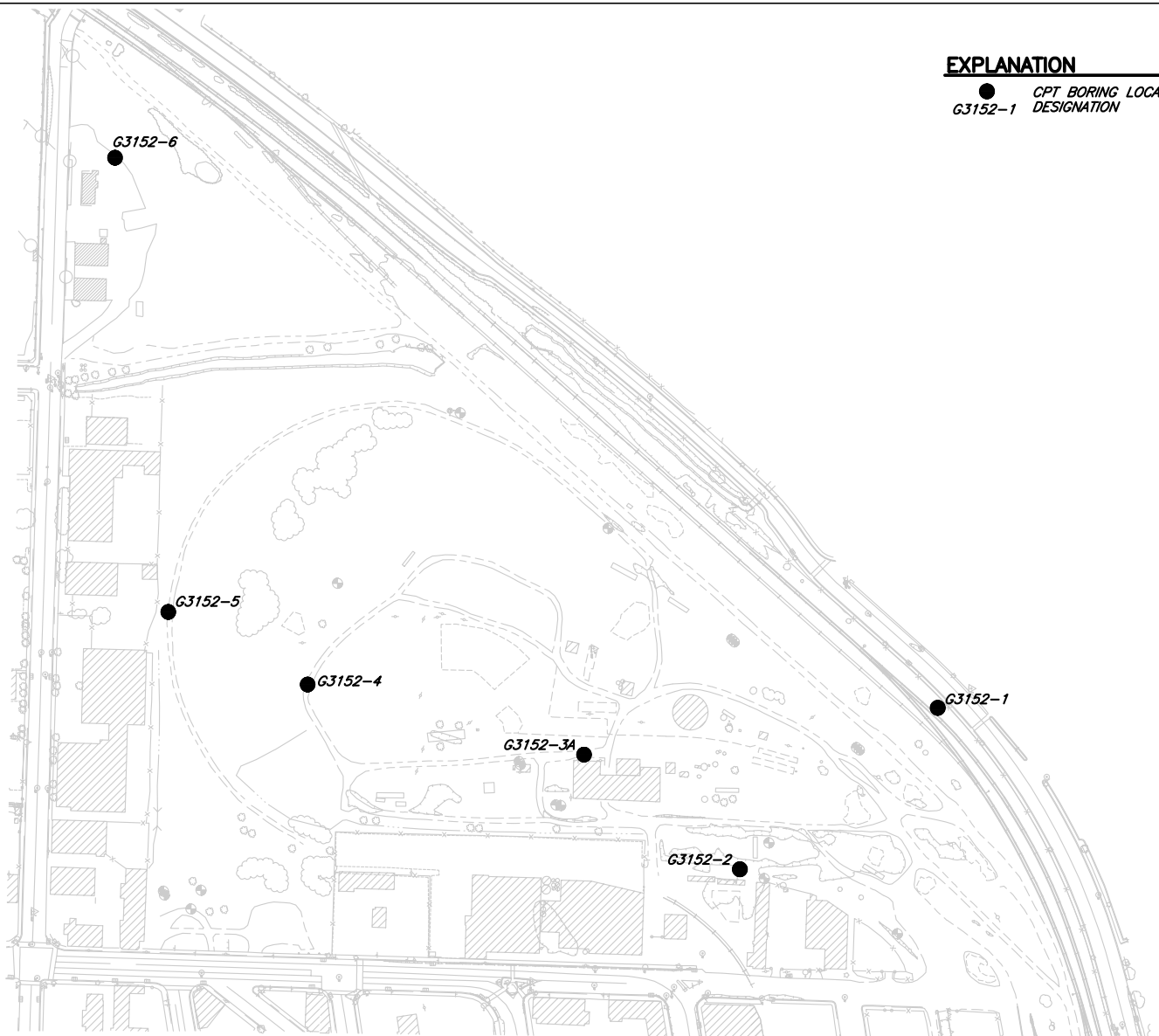
The field investigation was conducted on February 8, 2006. The CPT hole locations are shown in Figure 2. Graphs of the variation of cone tip resistance, side friction, and equivalent blow counts with depth are included in Appendix A.



SOURCE: EUREKA USGS 7.5 MINUTE QUADRANGLE

1"=2000'±

SHN Consulting Engineers & Geologists, Inc.	Security National Properties Former Railroad Yard Eureka, California	Site Location Map SHN 005265.100	
	March 2006	005265-100-LCTN	Figure 1



EXPLANATION

G3152-1 CPT BORING LOCATION AND DESIGNATION

NOTE:

BASE MAP ADAPTED FROM AERIAL PHOTOGRAPH TAKEN ON SEPTEMBER 21, 1995 BY RICHARD B. DAVIS COMPANY, INC., OF SMITH RIVER, CALIFORNIA

1"=200'

0 200

Consulting Engineers & Geologists, Inc.

Security National Properties
Former Railroad Yard
Eureka, California

Site Plan with LPT Boring Locations
SHN 005265.100

March 2006 | 005265-100-SITE | Figure 1

4.0 Site Conditions

4.1 Surface Conditions

The project site is relatively flat. At the waterfront, the bathymetry of the ground beneath the harbor is not known in detail, but we assume a slope down to a depth of approximately 20 feet within the harbor.

The property is currently vacant, with occasional piles of debris. The Clark Slough traverses the western corner of the property

4.2 Subsurface Soil

Based on a review of predevelopment maps for the city of Eureka, two sloughs traversed through the Balloon Tract prior to being developed. Both of the sloughs originated near Boring B-1, and flowed to the northwest and southwest across the property. These sloughs have since been backfilled as the City of Eureka was developed. Evidence of deeper fill materials at the estimated slough locations was not encountered within either the SHN or Geomatrix borings; however, the historical slough locations could have easily been missed with the sparse configuration of subsurface investigation locations.

A cap of miscellaneous fill materials was encountered across the site. This fill is highly variable, including silty sand, clay, gravel, miscellaneous construction debris, and organic materials. The upper uncontrolled fill materials are generally of soft consistency or loose, but generally contain granular materials of sufficient quantity to provide increased strength and resistance to shallow and lateral loads. The fill is generally 5 feet in thickness at the ground surface.

Beneath the fill, there is a layer of native soil that consists of very soft clay with organics that is highly susceptible to consolidation and has a low shear strength. This material is locally referred to as bay mud. The soft fine-grained layer generally was encountered from a depth of 5 to 8 feet below the ground surface. Within the central portion of the property, the thickness is greater, and extends from 5 feet to a depth of up to 14 feet below the ground surface.

In some areas, the soft fine-grained layer is overlain by a lense of silty or clayey sand with a thickness on the order of a few feet. It is unclear whether this material was placed as fill or whether it is native soil materials. This sand is loose, and is subject to liquefaction.

Beneath the soft fine-grained layer, the native soil material transitions into a sand and gravelly sand that generally becomes denser with increasing depth. The transition zone consists typically of silty or clayey sand materials. The transition from the clay to a dense sand occurs relatively quickly, generally within a depth of a few feet. One exception to this was observed at the location of CPT G3152-6, where the material transitioned to a cleaner sand material, but remained loose up to a depth of approximately 22 feet beneath the ground surface.

4.3 Groundwater

Groundwater was encountered generally at depths between 4 to 6 feet below the ground surface within the Balloon Tract. Groundwater conditions can be expected to fluctuate in response to seasons, storm events, and other factors. For purposes of evaluation of excavations or geologic hazards such as liquefaction, a depth to groundwater of approximately 5 feet is a reasonable assumption.

4.4 Seismic Setting and UBC Seismic Parameters

The State of California designates faults as active, potentially active, and inactive depending on the recency of movement that can be substantiated for a fault. A fault is considered active if there is evidence of rupture within Holocene geologic time, or within the last 11,000 years. A fault is considered potentially active if there is evidence of rupture within the last 1.6 million years. No active or potentially active faults are known to project through the project site. A number of active regional and local faults traverse the project region.

The nearest identified active fault is the Little Salmon Fault, with a slip rate estimated at about 0.2 inches (5 millimeters) per year and a characteristic magnitude of 7.0, located within approximately 1.2 miles (2 kilometers) of the site.

Within the last 100 years, we are aware of three earthquakes that have occurred near the project with magnitudes greater than M7.0, the nearest of which were two M7.2 events that occurred in 1923 and 1980, both within approximately 26 miles from the site, and the most recent of which was a M7.1 that occurred in 1992 approximately 28 miles from the site. Other closer historical earthquakes, such as a M6.5 earthquake that occurred within 16 miles of the site in 1954, have occurred. Larger earthquakes are possible from a number of sources, including the Cascadia subduction zone.

At a minimum, structures should be designed in accordance with the 1997 Uniform Building Code (UBC) criteria. UBC-based design requires the definition of the following seismic parameters: a Seismic Zone Factor (Z), a Soil Profile Type (S), Seismic Source Type, Near-Source Factors (N_a and N_v), and Seismic Coefficients (C_a and C_v).

The most critical fault capable of causing the strongest ground motion at the site is the Little Salmon Fault, a Type "A" fault in accordance with the 1997 UBC. The 1997 UBC places this area in Seismic Zone 4. A Soil Profile Type S_D, or stiff soil, may be assumed for the upper 100 feet of soil near the ground surface, based on the conditions encountered during the field investigations. Near-source factors N_a and N_v of 1.5 and 2.0, respectively, from Tables 16-S and 16-T of the 1997 UBC are indicated. Seismic Coefficients C_a and C_v of 0.66 and 1.28, respectively, were determined from the N_a and N_v values, the soil profile type, and the seismic zone factor per UBC Tables 16-Q and 16-R. The resulting seismic design parameters are summarized in Table 1.

Table 1
UBC Seismic Design Parameters

Parameter	Recommended UBC Criteria
Seismic Zone	4
Soil Profile Type	S_D (Stiff Soil)
Seismic Source Type	"A"
Distance to Seismic Source	Less than 2 kilometers to "A"
Near Source Factor, N_a	1.5
Near Source Factor, N_v	2.0
Seismic Coefficient, C_a	0.66
Seismic Coefficient, C_v	1.28

4.5 Expansive Soils

Clay soil was encountered within the subsurface borings. The expansive potential of the clay has not been evaluated, but the clay was encountered at depths of around 5 feet or more, which is generally at the level of groundwater. These clay materials will not be subject to wetting and drying, and the risk of adverse consequences to foundations or slabs-on-grade from expansive behavior of soils is considered low.

5.0 Conclusions and Discussion

Based on the results of the current and previous broad field investigations performed at the site, it is our opinion that the Balloon Tract can be developed, provided that the geologic hazards discussed below are understood and acknowledged.

The primary geotechnical site considerations are the presence of weak and compressible soils, a high groundwater table, and potentially liquefiable sands and associated adverse effects to building structures. As is much of Humboldt County, the site is subject to strong ground motion from seismic sources. Other geohazards, which are no greater at this site than at other locations within the City of Eureka in the lower elevation areas, include high water levels associated with storm surges, seiches, and tsunamis, which are outside of the scope of this report.

Weak, compressible organics and clay, or liquefiable sand soil, extends up to depths of at least 10 feet beneath the project site. Consequently, deep foundations will be required to transfer structure loads to the denser sand soil at greater depth. Based on the CPT results, pile or pier lengths of approximately 25 to 30 feet in length may be required. Deeper piles, say 35 to 40 feet, may be required in the zone west of the Clark Slough.

The soft fine-grained layer with organics that was described above is considered highly compressible. If the proposed grade is to be increased, the ground surface could be subject to excessive ground settlement, dependent upon the amount of increase in site elevation. Also, for shallow foundation loading where significant pressures are extended to depths greater than 5 feet, these foundations would be subject to excessive settlement. The amount of settlement depends on the magnitude, area, and duration of the loading. The rate of settlement is correlated to soil type and permeability, and to the degree of soil saturation. The native clay soils would be anticipated to consolidate slowly under added loadings.

Liquefaction is a phenomenon that occurs during or closely following dynamic loading of loose or medium dense, low cohesion soil materials beneath the groundwater surface. Increased soil particle size, increased silt and clay content, increased cohesion, and increased geologic age decrease liquefaction risk. During shaking, pore water pressure builds up until shear strength is significantly reduced. Liquefied soil can be ejected to the ground surface in sand boils "sand volcanoes," or through ground cracks. Shallow foundation bearing support can be temporarily lost. Block (lateral) gliding of upper, non-liquefied soils can occur, or lateral spreading or movement of liquefied soils may occur, even on mild slope gradients under certain conditions.

Potential liquefiable sand materials were encountered within most of the CPT borings and auger borings at various depths, but were generally limited to sand layers with a thickness of 1 to 3 feet. The liquefiable materials were generally immediately above and below the soft, fine-grained layer that was described above. The risk of liquefaction was determined using methods described by Youd et al. (2001) for evaluation of CPT and sampler blow count data.

An exception to the limited liquefaction potential was within the zone west of the Clark Slough. The potential for liquefaction was a high risk for a large amount of the soil material from a depth of 7 to 22 feet beneath the ground surface at both the previous and current boring locations within this area.

Lateral spreading risk is considered a high risk within the area west of the Clark Slough where the risk of liquefaction is extensive and where the ground slopes down into the harbor. It may be necessary to require a minimum setback from the harbor shoreline to limit development within this zone of high risk for lateral spreading. Lateral spreading is considered a low risk within the remainder of the site, based on the limited subsurface investigation, due to the relatively level gradient across the site and intermittent liquefaction potential. Development within the triangle-shaped area at the west of the property should be avoided or limited to low rise structures with heavily reinforced slabs in addition to deep foundations. For conceptual design, we recommend that proposed structures be setback from the harbor shoreline a minimum of 250 feet. Alternatively, deep soil treatments can be utilized to improve resistance to liquefaction.

Recent building codes have been based on the criteria that structures should be able to:

1. resist a minor level of earthquake motion without damage;
2. resist a moderate level of earthquake ground motions without structural damage, but possibly experience some nonstructural damage; and
3. resist a major level of earthquake ground motion having an intensity equal to the strongest either experienced or forecast for the building site, without collapse, but possibly with some structural as well as nonstructural damage." (Kramer, 1996).

Deep foundations may be used to meet these building criteria, which we assume are an acceptable level of risk for the proposed construction.

In our opinion, excessive settlement due to seismic compaction, or co-seismic settlement, is a high risk within the area west of Clark Slough. Within the remainder of the site, the amount of estimated co-seismic settlement is manageable for facilities independent of the building structure such as floor slabs, provided they are designed and stiffened to withstand differential settlement. We estimate that co-seismic settlement may generally result in settlements of approximately 1 inch based on the results of the majority of CPT borings. Differential settlement may be estimated to be approximately ¾ inches. The estimated co-seismic settlement may be evaluated to a more accurate degree through a program of borehole drilling and sampling. For building structures founded upon deep foundations such as piles, the co-seismic settlement would not be expected to cause adverse effects on the building structure. The deep foundations should be designed for the drag forces due to soil settlement.

The building floor slabs may be supported on grade, with the understanding that settlement may occur due to co-seismic settlement as discussed above. The upper soils will likely need to be over-excavated and replaced as engineered fill to a certain depth that should be determined during detailed geotechnical investigations, say 3 feet for conceptual purposes, to provide a uniform support for slabs-on-grade. Floor slabs-on-grade will need to be stiffened to withstand the estimated settlements.

6.0 Additional Services

Design-level recommendations for site preparation, foundations, and appurtenant facilities were beyond the scope of the current geotechnical investigation. These services will require a more detailed field investigations specific to the proposed development within a specific area. A proposal for these additional services can be provided upon request.

7.0 Limitations

This report has been prepared for the specific application to the conceptual planning for the development of the Balloon Tract as discussed herein. SHN prepared the findings and conclusions presented herein in accordance with generally accepted geotechnical engineering practices at the time and location that this report was prepared. No other warranty, express or implied, is made.

Soil and rock materials are typically not homogeneous in type, strength, and other geotechnical properties, and can vary between points of observation and exploration. In addition, groundwater and soil moisture conditions can vary seasonally and for other reasons. SHN does not and cannot have a complete knowledge of the subsurface conditions underlying a site. The conclusions presented in this report are based upon the findings at the points of exploration, interpolation and extrapolation of information between and beyond the points of observation, which are subject to confirmation of the conditions revealed by construction.

The scope of SHN's geotechnical services did not include assessment for the presence or absence of hazardous/toxic substances in the soil, ground water, surface water, or atmosphere, or the presence of any environmentally sensitive habitats or culturally significant areas.

8.0 References

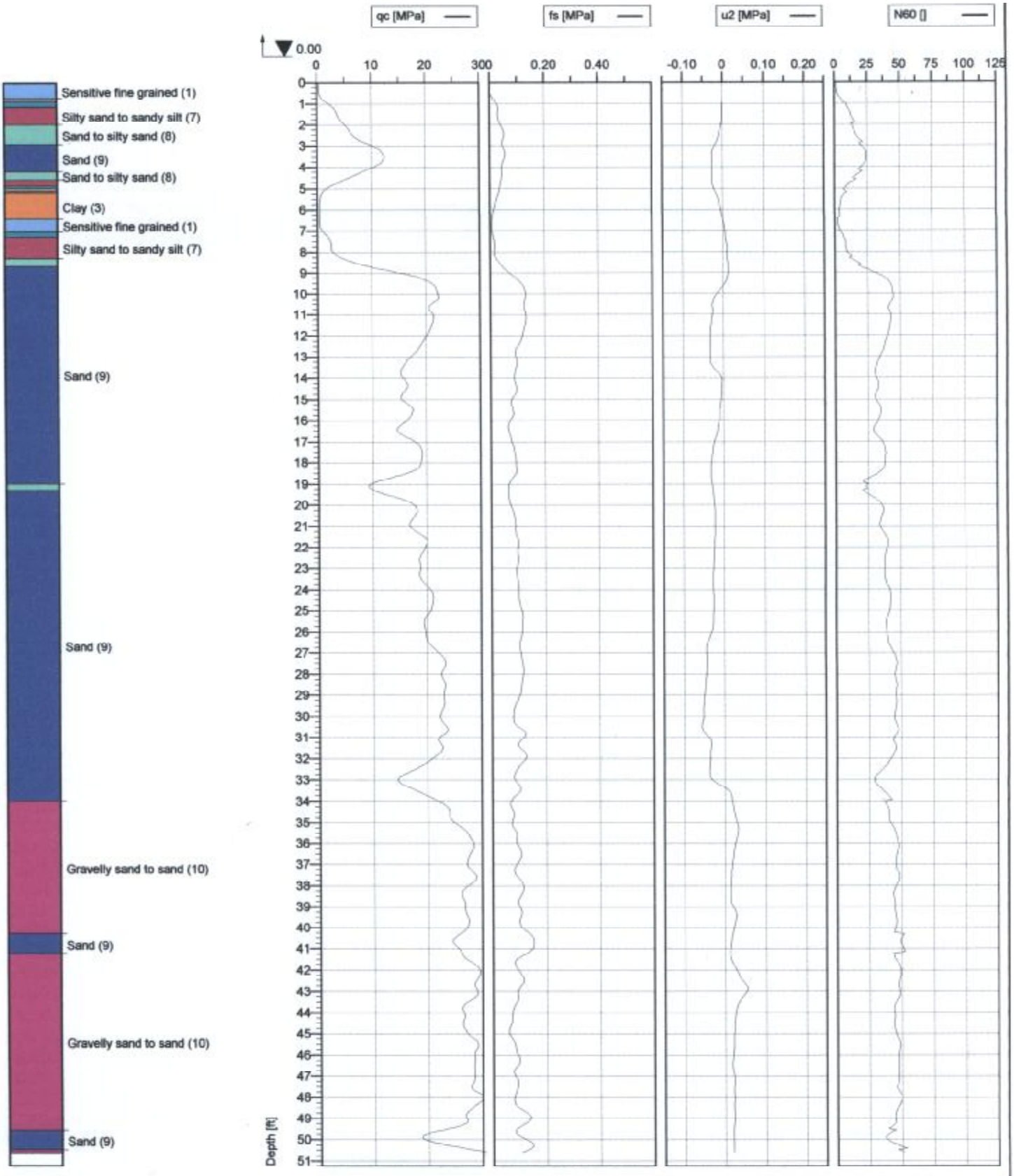
International Conference of Building Officials (1997). Uniform Building Code.

Kramer, S. L. (1996). Geotechnical Earthquake Engineering, Prentice-Hall international series in civil engineering and engineering mechanics, Prentice Hall, Upper Saddle River, N.J.

Youd, T.L. and I.M. Idriss. (2001), Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 127, No. 10, October 2001.

Appendix A

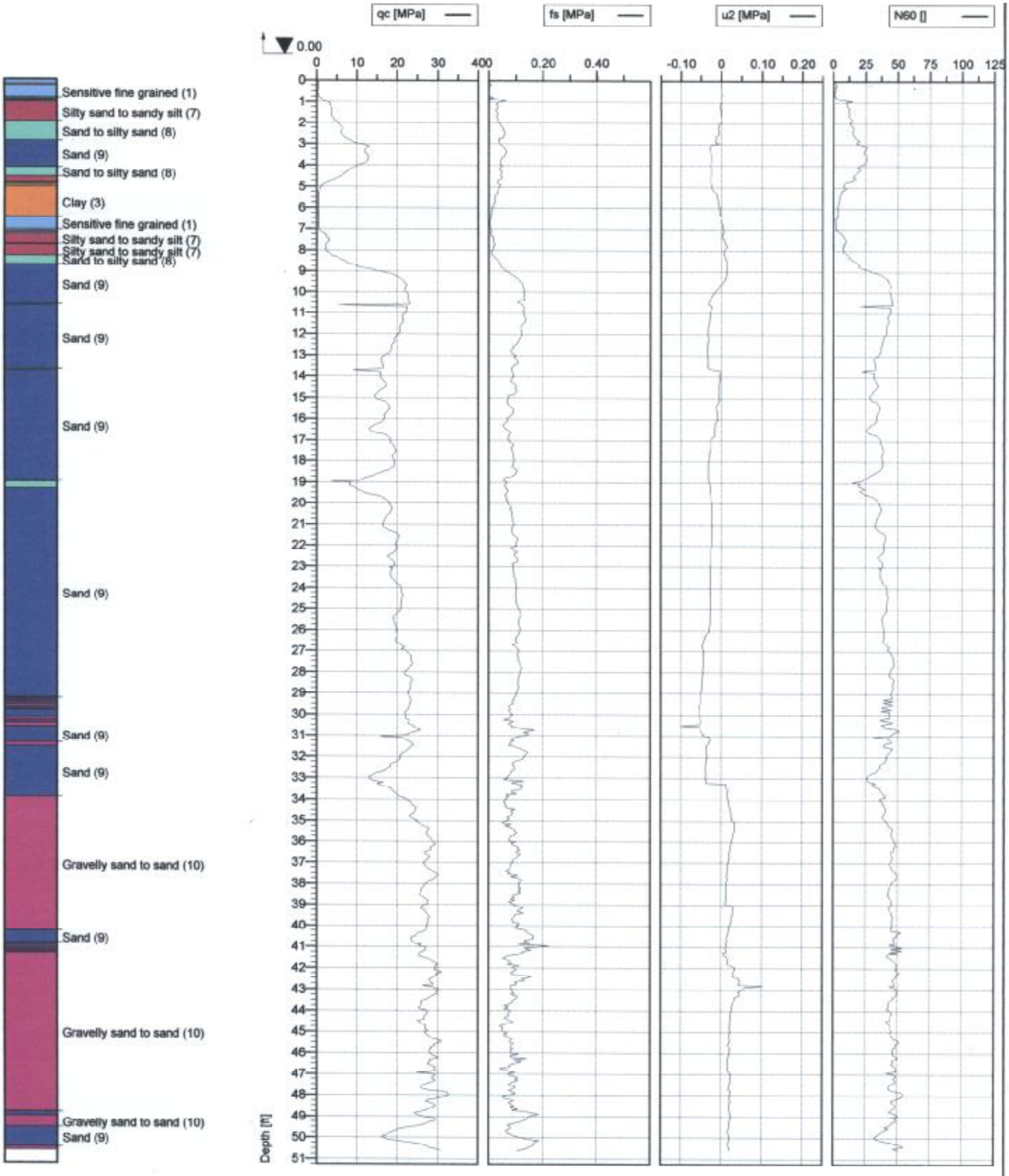
Subsurface Exploration Logs – SHN CPT Logs



U2

Cone No: 3335
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Test no: G3152-1	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00
Client: SHN Eureka,Ca		Date: 2/8/2006 / Scale: 1 : 76
Project: Balloon Track		Page: 1/1 / Fig:
		File: G3152-1.cpd



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Tip area [cm2]: 10
Sleeve area [cm2]: 150

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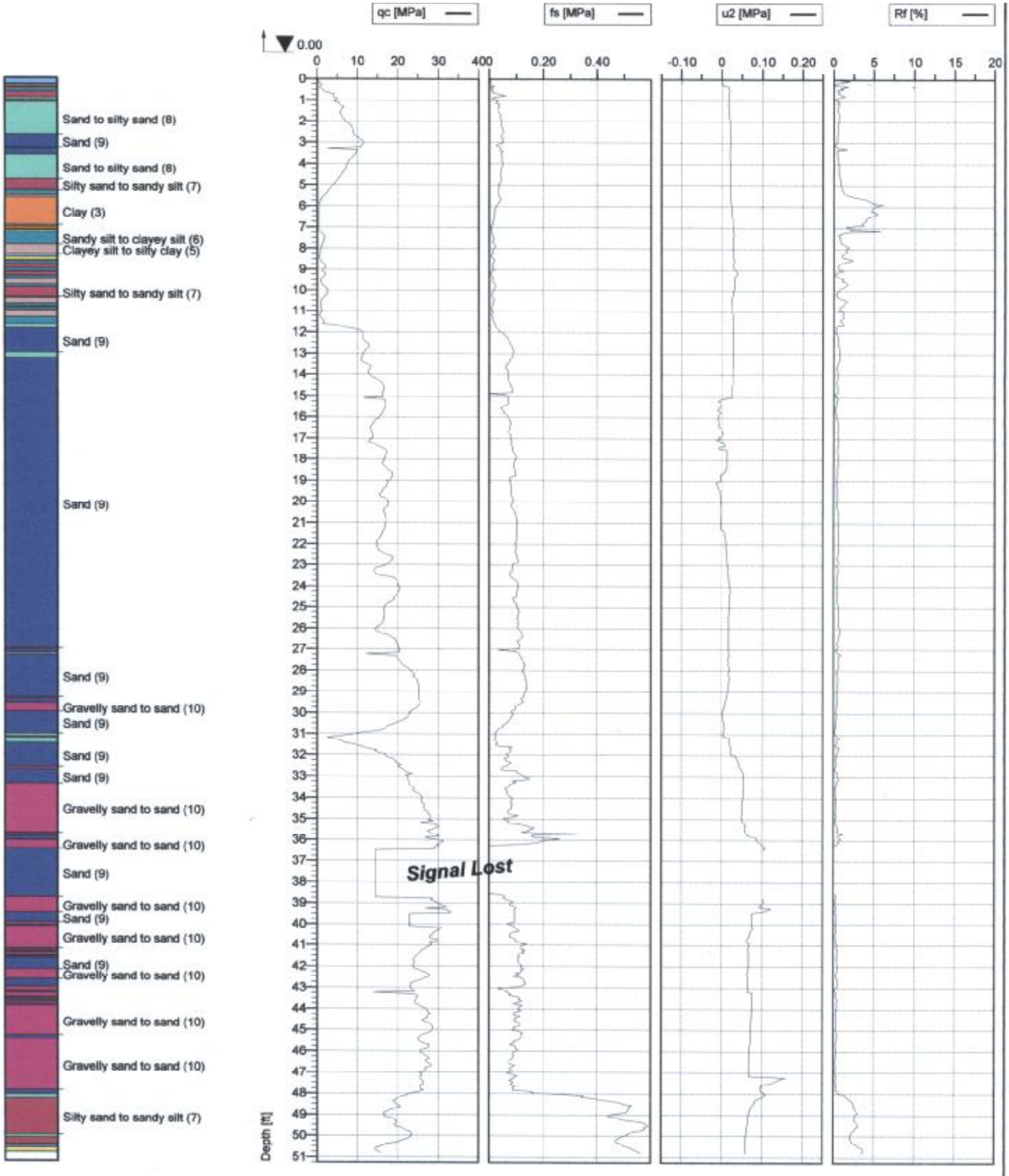
Project: Balloon Track		Page: 1/1	Fig:
		File: G3152-2.CPT	



Cone No: 3335
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Test no: G3152-3A	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	
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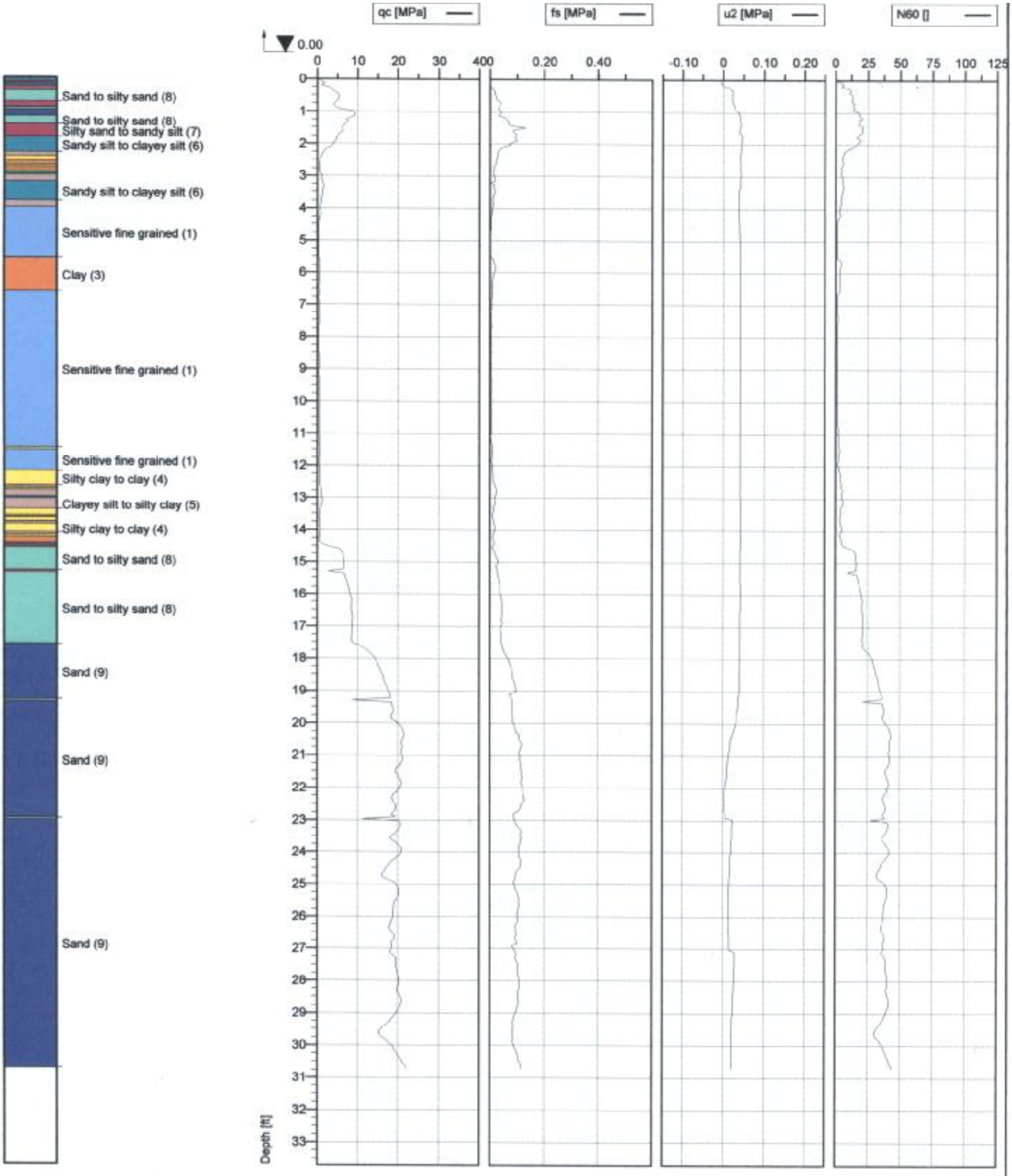
Project: Balloon Track		Page: 1/1	Fig:
		File: G3152-3a.CPT	



Cone No: 3335
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Test no: G3152-4	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00
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Project: Balloon Track		Page: 1/1 / Fig:
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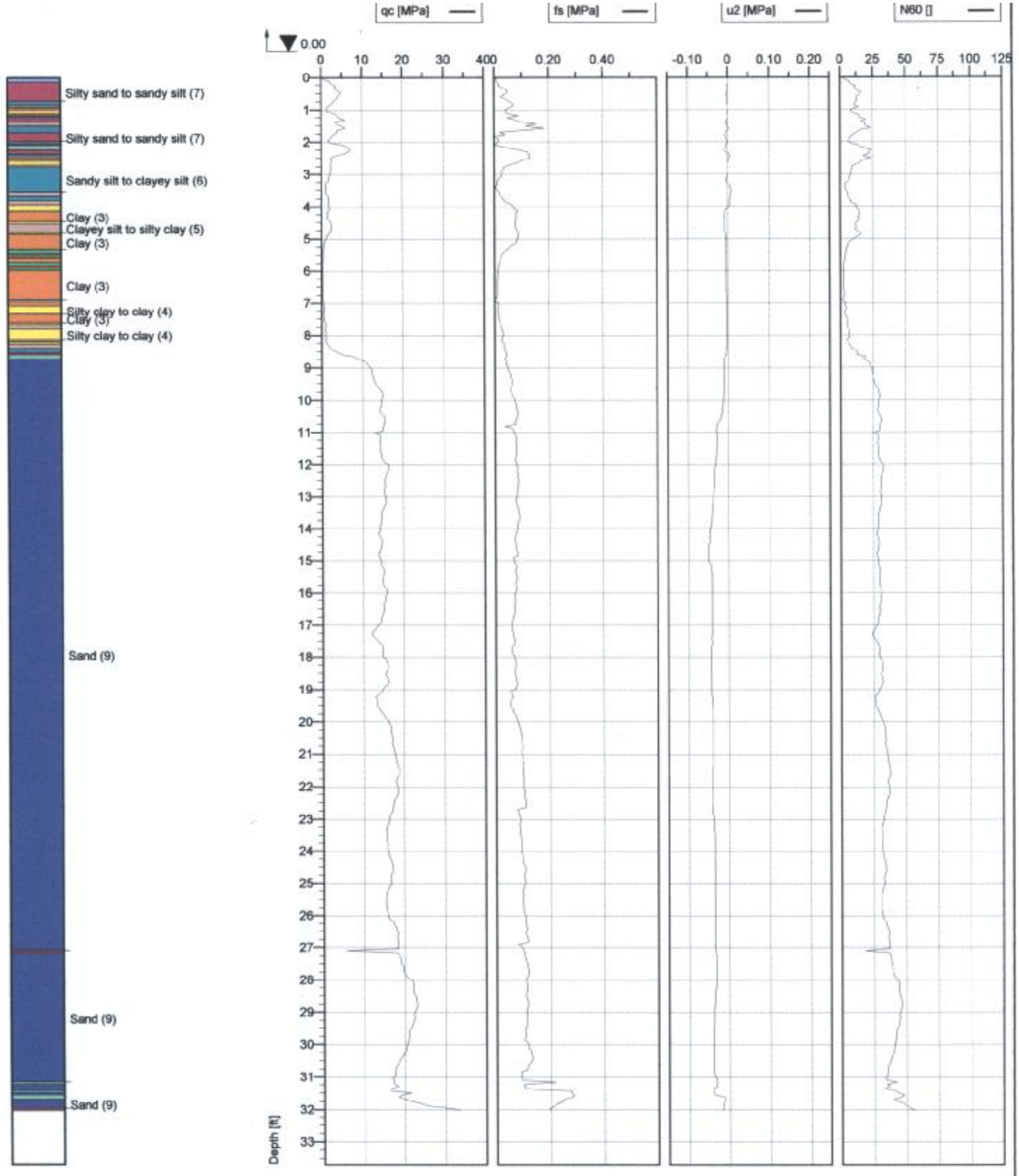

Cone No: 3335
Tip area [cm2]: 10
Sleeve area [cm2]: 150

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Project: Balloon Track		Page: 1/1	Fig:
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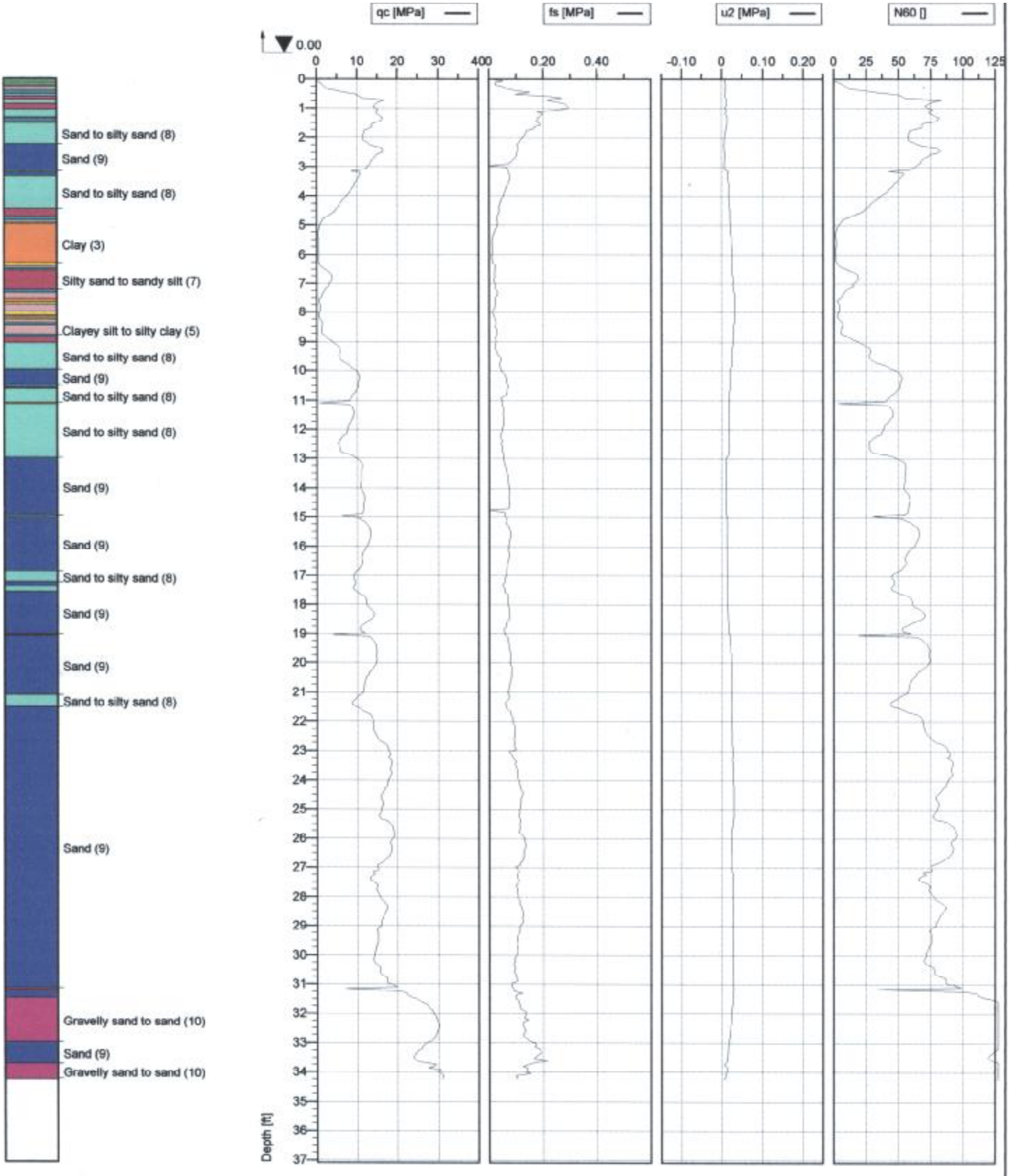


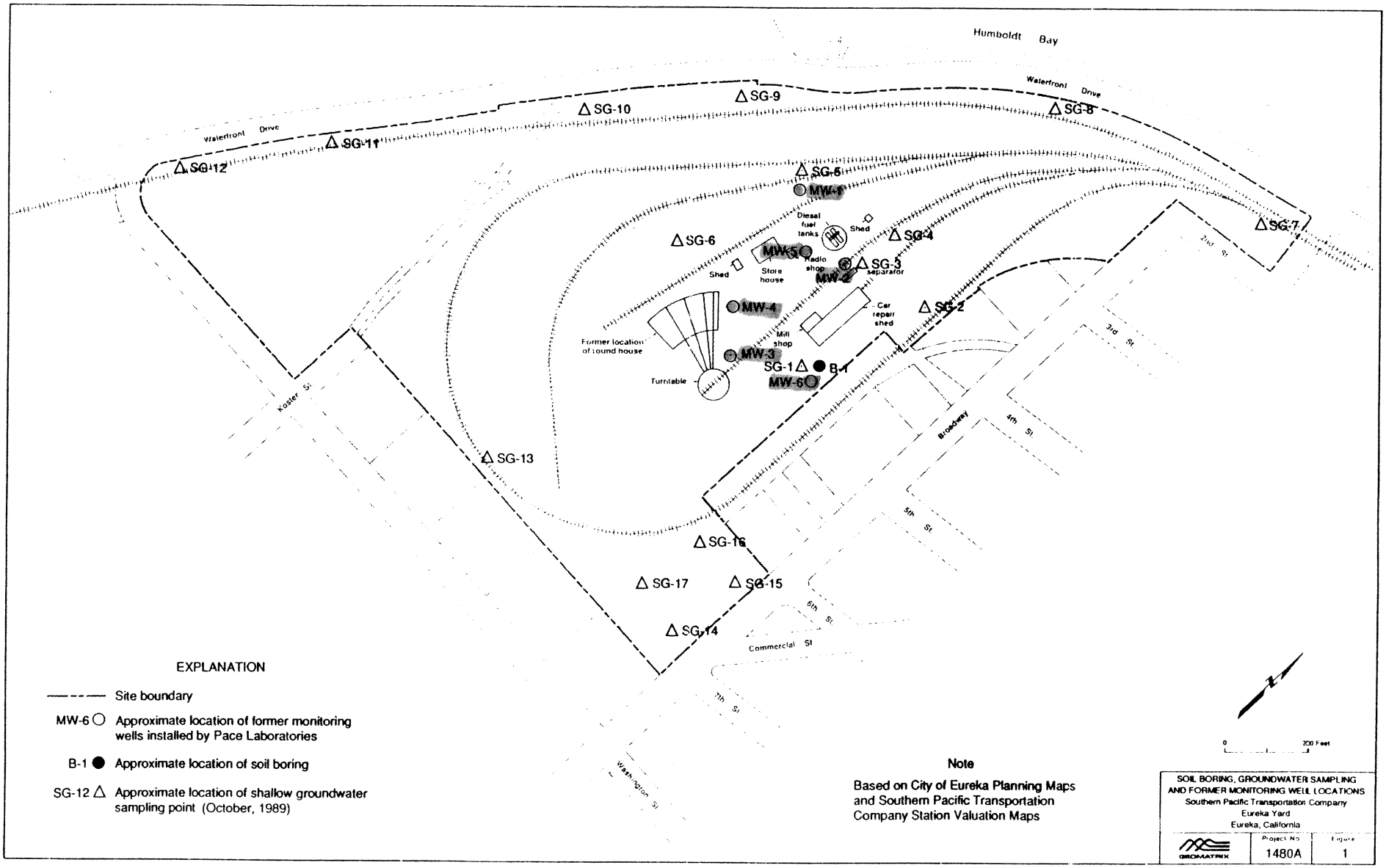
U2

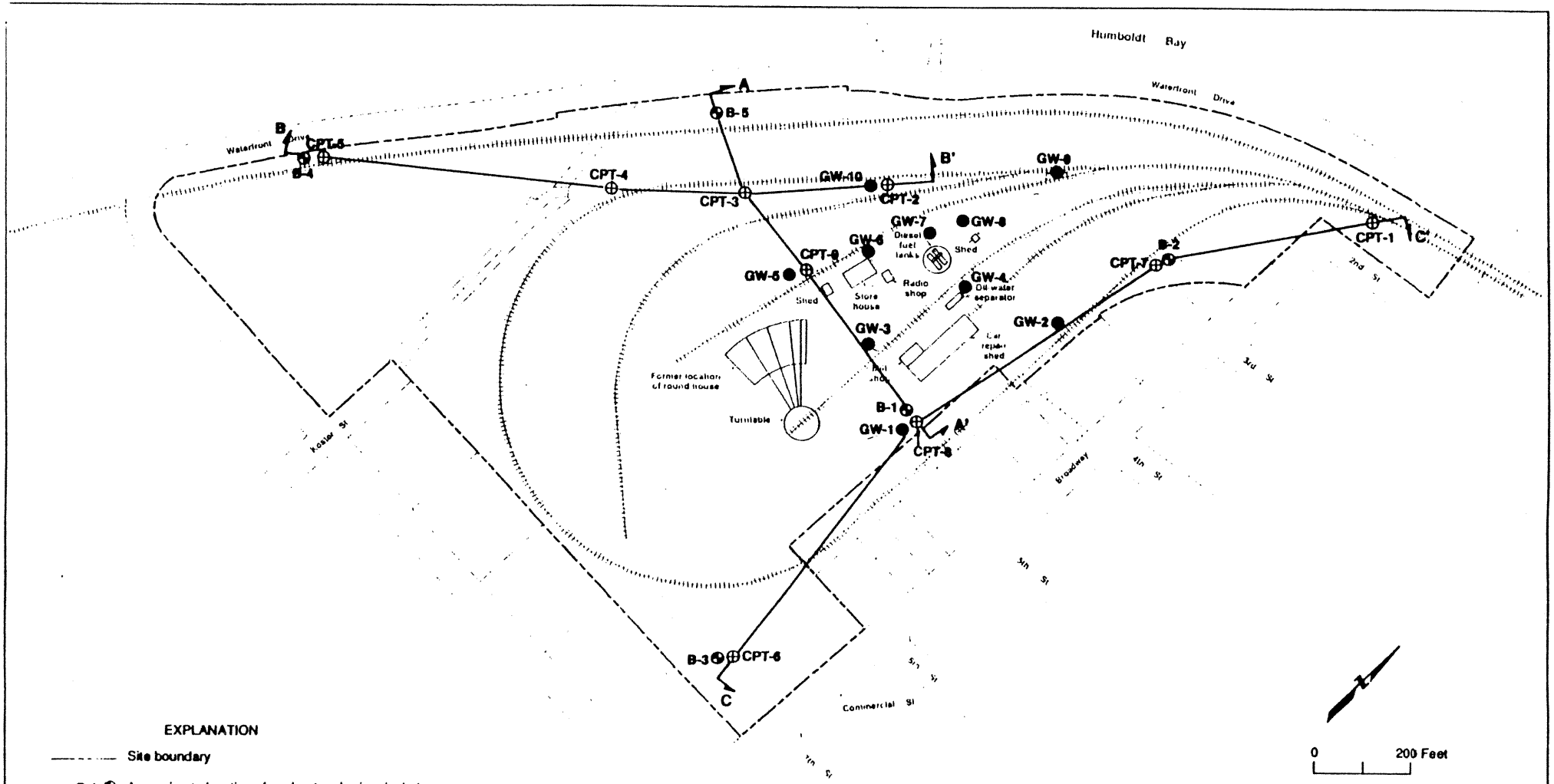
Cone No: 3335
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Test no: G3152-6	Position: X: 0.00 m, Y: 0.00 m		Ground level: 0.00
Client:	SHN Eureka, Ca	Date: 2/8/2006	Scale: 1 : 55
Project:	Balloon Track	Page: 1/1	Fig:
		File: G3152-6.CPT	

Appendix B

Subsurface Exploration Logs by Others


Humboldt Bay
Waterfront Drive
Waterfront Drive
SG-12
SG-11
SG-10
SG-9
SG-8
SG-7
SG-6
SG-5
SG-4
SG-3
SG-2
SG-1
SG-13
SG-14
SG-15
SG-16
SG-17
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6
B-1
Diesel fuel tanks
Shed
Radio shop
Store house
Shed
Oil separator
Car repair shed
Mill shop
Former location of round house
Turntable
Koster St
2nd St
3rd St
4th St
5th St
6th St
7th St
Broadway
Commercial St
Washington St
EXPLANATION
Site boundary
MW-6 ○ Approximate location of former monitoring wells installed by Pace Laboratories
B-1 ● Approximate location of soil boring
SG-12 △ Approximate location of shallow groundwater sampling point (October, 1989)
Note
Based on City of Eureka Planning Maps and Southern Pacific Transportation Company Station Valuation Maps
0
200 Feet
SOIL BORING, GROUNDWATER SAMPLING AND FORMER MONITORING WELL LOCATIONS
Southern Pacific Transportation Company
Eureka Yard
Eureka, California
GEOMATRIX
Project No.
1480A
Figure
1



EXPLANATION

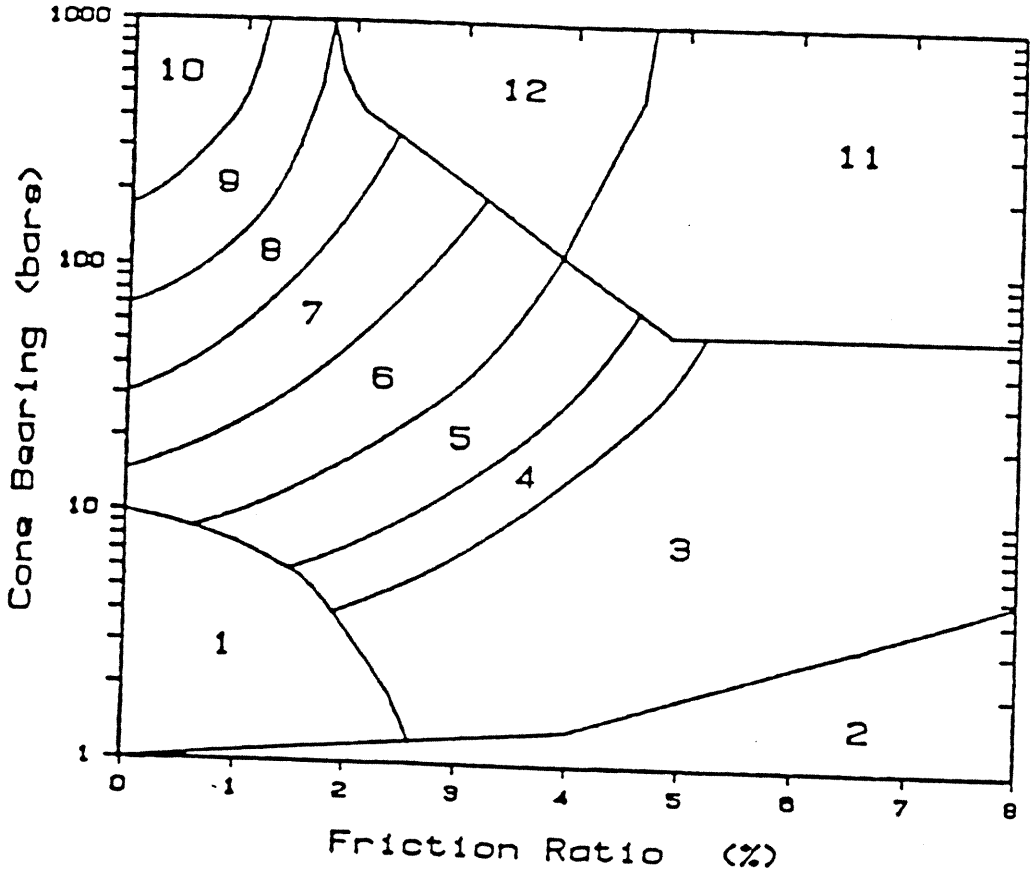
- Site boundary
- B-1 ⊕ Approximate location of exploratory boring; includes B-1, which was completed during an earlier phase of work
- CPT-1 ⊕ Approximate location of CPT
- GW-1 ● Approximate location of shallow groundwater sample
- A — A' Location of geologic cross section

Note
Based on City of Eureka Planning Maps and Southern Pacific Transportation Company Station Valuation Maps.

SOIL BORING, CPT, AND GROUNDWATER SAMPLE LOCATIONS
SPTCo. Eureka Yard Site
Eureka, California

GEOMATRIX	Project No. 1480A-48007	Figure 1

1 bar = 100 kPa = 1.02 kg/cm^2 = 1.04 tsf



Zone	Soil Behaviour Type	Q_c/N
1)	sensitive fine grained	2
2)	organic material	1
3)	clay	1
4)	silty clay to clay	1.5
5)	clayey silt to silty clay	2
6)	sandy silt to clayey silt	2.5
7)	silty sand to sandy silt	3
8)	sand to silty sand	4
9)	sand	5
10)	gravelly sand to sand	6
11)	very stiff fine grained (*)	1
12)	sand to clayey sand (*)	2

(*) overconsolidated or cemented

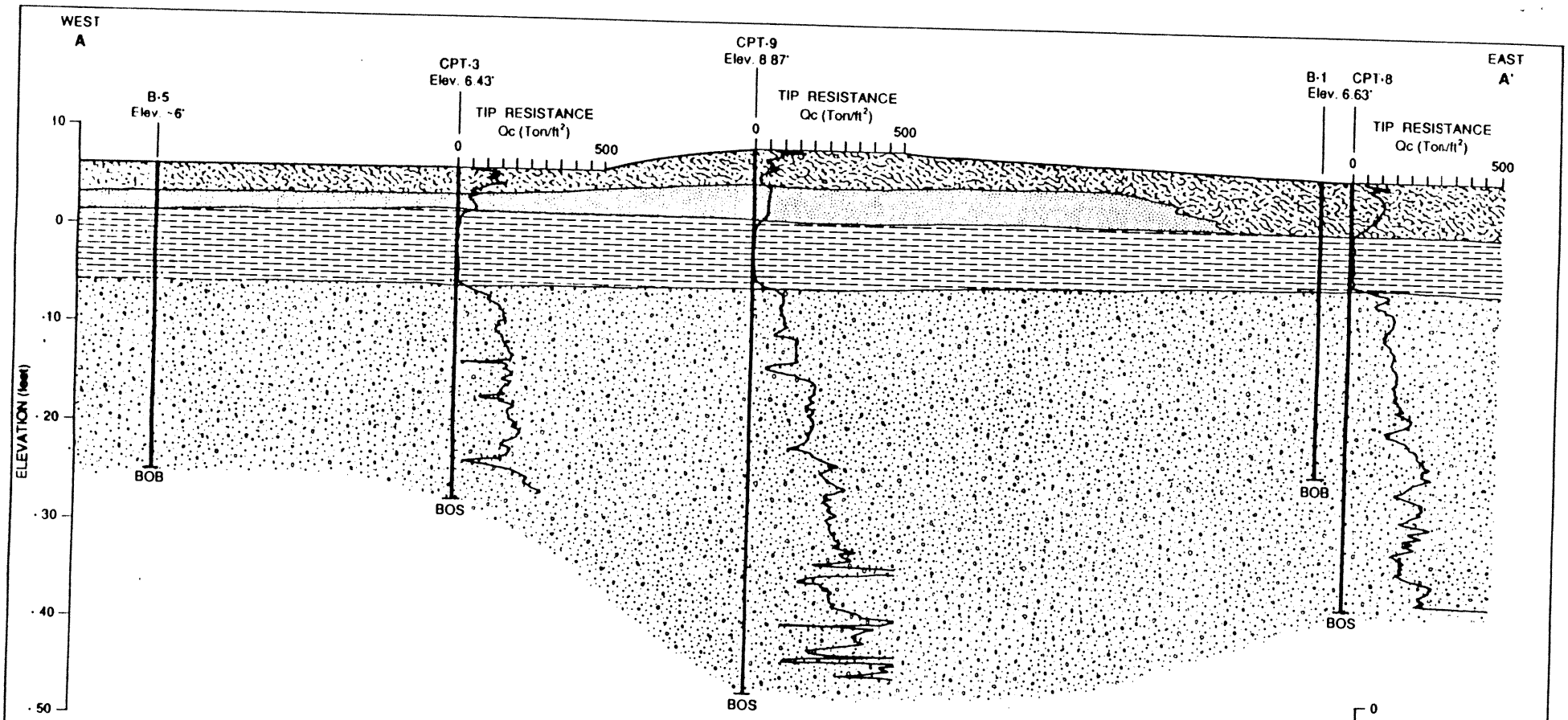
From Robertson and Campanella, 1984.

GEOMATRIX

SIMPLIFIED SOIL BEHAVIOR TYPE CHART
FOR STANDARD ELECTRONIC FRICTION CONE
SPTCo. Eureka Yard Site
Eureka, California

Figure 2

Project No. 1480A-48007



EXPLANATION

Generalized Hydrogeologic Units

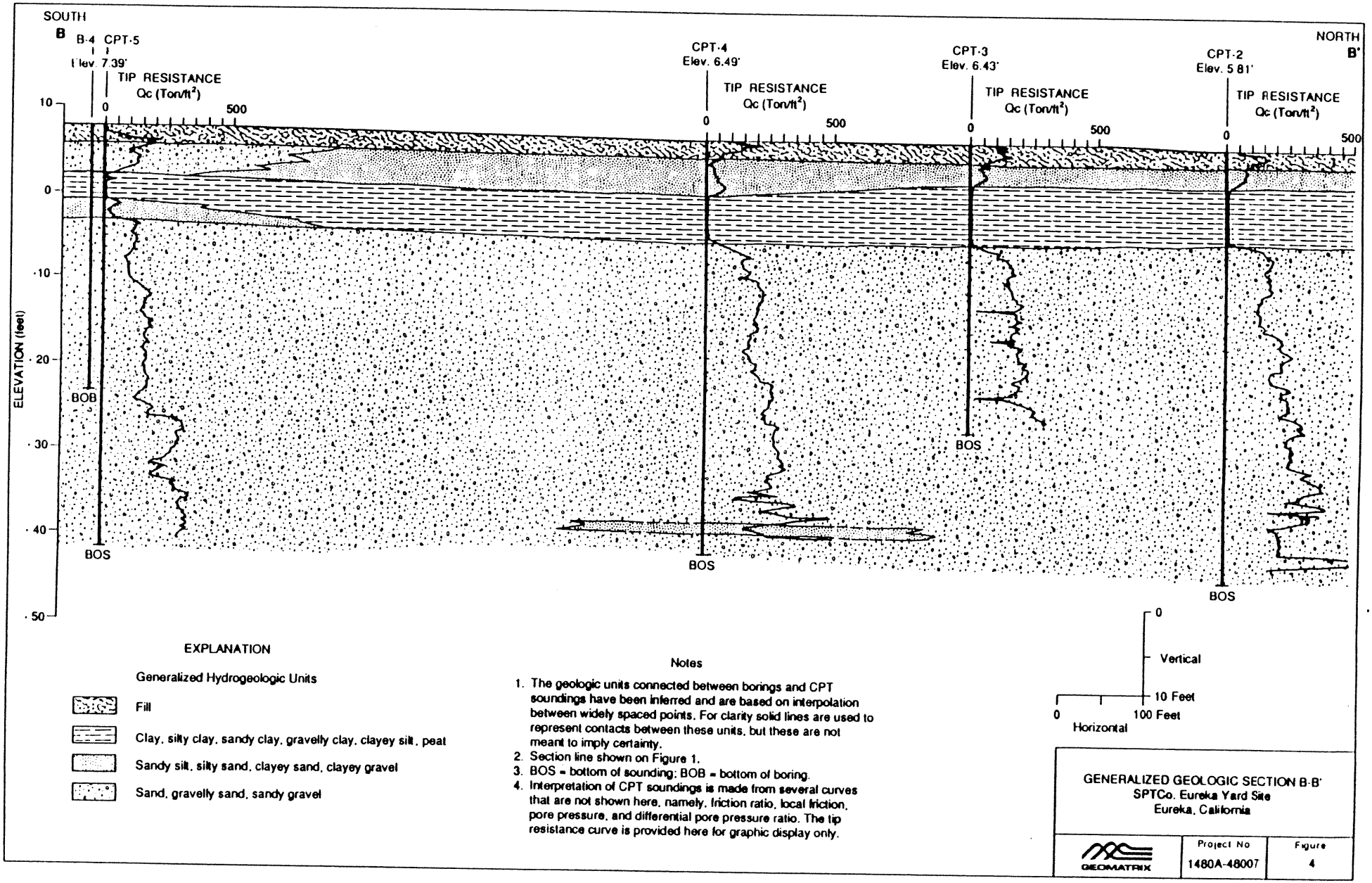
- Fill
- Clay, silty clay, sandy clay, gravelly clay, clayey silt, peat
- Sandy silt, silty sand, clayey sand, clayey gravel
- Sand, gravelly sand, sandy gravel

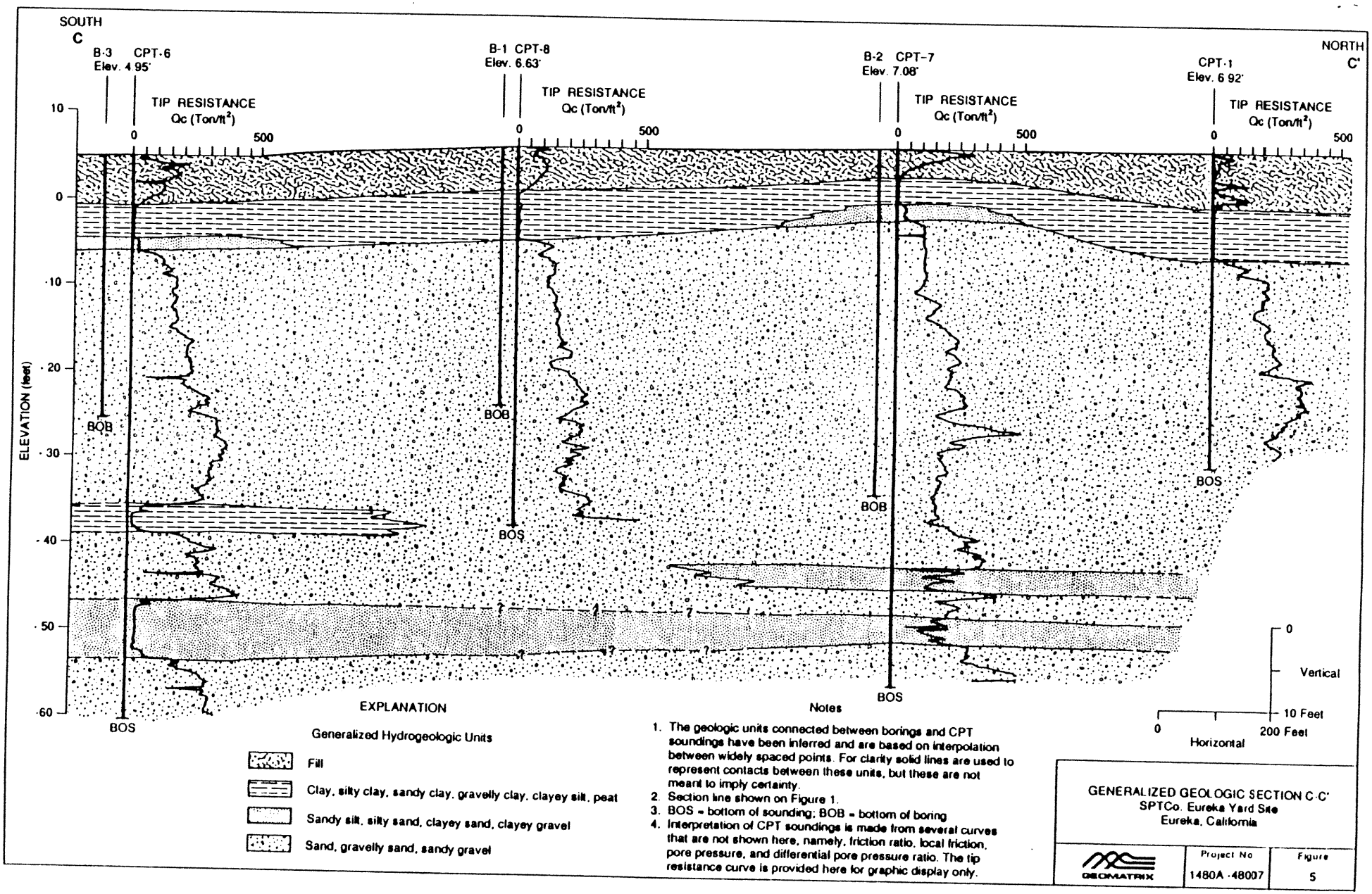
Notes

1. The geologic units connected between borings and CPT soundings have been inferred and are based on interpolation between widely spaced points. For clarity solid lines are used to represent contacts between these units, but these are not meant to imply certainty.
2. Section line shown on Figure 1.
3. BOS = bottom of sounding; BOB = bottom of boring.
4. Interpretation of CPT soundings is made from several curves that are not shown here, namely, friction ratio, local friction, pore pressure, and differential pore pressure ratio. The tip resistance curve is provided here for graphic display only.

GENERALIZED GEOLOGIC SECTION A-A'
SPTCo. Eureka Yard Site
Eureka, California

GEOMATRIX | Project No. 1480A-48007 | Figure 3


SOUTH
B
B-4
CPT-5
Elev. 7.39'
TIP RESISTANCE
Qc (Tsf/ft²)
0
500
CPT-4
Elev. 6.49'
CPT-3
Elev. 6.43'
CPT-2
Elev. 5.81'
NORTH
B'
10
0
-10
-20
-30
-40
-50
ELEVATION (feet)
BOB
BOS
EXPLANATION
Generalized Hydrogeologic Units
Fill
Clay, silty clay, sandy clay, gravelly clay, clayey silt, peat
Sandy silt, silty sand, clayey sand, clayey gravel
Sand, gravelly sand, sandy gravel
Notes
1. The geologic units connected between borings and CPT soundings have been inferred and are based on interpolation between widely spaced points. For clarity solid lines are used to represent contacts between these units, but these are not meant to imply certainty.
2. Section line shown on Figure 1.
3. BOS = bottom of sounding; BOB = bottom of boring.
4. Interpretation of CPT soundings is made from several curves that are not shown here, namely, friction ratio, local friction, pore pressure, and differential pore pressure ratio. The tip resistance curve is provided here for graphic display only.
0
Vertical
10 Feet
0
100 Feet
Horizontal
GENERALIZED GEOLOGIC SECTION B-B'
SPTCo. Eureka Yard Site
Eureka, California
GEOMATRIX
Project No
1480A-48007
Figure
4



EXPLANATION

Generalized Hydrogeologic Units

- Fill
- Clay, silty clay, sandy clay, gravelly clay, clayey silt, peat
- Sandy silt, silty sand, clayey sand, clayey gravel
- Sand, gravelly sand, sandy gravel

Notes

1. The geologic units connected between borings and CPT soundings have been inferred and are based on interpolation between widely spaced points. For clarity solid lines are used to represent contacts between these units, but these are not meant to imply certainty.
2. Section line shown on Figure 1.
3. BOS = bottom of sounding; BOB = bottom of boring
4. Interpretation of CPT soundings is made from several curves that are not shown here, namely, friction ratio, local friction, pore pressure, and differential pore pressure ratio. The tip resistance curve is provided here for graphic display only.

GENERALIZED GEOLOGIC SECTION C-C'
SPTCo. Eureka Yard Site
Eureka, California

GEOMATRIX	Project No	Figure
	1480A-48007	5

GEOMATRIX

ATTACHMENT A

SOIL BORING LOGS

PROJECT: SPTCo. - EUREKA YARD
Eureka, California

Log of Boring No. B-1

BORING LOCATION: Southeast of former car repair shed (at GW-1, CPT-8)

ELEVATION AND DATUM: 6.63 ft (NGVD)

DRILLING CONTRACTOR: All Terrain Drilling

DATE STARTED: 8/21/89

DATE FINISHED: 8/21/89

DRILLING METHOD: 8" OD hollow stem auger

TOTAL DEPTH: 30'

MEASURING POINT: Ground surface

DRILLING EQUIPMENT: CME 55

DEPTH TO WATER	FIRST	COMPL.	24 HRS.
	3.6'		

SAMPLING METHOD: Dry core - continuous (5' barrel)

LOGGED BY: N. Bice

HAMMER WEIGHT: 140 lbs.

DROP: 30"

RESPONSIBLE PROFESSIONAL: N. Bice

REG. NO. CEG #1259

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/Foot	DESCRIPTION (NAME (USCS Symbol): color, moist, % by wt., plast., density, structure, cementation, react. w/HCl, geo. inter.)	REMARKS
				Surface Elevation:	
1				FILL Well backfill material, coarse sand	
5				SAND (SP) Dark gray, wet, clean, fine grained, predominantly quartz	
				PEAT (PT) Upper 2" black, mixture of roots and silty clay (80% roots, 20% clay)	
10				SAND (SW) Very dark gray, wet, 10% silt, fine grained, predominantly quartz	
15				SAND (SP) Very dark gray, wet, clean, 90% medium sand, 10% coarse sand, rounded to subrounded, predominantly quartz, trace shells, trace gravel	
20					
25					Heaving sands

B-1-89/Modified

Geomatrix Consultants | Project No. 1480A-48007 | Figure A-1

PROJECT: SPTCo. - EUREKA YARD
Eureka, California

Log of Boring No. B-1 cont'd.

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/Foot	DESCRIPTION NAME (USCS Symbol): color, moist, % by wt., plast., density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
30				SAND (SP) Very dark gray, wet, clean, 90% medium sand, 10% coarse sand, rounded to subrounded, predominantly quartz, trace shells, trace gravel	
				Bottom of boring at 30 feet	
35					
40					
45					
50					
55					
60					

B-2-89/Modified

PROJECT: SPTCo. - EUREKA YARD Eureka, California		**Log of Boring No. B-2**	
BORING LOCATION: West of 3rd Street (at CPT 7)		ELEVATION AND DATUM: 7.08 ft (NGVD)	
DRILLING CONTRACTOR: All Terrain Drilling		DATE STARTED: 2/22/90	DATE FINISHED: 2/22/90
DRILLING METHOD: 8" OD hollow stem auger		TOTAL DEPTH: 40'	MEASURING POINT: Ground surface
DRILLING EQUIPMENT: CME 75		DEPTH TO WATER: FIRST 6'	COMPL. / 24 HRS.
SAMPLING METHOD: Modified California split spoon (1.5')		LOGGED BY: D. Zemo, T. Eckard	
HAMMER WEIGHT: 140 lbs.	DROP: 30"	RESPONSIBLE PROFESSIONAL: N. Bice	REG. NO. CEG #1259

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/Foot	DESCRIPTION NAME (USCS Symbol): color, moist, % by wt., plast., density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	REMARKS
1			71	GRAVEL FILL Varies from medium gravel to silty sand; diesel staining and odor from 1' to 4.5'; petroleum hydrocarbon product at 1.5'	
			39		
			30		
5			8	SILTY SAND (SM) Dark gray, moist, 80% medium sand, 5% fine sand, 15% silt, no distinct bedding, loose, abundant shell fragments	Water at 6'
			6		
			41	CLAY (CL) Dark gray, wet, medium plastic, stiff	Sharp contact at 7'
10			41	SAND (SP) Dark gray, wet, 75% medium sand, 20% fine sand, 5% silt, no distinct bedding, loose, abundant shell fragments	
15			39		
20			60		
25			82		

B-1-89/Modified

Geomatrix Consultants	Project No. 1480A-48007	Figure A-3

PROJECT: SPTCo. - EUREKA YARD
Eureka, California

Log of Boring No. B-2 cont'd.

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/Foot	DESCRIPTION: NAME (USCS Symbol): color, moist, % by wt., plast., density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
30				SAND (SP) Dark gray, wet, 75% medium sand, 20% fine sand, 5% silt, nodistinct bedding, loose, abundant shell fragments	
35					
40			82	Color change to dark greenish gray (5GY 4/1), wet, 25% coarse sand, 70% medium sand, 5% fine sand, loose, no distinct bedding	
				Bottom of boring at 40 feet	
45					
50					
55					
60					

B-2-89/Modified

PROJECT: SPTCo. - EUREKA YARD
Eureka, California

Log of Boring No. B-3

BORING LOCATION: Washington/Broadway (at CPT-6, SG-17)

ELEVATION AND DATUM: 4.95 ft (NGVD)

DRILLING CONTRACTOR: All Terrain Drilling

DATE STARTED: 2/22/90

DATE FINISHED: 2/22/90

DRILLING METHOD: 8" OD hollow stem auger

TOTAL DEPTH: 31'

MEASURING POINT: Ground surface

DRILLING EQUIPMENT: CME 75

DEPTH TO WATER: FIRST 7' | COMPL. | 24 HRS.

SAMPLING METHOD: Modified California split spoon (1.5')

LOGGED BY: D. Zemo, T. Eckard

HAMMER WEIGHT: 140 lbs. | DROP: 30"

RESPONSIBLE PROFESSIONAL: N. Bice | REG. NO. CEG #1259

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/Foot	DESCRIPTION: NAME (USCS Symbol): color, moist, % by wt., plast., density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
				Surface Elevation:	
1			57	GRAVEL FILL Iron-oxide staining; varies from medium gravel to silty sand	
			15		
			4		
5			4		
			16	CLAY (CL) Light olive gray, (5Y 5/2) moist, stiff, medium plastic; interbedded with fine sand (SP) at 6.2'	Water at 7'
			6		
			16	SANDY CLAY (CL) with CLAYEY SAND (SC) (interbedded) Clay is medium gray, stiff, contains roots, wet, sand is 40% medium, 40% fine, 20% silt, wet	
10				SILTY SAND (SM) Dark gray, wet, 50% medium sand, 30% fine sand, 20% silt, no distinct bedding	
			19	SAND (SP) Dark gray, wet, 60% medium sand, 40% fine sand, loose, no distinct bedding	
15					
20			40	SAND (SW) Dark gray, wet, 10 - 20% fine gravel (<1"), 60% coarse sand, 10 - 20% medium sand, 10% fine sand, loose, no distinct bedding, trace shell fragments, grades to gravelly sand	
25			52	SAND (SW) with GRAVEL Dark gray, wet, 15% fine gravel, 60% coarse sand, 15% medium sand, 10% fine sand, loose, no distinct bedding, trace shell fragments	

B-1-89/Modified

PROJECT: SPTCo. - EUREKA YARD
Eureka, California

Log of Boring No. B-3 cont'd.

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/Foot	DESCRIPTION NAME (USCS Symbol): color, moist, % by wt., plast., density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
30			49	SAND (SW) with GRAVEL Dark gray, wet, 15% fine gravel, 60% coarse sand, 15% medium sand, 10% fine sand, loose, no distinct bedding, trace shell fragments	
				GRAVELLY SAND (SW) Dark gray, wet, 40% coarse sand, 25 - 30% fine gravel,15% medium sand, 15% fine sand, loose, no distinct bedding, trace shell fragments	
35				Bottom of boring at 31'	
40					
45					
50					
55					
60					

B-2-89/Modified

PROJECT: SPTCo. - EUREKA YARD
Eureka, California

Log of Boring No. B-4

BORING LOCATION: Washington/Waterfront (at CPT-5, SG-12)

ELEVATION AND DATUM: 7.39 ft (NGVD)

DRILLING CONTRACTOR: All Terrain Drilling

DATE STARTED: 2/23/90

DATE FINISHED: 2/23/90

DRILLING METHOD: 8" OD hollow stem auger

TOTAL DEPTH: 31'

MEASURING POINT: Ground surface

DRILLING EQUIPMENT: CME 75

DEPTH TO WATER: FIRST 6' | COMPL. | 24 HRS.

SAMPLING METHOD: Modified California split spoon (1.5')

LOGGED BY: D. Zemo, T. Eckard

HAMMER WEIGHT: 140 lbs. | DROP: 30"

RESPONSIBLE PROFESSIONAL: N. Bice | REG. NO. CEG #1259

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/Foot	DESCRIPTION (NAME (USCS Symbol): color, moist, % by wt., plast., density, structure, cementation, react. w/HCl, geo. inter.)	REMARKS
				Surface Elevation:	
1			17	GRAVEL FILL Varies from 2" gravel to sandy clay	
			30	SAND (SP) Light olive gray (5Y 5/2), moist, 80% medium sand, 20% fine sand, loose, no distinct bedding	
5			35		
			39		
			10	SILTY CLAY (CH) Olive gray (5Y 4/1), wet <5% gravel (1"), soft, high plasticity	Water at 6'
			5	CLAY (CL) Olive gray, (5Y 4/1), wet, medium stiff, medium plasticity, trace laminations; roots	
10			15	SAND (SP) with CLAY Olive gray (5Y 4/1), wet, 50% medium sand, 50% fine sand, sandy clay interbeds, clay is medium stiff, medium plastic; roots	
			11	SAND (SP) Dark greenish gray (5GY 4/1), wet, 50% medium sand, 50% fine sand, <5% silt, no distinct bedding, loose	
15					
20			56		
25			39		

B-1-89/Modified

Geomatrix Consultants | Project No. 1480A-48007 | Figure A-7

PROJECT: SPTCo . - EUREKA YARD
Eureka, California

Log of Boring No. B-4 cont'd.

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/Foot	DESCRIPTION: NAME (USCS Symbol): color, moist, % by wt., plast., density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
30			56	SAND (SP) Dark greenish gray (5GY 4/1), wet, 50% medium sand, 50% fine sand, <5% silt, loose, no distinct bedding	
				Bottom of boring at 31'	
35					
40					
45					
50					
55					
60					

B-2-89/Modified

PROJECT: SPTCo. - EUREKA YARD
Eureka, California

Log of Boring No. B-5

BORING LOCATION: Near Waterfront Drive (at SG-10, SG-11A)

ELEVATION AND DATUM: Est. 6.0 ft. (NGVD)

DRILLING CONTRACTOR: All Terrain Drilling

DATE STARTED: 2/23/90

DATE FINISHED: 2/23/90

DRILLING METHOD: 8" OD hollow stem auger

TOTAL DEPTH: 31'

MEASURING POINT: Ground surface

DRILLING EQUIPMENT: CME 75

DEPTH TO WATER: FIRST 7' | COMPL. | 24 HRS.

SAMPLING METHOD: Modified California split spoon (1.5')

LOGGED BY: D. Zemo, T. Eckard

HAMMER WEIGHT: 140 lbs. | DROP: 30"

RESPONSIBLE PROFESSIONAL: N. Bice | REG. NO. CEG #1259

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/Foot	DESCRIPTION (NAME (USCS Symbol): color, moist, % by wt., plast., density, structure, cementation, react. w/HCl, geo. inter.)	REMARKS
				Surface Elevation:	
1			25	GRAVEL FILL Sandy, clayey, gravel up to 2"	
			25		
5					
			3	CLAY (CH) Medium to dark gray, wet, soft, high plasticity, trace fine sand, rootlets	Water at 7'
			4		
10				SILTY CLAY (CH) Medium to dark gray, wet, soft, high plasticity, few sand interbeds (1 cm thick), 5% fine sand, rootlets	
15			20	SAND (SP) Medium gray to dark greenish gray (5GY 4/1), wet, 25% coarse sand, 70% medium sand, 5% fine sand, <5% silt/clay, trace shell fragments	
20			59		
25			40		

B-1-89/Modified

PROJECT: SPTCo. - EUREKA YARD
Eureka, California

Log of Boring No. B-5 cont'd.

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/Foot	DESCRIPTION NAME (USCS Symbol): color, moist, % by wt., plast., density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
30			62	SAND (SP) Medium gray, wet, 50% medium sand, 50% fine sand, loose, no distinct bedding, trace fine gravel	
				Bottom of boring at 31'	
35					
40					
45					
50					
55					
60					

B-2-89/Modified

GEOMATRIX

ATTACHMENT B

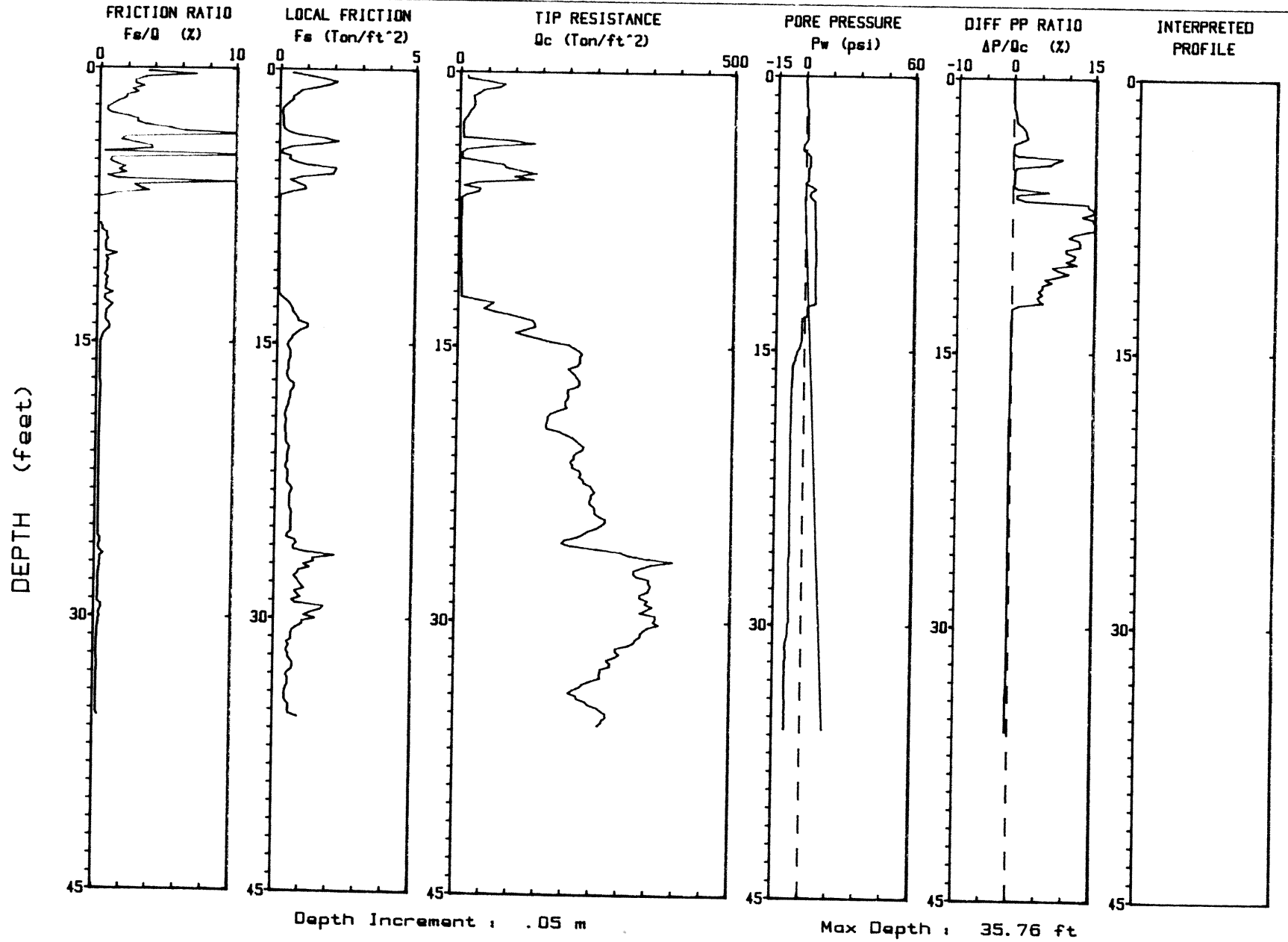
CPT SOUNDING LOGS

V B I

Operator : VIRGIL A. BAKER
Location : CPT-1

CPT Date : 02/22/90 13:49
Cone Used : 322

Sounding : 32 Pg 1 / 1
Job No. : 1488A



Depth Increment : .05 m

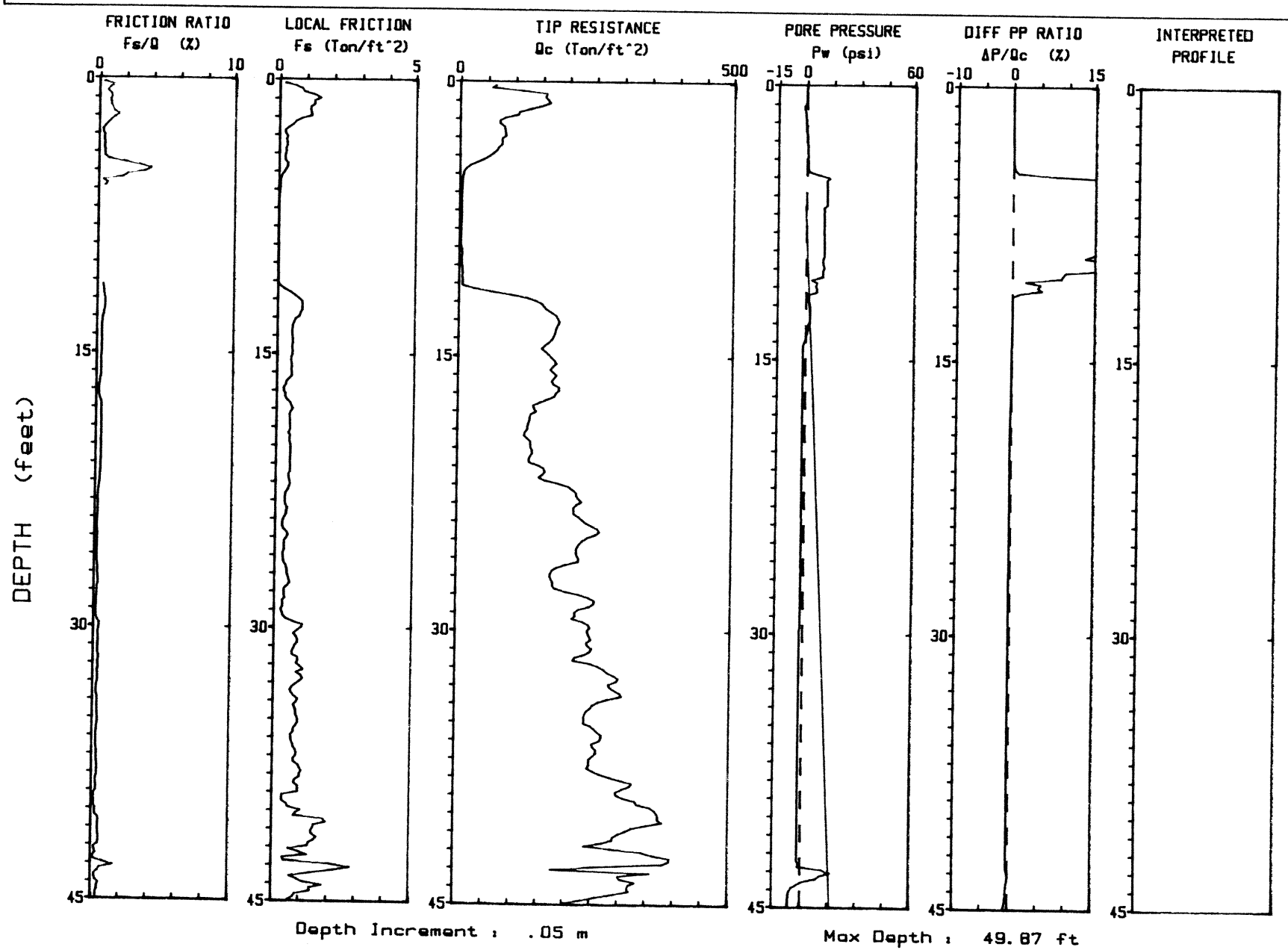
Max Depth : 35.76 ft

V B I

Operator : VIRGIL A. BAKER
Location : CPT-2

CPT Date : 02/22/90 14:58
Cone Used : 322

Sounding : 33 Pg 1 / 2
Job No. : 1488A



Depth Increment : .05 m

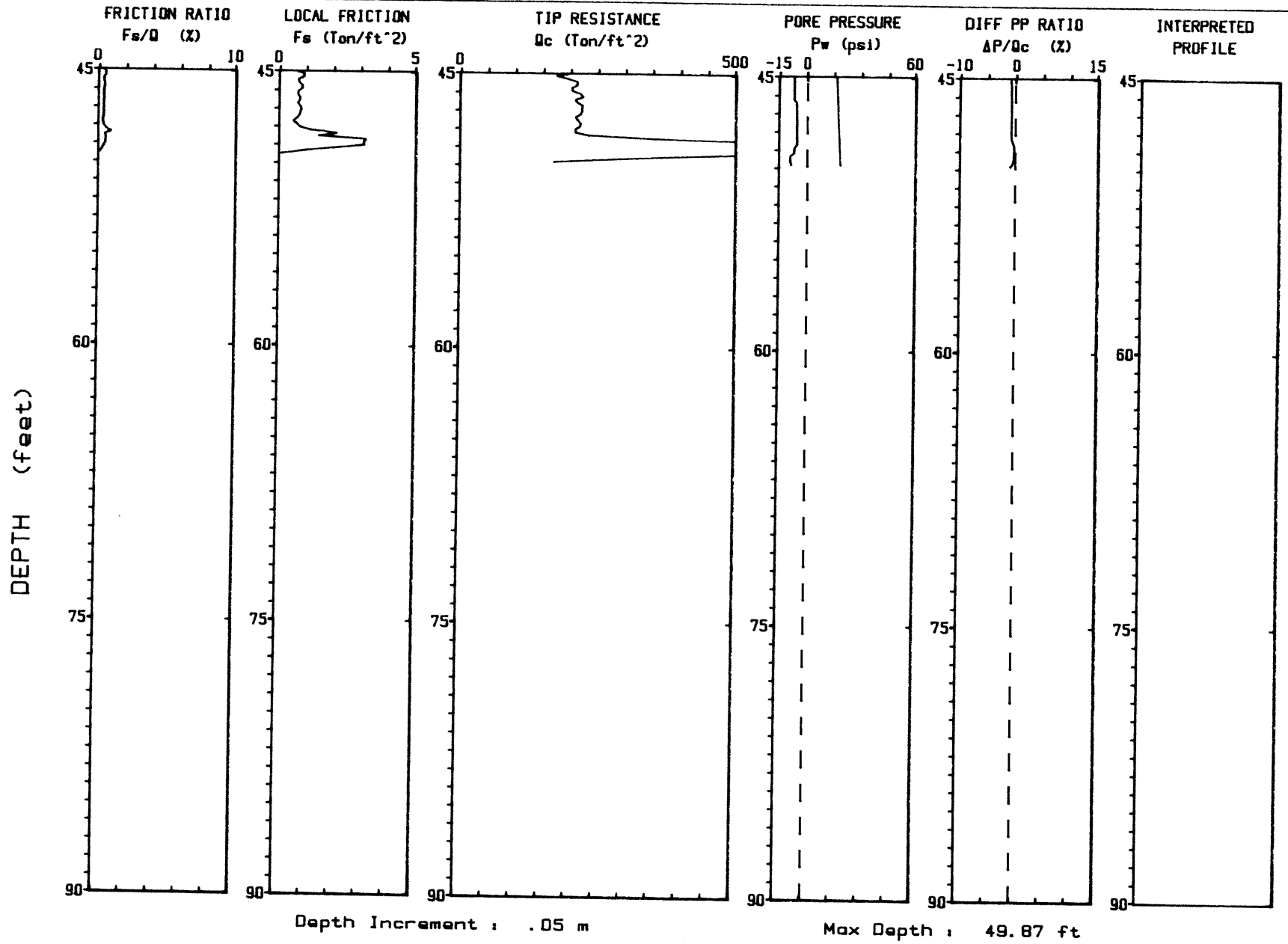
Max Depth : 49.87 ft

V B I

Operator : VIRGIL A. BAKER
Location : CPT-2

CPT Date : 02/22/90 14:58
Cone Used : 322

Sounding : 33 Pg 2 / 2
Job No. : 1488A



Depth Increment : .05 m

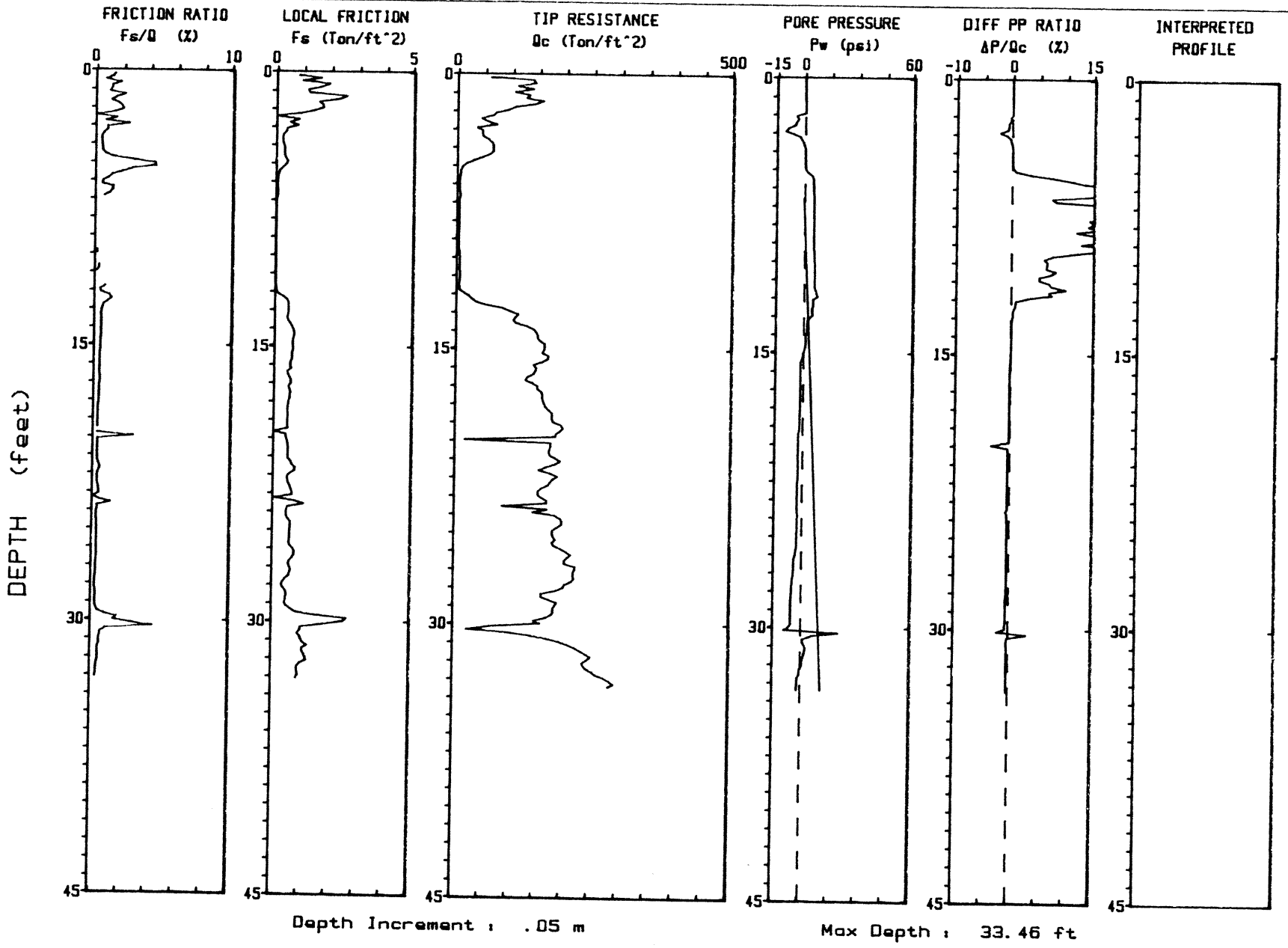
Max Depth : 49.87 ft

V B I

Operator : VIRGIL A. BAKER
Location : CPT-3

CPT Date : 02/22/90 15:36
Cone Used : 322

Sounding : 34 Pg 1 / 1
Job No. : 1488A



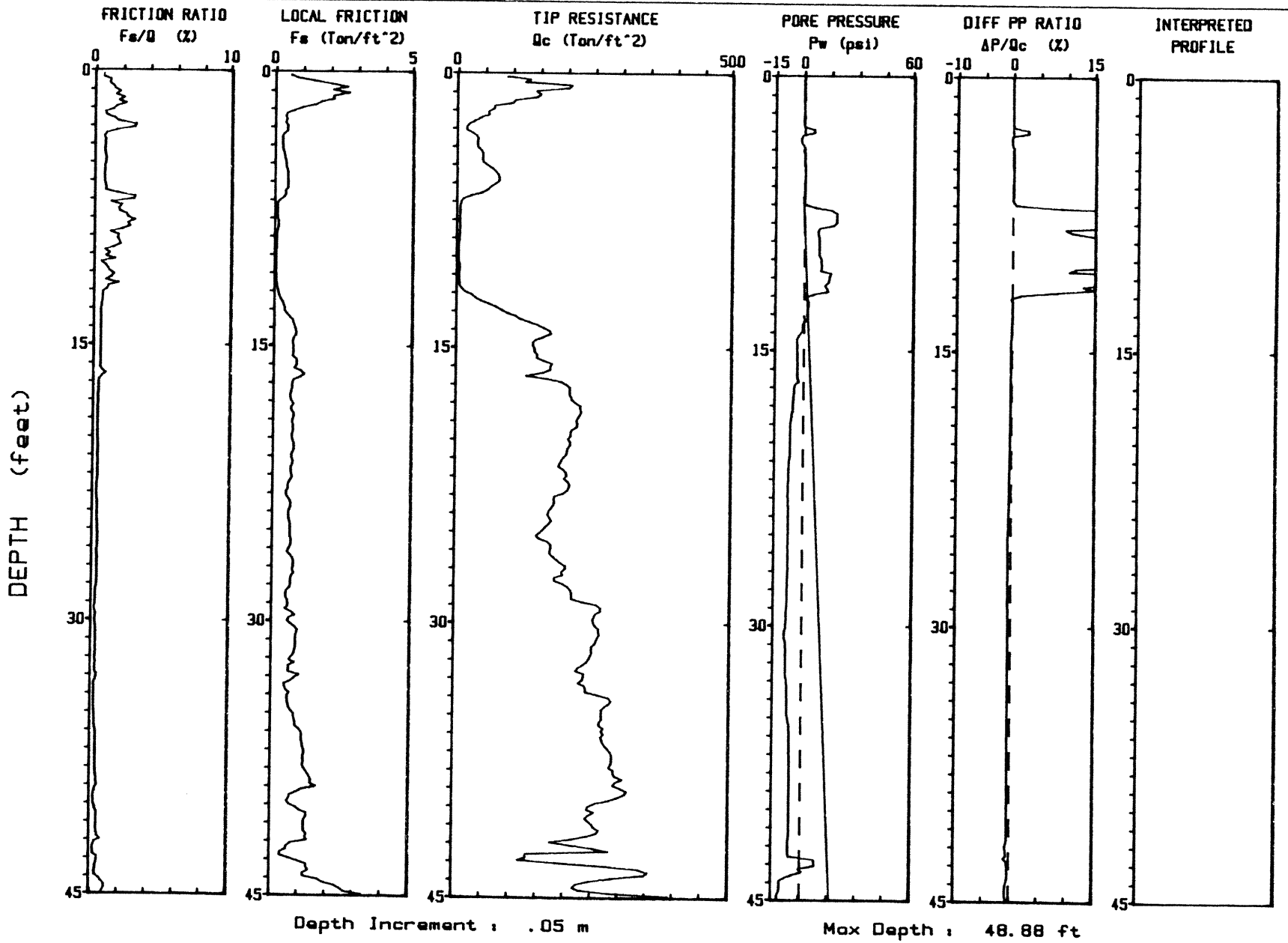
Depth Increment : .05 m

Max Depth : 33.46 ft

V B I

Operator : VIRGIL A. BAKER CPT Date : 02/22/90 16:06 Sounding : 35 Pg 1 / 2

Location : CPT-4 Cone Used : 322 Job No. : 1488A

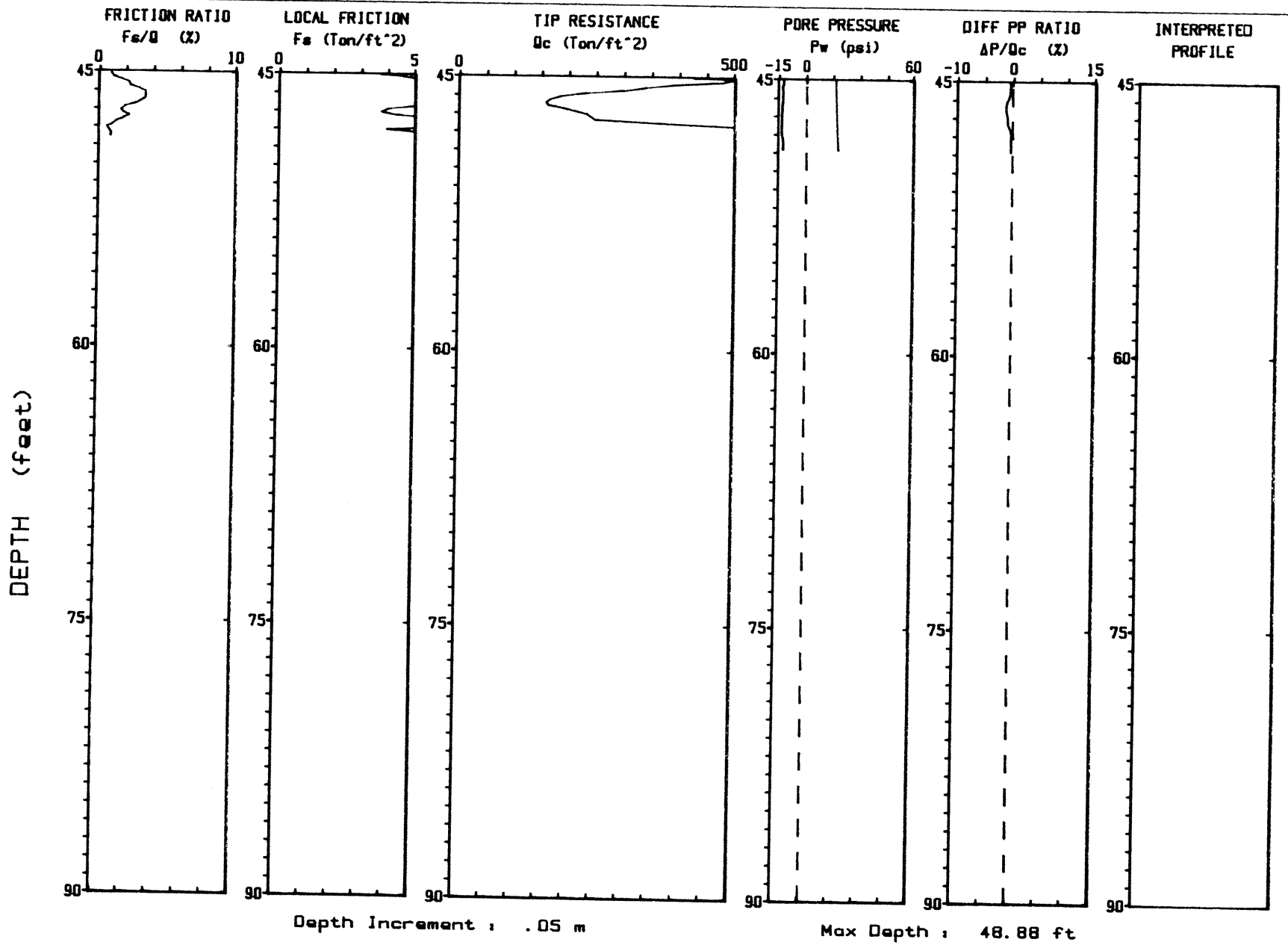


V B I

Operator : VIRGIL A. BAKER
Location : CPT-4

CPT Data : 02/22/90 16:06
Cone Used : 322

Sounding : 35 Pg 2 / 2
Job No. : 1488A

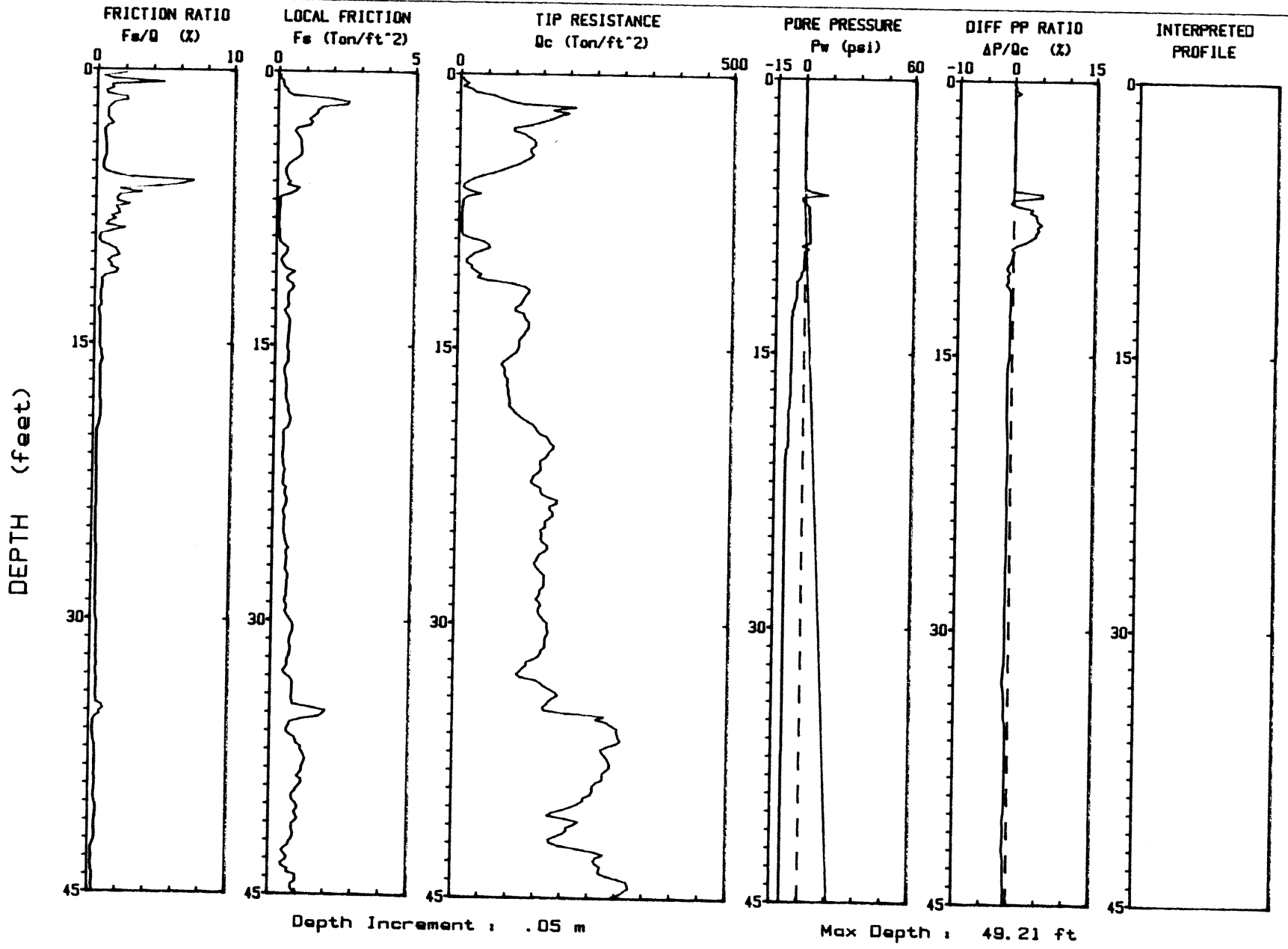


V B I

Operator : VIRGIL A. BAKER
Location : CPT-5

CPT Date : 02/22/90 16:44
Cone Used : 322

Sounding : 36 Pg 1 / 2
Job No. : 1488A

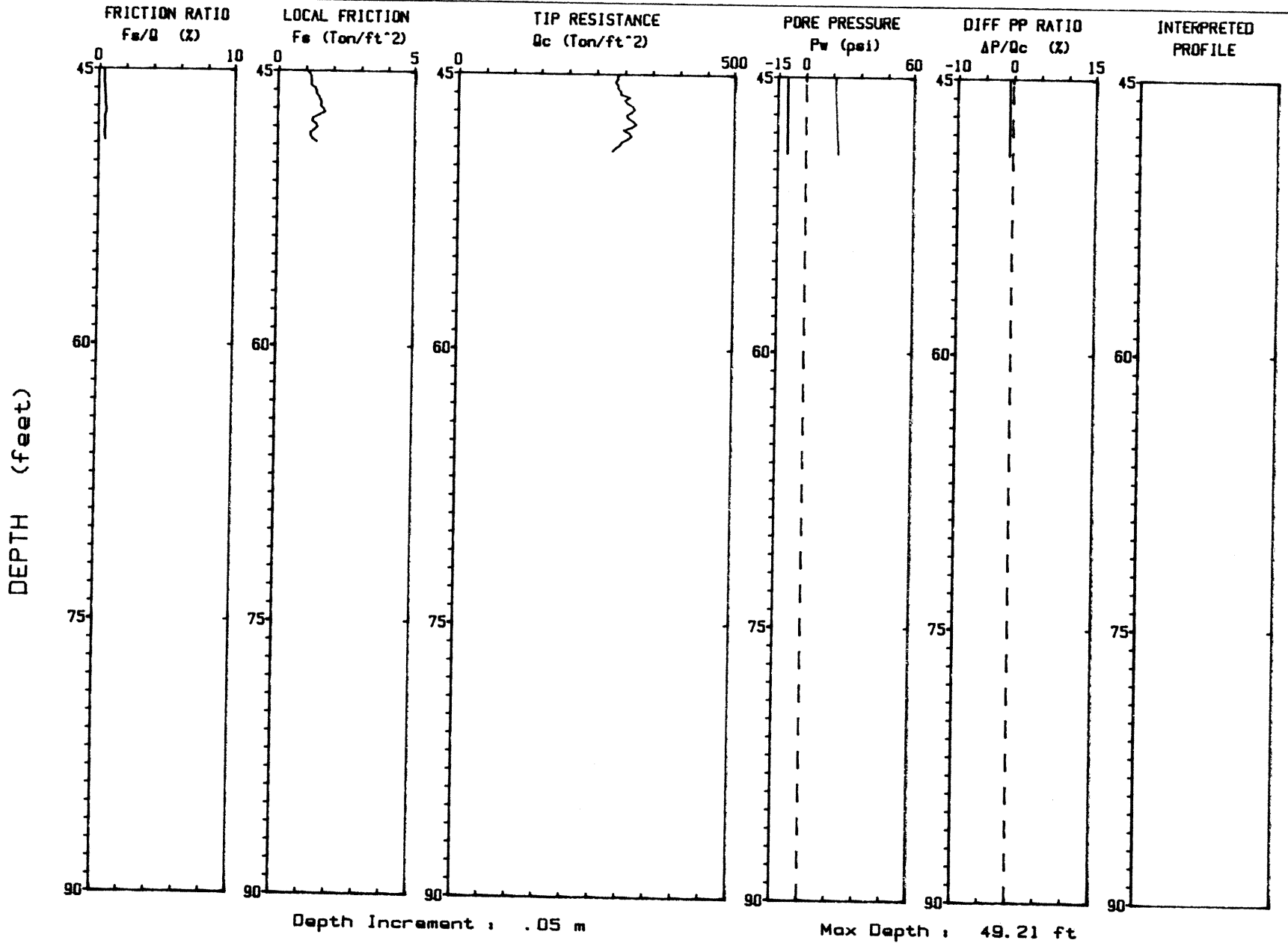


V B I

Operator : VIRGIL A. BAKER
Location : CPT-5

CPT Date : 02/22/90 16:44
Cone Used : 322

Sounding : 36 Pg 2 / 2
Job No. : 1488A



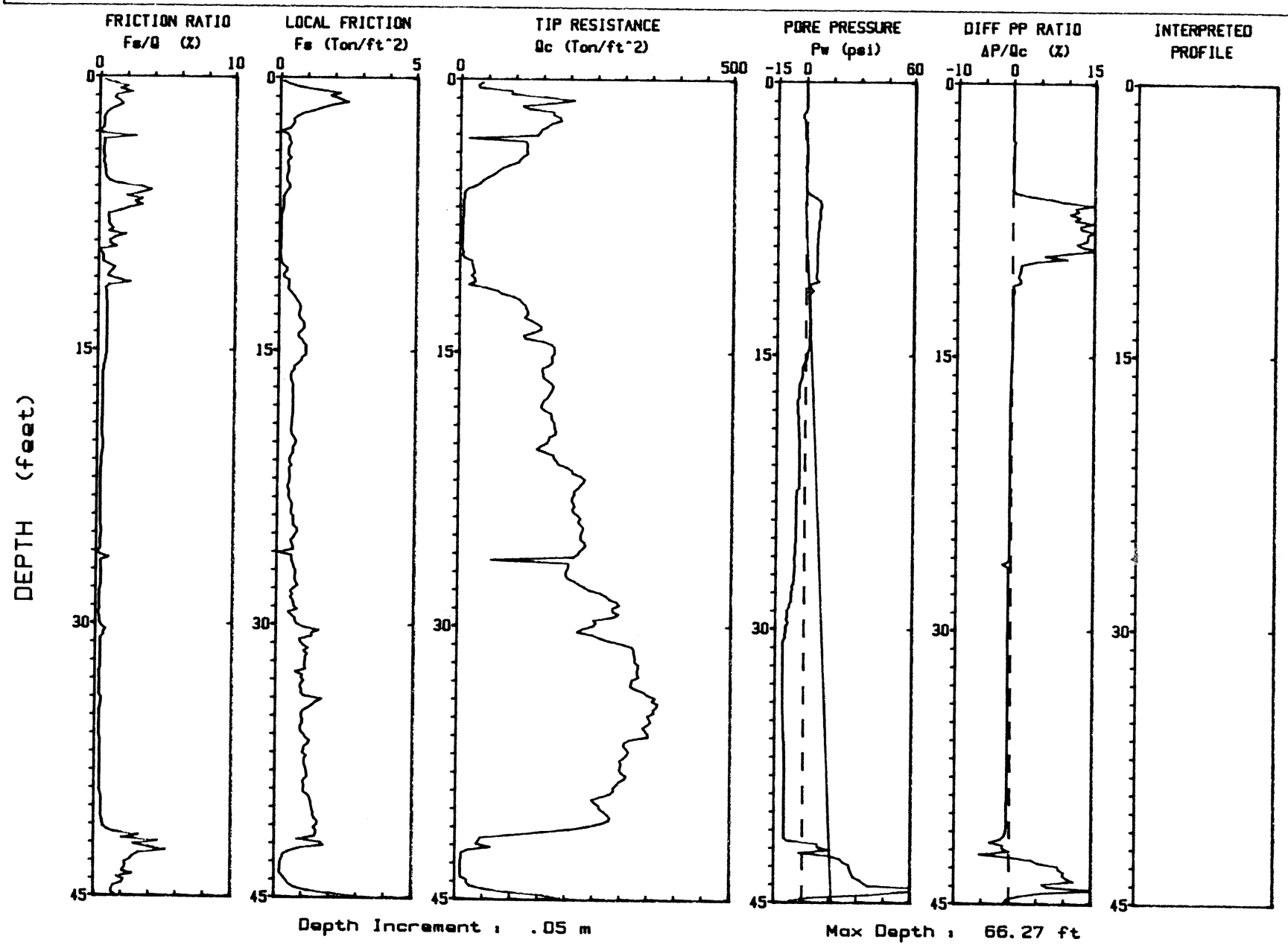
Depth Increment : .05 m

Max Depth : 49.21 ft

V B I

Operator : VIRGIL A. BAKER CPT Date : 02/22/91 17:45 Sounding : 39 Pg 1 / 2

Location : CPT-6 Cone Used : 322 Job No. : 1488A



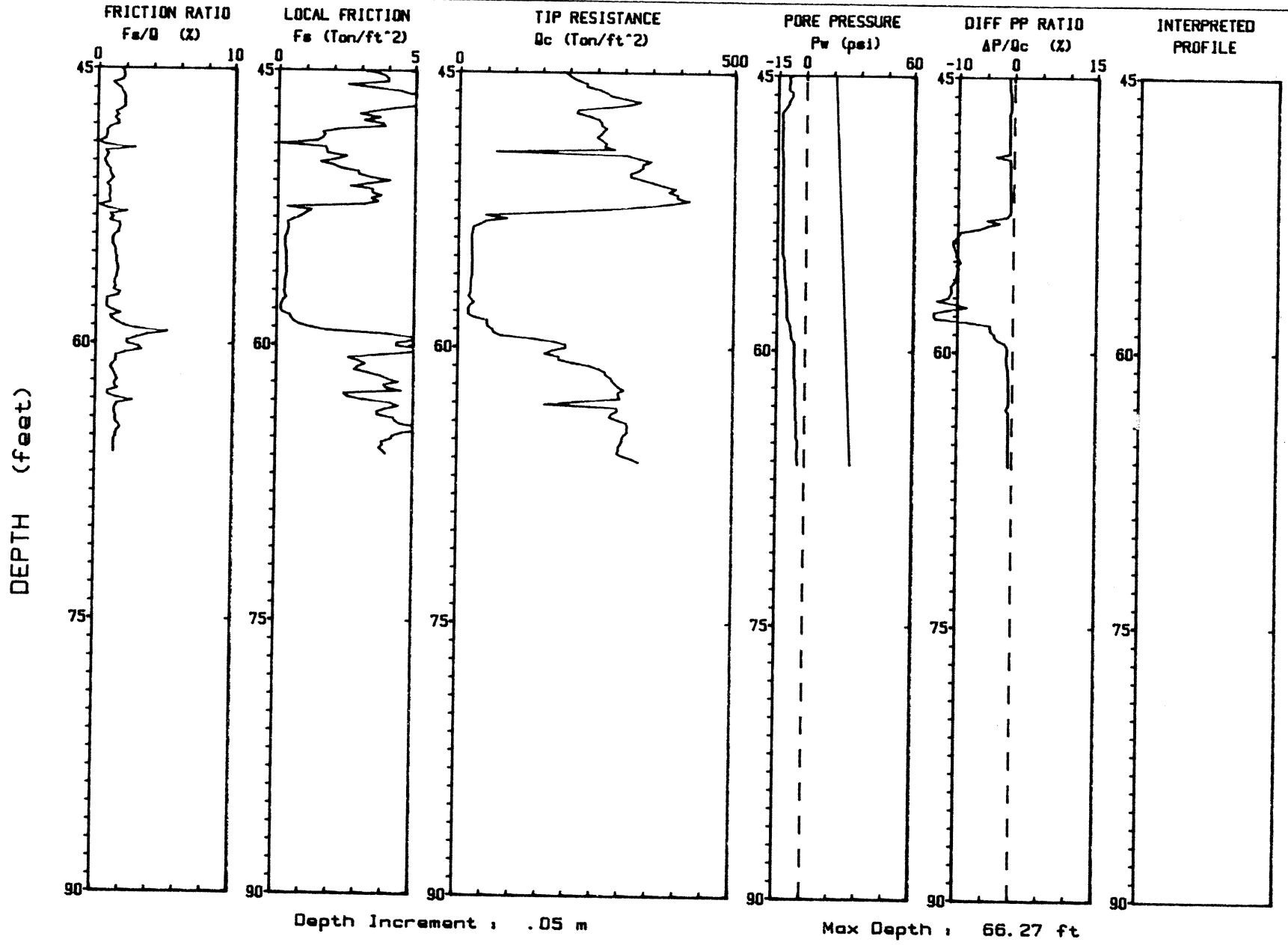
Depth Increment : .05 m Max Depth : 66.27 ft

V B I

Operator : VIRGIL A. BAKER
Location : CPT-6

CPT Date : 02/22/91 17:45
Cone Used : 322

Sounding : 39 Pg 2 / 2
Job No. : 1488A



Depth Increment : .05 m

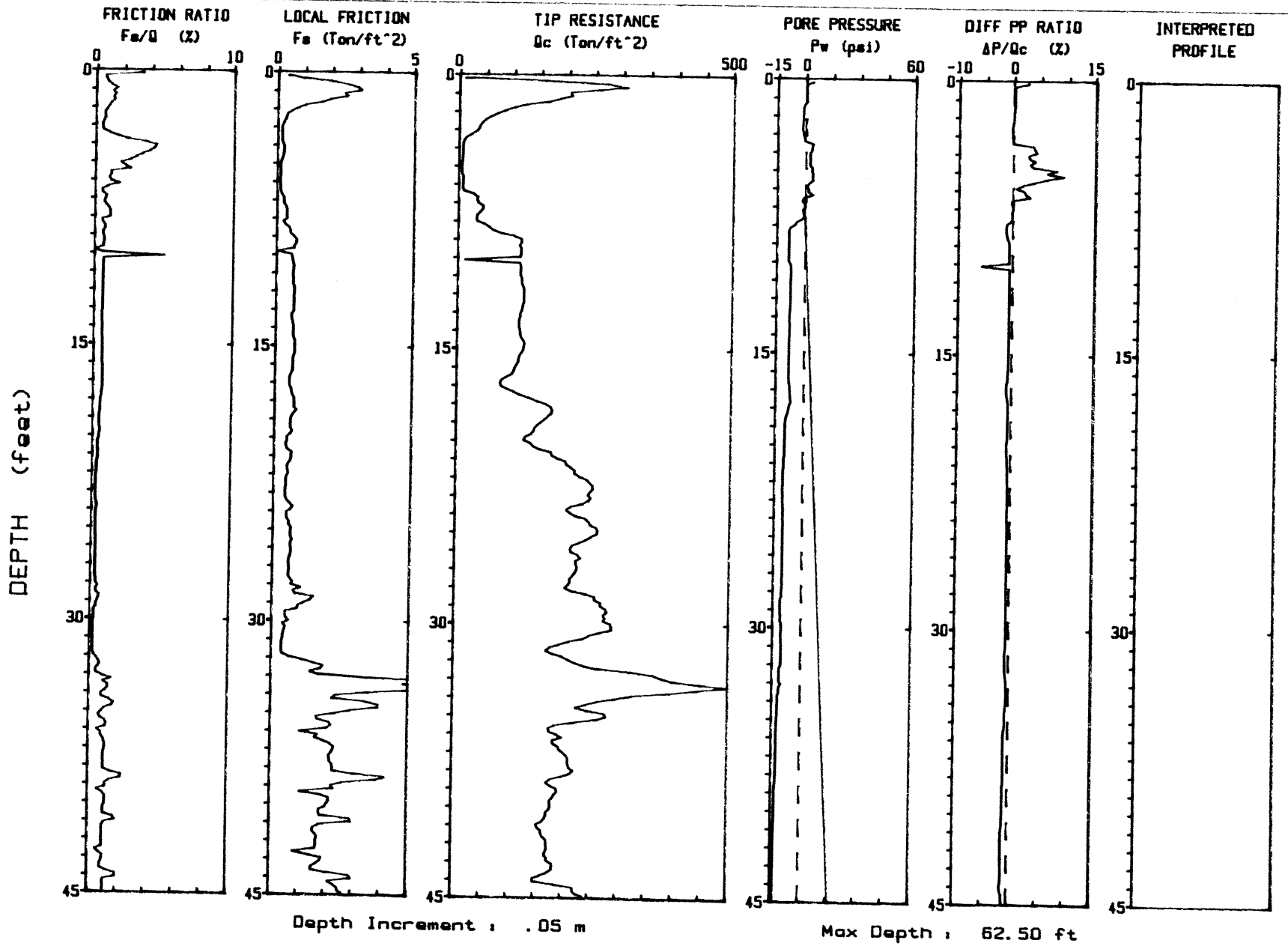
Max Depth : 66.27 ft

V B I

Operator : VIRGIL A. BAKER
Location : CPT-7

CPT Date : 02/23/91 07:32
Cone Used : 322

Sounding : 40 Pg 1 / 2
Job No. : 1488A

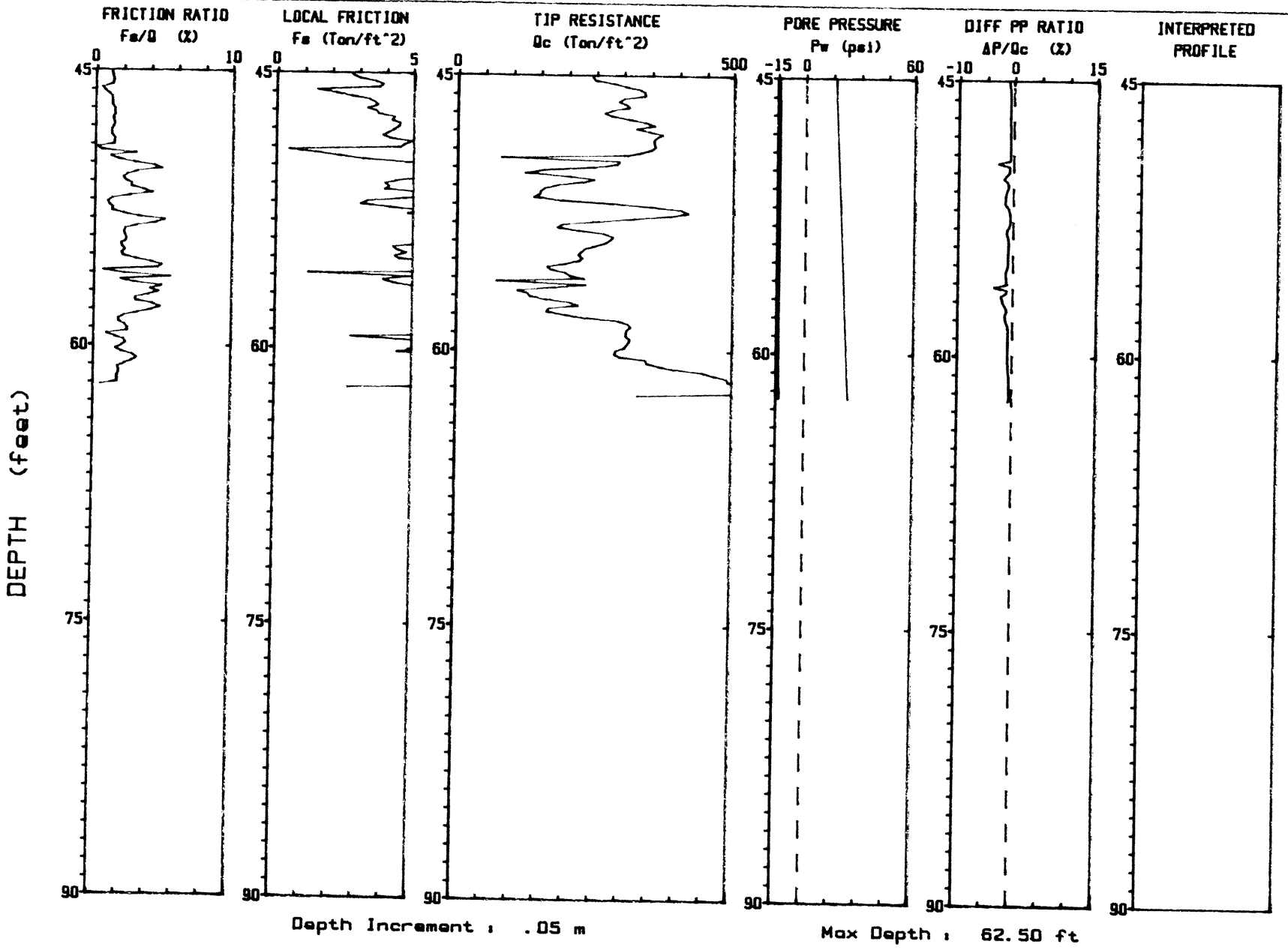


V B I

Operator : VIRGIL A. BAKER
Location : CPT-7

CPT Date : 02/23/91 07:32
Cone Used : 322

Sounding : 40 Pg 2 / 2
Job No. : 1488A



Depth Increment : .05 m

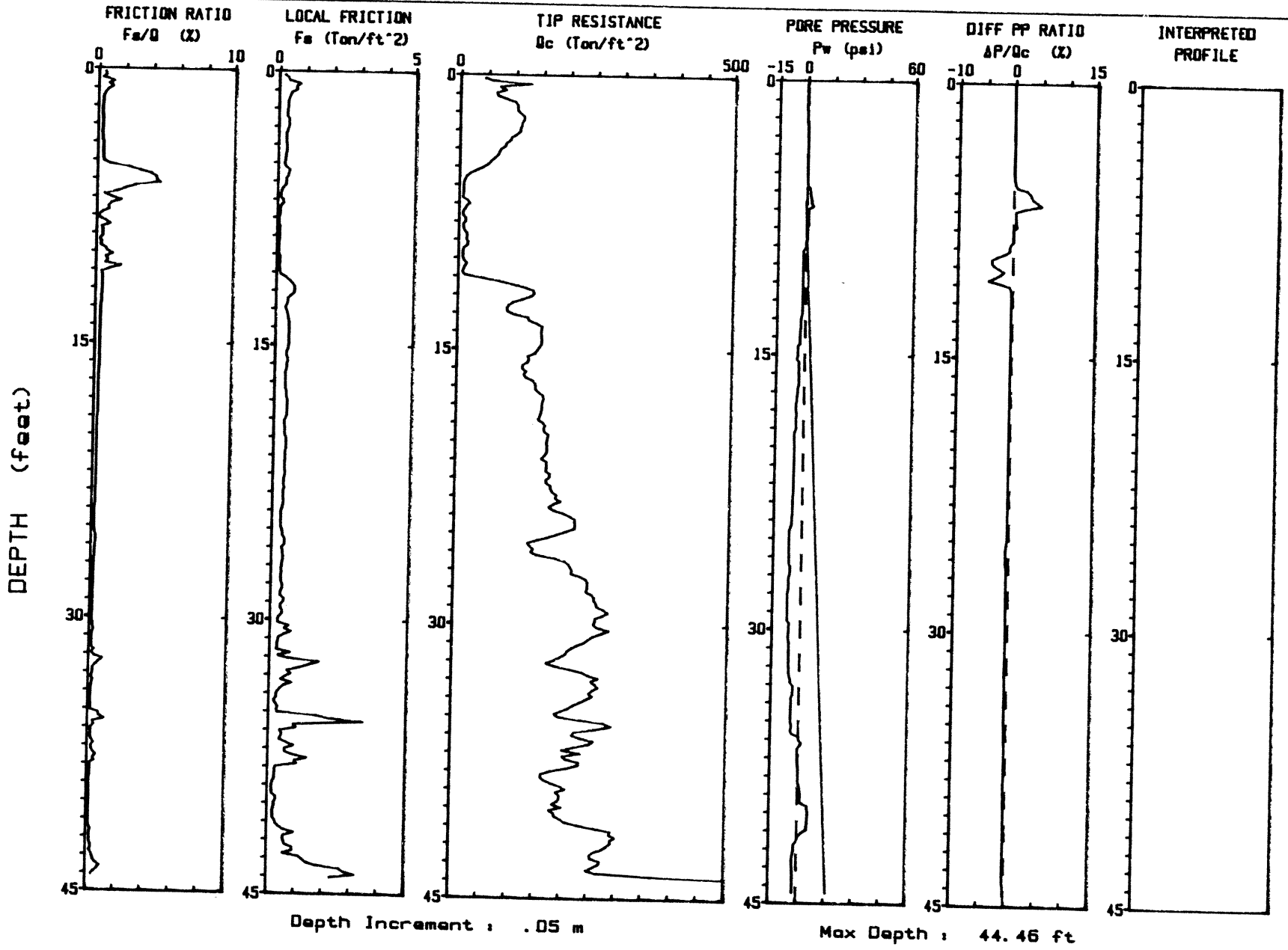
Max Depth : 62.50 ft

V B I

Operator : VIRGIL A. BAKER
Location : CPT-8

CPT Date : 02/23/91 09:16
Cone Used : 322

Sounding : 1 Pg 1 / 1
Job No. : 1480A



Depth Increment : .05 m

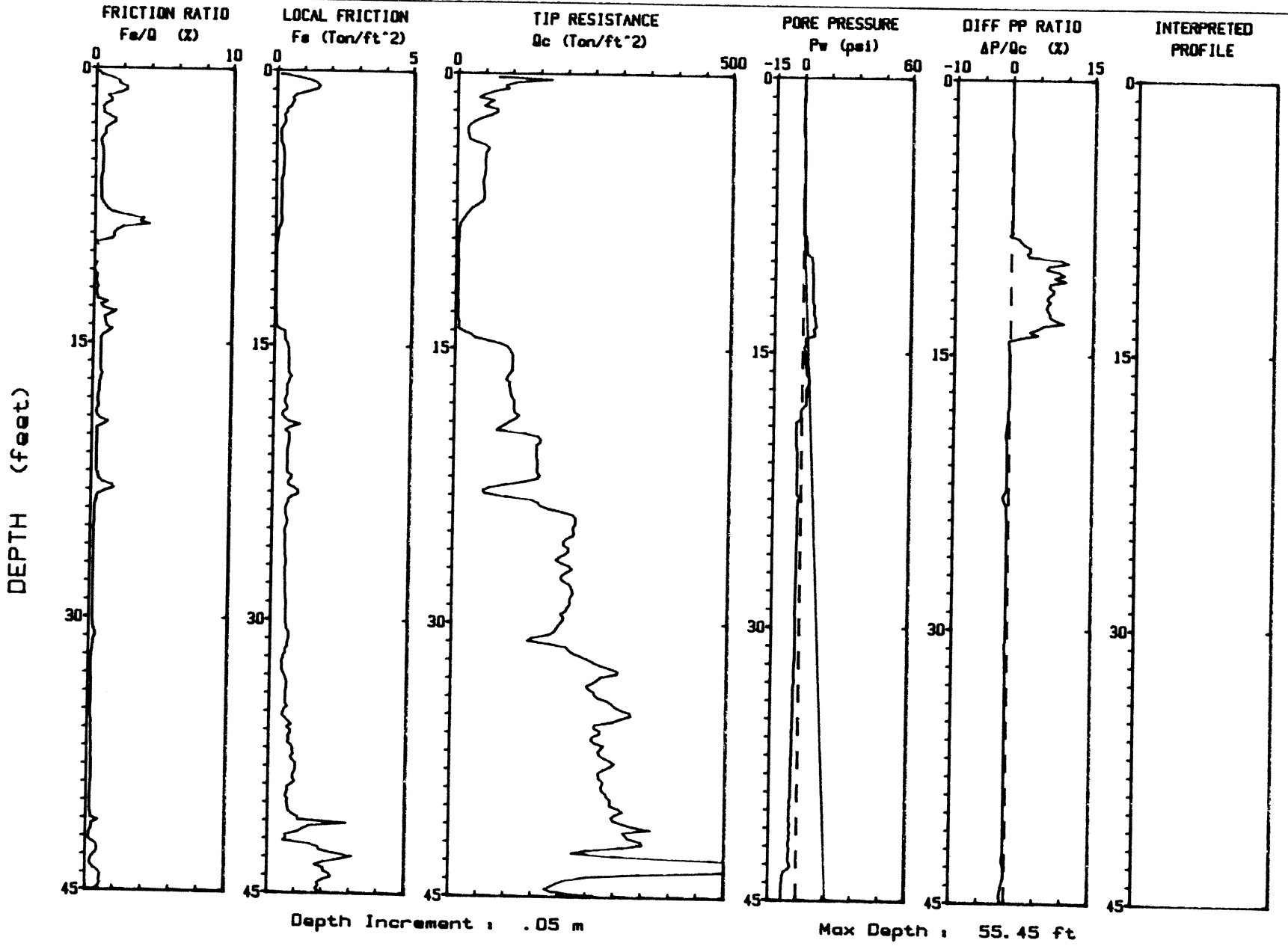
Max Depth : 44.46 ft

V B I

Operator : VIRGIL A. BAKER
Location : CPT-9

CPT Date : 02/23/91 10:05
Cone Used : 322

Sounding : 2 Pg 1 / 2
Job No. : 1480A



Depth Increment : .05 m

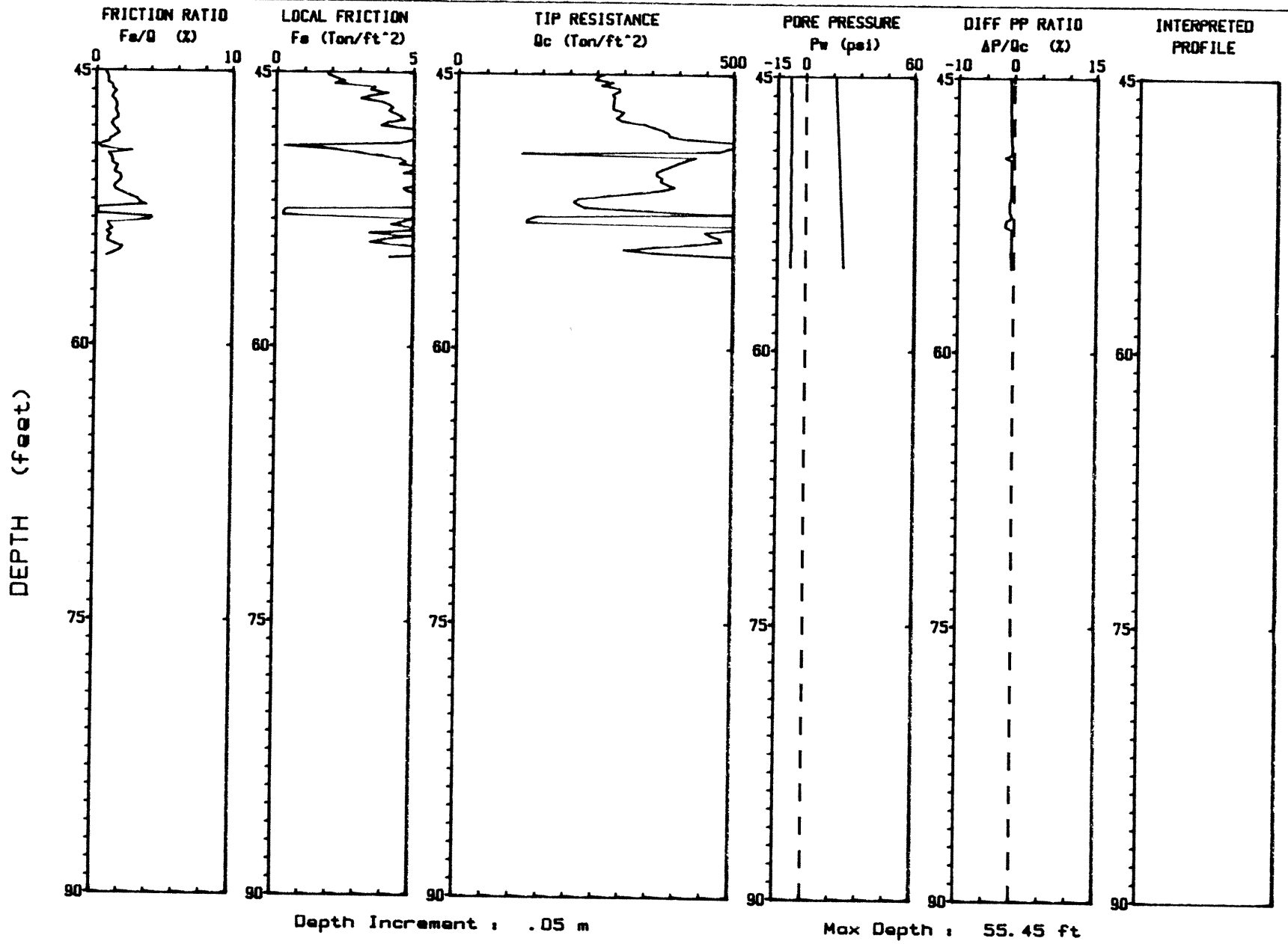
Max Depth : 55.45 ft

V B I

Operator : VIRGIL A. BAKER
Location : CPT-8

CPT Date : 02/23/91 10:05
Cone Used : 322

Sounding : 2 Pg 2 / 2
Job No. : 1480A



Depth Increment : .05 m

Max Depth : 55.45 ft