03.15-03/20/98-01979

VARSOL INVESTIGATION
SUMMARY REPORT
OPERABLE UNIT NO. 15 (SITE 88)
MARINE CORPS BASE
MCB CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0356

MARCH 20, 1998

Prepared for:

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND

Norfolk, Virginia

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1.0 INTRODUCTION

Marine Corps Base (MCB) Camp Lejeune was placed on the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) National Priorities List (NPL) effective November 4, 1989 (54 Federal Register 41015, October 4, 1989). Subsequent to this listing, the United States Environmental Protection Agency (USEPA) Region IV, the North Carolina Department of Environment and Natural Resources (NC DENR), the United States Department of the Navy (DoN) and the Marine Corps entered into a Federal Facilities Agreement (FFA) for MCB Camp Lejeune in 1991. The primary purpose of the FFA was to ensure that environmental impacts associated with past and present activities at the MCB are throughly investigated, and that appropriate CERCLA response and Resource Conservation Recovery Act (RCRA) corrective action alternatives are developed and implemented as necessary to protect public health and welfare, and the environment (MCB Camp Lejeune FFA, 1989). The fiscal year 1998 Site Management Plan for MCB, Camp Lejeune, a primary document referenced in the FFA, identifies 42 sites that require Remedial Investigation/Feasibility Study (RI/FS) activities. These 42 sites have been divided into 18 Operable Units (OUs).

1.1 Operable Unit Description

This report describes the Varsol Investigation conducted at OU No. 15 (Sites 88). As shown on Figure 1-1, OU No. 15 (Site 88) is located in the eastern portion of MCB Camp Lejeune. Operable Unit No. 15 (Site 88) is also known as "Building 25, Morale, Welfare, and Recreation Dry Cleaners".

1.2 Site History

Five underground storage tanks (USTs) were formerly located on the north side of Building 25. These USTs were used to store Varsol, a dry cleaning fluid. The USTs were reportedly installed in the 1940s, at the time the building was constructed. These USTs were used in conjunction with the dry cleaning operations until the early 1970s. Varsol is a petroleum-based dry cleaning fluid. According to one manufacturer of Varsol (Exxon), its current composition has changed since it was used at Site 88. Current classifications of Varsol include a Naphtha or White Spirits. Naphtha is a volatile petroleum distillate from gasoline fractions. White Spirits can be defined as a mixture of hydrocarbons derived from a petroleum source. Both Naphtha and White Spirits exhibit densities of less than 1.0 (i.e., less than water). Because of Varsol's flammability, its use was discontinued in the 1970s and replaced with tetrachloroethene (PCE). Between September 1995 and March 1996 OHM Remediation Services Corp. (OHM) removed the five USTs, tank contents, and contaminated soils adjacent to Building 25 (OHM 1996).

1.3 Investigation History

Information from the OHM tank removal report (OHM 1996) indicated that solvent related contamination was present in groundwater at Site 88. This information prompted a Remedial Investigation/Feasibility Investigation at the site. A Remedial Investigation was conducted at Site 88 in two phases. The first phase, conducted in July and August of 1996, focused on defining the nature and extent of chlorinated solvent contamination in groundwater. The second phase, conducted in April and May of 1997, focused on a more complete definition of the horizontal and vertical extent of chlorinated solvent contamination in groundwater and soil. A draft remedial investigation report was issued by Baker Environmental, Inc. (Baker) in November 1997 (Baker, 1997).

Tetrachloroethene (PCE) was detected during the Phase I RI in groundwater at concentrations that suggested that free product may be present in the subsurface at Site 88 (e.g., dissolved concentrations above 10% of the solubility of PCE in water). Based on that kind of information, Naval Facilities Engineering Service Center (NFESC) selected Site 88 as a candidate site to test an on-site treatment technology for surfactant enhanced aquifer remediation (SEAR). NFESC contracted Duke Engineering and Services (Duke [formerly Intera Incorporated]) to conduct the investigations necessary for the SEAR.

To date, six phases of work have been conducted at Site 88. These phases may be summarized as follows:

- Two DNAPL investigation phases were conducted in July and August 1997. This work was performed to determine the nature and extent of DNAPL at Site 88. The scope and findings of these investigations were detailed in a September 15, 1997 report issued by Baker (Baker, 1997a).

- An additional investigation was conducted in November 1997. This investigation served to further identify the extent of DNAPL contamination and the extent and depth of the silt/clay layer. This investigation included the installation of 12 CPT borings and 18 direct-push soil borings.

- In December 1997 wells were installed for free phase DNAPL recovery, Partitioning Inter-well Tracer Testing (PITT), and ultimately, the SEAR. A total of 14 wells were installed during this effort.

- In January, 1998 a free phase DNAPL pilot recovery study was performed. This pilot study was conducted to determine how and at what rate DNAPL could be removed from the aquifer.

- A full-scale free phase DNAPL recovery was initiated in February 1998. The effort included pumping of groundwater and DNAPL from six wells containing DNAPL.

During the initial DNAPL investigation it was evident that soil contamination at, and above the water table was present in borings in the vicinity of the former UST area. Photoionization detector (PID) screening of soils revealed elevated levels of total organic vapors just above the water table. The presence of these elevated PID readings above the water table suggests that the contaminant is less dense than water. Additionally, a petroleum odor was noted from these samples. This evidence, as well as historical information regarding product usage, suggests that Varsol was the contaminant observed during the DNAPL investigation.

1.4 Varsol Investigation

A Varsol investigation was conducted at Site 88 concurrent with the November 1997 DNAPL investigation and the February 1988 free phase DNAPL recovery. This Varsol investigation served two purposes. Firstly, this investigation examined the presence of a Varsol LNAPL. The presence of a Varsol LNAPL would effect the SEAR effluent treatment. Secondly, this investigation was to provide information for the remediation of Varsol contamination. Groundwater would be reinjected into the surficial aquifer as part of the SEAR. Under North Carolina law, contaminants cannot be reintroduced into the environment (i.e., reinjected into the aquifer).

The work performed in November 1997 included the installation of cone penetrometer test (CPT) borings and direct-push soil boings. Baker Environmental, Inc. (Baker) provided site management and support for the field work. Fugro, Geosciences, Inc. was contracted to complete the CPT and direct-push borings. The work performed in February 1998 included the sampling of groundwater from five PITT and product recovery wells. This summary report discusses the tasks and findings specific to the Varsol investigation.

2.0 VARSOL INVESTIGATION

Subsurface soil samples for Varsol analysis were collected between November 13 and November 22, 1997 during the additional DNAPL investigation work. The scope of the DNAPL investigation included the installation of 12 CPT borings and 18 direct-push soil borings. Samples for Varsol analysis were collected from selected borings. Figure 2-1 shows the locations of the soil borings where Varsol samples were collected and Appendix A provides the boring logs for the CPT borings.

Only one subsurface soil sample for Varsol analysis was collected during the PITT/SEAR well installation in December 1997. This is because the locations of the wells were in close proximity to many previous DNAPL investigation borings. Data from most of these well borings would not have provided any supplemental information on the extent of Varsol contamination.

Groundwater samples were collected during the DNAPL recovery period to ascertain the presence of dissolved-phase Varsol contamination. The scope of work included collection of five groundwater samples from selected PITT and recovery wells. Figure 2-2 shows the well locations from which Varsol samples were collected.

2.1 CPT Soil Sampling

The primary purpose of the CPT borings was to provide lithology information under the site. A large 20 ton track-mounted truck was used to install the CPT borings. A hydraulic press was used to drive a steel cone-tipped assembly through soils. Pressure sensors inside the assembly measured tip and sleeve resistance. This data was then transformed by an on-board computer to lithologies in real time. Lithologies were examined to determine the presence and thickness of the silt/clay layer and to select depths for soil sample collection. The truck was moved approximately one foot from the lithology boring to advance soil sampling borings. The same hydraulic press was used to drive the soil sampler.

The secondary purpose of the CPT borings was to collect data on the extent of Varsol contamination through the collection and analysis of subsurface soil samples. One subsurface soil sample was collected for Varsol analysis from each of eleven of the twelve CPT borings. A specially adapted large-core sampler was used to collect samples from the CPT borings. The sampler was shorter than a standard large-core sampler (one foot in length). The sampler accommodated a retractable steel tip to obtain samples from discrete depth intervals. The target depth for the borings varied. CPT borings in the vicinity of DNAPL contamination did not penetrate the silt/clay layer. Other borings penetrated through the silt/clay layer, exceeding depths of 25 feet below the ground surface (B.S.). Soil samples for Varsol analysis were collected at the water table/vadose zone interface (sample interval 8 to 10 feet B.S.). Soil aliquots for Varsol analysis were collected from the upper portion of the sample, just above the groundwater table.

Soil samples were collected in a manner to reduce contaminant loss through sample handling. Subsurface soil samples for were collected in clear, acetate liners. Each end of the liner was sealed to so that any volatile vapors could accumulate in the headspace. Prior to sample collection, the headspace was screened using the PID meter. Soils were then extruded directly from the liner into one labeled, 8-ounce clear glass jar. The samples were stored on ice, in the custody of Baker personnel, until they were shipped to the laboratory. Samples were shipped within 48 hours of collection to Quanterra Environmental Services (Quanterra) for analysis. Samples were shipped in a custody-sealed cooler with a chain-of-custody and analysis form enclosed.

Chain-of-Custody/Analysis Request forms are provided in Appendix B. Subsurface soil samples were analyzed in accordance with SW846 Modified Method 8015.

Soil investigative derived waste (IDW) was not generated from the CPT sampling or direct-push sampling. Additionally, all soil sample aliquots were used to fill sample jars.

2.2 Geoprobe Soil Sampling

The primary purpose of these geoprobe borings was to define the extent of DNAPL contamination and provide additional characterization of the DNAPL. The secondary purpose of these borings was to also define the extent of Varsol contamination. A Geoprobe sampling assembly, mounted on a small golf-cart styled vehicle, was used to advance these soil borings. Soil samples were collected using a macro-core sampler capable of sampling discrete depths. The target depth for the borings was approximately 20 feet below the ground surface (B.S.); at the top of a silt and clay layer. Soil samples for Varsol analysis were collected just above the water table (from the 7 to 9 foot B.S. sample interval).

Soil samples were collected in a manner to reduce contaminant loss through sample handling. Subsurface soil samples for were collected in clear, acetate liners. Each end of the liner was sealed to minimize volatile organic vapor loss. Soil samples for Varsol analysis were extruded directly from the liner into one labeled, 8-ounce clear glass jar. The samples were stored on ice, in the custody of Baker personnel, until they were shipped to the laboratory. Samples were shipped within 48 hours of collection to Quanterra for analysis. Samples were shipped in a custody-sealed cooler with a chain-of-custody and analysis form enclosed. Chain-of-Custody/Analysis Request forms are provided in Appendix B. Subsurface soil samples were analyzed in accordance with SW846 Modified Method 8015.

Minimal IDW was generated during this phase of the investigation. Soils in the extruded liners that were not used for sample collection were placed into one 55-gallon DOT-approved drum. The drum was labeled and stored on site until the December well installation phase of work.

2.3 Groundwater Sampling

Groundwater samples were collected for the purpose of identifying the presence of Varsol contamination in shallow groundwater. Groundwater samples for Varsol analysis were collected on February 17, 1998 from wells 88-HC02, 88-EX02, 88-EX05, 88-RW03, and 88-RW06 (Figure 2-2).

Groundwater samples were collected in a manner to insure that a representative sample would be collected. Low-flow purging and sampling methodologies were used. A peristaltic pump was used to purge and collect the groundwater. The pump intake was placed approximately 2 feet below the water level in each well. A pumping rate was selected that minimized drawdown (i.e., less than 1 foot). These pumping rates ranged from 600 mL/min to 900 mL/min. Purging was completed when three consecutive readings for conductivity were within 10%, pH readings were within 0.1 SU, and the turbidity was less than 10 NTU, or showed no improvement. A minimum of three well volumes were purged before samples were collected. Groundwater purge records are included as Appendix C.

Groundwater samples were collected in a manner to reduce contaminant loss through sample handling. Goundwater samples were collected immediately after purging and placed directly into two labeled, 1 liter amber glass containers. The samples were stored on ice, in the custody of Baker personnel, until they were shipped to the laboratory. Samples were shipped within 48 hours of collection to Quanterra for analysis. Samples were shipped in a custody-sealed cooler with a chain-of-custody and analysis form enclosed. Chain-of-Custody/Analysis Request forms are provided in Appendix B. Groundwater samples were analyzed in accordance with SW846 Modified Method 8015.

2.4 Subsurface Soil Sampling Results

The analytical results indicate the presence of Varsol contamination in subsurface soil samples. Table 2-1 contains a summary of the analytical results from the soil sampling. The samples exhibiting the presence of Varsol are located around the former UST area, including areas under Building 25 (Figure 2-1). The sample from boring 88-IS30 exhibited the highest concentration of Varsol (4,900 mg/kg). The sample from boring 88-RW03 exhibited the second highest concentration of Varsol (3,600 mg/kg).

The estimated extent of Varsol contamination in subsurface soil is also presented on Figure 2-1. Both quantitative analytical data and qualitative PID data were used to estimate the extent of contamination. The analytical data show that subsurface soil Varsol contamination is present in the vicinity of the former UST area, northeast of that area (at 88-IS17), and also under Building 25. The highest levels of Varsol contamination is observed under Building 25. Contamination appears to dissipate between borings 88-RW03 and 88-IS30 and the southernmost row of CPT borings. The PID data can be used to better estimate where the Varsol contamination dissipates. It is considered that Varsol contamination is represented by elevated PID readings in soil above the groundwater table (6 to 8 feet B.S.). PID readings from Phase I DNAPL Investigation borings 88-IS04, 88-IS05, and 88-IS09 (Appendix A) suggest that contamination (represented by total organic vapors) diminishes to nondetectable levels between 88-IS09 and 88-IS04. The boring log for 88-IS04 indicates that the PID readings are at background levels.

2.5 Groundwater Sampling Results

The analytical results indicate the presence of Varsol contamination in groundwater. Table 2-2 contains all analytical results form the soil sampling. The samples exhibiting the presence of Varsol are located around the former UST area, including areas under Building 25 (Figure 2-2). Groundwater contamination appears at the highest concentrations at wells 88-RW03 (3,600 µg/L) and 88-RW06 (4,900 µg/L), underneath Building 25.

The presence of a light non-aqueous phase liquid (LNAPL) was also investigated. Several groundwater wells installed in December 1997 were double screened to be used for possible Varsol recovery. These wells include 88-HC01, 88-HC02, 88-IN01 through IN03, and 88-RW03 through 88-RW05. During the December 1997, January and February 1998 work, water and NAPL levels were monitored. Varsol is less dense than water and will float as an LNAPL. The presence of LNAPL was not observed during the monitoring of water and NAPL levels. This evidence that suggests free phase LNAPL is not present at Site 88.

3.0 INVESTIGATION-DERIVED WASTE MANAGEMENT

Investigation-derived waste (IDW) includes. Soil IDW is currently being stored in a rolloff located at Site 88. The soil was placed in 1 DOT approved 55-gallon drum. Subsequent to this investigation, additional groundwater wells were installed at Site 88. A 22 cubic yard roll-off box was mobilized to the site for storage of drilling cuttings. At the direction of Baker personnel, the soil from the drum was placed in the roll-off box. Additional wells are anticipated to be installed at Site 88 after the free-phase DNAPL recovery. Soil cuttings from these wells will also be placed in the rolloff box. Upon well installation completion, soil samples will be collected to characterize the soil for proper disposal.

Investigation-derived waste (IDW) also includes groundwater. The groundwater IDW was stored in an 8,800 gallon tanker trailer, which also stored well development water. Prior to the start of the DNAPL recovery, a sample of the development and purge was collected to determine if it could be treated at the Lot 203 groundwater treatment plant. The analytical results from this sample are presented in Appendix D. Personnel from OHM gave Baker approval, based on the analytical results, to dispose groundwater from the tanker to the Lot 203 treatment plant. An OHM vacuum truck was used to transfer the water from the tanker to the treatment plant.

4.0 REFERENCES

OHM 1996. "Draft Contractor's Closeout Report Underground Storage Tank Removals at Building 25 MCB Camp Lejeune Jacksonville, North Carolina". OHM Remediation Services Corp. July, 1996.

Baker 1997. "Focused Remedial Investigation Report Operable Unit No. 15 (Site 88), Marine Corps Base Camp Lejeune, North Carolina". Baker Environmental, Inc. November, 1997.

Baker 1997a "DNAPL Investigation Summary Report Operable Unit No. 15 (Site 88), Marine Corps Base Camp Lejeune, North Carolina". Baker Environmental, Inc. September, 1997.

TABLES

TABLE 2-1
ANALYTICAL RESULTS
VARSOL IN SUBSURFACE SOIL SAMPLES
CTO-0356 OPERABLE UNIT NO. 15 (SITE 88)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Sample ID	Date Sampled	Sample Interval (ft bgs)[1]	Analytical Result (mg/kg)[2]	Detection Limit (mg/kg)
IR88-CPT01-01	11/15/97	8-9 ft	ND[3]	12
IR88-CPT02-01	11/15/97	8-9 ft	ND	13
IR88-CPT03-01	11/15/97	8-9 ft	280	12
IR88-CPT04-01	11/15/97	8-9 ft	ND	12
IR88-CPT05-01	11/15/97	8-9 ft	ND	12
IR88-CPT06-01	11/15/97	8-9 ft	ND	13
IR88-CPT07-01	11/15/97	8-9 ft	ND	12
IR88-CPT08-01	11/15/97	8-9 ft	ND	11
IR88-CPT09-01	11/15/97	8-9 ft	ND	12
IR88-CPT10-01	11/14/97	8-9 ft	ND	12
IR88-CPT11-01	11/15/97	8-9 ft	ND	12
IR88-IS14-01	11/18/97	8-9 ft	ND	12
IR88-IS15-01	11/18/97	8-9 ft	ND	12
IR88-IS16-01	11/19/97	8-9 ft	ND	13
IR88-IS17-01	11/19/97	8-9 ft	880	13
IR88-IS18-01	11/19/97	8-9 ft	ND	13
IR88-IS19-01	11/19/97	8-9 ft	130	13
IR88-IS20-01	11/19/97	8-9 ft	ND	13
IR88-IS21-01	11/20/97	8-9 ft	27	13
IR88-IS22-01	11/20/97	8-9 ft	200	13
IR88-IS25-01	11/21/97	8-9 ft	ND	13
IR88-IS27-01	11/21/97	8-9 ft	ND	12
IR88-IS28-01	11/21/97	8-9 ft	ND	13
IR88-IS29-01	11/22/97	8-9 ft	69	13
IR88-IS30-01	11/22/97	8-9 ft	4,900	13
IR88-IS31-01	11/22/97	8-9 ft	ND	13
IR88-RW03-98A	12/5/97	8.5 ft	3,600	580

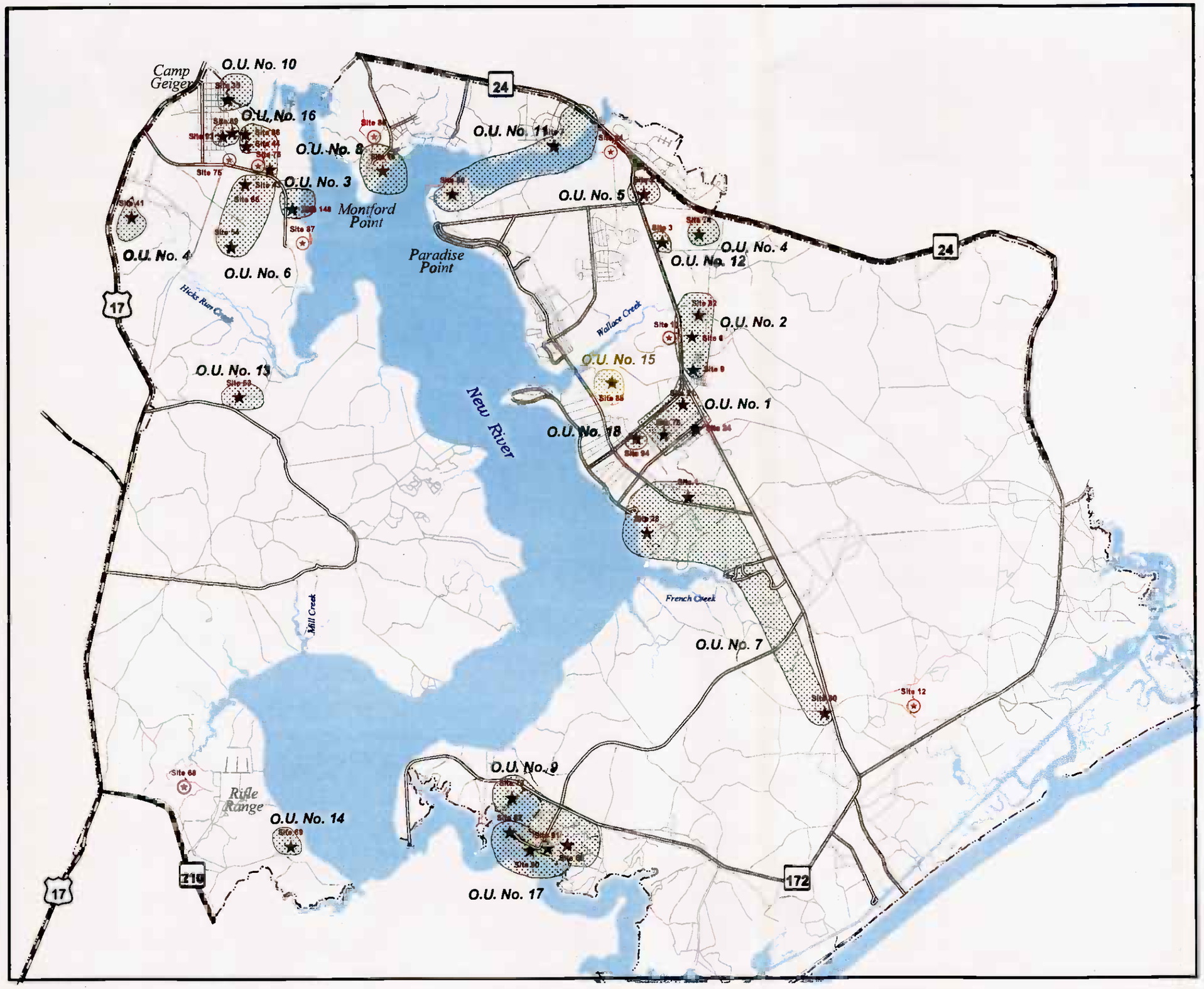
Notes: [1] feet below ground surface
[2] milligrams per kilogram
[3] Not Detected

TABLE 2-2
ANALYTICAL RESULTS
VARSOL IN GROUNDWATER SAMPLES
CTO-0356 OPERABLE UNIT NO. 15 (SITE 88)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Sample ID	Date Sampled	Analytical Result (ug/L)[1]	Detection Limit (ug/L)
IR88-RW06-98A	2/17/98	4,900	200
IR88-RW03-98A	2/17/98	7,100	200
IR88-EX02-98A	2/17/98	3,300	200
IR88-EX05-98A	2/17/98	360	200
IR88-HC02-98A	2/17/98	ND[2]	200

Notes: [1] micrograms per liter
[2] Not detected'

FIGURES



LEGEND

- Remedial Investigation Site
- Pre-Remedial Investigation Site
- Operable Unit Boundary
- Operable Unit No. 15 Boundary
- Secondary Highway
- Primary Highway
- Light Duty Road
- Camp Lejeune Boundary

N
W E
S

Scale
0 1 2 3 Miles

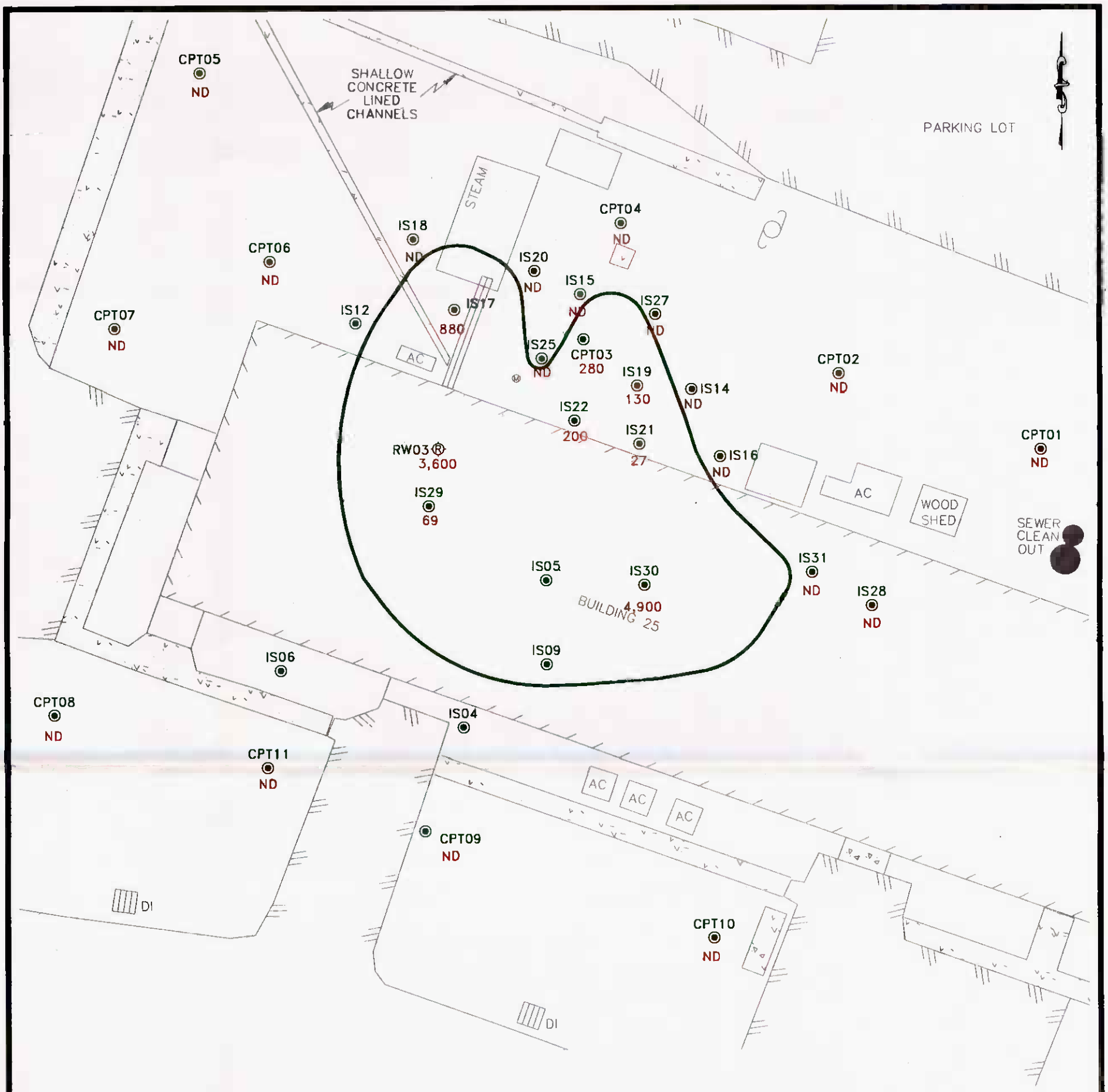
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

OPERABLE UNITS AND SITE LOCATIONS
OPERABLE UNIT NO. 15 (SITE 88)
VARSOL INVESTIGATION
CTO 0356

Baker

FIGURE 1 - 1

01979AA01V



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LEGEND

IS12 – SOIL BORING

CPT01 – CONE PENETRATION

RW03 – RECOVERY WELL

M – MANHOLE

– ESTIMATED EXTENT OF SOIL CONTAMINATION

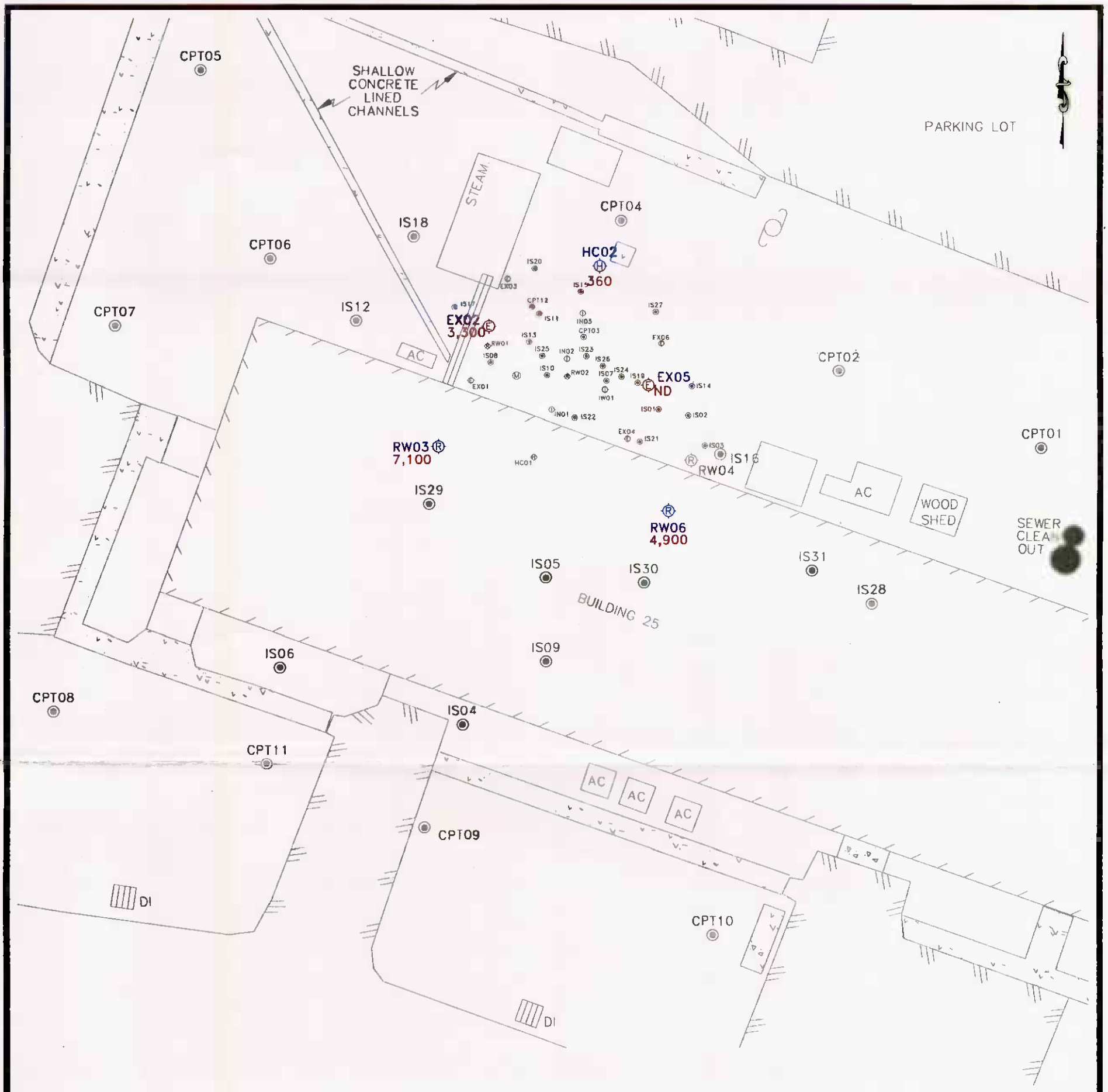
ND – NOT DETECTED

880 – CONCENTRATION OF VARSOL (mg/kg)

SOURCE: LANIER SURVEYING COMPANY, 1997.

FIGURE 2–1
VARSOL INVESTIGATION
VARSOL CONCENTRATIONS IN SUBSURFACE SOILS
OPERABLE UNIT NO.15 (SITE 88)
DNAPL INVESTIGATION

MCB, CAMP LEJEUNE, NORTH CAROLINA



20 0 10 20
1 inch = 20 ft.

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356608SI

LEGEND

- EX02 (E) – EXTRACTION WELL
- RW01 (R) – RECOVERY WELL
- IN01 (I) – INJECTION WELL
- HC02 (H) – HYDRAULIC CONTROL
- CPT01 – CONE PENETRATION
- IS01 – SOIL BORING
- IW01 (I) – INJECTION WELL (NOT TO BE USED)
- (M) – MANHOLE
- 7,100 – CONCENTRATION OF VARSOL (ug/L)

SOURCE: LANIER SURVEYING COMPANY, 1997.

FIGURE 2-2
VARSOL INVESTIGATION
VARSOL CONCENTRATIONS IN GROUNDWATER
OPERABLE UNIT NO.15 (SITE 88)
DNAPL INVESTIGATION

MCB, CAMP LEJEUNE, NORTH CAROLINA

APPENDIX A
VARSOL INVESTIGATION BORING LOGS

Hole No.

DRILLING LOG | DIVISION

INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Bldg 25: DNAPL Source Zone Boring
2. LOCATION (Coordinates or Station): Bldg 25: UST T25-2 Area
3. DRILLING AGENCY: GeoEnvironmental
4. HOLE NO. (As shown on drawing title and file number): IRBB-IS01
5. NAME OF DRILLER: Rich Melton
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 19 ft
10. SIZE AND TYPE OF BIT: Direct Push
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 1 | UNDISTURBED 5
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~9 ft bgs
16. DATE HOLE: STARTED 7/25/97 @ 1025 | COMPLETED 7/25/97 @
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: Geologist: Fred Holzmer INTERA

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		TANK Removal | Backfill: clean f. SAND, tan, moist, loose			Geoprobe cont tube 1 11/16 in ID
						HNu 0.5' = 1.6
						1.0 = 4.2
				85%		1.5 = 3.9
	2					2.0 = 3.5
					3	
						3.5 = 2.9
	4					4.0 = 2.6
			4.5 Contact @ native sed: f. SAND w silt/clay, wet, cohesive, low plast, mottled lt/med gray			4.5 = 2.1
				75%		5.0 = 56 (Sample IS01-1)
						HS 5.2 = 796
						5.5 = 98
	6					strong chemical odor: smells like petrol distillates (Varsol?)
						Sample 01-1 @ 5.4-5.5
					7	
						7.0 = 196
						7.5 = 511
	8			85%		8.0 = 780 (Sample IS01-2)
						HS @ " = 1950
						8.5 = 1024 (Sample IS01-2)
						HS @ " = 1640
						9.0 = 331
						Strong chem odor
	10		med gray, wet, loose		10	
						10 = 311
						HS 10.0 = 1436 (Sample IS01-4)
						10.5 = 96
			11.0 f. SAND, w decreased silt/clay, wet, cohesive, slight plast, lt gray			11 = 117
				100%		11.5 = 121
	12					12 = 34
						12.5 = 25
						mild chem. odor
					13	13 = 17
			f. SAND w minor fines, wet, cohesive, no plast, lt gray			resistant probing layer ~14-16'
						Sample tube split lengthwise
	14					14 = 44
			Core samples from ~14-19 may be borehole backfilling	60%		trace chem. odor
						15 = 13
						HS 15.5 = 32
						HS 16.0 = 72
	16				16	
			Samples from 16-19 of unknown depth (borehole backfilling?)			Core samples clogged in sampler, extruded, not represent. samples
			Flowing sands, borehole not staying open between Core runs	?		
	18					
			TD = 19'; descriptions to ~14' bgs.		19	

Hole No.

DRILLING LOG	DIVISION	INSTALLATION: MCB Camp Lejeune	SHEET 1 OF 1 SHEETS
1. PROJECT: Bldg 25 DNAPL Source Zone Borings		10. SIZE AND TYPE OF BIT: Direct Push	
2. LOCATION (Coordinates or Station): N of Bldg 25: T25-1 Area		11. DATUM FOR ELEVATION SHOWN (TBM or MSL):	
3. DRILLING AGENCY: GeoEnvironmental		12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
4. HOLE NO. (As shown on drawing title and file number): IRBB-IS02		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED	UNDISTURBED: 7
5. NAME OF DRILLER: Rich Melton		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: ~ 9 ft bgs	
		16. DATE HOLE: STARTED 7/25/97 @ 1430	COMPLETED 7/25/97 @ 1510
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING: %	
9. TOTAL DEPTH OF HOLE: 20 ft		19. SIGNATURE OF INSPECTOR: Geologist: Fred Hoffner INTERA	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Tank Removal | Backfill: f. SAND, clean, moist, loose			Cont. tube Samples 1 1/16 in ID
						HNu 1.5' = 3.1
						2.0 3.1
						2.5 2.6
	2			80%		3.0 2.8
						3.5 2.3
	4				4	
						4.5' = 120
						5 97
			4.9 Contact Native sed's f. SAND w/ some silt/clay, moist, cohesive, slt to low plast, minor peat, organic decay smell, med-dk gray	100%		5.5 61
	6					6. 33
						6.5 158
			6.1 f. SAND w/ minor silt/clay, wet, cohesive, lt gray, org decay & hydrocarb smell			
			6.8 CLAY seam, w/ some silt, wet, med plast, lt to greenish gray w/ yellow-orange mottling		7	
		NR				
			7.5 f. SAND (w/ intermitant silt & clay, decreasing w/ depth) wet, cohesive, lt to med gray strong hydrocarb smell			
	8			70%		8' = 394 strong hydrocarb smell (Sample IS02-1)
						HS 8.3 = 1616
						8.5 1032
						HS 8.8 = 1180 (Sample IS02-2, IS02-3)
						9 909
			9.0 f. SAND, trace silt, wet, loose, lt tannish gray, strong hydrocarb smell			9.5 115 open to atm
	10				10	
			10.5 si-f. SAND, wet, loose, tan to lt gray			11 = 146
				90%		11.5 68
						12 27
	12		11.9 f. SAND w/ minor silt, lt to med gray			12.5 12
					13	
					NS	Muck sample; will use discrete sampler
	14		14 si-f. SAND		14	Discrete sampler (2' x 1" ID)
						HNu 14.5' = 2.8
						15 2.8
			f. SAND, minor silt			15.5 2.7
	16		16 si-cl-f. SAND		16	16.3 – 16.5 = 2.0 (Sample IS02-4)
			grading to si-CLAY, wet, soft, med plast, olive gray	100%		17 2.0
			16.6 grading to si-cl-f. SAND, low plast.			17.3 2.3
			17.4		18	
	18					HNu 18.5 = 1.6
			18.4 CLAY w/ peat, med plast, olive to charcoal brn @ 20'	80%		19 1.6
					20	

ENG FORM 1836 — PREVIOUS EDITIONS ARE OBSOLETE — PROJECT — HOLE NO.

Hole No.

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS
		MCB Camp Lejeune	

1. PROJECT: Bldg 25 DNAPL Source Zone Borings
2. LOCATION (Coordinates or Station): N-side Bldg 25 @ former AST/PCE (5 ft west of Air Comp)
3. DRILLING AGENCY: GeoEnvironmental
4. HOLE NO. (As shown on drawing title and file number): IR88-IS03
5. NAME OF DRILLER: Rich Melton
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 16'
10. SIZE AND TYPE OF BIT: Direct Push
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED _____ UNDISTURBED 4
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~9 ft bgs
16. DATE HOLE: STARTED 7-25-97 @ 1654 COMPLETED 7-25-97 @ 1725
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Geologist: Fred Holzmer INTERA

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Soil Zone/orig bldg constr backfill. f. SAND w minor silt, color alternating lt brn to dk brn to charcoal brn (3.2-3.5)			HNu 1' = 92 ppm 1.5 66 2 210 mild sweet smell 2.5 400 HS 2.8 = 191 (Sample IS03-1) 3 309 3.5 10
	2			100%		
			2.8 Native sed contact f. SAND w some silt/clay, moist, cohesive, friable to slt plast, lt brn-gray			
	4				4	4.5 = 153 mild sweet smell 5 40
			5.4 si-CLAY, moist, firm, low plast, lt. gray	100%		5.5 51 HS 5.7 26 (Sample IS03-2) 6 82 HS 6.1 12 6.5 14
	6		6.0 f. SAND, minor fines, moist, friable, mottled yel-orange in tan matrix		7	7.5 = 211 mild sweet smell HS 7.6 108 (Sample IS03-3) 8 23 8.5 11
	8			TD%		9 14
	10				10	10 = 6 10.5 2.8 11 2.4
			11.5 grading to med gray (texture as above	100%		11.5 3.0 12 2.41 12.5 2.6
	12				13	
	14					14 = 2.2 14.5 = 1.6 15 1.9 15.5 2.1
	16		as above to TD @ 16.0			
	18					

Hole No.

DRILLING LOG	DIVISION	INSTALLATION: MCB Camp Lejeune	SHEET 1 OF 1 SHEETS

1. PROJECT: Bldg 25 DNAPL Source Zone Borings
2. LOCATION (Coordinates or Station): ~6' W of TW04 (S-side Bldg 25)
3. DRILLING AGENCY: GeoEnvironmental
4. HOLE NO. (As shown on drawing title and file number): IR88-ISB4
5. NAME OF DRILLER: Rich Melton
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 13 ft
10. SIZE AND TYPE OF BIT: Direct Push
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED _____ UNDISTURBED 4
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~9.5 ft bgs
16. DATE HOLE: STARTED 7-26-97 @ 0740 COMPLETED 7-26-97 @ 0815
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: Geologist: Fred Holzmer INTERA

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Grass, soil zone, f. SAND w silt, moist, cohesive, friable, gray brn			HNa Backgrnd = 1.5 1.0' = 1.5 ppm 1.5 1.5 2 1.7
	2		si - v.f. SAND	95%		2.5 1.7 3 1.6 3.5 1.6
	4				4	
			5.1 Sediments sat'd to ~7.0 ft bgs; then unsat'd (recharge pulse from recent rains)	90%		5 = 1.5 5.5 = 1.5 6 = 1.5 6.5 = 1.5
	6		6.1 si-CLAY w f. sand, moist cohesive, low plast, lt brn			
			6.5 SiL-v.f.SAND, silt, moist firm, cohesive, friable, tan w yel-orange mottling		7	
	8					8.5 = 2.7 9 1.9
			9.1 sat'd	80%		9.5 2.7
			7-24-97 WL = 9.36 btoc @ MW02 (~20 ft from boring)			
	10				10	11 = 9.2 11.25 34 11.5 17
			11.0 grading to f. to v.f. SAND, clean, wet, stiff, cohesive, tan	80%		12 107 Sample ISB4-1 12-12.2 12.5 22
	12		TD = 13			
					13	
	14					

Hole No.

DRILLING LOG	DIVISION	INSTALLATION	SHEET / OF / SHEETS
		MCB Camp Lejeune	1 of 1

1. PROJECT: Bldg 25 DNAPL Source Zone Borings
2. LOCATION (Coordinates or Station): Inside Bldg 25, ~ 13' from S-of N-wall
3. DRILLING AGENCY: Geoprobe
4. HOLE NO. (As shown on drawing title and file number): IRBB-ISO5
5. NAME OF DRILLER: Rich Melton
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 20 ft
10. SIZE AND TYPE OF BIT: Direct Push
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: 7
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~ 9-9.5 ft bgs
16. DATE HOLE: STARTED 7-26-97 @ 0915 | COMPLETED 7-26-97 @ 1026
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: Geologist: Fred Holzmer INTERA

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0-.35 Conc	.4		Cont tube samples 1 1/4" ID (43 mm)
			.35 construction backfill; f. SAND, moist, loose, tan to lt brn			HNu
						1.0 = 240 ppm
						1.5 445 strong hydrocarb smell
	2		2.1 Native soil/zone contact f. SAND w/ micaceous silt/clay, lt brn w/ charcoal mottling, loose	70%		2 609
						2.5 861
						HS 2.8 1005 Sample ISO5-1
						3 760
	4		as above, grading to buff color	4		
						4.5 = 308
						5 844 strong hydrocarb smell
			4.5 cl-SILT, moist, cohesive, friable mottled lt gray-brn & yellow-orange.			5.5 945
			w/ f sand fraction	95%		HS 5.8 1179 Sample ISO5-2
	6					6 1051
			6.1 si-CLAY, moist, firm, low-med plast, lt gray/brn & yel-org grading @ 6.5 cl-SILT, slt plast			6.5 653
		NR		7		
			7.0 SILT/v.f. SAND, moist cohesive, friable, some clay clasts, buff color			7.5 = 947 strong hydrocarb smell
	8					8 887
				100%		HS 8.4 1225
			increasing v.f. sand content			8.5 845 Sample ISO5-3
			v.f. SAND / SILT, clean (no clay)			
	10		darker (lt gray) w/ depth	10		HS 10.2 938 Sample ISO5-4
						10.5 = 621
						11 371
				90%		11.5 154
	12					12 100
						12.5 101
				13		
			as above			13.5 = 39
	14					14 89
				90		14.5 60
						15 49
						15.5 36
	16			16		16.5 = 73
					1" dia discrete sampler	17 = 52
				100		17.5 = 45
	18			18		
			18.2 grading to cl-SILT wet, cohesive, med-gray		as above	18.5 = 30
				100		19 11
			19.3 grading to si-CLAY, wet cohesive, low-med plast, med-gray TD = 20' bgs			19.5 9.3
						20 9.9

Hole No.

DRILLING LOG | DIVISION | INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Bldg 25 DNAPL Source Zone Borings
2. LOCATION (Coordinates or Station): SW Corner Bldg 25 (outside ~5' S of Bldg)
3. DRILLING AGENCY: GeoEnvironmental
4. HOLE NO. (As shown on drawing title and file number): IRBB-IS06
5. NAME OF DRILLER: Rich Melton
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 14 ft
10. SIZE AND TYPE OF BIT: Direct Push
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: 5
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~ 9.5 ft bgs
16. DATE HOLE: STARTED 7-26-97 @ 1412 | COMPLETED 7-26-97 @
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Geologist: Fred Holzner INTERA

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Soil horizon: v.f. SAND, moist, cohesive, friable, dk brn			Geoprobe cont tube 1 1/16" ID HNu
						1.0 = 3.6
						1.5 = 3.3
	2			100%		2 3
			2.6 grading to unweathered sed's. Si - v.f. SAND, moist, cohesive friable, tan w mottled yel-orange			2.5 3
						3 2.8
						3.5 2.7
	4				4	
						4.5 = 2.9
				100		5 2.5
						5.5 2.4
	6					6 2.5
						6.5 2.5
					7	
			as above			7.5 = 100
	8					8 130
						8.5 5.4
				80%		9 12.6 strong hydrocarbon smell
			wet	Resampled; Sed's dropped out of tube on 1st try		HS 9.3 — 405 9.5 61 Sample IS06-1
	10				10	
			as above	Sampled dropped out; moved rig ~1' & used 2'x1"d scrape sampler		10.1' = 3.6 (bkgrnd)
						10.5 "
						11 "
						11.5 "
				100%		12 "
	12		11.6 grading to f. SAND, minor fines, wet, cohesive, yel-orange		12	12.1 = 7.5
						12.5 6.6 (Bkgrnd)
				100%		13 6.4
			13.0 grading to f. to v.f. SAND, minor fines, wet, cohesive, med gray (to TD = 14' bgs)			13.5 6.5
	14				14	TD = 14' bgs
	16					
	18					

Hole No.

DRILLING LOG	DIVISION	INSTALLATION: MCB Camp Lejeune	SHEET 1 OF 1 SHEETS

1. PROJECT: Bldg 25 DNAPL
2. LOCATION (Coordinates or Station): N-side Bldg 25 @ Tank T25-4
3. DRILLING AGENCY: Geo Environmental
4. HOLE NO. (As shown on drawing title and file number): IRBB-ISØ7
5. NAME OF DRILLER: Rich Melton
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 20 ft
10. SIZE AND TYPE OF BIT: Direct Push
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: 7
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE: STARTED 7.26.97 @ 1555 | COMPLETED 7.26.97 @
17. ELEVATION TOP OF HOLE: ~ 9-9.5 ft bgs
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Geologist: Fred Hoffman INTERA

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	2		0.0 Tank yard backfill f-v.f. SAND, clean, moist, loose tan.	75%		Geoprobe Cont tube 1 1/16" ID HNu 1.0' = 4.0 (bkgrd) 1.5 3.6 2 3.4 2.5 3.5 3 3.3 3.5 3.6
	4				4	
	6	NR	4.7 Contact w native seds: SILT w clay & f. sand, moist cohesive, friable, med-gray 5.5 grading to cl-SILT, trace f. sand, minor peat, moist, cohesive, slt plast, organic decay odor, dk gray	70%		4.5' = 3.1 5 138 Sample ISØ7-1 HS 5.3 — 83 5.5 20 6 112
	8		cl-SILT / cl-f. SAND moist cohesive, friable, slt plast, occassional plant fibers & clay clasts, med-dk gray w mottled yel-orange	90%	7	7.5' = 4 8 29 8.5 171 strong hyd-carb smell HS 8.8 — 477 9 53 Sample ISØ7-2 9.5 79
	10		9.2 f.-v.f. SAND. w silt, 9.8 si-f. SAND, wet, firm, cohesive, olive gray	100%	10	10' = 47 10.5 37 Sample ISØ7-3 HS 10.8 — 195 11 44 11.5 32 12 11 12.5 9
	12				13	13 13 13 113(?) probably backfill from above 13.5 153(?) 14 90(?)
	14			50%(?)		14.5 14 15 14 15.5 10
	16				16 1" ID Sampler	16.5' = 12 17 13
	18		17.8 grading to SILT w clay & v.f. sand, wet. firm	100%	18 1" ID sample	17.5 16 18 77 18 81 Sample ISØ7-4 18.5 701
			19 si-sa-CLAY w plant matter, soft, olive-gray TD push = 20'; TD recovery ~ 19'	50% likely bottom foot dropped out		19 219

Hole No.

DRILLING LOG	DIVISION	INSTALLATION: MCB Camp Lejeune	SHEET 1 OF 1 SHEETS

1. PROJECT: Bldg 25 DNAPL Source Zone Borings
2. LOCATION (Coordinates or Station): N-side of Bldg 25, ~ 20' west of tank T25-4
3. DRILLING AGENCY:
4. HOLE NO. (As shown on drawing title and file number): IR88-ISOB
5. NAME OF DRILLER: Rich Melton
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN:
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE: 21 ft
10. SIZE AND TYPE OF BIT: Direct Push
11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED: UNDISTURBED: 9
14. TOTAL NUMBER CORE BOXES:
15. ELEVATION GROUND WATER: ~ 9-9.5 ft bgs
16. DATE HOLE: STARTED 7-27-97 @ 0728 COMPLETED 7-27-97 @
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: Geologist: Fred Hofman / INTERA

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 Backfill f. SAND, tan			Geoprobe cont. tube sampler 1 1/16" ID
			-.8 Native soil contact si-cl-f. SAND, wet, soft, minor peat matter, dk gray-brn low plast	80%		HNu 0.5' = 54 ppm
	2					1 = 33
						1.5 = 48
						2 = 23
			2.6 grading to f. SAND w fines, moist, cohesive, firm friable, lt brn			2.5 = 280
						3 = 234
	4			4		Sample ISOB-6 Hydrocarb Sample
						Sample ISOB-4 4.5 = 604 strong hydrocarb smell
						5 = 523
				95%		5.5 = 350
	6					6 = 516
						6.5 = 381
			6.4 grading to cl-f. SAND, wet, cohesive, low plast, med gray-brn			
			7.2 grading to f. SAND w fines, moist to wet, cohesive, lt gray, soft to med firm	7		7 = 340 Sample ISOB-5
				100	8-10 dropped out	7.5 = 442
	8		8-10 Sample interval uncertain	8		8 = 166 Sample ISOB-6 — Hydro Carb Sample
		?			1" ID discrete sampler (collected ~1' N of orig boring)	Looks like 7-8' interval = 440
				50%		Bottom ½ dropped out of sample tube = 340
						= 83
	10		si-f. SAND, wet, cohesive firm, lt gray	10		10' = 56
			10.8 grading to f. SAND, minor fines, lt gray brn			10.5 = 41
				100		11 = 32
			grading to med gray			11.5 = 28
	12		some clay content, slt plast			12 = 23
			f. SAND w silt, minor clay			12.5 = 24
				13		13 = 81
						13.5 = 13
	14			100		14 = 15
				14.5		15 = 52
			17.0 ~~grading to si-cl-f. SAND~~			15.5 = 13
				95%		16 = 12
	16			6.5	NS	
			17.0 grading to si-cl-f. SAND	17		NS 17.5 = 829 strong solvent (sweet) small
						17.5 = 870 Sample ISOB-1
			grading to si-cl-v.f. SAND slt plast			18 = 534
	18					NS 18.5 = 875
						Sample ISOB-2 18.5 = 683 DNAPL(?) fluid inclusion
				19		19 = 871
			19.0 grading to si-CLAY, wet, soft med plast, med gray, to TD = 21' bgs		HSA Sc 926	(Bkgnd 58) 19.5 = 871 (Bkgnd 200)
						Sample ISOB-3 20 = 230 (" 220)

Hole No.

DRILLING LOG | DIVISION

INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Bldg 25 DNAPL Source Zone Borings
2. LOCATION (Coordinates or Station): Inside Bldg 25: ~ 25 ft S of N-wall
3. DRILLING AGENCY: GeoEnvironmental
4. HOLE NO. (As shown on drawing title and file number): IR88-IS09
5. NAME OF DRILLER: Rich Melton
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 21 ft
10. SIZE AND TYPE OF BIT: Direct Push
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: 8
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~ 9-9.5 ft bgs
16. DATE HOLE: STARTED 7-27-97 @ 1040 | COMPLETED 7-27-97 @
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Geologist: Fred Hafner INTERA

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0. - .4 Conc floor		Conc.	
			.4 Construction backfill f. SAND, moist, loose, tan to lt brn			HNu .5' = 134 1 151 1.5 174 2 220 2.5 15 3 3.5
	2		2.3 Contact with native sed si-f. SAND, firm, cohesive friable, lt gray-brn	70%		
	4				4	4.5' = 176 5 81
				95%		5.5 206 6 160 6.5 15
	6		6.4 si-v.f. SAND, moist, cohesive, mottled lt gray & yel-orange		7	7' = 518 strong hydrocarbon smell 7.5 367
	8			100%		8 370 8.5 470
		NR				
	10		as above, lt gray, wet		10	10' = 44 10.5 181 (Sampl 1509-1) 11 21
				70%		11.5 29 12 36
	12				13	13' = 62
			13.5 as above, grading to yel-orange			13.5 33 14 9 (Sampl 1509-2)
	14			90%		14.5 41 moderate solvent smell
					15	15 105 15 55
	16				1" ID discrete sampler	15.5 6 after HNu malfcn & repair 16' = 6 16.5 2.5
			increasing fines, slt plast		17	17 10
					as above	17 7
	18		as above, grading to med gray	50%		17.5 2 18
		NR			bottom	
			as above		19.1	19' = 3 17.5 1.3
			19.1 si-CLAY w minor v.f. sand, wet, med plast, med gray (to TD = 21' bgs)			20 1.5

Hole No.

DRILLING LOG	DIVISION	INSTALLATION: MCB Camp Lejeune	SHEET 1 OF 1 SHEETS
1. PROJECT: Bldg 25 DNAPL Source Zone Borings		10. SIZE AND TYPE OF BIT: Direct Push	
2. LOCATION (Coordinates or Station): N-side Bldg 25: ~ 10' W-SW of Tank T25-4		11. DATUM FOR ELEVATION SHOWN (TBM or MSL):	
3. DRILLING AGENCY: GeoEnvironmental		12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
4. HOLE NO. (As shown on drawing title and file number): IR88-IS10		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED	UNDISTURBED: 8
5. NAME OF DRILLER: Rich Melton		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: ~ 9-9.5 ft bgs	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED 7.27.97 @ 1454	COMPLETED 7.27.97
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE: 21		18. TOTAL CORE RECOVERY FOR BORING: %	
		19. SIGNATURE OF INSPECTOR: Geologist: Fred Hafner INTERA	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Tank yank backfill f.-v.f. SAND, clean, tan			Geoprobe cont tube sampler 1 1/16" ID
	2			75%		HNu - DL 101
						0.5 = .8 (Bkgrnd)
						1 .8
						1.5 1
						2 .9
						2.5 1
			3-4' interval dropped out of tube upon retrieval			
		NR				
	4		si-v.f. SAND, moist, cohesive soft, lt tan-gray	4		
						4.5' = 3.1
						5 .4
						5.5 1.1
				85%		6 2.3
	6					6.5 .7
			6.1 si-CLAY, moist, med plast, lt gray			
		NR				
			si-v.f. SAND, moist, cohesive, buff color w yel-orange	7		
						7' = 4.1
						7.5 18
	8					8 34
				100%		8.5 19
			8.7 as above, grading to lt gray & wet			9 0.6
						9.5 .7
	10			10		
			as above			10' = 4
						10.5 217
				35%		11 73
		NR	11.1-13: sampled dropped out out of tube upon retrieval.			
	12					
			as above, lt gray & bright yellow-orange pockets, wet	13		13' = 3.3
			13.8 grading to med-gray			13.5 1.0 HNu ?!
	14					14 1.0
				100		14.5 1.0 mod solvent smell
						15 → 15.4 Sample IS10-1
			v.f. SAND, minor silt.	15	1" LD discrete Sampler	HNu out of order
						Sample tubes noticably cool upon retrieval, with strong solvent smell
	16			90%		16.1-16.4 Sample IS10-2
						17.2 Sample IS10-3
			increasing fines, w coarse plant fibers	17	as above	Sample tube noted cool. Fluid inclusions of DNAPL(?) associated with sporadic peat (plant fibers) @ 17.2-17.4, & trapped droplets @ 17.6-17.8'
			17.7 grading to cl-SILT, low plast med gray			17.75 Sample IS10-4
	18					
		NR	Sample dropped out upon retrieval			
				19	as above	Strong solvent smell @ 19.0, decreasing to none @ ~ 19.5
			si-CLAY, decreasing silt w depth, soft, med plast, med-dk gray			
			20.5 organic CLAY (fine peat layers) with no solvent smell, poss organic			

Hole No.

DRILLING LOG	DIVISION	INSTALLATION: MCB Camp Lejeune	SHEET 1 OF 1 SHEETS

1. PROJECT: Bldg 25 DNAPL Source Zone Borings
2. LOCATION (Coordinates or Station): N-side Bldg 25; ~16' W of Tank T25-4
3. DRILLING AGENCY: GeoEnvironmental
4. HOLE NO. (As shown on drawing title and file number): IRBB-IS11
5. NAME OF DRILLER: Rich Melton
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 18 ft
10. SIZE AND TYPE OF BIT: Direct Push
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: 6
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~9-9.5 ft bgs
16. DATE HOLE: STARTED 7-27-97 @ 1728 | COMPLETED 7-27-97
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Geologist: Fred Hohmer INTERA

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Mixed tank yank backfill & native sediments, disturbed thru-out f. to v.f. SAND			HNu 0.5' = 7.7 (bkgrnd) 1 7.2 1.5 6.4 2 6.8 2.5 6.4
	2	NR	See below	75	4	
	4	NR	Core sample dropped out upon retrieval (Geoprobe needs to develop catcher baskets to prevent this)	0%	7	
	6					
	8		cl- f. to v.f. SAND, wet, soft; low plast, occassional gray clay clasts in dk-gray brn matrix	70%	10	7.5' = 6.4 8 8.7 moderate 8.5 70 hydrocarb & organic 9 27 decay smell
	10		Core tube stuck in barrel due to flowing sands; had to destroy tube: misc disturbed core described: f. to v.f. SAND, wet, cohesive, lt to med gray	30%	13	strong hydrocarb smell
	12		No sample collected		NS	
	14		si- f.- v.f. SAND, wet, cohesive, med gray	100%	14 1" ID discrete sampler	14' = 5 14.5 4 (bkgrnd) 15 4 no solvent 15.5 4 smell 16 4 IS11-1
	16		16.0 grading to cl-SILT, wet soft, low plast, med gray 16.4 grading to si-CLAY, wet, soft low-med plast, med gray. (to TD = 18' bgs) sparse plant fibers	70%	16 as above	16.5 43 mild solvent smell 17 18 17.5 17 organic decay smell
	18				18	

Hole No.

DRILLING LOG | DIVISION

INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Geoprobe Soil sampling @ Bldg 25
2. LOCATION (Coordinates or Station): N-side of Bldg 25
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IR88-IS14
5. NAME OF DRILLER: Frank
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 22 ft
10. SIZE AND TYPE OF BIT: 1" & 1 3/4" ID core barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: 7
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~ 8 ft BGS
16. DATE HOLE: STARTED 11-18-97 @ 0912 | COMPLETED 11-18-97 @ 1450
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: Fred Holzner DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 Grass, v.f. SAND, moist, cohesive, loose, tan			444
			1.5 si-CLAY, tan-brn, low plast			18
			1.6 SILT w v.f. sand, moist, friable, charcoal-brn grading to dk brn			78
	2					74
			2.8 SILT w clay & v.f. sand, moist slt plast, gray-brn			24
						20
				3		19
	4					8
						13
			5.1 Si-CLAY, wet, low plast	80%		9
						5
		NR				3
	6		6.0 Cl-SILT w v.f. sand, slt plast, moist grading to wet @ ~ 7.0, gray	6		4
						2
			7.7 SILT w minor clay, wet, cohesive, tan to buff, trace v.f. sand			1
				100		1
	8					1
			8.4 si-CLAY, wet, low plast, tan-gray			1
			8.5 v.f. SAND, trace fines, wet, cohesive, lt gray w tan & yel-org mottling			0
				9		0
						0
	10					1
			10.4 grading to cl-si-v.f. sand, wet, slt plast, med-gray cohesive	85%		2
			10.8 v.f. SAND, wet, loose, gray			1
		NR				1
	12		12.0 si-v.f. SAND, wet, cohesive med-gray	12		12
						0
			13.1 thin cl-si-v.f. SAND seam, slt plast			1
			13.2 f.-v.f. SAND, trace fines, wet cohesive,	70%		0
	14					0
			grading to v.f. SAND			
				15		0
						0
	16					2
				50%		1
		NR				
	18		18.0 CLAY, v. soft, med plast gray	18		3
			20.1 grading to CLAY w peat, soft, med plast, gray-brn to TD @ 22'	100		0
						0
						0
						0

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Hole No.

DRILLING LOG	DIVISION	INSTALLATION: MCB Camp Lejeune	SHEET 1 OF 1 SHEETS
1. PROJECT: Geoprobe soil sampling Bldg 25		10. SIZE AND TYPE OF BIT: 1" & 1 3/4" ID core barred	
2. LOCATION (Coordinates or Station): N-side of Bldg 25		11. DATUM FOR ELEVATION SHOWN (TBM or MSL):	
3. DRILLING AGENCY: FUGRO		12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
4. HOLE NO. (As shown on drawing title and file number): IRBB-IS15		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED	UNDISTURBED: 7
5. NAME OF DRILLER: Frank Ward		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: ~ 8 ft BGS	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED 11-18-97@1500	COMPLETED 11-18-97@1730
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE: 22 ft		18. TOTAL CORE RECOVERY FOR BORING: %	
		19. SIGNATURE OF INSPECTOR: Fred Holzmer DE&S Geologist	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	Hnu
	0		0 Appears to be mixed backfill from tank removal area: clean f. sand w native soil: si-f. sand w clay			Core samples collected in 1-11/16" ID core tubes	0
	2			70%			0
							2
							1
	4						1
				50%			0
							0
	6			6			
			6.4 CLAY, soft, wet, med plast, yel-org & gray				2
			6.6 si-v.f. SAND, moist, cohesive buff	85			4
							6
	8					IS15-01 8-9'	13
				9			
			9.5 grading to SILT w v.f. sand, wet, cohesive, gray				3
	10		w intermitant zones of SILT w clay & v.f sand	85%			2
							4
							3
							0
	12			12			
							1
							5
				80			6
	14						0
				15			
	16	NR					
				0			
				18			
			18.0 SILT, wet, cohesive, gray				8
			19.0 CLAY, wet, v. soft, med plast gray	90%		IS15-02 @ 19' above clay contact	25
			19.9 CLAY w peat, low-med plast gray-brn				0
							0

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Hole No.

DRILLING LOG | DIVISION | INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Geoprobe Soil sampling @ Bldg 25
2. LOCATION (Coordinates or Station): 5ft N of Bldg 25
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IRBB-IS16
5. NAME OF DRILLER: Frank Ward
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 20 ft
10. SIZE AND TYPE OF BIT: 1" & 1 3/4" ID core barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: 2
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE: STARTED 11.19.97 | COMPLETED 11.19.97
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Fred Holyman DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						IS16 is located 1 ft E of IS03
	2					
	4					
	6					
	8		8.0 si-v.f. SAND, wet, cohesive, tan	8		4
				75%		7
						8
					IS16-01 8-9'	7
	10			10		
	12					
	14					
	16		16.0 si-v.f. SAND, wet, cohesive, firm, gray to loose	16		2
						3
			17.5 grading to SILT w/ v.f. sand, wet, soft, cohesive,	100%		70
	18					320
						Strong solvent smell 500
			18.6 grading to si-CLAY, wet, v. soft, low plast			IS16-02 @18.5' 250
	20			20		250 500

25

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Hole No.

DRILLING LOG | DIVISION | INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Geoprobe Soil Sampling @ Bldg 25
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IR88-IS17
5. NAME OF DRILLER: Frank Ward
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 21 ft
10. SIZE AND TYPE OF BIT: 1" & 1¾" ID core barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED _____ UNDISTURBED 2
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~ 8 ft BGS
16. DATE HOLE: STARTED 11-19-97 @ 1015 COMPLETED 11-19-97 @ 1150
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Fred Hohmer DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	2					
	4					
	6					
	8		8.0 si-v.f. SAND, wet, loose, lt. gray	8		Hnu Strong hydrocarb smell 280
				80%		IS17-01 8-9' 160
	10			10		70 80
	12					
	14					
	16					
			17.0 SILT w clay & v.f. sand, firm, wet, cohesive, slt plast, gray	17		Hnu 220
	18		18.5 grading to si-CLAY w v.f. sand & peat, wet, v. soft, low plast gray	100%		Strong solvent odor IS17-02 @ 18.0' → 400 100
			19.8 CLAY w peat, soft to firm, low plast, peat decreasing w depth			190 40
	20					80

ENG FORM 1836-1 | PROJECT | HOLE NO. 20

Hole No.

DRILLING LOG | DIVISION | INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Geoprobe Soil Sampling @ Bldg 25
2. LOCATION (Coordinates or Station): ~12 ft N of well TW-3
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IR88-IS18
5. NAME OF DRILLER: Frank Ward
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 21 ft
10. SIZE AND TYPE OF BIT: 1" & 1 3/4" ID core barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: 2
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~8 ft BGS
16. DATE HOLE: STARTED 11.19.97 @ 1400 | COMPLETED 11.19.97
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: Fred Holzner DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	8		8.0 f. to v.f. SAND, wet, loose to cohesive, firm, lt gray	8 / 100% / 10		Hnu 6 2 2 0
	18		17.0 si- v.f. SAND, wet, firm, cohesive, gray	17 / 100%	IS18-02 @ 18.4' →	3 7 7 3 1 0
			18.0 grading to cl-SILT w f. sand & peat particles, slt plast.			
			18.8 grading to si-CLAY w f sand & peat particles, wet, soft, med gray low plast			
	20		19.6 grading to CLAY w peat, minor silt & f. sand, soft-firm, low plast			

ENG FORM 1836 | PROJECT | HOLE NO.

Hole No.

DRILLING LOG | DIVISION | INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Geoprobe Soil Sampling @ Bldg 25
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IR88-IS19
5. NAME OF DRILLER: Frank Ward
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 21 ft
10. SIZE AND TYPE OF BIT: 1" & 1¾" ID core barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: 2
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~ 8 ft BGS
16. DATE HOLE: STARTED 11.19.97 @ 1510 | COMPLETED 11.19.97
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Fred Holzmer DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	8		8.0 si-f. SAND, wet, gray	8		Hnu 40
			8.7 si-cl-v.f. SAND w peat	80%		Strong hydrocarb Smell 280
					IS19-01 @ 8-9'	170
	10			10		250
	17		17.0 si-f. SAND, wet, firm,	17		Hnu 12
	18		18.2 grading to cl-SILT w v.f. sand & peat particles, wet, slt plast	100%		3
			18.9 grading to si-CLAY w v.f. sand & peat particles, wet, low plast, soft			.5
	20		19.5 grading to CLAY w minor silt, peat particles; v. soft, low-med plast			.5 .5

ENG FORM 1836 | PROJECT 211 | HOLE NO. 3

Hole No.

DRILLING LOG	DIVISION	INSTALLATION: MCB Camp Lejeune	SHEET 1 OF 1 SHEETS

1. PROJECT: Geoprobe Soil Sampling @ Bldg 25
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IR88-IS20
5. NAME OF DRILLER: Frank Ward
6. DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 21 ft
10. SIZE AND TYPE OF BIT: 1" & 1 3/4" ID core barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED; UNDISTURBED: 2
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~8 ft BGS
16. DATE HOLE: STARTED 11.19.97 @ 1630; COMPLETED 11.19.97
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Fred Holzman DE & S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	8		8.0 si-v.f. SAND, wet, firm, lt gray	8		Hnu 4
			lt brn	100%		11
			tan-gray			125
	10			10		25
						3
	17		17.0 si-v.f. SAND, wet, firm,	17		Hnu
						slight solvent smell 38
	18			100%		10
						IS20-02 @ 18.5 52
			19.0 grading to cl-SILT, wet, slt plast			20
	20		19.4 grading to CLAY; wet, soft, low plast, w peat particles			9

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Hole No.

DRILLING LOG

DIVISION	INSTALLATION: MCB Camp Lejeune	SHEET 1 OF 1 SHEETS

1. PROJECT: Geoprobe Soil Sampling at Bldg 25	10. SIZE AND TYPE OF BIT: 1" & 1 3/4" ID core barrel
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY: FUGRO	12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
4. HOLE NO. (As shown on drawing title and file number): IRBB-IS21	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED: — UNDISTURBED: 3
5. NAME OF DRILLER: Frank Ward	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER: ~ 8 ft BGS
	16. DATE HOLE — STARTED: 11-20-97 @ 0835 — COMPLETED: 11-20-97
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE: 21 ft	19. SIGNATURE OF INSPECTOR: Fred Holzmer DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	2					
	4					
	6					
	8		8.0 f. to v.f. SAND, wet, soft to firm, buff to lt gray	8 – 100% – 10		IS21-01 @ 8-9' → Hnu: 200, 350, 90, 50, 170
	10					
	12					
	14					
	16		16.0 f. SAND, trace fines, wet, firm, med gray	16 – 90% – 20		Hnu: 8; Fluid inclusions that appear to be DNAPL @ ~18.5-18.9'
			17.5 grading to si-v.f. SAND w minor clay, wet, firm, cohesive, med-gray			7, 20
	18					100, 110; Resample w 1" dia coretube — 80%; Hnu 400, 400, 420; Strong solvent smell
			19.5 grading to si-CLAY, w peat particles wet, low plast to TD @ 20.5' gray to gray-brn			350, 200, 400
	20					

ENG FORM 1836 … PROJECT … HOLE NO.

Hole No.

DRILLING LOG | DIVISION | INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Geoprobe Soil Sampling at Bldg 25
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IR88-IS22
5. NAME OF DRILLER: Frank Ward
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 22 ft
10. SIZE AND TYPE OF BIT: 1" & 1 3/4" ID core barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: 3
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~8 ft BGS
16. DATE HOLE: STARTED 11·20·97 @ 1140 | COMPLETED 11·20·97
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: Fred Holzmer DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	2					
	4					
	6					
	8		8.0 f. to v.f. SAND, minor silt, wet, cohesive, lt. gray to buff	8		Hnu 400
				100%		400
					IS22-01 8-9'	360
	10			10		360
						425
	12					
	14					
	16		16.0 f. to v.f. SAND, wet, firm, lt gray	16		Hnu Strong solvent odor 420
			17.5 grading to si-cl-f. SAND, wet firm to slt soft, slt plast			380
	18		18.4 grading to cl-SILT w v.f. sand, wet, soft, low plast, med gray	100%	20	Perm Test Core & Hnu 400 340 220
			19.2 grading to si-CLAY, wet, soft, low plast., med-dk gray			420
						440
	20					90 260
				20	22	340 160
	22		21.0 grading to CLAY w silt & peat particles, peat increasing w depth, low plast, brown, solvent smell			

ENG FORM 1836 | PROJECT | HOLE NO.

Hole No.

DRILLING LOG | DIVISION | INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Geoprobe Soil Sampling @ Bldg 25
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IRBB - IS23
5. NAME OF DRILLER: Frank Ward
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 21 ft
10. SIZE AND TYPE OF BIT: 1 3/4" ID core barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: 1
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~8 ft BGS
16. DATE HOLE: STARTED 11-21-97 | COMPLETED 11-21-97
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Fred Hoffmeier DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	16		17.0 v.f. SAND, wet, firm, gray	17		* PA Samples * Hnu 40
	18		18.3 grading to SILT w/ v.f. sand & clay, wet, firm, slt plast	95%		IS23-01 @ 17.5' → 160 VOA IS23-02 @ 18.25' → 240 VOA 380
			19.0 grading to si-CLAY w/ peat particles, wet, v. soft, low-med plast med-dk gray			IS23-03 @ 19.0' 320 VOA IS23-04: 19.5-19.9 70 Kv/Cc
	20		20.2 as above grading to gray-brn, w/ increasing peat fragments, hi plast			IS23-05: 20.0-20.4 24 Kv/Cc

ENG FORM 1836 | PROJECT | HOLE NO. 40

Hole No.

DRILLING LOG | DIVISION | INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Geoprobe Soil Sampling @ Bldg 25
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IR88-IS24
5. NAME OF DRILLER: Frank Ward
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 20 ft
10. SIZE AND TYPE OF BIT: 1 3/4" ID Core barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~ 8 ft BGS
16. DATE HOLE | STARTED: 11.20.97 @ 1600 | COMPLETED: 11.20.97
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Fred Hobmer DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	2					
	4					
	6					
	8					
	10					
	12					No Performance Assessment VOC samples collected here due to difficult sampling & poor recovery
	14					
	16			16		Difficulty collecting core: 1st attempt recovered ~25% 2nd " " ~40% → strong solvent smell. Estimate recovered core is from ~ 17.5-19.0 ft based on nearby logs IS07 & IW01
	18		~17.5 si-v.f. SAND, wet, firm; ~18.0 grading to cl-SILT; ~19.0 grading to si-CLAY, wet, v. soft, ẅ peat fragments v. soft, low-med plast			Hnu: 17 — 420; 18 — 440, 360; 19 — 250
	20			20		

ENG FORM 1836 — PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO.

Hole No.

DRILLING LOG | DIVISION | INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Geoprobe Soil Sampling @ Bldg 25
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IR00-IS25
5. NAME OF DRILLER: Frank Ward
6. DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 20 ft
10. SIZE AND TYPE OF BIT: 1" & 1 3/4" ID Core barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: 2
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~ 8 ft BGS
16. DATE HOLE: STARTED 11-21-97 @ 0850 | COMPLETED 11-21-97
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Fred Hohmer DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	8		8.0 f. to v.f. SAND, wet, firm, lt gray to buff, sparse peat fragments	8 / 75% / 10		Hnu 6 6 7 3
	16		16.0 f. SAND, wet, stiff,	16		Hnu 38 80 440 260 280 480 420 * PA Samples * IS25-01 @ 17' IS25-02 @ 18' IS25-03 @ 19'
	18		17.5 SILT w clay & v.f. sand, sparse peat fragments, slt plast, med dk gray 18.4 grading to v.f. SAND 18.5 Cl-SILT w v.f. SAND, slt-low plast 18.7 si-CLAY, med soft, low plast minor peat, med gray 19.0 thin si-v.f. SAND seam followed by si-CLAY, minor peats, low-mod plast. gray-brn	85%		
	20			20		

ENG FORM 1836 | PROJECT | HOLE NO.

Hole No.

DRILLING LOG | DIVISION | INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Geoprobe Soil Sampling at Bldg 25
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IR88-IS26
5. NAME OF DRILLER: Frank Ward
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 20 ft
10. SIZE AND TYPE OF BIT: 1 3/4" ID core barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: 1
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~ 8 ft BGS
16. DATE HOLE: STARTED 11.21.97 @ 1000 | COMPLETED 11.21.97
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Fred Hohner DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	16		16.0 f. SAND, wet, firm, sparse peat fragments, gray	16		* PA Samples * Hnu 13
			17.2 si-v.f. SAND, wet, stiff, sparse peat fragments			4
	18		17.7 grading to cl-SILT, wet, slt plast, sparse peat fragments, med-soft	80%		IS26-01 @ 17.0' → 60
			18.3 grading to si-CLAY, wet, soft, low plast, sparse peat frags			160
		NR				IS26-02 @ 17.75' → 130
						IS26-03 @ 18.5' → 60
	20			20		62

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO.

Hole No.

DRILLING LOG | DIVISION | INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Geoprobe Soil Sampling at Bldg 25
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IRBB-IS27
5. NAME OF DRILLER: Frank Ward
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 10 ft
10. SIZE AND TYPE OF BIT: 1" ID core barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: /
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~ 8 ft BGS
16. DATE HOLE: STARTED 11.21.97 @ 1035 | COMPLETED 11.21.97
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Fred Holzmer DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	2					
	4					
	6					
	8		8.0 f. to v.f. SAND w/ intermittant si-cl-f. SAND layers, wet, firm, grading from brn to yel-orange to lt gray	8		Hnu
						1
					IS27-01 @ 8-9' Varsol Sample	0
				65%		1.5
		NR				
	10			10		

ENG FORM 1836 — PROJECT — HOLE NO.

Hole No.

DRILLING LOG | DIVISION | INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Geoprobe Soil Sampling inside Bldg 25
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IR88-IS28
5. NAME OF DRILLER: Frank Ward
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 20
10. SIZE AND TYPE OF BIT: 1" & 1¾" ID core barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: 3
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~ 8 ft BGS
16. DATE HOLE: STARTED 11.21.97 @ 1935 | COMPLETED 11.22.97 @ 0815
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Fred Hohmer DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	2					
	4					
	6					
	8		8.0 f. to v.f. SAND, wet, firm, tan to buff color	8		Hnu 1 1 1 1
	10			80% 10		
	12					No VOC sample collected since no contacts were observed between sand to silt to clay, & no evidence of contam.
	14		cl-SILT, med-firm, gray, low plast, sparse peat	14		Poor recovery: 1.5 ft from somewhere between 14-18. ft
	16			40%		PID malfunction but no evidence of contamination, only mild organic decay smell
	18		18.0 CLAY, wet, soft, low-med plast, sparse peat, med-gray 18.7 grading to peaty-CLAY, soft-firm, low plast, gray/sl-brn	18 100%		Hnu malfunction; but no evidence of contam; mild organic decay odor only.
	20			20		

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO.

Hole No.

DRILLING LOG | DIVISION | INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

1. PROJECT: Geoprobe soil sampling inside Bldg 25
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IRBB-IS29
5. NAME OF DRILLER: Frank Ward
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 20 ft
10. SIZE AND TYPE OF BIT: 1" & 1¾" ID core barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED: | UNDISTURBED: 2
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: ~ 8 ft BGS
16. DATE HOLE: STARTED 11·22·97 @ 0825 | COMPLETED 11·22·97
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Fred Holzmer DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	2					
	4					
	6					
	8		8.0 f. SAND, moist on top, then wet, firm, tan, grading to lt gray	8 / 75%		IS29-01 8-9' Strong hydrocarb smell — Hnu: 58, 170, 250, 120
	10	NR		10		
	12					
	14					
	16			16 / 50%		* * Due to poor recovery, (50%), depth of Hnu readings & geologic descriptions are estimated to be from ~18-19.5 ft but not known w certainty of actual depth — Hnu: 300, 260
	18		~18.0 f. to v.f. SAND, minor silt, wet, firm, gray, sparse peat; 18.9 grading to CLAY, variable silt content, low-med plast, med-dk gray soft			IS29-02 ~18.8' * * free-phase DNAPL observed in voids (~⅛") — Hnu: 260, 200
	20		TD @ ~ 19.8	20		

ENG FORM 1836 — PREVIOUS EDITIONS ARE OBSOLETE — PROJECT — HOLE NO.

Hole No.

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS
		MCB Camp Lejeune	

1. PROJECT: Geoprobe Soil Sampling inside Bldg 25	10. SIZE AND TYPE OF BIT: 1" & 1¾" dia core barrel
2. LOCATION (Coordinates or Station): 0	11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
4. HOLE NO. (As shown on drawing title and file number): IR88-IS30	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED; UNDISTURBED: 2
5. NAME OF DRILLER: Frank Ward	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE: STARTED 11-22-97 @ 1030; COMPLETED 11-22-97
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE: 20 ft	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR: Fred Holzner DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	2					
	4					
	6					
	8		8.0 f. SAND, wet, firm	8		Hnu
				60%		IS30-01 8-9' 250 200 60
	10			10		
	12					
	14					Core sample from 16-20 ft had poor recovery (~40%). Recovered core is estimated to be from a depth interval of ~18.5-20 ft
	16			16		
				40%		
	18		~18.5 si-CLAY, soft-firm, low plast, med-gray			
			~18.8 CLAY w minor silt, soft, low to med plast, med-gray minor peat, grading to brn-gray w increasing Peat			* * * Hnu
	20			20		IS30-02 → @~18.8'; abundant free-phase DNAPL in core-catcher tracks & 200 70 60

ENG FORM ... PROJECT ... HOLE NO.

Hole No.

DRILLING LOG | DIVISION | INSTALLATION: MCB Camp Lejeune | SHEET 1 OF 1 SHEETS

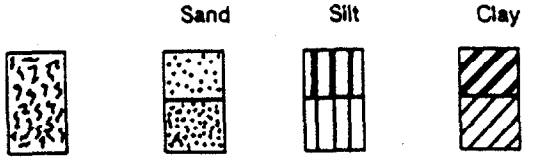
1. PROJECT: Geoprobe Soil Sampling inside Bldg 25
2. LOCATION (Coordinates or Station): 7.7 ft
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IR88-IS31
5. NAME OF DRILLER: Frank Ward
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 20 ft
10. SIZE AND TYPE OF BIT: 1" & 1 3/4" dia core barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED: 2
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE: STARTED 11-22-97 @ 1400 | COMPLETED 11-22-97
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Fred Hohmer DE&S Geologist

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	8		8.0 f. to v.f. SAND, wet, firm, lt yel-orange w lt gray mottling assoc'd w clayey areas.	90%	IS30-01 8-9 ft	Hnu 9, 15, 5, 12
	16		16.0 v.f. SAND, wet, firm, sparse peat frags, gray	95%	IS31-02 @ ~16.8 ft →	Hnu 110, 100, 20, 8, 1, 1, 0
			17.0 interlayered v.f. SAND & CLAY firm,			
			17.5 CLAY, soft, low-med plast, w minor v.f. sand seams (< ½") med-dk gray, sparse peat			
			18.9 grading to peaty-CLAY, low-med plast, soft-firm, gray-brn			
	20					

ENG FORM ... PROJECT ... HOLE NO.

Key To Soil Classification and Symbols

SOIL TYPE
(Shown in Symbol Column)



Predominant Type Shown Heavy

SAMPLE TYPE
(Shown in Samples Column)

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (Major portion Retained on No. 200 Sieve)
Includes (1) clean gravels and sand described as fine, medium or course, depending on distribution of grain sizes (2) silty or clayey gravels and sands and (3) fine grained low plasticity soils (PI < 10) such as sandy silts. Condition is rated according to relative density, as determined by lab tests or estimated from resistance to sampler penetration.

Descriptive Term	Penetration Resistance*	Relative Density
Loose	0 - 10	0 to 40%
Medium Dense	10 - 30	40 to 70%
Dense	30 - 50	70 to 90%
Very Dense	Over 50	90 to 100%

* Blows/Foot, 140# Hammer, 30" Drop

FINE GRAINED SOILS (Major Portion Passing No. 200 Sieve)
Includes (1) inorganic and organic silts and clays, (2) sandy, gravelly or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings or by unconfined compression tests for soils with PI $\geq$ 10.

Descriptive Term	Cohesive Shear Strength Tons/Square Foot
Very Soft	Less Than 0.125
Soft	0.125 to 0.25
Firm	0.25 to 0.50
Stiff	0.50 to 1.00
Very Stiff	1.00 to 2.00
Hard	2.00 and Higher

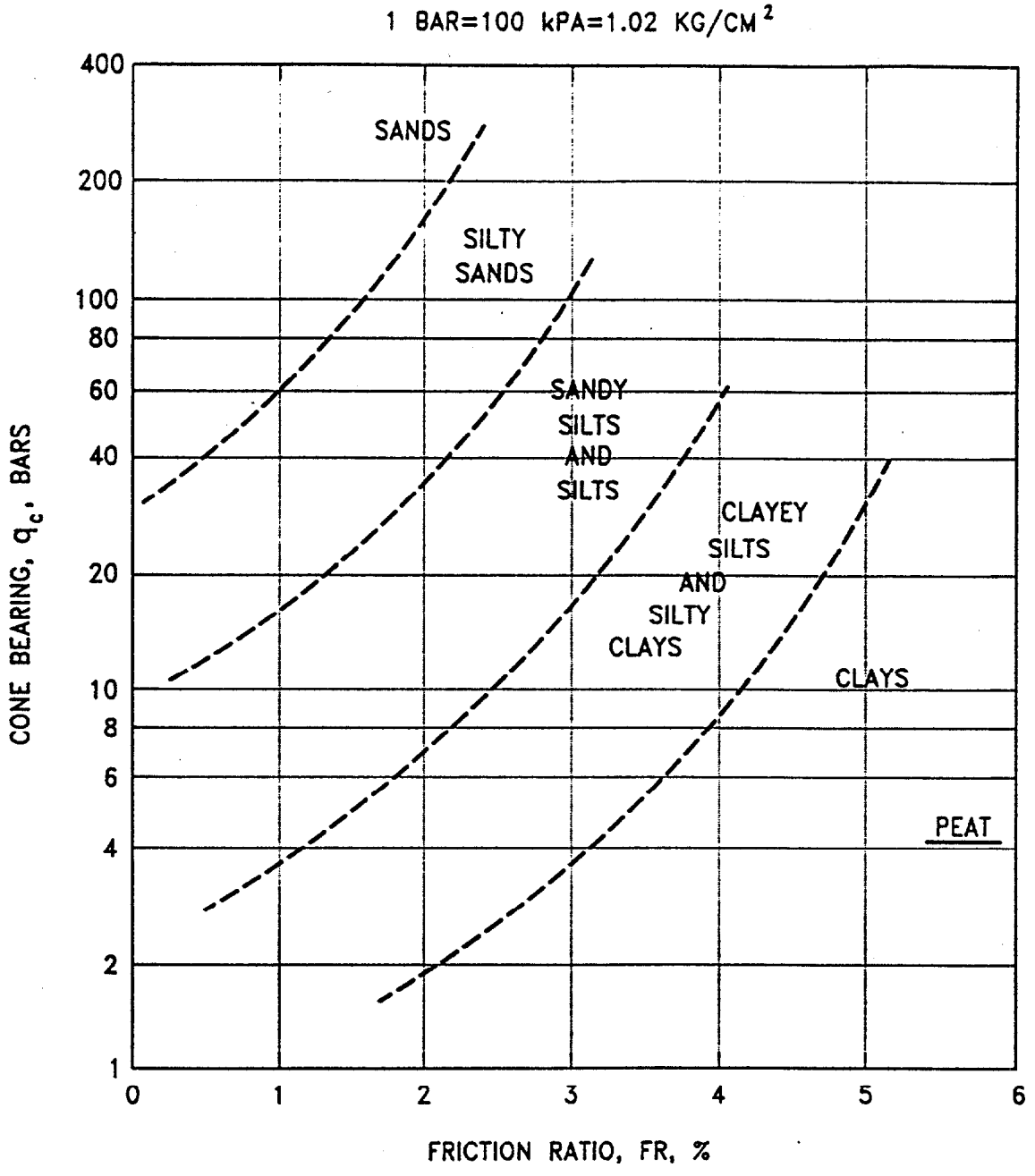
Note: Slickensided and fissured clay may have lower unconfined compressive strengths than shown above because of planes of weakness or shrinkage cracks; consistency ratings of such soils are based on hand penetrometer readings.

TERMS CHARACTERIZING SOIL STRUCTURE

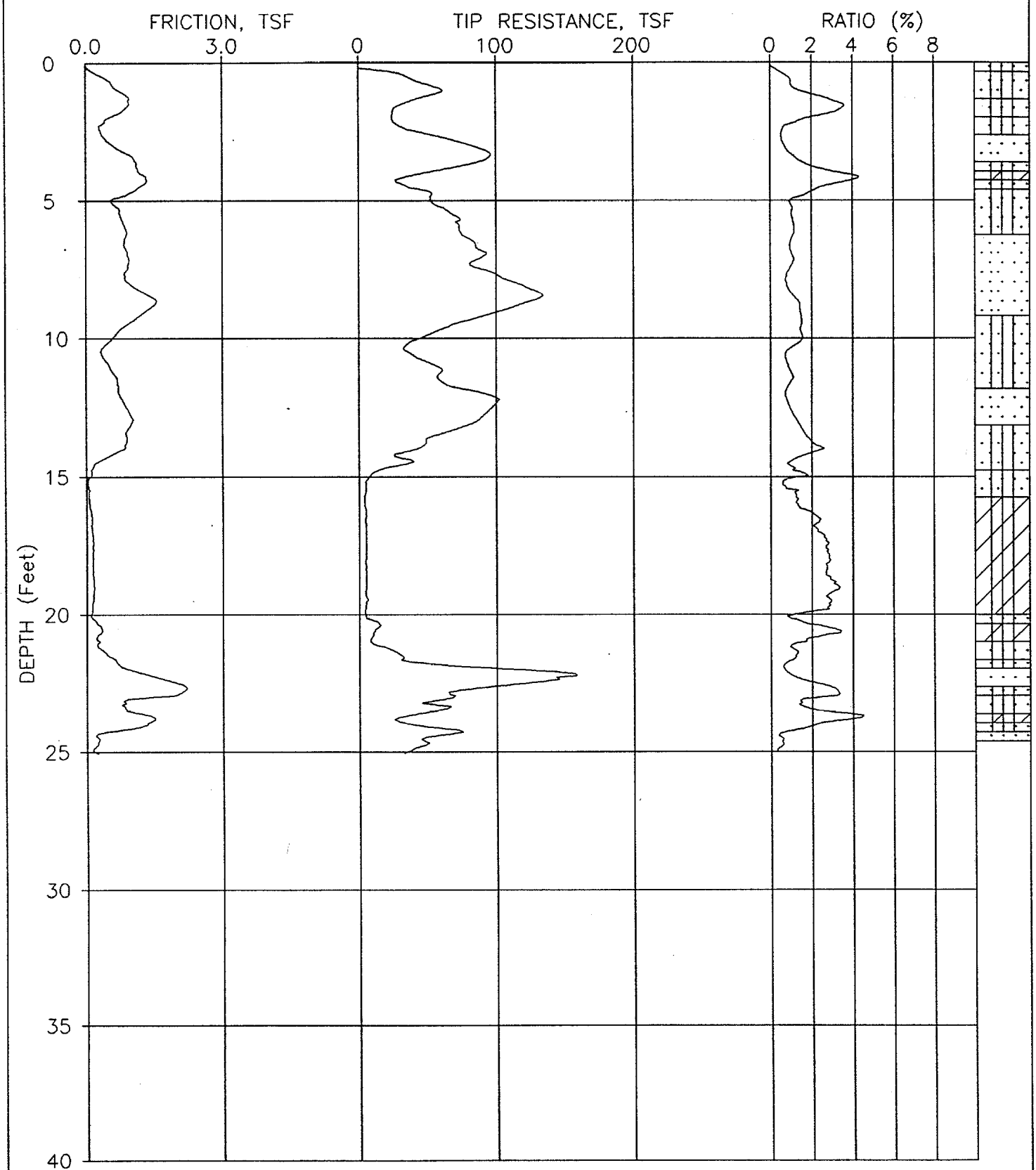
Parting:	paper thin in size
Seam:	1/8" to 3" thick
Layer:	greater than 3"
Fissured:	containing shrinkage cracks, frequently filled with fine sand or silt, usually more or less vertical
Sensitive:	pertaining to cohesive soils that are subject to appreciable loss of strength when remolded
Interbedded:	composed of alternate layers of different soil types
Laminated:	composed of thin layers of varying color and texture
Calcareous:	containing appreciable quantities of calcium carbonate
Well Graded:	having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Poorly Graded:	predominantly of one grain size, or having a range of sizes with some intermediate size missing
Flocculated:	pertaining to cohesive soils that exhibit a loose knit or flakey structure
Slickensided:	having inclined planes of weakness that are slick and glossy in appearance.

Degree of Slickensided Development

Slightly Slickensided:	slickensides present at intervals of 1' to 2', soil does not easily break along these plates
Moderately Slickensided:	slickensides spaced at intervals of 1' to 2', soil breaks easily along these planes
Extremely Slickensided:	continuous and interconnected slickensides spaced at intervals of 4" to 12', soil breaks along the slickensides into pieces 3" to 6" in size
Intensely Slickensided:	slickensides spaced at intervals of less than 4", continuous in all directions; soil breaks down along planes into nodules 1/4" to 2" in size.

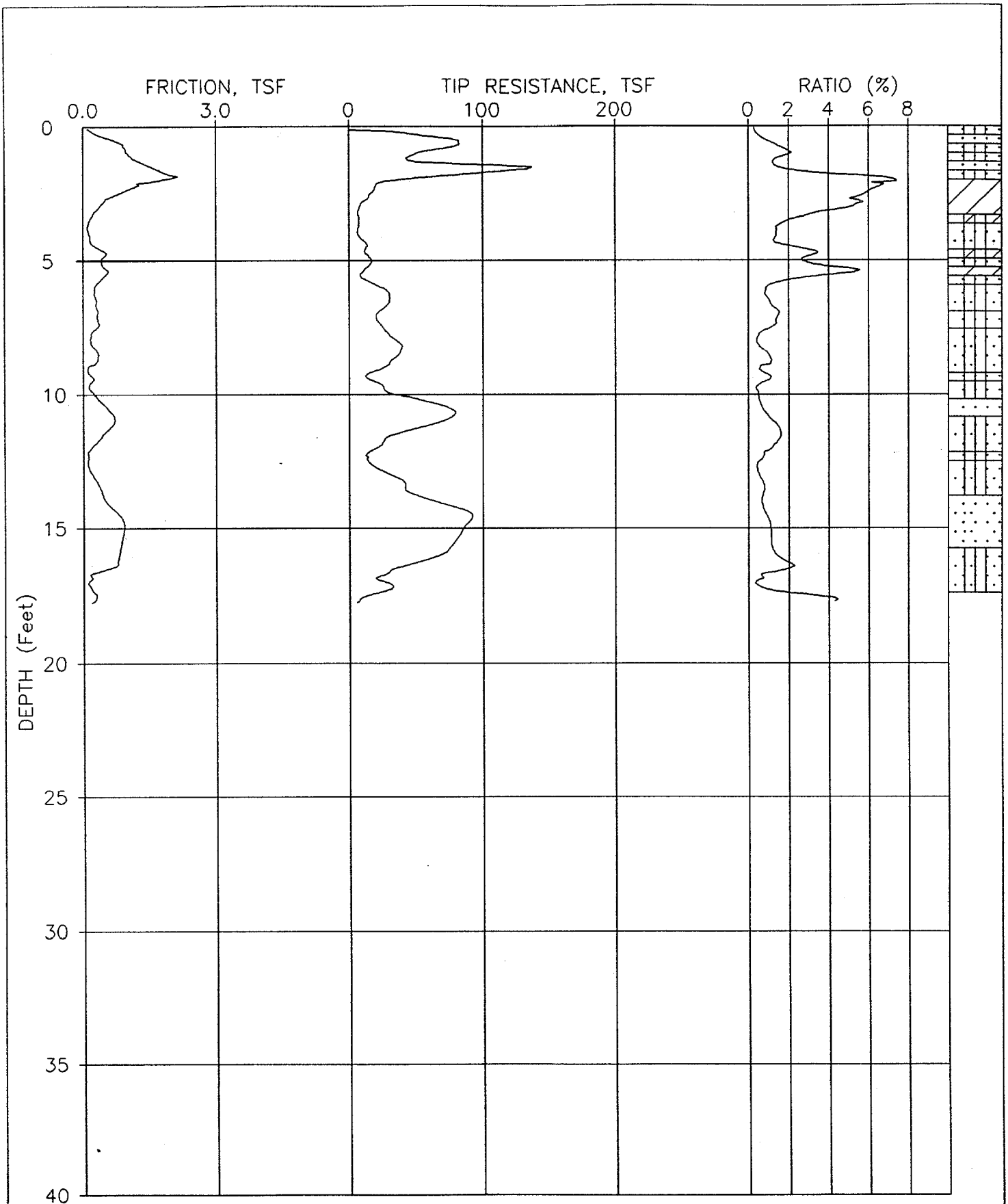


CAMPANELLA AND ROBERTSON CLASSIFICATION CHART (1983)



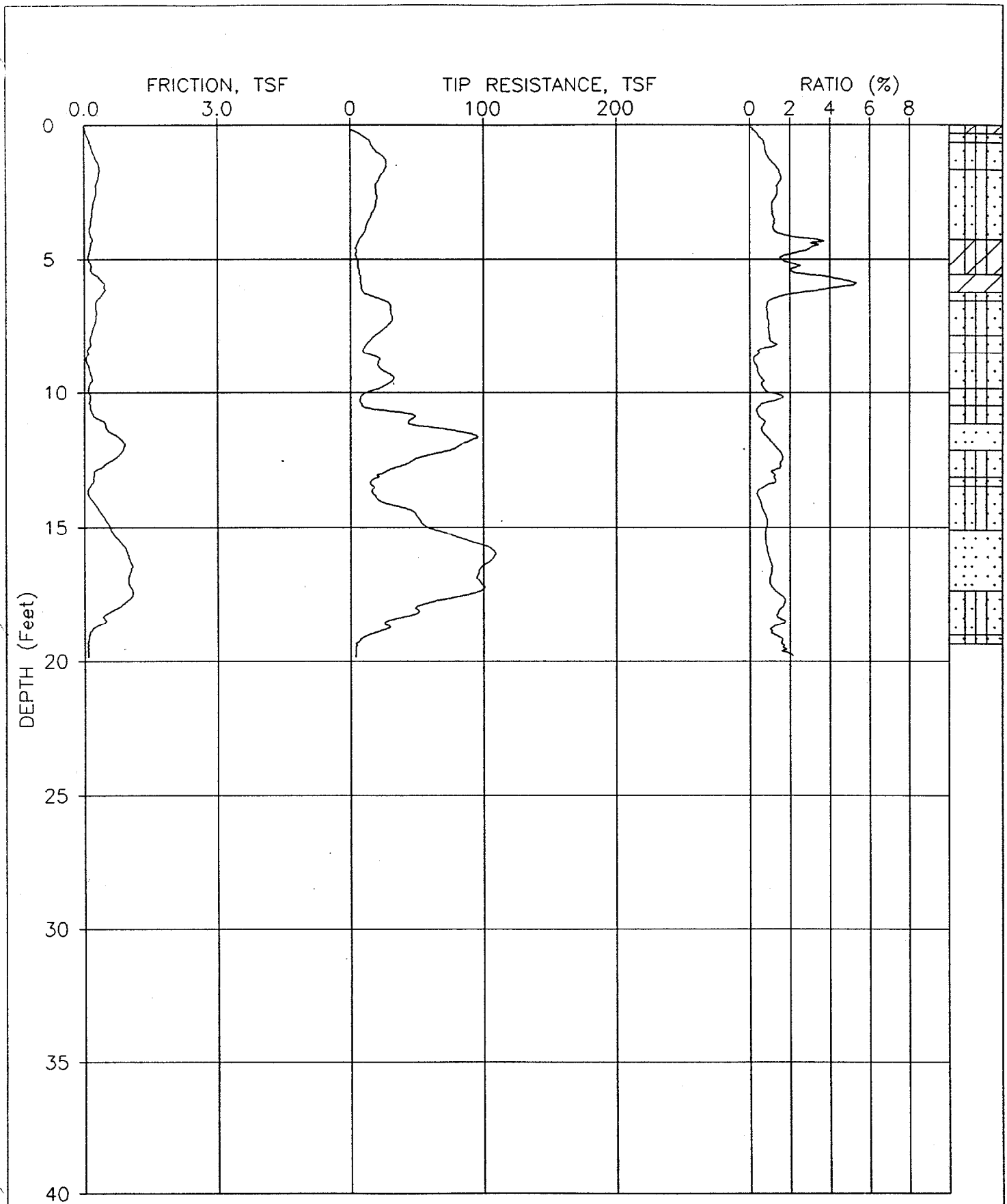
JOB NUMBER: 97-7257 CPT NUMBER: 01 DATE: 11-13-1997
ELEVATION: 0.00 CONE NUMBER: F7.5CKEV611 PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC



JOB NUMBER: 97-7257 CPT NUMBER: 02 DATE: 11-13-1997

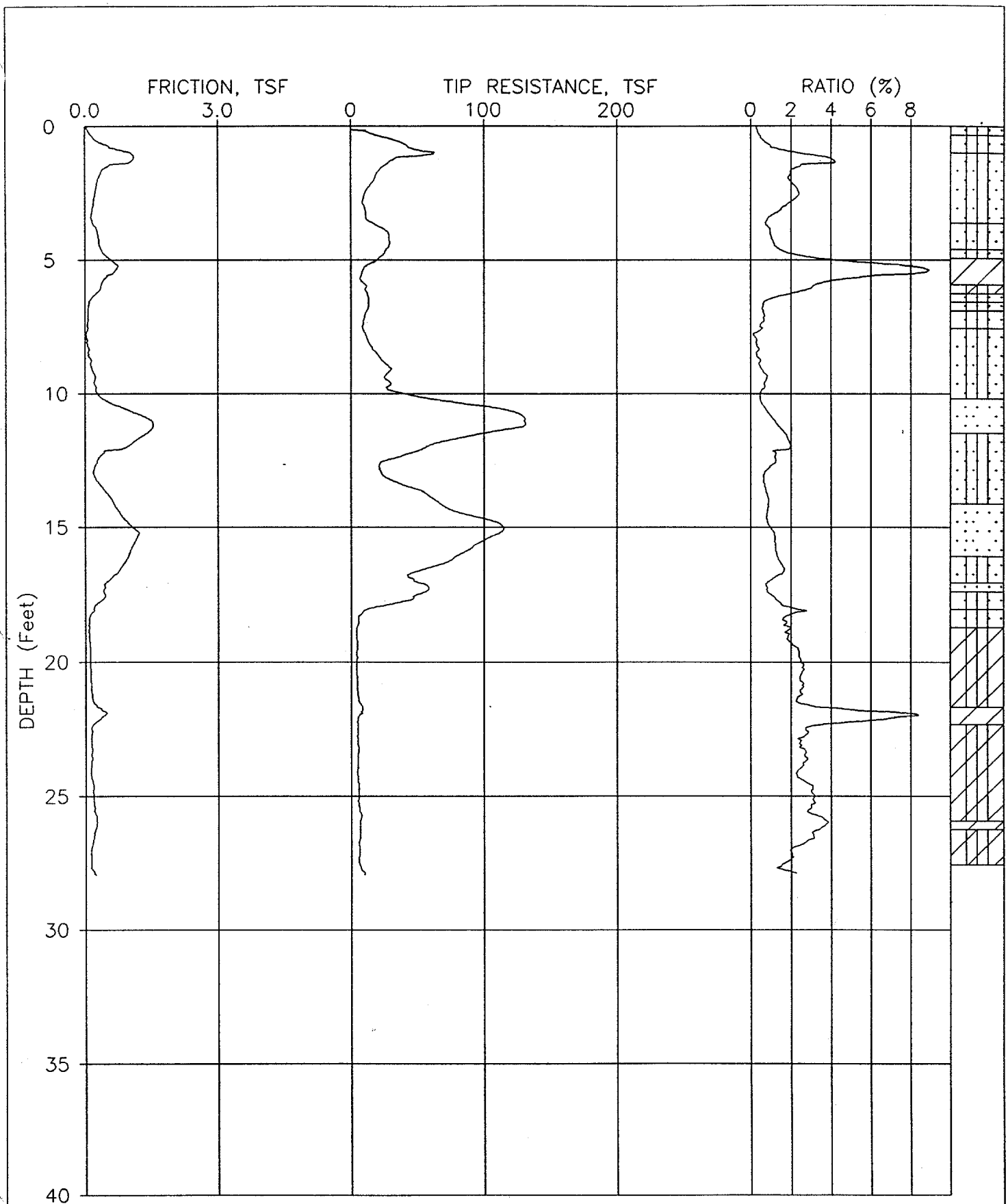
ELEVATION: 0.00 CONE NUMBER: F7.5CKEV611 PLATE: 1 OF 1



JOB NUMBER: 97-7257 CPT NUMBER: 03 DATE: 11-13-1997

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV611 PLATE: 1 OF 1

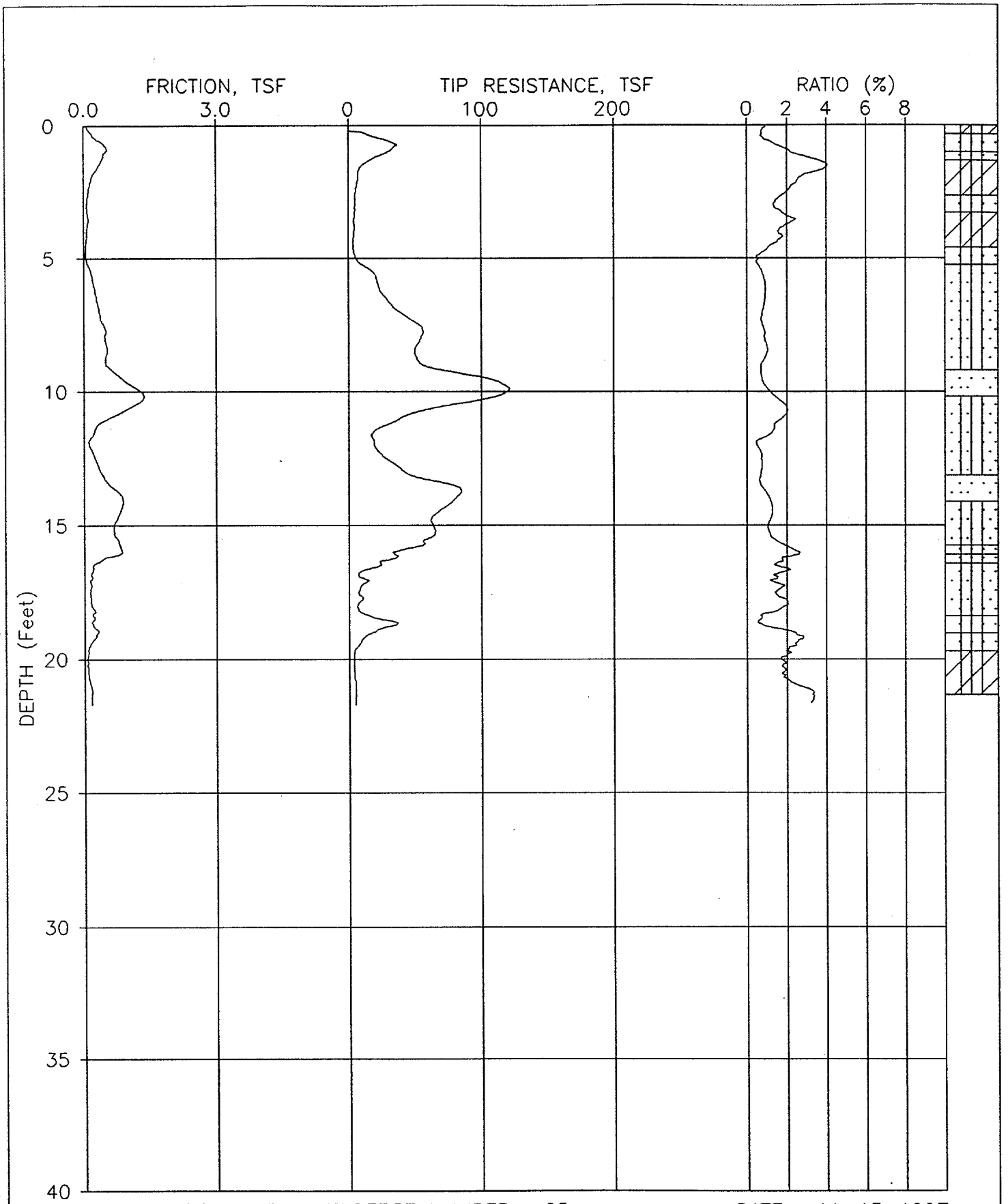
FUGRO GEOSCIENCES,INC



JOB NUMBER: 97-7257 CPT NUMBER: 04 DATE: 11-13-1997

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV611 PLATE: 1 OF 1

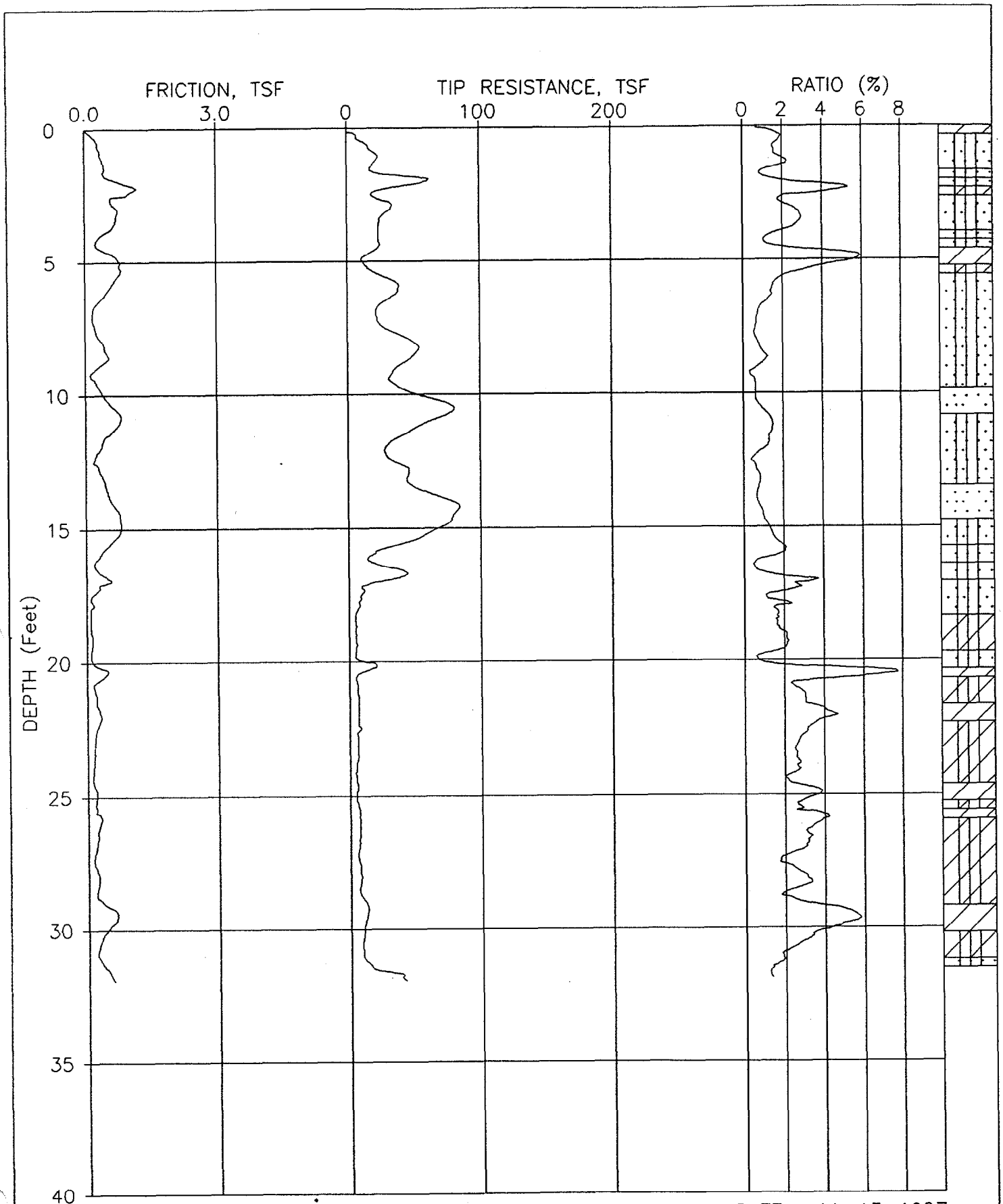
FUGRO GEOSCIENCES,INC



JOB NUMBER: 97-7257.DEPT NUMBER: 05 DATE: 11-13-1997

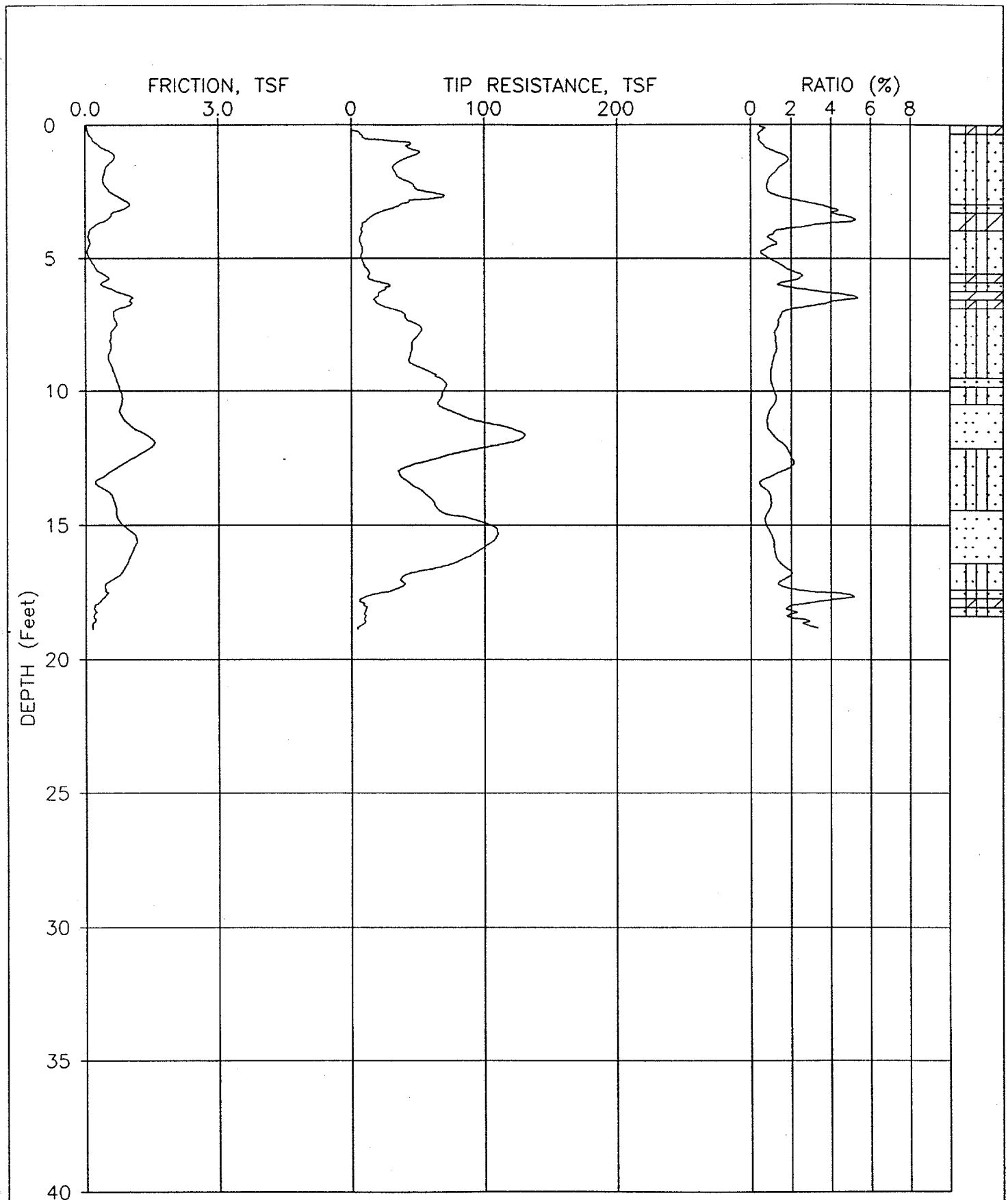
ELEVATION: 0.00 CONE NUMBER: F7.5CKEV611 PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC



JOB NUMBER: 97-7257 CPT NUMBER: 06 DATE: 11-13-1997

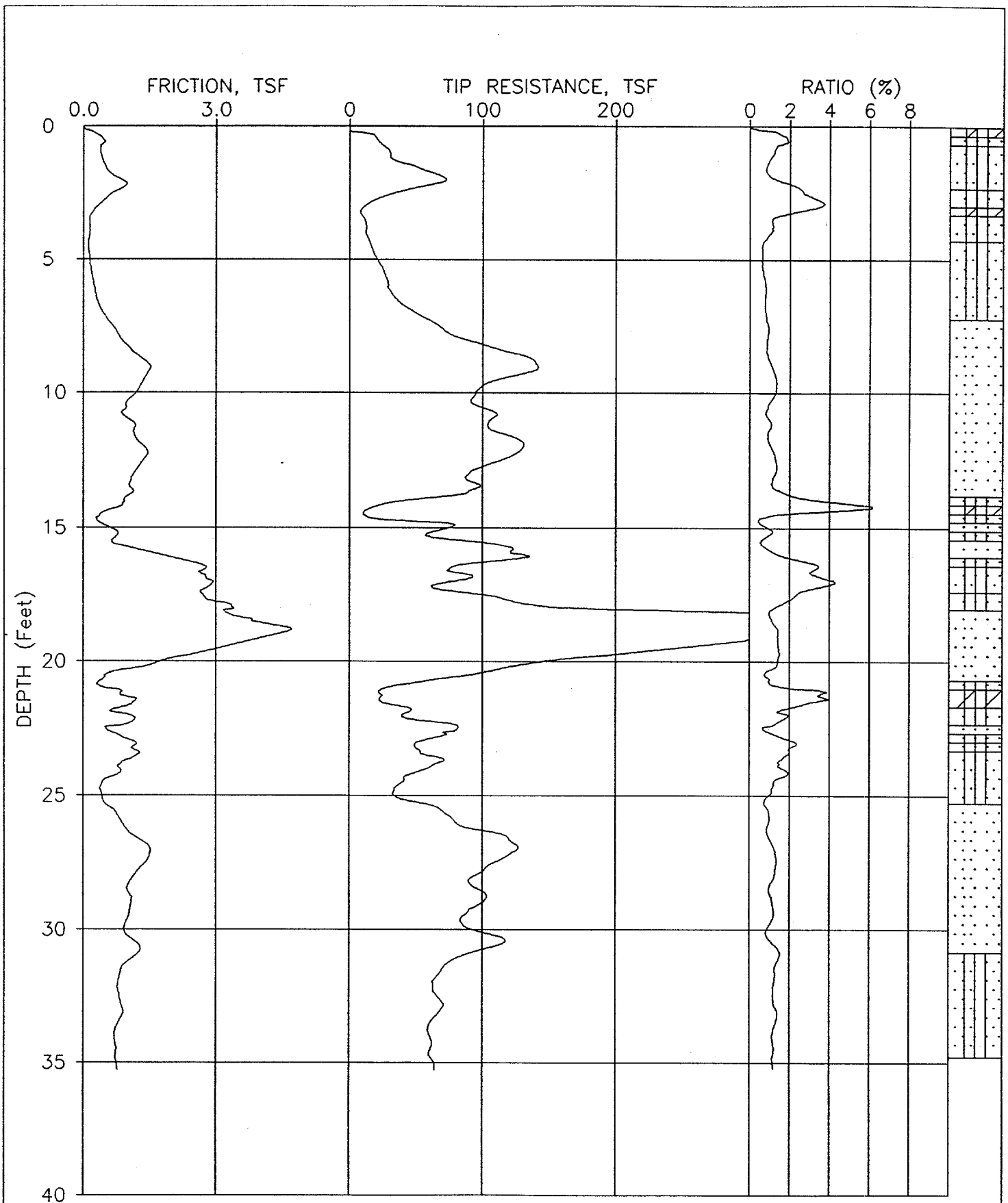
ELEVATION: 0.00 CONE NUMBER: F7.5CKEV611 PLATE: 1 OF 1



JOB NUMBER: 97-7257 CPT NUMBER: 07 DATE: 11-14-1997

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV611 PLATE: 1 OF 1

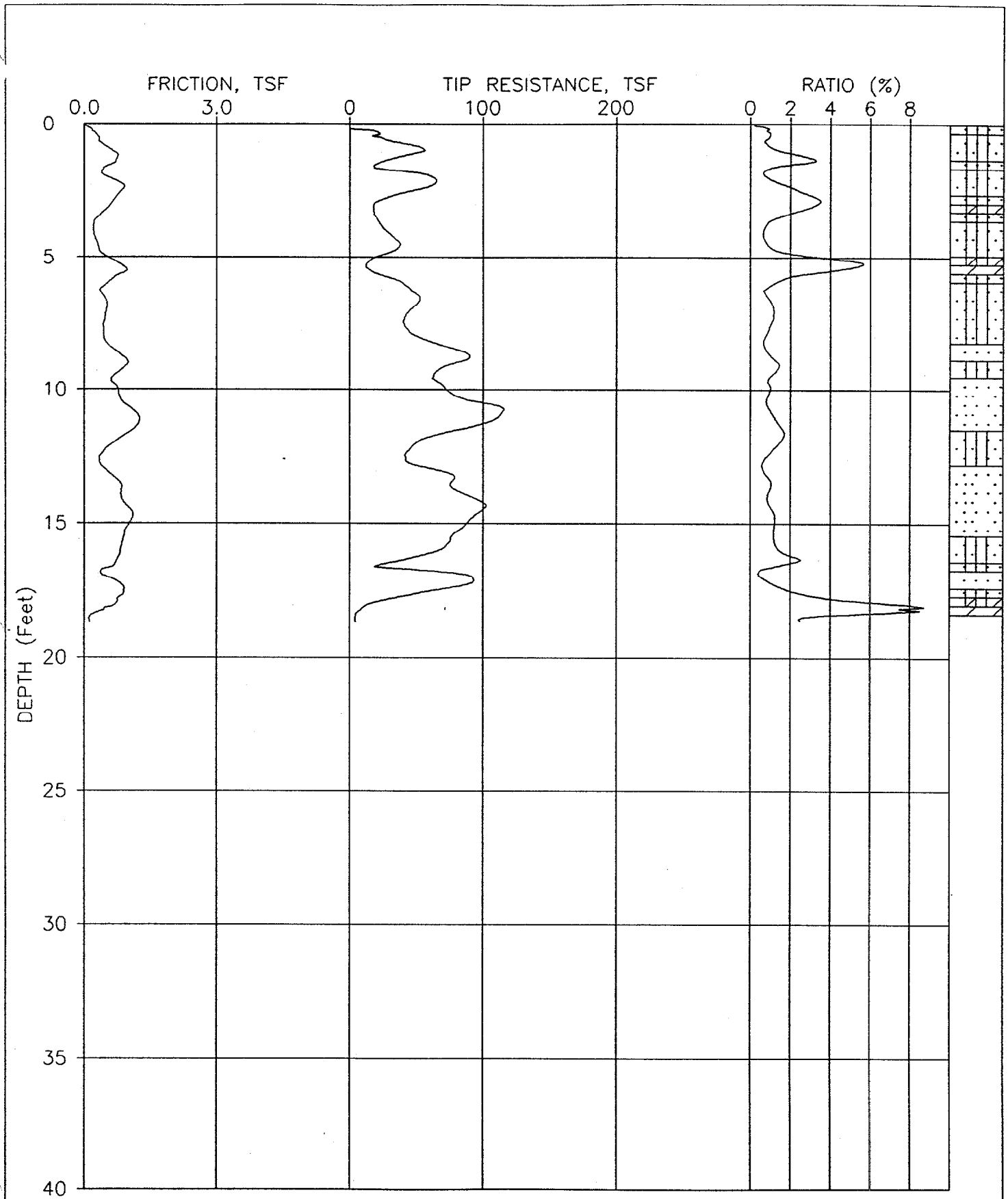
FUGRO GEOSCIENCES,INC



JOB NUMBER: 97-7257 CPT NUMBER: 08 DATE: 11-14-1997

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV611 PLATE: 1 OF 1

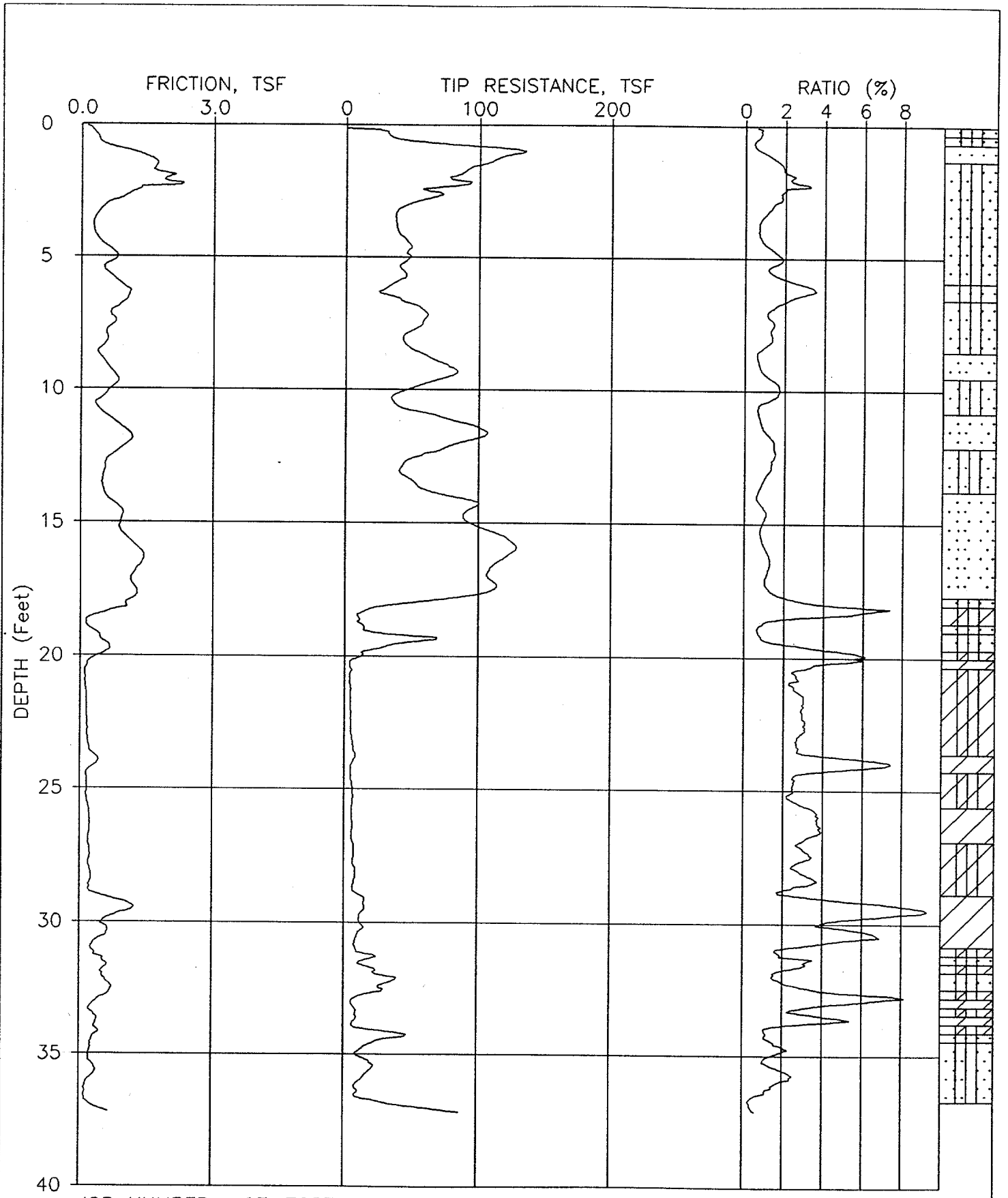
FUGRO GEOSCIENCES,INC



JOB NUMBER: 97-7257 CPT NUMBER: 09 DATE: 11-14-1997

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV611 PLATE: 1 OF 1

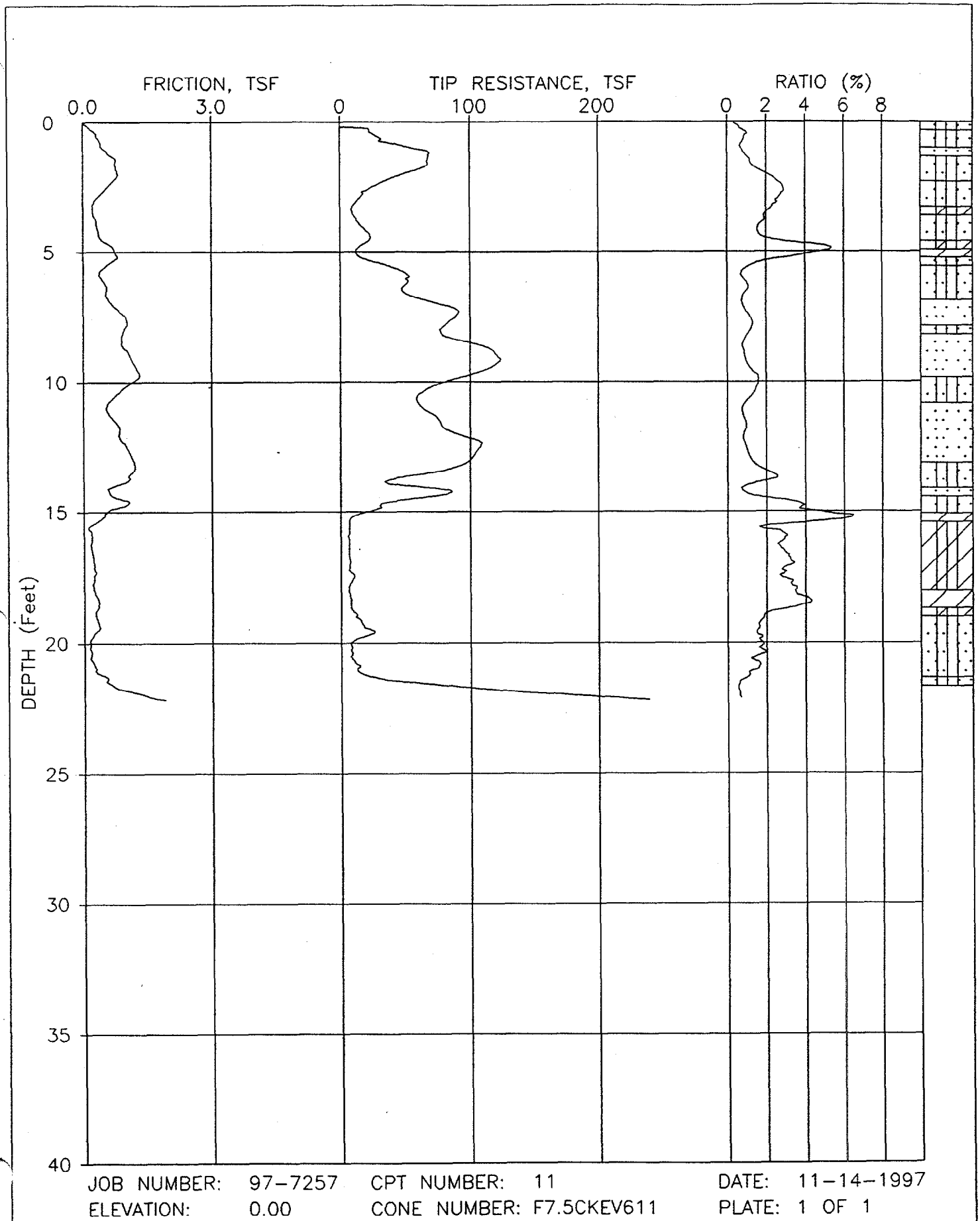
FUGRO GEOSCIENCES,INC



JOB NUMBER: 97-7257 CPT NUMBER: 10 DATE: 11-14-1997

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV611 PLATE: 1 OF 1

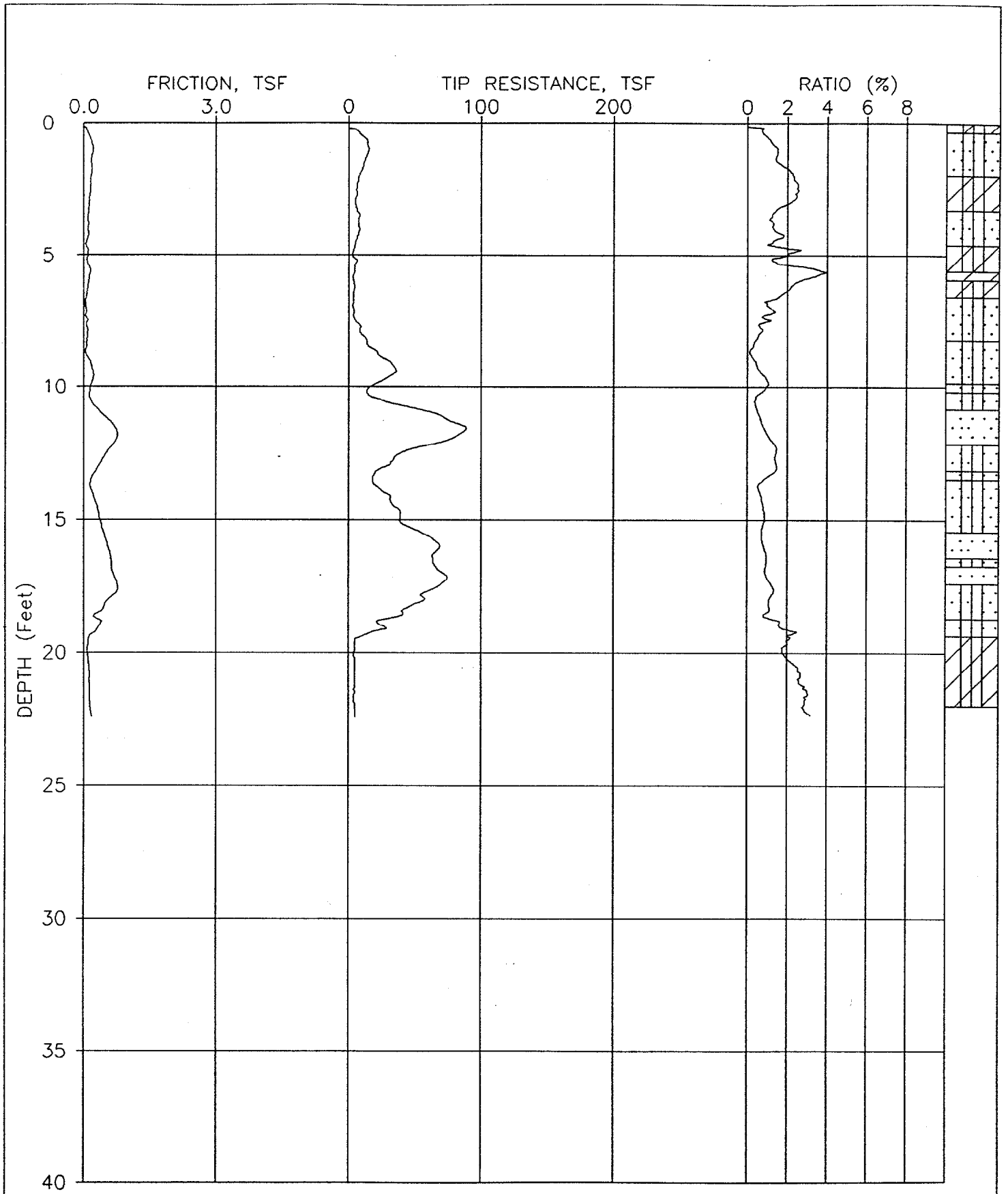
FUGRO GEOSCIENCES,INC



JOB NUMBER: 97-7257 CPT NUMBER: 11 DATE: 11-14-1997

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV611 PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC



JOB NUMBER: 97-7257 CPT NUMBER: 12 DATE: 11-15-1997

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV611 PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC

APPENDIX B
CHAIN-OF-CUSTODY/ANALYSIS REQUEST FORMS

Quanterra Environmental Services
5815 Middlebrook Pike
Knoxville, Tennessee 37921
(423) 588-6401

QUOTE 21587

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD*

H7K180134
Reference Document No. 3740
Page 1 of 2

Project Name/No. [1] SITE 88 DIESEL INVEST. | Samples Shipment Date [7] NOV. 17, 1997 | Bill to: [5] M. BARTMAN
Sample Team Members [2] M. DEJOHN | Lab Destination [8] KNOXVILLE, TN
Profit Center No. [3] SRN | Lab Contact [9] J. MCKINNEY
Project Manager [4] M. BARTMAN | Project Contact/Phone [12] BARTMAN 412/269-2053 | Report to: [10] M. BARTMAN
Purchase Order No. [6] CTO-356 | Carrier/Waybill No. [13] 5253135285
Required Report Date [11] SEE P.O.

ONE CONTAINER PER LINE

Sample [14] Number	Sample [15] Description/Type	Date/Time [16] Collected	Container [17] Type	Sample [18] Volume	Pre- [19] servative	Requested Testing [20] Program		Condition on [21] Receipt	Disposal [22] Record No.
R88-CPTΦ1-Φ1	SOIL ✓	11/15/97 1250	8oz GLASS	8oz	METH.	VARSOL	NONE	10 rounded @ 5C	
R88-CPTΦ1-Φ2	↓	11/15/97 1255	GLASS	4oz	NONE	VOA	METH	FOR LAB USE ONLY custody seals intact jcm 11/18/97	
R88-CPTΦ2-Φ1	✓	11/15 1320	↓	8oz	METH	VARSOL	NONE		
R88-CPTΦ2-Φ2	↓	11/15 1340	↓	4oz	NONE	VOA	METH.		
R88-CPTΦ3-Φ1	✓	11/15 1350 1360	↓	8oz	METH	VARSOL	NONE		
R88-CPTΦ3-Φ2	↓	11/15 1410	↓	4oz	N	VOA	METH		
R88-CPTΦ4-Φ1	✓	11/15 1500	↓	8oz	↓	VARSOL	NONE		
R88-CPTΦ4-Φ2	SOIL	11/15 1530	GLASS	4oz.	METH.	VOA	METH		

Special Instructions: [23] 7 DAY TURNAROUND TIME FOR VOA & VARSOL / ROUTINE FOR ANIONS & CATIONS

Possible Hazard Identification: [24]
Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐

Sample Disposal: [25]
Return to Client ☐ Disposal by Lab ☒ Archive (mos.)

Turnaround Time Required: [26]
Normal ☐ Rush ☐ SEE LINE "23"

QC Level: [27]
I. ☐ II. ☐ III. ☐ Project Specific (specify): SEE D.O.

1. Relinquished by [28] (Signature/Affiliation) BAKER	Date: 11/17/97 Time: 1600	1. Received by [28] (Signature/Affiliation)	Date: 11/18/97 Time: 1000
2. Relinquished by (Signature/Affiliation)	Date: Time:	2. Received by (Signature/Affiliation)	Date: Time:
3. Relinquished by (Signature/Affiliation)	Date: Time:	3. Received by (Signature/Affiliation)	Date: Time:

Comments: [29]

White: To accompany samples
Yellow: Field copy
*See back of form for special instructions.

00000005

H7K160134

Quanterra Environmental Services
5815 Middlebrook Pike
Knoxville, Tennessee 37921
(423) 588-6401

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD (cont.)*

Reference Document No.[30] 3740
Page 2 of 2

Project Name SITE 88 DYNARL INVEST. Project No. CTO-356 Samples Shipment Date Nov. 17, 1997

ONE CONTAINER PER LINE

Sample[14] Number	Sample[15] Description/Type	Date/Time[16] Collected	Container[17] Type	Sample[18] Volume	Pre-[19] servative	Requested Testing[20] Program	Condition on[21] Receipt	Disposal[22] Record No.
R88-CPT05-01	SOIL ✓	11/15 1120	GLASS	8 OZ	NONE	VARSOL		
R88-CPT05-02	↓	11/15 1140	↓	4	METH.	VOA	FOR LAB USE ONLY	
R88-CPT06-01	✓	11/15 1055		8	NONE	VARSOL		
R88-CPT06-02		11/15 1110		4	METH	VOA (HOLD)		
R88-CPT07-01	✓	11/15 1025		8	NONE	VARSOL	FOR LAB USE ONLY	
R88-CPT07-02		11/15 1040		4	METH	VOA		
R88-CPT08-01	✓	11/15 0830		8	NONE	VARSOL	FOR LAB USE ONLY	
R88-CPT08-02		11/15 0845		4	METH	VOA		
R88-CPT09-01	✓	11/15 0800		8	NONE	VARSOL		
R88-CPT09-02		11/15 ~~0900~~ 0815		4	METH	VOA	FOR LAB USE ONLY	
R88-CPT10-01	✓	11/14 1600		8	NONE	VARSOL		
R88-CPT10-02	↓	11/14 1615	↓	4	METH	VOA	FOR LAB USE ONLY	
R88-CPT11-01	SOIL ✓	11/15 0930	GLASS	8	NONE	VARSOL		
R88-FBM01	METHANOL BLANK	11/15 1050	GLASS	4	—	VOA	FOR LAB USE ONLY	
R88-RW01-97D	GROUNDWATER ✓	11/17 1220	PLASTIC	1 L	HNO_3	CATIONS PHL2		
R88-RW01-97D	↓ ✓	11/17 1220	↓	500 mL	NONE	ANIONS		
R88-RW02-97D	↓ ✓	11/17 1235		1 L	HNO_3	CATIONS PHL2	FOR LAB USE ONLY	
R88-RW02-97D	GROUNDWATER ✓	11/17 1235	↓	500 mL	NONE	ANIONS		
R88-FB02	POTABLE WATER ✓	11/17 1420	↓	1 L	HNO_3	CATIONS PHL2		
R88-FB02	↓ ✓	1420	PLASTIC	500 mL	NONE	ANIONS		

White: To accompany samples Yellow: Field copy

*See back of form for special instructions.

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Quanterra Environmental Services
5815 Middlebrook Pike
Knoxville, Tennessee 37921
(423) 588-6401

Quote# 21587

H7K200172

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD*

Reference Document No. 3741
Page 1 of 2

Project Name/No. [1] SITE 88 DNAPL
Sample Team Members [2] M. DeJOHN
Profit Center No. [3] SRN
Project Manager [4] M. BARTMAN
Purchase Order No. [6]
Required Report Date [11] SEE P.O.

Samples Shipment Date [7] NOV. 19, 1997
Lab Destination [8] KNOXVILLE, TN
Lab Contact [9] J. McKINNEY
Project Contact/Phone [12] M. BARTMAN
Carrier/Waybill No. [13] 5253135274 FED-EX

Bill to: [5] M. BARTMAN
Report to: [10] M. BARTMAN

ONE CONTAINER PER LINE

Sample [14] Number	Sample [15] Description/Type	Date/Time [16] Collected	Container [17] Type	Sample [18] Volume	Pre- [19] servative	Requested Testing [20] Program	Condition on [21] Receipt	Disposal [22] Record No.
IR88-IS14-01	SOIL	11/18/97 0955	GLASS	8 oz.	—	VARSOL	Rec'd @ 4°C	
IR88-IS14-02	"	11/18 1450	"	4 oz.	METH.	VOA	w/ Custody Seals	
IR88-IS15-01	"	11/18 1525	"	8 oz	—	VARSOL	Present and	
IR88-IS15-02	"	11/18 1715	"	4 oz	METH	VOA	Intact BPB 11/20/97	
IR88-IS16-01	"	11/19/97 0835	"	8 oz	—	VARSOL		
IR88-IS16-02	"	11/19 0930	"	4 oz	METH	VOA		
IR88-IS17-01	"	11/19 1045	"	8 oz	—	VARSOL		
IR88-IS17-02	SOIL	11/19 1120	GLASS	4 oz	METH.	VOA		

Special Instructions: [23] 24-HR TURNAROUND TIME

Possible Hazard Identification: [24]
Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐

Sample Disposal: [25]
Return to Client ☐ Disposal by Lab ☒ Archive (mos.)

Turnaround Time Required: [26]
Normal ☐ Rush ☒

QC Level: [27]
I. ☐ II. ☐ III. ☐ Project Specific (specify): SEE P.O.

1. Relinquished by [28] (Signature/Affiliation)	Date: 11/19/97 Time: 1600	1. Received by [28] (Signature/Affiliation)	Date: 11/20/97 Time: 0850
2. Relinquished by (Signature/Affiliation)	Date: Time:	2. Received by (Signature/Affiliation)	Date: Time:
3. Relinquished by (Signature/Affiliation)	Date: Time:	3. Received by (Signature/Affiliation)	Date: Time:

Comments: [29]

MCA 3/15/91

White: To accompany samples
Yellow: Field copy
*See back of form for special instructions.

00000007

Quanterra
Environmental Services
5815 Middlebrook Pike
Knoxville, Tennessee 37921
(423) 588-6401

H7K200172

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD (cont.)*

Reference Document No.[30] 3741
Page 2 of 2

Project Name SITE 88 - DNAPL
Project No. CTO-356
Samples Shipment Date Nov. 19, 1997

ONE CONTAINER PER LINE

Sample[14] Number	Sample[15] Description/Type	Date/Time[16] Collected	Container[17] Type	Sample[18] Volume	Pre-[19] servative	Requested Testing[20] Program	Condition on[21] Receipt	Disposal[22] Record No.
IR88-IS18-01	SOIL	11/19 1405	GLASS	8 oz.	—	VARSOL	Rec'd @ 4°C	
IR88-IS18-02	SOIL	11/19 1430	GLASS	4 oz	METH.	VOA	BPB 11/20/97	LAB
								USE ONLY
								FOR LAB USE ONLY
								FOR LAB USE ONLY
								FOR LAB USE ONLY
								FOR LAB USE ONLY
								FOR LAB USE ONLY
								FOR LAB USE ONLY
								FOR LAB USE ONLY
								FOR LAB USE ONLY
								FOR LAB USE ONLY
								FOR LAB USE ONLY

White: To accompany samples Yellow: Field copy

*See back of form for special instructions.

MCA 3/15/91

00000008

Quanterra Environmental Services
5815 Middlebrook Pike
Knoxville, Tennessee 37921
(423) 588-6401

Quote # ~~EOB 21688~~ 21587

H7K220142

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD*

Reference Document No. 3742
Page 1 of 2

Project Name/No. [1] SITE 88 DNAPL INVEST.
Samples Shipment Date [7] Nov. 21, 1997
Bill to: [5] M. BARTMAN

ple Team Members [2] M. DEJOHN
Lab Destination [8] KNOXVILLE, TN

Profit Center No. [3] SRM
Lab Contact [9] J. MCKINNEY

Project Manager [4] M. BARTMAN
Project Contact/Phone [12] M. BARTMAN
Report to: [10] M. BARTMAN

Purchase Order No. [6] SEE D.O.
Carrier/Waybill No. [13] FED-EX 5253135226

equired Report Date [11] SEE D.O.

ONE CONTAINER PER LINE

Sample [14] Number	Sample [15] Description/Type	Date/Time [16] Collected	Container [17] Type	Sample [18] Volume	Pre- [19] servative	Requested Testing [20] Program	Condition on [21] Receipt	Disposal [22] Record No.
88-IS19-01	SOIL	11/19/97 1540	GLASS	8 oz	—	VARSOL	Rec'd @ 2°C	
88-IS19-02	"	1620	"	4 oz	METH.	VOA	~~not~~ No Custody	
88-IS19-03	"	1625	"	4 oz	—	MOISTURE CONTENT	Seals, BPB 11/22/97	
88-IS19-04	"	1630	"	4 oz	—	" "	"	
88-IS20-01	"	1645	"	8 oz	—	VARSOL	"	
88-IS20-02	"	1720	"	4 oz	METH	VOC	"	
88-IS21-01	"	11/20/97 0905	"	8 oz	—	VARSOL	"	
88-IS21-02	SOIL	1010	GLASS	4 oz	METH	VOC	"	

FOR LAB USE ONLY

pecial Instructions: [23]

ossible Hazard Identification: [24]
on-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐

Sample Disposal: [25]
Return to Client ☐ Disposal by Lab ☒ Archive (mos.)

urnaround Time Required: [26]
ormal ☐ Rush ☒ 24-HR

QC Level: [27]
I. ☐ II. ☐ III. ☐ Project Specific (specify): SEE. D.O.

. Relinquished by [28] gnature/Affiliation)	Date: 11/21/97 Time: 1300	1. Received by [28] (Signature/Affiliation)	Date: 11/22/97 Time: 0945
. Relinquished by gnature/Affiliation)	Date: Time:	2. Received by (Signature/Affiliation)	Date: Time:
. Relinquished by gnature/Affiliation)	Date: Time:	3. Received by (Signature/Affiliation)	Date: Time:

omments: [29]

White: To accompany samples
Yellow: Field copy
*See back of form for special instructions.

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Quanterra
Environmental Services
15 Middlebrook Pike
xville, Tennessee 37921
(423) 588-6401

177K220142

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD (cont.)*

Reference Document No.[30] 3742
Page 2 of 2

Project Name SITE 88 - DHARL INVEST. Project No. CTO-356 Samples Shipment Date Nov. 21, 1997

ONE CONTAINER PER LINE

Sample[14] Number	Sample[15] Description/Type	Date/Time[16] Collected	Container[17] Type	Sample[18] Volume	Pre-[19] servative	Requested Testing[20] Program	Condition on[21] Receipt	Disposal[22] Record No.
88-IS21-Φ3	SOIL	11/20/97 1015	GLASS	4 oz	METH	VOA	Rec'd @ 2 °C	
88-IS21-Φ4		1040		4 oz	METH	VOA	BPB 11/22/97	FOR LAB USE ONLY
88-IS22-Φ1		1150		8 oz	—	VARSOL		
88-IS22-Φ2		1340		4 oz	METH	VOA		
88-IS22-Φ3		1343		4 oz	METH	VOA		
88-IS22-Φ4		1345		4 oz	METH	VOA		
88-IS23-Φ1		1540		4 oz	METH	VOA		
88-IS23-Φ2		1541		4 oz	METH	VOA		
88-IS23-Φ3		1542		4 oz	METH	VOA		
88-IS25-Φ1		11/21/97 0900		8 oz	—	VARSOL		
88-IS25-Φ2		0923		4 oz	METH	VOA		
88-IS25-Φ3		0924		4 oz	METH	VOA		
88-IS25-Φ4		0925		4 oz	METH	VOA		
88-IS26-Φ1		1030		4 oz	METH	VOA		
88-IS26-Φ2		1033		4 oz	METH	VOA		
88-IS26-Φ3		1035		4 oz	METH	VOA		
R88-IS27-Φ1		1045		8 oz	—	VARSOL		

White: To accompany samples Yellow: Field copy

*See back of form for special instructions.

MCA 3/15/91

00000008

Quote #21587

H7K240146

Baker

Baker Environmental, Inc.
Airport Office Park, Bldg. 3
420 Rouser Road
Coraopolis, PA 15108
412-269-6000
412-269-6097 (fax)

CHAIN-OF-CUSTODY RECORD

Lab and BOA #: QUANTERRA
Delivery Order #
Project Number: CTO-356
Project Name: SITE 88 RARL INVEST.
Field Team: M. DEJONG
SEND RESULTS TO: M. BARTMAN

	Sample Number	Date	Time	Sample Location	Matrix Type (1) GB (2)	Matrix Type (1) COM (2)	Analytical Methods: VARSOL	Analytical Methods: VOA	Type of Container(s) (3)	Number of Container(s)	Remarks
IR88	IS28-01	11/21/97	2005		SB			1	8 oz	1	
	IS29-01	11/22	0940					1		1	HIGH CONTAMINATION LEVEL
	IS29-02		0920						4 oz	1	" " "
	IS30-01		1430					1		1	" " "
	IS30-02		1055						4 oz	1	" " "
	IS31-01		1005					1		1	
	IS32-02	11/22	1545		SB				4 oz	1	

General Comments

Rec'd @ 6°C
w/ custody Seals
Intact BAB
11/24/97

Relinquished By: [signature] Date: 11/24/97 Time: 1200
Received By: [signature] Date: 11/24/97 Time: 21:30
Shipped by (check one): Hand ☐ Overnight ☒ Other ☐

Relinquished By: _____ Date: _____ Time: _____
Received By: _____ Date: _____ Time: _____
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Relinquished By: _____ Date: _____ Time: _____
Received By: _____ Date: _____ Time: _____
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Sample Stored at 4 Degrees C: Yes ☒ No ☐
Chain-of-custody seal on cooler: Yes ☒ Number: _____ No ☐
Analysis turnaround: Priority ☒ 24 hrs. Regular ☐
See Work Order ☐
See Analysis Request Form ☐

Sample Disposal: Return to Baker ☐ Lab Disposal ☒
Archive until: _____ (date)

NOTES:
(1) A - Air; GW - Groundwater; L - Leachate; S - Spring; SS - Surface Soil; SB - SubSurface Soil; SW - Surface Water; W - Waste; WP - Wipe; WW - Wastewater
(2) GB - Grab; COM - Composite
(3) P - Plastic; G - Glass

White - Return with analytical results; Yellow - Laboratory Copy; Pink - Field Copy

Courier Name: Fed-ex
Courier Pickup Number: 525135171
File Name: _____

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Envirodyne Environmental Services
5815 Middlebrook Pike
Knoxville, Tennessee 37921
(423) 588-6401

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD*

Reference Document No. 975
Page 1 of 1

Project Name/No. [1] VARSOL INVESTIGATION
Sample Team Members [2] M. DEJOHN
Profit Center No. [3] SRN
Project Manager [4] M. BARTMAN
Purchase Order No. [6]
Required Report Date [11]

Samples Shipment Date [7] 2/18/98
Lab Destination [8] KNOXVILLE
Lab Contact [9] J. MCKINNEY
Project Contact/Phone [12]
Carrier/Waybill No. [13] FED-EX

Bill to: [5] M. BARTMAN
Report to: [10] M. BARTMAN

ONE CONTAINER PER LINE

Sample Number [14]	Sample Description/Type [15]	Date/Time Collected [16]	Container Type [17]	Sample Volume [18]	Preservative [19]	Requested Testing Program [20]	Condition on Receipt [21]	Disposal Record No. [22]
IR88-RW06-98A	GROUNDWATER	2/17/98 1035	(2) AMBER	1L	HCl	VARSOL™		
IR88-RW03-98A	↓	1045	↓	↓	↓	↓	FOR LAB USE ONLY	
IR88-EX02-98A		1555						
IR88-HC02-98A	↓	1645	↓	↓	↓	↓		
IR88-EX05-98A	GROUNDWATER	2/17 1645 1710	(2) AMBER	1L	HCl	VARSOL™	FOR LAB USE ONLY	

Special Instructions: [23]

Possible Hazard Identification: [24]
Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☒

Sample Disposal: [25]
Return to Client ☐ Disposal by Lab ☒ Archive (mos.)

Turnaround Time Required: [26]
Normal ☐ Rush ☒ (7-DAYS)

QC Level: [27]
I. ☐ II. ☐ III. ☐ Project Specific (specify): SEE D.O.

1. Relinquished by [28] (Signature/Affiliation) MARK KYLE	Date: 2/18/98 Time: 1300	1. Received by [28] (Signature/Affiliation)	Date: Time:
2. Relinquished by (Signature/Affiliation)	Date: Time:	2. Received by (Signature/Affiliation)	Date: Time:
3. Relinquished by (Signature/Affiliation)	Date: Time:	3. Received by (Signature/Affiliation)	Date: Time:

Comments: [29]

White: To accompany samples
Yellow: Field copy
*See back of form for special instructions.

MCA 3/15/91

APPENDIX C
GROUNDWATER SAMPLING PURGE RECORDS

CTO-356

88-RW03 2" OD WELL

	TD	: 22.30'
0907	SWL	: 6.88'
	WATER COLUMN (WC = TD - SWL)	: 15.42'
	WELL VOLUME (VOL = WC x 0.16)	: 2.5 GAL

TIME	WELL VOLUME	GAL	COND	TEMP	pH	TURB	COMMENTS
0953	1	2.5	359	25.0°C	5.65	7.8	CLEAR, STRONG HYDROCARBON ODOR
1007	2	5.0	387	26.2	5.65	13.9	SL. "HAZY", " " "
1028	3	7.5	447	26.4	5.77	31.4	As above
1042	4	10.0	409	25.5	5.74	43.2	SL. TURBID, " " "
1045	COLLECT SAMPLE IR88-RW03-98A						

88-RW06 2" OD WELL

	TD	20.69'
0912	SWL	7.61
	WATER COLUMN	13.08'
	WELL VOLUME	2.1 GAL

TIME	WELL VOLUME	GAL.	COND.	TEMP.	pH	TURB.	COMMENTS
1003	1	2.0	207	26.5°C	4.54	1.7	CLEAR, VARSOL™ ODOR, SL. FLOATING SHEEN IN BUCKET
1015	2	4.0	204	26.4	4.69	1.8	" " "
1031	3	6.3	202	26.8	4.63	1.6	" " "
1035	COLLECT SAMPLE IR88-RW06-98A						

MKD 2/17

CTO-356

FLOW RATE ~ 750 mL/min

FLOW RATE ~ 600 mL/min

2/17 MKD

88-EX02

TD	21.11
SWL	5.89'
WATER COLUMN	15.22
WELL VOLUME	9.9 GAL

TIME	WELL VOLUME	GALLONS	TEMP	COND	pH	TURB.	COMMENTS
1440	1	10.0	24.0	203	4.65	1.6	CLEAR, SOLVENT ODOR
1515	2	20.0	23.7	220	4.50	0.9	" " "
1550	3	30.0	24.0	230	4.60	0.8	" " "
1555	COLLECT SAMPLE IR88-EX02-98A						

88-EX05

TD	21.57
SWL	5.35'
WATER COLUMN	16.22'
WELL VOLUME	10.5 GAL.

TIME	WELL VOLUME	GALLONS	TEMP	COND	pH	TURB.	COMMENTS
1435	1	10.5	19.7	35	6.14	77	SL. TURBID, NO ODOR, SL. FLOATING SHEEN IN BUCKET
1522	2	21.0	20.0	40	5.80	29	" " " "
1612	3	31.5	20.3	50	5.51	20	" " " "
1704	4	42.0	20.3	83	5.27	9.3	

MKD 2/17

FLOW RATE ~900 mL/min

FLOW RATE ~900 mL/min

2/17 MKD

88-HC02

TD	19.98
SWL	6.04'
WATER COLUMN	13.94'
WELL VOLUME	2.2 GAL

TIME	WELL VOLUME	GALLON	TEMP	COND	PH	TURB.	COMMENTS
1619	1	2.5	19.3	168	4.96	1.3	CLEAR, NO ODOR
1627	2	5.0	19.5	169	4.47	1.0	" " "
1638	3	7.5	19.6	166	4.46	0.9	
1645	COLLECT SAMPLE IR88-HC02-98A						

1733 UNLOAD EQUIP & SUPPLIES.
1746 DEPART LOT 203. DONE FOR THE DAY

MKD 2/17

MKD 2/17/98

2/17 MKD

APPENDIX D
INVESTIGATIVE-DERIVED WASTE ANALYTICAL DATA

910-451-1501

QUANTERRA INCORPORATED

PRELIMINARY DATA SUMMARY

The results shown below may still require additional laboratory review and are subject to change. Actions taken based on these results are the responsibility of the data user.

Baker Environmental, Inc.

Lot #: H8B070115 Camp LeJeune Date Reported: 2/10/98

Project Number: CTO-356

PARAMETER	RESULT	REPORTING LIMIT	UNITS	ANALYTICAL METHOD	
Client Sample ID: IR88-TNK01-98A					
Sample #: 001 Date Sampled: 02/06/98 13:00 Date Received: 02/07/98 Matrix: WATER					
Trace Inductively Coupled Plasma (ICP) Metals					In Review
Arsenic	ND	0.010	mg/L	SW846 6010A	
Lead	ND	0.0030	mg/L	SW846 6010A	
Selenium	ND	0.0050	mg/L	SW846 6010A	
Thallium	ND	0.010	mg/L	SW846 6010A	
Inductively Coupled Plasma (ICP) Metals					In Review
Silver	ND	0.010	mg/L	SW846 6010A	
Aluminum	1.8	0.20	mg/L	SW846 6010A	
Barium	ND	0.20	mg/L	SW846 6010A	
Beryllium	ND	0.0050	mg/L	SW846 6010A	
Calcium	22.7	5.0	mg/L	SW846 6010A	
Cadmium	ND	0.0050	mg/L	SW846 6010A	
Cobalt	ND	0.050	mg/L	SW846 6010A	
Chromium	ND	0.010	mg/L	SW846 6010A	
Copper	ND	0.025	mg/L	SW846 6010A	
Iron	0.57	0.10	mg/L	SW846 6010A	
Potassium	ND	5.0	mg/L	SW846 6010A	
Magnesium	ND	5.0	mg/L	SW846 6010A	
Manganese	0.063	0.015	mg/L	SW846 6010A	
Sodium	11.5	5.0	mg/L	SW846 6010A	
Nickel	ND	0.040	mg/L	SW846 6010A	
Antimony	ND	0.060	mg/L	SW846 6010A	
Vanadium	ND	0.050	mg/L	SW846 6010A	
Zinc	0.049	0.020	mg/L	SW846 6010A	
Mercury in Liquid Waste (Manual Cold-Vapor)					In Review
Mercury	ND	0.00020	mg/L	SW846 7470A	
Volatile Organics by GC/MS					In Review
Chloromethane	ND	200	ug/L	SW846 8260A	
Bromomethane	ND	200	ug/L	SW846 8260A	
Vinyl chloride	ND	200	ug/L	SW846 8260A	
Chloroethane	ND	200	ug/L	SW846 8260A	
Methylene chloride	140 B	100	ug/L	SW846 8260A	
Acetone	ND	1000	ug/L	SW846 8260A	
Carbon disulfide	ND	100	ug/L	SW846 8260A	

(Continued on next page)

QUANTERRA INCORPORATED

PRELIMINARY DATA SUMMARY

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Lot #: H8B070115 | Baker Environmental, Inc. | Camp LeJeune | Project Number: CTO-356 | Date Reported: 2/10/98

Client Sample ID: IR88-TNK01-98A
Sample #: 001 Date Sampled: 02/06/98 13:00 Date Received: 02/07/98 Matrix: WATER

PARAMETER	RESULT	REPORTING LIMIT	UNITS	ANALYTICAL METHOD	
Volatile Organics by GC/MS					In Review
1,1-Dichloroethene	ND	100	ug/L	SW846 8260A	
1,1-Dichloroethane	ND	100	ug/L	SW846 8260A	
1,2-Dichloroethene (total)	250	100	ug/L	SW846 8260A	
Chloroform	24 J	100	ug/L	SW846 8260A	
1,2-Dichloroethane	ND	100	ug/L	SW846 8260A	
2-Butanone	ND	500	ug/L	SW846 8260A	
1,1,1-Trichloroethane	ND	100	ug/L	SW846 8260A	
Carbon tetrachloride	ND	100	ug/L	SW846 8260A	
Bromodichloromethane	ND	100	ug/L	SW846 8260A	
1,2-Dichloropropane	ND	100	ug/L	SW846 8260A	
cis-1,3-Dichloropropene	ND	100	ug/L	SW846 8260A	
Trichloroethene	130	100	ug/L	SW846 8260A	
Dibromochloromethane	ND	100	ug/L	SW846 8260A	
1,1,2-Trichloroethane	ND	100	ug/L	SW846 8260A	
Benzene	ND	100	ug/L	SW846 8260A	
trans-1,3-Dichloropropene	ND	100	ug/L	SW846 8260A	
Bromoform	ND	100	ug/L	SW846 8260A	
4-Methyl-2-pentanone	ND	500	ug/L	SW846 8260A	
2-Hexanone	ND	500	ug/L	SW846 8260A	
Tetrachloroethene	93000 E	100	ug/L	SW846 8260A	
1,1,2,2-Tetrachloroethane	ND	100	ug/L	SW846 8260A	
Toluene	ND	100	ug/L	SW846 8260A	
Chlorobenzene	ND	100	ug/L	SW846 8260A	
Ethylbenzene	ND	100	ug/L	SW846 8260A	
Styrene	ND	100	ug/L	SW846 8260A	
Xylenes (total)	ND	100	ug/L	SW846 8260A	

B Method blank contamination. The associated method blank contains the target analyte at a reportable level.

J Estimated result. Result is less than RL.

E Estimated result. Result concentration exceeds the calibration range.

Volatile Organics by GC/MS					In Review
Tetrachloroethene	110000 D	6200	ug/L	SW846 8260A	

D Result was obtained from the analysis of a dilution.

(Continued on next page)

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Lot #: H8B070115

Baker Environmental, Inc.
Camp LeJeune
Project Number: CTO-356

Date Reported: 2/10/98

PARAMETER	RESULT	REPORTING LIMIT	UNITS	ANALYTICAL METHOD	
Client Sample ID: IR88-TNK01-98A					
Sample #: 001 Date Sampled: 02/06/98 13:00 Date Received: 02/07/98 Matrix: WATER					
Extractable Petroleum Hydrocarbons					In Review
Varsol	4000	200	ug/L	SW846 8015 MOD	