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*

*Under:*

**LANTDIV CLEAN Program**
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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 |

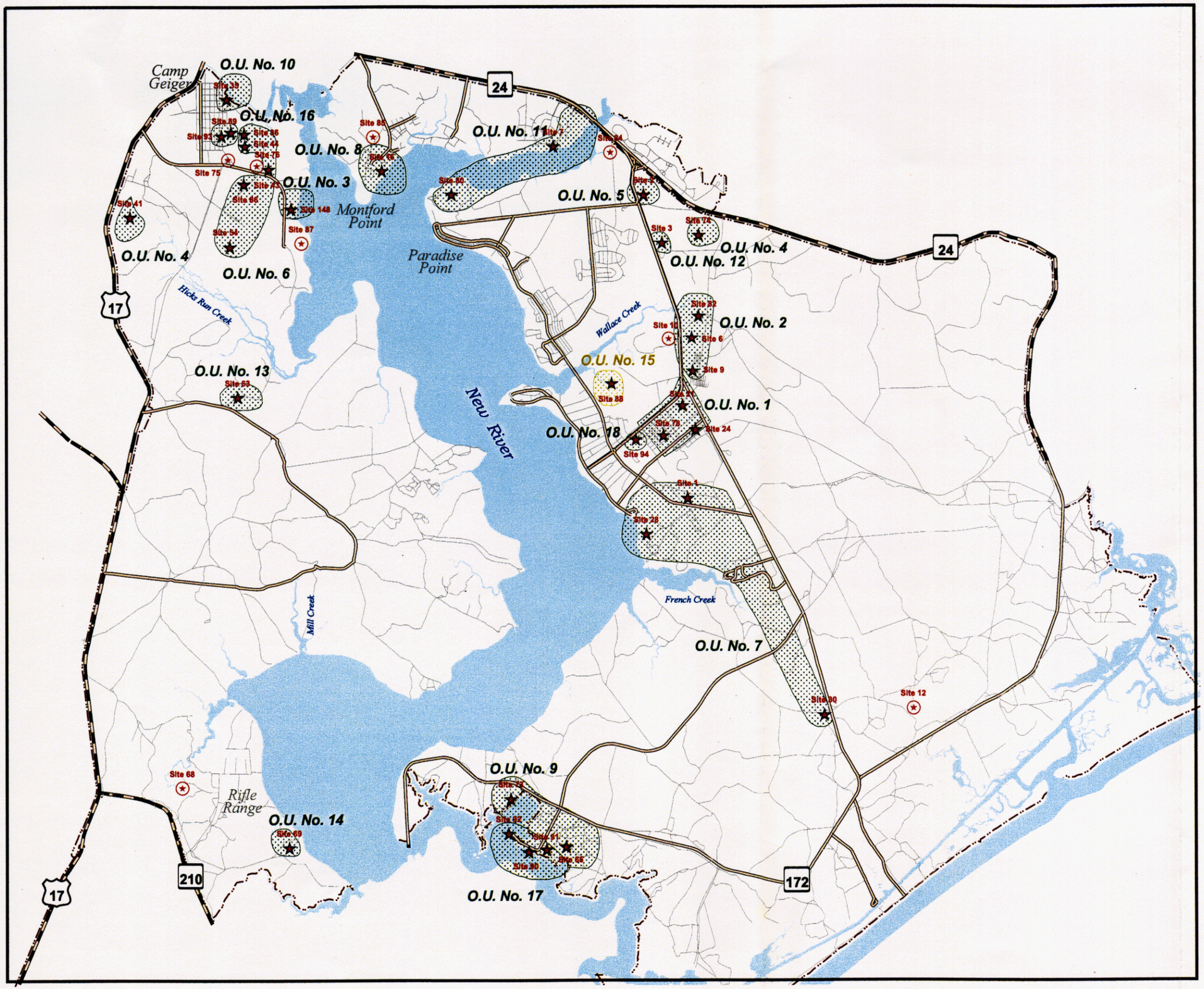
Notes: [1] feet below ground surface
[2] milligrams per kilogram
[3] Not Detected

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**

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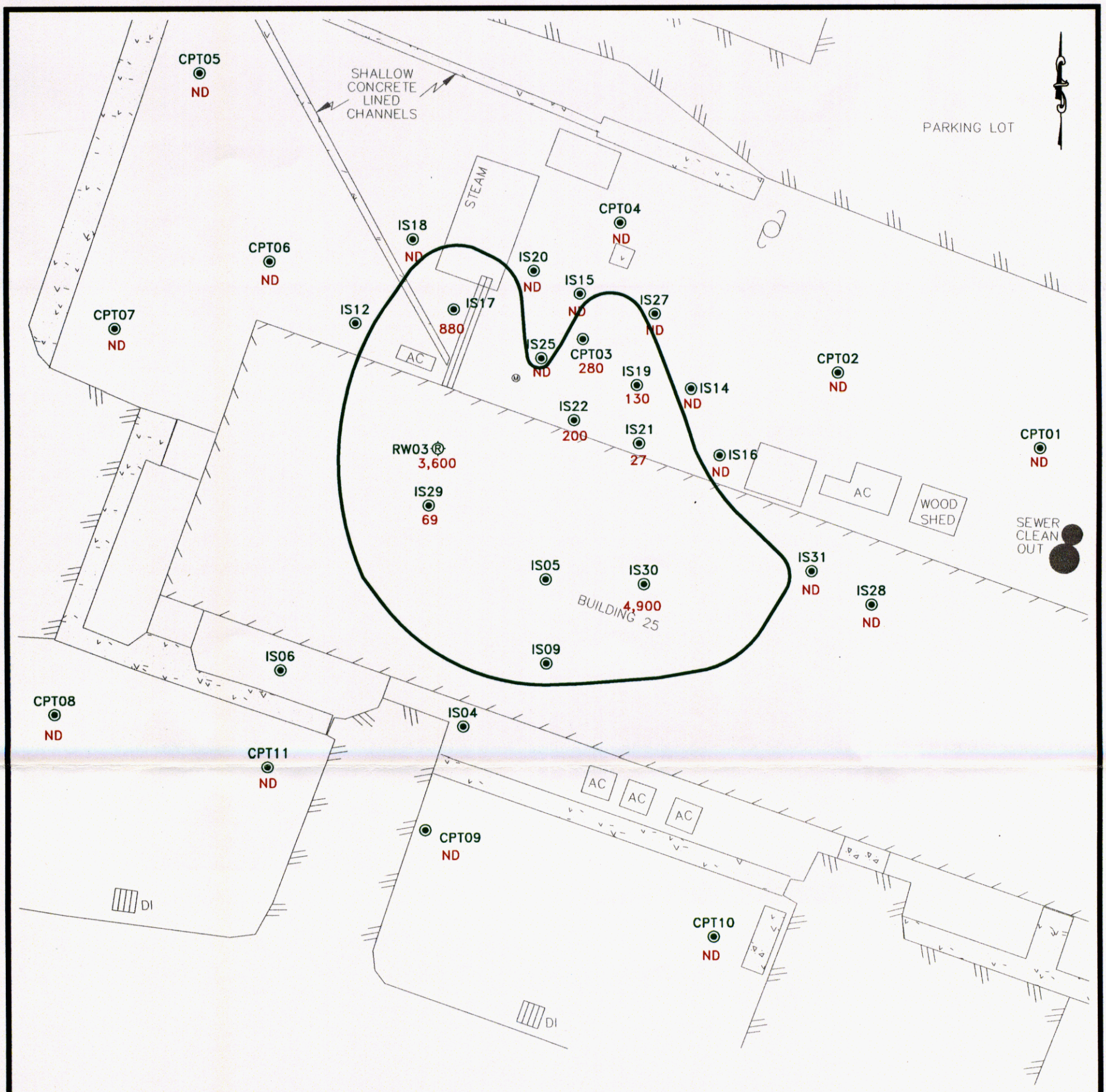


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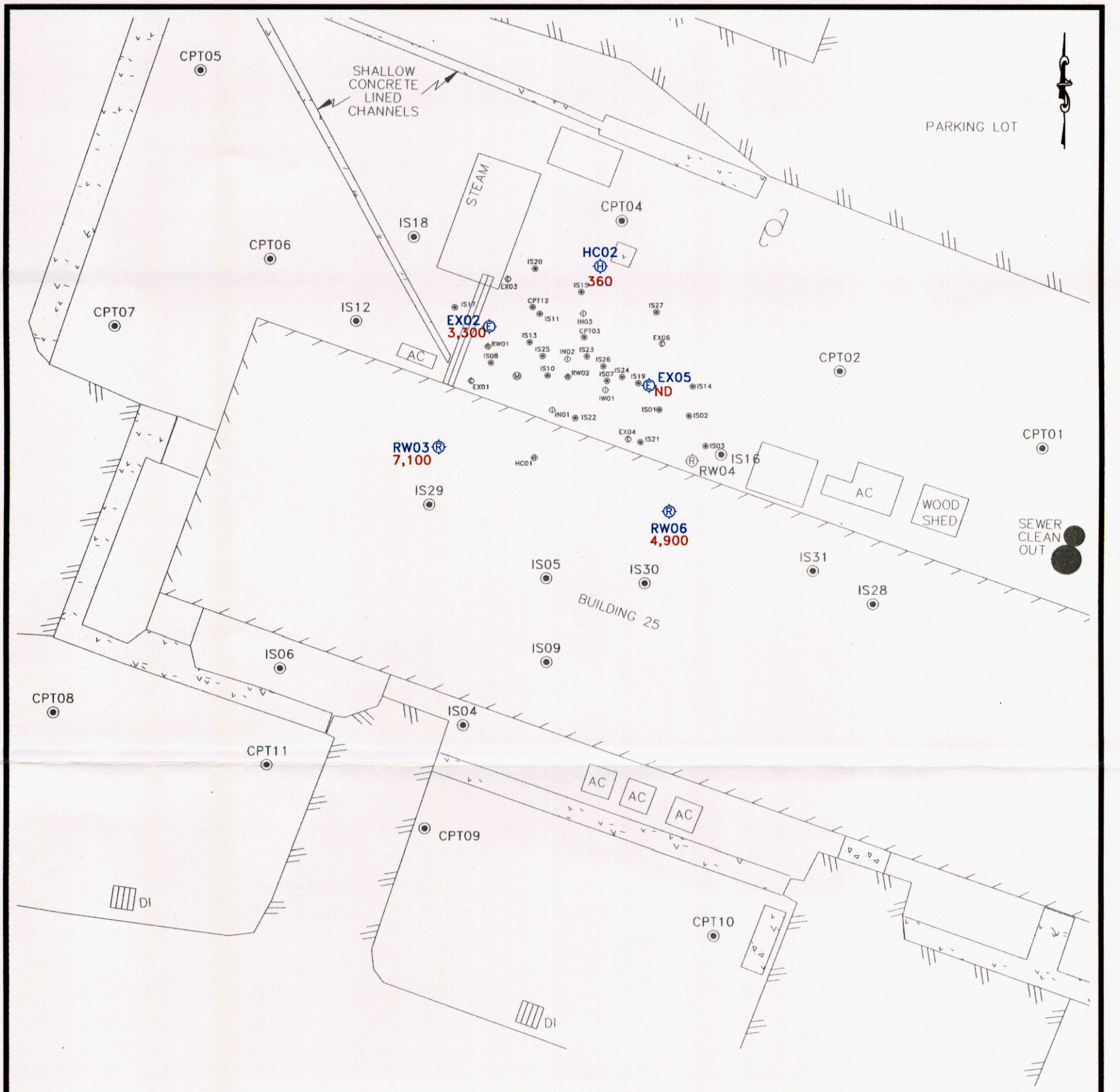
## LEGEND

- 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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## 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<br>1' = 92 ppm<br>1.5 66<br>2 210 mild sweet smell<br>2.5 400<br>HS 2.8 = 191 (Sample IS03-1)<br>3 309<br>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<br>5 40 |
| | | | 5.4 si-CLAY, moist, firm, low plast, lt. gray | 100% | | 5.5 51<br>HS 5.7 26 (Sample IS03-2)<br>6 82<br>HS 6.1 12<br>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<br>HS 7.6 108 (Sample IS03-3)<br>8 23<br>8.5 11 |
| | 8 | | | TD% | | 9 14 |
| | 10 | | | | 10 | 10 = 6<br>10.5 2.8<br>11 2.4 |
| | | | 11.5 grading to med gray (texture as above | 100% | | 11.5 3.0<br>12 2.41<br>12.5 2.6 |
| | 12 | | | | 13 | |
| | 14 | | | | | 14 = 2.2<br>14.5 = 1.6<br>15 1.9<br>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<br>1.0' = 1.5 ppm<br>1.5 1.5<br>2 1.7 |
| | 2 | | si - v.f. SAND | 95% | | 2.5 1.7<br>3 1.6<br>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<br>5.5 = 1.5<br>6 = 1.5<br>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<br>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<br>11.25 34<br>11.5 17 |
| | | | 11.0 grading to f. to v.f. SAND, clean, wet, stiff, cohesive, tan | 80% | | 12 107 Sample ISB4-1<br>12-12.2<br>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<br>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<br>HNu<br>1.0' = 4.0 (bkgrd)<br>1.5 3.6<br>2 3.4<br>2.5 3.5<br>3 3.3<br>3.5 3.6 |
| | 4 | | | | 4 | |
| | 6 | NR | 4.7 Contact w native seds: SILT w clay & f. sand, moist cohesive, friable, med-gray<br>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<br>5 138 Sample ISØ7-1<br>HS 5.3 — 83<br>5.5 20<br>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<br>8 29<br>8.5 171 strong hyd-carb smell<br>HS 8.8 — 477<br>9 53 Sample ISØ7-2<br>9.5 79 |
| | 10 | | 9.2 f.-v.f. SAND. w silt,<br>9.8 si-f. SAND, wet, firm, cohesive, olive gray | 100% | 10 | 10' = 47<br>10.5 37 Sample ISØ7-3<br>HS 10.8 — 195<br>11 44<br>11.5 32<br>12 11<br>12.5 9 |
| | 12 | | | | 13 | 13 13<br>13 113(?) probably backfill from above<br>13.5 153(?)<br>14 90(?) |
| | 14 | | | 50%(?) | | 14.5 14<br>15 14<br>15.5 10 |
| | 16 | | | | 16 1" ID Sampler | 16.5' = 12<br>17 13 |
| | 18 | | 17.8 grading to SILT w clay & v.f. sand, wet. firm | 100% | 18 1" ID sample | 17.5 16<br>18 77<br>18 81 Sample ISØ7-4<br>18.5 701 |
| | | | 19 si-sa-CLAY w plant matter, soft, olive-gray<br>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 | 10. SIZE AND TYPE OF BIT: Direct Push |
| 2. LOCATION (Coordinates or Station): N-side of Bldg 25, ~ 20' west of tank T25-4 | 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-IS08 | 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED: UNDISTURBED: 9 |
| 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 |
| | 16. DATE HOLE: STARTED 7-27-97 @ 0728; COMPLETED 7-27-97 @ |
| 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: Geologist: Fred Hofmer 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 11/16" 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; 1 33; 1.5 48; 2 23; 2.5 280; 3 234 |
| | 2 | | 2.6 grading to f. SAND w fines, moist, cohesive, firm friable, lt brn | | | |
| | 4 | | | 4 | | Sample IS08-6 Hydrocarb Sample; Sample IS08-4 4.5 604 strong hydrocarb smell; 5 523; 5.5 350; 6 516; 6.5 381 |
| | 6 | | 6.4 grading to cl-f. SAND, wet, cohesive, low plast, med gray-brn | 95% | | |
| | | | 7.2 grading to f. SAND w fines, moist to wet, cohesive, lt gray, soft to med firm | 100 | 7 8-10 dropped out | 7 340 Sample IS08-5; 7.5 442 Sample IS08-6 Hydro Carb Sample; 8 166 |
| | 8 | ? | 8-10 Sample interval uncertain | 50% | 8 1" ID discrete sampler (collected ~1' N of orig boring) | Looks like 7-8' interval 440; Bottom 1/2 dropped out of sample tube 340; 83 |
| | 10 | | si-f. SAND, wet, cohesive firm, lt gray | 100 | 10 | 10' = 56; 10.5 41; 11 32; 11.5 28; 12 23; 12.5 24 |
| | | | 10.8 grading to f. SAND, minor fines, lt gray brn | | | |
| | 12 | | grading to med gray some clay content, slt plast | | | |
| | | | f. SAND w silt, minor clay | | | |
| | 14 | | | 100 | 13 | 13 81; 13.5 13; 14 15 |
| | | | ~~17.0 grading to si-cl-f. SAND~~ | 95% | 14.5 | 15 52; 15.5 13; 16 12 |
| | 16 | | | | | |
| | | | 17.0 grading to si-cl-f. SAND | | 16.5 NS | |
| | 18 | | grading to si-cl-v.f. SAND slt plast | | 17 | HS 17.5 — 829 strong solvent (sweet) smell; 17.5 870; Sample IS08-1 18 534; HS 18.5 — 875; Sample IS08-2 18.5 683 DNAPL(?) fluid inclusion; 19 871 |
| | | | 19.0 grading to si-CLAY, wet, soft med plast, med gray, to TD = 21' bgs | | 19 HS M.Sc 925 | " 254 (Bkgrd 200); Sample IS08-3 19.5 871 (" 165); 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<br>1 151<br>1.5 174<br>2 220<br>2.5 15<br>3<br>3.5 |
| | 2 | | 2.3 Contact with native sed si-f. SAND, firm, cohesive friable, lt gray-brn | 70% | | |
| | 4 | | | | 4 | 4.5' = 176<br>5 81 |
| | | | | 95% | | 5.5 206<br>6 160<br>6.5 15 |
| | 6 | | 6.4 si-v.f. SAND, moist, cohesive, mottled lt gray & yel-orange | | 7 | 7' = 518 strong hydrocarbon smell<br>7.5 367 |
| | 8 | | | 100% | | 8 370<br>8.5 470 |
| | | NR | | | | |
| | 10 | | as above, lt gray, wet | | 10 | 10' = 44<br>10.5 181 (Sampl 1509-1)<br>11 21 |
| | | | | 70% | | 11.5 29<br>12 36 |
| | 12 | | | | 13 | 13' = 62 |
| | | | 13.5 as above, grading to yel-orange | | | 13.5 33<br>14 9 (Sampl 1509-2) |
| | 14 | | | 90% | | 14.5 41 moderate solvent smell |
| | | | | | 15 | 15 105<br>15 55 |
| | 16 | | | | 1" ID discrete sampler | 15.5 6 after HNu malfcn & repair<br>16' = 6<br>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<br>18 |
| | | NR | | | bottom | |
| | | | as above | | 19.1 | 19' = 3<br>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<br>0.5' = 7.7 (bkgrnd)<br>1 7.2<br>1.5 6.4<br>2 6.8<br>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<br>8 8.7 moderate<br>8.5 70 hydrocarb & organic<br>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<br>1" ID discrete sampler | 14' = 5<br>14.5 4 (bkgrnd)<br>15 4 no solvent<br>15.5 4 smell<br>16 4 IS11-1 |
| | 16 | | 16.0 grading to cl-SILT, wet soft, low plast, med gray<br>16.4 grading to si-CLAY, wet, soft low-med plast, med gray. (to TD = 18' bgs) sparse plant fibers | 70% | 16<br>as above | 16.5 43 mild solvent smell<br>17 18<br>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 |

ENG FORM 1836 MAR 71 | PREVIOUS EDITIONS ARE OBSOLETE. | PROJECT 22 | HOLE NO. 0

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 |

ENG FORM 1836 MAR 71 | PREVIOUS EDITIONS ARE OBSOLETE. | PROJECT | HOLE NO. 0

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

ENG FORM 1836 MAR 71 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): 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<br>Strong hydrocarb smell<br>280 |
| | | | | 80% | | IS17-01<br>8-9'<br>160 |
| | 10 | | | 10 | | 70<br>80 |
| | 12 | | | | | |
| | 14 | | | | | |
| | 16 | | | | | |
| | | | 17.0 SILT w clay & v.f. sand, firm, wet, cohesive, slt plast, gray | 17 | | Hnu<br>220 |
| | 18 | | 18.5 grading to si-CLAY w v.f. sand & peat, wet, v. soft, low plast gray | 100% | | Strong solvent odor<br>IS17-02 @ 18.0' → 400<br>100 |
| | | | 19.8 CLAY w peat, soft to firm, low plast, peat decreasing w depth | | | 190<br>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 |

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 | 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) IR88-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 | | Hnu 200 |
| | | | | 100% | | IS21-01 @ 8-9' → 350 90 50 |
| | 10 | | | 10 | | 170 |
| | 12 | | | | | |
| | 14 | | | | | |
| | 16 | | 16.0 f. SAND, trace fines, wet, firm, med gray | 16 | | Hnu 8 |
| | | | | | | Fluid inclusions that appear to be DNAPL @ 18.5-18.9' 7 |
| | | | 17.5 grading to si-v.f. SAND w̄ minor clay, wet, firm, cohesive, med-gray | 90% | | 20 |
| | 18 | | | | | 100 |
| | | | | | | Hnu 110 |
| | | | | | | Resample w̄ 1" dia coretube 400 |
| | | | 19.5 grading to si-CLAY, w̄ peat particles wet, low plast to TD @ 20.5' gray to gray-brn | 80% | | Strong solvent smell 400 350 |
| | 20 | | | 20 | | 420 200 400 |

③ 18
① 18
② 1

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 | 10. SIZE AND TYPE OF BIT 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) IR88 - IS23 | 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED 1 |
| 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 11-21-97 — COMPLETED 11-21-97 |
| 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 | Hnu | |
|---|---|---|---|---|---|---|---|---|
| | 2 | | | | | | | |
| | 4 | | | | | | | |
| | 6 | | | | | | | |
| | 8 | | | | | | | |
| | 10 | | | | | | | |
| | 12 | | | | | | | |
| | 14 | | | | | | | |
| | 16 | | | | | | | |
| | | | 17.0 v.f. SAND, wet, firm, gray | 17 | | * PA Samples * | 40 | |
| | | | | | | IS23-01 @ 17.5' → | 160 | VOA |
| | 18 | | 18.3 grading to SILT w/ v.f. sand & clay, wet, firm, slt plast | 95% | | 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/Co |
| | 20 | | 20.2 as above grading to gray-brn, w/ increasing peat fragments, [illegible] plast | | | IS23-05: 20.0-20.4 | 24 | Kv/Co |
| | | | | | | | 40 | |

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-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<br>6<br>6<br>7<br>3 |
| | 16 | | 16.0 f. SAND, wet, stiff, | 16 | | Hnu<br>38<br>80<br>440<br>260<br>280<br>480<br>420<br>* PA Samples *<br>IS25-01 @ 17'<br>IS25-02 @ 18'<br>IS25-03 @ 19' |
| | 18 | | 17.5 SILT w clay & v.f. sand, sparse peat fragments, slt plast, med dk gray<br>18.4 grading to v.f. SAND<br>18.5 Cl-SILT w v.f. SAND, slt-low plast<br>18.7 si-CLAY, med soft, low plast minor peat, med gray<br>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 | 10. SIZE AND TYPE OF BIT 1" 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) IR88-IS27 | 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED 1 |
| 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 11-21-97 @ 1035 — COMPLETED 11-21-97 |
| 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 10 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 w̄ intermittant si-cl-f. SAND layers, wet, firm, grading from brn to yel-orange to lt gray | 8 | | IS27-01 @ 8-9' Varsol Sample — Hnu 1, 0, 1.5 |
| | | NR | | 65% | | |
| | 10 | | | 10 | | |

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): 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<br>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 MCB Camp Lejeune | SHEET 1 OF 1 SHEETS |
|---|---|---|---|

| | |
|---|---|
| 1. PROJECT Geoprobe Soil Sampling inside Bldg 25 | 10. SIZE AND TYPE OF BIT 1" & 1 3/4" dia core barrel |
| 2. LOCATION (Coordinates or Station) | 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 |
| | 16. DATE HOLE — STARTED 11-22-97 @ 1030 — COMPLETED 11-22-97 |
| 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 20 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. 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 | | | * * * Hnu |
| | | | ~18.8 CLAY w̄ minor silt, soft, low to med plast, med-gray minor peat, grading to brn-gray w̄ increasing peat | | | IS30-02 → 200 @~18.8'; abundant free-phase DNAPL in core-catcher tracks & 70 |
| | 20 | | | 20 | | 60 |

ENG FORM 1836 Contract PROJECT HOLE NO.

Hole No.

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

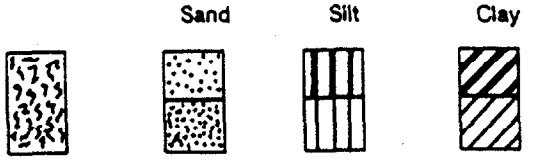
1. PROJECT: Geoprobe Soil Sampling inside Bldg 25
2. LOCATION (Coordinates or Station): 7.7 ft
3. DRILLING AGENCY: FUGRO
4. HOLE NO. (As shown on drawing title and file number): IR88-IS31
5. NAME OF DRILLER: Frank Ward
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF 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 |

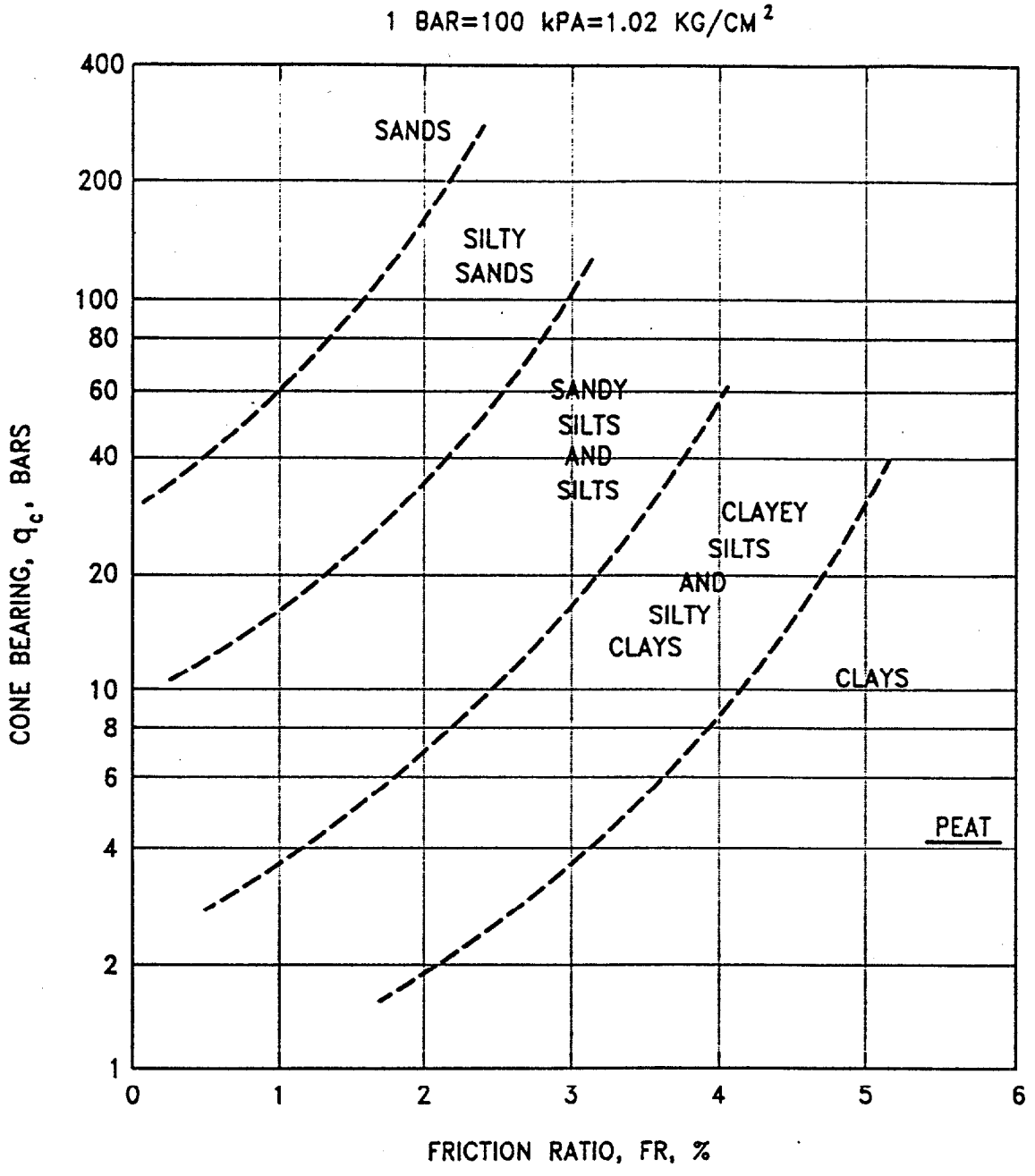
Note: Slickensided and fissured clay may have lower unconfined compressive strengths than shown above because of planes of weakness or shrinkage cracks; consistency ratings of such soils are based on hand penetrometer readings.

## TERMS CHARACTERIZING SOIL STRUCTURE

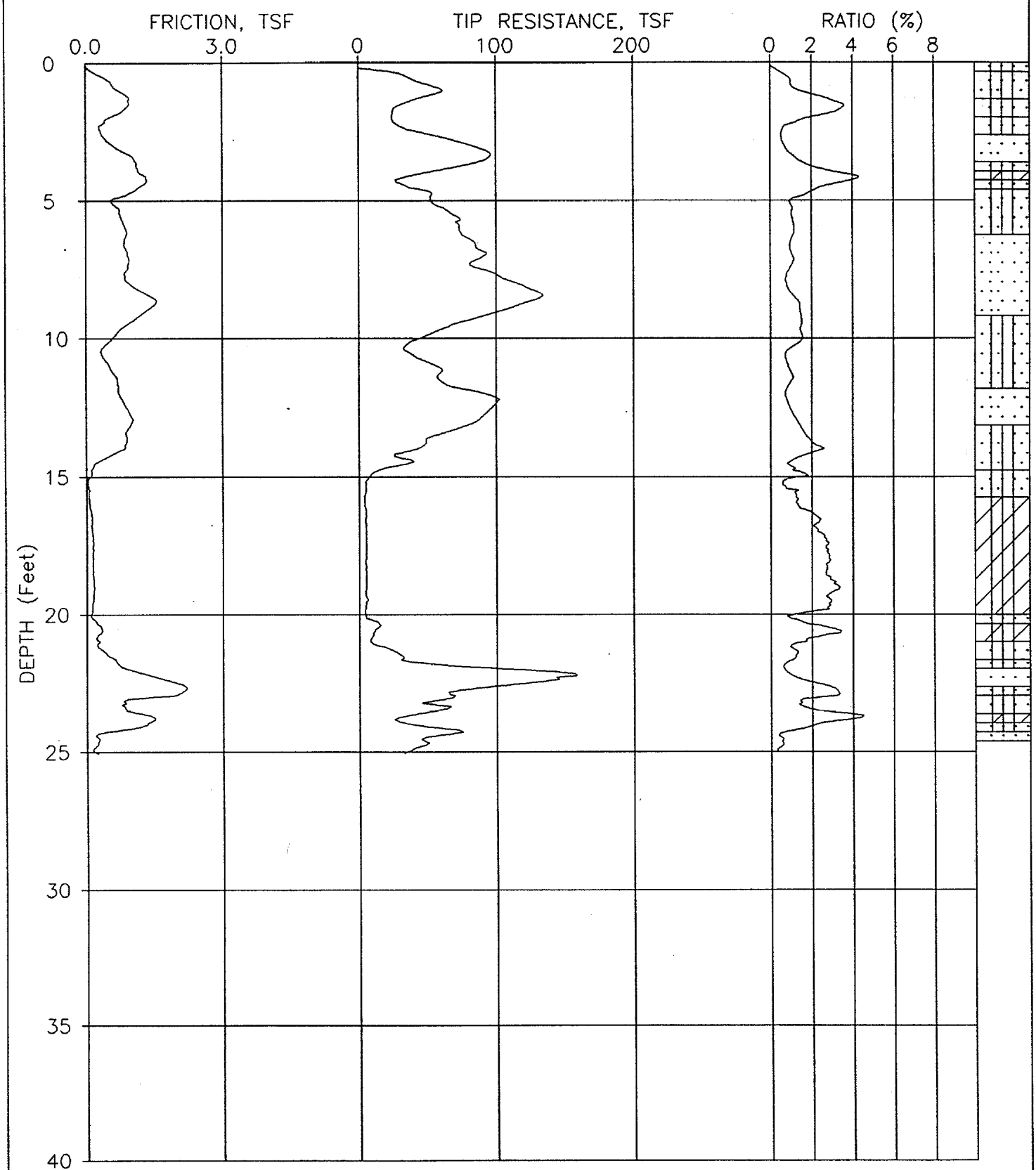
| | |
|---|---|
| Parting: | paper thin in size |
| Seam: | 1/8" to 3" thick |
| Layer: | greater than 3" |
| Fissured: | containing shrinkage cracks, frequently filled with fine sand or silt, usually more or less vertical |
| Sensitive: | pertaining to cohesive soils that are subject to appreciable 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. |

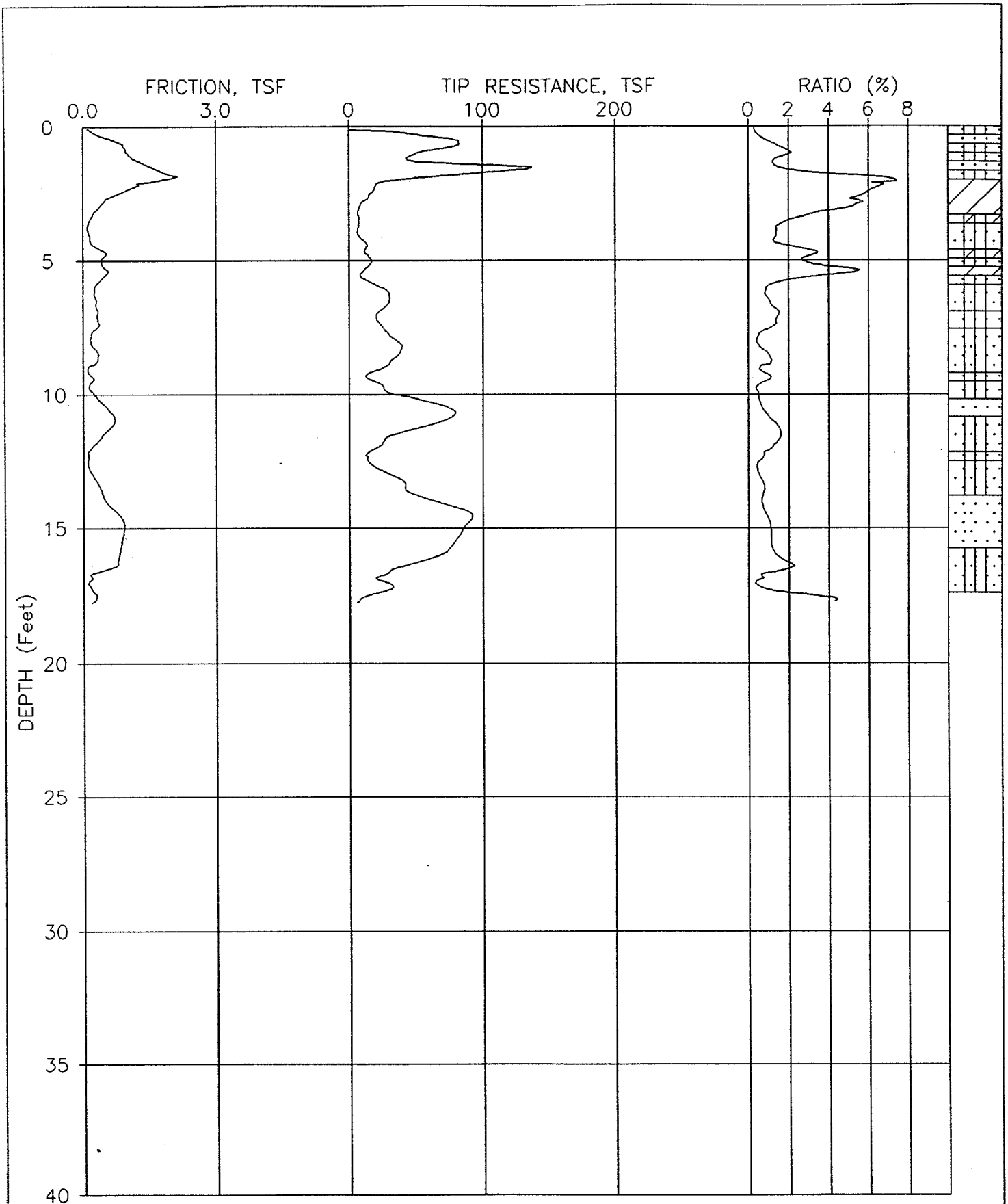



**CAMPANELLA AND ROBERTSON CLASSIFICATION CHART (1983)**



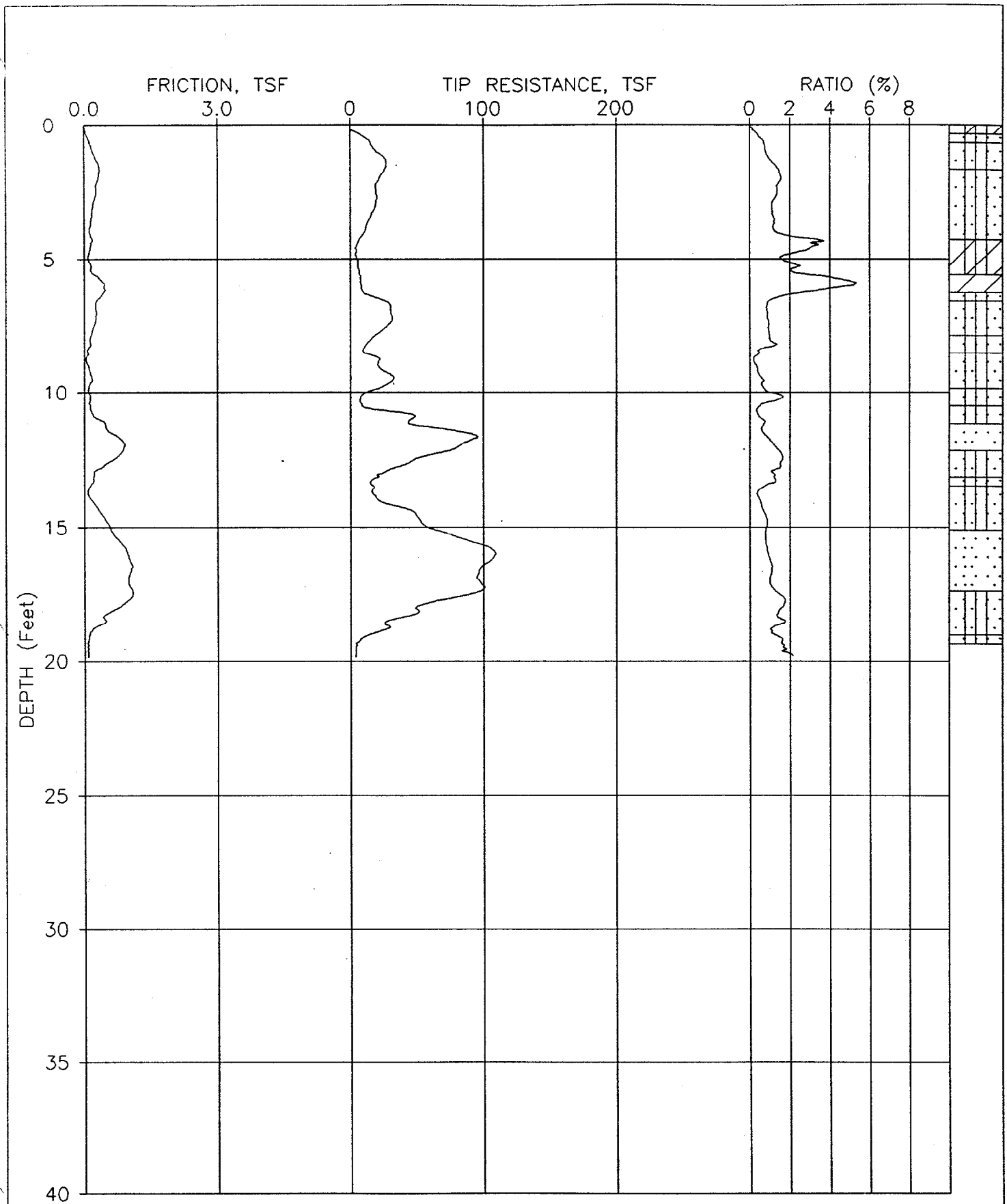

JOB NUMBER: 97-7257 CPT NUMBER: 01 DATE: 11-13-1997
ELEVATION: 0.00 CONE NUMBER: F7.5CKEV611 PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC




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

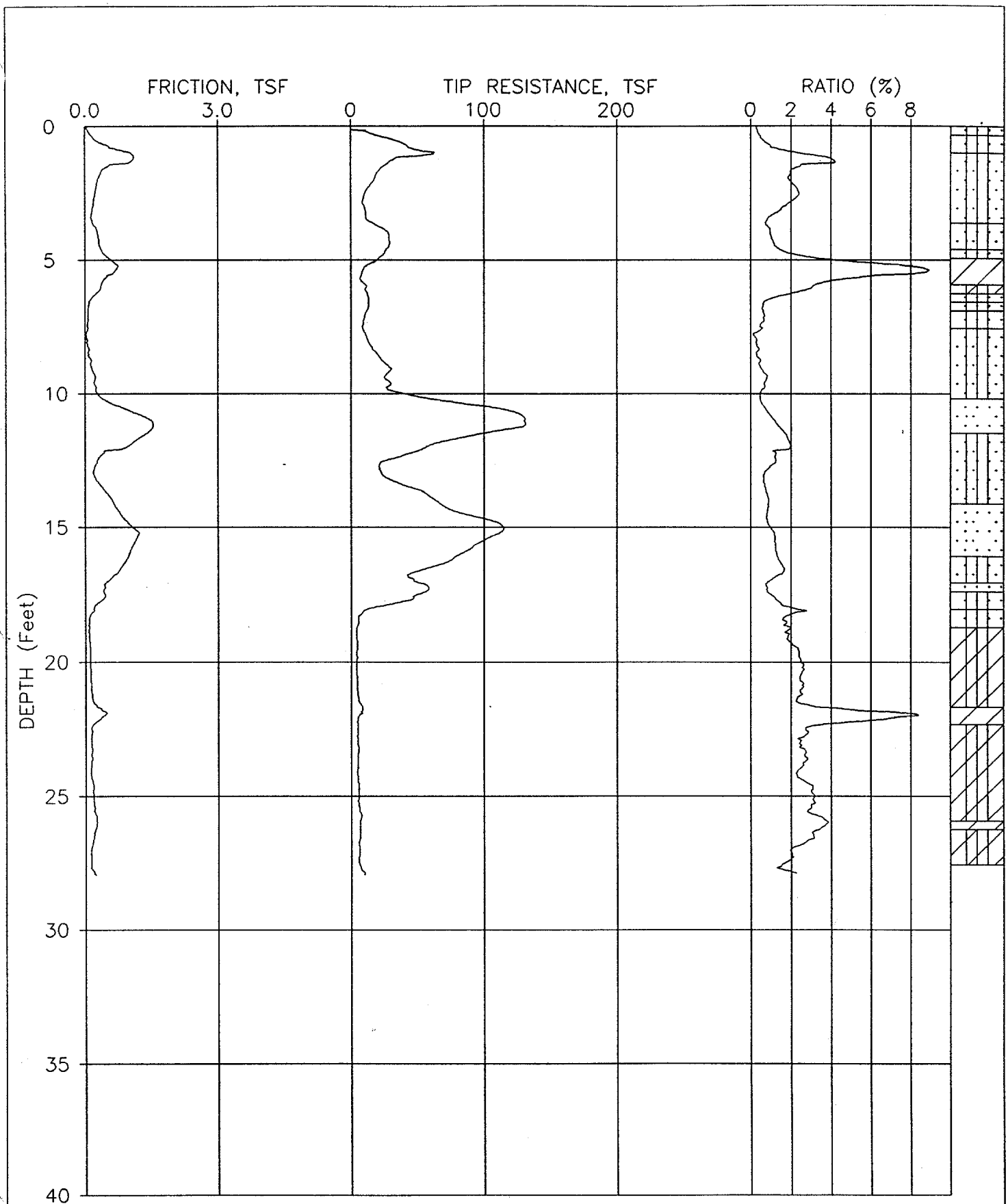
ELEVATION: 0.00 CONE NUMBER: F7.5CKEV611 PLATE: 1 OF 1




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

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

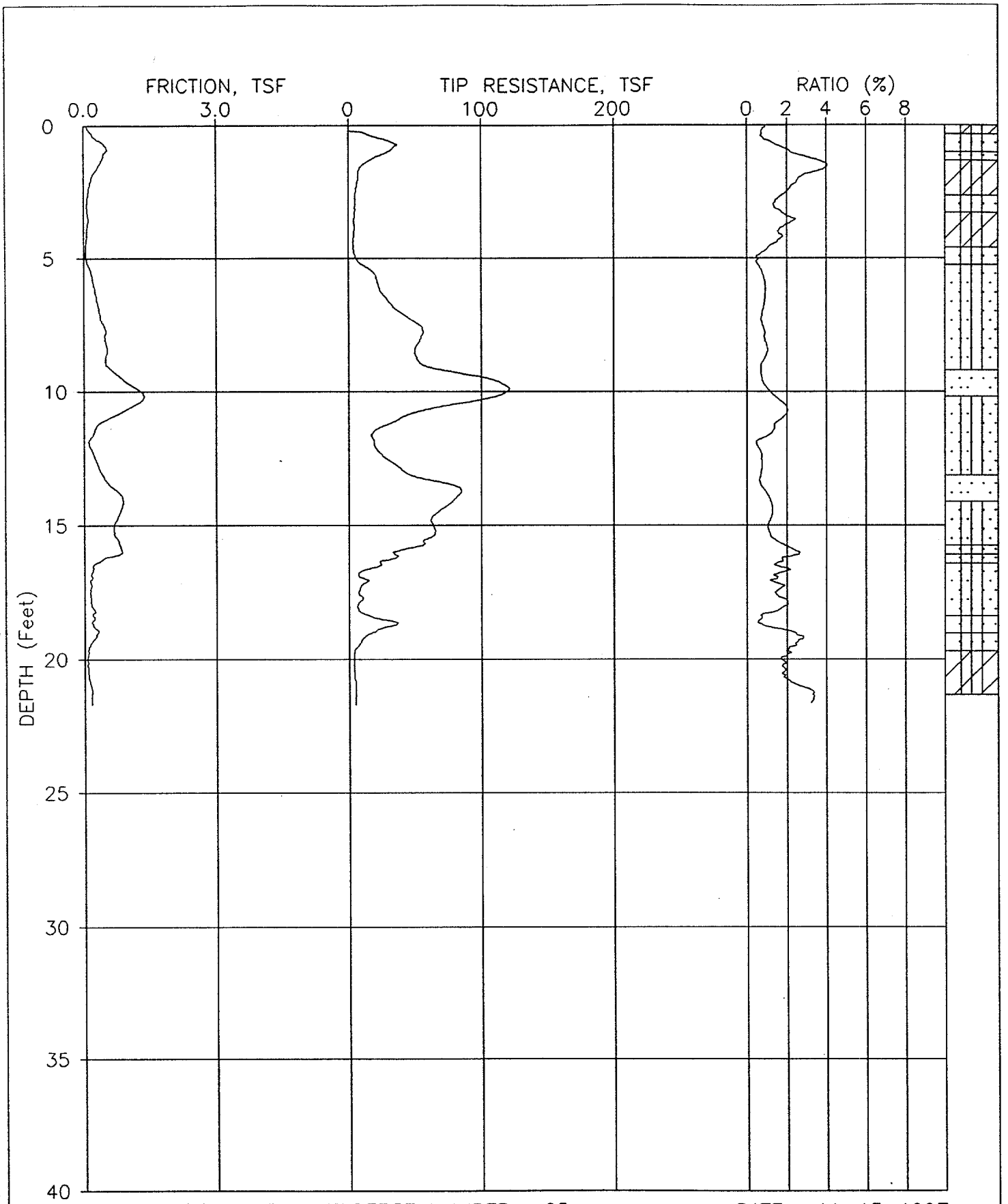
FUGRO GEOSCIENCES,INC




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

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

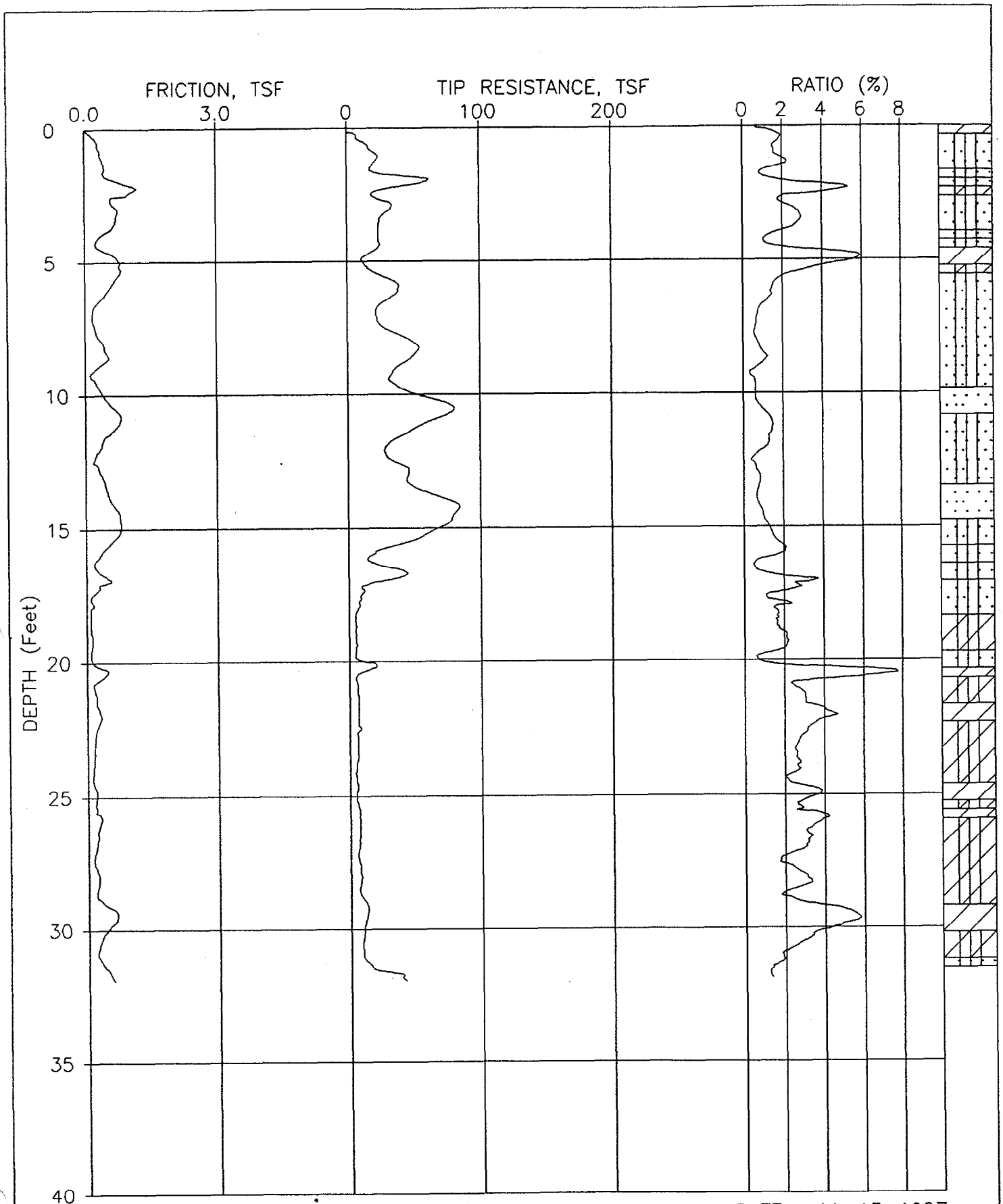
FUGRO GEOSCIENCES,INC




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

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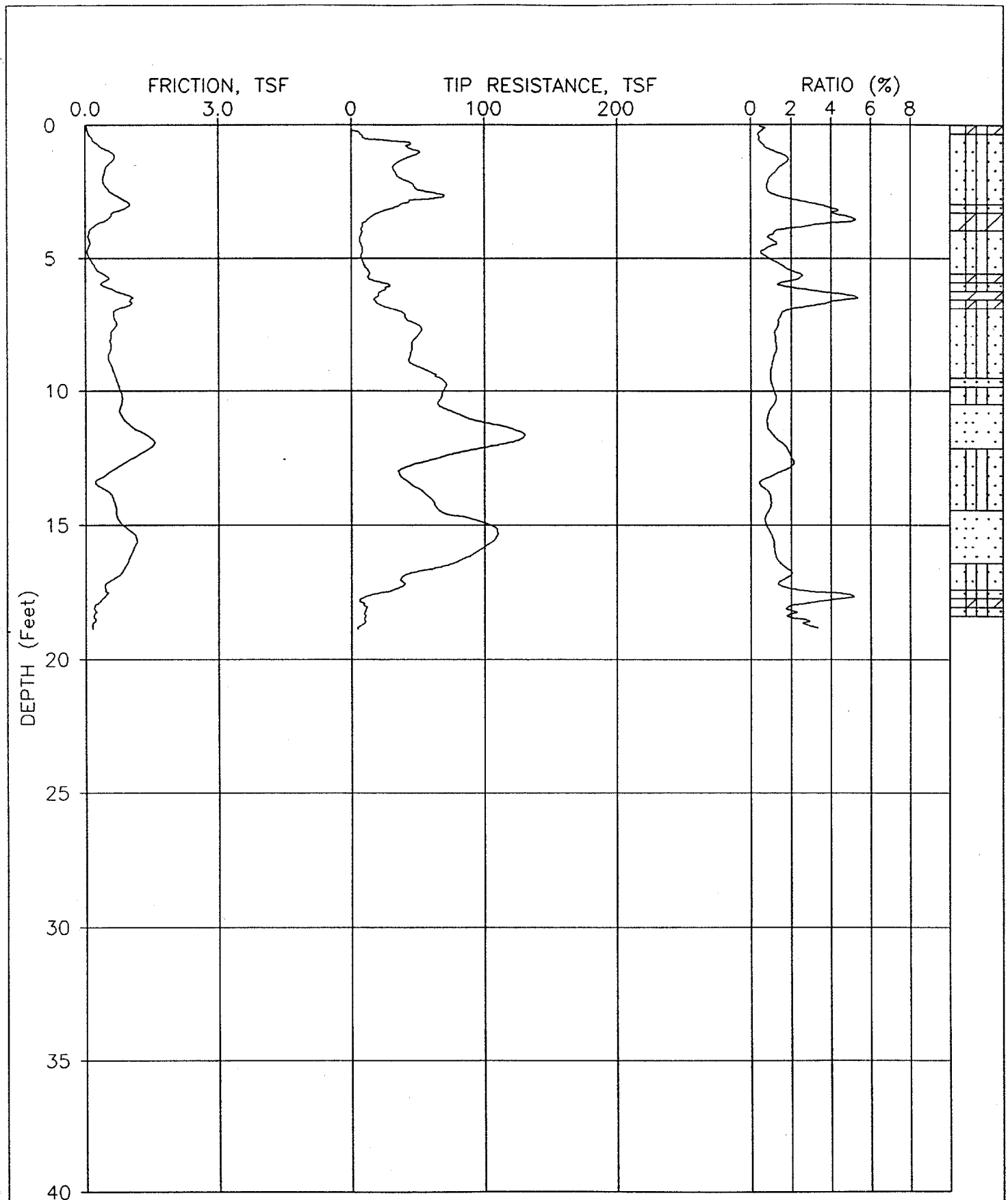
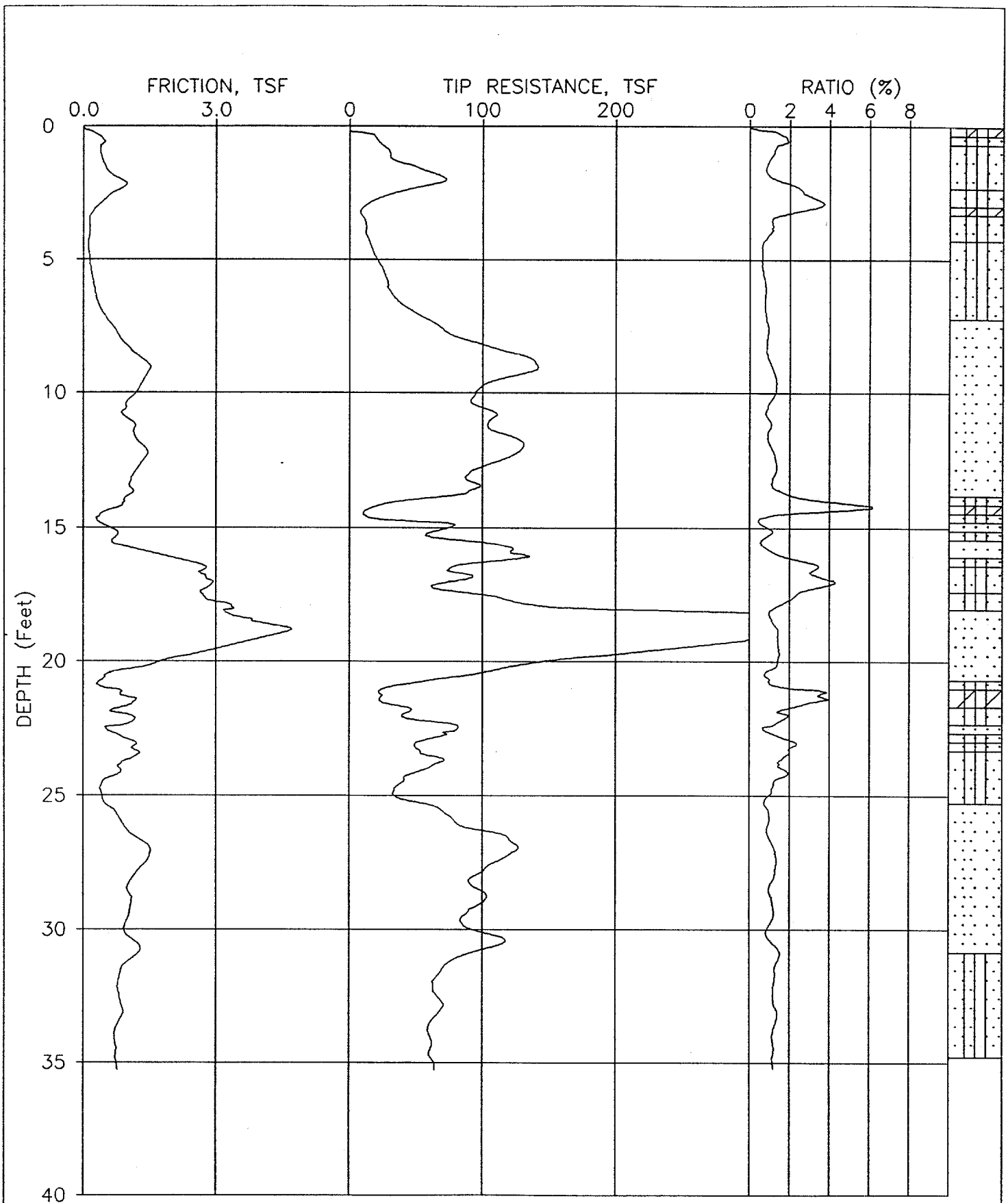
ELEVATION: 0.00 CONE NUMBER: F7.5CKEV611 PLATE: 1 OF 1




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

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

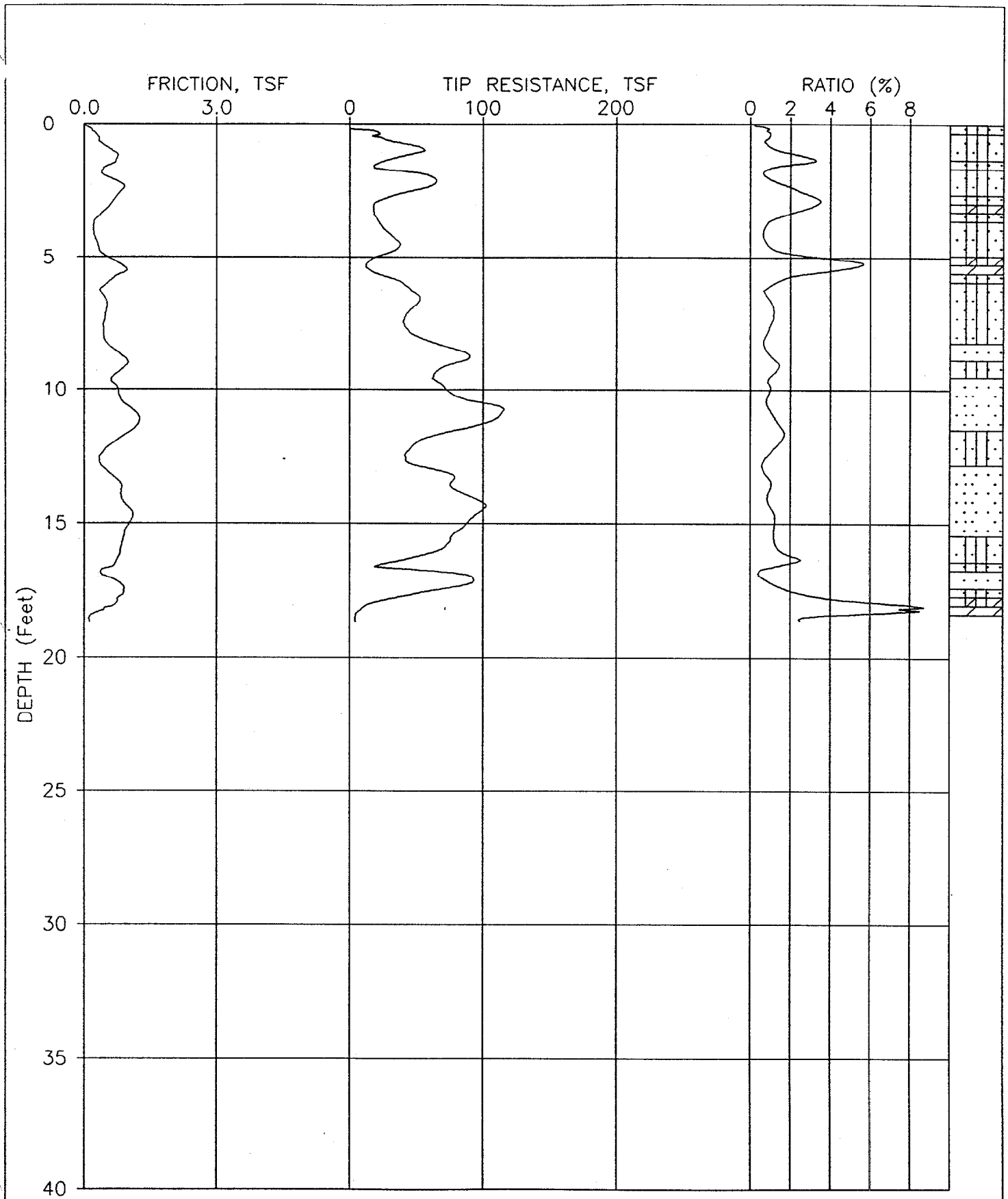
FUGRO GEOSCIENCES,INC




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

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

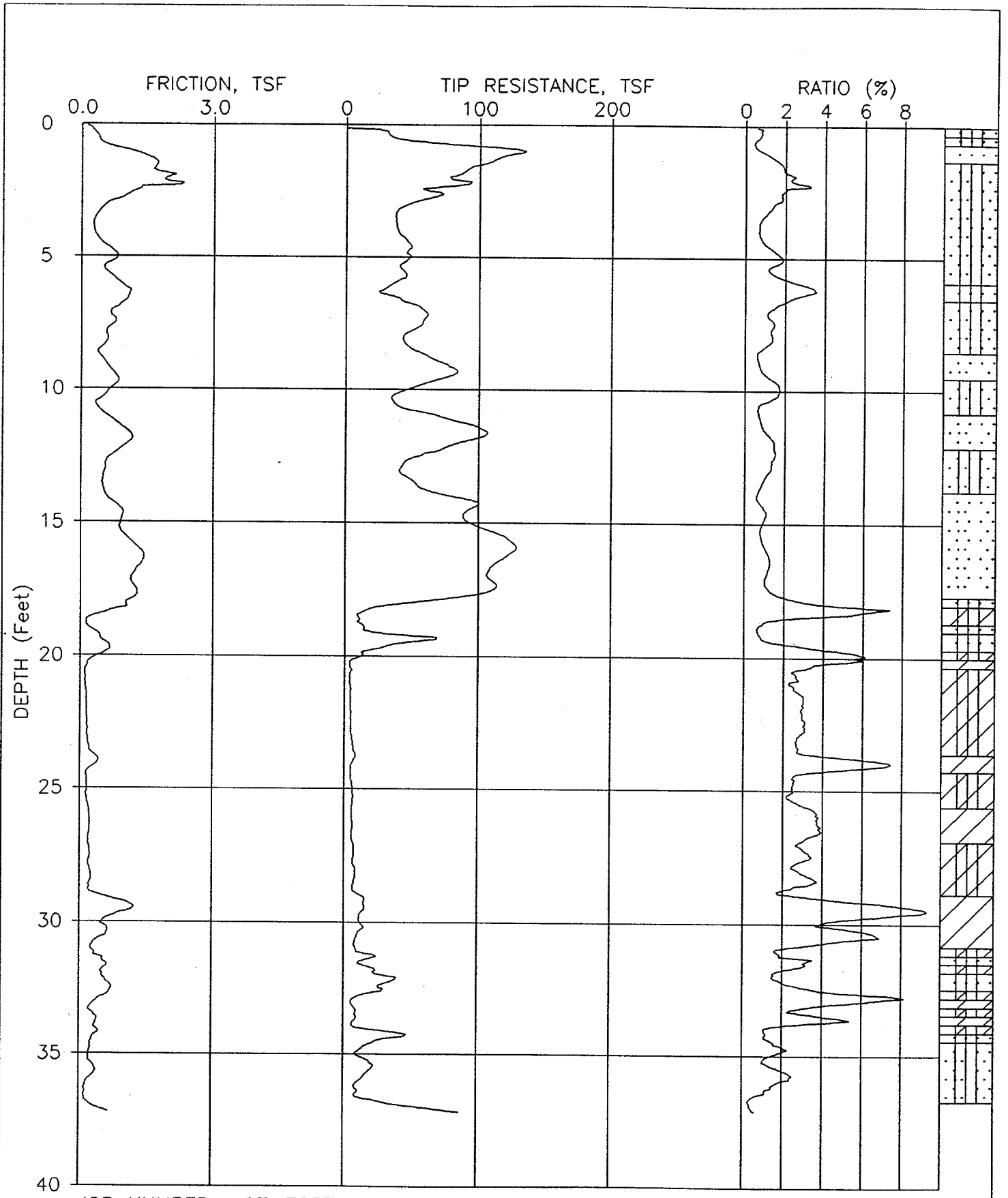
FUGRO GEOSCIENCES,INC




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

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

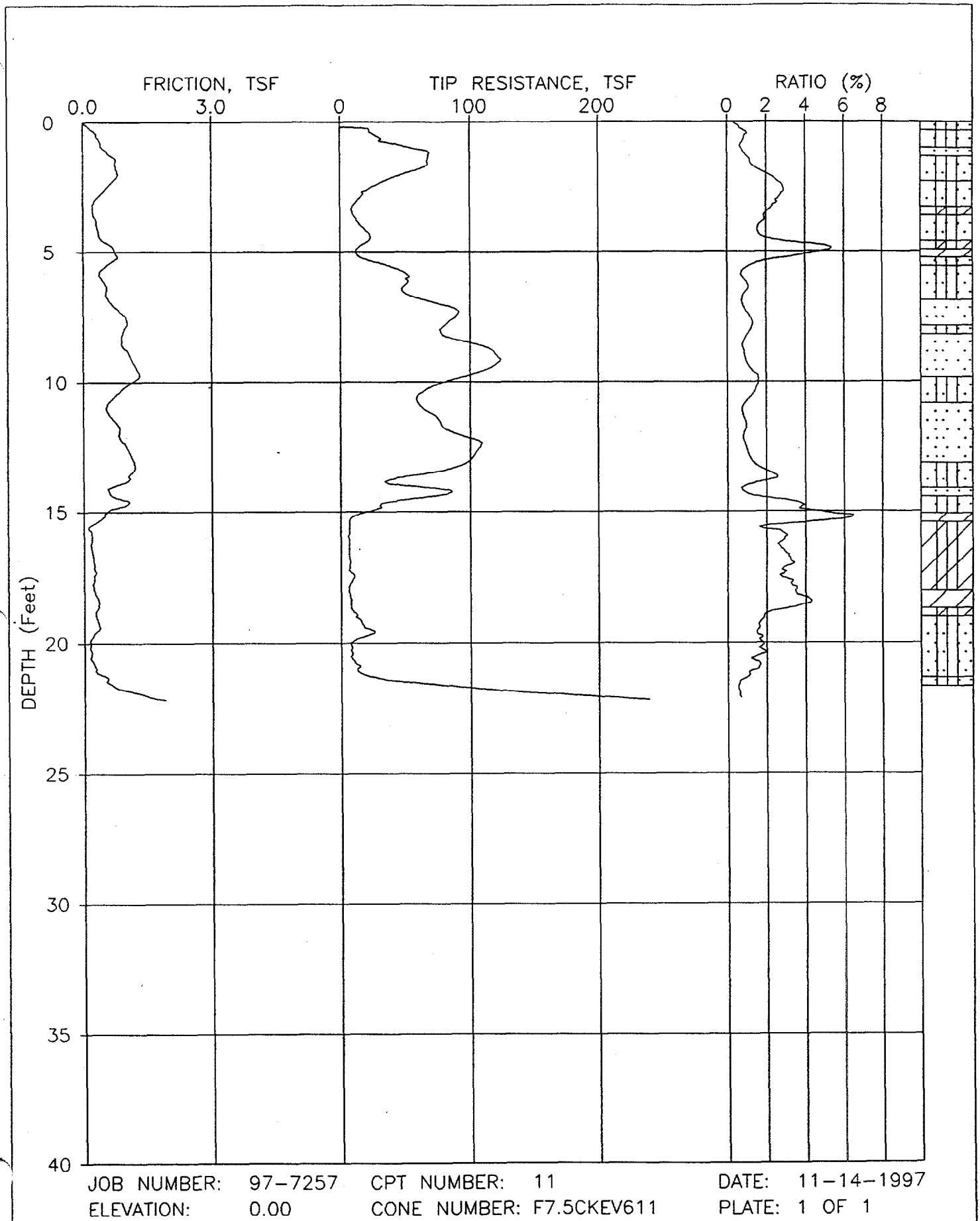
FUGRO GEOSCIENCES,INC




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

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

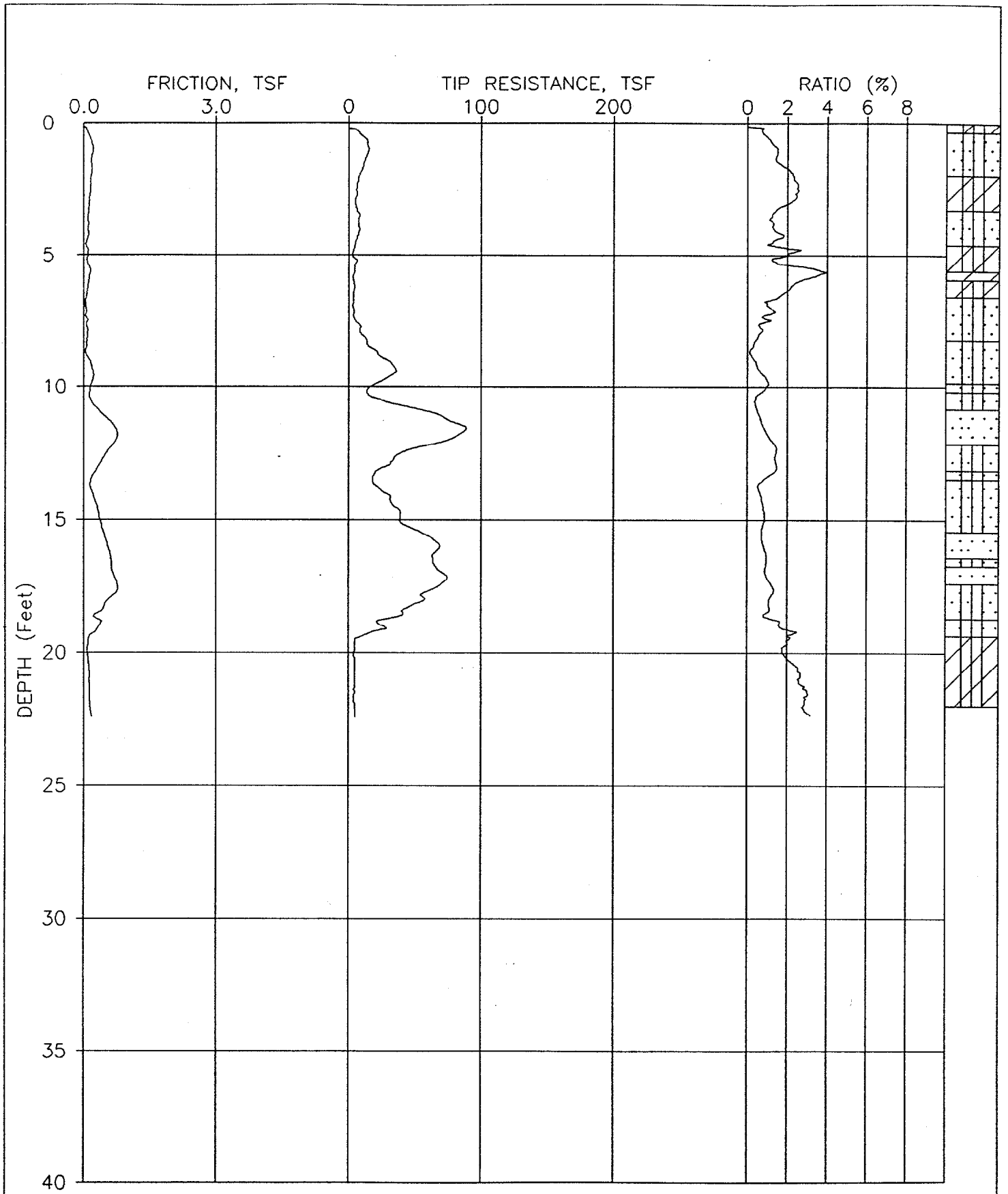
FUGRO GEOSCIENCES,INC




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 DNAPL INVEST.
Sample Team Members 2 M. DEJOHN
Profit Center No. 3 SRN
Project Manager 4 M. BARTMAN
Purchase Order No. 6 CTO-356
Required Report Date 11 SEE D.O.

Samples Shipment Date 7 NOV. 17, 1997
Lab Destination 8 KNOXVILLE, TN
Lab Contact 9 J. McKINNEY
Project Contact/Phone 12 BARTMAN 412/269-2053
Carrier/Waybill No. 13 5253135285

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 | Pre-servative 19 | Requested Testing Program 20 | Condition on Receipt 21 | Disposal Record No. 22 |
|---|---|---|---|---|---|---|---|---|
| R88-CPT01-01 | SOIL ✓ | 11/15/97 1250 | ~~8oz~~ GLASS | 8oz | ~~METH.~~ | VARSOL NONE | received @ 5C | |
| R88-CPT01-02 | | 11/15/97 1255 | GLASS | 4oz | ~~NONE~~ | VOA METH | custody seals | |
| R88-CPT02-01 | ✓ | 11/15 1320 | | 8oz | ~~METH~~ | VARSOL NONE | intact JOM | |
| R88-CPT02-02 | | 11/15 1340 | | 4oz | ~~NONE~~ | VOA METH. | | 11/18/97 |
| R88-CPT03-01 | ✓ | 11/15 ~~1500~~ 1350 | | 8oz | ~~METH~~ | VARSOL NONE | | |
| R88-CPT03-02 | | 11/15 1410 | | 4oz | ~~N~~ | VOA METH | | |
| R88-CPT04-01 | ✓ | 11/15 1500 | | 8oz | | VARSOL NONE | | |
| R88-CPT04-02 | SOIL | 11/15 1530 | GLASS | 4oz. | METH. | VOA METH | | |

FOR LAB USE ONLY

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 SEE LINE "23"
Normal ☐ Rush ☐

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

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

1. Received by 28 (Signature/Affiliation) [signature] QES KNX Date: 11/18/97 Time: 1000
2. Received 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.

0000005

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.

00000006

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 |
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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.

00000007

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: _____

000000

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

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.



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)

QUANTERRA INCORPORATED

PRELIMINARY DATA SUMMARY

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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.

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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 | |