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NWS EARLE
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NAVAL FACILITIES ENGINEERING SERVICE CENTER
Port Hueneme, California 93043-4328

Site Specific Report
SSR-2187-ENV

SITE CHARACTERIZATION AND ANALYSIS PENETROMETER SYSTEM

SITE CHARACTERIZATION
AT NAVAL WEAPONS STATION, EARLE,
COLTS NECK, NEW JERSEY

SITE 16/F

by

Jed Costanza
Doug Zillmer

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Approved for public release; distribution unlimited.

EXECUTIVE SUMMARY

An investigation was conducted from 16 October to 4 November 1995 at Naval Weapons Station Earle, Colts Neck, New Jersey, Site 16/F. Twenty Nine SCAPS pushes were completed and three soil samples were collected for analysis.

The near surface geology, as interpreted through soil boring logs and the SCAPS investigation data consists of sand and sand to silty sand.

The majority of the Polynuclear Aromatic Hydrocarbon (PAH) contamination is centered around monitoring well MW-16-4. PAH contamination is located in areas of silty sand between 8 and 12 feet below ground surface. The analysis of the collected soil samples confirm these findings.

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This report documents the Site Characterization and Analysis Penetrometer System (SCAPS) investigation of Site 16/F at Naval Weapons Station Earle, Colts Neck, New Jersey. The investigation consisted of pushing a penetrometer probe (known as a "push") into the subsurface at locations in and around the site to determine soil lithology, and the vertical and lateral extent of hydrocarbon contamination. The investigation was conducted from 16 October to 4 November 1995. Twenty nine SCAPS pushes were completed and three soil samples were collected for analysis.

1. INTRODUCTION

1.1 Objectives

The objective of the SCAPS investigation was to define the extent of polynuclear aromatic hydrocarbon (PAH) contamination in the area of Site 16/F.

1.2 Site Location

Naval Weapons Station (NWS) Earle is located in east-central Monmouth County between the town of Freehold and Atlantic shore. Site 16/F is located in the north-central portion of NWS Earle as shown in the location key of Figure 1. (NEESA, 1983)

1.3 Site History

Site 16 (Fuel Line Connecting Buildings C-20 and C-50), was identified during the completion of the Initial Assessment Study in 1983. Site F (C-50 Roundhouse Area), was identified during an analysis performed for the Environmental Protection Agency by the Environmental Photographic Interpretation Center (EPIC), at the Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. The two sites are referred to as Site 16/F because Site 16 is located within EPIC Site F. Site 16/F, as shown in Figure 1, is the entire 8-acre railroad maintenance yard that has been active since the late 1940s.

Site 16 is located northwest of Building C-19, a forklift maintenance facility. This site is the result of leakage from an underground fuel line that was used to transport diesel fuel from underground storage tanks located next to Building C-20 to a dispensing station located approximately 100 feet north/northwest of Building C-50. The leak in the fuel transfer line was discovered in 1977 when soil residue was found in locomotive fuel tanks. Use of the fuel line was discontinued after subsequent excavation activities confirmed the leak. Part or all of the diesel transfer line is still in place. The underground storage tanks originally located adjacent to Building C-20 were removed.

EPIC Site F includes two former diesel tank areas around Building C-50, an oil water separator and a leach field east of Building C-50, a solvent leach field northwest of Building C-50, and a locomotive wash area north of Building C-19. Building C-50 is known as the Roundhouse and is used for the maintenance and repair of locomotives and rail cars. Investigations at these areas have been concerned with petroleum hydrocarbon and solvent contamination of soil, groundwater, surface water, and sediment.

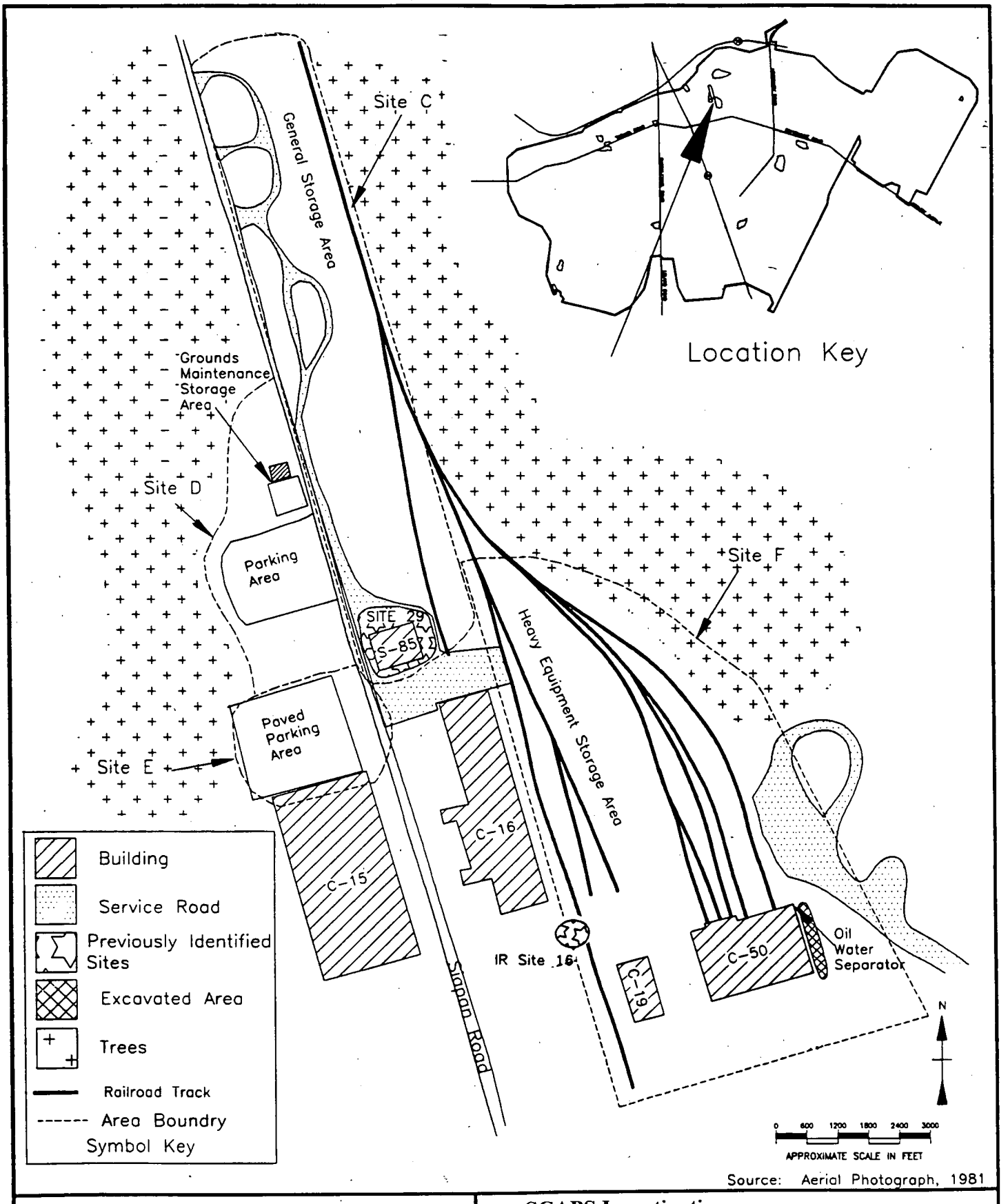


Figure 1 - Site 16/F Location

SCAPS Investigation
Naval Weapons Station Earle
Earle, New Jersey

In 1992 five soil borings were completed in the area northwest of Building C-19 in the reported location of the underground fuel line leak. One soil sample was collected from each soil boring at approximately 8 feet below ground surface. This sample location is below the depth of the fuel pipeline and above the depth of groundwater. All soil samples contained elevated levels of TPH ranging from 4,700 mg/kg to 22,000 mg/kg. Low levels of semivolatile compounds were also detected. A geophysical survey of the area during the 1992 investigation indicated a number of buried lines at the site, however the exact location of the leaking fuel line was not determined.

In 1995 a soil gas survey was completed across Site 16/F. A total of 96 soil gas samples were collected and analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), trichloroethylene (TCE), and tetrachloroethene (PCE). Twenty soil borings and six monitoring wells were installed based on the results of the soil gas survey. Petroleum in the free phase was found in monitoring wells MW16-04 and MW16-05 during gauging activities. An analysis the free phase petroleum found that it is consistent with weathered No.2 diesel fuel.

1.4 Site Geology

The near surface geology, as determined by the SCAPS investigation data consists primarily of sand, silty sand, and secondarily of silty clay.

NWS Earle lies in the Atlantic Coastal Plain which was formed over the last 170-200 million years as a result of depositional and erosional unconsolidated layers of sands, clays, and marls on a gently southeastward dipping bedrock surface which is 1300 to 6000 feet below the ground surface. (NEESA, 1983)

The near surface geology of Site 16/F is known as the Vincentown Formation. The Vincentown Formation is a fossiliferous quartz sand, up to 130 feet thick, that contains some coarse grained glauconite and some clay. An upper member is a lime sand with abundant fossil fragments. (NEESA, 1983)

The Vincentown Formation is an important source of water for low-yield home wells, with an average range of 10 to 50 gallons per minute. A substantial portion of the northern part of NWS Earle lies within the outcrop area and hence is a recharge zone. Groundwater flow is generally to the east toward the Atlantic Coast. (NEESA, 1983)

1.5 Investigation Procedure

The investigation began by pushing holes near the monitoring well MW-16-05 which was reported to have several inches of free product. The investigation then proceeded to the east in an attempt to further define the extent of PAH contamination. Appendix A contains the methods used during the investigation.

2. INTERPRETATIONS

2.1 Interpreting Laser Induced Fluorescence Data

SCAPS is a field screening technique that detects petroleum hydrocarbons using the technique of laser induced fluorescence (LIF). SCAPS measures the presence of petroleum hydrocarbons by detecting polynuclear aromatic hydrocarbons (PAHs). PAHs are virtually found in all petroleum fuel mixtures. The PAHs fluorescence under ultra violet excitation, so that the amount of fluorescence is related to the amount of PAHs. A detailed system description is included in Appendix B.

The sensitivity of SCAPS varies with the portion of PAHs in the petroleum fuel. The present SCAPS system is most sensitive to PAHs with three or more rings like those found in heavy fuels such as diesel fuel and heating oils. The system has a reduced sensitivity to lighter fuels such as avgas, JP-5, and JP-4 which contain a smaller portion of three or more ringed PAHs.

The Laser Induced Fluorescence (LIF) system is quantitative in a known soil matrix with a known contaminant. However, when operated in the field the LIF system is semi-quantitative due to typical variations in the local soil matrix and contaminant type.

SCAPS results are intended to be used to gain a better understanding of contaminant distribution while reducing the number of investigation iterations at a site. Experience has shown that the measured fluorescence intensity is a good gross indicator of the location and amount of petroleum at a site, and that the SCAPS measurements are most effective when used in conjunction with a reduced number of soil samples that provide a quantitative measurement of the amount of contamination. The SCAPS results are not intended to define the extent of contamination for regulatory purposes.

Interpretation of the LIF response is completed by performing statistical analysis of the data collected to determine the Fluorescence Threshold (FT). The statistical analysis is included in Appendix C. A responding fluorescent intensity below the FT represents the normal population of responses that is expected from a complex soil system. A responding fluorescent intensity above the FT represents a different population of responses that can be shown to represent petroleum hydrocarbon contamination. This is shown during each investigation by collecting soil samples from ten percent of the push locations and sending the samples to contracted laboratories for total petroleum hydrocarbon analysis.

2.2 Interpolation of Laser Induced Fluorescence Data

The Groundwater Modeling System version 1.2 is used to interpolate the LIF responses to give a visual summary of SCAPS results. Interpolations are performed by bounding all data by a grid. The distance between each grid node is selected to represent the average distance between push locations. The interpolation is made by using the Inverse Distance Weighted method which uses Gradient Hyperplane Nodal Functions to determine a scalar value at the nearest grid node. Appendix C, section 3 contains all assumptions used to generate the interpolation.

This interpolation is then combined with SCAPS soil data to create a stratigraphic cross section showing LIF results and the associated soil type. This visual aid is intended to be used to help guide in the selection of future sample locations, in the determination of monitoring well screen locations, and in the design of remediation systems.

2.3 LIF System Output

A push profile is generated after the LIF system collects the data. All the profiles are included in Appendix D. A profile consists of five columns of information. The first three columns are cone penetrometer data that is discussed in section 2.4. The last two columns of information are LIF system results. The first of the last two columns represents the Peak Wavelength in nanometers of the responding signal. This is used in real time to indicate:

- consistency with previous results
- consistency of the response with depth
- consistency with known contaminant responses from previous investigations

The second of the last two columns represents the peak Raw Fluorescent intensity of the responding signal. This is used in real time to indicate:

- the magnitude of the responding signal with respect to previous signals
- the depth and thickness of the positive response

Responses at or near the ground surface are considered false positives since they could represent plant materials.

2.4 Cone Penetrometer Data

As mentioned in the previous section, the push profile consists of six columns of information. The first three columns are cone penetrometer data results. The first of the three columns represents the cone pressure in tons per square foot (tsf). The cone pressure measurement, q_c, is recorded with a Wheatstone bridge strain gauge in terms of the voltage and converted to bearing pressure expressed as tons per square foot (tsf). Results may be used in geotechnical design or along with sleeve friction to determine soil classification. The cone resistance is a measure of the grain-to-grain skeleton strength for sands and silts. Further advancement of the probe is stopped if this measurement exceeds 1000 tsf at any time during the push.

The second of the first three columns represents the sleeve friction in tons per square foot (tsf). The sleeve friction resistance, f_g, is the resistance of the soil as it slides past the friction sleeve. Further advancement of the probe is stopped if this measurement exceeds 8 tsf at any time during the push.

The third column represents the soil type as a number between 1 and 12. This is determined from the ratio of cone pressure and sleeve friction. Appendix E contains the chart used to convert the soil type number to a descriptive classification.

Techniques for using the soil strength measurements (cone pressure and sleeve friction) made with the cone penetrometer to determine soil type have been well-documented (Olsen and Farr, 1986). The classification scheme used by the SCAPS was devised by Robertson and Campanella (1989) to identify the types of soils encountered by cone penetrometer probes. For a detailed description of the output interpretation see Roberston and Campanella (1989), "Guidelines for Geotechnical Design Using the Cone Penetrometer Test and CPT with Pore Pressure Measurement." Hogentogler & Co., Inc., Columbia, MD.

SCAPS standard electrical cone penetrometer instrumentation consists of strain gauges measuring cone pressure and sleeve friction in accordance with American Society of Testing and Materials (ASTM) Standard D3441. The probe does not fully conform to ASTM standard because the diameter changes less than one foot above the friction sleeve.

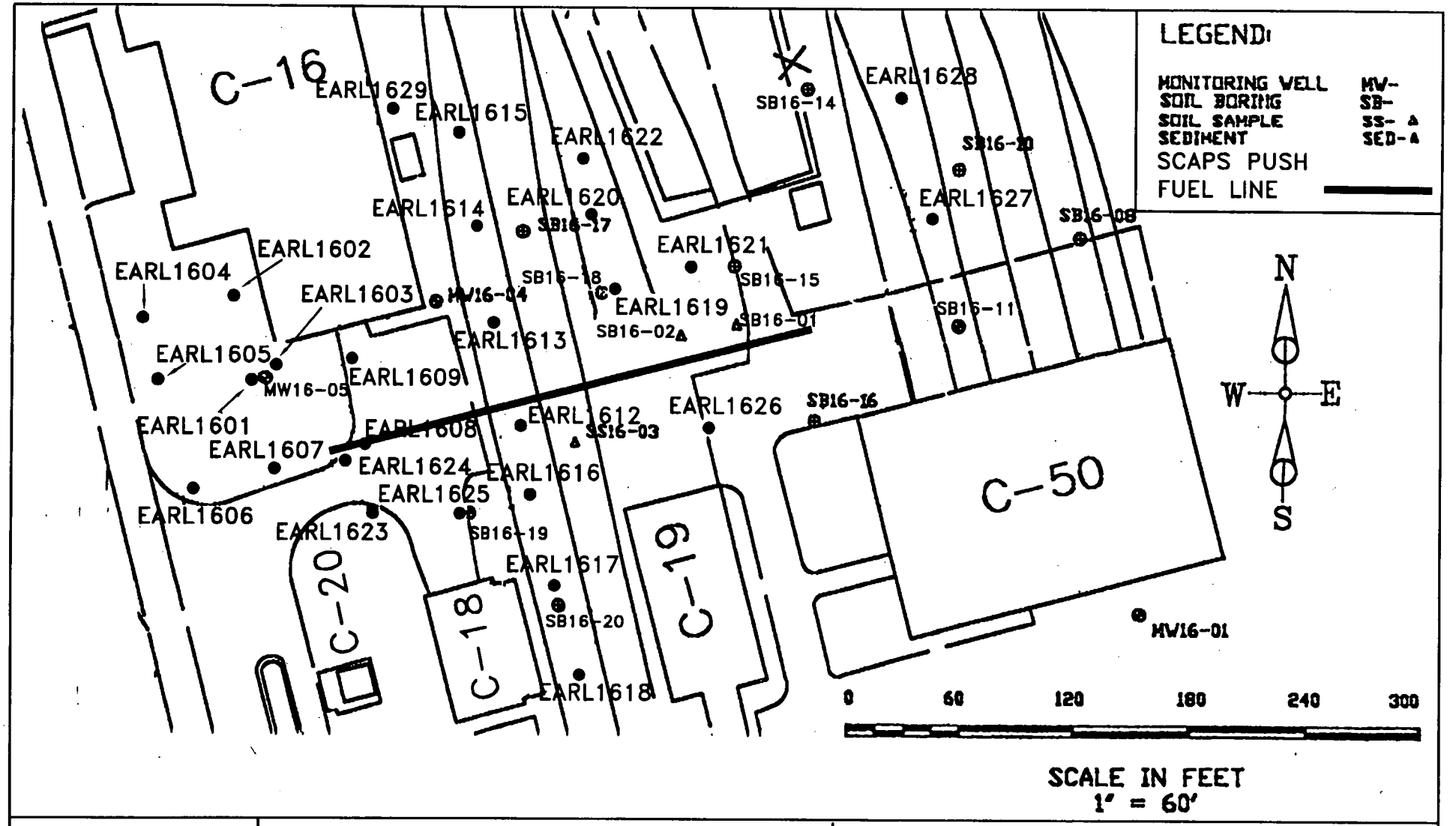
3. RESULTS

Figure 2 shows the locations of SCAPS pushes completed at Site 16/F. Figure 3 provides a visual representation of the Site 16/F fluorescent intensity results at approximately 10 feet below ground surface. The areas of highest fluorescent intensity are indicated by the colors red and green. The raw SCAPS results along with the confirmation sample results are in Appendix F.

Figure 3 shows that the majority of the PAH contamination was found to be centered around monitoring well MW-16-4. The soil samples that were collected from push holes EARL1621 and EARL1629 and analyzed for Total Recoverable Petroleum Hydrocarbons (TRPH EPA Method 9073) confirms this interpolation. The soil sample collected from push hole EARL1627 confirms that there is PAH contamination just north of Building C-50.

Figure 4 is a stratigraphic cross section of Site 16/F looking north along line A-A as shown in Figure 3. Figure 5 is a cross-section of Site 16/F looking east along line B-B as shown in Figure 3. The contour data in both figures show that the highest fluorescent intensity results were from areas of silty sand. This indicates that PAH contamination is associated with this soil type.

In Figure 4, the majority of PAH contamination is associated with push EARL1613 between the depths of 7.15 and 11.54 feet below ground surface. Two other areas of PAH contamination are associated with pushes EARL1621 (between 3.66 and 8.27 feet below ground surface) and EARL1627 (between 9.90 and 10.40 feet below ground surface). Soil samples collected from these areas confirm the SCAPS findings. The contour lines between EARL1621 and EARL1627 show a potential distribution of PAH contamination.



SITE 16/F	Figure 2 – SCAPS Push Locations	SCAPS INVESTIGATION NAVAL WEAPONS STATION EARLE EARLE, NEW JERSEY

Figure 3 - Interpolation of Fluorescent Intensity Results
10 Feet Below Ground Surface
Grid spacing is 20 feet(x), 20 feet(y), 6 inches(z)
by Inverse Distance Weighted, 100 nearest nodes

SCAPS INVESTIGATION
NAVAL WEAPONS STATION EARLE
EARLE, NEW JERSEY

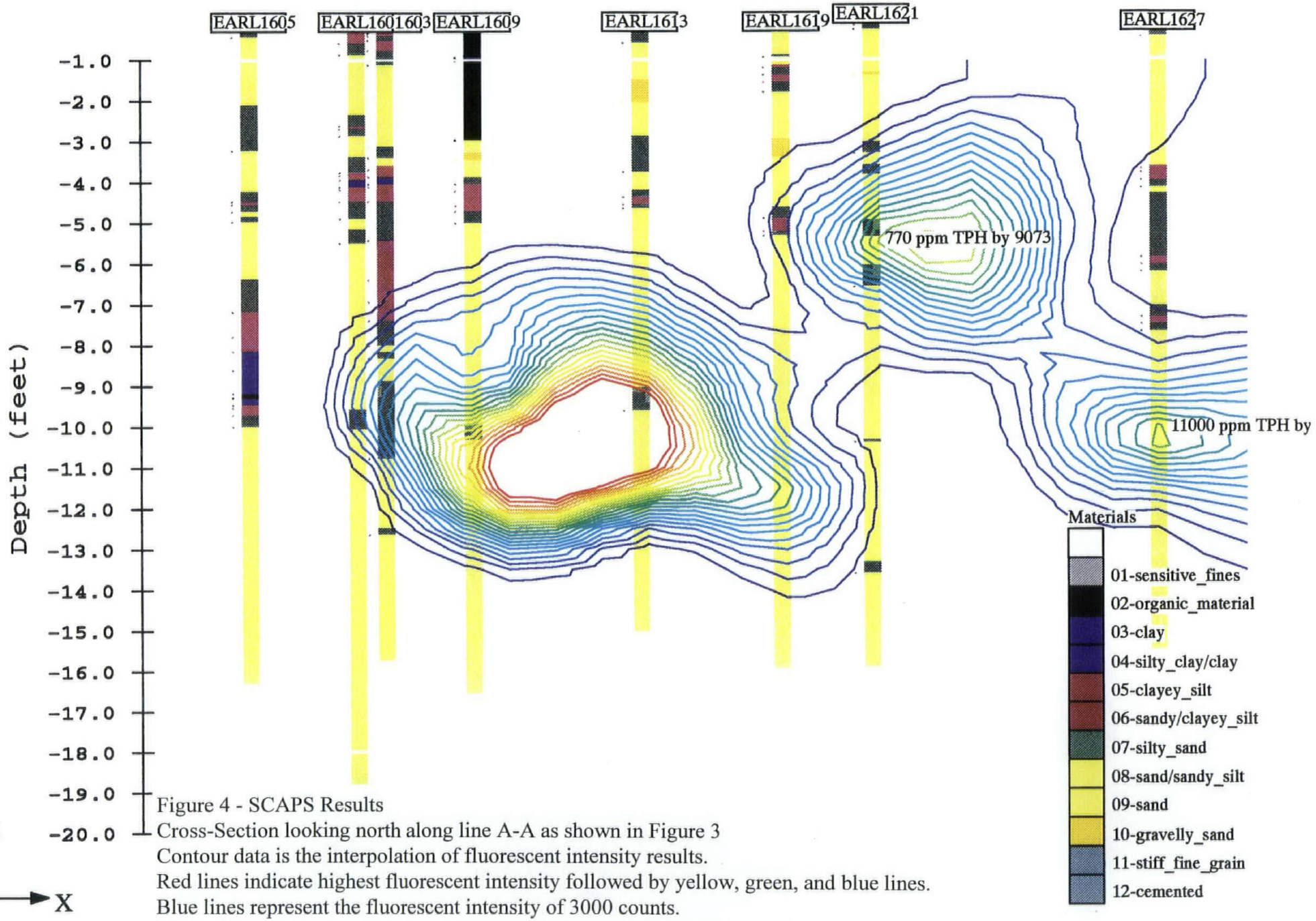


Figure 4 - SCAPS Results
Cross-Section looking north along line A-A as shown in Figure 3
Contour data is the interpolation of fluorescent intensity results.
Red lines indicate highest fluorescent intensity followed by yellow, green, and blue lines.
Blue lines represent the fluorescent intensity of 3000 counts.
Vertical bars indicate soil types as interpreted from cone penetrometer data.

In Figure 5, the majority of the PAH contamination is associated with push EARL1613 between the depths of 7.15 and 11.54 feet below ground surface. The PAH contamination is then distributed to the north in the silty sand in pushes EARL1614 (between 8.77 and 11.66 feet below ground surface) and EARL1615 (between 9.38 and 11.54 feet below ground surface)

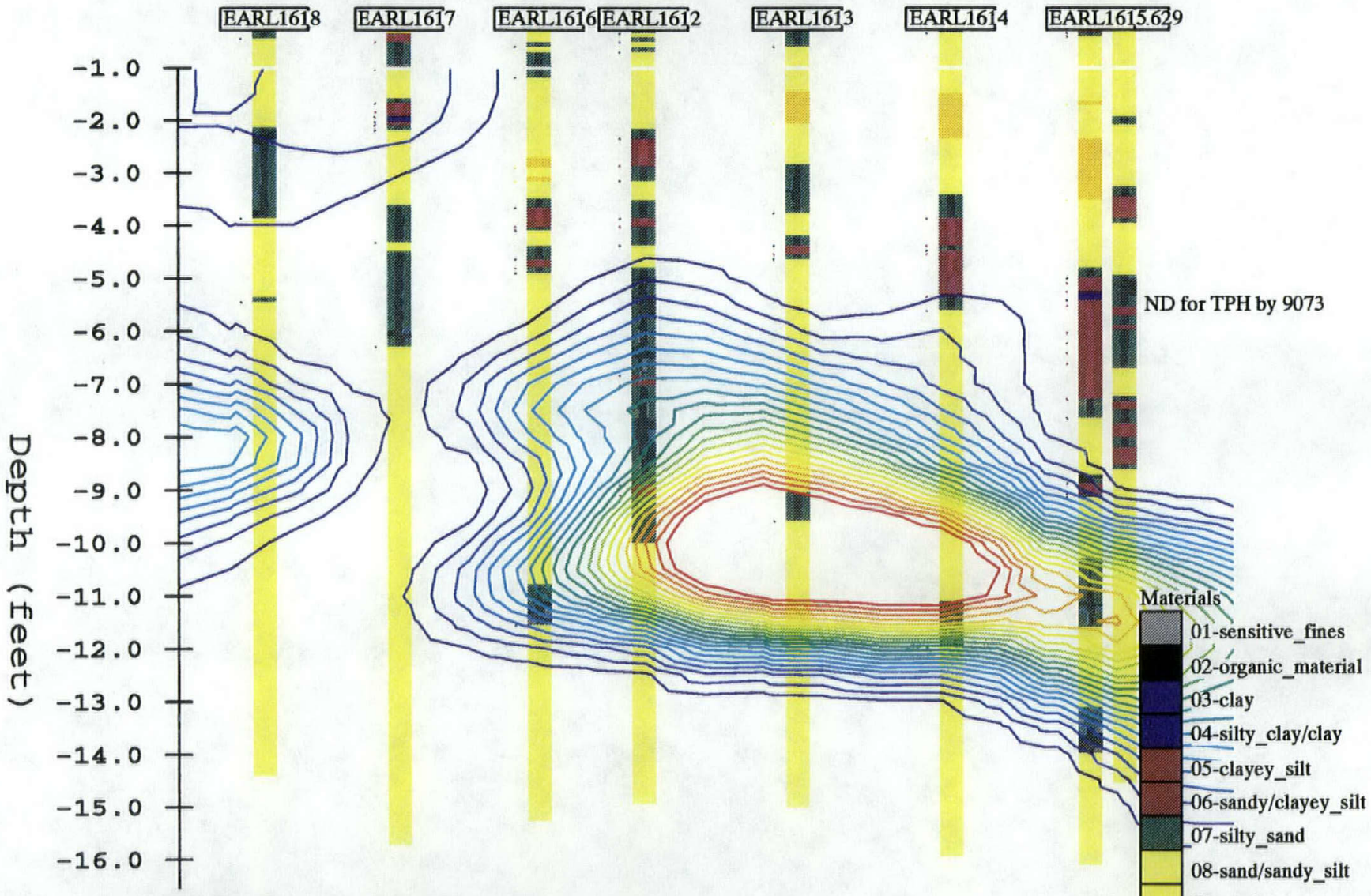
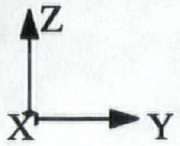


Figure 5 - SCAPS Results
Cross-Section looking west along line B-B as shown in Figure 3
Contour data is the interpolation of fluorescent intensity results.
Red lines indicate highest fluorescent intensity followed by yellow, green, and blue lines.
Blue lines represent the fluorescent intensity of 3000 counts.
Vertical bars indicate soil types as interpreted from cone penetrometer data.



REFERENCES

Olsen and Farr, 1986: "Site Characterization Using the Cone Penetrometer Test." Proceedings of the ASCE Conference on the Use of In-Situ Testing in Geotechnical Engineering. American Society of Civil Engineers, New York, N.Y.

NEESA, 1983: "Initial Assessment Study of Naval Weapons Station Earl, Colts Neck, New Jersey" NEESA 13-020, February 1983.

APPENDIX A - METHODS

APPENDIX A - METHODS
Naval Weapons Station Earle - Site 16/F

A.1 Permits.

No permits were required to complete or abandon push holes.

A.2 Push Hole Clearance.

Ground Penetrating Radar (GSSI Sir System 2) and a magnetic induction pipeline locator were used to check each push location for the presence of buried objects or utilities. The hole clearance records are included at the end of this Appendix.

A.3 Surveying.

Push locations were determined by triangulation of bearings from monitoring well MW-16-5, the fire hydrant next to Building C-15, and a temporary bench mark. The surveying records are included at the end of this Appendix.

A.4 Grouting.

A grout tube is attached to the tip of the SCAPS probe. Following the data collection activities for each push, the attached grout pump is used to force grout to fill the hole as the probe is withdrawn. The grouting process consists of initially pumping approximately one gallon of water down the grout tube to force a sacrificial tip off the end of the SCAPS probe. Once the tip is removed a grout mixture of 15 lbs of Portland Cement, 1 lb Bentonite and 4 gallons of water per 10 feet of push hole is pumped at a rate equal to the SCAPS probe withdrawal rate. A constant pressure is maintained on the grout tube as the probe is withdrawn. Grout flow is monitored to identify any blockage of the tubing.

A.5 Decontamination.

All sampling and data collection devices coming in contact with potentially contaminated materials were decontaminated in accordance with ASTM 5088, Practice for Decontamination of Field Equipment Used at Non-radioactive Waste Sites.

Upon completion of push operations for penetration and fluoroscopic tests, the push rod and probe are cleaned as they are withdrawn using pressurized hot water. The hot water (140 degree Fahrenheit) is flushed through a cleaning collar at 150 psi (connected to a hot water storage system which contains all wash fluids) located beneath the truck.

A.6 Investigative Derived Waste.

All decontamination water was collected into a 55-gallon drum for analysis and proper disposal. Three 55-gallon drums of Investigative derived waste (IDW) water were generated during the investigation. The drums were left on a pallet. Northern Division, Naval Facilities Engineering Command has the responsibility for the analysis and disposal of the three IDW drums.

IDW was generated during operation of the CPT system. Types of waste produced include: 1) wash water from rod decontamination operations, 2) solidified grout, and 3) wash water from grouting equipment cleanup. IDW was placed in 55-gallon drums, labeled, and stored on pallets at the site.

The decontamination wastewater was expected to contain traces of petroleum hydrocarbons and suspended solids. Although the wash water is not expected to meet hazardous classification as defined in RCRA, the material was containerized, labeled, and stored at the SCAPS staging area.

The solidified grout consists of hydrated cement with a small amount of non-hazardous admixture (bentonite and Sikament). Grouting cleanup wash water consists of potable water with small amounts of cement particles and cement sludge. The wash water was disposed of on-site in accordance with the California Stormwater Best Management Practice Handbook.

A.7 Collection and Analysis of Samples.

Three soil samples were collected during the investigation. The soil samples were collected from holes within twelve inches of the SCAPS push hole, and at depths that correspond to LIF results. A MOSTAP soil sampler was used to collect each soil sample.

The soil samples were analyzed by a PWC Jacksonville contracted laboratory. The chain-of-custody records and analysis are given at the end of this Appendix. The sample depths and corresponding SCAPS results are given in Appendix F.

Push Hole Clearance Records

DATE 11/2/95

LOCATION	FILE #	DIR OF PULL	REMARKS
NWSE #12	303	N-S	LOCATED OBSTRUCTION APPROX ~~5-10'~~ "N" 2'-4" OF MARK.
	304	E-W	OK
#26	305	N-W	POSSIBLE OBSTRUCTIO WITH RE-PULL
	306	E-W	
#26	307	N-S	OBSTRUCT NEAR NORTH SIDE OF MARK. MARK SHOULD BE CLEAR
#19	308	N-S	CLEAR
	309	E-W	POSSIBLE OBSTRUCTION MOVED MARK EAST.
#20	310	N-S	POSSIBLE DEFECT OF OBSTRUCTION
	311	E-W	* CHANGED
	312	N-S	— BAD GAINS REDO
	313		BAD FIVE
	314	N-S	CLEAR HOLE
#21	315	N-S	CLEAR
	316	E-W	CLEAR

LOCATION	FILE#	DIR	REMARKS
#27	317	N-S	POSSIBLE [illegible]
	318	E-W	PACK [illegible]
	319	DIA N-S	NO VISIBLE OBSTRUCTION
	320	DIA E-W	
#29	321		[illegible]
	322	N-S	
	[illegible]	[illegible]	PO[illegible] OBSTRUCTION [illegible] MOVED 2-N
	324	E-W	CLEAR
#30	325	N-S	CLEAR
	326	E-W	CLEAR

DATE 17 OCT 95

LOCATION I.D	FILE #	DIR OF PULL	REMARKS
NWSE 1	255	E-W	O.K
	256	N-S	O.K
NWSE 2	257	E-W	OK
	258	N-S	OK
#3	259	E-W	DIST. POSS. SEWAGE LINE W OF MARK
	260	N-S	O.K
#4	261	E-W	O.K
	262	N-S	O.K
#5	263	E-W	O.K.
	264	N-S.	POSS DIST. FIBER OPTIC CABLE IN AREA
	265 > TRASH FILES		
	266		
	267	N-S	LOCATING POSSIBLE UTILITIES
	268	N-S	MOVED MARK EAST LOCKED FOR SEWER CONNECTION
	269	N-S	OK
	270	E-W	O.K
#6	271	N-S	O.K
	272	E-W	O.K.
#7	273	E-W	O.K.
	274	N-S	OK
#24	275	W-E	POS. DETECT
		S-N	" "
	276	W-E	
	277		
	278	S-N	

279

BLANK FILE FOR EXTRA READING

Hole #	File #	Dir of Roll	Remarks
24	280	W-E	OK.) HOLE BTWN #7 & #8
	281	N-S	OK
#16	282	N-S	O.K
	283	W-E	O.K.
#17	284	W-E	O.K
	285	S-N	O.K
#18	286	N-S	O.K
	287	W-E	OK.
#12	288	W-E	→ Re Check *
	289	N-S	→ Recheck *
	290	W-E	→ OK
#13	291	W-E	ok
	292	N-S	OK
#14	293	W-E	ok
	294	N-S	OK
#15	295	W-E	OK
	296	N-S	OK
#16	297	W-E	OK
	298	N-S	
#23	299	W-E	OK
	300	N-S	OK
	301	W-E	OK

Surveying Records

SCAPS
FIELD SURVEY FORM

DATE: 18 OCT 95
PROJECT#: NAVAL WEAPONS STATION, EARLE NJ.

BENCHMARKS:

	Description of Benchmarks	I. D. on Benchmarks
(BM #1)	MONITORING WELL	MW-16-5
(BM #2)		
(BM #3)		
(BM #4)	TEMP BENCH MARK	
(BM#5)		

*Description of Benchmarks - Monitoring Wells, Survey stakes, Telephone Poles etc..
*Identifiaction of benchmarks - Markings, symbols, etc..

Special Notes regarding Benchmarks & Survey:

* BENCH MARK IS ESTABLISHED ON ROAD OVER TRACKS BTWN C-18 & C-19. MARK IS ON SOUTH EDGE BTW TRACKS.
(*) - DENOTES DISTANCE FROM BLDGS

SURVEY:

Benchmark Orientation

Benchmark # BM #4 (BM #1, BM #2, etc) bearing to BM #1 (BM #, Building, Tower, Mag. North, etc) in relative degrees 0 (Mag. North - N/A)

Survey From BM 4 to Project Push Location #'s:

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
BEARING (Relative, actual for Mag.)										
DISTANCE (Feet)										

	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20
BEARING (Relative, actual for Mag.)		050	052	053	053.5	272	233.5	234	089	078
DISTANCE (Feet)		30.0	44/88	70/140	95/190	3.0	57.0	53.0	101	151
		22.09 22.39	22.06 HALF STADA 22.50	22.32 23.02 (HALF STADA)	23.45 22.5 (HALF STADA)		6.75 7.32	6.27 6.8	C-19	C19

	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30
BEARING (Relative, actual for Mag.)	113.5	184				140	121	108		
DISTANCE (Feet)	41	184				94.0	90	155		
	DISTANCE FROM HOLE #19 APPROX DUE-EAST	C-19				24.41 23.47	C-59	C-50	FROM BLDG 19 184' N-S 11' W-E	

SCAPS
FIELD SURVEY FORM

DATE: 18 OCT 95
PROJECT#: NAVAL WEAPON STATION, EARLE N.J.

BENCHMARKS:

	Description of Benchmarks	I. D. on Benchmarks
(BM #1)	MONITORING WELL	MW-16-5
(BM #2)	MONITORING WELL	MW-16-A
(BM #3)	FIRE HYDRANT NEXT TO C-15	NONE
(BM #4)	TEMP MARK (195' @ SOUTHERN EDGE RD.)	NONE
(BM#5)		

*Description of Benchmarks - Monitoring Wells, Survey stakes, Telephone Poles etc..
*Identifiaction of benchmarks - Markings, symbols, etc..

Special Notes regarding Benchmarks & Survey:
* HOLES #24 & 23 WERE BLOCKED BY VEHICLE SIGHTED ANGLE THROUGH UPER SITES
* B.M #A WAS CREATED TO SITE HOLES.

SURVEY:

Benchmark Orientation

Benchmark # BM 1 (BM #1, BM #2, etc) bearing to BM 3 BM 2 (BM #, Building, Tower, Mag. North, etc) in relative degrees 0 (Mag. North - N/A)

Survey From BM 1 to Project Push Location #'s:

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
BEARING (Relative, actual for Mag.)	350.5	63.5	125.0	019.5	351	294	257	207	160	
DISTANCE (Feet)	5.50	48.0	8.5	71.0	54.0	68.0	48.0	64.0	44.0	
	23.905 23.96	23.29 23.77	23.955 24.04	23.04 23.75	23.06 23.6	22.7 23.38	23.32 23.8	22.81 23.45	23.19 23.63	

	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20
BEARING (Relative, actual for Mag.)										
DISTANCE (Feet)										

	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30
BEARING (Relative, actual for Mag.)			222	227	207					
DISTANCE (Feet)					129.0					
					23.61 24.9					

Chain of Custody Records

CHAIN OF CUSTODY RECORD

NAVY PUBLIC WORKS CENTER JACKSONVILLE
ATTN: CODE 330 (ENVIRONMENTAL LABORATORY)
JACKSONVILLE, FL 32212-0030

PROJECT # 600063 CONTRACT #: N68931-95-A-9460

D.O.# CALL# 51 COLLECTED BY: JW

JRATORY: COLUMBIA ANALYTICAL SERVICES #00025616 PHONE: 904 739-2277
840 BAYCENTER ROAD
ADDRESS: JACKSONVILLE, FL 32212-0030 FAX: 904 737-0610

SAMPLE ID #	DATE	TIME	COMP	GRAB	WELL	SAMPLE LOCATION	SAMP.COMP	PH	TEMP	# CONT	REMARKS / TESTS REQUIRED	CONTAINER TYPE / PRESERVATION: 500mL wms - 4°C							
610-0200	11-3-95	2308		X		SITE 16	SOLID	—	—	1	9073	1			EARL 29		5-5.6		107 ul
610-0201	11-4-95	1028		X		21SS	SOLID	-	—	1	9073	1			4.8-6				770
610-0202	11-4-95	1133		X		27SS	SOLID	-	—	1	9073	1			9.6-11				11,000

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
[signature]	11-16-95	1535	
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY LAB BY: [signature] 11/16

REMARKS:

J950918

PWCENVLAB FORM-12 DTD 11-22-94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Navy Public Works
Project: 60063 Call #51
Sample Matrix Soil

Service Request: J950918
Date Collected: 11/3,4/95
Date Received: 11/16/95
Date Extracted: 11/17/95
Date Analyzed: 11/17/95

Total Recoverable Petroleum Hydrocarbons
EPA Method 9073
Units: mg/Kg (ppm)

Sample Name	Lab Code	MRL	Result
610-0200	J950918-1	10	U
610-0201	J950918-2	10	770
610-0202	J950918-3	10	11,000
Method Blank	J951117-MB	10	U

U Not detected at or above the MRL.

Approved By: Tom D. Hissinger Date: 11/20/95

APPENDIX B - SYSTEM DESCRIPTION

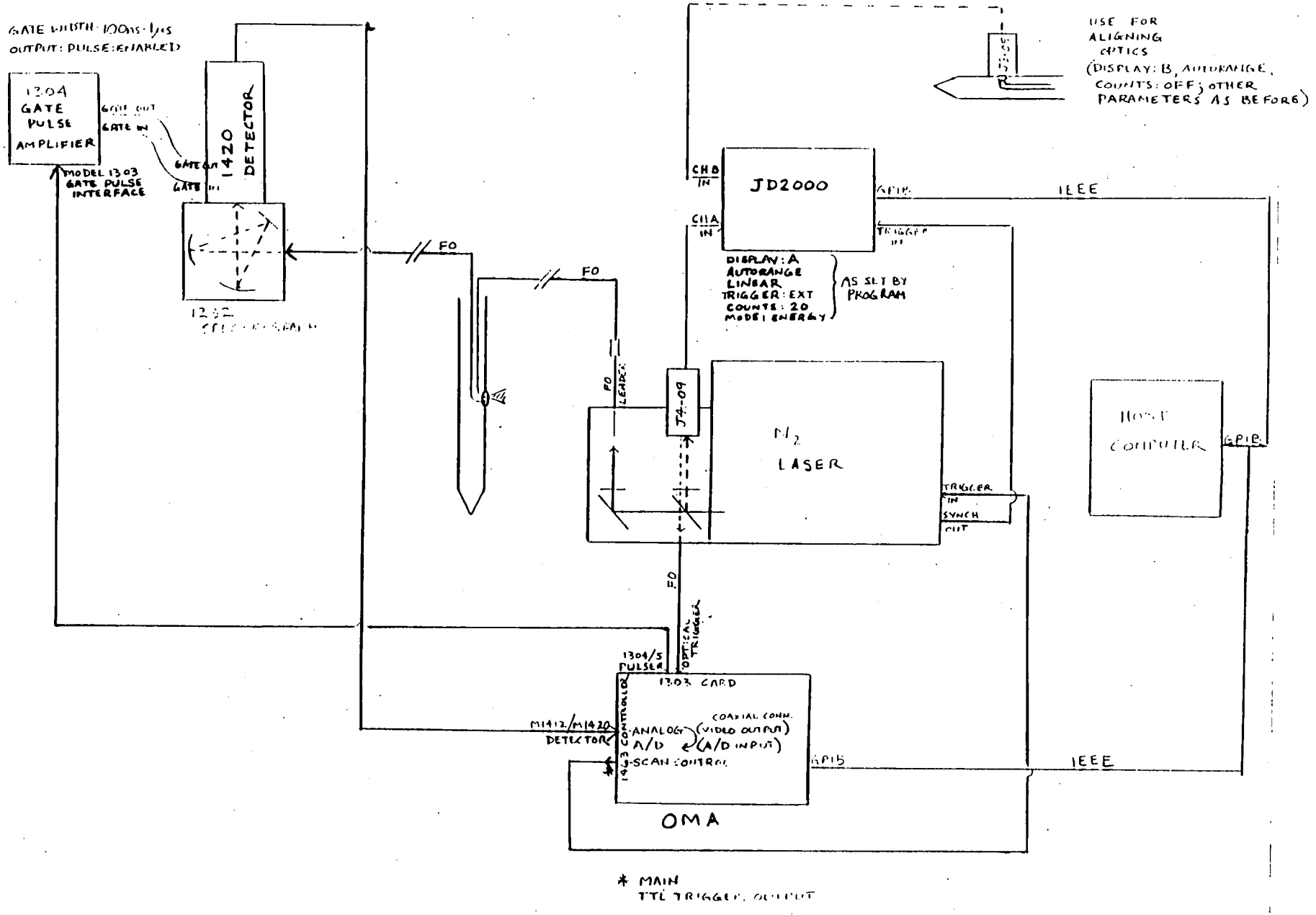
B.1. LIF System Description.

The LIF system is capable of measuring the occurrence of polynuclear aromatic hydrocarbons of 3 or more rings.

A schematic diagram of the fiber optic fluorometer system is shown in Figure B-1. The system was adapted from a design originally developed for in-situ fluorescence measurements in sea water (Lieberman, 1991; Inmand, 1990; Lieberman, 1989). The penetrometer sensor system uses two 365 micron diameter UV/visible transmitting (high OH silica clad silica) optical fibers. One fiber is used to carry excitation radiation down through the penetrometer rod and a second fiber collects the fluorescence generated in the soil sample and carries it back to the detector system at the surface. The standard fiber length is 100 meters which permits collection of fluorescence data to the maximum push depth (50 meters) using a standard 20 ton penetrometer rig. Excitation and emission fibers are isolated from the soil at the probe tip by a 6.35 millimeter diameter sapphire window mounted flush with the outside of the probe approximately 60 centimeters from the tip.

Excitation radiation is provided by a pulsed nitrogen laser (Model PL2300, Photon Technology, Inc.) that operates at 337 nanometers with a pulse width of 0.8 nanoseconds and a pulse energy of 1.4 millijoules. The beam is coupled into the excitation fiber using a 2 inch focal length quartz lens. The primary output of the laser is at 337 nanometers; however, there are secondary fluorescence lines in the region from 380 to 459 nanometers. In order to minimize the contribution of these lines to the measured fluorescence backgrounds, a mirror which selectively reflects only 337 nanometers is used to redirect the laser line before coupling it into the excitation fiber. Optical triggering of the detector eliminates problems associated with laser jitter.

A photodiode array detector system is used to quantify the fluorescence emission spectrum brought back to the surface over the receiving fiber. The detector system consists of a Model 1420 Intensified Photodiode Array Detector (EG&G PARC) coupled to a quarter-meter spectrograph which houses a 300 line/millimeter diffraction grating. The 1024 element array (700 elements are intensified) consists of 25 micron wide diodes centered at 25 micron increments. For the 300 line/millimeter grating, the dispersion of the spectrograph translates to a spectral resolution of 0.45 nanometers per pixel at the array surface when a 25 micron input slit is used. Readout of an emission spectra requires approximately 16 milliseconds. Because the detector can be readout quickly it is possible to add spectra from multiple laser shots in order to improve the signal to noise ration of the measurement. At present, 20 laser shots are used per sample interval.


GATE WIDTH: 100ns-1μs
OUTPUT: PULSE: ENABLED
1304 GATE PULSE AMPLIFIER
GATE OUT
GATE IN
GATE OUT
GATE IN
MODEL 1303 GATE PULSE INTERFACE
1420 DETECTOR
1332
FO
FO
FO LEADS
J4-09
N2 LASER
TRIGGER IN
SYNCH OUT
FO
OPTICAL TRIGGER
1304/5 PULSER
1303 CARD
M1412/M1420 DETECTOR
1463 CONTROLLER
ANALOG
A/D
SCAN CONTROL
COAXIAL CONN.
(VIDEO OUTPUT)
(A/D INPUT)
GPIB
IEEE
OMA
CHB IN
CHA IN
JD2000
GPIB
TRIGGER IN
DISPLAY: A
AUTORANGE
LINEAR
TRIGGER: EXT
COUNTS: 20
MODE: ENERGY
AS SET BY PROGRAM
USE FOR ALIGNING OPTICS
(DISPLAY: B, AUTORANGE, COUNTS: OFF; OTHER PARAMETERS AS BEFORE)
HOST COMPUTER
GPIB
IEEE
* MAIN TTL TRIGGER OUTPUT

Control and readout of the detector is performed by a Model 1460 optical multichannel analyzer (OMA) (EG&G PARC). Measurements are initiated by an electronic signal from the OMA that fires the laser. The laser pulse then triggers an optical detector which sends an electronic signal to a fast pulsed (Model 1304, EG&G PARC). The pulsed implements an appropriate delay (approximately 350 nanoseconds for a 50 meter fiber and 750 nanoseconds for a 100 meter fiber), and gates the detectors "on" for a period of 100 nanoseconds. Time-gating of the detector is set so that the detector is gated "on" to coincide with the arrival of the fluorescence signal at the detector. Because most fluorophores of interest have fluorescent lifetimes in the range of 5 to 100 nanoseconds, time-gating the detector maximizes signal-to-noise by minimizing contributions to the signal from background light and detector noise.

The resulting fluorescent intensity is a measure of the response to the input energy. The greater the number, the greater the amount of responding energy. The relationship is linear in that with increasing amounts of PAHs, the responding energy increases. The response is relative to the type of PAH so that the relationship is can't be exactly determined. This makes SCAPS a semi-quantitative analysis technique. If the relationship could be determined it would be quantitative.

A 486-based microprocessor host computer is used to automate the overall measurement process. The host computer controls the OMA system and stores fluorescence emission data received from the OMA, collects data from strain gauges, estimates soil type from strain gauge data and monitors depths from transducers on the hydraulic ram. A typical fluorescence emission spectrum from the LIF-POL sensor is shown in Figure 3. As the probe is pushed into the soil the data acquisition software generates real-time depth plots of maximum fluorescence intensity, wavelength of maximum intensity, point resistance, sleeve friction and soil characteristics as interpreted from the strain gauge data. Under normal operating conditions, a fluorescence emission spectrum is collected approximately every 2 seconds. For the standard push rate of 2 centimeters/sec this corresponds to a vertical resolution between measurements of 2-4 centimeters. The entire fluorescence emission spectrum is stored on a fixed disk to facilitate post-processing of the data.

B.2. Quality Control & Calibration Standards.

Two different types of standards are used during field operations. A quality control standard based on a solution of quinine sulfate is used to ensure the system is functioning correctly. This standard also allows the data to be normalized if the probe is changed in the middle of field operations. A set of calibration standards is prepared to evaluate the sensitivity of the sensor to the soil type at the site and the fuel type expected to be encountered. This set of standards is used to establish the noise in the measurement as well as the sensitivity of the sensor to the soil/fuel combination.

The quality control standard, designed to evaluate the system performance and internal noise, consists of dilute sulfuric acid mixed with 10 parts per million (ppm), by weight, quinine sulfate. Quinine sulfate has a high quantum efficiency so that it fluoresces quite strongly, is chemically stable, easily reproducible, and exhibits minimal photodegradation.

A single measurement of the quinine sulfate standard averages 20 fluorescence spectra (analogous to the in-situ push averaging), and the measurement is repeated three times directly before and after a push. The short term system stability is defined as the standard deviation of the three measurements. Typical results show an average standard deviation of 1-2 percent of the fluorescent intensity.

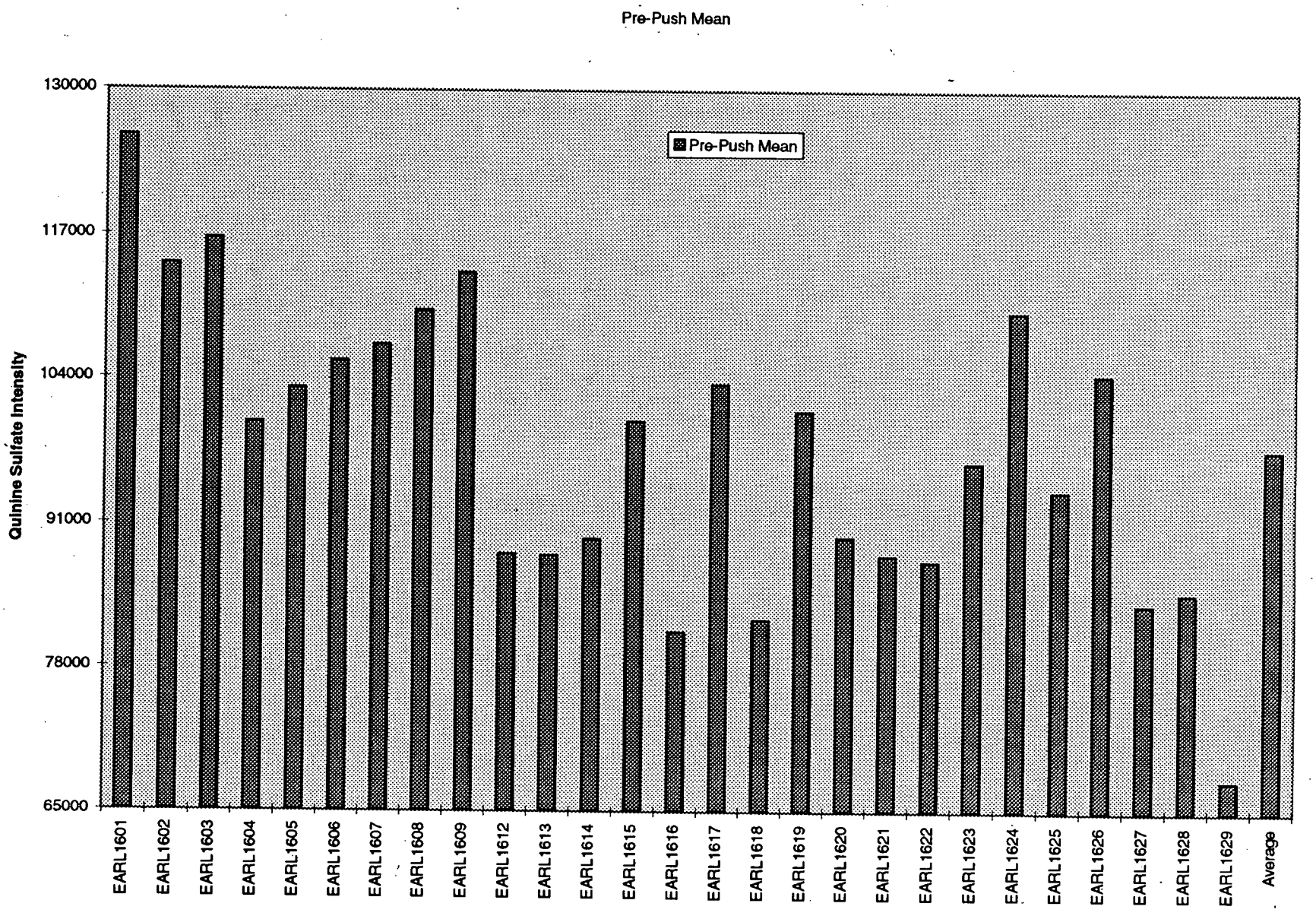
The quinine sulfate data is also used to normalize data taken using different probes. Figure B-2 shows the quinine sulfate data collected pre push during the investigation. The quinine sulfate data was used to normalize the data for all of the pushes for a consistent data set throughout the site.

In addition to the quinine sulfate quality control standard, series of spiked soil standards are prepared using soil gathered from the site. The sensitivity of the sensor will depend on the type of hydrocarbons encountered. For instance, diesel fuel (which is composed mostly of heavy polynuclear aromatic hydrocarbons (PAHs)) tends to fluoresce strongly when excited by a nitrogen laser, so that a small amount of fuel can give a large fluorescence signal. On the other hand, some jet fuels (e.g. JP-5) are composed of a greater fraction of lighter PAHs, which are not efficiently excited by the nitrogen laser, so that a larger amount of jet fuel is needed to give the same fluorescence signal as diesel fuel. Hence the sensor is less sensitive to this type of fuel.

The fuel chosen as the standard for the investigation was diesel fuel marine (DFM). One of the difficulties in establishing the target fuel is that often many different fuels were used during the history of the site. In addition, the contaminant has aged and weathered from long term exposure at the site. This is the same problem that many other quantifying analytical methods also encounter, and for this reason, SCAPS LIF-POL sensor is intended to be a screening tool to establish the presence of contamination, rather than a quantitative method for measuring the amount of contamination.

To prepare the standards, a sample of soil was collected from the site. The soil was gathered from near surface, at a depth of 6-12 inches, to reduce hydrocarbon contamination from aerosols and other airborne particulant, and was grossly sifted to remove sticks and other large debris. A series of soil samples were prepared by spiking the soil with known DFM concentrations. The spiked samples were placed on a shaker table for 24 hours to uniformly distribute the fuel.

The fluorescence spectra from the spiked samples were measured at the start of each day of field operations. As with the quinine sulfate, 20 shots are averaged to provide a single measurement. The standard deviation of the calibration standards reflects both the internal noise as well as the variations due to non-homogeneous in the soil, and can be compared


Pre-Push Mean
Pre-Push Mean
Quinine Sulfate Intensity
130000
117000
104000
91000
78000
65000
EARL1601
EARL1602
EARL1603
EARL1604
EARL1605
EARL1606
EARL1607
EARL1608
EARL1609
EARL1612
EARL1613
EARL1614
EARL1615
EARL1616
EARL1617
EARL1618
EARL1619
EARL1620
EARL1621
EARL1622
EARL1623
EARL1624
EARL1625
EARL1626
EARL1627
EARL1628
EARL1629
Average

to that of the internal standard (quinine sulfate) to assess the non-homogeneous of the soil at the site. The calibration data is included in Appendix D. This data is used to calculate the sensitivity of response of the fuel to the local soil, as well as the baseline and standard deviations that are needed to determine the detection threshold at the site.

APPENDIX C - DETECTION THRESHOLD DETERMINATION

APPENDIX C - DETECTION THRESHOLD DETERMINATION

C.1. Detection Threshold

The ability of the LIF sensor to measure small amounts of contaminant will be limited by:

- Its variable sensitivity to the hydrocarbons present in the soil
- The ambient fluorescence of the soil
- Fluctuations in the output energy of the nitrogen laser
- Variations in the detector temperature
- Changes in optical alignment

In practice, setting the detection threshold is a two part process. The first part consists of establishing a fluorescence threshold. This is the value of fluorescent intensity that must be exceeded to indicate the presence of contamination. The second part is to relate this fluorescence threshold to a correlation of petroleum concentrations to establish the detection threshold in milligrams/kilograms (ppm).

The correlation of petroleum concentrations is determined by preparing standards consisting of soil with known concentrations of contaminant. This procedure is carried out using only the lower concentration calibration standards. For the Naval Weapons Station Earle the following values were used in calculating the detection threshold: 0 ppm, 520 ppm, 1,002 ppm, 2,010 ppm, 4,098 ppm, 6,124 ppm, 9,962 ppm, and 19,744 ppm. Experiments have shown that for the full range of calibration standards (up to 25,000 ppm), the calibration data is not well fit by a linear regression. This is not surprising because of the complicated interaction between the fuel and soil type. By restricting the data set to the low concentration samples, the data is well fit using the linear regression and this approach gives much more confidence in the sensitivity near the detection threshold.

The fluorescence intensity for each calibration sample is measured in triplicate daily at the start of operations. The three measurements are averaged to provide a single measured intensity for each concentration. The data is regressed to establish a slope and intercept. The intercept is given by the intensity of the unspiked calibration standard (0 ppm). The slope is found from the least squares fit using this intercept.

Intercept: $b = y_0$ = intensity measured on 0 ppm calibration sample

Slope: $M = \Sigma(y_i - y_0)x_i / \Sigma(x_i^2)$

The variance in the regression is given by:

$$V = \Sigma(mx_i + b - y_i)^2 / (n-1)$$

where V is the biased estimator of the residual mean square of the fit and the data, and the standard deviation of the fit is:

$\sigma = \text{Sqrt}(V)$

For the calibration soils, x is given by the concentration (C) of the target fuel, while y is the measured fluorescence intensity (I) of the sample. The sensitivity and background are defined as follows:

sensitivity = slope of fitted data = m

background = intercept of fitted data = b

The noise is defined as:

noise = standard deviation of the fit = σ

The noise is defined as 1.00 times the standard deviation in order to establish a conservative fluorescence threshold. (The fluorescence threshold is given as the sum of the background and the noise values). Using the standard assumption of a normal "student's T" distribution statistics, and the number of points used in these fits (typically 8), this corresponds to an 80% confidence limit. This was chosen because the sensor is used as a field screening tool, and it was considered important to reduce the possibility for false negatives.

The quantities needed to calculate the fluorescence threshold and the detection threshold are now known. These are determined from:

Fluorescence threshold = background + noise = $b + \sigma$

Detection threshold = noise / sensitivity = σ / m

The fluorescence threshold is the quantitative limit that the fluorescence intensity must exceed in order to qualify as a "detect". If the fluorescence intensity is less that the fluorescence threshold, the sensor indicates "none-detected".

The detection threshold is the amount of contaminant that corresponds to the fluorescence threshold. This is the practical detection level in ppm, as determine from the calibration standards for a given site, and is found by taking the fluorescence threshold and working back to the concentration needed to produce this intensity. The detection threshold is used to compare the ppm of petroleum present in the sample as determined by Total Recoverable Petroleum Hydrocarbon (TRPH, EPA Method 8015-Modified) and Total Petroleum Hydrocarbon (TPH, EPA Method 418.1) with the fluorescence measurements for the validation phase of the site characterization. TPH and TRPH values above the

detection threshold value are considered "detects", while those less than the detection threshold are not detectable by the SCAPS sensor.

This method for setting the fluorescence threshold and detection threshold is based on a standard analytical chemical approach for quantifying the response of a detector. It is also easily reproducible, and the results follow directly from applying a well defined series of data reduction techniques that can be documented and repeated at any site.

This approach does have limitations. The background level is determined by a single soil sample, chosen near the surface at one location from the site. It is possible that the soil sample is contaminated, so that the background represents not only the natural fluorescence but a contribution from the contaminant. Even if it is not contaminated, the background from this single sample may not be representative of the whole site. The following additional interpretation approaches have been developed because of this single soil sample limitation.

C.2. Fluorescent Threshold

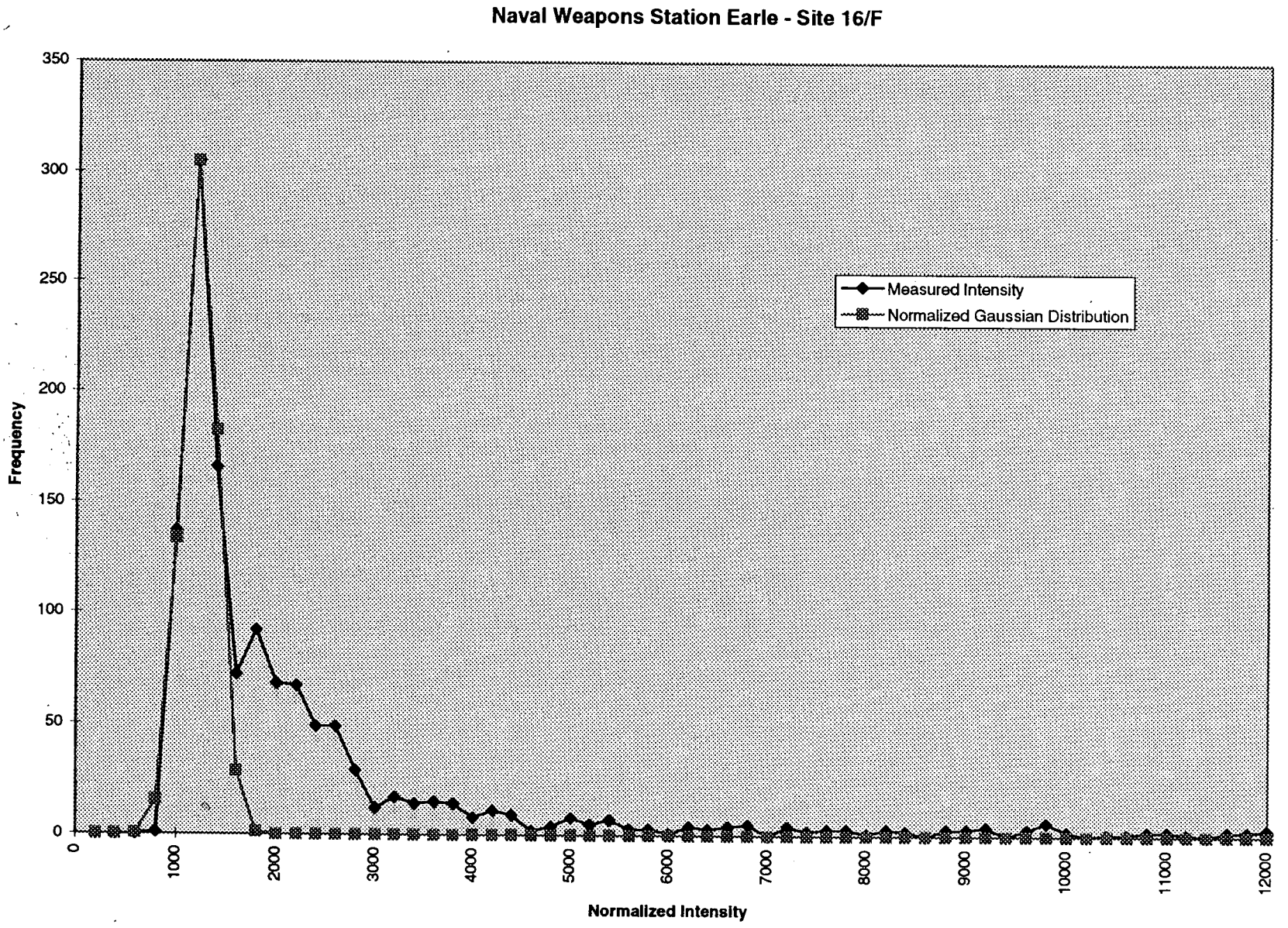
C.2.1 Histogram

It can be shown that LIF responses from the uncontaminated soil system are normally (Gaussian) distributed. It can be shown that LIF responses from the contaminated soil system are not normally distributed. This may be due to a variety of reasons including but not limited to:

- the limited vertical duration of the contaminant when compared to the uncontaminated soil system
- the relatively recent release of contamination on the geologic time scale

The underlying principle is that these are two different populations. The value of Fluorescence that marks the separation of the two populations is referred to as the Fluorescent Threshold (FT). Once the FT is determined, the LIF results can be interpreted to define the contaminated population.

The procedure consists of Ranking all the Fluorescent Intensity results generated during an investigation from least to highest without regard to depth or push location. Next, determine the frequency of occurrence within each 200 count range. With this frequency of occurrence information, construct a histogram as shown in Chart 1.



Fluorescent Threshold = 1673 Counts
Fit on Population of 10,000
Correlation = 0.924

On this histogram plot a normal distribution using the formula:

$f(x) = (\exp(-(x-\mu)^2/2*\sigma^2) / \mathrm{sqrt}(2\sigma^2\pi)$

Limit the calculation of the mean and standard deviation to the population that appears to be not-contaminated. Then generate the normal distribution normalized to the most frequently occurring Fluorescent Intensity. At this point it should be obvious that a portion of the Fluorescent Intensity data lie along the normal distribution curve with the larger values representing the contaminated population. Perform a students t-test comparison to find the best fit of the normal distribution and the Fluorescent Intensity data set. Calculate the standard deviation and mean values based on the values that best fit the probability curve. The point at which the Fluorescent Intensity data no longer fits the normal curve should be obvious by inspection or by calculating the 95% upper confidence limit value:

$UC = \mu + t*\sigma$ With $t = 1.96$ (students t value for n = infinity)

C.2.2 Quantile

Another method to determine the underlying distribution of data is the Quantile approach. This breaks the data set up by percentage of population so that 50% of the population lies below and above the mean value. Through the quantile method the FT can be determined by inspection.

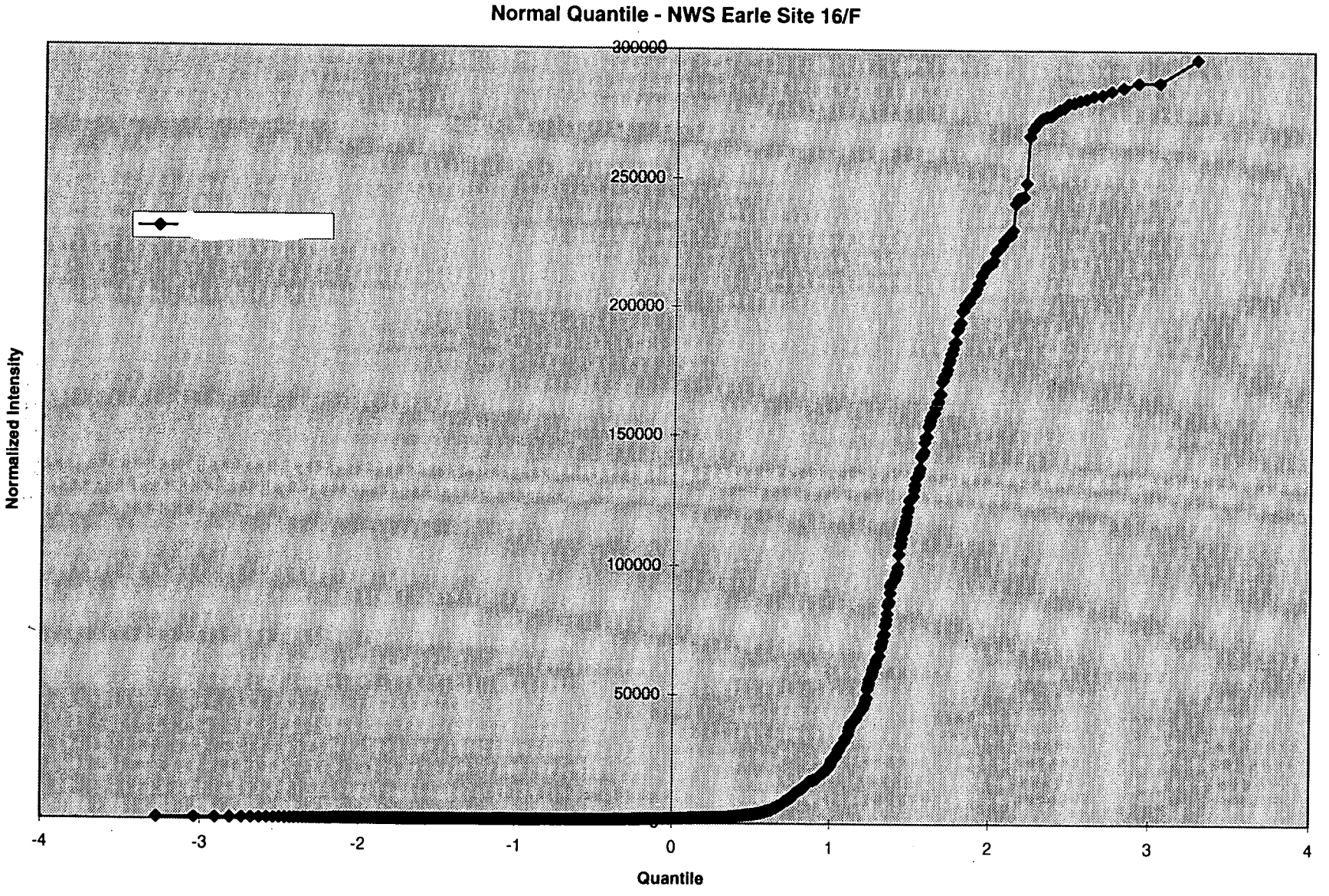
The procedure involves ranking the data from every push without regard to depth or location from lowest to highest. For each value calculate the quantile:

use: $f_i = (i-3/8)/(n+1/4)$

to calculate: $Q(f_i) = 4.91\ [f_i^{0.14} - (1 - f_i)^{0.14}]$

Plot $Q(f_i)$ verses the intensity for each corresponding rank as shown in Chart 2. Linearity indicates that the sample data are consistent with a normal reference distribution. Different linear regions of differing slopes known as clusters will be obvious. Each cluster represents a different population. There is one population of relatively low intensity values that represents one cluster and a population of high intensity values that represents the contaminated population. It may be possible to identify saturated conditions by observing a further cluster at higher intensity values.

This method is a powerful interpretation tool that is best used in conjunction with the following reference: "Statistical Design and Analysis of Experiments, With Applications to Engineering and Science" by Mason, Robert., et all., John Wiley and Sons, Inc., 1989.


Normal Quantile - NWS Earle Site 16/F
Normalized Intensity
300000
250000
200000
150000
100000
50000
0
-4
-3
-2
-1
0
1
2
3
4
Quantile

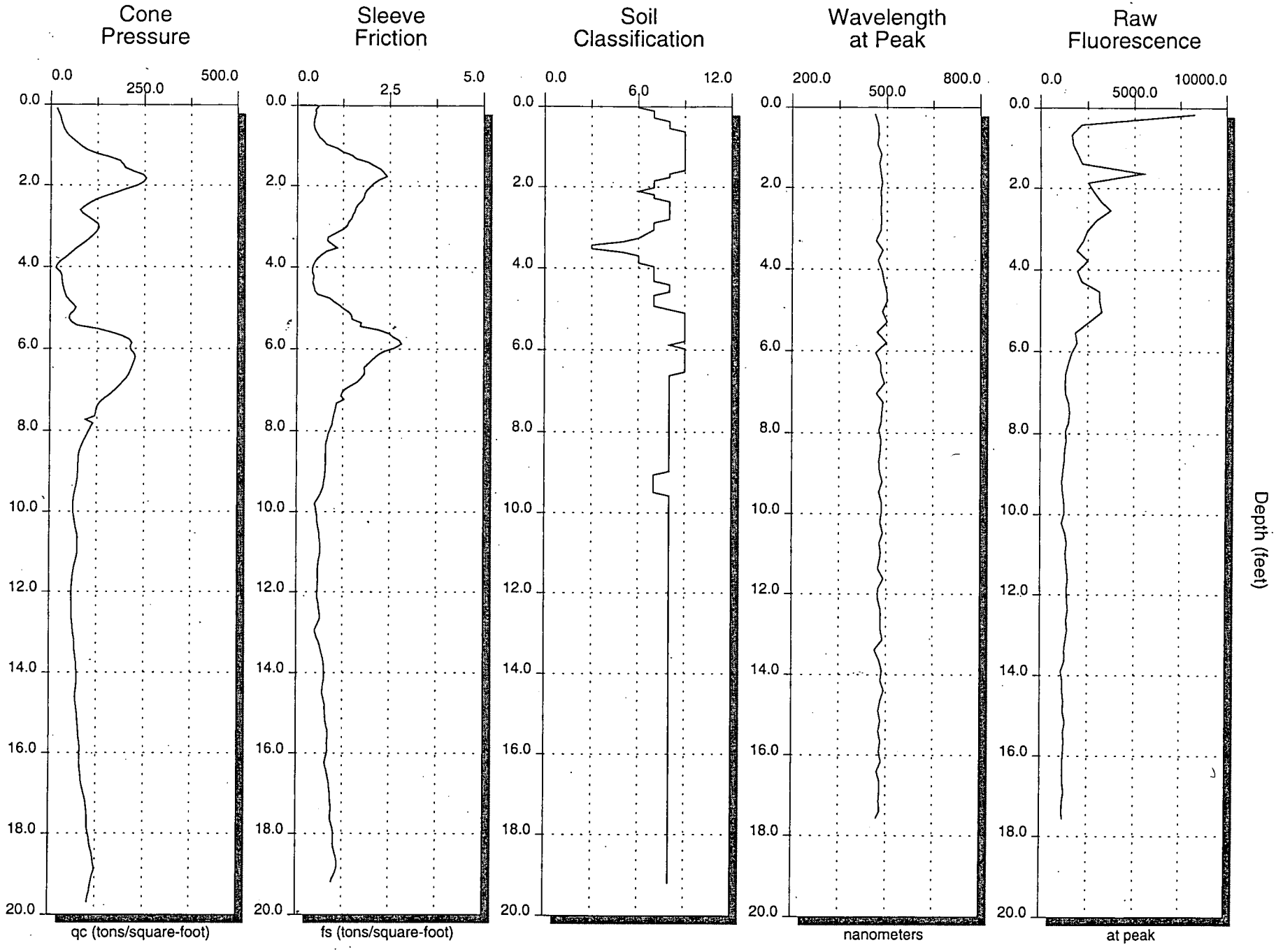
C.3. Groundwater Modeling System Assumptions.

The Department of Defense Groundwater Modeling System (GMS) is a comprehensive graphical user environment for numerical modeling. It was developed by the Engineering Computer Graphics Laboratory of Brigham Young University in cooperation with the U.S. Army Corps of Engineers Waterways Experiment Station. GMS is intended to be used for groundwater modeling applications but the interface has been written in a general fashion so that it can be used as a platform for any type of two or three-dimensional numerical modeling.

The interpolation of fluorescent intensity data is done using the Inverse Distance Weighted (IDW) method. This method is based on the assumption that the interpolating surface should be influenced most by the nearby points and less by the more distant points. Gradient Hyperplane Nodal Function was used with the 75 nearest nodes and 32 nearest Octants to generate the interpolation. The following table gives the grid information.

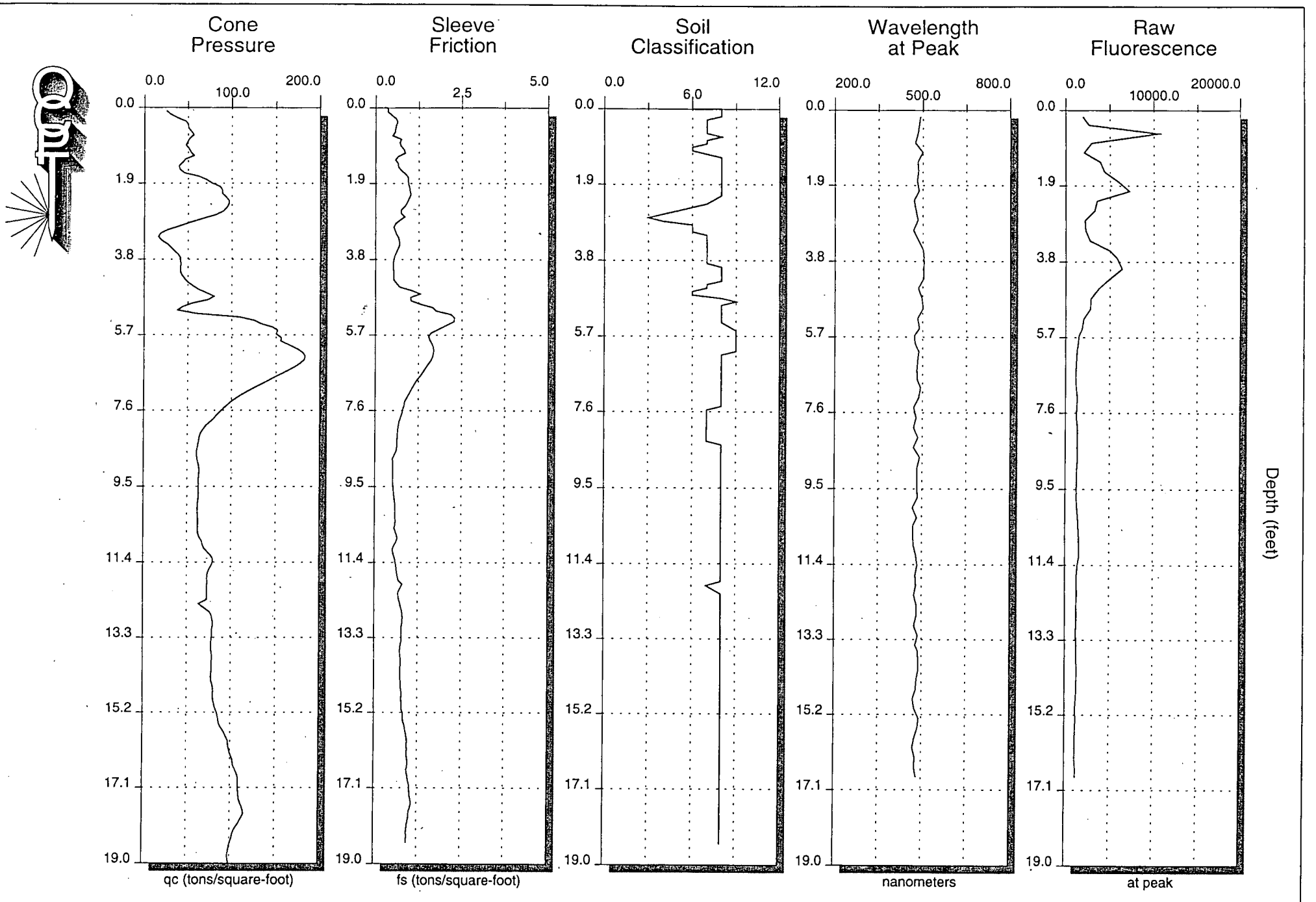
	Easting (feet)	Northing (feet)	Depth (feet)
Start	588083.7	523057.4	-18.5
End	588574.5	523417.8	0
Grid Spacing	20	20	6 inches

APPENDIX D - STRIP CHARTS WITH DETECTION THRESHOLD



Time: 10:37:37
Date: 10-17-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1601.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



Time: 11:40:52
Date: 10-17-1995
Version: 1.0

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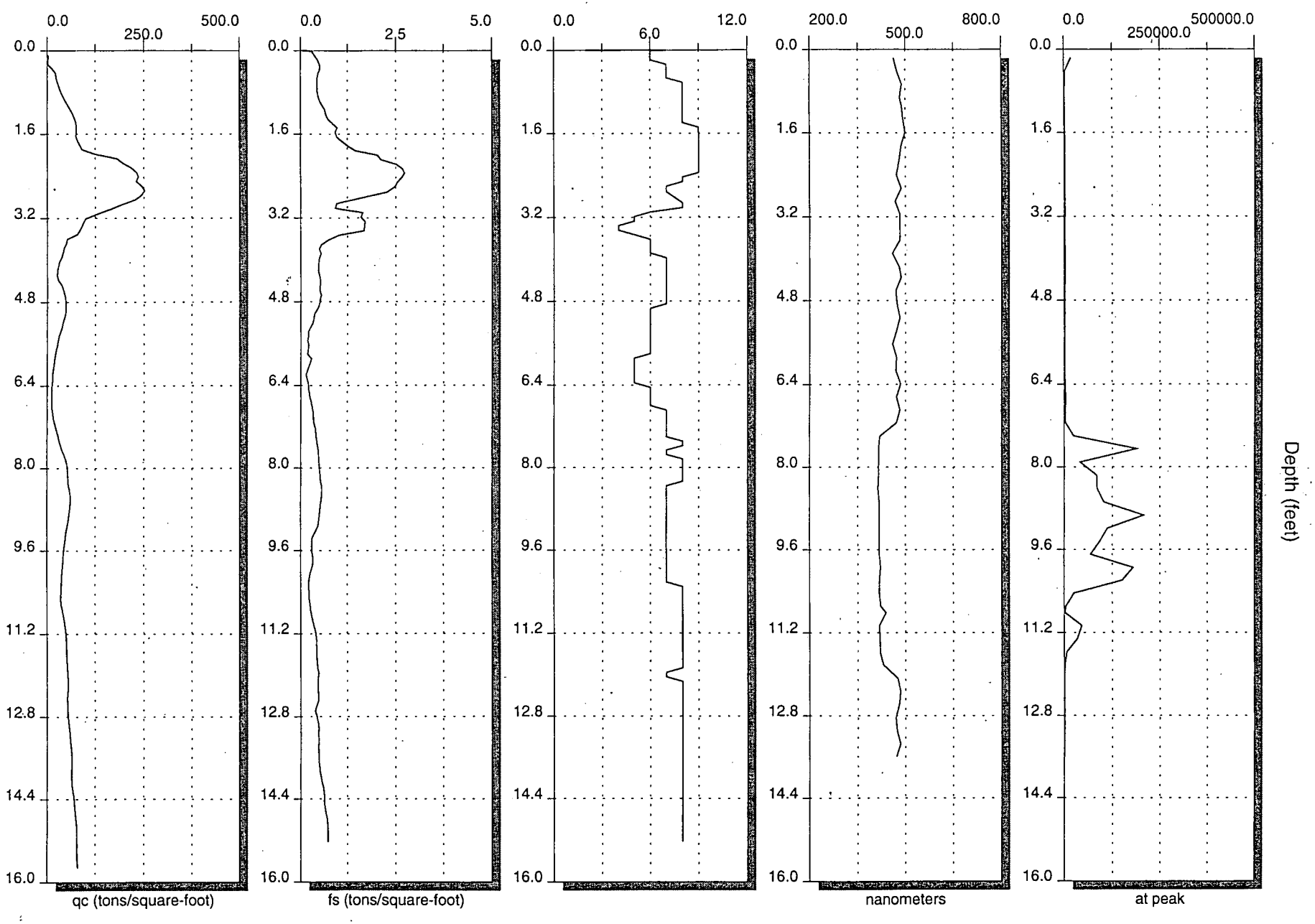
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



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Version: 1.0

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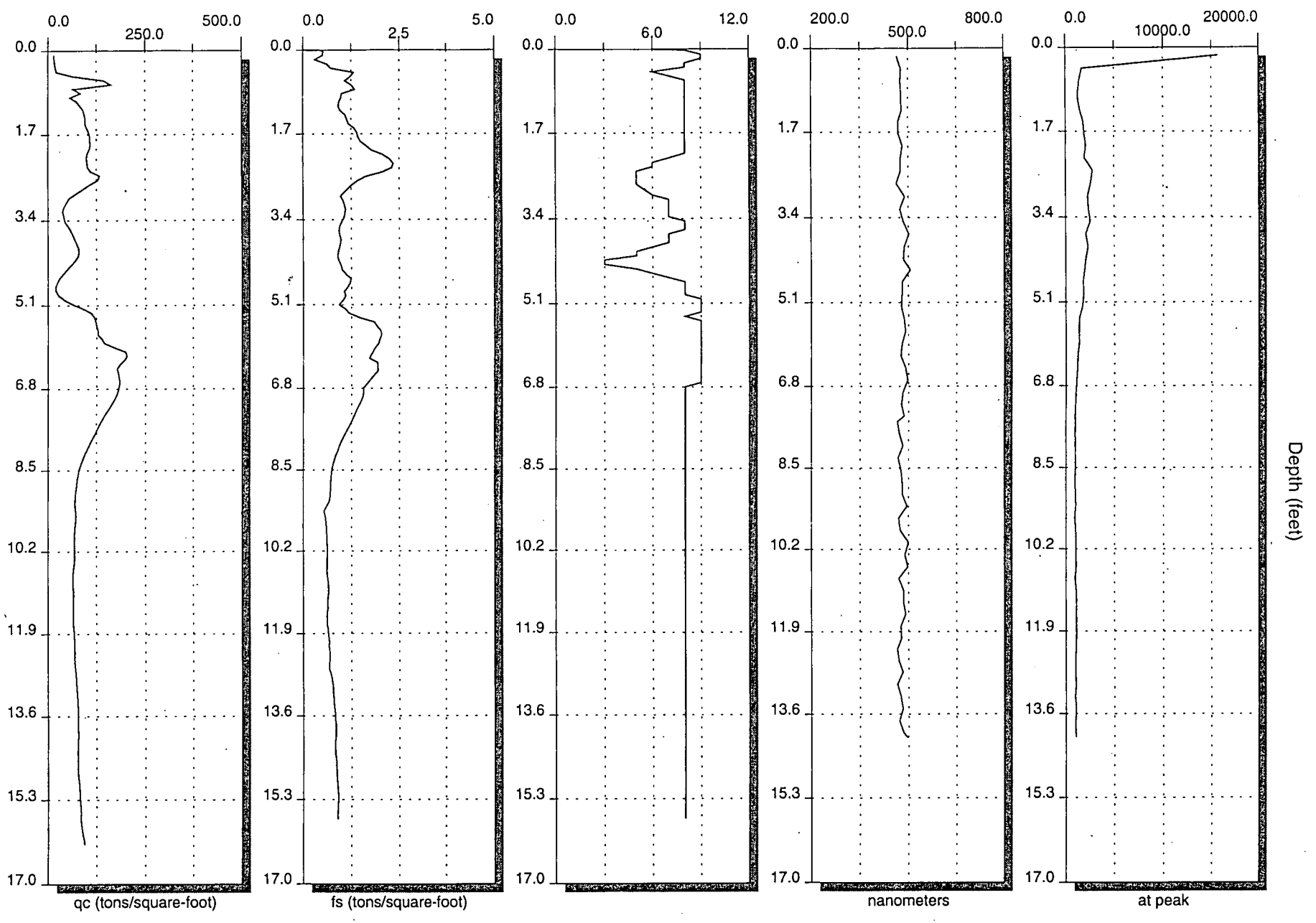
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



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Date: 10-17-1995
Version: 1.0

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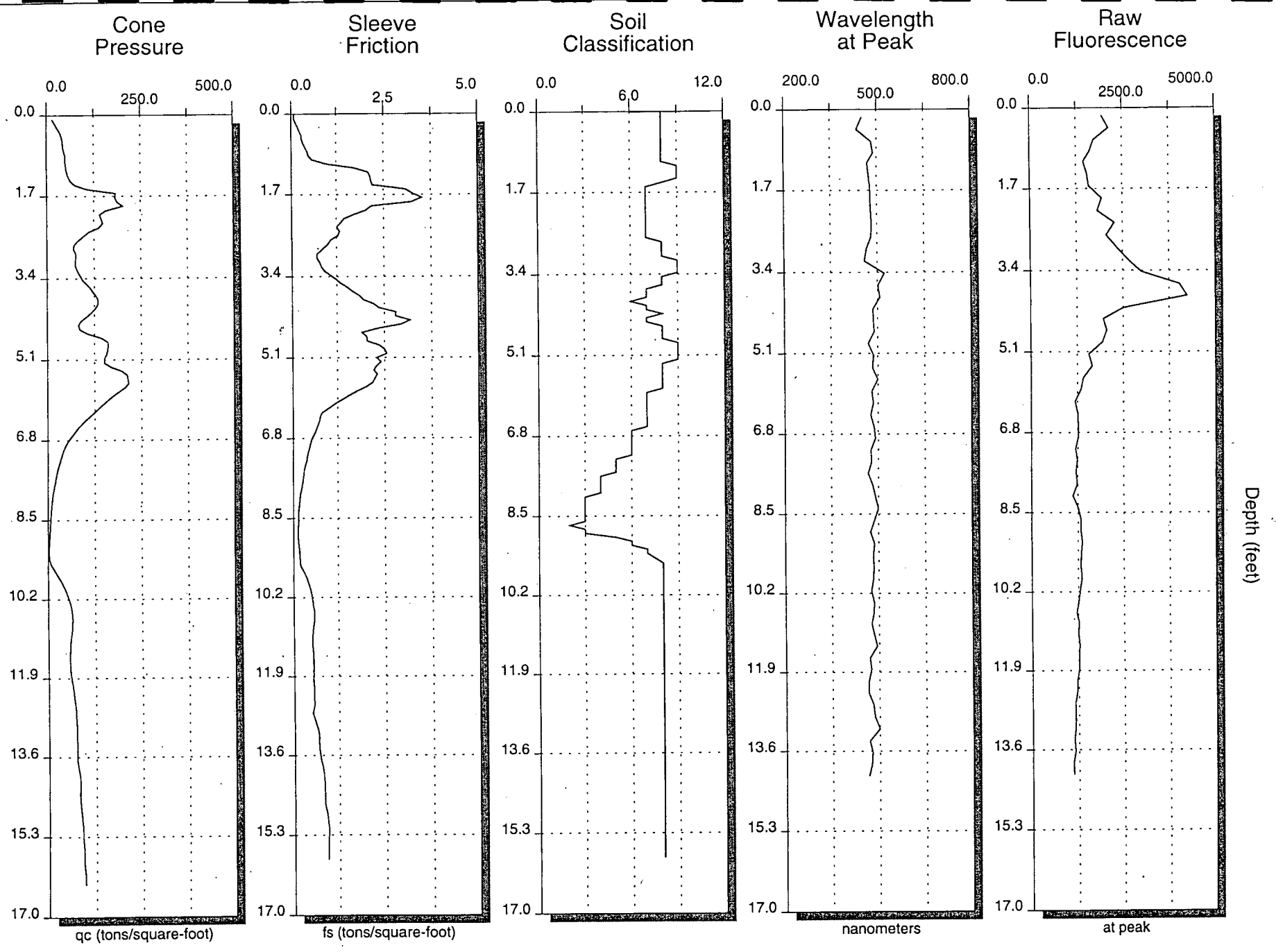
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



Time: 17:04:50
Date: 10-17-1995
Version: 1.0

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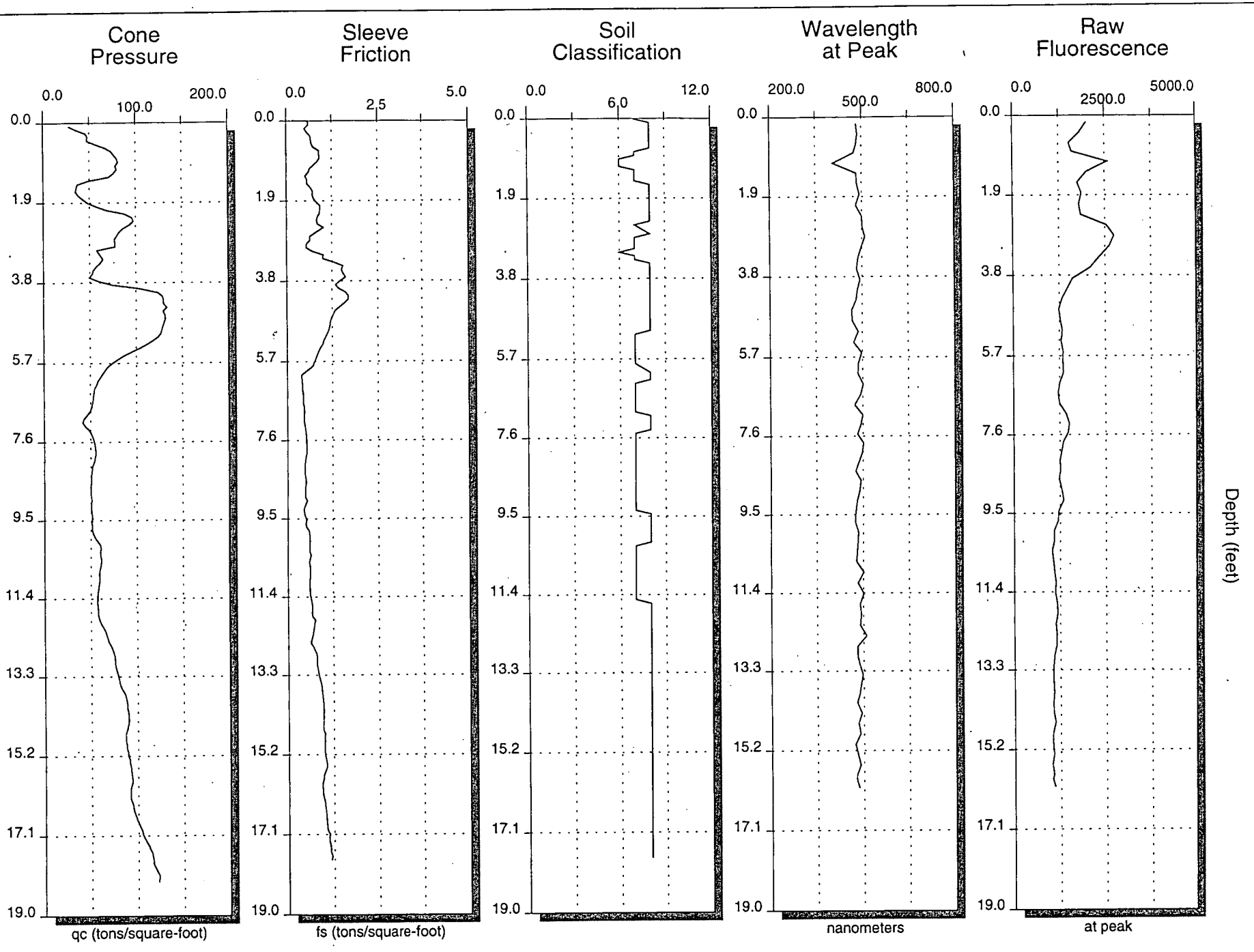
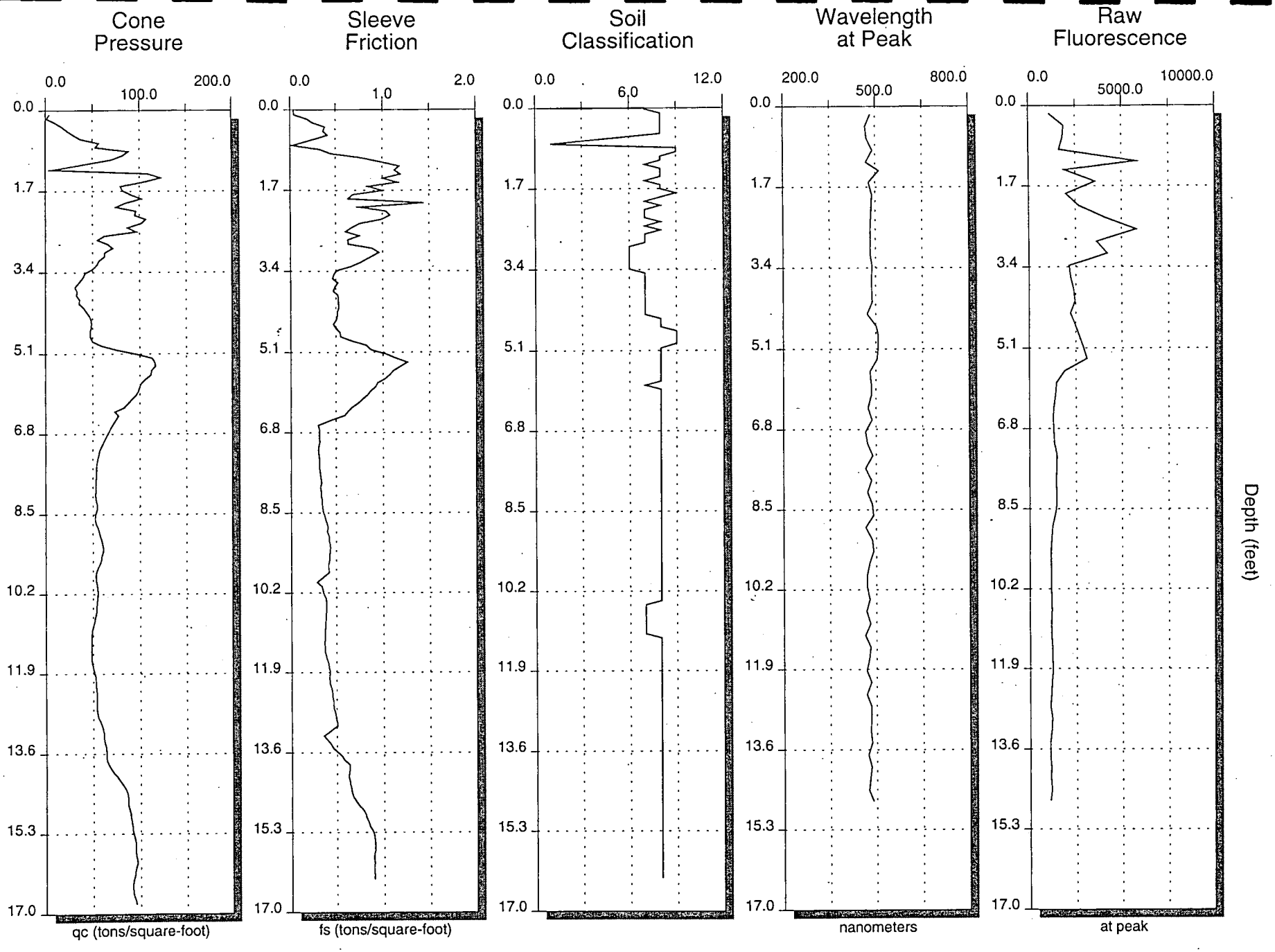
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



Time: 16:11:40
Date: 10-17-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1606.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



Time: 19:51:13
Date: 10-17-1995
Version: 1.0

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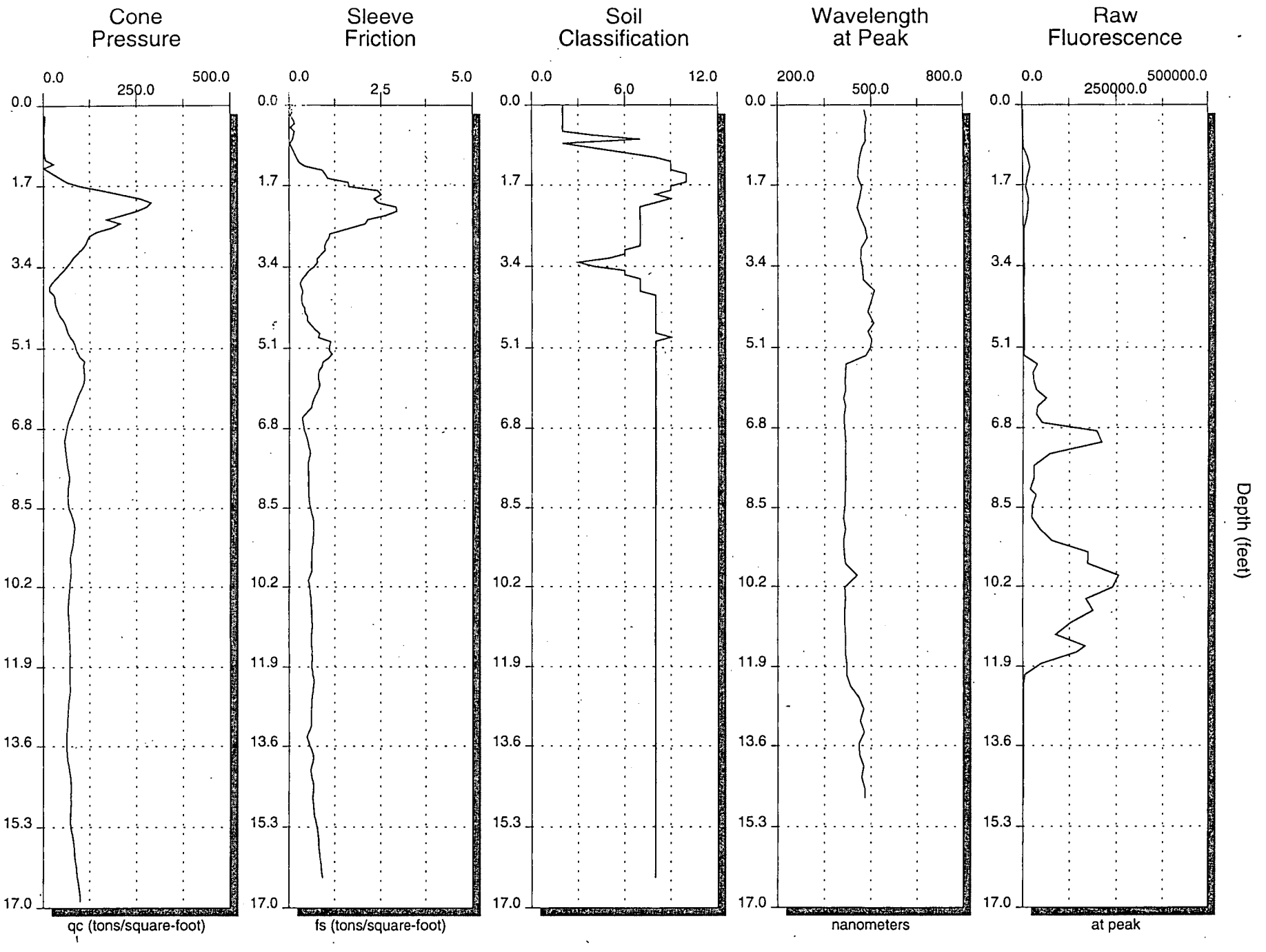
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



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Version: 1.0

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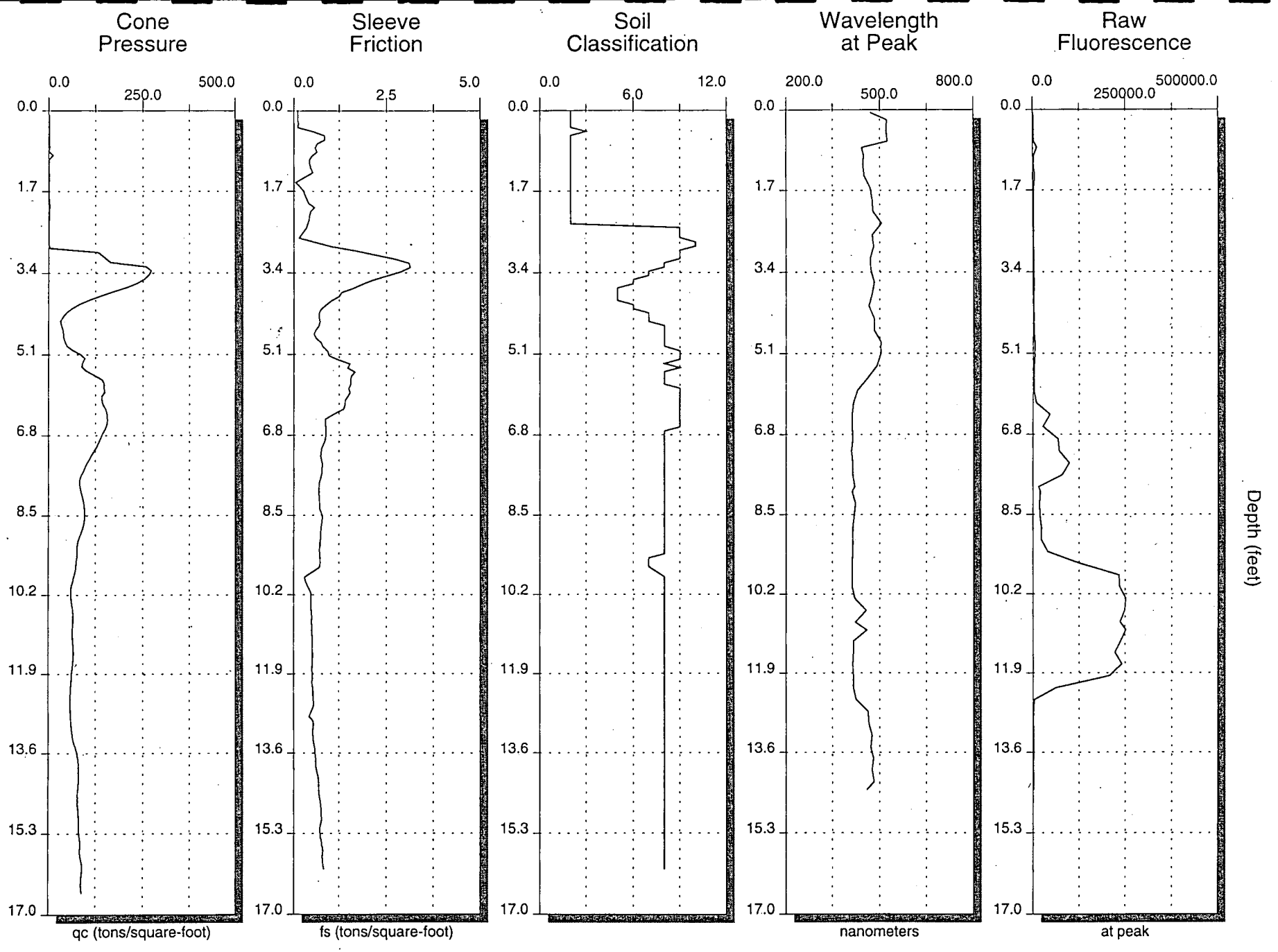
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



Time: 17:57:25
Date: 10-17-1995
Version: 1.0

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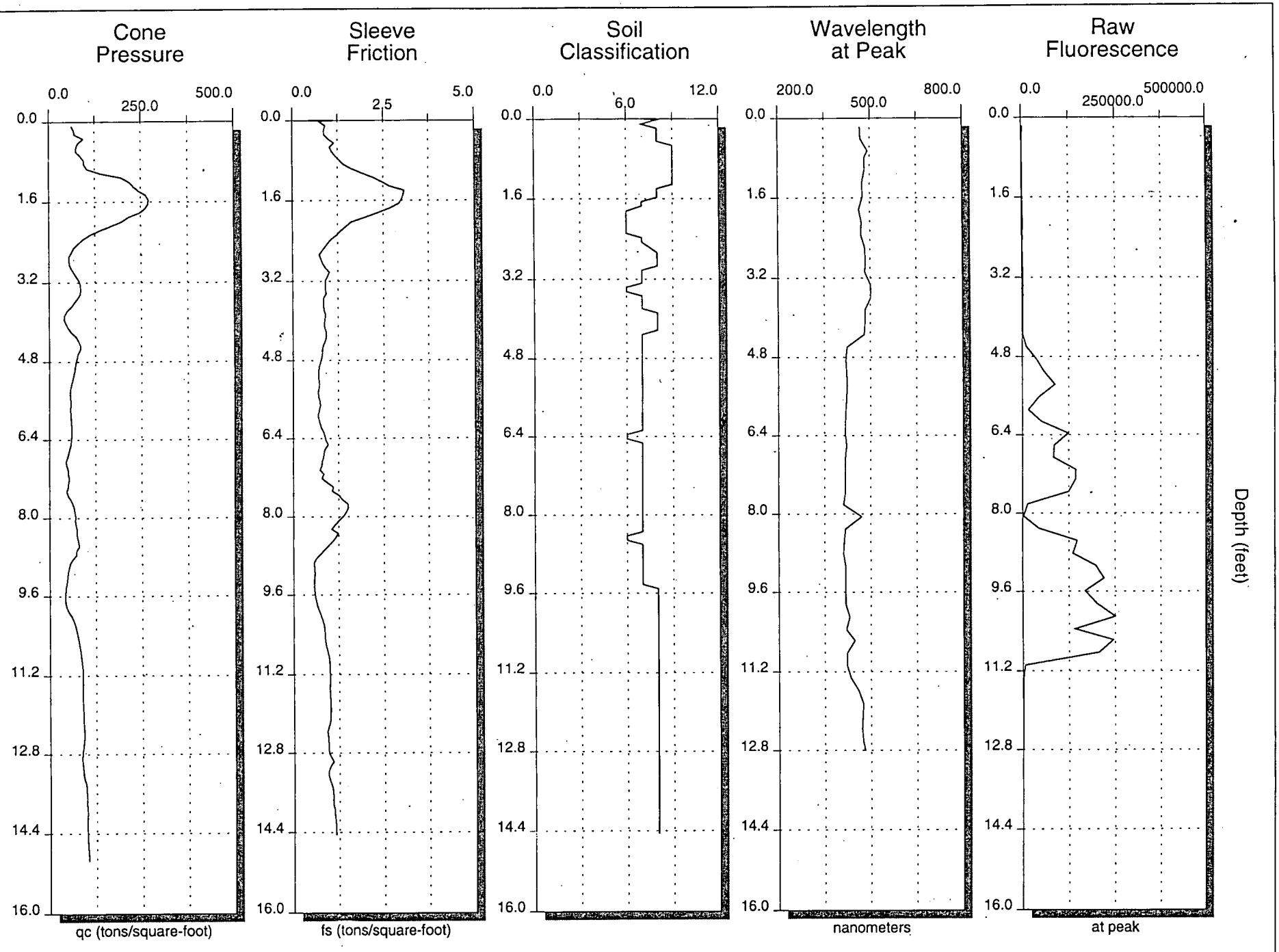
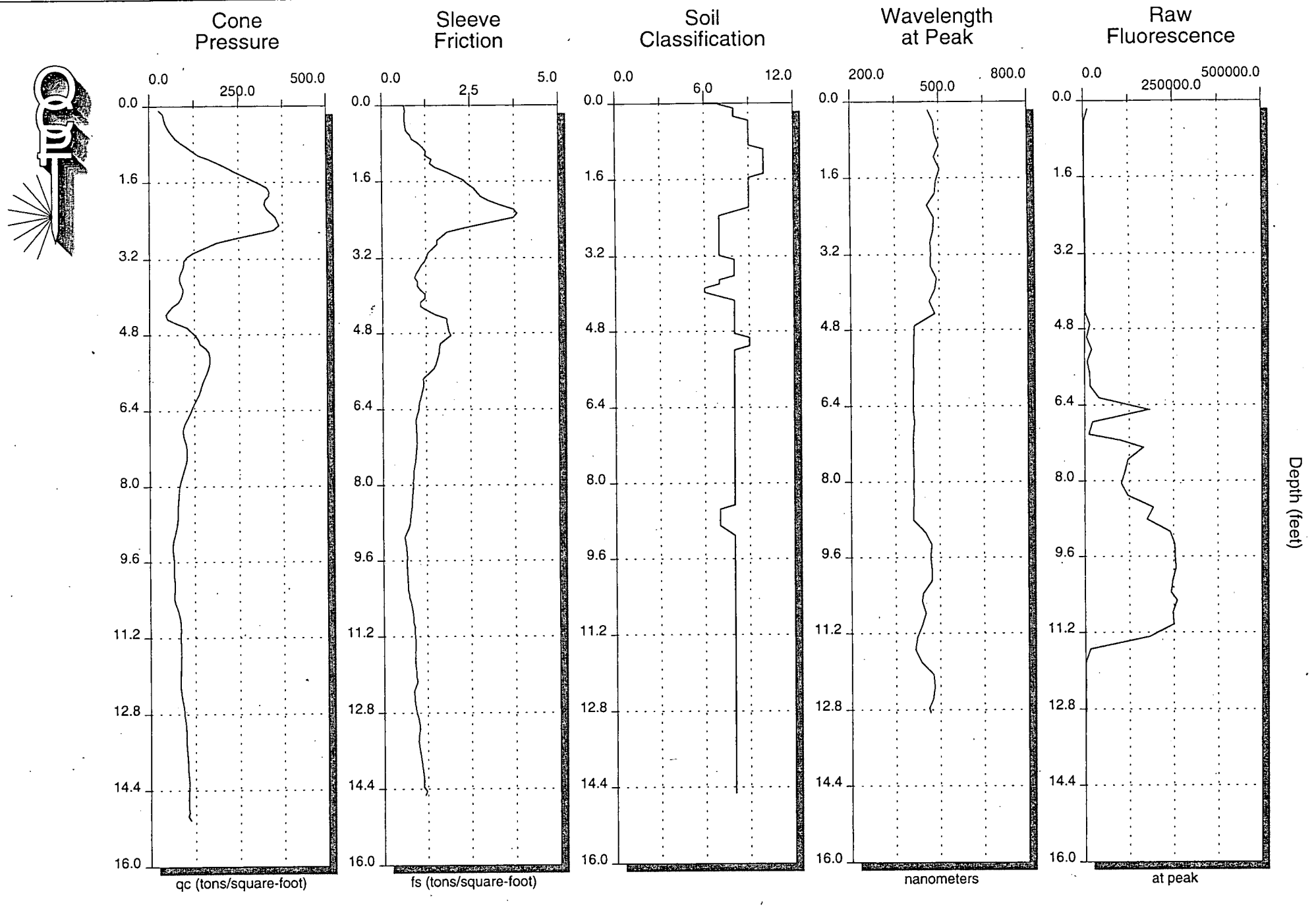
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



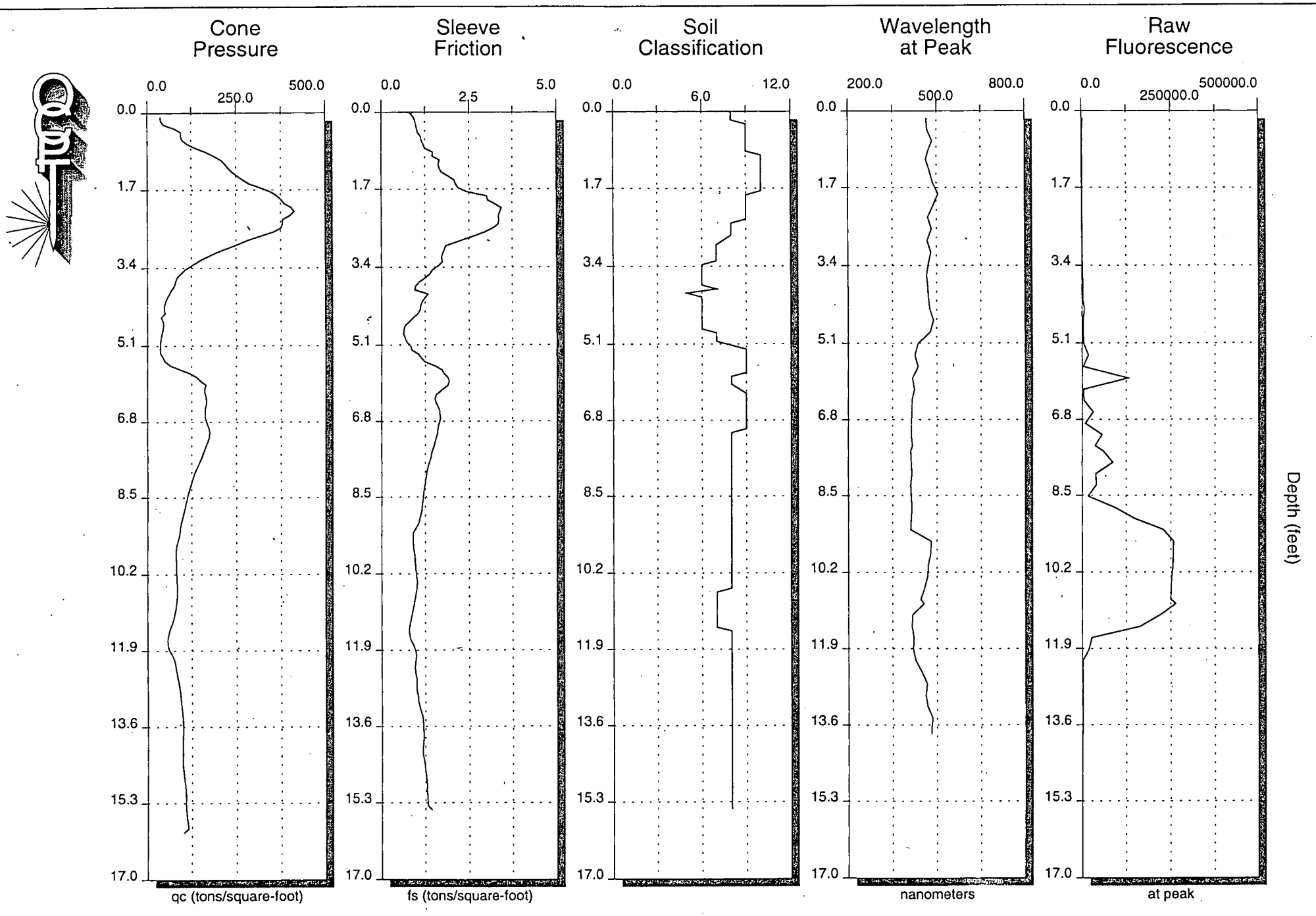
Time: 10:59:49
Date: 11-03-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1612.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



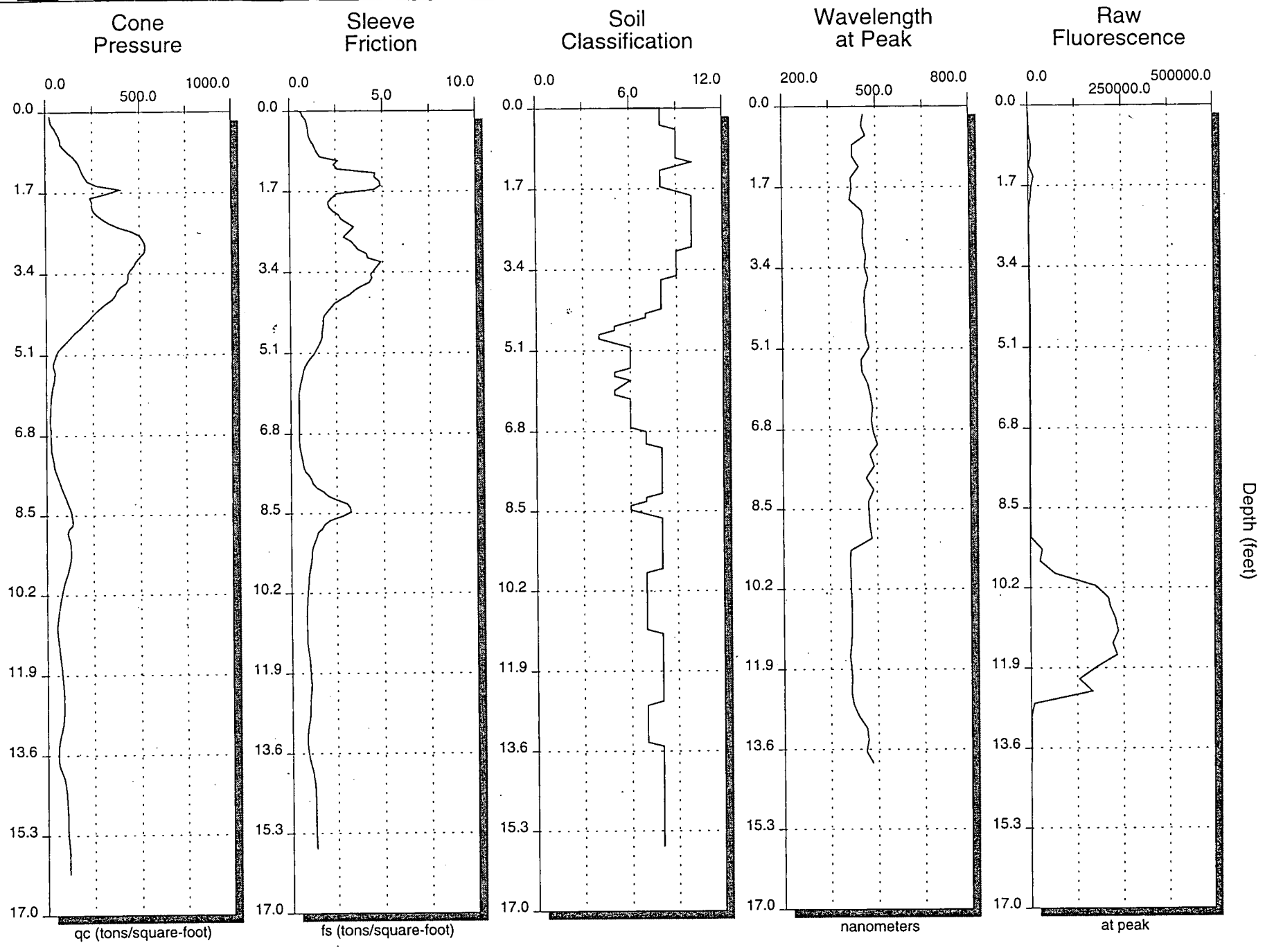
Time: 12:01:46
Date: 11-03-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1613.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



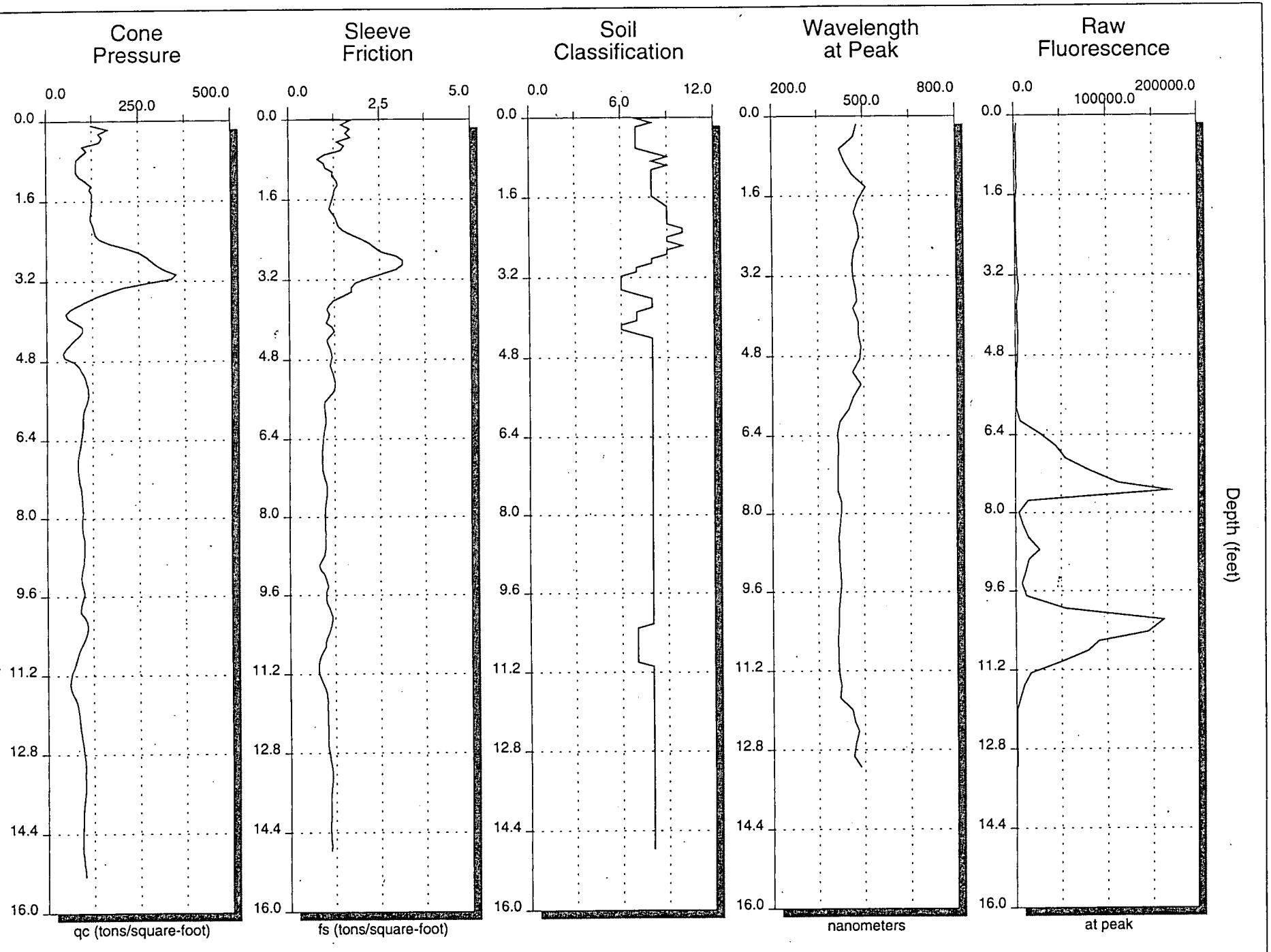
Time: 12:38:03
Date: 11-03-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1614.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



Time: 13:19:57
Date: 11-03-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1615.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



Time: 10:15:27
Date: 11-03-1995
Version: 1.0

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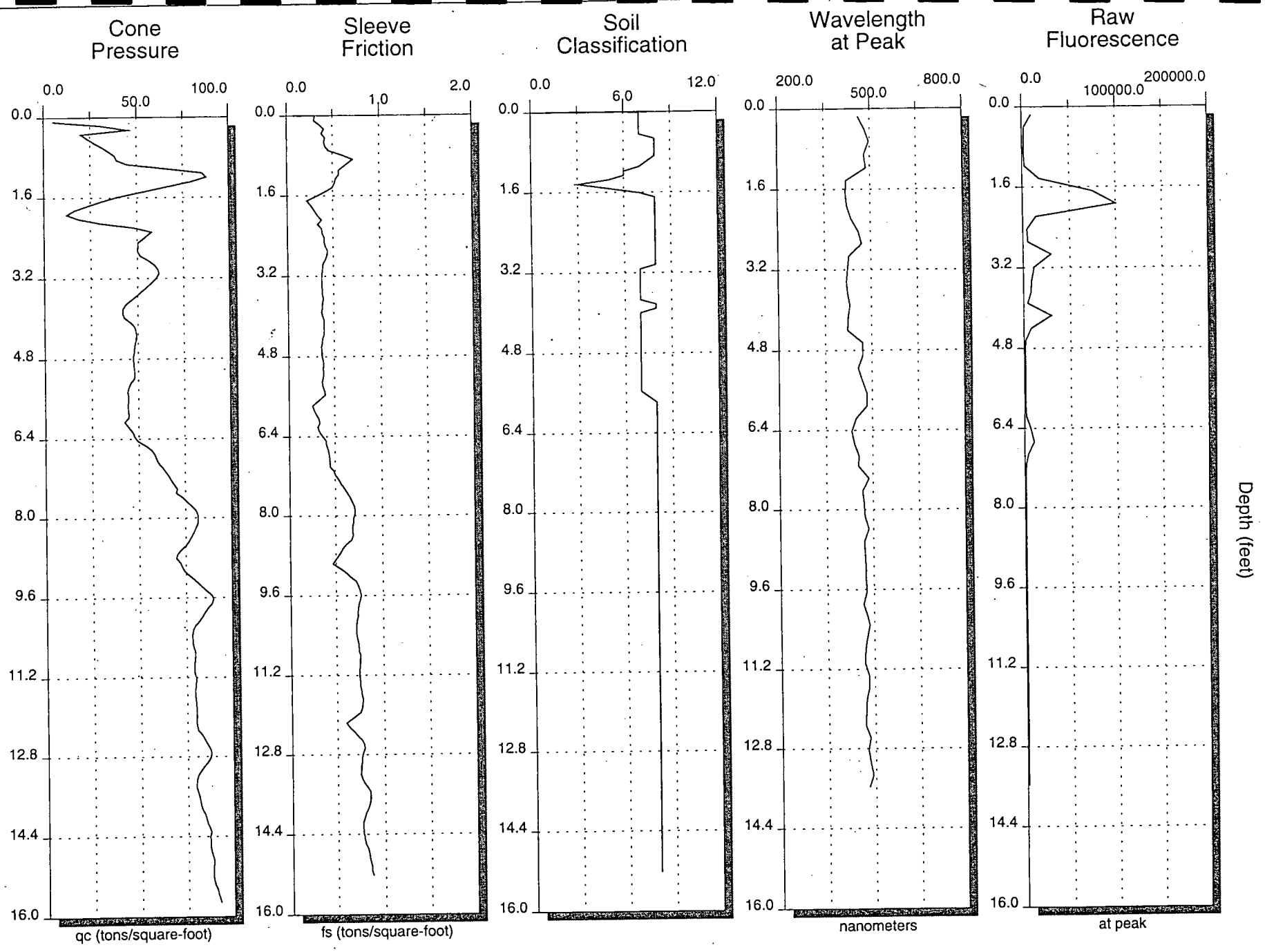
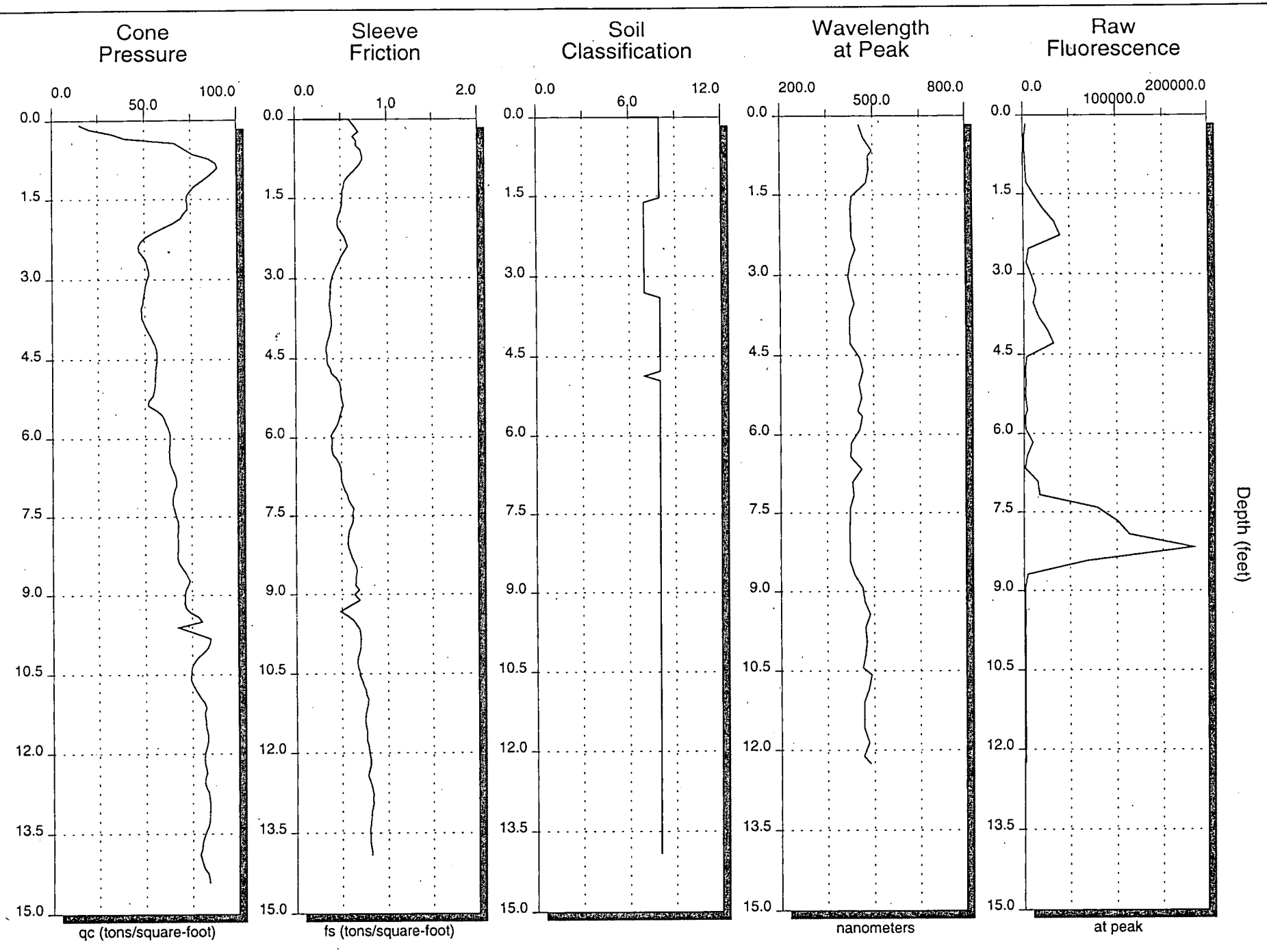
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



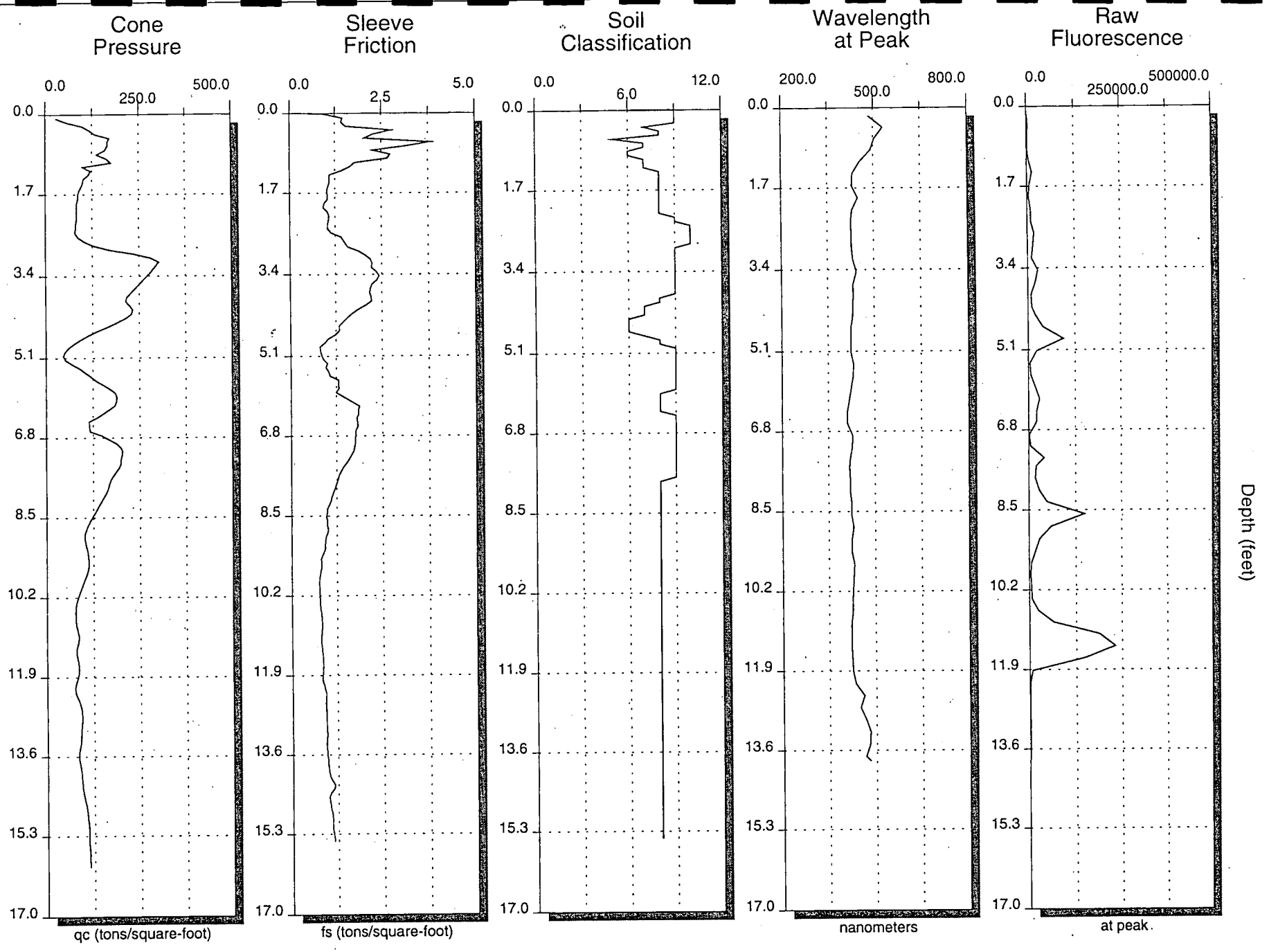
Time: 11:23:07
Date: 10-18-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1617.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



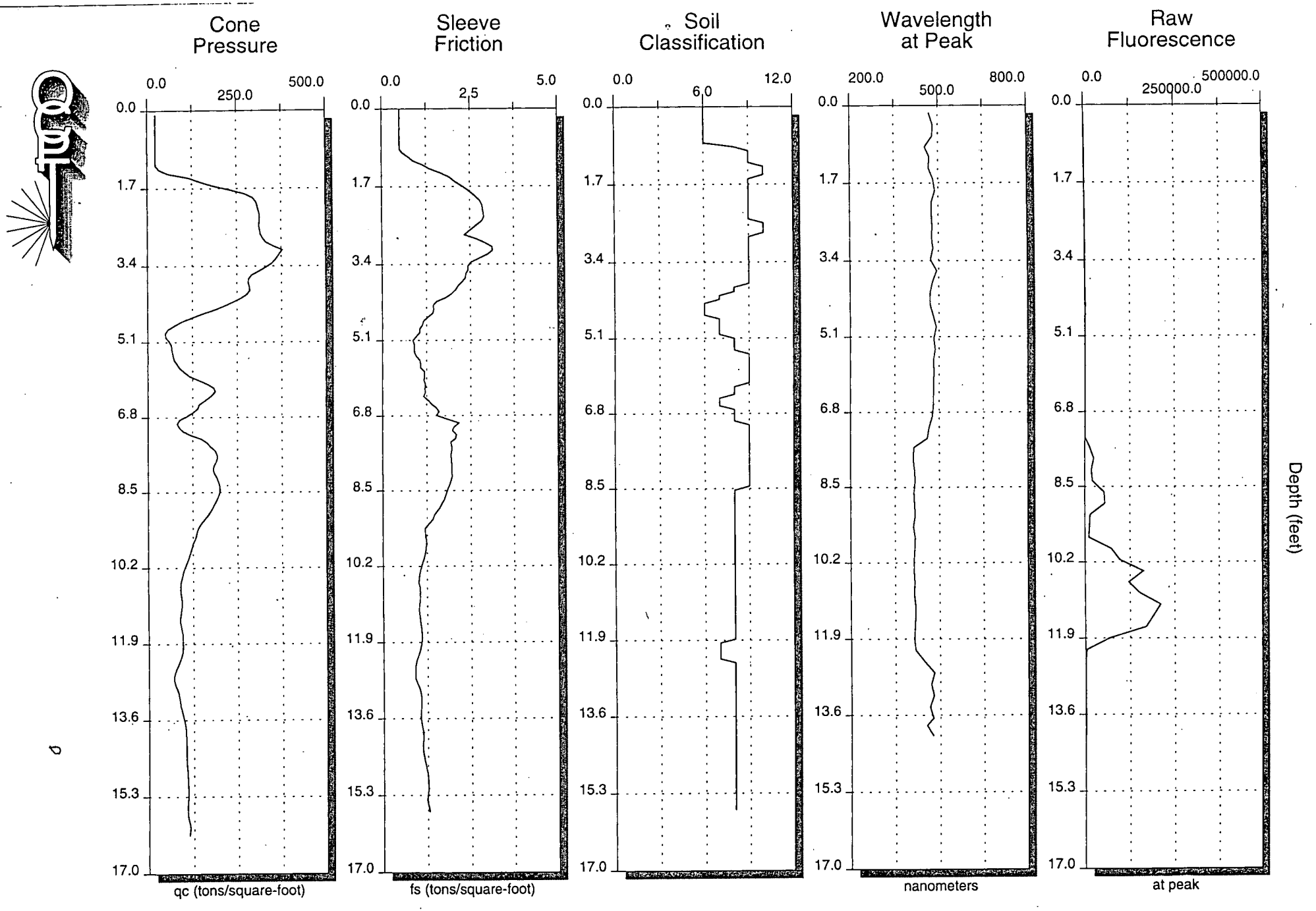
Time: 10:32:10
Date: 10-18-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1618.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



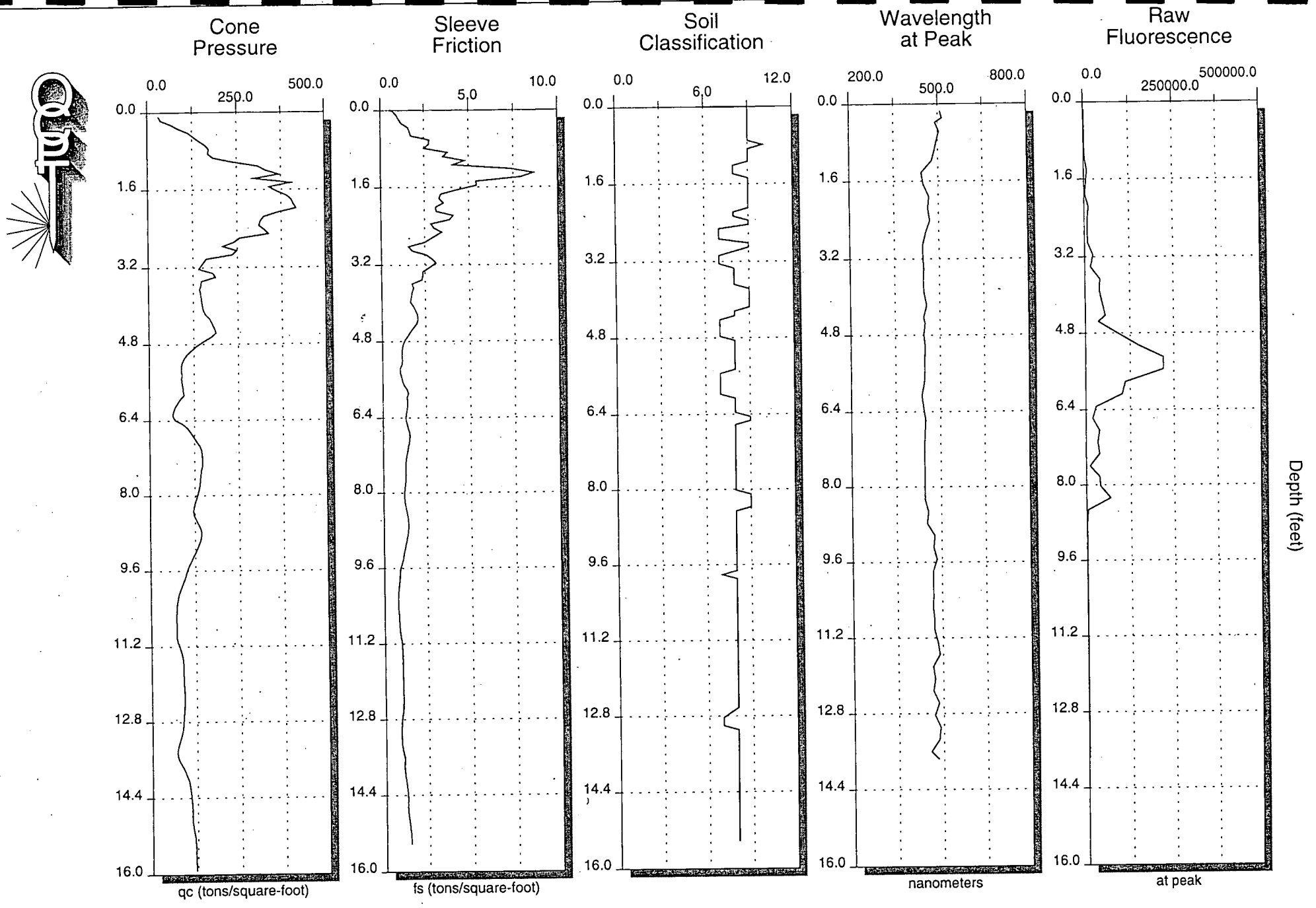
Time: 16:43:28
Date: 11-03-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1619.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



Time: 17:19:04
Date: 11-03-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1620.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



Time: 18:41:35
Date: 11-03-1995
Version: 1.0

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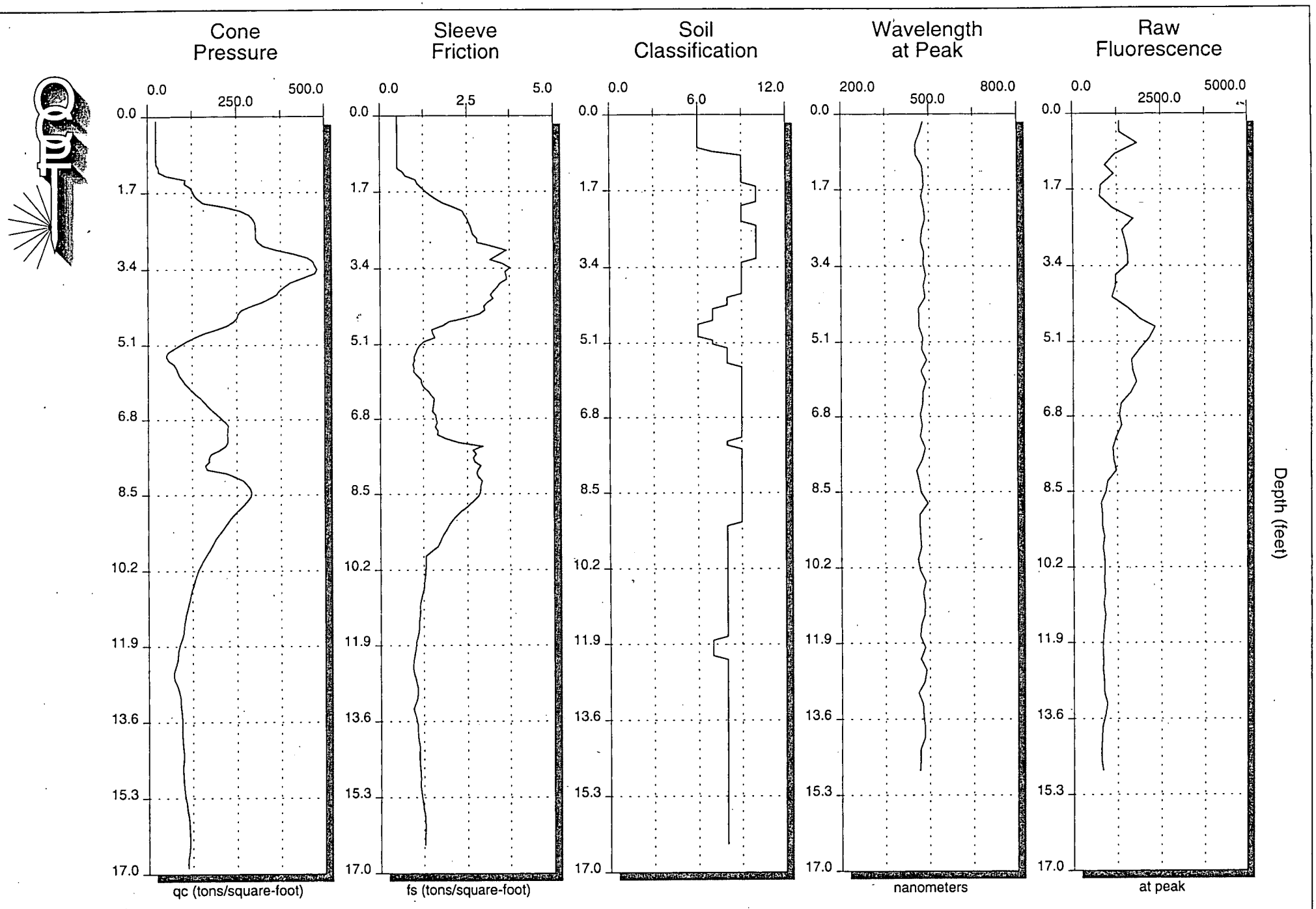
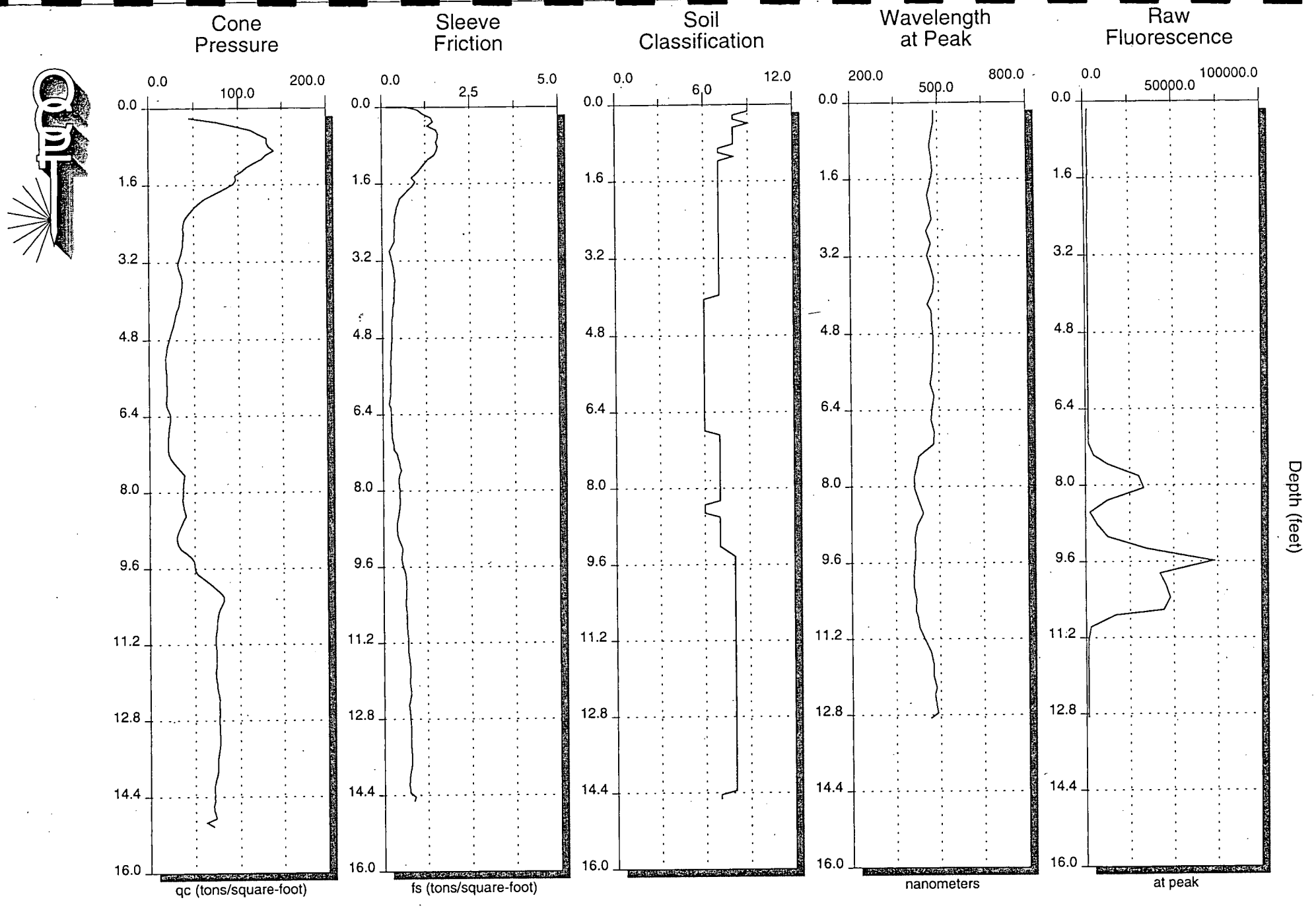
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



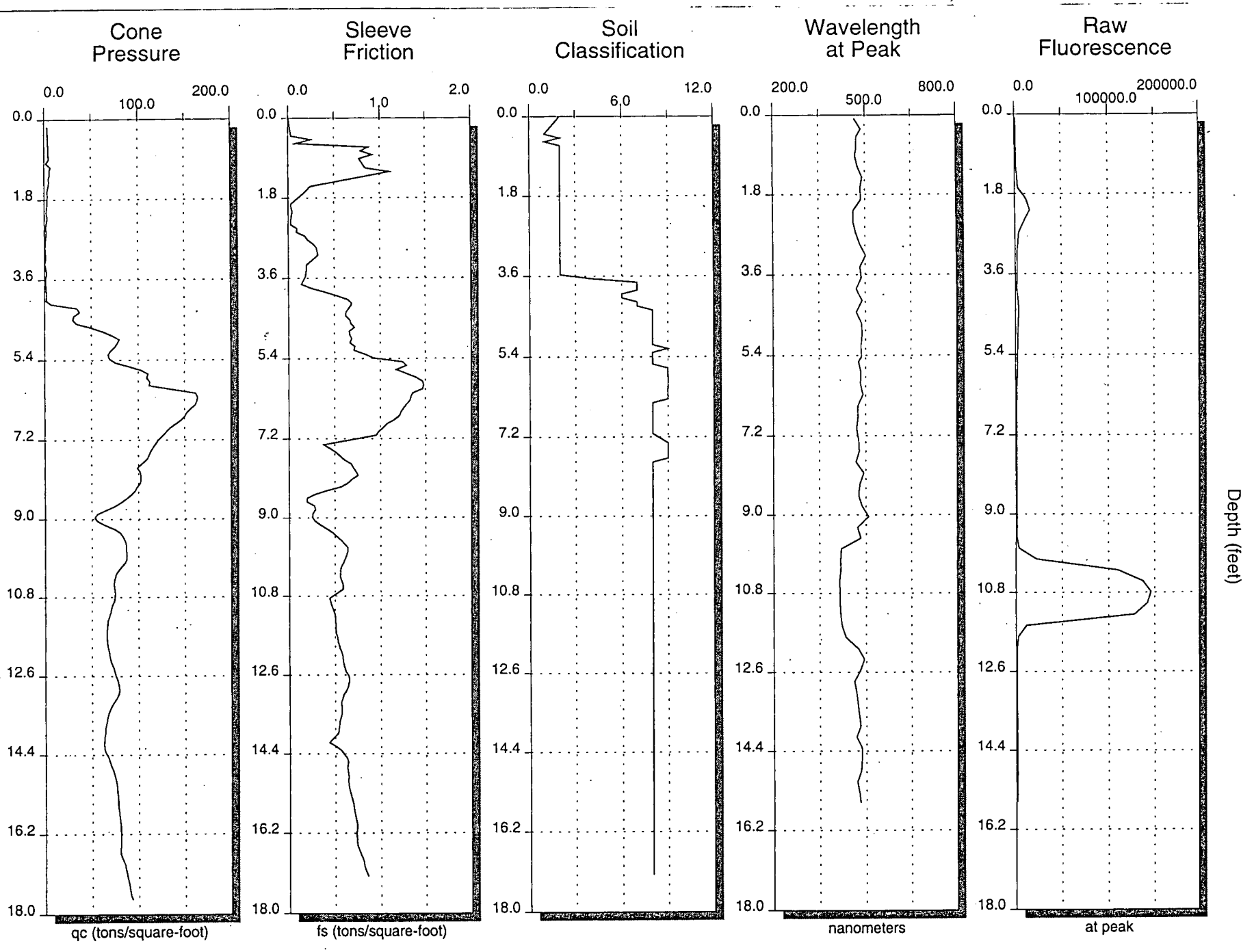
Time: 17:57:50
Date: 11-03-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1622.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



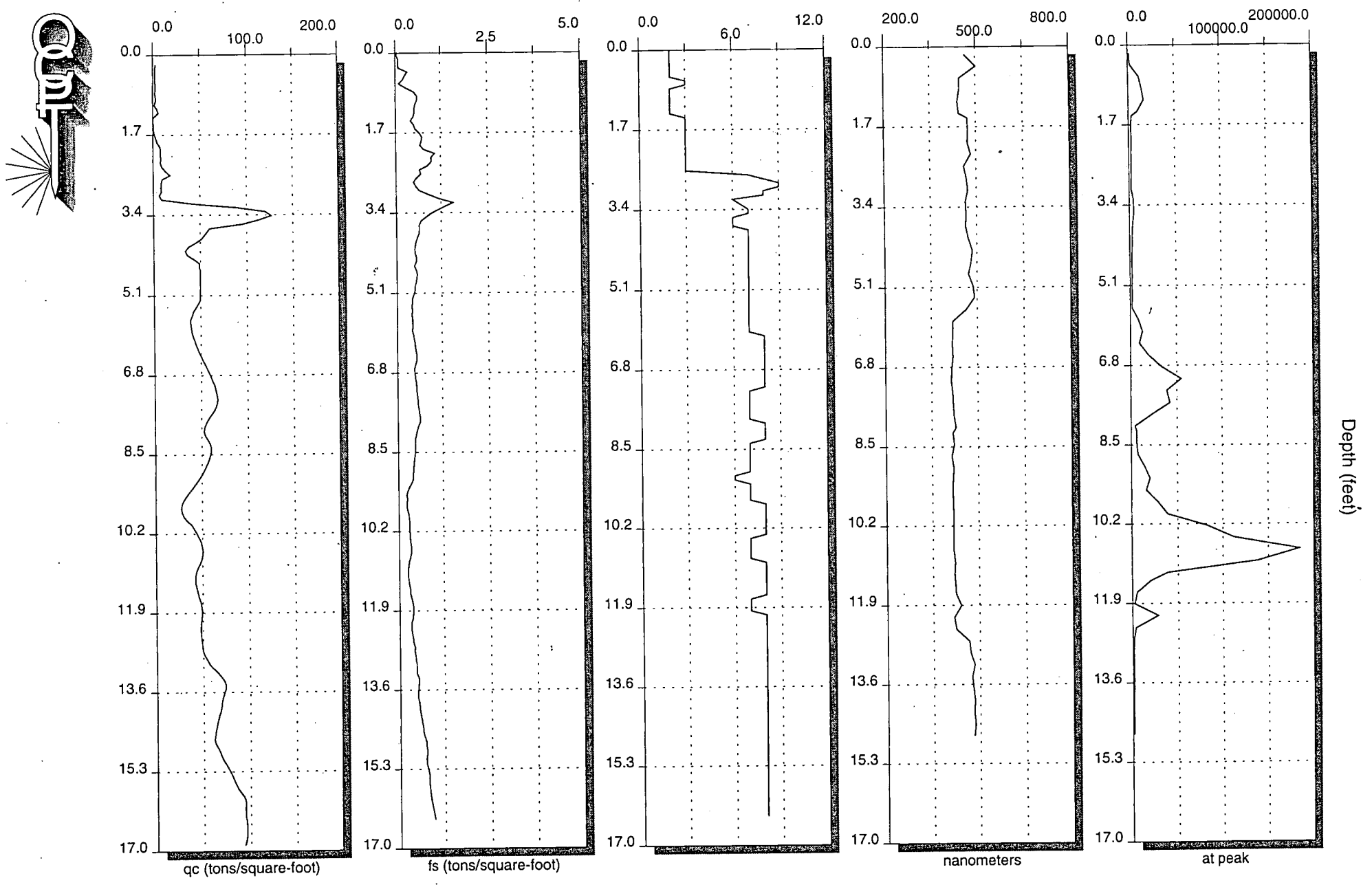
Time: 09:27:21
Date: 10-18-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1623.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



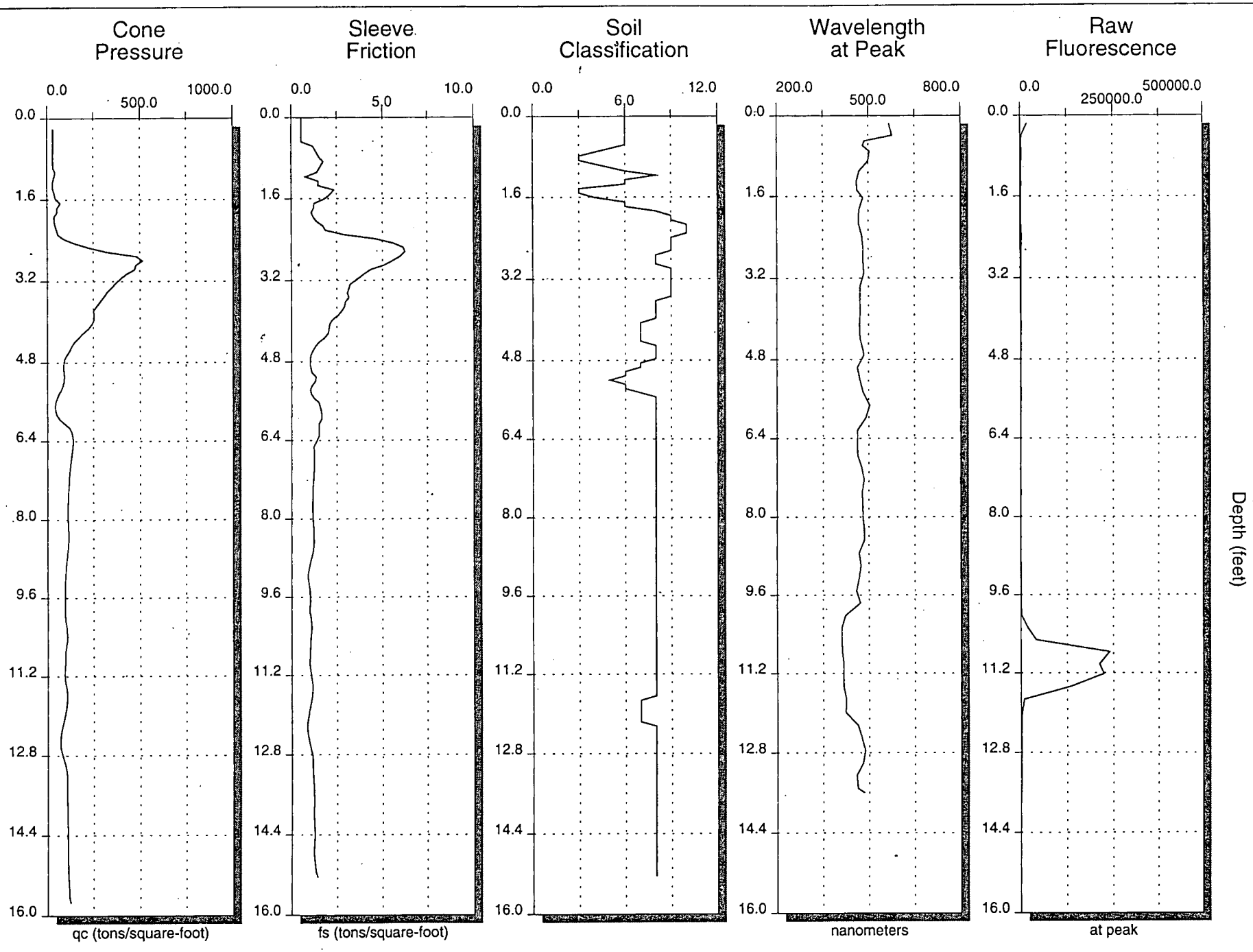
Time: 20:25:13
Date: 10-17-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1624.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



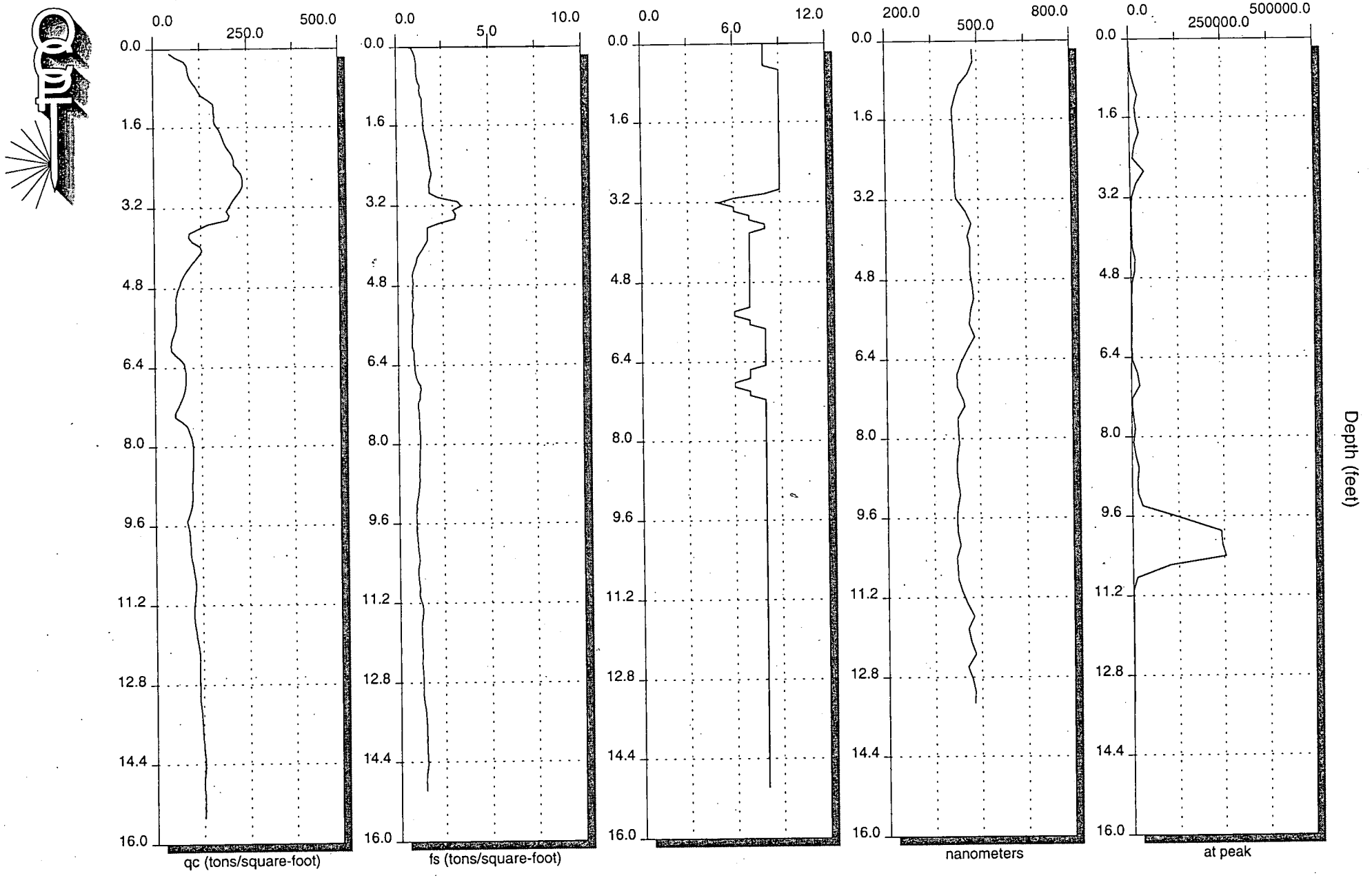
Time: 21:51:37
Date: 10-17-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1625.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



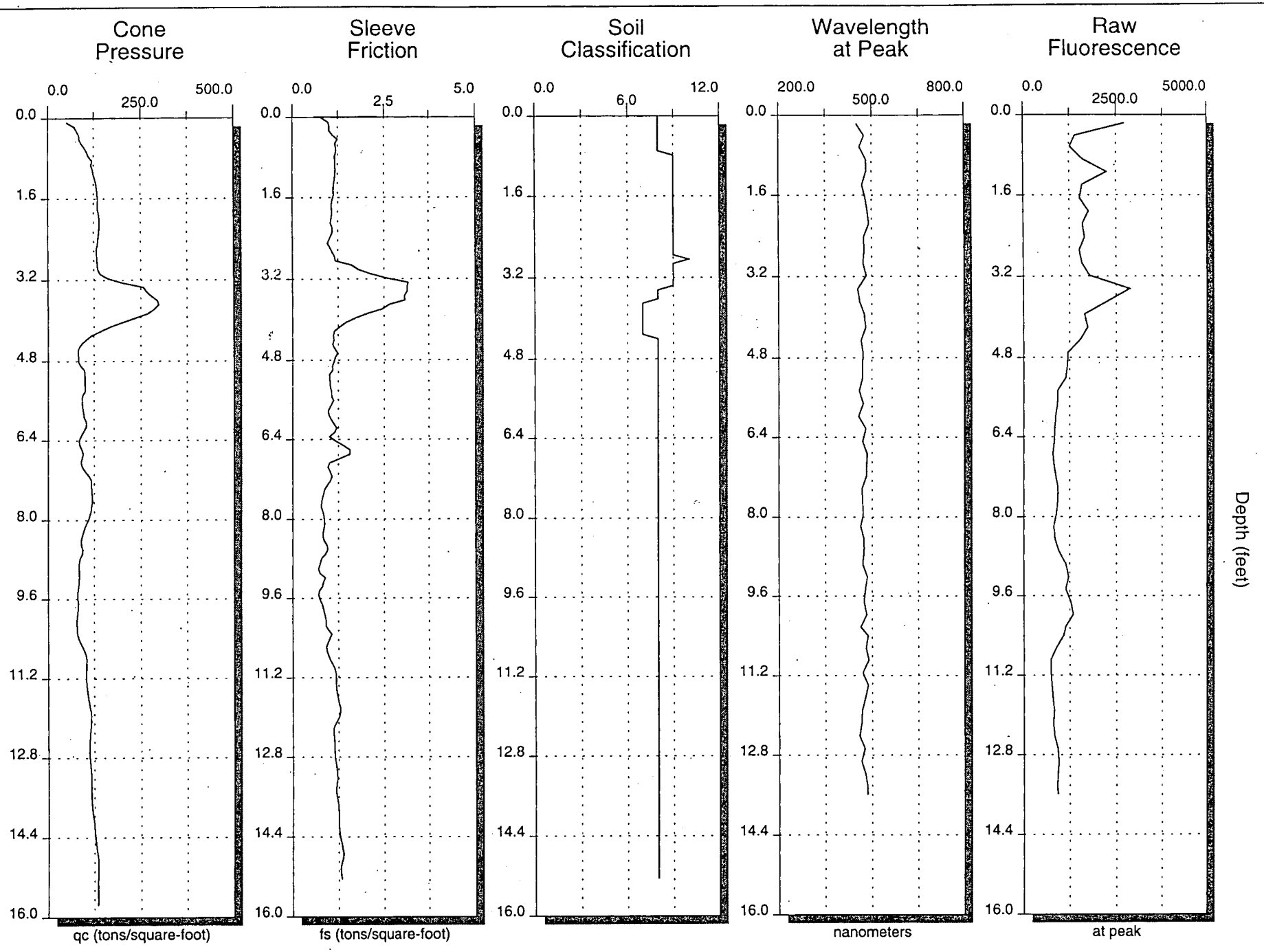
Time: 19:38:18
Date: 11-03-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1626.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



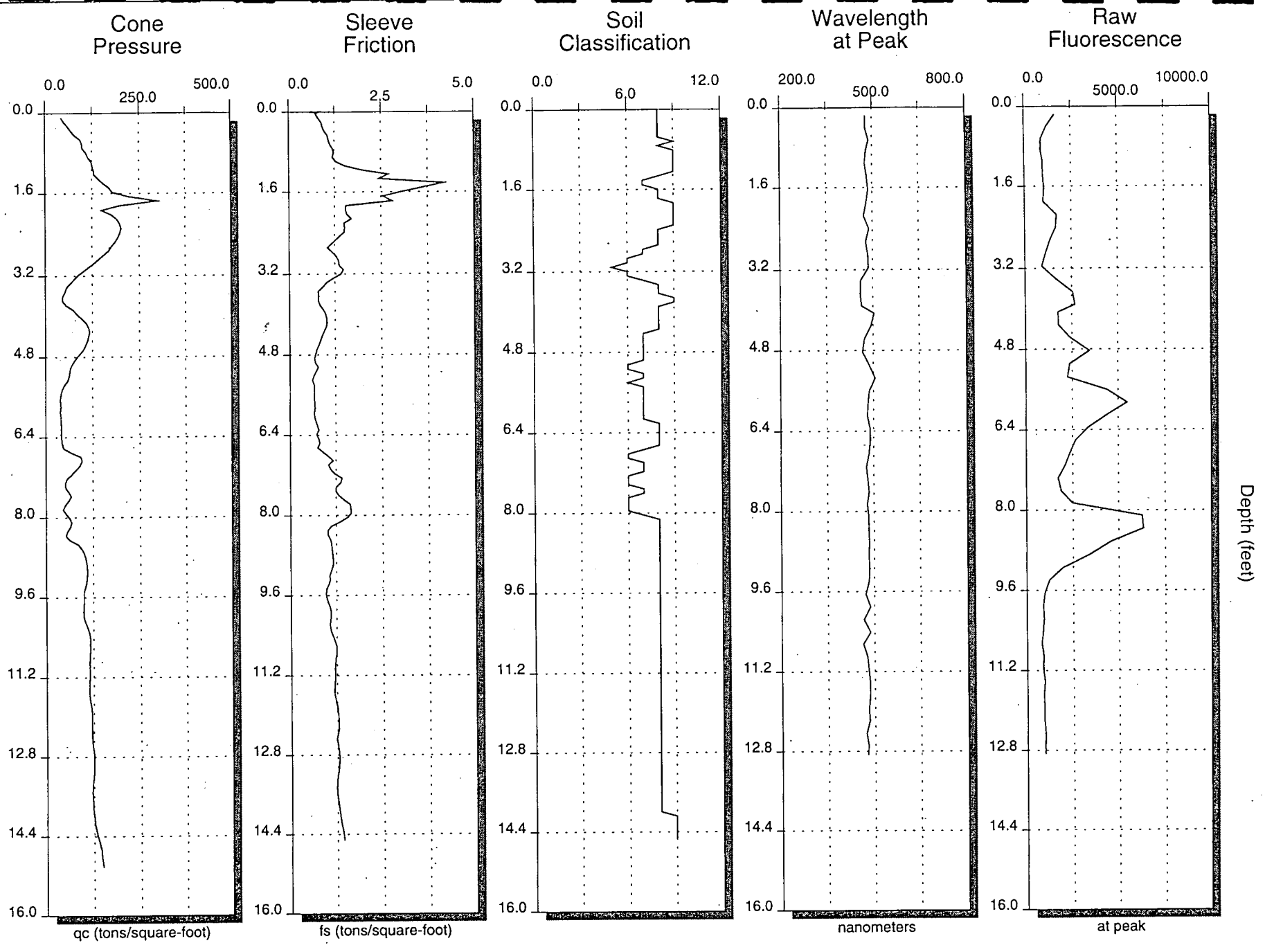
Time: 20:32:34
Date: 11-03-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1627.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL



Time: 21:16:46
Date: 11-03-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1628.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL

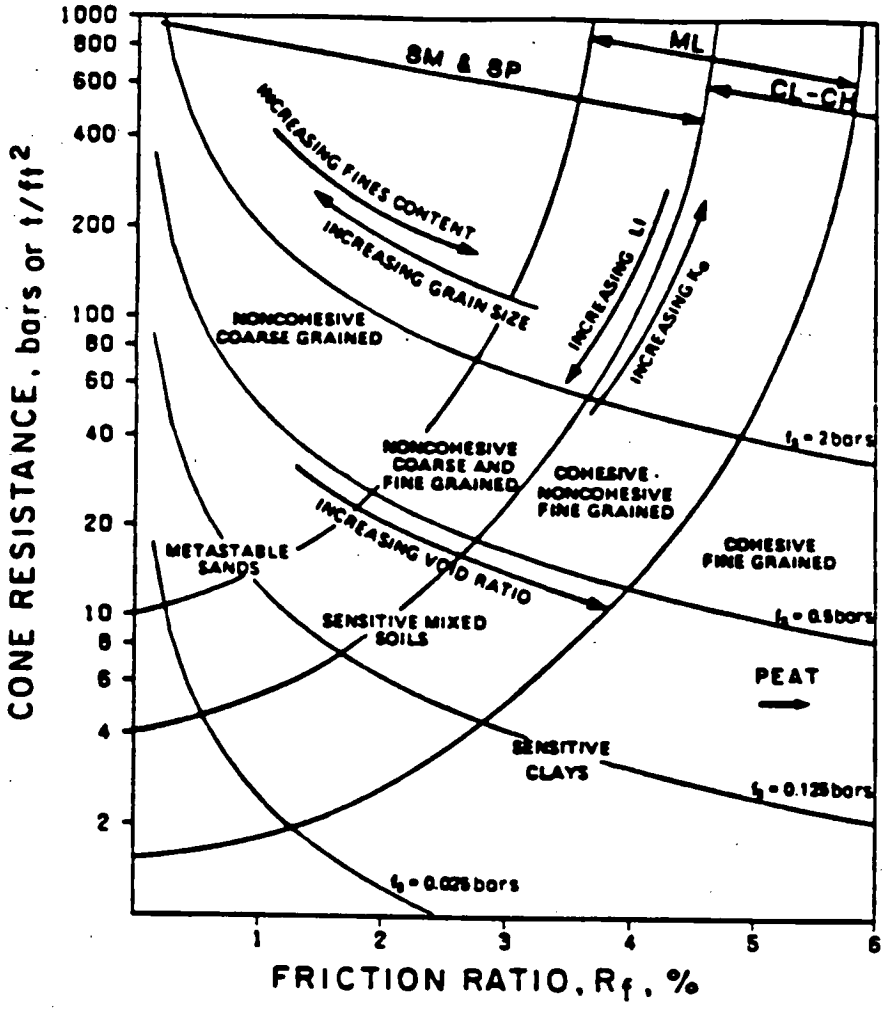


Time: 22:09:19
Date: 11-03-1995
Version: 1.0

Push: C:\BASIC71\DATA\EARL1629.PSH
Probe: C:\BASIC71\DATA\PROBE14E.PRB
Calibration: C:\BASIC71\DATA\OCT17DFM.CAL

APPENDIX E - SOIL CONVERSION CHART

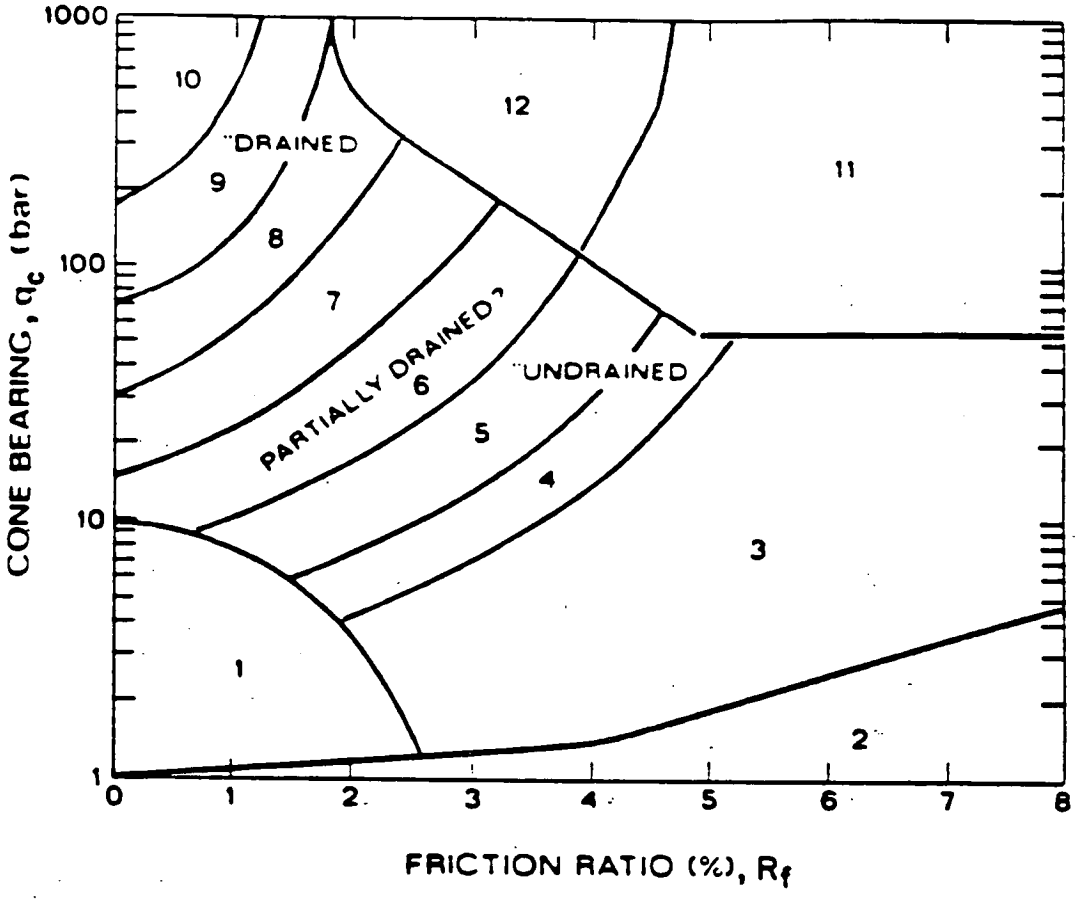
APPENDIX E - SOIL CONVERSION CHART



1 bar = 100 kPa ≈ 1 kg/cm²

Figure E.1 - Soil Classification Chart for Standard Electronic Friction Cone (Adapted from Douglas and Olsen, 1981)

APPENDIX E - SOIL CONVERSION CHART



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

(*) overconsolidated or cemented

Figure E.2 - Simplified Soil Classification Chart for Standard Electronic Friction Cone (Roberston et al, 1986)

APPENDIX F - RAW DATA

SCAPS LIF and Geotechnical Data

Push Id	**EARL1601.CSV**	**North Coordinate (feet):**	523240.66
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588179.75
Time Started	10:37 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.16	462	6417	sandy silt to silty clay	
0.42	472	1688	sandy silt to silty clay	
0.68	474	1282	silty sand to sandy silt	
0.93	470	1335	sand to silty sand	
1.17	483	1526	sand	
1.40	476	1698	sand	
1.64	481	4231	sand	
1.87	485	1941	sand	
2.10	481	2175	sand	
2.34	483	2487	silty sand to sandy silt	
2.55	481	2872	silty sand to sandy silt	
2.79	483	2283	silty sand to sandy silt	
3.05	481	1918	sand to silty sand	
3.30	466	1748	sand to silty sand	
3.53	487	1484	silty sand to sandy silt	
3.78	472	1932	sandy silt to silty clay	
4.04	485	1510	clay	
4.29	491	1689	sandy silt to silty clay	
4.53	500	2418	silty sand to sandy silt	
4.78	502	2426	silty sand to sandy silt	
5.03	487	2511	sand to silty sand	
5.54	470	1437	sand to silty sand	
5.79	500	1504	sand	
6.05	466	1284	sand	
6.29	481	1157	sand	
6.54	483	1048	sand	
7.04	468	1044	sand	
7.25	489	1165	sand to silty sand	
7.50	485	1208	sand to silty sand	
7.75	483	1165	sand to silty sand	
7.93	476	1052	sand to silty sand	
8.18	483	1068	sand to silty sand	
8.44	481	1014	sand to silty sand	
8.69	476	995	sand to silty sand	
8.95	479	948	sand to silty sand	
9.21	487	899	sand to silty sand	
9.46	476	940	sand to silty sand	
9.72	485	992	silty sand to sandy silt	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1601.CSV**	**North Coordinate (feet):**	523240.66
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588179.75
Time Started	10:37 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
9.97	485	1005	silty sand to sandy silt	
10.47	489	1038	sand to silty sand	
10.73	479	1104	sand to silty sand	
10.97	483	1046	sand to silty sand	
11.11	481	1068	sand to silty sand	
11.37	474	1110	sand to silty sand	
11.62	491	1145	sand to silty sand	
11.87	474	1096	sand to silty sand	
12.14	474	1119	sand to silty sand	
12.39	483	1152	sand to silty sand	
12.63	483	1086	sand to silty sand	
12.90	483	1125	sand to silty sand	
13.14	489	1059	sand to silty sand	
13.64	479	1020	sand to silty sand	
13.90	487	879	sand to silty sand	
14.16	483	945	sand to silty sand	
14.39	493	932	sand to silty sand	
14.64	483	983	sand to silty sand	
14.90	476	956	sand to silty sand	
15.15	483	1041	sand to silty sand	
15.40	476	981	sand to silty sand	
15.65	483	997	sand to silty sand	
15.91	479	978	sand to silty sand	
16.16	485	955	sand to silty sand	
16.41	472	954	sand to silty sand	
16.91	481	1005	sand to silty sand	
17.15	479	946	sand to silty sand	
17.40	481	930	sand to silty sand	
17.58	470	957	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1602.CSV**	**North Coordinate (feet):**	523283.56
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588169.94
Time Started	11:40 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.16	491	1661	sandy silt to silty clay	
0.38	487	2242	sand to silty sand	
0.59	483	9003	sand to silty sand	
0.83	474	2513	silty sand to sandy silt	
1.07	500	1789	silty sand to sandy silt	
1.30	483	3338	silty sand to sandy silt	
1.55	485	3729	sandy silt to silty clay	
1.79	481	5025	sand to silty sand	
2.04	487	6154	sand to silty sand	
2.53	476	2791	sand to silty sand	
3.03	468	1937	clayey silt to silty clay	
3.28	485	2351	silty clay to clay	
3.53	502	4271	sandy silt to silty clay	
3.72	504	4960	silty sand to sandy silt	
3.97	504	5427	silty sand to sandy silt	
4.22	504	4236	silty sand to sandy silt	
4.47	485	3167	sand to silty sand	
4.72	498	2429	sand to silty sand	
4.98	502	2391	silty sand to sandy silt	
5.22	483	1763	sand to silty sand	
5.66	472	1297	sand to silty sand	
5.87	474	1217	sand to silty sand	
6.07	487	1113	sand	
6.31	483	1070	sand	
6.55	481	1014	sand	
6.80	483	998	sand to silty sand	
6.98	493	1061	sand to silty sand	
7.23	487	1147	sand to silty sand	
7.48	470	1109	sand to silty sand	
7.73	479	1063	sand to silty sand	
7.98	470	1181	sand to silty sand	
8.22	485	1179	silty sand to sandy silt	
8.46	470	1159	silty sand to sandy silt	
8.71	491	1194	silty sand to sandy silt	
8.97	483	1138	sand to silty sand	
9.47	483	1110	sand to silty sand	
9.72	485	1106	sand to silty sand	
9.98	468	1161	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1602.CSV**	**North Coordinate (feet):**	523283.56
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588169.94
Time Started	11:40 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.23	483	1241	sand to silty sand	
10.42	470	1285	sand to silty sand	
10.67	470	1348	sand to silty sand	
10.92	472	1360	sand to silty sand	
11.17	481	1384	sand to silty sand	
11.42	485	1216	sand to silty sand	
11.66	479	1147	sand to silty sand	
11.92	481	1153	sand to silty sand	
12.17	474	1162	sand to silty sand	
12.43	483	1119	silty sand to sandy silt	
12.69	483	1129	sand to silty sand	
12.95	474	1102	sand to silty sand	
13.21	487	1085	sand to silty sand	
13.45	479	1141	sand to silty sand	
13.58	487	1095	sand to silty sand	
13.84	489	1131	sand to silty sand	
14.09	489	1174	sand to silty sand	
14.32	483	1160	sand to silty sand	
14.57	481	1144	sand to silty sand	
14.81	470	1096	sand to silty sand	
15.06	476	1015	sand to silty sand	
15.30	491	1094	sand to silty sand	
15.55	487	1032	sand to silty sand	
16.04	470	1002	sand to silty sand	
16.29	479	996	sand to silty sand	
16.54	476	1057	sand to silty sand	
16.78	483	1075	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1603.CSV**	**North Coordinate (feet):**	523248.02
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588192.63
Time Started	11:40 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.17	464	15277	organic material	
0.42	474	2462	silty sand to sandy silt	
0.67	489	1790	sandy silt to silty clay	
0.92	483	1405	silty sand to sandy silt	
1.09	489	1580	sand to silty sand	
1.34	493	1696	sand to silty sand	
1.59	500	1944	sand to silty sand	
1.85	487	1915	sand to silty sand	
2.04	483	1585	sand	
2.41	472	1525	sand	
2.66	487	1664	sand	
2.90	468	1992	sand	
3.15	483	2415	silty sand to sandy silt	
3.65	483	2068	sandy silt to silty clay	
3.90	460	2422	silty clay to clay	
4.16	481	2478	sandy silt to silty clay	
4.36	487	2322	sandy silt to silty clay	
4.61	470	2132	silty sand to sandy silt	
4.88	474	2157	silty sand to sandy silt	
5.12	483	2188	silty sand to sandy silt	
5.38	472	2031	silty sand to sandy silt	
5.63	460	2145	sandy silt to silty clay	
5.88	472	2113	sandy silt to silty clay	
6.14	470	2035	sandy silt to silty clay	
6.39	485	2334	clayey silt to silty clay	
6.90	483	2851	clayey silt to silty clay	
7.14	472	3177	sandy silt to silty clay	
7.40	419	20220	silty sand to sandy silt	
7.65	415	157739	silty sand to sandy silt	
7.91	415	34266	silty sand to sandy silt	
8.16	415	70437	silty sand to sandy silt	
8.42	413	71417	sand to silty sand	
8.68	417	85963	sand to silty sand	
8.93	417	173086	silty sand to sandy silt	
9.19	417	93427	silty sand to sandy silt	
9.44	417	77151	silty sand to sandy silt	
9.95	422	149881	silty sand to sandy silt	
10.19	417	126481	silty sand to sandy silt	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1603.CSV**	**North Coordinate (feet):**	523248.02
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588192.63
Time Started	11:40 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.44	417	21453	silty sand to sandy silt	
10.69	422	4008	silty sand to sandy silt	
10.82	438	1776	sand to silty sand	
11.07	417	37915	sand to silty sand	
11.32	419	27890	sand to silty sand	
11.57	419	5594	sand to silty sand	
11.82	430	1862	sand to silty sand	
12.08	476	1248	sand to silty sand	
12.34	485	1240	sand to silty sand	
12.59	481	1207	sand to silty sand	
12.84	470	1298	sand to silty sand	
13.35	485	1227	sand to silty sand	
13.60	472	1127	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1604.CSV**	**North Coordinate (feet):**	523272.52
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588124.57
Time Started	10:44 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.16	466	15327	sandy silt to silty clay	
0.42	479	1664	sandy silt to silty clay	
0.67	476	1388	sand	
0.91	479	1255	sand to silty sand	
1.07	479	1281	silty sand to sandy silt	
1.27	481	1457	sand to silty sand	
1.49	470	1769	sand to silty sand	
1.73	470	1877	sand to silty sand	
1.98	483	2059	sand to silty sand	
2.22	476	1890	sand to silty sand	
2.48	476	2717	sand to silty sand	
2.73	464	2531	silty sand to sandy silt	
2.98	489	2221	clayey silt to silty clay	
3.23	474	2302	clayey silt to silty clay	
3.48	485	2474	sandy silt to silty clay	
3.73	502	2026	silty sand to sandy silt	
3.99	487	2243	sand to silty sand	
4.23	485	2012	silty sand to sandy silt	
4.45	506	1909	sandy silt to silty clay	
4.69	481	1760	clay	
4.93	481	1820	sandy silt to silty clay	
5.18	479	1686	sand to silty sand	
5.43	487	1359	sand to silty sand	
5.68	491	1333	sand	
5.92	481	1349	sand	
6.17	476	1194	sand	
6.42	491	1168	sand	
6.68	498	1080	sand	
6.93	483	1013	sand	
7.18	479	967	sand	
7.42	487	921	sand to silty sand	
7.54	466	930	sand to silty sand	
7.79	472	924	sand to silty sand	
8.04	483	936	sand to silty sand	
8.29	468	949	sand to silty sand	
8.54	476	949	sand to silty sand	
8.80	481	906	sand to silty sand	
9.04	481	945	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and G otechnical Data

Push Id	**EARL1604.CSV**	**North Coordinate (feet):**	523272.52
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588124.57
Time Started	10:44 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
9.30	495	989	sand to silty sand	
9.55	470	882	sand to silty sand	
10.05	500	1002	sand to silty sand	
10.31	489	1013	sand to silty sand	
10.56	498	1023	sand to silty sand	
10.80	470	924	sand to silty sand	
11.04	485	1019	sand to silty sand	
11.29	485	1054	sand to silty sand	
11.54	491	1036	sand to silty sand	
11.79	476	1058	sand to silty sand	
12.04	479	1044	sand to silty sand	
12.26	466	1013	sand to silty sand	
12.50	470	963	sand to silty sand	
12.99	466	1006	sand to silty sand	
13.24	476	931	sand to silty sand	
13.49	483	1013	sand to silty sand	
13.74	472	986	sand to silty sand	
13.98	485	990	sand to silty sand	
14.08	498	1025	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1605.CSV**	**North Coordinate (feet):**	523240.05
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588131.93
Time Started	5:04 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.16	453	1849	sandy silt to silty clay	
0.42	436	2020	sand to silty sand	
0.68	483	1624	sand to silty sand	
0.92	489	1520	sand to silty sand	
1.13	470	1370	sand to silty sand	
1.39	474	1457	sand to silty sand	
1.65	479	1501	sand	
1.90	479	1832	sand	
2.16	481	1719	silty sand to sandy silt	
2.41	483	2158	silty sand to sandy silt	
2.66	481	1947	silty sand to sandy silt	
2.91	466	2218	silty sand to sandy silt	
3.16	460	2502	silty sand to sandy silt	
3.42	523	2852	sand to silty sand	
3.68	502	3816	sand	
3.93	508	4005	sand to silty sand	
4.18	485	2386	silty sand to sandy silt	
4.41	487	1853	silty sand to sandy silt	
4.65	489	1944	silty sand to sandy silt	
4.90	470	1829	silty sand to sandy silt	
5.14	487	1473	sand to silty sand	
5.40	483	1553	sand	
5.65	500	1329	sand	
5.89	481	1268	sand to silty sand	
6.14	485	1122	sand to silty sand	
6.40	476	1186	silty sand to sandy silt	
6.90	491	1195	silty sand to sandy silt	
7.15	476	1127	silty sand to sandy silt	
7.40	479	1169	sandy silt to silty clay	
7.64	468	1133	sandy silt to silty clay	
7.90	483	1169	clayey silt to silty clay	
8.15	491	1054	silty clay to clay	
8.39	500	1179	silty clay to clay	
8.64	487	1250	clay	
8.89	474	1252	clay	
9.14	487	1289	clay	
9.39	483	1260	clay	
9.64	485	1248	sandy silt to silty clay	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and G ot chnical Data

Push Id	**EARL1605.CSV**	**North Coordinate (feet):**	523240.05
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588131.93
Time Started	5:04 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.15	476	1232	sand to silty sand	
10.40	485	1192	sand to silty sand	
10.65	483	1140	sand to silty sand	
10.85	476	1195	sand to silty sand	
11.10	485	1177	sand to silty sand	
11.34	493	1210	sand to silty sand	
11.60	470	1192	sand to silty sand	
11.85	474	1197	sand to silty sand	
12.11	466	1144	sand to silty sand	
12.35	466	1141	sand to silty sand	
12.61	481	1091	sand to silty sand	
12.86	485	1097	sand to silty sand	
13.38	468	1063	sand to silty sand	
13.63	476	1088	sand to silty sand	
13.88	474	1039	sand to silty sand	
14.13	466	1050	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1606.CSV**	**North Coordinate (feet):**	523183.67
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588150.93
Time Started	4:11 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.16	483	1861	silty sand to sandy silt	
0.41	487	1684	silty sand to sandy silt	
0.65	483	1416	sand to silty sand	
0.86	474	1489	sand to silty sand	
1.11	407	2385	sand to silty sand	
1.35	483	1860	silty sand to sandy silt	
1.60	485	1627	sandy silt to silty clay	
1.85	493	1727	silty sand to sandy silt	
2.36	500	1707	sand to silty sand	
2.61	502	2352	sand to silty sand	
2.86	510	2543	sand to silty sand	
3.62	483	1938	silty sand to sandy silt	
3.88	493	1491	silty sand to sandy silt	
4.12	485	1355	sand to silty sand	
4.34	481	1223	sand to silty sand	
4.59	466	1143	sand to silty sand	
4.84	468	1179	sand to silty sand	
5.35	472	1197	sand to silty sand	
5.59	498	1246	silty sand to sandy silt	
5.84	487	1240	silty sand to sandy silt	
6.09	485	1254	silty sand to sandy silt	
6.60	493	1118	sand to silty sand	
6.85	474	1154	silty sand to sandy silt	
7.09	500	1316	silty sand to sandy silt	
7.33	493	1394	silty sand to sandy silt	
7.55	483	1361	sand to silty sand	
7.77	502	1243	sand to silty sand	
8.01	498	1196	silty sand to sandy silt	
8.22	487	1153	silty sand to sandy silt	
8.45	476	1167	silty sand to sandy silt	
8.67	493	1134	silty sand to sandy silt	
8.92	489	1197	silty sand to sandy silt	
9.18	481	1245	silty sand to sandy silt	
9.43	476	1120	silty sand to sandy silt	
9.93	485	996	sand to silty sand	
10.19	483	1001	sand to silty sand	
10.41	481	950	sand to silty sand	
10.65	479	981	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1606.CSV**	**North Coordinate (feet):**	523183.67
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588150.93
Time Started	4:11 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.90	502	1008	silty sand to sandy silt	
11.16	483	1041	silty sand to sandy silt	
11.41	502	1029	silty sand to sandy silt	
11.66	489	1073	silty sand to sandy silt	
11.92	493	1082	silty sand to sandy silt	
12.18	489	1039	sand to silty sand	
12.44	510	1063	sand to silty sand	
12.70	481	1054	sand to silty sand	
13.14	487	981	sand to silty sand	
13.40	498	969	sand to silty sand	
13.64	491	975	sand to silty sand	
13.85	487	989	sand to silty sand	
14.06	479	968	sand to silty sand	
14.31	493	972	sand to silty sand	
14.80	489	955	sand to silty sand	
15.05	472	954	sand to silty sand	
15.30	481	978	sand to silty sand	
15.55	489	937	sand to silty sand	
15.80	476	975	sand to silty sand	
15.90	476	946	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1607.CSV**	**North Coordinate (feet):**	523194.09
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588191.40
Time Started	7:51 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.17	485	1007	clay	
0.42	468	1714	silty sand to sandy silt	
0.67	472	1655	sand to silty sand	
0.92	491	1488	sand to silty sand	
1.36	512	1742	sand	
1.60	479	3247	sand to silty sand	
1.86	489	1810	sand to silty sand	
2.11	487	2443	sand to silty sand	
2.36	485	3745	sand to silty sand	
2.61	483	5291	silty sand to sandy silt	
2.87	483	3315	sand to silty sand	
3.11	483	3858	silty sand to sandy silt	
3.37	489	1953	sandy silt to silty clay	
3.86	487	2166	sandy silt to silty clay	
4.11	489	2240	silty sand to sandy silt	
4.37	472	2013	silty sand to sandy silt	
4.62	502	2258	silty sand to sandy silt	
4.80	508	2411	silty sand to sandy silt	
5.06	508	2628	sand to silty sand	
5.32	504	2808	sand	
5.57	481	1719	sand to silty sand	
5.83	485	1307	sand to silty sand	
6.08	485	1260	sand to silty sand	
6.35	474	1175	sand to silty sand	
6.60	487	1140	sand to silty sand	
6.85	466	1173	sand to silty sand	
7.10	472	1199	sand to silty sand	
7.36	489	1322	sand to silty sand	
7.62	466	1312	sand to silty sand	
7.87	485	1287	sand to silty sand	
8.13	472	1301	sand to silty sand	
8.38	487	1317	sand to silty sand	
8.63	491	1231	sand to silty sand	
8.88	466	1100	sand to silty sand	
9.14	487	1064	sand to silty sand	
9.39	491	1025	sand to silty sand	
9.64	479	1028	sand to silty sand	
10.15	470	1037	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1607.CSV**	**North Coordinate (feet):**	523194.09
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588191.40
Time Started	7:51 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.66	468	1070	sand to silty sand	
10.92	481	1039	silty sand to sandy silt	
11.18	464	1041	silty sand to sandy silt	
11.42	481	1078	silty sand to sandy silt	
11.67	476	1079	sand to silty sand	
11.93	468	1107	sand to silty sand	
12.18	483	1054	sand to silty sand	
12.43	468	1033	sand to silty sand	
12.68	483	977	sand to silty sand	
12.94	483	1065	sand to silty sand	
13.20	481	1037	sand to silty sand	
13.46	485	963	sand to silty sand	
13.71	472	961	sand to silty sand	
13.96	483	1006	sand to silty sand	
14.22	479	997	sand to silty sand	
14.47	474	1035	sand to silty sand	
14.70	489	978	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1608.CSV**	**North Coordinate (feet):**	523206.96
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588238.01
Time Started	6:39 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.30	485	1359	organic material	
0.54	481	1360	organic material	
0.79	483	1352	organic material	
0.90	472	1508	organic material	
1.12	464	11684	silty clay to clay	
1.33	460	16957	organic material	
1.75	470	7064	sand	
1.97	464	12850	gravely sand to sand	
2.18	455	12242	sand	
2.39	466	8808	sand to silty sand	
2.60	481	2657	silty sand to sandy silt	
2.81	487	2694	silty sand to sandy silt	
3.03	468	2583	silty sand to sandy silt	
3.24	466	1966	silty sand to sandy silt	
3.46	472	3732	silty sand to sandy silt	
3.69	474	1972	clayey silt to silty clay	
3.91	510	1726	silty clay to clay	
4.14	500	1536	silty sand to sandy silt	
4.59	508	3283	sand to silty sand	
4.77	489	3248	sand to silty sand	
4.94	502	2961	sand to silty sand	
5.10	498	2474	sand to silty sand	
5.27	483	2088	sand to silty sand	
5.46	417	33118	sand to silty sand	
5.63	417	23177	sand to silty sand	
5.81	415	25175	sand to silty sand	
5.99	417	31079	sand to silty sand	
6.17	411	55031	sand to silty sand	
6.35	417	34083	sand to silty sand	
6.52	413	31504	sand to silty sand	
6.69	413	45123	sand to silty sand	
6.87	415	174461	sand to silty sand	
7.10	417	186243	sand to silty sand	
7.35	417	64053	sand to silty sand	
7.60	417	26022	sand to silty sand	
7.85	417	26600	sand to silty sand	
8.11	417	17659	sand to silty sand	
8.22	415	31255	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1608.CSV**	**North Coordinate (feet):**	523206.96
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588238.01
Time Started	6:39 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
8.48	415	22090	sand to silty sand	
8.72	411	21308	sand to silty sand	
8.97	417	40250	sand to silty sand	
9.22	411	69101	sand to silty sand	
9.47	413	154737	sand to silty sand	
9.71	417	153763	sand to silty sand	
10.22	415	212663	sand to silty sand	
10.71	415	166305	sand to silty sand	
11.22	417	78031	sand to silty sand	
11.46	417	147732	sand to silty sand	
11.60	417	127305	sand to silty sand	
11.84	422	43127	sand to silty sand	
12.08	422	4426	sand to silty sand	
12.33	434	1343	sand to silty sand	
12.57	462	1202	sand to silty sand	
13.07	466	1239	sand to silty sand	
13.32	479	1162	sand to silty sand	
13.56	462	1170	sand to silty sand	
14.04	476	1213	sand to silty sand	
14.27	470	1177	sand to silty sand	
14.51	481	1141	sand to silty sand	
14.71	481	1052	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	EARL1609.CSV	**North Coordinate (feet):**	523251.08
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588231.87
Time Started	5:57 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.22	523	2702	organic material	
0.44	521	2632	organic material	
0.67	525	2356	organic material	
0.80	443	9796	organic material	
0.97	449	3079	clay	
1.16	447	2091	organic material	
1.40	451	4817	organic material	
1.65	470	2456	organic material	
2.14	479	1831	organic material	
2.39	506	2202	organic material	
2.63	476	1717	organic material	
2.87	481	1716	organic material	
3.36	472	2149	gravely sand to sand	
3.61	483	3145	sand	
3.85	476	2042	silty sand to sandy silt	
4.11	466	1705	sandy silt to silty clay	
4.36	483	2820	clayey silt to silty clay	
4.61	483	2415	sandy silt to silty clay	
4.85	504	4122	silty sand to sandy silt	
5.11	504	4209	sand to silty sand	
5.36	491	3087	sand to silty sand	
5.62	462	2620	sand	
5.88	430	2531	sand	
6.14	417	7610	sand to silty sand	
6.38	413	39540	sand	
7.15	411	61608	sand	
7.40	415	85080	sand to silty sand	
7.66	415	68560	sand to silty sand	
7.91	422	13423	sand to silty sand	
8.01	413	17128	sand to silty sand	
8.27	424	15304	sand to silty sand	
8.52	419	16289	sand to silty sand	
8.78	415	19865	sand to silty sand	
9.03	415	19423	sand to silty sand	
9.29	415	34250	sand to silty sand	
9.54	413	108205	sand to silty sand	
9.79	413	201244	sand to silty sand	
10.04	413	202316	silty sand to sandy silt	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	EARL1609.CSV	**North Coordinate (feet):**	523251.08
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588231.87
Time Started	5:57 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.29	422	216892	sand to silty sand	
10.55	457	214658	sand to silty sand	
10.97	460	217111	sand to silty sand	
11.21	417	205306	sand to silty sand	
11.46	417	191969	sand to silty sand	
11.71	415	207502	sand to silty sand	
11.96	417	179730	sand to silty sand	
12.22	417	53896	sand to silty sand	
12.47	426	3497	sand to silty sand	
12.73	464	1213	sand to silty sand	
12.98	466	1128	sand to silty sand	
13.48	472	1091	sand to silty sand	
13.73	481	1085	sand to silty sand	
13.98	476	1089	sand to silty sand	
14.23	483	1011	sand to silty sand	
14.40	460	1015	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geot chnical Data

Push Id	**EARL1612.CSV**	**North Coordinate (feet):**	523216.76
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588319.56
Time Started	10:59 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.17	468	4097	sand to silty sand	
0.42	470	1437	silty sand to sandy silt	
0.67	493	1268	sand to silty sand	
0.79	483	1506	sand to silty sand	
1.05	483	1740	sand	
1.32	474	1994	sand	
1.57	476	2419	sand	
1.84	464	3227	sand to silty sand	
2.09	472	3713	silty sand to sandy silt	
2.34	470	2499	sandy silt to silty clay	
2.59	483	2020	sandy silt to silty clay	
2.84	485	2662	silty sand to sandy silt	
3.34	502	3731	sand to silty sand	
3.60	502	3042	silty sand to sandy silt	
3.85	483	2127	sandy silt to silty clay	
4.08	483	2105	silty sand to sandy silt	
4.34	481	1638	sand to silty sand	
4.59	424	12250	sand to silty sand	
4.85	419	42460	silty sand to sandy silt	
5.36	424	97162	silty sand to sandy silt	
5.62	422	49386	silty sand to sandy silt	
5.88	419	17829	silty sand to sandy silt	
6.12	417	56670	silty sand to sandy silt	
6.62	422	94503	silty sand to sandy silt	
6.86	417	92565	sandy silt to silty clay	
7.11	417	159035	silty sand to sandy silt	
7.31	417	158296	silty sand to sandy silt	
7.56	417	137580	silty sand to sandy silt	
7.81	411	15434	silty sand to sandy silt	
8.06	470	2543	silty sand to sandy silt	
8.31	417	48837	silty sand to sandy silt	
8.82	411	149992	silty sand to sandy silt	
9.07	417	218542	sandy silt to silty clay	
9.33	417	242842	silty sand to sandy silt	
9.59	417	186670	silty sand to sandy silt	
9.84	417	221698	silty sand to sandy silt	
10.10	430	276973	sand to silty sand	
10.35	419	156274	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1612.CSV**	**North Coordinate (feet):**	523216.76
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588319.56
Time Started	10:59 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.57	447	271283	sand to silty sand	
10.82	422	228316	sand to silty sand	
11.08	422	7159	sand to silty sand	
11.34	434	2006	sand to silty sand	
11.60	460	1201	sand to silty sand	
11.86	474	1153	sand to silty sand	
12.12	472	1181	sand to silty sand	
12.37	470	1213	sand to silty sand	
12.63	474	1099	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1613.CSV**	**North Coordinate (feet):**	523269.47
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588305.46
Time Started	12:01 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.17	464	14326	silty sand to sandy silt	
0.42	483	3143	silty sand to sandy silt	
0.66	487	2261	sand to silty sand	
0.91	502	2127	sand	
1.16	485	1726	sand	
1.42	504	1652	gravely sand to sand	
1.67	491	1414	gravely sand to sand	
1.92	487	1193	gravely sand to sand	
2.17	460	2069	sand	
2.68	481	3047	sand	
3.19	472	2906	silty sand to sandy silt	
3.44	470	3154	silty sand to sandy silt	
3.71	491	3603	silty sand to sandy silt	
3.95	485	2659	sand to silty sand	
4.20	466	2231	silty sand to sandy silt	
4.46	485	2273	sandy silt to silty clay	
4.71	415	16713	sand to silty sand	
4.97	413	6494	sand to silty sand	
5.23	413	22370	sand to silty sand	
5.48	411	8343	sand	
5.74	413	16647	sand to silty sand	
5.99	411	17213	sand to silty sand	
6.24	411	44805	sand to silty sand	
6.50	411	198840	sand to silty sand	
6.76	415	24329	sand to silty sand	
7.02	411	12890	sand to silty sand	
7.15	411	110980	sand to silty sand	
7.30	411	182125	sand to silty sand	
7.55	411	134067	sand to silty sand	
7.80	413	125452	sand to silty sand	
8.31	413	134030	sand to silty sand	
8.56	411	213776	sand to silty sand	
8.81	411	194007	sand to silty sand	
9.07	451	266711	silty sand to sandy silt	
9.33	472	280573	silty sand to sandy silt	
9.59	468	282309	sand to silty sand	
9.85	472	284218	sand to silty sand	
10.10	472	274470	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1613.CSV**	**North Coordinate (feet):**	523269.47
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588305.46
Time Started	12:01 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.36	443	269448	sand to silty sand	
10.53	438	287507	sand to silty sand	
10.78	451	274287	sand to silty sand	
11.03	438	277630	sand to silty sand	
11.29	422	201230	sand to silty sand	
11.54	415	15770	sand to silty sand	
11.81	436	1722	sand to silty sand	
12.06	476	1154	sand to silty sand	
12.32	481	1116	sand to silty sand	
12.58	474	1158	sand to silty sand	
12.87	466	1206	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1614.CSV**	**North Coordinate (feet):**	523320.95
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588295.65
Time Started	12:38 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.16	466	4108	silty sand to sandy silt	
0.42	468	1446	sand to silty sand	
0.67	485	1303	sand to silty sand	
0.92	470	1464	sand	
1.09	464	1478	sand	
1.34	476	1357	sand	
1.59	487	1378	gravely sand to sand	
1.84	506	1340	gravely sand to sand	
2.09	489	1190	gravely sand to sand	
2.35	470	1219	sand	
2.60	483	1638	sand	
2.86	468	1513	sand	
3.11	481	1735	sand to silty sand	
3.61	466	2648	silty sand to sandy silt	
3.87	470	3695	sandy silt to silty clay	
4.13	472	2406	sandy silt to silty clay	
4.35	476	7361	silty sand to sandy silt	
4.60	489	3576	sandy silt to silty clay	
5.11	436	5005	sandy silt to silty clay	
5.36	426	18796	silty sand to sandy silt	
5.62	436	3393	sand to silty sand	
5.88	417	142053	sand	
6.13	424	3702	sand	
6.38	415	5384	sand to silty sand	
6.89	413	9662	sand	
7.14	413	61557	sand	
7.39	417	40350	sand	
7.51	411	65595	sand to silty sand	
7.76	413	94681	sand to silty sand	
8.02	415	42036	sand to silty sand	
8.26	411	44138	sand to silty sand	
8.52	413	18598	sand to silty sand	
8.77	415	100090	sand to silty sand	
9.02	413	161366	sand to silty sand	
9.52	481	281115	sand to silty sand	
9.79	479	279671	sand to silty sand	
10.04	470	279335	sand to silty sand	
10.55	457	273711	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and G otechnical Data

Push Id	**EARL1614.CSV**	**North Coordinate (feet):**	523320.95
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588295.65
Time Started	12:38 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.79	445	272803	sand to silty sand	
10.89	455	287478	sand to silty sand	
11.14	417	240978	silty sand to sandy silt	
11.40	415	178334	silty sand to sandy silt	
11.66	422	29719	silty sand to sandy silt	
11.92	419	20754	sand to silty sand	
12.17	428	2082	sand to silty sand	
12.43	449	1165	sand to silty sand	
12.68	466	1084	sand to silty sand	
12.94	462	1070	sand to silty sand	
13.45	485	1140	sand to silty sand	
13.71	481	1166	sand to silty sand	
13.80	481	1160	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	EARL1615.CSV	**North Coordinate (feet):**	523368.75
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588286.45
Time Started	1:19 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.16	462	1796	sandy silt to silty clay	
0.41	455	1392	silty sand to sandy silt	
0.62	468	2416	sand to silty sand	
0.82	426	6696	sand to silty sand	
1.05	426	7025	sand	
1.28	447	2073	sand	
1.51	422	13594	sand	
1.74	424	7519	sand	
1.96	417	5310	sand to silty sand	
2.42	462	1471	gravely sand to sand	
2.65	457	1275	gravely sand to sand	
2.89	460	1703	gravely sand to sand	
3.14	468	1812	gravely sand to sand	
3.38	464	1216	gravely sand to sand	
3.63	474	1276	sand	
3.89	464	1433	sand	
4.08	462	1860	sand	
4.32	464	2350	sand to silty sand	
4.57	466	2151	sand to silty sand	
4.81	466	1826	silty sand to sandy silt	
5.07	476	1940	sandy silt to silty clay	
5.33	451	1809	silty clay to clay	
5.58	453	1114	sandy silt to silty clay	
5.84	472	1395	sandy silt to silty clay	
6.09	481	2076	clayey silt to silty clay	
6.60	483	2019	sandy silt to silty clay	
6.86	489	2445	sandy silt to silty clay	
7.12	502	2361	sandy silt to silty clay	
7.33	479	1852	silty sand to sandy silt	
7.58	491	1440	silty sand to sandy silt	
8.09	489	1122	sand to silty sand	
8.34	472	1093	sand to silty sand	
8.59	474	1076	sand to silty sand	
8.85	476	1527	sandy silt to silty clay	
9.12	483	1428	sand to silty sand	
9.38	415	30848	sand to silty sand	
9.90	415	64364	sand to silty sand	
10.16	415	171146	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	EARL1615.CSV	**North Coordinate (feet):**	523368.75
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588286.45
Time Started	1:19 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.42	417	204876	silty sand to sandy silt	
10.60	417	209704	silty sand to sandy silt	
10.85	417	222937	silty sand to sandy silt	
11.12	417	230398	silty sand to sandy silt	
11.38	415	216012	silty sand to sandy silt	
11.63	411	227020	sand to silty sand	
11.89	415	171575	sand to silty sand	
12.14	417	126989	sand to silty sand	
12.39	415	161329	sand to silty sand	
12.65	422	8151	sand to silty sand	
13.15	464	1120	silty sand to sandy silt	
13.40	468	1136	silty sand to sandy silt	
13.65	462	1187	silty sand to sandy silt	
13.90	483	1225	silty sand to sandy silt	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geot chnical Data

Push Id	**EARL1616.CSV**	**North Coordinate (feet):**	523181.83
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588325.08
Time Started	10:15 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.17	481	3574	sand	
0.42	470	2067	sand	
0.67	424	2760	silty sand to sandy silt	
0.92	441	2789	silty sand to sandy silt	
1.17	466	2270	sand to silty sand	
1.42	510	3232	sand	
1.68	485	1505	sand to silty sand	
1.93	470	1704	sand to silty sand	
2.44	487	1849	sand	
2.70	470	2297	gravely sand to sand	
2.95	464	2366	sand	
3.20	466	3139	sand	
3.45	474	4779	sand to silty sand	
3.70	479	2247	sandy silt to silty clay	
3.84	466	2123	sandy silt to silty clay	
4.10	483	2596	sand to silty sand	
4.35	483	3544	silty sand to sandy silt	
4.61	491	2932	sandy silt to silty clay	
4.86	487	2666	sand to silty sand	
5.12	464	1522	sand to silty sand	
5.37	491	1392	sand to silty sand	
5.62	466	1261	sand to silty sand	
5.86	451	1185	sand to silty sand	
6.12	422	5837	sand to silty sand	
6.37	413	32136	sand to silty sand	
6.62	417	52937	sand to silty sand	
6.88	415	65477	sand to silty sand	
7.12	415	96629	sand to silty sand	
7.38	415	134992	sand to silty sand	
7.54	415	201717	sand to silty sand	
7.75	426	16596	sand to silty sand	
7.99	426	4345	sand to silty sand	
8.24	422	9535	sand to silty sand	
8.75	419	31388	sand to silty sand	
8.95	419	17362	sand to silty sand	
9.20	424	13281	sand to silty sand	
9.44	426	8147	sand to silty sand	
9.70	422	13839	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1616.CSV**	**North Coordinate (feet):**	523181.83
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588325.08
Time Started	10:15 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
9.95	417	64750	sand to silty sand	
10.18	417	194289	sand to silty sand	
10.42	415	173972	sand to silty sand	
10.61	413	109233	sand to silty sand	
10.80	415	95364	silty sand to sandy silt	
11.02	415	61261	silty sand to sandy silt	
11.26	417	19590	silty sand to sandy silt	
11.50	424	10727	sand to silty sand	
11.75	419	5783	sand to silty sand	
11.99	460	1459	sand to silty sand	
12.24	468	1237	sand to silty sand	
12.43	481	1234	sand to silty sand	
12.93	464	1298	sand to silty sand	
13.15	487	1318	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	EARL1617.CSV	**North Coordinate (feet):**	523134.03
Date Started:	Wednesday, October 18, 1995	**East Coordinate (feet):**	588337.95
Time Started	11:23 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.16	462	9638	sensitive fine grained	
0.40	483	2198	sandy silt to silty clay	
0.66	498	1832	silty sand to sandy silt	
0.92	481	1634	silty sand to sandy silt	
1.18	487	2399	sand to silty sand	
1.68	419	70894	sandy silt to silty clay	
1.94	424	94485	clay	
2.18	436	13352	sand to silty sand	
2.44	460	4052	sand to silty sand	
2.68	470	4837	sand to silty sand	
2.93	428	27944	sand to silty sand	
3.19	424	10869	sand to silty sand	
3.45	419	8305	sand to silty sand	
3.70	424	7192	silty sand to sandy silt	
3.90	430	4029	silty sand to sandy silt	
4.15	424	27738	silty sand to sandy silt	
4.40	422	7338	sand to silty sand	
4.90	470	1294	silty sand to sandy silt	
5.16	455	1253	silty sand to sandy silt	
5.41	468	1241	silty sand to sandy silt	
5.66	483	1267	silty sand to sandy silt	
5.91	483	1238	silty sand to sandy silt	
6.42	432	6408	sand to silty sand	
6.67	441	9548	sand to silty sand	
6.92	455	3497	sand to silty sand	
7.12	453	1515	sand to silty sand	
7.63	466	1124	sand to silty sand	
7.87	470	1120	sand to silty sand	
8.13	472	1068	sand to silty sand	
8.39	485	1035	sand to silty sand	
8.64	470	1024	sand to silty sand	
8.89	472	1088	sand to silty sand	
9.14	474	1123	sand to silty sand	
9.64	476	1115	sand to silty sand	
9.90	466	1034	sand to silty sand	
10.15	479	988	sand to silty sand	
10.32	485	1028	sand to silty sand	
10.57	476	1044	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1617.CSV**	**North Coordinate (feet):**	523134.03
Date Started:	Wednesday, October 18, 1995	**East Coordinate (feet):**	588337.95
Time Started	11:23 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.82	470	1044	sand to silty sand	
11.07	468	1045	sand to silty sand	
11.33	481	1046	sand to silty sand	
11.58	481	1041	sand to silty sand	
12.08	470	1019	sand to silty sand	
12.33	468	1033	sand to silty sand	
12.83	476	992	sand to silty sand	
13.09	483	1094	sand to silty sand	
13.34	491	1065	sand to silty sand	
13.58	479	1091	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1618.CSV**	**North Coordinate (feet):**	523087.45
Date Started:	Wednesday, October 18, 1995	**East Coordinate (feet):**	588350.83
Time Started	10:32 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.16	455	4087	sandy silt to silty clay	
0.41	470	1847	silty sand to sandy silt	
0.66	498	1878	sand to silty sand	
0.77	485	2665	sand to silty sand	
1.28	479	4326	sand to silty sand	
1.53	432	14689	sand to silty sand	
1.77	428	25261	sand to silty sand	
2.02	430	39568	sand to silty sand	
2.27	430	47259	silty sand to sandy silt	
2.53	443	6688	silty sand to sandy silt	
2.78	426	3674	silty sand to sandy silt	
3.28	428	16146	silty sand to sandy silt	
3.53	438	12379	silty sand to sandy silt	
3.79	424	19100	silty sand to sandy silt	
4.04	424	30285	sand to silty sand	
4.29	426	38443	sand to silty sand	
4.80	466	1784	sand to silty sand	
5.05	453	2481	sand to silty sand	
5.30	462	2119	sand to silty sand	
5.55	449	4345	sand to silty sand	
5.66	464	2130	sand to silty sand	
5.91	455	2170	sand to silty sand	
6.42	426	4228	sand to silty sand	
6.66	462	1824	sand to silty sand	
6.91	432	18024	sand to silty sand	
7.17	436	20213	sand to silty sand	
7.41	424	94027	sand to silty sand	
7.67	424	119403	sand to silty sand	
7.92	422	134700	sand to silty sand	
8.17	424	217309	sand to silty sand	
8.42	424	81962	sand to silty sand	
8.68	438	4664	sand to silty sand	
8.93	464	1674	sand to silty sand	
9.18	470	1291	sand to silty sand	
9.43	487	1656	sand to silty sand	
9.94	476	1276	sand to silty sand	
10.19	472	1335	sand to silty sand	
10.44	464	1258	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	EARL1618.CSV	**North Coordinate (feet):**	523087.45
Date Started:	Wednesday, October 18, 1995	**East Coordinate (feet):**	588350.83
Time Started	10:32 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.58	491	1285	sand to silty sand	
10.83	483	1321	sand to silty sand	
11.09	468	1316	sand to silty sand	
11.35	468	1263	sand to silty sand	
11.60	468	1279	sand to silty sand	
11.86	483	1264	sand to silty sand	
12.11	466	1251	sand to silty sand	
12.26	487	1343	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	EARL1619.CSV	**North Coordinate (feet):**	523287.85
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588368.00
Time Started	4:43 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.17	485	1818	sand to silty sand	
0.42	531	3553	sand	
0.66	504	2155	sand	
0.90	491	1351	silty sand to sandy silt	
1.15	455	5110	clayey silt to silty clay	
1.40	432	12989	sandy silt to silty clay	
1.66	430	6412	silty sand to sandy silt	
1.91	449	3714	sand to silty sand	
2.16	430	8623	sand to silty sand	
2.42	426	8643	sand to silty sand	
2.67	428	16754	sand to silty sand	
2.93	428	13652	gravely sand to sand	
3.44	443	25717	sand	
3.70	432	18532	sand	
3.95	432	7795	sand	
4.20	430	9455	sand	
4.37	430	18341	sand	
4.61	424	37935	silty sand to sandy silt	
4.86	424	89971	sandy silt to silty clay	
5.12	424	21212	sandy silt to silty clay	
5.38	432	4067	sand to silty sand	
5.63	430	6120	sand	
5.88	424	17326	sand	
6.14	417	28177	sand	
6.39	411	21126	sand	
6.90	428	1858	sand to silty sand	
7.15	426	4936	sand	
7.40	419	39397	sand	
7.57	417	18906	sand	
7.82	419	16296	sand	
8.07	419	26208	sand	
8.33	424	46550	sand to silty sand	
8.59	424	142905	sand to silty sand	
8.84	430	57790	sand to silty sand	
9.11	424	27419	sand to silty sand	
9.36	424	16331	sand to silty sand	
9.62	432	6163	sand to silty sand	
10.13	428	5780	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1619.CSV**	**North Coordinate (feet):**	523287.85
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588368.00
Time Started	4:43 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.39	426	6727	sand to silty sand	
10.64	426	22602	sand to silty sand	
10.89	422	62605	sand to silty sand	
11.14	422	181929	sand to silty sand	
11.40	422	223284	sand to silty sand	
11.65	424	143106	sand to silty sand	
11.92	426	7434	sand to silty sand	
12.18	434	1630	sand to silty sand	
12.43	462	959	sand to silty sand	
12.69	449	894	sand to silty sand	
13.21	481	897	sand to silty sand	
13.48	479	888	sand to silty sand	
13.73	466	930	sand to silty sand	
13.83	481	932	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1620.CSV**	**North Coordinate (feet):**	523326.47
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588355.74
Time Started	5:19 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.17	470	1037	sandy silt to silty clay	
0.43	483	962	sandy silt to silty clay	
0.68	481	988	sandy silt to silty clay	
0.91	455	996	sandy silt to silty clay	
1.13	470	998	sandy silt to silty clay	
1.38	468	1201	sand to silty sand	
1.62	483	936	sand	
1.87	489	910	gravely sand to sand	
2.12	476	1296	sand	
2.38	476	1752	sand	
2.63	479	1736	sand	
2.88	476	1847	sand	
3.37	472	1351	sand	
3.62	493	1103	sand	
3.88	479	1150	sand	
4.13	470	1797	sand	
4.37	470	3125	sand	
4.62	481	2286	silty sand to sandy silt	
4.88	491	1626	sandy silt to silty clay	
5.13	483	1313	silty sand to sandy silt	
5.39	487	1566	silty sand to sandy silt	
5.64	481	1664	sand to silty sand	
5.89	483	1796	sand to silty sand	
6.14	481	1788	sand	
6.64	481	1670	sand	
6.90	476	1689	sand to silty sand	
7.15	466	1501	silty sand to sandy silt	
7.39	460	1542	sand to silty sand	
7.60	413	14536	sand	
7.86	411	26895	sand	
8.11	415	19841	sand	
8.36	417	22425	sand	
8.63	413	57755	sand	
8.88	415	60235	sand	
9.13	417	15627	sand to silty sand	
9.39	411	13592	sand to silty sand	
9.64	417	11951	sand to silty sand	
9.89	415	79593	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1620.CSV**	**North Coordinate (feet):**	523326.47
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588355.74
Time Started	5:19 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.15	413	104849	sand to silty sand	
10.40	413	176026	sand to silty sand	
10.65	415	131494	sand to silty sand	
10.89	413	166518	sand to silty sand	
11.14	417	228629	sand to silty sand	
11.64	415	184028	sand to silty sand	
11.90	413	73745	sand to silty sand	
12.16	417	4438	sand to silty sand	
12.40	447	1193	sand to silty sand	
12.66	481	942	silty sand to sandy silt	
12.92	470	1002	sand to silty sand	
13.42	466	1005	sand to silty sand	
13.67	476	1028	sand to silty sand	
13.83	455	993	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	EARL1621.CSV	**North Coordinate (feet):**	523298.89
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588407.24
Time Started	6:41 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.15	508	1980	sandy silt to silty clay	
0.30	514	2262	sand to silty sand	
0.39	491	2199	sand to silty sand	
0.58	504	2154	sand	
0.82	493	2060	sand	
0.94	489	2042	sand	
1.18	479	4077	sand	
1.43	443	9783	sand	
1.67	449	5694	sand	
1.91	468	3005	sand to silty sand	
2.16	464	13078	sand	
2.41	470	9143	sand	
2.66	455	8848	sand	
2.91	445	9762	sand	
3.41	447	17667	sand	
3.66	445	45977	silty sand to sandy silt	
3.91	447	44303	sand to silty sand	
4.17	455	52457	sand to silty sand	
4.42	445	61572	sand	
4.55	449	39941	sand	
5.05	449	163689	silty sand to sandy silt	770 ppm by TRPH 9073
5.30	447	243353	silty sand to sandy silt	770 ppm by TRPH 9073
5.55	447	242973	sand to silty sand	770 ppm by TRPH 9073
5.81	445	122723	sand to silty sand	770 ppm by TRPH 9073
6.07	436	112886	silty sand to sandy silt	770 ppm by TRPH 9073
6.33	443	31848	silty sand to sandy silt	
6.58	449	21046	sand to silty sand	
6.84	447	41487	sand to silty sand	
7.09	445	36361	sand to silty sand	
7.34	445	41180	sand to silty sand	
7.59	445	11825	sand to silty sand	
7.82	445	41180	sand to silty sand	
8.27	445	74188	sand to silty sand	
8.52	455	5066	sand to silty sand	
8.78	451	1458	sand	
9.03	476	1136	sand to silty sand	
9.28	472	1131	sand to silty sand	
9.54	483	1133	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1621.CSV**	**North Coordinate (feet):**	523298.89
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588407.24
Time Started	6:41 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
9.78	470	1095	sand to silty sand	
10.30	470	1118	silty sand to sandy silt	
10.55	468	1163	sand to silty sand	
11.04	472	1146	sand to silty sand	
11.29	483	1177	sand to silty sand	
11.55	489	1140	sand to silty sand	
11.80	466	1136	sand to silty sand	
12.07	472	1133	sand to silty sand	
12.58	485	1085	sand to silty sand	
12.83	470	1112	sand to silty sand	
13.09	489	1055	sand to silty sand	
13.60	457	1103	sand to silty sand	
13.76	483	1295	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1622.CSV**	**North Coordinate (feet):**	523355.88
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588350.83
Time Started	5:57 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.16	481	1484	sandy silt to silty clay	
0.66	455	2041	sandy silt to silty clay	
0.91	455	1332	sandy silt to silty clay	
1.16	476	1016	sandy silt to silty clay	
1.60	483	884	sand	
1.85	474	850	sand	
2.11	483	1237	gravely sand to sand	
2.35	487	1910	gravely sand to sand	
2.60	476	1549	sand	
2.85	472	1653	sand	
3.10	483	1725	gravely sand to sand	
3.35	481	1741	gravely sand to sand	
3.85	481	1338	sand	
4.10	487	1229	sand	
4.35	464	1743	sand	
4.59	466	2128	sand to silty sand	
4.77	466	2603	sand to silty sand	
5.01	479	2422	silty sand to sandy silt	
5.26	474	2118	sandy silt to silty clay	
5.51	491	1848	silty sand to sandy silt	
5.76	472	1891	sand to silty sand	
6.02	489	2008	sand to silty sand	
6.27	479	1826	sand	
6.51	479	1518	sand	
6.76	470	1462	sand	
7.25	470	1367	sand	
7.51	487	1255	sand	
8.02	457	1358	sand	
8.26	466	1085	sand	
8.51	472	1025	sand	
8.76	495	879	sand	
9.02	468	915	sand	
9.27	468	913	sand	
9.52	470	977	sand	
10.01	462	981	sand to silty sand	
10.51	487	973	sand to silty sand	
10.77	479	1001	sand to silty sand	
11.27	483	1004	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1622.CSV**	**North Coordinate (feet):**	523355.88
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588350.83
Time Started	5:57 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
11.48	472	971	sand to silty sand	
11.74	468	935	sand to silty sand	
12.00	485	914	sand to silty sand	
12.26	470	929	silty sand to sandy silt	
12.51	489	923	silty sand to sandy silt	
12.76	483	956	sand to silty sand	
13.01	462	960	sand to silty sand	
13.26	476	1058	sand to silty sand	
13.52	479	995	sand to silty sand	
13.77	483	907	sand to silty sand	
14.02	483	886	sand to silty sand	
14.27	468	867	sand to silty sand	
14.52	468	870	sand to silty sand	
14.76	466	918	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1623.CSV**	**North Coordinate (feet):**	523172.02
Date Started:	Wednesday, October 18, 1995	**East Coordinate (feet):**	588242.91
Time Started	9:27 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.42	487	2228	sand	
0.67	479	1968	sand to silty sand	
0.92	472	1948	sand to silty sand	
1.16	479	2061	sand to silty sand	
1.43	483	2223	silty sand to sandy silt	
1.68	474	1968	silty sand to sandy silt	
1.93	464	2087	silty sand to sandy silt	
2.18	472	1960	silty sand to sandy silt	
2.67	460	1571	silty sand to sandy silt	
2.93	474	1573	silty sand to sandy silt	
3.18	462	1597	silty sand to sandy silt	
3.68	485	1667	silty sand to sandy silt	
3.93	481	1719	silty sand to sandy silt	
4.19	462	1735	silty sand to sandy silt	
4.33	474	1696	silty sand to sandy silt	
4.58	476	1667	sandy silt to silty clay	
4.84	481	1692	sandy silt to silty clay	
5.09	481	1626	sandy silt to silty clay	
5.35	479	1702	sandy silt to silty clay	
5.60	476	1671	sandy silt to silty clay	
5.85	470	1644	sandy silt to silty clay	
6.11	483	1650	sandy silt to silty clay	
6.36	476	1720	sandy silt to silty clay	
6.86	483	1680	sandy silt to silty clay	
7.11	481	1665	sandy silt to silty clay	
7.36	430	4609	silty sand to sandy silt	
7.55	424	12574	silty sand to sandy silt	
7.81	413	30398	silty sand to sandy silt	
8.06	415	33208	silty sand to sandy silt	
8.32	430	12620	silty sand to sandy silt	
8.57	445	2494	silty sand to sandy silt	
8.82	424	6658	silty sand to sandy silt	
9.08	415	12614	sandy silt to silty clay	
9.33	417	34686	silty sand to sandy silt	
9.58	415	73464	silty sand to sandy silt	
10.09	411	46117	sand to silty sand	
10.36	419	48565	sand to silty sand	
10.61	417	44823	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	EARL1623.CSV	**North Coordinate (feet):**	523172.02
Date Started:	Wednesday, October 18, 1995	**East Coordinate (feet):**	588242.91
Time Started	9:27 AM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.72	424	17010	sand to silty sand	
10.97	430	2734	sand to silty sand	
11.23	449	1409	sand to silty sand	
11.73	476	1218	sand to silty sand	
11.98	476	1194	sand to silty sand	
12.23	487	1185	sand to silty sand	
12.37	481	1188	sand to silty sand	
12.62	487	1191	sand to silty sand	
12.76	491	1227	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1624.CSV**	**North Coordinate (feet):**	523198.99
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588228.19
Time Started	8:25 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.93	468	1263	organic material	
1.41	491	2165	organic material	
1.67	485	3017	organic material	
2.17	462	14406	organic material	
2.42	462	8695	organic material	
2.93	483	2635	organic material	
3.18	502	1695	organic material	
3.92	470	1413	organic material	
4.18	489	2605	silty sand to sandy silt	
4.43	470	3348	sandy silt to silty clay	
4.68	487	2529	silty sand to sandy silt	
4.94	489	2228	sand to silty sand	
5.19	485	2116	sand to silty sand	
5.43	487	1830	sand to silty sand	
5.53	476	1884	sand to silty sand	
5.78	485	1809	sand to silty sand	
6.03	483	1380	sand to silty sand	
6.28	491	1218	sand	
6.78	474	1076	sand	
7.04	470	1055	sand to silty sand	
7.30	476	1079	sand to silty sand	
7.55	479	1076	sand to silty sand	
8.04	493	1074	sand	
8.30	481	1131	sand to silty sand	
8.55	476	1103	sand to silty sand	
8.80	487	1077	sand to silty sand	
9.04	508	1185	sand to silty sand	
9.29	472	1170	sand to silty sand	
9.53	483	1080	sand to silty sand	
10.03	417	19865	sand to silty sand	
10.28	417	97865	sand to silty sand	
10.53	413	121708	sand to silty sand	
10.79	415	129735	sand to silty sand	
11.04	415	126220	sand to silty sand	
11.55	422	10311	sand to silty sand	
11.81	434	2129	sand to silty sand	
12.07	474	1049	sand to silty sand	
12.30	493	996	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1624.CSV**	**North Coordinate (feet):**	523198.99
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588228.19
Time Started	8:25 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
12.56	481	1019	sand to silty sand	
12.81	462	996	sand to silty sand	
13.06	468	1003	sand to silty sand	
13.32	472	1011	sand to silty sand	
13.58	476	976	sand to silty sand	
13.83	481	1009	sand to silty sand	
14.08	468	1064	sand to silty sand	
14.34	485	1052	sand to silty sand	
14.59	485	1145	sand to silty sand	
14.85	483	1315	sand to silty sand	
15.10	470	1017	sand to silty sand	
15.35	476	1186	sand to silty sand	
15.58	481	1079	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1625.CSV**	**North Coordinate (feet):**	523172.64
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588287.67
Time Started	9:51 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.17	464	1328	organic material	
0.42	502	2207	organic material	
0.67	447	11916	organic material	
0.92	447	14913	organic material	
1.18	441	17217	clay	
1.42	445	9772	organic material	
1.52	472	3238	organic material	
1.77	474	2466	organic material	
2.03	472	2863	clay	
2.28	483	2536	clay	
2.54	460	2672	clay	
2.79	468	2458	clay	
3.04	472	2163	clay	
3.54	466	4931	sand to silty sand	
4.05	472	2720	sandy silt to silty clay	
4.31	485	2573	silty sand to sandy silt	
4.56	481	2094	silty sand to sandy silt	
4.82	472	2164	silty sand to sandy silt	
5.07	487	2213	silty sand to sandy silt	
5.32	491	2232	silty sand to sandy silt	
5.58	464	1939	silty sand to sandy silt	
5.83	419	8971	silty sand to sandy silt	
6.08	419	13323	silty sand to sandy silt	
6.33	417	9874	silty sand to sandy silt	
6.83	415	34806	sand to silty sand	
7.33	417	40409	sand to silty sand	
7.84	422	23109	silty sand to sandy silt	
8.09	428	4330	silty sand to sandy silt	
8.20	417	6220	silty sand to sandy silt	
8.46	422	6071	sand to silty sand	
8.70	413	7456	sand to silty sand	
8.96	419	14833	silty sand to sandy silt	
9.21	417	20681	silty sand to sandy silt	
9.47	415	16494	silty sand to sandy silt	
9.72	417	29686	silty sand to sandy silt	
9.98	417	40420	silty sand to sandy silt	
10.23	417	86480	sand to silty sand	
10.73	417	190971	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1625.CSV**	**North Coordinate (feet):**	523172.64
Date Started:	Tuesday, October 17, 1995	**East Coordinate (feet):**	588287.67
Time Started	9:51 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.99	422	144153	silty sand to sandy silt	
11.24	419	40223	silty sand to sandy silt	
11.41	422	20893	silty sand to sandy silt	
11.66	424	5399	sand to silty sand	
11.91	441	2686	sand to silty sand	
12.16	417	28989	sand to silty sand	
12.42	424	3808	silty sand to sandy silt	
12.67	466	1552	sand to silty sand	
12.93	470	1300	sand to silty sand	
13.17	483	1282	sand to silty sand	
13.43	474	1347	sand to silty sand	
13.69	479	1386	sand to silty sand	
13.95	483	1299	sand to silty sand	
14.20	481	1311	sand to silty sand	
14.47	485	1383	sand to silty sand	
14.70	481	1595	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geot chnical Data

Push Id	**EARL1626.CSV**	**North Coordinate (feet):**	523216.15
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588417.67
Time Started	7:38 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.40	578	3564	sandy silt to silty clay	
0.51	487	2608	sandy silt to silty clay	
0.61	483	2519	sandy silt to silty clay	
0.71	504	3657	sandy silt to silty clay	
0.90	500	2509	sandy silt to silty clay	
1.31	462	2870	clay	
1.63	483	2437	sandy silt to silty clay	
1.86	470	2077	sandy silt to silty clay	
2.11	468	2260	silty clay to clay	
2.36	479	3838	sand to silty sand	
2.60	483	3007	gravely sand to sand	
2.86	483	2533	sand	
3.11	485	2333	sand	
3.37	472	2068	sand to silty sand	
3.87	472	1439	sand	
4.13	470	2203	sand to silty sand	
4.38	472	2111	sand to silty sand	
4.63	483	1979	silty sand to sandy silt	
4.71	485	1860	silty sand to sandy silt	
4.96	464	1387	silty sand to sandy silt	
5.22	472	1654	sand to silty sand	
5.47	483	2175	silty sand to sandy silt	
5.73	504	1746	clayey silt to silty clay	
5.98	491	1122	silty sand to sandy silt	
6.23	464	953	sand to silty sand	
6.49	464	893	sand to silty sand	
6.74	464	821	sand to silty sand	
7.24	485	816	sand to silty sand	
7.49	479	1508	sand to silty sand	
7.75	481	1034	sand to silty sand	
8.00	481	801	sand to silty sand	
8.23	485	880	sand to silty sand	
8.49	485	844	sand to silty sand	
8.74	468	861	sand to silty sand	
8.99	474	943	sand to silty sand	
9.26	468	899	sand to silty sand	
9.51	460	897	sand to silty sand	
9.76	472	893	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1626.CSV**	**North Coordinate (feet):**	523216.15
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588417.67
Time Started	7:38 PM,	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.02	424	1735	sand to silty sand	
10.52	411	37667	sand to silty sand	
10.77	413	224556	sand to silty sand	
11.02	417	199236	sand to silty sand	
11.22	417	209753	sand to silty sand	
11.47	417	126046	sand to silty sand	
11.72	426	7794	sand to silty sand	
11.99	424	2731	sand to silty sand	
12.24	464	1056	silty sand to sandy silt	
12.50	476	926	silty sand to sandy silt	
12.76	487	958	sand to silty sand	
13.01	481	922	sand to silty sand	
13.26	460	897	sand to silty sand	
13.52	464	836	sand to silty sand	
13.60	485	930	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1627.CSV**	**North Coordinate (feet):**	523324.63
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588533.56
Time Started	8:32 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.17	485	2279	sand to silty sand	
0.42	487	2331	sand to silty sand	
0.67	470	5377	sand to silty sand	
0.89	441	13539	sand to silty sand	
1.14	428	25306	sand	
1.39	417	16669	sand	
1.64	419	20442	sand	
1.91	422	28988	sand	
2.16	424	13941	sand	
2.41	426	8016	sand	
2.67	424	43013	sand	
2.93	424	17652	sand	
3.43	457	2291	sand	
3.68	476	2922	clayey silt to silty clay	
3.93	464	4075	silty sand to sandy silt	
4.16	472	3849	sand to silty sand	
4.41	472	12661	silty sand to sandy silt	
4.66	472	11421	silty sand to sandy silt	
4.92	479	3310	silty sand to sandy silt	
5.18	483	2215	silty sand to sandy silt	
5.43	472	2131	silty sand to sandy silt	
5.69	468	2195	silty sand to sandy silt	
5.95	485	1575	sandy silt to silty clay	
6.20	462	1459	sand to silty sand	
6.71	426	18006	sand to silty sand	
6.97	428	25079	sand to silty sand	
7.23	447	2613	silty sand to sandy silt	
7.35	451	2242	sandy silt to silty clay	
7.85	430	10629	sand to silty sand	
8.11	432	5184	sand to silty sand	
8.37	426	11729	sand to silty sand	
8.63	424	21205	sand to silty sand	
8.88	428	16895	sand to silty sand	
9.13	434	18154	sand to silty sand	
9.90	426	282720	sand to silty sand	11000 ppm by TRPH 9073
10.15	434	285682	sand to silty sand	11000 ppm by TRPH 9073
10.40	422	296721	sand to silty sand	11000 ppm by TRPH 9073
10.83	426	13109	sand to silty sand	11000 ppm by TRPH 9073

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	EARL1627.CSV	**North Coordinate (feet):**	523324.63
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588533.56
Time Started	8:32 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
11.08	438	1377	sand to silty sand	
11.33	455	1058	sand to silty sand	
11.58	476	1101	sand to silty sand	
11.83	457	1169	sand to silty sand	
12.08	466	1092	sand to silty sand	
12.33	481	1265	sand to silty sand	
12.59	455	1120	sand to silty sand	
12.85	470	1088	sand to silty sand	
13.10	479	1051	sand to silty sand	
13.33	476	1083	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1628.CSV**	**North Coordinate (feet):**	523387.75
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588517.00
Time Started	9:16 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.17	451	3144	sand to silty sand	
0.41	476	1620	sandy silt to silty clay	
0.64	462	1461	sand to silty sand	
0.90	483	1864	sand to silty sand	
1.15	483	2594	sand to silty sand	
1.40	470	1833	sand	
1.66	481	1764	sand	
1.92	487	2036	sand	
2.17	491	1844	sand	
2.43	474	1911	sand	
2.67	476	1746	sand	
2.93	472	1821	sand	
3.18	483	2062	sand	
3.44	455	3300	sand	
3.70	462	2596	sand	
3.94	476	1904	sand to silty sand	
4.20	481	2003	silty sand to sandy silt	
4.45	466	1762	silty sand to sandy silt	
4.70	472	1381	silty sand to sandy silt	
4.95	470	1366	sand to silty sand	
5.21	470	1316	sand to silty sand	
5.47	460	1066	sand to silty sand	
5.72	472	1059	sand to silty sand	
5.98	457	998	sand to silty sand	
6.74	485	910	sand to silty sand	
6.98	483	954	sand to silty sand	
7.17	483	1001	sand to silty sand	
7.43	468	1073	sand to silty sand	
7.68	470	1063	sand to silty sand	
7.94	472	1023	sand to silty sand	
8.19	464	939	sand to silty sand	
8.45	474	978	sand to silty sand	
8.70	474	1099	sand to silty sand	
8.96	470	1313	sand to silty sand	
9.21	485	1400	sand to silty sand	
9.71	474	1463	sand to silty sand	
9.97	483	1544	sand to silty sand	
10.22	464	1306	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1628.CSV**	**North Coordinate (feet):**	523387.75
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588517.00
Time Started	9:16 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.40	487	1248	sand to silty sand	
10.64	481	1024	sand to silty sand	
10.89	489	842	sand to silty sand	
11.15	470	845	sand to silty sand	
11.40	487	876	sand to silty sand	
11.65	479	909	sand to silty sand	
11.90	468	952	sand to silty sand	
12.15	466	923	sand to silty sand	
12.42	460	958	sand to silty sand	
12.67	476	1060	sand to silty sand	
12.93	466	1092	sand to silty sand	
13.18	479	1063	sand to silty sand	
13.43	485	1049	sand to silty sand	
13.59	485	1067	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1629.CSV**	**North Coordinate (feet):**	523380.4
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588252.11
Time Started	10:09 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
0.16	479	2374	silty sand to sandy silt	
0.41	479	1707	sand to silty sand	
0.66	489	1287	sand to silty sand	
0.86	481	1269	sand to silty sand	
1.12	476	1421	sand	
1.38	483	1424	sand	
1.64	487	1502	sand	
1.90	481	1427	sand to silty sand	
2.15	472	2460	sand to silty sand	
2.40	489	2388	sand	
2.65	479	1937	sand	
2.90	485	1591	sand to silty sand	
3.41	462	2394	silty sand to sandy silt	
3.67	460	3670	sandy silt to silty clay	
3.92	464	3833	sand to silty sand	
4.07	504	2528	sand to silty sand	
4.32	493	2554	sand	
4.83	466	4967	sand to silty sand	
5.08	487	3408	silty sand to sandy silt	Not-Detected by TRPH 9073
5.35	506	3237	silty sand to sandy silt	Not-Detected by TRPH 9073
5.60	487	6343	sandy silt to silty clay	Not-Detected by TRPH 9073
5.86	483	7909	sandy silt to silty clay	Not-Detected by TRPH 9073
6.10	481	6341	silty sand to sandy silt	Not-Detected by TRPH 9073
6.36	489	4830	silty sand to sandy silt	Not-Detected by TRPH 9073
6.61	489	3823	silty sand to sandy silt	Not-Detected by TRPH 9073
6.86	485	3389	sand to silty sand	
7.12	476	2992	sand to silty sand	
7.36	481	2470	sandy silt to silty clay	
7.86	479	3559	sandy silt to silty clay	
8.11	483	9021	silty sand to sandy silt	
8.36	483	9118	sandy silt to silty clay	
8.62	485	6634	sand to silty sand	
8.88	483	4937	sand to silty sand	
9.15	485	2797	sand to silty sand	
9.39	483	1751	sand to silty sand	
9.91	487	1256	sand to silty sand	
10.16	466	1312	sand to silty sand	
10.65	464	1142	sand to silty sand	

Summary data based on field data that was collected using SCAPS

SCAPS LIF and Geotechnical Data

Push Id	**EARL1629.CSV**	**North Coordinate (feet):**	523380.4
Date Started:	Friday, November 03, 1995	**East Coordinate (feet):**	588252.11
Time Started	10:09 PM	**Elevation (feet):**	0
		Fluorescent Threshold (counts)	**1673**

Depth (feet)	Peak Wavelength (nm)	Normalized Intensity	Soil Classification based on CPT data	Interpretation
10.90	476	1263	sand to silty sand	
11.17	481	1238	sand to silty sand	
11.42	485	1352	sand to silty sand	
11.67	485	1282	sand to silty sand	
11.93	481	1313	sand to silty sand	
12.18	483	1311	sand to silty sand	
12.43	472	1385	sand to silty sand	
12.69	479	1371	sand to silty sand	

Summary data based on field data that was collected using SCAPS