US Army Corps
of Engineers
Philadelphia District

PEARCE CREEK CONFINED DISPOSAL FACILITY MODIFICATION

CECIL COUNTY
MARYLAND

GEOTECHNICAL DESIGN NARRATIVE

INITIAL SUBMISSION
JUNE 2014

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CECIL COUNTY, MARYLAND
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PREPARED BY:

UNITED STATES ARMY CORPS OF ENGINEERS
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Geotechnical Design Narrative

1. Introduction

The Pearce Creek Confined Disposal Facility (CDF), operated by the U.S. Army Corps of Engineers, Philadelphia District, is located in Cecil County, Maryland along the eastern shore of the Chesapeake Bay, south of the Chesapeake and Delaware (C&D) Canal. The facility was constructed at the confluence of Pearce Creek and the Elk River. The Pearce Creek CDF is one of several CDFs used to contain materials resulting from periodic dredging to maintain navigable depths in the C&D canal, Elk River and Chesapeake Bay as shown in Figure 1.

Figure 1 – Site Map

In an effort to obtain a "Water Quality Permit" to place dredged materials within the CDF, several studies were conducted to determine the extent of the connection between groundwater quality within the CDF and the surrounding communities. Based on these studies, it was determined that a liner system would be installed within the CDF to isolate newly placed dredged material from the underlying aquifer. In conjunction with this liner placement, other aspects of the CDF will be improved prior to resuming dredged material placement operations at the Pearce Creek CDF. These improvements include:

- Clearing and grubbing of existing vegetation within the interior of the CDF
- Grading of the existing perimeter dikes to elevation of 50 ft NAVD88
- Relocation of the existing sluice and associated outlet works
- Re-grading the interior of the CDF to accommodate the outlet works relocation
- Installation of an impervious liner system

2. Proposed Alterations

The existing containment dike varies in elevation from 43 to 50 feet NAVD88. The interior topography is currently sloped to drain to the southeast towards the existing sluice (Figure 2). Drainage ditches along the outer perimeter of the CDF are sloped to drain stormwater runoff from the containment dike to Pearce Creek Lake.

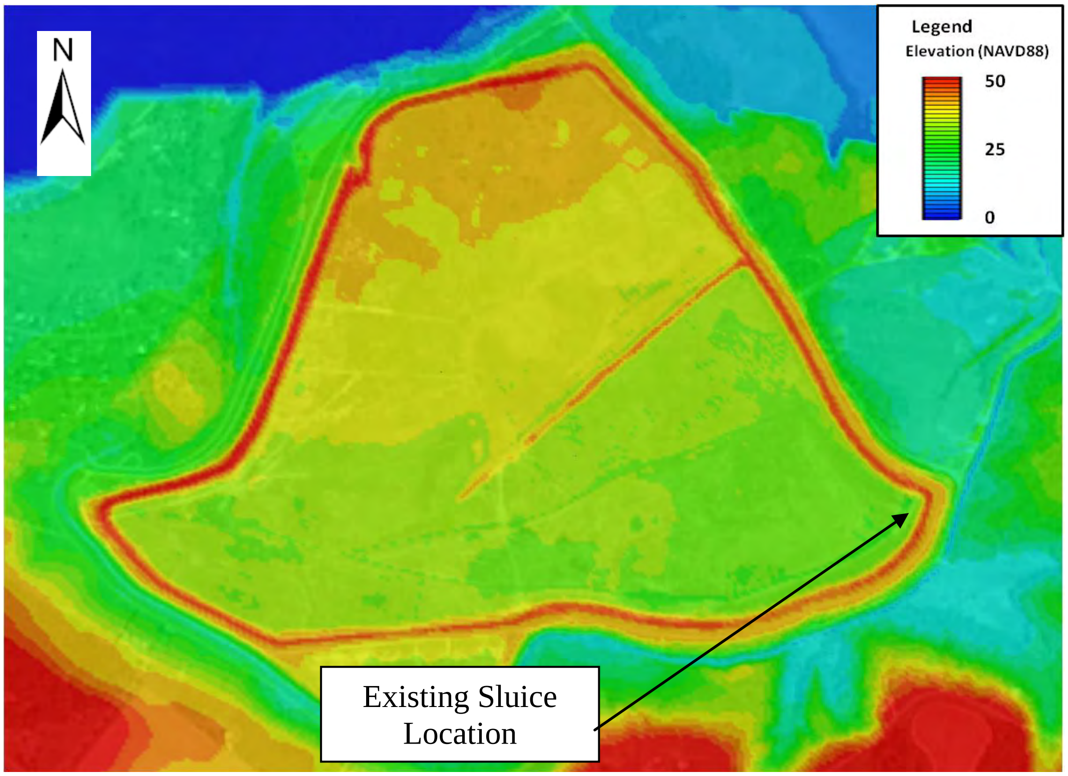

Figure 2 – Pre Construction Grades

As part of the improvements being implemented at the Pearce Creek CDF, the location of the sluice and associated piping is being relocated. This modification will relocate the sluice from the southeast corner of the CDF to the north, adjacent to the Elk River (Figure 3). The liner system and interior topographic contours will be graded to allow positive drainage to the new sluice location resulting in cuts of up to 18 feet and fills on the order of 10 feet. Water resulting from dredge disposal operations and stormwater falling within the 260 acre containment will flow out of the new sluice, through 4, 36-inch diameter outflow pipes, and discharge to the Elk River over an improved riprap outlet.

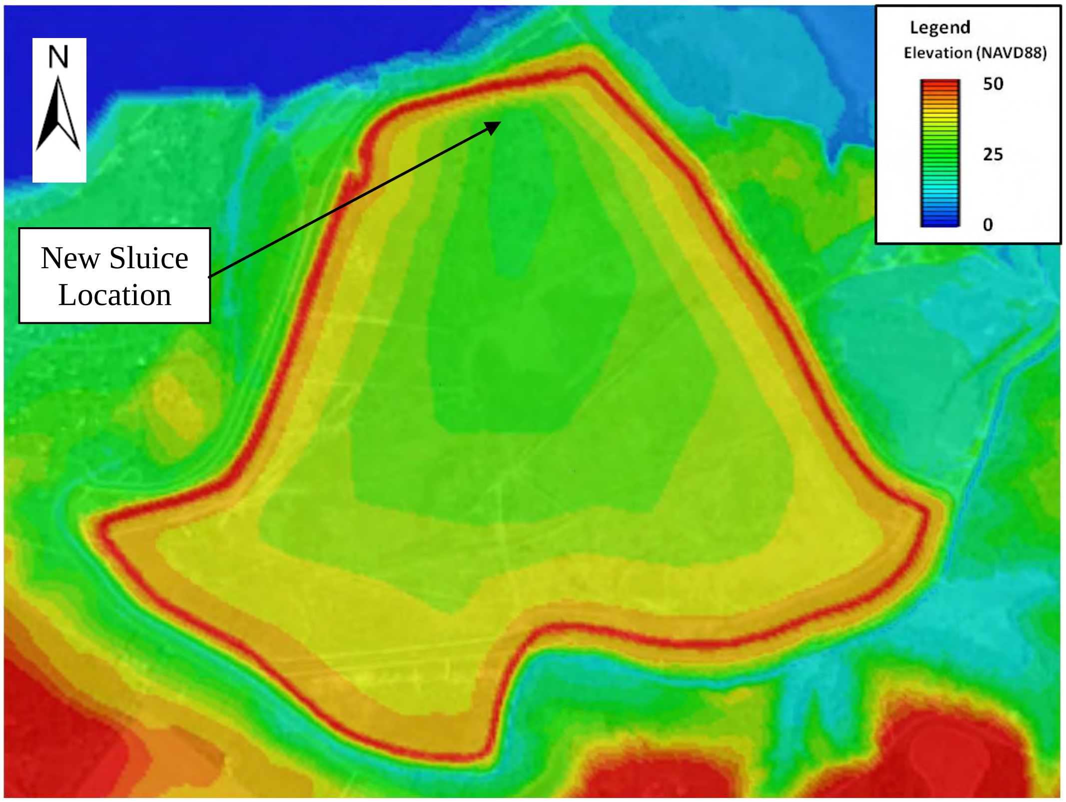

Figure 3 – Post-Construction Grading

3. Subsurface Conditions

Numerous geotechnical and groundwater studies have been conducted in the past within the Pearce Creek CDF project limits. These reports included a 1988 field investigation performed by Urban Engineers, Inc. (UEI), a 1996 report titled "Subsurface Investigation, Pearce Creek Disposal Area" prepared by Black & Veatch Special Projects Corporation (B&VSPC), a 1996 USACE generated report titled "Phase II Report, Pearce Creek Disposal Area, Groundwater

Investigation", a 1997 report prepared by Woodward-Clyde Consultants (Woodward-Clyde) titled "Final Laboratory Test Results", a 1999 feasibility study performed by Duffield Associates (Duffield) titled "Long Term Life Cycle Evaluation of Pearce Creek Dredged Material Containment Area", a 2009 report performed by EA Engineering, Sciences and Technology, Inc. (EA) titled "Sampling Report for Soil Sampling at Pearce Creek Dredged Material Containment Area", and a 2013 report prepared by Kleinfelder titled "Subsurface Exploration Report, Pearce Creek Confined Disposal Facility".

In general, the subsurface soils underlying the CDF are comprised of dredged materials underlain by natural localized tidal marsh deposits and interlayered sand and clay strata. The dredged material is typically about 25 to 35 feet in thickness extending from the ground surface (ranging from about elevation (EL) +40 to +30) to about EL 0, with localized deposits extending to about EL -10. Very localized tidal marsh deposits ranging from 5 to 20 feet in thickness were encountered below the dredged materials and typically consisted of fibrous and fine grained peat (PT), organic silt (OL), and organic clay (OH). The dredged materials and/or locally encountered tidal marsh is underlain by an "upper" sand strata extending to EL -20 to -90 depending on location. The upper sands are underlain by variable thickness of interlayered clay and sand strata extending to the maximum depths explored to about EL -170 feet. Groundwater levels generally range from approximately EL +10 to +2, with localized perched water levels as high as EL +18. Boring logs and approximate subsurface soil profiles developed for the analyses are presented in Appendix A.

4. Soil Parameters

Geotechnical design parameters were based on the available existing field and laboratory test data obtained from the aforementioned studies. A summary of the laboratory test results is presented in Appendix B. The soil parameters presented in Table 1 are the values used in the settlement analyses. A discussion regarding selection of these values is provided in the following paragraphs.

Table 1. Soil Properties

Material	Total Unit Weight	Consolidation Parameters				Standard Penetration Values	
	γ (pcf)	C_c'	C_α	OCR	C_v (ft^2/day)	Lower Limit	Upper Limit
Dredged Material	110	0.25	0.0025	1	1.5	0	5
Tidal Marsh	105	0.25	0.0025	1	1.5	0	5
Upper Sands	110	N/A	N/A	N/A	N/A	15	30
Upper Clays	110	0.18	0.0018	1	1.5	10	20
Intermediate Sands	115	N/A	N/A	N/A	N/A	40	75
Intermediate Clays	120	0.15	0.0015	1	1.5	20	40
Lower Sands	120	N/A	N/A	N/A	N/A	75	100
Lower Clays	125	0.1	0.001	1	1.5	40	100

4.1 Total Unit Weights

Total unit weights were plotted from laboratory data provided in the various reports for summarized in Appendix B. Considerable scatter was evident in the unit weights, which ranged from about 98 pcf to 138 pcf. Water content data was also plotted, indicating a range from about 16% to 109%. However, when considering material type, the total unit weight for the dredged material ranged from 100 to 132 pcf, 100 pcf to 125 for the tidal marsh material; 100 pcf to 138 pcf for the natural clay/silts; and 97 pcf to 120 pcf for the natural sands.

4.2 Consolidation Parameters

4.2.1 Compression Ratio, C_c'

Compression ratio, C_c', $\left(C_c' = {}^{C_c}\!/_{1+e_0}\right)$ values were plotted from laboratory data provided in the various reports. Considerable scatter was evident in the values, which ranged from about

0.08 to 0.28. These values corresponded with samples obtained at elevations ranging from about +18 ft to +35 ft, thus indicating that they were representative of the dredged materials only. In the interest of being conservative, a value of 0.25 was selected for the dredged materials.

In the absence of applicable testing data, the tidal marsh strata was characterized by guidance provided in DM7-1, which reports such soils as having C_c' values that range from 0.1 to 0.25. A value of 0.25 was selected in an effort to be conservative.

To arrive at a compression ratio value for the natural clays, Skempton's approximation for the consolidation index of clay based on liquid limit data, which states $C_c = 0.009(LL - 10)$, was used. With liquid limits ranging from 25% to 80%, C_c ranged from 0.135 to 0.63. An initial void ratio of 1.5, based on guidance provided in NAVFAC DM-7.1, was used to convert these C_c (compression index) values toC_c' (compression ratio). Thus C_c' ranging from 0.06 to 0.25 was obtained. Based on the relatively high STP values, C_c' of 0.10 to 0.18 were selected, with values decreasing with depth.

4.2.2 Coefficient of Secondary Compression, C_α

Coefficients of secondary compression were obtained by applying the relationship $\frac{C_\alpha}{C_c} = 0.01 to\ 0.085$, which is provided in EM 1110-1-1904. Thus, C_α ranging from 0.0010 to 0.0025 were selected for all compressible materials, with C_α decreasing with depth. For the purposes of converting C_α to C_α' $\left(C_\alpha' = \frac{C_\alpha}{1+e_f}\right)$, a value of 0 was selected for e_f in the interest of conservatism.

4.2.3 Overconsolidation Ratio, OCR

For the purpose of this design, all compressible materials were considered to be normally consolidated. The DMT data provided by Duffield, though highly variable, suggests that the average OCR value for the dredged materials is about 1. As there is no available OCR data at depths below the dredged materials, an OCR of 1 was selected. Conceptually this value is reasonable, as a pre-consolidation stress exceeding the in-situ stresses at depths greater than 50 feet or more is unlikely.

4.2.4 Coefficient of Consolidation, C_v

Coefficients of consolidation were plotted from laboratory data provided in the various reports for undisturbed samples; refer to Appendix B. For a loading condition of 4000 psf, a C_v of 1.5 ft^2/day was selected.

4.3 Standard Penetration Testing

Standard Penetration Testing (SPT) was performed in several of the borings advanced within the CDF. The SPT N value of the dredged materials and the tidal marsh area generally ranged from 0 to 5 blows, indicating very soft to medium stiff soils.

The sand layers exhibited a wide range of N values, with generally increasing values with depth. When breaking the sands into three general strata, an upper, intermediate and lower region, the range of N values narrowed, with 15 to 30 blows characterizing the upper sands, 40 to 75 blows characterizing the intermediate sands, and 75 to 100 blows characterizing the lower sands.

The same trend is true of the clays. When breaking the clays into three general strata, an upper, intermediate and lower region, the range of N values narrowed, with 10 to 20 blows characterizing the upper clays, 20 to 40 blows characterizing the intermediate clays, and 40 to 100 blows characterizing the lower clays.

5. Settlement

Settlement under load can be classified according to two major types: immediate, or elastic, settlement and two phases of consolidation settlement, primary and secondary. Elastic settlement takes place during or immediately after the application of the load where as consolidation settlement is time dependant and takes place as the result of the extrusion of the pore pressure being removed from the saturated clayey soils. Typically, immediate or elastic settlement occurs in granular soils (i.e. sands) and consolidation settlement is attributed to cohesive materials such as silts and clay.

To evaluate the settlement of the proposed liner under the loading imposed by future placement of dredged materials, dike raisings, etc. the immediate settlement of the underlying natural sands and consolidation settlement of the dredged material, tidal marsh and natural silt/clay deposits was calculated. The materials underlying the liner expected to contribute the majority of the settlement beneath the proposed liner system are comprised of the soft, compressible, dredged materials. In general, the expected elastic or immediate settlement of the natural sands and consolidation of the stiff to hard natural clayey soils are expected to contribute little to the overall settlement over the life of the liner system.

Estimates for immediate settlement were performed using Schmertmann's method for calculating immediate settlements. Consolidation for primary and secondary analyses was performed following procedures outlined in EM 1110-1-1904. Settlement calculations were performed by developing an excel spreadsheet that utilizes the Schmertmann and consolidation settlement theory which is detailed in Appendix C. The input and output data from the excel spreadsheet analyses is also included in Appendix C.

Due to the high variability in the strata thicknesses, it is expected that the magnitude of computed overall settlement could vary significantly. To conservatively account for the potential of large differential settlement, computations assuming variations of stratum thicknesses were performed to develop a "most" and "least" case basis for settlement of the dredged materials and natural soils. These scenarios were developed by inspecting several cross section subsurface soil profiles and determining areas that resulted in these extreme values. Settlement calculations assumed a potentially compressible zone to depths of approximately 170 feet deep, corresponding to about elevation -130 ft elevation. Table 3 summarizes the "most" and "least" case settlements for both the dredged materials and the natural soils.

Table 3. Total Settlements

Layer	**Least Case (in)**	**Most Case (in)**
Dredged Material	49	69
Tidal Marsh	0	22
Natural Soils	7	14
TOTAL	**56**	**105**

However, it is our opinion that the most case settlement values are not likely to be realized, as these calculations assume that the entire 4000 pounds per square foot load is placed instantaneously. In reality, this load will be placed incrementally over at least a 25 year period, thus reducing total settlements. Additionally, our analysis does not account for buoyancy effects during consolidation, which would also reduce total settlements.

6. Liner Analyses

6.1. Liner System

The proposed liner system will be comprised of a 40 mil Linear Low Density Polyethylene (LLDPE) geomembrane with 16 ounce/square yard non-woven needle punched geotextile placed both above and below the membrane. The geomembrane will serve as the impermeable boundary between the proposed dredged materials and underlying aquifers while the geotextile layers will be utilized for cover and subgrade protection and to vent the base of the of membrane from the remote chance of an accumulation of gases which may emit from the underlying soils. The following evaluation, design calculations, and criteria are from "Designing with Geosynthetics", Volumes 1 & 2, authored by Dr. Robert M. Koerner. Calculation for membrane thickness, strain, anchorage, side slope soli cover stability and gas venting are presented in Appendix D.

6.2. Geomembrane Thickness

The geomembrane material will be installed on a graded soil subgrade free of surface protrusions, rocks, etc. The geomembrane will also be “sandwiched” between an upper and lower layer of 16 oz/sy geotextile which will also provide a clean working surface and added protection from puncture during field placement and placement of the protective cover soils. Since the liner material will be protected from tear and puncture during construction, the liner thickness must be selected to withstand subsurface deformations that the liner may be subject to over the service lifetime. It is expected that deformation will be caused by differential settlement from the underlying dredged materials and natural sand and clay deposits. Extremely conservative estimates of the least and most case settlement analyses results in settlements ranging from approximately 56 to 105 inches, which potentially equates to differential settlements up to 49 inches. Based on a maximum loading of 4,000 pounds per square foot from future dike raising and dredged material placement, a differential settlement angle of 45 degrees was conservatively chosen in the event abrupt changes in subsurface conditions are present. However, this value is very unlikely as any differential settlement will most likely occur over several hundred feet which would result in less abrupt angles of 25 degrees, or less. The thickness of the geomembrane was conservatively calculated based on these values resulting in a required thickness of 34 mils, thus the proposed 40 mil liner is adequate.

Additionally, axis-symmetric tensile strain was evaluated for the condition of out of plane stresses. This procedure takes into consideration a center point deflection (settlement) over a specified circular area. Again, to be conservative, a deflection, or settlement of 120 inches (10 feet) over a 50 foot radius was evaluated, which would be very unlikely to occur. The resulting strain was computed to be approximately 10 percent, which is much less than typical yield strain of 40 percent or more determined from testing performed on 40 mil LLDPE membranes. If this magnitude of settlement were to occur over more realistic lengths of 200 to 500 feet, the actual strain is significantly reduced to less than 1 percent (0.67 and 0.11 percent respectively).

6.3. Geomembrane Anchorage and Side Slope Cover Soil Stability

The proposed liner design incorporates the membrane running up the embankment dike slope of 3 horizontal to 1 vertical and being anchored in place at elevation +47 feet beneath 3 feet of perimeter dike fill. The proposed design has the liner transversing the dike horizontally for under the 3 feet of fill for a minimum of 10 feet. Based on the calculations, the minimum length of geomembrane runout without an anchor is 6 feet.

Based on the proposed grading of the interior of the CDF, 3 to 1 horizontal to vertical side slopes ranging from approximately 38 to 90 feet in length are required. The resulting factors of safety for stability of the cover soil over the proposed slopes ranged from 1.8 to 1.6, respectively.

6.4. Gas Venting

Due to the impermeable nature of a geomembrane liner, subsurface generated gases caused either by the biodegradaton of organic material in the subsurface soils below the liner or by fluxuations (rising) in groundwater levels that expel air in the soil voids upward. Based on the available subsurface data, the existing dredged materials to be covered are generally not organic in nature. Further, only localized pockets of tidal marsh deposits (i.e. organic silts and clayey soils) are present. Consequently, it is anticipated that the generation of gases will be limited. However, to address the concern of venting gases which could be collected beneath the liner the transmissivity of the geotextile was evaluated.

Based on numerous studies undertaken to determine the effects of global warming from natural sources (Svensson and Rosswell 1984, Harriss et al. 1985, Crill et al. 1988, Morrissey and Livingston 1995) and the "Proposed Regulatory Framework for Evaluatoin of the Methane Hazard Dute to Vapor Intrusion" typical emission fluxes for methane have been estimated for wetlands, marsh deposits, etc. The emission flux for methane reportedly ranged from approximately $2.4x10^{-8}$ to $1.3x10^{-5}$ m^3/m^2-day. Assuming the greatest gas volume generation, the proposed 16 oz/sy non-woven geotextile to be used under the geomembrane will have a factor of safety of over 5 considering the geotextiles allowable transmissivity. This is considered adequate to move the gas to a passive venting system established at the top of the surrounding perimeter dikes.

6.5. Compatibility

In its various densities, (high density, linear medium-density, and linear low-density) polyethylene is the most widely used polymer in the manufacturing of geomembranes. These membranes are manufactured and distributed throughout the world. A wide range of geomembranes have been developed, all of which relate to the primary function of a material being “impermeable”. In the case of liquid waste containment, the competing material is natural or amended clay which has a targeted hydraulic conductivity (permeability) of $1x10^{-9}$m/s. The permeability of typical geomembranes is on the order of $1x10^{-11}$m/s to $1x10^{-14}$m/s.

Significant research and testing has been performed by manufacturers, the geosynthetic institute and academia to evaluate the ability of a geomembrane to resist strain, puncture, and ultraviolet and chemical degradation. Included in Appendix F, Chemical Resistance to Polyethylenes, the table provides information on the probable performance of a LLDPE geomembrane under normal conditions. Based on the available information, the composition of the dredged materials (slightly acidic nature) will be much less caustic than any of the industry compounds listed which meet acceptable performance criteria. As such, geomembranes are commonly used for containment of sewage sludge, radioactive or hazardous waste liquids and liners for primary, secondary and/or tertiary solid waste landfills and waste piles.

The proposed subgrade elevation that the liner will be established atop will be sloped to the sluice structure to promote positive drainage. In addition to providing a protective cushion, the 16 ounce nonwoven geotextile will also function as a drain because of the materials transmissivity. The liner will be mechanically attached or bonded to the top of the sluice foundation slab to allow for water atop the liner and saturated protective cover materials to drain directly into the sluice structure. Since the geomembrane is resistant to harsh chemicals, degradation of the liner will not be a concern if water were to remain in contact with the membrane as the result of localized differential settlement. It our understanding that any local pools/puddles that may occur at the ground surface would be mitigated by maintenance grading activities performed to facilitate drying of the dredged materials.

7. Perimeter Dike Slope Stability

A geotechnical study by Duffield Associates was conducted to evaluate the stability of the perimeter dikes assuming dredged materials are placed to within 2 feet of the dike crest at approximately elevation 50 as well as the stability of the dikes assuming the dikes are raised approximately 5 to 8 feet, to elevation 58 feet.

The analysis concluded that adequate factors of safety of 1.3 to 2.7 for the exterior slopes and factors of safety of 1.2 to 2.3 for the interior slopes exist for the proposed slope configuration. These values are based on the strength of the dredged materials within the CDF from laboratory testing conducted over 15 years ago. Typically, as the dredged materials consolidate and dry, these materials exhibit strength gain, thus it is likely that these factors of safety have actually increased over those calculated by Duffield Associates. The "Analysis of Existing Dikes" dated September 1999 is included in Appendix E.

8. References

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2. Department of the Navy, Naval Facilities Engineering Command (1982). “Soil Mechanics.” *NAVFAC DM-7.1*, Alexandria, VA.

3. Duncan, J.M., and Buchignani, A.L. (1987). *An Engineering Manual for Settlement Studies*, Department of Civil and Environmental Engineering, Virginia Polytechnic Institute and State University.

4. Duncan, J.M. and Wright, S.G. (2005). *Soil Strength and Slope Stability*, John Wiley & Sons, Inc., Hoboken, New Jersey.

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Appendix A

Subsurface Data

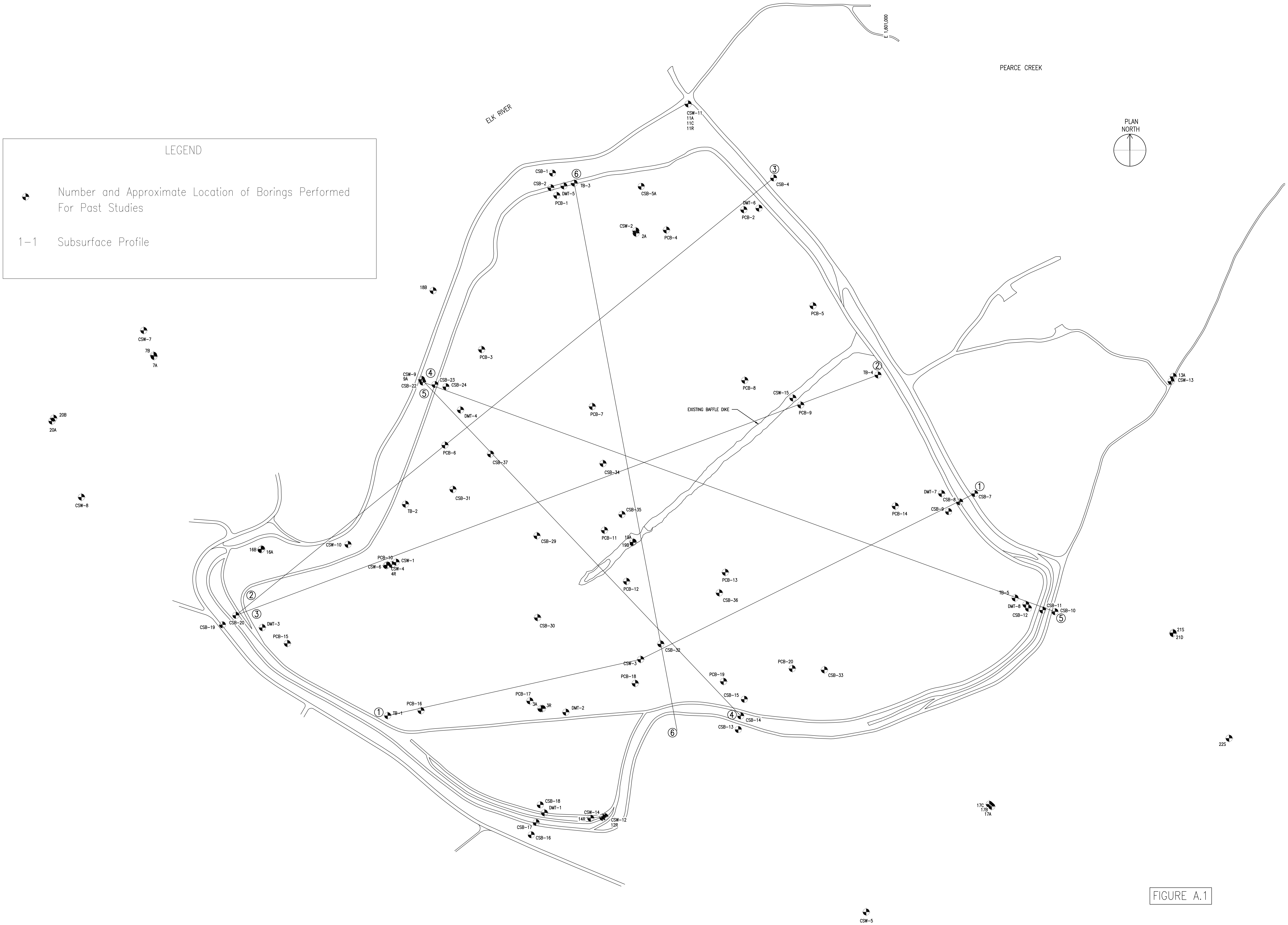
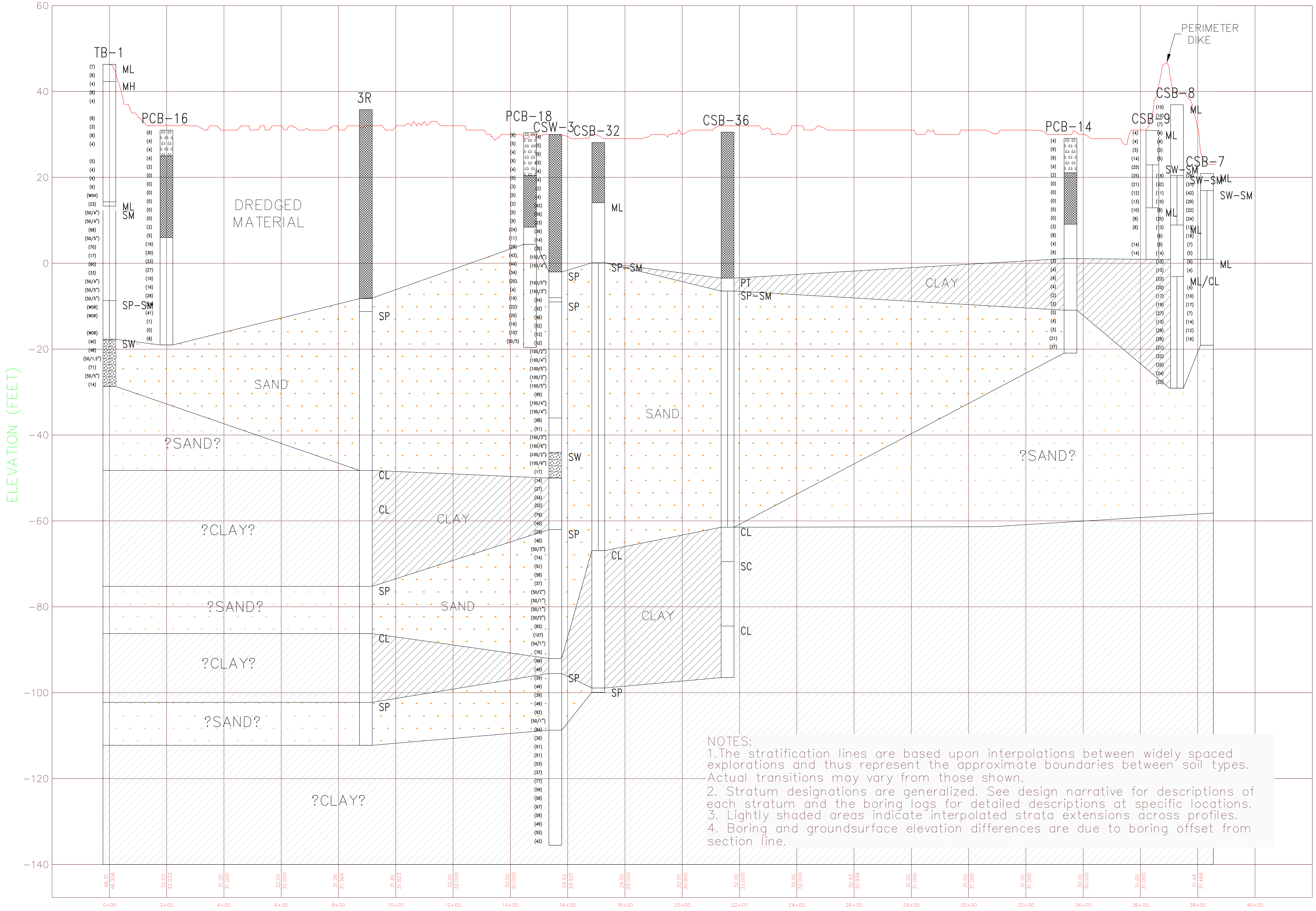

LEGEND
Number and Approximate Location of Borings Performed For Past Studies
1-1 Subsurface Profile
ELK RIVER
PEARCE CREEK
PLAN NORTH
E 1,601,000
EXISTING BAFFLE DIKE
CSW-11
11A
11C
11R
CSB-1
CSB-2
DMT-5
PCB-1
TB-3
CSB-5A
CSB-4
DMT-6
PCB-2
CSW-2
2A
PCB-4
18B
CSW-7
7B
7A
PCB-3
CSB-5
PCB-5
CSW-9
9A
CSB-22
CSB-23
CSB-24
DMT-4
PCB-7
PCB-8
CSW-15
PCB-9
TB-4
13A
CSW-13
20B
20A
PCB-6
CSB-37
CSB-34
CSW-8
TB-2
CSB-31
CSB-35
PCB-11
19A
19B
CSB-29
DMT-7
CSB-8
CSB-7
CSB-9
PCB-14
CSW-10
16B
16A
PCB-10
CSW-1
CSW-6
CSW-4
4R
PCB-13
PCB-12
CSB-36
TB-5
DMT-8
CSB-11
CSB-10
CSB-12
CSB-19
CSB-20
DMT-3
PCB-15
CSB-30
CSB-32
CSW-3
21S
21D
PCB-18
PCB-20
CSB-33
PCB-19
CSB-15
PCB-17
3A
3R
DMT-2
PCB-16
TB-1
CSB-14
CSB-13
22S
CSB-18
DMT-1
CSW-14
14R
CSW-12
12R
CSB-17
CSB-16
17C
17B
17A
CSW-5
①
②
③
④
⑤
⑥

FIGURE A.1



NOTES:
1.The stratification lines are based upon interpolations between widely spaced explorations and thus represent the approximate boundaries between soil types. Actual transitions may vary from those shown.
2. Stratum designations are generalized. See design narrative for descriptions of each stratum and the boring logs for detailed descriptions at specific locations.
3. Lightly shaded areas indicate interpolated strata extensions across profiles.
4. Boring and groundsurface elevation differences are due to boring offset from section line.

SUBSURFACE PROFILE 1

FIGURE A.2

NOTES:

1. The stratification lines are based upon interpolations between widely spaced explorations and thus represent the approximate boundaries between soil types. Actual transitions may vary from those shown.
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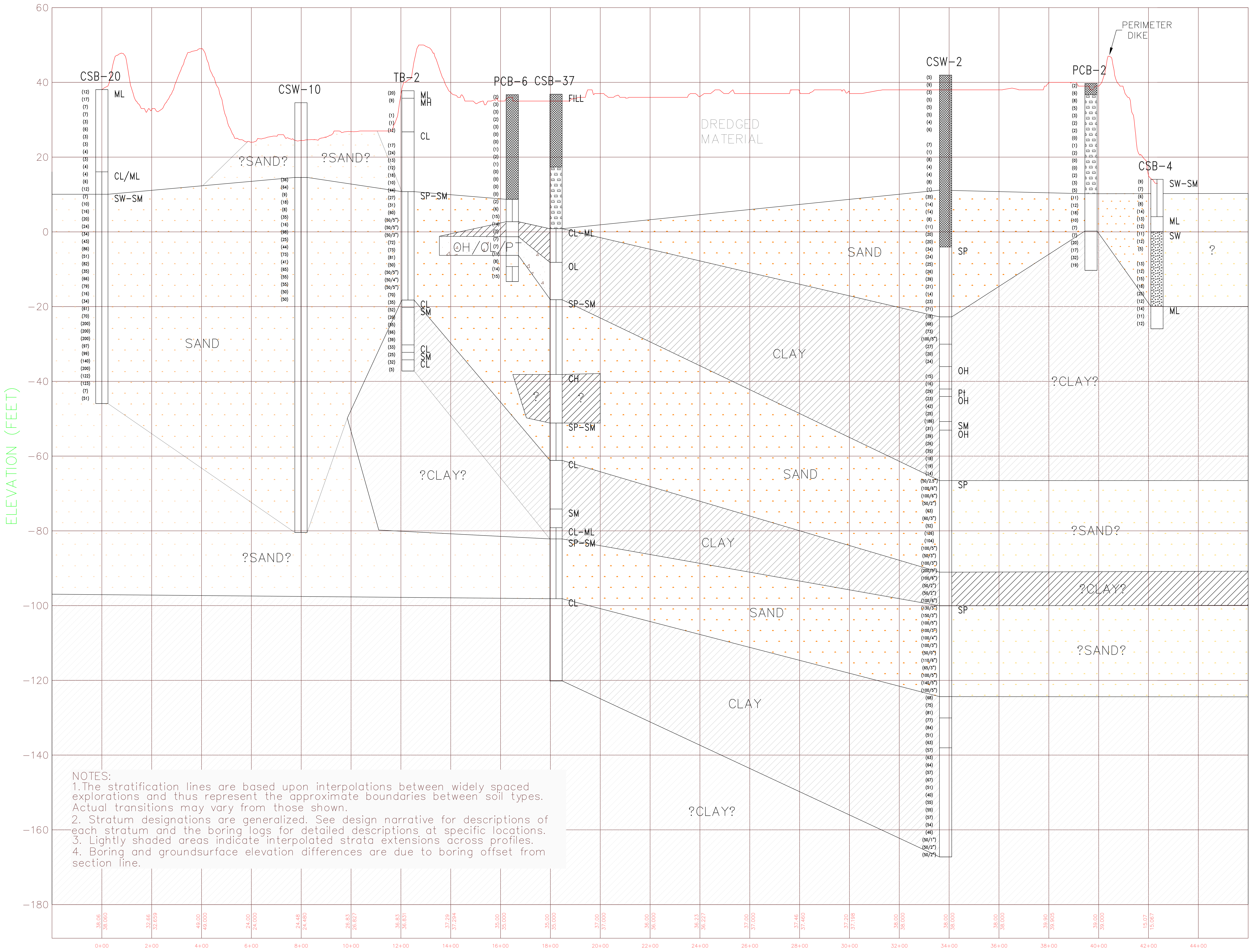
3. Lightly shaded areas indicate interpolated strata extensions across profiles.
4. Boring and groundsurface elevation differences are due to boring offset from section line.

SUBSURFACE PROFILE 2

FIGURE A.3



NOTES:
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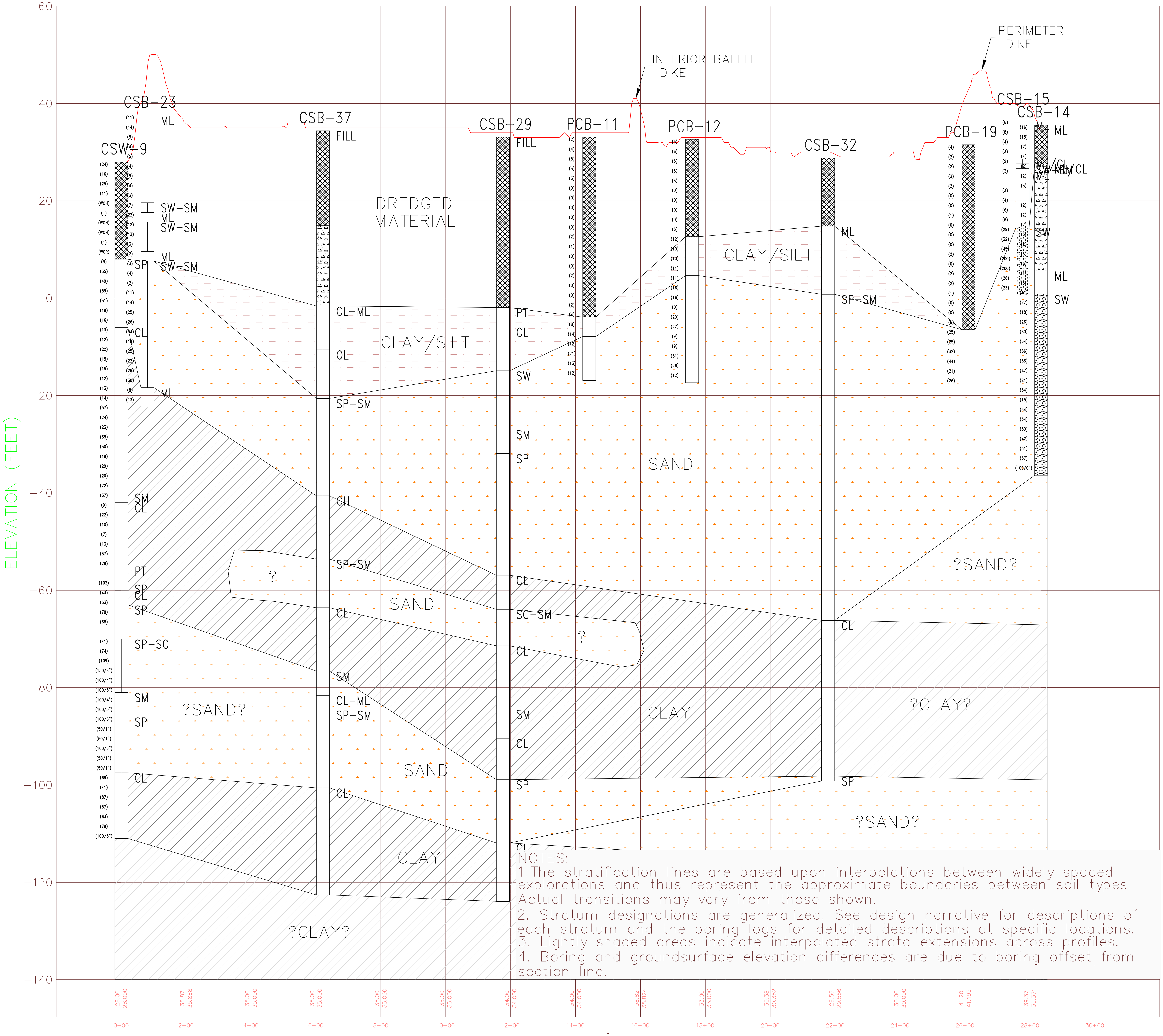
SUBSURFACE PROFILE 3

FIGURE A.4



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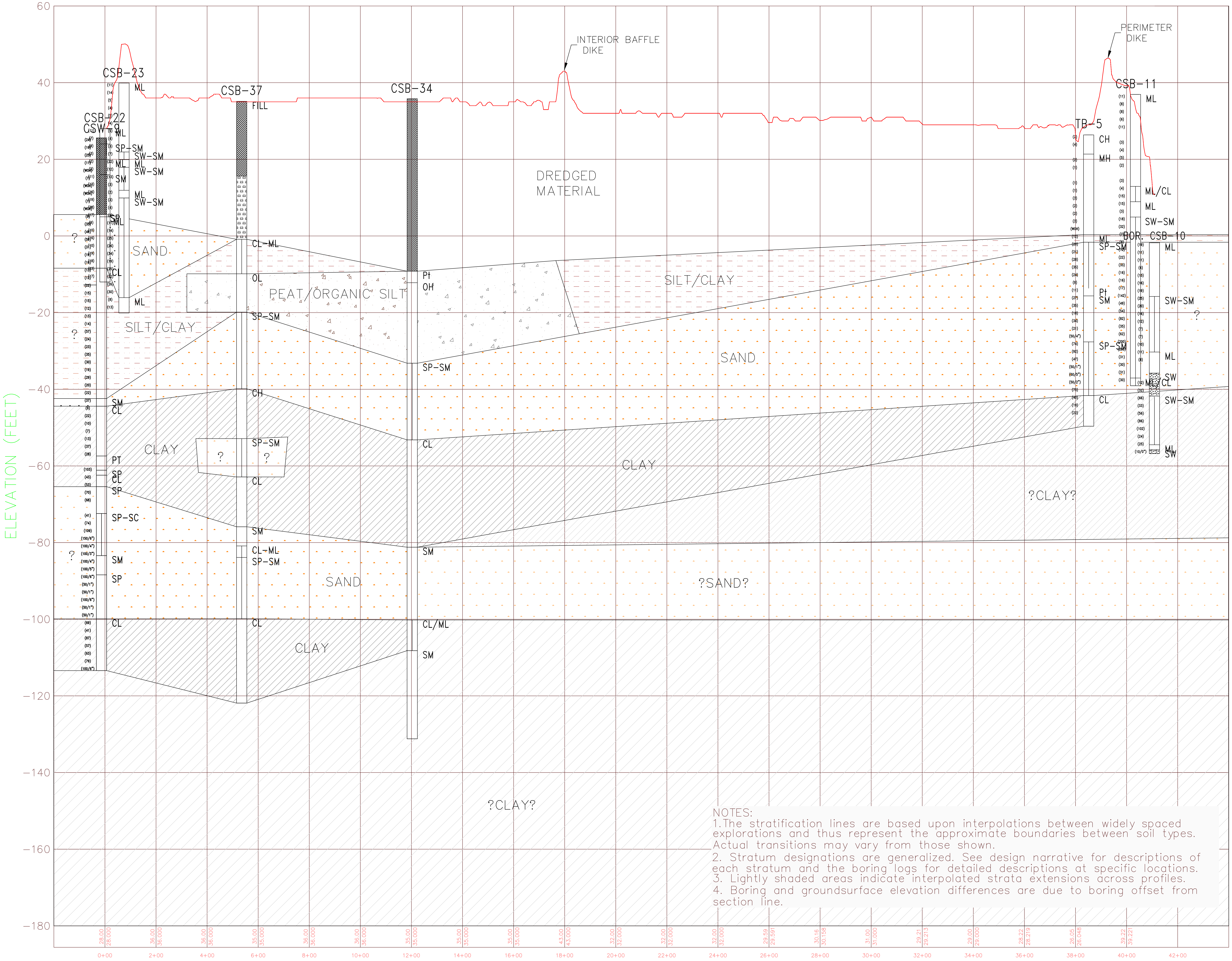
4. Boring and groundsurface elevation differences are due to boring offset from section line.

SUBSURFACE PROFILE 4

FIGURE A.5



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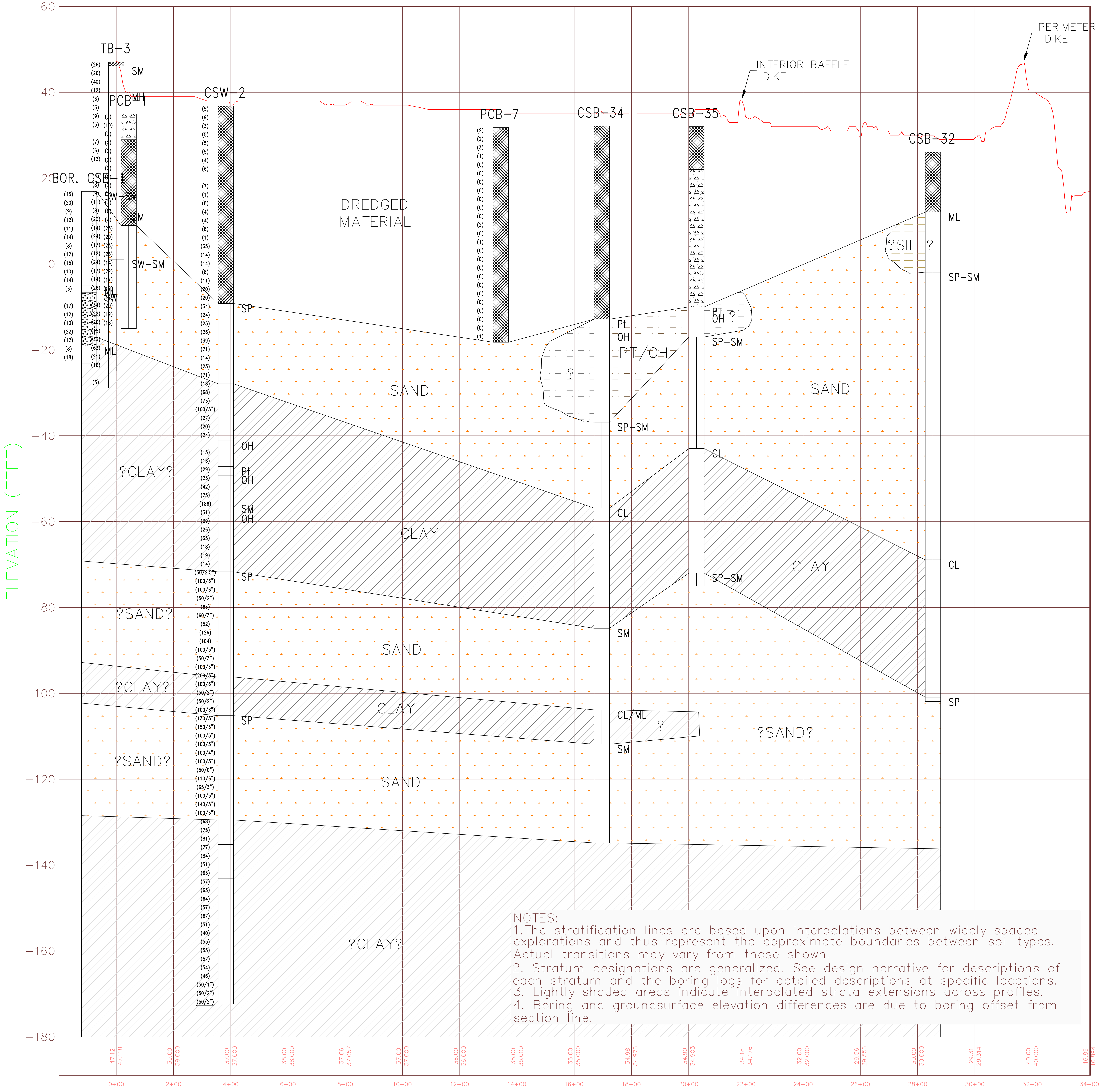
SUBSURFACE PROFILE 5

FIGURE A.6



NOTES:
1. The stratification lines are based upon interpolations between widely spaced explorations and thus represent the approximate boundaries between soil types. Actual transitions may vary from those shown.
2. Stratum designations are generalized. See design narrative for descriptions of each stratum and the boring logs for detailed descriptions at specific locations.
3. Lightly shaded areas indicate interpolated strata extensions across profiles.
4. Boring and groundsurface elevation differences are due to boring offset from section line.

SUBSURFACE PROFILE 6

FIGURE A.7

Hole No. CSB-1

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF SHEETS

1. PROJECT Pearce Creek Disposal Area
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY Froehling & Roberston
4. HOLE NO. (As shown on drawing title and file number) CSB-1
5. NAME OF DRILLER John Organ
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN --
8. DEPTH DRILLED INTO ROCK --
9. TOTAL DEPTH OF HOLE 40.0'
10. SIZE AND TYPE OF BIT 2" split spoon
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL CME 55
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 19 UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES --
15. ELEVATION GROUND WATER
16. DATE HOLE STARTED 6-29-88 COMPLETED 6/30/88
17. ELEVATION TOP OF HOLE --
18. TOTAL CORE RECOVERY FOR BORING -- %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Brown coarse to fine SAND, few pieces interlayed silt & clay (Red and grey) Dry	5-6 9-9	S-1 0.8'	Start drilling at 1:30 p.m. Boring hole (39.5') from base of slope
	2		Same, reddish brown with, little fine gravel	8-10 10-12	S-2 1.0'	
	4		Reddish brown fine SAND, little silt moist w/mica	3-4 5-5	S-3 1.0'	
	6	SW SM	Brown fine SAND, few pieces interlayeved silt, (red & gray) trace gravel	6-5 7-8	S-4 1.0'	
	8		Brown mostly fine SAND, little silt, moist	5-5 6-9	S-5 1.0'	
	10		Brown coarse to fine sand, trace red gray silty clay, trace gravel	6-7 7-7	S-6 1.0'	ground water 10.5 Static
	12		Same	2-4 4-7	S-7 1.0'	
	14		Same mostly fine SAND	6-6 6-6	S-8 1.0'	
	16		Grey coarse to fine SAND, few fine gravel trace, silt	7-7 8-7	S-9 1.0'	
	18		Same	4-4 6-8	S-10 1.0'	
22.0'	20		Same	7-8 6-4	S-11 1.0'	
23.5'	22	ML	Grey black organic SILT, w/roots, wood fiber, trace f sand	1-2 4-4	S-12 1.5	
	24		Gray SAND & organic silt, w/roots, mica	Light Mach	np-1 1.9'	
	26	SW	Grey coarse to fine SAND trace silt, trace fine gravel	3-7 10-8	S-13 1.0	
	28		Same, grey brown	5-6 6-8	S-14 1.7'	Stopped at 5 pm
	30		Same	3-3 7-6	S-15 1.0	Start at 7:00 am 6/30/88
	32		Same	8-9 13-13	S-16 1.0'	
36.0'	34		Same	9-7 5-4	S-17 1.0	Hole collapsed at 36.0'
	36	ML	Dark grey SILT, organic w/ woody pieces, little coarse to fine sand, trace fine quarel	4-4 4-3	S-18 1.0'	After completion of boring
	38 40		Grey fine SAND & Silt organic smell, trace of gravel	5-8 10-11	S-19 1.0'	finished hole 9am 6/30/88

bottom of hole 40.0'

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

TRANSLUCENT

PROJECT Pearce Creek Dis. Area

HOLE NO. CSB-1

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 2 SHEETS

1. PROJECT Pearce Creek Disposal Area
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY Froehking & Roberston
4. HOLE NO. (As shown on drawing title and file number) CSB-2
5. NAME OF DRILLER John Organ
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 72.0'
10. SIZE AND TYPE OF BIT 2" Split Spoon
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL CME 55
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 36- UNDISTURBED --
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE STARTED 6/30/88 COMPLETED 7/1/88
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0 2		Brown, SILT with sand, w/roots, mica & clay lenses.	3-4 5-6	S-1 1.0'	Started Hole 10:30 am 6/30/88
	4		Brown gray SILT, trace sand, clay lenses, woody fibers	6-6 6-6	S-2 1.5	20' of casing used due to water loss
		ML	Same, moist	2-2 3-3	S-3 1.1	
	6		Same, w/roots	2-2 4-4	S-4 1.8	
10.0	8		Same	2-2 2-3	S-5 1.5	
	10	ML/CL	Same, dark grey w/mica	1-2 1-2	S-6 1.5	
	12		Same, w/reeds & woody fibers	2-2 1-2	S-7 1.5	
	14		Same, moist	2-2 2-2	S-8 1.5	
	16		Same	2-1 1-2	S-9 1.5	
	18		Same	2-2 3-2	S-10 1.5	
	20		Same, w/reeds, & roots	2-2 2-2	S-11 1.5	
	22		Same laminated, trace fine sand	3-3 2-3	S-12 1.2	
	24		Same, w/roots, wet, trace fine sand	1-2 2-2	S-13 1.5	
28.0	26		Same, wet	2-2 1-2	S-14 1.5	Driller lost fluid at 28.0'
30.0	28	SW SM	Grey brown medium to fine SAND, trace SILT, trace fine gravel	4-5 2-2	S-15 0.4	
32.0	30	ML	dark grey SILT, trace of sand	2-8 9-5	S-16 1.2	
34.0	32	SW SM	Reddish brown mostly fine SAND, little Silt & Clay	5-10 10-7	S-17 1.0'	
36.0	34	ML/CL	red brown gray lensed clayey silt, w/fine sand trace fine gravel	4-5 8-8	S-18 1.0	
	36		Grey fine SAND, little silt	8-8 9-5	S-19 1.0	
	38 40	SW	Brown well graded coarse to fine SAND, little silt	3-3 2-2	S-20 0.9'	

DRILLING LOG (Co Sheet)	ELEVATION TOP OF HOLE	Ho No. CSB-2
PROJECT	INSTALLATION	SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	40	SW SM	Grey SAND, coarse to fine few fine gravel	4-2 2-4	S-21 1.0	
	42		Grey SAND, mostly fine pieces of COAL (possible fill)	2-2 3-4	S-22 1.0	
	44		Same, large piece gravel in spoon	3-2 3-3	S-23 0.6	
	46		Same	4-4 5-6	S-24 0.8	Concluded drilling at 5 pm
	48		Brown grey coarse to fine SAND mostly fine-trace silt & gravel	8-11 10-9	S-25 1.0	7/1 started drilling 7:30am
52.0'	50		same, mostly medium to fine SAND, little silt	6-10 9-0	S-26 1.0	
54.0'	52	ML	dark grey brown SILT, organic w/roots fibers trace fine sand	6-8 10-11	S-27 1.5	
	54		Grey SAND coarse to fine trace silt w/mica	11-10 9-10	S-28 1.0'	
	56		Same, trace fine gravel	9-9 10-8	S-29 1.2'	
	58		Same	4-3 4-5	S-30 1.2'	
	60	SW	Same, little fine gravel few silt	3-4 4-4	S-31 1.0'	
	62		same, trace silt	5-13 20-22	S-32 1.0'	
	64		Same	13-21 32-20	S-33 1.0	
	66		Same	13-15 17-15	S-34 1.0	
	68	SW SM	Grey very fine SAND, w/organic & wood pieces little SILT, mica	5-6 8-8	S-35 1.0'	
	70		Same, trace organics	5-5 3-3	S-36 1.0	Concluded drilling at 1:45
	72		Bottom of hole 72.0'			
	64					
	66					
	68					
	70					
	72					

ENG FORM 1836-A JUN 67	GPO: 1969 OF—329-243	PROJECT Pearce Creek Disposal Area	HOLE NO. CSB-2

DRILLING LOG

DIVISION

INSTALLATION

HOLE NO. CSB-4 [redacted]

SHEET **OF** **SHEETS**

1. PROJECT Pearce Creek Disposal Area

2. LOCATION (Coordinates or Station)

3. DRILLING AGENCY Froelhing & Robertson

4. HOLE NO. (As shown on drawing title and file number) CSB-4

5. NAME OF DRILLER John Organ

6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.

7. THICKNESS OF OVERBURDEN

8. DEPTH DRILLED INTO ROCK

9. TOTAL DEPTH OF HOLE 40.0'

10. SIZE AND TYPE OF BIT 2" Split Spoon

11. DATUM FOR ELEVATION SHOWN (TBM or MSL)

12. MANUFACTURER'S DESIGNATION OF DRILL CME 55

13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 19 UNDISTURBED 1

14. TOTAL NUMBER CORE BOXES

15. ELEVATION GROUND WATER

16. DATE HOLE STARTED 7/7/88 COMPLETED 7/7/88

17. ELEVATION TOP OF HOLE

18. TOTAL CORE RECOVERY FOR BORING %

19. SIGNATURE OF INSPECTOR Kenneth O'Rourke

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0 2		Reddish brown, fine sand little grey silt. trace clay lenses. w/mica	4-4 5-4	S-1 1.0'	Start drilling 7:00a.m.
	4	SW SM	Same,	3-3 4-5	S-2 1.0'	
	6		Same, grey silt, trace	4-3 3-4	S-2 1.0'	
	8		Reddish brown course to fine sand, little silt moist	3-2 6-8	S-4 1.0'	8-0' ground water static
	10		Same, with fine gravel little purple, red clayey silt	8-6 8-8	S-5 0.6'	
	12	ML	Red silt w/grey clay Lenses	6-6 7-8	S-6 1.0'	
	14		Red, brown, grey, purple silt, laminated, little medium to fine sand	4-5 7.8	S-7 1.0'	
	16		Reddish brown coarse to fine sand, little silt,trace gravel	4.4 7.10	S-8 0.8'	Large 2" piece of gravel jammed in spoon re: low recovery
	18	SW	Same, grey brownwet trace silt, trace fine gravel	4-6 6-6	S-9 1.0'	Started losing water at 16.0'mud used
	20		Same , tip of spoon had black organic woody material	3-3 2-1	S-10 1.5'	
	22		Mostly sand top & bottom	light Mach	UP-1 1.9'	
			Grey coarse to fine sand few fine gravel trace silt	4-6 7-10	S-11 1.2'	
	24		Same	9-8 4-4	S-12 1.0'	
	26 28		Same, mostly medium to fine sand	5-6 9-9	S-13 1.0'	
	30		Same, mostly fine sand	7-7 11-13	S-14 1.2'	
	32		Same, coarse to fine sand, little fine gravel trace silt	9-12 13.9	S-15 0.9'	
	34		Same, trace silt	9-7 5-5	S-16 0.8'	
	36	ML	dark grey clayey silt little fine sand	6-7 7-5	S-17 2.0'	
	38		Same,race fine sand	3-6 5-6	S-18 1.5'	36.4' hole collapsed after completion of boring
	40		Same	5-7 5-7	S-19 1.5'	Boring completed at 2:30 pm

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek

HOLE NO CSB-4

Hole No. CSB-5 [redacted]

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 2 SHEETS

1. PROJECT Pearce Creek Disposal Area

2. LOCATION (Coordinates or Station)

3. DRILLING AGENCY Froelhing & Robertson

4. HOLE NO. (As shown on drawing title and file number) CSB-5

5. NAME OF DRILLER John Organ

6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.

7. THICKNESS OF OVERBURDEN --

8. DEPTH DRILLED INTO ROCK --

9. TOTAL DEPTH OF HOLE 74.0'

10. SIZE AND TYPE OF BIT 2" Split Spoon

11. DATUM FOR ELEVATION SHOWN (TBM or MSL)

12. MANUFACTURER'S DESIGNATION OF DRILL CME 55

13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 37; UNDISTURBED 0

14. TOTAL NUMBER CORE BOXES

15. ELEVATION GROUND WATER --

16. DATE HOLE: STARTED 7/12/88; COMPLETED 7/13/88

17. ELEVATION TOP OF HOLE --

18. TOTAL CORE RECOVERY FOR BORING -- %

19. SIGNATURE OF INSPECTOR Kenneth O'Rourke

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0	ML/CL	Brown silt, little fine sand w/roots & mica	6-6 7-8	S-1 1.2'	Start drilling 8:30 a.m.
	2		Same, brown grey	6-9 7-6	S-2 1.5'	
	4		Same, grey moist	3-3 2-3	S-3 1.5'	
	6		Same, trace of organics few fine sand	3-3 1-2	S.4 1.5'	
	8		Same, trace fine sand	1-2 1-3	S-5 1.5'	
	10		Same, wet	WOH/ 24"	S-6 1.0'	
	12		Same,	WOH/ 12" 2-2	S-7 1.0'	Driller lost fluid at 12.0' cased hole to 14.5
	14		Same, few organics	WOH/ 12" 2-2	S-8 1.0'	
	16		Same	1-1 2-1	S-9 1.8'	
	18		Same	3-3 3-4	S-10 1.3'	ground water level 19.6 static
	20		Same	1-2 2-3	S-11 1.2'	
	22		Same	2-3 2-3	S-12 1.4'	
	24		Same, loose	1-1 1-1	S-13 1.3'	
	26		Same grey black, loose	1-2 1-2	S-14 1.3'	
	28		Same to 28.6' from 28.6' to 29.5' tan fine sand	2-2 6-8	S-15 1.5'	driller lost fluid @29.0' cased hole to 35.0'
	30	SW	grey brown fine sand, trace silt	7-8 9-6	S-16 1.0'	
	32		grey brown interlayer fine sand & silt	2-2 4-6	S-17 1.2'	
	34		Grey brown coarse to fine snad, trace silt trace clay lenses.	4-6 9-8	S-18 1.2'	
	36		Same, few fine gravel	12-12 12-12	S-19 1.0'	
	38		Same	13-12 14-11	S-20 1.0'	
	40					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT Pearce Creek Dis. Area

HOLE NO. CSB-5

DRILLING LOG (Cont[redacted]eet) ELEVATION TOP OF HOLE

Hole [redacted] CSB-5

PROJECT Pearce Creek Diposal Area	INSTALLATION	SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	40		Brown fine sand, trace silt	7-7 8-7	S-21 1.0'	
	42		brown black, fine sand 42.0-42.6' Black organic sand & silt 42.6' to 43.1'	5-4 6-6	S-22 1.2'	
	44	SW	brown grey coarse to fine sand trace silt	11-10 10-9	S-23 1.0'	
	46	SM	Same, trace fine gravel	5-4 5-6	S-24 0.9'	
	48		Same	5-9 8-7	S-25 1.0'	
	50		Same	5-5 10-15	S-26 0.8'	
	52		Same, light brown	9-17 27-26	S-27 1.0'	
	54		Same	14-19 27-37	S-28 1.0'	
	56		Same, few fine gravel	13-6 8-9	S-29 0.6'	
	58		Same, little silt, trace gravel	7-8 9-11	S-30 0.4'	Start 7:00 a.m. 7/13/88
	60		Brown grey silt, trace fine sand, clay lenses	10-11 17-19	S-31 1.0'	
	62		Same, little clay	9-12 15-16	S-32 1.0'	
	64	ML/CL	Same	10-12 17-15	S-33 1.4'	
	66		Grey silt, 1 large piece of gravel trace fine sand	7-15 15-18	S-34 1.7'	
	68		Grey clayey silt, blue & white specks throughout	6-8 9.9	S-35 1.5'	
	70		Same	7-6 6-8	S-36 1.9'	See Note below
	72		Brown clayey silt, trace fine sand	3-4 6-7	S-37 1.2'	Hole finished 7/13/88 11:00 a.m.
	74					Hole collapsed after completion of boring Note: Wanted tube in this area-not enough rods for tube. Finished hole-Contacted corps who O.Kd not taking tube

ENG FORM 1836-A JUN 67 GPO: 1969 OF—329-243

PROJECT Pearce Creek Disposal Area	HOLE NO. CSB-5

DRILLING LOG

DIVI

INSTALLATION

SHEET 1 OF 1 SHEETS

1. PROJECT Pearce Creek Disposal Area
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY Froelhing & Robertson
4. HOLE NO. (As shown on drawing title and file number) CSB-5A
5. NAME OF DRILLER John Organ
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ________ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN --
8. DEPTH DRILLED INTO ROCK --
9. TOTAL DEPTH OF HOLE 26.0'
10. SIZE AND TYPE OF BIT 2" Split Spoon
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL CME 55
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 4 UNDISTURBED 2
14. TOTAL NUMBER CORE BOXES --
15. ELEVATION GROUND WATER
16. DATE HOLE STARTED 7/15/88 COMPLETED 7/15/88
17. ELEVATION TOP OF HOLE --
18. TOTAL CORE RECOVERY FOR BORING -- %
19. SIGNATURE OF INSPECTOR Kenneth O'Rourke

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		drilled through to 8.0'			Start 7:00 a.m. 7/15/88 Hole offset 4.0' north
	2					
	4					
	6					
	8		Grey Loose SILT, w/mica organic roots & fibers trace fine sand & gravel	WOH-12" 1-1	S-1 1.4'	
	10		Same from bottom of tube (in Sample Jar)	Light Mach	NP-1 2.0'	Driller lost fluid at 12.0'
	12	ML	Same, W/clay lenses trace fine sand	1-2 2-2	S-2 1.5'	
	14	CL				
	16					
	18					
	20		Brown grey laminated SILT, w/clay lenses, trace fine sand w/roots	2-2 3-3	S-3 2.0'	
	22		DK Grey Clayey SILT.	Light Mach	NP-2 2.0'	
	24		Same	2-2 2-3	S-4 2.0'	Finished 10 a.m. 7/15/88
	26		Bottom of hole 26.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek Disposal HOLE NO. CSB 5-A

Hole No. CSB-7

DRILLING LOG

VISION

INSTALLATION

SHEET 1 OF 1 SHEETS

1. PROJECT Pearce Creek Dis. Area

2. LOCATION (Coordinates or Station)

3. DRILLING AGENCY Froehling &Robertson

4. HOLE NO. (As shown on drawing title and file number) CSB-7

5. NAME OF DRILLER John Organ

6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.

7. THICKNESS OF OVERBURDEN

8. DEPTH DRILLED INTO ROCK

9. TOTAL DEPTH OF HOLE 40.0'

10. SIZE AND TYPE OF BIT 2" Split Spoon

11. DATUM FOR ELEVATION SHOWN (TBM or MSL)

12. MANUFACTURER'S DESIGNATION OF DRILL CME 55

13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | DISTURBED 19 | UNDISTURBED 1

14. TOTAL NUMBER CORE BOXES

15. ELEVATION GROUND WATER

16. DATE HOLE | STARTED 6/24/88 | COMPLETED 6/24/88

17. ELEVATION TOP OF HOLE

18. TOTAL CORE RECOVERY FOR BORING %

19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Brown sandy SILT, few fine sand	7-11 18-20	S-1 1.5'	Start 5 am 6/24/88
	2	ML	Same, trace f sand clay lenses	11-14 17-20	S-2 1.5'	
	4		Brown silty SAND, little fine gravel	13-28 14-13	S-3 1.0'	
ground water 8.0'	6		Brown well graded SAND with silt, few gravel, w/shells wet	10-10 10-14	S-4 1.5'	groundwater 8.0'
	8	SW SM	Same mostly medium to fine SAND, wet w/shell pieces	11-11 11-13	S-5 1.5'	
	10		Same reddish brown wet	10-11 13-15	S-6 1.0'	
	12		Same brown, wet	8-8 9-10	S-7 1.5'	
	14		Same, tar, wet w/mica	7-9 9-10	S-8 1.5'	
	16		Same, reddish brown wet	5-4 3-3	S-9 1.0'	
	18		Same reddish brown trace clay, wet	3-3 2-1	S-10 1/0'	
	20		Dark grey SILT, trace fine sand, w/mica moist	3-3 3-2	S-11 1.5'	
	22		Dark grey SILT, cohesive wet	2-2 2-2	S-12 1.5'	
	24	ML	Same top and bottom	light mach	UP-1 1.0'	feel piston hung up about 1.0' in tube due to epoxy having problems w/tubes
	26		Same	2-2 2-3	S-13 1.5	
	28		Same	4-5 5-3	S-14 1.8	
	30		Black, grey dk brown SILT w/organics & mica trace clay lenses blocky	5-7 10-10	S-15 1.0	
	32		Dk brown SILT w/organics trace fine gravel	3-3 4-5	S-16 0.4'	
	34		Dk grey SILT, trace fine sand	4-6 8-8	S-17 1.5	
	36		Same	6-6 6-6	S-18 1.5	
	38		38.0-39.0 same 39-39.5 dk grey black Silt w/ organics trace of sand bottom of hole 40.0'	6-8 8-10	S-19 1.5	
	40					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek

HOLE NO. CSB-7

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 1 SHEETS

1. PROJECT
Pearce Creek Disposal Area

2. LOCATION (Coordinates or Station)

3. DRILLING AGENCY
Froehlihg & Robertson

4. HOLE NO. (As shown on drawing title and file number) CSB -7A

5. NAME OF DRILLER
Brad Organ

6. DIRECTION OF HOLE
☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.

7. THICKNESS OF OVERBURDEN –

8. DEPTH DRILLED INTO ROCK –

9. TOTAL DEPTH OF HOLE 38.0'

10. SIZE AND TYPE OF BIT 2" Split Spoon

11. DATUM FOR ELEVATION SHOWN (TBM or MSL)

12. MANUFACTURER'S DESIGNATION OF DRILL
CME 55

13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 | UNDISTURBED 2

14. TOTAL NUMBER CORE BOXES --

15. ELEVATION GROUND WATER 8.0'

16. DATE HOLE: STARTED 9/8/88 | COMPLETED 9/8/88

17. ELEVATION TOP OF HOLE –

18. TOTAL CORE RECOVERY FOR BORING – %

19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Drill through to 1st sample at 28.0'			
	2					
	4					
	6					
	8					GROUND WATER 8.0'
	10					
	12					
	14					
	16					
	18					
	20					
	22					
	24					
	26					
	28		Dk. Grey Micaceous Clayey SILT	2-2 2-3	S-1 2.0'	Start hole 10:30 9/8/88
	30	ML	Same Sample in jar from bottom of tube	Light MACH.	UP-1 2.0'	* Note undisturbed dropped 2.0' while removing from rods-marked on tube -
	32		Black brown SILT W/ organics	5-7 8-8	S-2 1.1'	** Attempted tube at 32.0' malfunction of piston retainer took spoon at 32.0'. piston at 34.0'
	34		DK Grey Clayey SILT w/Gravel	Light Mach.	UP-2 2.0'	
	36	SW SM	Brown medium to fine Sand, trace silt	4-4 5-5	S-3 1.0'	Finished hole 5:00 p.m.
			Bottom of hole 38.0'			9/8/88

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek | HOLE NO. CSB 7-A

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 2 SHEETS

1. PROJECT Pearce Creek Disposal Area
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY Froelhing & Robertson
4. HOLE NO. (As shown on drawing title and file number) CSB-8
5. NAME OF DRILLER John Organ
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 66.0'
10. SIZE AND TYPE OF BIT 2" Split Spoon
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL CME 55
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 32 UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE STARTED 7/13/88 COMPLETED 7/14/88
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR Kenneth O'Rourke

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0 2	ML	Brown silt, w/roots & mica dry	5-5 5-5	S-1 1.5'	Start 12:30 p.m. cased hole to 10.0'
	4		Same	5-5 5-5	S-2 1.0'	
	6		Brown grey silt, trace of organic, moist	2-4 3-4	S-3 1.3'	
	8		Same	4-2 2-3	S-4 1.0'	
	10	ML/ CL	Same	1-2 2-3	S-5 1.4'	
			Same	1-1 2-3	S-6 2.0'	Ground water 11.6'
	12		Same	2-3 2-4	S-7 1.7'	
	14		Same-sample in jar taken from bottom of tube	light beach	UP-1 1.5'	Tube pushed 2.0' 1.5 recovery-
	16		Some w/organics & piece of gravel 16.0' to 16.5' (A)			Samples A&B
	18	SW	Brown grey coarse to fine sand trace fine gravel some silt (B)	4-8 10-13	S-8 1.0'	
	20	SW	Brown grey coarse to fine sand, little silt trace fine gravel w/mica	12-15 17-11	S-9 1.0'	finished drilling 3:30 pm Start 7:00am 7/14/88
			Same	3-5 6-6	S-10 1.0'	
	22		Same	3-4 6-6	S-11 1.0'	
	24		Same	3-3 5-6	S-12 0.8'	
	26		Same mostly fine sand, trace silt	6-12 13-16	S-13 1.0'	
	28		Brown grey silt, some fine sand	9-9 4-7	S-14 1.0'	
	30		Same, trace fine sand w/mica	3-3 3-3	S-15 1.2'	
	32	ML	Same	4-4 5-6	S-16 1.5'	
	34		Grey silt, trace fine sand	4-7 7-9	S-17 1.5'	
	36		Same	4-5 8-10	S-18 1.6'	Hole collapsed 36.9'
	38 40		Grey silt	4-6 7-9	S-19 1.3'	

PROJECT Pearce Creek Dis. Area HOLE NO. CSB-8

DRILLING LOG (Cont [redacted]et) | ELEVATION TOP OF HOLE | **Hole N[redacted]** CSB-8

PROJECT Pearce Creek Disposal Area | INSTALLATION | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (*Description*) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (*Drilling time, water loss, depth of weathering, etc., if significant*) g
	40		Grey silt, few organics w/mica	10-11 12-13	S-20 1.2'	
	42	ML/ CL	Grey clayey silt	10-10 10-12	S-21 1.5'	
	44		Same wet & loose	8-8 9-9	S-22 0.6'	
	46		Same	7-9 10-11	S-23 1.5'	
	48		Black micacious silt trace fine sand	15-14 13-18	S-24 1.5'	
	50		Same	4-5 8-11	S-25 1.0'	
	52	ML/ CL	Dark grey clayey silt	11-15 13-17	S-26 1.0'	
	54		Same, w/blue & white specks	7-13 15-15	S-27 1.0'	
	56		Same, loose	10-10 11-11	S-28 0.4'	
	58		Same	9-10 12-12	S-29 1.5'	
	60		Same dry	9-9 11-11	S-30 1.0'	
	62		Same, trace organics & wood	9-11 13-15	S-31 1.5'	
	64		Dk. grey clayey silt	6-9 13-16	S-32 1.5'	Finished drilling 3:00pm
	66		Bottom of hole 66.0'			

Hole No. CSB 8A

DRILLING LOG | DIVISION | INSTALLATION Pearce Creek | SHEET 1 OF 1 SHEETS

1. PROJECT
Pearce Creek Disposal Area

2. LOCATION (Coordinates or Station)

3. DRILLING AGENCY
Froehling & Robertson

4. HOLE NO. (As shown on drawing title and file number) CSB 8-A

5. NAME OF DRILLER
John Birch

6. DIRECTION OF HOLE
☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.

7. THICKNESS OF OVERBURDEN —

8. DEPTH DRILLED INTO ROCK —

9. TOTAL DEPTH OF HOLE 44.0'

10. SIZE AND TYPE OF BIT 2" Split Spoon

11. DATUM FOR ELEVATION SHOWN (TBM or MSL)

12. MANUFACTURER'S DESIGNATION OF DRILL
CME-45

13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | DISTURBED 2 | UNDISTURBED 1

14. TOTAL NUMBER CORE BOXES

15. ELEVATION GROUND WATER

16. DATE HOLE | STARTED 8/16/88 | COMPLETED 8/18/88

17. ELEVATION TOP OF HOLE —

18. TOTAL CORE RECOVERY FOR BORING — %

19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Drill through to 38.0' for 1st sample			Start drilling at on 8-16-88 Hole moved 3.0' south 35.0' of casing driven finish for day 5:45PM
	38		Black SILT, w/ organic fibers	5-6 7-9	S-1 1.0'	8/17/88 start at 9AM finish for day 2:30PM
	40		Same, sample from bottom bottom of tube in jar	Light mach	up-1 2.0'	breakdown (starter) start drilling 6:30am
	42		Same	4-6 10-10	S-2 1.0'	finished hole 10:30AM
	44		Bottom of hole 44.0'			8/18/88

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT Pearce Creek Disposal Area | HOLE NO. CSB-8A

Hole No.

DRILLING LOG

DIVISION

INSTALLATION Pearce Creek

SHEET 1 OF 1 SHEETS

1. PROJECT Pearce Creek Disposal Area
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY Froehling & Robertson
4. HOLE NO. (As shown on drawing title and file number) CSB 9
5. NAME OF DRILLER John Birch
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ________ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN ——
8. DEPTH DRILLED INTO ROCK ——
9. TOTAL DEPTH OF HOLE 30.0'
10. SIZE AND TYPE OF BIT 2" SPLIT SPOON
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL CME 45
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 14 UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES ——
15. ELEVATION GROUND WATER 8.5'
16. DATE HOLE STARTED 8/10/88 COMPLETED 8/15/88
17. ELEVATION TOP OF HOLE ——
18. TOTAL CORE RECOVERY FOR BORING —— %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0	ML	Brown grey silt w/ organic roots & fibers	WOH.2 2-3	S-1 2.0'	Start Drilling 2:00 PM 8/10/88 8.0' fill drilled through before 1st sample.
	2		Same, trace sand	2-2 2-2	S-2 2.0'	
	4		Same, clay lenses	1-12" 2-3	S-3 2.0'	
	6		Gray Brown SILT, trace clay	3-6 8-13	S.4 2.0'	
	8	SW SM	Brown Coarse to fine SAND, little silt	12-12 13-14	S-5 2.0'	Groundwater at 8.5' finished drilling 5 PM start drilling 8:30 AM 8/11/88
	10 12		Brown Grey coarse to fine SILTY SAND trace gravel	11-13 12-12	S-6 1.5'	
			Same, few fine gravel	7-9 12-10	S-7 1.2'	
	14		Same	7-6 6-7	S-8 1.0'	
	16		Same	7-5 8-10	S-9 1.0'	Start 8:00AM 8/12/88
	18	ML	Grey micaceous SILT few fine sand	5-4 6-7	S-10 1.4'	finish 3:00PM break down
	20		Grey micaceous SILT trace fine sand	3-4 4-7	S-11 1.0'	Start 1:30PM 8/15/88
	22		Same	3-3 5-6	S-12 1.5	Driller made attempt for tube, tube came up empty made driller take sample
	24		Same - sample from bottom of tube in jar	Light mach	up-1 2.0'	
	26		Same	5-6 8-10	S-13 2.0'	
	28		Same, more dense	6-6 8-10	S-14 2 0'	Finished hole 6:45 PM 8/15/88
	30		Bottom of hole 30.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek Dis Area

HOLE NO. CSB-9

Hole No. CSB-10

DRILLING LOG

VISION

INSTALLATION

SHEET 1 OF 2 SHEETS

1. PROJECT Pearce Creek Disposal Area
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY Froehling &Robertson
4. HOLE NO. (As shown on drawing title and file number) CBS 10
5. NAME OF DRILLER John Organ
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 55.0'
10. SIZE AND TYPE OF BIT 2" Split Spoon
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL CME 55
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 26 UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE STARTED 6/27/88 COMPLETED 6/29/88
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Brown SILT, little medium to fine sand, trace fine gravel w/mica & clay lenses dry	7-10 9-7	S-1 1.5	start 6:00 am 6/27/88
	2	ML	Same, little fine sand, clay lenses	7-6 5-4	S-2 1.0'	
	4		Grey dk brown SILT, w/organic fibers, trace fine sand & clay	8-6 5-3	S-3 1.0'	
	6		Brown grey SILT, w/mica trace fine sand w/roots & fibers	3-3 3-3	S-4 1.0'	
	8		Grey brown SILT trace fine sand, few seams clay	3-6 7-8	S-5 1.0'	water at 9.4' static
	10		Same	9-9 7-6	S-6 1.0'	
14.0	12		Grey, reddish brown SILT little coarse to fine sand, trace fine gravel moist	2-5 14-17	S-7 1.5	
	14		Grey mostly fine SAND, trace fine gravel & silt wet	10-14 11-14	S-8 1.2'	
	16		Reddish brown well graded SAND, little fine gravel trace silt w/mica	12-10 10-7	S-9 1.0'	
	18	SW SM	Same	7-7 9-7	S-10 1.0	
	20		Same, brown, grey	8-7 5-5	S-11 1.0'	
	22		Same, grey mostly fine SAND	5-4 3-4	S-12 1.0'	
	24		Same, trace fine gravel	5-4 3-3	S-13 0.8	
	26		Same	3-4 8-6	S-14 1.2	
28.5	28		Reddish brown & grey fine SAND from (28.0-28.5)(Sample A)	5-6	S-15	
	30		Grey black SILT, w/woody organics trace f sand (sampleB) (28.5-29.0)	5-4	1.0	Sample A & B
		ML	Same	3-3 5-6	S-16 1.5'	concluded drilling 12:00pm start at 7:00 am 6/29
34.0	32		Drillers error drilled through 32.0'to 34.0' tube area took tube at 34-36.0			
	34		Grey very fine SAND, little silt top & bottom	light mech	U-PI 1.9'	
	36	SM	Grey fine SAND, little silt wet	5-5 7-8	S-17 1.0	
	38 40		Reddish brown & grey fine SAND, little Silt wet	12-14 18-20	S-18 1.5	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT Pearce Creek

HOLE NO. CSB-10

DRILLING LOG (Continuation Sheet) | ELEVATION TOP OF HOLE | Hole No. CSB-10

PROJECT Pearce Creek Dis. Area | INSTALLATION | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	40		Reddish brown medium to fine SAND, mostly fine, little silt moist	14-13 53-57	S-19 1.0'	
	42	SW SM	Reddish brown coarse to fine SAND, little silt trace fine gravel moist	14-9 24-26	S-20 1.0'	
	44		Mostly fine sand, little silt	17-20 36-38	S-21 1.0'	
	46		Tan coarse to fine SAND little fine gravel, trace silt	15-30 56-62	S-22 1.0'	
	48		Same	19-41 61-43	S-23 1.5	
	50		Brown mostly fine SAND & silt	13-13 11-14	S-24 1.2'	-hole collapsed 51.5'
	52		(52-52.7) same	10-11 14-15	S-25 1.5	
		ML	(52.7-53.7) Grey brown SILT trace fine sand			samples A & B
	54	SW	Brown, medium to fine SAND, trace clay lenses & gravel	12-11 10-12	S-26 1.5	finished boring 11:00am
	55		Bottom of hole 55.0'			6/29/88

ENG FORM 1836-A
JUN 67

GPO: 1969 OF—329-242

PROJECT Pearce Creek | HOLE NO. CSB-10

OF 1 SHEETS

1. PROJECT Pearce Creek Disposal Area

2. LOCATION (Coordinates or Station)

3. DRILLING AGENCY Froehling & Robertson

4. HOLE NO. (As shown on drawing title and file number) CSB 10A

5. NAME OF DRILLER Brad Organ

6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ________ DEG. FROM VERT.

7. THICKNESS OF OVERBURDEN –

8. DEPTH DRILLED INTO ROCK –

9. TOTAL DEPTH OF HOLE 12.0'

10. SIZE AND TYPE OF BIT 2" Split Spoon

11. DATUM FOR ELEVATION SHOWN (TBM or MSL)

12. MANUFACTURER'S DESIGNATION OF DRILL CME 55

13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 2 UNDISTURBED 1

14. TOTAL NUMBER CORE BOXES –

15. ELEVATION GROUND WATER –

16. DATE HOLE STARTED 9/9/88 COMPLETED 9/9/88

17. ELEVATION TOP OF HOLE –

18. TOTAL CORE RECOVERY FOR BORING – %

19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Drill through to 6.0' before 1st Sample			Start Drilling 9:00 a.m. 9/9/88
	2					
	4					
	6	ML				
			Brown grey black SILT, w/ roots & fibers, trace fine sand clay lenses	1-3 3-3	S-1 1.0'	
	8					
			Brown grey SILT, sample in jar from bottom of tube	Light Mach	UP-1 2.0'	ground water at 9.5'
	10					
			Grey brown SILT, trace fine sand, w/clay lenses	6-4 4-4	S-2 2.0'	
	12		Bottom of hole 12.0'			finished hole 12:30 p.m. 9/9/88

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT Pearce Creek Disposal Area

HOLE NO. CSB-10A

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 2 SHEETS

1. PROJECT Pearce Creek Disposal Area
2. LOCATION (Coordinates or Station) --
3. DRILLING AGENCY Froehling & Robertson
4. HOLE NO. (As shown on drawing title and file number) CSB-11
5. NAME OF DRILLER Brad Organ
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN --
8. DEPTH DRILLED INTO ROCK --
9. TOTAL DEPTH OF HOLE 76.0'
10. SIZE AND TYPE OF BIT 2" split spoon
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) --
12. MANUFACTURER'S DESIGNATION OF DRILL CME 55
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES --
15. ELEVATION GROUND WATER 27.5
16. DATE HOLE STARTED 9/1/88 COMPLETED 9/2/88
17. ELEVATION TOP OF HOLE --
18. TOTAL CORE RECOVERY FOR BORING -- %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0 2		Brown SILT, trace fine sand, w/mica	5-5 6-5	S-1 1.2'	Start 5:00 am 9-1-88
	4		Same, moist, trace organic fibers	4-4 4-6	S-2 1.5'	
	6		Same, trace fine sand trace fine gravel	3-4 4-3	S-3 1.5'	
	8		Same, w/clay lenses	2-3 3-5	S-4 1.5'	
	10		Same	4-6 5-5	S-5 0.8'	
	12	ML	Same, sample from bottom of tube	Light Mach	Up-1 2.0'	
	14		Brown grey SILT, w/clay lenses, trace fine sand	2-1 2-2	S-6 1.0'	
	16		Same, w/organic fibers wet	1-2 2-2	S-7 0.3'	
	18		Same	2-2 3-3	S-8 1.2'	
	20		Black micaceous SILT	1-1 1-2	S-9 2.0'	
	22		Same, sample from bottom of tube	light Mach	UP-2 2.0'	
	24		Same trace of organics	1-2 1-3	S-10 2.0'	
	26		Same, trace clay lenses	2-2 2-2	S-11 1.9'	
	28	ML/ CL	Brown clayey SILT, trace medium to fine sand	3-6 9-12	S-12 1.5'	Ground water reading 27.5' 9/6/88
	30		Reddish brown, grey SILT laminated, trace fine sand	5-6 9-6	S-13 1.4'	
	32		Brown red grey SILT trace fine sand	3-1 2-1	S-14 0.3'	2 attempts made to obtain sample
	34	SW	Reddish brown coarse to fine SAND, few fine gravel trace silt	9-9 9-9	S-15 1.0'	
	36	SM	Same, little fine gravel	23-16 16-10	S-16 1.5'	35.0' casing driven
	38		Same	5-4 3-4	S-17 0.8'	
	40		Same, mostly fine SAND	5-5 3-3	S-18 0.4'	Told driller to thicken mud to much wash in spoon

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT Pearce Creek Disposal Area

HOLE NO. CSB-11

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

Hole No. CSB-11

PROJECT: Pearce Creek Disposal Area

INSTALLATION

SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	40 42		Brown grey mostly fine SAND, little silt, few fine gravel w/mica	6-5 7-8	S-19 1.4'	
	44		Brown coarse to fine SAND, some fine gravel trace silt w/mica	7-9 13-19	S-20 1.0'	Finished drilling 5:00pm
	46		Tan very fine SAND, little silt w/mica	12-15 18-10	S-21 0.9'	Start 6:00 am 9-2-88
	48	SW SM	Same, tan, grey white Same, some clayey silt seams	14-9 7-8	S-22 1.3'	
	50			8-8 8-15	S-23 1.5'	
	52		Same	8-8 9-18	S-24 1.8'	
	54		Reddish tan white fine SAND, trace silt	17-42 100/5"	S-25 0.8'	
	56		Tan medium to fine SAND, trace silt	32-27 22-22	S-26 1.5'	
	58		Same	10-20 34-40	S-27 1.2'	
	60		Same, laminated w/clay lenses	32-39 43- 100/4"	S-28 1.2'	
	62		Tan coarse to fine SAND little silt	22-19 16-13	S-29 1.0'	
	64		Same, reddish brown, w/ trace fine gravel	26-28 34-45	S-30 1.2'	
	66		Same	45 100/5"	S-31 0.9'	
	68		Same mostly fine SAND trace clay lenses	45 100/5"	S-32 1.0'	
	70		Same, coarse to fine SAND, little fine gravel	75-23 8-10	S-33 1.2'	
	72		Same mostly fine SAND trace clay lenses	16-16 14-25	S-34 1.4'	
	74		Same mostly fine SAND	17-17 14-23	S-35 0.9'	2-attempts
	76	ML/ CL	Grey clayey SILT	11-16 14-18	S-36 1.5'	finish hole at 3:00 p.m. 9/2/88
			Bottom of hole 76.0'			

ENG FORM 1836-A
JUN 67

GPO: 1968 OF—329-348

PROJECT: Pearce Creek Disposal Area

HOLE NO. CSB 11

DRILLING LOG

DIVISI

INSTALLATION

SHEET 1 OF 1 SHEETS

1. PROJECT Pearce Creek Disposal Area

2. LOCATION (Coordinates or Station)

3. DRILLING AGENCY Froehling & Robertson

4. HOLE NO. (As shown on drawing title and file number) CSB-12

5. NAME OF DRILLER John Birch

6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.

7. THICKNESS OF OVERBURDEN

8. DEPTH DRILLED INTO ROCK

9. TOTAL DEPTH OF HOLE 40.0'

10. SIZE AND TYPE OF BIT 2" split.spoon

11. DATUM FOR ELEVATION SHOWN (TBM or MSL)

12. MANUFACTURER'S DESIGNATION OF DRILL CME 45

13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 20 UNDISTURBED 0

14. TOTAL NUMBER CORE BOXES

15. ELEVATION GROUND WATER

16. DATE HOLE STARTED 8/23/88 COMPLETED 8/26/88

17. ELEVATION TOP OF HOLE

18. TOTAL CORE RECOVERY FOR BORING %

19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Grey black micaceous SILT, trace organics	WOH/ 24"	S-1 1.0'	Start drilling 1:00 pm 8/23/88 9.8' drilled through before 1st sample taken
	2		Same, grey brown	WOH-2 1-2	S-2 1.0'	
	4		Same w/roots & fibers	1-1 1-1	S-3 1.8'	
	6	ML	Same	1/12" 1-1	S-4 2.0'	
	8		Same w/roots & fibers few clay lenses	1/12" 1/12"	S-5 2.0'	
	10		Same, little clay lenses, trace sand	1-1 2-3	S-6 2.0'	
	12		Grey brown SILT, little clay lenses, organic roots, trace sand	1-2 3-4	S-7 2.0'	
	14		Grey brown SILT, trace fine sand	11-18 18-28	S-8 1.7'	
	16		Grey brown SILT, trace of sand	9-12 25-22	S-9 2.0'	Sample A&B
	18		Grey brown coarse to fine SAND little fine gravel & silt Brown coarse to fine SAND little fine gravel, trace silt	15-13 12-10	S-10 1.2'	
	20	SW	Grey, mostly fine SAND, trace fine gravel	9-17 12-9	S-11 1.0'	finished drilling 5:45pm
	22		Same	7-8 9-10	S-12 0.5'	Start drilling 2:30 pm 8/25/88 2-attempts to obtain Sample
	24		Grey brown coarse to fine SAND, some fine gravel, trace silt	15-13 13-15	S-13 0.9'	
	26		Brown coarse to fine SAND little fine gravel & silt	9-14 14-16	S-14 1.0'	
	28		Brown grey fine SAND little silt 1 large peice red sand stone	9-15 15-16	S-15 1.4'	finish for day 5:45pm
	30		Grey, white, fine SAND trace silt, w/clay lenses	5-5 15-22	S-16 1.5'	Start drilling 7:00am 8/26/88
	32		Same	5-6 13-13	S-17 1.0'	*Had driller attempt tube at 38.0' he pushed tube about 6" and could go no further. Tube had about 2" silt& 4" sand inside. Instructed driller to take spoon which is sample (20)
	34		Same	11-11 11-10	S-18 1.2'	
	36 38	ML/ CL	Brown grey clayey SILT trace fine sand *silt layer about 2.2'	4-5 8-17	S-19 1.5'	
	40		Brown red fine SAND trace silt	15-13 12-15	S-20* 1.0'	finish 2:30 pm

Bottom of hole

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek Disposal Area

HOLE NO. CSB-12

HOLE NO. CSB-13

DRILLING LOG DIVISION	INSTALLATION
SHEET 1 OF 2 SHEETS	
1. PROJECT Pearce Creek Disposal Area	10. SIZE AND TYPE OF BIT 2" Split Spoon
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY Froehling & Robertson	12. MANUFACTURER'S DESIGNATION OF DRILL CME 55
4. HOLE NO. (As shown on drawing title and file number) CSB-13	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED 27 — UNDISTURBED 1
5. NAME OF DRILLER John Organ	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER 9.4' static
7. THICKNESS OF OVERBURDEN	16. DATE HOLE — STARTED 6/22/88 — COMPLETED 6/23/88
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE 55.0'	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Brown SILT, trace fine sand dry	7-6 5-4	S-1 1.0'	started hole at 12:00 noon
	2		Brown SILT, little fine sand w/fiberous material & mica	3-3 3-3	S-2 1.2'	
	4		Same, vegetation & roots	15-11 11-12	S-3 1.5'	
	6	ML	Brown grey SILT, w/mica little sand, woody organics	4-4 4-4	S-4 1.2'	
	8		Brown, grey, black SILT with sand, little organics moist	2-1 2-3	S-5 1.5'	
	10		Same, w/woody orgaincs moist	2-2 2-2	S-6 1.5'	
	12		Brown grey SILT, trace fine sand moist	1/12" 1/12"	S-7 1.5'	
	14		Same	1/12" 1/12"	S-8 1.0'	
	16		Undisturbed tube taken top same - bottom silty f sand	light mach	U.P1	concluded for day 2pm
	18		Brown well graded SAND w/silt & gravel, mostly f sand coarse to fine gravel, w/mica wet	12-14 24-18	S-9 1.0'	started 5am 6/23/88
	20		Brown well graded SAND w/silt mostly fine, clay lenses	6-8 10-13	S-10 1.0'	Hit seam of gravel about 19.6' driller cased hole at 25.0' Hole would not stay open
	22	SW	Brown grey SAND, mostly fine little silt wet	8-18 16-29	S-11 1.0	
	24	SM	Brown silty SAND, coarse to fine, little gravel	14-11 12-15	S-12 0.5	
	26		Brown grey silty SAND, mostly fine, trace f gravel	14-15 16-18	S-13 1.2	
	28		Reddish brown silty SAND fine w/mica	21-32 37-48	S-14 1.5'	
	30		Same, reddish grey	29-38 42-47	S-15 1.2'	
	32		Same	21-20 16-14	S-16 1.5'	
	34		Same	9-9 21-25	S-17 1.5'	
	36		Red brown & grey silty SAND mostly fine w/mica	15-15 16-17	S-18 1.5	
	38					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT Pearce Creek Dis. Area

HOLE NO. CSB-13

DRILLING LOG (Co Sheet) | ELEVATION TOP OF HOLE | **Ho No.** CSB-13

PROJECT: Pearce Creek Disposal Area | INSTALLATION | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (*Description*) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (*Drilling time, water loss, depth of weathering, etc., if significant*) g
	38	SW SM	Reddish brown & grey silty SAND, mostly fine w/mica	10-20 27-26	S-19 1.0'	
	40	SW	Reddish brown well graded SAND, trace silt	18-28 19-19	S-20 1.0'	
	42		Same, mostly medium to fine SAND	15-26 30-32	S-21 1.0'	
	44		Same, little silt	15-20 21-22	S-22 1.0'	
	46		Reddish brown coarse to fine SAND, little silt trace fine gravel	7-17 17-10	S-23 1.0'	
	48		Brown SAND mostly fine, little silt	38-36 27-26	S-24 1.5'	
	50		Same	21-27 42-48	S-25 1.5'	
	52		Same	18-20 24-25	S-26 1.5'	Hole caued in 52.0' after completion of boring
	54		Same	19-22 23-21	S-27 1.0'	Completed boring 1:30pm
	55		Bottom of hole 55.0'			

ENG FORM 1836-A
JUN 67

GPO: 1969 OF—329-242

PROJECT: Pearce Creek Dis. Area | HOLE NO. CSB-13

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 2 SHEETS

1. PROJECT Pearce Creek Disposal Area
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY Froehling & Robertson
4. HOLE NO. (As shown on drawing title and file number) CSB-14
5. NAME OF DRILLER John & Brad Organ
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 72.0'
10. SIZE AND TYPE OF BIT 2" Splt Spoon
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL CME 55
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 35 UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER 20.6'
16. DATE HOLE STARTED 9/7/88 COMPLETED 9/8/88
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0	...	Brown SILT, w/mica & roots	7-8 8-8	S-1 1.0'	
	2		Grey brown SILT, w/mica clay lenses.	8-9 9-11	S-2 1.2'	
	4		Same moist.	3-4 3-4	S-3 1.2'	
	6	ML	Dark grey SILT, w/mica organic fibers, clay lenses trace fine sand.	3-2 2-2	S-4 1.2'	
	8		Same	1-1 1-2	S-5 1.5'	Start drilling 6:00 am 9/7/88 Started hole over from 0.0'
	10		Same wet	1-1 1-1	S-6 1.2'	
	12		Same	2-1 2-2	S-7 2.0'	
	14		Sample in jar from bottom of tube same	light mach	UP-1 2.0'	
	16		Grey black clayey SILT w/organic fibers.			
	18	ML/ CL	Same	1-1 1-2	S-8 1.5'	
			Same	1-1 1-1	S-9 2.0'	Ground Water 20.6'
	20			1-1 1-2	S-10 2.0'	6" of water above collapse Hole collapsed @ 21.0'
	22		Same	WOH-1 2-2	S-11 2.0'	
	24		Same, trace fine sand	1-1 1-1	S-12 2.0'	
	26		Same	1-1 2-2	S-13 1.7'	
	28		Same, grey brown, trace organics.	WOH-1 2-2	S-14 2.0'	
	30		Brown SILT, w/mica trace fine sand wet.	1-1 3-3	S-25 2.0'	
	32		Same	1-2 3-3	S-16 2.0'	
	34		Same, Brown grey.	1-2 9-20	S-17 A&B 2.0'	→ Samples A & B
	36	SN	Brown coarse to fine SAND Brown fine SAND, little SILT	13-13 14-14	S-18 2.0'	
	38		Same, trace fine gravel	7-9 9-7	S-19 1.5'	40.0' Casing
	40					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek Disposal Area

HOLE NO. CSB-14

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE | **Hole No.** CSB-14

PROJECT Pearce Creek Disposal Area | INSTALLATION | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	40		Brown grey mostly very fine SAND, little silt w/mica	11-11 15-19	S-20 2.0'	
	42		Brown red fine SAND., little silt w/mica	11-15 15-19	S-21 1.5'	
	44		Brown very fine SAND trace gravel & silt	19-24 40-40	S-22 1.2'	
	46		Brown tan, white, very fine SAND	17-29 37-50	S-23 1.3'	
	48		Same	25-30 33-37	S-24 2.0'	
	50		Same	14-20 27-30	S-25 1.4'	
	52	SW	Same, few silt	7-10 11-14	S-26 1.4'	
	54		Brown grey medium to fine SAND, few silt	10-14 20-28	S-27 1.6'	
	56		Same, trace clay lenses	8-10 5-12	S-28 1.3'	
	58		Same coarse to fine SAND, trace clay lenses	12-13 15-17	S-29 1.4'	
	60		Same	12-15 19-24	S-30 0.8'	Start 6:00 am 9/8/88
	62		Tan coarse to fine SAND, trace silt	10-13 17-30	S-31 1.0'	
	64		Same, trace fine gravel, few silt	12-19 23-30	S-32 1.2'	
	66		Brown, tan coarse to fine SAND, trace silt	23-18 23-18	S-33 1.0'	Lost drilling fluid
	68		Same, w/clay lenses	23-27 30-28	S-34 1.2'	
	70		Same, w/clay lenses little fine gravel	21-32 100/5"	S-35 1.5'	Finished hole 9:45am
			Bottom of hole 71.5			

ENG FORM 1836-A JUN 67 | GPO : 1968 OF—[illegible] | PROJECT Pearce Creek Disposal Area | HOLE NO. CSB-14

DRILLING LOG	DIVISION	INSTALLATION

Hole [illegible] -15

[illegible]ET 1 [illegible] 1 SHEETS

1. PROJECT Pearce Creek Disposal Area	10. SIZE AND TYPE OF BIT 2" Split Spoon
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY Froehling & Robertson	12. MANUFACTURER'S DESIGNATION OF DRILL CME 55
4. HOLE NO. (As shown on drawing title and file number) CSB-15	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 17; UNDISTURBED 1
5. NAME OF DRILLER Brod Organ	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.	15. ELEVATION GROUND WATER 11.5'
7. THICKNESS OF OVERBURDEN	16. DATE HOLE: STARTED 9-21-88; COMPLETED 9-22-88
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE 36.0'	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0 2	ML	Brown grey black organic SILT little clay lenses trace sand w/roots & fiber	3-3 3-4	S-1 1.0'	Start drilling 1:30 pm 9/21/88
	4		Brown grey SILT, laminated Same clay lenses, w/mica & organics	3-3 5-4	S-2 2.0'	Drilling through 10.0' to 1st sample
	6		Same	2-2 2-2	S-3 1.8'	
	8		Same Grey black clayey SILT w/ organic roots & fibers	2-2 1-3	S-4 2.0'	
	10	ML/ CL SW/ SM	Grey fine SAND, some SILT a w/ organic fibers from 9.5'-10.0	1-12" 1-1	S-5 A & B 2.0'	Sample A & B
	12		Dk. grey SILT, w/mica	1-1 2-1	S-6 2.0 '	Start 6:30am 9/22/88 ground water at 11.5'
	14	ML	Same - Sample in Jar from bottom of tube	light Mach	UP-1 2.0'	
	16		Same, grey, brown, black laminated trace organics	1-1 2-2	S-7 1.5'	
	18		Same,	2-2 2-2	S-8 2.0'	
	20		Brown grey SILT, trace organics, little fine SAND	2-3 3-4	S-9 1.5'	
	22		Brown SILT, some fine SAND trace fine gravel	2-2 4-15	S-10 1.2'	
	24	SW	Brown mostly fine SAND few SILT, trace fine gravel	11-14 15-16	S-11 1.5'	
	26		Same	11-15 17-10	S-12 1.0'	Hole collapsed
	28		Brown coarse to fine SAND, little fine gravel trace SILT wet	17-18 27-27	S-13 2.0'	
	29.0 30		Tan very fine SAND, trace SILT w/mica	37 100/6"	S-14 0.8'	
	30.9 32		Same tan, white	50- 100/4"	S-15 0.8'	
	34		Same, little SILT	21-12 14-18	S-16 1.2'	
	36		Same, fine SAND	11-12 11-10	S-17 0.8'	
			Bottom of hole 36.0'			Finished hole 11:am 9/22/88

ENG FORM 1836 MAR PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT Pearce Creek Disposal Area | HOLE NO.

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 2 SHEETS

1. PROJECT Pearce Creek Disposal Area
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY Froehling &Robertson
4. HOLE NO. (As shown on drawing title and file number) CSB-16
5. NAME OF DRILLER John Organ
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 55.0'
10. SIZE AND TYPE OF BIT 2" split spoon
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL CME 55
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 27 UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER 9.4
16. DATE HOLE STARTED 6/17/88 COMPLETED 6/22/88
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Brown silty SAND, mostly fine w/mica dry	4-6 7-7	S-1 1.2'	Started hole at 10:30 am - 6/17/88
	2	SM	Same	3-3 3-4	S-2 1.5'	
	4		Same	4-4 5-5	S-3 1.2'	stopped drilling due to broken hydraulic line 1:30
	6	ML	Brown sandy Silt	2-2 1-3	S-4 1.5'	6/20/88 started drilling at 9:30 am-damage to rig over weekend
	8	SM	Brown silty SAND, mostly fine, w/mica, trace of clay lenses	11-11 8-10	S-5 1.5'	ground water a 9.4' static - 24 hrs
	10		Same	7-11 14-14	S-6 1.0'	
	12		12.0-12.5 brown silty SAND 12.5 -13.0 brown grey SILT w/clay	8-6 5-7	S-7 1.0'	
	14		Brown grey interlayered micaceous silt	4-7 8-10	S-8 1.0'	
	16		Same, grey black	4-6 9-11	S-9 1.5'	Stopped drilling 1:30 pm
	18	ML	Same top & bottom to tube	light Mach	UP 1.8'	started drilling 5:00 am no pressure gauge on rig
	20		Same	4-7 9-9	S-10 1.2'	
	22		Same	8-9 10-10	S-11 1.2'	
	24		Same	2-4 6-10	S-12 1.0'	
	26		Same from 26.0 to 27.0'	8-10 10-11	S-13 1.2'	
	28		27.0-27.2 grey brown silty SAND, trace gravel			
			Reddish brown fine silty SAND, moist	21-42 42-21	S-14 1.0'	
	30		Same, reddish brown white wet	7-8 9-9	S-15 0.8'	
	32 32.5	SM	Same, brown, white	100/5"	S-16 0.4'	
	34		Same, trace medium sand	55-73 59-48	S-17 1.5'	
	36		Same	11-12 15-18	S-18 1.0'	
	38					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT Pearce Creek | HOLE NO. CSB-16

DRILLING LOG (Co Sheet) ELEVATION TOP OF HOLE | Ho No. CSB-16

PROJECT | INSTALLATION | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (*Description*) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (*Drilling time, water loss, depth of weathering, etc., if significant*) g
	38		Reddish brown, grey coarse to fine SAND, trace fine gravel	8-11 20-26	S-19 1.0'	
	40		Same mostly fine SAND	28-48 27-60	S-20 1.5'	
	42 42.9	SM	Brown coarse to fine silty SAND, trace fine gravel	48- 100/5"	S-21 0.9	
	44 45.5		Brown, red coarse to fine SAND trace fine gravel	49-42 100/6"	S-22 1.0'	
	46 47.9		Brown coarse to fine SAND, trace silt, trace f gravel	80-80 100/5"	S-23 1.0'	
	48 48.9		Same	54- 100/5"	S-24 0.9'	
	50 50.9		Grey mostly fine SAND trace silt, trace fine gravel	100/5"	S-25 0.4'	
	52 52.9		Grey mostly fine SAND trace silt	50- 100/4"	S-26 0.5'	
	54		Same	38-49 46-42	S-27 0.5	
	55		Bottom of hole 55.0'			

ENG FORM 1836-A
JUN 67

GPO : 1969 OF—329-243

PROJECT Pearce Creek | HOLE NO. CSB-16

DRILLING LOG | SION | **INSTALLATION** | **Hole No.** CSB-17 [redacted]

SHEET 1 **OF** 2 **SHEETS**

1. PROJECT Pearce Creek Disposal Area

2. LOCATION *(Coordinates or Station)*

3. DRILLING AGENCY Froehling & Robertson

4. HOLE NO. *(As shown on drawing title and file number)* CSB

5. NAME OF DRILLER John Organ

6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ________ DEG. FROM VERT.

7. THICKNESS OF OVERBURDEN --

8. DEPTH DRILLED INTO ROCK --

9. TOTAL DEPTH OF HOLE 80.0'

10. SIZE AND TYPE OF BIT 2" Split Spoon

11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*

12. MANUFACTURER'S DESIGNATION OF DRILL CME 55

13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 39.0 UNDISTURBED 1

14. TOTAL NUMBER CORE BOXES --

15. ELEVATION GROUND WATER 27.7' static

16. DATE HOLE STARTED 8/2/88 COMPLETED 8/4/88

17. ELEVATION TOP OF HOLE --

18. TOTAL CORE RECOVERY FOR BORING -- %

19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS *(Description)* d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling time, water loss, depth of weathering, etc., if significant)* g
	0		Brown grey Silt, trace fine sand w/clay lenses & mica	4-5 5-6	S-1 1.5'	
	2		Same, trace organic fibers	5-7 7-7	S-2 1.2'	
	4		Same	2-3 3-3	S-3 1.5'	
	6		Same, few organic fibers, moist	1-2 2-1	S-4 1.8'	
	8	ML	Same, clayey Silt	1-1 1-2	S-5 1.5'	
	10	CL	Same	1-1 1-1	S-6 1.5'	
	12		Same sample from bottom of tube	light mach	UP-1 1.9'	
	14		Same	1-2 2-1	S-7 2.0'	
	16		Grey; reddish brown Silt, w/ organics clay lenses.	2-2 1-2	S-8 2.0'	Driller losing fluid 18.0'
	18		Dk grey clayey silt	Woh/18" 1	S-9 1.5'	
	20		Same	1-2 1-1	S-10 2.0'	
	22			2-2 2-2	S-11 2.0'	
	24		Same	2-2 2-2	S-12 2.0'	
	26		Dk grey & black clayey silt w/organic roots & fibers	1-2 2-2	S-13 2.0'	Ground water 27.7' 8/4/88 w/casing out
	28		Same	2-3 3-2	S-14 2.0'	
	30	SW SM	Grey brown fine Sand some Silt, trace fine gravel	10-10 14-14	S-15 2.0'	
	32		Reddish brown fine Sand some Silt	9-14 13-25	S-16 1.5'	
	34		Tan reddish brown, very fine Sand, some silt w/mica	2-3 4-12	S-17 1.5'	
	36		Same	7-9 11-15	S-18 1.5'	
	38		Same	27-32 41-52	S-19 1.0'	
	40					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek Disposal | HOLE NO.

DRILLING LOG (Con[illegible]heet)

ELEVATION TOP OF HOLE

H[illegible] No. CSB-17

PROJECT Pearce Creek Disposal Area

INSTALLATION

SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	40		White, reddish brown fine Sand, little silt, trace fine gravel w/mica	31-41 40-49	S-20 1.0'	
	42		Same	11-15 15-14	S-21 1.0'	
	44		Same	10-27 28-30	S-22 1.2'	
	46 47.5		Same	39-60 100/6"	S-23 1.2'	
	48		Same, few silt	24-36 27-33	S-24 1.2'	Hole caved in 50.0'
	50	SW	Same	15-21 5-6	S-25 1.0'	8/4/88 at completion of Hole
	52 53.0'	SM	Same	62-100/ 3"	S-26 1.0'	Start losing drillingfluid 53.0'
	54		Grey medium to fine Sand trace silt	31-16 6-4	S-27 1.2'	
	56		Grey white, brown mostly fine sand, trace fine gravel	9-19 19-21	S-28 1.5'	
	58		Reddish brown coarse to fine Sand, trace silt & gravel	10-24 36-39	S-29 1.2'	
	60		Same, few fine gravel trace silt	15-29 41-56	S-30 1.5'	
	62 62.5		Same, grey, few fine gravel trace silt	100/ 6"	S-31 0.5'	Finished drilling 2:45pm
	64		Same, little fine gravel	20-27 34-36	S-32 1.2'	Start drilling 3:00 pm 8/3/88
	66		Same	28-33 37-44	S-33 1.5'	
	68 68.5		Same	100/ 6"	S-34 0.6'	
	70		Brown, grey coarse to fine Sand, little silt	18-26 18-20	S-35 1.0'	stop drilling due to spraying by air 6:00 pm Start 5am 8/4/88
	72	ML	Grey, white, reddish brown laminated Silt with sand	14-25 44-70	S-36 1.2'	
	74	SW SM	Grey, reddish brown laminated fine Sand, little silt	27-23 23-28	S-37 1.5'	
	76		Same trace silt	25-34 36-46	S-38 1.8'	
	78		Same	12-16 20-25	S-39 2.0'	Finished hole 9:00 am 8/4/88
	80		Bottom of hole 80.0'			

ENG FORM 1836-A JUN 67

GPO: 1969 OF—329-343

PROJECT Pearce Creek Disposal Area

HOLE NO. CSB-17

Hole B-18

SHEET 1 OF 2 SHEETS

DRILLING LOG

DIVISION

INSTALLATION

1. PROJECT: Pearce Creek Disposal Area

2. LOCATION (Coordinates or Station)

3. DRILLING AGENCY: Froehling & Robertson

4. HOLE NO. (As shown on drawing title and file number): CSB-18

5. NAME OF DRILLER: Brad Organ

6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.

7. THICKNESS OF OVERBURDEN

8. DEPTH DRILLED INTO ROCK

9. TOTAL DEPTH OF HOLE: 46.0'

10. SIZE AND TYPE OF BIT

11. DATUM FOR ELEVATION SHOWN (TBM or MSL)

12. MANUFACTURER'S DESIGNATION OF DRILL: CME-55

13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 22 UNDISTURBED 1

14. TOTAL NUMBER CORE BOXES

15. ELEVATION GROUND WATER: 12.5'

16. DATE HOLE: STARTED 9/22/88 COMPLETED 9/23/88

17. ELEVATION TOP OF HOLE

18. TOTAL CORE RECOVERY FOR BORING %

19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0 2		Dk grey micaceous SILT, w/organic roots & fibers	WOH-1 1-2	S-1 1.5'	Start drilling 12:30 pm on 9/22/88
	4	ML	Same, clay lenses	WOH- WOH 1-3	S-2 1.2'	11.0' drilled through before 1st sample taken
	6		Same	1-3 2-2	S-3 2.0'	15.0'casing used
	8	ML/LL	Same, clayey SILT w/roots & fibers sample from Bott. of tube	light mach	UP-1 2.0'	
	10		clayey? Grey black slsyey SILT w/organics, trace fine SAND.	2-2 2-2	S-4 1.9'	
	12		Same	WOH/ 1.0' 1-2	S-5 1.3'	
	14		Grey clayey SILT, trace fine.SAND w/mica	WOH-1 2-2	S-6 1.5'	12.5' ground water reading
	16		Grey clayey SILT, trace organics & fine SAND wet	1-2 2-2	S-7 2.0'	Finished drilling 5pm
	18		Brown, grey clayey SILT, few fine SAND w/mica	1-1 2-2	S-8 2.0'	Told driller to take tube here. They only had one cap, so took spoon
	20		Reddish brown, grey clayey SILT little fine interlayed SAND w/clay lenses & mica	5-6 9-12	S-9 2.0'	Start 7:00 am 9/23/88
	22		Brown, grey SILT, little Very fine SAND w/mica	17-13 13-20	S-10 1.2'	
	24	SW	Grey very fine SAND, trace SILT w/mica	13-13 18-18	S-11 2.0'	
	26	SM	Grey brown very fine SAND little SILT, trace clay	7-7 14-16	S-12 2.0'	
	28		Same	7-20 11-11	S-13 1.5'	
	30		Same	8-8 16-14	S-14 1.1'	
	32		Same, trace SILT	14-14 17-26	S-15 1.5'	
	34		Same, reddish brown tan, few SILT	24-21 34-36	S-16 1.3'	
	36		Same, reddish brown, tan	16-16 18-18	S-17 1.2'	
	38		Same, little SILT	15-17 24-50	S-18 1.5'	
	38.4 40		Same, trace SILT	100/ 4"	S-19 0.4'	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT: Pearce Creek Disposal Area

HOLE NO.: CSB-18

DRILLING LOG (Cont Sheet) ATION TOP OF HOLE

Hole No. C 8

PROJECT Pearce Creek Disposal Area

INSTALLATION

SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	40 41	SW	Reddish brown fine SAND little SILT	39- 100/5"	S-20 0.9'	
	42	SM	Same coarse to fine SAND, trace fine gravel & SILT	10-28 38-36	S-21 1.7'	
	44		Same, tan	39-37 45- 50/3"	S-22 1.5'	Finished hole 2:00 pm 9/23/88
	46		Bottom of hole 46.0'			

ENG FORM 1836-A JUN 67

GPO: 1968 OF—319-248

PROJECT Pearce Creek Disposal Area

HOLE NO. CSB18

DRILLING LOG | VISION | INSTALLATION | SHEET 1 OF 2 SHEETS

1. PROJECT: Pearce Creek Disposal Area
2. LOCATION (Coordinates or Station):
3. DRILLING AGENCY: Froehling &Robertson
4. HOLE NO. (As shown on drawing title and file number): CSB19
5. NAME OF DRILLER: John Organ
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN:
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE: 54.0'
10. SIZE AND TYPE OF BIT: 2" Split Spoon
11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
12. MANUFACTURER'S DESIGNATION OF DRILL: CME 55
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 27 | UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES:
15. ELEVATION GROUND WATER: 12.0'
16. DATE HOLE: STARTED 6/7/88 | COMPLETED 6/13/88
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Red brown well graded SAND w/silt dry	7-8 10-11	S-1 1.3'	Start boring at 4:00 pm
	2 4		Same w/mica dry	7-8 4-5	S-2 1.1'	Finished at 1700 hr Start 8:30 am 6/9
	6		Same, mostly f sand dry	19-13 17-19	S-3 1.5'	
	8		Same, mostly f sand dry	14-8 9-11	S-4 1.2'	
	10		Same	14-24 34-34	S-5 1.0'	
	12	SW	Same, sample moist	24-24 24-26	S-6 0.7'	12.0' ground water
	14	SM	Same red, brown grey black, silty SAND wet	8-9 10-10	S-7 1.0	
	16		Same wet	7-8 10-12	S-8 1.0'	
	18		Same light grey brown v.f. silty SAND wet	11-12 14-14	S-9 1.0'	
	20		Same, wet	11-12 11-9	S-10 1.0'	
	22		Same wet	9-5 4-7	S-11 1.0'	
	24		Reddish brown, silty SAND mostly m-f sand, wet	8-9 11-12	S-12 1.5'	
	26		Brown silty SAND, little fine gravel wet	8-9 10-13	S-13 1.2'	
	28		Brown, grey silty, SAND coarse to fine grained	7-8 10-10	S-14 1.2'	
	30		Tan, mostly fine SAND	4-4 6-8	S-15 1.0'	
	32	SW SM	Same medium to fine grained trace silt	6-7 11-14	S-16 1.5	Finished at 1500 hrs
	34		Same	11-8 7-8	S-17 0.9	6/13 start
	36		Same, mostly coarse to fine SAND, few fine gravel, trace silt	2-1 1-2	S-18 1.0'	
	38		Same	5-3 3-7	S-19 1.0'	
	40		Brown red, grey mostly fine SAND	14-13 17-64	S-20 1.0'	
	40- 40.5		Dense reddish brown silty SAND, few fine gravel	100/5"	S-21 0.5'	
	42 43		White grey fine silty SAND	51- 100/4"	S-22 1.0'	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT: Pearce Creek | HOLE NO. CSB-19

DRILLING LOG (Con[illegible]heet) ELEVATION TOP OF HOLE

Ho[illegible]No. CSB-19

PROJECT

INSTALLATION

SHEET 2
OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	44	SW	Reddish brown, silty SAND	73	S-23	
	45.0	SM	fine	100/4"	0.7'	
	46		Light brown grey, Silty SAND	39-30	S-24	
				39-35	1.3'	
	48		Same, grey	26-37	S-25	
	49.5			100/5"	1.3'	
	50		Same	32-42	S-26	
				48-47	1.7	
	52		Same grey red	15-35	S-27	
				35-42	1.5'	
	54					finsihed boring 6/13/88
			Bottom of boring 54.0'			

ENG FORM 1836-A
JUN 67

GPO: 1969 OF—329-243

PROJECT Pearce Creek

HOLE NO. CSB-19

Hole No. CSB-20

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 2 SHEETS

1. PROJECT Pearce Creek Disposal Area
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY Froehling & Robertson
4. HOLE NO. (As shown on drawing title and file number) CSB 20
5. NAME OF DRILLER John Organ
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN --
8. DEPTH DRILLED INTO ROCK --
9. TOTAL DEPTH OF HOLE 84.0'
10. SIZE AND TYPE OF BIT 2" Split Spoon
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL CME 55
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 42 UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES --
15. ELEVATION GROUND WATER 18.0'
16. DATE HOLE STARTED 7/20/88 COMPLETED 8/1/88
17. ELEVATION TOP OF HOLE 40' --
18. TOTAL CORE RECOVERY FOR BORING -- %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Brown silt, trace fine sand, w/mica trace of roots & fibers	6-6 6-7	S-1 1.0'	Start drilling 10:30 7/20/88
	2		Brown grey silt, trace fine sand, trace of organics	9-11 6-6	S-2 1.0'	
	4		Same, grey, trace organics	2-3 4-5	S-3 1.5'	
	6		Same, trace organics clay lenses	2-3 4-5	S-4 1.5'	
	8	ML	Same, few fine sand	2-1 2-2	S-5 1.5'	
	10		Same, little fine sand trace of organics sea shell pieces	2-3 3-5	S-6 1.0'	
	12		Same	1-1 2-1	S-7 1.0'	
	14		Same, some sand clay lenses	2-2 1-2	S-8 0.8'	
	16		Dk grey silt, trace fine sand w/roots and fibers	2-2 2-2	S-9 0.5'	Ground water reading
	18		Grey brown silt, little medium to fine sand, trace fine gravel	2-2 1-2	S-10 1.7'	Static casing removed 18.0' 8/1/88
	20		Brown grey silt, trace fine sand	2-2 2-3	S-11 1.5'	
	22		Grey clayey silt	2-2 2-2	S-12 1.5'	
	24		Brown grey clayey silt, little fine sand	2-3 3-3	S-13 1.5'	
	26		Same	3-5 7-7	S-14 1.5'	Finished drilling 1:45 pm
	28	SW	Brown grey mostly fine sand, little silt w/mica	3-3 4-3	S-15 0.5'	Start 5 am 7/21/88
	30	SM	Brown grey medium to fine sand, little silt, trace fine gravel, (1 large piece)	4-6 4-5	S-16 1.0'	
	32		Brown fine sand, w/clay lenses, little silt	4-7 9-15	S-17 1.0'	
	34		Same	6-8 12-16	S-18 1.0'	
	36		Same	12-14 10-29	S-19 0.9'	
	38		Same, some silt	10-15 19-28	S-20 1.0	
	40					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek Disposal Area

HOLE NO. CSB-20

DRILLING LOG (Co[illegible] Sheet) ELEVATION TOP OF HOLE **H[illegible] No.** CSB-20

PROJECT | INSTALLATION | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	40		Grey, light brown very fine sand trace silt	20-19 24-17	S-21 1.0'	Casing driven to 40.0' on 7/25/88
	42		Same	14-47 39-38	S-22 1.5'	
	44		Same	12-15 36-61	S-23 1.2'	Hole collapsed 44.5'
	46		Grey white fine sand trace silt	30-32 50-61	S-24 1.2'	
	48		Brown, red, grey coarse to fine Sand, trace clayey silt trace fine gravel	12-15 20-15	S-25 1.2'	
	50	SW	Tan, red coarse to fine sand	14-11 55-57	S-26 1.2'	
	52	SM	Reddish brown coarse to fine sand, little silt, trace fine gravel	21-40 39-36	S-27 1.5'	Stopped drilling 9:30am
	54		Same, mostly fine sand	15-11 5-8	S-28 1.3'	to get rig #2 set up on Boring CSB-24 Start drilling 10:30am 7/25/88
	56		Same coarse to fine sand, some fine gravel	6-7 27-47	S-29 1.5'	Stopped drilling 3:15pm
	58		Same	24-37 24-23	S-30 1.2'	Start drilling 5:30 am 7/26/88 Casing driven to 60.0'
	60		Same	28-33 37-37	S-31 1.0'	8/1/88
	62 62.5		Grey white fine sand trace silt w/mica	100/ 6"	S-32 0.6'	Finished 9:00am 7/26/88
	64 64.5		Same, grey brown	100/ 6"	S-33 0.4'	Start drilling 5am on 8/1/88
	66 66.4		Brown grey coarse to fine sand, trace silt trace fine gravel	100/ 5"	S-34 0.3'	
	68		Brown grey fine sand, trace silt	37-41 56-64	S-35 1.6'	
	70		Same	39-47 52-60	S-36 1.2'	
	72		Tan, grey fine sand, trace silt	44-50 90- 100/5"	S-37 1.5'	
	74 74.5		Same	100/ 5"	S-38 0.4'	
	76		Same	52-60 62-77	S-39 1.6'	
	78		Same	57-61 62-24	S-40 1.5'	
	80	Top Bottom	Greyish medium to fine sand, some silt from 80.0' to 81.5' Reddish fine sand, from 81.5' to 82.0'	7-6 1-12	S-42 2.0'	Samples A & B
	82		Same	21-27 24-24	S-42 1.5'	Finish drilling at 12:30
	84		Bottom of hole 84.0'			Move to CSB-17 to set up by 1:30 quit for day

PROJECT Pearce Creek Disposal Area | HOLE NO. CSB-20

HOLE NO.

DRILLING LOG	DIVISION	INSTALLATION
		SHEET 1 OF 1 SHEETS

1. PROJECT Pearce Creek Disposal Area	10. SIZE AND TYPE OF BIT 2" Split Spoon
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY Froehling & Robertson Inc.	12. MANUFACTURER'S DESIGNATION OF DRILL CME 55
4. HOLE NO. (As shown on drawing title and file number) CSB-22	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED 20 — UNDISTURBED 0
5. NAME OF DRILLER John Organ	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE — STARTED 6/7/88 — COMPLETED 6/7/88
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE 30'
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 40.0'	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0	ML	Red, grey, white sandy SILT trace gravel dry	5-7 4-4	S-1 1.0'	start boring 8:00 am
	2		Red, grey, tan, SILT w/ f sand	3-3 4-5	S-2 1.0'	
	4	SP SM	Brown tan poorly graded SAND. w/silt	4-4 5-5	S-3 1.0'	24 hr water reading collapsed at 5/4'
	6		Same, moist, w/mica	2-2 1-1	S-4 1.2'	
	8	ML	Grey, black SILT moist w/ organics, laminated w/mica	1-12" 1-1	S-5 1.5'	
	10		Brown, grey SILT little f sand	1-1 1-12"	S-6 2.0'	
	12		Reddish brown silty SAND	1-4 7-8	S-7 1.3'	
	14	SM	Same, moist, w/mica	5-6 9-12	S-8 1.1	8
	16		Same trace gravel	4-7 9-11	S-9 0.7'	
	18		Same, mostly f SAND w/mica	7-9 10-11	S-10 1.5'	
	20		Same	7-14 14-16	S-11 1.5'	
	22		Same	8-9 8-11	S-12 1.8'	[illegible]
	24		Brown grey SILT, w/mica	5-4 5-7	S-13 1.5'	
	26		Brown grey sandy SILT trace f sand	4-4 6-10	S-14 1.3'	
	28		Red brown sandy SILT	7-8 8-10	S-15 1.2'	15
	30	ML	Light grey SILT, trace f sand w/mica	5-5 5-6	S-16 0.8'	
	32		dark grey med. dense SILT	7-8 11-12	S-17 1.5'	
	34		Same	6-9 9-9	S-18 1.2'	
	36		Same	8-10 13-11	S-19 1.5'	
	38		Same	7-8 9-10	S-20 1.5'	Finished boring 1500 hrs
	40		Bottom of boring 40.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT Pearce Creek Disposal Area HOLE NO. CSB-22

H[illegible] No. CSB-23 [redacted]

DRILLING LOG | **DIVISION** | **INSTALLATION** | **SHEET** 1 **OF** 2 **SHEETS**

1. PROJECT Pearce Creek Disposal Area

2. LOCATION (Coordinates or Station)

3. DRILLING AGENCY Froelhing & Robertson

4. HOLE NO. (As shown on drawing title and file number) CSB

5. NAME OF DRILLER John Organ

6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.

7. THICKNESS OF OVERBURDEN --

8. DEPTH DRILLED INTO ROCK --

9. TOTAL DEPTH OF HOLE 60.0'

10. SIZE AND TYPE OF BIT 2" Split Spoon

11. DATUM FOR ELEVATION SHOWN (TBM or MSL)

12. MANUFACTURER'S DESIGNATION OF DRILL CME 55

13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | **DISTURBED** 30 | **UNDISTURBED** 0

14. TOTAL NUMBER CORE BOXES --

15. ELEVATION GROUND WATER

16. DATE HOLE | **STARTED** 7/19/88 | **COMPLETED** 7/20/88

17. ELEVATION TOP OF HOLE --

18. TOTAL CORE RECOVERY FOR BORING -- %

19. SIGNATURE OF INSPECTOR Kenneth O'Rourke

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Brown SILT, w/roots & fibers, trace fine sand	5-5 6-7	S-1 1.5'	Start drilling 9:30 a.m.
	2		Same - w/mica	5-7 7-6	S-2 1.0'	
	4		Same - w/roots. About 2" of red grey white silt cease clayey silt	3-3 2-4	S-3 1.2'	
	6		Brown SILT, trace fine sand w/mica	2-2 2-2	S-4 1.2'	
	8	ML	Same, w/roots & fibers	2-2 3-4	S-5 1.2'	
	10		Same w/clay lenses	1-1 3-3	S-6 1.5'	Started Losing fluid 12.0'
	12		Brown grey SILT, little fine sand w/woody fibers	1-2 3-4	S-7 1.0'	Pushed casing to 14.5'
	14		Same	2-2 2-2	S-8 1.0'	Grounded water at 15.5'
	16		Grey SILT, w/roots & fibers, fibers, clay lenses, trace fine sand	2-2 1-2	S-9 1.5'	
	18	SW SM	Brown coarse to fine sand few reddish silt, tract of fine gravel w/woody fibers	2-3 4-5	S-10 1.2'	
	20	ML	Brownish red clayey SILT, trace fine sand, trace fine gravel	6-10 12-10	S-11 1.0'	
	22	SW	Brown medium to fine SAND, few Silt	5-6 6-7	S-12 1.0'	
	24	SM	Same, fine SAND w/mica wet	4-6 7-6	S-13 0.8'	Start drilling 5 a.m. 7/20/88
	26		Same Grey brown	3-2 1-1	S-14 1.2'	
	28	ML	Grey black SILT, w/organic fibers, trace fine sand	1/12" 2-2	S-15 1.9'	
	30	SW	Brown grey fine SAND, some some silt w/mica	2-1 2-2	S-16 1.0'	
	32	SM	Same, w/roots & fibers	2-2 2-1	S-17 1.0'	
	34		Same, little silt	2-1 1-2	S-18 1.0'	
	36		Same some silt	4-5 6-6	S-19 1.0'	
	38		Same	6-6 8-9	S-20 1.0'	
	40					

DRILLING LOG (Cont[illegible]eet) ELEVATION TOP OF HOLE

Hole [illegible] CSB-23

PROJECT Pearce Creek Disposal Area

INSTALLATION

SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	40		Brown fine sand, little silt w/mica	11-12 13-14	S-21 1.2'	
	42		Same	10-12 14-14	S-22 1.5'	
	44	SW SM	Same	10-15 19-18	S-23 1.2'	
	46		Same, some silt	10-11 8-6	S-24 1.5'	
	48		Same, grey	13-14 11-11	S-25 0.8'	
	50		Same grey brown	10-12 10-11	S-26 1.5'	
	52		Same	6-11 15-20	S-27 1.5'	
	54		Same	13-19 11-9	S-28 1.2'	
	56		Grey silt, little fine sand	4-4 4-5	S-29 1.0'	
	58	ML	Same	6-6 7-6	S-30 1.0'	Hole collapsed 58.7
	60		Bottom of boring			Finished boring 9:30 am 7/20/88 Silt layers throughout boring were about 2.0' didn't take tube at 58.0' took spoon and had some material completion depth was 60.0' so called hole.

ENG FORM JUN 67 1836-A

GPO: 1969 OF—329-248

PROJECT Pearce Creek Disposal Area

HOLE NO. CSB-23

DRILLING LOG

DIV[redacted]N

INSTALLATION [redacted]

SHEET 1 OF 1 SHEETS

1. PROJECT Pearce Creek Disposal Area
2. LOCATION (Coordinates or Station) --
3. DRILLING AGENCY Froelhing & Robertson
4. HOLE NO. (As shown on drawing title and file number) CSB-24
5. NAME OF DRILLER John-Birch
6. DIRECTION OF HOLE ☒ VERTICAL ☒ INCLINED ________ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN --
8. DEPTH DRILLED INTO ROCK --
9. TOTAL DEPTH OF HOLE 15.0'
10. SIZE AND TYPE OF BIT 2" split spoon
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL Rig #2 CME 45
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | DISTURBED 7 | UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES --
15. ELEVATION GROUND WATER 4.5'
16. DATE HOLE | STARTED 7/21/88 | COMPLETED 7/21/88
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR Kenneth O'Rourke

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0	SW	Light grey brown fine sand, trace silt	2-2 4-2	S-1 1.2'	Start drilling at 11:15am Removed 3.0' of fill before sample #1 taken
	2	SM	Same. Wet w/shell pieces	1-12" WOH 12"	S-2 1.0'	
	4		Same	2-1 1-2	S-3 1.0'	Ground Water at 4.5'
	6		From 7.0' to 7.5' Same From 7.5' to 8.0' Dk grey silt w/organics & trace sand	2 WOH for 1.5'	S-4 A&B 1.0'	Samples A&B
	8	ML/CL	Same sample in jar from bottom of tube	light mach	UP1 2.0'	
	10		Brown grey silt, trace fine sand, clay lenses	2-2 2-2	S-5 1.5'	
	12		Black grey clayey silt. trace fine sand Dk clayey silt from 14.0' to 14.5'	WOH12" 1-2	S-6 2.0'	
	14	sm	Grey brown fine sand trace silt & clay	1-12" 7-7	S-7 1.5'	Samples A&B
	16		Bottom of hole 16.0'			Finished drilling at 2:45 pm

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PROJECT Pearce Creek Disposal Area | HOLE NO. CSB-24

DRILLING LOG

DIVISION NORTH ATLANTIC DIVISION

INSTALLATION PHILADELPHIA DISTRICT

SHEET 1 OF 7

1. PROJECT Pearce Creek
2. LOCATION (Coordinates or Station) 1598009 E, 642557 N
3. DRILLING AGENCY UNI-TECH DRILLING CO., INC.
4. HOLE NO. (As shown on drawing title and file number) CSW-1
5. NAME OF DRILLER Joseph Jester
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 139.5 Ft.
10. SIZE AND TYPE OF BIT 4-3/4" side discharge drag bit
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NAVD 88
12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN disturbed: 68 undisturbed: 1 att. 0 accepted
14. TOTAL NUMBER OF CORE BOXES 0
15. ELEVATION GROUND WATER
16. DATE HOLE STARTED 12/07/95 COMPLETED 12/12/95
17. ELEVATION TOP OF HOLE 35.27 Ft.
18. TOTAL CORE RECOVERY FOR BORING
19. SIGNATURE OF INSPECTOR S.M. Cook

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
35.3	.0						
33.5	1.8	▥	SILT; dark brown; medium dense; with some wood; trace mica; dry; turning black; solfter and moist; with less vegetation in tip 2"	14"	SPT 1	Boring located in western part of disposal area, on flat silty area 2-4 ft. above surrounding ground. Unless otherwise noted SPT samples were taken according to ASTM 1586. Chemical sample CSW-1-1'-1' @ 14:10, from top of sample.	8 10 11 11
33.0 32.8 32.3	2.3 2.5 3.0	▨ ▥ ▨ ▨	Silty CLAY; black; low plasticity; firm; moist; then 6" Silty SAND; dark gray; loose; fine grained; poorly graded; w/ trace mica; then 6" Silty CLAY as top	18"	SPT 2	Areas with wood are orangish. Chemical sample CSW-1-2.5'-3' taken @ 14:28 (middle 6" Silty SAND)	8 4 3 3
		▨	CLAY; black; soft; low plasticity; organic; with trace wood; trace mica; trace sand in one <1/2" lens Top 5" as above; then	24"	SPT 3	Chemical sample CSW-1-4'-6' taken @ 14:35 (1 jar) Turned chocolate brown after exposed to air in sample jar for several days.	WOH WOH WOH 5
29.0	6.3	░	SAND; dark brown; dense; medium grained; poorly graded; with trace silt; trace mica	12"	SPT 4	Chemical sample CSW-1-6.5'-7' taken @ 14:45	10 14 17 17
27.0	8.3	▨	Top 7" SAND; as base of SPT4 with coarser grains; wet Base 6" clay; black; as SPT3	13"	SPT 5	trace red and yellow and black colors in thin lenses	8 2 3 2
24.1	11.2	▨ ▥	As base of SPT 5, grading drier with some vegetation with increasing sand; then base 7" Silty SAND; dark brown-black; loose	22"	SPT 6		2 3 3 4
23.3 22.1	12.0 13.2	▨ ░	Top 14" Silty CLAY; light brown with black spots; with some vegetation ; then grading through black Silty SAND to SAND; tan; medium dense, medium grained, poorly graded.	24"	SPT 7	Chemical sample CSW-1-13'-14' taken @ 15:06	5 6 6 7
19.3	16.0	░	SAND; as base of SPT 7; with more gray and black areas with some silt. Trace gray and red clay and wood in tip	8"	SPT 8		4 5 7 7
		▥	Sandy SILT; dark brown; loose; fine grained sand; wet	7"	SPT 9	Chemical sample CSW-1-16'-18' taken @ 15:13	4 3 3 2
						(continued)	

Hole No.CSW-1

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 35.27 Ft.

SHEET 2 OF 7

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
17.3	18.0	▥					
16.3	19.0	░		0"	U-1	Undisturbed tube driven @ 15:15 @ 200 psi. Recovered 0" @ 15;30. No recovery	
		░	SAND; black; medium dense; moderately well graded; medium grained; organic smell; with one large piece of wood; trace fine gravel; with some silt.	9"	SPT 10		4 7 8 8
		░	SAND; as SPT 10 above with trace soft brown clay in one 2" lens.	14"	SPT 11		7 8 10 10
11.3	24.0	▨	CLAY; yellow-brown; firm; very moist-wet; plastic; with some silt; trace sand	19"	SPT 12	Chemical sample CSW-1-24'-26' taken @ 15:57	2 3 3 5
9.3	26.0	▥	Sandy SILT; yellow-brown; medium dense; dry; with trace gravel; trace mica	10"	SPT 13	Harder and drier than SPT 12 Soil pH in water = 5.7 @10 min.	10 12 12 14
		▥	As SPT 13	2"	SPT 14	Driller says gad a difficult time getting spoon down, may be trying to push a piece of gravel. End of day 12/7/95	7 11 15 18
5.1	30.2	░	Top 4" as SPT 13; then SAND; light pinkish gray with some orange areas; very dense; v. fine grained; poorly grained; wet; with some silt in lenses.	12"	SPT 15		7 21 32 37
3.3	32.0	▥	Silty SAND; pintk and yellow; dense; fine grained; poorly graded; with trace clay.	14"	SPT 16	Chemical sample CSW-1-32'-34' taken	10 15 17 23
		▥	Top 9" Silty SAND; gray-pink; dense; very fine grained; poorly graded; with trace clay; then Silty SAND; yellow and orange; very dense; moderately well graded; with trace clay in laminations	14"	SPT 17	Silty SAND has dark red-orange spots.	14 15 20 27
-.7	36.0	░	SAND; white; very dense; medium grained; angular; quartz; clean.	9"	SPT 18		55 100/ 5"
		░	SAND; as SPT 18	3"	SPT 19	Gravel and Clay in 6" slough	100/ 3"
						(continued)	

Hole No.CSW-1

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 35.27 Ft.

SHEET 3 OF 7

PROJECT
Pearce Creek

INSTALLATION
PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
-4.7	40.0						
			SAND; as SPT 18; poorly graded in lenses; with some coarse grained sand.	12"	SPT 20		55 100/ 6"
			SAND; white; very dense; coarse grained; poorly graded; clean; quartz with trace feldspar; angular.	5"	SPT 21		67 100/ 6"
			SAND; pinkish and yellow; very dense; coarse grained; well graded; angular; with some silt	9"	SPT 22	Switched to downhole hammer to improve recovery and driving distance. Hole reamed w/6" open-discharge bit. Blows listed below are not directly comparable to standard N values.	12 20 27
-10.7	46.0						
			Gravelly SAND; white; very dense; well graded; gravel is fine sized; with 4" lens of fine Silty SAND; gray and yellow.	8"	SPT 23		7 52 50/ 2"
			As SPT 23 with yellow and black silt/clay lens.	2"	SPT 24	2" gravel slough. Circulating longer and harder as ream to 50'.	100/ 4"
			As SPT 23	<1"	SPT 25	4" gravel in top slough	100/ 5"
			Gravelly SAND; white, very dense; medium grained; well graded; clean; gravel is fine sized, rounded	5"	SPT 26		100/ 5"
			As SPT 26 with 2" yellowish lens	7"	SPT 27		47 100/ 6"
-20.7	56.0						
			SAND; tan; very dense; medium grained; poorly graded.	<1"	SPT 28		100/ 4"
-22.7	58.0						
			Gravelly SAND; tan; very dense; medium grained; poorly graded.	1"	SPT 29		100/ 2"
			Gravelly SAND; pinkish; as SPT 26	1"	SPT 30		60 100/ 4"
-26.7	62.0					*(continued)*	

Hole No.CSW-1

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 35.27 Ft.

SHEET 4 OF 7

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-26.7	62.0						
			SAND; pinkish light brown; very dense; medium grained; poorly graded; with trace silt (light brown and white)	3"	SPT 31		100/ 5"
			SAND; light brown; as SPT 31	6"	SPT 32	Soil pH in water = 6.25 @ 10 min.	100/ 6"
			SAND; light brown; very dense; medium grained; very poorly graded; clean	4"	SPT 33		57 50/ 2"
			SAND; as SPT 31	3"	SPT 34		100/ 4"
			SAND; white; very dense; medium grained; poorly graded; with some white silt.	8"	SPT 35		20 29 39
			SAND; as SPT 33; clean	4"	SPT 36		40 50/ 2"
			SAND; light brown with yellow and dark red lens near base very dense; medium grained; poorly graded; with some silt.	9"	SPT 37	Dark red-black lens is cemented, <1/2" thick	27 54 50/ 1"
-40.7	76.0		Sandy SILT; white with orange spots and pink, very dense; poorly graded; sand is very fine-fine; dilatant; with trace clay.	14"	SPT 38	Orange spots are harder w/larger grains.	7 12 40
-42.7	78.0		SAND; light brown; pink and white; very dense; very fine to fine grained; low dilatancy; with some silt; trace gray-white silty clay.	12"	SPT 39	One yellow-brown area near base. Chemical sample CSW-1-78'-79.5' taken @ 14:52 End of day 12/8/95	27 55 43
			No recovery	0"	SPT 40	Slough	38 50/ 1"
			SAND; white, very clean; very fine-fine grained; poorly graded with trace white silt.	8"	SPT 41		27 35 53
						(continued)	

Hole No.CSW-1

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 35.27 Ft.

SHEET 5 OF 7

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
-48.7	84.0						
			SAND; same as SPT 41	8"	SPT 42		15 23 31
			No recovery	0"	SPT 43	1/2" slough	21 38 50
			SAND; same as SPT 41	10"	SPT 44		15 23 30
			SAND; same as SPT 41	1"	PT 45	2" slough	19 28 60
			SAND; same as SPT 41	8"	SPT 46		21 60 50/ 1"
			SAND; same as SPT 41	9"	SPT 47		19 43 60
			SAND; same as SPT 41	12"	SPT 48		15 21 29
			SAND; same as SPT 41	7"	SPT 49		15 25 39
			SAND; same as SPT 41	1/2"	SPT 50		59 50/ 1"
			SAND; light gray; very dense; medium grained; poorly graded; clean	4"	SPT 51		45 50/ 2"
			SAND; same as SPT 51	2"	SPT 52		37 50/ 2"
						(continued)	

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PROJECT Pearce Creek

HOLE NUMBER CSW-1

Hole No.CSW-1

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 35.27 Ft.

SHEET 6 OF 7

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.	
-70.7	106.0							106
			SAND; light gray; very dense; medium grained; well graded; trace gravel	4"	SPT 53		45 50/2"	
			SAND; same as SPT 51	2"	SPT 54	End of day 12/11/95	39 50/1"	108
			SAND; white; very dense; coarse grained; well graded; trace gravel; some white silt.	2"	SPT 55	2" slough	27 32 55	110
			SAND; pinkish white; very dense; medium grained; poorly graded; trace silt.	6"	SPT 56	Similar to SPT 41	39 50/1"	112
			SAND; same as SPT 56	5"	SPT 57		100/5"	114
			SAND; same as SPT 56	2"	SPT 58		100/6"	116
			SAND; same as SPT 56	1/2"	SPT 59	1/2" slough	100/4"	118
			No recovery	0"	SPT 60		100/3"	120
			No soil recovery, 1/2" size sand stone gravel pinkish brown.	1/2"	SPT 61		100/5"	122
			No recovery	0"	SPT 62		100/2"	124
			No recovery	0"	SPT 63		82 100/5"	126
						(continued)		128

Hole No.CSW-1

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 35.27 Ft.

SHEET 7 OF 7

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
-92.7	128.0						
		░	SAND; 9" gray; 1" olive gray; very dense; coarse grained; well graded.	10"	SPT 64	Sample 13:00 No sample	27 39 50
		░	SAND; olive yellow; very dense; coarse grained; well graded.	8"	SPT 65		43 100/5"
		░	No sample			Hit hardpan and drilled through, no sample.	
-97.7	133.0						
		▨	CLAY; with some brown and light gray with occasional black spots; hard, moist to dry; plastic.	12"	SPT 67		24 40 62
		▨	CLAY; variegated red and gray; hard; dry; plastic.	4"	SPT 68		39 50/2"
		▨	CLAY; red gray mix; hard; dry; plastic;	9"	SPT 69	Chemical sample CSW-1-138'-139.5' taken @ 14:30	15 27 39
-104.2	139.5						
			Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on Laboratory Analyses.			End of Boring at 139.5' Placed well screen (119'-129') on 12/13/95.	

Hole No.CSW-2

DRILLING LOG	DIVISION NORTH ATLANTIC DIVISION
INSTALLATION PHILADELPHIA DISTRICT	*SHEET 1* *OF 10*

1. PROJECT
Pearce Creek

2. LOCATION *(Coordinates or Station)*
1599473.82 E, 644581.83 N

3. DRILLING AGENCY
UNI-TECH DRILLING CO., INC.

4. HOLE NO. *(As shown on drawing title and file number)* CSW-2

5. NAME OF DRILLER
Joseph Jester

6. DIRECTION OF HOLE
☒ VERTICAL ☐ INCLINED

7. THICKNESS OF OVERBURDEN

8. DEPTH DRILLED INTO ROCK

9. TOTAL DEPTH OF HOLE 209.2 Ft.

10. SIZE AND TYPE OF BIT 4-3/4" side discharge trivane

11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*
NAVD 88

12. MANUFACTURER'S DESIGNATION OF DRILL
Failing 1500

13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN
disturbed: undisturbed: att. accepted

14. TOTAL NUMBER OF CORE BOXES 0

15. ELEVATION GROUND WATER

16. DATE HOLE STARTED COMPLETED
10/30/95 11/07/95

17. ELEVATION TOP OF HOLE 39.89 Ft.

18. TOTAL CORE RECOVERY FOR BORING

19. SIGNATURE OF INSPECTOR
S.M. Cook

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
39.9	.0						
			Silty SAND; brown; loose; moist.	2"	SPT 1	Unless otherwise noted, SPT samples taken according to ASTM 1586 Using bentonite mud, "QuickGel" by Baroid. Recovery too low; no environmental sample.	2 3 2 3
			Silty SAND; brown; loose; medium-grained; moist	14"	SPT 2	Chemical sample CSW-2-2'-3' taken @ 10:46	5 5 4 4
35.9	4.0						
34.9	5.0		SAND; gray-black; very loose; medium-grained; moist; with some silt; some organics.	13"	SPT 3	Chemical sample CSW-2-6'-7' taken @ 10:50	1 1 2 4
			SILT; gray-black; very loose; with some fine to coarse sand; moist. SILT; brown; loose; with some sand; some wood; trace mica.	10"	SPT 4		2 3 2 3
			As SPT 4, above	17"	SPT 5		2 3 2 1
			As SPT 4, above	13"	SPT 6	Chemical sample CSW-2-10'-12' taken @ 10:59	2 3 2 1
			As SPT 4 above, with silty sand lens; lens is black; moist; with medium sand; 3" at base.	24"	SPT 7		2 2 2 2
			SILT; brown; loose; moist with some wood; trace sand; clay.	24"	SPT 8	Chemical sample CSW-2-14'-16' taken @ 11:07 ~10% fine to medium sand by settling jar volume.	2 3 3 3
			As SPT 8, above.	24"	U-1	Drove Undisturbed tube @ 11:11 @ 1150 psi Retrieved tube @ 11:27	
						(continued)	

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16
18

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MAR 71

PROJECT	HOLE NUMBER
Pearce Creek	CSW-2

Hole No.CSW-2

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE 39.89 Ft.	SHEET 2 OF 10
PROJECT Pearce Creek	INSTALLATION PHILADELPHIA DISTRICT	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
21.9	18.0		As SPT 8, slightly drier Base has more organic black silty clay	24"	SPT 9	Chemical sample CSW-2-18'-20' taken @ 11:39	3 3 4 4
			As SPT 8 above, with middle 0.8' SILT; black and brown laminations; very loose; very moist.	24"	SPT 10		0 0 1 2
17.9	22.0		Organic Silty CLAY; dark brown; firm; medium plasticity; trace mica	24"	SPT 11		3 4 4 5
			As SPT 11, moist. Silty CLAY; gray with black mottles; drier near base; one red-brown mottle at 25.2; low plasticity.	24"	SPT 12		2 2 2 2
			Clayey SILT; loose; gray and yellow-brown; with some very fine sand; with trace fine to medium sand; one 4" silty sand lens.	20"	SPT 13		2 2 2 2
				16"	SPT 14	Chemical sample CSW-2-28'-30' taken @ 12:05	3 4 4 7
			As SPT 14, above.	12"	SPT 15		0 0 1 2
7.9	32.0		SAND; tan; dense; poorly graded; medium grained; quartz; rounded; wet; with trace wood.	14"	SPT 16		16 12 23 14
			SAND; brown-tan; medium dense; poorly graded; fine grained; with some medium sand; trace silt in lenses.	9"	SPT 17	Chemical sample CSW-2-34'-36' taken @ 13:31	6 7 7 7
3.5	36.3		Top 4" Sand, as above,then SILT; dark brown; medium dense; with trace fine sand; trace mica	16"	SPT 18		5 7 7 4
.7	39.2		Organic SILT; black; with some wood Base 10" clayey SILT; brown and red.	24"	SPT 19	Sampled base	3 4 4 4
						(continued)	

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE.
MAR 71

PROJECT	HOLE NUMBER
Pearce Creek	CSW-2

Hole No.CSW-2

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 39.89 Ft.

SHEET 3 OF 10

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
-.1	40.0						
-1.1 -2.1	41.0 42.0		Top as SPT 19 above; colored black; brown; red with yellow mottles. Base 12" Brown SILT and tan SAND lenses.	24"	SPT 20		4 6 5 5
-2.7 -3.1	42.6 43.0		Top 7" Silty CLAY as top of SPT 20 then 3" SAND; gray medium grained then 2" SILT; then 5" SAND; tan; fine-grained; wet; with organic black laminations.	17"	SPT 21		7 8 12 14
-5.6 -6.1	45.5 46.0		SAND; tan; medium dense; poorly graded; very fine grained; in laminations. Base 6" Gray-brown SILT and SAND laminations; with silt; wood and roots in bottom 2".	17"	SPT 22		9 9 11 15
			SAND; gray-brown; dense; well graded; fine to coarse grained; quartz; wet; with brown woody silt lenses.	16"	SPT 23		13 16 18 23
				1"	SPT 24	No sample – insufficient recovery 1.5" piece of shattered quartz gravel stuck in tip of spoon Lost ~10 gal. mud, mixed thicker	6 12 12 14
			SAND; gray-brown; medium dense; well graded; fine to coarse grained; mostly medium, with some fine gravel.	10"	SPT 25		11 11 14 16
			SAND; gray; medium dense; medium to coarse grained; with some fine gravel.	11"	SPT 26		7 12 14 21
			SAND; gray; dense; well graded; medium to coarse grained; with some fine rounded quartz gravel.	13"	SPT 27		16 22 17 18
-18.1	58.0		SAND; gray; medium dense; well-graded; medium to coarse grained.	12"	SPT 28		16 12 9 8
-20.1	60.0		Silty SAND; dark brown; medium dense; fine grained; wet; with trace wood.	24"	SPT 29		5 7 7 12
			SAND; brown; medium dense; poorly graded into 2"-4" lense; fine to medium grained; with some coarse sand; with trace gravel; trace silt.	11"	SPT 30		7 9 14 20
						(continued)	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek

HOLE NUMBER CSW-2

Hole No.CSW-2

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE 39.89 Ft.	SHEET 4 OF 10
PROJECT Pearce Creek	INSTALLATION PHILADELPHIA DISTRICT	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-22.1	62.0						
		░	SAND; medium brown; very dense; poorly graded; fine grained; grains are quartz; med-high sphericity; with trace silt.	16"	SPT 31		25 29 42 57
		░	As above, yellow; grading more silty				
-24.8	64.7	▨	Base 10" clayey SILT; gray; medium dense; moist; with trace fine sand; grading to CLAY; medium plasticity.	17"	SPT 32		16 9 9 10
		▨	Top CLAY; light gray; as above, then 12" SAND; yellow-brown; very dense; with some silt; then 2" Gray CLAY in base.	21"	SPT 33		7 11 57 24
-27.0	66.9	░					
-27.9	67.8	▨					
-28.1	68.0	▨	3"-4" lenses of alternating Silty SAND; yellow-brown and gray; with some gravel; rounded; up to 1.25" and CLAY; gray; as above.	17"	SPT 34		25 33 40 44
-30.1	70.0	▥	Silty SAND; brown and gray; very dense; sand is brownish; fine to medium grained; poorly graded; silty areas are light gray.	5"	SPT 35		100/5"
-32.1	72.0	▨	Organic Silty CLAY; dark gray; very stiff; medium plasticity; with trace fine sand; trace mica; trace wood often in whitish spots. Top 4" has trace gravel.	24"	SPT 36		12 13 14 15
		▨	Silty CLAY; as above; very stiff	24"	SPT 37	Slightly easier to cut w/knife than above	7 9 11 13
		▨	Silty CLAY; as above; with trace fine to coarse sand in top 7".	24"	SPT 38		13 12 12 15
-38.1	78.0	▨	Organic CLAY; gray; medium plasticity; trace wood.	24"	U-2	Drove Undisturbed tube @ 10:02 @ 100 psi Retrieved @ 10:19	
		▨	Organic CLAY; gray; stiff; medium plasticity; trace wood.	24"	SPT 39		7 8 7 9
		▨	Organic CLAY; gray; as SPT 39	24"	SPT 40		6 7 9 8
						(continued)	

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE.
MAR 71

PROJECT	HOLE NUMBER
Pearce Creek	CSW-2

Hole No.CSW-2

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 39.89 Ft.

SHEET 5 OF 10

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-44.1 -44.3 -46.2	84.0 84.2 86.1	▨	Top 4" as above; grading brownish; then PEAT; brown changing to black; medium dense; dry	24"	SPT 41	Chemical sample CSW-2-84'-86' taken @ 11:20 Turns darker with exposure to air; Silt goes from brown to black in seconds.	9 16 13 28
		▨	Top 2" PEAT; as above, then Organic Silty CLAY; gray with black spots; very stiff; medium; plasticity; mosit; with trace mica sparkles.	24"	SPT 42	Cuts easily w/knife - cream cheese texture	10 11 12 13
		▨	As SPT 42 above	24"	SPT 43	Top has 1/2" nodule of geenish white rounded medium sand-sized particles.	19 20 22 30
		▨	Organic Silty CLAY; gray-brown; very stiff; as above.	24"	SPT 44		11 10 15 10
-52.8	92.7	▨	Organic Silty CLAY; as above; then Base 4" Silty SAND; gray; medium dense; poorly graded; medium dense; poorly graded; medium grained; wet.	24"	SPT 45	Brown changes to gray w/exposure to air. Sampled base	70 68 118 110
-54.8 -55.1 -55.3 -56.1	94.7 95.0 95.2 96.0	▨	Top 8" Silty SAND; as above, then Organic Silty CLAY; gray-brown; some wood; with 2" silty SAND lens 95-95.2.	24"	SPT 46	Sampled top	12 13 18 18
		▨	Organic CLAY; gray-brown; hard; dry; with some wood; trace mica sparkles (less than SPT 42).	24"	SPT 47		19 20 19 23
		▨	Organic CLAY; very stiff; as above.	24"	SPT 48		11 12 14 14
		▨	Organic CLAY; hard; as above.	24"	SPT 49		13 17 18 18
		▨	Organic CLAY; very stiff; as above.	24"	SPT 50	Chemical sample CSW-2-102'-104' taken	7 9 9 11
		▨	Organic CLAY; very stiff; as above.	24"	SPT 51		6 8 11 11

(continued)

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek

HOLE NUMBER CSW-2

Hole No.CSW-2

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 39.89 Ft.

SHEET 6 OF 10

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-66.1	106.0	▨	As above; stiff; with trace fine sand, trace gravel; with 2" Silty SAND lens	24"	SPT 52		8 8 8 7
-68.6	108.5	░	Top 6" as above then grades to Silty SAND; brown; fine; then SAND; white-light gray; very dense; poorly graded; fine to medium grained; rounded; wet; quartz.	8.5"	SPT 53		26 50/2.5"
		░	4" SAND; white; as above; with black roots; then SAND; gray-brown; very dense; some silt; fine grained; grading to SAND; gray; fine to medium; with trace silt; trace fine quartz rounded gravel.	15"	SPT 54		22 37 100/6"
		░	SAND; gray; very dense; fine grained; with trace silt; trace gray clay in 1" lens	5"	SPT 55		100/6"
		░	SAND; gray and brown; very dense; very fine to medium grained; with some silt.	4"	SPT 56	Piece of gravel in slough	90 50/2"
		░	SAND; brown and gray; very dense; poorly graded; fine to medium grained; with some silt; some gravel.	17"	SPT 57	Chemical sample CSW-2-116'-118' taken	55 36 27 21
		░	SAND; brown, black, and gray; very dense; well graded; with some silt.	3"	SPT 58		60/3"
-80.1	120.0	⁘	Gravelly SAND; gray with orange-brown areas; very dense; well graded; with trace silt.	6"	SPT 59	Rounded piece of gravel (quartz) stuck in tip of spoon	76 33 19 34
-82.1	122.0	░	SAND; light greenish brown; very dense; poorly graded; medium grained; with trace dark brown-black silty (lens); trace gravel in yellowish lens at tip.	17"	SPT 60	~5% silt by settling jar test.	80 72 54 30
-84.1	124.0	⁘	Sandy GRAVEL; gray, brown-black, and yellow; very dense; rounded; spherical; with trace black silt; sand matrix is mostly medium-grained	11"	SPT 61	Maximum particle axis is 1.25"	19 26 78 100/5"
-86.1	126.0	░	SAND; gray with orange spots; very dense; poorly graded; fine to medium grained; with some gravel; trace silt.	4"	SPT 62	Sounds like bit is on gravel as reaming to 126' Circulating strongly for ~5 min. to remove gravel	52 100/5"
						(continued)	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek

HOLE NUMBER CSW-2

Hole No.CSW-2

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 39.89 Ft.

SHEET 7 OF 10

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-88.1	128.0						
		░	SAND; pink-white; very dense; poorly graded; very fine to fine grained; with some silt.	8"	SPT 63	2" brownish pink silty sand lens	36 78 50/3"
-90.1	130.0						
		▒	GRAVEL; very dense; matrix is pink silt and sand; some silt; trace sand.	2"	SPT 64	changed to 6" rollerbit when reaming to 132'	100/3"
		▒	No recovery.	0"	SPT 65	A few pieces of rounded gravel in spoon	200/3"
-93.1	133.0						
		▨	Clayey SILT; white with some red; very dense; low plasticity; slightly moist; with some fine sand.	15"	SPT 66	Extra recovery from dropping spoon into base of hole; Driven when set.	58 100/6"
-96.1	136.0						
		▥	Interbedded SILT and SAND; white to pink; very dense; sand is very fine grained; very poorly graded; silt has some clay; dilatant; low plasticity.	14"	SPT 67	Driven when set	94 50/2"
		▥	As SPT 67 above Clayey SILT is light gray lenses are ~4" thick	12"	SPT 68	Driven when set	66 50/2"
-100.1	140.0						
		▨	Silty CLAY; gray; hard; medium plasticity; moist; with <2" lenses of Sandy SILT.	20"	SPT 69	Driven when set	49 56 100/6"
-102.1	142.0						
		░	SAND; white-gray; very dense; fine grained; poorly graded; wet; with trace silt.	4"	SPT 70	Driven when set	130/3"
-104.1	144.0						
		▨	Interbedded SAND; white with orange-stained spot; very dense; fine- grained; with some silt; and CLAY; gray; hard; medium plasticity.	4"	SPT 71	Driven when set	150/3"
-106.1	146.0						
		░	SAND; white, gray, and black; very dense; fine grained; poorly graded; wet with some silt.	4"	SPT 72	Rounded quartz gravel stuck in tip	100/5"
		░	SAND; tan; very dense; very poorly graded; medium grained; quartz; with trace silt (<5%).	3"	SPT 73		100/3"
-110.1	150.0						
						(continued)	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek

HOLE NUMBER CSW-2

Hole No.CSW-2

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 39.89 Ft.

SHEET 8 OF 10

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-110.1	150.0						
		▨	Interbedded SAND; white; fine to medium grained; poorly graded; and Silty CLAY; light gray; medium plasticity.	6"	SPT 74	Driven when set	100/4"
-112.1	152.0						
		░	SAND; tan; very dense; very poorly graded; medium grained; clean.	3"	SPT 75		100/3"
		░	SAND; as SPT 75 above.	1"	SPT 76	Driven when set; material in top Spoon bounced but didn't move at all	50/0"
		░	SAND; tan and yellow; very dense; medium grained; with trace silt.	2"	SPT 77	Changed to downhole hammer; reamed to 156'w/open-end 6" trivane bit. Blows from SPT 77 on not valid for comparison with standard N values. Silt <5% by settling jar	20 110/6"
		░	SAND; tan-yellow; very dense; medium grained; very poorly graded; rounded.	1"	SPT 78	Lots of slough in spoon Sand in wash	25 27 85/3"
		░	SAND; tan-yellow; as above (SPT 77)	5"	SPT 79	No movement over last 40 blows	61 100/5"
		░	SAND; as above; with a tan silty spot	4"	SPT 80		140/5"
		░	SAND; as SPT 77 and 78 above	3"	SPT 81		100/5"
-126.4	166.3						
		▩	Top 2" SAND; as above then 1/2" bright red silty sand; then 12" CLAY; gray; hard; medium plasticity; dry.	14"	SPT 82	Spoon bulging open; will only drive 18" on rest Significantly below plastic limit	50 60 80 70
-128.1	168.0						
		▨	Silty CLAY; gray w/red areas; hard;low plasticity; dry; w/trace fine sand.	18"	SPT 83		39 34 41
-130.1	170.0						
		▩	CLAY; gray with some red spots; hard; medium plasticity; dry-slightly moist.	24"	SPT 84	Driven when set	26 49 32
-132.1	172.0					*(continued)*	

Hole No.CSW-2

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE 39.89 Ft.	SHEET 9 OF 10
PROJECT Pearce Creek	INSTALLATION PHILADELPHIA DISTRICT	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-132.1	172.0						
		▥	SILT; light gray; very dense; unable to roll thread; slight dilitancy; dry-slightly moist; with trace clay; some very fine sand.	24"	SPT 85	Driven when set ~15% sand in settling jar	24 43 34
		▥	SILT; light gray; very dense; not plastic; with trace sand; slightly moist.	17"	SPT 86		23 30 54
		▥	SILT; light gray; very dense; non-plastic; some very fine to coarse sand; slightly moist to dry; with trace mica.	16"	SPT 87	Chemical sample CSW-2-176'-177.5' taken @ 10:15	33 20 31
		▥	SILT; as SPT 87 above with a few brown spots.	17"	SPT 88		18 29 34
-140.1	180.0						
		▨	Silty CLAY; gray and brown laminations; hard; medium plasticity; dry; with trace mica.	15"	SPT 89		16 22 35
		▨	Silty CLAY; as SPT 89 above.	20"	SPT 90	Driven when set	17 32 31
		▨	Silty CLAY; gray with some brown and occasional black organic spots; medium plasticity; dry.	19"	SPT 91	top of sample is siltier	31 31 33
-146.1	186.0						
		▨	CLAY; dark gray to brown; hard; medium plasticity; trace wood; slightly moist-dry.	15"	SPT 92		14 25 32
		▨	CLAY; as SPT 92 above; with a light gray silty lens.	12"	SPT 93		14 20 47
		▨	CLAY; dark gray-brown; as SPT 92 above.	15"	SPT 94		12 25 26
		▨	CLAY; dark gray, as above, then CLAY; red and light gray; hard; medium plasticity; slightly moist-dry.	18"	SPT 95		12 18 22
						(continued)	

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ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.	PROJECT Pearce Creek	HOLE NUMBER CSW-2

Hole No.CSW-2

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 39.89 Ft.		SHEET 10 OF 10
PROJECT Pearce Creek	INSTALLATION PHILADELPHIA DISTRICT	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-154.1	194.0						
		▨	CLAY; red, brown, and gray; hard; with coarse sand-sized nodules throughout; dry-slightly moist.	11"	SPT 96	Sand-sized material is rounded. Parts of sample are cemented together.	14 23 32
		▨	CLAY; red and gray; hard; medium plasticity; dry-slightly moist.	12"	SPT 97	No nodules as in previous sample.	13 25 30
		▨	CLAY; as SPT 97 above.	11"	SPT 98		12 24 33
		▨	CLAY; as SPT 97 above.	13"	SPT 99		14 24 30
		▨	CLAY; as SPT 97 above.	12"	SPT 100		14 25 21
		▨	CLAY; as SPT 97 above; very hard; dry; trace sand.	11"	SPT 101		17 42 50/1"
		▨	CLAY; as SPT 101 above.	12"	SPT 102		62 50/2"
		▨	CLAY; as SPT 101 above.	13"	SPT 103		54 63 50/2"
-169.3	209.2						
			Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on Laboratory Analyses.			Grouted up to ~130 depth w/ tremie pipe (~108 gallons) on 11/07/95. Placed well screen (~117.5'-127.5') on 11/09/95.	

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE. MAR 71	PROJECT Pearce Creek	HOLE NUMBER CSW-2

Hole No.CSW-3

DRILLING LOG DIVISION NORTH ATLANTIC DIVISION
INSTALLATION PHILADELPHIA DISTRICT
SHEET 1 OF 8

1. PROJECT Pearce Creek
2. LOCATION *(Coordinates or Station)* 1598503 E, 641963 N
3. DRILLING AGENCY UNI-TECH DRILLING CO., INC.
4. HOLE NO. *(As shown on drawing title and file number)* CSW-3
5. NAME OF DRILLER Joseph Jester
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 165.5 Ft.
10. SIZE AND TYPE OF BIT 4-3/4" side discharge trivane
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)* NVAD 88
12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN disturbed: 83 undisturbed: 0 attempted!
14. TOTAL NUMBER OF CORE BOXES 0
15. ELEVATION GROUND WATER
16. DATE HOLE STARTED 11/09/95 COMPLETED 11/20/95
17. ELEVATION TOP OF HOLE 31.07 Ft.
18. TOTAL CORE RECOVERY FOR BORING
19. SIGNATURE OF INSPECTOR S.M. Cook

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
31.1	.0						
		▥	SILT; brown; loose; moist; with trace sand; trace vegetation trace mica	7"	SPT 1	Unless otherwise noted, SPT samples taken according to ASTM 1586 Using bentonite mud, "QuickGel" by Baroid. Chemical sample CSW-3-0'-2' taken @ 9:40	2 2 2 4
		▥	SILT; brown; loose; moist with trace sand; trace very fine mica	15"	SPT 2	Chemical sample CSW-3-2'-4' taken @ Soil pH in water= 7.5	1 2 3 4
		▥	SILT; as SPT 2, above.	21"	SPT 3	Chemical sample CSW-3-4'-6' taken @ Soil pH in water= 6	3 4 5 6
		▥	SILT; as SPT 1, above	15"	SPT 4		2 2 3 5
21.1	10.0	▥	SILT; brown; loose moist; with some wood; trace sand; trace mica.	24"	SPT 5		2 2 2 2
19.1	12.0	▨	CLAY; black; soft; low plasticity; trace silt; trace organics	17"	SPT 6	Chemical sample CSW-3-10'-12' taken @ Soil pH in water= 6.33	2 2 2 3
17.1	14.0	▨	Silty CLAY; dark gray, brown mix; soft; some organics.	21"	SPT 7		1 1 1 1
15.1	16.0	▥	Sandy SILT; dark brown to yellow; loose; trace gravel; moist.	13"	SPT 8		2 1 3 3
13.1	18.0	░	SAND; brown; dense; poorly graded; find grained; with trace silt.	15"	SPT 9		16 18 24 32

(continued)

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE.
MAR 71

PROJECT Pearce Creek
HOLE NUMBER CSW-3

Hole No.CSW-3

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 31.07 Ft.

SHEET 2 OF 8

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
13.1	18.0	▥	Silty SAND; light brown; dense; with some gravel.	10"	SPT 10	Chemical sample CSW-3-18'-20' taken @ Soil pH in water = 4.6 @ 5 min. = 4.4 @ 15 min. = 4.4 @ 30 min. = 4.36 @ 45 min.	17 24 32 39
		▥	Sandy SILT; dark gray; stiff; moist; sand is very fine grained; with trace mica.	12"	SPT 11		7 10 13 14
		▥	Sandy SILT; dark gray; stiff; clean white sand at bottom.	10"	SPT 12		12 17 19 25
7.1	24.0	░	SAND; white; medium dense; poorly graded; very fine-fine grained.	17"	SPT 13		6 7 7 9
5.1	26.0	▥	SILT; light brown; stiff; moist; some very fine sand.	24"	SPT 14		9 11 14 17
3.1	28.0	░	SAND; gray and light brown mix; dense; poorly graded; fine grained; with trace silt.	11"	SPT 15		40 100/5"
1.1	30.0	▨	Silty CLAY; light gray; hard; plastic; w/trace sand.	3"	SPT 16		100/4"
-.9	32.0	░	SAND; white; dense; poorly graded; fine grained; brown silty sand at bottom 6 inches.	14"	SPT 17		40 23 29 33
		░	SAND; light brown; dense; poorly graded.	11"	SPT 18	Chemical sample CSW-3-34'-36' taken @ 14:30 Soil pH in water = 5.11 @ 5 min. = 5.12 @ 15 min.	37 100/5"
		░	SAND; white; very dense; coarse grained; poorly graded.	14"	SPT 19		47 28 100/3"
-6.9	38.0	▥	SILT; brown; stiff; non plastic; moist; sand at bottom 12 inches medium grained.	24"	SPT 20	Sampled sand for geotech jar Soil pH in water = 4.45 @ 5 min. = 4.29 @ 25 min. = 4.27 @ 45 min.	23 33 31 49
-7.9	39.0	░					
						(continued)	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek

HOLE NUMBER CSW-3

Hole No.CSW-3

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 31.07 Ft.

SHEET 3 OF 8

PROJECT
Pearce Creek

INSTALLATION
PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
-8.9	40.0						
			SAND; white; medium dense; poorly graded; fine grained.	14"	SPT 21		21 23 29 29
			SAND; white and brown mix; dense; mediume grained; poorly graded; trace gravel.	12"	SPT 22		21 23 23 25
			SAND; same as SPT 22	11"	SPT 23		23 25 27 30
			SAND; same as SPT 22; loose; dark brown silt at bottom 6 inches.	14"	SPT 24	Soil pH in water = 4.56 @ 5 min. (silt) = 4.60 @ 25 min. (silt) = 4.66 @ 5 min. (brown sand) = 4.63 @ 25 min. (brown sand)	8 6 6 4
			SAND; gray-grown; loose; poorly graded; medium grained; quartz.	9"	SPT 25		4 5 7 9
			SAND; same as SPT 25	8"	SPT 26		55 100/2"
			SAND; same as SPT 25	0"	SPT 27		100/4"
			SAND; white with gray; very dense; medium graded; trace gravel.	5"	SPT 28		100/5"
			SAND; white; dense, very dense; well graded quartz and feldspAr; subangular; with some fine gravel.	3"	SPT 29		100/3"
			SAND; same as SPT 29	5"	SPT 30		100/5"
			SAND; same as SPT 29	7"	SPT 31		47 46 49 51
-30.9	62.0						
						(continued)	

Hole No.CSW-3

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE 31.07 Ft.	SHEET 4 OF 8
PROJECT Pearce Creek	INSTALLATION PHILADELPHIA DISTRICT	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-30.9	62.0						
		░	SAND; light gray; very dense; poorly graded; fine grained with some silt; about 3 inches silt with clay on top; stiff; plastic.	12"	SPT 32		55 100/4"
		░	SAND; light gray, very dense; poorly graded; fine grained; with some silt	11"	SPT 33		45 100/4"
-34.9	66.0						
		▥	Silty SAND; on top 7 inches; gray; loose; medium graded; fine grained. Silty CLAY at bottom 6 inches; gray; hard; moist.	13"	SPT 34		42 28 40 52
-36.9	68.0						
		░	SAND; light gray; medium dense; very fine to well grained; 2 inches silty clay on top; gray; hard; moist.	18"	SPT 35		30 23 28 27
-38.9	70.0						
		▥	Silty SAND; light gray; brown lenses; dense; well graded.	11"	SPT 36		55 100/3"
-40.9	72.0						
		▨	Silty CLAY; on top 3 inches; gray; hard. SAND on bottom 3 inches; brown; medium grained.	6"	SPT 37	pH of brown sand = 4.8	100/6"
-42.9	74.0						
		░	SAND; dark gray; dense; well graded; with trace silt.	9"	SPT 38		65 100/2"
		░	SAND; same as SPT 38.	7"	SPT 39		100/6"
		░	SAND; light gray; very dense; very fine to fine grained; very poorly graded; with some silt.	16"	SPT 40	Changed to downhole hammer; reamed to 78'w/open-end 6" trivane bit. Blows below 78' depth not valid for comparison with standard N values.	8 8 9 10
-48.9	80.0						
		▥	Sandy SILT; light gray; hard; moist; some clay; gravel on top 5 inches.	17"	SPT 41		5 7 7
-50.9	82.0						
		▨	Silty CLAY; gray; stiff; low plasticity; moist.	15"	SPT 42		5 6 21
-52.9	84.0					(continued)	

Hole No.CSW-3

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 31.07 Ft.		SHEET 5 OF 8
PROJECT Pearce Creek	INSTALLATION PHILADELPHIA DISTRICT	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-52.9	84.0						
			SILT; gray; hard; low plasticity; dry to moist; with some clay; trace very fine sand.	20"	SPT 43		7 14 20
			Tube Sample.	12"	SPT 44	Tube sample @ 14:00 on 11/10/95 Driven @ 250 psi 12" recovery	
-57.5	88.6		7 inch SILT on top; gray; hard; moist; then 8 inch SAND at bottom; gray; loose; well graded; wet.	15"	SPT 45		12 37 42
-58.9	90.0		SILT; gray; stiff; trace clay; low plasticity; fine sand at bottom of sample.	13"	SPT 46		7 15 25
-60.9	92.0		Silty SAND; gray; loose; very poorly graded; very fine grained.	10"	SPT 47		10 11 14
-62.9	94.0		SAND; light gray; loose; poorly graded; very fine grained; with trace silt.	11"	SPT 48		9 16 24
			SAND; light gray; dense; poorly graded; very fine to fine grained; with trace silt.	9"	SPT 49		32 52 50/3"
			SAND; light gray; dense; very poorly graded; fine grained; with trace silt.	11"	SPT 50		42 34 40
			SAND; same as SPT 50.	16"	SPT 51		18 20 31
			SAND; same as SPT 50; trace silt.	11"	SPT 52		17 25 33
			SAND; same as SPT 50.	13"	SPT 53		12 16 21
						(continued)	

Hole No.CSW-3

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE 31.07 Ft.	SHEET 6 OF 8
PROJECT Pearce Creek	INSTALLATION PHILADELPHIA DISTRICT	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
-74.9	106.0						
		░	SANE; gray with white mix; very dense; medium grained; well graded; quartz; subangular; wet.	11"	SPT 54		22 57 50/2"
		░	SAND; same as SPT 54.	8"	SPT 55		45 50 50/1"
		░	SAND; same as SPT 54.	2"	SPT 56		75 50/1"
		░	SAND; light olive brown; dense; well graded; coarse grained; wet; trace gravel; trace silt.	9"	SPT 57		45 51 50/2"
-82.9	114.0						
		▥	Silty SAND; light gray; dense; poorly graded; fine grained; wet; trace gravel.	9"	SPT 58		25 34 51
-84.9	116.0						
		░	SAND; light gray; dense; poorly graded; fine grained; wet; with trace silt; Two 1-1/2 inch CLAY; gray, brown mix; plastic; moist; very stiff; between sand.	12"	SPT 59	first Clay lenses observed; red and brown	27 45 62
		░	SAND; light gray; very dense; poorly graded; fine grained; wet; with trace silt.	9"	SPT 60		35 70 54/1"
		░	SAND; light gray; bottom 2 inches bright red; dense; poorly graded; fine grained; dry to moist; with trace silt.	11"	SPT 61		19 31 45
-90.9	122.0						
		▨	5 inch CLAY; light gray and red; very stiff; plastic; moist; then 3 inch SAND at bottom; gray; dense; poorly graded; fine grained; moist.	8"	SPT 62		22 39 27
		▨	CLAY; gray, hard; low plasticity; dry; sand lens in between (1-1/2 inch) gray; dense	12"	SPT 63		12 21 25
-94.4	125.5						
		░	SAND; gray; dense; fine grained; poorly graded; moist; 2 inch clay on top; gray; hard; plastic; moist.	11"	SPT 64		11 17 22
-96.9	128.0						
						(continued)	

Hole No.CSW-3

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 31.07 Ft.

SHEET 7 OF 8

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-96.9	128.0						
		▥	Silty SAND; light tan-gray; medium dense; fine grained; clay lenses; gray; hard; plastic; dry.	12"	SPT 65		14 19 30
-98.9	130.0						
		░	SAND; tan; medium dense; fine grained; 2 inches silt at bottome; dark gray; hard; dry.	13"	SPT 66		7 16 23
-100.3	131.4						
		░	SAND; dark gray; medium dense; fine grained; poorly graded; trace silt.	9"	SPT 67		14 20 29
		░	SAND; same as SPT 67.	11"	SPT 68		17 39 53
-104.9	136.0						
		▥	Silty SAND top 6 inches; dark gray; dense; poorly graded; fine grained; moist; silty clay bottom 7 inches; dark gray; hard; plastic; dry.	13"	SPT 69		39 50/1"
-106.9	138.0						
		░	SAND; dark gray; dense; fine grained; poorly graded;	11"	SPT 70		17 35 49
-107.7	138.7						
		▨	Silty CLAY; bottom 2 inches; dark gray; hard; plastic; dry.				
		▨	CLAY; dark purplish gray; dense; hard; dry.	11"	SPT 71	pH = 5.64	8 14 22
		▨	Same as SPT 71.	13"	SPT 72		10 21 29
		▨	Same CLAY; a little more brownish.	12"	SPT 73		12 21 30
		▨	Same CLAY as 140 feet to 142 feet.	15"	SPT 74		12 24 29
		▨	Same CLAY with trace white gray color.	15"	SPT 75		9 14 23
						(continued)	

Hole No.CSW-3

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 31.07 Ft.

SHEET 8 OF 8

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
-118.9	150.0	▨	Same CLAY as SPT 71; with trace organics; (wood chips); dary gray- brown color; trace white gray silty clay.	16"	SPT 76	pH = 5.57	14 41 36
		▨	Same CLAY as SPT 71; dark gray-brown; plasticity; no dilitancy.	12"	SPT 77		14 27 32
		▨	CLAY; brown; hard; dry; with bottom 3 inches vary gray.	12"	SPT 78		17 23 35
		▨	CLAY; same as SPT 77; dark gray-brown.	11"	SPT 79		16 29 38
		▨	CLAY; dark gray-brown; hard; dry; with trace organics.	15.5"	SPT 80		12 23 36
		▨	CLAY; dark gray; hard; dry.	10"	SPT 81		14 20 29
		▨	CLAY; dark gray; dense; hard; dry.	16"	SPT 82		12 20 35
		▨	Same CLAY as SPT 82.	15"	SPT 83	No geotech jar sample	8 17 25
-134.4	165.5		Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on Laboratory Analyses.			End of Boring at 165.5' on 11/20/95. Grouted up to -125 depth w/ tremie pipe (~45 gallons) on 11/20/95. Placed well screen (109'-119') on 11/21/95.	

Hole No.CSW-4

DRILLING LOG

DIVISION NORTH ATLANTIC DIVISION

INSTALLATION PHILADELPHIA DISTRICT

SHEET 1 OF 3

1. PROJECT Pearce Creek
2. LOCATION *(Coordinates or Station)* 1597955.23 E, 642539.68 N
3. DRILLING AGENCY UNI-TECH DRILLING CO., INC.
4. HOLE NO. *(As shown on drawing title and file number)* CSW-4
5. NAME OF DRILLER Joseph Jester
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 60 Ft.
10. SIZE AND TYPE OF BIT 4-3/4 inch side discharge drag bit
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)* NAVD 88
12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN disturbed: undisturbed: 1 att. 0 accepted
14. TOTAL NUMBER OF CORE BOXES 0
15. ELEVATION GROUND WATER
16. DATE HOLE STARTED 1/3/96 COMPLETED 1/4/96
17. ELEVATION TOP OF HOLE 36.25 Ft.
18. TOTAL CORE RECOVERY FOR BORING
19. SIGNATURE OF INSPECTOR Lusheng Yan

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
36.2	.0						
			See log of CSW-1 (located ~100 feet away) for continuous samples and better defined lithology/stratigraphy.			Mud rotary drilling with Bentonite mud. SPT samples according to ASTM 1586: 2-inch spoon; SPT sampler driven w/140 lb. hammer; 30" drop.	
				0"	U-X	Tube driven; no recovery	
						(continued)	

Hole No.CSW-4

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 36.25 Ft.

SHEET 2 OF 3

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
18.2	18.0						
			Silty SAND; dark gray; loose; wet. Lower 6" CLAY; black; organic; w/trace sand, trace gravel, trace white shells.	20"	SPT 1		10 12 12 16
16.2	20.0		SAND; dark gray; dense; medium to coarse grained; w/trace gravel	8"	SPT 2		13 16 17 20
11.2	25.0						
-.7	37.0						
						(continued)	

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PROJECT Pearce Creek

HOLE NUMBER CSW-4

Hole No.CSW-4

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 36.25 Ft.

SHEET 3 OF 3

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
-3.7	40.0						
		░	SAND; white; dense; medium grained	5"	SPT 3	some gravel slough on top	100/5"
		░		0"	SPT 4	No recovery for split spoon sample	100/4"
		░	SAND; white; coarse grained; w/some gravel	1"	SPT 5		100/1"
-22.1	58.4	▨	Top 5" SAND; light gray; dense; poorly graded; coarse grained; w/some gravel Lower 6" Silty CLAY; white; hard; moist	11"	SPT 6		42 31 41 50
-23.7	60.0						
			Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on Laboratory Analyses.			end of boring at 60' on 1/3/96. Placed well screen 49'-59' on 1/4/96.	

Hole No.CSW-5

DRILLING LOG

DIVISION NORTH ATLANTIC DIVISION

INSTALLATION PHILADELPHIA DISTRICT

SHEET 1 OF 8

1. PROJECT Pearce Creek
2. LOCATION (Coordinates or Station) 1600880.22 E, 640417.95 N
3. DRILLING AGENCY UNI-TECH DRILLING CO., INC.
4. HOLE NO. (As shown on drawing title and file number) CSW-5
5. NAME OF DRILLER Joseph Jester
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 153.5 Ft.
10. SIZE AND TYPE OF BIT 4-3/4" side-discharge trivane
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NAVD 88
12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN disturbed: undisturbed: att. accepted
14. TOTAL NUMBER OF CORE BOXES 0
15. ELEVATION GROUND WATER
16. DATE HOLE STARTED 11/27/95 COMPLETED 11/30/95
17. ELEVATION TOP OF HOLE 47.30 Ft.
18. TOTAL CORE RECOVERY FOR BORING
19. SIGNATURE OF INSPECTOR S.M. Cook

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/6in.
47.3	.0						
		▥	Silty SAND; brown; loose; trace gravel; trace clay	15"	SPT 1	Unless otherwise noted, SPT samples taken according to ASTM 1586 Using bentonite mud, "QuickGel" by Baroid. Chemical sample CSW-5-0'-2' taken @ 10:04	5 6 8 8
		▥	Sandy SILT; brown; loose; fine grained; moist; trace organics; trace gravel.	16"	SPT 2	Chemical sample CSW-5-2'-4' taken @ 10:10	3 3 5 3
		▥	Sandy SILT; brown-gray; medium dense; sand is very fine grained; with trace organics.	20"	SPT 3	Chemical sample CSW-5-4'-6' taken @ 10:15	7 8 10 12
41.3	6.0						
		▥	SILT; gray with yellow-orange spots; medium dense; gravel mix on top 12 inches with some sand; trace organics; trace mica.	23"	SPT 4		8 9 12 14
		▥	SILT; gray; hard; moist; trace organics; 8 inches fine sand at bottom; gray; medium dense.	18"	SPT 5	Chemical sample CSW-5-8'-10' taken @ 10:30 pH = 7.6	8 12 12 15
37.3	10.0						
		░	SAND; gray and brown mix; medium dense; poorly graded; medium dense; with some silt.	15"	SPT 6		11 15 19 21
		░	SAND; gray; medium dense; fine grained; poorly graded; moist; with trace silt.	14"	SPT 7	Chemical sample CSW-5-12'-14' taken @ 10:45	7 11 11 14
		░	SAND; same as SPT 14	12"	SPT 8		11 14 19 25
		░	SAND; yellowish-brown; medium dense; well graded; with some silt;	15"	SPT 9		7 7 8
29.9	17.4	▥	8 inch black sandy silt at bottom; trace gravel; trace mica.			(continued)	10

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PROJECT Pearce Creek

HOLE NUMBER CSW-5

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE	47.30 Ft.
SHEET 2 OF 8	
PROJECT	Pearce Creek
INSTALLATION	PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
29.3	18.0		Sandy SILT; dark gray to black; medium dense; moist; trace gravel.	13"	SPT 10	Chemical sample CSW-5-18'-20' taken @ 11:00 pH = 6.65 pH @ 15 min.= 6.25	7 7 9 10
			Silty SAND; dark gray-black; loose; very poorly graded; very fine grained; with trace mica.	12"	SPT 11	pH = 6.3	8 8 10 10
			Silty SAND; same as SPT 11.	22"	SPT 12	pH = 5.6	7 7 8 7
			Sandy SILT; dark gray-balck; medium dense; soft; moist.	18"	SPT 13		8 10 10 12
			Sandy SILT; same as SPT 13.	18"	SPT 14	pH = 6.0	9 9 10 10
19.3	28.0		SILT; dark gray-black; medium dense; moist; trace gravel; some very fine sand.	14"	SPT 15	10 inches slough	7 7 9 7
			SILT; black, gray, and brown traces; soft; moist; some very fine sand; trace clay; trace mica.	13"	SPT 16	pH = 5.8 pH @ 10 min.= 5.8	7 7 6 7
			SILT; same as SPT 16.	14"	SPT 17	pH = 5.8	5 5 6 5
			SILT; black; hard; moist to dry; some clay.	16"	SPT 18	pH = 6.0	6 6 6 6
11.3	36.0		Silty CLAY; black; stiff; moist; non-plastic; trace mica.	24"	SPT 19		7 7 8 9
			Silty CLAY; same as SPT 19.	24"	SPT 20		8 12 14 17
						(continued)	

Hole No.CSW-5

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 47.30 Ft.

SHEET 3 OF 8

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
7.3	40.0						
		▨	Silty CLAY; same as SPT 19.	24"	SPT 21		7 8 12 14
5.3	42.0	▩	CLAY; black; stiff; plastic; moist.	4"	SPT 22	pH = 6.1	8 10 10 10
		▩	CLAY; black; stiff; plastic; moist; lenses of gravel; trace sand.	24"	SPT 23		7 11 11 10
1.3	46.0	▨	Silty CLAY; black; stiff; non plastic; moist.	20"	SPT 24		5 7 8 10
		▨	No recovery.	0"	SPT 25	No recovery	5 6 6 7
		▨	Silty CLAY; same as SPT 20; trace organics on top 6 inches; trace gravel.	24"	SPT 26	Chemical sample CSW-5-50'-52' taken @ 13:45	7 11 15 19
		▨	Silty CLAY; black; hard; medium plastic; moist; trace sand; trace gravel.		SPT 27	pH = 6.4	6 9 12 18
		▨	3 inches Silty CLAY at top; same as SPT 27; 2 inches organic peat; black.	5"	SPT 28	Chemical sample CSW-5-54'-56' taken @ 14:15 on 11/27/95 Sampled peat	100/5"
-8.9	56.2	░	Silty CLAY; greenish-gray, top 2 inches; SAND; gray; dense; medium grained; quartz; poorly graded; bottom 8 inches.	10"	SPT 29	greenish clay sampled	32 45 58 100/2"
-10.2	57.5	▨	Silty CLAY; black; hard; plastic; moist.	1"	SPT 30	Changed to downhole hammer; reamed to 58'w/open-end 6" trivane bit. Blows below are not valid for comparison with standard N values. Only driving sampler <1.5 feet so it doesn't get stuck	75 50/1"
-11.7	59.0	░	SAND; white; dense; fine grained; poorly graded.	3"	SPT 31		100/5"
						(continued)	

Hole No.CSW-5

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE 47.30 Ft.	SHEET 4 OF 8
PROJECT Pearce Creek	INSTALLATION PHILADELPHIA DISTRICT	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
-14.7	62.0						
			SAND; gray and black; dense; fine grained; poorly graded; with trace clay in lens.	10"	SPT 32	pH = 6.15	36 100/6"
			SAND; gray-white, very dense; medium grained; poorly graded.	5"	SPT 33		48 50/2"
			No recovery.	0"	SPT 34	No recovery	50/2"
-22.5	69.7		SAND; gray to dark gray; very dense; poorly graded; fine to medium grained; with trace organics; trace silt.		SPT 35		39 68 32
-23.4 -24.7	70.7 72.0		Top 8 inches CLAY; dark gray; hard; medium plasticity; moist; with trace mica. Base 5 inches CLAY; as above; thinly bedded with SAND; gray; medium grained; with some wood; trace gravel.	13"	SPT 36		6 12 13
			SAND; gray; very dense; fine to medium grained; poorly graded; rounded; clean.	7"	SPT 37		61 50/2"
-28.7	76.0		SAND; light gray; very dense; fine grained; poorly graded; with trace wood; clean.	11"	SPT 38		48 53 67
-31.0	78.2		Clayey SAND; dark gray; very fine to fine grained; poorly graded; with some silt; trace wood; thinly bedded with laminations of CLAY; gray as SPT 36 Top.	15"	SPT 39		9 12 18
-32.7	80.0		Top 3 inches as above; then Silty SAND; orange-brown; medium grained; poorly graded; rounded quartz.	6.5"	SPT 40	Contact is cemented. Drilling harder as go to 80' Jarred sample of base	45 50/2"
-34.7	82.0		SAND; tan with orange and black areas; very dense; coarse grained; poorly graded; quartz; some feldspar; with some medium-fine sand; with trace fine gravel; trace wood; trace silt.	10"	SPT 41	pH = 6.3	33 55 69
-36.7	84.0		Gravelly SAND; orange-light brown; very dense; well graded; with trace silt; trace wood.	11"	SPT 42	~3/4" Silt lens in tip Bentonite drilling mud invading coarser areas of sample	37 58 72
						(continued)	

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PROJECT	HOLE NUMBER
Pearce Creek	CSW-5

Hole No.CSW-5

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE 47.30 Ft.	SHEET 5 OF 8
PROJECT Pearce Creek	INSTALLATION PHILADELPHIA DISTRICT	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-36.7	84.0						
		░	SAND; tan and orange; dense; subrounded to subangular; poorly graded in lenses; fine to coarse grained; with trace silt and light brown silt lens.	9"	SPT 43	Silt lens ~1/2" thick Bentonite drilling mud invading coarser areas of sample, removed from sample. Chemical sample CSW-5-84'-85.5' taken @ 10:40 on 11/28/95.	21 25 40
-38.7	86.0						
		▒	Gravelly SAND; light brown-orange alternating in layers; very dense; well graded; medium grained; gravel is <3/8" size; quartz; rounded.	8"	SPT 44		67 100/5"
		▒	Gravelly SAND; as above; with some white and light gray bands; with trace pyrite in top.	11"	SPT 45	One pyrite concretion in slough. Broke it open and included in sample. Fine gravel sized.	30 68 34
-42.7	90.0						
		░	SAND; orange, gray, and white in bands; very dense; medium grained; poorly graded; with some coarse grained sand in lenses; with trace silt; trace gravel.	10"	SPT 46		9 12 24
-44.5	91.7						
		▨	CLAY; cream-colored with orange spots in top 10 inches; turning light gray without spots below; stiff; slightly moist; low plasticity.	13"	SPT 47		7 13 23
-46.5	93.7						
		▨	Silty CLAY; light gray-white; very stiff; very slightly moist; low plasticity.	15"	SPT 48		9 20 27
		▨	Clayey SILT; light gray-white; hard; very slightly moist; with some very fine sand.	15"	SPT 49		15 23 29
		▨	Silty CLAY; variegated gray with brown areas; very hard; low plasticity; very slightly moist.	12"	SPT 50	One blue-black area	11 21 32
-52.4	99.7						
		▨	CLAY; medium brown with a few red or yellow spots; hard; plastic; dry; with trace medium sand-sized particles in one blob (~1/4 inch diameter)	18"	SPT 51		9 23 30
		▨	CLAY; red and gray with some yellowish-green; hard; dry.	15"	SPT 52		17 33 42
		▨	CLAY; red, gray and pink; with some yellow spots; hard; dry.	15"	SPT 53		7 17 23
						(continued)	

Hole No.CSW-5

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 47.30 Ft.

SHEET 6 OF 8

PROJECT
Pearce Creek

INSTALLATION
PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-58.7	106.0						
			CLAY; gray with some red areas; as above.	14"	SPT 54		12 27 30
-60.4	107.7						
			Silty CLAY; light gray with red, yellow and purple spots; hard; dry; with trace very fine sand in laminations.	18"	SPT 55		11 22 25
			Silty CLAY; light gray, brown and red with some yellow areas; as SPT 55 above.	18"	SPT 56		9 16 24
			Silty CLAY; light gray, yellow-brown, and redish; as SPT 55 above; without sand.	14"	SPT 57		12 26 34
			Silty CLAY; light gray and brown; as above SPT 57.	15"	SPT 58		17 29 42
			As SPT 58; with a few black spots in brown clay.	15"	SPT 59		15 35 42
-70.4	117.7						
			CLAY; brown with a few gray, black and yellowish spots; hard; dry; low plasticity; with trace sparkles (mica?).	10"	SPT 60		19 26 38
			CLAY; dark red-brownish gray with a few black organic spots; hard; dry; low plasticity; with trace sparkles (mica?).	17"	SPT 61		9 26 31
			As SPT 61	11"	SPT 62	pH = 6.2	12 27 35
			As SPT 61	15"	SPT 63	Brown-black spots of decomplsed wood also have white sand-sized hard grains. Driller said began to chatter as drilling to 126'.	10 25 40
			As SPT 61; with trace sand to fine gravel-sized pieces of gray hardpan.	5"	SPT 64	Lots of difficulty drilling to 128', bit chattering ~ 126.3'-127.3'.	100/5"
-80.4	127.7						
						(continued)	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT
Pearce Creek

HOLE NUMBER
CSW-5

Hole No.CSW-5

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 47.30 Ft.

SHEET 7 OF 8

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-80.7	128.0						
		▨	Silty CLAY; dark purplish brown-gray with trace whitish hardpan up to trace gravel size.	15"	SPT 65	Large piece of hardpan near top of spoon. pH = 6.1 end of day 11/28/95	15 31 39
		▨	No sample.			No sample - hardpan 129.5'-131.5'	
		▨	Silty CLAY; dark purplish gray-brown; hard; dry; with occasional hard spots of tan and more occasional spots of blue-black; with trace sparkles (mica?).	14"	SPT 66		15 23 35
		▨	As SPT 66.	8"	SPT 67		27 100/5"
		▨	Silty CLAY; dark chocolate brown with hard tan and gray spots; as SPT 66.	13"	SPT 68		19 30 43
		▨	As SPT 66 above.	17"	SPT 69		14 22 30
		▨	Silty CLAY; dark and light gray-brown laminations; hard; with trace fine sand-sized material in light gray laminations.	4"	SPT 70	More hardpan as drilling to 142'.	100/5"
		▨	As SPT 70, increasing gray laminations.	18"	SPT 71		19 23 25
		▨	As SPT 71.	17"	SPT 72		11 21 23
		▨	As SPT 71.	10"	SPT 73	More hardpan as drilling to 148'.	15 19 25
		▨				Hardpan to ~149' depth. No sample.	
						(continued)	

Hole No.CSW-5

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 47.30 Ft.

SHEET 8 OF 8

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-102.7	150.0						
		▨	As SPT 71.	18"	SPT 74		11 20 25
		▨	As SPT 70, fewer gray laminations.	14"	SPT 75	Chemical sample CSW-5-152'-153.5' taken @ 14:40	12 24 28
-106.2	153.5		Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on Laboratory Analyses.			end of boring @ 153.5 Grouted up to ~92 depth w/ tremie pipe (~75 gallons) on 11/29/95. Placed well screen (80.3'-90.3') on 11/30/95.	

150
152
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172

Hole No.CSW-6

DRILLING LOG

DIVISION NORTH ATLANTIC DIVISION

INSTALLATION PHILADELPHIA DISTRICT

SHEET 1 OF 2

1. PROJECT Pearce Creek
2. LOCATION *(Coordinates or Station)* 1597948.77 E, 642535.94 N
3. DRILLING AGENCY UNI-TECH DRILLING CO., INC.
4. HOLE NO. *(As shown on drawing title and file number)* CSW-6
5. NAME OF DRILLER Joseph Jester
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 22 Ft.
10. SIZE AND TYPE OF BIT 6 inch side discharge drag bit
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)* NAVD 88
12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN disturbed: 2 undisturbed: 0 attempted
14. TOTAL NUMBER OF CORE BOXES 0
15. ELEVATION GROUND WATER
16. DATE HOLE STARTED 01/04/96 COMPLETED 01/04/96
17. ELEVATION TOP OF HOLE 36.23 Ft.
18. TOTAL CORE RECOVERY FOR BORING
19. SIGNATURE OF INSPECTOR Lusheng Yan

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
36.2	.0						
						No sample in first 18 feet Refer to logs of CSW-1 and CSW-4 for lithology/stratigraphy. Unless otherwise noted, samples taken according to ASTM 1586. Using bentonite mud "QuickGel" by Baroid to drill.	
18.2	18.0						
						(continued)	

Hole No.CSW-6

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 36.23 Ft.

SHEET 2 OF 2

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
18.2	18.0	░					
17.7	18.5	▨	Top 6": SAND; white; wet; w/some gravel Middle 12": CLAY; black; soft; wet; w/white shells Bottom 3": SAND; black; coarse grained; w/some gravel	21"	SPT 1		4 5 12 14
16.7	19.5	░	SAND; black; loose; coarse grained; wet; w/some gravel	10"	SPT 2		7 9 15 15
14.2	22.0		Classifications listed above are based on B&V standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on Laboratory Analyses.			End of boring at 22'. Installed 2" diameter piezometer on 1/4/96. One foot screened interval placed at 21'-22' depth.	

Hole No.CSW-7

DRILLING LOG

DIVISION NORTH ATLANTIC DIVISION

INSTALLATION PHILADELPHIA DISTRICT

SHEET 1 OF 6

1. PROJECT Pearce Creek
2. LOCATION (Coordinates or Station) 1596466.66 E, 643972.77 N
3. DRILLING AGENCY UNI-TECH DRILLING CO., INC.
4. HOLE NO. (As shown on drawing title and file number) CSW-7
5. NAME OF DRILLER Joseph Jester
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 106.6 Ft.
10. SIZE AND TYPE OF BIT 4-3/4" side-discharge trivane
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NAVD 88
12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN disturbed: 51 undisturbed: 3 att. 2 accepted
14. TOTAL NUMBER OF CORE BOXES 0
15. ELEVATION GROUND WATER
16. DATE HOLE STARTED 12/14/95 COMPLETED 12/15/95
17. ELEVATION TOP OF HOLE 8.12 Ft.
18. TOTAL CORE RECOVERY FOR BORING
19. SIGNATURE OF INSPECTOR S.M. Cook

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
8.1	.0						
			SAND; brown-orange; medium grained; poorly graded; with trace roots; trace silt; trace gray clay in one ball; moist-wet; medium dense.	16"	SPT 1	Unless otherwise noted, SPT samples taken according to ASTM 1586 Using bentonite mud, "QuickGel" by Baroid. Chemical sample CSW-7-1'-2' taken @	5 8 10 10
4.1	4.0		SAND; brown; medium grained; poorly graded; wet; trace silt; medium dense.	9"	SPT 2	Chemical sample CSW-7-2'-3' taken @ 11:17	7 11 11 12
			SILT; brown; soft; wet; with trace sand.	6"	SPT 3	Chemical sample CSW-7-4'-5' taken @ 11:21 Mud on outside of spoon is red (dredge fill clay)	3 2 2 2
1.1	7.0		SILT; as above; then At 7 foot grades into SAND; brown; medium dense; medium to fine grained; well graded; wet; with some rounded gravel.	22"	SPT 4		2 7 8 8
			No recovery.	0"	SPT 5	Not enough for chemical sample. Quartz gravel stuck in tip.	4 5 7 8
			SAND; as above SPT 5 base; trace mica.	12"	SPT 6	Chemical sample CSW-7-10'-11' taken @ 11:38 2 large gravel pieces in tip.	6 7 9 11
			SAND; brown; medium dense; medium grained; moderately well graded; subangular; with some coarse sand; trace gravel; quartz; wet.	13"	SPT 7		8 8 10 12
-7.9	16.0		SAND; same as SPT 7	11"	SPT 8	Chemical sample CSW-7-14'-15' taken @ 11:48	9 12 15 19
			Sandy GRAVEL; brown; well graded; with trace ; trace silt.	5"	SPT 9	Larger gravel pieces in slough.	11 15 17 19
						(continued)	

Hole No.CSW-7

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 8.12 Ft.

SHEET 2 OF 6

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.	
-9.9	18.0	⁘	Gravelly SAND; brown; medium dense.	7"	SPT 10		15 15 19 20	18
		⁘	Piece of gravel stuck in tip.	1"	SPT 11	Recovery too low for chemical sample. Circulating hard to clean out gravel.	15 21 30 25	20
		⁘	Gravelly SAND; brown and gray; as SPT 10; with trace silt.	4"	SPT 12	Recovery too low for chemical sample.	12 15 23 29	22
-15.9 -16.4	24.0 24.5	▥	Top 6 inches Silty SAND; fine grading to SILT; brown-gray; stiff; with some sand; trace mica; trace wood; trace coarse sand.	14"	U-X	Chemical sample CSW-7-24'-26' taken @ 12:20	5 6 6 7	24
-18.9	27.0	▥ ▨	No recovery.	0"	SPT 13	No recovery. When drove tube, kelly picked up. Small amount of gray clay and large gravel fell out of tip.		26
		▨	Organic CLAY; brownish gray w/occ. black spots; hard; not dilatant; low plasticity; with trace sand and gravel; trace organics; moist.	22"	SPT 14		16 21 27 34	28
		▨	CLAY; as SPT 14; not quite as moist.	14"	SPT 15		10 12 18 23	30
		▨	CLAY; as SPT 14; with less gravel.	24"	SPT 16	Sample cut down middle by a piece of gravel driven in tip.	11 13 17 21	32
		▨	CLAY; as SPT 14; with less gravel.	18"	SPT 17		10 15 21 25	34
		▨	CLAY; brown-gray; very stiff; not dilatant; low to moderate plasticity; with trace sand; trace mica; trace organics.	20"	SPT 18		9 15 15 20	36
		▨	CLAY; as SPT 18.	16"	SPT 19	Sample cut by gravel; looks like twisted ribbon; unable to clean all bentonite mud off.	10 19 27 25	38 40

(continued)

Hole No.CSW-7

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 8.12 Ft.

SHEET 3 OF 6

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
-31.9	40.0	▨					
			CLAY; as SPT 18 above.	24"	SPT 20	Piece of rounded gravel in tip.	12 19 23 21
			CLAY; as SPT 18 above.	24"	SPT 21		11 15 17 19
			CLAY; as above; with shell decomposed in top; fine gravel-sized orange piece of cemented sand-sized grains.	24"	U-1	Drove @ 14:56 @ 100 psi. Retrieved 24" @ 15:15 Took jar sample of top 1"	
			CLAY; gray; as above; no sand.	24"	SPT 22		7 9 12 15
			CLAY; gray; as above; no sand.	24"	SPT 23		12 12 17 19
			CLAY; gray with occasional black spots; as SPT 18 above; trace sand-sized grains in orange spots; moist.	24"	SPT 24		12 13 13 17
			CLAY; as SPT 24.	24"	SPT 25		7 9 9 12
			CLAY; as SPT 24.	24"	SPT 26		8 9 11 11
			CLAY; as SPT 24; slightly moister.	24"	SPT 27		10 13 13 15
			CLAY; as SPT 24; moister.	24"	SPT 28	Chemical sample CSW-7-58'-60' taken @ 16:32 on 12/14/95.	9 12 21 25
			CLAY; brown-gray with occasional black spots; firm; plastic; moist.	24"	SPT 29	Easily able to push in thumb 1"	8 10 10 13
						(continued)	

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE.
MAR 71

PROJECT Pearce Creek

HOLE NUMBER CSW-7

Hole No.CSW-7

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE: 8.12 Ft.

SHEET 4 OF 6

PROJECT: Pearce Creek

INSTALLATION: PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-53.9	62.0						
			CLAY; as SPT 29 above.	20"	SPT 30		8 8 10 12
			CLAY; as SPT 29 above.	18"	SPT 31		7 7 8 9
			CLAY; as SPT 29; firm; very moist.	17"	SPT 32		9 12 14 18
			Organic CLAY; light brown; as SPT 29; grading more woody; then; Base 4 inches peat; brown turning black with air exposure; dry.	24"	SPT 33	Chemical sample of peat, CSW-7-69.5'-70' taken @ 08:55 on 12/15/95. Peat pH in water = 8.45 after 12 minutes. @ 15 minutes = 8.01 @ 35 minutes = 7.0 @ 1 hour = 7.0 Parts of SPT 34 are runny in spoon.	5 11 17 19
-61.5	69.6						
-61.9	70.0						
			Sandy SILT; gray-green; medium dense; with some clay as in SPT 33; grading to 4 inches peat in tip.	24"	U-2		10 13 17 20
-63.5	71.6						
-63.9	72.0						
			PEAT and tan-white SAND; medium grained.	20"	SPT 34	Drove tube @ 9:08 @ 100 psi Recovered 20" @ 9:23	
-65.9	74.0						
			SILT; light brown-white; medium dense; very moist; with some peat/ wood; some sand; with trace mica; some clay (gray and brown).	13"	SPT 35	Parts of sample are runny	8 9 14 20
-67.9	76.0						
			Silty SAND; gray; very dense; medium grained; poorly graded; some clay near top.	12"	SPT 36	Silt/Clay in <1/2" laminations	15 23 35 45
-69.4	77.5						
-70.2	78.3						
			Top 4 inches CLAY; brown and gray with some gravel; then; SAND; red, tan, gray, and yellow; very dense; medium grained; poorly graded; top 1 inch is read weakly cemented, with trace silt.	10"	SPT 37	One large rounded piece of gravel in top clay.	47 100/4"
			SAND; brown with yellowish laminations; very dense; medium grained; poorly graded.	7"	SPT 38	Changed to downhole hammer; reamed to 80'w/open-end 6" trivane bit. Blows below not valid for comparison with standard N values.	37 50/2"
			SAND	0"	SPT 39	One yellow cemented piece of sand in spoon, 3/4" size	41 100/6"
-75.9	84.0					(continued)	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT: Pearce Creek

HOLE NUMBER: CSW-7

Hole No.CSW-7

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 8.12 Ft.

SHEET 5 OF 6

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-75.9	84.0						
		▥	Silty SAND; orange-yellow and brown; very dense; medium grained; poorly graded; with trace white clay in one 3/4 inch spot. silt lens.	10"	SPT 40	Chemical sample CSW-7-84'-85' taken @ 11:23	30 59 50/1"
-77.4	85.5						
		░	SAND; yellow, red, black, white, and gray; very dense; fine to medium grained; with some white clay; some moderately cemented black and red areas; some yellow-orange silt.	11"	SPT 41	1" gray Sand/Silt 2" yellow 1" cemented black 1" white Clay 1-2" white Sand 4" yellow w/red	27 100/5"
-79.4	87.5						
		▥	Silty SAND; tan, orange-yellow; very dense; medium to fine grained; poorly graded; with some white clay/silt; trace gravel.	14"	SPT 42	Interlayered 1/4"-1/2" laminations of tan clean Sand; yellow Silty Sand; white Clay; white Silty Sand. SPT 41 Soil (yellow Silty Sand) pH in water: @ 1 min.= 6.5 @ 2 min.= 6.2 @ 10 min.= 5.5	15 35 41
		▥	Silty SAND; as above in SPT 42; with 5 inch coarse sand; then Silty SAND; orange-yellow, red, white; then CLAY; pink; hard; not dilatant; very slightly moist.	18"	SPT 43	4" yellow-orange Silty Sand 3/4" red Silty Sand 3" white Silty Sand 4" pink/white Silt/Clay	12 26 39
-83.4	91.5	▨					
-83.9	92.0						
		▥	Sandy SILT; white; dense; sand is very fine to fine grained; with some clay; interlayered <1 inch lenses; grading to 4 inches red and white silty clay in base; variegated.	18"	SPT 44		12 22 37
		▥	Silty SAND; white; very dense; very fine-fine grained; poorly graded; with trace clay and gravel near top.	7"	SPT 45	Sandy areas are wet.	12 30 47
		▥	Sandy SILT; white with trace pink; very dense; with some clay.	18"	SPT 46	Interlayered area w/more Clay/Silt are <1" thick	15 28 35
-89.6	97.7						
		▨	Silty CLAY; white; hard; not dilatant; very slightly moist; plastic; with trace sand.	11"	SPT 47	2" fine-medium sand lens @ 2"-4" above base	17 33 48
-91.4	99.5						
		▥	Silty SAND; white; very dense; interbedded in laminations; with some clay.	12"	SPT 48	Chemical sample CSW-7-100'-101.5' taken @ 13:03 from sandier parts of sample. Clay is light gray w/trace pink and red.	15 25 27
-93.4	101.5						
		░	SAND; white-tan; very dense; fine to medium grained; very poorly; graded; clean; quartz; with trace silt in hairline; laminations.	10"	SPT 49		37 51 50/1"
		░	SAND; as SPT 49 above; with trace red-orange clay laminations.	6"	SPT 50		58 50/1"
						(continued)	

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PROJECT Pearce Creek

HOLE NUMBER CSW-7

Hole No.CSW-7

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 8.12 Ft.

SHEET 6 OF 6

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
-97.9	106.0						
-98.9	107.0	▨	SAND; as SPT 49 above; with ~40% white clay in discrete lumps and laminations.	6"	SPT 51	Chemical sample CSW-7-106'-106.6' taken @ 13:48	33 50/1"
			Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on Laboratory Analyses.			Grouted up to >91' depth w/ tremie pipe (~25 gallons) on 12/15/95. Reamed and placed well screen (81'-91 ') on 12/18/95.	

Hole No.CSW-8

DRILLING LOG

DIVISION NORTH ATLANTIC DIVISION

INSTALLATION PHILADELPHIA DISTRICT

SHEET 1 OF 7

1. PROJECT Pearce Creek
2. LOCATION *(Coordinates or Station)* 1596085.38 E, 642953.40 N
3. DRILLING AGENCY UNI-TECH DRILLING CO., INC.
4. HOLE NO. *(As shown on drawing title and file number)* CSW-8
5. NAME OF DRILLER Joseph Jester
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 133.5 Ft.
10. SIZE AND TYPE OF BIT 4-3/4" side-discharge trivane
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)* NAVD 88
12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN disturbed: 67 undisturbed: 0 attempted
14. TOTAL NUMBER OF CORE BOXES 0
15. ELEVATION GROUND WATER
16. DATE HOLE STARTED 12/04/95 COMPLETED 12/07/95
17. ELEVATION TOP OF HOLE 25.38 Ft.
18. TOTAL CORE RECOVERY FOR BORING
19. SIGNATURE OF INSPECTOR S.M. Cook

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
25.4	.0						
			Sandy SILT; brown; loose; sand is fine to medium grained; slightly moist.	11"	SPT 1	Unless otherwise noted, SPT samples taken according to ASTM 1586 Using bentonite mud, "QuickGel" by Baroid. Chemical sample CSW-8-0'-1' taken @ 08:24	3 4 6 8
			Silty SAND; orange-brown; medium dense; medium grained; dry; quartz; subrounded; poorly graded.	7"	SPT 2	Chemical sample CSW-8-2'-3' taken @ 08:30 Extra volume for QA duplicate taken.	8 12 12 16
21.4	4.0						
			SAND; orange-brown; dense; medium grained; poorly graded; quartz; subrounded; dry; with trace silt.	5"	SPT 3	Chemical sample CSW-8-4'-5' taken @ 08:36	17 19 24 25
			SAND; tan; very dense; medium grained; poorly graded; dry; with traced fine sand.	11"	SPT 4		18 24 28 —
			SAND; tan; medium dense; medium grained; poorly graded; slightly moist; with some fine sand; trace silt in lenses; trace black organic spots.	17"	SPT 5	Chemical sample CSW-8-8'-10' taken @ 09:02	8 8 9 10
			SAND; tan; mediume dense; medium to coarse grained; moderately well graded; with trace fine sand and silt in lenses; wet.	11"	SPT 6		7 8 8 8
			SAND; orange-brown; loose; coarse grained; moderately well graded; as SPT 6.	12"	SPT 7		4 4 3 3
11.4	14.0						
10.8	14.6		7 inches SILT; black; loose; moist; with trace sand; then CLAY; tan; stiff; moderately plastic; wet; with trace mica.	18"	SPT 8	Chemical sample CSW-8-14'-14.5' taken @ 09:22	4 5 5 6
9.4	16.0						
			Clayey SILT; tan; medium dense; with some fine sand; trace mica.	19"	SPT 9		3 8 10 10
7.4	18.0						
						(continued)	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek

HOLE NUMBER CSW-8

Hole No.CSW-8

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 25.38 Ft.

SHEET 2 OF 7

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
7.4	18.0						
			SAND; tan and yellowisk; medium dense; fine grained; with trace silt in lenses; wet.	13"	SPT 10	Chemical sample CSW-8-18'-20' taken @ 09:33	8 10 10 12
			SAND; light brown; loose; fine-medium grained; with some silt.	13"	SPT 11		3 4 4 4
3.4	22.0						
			Silty SAND; light brown; loose; fine grained; poorly graded; subrounded; quartz; wet.	20"	SPT 12		2 2 2 2
			Silty SAND; light and dark brown; loose; fine-medium grained; wet; poorly graded. Base 5 inches SILT; dark brown-black; with wood.	20"	SPT 13		3 2 2 2
-.6	26.0						
-1.4	26.8		Organic SILT; brown and black; medium dense; Top 5 inches light brown clayey; wet; then; 3 inches as Base of SPT 13; then; <1 inch SAND; white; with trace fine gravel.	9"	SPT 14		3 5 7 8
			SAND; tan and bright orange; medium dense; medium grained; poorly graded; with some orange silt in lenses.	18"	SPT 15	Soil pH in water = 7.95	18 19 5 33
			SAND; tan; dense; medium grained; moderately well graded; with some silt; trace quartz fine gravel.	16"	SPT 16		15 19 21 24
-6.6	32.0						
			Gravelly SAND; tan with orange-red silty laminations; medium grained; well graded; with trace silt.	10"	SPT 17	Silt ~ 10% by volume in settling jar. Gravel maximum axis is 1". Gravel is rounded quartz.	17 21 27 32
			Gravelly SAND; orange-yellow; dense; well graded; with some silt.	14"	SPT 18		17 18 18 21
-11.1	36.5						
			Top 6 inches as SPT 18; then; SAND; tan and orange; dense; fine grained; poorly graded; with trace silt	11"	SPT 19		12 15 18 20
			SAND; tan, light gray, and orange; dense; fine and medium grained; (finer near top); with some silt in fine grained areas.	16"	SPT 20		13 15 15 17
						(continued)	

Hole No.CSW-8

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 25.38 Ft.

SHEET 3 OF 7

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
-14.6	40.0		SAND; tan and orange; medium dense; medium grained; poorly graded; with trace orange silt in base.	11"	SPT 21	Base 5" orange	11 12 15 25
			SAND; tan and orange; very dense; fine and medium grained; poorly graded; with trace silt.	13"	SPT 22		18 45 100/3"
			SAND; tan; very dense; medium grained; poorly graded; with trace light orange silt in laminations.	16"	SPT 23		28 34 45 60
			SAND; as SPT 23 above in top 6 inches; Base 4" grading finer sand and some orange silt.	10"	SPT 24		12 20 32 49
			SAND; orange with some tan near base; very dense; medium grained; poorly graded; with some orange silt.	20"	SPT 25	Chemical sample CSW-8-48'-50' taken @ 12:08	25 34 40 44
-24.6	50.0		Clayey SAND; tan, orange, and light gray; dense; fine to medium grained; poorly graded; with some silt.	22"	SPT 26	gray Clay, Clayey Sand interlayered w/orange Sand, Silty Sand.	17 19 20 24
-26.6 *-27.1*	52.0 52.5		Top 6 inches Silty SAND; tan, orange and light gray; then CLAY; light gray; hard; plastic; with trace silt and sand in orange spots.	14"	SPT 27		19 25 31 40
-28.6	54.0		Silty SAND; gray and orange; dense; fine grained; poorly graded; with some gray clay.	17"	SPT 28	orange laminations Clay mostly in one 3" lens	25 23 19 19
			As SPT 28 above; with more gray silt and clay	13"	SPT 29		15 18 25 32
			Sandy SILT; white-light gray with orange laminations; dense; sand is very fine to fine grained; moist-wet; with trace mica; some gray clay	17"	SPT 30		15 25 25 32
			As SPT 30.	14"	SPT 31		11 17 12 35

(continued)

Hole No.CSW-8

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 25.38 Ft.

SHEET 4 OF 7

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-36.6	62.0						
-37.4 -37.8	62.8 63.2	▥ ▨	As SPT 30 above; with 6 inches gray CLAY in middle. SAND; tan; medium grained; in tip	14"	SPT 32	gray Clay has orange Silty Sand spots	11 20 100/6"
-40.2	65.6	░	SAND; tan with some light orange areas; very dense; medium grained; poorly graded; with trace gray silty spots and orange silt.	10"	SPT 33		60 100/5"
-42.6	68.0	▥	Silty SAND; tan and orange with some light gray; fine grained; poorly graded; with some gray clay in lenses.	15"	SPT 34		23 38 67 70
		░	SAND; tan with orange laminations; very dense; fine grained; poorly graded; with some silt.	13"	SPT 35		23 57 100/5"
		░	SAND; tan and light orange; very dense; fine grained; poorly graded; with some silt.	18"	SPT 36		37 57 57 58
		░	SAND; as SPT 36; with some mediume grained sand.	14"	SPT 37		38 100/3"
		░	SAND; orange with gray silty blobs; very dense; medium grained; poorly graded; with some orange silt.	6"	SPT 38		100/6"
-52.6	78.0	░	SAND; tan-orange; very dense; medium grained; poorly graded; with trace silt.	6"	SPT 39		100/6"
-53.4	78.7	▥	Silty SAND; yellow-orange; very dense; fine grained; poorly graded.	13"	SPT 40	Changed to downhole hammer; reamed to 78'w/open-end 6" trivane bit and large rods. Blows below 78' not valid for comparison with standard N values.	21 23 29
		░	SAND; yellow-orange with some whitish lenses; coarse graded; with trace yellow-orange silt; trace medium-fine sand; trace white clay.	10"	SPT 41	Soil pH in water: @ 1 min.= 4.8 @ 15 min.= 5.0 Settling volume @ 15 min.~50% silt	21 78 50/2"
-58.6	84.0	░	SAND; tan; very dense; fine to medium grained; poorly graded; with some white-light gray with orange spots clay; trace mica.	4"	SPT 42		100/5"
						(continued)	

Hole No.CSW-8

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE 25.38 Ft.	SHEET 5 OF 7
PROJECT Pearce Creek	INSTALLATION PHILADELPHIA DISTRICT	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-58.6	84.0						
			SAND; yellow; very dense; medium grained; poorly graded; with silty CLAY; white-light gray; hard.	1"	SPT 43	Low recovery SAND and CLAY separate	100/4"
-60.6	86.0						
			SAND; yellow-orange; very dense; medium grained; poorly graded; with some silt.	2"	SPT 44		100/5"
			SAND; as SPT 44 above; with some white silty clay in one lens.	6"	SPT 45		100/6"
			No recovery.	0"	SPT 46	No recovery	100/5"
			SAND; orange with some dark brown-black cemented spots; very dense; fine to medium grained; poorly graded; with some orange silt.	14"	SPT 47	Top is medium grained Base is fine grained	43 21 25
			SAND; orange; very dense; coarse to medium grained; moderately well graded; with some orange silt; with trace laminations of cream- colored silt; trace dark brown iron-cemented nodules (as SPT 47).	12"	SPT 48		11 21 27
			SAND; orange; very dense; medium grained; well graded; with some silt.	12"	SPT 49	cream-colored laminations of Silt	15 51 45
-72.4	97.7						
			Silty SAND; orange with dark brown and cream-colored lamiantions; fine to medium grained; poorly graded.	14"	SPT 50	Chemical sample CSW-8-98'-98.5' taken @ 11:50 on 12/7/95 Dark brown iron-cemented grains concentrated in laminations; cream- colored Silt in laminations.	37 47 59
			As SPT 50; more medium grained; much less dark brown laminations; lighter color (tan-orange).	9"	SPT 51	trace reddish color near tip	15 27 35
-76.4	101.7						
			SAND; tan and orange; very dense; mostly medium grained; with some silt; trace clay.	13"	SPT 52	some fine orange Silty Sand and gray-cream Clay laminations, mostly near base	33 34 35
-78.4	103.7						
			Silty SAND and CLAY; sand is light orange to dark orange-brown; clay is light gray with orange spots; sand is fine to medium; poorly graded; clay is plastic.	7"	SPT 53	Clay mainly in 3" lens	45 100/4"
-79.6	105.0						
						(continued)	

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PROJECT	HOLE NUMBER
Pearce Creek	CSW-8

Hole No.CSW-8

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE 25.38 Ft.	SHEET 6 OF 7
PROJECT Pearce Creek	INSTALLATION PHILADELPHIA DISTRICT	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-80.6	106.0						
-81.6	107.0		SILT; white to light gray with some yellow-orange, brown and ice red; very dense; with some sand; sand is mostly fine-very fine grained; with trace clay.	9"	SPT 54	medium grained sand, silt, and 1/4" x 3/4" rust colored cemented Sand nodule in tip. d=110.2 ~3/4" spot of light gray Silt @ top. Darder orange-brown in the Sand just below this.	12 17 24
-83.6	109.0		Silty SAND; tan and orange; very dense; fine to medium grained; poorly graded; with lens of tan silt.	6"	SPT 55		49 50/1.5"
			SAND; tan and orange; very dense; medium grained; poorly graded; with some silt.	8"	SPT 56		33 47 50/2"
			SAND; tan; very dense; medium grained; poorly graded; quartz; subrounded; with trace beige silt in some areas of the sand.	3"	SPT 57	occasional white grains 116.2 Low recovery 118.2 Silt near top 120.2 ~5% Silt by settling volume 122.2 Soil pH in water = 6.3 @ 5 min. occasional white grains	49 50/2"
-90.6	116.0		SAND; as SPT 57 above.	5"	SPT 58		59 50/1"
-91.6	117.0		SILT; white; with some sand mostly cemented into dark rust colored nodules.	1.5"	SPT 59		39 50/1"
			SAND; orange-tan; as SPT 57; without beige siltier areas; some white silt in one lens; with dark rust-colored sand nodules.	5"	SPT 60		30 50/2"
			SAND; orange-brown; very dense; medium to coarse grained; with trace silt.	5"	SPT 61		27 39 50/1"
			SAND; orange; as SPT 61; quartz; subangular.	9"	SPT 62		30 41 58
			SAND; greenish-yellow and tan; very dense; medium to coarse grained; poorly graded; with trace silt; some fine sand.	10"	SPT 63	One black laminationand one red Silt lamination Silt <10% by settling volume	15 25 39
			SAND; orange with trace black, white and red spots; as SPT 63.	9"	SPT 64		33 50 50/1"
						(continued)	

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 25.38 Ft.

SHEET 7 OF 7

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-102.6	128.0						
		░	SAND; tan; very dense; medium to coarse grained; subangular; quartz; with trace feldspar; with some fine sand; trace silt.	9"	SPT 65	One dark rust-colored nodule.	21 43 60
-104.6	130.0						
		▨	Silty CLAY; light gray and pinkish brown; low plasticity; moist; with trace sand.	8"	SPT 66		20 39 50/3"
		▨	Clayey SILT; variegated light gray and dark red with some pinkish brown and occasional dark blue spots; low dilatancy; some parts low plasticity; with some lenses with very fine sand.	17"	SPT 67		15 32 44
-108.1	133.5						
			Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on Laboratory Analyses.			Reamed to 132' depth Set well base @ 130'6.5" on 12/6/95.	

Hole No.CSW-9

DRILLING LOG

DIVISION NORTH ATLANTIC DIVISION

INSTALLATION PHILADELPHIA DISTRICT

SHEET 1 OF 7

1. PROJECT Pearce Creek
2. LOCATION *(Coordinates or Station)* 1598164 E, 643674 N
3. DRILLING AGENCY UNI-TECH DRILLING CO., INC.
4. HOLE NO. *(As shown on drawing title and file number)* CSW-9
5. NAME OF DRILLER Joseph Jester
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 139 Ft.
10. SIZE AND TYPE OF BIT 4-3/4" side-discharge trivane
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)* NAVD 29
12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN disturbed: 69 undisturbed: 0 attempted
14. TOTAL NUMBER OF CORE BOXES 0
15. ELEVATION GROUND WATER
16. DATE HOLE STARTED 02/19/96 COMPLETED 02/21/96
17. ELEVATION TOP OF HOLE 28.38 Ft.
18. TOTAL CORE RECOVERY FOR BORING
19. SIGNATURE OF INSPECTOR S.M. Cook

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
28.4	.0						
			SAND; tan; medium dense; poorly graded; medium grained; with trace clay.	12"	SPT 1	Unless otherwise noted, SPT samples taken according to ASTM 1586 Using bentonite mud, "QuickGel" by Baroid.	7 14 10 8
26.4	2.0						
			CLAY; yellow with some gray and red; stiff; low plasticity; with some sand.	9"	SPT 2		7 7 9 12
24.1	4.3						
			Top 4" CLAY; gray-brown with some red; low plasticity; then SAND; tan; dense; medium grained; poorly graded; wet;	13"	SPT 3		8 11 14 16
			SAND; tan turning black at tip; as above; medium dense; silty at tip; wet.	13"	SPT 4		6 5 6 9
20.4	8.0						
20.1	8.3						
			Top 4" Silty SAND; black; grading to silt; black soft; wet; non-plastic; trace fine sand;	14"	SPT 5		WOH – – –
18.4	10.0						
			Alternating black organic clayey silt and fine silty sand; soft; wet; trace organic material; Base 2" is woody; drier	20"	SPT 6		1 0 1 1
			as SPT 6; runny in parts; gray and black spotted clay.	24"	SPT 7		WOH – – –
			Sandy SILT; yellow-gray; wet; runny; soft.	8"	SPT 8		1 WOH WOH WOH
			Silty SAND; yellow-gray; very loose; runny; wet; medium grained; poorly graded	6"	SPT 9		1 0 1 1
						(continued)	

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PROJECT Pearce Creek

HOLE NUMBER CSW-9

Hole No.CSW-9

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE: 28.38 Ft.

SHEET 2 OF 7

PROJECT: Pearce Creek

INSTALLATION: PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
10.4	18.0						
			Silty SAND; As SPT 9; dark brown with yellow near tip.	9"	SPT 10		WOR – – –
8.4	20.0						
			SAND; tan; loose; medium grained; poorly graded; wet with trace silt; some multicolored clay in top 3"; trace mica.	8"	SPT 11		2 4 5 7
			SAND; brown with occ. orange areas; dense; medium to fine grained; poorly graded; with some silty trace mica.	15"	SPT 12		10 17 18 18
			SAND; orange; dense; medium grained; poorly graded; with some silt; trace mica flakes.	15"	SPT 13		18 22 27 30
			SAND; as SPT 13.	13"	SPT 14		18 27 32 30
			SAND; orange to reddish; As SPT 13.	16"	SPT 15		14 15 16 16
-2.1	30.5		Top 6" as above; then Silty SAND; gray-yellow, medium dense; very fine; trace mica; trace black orange silt spots; trace gravel.	20"	SPT 16	On piece of gravel at sand/silty sand interface.	9 9 10 12
			Silty SAND; gray; medium dense; very fine grained; poorly graded; with trace mica.	13"	SPT 17		10 8 8 8
-5.6	34.0		Silty CLAY; gray; stiff; with some very fine sand; with trace mica; trace wood.	12"	SPT 18		9 7 6 7
			As SPT 18; Silty CLAY; with some very fine sand.	19"	SPT 19		4 6 6 8
-9.6	38.0						
			CLAY; gray; very stiff; low plasticity; trace mica; trace sand.	21"	SPT 20		10 10 12 10
						(continued)	

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PROJECT: Pearce Creek

HOLE NUMBER: CSW-9

Hole No.CSW-9

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 28.38 Ft.

SHEET 3 OF 7

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
-11.6	40.0						
		▨	Top 7" as SPT 21, slightly softer; grading brown; then; Clayey PEAT; brown-black; moist; grading into woody clay at base.	24"	SPT 21	Peat turns black with exposure to air.	10 8 7 8
		▨	CLAY; gray-brown; stiff; low plasticity; with trace wood; some; trace angular sand-sized grains.	22"	SPT 22		8 8 7 8
		▨	CLAY; brown; as SPT 22.	21"	SPT 23		6 6 6 5
		▨	CLAY; brown; as SPT 22.	21"	SPT 24	One orange spot ~ 1/4" wide.	5 6 7 7
-19.6	48.0						
		▨	Silty CLAY; brown with occ. white or gray sand blobs; as SPT 22.	19"	SPT 25	Turns darker with exposure to air.	8 6 8 8
-21.6	50.0						
		▨	CLAY; brown truning to gray-black with exposure to air; hard; as SPT 22; with some black areas.	24"	SPT 26		22 25 32 35
		▨	CLAY; as SPT 26; with more frequent white spots on inner surface of sample as broken apart; no angular grains as before.	23"	SPT 27		11 15 9 12
		▨	CLAY; as SPT 27	20"	SPT 28		11 14 9 12
		▨	CLAY; as SPT 27.	4"	SPT 29	Looks like most of sample pulled out tip (did not break off - trap bent backwards).	12 10 25 18
		▨	CLAY; gray and black; as SPT 27.	21"	SPT 30		12 15 15 18
		▨	CLAY; as SPT 30.	20"	SPT 31		10 10 9 10
						(continued)	

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PROJECT Pearce Creek

HOLE NUMBER CSW-9

Hole No.CSW-9

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE 28.38 Ft.	SHEET 4 OF 7
PROJECT Pearce Creek	INSTALLATION PHILADELPHIA DISTRICT	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-33.6	62.0	▨	CLAY; as SPT 31.	23"	SPT 32		12 12 17 15
		▨	CLAY; as SPT 31; with more frequent white shells (trace).	23"	SPT 33		5 9 11 12
		▨	CLAY; as SPT 31.	24"	SPT 34		10 10 12 10
-39.6	68.0	▥	Silty SAND; dark gray; very dense; fine grained; with trace mica; trace wood.	24"	SPT 35		14 17 20 20
-41.6	70.0	▨	Silty CLAY; gray and black; firm; low plasticity; low to no dilatancy; with trace wood and trace mica flakes.	21"	SPT 36	End of day 02/19/96.	3 4 5 5
-43.6	72.0	▨	CLAY; dark olive green with black; with trace vegetative matter; trace mica; moderate plasticity; no dilatancy; moist;	24"	SPT 37		12 10 12 15
		▨	As SPT 37; with occ. white spots (shell remnants).	24"	SPT 38		3 1 9 9
		▨	As SPT 38.	24"	SPT 39		3 3 4 3
		▨	As SPT 38; slightly more frequent shell pieces; turning black with green in base 8"	24"	SPT 40		3 5 8 9
		▨	CLAY; black; as SPT 40.	5"	SPT 41	Low recovery; appears most of sample pulled out base of spoon.	8 17 20 25
-54.6	83.0	▨ ≈	Top 12" as SPT 41; PEAT; gray with brown and black; dry; light; some shells.	21"	SPT 42		13 12 16 18
						(continued)	

Hole No.CSW-9

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 28.38 Ft.

SHEET 5 OF 7

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
-55.6 -57.6	84.0 86.0			21"		Drilled to 86' easily no resistance – still in peat or clay.	
-58.3 -59.6	86.7 88.0		Top 8" as SPT 41 (black organic clay) then Grading over 4" into SAND; gray; very dense; fine to coarse grained in poorly graded lenses; with trace silt; trace wood; trace fine gravel.	16"	SPT 43	Photo.	7 37 66 48
			Interbedded lenses of SAND; PEAT and woody CLAY. As SPT 42 and 43; and brown woody clay.	17"	SPT 44		10 25 18 15
-62.6	91.0		Slough of CLAY to fine gravel; as SPT 44.	0"	SPT 45	~ 2" slough.	51 18 35 50
			SAND; light brown to yellow-brown; very dense; coarse grained; poorly graded; with some fine gravel; some medium sand.	14"	SPT 46		57 40 30 52
-67.6	96.0		As SPT 46; SAND.	5"	SPT 47	Switched to downhole hammer @ 94'. Sampling through open and trivane 6" bit, large rods. Blow counts not comparable to above. Difficulty turning bit @ 94.7. Broken pieces of large quartz rounded gravel in wash as circulating @ 96'.	12 22 46
-69.6	98.0		Silty SAND; white; poorly graded; medium grained; soupy in parts; slightly dilatant (rubbery) when manipulated.	14"	SPT 48		
			Silty SAND and CLAY; as SPT 48; with <2" lenses of light gray clay; clay is plastic; moist.	15"	SPT 49		17 21 20
			SAND and CLAY; clay as SPT 49; sand is medium grained; poorly graded; with some silt.	15"	SPT 50		22 33 41
			As SPT 50; clay has trace gravel.	7"	SPT 51		25 39 70
			As SPT 51.	5"	SPT 52		150/6"
						(continued)	

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PROJECT Pearce Creek

HOLE NUMBER CSW-9

Hole No.CSW-9

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 28.38 Ft.

SHEET 6 OF 7

PROJECT Pearce Creek

INSTALLATION PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (If significant)	BLOWS/ 6in.
-77.6	106.0						
			As SPT 51; SAND and CLAY interlensed.	5"	SPT 53	Lenses <2" thick.	54 100/4"
				0"	SPT 54	No Recovery.	33 100/3"
-80.6	109.0						
			Silty SAND; white; fine to medium grained; poorly graded.	2"	SPT 55	Piece of quartz slough blocking spoon; broken gravel originally > spoon diameter.	31 100/4"
				<1"	SPT 56	~ 2" slough sand and clay.	100/5"
-85.6	114.0						
			SAND; light tan to white; dense; medium grained; very poorly graded; quartz; trace silt.	4"	SPT 57	Some drilling fluid invaded sample, scraped most off @ edges.	100/6"
			SAND; as SPT 57; slightly coarser (still medium grained); slightly darker.	5"	SPT 58		50 50/1"
			SAND; as SPT 58; brown.	5"	SPT 59		62 50/1"
			SAND; as SPT 58; brown to gray.	5"	SPT 60	Gray may be from drilling fluid.	100/6"
			SAND; white, tan, and brown; very dense; coarse grained; poorly graded; with some silt; trace fine-medium sand; trace clay in laminations.	10"	SPT 61	Slightly more feldspar grains than previously, still <5%.	31 57 50/1"
			SAND; reddish-brown; dense; coarse grained; moderately well graded; with some silt; some gray clay in 1/2" lenses.	6"	SPT 62	Gray and red clay in wash as drill to 126'.	39 50/1"
-97.1	125.5						
			CLAY; variegated brown, red, pink, gray, and green; hard; plastic; with deep wine red or orange spots; moderately moist; with multicolored sand in base 1".	16"	SPT 63	Lot of coarse sand (slough?) on top.	16 31 38
-99.6	128.0					*(continued)*	

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MAR 71

PROJECT Pearce Creek

HOLE NUMBER CSW-9

Hole No.CSW-9

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE
28.38 Ft.

SHEET 7
OF 7

PROJECT
Pearce Creek

INSTALLATION
PHILADELPHIA DISTRICT

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS (if significant)	BLOWS/ 6in.
-99.6	128.0						
		▨	Silty SAND and CLAY; orange red and gray; sand and silt weakly to moderately cemented in laminations.	4"	SPT 64		29 41
		▨	Sandy CLAY; light gray; hard; dilatant.	9"	SPT 65		29 37 50
-103.6	132.0						
		▨	CLAY; variegated red and gray; dry; moderately plastic; with some silt; trace very fine sand.	20"	SPT 66	Driven 2" when set silt and sand more prevalent in gray areas.	12 25 32
		▨	CLAY; red and gray; as SPT 66.	20"	SPT 67	Driven when set.	50/1" 27 36
-107.6	136.0						
		▨	Sandy CLAY; light gray; dense slightly moist; fine grained; with trace medium trace coarse grained sand.	20"	SPT 68	Able to mold with finger pressure 60% silt/clay by settling volume after ~ 16 hours.	14 34 45
		▨	Sandy CLAY; as SPT 68.	11"	SPT 69		42 100/6"
-110.6	139.0						
			Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on Laboratory Analyses.			E.O.B. @ 139'.	

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PROJECT
Pearce Creek

HOLE NUMBER
CSW-9

US ARMY CORP OF ENGINEERS

BORING NUMBER CSW-10

DATE DRILLED 8/6/96

SURFACE ELEVATION 32.53 NAVD 88

NORTHING 1597712

CLIENT USEPA

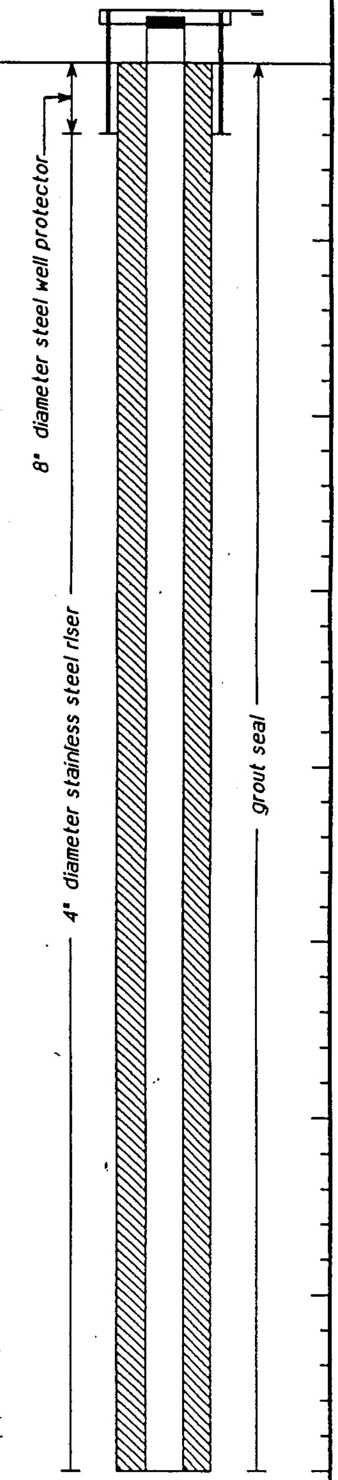
PROJECT PEARCE CREEK

GEOLOGIST D. SIRKIS

EASTING 642664

DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
						SP	
5							
10							
15							
20		0.7	36	NA			light grey, very fine SAND, with rust brown lenses, some silt
		1.0	64	NA			light grey, very fine SAND, with rust brown lenses, some silt, with some clay
25		1.3	9	NA		SW	light rust brown fine SAND alternating light brown, light rust, and light grey fine to medium SAND, with clay lenses from 24'-24'2"
		1.0	18	NA			alternating light brown, light rust, and light grey fine to medium SAND
		0.8	8	NA		SP	light brown medium SAND
30		1.2	35	NA		SW	alternating layers of light brown, rust, and light grey fine to medium SAND
		1.3	16	NA			
35		1.5	98	NA			alternating layers of light brown, rust, and light grey fine to medium SAND, trace clay rust brown medium to coarse SAND, some clay
		1.1	25	NA			
		1.0	44	NA			alternating thin layers of light brown and light grey medium to coarse SAND, trace clay
40		1.2	73	NA			

WELL DIAGRAM



US ARMY CORP OF ENGINEERS

BORING NUMBER CSW-10

DATE DRILLED 8/6/96

SURFACE ELEVATION 32.53 NAVD 88

NORTHING 1597712

CLIENT USEPA

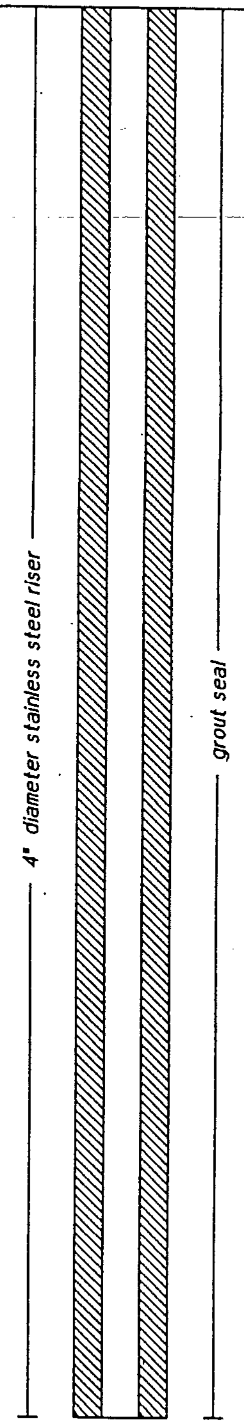
PROJECT PEARCE CREEK

GEOLOGIST D. SIRKIS

EASTING 642664

DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
						SW	alternating thin layers of light brown and light grey medium to coarse SAND, trace gravel
		0.7	41	NA		GW	light brown sandy GRAVEL
							maximum diameter is .5"
		1.0	65	NA			purplish grey silty sand on tip of spoon
45						SM	purplish grey silty SAND grading into cream colored gravelly SAND at 45.1'
		1.1	55	NA			purplish grey silty SAND grading into cream colored gravelly SAND to 47.4'
						SP	white clean fine SAND and gravel
		0.75	55	NA			as above, no gravel
50						SW	white coarse well sorted SAND, trace fine black sand particles
		0.5	50	NA			white fine to medium SAND, some soft silty clay micaeous
		0.25	50	NA			1" thick gravel and sand lens, trace clay
55							micaeous white fine to medium SAND, trace clay
60							
65							gravel
70							
75							
80							

WELL DIAGRAM



US ARMY CORP OF ENGINEERS

BORING NUMBER *CSW-10*

DATE DRILLED *8/6/96*

SURFACE ELEVATION *32.53 NAVD 88*

NORTHING *1597712*

CLIENT *USEPA*

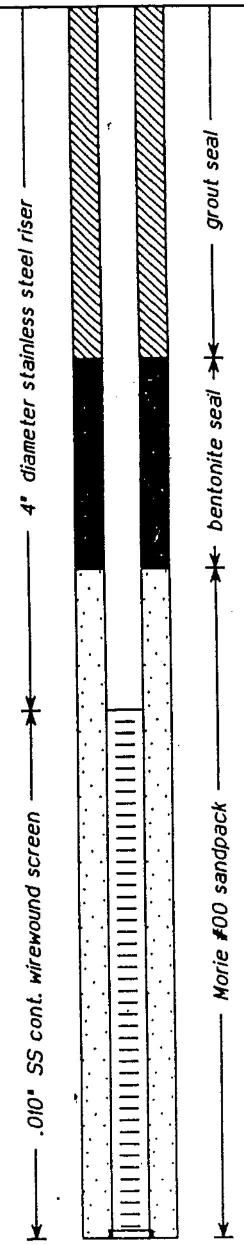
PROJECT *PEARCE CREEK*

GEOLOGIST *D. SIRKIS*

EASTING *642664*

DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
						SW	
							pebbles, iron cemented sandstone, and white gravel quartzite pebbles
85							
90							
							gravel layer
95							
100							
105							
110							
115							*Bottom of Boring at 115'*
120							

WELL DIAGRAM



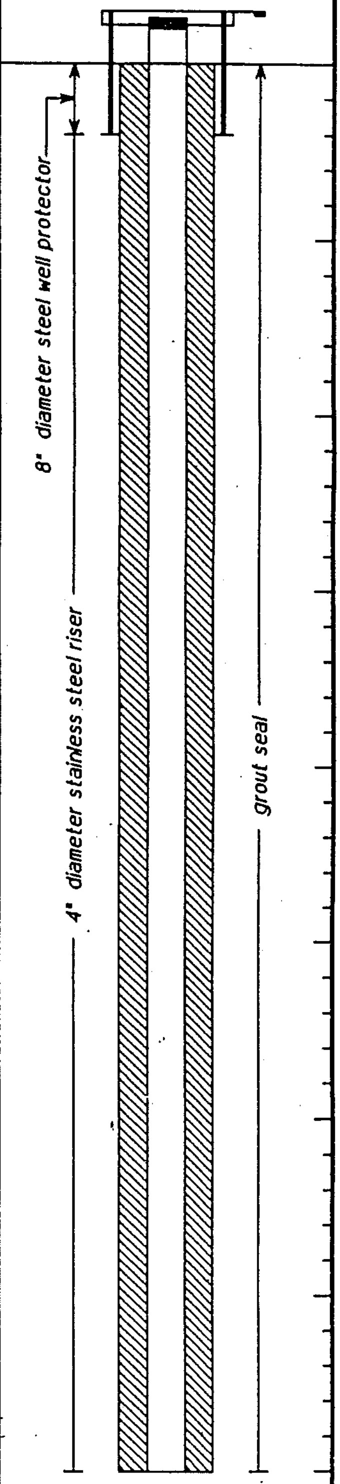
US ARMY CORP OF ENGINEERS

BORING NUMBER CSW-11
DATE DRILLED 8/22/96
SURFACE ELEVATION 24.46 NAVD 88
NORTHING 1599284

CLIENT USEPA
PROJECT PEARCE CREEK
GEOLOGIST D. SIRKIS
EASTING 645357

DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
						SM	brown silty SAND, trace gravel, dry
		1.0	39	NA			dark brown micaceous silty SAND
		1.0	13	NA		SW	orange fine to medium SAND, trace gravel, dry
5							
		1.0	8	NA		CL	grey soft CLAY
						SP	tan medium clean sand
		1.2	8	NA		SW	orange fine to coarse SAND, trace gravel
						GW	white SAND and GRAVEL, dry
10		1.3	15	NA			
		1.2	17	NA			
		1.1	17	NA			
15							
		1.0	22	NA			
		1.2	11	NA		SW	orange-brown fine to medium SAND, trace gravel, moist
20		1.5	8	NA			dark grey to light grey fine to coarse SAND, trace gravel
		2.0	28	NA			grey fine to coarse SAND, saturated, trace gravel to 1" maximum diameter
							brown-grey fine to coarse sand, saturated
		1.6	21	NA			more gravelly
25							
		1.7	30	NA			1" max gravel diameter
		1.7	11	NA			grey-brown fine to coarse SAND, trace gravel
							greenish-grey very fine to medium SAND, trace silt, saturated
30		1.6	[illegible]	NA			
							grey gravelly SAND, saturated
		2.0	37	NA			greenish-grey very fine to medium SAND, trace silt, saturated
		2.0	34	NA			as above, very fine to coarse, trace gravel
35							wood pieces, small amount of red clay, more gravel
		2.0	21	NA		CL	orange and grey CLAY with lenses of sandy clay and clayey sand
		1.2	14	NA			more orange, few lignite seams
40		1.6	27	NA			

WELL DIAGRAM



US ARMY CORP OF ENGINEERS

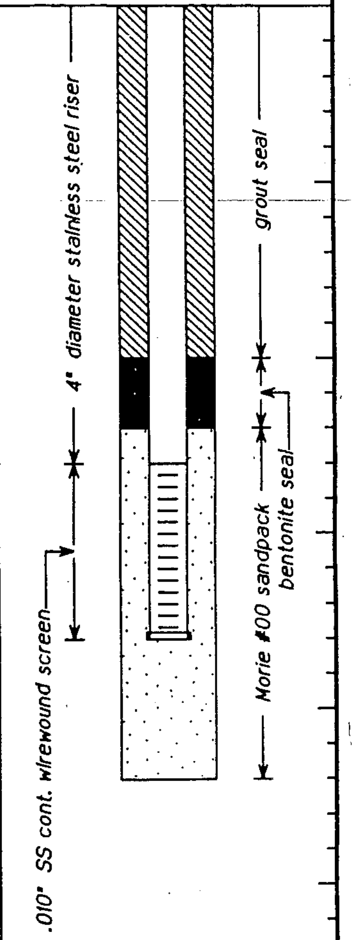
BORING NUMBER CSW-11
DATE DRILLED 8/22/96
SURFACE ELEVATION 24.46 NAVD 88
NORTHING 1599284

CLIENT USEPA
PROJECT PEARCE CREEK
GEOLOGIST D. SIRKIS
EASTING 645357

DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
					▨	CL	
							0.2' gravelly sand lense
		1.7	5	NA	⋯	SW	orange-brown fine to coarse SAND
							grey clay lense, gravelly sand
		0.6	9	NA	▨	CL	orange, tan, and light grey CLAY, sandy gravel to 44.1'
45							
		1.1	27	NA			
							light grey sandy clay
		1.4	16	NA			light grey CLAY and sandy CLAY
50		1.6	17	NA			
		1.7	35	NA			
					⋯	SP	orange and tan medium SAND, saturated
		1.0	45	NA		SW	0.1' iron concretion
55							
		1.1	45	NA			
							gravel piece
			24	NA			
							gravel piece
							orange-brown gravelly SAND
60		1.0	40	NA	▨	CL	red-grey stiff CLAY
							Bottom of Boring at 62'
65							
70							
75							
80							

-37.4

WELL DIAGRAM



US ARMY CORP OF ENGINEERS

BORING NUMBER CSW-12

DATE DRILLED 8/14/96 - 8/22/96

SURFACE ELEVATION 39.02 NAVD 88

NORTHING 1599284

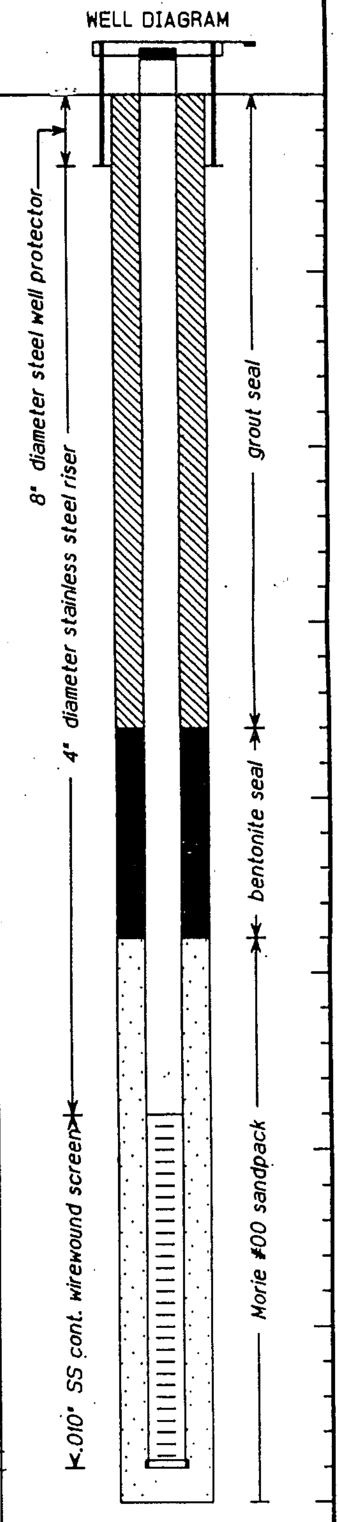
CLIENT USEPA

PROJECT PEARCE CREEK

GEOLOGIST D. SIRKIS

EASTING 641002

DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
						OH	dark brown organic SILT, some clay
5							
							dark brown organic CLAY, some peat
		1.7	2	NA			grey silty CLAY (from cuttings), slightly micaeous, soft
10							
15							silty CLAY
20							
25							grey silty material (from cuttings)
30						SP	white and black fine grained, well sorted SAND, wet
							as above, becoming all white, trace very fine black mineral
		1.5	76	NA		SW	tan fine to medium grained silty SAND
		0.3	50	NA			
35						SP	tan medium clean SAND
							1/4" grey clay seam
		1.0	11	NA			white medium SAND with 1/4" brown clay seams
		1.0	9	NA			white fine grained SAND, trace kaolinite
40		1.3	60	NA		SW	yellow silty clay seam, trace gravel
						SP	tan fine to medium grained SAND



US ARMY CORP OF ENGINEERS

BORING NUMBER CSW-12

DATE DRILLED 8/14/96 - 8/22/96

SURFACE ELEVATION 39.02 NAVD 88

NORTHING 1599284

CLIENT USEPA

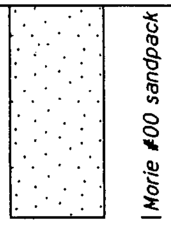
PROJECT PEARCE CREEK

GEOLOGIST D. SIRKIS

EASTING 641002

DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
						SP	white fine grained SAND
		1.2	24	NA			GRAVEL (from cuttings)
						SW	grey fine to medium grained silty SAND
						OL	yellow-brown silty CLAY, some sand, trace gravel
		2.0	84	NA		SW	whitish grey fine to medium SAND, trace mica
45						SP	as above, trace silt
6.8			18	NA			light colored fine SAND (from cuttings)
							Bottom of Boring at 46'
50							
55							
60							
65							
70							
75							
80							

WELL DIAGRAM



US ARMY CORP OF ENGINEERS

BORING NUMBER CSW-13

CLIENT USEPA

DATE DRILLED 8/8/96 - 8/9/96

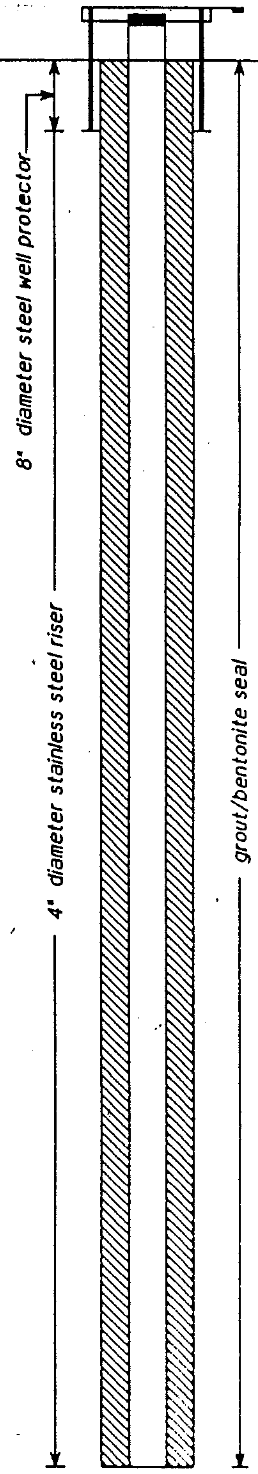
PROJECT PEARCE CREEK

SURFACE ELEVATION 18.32 NAVD 88

GEOLOGIST D. SIRKIS

NORTHING 1602744

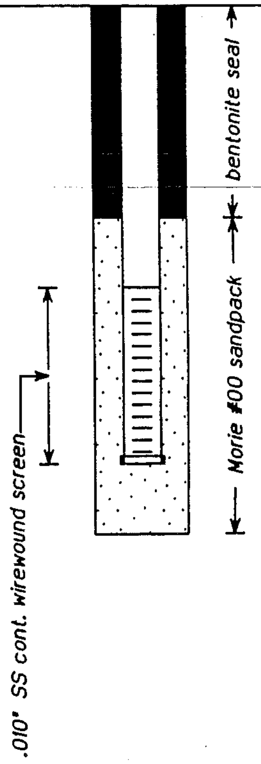
EASTING 643662

DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
5								
10								
15								
20								
25								
30								
35								
40								

US ARMY CORP OF ENGINEERS

BORING NUMBER CSW-13
DATE DRILLED 8/8/96 - 8/9/96
SURFACE ELEVATION 18.32 NAVD 88
NORTHING 1602744
CLIENT USEPA
PROJECT PEARCE CREEK
GEOLOGIST D. SIRKIS
EASTING 643662

DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
45								
50								
55								
60								
65								
70								
75								
80								



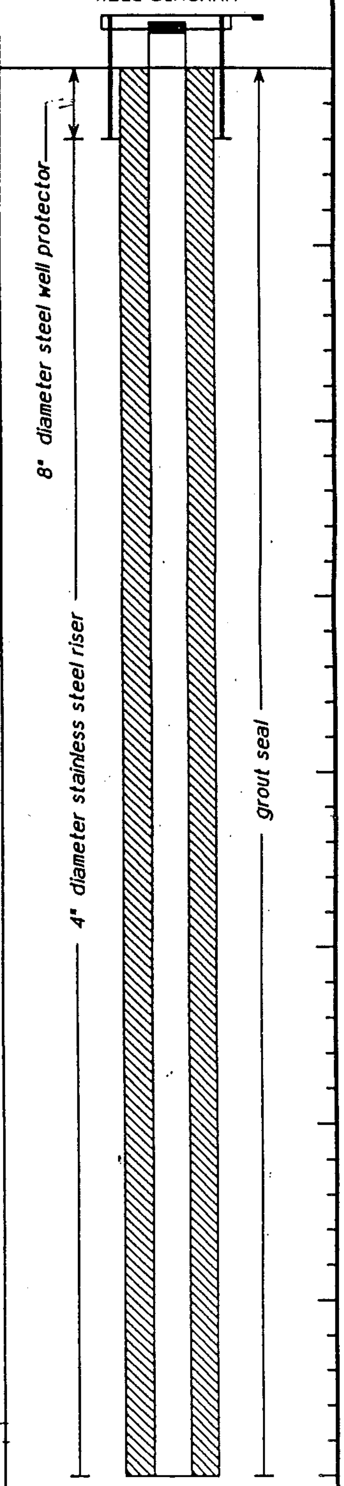
US ARMY CORP OF ENGINEERS

BORING NUMBER CSW-14
DATE DRILLED 8/14/96 - 8/22/96
SURFACE ELEVATION 39.02 NAVD 88
NORTHING 1599271

CLIENT USEPA
PROJECT PEARCE CREEK
GEOLOGIST D. SIRKIS
EASTING 640997

DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
						OH	dark brown organic SILT, some clay
5							
							dark brown organic CLAY, some peat
		1.7	2	NA			grey silty CLAY (from cuttings), slightly micaeous soft
10							
15							silty CLAY
20							
25							grey SILTY material (from cuttings)
30						SP	white and black fine grained, well sorted SAND, wet
							as above, becoming all white, trace very fine black mineral
		1.5	76	NA		SW	
		0.3	50	NA			
35						SP	tan, medium, clean SAND
							1/4" grey clay seam
		1.0	11	NA			white medium SAND with 1/4" brown clay seams
		1.0	9	NA			white fine grained SAND, trace kaolinite
40		1.3	60	NA		SW	yellow silty clay seam, trace gravel
						SP	tan fine to medium grained SAND

WELL DIAGRAM

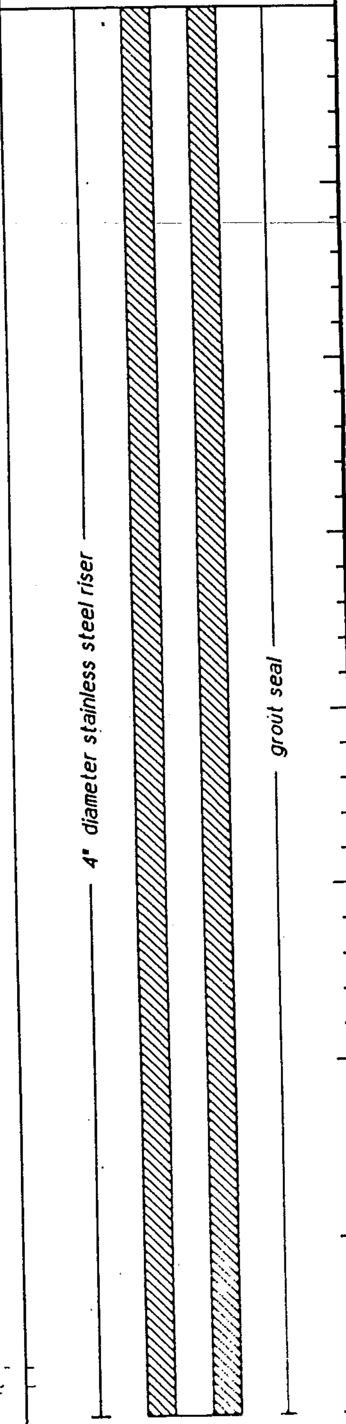


BORING NUMBER CSW-14
DATE DRILLED 8/14/96 - 8/22/96
SURFACE ELEVATION 39.02 NAVD 88
NORTHING 1599271

CLIENT USEPA
PROJECT PEARCE CREEK
GEOLOGIST D. SIRKIS
EASTING 640997

DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
						SP	white fine grained SAND
		1.2	24	NA			GRAVEL (from drill cuttings)
		2.0	84	NA		SW	grey fine to medium silty SAND
						OL	yellow brown silty CLAY, some sand, trace gravel
			18	NA		SW	whitish grey fine to medium SAND, trace mica
45						SP	as above, trace silt
							light colored fine SAND (from drill cuttings)
50							white fine well sorted SAND with 1/8" clay seams
							white fine SAND, trace very fine black mineral
		1.0	140	NA			
		1.0	36	NA			
55							
60							drillers lost 350 gallons of fluid down hole
		0.6	24	NA			white fine well sorted SAND, trace very fine black mineral
		0.5	87	NA			red/brown coarse SAND, well sorted, trace clay
65							
70							
75							
80							

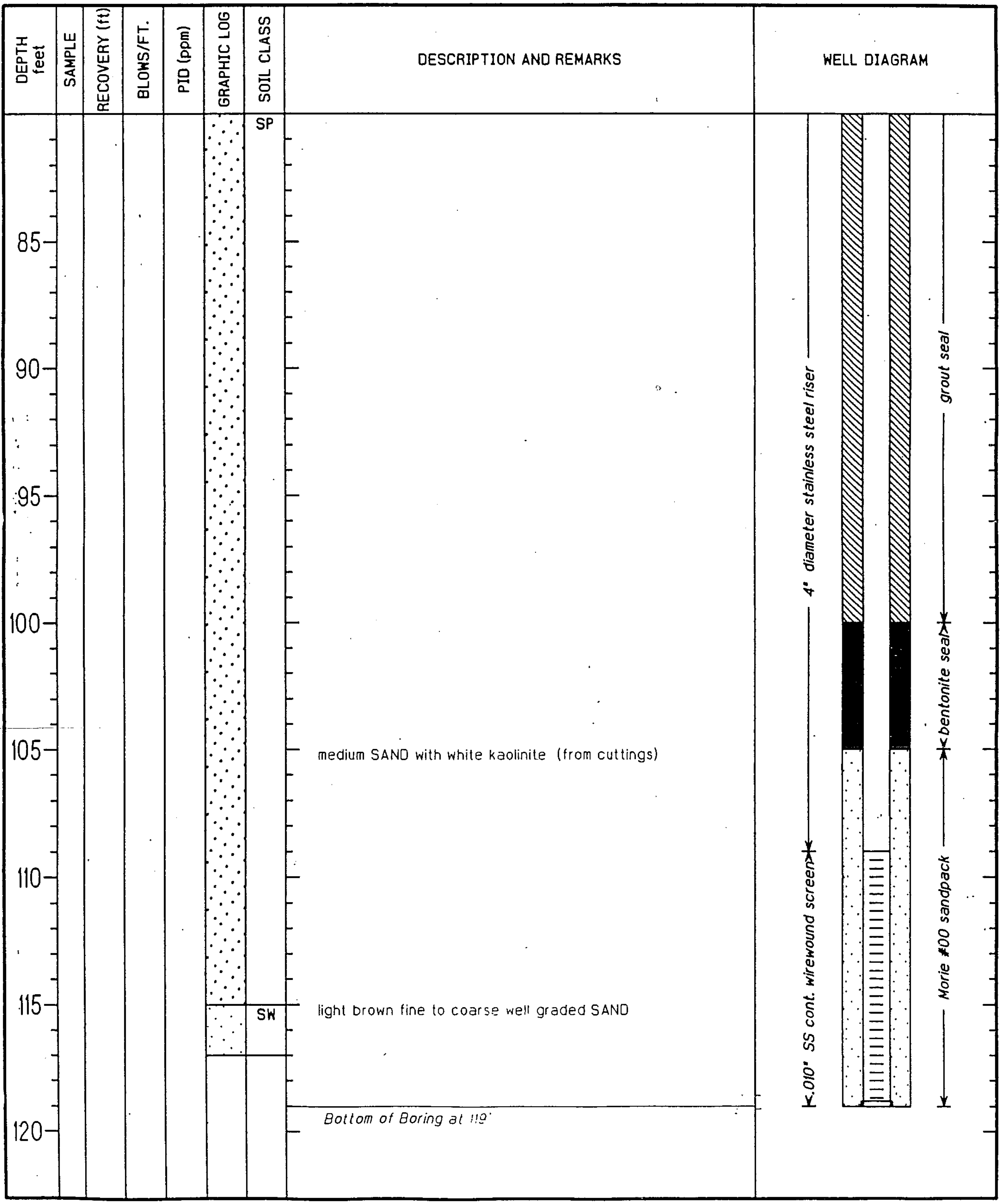
WELL DIAGRAM



US ARMY CORP OF ENGINEERS

BORING NUMBER CSW-14
DATE DRILLED 8/14/96 - 8/22/96
SURFACE ELEVATION 39.02 NAVD 88
NORTHING 1599271

CLIENT USEPA
PROJECT PEARCE CREEK
GEOLOGIST D. SIRKIS
EASTING 640997



medium SAND with white kaolinite (from cuttings)

light brown fine to coarse well graded SAND

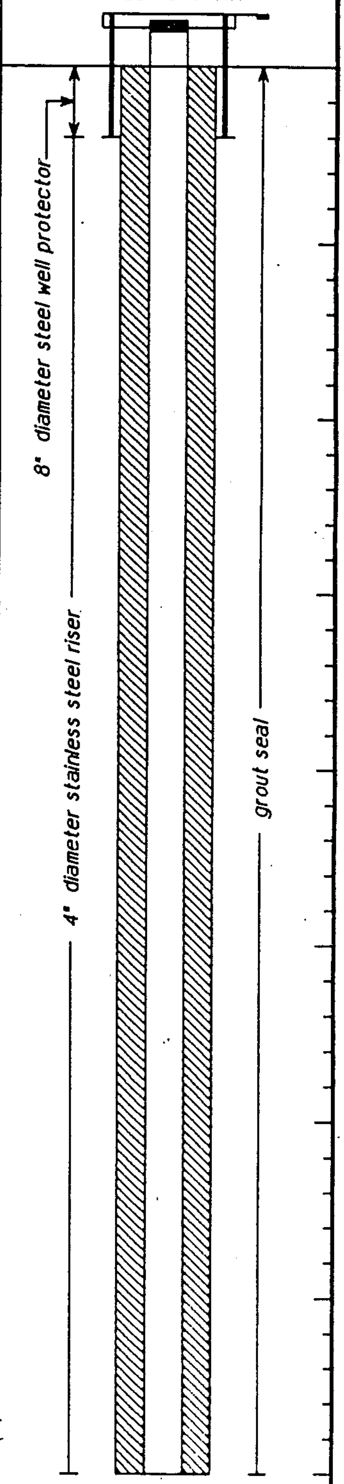
Bottom of Boring at 119'

US ARMY CORP OF ENGINEERS

BORING NUMBER CSW-15
DATE DRILLED 8/6/96
SURFACE ELEVATION 47.00 NAVD 88
NORTHING 1600433
CLIENT USEPA
PROJECT PEARCE CREEK
GEOLOGIST D. SIRKIS
EASTING 643560

DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
						FM ML	dike fill: dark brown, clayey SILT, trace sand and mica flakes augered down to 15' below the surface
5							
10							
15		2.0	4	NA		ML	grey clayey SILT, or silty CLAY, peat partings, wet
			7	NA			grey clayey SILT, or silty CLAY, more peat, wet
		1.1	4	NA			
20							grey clayey SILT, or silty CLAY, peat, some wood chips
		2.0	9	NA			grey clayey SILT, or silty CLAY, peat
		0.0	8	NA			bottom of 4" spoon
25		2.0	5	NA			grey clayey SILT, less peat
		2.0	3	NA			grey clayey SILT, peat throughout
		1.5	4	NA			grey clayey SILT, some peat, trace woodchips
30							
		1.8	6	NA			grey clayey SILT, trace peat, trace fine sand at top
		2.0		NA		PT	peat layer with wood chips
						OH	grey silty CLAY with tanish, brown clay stringer in middle of spoon
35		2.0	2	NA			peat stringer thru clay and more peat in bottom of spoon
		2.0	4	NA			grey silty CLAY with occasional peat stringers small area of tanish brown clay at top of spoon
			2	NA			brownish grey silty CLAY with peat
40							

WELL DIAGRAM



US ARMY CORP OF ENGINEERS

BORING NUMBER CSW-15

DATE DRILLED 8/6/96

SURFACE ELEVATION 47.00 NAVD 88

NORTHING 1600433

CLIENT USEPA

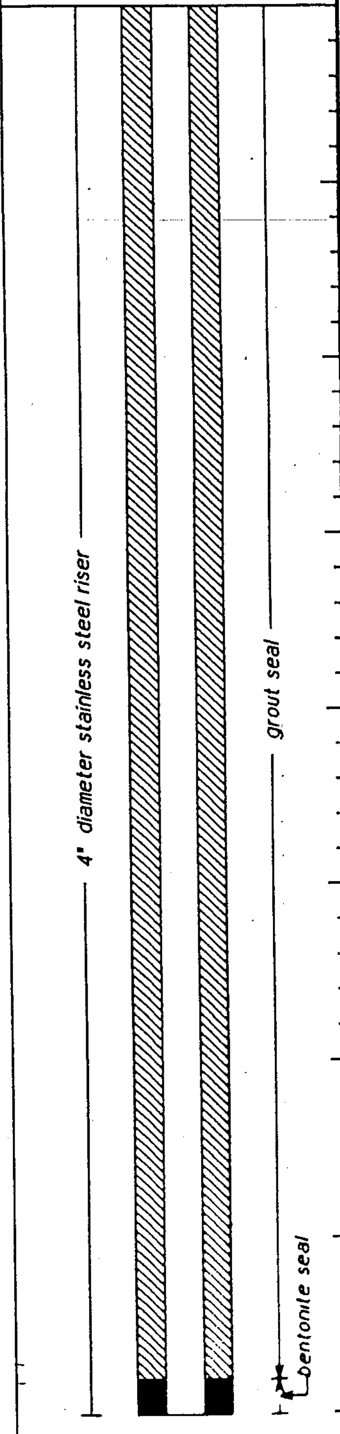
PROJECT PEARCE CREEK

GEOLOGIST D. SIRKIS

EASTING 643560

DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
						OH	
		2.0	3	NA		ML	grey clayey SILT and peat stringers, trace sand
		2.0	2	NA			
45		2.0	5	NA			sandy grey clayey SILT, less peat, no sand
		1.6		NA		CL	silty CLAY, no peat
50		1.7	4	NA			silty CLAY, sandy with trace brown clay 2" of peat plugs
		1.7	9	NA		PT	grey silty PEAT, with wood fragments
		1.5	6	NA			grey silty PEAT, with occasional wood chunks
55		2.0	8	NA			brown silty PEAT
		0.8	10	NA			reddish brown PEAT, with occational wood fragments
60		1.5	6	NA			reddish brown PEAT, with occational wood fragments, siltier with depth
		2.0	8	NA		ML PT	grey sandy SILT, trace clay grey silty PEAT
		1.6	8	NA		OH	greenish-grey CLAY, trace sand grey/white CLAY, trace gravelly sand at bottom
65		1.7	14	NA			white, grey/brown CLAY, stringers of brown organic silt
		2.0	12	NA			grey, brown CLAY, varigated
70		2.0	10	NA			grey and green CLAY with some brown layers of peat, some sand
		2.0	14	NA			greenish-grey CLAY, trace to some sand, trace mica, trace peat, dry
		2.0	16	NA			
75							
80		2.0	17	NA			

WELL DIAGRAM



US ARMY CORP OF. ENGINEERS.

BORING NUMBER CSW-15

DATE DRILLED 8/8/96

SURFACE ELEVATION 47.00 NAVD 88

NORTHING 1600433

CLIENT USEPA

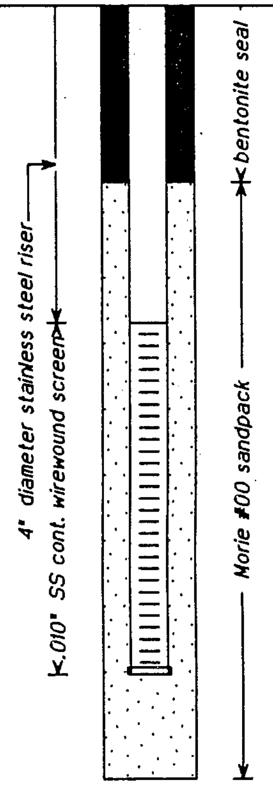
PROJECT PEARCE CREEK

GEOLOGIST D. SIRKIS

EASTING 643560

DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
						OH	grey, stiff silty CLAY, slightly fossiliferous, trace peat
85		1.5	25	NA			
						SW	fine to coarse well graded SAND wet
90		1.2	69	NA		GW	brown SAND and GRAVEL, wet
						SP	white, fine grained SAND, well sorted, wet
95		1.0	93	NA			
100			21	NA			tan coarse SAND, well sorted, trace silt, wet
						CL	red CLAY with grey clay stringers
							Bottom of Boring at 102'
105							
110							
115							
120							

WELL DIAGRAM



DUFFIELD ASSOCIATES
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WILMINGTON, DELAWARE 19808-1232
TEL. (302)239-6634 FAX (302)239-8485
E-MAIL: DUFFIELD@DUFFNET.COM

U.S. Army Corps Of Engineers
Pearce Creek Dredged Material
Containment Area
Cecilton, MD

Log of Boring TB-1

(Page 1 - 2)

Date Started : November 11, 1998
Date Completed : November 12, 1998
Weather : Clear, 60's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 47.4'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 641619
Easting : 1597957

Depth in Feet	Surf. Elev. 47.4'	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
0	46	ML		Brown SILT, some fine sand, trace medium sand, trace coarse sand, trace gravel, trace root material.	1	22	3-3-4-5
		ML		Brown and dark gray clayey SILT, trace fine sand, trace organics, trace mica.	2	22	3-4-4-4
5		MH		Dark gray clayey SILT, trace fine sand, trace mica and organics.	3	21	3-2-2-3
	41				4	20	3-4-4-4
				Same, trace gravel.	5	20	1-2-2-2
10	36				SH-1	21	
				Dark gray clayey SILT, trace fine sand, trace mica and organics.	6	22	1-4-4-5
				Same (less plant material).			
15					7	24	1-1-2-3
	31				8	24	4-4-4-4
				Same (less plant material).	9	23	2-2-2-2
20	26				SH-2	24	
					10	23	3-2-3-2
				Same, lenses of fine sand, lenses of plant material.			
25					11	12	WR/12"-4-4
	21			Same (less plant material).	12	24	2-2-2-2
				Same, lenses of plant material.	13	24	4-5-4-5
30	16			Same, lenses of plant material, lenses of light-gray/brown silt.	14	24	WR/2"-WH/4"
		ML		Light-gray/light-brown mottled SILT, trace to little fine sand, trace mica.	15	24	13-12-11-12
35		SM		Light-gray/light-brown fine SAND, some silt, trace mica and organics (dry, loose).	16	10	15-50/4"
	11				17	10	40-50/4"
				Same (last 6" denser and damp).	18	19	16-31-37-50
40							

1. Wet on spoon at 46'.
2. Wash drilling started at 52'.
3. No bottom at 56', rods sunk, stopped wash.
4. No bottom at 60'.
5. Restart washing at 64'.
6. Borehole grouted with cement-bentonite grout after auger removal.

F:\boring logs\3769ge\tb-1.bor

09-18-1999

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U.S. Army Corps Of Engineers
Pearce Creek Dredged Material
Containment Area
Cecilton, MD

Log of Boring TB-1

(Page 2 - 2)

Date Started : November 11, 1998
Date Completed : November 12, 1998
Weather : Clear, 60's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 47.4'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 641619
Easting : 1597957

Depth in Feet	Surf. Elev. 47.4'	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
40	6	SM		Interlayered light-brown/light-gray fine SAND, trace silt, trace mica, (dense, damp to wet).	19	16	18-20-50/5"
				Same (dense, damp to wet).	20	18	22-20-50-49
45				Same (dense, wet).	21	20	10-8-9-15
	1				22	22	24-30-30-50/4"
					23	18	15-15-18-20
50				Light-brown fine SAND, trace silt, trace mica.	24	20	15-50/4"
	-4			Same, fine to medium sand (bottom 5").	25	24	17-50/5"
55				Interlayered light-gray/light-brown fine SAND, trace silt, trace mica.	26	12	18-50/5"
	-9	SP/SM		Light brown fine to medium SAND, trace silt, trace mica.	27	24	WR-WR-WR-WR
60				No recovery.			WR-WR-WR-WR
	-14			Light-brown fine SAND, trace silt, trace mica.	28	8	WR-WR-WR-WR/5"
65		SW		Varicolored fine to coarse SAND, trace gravel, trace silt.	29	19	10-22-18-18
	-19			Same, 2" thick lense of dark-brown/gray micaceous clay interlayered with fine sand.	30	11	14-28-20-50/2"
				Light-gray/brown fine to coarse SAND and gravel interlayered with dark-gray/brown clay and fine to coarse sand, trace gravel.	31	3	50/1.5"
70	-24				32	10	5-25-46-40
				Light-gray fine to coarse SAND, trace gravel, trace silt.	33	14	20-50/4.5"
75				Light-red/gray mottled fine SAND, some silt.	34	6	13-14
	-29						
80							

1. Wet on spoon at 46'.
2. Wash drilling started at 52'.
3. No bottom at 56', rods sunk, stopped wash.
4. No bottom at 60'.
5. Restart washing at 64'.
6. Borehole grouted with cement-bentonite grout after auger removal.

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Log of Boring TB-2

(Page 1 - 2)

Date Started : November 13, 1998
Date Completed : November 16, 1998
Weather : Overcast, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 35.7'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 642911
Easting : 1598066

Depth in Feet	Surf. Elev. 35.7	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
0							
	34	ML		Brown mottled SILT and fine sand, trace root and plant material.	1	10	4-8-12-10
				Dark gray clayey SILT, trace fine sand, trace mica and organics.	2	9	5-5-4-4
5					SH-1	24	
	29	MH			3	24	1/12"-1-1
				Same, trace plant material.	4	24	WH/12"-1-2
10					5A	24	1-8-4-6
	24			Brown silty CLAY and fine sand, trace plant material.	5B		
					SH-2	23	
15				Gray/brown mottled silty CLAY, trace fine sand.	6	24	5-6-9-10
	19				7	24	11-11-13-14
		CL			8	24	3-5-8-8
20							
	14				9	24	3-5-7-10
				Gray/brown mottled silty CLAY, some fine sand (wet).	10	24	6-9-9-11
25					11	22	5-4-6-7
	9				12A	24	8-15-29-29
				Light-gray/ light-brown mottled fine SAND, little silt, trace coarse sand.	12B		
					13	18	10-13-14-15
30							
	4			Light-gray/light-brown fine SAND, trace silt (begin wet).	14	20	6-12-19-23
		SP/SM		Light-gray fine SAND, with 1" thick brown fine sand lens with gravel sized iron oxide deposits.	15	20	8-15-45-30
35				Light-gray fine SAND, trace silt.	16	18	30-35-50/5"
	-1				17	14	8-19-35-50/5.5"
				Light-gray fine to medium SAND, trace silt.	18	11	22-42-50/3"
40							

1. Wet on spoon at 29.8'.
2. Wash drilling started at 36'.
3. Mud rotary drilling began at 46'.
4. Borehole grouted with cement-bentonite grout after auger removal.

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Log of Boring TB-2

(Page 2 - 2)

U.S. Army Corps Of Engineers
Pearce Creek Dredged Material
Containment Area
Cecilton, MD

Date Started : November 13, 1998
Date Completed : November 16, 1998
Weather : Overcast, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 35.7'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 642911
Easting : 1598066

Depth in Feet	Surf. Elev. 35.7	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
40							
	-6	SP/SM		Varicolored fine to coarse SAND, trace silt.	19	11	20-24-48-50
					20	15	37-37-36-46
45					21	16	14-46-35-28
	-11				22	10	9-16-34-40
				Light-orange/brown fine to coarse SAND, trace gravel, trace silt.	23	4	30-50/5"
50					24	10	16-35-50/4"
	-16			Same, increasing gravel content.	25	3	16-50/5"
55					26	11	15-37-33-29
	-21	CL		Light-gray CLAY, trace fine sand.	27	14	7-13-22-20
		SM		Light-gray fine SAND, some silt, interlayered with light gray clay, trace fine sand.	28A	19	16-22-30-38
60				Orange/brown fine to medium SAND, trace coarse sand,trace gravel, trace silt.	28B 29A	20	13-10-10-25
	-26			Light gray fine SAND, some silt, with lenses of light gray clay, trace fine sand.	29B		
					30	20	12-16-39-50/5"
65					31	18	23-34-32-34
	-31				32	12	10-19-20-17
		CL		Light-reddish/gray mottled CLAY and fine sand, with lenses of orange/brown fine sand.	33	19	8-13-20-21
70	-36	SM		Light-gray/brown fine to medium SAND, some silt, with lenses of light-gray clay, little fine sand.	34	9	9-11-14-17
		CL		Light-reddish gray CLAY and fine sand, with 2" thick lens of orange/brown fine to medium sand, trace silt	35	20	6-11-21-31
75					36	4	3-5
	-41						
80							

1. Wet on spoon at 29.8'.
2. Wash drilling started at 36'.
3. Mud rotary drilling began at 46'.
4. Borehole grouted with cement-bentonite grout after auger removal.

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U.S. Army Corps Of Engineers
Pearce Creek Dredged Material
Containment Area
Cecilton, MD

Log of Boring TB-3

(Page 1 - 2)

Date Started : November 20, 1998
Date Completed : November 23, 1998
Weather : Variable sun, breezy, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 50.2'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 644873
Easting : 1599097

Depth in Feet	Surf. Elev. 50.2	USCS	GRAPHIC	DESCRIPTION	Sample Number/ (psi)	Rec'y (in)	No. Blows per 6 inches
0				Graded Aggregate.		20	10-12-14-16
	49			Brown fine SAND, some to and silt.	1		
		SM			2	23	9-9-17-23
5				Brown fine to coarse SAND and gravel, little silt.	3	24	9-19-21-24
	44					16	8-8-4-5
				Dark-gray clayey SILT, some fine sand, trace mica and organics, with lenses of plant material.	4		
					5	16	1-1-2-2
10	39			Same, with trace fine sand.	6	18	1-2-1-1
					7	24	1-4-5-4
15					8	24	2-2-3-3
	34				SH-1	24	
					9	24	1-3-4-5
20	29	MH			10	24	1-3-3-4
					11	24	5-6-6-4
25					SH-2	24	
	24				12	24	1-2-2-3
					13	24	3-3-5-6
30	19				14	24	2-5-4-5
					15	24	5-6-5-4
35					16A	22	1-2-6-13
	14			Varicolored gray/brown fine SAND, trace medium sand, trace coarse sand, some silt, with 1" thick lens of organic clay.	16B		
		SM			17	24	9-9-14-17
40					18	22	5-5-9-12

1. Wet on rods at 49.3'.
2. Heave in augers at 52', began washing.
3. Borehole grouted with cement-bentonite grout after auger removal.

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Log of Boring TB-3

(Page 2 - 2)

Date Started : November 20, 1998
Date Completed : November 23, 1998
Weather : Variable sun. breezy, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 50.2'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 644873
Easting · 1599097

Depth in Feet	Surf. Elev. 50.2	USCS	GRAPHIC	DESCRIPTION	Sample Number/ (psi)	Rec'y (in)	No. Blows per 6 inches
40							
	9			Varicolored to gray fine SAND, trace to little silt, with lenses of dark-gray clay (thickness range: 1/2" to 4").	19	24	8-13-11-9
		SM			20	24	2-7-10-6
45					21	24	5-3-9-11
	4			Varicolored fine SAND, trace coarse sand, trace silt.	22		9-12-12-8
					23		3-4-13-13
50				Same.			
	-1				24		4-5-9-9
					25		11-13-13-14
55				Gray fine to coarse SAND, some silt, trace peat.	26		
	-6				27A	24	8-15-19-20
				Gray fine to coarse SAND, trace gravel.	27B		
		SW/SM			28	16	6-10-12-17
60							
	-11				29	18	6-14-12-11
					30	14	11-8-7-6
65					31	18	5-20-23-23
	-16				32	6	16-25-38-33
				Gray fine SAND, trace medium sand, trace coarse sand, trace silt.	33	6	14-10-11-12
70							
	-21				34	14	4-8-8-9
				Dark-gray fine SAND and silty clay (organic odor).	SH-3	24	
					36	14	1-3
75							
	-26						
80							

1. Wet on rods at 49.3'.
2. Heave in augers at 52', began washing.
3. Borehole grouted with cement-bentonite grout after auger removal.

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Log of Boring TB-4

(Page 1 - 2)

Date Started : November 18, 1998
Date Completed : November 19, 1998
Weather : Variable sun, breezy, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 48.0'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 643701
Easting · 1600953

Depth in Feet	Surf. Elev. 48.0	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
0	47	ML		Brown mottled SILT, little fine sand.	1	14	4-5-6-8
					2	17	6-8-8-9
5		MH		Dark-gray clayey SILT, some/and fine sand, trace plant material.	3	17	2-2-3-4
	42				4	24	4-4-4-5
					5	24	2-2-4-6
10	37				6	24	3-3-3-5
		CL		Brown/light-gray varegated mottled CLAY, trace fine sand.	7	22	4-6-8-6
15		ML		Dark-gray clayey SILT, trace fine sand and organics.	8	24	2-1-3-4
	32				SH-1	24	
					9	24	2-2-2-3
20	27				10	24	2-2-2-3
					11	24	3-3-2-2
25					SH-2	24	
	22	SM		Light-gray/brown fine to coarse SAND, trace gravel, trace silt.	12	24	9-20-20-19
					13	24	8-14-10-9
30	17				14	24	3-3-4-3
		MH		Light-gray/brown mottled clayey SILT and fine sand.	15	18	2-4-4-5
35	12				16	24	2-4-2-3
					17	24	3-2-3-3
40					18	24	WH-WH-2-4

1. Wet on spoon at 25.0'.
2. Heave in augers at 58', began washing.
3. Driller washed using 150 gal. of water, could not remove last 12" of heave. Light gray/brown F/C SAND present in wash water. Spoon driven in attempt to remove heaved material prior to drilling to next sampling increment.
4. Borehole grouted with cement-bentonite grout after auger removal.

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Log of Boring TB-4

(Page 2 - 2)

Date Started : November 18, 1998
Date Completed : November 19, 1998
Weather : Variable sun. breezy, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 48.0'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 643701
Easting : 1600953

Depth in Feet	Surf. Elev. 48.0	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
40		MH					
	7				19	24	1-3-3-3
				Gray/brown clayey SILT, trace to little fine sand	20	24	4-5-5-6
45	2			Brown/gray clayey SILT, trace to little fine sand, trace mica.	21	24	2-4-5-6
					22	24	7-8-6-8
					23	24	2-4-4-5
50	-3				SH-3	24	
					24	24	4-5-7-9
55	-8				25	24	3-4-6-7
						24	6-5-24-17
		SM		Gray fine to coarse SAND, little gravel, little silt.	26		
				No Recovery (58.0'-60.0').		0	8-5-12-16
60	-13			Light-gray fine to medium SAND, little silt.	27	4	8-15-11-16
				No Recovery (62.0'-64.0'), see note #3.			
				Light-gray fine SAND, little medium sand, little coarse sand, trace silt.		0	
65	-18			Same, with lenses of gray clay.	28	9	7-16-14-11
					29	24	16-22-35-50/5"
70	-23			Light gray/light brown FINE SAND, trace silt.	30	20	9-38-35-29
					32	20	22-14-14-10
		CL		Gray CLAY, trace fine sand, with 1" lenses of light gray fine sand.	33		6-9-17-26
75	-28						
80							

1. Wet on spoon at 25.0'.
2. Heave in augers at 58', began washing.
3. Driller washed using 150 gal. of water, could not remove last 12" of heave. Light gray/brown F/C SAND present in wash water. Spoon driven in attempt to remove heaved material prior to drilling to next sampling increment.
4. Borehole grouted with cement-bentonite grout after auger removal.

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Log of Boring TB-5

(Page 1 - 2)

Date Started : November 17, 1998
Date Completed : November 18, 1998
Weather : Variable sun. breezy, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 28.9'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 642338
Easting : 1601791

Depth in Feet	Surf. Elev. 28.9	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
0							
		CH		Dark-gray mottled CLAY, trace fine sand, trace plant material.	1	12	1-1-1-2
	27						
					2	12	2-2-2-3
5		MH		Dark-gray clayey SILT, trace fine sand, trace organics, with lenses of plant material.	SH-1	14	
	22				3	24	WH-WH-2-1
					4	8	WH-1-1-1
10							
					SH-2	24	
	17						
					5	9	WR-1-1-1
15					6	24	WH-WH-1-1
	12				7	24	1-1-2-2
					8	24	1-1-1-2
20							
					9	24	WH-WH-2-1
	7						
					10		2-2-1-2
25				Brown clayey SILT, little fine sand.	11	24	WR-WR-WH-WH
	2	ML		Light-gray mottled SILT, some fine sand, trace gravel, trace mica.	12	24	3-5-7-10
		SP/SM		Light-brown fine to coarse SAND and gravel, trace silt (saturated).	13	24	6-10-10-7
30							
					14	12	6-11-10-12
	-3						
					15	13	15-14-14-15
35					16	14	16-15-20-10
	-8				17	7	14-14-10-6
				No Recovery (38.0' to 40.0'), see note #3.		0	3-4-5-6
40							

1. Unable to determine starting depth of wet on spoon.
2. "Washed" to keep hole open beginning at 30.0'.
3. Woody plant material fragments observed coming up in wash water, 38.0' to 40.0'.
4. Reddish/gray CLAY observed on outside of spoon. Possibly losing sample due to difficulties removing spoon from sample area.
5. Borehole grouted with cement-bentonite grout after auger removal.

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Log of Boring TB-5

(Page 2 - 2)

Date Started : November 17, 1998
Date Completed : November 18, 1998
Weather : Variable sun. breezy, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 28.9'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 642338
Easting : 1601791

Depth in Feet	Surf. Elev. 28.9	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
40							
		PT		Dark-gray/brown organic SILT and PEAT, little fine sand.	18	24	5-5-6-6
	-13						
				Gray fine SAND and clayey SILT, trace medium sand, trace coarse sand, trace gravel with small lenses of woody material.	19	12	10-14-13-10
45					20	15	10-20-15-13
	-18	SM			21	15	4-9-9-19
					22	15	14-14-19-15
50				Varicolored fine SAND, some silt, with 1" lenses of light-gray fine sand.			
					23	14	5-10-11-10
	-23			Light-reddish/gray/brown fine SAND, and mottled SILT.	24	4	42-50/4"
55				Varicolored fine SAND, trace to little silt.	25	17	40-42-32-28
	-28				26	12	17-42-50/4.5"
					27	20	24-20-27-35
60		SP/SM		No Recovery (60.0' to 60.6').		0	48-50/1"
	-33						
					28	7	30-50/5"
65					29	4	40-50/2"
	-38				30	20	25-35-40-34
				Gray CLAY, little fine sand.		0	11-14-26-33
70				No Recovery (68.0' to 70.0'), see note #4.			
	-43	CL		Red/light-gray/brown variegated CLAY, some to and fine sand.	31	1	6-8-11-16
					32	15	6-8-14-17
75				Red/light-gray/brown variegated CLAY, trace to little fine sand.	SH-3	18	
	-48						
80							

1. Unable to determine starting depth of wet on spoon.
2. "Washed" to keep hole open beginning at 30.0'.
3. Woody plant material fragments observed coming up in wash water, 38.0' to 40.0'.
4. Reddish/gray CLAY observed on outside of spoon. Possibly losing sample due to difficulties removing spoon from sample area.
5. Borehole grouted with cement-bentonite grout after auger removal.

BORING LOG CSB-29

Date Begin - End: 12/12/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Mostly Cloudy
Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,718.082 Easting: 1,598,869.247 Surveyed Surface Elevation (ft.): 33.47 Surface Condition: Cleared Area	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Lean CLAY with Sand (CL): subrounded sand, low to medium plasticity fines, brownish gray, dark gray, and black, moist, very soft, 20% organic matter, including decomposed reeds and roots.			PP=0.25	84 in.								DREDGE MATERIALS
∇															
30															
	5														
						PP=0.25	120 in.								
25			10% organic matter												
	10														
20															
						PP=0.5									
	15														
						PP=0.25	72 in.								No vibration required 17 to 27 feet.
15															

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PROJECT NO.: 130226
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CHECKED BY: DG
DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-29

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/12/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Mostly Cloudy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-29

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,718.082 Easting: 1,598,869.247 Surveyed Surface Elevation (ft.): 33.47 Surface Condition: Cleared Area	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Lean CLAY (CL): grey, light gray, and brown, wet, very soft												
10															
	25														
						PP=0.25	120 in.								No vibration required 27 to 37 feet.
5															
	30														
0															
						PP=0.5									
	35		**Fibrous PEAT (PT)**: brown and black, organic, wet	S-1											TIDAL MARSH DEPOSITS
							120 in.								
-5															
			Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, light brown and gray, wet, hard												UPPER SAND

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BORING LOG CSB-29

Pearce Creek CDF
Earleville, MD

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Date Begin - End:	12/12/2012	**Drill Company:**	Boart Longyear		**BORING LOG CSB-29**
Logged By:	D. Grahl	**Drill Crew:**	R. Parr		
Hor.-Vert. Datum:	MD State Plane - NAVD88	**Drill Equipment:**	LS 600		
Angle from Vert.:	0 degrees	**Exploration Method:**	Sonic Continuous		
Weather:	40's, Mostly Cloudy	**Exploration Diameter:**	6 in O.D./ 4 in. I.D.		

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,718.082 Easting: 1,598,869.247 Surveyed Surface Elevation (ft.): 33.47 Surface Condition: Cleared Area	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-10			**Silty SAND with Gravel (SM)**: rounded sand, low plasticity fines, gray and brownish gray, wet	S-2											
			Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, yellowish brown and gray, wet	S-3											
	45		**Clayey SAND with Gravel (SC)**: rounded sand, medium plasticity fines, yellowish brown and gray, wet, loose												
			Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, light gray and yellowish brown, wet	S-4											
			Clayey SAND with Gravel (SC): rounded sand, medium plasticity fines, yellowish brown and gray	S-5			120 in.								
-15			**Lean CLAY with Sand (CL)**: rounded sand, medium plasticity fines, light gray and yellowish brown												
	50		**Clayey SAND with Gravel (SC)**: rounded sand, medium plasticity fines, yellowish brown and light gray, wet												
			Poorly-Graded SAND with Gravel (SP): rounded gravel, rounded sand, non-plastic fines, brown, brownish yellow, and yellowish brown												
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, pale brown, wet												
-20			**Poorly-Graded SAND with Gravel (SP)**: rounded gravel, rounded sand, non-plastic fines, pale brown, wet												
	55		**Sandy SILT (ML)**: rounded sand, low plasticity fines, light gray and yellowish brown, wet	S-6											
-25			**Poorly-Graded SAND with Gravel (SP)**: rounded gravel, rounded sand, non-plastic fines, yellowish brown and light brown, wet	S-7			120 in.								Clay stringers at approximately 59 and 60.3 feet.

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BORING LOG CSB-29

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/12/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Mostly Cloudy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-29

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,718.082 Easting: 1,598,869.247 Surveyed Surface Elevation (ft.): 33.47 Surface Condition: Cleared Area	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Silty SAND (SM): rounded sand, non-plastic fines, light gray, yellowish brown and light brown, wet												
-30															
				S-8				SM	23.0		100	13			
	65		**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, pale brown and light gray, wet												
				S-9											
							120 in.								
-35															
	70														
-40															
	75														
							120 in.								
-45															

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REVISED:	12/29/2013

BORING LOG CSB-29

Pearce Creek CDF
Earleville, MD

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Date Begin - End: 12/12/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Mostly Cloudy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-29

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,718.082 Easting: 1,598,869.247 Surveyed Surface Elevation (ft.): 33.47 Surface Condition: Cleared Area	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, yellowish brown and light gray, wet												
-50			**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, yellowish brown, wet												
	85		**Sandy Lean CLAY (CL)**: rounded sand, medium plasticity fines, light brown and light gray, wet												
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellowish brown, wet	S-10											
			Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, yellowish brown and gray, wet				120 in.								
-55			**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, yellowish brown, wet												
	90		**Lean CLAY (CL)**: rounded sand, medium to high plasticity fines, light gray and yellowish brown, wet												
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light gray and yellowish brown, wet												UPPER CONFINING LAYER
-60			**Lean CLAY (CL)**: rounded sand, medium plasticity fines, reddish gray, light gray and pink, wet			PP=2.0									
	95			S-11		PP=3.0		CL	20.1				38	18	
						PP=3.5									
-65			**Silty SAND (SM)**: rounded sand, non-plastic to low plasticity fines, light gray, yellowish brown, brown and red, wet				120 in.								LOWER SAND

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BORING LOG CSB-29

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/12/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Mostly Cloudy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-29

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,718.082 Easting: 1,598,869.247 Surveyed Surface Elevation (ft.): 33.47 Surface Condition: Cleared Area	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Silty SAND (SM): rounded sand, non-plastic to low plasticity fines, light gray, yellowish brown, brown and red, wet												
-70			**Clayey SAND (SC)**: rounded sand, medium plasticity fines, red, light gray and yellowish brown, moist	S-12											
	105		**Lean CLAY with Sand (CL)**: rounded sand, medium plasticity fines, red and gray, moist	S-13		PP=3.0									
			Lean CLAY (CL): rounded sand, medium plasticity fines, gray and dark gray, moist	S-14											
			Clayey SAND (SC): rounded sand, medium plasticity fines, dark gray and light gray, moist	S-15											
-75			**Sandy Lean CLAY (CL)**: rounded sand, low plasticity fines, dark gray, wet				120 in.								
			Silty SAND (SM): rounded sand, low plasticity fines, dark gray, wet												
	110		**Sandy Lean CLAY (CL)**: rounded sand, medium plasticity fines, dark gray, moist												
			Clayey SAND (SC): rounded sand, medium plasticity fines, dark gray												
-80	115		**Sandy Lean CLAY (CL)**: rounded sand, medium plasticity fines, dark gray	S-16											
			Silty SAND (SM): rounded sand, low plasticity fines, gray and dark gray, wet												
			Sandy Lean CLAY (CL): rounded sand, low plasticity fines, dark gray, wet				120 in.								
			Lean CLAY (CL): rounded sand, medium plasticity fines, red and gray, moist												
-85			**Silty SAND (SM)**: rounded sand, low plasticity fines, yellowish red, light gray and brownish yellow, wet												

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BORING LOG CSB-29

Pearce Creek CDF
Earleville, MD

Date Begin - End:	12/12/2012	**Drill Company:**	Boart Longyear		**BORING LOG CSB-29**
Logged By:	D. Grahl	**Drill Crew:**	R. Parr		
Hor.-Vert. Datum:	MD State Plane - NAVD88	**Drill Equipment:**	LS 600		
Angle from Vert.:	0 degrees	**Exploration Method:**	Sonic Continuous		
Weather:	40's, Mostly Cloudy	**Exploration Diameter:**	6 in O.D./ 4 in. I.D.		

Northing: 642,718.082
Easting: 1,598,869.247
Surveyed Surface Elevation (ft.): 33.47

Surface Condition: Cleared Area

Surveyed Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	LABORATORY RESULTS USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Lean CLAY (CL): rounded sand, medium plasticity fines, white and yellowish red, wet												
			Silty SAND (SM): rounded sand, low plasticity fines, light gray and yellowish brown, wet												
-90	125		**Lean CLAY with Sand (CL)**: rounded sand, medium plasticity fines, light brown, white and light gray, wet												
			Silty SAND (SM): rounded sand, low plasticity fines, light gray, wet												
			Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, wet												
			Silty SAND (SM): rounded sand, low plasticity fines, light gray				91 in.								
-95	130		**Sandy Lean CLAY (CL)**: rounded sand, medium plasticity fines, light gray and white, wet												Sand occurs as approximately 1/4 inch seams.
			Lean CLAY (CL): rounded sand, high plasticity fines, red, wet												
-100			**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, yellowish red and light brown, wet												
	135		**Clayey SAND (SC)**: rounded sand, medium plasticity fines, light gray, wet												
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brown, wet												
-105							120 in.								

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CHECKED BY:	DG
DATE:	12/28/2013
REVISED:	12/29/2013

BORING LOG CSB-29

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/12/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Mostly Cloudy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-29

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,718.082 Easting: 1,598,869.247 Surveyed Surface Elevation (ft.): 33.47 Surface Condition: Cleared Area	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Clayey SAND (SC): rounded sand, medium plasticity fines, red, wet												
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brown and yellowish brown, wet												
-110			**Silty SAND (SM)**: rounded sand, non-plastic to low plasticity fines, yellowish brown, yellowish red, red, and reddish gray, wet												
	145		**Lean CLAY (CL)**: medium to high plasticity fines, red and gray, wet	S-17			120 in.								LOWER CONFINING LAYER
-115	150														
			Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, light gray, wet												
-120			**Clayey SAND (SC)**: rounded sand, medium plasticity fines, gray, red and yellowish brown, wet												
	155		**Lean CLAY (CL)**: medium plasticity fines, gray, wet												
-125															

The exploration was terminated at approximately 157 ft. below ground surface. The exploration was backfilled with grout on December 12, 2012.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 1 ft. below ground surface during drilling.
GENERAL NOTES:
The exploration location and elevation were surveyed by Polaris.

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PROJECT NO.: 130226
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DATE: 12/28/2013
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BORING LOG CSB-29

Pearce Creek CDF
Earleville, MD

BORING LOG CSB-30

Date Begin - End: 12/13/2012 - 12/14/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 50's, Clear

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

FIELD EXPLORATION | LABORATORY RESULTS

Northing: 642,218.093
Easting: 1,598,872.603
Surveyed Surface Elevation (ft.): 32.76

Surface Condition: Phragmites

Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			SILT (ML): low plasticity fines, brown, wet			PP=0	84 in.								DREDGE MATERIAL
30 ▽			**Lean CLAY with Sand (CL)**: subrounded sand, medium plasticity fines, brown and gray, moist, fine grained sand			PP=1.0 PP=1.5									
25	5		**Lean CLAY (CL)**: subrounded sand, medium to high plasticity fines, dark gray and black, wet, fine grained sand			PP=0.25 PP=0.5 PP=0.5	120 in.								20% organic matter.
20	10		**Elastic SILT (MH)**: subrounded sand, low to medium plasticity fines, dark gray, wet, fine grained sand			PP=0.25 PP=0.25									
15	15		**Lean CLAY (CL)**: subrounded sand, medium plasticity fines, dark gray, gray, brown and black, wet, fine grained sand			PP=0.5	103 in.								20% organic matter.
			Elastic SILT (MH): subrounded sand, low to medium plasticity fines, gray, wet, very soft, fine grained sand												

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CHECKED BY:	DG
DATE:	12/28/2013
REVISED:	12/29/2013

BORING LOG CSB-30

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/13/2012 - 12/14/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 50's, Clear

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-30

FIELD EXPLORATION

Northing: 642,218.093
Easting: 1,598,872.603
Surveyed Surface Elevation (ft.): 32.76

Surface Condition: Phragmites

LABORATORY RESULTS

Surveyed Elevation (feet)	Depth (feet)	Description	Sample Number	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
10		**Elastic SILT (MH)**: subrounded sand, low to medium plasticity fines, gray, wet, very soft, fine grained sand											
	25	**Lean CLAY (CL)**: subrounded sand, medium plasticity fines, dark gray, black and gray, wet, soft, fine grained sand											20% organic matter.
5				PP=0.75 PP=1.0	109 in.								
	30	**Elastic SILT (MH)**: subrounded sand, medium plasticity fines, gray and black, wet, very soft, fine grained sand		PP=0.25									10% organic matter from 29.5 to 31 feet.
0				PP=0.5									
	35			PP=0.25 PP=0.5									
-5		**Fibrous PEAT (PT)**: high plasticity fines, dark brown and brown, wet	S-1		87 in.								TIDAL MARSH DEPOSITS
		Organic CLAY (OH): subrounded sand, high plasticity fines, yellow brown and dark brown, wet, fine grained sand											

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BORING LOG CSB-30

Pearce Creek CDF
Earleville, MD

Date Begin - End:	12/13/2012 - 12/14/2012	**Drill Company:**	Boart Longyear		**BORING LOG CSB-30**
Logged By:	D. Grahl	**Drill Crew:**	R. Parr		
Hor.-Vert. Datum:	MD State Plane - NAVD88	**Drill Equipment:**	LS 600		
Angle from Vert.:	0 degrees	**Exploration Method:**	Sonic Continuous		
Weather:	50's, Clear	**Exploration Diameter:**	6 in O.D./ 4 in. I.D.		

		FIELD EXPLORATION						LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,218.093 Easting: 1,598,872.603 Surveyed Surface Elevation (ft.): 32.76 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Organic CLAY (OH): subrounded sand, high plasticity fines, yellow brown and dark brown, wet, fine grained sand												
				S-2											
-10															
	45		**Sandy SILT with Gravel (ML)**: subrounded to rounded gravel, subrounded to rounded sand, non-plastic fines, light gray and yellowish brown, wet, medium to fine grained sand, medium to fine to grained gravel	S-3											UPPER SAND
							120 in.								
			Silty SAND (SM): rounded sand, non-plastic fines, olive yellow and yellowish brown, wet, medium to fine grained sand												
-15															
			Poorly-Graded SAND with Silt and Gravel (SP-SM): rounded gravel, rounded sand, non-plastic fines, yellowish brown, wet, coarse to fine grained sand, medium to fine grained gravel												
	50														
				S-4											Occasional discontinuous clay lenses 1/2 inch thick.
-20															
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellowish brown and gray, wet, coarse to medium grained sand												
	55		**Silty SAND (SM)**: rounded sand, non-plastic fines, light gray, wet, medium to fine grained sand												
				S-5											
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellow and pale brown, wet, coarse to medium grained sand, fine grained gravel												
							120 in.								
-25			**Poorly-Graded SAND with Gravel (SP)**: rounded gravel, rounded sand, non-plastic fines, yellowish brown, wet, coarse to medium grained sand												
				S-6											

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PROJECT NO.:	130226	BORING LOG CSB-30	
DRAWN BY:	KLW		
CHECKED BY:	DG	Pearce Creek CDF Earleville, MD	
DATE:	12/28/2013		
REVISED:	12/29/2013		

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Date Begin - End:	12/13/2012 - 12/14/2012	**Drill Company:**	Boart Longyear		**BORING LOG CSB-30**
Logged By:	D. Grahl	**Drill Crew:**	R. Parr		
Hor.-Vert. Datum:	MD State Plane - NAVD88	**Drill Equipment:**	LS 600		
Angle from Vert.:	0 degrees	**Exploration Method:**	Sonic Continuous		
Weather:	50's, Clear	**Exploration Diameter:**	6 in O.D./ 4 in. I.D.		

		FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Northing: 642,218.093 Easting: 1,598,872.603 Surveyed Surface Elevation (ft.): 32.76 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		Clayey SAND (SC): rounded sand, medium plasticity fines, white and yellow, wet, medium to fine grained sand	S-7											
-30		**Lean CLAY (CL)**: rounded sand, medium plasticity fines, white and yellow, fine grained sand	S-8				CL	21.1				33	15	
	65	**Poorly-Graded SAND with Silt (SP-SM)**: rounded sand, non-plastic fines, light brownish gray, yellow and white, wet, coarse to fine grained sand	S-9											
-35		Grades to light gray, yellow, white, yellowish brown and yellowish red				120 in.								
	70													
-40														
	75		S-10											
		Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, light gray and yellow, wet, firm, medium to fine grained sand	S-11											
-45		**Lean CLAY (CL)**: rounded sand, medium plasticity fines, light gray and yellow, wet, firm, fine grained sand			PP=2.0	118 in.								
		Silty SAND (SM): rounded sand, non-plastic fines, light gray and yellow, wet, medium to fine grained sand												

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PROJECT NO.:	130226
DRAWN BY:	KLW
CHECKED BY:	DG
DATE:	12/28/2013
REVISED:	12/29/2013

BORING LOG CSB-30

Pearce Creek CDF
Earleville, MD

Date Begin - End:	12/13/2012 - 12/14/2012	**Drill Company:**	Boart Longyear
Logged By:	D. Grahl	**Drill Crew:**	R. Parr
Hor.-Vert. Datum:	MD State Plane - NAVD88	**Drill Equipment:**	LS 600
Angle from Vert.:	0 degrees	**Exploration Method:**	Sonic Continuous
Weather:	50's, Clear	**Exploration Diameter:**	6 in O.D./ 4 in. I.D.

BORING LOG CSB-30

FIELD EXPLORATION / LABORATORY RESULTS

Northing: 642,218.093
Easting: 1,598,872.603
Surveyed Surface Elevation (ft.): 32.76

Surface Condition: Phragmites

Surveyed Elevation (feet)	Depth (feet)	Description	Sample Number	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		Silty SAND (SM): rounded sand, non-plastic fines, light gray and yellow, wet, medium to fine grained sand	S-12										
-50													
		Clayey SAND (SC): rounded sand, low plasticity fines, light gray, wet, medium to fine grained sand		PP=4.5									
	85		S-13	PP=4.5									
		Poorly-Graded SAND (SP): rounded sand, non-plastic fines, white, wet, medium grained sand			120 in.								
-55													
		Sandy Lean CLAY (CL): light gray, wet, firm, fine grained sand	S-14	PP=2.0									
		Poorly-Graded SAND with Silt (SP-SM): light gray, wet, coarse to fine grained sand											
	90												
			S-15										
-60													
		Lean CLAY with Sand (CL): light gray, wet, hard, fine grained sand	S-16										
		Silty SAND (SM): light gray, wet, medium to fine grained sand	S-17										
		Lean CLAY with Sand (CL): light gray, wet, hard, fine grained sand	S-18										
	95												LOWER SAND
		Silty SAND (SM): light gray, wet, medium grained sand	S-19										
		Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, light gray, wet, medium to fine grained sand			120 in.								
-65													

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BORING LOG CSB-30

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/13/2012 - 12/14/2012
Drill Company: Boart Longyear
Logged By: D. Grahl
Drill Crew: R. Parr
Hor.-Vert. Datum: MD State Plane - NAVD88
Drill Equipment: LS 600
Angle from Vert.: 0 degrees
Exploration Method: Sonic Continuous
Weather: 50's, Clear
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-30

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,218.093 Easting: 1,598,872.603 Surveyed Surface Elevation (ft.): 32.76 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-70	105		**Poorly-Graded SAND with Silt (SP-SM)**: rounded sand, non-plastic fines, light gray, wet, medium to fine grained sand	S-20											
-75	110		**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, light gray, coarse to fine grained sand				101 in.								
-80			grades to light brownish gray, medium to fine grained sand												
	115		grades to yellowish brown	S-21											117.5 to 119 Frequent Poorly-Graded SAND (SP) partings about 1/4 inch thick.
			Silty SAND (SM): rounded sand, non-plastic fines, gray, wet, medium to fine grained sand				120 in.								
-85			**Lean CLAY partings (CL)**: rounded sand, medium plasticity fines, dark gray and light gray, wet, hard, fine grained sand												119 to 120.5 feet Occasional Lean CLAY partings about 1/4 inch thick.
			Silty SAND (SM): rounded sand, non-plastic fines, light gray and dark gray, wet, medium to fine grained sand	S-22											

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BORING LOG CSB-30

Pearce Creek CDF
Earleville, MD

BORING LOG CSB-30

Date Begin - End: 12/13/2012 - 12/14/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 50's, Clear

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

			FIELD EXPLORATION					LABORATORY RESULTS								
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,218.093 Easting: 1,598,872.603 Surveyed Surface Elevation (ft.): 32.76 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray, wet, firm, fine grained sand												
			Silty SAND (SM): rounded sand, non-plastic fines, light gray and dark gray, wet, medium to fine grained sand												121.8 to 124.3 feet Occasional Silty SAND (SM) partings about 1/4 inch thick.
-90			**Lean CLAY (CL)**: rounded sand, medium plasticity fines, light gray and dark gray, wet, hard, fine grained sand	S-23											
	125		**Silty SAND (SM)**: rounded sand, non-plastic fines, light gray, wet, fine grained sand												
-95			**Lean CLAY (CL)**: rounded sand, medium plasticity fines, dark gray and light gray, wet, fine grained sand				120 in.								125.3 to 128.5 feet Occasional Silty SAND (SM) partings about 1/4 inch thick.
	130		**Silty SAND (SM)**: rounded sand, non-plastic fines, light gray, wet, fine grained sand												
			Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray, wet, fine grained sand												
			Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, fine grained sand												
-100			**Lean CLAY (CL)**: rounded sand, medium plasticity fines, dark gray, wet, fine grained sand												
			Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, fine grained sand												
	135		**Lean CLAY (CL)**: rounded sand, medium plasticity fines, dark gray, wet, fine grained sand												134 to 136.5 feet Frequent Poorly-Graded SAND (SP) seams 1/4 inch to 1 inch thick.
			Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, fine grained sand												
			Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray, wet, fine grained sand												
-105			**Silty SAND (SM)**: rounded sand, non-plastic fines, light gray, wet, fine grained sand				120 in.								
			Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray and light gray, wet, fine grained sand												

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PROJECT NO.: 130226
DRAWN BY: KLW
CHECKED BY: DG
DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-30

Pearce Creek CDF
Earleville, MD

gINT FILE: E:\company\projects\130226 Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj R:KLF_STANDARD_GINT_LIBRARY_SR.1.1.GLB [KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 12/13/2012 - 12/14/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 50's, Clear

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-30

Northing: 642,218.093
Easting: 1,598,872.603
Surveyed Surface Elevation (ft.): 32.76

Surface Condition: Phragmites

Surveyed Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	LABORATORY RESULTS USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellowish red, reddish yellow and yellowish brown, wet, coarse to medium grained sand	S-24											
			Clayey SAND (SC): rounded sand, medium plasticity fines, light gray, wet, medium to fine grained sand												
-110			**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, light brown, yellowish brown and yellowish red, wet, coarse to medium grained sand												Occasional discontinuous clay lenses.
	145		**Sandy Lean CLAY (CL)**: rounded sand, medium plasticity fines, light gray and yellowish brown, wet, fine grained sand	S-25											LOWER CONFINING LAYER
			Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, pink and yellow, wet, fine grained sand				120 in.								
-115															
	150			S-26											
-120			**Sandy Lean CLAY (CL)**: rounded sand, medium plasticity fines, light gray and red, wet, fine grained sand												
				S-27				CL	11.7				29	19	
	155														
-125															

The exploration was terminated at approximately 157 ft. below ground surface. The exploration was backfilled with grout on December 14, 2012.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 3.5 ft. below ground surface during drilling.
GENERAL NOTES:
The exploration location and elevation were surveyed by Polaris.

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PROJECT NO.: 130226
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DATE: 12/28/2013
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BORING LOG CSB-30

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/11/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Foggy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-31

Northing: 643,001.615
Easting: 1,598,356.063
Surveyed Surface Elevation (ft.): 35.14

Surface Condition: Scrub/Phragmites

Surveyed Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
				Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
35			**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, brown, moist				84 in.								DREDGE MATERIAL
			Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray and brown, mottled, moist to wet, firm to soft			PP=0.75									
▽						PP=0.5									
				S-1											
30	5														
			Sandy SILT (ML): rounded sand, non-plastic to low plasticity fines, dark gray, moist, very soft			PP=0.25									
				S-2											
			Lean CLAY (CL): rounded sand, low to medium plasticity fines, dark gray and brown, wet, soft to very soft, occasional wood fragments				120 in.								
25	10														
20	15		**Lean CLAY (CL)**: rounded sand, medium plasticity fines, light brown, moist, firm			PP=0.75									QUATERNARY LOWLAND DEPOSITS
				S-3											
						PP=1.5									
			Lean CLAY with Sand (CL): rounded sand, low plasticity fines, light brown, moist, firm				120 in.								

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BORING LOG CSB-31

Pearce Creek CDF
Earleville, MD

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Date Begin - End: 12/11/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Foggy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-31

Northing: 643,001.615
Easting: 1,598,356.063
Surveyed Surface Elevation (ft.): 35.14

Surface Condition: Scrub/Phragmites

FIELD EXPLORATION							LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
15		**Sandy Lean CLAY (CL)**: rounded sand, low to medium plasticity fines, light brown, firm			PP=1.0									
		Silty SAND (SM): rounded sand, non-plastic fines, yellowish brown and light gray, moist												
10	25	**Lean CLAY (CL)**: rounded sand, medium plasticity fines												
		Silty SAND (SM): rounded sand, non-plastic fines, yellowish brown and light gray, moist												
		Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, yellowish brown and light gray, wet, soft			PP=0.75	120 in.								
5	30													
		Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, light brown, light brownish gray and yellow, wet												UPPER SAND
0	35		S-4				SP-SM	18.1		100	11			
		Grades to light brown, yellow, white and light gray				120 in.								

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BORING LOG CSB-31

Pearce Creek CDF
Earleville, MD

BORING LOG CSB-31

Date Begin - End: 12/11/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Foggy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

Northing: 643,001.615
Easting: 1,598,356.063
Surveyed Surface Elevation (ft.): 35.14

Surface Condition: Scrub/Phragmites

Surveyed Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS								
				Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-5			**Poorly-Graded SAND with Silt (SP-SM)**: rounded sand, non-plastic fines, light brown, yellow, white and light gray, wet												
-10	45														
			Clayey SAND (SC): subrounded to rounded sand, low to medium plasticity fines, yellowish brown and light gray, wet	S-5											
			Poorly-Graded SAND with Gravel (SP): rounded sand, non-plastic fines, white, wet	S-6			120 in.								
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, brown, yellowish brown, brownish yellow and light gray, wet	S-7											
-15	50														
			Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, light brown, white and brownish yellow, wet												
-20	55			S-8											
			Poorly-Graded SAND with Silt and Gravel (SP-SM): rounded gravel, rounded sand, non-plastic fines, white, wet				120 in.								
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, white, light gray, yellowish brown and brownish yellow, wet												

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BORING LOG CSB-31

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/11/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Foggy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-31

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 643,001.615 Easting: 1,598,356.063 Surveyed Surface Elevation (ft.): 35.14 Surface Condition: Scrub/Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-25			**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, white, light gray, yellowish brown and brownish yellow, wet												
-30	65														
			grades to light brown, yellowish brown, brownish yellow and gray				120 in.								
-35	70														
			Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, light brown, yellowish brown and light brownish gray, wet												
				S-9											
-40	75														
			Lean CLAY (CL): subrounded sand, medium plasticity fines, light greenish gray												
			Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, light brown, yellowish brown and light brownish gray, wet				120 in.								
			Silty SAND (SM): rounded sand, non-plastic fines, light brown, white and brownish yellow, wet												
				S-10											

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BORING LOG CSB-31

Pearce Creek CDF
Earleville, MD

Date Begin - End:	12/11/2012	**Drill Company:**	Boart Longyear	**BORING LOG CSB-31**
Logged By:	D. Grahl	**Drill Crew:**	R. Parr	
Hor.-Vert. Datum:	MD State Plane - NAVD88	**Drill Equipment:**	LS 600	
Angle from Vert.:	0 degrees	**Exploration Method:**	Sonic Continuous	
Weather:	40's, Foggy	**Exploration Diameter:**	6 in O.D./ 4 in. I.D.	

Surveyed Elevation (feet)	Depth (feet)	FIELD EXPLORATION Northing: 643,001.615 Easting: 1,598,356.063 Surveyed Surface Elevation (ft.): 35.14 Surface Condition: Scrub/Phragmites	Sample Number	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	LABORATORY RESULTS USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-45		**Silty SAND (SM)**: rounded sand, non-plastic fines, light brown, white and brownish yellow, wet											
		Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, light brown, white and brownish yellow, wet											
		Silty SAND (SM): rounded sand, non-plastic fines, light brown, white and brownish yellow, wet											
-50	85	**Sandy Lean CLAY (CL)**: rounded sand, medium plasticity fines, light brown, white and brownish yellow, wet	S-11										LOWER SAND
		Silty SAND (SM): rounded sand, non-plastic fines, light brown, white and brownish yellow, wet			120 in.								
		Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, light brown, white and brownish yellow, wet											
		Silty SAND (SM): rounded sand, non-plastic fines, light brown, yellowish brown and white, wet											
-55	90												
			S-12			SM	22.2		100	17			
-60	95												
		Grades to light brown, yellowish brown and gray			120 in.								

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BORING LOG CSB-31

Pearce Creek CDF
Earleville, MD

BORING LOG CSB-31

Date Begin - End: 12/11/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Foggy
Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

Northing: 643,001.615
Easting: 1,598,356.063
Surveyed Surface Elevation (ft.): 35.14

Surface Condition: Scrub/Phragmites

		FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)		Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-65		**Silty SAND (SM)**: rounded sand, non-plastic fines, light brown, yellowish brown and gray, wet	S-13											Cemented layers from 103 to 104 feet.
-70	105													
		Lean CLAY with Sand (CL): light gray and red, moist, firm to hard	S-14		PP=2.5-3.0		CL	17.6				26	10	
					PP=2.5	120 in.								
-75	110													
		Interbedded Silty SAND (SM) and Sandy Lean CLAY (CL): rounded sand, low to medium plasticity fines, light gray and red, wet			PP=4.5+									
					PP=4.5+									
-80	115	**Silty SAND (SM)**: rounded sand, non-plastic to low plasticity fines, light gray and light brown, wet												
		Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, light gray and yellowish brown, wet				120 in.								

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BORING LOG CSB-31

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/11/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Foggy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-31

Northing: 643,001.615
Easting: 1,598,356.063
Surveyed Surface Elevation (ft.): 35.14

Surface Condition: Scrub/Phragmites

Surveyed Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
				Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-85			**Poorly-Graded SAND with Silt (SP-SM)**: rounded sand, non-plastic fines, light gray and yellowish brown, wet												
				S-15											
-90	125														
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brown, brown, yellowish brown, light gray and red, wet				120 in.								
			Lean CLAY (CL): subrounded sand, medium plasticity fines, light brown, brown, yellowish brown, light gray and red, wet												
-95	130					PP=3.5									
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brown, brown, yellowish brown, light gray and red, wet												
			Clayey SAND (SC): yellowish red, light gray and brownish yellow, wet												
				S-15A											
-100	135														
			Lean CLAY with Sand (CL): subrounded sand, medium plasticity fines, red, gray and brown, moist, hard				120 in.								LOWER CONFINING UNIT
				S-16		PP=4.5+									

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PROJECT NO.: 130226
DRAWN BY: KLW
CHECKED BY: DG
DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-31

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/11/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Foggy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-31

		FIELD EXPLORATION					LABORATORY RESULTS								
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 643,001.615 Easting: 1,598,356.063 Surveyed Surface Elevation (ft.): 35.14 Surface Condition: Scrub/Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-105			**Lean CLAY with Sand (CL)**: subrounded sand, medium plasticity fines, red, gray and brown, moist, hard												
			Silty SAND (SM): subrounded sand, red, gray and brown, moist												
			Lean CLAY with Sand (CL): subrounded sand, medium plasticity fines, red, gray and brown, moist, hard												
-110	145		**Silty SAND (SM)**: subrounded to rounded sand, non-plastic fines, gray, wet	S-17											
							120 in.								
			Lean CLAY with Sand (CL): subrounded sand, medium to high plasticity fines, brown and gray, moist												
				S-19											
-115	150														
			Clayey SAND (SC): subrounded to rounded sand, low plasticity fines, gray and brown, wet												
				S-20											
-120	155		**Lean CLAY (CL)**: subrounded sand, medium plasticity fines, gray and dark gray, moist, hard												
						PP=4.5+	120 in.								
				S-21											

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PROJECT NO.: 130226
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DATE: 12/28/2013
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BORING LOG CSB-31

Pearce Creek CDF
Earleville, MD

gINT FILE: E:\company\projects\130226 Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj R:KLF_STANDARD_GINT_LIBRARY_SR.1.1.GLB [KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 12/11/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Foggy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-31

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 643,001.615 Easting: 1,598,356.063 Surveyed Surface Elevation (ft.): 35.14 Surface Condition: Scrub/Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-125			**Silty SAND with lignite fragments (SM)**: rounded sand, non-plastic fines, light gray, gray and black, wet	S-22	☒										
			Silty SAND (SM): rounded sand, non-plastic fines, dark gray and gray, wet	S-23	☒										
-130	165														
-135	170														
-140	175														

The exploration was terminated at approximately 167 ft. below ground surface. The exploration was backfilled with grout on December 11, 2012.

GROUNDWATER LEVEL INFORMATION:
⊻ Groundwater was observed at approximately 2.5 ft. below ground surface during drilling.
GENERAL NOTES:
The exploration location and elevation were surveyed by Polaris.

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PROJECT NO.:	130226
DRAWN BY:	KLW
CHECKED BY:	DG
DATE:	12/28/2013
REVISED:	12/29/2013

BORING LOG CSB-31

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/15/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Partly Cloudy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-32

Northing: 642,057.079
Easting: 1,599,625.909
Surveyed Surface Elevation (ft.): 29.19

Surface Condition: Phragmites

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
25	5		**Lean CLAY with Sand (CL)**: subrounded to rounded sand, medium plasticity fines, brown and gray, wet, soft to firm, fine grained sand	S-1			52 in.								Surface Water DREDGE MATERIAL
20	10		**Elastic SILT (MH)**: rounded sand, low to medium plasticity fines, gray and dark gray, wet, fine grained sand	S-2			120 in.								
15			**SILT (ML)**: rounded sand, low plasticity fines, yellowish brown and gray, wet, fine grained sand												QUATERNARY LOWLAND DEPOSITS
	15		**Silty SAND (SM)**: rounded sand, non-plastic fines, yellowish brown and gray, wet, medium to fine grained sand	S-3											
10			**SILT with Sand (ML)**: rounded sand, low plasticity fines, yellowish brown and gray, wet, medium to fine grained sand	S-4			120 in.								

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PROJECT NO.: 130226
DRAWN BY: KLW
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DATE: 12/28/2013
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BORING LOG CSB-32

Pearce Creek CDF
Earleville, MD

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BORING LOG CSB-32

Date Begin - End: 12/15/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Partly Cloudy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,057.079 Easting: 1,599,625.909 Surveyed Surface Elevation (ft.): 29.19 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Gravelly SILT with Sand (ML): rounded gravel, rounded sand, low plasticity fines, yellowish brown and light gray, wet, medium to fine grained sand, coarse to medium grained gravel	S-5 S-6											
			Clayey SAND (SC): rounded sand, medium plasticity fines, yellowish brown, brownish gray and gray, wet, medium to fine grained sand	S-7											
5			**Lean CLAY (CL)**: rounded sand, medium plasticity fines, brownish yellow, yellowish brown and gray, wet, fine grained sand	S-8											
	25		**Silty SAND (SM)**: rounded sand, non-plastic fines, yellowish brown, yellow and gray, wet, fine grained sand	S-9											
			Sandy SILT (ML): rounded sand, non-plastic fines, light gray and yellowish brown, wet, fine grained sand	S-10											
			Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, fine grained sand												
0			**Poorly-Graded SAND with Silt (SP-SM)**: rounded sand, non-plastic fines, light brownish gray, light gray, and gray, wet, coarse to fine grained sand				120 in.								UPPER SAND
	30			S-11											Occasional Silty Sand layers up to 1 inch thick.
-5	35						120 in.								
-10			**Silty SAND (SM)**: rounded sand, non-plastic fines, brown, wet, medium to fine grained sand												

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PROJECT NO.: 130226
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BORING LOG CSB-32

Pearce Creek CDF
Earleville, MD

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Date Begin - End: 12/15/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Partly Cloudy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-32

Northing: 642,057.079
Easting: 1,599,625.909
Surveyed Surface Elevation (ft.): 29.19

Surface Condition: Phragmites

		FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)		Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light gray, light brownish gray and white, wet, medium grained sand												
-15														
	45													
		Clayey SAND (SC): rounded sand, medium plasticity fines, light brown, medium grained sand	S-12											
		Silty SAND (SM): rounded sand, non-plastic fines, light brown, wet, medium grained sand												
		Poorly-Graded SAND (SP): rounded sand, non-plastic fines, white and light gray, wet, coarse to medium grained sand				120 in.								
-20														
	50													
		Poorly-Graded SAND with Silt and Gravel (SP-SM): rounded gravel, rounded sand, non-plastic fines, white, gray and yellow, wet, coarse to medium grained sand, medium to fine grained gravel												
			S-13				SP-SM	8.9		63	8.2			
-25														
	55													
		Poorly-Graded SAND (SP): rounded gravel, rounded sand, non-plastic fines, light brownish gray, yellowish brown and yellow, wet, coarse to medium grained sand, fine grained gravel	S-14											
		Clayey SAND (SC): rounded gravel, rounded sand, non-plastic fines, light gray, wet, medium to fine grained sand, fine grained gravel	S-15			120 in.								
-30		**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, yellow and light brown, wet, coarse to fine grained sand												
			S-16											

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PROJECT NO.: 130226
DRAWN BY: KLW
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DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-32

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/15/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Partly Cloudy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-32

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,057.079 Easting: 1,599,625.909 Surveyed Surface Elevation (ft.): 29.19 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellow and light brown, wet, coarse to fine grained sand												
			Silty SAND (SM): rounded sand, non-plastic fines, yellowish brown and light brownish gray, wet, medium to fine grained sand	S-17											
			Poorly-Graded SAND with Silt (SP-SM): rounded gravel, rounded sand, non-plastic fines, gray, wet, coarse to medium grained sand, fine gravel	S-18											
-35															
			SILT (ML): rounded sand, low plasticity fines, gray, wet, fine grained sand	S-19											
	65														
			Silty SAND (SM): rounded sand, non-plastic fines, gray and dark gray, wet, fine grained sand	S-20											
			Lean CLAY (CL): rounded sand, medium plasticity fines, gray, wet, fine grained sand	S-21 S-22											
			Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, fine grained sand												
							120 in.								
-40															
	70														
			Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, gray, wet, fine grained sand												
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, gray, light brown and yellowish brown, wet, medium grained sand												
-45															
	75														
							120 in.								
-50															

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PROJECT NO.: 130226
DRAWN BY: KLW
CHECKED BY: DG
DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-32

Pearce Creek CDF
Earleville, MD

Date Begin - End:	12/15/2012	**Drill Company:**	Boart Longyear
Logged By:	D. Grahl	**Drill Crew:**	R. Parr
Hor.-Vert. Datum:	MD State Plane - NAVD88	**Drill Equipment:**	LS 600
Angle from Vert.:	0 degrees	**Exploration Method:**	Sonic Continuous
Weather:	40's, Partly Cloudy	**Exploration Diameter:**	6 in O.D./ 4 in. I.D.

BORING LOG CSB-32

FIELD EXPLORATION

Northing: 642,057.079
Easting: 1,599,625.909
Surveyed Surface Elevation (ft.): 29.19

Surface Condition: Phragmites

LABORATORY RESULTS

Surveyed Elevation (feet)	Depth (feet)	Description	Sample Number	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, fine grained sand											
			S-24										
-55		**Lean CLAY (CL)**: rounded sand, medium plasticity fines, gray, wet, firm, fine grained sand	S-25										
	85	**Clayey SAND (SC)**: rounded sand, medium plasticity fines, gray, wet, medium grained sand	S-26										
		Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brownish gray, wet, medium grained sand	S-27										
					120 in.								
-60													
	90	Grades to light brownish gray, yellow, yellowish brown and light gray											
			S-28										
-65													
	95	**Lean CLAY (CL)**: rounded sand, medium to high plasticity fines, red and gray, wet, fine grained sand											UPPER CONFINING LAYER
			S-29	PP=4.0									
				PP=4.5									
					120 in.								
-70													

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PROJECT NO.:	130226
DRAWN BY:	KLW
CHECKED BY:	DG
DATE:	12/28/2013
REVISED:	12/29/2013

BORING LOG CSB-32

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/15/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Partly Cloudy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-32

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,057.079 Easting: 1,599,625.909 Surveyed Surface Elevation (ft.): 29.19 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Lean CLAY (CL): rounded sand, medium to high plasticity fines, red and gray, wet, fine grained sand Grades to red, light gray and pink	S-30											
-75	105														
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellowish brown, light gray and light brownish gray, medium to fine grained sand	S-31											
-80	110														
-85	115														
-90															

The exploration was terminated at approximately 108 ft. below ground surface. The exploration was backfilled with grout on December 16, 2012.

GROUNDWATER LEVEL INFORMATION:
⊻ Groundwater was observed at approximately 8 ft. below ground surface during drilling.
GENERAL NOTES:
The exploration location and elevation were surveyed by Polaris.

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PROJECT NO.: 130226
DRAWN BY: KLW
CHECKED BY: DG
DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-32

Pearce Creek CDF
Earleville, MD

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BORING LOG CSB-33

Date Begin - End: 12/14/2012 - 12/15/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 30's, Clear
Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 641,898.492 Easting: 1,600,625.289 Surveyed Surface Elevation (ft.): 28.9 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, brown and dark gray, wet, firm, fine grained sand				56 in.								Surface Water
						PP=1.5									DREDGE MATERIAL
▽															
			Lean CLAY (CL): dark gray, wet, soft, fine grained sand			PP=0.25-0.5									
25															
	5														
			Elastic SILT (MH): rounded sand, low to medium plasticity fines, gray and black, wet, very soft, 5% organic matter, fine grained sand				120 in.								
20															
	10														
15															
			20% Organic Matter												
	15														
			Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray and gray, wet, soft to firm, 5% organic matter, fine grained sand												
						PP=0.5									
							97 in.								
10															
						PP=0.5									

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PROJECT NO.: 130226
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BORING LOG CSB-33

Pearce Creek CDF
Earleville, MD

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Date Begin - End:	12/14/2012 - 12/15/2012	**Drill Company:**	Boart Longyear	**BORING LOG CSB-33**
Logged By:	D. Grahl	**Drill Crew:**	R. Parr	
Hor.-Vert. Datum:	MD State Plane - NAVD88	**Drill Equipment:**	LS 600	
Angle from Vert.:	0 degrees	**Exploration Method:**	Sonic Continuous	
Weather:	30's, Clear	**Exploration Diameter:**	6 in O.D./ 4 in. I.D.	

FIELD EXPLORATION								LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 641,898.492 Easting: 1,600,625.289 Surveyed Surface Elevation (ft.): 28.9 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Elastic SILT (MH): rounded sand, low to medium plasticity fines, dark gray and black, wet, very soft, fine grained sand			PP=0									
5	25		**Lean CLAY (CL)**: rounded sand, medium plasticity fines, dark gray and gray, wet, soft, fine grained sand			PP=0.75-1.0									
			Elastic SILT (MH): rounded sand, low plasticity fines, dark gray and black, wet, very soft, fine grained sand	S-1		PP=0.5 PP=0.25									Advanced from 17 to 27 feet, barrel sank an additional 2.5 feet from 27 to 29.5 feet.
0			**Lean CLAY (CL)**: medium plasticity fines, gray, wet, soft to firm, fine grained sand			PP=0.5-0.75									
-5	30		**Elastic SILT (MH)**: rounded sand, low to medium plasticity fines, gray, wet, very soft to soft, fine grained sand			PP=0 PP=0.5	90 in.								
	35		**Fibrous PEAT (PT)**: non-plastic fines, dark brown and yellowish brown, wet, 50% Fibers	S-2											TIDAL MARSH
-10			**Organic SILT (OL)**: subrounded sand, low plasticity fines, gray and light brown, wet, soft, 25% Fibers	S-3			120 in.								

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PROJECT NO.:	130226
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BORING LOG CSB-33

Pearce Creek CDF
Earleville, MD

BORING LOG CSB-33

Date Begin - End: 12/14/2012 - 12/15/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 30's, Clear

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

FIELD EXPLORATION

LABORATORY RESULTS

Northing: 641,898.492
Easting: 1,600,625.289
Surveyed Surface Elevation (ft.): 28.9

Surface Condition: Phragmites

Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Clayey SAND (SC): rounded sand, medium plasticity fines, light gray, wet, medium to fine grained sand	S-4											UPPER SAND
-15			**Gravelly Lean CLAY (CL)**: subrounded to rounded gravel, subrounded to rounded sand, medium plasticity fines, light brown, yellow and brownish gray, wet, firm, medium to fine grained sand, coarse to medium grained gravel	S-5 S-6											
	45		**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, yellowish brown and light brownish gray, wet, medium to fine grained sand	S-7											
			Sandy SILT (ML): rounded sand, low plasticity fines, light gray and yellowish brown, wet, firm, medium to fine grained sand	S-8											
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brown, light brownish gray and yellowish brown, wet, medium grained sand				120 in.								
-20			**Silty SAND (SM)**: rounded sand, non-plastic fines, light brown, light brownish gray and gray, wet, medium to fine grained sand												
-25	50		**Poorly-Graded SAND with Silt (SP-SM)**: subrounded to rounded sand, non-plastic fines, yellowish brown, light brown and light brownish gray, wet, coarse to fine grained sand												
			Silty SAND (SM): rounded sand, non-plastic fines, gray, wet, medium to fine grained sand												
	55		**Poorly-Graded SAND (SP)**: rounded gravel, rounded sand, non-plastic fines, light gray and brownish yellow, wet, coarse to medium grained sand, fine grained gravel	S-9			120 in.								
-30			Grades to light gray, light brownish gray and yellowish brown, medium grained sand	S-10											

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KLEINFELDER
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PROJECT NO.: 130226
DRAWN BY: KLW
CHECKED BY: DG
DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-33

Pearce Creek CDF
Earleville, MD

BORING LOG CSB-33

Date Begin - End: 12/14/2012 - 12/15/2012
Drill Company: Boart Longyear
Logged By: D. Grahl
Drill Crew: R. Parr
Hor.-Vert. Datum: MD State Plane - NAVD88
Drill Equipment: LS 600
Angle from Vert.: 0 degrees
Exploration Method: Sonic Continuous
Weather: 30's, Clear
Exploration Diameter: 6 in O.D./ 4 in. I.D.

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 641,898.492 Easting: 1,600,625.289 Surveyed Surface Elevation (ft.): 28.9 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, dark gray and light gray, wet, coarse to fine grained sand	S-11											
			Lean CLAY (CL): rounded sand, medium plasticity fines, white and light gray, wet, hard, fine grained sand			PP=2.5									
-35				S-12		PP=4.5+									
	65					PP=4.5+									
			Silty SAND (SM): rounded sand, non-plastic to low plasticity fines, gray, wet, medium to fine grained sand	S-13			120 in.								End of Day 12/14/2012
-40															
	70		non-plastic fines, grades to light gray and gray												
-45															
	75			S-14											
			grades to light gray, light brownish gray, reddish yellow, yellow and brownish yellow				120 in.								
-50															

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BORING LOG CSB-33

Pearce Creek CDF
Earleville, MD

Date Begin - End:	12/14/2012 - 12/15/2012	**Drill Company:**	Boart Longyear
Logged By:	D. Grahl	**Drill Crew:**	R. Parr
Hor.-Vert. Datum:	MD State Plane - NAVD88	**Drill Equipment:**	LS 600
Angle from Vert.:	0 degrees	**Exploration Method:**	Sonic Continuous
Weather:	30's, Clear	**Exploration Diameter:**	6 in O.D./ 4 in. I.D.

BORING LOG CSB-33

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 641,898.492 Easting: 1,600,625.289 Surveyed Surface Elevation (ft.): 28.9 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, light gray, light brownish gray, reddish yellow, yellow and brownish yellow, wet, medium to fine grained sand	S-15											
-55															
	85														
			Grades to light brownish gray, light gray and yellowish brown				120 in.								
-60															
	90		**Poorly-Graded SAND (SP)**: light gray, light brownish gray and yellowish brown, medium grained sand												
				S-16											
-65															
	95														
			Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, yellow, brownish yellow, light gray and light brownish gray, medium to fine grained sand				120 in.								
				S-17											
-70															

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BORING LOG CSB-33

Pearce Creek CDF
Earleville, MD

BORING LOG CSB-33

Date Begin - End: 12/14/2012 - 12/15/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 30's, Clear

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

Northing: 641,898.492
Easting: 1,600,625.289
Surveyed Surface Elevation (ft.): 28.9

Surface Condition: Phragmites

FIELD EXPLORATION						LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Description	Sample Number	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellowish brown and light gray, medium grained sand	S-18										
		Lean CLAY (CL): rounded sand, medium plasticity fines, light gray and red, wet, fine grained sand	S-19 S-20	PP=2.5									
-75		**Silty SAND (SM)**: rounded sand, low plasticity fines, light gray and red, wet, fine grained sand	S-21	PP=0.5									
		Sandy SILT (ML): rounded sand, low plasticity fines, light gray and red, wet, soft, fine grained sand		PP=2.5									UPPER CONFINING LAYER
	105	**Lean CLAY (CL)**: rounded sand, medium to high plasticity fines, light grayish red, olive yellow and olive brown, wet, firm to hard, fine grained sand	S-22	PP=4.5+	120 in.								
-80	110	Grades to red, gray, olive yellow and olive brown	S-23	PP=4.5+									
-85		**Lean CLAY with Sand (CL)**: subrounded sand, medium plasticity fines, gray, olive yellow and olive brown, wet, hard, fine grained sand		PP=4.5+									
	115		S-24			CL	15.6				34	18	
-90													

The exploration was terminated at approximately 117 ft. below ground surface.
The exploration was backfilled with grout on December 15, 2012.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 2.5 ft. below ground surface during drilling.
GENERAL NOTES:
The exploration location and elevation were surveyed by Polaris.

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BORING LOG CSB-33

Pearce Creek CDF
Earleville, MD

BORING LOG CSB-34

Date Begin - End: 12/18/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Foggy
Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

Northing: 643,159.782
Easting: 1,599,272.899
Surveyed Surface Elevation (ft.): 35.24

Surface Condition: Phragmites

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
35		▨	**Lean CLAY with Sand (CL)**: subrounded sand, medium plasticity fines, dark gray and reddish brown, moist to wet, soft, 20% organic matter, fine grained sand				39 in.								DREDGE MATERIALS
30	5	▨		S-1											
	▽	▨													
		▥	**Elastic SILT (MH)**: subrounded sand, low plasticity fines, dark gray and black, wet, very soft, 10% organic matter, fine grained sand				51 in.								
		▥				PP=0.25									
25	10	▥													
		▥		S-2				MH	5.5		100	90	50	14	
		▥				PP=0									
20	15	▥													
		▨	**Sandy Lean CLAY (CL)**: subrounded sand, medium plasticity fines, gray and brown, wet, very soft, fine grained sand			PP=0	117 in.								
		▥	**Elastic SILT (MH)**: subrounded sand, low plasticity fines, gray and dark gray, wet, very soft, fine grained sand												

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BORING LOG CSB-34

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Earleville, MD

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Date Begin - End: 12/18/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Foggy
Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-34

FIELD EXPLORATION | LABORATORY RESULTS

Northing: 643,159.782
Easting: 1,599,272.899
Surveyed Surface Elevation (ft.): 35.24

Surface Condition: Phragmites

Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
15			**Elastic SILT (MH)**: subrounded sand, low plasticity fines, gray and dark gray, wet, very soft, fine grained sand												
			Silty SAND (SM): rounded sand, non-plastic fines, gray and dark gray, wet, very soft, fine grained sand	S-3											
			Elastic SILT (MH): rounded sand, low plasticity fines, gray, dark gray and black, wet, very soft, fine grained sand												
10	25														
			Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray and black, soft, fine grained sand												
			Elastic SILT (MH): rounded sand, low plasticity fines, gray, dark gray and black, wet, very soft, fine grained sand				95 in.								
5	30														
0	35		grades to gray and dark gray												
							96 in.								

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Pearce Creek CDF
Earleville, MD

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Date Begin - End:	12/18/2012	**Drill Company:**	Boart Longyear
Logged By:	D. Grahl	**Drill Crew:**	R. Parr
Hor.-Vert. Datum:	MD State Plane - NAVD88	**Drill Equipment:**	LS 600
Angle from Vert.:	0 degrees	**Exploration Method:**	Sonic Continuous
Weather:	40's, Foggy	**Exploration Diameter:**	6 in O.D./ 4 in. I.D.

BORING LOG CSB-34

FIELD EXPLORATION								LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 643,159.782 Easting: 1,599,272.899 Surveyed Surface Elevation (ft.): 35.24 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-5			**Elastic SILT (MH)**: rounded sand, low plasticity fines, gray, dark gray and black, wet, very soft, fine grained sand												
-10	45														
			Fibrous PEAT (PT): medium plasticity fines, dark brown and gray, wet, very soft, 50% Fibers				115 in.								TIDAL MARSH DEPOSITS
			Organic CLAY (OH): rounded sand, medium to high plasticity fines, dark brownish gray and dark gray, wet, soft, 10% Fibers, fine grained sand												
-15	50			S-5											
			Clayey SAND (SC): rounded sand, medium plasticity fines, gray, wet, medium to fine grained sand	S-6											
			Organic CLAY (OH): rounded sand, medium to high plasticity fines, dark brownish gray and dark gray, wet, soft, 10% fibers												
-20	55														
				S-7				OH	60.1				103	66	
							115 in.								

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BORING LOG CSB-34

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Earleville, MD

BORING LOG CSB-34

Date Begin - End: 12/18/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Foggy
Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 643,159.782 Easting: 1,599,272.899 Surveyed Surface Elevation (ft.): 35.24 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-25			**Organic CLAY (OH)**: rounded sand, medium to high plasticity fines, dark brownish gray and dark gray, wet, soft, 10% fibers wood fragments												
			Sandy CLAY (CL): rounded sand, medium plasticity fines, gray, wet, soft, fine sand												
-30	65		**Organic CLAY (OH)**: rounded sand, medium to high plasticity fines, dark brownish gray and dark gray, wet, soft wood fragments												
			Sandy Organic CLAY (OH): rounded sand, medium to high plasticity fines, balck and dark brown, wet, soft	S-8			120 in.								
-35	70		**Silty SAND (SM)**: rounded sand, medium to high plasticity fines, brown, dark gray and light gray, wet, coarse to fine grained sand	S-9											UPPER SAND
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, brown, yellowish brown and light gray, wet, coarse to medium grained sand	S-10											
			Silty SAND (SM): gray and yellowish brown, wet, medium to fine grained sand	S-11											
-40	75		**Poorly-Graded SAND with Gravel (SP)**: rounded sand, non-plastic fines, yellowish brown and light brownish gray, wet, coarse to medium grained sand	S-12											
			Silty SAND (SM): rounded sand, medium plasticity fines, yellowish brown, light brownish gray and gray, wet	S-13			120 in.								
			Lean CLAY (CL): rounded sand, medium plasticity fines, light gray and yellowish brown, wet, firm	S-14											

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Earleville, MD

Date Begin - End: 12/18/2012
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Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Foggy

Drill Company: Boart Longyear
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Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-34

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 643,159.782 Easting: 1,599,272.899 Surveyed Surface Elevation (ft.): 35.24 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-45			**Silty SAND (SM)**: rounded sand, low plasticity fines, white, wet, medium to fine grained sand	S-15											
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brown and light gray, wet, medium grained sand	S-16											
-50	85		**Sandy Silty CLAY (CL-ML)**: rounded sand, low plasticity fines, light gray and yellow, wet, firm, medium to fine grained sand	S-17			120 in.								UPPER CONFINING LAYER
			Lean CLAY (CL): rounded sand, medium plasticity fines, gray and dark gray, wet, firm, fine sand												
-55	90		**Sandy SILT (ML)**: rounded sand, low plasticity fines, light gray and gray, wet, firm, fine grained sand												
			Lean CLAY with occasional Silty SAND (SM) innterbesd up to approximately 1/4" thick (CL): rounded sand, medium plasticity fines, light gray and gray, wet, firm, fine grained sand												Occasional Silty Sand interbeds approximately 1/2 inch thick.
			Sandy SILT (ML): rounded sand, low plasticity fines, light gray and gray, wet, soft, fine grained sand												Occasional Lean Clay interbeds approximately 1/4 inch thick.
-60	95		**Lean CLAY (CL)**: rounded sand, medium plasticity fines, dark gray, wet, hard, fine grained sand												
			Clayey SAND (SC): rounded sand, medium plasticity fines, gray, wet, fine grained sand	S-18											
			Lean CLAY (CL): rounded sand, medium plasticity fines, yellowish red, yellow and brown, wet, hard, fine grained sand				120 in.								

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Date Begin - End:	12/18/2012	**Drill Company:**	Boart Longyear	**BORING LOG CSB-34**
Logged By:	D. Grahl	**Drill Crew:**	R. Parr	
Hor.-Vert. Datum:	MD State Plane - NAVD88	**Drill Equipment:**	LS 600	
Angle from Vert.:	0 degrees	**Exploration Method:**	Sonic Continuous	
Weather:	40's, Foggy	**Exploration Diameter:**	6 in O.D./ 4 in. I.D.	

FIELD EXPLORATION								LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 643,159.782 Easting: 1,599,272.899 Surveyed Surface Elevation (ft.): 35.24 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-65			**Lean CLAY (CL)**: rounded sand, medium plasticity fines, gray, light gray, and reddish gray, wet, hard, fine grained sand												
-70	105														
							120 in.								
			Sandy Silty CLAY (CL-ML): rounded sand, low plasticity fines, dark gray, wet, soft												Coarse gravel sized concretion at 107.8 feet
			Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, dark gray, wet, firm, fine grained sand												
-75	110														
				S-19											
			Sandy Silty CLAY (CL-ML): rounded sand, low plasticity fines, wet, soft, fine grained sand												
			Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, dark gray, wet, hard, fine grained sand												Cobble sized concretion at 114.8 to 115.3 feet.
-80	115														
			Interbedded Silty SAND (SM) and Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray and light gray, wet, firm, fine grained sand, layers approximately 1/4 to 1/2 inch thick												
							120 in.								LOWER SAND
			Silty SAND (SM): rounded sand, non-plastic fines, yellow, light gray and yellowish red, wet, medium to fine grained sand												

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Date Begin - End:	12/18/2012	**Drill Company:**	Boart Longyear
Logged By:	D. Grahl	**Drill Crew:**	R. Parr
Hor.-Vert. Datum:	MD State Plane - NAVD88	**Drill Equipment:**	LS 600
Angle from Vert.:	0 degrees	**Exploration Method:**	Sonic Continuous
Weather:	40's, Foggy	**Exploration Diameter:**	6 in O.D./ 4 in. I.D.

BORING LOG CSB-34

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 643,159.782 Easting: 1,599,272.899 Surveyed Surface Elevation (ft.): 35.24 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-85			**Silty SAND (SM)**: rounded sand, non-plastic fines, yellow, light gray and yellowish red, wet, medium to fine grained sand												
			Lean CLAY (CL): dark gray, wet												
			Silty SAND (SM): rounded sand, non-plastic fines, yellow, light gray and yellowish red, wet, medium to fine grained sand												
-90	125														
							120 in.								Occasional Silt interbeds approximately 1/2 inch thick from 127 to 135.7 feet.
-95	130			S-20				SM	22.6		100	29			
-100	135														
			Sandy SILT (ML): rounded sand, low plasticity fines, light gray and yellow, wet, soft, fine grained sand	S-21											
			Silty SAND (SM): rounded sand, low plasticity fines, light brownish gray and yellowish brown, wet, medium to fine grained sand	S-22			120 in.								
			Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, red and gray, wet, firm, fine grained sand												

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Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Foggy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-34

Northing: 643,159.782
Easting: 1,599,272.899
Surveyed Surface Elevation (ft.): 35.24

Surface Condition: Phragmites

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log		Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-105			**Sandy SILT (ML)**: rounded sand, medium plasticity fines, light gray, wet, soft to firm, fine grained sand	S-23											
			Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, red and gray, fine grained sand	S-24											
			Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, wet, fine grained sand												
			Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, red and light gray, wet, fine grained sand												
-110	145		**Silty SAND (SM)**: rounded sand, non-plastic fines, light gray and yellowish brown, wet, medium to fine grained sand	S-25 S-26			120 in.								
			Sandy SILT (ML): rounded sand, low plasticity fines, light gray, yellow and red, wet, fine grained sand												
-115	150		**Silty SAND (SM)**: rounded sand, low plasticity fines, light grayish yellow and reddish yellow, wet, fine grained sand	S-27											
			Sandy SILT (ML): rounded sand, non-plastic to low plasticity fines, light gray, yellow and reddish yellow, wet, fine grained sand												
			Silty SAND (SM): rounded sand, non-plastic fines, light gray and yellow, wet, fine grained sand												
			Clayey SAND (SC): rounded sand, medium plasticity fines, light gray, red and dark gray, wet, fine grained sand	S-28											Occasional Lean Clay interbeds approximately 1/4 inch thick.
-120	155		**Lean CLAY with Sand (CL)**: rounded sand, medium plasticity fines, dark gray, wet, fine grained sand												
			Clayey SAND (SC): rounded sand, medium plasticity fines, gray and dark gray, wet, fine grained sand	S-29											Frequent Silty SAND (SM) interbeds approximately 1/4 inch thick.
			Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray and light gray, wet, firm, fine grained sand				120 in.								
			Silty SAND (SM): rounded sand, non-plastic to medium plasticity fines, gray and light gray, wet, fine grained sand												Frequent Lean CLAY (CL) interbeds approximately 1/4 inch thick.

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PROJECT NO.:	130226
DRAWN BY:	KLW
CHECKED BY:	DG
DATE:	12/28/2013
REVISED:	12/29/2013

BORING LOG CSB-34

Pearce Creek CDF
Earleville, MD

BORING LOG CSB-34

Date Begin - End: 12/18/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Foggy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

Northing: 643,159.782
Easting: 1,599,272.899
Surveyed Surface Elevation (ft.): 35.24

Surface Condition: Phragmites

Surveyed Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	LABORATORY RESULTS USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-125															
			Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray, wet, fine grained sand												
			Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, fine grained sand												Frequent Silty SAND (SM) interbeds approximately 1/4 inch thick.
			Lean CLAY (CL): rounded sand, non-plastic to medium plasticity fines, dark gray and light gray, wet, fine grained sand												
-130	165		**Poorly-Graded SAND with Silt (SP-SM)**: rounded sand, non-plastic fines, light gray and light brownish gray, wet, medium to fine grained sand												
			Poorly-Graded SAND with Lignite fragments (SP): light gray and black, wet												
-135	170														
-140	175														

The exploration was terminated at approximately 167 ft. below ground surface. The exploration was backfilled with grout on December 18, 2012.

GROUNDWATER LEVEL INFORMATION:
⊻ Groundwater was observed at approximately 6 ft. below ground surface during drilling.
GENERAL NOTES:
The exploration location and elevation were surveyed by Polaris.

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PROJECT NO.: 130226
DRAWN BY: KLW
CHECKED BY: DG
DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-34

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/19/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Overcast

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-35

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,848.479 Easting: 1,599,388.738 Surveyed Surface Elevation (ft.): 35.09 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
35			**Sandy SILT (ML)**: subrounded to rounded sand, low plasticity fines, gray and yellowish brown, moist, soft, medium to fine grained sand.				23 in.								DREDGE MATERIAL
30	5														Environmental sample CSB-35 collected at 5 feet.
	▽														
			Silty SAND (SM): rounded sand, non-plastic fines, yellowish brown, brownish yellow and light gray, wet, medium to fine grained sand				71 in.								
25	10		**Elastic SILT (MH)**: rounded sand, low plasticity fines, dark gray, gray and black, wet, fine grained sand												
20	15														
			Same as above 10% organic matter				108 in.								

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PROJECT NO.: 130226
DRAWN BY: KLW
CHECKED BY: DG
DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-35

Pearce Creek CDF
Earleville, MD

gINT FILE: E:\company\projects\130226 Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj R:KLF_STANDARD_GINT_LIBRARY_SR.1.1.GLB [KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 12/19/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Overcast

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-35

FIELD EXPLORATION								LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,848.479 Easting: 1,599,388.738 Surveyed Surface Elevation (ft.): 35.09 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
15			**Elastic SILT (MH)**: rounded sand, low plasticity fines, dark gray, gray and black, wet, fine grained sand												
				S-1											
10	25														
							100 in.								
			Sandy SILT (ML): rounded sand, low plasticity fines, dark gray, wet, soft, fine grained sand												
5	30														
			Elastic SILT (MH): rounded sand, low plasticity fines, dark gray, black and yellowish brown, wet, soft, fine grained sand												
0	35														
							100 in.								

PROJECT NO.:	130226
DRAWN BY:	KLW
CHECKED BY:	DG
DATE:	12/28/2013
REVISED:	12/29/2013

BORING LOG CSB-35

Pearce Creek CDF
Earleville, MD

gINT FILE: E:\company\projects\130226 Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj R:KLF_STANDARD_GINT_LIBRARY_SR.1.1.GLB [KLF_BORING/TEST PIT SOIL LOG]

BORING LOG CSB-35

Date Begin - End: 12/19/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Overcast

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,848.479 Easting: 1,599,388.738 Surveyed Surface Elevation (ft.): 35.09 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-5			**Elastic SILT (MH)**: rounded sand, low plasticity fines, dark gray, black and yellowish brown, wet, soft, fine grained sand												
			Fiberous PEAT (PT): rounded sand, medium plasticity fines, dark brown, wet, 50% fibers	S-2											TIDAL MARSH DEPOSITS
-10	45		**Organic CLAY (OH)**: medium plasticity fines, dark brown, wet, very soft, 30% organic material	S-3											
			Poorly-Graded SAND (SP): rounded gravel, rounded sand, non-plastic fines, gray, wet, medium to fine grained sand, fine grained gravel				108 in.								
			Sandy Fine Grained PEAT (PT): rounded sand, non-plastic fines, dark brown and gray, wet	S-4											UPPER SAND
-15	50		**Silty SAND (SM)**: brown, yellowish brown and light gray, wet												
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, brown and yellowish brown, wet, fine grained sand												
			Silty SAND (SM): rounded sand, non-plastic fines, yellowish brown and light gray, wet, medium to fine grained sand	S-5											
			Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, light brown, brownish yellow and gray, medium grained sand												
-20	55		**Poorly-Graded SAND with Gravel (SP)**: rounded gravel, rounded sand, non-plastic fines, brown, yellowish brown and brownish yellow, wet, coarse to medium grained sand, fine grained gravel	S-6											
			Grades to light brown, yellow, yellowish brown, brown and light brownish gray				120 in.								

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DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-35

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/19/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Overcast
Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

Northing: 642,848.479
Easting: 1,599,388.738
Surveyed Surface Elevation (ft.): 35.09

Surface Condition: Phragmites

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log		Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-25			**Poorly-Graded SAND (SP)**: rounded gravel, rounded sand, non-plastic fines, light brown, yellow, yellowish brown, brown and light brownish gray, wet, coarse to medium grained sand, fine grained gravel												Iron stained bed at approximately 61 feet.
			Silty SAND (SM): rounded sand, non-plastic fines, yellowish brown and light gray, wet, medium to fine grained sand	S-7											
-30	65		**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, brown and brownish yellow, wet, coarse to fine grained sand												
			Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, wet, fine grained sand	S-8											
			Silty SAND (SM): rounded sand, non-plastic fines, light gray, yellow and yellowish brown, wet, medium to fine grained sand				120 in.								
-35	70		**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, brown, light brown and yellowish brown, wet, medium grained sand												
			Lean CLAY (CL): rounded sand, medium plasticity fines, light gray and yellow, wet, firm, fine grained sand	S-9											
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brown and yellowish brown, wet, medium grained sand												
-40	75		**Poorly-Graded SAND with Silt (SP-SM)**: yellowish brown, wet, medium to fine grained sand												
			Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, light gray and yellowish brown, wet, fine grained sand	S-10											UPPER CONFINING LAYER
			Lean CLAY (CL): rounded sand, medium plasticity fines, red and light gray, wet, fine grained sand				120 in.								
			Sandy Silty CLAY (CL-ML): rounded sand, low to medium plasticity fines, light gray, wet, hard, fine grained sand												

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PROJECT NO.: 130226
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BORING LOG CSB-35

Pearce Creek CDF
Earleville, MD

BORING LOG CSB-35

Date Begin - End: 12/19/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Overcast

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

Northing: 642,848.479
Easting: 1,599,388.738
Surveyed Surface Elevation (ft.): 35.09

Surface Condition: Phragmites

Surveyed Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	LABORATORY RESULTS USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-45			**Sandy Silty CLAY (CL-ML)**: rounded sand, low to medium plasticity fines, light gray, wet, hard, fine grained sand	S-11											
			Lean CLAY (CL): rounded sand, medium to high plasticity fines, dark brown and gray, wet, firm, fine grained sand												
-50	85			S-12				CL	16.9				35	18	
							120 in.								
-55	90														Slickenside failure surface at approximately 90.5 feet.
			Gravelly Lean CLAY with Sand (CL): angular to subrounded gravel, subrounded sand, medium plasticity fines, gray and brownish gray, wet, medium to fine grained sand, medium grained gravel	S-13											
				S-14											
			Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, medium to fine grained sand	S-16											
			Silty CLAY (CL-ML): rounded sand, medium plasticity fines, light gray, wet, hard, fine grained sand												
-60	95														
			Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, wet, fine grained sand	S-17											Occasional Silty Sand interbeds 1/4 inch thick.
							120 in.								

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PROJECT NO.: 130226
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DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-35

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/19/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Overcast

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-35

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,848.479 Easting: 1,599,388.738 Surveyed Surface Elevation (ft.): 35.09 Surface Condition: Phragmites	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-65			**Lean CLAY (CL)**: rounded sand, medium plasticity fines, light gray, wet, fine grained sand	S-18											
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light gray, wet, fine grained sand												
			Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, wet, fine grained sand												Occasional Lean Clay interbeds 1/2 inch thick. LOWER SAND
-70	105		**Poorly-Graded SAND with Silt (SP-SM)**: rounded sand, non-plastic fines, light gray, yellow and yellowish brown, wet, coarse to medium grained sand	S-19				SP-SM	15.5		100	11			
-75	110														
-80	115														

The exploration was terminated at approximately 107 ft. below ground surface. The exploration was backfilled with grout on December 19, 2012.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 7 ft. below ground surface during drilling.
GENERAL NOTES:
The exploration location and elevation were surveyed by Polaris.

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PROJECT NO.: 130226
DRAWN BY: KLW
CHECKED BY: DG
DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-35

Pearce Creek CDF
Earleville, MD

BORING LOG CSB-36

Date Begin - End: 12/19/2012 - 12/20/2012
Drill Company: Boart Longyear
Logged By: D. Grahl
Drill Crew: R. Parr
Hor.-Vert. Datum: MD State Plane - NAVD88
Drill Equipment: LS 600
Angle from Vert.: 0 degrees
Exploration Method: Sonic Continuous
Weather: 40's, Overcast
Exploration Diameter: 6 in O.D./ 4 in. I.D.

		FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,369.218 Easting: 1,599,983.54 Surveyed Surface Elevation (ft.): 31.62 Surface Condition: Bare Earth	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		▨	**Sandy Lean CLAY (CL)**: subrounded to rounded sand, medium plasticity fines, gray and yellowish brown, moist to wet, medium to fine grained sand				60 in.							DREDGE MATERIALS
30														
▽														
		▮	**Elastic SILT (MH)**: rounded sand, low plasticity fines, dark gray and black, wet, soft, fine grained sand											
	5													Environmental samples CSB-36A, CSB-36A-MS and CSB-36A-MSD collected at 5 feet.
25														
			Grades to dark gray and brown, 10% organic matter				60 in.							
														Environmental sample CSB-36B collected at 8 feet.
	10													
						PP=0.75								
20														
						PP=0.5								
	15													
15														
		▮	**Elastic SILT (MH)**: rounded sand, low plasticity fines, dark gray, yellowish brown and black, wet, soft, 20% organic matter				120 in.							

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PROJECT NO.:	130226
DRAWN BY:	KLW
CHECKED BY:	DG
DATE:	12/28/2013
REVISED:	12/29/2013

BORING LOG CSB-36

Pearce Creek CDF
Earleville, MD

BORING LOG CSB-36

Date Begin - End: 12/19/2012 - 12/20/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Overcast

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

		FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Northing: 642,369.218 Easting: 1,599,983.54 Surveyed Surface Elevation (ft.): 31.62 Surface Condition: Bare Earth	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		Elastic SILT (MH): rounded sand, low plasticity fines, dark gray and black, wet, soft, fine grained sand												
10					PP=0.5									
	25													
5														
						85 in.								
		Elastic SILT (MH): rounded sand, low plasticity fines, dark gray, yellowish brown and black, wet, soft, 20% organic matter												
	30													
0														
	35	**Sandy Fine Grained PEAT (PT)**: rounded sand, non-plastic fines, dark brown, wet, fine grained sand												TIDAL MARSH DEPOSITS
			S-1											
-5														
		Sandy SILT (ML): rounded sand, low plasticity fines, yellowish brown, light brownish gray and light gray, wet, medium to fine grained sand				120 in.								UPPER SAND
			S-2											
		Silty SAND (SM): rounded sand, non-plastic fines, yellowish brown and light gray, wet, medium to fine grained sand	S-3											
			S-4				GP-GM	7.6		38	5.5			

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PROJECT NO.: 130226
DRAWN BY: KLW
CHECKED BY: DG
DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-36

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/19/2012 - 12/20/2012
Drill Company: Boart Longyear
Logged By: D. Grahl
Drill Crew: R. Parr
Hor.-Vert. Datum: MD State Plane - NAVD88
Drill Equipment: LS 600
Angle from Vert.: 0 degrees
Exploration Method: Sonic Continuous
Weather: 40's, Overcast
Exploration Diameter: 6 in O.D./ 4 in. I.D.

Northing: 642,369.218
Easting: 1,599,983.54
Surveyed Surface Elevation (ft.): 31.62

Surface Condition: Bare Earth

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log		Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-10			**Poorly-Graded GRAVEL with Silt and Sand (GP-GM)**: rounded gravel, rounded sand, non-plastic fines, reddish yellow, wet, coarse to fine grained gravel, coarse to medium grained sand												
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, reddish yellow and yellowish brown, wet, medium grained sand	S-5											
	45		**Silty SAND (SM)**: rounded sand, non-plastic fines, light brown and yellowish brown, wet, medium to fine grained sand	S-6											
-15			**Sandy SILT (ML)**: rounded sand, non-plastic fines, yellowish brown, light brownish gray and light gray, wet, soft, medium to fine grained sand				120 in.								
	50		**Poorly-Graded SAND with Silt (SP-SM)**: rounded sand, non-plastic fines, reddish yellow and brownish yellow, wet, medium to fine grained sand	S-7 S-8											
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brown and yellowish brown, wet, coarse to medium grained sand	S-9											
-20			**Silty SAND (SM)**: rounded sand, non-plastic fines, light brownish gray and light gray, wet, coarse to fine grained sand	S-10											
			Clayey SAND (SC): rounded sand, medium plasticity fines, light brown and light gray, wet, medium to fine grained sand	S-11											
	55		**Poorly-Graded SAND with Silt and Gravel (SP-SM)**: rounded gravel, rounded sand, non-plastic fines, yellow and brown, coarse to medium grained sand, medium to fine grained gravel	S-12											
-25			**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, light brown and yellowish brown, wet, medium grained sand	S-13 S-14											
			Silty SAND (SM): rounded sand, non-plastic fines, light gray and yellowish brown, wet, medium to fine grained sand				120 in.								
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brownish gray, yellowish brown and dark brown, wet, coarse to medium grained sand	S-15											

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PROJECT NO.: 130226
DRAWN BY: KLW
CHECKED BY: DG
DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-36

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/19/2012 - 12/20/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Overcast

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-36

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,369.218 Easting: 1,599,983.54 Surveyed Surface Elevation (ft.): 31.62 Surface Condition: Bare Earth	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Poorly-Graded SAND with Silt and Gravel (SP-SM): rounded gravel, rounded sand, non-plastic fines, light brown and yellow, wet, coarse to medium grained sand, fine grained gravel												
-30			**Lean CLAY (CL)**: rounded sand, medium plasticity fines, yellow, light brownish gray and gray, moist, firm to hard, fine grained sand	S-16											
	65		**Silty CLAY with Sand (CL-ML)**: rounded sand, low plasticity fines, light gray and gray, moist, firm to hard, fine grained sand	S-17											
			Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray and gray, moist, fine grained sand	S-18											
-35			**Silty SAND (SM)**: rounded sand, non-plastic fines, light gray, wet, medium to fine grained sand	S-19			120 in.								
-40	70 75		**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, light brownish gray and yellowish brown, medium to fine grained sand	S-20											
-45			**Poorly-Graded SAND with Silt (SP-SM)**: rounded sand, non-plastic fines, yellowish brown and light gray, wet, medium grained sand	S-21			120 in.								
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellowish brown, light brown, light gray, medium grained sand												

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BORING LOG CSB-36

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/19/2012 - 12/20/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Overcast
Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

Northing: 642,369.218
Easting: 1,599,983.54
Surveyed Surface Elevation (ft.): 31.62

Surface Condition: Bare Earth

			FIELD EXPLORATION					LABORATORY RESULTS								
Surveyed Elevation (feet)	Depth (feet)	Graphical Log		Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
-50			**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, yellowish brown, light brown, light gray, medium grained sand	S-22											
	85		**Poorly-Graded SAND with Silt (SP-SM)**: rounded sand, non-plastic fines, yellowish brown and light gray, wet, medium grained sand	S-23											
-55			**Lean CLAY (CL)**: rounded sand, medium plasticity fines, light gray, wet, firm, fine grained sand	S-24											
			Poorly-Graded SAND (SP): rounded sand, medium plasticity fines, light gray and light brown, wet, medium grained sand	S-25			120 in.								
-60	90		**Poorly-Graded SAND (SP-SM)**: rounded sand, medium plasticity fines, yellowish brown and light gray, wet, medium to fine grained sand	S-26											Frequent Lean CLAY (CL) nodules.
			Lean CLAY (CL): rounded sand, medium plasticity fines, light gray and red, moist, firm, fine grained sand												UPPER CONFINING LAYER
			SILT (ML): rounded sand, low plasticity fines, white, wet, firm, fine grained sand												
-65	95		**Lean CLAY (CL)**: rounded sand, medium plasticity fines, light gray and red, wet, firm, fine grained sand	S-27			120 in.								Red color bands from 96.5 to 97 feet.
															LOWER SAND

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BORING LOG CSB-36

Pearce Creek CDF
Earleville, MD

BORING LOG CSB-36

Date Begin - End: 12/19/2012 - 12/20/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 40's, Overcast
Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

Northing: 642,369.218
Easting: 1,599,983.54
Surveyed Surface Elevation (ft.): 31.62
Surface Condition: Bare Earth

Surveyed Elevation (feet)	Depth (feet)	FIELD EXPLORATION	Sample Number	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	LABORATORY RESULTS USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, medium to fine grained sand											
-70		**Lean CLAY (CL)**: rounded sand, medium plasticity fines, light gray, wet, fine grained sand											
		Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, medium to fine grained sand	S-28			SM	23.2		100	17			
		Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, wet, fine grained sand	S-29			CL	11.3				33	17	
	105	**Silty SAND (SM)**: rounded sand, non-plastic fines, light gray, wet, medium to fine grained sand											
-75		**Lean CLAY (CL)**: rounded sand, medium plasticity fines, light gray, wet, fine grained sand	S-30										
		Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, medium to fine grained sand			120 in.								
		Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, wet, fine grained sand											Occasional Lean Clay nodules from 108 to 111 feet.
	110	**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, yellowish brown, wet, medium grained sand											
-80	115	**Interbedded Silty SAND (SM) and Lean CLAY (CL)**: rounded sand, non-plastic to medium plasticity fines, gray and dark gray, wet, firm, medium grained sand, layers approximately 1/8 to 1 inch thick	S-31										
		Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray, wet, firm, medium to fine grained sand											Silty SAND (SM) partings.
-85		**Silty SAND (SM)**: rounded sand, medium plasticity fines, light gray, wet, medium to fine grained sand											
		Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, gray, wet, firm, fine grained sand											Occasional Silty SAND (SM) interbeds approximately 1/16 to 1/4 inch thick.
		Lean CLAY (CL): rounded sand, low to medium plasticity fines, interbedded dark gray and gray, wet, medium to fine grained sand											

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BORING LOG CSB-36

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/19/2012 - 12/20/2012
Drill Company: Boart Longyear
Logged By: D. Grahl
Drill Crew: R. Parr
Hor.-Vert. Datum: MD State Plane - NAVD88
Drill Equipment: LS 600
Angle from Vert.: 0 degrees
Exploration Method: Sonic Continuous
Weather: 40's, Overcast
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-36

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 642,369.218 Easting: 1,599,983.54 Surveyed Surface Elevation (ft.): 31.62 Surface Condition: Bare Earth	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, medium to fine grained sand												
-90			**Lean CLAY (CL)**: rounded sand, medium plasticity fines, dark gray, wet, fine grained sand												Occasional Silty SAND (SM) partings.
			Silty SAND (SM): rounded sand, non-plastic fines, dark gray, wet, fine grained sand												
			Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray, wet, firm, fine grained sand	S-32											
	125		**Silty SAND (SM)**: rounded sand, non-plastic fines, light gray, wet, fine grained sand												
			Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray, wet, fine grained sand	S-33											
-95			**Silty SAND (SM)**: rounded sand, non-plastic fines, yellowish red, reddish yellow and light gray, fine grained sand												
	130														
-100															
	135														
-105															

The exploration was terminated at approximately 127 ft. below ground surface. The exploration was backfilled with grout on December 20, 2012.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 4 ft. below ground surface during drilling.
GENERAL NOTES:
The exploration location and elevation were surveyed by Polaris.

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PROJECT NO.:	130226
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BORING LOG CSB-36

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/17/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 50's, Foggy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-37

FIELD EXPLORATION

Northing: 643,217.779
Easting: 1,598,585.816
Surveyed Surface Elevation (ft.): 34.79

Surface Condition: Bare Sand

LABORATORY RESULTS

Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, brown, moist, medium grained sand				46 in.								DREDGE MATERIALS
			Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, brown, gray and yellowish brown, moist, firm, coarse to fine grained sand			PP=1.5									
30	5			S-1		PP=1.5									
	▽														
			Elastic SILT (MH): rounded sand, low to medium plasticity fines, gray, dark gray and black, wet, soft, 10% organic matter, fine grained sand				120 in.								
25	10					PP=0.25									
				S-2		PP=0.5									
20	15					PP=0									
							84 in.								
						PP=0									
15						PP=0.25									

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BORING LOG CSB-37

Pearce Creek CDF
Earleville, MD

KLEINFELDER
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Date Begin - End: 12/17/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 50's, Foggy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-37

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 643,217.779 Easting: 1,598,585.816 Surveyed Surface Elevation (ft.): 34.79 Surface Condition: Bare Sand	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Lean CLAY (CL): rounded sand, medium plasticity fines, gray, dark gray, light brown and black, wet, very soft to firm, 5% organic matter, fine grained sand												
				S-3		PP=0.5									
						PP=0.75									
10	25														
						PP=0.5									
			grades to gray, dark gray and brown, firm				120 in.								
						PP=0.75									
5	30														
			Silty SAND (SM): rounded sand, non-plastic to low plasticity fines, brownish gray and gray, wet, wood fragments, medium to fine grained sand												QUATERNARY LOWLAND DEPOSITS
				S-4											
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, brownish gray and gray, wet, wood fragments, coarse to fine grained sand												
0	35			S-5											
			Sandy SILT (ML): rounded sand, non-plastic fines, yellowish brown, brownish yellow and light brownish gray, mottled, fine grained sand	S-6											
			SILT (ML): rounded sand, low plasticity fines, yellowish brown, light brownish gray and gray, wet, soft, fine grained sand				120 in.								
						PP=1.25									
				S-7											
-5															

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BORING LOG CSB-37

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/17/2012
Drill Company: Boart Longyear
Logged By: D. Grahl
Drill Crew: R. Parr
Hor.-Vert. Datum: MD State Plane - NAVD88
Drill Equipment: LS 600
Angle from Vert.: 0 degrees
Exploration Method: Sonic Continuous
Weather: 50's, Foggy
Exploration Diameter: 6 in O.D./ 4 in. I.D.

FIELD EXPLORATION | LABORATORY RESULTS

Northing: 643,217.779
Easting: 1,598,585.816
Surveyed Surface Elevation (ft.): 34.79

Surface Condition: Bare Sand

Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, light brown and gray, wet, fine grained sand	S-8		PP=0.25									
			Clayey SAND (SC): gray, light gray and light brownish gray, wet	S-9											
			Lean CLAY (CL): light gray, yellowish brown, light brown and gray, wet, soft			PP=0.25									
				S-10		PP=0.5									
-10	45		**Organic SILT and Lean CLAY (OL)**: rounded sand, low to medium plasticity fines, dark gray, organic, wet, firm, fine grained sand												TIDAL MARSH DEPOSITS
				S-11		PP=1.25									
							120 in.								
-15	50														
				S-12											
-20	55		**Silty GRAVEL with Sand (GM)**: rounded gravel, rounded sand, low plasticity fines, brownish yellow, wet, coarse to medium grained sand, medium to fine grained gravel												UPPER SAND
				S-13											
							120 in.								
			Poorly-Graded SAND with Silt (SP-SM): rounded gravel, rounded sand, non-plastic fines, yellowish brown, wet, coarse to medium grained sand, medium to fine grained gravel												
-25															

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Pearce Creek CDF
Earleville, MD

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Angle from Vert.: 0 degrees
Exploration Method: Sonic Continuous
Weather: 50's, Foggy
Exploration Diameter: 6 in O.D./ 4 in. I.D.

Northing: 643,217.779
Easting: 1,598,585.816
Surveyed Surface Elevation (ft.): 34.79

Surface Condition: Bare Sand

		FIELD EXPLORATION					LABORATORY RESULTS								
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, gray, wet, soft, medium grained sand	S-14											
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellowish brown, wet, medium grained sand	S-15				GW-GM	6.5		35	8.4			
			Sandy SILT (ML): rounded sand, non-plastic fines, lilght gray, wet, medium grained sand												
			Well-Graded GRAVEL with Silt and Sand (GW-GM): rounded gravel, rounded sand, non-plastic fines, brown, wet, coarse to medium grained sand, medium to fine grained gravel												
-30	65		**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, brown, wet, medium grained sand	S-16											
			Silty GRAVEL with Sand (GM): rounded gravel, rounded sand, non-plastic fines, brown and yellowish brown, wet, coarse to medium grained sand, medium to fine grained gravel				120 in.								
			Silty SAND with Gravel (SM): rounded gravel, rounded sand, non-plastic fines, brown and yellowish brown, wet, medium to fine grained sand, medium to fine grained gravel												
-35	70		**Poorly-Graded SAND with Silt (SP-SM)**: rounded gravel, rounded sand, non-plastic fines, yellowish brown, wet, medium to fine grained sand, medium to fine grained gravel												
			Poorly-Graded GRAVEL with Sand (GP): rounded gravel, rounded sand, non-plastic fines, dark reddish brown, wet, coarse to medium grained sand, medium to fine grained gravel												
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellowish brown, light gray and brown, wet, medium to fine grained sand												
			Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, wet, fine sand												
-40	75		**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, light brown and brownish gray, wet, medium to fine grained sand												
			Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, yellowish brown and light gray, wet, fine sand	S-17											UPPER CONFINING LAYER
			Silty SAND (SM): rounded sand, non-plastic fines, light brown and yellowish brown, wet, fine sand				120 in.								
			Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, fine sand												
-45			**Poorly-Graded SAND (SP)**: rounded sand, non-plastic fines, reddish brown, wet, medium to fine grained sand	S-18				CH	23.1				51	30	

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BORING LOG CSB-37

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/17/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 50's, Foggy
Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-37

FIELD EXPLORATION | LABORATORY RESULTS

Northing: 643,217.779
Easting: 1,598,585.816
Surveyed Surface Elevation (ft.): 34.79

Surface Condition: Bare Sand

Surveyed Elevation (feet)	Depth (feet)	Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		Fat CLAY (CH): medium to high plasticity fines, red, light gray and gray, wet, firm to hard, fine grained sand												
			S-20		PP=3.0									
			S-19											
-50	85													
		Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, reddish gray, wet, coarse to medium grained sand				120 in.								LOWER SAND
		Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light gray and light brownish gray, wet, medium to fine grained sand												
-55	90													
			S-21											
-60	95													
		Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, medium to fine grained sand	S-22											
		Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellow and reddish brown, wet, medium to fine grained sand				120 in.								
		Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, yellowish red and gray, wet, hard, fine grained sand												
-65														

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BORING LOG CSB-37

Pearce Creek CDF
Earleville, MD

gINT FILE: E:\company\projects\130226 Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj R:KLF_STANDARD_GINT_LIBRARY_SR.1.1.GLB [KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 12/17/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 50's, Foggy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-37

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 643,217.779 Easting: 1,598,585.816 Surveyed Surface Elevation (ft.): 34.79 Surface Condition: Bare Sand	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Lean CLAY (CL): rounded sand, medium plasticity fines, gray and light gray, wet, fine grained sand												Frequent Silty SAND (SM) partings less than 1/8 inch thick.
				S-23											
			Silty SAND (SM): rounded sand, low to medium plasticity fines, gray and dark gray, wet, fine grained sand												Frequent Lean CLAY (CL) nodules.
-70	105		**Lean CLAY (CL)**: rounded sand, medium plasticity fines, wet, fine grained sand												Frequent Silty SAND (SM) interbeds approximately 1/8 inch thick.
			Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray, wet, fine grained sand	S-24											
							120 in.								
			Grades to light gray and red												
-75	110		**Silty SAND (SM)**: rounded sand, non-plastic fines, reddish yellow and light gray, fine grained sand												
			SILT (ML): rounded sand, low plasticity fines, light gray, yellowish brown and red, fine grained sand												
			Lean CLAY with Sand (CL): subrounded to rounded sand, medium plasticity fines, light gray and white, wet, fine grained sand												
			Silty SAND (SM): rounded sand, low plasticity fines, light gray and yellowish brown												
			Lean CLAY (CL): rounded sand, medium plasticity fines, reddish gray, wet, fine grained sand												
-80	115		**Silty SAND (SM)**: rounded sand, low plasticity fines, light gray, wet, medium to fine grained sand												
			Sandy SILT (ML): rounded sand, low plasticity fines, light gray and white, wet, medium to fine grained sand												
			Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, wet, fine grained sand				98 in.								
			Silty SAND (SM): rounded sand, non-plastic fines, light gray and light yellowish brown, wet, medium to fine grained sand												
-85															

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.: 130226
DRAWN BY: KLW
CHECKED BY: DG
DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-37

Pearce Creek CDF
Earleville, MD

Date Begin - End: 12/17/2012
Logged By: D. Grahl
Hor.-Vert. Datum: MD State Plane - NAVD88
Angle from Vert.: 0 degrees
Weather: 50's, Foggy

Drill Company: Boart Longyear
Drill Crew: R. Parr
Drill Equipment: LS 600
Exploration Method: Sonic Continuous
Exploration Diameter: 6 in O.D./ 4 in. I.D.

BORING LOG CSB-37

			FIELD EXPLORATION					LABORATORY RESULTS							
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 643,217.779 Easting: 1,598,585.816 Surveyed Surface Elevation (ft.): 34.79 Surface Condition: Bare Sand	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Silty SAND (SM): rounded sand, non-plastic fines, light gray and light yellowish brown, wet, medium to fine grained sand	S-25											
-90	125														
			Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brown, yellowish brown and yellowish red, wet, coarse to medium grained sand				120 in.								
-95	130														
			Silty SAND (SM): red, yellowish brown, brownish yellow, light brownish gray and light gray, wet, coarse to fine grained sand	S-26											
-100	135		**Lean CLAY (CL)**: grayish red and light gray, wet, firm												LOWER CONFINING LAYER
			Sandy SILT (ML): gray and grayish red, wet												
			Lean CLAY (CL): reddish gray and light gray, wet												
			Silty SAND (SM): gray, wet				120 in.								
			Lean CLAY (CL): grayish red and gray, wet, medium to fine grained sand												
-105															

gINT FILE: E:\company\projects\130226 Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj R:KLF_STANDARD_GINT_LIBRARY_SR.1.1.GLB [KLF_BORING/TEST PIT SOIL LOG]

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.: 130226
DRAWN BY: KLW
CHECKED BY: DG
DATE: 12/28/2013
REVISED: 12/29/2013

BORING LOG CSB-37

Pearce Creek CDF
Earleville, MD

Date Begin - End:	12/17/2012	**Drill Company:**	Boart Longyear	**BORING LOG CSB-37**
Logged By:	D. Grahl	**Drill Crew:**	R. Parr	
Hor.-Vert. Datum:	MD State Plane - NAVD88	**Drill Equipment:**	LS 600	
Angle from Vert.:	0 degrees	**Exploration Method:**	Sonic Continuous	
Weather:	50's, Foggy	**Exploration Diameter:**	6 in O.D./ 4 in. I.D.	

FIELD EXPLORATION | LABORATORY RESULTS

Northing: 643,217.779
Easting: 1,598,585.816
Surveyed Surface Elevation (ft.): 34.79

Surface Condition: Bare Sand

Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Silty SAND (SM): rounded sand, non-plastic fines, light gray												
			Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, red and gray												
			Silty SAND (SM): rounded sand, non-plastic fines, light gray and yellowish brown, wet, fine grained sand												
			Sandy SILT (ML): rounded sand, low plasticity fines, gray, wet, fine grained sand												
-110	145		**Lean CLAY (CL)**: rounded sand, medium plasticity fines, red and gray, wet, fine grained sand												
			Sandy SILT (ML): rounded sand, non-plastic to low plasticity fines, gray, wet, fine grained sand				120 in.								
-115	150		**Lean CLAY (CL)**: yellowish brown, brownish yellow, red and reddish gray, wet, fine grained sand												
			Silty SAND (SM): light gray, wet, fine grained sand												
-120	155		**Sandy SILT (ML)**: rounded sand, non-plastic to low plasticity fines, gray and light gray, fine grained sand												
			Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, grayish yellow, wet, fine grained sand												
-125															

The exploration was terminated at approximately 157 ft. below ground surface. The exploration was backfilled with grout on December 17, 2012.

GROUNDWATER LEVEL INFORMATION:
∇ Groundwater was observed at approximately 7 ft. below ground surface during drilling.
GENERAL NOTES:
The exploration location and elevation were surveyed by Polaris.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	130226
DRAWN BY:	KLW
CHECKED BY:	DG
DATE:	12/28/2013
REVISED:	12/29/2013

BORING LOG CSB-37

Pearce Creek CDF
Earleville, MD

EA Engineering, Science, and Technology, Inc.

1319 Woodbridge Station Way, Suite 200
Edgewood, MD 21040
410-538-8202

Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-1**	Location: Pearce Creek	Geologist: Nelson Brooks
Subcontractor: Uni-Tech Drilling Co., Inc.	Name of Driller: Jay Blemmings	
Model Drill Rig: CME55LC ATV	Drilling Method: Mud Rotary	
Date Started: 09/09/2008	Date Completed: 09/09/2008	Depth of Hole (ft): 50	Soil Boring
Elevation (ft): 38.05	Northing (ft): 644797.87	Easting (ft): 1598990.42	MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
0	▥	ML: Dark brown (10YR 4/3), silt with trace organics and iron staining, dry, medium stiff			2 3 4 5	0-2	50	PCB-1-0-2
-2	▨	CL: Black (5Y 2.5/1), clay, moist, medium stiff, homogeneous			6 6 4 4	2-4	50	PCB-1-2-4
-4	🟨	SM: Very dark gray (5Y 3/1), silty fine grain sand, moist, loose sand			4 5 2 1	4-6	58	PCB-1-4-6
-6	▥	ML: Black (5Y 2.5/1), silt, wet, very soft, homogeneous			2 1 1 1	6-8	41	PCB-1-6-8
-8	▥				1 1 1 1	8-10	87	PCB-1-8-10
-10	▥				1 1 1 2	10-12	79	PCB-1-10-12
-12	▥				1 1 1 1	12-14	79	PCB-1-12-14
-14	▥				R R R 1	14-16	83	PCB-1-14-16
-16	▥				1 2 1 1	16-18	83	PCB-1-16-18
-18	▥	ML: Black (5Y 2.5/1), silt, wet, medium stiff, homogeneous			3 4 3 2	18-20	79	PCB-1-18-20
-20	▥	ML: Black (5Y 2.5/1), silt, wet, very soft, homogeneous	0.0 / 6.7 / 59.9 / 33.4	ML	2 1 2 2	20-22	91	PCB-1-20-22
-22	▥				R R R R	22-24	25	PCB-1-22-24
-24								

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-1**

Location: PCB-1

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
-24		ML: Black (5Y 2.5/1), silt, wet, very soft, homogeneous with poorly sorted sand laminations, medium grain sub-angular sand with shell fragments	5.3 / 66.8 / 17.9 / 10.0	SC-SM	3 2 2 3	24-26	50	PCB-1-24-26
-26		SC-SM: Light olive brown (2.5Y 5/6), silty, clayey medium grain sand and trace coarse grained sub-rounded sand, wet, medium dense			9 9 14 16	26-28	70	PCB-1-26-28
-28		SP: Yellowish brown (10YR 5/6), poorly graded medium grain sand and trace coarse grained sub-rounded sand, wet, medium dense			12 11 9 13	28-30	50	PCB-1-28-30
-30		SM: Olive brown (2.5Y 4/1), silty medium grain sand with little fine sub-rounded gravel (predominantly quartz), wet, medium dense			9 10 13 18	30-32	41	PCB-1-30-32
-32		SP-SM: Dark gray (2.5Y 4/1), poorly graded medium grained sand with silt and trace fine sub-rounded gravel (predominantly quartz), wet, medium dense sand			17 11 15 12	32-34	50	PCB-1-32-34
-34		SP-SM: Dark gray (2.5Y 4/1), poorly graded medium grained sand with silt and dense sand, wet			3 7 7 9	34-36	41	PCB-1-34-36
-36					7 14 8 6	36-38	75	PCB-1-36-38
-38					9 7 10 10	38-40	91	PCB-1-38-40
-40					5 5 7 7	40-42	41	PCB-1-40-42
-42					5 6 6 8	42-44	45	PCB-1-42-44
-44					9 10 10 10	44-46	50	PCB-1-44-46
-46		SP-SM: Dark gray (2.5Y 4/1), poorly graded fine grained sub-rounded sand with silt and gravel, wet, medium dense sand			9 10 9 8	46-48	75	PCB-1-46-48
-48					5 9 9 9	48-50	62	PCB-1-48-50
-50		END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-2**	Location: Pearce Creek	Geologist: Nelson Brooks
Subcontractor: Uni-Tech Drilling Co., Inc.	Name of Driller: Jay Blemmings	
Model Drill Rig: CME55LC ATV	Drilling Method: Mud Rotary	
Date Started: 09/10/2008	Date Completed: 09/10/2008	Depth of Hole (ft): 50	Soil Boring
Elevation (ft): 37.65	Northing (ft): 644710.70	Easting (ft): 1600133.14	MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
0		ML: Brown (10YR 4/3), silt with trace organics (disturbed soil from site clearing), dry, very soft, blocky			1 1 1 1	0-2	33	PCB-2-0-2
-2		ML: Brown (10YR 5/3), sandy silt, dry, stratified, soft ML: Very dark gray (2.5Y 3/1), silt, dry, medium stiff, homogeneous			1 2 4 4	2-4	83	PCB-2-2-4
-4					4 4 4 4	4-6	75	PCB-2-4-6
-6		ML: Very dark gray (2.5Y 3/1), silt, moist, medium stiff, horizontal black color laminations observed in matrix			2 2 3 1	6-8	79	PCB-2-6-8
-8		ML: Very dark gray (5Y 3/1), silt, wet, very soft, no black laminations			2 2 1 1	8-10	75	PCB-2-8-10
-10		CL: Very dark gray (5Y 3/1), clay, wet, very soft, no black laminations trace organics at 11 feet bgs CL: Very dark gray (5Y 3/1), clay, wet, very soft, no black laminations			H H 2 H	10-12	58	PCB-2-10-12
-12					H H 2 1	12-14	50	PCB-2-12-14
-14					H H H H	14-16	75	PCB-2-14-16
-16		CL: horizontal black color laminations observed near bottom of spoon			H H 1 2	16-18	67	PCB-2-16-18
-18		ML: Very dark gray (5Y 3/1), silt, wet, very soft, no black laminations			H 1 1 1	18-20	50	PCB-2-18-20
-20					H H H H	20-22	92	PCB-2-20-22
-22					H 1 1 1	22-24	79	PCB-2-22-24
-24								

Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: PCB-2

Location: PCB-2

Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS
ML: 2-in. sandy silt stratification with fine grained sand at 25.5 feet bgs, wet	0.0 / 12.7 / 60.2 / 27.1	ML
CL: Very dark gray (5Y 3/1), clay, wet, very soft, no black laminations		
CL: Strong brown (7.5YR 4/6), sandy clay laminations at approximately 27, 27.25, and 27.5 feet bgs, wet		
CL: Very dark gray (5Y 3/1), clay, wet, very soft, no black laminations		
SW: Olive brown (2.5Y 5/4), well graded medium grained sand, wet, medium dense		
SP: Olive brown (2.5Y 5/4), poorly graded medium grained sand with little coarse sand, moist, medium dense		
SP: Gray (2.5Y 6/1), poorly graded medium grained sub-angular sand, moist, loose sand		
SP: Olive brown (2.5Y 5/4), poorly graded medium grained sub-angular sand, moist, medium dense		
SP: Gray (2.5Y 5/1), poorly graded medium grained sub-angular sand, 1/2-in. clay stratification at 37.5 feet bgs, gray (2.5Y 5/1), wet		
CL: Reddish brown (5YR 4/3), clay, wet, soft		
SC: Dark gray (5Y 4/1), clayey sand with wood fragments, moist		
CL: Light olive brown (2.5Y 5/3), clay, wet, very stiff	3.1 / 57.3 / 30.0 / 9.6	SC
CL: Gray (2.5Y 5/1), sandy lean clay with trace fine grained sand and fine grained sub-rounded gravel, wet, stiff, horizontal iron staining		
CL: Gray (2.5Y 5/1), sandy lean clay with trace fine grained sand and fine grained sub-rounded gravel, wet, stiff, horizontal iron staining; small recovery because of a coarse gravel stuck in the cutting shoe		
END OF BORING = 50 FT		

Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
H H 2 1	24-26	83	PCB-2-24-26
H 2 1 1	26-28	83	PCB-2-26-28
H H 5 7	28-30	67	PCB-2-28-30
2 5 6 6	30-32	25	PCB-2-30-32
5 5 7 7	32-34	33	PCB-2-32-34
7 9 9 5	34-36	46	PCB-2-34-36
7 5 5 4	36-38	50	PCB-2-36-38
3 4 3 2	38-40	83	PCB-2-38-40
R 4 3 2	40-42	50	PCB-2-40-42
7 10 10 11	42-44	75	PCB-2-42-44
7 9 8 6	44-46	58	PCB-2-44-46
20 17 15 16	46-48	8	PCB-2-46-48
20 12 7 8	48-50	8	PCB-2-48-50

EA Engineering, Science, and Technology, Inc.

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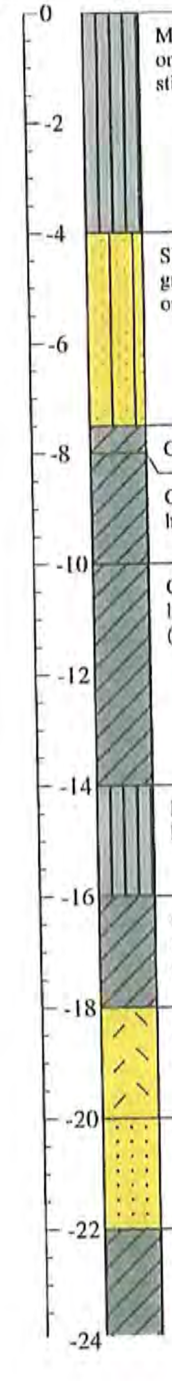
Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-3**
Location: Pearce Creek
Geologist: Nelson Brooks
Subcontractor: Uni-Tech Drilling Co., Inc.
Name of Driller: Jay Blemmings
Model Drill Rig: CME55LC ATV
Drilling Method: Mud Rotary
Date Started: 09/12/2008
Date Completed: 09/12/2008
Depth of Hole (ft): 50
Soil Boring
Elevation (ft): 37.54
Northing (ft): 643856.43
Easting (ft): 1598531.25
MD State Plane/NAD 83/NAVD 88
Surface Conditions: Soil and cleared brush
Comments:



Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
ML: Light olive brown (2.5Y 5/4), silt with few organics (disturbed soil from site clearing), dry, medium stiff			1 1 2 3	0-2	75	PCB-3-0-2
			2 3 3 3	2-4	83	PCB-3-2-4
SM: Light olive brown (2.5Y 5/4), silt with few fine grain sand, moist, medium stiff, iron staining, trace organics			1 3 3 3	4-6	75	PCB-3-4-6
			3 3 2 3	6-8	50	PCB-3-6-8
CL: Black (5Y 2.5/1), clay, wet, CL: Black (5Y 2.5/1), micaceous clay, wet, soft, homogenous, trace organics			1 1 2 1	8-10	58	PCB-3-8-10
CL: Black (5Y 2.5/1), micaceous clay, wet, very soft, homogenous, black laminations; 11'- 2" very dark gray (2.5Y 3/1), silty sand			H H H H	10-12	75	PCB-3-10-12
			H 2 1 1	12-14	75	PCB-3-12-14
ML: Very dark gray (5Y 3/1), clay with trace silt laminations, wet, very soft, trace organics, iron staining			H H H H	14-16	75	PCB-3-14-16
CL: Very dark gray (5Y 3/1), clay, wet, medium stiff, homogenous; 17'- 1" lignite lens with dark gray (2.5Y 4/1) medium grain angular sand			1 2 3 3	16-18	67	PCB-3-16-18
SP: Yellowish brown (2.5Y 6/3), poorly graded medium grain angular sand, wet, medium dense			4 4 5 5	18-20	50	PCB-3-18-20
SW: Dark gray (2.5Y 4/1), well graded medium grain sub-angular sand, wet, very loose, homogenous			H H 2 1	20-22	33	PCB-3-20-22
CL: Very dark gray (5Y 3/1, micaceous clay, wet, soft; 23'- 1" lens of olive gray (5Y 5/2), clay			H 1 1	22-24	58	PCB-3-22-24

Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: PCB-3

Location: PCB-3

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results		Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
			% Gr / Sa / Si / Cl	USCS				
-24		CL: Black (5Y 2.5/1), clay with trace fine grain sand, wet, very soft, trace organics, black laminations			H H H H	24-26	67	PCB-3-24-26
-26		CL: Very dark gray (5Y 3/1), micaceous clay with black laminations with trace fine grain sub-rounded gravel, wet, very soft, iron staining			H H H H	26-28	33	PCB-3-26-28
-28		CL: Very dark gray (5Y 3/1), micaceous clay with trace fine grain sand, black laminations, wet, soft, trace organics, homogenous; 31'- brown (10YR 5/3), clay lamination, wet, very soft			H H 1 1	28-30	42	PCB-3-28-30
-30		ML: Very dark gray (5Y 3/1), micaceous silt with black laminations, wet, soft, homogenous, trace lignites, trace organics, iron staining; 33'- 2" black (5Y 2.5/1), medium grain sub-angular sand stratification	4.3 / 10.4 / 68.4 / 16.9	CL-ML	H H H H	30-32	67	PCB-3-30-32
-32					1 0 1 1	32-34	67	PCB-3-32-34
-34		SM: Brown (10YR 5/3), silty fine grain sub-rounded sand, wet, medium dense SM: Light olive brown (2.5Y 5/3), silty medium grain sub-rounded sand with trace coarse grain sand, wet, medium dense	3.3 / 77.4 / 10.9 / 8.4	SM	7 8 8 11	34-36	58	PCB-3-34-36
-36		SM: Yellowish brown (10YR 5/4), silty medium grain sub-rounded to sub-angular sand, wet, medium dense			5 12 12 15	36-38	75	PCB-3-36-38
-38		SM: Yellowish brown (10YR 5/4), silty fine grain sub-rounded to sub-angular sand, wet, medium dense			9 10 9 11	38-40	75	PCB-3-38-40
-40		SM: Light olive brown (2.5Y 5/3) silty fine grain sub-angular sand, wet, loose sand ML: Yellowish brown (10YR 5/4), silt with few fine grain sand, wet, stiff			5 5 4 5	40-42	83	PCB-3-40-42
-42		ML: Gray (2.5Y 5/1), micaceous silt with trace fine grain sand, wet, stiff	0.5 / 32.0 / 48.4 / 19.1	CL-ML	3 4 4 5	42-44	83	PCB-3-42-44
-44					2 3 4 6	44-46	96	PCB-3-44-46
-46		ML: Gray (2.5Y 5/1), micaceous silt with trace fine grain sand, wet, medium stiff, trace lignites			2 2 3 5	46-48	67	PCB-3-46-48
-48		ML: Gray (2.5Y 5/1), micaceous silt with trace fine grain sand, wet, stiff			5 5 5 6	48-50	67	PCB-3-48-50
-50		END OF BORING = 50 FT						

EA Engineering, Science, and Technology, Inc.

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: PCB-4

Location: Pearce Creek

Geologist: Nelson Brooks

Subcontractor: Uni-Tech Drilling Co., Inc.

Name of Driller: Jay Blemmings

Model Drill Rig: CME55LC ATV

Drilling Method: Mud Rotary

Date Started: 09/09/2008

Date Completed: 09/09/2008

Depth of Hole (ft): 50

Soil Boring

Elevation (ft): 38.93

Northing (ft): 644586.66

Easting (ft): 1599660.30

MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results		Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
			% Gr / Sa / Si / Cl	USCS				
0	▥	ML: Dark grayish brown (10YR 4/3), silt with trace organics and iron staining (disturbed soil from site clearing), dry, very soft			H 1 1 1	0-2	25	PCB-4-0-2
-2	▥	SM: Olive brown (2.5Y 4/3), silty fine grained sand, moist, soft			1 1 2 2	2-4	58	PCB-4-2-4
-4	▥	ML: Dark brown (2.5Y 3/2), silt, dry, medium stiff			3 4 4 5	4-6	83	PCB-4-4-6
-6	▨	CL: Very dark gray (5Y 3/1), clay, moist, soft			5 3 3 2	6-8	75	PCB-4-6-8
-8	▥	SM: Dark olive gray (5Y 3/2), silty medium grain sand, wet, very loose sand; 2 in. clay lens at 11 ft bgs			1 1 1 3	8-10	100	PCB-4-8-10
-10	▥				H 1 H 1	10-12	42	PCB-4-10-12
-12	▨	CL: Black (5Y 2.5/1), clay, wet, very soft, darker black horizontal laminations observed throughout; woody material observed at 15 and 15.5 feet bgs			H 1 H 1	12-14	92	PCB-4-12-14
-14	▨				H H H H	14-16	100	PCB-4-14-16
-16	▨				H H H H	16-18	100	PCB-4-16-18
-18	▨				H H 1 2	18-20	75	PCB-4-18-20
-20	▨	CL: Very dark gray (5Y 3/1), clay, wet, very soft			H H 2 1	20-22	100	PCB-4-20-22
-22	▨				H H	22-24	100	PCB-4-22-24
-24								

Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-4**

Location: PCB-4

Depth (ft)	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
-24				H H H H	24-26	58	PCB-4-24-26
-26				H H H H	26-28	92	PCB-4-26-28
-28	CL: Black (2/5Y 2/5/1), clay, wet, very soft			H H H H	28-30	83	PCB-4-28-30
-30	CL: Very dark gray (2/5Y 3/1), clay, wet, very soft			R R R 2	30-32	83	PCB-4-30-32
-32	CL: Dark gray (2/5Y 4/1), clay, wet, medium stiff			2 2 3 3	32-34	92	PCB-4-32-34
-34	SM: Very dark gray (5Y 3/1), silty fine grained sand, wet, very loose sand			R R 1 1	34-36	75	PCB-4-34-36
-36	ML: Very dark gray (5Y 3/1), silt, wet, very soft; stratifications of silty sand within silty clay, dark gray (2/5Y 4/1)			H H H H	36-38	50	PCB-4-36-38
-38		1.7 / 12.4 / 55.3 / 30.6	ML	1 1 2 2	38-40	58	PCB-4-38-40
-40	ML: Dark gray (2.5Y 4/1), silt, wet, very soft			H 1 3 3	40-42	83	PCB-4-40-42
-42	SC: Brown (2.5Y 5/2), clayey fine grained sand, wet, loose sand			3 4 3 3	42-44	83	PCB-4-42-44
-44	SM: Dark gray (2.5Y 4/1), silty medium grained sand with a coarse grained sand stratification at 45.5 feet bgs, wet, loose sand; coarse grained sand lens at 47.5 feet bgs	3.8 / 87.6 / 2.0 / 6.6	SP-SM	3 3 3 4	44-46	58	PCB-4-44-46
-46				4 8 10 12	46-48	50	PCB-4-46-48
-48	SP-SM: Light gray (2.5Y 7/1), poorly graded sand with silt, wet, medium dense			6 8 13 16	48-50	50	PCB-4-48-50
-50	END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-5**	Location: Pearce Creek	Geologist: Nelson Brooks
Subcontractor: Uni-Tech Drilling Co., Inc.	Name of Driller: Jay Blemmings	
Model Drill Rig: CME55LC ATV	Drilling Method: Mud Rotary	
Date Started: 09/10/2008	Date Completed: 09/10/2008	Depth of Hole (ft): 50	Soil Boring
Elevation (ft): 35.35	Northing (ft): 644123.43	Easting (ft): 1600556.15	MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
0		ML: Dark brown (7.5YR 3/2), silt with trace fine grain sand (disturbed soil from site clearing), dry, soft			2 1 2 1	0-2	42	PCB-5-0-2
-2					2 2 1 2	2-4	50	PCB-5-2-4
-4		ML: Very dark gray (5Y 3/1), silt, moist, soft, root fragments, iron concretions			2 1 2 2	4-6	83	PCB-5-4-6
-6		ML: Very dark gray (5Y 3/1), silt, wet, soft, root fragments, iron concretions			1 2 1 1	6-8	33	PCB-5-6-8
-8					1 2 1 1	8-10	75	PCB-5-8-10
-10					H H H H	10-12	83	PCB-5-10-12
-12					H H H H	12-14	50	PCB-5-12-14
-14					H H H H	14-16	96	PCB-5-14-16
-16		ML: Very dark gray (5Y 3/1), silt, wet, soft, root fragments, iron concretions, black laminations			H H H 2	16-18	54	PCB-5-16-18
-18					H H H H	18-20	75	PCB-5-18-20
-20					R R R R	20-22	50	PCB-5-20-22
-22			0.0 / 2.8 / 65.5 /	ML	R R R R	22-24	75	PCB-5-22-24
-24								

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-5**

Location: PCB-5

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
-24			31.7		H H H H	24-26	33	PCB-5-24-26
-26					R R H H	26-28	83	PCB-5-26-28
-28					2 1 2 2	28-30	83	PCB-5-28-30
-30		ML: Olive gray (5Y 4/2), silt, wet ML: Gray (2.5Y 5/1), silt with trace fine grain sand, wet, very stiff	1.7 / 17.7 / 54.3 / 26.3	CL-ML	1 5 8 10	30-32	75	PCB-5-30-32
-32		ML: Light olive brown (2.5Y 5/3), silt with little coarse grain sand, wet, hard			5 7 50/3	32-34	50	PCB-5-32-34
-34		no recovery			4 4 3 3	34-36	0	N/A
-36		CL: Light olive brown (2.5Y 5/3), clay, wet, medium stiff, iron staining			3 3 3 5	36-38	58	PCB-5-36-38
-38		CL: Light olive brown (2.5Y 5/3), clay, wet, stiff, iron staining			4 6 7 5	38-40	67	PCB-5-38-40
-40		CL: Light olive brown (2.5Y 5/3), clay, wet, soft, iron staining CL: Fine grain sand with sub-rounded fine grain gravel, wet			H H H H	40-42	58	PCB-5-40-42
-42		CL: Grayish brown (2.5Y 4/2), clay, wet, medium stiff			3 3 3 4	42-44	58	PCB-5-42-44
-44		CL: Grayish brown (2.5Y 4/2), clay, wet, stiff			4 4 6 9	44-46	42	PCB-5-44-46
-46					4 4 5 5	46-48	17	PCB-5-46-48
-48		CL: Dark grayish brown (2.5Y 4/2), clay with little fine grain sand, wet, stiff			4 9 9 4	48-50	25	PCB-5-48-50
-50		END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-6**	Location: Pearce Creek	Geologist: Nelson Brooks
Subcontractor: Uni-Tech Drilling Co., Inc.	Name of Driller: Jay Blemmings	
Model Drill Rig: CME55LC ATV	Drilling Method: Mud Rotary	
Date Started: 09/11/2008	Date Completed: 09/11/2008	Depth of Hole (ft): 50 — Soil Boring
Elevation (ft): 34.65	Northing (ft): 643272.14 — Easting (ft): 1598307.21	MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
0		SW: Light yellowish brown (2.5Y 6/4), well graded fine grain sub-angular sand with silt (disturbed soil from site clearing), dry, loose			1 1 1 3	0-2	50	PCB-6-0-2
-2		ML: Dark grayish brown (2.5Y 4/2), clayey silt with light gray laminations, moist, medium stiff, slight plasticity, iron staining			2 1 2 3	2-4	67	PCB-6-2-4
-4		ML: Gray (2.5Y 5/1), silt, wet, soft, high plasticity, black laminations, iron staining			1 1 2 2	4-6	75	PCB-6-4-6
-6		ML: Very dark gray (5Y 3/1), silt, wet, high plasticity, soft, homogenous			2 1 1 2	6-8	50	PCB-6-6-8
-8		ML: Very dark gray (5Y 3/1), silt with trace medium grain sub-rounded sand and sub-rounded quartz grains and mica flakes, wet, soft, iron staining			1 2 1 2	8-10	50	PCB-6-8-10
-10		SP: Light yellowish brown (2.5Y 6/4), medium grained sand lamination, wet			H H H H	10-12	92	PCB-6-10-12
		ML: Very dark gray (5Y 3/1), clayey silt, wet, soft, black laminations, trace organics, iron staining						
-12					H H H H	12-14	50	PCB-6-12-14
-14					H H 1 1	14-16	83	PCB-6-14-16
-16		SM: Black (5Y 2.5/1), fine and medium grain sand, wet, very loose			1 1 1 1	16-18	50	PCB-6-16-18
		SM: Black (5Y 2.5/1), fine and medium grain sub-angular sand, wet, very loose						
-18		SC: Light yellowish brown (2.5Y 6/3) sand, with gray clay lamination, wet			1 1 0 0	18-20	50	PCB-6-18-20
-20		SM: Black (5Y 2.5/1), fine and medium grain sub-angular sand, wet, very loose			H H H H	20-22	50	PCB-6-20-22
		ML: Very dark gray (5Y 3/1), silt with fine grain sand laminations, wet, very soft						
-22		ML: Very dark gray (5Y 3/1), silt with fine grain sand laminations, wet, very soft, trace organic woody matter (lignite)	0.0 / 7.6 / 62.8 /	ML	H H H H	22-24	58	PCB-6-22-24
-24								

Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-6**

Location: PCB-6

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results: % Gr / Sa / Si / Cl	Geotechnical Results: USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
-24		ML: Very dark gray (5Y 3/1), silt, wet, very soft, black laminations iron stainings	29.6		H H H H	24-26	42	PCB-6-24-26
-26					R R R R	26-28	50	PCB-6-26-28
-28		SP: Light olive brown (2.5Y 5/3), poorly graded medium grain sand with trace sub-rounded fine gravel, wet, loose sand			H H 2 3	28-30	50	PCB-6-28-30
-30		SM: Light olive brown (2.5Y 5/3), silty fine and medium grain sand, wet, sub-angular and sub-rounded quartz grains and mica flakes, poorly graded, medium dense sand			2 2 4 10	30-32	42	PCB-6-30-32
-32					9 8 7 9	32-34	50	PCB-6-32-34
-34		CL: Gray (2.5Y 5/1), silty clay with little fine sand, wet, stiff, homogenous, iron staining			2 9 5 5	34-36	83	PCB-6-34-36
-36		CL: Dark gray (5Y 4/1), silty clay, wet, medium stiff, homogenous			2 2 5 4	36-38	50	PCB-6-36-38
-38		OL: Dark gray (5Y 4/1), organic silt with trace medium and coarse grain sand, and trace fine grain sub-rounded gravel, wet, medium stiff, iron staining	0.5 / 26.5 / 55.8 / 17.2	ML	3 4 3 3	38-40	58	PCB-6-38-40
-40					2 2 5 6	40-42	50	PCB-6-40-42
-42					4 5 6 7	42-44	67	PCB-6-42-44
-44		CL: Dark gray (2.5Y 4/1), clay with trace sub-angular coarse grain sand, wet, stiff, pungent hydrogen sulfate odor			2 3 5 6	44-46	75	PCB-6-44-46
-46		SM: Dark greenish gray (GLEY 1 4/1), fine and medium grain sub-angular silty sand, wet, medium dense, poorly graded			3 7 7 10	46-48	58	PCB-6-46-48
-48		SP: Greenish gray (GLEY 2 6/4), poorly graded fine and medium grain sand, with little light yellowish brown (2.5Y 6/3) silty sand, wet, dense			3 8 7 6	48-50	50	PCB-6-48-50
-50		END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-7**	Location: Pearce Creek	Geologist: Nelson Brooks
Subcontractor: Uni-Tech Drilling Co., Inc.	Name of Driller: Jay Blemmings	
Model Drill Rig: CME55LC ATV	Drilling Method: Mud Rotary	
Date Started: 09/12/2008	Date Completed: 09/12/2008	Depth of Hole (ft): 50	Soil Boring
Elevation (ft): 34.87	Northing (ft): 643507.99	Easting (ft): 1599207.45	MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
0		ML: Dark grayish brown (2.5Y 4/2) silt with few organics (disturbed soil from site clearing), dry, stiff			H 1 1 1	0-2	75	PCB-7-0-2
-2		ML: Dark grayish brown (2.5Y 4/2) silt with few fine sands, wet, soft, trace organics, iron staining			1 1 1 1	2-4	83	PCB-7-2-4
-4		SM: Very dark gray (5Y 3/1) silty sub-rounded fine grain sand, wet, soft, iron staining			2 2 1 2	4-6	67	PCB-7-4-6
-6		ML: Very dark gray (5Y 3/1) micaceous silt, wet, very soft, black laminations, iron staining, homogenous			1 1 0 1	6-8	75	PCB-7-6-8
-8		ML: Very dark gray (5Y 3/1) micaceous silt, wet, very soft, black laminations, trace organics, iron staining, homogenous			H H H H	8-10	83	PCB-7-8-10
-10		CL: Very dark gray (5Y 3/1) micaceous clay, wet, very soft, black laminations, trace organics, homogenous			H H H H	10-12	75	PCB-7-10-12
-12		CL: Very dark gray (5Y 3/1) micaceous clay, wet, very soft, black laminations, trace organics, trace lignites, homogenous			H H H 1	12-14	96	PCB-7-12-14
-14		ML: Very dark gray (5Y 3/1) micaceous silt, wet, very soft, black laminations, trace organics, homogenous 15'- 2" black (5Y 2.5/1) fine sand lens, sub-rounded grains			H H H H	14-16	92	PCB-7-14-16
-16		ML: Very dark gray (5Y 3/1) micaceous silt, wet, very soft, black laminations, homogenous			H H H H	16-18	83	PCB-7-16-18
-18		CL: Very dark gray (5Y 3/1) micaceous clay, wet, very soft, black laminations, homogenous 19'- 2" black (5Y 2.5/1) fine grained sand lens			H H H H	18-20	96	PCB-7-18-20
-20		ML: Very dark gray (5Y 3/1) micaceous silt with trace fine sand, wet, very soft, homogenous, iron stainings			H H H H	20-22	58	PCB-7-20-22
-22		ML: Very dark gray (5Y 3/1) micaceous silt with trace fine sand, wet, soft, homogenous, iron stainings			H 1 |	22-24	8	PCB-7-22-24
-24								

Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: PCB-7

Location: PCB-7

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results		Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
			% Gr / Sa / Si / Cl	USCS				
-24		MH: Very dark gray (5Y 3/1) micaceous elastic silt with black laminations, wet, very soft, trace lignites, homogenous	4.6 / 17.4 / 49.9 / 28.1	MH	H H H H	24-26	75	PCB-7-24-26
-26		MH: Very dark gray (5Y 3/1) micaceous elastic silt with black laminations, wet, very soft, homogenous			H H 1 1	26-28	83	PCB-7-26-28
-28		MH: Very dark gray (5Y 3/1) micaceous elastic silt with black laminations, wet, very soft, trace organics, homogenous 29.5'- 1" light yellow brown (2.5Y 6/3) silty clay lamination			H H H H	28-30	96	PCB-7-28-30
-30		ML: Very dark gray (5Y 3/1) micaceous silt with black laminations, wet, very soft, homogenous			H H H H	30-32	58	PCB-7-30-32
-32		ML: Very dark gray (5Y 3/1) micaceous silt with black laminations, wet, very soft, homogenous, trace lignites, trace organics, iron staining 33'- 2" black (5Y 2.5/1) medium grained sand lens, sub-angular			H H H H	32-34	75	PCB-7-32-34
-34		ML: Very dark gray (5Y 3/1) micaceous silt with black laminations, wet, very soft, homogenous, iron staining			H H H H	34-36	58	PCB-7-34-36
-36		ML: Very dark gray (5Y 3/1) micaceous silt wet, very soft, homogenous few lignites			H H H H	36-38	58	PCB-7-36-38
-38		MH: Very dark gray (5Y 3/1) micaceous elastic silt wet, very soft, homogenous some organics and lignites			H H H H	38-40	75	PCB-7-38-40
-40		ML: Very dark gray (5Y 3/1) micaceous silt with trace fine sand, wet, very soft,			H H H H	40-42	96	PCB-7-40-42
-42		ML: Very dark gray (5Y 3/1) micaceous silt with trace fine sand, wet, very soft, trace lignites			H H H H	42-44	67	PCB-7-42-44
-44		ML: Very dark gray (5Y 3/1) micaceous silt with trace fine sand, wet, very soft, black laminations, trace lignites	0.9 / 12.2 / 65.4 / 21.5	ML	H H H H	44-46	67	PCB-7-44-46
-46		ML: Very dark gray (5Y 3/1) micaceous silt with trace fine sand, wet, very soft, homogenous, black laminations			H H H H	46-48	92	PCB-7-46-48
-48		ML: Very dark gray (5Y 3/1) micaceous silt with trace fine sand, wet, very soft, homogenous, black laminations49.5'- dark grayish brown (2.5Y 4/2) clay laminations			H H 1 1	48-50	75	PCB-7-48-50
-50		END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: PCB-8

Location: Pearce Creek

Geologist: Nelson Brooks

Subcontractor: Uni-Tech Drilling Co., Inc.

Name of Driller: Jay Blemmings

Model Drill Rig: CME55LC ATV

Drilling Method: Mud Rotary

Date Started: 09/11/2008

Date Completed: 09/11/2008

Depth of Hole (ft): 50

Soil Boring

Elevation (ft): 32.97

Northing (ft): 643668.19

Easting (ft): 1600139.09

MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	 USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
0		ML: Dark gray (2.5Y 4/1), silt (disturbed soil from site clearing), moist, soft, iron staining, trace organics			1 1 2 1	0-2	67	PCB-8-0-2
-2		ML: Dark gray (2.5Y 4/1), silt, moist, soft, iron staining, trace organics ML: Very dark gray (5Y, 3/1), silt, moist, soft, iron staining			2 1 2 2	2-4	75	PCB-8-2-4
-4		ML: Very dark gray (5Y, 3/1), silt, wet, soft, homogenous, black laminations, iron staining, trace organics			1 0 1 1	4-6	50	PCB-8-4-6
-6		ML: Very dark gray (5Y, 3/1), micaceous silt, wet, soft, homogenous, black laminations, iron staining			1 1 1 1	6-8	50	PCB-8-6-8
-8					1 1 1 1	8-10	96	PCB-8-8-10
-10		CL: Very dark gray (5Y, 3/1), clay, wet, soft, homogenous, black laminations, iron staining, trace organics			H H H H	10-12	96	PCB-8-10-12
-12					H H H H	12-14	100	PCB-8-12-14
-14		CL: Very dark gray (5Y, 3/1), clay, wet, soft, homogenous			H H H H	14-16	96	PCB-8-14-16
-16		CL: Very dark gray (5Y, 3/1), clay, wet, soft, homogenous, trace organics , iron staining			H H 1 1	16-18	96	PCB-8-16-18
-18		CL: Very dark gray (5Y, 3/1), clay, wet, soft, homogenous			1 0 1 0	18-20	83	PCB-8-18-20
-20		MH: Very dark gray (5Y, 3/1), elastic silt, wet, soft, homogenous, trace lignites	0.3 / 4.1 / 58.8 / 36.8	MH	H H H H	20-22	96	PCB-8-20-22
-22		MH: Very dark gray (5Y, 3/1), elastic silt, wet, soft, homogenous, black laminations			H H H H	22-24	96	PCB-8-22-24
-24								

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: PCB-8

Location: PCB-8

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results		Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
			% Gr / Sa / Si / Cl	USCS				
-24					H H H H	24-26	67	PCB-8-24-26
-26		MH: Very dark gray (5Y, 3/1), elastic silt, wet, soft, homogenous			H H 1 1	26-28	92	PCB-8-26-28
-28		CL: Very dark gray (5Y, 3/1), clay, wet, very soft, homogeneous, black laminations			H H H H	28-30	67	PCB-8-28-30
-30		ML: Very dark gray (5Y, 3/1), silt, wet, very soft, homogenous, black laminations, trace organics, iron staining			H H H H	30-32	50	PCB-8-30-32
-32					H H H H	32-34	58	PCB-8-32-34
-34		ML: Very dark gray (5Y, 3/1), silt, wet, very soft, homogenous, black laminations, iron staining			H H H H	34-36	58	PCB-8-34-36
-36		ML: Very dark gray (5Y, 3/1), silt, wet, very soft, homogenous, black laminations, trace organics			H H H H	36-38	50	PCB-8-36-38
-38		ML: Very dark gray (5Y, 3/1), silt, wet, very soft, homogenous, black laminations, iron staining			H H H H	38-40	67	PCB-8-38-40
-40			0.0 / 9.8 / 63.1 / 27.1	ML	H H H H	40-42	83	PCB-8-40-42
-42		ML: Very dark gray (5Y, 3/1), silt, wet, very soft, homogenous, black laminations, trace organics; 42.5'-0.5" fine grain sand lamination			H H H H	42-44	83	PCB-8-42-44
-44					H H H H	44-46	67	PCB-8-44-46
-46		ML: Very dark gray (5Y, 3/1), silt, wet, soft, homogenous, black laminations, trace organics; 46.5'-5" lens of lignites with silt			1 1 2 2	46-48	83	PCB-8-46-48
-48		ML: Very dark gray (5Y, 3/1), silt, wet, medium stiff, homogenous, black laminations, trace organics			2 2 2 3	48-50	58	PCB-8-48-50
-50		END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-9**	Location: Pearce Creek	Geologist: Melissa Whitehead
Subcontractor: Uni-Tech Drilling Co., Inc.	Name of Driller: Jay Blemmings	
Model Drill Rig: CME55LC ATV	Drilling Method: Mud Rotary	
Date Started: 09/15/2008	Date Completed: 09/15/2008	Depth of Hole (ft): 50	Soil Boring
Elevation (ft): 30.81	Northing (ft): 643517.12	Easting (ft): 1600481.01	MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
0		ML: Dark grayish brown (2.5Y 4/2), silt with few organics (disturbed soil from site clearing), dry, soft			1 1 1 2	0-2	75	PCB-9-0-2
-2		ML: Dark grayish brown (2.5Y 4/2), silt with few organics, dry, soft			1 1 2 2	2-4	58	PCB-9-2-4
-4		ML: Very dark gray (5Y 3/1), micaceous silt with black laminations, dry ML: Very dark gray (5Y 3/1), micaceous silt with black laminations, trace root organics, wet, soft, homogenous			1 1 2 1	4-6	58	PCB-9-4-6
-6		ML: Very dark gray (5Y 3/1), micaceous silt with black laminations, trace root organics, trace wood lignites, iron staining, wet, very soft, homogenous			H H H H	6-8	75	PCB-9-6-8
-8		ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous			H H H H	8-10	92	PCB-9-8-10
-10					H H H H	10-12	75	PCB-9-10-12
-12		ML: Very dark gray (5Y 3/1), micaceous silt with black laminations, wet, very soft, homogenous			H H H H	12-14	75	PCB-9-12-14
-14					H H H H	14-16	92	PCB-9-14-16
-16					H H H H	16-18	67	PCB-9-16-18
-18		ML: Very dark gray (5Y 3/1), silt with some black organic roots, wet ML: Very dark gray (5Y 3/1), micaceous silt with black laminations, wet, very soft, trace organics, trace lignites; 19.5'- 1" Grayish brown (10YR 5/2), clay stratification			H H H H	18-20	58	PCB-9-18-20
-20		ML: Very dark gray (5Y 3/1), micaceous silt with black laminations, wet, very soft, trace lignites, homogenous			H H H H	20-22	67	PCB-9-20-22
-22		ML: Very dark gray (5Y 3/1), micaceous silt with black laminations, wet, very soft, few lignites, homogenous			H H H H	22-24	67	PCB-9-22-24
-24								

Log of Boring: **PCB-9**

Location: PCB-9

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
-24		ML: Very dark gray (5Y 3/1), micaceous silt with black laminations, wet, very soft, trace lignites, trace organics, iron staining			H H H H	24-26	67	PCB-9-24-26
-26		MH: Very dark gray (5Y 3/1), micaceous elastic silt with black laminations, wet, very soft, trace lignites			H H H H	26-28	83	PCB-9-26-28
-28		MH: Very dark gray (5Y 3/1), micaceous elastic silt with black laminations, wet, very soft, trace organics, homogenous; 29.75'- laminations of clay light brown clay with very dark gray clay			H H H H	28-30	96	PCB-9-28-30
-30					H H H H	30-32	83	PCB-9-30-32
-32		MH: Very dark gray (5Y 3/1), micaceous elastic silt with black laminations, wet, hard, trace lignites, homogenous			12 18 25 34	32-34	67	PCB-9-32-34
-34		OH: Very dark grayish brown (10YR 3/2), organic silt, medium stiff, moist, few organics, trace lignites	12.6 / 23.7 / 33.6 / 30.1	MH	H H H 4	34-36	83	PCB-9-34-36
-36		OH: Very dark grayish brown (10YR 3/2), micaceous organic silt, medium stiff, moist, few organics, little lignites, sporadic iron staining and trace iron cementation			1 2 2 3	36-38	92	PCB-9-36-38
-38		ML: Gray (5Y 4/1), micaceous silt with fine grain sand, wet, stiff, homogeneous, trace organics			2 2 4 5	38-40	96	PCB-9-38-40
-40		ML: Gray (5Y 4/1), micaceous silt with fine grain sand, wet, very stiff, black laminations, iron staining, trace black organics			4 10 10 12	40-42	83	PCB-9-40-42
-42		ML: Dark gray (5Y 4/1), micaceous silt, wet, very stiff, iron staining, trace lignites, trace iron cementations			8 8 10 11	42-44	67	PCB-9-42-44
-44		CL: Gray (2.5Y 5/1), micaceous clay, wet, medium stiff, iron staining, trace iron cementations, trace lignites			2 2 3 4	44-46	96	PCB-9-44-46
-46		CL: Gray (2.5Y 5/1), micaceous clay with fine grain sand, wet, soft, homogeneous, few organics			H H 1 2	46-48	50	PCB-9-46-48
-48		CL: Greenish gray (GLEY1 5/1), clay, wet, soft, homogenous, iron staining, trace iron cementation			H H 2 1	48-50	83	PCB-9-48-50
-50		END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-10**

Location: Pearce Creek

Geologist: Nelson Brooks

Subcontractor: Uni-Tech Drilling Co., Inc.

Name of Driller: Jay Blemmings

Model Drill Rig: CME55LC ATV

Drilling Method: Mud Rotary

Date Started: 09/08/2008

Date Completed: 09/08/2008

Depth of Hole (ft): 50

Soil Boring

Elevation (ft): 34.37

Northing (ft): 642541.80

Easting (ft): 1597983.03

MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

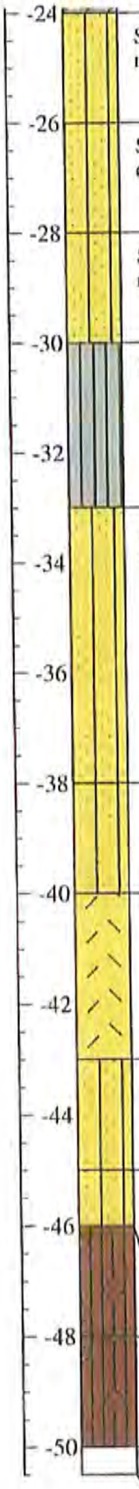
Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
0		ML: Very dark gray (5Y 3/1), silt with trace organics (disturbed soil from site clearing), dry, stiff			3 2 3 4	0-2	25	PCB-10-0-2
-2		ML: Very dark gray (5Y 3/1), clayey silt, dry, soft, homogeneous			3 4 3 2	2-4	29	PCB-10-2-4
-4		ML: Black (5Y 2.5/1), silt, moist, very soft, high plasticity, homogeneous			2 3 3 8	4-6	42	PCB-10-4-6
		SP: Dark gray (5Y 4/1), poorly graded medium grain sand with trace coarse grained sub-rounded sand, wet, medium dense						
-6					5 5 6 4	6-8	38	PCB-10-6-8
-8		ML: Black (5Y, 2.5/1), silt, wet, very soft, homogeneous			1 0 1 2	8-10	46	PCB-10-8-10
-10		SP: Dark gray (5Y 4/1), poorly graded medium grain sand with trace coarse grained sand, wet, loose sand			2 3 5 3	10-12	67	PCB-10-10-12
-12					3 7 7 6	12-14	25	PCB-10-12-14
		SP: Light olive brown (2.5Y 5/4) poorly graded medium grain sand, wet, loose sand						
-14					2 2 2 2	14-16	38	PCB-10-14-16
		SM: Light olive brown (2.5Y 5/3), silty fine grain sub-rounded sand, wet loose sand						
-16		SM: Light olive brown (2.5Y 5/4), silty fine grain sand with little sub-rounded fine gravel, wet, loose sand			2 3 3 3	16-18	50	PCB-10-16-18
		SM: Light olive brown (2.5Y 5/4), silty fine grain sand, wet, loose sand						
-18					2 3 7 6	18-20	33	PCB-10-18-20
		SM: Black (5Y 2.5/1), silty medium and fine grain sand with little fine sub-rounded gravel, wet, loose sand						
-20		GM: Light olive brown (2.5Y 5/4), silty fine grain gravel with few coarse grain sand, wet, loose sand, iron staining becoming more apparent			5 5 5 6	20-22	38	PCB-10-20-22
-22					3 H H H	22-24	50	PCB-10-22-24
		CL: Dark olive gray (5Y 3/2), clay, wet, very soft						
-24								

Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-10**

Location: PCB-10



Depth (ft)	Description of Materials	Geotechnical Results		Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
		% Gr / Sa / Si / Cl	USCS				
-24	SM: Light yellowish brown (2.5Y 6/4), silty sand, wet, medium dense	8.2 / 46.4 / 31.1 / 14.3	SC-SM	4 4 8 12	24-26	42	PCB-10-24-26
-26	SM: Light gray (2.5Y 7/2), silty sand, wet, medium dense			9 15 15 14	26-28	67	PCB-10-26-28
-28	SM: Light gray (2.5Y 7/1), silty fine grained sand, wet, medium dense sand, homogeneous			6 6 10 13	28-30	54	PCB-10-28-30
-30	ML: Pinkish gray (7/5 YR 6/2), silt, wet, very stiff	0.5 / 54.0 / 26.1 / 19.4	SM	9 23 50/4	30-32	4	PCB-10-30-32
-32				12 18 25 34	32-34	75	PCB-10-32-34
-34	SM: Light yellowish brown (2.5Y 6/3), silty fine grain sand, wet, very loose sand, well sorted			19 24 32 38	34-36	50	PCB-10-34-36
-36				8 9 9 10	36-38	50	PCB-10-36-38
-38	SM: Light yellowish brown (2.5Y 6/3), silty fine grain sand, wet, very loose sand, well sorted with black laminations			10 18 25 26	38-40	17	PCB-10-38-40
-40	SP: Light gray (2.5Y 7/2), poorly graded medium grain sand, wet, very dense sand			29 34 38 41	40-42	50	PCB-10-40-42
-42				27 42 50/3	42-44	33	PCB-10-42-44
-44	SM: Light yellowish brown (2.5Y 6/4), silty coarse sand with little fine grain gravel, wet, very dense sand SM: Light yellowish brown (2.5Y 6/3), silty medium grain sand with few fine grained gravel, wet, very dense sand			13 22 24 31	44-46	17	PCB-10-44-46
-46	GM: Pale olive (5Y 6/3), silty sub-angular fine grain gravel with trace silt, wet, well sorted and very dense			33 50/3	46-48	29	PCB-10-46-48
-48	GM: Pale olive (5Y 6/3), silty sub-angular fine grain gravel with trace silt, wet, well sorted and very dense sand			24 31 50/3	48-50	33	PCB-10-48-50
-50	END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-11**	Location: Pearce Creek	Geologist: Melissa Whitehead
Subcontractor: Uni-Tech Drilling Co., Inc.	Name of Driller: Jay Blemmings	
Model Drill Rig: CME55LC ATV	Drilling Method: Mud Rotary	
Date Started: 09/16/2008	Date Completed: 09/16/2008	Depth of Hole (ft): 50 — Soil Boring
Elevation (ft): 33.50	Northing (ft): 642751.86 — Easting (ft): 1599281.83	MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
0		ML: Dark grayish brown (2.5Y 4/2), silt with little fine grain sand and few organics (disturbed soil from site clearing), dry, soft, iron staining			1 1 1 1	0-2	33	PCB-11-0-2
-2		SM: Gray (5Y 5/1), silty fine grain sub-rounded sand, moist, poorly graded, very loose sand, trace organics, iron staining			H 2 2 2	2-4	58	PCB-11-2-4
-4		ML: Black (GLEY1 5Y 3/1), micaceous silt with fine grain sand, wet, medium stiff, trace organics, iron staining			2 2 3 3	4-6	67	PCB-11-4-6
-6		ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous, black laminations, few organics			2 2 1 H	6-8	58	PCB-11-6-8
-8		ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous, black laminations, few organics			H 1 2 1	8-10	75	PCB-11-8-10
-10		ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous, black laminations, few organics			H H H H	10-12	96	PCB-11-10-12
-12		ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, black laminations, trace organics, trace lignites			H H H H	12-14	83	PCB-11-12-14
-14		ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, iron staining, few organics			H H H H	14-16	96	PCB-11-14-16
-16					H H H H	16-18	75	PCB-11-16-18
-18		ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, black laminations, trace organics			H H H H	18-20	75	PCB-11-18-20
-20		ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous, iron staining;21'- 2" lens of mottled brown (7.5YR 5/3) silt from the Potomac formation	2.8 / 13.1 / 55.2 / 28.9	ML	H H 2 1	20-22	75	PCB-11-20-22
-22		ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous, trace organics			H H	22-24	75	PCB-11-22-24
-24								

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-11**

Location: PCB-11

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results		Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
			% Gr / Sa / Si / Cl	USCS				
-24		ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, mottled black (Gley 1 2.5/1) silt, trace organics			R R R R	24-26	58	PCB-11-24-26
-26					H H H 1	26-28	75	PCB-11-26-28
-28		ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous, black laminations, trace organics			H H 2 1	28-30	92	PCB-11-28-30
-30		ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous			H H H H	30-32	75	PCB-11-30-32
-32		ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous, trace lignites			H H H H	32-34	75	PCB-11-32-34
-34		ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous; 35.5'- 1" lamination of lignite with brown (7.5YR 5/3) silt			H H 2 1	34-36	83	PCB-11-34-36
-36		ML: Dark gray (2.5Y 4/1), silt with fine grain sub-angular sand, wet, stiff, trace lignites			H H 4 6	36-38	83	PCB-11-36-38
-38		ML: Dark gray (2.5Y 4/1), silt with laminations of fine grain sub-angular sand with trace coarse grain sand, wet, stiff, poorly graded			4 4 4 5	38-40	83	PCB-11-38-40
-40		ML: Gray (2.5Y 6/1), silt with trace organics, wet						
		ML: Olive gray (5Y 4/2), silt with trace medium grain sub-angular sand, poorly graded, wet			5 6 8 9	40-42	75	PCB-11-40-42
-42		SM: Gray (2.5Y 6/1), fine grain micaceous silty sand, wet, medium dense	0.4 / 84.2 / 9.2 / 6.2	SM	4 5 7 9	42-44	33	PCB-11-42-44
		SM: Dark yellowish brown (10YR 4/6), medium grain angular silty sand, wet, medium dense						
-44		SM: Light olive brown (2.5Y 5/4), fine grain silty sand with trace sub-angular medium grain silty sand, wet, medium dense			5 6 11 10	44-46	58	PCB-11-44-46
-46		SM: Light gray (2.5Y 7/2), fine grain sub-rounded micaceous silty sand, wet			5 6 7 7	46-48	33	PCB-11-46-48
-48		SP: Light olive brown (2.5Y 5/3) medium grained angular sand, wet, medium dense			6 6 6 6	48-50	42	PCB-11-48-50
		SW: Light olive brown (2.5Y 5/6) well graded coarse grain angular sand, wet, medium dense 49.75'- 1" Light gray (2.5Y 7/1) medium grain angular sand						
-50		END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-12**	Location: Pearce Creek	Geologist: Melissa Whitehead
Subcontractor: Uni-Tech Drilling Co., Inc.	Name of Driller: Jay Blemmings	
Model Drill Rig: CME55LC ATV	Drilling Method: Mud Rotary	
Date Started: 09/15/2008	Date Completed: 09/15/2008	Depth of Hole (ft): 50	Soil Boring
Elevation (ft): 33.02	Northing (ft): 642439.55	Easting (ft): 1599416.85	MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
0	▥	ML: Dark grayish brown (2.5Y 4/2), silt with little silt, few organics (disturbed soil from site clearing), dry, medium stiff			1 3 2 2	0-2	58	PCB-12-0-2
-2	▥	ML: Very dark gray (5Y 3/1), micaceous silt, moist, medium stiff, trace organics, trace iron staining			2 3 3 3	2-4	67	PCB-12-2-4
-4	▥	ML: Very dark gray (5Y 3/1), micaceous silt with black laminations, wet, medium stiff, trace lignites, trace iron staining			2 2 3 2	4-6	83	PCB-12-4-6
-6	▥	ML: Very dark gray (5Y 3/1), micaceous silt with black laminations, wet, medium stiff, trace iron staining			2 2 3 2	6-8	58	PCB-12-6-8
-8	▥	ML: Very dark gray (5Y 3/1), micaceous silt with black laminations, wet, soft, homogenous			2 1 2 1	8-10	92	PCB-12-8-10
-10	▨	CL: Very dark gray (5Y 3/1), micaceous clay with black laminations, wet, very soft, homogenous			H H H H	10-12	92	PCB-12-10-12
-12	▨	CL: Very dark gray (5Y 3/1), micaceous clay with black laminations, wet, very soft, homogenous, trace lignites			H H H H	12-14	92	PCB-12-12-14
-14	▨	CL: Very dark gray (5Y 3/1), micaceous clay with black laminations, wet, very soft, homogenous, iron staining and concretions			H H H H	14-16	67	PCB-12-14-16
-16	▥	ML: Very dark gray (5Y 3/1), micaceous silt with black laminations, wet, very soft, homogenous, trace lignites, iron staining and concretions			H H H H	16-18	83	PCB-12-16-18
-18	▥	ML: Very dark gray (5Y 3/1), micaceous silt with trace fine grain sand, wet, soft, trace organics			H 2 1 2	18-20	50	PCB-12-18-20
-20	▥	ML: Gray (2.5Y 6/1), micaceous silt with few fine grain sand, wet, stiff, iron staining, trace organics	13.6 / 18.5 / 51.9 / 16.0	CL-ML	2 5 7 8	20-22	67	PCB-12-20-22
-22	▥	ML: Gray (2.5Y 6/1), micaceous silt with little fine grain sand, wet, stiff, iron staining, trace iron cementation,			6 7 12 13	22-24	67	PCB-12-22-24
-24								

Log of Boring: **PCB-12**

Location: PCB-12

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
-24		ML: Gray (2.5Y 6/1), micaceous silt with little fine sands, wet, stiff, homogenous			5 5 5 7	24-26	83	PCB-12-24-26
-26					5 5 6 7	26-28	50	PCB-12-26-28
-28		SM: Gray (2.5Y 6/1, medium grain sub-angular silty sand, wet, medium dense, iron stainings	1.0 / 69.9 / 17.0 / 12.1	SM	4 5 6 5	28-30	50	PCB-12-28-30
-30		SM: Light gray (2.5Y 7/1), angular to sub-angular medium grain silty sand with trace coarse grain sand, wet, medium dense, iron staining			6 8 8 12	30-32	67	PCB-12-30-32
-32		ML: Light yellowish brown (2.5Y 6/3), micaceous clayey silt with some fine grain sand, wet, very stiff			7 7 9 15	32-34	50	PCB-12-32-34
-34		SM: Gray (2.5Y 6/1), fine grain micaceous sand, wet, loose sand 35.5'- 1" dark gray clay lens			H H H 4	34-36	83	PCB-12-34-36
-36		SM: Gray (2.5Y 6/1), fine grain sub-angular micaceous sand, with 3" of light brownish gray (2.5Y 6/2), clay and silt laminations, wet, dense, iron staining			13 13 16 17	36-38	58	PCB-12-36-38
-38		SM: Light gray (2.5Y 7/1), fine grain sub-angular micaceous sand with trace medium grain sand, wet, dense			13 13 14 14	38-40	58	PCB-12-38-40
-40		SP: Light gray (2.5Y 7/1), poorly graded medium grain sub-angular sand with trace clay, wet, medium dense			4 4 5 6	40-42	58	PCB-12-40-42
-42		SC: Light gray (2.5Y 7/1), medium grain sub-angular clayey sand, wet, loose; 43.5'- 2" coarse sand lens, sub-angular saline/quartz gravel			3 4 5 3	42-44	42	PCB-12-42-44
-44		SC: Light gray (2.5Y 7/1), medium grain sub-angular clayey sand, wet, dense			10 14 17 22	44-46	50	PCB-12-44-46
-46		SM: Olive yellow (2.5Y 6/6), fine grain sub-angular silty sand, wet, medium dense			7 16 10 10	46-48	50	PCB-12-46-48
-48		SP-SM: Yellowish brown (10YR 5/6), poorly graded medium grain sub-angular sand with silt, wet, medium dense 49.5'- 3" laminations of black silt and gray (2.5Y 5/1) fine grain sand			6 6 6 6	48-50	42	PCB-12-48-50
-50		END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-13**	Location: Pearce Creek	Geologist: Melissa Whitehead
Subcontractor: Uni-Tech Drilling Co., Inc.	Name of Driller: Jay Blemmings	
Model Drill Rig: CME55LC ATV	Drilling Method: Mud Rotary	
Date Started: 09/22/2008	Date Completed: 09/22/2008	Depth of Hole (ft): 50 / Soil Boring
Elevation (ft): 32.47	Northing (ft): 642494.67 / Easting (ft): 1600020.22	MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results		Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
			% Gr / Sa / Si / Cl	USCS				
0		ML: Olive gray (2.5Y 4/3), silt with little fine grain sand, trace organics (disturbed soil from site clearing), dry, soft, iron staining			1 2 1 1	0-2	17	PCB-13-0-2
-2		ML: Dark grayish brown (2.5Y 4/2), silt with few organics, dry, iron staining, medium stiff			3 2 2 3	2-4	67	PCB-13-2-4
-4		ML: Very dark grayish brown (2.5Y 3/2), clayey silt, moist, soft, trace organics			3 2 2 2	4-6	50	PCB-13-4-6
-6		ML: Dark grayish brown (5Y 3/1), micaceous silt, trace organics, wet, soft			2 2 1 1	6-8	50	PCB-13-6-8
-8		ML: Dark grayish brown (5Y 3/1), micaceous silt with black laminations, trace organics, trace lignites, wet, very soft, homogenous			1 1 1 H	8-10	50	PCB-13-8-10
-10		ML: Dark grayish brown (5Y 3/1), micaceous silt with mottled black silt, trace dark grayish brown (2.5Y 4/2) silt, trace lignites, wet, very soft			H H H H	10-12	58	PCB-13-10-12
-12		ML: Dark grayish brown (5Y 3/1), micaceous silt, few organics, wet, soft			H 1 1 1	12-14	50	PCB-13-12-14
-14		ML: Dark grayish brown (5Y 3/1), micaceous silt with mottled black silt, trace organics, iron staining, wet, very soft, homogenous			H H H H	14-16	96	PCB-13-14-16
-16					H H H H	16-18	58	PCB-13-16-18
-18		ML: Dark grayish brown (5Y 3/1), micaceous silt with mottled black silt, trace lignites, trace organics, iron staining, wet, very soft, homogenous			H 1 1 1	18-20	83	PCB-13-18-20
-20		ML: Dark gray (5Y 4/1), micaceous silt with mottled black silt, trace lignites, trace organics, iron staining, wet, very soft			H H H H	20-22	75	PCB-13-20-22
-22		ML: Dark gray (5Y 4/1), micaceous silt, trace lignites, iron staining, very soft, wet, homogenous			H H	22-24	58	PCB-13-22-24
-24								

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: PCB-13

Location: PCB-13

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results		Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
			% Gr / Sa / Si / Cl	USCS				
-24		ML: Dark gray (5Y 4/1), silt, trace organics, wet, very soft, homogenous			H H H H	24-26	75	PCB-13-24-26
-26		ML: Dark gray (5Y 4/1), silt with black laminations, few organics, trace laminations, wet, very soft			H H H H	26-28	50	PCB-13-26-28
-28		ML: Dark gray (5Y 4/1), silt with black laminations, trace fine silt, trace organics, trace lignites, wet, very soft	0.1 / 3.6 / 63.7 / 32.6	ML	H H H H	28-30	96	PCB-13-28-30
-30		ML: Dark gray (5Y 4/1), silt with black mottled silt, trace organics, wet, very soft, homogenous			H H H H	30-32	83	PCB-13-30-32
-32		ML: Dark gray (5Y 4/1) silt with black laminations, trace organics, wet, very soft, homogenous			H H H H	32-34	75	PCB-13-32-34
-34		ML: Dark gray (5Y 4/1), silt, wet, very soft, homogenous			H H H H	34-36	92	PCB-13-34-36
-36		MH: Dark gray elastic silt (5Y 4/1) with trace organics, wet			H H H H	36-38	75	PCB-13-36-38
-38					H H 2 1	38-40	75	PCB-13-38-40
-40		PT: Dark olive gray (5Y 3/2), clayey silt with some organics, trace lignites, wet, soft, homogenous	0.1 / 20.0 / 57.1 / 22.8	MH	H H H H	40-42	58	PCB-13-40-42
-42		PT: Dark gray (5Y 4/1), clay with some organics, few lignites, wet, soft, homogenous			H H H 2	42-44	67	PCB-13-42-44
-44		OH: Dark olive gray (5Y 3/2), organic silt with few gray (5Y 5/1) fine grain sub-angular sand, some organics, trace lignites, wet, medium stiff			1 2 2 3	44-46	75	PCB-13-44-46
-46		SM: Gray (2.5Y 5/1), fine grain silty sand with trace clay, light olive brown (2.5Y 5/4) fine grain sand laminations at 47' for 4", wet, soft, very loose			1 2 2 5	46-48	42	PCB-13-46-48
-48		SM: Olive yellow (2.5Y 6/6), medium grain sub-angular silty sand, trace sub-rounded fine grain gravel, wet			6 10 10 12	48-50	33	PCB-13-48-50
-50		SM: White (2.5Y 8/1), fine grain silty sand, wet						
		END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: PCB-14

Location: Pearce Creek

Geologist: Melissa Whitehead

Subcontractor: Uni-Tech Drilling Co., Inc.

Name of Driller: Jay Blemmings

Model Drill Rig: CME55LC ATV

Drilling Method: Mud Rotary

Date Started: 09/19/2008

Date Completed: 09/19/2008

Depth of Hole (ft): 50

Soil Boring

Elevation (ft): 30.17

Northing (ft): 642899.81

Easting (ft): 1601058.87

MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results		Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
			% Gr / Sa / Si / Cl	USCS				
0		ML: Dark grayish brown (2.5Y 4/2), silt with little fine grain sand and little organics (disturbed soil from site clearing), dry, medium stiff, iron staining			2 2 2 4	0-2	58	PCB-14-0-2
-2		ML: Very dark gray (2.5Y 3/1), silt with trace clay, moist, stiff, iron staining			4 4 5 5	2-4	58	PCB-14-2-4
-4		ML: Very dark gray (5Y 3/1), micaceous silt with mottled black silt, trace organics, wet, medium stiff, homogenous			5 4 5 3	4-6	75	PCB-14-4-6
-6		ML: Very dark gray (5Y 3/1), micaceous silt with mottled black silt, trace organics, wet, soft, homogenous			2 2 2 1	6-8	67	PCB-14-6-8
-8		CL: Very dark gray (5Y 3/1), micaceous clay with mottled black clay, trace lignites, trace organics, wet, soft, homogenous			1 1 1 1	8-10	96	PCB-14-8-10
-10		CL: Very dark gray (5Y 3/1), micaceous clay with trace organics, wet, very soft, homogenous			H H H H	10-12	96	PCB-14-10-12
-12		CL: Very dark gray (5Y 3/1), micaceous clay with mottled black clay, trace lignites, wet, very soft			H H H H	12-14	96	PCB-14-12-14
-14		CL: Very dark gray (5Y 3/1), micaceous clay with mottled black clay, trace organics, wet, very soft, homogenous			H H H H	14-16	83	PCB-14-14-16
-16		CL: Very dark gray (5Y 3/1), micaceous clay with trace organics, trace lignites, wet, very soft, homogenous			H H H H	16-18	83	PCB-14-16-18
-18		CL: Very dark gray (5Y 3/1), micaceous clay with trace sub-angular fine grain sand, black mottled clay, trace organics, wet, very soft, homogenous			H H H H	18-20	50	PCB-14-18-20
-20		ML: Yellowish brown (10YR 5/4), sandy silt with trace mica, wet, medium stiff	30.2 / 28.5 / 27.9 / 13.4	GC-GM	1 1 2 4	20-22	42	PCB-14-20-22
-22		ML: Yellowish brown (10YR 5/4), clayey silt with trace medium grain sub-rounded sand, wet, medium dense			1 3 5 7	22-24	75	PCB-14-22-24
-24								

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: PCB-14

Location: PCB-14

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results: % Gr / Sa / Si / Cl	Geotechnical Results: USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
-24		ML: Gray (2.5Y 5/1), silt with black mottled silt and trace dark yellowish brown (10YR 4/4) angular sand, wet, medium stiff			2 2 2 4	24-26	58	PCB-14-24-26
-26		ML: Light brownish (2.5Y 6/2), silt with trace yellowish brown (10YR 5/6) clay, trace very fine grain sand, iron staining, wet, stiff			3 4 5 8	26-28	25	PCB-14-26-28
-28		CL: Grayish brown (2.5Y 6/2), clay with trace very fine angular sand, wet, soft, homogenous			1 1 2 2	28-30	33	PCB-14-28-30
-30		CL: Gray (2.5Y 6/1), clay with trace angular sand, iron stainings, wet, medium stiff, homogenous			1 2 2 3	30-32	83	PCB-14-30-32
-32		CL: Gray (2.5Y 5/1), micaceous clay, wet, soft, homogenous			1 2 2 2	32-34	50	PCB-14-32-34
-34		ML: Very dark gray (5Y 3/1), clayey silt with angular fine grain sand, wet, medium stiff, homogenous			1 2 2 3	34-36	58	PCB-14-34-36
-36		ML: Very dark gray (5Y 3/1), clayey silt, with trace sub-rounded fine grain sand, 2"- gray (2.5Y 6/1) fine grain sub-rounded sand lens at 37.5', wet			1 1 1 1	36-38	75	PCB-14-36-38
-38		CL: Dark gray (2.5Y 4/1), clay with little fine grain sub-rounded sand, wet, soft, homogenous CL: Dark gray silty clay (5Y 4/1) with trace organics, wet			1 1 2 2	38-40	50	PCB-14-38-40
-40		SM: Greenish gray (GLEY 1 6/1), silty very fine grain sand, iron staining, sub-angular, wet, loose	1.2 / 80.6 / 8.8 / 9.4	SM	1 2 3 3	40-42	58	PCB-14-40-42
-42		SM: Greenish gray (GLEY 1 6/1), silty very fine grain sand, iron staining, with little dark grayish brown (2.5Y 3/2) fine grain sand, iron staining, wet, loose			2 2 2 2	42-44	50	PCB-14-42-44
-44		SP: Greenish gray (GLEY 1 6/1), poorly graded very fine grain sand with trace olive brown (2.5Y 4/3) silt, wet, very loose			1 2 1 1	44-46	33	PCB-14-44-46
-46		SM: Very dark bluish gray (GLEY 2 3/1), fine grain sub-rounded silt sand, wet, medium dense			4 9 12 12	46-48	33	PCB-14-46-48
-48		ML: Very dark greenish gray (GLEY2 3/1), sandy silt with few medium grain sub-rounded sand, trace angular, fine gravel, wet, hard			15 15 22 24	48-50	33	PCB-14-48-50
-50		END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-15**	Location: Pearce Creek	Geologist: Melissa Whitehead
Subcontractor: Uni-Tech Drilling Co., Inc.	Name of Driller: Jay Blemmings	
Model Drill Rig: CME55LC ATV	Drilling Method: Mud Rotary	
Date Started: 09/17/2008	Date Completed: 09/17/2008	Depth of Hole (ft): 50 — Soil Boring
Elevation (ft): 34.41	Northing (ft): 642060.01 — Easting (ft): 1597344.06	MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

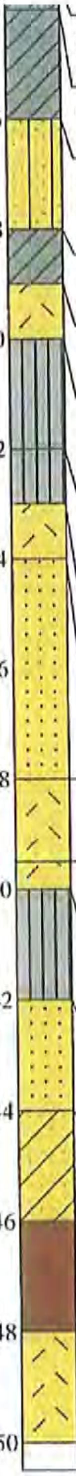
Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS
0	▥	ML: Dark gray (2.5Y 4/1), silt (disturbed soil from site clearing) with few organics, dry, medium stiff, iron staining		
-2	▥	ML: Dark gray (2.5Y 4/1), clayey silt with few organics, moist, stiff, trace lignites		
-4	▥	ML: Black (5Y 2.5/1), micaceous silt with black laminations, moist, medium stiff, trace lignites		
-6	▨	CL: Black (5Y 2.5/1), micaceous clay, wet, soft, homogenous, trace lignites		
-8	▨	CL: Very dark gray (5Y 3/1), micaceous clay with trace medium grain sub-rounded sand, wet, soft, little lignites		
-10 -12	▨	CL: Very dark gray (5Y 3/1), micaceous clay, wet, very soft, homogenous		
-14	▥	ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous		
	░	SP: Dark gray (5Y 4/1), poorly graded fine grain sub-angular sand, iron staining, wet, loose		
-16 -18	░	SW: Dark gray (5Y 4/1), well graded fine grain sub-angular sand, wet, loose	3.4 / 84.3 / 6.3 / 6.0	SM
	▨	CL: Very dark gray (5Y 3/1), micaceous clay, wet, soft, homogenous		
-20	▨	CL: Very dark gray (5Y 3/1), micaceous clay wet, soft, homogenous		
-22	▥	ML: Dark gray (5Y 4/1), silt with black (GLEY 1 2.5/1) laminations, wet		
	▨	CL: Dark gray (5Y 4/1), micaceous silt with few fine grain sand, wet, soft, few organics, iron stainings		
-24				

Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
2 3 3 4	0-2	58	PCB-15-0-2
3 3 4 5	2-4	75	PCB-15-2-4
3 4 3 3	4-6	75	PCB-15-4-6
3 4 1 1	6-8	83	PCB-15-6-8
1 1 1 1	8-10	96	PCB-15-8-10
H H H H	10-12	96	PCB-15-10-12
H H H H	12-14	83	PCB-15-12-14
1 2 3 5	14-16	58	PCB-15-14-16
2 2 3 4	16-18	33	PCB-15-16-18
2 1 1 1	18-20	50	PCB-15-18-20
1 1 1 1	20-22	75	PCB-15-20-22
H 1 0	22-24	50	PCB-15-22-24

Log of Boring: **PCB-15**

Location: PCB-15



Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
-24		CL: Very dark gray (5Y 3/1), micaceous clay wet, soft, homogenous CL: Light olive brown (2.5Y 5/3), silty clay, wet, stiff, trace organics, potential iron staining, homogenous			2 2 5 10	24-26	67	PCB-15-24-26
-26		SM: Light olive brown (2.5Y 5/3), medium grain sub-rounded silty sand with trace coarse grain and trace fine grain gravel, wet, medium dense	9.7 / 56.5 / 23.5 / 10.3	SM	5 5 8 9	26-28	92	PCB-15-26-28
-28		CL: Light greenish gray (Gley 1 7/1), clay with trace fine grain sand iron staining, wet SP: Light olive brown (2.5Y 5/3) poorly graded fine grain sub-angular sand, wet, medium dense			5 9 8 13	28-30	42	PCB-15-28-30
-30		ML: Light yellowish brown (2.5Y 6/3), clayey with few fine grain sand, laminations of white (2.5Y 8/1) fine grain sand, wet, medium dense			7 8 7 9	30-32	58	PCB-15-30-32
-32		ML: Light yellowish brown (2.5Y 6/3), silt with few fine grain sand and trace fine grain round gravel, wet, stiff, iron staining			6 12 15 23	32-34	25	PCB-15-32-34
-34		SP: White (2.5Y 8/1), poorly graded fine grain sub-rounded to sub-angular sand, wet, dense			41 50/3	34-36	25	PCB-15-34-36
-36		SW: White (5Y 8/1), well graded medium grain sub-rounded sand, wet, very dense, homogeneous			50/6	36-38	17	PCB-15-36-38
-38		SP: White (5Y 8/1), poorly graded medium grain sub-angular sand, wet, medium dense, potential iron staining			10 10 10 6	38-40	33	PCB-15-38-40
-40		SP: Light yellow brown (2.5Y 6/3), fine grain sand lamination, wet ML: Gray (5Y 5/1), micaceous clayey silt with trace fine grain sand, wet, medium dense, iron staining 41'- 1" white (2.5Y 8/1), fine grain sand stratification			6 9 10 14	40-42	42	PCB-15-40-42
-42		SW: White (5Y 8/1), well graded medium grained sub-angular sand with trace sub-rounded coarse grain sand and trace sub-angular fine gravel, wet, medium dense			6 13 9 6	42-44	33	PCB-15-42-44
-44		SC: White (2.5 8/1), clayey fine grain sub-angular sand with trace medium grain sand, wet, very loose			1 1 H H	44-46	8	PCB-15-44-46
-46		GP: Angular coarse grain sand and sub-rounded fine grain gravel possible slush, wet			H 1 H H	46-48	17	PCB-15-46-48
-48		SP: Light gray (2.5Y 7/1), poorly graded fine grain sand with light gray (2.5Y 7/2) silty clay laminations and trace sub-rounded fine grain gravel, wet, very loose			H H 2 H	48-50	25	PCB-15-48-50
-50		END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-16**	Location: Pearce Creek	Geologist: Melissa Whitehead
Subcontractor: Uni-Tech Drilling Co., Inc.	Name of Driller: Jay Blemmings	
Model Drill Rig: CME55LC ATV	Drilling Method: Mud Rotary	
Date Started: 09/17/2008	Date Completed: 09/17/2008	Depth of Hole (ft): 50 — Soil Boring
Elevation (ft): 32.08	Northing (ft): 641649.50 — Easting (ft): 1598160.73	MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments: Comment

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
0		ML: Dark grayish brown (2.5Y 4/2) silt with little fine silt, few organics (disturbed soil from site clearing), dry, stiff, iron staining			1 3 3 2	0-2	58	PCB-16-0-2
-2		ML: Dark grayish brown (2.5Y 4/2) clayey silt with few organics, trace lignites, moist, stiff			2 2 2 2	2-4	67	PCB-16-2-4
-4		ML: Micaceous black (Gley 1 2.5/) silt, wet, soft, homogenous			2 2 2 1	4-6	75	PCB-16-4-6
-6		ML: Micaceous black (5Y 2.5/1) silt, wet, soft, homogenous			1 2 2 1	6-8	96	PCB-16-6-8
-8					1 1 1 1	8-10	96	PCB-16-8-10
-10		ML: Very dark gray (5Y 3/1) micaceous silt with black laminations, very soft, wet, homogenous			H H H H	10-12	96	PCB-16-10-12
-12		ML: Very dark gray (5Y 3/1) micaceous silt with black laminations, very soft, wet, homogenous, trace organics			H H H H	12-14	96	PCB-16-12-14
-14		ML: Very dark gray (5Y 3/1) micaceous silt with vertical black laminations, very soft, wet, homogenous, iron staining, trace organics			H H H H	14-16	96	PCB-16-14-16
-16		ML: Very dark gray (5Y 3/1) micaceous silt with few fine grained sand, wet, very soft, iron cementations ML: 17.5'- Pale olive (5Y 6/3) silt lamination, wet			H H H H	16-18	96	PCB-16-16-18
-18		ML: Very dark gray (5Y 3/1) micaceous silt with few fine grained sand, wet, very soft, homogenous			H H H H	18-20	50	PCB-16-18-20
-20		ML: Very dark gray (5Y 3/1) silt with mottled black (5Y 2.5/1) silt, wet, very soft, trace organics	0.1 / 5.3 / 68.5 / 26.1	ML	H H H H	20-22	96	PCB-16-20-22
-22		ML: Very dark gray (5Y 3/1) silt with trace fine sands, black laminations wet, soft, iron staining			H 1 1 1	22-24	75	PCB-16-22-24
-24								

Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: PCB-16

Location: PCB-16

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
-24		ML: Gray (2.5Y 6/1) clayey silt mottled with light yellowish brown (2.5Y 6/4) clayey silt with fine grained sand, medium dense, wet, potential iron staining			H H 5 5	24-26	75	PCB-16-24-26
-26		SW: Light gray (2.5Y 7/1) sand, very fine grained, wet, medium dense well graded			5 7 9 14	26-28	42	PCB-16-26-28
-28		SW: 27.5'- 0.5" alternating lenses of light gray (2.5Y 7/1) sand and light yellowish brown (2.5Y 7/1) sand, fine grained, possible iron staining, wet SW: Light gray (2.5Y 6/3) sand, very fine grained, wet, medium dense, well graded; 29.5'- 1 0.25" light yellowish brown (2.5Y 7/1) very fine sand lamination			14 17 13 16	28-30	33	PCB-16-28-30
-30		SM: White (5Y 8/1) silty sand, very fine, wet, dense, homogenous	0.0 / 84.2 / 10.2 / 5.6	SM	11 11 12 18	30-32	58	PCB-16-30-32
-32		SM: Light gray (5Y 7/1) silty sand, very fine, wet, dense, homogenous			11 12 15 15	32-34	50	PCB-16-32-34
-34		ML: Grayish brown (2.5Y 5/2) silt, with little fine sands, wet, medium stiff, micaceous, potential iron staining; 35.5'- 1" lens of white (5Y 8/1) very fine grained sand			2 4 6 6	34-36	58	PCB-16-34-36
-36		SW: White (5Y 8/1) sand, very fine grained, wet, dense, well graded, homogenous			6 5 11 15	36-38	50	PCB-16-36-38
-38		SW: 37.5'- light brownish gray (2.5Y 6/2) very fine sand lamination, possible iron staining, wet SW: White (5Y 8/1) sand, very fine grained, wet, dense, well graded, homogenous 41.5'- 1" lens of dark yellowish brown (10 YR 4/6) fine sand, possible iron staining			13 15 13 19	38-40	50	PCB-16-38-40
-40		SW: White (5Y 8/1) sand, very fine grained, thin black laminations, wet, very dense, well graded			18 21 38 33	40-42	42	PCB-16-40-42
-42		SP: White (5Y 8/1) sand, medium grained with trace fine grains , angular, wet, very dense, poorly sorted, trace light olive brown (2.5Y 5/6) sand, possible iron staining 43.5'- 2" course sand lens, sub-angular saline/quartz gravel			10 18 23 24	42-44	33	PCB-16-42-44
-44		CL: Very dark gray (5Y 3/1) clay with some fine grained sand, wet, very soft, possible slush			H H 1 0	44-46	8	PCB-16-44-46
-46		SC: Light olive brown (2.5Y 5/3) clayey sub-angular fine grained sand, few angular course sand and trace angular fine gravel, wet, soft and loose			H H H H	46-48	25	PCB-16-46-48
-48		SP: Brownish yellow (10 YR 6/6) sand, medium grained, with trace course grains, angular, wet, loose, poorly graded			2 3 5 5	48-50	42	PCB-16-48-50
-50		END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-17**

Location: Pearce Creek

Geologist: Melissa Whitehead

Subcontractor: Uni-Tech Drilling Co., Inc.

Name of Driller: Jay Blemmings

Model Drill Rig: CME55LC ATV

Drilling Method: Mud Rotary

Date Started: 09/18/2008

Date Completed: 09/18/2008

Depth of Hole (ft): 50

Soil Boring

Elevation (ft): 30.55

Northing (ft): 641708.85

Easting (ft): 1598826.01

MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results		Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
			% Gr / Sa / Si / Cl	USCS				
0		ML: Dark gray (2.5Y 4/1), silt with little fine grain sand, few organics (disturbed soil from site clearing), dry, medium stiff, iron staining			2 3 2 3	0-2	58	PCB-17-0-2
-2		SC: Dark gray (2.5Y 4/1), silt with little fine sand, trace organics trace lignites, dry, soft, iron staining			2 1 2 2	2-4	42	PCB-17-2-4
-4		CL: Very dark gray (5Y 3/1), micaceous clay, very soft, wet, homogenous iron staining			1 0 0 0	4-6	96	PCB-17-4-6
-6		PT: Very dark gray (5Y 3/1), micaceous clay, very soft, wet, homogenous iron staining, mostly organics, trace lignites, wet, soft, resembles peat			1 1 1 1	6-8	58	PCB-17-6-8
-8		ML: Very dark gray (5Y 3/1, micaceous silt, mottled black clay, wet, very soft, few organics			1 0 1 0	8-10	67	PCB-17-8-10
-10		CL: Very dark gray (5Y 3/1), micaceous clay, few lignites, wet, very soft homogenous			H H H H	10-12	58	PCB-17-10-12
-12		ML: Very dark gray (5Y 3/1), micaceous silt, trace lignites, trace organics, iron staining, wet, very soft, homogenous			H H H H	12-14	83	PCB-17-12-14
-14		CL: Very dark gray (5Y 3/1), micaceous clay, trace organics, wet, very soft homogenous			H H H H	14-16	96	PCB-17-14-16
-16		CL: Very dark gray (5Y 3/1), micaceous clay, few organics, trace lignites, wet, very soft, homogenous			H H H H	16-18	96	PCB-17-16-18
-18		ML: Very dark gray (5Y 3/1), micaceous silt with black mottled silt, trace organics, wet, very soft, homogenous			H H H H	18-20	83	PCB-17-18-20
-20		ML: Very dark gray (5Y 3/1), micaceous silt with black mottled silt, trace lignites, iron staining, wet, very soft,	0.2 / 6.1 / 67.1 / 26.6	ML	H H H H	20-22	75	PCB-17-20-22
-22		ML: Very dark gray (5Y 3/1), micaceous silt , trace lignites, wet, very soft, homogenous			H H H H	22-24	96	PCB-17-22-24
-24								

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-17**

Location: PCB-17

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results		Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
			% Gr / Sa / Si / Cl	USCS				
-24		ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous			H H H H	24-26	92	PCB-17-24-26
-26		ML: Very dark gray (5Y 3/1), micaceous silt with mottled black silt, trace lignites, iron staining, wet, very soft			H H H H	26-28	83	PCB-17-26-28
-28		ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous			H ·H H H	28-30	58	PCB-17-28-30
-30					H H H H	30-32	75	PCB-17-30-32
-32					H H H H	32-34	58	PCB-17-32-34
-34					H H H H	34-36	67	PCB-17-34-36
-36		CL: Very dark gray (5Y 3/1), micaceous clay, trace lignites, trace organics, wet, very soft, homogenous			H H H H	36-38	50	PCB-17-36-38
-38		PT: Very dark gray (5Y 3/1), micaceous mostly organic clay with few lignites, wet, soft, resembles peat			H 3 2 2	38-40	50	PCB-17-38-40
-40		OH: Very dark gray (5Y 3/1), micaceous organic silt, few organics, few lignites medium stiff, homogenous, wet	0.8 / 42.7 / 36.4 / 20.1	MH	1 2 3 3	40-42	67	PCB-17-40-42
-42		OH: Very dark gray (5Y 3/1), micaceous organic silt, little organics, trace lignites, wet, soft			1 2 2 2	42-44	58	PCB-17-42-44
-44		ML: Very dark gray (5Y 3/1), silt with some fine grain sub-angular sand with trace angular medium grain sand, trace lignites, wet, medium dense			2 2 3 3	44-46	42	PCB-17-44-46
-46		SM: Gray (2.5Y 5/1), fine grain angular silty sand with trace medium grain sand, wet, loose, trace, sub-angular course gravel			2 4 7 8	46-48	33	PCB-17-46-48
-48		SM: Sub-angular medium grain sand with trace fine sub-rounded gravel yellowish brown (10 YR 5/6), poorly graded, wet			5 7 7 9	48-50	33	PCB-17-48-50
-50		SP: Light brownish gray (2.5Y 6/2), poorly graded coarse grain sub-angular sand with trace sub-rounded fine grain gravel, wet, medium dense						
		END OF BORING = 50 FT						

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Edgewood, MD 21040
410-538-8202

Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-18**

Location: Pearce Creek

Geologist: Melissa Whitehead

Subcontractor: Uni-Tech Drilling Co., Inc.

Name of Driller: Jay Blemmings

Model Drill Rig: CME55LC ATV

Drilling Method: Mud Rotary

Date Started: 09/16/2008

Date Completed: 09/16/2008

Depth of Hole (ft): 50

Soil Boring

Elevation (ft): 31.49

Northing (ft): 641816.13

Easting (ft): 1599469.63

MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
0	▥	ML: Dark gray (2.5Y 4/1) silt with little fine silt, few organics (disturbed soil from site clearing), dry, stiff, iron staining			2 2 4 3	0-2	42	PCB-18-0-2
-2	▥	ML: Dark gray (2.5Y 4/1) micaceous clayey silt, moist, medium stiff, trace organics, trace lignites, iron staining			2 2 3 3	2-4	58	PCB-18-2-4
-4	▥	ML: Very dark grayish brown (2.5Y 3/2) micaceous clayey silt, wet, medium dense, iron staining, few organics			3 2 2 3	4-6	67	PCB-18-4-6
-6	▥	ML: Very dark gray (5Y 3/1) micaceous silt, black laminations, wet, medium dense			2 3 3 2	6-8	92	PCB-18-6-8
-8	▨	CL: Very dark gray (5Y 3/1) micaceous clay, mottled black clay, wet, soft, trace organics			2 2 2 1	8-10	83	PCB-18-8-10
-10	▥	ML: Very dark gray (5Y 3/1) micaceous silt, black laminations, wet, very soft, iron stainings			H H H H	10-12	96	PCB-18-10-12
-12	▥	ML: Very dark gray (5Y 3/1) micaceous silt, mottled black clay, wet, soft, trace organics			1 2 1 1	12-14	75	PCB-18-12-14
-14	▥	ML: Very dark gray (5Y 3/1) micaceous silt, mottled black clay, wet, soft, trace organics, iron stainings, iron cementations			H H H 1	14-16	67	PCB-18-14-16
-16	▨	CL: Very dark gray (5Y 3/1) micaceous clay, wet, very soft, homogenous			1 1 1 1	16-18	92	PCB-18-16-18
-18	▨	CL: Olive gray (5Y 4/2) micaceous clay, wet, very soft, homogenous trace organics			H H H H	18-20	25	PCB-18-18-20
-20	▨	CL: Olive gray (5Y 4/2) micaceous clay, wet, very soft, homogenous			1 3 6 7	20-22	75	PCB-18-20-22
	▥	ML: 3" interlayered light olive brown (2.5Y 5/3) fine sands and brown (7YR 4/4) fine sand laminations, wet						
-22	▥	ML: Gray (2.5Y 5/1) silt with little fine sands, wet, dense, poorly graded 1" lenses of grayish brown (2.5Y 5/2) clay with fine sand	6.9 / 40.1 / 39.5 /	ML	5 10 14 16	22-24	58	PCB-18-22-24
-24								

Log of Boring: **PCB-18**

Location: PCB-18

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results		Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
			% Gr / Sa / Si / Cl	USCS				
-24		ML: Light olive brown (2.5Y 5/3) silt with little fine grained sand, sub-rounded, wet, stiff	13.5		5 6 5 12	24-26	67	PCB-18-24-26
-26		ML: 25.5'- light olive brown (5Y 5/4) sand laminations, medium grained, angular, wet SW: Gray (2.5Y 7/1) very fine grained sand, wet, dense, homogenous well graded, sub-rounded			8 14 14 18	26-28	42	PCB-18-26-28
-28		SP: White (2.5Y 8/1) very fine sand, wet, dense, homogenous, poorly graded, sub-rounded	0.2 / 90.2 / 5.3 / 4.3	SP-SM	9 20 23 23	28-30	50	PCB-18-28-30
-30					10 23 21 20	30-32	92	PCB-18-30-32
-32					6 13 21 26	32-34	50	PCB-18-32-34
-34		SW: White (2.5Y 8/1) very fine sand, wet, medium dense, homogenous, well graded, sub-rounded, light yellowish brown (2.5Y 6/4) very fine sand laminations at 37', potential iron staining			9 10 10 9	34-36	58	PCB-18-34-36
-36					9 H 4 6	36-38	83	PCB-18-36-38
-38					9 12 7 5	38-40	50	PCB-18-38-40
-40		SW: White (2.5Y 8/1) very fine sand, wet, medium dense, homogenous, well graded, sub-rounded			11 13 9 7	40-42	75	PCB-18-40-42
-42		SW: Gray (2.5Y 6/1) medium grained sand, sub-rounded, wet, medium dense, well graded, homogenous			6 9 11 7	42-44	42	PCB-18-42-44
-44		SW: Light yellowish brown (2.5Y 6/4) medium grained sand, wet, medium dense, homogenous, sub-angular well graded, potential iron staining			8 9 7 7	44-46	42	PCB-18-44-46
-46		SP: Light yellowish brown (2.5Y 6/4) silt with few fine grained sand, wet, medium dense, sub-rounded, potential iron staining			8 5 5 8	46-48	42	PCB-18-46-48
-48		SP: Light olive brown (2.5Y 5/4) sand, medium grained with trace fine grains, wet, very dense, poorly graded, sub-angular			8 22 38 50/5	48-50	42	PCB-18-48-50
-50		END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-19**	Location: Pearce Creek	Geologist: Melissa Whitehead
Subcontractor: Uni-Tech Drilling Co., Inc.	Name of Driller: Jay Blemmings	
Model Drill Rig: CME55LC ATV	Drilling Method: Mud Rotary	
Date Started: 09/18/2008	Date Completed: 09/18/2008	Depth of Hole (ft): 50 — Soil Boring
Elevation (ft): 31.91	Northing (ft): 641828.03 — Easting (ft): 1600009.60	MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
0		ML: Dark gray (2.5Y 4/1), silt with little fine sand, few organics (disturbed soil from site clearing), dry, stiff, iron staining			1 2 2 3	0-2	58	PCB-19-0-2
-2		ML: Very dark gray (5Y 3/1), silt, trace organics, moist, soft, iron staining			1 1 1 2	2-4	75	PCB-19-2-4
-4		ML: Very dark gray (5Y 3/1), micaceous silt, moist, soft, trace organics ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft			2 1 1 2	4-6	83	PCB-19-4-6
-6		ML: Very dark gray (5Y 3/1), micaceous silt with mottled black silt, trace lignites, wet, soft, homogenous			1 2 1 1	6-8	83	PCB-19-6-8
-8		ML: Very dark gray (5Y 3/1), micaceous silt with mottled black silt, trace lignites, trace organics, wet, very soft, homogenous			1 1 1 2	8-10	83	PCB-19-8-10
-10					H H H H	10-12	83	PCB-19-10-12
-12					H H H H	12-14	83	PCB-19-12-14
-14		ML: Very dark gray (5Y 3/1), micaceous silt with mottled black silt, few organics, homogenous, wet			H H 1 0	14-16	92	PCB-19-14-16
-16		ML: Very dark gray (5Y 3/1), micaceous silt with trace fine sands, black laminations, iron staining, wet			H H H H	16-18	96	PCB-19-16-18
-18		ML: Very dark gray (5Y 3/1) micaceous silt with trace fine grain sand, iron staining, homogenous, wet			H H H H	18-20	83	PCB-19-18-20
-20		ML: Very dark gray (5Y 3/1), micaceous silt with a thin layer of trace organics, wet, very soft			H H H H	20-22	96	PCB-19-20-22
-22		ML: Very dark gray (5Y 3/1), micaceous silt with thin black laminations and mottled black silt, iron staining, trace organics, wet, soft			H 1 |	22-24	58	PCB-19-22-24
-24								

Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-19**

Location: PCB-19

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results		Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
			% Gr / Sa / Si / Cl	USCS				
-24		ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous trace lignites, trace organics			H H H H	24-26	96	PCB-19-24-26
-26		ML: Very dark gray (5Y 3/1), silt with few fine grain sub-rounded sand, wet	2.4 / 9.5 / 71.6 / 16.5	ML	1 1 1 1	26-28	50	PCB-19-26-28
-28					2 1 1 0	28-30	58	PCB-19-28-30
-30		ML: Very dark gray (5Y 3/1), silt, trace organics, wet, very soft, mottled black clay, homogenous			H H 1 0	30-32	83	PCB-19-30-32
-32		ML: Very dark gray (5Y 2/3), silt, trace organics, iron staining, wet, very soft			H H H H	32-34	75	PCB-19-32-34
-34		ML: Very dark gray (5Y 3/1), silt with few fine grain sub-angular sand, trace angular medium grain sand, wet, very soft			H H H H	34-36	42	PCB-19-34-36
-36		ML: Dark gray (5Y4/1), silt with little fine grained rounded sand, trace sub-angular fine gravel, wet, loose, poorly graded			2 2 4 5	36-38	50	PCB-19-36-38
-38		SP: Light yellowish brown (2.5Y 6/4), poorly graded fine grain sub-rounded sand with bands of yellowish brown (10YR 5/4) fine grain sand and pale yellow (2.5Y 7/3) fine grain sand, wet, dense	1.8 / 86.4 / 3.1 / 8.7	SP-SM	9 10 15 16	38-40	67	PCB-19-38-40
-40		SP: Light yellowish brown (2.5Y 6/4), poorly graded fine grain sub-rounded sand, wet, dense			6 10 15 19	40-42	58	PCB-19-40-42
-42		SP: Pale yellow (2.5Y 7/3), poorly graded fine grain sand with white and black laminations at 43' for 2", possible iron staining, wet, dense, angular			12 13 19 23	42-44	50	PCB-19-42-44
-44		SP: White (5Y 8/1), poorly graded fine grain sand with light olive brown (2.5Y 5/3) laminations, wet, very dense, angular			19 17 27 29	44-46	67	PCB-19-44-46
-46		SP: White (5Y 8/1), poorly graded fine grain sand with yellowish brown (10YR 5/4) fine grain sand, potential iron staining, wet, medium dense, angular			6 11 10 15	46-48	50	PCB-19-46-48
-48		SP: Gray (5Y 6/1), poorly graded fine grain angular sand with trace black sand laminations, wet, dense			7 11 15 15	48-50	50	PCB-19-48-50
-50		END OF BORING = 50 FT						

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Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-20**

Location: Pearce Creek

Geologist: Melissa Whitehead

Subcontractor: Uni-Tech Drilling Co., Inc.

Name of Driller: Jay Blemmings

Model Drill Rig: CME55LC ATV

Drilling Method: Mud Rotary

Date Started: 09/19/2008

Date Completed: 09/19/2008

Depth of Hole (ft): 50

Soil Boring

Elevation (ft): 30.74

Northing (ft): 641906.46

Easting (ft): 1600429.18

MD State Plane/NAD 83/NAVD 88

Surface Conditions: Soil and cleared brush

Comments:

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
0	▥	ML: Dark grayish brown (2.5Y 4/2), silt with few organics and trace lignites (disturbed soil from site clearing), dry, stiff, iron staining			2 3 3 4	0-2	13	PCB-20-0-2
-2	▥	ML: Dark grayish brown (2.5Y 4/2), silt with trace organics, dry, stiff, iron staining			2 3 3 3	2-4	58	PCB-20-2-4
-4	▥	ML: Very dark gray (5Y 3/1), micaceous silt with mottled black clay, trace organics, trace lignites, iron staining, moist, soft, homogenous			2 2 2 2	4-6	58	PCB-20-4-6
-6	▥	ML: Very dark gray (5Y 3/1), micaceous silt with mottled black clay, few organics, wet, soft, homogenous			3 2 3 3	6-8	67	PCB-20-6-8
-8	▥	ML: Very dark gray (5Y 3/1), micaceous silt, trace organics, wet, very soft homogenous			2 2 1 1	8-10	83	PCB-20-8-10
-10	▥				H H H H	10-12	96	PCB-20-10-12
-12	▨	CL: Very dark gray (5Y 3/1), micaceous clay with mottled black clay, very soft, wet, homogenous			H H H H	12-14	100	PCB-20-12-14
-14	▨	CL: Very dark gray (5Y 3/1), micaceous clay with mottled black clay, trace organics, iron stainings, very soft, wet, homogenous			H H H H	14-16	75	PCB-20-14-16
-16	▨	CL: Very dark gray (5Y 3/1), micaceous clay with few angular fine grained sands, wet, soft, iron staining			1 0 1 1	16-18	33	PCB-20-16-18
-18	▨	CL: Very dark gray (5Y 3/1), micaceous clay with trace sub-rounded fine grain sand, black mottled clay, trace organics, wet, very soft, homogenous			H H H H	18-20	83	PCB-20-18-20
-20	▥	ML: Olive gray (5Y 5/2), silt with few fine grain sand, trace sub-rounded medium grain sand, potential iron staining, wet, medium stiff	4.4 / 36.5 / 43.5 / 15.6	ML	H 3 3 3	20-22	75	PCB-20-20-22
-22	▥	ML: Olive gray (5Y 5/2), silt, trace organics, potential iron staining, wet, soft			2 2 2 2	22-24	67	PCB-20-22-24
-24								

Pearce Creek Dredged Material Containment Area, Maryland

Log of Boring: **PCB-20**

Location: PCB-20

Depth (ft)	USCS Log	Description of Materials	Geotechnical Results % Gr / Sa / Si / Cl	Geotechnical Results USCS	Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number
-24		SM: White (5Y 8/1), fine grain silty sand with little olive yellow (2.5Y 6/6) fine grain sand, potential iron staining, dense, wet, sub-rounded	0.7 / 81.8 / 11.7 / 5.8	SM	9 13 17 24	24-26	75	PCB-20-24-26
-26					13 18 25 36	26-28	67	PCB-20-26-28
-28		SM: White (5Y 8/1), fine grain silty sand with little olive yellow (2.5Y 6/6) fine grain sand, potential iron staining, dense, wet, sub-angular			19 33 50/4	28-30	50	PCB-20-28-30
-30		SM: White (5Y 8/1), fine grain sub-rounded silty sand with potential iron staining, wet, very dense			50/5	30-32	25	PCB-20-30-32
-32		SM: White (5Y 8/1), fine grain sub-rounded silty sand, wet, very dense, homogeneous			13 24 27	32-34	58	PCB-20-32-34
-34					11 33 50/5	34-36	33	PCB-20-34-36
-36		SM: White (5Y 8/1) fine grain silty sand with few light yellowish brown (2.5Y 6/4) sand, sub-rounded, possible iron staining, very dense, wet			50/5	36-38	4	PCB-20-36-38
-38		SM: White (5Y 8/1), fine grain sub-angular silty sand, wet, very dense, homogeneous			50/4	38-40	25	PCB-20-38-40
-40		SM: White (5Y 8/1) fine grain sub-angular silty sand with a 3" lens of grayish brown (2.5Y 5/2) fine grain sub-angular sand, wet, very dense			32 33 38 47	40-42	33	PCB-20-40-42
-42		SM: White (5Y 8/1), fine grain sub-rounded silty sand, wet, very dense, homogeneous			18 33 50/4	42-44	50	PCB-20-42-44
-44					42 50/3	44-46	25	PCB-20-44-46
-46		no recovery				46-48	0	N/A
-48		SM: White (5Y 8/1) fine grain silty sand with laminations of light olive brown (2.5Y 5/4) very fine grain sand, wet, very dense, homogeneous			18 21 31 34	48-50	25	PCB-20-48-50
-50		END OF BORING = 50 FT						

Appendix B

Soil Indices

USCS	Test Boring #	Top of Borehole	Sample Depth (ft)	Sample Elevation (ft)	Natural Water Content (%)	Less Then No. 200 Sieve (%)	Atterberg Limits		Void Ratio, eo	Specific Gravity, Gs	Dry Density (pcf)	Total Density (pcf)	Unconfined Compressive strength, qu (ksf)	Triaxial				Direct Shear		Consolidation Test			Consolidation Approx.			Ko (cm/sec)
							LL	PI						UU (Q) (ksf)	CU (R)		CD (S)	C' (ksf)	ϕ' (degrees)	Pc (ksf)	c'_c	c'_r	c'_c	c'_r	c'_r	
															C (ksf)	ϕ (degrees)	ϕ' (degrees)									
CH	CSB-5A	36.0	9.0	27.0	48.8	80.0	65	33			72.2	107.43		0.54	0.4	17.5										
CH	CSB-8A	38.0	41.0	-3.0	32.7	99.0	57	28			88.1	116.91			1.2	16										
CH	CSB-11	36.0	21.0	15.0	59.3	92.0	78	44	0.644		63.5	101.16		0.6	0.4	16							0.372	0.074	0.037	
CH	CSB-15	37.0	13.0	24.0	57.9	97.0	78	46		2.67	65.8	103.9	0.34							0.95	0.27	0.014				
CH	CSW-7	8.0	45.0	-37.0	30.9		51	24	0.878	2.67	88.8	116.24											0.196	0.039	0.02	2.40E-06
CH	TB-5	28.9	5.0	23.9	67.2	94.7	71	38			56.6	94.635	0.37							2.1	0.25	0.03				
				Average:	49.5	92.5	66.67	35.5	0.761	2.67	72.5	108.36	0.355	0.57	0.667	16.5				1.53	0.26	0.022	0.284	0.057	0.028	2.4E-06
CL	CSB-11	36.0	11.0	25.0	24.0	83.0	23	8		2.68	101.3	125.61								1.4	0.09	0.007				
CL	CSW-3	31.0	87.0	-56.0	19.1		34	14	0.542	2.69	108.9	129.7											0.14	0.028	0.014	9.00E-07
CL	CSW-7	8.0	73.0	-65.0	30.9		49	21	0.87	2.7	90.1	117.94											0.188	0.038	0.019	8.00E-07
CL	CSS-5	38.0	12.3	25.7	24.4		34	12	0.655		101.3	126.02								1.2	0.078	0.01	0.131	0.026	0.013	
CL	CSS-5	38.0	12.8	25.2	26.5						96.4	121.95														
CL	TB-2	35.7	13.0	22.7	27.4	91.1	39	15			96.9	123.45	2.594							5.49	0.08	0.014				
CL	TB-2	35.7	17.0	18.7	21.1	94.5	30	12																		
CL	TB-5	28.9	75.0	-46.1	15.8	88.7					119.1	137.92	5.52		0	32				0.64	0.2	0.026				
				Average:	23.7	89.3	34.83	13.7	0.689	2.69	102	126.12	4.057		0	32				2.18	0.112	0.014	0.153	0.031	0.015	8.5E-07
CL-ML	PCB-3	37.5	32	5.5	40.5	85.3	24	7																		
CL-ML	PCB-3	37.5	44	-6.5	24.6	89.0	26	6																		
CL-ML	PCB-5	35.3	32	3.3	17.3	80.6	25	6																		
CL-ML	PCB-12	33.0	22	11.0	20.6	67.9	29	7																		
				Average:	25.7	80.7	26	6.5																		
MH	CSB-7A	22.0	35.0	-13.0	35.7	99.0	53	22		2.59	84	113.99	2.12							2	0.17	0.008				
MH	CSB-8	38.0	15.0	23.0	61.1	98.0	95	53			62.1	100.04		0.84												
MH	CSB-14	36.0	15.0	21.0	51.8	95.0	71	35			67.6	102.62		0.5	0.4	8										
MH	CSB-16	19.0	19.0	0.0	42.6	99.0	62	26			77.4	110.37	0.14		0.8	8										
MH	CSB-18	37.0	7.0	30.0	59.3	98.0	81	43	2.6		62.6	99.722	0.31							0.56	0.25	0.05	0.178	0.036	0.018	
MH	CSW-2	40.0	17.0	23.0	54.7		68	34	1.488	2.55	64	99.008											0.21	0.042	0.021	2.25E-06
MH	CSW-2	40.0	79.0	-39.0	49.7		80	43	1.342	2.63	70.1	104.94											0.269	0.054	0.027	2.80E-06
MH	TB-1	47.4	11.0	36.4	39.2	92.7	59	26			79.4	110.52	2.02													
MH	TB-1	47.4	21.0	26.4	49.8	91.0	54	23			71.1	106.51		0.880						4.71	0.18	0.02				
MH	TB-2	35.7	5.0	30.7	49.4	93.6	71	32			69.1	103.24		0.540												
MH	TB-3	50.2	17.0	33.2	46.2	89.0	52	22			72	105.26	1.390					0.460	25	3.52	0.21	0.034				
MH	TB-3	50.2	25.0	25.2	50.2	89.0	58	23							0.91	9										
MH	TB-4	48.0	25.0	23.0	49.8	90.8					65.7	98.419		0.887												

Laboratory Testing Summary

Figure B.1

June 2014

USCS	Test Boring #	Top of Borehole	Sample Depth (ft)	Sample Elevation (ft)	Natural Water Content (%)	Less Then No. 200 Sieve (%)	Atterberg Limits		Void Ratio, eo	Specific Gravity, Gs	Dry Density (pcf)	Total Density (pcf)	Unconfined Compressive strength, qu (ksf)	Triaxial				Direct Shear		Consolidation Test			Consolidation Approx.			Ko (cm/sec)
															CU (R)		CD (S)									
							LL	PI						UU (Q) (ksf)	c (ksf)	Φ (degrees)	Φ' (degrees)	C' (ksf)	Φ' (degrees)	Pc (ksf)	c'_c	c'_r	c'_c	c'_r	c'_r	
MH	TB-4	48.0	51.0	-3.0	49.9	83.6	55	15						1.77												
MH	TB-5	28.9	11.0	17.9	67.5	99.2	72	36			59.8	100.17		0.505						0.64	0.2	0.026				
MH	PCB-7	34.9	26	8.9	66.1	78.0	55	16																		
MH	PCB-8	33.0	22	11.0	71.3	95.6	51	15																		
MH	PCB-9	30.8	36	-5.2	104.8	63.7	73	12																		
MH	PCB-13	32.5	42	-9.5	92.0	79.9	54	11																		
MH	PCB-17	30.1	42	-11.9	108.8	56.5	66	7																		
				Average:	60.0	88.4	64.74	26	1.81	2.59	69.608	111.37	1.196	0.846	0.703	8.33		0.46	25	2.29	0.202	0.028	0.219	0.044	0.022	2.53E-06
ML	CSS-6	58.2	29.1	29.1	23.7						100.6	124.44			0	34										
ML	CSS-6	59.2	29.6	29.6	18.3						111.6	132.02	2.53													
ML	TB-4	48.0	17.0	31.0	34.2	89.2	40	12			84.2	113	1.33					0.45	23	2.51	0.16	0.014				
ML	PCB-1	38.0	22	16.0	50.7	93.3	43	15																		
ML	PCB-2	37.6	25.5	12.1	52.5	87.3	32	8																		
ML	PCB-4	38.9	40	-1.1	49.6	85.9	38	9																		
ML	PCB-5	35.3	24	11.3	55.1	97.2	40	11																		
ML	PCB-6	34.7	24	10.7	52.5	92.4	39	12																		
ML	PCB-6	34.7	40	-5.3	35.7	73.0	40	11																		
ML	PCB-7	34.9	46	-11.1	61.7	86.9	42	3																		
ML	PCB-8	33.0	42	-9.0	66.0	90.2	29	5																		
ML	PCB-11	33.5	22	11.5	51.6	84.1	42	11																		
ML	PCB-13	32.5	17	15.5	66.3	96.3	49	14																		
ML	PCB-16	32.1	22	10.1	54.3	94.6	41	10																		
ML	PCB-17	30.1	22	8.1	48.5	93.7	39	12																		
ML	PCB-18	31.5	24	7.5	19.0	53.0	19	1																		
ML	PCB-19	31.9	28	3.9	36.6	88.1	21	2																		
ML	PCB-20	30.7	21	9.7	20.1	59.1	23	3																		
				Average:	44.2	85.3	36.06	8.69			98.8	142.51	1.93		0	34		0.45	23	2.51	0.16	0.014				
OH	CSS-3	40.0	12.4	27.6	44.3						73.2	105.63			0.13	32										
OH	CSS-3	40.0	12.9	27.1	44.0	90.0	56	26			73.6	105.98			0.13	32										
OH	CSS-3	40.0	13.4	26.6	46.1						72.7	106.21			0.13	32										
OH	CSS-4	37.0	12.9	24.1	40.8						77.3	108.84	2.13													
OH	CSS-4	37.0	13.2	23.8	48.3	93.5	53	24			70.4	104.4		0.79												
OH	CSS-4	37.0	13.4	23.6	55.6						64.8	100.83														8.90E-07
OH	CSS-6	40.0	14.2	25.8	60.3	100.0	80	39	1.509		62.3	99.867			0	37.9				1.4	0.22	0.026	0.251	0.05	0.025	

Laboratory Testing Summary
(con't)

Figure B.1

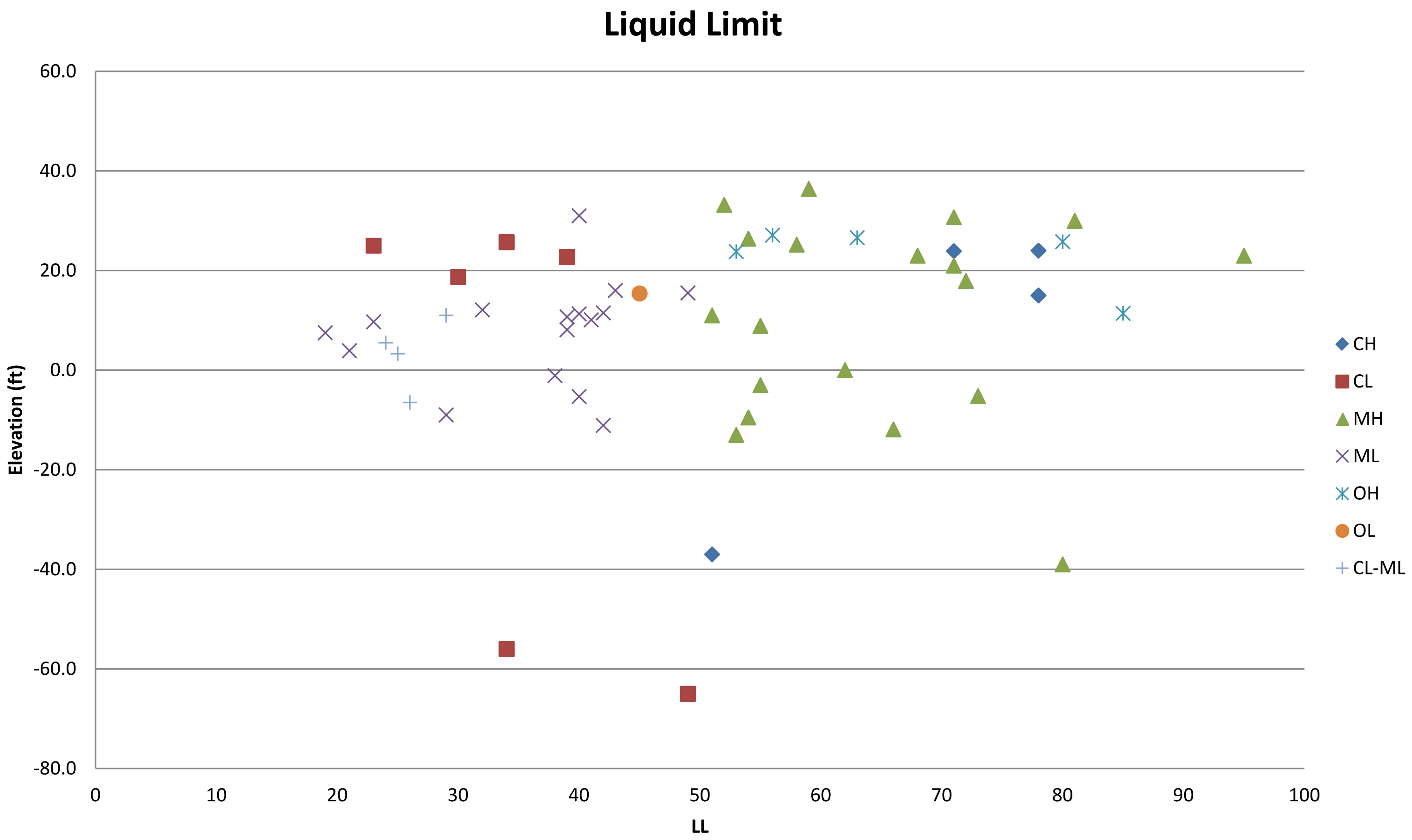
June 2014

							Atterberg Limits							Triaxial				Direct Shear		Consolidation Test			Consolidation Approx.			
															CU (R)		CD (S)									
USCS	Test Boring #	Top of Borehole	Sample Depth (ft)	Sample Elevation (ft)	Natural Water Content (%)	Less Then No. 200 Sieve (%)	LL	PI	Void Ratio, eo	Specific Gravity, Gs	Dry Density (pcf)	Total Density (pcf)	Unconfined Compressive strength, qu (ksf)	UU (Q) (ksf)	C (ksf)	ϕ (degrees)	ϕ' (degrees)	C' (ksf)	ϕ' (degrees)	Pc (ksf)	c'_c	c'_r	c'_c	c'_r	c'_r	Ko (cm/sec)
OH	CSS-6	40.0	14.7	25.3	64.0						60.5	99.22		0.64												
OH	CSS-6	40.0	28.6	11.4	67.5		85	36			60.5	101.34			0	45										
OH	CSS-7	39.0	12.4	26.6	44.5		63	31			75	108.38														3.70E-07
OH	CSS-7	39.0	12.8	26.2	36.1						81.8	111.33	0.77													
OH	CSS-7	39.0	13.3	25.7	36.9						78.5	107.47		0.63												
				Average:	49.0	94.5	67.4	31.2			70.883	105.64	1.45	0.687	0.078	35.78				1.4	0.22	0.026	0.251	0.05	0.025	6.3E-07
OL	CSS-1	29.0	13.1	15.9	76.1						57.1	100.55		0.55												
OL	CSS-1	29.0	13.6	15.4	40.2	74.5	45	32			78.8	110.48		0.53												
				Average:	58.2	74.5	45	32			67.95	107.46		0.54												
SM	CSS-2	49.0	27.4	21.6	33.1						84.3	112.2		0.54												
SM	CSS-2	49.0	27.9	21.1	32.1						85.8	113.34		0.48												
SM	CSS-2	49.0	28.4	20.6	21.3						83.4	101.16		8.56												
SM	TB-3	50.2	73.0	-22.8	31.8	48.8					88.7	116.91	1.520													
SM	PCB-3	37.5	38	-0.5	18.6	19.3																				
SM	PCB-10	34.4	31.5	2.9	20.5	45.5	18	1																		
SM	PCB-11	33.5	44	-10.5	19.2	15.4																				
SM	PCB-12	33.0	42	-9.0	17.0	29.1	15	1																		
SM	PCB-14	30.1	42	-11.9	27.3	18.2																				
SM	PCB-15	34.4	17	17.4	24.5	12.3																				
SM	PCB-15	34.4	27	7.4	18.5	33.8	17	1																		
SM	PCB-16	32.1	32	0.1	27.0	15.8																				
SM	PCB-20	30.7	26	4.7	22.5	17.5																				
				Average:	29.6	48.8	16.67	1			85.55	110.85	1.520	3.193												

Laboratory Testing Summary
(con't)

Figure B.1

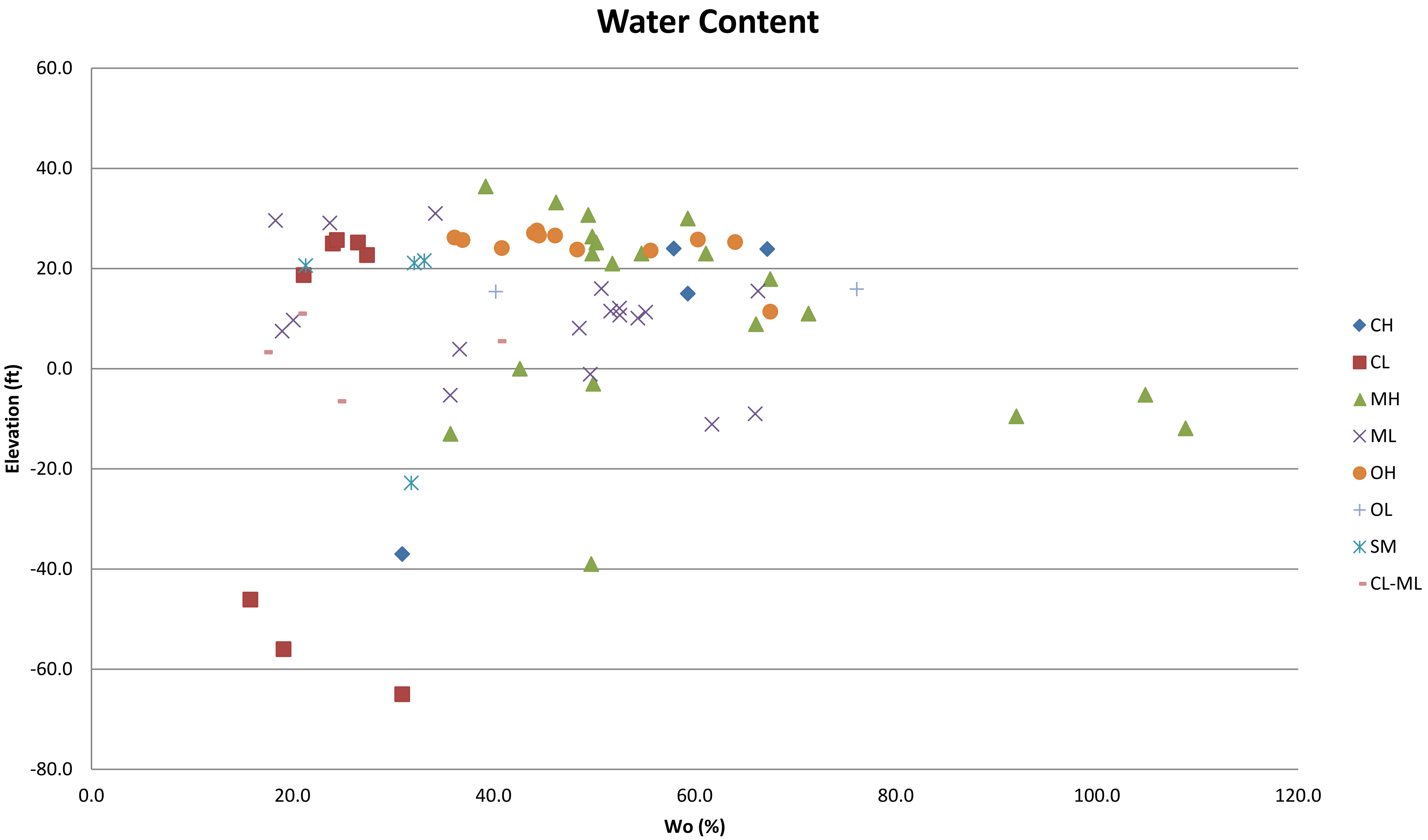
June 2014



Liquid Limit Vs. Elevation

Figure B.2

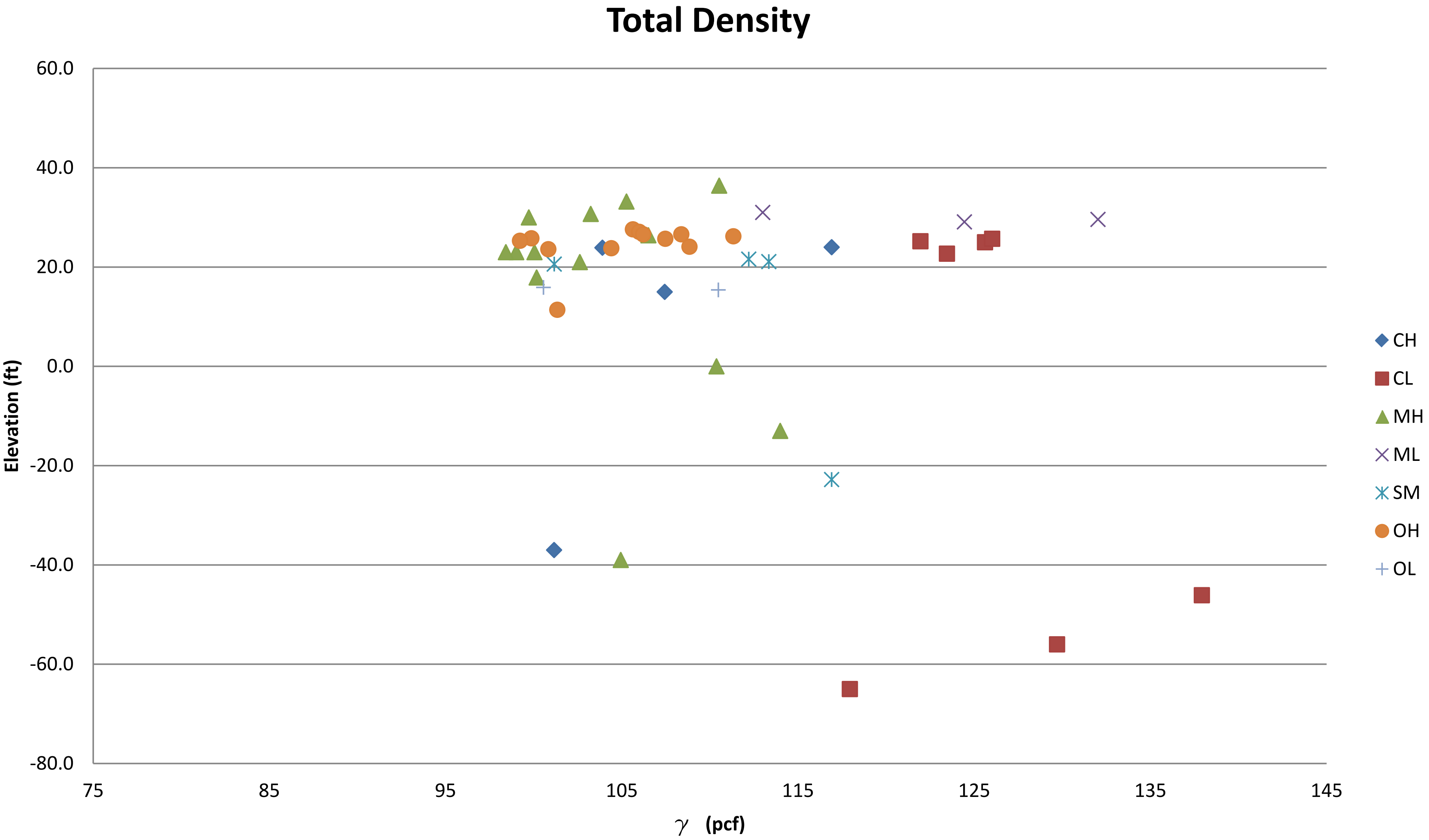
June 2014



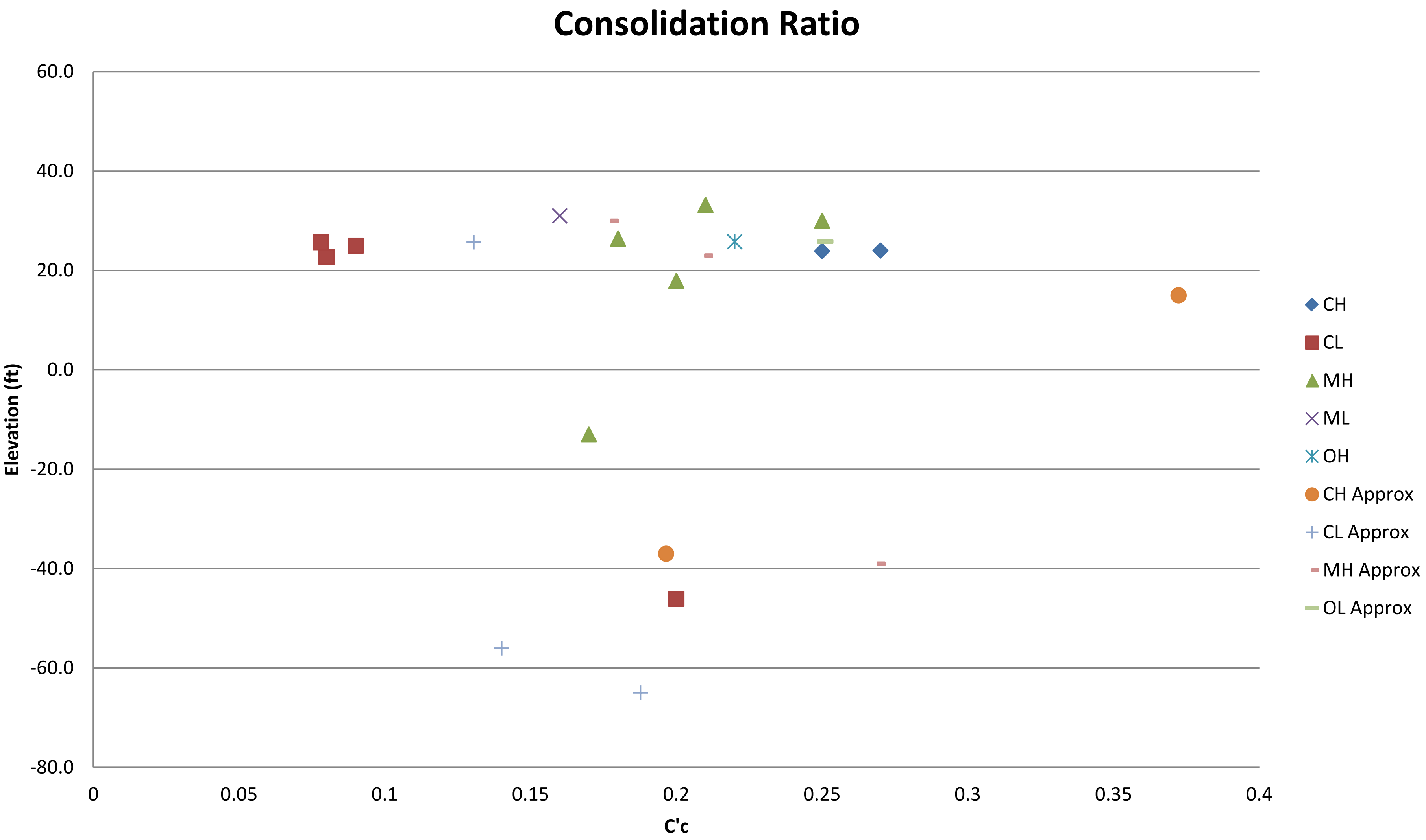
Water Content Vs. Elevation

Figure B.3

June 2014



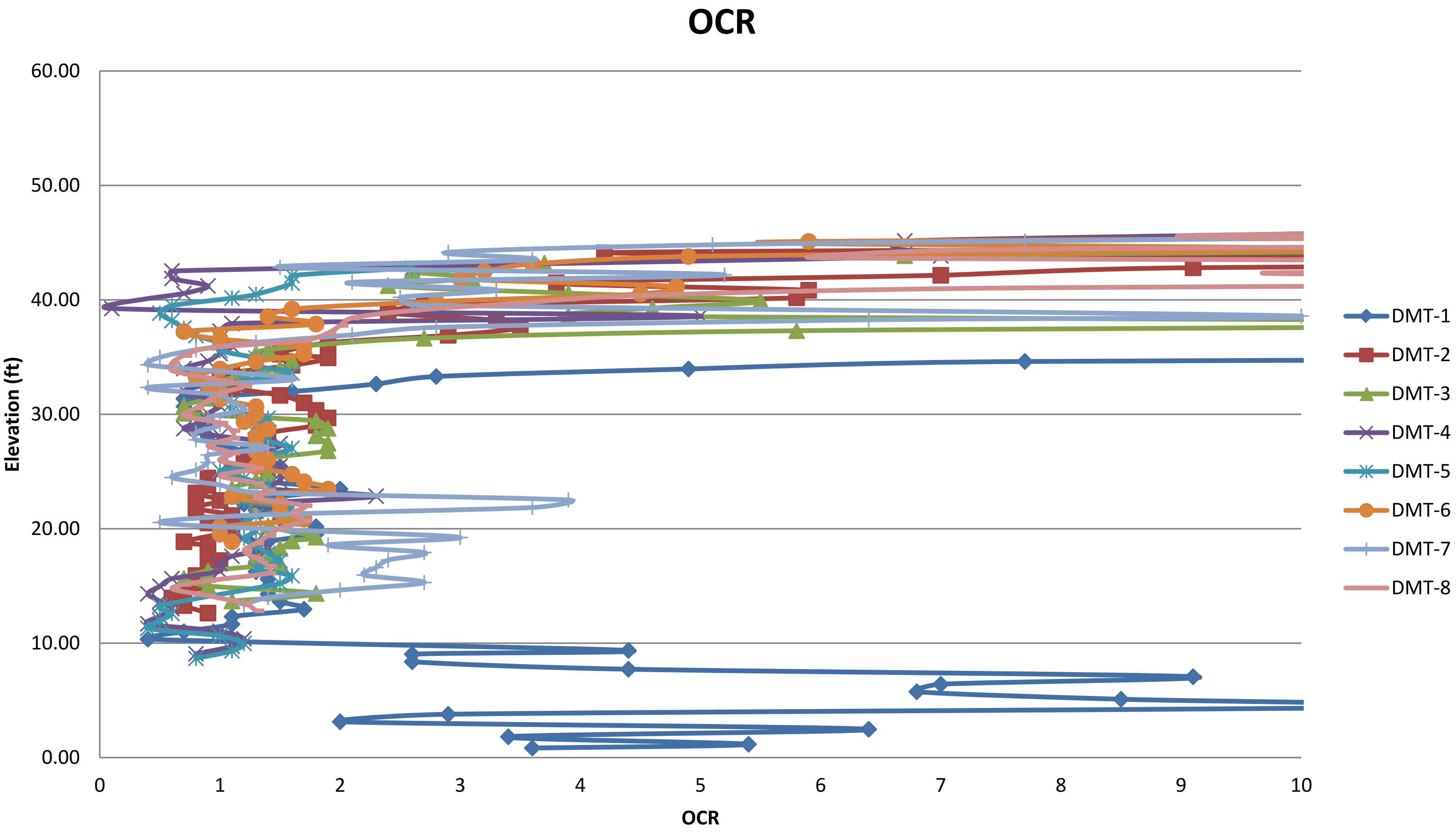
	Total Density Vs. Elevation	Figure B.4
		June 2014



Consolidation Ratio Vs. Elevation

Figure B.5

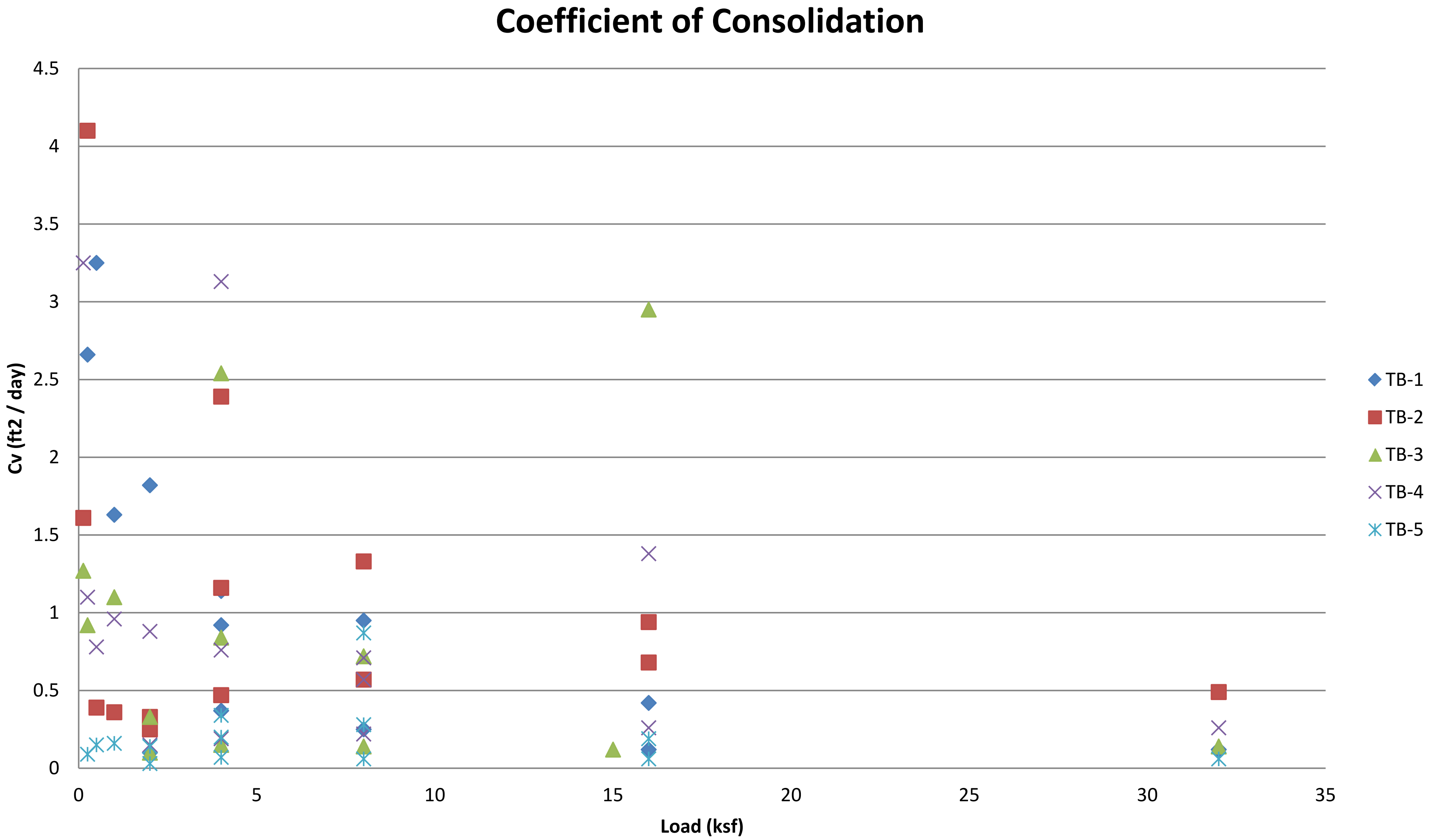
June 2014



Overconsolidation Ratio of Dredged Materials Vs. Elevation

Figure B.6

June 2014



Time Rate of Consolidation Vs. Elevation

Figure B.7

June 2014

Appendix C

Settlement Analysis

Immediate Settlement

The subsurface conditions encountered are highly variable, with layers of clays, silts, and sands existing throughout. For purposes of calculating total settlements, immediate settlement was only calculated for the sand layers. Since subsurface conditions in these layers are granular in consistency, settlement is considered elastic. This occurs during or immediately after construction and application of the loading. Elastic settlement can be estimated by use of a semi-empirical strain influence methodology proposed by Schmertmann (1970) and modified by Schmertmann, Hartmann, and Brown (1978), as described in the following discussion.

This method was developed to estimate foundation settlements in sands. To utilize this method, the subsurface is broken into layers. Each layer has a constant value of strain and soil modulus. Settlement is calculated by summing the influence of all layers, as calculated by equation B-1.

$$S = C_1\, C_2\, \Delta p \sum_0^{2B,4B} \frac{I_z}{E_s} \Delta z \text{ , (eq. B-1)}$$

where: Δp = net foundation pressure = bearing pressure minus initial effective vertical stress

I_z = vertical strain influence factor (from Figure B-1)

E_s = soil modulus of deformation

Δz = thickness of soil layer

C_1 = pressure change correction factor for effective overburden

= $1 - 0.5\,\frac{\sigma'_{vo}}{\Delta p}$

σ'_{vo} = initial effective vertical stress at the base of footing

C_2 = time influence factor = 1 + (0.2)(log (t/0.1))

t = time of interest (in years)

The soil modulus of deformation can be estimated by equation B-2

$$E_s = 2.5q_c\text{, (eq. B-2)}$$

Where q_c is the cone tip resistance measured in a Cone Penatrometer Test, and can be estimated as 3 x the SPT blow count of the soil.

Schmertmann developed the diagram shown in Figure B-1 to determine the appropriate strain influence factor, I_z, for each layer within the profile. Two distributions are shown: one for square or circular footings (L/B=1), and a second for strip footings (L/B>10). Both are triangular distributions, and the one for square or circular footings begins at a value of 0.1 at the base of the footing, while the one for strip footings begins at a value of 0.2 at the base of the footing. The maximum strain factor, I_{zp}, occurs at a depth equal to B/2 for square footings and B for strip footings, and can be calculated using equation B-3.

$$I_{\mathrm{zp}} = 0.5 + 0.1\sqrt{\frac{\Delta \mathrm{p}}{\sigma'_{\mathrm{vp}}}}, \text{ (eq. B-3)}$$

where σ'_{vp} = initial effective stress at the depth of maximum strain influence.

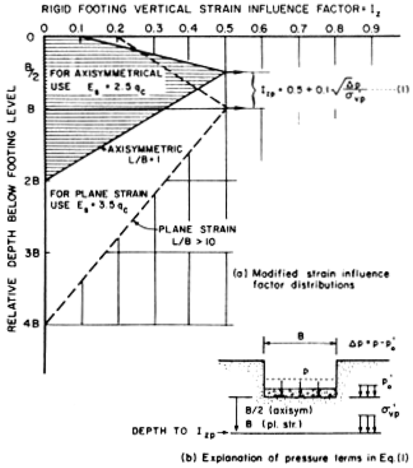


Figure B-1. Strain influence factor diagram (from Schmertmann et al., 1978).

Primary Consolidation

Primary consolidation occurs in fine grained soils when an applied load causes the water content of the soil to decrease with a comparable decrease in void space. For normally consolidated soils, this change in void space can be calculated by equation B-4.

$$\Delta e = C_c \log\left(\frac{P_f}{P_p}\right), \text{ (eq. B-4)}$$

where: C_c = the consolidation ratio
P_f = the final pressure exert on the soil after loading,
= $P_p + \Delta P$
P_p = the preconsolidation pressure, which for a normally consolidated soil is equal to the in-situ stress of the soil.

Subsequently, the primary consolidation of a normally consolidated soil is given by equation B-5.

$$\Delta H = H_0 \frac{C_c}{1+e_0} \log\left(\frac{P_f}{P_p}\right), \text{ (eq. B-5)}$$

where: H_0 = the initial height, or thickness, of the strata
e_0 = the initial void ratio of the soil

The compression ratio and initial void ratio of the soil are determined through laboratory testing. However, more often than not, the consolidation ratio of a soil goes unreported. Rather, it is common practice to provide the compression index of a soil, C_c', which is defined as $\frac{C_c}{1+e_0}$. Taking this into account, the primary consolidation for normally consolidated soils is given by equation B-6

$$\Delta H = C_c' \log\left(\frac{P_f}{P_p}\right), \text{(eq. B-6)}$$

Time Rate of Consolidation

During the initial loading of a compressible soil, the load is felt by the water content of the soil, causing the pore pressures in the soil to increase. As pore pressure decrease, water is squeezed out of the void space of the soil and the soil compresses. This process is governed by how quickly the water trapped in the soils pores can escape. The time that this process takes is given by equation B-7.

$$t = \frac{T_v H_0}{C_v} \text{ (eq. B-7)}$$

where: T_v = a non-dimensional time factor corresponding to the percentage of consolidation that has occurred at time t; varies with degree of consolidation

H_0 = the longest drain path that water must take to escape the pore space

C_v = the coefficient of consolidation

Secondary Compression

Secondary compression occurs due to the break-down of soil structure of time. Rate of secondary compression, unlike that of primary consolidation, is constant over time. The amount of secondary compression that can be expected is given in equation B-8.

$$\Delta H_s = \frac{C\alpha}{1+e_f} \log\left(\frac{t}{t_{100}}\right), \text{(eq. B-8)}$$

Where: t = the time for secondary compression to be calculated for

t_{100} = the time for 100% of primary compression to occur

C_v = the coefficient of secondary compression

e_f = the void ratio after 100% of primary compression has occurred,,

Project Name: Pearce Creek Liner Installation
Project Location: Pearce Creek, Maryland
Project Number: -
Calculations By: Conor McCafferty
Date: 6/20/2014

Ground Elevation (ft):	35
Areal Width (ft):	1000
Areal Length (ft):	1000
Contact Pressure (psf);	4000
Water Table Elevation (ft):	0
Depth of Embedment (ft):	0
Unit Weight of Soil Above Embedment (psf):	120
Time (years)	50

Instructions:
1. All Input values appear in red
2. Refer to OCR vs PI plot for corresponding Kc values
3. Reaply filters on each sheet after running new calculation
4. Water table elevation must be on a layer boundry
5. Insert project information on lines 1-5
6. When immediate settlement of clay does not apply, set v = 1

Material Type:

1 = Cohesive Soils (Clays, Silts, etc.)
2 = Clean, fine to medium sands and slightly silty sands
3 = Coarse sands and sands with little gravel
4 = Sandy gravel and gravel

Soft Dredge
Stiff Dredge
Natural Sands
Natural Clays
Peat/Organic Silts

Layer	**Top Elevation (ft)**	**Thickness (ft)**	**Material Type**	**γ_{moist} (psf)**	**C'_c**	**C_r**	**C_v (ft^2/day)**	**C_α**	**P_p (psf)**	**Kc**	**Cu (tsf)**	**Es (tsf)**	**v**	**N**
1	35	29	1	110	0.25	0.024	1.5	0.002	1500				1	
2	6	6	2	110										50
3	0	94	2	115										75
4	-94	6	1	120	0.15	0.01	1.5	0.002	6000				1	
5	-100	4	2	115										100
6	-104	16	1	125	0.1	0.01	1.5	0.002	6500				1	
7	-120	10	2	120										100
8	-130													
9	-130													
10	-130													

Note: Layer thicknesses from Profile 2

Immediate Settlements

Schmertmann Input Parameters	
Δp (tsf)	2.0
σ'vd (tsf)	0.0
C1	1.0
Ct	1.5

Layer	Top Elevation (ft)	Thickness (ft)	Material Type	γmoist (psf)	Es (tsf)	I	ΔH (ft)	ΔH (in)
2.0	6.0	6.0	2.0	110.0	437.5	0.1	0.0	0.1
3.0	0.0	94.0	2.0	115.0	656.3	0.2	0.1	0.9
5.0	-100.0	4.0	2.0	115.0	875.0	0.2	0.0	0.0
7.0	-120.0	10.0	2.0	120.0	875.0	0.2	0.0	0.1
						Σ	0.1	1.1

Primary Consolidation

Layer	Top Elevation (ft)	Thickness (ft)	Material Type	γmoist (psf)	C'c	C'r	Po,$_{bottom}$ (psf)	Po (psf)	Pp (psf)	Δp (psf)	Pf (psf)	OCR	Δε	ΔH (in)
1.0	35.0	29.0	1.0	110.0	0.3	0.0	3190.0	1595.0	1595.0	3999.9	5594.9	1.0	0.1	47.4
4.0	-94.0	6.0	1.0	57.6	0.2	0.0	9140.0	8967.2	8967.2	3949.4	12916.6	1.0	0.0	1.7
6.0	-104.0	16.0	1.0	62.6	0.1	0.0	10352.0	9851.2	9851.2	3931.5	13782.7	1.0	0.0	2.8
													Σ	51.9

Secondary Consolidation

Layer	t at 99% Primary (yrs)	ΔH (in)
1.0	0.7	1.3
4.0	0.0	0.5
6.0	0.2	0.9
	Σ	2.7

TOTALS

	Soft Dredge	Stiff Dredge	Natural Sands	Natural Clays	ΔH (in)
Immediate Settlement:	0.0	0.0	1.1	0.0	1.1
Primary Settlement:	47.4	0.0	0.0	4.5	51.9
Secondary Settlement:	1.3	0.0	0.0	1.4	2.7
				Σ	55.7

Least case natural soils settlement = 7.0 inches

Total settlement for specific Profile 2 layer thicknesses

Project Name:	Pearce Creek Liner Installation
Project Location:	Pearce Creek, Maryland
Project Number:	-
Calculations By:	Conor McCafferty
Date:	6/20/2014

Ground Elevation (ft):	30
Areal Width (ft):	1000
Areal Length (ft):	1000
Contact Pressure (psf);	4000
Water Table Elevation (ft):	0
Depth of Embedment (ft):	0
Unit Weight of Soil Above Embedment (psf):	120
Time (years)	50

Instructions:
1. All Input values appear in red
2. Refer to OCR vs PI plot for corresponding Kc values
3. Reaply filters on each sheet after running new calculation
4. Water table elevation must be on a layer boundry
5. Insert project information on lines 1-5
6. When immediate settlement of clay does not apply, set v = 1

Soft Dredge
Stiff Dredge
Natural Sands
Natural Clays
Peat/Organic Silts

Material Type:	
	1 = Cohesive Soils (Clays, Silts, etc.)
	2 = Clean, fine to medium sands and slightly silty sands
	3 = Coarse sands and sands with little gravel
	4 = Sandy gravel and gravel

Layer	**Top Elevation (ft)**	**Thickness (ft)**	**Material Type**	**γ_{moist} (psf)**	**C'_c**	**C_r**	**C_v (ft^2/day)**	**C_α**	**P_p (psf)**	**PI**	**Kc**	**Cu (tsf)**	**Es (tsf)**	**v**	**N**
1	30	30	1	110	0.25	0.024	1.5	0.002	1500					1	
2	0	34	2	115											25
3	-34	34	2	115											75
4	-68	62	1	125	0.1	0.01	1.5	0.002	6000					1	
5	-130														
6	-130														
7	-130														
8	-130														
9	-130														
10	-130														

Note: Layer thicknesses from Profile 4

Immediate Settlement

Schmertmann Input Parameters	
Δp (tsf)	2.0
σod (tsf)	0.0
C1	1.0
Ct	1.5

Layer	Top Elevation (ft)	Thickness (ft)	Material Type	γ_{moist} (psf)	Es (tsf)	I	ΔH (ft)	ΔH (in)
2.0	0.0	34.0	2.0	115.0	218.8	0.1	0.1	0.8
3.0	-34.0	34.0	2.0	115.0	656.3	0.2	0.0	0.3
						Σ	**0.1**	**1.1**

Primary Consolidation

Layer	Top Elevation (ft)	Thickness (ft)	Material Type	γ_{moist} (psf)	C'_c	C_r	$P_{o,bottom}$ (psf)	P_o (psf)	P_p (psf)	Δp (psf)	P_f (psf)	OCR	Δε	ΔH (in)
1.0	30.0	30.0	1.0	110.0	0.3	0.0	3300.0	1650.0	1650.0	3999.9	5649.9	1.0	0.1	48.1
4.0	-68.0	62.0	1.0	62.6	0.1	0.0	10758.0	8817.4	8817.4	3952.6	12770.0	1.0	0.0	12.0
													Σ	**60.1**

Secondary Consolidation

Layer	t at 99% Primary (yrs)	ΔH
1.0	0.7	1.3
4.0	3.1	1.8
	Σ	3.1

TOTALS

	Soft Dredge	Stiff Dredge	Natural Sands	Natural Clays	ΔH (in)
Immediate Settlement:	0.0	0.0	1.1	0.0	1.1
Primary Settlement:	48.1	0.0	0.0	12.0	60.1
Secondary Settlement:	1.3	0.0	0.0	1.8	3.1
				Σ	**64.3**

Least case dredged materials settlement = 49.4 inches

Total settlement for specific Profile 4 layer thicknesses

Project Name: Pearce Creek Liner Installation
Project Location: Pearce Creek, Maryland
Project Number: -
Calculations By: Conor McCafferty
Date: 6/20/2014

Ground Elevation (ft):	35
Areal Width (ft):	1000
Areal Length (ft):	1000
Contact Pressure (psf);	4000
Water Table Elevation (ft):	0
Depth of Embedment (ft):	0
Unit Weight of Soil Above Embedment (psf):	120
Time (years)	100

Instructions:
1. All Input values appear in red
2. Refer to OCR vs PI plot for corresponding Kc values
3. Reaply filters on each sheet after running new calculation
4. Water table elevation must be on a layer boundry
5. Insert project information on lines 1-5
6. When immediate settlement of clay does not apply, set v = 1

Material Type:

1 = Cohesive Soils (Clays, Silts, etc.)
2 = Clean, fine to medium sands and slightly silty sands
3 = Coarse sands and sands with little gravel
4 = Sandy gravel and gravel

Soft Dredge
Stiff Dredge
Natural Sands
Natural Clays
Tidal Marsh

Layer	**Top Elevation (ft)**	**Thickness (ft)**	**Material Type**	**γmoist (psf)**	**C'c**	**C'r**	**Cv (ft2/day)**	**C_{α}**	**Pp (psf)**	**Kc**	**Cu (tsf)**	**Es (tsf)**	**v**	**N**
1	35	35	1	110	0.25	0.024	1.5	0.0025	1500				1	
2	0	5	1	110	0.25	0.024	1.5	0.0025	2750				1	
3	-5	25	1	105	0.25	0.026	1.5	0.0025	2600				1	
4	-30	20	2	110										35
6	-50	30	1	120	0.15	0.015	1.5	0.0015	3500				1	
4	-80	20	2	115										75
8	-100	10	1	125	0.1	0.01	1.5	0.001	500				1	
4	-110	20	2	120										100
9	-130													
10	-130													

Note: Layer thicknesses from Profile 5

Immediate Settlement

Schmertmann Input Parameters	
Δp (tsf)	2.0
σod (tsf)	0.0
C1	1.0
Ct	1.6

Layer	Top Elevation (ft)	Thickness (ft)	Material Type	γ_{moist} (psf)	Es (tsf)	I	ΔH (ft)	ΔH (in)
4.0	-30.0	20.0	2.0	110.0	306.3	0.2	0.0	0.4
4.0	-80.0	20.0	2.0	115.0	656.3	0.2	0.0	0.2
4.0	-110.0	20.0	2.0	120.0	875.0	0.2	0.0	0.2
						Σ	**0.1**	**0.8**

Primary Consolidation

Layer	Top Elevation (ft)	Thickness (ft)	Material Type	γ_{moist} (psf)	C'_c	C_r	$P_{o,bottom}$ (psf)	P_o (psf)	P_p (psf)	Δp (psf)	P_f (psf)	OCR	Δε	ΔH (in)
1.0	35.0	35.0	1.0	110.0	0.3	0.0	3850.0	1925.0	1925.0	3999.9	5924.9	1.0	0.1	51.3
2.0	0.0	5.0	1.0	47.6	0.3	0.0	4088.0	3969.0	3969.0	3998.7	7967.7	1.0	0.1	4.5
3.0	-5.0	25.0	1.0	42.6	0.3	0.0	5153.0	4620.5	4620.5	3996.6	8617.1	1.0	0.1	20.3
6.0	-50.0	30.0	1.0	57.6	0.2	0.0	7833.0	6969.0	6969.0	3977.2	10946.2	1.0	0.0	10.6
8.0	-100.0	10.0	1.0	62.6	0.1	0.0	9511.0	9198.0	9198.0	3940.3	13138.3	1.0	0.0	1.9
													Σ	**88.6**

Secondary Consolidation

Layer	t at 99% Primary (yrs)	ΔH
1.0	1.0	2.1
2.0	0.0	0.6
3.0	0.5	1.7
5.0	0.7	1.2
7.0	0.1	0.0
	Σ	**5.5**

Total Settlement

	Soft Dredge	Tidal Marsh	Natural Sands	Natural Clays	ΔH (in)
Immediate Settlement:	0.0	0.0	0.8	0.0	0.8
Primary Settlement:	55.8	20.3	0.0	12.4	88.6
Secondary Settlement:	2.7	1.7	0.0	1.2	5.5
				Σ	**94.9**

Most case natural soil settlement = 14.4 inches
Most case Tidal marsh settlements = 22 inches
Total settlement for specific Profile 5 thicknesses

Project Name: Pearce Creek Liner Installation
Project Location: Pearce Creek, Maryland
Project Number: -
Calculations By: Conor McCafferty
Date: 6/20/2014

Instructions:
1. All Input values appear in red
2. Refer to OCR vs PI plot for corresponding Kc values
3. Reaply filters on each sheet after running new calculation
4. Water table elevation must be on a layer boundry
5. Insert project information on lines 1-5
6. When immediate settlement of clay does not apply, set v = 1

Material Type:
1 = Cohesive Soils (Clays, Silts, etc.)
2 = Clean, fine to medium sands and slightly silty sands
3 = Coarse sands and sands with little gravel
4 = Sandy gravel and gravel

Soft Dredge
Stiff Dredge
Natural Sands
Natural Clays
Tidal Marsh

Ground Elevation (ft):	35
Areal Width (ft):	1000
Areal Length (ft):	1000
Contact Pressure (psf);	4000
Water Table Elevation (ft):	0
Depth of Embedment (ft):	0
Unit Weight of Soil Above Embedment (psf):	120
Time (years)	100

Layer	Top Elevation (ft)	Thickness (ft)	Material Type	γmoist (psf)	C'c	C'r	Cv (ft2/day)	C_α	Pp (psf)	PI	Kc	Cu (tsf)	Es (tsf)	v	N
1	35	35	1	110	0.25	0.024	1.5	0.0025	1					1	
2	0	16	1	110	0.25	0.024	1.5	0.0025	1					1	
3	-16	18	1	105	0.25	0.026	1.5	0.0025	1					1	
4	-34	32	2	110											30
5	-66	32	2	115											75
6	-98	6	1	120	0.1	0.01	1.5	0.001	1					1	
7	-104	20	2	120				0							100
8	-124	6	1	125	0.1	0.01	1.5	0.001	1					1	
9	-130														
10	-130														

Note: Layer thicknesses from Profile 6

Immediate Settlement of Sands

Schmertmann Input Parameters	
Δp (tsf)	2.0
σod (tsf)	0.0
C1	1.0
Ct	1.6

Layer	Top Elevation (ft)	Thickness (ft)	Material Type	γ_{moist} (psf)	Es (tsf)	I	ΔH (ft)	ΔH (in)
4.0	-34.0	32.0	2.0	110.0	262.5	0.2	0.1	0.8
5.0	-66.0	32.0	2.0	115.0	656.3	0.2	0.0	0.4
7.0	-104.0	20.0	2.0	120.0	875.0	0.2	0.0	0.2
						Σ	**0.1**	**1.3**

Primary Consolidation

Layer	Top Elevation (ft)	Thickness (ft)	Material Type	γ_{moist} (psf)	C'_c	C_r	$P_{o,bottom}$ (psf)	P_o (psf)	P_p (psf)	Δp (psf)	P_f (psf)	OCR	Δε	ΔH (in)
1.0	35.0	35.0	1.0	110.0	0.3	0.0	3850.0	1925.0	1925.0	3999.9	5924.9	1.0	0.1	51.3
2.0	0.0	16.0	1.0	47.6	0.3	0.0	4611.6	4230.8	4230.8	3998.1	8228.9	1.0	0.1	13.9
3.0	-16.0	18.0	1.0	42.6	0.3	0.0	5378.4	4995.0	4995.0	3994.9	8989.9	1.0	0.1	13.8
6.0	-98.0	6.0	1.0	57.6	0.1	0.0	8930.4	8757.6	8757.6	3944.9	12702.5	1.0	0.0	1.2
8.0	-124.0	6.0	1.0	62.6	0.1	0.0	10458.0	10270.2	10270.2	3910.3	14180.5	1.0	0.0	1.0
													Σ	**81.1**

Secondary Consolidation

Layer	t at 99% Primary (yrs)	ΔH
1.0	1.0	2.1
2.0	0.2	1.3
3.0	0.3	1.4
6.0	0.0	0.3
8.0	0.0	0.0
	Σ	5.0

TOTALS

	Soft Dredge	Tidal Marsh	Natural Sands	Natural Clays	ΔH (in)
Immediate Settlement:	0.0	0.0	1.3	0.0	1.3
Primary Settlement:	65.1	13.8	0.0	2.2	81.1
Secondary Settlement:	3.4	1.4	0.0	0.3	5.0
				Σ	**87.5**

Most case dredge material settlement = 68.5 inches

Total settlements for specific Profile 6 thicknesses

Appendix D

Liner Calculations

Geomembrane Thickness Determination

Consider worst case scenario:

Maximum settlement angle mobilizing geomembrane tension

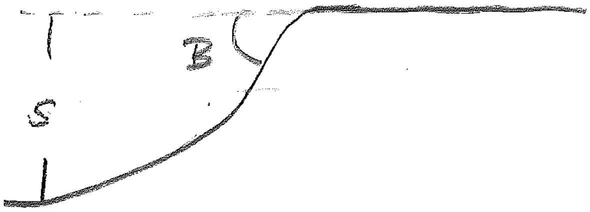
$$t = \frac{\sigma_n x (\tan\delta_U + \tan\delta_L)}{\sigma_{allow} (\cos\beta - \sin\beta \tan\delta_L)}$$

Eq. 5.19
Designing w/
Geosynthetics Vol 2
6th Ed. Robert Koerner
p.

For maximum loading

$\sigma_n = (100 * 40) = 4{,}000$ psf $\cong$ 192 kPa

$\beta = 45°$ (max.)



Assume LLDPE over nonwoven needle punch geotextile

x = distance to mobilize membrane deformation
= 50 mm

δ_U = angle of shearing resistance between membrane & adj. material above geomembrane

δ_L = angle below geomembrane

using Table 5.6

membrane to geotextile - for nonwoven (needle punched), $\delta = 8°$

σ_{allow} = allowable geomembrane stress

Geomembrane allowable tensile stress based on typical wide-width tensile test (ASTM D4385) results presented in "Design w/ Geosynthetics," Vol 2. (Fig. 5.15, p. 579)

$\sigma_{allowable}$ = 6,000 kPa to 8,000 kPa for 40 mil LLDPE

use σ_{all} = 6,000 kPa to be conservative

$$t = \frac{192(0.05)(\tan 8 + \tan 8)}{6,000(\cos 45 - \sin 45 \times \tan 8)}$$

$= 0.030 = 30$ mils $<$ proposed 40 mil geomembra

∴ OK

Check membrane strain

$$\varepsilon(\%) = \left\{ \frac{\tan^{-1}\left[\left(\frac{4L\delta}{L^2-4\delta^2}\right)\right]\left(\frac{L^2+4\delta^2}{4\delta}\right)-L}{L} \right\} \times 100$$

Equ. 5.5, Designing w/ Geosynthetics Vol 2 6th edition
Robert Koerner

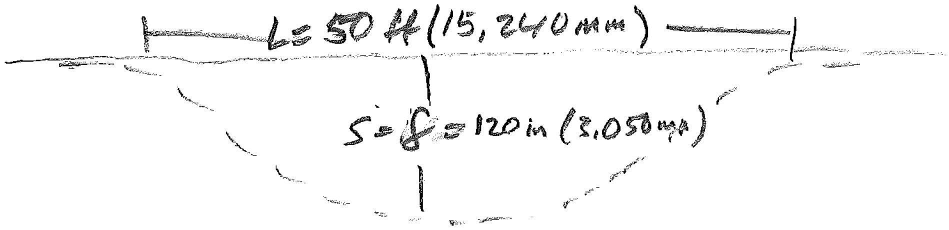
for $\delta < L/2$
$\tan^{-1}$ in radians

L = diameter of concern (mm)

δ = center point deflection (settlement) (mm)

P = pressure on Membrane

ε = geomembrane tensile strain (%)



$$\varepsilon = \left\{ \frac{\tan^{-1}\left[\left(\frac{4(15,240)(3,050)}{(15,240^2)-4(3,050)^2}\right)\right]\left(\frac{(15,240)^2+4(3,050)^2}{4(3,050)}\right\}-15,240}{15,240} \right.$$

$$= \frac{\tan^{-1}\left[0.953244\right] \times 22087.51 - 15,240}{15,240}$$

$$= \frac{1578.9}{15,240} = 0.103 \times 100 = 10.3\%$$

$\varepsilon = 10.3\% < 30\%$ for LLDPE $\therefore$ OK

Geomembrane Strain

L (mm)	**δ (mm)**	**$(4L\delta/(L^2-4\delta^2))$**	**$((L^2+4\delta^2)/4\delta)$**	**ε (%)**
15240	3050	0.953244234	22087.5082	10.36%
L (ft)	**δ (ft)**			
50	10	0.952380952	72.5	10.35%
100	10	0.416666667	260	2.65%
200	10	0.202020202	1010	0.67%
500	10	0.080128205	6260	0.11%

Note: The above table evaluates the strain (ε) for varying diameters of concern.

Runout/Anchor Trench

Calculate minimum length of geomembrane runout without anchor trench, L_{RO}

Using eq. (5.26) from "Designing w/ Geosynthetics", Vol 2, Koerner, pg. 596

$$L_{RO} = \frac{T_{allow}(\cos\beta - \sin\beta\tan\delta_L)}{\sigma_n(\tan\delta_U + \tan\delta_L)}$$

T_{all} = allowable force in geomembrane = $\sigma_{all}t$, where

σ_{all} = allowable stress in geomembrane

t = membrane thickness = 40 mil

β = side slope angle = 3:1 = 18.46°

δ = angle of shearing resistance between textured membrane & adjacent material
u (upper) L (lower)

σ_n = applied normal stress from cover soil.

$T_{all} = \sigma_{allowable} \times t$

For LLDPE, σ_{all} = 6,000 kPa ∴ T_{all} = 6,000(0.001)

t = 40 mil = 1 mm = 6.0 kN/m

$\delta_U = 0$ $\delta_L = 32°$ for textured HDPE & non woven geotextile

Cover material above liner

σ_n = 115(3) = 345 #/ft² = 16.5 kPa

$$L_{RO} = \frac{6(\cos 18.4 - \sin 18.4 * \tan 8)}{16.5(\tan 0 + \tan 25)} = \frac{6\ (0.9045)}{18\ (0.1405)}$$

= 0.7 meters

= 2.3 feet < 10' actual runout ∴ OK.

EMF 1/3

Side Slope Cover Stability - Finite Slope

$$W_A = \gamma h^2\left(\frac{L}{h} - \frac{1}{\sin\beta} - \frac{\tan\beta}{2}\right) \qquad (3.15)$$

$$N_A = W_A\cos\beta \qquad (3.16)$$

$$W_P = \frac{\gamma h^2}{\sin 2\beta} \qquad (3.18)$$

The resulting *FS* value is then obtained from the following equation:

$$FS = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \qquad (3.25)$$

where

W_A = total weight of the active wedge,
W_P = total weight of the passive wedge,
N_A = effective force normal to the failure plane of the active wedge,
N_P = effective force normal to the failure plane of the passive wedge,
γ = unit weight of the cover soil, ≅ 100pcf
h = thickness of the cover soil, ≅ 1 foot
L = length of slope measured along the geomembrane, ≅ 38 to 90 ft.
β = soil slope angle beneath the geomembrane, 3:1 slope = 18.4°
φ = friction angle of the cover soil,

δ = interface friction angle between cover soil and geotextile use 25°
C_a = adhesive force between cover soil of the active wedge and the geomembrane, ≅ 0
c_a = adhesion between cover soil of the active wedge and the , ≅ 0
a = $(W_A - N_A \cos\beta)\cos\beta$,
b = $-[(W_A - N_A\cos\beta)\sin\beta\tan\varphi + (N_A\tan\delta + C_a)\sin\beta\cos\beta + \sin\beta(C + W_p\tan\varphi)]$, and
c = $(N_A\tan\delta + C_a)\sin^2\beta\tan\varphi$.

Pg. 588-589, Designing w/ Geosynthetics, Vol 6 6th Edition

For L = 38

$$W_a = 100(1)^2\left(\frac{38}{1} - \frac{1}{\sin 18.4} - \frac{\tan 18.4}{2}\right)$$

$$= 100(38 - 3.168 \quad - 0.1663)$$

$$= 2,466.6$$

$$N_a = 2,466.6 * \cos 18.4 = 2,340.5$$

$$W_p = \frac{100(1)^2}{\sin 2(18.4)} = 166.9$$

$$a = (2,466. - 2,340.5 \cos 18.4) \cos 18.4$$

$$= 232.6$$

$$b = -[(2,466.6 - 2,340.5 \cos 18.4) \sin 18.4 \tan 25$$

$$+ (2,340.5 \tan 25 + 0) \sin 18.4 \cos 18.4 +$$

$$\sin 18.4 (0 + 166.9 \tan 25)]$$

$$= 36.2 + 326.9 + 77.8 = -440.9$$

$$c = (2,340.5 \tan 25 + 0) \sin^2 18.4 \tan 25 = 50.7$$

$$FS = \frac{+440.9 + \sqrt{(-440.9)^2 - 4(232.6)50.7}}{2(232.6)}$$

FS = 1.77 (For 38 ft slope)

For 90 ft slope

$$W_a = 100(1)^2\left(\frac{90}{1} - \frac{1}{\sin 18.4} - \frac{\tan 18.4}{2}\right)$$

$$= 100(90 - 3.168 - 0.1663)$$

$$= 8{,}666.6$$

$$N_a = 8{,}666.6 * \cos 18.4 = 8{,}223.5$$

$$W_p = 166.9$$

$$a = (8{,}666.6 - 8{,}223.5 \cos 18.4) \cos 18.4$$

$$= 819.3$$

$$b = -\Big[(8{,}666.6 - 8{,}223.5 \cos 18.4) \sin 18.4 \ \tan 25$$

$$+ (8{,}223.5 \tan 25 + 0) \sin 18.4 \ \cos 18.4$$

$$+ \sin 18.4 (0 + 166.9 \tan 25)\Big]$$

$$= -[258.6 + 1148.5 + 24.6] = -1{,}431.7$$

$$c = (8{,}223.5 \tan 25 + 0) \sin^2 18.4 \ \tan 25 = 178.2$$

$$FS = \frac{+1431.7 + \sqrt{(-1431.7)^2 - 4(819.3)(178.2}}{2(819.3}$$

$$FS = 1.6 \quad (\text{For } 90 \text{ ft slope})$$

Check venting capacity of liner system.

Non-woven geotextile will allow lateral & upward escape of water & gases.

No. Studies & research indicates methan emmission fluxes for wetlands & organic soils to range from 1.3×10^{-5} m³/m²-day to 2×10^{-8} m³/m²-day

Assume gas generation of 1.3×10^{-5} m³/m²-day

$\gamma_{moist\,air} = 0.0118$ kN/m³ (Koerner, p. 572)

Gas Flow rate

$$q = 1.3 \times 10^{-5} \left(\frac{1{,}000}{2} \right)$$

$$= 0.0065 \text{ m}^3/\text{day} = 4.5 \times 10^{-6} \text{ m}^3/\text{min}$$

Air gradient, assuming uniform distribution of 7.6 kPa @ center to zero @ edge is:

$$i = \frac{\Delta P / \gamma_{air}}{L/2}$$

$$= \frac{7/0.0118}{1000/2} = 1.19$$

$q = kiA = ki(t \times w)$

$kt = \Theta_{reqd} = q / i \times W$ Eq. 2.20 Designing w/ Geosynthetics, Vol 1 6th edition

Θ = transmissivity of the geotextile

W = width of geotextile test specimen (use 1 meter)

$$\Theta_{reqd} = \frac{4.5\times10^{-6}}{1.19\ (1)} = 3.78\times10^{-6}\ m^3/min\text{-}m$$

Based on 1 foot of soil cover @ end of construction. γ_T = 100pcf ≅ 5 kPa

Thus for a normal stress of 5kPa and air pressure of 7kPa Θ_{allow} ≅ 0.2 m³/min-m Fig. 2.17a, p. 154 for 16 oz geotextile

The $FS = \frac{\Theta_{all}}{\Theta_{reqd}}$

$$FS = \frac{0.2}{3.78\times10^{-6}}$$

= 5.2 which is adequate

Appendix E

Global Slope Stability Analyses

ANALYSIS OF EXISTING DIKES
PEARCE CREEK
DREDGED MATERIAL CONTAINMENT AREA
WEST VIEW SHORES
CECIL COUNTY, MARYLAND

Contract Number DACW61-98-D-0008
Task Order No. 11

September 1999

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W.O. 3769.GL

Analysis of Existing Dikes
Pearce Creek Dredged Material Containment Area

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Analysis of Existing Dikes
Pearce Creek Dredged Material Containment Area

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Analysis of Existing Dikes
Pearce Creek Dredged Material Containment Area

Analysis of Existing Dikes
Pearce Creek Dredged Material Containment Area

EXECUTIVE SUMMARY

Duffield Associates previously performed a feasibility study of the long term utilization of the U.S. Army Corps of Engineers' Pearce Creek Dredged Material Containment Area. This 260-acre area is located in Cecil County, Maryland, along the Elk River, near its confluence with the Chesapeake Bay. The feasibility study is summarized in Duffield Associates' April 1999 report titled "Feasibility Study, Long Term Life Cycle Evaluation of Pearce Creek Dredged Material Containment Area," (W.O. 3769.GE).

This report summarizes an evaluation of the stability of the current dike configuration, assuming dredged materials are placed to within 2 feet of the crest of the existing dike system, as well as the stability of the dikes assuming the dikes are raised approximately 5 to 8 feet, to elevation 58, prior to the next scheduled dredged material placement. The six dike cross sections, including the stratigraphy and corresponding shear strength parameters, developed as part of the feasibility study were used as the basis for this evaluation. This report should therefore be reviewed in conjunction with the feasibility study report.

As discussed in the feasibility study report, based on the subsurface explorations performed at the site and the subsequent laboratory testing, the subsurface conditions encountered along the dike consist of a 25 to 35-foot thick layer of soil fill (previously placed dredged material) underlain by predominately sand soils. The consistency of the fine grained dredged materials varied from a surficial stiff crust to very soft to stiff, medium to high plasticity silts and clays.

Analysis of the existing dikes, with the existing dredged material elevations (approximate elevations 30 to 40 feet), indicates factors of safety of 1.3 to 2.7 for the exterior slopes and factors of safety of 1.2 to 2.3 for the interior slopes. The analysis of the existing dikes with the interior area filled to elevation 50 with dredged material, allowing approximately 2 feet for freeboard, indicates that adequate factors of safety should exist in all but two locations. At these two locations, Cross Section A-A for the steady state seepage condition and Cross Section E-E for the end of construction condition, factors of safety greater than one (1.3 and 1.2, respectively) but slightly less than the recommended values (1.5 and 1.3, respectively) were estimated.

The stability of the dike system was also analyzed assuming the dikes will be raised to elevation 58 prior to the next scheduled placement of dredged materials. The top of dike elevation of 58 feet was selected based on projected capacity considerations as discussed in the recommendations and conclusions of the feasibility study. The raised dikes were analyzed using both the existing dredged material elevations and a future dredged material elevation of 50 feet.

For the case assuming the existing dredged material elevations end of construction conditions were used and only the stability of the interior slopes was reviewed, since the stability of the exterior slopes is more critical using the higher dredged material elevation. This analysis indicates factors of safety for the interior slopes ranging from 1.1 to 1.9. To achieve factors of safety of 1.3 or greater for the end of construction conditions, the dike raising could be staged, with an initial dike raising followed by an additional dike raising once adequate strength gain has occurred in the underlying soils. However, due to the large volume of drier dredged material (the existing “crust”) which is presently available for raising the dike, and which will be submerged if it is not removed prior to the next dredging event, it would be beneficial to raise the dike to as high an elevation as possible (up to 58 feet) prior to the placement of additional dredged material in the disposal area. Additionally, the sooner the dikes are raised, the sooner the soils beneath the dikes will obtain an increase in strength due to consolidation of these soft soils.

For the case assuming a dredged material elevation of 50 feet, both end of construction and steady state seepage conditions were reviewed for the exterior slopes. The end of construction condition was also reviewed for the interior slope for this case. This analysis indicates that adequate factors of safety exist at three of the six cross sections (Cross Sections C-C, D-D and F-F). Adequate factors of safety also exist at Cross Section E-E, with one exception. As in the 2-foot freeboard condition for this cross section, the factor of safety for the exterior slope for the end of construction condition (1.2) is slightly less than the recommended value (1.3). However, due to the location of the critical slip surface, raising the dike in smaller lifts or introducing a setback into the slope geometry will not result in an increased factor of safety.

A 20-foot setback should be included in the design for the dike raising in the vicinity of Cross Section A-A and a 10-foot setback should be included in the design in the vicinity of Cross Section B-B. If these setbacks are incorporated into the design, this analysis indicates that adequate factors of safety should exist for the raised dike, assuming a dredged material elevation of approximately 50 feet.

1.0 BACKGROUND

1.1 Introduction

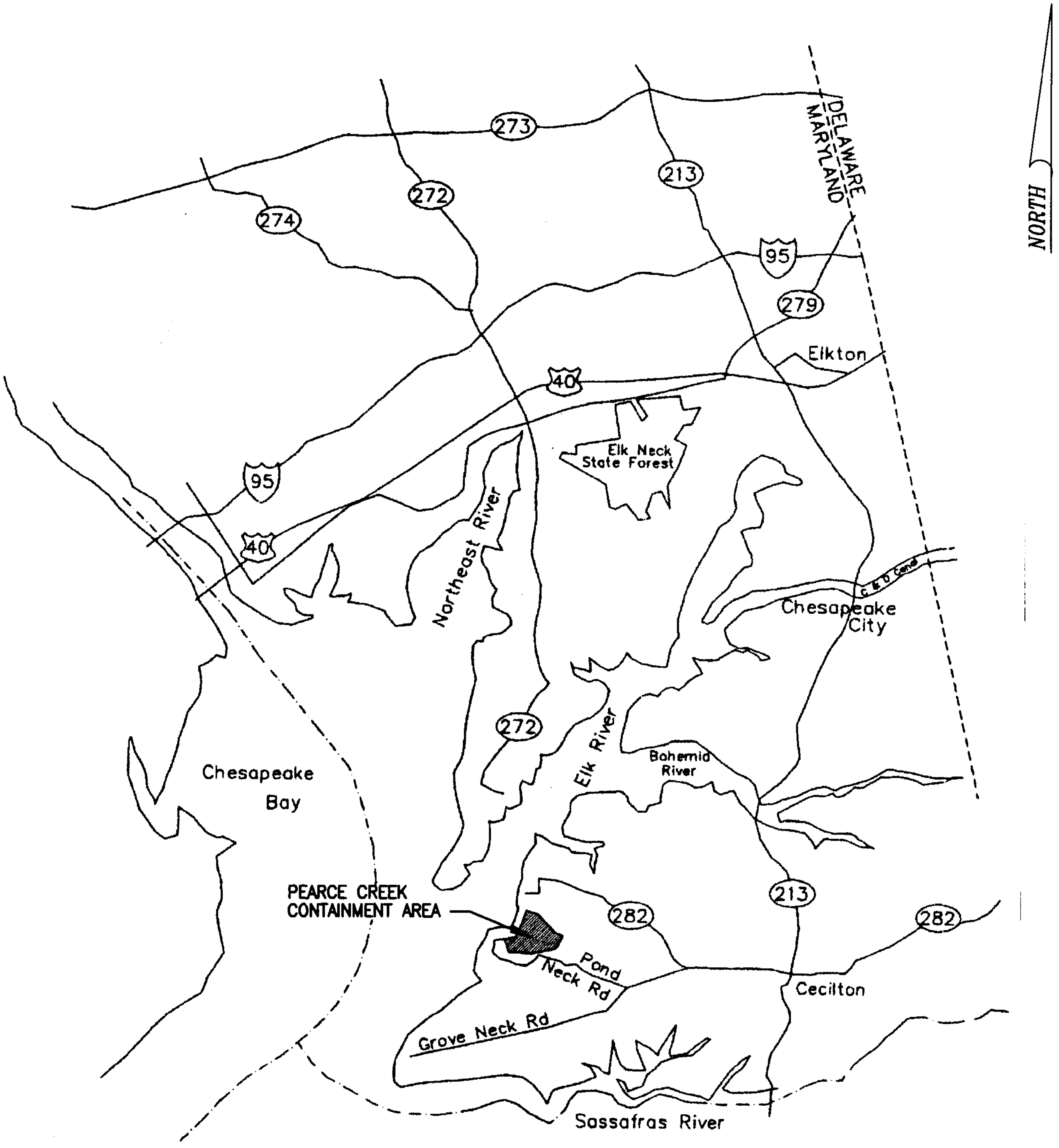
The Pearce Creek Dredged Material Containment Area is an existing facility utilized by the U.S. Army Corps of Engineers Philadelphia District as part of its ongoing Operation and Maintenance (O&M) dredging program for the Chesapeake and Delaware Canal. The containment area is located in the western part of Cecil County, Maryland, along the Elk River, near its confluence with the Chesapeake Bay (Figure 1.1, Regional Location Sketch and Figure 1.2, Site Location Sketch). Duffield Associates previously performed a feasibility study of the long term utilization of the U.S. Army Corps of Engineers' Pearce Creek Dredged Material Containment Area. This feasibility study is summarized in Duffield Associates' April 1999 report entitled "Feasibility Study, Long Term Life Cycle Evaluation of Pearce Creek Dredged Material Containment Area," (W.O. 3769.GE). The feasibility study report includes a project overview, a discussion of the history of the site, a summary and review of existing geotechnical data and new data collected as part of the feasibility study, an evaluation of the long term capacity of the site and a review of potential options for increasing the site capacity.

The purpose of this report is to summarize an evaluation of the stability of the current dike configuration, assuming dredged materials are placed to within 2 feet of the crest of the existing dike system, as well as the stability of the dikes assuming the dikes are raised approximately 5 to 8 feet prior to the next scheduled dredged material placement. The dike cross sections, including the stratigraphy and corresponding shear strength parameters, developed as part of the feasibility study were used as the basis for this evaluation. This report should therefore be reviewed in conjunction with the feasibility study report. This work was performed under Task Order No. 0011 of the U.S. Army Corps of Engineers' Contract Number DACW61-98-D-0008, in accordance with the agreement between Duffield Associates and the U.S. Army Corps of Engineers, Philadelphia District, dated September 29, 1998.

1.2 Previous Subsurface Explorations

Previous subsurface explorations at the site were discussed in the feasibility study report. These explorations are summarized as follows.

- Fifteen Standard Penetration Test (SPT) borings were performed in the vicinity of the site as part of a two-phase groundwater evaluation conducted by the District to address concerns raised by residents of an adjacent community regarding the impact of the containment area on local groundwater. Groundwater monitor wells (CSW-1 through CSW-15) were installed in the resulting boreholes and limited geotechnical laboratory testing was performed on selected soil samples collected as the boreholes



NOTE:

THIS SKETCH IS ADAPTED FROM A SKETCH TITLED "PEARCE CREEK DREDGE MATERIAL DISPOSAL AREA VICINITY MAP" BY THE U.S. ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT. (NO DATE)

REGIONAL LOCATION SKETCH

PEARCE CREEK DREDGED MATERIAL CONTAINMENT AREA

CECIL COUNTY ~ MARYLAND

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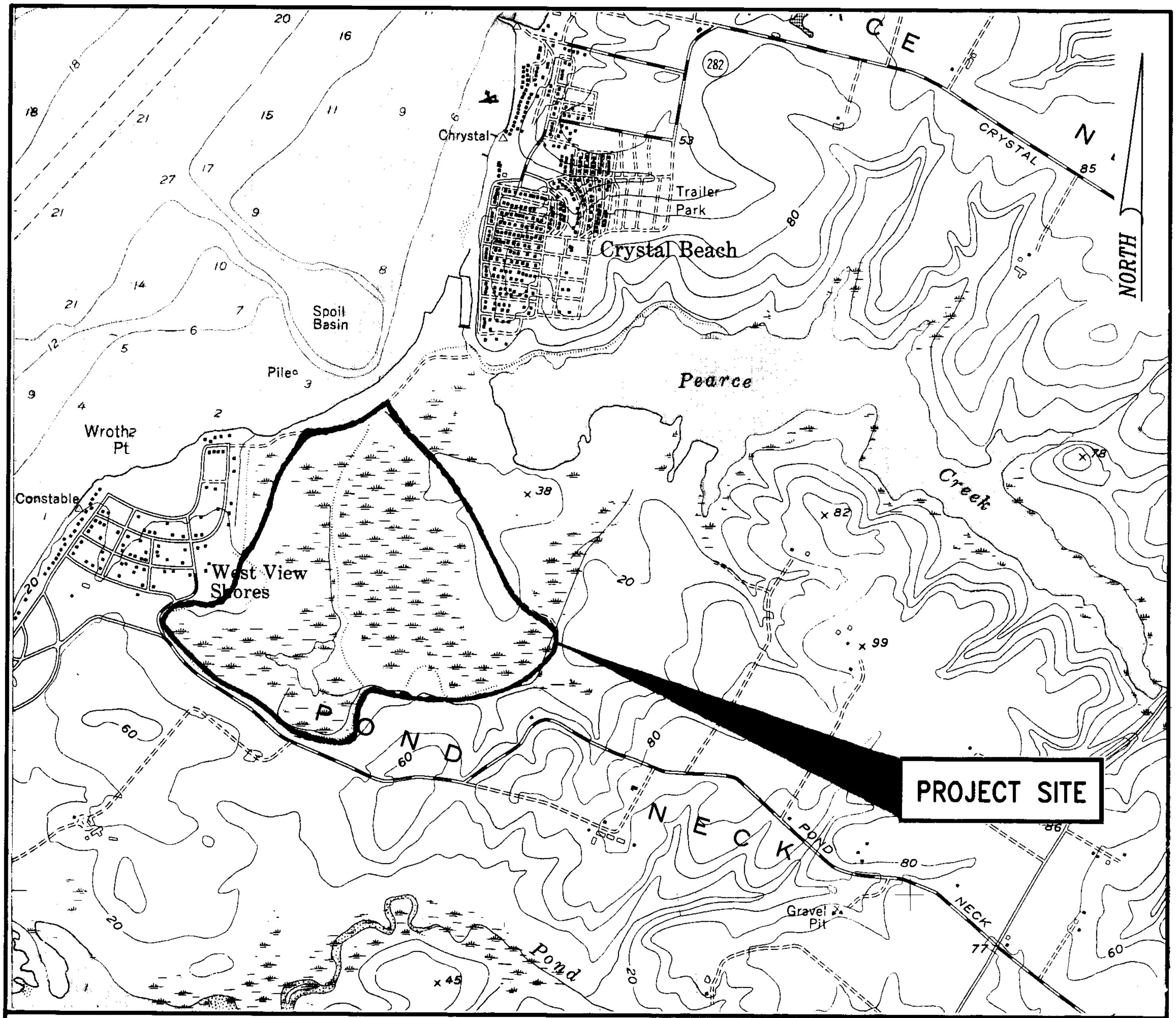
Drawn: CFY Chk'd: JFC	Date: 12 FEBRUARY 1999
Scale: NONE	W.O.: 3769.GE
Drawing No: A-3769GE-14	FIGURE 1.1



NOTE:

THIS LOCATION SKETCH IS ADAPTED FROM THE U.S.G.S. TOPOGRAPHIC MAP, 7.5 MINUTE SERIES, FOR EARLEVILLE, MD.

SITE LOCATION SKETCH

PEARCE CREEK DREDGED MATERIAL CONTAINMENT AREA

CECIL COUNTY ~ MARYLAND

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Drawn: CFY Chk'd:	Date: 12 FEBRUARY 1999
Scale: 1" = 2000'	W.O.: 3769.GE
Drawing No: A-3769GE-13	FIGURE 1.2

were advanced. The Monitor Well Installation Logs for these wells, as well as a summary of the evaluation is included in an October 1997 Corps of Engineers' report titled "Pearce Creek Disposal Area Groundwater Investigation, Pearce Creek, MD, Phase II Report" and a March 1998 Roy F. Weston, Inc. report titled "Review of Groundwater Investigations for the Pearce Creek Dredged Material Disposal Area, Pearce Creek, Maryland."

- Twenty-four SPT borings (CSB-1 through CSB-24) were performed along the perimeter dike by the District in 1988, prior to the most recent dike raising. The borings were generally performed in groups of three, to define stratigraphic and soil strength cross sections at various locations along the dikes. Continuous split spoon sampling was performed throughout the depth of the borings, and geotechnical laboratory testing was performed on selected samples.

- Seven borings (CSS-1 through CSS-7) were performed by the District in 1997 along the perimeter dike. One split spoon sample and one undisturbed thin-wall tube (Shelby tube) sample were collected from the bottom of each boring, and geotechnical laboratory testing was performed on selected samples.

The locations of these wells and borings are indicated in Figure A.1, "Subsurface Exploration Location Plan." A tabular summary of the geotechnical laboratory index and strength testing data obtained as part of these evaluations is included in Appendix C as Table C.1, "Summary of Previous Laboratory Tests."

1.3 Feasibility Study Subsurface Exploration

A field and laboratory testing program was performed by Duffield Associates as part of the feasibility study. The goal of this program was both to confirm the available existing subsurface data and to supplement this information to assist in the selection of soil strength parameters for the dike stability analyses. Duffield Associates' field program, performed in November 1998, included the performance of five SPT borings and eight dilatometer (DMT) soundings.

The SPT borings (TB-1 through TB-5) were performed at locations along the existing perimeter dike, and included continuous split spoon sampling, except where undisturbed Shelby tube sampling was performed. Thirteen thin-walled undisturbed Shelby tube samples, representative of silt and clay soils encountered, were obtained during the drilling program to permit laboratory strength and compressibility testing of these soils. The dilatometer soundings (DMT-1 through DMT-8) were located along the centerline of the perimeter dike, and were generally advanced through the compressible foundation soils. The soundings were utilized in assessing the uniformity of the dike soils. The logs for the borings and soundings are included in Appendix B of this report. The locations of the borings and soundings are indicated on Figure A.1.

Following completion of the field program, both disturbed (split-spoon) and undisturbed (Shelby tube) soil samples obtained from the Standard Penetration Test borings were returned to Duffield Associates' geotechnical laboratory for testing of selected samples. The results of the laboratory testing are included in Table D.1, "Laboratory Test Results Summary" of Appendix D.

2.0 SUBSURFACE CONDITIONS

2.1 Stratigraphy

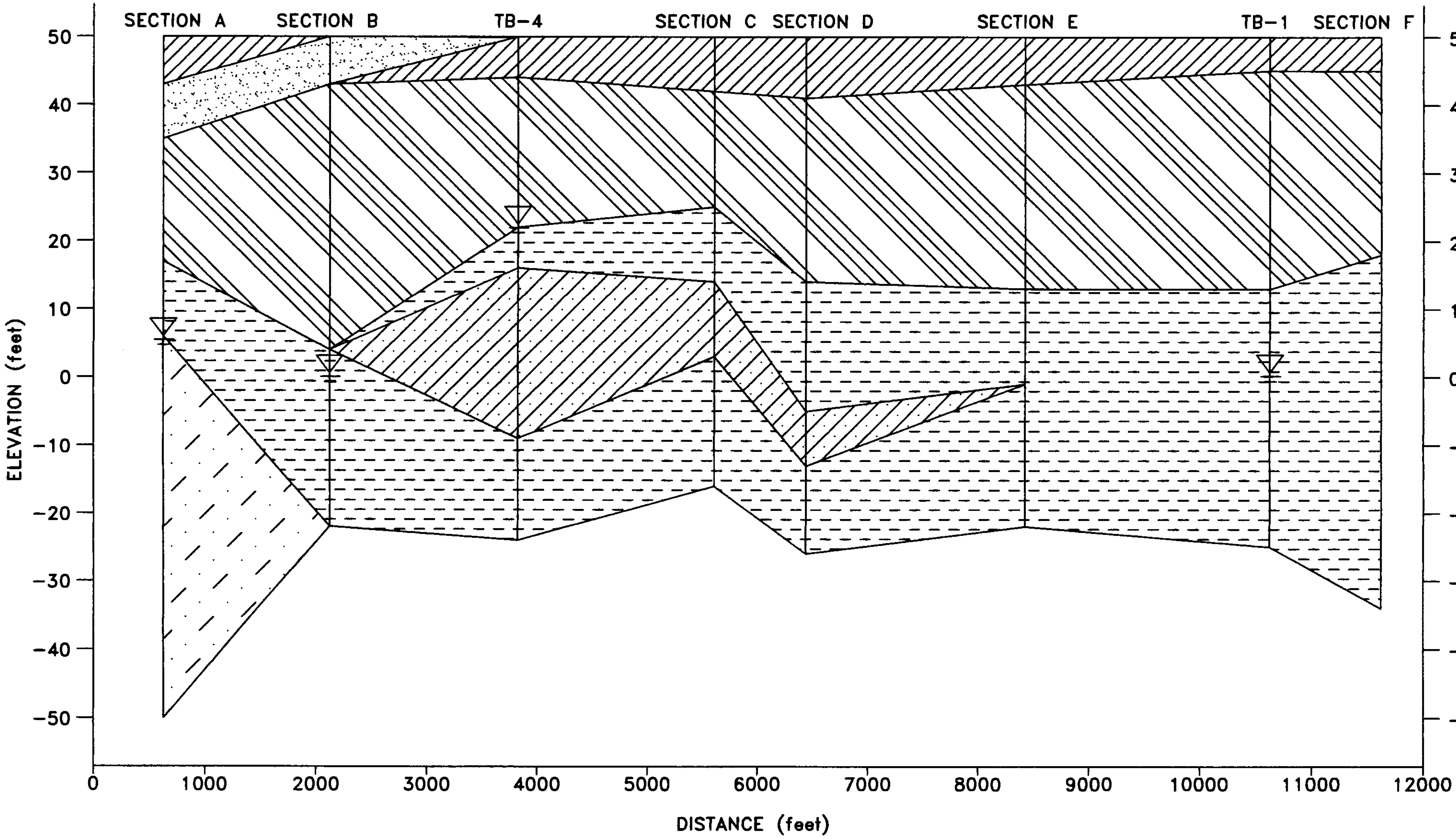
The subsurface conditions encountered by the SPT test borings and dilatometer soundings located along the perimeter dike as part of the feasibility study were consistent with those encountered in the test borings performed as part of previous subsurface explorations. The conditions along the perimeter dike generally consisted of a 25 to 35 foot thick layer of soil fill (dredged material), extending from existing grade (average "top of dike" elevation 50 to 52 ±) to elevations ranging from 5 to 25 feet, underlain by a loose to very dense sand/silty sand stratum. In several of the test borings a lense of medium stiff to very stiff silt was encountered within this sand stratum. The sand stratum was underlain by stiff to hard sandy silts and clays. At TB-4 a layer of soft to medium stiff silt was encountered between a depth of 32 to 57 feet (elevation 18 to - 9) below existing grade.

Two different strata were identified within the soil fill materials, an upper "crust," consisting of 4 to 8 feet of medium stiff to stiff silts and medium dense to dense silty sands, underlain by predominantly fine-grained soils, including low plasticity silts and clays and high plasticity silts and clays (classified as ML, CL, MH, and CH soils in the Unified Soil Classification System), ranging in consistency from very soft to stiff. This gray to dark gray dredged material contained varying amounts of organics, fine sand and mica.

The subsurface conditions encountered are illustrated in a stratigraphic profile along the centerline of the perimeter dike, which is included as Figure 2.1, Stratigraphic Profile. The locations of the sections and test borings identified on the stratigraphic profile are indicated in Figures A.1 and 3.1.

2.2 Groundwater Conditions

During the feasibility study field program, groundwater was encountered at depths ranging from 25 to 50 feet below the existing ground surface, corresponding to elevations ranging from approximately 0.9 feet to 23 feet. The depth to groundwater was based on the "wet-on-spoon" conditions observed during the SPT borings. Since "wash water" was used during the drilling program and water levels in the boreholes



U.S. ARMY CORPS OF ENGINEERS
Pearce Creek Dredged Material
Containment Area
CECILTON, MD.
W.O. 3769.GE

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FIGURE 3.1

Stratagraphic Profile

Soil Strata From Top of Dike

NOTE: SEE FIGURE 4.1 FOR LOCATIONS OF SECTIONS AND TEST BORINGS.

LEGEND

▨ Crust (dredged material) ML, SM
░ Sand (dredged material) SM/SP
▨ Silt/Clay (in-situ material) ML, CL
☰ Sand (in-situ material) SW, SP, SM
▨ Silt (in-situ material) MH, ML
▧ Clay/Silt (dredged material) CL, CH, MH, ML
▽ WATER LEVEL AS NOTED IN TEST BORING LOGS

were not allowed to equilibrate following completion of the field program, actual groundwater elevations may vary from those observed.

Based on review of the soil stratigraphy, it is probable that the shallow depths to groundwater encountered were influenced by the underlying fine grained soils and may be indicative of impeded subsurface drainage and “perched” conditions. The greater depths to groundwater, observed in the sand strata, are consistent with available groundwater information. Review of the data provided in the March 1998 groundwater investigation by Roy F. Weston, Inc., indicates variable areal, and fluctuating, groundwater elevations. These range from elevation 2 feet along the north side and 10 feet along the southeast side of the containment area.

Since effective (perched or natural) groundwater levels will vary based on dredging operations and seasonal fluctuations, for the dike stability analyses groundwater elevations were conservatively assumed to extend from the dredged material surface on the interior slope of the dike, to the toe of the exterior slope of the dike.

3.0 ANALYSIS

3.1 Introduction

Based on the capacity evaluation performed for the feasibility study, it was concluded that the existing dike configuration has adequate capacity to permit disposal of dredged material for the next 20 to 50 years for the anticipated dredged material disposal scenarios. (These scenarios are presented and discussed in the feasibility study report.) It was also concluded that a top of dike elevation maintained at approximately 58 feet would be required to provide a 50-year capacity for the disposal scenario with the greatest dredged material volume. Based on these findings, the District requested additional evaluation of the stability of the perimeter dike system. Duffield Associates was requested to review the stability of the dike for the following three configurations:

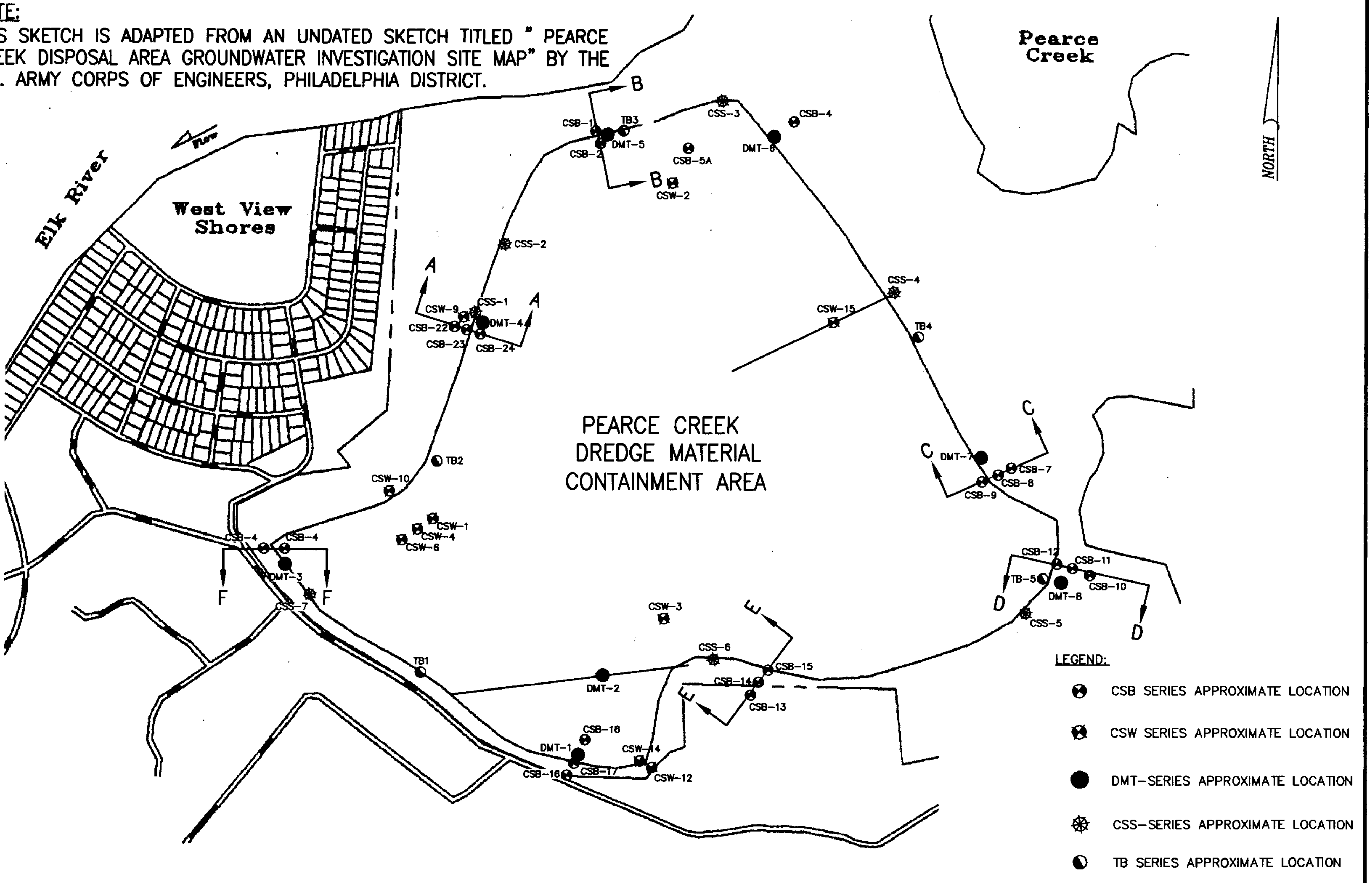
1. Existing Conditions (i.e., top of dike elevations of approximately 52 feet with the existing dredged material elevations, which vary from approximate elevation 30 to 40 feet).

2. Existing Dike with 2-Foot Freeboard (i.e., top of dike elevations of approximately 52 feet and dredged material elevation of 50 feet).

3. Raised Dike (i.e., top of dike elevation of 58 feet and a dredged material elevation of 50 feet).

NOTE:

THIS SKETCH IS ADAPTED FROM AN UNDATED SKETCH TITLED " PEARCE CREEK DISPOSAL AREA GROUNDWATER INVESTIGATION SITE MAP" BY THE U.S. ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT.



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CROSS SECTION LOCATION SKETCH

PEARCE CREEK DREDGED MATERIAL CONTAINMENT AREA

CECIL COUNTY ~ MARYLAND

Drawn: CFY	Chk'd: JFC	Date: 12 FEBRUARY 1999	
Scale:	NONE	W.O.:	3769.GE
File No:	A-3769GE-15	FIGURE 4.1	

No:	Revision:	Date:

In addition, the stability of the interior slope of the raised dike (to elevation 58) was evaluated while maintaining the existing interior dredged material elevations. The purpose of this analysis was to review the stability of the dike system following construction of the raised dikes to the projected 50-year capacity configuration and prior to the placement of new dredged materials. This was considered the critical case for the interior slope of the perimeter dike.

The slope stability analyses for these configurations were performed utilizing the subsurface stratigraphy developed as part of the feasibility study for six cross sections through the perimeter dike (identified as Cross Sections A-A through F-F in Figure 3.1). These cross sections were developed using the topographic information included on the plan in Appendix A.

Groundwater conditions assumed for each cross section were dependent upon the elevation of the dredged material within the containment area for each configuration analyzed. In general, groundwater elevations were conservatively assumed to extend from the dredged material surface on the interior slope of the dike to the toe of the exterior slope of the dike.

Shear strength parameters developed as part of the feasibility study were used in this evaluation. As discussed in the feasibility report, the shear strength parameters were estimated for each stratum based on the field and laboratory test data for the borings and dilatometer soundings performed in the vicinity of each cross section. Unconsolidated-undrained (UU) and consolidated-drained (CD) strengths were selected for each stratum. The UU strength parameters were used in the stability analyses reflecting “end of construction” conditions, while the CD strength parameters were used to evaluate the long term, or “steady state” conditions. For granular soils, the friction angles estimated for the unconsolidated-undrained condition based on the SPT and DMT data were used throughout the analysis. For the fine grained, cohesive materials, the UU strength parameters were selected based on evaluation of the SPT data, the DMT data, the unconfined compression strength, and the UU testing performed as part of the feasibility study; and the field and laboratory data from the previous evaluations. Shear strength parameters for the consolidated-drained condition were derived from the consolidated-undrained triaxial (with pore pressure measurement) test data from the previous evaluations and direct shear tests performed as part of the feasibility study. The shear strengths utilized are indicated in the tabular summary included with each slope stability cross section in Appendix E.

The analyses were performed using the REAME (Rotational Equilibrium Analysis of Multilayered Embankments) slope stability computer program (University of Kentucky, 1997). This software package allows the dike cross section to be divided into multiple layers defined by three strength parameters (friction angle, ϕ; cohesion, c; and unit weight, γ). A variety of seepage conditions and failure types can be imposed on the cross section. The program searches for the critical failure surface and provides the factor of safety for this surface. Six methods are available to analyze the failure mechanism. The method chosen for the analyses in this evaluation was the Modified

Spencer Method. The minimum factors of safety for each cross section are summarized in Table 3.1 and are discussed in the following three sections. Minimum required factors of safety of 1.3 for short-term, end-of-construction conditions and 1.5 for long-term, steady state conditions were used as a guide in the slope stability analysis.

3.2 Existing Conditions

Stability analyses were performed on the six cross sections developed based on the existing dike and dredged material configurations. The unconsolidated-undrained strength parameters developed for each section were utilized for these analyses. The resulting minimum factors of safety ranged from 1.3 in Section E-E to 2.7 in Section F-F for the exterior slopes and from 1.2 in Section D-D to 2.3 in Section A-A for the interior slopes. It should be noted that the analyses indicate that an area of local instability may exist in the vicinity of the toe of the exterior slope in Cross Section A-A, where existing 1H:1V slopes were indicated by the topographic plan. Figures illustrating the dike cross sections, the soil stratigraphy, a summary of the soil parameters utilized in the analysis, as well as the location of the critical failure surfaces and the corresponding factors of safety for the existing conditions are included in Appendix E as Figures E.1, 6, 11, 15, 19 and 23.

3.3 Existing Dike with 2-Foot Freeboard

Additional analysis was performed to review the stability of the existing dikes when dredged material is placed to within 2 feet of the existing top of dike (i.e., approximately elevation 50). Although strength gains may occur in the soils underlying the existing dike by the time the disposal area reaches this elevation, this analysis was conservatively performed using the existing unconsolidated-undrained soil strength parameters to represent the end of construction condition. As indicated in Section 3.1, the consolidated-drained soil strength parameters were used in the steady state seepage analyses.

For the exterior slopes, the resulting factors of safety for the end of construction condition were 1.3 or greater for five of the six cross sections. Although a factor of safety of 1.3 was obtained for Cross Section E-E in the feasibility study, further review of this section indicated a lesser factor of safety of 1.2 under the 2-foot freeboard condition, as illustrated in Figure E.20.

The resulting factors of safety for the exterior slope under the steady state seepage condition were 1.5 or greater for all cross sections evaluated, except Cross Section A-A. For Cross Section A-A, the minimum factor of safety for the steady state seepage condition was determined to be approximately 1.3, as illustrated in Figure E.2.

PEARCE CREEK DREDGE MATERIAL CONTAINMENT AREA

Table 3.1
Slope Stability Summary

FACTORS OF SAFETY (1)											
Cross Section (2)	Existing Dike (~ Elevation 52 feet)				Raised Dike (Elevation 58 feet)						
	Existing Dredged Material Elevation		2-Foot Freeboard Condition		Ex. Dredged Material El.	Dredged Material Elevation of 50 feet					
			End-of-Construction	Steady State		End-of-Construction				Steady State	
	Exterior	Interior	Exterior	Exterior	Interior (3)	Exterior		Interior		Exterior	
						No Setback	Setback (4)	No Setback	Setback (4)	No Setback	Setback (4)
A-A	1.9	2.3	1.3	1.3	1.9	1.0	1.3	2.2	1.8	1.0	1.7
B-B	1.6	2.1	1.6	1.5	1.7	1.3	1.3	2.2	2.1	1.4	1.7
C-C	2.4	1.9	2.3	2.0	1.2	1.6	NA	1.6	NA	1.6	NA
D-D	1.6	1.2	1.6	2.0	1.1	1.6	NA	1.9	NA	2.1	NA
E-E	1.3	1.3	1.2	1.5	1.2	1.2	NA	2.2	NA	1.5	NA
F-F	2.7	2.0	1.7	1.8	1.8	1.4	NA	2.1	NA	1.6	NA

Notes:

1. Minimum Factor of Safety calculated using Modified Spencers Method.
2. See Figure 3.1 for Cross Section locations.
3. End of Construction analysis, including setbacks in Cross Sections A-A and B-B.
4. Setback for Cross Section A-A is 20 feet. Setback for Cross Section B-B is 10 feet.
5. This table is part of a report entitled "Analysis of Existing Dikes, Pearce Creek Dredged Materila Containment Area," dated August 1999 and should be reviewed only in the context of that report.

Analyses of the interior slopes were not performed for this configuration, since raising the dredged material elevation from the existing levels to within two feet of the top of the dike would only increase the factors of safety for the interior slopes above those determined for the existing conditions.

Figures illustrating the dike cross sections, the soil stratigraphy, a summary of the soil parameters utilized in the analysis, as well as the location of the critical failure surfaces and the corresponding factors of safety for the existing conditions are included in Appendix E as Figures E.2, 7, 12, 16, 20, and 24. For cross sections, Cross Sections C-C, E-E and F-F, the analyses indicates the critical failure surface to consist of a surficial failure on the exterior slope of the dikes. At these locations, an additional circle, and the corresponding factor of safety, are included on the figures to demonstrate that the factor of safety increases for deeper failure surfaces under steady state seepage condition.

3.4 Raised Dike

3.4.1 Introduction

The stability of the six cross sections was analyzed assuming the dikes will be raised to elevation 58 prior to the next scheduled placement of dredged materials. The top of dike elevation of 58 feet was selected based on the recommendations and conclusions of the feasibility study, as discussed in Section 3.1. The raised dike was analyzed using the existing dredged material elevation (approximate elevation 30 to 40) and a future dredged material elevation of 50 feet. For the case assuming the existing dredged material elevations, end of construction conditions were used, and only the stability of the interior slopes were reviewed (since the stability of the exterior slopes is more critical using the higher dredged material elevation). For the case assuming a dredged material elevation of 50 feet, both end of construction and steady state seepage conditions were reviewed for the exterior slopes. The end of construction condition was also reviewed for the interior slope for this case.

The raised dike analysis was based on the assumption that the existing slopes of the exterior of the embankments will be maintained as the dikes are expanded toward the interior, that the dike materials will consist of compacted dredged materials excavated from the center of the disposal area, (with similar engineering properties to the existing dike fill materials), and that a 15 foot top of dike width will be maintained. Although strength gains occur in the soils underlying the existing dike by the time the disposal area reaches elevation 50, this analysis was conservatively performed using the existing unconsolidated-undrained soil strength parameters to represent the end of construction condition. As discussed in Section 3.1, the consolidated-drained soil strength parameters were used in the steady state seepage analyses.

3.4.2 Raised Dike with Existing Dredged Material Elevations

Analysis of the raised dike with the existing dredged material elevations indicates end of construction factors of safety for the interior slopes ranging from 1.1 at Cross Section D-D to 1.9 at Cross Section A-A. Factors of safety greater than 1.3 (1.9, 1.7 and 1.8) were calculated for Cross Sections A-A, B-B and F-F, respectively, while a factor of safety of 1.2 was calculated for Cross Sections C-C and E-E. The lowest factor of safety, 1.1, was calculated for Cross Section D-D, using an interior slope of 6H:1V. Figures illustrating the dike cross sections, and the location of the critical failure surfaces and the corresponding factors of safety for the existing conditions are included in Appendix E as Figures E.3, 8, 13, 17, 21, and 25.

As indicated in the feasibility report, to achieve factors of safety of 1.3 or greater, the analysis indicates that the dike raising could be staged, with an initial dike raising followed by a future dike raising once adequate strength gain has occurred in the underlying soils. However, as also discussed in the feasibility report, due to the large volume of drier dredged material (the existing “crust”) which is available for raising the dikes, and which will be submerged if it is not removed prior to the next dredging event, it would be beneficial to raise the dike to as high an elevation as possible (up to 58 feet) prior to the placement of additional dredged material in the disposal area. The sooner the dikes are raised, the sooner the soils beneath the dikes will obtain an increase in strength due to consolidation of these soft soils.

3.4.3 Raised Dike with Dredged Material Elevation of 50 Feet

3.4.3.1 Cross Section A-A

For Cross Section A-A, factors of safety as low as 1.0 were obtained along the exterior slope for both the end of construction and steady state seepage conditions for the raised dike, as illustrated in Figure E.4. This factor of safety appears to represent a surficial veneer condition. Therefore Figure E.4 also includes an additional failure circle with factors of safety corresponding to the end of construction and steady state seepage conditions. However, this additional circle illustrates that for the end of construction condition, a factor of safety of less than 1.3 was obtained even for the deeper failure surface. If a 20 foot setback of the exterior slope is included in the design (prior to raising the dike to a final elevation of 58 feet), the minimum factor of safety increases to 1.3 for the end of construction condition and 1.7 for the steady state seepage condition for the exterior slope, and 1.8 for the end of construction condition for the interior slope. The configuration of the raised dike with the 20 foot setback, and the location of the critical failure surfaces and the corresponding factors of safety for this case are included on Figure E.5.

3.4.3.2 Cross Section B-B

For Cross Section B-B, the analyses indicated factors of safety of 1.3 and 2.2 for the end of construction conditions for the exterior and interior slopes, respectively, for the raised dike. However a factor of safety of 1.4 was obtained for the corresponding steady state condition for the exterior slope, as illustrated in Figure E.9. As with Cross Section A-A, if a 10 foot setback of the exterior slope is included in the design (prior to raising the dike to a final elevation of 58 feet), the factor of safety for the exterior slope increases to 1.7 for the steady state seepage condition. The configuration of the raised dike with the 10 foot setback, and the location of the critical failure surfaces and the corresponding factors of safety for this case are included on Figures E.10.

3.4.3.3. Cross Sections C-C, D-D and F-F

For Cross Sections C-C, D-D and F-F, the analyses indicate factors of safety ranging from 1.4 to 1.6 for the exterior slope and 1.6 to 2.1 for the interior slope for the end of construction condition, and from 1.6 to 2.2 for the exterior slope for the steady state seepage condition. The locations of the critical failure surfaces and the corresponding factors of safety for these cross sections are included on Figures E.14, 18, and 26. For Cross Sections C-C and F-F, the critical slip circle for the steady state seepage condition is located on the exterior slope and represents a surficial or veneer condition. Therefore, for these cross sections, an additional circle, and the corresponding factor of safety, is included on the figures to illustrate that the factor of safety increases for deeper failure surfaces for the steady state seepage condition.

3.4.3.4 Cross Section E-E

For Cross Section E-E, the analyses indicate a factor of safety of 1.2 the exterior slope and 2.2 for the interior slope for the end of construction condition, and 1.5 for the exterior slope for the steady state seepage condition**.** The locations of the critical failure surfaces and the corresponding factors of safety for these conditions are included on Figure E.22. As shown on this figure, the critical slip circle for the steady state seepage condition is located on the exterior slope and appears to represent a surficial or veneer failure surface. Therefore, an additional circle, and the corresponding factor of safety, is also included to illustrate that the factor of safety increases for deeper failure surfaces for the steady state seepage condition. Due to the location of the critical surface on the exterior slope, end of construction condition, as shown in Figure E.17, a setback for the raised dike will not change the critical surface or increase the minimum factor of safety (1.2) for this condition.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the data reviewed, field and laboratory testing and stability analyses performed in conjuction with the feasibility study performed by Duffield Associates for the Pearce Creek Dredged Material Disposal Area, as well as the additional analyses performed as part of this task, the following conclusions and recommendations are presented.

1. Existing Conditions

   Analysis of the existing dike, with the existing dredged material elevations, indicates factors of safety of 1.3 to 2.7 for the exterior slopes and factors of safety of 1.2 to 2.3 for the interior slopes of the dike in its current configuration for the sections evaluated.

2. Existing Dike with 2 Foot Freeboard

   The analysis of the existing dikes with the interior area filled to elevation 50 with dredged material, allowing approximately 2 feet for freeboard, indicates that adequate factors of safety (greater than 1.3 for end of construction conditions and greater than 1.5 for steady state seepage conditions) should result in all but two locations. At these locations, Cross Section A-A for the steady state seepage condition and Cross Section E-E for the end of construction condition, factors of safety greater than one (1.3 and 1.2, respectively), but slightly less than the recommended values (1.5 and 1.3, respectively) were estimated.

3. Raised Dike with Existing Dredged Material Elevation

   The result of stability analyses estimated factors of safety for the interior slopes ranging from 1.1 to 1.9 for the end of construction condition if the dike is to be raised to elevation 58 prior to the placement of additional dredged material, as recommended in the feasibility study. To achieve factors of safety of 1.3 or greater for the end of construction conditions, dike raising could be staged, with an initial dike raising followed by and additional dike raising once adequate strength gain has occurred in the underlying soils. However, as also discussed in the feasibility study report, due to the large volume of drier dredged material (the existing “crust”) which is presently available for raising the dike, and which will be submerged if it is not removed prior to the next dredging event, it would be beneficial to raise the dike to as high an elevation as possible (up to 58 feet) prior to the placement of additional dredged material in the disposal area. As discussed previously, the sooner the dikes are raised, the sooner the soils beneath the dikes will obtain an increase in strength due to consolidation of these soft soils.

Consistent with the feasibility study report, it is recommended that if the District intends to raise the dike to 58 feet to accommodate the larger disposal volume, a final design should be performed prior to the dike raising. This design should include: determination of a final dike configuration which would optimize the volume of the containment area; consider the variation in soil stratigraphy and dredged material strength; provide guidelines for phased dike construction, benching, and maintenance; and consider settlement of the perimeter dikes.

4. Raised Dike with Dredged Material Elevation of 50 Feet

Assuming the dikes are raised to elevation 58 prior to the placement of additional dredged material in the disposal area, as recommended in the feasibility study report, this analysis indicates that adequate factors of safety should result at Cross Sections C-C, D-D and F-F. Adequate factors of safety should also result at Cross Section E-E, with one exception. As in the 2-foot freeboard condition for this cross section, the factor of safety for the exterior slope for the end of construction condition (1.2) is estimated to be slightly less than the recommended value (1.3). However, due to the location of the critical slip surface, raising the dike in smaller lifts or introducing a setback into the slope geometry will not provide an increased factor of safety.

A 20-foot setback should be included in the design for the dike raising in the vicinity of Cross Section A-A and a 10-foot setback should be included in the design of the dikes in the vicinity of Cross Section B-B. If these setbacks are incorporated into the design, the analysis indicates that adequate factors of safety should exist for the raised dike, assuming a dredged material elevation of approximately 50 feet.

These conclusions and recommendations have been prepared according to generally accepted soils and foundation engineering standards and are based on the information referenced herein. In the event that further information becomes available which is inconsistent with the information presented herein, this report shall not be considered valid unless the additional information has been reviewed and the recommendations of this report modified and re-approved in writing by Duffield Associates, Inc.

APPENDIX A

SUBSURFACE EXPLORATION LOCATION PLAN

APPENDIX B

1998 FIELD DATA

Test Boring and Dilatometer Locations

Notes;

1) Surveys performed by VanDemark & Lynch, Incorporated of Wilmington, DE on 12/2/98.
2) Horizontal datum is referenced to the Maryland State Plane Coordinate System NAD 1983.
3) Vertical datum is referenced to the NAVD 1988.
4) All coordinates listed are at ground surface.
5) TB – Test Boring, DMT – Dilatometer Sounding.

Designation	Northing	Easting	Elevation
TB-1	641619	1597957	47.4
TB-2	642911	1598066	35.7
TB-3	644873	1599097	50.2
TB-4	643701	1600953	48.0
TB-5	642338	1601791	28.9
DMT-1	641025	1598915	37.9
DMT-2	641640	1599046	47.4
DMT-3	642157	1597191	47.8
DMT-4	643487	1598402	50.4
DMT-5	644856	1599034	50.0
DMT-6	644720	1600226	49.7
DMT-7	642976	1601342	48.1
DMT-8	642298	1601857	47.6

DUFFIELD
ASSOCIATES

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GENERAL NOTES

DUFFIELD ASSOCIATES uses the following definitions and terminology to classify and correlate the field and laboratory samples.

VISUAL UNIFIED CLASSIFICATIONS: The soil samples are described by color, major constituent, modifiers (by percentage), and density (or consistency). Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a No. 200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a No. 200 sieve; they are described as: clays or clayey silts if they are cohesive and silts if they are noncohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their strength or consistency and their plasticity.

The Unified Soil Classification symbols are:

COARSE GRAINED SOILS

GW - Well graded gravels
GP - Poorly graded gravels
GM - Silty gravels
GC - Clayey gravels
SW - Well graded sands
SP - Poorly graded sands
SM - Silty sands
SC - Clayey sands

FINE GRAINED SOILS

ML - Silts of low plasticity
CL - Clays of low to medium plasticity
OL - Organic silt clays of low plasticity
MH - Silts of high plasticity
CH - Clays of high plasticity
OH - Organic silt clays of high plasticity
PT - Peat and highly organic soils

SIZE DESCRIPTION

F - Fine
M - Medium
C - Coarse
G - Gravel

MODIFIERS (PERCENTAGE)

Tr -	Trace	1 - 10%
Ltl -	Little	11 - 20%
Some		21 - 35%
& -	And	36 - 50%

COLOR

Or - Orange
Yel - Yellow
Br - Brown

Blk - Black
Gr - Gray
R - Red

Vc - Varicolored
Dk - Dark
Lt - Light

DENSITY: COARSE GRAINED SOILS

Very loose	4 blows/ft or less
Loose	5 to 10 blows/ft
Medium	11 to 30 blows/ft
Dense	31 to 50 blows/ft
Very Dense	51 blows/ft or more

CONSISTENCY: FINE GRAINED SOILS

Very soft	2 blows/ft or less
Soft	3 to 4 blows/ft
Medium	5 to 8 blows/ft
Stiff	9 to 15 blows/ft
Very stiff	16 to 30 blows/ft
Hard	31 blows/ft or more

NOTE: The Standard Penetration Test "N" value is the number of blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split spoon sampler, except where otherwise noted.

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Log of Boring TB-1

(Page 1 - 2)

U.S. Army Corps Of Engineers
Pearce Creek Dredged Material
Containment Area
Cecilton, MD

Date Started : November 11, 1998
Date Completed : November 12, 1998
Weather : Clear, 60's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 47.4'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 641619
Easting : 1597957

Depth in Feet	Surf. Elev. 47.4'	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
0							
	46	ML		Brown SILT, some fine sand, trace medium sand, trace coarse sand, trace gravel, trace root material.	1	22	3-3-4-5
		ML		Brown and dark gray clayey SILT, trace fine sand, trace organics, trace mica.	2	22	3-4-4-4
5				Dark gray clayey SILT, trace fine sand, trace mica and organics.	3	21	3-2-2-3
	41						
					4	20	3-4-4-4
				Same, trace gravel.			
					5	20	1-2-2-2
10							
	36				SH-1	21	
				Dark gray clayey SILT, trace fine sand, trace mica and organics.	6	22	1-4-4-5
				Same (less plant material).			
15					7	24	1-1-2-3
	31						
					8	24	4-4-4-4
		MH		Same (less plant material).			
					9	23	2-2-2-2
20							
	26				SH-2	24	
					10	23	3-2-3-2
				Same, lenses of fine sand, lenses of plant material.			
25					11	12	WR/12"-4-4
	21			Same (less plant material).			
					12	24	2-2-2-2
				Same, lenses of plant material.			
					13	24	4-5-4-5
30	16			Same, lenses of plant material, lenses of light-gray/brown silt.	14	24	WR/2"-WH/4"
		ML		Light-gray/light-brown mottled SILT, trace to little fine sand, trace mica.	15	24	13-12-11-12
35				Light-gray/light-brown fine SAND, some silt, trace mica and organics (dry, loose).	16	10	15-50/4"
	11	SM			17	10	40-50/4"
				Same (last 6" denser and damp).			
					18	19	16-31-37-50
40							

1. Wet on spoon at 46'.
2. Wash drilling started at 52'.
3. No bottom at 56', rods sunk, stopped wash.
4. No bottom at 60'.
5. Restart washing at 64'.
6. Borehole grouted with cement-bentonite grout after auger removal.

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Cecilton, MD

Log of Boring TB-1

(Page 2 - 2)

Date Started : November 11, 1998
Date Completed : November 12, 1998
Weather : Clear, 60's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 47.4'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 641619
Easting : 1597957

Depth in Feet	Surf. Elev. 47.4'	USCS	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
40	6	SM	Interlayered light-brown/light-gray fine SAND, trace silt, trace mica, (dense, damp to wet).	19	16	18-20-50/5'
			Same (dense, damp to wet).	20	18	22-20-50-49
45			Same (dense, wet).	21	20	10-8-9-15
	1			22	22	24-30-30-50/4"
				23	18	15-15-18-20
50			Light-brown fine SAND, trace silt, trace mica.	24	20	15-50/4"
	-4		Same, fine to medium sand (bottom 5").	25	24	17-50/5"
			Interlayered light-gray/light-brown fine SAND, trace silt, trace mica.	26	12	18-50/5"
55		SP/SM	Light brown fine to medium SAND, trace silt, trace mica.			
	-9			27	24	WR-WR-WR-WR
			No recovery.			WR-WR-WR-WR
60						
	-14					
			Light-brown fine SAND, trace silt, trace mica.	28	8	WR-WR-WR-WR/5"
65		SW	Varicolored fine to coarse SAND, trace gravel, trace silt.	29	19	10-22-18-18
	-19		Same, 2" thick lense of dark-brown/gray micaceous clay interlayered with fine sand.	30	11	14-28-20-50/2"
			Light-gray/brown fine to coarse SAND and gravel interlayered with dark-gray/brown clay and fine to coarse sand, trace gravel.	31	3	50/1.5"
70						
	-24			32	10	5-25-46-40
			Light-gray fine to coarse SAND, trace gravel, trace silt.	33	14	20-50/4.5"
75			Light-red/gray mottled fine SAND, some silt.	34	6	13-14
	-29					
80						

1. Wet on spoon at 46'.
2. Wash drilling started at 52'.
3. No bottom at 56', rods sunk, stopped wash.
4. No bottom at 60'.
5. Restart washing at 64'.
6. Borehole grouted with cement-bentonite grout after auger removal.

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Cecilton, MD

Log of Boring TB-2

(Page 1 - 2)

Date Started : November 13, 1998
Date Completed : November 16, 1998
Weather : Overcast, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 35.7'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 642911
Easting : 1598066

Depth in Feet	Surf. Elev. 35.7	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
0							
	34	ML		Brown mottled SILT and fine sand, trace root and plant material.	1	10	4-8-12-10
		MH		Dark gray clayey SILT, trace fine sand, trace mica and organics.	2	9	5-5-4-4
5					SH-1	24	
	29				3	24	1/12"-1-1
				Same, trace plant material.	4	24	WH/12"-1-2
10					5A	24	1-8-4-6
	24	CL		Brown silty CLAY and fine sand, trace plant material.	5B		
					SH-2	23	
15				Gray/brown mottled silty CLAY, trace fine sand.	6	24	5-6-9-10
	19				7	24	11-11-13-14
					8	24	3-5-8-8
20							
	14				9	24	3-5-7-10
				Gray/brown mottled silty CLAY, some fine sand (wet).	10	24	6-9-9-11
25					11	22	5-4-6-7
	9				12A	24	8-15-29-29
		SP/SM		Light-gray/ light-brown mottled fine SAND, little silt, trace coarse sand.	12B		
					13	18	10-13-14-15
30							
	4			Light-gray/light-brown fine SAND, trace silt (begin wet).	14	20	6-12-19-23
				Light-gray fine SAND, with 1" thick brown fine sand lens with gravel sized iron oxide deposits.	15	20	8-15-45-30
35				Light-gray fine SAND, trace silt.	16	18	30-35-50/5"
	-1				17	14	8-19-35-50/5.5"
				Light-gray fine to medium SAND, trace silt.	18	11	22-42-50/3"
40							

1. Wet on spoon at 29.8'.
2. Wash drilling started at 36'.
3. Mud rotary drilling began at 46'.
4. Borehole grouted with cement-bentonite grout after auger removal.

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Containment Area
Cecilton, MD

Log of Boring TB-2

(Page 2 - 2)

Date Started : November 13, 1998
Date Completed : November 16, 1998
Weather : Overcast, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 35.7'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 642911
Easting : 1598066

Depth in Feet	Surf. Elev. 35.7	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
40							
				Varicolored fine to coarse SAND, trace silt.	19	11	20-24-48-50
	-6						
					20	15	37-37-36-46
45					21	16	14-46-35-28
	-11				22	10	9-16-34-40
		SP/SM		Light-orange/brown fine to coarse SAND, trace gravel, trace silt.	23	4	30-50/5"
50							
					24	10	16-35-50/4"
	-16						
				Same, increasing gravel content.	25	3	16-50/5"
55					26	11	15-37-33-29
	-21	CL		Light-gray CLAY, trace fine sand.	27	14	7-13-22-20
				Light-gray fine SAND, some silt, interlayered with light gray clay, trace fine sand.	28A	19	16-22-30-38
60				Orange/brown fine to medium SAND, trace coarse sand,trace gravel, trace silt.	28B		
					29A	20	13-10-10-25
	-26			Light gray fine SAND, some silt, with lenses of light gray clay, trace fine sand.	29B		
		SM			30	20	12-16-39-50/5"
65					31	18	23-34-32-34
	-31				32	12	10-19-20-17
		CL		Light-reddish/gray mottled CLAY and fine sand, with lenses of orange/brown fine sand.	33	19	8-13-20-21
70							
	-36	SM		Light-gray/brown fine to medium SAND, some silt, with lenses of light-gray clay, little fine sand.	34	9	9-11-14-17
		CL		Light-reddish gray CLAY and fine sand, with 2" thick lens of orange/brown fine to medium sand, trace silt	35	20	6-11-21-31
75					36	4	3-5
	-41						
80							

1. Wet on spoon at 29.8'.
2. Wash drilling started at 36'.
3. Mud rotary drilling began at 46'.
4. Borehole grouted with cement-bentonite grout after auger removal.

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Cecilton, MD

Log of Boring TB-3

(Page 1 - 2)

Date Started : November 20, 1998
Date Completed : November 23, 1998
Weather : Variable sun, breezy, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 50.2'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 644873
Easting : 1599097

Depth in Feet	Surf. Elev. 50.2	USCS	GRAPHIC	DESCRIPTION	Sample Number/ (psi)	Rec'y (in)	No. Blows per 6 inches
0				Graded Aggregate.		20	10-12-14-16
	49			Brown fine SAND, some to and silt.	1		
					2	23	9-9-17-23
		SM					
5				Brown fine to coarse SAND and gravel, little silt.	3	24	9-19-21-24
	44					16	8-8-4-5
				Dark-gray clayey SILT, some fine sand, trace mica and organics, with lenses of plant material.	4		
					5	16	1-1-2-2
10							
	39			Same, with trace fine sand.	6	18	1-2-1-1
					7	24	1-4-5-4
15					8	24	2-2-3-3
	34				SH-1	24	
					9	24	1-3-4-5
20							
	29	MH			10	24	1-3-3-4
					11	24	5-6-6-4
25					SH-2	24	
	24						
					12	24	1-2-2-3
					13	24	3-3-5-6
30							
	19				14	24	2-5-4-5
					15	24	5-6-5-4
35					16A	22	1-2-6-13
	14			Varicolored gray/brown fine SAND, trace medium sand, trace coarse sand, some silt, with 1" thick lens of organic clay.	16B		
		SM			17	24	9-9-14-17
					18	22	5-5-9-12
40							

1. Wet on rods at 49.3'.
2. Heave in augers at 52', began washing.
3. Borehole grouted with cement-bentonite grout after auger removal.

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Cecilton, MD

Log of Boring TB-3

(Page 2 - 2)

Date Started : November 20, 1998
Date Completed : November 23, 1998
Weather : Variable sun. breezy, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 50.2'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 644873
Easting · 1599097

Depth in Feet	Surf. Elev. 50.2	USCS	GRAPHIC	DESCRIPTION	Sample Number/ (psi)	Rec'y (in)	No. Blows per 6 inches
40	9	SM		Varicolored to gray fine SAND, trace to little silt, with lenses of dark-gray clay (thickness range: 1/2" to 4").	19	24	8-13-11-9
					20	24	2-7-10-6
45					21	24	5-3-9-11
	4	SW/SM		Varicolored fine SAND, trace coarse sand, trace silt.	22		9-12-12-8
					23		3-4-13-13
50	-1			Same.	24		4-5-9-9
					25		11-13-13-14
55				Gray fine to coarse SAND, some silt, trace peat.	26		
	-6				27A	24	8-15-19-20
				Gray fine to coarse SAND, trace gravel.	27B		
					28	16	6-10-12-17
60	-11				29	18	6-14-12-11
					30	14	11-8-7-6
65					31	18	5-20-23-23
	-16				32	6	16-25-38-33
				Gray fine SAND, trace medium sand, trace coarse sand, trace silt.	33	6	14-10-11-12
70	-21				34	14	4-8-8-9
				Dark-gray fine SAND and silty clay (organic odor).	SH-3	24	
75					36	14	1-3
	-26						
80							

1. Wet on rods at 49.3'.
2. Heave in augers at 52', began washing.
3. Borehole grouted with cement-bentonite grout after auger removal.

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Cecilton, MD

Log of Boring TB-4

(Page 1 - 2)

Date Started : November 18, 1998
Date Completed : November 19, 1998
Weather : Variable sun, breezy, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 48.0'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 643701
Easting · 1600953

Depth in Feet	Surf. Elev. 48.0	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
0							
	47	ML		Brown mottled SILT, little fine sand.	1	14	4-5-6-8
					2	17	6-8-8-9
5		MH		Dark-gray clayey SILT, some/and fine sand, trace plant material.	3	17	2-2-3-4
	42						
					4	24	4-4-4-5
					5	24	2-2-4-6
10							
	37				6	24	3-3-3-5
		CL		Brown/light-gray varegated mottled CLAY, trace fine sand.	7	22	4-6-8-6
15		ML		Dark-gray clayey SILT, trace fine sand and organics.	8	24	2-1-3-4
	32						
					SH-1	24	
					9	24	2-2-2-3
20							
	27				10	24	2-2-2-3
					11	24	3-3-2-2
25					SH-2	24	
	22						
		SM		Light-gray/brown fine to coarse SAND, trace gravel, trace silt.	12	24	9-20-20-19
					13	24	8-14-10-9
30							
	17				14	24	3-3-4-3
		MH		Light-gray/brown mottled clayey SILT and fine sand.	15	18	2-4-4-5
35					16	24	2-4-2-3
	12						
					17	24	3-2-3-3
					18	24	WH-WH-2-4
40							

1. Wet on spoon at 25.0'.
2. Heave in augers at 58', began washing.
3. Driller washed using 150 gal. of water, could not remove last 12" of heave. Light gray/brown F/C SAND present in wash water. Spoon driven in attempt to remove heaved material prior to drilling to next sampling increment.
4. Borehole grouted with cement-bentonite grout after auger removal.

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Log of Boring TB-4

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Pearce Creek Dredged Material
Containment Area
Cecilton, MD

Date Started : November 18, 1998
Date Completed : November 19, 1998
Weather : Variable sun. breezy, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 48.0'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 643701
Easting : 1600953

Depth in Feet	Surf. Elev. 48.0	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
40							
	7				19	24	1-3-3-3
				Gray/brown clayey SILT, trace to little fine sand	20	24	4-5-5-6
45				Brown/gray clayey SILT, trace to little fine sand, trace mica.	21	24	2-4-5-6
	2						
					22	24	7-8-6-8
		MH			23	24	2-4-4-5
50							
	-3				SH-3	24	
					24	24	4-5-7-9
55					25	24	3-4-6-7
	-8					24	6-5-24-17
				Gray fine to coarse SAND, little gravel, little silt.	26		
				No Recovery (58.0'-60.0').		0	8-5-12-16
60							
	-13			Light-gray fine to medium SAND, little silt.	27	4	8-15-11-16
				No Recovery (62.0'-64.0'), see note #3.			
				Light-gray fine SAND, little medium sand, little coarse sand, trace silt.		0	
65		SM		Same, with lenses of gray clay.	28	9	7-16-14-11
	-18						
					29	24	16-22-35-50/5"
				Light gray/light brown FINE SAND, trace silt.	30	20	9-38-35-29
70							
	-23				32	20	22-14-14-10
		CL		Gray CLAY, trace fine sand, with 1" lenses of light gray fine sand.	33		6-9-17-26
75							
	-28						
80							

1. Wet on spoon at 25.0'.
2. Heave in augers at 58', began washing.
3. Driller washed using 150 gal. of water, could not remove last 12" of heave. Light gray/brown F/C SAND present in wash water. Spoon driven in attempt to remove heaved material prior to drilling to next sampling increment.
4. Borehole grouted with cement-bentonite grout after auger removal.

DUFFIELD ASSOCIATES
5400 LIMESTONE ROAD
WILMINGTON, DELAWARE 19808-1232
TEL. (302)239-6634 FAX (302)239-8485
E-MAIL: DUFFIELD@DUFFNET.COM

Log of Boring TB-5

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U.S. Army Corps Of Engineers
Pearce Creek Dredged Material
Containment Area
Cecilton, MD

Date Started : November 17, 1998
Date Completed : November 18, 1998
Weather : Variable sun. breezy, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 28.9'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 642338
Easting : 1601791

Depth in Feet	Surf. Elev. 28.9	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
0	27	CH		Dark-gray mottled CLAY, trace fine sand, trace plant material.	1	12	1-1-1-2
					2	12	2-2-2-3
5		MH		Dark-gray clayey SILT, trace fine sand, trace organics, with lenses of plant material.	SH-1	14	
	22				3	24	WH-WH-2-1
10					4	8	WH-1-1-1
	17				SH-2	24	
					5	9	WR-1-1-1
15					6	24	WH-WH-1-1
	12				7	24	1-1-2-2
20					8	24	1-1-1-2
	7				9	24	WH-WH-2-1
					10		2-2-1-2
25				Brown clayey SILT, little fine sand.	11	24	WR-WR-WH-WH
	2	ML		Light-gray mottled SILT, some fine sand, trace gravel, trace mica.	12	24	3-5-7-10
30		SP/SM		Light-brown fine to coarse SAND and gravel, trace silt (saturated).	13	24	6-10-10-7
	-3				14	12	6-11-10-12
					15	13	15-14-14-15
35					16	14	16-15-20-10
	-8				17	7	14-14-10-6
40				No Recovery (38.0' to 40.0'), see note #3.		0	3-4-5-6

1. Unable to determine starting depth of wet on spoon.
2. "Washed" to keep hole open beginning at 30.0'.
3. Woody plant material fragments observed coming up in wash water, 38.0' to 40.0'.
4. Reddish/gray CLAY observed on outside of spoon. Possibly losing sample due to difficulties removing spoon from sample area.
5. Borehole grouted with cement-bentonite grout after auger removal.

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U.S. Army Corps Of Engineers
Pearce Creek Dredged Material
Containment Area
Cecilton, MD

Log of Boring TB-5

(Page 2 - 2)

Date Started : November 17, 1998
Date Completed : November 18, 1998
Weather : Variable sun. breezy, 50's
Drilling Agency : Walton
Driller : Kevin
Drilling Equipment : CME-55

Testing Method : 140 lb. hammer falling 30"
Logged by: : MSJ
Surface Elevation : 28.9'
Horizontal Datum : MSPCS NAD 1983
Vertical Datum : NAVD 1988
Northing : 642338
Easting : 1601791

Depth in Feet	Surf. Elev. 28.9	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
40							
		PT		Dark-gray/brown organic SILT and PEAT, little fine sand.	18	24	5-5-6-6
	-13						
				Gray fine SAND and clayey SILT, trace medium sand, trace coarse sand, trace gravel with small lenses of woody material.	19	12	10-14-13-10
45					20	15	10-20-15-13
	-18				21	15	4-9-9-19
		SM					
					22	15	14-14-19-15
50				Varicolored fine SAND, some silt, with 1" lenses of light-gray fine sand.	23	14	5-10-11-10
	-23			Light-reddish/gray/brown fine SAND, and mottled SILT.	24	4	42-50/4"
				Varicolored fine SAND, trace to little silt.			
55					25	17	40-42-32-28
	-28				26	12	17-42-50/4.5"
					27	20	24-20-27-35
60				No Recovery (60.0' to 60.6').		0	48-50/1"
		SP/SM					
	-33				28	7	30-50/5"
					29	4	40-50/2"
65							
	-38				30	20	25-35-40-34
				Gray CLAY, little fine sand.		0	11-14-26-33
70				No Recovery (68.0' to 70.0'), see note #4.			
					31	1	6-8-11-16
	-43	CL		Red/light-gray/brown variegated CLAY, some to and fine sand.			
					32	15	6-8-14-17
				Red/light-gray/brown variegated CLAY, trace to little fine sand.	SH-3	18	
75							
	-48						
80							

1. Unable to determine starting depth of wet on spoon.
2. "Washed" to keep hole open beginning at 30.0'.
3. Woody plant material fragments observed coming up in wash water, 38.0' to 40.0'.
4. Reddish/gray CLAY observed on outside of spoon. Possibly losing sample due to difficulties removing spoon from sample area.
5. Borehole grouted with cement-bentonite grout after auger removal.

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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)      SNDG. NO.  D-1
IN-SITU SOIL TESTING, L.C.                                                            PAGE 1
JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware              FILE NO. : IST-9863
LOCATION: As Planned -- Refusal at 11.3m
SNDG.BY : R. FAILMEZGER                                                               SNDG.DATE: 11-17-98
ANAL.BY : R. FAILMEZGER                                                               ANAL.DATE: 11-17-98

ANALYSIS PARAMETERS:      LO RANGE   =10.00 BARS    ROD DIAM.    = 3.57 CM       BL.THICK. = 12.7 MM    SU  FACTOR = 1.00
 SURF.ELEV.  = 15.00 M    LO  GAGE 0 = 0.02 BARS    FR.RED.DIA. = 4.80 CM       BL.WIDTH  = 94.9 MM    PHI FACTOR = 1.00
 WATER DEPTH = 11.00 M    HI  GAGE 0 = 0.15 BARS    LIN.ROD WT. = 6.50 KGF/M    DELTA-A   = 0.20 BARS  OCR FACTOR = 1.00
 SP.GR.WATER = 1.000      CAL GAGE 0 = 0.00 BARS    DELTA/PHI    = 0.50          DELTA-B   = 0.28 BARS   M  FACTOR = 1.00
 MAX SU ID   = 0.60       SU OPTION  = MARCHETTI    MIN PHI ID   = 1.20          OCR OPTION= MARCHETTI  KO FACTOR = 1.00
UNIT CONVERSIONS:         1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI    1 M = 3.2808 FT

  Z    THRUST   A     B     C      DA    DB    ZMRNG ZMLO  ZMHI  ZMCAL   P0    P1    P2     U0    GAMMA   SVP
 (M)   (KGF)  (BAR) (BAR) (BAR)  (BAR) (BAR)  (BAR) (BAR) (BAR) (BAR)  (BAR) (BAR) (BAR)  (BAR)  (T/M3) (BAR)
*****  ****** ***** ***** *****  ***** *****  ***** ***** ***** *****  ***** ***** *****  ****** ****** ******

 0.20  2400.   4.08 23.20         0.20  0.28  10.00  0.02  0.15  0.00   3.33 22.77         0.000   2.00  0.035
 0.40  1900.   4.27 12.00         0.20  0.28  10.00  0.02  0.15  0.00   4.09 11.57         0.000   1.90  0.073
 0.60   980.   2.92  8.18         0.20  0.28  10.00  0.02  0.15  0.00   2.86  7.88         0.000   1.80  0.110
 0.80   630.   2.24  6.45         0.20  0.28  10.00  0.02  0.15  0.00   2.23  6.15         0.000   1.70  0.144
 1.00   500.   1.25  3.98         0.20  0.28  10.00  0.02  0.15  0.00   1.32  3.68         0.000   1.70  0.177
 1.20   440.   1.09  3.74         0.20  0.28  10.00  0.02  0.15  0.00   1.16  3.44         0.000   1.70  0.211
 1.40   390.   0.80  2.78         0.20  0.28  10.00  0.02  0.15  0.00   0.90  2.48         0.000   1.60  0.243
 1.60   330.   0.72  2.45         0.20  0.28  10.00  0.02  0.15  0.00   0.84  2.15         0.000   1.60  0.274
 1.80   250.   0.70  1.98         0.20  0.28  10.00  0.02  0.15  0.00   0.84  1.68         0.000   1.60  0.306
 2.00   140.   0.38  1.10         0.20  0.28  10.00  0.02  0.15  0.00   0.55  0.80         0.000   1.50  0.336
 2.20    80.   0.44  1.16         0.20  0.28  10.00  0.02  0.15  0.00   0.61  0.86         0.000   1.50  0.366
 2.40    90.   0.53  1.24         0.20  0.28  10.00  0.02  0.15  0.00   0.70  0.94         0.000   1.50  0.395
 2.60    90.   0.62  1.36         0.20  0.28  10.00  0.02  0.15  0.00   0.79  1.06         0.000   1.50  0.425
 2.80   100.   0.62  1.40         0.20  0.28  10.00  0.02  0.15  0.00   0.78  1.10         0.000   1.50  0.454
 3.00   110.   0.73  1.43         0.20  0.28  10.00  0.02  0.15  0.00   0.90  1.13         0.000   1.50  0.483
 3.20   110.   0.84  1.64         0.20  0.28  10.00  0.02  0.15  0.00   1.00  1.34         0.000   1.50  0.513
 3.40   140.   1.08  2.06         0.20  0.28  10.00  0.02  0.15  0.00   1.24  1.76         0.000   1.60  0.543
 3.70   160.   1.31  2.35         0.20  0.28  10.00  0.02  0.15  0.00   1.46  2.05         0.000   1.60  0.590
 3.80   160.   1.43  2.34         0.20  0.28  10.00  0.02  0.15  0.00   1.59  2.04         0.000   1.60  0.606
 4.00   200.   1.46  2.48         0.20  0.28  10.00  0.02  0.15  0.00   1.61  2.18         0.000   1.60  0.638
 4.20   220.   1.53  2.49         0.20  0.28  10.00  0.02  0.15  0.00   1.69  2.19         0.000   1.60  0.669
 4.40   250.   1.26  4.60         0.20  0.28  10.00  0.02  0.15  0.00   1.30  4.30         0.000   1.80  0.702
 4.60   240.   1.72  2.66         0.20  0.28  10.00  0.02  0.15  0.00   1.88  2.36         0.000   1.60  0.736
 4.80   210.   1.56  2.57         0.20  0.28  10.00  0.02  0.15  0.00   1.71  2.27         0.000   1.60  0.767
 5.00   240.   1.92  3.10         0.20  0.28  10.00  0.02  0.15  0.00   2.06  2.80         0.000   1.60  0.798
 5.20   260.   2.02  3.15         0.20  0.28  10.00  0.02  0.15  0.00   2.17  2.85         0.000   1.60  0.830
 5.40   280.   2.34  3.51         0.20  0.28  10.00  0.02  0.15  0.00   2.49  3.21         0.000   1.60  0.861
 5.60   300.   2.44  3.58         0.20  0.28  10.00  0.02  0.15  0.00   2.59  3.28         0.000   1.60  0.893
 5.80   310.   2.14  3.36         0.20  0.28  10.00  0.02  0.15  0.00   2.28  3.06         0.000   1.60  0.924
 6.00   320.   2.13  3.33         0.20  0.28  10.00  0.02  0.15  0.00   2.27  3.03         0.000   1.60  0.956
 6.20   350.   2.21  3.40         0.20  0.28  10.00  0.02  0.15  0.00   2.35  3.10         0.000   1.60  0.987
 6.40   360.   2.30  3.47         0.20  0.28  10.00  0.02  0.15  0.00   2.45  3.17         0.000   1.60  1.018
 6.60   390.   2.39  3.51         0.20  0.28  10.00  0.02  0.15  0.00   2.54  3.21         0.000   1.60  1.050
 6.80   390.   2.48  3.64         0.20  0.28  10.00  0.02  0.15  0.00   2.63  3.34         0.000   1.60  1.081
 7.00   400.   2.63  3.81         0.20  0.28  10.00  0.02  0.15  0.00   2.78  3.51         0.000   1.70  1.114
 7.20   420.   2.74  3.96         0.20  0.28  10.00  0.02  0.15  0.00   2.88  3.66         0.000   1.70  1.147
 7.40   440.   2.91  4.12         0.20  0.28  10.00  0.02  0.15  0.00   3.05  3.82         0.000   1.70  1.180
 7.60   500.   3.24  4.79         0.20  0.28  10.00  0.02  0.15  0.00   3.37  4.49         0.000   1.70  1.214
 7.80   500.   2.57  3.91         0.20  0.28  10.00  0.02  0.15  0.00   2.71  3.61         0.000   1.70  1.247
 8.00   550.   2.61  4.36         0.20  0.28  10.00  0.02  0.15  0.00   2.73  4.06         0.000   1.70  1.280
 8.20   590.   2.00  3.19         0.20  0.28  10.00  0.02  0.15  0.00   2.14  2.89         0.000   1.60  1.313
 8.40   600.   1.38  2.62         0.20  0.28  10.00  0.02  0.15  0.00   1.52  2.32         0.000   1.60  1.344
 8.70  3130.   7.71 20.60         0.20  0.28  10.00  0.02  0.15  0.00   7.28 20.17         0.000   1.95  1.396
 8.80  2980.   5.20  9.52         0.20  0.28  10.00  0.02  0.15  0.00   5.19  9.22         0.000   1.80  1.415
 9.00  2000.   5.22  7.47         0.20  0.28  10.00  0.02  0.15  0.00   5.31  7.17         0.000   1.80  1.450
 9.20  5160.   9.40 31.45         0.20  0.28  10.00  0.02  0.15  0.00   8.51 31.02         0.000   2.15  1.489
 9.40  7580.  15.05 48.20         0.20  0.28  10.00  0.02  0.15  0.00  13.47 47.77         0.000   2.15  1.531
 9.60  6980.  13.25 40.30         0.20  0.28  10.00  0.02  0.15  0.00  11.97 39.87         0.000   2.15  1.573
 9.80  5840.  12.65 34.65         0.20  0.28  10.00  0.02  0.15  0.00  11.62 34.22         0.000   2.15  1.615
10.00  7380.  15.20 43.60         0.20  0.28  10.00  0.02  0.15  0.00  13.85 43.17         0.000   2.15  1.658
10.20  6780.  17.20 44.10         0.20  0.28  10.00  0.02  0.15  0.00  15.93 43.67         0.000   2.10  1.699
10.40  4340.   7.98 24.45         0.20  0.28  10.00  0.02  0.15  0.00   7.37 24.02         0.000   2.00  1.740
10.60  4390.   6.78 24.35         0.20  0.28  10.00  0.02  0.15  0.00   6.11 23.92         0.000   2.00  1.779
10.80  6490.  13.80 37.90         0.20  0.28  10.00  0.02  0.15  0.00  12.67 37.47         0.000   2.15  1.820
11.00  6870.  10.50 31.45         0.20  0.28  10.00  0.02  0.15  0.00   9.53 31.02         0.000   2.15  1.862
11.20  6560.  13.05 35.45         0.20  0.28  10.00  0.02  0.15  0.00  12.00 35.02         0.020   2.15  1.884
11.30  8300.  11.80 39.60         0.20  0.28  10.00  0.02  0.15  0.00  10.48 39.17         0.029   2.15  1.896
END OF SOUNDING                  (INTERPRETED SOIL PARAMETERS ON NEXT PAGE)
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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)        SNDG. NO.  D-1
IN-SITU SOIL TESTING, L.C.                                                              PAGE 2
JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware                FILE NO. : IST-9863
LOCATION: As Planned -- Refusal at 11.3m
SNDG.BY : R. FAILMEZGER                                                                 SNDG.DATE: 11-17-98
ANAL.BY : R. FAILMEZGER                                                                 ANAL.DATE: 11-17-98

ANALYSIS PARAMETERS:      LO RANGE   =10.00 BARS   ROD DIAM.    = 3.57 CM      BL.THICK. = 12.7 MM   SU  FACTOR = 1.00
 SURF.ELEV.  = 15.00 M    LO  GAGE 0 = 0.02 BARS   FR.RED.DIA. = 4.80 CM      BL.WIDTH  = 94.9 MM   PHI FACTOR = 1.00
 WATER DEPTH = 11.00 M    HI  GAGE 0 = 0.15 BARS   LIN.ROD WT. = 6.50 KGF/M   DELTA-A   = 0.20 BARS OCR FACTOR = 1.00
 SP.GR.WATER = 1.000      CAL GAGE 0 = 0.00 BARS   DELTA/PHI    = 0.50         DELTA-B   = 0.28 BARS  M  FACTOR = 1.00
 MAX SU ID   = 0.60       SU OPTION  = MARCHETTI   MIN PHI ID   = 1.20         OCR OPTION= MARCHETTI  K0 FACTOR = 1.00
UNIT CONVERSIONS:         1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI    1 M = 3.2808 FT

  Z      KD     ID    UD     ED      K0     SU     QD     PHI    SIGFF   PHIO    PC     OCR      M       SOIL TYPE
 (M)                       (BAR)          (BAR)  (BAR)  (DEG)  (BAR)   (DEG)  (BAR)           (BAR)
*****  ***** ***** ***** ******  *****  *****  *****  *****  ******  *****  *****  *****  ******  ************


  0.20  95.27  5.83  0.00   674.                                                               3125.      SAND
  0.40  55.87  1.83  0.00   259.   6.60          52.8   45.4    0.13   41.1  20.46  279.3   1071.   SILTY SAND
  0.60  26.11  1.75  0.00   174.   3.24          24.9   40.9    0.18   36.6   8.30   75.7    594.   SANDY SILT
  0.80  15.52  1.75  0.00   136.   2.06          15.1   37.8    0.23   33.6   4.39   30.5    396.   SANDY SILT
  1.00   7.43  1.79  0.00    82.   1.08          14.5   38.0    0.29   34.1   1.37    7.7    182.   SANDY SILT
  1.20   5.51  1.96  0.00    79.   0.88          13.1   36.7    0.34   33.0   1.03    4.9    154.   SILTY SAND
  1.40   3.72  1.74  0.00    55.   0.69          12.5   35.9    0.39   32.3   0.68    2.8     85.   SANDY SILT
  1.60   3.05  1.57  0.00    46.   0.65          10.6   34.0    0.43   30.5   0.63    2.3     62.   SANDY SILT
  1.80   2.75  1.00  0.00    29.   0.73                                       0.50    1.6     35.      SILT
  2.00   1.63  0.46  0.00     9.   0.44   0.06                                0.24    0.7      7.      MUD
  2.20   1.66  0.41  0.00     9.   0.45   0.06                                0.27    0.7      7.      MUD
  2.40   1.77  0.35  0.00     8.   0.48   0.07                                0.33    0.8      7.      MUD
  2.60   1.85  0.35  0.00     9.   0.50   0.08                                0.38    0.9      8.      MUD
  2.80   1.73  0.40  0.00    11.   0.47   0.08                                0.36    0.8      9.      MUD
  3.00   1.86  0.26  0.00     8.   0.51   0.10                                0.43    0.9      7.      MUD
  3.20   1.96  0.33  0.00    12.   0.53   0.11                                0.50    1.0     10.      MUD
  3.40   2.27  0.43  0.00    18.   0.62   0.14                                0.66    1.2     18.   SILTY CLAY
  3.70   2.48  0.40  0.00    20.   0.67   0.17                                0.82    1.4     22.   SILTY CLAY
  3.80   2.62  0.28  0.00    16.   0.70   0.19                                0.92    1.5     18.      CLAY
  4.00   2.53  0.35  0.00    20.   0.68   0.19                                0.92    1.4     21.   SILTY CLAY
  4.20   2.52  0.30  0.00    17.   0.68   0.20                                0.96    1.4     19.      CLAY
  4.40   1.85  2.32  0.00   104.   0.74           7.8   24.2    0.99   22.0   1.40    2.0    100.   SILTY SAND
  4.60   2.55  0.26  0.00    17.   0.68   0.22                                1.08    1.5     18.      CLAY
  4.80   2.23  0.32  0.00    19.   0.61   0.19                                0.91    1.2     19.      CLAY
  5.00   2.59  0.36  0.00    26.   0.69   0.24                                1.19    1.5     28.   SILTY CLAY
  5.20   2.61  0.31  0.00    24.   0.70   0.25                                1.26    1.5     27.      CLAY
  5.40   2.89  0.29  0.00    25.   0.76   0.30                                1.53    1.8     31.      CLAY
  5.60   2.90  0.27  0.00    24.   0.76   0.31                                1.59    1.8     30.      CLAY
  5.80   2.47  0.34  0.00    27.   0.66   0.26                                1.28    1.4     29.      CLAY
  6.00   2.38  0.33  0.00    26.   0.64   0.26                                1.25    1.3     27.      CLAY
  6.20   2.39  0.32  0.00    26.   0.64   0.27                                1.30    1.3     27.      CLAY
  6.40   2.40  0.30  0.00    25.   0.65   0.28                                1.35    1.3     26.      CLAY
  6.60   2.42  0.26  0.00    23.   0.65   0.29                                1.41    1.3     24.      CLAY
  6.80   2.43  0.27  0.00    25.   0.65   0.30                                1.46    1.4     26.      CLAY
  7.00   2.49  0.26  0.00    26.   0.67   0.32                                1.57    1.4     27.      CLAY
  7.20   2.51  0.27  0.00    27.   0.67   0.34                                1.64    1.4     29.      CLAY
  7.40   2.59  0.25  0.00    27.   0.69   0.36                                1.76    1.5     30.      CLAY
  7.60   2.77  0.33  0.00    39.   0.74   0.40                                2.02    1.7     46.      CLAY
  7.80   2.17  0.33  0.00    31.   0.59   0.30                                1.42    1.1     29.      CLAY
  8.00   2.13  0.49  0.00    46.   0.58   0.30                                1.41    1.1     42.   SILTY CLAY
  8.20   1.63  0.35  0.00    26.   0.44   0.22                                0.96    0.7     22.      CLAY
  8.40   1.13  0.52  0.00    28.   0.28   0.15                                0.55    0.4     24.   SILTY CLAY
  8.70   5.21  1.77  0.00   447.   0.83          94.4   37.2    2.24   36.9   6.12    4.4    842.   SANDY SILT
  8.80   3.67  0.78  0.00   140.   0.92                                       3.64    2.6    208.   CLAYEY SILT
  9.00   3.66  0.35  0.00    64.   0.92   0.68                                3.73    2.6     95.      CLAY
  9.20   5.71  2.65  0.00   781.   0.80         167.2   40.3    2.45   40.1   6.50    4.4   1563.   SILTY SAND
  9.40   8.80  2.55  0.00  1190.   1.14         237.2   41.3    2.54   41.2  13.91    9.1   2839.   SILTY SAND
  9.60   7.61  2.33  0.00   968.   1.00         221.5   41.1    2.61   41.0  11.03    7.0   2179.   SILTY SAND
  9.80   7.20  1.94  0.00   784.   1.00         179.2   39.8    2.65   39.7  10.94    6.8   1718.   SILTY SAND
 10.00   8.36  2.12  0.00  1017.   1.10         228.3   40.7    2.74   40.7  14.08    8.5   2374.   SILTY SAND
 10.20   9.37  1.74  0.00   963.   1.27         195.5   39.4    2.78   39.4  18.94   11.1   2347.   SANDY SILT
 10.40   4.23  2.26  0.00   578.   0.67         142.0   38.8    2.83   38.8   5.05    2.9    989.   SILTY SAND
 10.60   3.44  2.91  0.00   618.   0.56         150.1   39.3    2.91   39.4   3.59    2.0    968.   SILTY SAND
 10.80   6.96  1.96  0.00   861.   0.97         200.3   39.8    2.98   39.9  11.61    6.4   1860.   SILTY SAND
 11.00   5.12  2.26  0.00   746.   0.70         230.8   41.1    3.09   41.3   6.32    3.4   1406.   SILTY SAND
 11.20   6.36  1.92  0.00   799.   0.89         206.8   39.9    3.09   40.1  10.15    5.4   1657.   SILTY SAND
 11.30   5.52  2.74  0.00   995.   0.71         282.4   42.1    3.17   42.3   6.79    3.6   1964.   SILTY SAND
END OF SOUNDING
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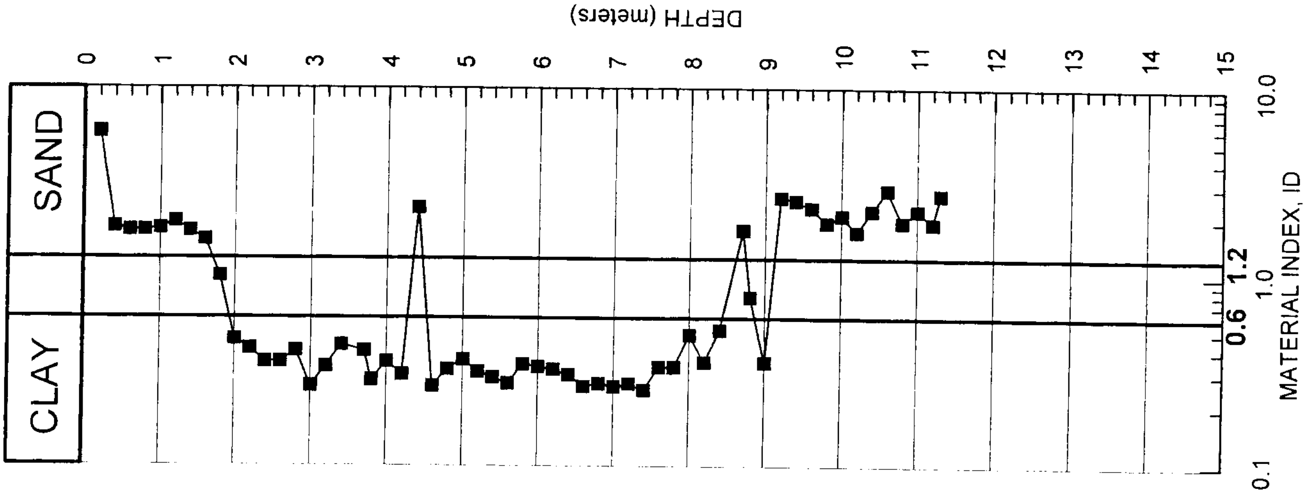
PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

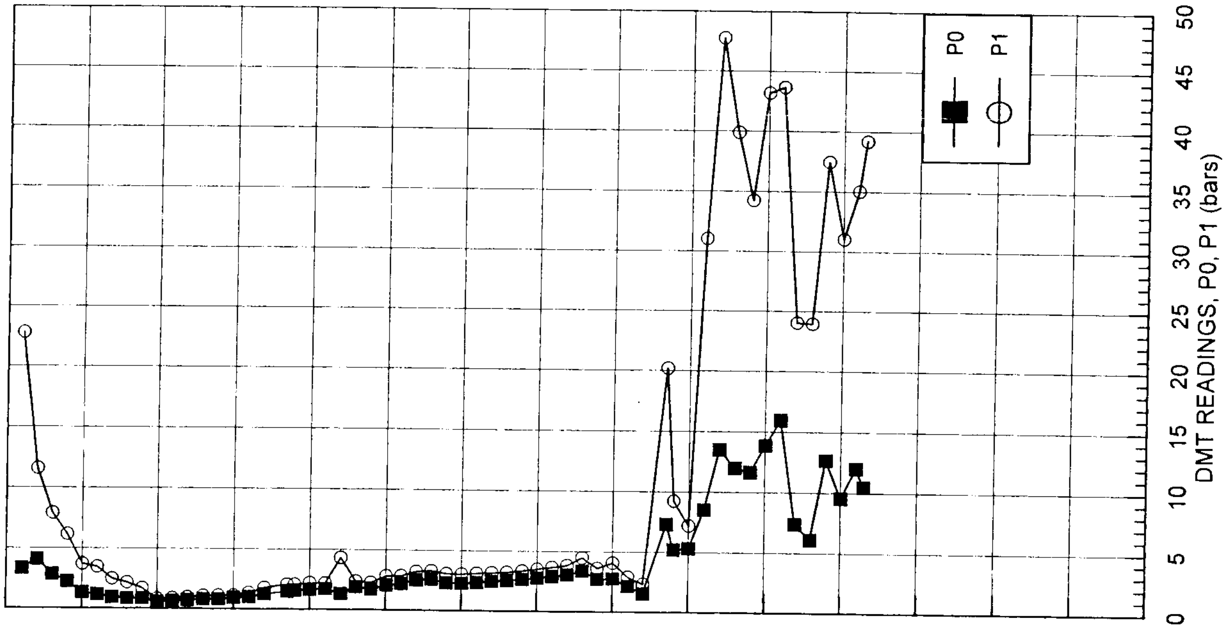
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-18-98

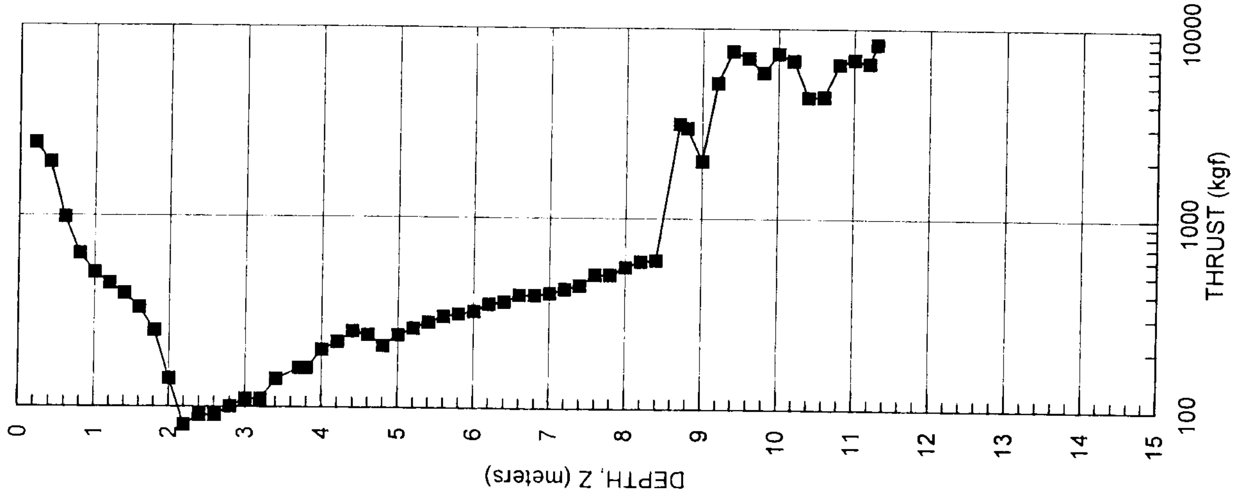
SOUNDING
D-1

DILATOMETER RESULTS

Ground Surface Elev.:
Water Depth: Not Found







PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

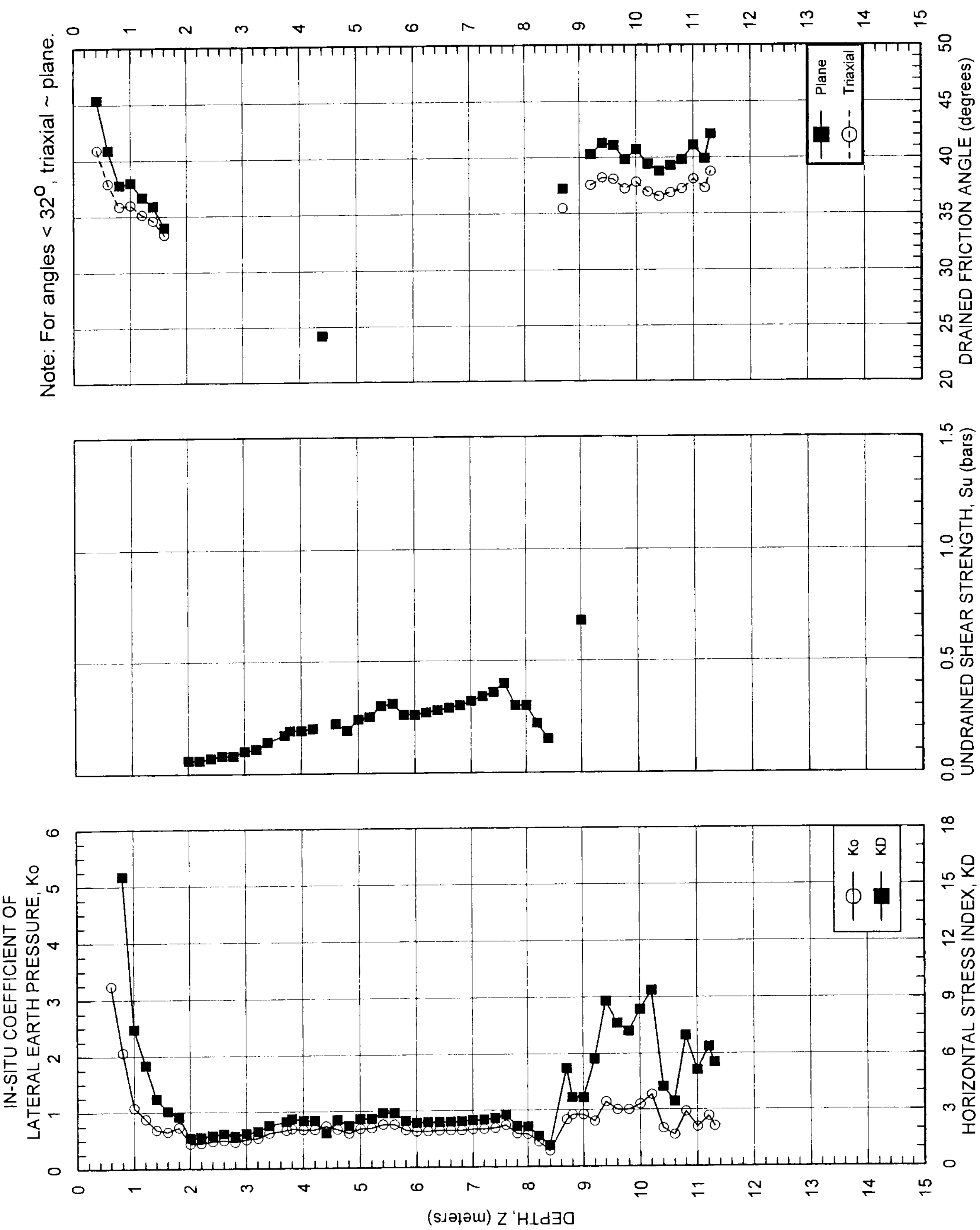
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-18-98

SOUNDING

D-1

INTERPRETED DMT STRENGTH PARAMETERS

Ground Surface Elev.:
Water Depth: Not Found



PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

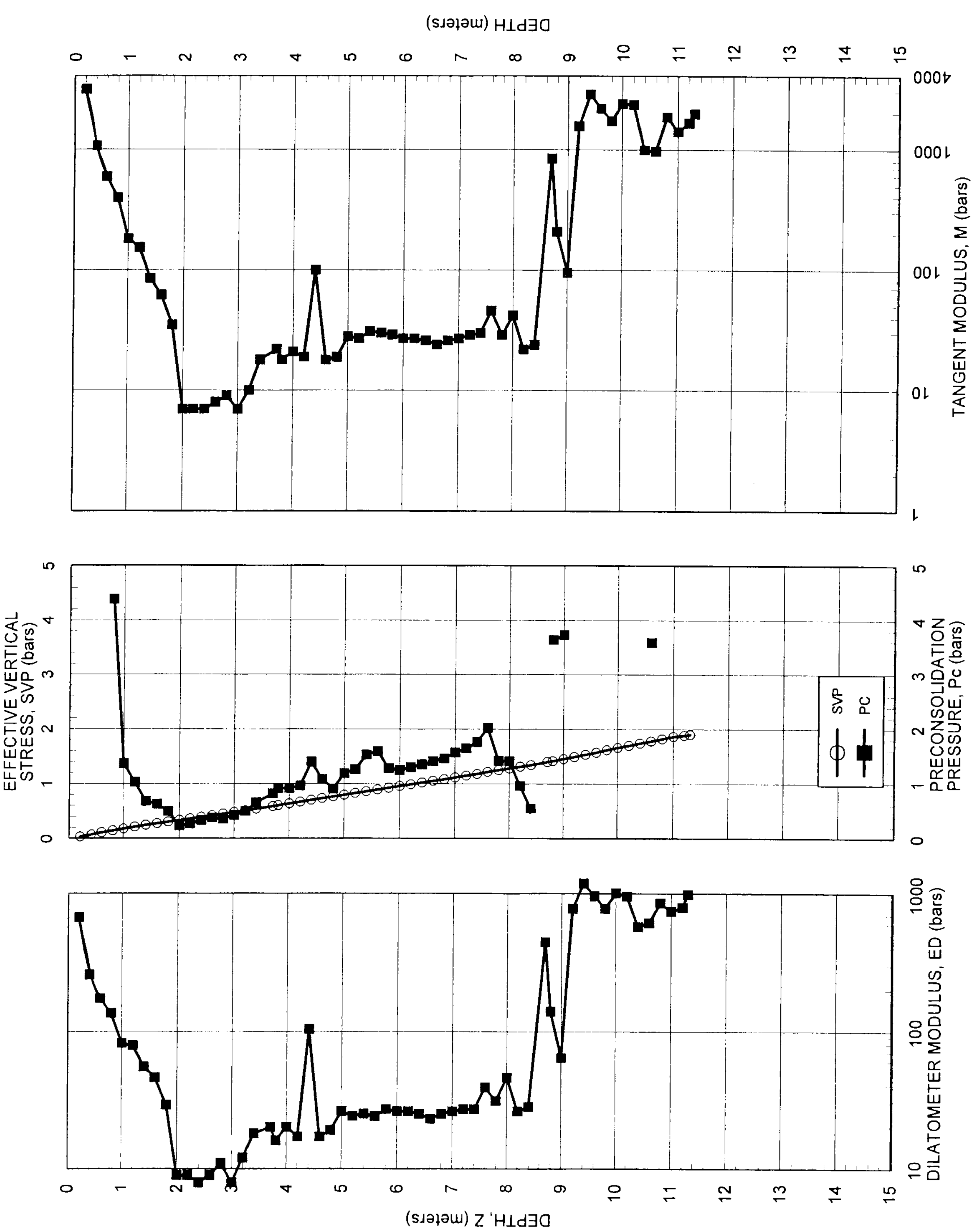
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-18-98

SOUNDING

D-1

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.:
Water Depth: None Found



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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)      SNDG. NO.  D-2
IN-SITU SOIL TESTING, L.C.                                                            PAGE 1
JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware              FILE NO. : IST-9863
LOCATION: As Planned
SNDG.BY : R. FAILMEZGER                                                               SNDG.DATE: 11-18-98
ANAL.BY : R. FAILMEZGER                                                               ANAL.DATE: 11-18-98

ANALYSIS PARAMETERS:     LO RANGE   =10.00 BARS   ROD DIAM.    = 3.57 CM      BL.THICK. = 12.7 MM    SU  FACTOR = 1.00
 SURF.ELEV.  = 15.00 M   LO  GAGE 0 = 0.02 BARS   FR.RED.DIA. = 4.80 CM       BL.WIDTH  = 94.9 MM    PHI FACTOR = 1.00
 WATER DEPTH = 11.00 M   HI  GAGE 0 = 0.15 BARS   LIN.ROD WT. = 6.50 KGF/M    DELTA-A   = 0.26 BARS  OCR FACTOR = 1.00
 SP.GR.WATER = 1.000     CAL GAGE 0 = 0.00 BARS   DELTA/PHI    = 0.50         DELTA-B   = 0.15 BARS   M  FACTOR = 1.00
 MAX SU ID   = 0.60      SU OPTION  = MARCHETTI   MIN PHI ID  = 1.20          OCR OPTION= MARCHETTI  K0 FACTOR = 1.00
UNIT CONVERSIONS:        1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI     1 M = 3.2808 FT

  Z    THRUST    A     B     C      DA    DB    ZMRNG ZMLO  ZMHI  ZMCAL   P0    P1    P2     U0    GAMMA   SVP
 (M)   (KGF)   (BAR) (BAR) (BAR)  (BAR) (BAR)  (BAR) (BAR) (BAR) (BAR)  (BAR) (BAR) (BAR)  (BAR)  (T/M3) (BAR)
*****  ******  ***** ***** *****  ***** *****  ***** ***** ***** *****  ***** ***** *****  ****** ****** ******

 0.20   700.   0.76  4.21         0.26  0.15  10.00  0.02  0.15  0.00   0.85  4.04         0.000   1.70  0.035
 0.40   900.   0.95  6.09         0.26  0.15  10.00  0.02  0.15  0.00   0.95  5.92         0.000   1.80  0.069
 0.60  1130.   2.79 10.15         0.26  0.15  10.00  0.02  0.15  0.00   2.69  9.85         0.000   1.90  0.106
 0.80   910.   2.01  7.08         0.26  0.15  10.00  0.02  0.15  0.00   2.02  6.91         0.000   1.80  0.142
 1.00   830.   1.06  5.56         0.26  0.15  10.00  0.02  0.15  0.00   1.10  5.39         0.000   1.80  0.177
 1.20   940.   2.89 10.85         0.26  0.15  10.00  0.02  0.15  0.00   2.76 10.55         0.000   1.90  0.214
 1.40   960.   2.19  8.76         0.26  0.15  10.00  0.02  0.15  0.00   2.12  8.59         0.000   1.90  0.251
 1.60   700.   1.96  7.03         0.26  0.15  10.00  0.02  0.15  0.00   1.97  6.86         0.000   1.80  0.287
 1.80   510.   1.35  4.71         0.26  0.15  10.00  0.02  0.15  0.00   1.44  4.54         0.000   1.80  0.323
 2.00   460.   1.90  5.33         0.26  0.15  10.00  0.02  0.15  0.00   1.99  5.16         0.000   1.70  0.357
 2.20   400.   1.92  4.67         0.26  0.15  10.00  0.02  0.15  0.00   2.04  4.50         0.000   1.70  0.390
 2.40   260.   1.42  2.82         0.26  0.15  10.00  0.02  0.15  0.00   1.61  2.65         0.000   1.60  0.423
 2.60   210.   1.43  2.99         0.26  0.15  10.00  0.02  0.15  0.00   1.61  2.82         0.000   1.60  0.454
 2.80   230.   1.87  3.10         0.26  0.15  10.00  0.02  0.15  0.00   2.07  2.93         0.000   1.60  0.485
 3.00   290.   2.14  3.74         0.26  0.15  10.00  0.02  0.15  0.00   2.32  3.57         0.000   1.70  0.518
 3.20   340.   2.00  3.64         0.26  0.15  10.00  0.02  0.15  0.00   2.18  3.47         0.000   1.70  0.551
 3.40   280.   1.52  2.38         0.26  0.15  10.00  0.02  0.15  0.00   1.74  2.21         0.000   1.60  0.584
 3.60   240.   1.41  2.26         0.26  0.15  10.00  0.02  0.15  0.00   1.63  2.09         0.000   1.60  0.615
 3.80   220.   1.73  2.90         0.26  0.15  10.00  0.02  0.15  0.00   1.93  2.73         0.000   1.60  0.646
 4.00   300.   1.61  2.59         0.26  0.15  10.00  0.02  0.15  0.00   1.82  2.42         0.000   1.60  0.678
 4.20   290.   1.28  2.17         0.26  0.15  10.00  0.02  0.15  0.00   1.50  2.00         0.000   1.60  0.709
 4.40   240.   1.22  2.12         0.26  0.15  10.00  0.02  0.15  0.00   1.44  1.95         0.000   1.60  0.741
 4.60   230.   1.39  2.32         0.26  0.15  10.00  0.02  0.15  0.00   1.60  2.15         0.000   1.60  0.772
 4.80   280.   1.87  3.14         0.26  0.15  10.00  0.02  0.15  0.00   2.07  2.97         0.000   1.60  0.803
 5.00   360.   2.19  3.61         0.26  0.15  10.00  0.02  0.15  0.00   2.38  3.44         0.000   1.70  0.836
 5.20   450.   2.39  4.28         0.26  0.15  10.00  0.02  0.15  0.00   2.56  4.11         0.000   1.70  0.869
 5.40   440.   2.53  4.21         0.26  0.15  10.00  0.02  0.15  0.00   2.71  4.04         0.000   1.70  0.903
 5.60   400.   2.54  4.26         0.26  0.15  10.00  0.02  0.15  0.00   2.71  4.09         0.000   1.70  0.936
 5.80   430.   2.27  4.33         0.26  0.15  10.00  0.02  0.15  0.00   2.43  4.16         0.000   1.70  0.969
 6.00   420.   2.22  3.81         0.26  0.15  10.00  0.02  0.15  0.00   2.40  3.64         0.000   1.70  1.003
 6.20   370.   2.35  3.67         0.26  0.15  10.00  0.02  0.15  0.00   2.54  3.50         0.000   1.70  1.036
 6.40   380.   2.43  3.55         0.26  0.15  10.00  0.02  0.15  0.00   2.63  3.38         0.000   1.60  1.068
 6.60   380.   2.31  3.42         0.26  0.15  10.00  0.02  0.15  0.00   2.51  3.25         0.000   1.60  1.100
 6.80   390.   2.20  3.31         0.26  0.15  10.00  0.02  0.15  0.00   2.40  3.14         0.000   1.60  1.131
 7.00   500.   2.02  3.61         0.26  0.15  10.00  0.02  0.15  0.00   2.20  3.44         0.000   1.70  1.164
 7.20   610.   2.10  4.41         0.26  0.15  10.00  0.02  0.15  0.00   2.24  4.24         0.000   1.70  1.197
 7.40   520.   2.00  3.13         0.26  0.15  10.00  0.02  0.15  0.00   2.20  2.96         0.000   1.60  1.229
 7.60   460.   2.29  3.37         0.26  0.15  10.00  0.02  0.15  0.00   2.50  3.20         0.000   1.60  1.261
 7.80   510.   2.14  3.76         0.26  0.15  10.00  0.02  0.15  0.00   2.32  3.59         0.000   1.70  1.293
 8.00   530.   2.55  3.82         0.26  0.15  10.00  0.02  0.15  0.00   2.75  3.65         0.000   1.70  1.326
 8.20   510.   2.26  3.46         0.26  0.15  10.00  0.02  0.15  0.00   2.46  3.29         0.000   1.60  1.359
 8.40   640.   1.30  4.46         0.26  0.15  10.00  0.02  0.15  0.00   1.40  4.29         0.000   1.80  1.392
 8.60   760.   2.04  3.28         0.26  0.15  10.00  0.02  0.15  0.00   2.24  3.11         0.000   1.60  1.426
 8.80   520.   2.54  3.66         0.26  0.15  10.00  0.02  0.15  0.00   2.74  3.49         0.000   1.70  1.458
 9.00   500.   2.58  3.71         0.26  0.15  10.00  0.02  0.15  0.00   2.78  3.54         0.000   1.70  1.491
 9.20   500.   2.84  4.08         0.26  0.15  10.00  0.02  0.15  0.00   3.04  3.91         0.000   1.70  1.525
 9.40   530.   2.64  4.06         0.26  0.15  10.00  0.02  0.15  0.00   2.83  3.89         0.000   1.70  1.558
 9.60   560.   2.51  4.05         0.26  0.15  10.00  0.02  0.15  0.00   2.69  3.88         0.000   1.70  1.591
 9.80   550.   2.66  3.98         0.26  0.15  10.00  0.02  0.15  0.00   2.85  3.81         0.000   1.70  1.625
10.00   550.   2.48  3.63         0.26  0.15  10.00  0.02  0.15  0.00   2.68  3.46         0.000   1.70  1.658
10.20   510.   2.32  3.17         0.26  0.15  10.00  0.02  0.15  0.00   2.54  3.00         0.000   1.60  1.691
10.40   550.   2.62  3.96         0.26  0.15  10.00  0.02  0.15  0.00   2.81  3.79         0.000   1.70  1.723
10.60   570.   3.02  4.31         0.26  0.15  10.00  0.02  0.15  0.00   3.22  4.14         0.000   1.70  1.756
END OF SOUNDING                   (INTERPRETED SOIL PARAMETERS ON NEXT PAGE)
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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)        SNDG. NO.  D-2
IN-SITU SOIL TESTING, L.C.                                                              PAGE 2
JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware                FILE NO. : IST-9863
LOCATION: As Planned
SNDG.BY : R. FAILMEZGER                                                                 SNDG.DATE: 11-18-98
ANAL.BY : R. FAILMEZGER                                                                 ANAL.DATE: 11-18-98

ANALYSIS PARAMETERS:     LO RANGE   =10.00 BARS   ROD DIAM.    = 3.57 CM     BL.THICK. = 12.7 MM   SU  FACTOR = 1.00
 SURF.ELEV.  = 15.00 M   LO  GAGE 0 = 0.02 BARS   FR.RED.DIA. = 4.80 CM      BL.WIDTH  = 94.9 MM   PHI FACTOR = 1.00
 WATER DEPTH = 11.00 M   HI  GAGE 0 = 0.15 BARS   LIN.ROD WT. = 6.50 KGF/M   DELTA-A   = 0.26 BARS OCR FACTOR = 1.00
 SP.GR.WATER = 1.000     CAL GAGE 0 = 0.00 BARS   DELTA/PHI    = 0.50        DELTA-B   = 0.15 BARS  M  FACTOR = 1.00
 MAX SU ID   = 0.60      SU OPTION  = MARCHETTI   MIN PHI ID   = 1.20        OCR OPTION= MARCHETTI  K0 FACTOR = 1.00
UNIT CONVERSIONS:        1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI     1 M = 3.2808 FT

  Z     KD     ID    UD     ED      K0     SU     QD     PHI    SIGFF   PHIO    PC     OCR      M      SOIL TYPE
 (M)                       (BAR)          (BAR)  (BAR)  (DEG)   (BAR)  (DEG)  (BAR)          (BAR)
***** ***** ***** ***** ****** ***** ***** ***** ***** ****** ***** ***** ***** ****** ************


 0.20  24.23  3.76  0.00   111.                                                               370.      SAND
 0.40  13.75  5.21  0.00   172.                                                               483.      SAND
 0.60  25.45  2.66  0.00   248.   3.09          31.3   42.5    0.18   38.4   7.14   67.6     841.   SILTY SAND
 0.80  14.21  2.43  0.00   170.   1.78          26.6   41.6    0.24   37.8   3.18   22.4     481.   SILTY SAND
 1.00   6.18  3.92  0.00   149.   0.76          28.3   42.7    0.30   39.4   0.75    4.2     310.      SAND
 1.20  12.92  2.82  0.00   270.   1.71          24.8   38.8    0.35   35.4   4.43   20.7     741.   SILTY SAND
 1.40   8.46  3.05  0.00   224.   1.15          28.7   39.8    0.41   36.7   2.28    9.1     528.   SILTY SAND
 1.60   6.85  2.49  0.00   170.   1.04          19.8   36.9    0.46   33.8   2.01    7.0     366.   SILTY SAND
 1.80   4.47  2.15  0.00   107.   0.80          15.1   34.9    0.51   31.9   1.22    3.8     189.   SILTY SAND
 2.00   5.57  1.59  0.00   110.   1.00          11.4   31.9    0.55   28.8   2.09    5.9     213.   SANDY SILT
 2.20   5.24  1.20  0.00    85.   1.01           9.4   29.8    0.58   26.7   2.27    5.8     159.   SANDY SILT
 2.40   3.81  0.65  0.00    36.   0.95                                       1.16    2.7      55.   CLAYEY SILT
 2.60   3.55  0.75  0.00    42.   0.90                                       1.11    2.4      61.   CLAYEY SILT
 2.80   4.26  0.42  0.00    30.   1.03   0.27                                1.58    3.3      49.   SILTY CLAY
 3.00   4.48  0.54  0.00    43.   1.07   0.31                                1.82    3.5      73.   SILTY CLAY
 3.20   3.95  0.59  0.00    45.   0.98   0.28                                1.60    2.9      69.   SILTY CLAY
 3.40   2.98  0.27  0.00    16.   0.78   0.21                                1.09    1.9      21.      CLAY
 3.60   2.65  0.28  0.00    16.   0.71   0.19                                0.95    1.5      18.      CLAY
 3.80   2.99  0.41  0.00    28.   0.78   0.23                                1.21    1.9      35.   SILTY CLAY
 4.00   2.69  0.33  0.00    21.   0.72   0.22                                1.07    1.6      24.      CLAY
 4.20   2.11  0.34  0.00    17.   0.57   0.17                                0.77    1.1      16.      CLAY
 4.40   1.94  0.36  0.00    18.   0.53   0.16                                0.71    1.0      15.   SILTY CLAY
 4.60   2.08  0.34  0.00    19.   0.57   0.18                                0.82    1.1      17.      CLAY
 4.80   2.57  0.44  0.00    31.   0.69   0.24                                1.19    1.5      35.   SILTY CLAY
 5.00   2.85  0.45  0.00    37.   0.75   0.29                                1.45    1.7      45.   SILTY CLAY
 5.20   2.94  0.61  0.00    54.   0.77                                       1.59    1.8      67.   CLAYEY SILT
 5.40   3.00  0.49  0.00    46.   0.78   0.33                                1.70    1.9      59.   SILTY CLAY
 5.60   2.90  0.51  0.00    48.   0.76   0.33                                1.67    1.8      59.   SILTY CLAY
 5.80   2.50  0.71  0.00    60.   0.67                                       1.38    1.4      66.   CLAYEY SILT
 6.00   2.39  0.52  0.00    43.   0.65   0.28                                1.33    1.3      45.   SILTY CLAY
 6.20   2.46  0.38  0.00    33.   0.66   0.29                                1.43    1.4      35.   SILTY CLAY
 6.40   2.47  0.28  0.00    26.   0.66   0.31                                1.48    1.4      28.      CLAY
 6.60   2.29  0.29  0.00    26.   0.62   0.29                                1.36    1.2      25.      CLAY
 6.80   2.13  0.31  0.00    26.   0.58   0.27                                1.24    1.1      23.      CLAY
 7.00   1.89  0.56  0.00    43.   0.52   0.24                                1.07    0.9      37.   SILTY CLAY
 7.20   1.88  0.89  0.00    69.   0.51                                       1.08    0.9      59.   CLAYEY SILT
 7.40   1.79  0.34  0.00    26.   0.49   0.24                                1.04    0.8      22.      CLAY
 7.60   1.98  0.28  0.00    24.   0.54   0.27                                1.24    1.0      21.      CLAY
 7.80   1.79  0.55  0.00    44.   0.49   0.25                                1.09    0.8      37.   SILTY CLAY
 8.00   2.07  0.33  0.00    31.   0.56   0.30                                1.40    1.1      28.      CLAY
 8.20   1.81  0.34  0.00    29.   0.49   0.26                                1.16    0.9      24.      CLAY
 8.40   1.01  2.06  0.00   100.   0.55          23.7   28.1    2.05   27.5   1.54    1.1      85.   SILTY SAND
 8.60   1.57  0.39  0.00    30.   0.42   0.23                                0.98    0.7      26.   SILTY CLAY
 8.80   1.88  0.27  0.00    26.   0.51   0.30                                1.33    0.9      22.      CLAY
 9.00   1.87  0.27  0.00    26.   0.51   0.30                                1.34    0.9      22.      CLAY
 9.20   1.99  0.29  0.00    30.   0.54   0.33                                1.52    1.0      26.      CLAY
 9.40   1.82  0.37  0.00    37.   0.49   0.30                                1.34    0.9      31.   SILTY CLAY
 9.60   1.69  0.44  0.00    41.   0.46   0.28                                1.23    0.8      35.   SILTY CLAY
 9.80   1.76  0.33  0.00    33.   0.48   0.30                                1.33    0.8      28.      CLAY
10.00   1.62  0.29  0.00    27.   0.44   0.28                                1.19    0.7      23.      CLAY
10.20   1.50  0.18  0.00    16.   0.40   0.26                                1.08    0.6      14.      CLAY
10.40   1.63  0.35  0.00    34.   0.44   0.29                                1.26    0.7      29.      CLAY
10.60   1.83  0.29  0.00    32.   0.50   0.35                                1.53    0.9      27.      CLAY
END OF SOUNDING
```

PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

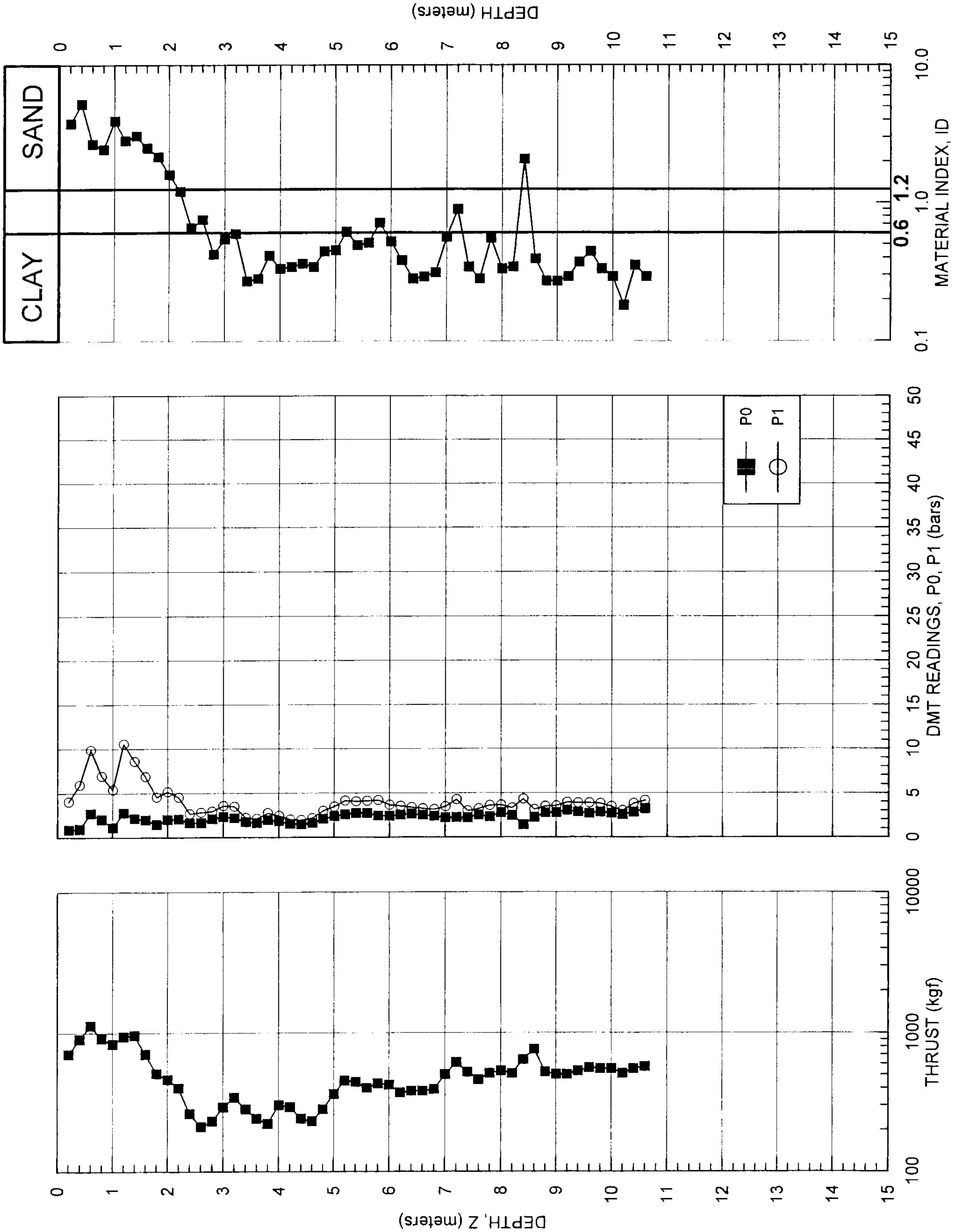
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-19-98

SOUNDING

D-2

DILATOMETER RESULTS

Ground Surface Elev.:
Water Depth: Not Found



PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

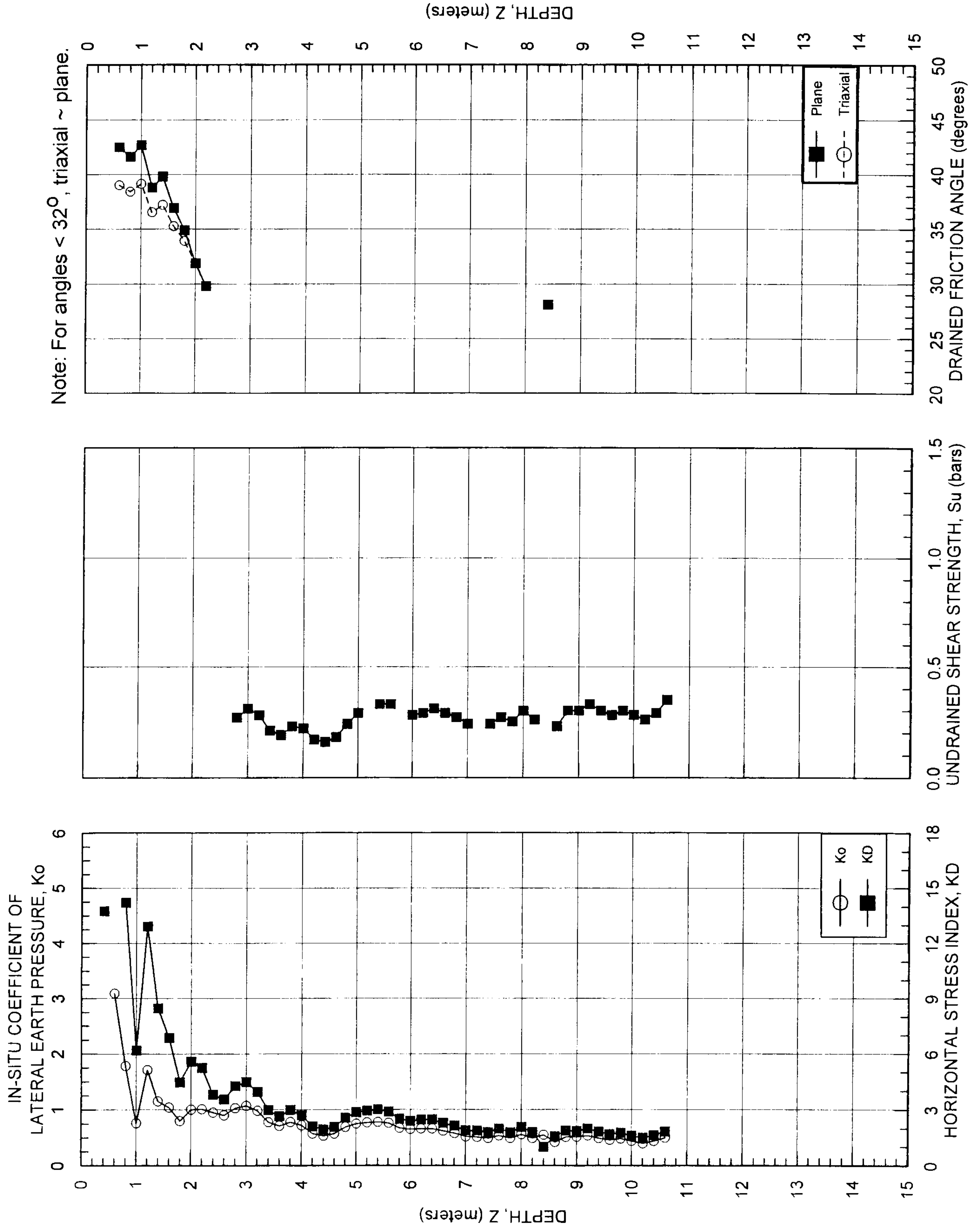
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-19-98

SOUNDING

D-2

INTERPRETED DMT STRENGTH PARAMETERS

Ground Surface Elev.:
Water Depth: None Found



PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

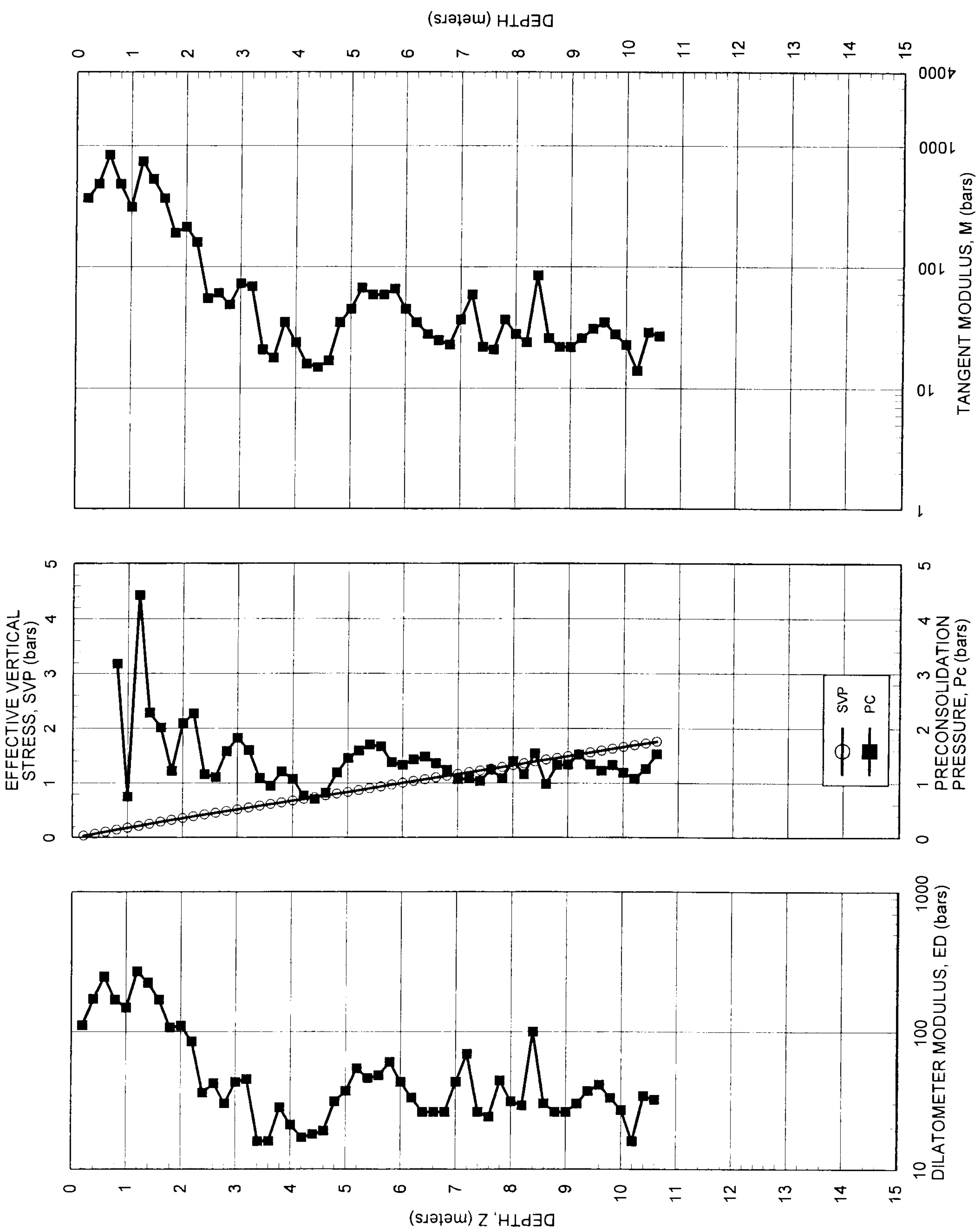
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-19-98

SOUNDING

D-2

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.:
Water Depth: None Found



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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)          SNDG. NO.  D-3
IN-SITU SOIL TESTING, L.C.                                                                PAGE 1
JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware                  FILE NO. : IST-9863
LOCATION: As Planned
SNDG.BY : R. FAILMEZGER                                                                   SNDG.DATE: 11-18-98
ANAL.BY : R. FAILMEZGER                                                                   ANAL.DATE: 11-18-98

ANALYSIS PARAMETERS:     LO RANGE   =10.00 BARS   ROD DIAM.     = 3.57 CM     BL.THICK. = 12.7 MM    SU  FACTOR = 1.00
 SURF.ELEV.  = 15.00 M   LO  GAGE 0 = 0.02 BARS   FR.RED.DIA. = 4.80 CM     BL.WIDTH  = 94.9 MM    PHI FACTOR = 1.00
 WATER DEPTH = 11.00 M   HI  GAGE 0 = 0.15 BARS   LIN.ROD WT. = 6.50 KGF/M  DELTA-A   = 0.27 BARS OCR FACTOR = 1.00
 SP.GR.WATER = 1.000     CAL GAGE 0 = 0.00 BARS   DELTA/PHI    = 0.50       DELTA-B   = 0.13 BARS  M  FACTOR = 1.00
 MAX SU ID   = 0.60      SU OPTION  = MARCHETTI   MIN PHI ID   = 1.20       OCR OPTION= MARCHETTI  K0 FACTOR = 1.00
UNIT CONVERSIONS:        1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI     1 M = 3.2808 FT

   Z    THRUST      A     B     C     DA    DB  ZMRNG  ZMLO  ZMHI ZMCAL     P0    P1    P2      U0  GAMMA    SVP
  (M)    (KGF)  (BAR) (BAR) (BAR)  (BAR) (BAR)  (BAR) (BAR) (BAR) (BAR)  (BAR) (BAR) (BAR)   (BAR) (T/M3)  (BAR)
 *****  ******  ***** ***** *****  ***** *****  ***** ***** ***** *****  ***** ***** *****  ****** ****** ******

  0.20    710.   3.61 10.35         0.27  0.13  10.00  0.02  0.15  0.00   3.55 10.07         0.000   1.90  0.035
  0.40    700.   1.93  6.18         0.27  0.13  10.00  0.02  0.15  0.00   1.99  6.03         0.000   1.80  0.071
  0.60    750.   3.14  8.10         0.27  0.13  10.00  0.02  0.15  0.00   3.16  7.95         0.000   1.80  0.107
  0.80    660.   2.85  7.13         0.27  0.13  10.00  0.02  0.15  0.00   2.91  6.98         0.000   1.80  0.142
  1.00    480.   1.79  4.94         0.27  0.13  10.00  0.02  0.15  0.00   1.90  4.79         0.000   1.70  0.176
  1.20    450.   1.23  3.76         0.27  0.13  10.00  0.02  0.15  0.00   1.37  3.61         0.000   1.70  0.210
  1.40    310.   0.84  2.43         0.27  0.13  10.00  0.02  0.15  0.00   1.03  2.28         0.000   1.60  0.242
  1.60    250.   0.68  2.46         0.27  0.13  10.00  0.02  0.15  0.00   0.86  2.31         0.000   1.60  0.273
  1.80    240.   0.83  2.52         0.27  0.13  10.00  0.02  0.15  0.00   1.02  2.37         0.000   1.60  0.305
  2.00    270.   0.76  2.28         0.27  0.13  10.00  0.02  0.15  0.00   0.95  2.13         0.000   1.60  0.336
  2.20    280.   1.57  3.29         0.27  0.13  10.00  0.02  0.15  0.00   1.75  3.14         0.000   1.70  0.369
  2.40    400.   2.23  4.44         0.27  0.13  10.00  0.02  0.15  0.00   2.39  4.29         0.000   1.70  0.402
  2.60    380.   2.14  3.94         0.27  0.13  10.00  0.02  0.15  0.00   2.32  3.79         0.000   1.70  0.435
  2.80    280.   2.06  3.76         0.27  0.13  10.00  0.02  0.15  0.00   2.24  3.61         0.000   1.70  0.469
  3.00    510.   4.08 10.10         0.27  0.13  10.00  0.02  0.15  0.00   4.06  9.82         0.000   1.80  0.503
  3.20    740.   2.95  6.86         0.27  0.13  10.00  0.02  0.15  0.00   3.02  6.71         0.000   1.80  0.538
  3.40    540.   2.04  4.55         0.27  0.13  10.00  0.02  0.15  0.00   2.18  4.40         0.000   1.70  0.573
  3.60    280.   1.32  2.87         0.27  0.13  10.00  0.02  0.15  0.00   1.51  2.72         0.000   1.60  0.605
  3.80    280.   1.34  2.98         0.27  0.13  10.00  0.02  0.15  0.00   1.53  2.83         0.000   1.60  0.637
  4.00    280.   1.62  3.09         0.27  0.13  10.00  0.02  0.15  0.00   1.82  2.94         0.000   1.60  0.668
  4.20    260.   1.59  2.96         0.27  0.13  10.00  0.02  0.15  0.00   1.79  2.81         0.000   1.60  0.699
  4.40    240.   1.48  2.85         0.27  0.13  10.00  0.02  0.15  0.00   1.68  2.70         0.000   1.60  0.731
  4.60    220.   1.24  2.58         0.27  0.13  10.00  0.02  0.15  0.00   1.44  2.43         0.000   1.60  0.762
  4.80    330.   1.33  2.94         0.27  0.13  10.00  0.02  0.15  0.00   1.52  2.79         0.000   1.60  0.794
  5.00    240.   1.31  2.87         0.27  0.13  10.00  0.02  0.15  0.00   1.50  2.72         0.000   1.60  0.825
  5.20    330.   1.18  2.65         0.27  0.13  10.00  0.02  0.15  0.00   1.38  2.50         0.000   1.60  0.856
  5.40    310.   1.18  2.42         0.27  0.13  10.00  0.02  0.15  0.00   1.39  2.27         0.000   1.60  0.888
  5.60    440.   1.53  3.90         0.27  0.13  10.00  0.02  0.15  0.00   1.68  3.75         0.000   1.70  0.920
  5.80    430.   2.64  3.87         0.27  0.13  10.00  0.02  0.15  0.00   2.85  3.72         0.000   1.70  0.954
  6.00    330.   2.72  3.99         0.27  0.13  10.00  0.02  0.15  0.00   2.93  3.84         0.000   1.70  0.987
  6.20    300.   2.85  4.10         0.27  0.13  10.00  0.02  0.15  0.00   3.06  3.95         0.000   1.70  1.020
  6.40    320.   3.00  4.19         0.27  0.13  10.00  0.02  0.15  0.00   3.21  4.04         0.000   1.70  1.054
  6.60    350.   2.47  3.77         0.27  0.13  10.00  0.02  0.15  0.00   2.67  3.62         0.000   1.70  1.087
  6.80    410.   2.54  3.99         0.27  0.13  10.00  0.02  0.15  0.00   2.74  3.84         0.000   1.70  1.120
  7.00    400.   2.66  3.96         0.27  0.13  10.00  0.02  0.15  0.00   2.87  3.81         0.000   1.70  1.154
  7.20    410.   2.60  3.81         0.27  0.13  10.00  0.02  0.15  0.00   2.81  3.66         0.000   1.70  1.187
  7.40    460.   2.41  4.00         0.27  0.13  10.00  0.02  0.15  0.00   2.60  3.85         0.000   1.70  1.220
  7.60    600.   2.51  4.09         0.27  0.13  10.00  0.02  0.15  0.00   2.70  3.94         0.000   1.70  1.254
  7.80    760.   2.91  6.69         0.27  0.13  10.00  0.02  0.15  0.00   2.99  6.54         0.000   1.80  1.288
  8.00    960.   2.10  7.91         0.27  0.13  10.00  0.02  0.15  0.00   2.08  7.76         0.000   1.90  1.324
  8.20   1440.   3.11 11.70         0.27  0.13  10.00  0.02  0.15  0.00   2.96 11.42         0.000   1.90  1.362
  8.40   2220.   3.32 12.25         0.27  0.13  10.00  0.02  0.15  0.00   3.15 11.97         0.000   1.90  1.399
  8.60   2390.   4.29 14.55         0.27  0.13  10.00  0.02  0.15  0.00   4.05 14.27         0.000   1.90  1.436
  8.80   2260.   3.81 11.75         0.27  0.13  10.00  0.02  0.15  0.00   3.69 11.47         0.000   1.90  1.474
  9.00   1090.   3.65  5.19         0.27  0.13  10.00  0.02  0.15  0.00   3.84  5.04         0.000   1.70  1.509
  9.20    490.   3.51  5.19         0.27  0.13  10.00  0.02  0.15  0.00   3.70  5.04         0.000   1.70  1.542
  9.40    460.   3.92  5.59         0.27  0.13  10.00  0.02  0.15  0.00   4.11  5.44         0.000   1.70  1.576
  9.60   1740.   2.47 13.70         0.27  0.13  10.00  0.02  0.15  0.00   2.18 13.42         0.000   1.90  1.611
  9.80   3710.   3.07 14.20         0.27  0.13  10.00  0.02  0.15  0.00   2.79 13.92         0.000   1.90  1.648
 10.00   4480.   4.11 14.50         0.27  0.13  10.00  0.02  0.15  0.00   3.87 14.22         0.000   1.90  1.686
 10.20   2260.   4.57 12.65         0.27  0.13  10.00  0.02  0.15  0.00   4.44 12.37         0.000   1.80  1.722
 10.40   1190.   2.27  7.68         0.27  0.13  10.00  0.02  0.15  0.00   2.27  7.53         0.000   1.90  1.758
END OF SOUNDING                     (INTERPRETED SOIL PARAMETERS ON NEXT PAGE)
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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)          SNDG. NO.  D-3
IN-SITU SOIL TESTING, L.C.                                                                PAGE 2
JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware                  FILE NO. : IST-9863
LOCATION: As Planned
SNDG.BY : R. FAILMEZGER                                                                   SNDG.DATE: 11-18-98
ANAL.BY : R. FAILMEZGER                                                                   ANAL.DATE: 11-18-98

ANALYSIS PARAMETERS:     LO RANGE   =10.00 BARS   ROD DIAM.   = 3.57 CM     BL.THICK. = 12.7 MM   SU  FACTOR = 1.00
 SURF.ELEV.  = 15.00 M   LO  GAGE 0 = 0.02 BARS   FR.RED.DIA. = 4.80 CM     BL.WIDTH  = 94.9 MM   PHI FACTOR = 1.00
 WATER DEPTH = 11.00 M   HI  GAGE 0 = 0.15 BARS   LIN.ROD WT. = 6.50 KGF/M  DELTA-A   = 0.27 BARS OCR FACTOR = 1.00
 SP.GR.WATER = 1.000     CAL GAGE 0 = 0.00 BARS   DELTA/PHI   = 0.50        DELTA-B   = 0.13 BARS  M  FACTOR = 1.00
 MAX SU ID   = 0.60      SU OPTION  = MARCHETTI   MIN PHI ID  = 1.20        OCR OPTION= MARCHETTI  K0 FACTOR = 1.00
UNIT CONVERSIONS:        1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI    1 M = 3.2808 FT

  Z     KD    ID    UD    ED      K0     SU     QD     PHI   SIGFF   PHIO     PC     OCR      M      SOIL TYPE
 (M)                     (BAR)          (BAR)  (BAR)  (DEG)  (BAR)   (DEG)  (BAR)         (BAR)
*****  ***** ***** ***** ******  *****  *****  *****  *****  ******  *****  *****  *****  ******  ************


 0.20 101.41  1.84  0.00   226.  12.34          10.8   39.3    0.06   32.7  44.40 1268.7   1062.   SILTY SAND
 0.40  27.87  2.03  0.00   140.   3.41          18.0   41.8    0.12   36.9   5.92   83.0    487.   SILTY SAND
 0.60  29.65  1.51  0.00   166.   3.76          15.3   37.7    0.17   32.9  11.81  110.8    586.   SANDY SILT
 0.80  20.47  1.40  0.00   141.   2.69          13.6   36.4    0.23   31.9   7.86   55.4    449.   SANDY SILT
 1.00  10.79  1.52  0.00   100.   1.54          11.3   35.6    0.28   31.5   2.90   16.5    258.   SANDY SILT
 1.20   6.55  1.63  0.00    78.   1.02          12.6   36.1    0.33   32.4   1.40    6.7    163.   SANDY SILT
 1.40   4.26  1.21  0.00    43.   0.81           9.0   33.4    0.38   29.6   0.90    3.7     72.   SANDY SILT
 1.60   3.15  1.68  0.00    50.   0.72           7.6   31.4    0.42   27.7   0.72    2.6     70.   SANDY SILT
 1.80   3.33  1.33  0.00    47.   0.79           6.8   29.7    0.46   26.0   0.94    3.1     67.   SANDY SILT
 2.00   2.84  1.23  0.00    41.   0.71           8.2   30.5    0.51   27.2   0.82    2.4     51.   SANDY SILT
 2.20   4.76  0.79  0.00    48.   1.12                                       1.42    3.9     84.   CLAYEY SILT
 2.40   5.94  0.80  0.00    66.   1.31                                       2.20    5.5    130.   CLAYEY SILT
 2.60   5.33  0.63  0.00    51.   1.21                                       2.01    4.6     95.   CLAYEY SILT
 2.80   4.79  0.61  0.00    47.   1.13                                       1.83    3.9     83.   CLAYEY SILT
 3.00   8.06  1.42  0.00   200.   1.44           8.2   26.3    0.73   23.4   7.35   14.6    458.   SANDY SILT
 3.20   5.62  1.22  0.00   128.   0.99          18.6   32.4    0.83   30.2   3.14    5.8    247.   SANDY SILT
 3.40   3.81  1.01  0.00    77.   0.95                                       1.57    2.7    118.      SILT
 3.60   2.50  0.80  0.00    42.   0.67                                       0.86    1.4     46.   CLAYEY SILT
 3.80   2.40  0.85  0.00    45.   0.65                                       0.85    1.3     48.   CLAYEY SILT
 4.00   2.72  0.62  0.00    39.   0.72                                       1.08    1.6     45.   CLAYEY SILT
 4.20   2.56  0.57  0.00    35.   0.69   0.21                                1.03    1.5     39.   SILTY CLAY
 4.40   2.30  0.61  0.00    35.   0.62                                       0.91    1.2     35.   CLAYEY SILT
 4.60   1.89  0.68  0.00    34.   0.52                                       0.70    0.9     29.   CLAYEY SILT
 4.80   1.91  0.84  0.00    44.   0.52                                       0.74    0.9     37.   CLAYEY SILT
 5.00   1.82  0.81  0.00    42.   0.50                                       0.71    0.9     36.   CLAYEY SILT
 5.20   1.61  0.82  0.00    39.   0.43                                       0.61    0.7     33.   CLAYEY SILT
 5.40   1.56  0.64  0.00    31.   0.42                                       0.60    0.7     26.   CLAYEY SILT
 5.60   1.83  1.23  0.00    72.   0.68          14.0   26.9    1.34   25.4   1.65    1.8     61.   SANDY SILT
 5.80   2.99  0.31  0.00    30.   0.78   0.35                                1.78    1.9     38.      CLAY
 6.00   2.97  0.31  0.00    32.   0.78   0.36                                1.82    1.8     40.      CLAY
 6.20   3.00  0.29  0.00    31.   0.78   0.37                                1.92    1.9     39.      CLAY
 6.40   3.05  0.26  0.00    29.   0.80   0.39                                2.03    1.9     37.      CLAY
 6.60   2.46  0.35  0.00    33.   0.66   0.31                                1.50    1.4     35.   SILTY CLAY
 6.80   2.44  0.40  0.00    38.   0.66   0.32                                1.53    1.4     40.   SILTY CLAY
 7.00   2.48  0.33  0.00    33.   0.67   0.33                                1.62    1.4     35.      CLAY
 7.20   2.37  0.30  0.00    30.   0.64   0.32                                1.54    1.3     30.      CLAY
 7.40   2.13  0.48  0.00    43.   0.58   0.29                                1.35    1.1     40.   SILTY CLAY
 7.60   2.15  0.46  0.00    43.   0.59   0.30                                1.41    1.1     40.   SILTY CLAY
 7.80   2.32  1.19  0.00   123.   0.63                                       1.63    1.3    130.      SILT
 8.00   1.57  2.73  0.00   197.   0.54          33.2   31.1    2.01   30.5   1.72    1.3    169.   SILTY SAND
 8.20   2.17  2.86  0.00   294.   0.55          48.3   33.6    2.12   33.1   2.13    1.6    341.   SILTY SAND
 8.40   2.25  2.80  0.00   306.   0.49          77.8   36.9    2.24   36.5   1.89    1.4    363.   SILTY SAND
 8.60   2.82  2.52  0.00   355.   0.56          80.4   36.7    2.29   36.4   2.61    1.8    483.   SILTY SAND
 8.80   2.50  2.11  0.00   270.   0.53          77.1   36.3    2.35   36.1   2.35    1.6    328.   SILTY SAND
 9.00   2.55  0.31  0.00    42.   0.68   0.45                                2.20    1.5     46.      CLAY
 9.20   2.40  0.36  0.00    47.   0.65   0.43                                2.04    1.3     48.   SILTY CLAY
 9.40   2.61  0.32  0.00    46.   0.70   0.48                                2.38    1.5     52.      CLAY
 9.60   1.36  5.14  0.00   390.   0.43          63.9   34.7    2.53   34.6   1.50    0.9    331.      SAND
 9.80   1.69  3.99  0.00   386.   0.33         139.4   40.1    2.71   40.0   1.12    0.7    370.      SAND
10.00   2.29  2.68  0.00   359.   0.37         164.6   40.8    2.79   40.8   1.58    0.9    428.   SILTY SAND
10.20   2.58  1.78  0.00   275.   0.57          74.7   35.0    2.71   34.9   3.07    1.8    334.   SANDY SILT
10.40   1.29  2.32  0.00   183.   0.51          42.6   30.9    2.66   30.8   1.98    1.1    155.   SILTY SAND
END OF SOUNDING
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PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

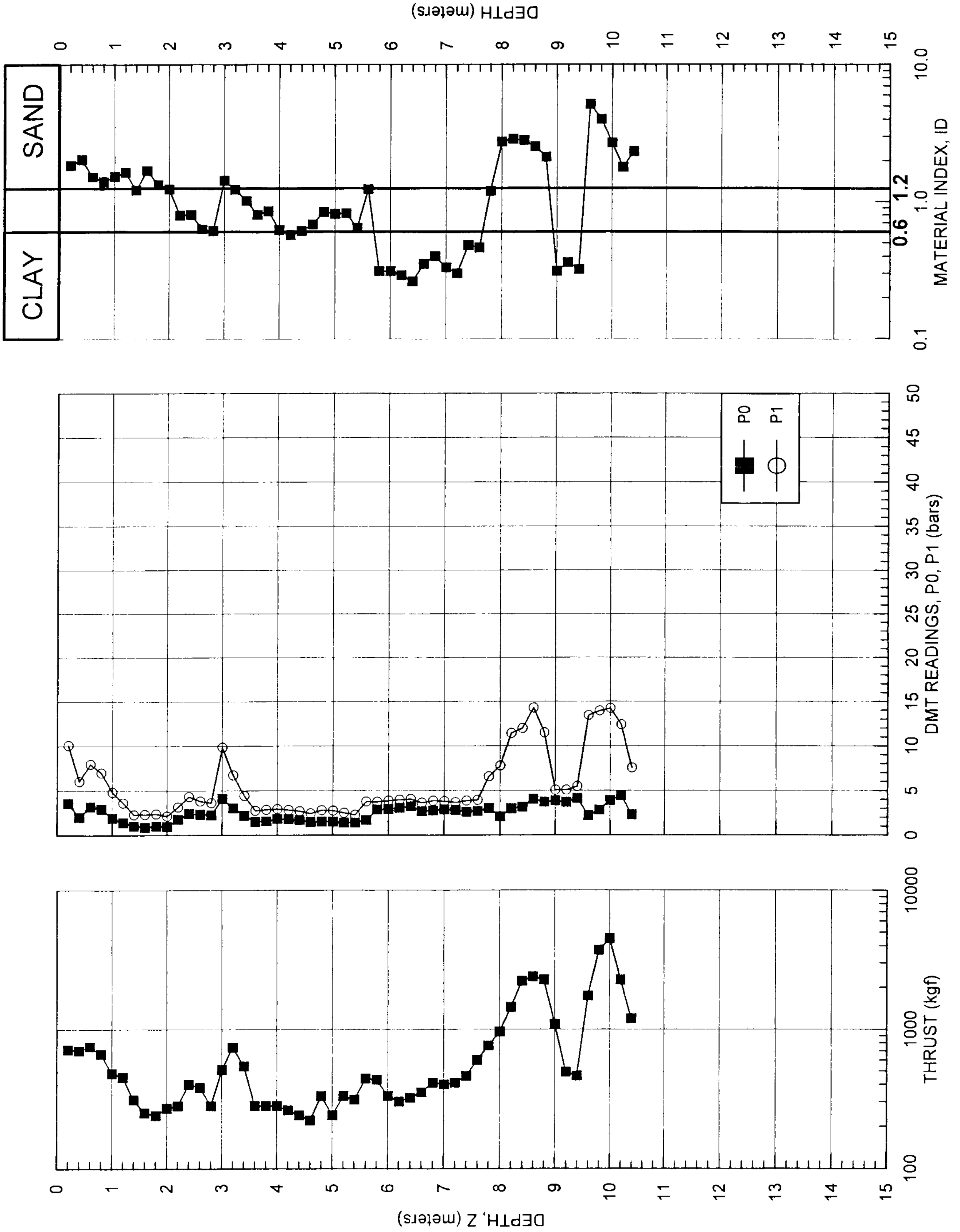
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-19-98

SOUNDING

D-3

DILATOMETER RESULTS

Ground Surface Elev:
Water Depth: Not Found



PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

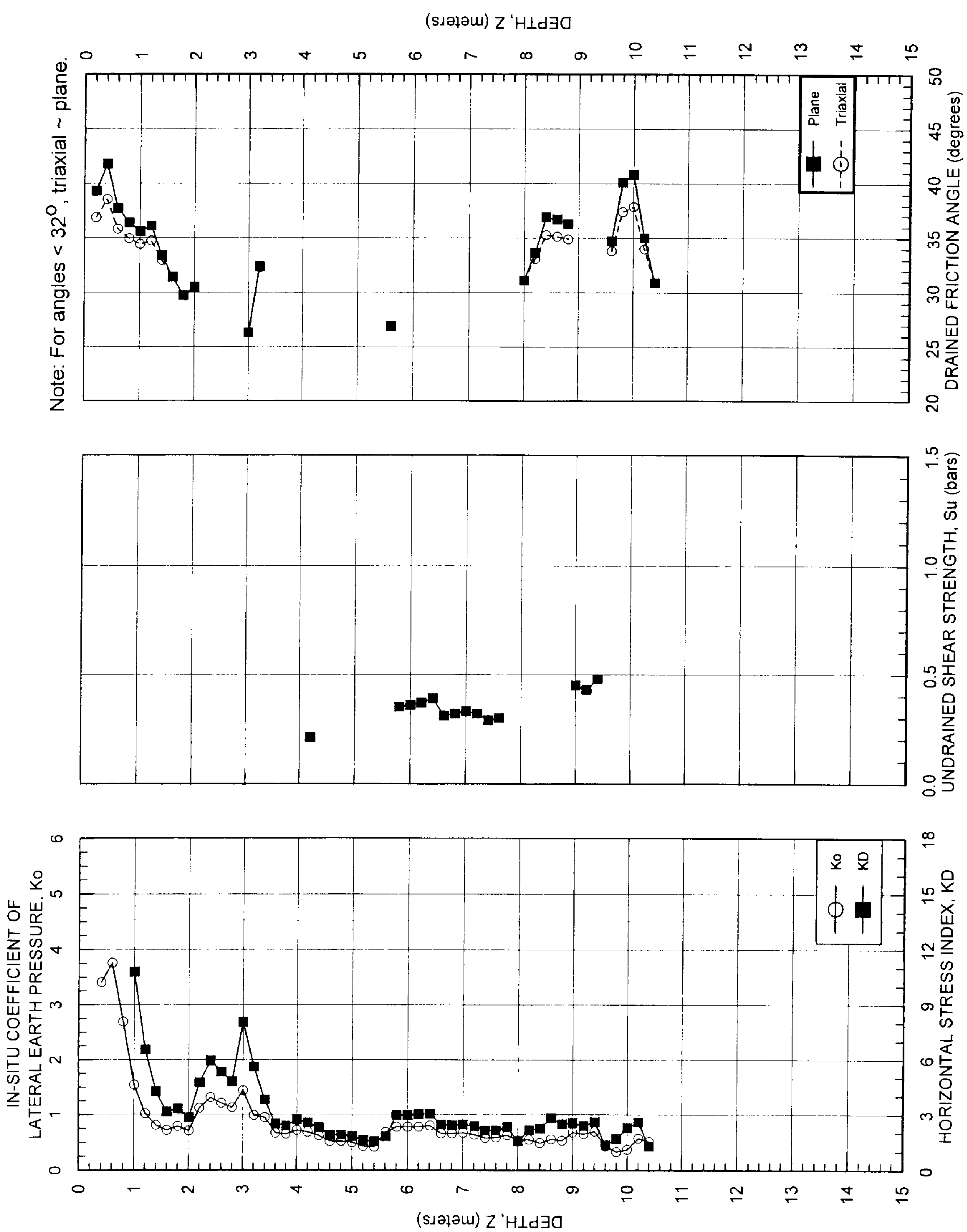
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-19-98

SOUNDING

D-3

INTERPRETED DMT STRENGTH PARAMETERS

Ground Surface Elev.:
Water Depth: None Found


Note: For angles < 32°, triaxial ~ plane.

PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

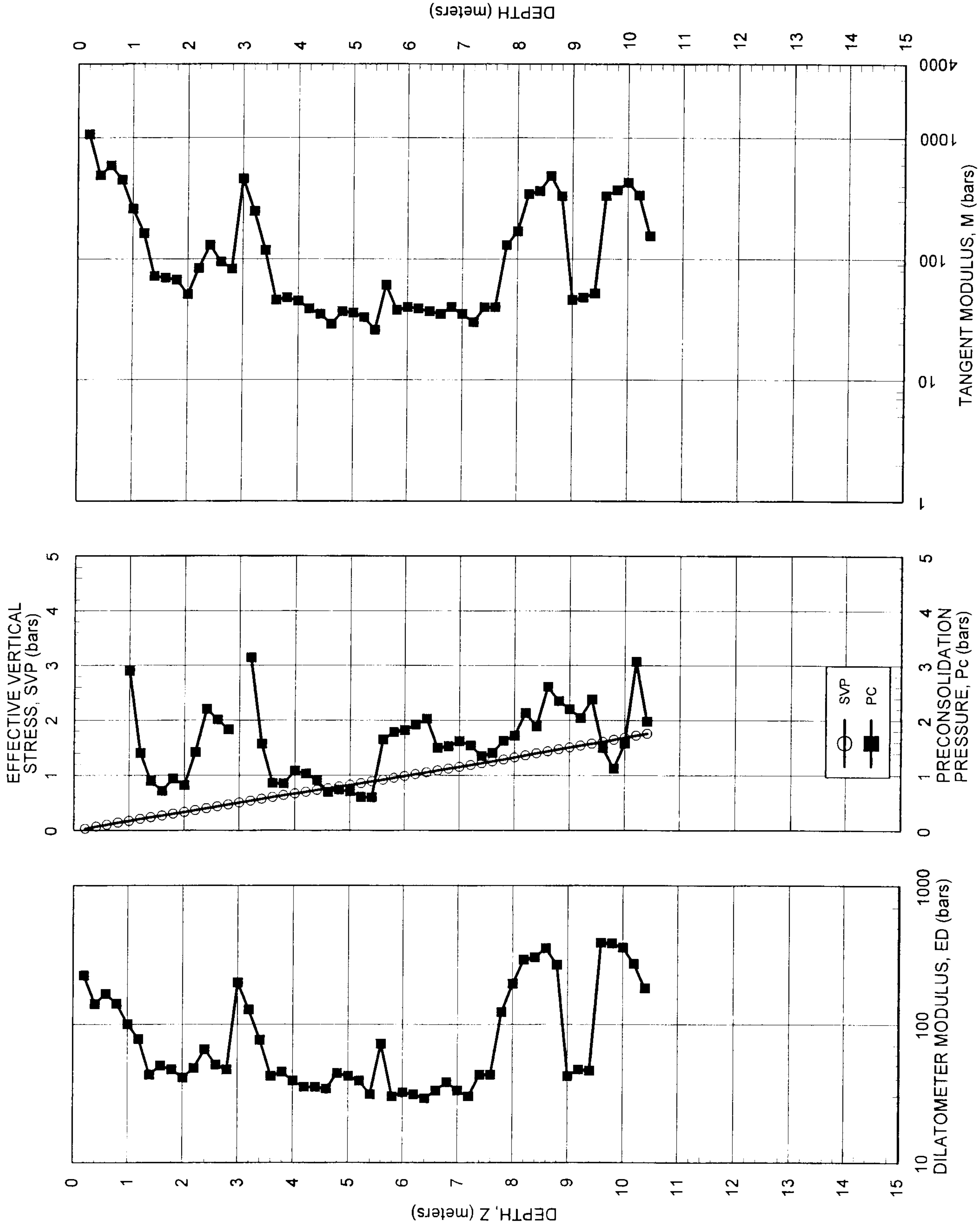
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-19-98

SOUNDING

D-3

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.:
Water Depth: None Found



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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)        SNDG. NO.  D-4
IN-SITU SOIL TESTING, L.C.                                                              PAGE 1
JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware                FILE NO. : IST-9863
LOCATION: As Planned
SNDG.BY : R. FAILMEZGER                                                                 SNDG.DATE: 11-17-98
ANAL.BY : R. FAILMEZGER                                                                 ANAL.DATE: 11-17-98

ANALYSIS PARAMETERS:      LO RANGE   =10.00 BARS   ROD DIAM.    = 3.57 CM      BL.THICK. = 12.7 MM   SU  FACTOR = 1.00
 SURF.ELEV.   = 15.00 M   LO  GAGE 0 = 0.02 BARS   FR.RED.DIA. = 4.80 CM      BL.WIDTH  = 94.9 MM   PHI FACTOR = 1.00
 WATER DEPTH =   9.30 M   HI  GAGE 0 = 0.15 BARS   LIN.ROD WT. = 6.50 KGF/M  DELTA-A   = 0.25 BARS OCR FACTOR = 1.00
 SP.GR.WATER = 1.000      CAL GAGE 0 = 0.00 BARS   DELTA/PHI    = 0.50         DELTA-B   = 0.19 BARS  M  FACTOR = 1.00
 MAX SU ID    = 0.60      SU OPTION  = MARCHETTI   MIN PHI ID   = 1.20         OCR OPTION= MARCHETTI  KO FACTOR = 1.00
UNIT CONVERSIONS:         1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI     1 M = 3.2808 FT

  Z    THRUST    A     B     C       DA    DB    ZMRNG ZMLO  ZMHI  ZMCAL   P0    P1    P2      U0    GAMMA   SVP
 (M)    (KGF)  (BAR) (BAR) (BAR)   (BAR) (BAR)   (BAR) (BAR) (BAR) (BAR)  (BAR) (BAR) (BAR)   (BAR)  (T/M3) (BAR)
*****  ******  ***** ***** *****   ***** *****   ***** ***** ***** *****  ***** ***** *****   ****** ****** ******

 1.40   1100.   2.21  6.32          0.25  0.19  10.00  0.02  0.15  0.00   2.26  6.11           0.000   1.70  0.245
 1.60    870.   1.87  5.24          0.25  0.19  10.00  0.02  0.15  0.00   1.95  5.03           0.000   1.70  0.278
 1.80    960.   2.17  7.32          0.25  0.19  10.00  0.02  0.15  0.00   2.16  7.11           0.000   1.80  0.313
 2.00   1510.   2.76 10.15          0.25  0.19  10.00  0.02  0.15  0.00   2.65  9.81           0.000   1.90  0.349
 2.40    570.   0.31  3.18          0.25  0.19  10.00  0.02  0.15  0.00   0.42  2.97           0.000   1.70  0.420
 2.60    430.   0.16  1.46          0.25  0.19  10.00  0.02  0.15  0.00   0.35  1.25           0.000   1.70  0.453
 2.80    390.   0.42  2.36          0.25  0.19  10.00  0.02  0.15  0.00   0.57  2.15           0.000   1.70  0.486
 3.00    340.   0.14  1.52          0.25  0.19  10.00  0.02  0.15  0.00   0.32  1.31           0.000   1.70  0.520
 3.40    300.   0.03  0.57          0.25  0.19  10.00  0.02  0.15  0.00   0.25  0.36           0.000   1.50  0.583
 3.60    310.   2.41  7.34          0.25  0.19  10.00  0.02  0.15  0.00   2.42  7.13           0.000   1.90  0.616
 3.80    350.   0.54  2.17          0.25  0.19  10.00  0.02  0.15  0.00   0.71  1.96           0.000   1.60  0.650
 4.00    360.   0.53  2.68          0.25  0.19  10.00  0.02  0.15  0.00   0.67  2.47           0.000   1.70  0.683
 4.20    360.   0.49  1.89          0.25  0.19  10.00  0.02  0.15  0.00   0.67  1.68           0.000   1.60  0.715
 4.40    290.   1.45  3.43          0.25  0.19  10.00  0.02  0.15  0.00   1.60  3.22           0.000   1.70  0.747
 4.60    260.   1.37  2.89          0.25  0.19  10.00  0.02  0.15  0.00   1.55  2.68           0.000   1.60  0.780
 4.80    190.   1.30  2.45          0.25  0.19  10.00  0.02  0.15  0.00   1.49  2.24           0.000   1.60  0.811
 5.00    160.   1.18  2.33          0.25  0.19  10.00  0.02  0.15  0.00   1.37  2.12           0.000   1.60  0.843
 5.20    170.   1.37  2.41          0.25  0.19  10.00  0.02  0.15  0.00   1.57  2.20           0.000   1.60  0.874
 5.40    170.   1.49  2.43          0.25  0.19  10.00  0.02  0.15  0.00   1.69  2.22           0.000   1.60  0.905
 5.60    160.   1.33  2.17          0.25  0.19  10.00  0.02  0.15  0.00   1.54  1.96           0.000   1.60  0.937
 5.80    190.   1.56  2.46          0.25  0.19  10.00  0.02  0.15  0.00   1.77  2.25           0.000   1.60  0.968
 6.00    190.   1.77  2.71          0.25  0.19  10.00  0.02  0.15  0.00   1.97  2.50           0.000   1.60  1.000
 6.20    180.   1.77  2.67          0.25  0.19  10.00  0.02  0.15  0.00   1.98  2.46           0.000   1.60  1.031
 6.40    220.   1.76  2.70          0.25  0.19  10.00  0.02  0.15  0.00   1.96  2.49           0.000   1.60  1.062
 6.60    250.   1.47  2.32          0.25  0.19  10.00  0.02  0.15  0.00   1.68  2.11           0.000   1.60  1.094
 6.80    270.   2.12  3.22          0.25  0.19  10.00  0.02  0.15  0.00   2.32  3.01           0.000   1.60  1.125
 7.00    330.   2.80  4.11          0.25  0.19  10.00  0.02  0.15  0.00   2.99  3.90           0.000   1.70  1.158
 7.20    330.   2.78  4.09          0.25  0.19  10.00  0.02  0.15  0.00   2.97  3.88           0.000   1.70  1.191
 7.40    320.   2.79  4.02          0.25  0.19  10.00  0.02  0.15  0.00   2.98  3.81           0.000   1.70  1.224
 7.60    340.   3.06  4.36          0.25  0.19  10.00  0.02  0.15  0.00   3.25  4.15           0.000   1.70  1.258
 7.80    360.   3.11  4.51          0.25  0.19  10.00  0.02  0.15  0.00   3.29  4.30           0.000   1.70  1.291
 8.00    380.   3.27  4.87          0.25  0.19  10.00  0.02  0.15  0.00   3.44  4.66           0.000   1.70  1.324
 8.20    390.   3.26  4.66          0.25  0.19  10.00  0.02  0.15  0.00   3.44  4.45           0.000   1.70  1.358
 8.40    470.   2.82  7.17          0.25  0.19  10.00  0.02  0.15  0.00   2.85  6.96           0.000   1.80  1.392
 8.60    470.   3.16  5.09          0.25  0.19  10.00  0.02  0.15  0.00   3.32  4.88           0.000   1.70  1.427
 8.80    450.   3.52  5.81          0.25  0.19  10.00  0.02  0.15  0.00   3.66  5.60           0.000   1.70  1.460
 9.00    460.   3.27  5.59          0.25  0.19  10.00  0.02  0.15  0.00   3.41  5.38           0.000   1.70  1.493
 9.20    440.   3.11  4.79          0.25  0.19  10.00  0.02  0.15  0.00   3.28  4.58           0.000   1.70  1.527
 9.40    430.   2.87  4.10          0.25  0.19  10.00  0.02  0.15  0.00   3.06  3.89           0.010   1.70  1.550
 9.60    450.   3.52  4.96          0.25  0.19  10.00  0.02  0.15  0.00   3.70  4.75           0.029   1.70  1.564
 9.80    480.   3.74  5.31          0.25  0.19  10.00  0.02  0.15  0.00   3.91  5.10           0.049   1.70  1.578
10.00    530.   3.21  5.31          0.25  0.19  10.00  0.02  0.15  0.00   3.36  5.10           0.069   1.70  1.591
10.20   1040.   1.80  7.51          0.25  0.19  10.00  0.02  0.15  0.00   1.77  7.30           0.088   1.80  1.606
10.40   1800.   2.71 11.70          0.25  0.19  10.00  0.02  0.15  0.00   2.52 11.36           0.108   1.90  1.623
10.60   1220.   2.29  4.67          0.25  0.19  10.00  0.02  0.15  0.00   2.42  4.46           0.128   1.70  1.639
10.80    800.   2.14  3.27          0.25  0.19  10.00  0.02  0.15  0.00   2.34  3.06           0.147   1.60  1.651
11.00    660.   1.83  3.14          0.25  0.19  10.00  0.02  0.15  0.00   2.02  2.93           0.167   1.60  1.663
11.20    670.   2.12  3.62          0.25  0.19  10.00  0.02  0.15  0.00   2.30  3.41           0.186   1.70  1.676
11.40    700.   2.56  3.67          0.25  0.19  10.00  0.02  0.15  0.00   2.76  3.46           0.206   1.60  1.689
11.60    620.   2.11  3.64          0.25  0.19  10.00  0.02  0.15  0.00   2.29  3.43           0.226   1.70  1.701
11.80    910.   2.11  4.60          0.25  0.19  10.00  0.02  0.15  0.00   2.24  4.39           0.245   1.70  1.715
12.00    900.   3.61  6.76          0.25  0.19  10.00  0.02  0.15  0.00   3.70  6.55           0.265   1.80  1.730
12.20    800.   4.05  6.71          0.25  0.19  10.00  0.02  0.15  0.00   4.17  6.50           0.285   1.80  1.745
12.40    530.   3.86  5.91          0.25  0.19  10.00  0.02  0.15  0.00   4.01  5.70           0.304   1.70  1.760
12.60    500.   3.39  5.82          0.25  0.19  10.00  0.02  0.15  0.00   3.52  5.61           0.324   1.70  1.774
END OF SOUNDING                     (INTERPRETED SOIL PARAMETERS ON NEXT PAGE)
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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)        SNDG. NO.  D-4
IN-SITU SOIL TESTING, L.C.                                                              PAGE 2
JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware                FILE NO. : IST-9863
LOCATION: As Planned
SNDG.BY : R. FAILMEZGER                                                                 SNDG.DATE: 11-17-98
ANAL.BY : R. FAILMEZGER                                                                 ANAL.DATE: 11-17-98

ANALYSIS PARAMETERS:      LO RANGE   =10.00 BARS   ROD DIAM.     = 3.57 CM     BL.THICK. = 12.7 MM   SU  FACTOR = 1.00
 SURF.ELEV.  = 15.00 M    LO  GAGE 0 = 0.02 BARS   FR.RED.DIA. = 4.80 CM       BL.WIDTH  = 94.9 MM   PHI FACTOR = 1.00
 WATER DEPTH =   9.30 M   HI  GAGE 0 = 0.15 BARS   LIN.ROD WT. = 6.50 KGF/M    DELTA-A   = 0.25 BARS OCR FACTOR = 1.00
 SP.GR.WATER = 1.000      CAL GAGE 0 = 0.00 BARS   DELTA/PHI     = 0.50        DELTA-B   = 0.19 BARS  M  FACTOR = 1.00
 MAX SU ID   = 0.60       SU OPTION  = MARCHETTI   MIN PHI ID    = 1.20        OCR OPTION= MARCHETTI  K0 FACTOR = 1.00
UNIT CONVERSIONS:         1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI    1 M = 3.2808 FT

  Z      KD     ID     UD     ED      K0     SU     QD     PHI    SIGFF   PHIO    PC     OCR     M      SOIL TYPE
 (M)                         (BAR)          (BAR)  (BAR)  (DEG)   (BAR)  (DEG)  (BAR)          (BAR)
*****  *****  *****  *****  ******  *****  *****  *****  *****  ******  *****  *****  *****  ******  ************

 1.40   9.21   1.71   0.00   134.   1.21           33.4   40.7    0.40   37.7   2.50   10.2    324.   SANDY SILT
 1.60   7.02   1.57   0.00   107.   1.00           26.2   38.9    0.45   36.0   1.87    6.7    231.   SANDY SILT
 1.80   6.92   2.28   0.00   172.   0.99           28.9   38.8    0.51   36.0   2.06    6.6    371.   SILTY SAND
 2.00   7.59   2.70   0.00   248.   1.00           48.0   41.1    0.58   38.7   2.43    7.0    560.   SILTY SAND
 2.40   1.00   6.10   0.00    89.   0.33           22.3   37.1    0.67   34.7   0.25    0.6     75.      SAND
 2.60   0.77   2.60   0.00    31.   0.36           17.2   34.6    0.71   32.1   0.28    0.6     27.   SILTY SAND
 2.80   1.18   2.74   0.00    55.   0.45           14.7   32.7    0.75   30.2   0.46    0.9     46.   SILTY SAND
 3.00   0.62   3.06   0.00    34.   0.40           13.8   31.9    0.79   29.5   0.36    0.7     29.   SILTY SAND
 3.40   0.44   0.41   0.00     4.          0.02                                0.05    0.1      3.      MUD
 3.60   3.92   1.95   0.00   164.   1.00            6.7   23.7    0.86   21.1   3.06    5.0    266.   SILTY SAND
 3.80   1.09   1.76   0.00    43.   0.53           13.1   29.4    0.97   27.3   0.71    1.1     37.   SANDY SILT
 4.00   0.99   2.66   0.00    62.   0.51           13.7   29.4    1.02   27.4   0.70    1.0     53.   SILTY SAND
 4.20   0.94   1.50   0.00    35.   0.52           13.8   29.1    1.06   27.2   0.72    1.0     30.   SANDY SILT
 4.40   2.14   1.01   0.00    56.   0.58                                       0.83    1.1     54.      SILT
 4.60   1.98   0.73   0.00    39.   0.54                                       0.77    1.0     34.   CLAYEY SILT
 4.80   1.84   0.50   0.00    26.   0.50   0.16                                0.71    0.9     22.   SILTY CLAY
 5.00   1.63   0.54   0.00    26.   0.44   0.14                                0.61    0.7     22.   SILTY CLAY
 5.20   1.80   0.40   0.00    22.   0.49   0.17                                0.74    0.8     19.   SILTY CLAY
 5.40   1.87   0.31   0.00    18.   0.51   0.18                                0.82    0.9     15.      CLAY
 5.60   1.64   0.27   0.00    15.   0.44   0.16                                0.69    0.7     12.      CLAY
 5.80   1.82   0.27   0.00    17.   0.50   0.19                                0.84    0.9     14.      CLAY
 6.00   1.98   0.27   0.00    18.   0.54   0.22                                0.98    1.0     15.      CLAY
 6.20   1.92   0.24   0.00    17.   0.52   0.22                                0.97    0.9     14.      CLAY
 6.40   1.85   0.27   0.00    18.   0.50   0.21                                0.94    0.9     15.      CLAY
 6.60   1.54   0.26   0.00    15.   0.41   0.17                                0.72    0.7     13.      CLAY
 6.80   2.06   0.30   0.00    24.   0.56   0.26                                1.18    1.0     21.      CLAY
 7.00   2.58   0.31   0.00    32.   0.69   0.35                                1.72    1.5     35.      CLAY
 7.20   2.49   0.31   0.00    32.   0.67   0.34                                1.68    1.4     34.      CLAY
 7.40   2.43   0.28   0.00    29.   0.66   0.34                                1.66    1.4     30.      CLAY
 7.60   2.58   0.28   0.00    31.   0.69   0.38                                1.87    1.5     35.      CLAY
 7.80   2.55   0.31   0.00    35.   0.68   0.38                                1.89    1.5     38.      CLAY
 8.00   2.60   0.35   0.00    42.   0.69   0.40                                1.99    1.5     47.   SILTY CLAY
 8.20   2.53   0.29   0.00    35.   0.68   0.40                                1.97    1.4     38.      CLAY
 8.40   2.05   1.44   0.00   142.   0.79           13.4   23.0    1.94   22.2   3.22    2.3    137.   SANDY SILT
 8.60   2.32   0.47   0.00    54.   0.63   0.38                                1.80    1.3     55.   SILTY CLAY
 8.80   2.51   0.53   0.00    67.   0.67   0.43                                2.07    1.4     73.   SILTY CLAY
 9.00   2.28   0.58   0.00    68.   0.62   0.39                                1.83    1.2     67.   SILTY CLAY
 9.20   2.15   0.40   0.00    45.   0.58   0.37                                1.71    1.1     42.   SILTY CLAY
 9.40   1.97   0.27   0.00    29.   0.54   0.33                                1.51    1.0     24.      CLAY
 9.60   2.35   0.29   0.00    36.   0.63   0.42                                2.01    1.3     37.      CLAY
 9.80   2.45   0.31   0.00    41.   0.66   0.45                                2.16    1.4     44.      CLAY
10.00   2.07   0.53   0.00    60.   0.56   0.36                                1.67    1.1     53.   SILTY CLAY
10.20   1.04   3.30   0.00   192.   0.48           38.7   30.9    2.43   30.7   1.56    1.0    163.   SILTY SAND
10.40   1.49   3.67   0.00   307.   0.44           65.5   34.8    2.55   34.7   1.63    1.0    261.      SAND
10.60   1.40   0.89   0.00    71.   0.37                                       0.94    0.6     60.   CLAYEY SILT
10.80   1.33   0.33   0.00    25.   0.34   0.22                                0.87    0.5     21.      CLAY
11.00   1.11   0.49   0.00    32.   0.27   0.18                                0.67    0.4     27.   SILTY CLAY
11.20   1.26   0.53   0.00    39.   0.32   0.21                                0.81    0.5     33.   SILTY CLAY
11.40   1.51   0.28   0.00    24.   0.40   0.26                                1.09    0.6     21.      CLAY
11.60   1.21   0.56   0.00    40.   0.30   0.20                                0.78    0.5     34.   SILTY CLAY
11.80   1.16   1.08   0.00    75.   0.29                                       0.73    0.4     63.      SILT
12.00   1.99   0.83   0.00    99.   0.54                                       1.71    1.0     86.   CLAYEY SILT
12.20   2.23   0.60   0.00    81.   0.60                                       2.06    1.2     78.   CLAYEY SILT
12.40   2.11   0.46   0.00    59.   0.57   0.41                                1.91    1.1     53.   SILTY CLAY
12.60   1.80   0.65   0.00    73.   0.49                                       1.51    0.8     62.   CLAYEY SILT
END OF SOUNDING
```

PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

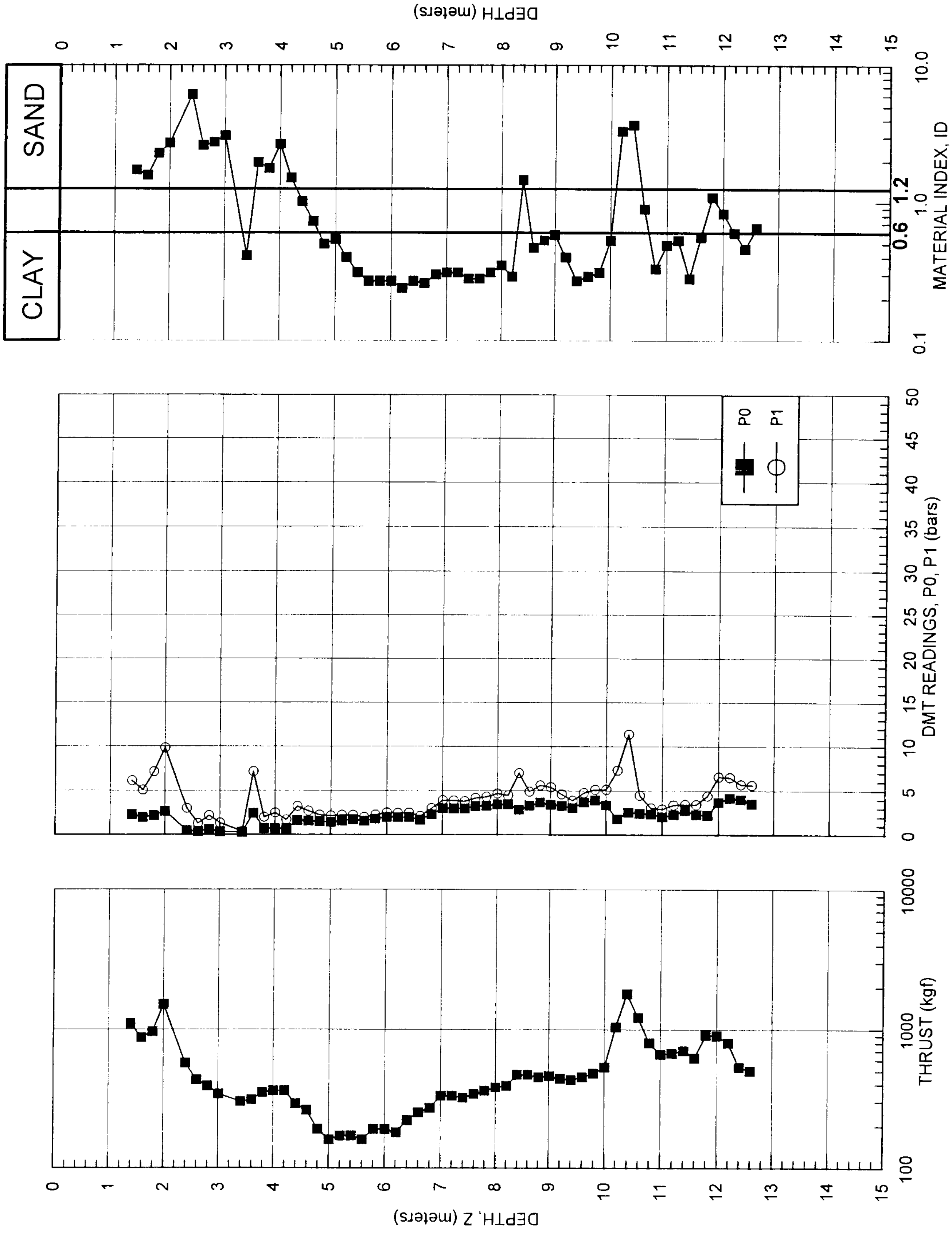
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-18-98

SOUNDING

D-4

DILATOMETER RESULTS

Ground Surface Elev:
Water Depth: ~9.3m



PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

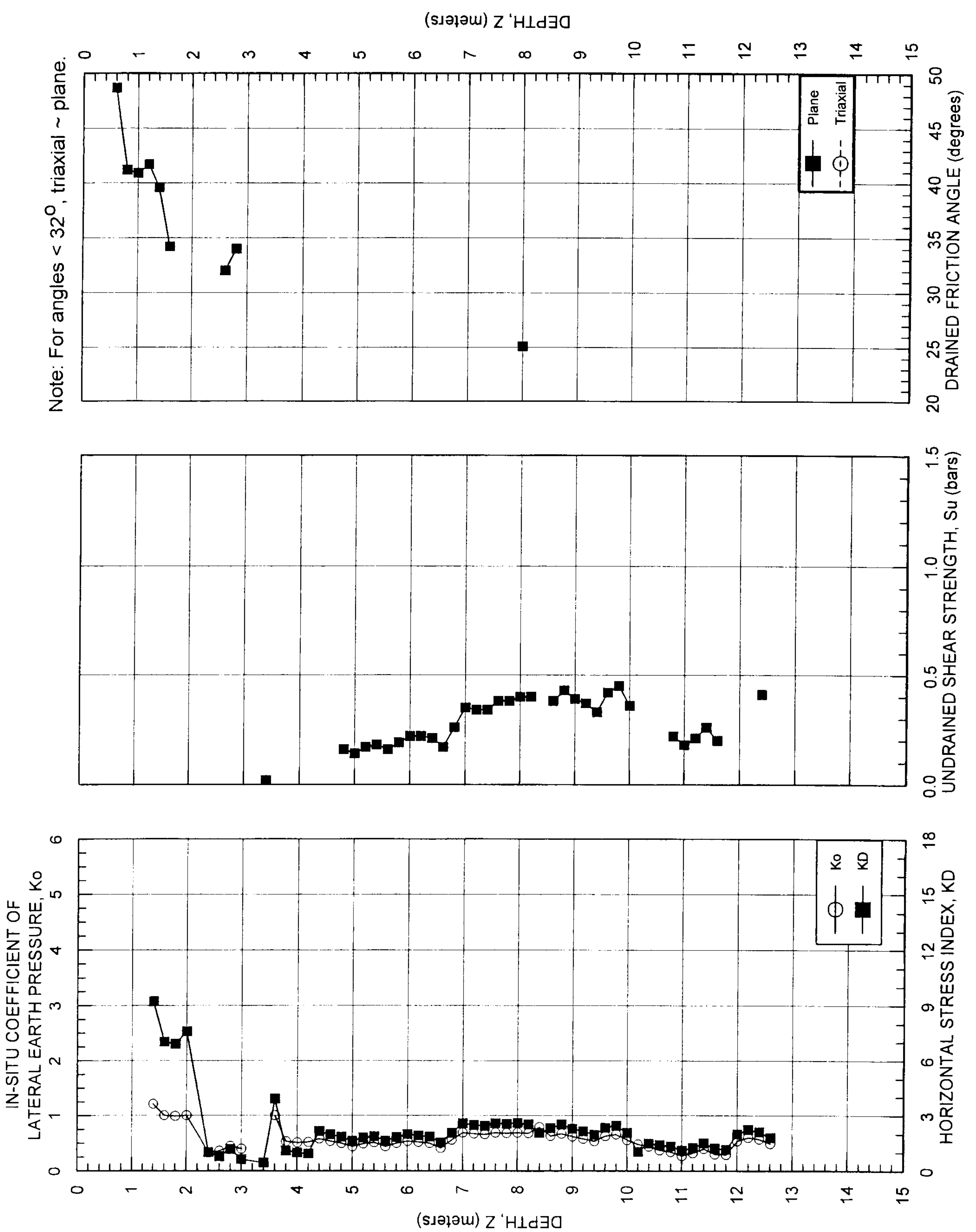
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-18-98

SOUNDING

D-4

INTERPRETED DMT STRENGTH PARAMETERS

Ground Surface Elev:
Water Depth: ~9.3 m



PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

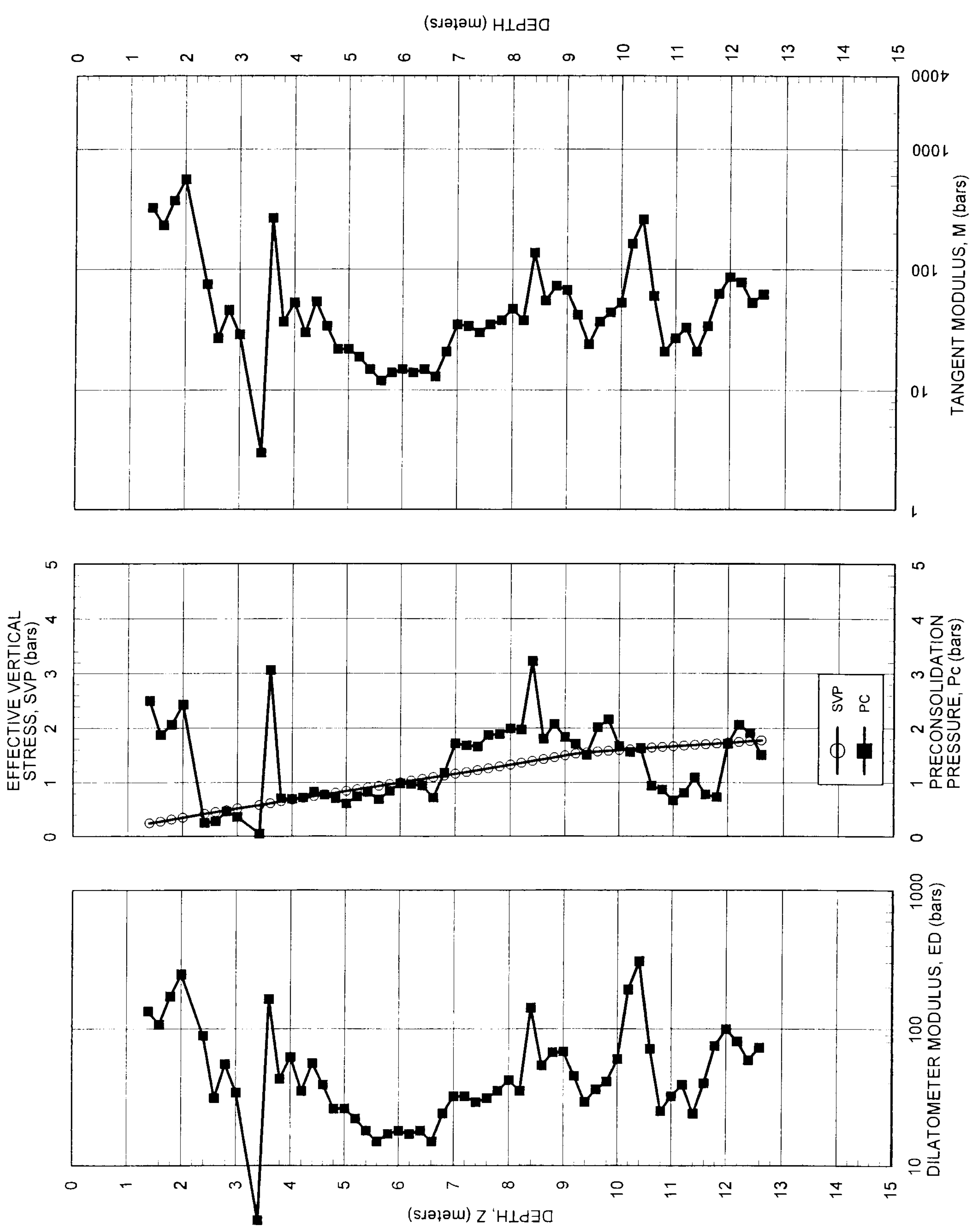
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-18-98

SOUNDING

D-4

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.:
Water Depth: ~9.3 m



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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)          SNDG. NO.  D-5
IN-SITU SOIL TESTING, L.C.                                                                PAGE 1
JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware                  FILE NO. : IST-9863
LOCATION: As Planned
SNDG.BY : R. FAILMEZGER                                                                   SNDG.DATE: 11-17-98
ANAL.BY : R. FAILMEZGER                                                                   ANAL.DATE: 11-17-98

ANALYSIS PARAMETERS:       LO RANGE   =10.00 BARS   ROD DIAM.     = 3.57 CM     BL.THICK. = 12.7 MM     SU  FACTOR = 1.00
 SURF.ELEV.  = 15.00 M     LO  GAGE 0 = 0.02 BARS   FR.RED.DIA. = 4.80 CM       BL.WIDTH  = 94.9 MM     PHI FACTOR = 1.00
 WATER DEPTH = 11.00 M     HI  GAGE 0 = 0.15 BARS   LIN.ROD WT. = 6.50 KGF/M    DELTA-A   = 0.25 BARS   OCR FACTOR = 1.00
 SP.GR.WATER = 1.000       CAL GAGE 0 = 0.00 BARS   DELTA/PHI     = 0.50        DELTA-B   = 0.18 BARS    M  FACTOR = 1.00
 MAX SU ID   = 0.60        SU OPTION  = MARCHETTI   MIN PHI ID    = 1.20        OCR OPTION= MARCHETTI   KO FACTOR = 1.00
UNIT CONVERSIONS:          1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI      1 M = 3.2808 FT

  Z    THRUST    A     B     C      DA    DB     ZMRNG ZMLO  ZMHI  ZMCAL   P0    P1    P2      U0   GAMMA    SVP
 (M)    (KGF)  (BAR) (BAR) (BAR)  (BAR) (BAR)  (BAR) (BAR) (BAR) (BAR)  (BAR) (BAR) (BAR)  (BAR)  (T/M3)  (BAR)
*****  ******  ***** ***** *****  ***** *****  ***** ***** ***** *****  ***** ***** *****  ****** ****** ******

  2.20   770.   1.31  3.71         0.25  0.18  10.00  0.02  0.15  0.00   1.44  3.51         0.000   1.70  0.385
  2.40   430.   0.77  2.32         0.25  0.18  10.00  0.02  0.15  0.00   0.94  2.12         0.000   1.60  0.417
  2.60   330.   0.73  3.09         0.25  0.18  10.00  0.02  0.15  0.00   0.86  2.89         0.000   1.70  0.450
  2.90   250.   0.50  1.90         0.25  0.18  10.00  0.02  0.15  0.00   0.68  1.70         0.000   1.60  0.498
  3.00   220.   0.34  1.57         0.25  0.18  10.00  0.02  0.15  0.00   0.53  1.37         0.000   1.60  0.514
  3.20   190.   0.59  1.68         0.25  0.18  10.00  0.02  0.15  0.00   0.79  1.48         0.000   1.60  0.545
  3.40   170.   0.58  1.70         0.25  0.18  10.00  0.02  0.15  0.00   0.78  1.50         0.000   1.60  0.577
  3.60   170.   0.67  1.54         0.25  0.18  10.00  0.02  0.15  0.00   0.88  1.34         0.000   1.60  0.608
  3.80   160.   0.80  1.67         0.25  0.18  10.00  0.02  0.15  0.00   1.01  1.47         0.000   1.60  0.640
  4.00   180.   0.91  1.76         0.25  0.18  10.00  0.02  0.15  0.00   1.12  1.56         0.000   1.60  0.671
  4.20   180.   1.24  2.23         0.25  0.18  10.00  0.02  0.15  0.00   1.44  2.03         0.000   1.60  0.702
  4.40   220.   1.30  2.06         0.25  0.18  10.00  0.02  0.15  0.00   1.51  1.86         0.000   1.60  0.734
  4.60   260.   1.62  2.56         0.25  0.18  10.00  0.02  0.15  0.00   1.82  2.36         0.000   1.60  0.765
  4.80   230.   1.64  2.53         0.25  0.18  10.00  0.02  0.15  0.00   1.85  2.33         0.000   1.60  0.797
  5.00   260.   2.06  3.54         0.25  0.18  10.00  0.02  0.15  0.00   2.24  3.34         0.000   1.70  0.829
  5.20   270.   1.77  2.93         0.25  0.18  10.00  0.02  0.15  0.00   1.96  2.73         0.000   1.60  0.861
  5.40   260.   1.63  2.74         0.25  0.18  10.00  0.02  0.15  0.00   1.83  2.54         0.000   1.60  0.893
  5.60   290.   1.72  3.01         0.25  0.18  10.00  0.02  0.15  0.00   1.91  2.81         0.000   1.60  0.924
  5.80   290.   1.82  3.20         0.25  0.18  10.00  0.02  0.15  0.00   2.00  3.00         0.000   1.60  0.956
  6.00   310.   1.94  3.16         0.25  0.18  10.00  0.02  0.15  0.00   2.13  2.96         0.000   1.60  0.987
  6.20   350.   2.29  3.59         0.25  0.18  10.00  0.02  0.15  0.00   2.48  3.39         0.000   1.70  1.019
  6.40   360.   2.32  3.55         0.25  0.18  10.00  0.02  0.15  0.00   2.51  3.35         0.000   1.70  1.053
  6.60   370.   2.39  3.49         0.25  0.18  10.00  0.02  0.15  0.00   2.59  3.29         0.000   1.60  1.085
  6.80   390.   2.61  3.86         0.25  0.18  10.00  0.02  0.15  0.00   2.80  3.66         0.000   1.70  1.118
  7.00   430.   2.87  4.29         0.25  0.18  10.00  0.02  0.15  0.00   3.05  4.09         0.000   1.70  1.151
  7.20   460.   2.79  4.16         0.25  0.18  10.00  0.02  0.15  0.00   2.97  3.96         0.000   1.70  1.184
  7.40   470.   2.84  4.38         0.25  0.18  10.00  0.02  0.15  0.00   3.01  4.18         0.000   1.70  1.218
  7.60   480.   2.31  3.92         0.25  0.18  10.00  0.02  0.15  0.00   2.48  3.72         0.000   1.70  1.251
  7.80   470.   2.76  4.31         0.25  0.18  10.00  0.02  0.15  0.00   2.93  4.11         0.000   1.70  1.284
  8.00   450.   3.09  4.65         0.25  0.18  10.00  0.02  0.15  0.00   3.26  4.45         0.000   1.70  1.318
  8.20   440.   3.20  4.63         0.25  0.18  10.00  0.02  0.15  0.00   3.38  4.43         0.000   1.70  1.351
  8.40   510.   2.91  4.38         0.25  0.18  10.00  0.02  0.15  0.00   3.09  4.18         0.000   1.70  1.385
  8.60   450.   3.61  5.16         0.25  0.18  10.00  0.02  0.15  0.00   3.78  4.96         0.000   1.70  1.418
  8.80   550.   3.24  5.05         0.25  0.18  10.00  0.02  0.15  0.00   3.40  4.85         0.000   1.70  1.451
  9.00   600.   3.25  5.24         0.25  0.18  10.00  0.02  0.15  0.00   3.40  5.04         0.000   1.70  1.485
  9.20   610.   3.42  5.14         0.25  0.18  10.00  0.02  0.15  0.00   3.59  4.94         0.000   1.70  1.518
  9.40   590.   3.31  4.73         0.25  0.18  10.00  0.02  0.15  0.00   3.49  4.53         0.000   1.70  1.551
  9.60   580.   3.57  5.12         0.25  0.18  10.00  0.02  0.15  0.00   3.74  4.92         0.000   1.70  1.585
  9.80   570.   3.89  5.37         0.25  0.18  10.00  0.02  0.15  0.00   4.07  5.17         0.000   1.70  1.618
 10.00   600.   4.13  5.74         0.25  0.18  10.00  0.02  0.15  0.00   4.30  5.54         0.000   1.70  1.651
 10.20   640.   3.87  5.53         0.25  0.18  10.00  0.02  0.15  0.00   4.04  5.33         0.000   1.70  1.685
 10.40   950.   3.11 10.65         0.25  0.18  10.00  0.02  0.15  0.00   2.99 10.32         0.000   1.90  1.720
 10.60  1030.   2.85  6.89         0.25  0.18  10.00  0.02  0.15  0.00   2.90  6.69         0.000   1.80  1.756
END OF SOUNDING                    (INTERPRETED SOIL PARAMETERS ON NEXT PAGE)
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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)        SNDG. NO.  D-5
IN-SITU SOIL TESTING, L.C.                                                              PAGE 2
JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware                FILE NO. : IST-9863
LOCATION: As Planned
SNDG.BY : R. FAILMEZGER                                                                 SNDG.DATE: 11-17-98
ANAL.BY : R. FAILMEZGER                                                                 ANAL.DATE: 11-17-98

ANALYSIS PARAMETERS:      LO RANGE   =10.00 BARS   ROD DIAM.    = 3.57 CM       BL.THICK. = 12.7 MM    SU  FACTOR = 1.00
 SURF.ELEV.   = 15.00 M   LO  GAGE 0 = 0.02 BARS   FR.RED.DIA. = 4.80 CM       BL.WIDTH  = 94.9 MM    PHI FACTOR = 1.00
 WATER DEPTH = 11.00 M    HI  GAGE 0 = 0.15 BARS   LIN.ROD WT. = 6.50 KGF/M    DELTA-A   = 0.25 BARS  OCR FACTOR = 1.00
 SP.GR.WATER = 1.000      CAL GAGE 0 = 0.00 BARS   DELTA/PHI    = 0.50          DELTA-B   = 0.18 BARS  M   FACTOR = 1.00
 MAX SU ID    = 0.60      SU OPTION  = MARCHETTI   MIN PHI ID   = 1.20          OCR OPTION= MARCHETTI  K0 FACTOR = 1.00
UNIT CONVERSIONS:         1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI    1 M = 3.2808 FT

  Z     KD    ID     UD     ED     K0      SU      QD     PHI    SIGFF   PHIO    PC     OCR     M      SOIL TYPE
 (M)                       (BAR)          (BAR)   (BAR)  (DEG)   (BAR)  (DEG)   (BAR)          (BAR)
*****  ***** ***** ***** ******  *****   *****   *****  *****  ******  *****   *****  *****  ******  ************

  2.20  3.74  1.43  0.00    72.   0.65            25.3   37.5    0.62   35.0    0.99    2.6   111.   SANDY SILT
  2.40  2.26  1.25  0.00    41.   0.57            14.5   33.4    0.65   30.7    0.69    1.6    42.   SANDY SILT
  2.60  1.92  2.35  0.00    70.   0.59            11.2   30.9    0.68   28.1    0.71    1.6    70.   SILTY SAND
  2.90  1.37  1.49  0.00    35.   0.58             8.9   28.4    0.74   25.7    0.66    1.3    30.   SANDY SILT
  3.00  1.03  1.58  0.00    29.   0.56             8.4   27.7    0.75   25.0    0.59    1.1    25.   SANDY SILT
  3.20  1.44  0.88  0.00    24.   0.38                                          0.33    0.6    20.   CLAYEY SILT
  3.40  1.34  0.93  0.00    25.   0.35                                          0.31    0.5    21.      SILT
  3.60  1.44  0.53  0.00    16.   0.38   0.09                                   0.37    0.6    14.   SILTY CLAY
  3.80  1.58  0.46  0.00    16.   0.42   0.10                                   0.44    0.7    14.   SILTY CLAY
  4.00  1.67  0.39  0.00    15.   0.45   0.12                                   0.51    0.8    13.   SILTY CLAY
  4.20  2.05  0.41  0.00    20.   0.56   0.16                                   0.73    1.0    18.   SILTY CLAY
  4.40  2.06  0.23  0.00    12.   0.56   0.17                                   0.77    1.0    11.      CLAY
  4.60  2.38  0.29  0.00    19.   0.64   0.21                                   1.01    1.3    19.      CLAY
  4.80  2.32  0.26  0.00    17.   0.63   0.21                                   1.00    1.3    17.      CLAY
  5.00  2.70  0.49  0.00    38.   0.72   0.27                                   1.32    1.6    44.   SILTY CLAY
  5.20  2.28  0.39  0.00    27.   0.62   0.22                                   1.06    1.2    26.   SILTY CLAY
  5.40  2.05  0.39  0.00    25.   0.56   0.20                                   0.92    1.0    22.   SILTY CLAY
  5.60  2.06  0.47  0.00    31.   0.56   0.21                                   0.97    1.0    28.   SILTY CLAY
  5.80  2.10  0.50  0.00    35.   0.57   0.22                                   1.03    1.1    31.   SILTY CLAY
  6.00  2.16  0.39  0.00    29.   0.59   0.24                                   1.11    1.1    27.   SILTY CLAY
  6.20  2.43  0.37  0.00    32.   0.65   0.29                                   1.38    1.4    33.   SILTY CLAY
  6.40  2.38  0.33  0.00    29.   0.64   0.29                                   1.38    1.3    30.      CLAY
  6.60  2.38  0.27  0.00    24.   0.64   0.30                                   1.43    1.3    25.      CLAY
  6.80  2.50  0.31  0.00    30.   0.67   0.33                                   1.59    1.4    32.      CLAY
  7.00  2.65  0.34  0.00    36.   0.71   0.36                                   1.79    1.6    41.      CLAY
  7.20  2.51  0.33  0.00    34.   0.67   0.35                                   1.69    1.4    37.      CLAY
  7.40  2.48  0.39  0.00    40.   0.67   0.35                                   1.70    1.4    43.   SILTY CLAY
  7.60  1.98  0.50  0.00    43.   0.54   0.27                                   1.23    1.0    37.   SILTY CLAY
  7.80  2.28  0.40  0.00    41.   0.62   0.33                                   1.58    1.2    40.   SILTY CLAY
  8.00  2.48  0.36  0.00    41.   0.67   0.38                                   1.84    1.4    44.   SILTY CLAY
  8.20  2.50  0.31  0.00    36.   0.67   0.39                                   1.92    1.4    39.      CLAY
  8.40  2.23  0.35  0.00    38.   0.60   0.35                                   1.64    1.2    36.   SILTY CLAY
  8.60  2.67  0.31  0.00    41.   0.71   0.45                                   2.22    1.6    47.      CLAY
  8.80  2.34  0.43  0.00    50.   0.63   0.39                                   1.86    1.3    51.   SILTY CLAY
  9.00  2.29  0.48  0.00    57.   0.62   0.39                                   1.84    1.2    56.   SILTY CLAY
  9.20  2.36  0.38  0.00    47.   0.64   0.41                                   1.97    1.3    48.   SILTY CLAY
  9.40  2.25  0.30  0.00    36.   0.61   0.40                                   1.86    1.2    35.      CLAY
  9.60  2.36  0.31  0.00    41.   0.64   0.43                                   2.06    1.3    42.      CLAY
  9.80  2.51  0.27  0.00    38.   0.67   0.47                                   2.31    1.4    42.      CLAY
 10.00  2.60  0.29  0.00    43.   0.70   0.51                                   2.49    1.5    48.      CLAY
 10.20  2.40  0.32  0.00    45.   0.65   0.46                                   2.23    1.3    46.      CLAY
 10.40  1.74  2.45  0.00   254.   0.63            30.9   28.3    2.54   28.2    2.79    1.6   233.   SILTY SAND
 10.60  1.65  1.31  0.00   132.   0.60            34.3   29.0    2.61   28.9    2.64    1.5   112.   SANDY SILT
END OF SOUNDING
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PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

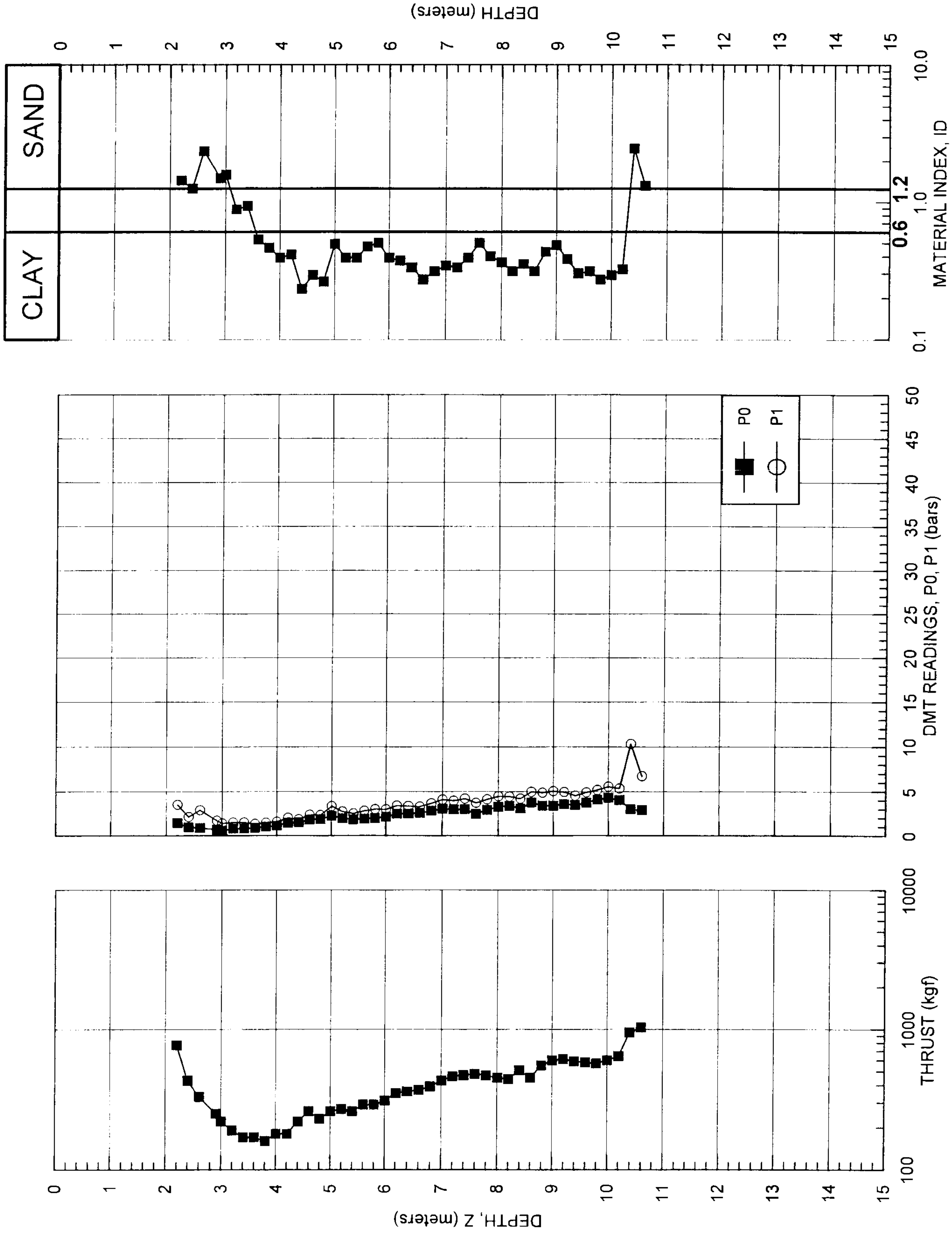
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-18-98

SOUNDING

D-5

DILATOMETER RESULTS

Ground Surface Elev:
Water Depth: Not Found



PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

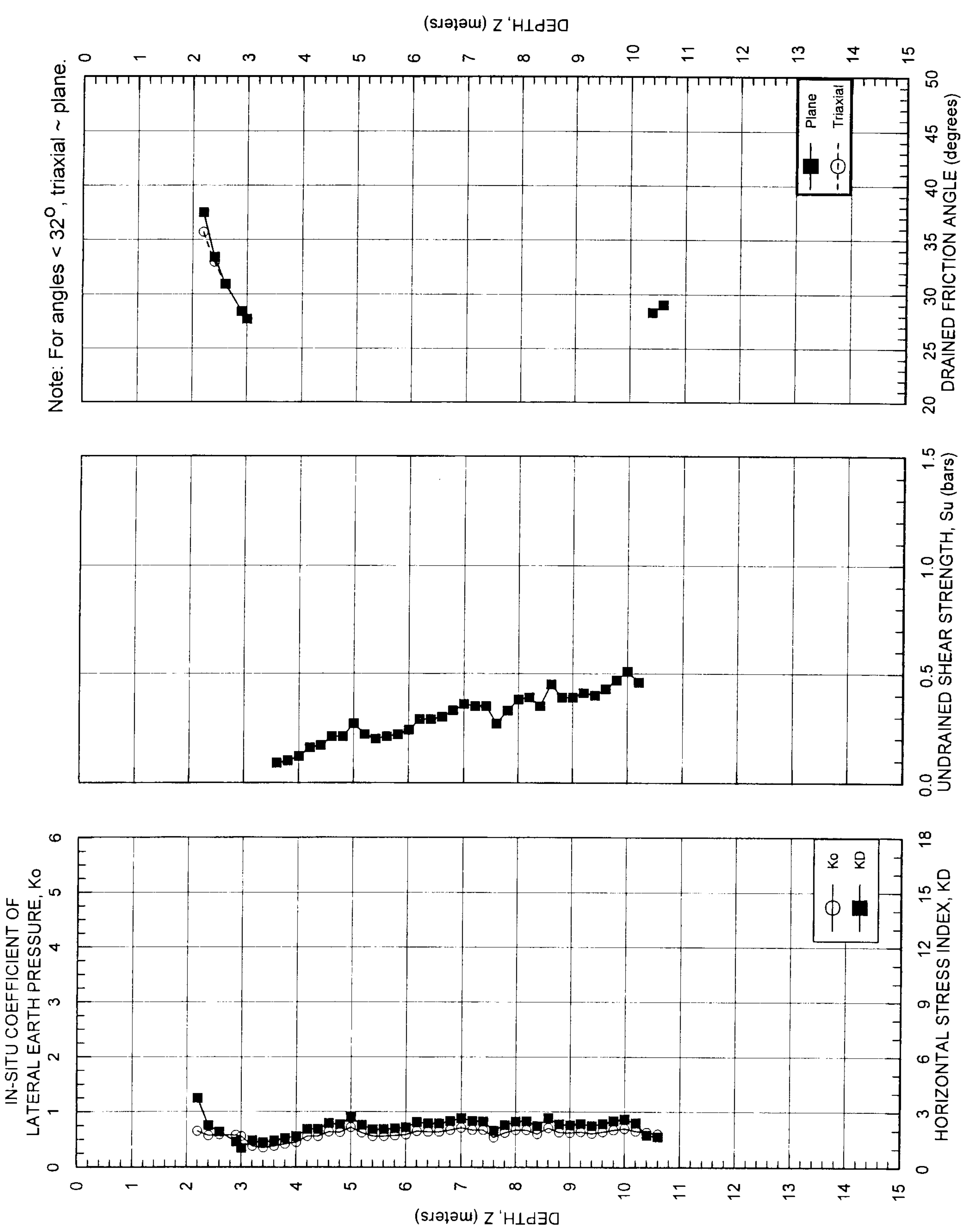
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-18-98

SOUNDING

D-5

INTERPRETED DMT STRENGTH PARAMETERS

Ground Surface Elev:
Water Depth: Not Found



PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

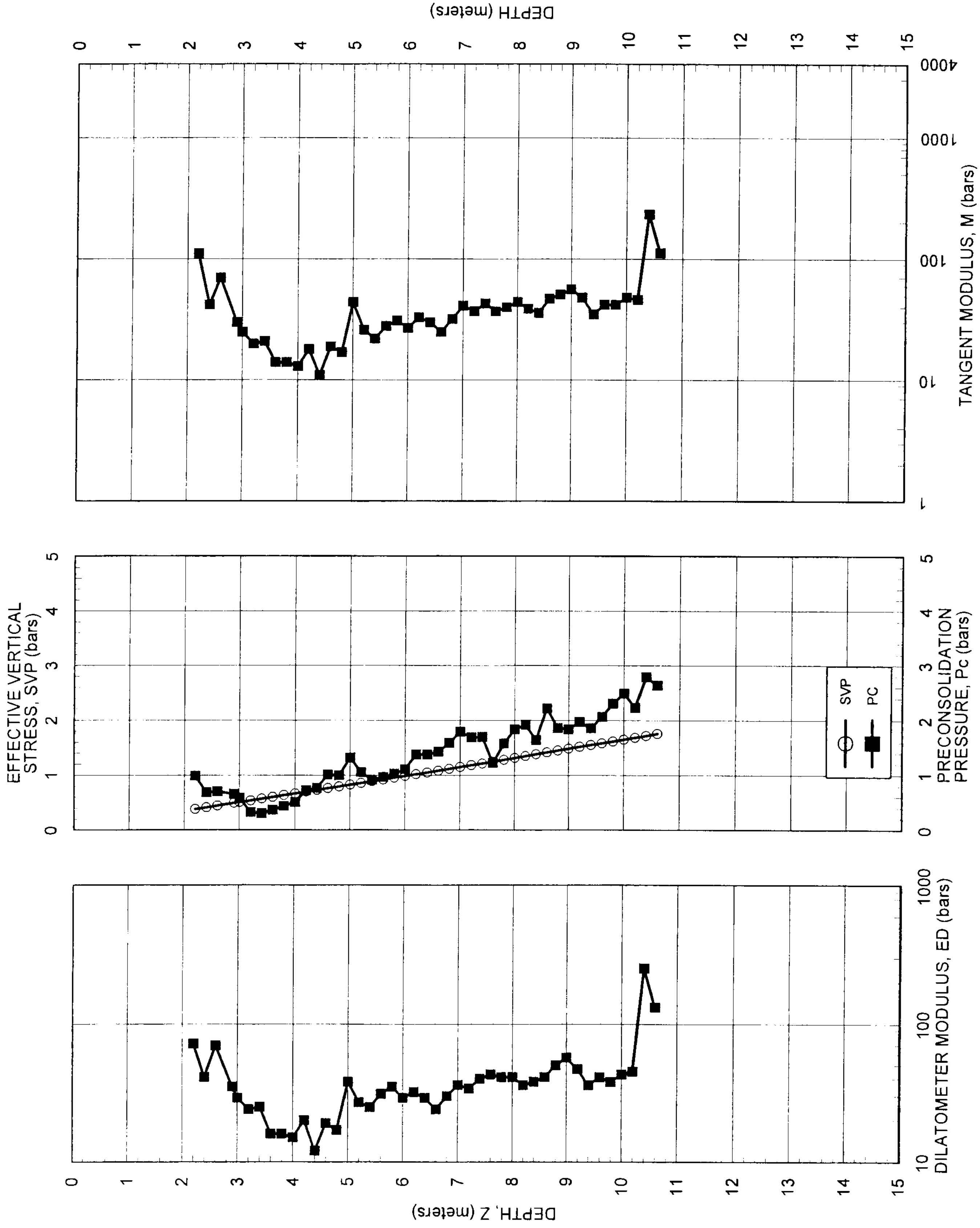
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-18-98

SOUNDING

D-5

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.:
Water Depth: Not Found



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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)      SNDG. NO.  D-6
IN-SITU SOIL TESTING, L.C.                                                             PAGE 1
JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware               FILE NO. : IST-9863
LOCATION: As Planned -- Refusal at 9.5m
SNDG.BY : R. FAILMEZGER                                                                SNDG.DATE: 11-17-98
ANAL.BY : R. FAILMEZGER                                                                ANAL.DATE: 11-17-98

ANALYSIS PARAMETERS:      LO RANGE   =10.00 BARS   ROD DIAM.    = 3.57 CM      BL.THICK. = 12.7 MM    SU  FACTOR = 1.00
 SURF.ELEV.  = 15.00 M    LO  GAGE 0 = 0.02 BARS   FR.RED.DIA. = 4.80 CM      BL.WIDTH  = 94.9 MM    PHI FACTOR = 1.00
 WATER DEPTH =  6.30 M    HI  GAGE 0 = 0.15 BARS   LIN.ROD WT. = 6.50 KGF/M   DELTA-A   = 0.24 BARS  OCR FACTOR = 1.00
 SP.GR.WATER = 1.000      CAL GAGE 0 = 0.00 BARS   DELTA/PHI   = 0.50         DELTA-B   = 0.19 BARS   M  FACTOR = 1.00
 MAX SU ID   = 0.60       SU OPTION  = MARCHETTI   MIN PHI ID  = 1.20         OCR OPTION= MARCHETTI  KO FACTOR = 1.00
UNIT CONVERSIONS:         1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI     1 M = 3.2808 FT

  Z    THRUST    A     B     C      DA    DB    ZMRNG ZMLO  ZMHI  ZMCAL   P0    P1    P2      U0    GAMMA   SVP
 (M)    (KGF)  (BAR) (BAR) (BAR)  (BAR) (BAR)  (BAR) (BAR) (BAR) (BAR)  (BAR) (BAR) (BAR)   (BAR)  (T/M3)  (BAR)
*****  ****** ***** ***** *****  ***** *****  ***** ***** ***** *****  ***** ***** *****  ****** ****** ******

 0.20   1780.   8.22 23.10        0.24  0.19  10.00  0.02  0.15  0.00   7.72 22.76         0.000   2.00  0.035
 0.40   2290.   3.30 12.25        0.24  0.19  10.00  0.02  0.15  0.00   3.10 11.91         0.000   1.90  0.073
 0.60   1840.   2.07 12.15        0.24  0.19  10.00  0.02  0.15  0.00   1.81 11.81         0.000   1.90  0.111
 0.80   1400.   4.29 19.40        0.24  0.19  10.00  0.02  0.15  0.00   3.78 19.06         0.000   2.00  0.149
 1.00   2380.   7.42 19.85        0.24  0.19  10.00  0.02  0.15  0.00   7.05 19.51         0.000   1.95  0.188
 1.20   1530.   3.37 10.30        0.24  0.19  10.00  0.02  0.15  0.00   3.27  9.96         0.000   1.90  0.225
 1.40    860.   1.62  4.23        0.24  0.19  10.00  0.02  0.15  0.00   1.73  4.02         0.000   1.70  0.261
 1.60    590.   2.35  6.45        0.24  0.19  10.00  0.02  0.15  0.00   2.39  6.24         0.000   1.70  0.294
 1.80    430.   1.64  3.07        0.24  0.19  10.00  0.02  0.15  0.00   1.81  2.86         0.000   1.60  0.326
 2.00    320.   1.45  3.02        0.24  0.19  10.00  0.02  0.15  0.00   1.61  2.81         0.000   1.60  0.358
 2.20    300.   1.47  3.17        0.24  0.19  10.00  0.02  0.15  0.00   1.63  2.96         0.000   1.60  0.389
 2.40    290.   1.53  3.09        0.24  0.19  10.00  0.02  0.15  0.00   1.69  2.88         0.000   1.60  0.421
 2.60    550.   2.18  6.31        0.24  0.19  10.00  0.02  0.15  0.00   2.21  6.10         0.000   1.70  0.453
 2.80    730.   2.31  5.60        0.24  0.19  10.00  0.02  0.15  0.00   2.39  5.39         0.000   1.70  0.486
 3.00    470.   1.87  3.93        0.24  0.19  10.00  0.02  0.15  0.00   2.01  3.72         0.000   1.70  0.520
 3.20    220.   1.32  2.29        0.24  0.19  10.00  0.02  0.15  0.00   1.51  2.08         0.000   1.60  0.552
 3.40    170.   1.28  2.60        0.24  0.19  10.00  0.02  0.15  0.00   1.46  2.39         0.000   1.60  0.584
 3.60    190.   1.62  3.29        0.24  0.19  10.00  0.02  0.15  0.00   1.78  3.08         0.000   1.60  0.615
 3.80    170.   0.83  2.22        0.24  0.19  10.00  0.02  0.15  0.00   1.00  2.01         0.000   1.60  0.646
 4.00    190.   1.15  2.32        0.24  0.19  10.00  0.02  0.15  0.00   1.33  2.11         0.000   1.60  0.678
 4.20    210.   1.84  3.24        0.24  0.19  10.00  0.02  0.15  0.00   2.01  3.03         0.000   1.60  0.709
 4.40    230.   1.90  3.31        0.24  0.19  10.00  0.02  0.15  0.00   2.07  3.10         0.000   1.60  0.741
 4.60    210.   1.61  2.48        0.24  0.19  10.00  0.02  0.15  0.00   1.81  2.27         0.000   1.60  0.772
 4.80    270.   1.41  2.44        0.24  0.19  10.00  0.02  0.15  0.00   1.60  2.23         0.000   1.60  0.803
 5.00    190.   1.31  2.38        0.24  0.19  10.00  0.02  0.15  0.00   1.50  2.17         0.000   1.60  0.835
 5.20    190.   1.50  2.96        0.24  0.19  10.00  0.02  0.15  0.00   1.67  2.75         0.000   1.60  0.866
 5.40    190.   1.63  2.84        0.24  0.19  10.00  0.02  0.15  0.00   1.81  2.63         0.000   1.60  0.898
 5.60    200.   1.65  2.76        0.24  0.19  10.00  0.02  0.15  0.00   1.84  2.55         0.000   1.60  0.929
 5.80    250.   2.08  3.34        0.24  0.19  10.00  0.02  0.15  0.00   2.26  3.13         0.000   1.60  0.960
 6.00    280.   2.16  3.59        0.24  0.19  10.00  0.02  0.15  0.00   2.33  3.38         0.000   1.70  0.993
 6.20    310.   2.20  3.96        0.24  0.19  10.00  0.02  0.15  0.00   2.35  3.75         0.000   1.70  1.026
 6.40    280.   2.42  3.68        0.24  0.19  10.00  0.02  0.15  0.00   2.60  3.47         0.010   1.70  1.050
 6.60    250.   2.34  3.44        0.24  0.19  10.00  0.02  0.15  0.00   2.53  3.23         0.029   1.60  1.062
 6.80    280.   2.46  3.68        0.24  0.19  10.00  0.02  0.15  0.00   2.64  3.47         0.049   1.70  1.075
 7.00    340.   2.49  4.02        0.24  0.19  10.00  0.02  0.15  0.00   2.65  3.81         0.069   1.70  1.089
 7.20    370.   2.66  4.32        0.24  0.19  10.00  0.02  0.15  0.00   2.82  4.11         0.088   1.70  1.103
 7.40    400.   2.64  4.48        0.24  0.19  10.00  0.02  0.15  0.00   2.79  4.27         0.108   1.70  1.116
 7.60    430.   3.07  4.88        0.24  0.19  10.00  0.02  0.15  0.00   3.22  4.67         0.128   1.70  1.130
 7.80    430.   3.18  4.95        0.24  0.19  10.00  0.02  0.15  0.00   3.33  4.74         0.147   1.70  1.144
 8.00    450.   2.20  6.48        0.24  0.19  10.00  0.02  0.15  0.00   2.23  6.27         0.167   1.80  1.159
 8.20    560.   2.51  4.22        0.24  0.19  10.00  0.02  0.15  0.00   2.67  4.01         0.186   1.70  1.173
 8.40    410.   3.09  4.44        0.24  0.19  10.00  0.02  0.15  0.00   3.26  4.23         0.206   1.70  1.187
 8.60    400.   3.18  4.51        0.24  0.19  10.00  0.02  0.15  0.00   3.35  4.30         0.226   1.70  1.201
 8.80    420.   3.45  4.86        0.24  0.19  10.00  0.02  0.15  0.00   3.62  4.65         0.245   1.70  1.215
 9.00    410.   2.53  3.85        0.24  0.19  10.00  0.02  0.15  0.00   2.71  3.64         0.265   1.70  1.228
 9.20    410.   2.54  4.15        0.24  0.19  10.00  0.02  0.15  0.00   2.70  3.94         0.285   1.70  1.242
 9.40    770.   2.88  4.52        0.24  0.19  10.00  0.02  0.15  0.00   3.04  4.31         0.304   1.70  1.256
END OF SOUNDING                   (INTERPRETED SOIL PARAMETERS ON NEXT PAGE)
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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)       SNDG. NO.  D-6
IN-SITU SOIL TESTING, L.C.                                                             PAGE 2
JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware               FILE NO. : IST-9863
LOCATION: As Planned -- Refusal at 9.5m
SNDG.BY : R. FAILMEZGER                                                                SNDG.DATE: 11-17-98
ANAL.BY : R. FAILMEZGER                                                                ANAL.DATE: 11-17-98

ANALYSIS PARAMETERS:       LO RANGE   =10.00 BARS   ROD DIAM.     = 3.57 CM    BL.THICK. = 12.7 MM   SU  FACTOR = 1.00
 SURF.ELEV.   = 15.00 M    LO  GAGE 0 = 0.02 BARS   FR.RED.DIA. = 4.80 CM    BL.WIDTH  = 94.9 MM   PHI FACTOR = 1.00
 WATER DEPTH =   6.30 M    HI  GAGE 0 = 0.15 BARS   LIN.ROD WT. = 6.50 KGF/M DELTA-A   = 0.24 BARS OCR FACTOR = 1.00
 SP.GR.WATER = 1.000       CAL GAGE 0 = 0.00 BARS   DELTA/PHI   = 0.50       DELTA-B   = 0.19 BARS  M  FACTOR = 1.00
 MAX SU ID    = 0.60       SU OPTION  = MARCHETTI   MIN PHI ID  = 1.20       OCR OPTION= MARCHETTI  K0 FACTOR = 1.00
UNIT CONVERSIONS:          1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI    1 M = 3.2808 FT

     Z     KD    ID    UD     ED     K0     SU     QD    PHI   SIGFF   PHIO     PC    OCR       M   SOIL TYPE
   (M)                     (BAR)          (BAR)  (BAR)  (DEG)   (BAR)  (DEG)  (BAR)            (BAR)
 *****  ***** ***** ***** ******  *****  *****  *****  *****  ******  *****  *****  *****  ******   ************

  0.20 220.69  1.95  0.00   522.                                                           2833.   SILTY SAND
  0.40  42.31  2.84  0.00   306.                                                           1182.   SILTY SAND
  0.60  16.41  5.51  0.00   347.   1.51          63.6   48.7    0.19   45.5   1.92   17.4   1030.      SAND
  0.80  25.41  4.04  0.00   530.   3.14          36.8   41.2    0.25   37.4  10.55   70.9   1793.      SAND
  1.00  37.56  1.77  0.00   432.   4.61          59.1   40.9    0.31   37.5  29.22  155.8   1623.   SANDY SILT
  1.20  14.52  2.04  0.00   232.   1.81          44.9   41.7    0.38   38.6   5.25   23.3    662.   SILTY SAND
  1.40   6.64  1.32  0.00    79.   0.94          26.8   39.6    0.43   36.6   1.54    5.9    167.   SANDY SILT
  1.60   8.12  1.61  0.00   134.   1.25          14.2   34.2    0.46   30.9   3.02   10.3    308.   SANDY SILT
  1.80   5.54  0.58  0.00    36.   1.25   0.26                                1.60    4.9     69.   SILTY CLAY
  2.00   4.51  0.74  0.00    42.   1.08                                       1.27    3.6     70.   CLAYEY SILT
  2.20   4.18  0.82  0.00    46.   1.02                                       1.23    3.2     75.   CLAYEY SILT
  2.40   4.03  0.70  0.00    41.   0.99                                       1.25    3.0     65.   CLAYEY SILT
  2.60   4.89  1.75  0.00   135.   0.91          14.3   32.0    0.69   29.3   2.16    4.8    245.   SANDY SILT
  2.80   4.91  1.26  0.00   104.   0.87          20.3   34.0    0.76   31.6   2.19    4.5    188.   SANDY SILT
  3.00   3.86  0.85  0.00    59.   0.96                                       1.45    2.8     92.   CLAYEY SILT
  3.20   2.74  0.37  0.00    20.   0.73   0.18                                0.90    1.6     23.   SILTY CLAY
  3.40   2.49  0.64  0.00    32.   0.67                                       0.82    1.4     35.   CLAYEY SILT
  3.60   2.89  0.73  0.00    45.   0.76                                       1.09    1.8     56.   CLAYEY SILT
  3.80   1.55  1.01  0.00    35.   0.42                                       0.43    0.7     30.      SILT
  4.00   1.97  0.58  0.00    27.   0.54   0.15                                0.66    1.0     23.   SILTY CLAY
  4.20   2.84  0.51  0.00    35.   0.75   0.24                                1.22    1.7     43.   SILTY CLAY
  4.40   2.80  0.50  0.00    36.   0.74   0.25                                1.25    1.7     43.   SILTY CLAY
  4.60   2.34  0.26  0.00    16.   0.63   0.21                                0.99    1.3     16.      CLAY
  4.80   1.99  0.39  0.00    22.   0.54   0.18                                0.80    1.0     19.   SILTY CLAY
  5.00   1.79  0.45  0.00    23.   0.49   0.16                                0.70    0.8     20.   SILTY CLAY
  5.20   1.93  0.65  0.00    38.   0.52                                       0.82    0.9     32.   CLAYEY SILT
  5.40   2.02  0.45  0.00    28.   0.55   0.20                                0.91    1.0     24.   SILTY CLAY
  5.60   1.98  0.39  0.00    25.   0.54   0.20                                0.91    1.0     21.   SILTY CLAY
  5.80   2.35  0.39  0.00    30.   0.64   0.26                                1.24    1.3     31.   SILTY CLAY
  6.00   2.35  0.45  0.00    36.   0.63   0.27                                1.27    1.3     37.   SILTY CLAY
  6.20   2.29  0.59  0.00    48.   0.62   0.27                                1.27    1.2     48.   SILTY CLAY
  6.40   2.47  0.34  0.00    30.   0.66   0.30                                1.46    1.4     32.      CLAY
  6.60   2.35  0.28  0.00    24.   0.63   0.29                                1.37    1.3     25.      CLAY
  6.80   2.41  0.32  0.00    29.   0.65   0.30                                1.44    1.3     30.      CLAY
  7.00   2.37  0.45  0.00    40.   0.64   0.30                                1.42    1.3     41.   SILTY CLAY
  7.20   2.48  0.47  0.00    45.   0.67   0.32                                1.54    1.4     48.   SILTY CLAY
  7.40   2.40  0.55  0.00    51.   0.65   0.31                                1.49    1.3     53.   SILTY CLAY
  7.60   2.74  0.47  0.00    50.   0.73   0.37                                1.84    1.6     59.   SILTY CLAY
  7.80   2.78  0.44  0.00    49.   0.74   0.38                                1.92    1.7     58.   SILTY CLAY
  8.00   1.78  1.96  0.00   140.   0.71          14.2   25.1    1.65   24.0   2.17    1.9    124.   SILTY SAND
  8.20   2.11  0.54  0.00    47.   0.57   0.28                                1.28    1.1     42.   SILTY CLAY
  8.40   2.58  0.32  0.00    34.   0.69   0.36                                1.76    1.5     37.      CLAY
  8.60   2.61  0.30  0.00    33.   0.70   0.37                                1.81    1.5     37.      CLAY
  8.80   2.78  0.30  0.00    36.   0.74   0.40                                2.03    1.7     42.      CLAY
  9.00   1.99  0.38  0.00    32.   0.54   0.27                                1.22    1.0     28.   SILTY CLAY
  9.20   1.95  0.51  0.00    43.   0.53   0.26                                1.19    1.0     37.   SILTY CLAY
  9.40   2.18  0.46  0.00    44.   0.59   0.31                                1.43    1.1     41.   SILTY CLAY
END OF SOUNDING
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PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

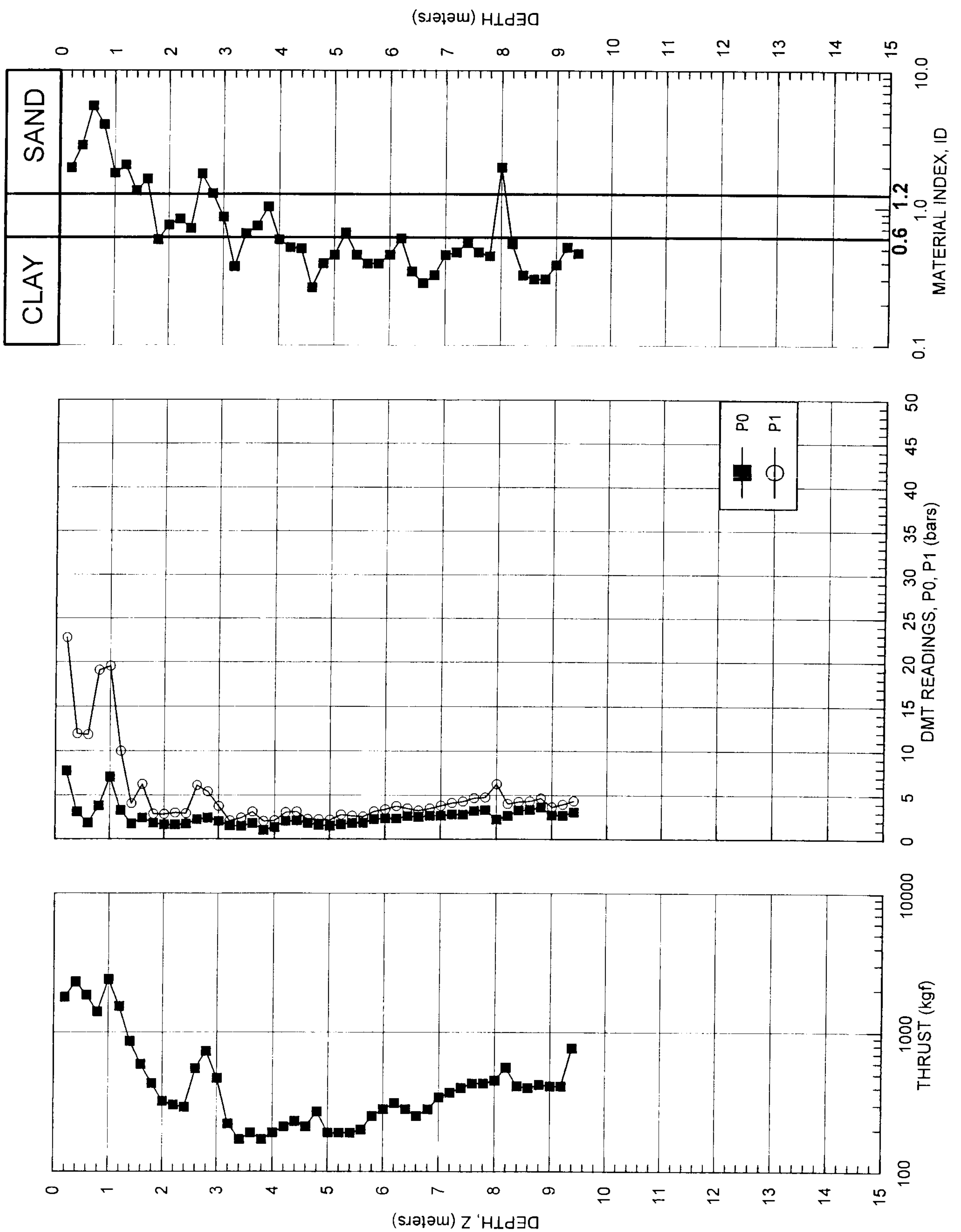
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-18-98

SOUNDING

D-6

DILATOMETER RESULTS

Ground Surface Elev.:
Water Depth: ~6.3 m



PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

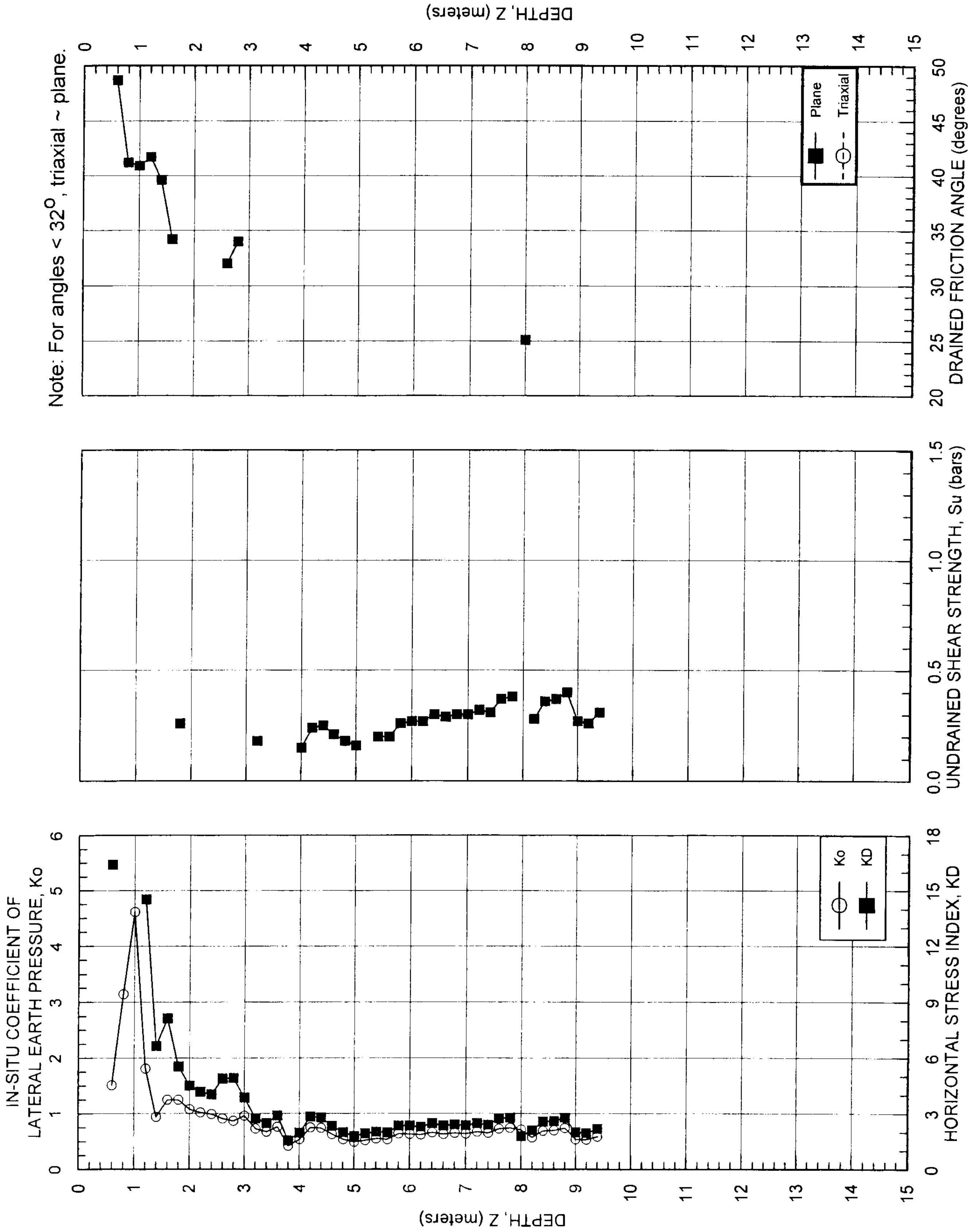
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-18-98

SOUNDING

D-6

INTERPRETED DMT STRENGTH PARAMETERS

Ground Surface Elev.:
Water Depth: ~6.3m



PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

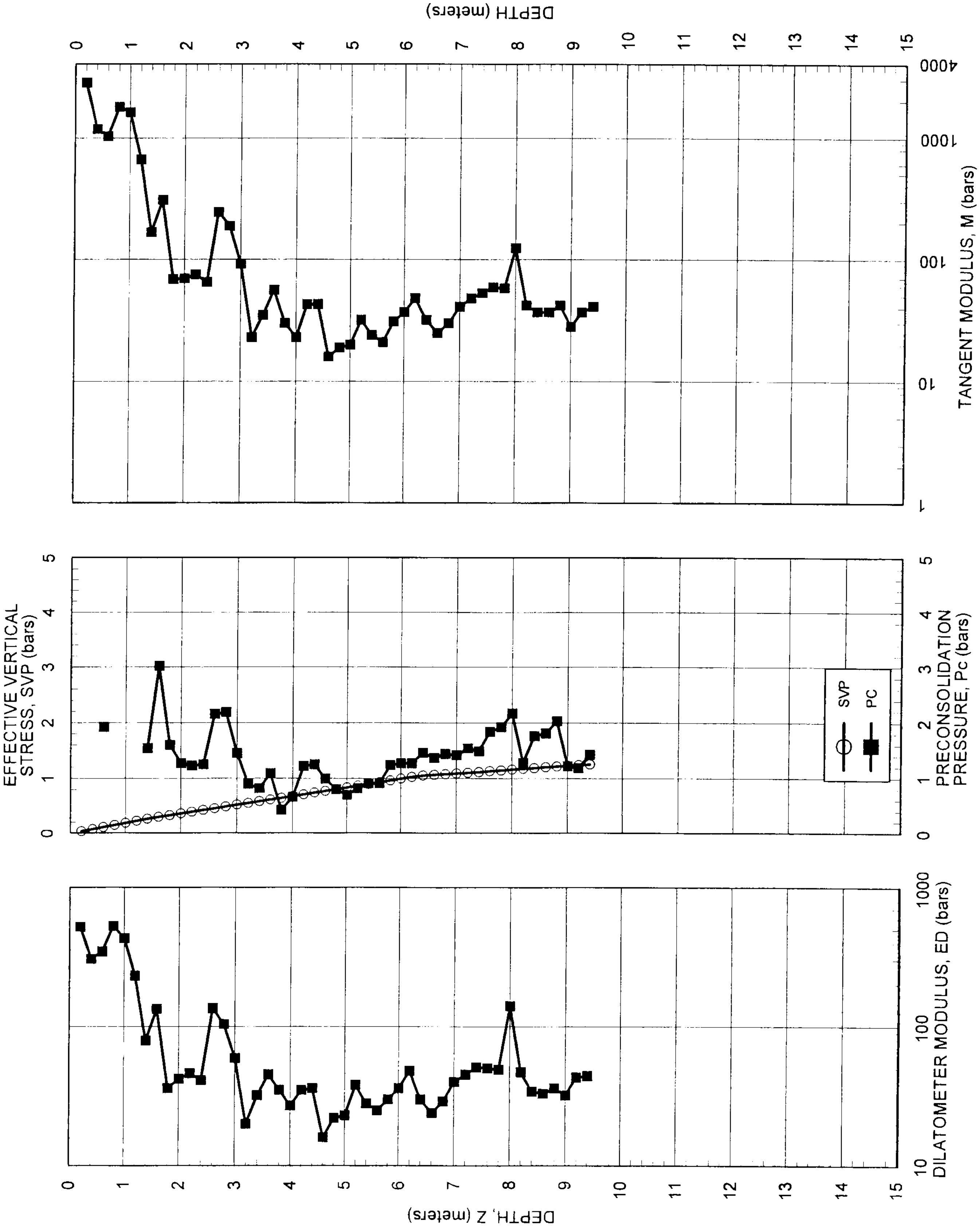
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-18-98

SOUNDING

D-6

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.:
Water Depth: ~6.3 m



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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)          SNDG. NO.  D-7
IN-SITU SOIL TESTING, L.C.                                                                PAGE 1
JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware                  FILE NO. : IST-9863
LOCATION: As Planned
SNDG.BY : R. FAILMEZGER                                                                   SNDG.DATE: 11-18-98
ANAL.BY : R. FAILMEZGER                                                                   ANAL.DATE: 11-18-98

ANALYSIS PARAMETERS:       LO RANGE   =10.00 BARS   ROD DIAM.    = 3.57 CM     BL.THICK. = 12.7 MM    SU  FACTOR = 1.00
 SURF.ELEV.   = 15.00 M    LO  GAGE 0 = 0.02 BARS   FR.RED.DIA.  = 4.80 CM     BL.WIDTH  = 94.9 MM    PHI FACTOR = 1.00
 WATER DEPTH = 10.20 M     HI  GAGE 0 = 0.15 BARS   LIN.ROD WT.  = 6.50 KGF/M  DELTA-A   = 0.26 BARS  OCR FACTOR = 1.00
 SP.GR.WATER = 1.000       CAL GAGE 0 = 0.00 BARS   DELTA/PHI    = 0.50        DELTA-B   = 0.17 BARS   M  FACTOR = 1.00
 MAX SU ID   = 0.60        SU OPTION  = MARCHETTI   MIN PHI ID   = 1.20        OCR OPTION= MARCHETTI  K0 FACTOR = 1.00
UNIT CONVERSIONS:          1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI     1 M = 3.2808 FT

  Z    THRUST    A     B     C      DA    DB    ZMRNG ZMLO  ZMHI  ZMCAL   P0    P1    P2     U0    GAMMA   SVP
 (M)    (KGF)  (BAR) (BAR) (BAR)  (BAR) (BAR)   (BAR) (BAR) (BAR) (BAR)  (BAR) (BAR) (BAR)  (BAR)  (T/M3) (BAR)
*****  ******  ***** ***** *****  ***** *****   ***** ***** ***** *****  ***** ***** *****  ****** ****** ******

 0.20    770.   3.13 12.35         0.26  0.17   10.00  0.02  0.15  0.00   2.94 12.03         0.000   1.90  0.035
 0.40    920.   1.97  8.57         0.26  0.17   10.00  0.02  0.15  0.00   1.90  8.38         0.000   1.90  0.072
 0.60    670.   1.36  4.62         0.26  0.17   10.00  0.02  0.15  0.00   1.46  4.43         0.000   1.80  0.109
 0.90    530.   1.24  6.69         0.26  0.17   10.00  0.02  0.15  0.00   1.23  6.50         0.000   1.80  0.162
 1.00    450.   0.94  4.02         0.26  0.17   10.00  0.02  0.15  0.00   1.05  3.83         0.000   1.70  0.179
 1.20    420.   0.73  3.61         0.26  0.17   10.00  0.02  0.15  0.00   0.85  3.42         0.000   1.70  0.212
 1.40    360.   0.97  4.42         0.26  0.17   10.00  0.02  0.15  0.00   1.06  4.23         0.000   1.80  0.246
 1.60    410.   0.58  4.17         0.26  0.17   10.00  0.02  0.15  0.00   0.66  3.98         0.000   1.70  0.281
 1.80    410.   1.61  6.16         0.26  0.17   10.00  0.02  0.15  0.00   1.64  5.97         0.000   1.80  0.315
 2.00    380.   0.84  3.68         0.26  0.17   10.00  0.02  0.15  0.00   0.96  3.49         0.000   1.70  0.350
 2.20    360.   1.25  3.52         0.26  0.17   10.00  0.02  0.15  0.00   1.40  3.33         0.000   1.70  0.383
 2.40    380.   1.32  3.19         0.26  0.17   10.00  0.02  0.15  0.00   1.49  3.00         0.000   1.60  0.415
 2.60    290.   1.46  3.14         0.26  0.17   10.00  0.02  0.15  0.00   1.64  2.95         0.000   1.60  0.447
 2.90   1480.   4.59 16.75         0.26  0.17   10.00  0.02  0.15  0.00   4.25 16.43         0.000   2.00  0.500
 3.00   1450.   3.72 14.20         0.26  0.17   10.00  0.02  0.15  0.00   3.46 13.88         0.000   1.90  0.519
 3.20   1350.   2.17  5.29         0.26  0.17   10.00  0.02  0.15  0.00   2.28  5.10         0.000   1.70  0.554
 3.40    700.   1.78  4.32         0.26  0.17   10.00  0.02  0.15  0.00   1.91  4.13         0.000   1.70  0.588
 3.60    430.   1.29  2.92         0.26  0.17   10.00  0.02  0.15  0.00   1.47  2.73         0.000   1.60  0.620
 3.80    280.   0.96  2.04         0.26  0.17   10.00  0.02  0.15  0.00   1.17  1.85         0.000   1.60  0.651
 4.00    190.   0.69  1.37         0.26  0.17   10.00  0.02  0.15  0.00   0.92  1.18         0.000   1.50  0.682
 4.20    150.   0.58  1.39         0.26  0.17   10.00  0.02  0.15  0.00   0.80  1.20         0.000   1.60  0.712
 4.40    200.   0.32  1.37         0.26  0.17   10.00  0.02  0.15  0.00   0.53  1.18         0.000   1.60  0.744
 4.60    210.   1.91  4.07         0.26  0.17   10.00  0.02  0.15  0.00   2.06  3.88         0.000   1.70  0.776
 4.80    400.   0.74  2.08         0.26  0.17   10.00  0.02  0.15  0.00   0.93  1.89         0.000   1.60  0.808
 5.00    360.   1.53  2.88         0.26  0.17   10.00  0.02  0.15  0.00   1.72  2.69         0.000   1.60  0.840
 5.20    480.   1.65  3.78         0.26  0.17   10.00  0.02  0.15  0.00   1.80  3.59         0.000   1.70  0.872
 5.40    480.   1.86  3.49         0.26  0.17   10.00  0.02  0.15  0.00   2.04  3.30         0.000   1.70  0.905
 5.60    460.   1.57  3.41         0.26  0.17   10.00  0.02  0.15  0.00   1.74  3.22         0.000   1.70  0.939
 5.80    390.   1.76  3.24         0.26  0.17   10.00  0.02  0.15  0.00   1.95  3.05         0.000   1.60  0.971
 6.00    440.   1.64  3.67         0.26  0.17   10.00  0.02  0.15  0.00   1.80  3.48         0.000   1.70  1.004
 6.20    450.   1.62  3.19         0.26  0.17   10.00  0.02  0.15  0.00   1.80  3.00         0.000   1.60  1.036
 6.40    630.   1.52  5.51         0.26  0.17   10.00  0.02  0.15  0.00   1.58  5.32         0.000   1.80  1.069
 6.60    700.   1.02  5.18         0.26  0.17   10.00  0.02  0.15  0.00   1.07  4.99         0.000   1.80  1.105
 6.80    560.   0.65  3.45         0.26  0.17   10.00  0.02  0.15  0.00   0.77  3.26         0.000   1.70  1.139
 7.00    620.   0.54  2.68         0.26  0.17   10.00  0.02  0.15  0.00   0.69  2.49         0.000   1.70  1.172
 7.20    540.   1.60  3.24         0.26  0.17   10.00  0.02  0.15  0.00   1.78  3.05         0.000   1.60  1.205
 7.40    420.   2.29  4.49         0.26  0.17   10.00  0.02  0.15  0.00   2.44  4.30         0.000   1.70  1.237
 7.60    660.   2.88  5.62         0.26  0.17   10.00  0.02  0.15  0.00   3.00  5.43         0.000   1.70  1.271
 7.80   2280.   6.50 20.55         0.26  0.17   10.00  0.02  0.15  0.00   6.07 20.23         0.000   2.00  1.307
 8.00   2920.   6.62 19.30         0.26  0.17   10.00  0.02  0.15  0.00   6.25 18.98         0.000   2.00  1.346
 8.20   2280.   3.08  7.20         0.26  0.17   10.00  0.02  0.15  0.00   3.14  7.01         0.000   1.80  1.383
 8.40   3340.   2.46 14.55         0.26  0.17   10.00  0.02  0.15  0.00   2.12 14.23         0.000   1.90  1.420
 8.60   5240.   5.78 23.45         0.26  0.17   10.00  0.02  0.15  0.00   5.16 23.13         0.000   2.00  1.458
 8.80   6000.   8.17 28.75         0.26  0.17   10.00  0.02  0.15  0.00   7.41 28.43         0.000   2.00  1.497
 9.00   5680.   6.61 24.30         0.26  0.17   10.00  0.02  0.15  0.00   5.99 23.98         0.000   2.00  1.536
 9.20   5320.   7.69 25.90         0.26  0.17   10.00  0.02  0.15  0.00   7.05 25.58         0.000   2.00  1.576
 9.40   4890.   7.15 24.80         0.26  0.17   10.00  0.02  0.15  0.00   6.54 24.48         0.000   2.00  1.615
 9.60   4890.   7.11 23.45         0.26  0.17   10.00  0.02  0.15  0.00   6.56 23.13         0.000   2.00  1.654
 9.80   5180.   7.18 25.10         0.26  0.17   10.00  0.02  0.15  0.00   6.55 24.78         0.000   2.00  1.693
10.00   4610.   7.84 26.65         0.26  0.17   10.00  0.02  0.15  0.00   7.17 26.33         0.000   2.00  1.733
10.20   2010.   4.78 11.00         0.26  0.17   10.00  0.02  0.15  0.00   4.74 10.68         0.000   1.80  1.770
10.40   1080.   2.75  6.54         0.26  0.17   10.00  0.02  0.15  0.00   2.82  6.35         0.020   1.80  1.786
10.60   1320.   2.81 10.30         0.26  0.17   10.00  0.02  0.15  0.00   2.70  9.98         0.039   1.90  1.802
END OF SOUNDING                   (INTERPRETED SOIL PARAMETERS ON NEXT PAGE)
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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)          SNDG. NO.  D-7
IN-SITU SOIL TESTING, L.C.                                                                 PAGE 2
JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware                   FILE NO. : IST-9863
LOCATION: As Planned
SNDG.BY : R. FAILMEZGER                                                                    SNDG.DATE: 11-18-98
ANAL.BY : R. FAILMEZGER                                                                    ANAL.DATE: 11-18-98

ANALYSIS PARAMETERS:       LO RANGE   =10.00 BARS    ROD DIAM.    = 3.57 CM      BL.THICK. = 12.7 MM    SU  FACTOR = 1.00
 SURF.ELEV.  = 15.00 M     LO  GAGE 0 = 0.02 BARS    FR.RED.DIA. = 4.80 CM      BL.WIDTH  = 94.9 MM    PHI FACTOR = 1.00
 WATER DEPTH = 10.20 M     HI  GAGE 0 = 0.15 BARS    LIN.ROD WT. = 6.50 KGF/M  DELTA-A   = 0.26 BARS OCR FACTOR = 1.00
 SP.GR.WATER = 1.000       CAL GAGE 0 = 0.00 BARS    DELTA/PHI   = 0.50         DELTA-B   = 0.17 BARS  M  FACTOR = 1.00
 MAX SU ID   = 0.60        SU OPTION  = MARCHETTI    MIN PHI ID  = 1.20         OCR OPTION= MARCHETTI  K0 FACTOR = 1.00
UNIT CONVERSIONS:          1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI     1 M = 3.2808 FT

  Z     KD     ID    UD     ED      K0     SU     QD     PHI   SIGFF   PHIO    PC     OCR     M     SOIL TYPE
 (M)                       (BAR)          (BAR)  (BAR)  (DEG)  (BAR)   (DEG)  (BAR)          (BAR)
*****  *****  *****  *****  ******  *****  *****  *****  *****  ******  *****  *****  *****  ******  ************


 0.20  83.91  3.10  0.00   316.                                                            1424.   SILTY SAND
 0.40  26.30  3.41  0.00   225.   3.09          26.7   44.6    0.12   40.2   4.77   66.0   768.      SAND
 0.60  13.43  2.04  0.00   103.   1.67          19.8   41.8    0.18   37.6   2.16   19.9   287.   SILTY SAND
 0.90   7.61  4.29  0.00   183.   1.06          15.9   39.2    0.26   35.3   1.24    7.7   414.      SAND
 1.00   5.86  2.66  0.00    97.   0.89          13.8   38.1    0.29   34.2   0.92    5.1   195.   SILTY SAND
 1.20   4.00  3.04  0.00    89.   0.68          13.7   37.4    0.34   33.8   0.61    2.9   152.   SILTY SAND
 1.40   4.30  2.99  0.00   110.   0.79          10.7   34.5    0.39   30.9   0.89    3.6   194.   SILTY SAND
 1.60   2.36  5.01  0.00   115.   0.51          14.5   36.3    0.45   33.1   0.42    1.5   143.      SAND
 1.80   5.22  2.63  0.00   150.   0.94          10.7   32.4    0.48   29.1   1.64    5.2   288.   SILTY SAND
 2.00   2.75  2.64  0.00    88.   0.63          12.3   33.4    0.54   30.3   0.72    2.1   118.   SILTY SAND
 2.20   3.65  1.38  0.00    67.   0.79          10.1   30.9    0.58   27.8   1.26    3.3   102.   SANDY SILT
 2.40   3.58  1.02  0.00    52.   0.91                                       1.03    2.5    77.      SILT
 2.60   3.67  0.80  0.00    46.   0.92                                       1.15    2.6    68.   CLAYEY SILT
 2.90   8.51  2.87  0.00   423.   1.22          40.4   37.5    0.80   35.4   5.01   10.0   997.   SILTY SAND
 3.00   6.68  3.01  0.00   361.   0.99          42.8   38.1    0.84   36.1   3.31    6.4   777.   SILTY SAND
 3.20   4.11  1.24  0.00    98.   0.66          44.6   38.8    0.90   37.0   1.53    2.8   159.   SANDY SILT
 3.40   3.26  1.16  0.00    77.   0.84                                       1.26    2.1   107.      SILT
 3.60   2.37  0.86  0.00    44.   0.64                                       0.81    1.3    46.   CLAYEY SILT
 3.80   1.79  0.58  0.00    24.   0.49   0.12                                0.55    0.8    20.   SILTY CLAY
 4.00   1.35  0.29  0.00     9.   0.35   0.09                                0.37    0.5     8.      MUD
 4.20   1.12  0.50  0.00    14.   0.27   0.08                                0.29    0.4    12.   SILTY CLAY
 4.40   0.71  1.23  0.00    23.   0.60           8.2   24.4    1.05   22.3   0.80    1.1    19.   SANDY SILT
 4.60   2.66  0.88  0.00    63.   0.71                                       1.21    1.6    74.   CLAYEY SILT
 4.80   1.16  1.02  0.00    33.   0.28                                       0.34    0.4    28.      SILT
 5.00   2.05  0.56  0.00    34.   0.56   0.19                                0.87    1.0    29.   SILTY CLAY
 5.20   2.07  0.99  0.00    62.   0.56                                       0.92    1.1    57.      SILT
 5.40   2.25  0.62  0.00    44.   0.61                                       1.09    1.2    43.   CLAYEY SILT
 5.60   1.85  0.85  0.00    51.   0.50                                       0.83    0.9    44.   CLAYEY SILT
 5.80   2.01  0.57  0.00    38.   0.55   0.21                                0.98    1.0    33.   SILTY CLAY
 6.00   1.79  0.93  0.00    58.   0.49                                       0.85    0.8    50.      SILT
 6.20   1.74  0.66  0.00    42.   0.47                                       0.83    0.8    35.   CLAYEY SILT
 6.40   1.48  2.36  0.00   130.   0.57          21.8   29.4    1.59   28.3   1.44    1.4   110.   SILTY SAND
 6.60   0.97  3.65  0.00   136.   0.47          26.4   30.9    1.67   29.9   1.03    0.9   116.      SAND
 6.80   0.68  3.23  0.00    86.   0.48          22.2   29.3    1.70   28.3   0.97    0.9    73.   SILTY SAND
 7.00   0.59  2.59  0.00    62.   0.45          24.9   30.0    1.76   29.1   0.90    0.8    53.   SILTY SAND
 7.20   1.48  0.71  0.00    44.   0.39                                       0.75    0.6    37.   CLAYEY SILT
 7.40   1.97  0.76  0.00    64.   0.54                                       1.21    1.0    55.   CLAYEY SILT
 7.60   2.36  0.81  0.00    84.   0.64                                       1.65    1.3    88.   CLAYEY SILT
 7.80   4.64  2.34  0.00   492.   0.81          66.9   35.5    2.07   35.0   5.12    3.9   885.   SILTY SAND
 8.00   4.65  2.03  0.00   442.   0.76          90.5   37.3    2.16   36.9   4.88    3.6   789.   SILTY SAND
 8.20   2.27  1.24  0.00   134.   0.48          80.1   37.1    2.22   36.8   1.85    1.3   140.   SANDY SILT
 8.40   1.50  5.70  0.00   420.   0.28         127.4   40.6    2.34   40.3   0.75    0.5   357.      SAND
 8.60   3.54  3.48  0.00   623.   0.48         187.2   42.0    2.43   41.9   2.35    1.6   997.      SAND
 8.80   4.95  2.84  0.00   729.   0.65         205.7   41.9    2.50   41.7   4.50    3.0  1372.   SILTY SAND
 9.00   3.90  3.00  0.00   624.   0.52         200.6   42.0    2.56   41.9   2.96    1.9  1050.   SILTY SAND
 9.20   4.47  2.63  0.00   643.   0.63         181.1   40.9    2.61   40.8   4.30    2.7  1146.   SILTY SAND
 9.40   4.05  2.75  0.00   623.   0.60         166.9   40.4    2.66   40.3   3.88    2.4  1058.   SILTY SAND
 9.60   3.97  2.53  0.00   575.   0.59         167.0   40.3    2.72   40.3   3.88    2.3   959.   SILTY SAND
 9.80   3.87  2.78  0.00   633.   0.57         178.6   40.6    2.80   40.6   3.71    2.2  1051.   SILTY SAND
10.00   4.14  2.67  0.00   665.   0.64         153.3   39.3    2.83   39.4   4.67    2.7  1140.   SILTY SAND
10.20   2.68  1.25  0.00   206.   0.61          64.1   33.6    2.75   33.6   3.51    2.0   249.   SANDY SILT
10.40   1.57  1.26  0.00   122.   0.58          36.5   29.4    2.66   29.4   2.53    1.4   104.   SANDY SILT
10.60   1.48  2.73  0.00   252.   0.52          46.1   31.3    2.74   31.3   2.20    1.2   215.   SILTY SAND
END OF SOUNDING
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PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

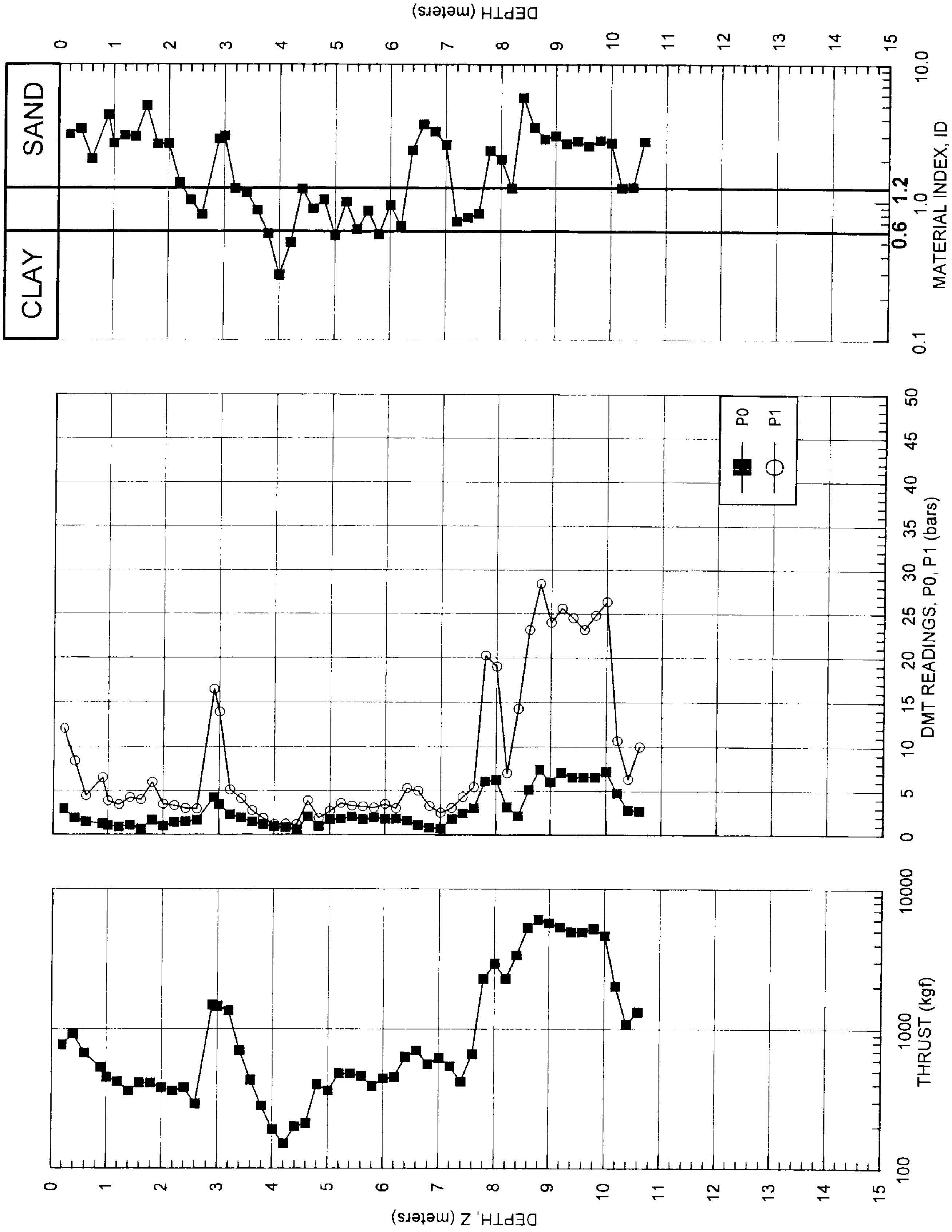
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-19-98

SOUNDING

D-7

DILATOMETER RESULTS

Ground Surface Elev.:
Water Depth: ~10.2 m



PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

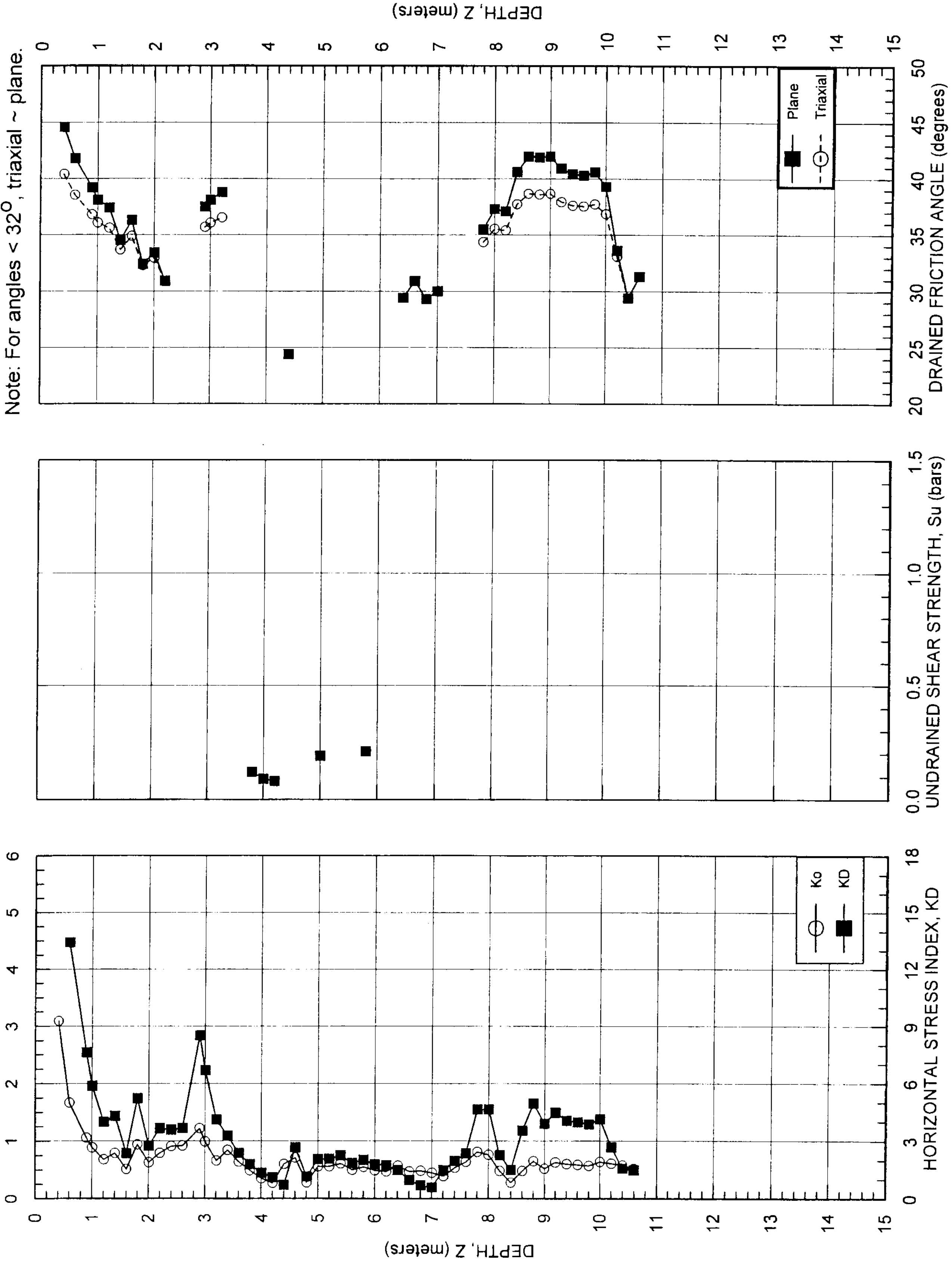
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-19-98

SOUNDING

D-7

INTERPRETED DMT STRENGTH PARAMETERS

Ground Surface Elev.:
Water Depth: ~10.2 m



Note: For angles < 32°, triaxial ~ plane.

PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

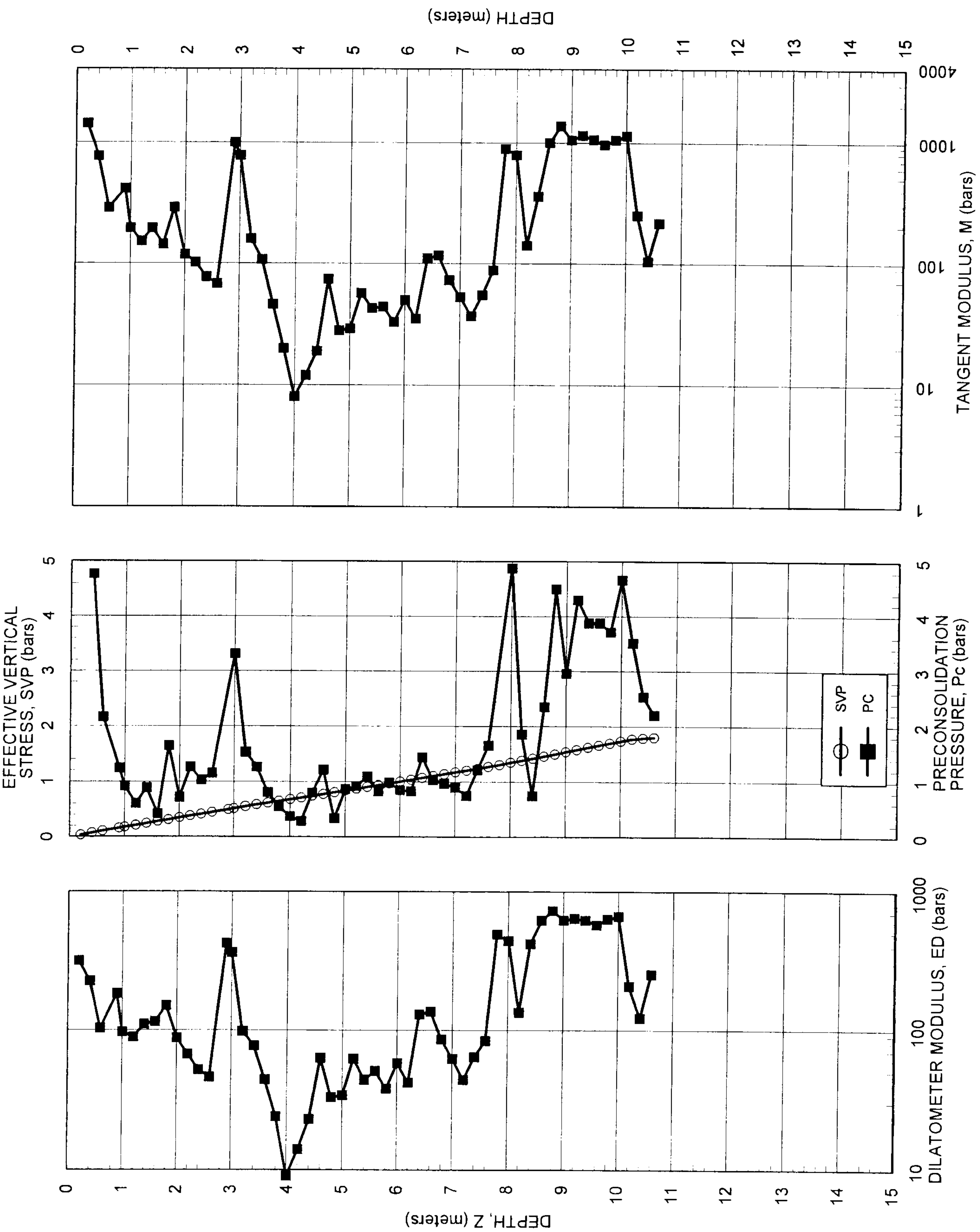
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-19-98

SOUNDING

D-7

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.:
Water Depth: ~10.2 m



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 DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)          SNDG. NO.  D-8
 IN-SITU SOIL TESTING, L.C.                                                                PAGE 1
 JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware                  FILE NO. : IST-9863
 LOCATION: As Planned
 SNDG.BY : R. FAILMEZGER                                                                   SNDG.DATE: 11-18-98
 ANAL.BY : R. FAILMEZGER                                                                   ANAL.DATE: 11-18-98

 ANALYSIS PARAMETERS:      LO RANGE   =10.00 BARS   ROD DIAM.    = 3.57 CM     BL.THICK. = 12.7 MM    SU  FACTOR = 1.00
  SURF.ELEV.  = 15.00 M    LO  GAGE 0 = 0.02 BARS   FR.RED.DIA. = 4.80 CM     BL.WIDTH  = 94.9 MM    PHI FACTOR = 1.00
  WATER DEPTH = 11.00 M    HI  GAGE 0 = 0.15 BARS   LIN.ROD WT. = 6.50 KGF/M  DELTA-A   = 0.27 BARS OCR FACTOR = 1.00
  SP.GR.WATER = 1.000      CAL GAGE 0 = 0.00 BARS   DELTA/PHI    = 0.50        DELTA-B   = 0.15 BARS  M  FACTOR = 1.00
  MAX SU ID   = 0.60       SU OPTION  = MARCHETTI   MIN PHI ID   = 1.20        OCR OPTION= MARCHETTI  K0 FACTOR = 1.00
 UNIT CONVERSIONS:         1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI     1 M = 3.2808 FT

  Z    THRUST    A     B     C     DA    DB    ZMRNG  ZMLO  ZMHI ZMCAL    P0    P1    P2       U0    GAMMA  SVP
 (M)    (KGF)  (BAR) (BAR) (BAR)  (BAR) (BAR)  (BAR) (BAR) (BAR) (BAR)   (BAR) (BAR) (BAR)    (BAR) (T/M3) (BAR)
*****  ******  ***** ***** *****  ***** *****  ***** ***** ***** *****   ***** ***** *****   ****** ****** ******


 0.20    630.   1.44  6.61         0.27  0.15  10.00  0.02  0.15  0.00    1.45  6.44          0.000   1.80  0.035
 0.40    700.   1.06  6.26         0.27  0.15  10.00  0.02  0.15  0.00    1.07  6.09          0.000   1.80  0.070
 0.60    500.   0.74  2.39         0.27  0.15  10.00  0.02  0.15  0.00    0.93  2.22          0.000   1.60  0.104
 0.80    560.   1.40  6.16         0.27  0.15  10.00  0.02  0.15  0.00    1.43  5.99          0.000   1.80  0.137
 1.00    560.   1.14  4.43         0.27  0.15  10.00  0.02  0.15  0.00    1.25  4.26          0.000   1.80  0.172
 1.20    560.   1.29  5.82         0.27  0.15  10.00  0.02  0.15  0.00    1.33  5.65          0.000   1.80  0.208
 1.40    670.   3.09  7.97         0.27  0.15  10.00  0.02  0.15  0.00    3.12  7.80          0.000   1.80  0.243
 1.60    850.   2.40  8.68         0.27  0.15  10.00  0.02  0.15  0.00    2.36  8.51          0.000   1.90  0.279
 1.80    780.   3.63  8.41         0.27  0.15  10.00  0.02  0.15  0.00    3.66  8.24          0.000   1.80  0.316
 2.00    560.   2.43  5.08         0.27  0.15  10.00  0.02  0.15  0.00    2.57  4.91          0.000   1.70  0.350
 2.20    350.   1.83  3.64         0.27  0.15  10.00  0.02  0.15  0.00    2.01  3.47          0.000   1.70  0.383
 2.40    270.   1.66  3.26         0.27  0.15  10.00  0.02  0.15  0.00    1.85  3.09          0.000   1.60  0.416
 2.60    230.   1.46  2.86         0.27  0.15  10.00  0.02  0.15  0.00    1.66  2.69          0.000   1.60  0.447
 2.80    210.   1.33  2.48         0.27  0.15  10.00  0.02  0.15  0.00    1.54  2.31          0.000   1.60  0.479
 3.00    220.   1.36  2.46         0.27  0.15  10.00  0.02  0.15  0.00    1.58  2.29          0.000   1.60  0.510
 3.20    180.   1.44  2.59         0.27  0.15  10.00  0.02  0.15  0.00    1.65  2.42          0.000   1.60  0.541
 3.40    170.   1.38  2.42         0.27  0.15  10.00  0.02  0.15  0.00    1.60  2.25          0.000   1.60  0.573
 3.60    250.   0.91  2.28         0.27  0.15  10.00  0.02  0.15  0.00    1.11  2.11          0.000   1.60  0.604
 3.80    230.   0.76  1.72         0.27  0.15  10.00  0.02  0.15  0.00    0.98  1.55          0.000   1.60  0.636
 4.00    200.   0.75  1.63         0.27  0.15  10.00  0.02  0.15  0.00    0.98  1.46          0.000   1.60  0.667
 4.20    280.   0.73  1.66         0.27  0.15  10.00  0.02  0.15  0.00    0.95  1.49          0.000   1.60  0.698
 4.40    380.   0.46  2.62         0.27  0.15  10.00  0.02  0.15  0.00    0.62  2.45          0.000   1.70  0.731
 4.60    520.   0.90  3.62         0.27  0.15  10.00  0.02  0.15  0.00    1.03  3.45          0.000   1.70  0.764
 4.80    490.   0.73  3.88         0.27  0.15  10.00  0.02  0.15  0.00    0.84  3.71          0.000   1.70  0.798
 5.00    430.   0.55  3.48         0.27  0.15  10.00  0.02  0.15  0.00    0.67  3.31          0.000   1.70  0.831
 5.20    450.   0.28  1.32         0.27  0.15  10.00  0.02  0.15  0.00    0.50  1.15          0.000   1.60  0.863
 5.40    410.   0.25  3.31         0.27  0.15  10.00  0.02  0.15  0.00    0.37  3.14          0.000   1.70  0.896
 5.60    380.   0.66  3.14         0.27  0.15  10.00  0.02  0.15  0.00    0.81  2.97          0.000   1.70  0.929
 5.80    360.   0.73  2.44         0.27  0.15  10.00  0.02  0.15  0.00    0.92  2.27          0.000   1.60  0.961
 6.00    370.   0.68  3.29         0.27  0.15  10.00  0.02  0.15  0.00    0.82  3.12          0.000   1.70  0.994
 6.20    420.   0.58  2.83         0.27  0.15  10.00  0.02  0.15  0.00    0.74  2.66          0.000   1.70  1.027
 6.40    370.   0.69  2.78         0.27  0.15  10.00  0.02  0.15  0.00    0.86  2.61          0.000   1.70  1.061
 6.60    390.   0.68  2.94         0.27  0.15  10.00  0.02  0.15  0.00    0.84  2.77          0.000   1.70  1.094
 6.80    370.   1.09  3.55         0.27  0.15  10.00  0.02  0.15  0.00    1.24  3.38          0.000   1.60  1.126
 7.00    400.   2.09  3.22         0.27  0.15  10.00  0.02  0.15  0.00    2.30  3.05          0.000   1.60  1.158
 7.20    220.   2.68  4.02         0.27  0.15  10.00  0.02  0.15  0.00    2.88  3.85          0.000   1.70  1.190
 7.40    230.   2.86  4.11         0.27  0.15  10.00  0.02  0.15  0.00    3.07  3.94          0.000   1.70  1.223
 7.60    250.   2.80  4.07         0.27  0.15  10.00  0.02  0.15  0.00    3.01  3.90          0.000   1.70  1.257
 7.80    340.   3.45  6.11         0.27  0.15  10.00  0.02  0.15  0.00    3.59  5.94          0.000   1.80  1.291
 8.00    370.   3.45  4.96         0.27  0.15  10.00  0.02  0.15  0.00    3.65  4.79          0.000   1.70  1.325
 8.20    460.   3.66  6.36         0.27  0.15  10.00  0.02  0.15  0.00    3.80  6.19          0.000   1.80  1.360
 8.40    550.   3.44  5.60         0.27  0.15  10.00  0.02  0.15  0.00    3.60  5.43          0.000   1.70  1.394
 8.60    500.   3.30  4.84         0.27  0.15  10.00  0.02  0.15  0.00    3.49  4.67          0.000   1.70  1.428
 8.80    450.   3.28  4.71         0.27  0.15  10.00  0.02  0.15  0.00    3.48  4.54          0.000   1.70  1.461
 9.00    470.   3.19  4.56         0.27  0.15  10.00  0.02  0.15  0.00    3.39  4.39          0.000   1.70  1.494
 9.20    490.   3.36  4.88         0.27  0.15  10.00  0.02  0.15  0.00    3.55  4.71          0.000   1.70  1.528
 9.40    500.   3.74  5.15         0.27  0.15  10.00  0.02  0.15  0.00    3.94  4.98          0.000   1.70  1.561
 9.60    520.   3.76  5.24         0.27  0.15  10.00  0.02  0.15  0.00    3.96  5.07          0.000   1.70  1.594
 9.80    580.   2.89  4.66         0.27  0.15  10.00  0.02  0.15  0.00    3.07  4.49          0.000   1.70  1.628
10.00    670.   2.08  3.42         0.27  0.15  10.00  0.02  0.15  0.00    2.28  3.25          0.000   1.70  1.661
10.20    560.   3.10  5.16         0.27  0.15  10.00  0.02  0.15  0.00    3.27  4.99          0.000   1.70  1.694
10.40    550.   3.74  5.47         0.27  0.15  10.00  0.02  0.15  0.00    3.92  5.30          0.000   1.70  1.728
10.60    520.   4.01  5.59         0.27  0.15  10.00  0.02  0.15  0.00    4.20  5.42          0.000   1.70  1.761
END OF SOUNDING                    (INTERPRETED SOIL PARAMETERS ON NEXT PAGE)
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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)          SNDG. NO.  D-8
IN-SITU SOIL TESTING, L.C.                                                                PAGE 2
JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware                  FILE NO. : IST-9863
LOCATION: As Planned
SNDG.BY : R. FAILMEZGER                                                                   SNDG.DATE: 11-18-98
ANAL.BY : R. FAILMEZGER                                                                   ANAL.DATE: 11-18-98

ANALYSIS PARAMETERS:      LO RANGE   =10.00 BARS   ROD DIAM.    = 3.57 CM     BL.THICK. = 12.7 MM   SU  FACTOR = 1.00
 SURF.ELEV.  = 15.00 M    LO  GAGE 0 = 0.02 BARS   FR.RED.DIA. = 4.80 CM     BL.WIDTH  = 94.9 MM   PHI FACTOR = 1.00
 WATER DEPTH = 11.00 M    HI  GAGE 0 = 0.15 BARS   LIN.ROD WT. = 6.50 KGF/M  DELTA-A   = 0.27 BARS OCR FACTOR = 1.00
 SP.GR.WATER = 1.000      CAL GAGE 0 = 0.00 BARS   DELTA/PHI   = 0.50        DELTA-B   = 0.15 BARS  M  FACTOR = 1.00
 MAX SU ID   = 0.60       SU OPTION  = MARCHETTI   MIN PHI ID  = 1.20        OCR OPTION= MARCHETTI  K0 FACTOR = 1.00
UNIT CONVERSIONS:         1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI    1 M = 3.2808 FT

  Z     KD     ID    UD     ED      K0     SU     QD     PHI   SIGFF   PHIO    PC    OCR      M     SOIL TYPE
 (M)                       (BAR)          (BAR)  (BAR)  (DEG)  (BAR)   (DEG)  (BAR)         (BAR)
***** ***** ***** ***** ****** ***** ***** ***** ***** ****** ***** ***** ***** ****** ************

 0.20 41.50  3.43  0.00  173.                                                           666.     SAND
 0.40 15.23  4.69  0.00  174.   1.66         22.5   46.1   0.12   41.8   1.41  20.1    505.     SAND
 0.60  8.95  1.39  0.00   45.   1.13         15.8   41.9   0.17   37.6   0.95   9.1    107.   SANDY SILT
 0.80 10.46  3.18  0.00  158.   1.40         16.0   39.6   0.22   35.4   1.86  13.6    402.   SILTY SAND
 1.00  7.23  2.42  0.00  105.   1.02         17.1   39.3   0.28   35.6   1.20   7.0    231.   SILTY SAND
 1.20  6.42  3.23  0.00  150.   0.95         16.9   38.2   0.34   34.6   1.24   6.0    317.   SILTY SAND
 1.40 12.82  1.50  0.00  163.   1.81         14.0   34.4   0.38   30.8   5.77  23.7    445.   SANDY SILT
 1.60  8.44  2.61  0.00  214.   1.20         23.7   37.9   0.45   34.8   2.72   9.7    501.   SILTY SAND
 1.80 11.60  1.25  0.00  159.   1.68         16.3   33.9   0.49   30.7   6.29  19.9    419.   SANDY SILT
 2.00  7.34  0.91  0.00   81.   1.51                                     2.66   7.6    178.     SILT
 2.20  5.24  0.73  0.00   51.   1.20                                     1.72   4.5     93.   CLAYEY SILT
 2.40  4.45  0.67  0.00   43.   1.07                                     1.45   3.5     72.   CLAYEY SILT
 2.60  3.71  0.62  0.00   36.   0.93                                     1.17   2.6     53.   CLAYEY SILT
 2.80  3.23  0.50  0.00   27.   0.83  0.19                               1.01   2.1     36.   SILTY CLAY
 3.00  3.09  0.45  0.00   25.   0.80  0.19                               1.01   2.0     32.   SILTY CLAY
 3.20  3.05  0.46  0.00   27.   0.80  0.20                               1.05   1.9     34.   SILTY CLAY
 3.40  2.79  0.41  0.00   23.   0.74  0.19                               0.96   1.7     27.   SILTY CLAY
 3.60  1.84  0.90  0.00   35.   0.50                                     0.53   0.9     29.   CLAYEY SILT
 3.80  1.55  0.58  0.00   20.   0.41  0.10                               0.43   0.7     17.   SILTY CLAY
 4.00  1.46  0.49  0.00   17.   0.39  0.10                               0.41   0.6     14.   SILTY CLAY
 4.20  1.37  0.56  0.00   19.   0.36  0.10                               0.39   0.6     16.   SILTY CLAY
 4.40  0.85  2.93  0.00   63.   0.49         14.8   29.5   1.09   27.7   0.69   0.9     54.   SILTY SAND
 4.60  1.35  2.33  0.00   84.   0.52         18.7   31.0   1.16   29.3   0.89   1.2     71.   SILTY SAND
 4.80  1.06  3.40  0.00   99.   0.49         18.4   30.6   1.20   28.9   0.80   1.0     85.     SAND
 5.00  0.81  3.91  0.00   91.   0.49         16.8   29.5   1.24   27.9   0.76   0.9     78.     SAND
 5.20  0.58  1.30  0.00   23.   0.45         18.3   30.0   1.29   28.5   0.66   0.8     19.   SANDY SILT
 5.40  0.41  7.53  0.00   96.   0.45         17.3   29.3   1.33   27.8   0.64   0.7     82.     SAND
 5.60  0.87  2.68  0.00   75.   0.55         14.6   27.4   1.36   26.0   0.98   1.0     64.   SILTY SAND
 5.80  0.95  1.48  0.00   47.   0.58         13.6   26.5   1.39   25.1   1.10   1.1     40.   SANDY SILT
 6.00  0.83  2.80  0.00   80.   0.56         14.3   26.7   1.44   25.3   1.05   1.1     68.   SILTY SAND
 6.20  0.72  2.60  0.00   67.   0.52         16.6   27.7   1.50   26.5   0.97   0.9     57.   SILTY SAND
 6.40  0.81  2.05  0.00   61.   0.57         14.4   26.2   1.53   24.9   1.13   1.1     52.   SILTY SAND
 6.60  0.77  2.31  0.00   67.   0.56         15.3   26.4   1.58   25.3   1.12   1.0     57.   SILTY SAND
 6.80  1.10  1.73  0.00   74.   0.63         13.4   25.0   1.60   23.8   1.48   1.3     63.   SANDY SILT
 7.00  1.99  0.32  0.00   26.   0.54  0.25                               1.15   1.0     22.     CLAY
 7.20  2.42  0.33  0.00   34.   0.65  0.33                               1.61   1.3     35.     CLAY
 7.40  2.51  0.28  0.00   30.   0.67  0.36                               1.74   1.4     33.     CLAY
 7.60  2.39  0.30  0.00   31.   0.65  0.35                               1.66   1.3     32.     CLAY
 7.80  2.78  0.66  0.00   82.   0.74                                     2.16   1.7     97.   CLAYEY SILT
 8.00  2.75  0.31  0.00   40.   0.73  0.43                               2.18   1.6     47.     CLAY
 8.20  2.79  0.63  0.00   83.   0.74                                     2.29   1.7     99.   CLAYEY SILT
 8.40  2.58  0.51  0.00   63.   0.69  0.42                               2.08   1.5     71.   SILTY CLAY
 8.60  2.45  0.34  0.00   41.   0.66  0.40                               1.96   1.4     43.     CLAY
 8.80  2.38  0.30  0.00   37.   0.64  0.40                               1.92   1.3     38.     CLAY
 9.00  2.27  0.29  0.00   35.   0.62  0.39                               1.82   1.2     34.     CLAY
 9.20  2.33  0.32  0.00   40.   0.63  0.41                               1.93   1.3     40.     CLAY
 9.40  2.52  0.26  0.00   36.   0.68  0.46                               2.24   1.4     39.     CLAY
 9.60  2.48  0.28  0.00   39.   0.67  0.46                               2.23   1.4     41.     CLAY
 9.80  1.89  0.46  0.00   49.   0.51  0.33                               1.49   0.9     42.   SILTY CLAY
10.00  1.37  0.42  0.00   34.   0.36  0.23                               0.93   0.6     28.   SILTY CLAY
10.20  1.93  0.53  0.00   60.   0.53  0.36                               1.60   0.9     51.   SILTY CLAY
10.40  2.27  0.35  0.00   48.   0.62  0.45                               2.11   1.2     47.   SILTY CLAY
10.60  2.39  0.29  0.00   42.   0.64  0.48                               2.32   1.3     44.     CLAY
END OF SOUNDING
```

PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

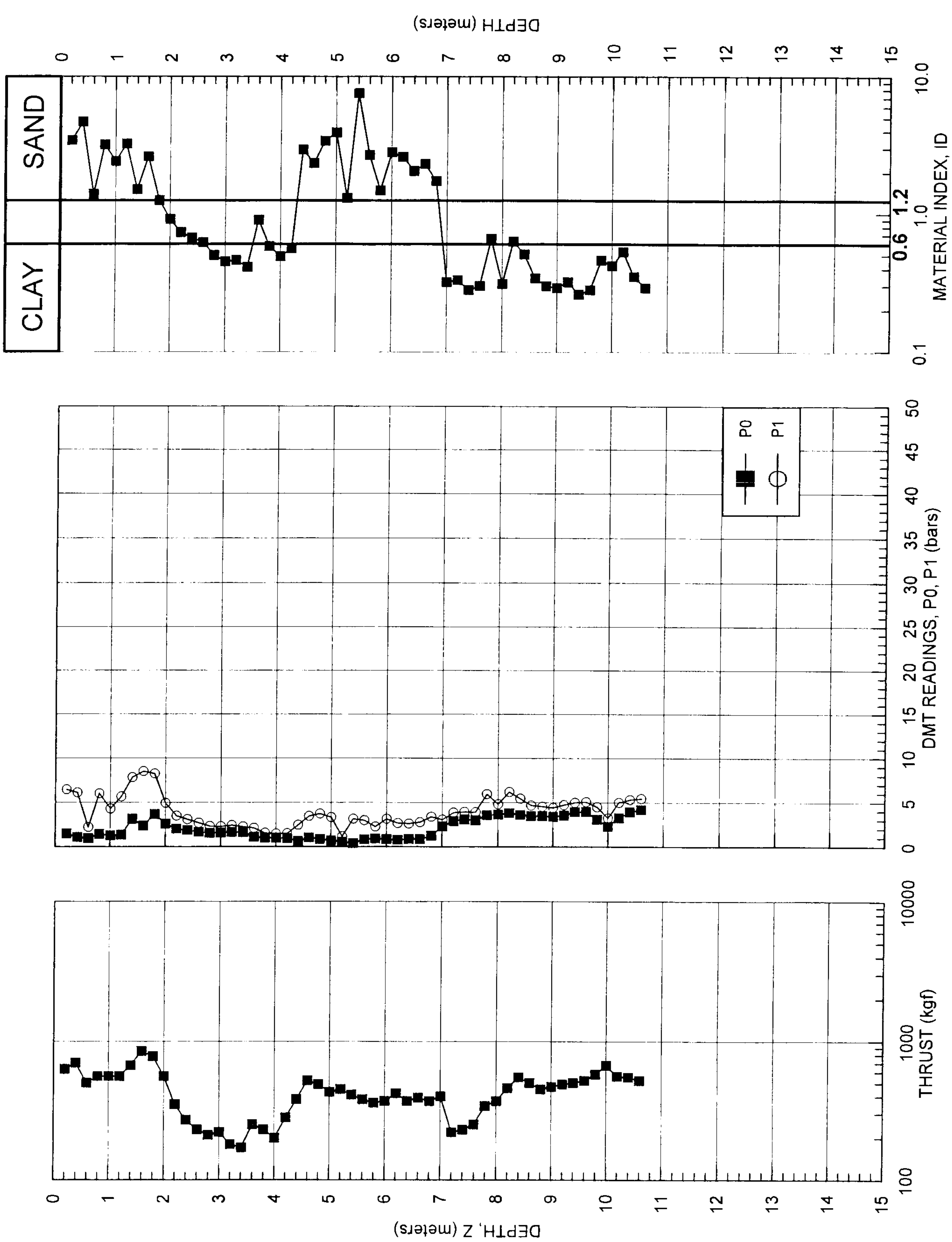
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-19-98

SOUNDING

D-8

DILATOMETER RESULTS

Ground Surface Elev.:
Water Depth: Not Found



PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

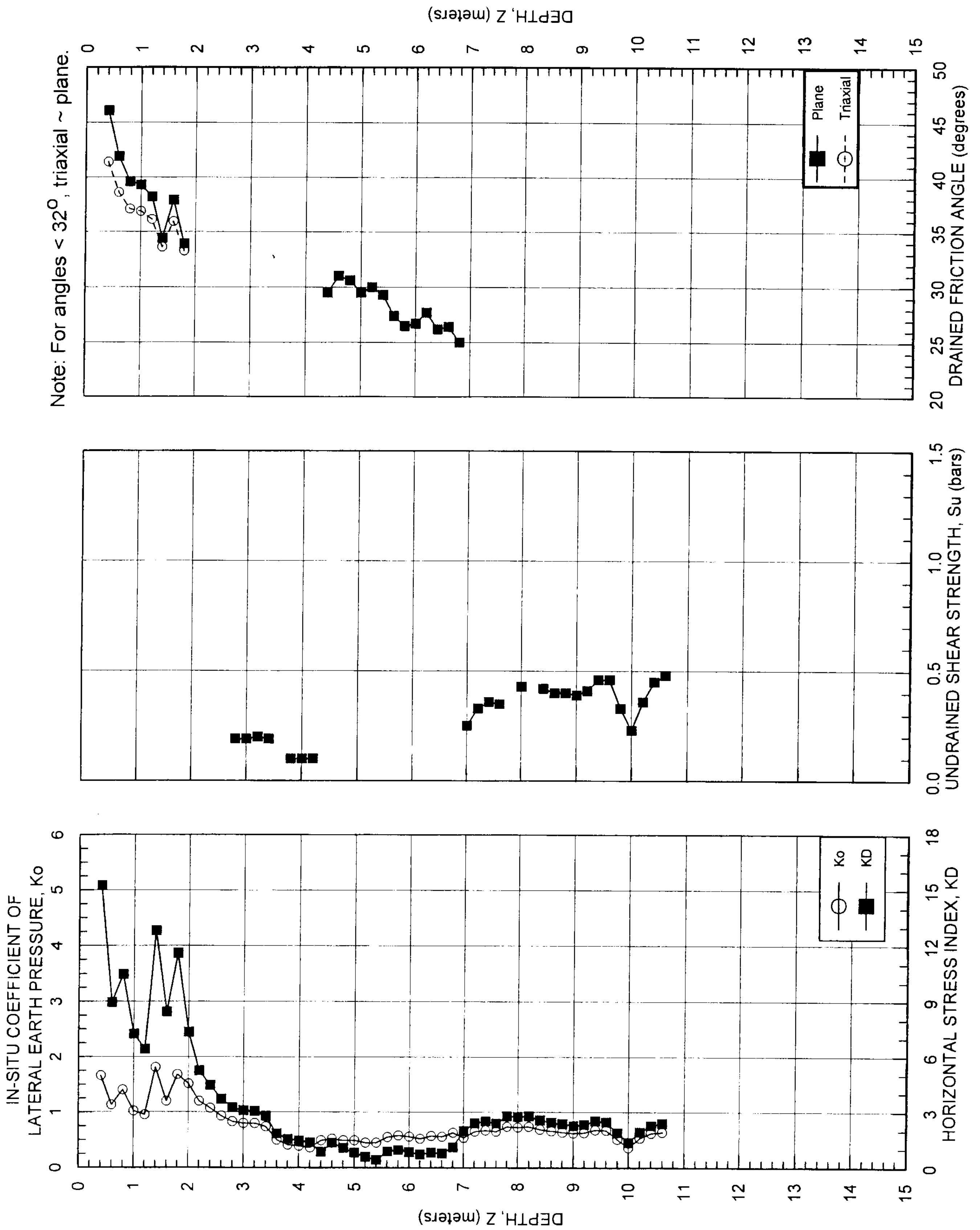
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-19-98

SOUNDING

D-8

INTERPRETED DMT STRENGTH PARAMETERS

Ground Surface Elev.:
Water Depth: None Found



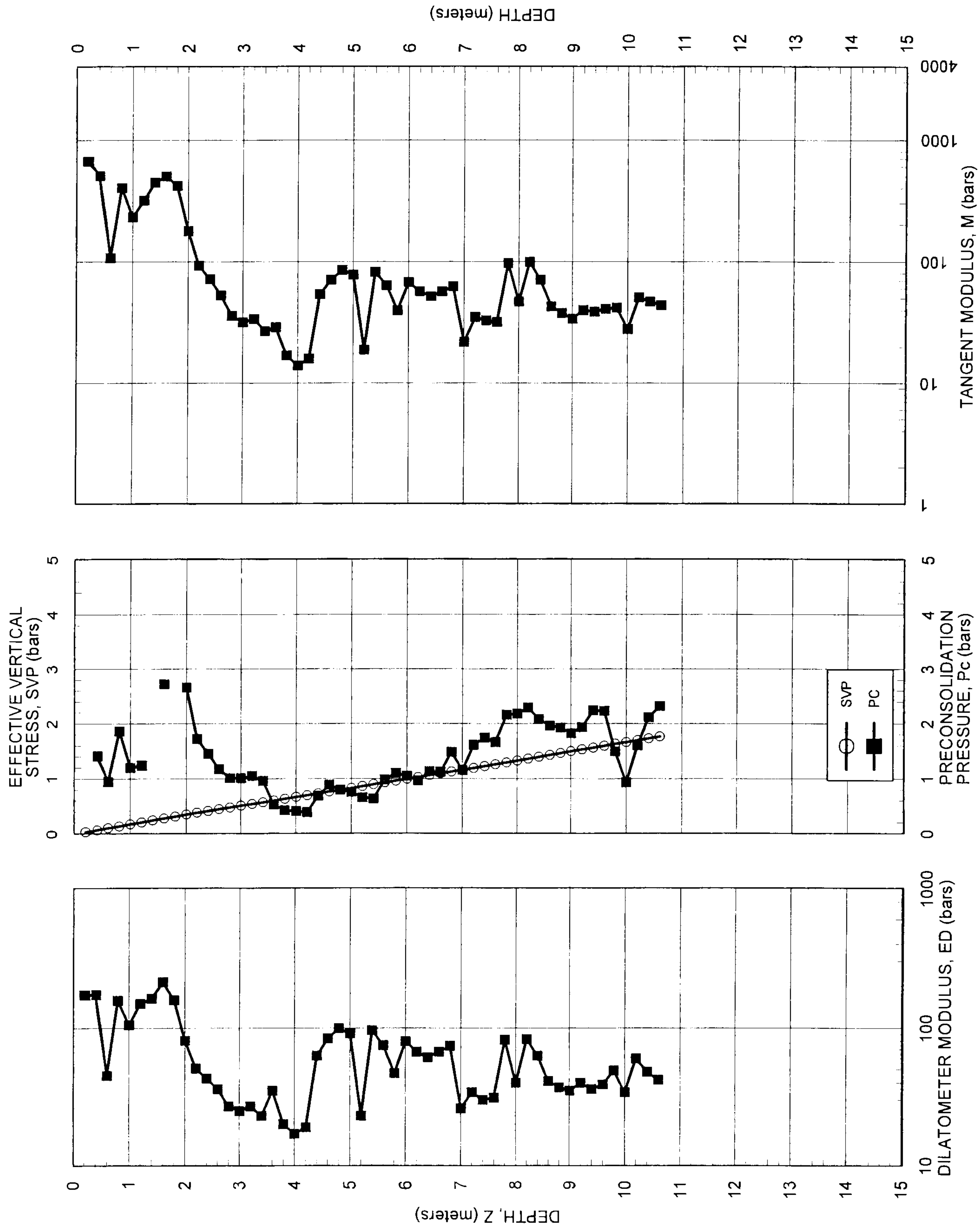
PROJECT: Corps of Engineers Dredge Storage Area
LOCATION: Cecilton, Maryland

IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 11-19-98

SOUNDING
D-8

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.:
Water Depth: None Found



APPENDIX C

LABORATORY TEST RESULTS
BY OTHER

PEARCE CREEK DREDGED MATERIAL CONTAINMENT AREA

TABLE C-1: SUMMARY OF PREVIOUS LABORATORY TESTS [1]

Test Boring Number	Sample Depth (feet)	Visual Description	Natural Water Content (ASTM D 2216) %	Less Than No. 200 Sieve (ASTM D 1140) %	Atterberg Limits (ASTM D 4318)		USCS Classification (ASTM D 2487)	Dry Density (PCF)	Unconfined Compressive [1] Strength, qu (ASTM D 2487) (KSF)	Triaxial				Consolidation Test (ASTM D 2435)	Grain Size (ASTM D 422)	
					Liquid Limit	Plasticity Index				UU (ASTM D 2850) (KSF)	CU (ASTM D 4767) C (KSF),	CU (ASTM D 4767) ϕ (degrees)	CD ϕ' (degrees)		Sieve	Hyd.
CSB-5A	8 - 10	Dark gray fat CLAY, some sand, trace mica, trace organics	45.8	80	65	33	CH	72.2		0.54	0.40	17.5	38.7		*	*
	22-24	Dark gray clayey SILT, inorganic, trace sand, trace mica, and organics	55.5	97	79	40	MH	64.5	0.70						*	*
CSB-7A	34-36	Dark gray clayey SILT, inorganic, trace mica, trace organics	35.7	99	53	22	MH	84.0	2.12					*	*	*
CSB-8	14-16	Dark gray clayey SILT, inorganic, trace mica, trace organics	61.1	98	95	53	MH	62.1		0.84					*	*
CSB-8A	40-42	Dark gray silty fat CLAY, trace mica and organics	32.7	99	57	28	CH	88.1			1.20	16	34		*	*
CSB-9	24-26	Dark gray clayey SILT, inorganic, trace mica, trace organics	36.4	99	56	23	MH	83.2	1.32						*	*
CSB-10A	8-10	Tan/light gray lean CLAY, some sand, trace mica, trace organics	20.0	79	39	20	CL	106.2	1.00						*	*
CSB-11	10-12	Tan lean CLAY, little sand, trace gravel, trace mica and organics	24.0	83	28	8	CL	101.3	0.38					*	*	*
	20-22	Dark gray fat CLAY, trace sand, mica, organics	59.3	92	78	44	CH	63.5		0.60	0.40	16	36		*	*
CSB-13	16-18	Tan/gray SILT/CLAY. inorganic, lean, some sand, trace mica	23.1	68	26	5	ML/CL	101.8	0.42						*	*
CSB-14	14-16	Dark gray clayey SILT, inorganic, trace sand, trace mica and organics	51.8	95	71	35	MH	67.6		0.50	0.40	15	34		*	*

[1] This laboratory testing was performed by others during previous geotechnical evaluations of the Pearce Creek Containment Area. The data sources are referenced in the report titled “C&D Canal Dredged Material Long Term Life Cycle Evaluation of Pearce Creek Dredged Material Containment Area,” by Duffield Associates, Incorporated, February 1999, and should be reviewed in the context of this report.

PEARCE CREEK DREDGED MATERIAL CONTAINMENT AREA

TABLE C-1: SUMMARY OF PREVIOUS LABORATORY TESTS [1]

					Atterberg Limits (ASTM D 4318)					Triaxial					Grain Size (ASTM D 422)	
											CU		CD			
											(ASTM D 4767)					
Test Boring Number	Sample Depth (feet)	Visual Description	Natural Water Content (ASTM D 2216) %	Less Than No. 200 Sieve (ASTM D 1140) %	Liquid Limit	Plasticity Index	USCS Classification (ASTM D 2487)	Dry Density (PCF)	Unconfined Compressive [1] Strength, qu (ASTM D 2487) (KSF)	UU (ASTM D 2850) (KSF)	C (KSF),	ϕ (degrees)	ϕ' (degrees)	Consolidation Test (ASTM D 2435)	Sieve	Hyd.
CSB-15	12-14	Gray fat CLAY, trace sand, mica, trace organics	57.9	97	78	46	CH	65.8	0.34					*	*	*
CSB-16	18-20	Dark gray clayey SILT, inorganic, trace mica, trace organics	42.6	99	62	26	MH	77.4	0.14		0.80	8	31		*	*
CSB-17	12-14	Gray/brown SILT, inorganic, trace sand, mica, trace organics	47.2	97	73	37	MH	70.3	0.23						*	*
CSB-18	6-8	Gray inorganic SILT, trace sand, mica, organics	59.3	98	81	43	MH	62.6	0.31					*	*	*

[1] This laboratory testing was performed by others during previous geotechnical evaluations of the Pearce Creek Containment Area. The data sources are referenced in the report titled “C&D Canal Dredged Material Long Term Life Cycle Evaluation of Pearce Creek Dredged Material Containment Area,” by Duffield Associates, Incorporated, February 1999, and should be reviewed in the context of this report.

PEARCE CREEK DREDGED MATERIAL CONTAINMENT AREA

TABLE C-1: SUMMARY OF PREVIOUS LABORATORY TESTS [1]

Test Boring Number	Sample Depth (feet)	Visual Description	Natural Water Content (ASTM D 2216) %	Less Than No. 200 Sieve (ASTM D 1140) %	Atterberg Limits (ASTM D 4318)		USCS Classification (ASTM D 2487)	Dry Density (PCF)	Unconfined Compressive [1] Strength, qu (ASTM D 2487) (KSF)	Triaxial				Consolidation Test (ASTM D 2435)	Grain Size (ASTM D 422)	
					Liquid Limit	Plasticity Index				UU (ASTM D 2850) (KSF)	CU (ASTM D 4767) c' (KSF),	CU (ASTM D 4767) φ' (degrees)	CD φ' (degrees)		Sieve	Hyd.
CSS-1	13.1	Dark gray lean CLAY, organic, with sand	76.1				OL	51.7		0.55						
	13.6		40.2	74.5	45	32	OL	78.8		0.53					*	*
CSS-2	27.4	Dark gray silty SAND, some organics	33.1				SM	84.3								
	27.9		32.1	40	NP	NP	SM	85.8							*	*
	28.4		21.3				SM	93.4								
CSS-3	12.4	Dark gray organic SILT	44.3				OH	73.2			0.13	32				
	12.9		44.0	90	56	26	OH	73.6							*	*
	13.4		46.1				OH	72.7								
CSS-4	12.7	Dark gray organic SILT	40.8				OH	77.3								
	13.2		48.3	93.5	53	24	OH	70.4		0.79					*	*
	13.7		55.6				OH	64.8								
CSS-5	12.3	Light gray/brown CLAY, lean, some organics	24.4	91	34	12	CL	101.3							*	*
	12.8		26.5				CL	96.4								
CSS-6	14.2	Dark gray organic SILT	60.3	100	80	39	OH	62.3						*	*	*
	14.7		64.0				OH	60.5		0.64						
	28.6	Dark gray organic CLAY	67.5	96	85	49	OH	60.5							*	*
	29.1	Lt./dk. gray clayey SILT, some organics	23.7				ML	100.6			0.25	31				
	29.6	Light gray clayey SILT, some organics	18.3				ML	111.6	1.27							
CSS-7	12.4	Dark gray organic CLAY	44.5	86	63	32	OH	75.0							*	*
	12.8		36.1				OH	81.8								
	13.3		36.9				OH	78.5		0.79						

[1] This laboratory testing was performed by others during previous geotechnical evaluations of the Pearce Creek Containment Area. The data sources are referenced in the report titled "C&D Canal Dredged Material Long Term Life Cycle Evaluation of Pearce Creek Dredged Material Containment Area," by Duffield Associates, Incorporated, February 1999, and should be reviewed in the context of this report.

APPENDIX D

LABORATORY TEST RESULTS
DUFFIELD ASSOCIATES, INC.

PEARCE CREEK DREDGED MATERIAL CONTAINMENT AREA

TABLE D.1 : LABORATORY TEST RESULTS SUMMARY

Test Boring Number	Sample Depth (feet)	Visual Description	Natural Water Content (ASTM D 2216) %	Less Than No. 200 Sieve (ASTM D 1140) %	Atterberg Limits (ASTM D 4318)		USCS Classification (ASTM D 2487)	Dry Density (PCF)	Unconfined Compressive [1] Strength, qu (ASTM D 2487) (KSF)	Triaxial [1]			Direct Shear [1] (ASTM D 3080)		Consolidation [1] Test	Grain Size [1] (ASTM D 422)	
					Liquid Limit	Plasticity Index				UU (ASTM D 2850)	$\overline{CU}$					Sieve	Hyd.
										(KSF)	C (ASTM D 4767) (KSF)	ϕ	C' (KSF)	ϕ'	(ASTM D 2435)		
TB-1	8 - 10	Gray clayey SILT, trace sand and organics	56.8	96.5			MH									*	*
	10 - 12	Gray and dark gray clayey SILT, trace sand and organics	39.2	92.7	59	26	MH	79.4	2.020								*
	20 - 22	Dark gray and brown clayey SILT, trace sand, mica and organics	49.8	91.0	54	23	MH	71.1		0.880					*		*
	38 - 40	Gray silty fine SAND, trace mica and organics	17.6	29.0			SM									*	
	56 - 58	Light brown fine to medium SAND, trace silt and mica	20.9	5.3			SP-SM									*	
TB-2	4 - 6	Dark gray clayey SILT, trace fine sand, mica and organics	49.4	93.6	71	32	MH	69.1		0.540							*
	12 - 14	Light-brown/gray silty CLAY, trace sand, mica and organics	27.4	91.1	39	15	CL	96.9	2.594						*		*
	16 - 18	Brown/gray mottled silty CLAY, trace sand	21.1	94.5	30	12	CL									*	*
	24 - 26	Brown/gray mottled silty CLAY, some sand	22.3	60.5			CL										
	40 - 42	Light gray fine to medium SAND, trace gravel and silt	14.3	6.7			SP-SM									*	

NOTE: 1. See accompanying test data.

PEARCE CREEK DREDGED MATERIAL CONTAINMENT AREA

TABLE D.1 : LABORATORY TEST RESULTS SUMMARY

Test Boring Number	Sample Depth (feet)	Visual Description	Natural Water Content (ASTM D 2216) %	Less Than No. 200 Sieve (ASTM D 1140) %	Atterberg Limits (ASTM D 4318)		USCS Classification (ASTM D 2487)	Dry Density (PCF)	Unconfined Compressive [1] Strength, qu (ASTM D 2487) (KSF)	Triaxial [1]			Direct Shear [1] (ASTM D 3080)		Consolidation [1] Test (ASTM D 2435)	Grain Size [1] (ASTM D 422)	
					Liquid Limit	Plasticity Index				UU (ASTM D 2850)	CU C (ASTM D 4767)					Sieve	Hyd.
										(KSF)	(KSF)	ϕ	C' (KSF)	ϕ'			
TB-3	2 - 4	Brown fine SAND, some/and silt	14.3	39.0			SM										
	4 - 6	Brown fine to coarse SAND, some gravel little silt	5.0	12.7			SM									*	
	6 - 8	Dark gray clayey SILT, some sand, trace mica and organics	38.6	79.2			MH										
	16 - 18	Dark gray clayey SILT, trace to little sand, trace mica and organics	46.2	89.0	52	22	MH	72.0	1.390				0.460	25°	*		
	24 - 26	Dark gray clayey SILT, trace sand, trace mica, trace organics	50.2	89.0	58	23	MH				.910	9°					*
	32 - 34	Dark gray clayey SILT, trace sand, trace mica, trace organics	56.6	96.9			MH										
	38 - 40	Varicolored fine SAND, some silt and clay	22.9	33.5			SM									*	
	48 - 50	Gray fine to medium SAND, trace silt	21.5	3.3			SP									*	
	64 - 66	Gray fine to coarse SAND, little gravel, trace silt	17.5	8.7			SW-SM									*	
	72 - 74	Gray fine SAND and silty clay, trace mica, trace organics	31.8	48.8			SM	88.7	1.520								

NOTE: 1. See accompanying test data.

TABLE D.1 : LABORATORY TEST RESULTS SUMMARY

Test Boring Number	Sample Depth (feet)	Visual Description	Natural Water Content (ASTM D 2216) %	Less Than No. 200 Sieve (ASTM D 1140) %	Atterberg Limits (ASTM D 4318)		USCS Classification (ASTM D 2487)	Dry Density (PCF)	Unconfined Compressive[1] Strength, qu (ASTM D 2487) (KSF)	Triaxial[1]			Direct Shear[1] (ASTM D 3080)		Consolidation[1] Test	Grain Size[1] (ASTM D 422)	
					Liquid Limit	Plasticity Index				UU (ASTM D 2850)	CU					Sieve	Hyd.
											C (ASTM D 4767)						
										(KSF)	(KSF)	ϕ	C' (KSF)	ϕ'	(ASTM D 2435)		
TB-4	4 - 6	Dark gray mottled clayey SILT, little sand, trace organics	44.5	89.3													
	8 - 10	Dark gray mottled clayey SILT, little sand, trace organics with sand lenses	18.10	41.89													
	14 - 16	Dark gray clayey SILT, little sand, trace organics	33.5	88.8													
	16 - 18	Dark and light gray clayey SILT, trace to little sand, trace mica and organics	34.2	89.2	40	12	ML	84.2	1.330				0.450	23°	*		*
	20 - 22	Dark gray clayey SILT, little sand, trace mica and organics	40.7	89.6													
	24 - 26	Dark gray and light gray clayey SILT, little sand, trace mica and organics	49.8	90.8			MH	65.7		0.887							
	28 - 30	Light gray brown fine to coarse SAND, some silt	13.0	33.2													
	38 - 40	Light gray brown mottled silty CLAY, little sand	25.3	85.0													
	50 - 52	Dark brown/gray clayey SILT, little sand, trace mica and organics	49.9	83.6	55	15	MH			1.77							
	60 - 62	Light gray fine to medium SAND, little silt	19.7	14.7													

NOTE: 1. See accompanying test data.

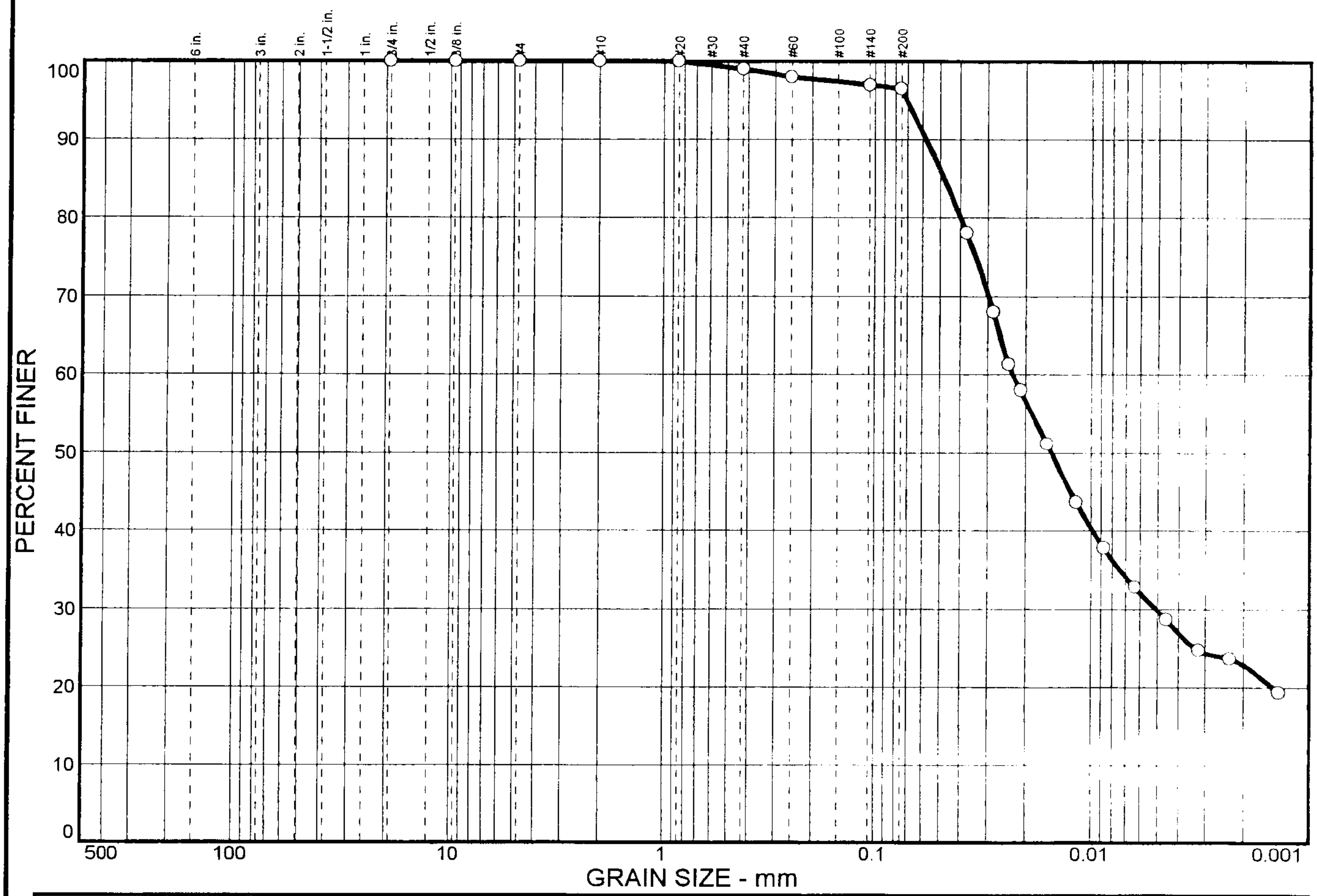
PEARCE CREEK DREDGED MATERIAL CONTAINMENT AREA

TABLE D.1 : LABORATORY TEST RESULTS SUMMARY

Test Boring Number	Sample Depth (feet)	Visual Description	Natural Water Content (ASTM D 2216) %	Less Than No. 200 Sieve (ASTM D 1140) %	Atterberg Limits (ASTM D 4318)		USCS Classification (ASTM D 2487)	Dry Density (PCF)	Unconfined Compressive [1] Strength, qu (ASTM D 2487) (KSF)	Triaxial [1]			Direct Shear [1] (ASTM D 3080)		Consolidation [1] Test	Grain Size [1] (ASTM D 422)	
					Liquid Limit	Plasticity Index				UU (ASTM D 2850) (KSF)	$\overline{\text{CU}}$ C (ASTM D 4767) (KSF)	ϕ	C' (KSF)	ϕ'	(ASTM D 2435)	Sieve	Hyd.
TB-5	4 - 6	Gray and dark gray silty CLAY, trace fine sand and organics	67.2	94.7	71	38	CH	56.6	0.370						*		
	10 - 12	Gray clayey SILT, trace mica and organics (plant stem)	67.5	99.2	72	36	MH	59.8		0.505					*		
	20 - 22	Dark gray silty CLAY, trace sand	11.3	98.0			MH										
	28 - 30	Light brown fine to coarse SAND, some gravel, little silt	13.1	11.6			SP-SM									*	
	40 - 42	Dark gray SILT, little sand with organics and peat	257.0	59.2			PT										
	44 - 46	Gray fine silty SAND, trace coarse sand and gravel	17.9	31.5			SM									*	
	54 - 56	Varicolored fine SAND, little silt	24.4	14.5			SM									*	
	72 - 74	Variegated red, light gray and brown CLAY, some/and fine sand	15.8	62.1	25	8	CL										
	74 - 75.5	Variegated pink, light gray, brown and red CLAY, little fine sand	15.8	88.7			CL	119.1	5.520		---	32°					

NOTE: 1. See accompanying test data.

PARTICLE SIZE DISTRIBUTION REPORT



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	3.5	66.6	29.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	100.0		
#4	100.0		
#10	100.0		
#20	100.0		
#40	99.0		
#60	98.0		
#140	97.0		
#200	96.5		

* (no specification provided)

Soil Description

Gray clayey SILT, trace sand and organics.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0478 D_{60}= 0.0229 D_{50}= 0.0152
D_{30}= 0.0050 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

Sample No.: S-5 **Source of Sample:** TB-1 **Date:** 12/28/98
Location: **Elev./Depth:** 8'-10'

DUFFIELD ASSOCIATES
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Client: U.S. Army Corps of Engineers
Project: Pearce Creek

Project No: 3769.GE **Reviewed by: JFC**

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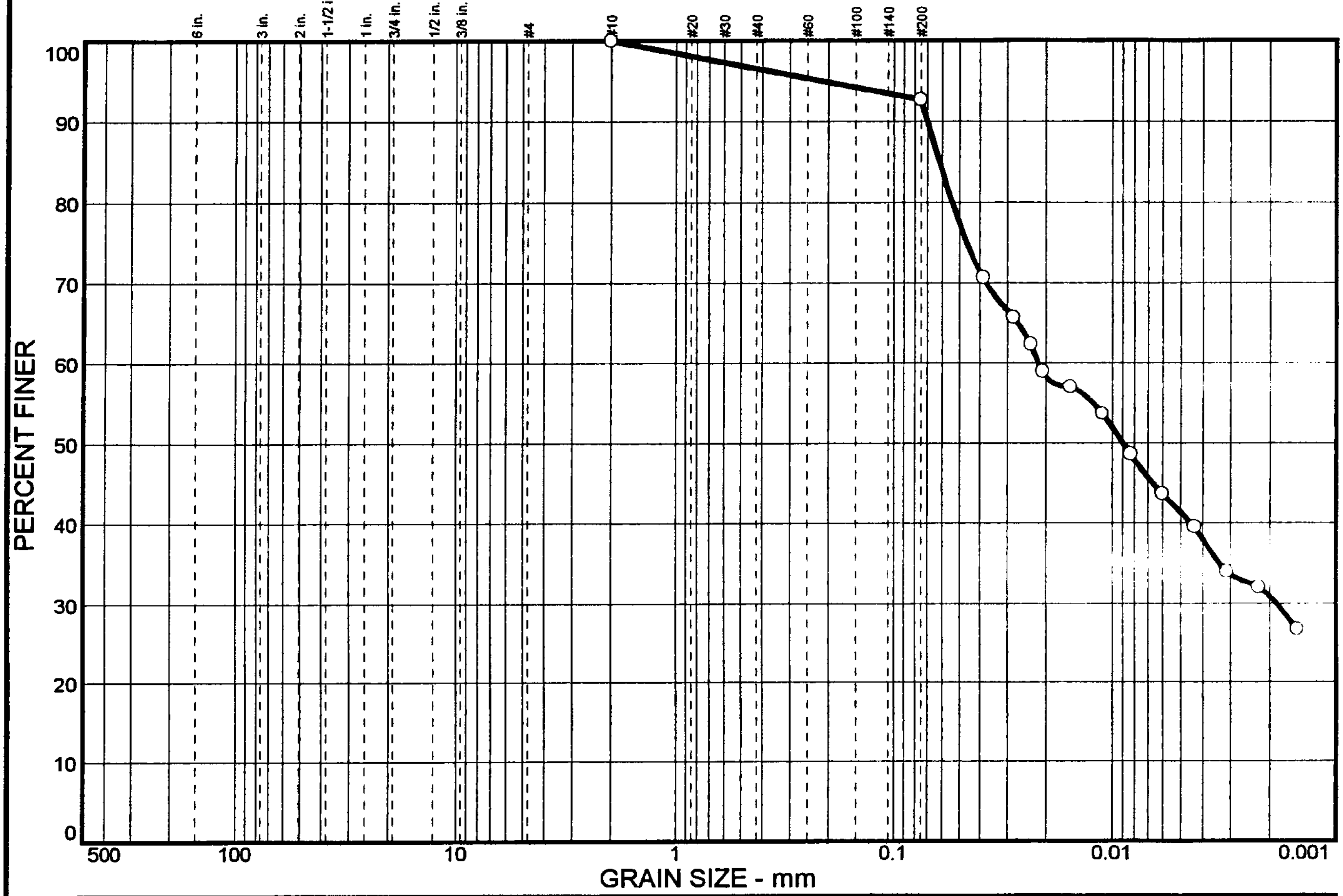

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	7.3	51.3	41.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#200	92.7		

* (no specification provided)

Soil Description

Gray/dark-gray clayey SILT, trace sand and organics.

Atterberg Limits

PL= 33 LL= 59 PI= 26

Coefficients

D_{85}= 0.0616 D_{60}= 0.0216 D_{50}= 0.0090
D_{30}= 0.0019 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

Sample No.: SH-1 **Source of Sample:** TB-1 **Date:** 12/22/98
Location: **Elev./Depth:** 10'-12'

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Project No: 3769.GE **Reviewed by: JFC**

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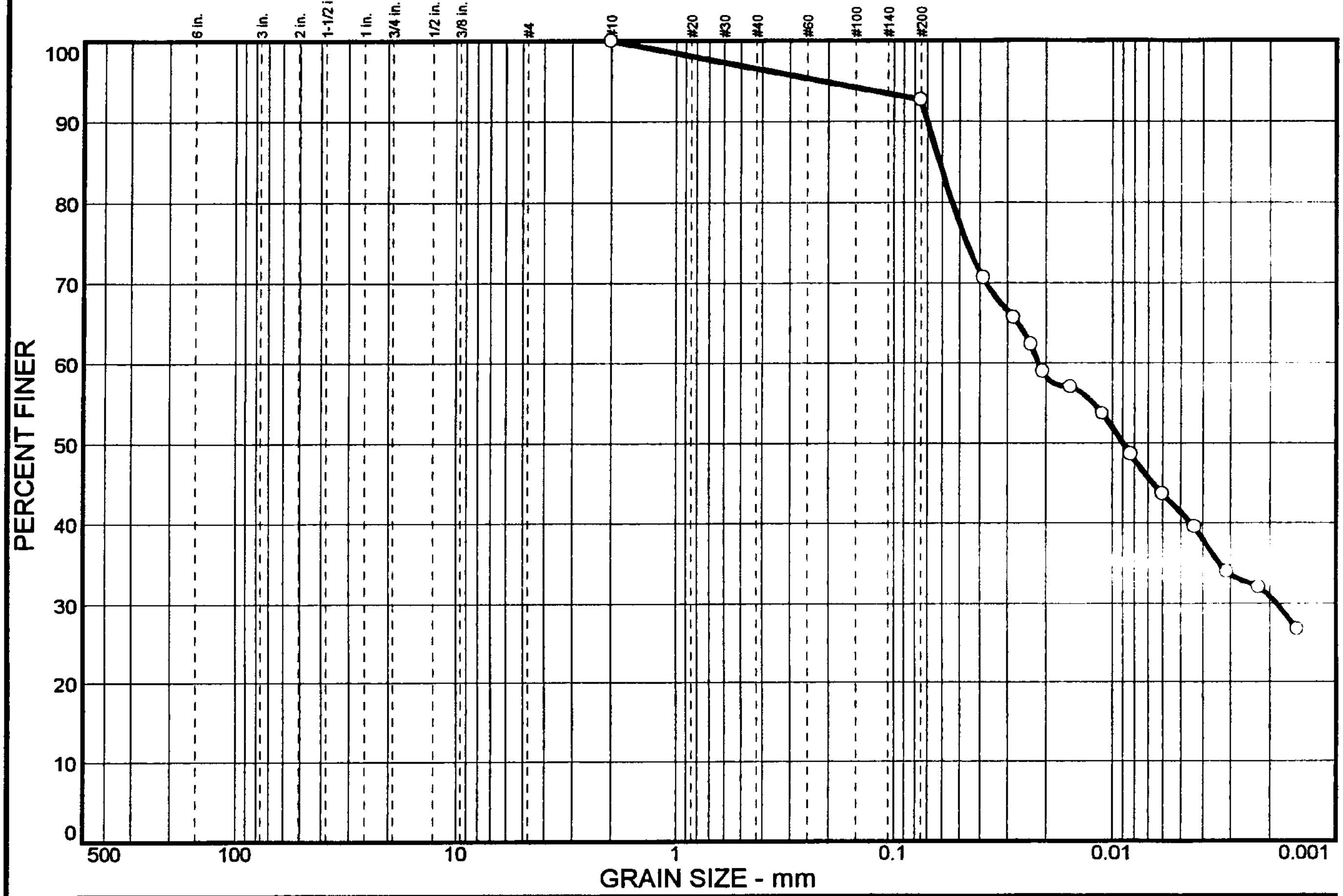

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	7.3	51.3	41.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#200	92.7		

* (no specification provided)

Soil Description

Gray/dark-gray clayey SILT, trace sand and organics.

Atterberg Limits

PL= 33 LL= 59 PI= 26

Coefficients

D_{85}= 0.0616 D_{60}= 0.0216 D_{50}= 0.0090

D_{30}= 0.0019 D_{15}= D_{10}=

C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

Sample No.: SH-1 **Source of Sample:** TB-1 **Date:** 12/22/98

Location: **Elev./Depth:** 10'-12'

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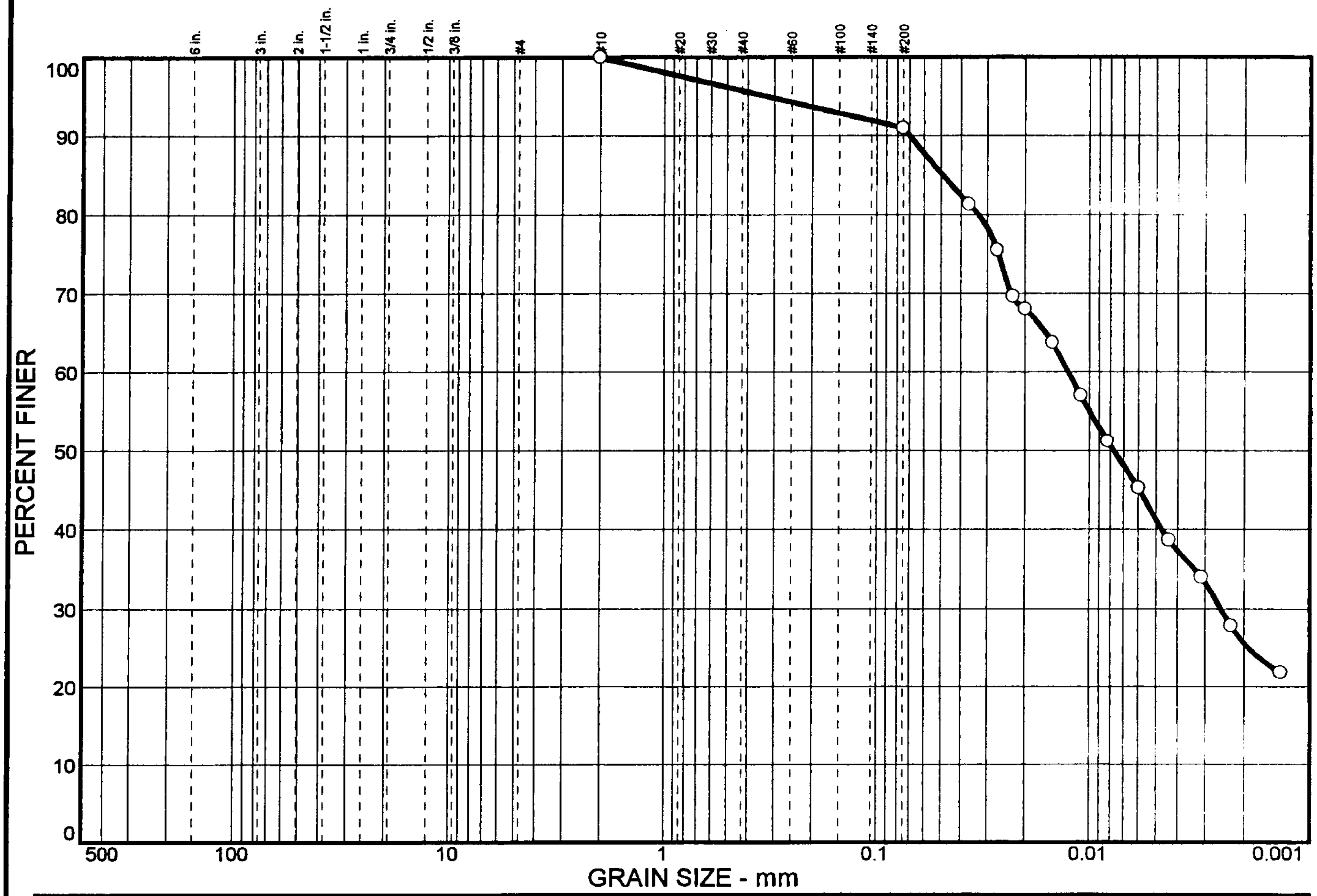

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	9.0	49.6	41.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#200	91.0		

* (no specification provided)

Soil Description

Dark-gray and brown clayey SILT, trace sand, mica and organics.

Atterberg Limits

PL= 31 LL= 54 PI= 23

Coefficients

D_{85}= 0.0490 D_{60}= 0.0125 D_{50}= 0.0077
D_{30}= 0.0025 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

Sample No.: SH-2 **Source of Sample:** TB-1 **Date:** 12/28/98
Location: **Elev./Depth:** 20'-22'

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Project: Pearce Creek

Project No: 3769.GE **Reviewed by: JFC**

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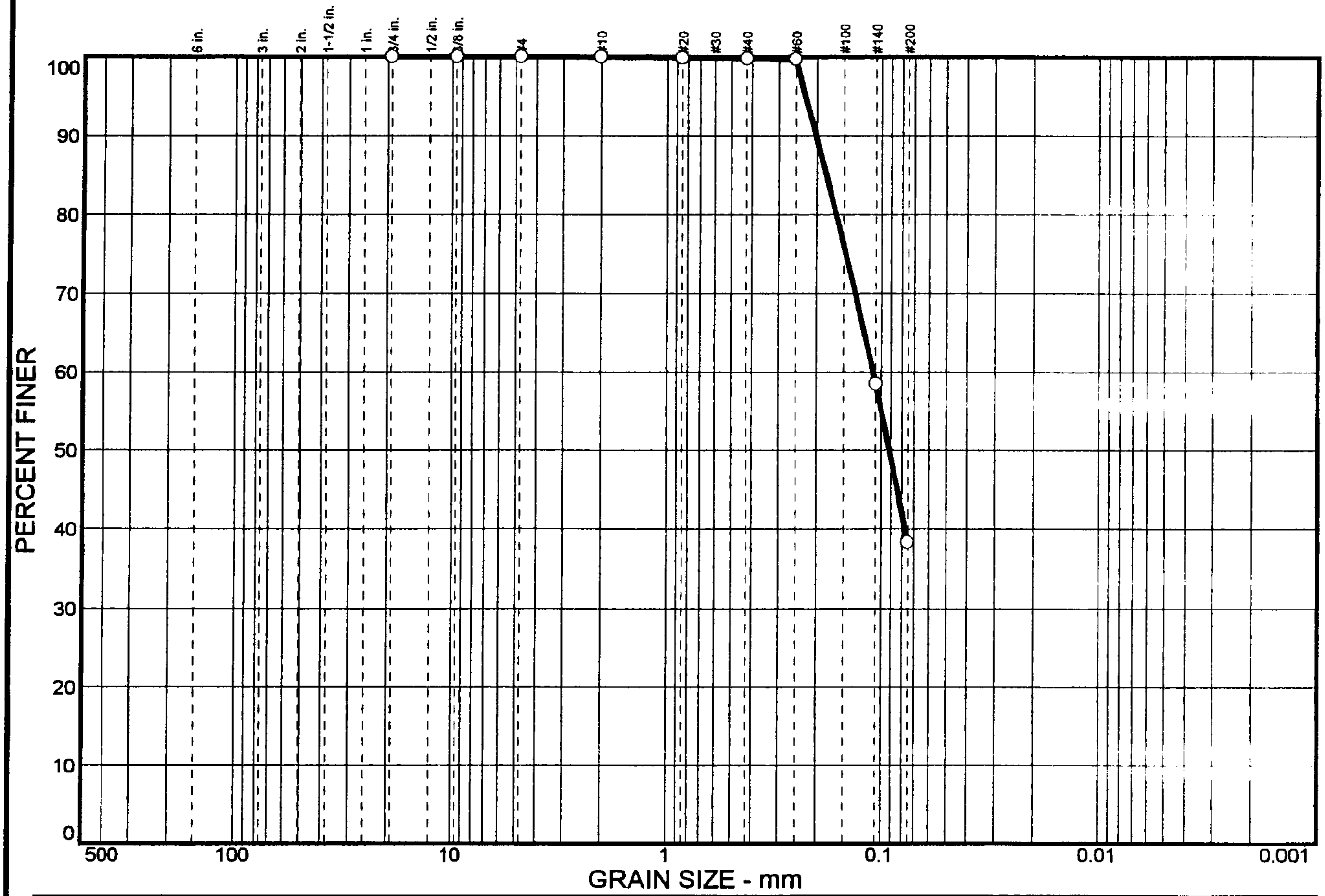

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	100.0		

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	100.0		
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.8		
#60	99.7		
#140	58.5		
#200	38.3		

* (no specification provided)

Soil Description

Gray silty fine SAND, trace mica and organics.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.180 D_{60}= 0.109 D_{50}= 0.0913
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample No.: S-18 **Source of Sample:** TB-1 **Date:** 12/18/98
Location: **Elev./Depth:** 38'-40'

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Project: Pearce Creek

Project No: 3769.GE **Reviewed by: JFC**

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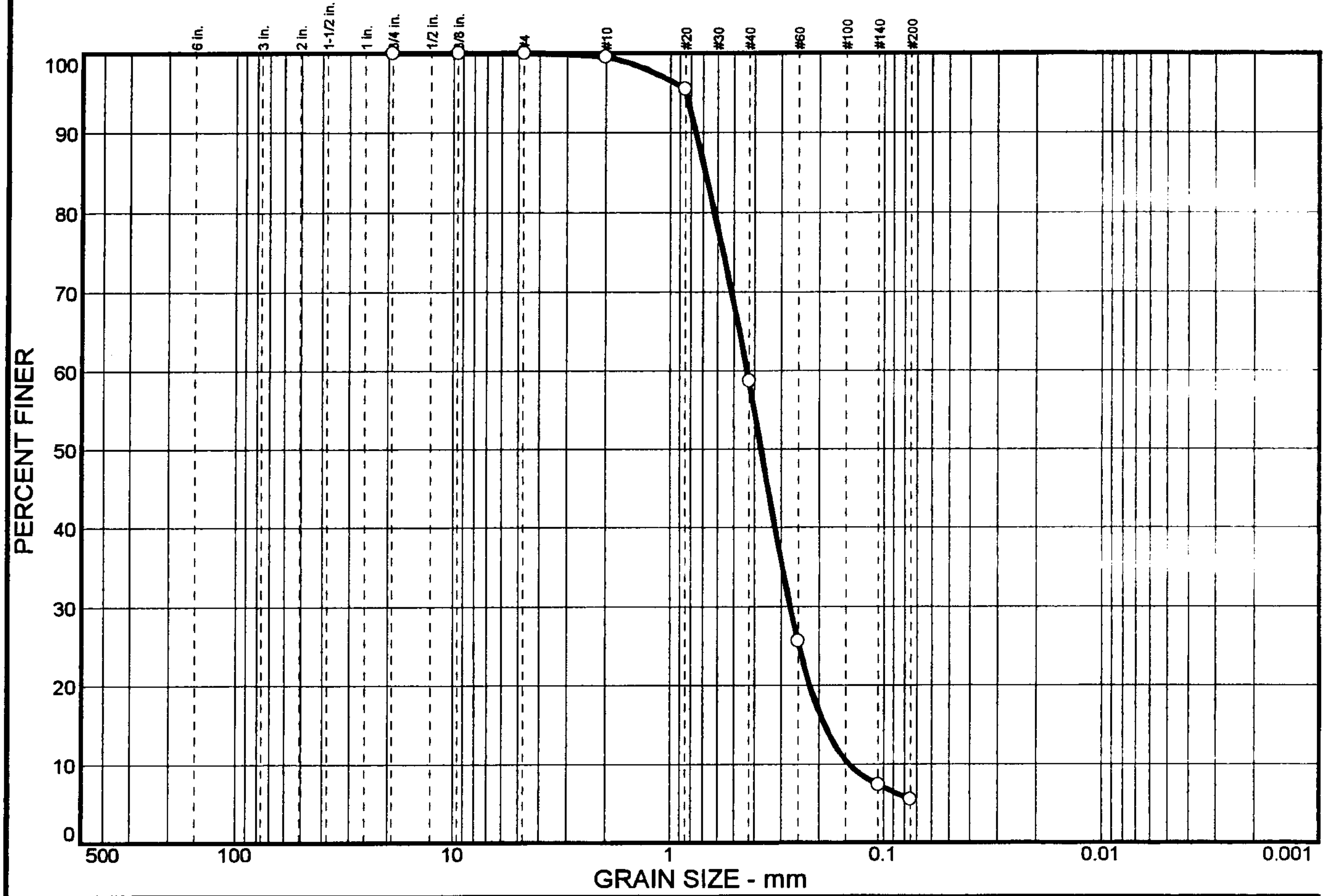

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	94.5	5.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	100.0		
#4	100.0		
#10	99.6		
#20	95.5		
#40	58.7		
#60	25.6		
#140	7.4		
#200	5.5		

* (no specification provided)

Soil Description

Light-brown fine to meidum SAND, trace silt, trace mica.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.683 D_{60}= 0.434 D_{50}= 0.372
D_{30}= 0.272 D_{15}= 0.188 D_{10}= 0.144
C_u= 3.02 C_c= 1.18

Classification

USCS= SP-SM AASHTO=

Remarks

Sample No.: S-27 **Source of Sample:** TB-1 **Date:** 12/08/98
Location: **Elev./Depth:** 56'-58'

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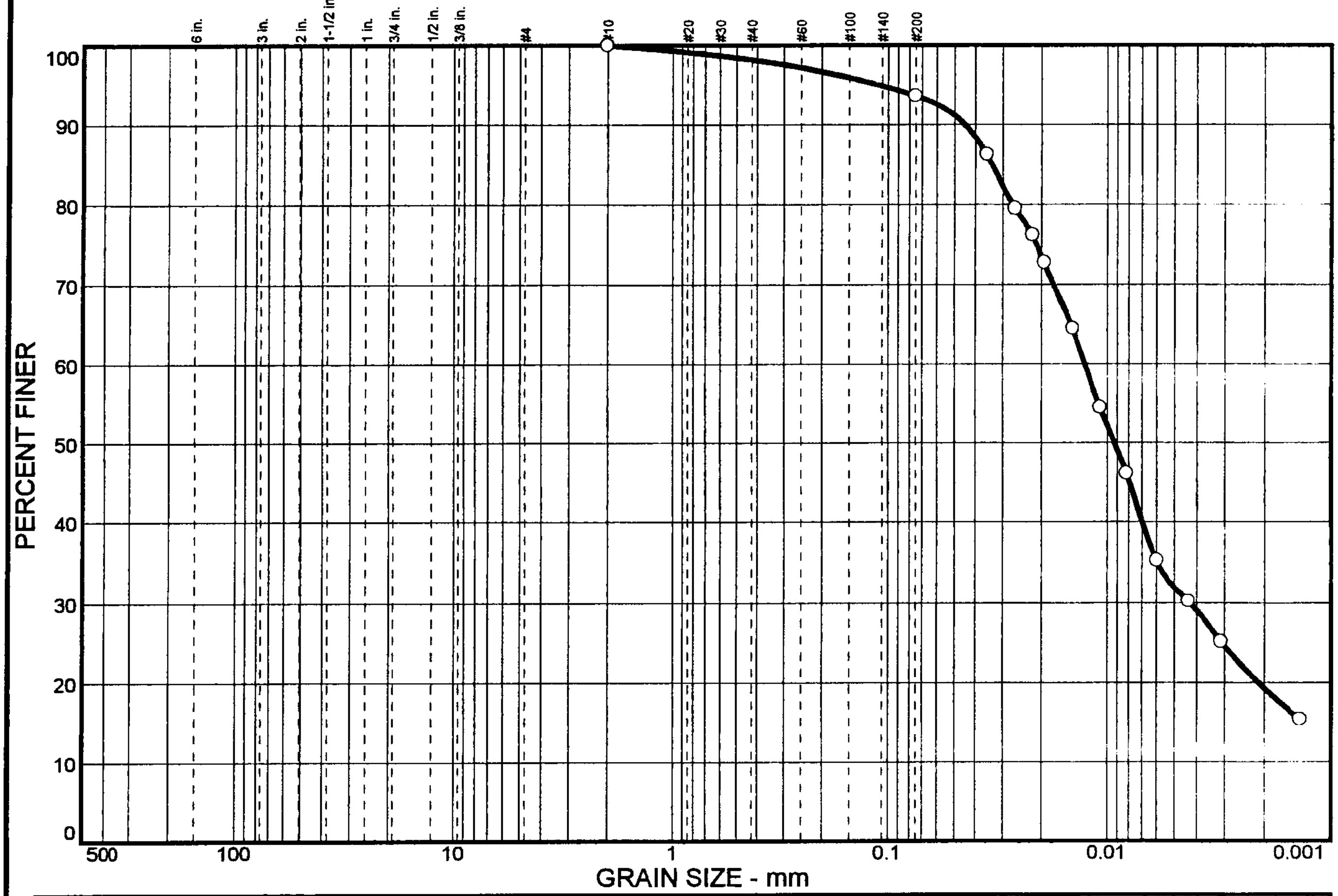
Project: Pearce Creek
Project No: 3769.GE **Reviewed by: JFC**

PARTICLE SIZE DISTRIBUTION REPORT



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	6.4	61.7	31.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#200	93.6		

* (no specification provided)

Soil Description

Dark-gray/black/gray SILT, some clay, trace fine sand, trace mica and organics.

Atterberg Limits

PL= 39 LL= 71 PI= 32

Coefficients

D_{85}= 0.0337 D_{60}= 0.0127 D_{50}= 0.0093
D_{30}= 0.0043 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

Sample No.: SH-1 **Source of Sample:** TB-2 **Date:** 01/09/99
Location: **Elev./Depth:** 4'-6'

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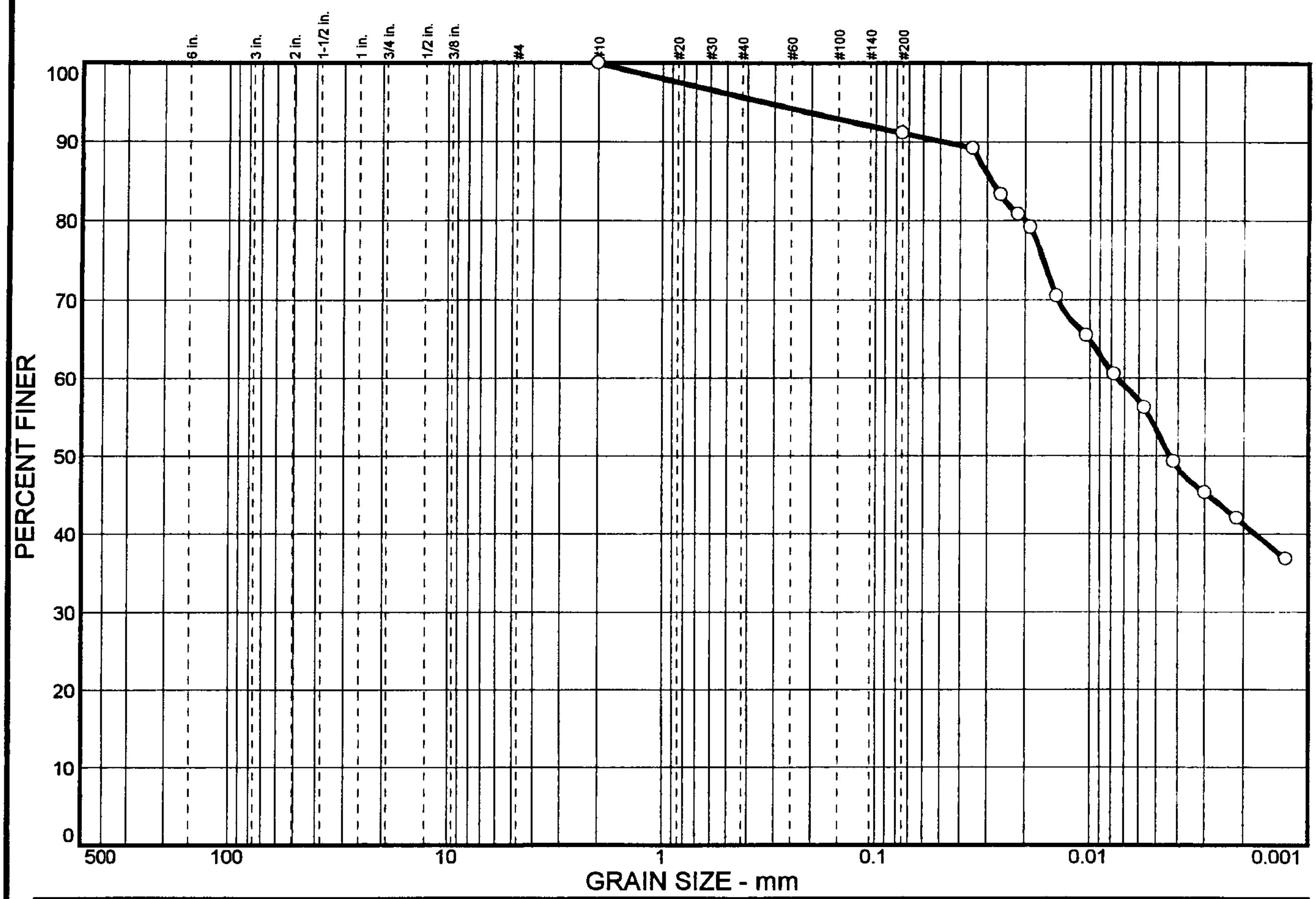

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	8.9	37.7	53.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#200	91.1		

* (no specification provided)

Soil Description

Light-br./gray silty CLAY, trace fine sand, trace medium sand, tr mica and organics.

Atterberg Limits

PL= 24 LL= 39.0 PI= 15.0

Coefficients

D_{85}= 0.0285 D_{60}= 0.0075 D_{50}= 0.0043
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample No.: SH-2 **Source of Sample:** TB-2 **Date:** 12/28/98
Location: **Elev./Depth:** 12'-14'

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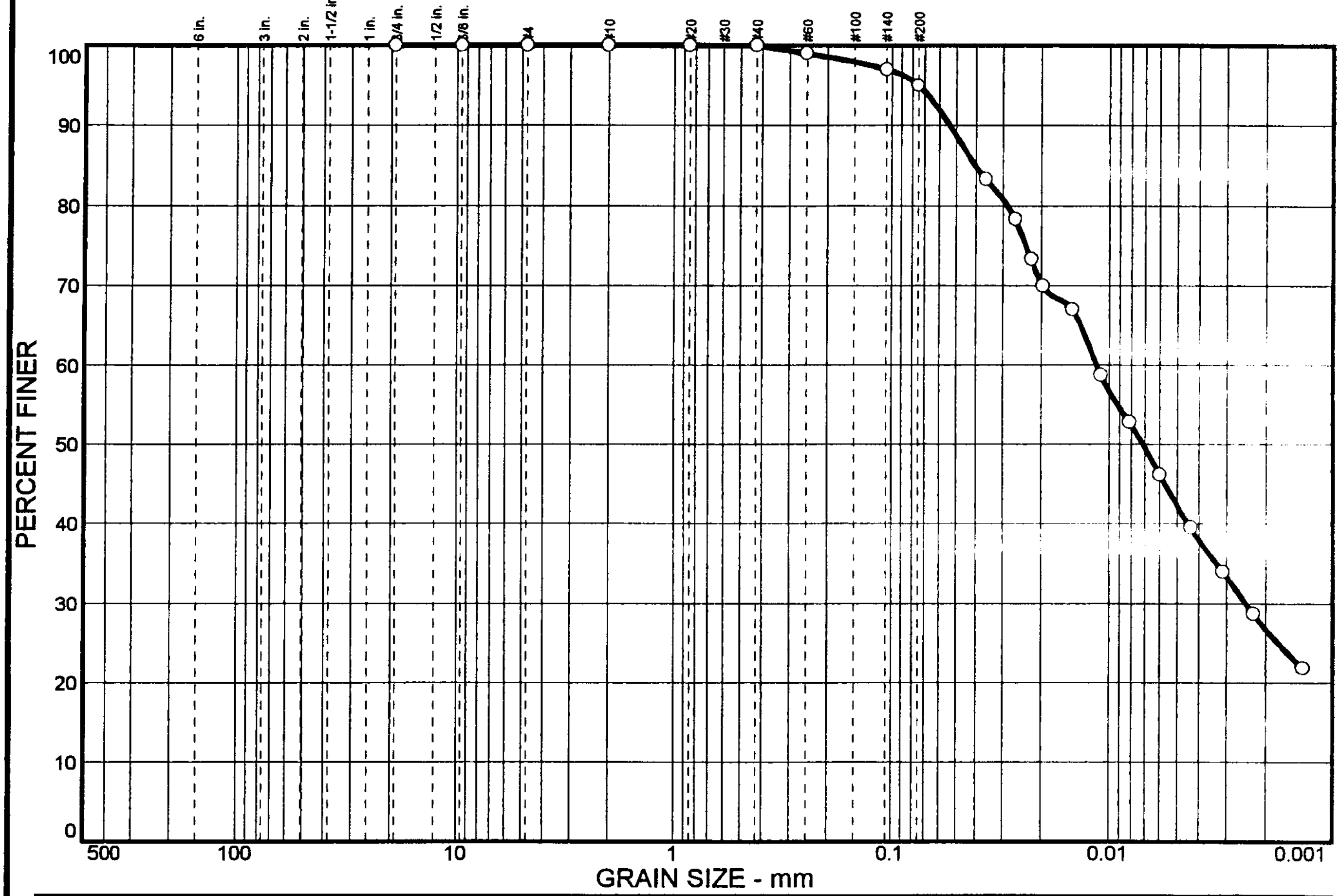
Project: Pearce Creek

Project No: 3769.GE **Reviewed by: JFC**

PARTICLE SIZE DISTRIBUTION REPORT



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	5.0	52.7	42.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	100.0		
#4	100.0		
#10	100.0		
#20	100.0		
#40	100.0		
#60	99.0		
#140	97.0		
#200	95.0		

* (no specification provided)

Soil Description

Gray/brown mottled silty CLAY, trace fine sand.

Atterberg Limits

PL= 18 LL= 30 PI= 12

Coefficients

D_{85}= 0.0402 D_{60}= 0.0113 D_{50}= 0.0071
D_{30}= 0.0025 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample No.: S-7 **Source of Sample:** TB-2 **Date:** 12/29/98
Location: **Elev./Depth:** 16'-18'

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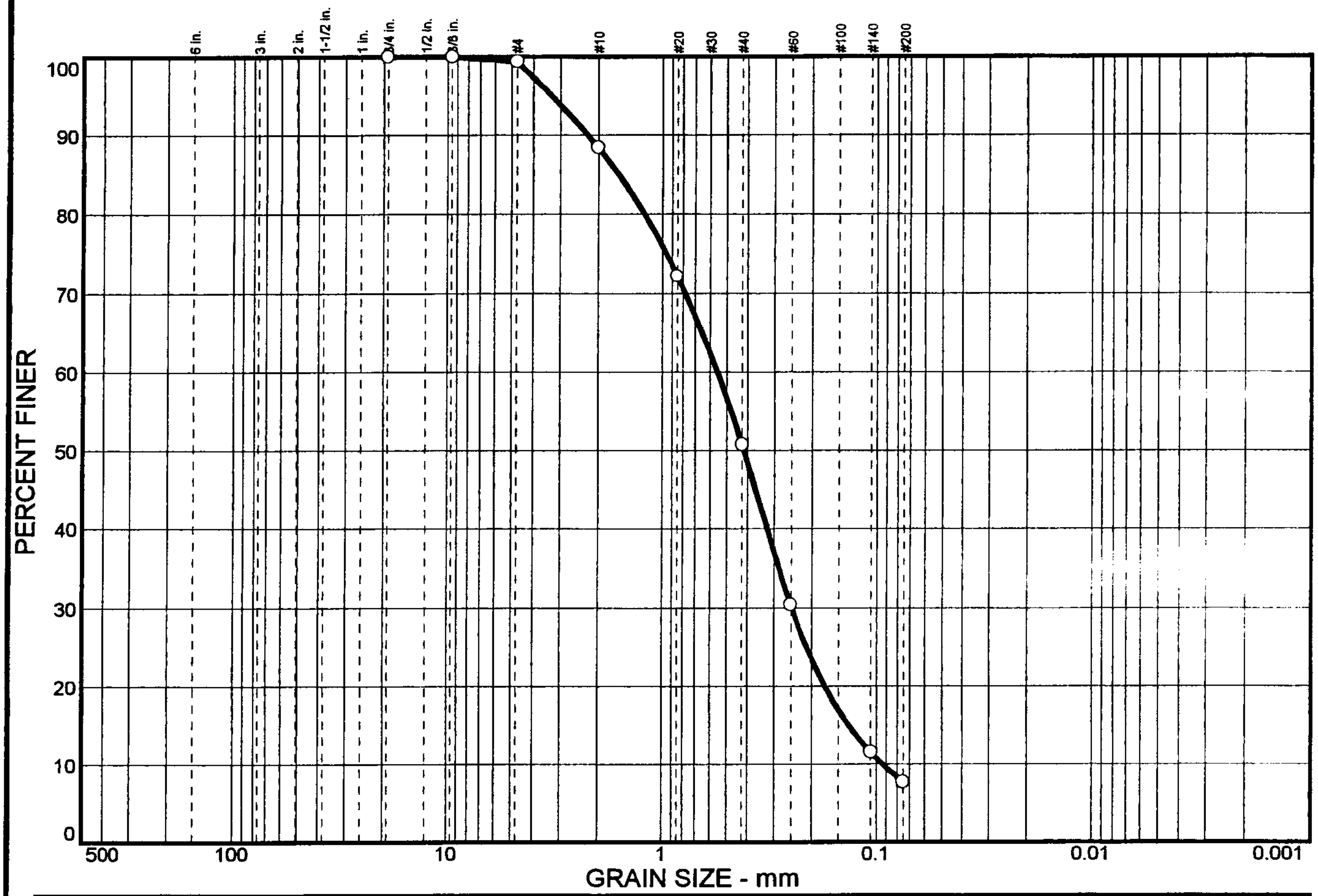
E-MAIL: DUFFIELD@DUFFNET.COM

Client: U.S. Army Corps of Engineers
Project: Pearce Creek

Project No: 3769.GE **Reviewed by: JFC**

PARTICLE SIZE DISTRIBUTION REPORT



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.6	91.7	7.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	100.0		
#4	99.4		
#10	88.4		
#20	72.2		
#40	50.8		
#60	30.4		
#140	11.5		
#200	7.7		

* (no specification provided)

Soil Description

Light gray fine to medium SAND, trace gravel and silt.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.61 D_{60}= 0.553 D_{50}= 0.416
D_{30}= 0.247 D_{15}= 0.134 D_{10}= 0.0934
C_u= 5.92 C_c= 1.18

Classification

USCS= SP-SM AASHTO=

Remarks

Sample No.: S-19 **Source of Sample:** TB-2 **Date:** 12/04/98
Location: **Elev./Depth:** 40'-42'

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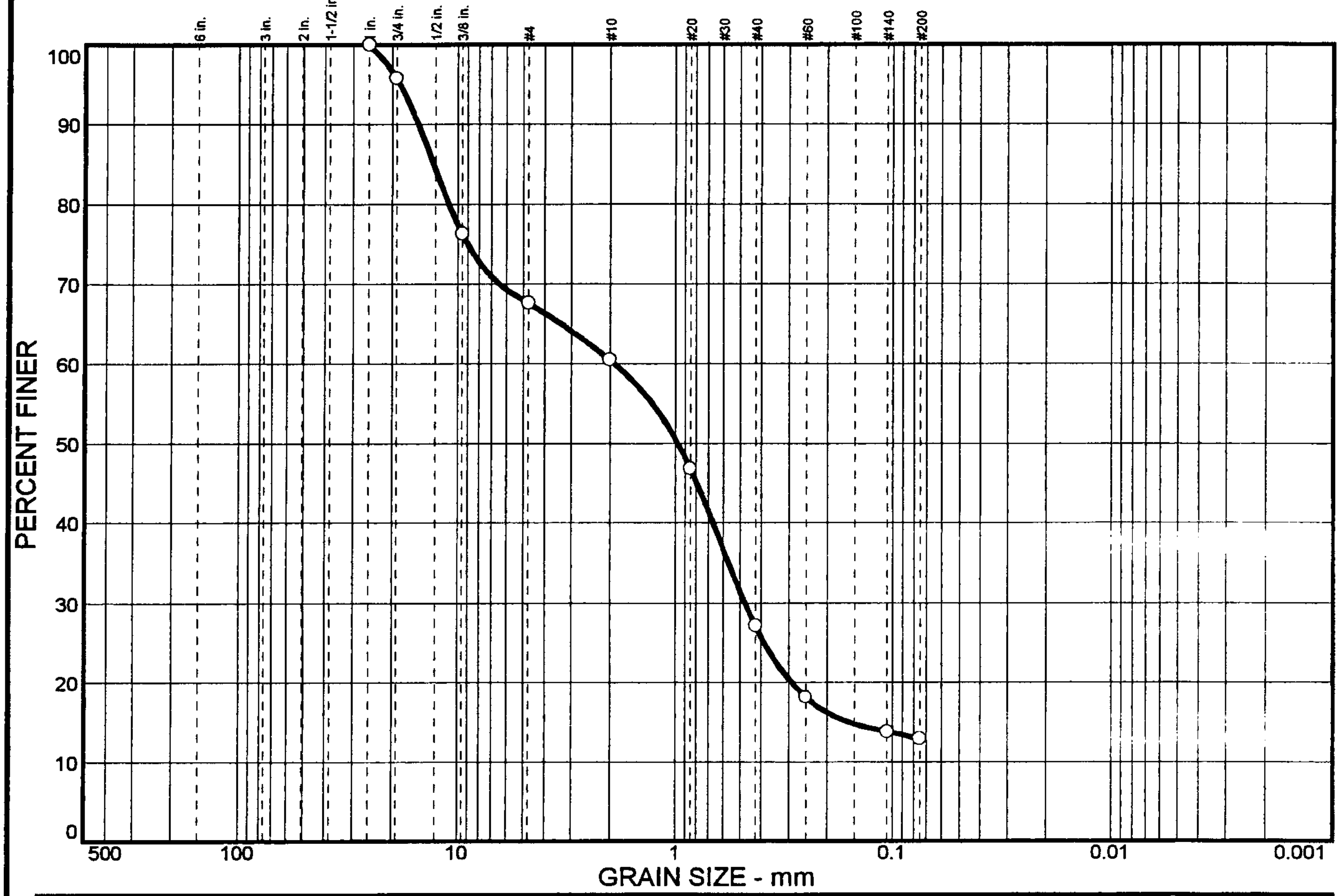
Client: U.S. Army Corps of Engineers
Project: Pearce Creek
Project No: 3769.GE **Reviewed by: JFC**

PARTICLE SIZE DISTRIBUTION REPORT



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	32.4	54.7	12.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
3/4 in.	95.8		
3/8 in.	76.3		
#4	67.6		
#10	60.5		
#20	46.9		
#40	27.1		
#60	18.1		
#140	13.8		
#200	12.9		

* (no specification provided)

Soil Description

Brown medium SAND some gravel, little fine sand, little silt, trace coarse sand.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 12.9 D_{60}= 1.90 D_{50}= 0.970
D_{30}= 0.475 D_{15}= 0.160 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample No.: S-3 **Source of Sample:** TB-3 **Date:** 12/08/98
Location: **Elev./Depth:** 4'-6'

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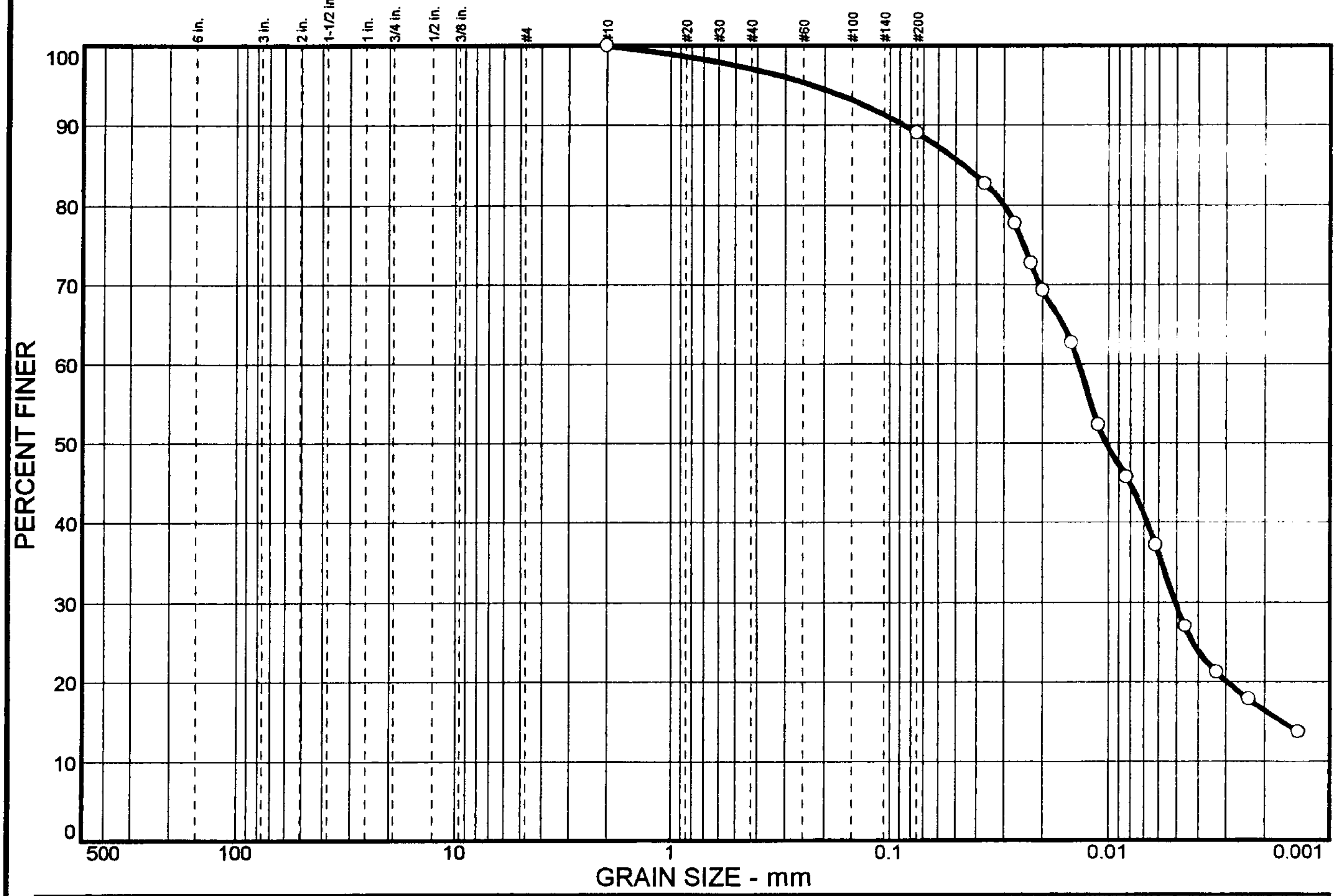
Client: U.S. Army Corps of Engineers
Project: Pearce Creek

Project No: 3769.GE **Reviewed by: JFC**

PARTICLE SIZE DISTRIBUTION REPORT



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	11.0	59.3	29.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#200	89.0		

* (no specification provided)

Soil Description

Dark gray clayey SILT, trace to little sand, trace mica and organics.

Atterberg Limits

PL= 35
LL= 58
PI= 23

Coefficients

D_{85}= 0.0460
D_{60}= 0.0136
D_{50}= 0.0102
D_{30}= 0.0050
D_{15}= 0.0017
D_{10}=
C_u=
C_c=

Classification

USCS= MH
AASHTO=

Remarks

Sample No.: SH-2
Source of Sample: TB-3
Date: 12/28/98
Location:
Elev./Depth: 24'-26'

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Project No: 3769.GE
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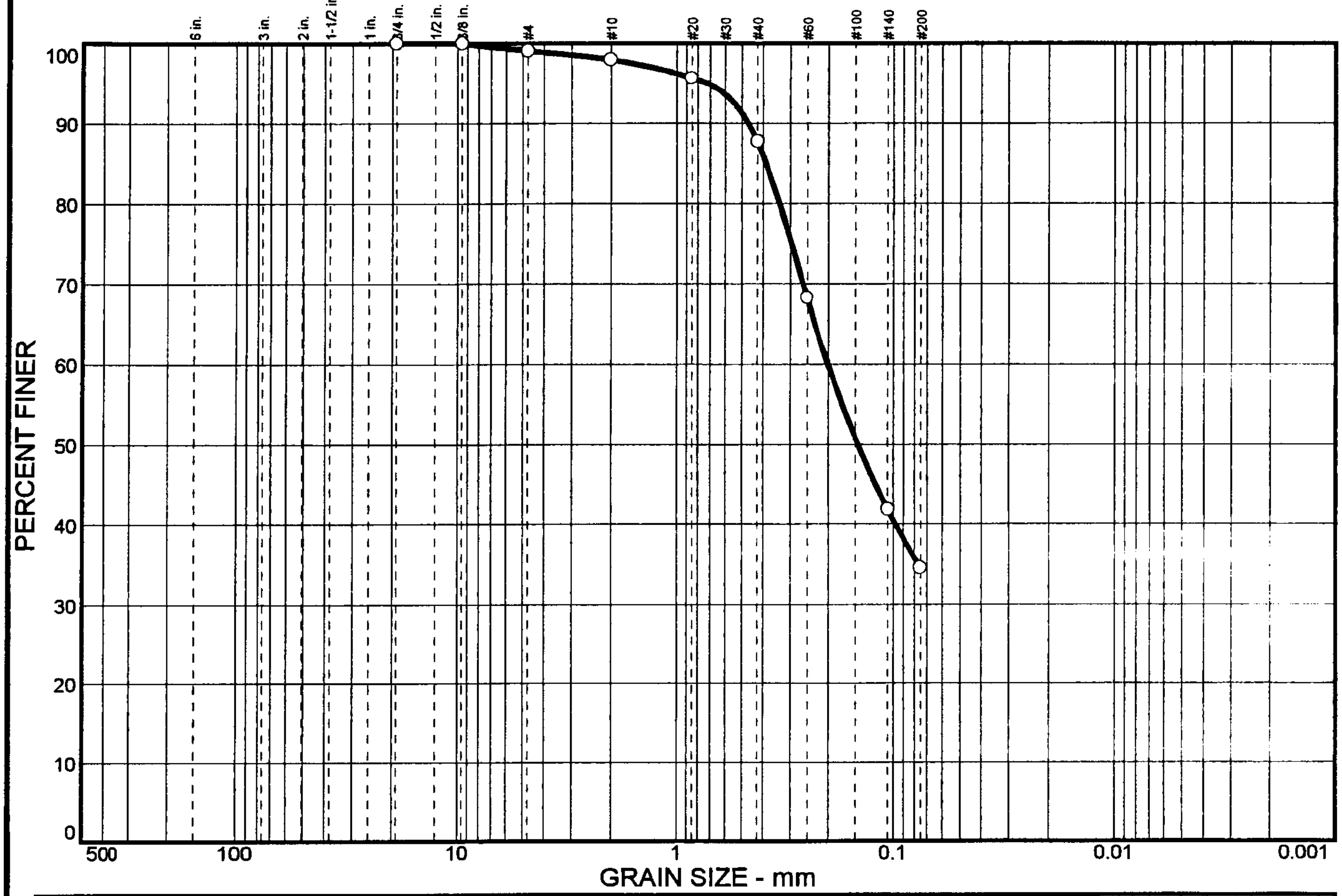
PARTICLE SIZE DISTRIBUTION REPORT



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.9	64.6	34.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	100.0		
#4	99.1		
#10	98.0		
#20	95.7		
#40	87.7		
#60	68.3		
#140	41.9		
#200	34.5		

* (no specification provided)

Soil Description

Varicolored fine SAND, some silt and clay, trace medium sand, trace coarse sand, trace gravel.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.388 D_{60}= 0.199 D_{50}= 0.145
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample No.: S-18 **Source of Sample:** TB-3 **Date:** 12/08/98
Location: **Elev./Depth:** 38'-40'

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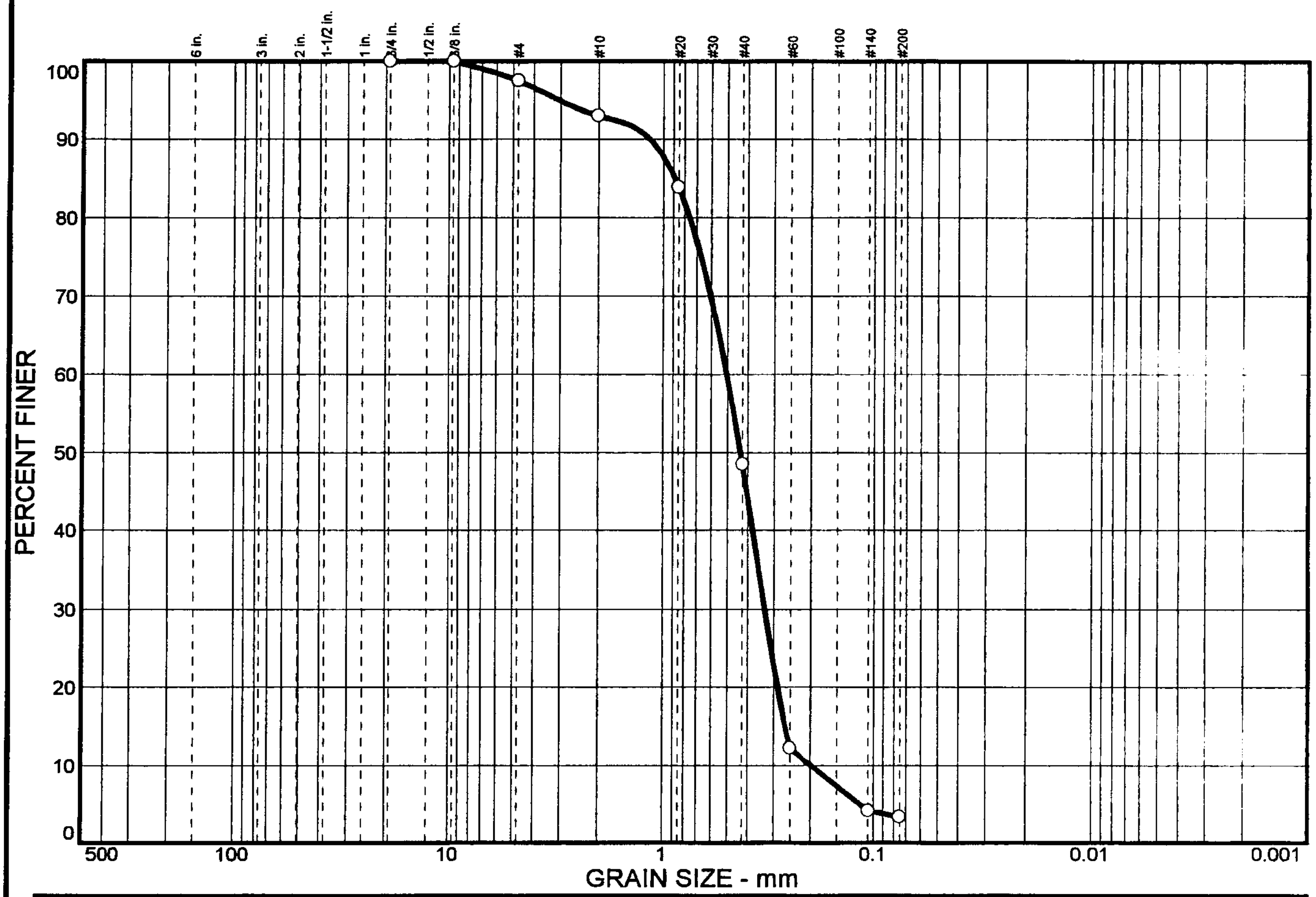
Project: Pearce Creek

Project No: 3769.GE **Reviewed by: JFC**

PARTICLE SIZE DISTRIBUTION REPORT



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.5	94.1	3.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	100.0		
#4	97.5		
#10	93.0		
#20	83.9		
#40	48.5		
#60	12.2		
#140	4.2		
#200	3.4		

* (no specification provided)

Soil Description

Gray fine to medium SAND, trace coarse sand, trace silt, trace gravel.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.885 D_{60}= 0.505 D_{50}= 0.434
D_{30}= 0.332 D_{15}= 0.264 D_{10}= 0.197
C_u= 2.56 C_c= 1.10

Classification

USCS= SP AASHTO=

Remarks

Sample No.: S-23 **Source of Sample:** TB-3 **Date:** 12/14/98
Location: **Elev./Depth:** 48'-50'

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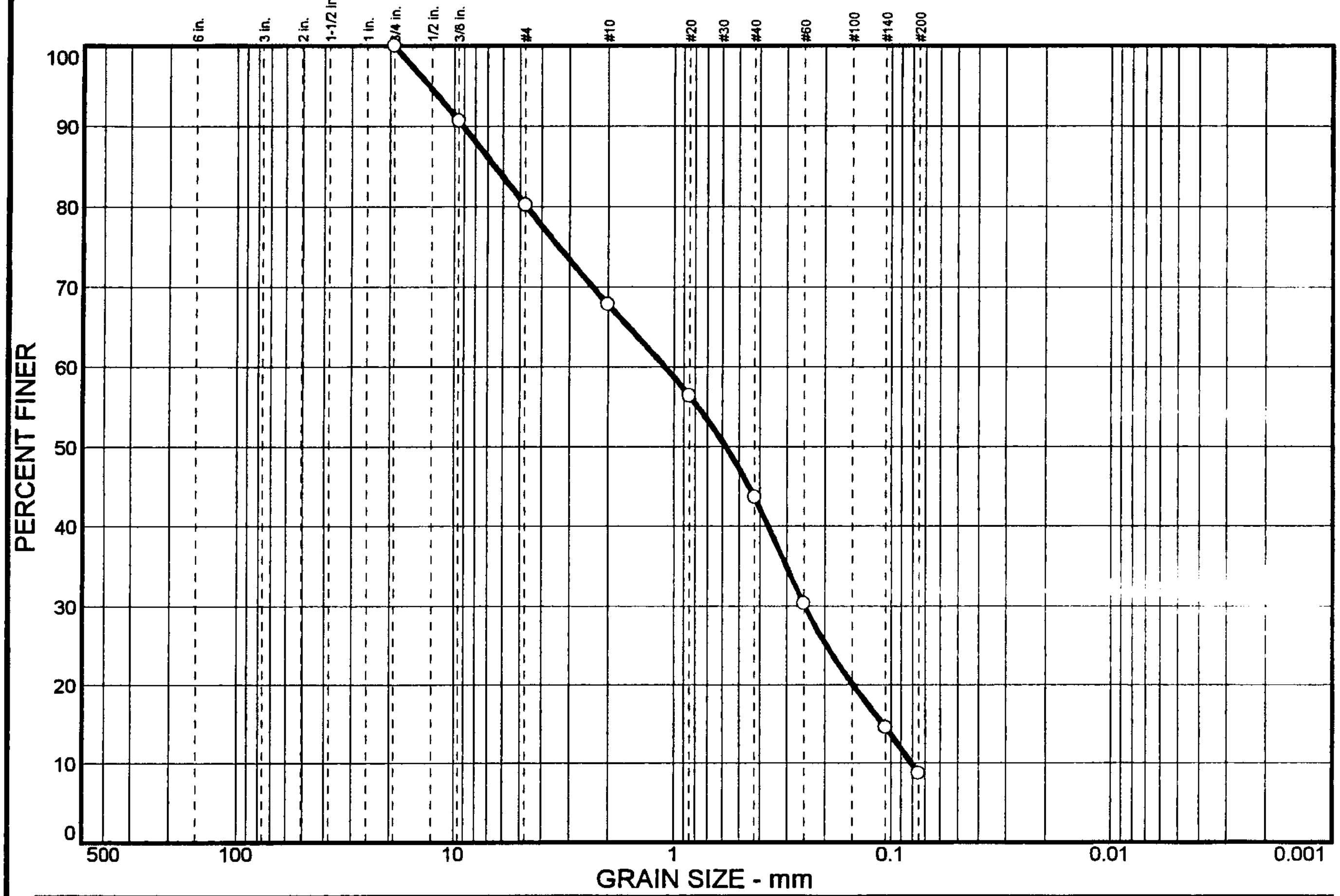
Client: U.S. Army Corps of Engineers
Project: Pearce Creek

Project No: 3769.GE **Reviewed by: JFC**

PARTICLE SIZE DISTRIBUTION REPORT



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	19.8	71.5	8.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	90.7		
#4	80.2		
#10	67.9		
#20	56.4		
#40	43.7		
#60	30.3		
#140	14.5		
#200	8.7		

* (no specification provided)

Soil Description

Gray fine to coarse SAND, little gravel, little coarse sand, trace silt.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 6.50 D_{60}= 1.10 D_{50}= 0.575
D_{30}= 0.247 D_{15}= 0.109 D_{10}= 0.0810
C_u= 13.54 C_c= 0.69

Classification

USCS= SW-SM AASHTO=

Remarks

Sample No.: S-31 **Source of Sample:** TB-3 **Date:** 12/08/98
Location: **Elev./Depth:** 64'-66'

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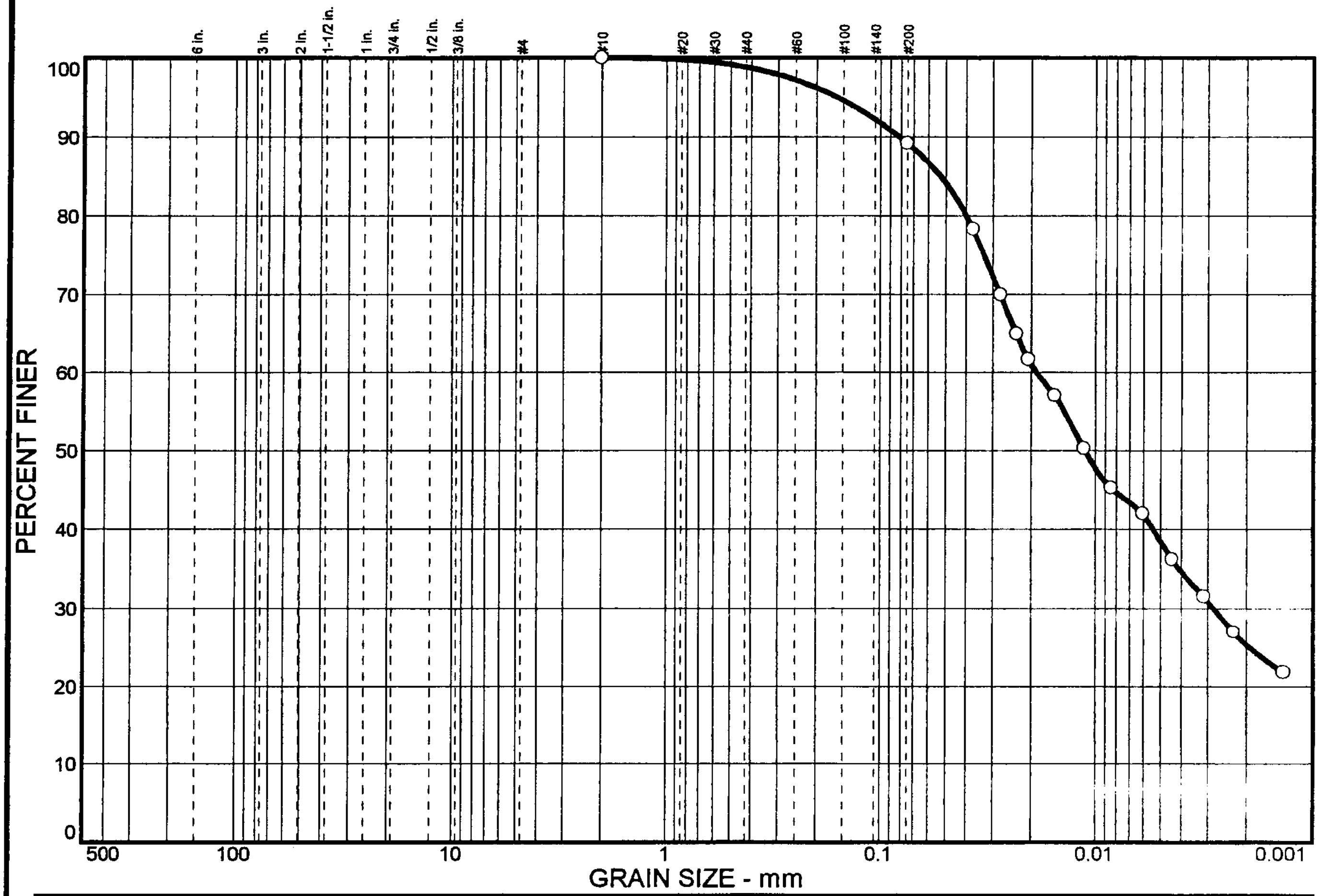
Client: U.S. Army Corps of Engineers
Project: Pearce Creek
Project No: 3769.GE **Reviewed by: JFC**

PARTICLE SIZE DISTRIBUTION REPORT



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	10.8	50.6	38.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#200	89.2		

* (no specification provided)

Soil Description

Dark-gray/light-gray clayey SILT, trace to little fine sand, trace mica and organics.

Atterberg Limits

PL= 27.5 LL= 40 PI= 12.5

Coefficients

D_{85}= 0.0526 D_{60}= 0.0188 D_{50}= 0.0112
D_{30}= 0.0028 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Sample No.: SH-1 **Source of Sample:** TB-4 **Date:** 12/15/98
Location: **Elev./Depth:** 16-18

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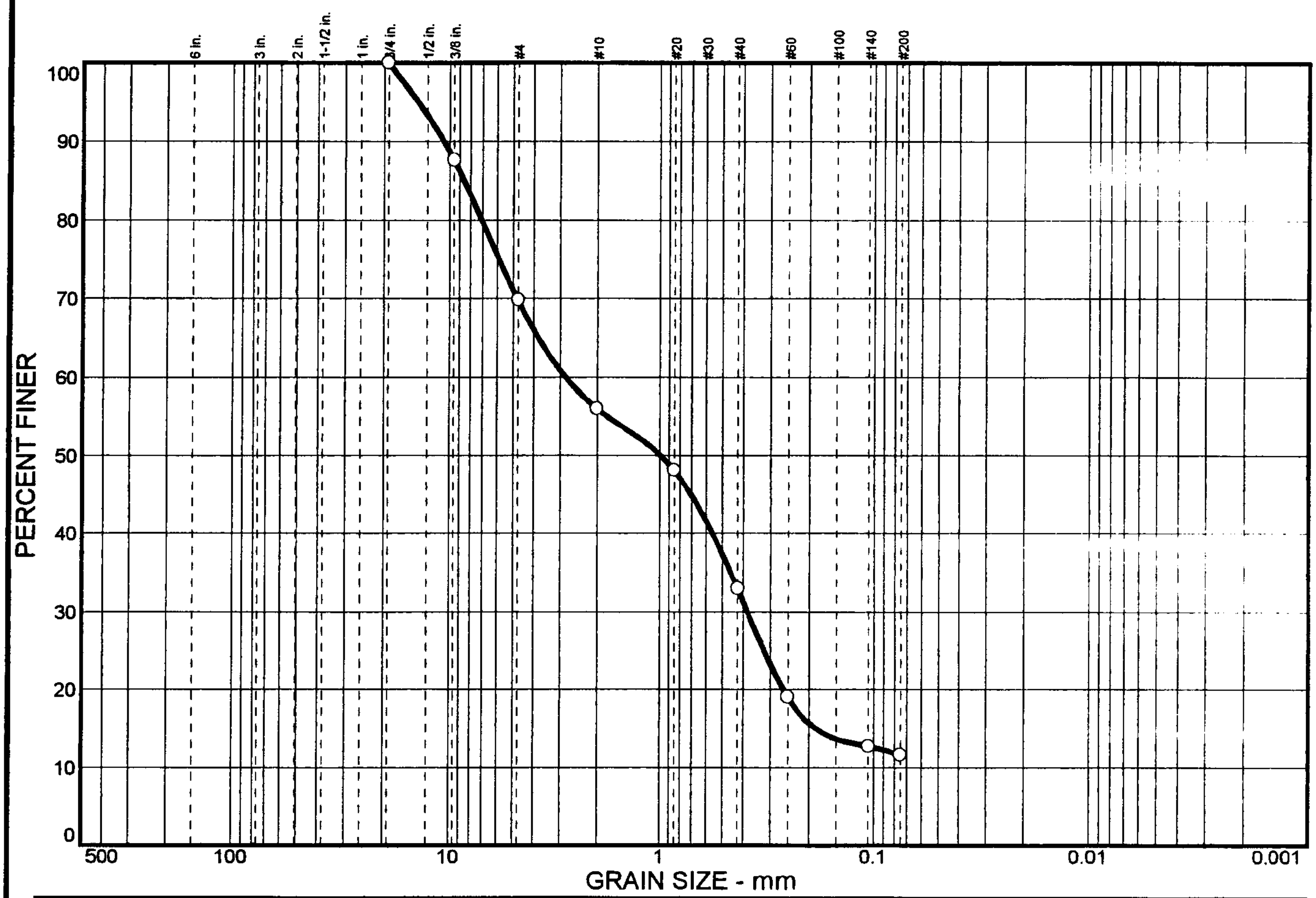
Project: Pearce Creek

Project No: 3769.GE **Reviewed by: JFC**

PARTICLE SIZE DISTRIBUTION REPORT



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	30.2	58.2	11.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	87.6		
#4	69.8		
#10	56.0		
#20	48.1		
#40	33.0		
#60	19.0		
#140	12.7		
#200	11.6		

* (no specification provided)

Soil Description

Light brown fine to coarse SAND, some gravel, little silt and clay.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 8.54 D_{60}= 2.81 D_{50}= 0.986
D_{30}= 0.382 D_{15}= 0.187 D_{10}=
C_u= C_c=

Classification

USCS= SP-SM AASHTO=

Remarks

Sample No.: S-13 **Source of Sample:** TB-5 **Date:** 12/08/98
Location: **Elev./Depth:** 28'-30'

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Project: Pearce Creek

Project No: 3769.GE **Reviewed by: JFC**

PARTICLE SIZE DISTRIBUTION REPORT

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	66.0	33.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	100.0		
#4	99.8		
#10	98.3		
#20	95.3		
#40	92.5		
#60	85.5		
#140	46.6		
#200	33.8		

* (no specification provided)

Soil Description

Gray fine silty SAND, trace medium sand, trace coarse sand, trace gravel.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.246 D_{60}= 0.140 D_{50}= 0.114
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample No.: S-20 **Source of Sample:** TB-5 **Date:** 12/08/98
Location: **Elev./Depth:** 44'-46'

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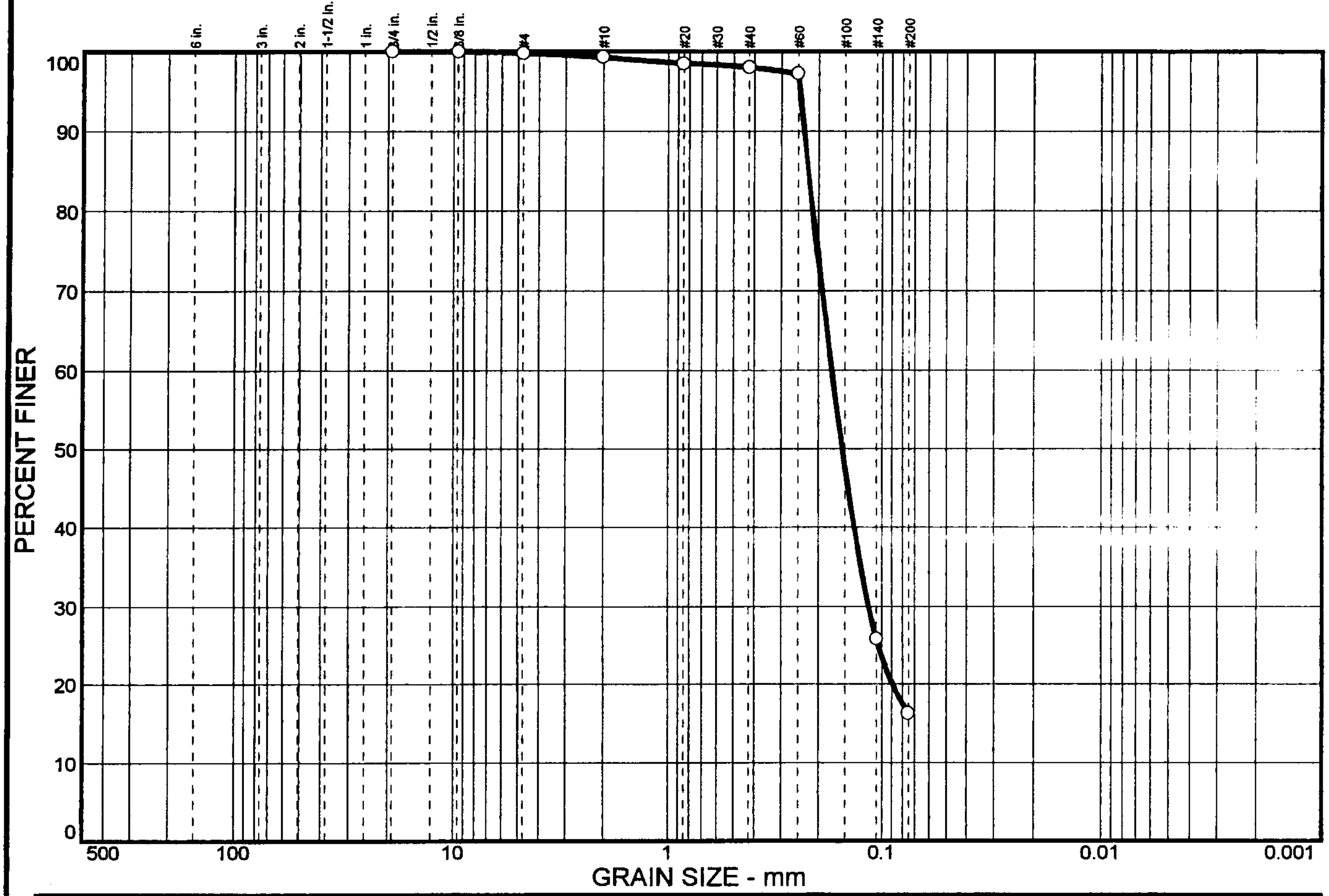
Client: U.S. Army Corps of Engineers
Project: Pearce Creek
Project No: 3769.GE **Reviewed by: JFC**

PARTICLE SIZE DISTRIBUTION REPORT



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	83.5	16.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	100.0		
#4	99.8		
#10	99.3		
#20	98.5		
#40	98.0		
#60	97.2		
#140	25.8		
#200	16.3		

* (no specification provided)

Soil Description

Varicolored fine SAND, little silt.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.222 D_{60}= 0.172 D_{50}= 0.153
D_{30}= 0.115 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample No.: S-25 **Source of Sample:** TB-5 **Date:** 12/08/98
Location: **Elev./Depth:** 54'-56'

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Client: U.S. Army Corps of Engineers
Project: Pearce Creek

Project No: 3769.GE **Reviewed by: JFC**

CONSOLIDATION TEST REPORT

Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α
2	0.25	2.66	0.000								
3	0.50	3.25	0.000								
4	1.00	1.63	0.001								
5	2.00	1.82	0.001								
6	4.00	1.14	0.002								
7	8.00	0.25	0.006								
8	16.00	0.12	0.009								
10	4.00	0.37									
11	2.00	0.10									
12	4.00	0.92	0.000								
13	8.00	0.95	0.001								
14	16.00	0.42	0.000								
15	32.00	0.12									

Material **Dark-gray and brown clayey SILT, trace sand, mica and organics.**

Overburden Pressure, p_o (ksf)

Preconsol. Pressure, p_c **4.71** (ksf)

Compression Index, c_c

	Before Test	After Test	
Water Content, w_o	**49.8** %	w_f	%
Void Ratio, e_o		e_f	
Saturation, s_o	%	s_f	%
Dry Density	**71.1** (pcf)		

USCS	**MH**	AASHTO	
LL	**54**	Gs	
PL	**31**	D_{10}	

Remarks

Compression Ratio, C'c = 0.18

Recompression Ratio, C'r = 0.02

Reviewed by:
JFC

Project No. **3769.GE** Client **U.S. Army Corps of Engineers**

Project **Pearce Creek**

Boring No.	**TB-1**	Sample No.	**SH-2 (20'-22')**
Depth/El.	**20.6'-20.8'**	Date	**12/28/98**

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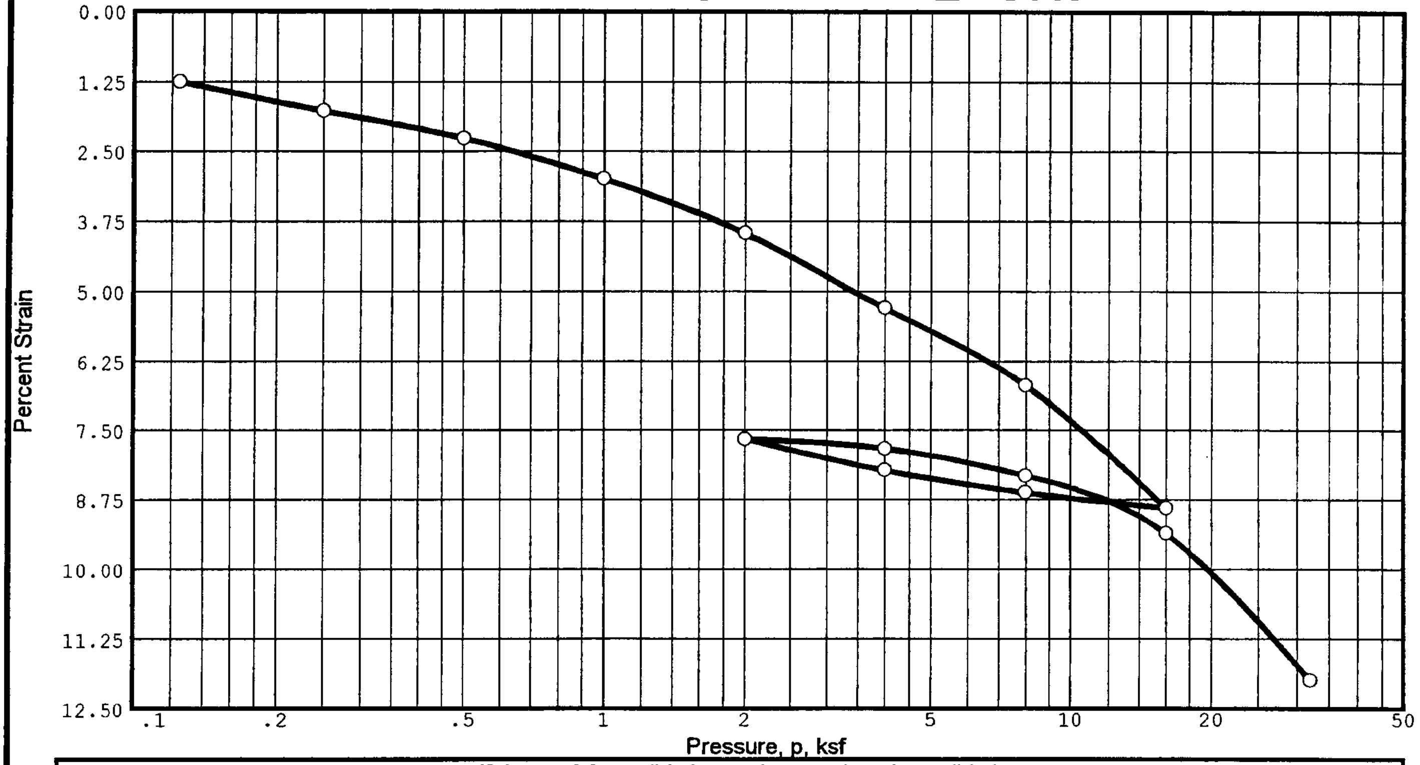
CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α
1	0.13	1.61	0.000	15	32.00	0.49	0.002				
2	0.25	4.10	0.001								
3	0.50	0.39	0.001								
4	1.00	0.36	0.001								
5	2.00	0.33	0.001								
6	4.00	0.47	0.001								
7	8.00	0.57	0.001								
8	16.00	0.68	0.002								
10	4.00	1.16									
11	2.00	0.25									
12	4.00	2.39	0.000								
13	8.00	1.33	0.000								
14	16.00	0.94	0.001								

Material **Light-br./gray silty CLAY,**

trace fine sand, trace medium sand, tr

Overburden Pressure, p_o (ksf)

Preconsol. Pressure, p_c **5.49** (ksf)

Compression Index, c_c

	Before Test		After Test
Water Content, w_o	**27.4** %	w_f	**26.0** %
Void Ratio, e_o		e_f	
Saturation, s_o	%	s_f	%
Dry Density	**97.0** (pcf)		

USCS **CL**	AASHTO
LL **39**	Gs
PL **24**	D_{10}

Project No. **3769.GE** Client **U.S. Army Corps of Engineers**

Project **Pearce Creek**

Boring No. **TB-2** Sample No. **SH-2 (12'-14')**

Depth/El. **13.2'-13.4'** Date **12/28/98**

Remarks

Compression Ratio C'c = 0.08

Recompression Ratio C'r = 0.014

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CONSOLIDATION TEST REPORT

Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α
1	0.13	1.27	0.000								
2	0.25	0.92	0.001								
4	1.00	1.10	0.001								
5	2.00	0.33	0.001								
6	4.00	0.15	0.004								
7	8.00	0.14	0.006								
8	16.00	0.12	0.008								
9	8.00	0.72									
10	4.00	0.84									
11	2.00	0.10									
12	4.00	2.54	0.000								
14	16.00	2.95	0.003								
15	32.00	0.14	0.009								

Material **Dark-gray clayey SILT, trace to little fine sand, trace mica and**

Overburden Pressure, p_o (ksf)

Preconsol. Pressure, p_c **3.52** (ksf)

Compression Index, c_c

	Before Test		After Test	
Water Content, w_o	**46.2** %	w_f	**31.1** %
Void Ratio, e_o		e_f	
Saturation, s_o	%	s_f	%
Dry Density	**72.0** (pcf)		

USCS	**MH**	AASHTO	
LL	**52**	Gs	
PL	**30**	D_{10}	

Remarks

Compression Ratio, C'c = 0.21

Recompression Ratio, C'r = 0.034

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JFC

Project No. **3769.GE** Client **U.S. Army Corps of Engineers**

Project **Pearce Creek**

Boring No. **TB-3**

Sample No. **SH-1 (16'-18')**

Depth/El. **17.0'-17.2'**

Date **12/18/98**

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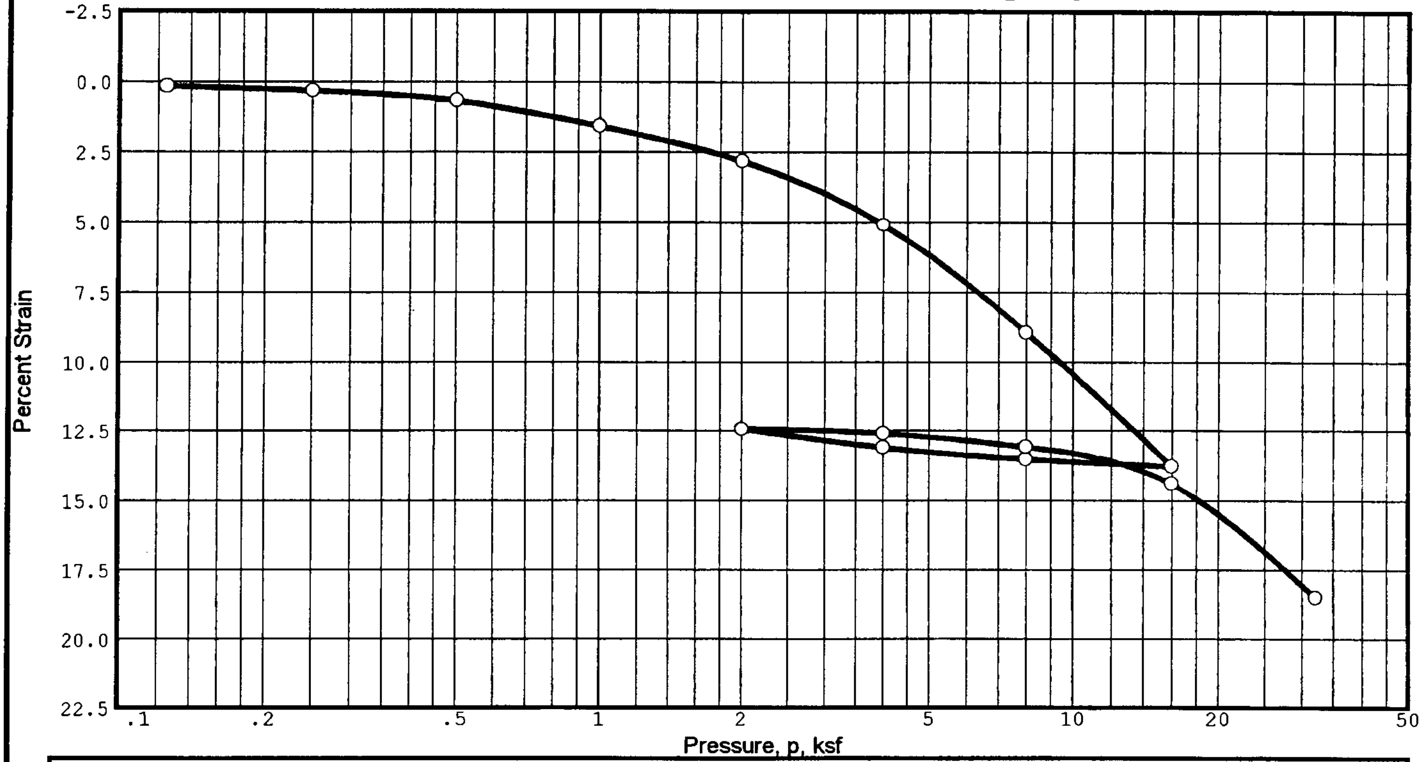
CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α
1	0.13	3.25	0.000	14	16.00	1.38	0.003				
2	0.25	1.10	0.000	15	32.00	0.26	0.007				
3	0.50	0.78	0.001								
4	1.00	0.96	0.001								
5	2.00	0.88	0.002								
6	4.00	0.19	0.003								
7	8.00	0.22	0.005								
8	16.00	0.26	0.006								
9	8.00	0.71									
10	4.00	3.13									
11	2.00	0.15									
12	4.00	0.76	0.000								
13	8.00	0.57	0.001								

Material **Dark-gray/light-gray clayey SILT, trace to little fine sand, trace**

Overburden Pressure, p_o (ksf)

Preconsol. Pressure, p_c **2.51** (ksf)

Compression Index, c_c

Before Test		After Test	
Water Content, w_o	**34.2** %	w_f	%
Void Ratio, e_o		e_f	
Saturation, s_o	%	s_f	%
Dry Density	**84.2** (pcf)		

USCS **ML**	AASHTO
LL **40**	Gs
PL **27**	D_{10}

Project No. **3769.GE** Client **U.S. Army Corps of Engineers**

Project **Pearce Creek**

Remarks

Compression Ratio, C'c = 0.16

Recompression Ratio, C'r = 0.014

Reviewed by:
JFC

Boring No.	**TB-4**	Sample No.	**SH-1 (16'-18')**
Depth/El.	**17.0'-17.2'**	Date	**12/15/98**

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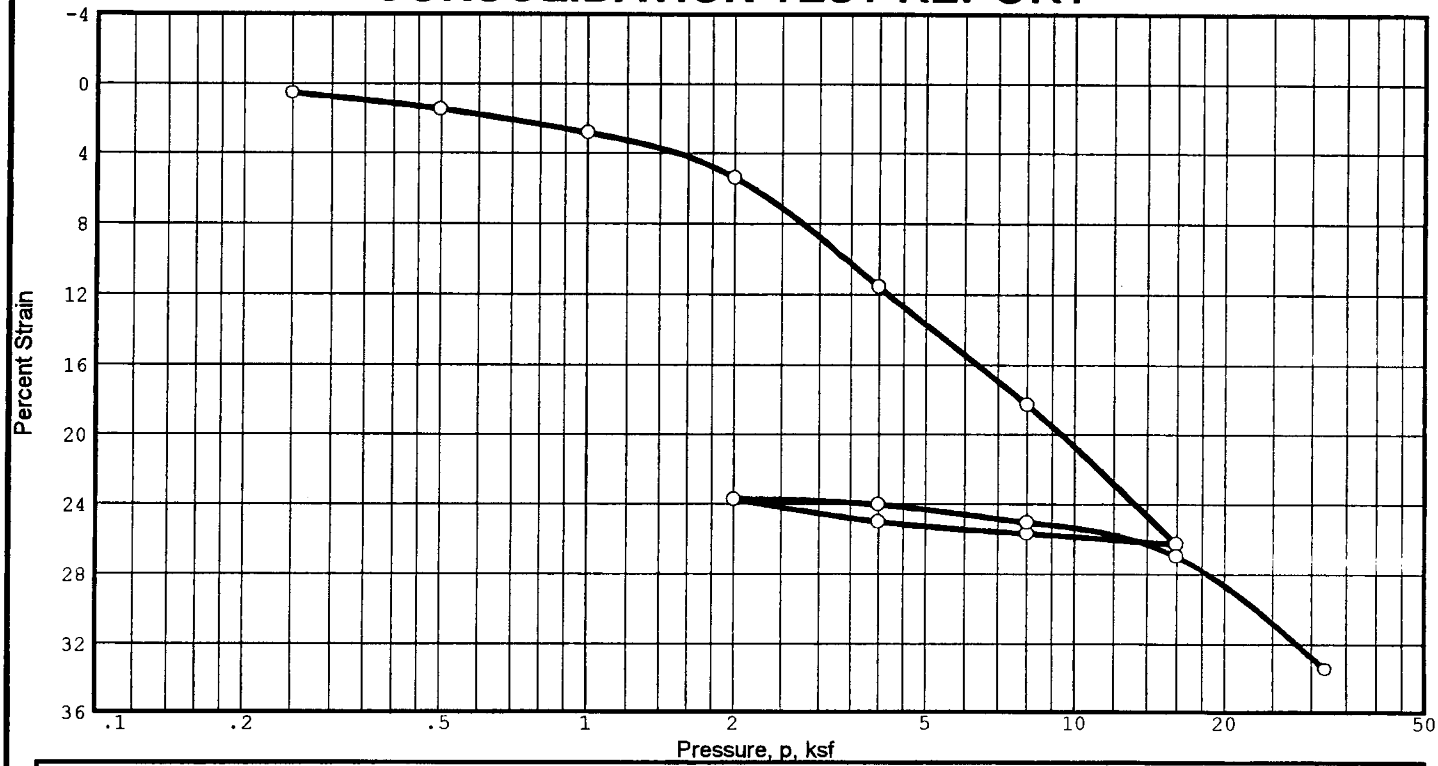
CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α
1	0.25	0.09	0.001	14	32.00	0.06	0.011				
2	0.50	0.15	0.002								
3	1.00	0.16	0.003								
4	2.00	0.14	0.007								
5	4.00	0.07	0.011								
6	8.00	0.06	0.018								
7	16.00	0.06	0.015								
8	8.00	0.87									
9	4.00	0.20									
10	2.00	0.03									
11	4.00	0.34	0.000								
12	8.00	0.28	0.002								
13	16.00	0.19	0.005								

Material **Gray/dark-gray silty CLAY,**

trace fine sand and organics

Overburden Pressure, p_o (ksf)

Preconsol. Pressure, p_c **2.10** (ksf)

Compression Index, c_c

	Before Test		After Test
Water Content, w_o	**67.2** %	w_f	**45.6** %
Void Ratio, e_o		e_f	
Saturation, s_o	%	s_f	%
Dry Density	**56.6** (pcf)		

USCS **CH**	AASHTO
LL **71**	Gs
PL **33**	D_{10}

Project No. **3769.GE** Client **U.S. Army Corps of Engineers**

Project **Pearce Creek**

Boring No. **TB-5**

Sample No. **SH-1 (4'-6')**

Depth/El. 5.1'-5.3'

Date 12/11/98

Remarks

Compression Ratio, C'c = 0.25

Recompression Ratio, C'r = 0.03

Reviewed by:
JFC

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CONSOLIDATION TEST REPORT

Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α
1	0.13	0.16	0.004	14	16.00	0.30	0.006				
2	0.25	0.06	0.003								
3	0.50	0.05	0.005								
4	1.00	0.09	0.010								
5	2.00	0.07	0.011								
6	4.00	0.05	0.010								
7	8.00	0.05	0.013								
8	4.00	0.84									
9	2.00	0.40									
10	1.00	0.03									
11	2.00	0.53	0.001								
12	4.00	0.28	0.001								
13	8.00	0.31	0.005								

Material **Gray clayey SILT, trace mica and organics (plant stem).**

Overburden Pressure, p_o (ksf)

Preconsol. Pressure, p_c **0.64** (ksf)

Compression Index, c_c

	Before Test			After Test	
Water Content, w_o	**67.5**	%	w_f	**49.2**	%
Void Ratio, e_o			e_f		
Saturation, s_o		%	s_f		%
Dry Density	**59.8**	(pcf)			

USCS	**MH**	AASHTO	
LL	**72**	Gs	
PL	**36**	D_{10}	

Project No. **3769.GE** Client **U.S. Army Corps of Engineers**

Project **Pearce Creek**

Remarks

Consolidation Ratio, C'c = 0.20

Reconsolidation Ratio, C'r = 0.026

Reviewed by:
JFC

Boring No. **TB-5** Sample No. **SH-2 (10'-12')**

Depth/El. **10.1'-10.3'** Date **12/12/98**

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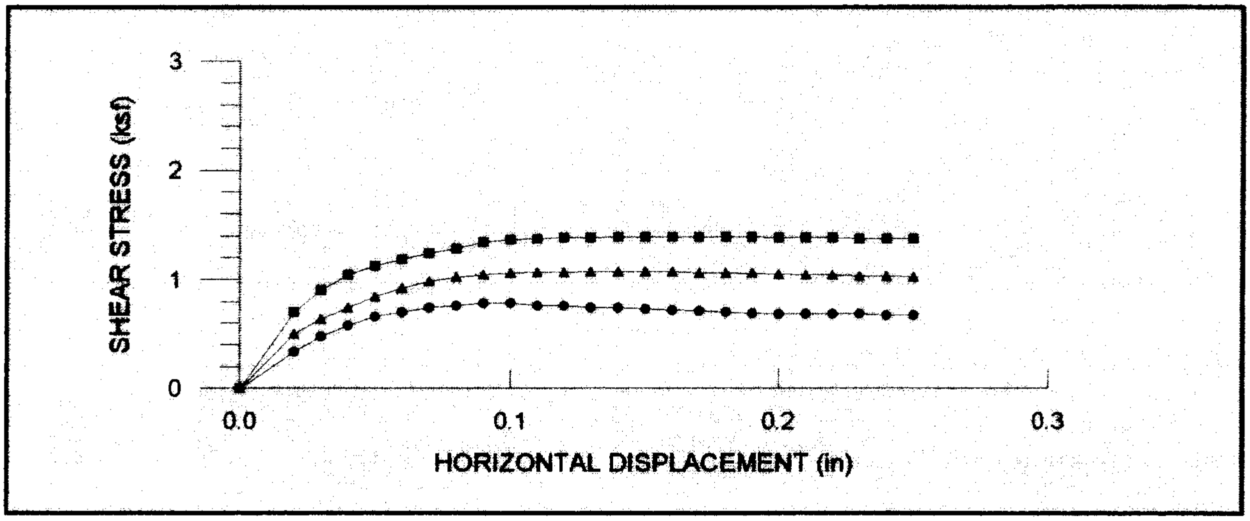
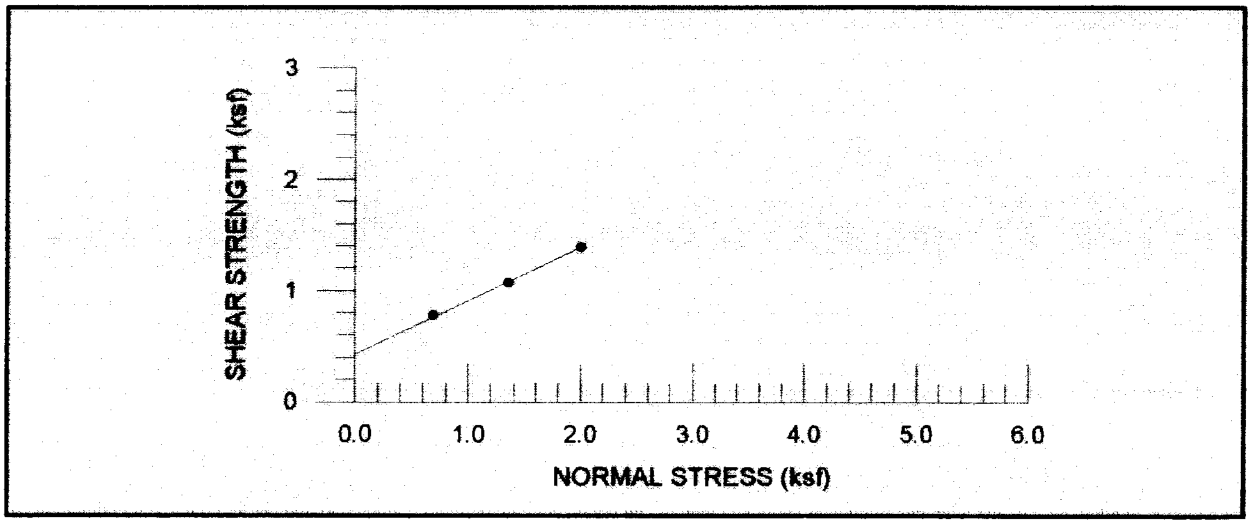
CONSOLIDATED/DRAINED DIRECT SHEAR (ASTM: D3080)





c' (ksf) = .46
$\phi' = 25^{\circ}$

Test No.	**1**	**2**	**3**
Normal Stress (ksf):	0.69	1.35	2.0
Max. Shear Strength (ksf):	.783	1.07	1.39
Rate of Strain (in/min):	0.02	0.02	0.02
Initial Height (in.):	1.00	1.00	1.00
Sample Diameter (in.):	2.48	2.48	2.48

Remarks:

Sample Identification: **TB-3 SH-1 (16'-18')**
Sample Description: Dark-gray clayey SILT, trace to little fine sand, trace mica and organics.
Initial Moisture Content (%): 46.2
% Passing No. 200 Sieve: 89.0
Dry Unit Weight (PCF): 72.0
Liquid Limit: 52
Plastic Limit: 30
Plastic Index: 22
USCS Class: MH

Legend

●— Test 1 (17.72' - 17.87')
▲— Test 2 (17.57' - 17.72')
■— Test 3 (17.42' - 17.57')

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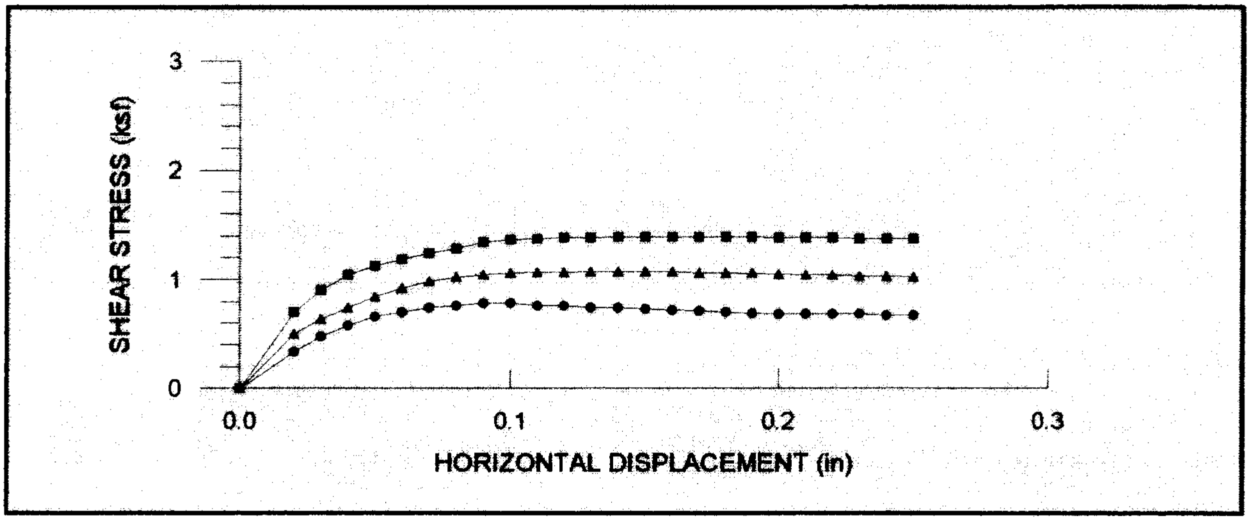
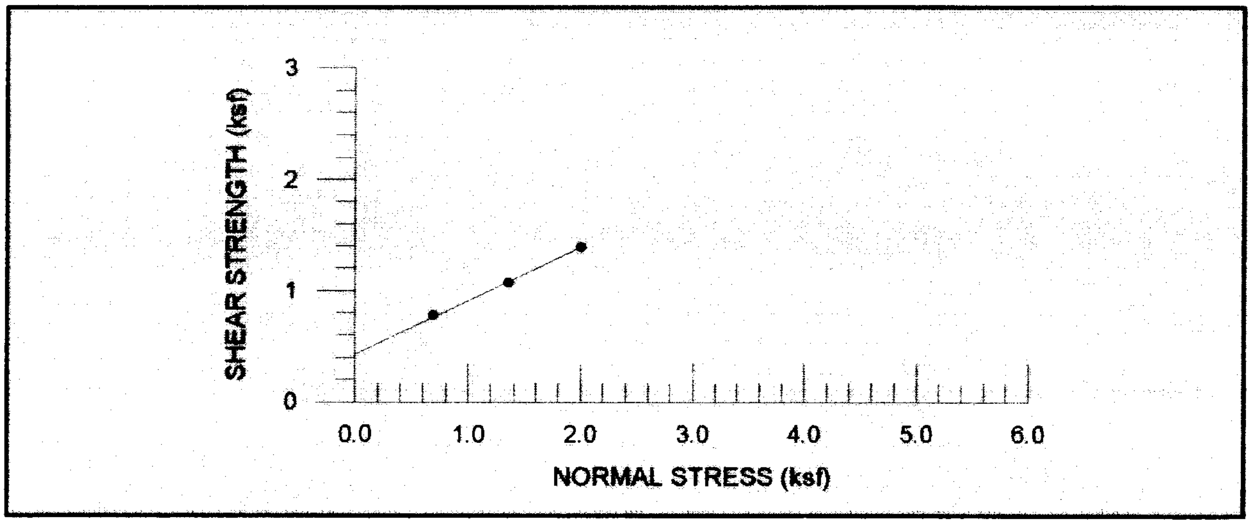
Project: Pearce Creek
Work Order Number: 3769.GD
Date: 01/99

Tested By: PGK
Reviewed By: JFC

CONSOLIDATED/DRAINED DIRECT SHEAR (ASTM: D3080)





c' (ksf) = .46
ϕ' = 25°

Test No.	1	2	3
Normal Stress (ksf):	0.69	1.35	2.0
Max. Shear Strength (ksf):	.783	1.07	1.39
Rate of Strain (in/min):	0.02	0.02	0.02
Initial Height (in.):	1.00	1.00	1.00
Sample Diameter (in.):	2.48	2.48	2.48

Remarks:

Sample Identification: **TB-3 SH-1 (16'-18')**
Sample Description: Dark-gray clayey SILT, trace to little fine sand, trace mica and organics.
Initial Moisture Content (%): 46.2
% Passing No. 200 Sieve: 89.0
Dry Unit Weight (PCF): 72.0
Liquid Limit: 52
Plastic Limit: 30
Plastic Index: 22
USCS Class: MH

Legend

- ● Test 1 (17.72' - 17.87')
- ▲ Test 2 (17.57' - 17.72')
- ■ Test 3 (17.42' - 17.57')

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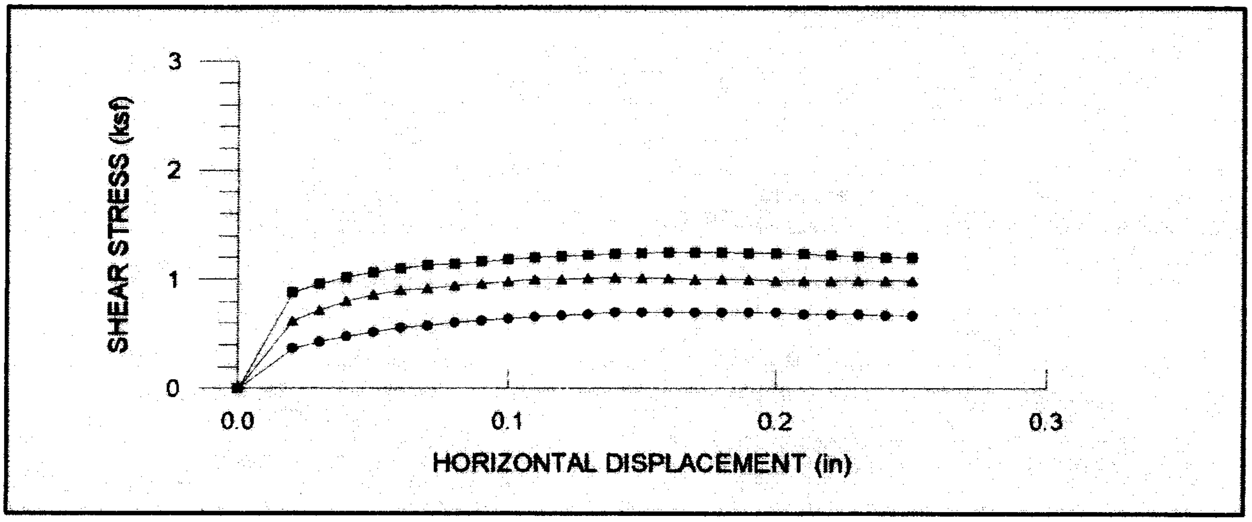
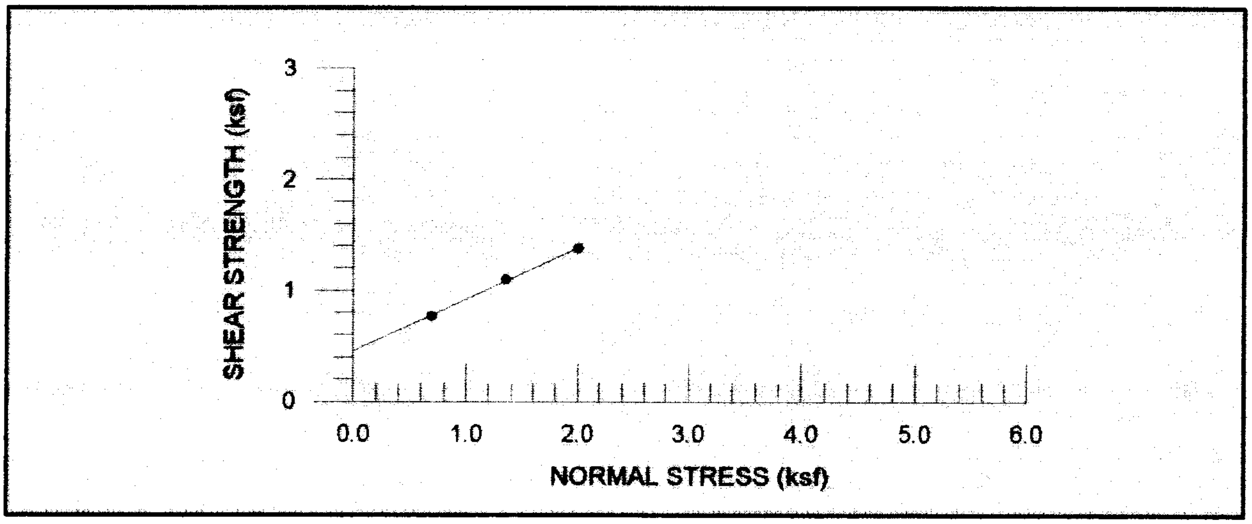
Work Order Number: 3769.GD
Date: 01/99

Tested By: PGK
Reviewed By: JFC

CONSOLIDATED/DRAINED DIRECT SHEAR (ASTM: D3080)





c' (ksf) = .45
ϕ' = 23°

Test No.	1	2	3
Normal Stress (ksf):	0.69	1.35	2.0
Max. Shear Strength(ksf):	0.77	1.1	1.38
Rate of Strain (in/min):	0.02	0.02	0.02
Initial Height (in.):	1.00	1.00	1.00
Sample Diameter (in.):	2.48	2.48	2.48

Remarks:

Sample Identification: **TB-4 SH-1 (16'-18')**
Sample Description: Dark-gray/light gray clayey SILT, trace to little fine sand, trace mica and organics.
Initial Moisture Content (%): 34.2
% Passing No. 200 Sieve: 93.2
Dry Unit Weight (PCF): 84.2
Liquid Limit: 40
Plastic Limit: 28
Plastic Index: 12
USCS Class: ML

Legend

● Test 1 (17.75' - 17.90')
▲ Test 2 (17.60' - 17.75')
■ Test 3 (17.45' - 17.60')

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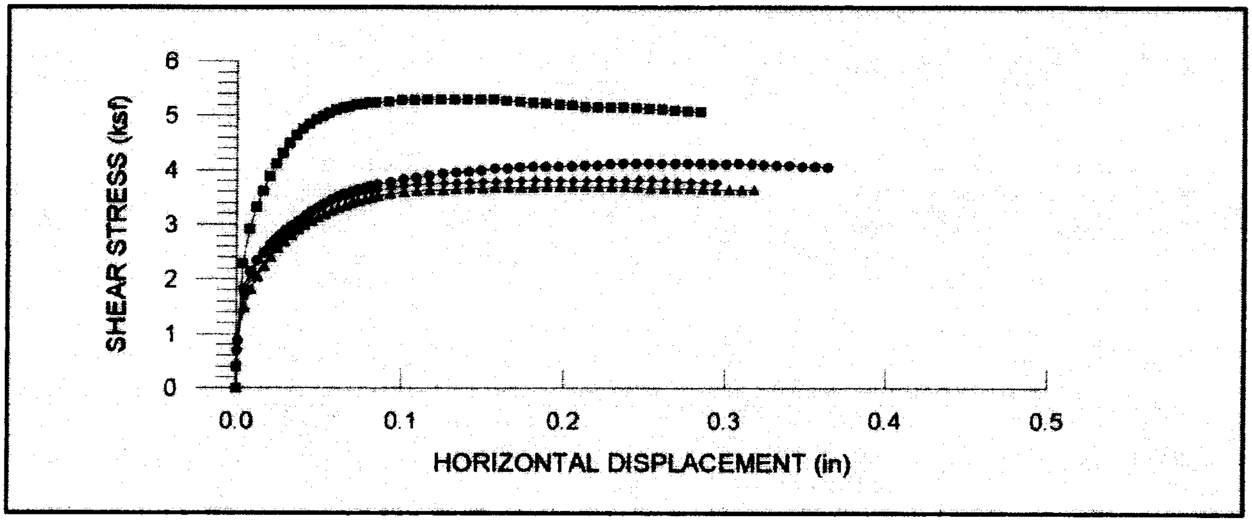
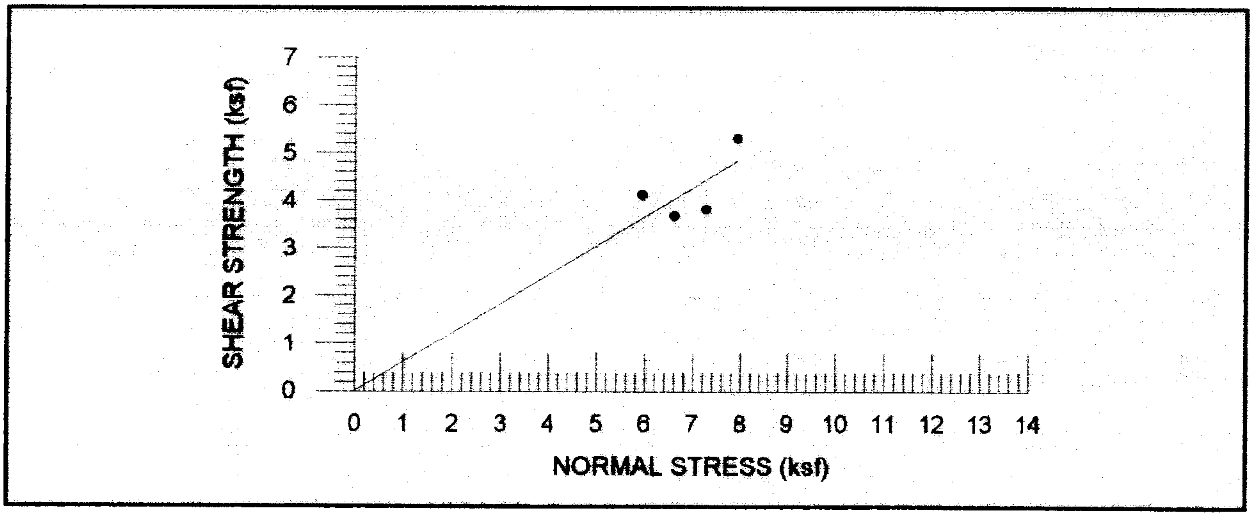
Project: Pearce Creek
Work Order Number: 3769.GD
Date: 01/99

Tested By: PGK
Reviewed By: JFC

CONSOLIDATED/DRAINED DIRECT SHEAR (ASTM: D3080)





c' (ksf) = 0
ϕ' = 32°

Test No.	1	2	3	4
Normal Stress (ksf):	5.94	6.61	7.92	7.27
Max. Shear Strength (ksf):	4.12	3.69	5.31	3.82
Rate of Strain (in/min):	0.02	0.02	0.02	0.02
Initial Height (in.):	1.00	1.00	1.00	1.00
Sample Diameter (in.):	2.48	2.48	2.48	2.48

Sample Identification: **TB-5 SH-3 (74.5'-75.5')**
Sample Description: Varicolored pink/light-gray/brown/red CLAY, little fine sand.
Initial Moisture Content (%): 15.5
% Passing No. 200 Sieve: 88.7
Dry Unit Weight (PCF): 119.1
Liquid Limit: --
Plastic Limit: --
Plastic Index: --
USCS Class: --

Legend

- ● Test 1 (75.15' - 75.40')
- ▲ Test 2 (75.90' - 75.15')
- ◆ Test 3 (75.65' - 75.90')
- ■ Test 4 (75.40' - 75.65')

Remarks:

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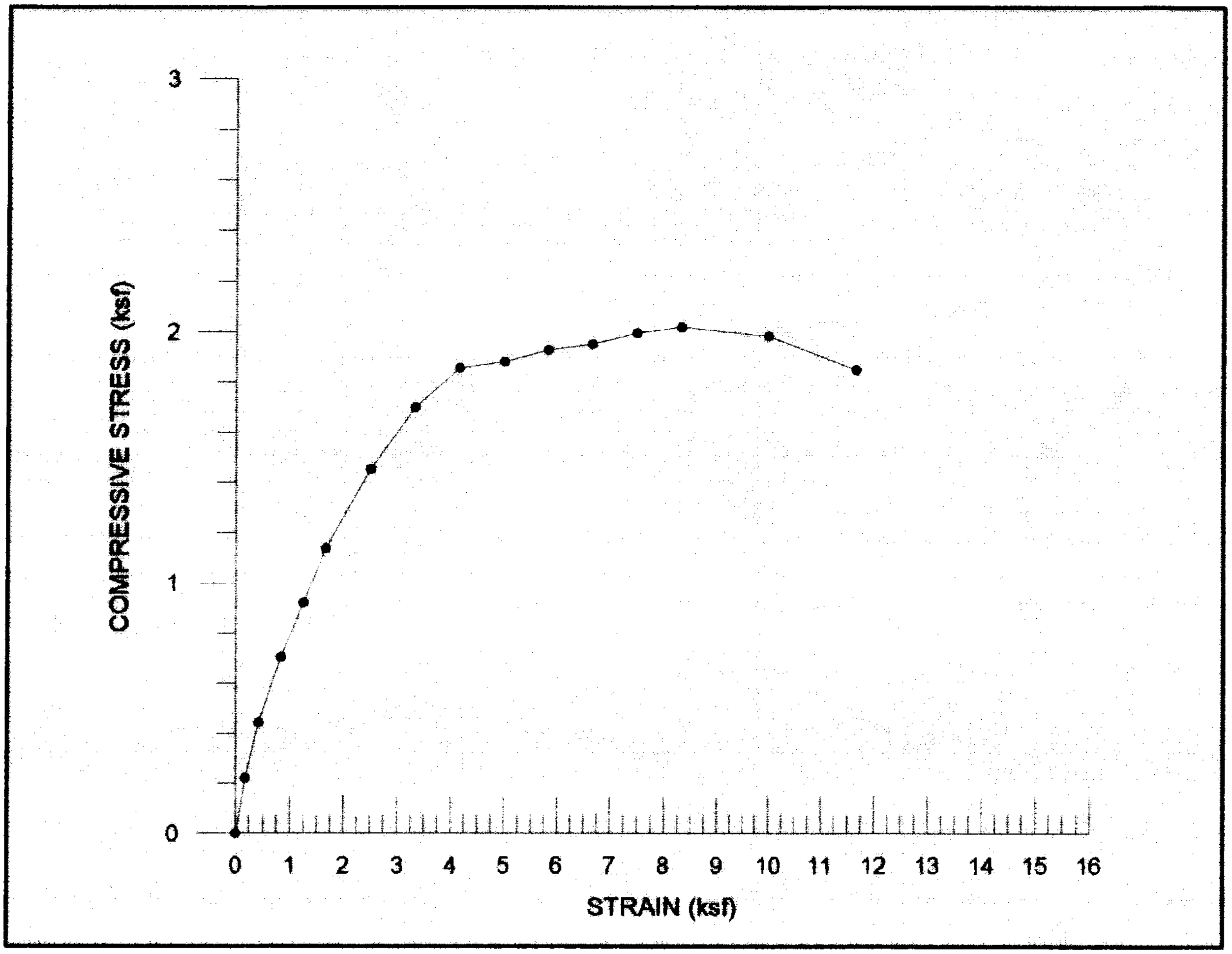
Project: Pearce Creek
Work Order Number: 3769.GD
Date: 01/99

Tested By: PGK
Reviewed By: JFC

UNCONFINED COMPRESSION TEST (ASTM: D2166)



Unconfined Compressive Strength: 2.020 ksf
Cohesion: 1.010 ksf

Initial Height (in.): 6.00
Initial Diameter (in.): 2.87
Rate of Strain (%/min.): 1.0

Failure Sketch:

Sample Identification: TB-1 SH-1 11.3'-11.8' (10'-12')
Sample Description: Gray/dark-gray clayey SILT, trace sand, trace organics.
Moisture Content (%): 39.2
% Passing No. 200 Sieve: 92.7
Dry Unit Weight (PCF): 79.4
Liquid Limit: 59
Plastic Limit: 33
Plastic Index: 26
USCS Class: MH

Remarks:

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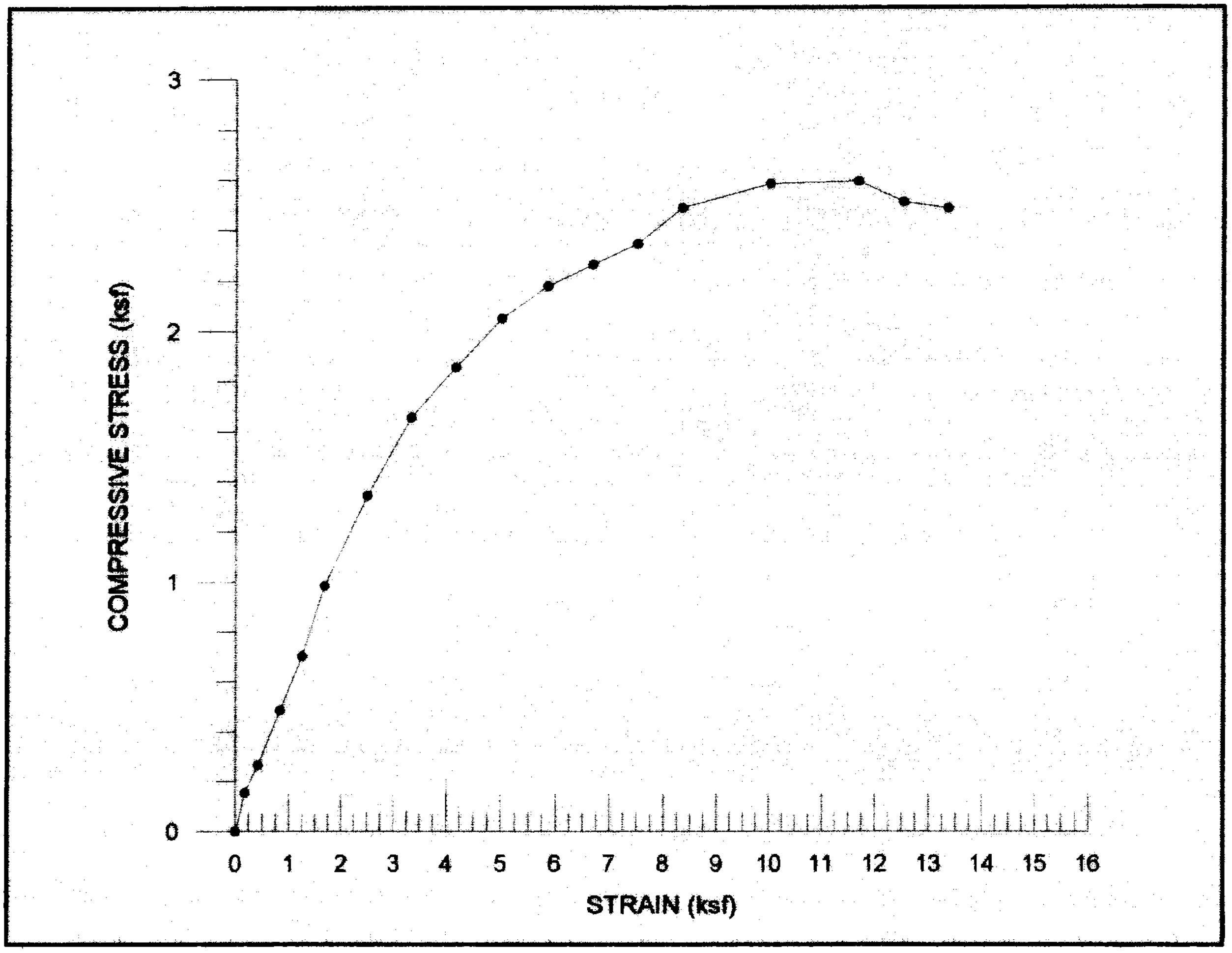
Project: Pearce Creek
Work Order Number: 3769.GE
Date: 11/24/98

Tested By: CFY
Reviewed By: JFC

UNCONFINED COMPRESSION TEST (ASTM: D2166)



Unconfined Compressive Strength: 2.594 ksf
Cohesion: 1.297 ksf

Initial Height (in.): 5.98
Initial Diameter (in.): 2.87
Rate of Strain (%/min.): 1.0

Failure Sketch:

Remarks:

Sample Identification: TB-2 SH-2 13.3'-13.8' (12'-14')
Sample Description: Light-brown/gray silty CLAY, trace fine sand, trace medium sand, trace mica and organics.
Moisture Content (%): 27.4
% Passing No. 200 Sieve: 91.1
Dry Unit Weight (PCF): 96.9
Liquid Limit: 39
Plastic Limit: 24
Plastic Index: 15
USCS Class: CL

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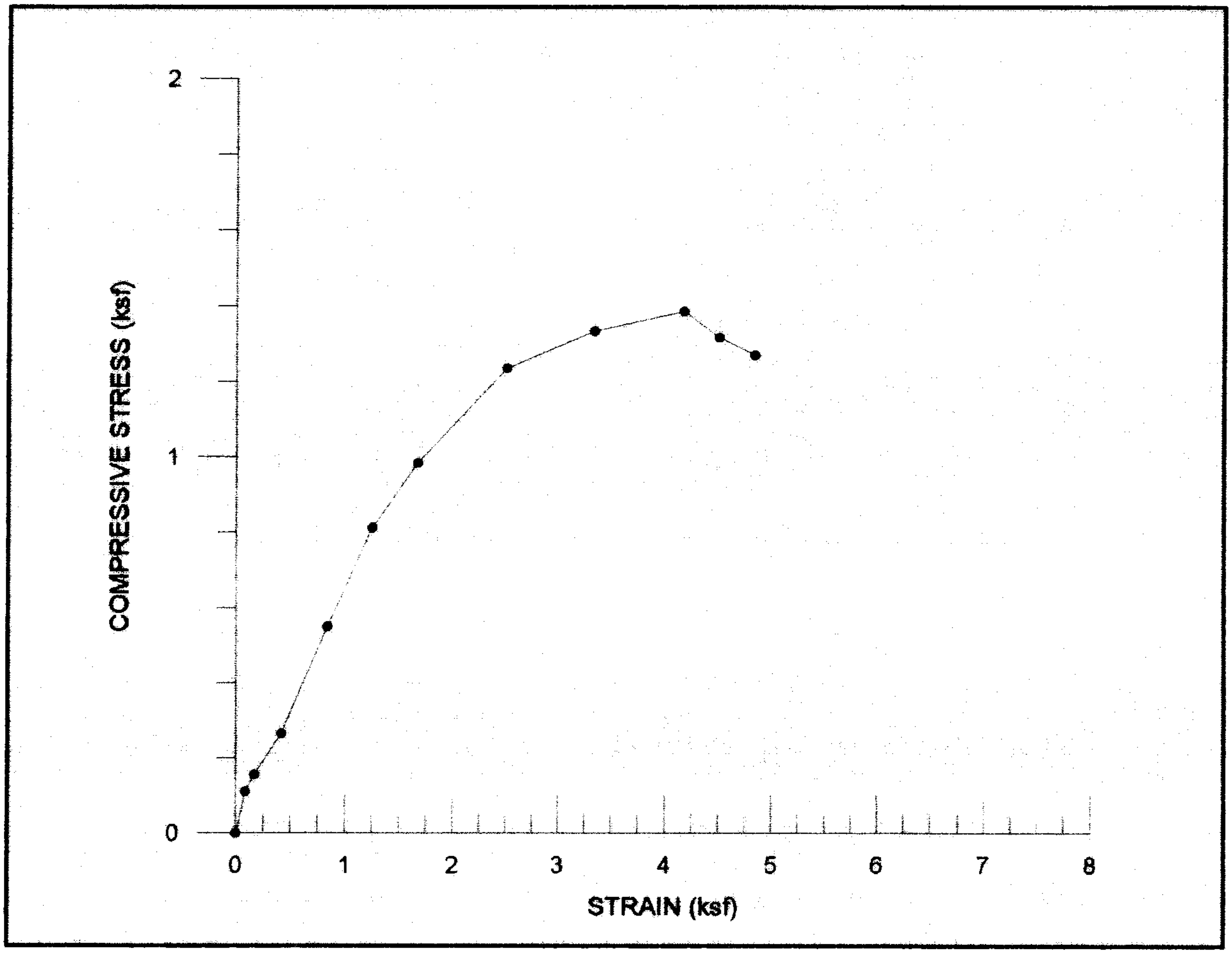
Project: Pearce Creek
Work Order Number: 3769.GE
Date: 11/24/98

Tested By: CFY
Reviewed By: JFC

UNCONFINED COMPRESSION TEST (ASTM: D2166)



Unconfined Compressive Strength: 1.386 ksf
Cohesion: .0693 ksf

Initial Height (in.): 5.98
Initial Diameter (in.): 2.87
Rate of Strain (%/min.): 1.0

Failure Sketch:

Sample Identification: TB-3 SH-1 16.9'-17.3' (16'-18')
Sample Description: Dark-gray clayey SILT, trace to little fine sand, trace mica and organics.
Moisture Content (%): 46.2
% Passing No. 200 Sieve: 89.0
Dry Unit Weight (PCF): 72.0
Liquid Limit: 52
Plastic Limit: 30
Plastic Index: 22
USCS Class: MH

Remarks:

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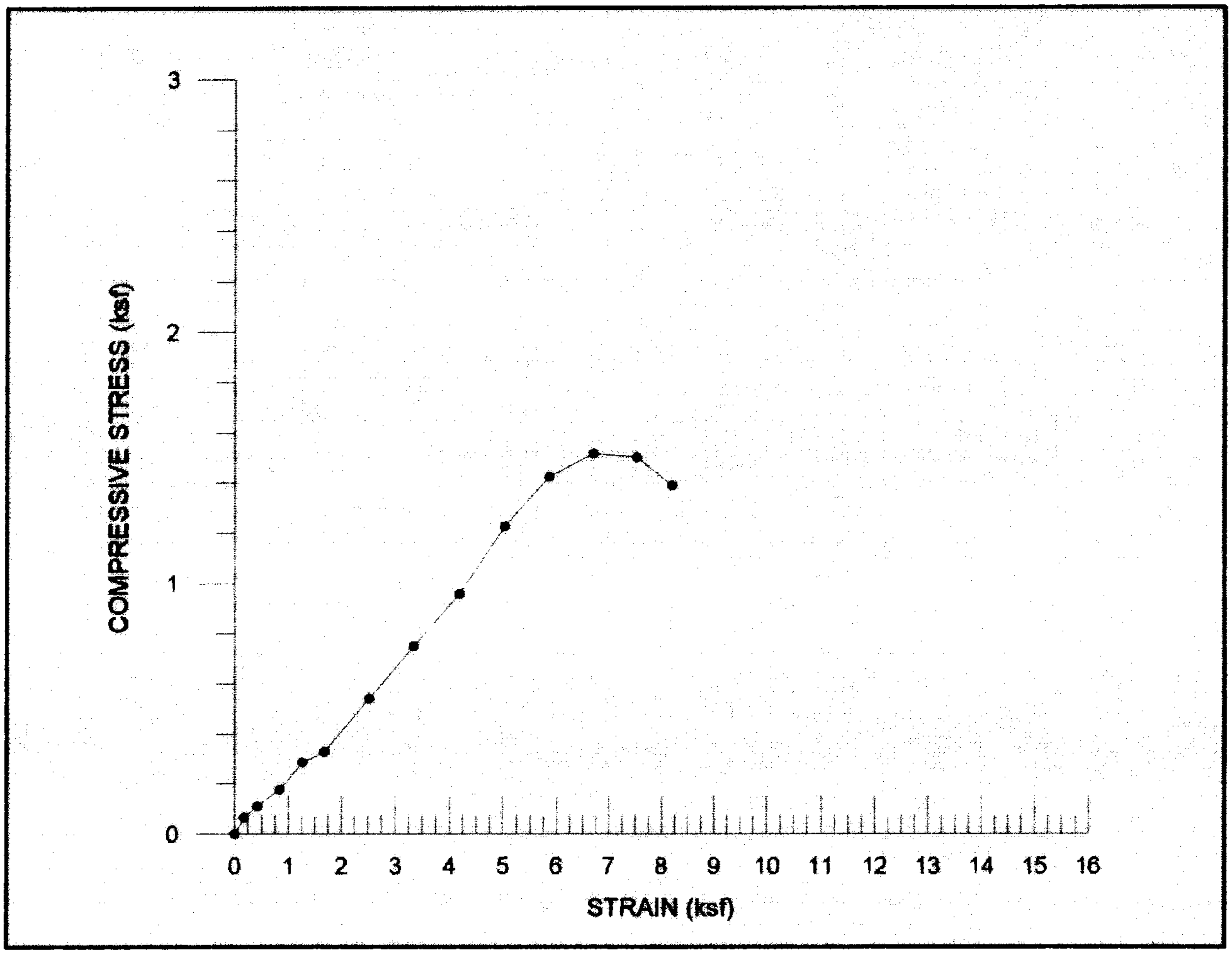
Project: Pearce Creek
Work Order Number: 3769.GE
Date: 12/11/98

Tested By: CFY
Reviewed By: JFC

UNCONFINED COMPRESSION TEST (ASTM: D2166)



Unconfined Compressive Strength: 1.516 ksf
Cohesion: 0.758 ksf

Initial Height (in.): 5.97
Initial Diameter (in.): 2.87
Rate of Strain (%/min.): 1.0

Sample Identification: TB-3 SH-3 73.3'-73.8' (72'-74')
Sample Description: Gray fine SAND and SILT, trace mica and organics.
Moisture Content (%): 31.8
% Passing No. 200 Sieve: 48.8
Dry Unit Weight (PCF): 88.6
Liquid Limit: --
Plastic Limit: --
Plastic Index: --
USCS Class: --

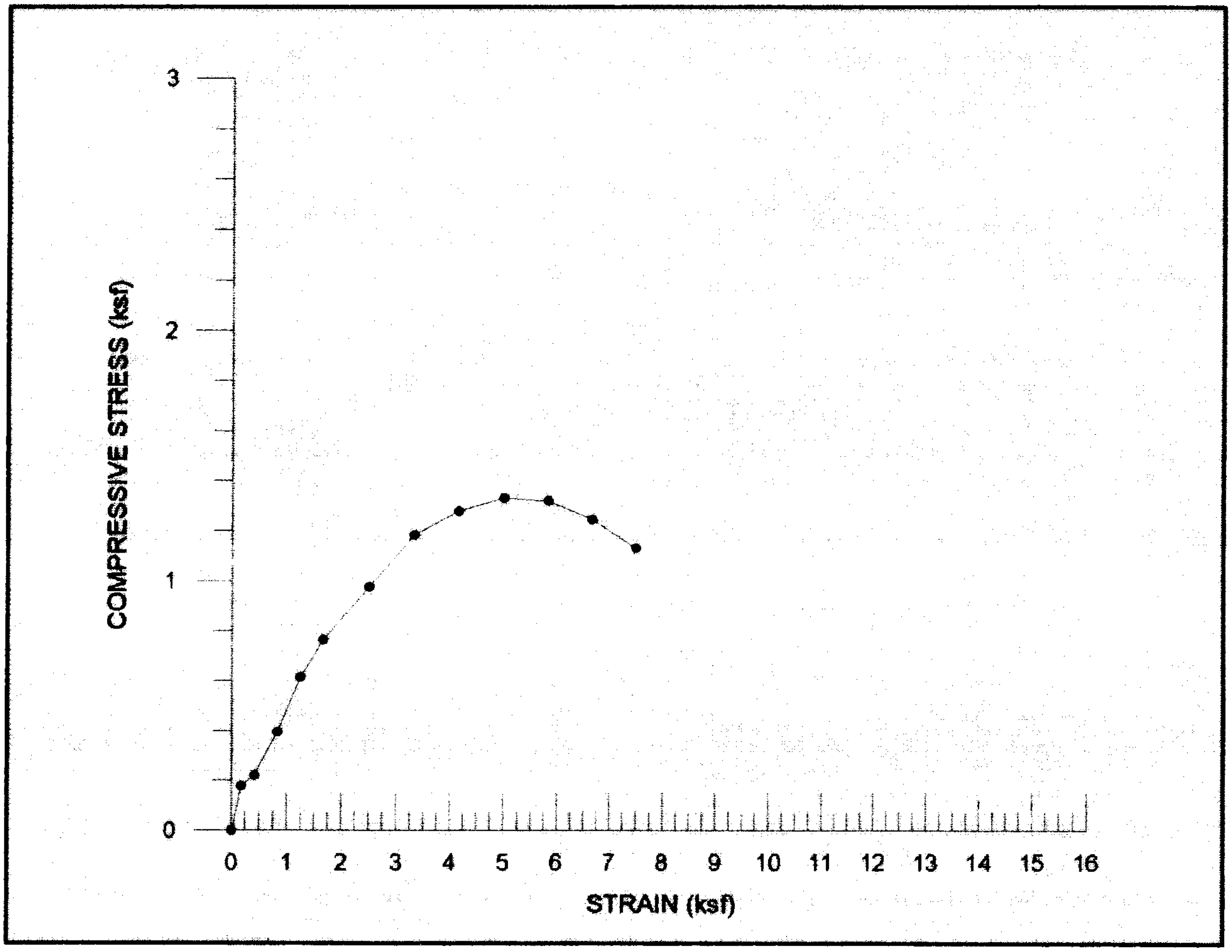
Failure Sketch:

Remarks:

Project: Pearce Creek
Work Order Number: 3769.GE
Date: 12/11/98

Tested By: CFY
Reviewed By: JFC

UNCONFINED COMPRESSION TEST (ASTM: D2166)



Unconfined Compressive Strength: 1.332 ksf
Cohesion: 0.666 ksf

Initial Height (in.): 6.00
Initial Diameter (in.): 2.87
Rate of Strain (%/min.): 1.0

Failure Sketch:

Sample Identification: TB-4 SH-1 17.2'-17.7' (16'-18')
Sample Description: Dark-gray/light-gray clayey SILT, trace to little fine sand trace mica and organics.
Moisture Content (%): 34.2
% Passing No. 200 Sieve: 93.2
Dry Unit Weight (PCF): 84.2
Liquid Limit: 40
Plastic Limit: 28
Plastic Index: 12
USCS Class: ML

Remarks:

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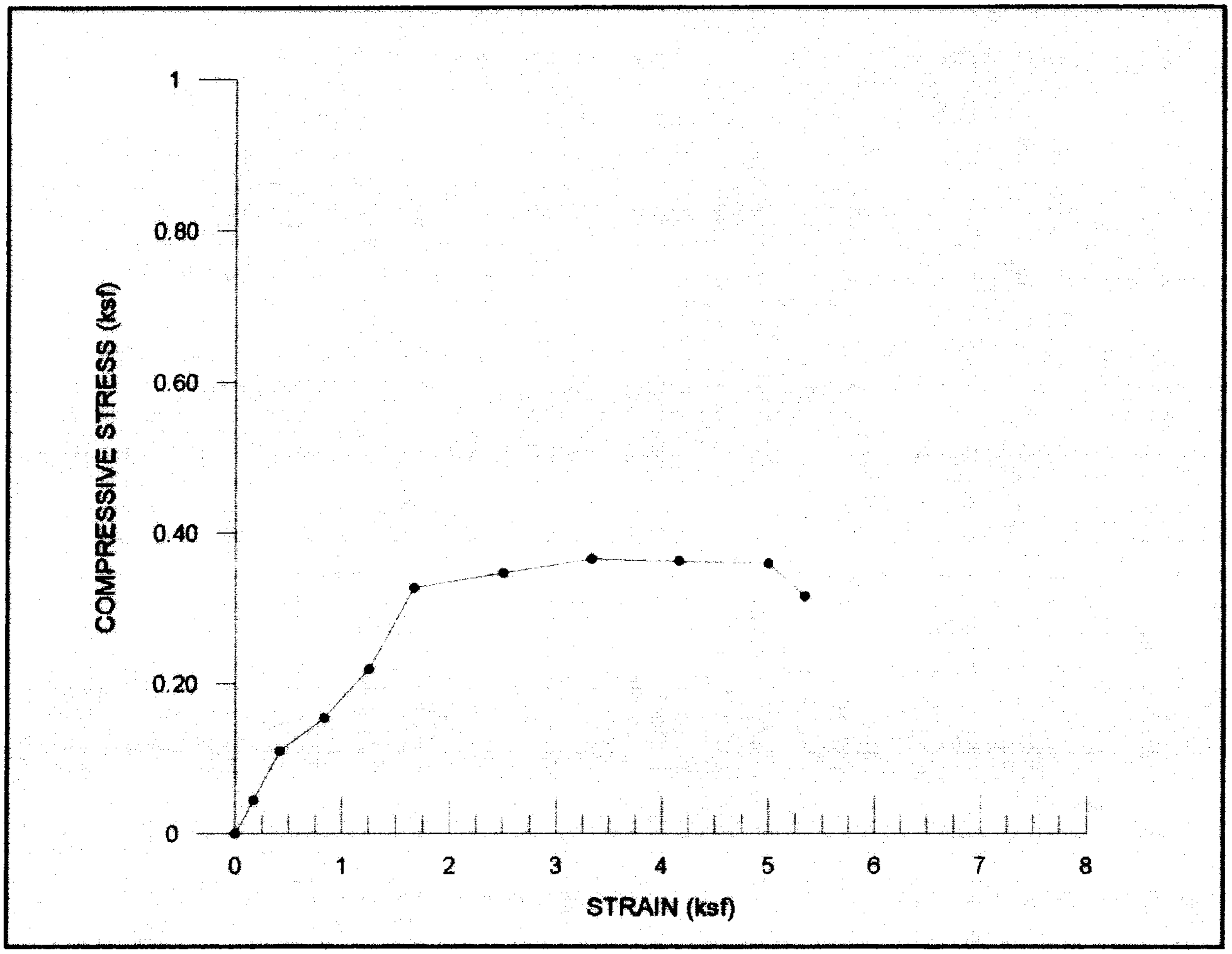
Project: Pearce Creek
Work Order Number: 3769.GE
Date: 11/24/98

Tested By: CFY
Reviewed By: JFC

UNCONFINED COMPRESSION TEST (ASTM: D2166)



Unconfined Compressive Strength: 0.365 ksf
Cohesion: 0.182 ksf

Initial Height (in.): 6.00
Initial Diameter (in.): 2.87
Rate of Strain (%/min.): 1.0

Failure Sketch:

Sample Identification: TB-5 SH-1 5.3'-5.8' (4'-6')
Sample Description: Gray/dark-gray silty CLAY, trace fine sand and organics (throught).
Moisture Content (%): 67.2
% Passing No. 200 Sieve: 94.7
Dry Unit Weight (PCF): 56.6
Liquid Limit: 71
Plastic Limit: 33
Plastic Index: 38
USCS Class: CH

Remarks:

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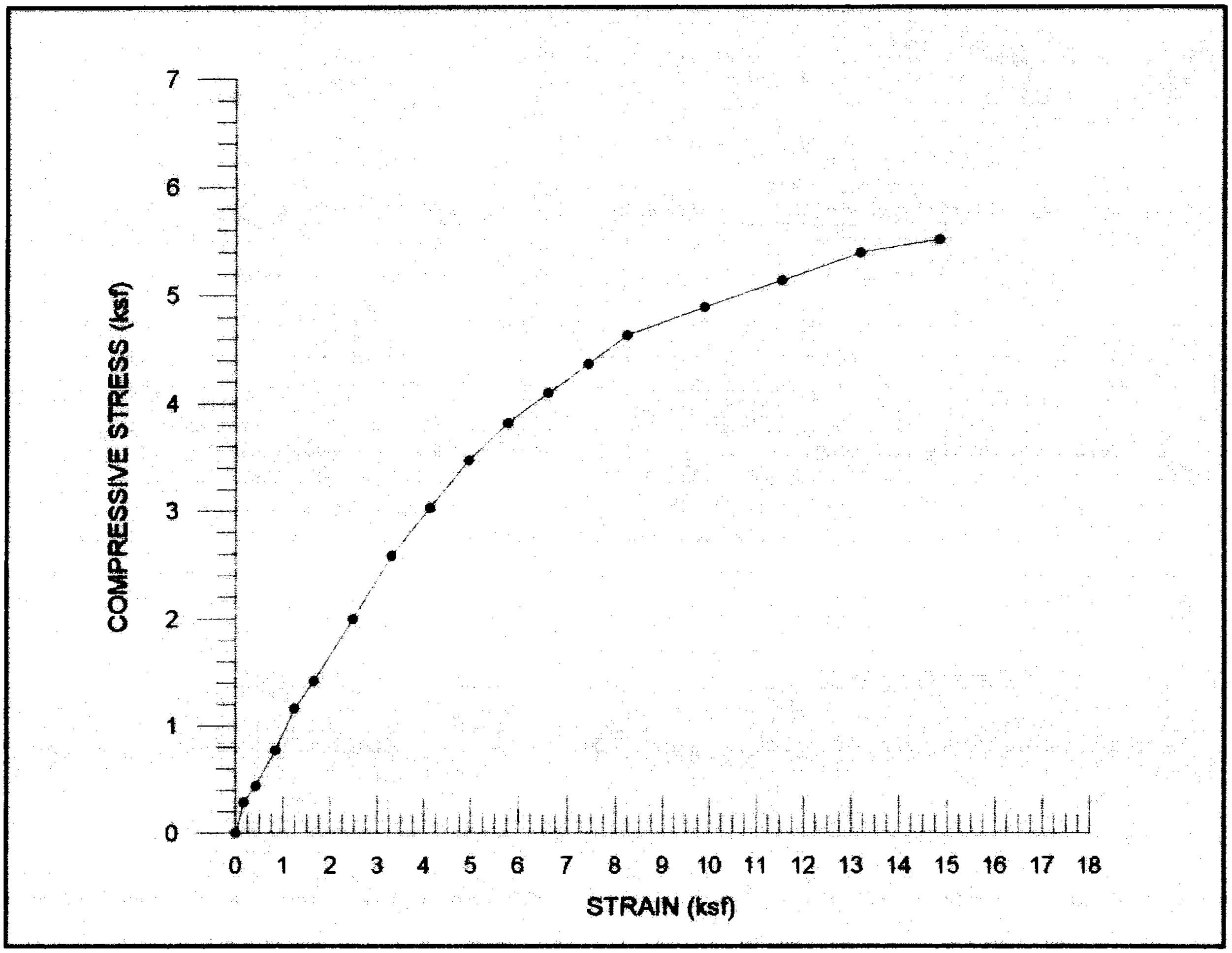
Project: Pearce Creek
Work Order Number: 3769.GE
Date: 12/03/98

Tested By: CFY
Reviewed By: JFC

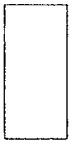
UNCONFINED COMPRESSION TEST (ASTM: D2166)



Unconfined Compressive Strength: 5.515 ksf
Cohesion: 2.757 ksf

Initial Height (in.): 6.06
Initial Diameter (in.): 2.87
Rate of Strain (%/min.): 1.0

Failure Sketch:



Remarks:

Sample Identification: TB-5 SH-3 74.2'-74.7' (74'-75.5')
Sample Description: Varicolored pink/light-gray/brown/red CLAY, little fine sand.
Moisture Content (%): 15.8
% Passing No. 200 Sieve: 88.7
Dry Unit Weight (PCF): 119.1
Liquid Limit: --
Plastic Limit: --
Plastic Index: --
USCS Class: --

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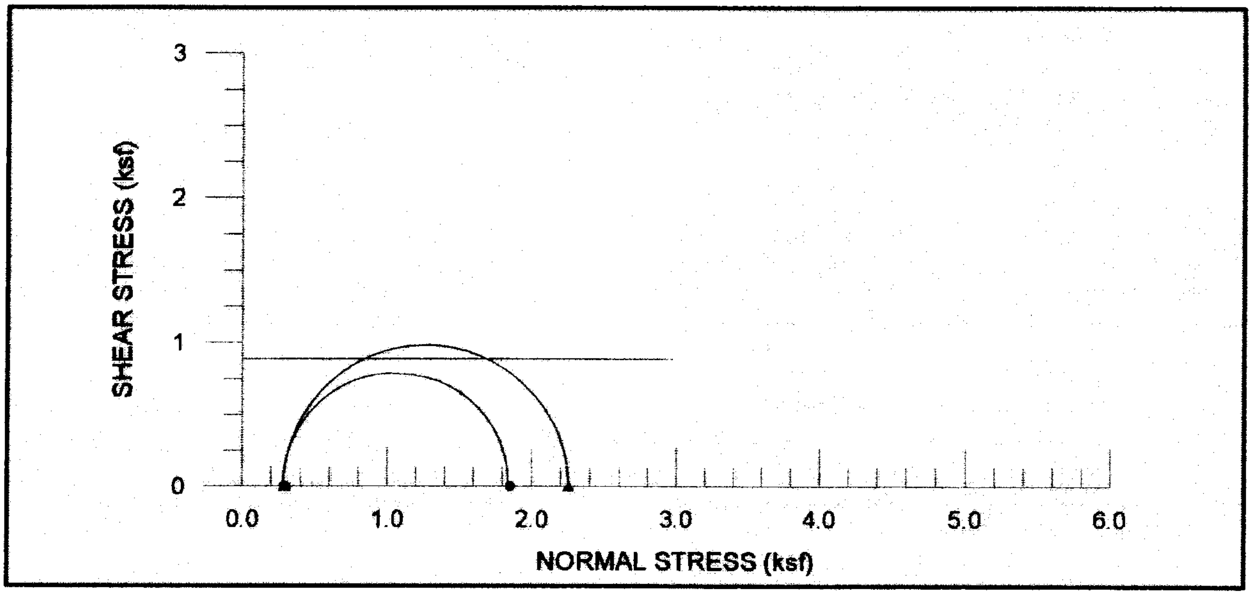
Project: Pearce Creek
Work Order Number: 3769.GE
Date: 12/13/98

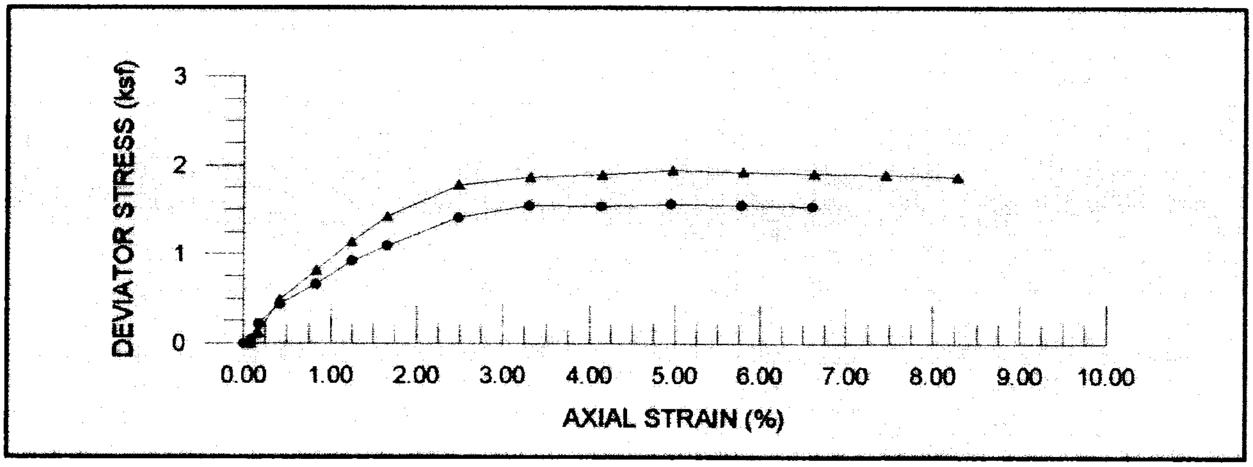
Tested By: CFY
Reviewed By: JFC

TRAXIAL TESTING

During the performance of the triaxial compression “Q-tests,” the same confining pressure was utilized for samples from a specific Shelby tube. While this would be expected to result in similar Mohrs Circles for a uniform soil, review of the samples tested indicated variations in the consistency of the 6-inch specimens prepared from each Shelby tube. The variations in strength observed in the test results of samples from the same tube are attributed to variations in the materials observed. The compressive strength data summarized on the following test reports represents an average of the compressive strength for each Shelby tube.

TRIAXIAL COMPRESSION TEST, Q (ASTM: D2850)

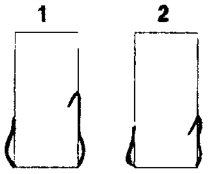




c (ksf) = 0.880 (average)

Minor Prin. Stress (ksf) :	0.29	0.29
Max. Deviator Stress (ksf):	1.56	1.96
Initial Height (in.):	6.06	6.04
Initial Diameter (in.):	2.87	2.87
Saturation:	95%	96%

Failure Sketch:



Remarks: Unable to obtain 3 complete samples, void in top part of tube due to piston sampler.

Sample Identification: **TB-1 SH-2 (20'-22')**
Sample Description: Dark-gray and brown clayey SILT, little sand, trace mica and organics.
Initial Moisture Content (%): 49.8
% Passing No. 200 Sieve: 91.0
Dry Unit Weight (PCF): 71.7
Liquid Limit: 54
Plastic Limit: 31
Plastic Index: 23
USCS Class: MH

Legend

● Trial 1 21.3'-21.8'
▲ Trial 2 20.8'-21.3'

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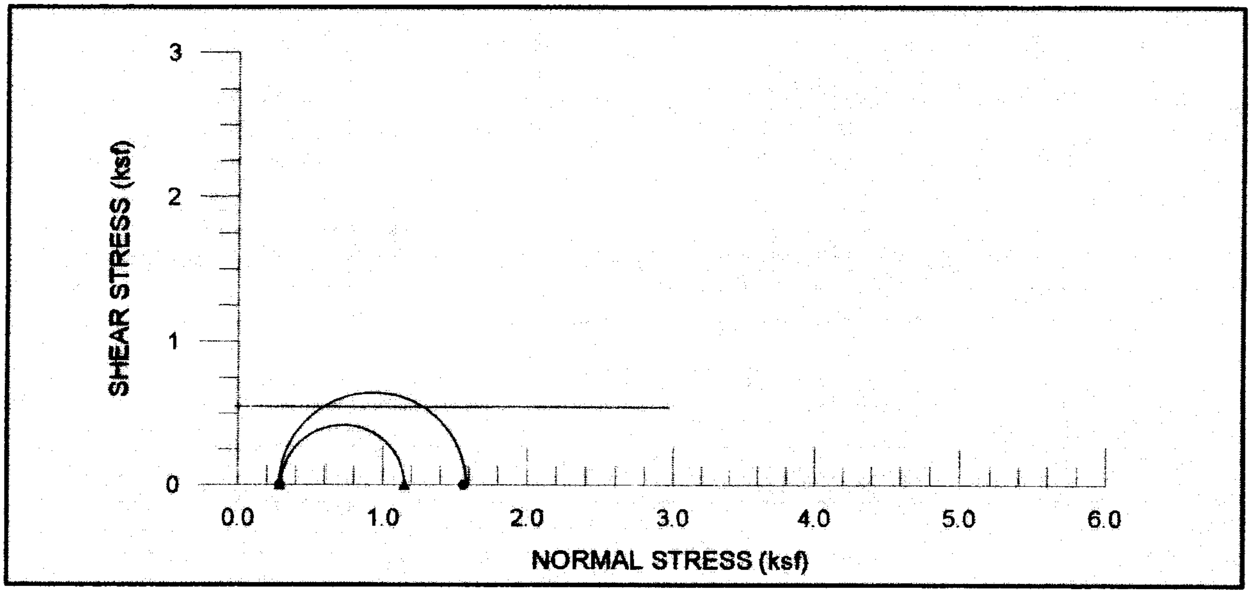
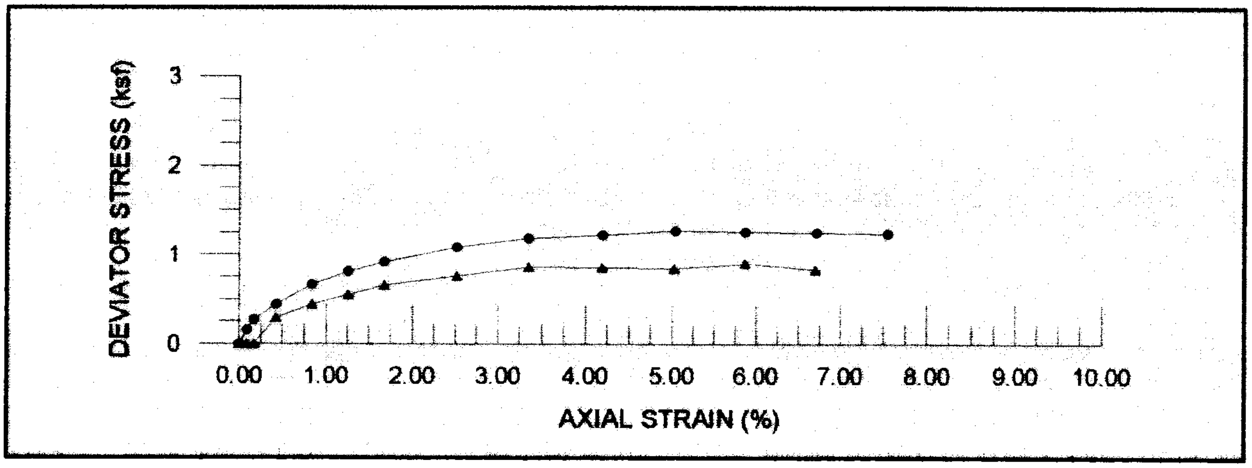
Project: Pearce Creek
Work Order Number: 3769.GE
Date: 12/98

Tested By: CFY
Reviewed By: JFC

TRIAXIAL COMPRESSION TEST, Q (ASTM: D2850)

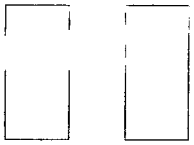




c (ksf) = 0.540 (average)

Minor Prin. Stress (ksf) :	0.29	0.29
Max. Deviator Stress (ksf):	1.27	0.86
Initial Height (in.):	5.96	5.97
Initial Diameter (in.):	2.87	2.87
Saturation:	98%	97%
Failure Sketch:	**1**	**2**

No distinct failure plain for both samples



Remarks: Unable to obtain 3 complete samples, void in top part of tube due to piston sampler.

Sample Identification: **TB-2 SH-1 (4'-6')**
Sample Description: Dark gray clayey SILT, trace fine sand, mica and organics.
Initial Moisture Content (%): 49.4
% Passing No. 200 Sieve: 93.6
Dry Unit Weight (PCF): 69.1
Liquid Limit: 71
Plastic Limit: 39
Plastic Index: 32
USCS Class: MH

Legend
—●— Trial 1 4.8' - 5.3'
—▲— Trial 2 4.3' - 4.8'

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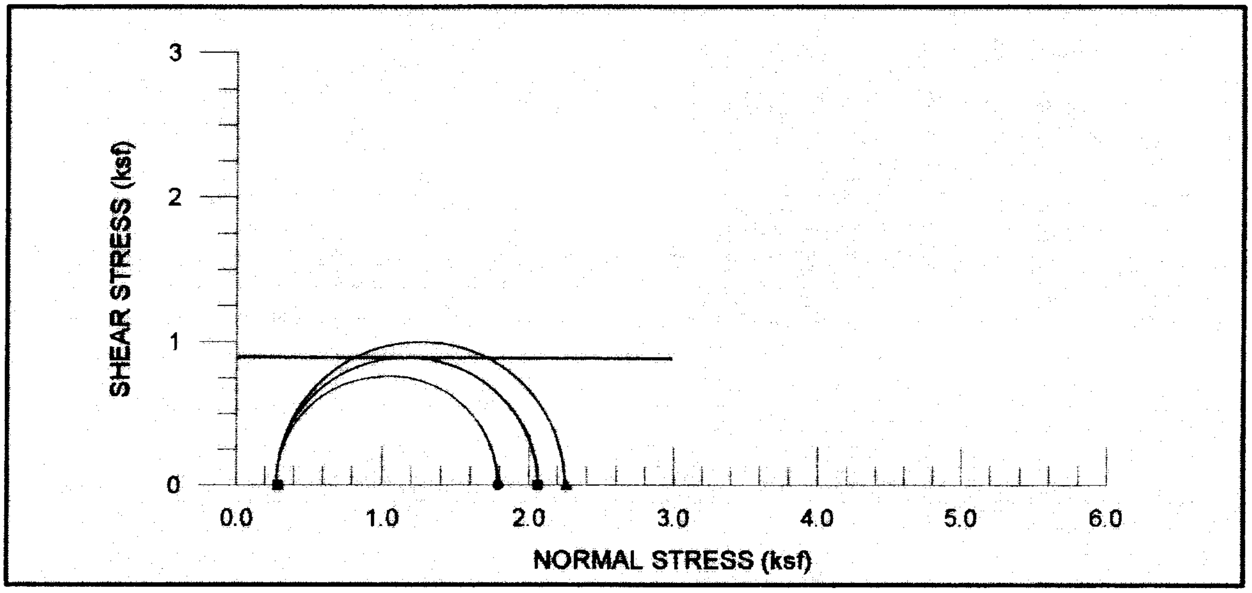
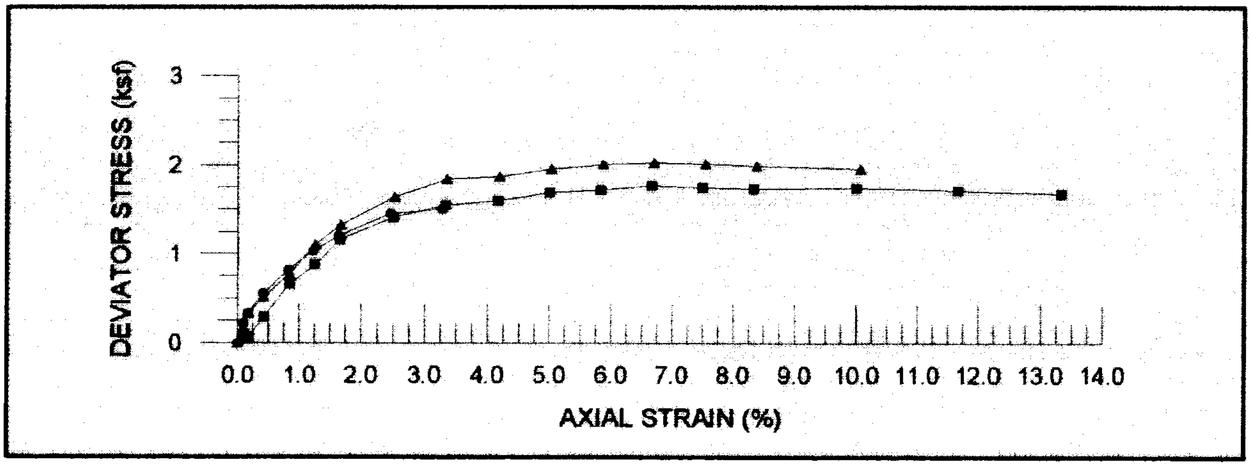
Project: Pearce Creek
Work Order Number: 3769.GE
Date: 1/99

Tested By: CFY
Reviewed By: JFC

TRIAXIAL COMPRESSION TEST, Q (ASTM: D2850)

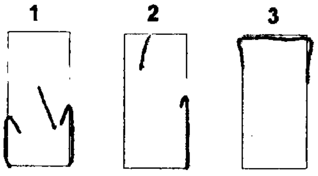




c (ksf) = 0.887 (average)

Minor Prin. Stress (ksf) :	0.29	0.29	0.29
Max. Deviator Stress (ksf):	1.51	2.03	1.78
Initial Height (in.):	6.10	5.96	6.00
Initial Diameter (in.):	2.87	2.86	2.87
Saturation:	97%	97%	98%

Failure Sketch:



Remarks:

Sample Identification: **TB-4 SH-2 (24'-26')**
Sample Description: Dark-gray /light-gray clayey SILT, trace to little fine fine sand, trace mica and organics.
Initial Moisture Content (%): 49.8
% Passing No. 200 Sieve: 90.8
Dry Unit Weight (PCF): 65.7
Liquid Limit: --
Plastic Limit: --
Plastic Index: --
USCS Class: --

Legend

●	Trial 1 25.3' - 25.8'
▲	Trail 2 24.8' - 25.3'
■	Trail 3 24.3' - 24.8'

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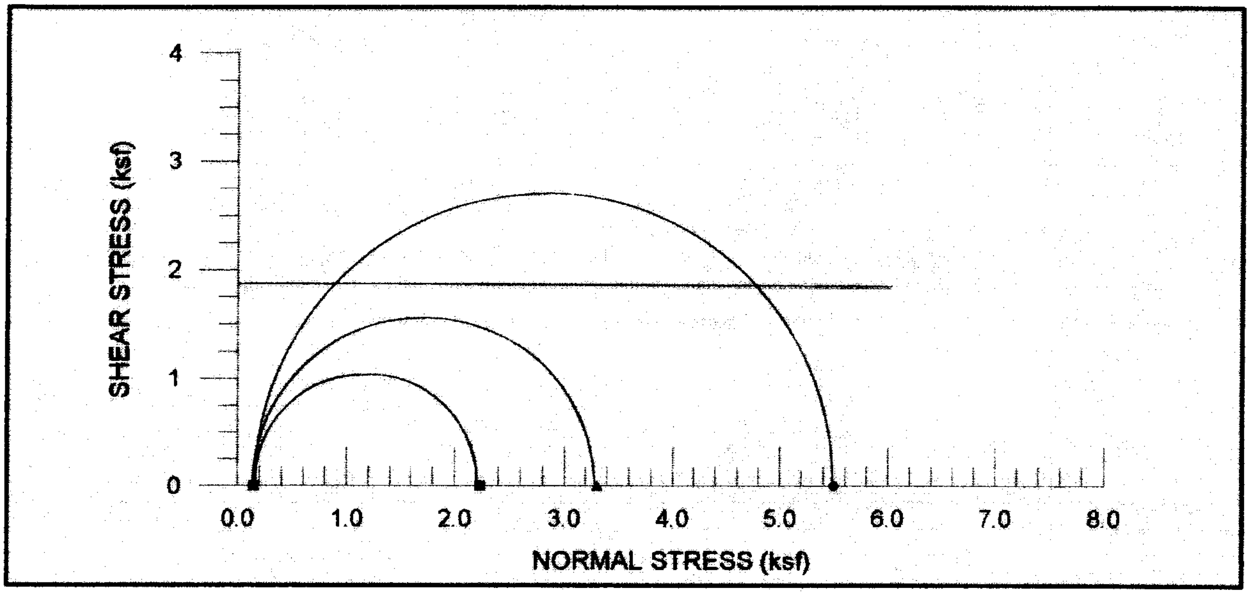
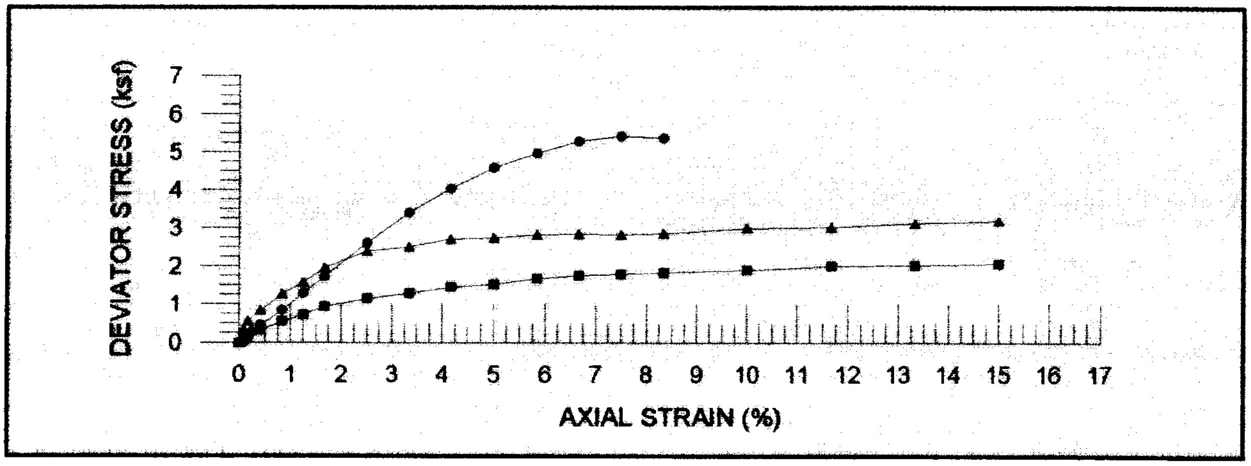
Work Order Number: 3769.GE
Date: 12/98

Tested By: CFY
Reviewed By: JFC

TRIAXIAL COMPRESSION TEST, Q (ASTM: D2850)

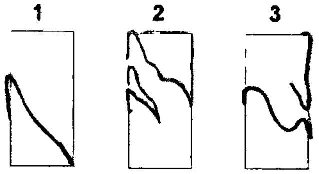




c (ksf) = 1.77

Minor Prin. Stress (ksf) :	.144	.144	.144
Max. Deviator Stress (ksf):	5.36	3.17	2.09
Initial Height (in.):	6.00	6.00	6.00
Initial Diameter (in.):	2.83	2.87	2.87
Saturation:	98%	95%	96%

Failure Sketch:



Remarks:

Sample Identification: **TB-4 SH-3 (50'-52')**
Sample Description: Dark-brown/gray clayey SILT, little fine to coarse sand trace mica and organics.
Initial Moisture Content (%): 49.9
% Passing No. 200 Sieve: 83.6
Dry Unit Weight (PCF): 68.7
Liquid Limit: 55
Plastic Limit: 40
Plastic Index: 15
USCS Class: MH

Legend

● Trial 1 51.3' - 51.8'
▲ Trial 2 50.8' - 51.3'
■ Trial 3 50.3' - 50.8'

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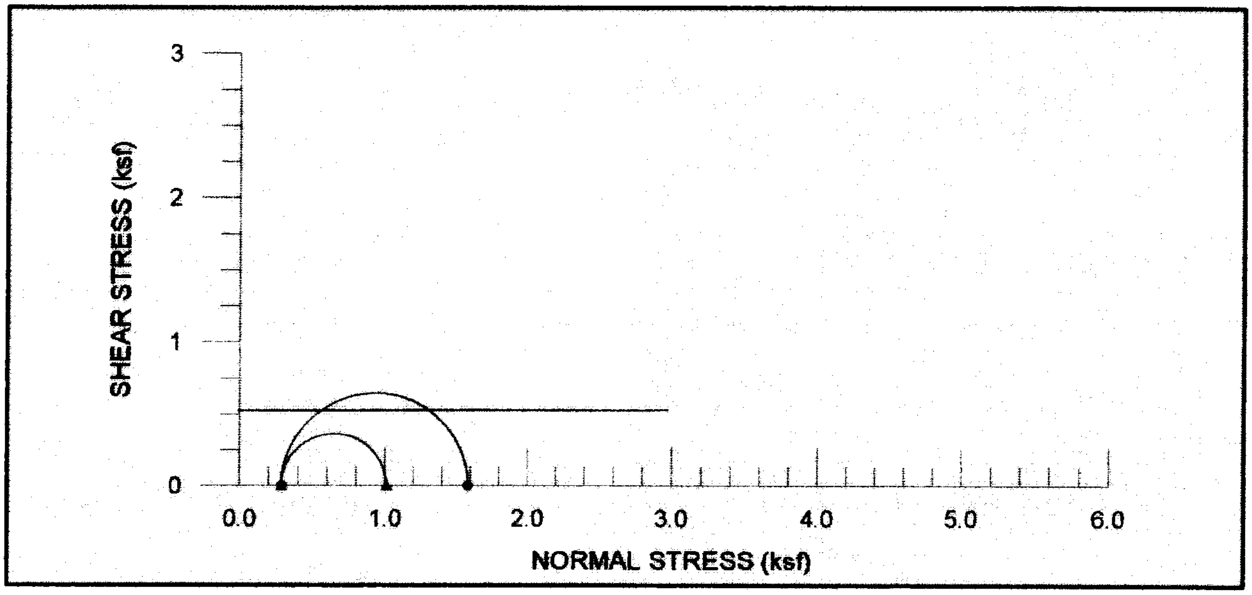
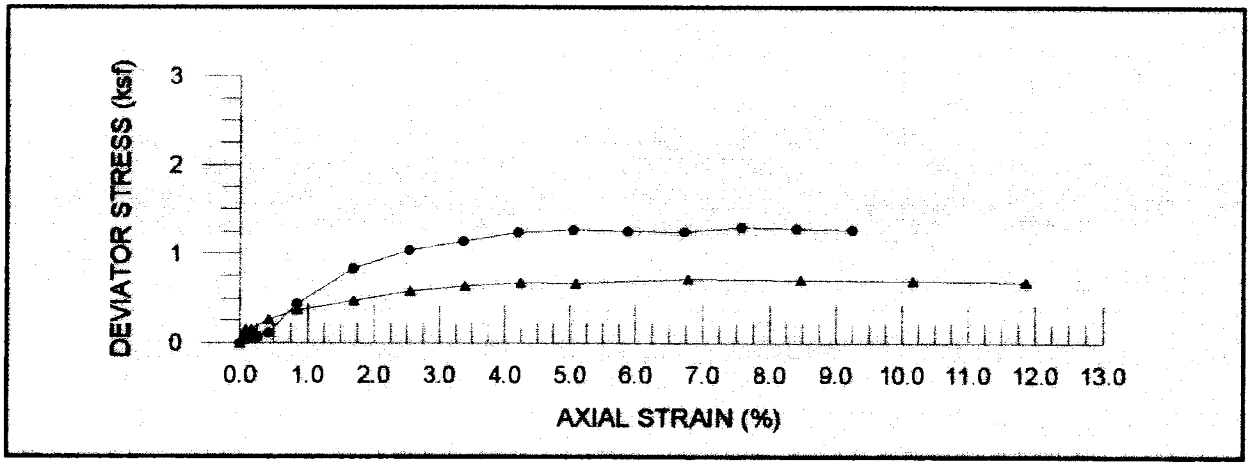
Work Order Number: 3769.GE
Date: 12/98

Tested By: CFY
Reviewed By: JFC

TRIAXIAL COMPRESSION TEST, Q (ASTM: D2850)

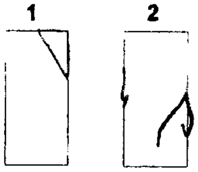




c (ksf) = 0.505

Minor Prin. Stress (ksf) :	0.29	0.29
Max. Deviator Stress (ksf):	1.30	0.725
Initial Height (in.):	5.95	5.90
Initial Diameter (in.):	2.87	2.88
Saturation:	97%	95%

Failure Sketch:



Remarks:

Sample Identification: **TB-5 SH-2 (10'-12')**
Sample Description: Gray clayey SILT, trace mica and organics (plant stem).
Initial Moisture Content (%): 67.8
% Passing No. 200 Sieve: 99.2
Dry Unit Weight (PCF): 59.8
Liquid Limit: 72
Plastic Limit: 36
Plastic Index: 36
USCS Class: MH

Legend

●— Trail 2 10.85' - 11.35'
▲— Trail 3 10.35' - 10.85'

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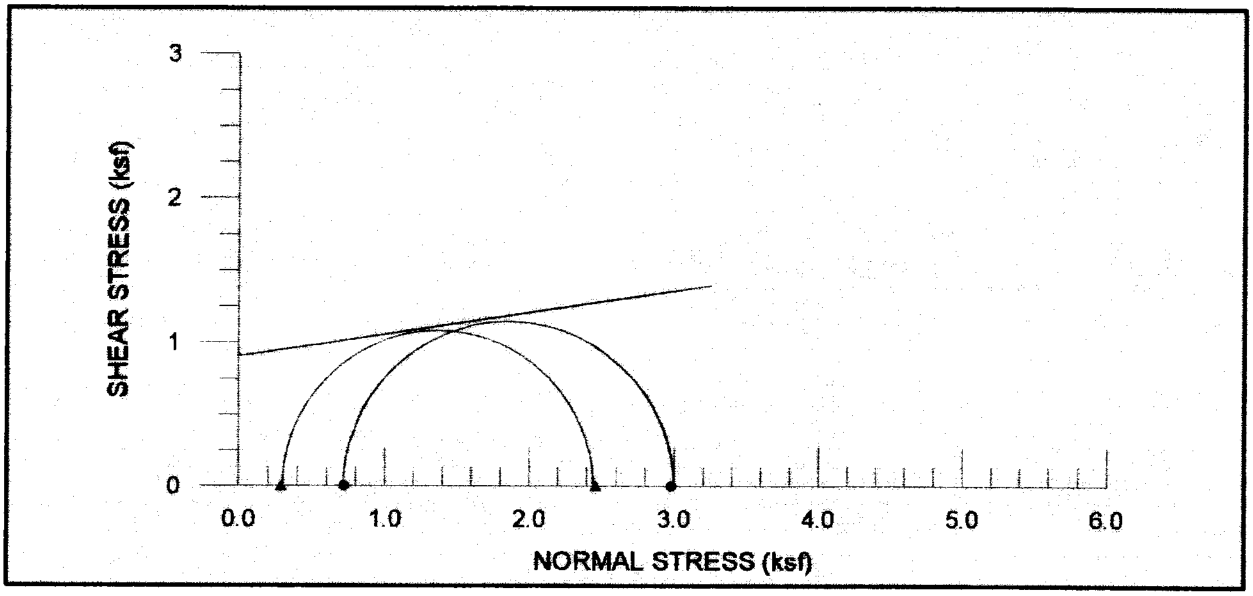
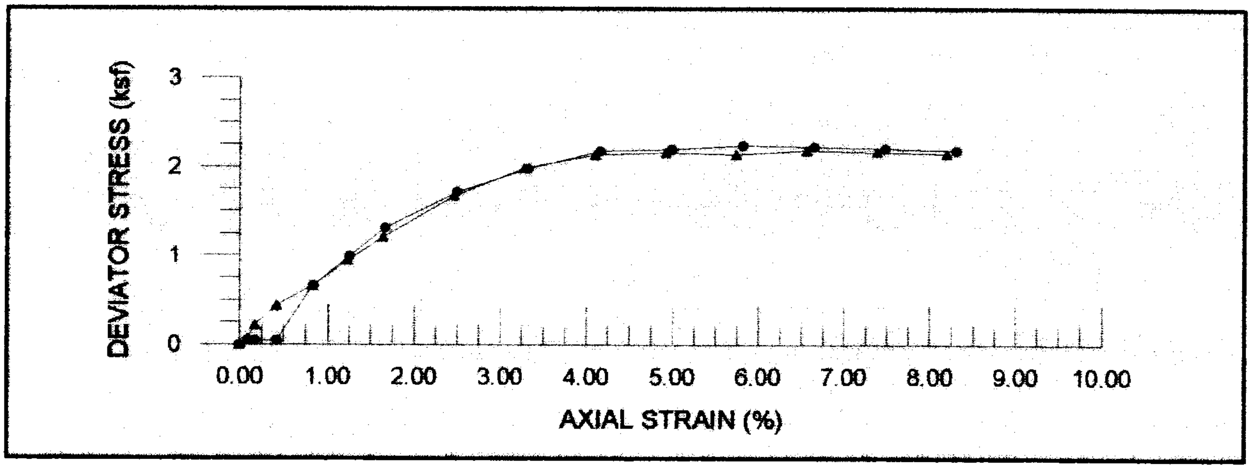
Date: 12/98

Tested By: CFY
Reviewed By: JFC

TRIAXIAL COMPRESSION TEST, R (ASTM: D4767)

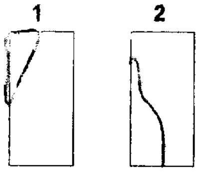




c (ksf) = 0.910
ϕ = 9 °

Minor Prin. Stress (ksf) :	0.72	0.29
Max Deviator Stress (ksf):	2.26	2.17
Initial Height (in.):	6.02	6.10
Initial Diameter (in.):	2.87	2.87
Saturation:	96%	96%

Failure Sketch:



Remarks:

Sample Identification: **TB-3 SH-2 (24'-26')**
Sample Description: Dark-gray clayey SILT, trace to little sand, trace mica and organics.
Initial Moisture Content (%): 50.2
% Passing No. 200 Sieve: 89.00
Dry Unit Weight (PCF): 97.0
Liquid Limit: 58
Plastic Limit: 35
Plastic Index: 23
USCS Class: MH

Legend Title

● Trial 1 25.3' - 25.8'
▲ Trial 2 24.8' - 25.3'

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Project: Pearce Creek
Work Order Number: 3769.GE
Date: 12/98

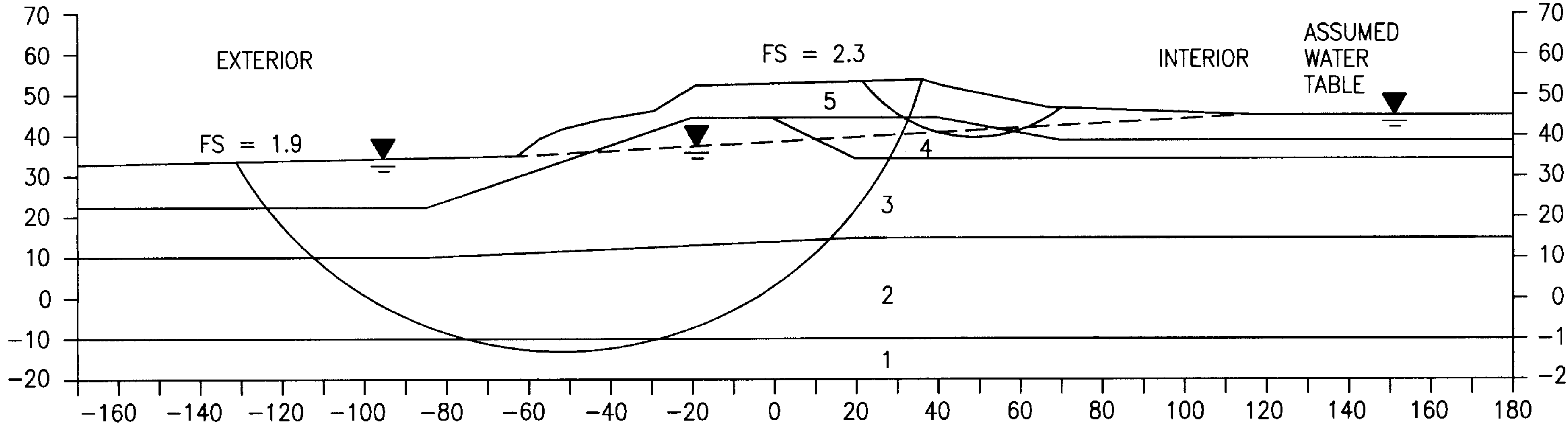
Tested By: CFY
Reviewed By: JFC

APPENDIX E

SLOPE STABILITY CROSS SECTIONS

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)	COHESION (PCF)	FRICTION ANGLE (deg.)
5	CLAY/SILT CRUST	120	0	30
4	FINE SAND	120	0	32
3	CLAY/SILT	115	600	0
2	SAND	120	0	32
1	CLAY	120	750	0

CROSS SECTION A–A
EXISTING CONDITIONS



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SLOPE STABILITY ANALYSIS
CROSS–SECTION A–A
PEARCE CREEK
DREDGED MATERIAL
CONTAINMENT AREA
CECIL COUNTY ~ MARYLAND

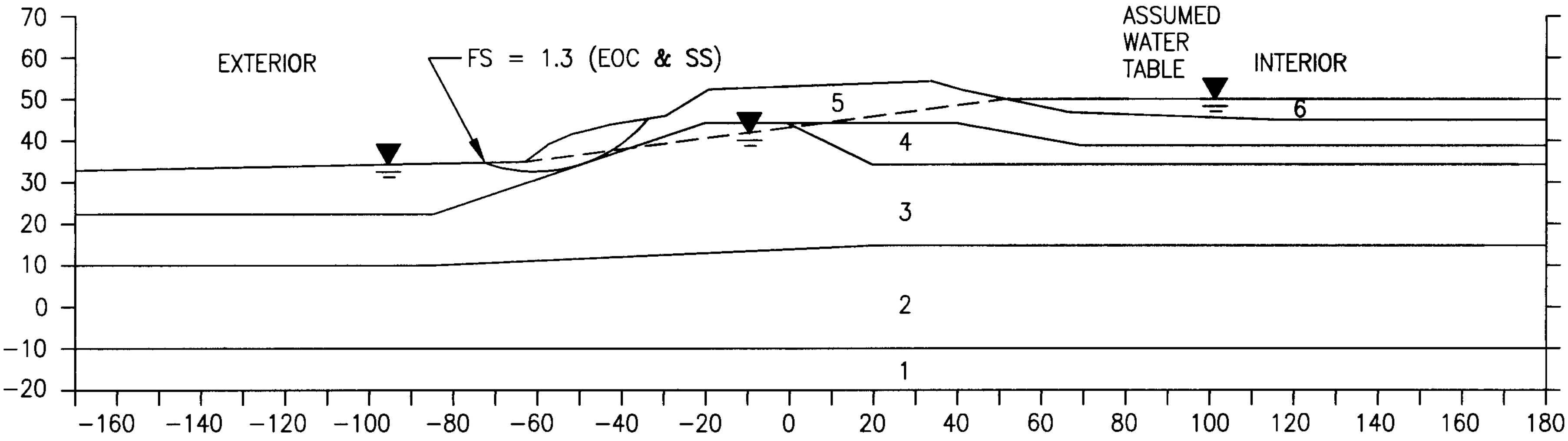
Drawn: CFY **Chk'd:** DSS
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A–3769GL–01
FIGURE E.1

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)		FRICTION ANGLE (deg.)	
		EOC	SS	EOC	SS	EOC	SS
6	NEW DREDGE	70	90	0	0	0	34
5	CLAY/SILT CRUST	120	120	0	0	30	30
4	FINE SAND	120	120	0	0	32	32
3	CLAY/SILT	115	120	600	0	0	34
2	SAND	120	120	0	0	32	32
1	CLAY	120	120	750	0	0	34

EOC = END OF CONSTRUCTION
SS = STEADY STATE SEEPAGE

CROSS SECTION A-A
EXISTING DIKE WITH 2 FOOT FREEBOARD
(TOP OF DREDGED MATERIAL AT EL. 50)



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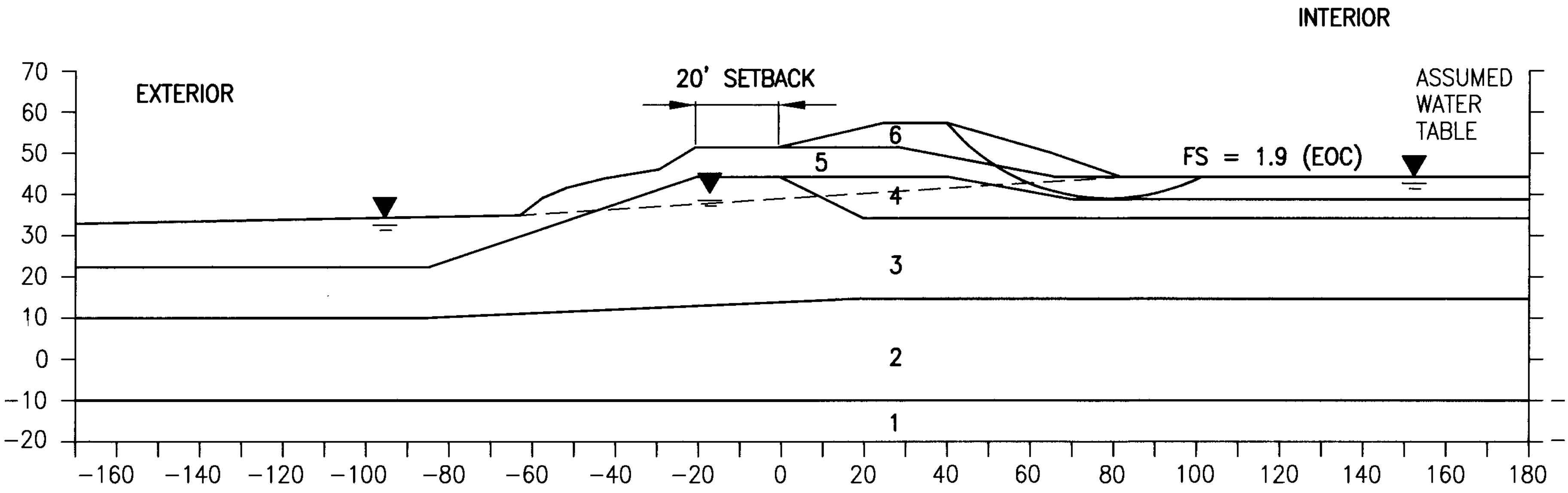
SLOPE STABILITY ANALYSIS
CROSS-SECTION A-A
PEARCE CREEK
DREDGED MATERIAL
CONTAINMENT AREA
CECIL COUNTY ~ MARYLAND

Drawn: CFY **Chk'd:** DSS
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A-3769GL-02
FIGURE E.2

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)	COHESION (PCF)	FRICTION ANGLE (deg.)
6	NEW DIKE	120	0	32
5	CLAY/SILT CRUST	120	0	30
4	FINE SAND	120	0	32
3	CLAY/SILT	115	600	0
2	SAND	120	0	32
1	CLAY	120	750	0

CROSS SECTION A–A
RAISED DIKE WITH EXISTING DREDGED MATERIAL
ELEVATION AND 20 FOOT SETBACK



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SLOPE STABILITY ANALYSIS
CROSS–SECTION A–A
PEARCE CREEK
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CECIL COUNTY ~ MARYLAND

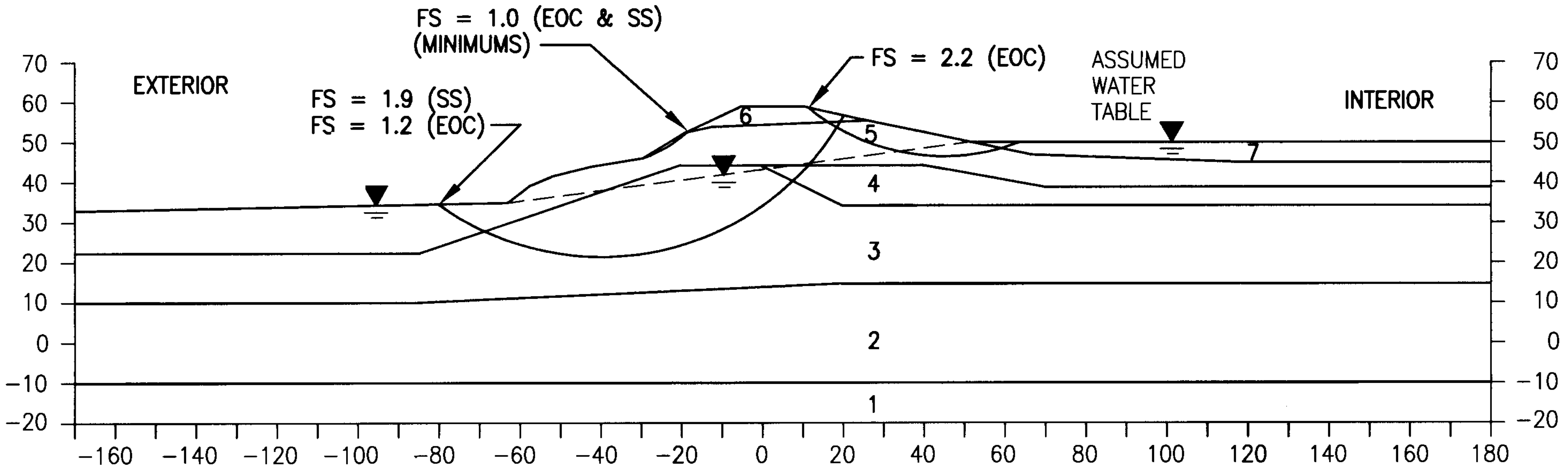
Drawn: CFY Chk'd: DSS
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A–3769GL–21
FIGURE E.3

No:	Revision:	Date:

CROSS SECTION A–A
RAISED DIKE WITH DREDGED MATERIAL
ELEVATION OF 50 FEET AND NO SETBACK

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)		FRICTION ANGLE (deg.)	
		EOC	SS	EOC	SS	EOC	SS
7	NEW DREDGE	70	90	0	0	0	34
6	NEW DIKE	120	120	0	0	32	32
5	CLAY/SILT CRUST	120	120	0	0	30	30
4	FINE SAND	120	120	0	0	32	32
3	CLAY/SILT	115	120	600	0	0	34
2	SAND	120	120	0	0	32	32
1	CLAY	120	120	750	0	0	34

EOC = END OF CONSTRUCTION
SS = STEADY STATE SEEPAGE



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SLOPE STABILITY ANALYSIS
CROSS–SECTION A–A
PEARCE CREEK
DREDGED MATERIAL
CONTAINMENT AREA
CECIL COUNTY ~ MARYLAND

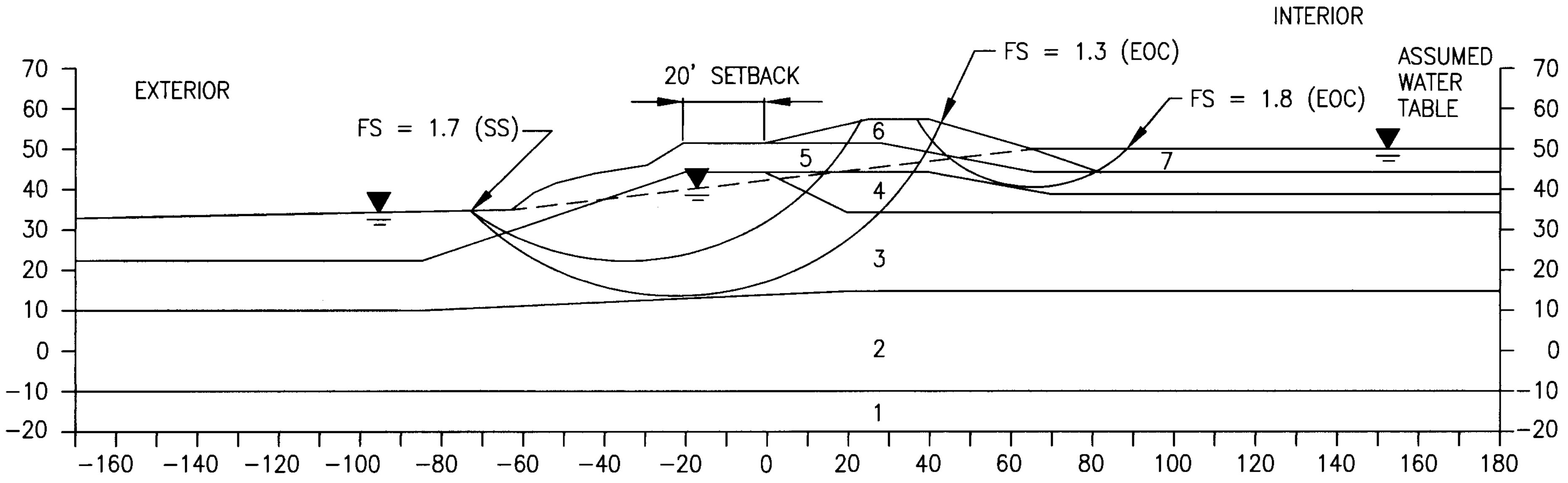
Drawn: CFY Chk'd: DSS
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A–3769GL–03
FIGURE E.4

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)		FRICTION ANGLE (deg.)	
		EOC	SS	EOC	SS	EOC	SS
7	NEW DREDGE	70	90	0	0	0	34
6	NEW DIKE	120	120	0	0	32	32
5	CLAY/SILT CRUST	120	120	0	0	30	30
4	FINE SAND	120	120	0	0	32	32
3	CLAY/SILT	115	120	600	0	0	34
2	SAND	120	120	0	0	32	32
1	CLAY	120	120	750	0	0	34

EOC = END OF CONSTRUCTION
SS = STEADY STATE SEEPAGE

CROSS SECTION A-A
RAISED DIKE WITH DREDGED MATERIAL
ELEVATION OF 50 FEET AND 20 FOOT SETBACK



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SLOPE STABILITY ANALYSIS
CROSS-SECTION A-A
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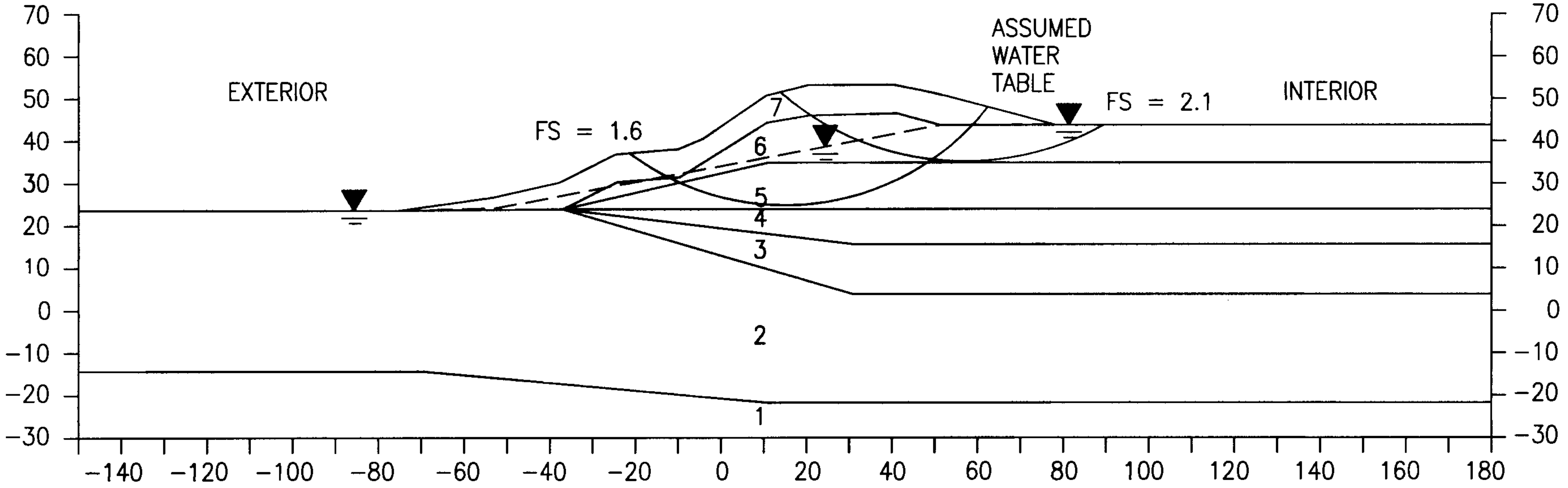
CONTAINMENT AREA
CECIL COUNTY ~ MARYLAND

Drawn: CFY Chk'd: DSS
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A-3769GL-04
FIGURE E.5

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)	COHESION (PCF)	FRICTION ANGLE (deg.)
7	CLAY/SILT CRUST	120	800	0
6	CLAY	115	200	0
5	CLAY	115	600	0
4	CLAY	115	800	0
3	SAND/SILT/CLAY	120	1100	0
2	SAND	115	0	33
1	CLAY	115	750	0

CROSS SECTION B–B
EXISTING CONDITIONS



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SLOPE STABILITY ANALYSIS
CROSS–SECTION B–B
PEARCE CREEK
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CECIL COUNTY ~ MARYLAND

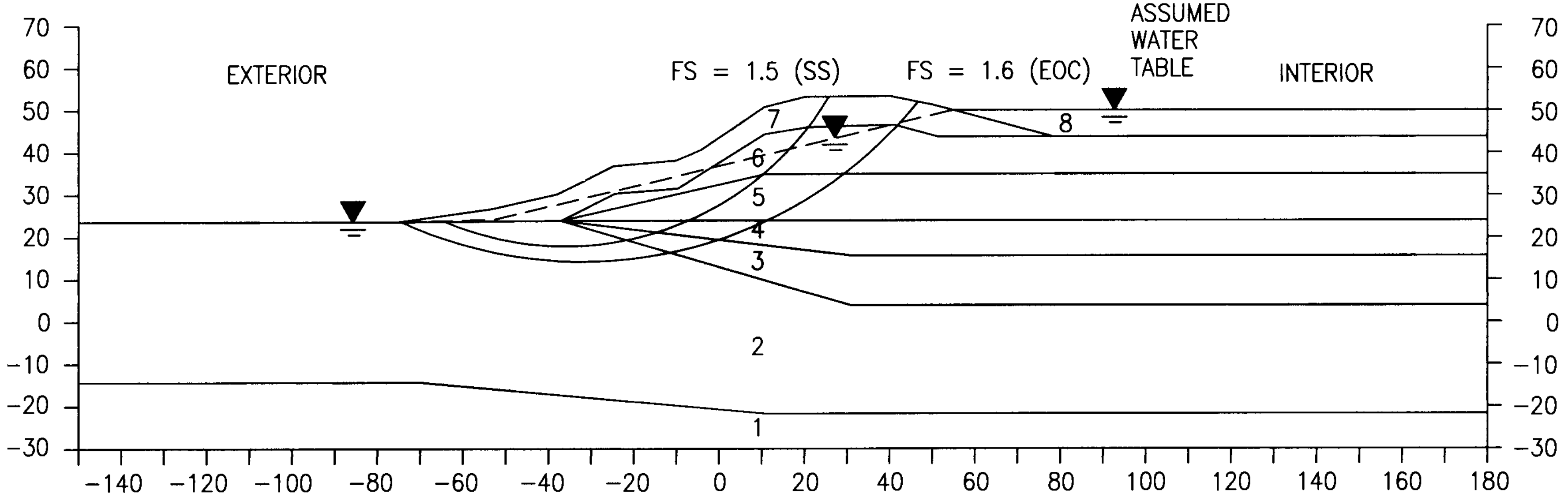
Drawn: CFY Chk'd: DSS	Date: 29 JULY 1999
Scale: 1" = 40'	W.O.: 3769.GL
File No: A–3769GL–05	FIGURE E.6

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)		FRICTION ANGLE (deg.)	
		EOC	SS	EOC	SS	EOC	SS
8	NEW DREDGE	70	90	0	0	0	34
7	CLAY/SILT CRUST	120	90	800	0	0	34
6	CLAY	115	90	200	0	0	34
5	CLAY	115	120	600	0	0	34
4	CLAY	115	120	800	0	0	34
3	SAND/SILT/CLAY	120	120	1100	0	0	34
2	SAND	115	120	0	0	33	33
1	CLAY	115	120	750	0	0	34

EOC = END OF CONSTRUCTION
SS = STEADY STATE SEEPAGE

CROSS SECTION B–B
EXISTING DIKE WITH 2 FOOT FREEBOARD



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SLOPE STABILITY ANALYSIS
CROSS–SECTION B–B
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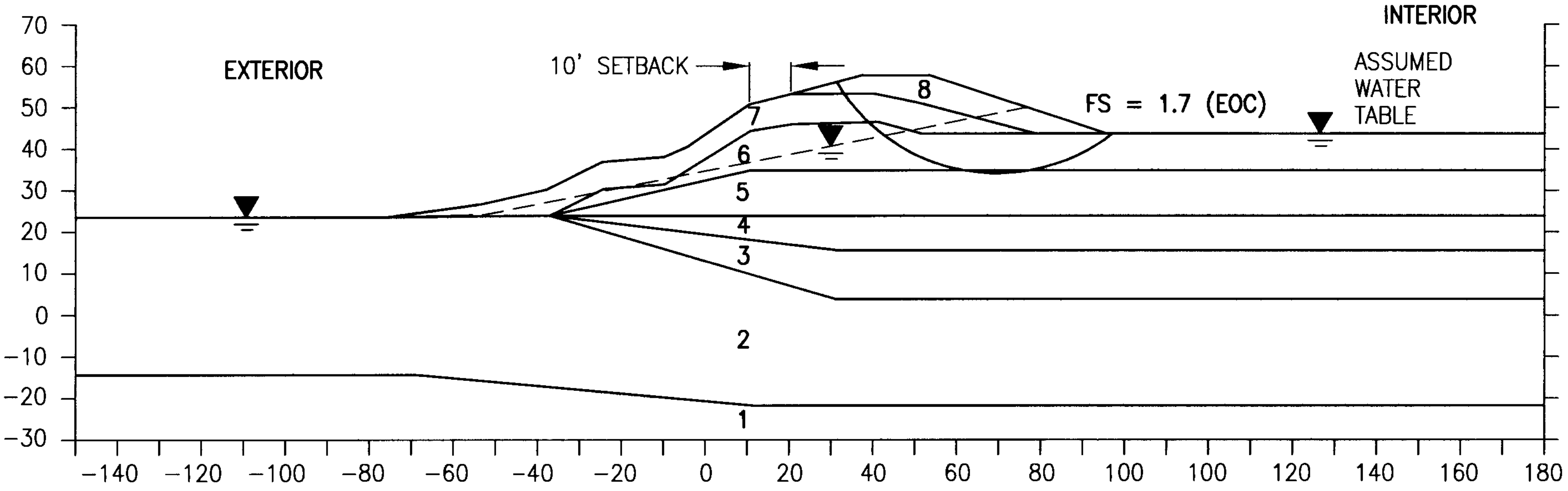
CECIL COUNTY ~ MARYLAND

Drawn: CFY	Chk'd: DSS	Date:	29 JULY 1999
Scale:	1" = 40'	W.O.:	3769.GL
File No:	A–3769GL–06	FIGURE E.7	

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)	COHESION (PCF)	FRICTION ANGLE (deg.)
8	NEW DIKE	120	800	0
7	CLAY/SILT CRUST	120	800	0
6	CLAY	115	200	0
5	CLAY	115	600	0
4	CLAY	115	800	0
3	SAND/SILT/CLAY	120	1100	0
2	SAND	115	0	33
1	CLAY	115	750	0

CROSS SECTION B–B
RAISED DIKE WITH DREDGED MATERIAL
EVELATION OF 50 FEET AND 10 FOOT SETBACK



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SLOPE STABILITY ANALYSIS
CROSS–SECTION B–B
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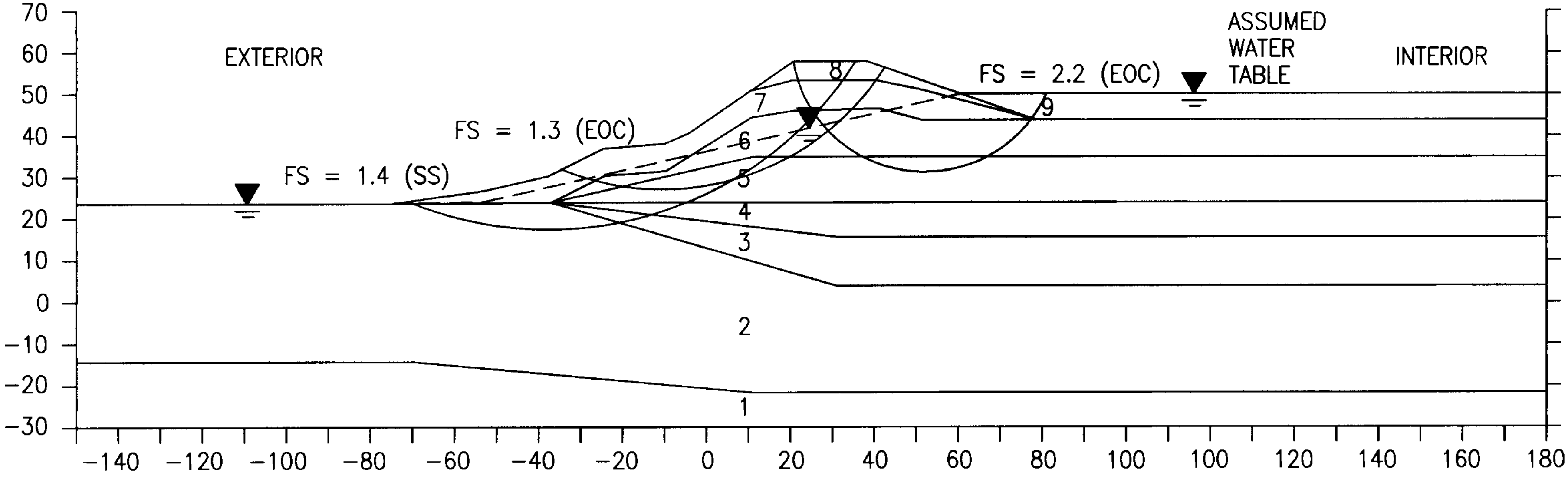
Drawn: CFY	Chk'd: DSS	Date:	29 JULY 1999
Scale:	1" = 40'	W.O.:	3769.GL
File No:	A–3769GL–22	FIGURE E.8	

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)		FRICTION ANGLE (deg.)	
		EOC	SS	EOC	SS	EOC	SS
9	NEW DREDGE	70	90	0	0	0	34
8	NEW DIKE	120	120	800	0	0	34
7	CLAY/SILT CRUST	120	120	800	0	0	34
6	CLAY	115	115	200	0	0	34
5	CLAY	115	115	600	0	0	34
4	CLAY	115	115	800	0	0	34
3	SAND/SILT/CLAY	120	120	1100	0	0	34
2	SAND	115	115	0	0	33	33
1	CLAY	115	115	750	0	0	34

EOC = END OF CONSTRUCTION
SS = STEADY STATE SEEPAGE

CROSS SECTION B–B
RAISED DIKE WITH DREDGED MATERIAL
ELEVATION OF 50 FEET AND NO SETBACK



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SLOPE STABILITY ANALYSIS
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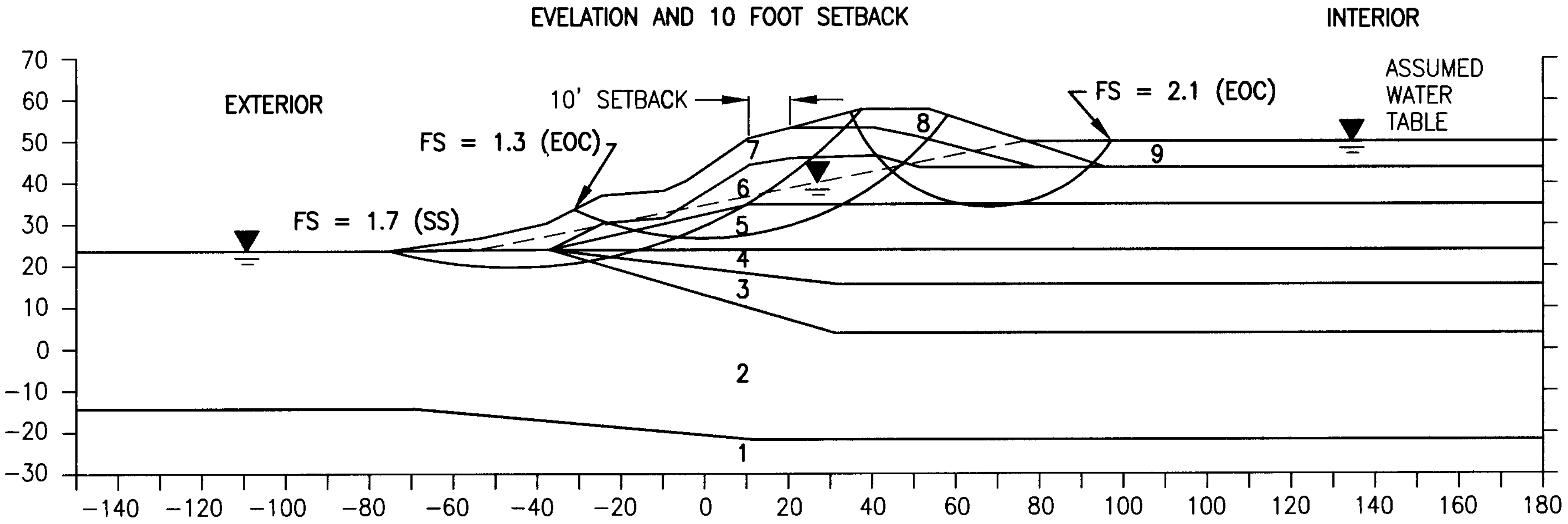
Drawn: CFY	Chk'd: DSS	Date:	29 JULY 1999
Scale:	1" = 40'	W.O.:	3769.GL
File No:	A–3769GL–07	FIGURE E.9	

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)		FRICTION ANGLE (deg.)	
		EOC	SS	EOC	SS	EOC	SS
9	NEW DREDGE	70	90	0	0	0	34
8	NEW DIKE	120	120	800	0	0	34
7	CLAY/SILT CRUST	120	120	800	0	0	34
6	CLAY	115	115	200	0	0	34
5	CLAY	115	115	600	0	0	34
4	CLAY	115	115	800	0	0	34
3	SAND/SILT/CLAY	120	120	1100	0	0	34
2	SAND	115	115	0	0	33	33
1	CLAY	115	115	750	0	0	34

EOC = END OF CONSTRUCTION
SS= STEADY STATE SEEPAGE

CROSS SECTION B-B
RAISED DIKE WITH EXISTING DREDGED MATERIAL EVELATION AND 10 FOOT SETBACK



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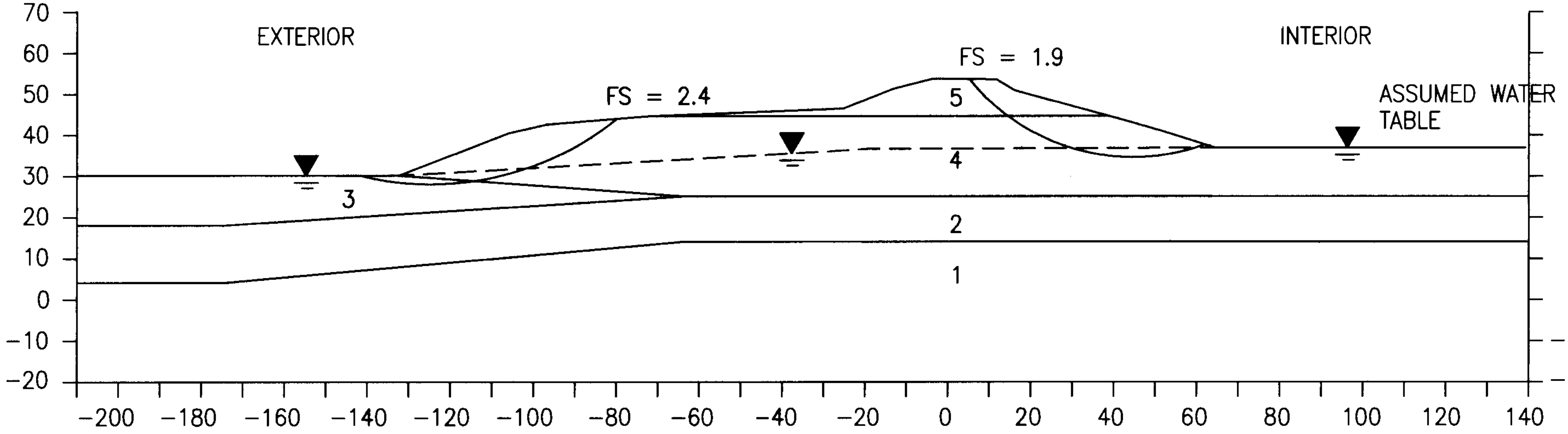
SLOPE STABILITY ANALYSIS
CROSS-SECTION B-B
PEARCE CREEK
DREDGED MATERIAL
CONTAINMENT AREA
CECIL COUNTY ~ MARYLAND

Drawn: CFY Chk'd: DSS
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A-3769GL-08
FIGURE E.10

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)	COHESION (PCF)	FRICTION ANGLE (deg.)
5	SAND	120	0	34
4	SILT	115	400	0
3	SAND	120	0	40
2	SAND	120	0	36
1	CLAY/SILT	115	1250	0

CROSS SECTION C–C
EXISTING CONDITIONS



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SLOPE STABILITY ANALYSIS
CROSS–SECTION C–C
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CECIL COUNTY ~ MARYLAND

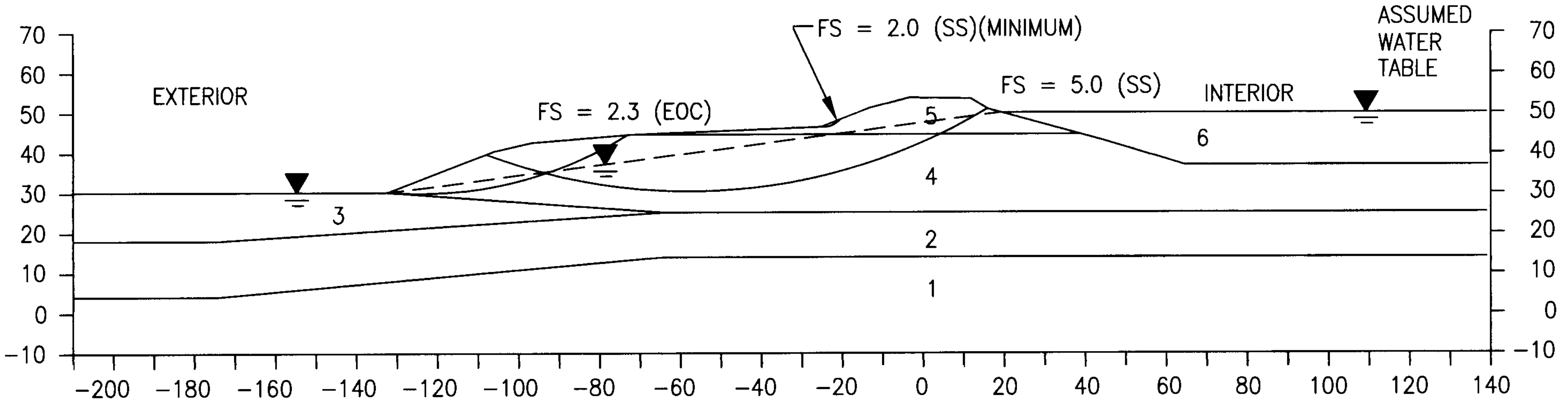
Drawn: CFY Chk'd: DSS
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A–3769GL–09
FIGURE E.11

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)		FRICTION ANGLE (deg.)	
		EOC	SS	EOC	SS	EOC	SS
6	NEW DREDGE	70	90	0	0	0	34
5	SAND	120	120	0	0	34	34
4	SILT	115	115	400	0	0	34
3	SAND	120	120	0	0	40	40
2	SAND	120	120	0	0	36	36
1	CLAY/SILT	115	115	1250	0	0	34

EOC = END OF CONSTRUCTION
SS = STEADY STATE SEEPAGE

CROSS SECTION C-C
EXISTING DIKE WITH 2 FOOT FREEBOARD



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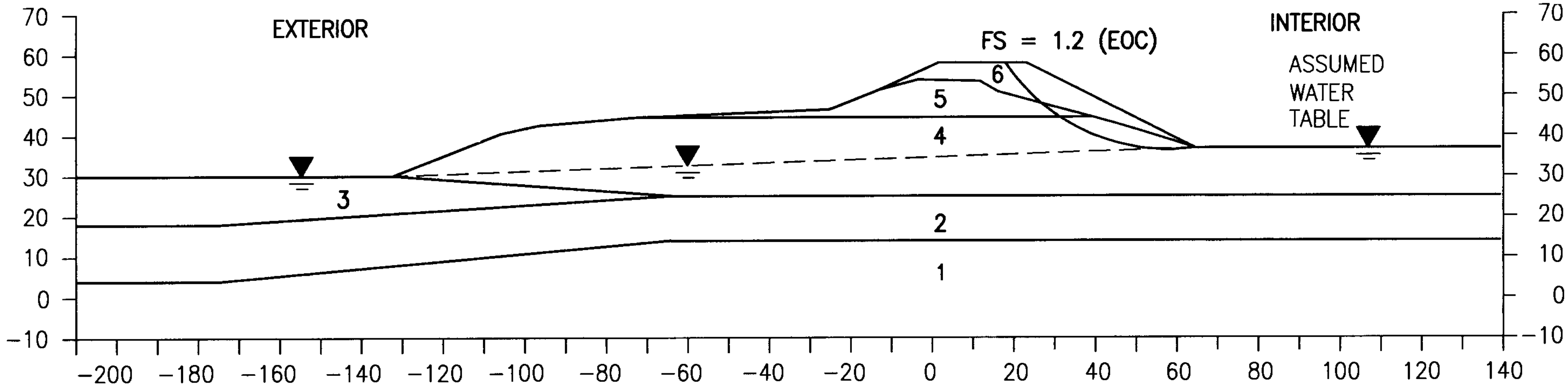
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A-3769GL-10
FIGURE E.12

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)	COHESION (PCF)	FRICTION ANGLE (deg.)
6	NEW DIKE	70	0	0
5	SAND	120	0	34
4	SILT	115	400	0
3	SAND	120	0	40
2	SAND	120	0	36
1	CLAY/SILT	115	1250	0

CROSS SECTION C–C
RAISED DIKE WITH EXISTING DREDGED MATERIAL ELEVATION



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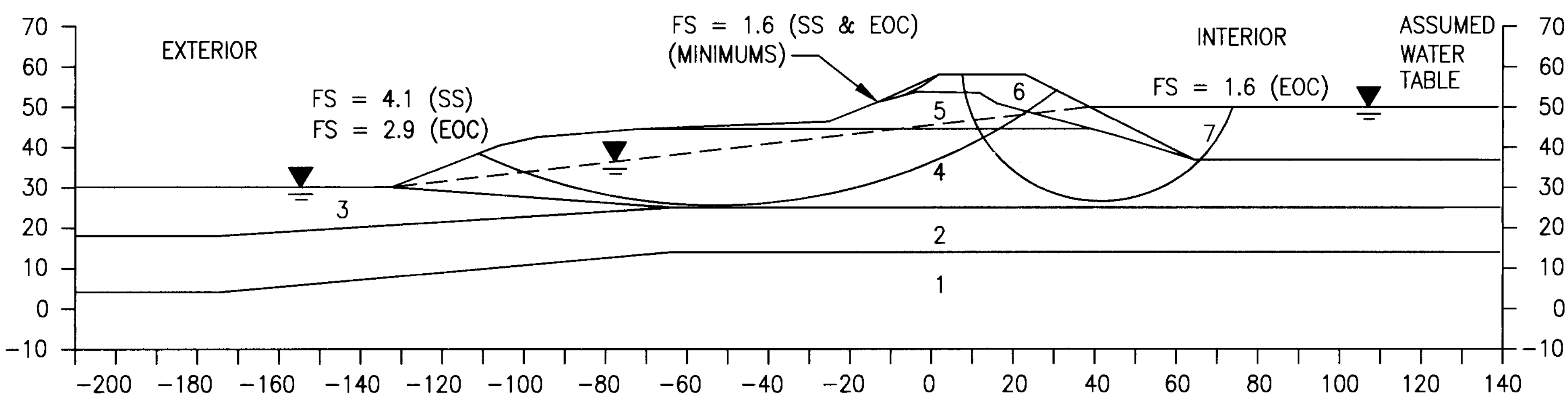
Drawn: CFY Chk'd: DSS
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A–3769GL–23
FIGURE E.13

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)		FRICTION ANGLE (deg.)	
		EOC	SS	EOC	SS	EOC	SS
7	NEW DREDGE	70	90	0	0	0	34
6	NEW DIKE	70	120	0	0	0	34
5	SAND	120	120	0	0	34	34
4	SILT	115	115	400	0	0	34
3	SAND	120	120	0	0	40	40
2	SAND	120	120	0	0	36	36
1	CLAY/SILT	115	115	1250	0	0	34

EOC = END OF CONSTRUCTION
SS = STEADY STATE SEEPAGE

CROSS SECTION C–C
RAISED DIKE WITH DREDGED MATERIAL ELEVATION OF 50 FEET



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SLOPE STABILITY ANALYSIS
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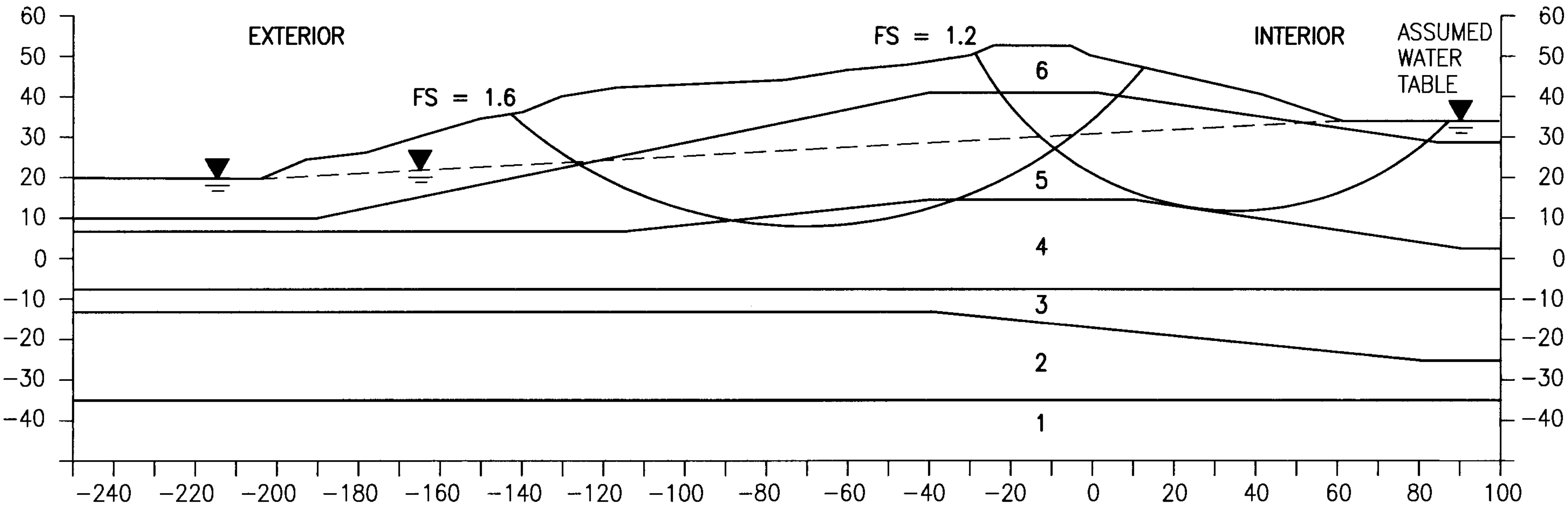
Scale:	1" = 40'	**W.O.:**	3769.GL
File No:	A–3769GL–11	FIGURE E.14	

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)	COHESION (PCF)	FRICTION ANGLE (deg.)
6	SILT/CLAY CRUST	110	800	0
5	SILT/CLAY	110	350	33
4	SAND	115	0	0
3	SILT/CLAY	120	1500	0
2	SAND	130	0	40
1	CLAY	130	3000	0

CROSS SECTION D-D
EXISTING CONDITIONS



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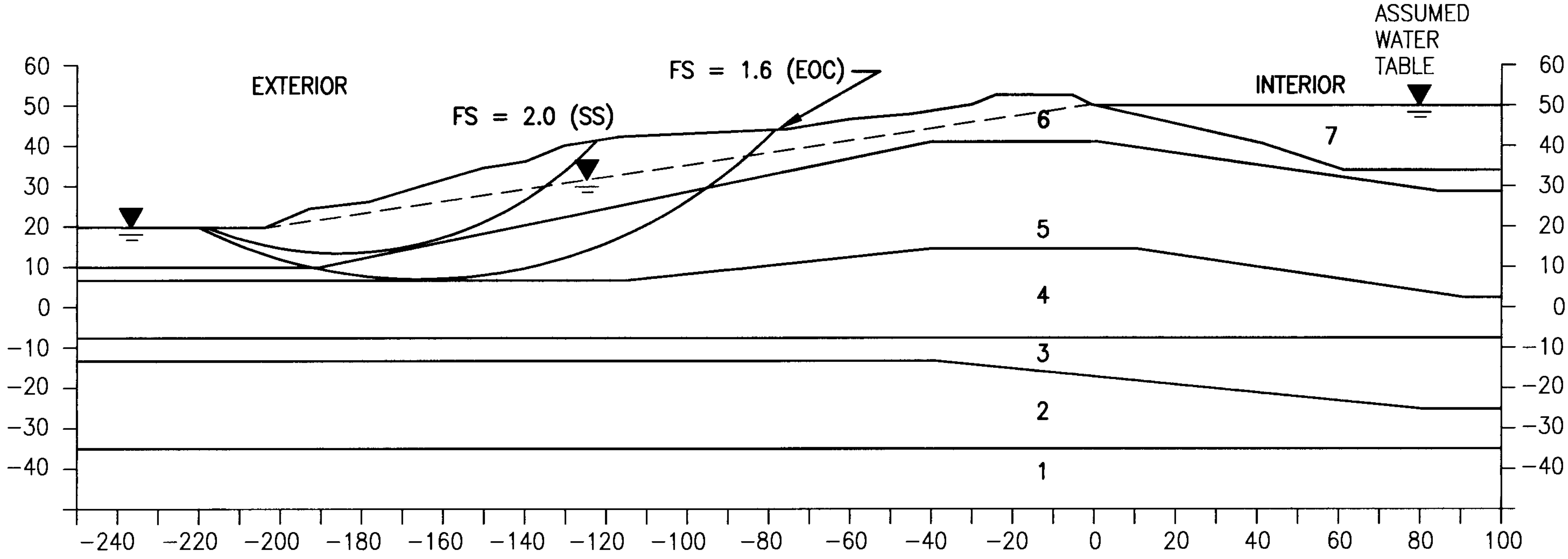
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A−3769GL−12
FIGURE E.15

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)		FRICTION ANGLE (deg.)	
		EOC	SS	EOC	SS	EOC	SS
7	NEW DREDGE	70	90	0	0	0	34
6	CLAY/SILT CRUST	110	120	800	0	0	34
5	SILT/CLAY	110	120	350	0	0	34
4	SAND	115	120	0	0	33	33
3	SILT/CLAY	120	120	1500	0	0	34
2	SAND	130	130	0	0	40	40
1	CLAY	130	130	3000	0	0	34

EOC = END OF CONSTRUCTION
SS = STEADY STATE SEEPAGE

CROSS SECTION D–D
EXISTING DIKE WITH 2 FOOT FREEBOARD



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SLOPE STABILITY ANALYSIS
CROSS–SECTION D–D
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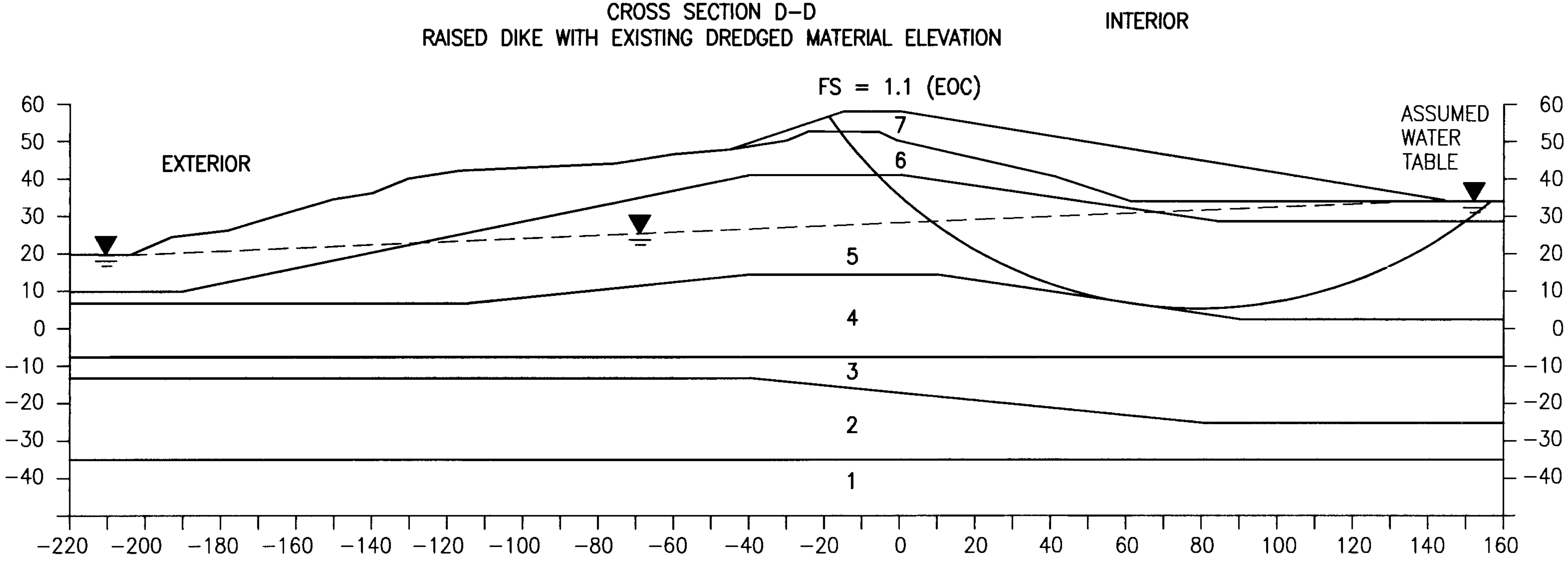
Drawn: CFY Chk'd: DSS
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A–3769GL–13
FIGURE E.16

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)	COHESION (PCF)	FRICTION ANGLE (deg.)
7	NEW DIKE	110	800	0
6	CLAY/SILT/CRUST	110	800	0
5	SILT/CLAY	110	350	0
4	SAND	115	0	33
3	SILT/CLAY	120	1500	0
2	SAND	130	0	40
1	CLAY	130	3000	0

CROSS SECTION D-D
RAISED DIKE WITH EXISTING DREDGED MATERIAL ELEVATION



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SLOPE STABILITY ANALYSIS
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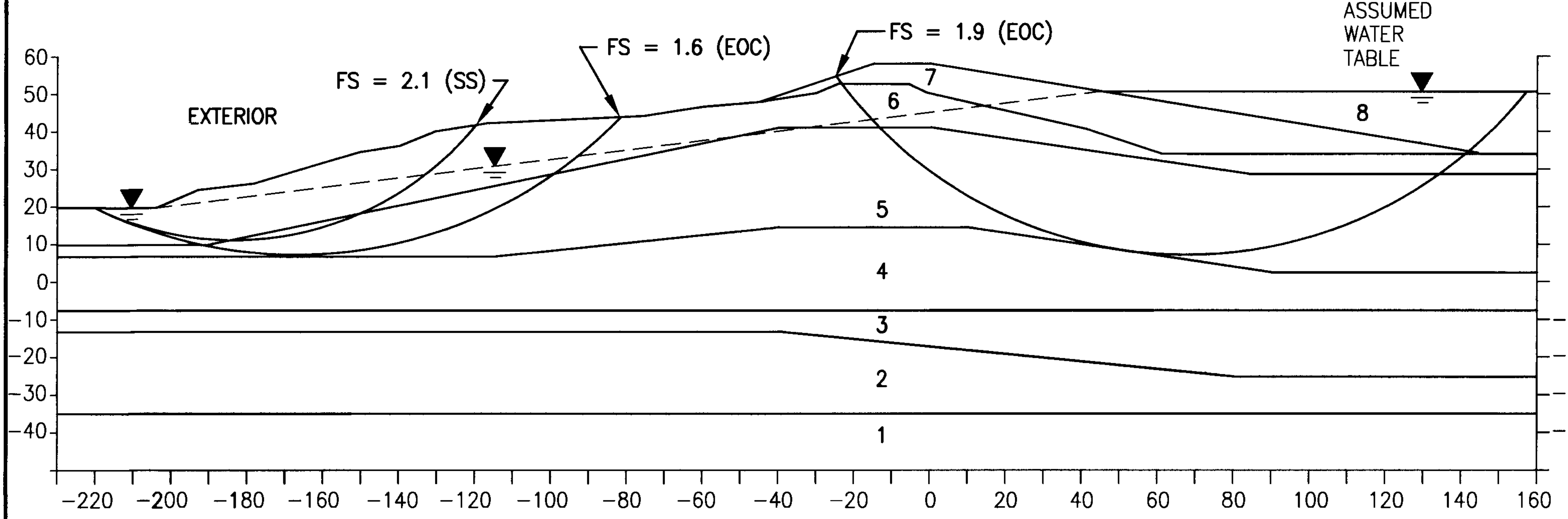
Drawn: CFY Chk'd: DSS
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A-3769GL-14
FIGURE E.17

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)		FRICTION ANGLE (deg.)	
		EOC	SS	EOC	SS	EOC	SS
8	NEW DREDGE	70	90	0	0	0	34
7	NEW DIKE	110	120	800	0	0	34
6	CLAY/SILT CRUST	110	120	800	0	0	34
5	SILT/CLAY	110	120	350	0	0	34
4	SAND	115	120	0	0	33	33
3	SILT/CLAY	120	120	1500	0	0	34
2	SAND	130	130	0	0	40	40
1	CLAY	130	130	3000	0	0	34

EOC = END OF CONSTRUCTION
SS= STEADY STATE SEEPAGE

CROSS SECTION D-D
RAISED DIKE WITH DREDGED MATERIAL ELEVATION OF 50 FEET



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SLOPE STABILITY ANALYSIS
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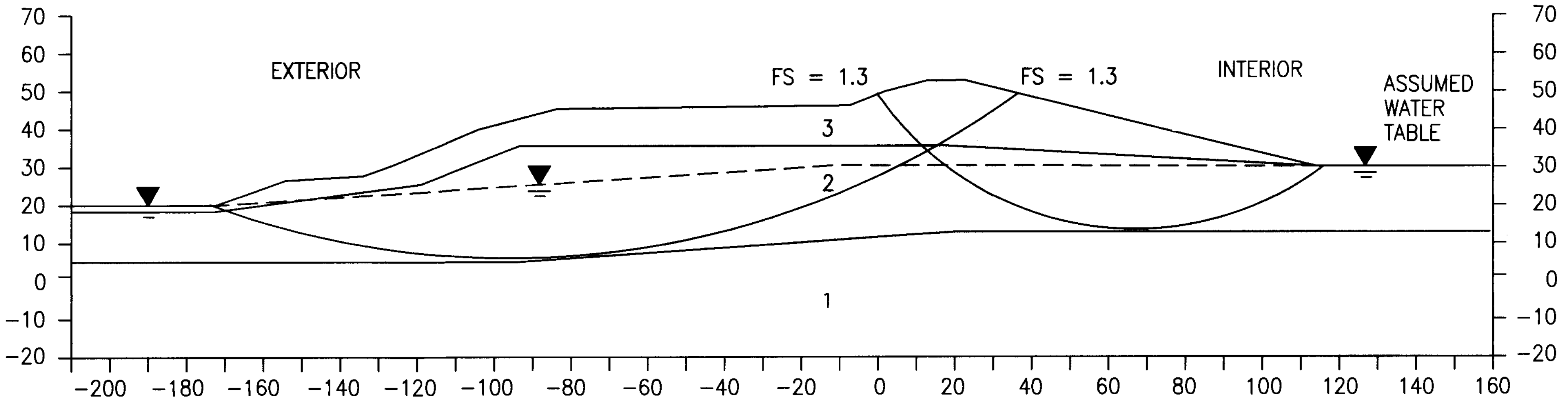
CECIL COUNTY ~ MARYLAND

Drawn: CFY	Chk'd: DSS	Date:	29 JULY 1999
Scale:	1" = 40'	W.O.:	3769.GL
File No:	A-3769GL-24	FIGURE E.18	

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)	COHESION (PCF)	FRICTION ANGLE (deg.)
3	CLAY/SILT CRUST	115	750	0
2	CLAY/SILT	110	400	0
1	SAND	120	0	37

CROSS SECTION E-E
EXISTING CONDITIONS



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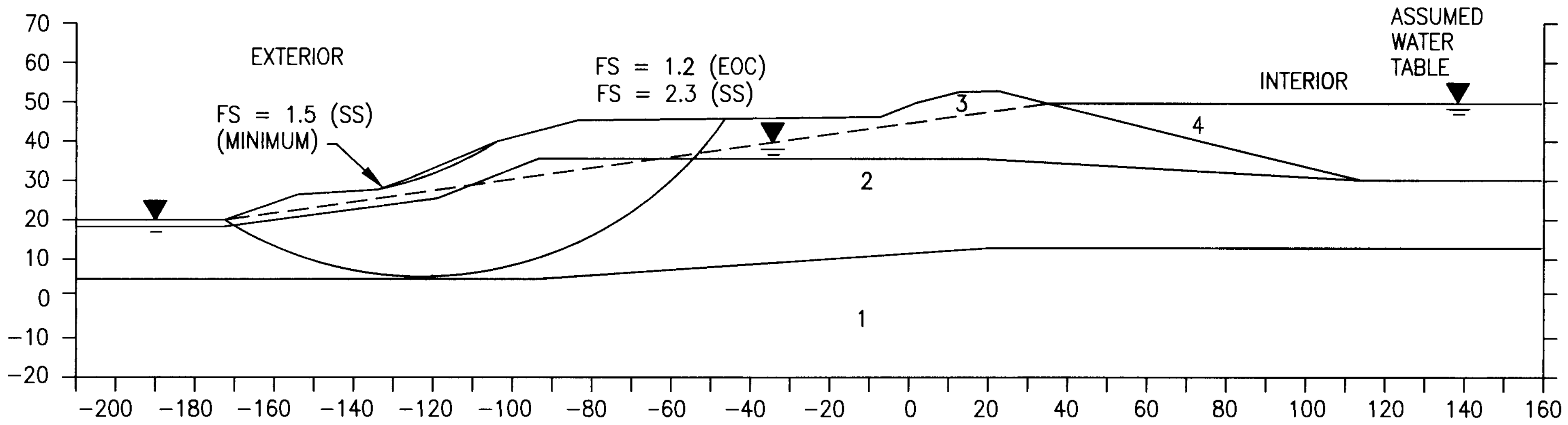
Scale:	1" = 40'	W.O.:	3769.GL
File No:	A-3769GL-15	FIGURE E.19	

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)		FRICTION ANGLE (deg.)	
		EOC	SS	EOC	SS	EOC	SS
4	NEW DREDGE	70	90	0	0	0	34
3	CLAY/SILT CRUST	115	115	750	0	0	34
2	CLAY/SILT	110	110	400	0	0	34
1	SAND	120	120	0	0	37	37

EOC = END OF CONSTRUCTION
SS = STEADY STATE SEEPAGE

CROSS SECTION E–E
EXISTING DIKE WITH 2 FOOT FREEBOARD



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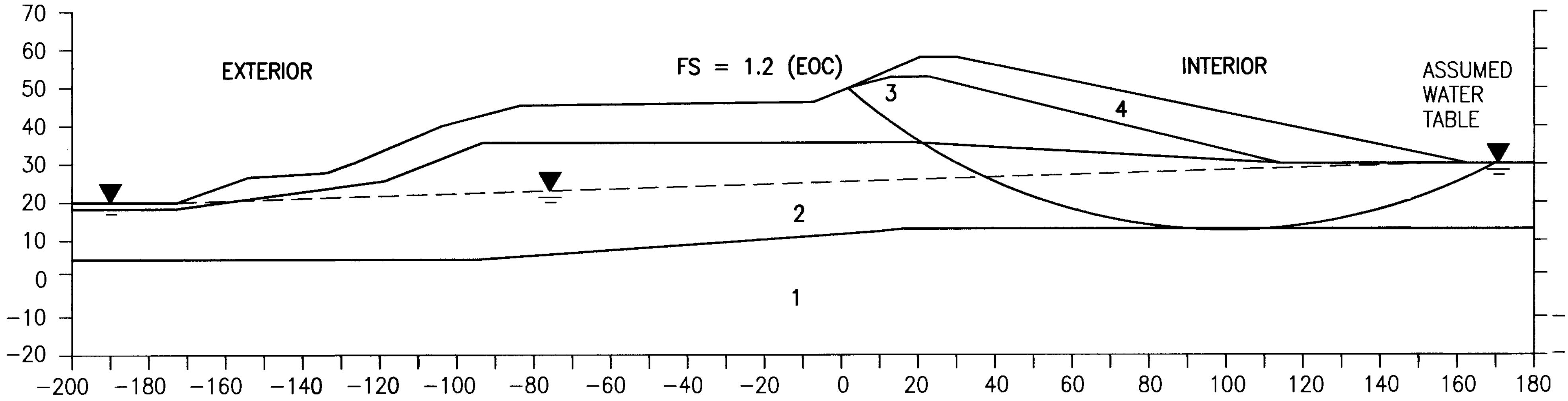
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A–3769GL–16
FIGURE E.20

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)	COHESION (PCF)	FRICTION ANGLE (deg.)
4	NEW DIKE	115	750	0
3	CLAY/SILT CRUST	115	750	0
2	CLAY/SILT	110	400	0
1	SAND	120	0	37

CROSS SECTION E–E
RAISED DIKE WITH EXISTING DREDGED MATERIAL ELEVATION



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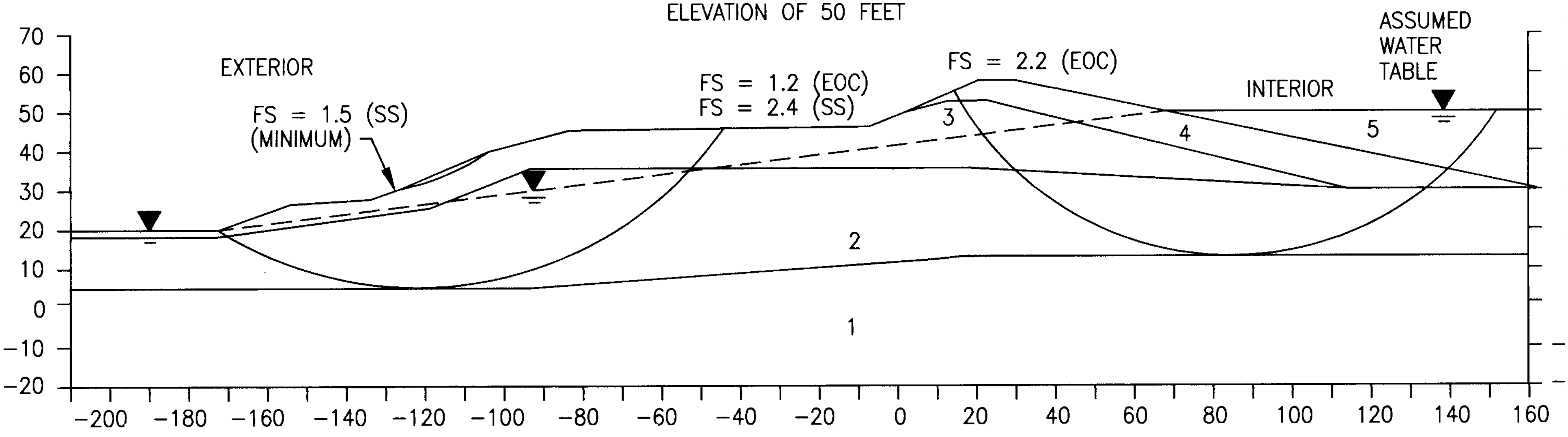
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A–3769GL–17
FIGURE E.21

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)		FRICTION ANGLE (deg.)	
		EOC	SS	EOC	SS	EOC	SS
5	NEW DREDGE	70	90	0	0	0	34
4	NEW DIKE	115	115	750	0	0	34
3	CLAY/SILT CRUST	115	115	750	0	0	34
2	CLAY/SILT	110	110	400	0	0	34
1	SAND	120	120	0	0	37	37

EOC = END OF CONSTRUCTION
SS = STEADY STATE SEEPAGE

CROSS SECTION E–E
RAISED DIKE WITH DREDGED MATERIAL
ELEVATION OF 50 FEET



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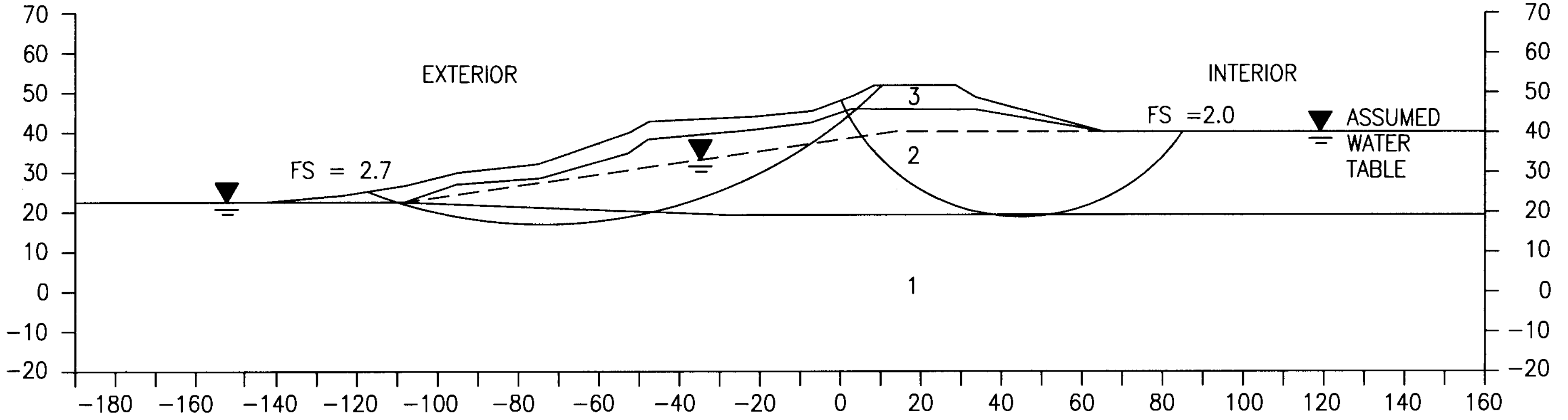
Drawn: CFY	Chk'd: DSS	Date: 29 JULY 1999
Scale:	1" = 40'	W.O.: 3769.GL
File No:	A–3769GL–25	FIGURE E.22
No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)	COHESION (PCF)	FRICTION ANGLE (deg.)
3	SILT/CLAY CRUST	110	800	0
2	SILT/CLAY	110	450	0
1	SAND	125	0	38

CROSS SECTION F–F
EXISTING CONDITIONS



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SLOPE STABILITY ANALYSIS
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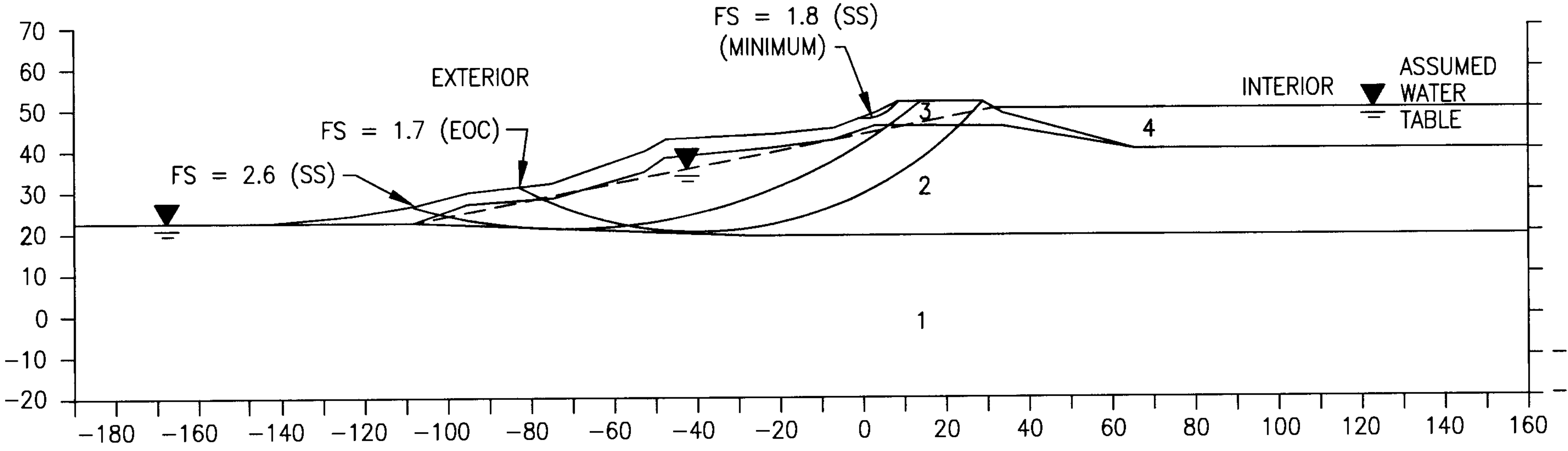
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A–3769GL–18
FIGURE E.23

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)		FRICTION ANGLE (deg.)	
		EOC	SS	EOC	SS	EOC	SS
4	NEW DREDGE	70	90	0	0	0	34
3	SILT/CLAY CRUST	110	110	800	0	0	34
2	SILT/CLAY	110	110	450	0	0	34
1	SAND	125	125	0	0	38	38

EOC = END OF CONSTRUCTION
SS = STEADY STATE SEEPAGE

CROSS SECTION F–F
EXISTING DIKE WITH 2 FOOT FREEBOARD



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SLOPE STABILITY ANALYSIS
CROSS–SECTION F–F
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CONTAINMENT AREA
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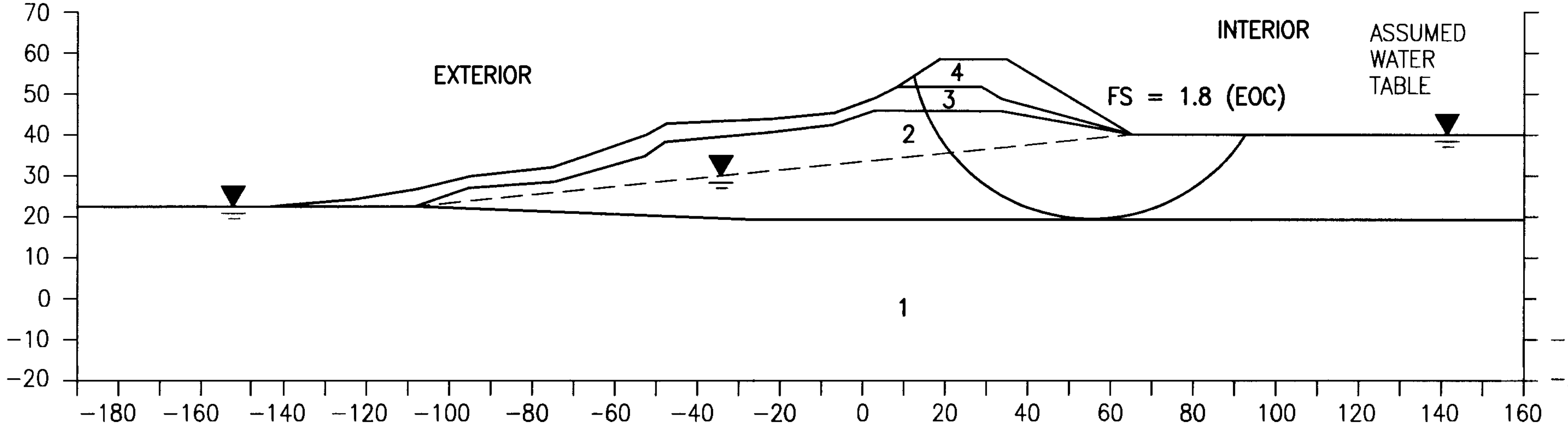
Drawn: CFY **Chk'd:** DSS	**Date:** 29 JULY 1999	
Scale: 1" = 40'	**W.O.:** 3769.GL	
File No: A–3769GL–19	FIGURE E.24	
No:	**Revision:**	**Date:**

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)	COHESION (PCF)	FRICTION ANGLE (deg.)
4	NEW DIKE	110	800	0
3	SILT/CLAY CRUST	110	800	0
2	SILT/CLAY	110	450	0
1	SAND	125	0	38

CROSS SECTION F–F
RAISED DIKE WITH EXISTING DREDGED MATERIAL ELEVATION



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SLOPE STABILITY ANALYSIS
CROSS–SECTION F–F
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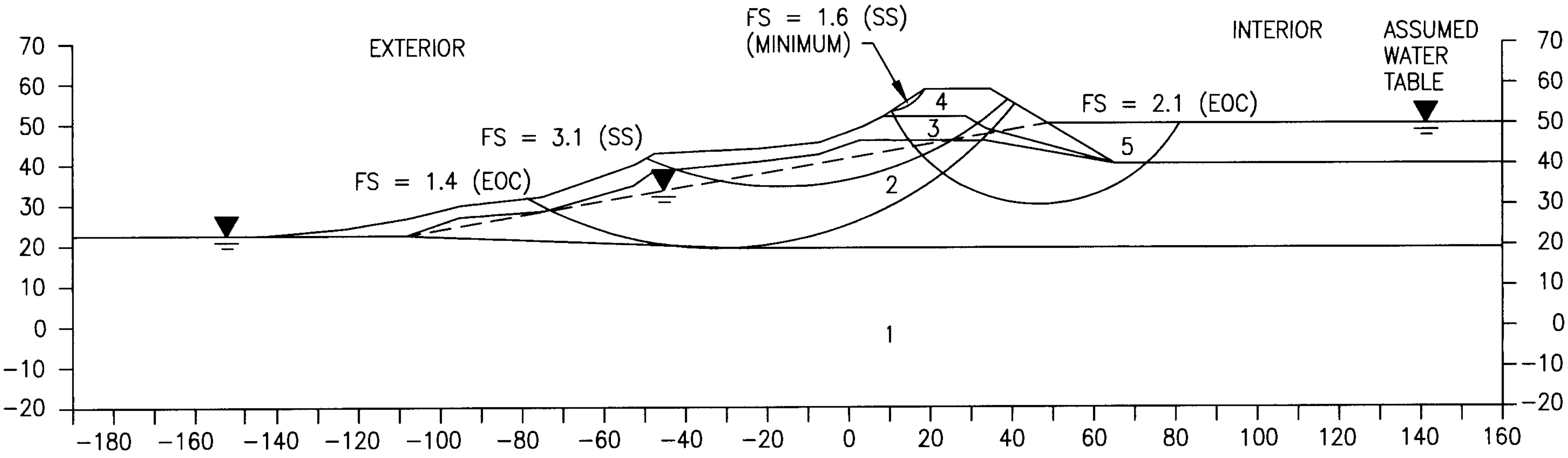
Date: 29 JULY 1999
Scale: 1" = 40'
W.O.: 3769.GL
File No: A–3769GL–20
FIGURE E.25

No:	Revision:	Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)		FRICTION ANGLE (deg.)	
		EOC	SS	EOC	SS	EOC	SS
5	NEW DREDGE	70	90	0	0	0	34
4	NEW DIKE	110	110	800	0	0	34
3	SILT/CLAY CRUST	110	110	800	0	0	34
2	SILT/CLAY	110	110	450	0	0	34
1	SAND	125	125	0	0	38	38

EOC = END OF CONSTRUCTION
SS = STEADY STATE SEEPAGE

CROSS SECTION F-F
RAISED DIKE WITH DREDGED MATERIAL ELEVATION OF 50 FEET



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SLOPE STABILITY ANALYSIS
CROSS-SECTION F-F
PEARCE CREEK
DREDGED MATERIAL
CONTAINMENT AREA
CECIL COUNTY ~ MARYLAND

Drawn: CFY	**Chk'd:** DSS	**Date:**	29 JULY 1999
Scale:	1" = 40'	**W.O.:**	3769.GL
File No:	A-3769GL-26	FIGURE E.26	

No:	Revision:	Date:

Appendix F

Chemical Resistance of Polyethylene

Chemical Resistance of Polyethylenes

SABIC® LDPE

SABIC® LLDPE

SABIC® HDPE

SABIC EuroPetrochemicals BV

Company profile

In Europe SABIC is a major polymer producer with an annual production of 6 million tons. The European SABIC business also harbours the sales organization for all SABIC products manufactured elsewhere in the world.
The European headquarter is located in Sittard (The Netherlands) and integrated world scale production facilities are based in Geleen (The Netherlands) and Gelsenkirchen (Germany) Geleen is also the hometown of a state of the art RD center. Sales offices operate from the Netherlands,The United Kingdom, France, Germany Italy, Spain and Denmark.

Apart from polyethylenes and polypropylenes SABIC in Europe also produces products like benzene, acetylene and MBTE. Polyethylenes and polypropylenes are used in automotive applications, dustbins, furniture, packaging, photo and imaging, pipes, sheets, textiles, wires and cables and many other applications.

The European branch forms part of SABIC, the largest Middle East petrochemicals player and the number 4 global player in polyolefins worldwide, producing almost 5 million tons of polyethylene and polypropylene per year. Apart from this SABIC is also active in chemicals, fertilizers and metals.

Introduction

The following tables give information on the probable performance under normal conditions of SABIC® LDPE, SABIC® LLDPE and SABIC® HDPE.

The factors evaluated are the resistance to chemical and physical attack and the permeability to various media.

The qualifications given in the tables hold for SABIC PE grades in general. The grade to be chosen depends on the application, and it will often be seen that the performance is better than indicated in the tables. Other factors having a strong influence are:
- The temperature,
- The contact time between the polyethylene and the medium,
- The presence of internal stress,
- The wall/film thickness.

Explanation

Symbol	**Meaning**	**Notes**
++	Good	The product has no effect
+	Fair	Less suitable grades and unfavourable conditions give rise to difficulties
o	Doubtful	Application of PE as packaging material (bottles) involves hazards which can be disregarded in some special cases only
-		Is not recommended for packaging applications
V	Unsuitable	The product produces inflammable, toxic or unpleasant-smelling vapours
CO2		Permeable to carbon dioxide
O2		Permeable to oxygen

It is recommended to use a low melt index grade to avoid the formation of internal and external stresses in order to minimize the hazard of environmental stress cracking if a "+" or "o" sign is indicated under ‘physical attack’.

It is recommended to use a high density grade if a "+" or "o" sign is indicated under ‘permeability’.

It is definitely inadvisable to use polyethylene as packaging material if a "–" sign is indicated!

Chemicals	Resistance to Chemical attack		Resistance to Physical attack	Permeability		Remarks
	+20°C	+60°C		+40°C	+60°C	
A						
Acetaldehyde	++	++	o	o	-	V
Acetanilide	++	++	++	++	++	
Acetic acid 5%	++	++	+	++	++	
Acetic acid 50%	++	++	+	+	+	V
Acetic anhydride	++	++	o	o	o	V
Acetone	++	++	o	o	-	V
Acetophenone	++	++	+	o	-	V
Acetylsalicylic acid	++	++	++	++	++	
Acrylonitrile	++	++	+	o	-	V
Adipic acid	++	++	+	+	+	
Alcohol	++	++	o	+	+	
Allylacohol	++	++	+	o	o	V
Alum (all types)	++	++	++	++	++	
Aluminium oxide	++	++	++	++	++	
Aluminium salts						See page 24
Amino acids	++	++	++	++	++	
Ammonia	++	++	++	++	++	CO2
Ammonium salts						See page 24
Ammonium-nitrate lime	++	++	++	++	++	
Amylacetate	++	++	o	o	-	V
Amylalcohol	++	++	+	+	+	V
Aniline	++	++	o	o	o	V

Chemicals	**Resistance to Chemical attack** +20°C	+60°C	**Resistance to Physical attack**	**Permeability** +40°C	+60°C	**Remarks**
Aniline dyes dry, -oil-soluble	++	++	+	+	+	
Aniline dyes dry, -water-soluble	++	++	++	+	+	
Aniline salts	++	++	+	+	+	
Aniseed oil	++	++	+	-	-	V
Anisole	++	++	o	o	-	V
Anthraquinone	++	++	+	++	++	
Antifreeze	++	++	+	++	++	
Antimony	++	++	++	++	++	
Antimony compounds						See page 24
Aqua regia	-	-	o	++	++	not recommended
Arsenic	++	++	++	++	++	
Arsenic trioxide	++	++	++	++	++	
Aspirin	++	++	++	++	++	
Atropine and its salts	++	++	++	++	++	
B						
Barium hydroxide	++	++	+	++	++	CO2
Barium salts						See page 24
Barium sulphide	++	++	++	+	++	
Battery acid	++	++	++	++	++	
Beer	++	++	++	+	+	CO2 (pressure)
Benzaldehyde	++	++	o	o	-	V
Benzene (benzole)	++	++	+	-	-	V

Chemicals	Resistance to Chemical attack		Resistance to Physical attack	Permeability		Remarks
	+20°C	+60°C		+40°C	+60°C	
Benzene hexachloride	++	++	+	+	+	V
Benzene sulphonic acid	++	++	o	++	++	
Benzoic acid	++	++	+	++	++	
Benzyl acetate	++	++	+	-	-	V
Benzyl Alcohol	++	++	o	+	+	V
Bicarburetted soda	++	++	++	++	++	
Bichromate sulphuric acid	o	-	+	++	++	
Bicycle oil	++	++	+	o	o	
Bismuth compounds						See page 24
Bismuth trichloride	++	++	o	+	+	
Bitumen	++	++	+	o	o	V
Blankite	++	++	++	++	++	O2,CO2
Bleaching liquor	+	-	++	++	++	
Bleaching lye	+	-	++	++	++	
Bleaching powder	++	+	++	++	++	
Blue ashes	++	++	++	++	++	
Borax	++	++	++	++	++	
Boric acid	++	++	++	++	++	
Boric acid solution	++	++	++	++	++	
Braking fluids	++	++	o	+	+	
Brass polish	++	++	+	++	++	
Brillantine	++	++	+	+	0	
Brine	++	++	++	++	++	

Chemicals	**Resistance to Chemical attack**		**Resistance to Physical attack**	**Permeability**		**Remarks**
	+20°C	**+60°C**		**+40°C**	**+60°C**	
Bromine	-	-	-	-	-	
Bromobenzene(-benzole)	++	++	+	-	-	
Bromophorm	++	++	+	-	-	
Butane diol	++	++	+	++	++	
Butanol	++	++	+	+	+	V
Butter	++	++	+	+	o	CO2
Butyl acetate	++	++	o	-	-	V
Butyl alcohol	++	++	+	+	+	V
Butyl chloride	++	++	+	-	-	
Butyl phenol	++	++	o	+	o	
Butylraldehyde	++	++	o	o	o	
Butyric acid	++	++	o	+	+	V
C						
Cadmium salts						See page 24
Cadmium suphide	++	++	++	++	++	
Caffeine and its salts	++	++	++	++	++	
Calcium hydroxide	++	++	++	++	++	CO2
Calcium hypochlorite	++	+	++	++	++	
Calcium salts						See page 24
Californian mixture	++	++	++	++	++	CO2
Calomel	++	++	++	++	++	
Camphor	++	++	o	o	o	V
Camphor oil	++	++	+	o	o	V

Chemicals	**Resistance to Chemical attack**		**Resistance to Physical attack**	**Permeability**		**Remarks**
	+20°C	**+60°C**		**+40°C**	**+60°C**	
Caprolactam	++	++	+	++	++	
Carbazole	++	++	++	+	o	V
Carbolineum	++	++	o	o	-	V
Carbon black	++	++	++	++	++	
Carbon disulphide	++	++	+	-	-	
Carbon tetrachloride	++	++	+	-	-	
Carnauba wax	++	++	+	+	+	
Castor oil	++	++	o	+	o	
Cattle feed	++	++	++	++	++	
Caustic potash	++	++	+	++	++	CO2
Caustic soda	++	++	+	++	++	CO2
Cellosolve	++	++	+	+	o	
Cellulose varnish	++	++	0	-	-	
Cetyl alcohol	++	++	+	+	+	
Chloral (+chloral hydrate)	++	++	o	o	o	V
Chloro-acetic acids	++	++	o	++	++	V
Chloroamine	++	++	++	++	++	
Chlorobenzene (-benzole)	++	++	+	-	-	
Chloroform	++	++	+	-	-	
Chloronitrobenzene - liquid	++	++	o	o		V
Chloronitrobenzene - solid	++	++	+	+		V
Chlorophenol (mono, etc.)	++	++	+	o	-	V
Chloropropionic acid	++	++	o	++		

Chemicals	**Resistance to Chemical attack**		**Resistance to Physical attack**	**Permeability**		**Remarks**
	+20°C	**+60°C**		**+40°C**	**+60°C**	
Chlorosulphonic acid						not recommended
Chromate yellow	++	++	++	++	++	
Chromatic acid	+	-	+	++	++	
Chromium salts						See page 24
Cinnamon	++	++	++	+	+	V
Cinnamon oil	++	++	+	-	-	
Citric acid	++	++	++	++	++	
Citronel oil	++	++	+	-	-	
Clove oil	++	++	+	o	o	V
Cloves	++	++	+	+	+	V
Cobalt salts						See page 24
Coconut fat	++	++	+	++	++	
Coconut oil	++	++	+	+	+	
Codliver oil	++	++	+	+	+	CO2
Coffee	++	++	++	o	o	V
Colophonium(resin)	++	++	++	++	++	
Copper green	++	++	++	++	++	
Copper oxide	++	++	++	++	++	
Copper oxychloride	++	++	++	++	++	
Copper salts						See page 24
Cotton-seed oil	++	++	+	+	o	
Cream (face , hands)	++	++	+	+	+	
Creolin	++	++	o	o	-	V

Chemicals	**Resistance to Chemical attack**		**Resistance to Physical attack**	**Permeability**		**Remarks**
	+20°C	**+60°C**		**+40°C**	**+60°C**	
Creosote	++	++	o	o	-	V
Cresol (ortho,meta,para)	++	++	o	o	o	V
Crude oils (minerals)	++	++	o	o	o	V
Cyanamide	++	++	++	++	++	
Cyclohexane	++	++	o	o	-	V
Cyclohexanol	++	++	o	+	+	V
Cyclohexanone	++	++	o	o	o	V
D						
DDT (powder)	++	++	+	++	++	
Decalin	++	++	+	-	-	
Detergents (liquid)	++	++	o	++	++	
Detergents (powder)	++	++	+	++	++	
Developer (phot.)	++	++	++	++	++	
Dextrin	++	++	++	++	++	
Dibutyl phthalate	++	++	o	+	++	
Dichlorobenzene (-benzole)	++	+	+	-	-	
Dichloroethylene	++	++	+	-	-	
Dichloromethane	++	++	+	-	-	
Diesel oil	++	++	+	o	o	V
Diethanol amine	++	++	+	++	++	CO2
Diethyl ether	++	++	++	-	-	
Diethyl Ketone	++	++	o	o	-	
Diethylene glycolether	++	++	o	+	+	V

Chemicals	**Resistance to Chemical attack**		**Resistance to Physical attack**	**Permeability**		**Remarks**
	+20°C	**+60°C**		**+40°C**	**+60°C**	
Dimethyl formamide	++	++	+	+	+	
Dioctyl phthalate	++	++	+	+	+	
Dioxane	++	++	o	o	o	V
Diphenyl amine	++	++	+	+	+	V
Diphenyl ether	++	++	+	o	-	V
Diphenyl oxide	++	++	+	o	-	V
Dolomite	++	++	++	++	++	
E						
Eau de cologne	++	++	+	o	o	V
Eau de Javelle	+	-	++	++	++	
Emulsion paint	++	++	++	++	++	
Engine oil	++	++	+	o	o	
Epsom salt	++	++	++	++	++	
Ether	++	++	o	-	-	V
Etheric oil	++	++	+	-	-	
Ethyl acetate	++	++	o	o	-	V
Ethyl alcohol	++	++	+	+	+	
Ethyl aniline	++	++	+	o	o	V
Ethyl benzene (-benzole)	++	++	+	-	-	
Ethyl benzoate	++	++	o	o	o	V
Ethyl chloride	++	++	+	-	-	
Ethylene chloride (mono,di)	++	++	+	-	-	
Ethylene chlorohydrine	++	++	+	-	-	

Chemicals	**Resistance to Chemical attack**		**Resistance to Physical attack**	**Permeability**		**Remarks**
	+20°C	**+60°C**		**+40°C**	**+60°C**	
Ethylene diamine	++	++	+	+	+	V, CO2
Ethylene glycol	++	++	+	++	++	
Ethylene salicylate	++	++	+	o	o	V
F						
Ferric salts						See page 24
Ferrous salts						See page 24
Fertilizer	++	++	++	++	++	
Fir-needle oil	++	++	+	-	-	V
Fixative (phot)	++	++	++	++	++	
Floor wax	++	++	o	o	o	
Formaldehyde 40%	++	++	+	+	+	V
Formaline	++	++	+	+	+	V
Formamide	++	++	+	+	+	
Formic acid	++	++	+	++	++	V
Freon	++	++	+	-	-	
Frigen	++	++	+	-	-	
Fruit juice	++	++	++	++	++	
Fuel oil	++	++	+	o	o	
Fuel oil (domestic use)	++	++	+	o	o	V
fungicides	++	++	++	++	++	
Furfural	++	++	+	o	o	V
Furfuryl alcohol	++	++	o	-	-	
G						

Chemicals	**Resistance to Chemical attack** +20°C	+60°C	**Resistance to Physical attack**	**Permeability** +40°C	+60°C	**Remarks**
Gallic acid (tannic acid)	++	++	+	++	++	
Galvanizing liquor	++	++	++	++	++	
gas liquor	++	++	+	+	+	
gasoline	++	++	+	o	-	V, HD grades only
Glacial-acetic acid	++	++	o	o	o	V
Glauber salt	++	++	++	++	++	
Glucose	++	++	++	++	++	
Glue (fish,bone)	++	++	++	++	++	
Glycerine (glycerol)	++	++	++	++	++	
Glycol	++	++	+	++	++	
Gypsum	++	++	++	++	++	
H						
Heptane	++	++	+	-	-	
Hexachlorocyclohexane	++	++	+	+	+ v	
Hexane	++	++	+	-	-	
Hexanol	++	++	+	+	+	V
Hexylalcohol	++	++	+	+	+	V
Honey	++	++	++	++	++	
Hydrobromic acid	++	++	++	++	++	
Hydrochloric acid	++	++	++	++	+	
Hydrochloric acid (chem.pure)	++	++	++	++	++	
Hydrocyanic acid	++	++	+	o	o	V, CO2
Hydrofluoric acid	++	++	+	+	+	V,CO2

Chemicals	**Resistance to Chemical attack** +20°C	+60°C	**Resistance to Physical attack**	**Permeability** +40°C	+60°C	**Remarks**
Hydrogen peroxide (sol.)	+	+	++	++	o	
Hydroquinone	++	++	++	++	++	
Hypo	++	++	++	++	++	
I						
I cont.						
Ink (printing ink)	++	++	+	+	o	
Ink (writing ink)	++	++	++	++	++	
Insecticides (oilsolution)	++	++	o	-	-	
Insecticides (powder)	++	++	+	+	+	
Insecticides(aqueous dispersion)	++	++	+	++	++	
Iodine	++	++	+	o	o	
Iodine tincture	++	++	+	+	o	
Iron salts						See page 24
Isobutanol	++	++	+	+	+	V
Isobutyl alcohol	++	++	+	+	+	V
Iso-Octane	++	++	+	o	-	V, see gasoline
Isopropyl acetate	++	++	+	o	o	V
Isopropyl ether	++	++	+	-	-	
J						
Jam	++	++	++	++	++	
K						
Kerosene	++	++	+	o	-	V,see gasoline
Ketchup	++	++	++	++	++	
L						

Chemicals	Resistance to Chemical attack		Resistance to Physical attack	Permeability		Remarks
	+20°C	+60°C		+40°C	+60°C	
Lactic acid	++	++	+	++	++	
Lanolin	++	++	+	+	+	
Lard	++	++	+	+	o	
Latex	++	++	+	++	++	
Lauryl alcohol	++	++	+	+	+	
Lauryl sulphate	++	++	o	+	+	
Lead acetate	++	++	++	++	++	
Lead oxide	++	++	++	++	++	
Lead salts						See page 24
Lemon oil	++	++	+	-	-	
Lime milk	++	++	+	++	++	
Lime salts						See page 24
Lime, slaked	++	++	++	++	++	
Lime, unslaked	++	++	++	++	++	
Lindane powder	++	++	+	+	+	
Linseed oil	++	++	+	+	o	
Lithium salts						See page 24
Liver of sulphur						see sodium sulphide
Lotion (hair, shaving)	++	++	+	+	o	
Lubricating oil	++	++	+	o	o	
M						
Magnesia	++	++	+	++	++	
Magnesium oxide	++	++	+	++	++	

Chemicals	Resistance to Chemical attack		Resistance to Physical attack	Permeability		Remarks
	+20°C	+60°C		+40°C	+60°C	
Magnesium salts						See page 24
Maleic acid	++	++	+	++	++	
Manganese salts						See page 24
Margarine	++	++	+	+	o	
Mayonnaise	++	++	+	++	o	
Menthol	++	++	+	+	o	V
Mercuric salts						See page 24
Mercurochrome	++	++	++	++	++	
Mercurous salts						See page 24
Mercury (metal)	++	++	++	++	++	
Mercury oxide	++	++	++	++	++	
Mercury salts						See page 24
Methanol	++	++	o	+	+	
Methyl acetate	++	++	o	o	o	V
Methyl alcohol	++	++	o	+	+	
Methyl salicylate	++	++	+	o	o	V
Methylene chloride	++	++	+	-	-	
Methylethylene ketone	++	++	o	o	-	
Milk	++	++	++	++	++	
Mineral oil	++	++	+	+	o	
Minerals	++	++	++	++	++	
Mohr's salt	++	++	++	++	++	

Chemicals	Resistance to Chemical attack		Resistance to Physical attack	Permeability		Remarks
	+20°C	+60°C		+40°C	+60°C	
Monochlorobenzene(-benzole)	++	++	+	-	-	
Morpholine	++	++	o	+	+	V
Mustard	++	++	++	++	++	
N						
Nail varnish	++	++	o	o	-	
Naphthalene	++	++	+	o	o	V
nickel oxide	++	++	++	++	++	
Nickel salts						See page 24
Nicotine	++	++	+	+	+	
Nitric acid (<=50%)	+	++	++			
Nitric acid (>50%)	-	-	o	+	+	
Nitrobenzene (-benzole)	++	++	o	o	o	V, not recommended
Nitrocresole	++	++	+	o	o	
Nitroglycerine	++	++	+	o	o	
Nonyl alcohol	++	++	+	o	o	V
Nutmeg	++	++	++	o	o	V
Nutmeg oil	++	++	+	-	-	
O						
Ochre	++	++	++	++	++	
Octane	++	++	+	o	-	V, see gasoline
Octanol	++	++	+	o	o	
Octyl alcohol	++	++	+	o	o	V
Oleic acid	++	++	+	+	o	

Chemicals	**Resistance to Chemical attack**		**Resistance to Physical attack**	**Permeability**		**Remarks**
	+20°C	**+60°C**		**+40°C**	**+60°C**	
Oleum	o	-	o	+	+	not recommended
Olive oil	++	++	+	+	o	
Oxalic acid (solid or solution)	++	++	++	++	++	
P						
Paint						see terpentine, varnish & emulsion paint
Palm oil	++	++	+	+	o	
Palmitinic acid	++	++	+	++	++	
Paraffin (solid)	++	++	+	++	++	
Paraffin oil	++	++	+	o	-	
Patent potash	++	++	++	++	++	
Peanut butter	++	++	+	+	o	
Pentachlorophenol	++	++	++	o	o	V
Pentane	++	++	+	-	-	
Pepper	++	++	++	++	++	
Peppermint oil	++	++	+	-	-	V
Perchloric-acid solution	+	o	++	++	+	
Perchloroethylene	++	++	+	-	-	
Perfumes	++	++	+	o	-	V, not recommended
Petrol						see gasoline
Petroleum	++	++	+	o	-	V
Petroleum ether	++	++	+	o	-	V
Phenol	++	++	o	+	+	V

Chemicals	**Resistance to Chemical attack**		**Resistance to Physical attack**	**Permeability**		**Remarks**
	+20°C	**+60°C**		**+40°C**	**+60°C**	
Phenol sulphonic acid	++	++	+	++	++	
Phenoxy-acetic acid	++	++	+	++	++	
Phenyl phenol	++	++	+	+	+	
Phosphating liquor (for metal)	++	++	++	++	++	
Phosphor chlorides (tri, penta,oxychloride)						not recommended
Phosphoric acid (conc.)	++	++	+	+	+	
Phthalic acid	++	++	++	++	++	
Phthalic anhydride	++	++	++	++	++	
Picrinic acid	++	++	+	+	+	
Pigments,dryfor paints, plastics etc.)	++	++	++	++	++	
Pine oil	++	++	o	o	o	V
Pitch	++	++	+	++	++	
Polishing wax	++	++	+	o	o	
Potash	++	++	++	++	++	
Potassium bromide	++	++	++	++	++	
Potassium cyanide	++	++	+	+	+	CO2, hazardous
Potassium hydroxide	++	++	+	++	++	CO2
Potassium iodide	++	++	++	++	++	
Potassium permanganate	+	+	++	++	++	
Potassium salts						See page 24
Potassium sulphate						See page 24
Potassium sulphide	++	++	+	+	++	O2, CO2

Chemicals	**Resistance to Chemical attack**		**Resistance to Physical attack**	**Permeability**		**Remarks**
	+20°C	**+60°C**		**+40°C**	**+60°C**	
Propanol	++	++	+	+	+	
Propargyl alcohol	++	++	+	+	+	
Propionic acid	++	++	o	++	++	V
Propulene glycol	++	++	+	++	++	
Propyl alcohol	++	++	+	+	+	
Prussic acid	++	++	+	o	o	V, very hazardous
Pyridine	+	++	o	o	o	V
Q						
Quinine ad its salts	++	++	++	++	++	
R						
Ratbane	++	++	++	++	++	
Red ochre						See page 24
Resorcine (resorcinol)	++	++	++	++	++	
Ricinus oil	++	++	o	+	o	
S						
Salad oil	++	++	+	+	o	
Salas sauce	++	++	+	++	o	
Salicyl aldehyde	++	++	+	o	o	v
Salicylic acid	++	++	++	++	++	
Salmiac	++	++	++	++	++	
Saltpetre (nitrate)						See page 24
Saponin	++	++	++	++	++	
Scouring powder	++	++	+	++	++	
Sesame oil	++	++	+	+	o	

Chemicals	**Resistance to Chemical attack**		**Resistance to Physical attack**	**Permeability**		**Remarks**
	+20°C	**+60°C**		**+40°C**	**+60°C**	
Shampoo	++	++	o	++	++	
Silicone oil	++	++	o	+	+	
Silver polish	++	++	+	++	++	
Silver salts						See page 24
Soap(soft, green & yellow)	++	++	o	++	++	
Soda	++	++	++	++	++	
Sodium cyanide	++	++	+	+	+	hazardous
Sodium hydroxide	++	++	+	++	++	CO2
Sodium hypochlorite	+	-	+	++	++	
Sodium salts						See page 24
Sodium sulphide	++	++	+	+	+	O2, CO2
Soldering fluid	++	++	++	++	++	
Solvent naphtha	++	++	+	-	-	
Soy oil	++	++	+	+	o	
Spermaceti	++	++	+	+	+	
Spindle oil	++	++	+	o	o	
Spirit	++	++	+	+	+	
Stannic salts (tin)						See page 24
Stannous salts (tin)						See page 24
Starch	++	++	++	++	++	
Stearic acid	++	++	++	++	++	
Strontium salts						See page 24
Styrene (styrol)	++	++	+	o	-	

Chemicals	**Resistance to Chemical attack**		**Resistance to Physical attack**	**Permeability**		**Remarks**
	+20°C	**+60°C**		**+40°C**	**+60°C**	
Sublimate	++	++	++	++	++	
Succinic acid	++	++	++	++	++	
Sucrose	++	++	++	++	++	
Sugar	++	++	++	++	++	
Sulphate of ammonia						See page 24
Sulphur	++	++	++	++	++	
Sulphur chloride						not recommended
Sulphur trioxide	o	-	o	+	0	V, not recommended
Sulphuric acid (50-90%)	+	+	+	++	++	
Sulphuric acid (90-100 %)	o	o	+	++	++	
Sulphuric acid (dilute)	++	++	++	++	++	
Sulphuryl chloride						not recommended
Superphosphate	++	++	++	++	++	
Syrup	++	++	++	++	++	
T						
Talcum grease	++	++	+	+	o	
Talcum powder	++	++	++	++	++	
Tannic acid	++	++	+	++	++	
Tannin	++	++	+	++	++	
Tar oil	++	++	o	o	o	V
Tartaric acid	++	++	++	++	++	
Tea	++	++	++	++	++	
Tetra						see "carbon tetrachl

Chemicals	**Resistance to Chemical attack**		**Resistance to Physical attack**	**Permeability**		**Remarks**
	+20°C	**+60°C**		**+40°C**	**+60°C**	
Tetra-ethyl lead						
Tetra-ethyl lead						
Tetrahychloroethane	++	++	+	-	-	
Tetrahydrofuran	++	++	o	-	-	
Tetralin	++	++	+	-	-	
Thallium salts						See page 24
Thio(sodium thiosulphate)						See page 24
Thioglycolic acid	++	++	+	o	o	V
Thionylchloride						not recommended
Thiophene	++	++	o	-	-	
Thomas meal	++	++	++	++	++	
Tin compounds						See page 24
Titanium tetrachloride						not recommended
Titanium white	++	++	++	++	++	
Toluene (toluol)	++	++	+	-	-	V
Tomato juice	++	++	++	++	++	
Toothpaste	++	++	+	+	+	
Transformer oil	++	++	+	o	o	
Trichloro-acetic acid	++	++	o	+o	v	
Trichlorobenzene (benzole)	++	++	+	-	-	
Trichloroethane	++	++	+	-	-	
Trichloroethylene	++	++	+	-	-	

Chemicals	**Resistance to Chemical attack**		**Resistance to Physical attack**	**Permeability**		**Remarks**
	+20°C	**+60°C**		**+40°C**	**+60°C**	
Tricresylphosphate	++	++	o	+	+	
Triethanolamine (turkey red oil)	++	++	o	++	++	
Turkey red oil	++	++	+	+	+	
Turpentine	++	++	+	-	-	
Turpentine (synthetic)	++	++	+	o	-	
Turpentine varnish	++	++	+	o	-	O2, not recommended
U						
Urea	++	++	++	++	++	
V						
Vanilla extract	++	++	+	o	o	V
Varnish						see terpentine varnish
Vaselin	++	++	+	+	o	
Vinegar	++	++	++	++	++	
Vinylchloride	++	++	+	-	-	
W						
Waterglass	++	++	+	++	++	
Wax: beeswax	++	++	+	+	+	
Wax: carnauba wax	++	++	+	+	+	
Wax: mineral-oil wax	++	++	+	+	o	
White lead	++	++	++	++	++	
White spirit	++	++	+	o	-	
X						
Xylene (xylol)	++	++	+	-	-	
Y						

Chemicals	**Resistance to Chemical attack**		**Resistance to Physical attack**	**Permeability**		**Remarks**
	+20°C	**+60°C**		**+40°C**	**+60°C**	
Yeast	++	++	++	++	++	
Yoghurt	++	++	++	++	++	
Z						
Zinc white	++	++	++	++	++	
Zinc, salts						See page 24

Metal salts

In the following table the resistance of polyethylene is evaluated to the action of various chemicals. Salts (and their solutions) whose chemical names can be composed out of the diagram are not included in the tables. These metal salts, nor solid nor in an aqueous solution, have no influence on polyethylene.

Metals		**Salts**	
Aluminium	Nickel	acetate	hydrosulphate
Ammonium	Potassium	arsenate	iodate, iodite
Antimoon	Silver	benzoate	metaphophate
Barium	Sodium	borate	molybate
Bismuth	Strontium	bromate	nitrate
Cadmium	Thallum	bromide	nitrite
Calcium	Tin	carbonate	oxalate
Chromium	Zinc	chlorate	perborate
Cobalt		chloride	persulphate
Copper		chromate	phosphate, phosphite
Iron		dicarbonate	rhodanide
Lead		dichromate	salicylate
Lithium		disulphate	silicate
Magnesium		ferric/ferrous cyanide	silicofluoride
Manganese		fluoride	sulphate, sulphite
Mercury		formiate	thiosulphate
Molybdenum		gluconate	