

## PEARCE CREEK CONFINED DISPOSAL FACILITY MODIFICATION

CECIL COUNTY MARYLAND

## **GEOTECHNICAL DESIGN NARRATIVE**

INITIAL SUBMISSION JUNE 2014

# PEARCE CREEK CONFINED DISPOSAL FACILITY MODIFICATION CECIL COUNTY, MARYLAND GEOTECHNICAL DESIGN NARRATIVE INITIAL SUBMISSION

**JUNE 2014** 

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# PEARCE CREEK CONFINED DISPOSAL FACILITY MODIFICATION CECIL COUNTY, MARYLAND DIKE RAISING, INLAND WATERWAY DELAWARE RIVER TO CHESAPEAKE BAY GEOTECHNICAL DESIGN NARRATIVE INITIAL SUBMISSION

## **List of Appendices**

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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.

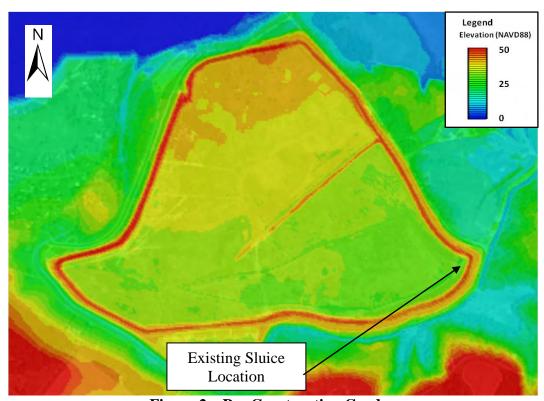


Figure 2 – Pre Construction Grades

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.

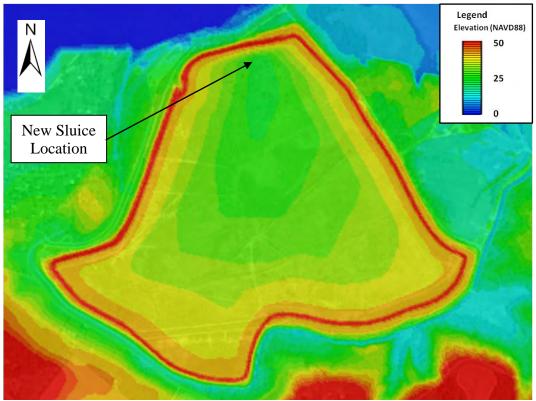


Figure 3 – Post-Construction Grading

## 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			Standa Penetra Valu	tion	
	γ (pcf)	$C_c'$	$C'_c$ $C_\alpha$ OCR $C_\nu$ (ft <sup>2</sup> /day)				Upper Limit
Dredged						0	5
Material	110	0.25	0.0025	1	1.5		
Tidal Marsh	105	0.25	0.0025	1	1.5	0	5
Upper						15	30
Sands	110	N/A	N/A	N/A	N/A		
Upper Clays	110	0.18	0.0018	1	1.5	10	20
Intermediate						40	75
Sands	115	N/A	N/A	N/A	N/A		
Intermediate						20	40
Clays	120	0.15	0.0015	1	1.5		
Lower						75	100
Sands	120	N/A	N/A	N/A	N/A		
Lower						40	100
Clays	125	0.1	0.001	1	1.5		

## 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 to  $C_c$  (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, $C_{\alpha}$

Coefficients of secondary compression were obtained by applying the relationship

 $\frac{C_{\alpha}}{C_{c}} = 0.01to~0.085$ , which is provided in EM 1110-1-1904. Thus,  $C_{\alpha}$  ranging from 0.0010 to 0.0025 were selected for all compressible materials, with  $C_{\alpha}$  decreasing with depth. For the purposes of converting  $C_{\alpha}$  to  $C'_{\alpha} \left( C'_{\alpha} = \frac{C_{\alpha}}{1 + e_{f}} \right)$ , 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<sup>2</sup>/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
TOT	TAL 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 Evaluation 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  $2.4 \times 10^{-8}$  to  $1.3 \times 10^{-5}$  m<sup>3</sup>/m<sup>2</sup>-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.

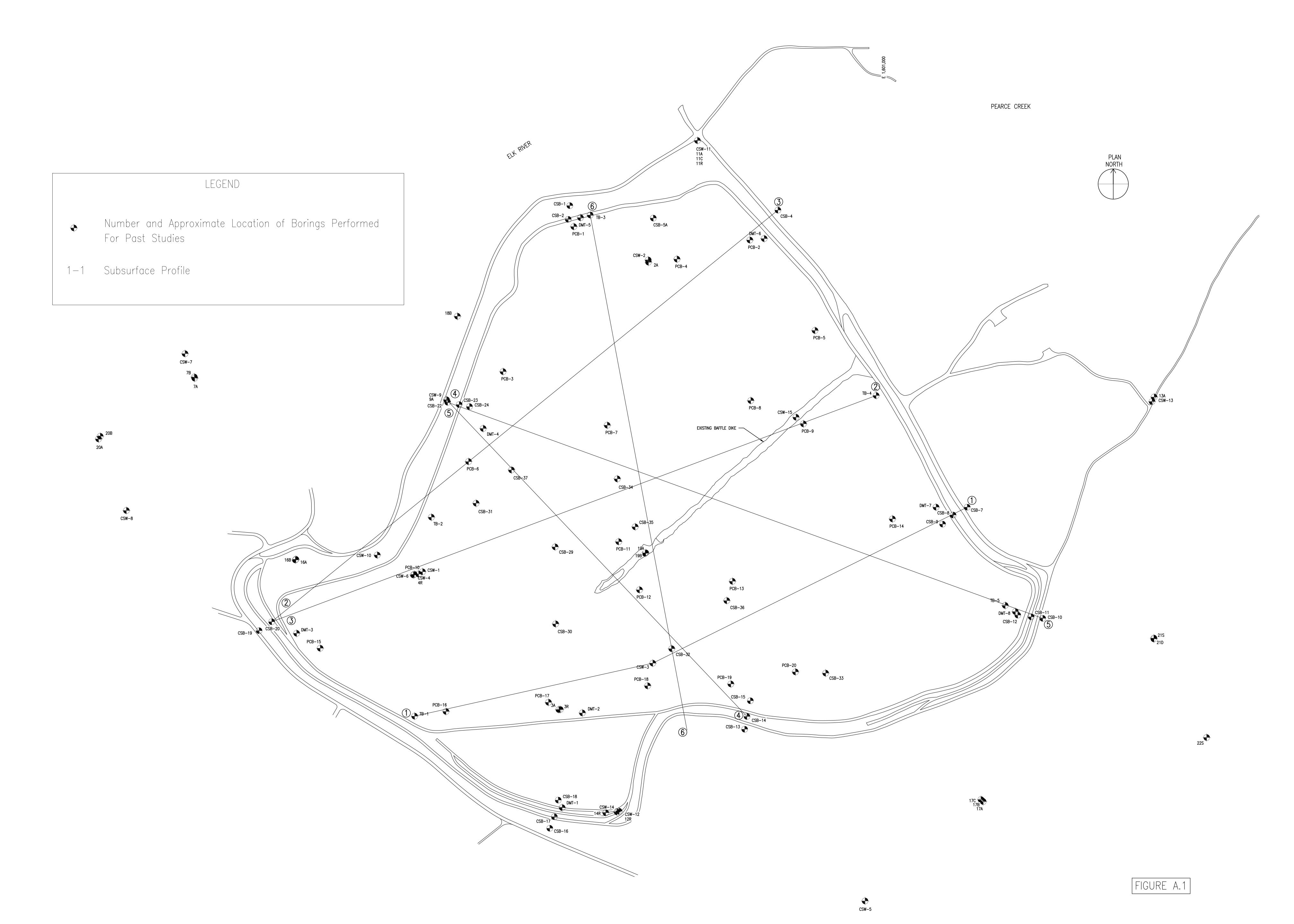
The analysis concluded that adequate factors of safety of 1.3 to 2.7 for the exterior slopes and factors of safety of 1.2 to 2.3 for the interior slopes exist for the proposed slope configuration. These values are based on the strength of the dredged materials within the CDF from laboratory testing conducted 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.

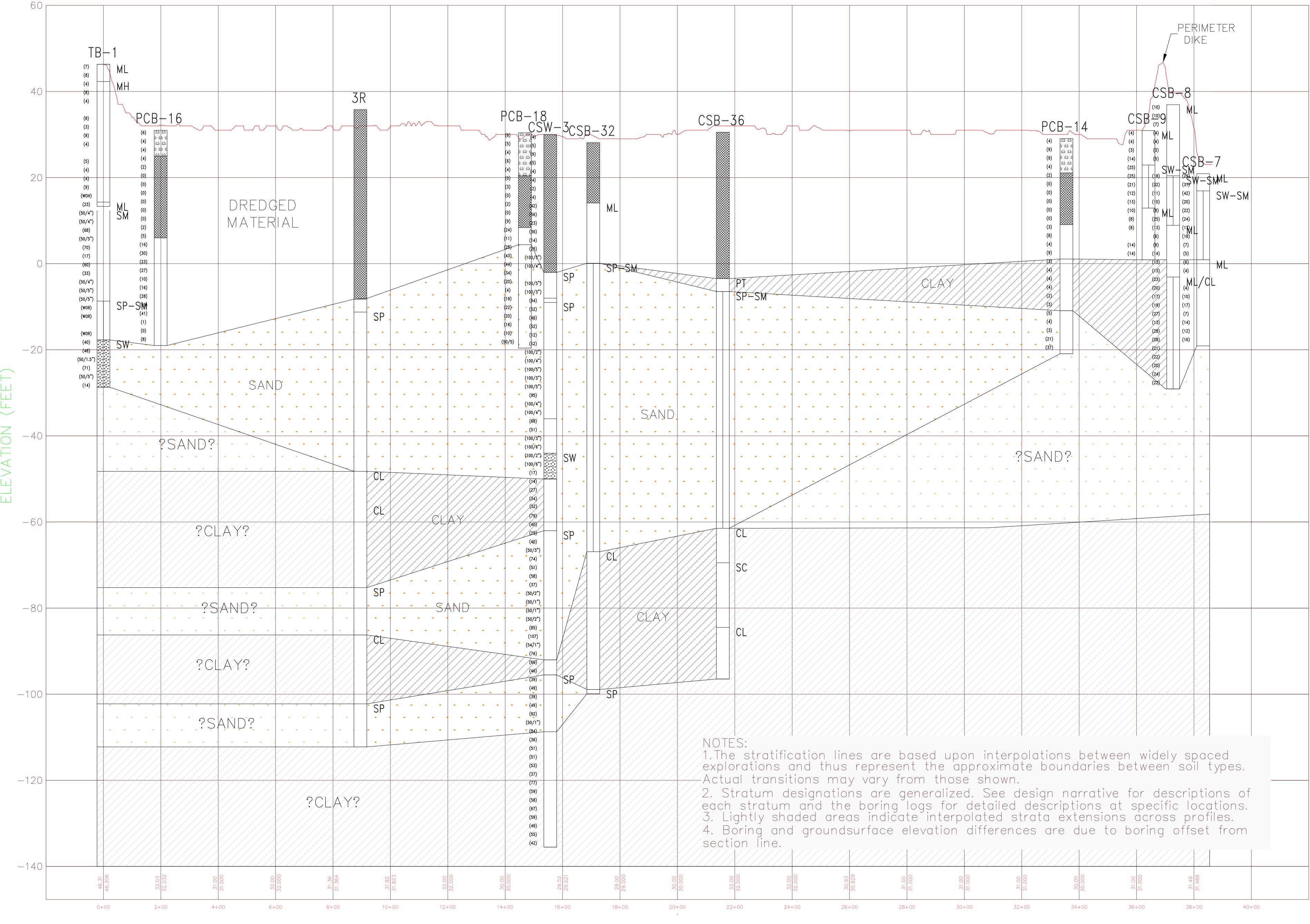
## 8. References

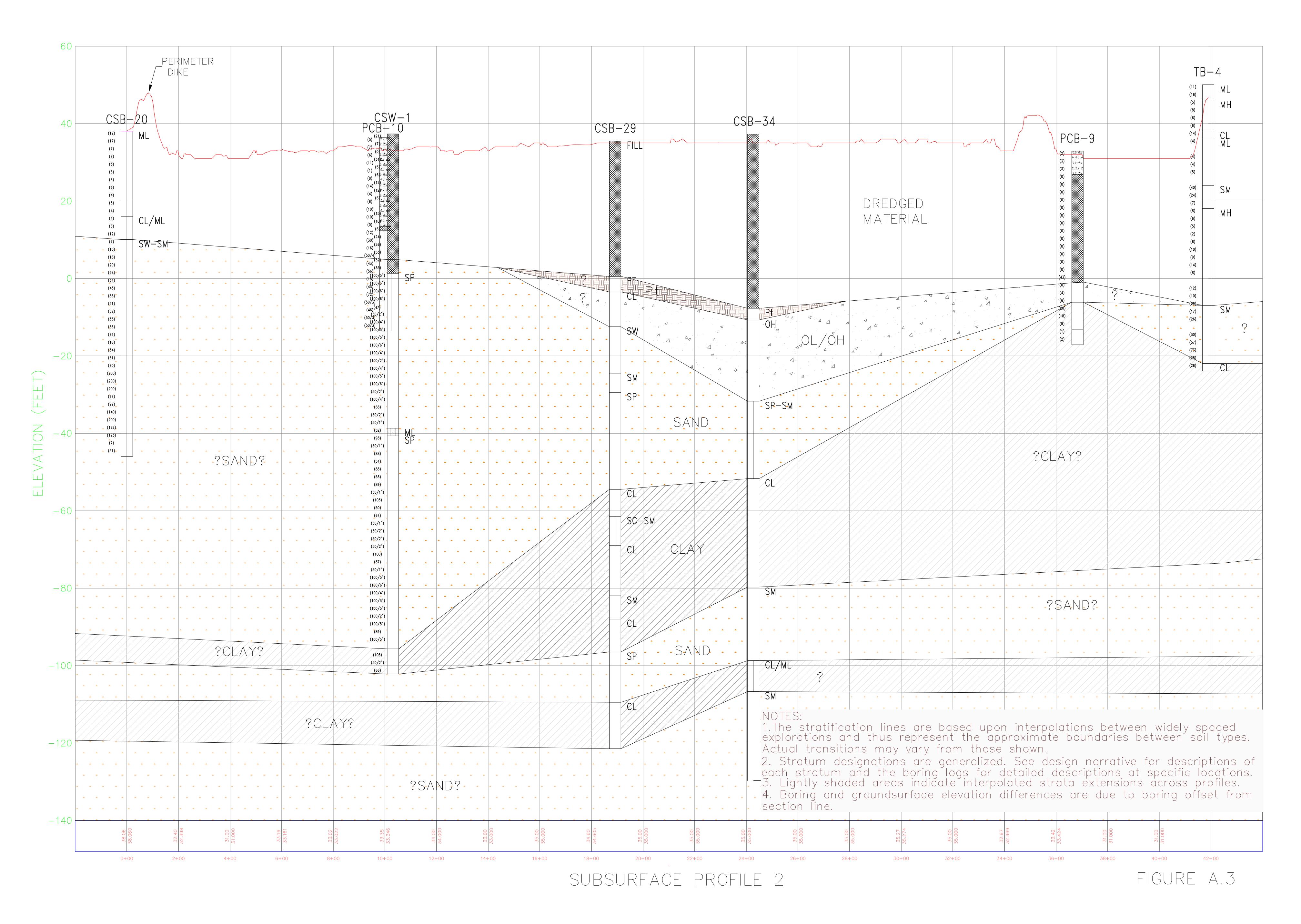
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- 4. Duncan, J.M. and Wright, S.G. (2005). *Soil Strength and Slope Stability*, John Wiley & Sons, Inc., Hoboken, New Jersey.
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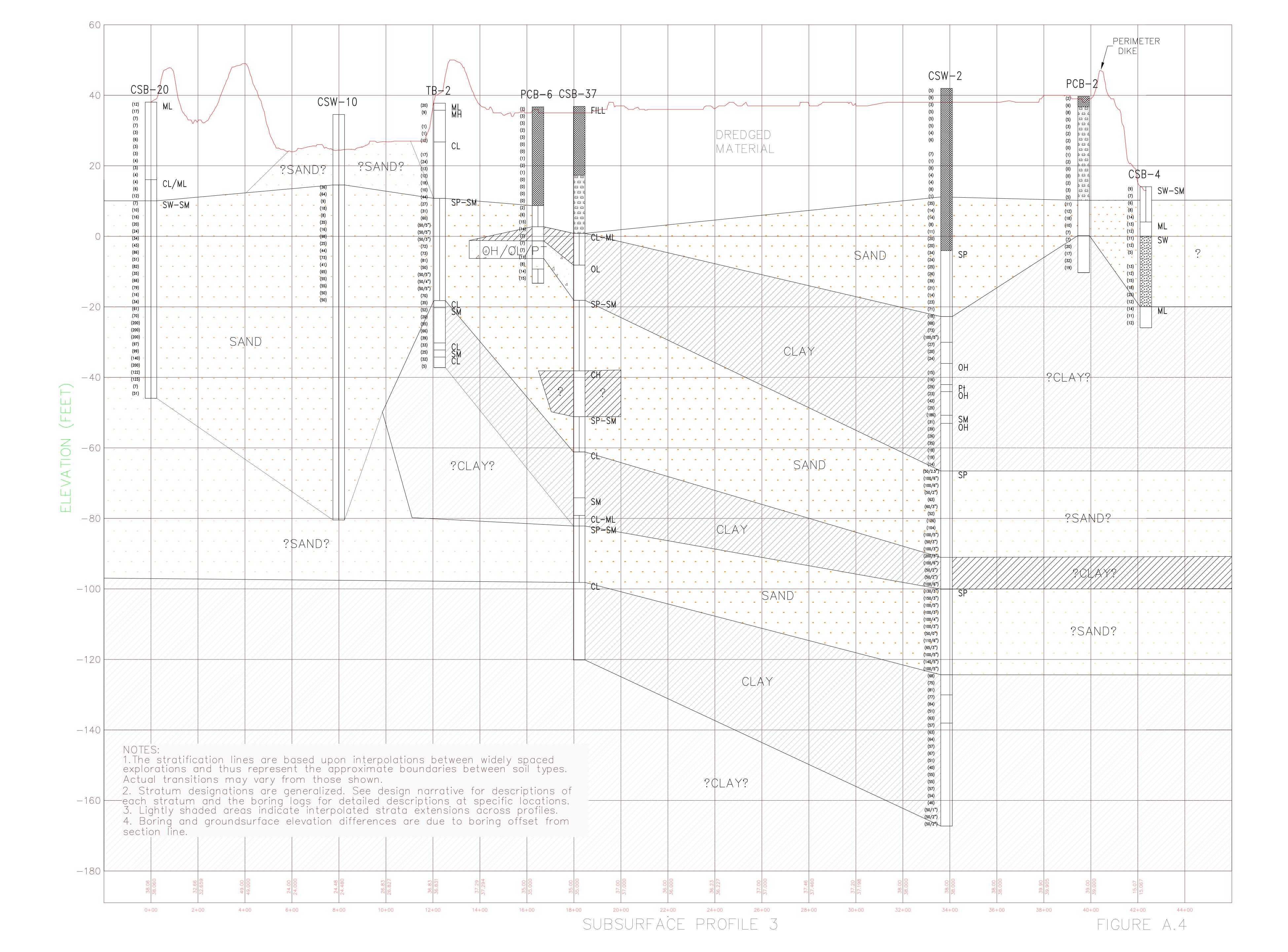
## Appendix A

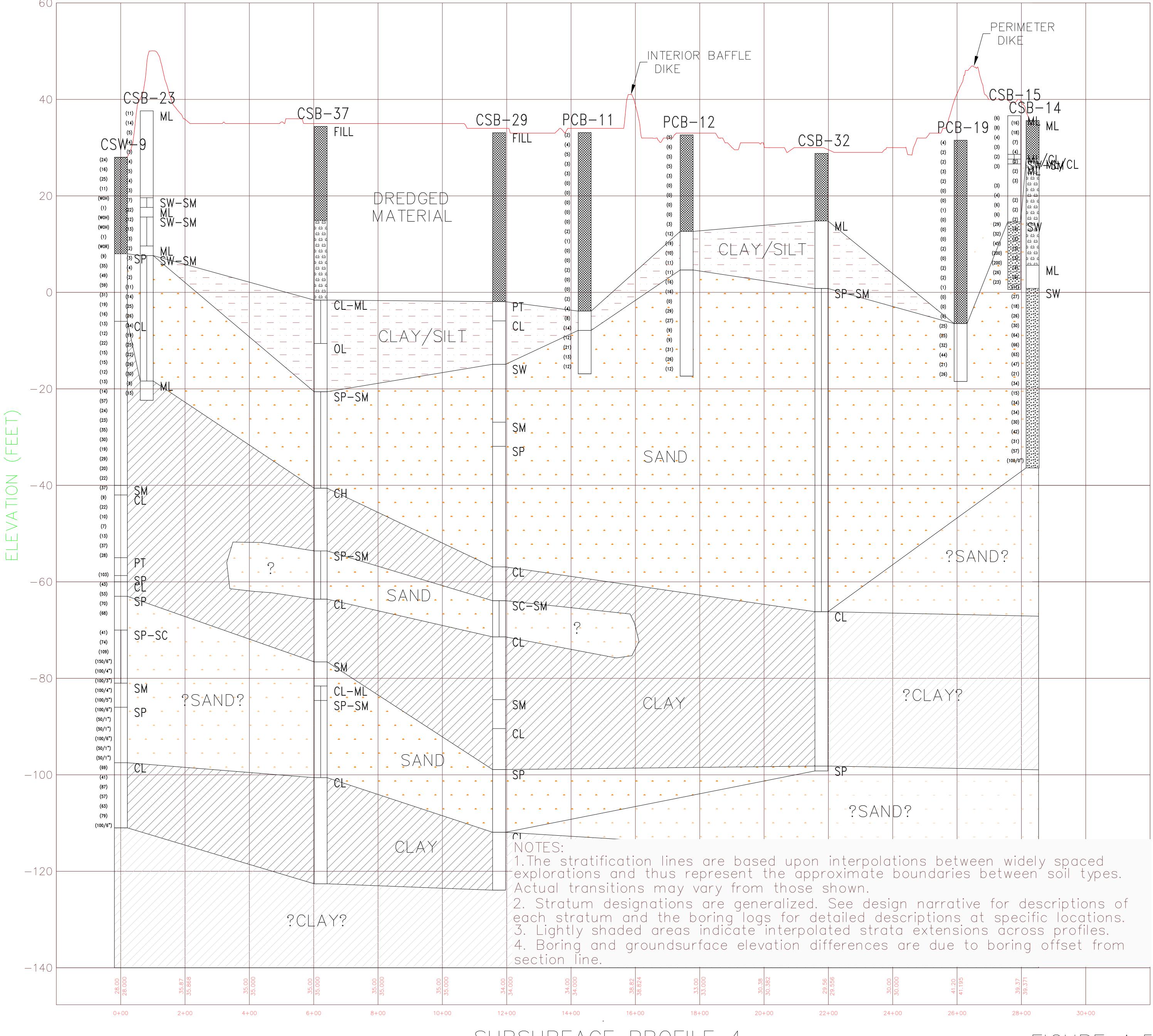
**Subsurface Data** 

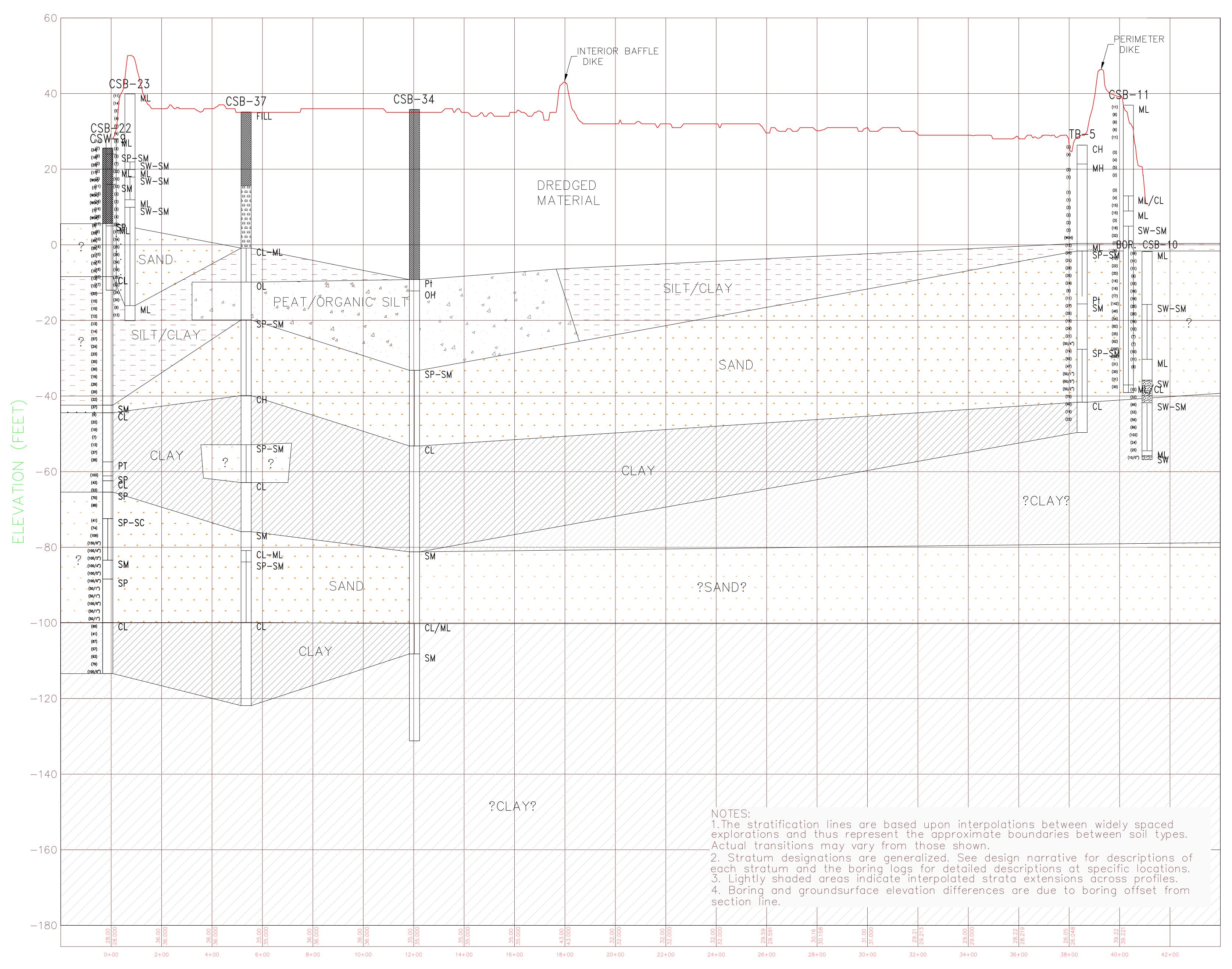


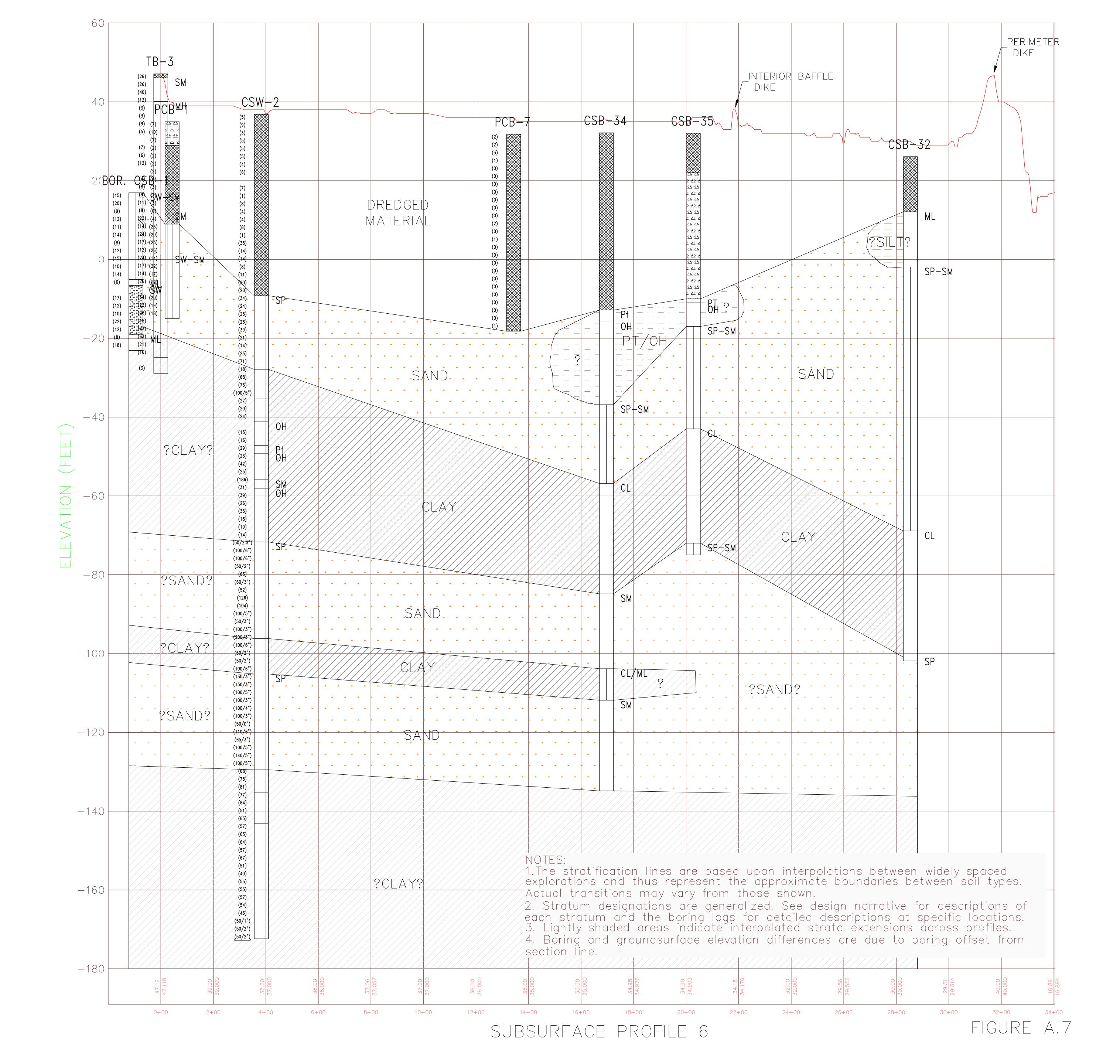












DRILL	ING LO		VISION	INSTALLA	TION		- (0)	SHEET 1		
PROJECT	710-00		agal Amer	10. SIZE A	ND TYPE	OF BIT	2" split sp	000		
LOCATION	(Coording	K Disp		II. DATUL	FOR EL	ROITAVA	SHOWN (TEM or MS	L)		
DRILLING	AGENCY			12. MANUF	CME 5		GNATION OF DRILL			
	Froehl	ing & R	oberston	13. TOTAL NO. OF OVER- DISTURBED UNDISTURBED						
and fills num	mbeel	out egates	CSB-1	17						
NAME OF C	DRILLER	John	Organ	14. TOTAL NUMBER CORE BOXES  15. ELEVATION GROUND WATER						
DIRECTION		E		16. DATE	HOLE	1	-29-88	COMPLETED		
VERTIC	AL D	NCLINED	DEG. FROM VERT.	17. ELEV/	ATION TO			6/30/88		
DEPTH DR				-			Y FOR BORING			
TOTAL DE			40.0'	19. SIGNA	TURE OF	INSPECT	OR			
LEVATION				LS	% CORE RECOV- ERY	BOX OR SAMPLE NO.	(Dellitera time	ARKS ster loss, depth of L., if significant		
0	0 _	c	Brown coarse to fine SA	ND	5-6	S-1	Start drilli	g		
	2 =		few pieces interlayed s & clay (Red and grey) D	silt	9-9	0.8'	p.m. Boring hole			
	Ξ		Same, reddish brown with, little fine grave		8-10 10-12	S-2 1.0'	from base of			
	4 =		Reddish brown fine SAND little silt moist w/mic		3-4 5-5	S-3 1.0'				
	6	SW	Brown fine SAND, few pi	eces	6-5	S-4				
	8 =	SM	interlayeved silt, (red gray) trace gravel		7-8	1.0'				
	=		Brown mostly fine SAND little silt, moist		5-5 6-9	S-5 1.0'				
	10-		Brown coarse to fine		6-7	S-6	ground water	10.5		
- 1	12_		sand, trace red gray silty clay, trace grave		7-7	1.0'	Static			
	ΙΞ		Same		2-4 4-7	S-7 1.0'				
	14		Same mostly fine	1	6-6	S-8				
	JE		SAND		6-6	1.0'				
	16—		Grey coarse to fine		7-7	S-9				
	Ξ		SAND, few fine gravel trace, silt		8-7	1.0'				
	18—		Same		4-4	S-10				
	13				6-8	1.0'				
1	20-		Samé		7-8	S-11				
22.0'	=		Dalle		6-4	1.0'				
	22-	-	Grey black organic SILT		1-2	S-12				
23.5'		ML	w/roots, wood fiber,		4-4	1.5				
	24-		f sand Gray SAND & organic		Light	np-1				
			silt, w/roots, mica		Mach	1.9'				
	26—	SW	Grey coarse to fine SANI	D  -	3-7	S-13				
	$\equiv$		trace silt, trace fine		0-8	1.0				
	28 —		gravel	-	5-6	S-14				
			Same, grey brown		6-8	1.7'	Ctorned	Town .		
	30 —			-	2.2	0.15	Stopped at 5			
	=		Same		3-3 7-6	1.0	start at /:0	0 am 6/30/88		
	32 =									
			Same		8-9	S-16				
	34 =		C	-	3-13	1.0'				
			Same		9-7 5-4	S-17 1.0				
36.0'	36						Hole collaps			
	36		Dark grey SILT, organic woody pieces, little coa		4-4		After complete	tion of boring		
	70	ML.	to fine sand, trace fine q		4-3	1.0'				
	38 =		Grey fine SAND & Silt on	-	5-8	S-19				
			smell, trace of gravel							

INSTALLATION SHEET VISION DRILLING LOG I. PROJECT 10. SIZE AND TYPE OF BIT 2" Split Spoon 11. DATUM FOR ELEVATION SHOWN (TEN or MSL) Pearce Creek Disposal Area 2. LOCATION (Coordinates or Station) 12. MANUFACTURER'S DESIGNATION OF DRILL 3. DRILLING AGENCY Froehking & Roberston 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN 36-UNDISTURBED 4, HOLE NO. (As shown on drawing title and tile number) CSB-2 14. TOTAL NUMBER CORE BOXES S. NAME OF DRILLER 15. ELEVATION GROUND WATER John Organ 6. DIRECTION OF HOLE STARTED COMPLETED 16. DATE HOLE 6/30/88 7/1/88 DEG. FROM VERT. X VERTICAL TINGLINED 17. ELEVATION TOP OF HOLE 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 8. DEPTH DRILLED INTO ROCK 19. SIGNATURE OF INSPECTOR 72.0' S. TOTAL DEPTH OF HOLE % CORE BOX OR SAMPLE NO. REMARKS CLASSIFICATION OF MATERIALS ELEVATION DEPTH LEGEND (Drilling time, water lose, depth of weathering, etc., if significant) Started Hole 10:30 am 3-4 S-1Brown, SILT with sand, 1.0' w/roots, mica & clay 6/30/88 5-6 lenses. 2 20' of casing used Brown gray SILT, trace 6-6 sand, clay lenses, woody 6-6 1.5 due to water loss 2-2 S - 3Same, moist ML 3 - 31.1 5-4 2-2 Same, w/roots 4-4 1.8 2-2 Same 5-5 2-3 1.5 10.0 S-6 Same, dark grey w/mica ML/CL 1 - 21.5 12. 2 - 2Same, w/reeds & woody S-7fibers 1 - 21.5 Same, moist S - 82-2 1.5 16-Same 2 - 15-9 1 - 21.5 18. Same 2-2 S - 103-2 1.5 20-2-2 S-11 Same, w/reeds, & roots 2-2 1.5 3-3 S - 12Same laminated, trace fine sand 2-3 1.2 24 1 - 2S-13 Same, w/roots, wet, trace fine sand 2-2 1.5 26 2-2 S-14 Same, wet 1 - 2Driller lost fluid at 28.0 28.0 28. S-15 Grey brown medium to fine 4-5 SAND, trace SILT, trace fine gravel 2-2 0.4 SM 30.0 30dark grey SILT, trace of 2-8 S-16 ML sand 9-5 1.2 32.0 32. Reddish brown mostly 5-10 S-17 SW fine SAND, little Silt & Clay 10-7 1.0 SM 34.0 red brown gray lensed clayey S-18 ML/CLsilt, w/fine sand trace fine 8-8 1.0 36.0 gravel S-19 Grey fine SAND, little silt 8-8 9-5 1+0 SW Brown well graded coarse 3-3 S-20 to fine SAND, little silt 2-2 0.9' HOLE NO.

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek Dis Area

CSB-2

ROJECT			heet) ELEVATION TOP OF HOLE	LLATION			Hc No. CSB-2	+
ioseci			113010	2022			OF 2 SHEETS	
ELEVATION	DEPTH b	LEGEND	CLASSIFICATION OF MATER (Description)	RIALS	% CORE RECOV- ERY e	SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
	40 _	SW	Grey SAND, coarse to	fine	4-2	S-21	8	
		SM	few fine gravel		2-4	1.0		
	42 —		Grey SAND, mostly fin	ne i	2-2	S-22		
	1		pieces of COAL (possi		3-4	1.0		
	44 -		Same, large piece gra	1201	3-2	S-23		
	-		in spoon	iver	3-3	0.6		
	46 —				_			
	46		Same		4-4	S-24		
	. =				5-6	0.8	Concluded drilling at 5 p	m
	48 —		Brown grey coarse to		8-11	S-25	7/1 started drilling 7:30	an
	1		SAND mostly fine-trac	ce	10-9	1.0		
	50 —	7	silt & gravel	a films	6-10	S-26		
	. =	3	same, mostly medium to SAND, little silt	.o rine	9-0	1.0		
52.0'	52 -							
	-	ML	dark grey brown SILT,		6-8	S-27		
54.0'			w/roots fibers trace	fine sand	10-11	1.5		
	-54 -		Grey SAND coarse to f	ine	11-10	S-28		
	1 3	3	trace silt w/mica		9-10	1.0		
	56		Same, trace fine grav	re1	9-9	S-29		
		1	0.00		10-8	1.2'		
	58 —	1	Cama		1 0	0.00		
	1	1	Same		4-3	S-30 1.2		
	60	-			4.2	1.4		
	60 _	SW	Same, little fine gra	ive1	3-4	S-31		
	-		few silt		4-4	1.0		
	62 —	=	same, trace silt		5-13	S-32		
	-	-			20-22	1.0'		
	64 -	-	Same		13-21	s-33		
	-	1	Danie		32-20	1.0		
	66 —	1				0.00		
		#	Same		13-15	S-34		
	-				17-15	1.0		
	68 -	SW	Grey very fine SAND,			S-35		
		SM	& wood pieces little	SILT,	8-8	1.0		
	70 -		mica Same, trace organics		5-5	S-36		
			bame, trace organics		3-3	1.0		
	72 -	-					Concluded drilling at 1:	+5
			Bottom of hole 72.0'					
	64							
	1							
	66 —							
	68 -				,			
	70 -							
	1							
	70							
	14							
	-							
NG FOR		-				1		
MO CODE	4.6		GPO: 1969 OF-		PROJECT		Creek Disposal HOLE NO.	

	ING LO	G	AIRION	INSTALLATION SHEET OF SHEETS							
Pearce	Creak	Diene	sal Area	11. DATUM FOR ELEVATION SHOWN (TEN - MEA)							
LOCATION	(Courden	DISDO	sal Area								
DRILLING				12. MANUFACTURER'S DESIGNATION OF DRILL							
Froelhi	An abam	Robert	son	CME 55							
ACMI MIO NUM	th cod	on drawn	CSB-4	BURDEN SAMPLES TAKEN 19							
John Or					VATION G						
DIRECTION	OF HOL						MTED	COMPLET	ro		
NERTIC	AL [	NCLINED	DEE. FROM VERT.	IL DAT	E HOLE	17	/7/88	7/7/88			
THICKNESS					ELEVATION TOP OF HOLE						
DEPTH DR		20.50.000			ATURE OF		Y FOR BORING	-			
. TOTAL DE			40.0'		nneth (	-	e				
LEVATION		100	CLASSIFICATION OF MATERIA (Description)	LS	RECOV-	BOX OR SAMPLE	(Delling tim	REMARKS	legith of		
0	0_	c	Reddish brown, fine san	2		f	- value Hin	g ato. If algorit	(manu)		
	=		little grey silt. trace		4-4	S-1	Start dr	illing 7:0	0a.m.		
	2		clay lenses. w/mica		5-4	1.0'					
	=	SW	Same,		3-3	S-2					
	4 =	SM			4-5	1.0'					
	_		Same, grey silt, trace		4-3	S-2					
	, =		The second secon		3-4	1.0					
	6		Reddish brown course to		3-2	IS-4					
	=		fine sand, little silt	moist	6-8	1.0					
	8 _		C==				8-0' grou	ind water			
	=		Same, with fine gravel little purple, red clay	017	8-6	S-5	5	static			
	10		silt	ey	8-8	0.6'					
	=		Red silt w/grey clay		6-6	S-6					
	Lenses Red, brown, grey, purp		Lenses		7-8	1.0					
			Red, brown, grey, purpl	е							
	. 3		silt, laminated, little medium to fine sand		4-5	S-7					
	14				7.8	1.0					
	Ξ		Reddish brown coarse to	)	4.4	S-8	Large 2"	piece of			
	16	3"	fine sand, little silt, gravel	trace	7.10	0.8	gravel ja	ammed in s	poon		
	=		Same, grey brownwet tra	ace	4-6	S-9		losing wat	A = -		
	18 =	SW	silt, trace fine gravel		6-6	1.0'	16.0' mud	used wat	er at		
			Same , tip of spoon		2.2		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				
	20 =		had black organic woody		3-3	S-10					
	20		material		2-1	1.5					
	=		Mostly sand top & botto	m	light	UP-1					
	22				Mach	1.9'					
	=		Grey coarse to fine san few fine gravel trace s	d ilt	4-6 7-10	S-11 1.2'					
	24 =				1 = 1 U	1.72					
			Same		9-8	S-12					
	26				4-4	1.0'					
	-		Same, mostly medium to fine sand		F 2	0.13					
	=		TIME SAILU		5-6	S-13					
1	28 =		Como1		9-9	1.0'					
			Same, mostly fine sand		7-7	S-14					
3	30 =				11-13	1.2					
			Same, coarse to fine		9-12	S-15					
1	2 =		sand, little fine grave. trace silt	1	13.9	0.9'					
	=			1							
	. =	2.21	Same, trace silt		9-7	S-16					
(3	4 =		dark grey clayey silt		5-5	0.8'					
	=		little fine sand		6-7	S-17					
	36	ML			7-5	2.0'	na it				
	=		Same, race fine sand		3-6	5-18	36.4 hole	collapse	d aft		
Same, race fine sand Same			C 2		5-6		completio	n of bori	ng		
	- 1										
:	38 =		Same		5-7	S-19					

M. No. CSB-5 OF 2 SWEETS 10. SIZE AND TYPE OF BIT 2" Split Spoon
11. DATUM FOR ELEVATION SHOWN (TEN or MEL) 12. MANUFACTURER'S DESIGNATION OF DRILL CME 55 13. TOTAL NO. OF OVER- DISTURSED UNDISTURSED UNDISTURSED 37

77 1 1 4	AGENCY	n 1 1	474.5cm	CME						
Froelhi	As shown	Kobe	ne title	13. TOTA	AL NO. OF DEN SAMPL	OVER-	N 37	O		
NAME OF D			CSB-5	14. TOT	AL HUMBER	CORE B				
John Or	rgan			15. ELEY	VATION GR	14.500	,			
DIRECTION			- participantial in	16. DATE HOLE 7/12/88 7/13/88						
VERTIC		77. 5. 45		17. ELE	VATION TO			1/15/00		
. THICKNESS				18. TOTAL CORE RECOVERY FOR BORING						
DEPTH DR				19. SIGNATURE OF INSPECTOR						
. TOTAL DE	PTH OF	HOLE	74.0'		eth O'R	_				
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIA (Description)	LS	% CORE RECOV- ERY	SAMPLE NO.	(Drilling time, v	MARKS vater loss, depth of tc., if vignitiesms)		
	0-		Brown silt, little	fine	6-6	S-1	Start dri	11ing 8:30		
	=		sand w/roots & mica		7-8	1.2	a.m.			
	2		Same, brown grey		6-9	S-2				
	=				7-6	1.5				
	4									
	=		Same, grey moist		3-3	S-3 1.5				
	6 -				2-3	1.5				
	-		Same, trace of orga	nics	3-3	S.4				
	=		few fine sand		1-2	1.5				
	8		Como traca file	n d						
	- 5	MLCL	Same, trace fine sa	nd.	1-2	S-5 1.5				
	10	CL	Carrie		= -2					
	=		Same, wet		WOH/	S-6				
	12 =				24"	1.0'	Driller 1	ost fluid at		
	-	1	0.4		WOH/	S-7		ed hole to		
	77.2		Same,		12"	1.0	14.5			
	14				2-2	0 0				
	=		Same, few organics		WOH/ 12"	S-8				
	16				2-2	1.0				
	=				1-1	5-9				
	18_		Same		2-1	1.8'				
	10-				3-3	5-10	1			
	-	1	Same			1.3'	ground wa	ter level		
	20	3			3-4		19.6 stat			
	-		Same		1-2	5-11				
	22	1			2-3	1 . 2				
		1	Same		2-3	S-12				
	67 =				2-3	1.4				
	24	-	Samo lagar		1-1	S-13	4			
	=		Same, loose		1-1	1.3				
	26	-			-					
	- 3		Same grey black, 10	ose	1-2	S-14				
	28				1-2	1.3'				
	5	-	Same to 28.6'	A sale	2-2	S-15	driller los	t fluid @ 9.0'		
	20	1	from 28.6 to 29.5 t	an	6-8	1.5'	cased hole	to 35.0'		
	30	1	grey brown fine sa	nd				45,00,15		
	=	SW	trace silt	uu,	7-8	S-16				
	32				9-6	1.0				
	-		grey brown interla	yer	2-2	S-17				
	34 _	3	fine sand & silt		4-6	1.2				
	700		Grey brown coarse		4-6	S-18				
	2.		fine snad, trace s		9-8	1.2				
	36		trace clay lenses.		12-12					
	1		Same, few fine gra	vel	12-12					
	38 _				12-12	1.0				
		3	Same		13-12	S-20	)			
	40	-1				1.0				

INSTALLATION

DIVISION

Pearce Creek Disposal Area
2. LOCATION (Coordinates or Station)

DRILLING LOG

3. DRILLING AGENCY

1. PROJECT

-- INSTITUTE

ROJECT	araa	Crook	Diposal Area			SHEET 2
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	RECOV- ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
3	b	С	Brown fine sand,	7-7	S-21	g
	40 =		trace silt	8-7	1.0'	
	42 -			0-/	1.0	0 3
			brown black, fine sand	5-4	S-22	
	1		42.0-42.6	6-6	1.2	
	44 _		Black organic sand & silt 42.6' to 43.1'	11 10	0 00	
	1 1	SW	brown grey coarse to fine	11-10		
	46 _	SM		10-9	1.0	
	1	SAT	Same, trace fine gravel	5-4	S-24	
	48 =	1	8	5-6	0.9	
	40		Same	5-9	S-25	
	-	1		8-7	1.0	
	50 _	1		0-7		
	-	1	Same	5-5	S-26	
	52	3		10-1	50.8	
		-	Same, light brown	9-17	S-27	
			James, IIght Diowil	27-2	61.0'	
	54		Cama			
	-		Same		9S-28	
	56		Camo for fit-	The second second	71.0'	
		1	Same, few fine gravel	13-6	S-29	
	58			8-9	0.6	
	30 _		Same, little silt, trace gravel	7 0	0.20	Start 7:00 a.m.
		1	graver			7/13/88
6	6.0			2-1	10.4	
		-	Brown grey silt, trace	10-1	1S-31	
	62	7	fine sand, clay lenses	17-1	91.0'	
		3	Same, little clay		S-32	T
		3				
	64	ML/C	LSame		61.0'	+
		-		10-1	25-33	1
	66 _			17-1	51,4'	
			Grey silt, 1 large piece	7-15	5-34	
			of gravel trace fine sand	115-1	81.7	
	68 —					1
	1		Grey clayey silt, blue	6-8	5-35	
	70 -		& white specks throughout	9.9	1.5	
	1		Same	7-6	S-36	Care Make a state of
	79	=	Dame	6-8	1.9	See Note below
	72 —			3-4	S-37	
		-	Brown clayey silt, trace		100	Lega Goog of the News Cold
	74 —		fine sand	6-7	1.2	Hole finished 7/13/8
		1				11:00 a.m.
						Hole collapsed after
						completion of boring
	1 5	7				Note: Wanted tube i
		7				this area-not enough
	1 =					rods for tube.
		3	d)			Finished hole- Contacted corps who
		3				O.Kd not taking tube
						January Caro
		1				
	-	_				
		=				
	-					
		=				
		]				1

Froel 4. HOLE NO.		e Cree		10. SIZE						
Froel 4. HOLE NO.	Pearce Creek Disposal Area  CCATION (Coordinates or Station)			10. SIZE AND TYPE OF BIT 2" Split Spoon 11. DATUM FOR ELEVATION SHOWN (TEM or MSL)						
Froel		tes or Stat	ioni	12. MAN			NATION OF DRILL			
A. HOLE NO.	AGENCY hing &	Rober	tson		CIE 5		DISTURBED UNDISTURBED			
			e title	13. TOT	AL NO. OF	ES TAKE	4 2			
S. NAME OF			CSB-5A	14. TOT	AL NUMBER	CORE B	OXES			
		John 0	rgan	15. ELE	VATION GR		TER   COMPLETED			
6. DIRECTION	77.0		DEG. FROM VERT.	16. DAT	E HOLE	3	15/88 7/15/88			
7. THICKNES				17. ELE	VATION TO	P OF HOL				
a. DEPTH DR					AL CORE R		FOR BORING			
9. TOTAL DE	PTH OF	HOLE	26.0'		neth 0'					
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIA (Description)	ALS	% CORE RECOV- ERY	BOX OR SAMPLE NO.	(Drilling time, water loss, depth of weathering, etc., if significant)			
-	0-		drilled thr	ough	1		Start 7:00 a.m. 7/15/88			
			to 8.0'	o ab.			Hole offset 4.0' north			
	2				-					
	-									
	T									
	4	1					(1)			
	=	1								
	6-	1								
	<del>-</del>	1								
		1								
	8	1	Grey Loose SILT, w/mic	a.	WOH-12	S-1				
	E	1	organic roots & fibers							
	10 =	1	trace fine sand & grave	el	1-1	1,4				
	10	1	Same from bottom of		Light	NP-1				
	1 = 2	1	tube (in Sample Jar)		Light Mach		Driller lost fluid at 12			
	12		sado (III sample sal)		110,011	2.0	DI 11101 1050 11414 40 12			
		ML	Same, W/clay lenses		1-2	S-2				
	1 50 =	1	trace fine sand		2-2	1.5				
	14-	OT								
	=	CL								
	16-	1								
	_	1								
	1	1								
1	18	4								
		1								
	20-	1-				-				
	1 =	7	Brown grey laminated		2-2	s-3				
	00 =	7	SILT, w/clay lenses, t	race	3-3	2.0'				
1	22	7	fine sand w/roots		Light					
		=	DK Grey Clayey SILT.		Mach	2.01				
	24	1								
	1 3	1	Comp		2-2	S-4	The same of the last			
	26-	-	Same		2-3	2.0	Finished 10 a.m. 7/15/88			
	20		Bottom of hole 26.0'		ill in a si		1			
		1	74 - 1260 2 2132 7160							
		1								
1	1									
f		1					k.			
	-	1								
1	-	3								
	-	-				1				
		7								
		7								
			1							
		7	1				T.			
		=								
	1.0									
	the section of									
	The state of the s									

Male No. Cab-/ INSTALLATION VISION DRILLING LOG OF 1 SHEETS 1. PROJECT 10. SIZE AND TYPE OF BIT 2" Split Spoon
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) Pearce Creek Dis. Area 2. LOCATION (Coordinates or Station) 12. MANUFACTURER'S DESIGNATION OF DRILL S DRILLING AGENCY CME 55 Froehling & Robertson 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN UNDISTURBED DISTURBED 4. HOLE NO. (As shown on drawing title and file number) CSB-7 S. NAME OF DRILLER 14. TOTAL NUMBER CORE BOXES John Organ 15. ELEVATION GROUND WATER 6. DIRECTION OF HOLE STARTED COMPLETED 16. DATE HOLE X VERTICAL \_\_INCLINED 17. ELEVATION TOP OF HOLE 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 8. DEPTH ORILLED INTO ROCK 19. SIGNATURE OF INSPECTOR 9. TOTAL DEPTH OF HOLE 40.01 CLASSIFICATION OF MATERIALS REMARKS ELEVATION DEPTH LEGEND (Drilling time, water loss, depth of weathering, etc., if significant) Start 5 am 6/24/88 Brown sandy SILT, few 7 - 11fine sand 1.5 18 - 20ML Same, trace f sand 11 - 14S-2 clay lenses 17 - 201.5' Brown silty SAND, 13-28 little fine gravel 1.0' 14-13 Brown well graded SAND with 10-10 5-4 ground silt, few gravel, w/shells 10-14 1.5 water wet groundwater 8.0' 8.01 Same mostly medium to fine 11-11 SW SAND, wet w/shell pieces 11-13 1.5' SM 10 Same reddish brown wet 10-11 S-6 13-15 1.0' Same brown, wet 8-8 S-7 9-10 1.5' 14 Same, tar, wet w/mica 7-9 S-8 9-10 1.5' 16 Same, reddish brown wet 5-9 3 - 31.0' 18 Same reddish brown trace 3-3 S-10 clay, wet 2 - 11/0' 20 Dark grey SILT, trace 3-3 S-11 fine sand, w/mica moist 3-2 1.5' 22 Dark grey SILT, cohesive 2 - 2S-12 2-2 1.51 24 Same top and bottom UP-1 light feel piston hung up about ML I.0' in tube due to epoxy maci 1.0' having problems w/tubes 26 Same 2-2 S-13 2-3 1.5 28 Same 4-5 S-14 5-3 1.8 30 Black, grey dk brown SILT 5-7 S - 15w/organics & mica trace clay lenses blocky 10-10 1.0 32 Dk brown SILT w/organics 3-3 S-16 trace fine gravel 4 - 50.4 34 Dk grey SILT, trace fine 4-6 S-17 sand 8-8 1.5 36 Same 6-6 S-18 6-6 1.5 38 38.0-39.0 same 6-8 S-19 39-39.5 dk grey black Siltw/ 8-10 organics trace of sand ENG FORM 18 36 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NO.

DRILL	ING LO	G DIV	VISION	IHBYALL	ATION			of 1 shears
PROJECT			63.6 S	10. SIZE	AHD TYPE	OF BIT	2" Split Sp	oon
Pearce	(Coording	Dispos	al Area	II. DATE	IM FOR EL	EVATION	THOWN (TBM or MS.	L)
		71.71.71.71.	F-0.5	1-5	10 17 4 1 20 12	R'S DESIG	HATION OF DRILL	
Froehli	hg & R	oberts	on		Æ 55	OVER	DISTURBED	UNDISTUMBRO
HOLE HO.	(An ahone	on drawle		BURT	IL NO. OF	ES TAKE	N 3	2
NAME OF	RILLER		CSB -7A		AL NUMBE			
		Organ		18. ELE	VATION GR	100200	0.0	
X VENTIC			DEG. FROM VERT.	16. DAT	E HOLE		3/88	9/8/88
	-			17. ELE	VATION TO			270700
L DEPTH DR		-		18. TOT	AL CORE	RECOVERY	FOR BORING	- 3
, TOTAL DE			38.0'	19. SIGN	ATURE OF	INSPECT	OR	
12 C UT			CLAMIFICATION OF MATERIA	ALS	% CORE	BOX OR		ARKS
ELEVATION	БЕРТН		(Description)		RECOV-	SAMPLE NO.	(Drilling time, w	aler lues, depth of a., il significant
a	0 -	-6	Drill through to 1st			- 1		g
	=		sample at 28.0'					
	2 -							
1	=		T					
	j. =		1 7 8		1			
	4							
	=						5	
	6 -						3	
	=							
	8 _		9			-	GROUND WA	TER
	=						8.01	
	10 =							
	10-							
	=							
	12-		1					
	11112			÷				
	14-							7
				))				
	J =						1	
	16-							3
	-				1			
	18-				1			
	7				,			
	20 -		3					
	-						l.C	
	22						1	
	24-							
		-						
	26-							
	-				12			
	1							
	28. —		Dk. Grey Micaceous		2-2	S-1	Start hole	10:30 9/8/88
	1		Clayey SILT		2-3	2.0'		
	30 -	ML				1	* Note undi	sturbed
	-		Same		Light	UP-1	dropped 2.0	' while
	20	(11)	Sample in jar from bot of tube	tom ·	MACH.	2.01	removing fr	
	32 -		Black brown SILT W/		5-7	S-2	marked on t	ube -
			organics		8-8	1.1'	Attempted t	ube
	34 -						at 32.0' ma	lfunction
	-		DK Grey Clayey SILT		Light	UP-2	of piston r	
	36 -		w/Gravel		Mach.	2.01	took spoon	
	20 -	SW	Brown medium to fine		14-14	S-3	piston at 3	4.0
		SM	Sand, trace silt		5-5	1.0'	Finished he	de 5:00 p.m.
			Bottom of hole 38.0					
	1.2		277					9/8/88 .
1			1			4.1		

DRILL	ING LOC	3 07	SION	INSTALL	MOITA		10	OF 2 SHEE	CTS
1. PROJECT				10. SIZE	AND TYPE	OF BIT	2" Split Sp	noon	
2 LOCATION	Comme	Creek	Disposal Area	11. DATE	M FOR EL	EVATION	SHOWN (TEM - A	Ma)	
S. DRILLING				12. MANL	FACTURE		NATION OF DRIL	_	
F	roelh	ing &	Robertson	12. TOT/	L NO. OF		E 55	UNDISTURBE	a
4. HOLE NO.	(As about	on drawing	CSB-8	BURG	EN SAMPL	ES TAKE	32	1 1	
S. NAME OF			, 300	-	ATION SR				$\dashv$
6. DIRECTION	ohn O	rgan		7 7 7 7			RTED	COMPLETES	$\dashv$
T VERTIC	AL U	HELINED .	DEG. FROM VERT.	FROM VERT. 16. DATE HOLE 17/13/88 7/14/88					
7. THICKNES	S OF OVE	RBURDEN			ATION TO				_
S. DEPTH DR	ILLED IN	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		18. TOTAL CORE RECOVERY FOR SORING 19. SIGNATURE OF INSPECTOR					-
. TOTAL DE	PTH OF	HOLE	66.0'		nneth				_
ELEVATION	St. Sept. of	LEGEND	CLASSIFICATION OF MATERIA	ALS	% CORE	SAMPLE NO.	(Drilling time,	MARKS water loos, dispite of to., if algorithms	nd.
a	0 -	c		7.81	•	- 1		g	一
	× =		Brown silt, w/root mica dry	S &	5-5	S-1	Start 12:	30 p.m. le to 10.0	. =
	2	ML			5-5	1.5	cased noi	,e to 10.0	F
			Same		5-5	S-2			E
	4				5-5	1.0'			E
			Brown grey silt,	race	2-4	S-3			
	6 =	1	of organic, moist		3-4	1.3			E
	=	1 1	Same		4-2	S-4			E
	8 =	1			2-3	1.0			F
		ML/	Same		1-2	S-5			E
	=	CL	5 a me		2-3	1.4			E
1	10-					0.6			F
	=	1	Same		1-1	2.0	Ground,	water 11.6	5 ' F
	12		Same		2-3	2.0			E
	1	1			2-3	S-7			-
	14_	3	Same-sample in jar		2-4	1.7	mula inst	-1 2 01	_
	1		taken from bottom				Tube push	rery-	E
	16		Some w/organics & of gravel 16.0' to	piece	_	+	Samples A	C.R	-
			Brown grey coarse	to	7 - 0	1	Samples A	LOD	
	18-	SW	fine sand trace fi		10-13	7.7			E
		Sw	Brown grey coarse		12-15				F
	20-	3	fine sand, little	silt	17-1	11.0'		drilling	F
		1	trace fine gravel	w/mid	a 3-5	S-10	3:30 pm S 7/14/88	Start 7:00	am
	9 7		Same		6-6	1.0'	//14/00		F
	7	=	Same			S-11	1		F
		#			6-6	1.0'			E
	24	Ξ	Same			S-12			F
	15.18	=	7.33		5-6	0.8'			E
	26-	=	Trans.		6-12	S-13	+		F
		3	Same mostly fine strace silt	sand,	1	61.0'			-
	28-	+	Brown grev silt,	SOMO	9-9	S-14	+		E
1		3	fine sand	o uit					E
	30-	=	Same, trace fine :	sand	4-7	1.0'			-
	1	=	w/mica		3-3	S-15			E
	32-	3	0		3-3	1.2	1		
		= <sub>ML</sub>	Same		4-4	S-16			
	34=	=	Grey silt, trace	fine	5-6	1.5	1		F
		3	sand		4-7	S-17	1		
	36-	=			7-9	1.5			
		=	Same		4-5	S-18			F
	38-	=	0.000		8-10	11		llapsed 36	5.91
	70	=	Grey silt		4-6	S-19			
	40	7			7-9	1.3			
ENG FOR	144						-		

DJECT			ELEVATION TOP OF HOLE INSTALLATION						
Pea	rce (	reek	Disposal Area			OF 2 SHEETS			
EVATION	DEPTH b	LEGEND	CLASSIFICATION OF MATERIALS (Descripsion)	% CORE RECOV- ERY e	SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)			
*	40 -		Grey silt, few organics	10-11		9			
	=		w/mica	12-13	1.2 *				
	42	ML/	Grey clayey silt	10-10	S-21				
	=	CL		10-12	1.5'				
	44 -		Same wet & loose	8-8	S-22				
	3			9-9	0.6				
	46 -		Same	7-9	S-23				
				10-11	1.5				
	48 -	3	Black micacious silt trace fine sand	15-14	S-24				
	50 -			13-18	1.5				
	30 =		Same	4-5	S-25				
	52 -			8-11					
	12	ML/	Dark grey clayey silt	11-15					
	54 —	CL	0	13-17	1.0'				
			Same, w/blue & white specks	7 – 1 3	S-27				
	56 —			I comment	1.0				
	1		Same, loose	10-10					
	58 —			11-11	0.4				
			Same	9-10					
	60 -			12-12					
		1	Same dry		1				
	62 -	=	Same, trace organics	11-11	S-31				
			& wood	13-15					
	64 -		Dk. grey clayey silt	6.0	S-32	Garty Live of Table 1			
			DR. grey crayey silt		1.5	Finished drilling 3:00pm			
	66		Bottom of hole 66.0'						
	1 3								
	1								
	-								
	1 5								
		3			}				
	-								
	1 -								
		=							
	-	1							

Pearce Creek SHEET DRILLING LOG OF 1 SHEETS I. PROJECT 10. SIZE AND TYPE OF BIT 2" Split Spoon earce Creek Disposal Area 2. LOCATION (Coordinates of Station) 12. MANUFACTURER'S DESIGNATION OF DRILL Froehling & Robertson CME-45 4. HOLE NO. (As shown on strawing title and file number) 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED UNDISTURBED CSB 8-A S. NAME OF DRILLER 14. TOTAL NUMBER CORE BOXES 18. ELEVATION GROUND WATER John Birch 6. DIRECTION OF HOLE COMPLETED 16. DATE HOLE VERTICAL \_\_INCLINED\_ DEG. FROM VERT. 8/16/88 8/18/88 17. ELEVATION TOP OF HOLE 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING & DEPTH DRILLED INTO ROCK 19. SIGNATURE OF INSPECTOR 9. TOTAL DEPTH OF HOLE CLASSIFICATION OF MATERIALS % CORE RECOV-ERY BOX OR SAMPLE NO. REMARKS ELEVATION DEPTH LEGEND (Drilling time, water loss, depth of weathering, etc., if significant) Start drilling at 0 Drill through to 38.0' for 1st on 8-16-88 sample Hole moved 3.0' south 35.0' of casing driven finish for day 5:45PM 38 Black SILT, w/ organic 5-6 8/17/88 start at 9AM S-1fibers 7-9 1.0' finish for day 2:30P# 40 Same, sample from bottomLight up-1 breakdown (starter) bottom of tube in jar 2.0' start orilling 6.30at mach 42 4-6 Same 5-2 10-10 1.0' finished hole 10:30AHhole 44.0' Bottom of 8/18/88

Hele No. DIVISION INSTALLATION SMEET 1 DRILLING LOG Pearce Creek OF 1 SNEETS 1. PROJECT SPLIT 10. SIZE AND TYPE OF BIT SPOON Pearce Creek Disposal Area 11. DATUM FOR ELEVATION SHOWN (TEM or LELL) 2. LOCATION (Coordinates or Station) 12. MANUFACTURER'S DESIGNATION OF DRILL 3. DRILLING AGENCY CME 45 Froehling & Robertson 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED UMDISTURBED 4. HOLE NO. (As about on drawing title) CSB 9 S. NAME OF DRILLER 14. TOTAL NUMBER CORE BOXES John Birch IE ELEVATION GROUND WATER 8.5' S. DIRECTION OF HOLE STARTED 8/15/88 16. DATE HOLE 8/10/88 X VERTICAL \_\_INCLINED\_ 17. ELEVATION TOP OF HOLE 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING & DEPTH DRILLED INTO ROCK 19. SIGNATURE OF INSPECTOR 9. TOTAL DEPTH OF HOLE 30.01 REMARKS
(Drilling time, water loss, dopth of westbering, etc., if significant) % CORE BOX OR RECOV- SAMPLE NO. CLASSIFICATION OF MATERIALS ELEVATION DEPTH LEGEND 0 -Brown grey silt w/ organic roots & fibers WOH.Z Start Drilling 2:00 2-3 2.0 PM 2 ---Same, trace sand 8/10/88 8.0' fill drilled 2-2 S-2through before 1st ML 2-2 2.01 sample. 1-12" S-3Same, clay lenses 2-3 2.0' Gray Brown SILT, trace 3-6 clay 8-13 2.0' 12-12 S-5 <u>Groundwater at 8.5'</u> 13-14 2.0' finished drilling 5 Brown Coarse to fine SAND, little silt 10 PM start drilling Brown Grey coarse to 8:30 AM fine SILTY SAND trace 11-13 S-6 8/11/88 1.5 12 gravel 12-12 SW Same, few fine gravel 7-9 S-7 SM 12-10 1.2 14 7-6 5-8 Same 6-7 1.0 16 7-5 Same 5-9 8-10 1.0' Start 8:00AM 8/12/88E 18 Grey micaceous SILT 5-4 S - 10ML few fine sand 6 - 71.4 finish 3:00PM break 20 down Grey micaceous SILT 3-4 S - 11Start 1:30PM 8/15/88 trace fine sand 4-7 1.0 22 Same 3 - 3S-12 Driller made attempt for tube, tube came 5-6 1.5 24 up empty made driller Same - sample from Light up-1 take sample bottom of tube in jar 2.0 mach 26 Same 5-6 S - 138-10 2.0 28 Same, more dense 9-14 6-6 8-10 2 0' Finished hole 6:45 30 PM 8/15/88 Bottom of hole 30.0' ENG FORM 1836 PREVIOUS EDITIONS ARE DESOLETE. PROJECT

SHEET INSTALLATION DRILLING LOG OF 2 SWEETS I. PROJECT 10. SIZE AND TYPE OF BIT 2" Split Spoon Pearce Creek Disposal Area 11. DATUM FOR ELEVATION SHOWN (TEM or MSL) LOCATION (Coordinates or Station) 12. MANUFACTURER'S DESIGNATION OF DRILL 3. DRILLING AGENCY CME 55 Froe.hling &Robertson 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED UNDISTURBED 4. HOLE NO. (As shown on drawing title **CBS** 10 14. TOTAL NUMBER CORE BOXES S. NAME OF DRILLER IS. ELEVATION GROUND WATER John Organ 6. DIRECTION OF HOLE 16. DATE HOLE 6/27/88 6/29/88 X VERTICAL [ INCLINED \_ 17. ELEVATION TOP OF HOLE 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 8. DEPTH DRILLED INTO ROCK 19. SIGNATURE OF INSPECTOR 9. TOTAL DEPTH OF HOLE 55.0' CLASSIFICATION OF MATERIALS (Description) % CORE RECOV-ERY BOX OR SAMPLE NO. REMARKS ELEVATION DEPTH LEGEND (Drilling time, water loss, depth of weathering, etc., if significant) Brown SILT, little medium to 7-10 S-1 start 6:00 am 6/27/88 fine sand, trace fine gravel w/mica & clay lenses dry 9-7 1.5 ML Same, little fine sand, 7-6 S - 2clay lenses 1.0' 5-4 Grey dk brown SILT, w/organic 8-6 S-3fibers, trace fine sand & clay 5-3 1.0' Brown grey SILT, w/mica trace fine sand w/roots & fibers 3-3 1.0' Grey brown SILT trace fine 3-6 S-5 water at 9.4' static sand, few seams clay 7 - 81.0' 10 Same 9-9 S-6 7-6 1.0 12. Grey, reddish brown SILT 2-5 S - 7little coarse to fine sand, trace fine gravel moist 14-17 1.5 14.0 Grey mostly fine SAND, trace 10-14 5-8 fine gravel & silt wet 11-14 1.2 16. Reddish brown well graded 12-10 5-9 SAND, little fine gravel trace 10-7 silt w/mica 1.0' 18 SW Same 7-7 5-10 SM 9-7 1.0 20 Same, brown, grey 8-7 5-11 5-5 1.0' 22 Same, grey mostly fine SAND 5-4 S-12 1.0 3-4 24 Same, trace fine gravel 5-4 S - 133-3 0.8 26 -Same 3-4 S-14 8-6 1.2 Reddish brown & grey fine SAND 5-6 from (28.0-28.5) (Sample A) 28.5 Sample A & B Grey black SILT, w/woody 5-4 1.0 30 organics trace f sand (sampleB) (28.5-29.0) S-16 1.5 3-3 MT. 5-6 concluded drilling 12:00pm 32 start at 7:00 am 6/29 Drillers error drilled through 32.0 to 34.0' tube area took 34.0 tube at 34-36.0 -34 Grey very fine SAND, little light U-PI silt top & bottom 1.9' mech SM 36 Grey fine SAND, little silt 5-5 S - 177-8 wet 1.0 38 Reddish brown & grey fine 12-14 S-18 SAND, little Silt wet 18-20 1.5 40 PROJECT Pearce Creek HOLE NO.

DJECT		U	heet) ELEVATION TOP OF HOLE			Ho to. CSB-10
7.7	Pearc	e Cree	k Dis. Area			OF 2 SHEETS
EVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	RECOV- ERY	BOX OR SAMPLE NO.	(Drilling time, water loss, depth of weathering, etc., if significant)
a	40 =	С	Reddish brown medium to fine SAND, mostly fine, little	14-13 53-57		8
	42	SW	silt moist  Reddish brown coarse to fine	14-9	S-20	
	44 =	SM	SAND, little silt trace fine gravel moist	24-26	1.0'	
			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	
	48		Same	19-41	S-23	
	50 =		Brown mostly fine SAND & silt	13-13	1.5 S-24	
	52 =			11-14	1.2'	-hole collapsed 51.5'
	=	ML	(52-52.7) same (52.7-53.7) Grey brown	10-11 14-15	S-25 1.5	samples A & B
	54	SW	Brown, medium to fine SAND,	12-11		was a second
	55 —		Bottom of hole 55.0'	10-12	1.5	finished boring 11:00am 6/29/88
	=					
	1.5					ļ.
	-					
	=					
	1 3					
	=					
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HOJECT								ог 1 зиши
OCATIO	Pear	ce Cre	eek Disposal Area	10. al	XIE AND TYP	LEVATIO	2" Split	A COLUMN TO THE REAL PROPERTY AND ADDRESS OF THE PARTY AND ADDRESS OF T
RILLING	Proc.	liling	& Robertson		NUFACTUR	EN'S DES	IGNATION OF DAIL	
OLE NO.	(As show	** *** *			CM	E 55		
	(Ae show		CSB 10A	BL	TAL NO. OF	LES TAK	EN DISTURBED	UNDISTUMBE
	Brad	Organ		14. TO	EVATION G	KOUND W	BOXES	
XXERTI	N OF HOL	LE NOT INC.	A THE STATE OF THE		TE HOLE		ARTED	COMPLETED
	S OF OVE			•	A STATE OF THE STA	9	/9/88	9/9/88
	ILLED IN				EVATION T		Y FOR BORING	
	PTH OF		12.0'	19. 510	NATURE OF	INSPEC.	TOR BORING	
VATION					1			
ø	0 -	C	(Description)	IALS	RECOV- ERY	BOX OR SAMPLE NO.	(Drilling time, weathering, a	MARKS wier loss, depth of ic., if significant
	Ξ	427	Drill through to 6.0' before 1st Sample				Start Drill 9/9/88	ing 9:00 a.m
	2 —						2/ 9/ 00	
	4				8			
	=							
	6 =	ML						
	=	PILI	Brown grey black SILT,	7.7 /	1-3	0.1		
	$\equiv$		roots & fibers, trace f	ine	3-3	S-1 1.0'		
	8 =		sand clay lenses		1		1 1 -	
	=		Brown grey SILT, sample in jar from bott	Om	light	UP-1		
	10_		of tube	OIII	Mach	2.0	ground wate	r at 9.5'
	$\equiv$		0		6-4	S-2		
2	12		Grey brown SILT, trace fine sand, w/clay lense	C.	4-4	2.01		0.000
	=		Bottom of hole 12.0'	D			finished hol 9/9/88	e 12:30 p.m.
		1				1	3/ 3/00	
	-							
	$\equiv$		10	0.1				
	_		1					
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Disposal Area

CSB-10A

DRILLI	NG LO	S DIV	VISION	INSTALL	ATION		-	or 2 sugars		
			sal Area	10. SIZE AND TYPE OF BIT 2" split spoon 11. DATUM FOR ELEVATION SHOWN (TRIS & IEL)						
LOCATION		tos or Stai	Ton)	12. MAHU			NATION OF DRILL			
Froehlin		bertso	on	IN TOTA	CME 55		DISTURBED   UNDISTURBED			
HOLE NO. (	Au ahoun	on drawin	CSB-11	BURDEN SAMPLES TAKEN						
NAME OF D					ATION GR					
. DIRECTION	OF HOL				172.7			MPLETED		
* VERTIC	AL U	HCLINED	DEG. FROM VERT.	18. DATE	ATION TO			0/2/88		
THICKNESS								- 1		
. TOTAL DE			76.0	19. SIGN	ATURE OF	INSPECT	OR			
ELEVATION			CLASSIFICATION OF MATERIA	LS	% CORE RECOV- ERY	BOX OR SAMPLE NO.	(Drilling time, wate weathering, sto.,	KS or lose, depth of		
a	О _	c	Brown SILT, trace fine	gand	5-5	S-1	Start 5:00 am			
	$\equiv$		w/mica	Banu,	6-5	1.2'	BEATE 5.00 an	7 1 00		
	2 _									
	-		Same, moist, trace orga	anic	4-4	S-2	107			
	4		fibers		4-6	1.5'				
	7		Same, trace fine sand	tract	3-4	S-3				
	, =		fine gravel	rrace	4-3	1.5				
	6 —				4176					
			Same, w/clay lenses		2-3 3-5	S-4 1.5'				
	8 —				3-5	1.5				
	-		Same		4-6	S-5				
	10		1		5-5	0.8'				
	=	ML	Same, sample from botto	om	Light	Up-1				
	12		of tube		Mach	2.0'				
	=		Brown grey SILT, w/clay	v	2-1	S-6				
	14		lenses, trace fine sand		2-2	1.0'				
	14-						1.8			
	. E		Same, w/organic fibers		1-2 2-2	S-7 0.3'				
	16-							14		
	Ξ		Same		2-2	S-8				
	18-				3-3	1.2'				
			Black micaceous SILT		1-1	S-9				
	20-				1-2	2.0!				
			Same, sample from botto	om of	light	IIP-2				
	20 =		tube	Jiii UL	Mach	2.0'				
	22-		Same trace of organics		1-2	S-10				
					1-3	2.0'				
	24-		Sama trace alam lamas		2-2 .	S-11				
		V	Same, trace clay lenses	5	2-2	1.9'				
	26-		The same of the same							
	-	ML/	Brown clayey SILT, trac	ce	3-46 9-12	S-12 1.5	Ground water	reading 27.		
	28-	CL	medium to fine sand		9-12	1.5	9/6/88	3		
	=		Reddish brown, grey SII		5-6	S-13	2,5,5			
	20		laminated, trace fine	sand	9-6	1.4'				
	30—		Brown red grey SILT tra	ace	3-1	S-14	2 attempts ma	ide to obtai		
	13		fine sand	200	2-1	0.3	sample			
	32	200	n - 111 - 1 - 12	- e i	n n	0.15				
	-	SW	Reddish brown coarse to SAND, few fine gravel		9-9	S-15 1.0'				
	34		silt graver		1 - 3					
	-	SM	Same, little fine grave	el	23-16		35.0' casing	driven		
	36				16-10	1.5'	J. U Casting	MITACII		
	36		Same		5-4	S-17	1			
	=			4	3-4	0.8'	5 5 1 4			
	38		dunce manufacture and		-	0.10	Told driller			
1	1	1	Same, mostly fine SAND		5-5	S-18	mud to much	mon de		
	-				3-3	0.4	spoon	WHEN IN .		

DJECT		(Cont		INSTALLATION			Hole No.	SHEET 2	_
Pe	earce (	Creek I	Disposal Area					OF 2 SHEETS	
EVATION	рертн Б	LEGEND	CLASSIFICATION OF (Description		% CORE RECOV- ERY	BOX OR SAMPLE NO.	(Drilling time, w	ARKS meer loss, depth of if lignificant)	
	40 _	- 20	Brown grey mostly	fine SAND,	6-5	S-19		8	-
	-		little silt, few w/mica	fine gravel	7-8	1.4			
	42								
	-		Brown coarse to f	ine SAND,	7-9	S=20			
	44 -		some fine gravel w/mica	trace silt	13-19	1.0	Finished dr	illing 5:00p	m
			Tan very fine SAN	D 14++10	12-15	S-21	Start 6:00 a		-
	. 12		silt w/mica	D, IICCIE	18-10	0.91			
	46			~		0.12			
	- UE	OF T	Same, tan, grey w		14-9	S-22			
	48 —	SW	Same, some clayey	silt seams	7-8	1.3'			
	=				8-8	S-23			
	50 -				8-15	1.51			
	=		Same		8-8	0 24			
					9-18	S-24 1.8'			
	52 —		Reddish tan white	fine	17-42	S-25			
	1 S		SAND, trace silt		100/5"				
	54				100/2	U+0.			
	1 3		Tan medium to fine	e SAND,	32-27	S-26			
	56		trace silt		22-22	1.5			
			Same		10-20	S-27			
	_				34-40	the same and			
	58 —		Same, laminated w	/clay	-	- 474			
	_		lenses	2.2	32-39 43-	7			
	50 —		4		43-	1,2'			
			Tan coarse to fine	e SAND	22-19				
	52		little silt		16-13	1.0'			
			Same, reddish brow	vn,	26-28	5=30			
	=		w/ trace fine grave	el	34-45				
1	54 —		0			1,2			
i			Same		45	S-31		2	
	6 —		Same mostly fine	CAND	100/5"	0.91			
	3		trace clay lenses		45	S-32			
-	8 _				1'00/5"	1.0'			
			Same, coarse to fi	Ine	75-23	S-33			
	=		SAND, little fine	gravel	8-10	1.2'			
1	0 =		Como mantilu Etan a		7-7-5-1	220			
	=		Same mostly fine S trace clay lenses	AND	16-16	S-34			
1	2 —				4-25	1.4			
	=		Same mostly fine SAND	-	17-17	S-35	2-attempts		
7	4		17000		14-23	0.9'			
		ML,	Grey clayey SILT		11-16	S-36			
	7/	CL	to an United Table		14-18	1.51	£1	h 44	
	76 —		Bottom of hole 76.	0'			finish hole		
	3							9/2/8	1.0
	_								į
	=								
	-								1
	limilim								Ì
	=		3						
	_			1					1
									1
	4.5			1					1
	=								1
	-								1
	7								1
	=								1
	-				1	1			1

DRILL	ING LOG	DIVISI	IHSYA	LLATION		SHEET
1. PROJECT	n		10. 812	E AND TYPE	E OF BIT	2" split.spoon
L LOCATION	(Coordinates	sposal Area	11. 62	YUM FOR EL	EVATION	N BHOWN (2DM or MSL)
1 DRILLING			12, MA	NUFACTURI	ER'S DESI	IGNATION OF DRILL
Froehli	ng & Rob	èrtson	Programme to the same of the s	IE 45	OVE	DISTURBED   UNDISTURBED
event tyre bitter	1000	CSB-12	BU BU	TAL NO. OF	LES TAKE	EN 20 UNDISTURBED
John Bi		1 200		TAL NUMBE		
6. DIRECTION			18. EL	EVATION G		
X VERTIC	AL MINCL	INED DEG. FRO	M VERT.	TE HOLE	1	23/88   8/26/88
7. THICKNES	S OF OVERBL	JROEN		EVATION TO		DLE
	ILLED INTO		18. TO	TAL CORE	RECOVER	Y FOR BORING
T	PTH OF HOL					191
ELEVATION	DEPTH LEG	GEND CLASSIFICATION OF (Description of description	MATERIALS	% CORE RECOV- ERY	BOX OR SAMPLE NO.	(Drilling time, water loss, depth at weathering, stc., if significant)
	0 =	Grey black micaco		WOII/	S-1	Start drilling 1:00 pm
	2_=	SILT, trace organ		24"	1 of	8/23/88
		Same, grey brown		WO11-2	1.0* S-2	9.8' drilled through before 1st sample taken
1	4 =			1-2	S-2 1.0	Sumpre taken
	7	Samo ti/monte a				-
	7	Same w/roots & fi	Lbers	1-1	S-3	
	6 ML	Same		1-1	1.8'	
	=	*		1/12"	S-4	
	4	Same w/roots & fi	hors	1-1	2.01	
	$\equiv$	few clay lenses	Ders	1/12"	S-5	
	10			1/12"	2.0'	
		Same, little clay		1-1	S-6	
	12	lenses, trace san	ıd	2-3	2.0'	
		Grey brown SILT,	little	1 . 2		-
	14	clay lenses, orga	nic	1-2	S-7	
	- 4	Grey brown SILT,			2.0' S-8	
	$\equiv$	fine sand	LIACE	11-18	1.7	
Ш И	16	Grey brown SILT,	trace of			
	=	sand		9-12	S-9	Sample A&B
	18	Grey brown coarse SAND little fine	to fine	25-22	2.0'	Squibte Wan
	$\equiv$	Silt Brown coarse to f		15-13	5-10	
	20 SW	little fine grave	1, trace	12-10	1.2'	
	- SW	Grey, mostly fine		0 0 17	S-11	
	22	fine gravel	DAND) LIAC	12-9	1.0	
		Same			-	finished drilling 5:45pm
	2/ =				S-12	Start drilling 2:30 pm 8/25/88
	24	Grey brown coarse	to fine	9-10	0.5	2-attempts to obtain
	=	SAND, some fine g	ravel,	15-13		-3.11V + 8
	26	trace silt Brown coarse to f:	ino Cam	13-15	0.9'	
	= =	little fine grave		9-14		
	28	Brown grey fine S.		14-16	1.0'	
	$\equiv$	silt 1 large peice	e red sand		S-15	
	30_=	Grey white fire	CAMIN		1.41	finish for day 5.75
	$\equiv$	Grey, white, fine trace silt, w/clay	1enses	5-5		Finish for day 5:45pm Start drilling 7:00am
	32_			15-22	Action to the second	8/26/88
	32	Same				
	=				S-17	
	34	Same		13-13	1.0'	*Had driller attempt tube at 38.0' he pushed tube
	$\equiv$			11-11	S-18	about 6" and could go no
	36			11-10	1.2	further. Tube had about
<i>y</i>	= ML	/ Brown grey clayey	SILT trace	4-5		2" silt& 4" sand inside. Instructed driller to
	The second secon	CL Fine sand Filt layer about	2.21	8-17	1.5'	take spoon which is
	=			15-13		sample(20)
	40 =	Brown red fine SAN	D trace	12-15		*
				14 13		finish 2:30 pm

DRIL	LING LO	og (	VISION	HSTALL	ATION		SHEET 1	T
1. PROJECT	Pearc		k Disposal Area	O. SIZE	AND TYP	E OF BIT	2" Split Spoon N SHOWN (TEM or MSL)	1
3. DRILLING				12. MAN	UFACTURE	ER'S DESI	IGNATION OF DRILL	-
4 Same	Froe hl	ing &R	obertson	CME	AL NO. OF	OVER-	DISTURBED UNDISTURBED	-
4. HOLE NO.	amb end		CSB-13	-			1 2/ 1 1	1
S. NAME OF	DRILLER				AL NUMBE	10. 2.000		+
6. DIRECTIO			DEG. FROM VERT.	IS. DAT	E HOLE	ST	6/22/88   COMPLETED	1
7. THICKNE				17. ELE	VATION TO	OP OF HO		+
a. DEPTH D					AL CORE I		Y FOR BORING	1
9. TOTAL D	EPTH OF	HOLE	55.0'	13. 5101	ATORE OF	INSPEC	TOR	
ELEVATION	ь	LEGEND	d (Description)		% CORE RECOV- ERY	BOX OR SAMPLE NO.	(Drilling time, water loss, depth of weathering, etc., if significant)	
	0 =		Brown SILT, trace fine s dry	and	7-6 5-4	S-1 1.0'	started hole at 12:00 noon	F
	=		Brown SILT, little fine w/fiberous material & mi		3-3 3-3	S-2 1.2'		E
	4 =		Same, vegetation & roots		15-11 11-12	S-3 1.5'		E
l y	6 =	ML	Brown grey SILT, w/mica little sand, woody organ	ics	4-4	S-4 1.2'		
	8 =	1112	Brown, grey, black SILT with sand, little organi		2-1	S-5		
	10 -		moist Same, w/woody orgainss m		2-3	1.5' S-6		
	12 =		Brown grey SILT, trace f	ine	2-2 1/12"	1.5' S-7		E
	14 —		sand moist	1110	1/12"	1.5		
	16 —		Same		1/12" 1/12"	S-8 1.0'		E
			Undisturbed tube taken to same - bottom silty f same	op nd	light mach	U.Pl	concluded for day 2pm	
	18 =		Brown well graded SAND w. & gravel, mostly f sand co to fine gravel, w/mica we	/silt parse et	12-14 24-18	S-9 1.0'	started 5am 6/23/88	E
	22 —		Brown well graded SAND w, mostly fine, clay lenses	/silt	6-8 10-13	S-10 1.0'	Hit seam of gravel about 19.6' driller cased hole at 25.0' Hole would not	F
		SW	Brown grey SAND, mostly f little silt wet	ine	8-18 16-29	S-11 1.0	stay open	E
	24 =	Sri	Brown silty SAND, coarse to fine, little gravel		14-11 12-15	S-12 0.5		E
	26 =		Brown grey silty SAND, mo fine, trace f gravel	stly	14-15 16-18	S-13 1.2		E
	28 =		Reddish brown silty SAND w/mica	fine	21-32 37-48	S-14 1.5'		E
	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'		E
	36		Red brown & grey silty SA mostly fine w/mica	ND	15-15 16-17	_		E
	38 =							
ENG FORM	1974	DESIGNA.	A. Lai-vains T. A. Ground C. S.		PROJECT			匚

MAR 71 1836 PREVIOUS EDITIONS ARE OBSOLETE

Pearce Creek Pis. Area

CSB-13

DJECT		-	heet) ELEVATION TOP OF HOLE			He No. CSB-13
	1.	100	ek Disposal Area  CLASSIFICATION OF MATERIALS		BOX OR	OF 2 SHEETS
LEVATION	DEPTH	LEGEND	(Description)	RECOV- ERY		(Drilling time, water loss, depth of weathering, etc., if significant)
	38 =	SW SM	Reddish brown & grey silty SAND, mostly fine w/mica	10-20 27-26	S-19 1.0'	g
	40 —		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 —	SW	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		
	52 —		Same	18-20 24-25	S-26 1.5'	Hole caued in 52.0' after completion of
	54 —		Same	19-22 23-21		boring  Completed boring 1:30pm

DRILL	LING LO	G C	OIVIBION	INSTALL	ногта.		-	SHEET 1
. PROJECT	Pearce	Creek	C Disposal Area	HO. BIZE	AND TYP	E OF BIT	2" Splt Spoo	or 2 sheets
LOCATION	(Coordin	eles or S	(ation)			2	IGNATION OF DRILL	
DRILLING	Froeh	ling &	Robertson		C	ME 55	2000	
HOLE NO.	(As show	n on dean	CSB-14		AL NO. OF		1 33	I
NAME OF					AL HUMBE			
DIRECTION		E.					20.6'	MPLETED
VENTIC				IS. DATE			7/7/88	/8/88
THICKNES					AL CORE	25-7-9-746	RY FOR BORING	
. TOTAL DE			72.0'		ATURE OF			
LEVATION	DEPTH	LEGEN		LS	% CORE RECOV- ERY	BOX OH SAMPLE	(Drilling time, wait weathering, sic.,	of Lone whenth ad
-	0 -	C .	Brown SILT , w/mica & ro	ots	7-8	S-1	g	II significano
	Ē			100				
	2		Grey brown SILT, w/mica clay lenses.		8-8	1.0'	-	
	Ξ				8-9 9-11	S-2		
	4-		Same moist.				-	
					3-4	S-3		
	6-		Dark grey SILT, w/mica organic fibers, clay le		3-4	1.21		
		ML	trace fine sand.	nses	3-2	S-4		
	8-		Same .		2-2	1.2'		
	=		Y House		1-1	S-5	Start drilling 9/7/88 Start	g 6:00 am
	10-		Same wet		1-2	1.5'	over from 0.0	i note
	=	1	Jame wel		1-1	S-6		
	12-		Same		1-1	1.2		
	Ξ		Cana		2-1	S-7		
	14-		Sample in jar from botto	m of	2-2	2.0'		
	Ξ		tube same .		light			
	16		Grey black clayey SILT		mach	2.0'		
	Ξ.		w/organic fibers.		I-1	S-8		*
	18 —	ML/ CL	Same		1-2	1.51		
	=	CL			1-1	S-9	Ground Wa	iter
	20 =		Same '		1-1	2.01	20.6'	
	_		Section 1		1-1	S-10	6" of water 1	
	22 =				1-2	2.0'	6" of water ab	ove collaps
	22 =		Same		WOH-1	S-11		
	=		( all - 1 - 1		2-2	2.0'		
	24 =		Same, trace fine sand	-				
1	: E				1-1	S-12		
	26 =		Same	-	1-1	2.0"		
	= =				1-1 2-2	S-13 1.7'		1
	28 —		Same, grey brown, trace					ĺ
	=		organics.	V	VOH-1	S-14		
9	30 =		Brown SILT, w/mica	-	2-2	2.01		
			trace fine sand wet.		1-1	S-25		
3	32 =				3-3	2.0'		
			Same :		1-2	S-16		
3	34 —				3-3	2.0'		
	=	-	Same, Brown grey.		1-2	S-17 A&B	Samples	s A & B
3	16		Brown coarse to fine SANI Brown fine SAND, little S	D		2.0'		
P	_ =	Ext	THE DAMP, TILLIE		3-13	S-18		
		5N				2.0'	14.	
				-		_		
. 3			Same, trace fine gravel		7-9	S-19		

.

DECT	earna (	-1-	INSTALLATION			Hole No. CSB-14
		reek	Disposal Area	W 5555	1.00	OF 2 SHEETS
LEVATION	Б	LEGEND	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV- ERY		(Drilling time, water loss, depth of weathering, etc., if significant)
	40 =		Brown grey mostly very fine SAND, little silt w/mica	11-11	S-20 2.01	8
	42 —		Brown red fine SAND, little silt w/mica	11-15 15-19	S-21	
	44-		Brown very fine SAND trace gravel & silt	19-24	1.5' S-22	
	46		Brown tan, white, very fine	40-40	1.2!	
	48 =		Same	37-50	S-23 1.3'	
	50		Same	25-30 33-37	S-24 2.0	
	52 =			14-20	S-25	14
	= =	GIN	Same, few silt	27-30	1.4'	
	54 =	1.	Brown grey medium to fine	7-10	S-26 1.4'	
	56		SAND, few silt Same, trace clay lenses	10-14 20-28	S-27 1.6'	
	-		cray renses	8-10	S-28	
	58		Same coarse to fine SAND , trace clay lenses	5-12	1.31	
	60		Same	12-13	S-29 1.4'	
	62 =		Tan coarse to fine SAND, trace	12-15	S-30 0.8'	Start 6:00 am 9/8/88
	64		Same, trace fine gravel, few	10-13 17-30	S-31 1,0'	
	66		silt	12-19	S-32	
	=		Brown, tan coarse to fine SAND, trace silt	23-30 23-18 23-18	1.2' S-33 1.0'	Lost drilling fluid
	68		Same, w/clay lenses	23-27	S-34	
	70 —		Same, w/clay lenses ittle fine gravel	30-28 21-32 100/5"	S-35	
		Ī	Bottom of hole 71.5	100/5	1.5	Finished hole 9:45am
	Linda					
	1111/111		*			
	Turnel.					

DRIL	LING LO	OG	DIVISION	HET	ALLAT	ION		Hole	-15 ==
2. LOCATIO	Pearco	Cree	ek Disposal Area	10. SI	ZE AH	O TYP	Z OF BI	T 2" Split Spoon	1 SWEET
1 DRILLIN	1 - 5 - 5 - 5	mes 01	Station			-		ON SHOWN (THM or MIL)	
	Froehl.	ing s	Robertson	12, M	E 55	CTUR	ER'S DE	SIGNATION OF DRILL	
4. HOLE NO		i on dra	wind title!	13. T	OTAL I	10. OF	OVER-	DISTURBED : III	
S. NAME OF	DRILLER	-	CSB-15					1 1/	I
6. DIRECTIO	Brod Or	rgan		18. EI	FVAT	UMBE	ROUND	BOXES	-
	ICAL []					_		11.5	
			DESI PROM VENT.	-	TE HO		19-	-21-88	
7. THICKNE	RILLED IN	RBURD	EN				POFH	OLE	-00
9. TOTAL D	EPTH OF H	OL E		19. 510	TAL C	ORER	INSPEC	TY FOR BORING	
ELEVATION		-	36.0'				INSPEC	TOR	
g	ь 0 —	CEGENI	(Description)		RE	RY	BOX OR SAMPLE HO.	(Drilling time, water loss weathering, etc., if sig	l. depair of
	0 =		Brown grey black organi	c STI	т 3	2	2 :	9	nilleanu)
	2 =		Later CTGA LEUGGE +22-	e san	d 3-		S-1	Start drilling 1	30 pm
		IL.	TIDEL		-	-	1.0'	9/21/88	
	, =		Brown grey SILT, laminat Same clay lenses, w/mica	ed	3-:	3	S-2	Drilling through to 1st sample	10.0'
	" =		& organics w/mics	1	5-4	1	2.0'	Junipie	
	=		Same		2-2		3-3		
	6				2-2		.81		
			Same		2-2	-	-		
	8 =			7	2.0	19	-4		
	-	6/	Grey black clayey SILT worganic roots & fibers	7/	1-3		.01		7
	10 -SW	I/CL	Grev fine SAND	a	1-1	A	-5 & B	0 1	
	10	SM	erganic libers from 9.5'-	-10.0	1-1	2	.0'	Sample A & B	
	12	- 1	Dk. grey SILT, w/mica		1-1	S-	-6	Start 6:30am 9/22	/88
	12				2-1	2.	0 1	ground water at 1	1.5'
	M	L	Same - Sample in Jar		ligh	t UP	-1		
	14	1	from bottom of tube		Mach	2	.01		
	$\equiv$		Same, grey, brown, black	1		+			
	16		laminated trace organics		1-1 2-2		-7		
	=		Same,	+	2-2	1.	5'		
	18_			1	2-2	S-	8		- 1
	-		Brown grey SILT, trace	-	2-2	2.	0 '		1
	20_		organics, little fine SAN	D	2-3	S-	9		
1	20		Brown SILT, some fine SAN	-	3-4	1.	51		i
	=	1/6	trace fine gravel	D -	2-2	S-	10		-
2	22	-			4-15	1.2			E
	∃ sw	I	Brown mostly fine SAND fe	W		1			E
2	4_	1 5	SILT, trace fine gravel	1	11-14				Ė
	=		ame		5-16	-			F
2	6_=	1 °	ame	1	1-15	S-1	2		F
	=	В	rown coarse to fine SAND	1	7-10	1.0	Ho:	le collapsed	
	=	1 +	Title fine gravel trace	1	7-18	5-1	3		
- 28		1 3	ILI WEE	2	7-27	2.0	F .		=
29.	.0	T	an very fine SAND, trace	3	7				F
30		3.	ILT w/mica		-	5-14			F
30.	9 -	Sa	ame tan, white		00/6'	p.8	-		F
32	=				)- )0/4''	S-1	5		E
		Sa	me, little SILT	10	0/4	0.8			E
34	7		The state of the s	21	-12	S-1	6		=
34		Sa	me, fine SAND	14	-18	1.2			=
	=		The UNIT	11	-12	S-1	7		=
36					-10	0.8			
	.=		Bottom of hole 36.0†		10	0.8	Fir	nished hole 11:am	F
			22.00.0				9/2	22/88	F
	3=		**						F
	$\exists$								F
FORM 183	,								=
7. 183	O PREVI	OUS ED	TIONS ARE OBSOLETE.	PRO	JECT	Paar	ce Cr	nok Ditter	-

INSTALLATION DRILLING LOG OF 2 SWEETS 1. PROJECT 10. SIZE AND TYPE OF BIT 2" split
11. DATUM FOR ELEVATION SHOWN (TEM or MSL) spoon Pearce Creek Disposal Area 2. LOCATION (Coordinates or Station) 12. MANUFACTURER'S DESIGNATION OF DRILL 3. DRILLING AGENCY CME 55 Froehling & Robertson 13. TOTAL NO. OF OVER-DISTURBED UNDISTURBED 4. HOLE NO. (As shown on drawing title CSB-16 14. TOTAL NUMBER CORE BOXES S. NAME OF DRILLER John Organ 15. ELEVATION GROUND WATER 9.4 6. DIRECTION OF HOLE 16. DATE HOLE E VERTICAL [ INCLINED 17. ELEVATION TOP OF HOLE 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 8. DEPTH DRILLED INTO ROCK 19. SIGNATURE OF INSPECTOR 9. TOTAL DEPTH OF HOLE 55.0 % CORE RECOV-ERY BOX OR SAMPLE NO. CLASSIFICATION OF MATERIALS REMARKS
(Drilling time, water lose, depth of weathering, etc., if significant) ELEVATION DEPTH LEGEND Started hole at 10:30 Brown silty SAND, mostly fine w/mica dry 7-7 1.21 am - 6/17/88SM Same 3-3 S-23-4 1.5 Same 4-4 S-3stopped drilling due to 5-5 1.2 broken hydraulic line 1:30 Brown sandy Silt 2-2 6/20/88 started drilling at 9:30 am-damage to rig ML 1 - 31.51 over weekend Brown silty SAND, mostly 11 - 11S-5fine, w/mica, trace of clay lenses SM 1.5' 8-10 ground water a 9.4' static - 24 hrs 10 Same 7 - 1114-14 1.0' 12 12.0-12.5 brown silty SAND 8-6 12.5 -13.0 brown grey SILT w/clay 1.0' 5 - 7Brown grey interlayered S - 8micaceous silt 8-10 1.0' 16 Same, grey black S-9 +-6 9-11 1.5' Stopped drilling 1:30 pm 18-MT. Same top & bottom light started drilling 5:00 am 1.8' no pressure gauge on rig to tube Mach 20 Same S-10 9-9 1.2 22 Same 8-9 S - 1110-10 1.2' Same 2-4 S - 126-10 1.0 26 Same from 26.0 to 27.0' 8-10 S-13 10 - 111.2' 27.0-27.2 grey brown 28 silty SAND, trace gravel Reddish brown fine silty SAND, moist 21-42 42-21 S-14 1.0 30 Same, reddish brown white 7-8 S-15 9-9 0.81 SM 32. Same, brown, white 00/5" S-16 32.5 0.41 Same, trace medium sand 55-73 S - 1759-48 1.5 36 Same 11-12 S-18 15-18 1.0' 38-HOLE NO.

		Con	Sheet) ELEVATION TOP OF HOLE			He No. CSB-16	
ROJECT			INSTALLATION			SMEET 2 OF 2 SHEETS	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV- ERY	BOX OR SAMPLE	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
a	38 –	c	d d	e	f	g	_
	20 -		Reddish brown, grey coarse to fine SAND, trace fine	8-11 20-26	S-19 1.0'		
	40 -		gravel	20 20	1.0		
	40 =		Same mostly fine SAND	28-48	S-20		
				27-60	1.5'		
	42.9	SM	Brown coarse to fine silty	48-	S-21		
	74.0	-	SAND, trace fine gravel	100/5"	0.9		
	44 -		Brown, red coarse to fine SAND	49-42	S-22		
	45.5-	-	trace fine gravel	100/6"			
	46 —						
	107 - 1	1	Brown coarse to fine SAND, trace silt, trace f gravel	80-80 100/5"	S-23 1.0'		
	47.9 -		trace sirt, trace r graver	100/5	1.0		
	48 —		Same	54-	S-24		
	48.9 -	1		100/5"	0.9'		
	50 —		Grey mostly fine SAND trace	100/5"	S-25		
	50.9		silt, trace fine gravel	22772	0.41		
	52 —		Cross mantle file care	EC	0.00		
	52.9		Grey mostly fine SAND trace silt	50- 100/4"	S-26 0.5'		
				100/4	5.7		
	54 —		Same	38-49	S-27		
	1			46-42	0.5		
	55 —		Bottom of hole 55.0				-
	-						
	_						
	-						
	- E	1					
		-					
	-	1					
	-	1					
	_		l				
	2						
	-						
	-		l,				
	-						
	9						
	1 5						
			1				
	1.3		1				
	8						
	-						
	1						
	-						
	-						
			1				
	5		[1]				
	7						
	The state of the s	}					
	-		1.1	V 1 7			
	8		III II				
		+					
	-	-					
	1						

DRILL	ING L	og J	SION	INSTAL	LATION		(3)	SHEE	1	
. PROJECT Pea	rce C	reek D	isposal Area	10. SIZE	AND TYP	E OF BIT	2" Split Sp N SHOWN (TEM or M	2005	SWEE	13
LOCATION										
DRILLING		& Robe	ertson	1Z. MAN		ER'S DES	IGNATION OF DRILL	-		Ī
HOLE NO.	(As shot	a Kob	ing title   CSB	13. TOT	AL NO. OF DEN SAMP	OVER-	EN 39.0	UNDIS	STURBE	D
NAME OF	DRILLER		Ů ma sa		AL NUMBE		BOXES			
DIRECTIO		LE	Organ		E HOLE		ARTED	COMPLET	CED	
X VERTI					VATION TO	OP OF HO	8/2/88	8/4/8		
DEPTH DR				18. TOT	AL CORE	RECOVER	Y FOR BORING			- 3
TOTAL DE	PTH OF	HOLE	80.0'	19. SIGN	ATURE OF	INSPEC	TOR			
LEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIA (Description)	LS	% CORE RECOV- ERY	BOX OR SAMPLE NO.	(Drilling time, w	IARKS meer loss, c., if sieni	depth o	ı
	.0 _		Brown grey Silt, trace		4-5	S-1		g		_
	2 =		sand w/clay lenses & mi	ca	5-6	1.5'				
	-		Same, trace organic fib	ers	5-7	S-2				
	4 E				7-7	1.2				
			Same		2-3	S-3				
	6 —				3-3	1.5'				
	1 3		Same, few organic fiber	s,	1-2	S-4				
	8 —	ML			2-1	1.8				
			Same, clayey Silt		1-1 1-2	S-5 1.5'				
	10 —		Same				-			
	Ξ	CL	Same		1-1	S-6 1.5'				
	12		Same sample from bottom	o.f	light	UP-I				
	=		tube	01	mach	1.9'				
	124 =		Same		1-2	S-7				
	Ξ.				2-1	2.0				
	16 =		Grey; reddish brown Sil	t, w/	2-2	S-8				
	18 =		organics clay lenses.		1-2	2.0	Driller losi	ng flu	id 18	
	=		Dk grey clayey silt		Woh/8"	S-9				
	20 —				1	1.5				
	Ξ		Same		1-2	S-10				
	22 =				1-1	2.0'				
					2-2 2-2	S-11 2.0'				
	24 =		Same							
	, Ξ		Danie		2-2 2-2	S-12 2.0'				
1	26 =		Dk grey & black clayey s	:11+	1-2	S-13				
	=		w/organic roots & fibers	111	2-2		Ground water			
1	28 =		Same		2-3	S-14	8/4/88 w/cas	ing ou	t	j
	30 =				3-2	2.0				
		SW SM	Grey brown fine Sand som	ie	10-10	S-15				
2	32 =		Silt, trace fine gravel		14-14	2.0'				
	Ξ		Reddish brown fine Sand some Silt		0-14	S-16				
2	34 =				13-25	1.51				
	=		Tan reddish brown, very Sand, some silt w/mica	fine	2-3 4-12	S-17				
3	36 =									
	Ξ		Same		7-9 11-15	S-18 1.5'				
3	38		Same	+						
1	i =		o dance		27-32 41-52	S-19 1.0'				
FORM	836	PREVIOU	S EDITIONS ARE DESOLETE.		PROJECT	D.	Creek Dispo	- I HO	E HA	_

DIECT	LOG	31	INSTALLATION			No. CSB-17
Pe	arce C	reek D	isposal Area			OF 2 SHEETS
EVATION	DEPTH b	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV- ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	40 -		White, reddish brown fine	31-41	S-20	
	=		Sand, little silt, trace fine		1.0	
	42 —		gravel w/mica		Jan S	
	=		Same	11-15	S-21	
				15-14	1.0'	
	44 —	1	Same	10-27	S-22	
	=			28-30	1.2'	
	46 —					
	47.5-		Same	39-60	S-23	
	48 -			100/6"	1.2'	
	40	1	Same, few silt	24-36	S-24	
				27-33		Hole caved in 50.0'
	50 —					8/4/88 at completion of
	=	SW	Same	15-21	5-23	Hole
	52 -	2"		5-6	1.0'	
	53.0 <u>T</u>		Same	62-100/	S-26	
	=	SM		3"	1.0'	Start losing drillingflui
	54 -		Croy modium to fire Carl	21 15	-	33.0
	= =		Grey medium to fine Sand trace silt	31-16	S-27	
	56 -			0-4	1+4	
			Grey white, brown mostly fine	9-19	S-28	
	-		sand, trace fine gravel	19-21	1.5'	
	58		Reddish brown coarse to fine	10.07	0 00	
	=		Sand, trace silt & gravel	10-24 36-39	S-29 1,2'	
	60 -			30 37	142	
	=		Same, few fine gravel trace	15-29	S-30	
	-		silt	41-56	1.5	
	62 -		Same, grey, few fine gravel	100/	S-31	
	62.5-	-	trace silt	6"	0.51	
	64 -	4				Finished drilling 2:45pm
			Same, little fine gravel	20-27	5-32	Start drilling 3:00 pm 8/3/88
	60			34-36	1.2	-1-1-4
	66		Same	28-33	S-33	
	=			37-44	1.5	
	68		Como	1007	F 4.	
	68.5 -		Same	100/	S-34 0.6'	
	70 -	1		U	0.0	
	1	1	Brown, grey coarse to fine	18-26	S-35	
	70		Sand, little silt	18-20	1.0'	stop drilling due to
	72		Grev white moddish to-	17.00	-	spraying by air 6:00 pm
	=	ML	Grey, white, reddish brown laminated Silt with sand	14-25 44-70		Start 5am 8/4/88
	74	-	with Sand	7770	1.2	
	- 2	SW	Grey, reddish brown laminated		S-37	
	76 =		fine Sand, little silt	23-28	1.5'	
	/0 _	SM	Same trace silt	25-34	S-38	
	-			36-46	1.8'	
	78 —					
	3			12-16		
	80 _			20-25	2.0'	Finished hole 9:00 am
			Bottom of hole 80.0			8/4/88
					1 4	
	-					
	=				-	
	-					
	1					
	4					
	) =					
	- × -	-A				

DRILL	ING LOG	DIVISION	MSTALI	ATION			2 shears
ROJECT	n.	SET DESCRIPTION		AND TYPE		SHOWN (TEM or	
OCATION	Pearce Cr	eek Disposal Area	II. DAY	UM POR ELI	EVATION	ANURA (TEM of	asit.
RILLING			12. MAN			NATION OF DR	ILL
	Froehling	& Robertson	13. TOT	CME-		DISTURBED	UNDISTURBED
OLE NO.	As shown on a	CSB-18				1 22	1 1
AME OF				AL NUMBER			
RECTION	Brad Orga			E HOLE	! STA	12.5 22/88	9/23/88
VERTIC	AL CINCLI	NED DEG. FROM	A VERT.	VATION TO			1 3/23/00
	OF OVERBU					Y FOR BORING	
	PTH OF HOLE		19. SIGN	ATURE OF	INSPECT	OR	
	DEPTH LEG	END CLASSIFICATION OF (Description			BOX OR SAMPLE NO.	(Drilling thems	REMARKS s, water lace, depth of , etc., if eignificant
a	0	Dk grey micaceous	SILT,	WOH-1	S-1	Start dri	11ing 12:30 pm
	, =	w/organic roots &	fibers	1-2	1.5'	on 9/22/8	-
	2 -	Same, clay lenses		WOH-		11.0' dri	lled through
	∃ <sub>ML</sub>	Jame, cray renses		WOH	S-2		t sample taken
	4 —	Same		1-3	1.2'	+	
	=			1-3 2-2	S-3 2.0'	15.0'casi	ng used
	6 =	Same, clayey SILT	w/roote	2-2	2.0		
	=	& fibers sample f		light mach	0P-1 2.0'	7	
	8 — ML	of tube clayey	6		- 1		4
	3 /	LL Grey black slsyey		2-2	S-4 1.9'		
	10-	w/organics, trace	fine SAND.	2-2	1.3		
	3	Same		WOH/	S-5		
4	12			1-2	1.3'		
		Grey clayey SILT,	trace	WOH-1	S-6	12.5' gro reading	und water
	14	fine.ŞAND w/mica		2-2	1.5'		
	14	Grey clayey SILT, organics & fine SA		1-2	S-7		
	16	organics a rine of	MEL WEL	2-2	2.0'	Finished Told dril	drilling 5pm ler to take
	10	Brown, grey claye			S-8	tube here	. They only,
		fine SAND w/mica		1-1		had one c	ap, so took
	18	Reddish brown, gr		5-6	2.0' S-9	spoon	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
	$\exists$	SILT little fine SAND w/clay lense		9-12	2.0'	Start /:0	00 am 9/23/88
	20	Brown, grey SILT,		17-13	S-10	+	
	=	Very fine SAND w/		13-20			
	22					1	
	SW	Grey very fine SA SILT w/mica	IND, trace	13-13 18-18			
	24 SM		ine SAND			1	
	=	little SILT, trac		7-7	S-12		
	26	0		14-16	2.0'	1	
	$\exists$	Same		7-20	S-13		
	28	Same		11-11	1.5'	1	
	=	Daille.		8-8	S-14		
	30-	m		16-14	1.1'	L.	
	30-	Same, trace SILT		14-14	S-15		
	= =			17-26	1.5'		
	32	Same, reddish bro	own	24-21	S-16	1	
	$\equiv$	tan, few SILT			1.3		
	34	Same, reddish bro	own, tan	34-36		1	
	=			16-16	S-17		
	36	Comic 1: ++1 crrs	T.	18-18	1.2'	1	
	$\exists$	Same, little SIL	L	15-17	S-18		
	38			24-50	1.5'		
	38.4	Same, trace SILT		100/	S-19		
	-40 =	1		4"	0.4	1	

1	100	(Cont S	INSTALLATION			Hole No. 8	1
	rce Cr	eek Di	sposal Area			OF 2 SHEETS	1
NOIT	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV- ERY c	BOX OR SAMPLE NO.	(Drilling time, water loss, depth of weathering, etc., if significant)	
	40 <u>-</u> 41 <u>-</u>	SW	Reddish brown fine SAND	39- 100/5"	S-20	. ·	
	42 —	SM	Same coarse to fine SAND,	10-28			
	44		trace fine gravel & SILT	38-36	1.7'		E
			Same, tan	39-37 45-	S-22		
	46		Bottom of hole 46.0'	50/3"	1.5'	Finished hole 2:00 pm 9/23/88	+
		6-A					

INSTALLATION VISION SHEET DRILLING LOG 1. PROJECT 10. SIZE AND TYPE OF BIT 2" Split Spot
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) Split Spoon Pearce Creek Disposal Area 2. LOCATION (Coordinates or Station) 12. MANUFACTURER'S DESIGNATION OF DRILL 3. DRILLING AGENCY CME 55 Froehling & Robertson DISTURBED UNDISTURBED 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN 4. HOLE NO. (As shown on drawing title and file number) 0 CSB19 14. TOTAL NUMBER CORE BOXES S. NAME OF DRILLER John Organ 15. ELEVATION GROUND WATER 12.0' 6. DIRECTION OF HOLE 6/13/88 16. DATE HOLE 6/7/88 X VERTICAL \_\_INCLINED DEG. FROM VERT. 17. ELEVATION TOP OF HOLE 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 8. DEPTH DRILLED INTO ROCK 19. SIGNATURE OF INSPECTOR 9. TOTAL DEPTH OF HOLE CLASSIFICATION OF MATERIALS (Description) BOX OR SAMPLE NO. REMARKS ELEVATION DEPTH LEGEND (Drilling time, water loss, depth of weethering, etc., il significant) Red brown well graded SAND S-1 Start boring at 4:00 pm w/silt dry 10-11 1.3 2 Same w/mica dry 7-8 S-2Finished at 1700 hr 4-5 1.1' Start 8:30 am 6/9 Same, mostly f sand dry 19-13 S-31.5 17-19 Same, mostly f sand dry 14-8 9-11 1.2 10 Same 14-24 S-51.0' 34 - 3412 Same, sample moist 24-24 S-6 SW 24 - 260.7' 12.0' ground water SM Same red, brown grey 8-9 5-7 black, silty SAND wet 10-10 1.0 16 Same wet 7-8 5-8 10 - 121.0' 18 Same light grey brown 11 - 125-9 v.f. silty SAND wet 14-14 1.0 20. Same, wet 11 - 12S - 1011 - 91.0 22 Same wet 9-5 S-11 4-7 1.0' Reddish brown, silty SAND 8-9 S - 12mostly m-f sand, wet 11 - 121.5 Brown silty SAND, little 8-9 S-13 fine gravel wet 10 - 131.2 28 Brown, grey silty, SAND 7-8 5-14 coarse to fine grained 10-10 1.2' 30 Tan, mostly fine SAND 4-4 S-15 6-8 1.0' 32 Same medium to fine grained 6-7 S-16 SM trace silt 11 - 141.5 Finished at 1500 hrs 34 Same 11 - 8S-17 6/13 start 7-8 0.9 36 Same, mostly coarse to fine 2 - 1S - 18SAND, few fine gravel, 1 - 21.0' trace silt 38 Same 5-3 S-19 3-7 I.0' 40 Brown red, grey mostly 14 - 13S - 20fine SAND 17 - 641.0' 40-Dense reddish brown silty 100/5" S - 21SAND, few fine gravel 40.5 0.5' 42 White grey fine silty SAND S-22 51-43 100/4" 1.0 PROJECT HOLE NO.

			INSTALLATION		of 2 SHEETS			
		LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV- ERY	NO.	(Drilling time, weathering,	MARKS water loss, depth of etc., if significant)	1
44	b 5.0*	SW SM	Reddish brown, silty SAND fine	73 100/4"	s-23 0.7'		g	+
46	5 -		Light brown grey, Silty SAND	39-30 39-35				
	9.5		Same, grey	26-37 100/5"				
50			Same	32-42 48-47	S-26			
52	2 -		Same grey red	15-35 35-42	S-27			
54			Bottom of boring 54.0'			finsihed b	oring 6/13/88	

DRILLING LOG  1. PROJECT  Pearce Creek Disposal Area  2. LOCATION (Coordinates or Station)					INSTALLATION SHEET 1						
					11. DAYUM FOR ELEVATION SHOWN (THE OF MEETS						
DRILLING			es ion	12. MANUFACTURER'S DESIGNATION OF DRILL							
HOLE NO.	(As show	Robe:		CME 55  13. TOTAL NO. OF OVER-   DISTURSED   UNDISTURSED							
NAME OF	metrica)		CSB 20	14. TOTAL NUMBER CORE BOXES							
	ohn Or	gan			VATION G						
X VERTI			DEG. FROM VERT.	16. DATE HOLE   STARTED   COMPLETED   7/20/88   8/1/88							
THICKNES	S OF OVE	RBURDE	N		VATION T	OP OF HO	LE. 401				
DEPTH DE				18. TOTAL CORE RECOVERY FOR BORING %  19. SIGNATURE OF INSPECTOR							
TOTAL DE			84.0†		1000						
LEVATION	Ь	LEGEND	(Description)		RECOV- ERY	BOX OR SAMPLE NO.	(Drilling time, water loss, depth of weathering, etc., if significant)				
	0 =		Brown silt, trace fine w/mica trace of roots &		6-6 6-7	S-1 1.0'	Start drilling 10:30 7/20/88				
	2		Brown grey silt, trace	fine	9-11	S-2					
	Ξ		sand, trace of organics	Tille	6-6	1.0'					
	4		Same, grey, trace organ	ics	2-3	S-3					
	6 =				4-5	1.5'					
	6		Same, trace organics cla	ay	2-3	S-4					
	8 =	MT	lenses		4-5	1.5					
		ML	Same, few fine sand		2-1	S-5					
	10 =			_	2-2	1.5'					
	=		Same, little fine sand t	race	2-3	S-6					
	12 =		of organics sea shell pi	leces	3-5	1.0'					
	=		Same		1-1	S-7					
	14 =				2-1	1.0'					
	Ξ		Same, some sand clay len	ses	2-2	S-8					
	16		Dis array add to the control of		1-2	0.8					
	=		Dk grey silt, trace fine w/roots and fibers	sand	2-2	S-9 0.5					
	18 —		Grey brown silt, little		F 11	100	Ground water reading				
	=		medium to fine sand, tra	ce	2-2 1-2	S-10 1.7	Static casing removed 18.0' 8/1/88				
	20 —		fine gravel Brown grey silt, trace f	ine	2-2	S-11	3/2/33				
	Ξ		sand	Ziic	2-3	1.51					
	22		Grey clayey silt		2-2	S-12					
	24				2-2	1.5'					
	24 =		Brown grey clayey silt,		2-3	S-13					
	26 =		little fine sand		3-3	1.5'					
			Same		3-5	S-14					
	28 =				7-7	1.5'	Finished drilling 1:45 pm				
	=		Brown grey mostly fine s little silt w/mica	and,	3-3	S-15	Start 5 am 7/21/88				
	30 =	OW.			4-3	0.5'					
	Ξ		Brown grey medium to fin sand, little silt, trace	e fine	4-6 4-5	S-16 1.0'	1				
+	32 =		gravel, (1 large piece) Brown fine sand, w/clay		4-7	S-17	ļ. 1\				
	, =		lenses, little silt		9-15	1.0'					
	34 =		Same .	-	6-8	S-18					
	Ξ				12-16	1.0'					
	36		Same	1	12-14	S-19					
	18				10-29	0.91	1				
			Same, some silt	-	10-15	S-20	1				
					19-28	1.0	7.				

OJECT	200	46.	heet) ELEVATION TOP OF HOLE		No. CSB-20			
OJECI			INSTALLATION			OF 2 SHEETS		
LEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	RECOY- ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)		
2	40 —	c	Grey, light brown very tine	20-19	S-21	Casing driven to 40.0		
	40 =		sand trace silt	24-17	1.0	on 7/25/88		
	_ =		bana craco otto		710			
	42 —		Same	14-47	S-22			
	=			39-38	1.5'			
	44 -	6				N		
	44		Same	12-15		Hole collapsed 44.5'		
	1 3			36-61	1.2			
	46 —			70 70	0.07			
	100		Grey white fine sand trace	30-32	S-24			
	) = )=		silt	50-61	1.2			
	48 —		Brown, red, grey coarse to	12-15	S-25			
	=		fine Sand, trace clayey silt	20-15	1.2			
	E		trace fine gravel	20-13	1.12			
	50 —	SW	Tan, red coarse to fine sand	14-11	S-26			
	-		Tan, red coarse to Time sand	55-57	1.2			
				33-37	1.2			
	52 —	SM	Reddish brown coarse to fine	21-40	S-27			
	=		sand, little silt, trace fine		1.5	A Designation of the second		
	54 -		gravel		100	Stopped drilling 9:30am		
	24		Same, mostly fine sand	15-11	S-28	to get rig #2 set up on Boring CSB-24		
	_ =			5-8	1.3	Start drilling 10:30am		
	56 —				III.	7/25/88		
	-		Same coarse to fine sand,	6-7	S-29	7723700		
			some fine gravel	27-47	1.5	Stopped drilling 3:15pm		
	58 —			01.07	- 00			
	_	-	Same	24-37		Start drilling 5:30 am		
				24-23	1.2	7/26/88		
	60 —		0	28-33	C 21	Casing driven to 60.0'		
	-		Same	37-37	S-31 1.0	8/1/88		
	(P)			31-31	1.0			
	62.5 -		Grey white fine sand trace	100/	S-32			
	02.5		silt w/mica	6"	0.6			
	V =		SIIL W/MICA	U.	0.0	Finished 9:00am 7/26/88		
	64.5 -		Same, grey brown	100/	S-33	Start drilling 5am on		
	=			6"	0.4	8/1/88		
	66 -							
	66.4 -		Brown grey coarse to fine	100/	S-34			
	-		sand, trace silt trace fine	5"	0.3			
	68 —		gravel	-				
			Brown grey fine sand, trace	37-41	S-35			
	_		silt	56-64	1.6'			
	70 -			20.17	0.07			
			Same	39-47	S-36			
	=	1		52-60	1.2'			
	72 —		Tan, grey fine sand, trace	44-50	S-37			
	0.1		silt	90-	1.5'			
	-	1	V. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	100/5				
	74.5 -	1	Same	100/	S-38			
	-	1		5"	0.4'			
	76 -	1			3.5			
	76 =	1	Same	52-60	S-39			
	_ =	1		62-77	1000			
	78 -	1			- 22			
			Same	57-61				
	-	1		62-24	1.5			
	80 -	Тор	Gravish madium to fine sand					
	-		Greyish medium to fine sand, some silt from 80.0' to 81.5'	7-6	S-42	Samples A & B		
		Bottom	Reddish fine sand, from 81.5'	1-12	2.0			
	82		10 02,0					
	-	1	Same	21-27	S-42	Finish drilling at 12:3		
	_			24-24	1.5			
	84		Rotton of help 0/ 0/					
	-		Bottom of hole 84.0'			Move to CSB-17 to set		
	112					up by 1:30 quit for day		
	-	-		1				
	1	1						
	1836-							

DRILLING LOG					INSTALLATION SHEET							
			Disposal Area	10. SIZE AND TYPE OF BIT 2" Split Spoon  11. DATUM FOR ELEVATION SHOWN (TEM or ASL)								
2. LOCATION (Coordinates or Station) 3. DRILLING AGENCY					12. MANUFACTURER'S DESIGNATION OF DRILL							
	Froe	hling &	Robertson Inc.	13. TOT	AL NO. OF	ME 55	OISTURBS	ib (u	NDISTUR	BED	1	
4. HOLE NO.	mb-m)	n on draw	CSB-22				1 20		0	- 22	1	
S. NAME OF	John	Organ			EVATION GE					_	1	
6. DIRECTIO	N OF HOL	E		16. DAT	TE HOLE	4	RTED		LETED		1	
7. THICKNES				17. ELE	VATION TO		7/88	_	7/88	_	1	
8. DEPTH DE			V.	18. TOTAL CORE RECOVERY FOR BORING								
9. TOTAL DE	PTH OF	HOLE	40.0'	19. SIGNATURE OF INSPECTOR								
ELEVATION	ь	LEGEND	CLASSIFICATION OF MATERIA (Description)	LS	% CORE RECOV- ERY	BOX OR SAMPLE NO.	(Drilling ti	REMARKS me, water k	; oss, depti signitioss	of		
	0 =	ML	Red, grey, white sandy trace gravel dry	SILT	5-7 4-4	S-1 1.0'	start bo	oring 8	:00 am		E	
	2 =		Red, grey, tan, SILT w/ f sand		3-3 4-5	S-2 1.0					E	
	4 =	SP SM	Brown tan poorly graded SAND. w/silt		4-4 5-5	S-3 1.0'	24 hr wa				E	
	6 =		Same, moist, w/mica		2-2 1-1	S-4 1.2'	COTTAPS	u at 3,	7.4		E	
	8 =	ML	Grey, black SILT moist organics, laminated w/m		1-12" 1-1	S-5 1.5'						
	10 =		Brown, grey SILT little f sand		1-1 1-12"	S-6 2.0					E	
	12 =		Reddish brown silty SAN	D	1-4 7-8	S-7 1.3						
	14 =	SM	Same, moist, w/mica		5-6 9-12	S-8 1.1	8				E	
	16 =		Same trace gravel		4-7 9-11	S-9 0.7'					E	
	18 =		Same, mostly f SAND w/m	ica	7-9 10-11	S-10 1.5'						
	20 =		Same		7-14 14-16	S-11 1.5'					E	
	22 =		Brown grey SILT, w/mica		3-9 8-11	S-12 1.8'	7 =				E	
	26				5-4 5-7	S-13 1.5'					E	
	28		Brown grey sandy SILT t f sand	race	4-4 6-10	S-14 1.3				3	=	
	30 =	ML	Red brown sandy SILT Light grey SILT, trace		7-8 3-10 5-5	S-15 1.2 <sup>†</sup> S-16	17				Ξ	
	32 =		f sand w/mica dark grey med. dense SI	LT	5-6 7-8	0.8' S-17						
	34 -		Same		6-9	1.5° S-18					=	
	36 =		Same		9-9 8-10	1.2' S-19					=	
	38 =		Same		7-8	1.5' S-20						
	40 =		Bottom of boring 40.0'	*	9-10	1	Finished	boring	1500	hrs		
ENG FORM	=		01 BULING 4010									
MANUA LAKIM	107/				PROJECT			-			_	

N. No. CSB-23

DRILL	DRILLING LOG				INSTALLATION SHEET 1						
1. PROJECT Pe. 2. LOCATION	arce C	reek D	isposal Area	10. SIZE AND TYPE OF BIT 2" Split Spoon 11. DATUM FOR ELEVATION SHOWN (TEM or MSL)							
			stion)	12. MAN	UFACTURE	R'S DESIG	GNATION OF DRILL		4		
3. DRILLING		Rober	tson		C	ME 55	3.13				
A. HOLE NO.	(As ahow	on draw	csB	13. TOT	AL NO. OF DEN SAMPI	OVER-	N 30	UNDISTURBED	1		
S. NAME OF	DRILLER		1 000	14. TOTAL NUMBER CORE BOXES							
6. DIRECTIO	N OF HOL	Jo	hn Organ	15. ELEVATION GROUND WATER							
VERTIC			DEG. FROM VERT.								
7. THICKNES	S OF OVE	ERBURDE	N ===		VATION TO			_	-		
8. DEPTH DR				15. TOTAL CORE RECOVERY FOR BORING  19. SIGNATURE OF INSPECTOR							
9. TOTAL DE	PTH OF	HOLE	60.0'	Kenneth O'Rourke							
ELEVATION	DEPTH	LEGEND	(Description)		RECOV-	SAMPLE (Drilling time, water lose, depth weathering, etc., if significant)			1		
	0 =		Brown SILT, w/roots & 1	libers		S-1	Start drilli	ng 9:30 a.m.	=		
	2 =		trace fine sand		6-7	1.5			E		
	=		Same - w/mica		S-7	S-2			F		
	7.7				7-6	1.0			E		
	4-		Same - w/roots. About	2"	3-3	S-3			E		
	=	-	of red grey white silt cease clayey silt		2-4	1.2			F		
	6-				0.0	0.1			E		
			Brown SILT, trace fine sand w/mica		2-2	S-4 1.2			E		
	8-	ML							F		
	=		Same, w/roots & fibers		2-2	S-5 1.2'			E		
	10-				3.4	4.4			E		
	11 =		Same w/clay lenses		1-1	S-6		07. 17. 70	F		
	12-		December Office 71117		3-3	1.5'			E		
	ΠΞ		Brown grey SILT, little fine sand w/woody fiber		1-2 3-4	S-7	Pushed casin	g to 14.5"	E		
	14					2,5			F		
	=		Same		2-2	S-8.	Grounded wat	er at 15.5'	E		
	16—				2-2	1.0			E		
	=		Grey SILT, w/roots & fi	bers,	2-2	S-9			F		
	10		fibers, clay lenses, tr		1-2	1.5			E		
	18-	SW	Brown coarse to fine sa reddish silt, tract of	nd few	2-3	S-10			=		
	_ =	SM	gravel w/woody fibers	Tine	4-5	1.2'			F		
	20 —	ML	Brownish red clayey SII	π	6-10	S-11			E		
			trace fine sand, trace	fine	12-10				F		
	25 —		T		- /	0.10			E		
	=	SW	Brown medium to fine SA few Silt	IND,	5 <b>-</b> 6	S-12			E		
	24			and the second	2520	15/1	20100707070		F		
	=	SM	Same, fine SAND w/mica	wet	4-6 7-6	S-13 0.8'	Start drilli: 7/20/88	ng 5 a.m.	E		
	26-		4			-	1720700		E		
			Same Grey brown		3-2	S-14			F		
	28 —				1-1	1.2'			E		
	=	ML	Grey black SILT, w/orga	nic	1/12"	S-15			E		
	30 —		fibers, trace fine sand		2-2	1.9'			F		
		CIT	Brown grey fine SAND, s	ome	2-1	S-16			E		
	32 —	SW	some silt w/mica		2-2	1.0			F		
		SM	Same, w/roots & fibers		2-2	S-17			E		
	34 —				2-1	1.0			E		
			Same, little silt		2-1	S-18			F		
M I	36 =				1-2	1.0			-		
			Same some silt		4-5	S-19			E		
8	20		The same states	5 1	6-6	1.0'			=		
	38 =		Same		6-6	S-20		6.7	E		
	40 =				8-9	1.01			=		
ENG FORM	1836	PREVIOU	S EDITIONS ARE OBSOLETE.		PROJECT			HOLE NO.	上		

OJECT			INSTALLATION			SHEET 2
	rce Cr	eek Di	sposal Area			OF 2 SHEETS
LEVATION	DEPTH b	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV- ERY e	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	40 -		Brown fine sand, little	11-12	S-21	g
		1	silt w/mica			
	42 —			13-14	1.2'	
			Same	10-12	S-22	
	44 —	SW		14-14	1.5'	
	-	SM	Same	10-15	S-23	
	_ =			19-18	1.21	
	46 —					
			Same, some silt	10-11	S-24	
	48 —		B	8-6	1.5'	
	=		Same, grey	13-14	S-25	
	50 —			11-11	0.8'	
	_		Same grey brown	10-12	S-26	
	, E			10-11	1.5'	
	52		Same	6-11		
				15-20		
	54 —			15-20	***	
	=		Same	13-19	S-28	
	56 —				1.2	
	1	- 1	Grey silt, little fine sand	4-4	S-29	
	= =	MI	C	4-5	1.0'	
	58	ML	Same	6-6	S-30	Hole collapsed 58.7
				7-6	1.0	
	60 —		Bottom of boring	-		Finished boring 9:30 am
	de la contraction de					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.

	ING LO	G O	W.	Instruce			OF 1 SHEETS	
I. PROJECT	Pearce	Creek	Disposal Area	10. SIZE	AND TYPE	OF BIT	2" split spoon	1
2. LOCATION 3. DRILLING	(Coordina	stee or Sta	tion)	7			GNATION OF DRILL	-
1	Froelh	ing & H	Robertson		#2 CM		DISTURBED   UNDISTURBED	-
4. HOLE NO.	(As show	on drawn	CSB-24	BUR	L NO. OF	ES TAKE	7 1	1
S. NAME OF	John-B	irch			AL NUMBE			+
6. DIRECTION	N OF HOL	E		16. DAT	EHOLE		RTED COMPLETED	1
X VERTIC				100000	VATION TO		/21/88   7/21/88	1
THICKNES							Y FOR BORING %	1
9. TOTAL DE			15,0'		ature of		727	
ELEVATION	ОЕРТН b	LEGEND	CLASSIFICATION OF MATERI (Description)	ALS	ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	1
	0 -	SW	Light grey brown fine		2-2	S-1	Start drilling at 11:15a	=
	2 =	SM	sand, trace silt		4-2	1.2'	Removed 3.0' of fill before sample #1 taken	E
		511	Same. Wet w/shell piec	es	1-12"	1725		E
	4 -		Same		WOH 12'	1.0' S-3	Ground Water at 4.5	E
	=				1-2	1.0	Takes at 4.7	F
	6 =		From 7.0'to 7.5' Same		2	S-4	Carrollar 100	E
	8 =		From 7.5' to 8.0' Dk gre silt w/organics & trace		WOH for 5!	A&B 1.0'	Samples A&B	E
	=	ML/	Same sample in jar fro		light mach	UP1 2.0'		=
	10		portom or tube		2-2	S-5		E
	12		Brown grey silt, trace sand, clay lenses	fine	2-2	1.5		E
	12		Black grey clayey silt		WOH12"	S-6		E
	14		Dk clayey silt from 14	.0' to	1-2	2.0'		F
	-		14.5 Grey brown fine sand t	race	1-12"	S-7	Samples A&B	E
	16	5m	silt & clay Bottom of hole 16.0	Lacc	7-7	1.5		E
			Bottom of noie 16.0				Finished drilling at 2:45 pm	E
		1						F
0								E
	-				-			E
	=							F
	_							E
	-							F
								E
					- 1			F
	-						1	E
	3							E
	1							1
								E
	-							F
	-							E
	1							E
		3						F
	1 2							E
	1							=
	1							E
	-							F
	1 3		19					E
ENC FOR	1							F
ENG FORM	1836	PREVIO	US EDITIONS ARE OBSOLETE.		PROJECT	T	HOLE NO.	

	LING LO	NORTH ATLANTIC DIVISION		DELPHI	IA DISTRICT	HEET 1 OF 7				
PROJEC					OF BIT 4-3/4" side discharge o	irag bit				
LOCAT	ION (Coordinate		NAVD		VATION SHOWN ((BM OF MSL)					
	009 E. 64255	7 N	12. MANUFA		'S DESIGNATION OF DRILL					
UNI-	TECH DRILLI	NG CO., INC.	13. TOTAL I	10. OF 0	VERBURDEN SAMPLES TAKEN	3.8.23.5				
and file	number)	CSW-1		ed; 68	undisturbed: 1 att. 0 ac of core boxes 0	cepted				
	of DRILLER oh Jester				UND WATER					
	TION OF HOLE		16. DATE HOLE STARTED COMPLETED							
⊠ VE	RTICAL IN	CLINED	17 FLEVAT		2/07/95 12/12/95 OF HOLE 35.27 Ft.					
	NESS OF OVERB				COVERY FOR BORING					
TOPI SIL	DEPTH OF HOLE		19. SIGNAT		INSPECTOR					
LEV,	DEPTH ON THE	CLASSIFICATION OF MATERIA (Description)	RE %	SAMPLE	REMARKS (If significant)	BLOWS/				
35.3	.0									
		SILT; dark brown; medium dens			Boring located in western	8				
	3	with some wood; trace mica; dr turning black; solfter and mois	t; 14	. SPT	part of disposal area on flat	10				
	3	with less vegetation in tip 2"	14	i	surrounding ground.	-11				
33.5	1.8				Unless otherwise noted SPT samples were taken	iff				
33.0	2.3	Silty CLAY; black; low plasticit	y:		according to ASTM 1586. Chemical sample CSW-1-1'-1'	8				
32.3	3.0	firm; moist; then 6" Silty SAND; dark gray;		SPT	@ 14:10 from top of sample.	4				
32.3	1111	loose; fine grained; poorly	18	2	Areas with wood are	3				
	3///	graded; w/ trace mica; then 6" Silty CLAY as top			orangish. Chemical sample	3				
		CLAY; black; soft; low plasticit	Ç.		CSW-1-2.5"-3" taken @ 14:28 (middle 6" Silty SAND)	WOH				
	1///	organic; with trace wood; trac		COT	Chamical sample CSW-1-4'-6'	WOH				
		mica; trace sand in one <1/2"	24	SPT	taken @ 14:35 (1 jar) Turned chocolate brown	WOH				
	*///				after exposed to air in	5				
29.0	63	Top 5" as above; then		-	sample jar for several days.	10				
20.0	6.3 - SAND; dark brown; dense;				Chemical sample CSW-1-6.5'-7' taken @ 14:45	14				
	SAND; dark brown; dense; medium grained; poorly gra with trace silt; trace mica		12	. SPT	All the state of t					
	3 × 1	with trace siit, trace inica		1 3		17				
						17				
27.0	8.3	Top 7" SAND; as base of SPT- with coarser grains; wet	4		trace red and yellow and black colors in thin lenses	8				
	1///	Base 6" clay; black; as SPT3	13	. SPT		2				
	=///	base o clay, black, as of to		5		3				
	3///					2				
	1///	As base of SPT 5, grading drie	er			5				
-	1///	with some vegetation with increasing sand; then base 7" Silty SAND; dark	22	" SPT		3				
24.1	11.2	base 7" Silty SAND; dark brown-black; loose	22	6		3				
23.3	12.0	S. OHIT SIGORY 1003E				4				
2010	-////	Top 14" Silty CLAY; light brown	1		Chemical sample	5				
	3///	with black spots; with some vegetation;		SPT	CSW-1-13'-14' taken @ 15:06	6				
22.1	13.2	then grading through black Sil	ty 24	7		Б				
	3%%	SAND to SAND; tan; medium dense,				7				
		medium grained, poorly graded				4				
	3/6/	SAND; as base of SPT 7; with more gray and black areas wit	h .	SPT		5				
	=/A/A	some silt,	8	8		7				
	4888	Trace gray and red clay and				7				
19.3	16.0	wood in tip	70	+	Chemical sample	4				
		Sandy SILT; dark brown; loose fine grained sand; wet	2,	-	CSW-1-16'-18' taken @ 15:13	3				
	fine grained sand; wet		7	SPT 9		3				
	= =		- 1, 417	3						
					To and to use of the second	2				
	1	EDITIONS ARE OBSOLETE. PRO			(continued)					

OJECT				ALLATIO	N	27 Ft.	OF 7
Pear	ce Cree	K	P	TILAUE	LPHI	A DISTRICT	
	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE	REMARKS (if significant)	BLOWS/ 6in.
16.3	18.0			0"	U-1	Undisturbed tube driven @ 15:15 @ 200 psi, Recovered 0" @ 15:30.	
	3					No recovery	
	2	27/47	SAND; black; medium dense;				4
	1 2		moderately well graded; medium grained; organic smell; with one	9"	SPT		T
	- 2		large piece of wood; trace fine gravel; with some silt.		10		8
	-						8
			SAND; as SPT 10 above with trace soft brown clay in one 2"		11		7
	-		lens.	14"	SPT		10
	1						10
11.3	24.0	,,,,,	CLAY: yellow-brown; firm; very	+	-	Chemical sample	2
	3		moist-wet; plastic; with some		350	CSW-1-24'-26' taken @ 15:57	3
	-		silt; trace sand	19"	SPT 12		3
	4						5
9.3	26.0		Sandy SILT: valley-brown			Harder and drier than SPT 12	10
			Sandy SILT; yellow-brown; medium dense; dry; with trace		CDT	Soil pH in water = 5.7 @10	12
	1		gravel; trace mica	10"	SPT 13	min.	12
	1				1		14
			As SPT 13			Driller says gad a difficult	7
	3		200		SPT	time getting spoon down, may be trying to push a piece of	-11
	17			2"	14	gravel.	15
	7					End of day 12/7/95	18
5.1	30.2	ШЩ	Top 4" as SPT 13; then				7
	2		SAND; light pinkish gray with some orange areas; very dense;	12"	SPT		21
			<ul> <li>v. fine grained; poorly grained; wet; with some silt in lenses.</li> </ul>	12	15		32
3.3	32.0		yet, with some out in larious.	1			37
	1		Silty SAND; pintk and yellow;			Chemical sample CSW-1-32'-34' taken	1,0
	3		dense; fine grained; poorly graded; with trace clay.	14"	SPT	USW 1-32 34 10hc/1	15
	-			-	16		17
	3						23
	2		Top 9" Silty SAND; gray-pink; dense; very fine grained; poorly				14
l l	2		graded; with trace clay; then Silty SAND; yellow and orange;	14"	SPT 17		15
			very dense; moderately well		0.	Silty SAND has dark red-orange spots.	20
7	36.0	ЩЩ	graded; with trace clay in laminations			2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -	55
	3		SAND; white; very dense; medium grained; angular; quartz; clean.				100/
	16		2 2 1 2 1 2 1 2 1 2 1 1 1 2 1 2 1 1 1 1	9"	SPT 18		5"
			SAND; as SPT 18	3"	SPT 19	Gravel and Clay in 6" slough	100/
						Z-a-Cavard	
	11070		EDITIONS ARE OBSOLETE. PROJECT	-1		(continued) HOLE NUI	4050

OJECT		LOC	(Cont. Sheet)	TINSTA	ALLATIO		27 Ft.	OF T
	ce Cree	k					A DISTRICT	
LEV.	DEPTH	LEGEND	CLASSIFICATION OF N		CORE REC %	SAMPLE	REMARKS (if significant)	BLOWS/ Sin.
-4.7	40.0							
	-		SAND; as SPT 18; poor					55
	3		In lenses; with some co grained sand.	arse	12"	SPT 20		100/
					-			
	The state of the s		SAND; white; very dens grained; poorly graded quartz with trace felds angular.	; clean;	5"	SPT 21		67 100/ 6"
	-							
	1.2		SAND; pinkish and yello				Switched to downhole hammer to improve recovery	12
	]		dense; coarse grained; graded; angular; with s	ome silt	9"	SPT	and driving distance. Hole reamed w/6" open-discharge	20
	1					22	bit. Blows listed below are	27
-10.7							not directly comparable to standard N values,	7
	3	0000	Gravelly SAND; white; well graded; gra					
	1 3	00.00	fine sized; with 4" lens	of fine	8"	SPT 23	-	52
	3	00.00	Silty SAND; gray and y	CHOW.		20	-	5
		00.00					and a second state of	100/
	3	0000	As SPT 23 with yellow silt/clay lens.	and black		J.,	2" gravel slough. Circulating longer and harder	4"
	-	0000	VW 2424/02/02/1		2"	SPT 24	as ream to 50°.	
	1 3	00.00						
	-	0000	4 - DOT - DO			-	All gravel in the player	100/
	1 9	00.00	As SPT 23			-	4" gravel in top slough	5"
	1 =	00.00			<1"	SPT 25		
	1 3	00.00						
		00.00	Gravally CAMP White	(arv	-	-		100/
	1 5	00.00	Gravelly SAND; white, or dense; medium grained;	well		007		5"
	1 - 3	0000	graded; clean; gravel i sized, rounded	stine	5"	SPT 26		
	=	0.00	any and any and and any			1		
	1 -	00.00	As SPT 26 with 2" yello	wish lens				47
	3	0.000	As DIT 20 WILL 2 Yell		l-sv	SPT		100/
	1	0000			7"	27		
-20.7	56.0	0000						
20.7	30.0		SAND; tan; very dense					100/
	=		grained; poorly graded		<1"	SPT		
					×1	28		
-22.7	58.0	710533 14053				14		1867
		00.00	Gravelly SAND; tan; ve	ry dense:				100/
	-	0000	medium grained; poorly	graded.	p.,	SPT		
	1	00.00.				29		
	1	00.00			\			
	-	00.00.	Gravelly SAND; pinkish	as SPT				60
	1	00.00	26		125	SPT		100/
		0.00			1	30		
-26.7	62.0	0.00						
		-					(continued)	

		LUG	(Cont. Sheet)	IINSTALLATIO		27 Ft.	OF 7
Pear	ce Cree	k		and the state of t		A DISTRICT	
LEV.	DEPTH	LEGEND	CLASSIFICATION OF MATER (Description)	RIALS CORE REC %	SAMPLE	REMARKS (if significant)	BLOWS/ Bin.
-26.7	62.0			7 7 7 7			10.07
	The state of the s		SAND; pinkish light brown; ve dense; medium grained; poorl graded; with trace silt (light brown and white)	ly	SPT 31		5"
	Almaria		SAND; light brown; as SPT 31	6"	SPT 32	Soil pH in water = 6.25 @ 10 min.	100/
	limilia		SAND; light brown; very dens medium grained; very poorly graded; clean	se;	SPT 33		57 50/ 2"
	ordinen la		SAND; as SPT 31	3"	SPT 34		100/
	- Indian		SAND; white; very dense; me grained; poorly graded; with some white silt.		SPT 35		20 29 39
	Thurst		SAND; as SPT 33; clean	ă"	SPT 36		40 50/ 2"
			SAND; light brown with yellow and dark red lens near base very dense; medium grained; poorly graded; with some sill	0"	SPT 37	Dark red-black lens is cemented, <1/2" thick	54 50/
-40.7	76.0		Sandy SILT; white with oran spots and pink, very dense; poorly graded; sand is very fine-fine; dilatant; with tracklay.	140	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 fine grained; low dilatancy; some silt; trace gray-white clay.	with 12"	SPT 39	One yellow-brown area near base. Chemical sample CSW-1-78'-79.5' taken @ 14:52	55 43
			No recovery	0"	SPT 40	End of day 12/8/95 Slough	38 50/ t"
			SAND; white, very clean; ver fine-fine grained; poorly grait with trace white silt.	ry aded 8"	SPT 41		27 35 53
		-	S EDITIONS ARE OBSOLETE,			(continued)	

DJEC		LUC		ALLATIO	N	27 Ft.	OF 7
	rce Cree	k	P	HILADE	LPHI	A DISTRICT	
					w		
LEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE	REMARKS (If significant)	BLOWS/ 6in.
48.7	84.0_	3000					15
	3		SAND; same as SPT 41				23
				8"	SPT 42		
	-				42		31
	- 3						
	2		No recovery			1/2" slough	21
	3	3475		0"	SPT		38
	1 2			11-1	43		50
	11						
	1	1	SAND; same as SPT 41				15
	1			10"	SPT		23
	3			10	44		30
	1 3						
	_		SAND; same as SPT 41			2" slough	19
	3				PT		28
	1 7			I.	45		60
	1 3						
			CAND, some or CRT 41				21
	1		SAND; same as SPT 41				60
	-			8"	SPT 46		50/
	1 2						10
				-			19
	1 7/2		SAND; same as SPT 41				
				9"	SPT		43
	1 3				47		60
	5						
			SAND; same as SPT 41				15
				1011	SPT 48		21
	19-			12	48		29
	11						
	-		SAND; same as SPT 41			Ī	15
			SAINE, COME OF STATE		SPT		25
	-			7."	49		39
	1						
	-		200		-		59
			SAND; same as SPT 41		SUZ		50/
	-			1/2"	SPT 50		
	2						45
	1 3		SAND; light gray; very dense; medium grained; poorly graded;		p. 1	ka 7	50/
			medium grained; poorly graded, clean	4"	SPT		2"
	1 3			1	51		
				4 2 2			
			SAND; same as SPT 51				37
				100	SPT		50/
	=			2"	52		
	1						
	-	THE SELVE				(continued)	
	DU 1938 PI	REVIOU	S EDITIONS ARE OBSOLETE. PROJECT Pearce			HO	LE NUMBER

DJECT	V 55 15			ALLATIO	N	27 Ft.	OF 7
Pear	ce Cree	K	P	HILADE	LPHI	A DISTRICT	
ELEV.	11.00	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE	REMARKS (if significant)	BLOWS/ 6in.
-70.7	106.0			-			
	milion		SAND; light gray; very dense; medium grained; well graded; trace gravel	4"	SPT 53		45 50/ 2"
			SAND; same as SPT 51				39
			SANS, SOME OF STATE	2"	SPT 54	End of day 12/11/95	50/
			SELVER ADVANCES ASSESSMENTS				27
	1 3		SAND; white; very dense; coarse grained; well graded; trace		2.2	2" slough	32
	dual		gravel; some white silt.	2"	SPT 55		55
	1		SAND; pinkish white; very dense;			Similar to SPT 41	39
	- Internation		medium grained; poorly graded; trace silt,	6"	SPT 56		50/
			CAND: same as COT FO				100/
	T. C.		SAND; same as SPT 56	5"	SPT 57		5"
	3				-		1007
	ahin		SAND; same as SPT 56	2"	SPT 58		100/
	3	11:50			-		100/
			SAND; same as SPT 56		++	1/2" slough	4"
	orlin			1/2"	SPT 59		
	1 =		No recovery				100/
	Ter lan		AND DESCRIPTION	0"	SPT 60		
	-		Me sail security. 1/80 statement				100/
	l in		No soil recovery, 1/2" size sand stone gravel pinkish brown.	1/2"	SPT 61		5"
	-						100/
			No recovery				2"
	H 9			0"	SPT 62		
	3				02		
	100		VPC 12 24 CASE				82
			No recovery	0"	SPT 63		100/
			S EDITIONS ARE OBSOLETE. PROJECT			(continued)	DLE NUMBER

CLAY; with some brown and light gray with occasional black spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic:  CLAY; red gray mix; hard; dry; plastic:  CLAY; red gray mix; hard; dry; plastic:  CLAY; red gray mix; hard; dry; plastic:  CCASSIFICATION OF MATERIALS (CORE REC % %)  REMARKS (If significant)  Sample 13:00  No sample  SAND: olive yellow; very dense; coarse grained; well graded.  8" SPT 65  Hit hardpan and drilled through, no sample,  CLAY; with some brown and light gray with occasional black spots; hard, moist to dry; feet and gray; hard; dry; plastic.  CLAY; red gray mix; hard; dry; plastic:  CLAY; red gray mix; hard; dry; plastic:  CLAY; red gray mix; hard; dry; plastic:	ROJECT				ALLATIO	N	27 Ft. A DISTRICT	OF 7
SAND: 9" gray; I" olive gray; yery dense; coarse grained; well graded.   10"   SPT   64     39   50     39   50     39   50     5"   5"   5"   5"   5"   5"	,							
SAND: olive yellow; very dense; coarse grained; well graded.  SAND: olive yellow; very dense; coarse grained; well graded.  SAND: olive yellow; very dense; coarse grained; well graded.  8" SPT 65  No sample  Hit hardpan and drilled through, no sample,  CLAY; with some brown and light gray with occasional black spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  SPT 68  CLAY; red gray mix; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  SPT 69  CLAY; red gray mix; hard; dry; plastic;  SPT 69  Chemical sample CSW-1-138'-139.5' taken © 27 14:30 39  End of Boring at 139.5' Placed well screen (119'-129') on 12/13/95.	ELEV.	DEPTH	LEGEND		REC	SAMPLE		BLOWS/ 6in.
Very dense; coarse grained; well graded.  SAND: olive yellow; very dense; coarse grained; well graded.  SAND: olive yellow; very dense; coarse grained; well graded.  8" SPT 65  No sample  Hit hardpan and drilled through, no sample,  CLAY; with some brown and light gray with occasional black spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  SPT 68  Chemical sample CSW-1-138"-139.5" taken © 27 14:30 39  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on	-92.7	128.0	-		1			27
SAND; olive yellow; very dense; coarse grained; well graded.  8" SPT 65  No sample  CLAY; with some brown and light gray with occasional black spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  9" SPT 68  CLAY; red gray mix; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  SPT 69  CLAY; red gray mix; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  SPT 69  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 visual Manual Classification; not on		3		SAND; 9" gray; 1" olive gray; very dense; coarse grained; well				
SAND; olive yellow; very dense; coarse grained; well graded.  8" SPT 65  No sample  CLAY; with some brown and light gray with occasional black spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic.  CLAY; red gray mix; hard; dry; plastic:  CLAY; red gray mix; hard; dry; plastic:  9" SPT 68  CLAY; red gray mix; hard; dry; plastic:  SPT Chemical sample CSW-1-138'-139.5' taken @ 27 14:30  Classifications listed above are based on ByWS standard classification procedures and ASTM D 2488-90 visual Manual Classification; not on		=		graded.	10"		1.	
CLAY; with some brown and light gray with occasional black spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  CLAY; variegated red and gray; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  C		3						50
CLAY; with some brown and light gray with occasional black spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  Classifications listed above are based on BVWS standard classification; procedures and ASTM D 2488–90 Visual Manual Classification; not on		-			-			
No sample  CLAY; with some brown and light gray with occasional black spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  SPT 69  Chemical sample CSW-1-138'-139.5' taken © 27 14:30  Chemical sample CSW-1-138'-139.5' taken © 27 39  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification, not on 12/13/95.		1		SAND: olive yellow; very dense;				
No sample  CLAY; with some brown and light gray with occasional black spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  9" SPT CSPT CSPT CSPT 14:30  CLAY; red gray mix; hard; dry; plastic;  9" SPT CSPT CSPT 14:30  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on		-		and the Branch was a second	8"	SPT		
CLAY; with some brown and light gray with occasional black spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic.  CLAY; red gray mix; hard; dry; plastic;  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on  Classification; not on  through, no sample,  24  40  5PT 67  Chemical sample CSW-1-138'-139.5' taken © 27  14:30  End of Boring at 139.5' Placed well screen (119'-129') on 12/13/95.			14.44		11	03		
CLAY; with some brown and light gray with occasional black spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic.  CLAY; red gray mix; hard; dry; plastic;  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on  Classification; not on  through, no sample,  24  40  5PT 67  Chemical sample CSW-1-138'-139.5' taken © 27  14:30  End of Boring at 139.5' Placed well screen (119'-129') on 12/13/95.		3						
CLAY; with some brown and light gray with occasional black spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic.  CLAY; red gray mix; hard; dry; plastic;  CLAY; red gr		2		No sample	11000			
gray with occasional black spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic.  CLAY; red gray mix; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  Gray with occasional black spots; hard, moist to dry; plastic.  SPT 67  CLAY; variegated red and gray; hard; dry; plastic.  SPT 68  Chemical sample CSW-1-138'-139.5' taken © 27 14:30  CSW-1-138'-139.5' taken © 27 14:30  End of Boring at 139.5' Placed well screen (119'-129') on 12/13/95.  End of Boring at 139.5' placed well screen (119'-129') on 12/13/95.	-97.7	133.0			4		thi dught, no sample,	
gray with occasional black spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic.  CLAY; red gray mix; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  9" SPT 68  CLAY: red gray mix; hard; dry; plastic;  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on  Classification; not on		- 3						
gray with occasional black spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic.  CLAY; red gray mix; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  GRAY: red gray mix; hard; dry; plastic;  GRA		2						
Spots; hard, moist to dry; plastic.  CLAY; variegated red and gray; hard; dry; plastic.  CLAY; red gray mix; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  GRAY; red gray mix; hard; dry;		- 2		CLAY; with some brown and light			1.5	
CLAY; variegated red and gray; hard; dry; plastic.  CLAY; red gray mix; hard; dry; plastic;  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on  CLAY; red gray mix; hard; dry; g" SPT 69 CSW-1-138'-139.5' taken © 27 14:30 39  End of Boring at 139.5' Placed well screen (119'-129') on 12/13/95.		-		spots; hard, moist to dry;	12"	SPT		40
CLAY; red gray mix; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  9" SPT 68  Chemical sample CSW-1-138'-139.5' taken @ 27 14:30  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on  CLAY; red gray mix; hard; dry; plastic;  9" SPT 69  Chemical sample CSW-1-138'-139.5' taken @ 27 14:30  End of Boring at 139.5' Placed well screen (119'-129') on 12/13/95.				plastic.	12	67		62
CLAY; red gray mix; hard; dry; plastic;  CLAY; red gray mix; hard; dry; plastic;  9" SPT 68  Chemical sample CSW-1-138'-139.5' taken © 27 14:30  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on 12/13/95.		7						
CLAY; red gray mix; hard; dry; plastic;  9" SPT 68  Chemical sample CSW-1-138'-139.5' taken © 27 14:30  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on 12/13/95.				CLAY; variegated red and gray;				
CLAY; red gray mix; hard; dry; plastic;  9" SPT 69 Chemical sample CSW-1-138'-139.5' taken © 27 14:30 39  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on 12/13/95.		2		hard; dry; plastic.	0410			
Plastic;  plastic;  g" SPT CSW-1-138'-139.5' taken @ 27  14:30  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on CSW-1-138'-139.5' taken @ 27  SPT CSW-1-138'-139.5' taken @ 27  I End of Boring at 139.5' Placed well screen (119'-129') on 12/13/95.		13			4"			
plastic;  plastic;  g" SPT CSW-1-138'-139.5' taken @ 27  14:30  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on CSW-1-138'-139.5' taken @ 27  SPT CSW-1-138'-139.5' taken @ 27  SPT CSW-1-138'-139.5' taken @ 27  I End of Boring at 139.5' Placed well screen (119'-129') on 12/13/95.						24		
plastic;  g" SPT CSW-1-138'-139.5' taken @ 27  14:30  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on Classification; not on Classification; not on Classification; not on CSW-1-138'-139.5' taken @ 27  Bend of Boring at 139.5' placed well screen (119'-129') on 12/13/95.		-		CLAY; red gray mix; hard; dry;				15
Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on		3		plastic;	9"	SPT 69		27
Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on	1010	139 5				55		39
		al contract leavest and contract contra		based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on			Placed well screen (119'-129')	

DRIL	LING LO	G NORTH ATLANTIC DIVISION	INSTAL			A DISTRICT	OF 10
PROJEC	T	MONTH A PEANTIC DIVISION	10. SIZE	AND	TYPE C	of BIT 4-3/4" side discharge tr	
	ce Creek	tes or Station)	11. DATU	M FOR	ELEV	ATION SHOWN (TBM or MSL)	
15994	473.82 E, 64			D 88		DESIGNATION OF DRILL	
	NG AGENCY	ING CO., INC.	Fail	ing 15	00		
HOLE N	10. (As shown o	on drawing title	10 C V 10 C V 10 C V	urbec		ERBURDEN SAMPLES TAKEN  undisturbed: att. accep	oted
	of DRILLER	CSW-2	14. TOT	AL NUN	BER O	F CORE BOXES O	
Josep	oh Jester					IND WATER	
	TION OF HOLE		16. DATE	E HOLE		ARTED COMPLETED /30/95 11/07/95	
100000	RTICAL 1	Tarrest -	17. ELEV	ATIO		OF HOLE 39,89 Ft.	
	NESS OF OVER		and the second second second			OVERY FOR BORING	
	DEPTH OF HO	E 209.2 Ft.		Cool		NSPECTOR	
1		CLASSIFICATION OF MATERI		CORE			
ELEY,	DEPTH Q	(Description)	ALS	REC %	SAMPLE	REMARKS (If significant)	PI OWS/
39.9	.0						
	3111111	Silty SAND; brown; loose; mois	t.			Unless otherwise noted, SPT	2
	4			2"	SPT	samples taken according to ASTM 1586	3
	7			2	1	Using bentonite mud,	2
	3					"QuickGel" by Baroid, Recovery too low; no	3
		Silty SAND; brown; loose;		-	-	environmental sample.	5
	4	medium-grained; moist				Chemical sample CSW-2-2'-3' taken @ 10:46	5
	4			14"	SPT 2	taken e 10.40	4
	311111			17			4
35.9	4.0					Chamical sample	4
	4000	SAND; gray-black; very loose	1			Chemical sample CSW-2-6'-7' taken @ 10:50	
34.9	5.0	medium-grained; moist; with some silt; some organics.		13"	SPT	2000	
					3		2
	=						4
	=	SILT: gray-black; very loose;					2
	3	with some fine to coarse sand	d:		SPT		3
		moist.  — SILT: brown; loose; with some		10"	4		2
	3	sand; some wood; trace mica,					3
			1				2
		As SPT 4, above					3
				17"	SPT 5		2
	311111				5		- 2
	3						
		As SPT 4, above			= 11	Chemical sample CSW-2-10'-12' taken @ 10:59	2
				13"	SPT	CSW-2-10-12 takell e 10.09	3
				13	6		2
	=						1
		As SPT 4 above, with silty sa	nd				2
	3	lens; lens is black; moist; with			SPT		2
		medium sand; 3" at base.		24"	7		2
	=						2
		3.12 1.37 1.46	. 14			012000 -1	2
	=	SILT; brown; loose; moist with some wood; trace sand; clay.			1.11	Chemical sample CSW-2-14'-16' taken @ 11:07	3
	3	some wood, trace sand, clay,		24"	SPT	~10% fine to medium sand by	_
	3				8	settling jar volume.	3
	=				1		3
		As SPT 8, above.		24"	U-1	Drove Undisturbed tube @ II:11 @ 1150 psi Retrieved tube @ 11:27	
						(continued)	
		US EDITIONS ARE OBSOLETE. PR			1	HOLE NU	

JECT	ce Creek		INSTAL	LATIO	PHIA	DISTRICT	
rear	ce Greek						
LEV.	DEPTH Q	CLASSIFICATION OF MAT (Description)	ERIALS (	CORE REC %	SAMPLE	REMARKS (if significant)	BLOWS/ 6in.
21.9	18.0						3
	3	As SPT 8, slightly drier		2,1		Chemical sample CSW-2-18'-20' taken @ 11:39	3
	311	David bar nave avenue bla	note:	24"	SPT 9		4
	3	Base has more organic bla silty clay	3CK				4
		As SPT 8 above, with midd	tle 0.8'				0
	3	SILT; black and brown		-	SPT		0
	3	laminations; very loose; ve moist.	ry	24"	10		- 0
	3						2
17.9	22.0	Organic Silty CLAY; dark b	ירחשה:				3
	1///	firm; medium plasticity; tra	ce	[]	SPT		4
	3///	mica		24"	11		4
	3///				7.4		.5
	- 4///	As SPT II, moist.				11	2
	3///	As St. I III Molect		20	SPT	33	2
	1 1///	Silty CLAY; gray with blac	k	24"	12		2
	3///	mottles; drier near base; or red-brown mottle at 25.2;	one		-11		2
	1 -1///	plasticity.	10.10	-			2
	3///	Clayey SILT; loose; gray	and	1	SPT		2
	1 -1///	yellow-brown; with some v fine sand; with trace fine	to	20,,	13		2
	3///	medium sand; one 4" silty lens.	sand				2
	1 -1//			-		Chemical sample	3
	3///				SPT	CSW-2-28'-30' taken @ 12:05	4
	1 3///			16	14		4
	3///						7
	1///	As SPT 14, above.					.0
	3///				SPT		0
	-1//			12"	15		1
7.0	32.0						2
7.9	32.0	SAND; tan; dense; poorly					16
	E .	graded; medium grained; q	uartz;	YAG!	SPT		12
		rounded, wet, with trace v	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	14"	16		23
	I I		- 5				14
	- 3	SAND: brown-tan; medium	dense;	-	7117	Chemical sample	6
	3	poorly graded; fine graine some medium sand; trace	d; with	A	SPT	CSW-2-34'-36' taken @ 13:31	7
	7	lenses.		9"	17		7
	3/8		e. = = 1		-		7.
3.5	36.3	Top 4" Sand, as above,th					5
	3	SILT; dark brown; medium with trace fine sand; trace	dense; e mica	1000	SPT		7
				16"	18		7
	3						4
		Organic SILT; black; with	some				3
	3	wood			SPT		4
.7	39.2	Base 10" clayey SILT; bro	own	24"	19	Sampled base	4
	3//	and red.	- 1018				4
	V//	4				(continued)	

OJECT	Total		(Cont. Sheet)	INST	ALLATIO	N DUIT	DICTOICE	
Pear	ce Cree	k		PI	HILADE	LPHIA	A DISTRICT	
LEV.	DEPTH	LEGEND	CLASSIFICATION OF MAT (Description)	TERIALS	CORE REC %	SAMPLE	REMARKS (If significant)	BLOWS/ 6in.
1	40.0	um.			1			4
	1		Top as SPT 19 above; col black; brown; red with yel	ored low		27		6
-1.1	41.0		mottles.  Base 12" Brown SILT and		24"	SPT 20		5
	3		SAND lenses.	tan				5
-2.1	42.0		T 7" F". FI AV 100	of				7
	42.6		Top 7" Silty CLAY as top SPT 20 then			SPT		8
-3.1	43.0	1111111	3" SAND; gray medium gra then	inea	17"	21		12
	9		2" SILT; then 5" SAND; tan; fine-graine					14
	-		with organic black laminat					9
	1 3		SAND; tan; medium dense; graded; very fine grained		200	SPT		9
-56	45.5		laminations.		17"	22		30
	1		Base 6" Gray-brown SILT SAND laminations; with silt	and wood				15
0.7	10.0		and roots in bottom 2".					13
	1 2		SAND; gray-brown; dense graded; fine to coarse gr	ained;	16"	SPT		16
			quartz; wet; with brown we silt lenses.	oody	10	23		18
	1							23
	1						No sample — insufficient recovery	6
	1 3				40	SPT	1.5" piece of shattered	12
						24	quartz gravel stuck in tip of spoon	12
	1 1						Lost ~10 gal. mud, mixed thicker	14
	1		SAND; gray-brown; mediu dense; well graded; fine t	m		Tu		11
	1 3		coarse grained; mostly me	edium.	10"	SPT 25		- 11
	11 13		with some fine gravel.		-	20		14
	-					_		7
	19		SAND: gray; medium dense medium to coarse grained	e; ; with				12
	-		some fine gravel.		1177	SPT 26		14
								21
	-	建建	GAND	radad:				16
			SAND; gray; dense; well g medium to coarse grained	; with		COT		22
	-		some fine rounded quartz gravel.		13"	SPT 27		17
								18
	-		SAND; gray; medium dens	e;				16
	1		well-graded; medium to co	oarse	0.430	SPT		12
	-		gi airiegi.		12"	28		9
_10 1	58.0							8
-10.1			Silty SAND; dark brown; m					5
	1 3		dense; fine grained; wet; trace wood.		24"	SPT		7
	1		20004-0000		24	29		7
-201	60.0							12
20.1	1		SAND; brown; medium den	se;				7
			poorly graded into 2"-4" fine to medium grained; w	ith	ipe	SPT		9
	1 6		some coarse sand; with t gravel; trace silt.	race	40	30		14
	6		2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4					20
			S EDITIONS ARE OBSOLETE.	PROJECT	1		(continued)	

OJECT				ALLATIO		89 Ft.	OF 10
Pear	ce Cree	k	P	HILADE	LPHIA	A DISTRICT	
		0	CLASSIFICATION OF MATERIALS	CORE	ше	1.00	_
LEV.	DEPTH	EGEND	(Description)	REC	SAMPLE	REMARKS (if significant)	OWS, 6in.
		)E		%	SS	47	퓹
-22.1	62.0						25
	3		SAND; medium brown; very dense; poorly graded; fine				29
			grained; grains are quartz; med-high sphericity; with trace	16"	SPT 31		
	1		silt.		0,		42
	1						57
-24.8	847		As above, yellow; grading more		UI.		16
24.0	04.7	1111	Base 10" clayey SILT; gray;	17"	SPT		9
	1 2		medium dense; moist; with trace	1	32		9
	1		fine sand; grading to CLAY; medium plasticity.		0.00		10
			Top CLAY; light gray; as above,				7
-27.0	66.9		then 12" SAND; yellow-brown; very	21"	SPT		- 11
	11 1 1		dense; with some silt; then	21	33		57
-27.9	67.8		2" Gray CLAY in base.				24
-28.1	08.0		3"-4" lenses of alternating Silty				25
	1 2		SAND; yellow-brown and gray;	1 5	CDT		33
	-	1111	with some gravel; rounded; up to 1.25" and	17"	SPT 34		40
	1 - 1		CLAY; gray; as above.		1		44
-30.1	70.0				-		100/5"
	-		Silty SAND; brown and gray; very dense; sand is brownish;		-		10073
	-		tine to medium grained; poorly	5"	SPT 35		
	2		graded; silty areas are light gray.		35		
-32.1	72.0		9.27				
	1		Organic Silty CLAY; dark gray; very stiff; medium plasticity; with				12
	1 3		trace fine sand: trace mica;	24"	SPT		13
	1 5		trace wood often in whitish spots.	24	36		14
	1 3		Top 4" has trace gravel.				15
			Silty CLAY; as above; very stiff			Slightly easier to cut w/knife	7
			Silty CEAT, as above, very stri	1	SPT	than above	9
				24"	37		- 11
	1 3						13
			Section 20 and the street Contractor				13
	1 3		Silty CLAY; as above; with trace fine to coarse sand in top 7".				12
				24"	SPT 38		12
	3				-		15
-38.1	78.0	1///				and the second second	15
			Organic CLAY; gray; medium			Drove Undisturbed tube @ 10:02 @ 100 psi	
	1	////\	plasticity; trace wood.	24"	U-2	Retrieved @ 10:19	
	-						
	1			1			
	-		Organic CLAY; gray; stiff;				7
	3		medium plasticity; trace wood.	2.20	SPT		8
	1 5			24"	39		7
	1 3	<b>////</b>					9
	1		Oracaia CLAVI are a CDT 30				6
	1 3		Organic CLAY; gray; as SPT 39				7
	1	1///		24"	SPT 40	1	9
	1. 3	<b>\</b> ///					- 8
		1111		_			d
		12.00	S EDITIONS ARE OBSOLETE. PROJECT Pearce			(continued)	

OJECT		-	(Cont. Sheet)		ALLATIO	N	89 Ft.	OF 10
Pear	ce Cree	!k		Pi	HILAUE	LPHI	A DISTRICT	
LEV.	DEPTH	LEGEND	CLASSIFICATION OF (Descriptio		CORE REC %	SAMPLE	REMARKS (if significant)	BLOWS/ Bin.
34.4	84.0	ımı.				-		-
7.7.0	0-112		Top 4" as above; grade brownish; then	ding			Chemical sample CSW-2-84'-86' taken @ 11:20	16
			PEAT; brown changing medium dense; dry	to black;	24"	SPT 41	Turns darker with exposure to air; Silt goes from brown	13
	-		median derise, dry			-6.	to black in seconds.	28
46.2	86.1					-		10
	17		Top 2" PEAT; as abov Organic Silty CLAY; gr	av with			Cuts easily w/knife - cream cheese texture	10
	7		black spots; very stift plasticity; mosit; with	f: medium;	24"	SPT 42		12
	-		sparkles.	trace inica				13
			Contract Services			-	Top has 1/2" nodule of geenish white rounded	19
	2		As SPT 42 above			1		20
					24"	SPT 43	medium sand-sized particles.	22
	3					7		30
	-		CONTRACTOR AND AND	are brown		-		- 11
	1		Organic Silty CLAY; gr very stiff; as above.	ay-brown,				10
	-				24"	SPT 44		15
								10
	-		Organic Silty CLAY; as	above:	-		Brown changes to gray	70
52.8	92.7		then	above,		SPT	w/exposure to air.	68
	-				24"	45		118
	1		Base 4" Silty SAND; g medium dense; poorly				Sampled base	110
	-		medium dense; poorly medium grained; wet,		1		Sampled top	12
	94.7		Top 8" Silty SAND; as	above.	U.S.	SPT		13
55.3	95.0 95.2		then Organic Silty CLAY; gr		24"	46		18
561	96.0		some wood; with 2" sil	ty SAND				18
30.1	90.0		lens 95-95.2. Organic CLAY; gray-b	roup.				19
			hard; dry; with some w mica sparkles (less th 42).	ne wood; trace	24"	SPT		20
	1 3					47		19
		Organic CLAY; very st						23
			tiff; as				41	
	8		above,		24"	SPT		12
	1					48		14
	1 - 3							14
	- 3		Organic CLAY; hard; a	is above.				13
	1 3				24"	SPT 49		17
						49		18
	-						4.5	7
			Organic CLAY; very st above.	tiff; as		100	Chemical sample CSW-2-102'-104' taken	9
			220121		24"	SPT 50		9
						2.5		11
			Bonne Bullione III			-		- 6
	1 3		Organic CLAY; very st above.	tiff; as		5		8
	1 2		1. 1.2.4.4.4.		24"	SPT 51		- 11
								11
		11111					(continued)	- 10

OJECT				ALLATIO	И	89 Ft. A DISTRICT	OF 10
Pear	ce Cree	r.		HILADE	LT.111/	4 DISTRICT	
LEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE	REMARKS (if significant)	BLOWS/ Bin,
-66.1	106.0	ım					
			As above; stiff; with trace fine sand, trace gravel; with 2" Silty				- 8
	] [		SAND lens	24"	SPT 52		- 8
	1 6				52		8
	1 5 2						7
68.6	108.5		Top 6" as above then grades to				26 50/2.5"
			Silty SAND; brown; fine; then SAND; white-light gray; very dense; poorly graded; fine to medium grained; rounded; wet; quartz.	8.5"	SPT 53		50/2.5
	- 3		4" SAND; white; as above; with				22
	3		black roots; then SAND; gray-brown; very dense;	15"	SPT		37
	10-		some silt; fine grained; grading to	-	54		100/6"
	_3		SAND; gray; fine to medium; with trace silt; trace fine quartz				IPO IOC
	3		rounded gravel.				100/6"
	-		SAND; gray; very dense; fine grained; with trace silt; trace	5"	SPT 55		
	3		gray clay in 1" lens				
	-				-	Diego of gravel in slavely	90
			SAND; gray and brown; very dense; very fine to medium		200	Piece of gravel in slough	50/2"
	-		grained; with some silt.	4"	SPT 56		30/12
	1						
	-		SAND: brown and grave very			Chemical sample	55
			SAND; brown and gray; very dense; poorly graded; fine to		SPT	CSW-2-116'-118' taken	36
	-		medium grained; with some silt; some gravel.	17."	57		27
	10						21
	I C		SAND; brown, black, and gray;				60/3"
	1	3	very dense; well graded; with		SPT		7 -
	-		some silt.	3"	58		
901	120.0						
00.7	.20.0	00.00	Gravelly SAND: gray with			Rounded piece of gravel	76
		0000	orange-brown areas; very dense; well graded; with trace	6"	SPT	(quartz) stuck in tip of spoon	33
	1	00.00	silt.	0	59		19
-82.1	122.0	00.00					34
	1		SAND; light greenish brown; very			~5% silt by settling jar test.	80
			dense; poorly graded; medium grained; with trace dark	17"	SPT		72
	0.		brown-black silty (lens); trace grayel in yellowish lens at tip.	,,,	60		54
-84.1	124.0		en eller on want many range at the p				30
		00.00	Sandy GRAVEL; gray,			Maximum particle axis is 1.25"	19
	0:	00.00	brown-black, and yellow; very dense; rounded; spherical; with	0.165	SPT		26
		00.00	trace black silt; sand matrix is mostly medium-grained	1.0	61		78
-86.1	126.0	00.00	3.300			Sounds like hit is an graval	100/5"
			SAND; gray with orange spots;			Sounds like bit is on gravel as reaming to 126'	52
			very dense; poorly graded; fine to medium grained; with some	4"	SPT	Circulating strongly for ~5	100/5"
			gravel; trace silt.		62	min. to remove gravel	
				5 1			
						(continued)	

		LUG	(Cont. Sheet)	VATION TOP O		39.	89 Ft.	OF 10
OJECT Pear	ce Cree	k.		INSTAL PHI			A DISTRICT	
								1
LEV.	DEPTH	LEGEND	CLASSIFICATION OF MAT (Description)	TERIALS	CORE REC %	SAMPLE	REMARKS (if significant)	BLOWS/ Bin.
-8 <u>8,1</u>	128.0							ici e
	3		SAND; pink-white; very de poorly graded; very fine to				2" brownish pink silty sand lens	36
	3		grained; with some silt.	to fine	8"	SPT	Terris	78
	1					63		50/3"
-90.1	130.0	28089						74433
	3		GRAVEL; very dense; matr pink silt and sand; some s					100/3"
	-	2000	trace sand.		2"	SPT 64	changed to 6" rollerbit when	
	1	0000			-		reaming to 132'	
	1	30,00	No recourse				A town pieces of remain	200/3
	1	2000	No recovery.	4.4	41	-	A few pieces of rounded gravel in spoon	20075
-93.1	133.0	3000			0"	SPT 65		-
	3				_			
			Clayey SILT; white with so	ome			Extra recovery from	58
	=		red; very dense; low plast slightly moist; with some fi	icity;		SPT	dropping spoon into base of hole; Driven when set.	100/6"
	1		sand.	116	15"	66	Hole, Diffell Wileli Set.	
-96.1	1360							
00.1	=	IIII	Interbedded SILT and SA				Driven when set	94
	3		white to pink; very dense; is very fine grained; very	sand		SPT	A	50/2"
	3		graded; silt has some clay dilatant; low plasticity.	(;	14"	67		
	=		and tone, low plasticity.					
	=		As SPT 67 above				Driven when set	66
	=		Clayey SILT is light gray are ~4" thick	lensus	12"	SPT		50/2"
	-				16	68		
100.1	140.0						A CONTRACTOR OF THE PARTY OF TH	
	1		Silty CLAY; gray; hard; me plasticity; moist; with <2"	dium			Driven when set	49
	3		of Sandy SILT.	CHOCO	20"	SPT 69		56
-	1 3				101	08		100/6"
102.1	142.0		CAND: GETTE	0000			Driven when set	are les
	=		SAND; white-gray; very de fine grained; poorly grade				Driven when set	130/3"
	=		wet; with trace silt.		4":	SPT 70		
	3					12		
104.1	144.0	7777	Interbedded SAND; white	with		-	Driven when set	150/3"
	3		orange-stained spot; very	y		COT	Sinem might see	
	3		dense; fine- grained; with silt; and	some	4"	SPT 71		
100 1	1465		CLAY; gray; hard; medium plasticity.					
106.1	146.0	1111	SAND; white, gray, and bla	ack:			Rounded quartz gravel stuck	100/5"
	1		very dense; fine grained; graded; wet with some silt	poorly		SPT	In tip	-
	=		graded, het hill some sit	,	4"	72		
	=					6		
	-		SAND; tan; very dense; ve	ery				100/3"
	3		poorly graded; medium gra quartz; with trace silt (<5	ained;		SPT		
	1		Against with those and 1/0		3"	73		
-110.1	150.0							
		-					(continued)	

OJECT				TALLATIO	N	.89 Ft.	OF 10
rear	ce Cree	K	F	HILADE	LPHI	A DISTRICT	
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %		REMARKS (if significant)	BLOWS/ 6in.
-110.1	150.0	17777					1 - 44
-112.1	152.0		Interbedged SAND; white; fine to medium grained; poorly graded; and Silty CLAY; light gray; medium plasticity.	6'''	SPT 74	Driven when set	100/4
			SAND; tan; very dense; very poorly graded; medium grained; clean.	3"	SPT 75		100/3
	-		SAND; as SPT 75 above.			Driven when set; material in	50/0"
	Jack			- In	SPT 76	Spoon bounced but didn't move at all	
			SAND; tan and yellow; very			Changed to downhole	20
	- Inni		dense; medium grained; with trace silt.	2'''	SPT 77	hammer; reamed to 156'w/open-end 6" trivane bit. Blows from SPT 77 on not valid for comparison with standard N values.	110/6"
	1		SAND; tan-yellow; very dense;			Silt <5% by settling jar Lots of slough in spoon	
	1		medium grained; very poorly graded; rounded.	10.	SPT	Lots of slough in spoon	25
	3				78	E	27
	=		SAND: tan-volley as above	-		Sand in wash	85/3"
	SAND; tan-yellow; as above (SPT 77)  SAND; as above; with a tan silty spot	5"	SPT 79	No movement over last 40 blows	100/5"		
			4"	SPT 80		140/5"	
	-		SAND; as SPT 77 and 78 above		SPT		100/5"
			Secret Great to the second	3"	81		
126.4	166.3	1111	Top 2" SAND; as above then 1/2" bright red silty sand; then			Spoon bulging open; will only	- 50
	-		12" CLAY; gray; hard; medium plasticity; dry.	14"	SPT 82	drive 18" on rest Significantly below plastic	60
400	7				JE	limit	70
128.1	68.0		Silty CLAY; gray w/red areas;				39
	7		hard; low plasticity; dry; w/trace fine sand.	1,,55	SPT		34
-130.1	70.0		1110 301101	18"	83		41
150,11	-0.0		CLAY; gray with some red spots;			Driven when set	26
	1		hard; medium plasticity; dry- slightly moist,	2.4	SPT	ACTIVITY OF THE STREET	49
				24"	84		32
130 11	72.0	1111					

DJECT				HILADE	N	.89 Ft. A DISTRICT	OF 10
						, D. D. T.	
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE	REMARKS (if significant)	BLOWS/ 6in.
-132.1	172.0	himmi					3000
	5		SILT; light gray; very dense; unable to roll thread; slight			Driven when set ~15% sand in settling jar	24
	4		dilitancy; dry-slightly moist; with	24"	SPT	-15% salid in settling lar	43
	1		trace clay; some very fine sand.		85		34
			SILT; light gray; very dense;				
	- 7		not plastic; with trace sand:				30
1	-		slightly moist.	17"	SPT 86		54
	3						
	=		SILT; light gray; very dense; non-plastic; some very fine to			Chemical sample CSW-2-176'-177.5' taken @	33
	_ =		coarse sand; slightly moist to dry; with trace mica.	16"	SPT 87	10:15	20
	3		ary, with trace linea.		01		31
	-		SILT; as SPT 87 above with a				18
	=		few brown spots.	65.2	SPT		29
				17"	88		34
-140.1	180.0 -		Silly CLAY, grave and have				-18
	=		Silty CLAY; gray and brown laminations; hard; medium		23.7		_
	=		plasticity; dry; with trace mica,	15"	SPT 89		22
	1 1						35
	3		Silty CLAY; as SPT 89 above.			Driven when set	17
	=			20"	SPT		32
	3				90		31
	7		Silty CLAY; gray with some	-	-	top of sample is siltier	31
	3		brown and occasional black		CDT	top of sample is sittle	31
	7		organic spots; medium plasticity; dry.	19"	SPT 91		33
146.1	186.0						- 55
	1		CLAY; dark gray to brown; hard;				14
	=		medium plasticity; trace wood; slightly moist-dry,	15"	SPT		25
	=			15	92		32
	-		CLAY; as SPT 92 above; with a				14
	1		light gray silty lens.		SPT		20
	-			12"	93		47
	-		A. 40				- Q.
	E		CLAY; dark gray-brown; as SPT 92 above.		-		12
	-		200	15"	SPT 94		25
1	1			- (	54		26
	-		CLAY; dark gray, as above, then				12
	ŧ		2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	1	SPT		18
	E		CLAY; red and light gray; hard;	18"	95		22
	1		medium plasticity; slightly moist-dry.				
_		-	EDITIONS ARE OBSOLETE. PROJECT			(continued)	

TH THE THE THE THE THE THE THE THE THE T	CLAY: red, brown, and gray: hard: with coarse sand-sized nodules throughout; dry-slightly moist.  CLAY: red and gray: hard: medium plasticity: dry-slightly moist.  CLAY: as SPT 97 above.	CORE REC %	SPT 96	REMARKS (if significant)  Sand-sized material is rounded, Parts of sample are cemented together.  No nodules as in previous sample.	/SMOJB 14 23 32 13 25 30
	CLAY: red, brown, and gray; hard; with coarse sand-sized nodules throughout; dry-slightly moist.  CLAY: red and gray; hard; medium plasticity: dry-slightly moist.  CLAY: as SPT 97 above.	11"	SPT 96	(if significant)  Sand-sized material is rounded. Parts of sample are cemented together.  No nodules as in previous	14 23 32 13 25 30
	hard; with coarse sand-sized nodules throughout; dry-slightly moist.  CLAY; red and gray; hard; medium plasticity; dry-slightly moist.  CLAY; as SPT 97 above.	12"	96 SPT 97	rounded, Parts of sample are cemented together.  No nodules as in previous	14 23 32 13 25 30
	hard; with coarse sand-sized nodules throughout; dry-slightly moist.  CLAY; red and gray; hard; medium plasticity; dry-slightly moist.  CLAY; as SPT 97 above.	12"	96 SPT 97	rounded, Parts of sample are cemented together.  No nodules as in previous	23 32 13 25 30
	CLAY; red and gray; hard; medium plasticity; dry-slightly moist.  CLAY; as SPT 97 above.	12"	96 SPT 97	No nodules as in previous	13 25 30
	medium plasticity: dry-slightly moist.  CLAY: as SPT 97 above.		.97		25 30
	CLAY; as SPT 97 above.		.97	sample.	30
		je		,	12
	CLAY: as SPT 97 above	)1"	444		-
	CLAY: as SPT 97 above	11" SPT 98			
	CLAY: as SPT 97 above		50		33
	ountil do of lot above.				14
1////		13"	SPT 99		30
-///					
	CLAY; as SPT 97 above.		-		14
		12"	100		21
	CLAY; as SPT 97 above; very				17
	hard; dry; trace sand.	1pe	SPT		42
			101		50/1"
	CLAY; as SPT 101 above.				62
		12"	SPT 102		50/2"
	CLAY; as SPT 101 above.	13"	SPT		54
-////	Classifications listed above are			Grouted up to ~130 depth w/	50/2"
	classification procedures and ASTM D 2488-90 Visual Manual Classification; not on Laboratory Analyses.			tremie pipe (~108 gallons) on 11/07/95. Placed well screen (~117.5'-127.5') on 11/09/95.	
	REVIOUS E	CLAY; as SPT 97 above; very hard; dry; trace sand.  CLAY; as SPT 101 above.  CLAY; as SPT 101 above.  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488–90 Visual Manual Classification; not on Laboratory Analyses.	CLAY; as SPT 97 above; very hard; dry; trace sand.  CLAY; as SPT 101 above.  12"  CLAY; as SPT 101 above.  13"  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488–90 Visual Manual Classification; not on Laboratory Analyses.	CLAY; as SPT 97 above; very hard; dry; trace sand.  CLAY; as SPT 101 above.  CLAY; as SPT 101 above.  12" SPT 101  CLAY; as SPT 101 above.  13" SPT 102  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488–90 Visual Manual Classification; not on Laboratory Analyses.	CLAY; as SPT 97 above; very hard; dry; trace sand.  CLAY; as SPT 101 above.  CLAY; as SPT 101 above.  12" SPT 102  CLAY; as SPT 101 above.  13" SPT 102  Classifications listed above are based on BWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification: not on Laboratory Analyses.  REVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NU

DRILLING LO	G DIVISION NORTH ATLANTIC DIVISION	INSTALLAT		Hole No.CS	SHEET
PROJECT	NONTH ATLANTIC DIVISION			IA DISTRICT  OF BIT 4-3/4" side discharge	OF A
Pearce Creek LOCATION (Coordinate	es or Station)	II. DATUM F	OR ELE	VATION SHOWN (TBM or MSL)	invane
1598503 E, 64196		NVAD 8	38	'S DESIGNATION OF DRILL	
UNI-TECH DRILL	ING CO. INC	Failing	1500		
HOLE NO. (As shown of	n drawing title	13. TOTAL N		VERBURDEN SAMPLES TAKEN  undisturbed: O attemp	to-di
and file number) NAME OF DRILLER	CSW-3			OF CORE BOXES O	(eq)
Joseph Jester		15. ELEVATI	ON GRO	UND WATER	
DIRECTION OF HOLE	0.0.00	16. DATE HO		TARTED COMPLETED /09/95 11/20/95	
▼ VERTICAL □ IN	77772	17. ELEVATI		OF HOLE 31.07 Ft.	
THICKNESS OF OVERB DEPTH DRILLED INTO	7.110-1011			COVERY FOR BORING	
TOTAL DEPTH OF HOLE		19. SIGNATO S.M. Co		INSPECTOR	
		1			
LEV. DEPTH 9	CLASSIFICATION OF MATERIA (Description)	REC	SAMPLE	REMARKS (if significant)	BLOWS/ 6in.
31.1 .0					1 10
3	SILT; brown; loose; moist; with			Unless otherwise noted, SPT	2
	trace sand; trace vegetation trace mica		SPT	samples taken according to	2
	W. C.	7"	1	ASTM 1586 Using bentonite mud,	2
				"QuickGel" by Baroid. Chemical sample	4
	SILT; brown; loose; moist with			CSW-3-0'-2' taken @ 9:40	1
3	trace sand; trace very fine mid	275		Chemical sample	- 2
		15"	SPT 2	CSW-3-2'-4' taken @ Soil pH in water= 7.5	3
4					-
	AND TO SERVICE STATE OF THE SE			40.00	4
=	SILT; as SPT 2, above.			Chemical sample CSW-3-4'-6' taken @	3
3		21"	SPT	Soil pH in water = 6	4
=		III IE	3		5
					- 6
4	SILT; as SPT I, above				2
3		15"	SPT		2
		15	4		3
					5
	SILT: brown: loose moist: with				2
	some wood; trace sand; trace		COT		2
	mica.	24"	SPT 5		2
A					-
21.1 10.0	MINVENEZU SAME PROGRAM		+	BOLESCEN SOLVE	2
1///	CLAY; black; soft; low plasticity trace silt; trace organics	/•		Chemical sample CSW-3-10'-12' taken @	2
		17"	SPT 6	Soil pH in water= 6.33	2
3///			O		2
19.1 12.0					3
1///	Silty CLAY; dark gray, brown mix; soft; some organics.				- 1
3///	min, sort, some diganics.	21"	SPT		1
1///		21	7		ħ
17.1 14.0					1
MININE	Sandy SILT; dark brown to				2
	yellow; loose; trace gravel; moist.		SPT		1
7	molecu	13"	8		3
15 ( 15 × 3)					3
15.1 16.0	CANDS brown dones				16
3////	SAND; brown; dense; poorly graded; find grained; with trace	9			
4000	silt.	15"	SPT		18
			a		24
13.1 18.0					32
13.1 10.0			_		

DJECT Pearce Creek		HILADI	N	O7 Ft.	OF 8
. saise orcen		HILAU	LEMI	A DISTRICT	
EV. DEPTH Q	CLASSIFICATION OF MATERIALS (Description)	CORE REC %		REMARKS (if significant)	BLOWS/ 6in.
13.1 18.0					
1 3111	Silty SAND; light brown; dense; with some gravel.			Chemical sample CSW-3-18'-20' taken @	17
3111		10"	SPT	Soil pH in water	24
				= 4.4 @ 15 min. = 4.4 @ 30 min.	32
	Sandy SILT; dark gray; stiff;			= 4.36 @ 45 min.	7
31111	moist; sand is very fine grained; with trace mica.	0.00	SPT		10
		12"	11		13
300					14
4	Sandy SILT; dark gray; stiff;				12
	clean white sand at bottom.	10"	SPT		17
4		10	12		19
7.1 24.0					25
1	SAND; white; medium dense; poorly graded; very fine-fine				6
3	grained.	17"	SPT		7
300		1 "	13		7
5.1 26.0					9
3	SILT; light brown; stiff; moist; some very fine sand.				9
3		24"	SPT 14		- 11
			15		14
3.1 28.0 -		-			17
300	SAND; gray and light brown mix; dense; poorly graded; fine				100/5"
	grained; with trace silt.	1111	SPT 15		100/5
1.1 30.0					
-1///	Silty CLAY; light gray; hard;				100/4"
1 1///	plastic; w/trace sand.	12.1	SPT		
3///		3"	16		
9 32.0		1			
= 1	SAND; white; dense; poorly	1			40
1 3	graded; fine grained; brown silty sand at bottom 6 inches.	14"	SPT		23
3/8/8		1	17		29
					33
3	SAND; light brown; dense; poorly graded.			Chemical sample CSW-3-34'-36' taken @	37
	3, 255 3.	11"	SPT 18	14:30 Soil pH in water	100/5"
1 3			10	= 5.11 @ 5 min.	
			_	= 5.12 @ 15 min.	
3/8/8	SAND; white; very dense; coarse grained; poorly graded.		5.3		47
1		14"	SPT 19		100/3"
			Į Ž		100/3
6.9 38.0	SILT; brown; stiff; non plastic;			Sampled sand for geotech	- 22
	moist; sand at bottom 12 inches			jar Soil pH in water	23
7.9 39.0	medium grained,	24"	SPT 20	= 4.45 @ 5 min. = 4.29 @ 25 min.	33
				= 4.27 @ 45 min.	49
	S EDITIONS ARE DESOLETE PROJECT		-	(continued)	4.5

		INS		N		OF E
ce Cree	k				A DISTRICT	
DEPTH	0	CLASSIFICATION OF MATERIALS	6000	Luce		
201 110	LEGEN	(Description)	REC %	SAMPL	REMARKS (If significant)	COWS/ 6in.
40.0				0,2		_ B
-		SAND; white; medium dense;				21
- 3		poorly graded; fine grained.	140	SPT		23
2			14	21		29
7						29
=		SAND; white and brown mix;			7	21
=		graded; trace gravel.	12"	SPT		23
3				22		23
-						25
3		SAND; same as SPT 22				23
=			Hr.	SPT		25
=				23		27
-			0			30
=		SAND; same as SPT 22; loose; dark brown silt at bottom 6			Soil pH in water = 4.56 @ 5 min. (silt)	8
-		inches.	14"	SPT	= 4.60 @ 25 min. (silt)	6
1					= 4.63 @ 25 min. (brown sand)	
-		CAND.	-			4
=		poorly graded; medium grained;				4
		quartz.	9"	SPT 25		5
3						7
-		SAND: came as SGT 25		-		9
3		SAIND, Saine as SP   25		200		55
=			8"	SPT 26		100/2"
3				-		
=		SAND: same as SPT 25				100/4"
3		2.0.2.000		CDT		100/1
3			0	27		
=						
- 2		SAND; white with gray; very				100/5"
=		dense; medium graded; trace gravel.	- Euro	SPT		
-			5.	28		
=				- 1		
=		SAND: white; dense, very dense;	1			100/3"
3		feldspAr; subangular; with some	3"	SPT		1
=		tine gravel.	3	29		
$\exists$	:XXX					
3		SAND; same as SPT 29				100/5"
=			5"	SPT		
3				30		
3						
=		SAND; same as SPT 29				47
3			7"	SPT		46
3				31		49
62.0 F				< 4		51
	DEPTH 40.0	DEPTH 40.0 1111111111111111111111111111111111	CLASSIFICATION OF MATERIALS (Description)  40.0  SAND: white: medium dense: poorly graded; fine grained.  SAND: white and brown mix; dense: mediume grained; poorly graded; trace gravel.  SAND: same as SPT 22; loose; dark brown silt at bottom 6 inches.  SAND: gray-grown; loose; poorly graded; medium grained; quartz.  SAND: same as SPT 25  SAND: white with gray: very dense; medium graded; trace gravel.  SAND: white; dense, very dense; well graded quartz and feldspAr; subangular: with some fine gravel.  SAND: same as SPT 29  SAND: same as SPT 29	DEPTH CLASSIFICATION OF MATERIALS (Description)  SAND; white; medium dense; poorly graded; fine grained.  SAND; white and brown mix; dense; mediume grained; poorly graded; trace gravel.  SAND; same as SPT 22  II"  SAND; same as SPT 22; loose; dark brown silt at bottom 6 inches.  SAND; gray—grown; loose; poorly graded; medium grained; quartz.  SAND; same as SPT 25  SAND; same as SPT 25  SAND; same as SPT 25  SAND; white with gray; very dense; medium graded trace gravel.  SAND; white; dense, very dense; well graded quartz and feldsphr; subangular; with some fine gravel.  SAND; same as SPT 29  SAND; same as SPT 29	DEPTH	DEPTH OF CLASSIFICATION OF MATERIALS CORE (Description) PHILADELPHIA DISTRICT  DEPTH OF CLASSIFICATION OF MATERIALS CORE (Description) REMARKS (Fragnineant)  40.00 SAND; white: medium dense; poorly graded; fine grained,  SAND; white and brown mix; dense; medium grained; poorly graded; trace gravel.  SAND; same as SPT 22 III SPT 23  SAND; same as SPT 22; loose; dark brown silt at bottom 6 inches.  SAND; gray—grown; loose; poorly graded; medium grained; guartz.  SAND; same as SPT 25  SAND; same as SPT 26  SAND; same as SPT 28  SAND; white with gray; very dense; well graded quartz and following graded; with some fine gravel.  SAND; same as SPT 28  SAND; same as SPT 28  SAND; same as SPT 29  SAND; same as SPT 29  SAND; same as SPT 29  SAND; same as SPT 29

OJECT			G (Cont. Sheet)	TALLATIO		07 Ft.	HEET 4
Pear	ce Cree	k				A DISTRICT	
LEV.	DEPTH	9	CLASSIFICATION OF MATERIALS	CORE	шœ		1 2
9210		EGEND	(Description)	REC		REMARKS (if significant)	OWS/ 6in.
30.0	62.0	3		%	SS.		B
30.9	62.0	1000	SAND; light gray; very dense;	-			55
	1 3		poorly graded; fine grained with some silt; about 3 inches silt		SPT		100/4
	1 3		with clay on top; stiff; plastic.	12"	32		10,07.5
	1						
			SAND; light gray, very dense;				45
	3		poorly graded; fine grained; with some silt		SPT		100/4
	3			H.	33		
34.9	66.0						
			Silty SAND; on top 7 inches;				42
	3		gray; loose; medium graded; fine grained.	13"	SPT		28
			Silty CLAY at bottom 6 inches; gray; hard; moist.	1,3	34		40
36.9	68.0	ШЩ	gray, nard, morst.	-			52
	=		SAND; light gray; medium dense; very fine to well grained; 2		4.		30
			inches silty clay on top; gray; hard; moist.	181	SPT 35		23
					33		28
38.9	70.0	пппп	CILL CAND RALL				27
	=		Silty SAND; light gray; brown lenses; dense; well graded.		52.8		55
	=			1177	SPT 36		100/3
40.9	72.0						
40.9	12.0		Silty CLAY; on top 3 inches;			pH of brown sand = 4.8	100/6
	3		gray; hard.		SPT	pri or or own saile - Are	.2278
	3		SAND on bottom 3 inches; brown; medium grained.	6"	37		
42.9	74.0		min me aram granteo.				
	=		SAND; dark gray; dense; well				65
	=		graded; with trace silt.	9"	SPT		100/2
	=			9	38		
	=						
	3		SAND; same as SPT 38.				100/6
	=	543		7***	SPT 39		
	=				55		
	1	3.4	CAND light grown value days	1	-	Philippe 11	-
	=		SAND; light gr y; very dense; very fine to fine grained; very			Changed to downhole hammer; reamed to	8
	=		poorly graded; with some silt.	16"	SPT 40	78'w/open-end 6" trivane bit. Blows below 78' depth	9
100	80.0				- 1	not valid for comparison with standard N values.	10
48.9	80.0		Sandy SILT; light gray; hard;			And what we have a straight of the straight of	5
	3		moist; some clay; gravel on top 5 inches.	1.2	SPT		7
	3		3 11011031	17	41		7
50.9	82.0						
	1		Silty CLAY; gray; stiff; low				5
	丰		plasticity; moist.	15.00	SPT		6
	3			15''	42		21
52.9	84.0						
						(continued)	

OJECT	G (Cont. Sheet)	TALLATIO		07 Ft.	SHEET S
Pearce Creek				A DISTRICT	
LEV. DEPTH ON 3931	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE	REMARKS (if significant)	BLOWS/ 6in.
52.9 84.0					1 00
3	SILT; gray; hard; low plasticity; dry to moist; with some clay;				7
3	trace very fine sand.	20"	SPT 43		14
3					20
	Tube Sample,			Tube sample @ 14:00 on	
17110		12"	SPT 44	11/10/95 Driven @ 250 psi 12" recovery	
	7 15 15 15 15 15 15 15 15 15 15 15 15 15	-			
- <i>57.5</i> 88.6	7 inch SILT on top; gray; hard; moist; then				37
	8 inch SAND at bottom; gray; loose; well graded; wet.	15"	SPT 45		42
- <i>58.9</i> 90.0					-16
311111	SILT; gray; stiff; trace clay; low plasticity; fine sand at bottom				7
311111	of sample.	13"	SPT		15
			46		25
- <i>60.9</i> 92.0 -	Silty SAND; gray; loose; very				- 40
	poorly graded; very fine grained.	11. 11	SPT		10
	g, diffed,	10"	47		14
62.9 94.0		1			
3/8/8	SAND; light gray; loose; poorly graded; very fine grained; with				9
	trace silt.	11	SPT 48		16
3///		100	4.0.		24
	SAND; light gray; dense; poorly				32
3	graded; very fine to fine grained; with trace silt.		SPT		52
$\exists$	g. onless, man trace silt.	9"	49		50/3"
1	SAND; light gray; dense; very poorly graded; fine grained; with				42
=	trace silt.	jp:	SPT 50		34
3					40
	SAND; same as SPT 50.	1			18
3		10"	SPT		20
]		16"	51		31
	SAND; same as SPT 50; trace silt.				17
		100	SPT 52		25
3///			-50		33
	SAND; same as SPT 50.	1			12
E			SPT		16
		13"	53		21
	EDITIONS ARE OBSOLETE. PROJECT	1		(continued)	

OJECT				TALLATIO	M	07 Ft.	OF 8
rear	CE CIE	e n		PHILADE	LPHI	A DISTRICT	
LEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE	REMARKS (If significant)	BLOWS/ 6in.
-74.9	106.0	150050					
			SANE; gray with white mix; very dense; medium grained; well				22
	-		graded; quartz; subangular; wet.	317.	SPT 54		57
							50/2
	-		SAND; same as SPT 54.				45
	3			-	SPT		50
	1			8"	55		50/1"
	1		SAND; same as SPT 54.				75
	_			2"	SPT 56		50/1"
	9				.00		
	-		SAND; light olive brown; dense;	1			45
	3		well graded; coarse grained; wet; trace gravel; trace silt.	1	SPT		51
			not, more graver, made sit.	9"	57		50/2"
-82.9	114.0						
	-		Silty SAND; light gray; dense;				25
	=		poorly graded; fine grained; wet; trace gravel.	9"	SPT		34
	3				58		51
84.9	116.0		Lucia de la compansión de	-			
	-		SAND; light gray; dense; poorly graded; fine grained; wet; with			first Clay lenses observed; red and brown	27
	-		trace silt; Two 1-1/2 inch CLAY; gray,	12"	SPT 59		62
			brown mix; plastic; moist; very stiff; between sand.				- 02
			SAND; light gray; very dense;				35
	12		poorly graded; fine grained; wet; with trace silt.	0"	SPT		70
	100			9"	60		54/1"
	3	Tune (	SAND; light gray; bottom 2 Inches bright red; dense; poorly				19
	=		graded; fine grained; dry to moist; with trace silt.	312	SPT 61		31
90.9	1220		water and the same of the same				45
30,9	144.0		5 inch CLAY; light gray and red;				22
	=		very stiff; plastic; moist; then 3 inch SAND at bottom; gray;	See.	SPT		39
			dense; poorly graded; fine grained; moist.	8"	62		27
	=		-				
	3		CLAY; gray, hard; low plasticity; dry; sand lens in between (1-1/2				12
	4		inch) gray; dense	12"	SPT 63		21
94.4	125.5				03		25
	=		SAND: grave dones fire accided				it
	3		SAND; gray; dense; fine grained; poorly graded; moist;		007		17
	=		2 Inch clay on top; gray; hard; plastic; moist.	11	SPT 64		22
96.9	280						
						(continued)	

OJECT	G (Cont. Sheet)	TALLATIO		07 Ft.	SHEET 7 OF 8
Pearce Creek				A DISTRICT	
LEV. DEPTH S	0/10015101510151015	The same	1		
LEV. DEPTH Q	CLASSIFICATION OF MATERIALS (Description)	CORE REC %		REMARKS (If significant)	BLOWS/ 6in.
96.9 128.0					
3000	Silty SAND; light tan-gray; medium dense; fine grained; clay				14
400	lenses; gray; hard; plastic; dry.	12"	SPT		19
			65		30
98.9 130.0	SAND; tan; medium dense; fine			-	7
- 1 - 1	grained; 2 inches silt at bottome; dark gray; hard; dry.		SPT		16
00.3 131.4	bottome, dark gray, hard, dry.	13"	66		23
<u> </u>					
4////	SAND; dark gray; medium dense;				14
	fine grained; poorly graded; trace silt.	9"	SPT		20
3		9	67		29
					(5-3)
	SAND; same as SPT 67.				17
4		11"	SPT 68		39
3///			08		53
74.9 136.0	Silty SAND top & lookery deals		_		- 20
3	Silty SAND top 6 inches; dark gray; dense; poorly graded; fine				39
	grained; moist; sllty clay bottom 7 inches; dark gray; hard;	13"	SPT 69		50/1"
06.9   138.0	plastic; dry.		m		
1800	SAND; dark gray; dense; fine				17
77.7  38.7 -	grained; poorly graded;	1	SPT		35
	Silty CLAY; bottom 2 inches; dark gray; hard; plastic; dry,	11"	70		49
				400 T 400 T	
1	CLAY; dark purplish gray; dense;			pH = 5.64	8
3///	hard; dry.	400	SPT		14
3///		2	71		22
	Same as SPT 71.				10
		13"	SPT		21
3///			72		29
	2 2/		-		-
=////	Same CLAY; a little more brownish.				12
		12"	SPT 73		21
					30
	Same CLAY as 140 feet to 142				12
3///	feet.		COT		24
-///		15"	SPT 74		29
3///					
	Same CLAY with trace white				g
3///	gray color.		CDT		14
		15"	SPT 75		23
3///					
		1		(continued)	

OJECT				TALLATIO	31.	.07 Ft.	HEET 8 OF 8
rear	ce cree	K	F	PHILADE	LPH.	IA DISTRICT	
LEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE	REMARKS (If significant)	BLOWS/ 6in.
118.9	150.0	ımı					
	3		Same CLAY as SPT 71; with trace organics; (wood chips);		-	pH = 5.57	14
	1 -		dary gray - brown color; trace	16"	SPT		41
	3		white gray silty clay,	1	76		36
	3		Same CLAY as SPT 71; dark gray-brown; plasticity; no				14
	=		dilitancy.	12"	SPT 77		27
	3				11		32
			The said frame of the said hard			1	
	3		CLAY; brown; hard; dry; with bottom 3 inches vary gray.				17
	3			12"	SPT 78		23
- 1	-				1,0		35
			OLAW SASS SASS SASS	-			-
	7		CLAY: same as SPT 77; dark gray-brown.				16
- 1	-			34.0	SPT 79		29
1	1						38
	-		CLAY; dark gray-brown; hard;	-			
	1		dry; with trace organics.				23
	-			15.5"	SPT 80		36
	1						20
	-		CLAY; dark gray; hard; dry.				14
	1		and a gray, hard, ary,		SPT		20
	=			10"	81		29
	ŧ						
	=	CLAY; dark gray; dens	CLAY; dark gray; dense; hard;				12
	1		dry,	16"	SPT		20
	1			16	82		35
	-						
	-		Same CLAY as SPT 82.			No geotech jar sample	8
!!	1			15"	SPT 83		17
34.4	65.5						25
	classification procedur	based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on			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.		
FORM	1836 PRE	VIOUS E	EDITIONS ARE OBSOLETE. PROJECT Pearce (			HOLE NU	

Hole No.CSW-4 DRILLING LOG DIVISION INSTALLATION SHEET 1 OF 3 NORTH ATLANTIC DIVISION PHILADELPHIA DISTRICT 1. PROJECT 10. SIZE AND TYPE OF BIT 4-3/4 inch side discharge drag bit Pearce Creek 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) LOCATION (Coordinates or Station) NAVD 88 1597955.23 E, 642539.68 N 12. MANUFACTURER'S DESIGNATION OF DRILL DRILLING AGENC Falling 1500 UNI-TECH DRILLING CO., INC. 3. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN 4. HOLE NO. (As shown on drawing title disturbed: undisturbed: I att. O accepted and file number) CSW-4 14. TOTAL NUMBER OF CORE BOXES O S. NAME OF DRILLER Joseph Jester 15. ELEVATION GROUND WATER 6. DIRECTION OF HOLE 16. DATE HOLE STARTED 1/3/96 1/4/96 VERTICAL INCLINED 17. ELEVATION TOP OF HOLE 36.25 Ft. 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 8. DEPTH DRILLED INTO ROCK 19. SIGNATURE OF INSPECTOR 60 Ft. TOTAL DEPTH OF HOLE Lusheng Yan SAMPLE ELEV. DEPTH CLASSIFICATION OF MATERIALS 무 CORE REMARKS OWS/ Bin. LEGE (Description) REC (if significant) % 36.2 0 D See log of CSW-1 (located ~100 Mud rotary drilling with Bentonite mud. feet away) for continuous samples and better defined lithology/stratigraphy. SPT samples according to ASTM 1586: 2-inch spoon: SPT sampler driven w/140 lb. hammer; 30" drop. Ð Tube driven; no recovery 0. U-X -12 -14 -16 -18 (continued)

PROJECT

Pearce Creek

HOLE NUMBER

CSW-4

ENG FORM 1838 PREVIOUS EDITIONS ARE OBSOLETE,

OJECT	LING	LUG	(Cont. Sheet)	ELEVATION TOP		36	.25 Ft.	SHEE	OF 3
	ce Cree	k		INST	HILADE	LPHI	A DISTRICT		
LEV.	DEPTH	LEGEND	CLASSIFICATION OF (Description	MATERIALS	CORE	SAMPLE	REMARKS		s.
		LEG	(Descriptio	11/	REC %	SAM	(if significan	t)	BLOWS/ Bin,
18.2	18.0							10	D
			Silty SAND; dark gray	; loose;					10
	-		wet.		1	SPT		_	12
	-		Lower 6" CLAY; black; w/trace sand, trace of trace white shells.	gravel.	20"	1		_	12
16.2	20.0		troce write stiens.					-	16
	1		SAND; dark gray; den to coarse grained; w/	se; medium				_	13
	=		to coarse grained; w/ gravel	trace	-	SPT			16
	3		3, -, -,		8"	2			17
	=							_	20
- 1	3					00.5			
	=								
	3								
	3								
110	25.0								
1112	-	IIIII							
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	7								
	= 1								
	3								
_		<i>9</i> 40				_4			لك
			DITIONS ARE OBSOLETE.				(continued)		

Pear	ce Cree	k		HILAD		IA DISTRICT	
LEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC	SAMPLE	REMARKS (if significant)	BLOWS/ Gin.
-3.7	40.0						1 @
	n churcha		SAND; white; dense; medium grained	.5"	SPT 3	some gravel slough on top	100/5
	والبيرا بيباييدا وبريا بيهيا يبييا ديداليعيها يبر			On	SPT 4	No recovery for split spoon sample	100/4
	dienden den den den den den den den den de		SAND; white; coarse grained; w/some gravel	4	SPT 5		100/1"
7.5	= =						
22.1	58.4	777	Top 5" SAND; light gray; dense; poorly graded; coarse grained;		0		42
	7		w/some gravel Lower 6" Silty CLAY; white;	- 14	SPT 6		31
2.7	60.0		hard; moist				50
3./	50.0		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.	50

Hole No.CSW-5 DRILLING LOG | DIVISION INSTALLATION NORTH ATLANTIC DIVISION PHILADELPHIA DISTRICT OF 8 10. SIZE AND TYPE OF BIT 4-3/4" side-discharge trivane Pearce Creek 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) LOCATION (Coordinates or Station) NAVD 88 1600880.22 E, 640417.95 N 12. MANUFACTURER'S DESIGNATION OF DRILL DRILLING AGENC UNI-TECH DRILLING CO., INC. Failing 1500 TOTAL NO. OF OVERBURDEN SAMPLES TAKEN HOLE NO. (As shown on drawing title disturbed: undisturbed: att. and file number! accepted CSW-5 14. TOTAL NUMBER OF CORE BOXES O 5, NAME OF DRILLER Joseph Jester 15. ELEVATION GROUND WATER 6. DIRECTION OF HOLE 16. DATE HOLE STARTED COMPLETED 11/27/95 VERTICAL INCLINED 11/30/95 17. ELEVATION TOP OF HOLE 47.30 Ft. 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 8. DEPTH DRILLED INTO ROCK 19 SIGNATURE OF INSPECTOR 9. TOTAL DEPTH OF HOLE 153,5 Ft. S.M. Cook ELEV. DEPTH CLASSIFICATION OF MATERIALS SAMPLE 呈 CORE REMARKS EGE (Description) REC OWS, (if significant) % m 47.3 D Silty SAND; brown; loose; trace 5 Unless otherwise noted, SPT gravel; trace clay samples taken according to 6 SPT 15" ASTM 1586 Using bentonite mud, 8 'QuickGel" by Baroid. Chemical sample CSW-5-0'-2' taken @ 10:04 8 Sandy SILT; brown; loose; fine 3 grained; moist; trace organics; Chemical sample CSW-5-2'-4' taken @ 10:10 3 trace gravel. SPT 16" 2 5 3 Sandy SILT; brown-gray; medium dense; sand is very fine Chemical sample CSW-5-4'-6' taken @ 10:15 7 grained; with trace organics. R SPT 20" 3 10 41.3 6.0 12 SILT; gray with yellow-orange spots; medium dense; gravel mix on top 12 inches with some sand; 8 q SPT 23" trace organics; trace mica. 4 12 14 -8 SILT; gray; hard; moist; trace organics; 8 inches fine sand at Chemical sample CSW-5-8'-10' taken @ 10:30 8 12 bottom; gray; medium dense. SPT pH = 7.618" 5 12 37.3 10.0 15 -10 SAND; gray and brown mix; medium dense; poorly graded; medium dense; with some silt. 11 SPT 15 15" 6 19 21 -12 SAND; gray; medium dense; fine grained; poorly graded; moist; 7 Chemical sample CSW-5-12'-14' taken @ 10:45 11 with trace silt. SPT 14" 11 14 SAND; same as SPT 14 11 14 SPT 12" 8 19 25 1B SAND; yellowish-brown; medium 7 dense; well graded; with some 7 silt: SPT 15" 9 29.9 8 8 inch black sandy silt at

mica.

bottom: trace gravel: trace

(continued)

10

JECT	ce Cree			TALLATIO	N	.30 Ft.	OF
ear	ce cree	K	P	HILADE	ELPHI	IA DISTRICT	
EV.	DEPTH	9	CLASSIFICATION OF MATERIALS	CORE	шœ		
		EGEND	(Description)	REC		REMARKS (if significant)	OWS/ 6in.
		9		%	SA	(it significant)	BLO
9.3	18.0	umn					
	3		Sandy SILT; dark gray to black; medium dense; moist; trace			Chemical sample	
	1 2		gravel.	13"	SPT		7
	3			1,0	10	pH @ 15 min.= 6.25	9
	_3						10
	=		Silty SAND; dark gray-black;			pH = 6.3	8
	3		loose; very poorly graded; very fine grained; with trace mica.	12"	SPT		8
	1			12"	11		10
		MIM					10
	1		Silty SAND; same as SPT II.			pH = 5.6	7
	4			1000	SPT		7
	=			22"	12		8
	-			1-		-	7
- 1	-	ШШ	Sandy SILT; dark gray-balck;				.8
	3		medium dense; soft; moist.				10
	-			18"	SPT 13		
	3						10
	-		Sandy Still Transport of Spring	-			12
- 1	4		Sandy SILT; same as SPT 13.			pH = 6.0	9
	3			18"	SPT 14		9
- 4	- +				1.0		10
9.3	28.0	11111	SILT; dark gray-black; medium	-		10.1	10
			dense; moist; trace gravel; some			to inches slough	
- 1	4		very fine sand,	14"	SPT		7
	3			100	15		9
- 1	_						7
	=		SILT: black, gray, and brown traces; soft; moist; some very			pH = 5.8 pH @ 10 min.= 5.8	7
	=		fine sand; trace clay; trace	13"	SPT		7
	=		mica.	13	16		6
	=						7
	=		SILT; same as SPT 16.			pH = 5.8	5
	3			14"	SPT		5
- 1	=			14	17		6
	=						5
	=		SILT; black; hard; moist to dry;			pH = 6.0	6
	=		some clay.	1020	SPT		6
	3			16"	18		6
1.3	36.0						6
	-	///	Silty CLAY; black; stiff; moist;				7
	3		non-plastic; trace mica.		SPT	-	7
	1			24"	19	-	8
	3	11/1					9
	-		Silty CLAY: same as SAT to			-	
	1		Silty CLAY; same as SPT 19,			-	8
	3			24"	SPT 20		12
1.1	3				20	J	14
1							17

Pear	ce Cree	k		ALLATIO	NC	A DISTRICT	OF
ELEV.	DEPTH	EGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %		REMARKS (If significant)	OWS/ Gin.
7.3	40.0				0,2		田田
			Silty CLAY; same as SPT 19.				7
	3			24"	SPT		8
	3			24	21		12
5.3	42.0 -						14
	3		CLAY; black; stiff; plastic; moist.			pH = 6.1	8
	=			4"	SPT		10
	3				22		10
	1 0-3						10
	=	$/\!\!/\!\!/\!\!\!/$	CLAY; black; stiff; plastic; moist; lenses of gravel; trace sand.		211		7
	-		2004	24"	SPT 23		- 11
2.0					100		- 11
7.3	46.0		Silty CLAY; black; stiff; non	-		-	10
	3		plastic; moist.				7
				20"	SPT 24		- 8
1	3				977		10
1			No recovery.			No recovery	.5
	3			1	SPT	No recovery	- 6
	3			0	25		- 6
	=						7
	3		Silty CLAY; same as SPT 20:			Chemical sample	7
	1		trace organics on top 6 inches; trace gravel,		SPT	CSW-5-50'-52' taken @ 13:45	11
1	3			24"	26	13.110	15
	=			1	=1		19
	=		Silty CLAY; black; hard; medium			pH = 6.4	6
	3		plastic; moist; trace sand; trace gravel.		SPT		9
	=				27		12
	3		Lancing Table 1				18
	3		3 inches Silty CLAY at top; same as SPT 27;			Chemical sample CSW-5-54'-56' taken @ 14:15	100/5
	=		2 inches organic peat; black.	5"	SPT	on 11/27/95	
	3			-	28	Sampled peat	
-8.9	56.2		Sold Bridge State				
			Silty CLAY: greenish-gray, top 2 inches:			greenish clay sampled	32
	. 3		SAND; gray; dense; medium grained; quartz; poorly graded;	10"	SPT 29		45
10.2	57.5	1111	bottom 8 inches.				58
	1		Silty CLAV: Nack: band: plants:		-	Changed to downhole	75
.,, .	====		Silty CLAY; black; hard; plastic; moist,		22	hammer; reamed to 58'w/open-end 6" trivane	50/1"
-11.7	59.0	1111		1"	SPT 30	bit. Blows below are not valid for comparison with	3071
	3					standard N values. Only driving sampler <1.5 feet	
	=		SAND: white; dense; fine			so it doesn't get stuck	100/5
		grained; poorly graded.	3"	SPT 31		.50/5	
			EDITIONS ARE OBSOLETE. PROJECT			(continued)	

Pear	ce Creek		TALLATI	NO	7.30 Ft. IA DISTRICT	OF 8
			HILAU	ELFH	IA DISTRICT	
ELEV.	DEPTH HT930	CLASSIFICATION OF MATERIALS (Description)	CORE REC %		REMARKS (If significant)	BLOWS/ 6in.
-14.7	62.0					
	300	SAND; gray and black; dense; fine grained; poorly graded; with			pH = 6.15	36
		trace clay in lens,	10"	SPT 32		100/6
	3	SAND; gray-white, very dense;			-	48
	= /3/33	medium grained; poorly graded.		COT	1	50/2"
	3.00		5"	SPT 33	1	-00/2
		No recovery.			No recovery	50/2"
	3000	and characters at		COT	, a recovery	40/2
	388		0"	SPT 34		
	3///					
	-	SAND; gray to dark gray; very				39
	3.00	dense; poorly graded; fine to medium grained; with trace		SPT		68
Vac al	3/8	organics; trace silt.		35		32
-22.5	69.7		4			_
02.4		Top 8 inches CLAY; dark gray;				6
-23.4	70.7	hard; medium plasticity; moist; with trace mica.	1000	SPT		12
-	3000	Base 5 inches CLAY; as above; thinly bedded with SAND; gray;	13"	36		13
-24.7	72.0	medium grained; with some wood;				-
	1000	trace gravel.				61
ĺ	=	SAND; gray; very dense; fine to medium grained; poorly graded;	1	SPT		50/2"
	3	rounded; clean.	7"	37		
	3					
		SAND; light gray; very dense;				46
	3	fine grained; poorly graded; with trace wood; clean.	1	SPT		53
	<b>=</b>		-11.	38		67
-28.7	76.0					
	= 1///	Clayey SAND; dark gray; very				9
	3////	fine to fine grained; poorly graded; with some silt; trace	15"	SPT		12
	1///	wood; thinly bedded with laminations of CLAY; gray as	15	39		18
210	<del>-</del> 3///	SPT 36 Top.				
-31.0	10.2	Top 3 inches as above; then			Contact is cemented.	45
	3	Silty SAND; orange-brown; medium grained; poorly graded;	6.5"	SPT	Drilling harder as go to 80' Jarred sample of base	50/2"
	3	rounded quartz.	5.5	40		
32.7	80.0					
	3000	SAND; tan with orange and black areas; very dense; coarse			E,6 = Hq	3.3
	3	grained; poorly graded; quartz;	10"	SPT		55
	3/8/	some feldspar; with some medium-fine sand; with trace	1	41		69
34.7	82.0	fine gravel; trace wood; trace silt,				
	-00000 -00000 -00000	Gravelly SAND; orange-light			~3/4" Silt lens in tip	37
		brown; very dense; well graded; with trace silt; trace wood.	1100	SPT	Bentonite drilling mud invading coarser areas of	58
	00.00	Have sitt trace wood.	"	42	sample	72
36.7	84.0					
	-4-	EDITIONS ARE OBSOLETE. PROJECT		-	(continued)	

ROJECT		LUI	G (Cont. Sheet)	TALLATIO	47	.30 Ft.	SHEET 5 OF 8
	ce Cree	ek				A DISTRICT	
					,	Ī	
LEV,	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %		REMARKS (if significant)	BLOWS/ 6in.
36.7	84.0						
		原則	SAND; tan and orange; dense;			Silt lens ~1/2" thick	21
			subrounded to subangular; poorly graded in lenses; fine to		SPT	Bentonite drilling mud invading coarser areas of	25
			coarse grained; with trace silt and light brown silt lens.	9"	43	sample, removed from	40
38.7	86.0		and light brown sitt lens.			sample, Chemical sample	
		00.00	Gravelly SAND; light			CSW-5-84'-85.5' taken @ 10:40 on 11/28/95.	67
	-	0000	brown-orange alternating in layers; very dense; well graded;	8"	SPT		100/5"
		0000	medium grained; gravel is <3/8" size; quartz; rounded.	0	44		
	1	00.00					
	-	00.00	Gravelly SAND; as above; with			One pyrite concretion in	30
- 4	-3	00.00	some white and light gray bands; with trace pyrite in top.	135	SPT	slough. Broke it open and included in sample. Fine	68
	-	00.00	A STAN TO STAN E A STAN TO STA	311.	45	gravel sized.	34
42.7	90.0	00.00					
		Jakes !	SAND; orange, gray, and white				9
	- 3		In bands; very dense; medium grained; poorly graded; with	0.0	SPT		12
4.0	. 3		some coarse grained sand in lenses; with trace silt; trace	10"	46		24
44.5	91.7	m	gravel.				
	-		CLAY; cream-colored with				7
	3		orange spots in top 10 inches;		COT		13
	-		turning light gray without spots below; stiff; slightly moist; low	13."	SPT 47		23
16.5	93.7		plasticity.				23
	Silty CLAY; light gray-	Silty CLAY: light gray white:				9	
	3		very stiff; very slightly moist;		land on		-
1		low plasticity.	low plasticity.	15"	SPT 48		20
	3						27
- 1			Clayey SILT; light gray-white;		-		15
	=	//// hard; very slightly mois	hard; very slightly moist; with				23
			some very fine sand.	15"	SPT 49		_
	=						29
			Silty CLAY: variegated gray with	-	-	Assetting black Torre	
	3		brown areas; very hard; low		220	One blue-black area	- 11
	7		plasticity; very slightly moist.	12"	SPT 50		21
52.4	99.7				24.0		32
	-		CLAY; medium brown with a few				9
	=		red or yellow spots; hard;		7		23
	-		plastic; dry; with trace medium sand-sized particles in one blob	18"	SPT 51		30
	+		(~1/4 inch diameter)				30
	-1		CLAVI and need asset the control of		-		
	=		CLAY; red and gray with some yellowish-green; hard; dry.				17
	-		The state of the s	15"	SPT 52		33
	1						42
	-						
	-		CLAY; red, gray and pink; with some yellow spots; hard; dry.				7
	-		Talle Janes, spots, hard, dry.	15"	SPT		17
	-6	////			53		23
	-6	1111					

DJECT	-			ALLATIO	N	.30 Ft.	SHEET OF
rear	ce Cree	K.	P	HILADE	ELPH:	IA DISTRICT	
EV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %		REMARKS (if significant)	BLOWS/
8.7	106.0	,,,,,					1 80
	2		CLAY; gray with some red areas; as above.				12
	- 3		as above.	14"	SPT		27
01	107.7			1	54		30
0.4						4	
	3		Silty CLAY: light gray with red, yellow and purple spots; hard;		Us to		31
	=		dry; with trace very fine sand in laminations.	18"	SPT 55		22
	-				00		25
	-		Silty CLAY: light gray, brown	-			9
	3		and red with some yellow areas;				16
	3		as SPT 55 above.	18"	SPT 56		24
	1						27
	3		Silty CLAY; light gray,				12
	=		yellow-brown, and redish; as SPT 55 above; without sand.	43.0	SPT		26
	3		3,10,000	14"	57		34
	=						
	1		Silty CLAY; light gray and brown; as above SPT 57.				17
	=		brown, as above SPT 57.	15"	SPT		29
	3			10	58		42
				-			
	=		As SPT 58; with a few black spots in brown clay.				15
İ	-		37-27-37-37-37-37-37-37-37-37-37-37-37-37-37	15"	SPT 59		35
2.4	117.7			- 1			42
	-		CLAY; brown with a few gray,				19
	1		black and yellowish spots; hard; dry; low plasticity; with trace		SPT		26
	-		sparkles (mica?).	10"	60	[1]	38
	1						
			CLAY; dark red-brownish gray				9
- }			with a few black organic spots; hard; dry; low plasticity; with	17"	SPT		26
	=		trace sparkles (mica?).	1 "	61		31
	_						
	-		As SPT 61			pH = 6.2	12
	-1			19%	SPT 62		27
	E				50		35
	-		As SPT 61			Brown-black spots of	10
	1		The man was	-	SPT	decomplsed wood also have	25
	-6			15"	63	white sand-sized hard grains.	40
	=					Driller said began to chatter as drilling to 126'.	
	-		As SPT 61; with trace sand to			Lots of difficulty drilling to	100/5"
	-		fine gravel-sized pieces of gray hardpan.	3	SPT	128', bit chattering ~ 126.3'-127.3',	
	=			5"	64	ireia Sictio	
2.4 1	27.7						
		11.14	EDITIONS ARE OBSOLETE. PROJECT			(continued)	

ROJECT			(Cont. Sheet)		ALLATIC	M	.30 Ft.	OF 8
Pear	ce Cree	K		Р	HILADE	LPHI	A DISTRICT	
LEV.	DEPTH	0	CLASSIFICATION OF	MATERIALS	CORE	wice		
		EGEND	(Descriptio		CORE	SAMPLE	REMARKS (if significant)	OWS/ Bin.
-		Ë			%	SA	(if significant)	B 0
80.7	128.0	11111						
	3		Silty CLAY; dark purpl brown-gray with trace	e whitish			Large piece of hardpan near top of spoon.	15
	=		hardpan up to trace of	gravel	15"	SPT	pH = 6.1	31
	3		size,		(534	65	end of day 11/28/95	39
	3		No sample.				No sample - hardpan	
	1						129.5'-131.5'	
	1							
	=							
	1		Silty CLAY; dark purpli	sh				15
	1 3		gray-brown; hard; dry occasional hard spots	of tan	14"	SPT		23
	=		and more occasional s blue-black; with trace	pots of sparkles	144	66		35
	=		(mica?).	7.0154				
	=		As SPT 66.					27
	3				8"	SPT		100/5"
	3				8	67		
	=							
	3		Silty CLAY; dark choco	plate				19
	=		brown with hard tan ar spots; as SPT 66.	nd gray		SPT		30
- 1	3				13	68		43
	7							
	3		As SPT 66 above.					14
	1					SPT		22
	3				17"	69		30
	#				1 1			_
	3		Silty CLAY; dark and li	aht				100/5"
	#		gray-brown lamination with trace fine sand-s	s; hard;		SPT		
1	3		material in light gray laminations.	1200	4"	70	More hardpan as drilling to	
- 1	#		laminations.		1 - 1		142.	
	-		As SPT 70, increasing	gray				19
	#		laminations.	~ ~ ~	100	SPT		23
	=				18"	71		25
- 1	3							
	1		As SPT 71.					- 0
	3		- C. S. 1 1 1 1			SPT		21
	-				17"	72		23
	3							
	1		As SPT 71.					15
	3					CCT		19
	7				10"	SPT 73	More hardpan as drilling to	25
	1						148'.	20
	1	11/1					Market and Carles and Carles and Carles	
	1						Hardpan to -149' depth. No sample.	
	7							
	3							
_	_ +	11/4_				_		
	4070 000	WYOU E	EDITIONS ARE OBSOLETE.	PROJECT			(continued) HOLE NU	

Pear	rce Creek		HILADE	N	A DISTRICT	OF 8
LEV.	DEPTH HT930	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE	REMARKS (if significant)	BLOWS/ 6in.
02.7	150.0					1 41
	1 3///	As SPT 71.		2.1		tr_
			18"	SPT 74		50
						25
		As SPT 70, fewer gray		- 1	Chemical sample	12
	3///	laminations.	14"	SPT 75	CSW-5-152'-153.5' taken @ 14;40	24
06.2	153.5	Classifications listed above are		, ,		28
	I martini matemparati matempar	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.	

Hole No.CSW-6 DRILLING LOG INSTALLATION NORTH ATLANTIC DIVISION PHILADELPHIA DISTRICT 10. SIZE AND TYPE OF BIT 6 inch side discharge drag bit Pearce Creek 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) LOCATION (Coordinates or Station) 1597948.77 E, 642535.94 N NAVD 88 MANUFACTURER'S DESIGNATION OF DRILL 3. DRILLING AGENCY Failing 1500

13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN UNI-TECH DRILLING CO., INC. 4. HOLE NO. (As shown on drawing title and file number) disturbed: 2 undisturbed: O attempted CSW-6 5. NAME OF DRILLER 14. TOTAL NUMBER OF CORE BOXES O Joseph Jester 15, ELEVATION GROUND WATER B. DIRECTION OF HOLE 16. DATE HOLE STARTED COMPLETED 01/04/96 01/04/96 ✓ VERTICAL ☐ INCLINED 17. ELEVATION TOP OF HOLE 36.23 Ft. 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 8. DEPTH DRILLED INTO ROCK 19. SIGNATURE OF INSPECTOR 9. TOTAL DEPTH OF HOLE 22 Ft. Lusheng Yan CLASSIFICATION OF MATERIALS ELEV. DEPTH 早 ша CORE SAMPL EGE (Description) REMARKS OWS/ 6in. REC (if significant) % 田 36.2 0 'n 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. -12 18.0 -18 (continued) ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT

Pearce Creek

HOLE NUMBER

	e Creek	D		N		
ELEV. D			HILADE	LPHI	A DISTRICT	
	DEPTH GEEN	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE	REMARKS (if significant)	OWS/ 6in.
18.2	18.0		-	ωZ		8
17.7	18.5	Top 6"; SAND; white; wet;				4
		w/some gravel Middle 12"; CLAY; black; soft; wet; w/white shells	21"	SPT		5
16.7	19.5	Bottom 3": SAND: black: coarse	21	1		12
	3////	grained; w/some gravel				14
1	∃####	SAND; black; loose; coarse grained; wet; w/some gravel				7
	4	graves, well wysome graver	10"	SPT		9
-5-2	3			2		15
14.2 2	22.0	Classifications listed above are			End of boring at 22', Installed 2" diameter	15
	de la contrate de la	classification procedures and ASTM D 2488-90 Visual Manual Classification; not on Laboratory Analyses.			piezometer on 1/4/96. One foot screened interval placed at 21'-22' depth.	

Hole No.CSW-7 DIVISION INSTALLATION DRILLING LOG NORTH ATLANTIC DIVISION PHILADELPHIA DISTRICT 10. SIZE AND TYPE OF BIT 4-3/4" side-discharge trivane Pearce Creek 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) LOCATION (Coordinates or Station) NAVD 88 1596466.66 E, 643972.77 N 12. MANUFACTURER'S DESIGNATION OF DRILL 3. DRILLING AGENC Failing 1500 UNI-TECH DRILLING CO., INC. 13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN 4. HOLE NO. (As shown on drawing title disturbed: 51 undisturbed: 3 att. 2 accepted CSW-7 5. NAME OF DRILLER 14. TOTAL NUMBER OF CORE BOXES O Joseph Jester 15. ELEVATION GROUND WATER B. DIRECTION OF HOLE 16. DATE HOLE STARTED 12/14/95 12/15/95 VERTICAL ☐ INCLINED 17. ELEVATION TOP OF HOLE 8.12 Ft. 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING B. DEPTH DRILLED INTO ROCK 19. SIGNATURE OF INSPECTOR 9. TOTAL DEPTH OF HOLE 106.6 Ft. S.M. Cook ELEV. DEPTH SAMPLE 무 CLASSIFICATION OF MATERIALS CORE EGEN REMARKS OWS/ Bin. (Description) REC (If significant) 9/ 8.1 O. ö SAND; brown-orange; medium 5 Unless otherwise noted, SPT grained; poorly graded; with samples taken according to trace roots; trace silt; trace gray clay in one ball; moist-wet; 8 SPT 16" **ASTM 1586** Using bentonite mud, 10 medium dense. "QuickGel" by Baroid. Chemical sample CSW-7-1'-2' 10 taken @ SAND; brown; medium grained; poorly graded; wet; trace silt; 7 Chemical sample CSW-7-2'-3' medium dense. 11 SPI taken @ 11:17 9" 11 4.0 12 SILT; brown; soft; wet; with 3 Chemical sample trace sand. CSW-7-4'-5' taken @ 11:21 Mud on outside of spoon is 2 SPT 6" 3 red (dredge fill clay) 2 2 SILT; as above; then 2 7.0 7 SPT 22" At 7 foot grades into SAND; 4 8 brown; medium dense; medium to fine grained; well graded; wet; with some rounded gravel. 8 Not enough for chemical 4 No recovery. sample. SPT 5 Quartz gravel stuck in tip. 0" 5 7 8 -10 SAND; as above SPT 5 base; Chemical sample CSW-7-10'-11' taken @ 11:38 2 large gravel pieces in tip. 6 trace mica. 7 SPT 12" 6 g 11 12 SAND; brown; medium dense; 8 medium grained; moderately well graded; subangular; with some 8 SPT 13" coarse sand; trace gravel; 10 quartz; wet. 12 SAND; same as SPT 7 Chemical sample 9 CSW-7-14'-15' taken @ 11:48 12 SPT 11" 8 15 16.0 -7.9 19 16 Sandy GRAVEL; brown; well Larger gravel pieces in 11 graded; with trace ; trace slough. 15 SPT 5" 9 17

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE, MAR 71

PROJECT Pearce Creek (continued)

CSW-7

19

18

ROJECT	ce Cree		1 74 74	HILADI	NC	2 Ft. A DISTRICT	OF 6
				TEAD		A DISTRICT	
LEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE	REMARKS (if significant)	BLOWS/ Bin.
-9.9	18.0_	o.,,,,,,,,,				Market Market Control	Ш
	3	00.00	Gravelly SAND; brown; medium dense.				15
	4	0,000	delise.	7	SPT		15
	3	00.00			10		19
		00.00					20
	3	00.00	Piece of gravel stuck in tip.			Recovery too low for chemical sample. Circulating	15
	-	0.000		P2:	SPT	hard to clean out gravel.	21
	4	00.00					30
	=	00.00	Account to the state of the sta	-			25
	1	00.00	Gravelly SAND; brown and gray; as SPT IO; with trace silt.			Recovery too low for chemical sample.	12
	=	00.00		4"	SPT 12		15
15.0	340 =	00.00			Ne.		23
	24.0	nnn	Top 6 inches Silty SAND; fine				29
10.4	24.0		grading to SILT; brown-gray; stiff; with			Chemical sample	6
	-		some sand; trace mica; trace	14"	U-X	CSW-7-24'-26' taken @ 12:20 -	6
	/ 3		wood; trace coarse sand.			-	7
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.	
			Organic CLAY; brownish gray w/occ. black spots; hard; not			-	16
	1		dilatant; low plasticity; with	22"	SPT	1	21
	1		trace sand and gravel; trace organics; moist,		14		27
	-					12	34
	7		CLAY; as SPT 14; not quite as moist.				10
- 1	-1			14"	SPT 15	1 -	12
- 1	#				10	-	18
			CLAY; as SPT 14; with less				23
	1		gravel.			Sample cut down middle by a piece of gravel driven in tip.	13
	7			24"	SPT 16		17
	1				-	-	21
	E		CLAY; as SPT 14; with less			-	10
	1		gravel.		SPT	-	15
	-			18"	17	-	21
	· ·				-		25
			CLAY; brown-gray; very stiff;			[1]	9
	1		not dilatant; low to moderate plasticity; with trace sand;	20"	SPT	_	15
	1		trace mica; trace organics.	20	18		15
	-						20
			CLAY; as SPT 18.				10
	3			16"	SPT	Sample cut by gravel; looks	19
- 1	=			10.	19	like twisted ribbon; unable to clean all bentonite mud off.	27
		////					25
EOPH	1838 005	VIOUS :	EDITIONS ARE OBSOLETE. PROJECT			(continued) HOLE NUMB	

JECT				TALLATIO	N	2 Ft.	OF
ear	ce Cree	· K	F	HILADE	LPH!	IA DISTRICT	
EV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE	REMARKS (If significant)	BLOWS/ 6in.
31.9	40.0	ımı					1 00
			CLAY; as SPT 18 above,		100	Piece of rounded gravel in tip.	12
	=			24"	SPT	tip.	19
	] 3			111-0	20		23
	=		August a supposition of			-	21
			CLAY; as SPT 18 above.				11
	1 2			24"	SPT 21		15
	3				-		17
	_		CLAY; as above; with shell			Drove @ 14:56 @ 100 psi.	19
			decomposed in top; fine gravel-sized orange piece of cemented sand-sized grains.	24"	U-1	Retrieved 24" @ 15:15 Took jar sample of top I"	
	- 3						
	-		CLAY; gray; as above; no sand.				7
	=		3-27, 2-27, 2-27, 10-22,	100	SPT		9
	3			24"	22		12
	-						15
	1		CLAY; gray; as above; no sand.				12
	3			24"	SPT		12
	3			-	23		17.
							19
	3		CLAY; gray with occasional black spots; as SPT 18 above;				12
	-		trace sand-sized grains in orange spots; moist.	24"	SPT 24		13
	=		or or go oporto, moiot,				13
	-		CLAY; as SPT 24.				17
	3		55.1, 63 51 1 24,	The I	SPT		9
	3			24"	25		9
	-						12
	=		CLAY; as SPT 24.				8
	=			24"	SPT		9
	=			24	26		- 11
	7						- 11
	1		CLAY; as SPT 24; slightly moister.				10
	-			24"	SPT		13
	=				27		13
	-		OLAVI SI POST E LIST SISTE			Augusta and a second	15
	-		CLAY; as SPT 24; moister.			Chemical sample CSW-7-58'-60' taken @	12
	-			24"	SPT 28	16:32 on 12/14/95.	21
	1				-		25
	-		CLAY; brown-gray with			Easily able to push in thumb	8
	1		occasional black spots; firm;		CD-	t"	10
	-		plastic; moist.	24"	SPT 29		10
	1						13
		-	EDITIONS ARE OBSOLETE. PROJECT			(continued)	

ROJECT				ALLATI	ON	2 Ft.	OF 6
rear	CE CLEE	riv.	P	HILAD	ELPH]	A DISTRICT	
LEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	COR REC %		REMARKS (if significant)	BLOWS/ 6in.
-53.9	62.0						1 0
	1		CLAY; as SPT 29 above.				8
	3			20"	SPT		8
	i i			20	30		10
	_			-			12
	=		CLAY; as SPT 29 above.				7
	3			18"	SPT		7
	3			10	31		8
							9
	3		CLAY: as SPT 29; firm; very moist.	4			9
	- 4		moisti	17"	SPT		12
	3				32		14
							18
	3		Organic CLAY; light brown; as SPT 29; grading more woody;			Chemical sample of peat, CSW-7-69.5'-70' taken @	5
	4		then; Base 4 inches peat; brown	24"	SPT	08:55 on 12/15/95. Peat pH	11
-61.5	69.6		turning black with air exposure;		33	in water = 8.45 after 12 minutes.	17
-61.9	70.0		dry.			@ 15 minutes = 8,01 @ 35 minutes = 7.0	19
	3		Sandy SILT; gray-green; medium dense; with some clay as	1		@ I hour = 7.0 Parts of SPT 34 are runny in	10
			in SPT 33; grading to 4 inches peat in tip.	24"	U-2	spoon.	13
-63.5				1			17
-63.9	72.0	999	FERENCE CONTRACTOR			Later and the state of the stat	20
			PEAT and tan-white SAND; medium grained.	20"	SPT 34	Drove tube @ 9:08 @ 100 psi Recovered 20" @ 9:23	
-65.9	74.0		CTI To BEEN BOOK OF THE CONTROL OF THE			L. E. C. T. S. C. C.	
	= =		SILT; light brown-white; medium dense; very moist; with some			Parts of sample are runny	8
	=		peat/ wood; some sand; with trace mica; some clay (gray	13"	SPT 35		14
	=		and brown).				20
67.9	76.0		Silty SAND; gray; very dense;	-		Cit (Clay is al /gi) landantian	15
	3		medium grained; poorly graded;		222	Silt/Clay in <1/2" laminations	23
69.4	77.5		some clay near top,	12"	SPT 36		35
09.4	11.5	<i>m</i>					45
70.2	78.3		Top 4 inches CLAY; brown and			One large rounded piece of	47
	3	1	gray with some gravel; then;		COT	gravel in top clay.	100/4
			SAND; red, tan, gray, and yellow; very dense; medium grained; poorly graded; top I inch is read weakly cemented, with trace silt.	10"	SPT 37		
		h	SAND; brown with yellowish			Changed to downhole	37
	3		laminations; very dense; medium grained; poorly graded.	7"	SPT 38	hammer; reamed to 80'w/open-end 6" trivane bit. Blows below not valid for	50/2"
						comparison with standard N values.	
			SAND			One yellow cemented piece	41
	=			0"	SPT 39	of sand in spoon, 3/4" size	100/6
75.9	84 0			100	50		
10.0	37.0	-			_	(continued)	

Hole No.CSW-7 ELEVATION TOP OF HOLE DRILLING LOG (Cont. Sheet) 8.12 Ft. INSTALLATION Pearce Creek PHILADELPHIA DISTRICT ELEV. DEPTH EGEND CLASSIFICATION OF MATERIALS SAMPLE CORE REMARKS (if significant) (Description) OWS Bin. REC % 점 -75.9 84.0 -84 Silty SAND; orange-yellow and brown; very dense; medium Chemical sample 30 CSW-7-84'-85' taken @ 11:23 grained; poorly graded; with trace white clay in one 3/4 inch 59 SPT 10" 40 85.5 50/1 spot, silt lens. -86 SAND; yellow, red, black, white, 1" gray Sand/Silt 2" yellow 27 and gray; very dense; fine to medium grained; with some white t" cemented black 100/5 SPT 11" I" white Clay clay; some moderately cemented 41 -79.4 B7.5 black and red areas; some 1-2" white Sand yellow-orange silt. yellow w/red BE Silty SAND: tan, orange-yellow; Interlayered 1/4"-1/2" 15 very dense; medium to fine laminations of tan clean Sand; yellow Silty Sand; white Clay; white Silty Sand. SPT 41 Soil (yellow Silty grained; poorly graded; with some white clay/silt; trace 35 SPT 14" 42 41 gravel. Sand) pH in water: @ 1 min.= 6.5 @ 2 min.= 6.2 - 90 Silty SAND; as above in SPT 42: with 5 inch coarse sand; then 12 @ 10 min.= 5.5 26 SPT 18" Silty SAND; orange-yellow, red, 43 4" yellow-orange Silty Sand 3/4" red Silty Sand 3" white Silty Sand 4" pink/white Silt/Clay -83.4 91.5 39 white; then CLAY; pink; hard; not dilatant; -83.9 92.0 very slightly moist. -92 12 Sandy SILT; white; dense; sand is very fine to fine grained; with some clay; interlayered <1 inch 22 SPT 18" lenses; grading to 4 inches red and white silty clay in base; 44 37 variegated. 94 Silty SAND; white; very dense; very fine-fine grained; poorly graded; with trace clay and Sandy areas are wet. 12 SPT 30 7" 45 gravel near top. 47 96 Sandy SILT; white with trace pink; very dense; with some Interlayered area w/more Clay/Silt are <1" thick clay. 28 SPT 16" 46 35 -89.6 97.7 98 Silty CLAY; white; hard; not dilatant; very slightly moist; plastic; with trace sand. 2" fine-medium sand lens @ 17 2"-4" above base 33 SPT 11" 47 -91.4 99.5 48 101 Silty SAND; white; very dense; Chemical sample CSW-7-100'-101.5' taken @ 15 interbedded in laminations; with 25 some clay. 13:03 from sandler parts of SPT 12" 48 sample. -93.4 101.5 27 Clay is light gray w/trace pink and red. -100 SAND; white-tan; very dense; 37 tine to medium grained; very 51 poorly; graded; clean; quartz; SPT 10" with trace silt in hairline; 49 50/1" laminations. -104 SAND; as SPT 49 above; with 58 trace red-orange clay 50/1" laminations. SPT 6" 50 -101

(continued)

Pear	ce Creek	(Cont. Sheet)	INSTALLATIO	V	2 Ft. A DISTRICT	OF 6
			11111101	21.1127	DISTRICT	
LEV.	DEPTH Q	CLASSIFICATION OF MATER (Description)	RIALS CORE REC %	SAMPLE	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	50/1"
	and without metricules of the contraction of the co	Classifications listed above a based on BVWS standard classification procedures and ASTM D 2488–90 Visual Mani Classification; not on Laboratory Analyses.	d		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 DIVISION INSTALLATION DRILLING LOG NORTH ATLANTIC DIVISION PHILADELPHIA DISTRICT OF 10. SIZE AND TYPE OF BIT 4-3/4" side-discharge trivane Pearce Creek II. DATUM FOR ELEVATION SHOWN (TBM or MSL) 2. LOCATION (Coordinates or Station) NAVD 88 1596085.38 E, 642953.40 N 12. MANUFACTURER'S DESIGNATION OF DRILL DRILLING AGENCY Failing 1500 13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN UNI-TECH DRILLING CO., INC. 4. HOLE NO. (As shown on drawing title disturbed: 67 undisturbed: O attempted and file number) CSW-B 14. TOTAL NUMBER OF CORE BOXES O 5. NAME OF DRILLER Joseph Jester 15. ELEVATION GROUND WATER B. DIRECTION OF HOLE 16. DATE HOLE STARTED 12/04/95 12/07/95 VERTICAL INCLINED 17. ELEVATION TOP OF HOLE 25.38 Ft. 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 8. DEPTH DRILLED INTO ROCK 19. SIGNATURE OF INSPECTOR 9. TOTAL DEPTH OF HOLE 133.5 Ft. S.M. Cook ELEV. DEPTH 9 CLASSIFICATION OF MATERIALS CORE SAMPLE REMARKS EGE (Description) REC % (if significant) 쩌 25.4 0. Sandy SILT; brown; loose; sand is fine to medium grained; 3 Unless otherwise noted, SPT samples taken according to 4 slightly moist. SPT 11" **ASTM 1586** Using bentonite mud, 6 "QuickGel" by Baroid, 8 Chemical sample CSW-8-0'-1' taken @ 08:24 Silty SAND; orange-brown; 8 medium dense; medium grained; Chemical sample CSW-8-2'-3' taken @ 08:30 Extra volume for QA 12 dry; quartz; subrounded; poorly SPT 7" graded. 2 12 duplicate taken. 21.4 4.0 16 Chemical sample CSW-8-4'-5' taken @ 08:36 SAND: orange-brown; dense; 17 medium grained; poorly graded; quartz; subrounded; dry; with 19 SPT 5" trace silt. 3 24 25 SAND; tan; very dense; medium 18 grained; poorly graded; dry; 24 with traced fine sand. SPT 1411 4 28 8 SAND; tan; medium dense; Chemical sample CSW-8-8'-10' taken @ 09:02 8 medium grained; poorly graded; 8 slightly maist; with some fine SPT 17" sand; trace silt in lenses; trace 9 black organic spots. 10 10 SAND; tan; mediume dense; 7 medium to coarse grained; 8 moderately well graded; with trace fine sand and silt in SPT ti 6 B lenses; wet. R 12 SAND; orange-brown; loose; 4 coarse grained; moderately well graded; as SPT 6. 4 SPT 12" 3 3 11.4 14.0 -14 4 7 Inches SILT; black; loose; Chemical sample 10.8 CSW-8-14'-14.5' taken @ moist; with trace sand; then 5 SPT 09:22 CLAY; tan; stiff; moderately 18" 8 plastic; wet; with trace mica, 5 6 9.4 16.0 -18 Clayey SILT; tan; medium dense; 3 with some fine sand; trace

18.0

mica.

8

10

10

-18

SPT

9

(continued)

19"

Hole No.CSW-8 ELEVATION TOP OF HOLE DRILLING LOG (Cont. Sheet) 25.38 Ft. PROJECT INSTALLATION Pearce Creek PHILADELPHIA DISTRICT ELEV. DEPTH EGEND CLASSIFICATION OF MATERIALS SAMPLE CORE REMARKS OWS/ Bin. (Description) REC (If significant) 7.4 18.0 -18 SAND; tan and yellowisk; medium dense; fine grained; with trace Chemical sample 8 CSW-8-18'-20' taken @ silt in lenses; wet. SPT 10 13" 10 10 12 -20 SAND; light brown; loose; 3 fine-medium grained; with some SPT 4 13" 11 4 34 22.0 d -22 Silty SAND; light brown; loose; 2 fine grained; poorly graded; subrounded; quartz; wet. 2 SPT 20" 12 2 2 -28 Silty SAND; light and dark brown; loose; fine-medium 3 grained; wet; poorly graded. 2 SPT 20 Base 5 inches SILT; dark 2 brown-black; with wood. 26.0 2 Organic SILT; brown and black; 3 medium dense; Top 5 inches light brown clayey; wet; then; 3 inches as Base of SPT 13; -1.4 26.8 5 SPT 14 7 <1 inch SAND; white; with trace 8 fine gravel. 28 Soil pH in water = 7.95 18 SAND; tan and bright orange; medium dense; medium grained; poorly graded; with some orange silt in lenses. 19 SPT 18" 15 5 33 30 SAND; tan; dense; medium 15 grained; moderately well graded; with some silt; trace quartz fine 19 SPT 16" gravel. 16 21 -6.6 32.0 24 Gravelly SAND; tan with orange-red silty laminations; medium grained; well graded; Silt - 10% by volume in 17 settling jar. SPT 21 Gravel maximum axis is 1". 10" with trace silt. Gravel is rounded quartz. 27 32 34 Gravelly SAND; orange-yellow: 17 dense; well graded; with some 18 SPT 14" 18 18 21 -36 Top 6 inches as SPT 18; then; SAND; tan and orange; dense; -11.1 36.5 12 15 fine grained; poorly graded; with SPT 11" trace silt 19 18 20 -38 SAND; tan, light gray, and 13 orange; dense; fine and medium grained; (finer near top); with some silt in fine grained areas. 15 SPT 16" 20 15 17 -40

ENG FORM 1838 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek

CSW-8

(continued)

POJECT			G (Cont. Sheet)	ALLATIO		.38 Ft.	OF 7
Pear	ce Cree	k	P	HILADE	ELPHI	A DISTRICT	
LEV.	DEPTH	0	CLASSIFICATION OF MATERIALS	CORE	wa.		
-	100	LEGEND	(Description)	REC		REMARKS (if significant)	OWS/ 6in.
		프		%	SS	W Significants	BLC
-14.6	40.0	155153		-			-
	2		SAND; tan and orange; medium dense; medium grained; poorly	1		Base 5" orange	11
	3		graded; with trace orange silt in base.	11"	SPT 21		12
	1				-		15
	1		CAMP.			-	25
	1		SAND; tan and orange; very dense; fine and medium grained;		-4	1	18
	1		poorly graded; with trace silt.	13"	SPT 22		45
	=						100/3
	-						_
	=		SAND; tan; very dense; medium grained; poorly graded; with	1	77.1		28
	=		trace light orange silt in laminations.	16"	SPT 23		34
	3		Jammatians.	-	23		45
	=						60
	=		SAND; as SPT 23 above in top 6 inches:	-			12
	7		Base 4" grading finer sand and	10"	SPT		20
	3		some orange silt.	1102	24		32
	1 4						49
	=		SAND; orange with some tan near base; very dense; medium			Chemical sample CSW-8-48'-50' taken ©	25
	=		grained; poorly graded; with	20"	SPT	12:08	34
	3		some orange silt,	1	25		40
24.6	50.0						44
	=		Clayey SAND; tan, orange, and			gray Clay, Clayey Sand	17
	3		light gray; dense; fine to medium grained; poorly graded; with	22"	SPT	interlayered w/orange Sand, Silty Sand.	19
	=		some silt,		26		20
26.6	52.0			1			24
27.1	52.5	ШШ	Top 6 inches Silty SAND; tan,		7		19
	3		orange and light gray; then CLAY; light gray; hard; plastic;	14"	SPT		25
	1		with trace silt and sand in orange spots.	14	27		31
28.6	54.0						40
	=		Silty SAND; gray and orange;			orange laminations	25
	3		dense; fine grained; poorly graded; with some gray clay.	17"	SPT	Clay mostly in one 3" lens	23
				14.	28		19
	=						19
	-		As SPT 28 above; with more				15
	=		gray silt and clay	13"	SPT		18
	3			13	29		25
	4				-		32
	3		Sandy SILT; white-light gray				15
	=		with orange laminations; dense; sand is very fine to fine		SPT		25
	3		grained; moist-wet; with trace	17"	30		25
	3		mīca; some gray clay				32
	7		As SPT 30.				- 11
	3		Activity of the		COT		17
	=			14"	SPT 31		12
_	=				1		
11	7	111111		1			35

OJECT			(Cont. Sheet)	100000000000000000000000000000000000000	ALLATIO	N	38 Ft.	OF 7
Pear	ce Cree	K		PI	HILADE	LPHI	A DISTRICT	
LEV.	DEPTH	LEGEND	CLASSIFICATION OF (Description		CORE REC %	SAMPLE	REMARKS (If significant)	BL OWS/ 6in.
36.6	62.0	.)11111						
374	62.8		As SPT 30 above; with gray CLAY in middle.	6 Inches			gray Clay has orange Silty Sand spots	- 11
37.8			SAND; tan; medium gra	ined; in tip	14"	SPT 32		20
	1					52		100/6
	=		SAND; tan with some li	abt		-		60
	3		orange areas; very de	nse;		SPT		100/5
20.0	3		medium grained; poorly with trace gray silty s		10"	33		
40.2	65.6	ШШ	orange silt.					
	3		Silty SAND; tan and or					23
	=		some light gray; fine g poorly graded; with so		15"	SPT		38
	3		clay in lenses.		15"	34		67
42.6	68.0							70
-	=		SAND; tan with orange		1			23
	3		laminations; very dense grained; poorly graded		13"	SPT		57
	3		some silt.			35		100/5
	3							
	3		SAND; tan and light or very dense; fine grains	ange;				37
1	=		graded; with some silt.		18"	SPT 36		57
	1					50		57
	-		211.2 1 202 12 0 17			_		38
	1		SAND; as SPT 36; with mediume grained sand.			25.4		100/3
	1 =				14"	SPT 37		100/5
	1 3				6.7			
			SAND; orange with gra	v siltv				100/6
	3		blobs; very dense; med grained; poorly graded	lium -	500	SPT		
	=		some orange silt.		6"	38		
	=					-		
	3		SAND; tan-orange; ver					100/6"
	3		medium grained; poorly with trace silt.	graded;	6"	SPT		
	1					39		
52.6	78.0	1111111		3				
534	78.7		Silty SAND; yellow-ora dense; fine grained; po			-	Changed to downhole hammer: reamed to	21
20.7		/80 (A)	graded.	40.4	13"	SPT 40	78'w/open-end 6" trivane bit and large rods. Blows below	23
	3						78' not valid for comparison with standard N values.	29
			CAND	What was			Soil pH in water:	21
	=		SAND; yellow-orange whitish lenses; coarse	graded;			@ 1 min.= 4.8 @ 15 min.= 5.0	78
	1		with trace yellow-oran trace medium-fine san		10"	SPT 41	Settling volume @ 15 min.~50% silt	50/2"
	=		white clay.		-			2016
	1	743/45 34/45	SAND; tan; very dense	tine to				100/5
	3	1011AV	medium grained; poorly	graded;		CDT		
	1		with some white-light or orange spots clay; tra	ce mica.	4"	SPT 42		
586	84.0							
00.0	04.0	-			-		(continued)	

		OG (Cont. Sheet)	INSTALLATIO		.38 Ft.	OF 7
Pearc	ce Creek				A DISTRICT	
	T-OUN S					
LEV.	DEPTH S	CLASSIFICATION OF MATERIA (Description)	LS CORE		(if significant)	BLOWS/ 6in.
58.6	84.0					
		SAND; yellow; very dense;	A. In	SPT 43	Low recovery SAND and CLAY separate	100/4
50.6	88.0	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 SPI	12"	SPT 48		21 27
72.4	97.7	A7), SAND; orange; very dense; medium grained; well graded; with some silt,	12"	SPT 49	cream-colored laminations of Silt	15 51 45
		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	37 47 59
6.4	01.7	As SPT 50; more medium grained; much less dark brown laminations; lighter color (tan-orange).	9"	SPT 51	Silt in laminations, trace reddish color near tip	15 27 35
		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
79.6 10		g light orange to dark orange-brown; clay is light gray	<b>∀</b> 7"	SPT 53	Clay mainly in 3" lens	45

Pears	e Creek		INSTALLATI	ON	.38 Ft,	OF I
Pearc	e Creek		PHILAD	ELPHI	IA DISTRICT	
LEV.	DEPTH S	CLASSIFICATION OF MATERIA	LS COR	Е ШОС		
	DEPTH S	(Description)	REC		REMARKS (if significant)	OWS,
			%	SS	, , , significant	BLO
80.6	06.0					
	3	SILT; white to light gray with some yellow-orange, brown and	1	-	medium grained sand, silt, and 1/4" x 3/4" rust colored	12
-81.6	07.0	ice red; very dense; with some sand; sand is mostly fine-very	9"	SPT	cemented Sand nodule in	17
	3000	fine grained; with trace clay.		54	tip. d=110.2 ~3/4" spot of light gray Silt @ top. Darder	24
	-311111				orange-brown in the Sand just below this.	
	3111111	Silty SAND; tan and orange; very dense; fine to medium			7-27 2-37-37 371-31	49
83.6	09.0	grained; poorly graded; with	6"	SPT		50/1,5
	1/8/8	lens of tan silt.		55		
	_ <del>_</del>					
- 1	=////	SAND; tan and orange; very				33
	4/8/3/	dense; medium grained; poorly graded; with some silt.	8"	SPT		47
	1000	P. New T. Street, Street, Land	8"	56		50/2"
	7//5/1			74		
		SAND; tan; very dense; medium			occasional white grains 116,2	49
	44344	grained; poorly graded; quartz; subrounded; with trace beige		SPT	Low recovery 118,2 Silt near top 120,2 ~5% Silt by settling	50/2"
	3	silt in some areas of the sand.	3"	57	volume 122.2 Soil pH in water	
					= 6,3 @ 5 min, occasional white grains	
	7	SAND; as SPT 57 above.				59
1	3/2/20	SECOND SECOND		SPT		50/("
	7/4/2		5"	58		
90.6	E 0.00					
90.0		SILT: white: with some sand			1	39
010		mostly cemented into dark rust				50/1"
-91.6	117.0	colored nodules,	1.5"	SPT 59		9071
	<b>1</b> 0000					
		CAMP AND THE STATE OF STATE		-		30
	#200	SAND; orange-tan; as SPT 57; without beige siltier areas; some	9	3.4		
	-3000	white silt in one lens; with dark rust-colored sand nodules.	5"	SPT 60		50/2"
	± (3.4)	1321 2310123 20114 11530.24				
- 1		Live de la companya d	-			
	3	SAND: orange-brown; very dense; medium to coarse		- 11		27
1	4.0	grained; with trace silt.	5"	SPT 61		39
	3000			01		50/1"
	- 4000					
	7	SAND; orange; as SPT 61; quartz; subangular,		3.1		30
	133434	quality, suballyular,	9"	SPT		41
	1000		2	62	-	58
	=	SAND; greenish-yellow and tan:			One black laminationand one	15
	3000	very dense; medium to coarse grained; poorly graded; with	10"	SPT	red Silt lamination Silt <10% by settling volume	25
		trace silt; some fine sand.	10	63		39
	1696					
	3	SAND: orange with trace black,				33
	300	white and red spots; as SPT		SPT		50
		63,	9"	64		50/1"
	3 (3)					
	13:76			-	(continued)	

CLASSIFICATION OF MATERIALS CORE REC ST (if significant)  SAND; tan; very dense; medium to coarse grained; subangular; quartz; with trace feldspar; with some fine sand; trace silt.  Silty CLAY; light gray and pinkish brown; low plasticity; moist; with trace sand.  Clayey SILT; variegated light gray and dark hills spots; low dilatancy:  Clayey SILT; variegated light gray and dark hills spots; low dilatancy:  SPT 66	ROJECT	ce Creek		(Cont. Sheet)		ALLATIO	N	38 Ft.	OF 7
SAND; tan; very dense; medium to coarse grained; subangular; quartz; with trace feldspar; with some fine sand; trace silt.  Silty CLAY; light gray and pinkish brown; low plasticity; moist; with trace sand.  Clayey SILT; variegated light gray and dark blue spots; low dilatancy; some parts low plasticity; with some lenses with very fine sand.  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488–90 Visual Manual Classification; not on	1 601	ce creer				HILADE	LPHI	A DISTRICT	
SAND; tan; very dense; medium to coarse grained; subangular; quartz; with trace feldspar; with some fine sand; trace silt.  Silty CLAY; light gray and pinkish brown; low plasticity; moist; with trace sand.  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.  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488–90 Visual Manual Classification; not on	LEV.	DEPTH	LEGEND			REC	SAMPLE		BLOWS/ 6in.
to coarse grained; subangular; quartz; with trace feldspar; with some fine sand; trace silt.    104.6   130.0   Silty CLAY; light gray and pinkish brown; low plasticity; moist; with trace sand.    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.    Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on	102.6	128.0	77.71		ء تداند سر		1 -54		
Silty CLAY; light gray and pinkish brown; low plasticity; moist; with trace sand.  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.  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on		1		SAND; tan; very dense to coarse grained; su	e; medium				21
Silty CLAY; light gray and pinkish brown; low plasticity; moist; with trace sand.  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.  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on		=		quartz; with trace feld	dspar; with	9"		medale,	43
Silty CLAY; light gray and pinkish brown; low plasticity; moist; with trace sand.  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.  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on		1					00		60
pinkish brown; low plasticity; moist; with trace sand.  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.  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on	04.0	-	1111	Silty CLAY: light gray	and	-			20
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.  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on		主		pinkish brown; low plas	sticity:		COT		39
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.  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on		1		moist, with trace sand		8"			50/3"
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.  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on		1							
pinkish brown and occasional dark blue spots; low dilatancy; some parts low plasticity; with some lenses with very fine sand.  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on		1		Clayey SILT; variegat	ed light				15
some parts low plasticity; with some lenses with very fine sand.  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on		1		pinkish brown and occ	asional	17"	SPT 67		32
Sand.  Classifications listed above are based on BVWS standard classification procedures and ASTM D 2488-90 Visual Manual Classification; not on	108.1	133.5		some parts low plastic	lity; with				44
				Classifications listed a based on BVWS stand classification procedu ASTM D 2488-90 Visu Classification: not on	ard res and			12/6/95.	

Hole No.CSW-9 DRILLING LOG DIVISION INSTALLATION NORTH ATLANTIC DIVISION PHILADELPHIA DISTRICT OF 10. SIZE AND TYPE OF BIT 4-3/4" side-discharge trivane 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) Pearce Creek LOCATION (Coordinates or Station) NAVD 29 1598164 E, 643674 N 12, MANUFACTURER'S DESIGNATION OF DRILL DRILLING AGENC Failing 1500 13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN UNI-TECH DRILLING CO., INC 4. HOLE NO. (As shown on drawing title disturbed: 69 undisturbed: O attempted and file number) CSW-9 14. TOTAL NUMBER OF CORE BOXES O 5. NAME OF DRILLER Joseph Jester 15. ELEVATION GROUND WATER 6. DIRECTION OF HOLE 16. DATE HOLE STARTED COMPLETED 02/19/96 02/21/96 W VERTICAL INCLINED 17. ELEVATION TOP OF HOLE 28.38 Ft. 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING B. DEPTH DRILLED INTO ROCK 19 SIGNATURE OF INSPECTOR 9. TOTAL DEPTH OF HOLE 139 Ft. S.M. Cook EGENO CLASSIFICATION OF MATERIALS CORE DEPTH SAMPLI REMARKS OWS/ (Description) REC (if significant) % 28.4 0. SAND; tan; medium dense; poorly 7 Unless otherwise noted, SPT graded: medium grained: with samples taken according to trace clay. SPT **ASTM 1586** 12" Using bentonite mud, 10 "QuickGel" by Baroid. 8 26.4 2.0 CLAY; yellow with some gray and red; stiff; low plasticity; with SPT 7 some sand. 9" 2 9 12 24.1 Top 4" CLAY; gray-brown with some red; low plasticity; then 8 SAND; tan; dense; medium grained; poorly graded; wet; 11 SPT 13" 3 14 16 B SAND; tan turning black at tip: 6 as above; medium dense; silty at 5 tip; wet. SPT 13 4 6 9 8 Top 4" Silty SAND; black; grading to silt; black soft; wet; non-plastic; trace fine sand; WOH SPT 14" 5 10.0 18.4 Alternating black organic clayey silt and fine silty sand; soft; 0 wet; trace organic material; SPT 20 Base 2" is woody; drier 6 1 as SPT 6; runny in parts; gray WOH and black spotted clay. SPT 24 Sandy SILT; yellow-gray; wet; 1 runny; soft. WOH SPT 8" 8 WOH WOH -18 Silty SAND; yellow-gray; very 1 loose; runny; wet; medium grained; poorly graded O SPT 9 6" Ť 1 (continued)

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Pearce Creek HOLE NUMBER

POJECT		G (Cont. Sheet)	INSTALLATI	ON	.38 Ft.	SHEET 2
Peard	ce Creek		PHILAD	ELPH:	IA DISTRICT	
LEV.	DEPTH 9	CLASSIFICATION OF MATERIAL	LS COR	ـ سرحد		
	DEPTH Q	(Description)	REC %	SAMPLE	REMARKS (if significant)	OWS/
10.4	18.0	7.5	/6	NZ		BLG
30.7	EIIIII	Silty SAND; As SPT 9; dark		+		WOR
	411111	brown with yellow near tip.		SPT		WOK
	311111		9"	10		-
8.4	20.0					
	=#//	SAND; tan; loose; medium			1	2
	3	grained; poorly graded; wet with trace silt; some multicolored	n 8"	SPT		4
	3	clay in top 3"; trace mica.	0	11		5
	3					7
	<b>∃</b>	SAND; brown with occ. orange areas; dense; medium to fine				10
		grained; poorly graded; with	15"	SPT		17
	3	some silty trace mica.		12		18
	- 1000	Carrier and Section 1				18
	10000	SAND; orange; dense; medium grained; poorly graded; with		1	M	18
	- ∃	some slit; trace mica flakes.	15"	SPT 13		22
	₹			10		27
- 1	-	SAND; as SPT 13.	-	-		30
		3ANU, 85 3FT 13.		323		18
	7///		13"	SPT 14		32
	3/3/3/3					30
		SAND; orange to reddish; As				14
	<b>=</b> ₹/\$/\$\frac{1}{2}	SPT 13.	1 32	SPT		15
	3		16"	15		16
- 11)						16
-2.1 3	30.5	Top 6" as above; then			On piece of gravel at	9
		Silty SAND; gray-yellow, medium dense; very fine; trace mica;	20"	SPT	sand/silty sand interface.	9
1	3111111	trace black orange silt spots; trace gravel.	20	16		10
						12
	3111111					10
- 1	-3111111	which are the second of the se	13"	SPT		8
3.40	=	Silty SAND; gray; medium dense; very fine grained; poorly		17		.8
5.6 3	4.0	graded; with trace mica.				8
	3///	Silty CLAY; gray; stiff; with some very fine sand; with trace mica;				7
	-1///	trace wood.	12"	SPT 18		- 6
	3///					7
	3///	As SPT 18; Silty CLAY; with some				4
	3///	very fine sand.		SPT		- 6
	3///		19"	19		6
9.6 3	38.0					8
	1///	CLAY; gray; very stiff; low				10
	3///	plasticity; trace mica; trace sand.	200	SPT		10
	=////		21"	20		12
						10
- 1		EDITIONS ARE OBSOLETE. PROJEC			(continued)	

ROJECT			(Cont. Sheet)	NSTALLATI		3.38 Ft.	OF
Pear	ce Cree	k				IA DISTRICT	
ELEV.	DEPTH		O ACCIETO TION OF WITH	- Luc	1,,,~		1
LEV.	DEFIN	EGEND	CLASSIFICATION OF MATERIALS (Description)	REC	SAMPLE	REMARKS (if significant)	OWS/ 6in.
***	10.0	<u></u>		%	SS		H 0
-11.0	40.0	1111	Top 7" as SPT 21, slightly	-	-	Peat turns black with	10
	1 3		softer; grading brown; then; Clayey PEAT; brown-black;		COT	exposure to air.	- 8
	1 3		moist; grading into woody clay	24"	SPT 21		7
	1		at base.				- 8
	1 7		CLAY; gray-brown; stiff; low			1	8
	3		plasticity; with trace wood; some; trace angular sand-sized	22"	SPT	l.	8
	1		grains,	22	22		7
	_3						8
	3		CLAY; brown; as SPT 22.				6
	-			21"	SPT 23		6
	3				23		6
	1		Albain Committee Committee				- 5
	1		CLAY; brown; as SPT 22.			One orange spot ~ 1/4" wide.	- 5
	-			21"	SPT 24		- 6
-19.6	480				-		7
-19.0	48.0		Silty CLAY; brown with occ.			Turns darker with exposure	8
	3		white or gray sand blobs; as SPT 22.	1112	COT	to air,	6
	=		Sr 1 22.	19"	SPT 25		- 8
-21.6	50.0						- 8
	=		CLAY; brown truning to				22
	3		gray-black with exposure to air; hard; as SPT 22; with some	24"	SPT		25
	=		black areas,	24	26		32
	=						35
	1		CLAY; as SPT 26; with more frequent white spots on inner				1)
	==		surface of sample as broken	23"	SPT		15
	3		apart; no angular grains as before.		27		9
			W. 10. 10. 10. 10.				12
	#		CLAY; as SPT 27	1			- 10
	3			20"	SPT 28		14
	1						9
	-		CLAY; as SPT 27.			Looks like most of sample	12
	1		AND IT WAS WELL BED		SPT	pulled out tip (did not break off - trap bent backwards).	10
	3			4"	29	off - trap bent backwards).	25
	ŧ						18
	=		CLAY; gray and black; as SPT				12
	3		27.	21"	SPT		15
	1			21	30		15
	=					II - 2	18
	Ŧ.		CLAY; as SPT 30,		9.11		10
	3			20"	SPT	1	10
	彭			2.0	31		9
-		11/4_				ے مترحہ سے بحریت را	10
	10.70 005	VIOUS E	DITIONS ARE OBSOLETE PROJECT			(continued)	

PTH ON O	CLASSIFICATION OF MATERIALS (Description)  CLAY; as SPT 31.	CORE REC %	was -	A DISTRICT  REMARKS (if significant)	BLOWS/ 6in.
LEGEN	(Description)  CLAY; as SPT 31.  CLAY; as SPT 31; with more	REC %	SAMPLE		BLOWS/ 6in.
.0	CLAY; as SPT 31; with more	23"			
	CLAY; as SPT 31; with more	23"	1		-
	CLAY; as SPT 31; with more	23"	1		12
	CLAY; as SPT 31; with more		SPT 32		12
	CLAY; as SPT 31; with more		100		17
	CEAT, 03 OF 1 OI, WITH HIGHE				- 5
3//	frequent white shells (trace).		SPT		9
-1///		23"	33		11
-1///					12
3///	CLAY; as SPT 31.				10
3///		24"	SPT		10
1///		24"	34		12
0 1///					10
	Silty SAND; dark gray; very dense; fine grained; with trace	-			14
311111	mica; trace wood.	24"	SPT		17
311111		-	35		20
0 -					20
3///	Silty CLAY; gray and black; firm; low plasticity; low to no			End of day 02/19/96.	3
-3///	dilatancy; with trace wood and trace mica flakes.	21"	SPT 36		4
3///	trace med riakes.		30		- 5
0 1///	At 4 Standard Standard Standard	-			5
-///	CLAY: dark olive green with black; with trace vegetative		3.4		12
-///	matter; trace mica; moderate plasticity; no dilatancy; moist;	24"	SPT 37		12
					15
-///	As SPT 37: with occ. white				3
1///	spots (shell remnants).	10.00	SPT		1
		24"	38		9
1///					9
1///	As SPT 38.				3
1///		24"	SPT		3
1///		24	39		4
-///					3
	As SPT 38; slightly more				3
-///	frequent shell pieces; turning black with green in base 8"	24"	SPT 40		5
			40		8
-1///	2.00				.9
	CLAY; black; as SPT 40,		-,-	Low recovery; appears most of sample pulled out base of	8
-///		5"	SPT 41	spoon.	17
					20
-///	Top 10" as COT 4"		-		25
	PEAT; gray with brown and				13
0	black; dry; light; some shells.	21"	SPT 42		12
19950			-/-		16
1555				(continued)	18
0		black; dry; light; some shells.	Top 12" as SPT 41; PEAT; gray with brown and	Top 12" as SPT 41; PEAT; gray with brown and black; dry; light; some shells.	Top 12" as SPT 41; PEAT; gray with brown and black; dry; light; some shells.

ELEVATION TOP OF HOLE DRILLING LOG (Cont. Sheet) 28.38 Ft. INSTALLATION Pearce Creek PHILADELPHIA DISTRICT ELEV. EGEND DEPTH CLASSIFICATION OF MATERIALS SAMPLE CORE REMARKS (Description) REC (If significant) 1% -55.6 84.0 Drilled to 86' easily no resistance - still in peat or clay. 21" -57.6 86.0 56 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; Photo. 86.7 -58.3SPI 16" 43 -59.6 88.0 trace fine gravel. 88 Interbedded lenses of SAND; PEAT and woody CLAY. As SPT 42 and 43; and brown woody SPT 17" 44 clay, Slough of CLAY to fine gravel; as SPT 44. ~ 2" slough. -62.6 91.0 SPT 0" 45 SAND; light brown to yellow-brown; very dense; coarse grained; poorly graded; SPT 14" with some fine gravel; some 46 medium sand. As SPT 46; SAND. Switched to downhole hammer @ 94'. Sampling through open and trivane 6" bit, large rods. Blow counts not comparable to above. SPT 50 47 Difficulty turning bit @ 94.7. Broken pieces of large -67.6 96.0 quartz rounded gravel in wash as circulating @ 96'. Silty SAND; white; poorly graded; medium grained; soupy in parts; slightly dilatant SPT 14" (rubbery) when manipulated. 48 -69.6 98.0 Silty SAND and CLAY; as SPT 48; with <2" lenses of light gray clay; clay is plastic; moist, 17 21 SPT 15" 49 20 -100 SAND and CLAY; clay as SPT 22 49; sand is medium grained; poorly graded; with some silt. 33 SPT 15" 50 41 100 As SPT 50; clay has trace 25 gravel. 39 SPT 7" 51 70 As SPT 51. 150/6 SPT 5" 52 -106 (continued)

JECT	G (Cont. Sheet)   ELEVATION TOP	ALLATIO		.38 Ft.	DE
Pearce Creek				A DISTRICT	
EV. DEPTH 9	CLASSIFICATION OF MATERIALS	0000	nor		
EV. DEPTH Q	(Description)	CORE		REMARKS (if significant)	WS/
LE LE	1.	%	SA	(if significant)	BLOWS/ Bin.
7.6 106.0		1			
3///	As SPT 51; SAND and CLAY interlensed.			Lenses <2" thick.	54
3////	interiorised.	5"	SPT		100/
1 1///			53		
3///				U. L. San	
1///		1/1		No Recovery.	33
0.6 109.0		0"	SPT		100/3
3		0	54		
31111	Silty SAND; white; fine to medium			Piece of quartz slough blocking spoon; broken	31
31111	grained; poorly graded.	750.	SPT	gravel originally > spoon	100/4
		2"	55	diameter.	
311111					
				~ 2" slough sand and clay.	100/5
3/11/11			SPT	a stage sails and stays	
		<1"	56		
5.6 114.0					
-	SAND; light tan to white; dense;			Some drilling fluid invaded	100/6
	medium grained; very poorly			sample, scraped most off @	10070
	graded; quartz; trace silt.	4"	SPT 57	edges.	
<b>∃</b> /((()))					
	SAND: 20 SRT E7: eliabelia				50
1888	SAND; as SPT 57; slightly coarser (still medium grained);				_
1 - 3	slightly darker.	5"	SPT 58		50/1
######################################			000		
	CAND - COT CO. have				
1/49/4/	SAND; as SPT 58; brown.				62
		5"	SPT 59		50/1"
4/8/8/1		1			
	20.21 A 20.12 A 27.77	-			
3333	SAND; as SPT 58; brown to gray.		. 4	Gray may be from drilling fluid.	100/6
4///	26.0	5"	SPT 60		
3/8/8		1 2	QU.		
	SAND; white, tan, and brown; very dense; coarse grained;			Slightly more feldspar grains than previously, still <5%.	31
	poorly graded; with some silt; trace fine-medium sand; trace	10"	SPT	The state of the s	5.7
-	clay in laminations,		61		50/1"
1844	SAND; reddish-brown; dense;				39
	coarse grained; moderately well graded; with some silt; some	6"	SPT		50/1"
7./ 125.5	gray clay in 1/2" lenses.		62	Gray and red clay in wash as	
3///				drill to 126'.	
3///	CLAY; variegated brown, red,			Lot of coarse sand (slough?)	16
3///	pink, gray, and green; hard; plastic; with deep wine red or		SPT	on top.	31
3///	orange spots; moderately moist;	16	63		38
2.6 128.0	with multicolored sand in base				
				(continued)	$\rightarrow$ $\leftarrow$
ORM 1838 PREVIOUS	EDITIONS ARE OBSOLETE. PROJECT			HOLE NU	VOER

POJEC	T		(Cont. Sheet)		ALLATIC	N	.38 Ft.	OF 7
Pear	rce Cree	k		P	HILADE	LPHI	A DISTRICT	
ELEV.	DEPTH	DI	CI ACCIPIAL TION	MATERIA	4	1,000	I	-
LLEV.	DEPTH	EGEND	CLASSIFICATION OF (Description		CORE	SAMPLE	REMARKS	OWS/
		LEG	M_ 445/76 845		%	SAN	(if significant)	BLO
-99.6	128.0	17777						
	1		Silty SAND and CLAY;	orange				29
	1 3		red and gray; sand ar weakly to moderately	cemented	4"	SPT		41
			in laminations.		4	64		
	1 2							
			Sandy CLAY; light gra	y: hard:				29
	1 2		dilatant.			SPT		37
	1 3				9,,	65		50
1036	132.0							
100.0	102.0		CLAY; variegated red	and grave			Delega Strategy and all and	12
	1 3		dry; moderately plastic	c: with			Driven 2" when set silt and sand more prevalent in gray	_
	=		some silt; trace very f	ine sand.	20"	SPT 66	areas.	25
	=							32
	-	////						
	3		CLAY; red and gray; a	s SPT 66.			Driven when set.	5051"
	=				20"	SPT		27
	1					67		36
107.6	136.0							
	#		Sandy CLAY: light gray	y; dense			Able to mold with finger	14
	3		slightly moist; fine grai trace medium trace co	ned; with arse	220	SPT	pressure 60% silt/clay by settling volume after ~ 16	34
	]		grained sand,		20"	68	hours.	45
	1					- 1		
	3		Sandy CLAY; as SPT 6	8.		SPT		42
110 6	139.0			9.	102	69		100/6"
110.0	-	2111	Classifications listed a	bove are			E.O.B. @ 139'.	10070
	=		based on BVWS standa classification procedur	erd es and				
	1=		ASTM D 2488-90 Visua	al Manual				
- 1	3		Classification; not on Laboratory Analyses.		1	- 1		
	-				1 1			
	=				1 1			
					1 1			
	3				1 1			
	=				1 1			
	=					1		
	=							
	=					- 1		
	4							
	3							
	=							
1	-							
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	=							
						- 1		
	=							
	7							
	. Transfer							
	Junton							

	BORING	NUN	18ER	<u>CSI</u>	V-10				CLIENT USEPA			<b></b>
	DATE D								PROJECT _ PEARCE CREEK			
	SURFAC	EE			32.5	53 NA	VD 88		GEOLOGIST D. SIRKIS			
	NORTHI	NG .		712					EASTING			
		ш	RECOVERY (ft)	ΞT.	æ	907	CLASS					
	DEPTH feet	SAMPLE	/ER)	4S/F	PIO (ppm)	뒫.	2	DESCRI	TION AND REMARKS		WELL DIAGRAM	
	8.	SA	CO\	BLOWS/FT	PID	GRAPHIC LOG	SOIL				4	_
			8		-	9	SP				1 1	<del>-                                    </del>
	-					$ \cdot \cdot \cdot  $	"	-	i,			-
	-											-
	_					<u>;</u>					Scto	-
	5-							_			soc	_
	-							-			i   i   i   i   i   i   i   i   i   i	-
	-							-			steel well protector	-
	-			•				-			35	-
	10					· ·		-			diame ter	-
	10-						1	-				
i					,			· -	<sub>D</sub>		8	.
	_							<b> </b> 				-
	;					: : : '		-				-
	: 15-							_				-
	-										l ser l	-
	: <u>-</u>									,	steen	
-	• -										\$85	. <i> ea </i> .
	-20-		0.7	38	NA			light grey, very fine SA	ND, with rust brown lenses,		taint	grout seal
	-							_ some silt .			er s	<i>S</i> -
			1.0	64	NA			light grey, very fine SA some silt, with some cla	ND, with rust brown lenses,		diameter stainless steel riser	-
	_					• • •		light rust brown fine SA			i i ii	
	25-		1.3	9	NA		SW	alternating light brown	light rust, and light grey			_
-			1.0	18	NA			<u> </u>	rith clay lenses from 24'-24'2"			-
	-							fine to medium SAND	light rust, and light grey			-
i	1		0.8	8	NA	• • •	SP	light brown medium SAN	ID			-
	30-											
	JU -		1.2	35	NA		SW	<ul> <li>alternating layers of light</li> <li>grey fine to medium SA</li> </ul>	ght brown, rust, and light ND			-
١	-		1.3	18	NA			-				-
			,					alternating layers of lig	ght brown, rust, and light			-
	٦. -		1.5	98	NA			grey fine to medium SA				-
	35-							rust brown medium to c	uarse SANU, some clay			-
	_		1.1	25	NA			-				
ļ	_		1.0	44	NA			alternating thin lavers	of light brown and light			-
	_				,			grey medium to coarse	SAND, trace clay			-
	40-		1.2	73	NA			<del>-</del>			T 7	1 _

	DILI	En	8/6/	₩-10 96				CLIENT <u>USEPA</u> PROJECT <u>PEARCE CREEK</u>	•	
					53 NA I	VD 88		GEOLOGIST D. SIRKIS		
		1597						EASTING		
	П				ရွ	S		270 (1710)		
DEРТН feet	LE	RECOVERY (ft)	BLOWS/FT.	PIO (ppm)	GRAPHIC LOG	CLASS				
유	SAMPLE	COVE	LOW.	) 01,	APH]	SOIL C	DESCRIP	TION AND REMARKS	WELL DIAGRAM	
		REC	8	-	GR					
-	[					SW	<ul> <li>alternating thin layers of grey medium to coarse</li> </ul>	of light brown and light SAND, trace gravel		
•	-	0.7	41	NA	0 0	GW	light brown sandy GRAV	'EL		
:	1				0.0		maximum diameter is .5"			
- -45		1.0	65	NA	1.1	SM	purplish grey silty sand			
45~	]		ė.	114	$ \cdot $ $ \cdot $		<ul> <li>purplish grey silty SAND colored gravelly SAND a</li> </ul>	o grading into cream at 45.1		
-		1.1	55	NA	[].[]		purplish grey silty SAND colored gravelly SAND	grading into cream		
-						SP	white clean fine SAND a			
		0.75	55	NA		<u> </u>	as above, no gravel	and Alasei		
50-			1			SW	white coarse well sorted	d SAND, trace fine black		
· : _			E.				sand particles			
-		0.5	50	NA			white fine to medium SA micaeous	ND, some soft silty clay		
٠ ـ		0.25	50	NA			I" thick gravel and sand	llens, trace clay		
55-			-		[· : · ]		<ul> <li>micaeous white fine to n</li> </ul>	medium SAND, trace clay		
		ĺ				-		•	riser	
_		į	ĺ						tee!	
_									Ss si	ō
<del>3</del> 0-						• [	-		eter stainless steel riser	שני אסונ
-						-			l st	S S
-						·			me te	
_									4 diame	
35-							gravel			
-						-	Arasci			
-						}				
7						t				
70:-		.					_			
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75-				ŀ	$\cdot \cdot  $		-			-
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30-			.	•	•	-	-			

BORING	A 11 14	וחדם	CSI	V-10			·	CLIENT USEPA	
DATE D								PROJECT PEARCE CREEK	
SURFAC	יב בו	EV.A.T	TON	32.5	53 NA I	/D 88		GEOLOGISTD. SIRKIS	
NORTHI	NG	1597	712					EASTING	
DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	CLASS	DESCRIP	TION AND REMARKS	WELL DIAGRAM
18	SA	ZECO.	BLO	PIG	GRAP	SOIL			
		u.				SW	-	t.	
	-						,		
							pebbles, iron cemented gravel quartzite pebble	sandstone, and white s	
85-							_		
	-						_		le di rise
	-			ļ					- s s te
00	$\left\{ \right.$						<u> </u>		ainles + + - + + + +
90-									4° diameter stainless steel riser
2	+						-	,,	iamet
	1						gravel layer		4° d
95-	+						_		
	]						-		
	-						_		
100-	_					1	- ·		
	-					1			
	1					:		•	
	-						-		l scree
105							-		, ouno
	+					1	-		t. wirewound screen
	1						-		SS cont. wirewound screen
110	-						-		
	1				.		-		.010
	+						-	•	
115	_					1_	0.44.2	uc'	<u> </u>
	+						Bottom of Boring at		
	1						-		
1,00	+		1				<u> </u>		
120									

	BORING							CLIENT _		
	DATE D					AR NA	VD AA	PROJECT	PEARCE CREEK  STD. SIRKIS	
	NORTHI			110N . 9284		10 ///	1000		645357	
						g	S	LASTINO		
	DEPTH" feet	J.E	RECOVERY (ft)	BLOWS/FT.	Œ Œ	GRAPHIC LOG	CLASS			
	DEP fee	SAMPLE	OVE	OMS	PIO (ppm)	PHI	SOIL C	DESCRIPTION AND R	EMARKS	WELL DIAGRAM
	<u> </u>		REC	<u> </u>		GR.			,	
	_					$\ \cdot\ _{\cdot}$	SM	brown silty SAND, trace gravel, dry	,	
	-		1.0	39	NA			dark brown micaceous silty SAND		4 4   1   1
	-					[. · .		•		ctor-
	5-		1.0	13	NA		SW	orange fine to medium SAND, trace	gravel, dry	rote
	5_		1.0	8	NA	-		grey soft CLAY		Well protecto
	-		1.0	0	""	//	CL SP	tan medium clean sand		steel w
	-		1.2	8	NA		S₩	orange fine to coarse SAND, trace	gravel	
	10					<del>5 c</del>	GW	white SAND and GRAVEL, dry		diameter
	10-		1.3	15	NA	о с О		<del>-</del>		
	ī -		1.2	17	NA.	0.0		•	·	8   8   1
	/ -									
_	i		1.1	17	NA	000		•		
	<u>:</u> 15–					0.0		<del>-</del>		
			1.0	22	NA	0.0		•		st ris
			1.2	11	NA	o c	SW	orange-brown fine to medium SAND moist	, trace gravel,	ss stee
	-20-		1.5	8	NA			<ul> <li>dark grey to light grey fine to coal trace gravel</li> </ul>	rse SAND,	diameter stainless steel riser
			2.0	28	NA			grey fine to coarse SAND, saturate gravel to 1" maximum diameter	ed, trace	meter :
	-					<u> </u> : : .		brown-grey fine to coarse sand, s	aturated	
0-	25-		1.6	21	NA			more gravelly		7 0 0 1
	20		1.7	30	NA			1" max gravel diameter		
	-		,		"	: : .		•		
	1		1.7	11	NA	: : :		grey-brown fine to coarse SAND, t	race gravel	
	30-		1.6	í.	NA			greenish-grey very fine to medium silt, saturated	SAND, trace	
			!					grey gravelly SAND, saturated		
			2.0	37	NA			greenish-grey very fine to medium silt, saturated		
	7.		2.0	34	NA			as above, very fine to coarse, trac		
	35-							wood pieces, small amount of red c		
	-		2.0	21	NA		CL	orange and grey CLAY with lenses and clayey sand	of sandy clay	
			1.2	14	NA			more orange, few lignite seams	· .	
	40-		1.6	27	NA			_	:	
			,40	"	''^					
	1					1				

	DRING NUMBER <u>CSW-11</u> ATE DRILLED <u>8/22/96</u> URFACE ELEVATION <u>24.46 NAVD 88</u>			PROJECT PEARCE CREEK						
SURF	CE E	LEVAT	ION .	24.4	16 NA	VD 88		GIST <u>D. SIRKIS</u>	<del> </del>	
NORTH	ING .		284				EASTI	NG <u>645357</u>		
DEPTH i	SAMPLE	RĒCOVERY (ft)	BLOWS/FT.	PIO (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND	D REMARKS		WELL DIAGRAM
	4					C L	0.2' gravelly sand lense	•		
		1.7	5	NA		SW	orange-brown fine to coarse SA	AND		l riser
45		0.6	9	NA	//	CL	grey clay lense, gravelly sand orange, tan, and light grey CLA' to 44.1'	Y, sandy gravel		inless steel
	-	1.1	27	NA						tainle
		1.4	16	NA			light grey sandy clay light grey CLAY and sandy CLAY	· Y	į	diameter stainless steel riser
50		1.6	17	NA			<del>_</del>			4. dia
5 - 6	-	1.7	35	NA			orange and tan medium SAND, s	aturated		* = *
55		1.0	45	NA.		SP S₩	0.1' iron concretion			
	-	1.1	45	NA			• •			0 sandpack
;	1		24	NA		6	gravel piece gravel piece			A screen Korie #00 sandpack
60	-	1.0	40	NA		CL	<ul><li>orange-brown gravelly SAND</li><li>red-grey stiff CLAY</li></ul>			SS cont. wirewound screen  K—  Morie #00
	+					1-	Bottom of Boring at 62'	<u> </u>		¥ L ¥
65	4						- : <del>-</del>	,	·	.010° SS
	1						- - ·			o.
	1						- -			
70	1					,	<del>-</del> -	·		
	. =						- -		,	
75	<del>-</del>						- <del>-</del>			
	1						-			
	. ]							·		
80	)   .	-					_			

В	ORING	NUM	BER _	CSW	-12				CLIENT USEPA			•	
D.	ATE DE	RILLI	ED	8/14/	96 -	8/22/	96		PROJECT PEARCE CREEK	<u></u>			<del></del>
S	URFAC	E EL	EVAT	ION _	39.0	2 NA 1	/D 88		GEOLOGIST	<del>,</del>			
	ORTHII		1599.				-		EASTING				
	DEРТН feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPT	ION AND REMARKS		WI ·	ELL DIAGRAM	_
	5-						ОН	dark brown organic SILT	, some clay		well protector		-
	10- (: -		1.7	2	NA			dark brown organic CLA grey silty CLAY (from c soft	Y, some peat uttings), slightly micaeous, 		8' diameter steel well protector sss steel riser		grout seal —
	15-							silty CLAY			8' diameter stainless steel riser		de bentonite seal ≯le
	25- 30-		•				SP	as above, becoming all	sined, well sorted SAND, wet		SS cont. wirewound screen		Morie #00 sandpack
	•		1.5	76 50	NA		SW	<ul> <li>hlack mineral</li> <li>tan fine to medium grain</li> </ul>	ed silty SAND		wirewoun		orie ≠00
	35-		1.0	11	NA NA		SP	tan medium clean SAND 1/4" grey clay seam white medium SAND with	1/4" brown clay seams	·	K.010' SS cont.		W
0	40-		1.0	9 60	NA NA		SW	white fine grained SANG yellow silty clay seam, tan.fine to medium grain	race gravel	į	¥		

	BORING	NUM	IBER .	CS	V-12					CLIENT USEPA	COLER	<del></del>			
	DATE D	RILL	ED _	<i>B/14/</i>	96 -	<i>B/22/</i>	96			PROJECT PEARCE	UKEEK	·			
	SURFAC				39.0	02 NA 1	/U 88			GEOLOGIST <u>D. SIR</u>	IV 12				<del></del>
	NORTHI	NG .		284						EASTING641002		<del></del>			_
	OEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS			TION AND REMARKS	, , , , , , , , , , , , , , , , , , ,		WELL DIAGRA		
of stan	- - - - 45- -		2.0	24 84 18	NA NA	11111	SP SW OL SW SP		white fine grained SANE GRAVEL (from cuttings grey fine to medium gra yellow-brown silty CLA' whitish grey fine to medium as above, trace silt light colored fine SAND Bottom of Boring at 44	) nined silty SAND Y, some sand, trace gradium SAND, trace mica (from cuttings)	avel			Morie #00 sandpack	
	50-														
	60-					,	55								
	65-					· ·					·				
	70-						1								
	75-	<del></del>										-	•		1-1-1-1-1
	-80-	-						-							-

BORING NUMBERCSW-13						CLIENT USEPA					
	DATE DRILLED <u>8/8/98 - 8/9/96</u> SURFACE ELEVATION <u>18.32 NAVD 88</u>					3/9/96	5	· · · · · · · · · · · · · · · · · · ·	PROJECT <u>PEARCE CREEK</u> GEOLOGIST <u>D. SIRKIS</u>		
						2 NA V	'D 88				
	NORTH	NG .		2744					EASTING		
	ОЕРТН feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPT	TION AND REMARKS	WELL DIAGRAM	
	5- 10- , 15- 20-		4							8 diameter steinless steel riser  4 diameter stainless steel riser  100000000000000000000000000000000000	
	30- 35- 40-							-			
	40-										

BORING NUMBERCSN-13								CLIENTUSEPA			
DATE DRILLED <u>8/8/96 - 8/9/96</u>								PROJECT <u>PEARCE CREEK</u>			
SURFACE ELEVATION 18.32 NAVD 88								GEOLOGIST D. SIRKIS			
NORTHI		1602	744					EASTING643662	_		
DEPTH feet	SAMPLE	REČOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPT	ION AND REMARKS WELL DIAGRAM			
-		1				,		Pertonite seal →	1 1		
45-							_		1		
50-			,		,		- - - - - -				
	]			<u> </u>				1 800	1		
55-	-						-	P S S S S S S S S S S S S S S S S S S S	┨		
	+			ļ			-	Wirew	1		
	1		*					ont	]		
60-		•					- - -	.010° SS cont. wirewound screen			
65-	-				<u>.</u>				1		
00-	1						F		1		
70-			7			,	- - - -				
75-							  -  -  -				
80-	₹ ₹ -						<u>-</u>				

BORING NUMBER CSW-14  DATE DRILLED 8/14/96 - 8/22/96  SURFACE ELEVATION 39.02 NAVD 88  NORTHING 1599271  PEARCE CREEK  SURFACE ELEVATION SS GEOLOGIST D. SIRKIS  EASTING 640997  DESCRIPTION AND REMARKS	METT DIAGEAW
SURFACE ELEVATION 39.02 NAVD 88 GEOLOGIST D. SIRKIS  NORTHING 1599271 EASTING 640997  WE CONCERT (LT) SOIL CLASS DESCRIPTION AND REMARKS  DESCRIPTION AND REMARKS	
NORTHING LEET FEET SAMPLE SAMPLE SAMPLE SAMPLE BLOWS/FT. PID (ppm) GRAPHIC LOS SOIL CLASS SOIL CLAS	
	rel well protector————————————————————————————————————
	TITITITITITITITITITITITITITITITITITITI
dark brown organic SILT, some clay	rel well protector————————————————————————————————————
	TITITITITITITITITITITITITITITITITITITI
	rel well prote
	TITITITITI
5-	, ie
dark brown organic CLAY, some peat	
1.7 2 NA grey silty CLAY (from cuttings), slightly micaeous	
- soft	diameter
	dian
silty CLAY	
	rise
	teel
	s ss:
	TITITITITITITITITITITITITITITITITITITI
	group -
	diameter stainless steel riser
	dia dia
grey SILTY material (from cuttings)	
30 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 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 13 60 NA SW vellow sity clay seam trace gravel	
tan fine to medium grained SAND	

BORING NUMBER	CLIENT USEPA
DATE DRILLED <u>8/14/96 - 8/22/96</u>	PROJECT PEARCE CREEK
SURFACE ELEVATION 39.02 NAVD 88	GEOLOGIST D. SIRKIS
NORTHING	EASTING
SAN SAN SOIL SOIL SOIL	ESCRIPTION AND REMARKS WELL DIAGRAM
1.2 24 NA SW grey fine to medi	rill cuttings)
45— 18 NA SW whitish grey fine as above, trace	e to medium SAND, trace mica
seams	orted SAND with 1/8" clay  The strace very fine black mineral
55- 1.0 36 NA	ss steel riser ————————————————————————————————————
O.8 24 NA white fine well s	gallons of fluid down hole sorted SAND, trace very fine drse SAND, well sorted, trace clay
65- 0.5 87 NA red/brown coar	arse SAND, well sorted, trace clay
70-	
75-	
80-	

BORING NUMBERCSW-14								CLIENT USEPA		
DATE DRILLED <u>8/14/96 - 8/22/96</u>								PROJECT PEARCE CREEK		
SURFACE ELEVATION 39.02 NAVD 88						/D 88		GEOLOGIST D. SIRKIS		
NORTHING								EASTING		
DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPT	ION AND REMARKS	WELL DIAGRAM	
85- 90- 100-						β .	medium SAND with white	kaolinite (from cuttings)	- 4° diameter stainless steel riser ————————————————————————————————————	
110-						SW	light brown fine to coars	e well graded SAND	K.010" SS cont. wirewound screen>	
120-	-		ľ				Bottom of Boring at 119	·	-	

## US ARMY CORP OF ENGINEERS

	BORING	NU	MBER	cs	W-15			CLIENT <u>USEPA</u>	
	DATE D							PROJECT <u>PEARCE CREEK</u>	
	SURFAC	CE E			<u>47.</u>	00 NA	VD 88		
	NORTHI	NG		0433	· · · ·	<del> </del>		EASTING <u>643560</u>	
	DEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS WELL DIAGRAM	
	- - 5- - -						EM ML	dike fill: dark brown, clayey SILT, trace sand and mica flakes augered down to 15' below the surface	-
	10-							- 5 I I KN KN I	- -
	· -		•						.:
\	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	-
	20-		2.0	9	NA NA			grey clayey SILT, or silty CLAY, more peat, wet  grey clayey SILT, or silty CLAY, peat, some wood chips grey clayey SILT, or silty CLAY, peat bottom of 4" spoon	_
	-		0.0	8	NA			- grey clayey SILT, or silty CLAY, peat - bottom of 4" spoon	-
	25-		2.0	5	NA			grey clayey SILT, less peat	
	-		2.0	3	NA			grey clayey SILT, peat throughout	-
	30 <del>-</del>		1.5	4	·NA			grey clayey SILT, some peat, trace woodchips	_
			1.8	6	NA 		PT	grey clayey SILT, trace peat, trace fine sand at top peat layer with wood chips	-
	35-		2.0	2	NA NA		он	grey silty CLAY with tanish, brown clay stringer in middle of spoon peat stringer thru clay and more peat in bottom	-
	-		2.0	4	NA			- of spoon - grey silty CLAY with occasional peat stringers _ small area of tanish brown clay at top of spoon	-
	40-		·	2	NA			brownish grey silty CLAY with peat	-

## US ARMY CORP OF ENGINEERS

BORING DATE D	RILLE	:o£	3/6/9	6	0 NAVD 88		CLIENT <u>USEPA</u> PROJECT <u>PEARCE CREE</u> GEOLOGIST <u>D. SIRKIS</u>	FK .		- -
NORTHI							EASTING			=
OEPTH feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PID (ppm)	GRAPHIC LOG SOIL CLASS	DESCRIP	TION AND REMARKS		WELL DIAGRAM	
		2.0	3	NA	OH ML	grey clayey SILT and	peat stringers, trace sand			
		2.0	2	NA		- -				1
45-		2.0	5	NA		sandy _ grey clayey SILT, less	peat, no sand			1
		1.6		NA	CL	silty CLAY, no peat	,			1
50-	-	1.7	4	NA		silty CLAY, sandy with 2" of peat plugs	trace brown clay			-
51	1	1.7	9	NA	PT PT	grey silty PEAT, with w	ood fragments			1
<i>F</i>	-	1.5	в	NA		grey silty PEAT, with o	ccasional wood chunks			1
55-		2.0	8	NA		brown silty PEAT			iser —	1
/   ; ·		0.8	10	NA		reddish brown PEAT, w fragments	ith occational wood		diameter stainless steel riser	1
60-	<u> </u>	1.5	6	NA		reddish brown PEAT, w fragments, siltier with	rith occational wood depth		stainless si IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	4
	] .	2.0	8	NA	## ##	grey sandy SILT, trac	e clay		leter si	1
	}	1.6	8	NA	ОН	greenish-grey CLAY,	trace sand e gravelly sand at bottom		4 dian	1
65	}	1.7	14	NA		white, grey/brown CLA				4
		2.0	12	NA		grey, brown CLAY, var	igated			1
70	_	2.0	10	NA		grey and green CLAY of peat, some sand	with some brown layers			1
10	1	2.0	14	NA		greenish-grey CLAY, mica, trace peat, dry	trace to some sand, trace			1
		2.0	16	NA						1
7.5	_]					-			seal	4
						_			THIMININIII	1
80						-	•	:		  -
00		2.0	17	NA						

## US ARMY CORP OF ENGINEERS.

,	BORING	NUN	18ER .	CSI	I-15			CLIENT USEPA	
	DATE D							PROJECT PEARCE CREEK	
	SÚRFAC	EE	LEVAT	ION .	47.0	00 NA	VD 88	GEOLOGIST D. SIRKIS	
	NORTHI	NG .		1433				EASTING	
	DEPTH ' feet	SAMPLE	RECOVERY (ft)	BLOWS/FT.	PIO (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
	85- 90-  .95-		1.5	25 69 93	NA NA		S₩ G₩ SP	grey, stiff silty CLAY, slightly fossiliferous, trace peat  fine to coarse well graded SAND wet  brown SAND and GRAVEL, wet white, fine grained SAND, well sorted, wet  tan coarse SAND, well sorted, trace silt, wet red CLAY with grey clay stringers  Bottom of Boring at 102'	4* diameter stainless steel riser  K.010* SS cont. wirewound screen→  K.010* SS cont. wirewound screen→  Morie #00 sandpack →  Abentonite seal
	105- 110-							- - - - - -	
	115-							- - - - - -	- - - -
	120-							<del>_</del>	_

# DUFFIELD MILMINGTON, DELAWARE 19808-1232 ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

## Log of Boring TB-1

(Page 1 - 2)

Logged by:

: 140 lb. hammer falling 30" : MSJ

**Testing Method** Surface Elevation Horizontal Datum

: 47.4' : MSPCS NAD 1983

U.S. Army Corps Of Engineers Pearce Creek Dredged Material Date Completed Weather

**Date Started** 

: November 11, 1998 : November 12, 1998 : Clear, 60's

Vertical Datum Northing Easting

: NAVD 1988 : 641619 : 1597957

Containment Area Cecilton, MD

**Drilling Agency** Driller

: Walton : Kevin

**Drilling Equipment** : CME-55

Depth in Feet	Surf. Elev. 47.4'	nscs	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			Same, trace gravel.	4	20	3-4-4-4
- 10 -				Carrie, (lace graves.	5	20	1-2-2-2
-	- 36			Dark gray clayey SILT, trace fine sand, trace mica and	SH-1	21	
-				organics. Same (less plant material).	6	22	1-4-4-5
15 - -	- 31				7	24	1-1-2-3
-	31	МН		Same (less plant material).	8	24	4-4-4
- 20 -					9	23	2-2-2-2
-	- 26				SH-2	24	
-				Same, lenses of fine sand, lenses of plant material.	10	23	3-2-3-2
25 - -	- 21			Same (less plant material).	11	12	WR/12"-4-4
-				Same, lenses of plant material.	12	24	2-2-2-2
30 -				Same, lenses of plant material, lenses of light-gray/brown silt.	13	24	4-5-4-5
-	- 16	N.P.I		Light-gray/light-brown mottled SILT, trace to little fine	14	24	WR/2"-WH/4"
3E ]		ML		sand, trace mica. Light-gray/light-brown fine SAND, some silt, trace mica	15 16	24 10	13-12-11-12 15-50/4"
35 - - -	- - 11	SM		and organics (dry, loose).	17	10	40-50/4"
35 - - - - 40		SIVI		Same (last 6" denser and damp).	18	19	16-31-37-50

1. Wet on spoon at 46'.

2. Wash drilling started at 52'.

<sup>3.</sup> No bottom at 56', rods sunk, stopped wash.

<sup>4.</sup> No bottom at 60'.

<sup>5.</sup> Restart washing at 64'.

# DUFFIELD MILMINGTON, DELAWARE 19808-1232 ASSOCIATES 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 2 - 2)

**Date Started** 

: November 11, 1998

Date Completed Weather

: November 12, 1998 : Clear, 60's

**Drilling Agency** 

: Walton : Kevin

Driller **Drilling Equipment**  **Testing Method** 

Horizontal Datum

: 140 lb, hammer falling 30" : MSJ

Logged by: Surface Elevation

: 47.4

: MSPCS NAD 1983

Vertical Datum

: NAVD 1988

2, 1998	Northing	: 641619
	Easting	: 1597957
	1	

6. Borehole grouted with cement-bentonite grout after auger removal.

		Cecilton	, MD	Driller : Kevin Drilling Equipment : CME-55			
• .		•	O				
Depth in Feet	Surf. Elev. 47.4'	. sosn	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
40 -	- 6			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	SM			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			Light brown fine to medium SAND, trace silt, trace mica.			
-				No recovery.	27	24	WR-WR-WR
60 -		SP/SM					WR-WR-WR
- - -	14			Light-brown fine SAND, trace silt, trace mica.	28	8	WR-WR-WR-WR/5"
65 ·				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"
70 -		sw		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	2 <b>4</b>		<i>:</i>		32	10	5-25-46-40
•	<u> </u>			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	3					
80	}						
	L						

1. Wet on spoon at 46'.

2. Wash drilling started at 52'.

<sup>3.</sup> No bottom at 56', rods sunk, stopped wash.

<sup>4.</sup> No bottom at 60'.

<sup>5.</sup> Restart washing at 64'.

# DUFFIELD S400 LIMESTONE ROAD WILMINGTON, DELAWARE 19808-1232 ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

U.S. Army Corps Of Engineers

Pearce Creek Dredged Material

### Log of Boring TB-2

(Page 1 - 2)

Date Started

: November 13, 1998 **Date Completed** : November 16, 1998

Weather Drilling Agency : Overcast, 50's : Walton

**Testing Method** 

Logged by: Surface Elevation Horizontal Datum

: MSJ : 35.7

: MSPCS NAD 1983

: 140 lb. hammer falling 30"

Vertical Datum Northing Easting

: NAVD 1988 : 642911 : 1598066

	Containme Ceciltor			Driller : Kevin Drilling Equipment : CME-55		I	
epth Surf. in Elev. Feet 35.7	USCS	GRAPHIC		DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
0 - 34	ML		Brown mottled material.	SILT and fine sand, trace root and plant	1	10	4-8-12-10
1			Dark gray claye organics.	ey SILT, trace fine sand, trace mica and	2	9	5-5-4-4
5 -					SH-1	24	
- 29	MH				3	24	1/12"-1-1
4.			Same, trace pl	ant material.	4	24	WH/12"-1-2
10 -			Brown silty CL	AY and fine sand, trace plant material.	5A 5B	24	1-8-4-6
-					SH-2	23	
15			Gray/brown mo	ottled silty CLAY, trace fine sand.	6	24	5-6-9-10
19					7	24	11-11-13-14
20 -	CL				8	24	3-5-8-8
- - 14					9	24	3-5-7-10
1			Gray/brown mo	ottled silty CLAY, some fine sand (wet).	10	24	6-9-9-11
25 -					11	22	5-4-6-7
- - - - -			Light-gray/ ligh	t-brown mottled fine SAND, little silt, trace	12A 12B	24	8-15-29-29
30 -			coarse sand.	S and any hade	13	18	10-13-14-15
- 4			Light-gray/light	-brown fine SAND, trace silt (begin wet).	14	20	6-12-19-23
-	SP/SM		Light-gray fine with gravel size	SAND, with 1" thick brown fine sand lensed 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 sitt.	18	11	22-42-50/3"

1. Wet on spoon at 29.8'.

2. Wash drilling started at 36'.

3. Mud rotary drilling began at 46'.

## DUFFIELD MILMINGTON, DELAWARE 19808-1232 ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

Log of Boring TB-2

(Page 2 - 2)

Easting

: 140 lb. hammer falling 30" : MSJ

**Testing Method** Logged by: Surface Elevation

: 35.7 : MSPCS NAD 1983

Horizontal Datum Vertical Datum Northing

: NAVD 1988 : 642911

: 1598066

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

Date Started Date Completed Weather

: November 13, 1998 : November 16, 1998 : Overcast, 50's

**Drilling Agency** 

: Walton : Kevin

Driller **Drilling Equipment** 

: CME-55

Depth in Feet	Surf. Elev. 35.7	. sosn	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
40 - -	6			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
-		SP/SM		Light-orange/brown fine to coarse SAND, trace gravel, trace silt.	23	4	30-50/5"
50 - -	46				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	28A	19	16-22-30-38
60 - -				gray clay, trace fine sand. Orange/brown fine to medium SAND, trace coarse sand,trace gravel, trace silt.	28B 29A	20	13-10-10-25
-	26	SM		Light gray fine SAND, some silt, with lenses of light gray clay, trace fine sand.	29B 30	20	12-16-39-50/5"
65 <b>-</b>					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 - -	- <b>-3</b> 6	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
7		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

1. Wet on spoon at 29.8'.

3. Mud rotary drilling began at 46'.

<sup>2.</sup> Wash drilling started at 36'.

# DUFFIELD MILMINGTON, DELAWARE 19808-1232 ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

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 Weather

: November 23, 1998 : Variable sun, breezy, 50's

Drilling Agency Driller

: Walton : Kevin

ing Equipment : CME-5

Testing Method

Horizontal Datum

Easting

: 140 lb. hammer falling 30" : MSJ

Logged by: : MSJ Surface Elevation : 50.2'

: MSPCS NAD 1983

Vertical Datum : NAVD 1988 Northing : 644873

: 644873 : 1599097

		1.		Drilling	Equipment : CME-55	T. I.		
epth in Feet	Surf. Elev. 50.2	nscs	GRAPHIC	DES	SCRIPTION	Sample Number/ (psi)	Rec'y (in)	No. Blows per 6 inches
0 -			T	Graded Aggregate.			20	10-12-14-16
1	49			Brown fine SAND, some	to and silt.	1 1		
4						2	23	9-9-17-23
5		SM		Brown fine to coarse SAN	ND and gravel, little silt.	3	24	9-19-21-24
	44			Dark-gray clayey SILT se	ome fine sand trace mice and	4	16	8-8-4-5
1				organics, with lenses of p	ome fine sand, trace mica and plant material.	5	16	1-1-2-2
10 -				Cana with two a fine and				
7	39			Same, with trace fine san	a.	6	18	1-2-1-1
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	МН				10	24	1-3-3-4
-			Ш			11	24	5-6-6-4
25						SH-2	24	
†	24					12	24	1-2-2-3
1						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			trace coarse sand, some	ne SAND, trace medium sand, silt, with 1" thick lens of	16B		A = 44 :=
1		SM		organic clay.		17	24	9-9-14-17
-						18	22	5-5-9-12

1. Wet on rods at 49.3'.

09-18-1999

2. Heave in augers at 52', began washing.

## DUFFIELD SAND LIMESTONE ROAD WILMINGTON, DELAWARE 19808-1232 ASSOCIATES E-MAIL: DUFFIELD@OUFFNET.COM

#### Log of Boring TB-3

(Page 2 - 2)

**Date Started** : November 20, 1998 **Date Completed** : November 23, 1998

Weather

: Variable sun. breezy, 50's : Walton

**Drilling Agency** Driller

**Drilling Equipment** 

: Kevin : CME-55 **Testing Method** 

Easting

: 140 lb. hammer falling 30" : MSJ

Logged by: Surface Elevation

: 50.2'

Horizontal Datum : MSPCS NAD 1983 Vertical Datum : NAVD 1988 Northing

: 644873 · 1599097

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

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

80

F:\boring logs\3769ge\tb-3.bor

09-18-1999

<sup>1.</sup> Wet on rods at 49.3'.

<sup>2.</sup> Heave in augers at 52', began washing.

<sup>3.</sup> Borehole grouted with cement-bentonite grout after auger removal.

# DUFFIELD MILMINGTON, DELAWARE 19808-1232 ASSOCIATES TELL (302)299-6834 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-4

(Page 1 - 2)

**Date Started** Date Completed : November 18, 1998 : November 19, 1998 : Variable sun, breezy, 50's

Weather **Drilling Agency** Driller

: Walton : Kevin

Drilling Equipment · CME SE **Testing Method** 

Horizontal Datum

: 140 lb. hammer falling 30" Logged by: : MSJ

Surface Elevation : 48.0'

> : MSPCS NAD 1983 : NAVD 1988

Vertical Datum Northing : 643701 Easting 1600953

			,	Drilling Equipment : CME-55			200
Depth in Feet	Surf. Elev. 48.0	nscs	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
0 1	- 47			Brown mottled SILT, little fine sand.	1	14	4-5-6-8
4		ML			2	17	6-8-8-9
5 -				Dark-gray clayey SILT, some/and fine sand, trace plant material.	3	17	2-2-3-4
†	- 42				4	24	4-4-4-5
1		MH			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 -	- 32			Dark-gray clayey SILT, trace fine sand and organics.	8	24	2-1-3-4
	52				SH-1	24	
20 -		ML			9	24	2-2-2-3
1	- 27				10	24	2-2-2-3
					11	24	3-3-2-2
25 -	- 22				SH-2	24	
-				Light-gray/brown fine to coarse SAND, trace gravel, trace silt.	12	24	9-20-20-19
30 -		SM			13	24	8-14-10-9
+	- 17				14	24	3-3-4-3
4				Light-gray/brown mottled clayey SILT and fine sand.	15	18	2-4-4-5
35 -	- 12	MH			16	24	2-4-2-3
-			$\ \ $		17	24	3-2-3-3
40 -			Ш		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.
  - 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.

U.S. Army Corps Of Engineers

Pearce Creek Dredged Material

Containment Area

Cecilton, MD

DUFFIELD MILMINGTON, DELAWARE 19808-1232
ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

#### Log of Boring TB-4

(Page 2 - 2)

Date Started

: November 18, 1998 : November 19, 1998

**Date Completed** Weather **Drilling Agency** 

: Variable sun. breezy, 50's

Driller

: Walton : Kevin

**Testing Method** 

Horizontal Datum

: 140 lb. hammer falling 30" : MSJ

Logged by: Surface Elevation : 48.0'

: MSPCS NAD 1983

Vertical Datum Northing Easting

: NAVD 1988 : 643701 : 1600953

epth in eet	Surf. Elev. 48.0	nscs	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	- 2			Brown/gray clayey SILT, trace to little fine sand, trace mica.	21	24	2-4-5-6
	_ 2				22	24	7-8-6-8
- 50 -		MH			23	24	2-4-4-5
	3				SH-3	24	
-					24	24	4-5-7-9
55 -	8		Ш		25	24	3-4-6-7
1				Gray fine to coarse SAND, little gravel, little silt.	26	24	6-5-24-17
60 -				No Recovery (58.0'-60.0').		0	8-5-12-16
-	13			Light-gray fine to medium SAND, little silt.  No Recovery (62.0'-64.0'), see note #3.	27	4	8-15-11-16
_				Light-gray fine SAND, little medium sand, little coarse sand, trace silt.		0	
65 -	18	SM		Same, with lenses of gray clay.	28	9	7-16-14-11
1					29	24	16-22-35-50/5"
70 -				Light gray/light brown FINE SAND, trace silt.	30	20	9-38-35-29
-	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						

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.

gray/brown F/C SAND present in wash water. Spoon driven in attempt to

remove

heaved material prior to drilling to next sampling increment.

# DUFFIELD MILMINGTON, DELAWARE 19808-1232 ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

#### Log of Boring TB-5

Logged by:

: 140 lb, hammer falling 30"

: MSPCS NAD 1983

(Page 1 - 2) : November 17, 1998

**Testing Method** Surface Elevation **Horizontal Datum** 

Vertical Datum

: MSJ : 28.9'

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

Date Started Date Completed Weather

Driller

: November 18, 1998 : Variable sun. breezy, 50's

: Walton

**Drilling Agency** : Kevin

Northing Easting

: NAVD 1988 : 642338 : 1601791

	<del></del>		Drilling Equipment : CME-55			
epth Su in Ele Feet 28	/. ဗြ	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
0 -			Dark-gray mottled CLAY, trace fine sand, trace plant		1	
- 27	СН		material.	1	12	1-1-1-2
1	Cn			2	12	2-2-2-3
5 -		III	Dark-gray clayey SILT, trace fine sand, trace organics,	SH-1	14	
- 22			with lenses of plant material.	3	24	WH-WH-2-1
10 -				4	8	WH-1-1-1
10				SH-2	24	
		Ш		5	9	WR-1-1-1
15 -	мн			6	24	WH-WH-1-1
12				7	24	1-1-2-2
20 -				8	24	1-1-1-2
20		Ш		9	24	WH-WH-2-1
}				10		2-2-1-2
25			Brown clayey SILT, little fine sand.	11	24	WR-WR-WH-WH
<del>-</del> 2	ML		Light-gray mottled SILT, some fine sand, trace gravel, trace mica.	12	24	3-5-7-10
30 -			Light-brown fine to coarse SAND and gravel, trace silt (saturated).	13	24	6-10-10-7
30 ]				14	12	6-11-10-12
}	SP/SM			15	13	15-14-14-15
35 -	SP/SM			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

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'

4. Reddish/gray CLAY observed on outside of spoon. Possibly losing sample

difficulties removing spoon from sample area.

## DUFFIELD MILMINGTON, DELAWARE 19808-1232 ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

#### Log of Boring TB-5

(Page 2 - 2)

» |

Testing Method Logged by: Surface Elevation : 140 lb. hammer falling 30"

: MSJ : 28.9'

: MSPCS NAD 1983

: November 17, 1998 Vertical Datum
: November 18, 1998 Northing

Easting

: NAVD 1988 : 642338 : 1601791

U.S. Army Corps Of Engineers Pearce Creek Dredged Material Containment Area Cecilton, MD Date Started
Date Completed
Weather
Drilling Agency

: November 18, 1998 : Variable sun. breezy, 50's : Walton

Driller : Kevin
Drilling Equipment : CME-55

: 2	Surf. Elev. 28.9	nscs	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
) -		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
5 🚽				Toosy material.	20	15	10-20-15-13
} -1	18	SM			21	15	4-9-9-19
,		Civi		Varicolored fine SAND, some silt, with 1" lenses of	22	15	14-14-19-15
+	22			light-gray fine sand.	23	14	5-10-11-10
1.	23			Light-reddish/gray/brown fine SAND, and mottled SILT.	24	4	42-50/4"
;				Varicolored fine SAND, trace to little silt.	25	17	40-42-32-28
7-2	28				26	12	17-42-50/4.5"
-					27	20	24-20-27-35
)		SP/SM		No Recovery (60.0' to 60.6').		0	48-50/1"
† 3	33				28	7	30-50/5"
; -					29	4	40-50/2"
} <	38				30	20	25-35-40-34
}				Gray CLAY, little fine sand.		0	11-14-26-33
1	42	CL		No Recovery (68.0' to 70.0'), see note #4.  Red/light-gray/brown variegated CLAY, some to and fine	31	1	6-8-11-16
1	43	OL.		sand.	32	15	6-8-14-17
; -				Red/light-gray/brown variegated CLAY, trace to little fine sand.	SH-3	18	

1. Unable to determine starting depth of wet on spoon.

2. "Washed" to keep hole open beginning at 30.0'.

F:\boning logs\3769ge\tb-5.bor

80

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.

Date Begin - End: **Drill Company:** 12/12/2012 **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 Exploration Method: Sonic Continuous Angle from Vert.: 0 degrees Weather: 40's, Mostly Cloudy Exploration Diameter: 6 in O.D./ 4 in. I.D. FIELD EXPLORATION LABORATORY RESULTS Recovery (NR=No Recovery) Plasticity Index (NP=No Plasticity tsf Surveyed Elevation (feet) Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,718.082 Graphical Log Sample Type Other Tests/ Remarks Easting: 1,598,869.247 Surveyed Surface Elevation (ft.): 33.47 Water Content (%) Depth (feet) USCS Symbol Surface Condition: Cleared Area 84 in. DREDGE MATERIALS Lean CLAY with Sand (CL): subrounded PP=0.25 sand, low to medium plasticity fines, brownish  $\bar{\Delta}$ gray, dark gray, and black, moist, very soft, 20% organic matter, including decomposed reeds and roots. -30 120 in. PP=0.25 -25 10% organic matter -20 P=0.5 PP=0.25 No vibration required 17 to 27 feet. 15 PROJECT NO.: 130226 **BORING LOG CSB-29** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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[KLF\_BORING/TEST PIT SOIL LOG]

Date Begin - End: **Drill Company:** 12/12/2012 **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 Exploration Method: Sonic Continuous Angle from Vert.: 0 degrees Weather: 40's, Mostly Cloudy Exploration Diameter: 6 in O.D./ 4 in. I.D. FIELD EXPLORATION LABORATORY RESULTS Plasticity Index (NP=No Plasticity) Recovery (NR=No Recovery) tsf Surveyed Elevation (feet) Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Blow Counts (BC)= Uncorr. blows/6 in. Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,718.082 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,869.247 Surveyed Surface Elevation (ft.): 33.47 Depth (feet) USCS Symbol Surface Condition: Cleared Area Lean CLAY (CL): grey, light gray, and brown, [KLF\_BORING/TEST PIT SOIL LOG] wet, very soft -10 25 R:KLF\_STANDARD\_GINT\_LIBRARY\_SR.1.1.GLB 120 in. No vibration required PP=0.25 27 to 37 feet. 30 -0 PP=0.5 Fibrous PEAT (PT): brown and black, S-1 TIDAL MARSH **DEPOSITS** organic, wet 11/ 120 in. -5 Lean CLAY with Sand (CL): rounded sand, **UPPER SAND** medium plasticity fines, light brown and gray, wet, hard PROJECT NO.: 130226 **BORING LOG CSB-29** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Date Begin - End: **Drill Company:** 12/12/2012 **Boart Longyear BORING LOG CSB-29** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Passing #200 Sieve (%) Dry Density (pcf) Surveyed Elevation (feet) Liquid Limit (NV=No Value) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,718.082 Graphical Log Sample Type Water Content (%) Easting: 1,598,869.247 Surveyed Surface Elevation (ft.): 33.47 Depth (feet) USCS Symbol Surface Condition: Cleared Area Silty SAND with Gravel (SM): rounded sand, low plasticity fines, gray and brownish gray, wet BORING/TEST PIT SOIL LOG S-2 -10 Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, yellowish brown and S-3 gray, wet [KLF Clayey SAND with Gravel (SC): rounded sand, medium plasticity fines, yellowish brown GINT\_LIBRARY\_SR.1.1.GLB and gray, wet, loose S-4 Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, light gray and yellowish brown, wet 120 in. Clayey SAND with Gravel (SC): rounded sand, medium plasticity fines, yellowish brown S-5 -15 Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, light gray and STANDARD yellowish brown Clayey SAND with Gravel (SC): rounded 50 sand, medium plasticity fines, yellowish brown R:KLF and light gray, wet Poorly-Graded SAND with Gravel (SP): rounded gravel, rounded sand, non-plastic Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj fines, brown, brownish yellow, and yellowish Poorly-Graded SAND (SP): rounded sand, non-plastic fines, pale brown, wet Poorly-Graded SAND with Gravel (SP): -20 rounded gravel, rounded sand, non-plastic fines, pale brown, wet Sandy SILT (ML): rounded sand, low S-6 plasticity fines, light gray and yellowish brown, Poorly-Graded SAND with Gravel (SP): rounded gravel, rounded sand, non-plastic fines, yellowish brown and light brown, wet 120 in. S-7 -25 Clay stringers at approximately 59 and 60 3 feet PROJECT NO.: 130226 **BORING LOG CSB-29** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Date Begin - End: **Drill Company:** 12/12/2012 **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 Exploration Method: Sonic Continuous Angle from Vert.: 0 degrees Weather: Exploration Diameter: 6 in O.D./ 4 in. I.D. 40's, Mostly Cloudy FIELD EXPLORATION LABORATORY RESULTS Plasticity Index (NP=No Plasticity) Recovery (NR=No Recovery) tsf Passing #200 Sieve (%) Liquid Limit (NV=No Value) Surveyed Elevation (feet) Dry Density (pcf) Blow Counts (BC)= Uncorr. blows/6 in. Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,718.082 Graphical Log Sample Type Other Tests/ Remarks Easting: 1,598,869.247 Surveyed Surface Elevation (ft.): 33.47 Water Content (%) Depth (feet) USCS Symbol Surface Condition: Cleared Area Silty SAND (SM): rounded sand, non-plastic fines, light gray, yellowish brown and light brown, wet [KLF\_BORING/TEST PIT SOIL LOG] -30 S-8 23.0 100 13 SM 65 Poorly-Graded SAND (SP): rounded sand, non-plastic fines, pale brown and light gray, R:KLF\_STANDARD\_GINT\_LIBRARY\_SR.1.1.GLB S-9 120 in. -35 70 E:\company\projects\130226 Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj -40 120 in. -45 PROJECT NO.: 130226 **BORING LOG CSB-29** DRAWN BY: KLW CHECKED BY: DG *KLEINFELDER* Pearce Creek CDF Earleville, MD Bright People. Right Solutions. gINT FILE: DATE: 12/28/2013 REVISED: 12/29/2013

Date Begin - End: **Drill Company:** 12/12/2012 **Boart Longyear BORING LOG CSB-29** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Passing #200 Sieve (%) Dry Density (pcf.) Surveyed Elevation (feet) Liquid Limit (NV=No Value) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,718.082 Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,869.247 Surveyed Surface Elevation (ft.): 33.47 Depth (feet) Graphical USCS Symbol Surface Condition: Cleared Area Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, yellowish brown and BORING/TEST PIT SOIL LOG light gray, wet Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellowish brown, wet -50 [KLF Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, light brown and light GINT\_LIBRARY\_SR.1.1.GLB gray, wet Poorly-Graded SAND (SP): rounded sand, S-10 non-plastic fines, yellowish brown, wet Sandy Lean CLAY (CL): rounded sand, 120 in. medium plasticity fines, yellowish brown and gray, wet Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellowish brown, wet -55 STANDARD Lean CLAY (CL): rounded sand, medium to high plasticity fines, light gray and yellowish R:KLF Poorly-Graded SAND (SP): rounded sand, **UPPER CONFINING** Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj non-plastic fines, light gray and yellowish **LAYER** brown, wet Lean CLAY (CL): rounded sand, medium plasticity fines, reddish gray, light gray and pink, wet PP=2.0 -60 PP=3.0 S-11 CL 20.1 38 18 P=3.5 120 in. Silty SAND (SM): rounded sand, non-plastic LOWER SAND to low plasticity fines, light gray, yellowish brown, brown and red, wet -65 E:\company\projects\130226 PROJECT NO.: 130226 **BORING LOG CSB-29** DRAWN BY: KLW CHECKED BY: DG EINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. gINT FILE: DATE: 12/28/2013 REVISED: 12/29/2013

Date Begin - End: **Drill Company:** 12/12/2012 **Boart Longyear BORING LOG CSB-29** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Passing #200 Sieve (%) Dry Density (pcf.) Surveyed Elevation (feet) Liquid Limit (NV=No Value) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,718.082 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,869.247 Surveyed Surface Elevation (ft.): 33.47 Depth (feet) USCS Symbol Surface Condition: Cleared Area Silty SAND (SM): rounded sand, non-plastic to low plasticity fines, light gray, yellowish brown, brown and red, wet Clayey SAND (SC): rounded sand, medium plasticity fines, red, light gray and yellowish brown, moist -70 Lean CLAY with Sand (CL): rounded sand, PP=3.0 105 medium plasticity fines, red and gray, moist S-13 Lean CLAY (CL): rounded sand, medium plasticity fines, gray and dark gray, moist S-15 Clayey SAND (SC): rounded sand, medium plasticity fines, dark gray and light gray, moist 120 in. Sandy Lean CLAY (CL): rounded sand, low plasticity fines, dark gray, wet -75 Silty SAND (SM): rounded sand, low plasticity fines, dark gray, wet Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray, moist Clayey SAND (SC): rounded sand, medium plasticity fines, dark gray Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray S-16 -80 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 Silty SAND (SM): rounded sand, low -85 plasticity fines, yellowish red, light gray and brownish yellow, wet PROJECT NO.: 130226 **BORING LOG CSB-29** DRAWN BY: KLW CHECKED BY: DG EINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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BORING/TEST PIT SOIL LOG

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STANDARD

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Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj

Date Begin - End: **Drill Company:** 12/12/2012 **Boart Longyear BORING LOG CSB-29** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,718.082 Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,869.247 Surveyed Surface Elevation (ft.): 33.47 Depth (feet) Graphical USCS Symbol Surface Condition: Cleared Area Lean CLAY (CL): rounded sand, medium BORING/TEST PIT SOIL LOG plasticity fines, white and yellowish red, wet Silty SAND (SM): rounded sand, low plasticity fines, light gray and yellowish brown, Lean CLAY with Sand (CL): rounded sand, -90 medium plasticity fines, light brown, white and light gray, wet [KLF 125 GINT\_LIBRARY\_SR.1.1.GLB Silty SAND (SM): rounded sand, low plasticity fines, light gray, wet Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, wet 91 in. Silty SAND (SM): rounded sand, low plasticity fines, light gray Sandy Lean CLAY (CL): rounded sand, Sand occurs as -95 medium plasticity fines, light gray and white, approximately 1/4 inch seams. STANDARD 130 R:KLF Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj Lean CLAY (CL): rounded sand, high plasticity fines, red, wet Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellowish red and light -100 brown, wet Clayey SAND (SC): rounded sand, medium plasticity fines, light gray, wet Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brown, wet 120 in. -105 E:\company\projects\130226 PROJECT NO.: 130226 **BORING LOG CSB-29** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

Date Log		_	End:	12/12/2012 D. Grahl	Drill Co	ew:		Boart R. Pa	: Longyear							BORING LOG CSB-			
			tum:	MD State Plane - NAVD88	Drill Equ			LS 60											
_		om V	ert.:	0 degrees				od: Sonic											
Wea	ather	: 	1	40's, Mostly Cloudy			iame	eter: 6 in (	D.D./ 4	in. I.D	<u> </u>								
				FIELD EXP	LURATIÓI	N T							LA T	ROK4	TORY				
Surveyed Elevation (feet)	Depth (feet)	Graphical Log		Northing: 642,718.082 Easting: 1,598,869.247 Surveyed Surface Elevation (ft.): 33.4 Surface Condition: Cleared Area	<b>1</b> 7	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		
			Poo nor bro	yey SAND (SC): rounded sand, me sticity fines, red, wet orly-Graded SAND (SP): rounded s n-plastic fines, light brown and yello wn, wet	and, owish		\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\												
110			to le	y SAND (SM): rounded sand, non- ow plasticity fines, yellowish brown owish red, red, and reddish gray, w	, vet														
	145-			an CLAY (CL): medium to high plases, red and gray, wet	ticity	0:-	M										LOWER CONFINING LAYER		
-						S-17	×		120 in.										
115 							>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>		111.										
	150-			an CLAY with Sand (CL): rounded dium plasticity fines, light gray, wet			>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>												
120				yey SAND (SC): rounded sand, me sticity fines, gray, red and yellowish		-													
-	155-			an CLAY (CL): medium plasticity fir y, wet	es,														
- 125 -		_	app The	e exploration was terminated at proximately 157 ft. below ground su e exploration was backfilled with grocember 12, 2012.		1	IV		1	≖	surfac GENE	dwater e durin RAL N	was og drilli OTES	bserve ng. :	ed at a	pproxii	TION:_ mately 1 ft. below groun were surveyed by Polar		
			\			JECT N		130226 KLW		l	BORI	DRING LOG CSB-29							
(	1	KL		INFELDER tright People. Right Solutions.	CHE	CKED I	BY:	DG 12/28/2013 12/29/2013				earce ( Earle		_					

Date Begin - End: **Drill Company:** 12/13/2012 - 12/14/2012 **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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,218.093 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,872.603 Surveyed Surface Elevation (ft.): 32.76 Depth (feet) USCS Symbol Surface Condition: Phragmites SILT (ML): low plasticity fines, brown, wet 84 in. DREDGE MATERIAL Lean CLAY with Sand (CL): subrounded sand, medium plasticity fines, brown and gray, [KLF\_BORING/TEST PIT SOIL LOG] moist, fine grained sand P=1.0 30 PP=1.5  $\bar{\Delta}$ Lean CLAY (CL): subrounded sand, medium to high plasticity fines, dark gray and black, wet, fine grained sand PP=0.25 R:KLF\_STANDARD\_GINT\_LIBRARY\_SR.1.1.GLB PP=0.5 PP=0.5 120 in. 20% organic matter. 25 Elastic SILT (MH): subrounded sand, low to medium plasticity fines, dark gray, wet, fine grained sand 10 PP=0.25 Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj 20 P=0.25 Lean CLAY (CL): subrounded sand, medium plasticity fines, dark gray, gray, brown and black, wet, fine grained sand PP=0.5 103 in. 15 20% organic matter. Elastic SILT (MH): subrounded sand, low to medium plasticity fines, gray, wet, very soft, fine grained sand PROJECT NO.: 130226 **BORING LOG CSB-30** DRAWN BY: KLW CHECKED BY: DG *KLEINFELDER* Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Date Begin - End: **Drill Company:** 12/13/2012 - 12/14/2012 **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 Exploration Method: Sonic Continuous Angle from Vert.: 0 degrees Weather: 50's, Clear Exploration Diameter: 6 in O.D./ 4 in. I.D. FIELD EXPLORATION LABORATORY RESULTS Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in. Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,218.093 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,872.603 Surveyed Surface Elevation (ft.): 32.76 Depth (feet) USCS Symbol Surface Condition: Phragmites Elastic SILT (MH): subrounded sand, low to medium plasticity fines, gray, wet, very soft, fine grained sand 10 Lean CLAY (CL): subrounded sand, medium plasticity fines, dark gray, black and gray, wet, 20% organic matter. soft, fine grained sand 109 in. PP=0.75 -5 PP=1.0 Elastic SILT (MH): subrounded sand, medium plasticity fines, gray and black, wet, PP=0.25 10% organic matter very soft, fine grained sand 30 from 29.5 to 31 feet. PP=0.5 P=0.25 PP=0.5 Fibrous PEAT (PT): high plasticity fines, dark TIDAL MARSH **DEPOSITS** brown and brown, wet S-1 -5 Organic CLAY (OH): subrounded sand, high plasticity fines, yellow brown and dark brown, wet, fine grained sand PROJECT NO.: 130226 **BORING LOG CSB-30** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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BORING/TEST PIT SOIL LOG

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Date Begin - End: **Drill Company:** 12/13/2012 - 12/14/2012 **Boart Longyear BORING LOG CSB-30** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,218.093 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,872.603 Surveyed Surface Elevation (ft.): 32.76 Depth (feet) USCS Symbol Surface Condition: Phragmites Organic CLAY (OH): subrounded sand, high plasticity fines, yellow brown and dark brown, wet, fine grained sand BORING/TEST PIT SOIL LOG S-2 -10 [KLF Sandy SILT with Gravel (ML): subrounded to **UPPER SAND** rounded gravel, subrounded to rounded sand, GINT\_LIBRARY\_SR.1.1.GLB non-plastic fines, light gray and yellowish brown, wet, medium to fine grained sand, medium to fine to grained gravel 120 in. Silty SAND (SM): rounded sand, non-plastic fines, olive yellow and yellowish brown, wet, -15 medium to fine grained sand STANDARD Poorly-Graded SAND with Silt and Gravel (SP-SM): rounded gravel, rounded sand, non-plastic fines, yellowish brown, wet, coarse 50 to fine grained sand, medium to fine grained R:KLF S-4 Occasional Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj 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 Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, medium to fine grained 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. Poorly-Graded SAND with Gravel (SP): -25 rounded gravel, rounded sand, non-plastic S-6 fines, yellowish brown, wet, coarse to medium grained sand E:\company\projects\130226 PROJECT NO.: 130226 **BORING LOG CSB-30** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

Date Begin - End: **Drill Company:** 12/13/2012 - 12/14/2012 **Boart Longyear BORING LOG CSB-30** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,218.093 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,872.603 Surveyed Surface Elevation (ft.): 32.76 Depth (feet) USCS Symbol Surface Condition: Phragmites Clayey SAND (SC): rounded sand, medium plasticity fines, white and yellow, wet, medium S-7 to fine grained sand S-8 CL Lean CLAY (CL): rounded sand, medium 21.1 33 15 plasticity fines, white and yellow, fine grained -30 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 65 120 in. Grades to light gray, yellow, white, yellowish brown and yellowish red -35 40 S-10 Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, light gray and yellow, S-11 wet, firm, medium to fine grained sand Lean CLAY (CL): rounded sand, medium 118 in. PP=2.0 plasticity fines, light gray and yellow, wet, firm, -45 fine grained sand Silty SAND (SM): rounded sand, non-plastic fines, light gray and yellow, wet, medium to fine grained sand PROJECT NO.: 130226 **BORING LOG CSB-30** DRAWN BY: KLW CHECKED BY: DG EINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Date Begin - End: **Drill Company:** 12/13/2012 - 12/14/2012 **Boart Longyear BORING LOG CSB-30** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,218.093 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,872.603 Surveyed Surface Elevation (ft.): 32.76 Depth (feet) USCS Symbol Surface Condition: Phragmites Silty SAND (SM): rounded sand, non-plastic fines, light gray and yellow, wet, medium to fine grained sand S-12 BORING/TEST PIT SOIL LOG -50 Clayey SAND (SC): rounded sand, low plasticity fines, light gray, wet, medium to fine grained sand S-13 PP=4.5 [KLF 85 GINT\_LIBRARY\_SR.1.1.GLB 120 in. Poorly-Graded SAND (SP): rounded sand, non-plastic fines, white, wet, medium grained -55 S-14 PP=2.0 Sandy Lean CLAY (CL): light gray, wet, firm, fine grained sand STANDARD Poorly-Graded SAND with Silt (SP-SM): light gray, wet, coarse to fine grained sand 90 R:KLF S-15 Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj -60 Lean CLAY with Sand (CL): light gray, wet, S-16 hard, fine grained sand S-17 Silty SAND (SM): light gray, wet, medium to fine grained sand S-18 Lean CLAY with Sand (CL): light gray, wet, hard, fine grained sand LOWER SAND Silty SAND (SM): light gray, wet, medium S-19 grained sand Poorly-Graded SAND with Silt (SP-SM): 120 in. rounded sand, non-plastic fines, light gray, -65 wet, medium to fine grained sand E:\company\projects\130226 PROJECT NO.: 130226 **BORING LOG CSB-30** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

Date Begin - End: **Drill Company:** 12/13/2012 - 12/14/2012 **Boart Longyear BORING LOG CSB-30** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** LS 600 MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Pocket Pen(PP)= Blow Counts (BC)= Uncorr. blows/6 in Passing No.4 Sieve (%) Northing: 642,218.093 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,872.603 Surveyed Surface Elevation (ft.): 32.76 Depth (feet) USCS Symbol Surface Condition: Phragmites Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, light gray, S-20 wet, medium to fine grained sand BORING/TEST PIT SOIL LOG -70 [KLF 105 R:KLF\_STANDARD\_GINT\_LIBRARY\_SR.1.1.GLB 101 in. Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light gray, coarse to fine -75 grained sand 110 -80 grades to light brownish gray, medium to fine grained sand S-21 grades to yellowish brown 117.5 to 119 Frequent Poorly-Graded SAND (SP) partings about 1/4 Silty SAND (SM): rounded sand, non-plastic 120 in. inch thick. fines, gray, wet, medium to fine grained sand -85 Lean CLAY partings (CL): rounded sand, 119 to 120.5 feet medium plasticity fines, dark gray and light Occasional Lean CLAY gray, wet, hard, fine grained sand partings about 1/4 inch Silty SAND (SM): rounded sand, non-plastic thick fines, light gray and dark gray, wet, medium to S-22 fine grained sand PROJECT NO.: 130226 **BORING LOG CSB-30** DRAWN BY: KLW CHECKED BY: DG EINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Hor.	Ver	. Dat	um:	MD State Pla	ane - NAVD88	Drill Eq			LS 60									
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Wea	ather	: 		50's, Clear				iam	eter: 6 in (	D.D./ 4	in. I.D	<u> </u>						
					FIELD EX	PLORATIO	N T	$\overline{}$		_				LA	BORA	TORY		JLTS 
Surveyed Elevation (feet)	Depth (feet)	Graphical Log		Easting: Surveyed Surfac	: 642,218.093 1,598,872.603 e Elevation (ft.): 32 dition: Phragmites	76	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
90	- - 125— -		plas grain Silty fines fine Lear plas hard Silty fines Lear plas fine Silty fines Silty fines	ticity fines, dark ned sand  y SAND (SM): rors, light gray and grained sand  n CLAY (CL): rotticity fines, light; d, fine grained sand  y SAND (SM): rors, light gray, wet, n CLAY (CL): rotticity fines, dark grained sand	unded sand, med gray, wet, firm, fi unded sand, non dark gray, wet, munded sand, med gray and dark graind unded sand, non fine grained sar unded sand, med gray and light graunded sand, non fine grained sar	ne	S-23	<b>*************************************</b>		120 in.								121.8 to 124.3 feet Occasional Silty SAN (SM) partings about 1 inch thick.  125.3 to 128.5 feet Occasional Silty SAN (SM) partings about 1 inch thick.
	130-		plass sance Silty fines Lean plass sance Silty fines Lean plas sance Silty fines Lean plas sance Silty fines Silty fines Silty fines Silty fines Silty fines Silty fines Silty	n CLAY (CL): routicity fines, dark day (SAND (SM): rous, light gray, wet, n CLAY (CL): routicity fines, dark day (SAND (SM): routicity fines, dark day (SAND (SM): rous, light gray, wet, n CLAY (CL): routicity fines, dark day (SAND (SM): rous, light gray, wet, n CLAY (CL): routicity fines, dark day (SAND (SM): rous, light gray, wet, n CLAY (CL): routicity fines, dark day (SAND (SM): rous, light gray, wet, s, light gray, wet, s, light gray, wet, s, light gray, wet,	unded sand, med gray, wet, fine grained sand, non fine grained sard, non fine grained sard, non fine grained sand, med gray, wet, fine grained sand, non fine grained sand, non fine grained sard, non fine grained sard, non fine grained sard, med gray, med sand, med sand, med gray, med sand, med grained sand, med	ium ained -plastic dium ained -plastic dd ium ained -plastic dd ium ained -plastic dd ium ained				120 in.								134 to 136.5 feet Frequent Poorly-Graded SAND (SP) seams 1/4 inch 1 inch thick.
(		~ {\_	fine	grained sand	gray and light gray	PRC DRA CHE	DJECT NAWN BY CKED I	′: BY:	130226 KLW DG 12/28/2013 12/29/2013		1		earce	_OG	CDF			

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Surveyed Elevation (feet)	Depth (feet)	Graphical Log		\$	Surveye	Eastined Sun	ig: 1,5 face E		.093 .603 n (ft.): 32 ragmites			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			
110	145-		n a g C p g F n a g	non-pland ye grained Clayey blastic grained Poorly non-pland ye grained Sandy mediunyellowitean (Clayer)	astic fillowish disance of SANN ty fine disance of Graduastic fillowish disance of the sance of	ines, in brow	yellov wn, w ht gra AND ( light t wet, Y (CL fines wet, fi	wish reter, counded ay, we specified says and says are specified says and says are specified says are specified says are specified says are says ar	ounded sa gray and med sa gray and med sa gray and med sa gray and med sa nd, med sand, med sand	lish yell medium nedium um to fil sand, ish bro edium nd, id and dium	ne wn	S-24											Occasional discontinuous clay lenses. LOWER CONFINING LAYER			
- 115 - -	150-	-		olastic			ht gra	ay, pin	k and y	ellow, v	vet,	S-26			120 in.											
	155-	-	) n		n plas	sticity	fines		nded sa gray an			S-27				CL	11.7				29	19				
125 - -		_	a T		imate plorat	ly 157 ion w	' ft. be as ba	elow g	ed at round s d with g								Groun ground GENE	d surfa RAL N	was o ce duri OTES	bserve ng dril	ed at a lling.	pproxii	TION: mately 3.5 ft. below were surveyed by Polar			
							DRA	JECT I	<b>/</b> :	130226 KLW		BOR			_OG	CSE	3-30									
KLEINF Bright Peo									N .	DATE			DG 12/28/2013 12/29/2013			Pe	earce Earle			:						

**Drill Company:** Date Begin - End: 12/11/2012 **Boart Longyear BORING LOG CSB-31** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Surveyed Elevation (feet) Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 643,001.615 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,356.063 Surveyed Surface Elevation (ft.): 35.14 Depth (feet) USCS Symbol Surface Condition: Scrub/Phragmites -35 Poorly-Graded SAND (SP): rounded sand, 84 in. DREDGE MATERIAL non-plastic fines, brown, moist Sandy Lean CLAY (CL): rounded sand, PP=0.75 medium plasticity fines, dark gray and brown, mottled, moist to wet, firm to soft P=0.5  $\nabla$ S-1 Sandy SILT (ML): rounded sand, non-plastic PP=0.25 to low plasticity fines, dark gray, moist, very S-2 120 in. Lean CLAY (CL): rounded sand, low to medium plasticity fines, dark gray and brown, wet, soft to very soft, occasional wood fragments 10 25 -20 Lean CLAY (CL): rounded sand, medium QUATERNARY PP=0.75 plasticity fines, light brown, moist, firm LOWLAND DEPOSITS S-3 PP=1.5 120 in. Lean CLAY with Sand (CL): rounded sand, low plasticity fines, light brown, moist, firm PROJECT NO.: 130226 **BORING LOG CSB-31** DRAWN BY: KLW CHECKED BY: DG *KLEINFELDER* Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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BORING/TEST PIT SOIL LOG

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BORING/TEST PIT SOIL LOG

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Date Begin - End: **Drill Company:** 12/11/2012 **Boart Longyear BORING LOG CSB-31** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 LS 600 Angle from Vert.: 0 degrees Exploration Method: Sonic Continuous Weather: Exploration Diameter: 6 in O.D./ 4 in. I.D. 40's, Foggy FIELD EXPLORATION LABORATORY RESULTS Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Surveyed Elevation (feet) Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf.) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Northing: 643,001.615 Passing No.4 Sieve (%) Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,356.063 Surveyed Surface Elevation (ft.): 35.14 Depth (feet) USCS Symbol Surface Condition: Scrub/Phragmites --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, -50 Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, light brown, white and S-11 brownish yellow, wet LOWER SAND Silty SAND (SM): rounded sand, non-plastic fines, light brown, white and brownish yellow, 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, 90 -55 S-12 22.2 SM 100 17 -60 120 in. Grades to light brown, yellowish brown and PROJECT NO.: 130226 **BORING LOG CSB-31** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

gINT FILE: E:\company\projects\130226 Usace-Pearce Creek

BORING/TEST PIT SOIL LOG

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Slurry Wall Investigation\field Work\gint\130226.gpj

Date Begin - End: **Drill Company:** 12/11/2012 **Boart Longyear BORING LOG CSB-31** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) Plasticity Index (NP=No Plasticity tsf Passing #200 Sieve (%) Surveyed Elevation (feet) Liquid Limit (NV=No Value) Dry Density (pcf) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 643,001.615 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,356.063 Surveyed Surface Elevation (ft.): 35.14 Depth (feet) USCS Symbol Surface Condition: Scrub/Phragmites --65 Silty SAND (SM): rounded sand, non-plastic fines, light brown, yellowish brown and gray, S-13 wet Cemented layers from 103 to 104 feet. 105 Lean CLAY with Sand (CL): light gray and S-14 PP=2.5-3.0 CL 17.6 10 26 red, moist, firm to hard 120 in. PP=2.5 110 -75 Interbedded Silty SAND (SM) and Sandy Lean CLAY (CL): rounded sand, low to medium plasticity fines, light gray and red, wet -80 Silty SAND (SM): rounded sand, non-plastic to low plasticity fines, light gray and light brown, wet Poorly-Graded SAND with Silt (SP-SM): 120 in. rounded sand, non-plastic fines, light gray and yellowish brown, wet PROJECT NO.: 130226 **BORING LOG CSB-31** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Date Beg		End:	12/11/2012	Drill Co	-	:		Longy	ear_		_					BORING LOG CSB-31
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			MD State Plane - NAVD88 0 degrees	Drill Equ			LS 60		nuoue							
Angle from Weather		۲1 L	40's, Foggy				od: Sonice eter: 6 in C									
715411161			FIELD EXF			J1116	<u>. 0 III C</u>	4 ا.ك.ر	ע.ו וויי	<u> </u>		LA	BORA	TORY	/ RESU	JLTS
Surveyed Elevation (feet) Depth (feet)	Graphical Log		Northing: 643,001.615 Easting: 1,598,356.063 Surveyed Surface Elevation (ft.): 35. Surface Condition: Scrub/Phragmite		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 - - 130 165-		roun gray	SAND with lignite fragments (S ded sand, non-plastic fines, light and black, wet  SAND (SM): rounded sand, non- s, dark gray and gray, wet	gray,	S-22											
135 170- 135 - - 140 175-	-	The	oximately 167 ft. below ground su exploration was backfilled with grember 11, 2012.							GENE	d surfa RAL N Polorati	OTES	: -	-	evation	were surveyed by Polaris.
					JECT No		130226 KLW			BOR	NG I	_OG	CSE	3-31		

Date Begin - End: **Drill Company:** 12/15/2012 **Boart Longyear BORING LOG CSB-32** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** LS 600 MD State Plane - NAVD88 Angle from Vert.: 0 degrees Exploration Method: Sonic Continuous Weather: 40's, Partly Cloudy Exploration Diameter: 6 in O.D./ 4 in. I.D. FIELD EXPLORATION LABORATORY RESULTS Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,057.079 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,599,625.909 Surveyed Surface Elevation (ft.): 29.19 Depth (feet) USCS Symbol Surface Condition: Phragmites 52 in. Lean CLAY with Sand (CL): subrounded to Surface Water rounded sand, medium plasticity fines, brown and gray, wet, soft to firm, fine grained sand DREDGE MATERIAL -25 S-1  $\nabla$ Elastic SILT (MH): rounded sand, low to 120 in. medium plasticity fines, gray and dark gray, wet, fine grained sand -20 S-2 SILT (ML): rounded sand, low plasticity fines, **QUATERNARY** LOWLAND DEPOSITS yellowish brown and gray, wet, fine grained S-3 Silty SAND (SM): rounded sand, non-plastic fines, yellowish brown and gray, wet, medium to fine grained sand SILT with Sand (ML): rounded sand, low plasticity fines, yellowish brown and gray, wet, medium to fine grained sand 120 in. -10 PROJECT NO.: 130226 **BORING LOG CSB-32** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

BORING/TEST PIT SOIL LOG

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Date Begin - End: **Drill Company:** 12/15/2012 **Boart Longyear BORING LOG CSB-32** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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. FIELD EXPLORATION LABORATORY RESULTS Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,057.079 Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,599,625.909 Surveyed Surface Elevation (ft.): 29.19 Depth (feet) Graphical Sample Number USCS Symbol Surface Condition: Phragmites Gravelly SILT with Sand (ML): rounded S-5 gravel, rounded sand, low plasticity fines, yellowish brown and light gray, wet, medium to S-6 fine grained sand, coarse to medium grained Clayey SAND (SC): rounded sand, medium S-7 plasticity fines, yellowish brown, brownish gray and gray, wet, medium to fine grained sand Lean CLAY (CL): rounded sand, medium S-8 plasticity fines, brownish yellow, yellowish brown and gray, wet, fine grained sand Silty SAND (SM): rounded sand, non-plastic S-9 25 fines, yellowish brown, yellow and gray, wet, fine grained sand Sandy SILT (ML): rounded sand, non-plastic fines, light gray and yellowish brown, wet, fine S-10 grained sand Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, fine grained sand Poorly-Graded SAND with Silt (SP-SM): 120 in. **UPPER SAND** rounded sand, non-plastic fines, light brownish gray, light gray, and gray, wet, coarse to fine -0 grained sand 30 Occasional Silty Sand layers up to 1 inch S-11 thick. -5 120 in. Silty SAND (SM): rounded sand, non-plastic fines, brown, wet, medium to fine grained -10 sand PROJECT NO.: 130226 **BORING LOG CSB-32** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Date	е Вес	gin - E	End:	12/15/2012	Drill Cor	npany	<b>/</b> :	Boart	Longy	ear							BORING LOG CSB-32
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Hor	Ver	t. Dat	tum:	MD State Plane - NAVD88	Drill Equ	iipme	nt:	LS 60	00								
_		om Ve	ert.:	0 degrees				od: Sonic									
Wea	ather	:	1	40's, Partly Cloudy			iam	eter: 6 in C	D.D./ 4	in. I.D							
				FIELD EXF	PLORATION	N			Γ_				LA	BORA	TORY		
Surveyed Elevation (feet)	Depth (feet)	Graphical Log		Northing: 642,057.079 Easting: 1,599,625.909 Surveyed Surface Elevation (ft.): 29. Surface Condition: Phragmites	19	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
75	- - - 105-		high grair Grad	n CLAY (CL): rounded sand, medi plasticity fines, red and gray, wet ned sand des to red, light gray and pink rly-Graded SAND (SP): rounded s plastic fines, yellowish brown, lig	s, fine	S-30	<u> </u>										
- 80 - -	- 110 -		The appr	light brownish gray, medium to fir ned sand  exploration was terminated at roximately 108 ft. below ground su exploration was backfilled with grember 16, 2012.	urface.					⊻	Groun surfac GENE	e durin RAL N	was o g drilli OTES	bserve ng. :	d at a	pproxii	ION:_mately 8 ft. below ground were surveyed by Polaris.
- 85 - -	- 115— -																
90		~ <l< td=""><td></td><td>INFELDER ight People. Right Solutions.</td><td>DRA</td><td>JECT N WN BY CKED E</td><td>': BY:</td><td>130226 KLW DG 12/28/2013</td><td></td><td>ı</td><td>BORI Pe</td><td>earce</td><td></td><td>CDF</td><td>-32</td><td></td><td></td></l<>		INFELDER ight People. Right Solutions.	DRA	JECT N WN BY CKED E	': BY:	130226 KLW DG 12/28/2013		ı	BORI Pe	earce		CDF	-32		

Date Begin - End: **Drill Company:** 12/14/2012 - 12/15/2012 **Boart Longyear BORING LOG CSB-33** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** LS 600 MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 641,898.492 Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,600,625.289 Surveyed Surface Elevation (ft.): 28.9 Depth (feet) Graphical USCS Symbol Surface Condition: Phragmites 56 in. Lean CLAY with Sand (CL): rounded sand, Surface Water medium plasticity fines, brown and dark gray, wet, firm, fine grained sand PP=1.5 DREDGE MATERIAL BORING/TEST PIT SOIL LOG  $\nabla$ Lean CLAY (CL): dark gray, wet, soft, fine grained sand PP=0.25-0.5 -25 IXLF. STANDARD\_GINT\_LIBRARY\_SR.1.1.GLB 120 in. Elastic SILT (MH): rounded sand, low to medium plasticity fines, gray and black, wet, very soft, 5% organic matter, fine grained sand R:KLF Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj 15 20% Organic Matter Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray and gray, wet, soft to P=0.5 firm, 5% organic matter, fine grained sand -10 P=0.5 E:\company\projects\130226 PROJECT NO.: 130226 **BORING LOG CSB-33** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. gINT FILE: DATE: 12/28/2013 REVISED: 12/29/2013

Date Begin - End: **Drill Company:** 12/14/2012 - 12/15/2012 **Boart Longyear BORING LOG CSB-33** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** LS 600 MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 641,898.492 Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,600,625.289 Surveyed Surface Elevation (ft.): 28.9 Depth (feet) Graphical USCS Symbol Surface Condition: Phragmites Elastic SILT (MH): rounded sand, low to medium plasticity fines, dark gray and black, wet, very soft, fine grained sand P=0 Lean CLAY (CL): rounded sand, medium -5 plasticity fines, dark gray and gray, wet, soft, P=0.75-1.0 fine grained sand 25 Elastic SILT (MH): rounded sand, low plasticity fines, dark gray and black, wet, very PP=0.5 soft, fine grained sand S-1 Advanced from 17 to 27 feet, barrel sank an PP=0.25 additional 2.5 feet from 27 to 29.5 feet. Lean CLAY (CL): medium plasticity fines, PP=0.5-0.75 -0 gray, wet, soft to firm, fine grained sand Elastic SILT (MH): rounded sand, low to 90 in. 30 medium plasticity fines, gray, wet, very soft to soft, fine grained sand -5 P=0.5 Fibrous PEAT (PT): non-plastic fines, dark TIDAL MARSH brown and yellowish brown, wet, 50% Fibers 120 in. Organic SILT (OL): subrounded sand, low plasticity fines, gray and light brown, wet, soft, 25% Fibers -10 S-3 PROJECT NO.: 130226 **BORING LOG CSB-33** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Date Begin - End: **Drill Company:** 12/14/2012 - 12/15/2012 **Boart Longyear BORING LOG CSB-33** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Surveyed Elevation (feet) Passing #200 Sieve (%) Dry Density (pcf.) Blow Counts (BC)= Uncorr. blows/6 in. Liquid Limit (NV=No Value) Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 641,898.492 Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,600,625.289 Surveyed Surface Elevation (ft.): 28.9 Depth (feet) Graphical USCS Symbol Surface Condition: Phragmites Clayey SAND (SC): rounded sand, medium **UPPER SAND** BORING/TEST PIT SOIL LOG plasticity fines, light gray, wet, medium to fine grained sand S-5 Gravelly Lean CLAY (CL): subrounded to rounded gravel, subrounded to rounded sand, medium plasticity fines, light brown, yellow S-6 and brownish gray, wet, firm, medium to fine grained sand, coarse to medium grained -15 gravel Poorly-Graded SAND (SP): rounded sand, IXLF. non-plastic fines, yellowish brown and light 45 S-7 brownish gray, wet, medium to fine grained GINT\_LIBRARY\_SR.1.1.GLB Sandy SILT (ML): rounded sand, low plasticity fines, light gray and yellowish brown, S-8 wet, firm, medium to fine grained sand 120 in. Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brown, light brownish gray and yellowish brown, wet, medium grained sand Silty SAND (SM): rounded sand, non-plastic -20 fines, light brown, light brownish gray and gray, wet, medium to fine grained sand Poorly-Graded SAND with Silt (SP-SM): 50 subrounded to rounded sand, non-plastic R:KLF fines, yellowish brown, light brown and light brownish gray, wet, coarse to fine grained Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj -25 Silty SAND (SM): rounded sand, non-plastic fines, gray, wet, medium to fine grained sand 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. Grades to light gray, light brownish gray and yellowish brown, medium grained sand S-10 -30 E:\company\projects\130226 PROJECT NO.: 130226 **BORING LOG CSB-33** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. gINT FILE: DATE: 12/28/2013 REVISED: 12/29/2013

STANDARD

Date Begin - End: **Drill Company:** 12/14/2012 - 12/15/2012 **Boart Longyear BORING LOG CSB-33** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** LS 600 MD State Plane - NAVD88 Exploration Method: Sonic Continuous Angle from Vert.: 0 degrees Weather: 30's, Clear Exploration Diameter: 6 in O.D./ 4 in. I.D. FIELD EXPLORATION LABORATORY RESULTS Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Liquid Limit (NV=No Value) Passing #200 Sieve (%) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 641,898.492 Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,600,625.289 Surveyed Surface Elevation (ft.): 28.9 Depth (feet) Graphical USCS Symbol Surface Condition: Phragmites Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, dark gray and S-11 light gray, wet, coarse to fine grained sand BORING/TEST PIT SOIL LOG Lean CLAY (CL): rounded sand, medium plasticity fines, white and light gray, wet, hard, PP=2.5 fine grained sand -35 S-12 IXLF. 65 STANDARD\_GINT\_LIBRARY\_SR.1.1.GLB PP=4.5+ S-13 Silty SAND (SM): rounded sand, non-plastic to low plasticity fines, gray, wet, medium to 120 in. End of Day 12/14/2012 fine grained sand -40 70 non-plastic fines, grades to light gray and gray R:KLF E:\company\projects\130226 Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj -45 S-14 120 in. grades to light gray, light brownish gray, reddish yellow, yellow and brownish yellow -50 PROJECT NO.: 130226 **BORING LOG CSB-33** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. gINT FILE: DATE: 12/28/2013 REVISED: 12/29/2013

Date Begin - End: **Drill Company:** 12/14/2012 - 12/15/2012 **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 Exploration Method: Sonic Continuous Angle from Vert.: 0 degrees Weather: 30's, Clear Exploration Diameter: 6 in O.D./ 4 in. I.D. FIELD EXPLORATION LABORATORY RESULTS Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Pocket Pen(PP)= Blow Counts (BC)= Uncorr. blows/6 in. Passing No.4 Sieve (%) Northing: 641,898.492 Graphical Log Sample Type Other Tests/ Remarks Easting: 1,600,625.289 Surveyed Surface Elevation (ft.): 28.9 Water Content (%) Depth (feet) USCS Symbol Surface Condition: Phragmites Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, light gray, light brownish gray, reddish yellow, yellow and S-15 brownish yellow, wet, medium to fine grained -55 85 120 in. Grades to light brownish gray, light gray and yellowish brown -60 90 Poorly-Graded SAND (SP): light gray, light brownish gray and yellowish brown, medium grained sand S-16 -65 Poorly-Graded SAND with Silt (SP-SM): 120 in. rounded sand, non-plastic fines, yellow, brownish yellow, light gray and light brownish gray, medium to fine grained sand S-17 -70 PROJECT NO.: 130226 **BORING LOG CSB-33** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj

BORING/TEST PIT SOIL LOG

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		om Ve	ert.:	0 degrees				od: Sonic									
vvea	ather	: 		30's, Clear FIELD EX			ıam	eter: 6 in (	ש.ע./ 4	in. I.D	<u>.                                      </u>		1 ^	BOP,	ATORY	/ PESI	IIITS
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Surveyed Elevation (feet)	Depth (feet)	Graphical Log		Northing: 641,898.492 Easting: 1,600,625.289 Surveyed Surface Elevation (ft.): 28 Surface Condition: Phragmites	3.9	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
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	-	1111	non-լ gray,	ly-Graded SAND (SP): rounded olastic fines, yellowish brown an medium grained sand	d light	S-18	×										
			√ plast	CLAY (CL): rounded sand, med icity fines, light gray and red, we ed sand		S-19 S-20	XX	PP=2.5									
	-		Silty	SAND (SM): rounded sand, low icity fines, light gray and red, we	t, fine	S-21	×	PP=0.5									
75	=		grain Sand	ed sand <b>ly SILT (ML)</b> : rounded sand, low	,	/	XX,	PP=2.5									UPPER CONFININ LAYER
-	105-		fine o	icity fines, light gray and red, we grained sand		S-22	$\bigvee$	PP=4.5+	_								
-	-		high	CLAY (CL): rounded sand, med plasticity fines, light grayish red, w and olive brown, wet, firm to h	olive		×										
	-		grain	ed sand			Š		120 in.								
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80	110-		Grad brow	les to red, gray, olive yellow and n	olive		<b>&gt;</b>	PP=4.5+									
-	-					S-23	× ×										
	-		sand	CLAY with Sand (CL): subroun, medium plasticity fines, gray, cw and olive brown, wet, hard, fin	live			PP=4.5+									
85 -	115-					S-24				CL	15.6				34	18	
	-		The	exploration was terminated at			Š				GROI	JNDW	ATFR	LEVFI	INFO	RMAT	TION:
90	-	_	appro The	exploration was terminated at oximately 117 ft. below ground sexploration was backfilled with gember 15, 2012.						⊻	Groun ground GENE	dwater d surfa <u>:RAL N</u>	was c ce duri	bserve ing dril <u>:</u>	ed at a lling.	pproxi	mately 2.5 ft. below were surveyed by Pola
			\	i name		OJECT I		130226 KLW			BORI	ING I	_OG	CSE	3-33		
(	+	<l< td=""><td></td><td>NFELDER ight People. Right Solutions.</td><td>CH DA</td><td>ECKED</td><td>BY:</td><td>DG 12/28/2013</td><td></td><td></td><td></td><td>earce Earle</td><td></td><td>_</td><td></td><td></td><td></td></l<>		NFELDER ight People. Right Solutions.	CH DA	ECKED	BY:	DG 12/28/2013				earce Earle		_			

Date Begin - End: **Drill Company:** 12/18/2012 **Boart Longyear BORING LOG CSB-34** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** LS 600 MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Surveyed Elevation (feet) Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Blow Counts (BC)= Uncorr. blows/6 in. Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 643,159.782 Graphical Log Sample Type Other Tests/ Remarks Easting: 1,599,272.899 Surveyed Surface Elevation (ft.): 35.24 Water Content (%) Depth (feet) USCS Symbol Surface Condition: Phragmites 39 in. DREDGE MATERIALS Lean CLAY with Sand (CL): subrounded -35 sand, medium plasticity fines, dark gray and reddish brown, moist to wet, soft, 20% organic matter, fine grained sand S-1 -30  $\bar{\Delta}$ Elastic SILT (MH): subrounded sand, low 51 in. plasticity fines, dark gray and black, wet, very soft, 10% organic matter, fine grained sand PP=0.25 10 25 S-2 МН 100 5.5 90 50 14 -20 Sandy Lean CLAY (CL): subrounded sand, 117 in. medium plasticity fines, gray and brown, wet, very soft, fine grained sand Elastic SILT (MH): subrounded sand, low plasticity fines, gray and dark gray, wet, very soft, fine grained sand PROJECT NO.: 130226 **BORING LOG CSB-34** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj

[KLF\_BORING/TEST PIT SOIL LOG]

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Date Begin - End: **Drill Company:** 12/18/2012 **Boart Longyear BORING LOG CSB-34** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** LS 600 MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Surveyed Elevation (feet) Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Blow Counts (BC)= Uncorr. blows/6 in. Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 643,159.782 Graphical Log Sample Type Other Tests/ Remarks Easting: 1,599,272.899 Surveyed Surface Elevation (ft.): 35.24 Water Content (%) Depth (feet) USCS Symbol Surface Condition: Phragmites Elastic SILT (MH): subrounded sand, low -15 plasticity fines, gray and dark gray, wet, very soft, fine grained sand BORING/TEST PIT SOIL LOG S-3 Silty SAND (SM): rounded sand, non-plastic fines, gray and dark gray, wet, very soft, fine grained sand Elastic SILT (MH): rounded sand, low plasticity fines, gray, dark gray and black, wet, very soft, fine grained sand IXLF. 25 -10 R:KLF\_STANDARD\_GINT\_LIBRARY\_SR.1.1.GLB Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray and black, soft, fine grained sand 95 in. Elastic SILT (MH): rounded sand, low plasticity fines, gray, dark gray and black, wet, very soft, fine grained sand 30 -5 Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj grades to gray and dark gray E:\company\projects\130226 PROJECT NO.: 130226 **BORING LOG CSB-34** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. gINT FILE: DATE: 12/28/2013 REVISED: 12/29/2013

Dat	e Be	gin - l	End:	12/18/2012	Drill Cor	mpany	<u>':</u>	Boart	Longy	ear							BORING LOG CSB-34
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1	ather			40's, Foggy				eter: 6 in C									
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Surveyed Elevation (feet)	Depth (feet)	Graphical Log		Northing: 643,159.782 Easting: 1,599,272.899 Surveyed Surface Elevation (ft.): 35	.24		Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	0	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	<u> </u>	Other Tests/ Remarks
-	Depth	Graph	Fire	Surface Condition: Phragmites		Sample Number	Samp	Blow Co Uncorr. Pocket	Recov (NR=N	USCS Symbol	Water	Dry De	Passir Sieve	Passir #200	Liquid (NV=N	Plastic (NP=N	Other Rema
	50-		Fibro dark the Fibers  Organ to high dark seand  Clayer plasting graine  Organ to high to high seand	c SILT (MH): rounded sand, locity fines, gray, dark gray and bioft, fine grained sand  us PEAT (PT): medium plasticity frown and gray, wet, very soft, so  nic CLAY (OH): rounded sand,	ty fines, 50%  medium gray and grained	S-5			115 in.	ОН	60.1				103	66	TIDAL MARSH DEPOSITS -
(		KL		<b>NFELDER</b> ght People. Right Solutions.	DRA CHE DATI	JECT N WN BY: CKED E E: ISED:	: BY:	130226 KLW DG 12/28/2013 12/29/2013				earce	_OG  Creek ville, M	CDF			

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Date Begin - End: **Drill Company:** 12/18/2012 **Boart Longyear BORING LOG CSB-34** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 LS 600 Angle from Vert.: 0 degrees Exploration Method: Sonic Continuous 40's, Foggy Weather: Exploration Diameter: 6 in O.D./ 4 in. I.D. FIELD EXPLORATION LABORATORY RESULTS Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Passing #200 Sieve (%) Dry Density (pcf) Surveyed Elevation (feet) Liquid Limit (NV=No Value) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 643,159.782 Graphical Log Sample Type Water Content (%) Easting: 1,599,272.899 Surveyed Surface Elevation (ft.): 35.24 Depth (feet) USCS Symbol Surface Condition: Phragmites Organic CLAY (OH): rounded sand, medium -25 to high plasticity fines, dark brownish gray and dark gray, wet, soft, 10% fibers wood fragments BORING/TEST PIT SOIL Sandy CLAY (CL): rounded sand, medium plasticity fines, gray, wet, soft, fine sand Organic CLAY (OH): rounded sand, medium to high plasticity fines, dark brownish gray and Z F 65 dark gray, wet, soft -30 STANDARD\_GINT\_LIBRARY\_SR.1.1.GLB wood fragments 120 in. Sandy Organic CLAY (OH): rounded sand, medium to high plasticity fines, balck and dark brown, wet, soft Silty SAND (SM): rounded sand, medium to **UPPER SAND** high plasticity fines, brown, dark gray and light gray, wet, coarse to fine grained sand 70 -35 R:KLF S-9 Slurry Wall Investigation\field Work\gint\130226.gpj S-10 Poorly-Graded SAND (SP): rounded sand, non-plastic fines, brown, yellowish brown and light gray, wet, coarse to medium grained S-11 Silty SAND (SM): gray and yellowish brown, wet, medium to fine grained sand S-12 40 Poorly-Graded SAND with Gravel (SP): rounded sand, non-plastic fines, yellowish brown and light brownish gray, wet, coarse to medium grained sand Silty SAND (SM): rounded sand, medium 120 in. plasticity fines, yellowish brown, light brownish gray and gray, wet Lean CLAY (CL): rounded sand, medium plasticity fines, light gray and yellowish brown, S-14 wet, firm PROJECT NO.: 130226 **BORING LOG CSB-34** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

Usace-Pearce Creek E:\company\projects\130226

Date Begin - End: **Drill Company:** 12/18/2012 **Boart Longyear BORING LOG CSB-34** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 LS 600 Angle from Vert.: 0 degrees Exploration Method: Sonic Continuous 40's, Foggy Weather: Exploration Diameter: 6 in O.D./ 4 in. I.D. FIELD EXPLORATION LABORATORY RESULTS Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 643,159.782 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,599,272.899 Surveyed Surface Elevation (ft.): 35.24 Depth (feet) USCS Symbol Surface Condition: Phragmites Silty SAND (SM): rounded sand, low -45 plasticity fines, white, wet, medium to fine grained sand S-15 BORING/TEST PIT SOIL Poorly-Graded SAND (SP): rounded sand, S-16 non-plastic fines, light brown and light gray, wet, medium grained sand UPPER CONFINING Sandy Silty CLAY (CL-ML): rounded sand, **LAYER** low plasticity fines, light gray and yellow, wet, Z F 85 firm, medium to fine grained sand -50 SR.1.1.GLB S-17 GINT LIBRARY 120 in. Lean CLAY (CL): rounded sand, medium plasticity fines, gray and dark gray, wet, firm, Sandy SILT (ML): rounded sand, low STANDARD plasticity fines, light gray and gray, wet, firm, fine grained sand 90 -55 R:KLF Lean CLAY with occastional Silty SAND (SM) Occasional Silty Sand innterbesd up to approximately 1/4" thick interbeds approximately Slurry Wall Investigation\field Work\gint\130226.gpj (CL): rounded sand, medium plasticity fines, 1/2 inch thick. light gray and gray, wet, firm, fine grained sand Occasional Lean Clay Sandy SILT (ML): rounded sand, low interbeds approximately plasticity fines, light gray and gray, wet, soft, 1/4 inch thick. fine grained sand Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray, wet, hard, fine grained sand -60 Clayey SAND (SC): rounded sand, medium plasticity fines, gray, wet, fine grained sand Lean CLAY (CL): rounded sand, medium Usace-Pearce Creek plasticity fines, yellowish red, yellow and 120 in. brown, wet, hard, fine grained sand E:\company\projects\130226 PROJECT NO.: 130226 **BORING LOG CSB-34** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

Date Begin - End: **Drill Company:** 12/18/2012 **Boart Longyear BORING LOG CSB-34** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 643,159.782 Graphical Log Sample Type Water Content (%) Easting: 1,599,272.899 Surveyed Surface Elevation (ft.): 35.24 Depth (feet) USCS Symbol Surface Condition: Phragmites Lean CLAY (CL): rounded sand, medium --65 plasticity fines, gray, light gray, and reddish gray, wet, hard, fine grained sand 105 -70 120 in. Coarse gravel sized Sandy Silty CLAY (CL-ML): rounded sand, concretion at 107.8 feet low plasticity fines, dark gray, wet, soft Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, dark gray, wet, firm, fine grained sand 110 -75 S-19 Sandy Silty CLAY (CL-ML): rounded sand, low plasticity fines, wet, soft, fine grained sand Lean CLAY with Sand (CL): rounded sand, Cobble sized medium plasticity fines, dark gray, wet, hard, -80 concretion at 114.8 to fine grained sand 115.3 feet. Interbedded Silty SAND (SM) and Lean CLAY (CL): rounded sand, medium plasticity fines, dark gray and light gray, wet, firm, fine 120 in. LOWER SAND grained sand, layers approximately 1/4 to 1/2 Silty SAND (SM): rounded sand, non-plastic fines, yellow, light gray and yellowish red, wet, medium to fine grained sand PROJECT NO.: 130226 **BORING LOG CSB-34** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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BORING/TEST PIT SOIL LOG

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Date Begin - End: **Drill Company:** 12/18/2012 **Boart Longyear BORING LOG CSB-34** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Surveyed Elevation (feet) Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 643,159.782 Graphical Log Sample Type Other Tests/ Remarks Easting: 1,599,272.899 Surveyed Surface Elevation (ft.): 35.24 Water Content (%) Depth (feet) USCS Symbol Surface Condition: Phragmites Silty SAND (SM): rounded sand, non-plastic --85 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 125 -90 120 in. Occasional Silt interbeds approximately 1/2 inch thick from 127 to 135.7 feet. 130 S-20 SM 22.6 100 29 -95 -100 S-21 Sandy SILT (ML): rounded sand, low plasticity fines, light gray and yellow, wet, soft, fine grained sand Silty SAND (SM): rounded sand, low 120 in. S-22 plasticity fines, light brownish gray and yellowish brown, wet, medium to fine grained Lean CLAY with Sand (CL): rounded sand, medium plasticity fines, red and gray, wet, firm, fine grained sand PROJECT NO.: 130226 **BORING LOG CSB-34** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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BORING/TEST PIT SOIL LOG

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Log	ged l	Зу:		D. Grahl	Drill Cr	ew:		R. Pa	ırr				L				
Hor.	Ver	. Dat	um:	MD State Plane - NAVE	D88 <b>Drill E</b> q	Juipme	nt:	LS 60	00								
Ang	le fro	om Ve	ert.:	0 degrees	Explora	ation M	leth	od: Sonic	Conti	nuous							
Wea	ather	:		40's, Foggy			iam	eter: 6 in C	D.D./ 4	in. I.D	<u> </u>						
				FIELD	EXPLORATIO	N	, ,						LA	BORA	TORY		JLTS I
Surveyed Elevation (feet)	Depth (feet)	Graphical Log		Northing: 643,159.782 Easting: 1,599,272.898 Surveyed Surface Elevation (ft. Surface Condition: Phragn	9 i.): 35.24	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	-		plast grain <b>Lear</b> medi	dy SILT (ML): rounded sand icity fines, light gray, wet, so led sand a CLAY with Sand (CL): rour um plasticity fines, red and	oft to firm, fine nded sand,	S-23 S-24											
	-		Sand medi grain Lear medi	thed sand  If Lean CLAY (CL): rounded um plasticity fines, light gray led sand  If CLAY with Sand (CL): round um plasticity fines, red and	y, wet, fine nded sand,		***************************************										
- 110 -	145-		Silty	fine grained sand  SAND (SM): rounded sand, , light gray and yellowish broum to fine grained sand		S-25											
	-		Sand	<b>dy SILT (ML)</b> : rounded sand	l. low	S-26			120 in.								
115	150-		plast fine of Silty plast	icity fines, light gray, yellow grained sand SAND (SM): rounded sand, icity fines, light grayish yello ish yellow, wet, fine grained	and red, wet, low ow and	S-27											
-	-		Sand to low reddi Silty	by SILT (ML): rounded sand w plasticity fines, light gray, ish yellow, wet, fine grained SAND (SM): rounded sand, light gray and yellow, wet, is	l, non-plastic yellow and sand , non-plastic		· >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>										
	-		Clay plast wet,		nd, medium d dark gray,	S-28											Occasional Lean Clay interbeds approximate 1/4 inch thick.
120	155-		medi grain Clay plast	with the same (SE): Foundation with the same ded sand ey SAND (SC): rounded sand icity fines, gray and dark grained sand	ny, wet, fine	S-29	<b>X X X X X X X X X X</b>										Frequent Silty SAND (SM) interbeds approximately 1/4 incl
	-		Lear plast firm,	CLAY (CL): rounded sand, icity fines, dark gray and ligh fine grained sand	ht gray, wet,		Ž Ž		120 in.								thick.
	-		to me	SAND (SM): rounded sand, edium plasticity fines, gray a fine grained sand			Ď Ž										Frequent Lean CLAY (CL) interbeds approximately 1/4 inc thick.
7			1		A A I	OJECT N		130226 KLW			BORI	NG I	_OG	CSE	3-34		
(	1	<b>&lt;</b> L		NFELDE ight People. Right Solutio	ons. DA	ECKED I TE: /ISED:		DG 12/28/2013 12/29/2013					Creek ville, N				

Date	е Вес	jin - E	nd:12/18/2012	Drill Co	mpany	<b>/</b> :	Boart	: Longy	ear							BORING LOG CSB-34
Log	ged E	Ву:	D. Grahl	Drill Cre	ew:		R. Pa	arr				L				
Hor.	Vert	t. Dat	ım: MD State Plane - NAVD88	Drill Equ	uipme	nt:	LS 60	00								
Ang	le fro	om Ve	rt.: 0 degrees	Explora	tion M	leth	od: Sonic	Conti	nuous							
Wea	ather	:	40's, Foggy	Explora	tion D	iam	eter: 6 in C	D.D./ 4	in. I.D	<u>.                                    </u>						
			FIELD E	KPLORATIO	N							LA	BORA	TORY	RESU	JLTS
Surveyed Elevation (feet)	Depth (feet)	Graphical Log	Northing: 643,159.782 Easting: 1,599,272.899 Surveyed Surface Elevation (ft.): 3 Surface Condition: Phragmite		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
	- - - 165— - -		Lean CLAY (CL): rounded sand, me plasticity fines, dark gray, wet, fine grand  Silty SAND (SM): rounded sand, no fines, light gray, wet, fine grained sand. The same content of the same class o	n-plastic nd n-plastic and light SM):  SM):  It gray and fine  Fragments  Surface.					五	Groun surfac GENE	e durin RAL N	was o g drillii OTES:	bserve ng.	ed at a	pproxir	Frequent Silty SAND (SM) interbeds approximately 1/4 inch thick.
135 - - - 140	170— 175—															
(		~ <l< td=""><td>EINFELDER Bright People. Right Solutions</td><td>DRA CHE DATI</td><td>JECT N WN BY CKED I E: ISED:</td><td>′: BY:</td><td>130226 KLW DG 12/28/2013 12/29/2013</td><td></td><td></td><td>BORI Pe</td><td>NG L earce ( Earle</td><td>Creek</td><td>CDF</td><td>3-34</td><td></td><td></td></l<>	EINFELDER Bright People. Right Solutions	DRA CHE DATI	JECT N WN BY CKED I E: ISED:	′: BY:	130226 KLW DG 12/28/2013 12/29/2013			BORI Pe	NG L earce ( Earle	Creek	CDF	3-34		

Date Begin - End: **Drill Company:** 12/19/2012 **Boart Longyear BORING LOG CSB-35** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** LS 600 MD State Plane - NAVD88 Exploration Method: Sonic Continuous Angle from Vert.: 0 degrees Weather: 40's, Overcast Exploration Diameter: 6 in O.D./ 4 in. I.D. FIELD EXPLORATION LABORATORY RESULTS Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Surveyed Elevation (feet) Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Blow Counts (BC)= Uncorr. blows/6 in. Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,848.479 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,599,388.738 Surveyed Surface Elevation (ft.): 35.09 Depth (feet) USCS Symbol Surface Condition: Phragmites -35 23 in. DREDGE MATERIAL Sandy SILT (ML): subrounded to rounded sand, low plasticity fines, gray and yellowish brown, moist, soft, medium to fine grained 30 Environmental sample CSB-35 collected at 5  $\bar{\Delta}$ Silty SAND (SM): rounded sand, non-plastic 71 in. fines, yellowish brown, brownish yellow and light gray, wet, medium to fine grained sand 25 Elastic SILT (MH): rounded sand, low plasticity fines, dark gray, gray and black, wet, fine grained sand 108 in. Same as above 10% organic matter PROJECT NO.: 130226 **BORING LOG CSB-35** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Date Begin - End: **Drill Company:** 12/19/2012 **Boart Longyear BORING LOG CSB-35** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** LS 600 MD State Plane - NAVD88 Exploration Method: Sonic Continuous Angle from Vert.: 0 degrees Weather: 40's, Overcast Exploration Diameter: 6 in O.D./ 4 in. I.D. FIELD EXPLORATION LABORATORY RESULTS Recovery (NR=No Recovery) Plasticity Index (NP=No Plasticity tsf Passing #200 Sieve (%) Liquid Limit (NV=No Value) Surveyed Elevation (feet) Dry Density (pcf) Blow Counts (BC)= Uncorr. blows/6 in. Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,848.479 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,599,388.738 Surveyed Surface Elevation (ft.): 35.09 Depth (feet) USCS Symbol Surface Condition: Phragmites Elastic SILT (MH): rounded sand, low plasticity fines, dark gray, gray and black, wet, fine grained sand S-1 25 100 in. Sandy SILT (ML): rounded sand, low plasticity fines, dark gray, wet, soft, fine grained sand 30 Elastic SILT (MH): rounded sand, low plasticity fines, dark gray, black and yellowish brown, wet, soft, fine grained sand 100 in. PROJECT NO.: 130226 **BORING LOG CSB-35** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Date Begin - End: **Drill Company:** 12/19/2012 **Boart Longyear BORING LOG CSB-35** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Surveyed Elevation (feet) Passing #200 Sieve (%) Dry Density (pcf) Liquid Limit (NV=No Value) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,848.479 Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,599,388.738 Surveyed Surface Elevation (ft.): 35.09 Depth (feet) Graphical USCS Symbol Surface Condition: Phragmites Elastic SILT (MH): rounded sand, low plasticity fines, dark gray, black and yellowish brown, wet, soft, fine grained sand S-2 Fiberous PEAT (PT): rounded sand, medium TIDAL MARSH plasticity fines, dark brown, wet, 50% fibers **DEPOSITS** Organic CLAY (OH): medium plasticity fines, dark brown, wet, very soft, 30% organic S-3 45 -10 Poorly-Graded SAND (SP): rounded gravel, 108 in. rounded sand, non-plastic fines, gray, wet, medium to fine grained sand, fine grained S-4 Sandy Fine Grained PEAT (PT): rounded sand, non-plastic fines, dark brown and gray, **UPPER SAND** Silty SAND (SM): brown, yellowish brown 50 -15 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, S-5 medium to fine grained sand Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, light brown, brownish yellow and gray, medium grained Poorly-Graded SAND with Gravel (SP): rounded gravel, rounded sand, non-plastic 55 -20 S-6 fines, brown, yellowish brown and brownish yellow, wet, coarse to medium grained sand, fine grained gravel 120 in. Grades to light brown, yellow, yellowish brown, brown and light brownish gray PROJECT NO.: 130226 **BORING LOG CSB-35** DRAWN BY: KLW CHECKED BY: DG EINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Date Begin - End: **Drill Company:** 12/19/2012 **Boart Longyear BORING LOG CSB-35** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Passing #200 Sieve (%) Dry Density (pcf) Surveyed Elevation (feet) Liquid Limit (NV=No Value) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,848.479 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,599,388.738 Surveyed Surface Elevation (ft.): 35.09 Depth (feet) USCS Symbol Surface Condition: Phragmites Poorly-Graded SAND (SP): rounded gravel, rounded sand, non-plastic fines, light brown, yellow, yellowish brown, brown and light Iron stained bed at brownish gray, wet, coarse to medium grained approximately 61 feet. sand, fine grained gravel Silty SAND (SM): rounded sand, non-plastic fines, yellowish brown and light gray, wet, S-7 medium to fine grained sand Poorly-Graded SAND (SP): rounded sand, non-plastic fines, brown and brownish yellow, wet, coarse to fine grained sand 65 -30 Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, wet, fine grained S-8 Silty SAND (SM): rounded sand, non-plastic fines, light gray, yellow and yellowish brown, 120 in. wet, medium to fine grained sand Poorly-Graded SAND (SP): rounded sand, non-plastic fines, brown, light brown and yellowish brown, wet, medium grained sand 70 -35 Lean CLAY (CL): rounded sand, medium S-9 plasticity fines, light gray and yellow, wet, firm, fine grained sand Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brown and yellowish brown, wet, medium grained sand Poorly-Graded SAND with Silt (SP-SM): yellowish brown, wet, medium to fine grained Sandy Lean CLAY (CL): rounded sand, UPPER CONFINING medium plasticity fines, light gray and **LAYER** S-10 yellowish brown, wet, fine grained sand 120 in. Lean CLAY (CL): rounded sand, medium plasticity fines, red and light gray, wet, fine grained sand Sandy Silty CLAY (CL-ML): rounded sand, low to medium plasticity fines, light gray, wet, hard, fine grained sand PROJECT NO.: 130226 **BORING LOG CSB-35** DRAWN BY: KLW CHECKED BY: DG EINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Date Begin - End: **Drill Company:** 12/19/2012 **Boart Longyear BORING LOG CSB-35** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Surveyed Elevation (feet) Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,848.479 Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,599,388.738 Surveyed Surface Elevation (ft.): 35.09 Depth (feet) Graphical USCS Symbol Surface Condition: Phragmites Sandy Silty CLAY (CL-ML): rounded sand, low to medium plasticity fines, light gray, wet, S-11 hard, fine grained sand Lean CLAY (CL): rounded sand, medium to high plasticity fines, dark brown and gray, wet, firm, fine grained sand 85 -50 S-12 16.9 35 18 120 in. 90 -55 Slickenside failure surface at Gravelly Lean CLAY with Sand (CL): angular S-13 approximately 90.5 feet. to subrounded gravel, subrounded sand, medium plasticity fines, gray and brownish S-14 gray, wet, medium to fine grained sand, medium grained gravel Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, medium to fine grained S-16 Silty CLAY (CL-ML): rounded sand, medium plasticity fines, light gray, wet, hard, fine grained sand Lean CLAY (CL): rounded sand, medium Occasional Silty Sand plasticity fines, light gray, wet, fine grained interbeds 1/4 inch thick. S-17 120 in. PROJECT NO.: 130226 **BORING LOG CSB-35** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Log	ged I	Зу:		D. Grahl			_	Drill Cre	ew:		R. Pa	arr				L				
Hor.	-Ver	t. Dat	um:	MD State	e Plane	- NAVI	D88	Drill Eq	uipme	nt:	LS 60	00								
Ang	le fro	om Ve	ert.:	0 degree	s		_	Explora	tion N	letho	d: Sonic	Conti	nuous							
Wea	ther	:		40's, Ove	ercast			Explora	tion D	iame	eter: 6 in (	D.D./ 4	in. I.D.	<u> </u>						
						FIELD	D EXPL	ORATIO	N							LA	BORA	TORY		JLTS
Surveyed	Depth (feet)	Graphical Log	Lean	East Surveyed Su	Condition	9,388.738 vation (ff n: Phragr	8 t.): 35.09 mites		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
70	- - - 105-		Poorling sand Lean plasti sand Poorling round yellow	CLAY (CL)	SAND (Si , light gra : rounded ght gray, SAND wi on-plastivish brov	P): rour ay, wet, d sand, , wet, fir th Silt ( c fines,	nded sa , fine gr medium ne grair (SP-SM	nd, ained m ned ): ray,	S-19				SP-SM	15.5		100	11			Occasional Lean Clay interbeds 1/2 inch thick. LOWER SAND
75	- 110-		appro The e	exploration voximately 10 exploration voximately 10 exploration voximately 20	)7 ft. belo was back	ow grou	ınd surf						⊻	Groun surfac GENE	e durin RAL N	was o g drillii OTES:	bserve ng.	ed at ap	oproxin	ION: nately 7 ft. below ground were surveyed by Polaris.
80	- - 1115— - -																			
									DJECT N		130226 KLW		Ī	BORI	NG L	_OG	CSB	3-35		

Date	e Beç	gin - E	nd:	12/19/2012 - 12	2/20/2012	Drill Co	mpany	<b>/</b> :	Boart	Longy	ear							BORING LOG CSB-
Log	ged l	Ву:		D. Grahl		Drill Cre	ew:		R. Pa	rr				L				
Hor.	-Ver	t. Datı	um:	MD State Plane	e - NAVD88	Drill Equ	uipme	nt:	LS 60	00								
Ang	le fro	om Ve	rt.:	0 degrees		Explora	tion M	etho	od: Sonic	Conti	nuous							
Wea	ather	:		40's, Overcast		Explora	tion D	iam	eter: 6 in C	).D./ 4	in. I.D							
					FIELD EXF	PLORATIO	N							LA	BORA	TORY	/ RESU	JLTS
Surveyed Elevation (feet)	Depth (feet)	Graphical Log		Northing: 642 Easting: 1,59 Surveyed Surface Ele Surface Conditio	99,983.54 evation (ft.): 31.6 on: 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
-30	-		round and y	y Lean CLAY (CL): led sand, medium p ellowish brown, mo rrained sand	plasticity fines	s, gray		>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>		60 in.								DREDGE MATERIAL
<u> </u>	5-		plasti	ic SILT (MH): round city fines, dark gray rained sand			-											Environmental sample CSB-36A, CSB-36A-MSD collected at 5 feet.
-25 - -	-	-	Grad matte	es to dark gray and er	brown, 10%	organic				60 in.								Environmental sample CSB-36B collected at feet.
-20	10							\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	PP=0.75									leet.
-15	- 15-	-		ic SILT (MH): round				>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	PP=0.5	120 in.								
	-	_		city fines, dark gray , wet, soft, 20% org			JECT N	<b>10</b> .:	130226		<u> </u>	30RI	NG I	_OG	CSE	3-36		
(	1	<l< td=""><td></td><td>NFELL ght People. Right</td><td></td><td></td><td>.WN BY CKED I</td><td>BY:</td><td>KLW DG 12/28/2013</td><td></td><td></td><td>Pe</td><td>earce</td><td>Creek</td><td>CDF</td><td></td><td></td><td></td></l<>		NFELL ght People. Right			.WN BY CKED I	BY:	KLW DG 12/28/2013			Pe	earce	Creek	CDF			
	-		1	2 + 56e68	Walter E.		ISED:		12/29/2013									

Date Begin - End: **Drill Company:** 12/19/2012 - 12/20/2012 **Boart Longyear BORING LOG CSB-36** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Pocket Pen(PP)= Blow Counts (BC)= Uncorr. blows/6 in Passing No.4 Sieve (%) Northing: 642,369.218 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,599,983.54 Surveyed Surface Elevation (ft.): 31.62 Depth (feet) USCS Symbol Surface Condition: Bare Earth Elastic SILT (MH): rounded sand, low plasticity fines, dark gray and black, wet, soft, fine grained sand 10 P=0.5 25 85 in. Elastic SILT (MH): rounded sand, low plasticity fines, dark gray, yellowish brown and black, wet, soft, 20% organic matter 30 -0 Sandy Fine Grained PEAT (PT): rounded TIDAL MARSH sand, non-plastic fines, dark brown, wet, fine **DEPOSITS** grained sand S-1 --5 120 in. Sandy SILT (ML): rounded sand, low **UPPER SAND** plasticity fines, yellowish brown, light brownish S-2 gray and light gray, wet, medium to fine grained sand Silty SAND (SM): rounded sand, non-plastic S-3 fines, yellowish brown and light gray, wet, S-4 GP-GM 7.6 38 5.5 medium to fine grained sand PROJECT NO.: 130226 **BORING LOG CSB-36** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Date Begin - End: **Drill Company:** 12/19/2012 - 12/20/2012 **Boart Longyear BORING LOG CSB-36** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Surveyed Elevation (feet) Passing #200 Sieve (%) Dry Density (pcf.) Liquid Limit (NV=No Value) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,369.218 Sample Type Water Content (%) Easting: 1,599,983.54 Surveyed Surface Elevation (ft.): 31.62 Depth (feet) Graphical USCS Symbol Surface Condition: Bare Earth 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 -10 grained sand Poorly-Graded SAND (SP): rounded sand, non-plastic fines, reddish yellow and yellowish S-5 brown, wet, medium grained sand Silty SAND (SM): rounded sand, non-plastic fines, light brown and yellowish brown, wet, S-6 medium to fine grained sand Sandy SILT (ML): rounded sand, non-plastic fines, yellowish brown, light brownish gray and light gray, wet, soft, medium to fine grained -15 120 in. Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, reddish S-7 yellow and brownish yellow, wet, medium to fine grained sand 50 S-8 Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brown and yellowish S-9 brown, wet, coarse to medium grained sand -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 S-11 plasticity fines, light brown and light gray, wet, medium to fine grained sand Poorly-Graded SAND with Silt and Gravel (SP-SM): rounded gravel, rounded sand, S-12 non-plastic fines, yellow and brown, coarse to medium grained sand, medium to fine grained Poorly-Graded SAND (SP): rounded sand, S-13 non-plastic fines, light brown and yellowish S-14 -25 brown, wet, medium grained sand Silty SAND (SM): rounded sand, non-plastic 120 in. fines, light gray and yellowish brown, wet, medium to fine grained sand Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brownish gray, S-15 yellowish brown and dark brown, wet, coarse to medium grained sand PROJECT NO.: 130226 **BORING LOG CSB-36** DRAWN BY: KLW CHECKED BY: DG EINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Date Begin - End: **Drill Company:** 12/19/2012 - 12/20/2012 **Boart Longyear BORING LOG CSB-36** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,369.218 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,599,983.54 Surveyed Surface Elevation (ft.): 31.62 Depth (feet) USCS Symbol Surface Condition: Bare Earth 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 -30 gravel S-16 Lean CLAY (CL): rounded sand, medium plasticity fines, yellow, light brownish gray and gray, moist, firm to hard, fine grained sand Silty CLAY with Sand (CL-ML): rounded sand, low plasticity fines, light gray and gray, moist, firm to hard, fine grained sand S-17 65 Lean CLAY (CL): rounded sand, medium S-18 plasticity fines, dark gray and gray, moist, fine grained sand S-19 -35 Silty SAND (SM): rounded sand, non-plastic 120 in. fines, light gray, wet, medium to fine grained Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brownish gray and yellowish brown, medium to fine grained sand 70 S-20 -40 75 Poorly-Graded SAND with Silt (SP-SM): S-21 rounded sand, non-plastic fines, yellowish -45 brown and light gray, wet, medium grained 120 in. Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellowish brown, light brown, light gray, medium grained sand PROJECT NO.: 130226 **BORING LOG CSB-36** DRAWN BY: KLW CHECKED BY: DG **EINFELDER** Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj

BORING/TEST PIT SOIL LOG

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R:KLF\_STANDARD\_GINT\_LIBRARY\_SR:1.1.GLB

Date Begin - End: **Drill Company:** 12/19/2012 - 12/20/2012 **Boart Longyear BORING LOG CSB-36** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Liquid Limit (NV=No Value) Passing #200 Sieve (%) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,369.218 Graphical Log Sample Type Water Content (%) Easting: 1,599,983.54 Surveyed Surface Elevation (ft.): 31.62 Depth (feet) USCS Symbol Surface Condition: Bare Earth Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellowish brown, light brown, S-22 light gray, medium grained sand -50 Poorly-Graded SAND with Silt (SP-SM): rounded sand, non-plastic fines, yellowish brown and light gray, wet, medium grained S-23 sand 85 S-24 Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, wet, firm, fine -55 grained sand 120 in. Poorly-Graded SAND (SP): rounded sand, medium plasticity fines, light gray and light brown, wet, medium grained sand S-25 Poorly-Graded SAND (SP-SM): rounded Frequent Lean CLAY 90 sand, medium plasticity fines, yellowish brown (CL) nodules. and light gray, wet, medium to fine grained S-26 sand -60 Lean CLAY (CL): rounded sand, medium UPPER CONFINING plasticity fines, light gray and red, moist, firm, **LAYER** fine grained sand SILT (ML): rounded sand, low plasticity fines, white, wet, firm, fine grained sand Lean CLAY (CL): rounded sand, medium plasticity fines, light gray and red, wet, firm, S-27 fine grained sand -65 Red color bands from 96.5 to 97 feet. 120 in. LOWER SAND PROJECT NO.: 130226 **BORING LOG CSB-36** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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BORING/TEST PIT SOIL

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Date Begin - End: 12/19/2012 - 12/20/2012 **Drill Company: Boart Longyear BORING LOG CSB-36** Logged By: **Drill Crew:** R. Parr D. Grahl Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticit Passing #200 Sieve (%) Dry Density (pcf.) Surveyed Elevation (feet) Liquid Limit (NV=No Value) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 642,369.218 Sample Type Water Content (%) Easting: 1,599,983.54 Surveyed Surface Elevation (ft.): 31.62 Depth (feet) Graphical USCS Symbol Surface Condition: Bare Earth Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, medium to fine grained Lean CLAY (CL): rounded sand, medium -70 plasticity fines, light gray, wet, fine grained BORING/TEST PIT SOIL S-28 SM 23 2 100 17 Silty SAND (SM): rounded sand, non-plastic fines, light gray, wet, medium to fine grained S-29 CL 11.3 33 17 sand Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, wet, fine grained Silty SAND (SM): rounded sand, non-plastic Z F 105 fines, light gray, wet, medium to fine grained SR.1.1.GLB S-30 Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, wet, fine grained -75 Silty SAND (SM): rounded sand, non-plastic GINT LIBRARY 120 in. fines, light gray, wet, medium to fine grained Lean CLAY (CL): rounded sand, medium Occasional Lean Clay nodules from 108 to plasticity fines, light gray, wet, fine grained 111 feet. Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellowish brown, wet, 110medium grained sand R:KLF Interbedded Silty SAND (SM) and Lean Slurry Wall Investigation\field Work\gint\130226.gpj CLAY (CL): rounded sand, non-plastic to -80 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 Silty SAND (SM) plasticity fines, dark gray, wet, firm, medium to partings. fine grained sand -85 Silty SAND (SM): rounded sand, medium Usace-Pearce Creek plasticity fines, light gray, wet, medium to fine grained sand Sandy Lean CLAY (CL): rounded sand, Occasional Silty SAND medium plasticity fines, gray, wet, firm, fine grained sand (SM) interbeds approximately 1/16 to Lean CLAY (CL): rounded sand, low to 1/4 inch thick medium plasticity fines, interbedded dark gray and gray, wet, medium to fine grained sand PROJECT NO.: 130226 **BORING LOG CSB-36** DRAWN BY: KLW CHECKED BY: DG EINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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		gin - E	End:	12/19/2012 - 12/	/20/2012	Drill Co		<b>/</b> :	Boart	Longy	ear							BORING LOG CSB-36
_	ged I	-		D. Grahl		Drill Cr			R. Pa									
		t. Dat		MD State Plane	- NAVD88	Drill Eq			LS 60									
_		om Ve	ert.:	0 degrees		-			od: Sonic									
Wea	ather	:		40's, Overcast				iam	eter: 6 in C	).D./ 4	in. I.D.	<u> </u>						
					FIELD EXF	LURATIO	N T			_				LA	BORA	TORY	′RESU	LIS
Surveyed Elevation (feet)	Depth (feet)	Graphical Log		Northing: 642, Easting: 1,599 Surveyed Surface Eler Surface Condition	9,983.54 vation (ft.): 31.6	62	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
90	-		fines, sand Lean plasti sand	CLAY (CL): rounded icity fines, dark gray,	dium to fine g d sand, medi , wet, fine gra	grained um ained												Occasional Silty SAND (SM) partings.
95			fines, Lean plasti grain Silty fines, Lean plasti sand Silty fines, gray, The e	SAND (SM): rounde, dark gray, wet, fine CLAY (CL): rounded icity fines, dark gray, ed sand SAND (SM): rounde, light gray, wet, fine CLAY (CL): rounded icity fines, dark gray, SAND (SM): rounde yellowish red, reddiffine grained sand exploration was term poximately 127 ft. beloexploration was backember 20, 2012.	grained sand, medid wet, firm, firm disand, non-grained sand disand, medid wet, fine gradish yellow an animated at the ground surgicians of the sand o	plastic d plastic d light	S-32				모	surface GENE	dwater e durin RAL N	was o g drilli OTES:	bserve ng. :	ed at a	pproxin	ON: nately 4 ft. below ground were surveyed by Polaris.
100 	130-																	
105	135-																	
-			_				DJECT N		130226 KLW		ſ	BORI	NG L	_OG	CSE	3-36		

Date Begin - End: **Drill Company:** 12/17/2012 **Boart Longyear BORING LOG CSB-37** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** LS 600 MD State Plane - NAVD88 Exploration Method: Sonic Continuous Angle from Vert.: 0 degrees Weather: 50's, Foggy Exploration Diameter: 6 in O.D./ 4 in. I.D. FIELD EXPLORATION LABORATORY RESULTS Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in. Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 643,217.779 Graphical Log Sample Type Other Tests/ Remarks Easting: 1,598,585.816 Surveyed Surface Elevation (ft.): 34.79 Water Content (%) Depth (feet) USCS Symbol Surface Condition: Bare Sand Poorly-Graded SAND (SP): rounded sand, 46 in. DREDGE MATERIALS non-plastic fines, brown, moist, medium grained sand 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 S-1 PP=1.5 30  $\bar{\Delta}$ 120 in. Elastic SILT (MH): rounded sand, low to medium plasticity fines, gray, dark gray and black, wet, soft, 10% organic matter, fine grained sand P=0.25 -25 10 S-2 P=0.5 PP=0 =0.25 PROJECT NO.: 130226 **BORING LOG CSB-37** DRAWN BY: KLW CHECKED BY: DG *KLEINFELDER* Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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[KLF\_BORING/TEST PIT SOIL LOG]

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Date Begin - End: **Drill Company:** 12/17/2012 **Boart Longyear BORING LOG CSB-37** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** LS 600 MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Passing #200 Sieve (%) Liquid Limit (NV=No Value) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 643,217.779 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,585.816 Surveyed Surface Elevation (ft.): 34.79 Depth (feet) USCS Symbol Surface Condition: Bare Sand 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 PP=0.5 PP=0.75 10 25 P=0.5 120 in. grades to gray, dark gray and brown, firm PP=0.75 -5 30 QUATERNARY Silty SAND (SM): rounded sand, non-plastic LOWLAND DEPOSITS to low plasticity fines, brownish gray and gray, wet, wood fragments, medium to fine grained sand Poorly-Graded SAND (SP): rounded sand, non-plastic fines, brownish gray and gray, wet, S-5 wood fragments, coarse to fine grained sand 35 S-6 Sandy SILT (ML): rounded sand, non-plastic fines, yellowish brown, brownish yellow and light brownish gray, mottled, fine grained sand SILT (ML): rounded sand, low plasticity fines, 120 in. yellowish brown, light brownish gray and gray, wet, soft, fine grained sand PP=1 25 S-7 PROJECT NO.: 130226 **BORING LOG CSB-37** DRAWN BY: KLW CHECKED BY: DG KLEINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Date Begin - End: **Drill Company:** 12/17/2012 **Boart Longyear BORING LOG CSB-37** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 LS 600 Angle from Vert.: 0 degrees Exploration Method: Sonic Continuous Weather: Exploration Diameter: 6 in O.D./ 4 in. I.D. 50's, Foggy FIELD EXPLORATION LABORATORY RESULTS Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Liquid Limit (NV=No Value) Passing #200 Sieve (%) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 643,217.779 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,585.816 Surveyed Surface Elevation (ft.): 34.79 Depth (feet) USCS Symbol Surface Condition: Bare Sand Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, light brown and gray, PP=0.25 wet, fine grained sand Clayey SAND (SC): gray, light gray and light S-9 brownish gray, wet 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 TIDAL MARSH sand, low to medium plasticity fines, dark **DEPOSITS** gray, organic, wet, firm, fine grained sand S-11 PP=1.25 120 in. -15 50 S-12 -20 Silty GRAVEL with Sand (GM): rounded **UPPER SAND** gravel, rounded sand, low plasticity fines, S-13 brownish yellow, wet, coarse to medium grained sand, medium to fine grained gravel 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 PROJECT NO.: 130226 **BORING LOG CSB-37** DRAWN BY: KLW CHECKED BY: DG EINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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BORING/TEST PIT SOIL LOG

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Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj

Date	в Ве	gin - E	nd:	12/17/2012		Drill Co	mpany	<b>/</b> :	Boart	Longy	ear							BORING LOG CSB-
Log	ged	Ву:		D. Grahl		Drill Cr	ew:		R. Pa	ırr				L				
Hor.	-Ver	t. Dat	um:	MD State Plane - NA	AVD88	Drill Eq	uipme	nt:	LS 60	00								
Ang	le fr	om Ve	ert.:	0 degrees		Explora	tion M	etho	od: Sonic	Conti	nuous							
Wea	ther	:		50's, Foggy		Explora	tion D	iame	eter: 6 in C	D.D./ 4	in. I.D							
				FI	IELD EXF	LORATIO	N							LA	BORA	TORY		JLTS
Surveyed Elevation (feet)	Depth (feet)	Graphical Log		Northing: 643,217 Easting: 1,598,585 Surveyed Surface Elevatio Surface Condition: Ba	5.816 on (ft.): 34.1	79	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
30	65-		med	rly-Graded SAND (SP): r plastic fines, brown, wet gravel with Sand (Gl el, rounded sand, non-playellowish brown, wet, co ned sand, medium to fine SAND with Gravel (SM) ded sand, non-plastic fin	and, non-m grained signature to me grained signature.  M): rounded signature to fine arse to me grained on the	eand, t,  -plastic I sand  Sand  and,  -e grained  and,  -e grained  be grained  led  s, brown  edium  gravel  d gravel,  n and	S-14 S-15 S-16			120 in.	GW-GM			35	8.4			
35	70-		Pool roun fines grair Pool roun fines med graw Pool non-and Lear plast	wish brown, wet, mediur I, medium to fine grained Indy-Graded SAND with Saded gravel, rounded san, yellowish brown, wet, red sand, medium to fine Indy-Graded GRAVEL with ded gravel, rounded sand, dark reddish brown, we imm grained sand, medium to fine Indy-Graded SAND (SP): replastic fines, yellowish be brown, wet, medium to fine CLAY (CL): rounded sandicity fines, light gray, we'rly-Graded SAND (SP): related	d gravel  Sitt (SP-Sid, non-pl medium t e grained th Sand (id, non-pl et, coarse um to fine  rounded s erown, light ine graine and, medi tt, fine sand	M): astic o fine gravel GP): astic e to e grained and, nt gray ed sand um		<u> </u>										
45	75-		non- gray.  Sand med light  Silty fines fine:  Lear plass  Pool non-	plastic fines, light brown wet, medium to fine grady Lean CLAY (CL): rour ium plasticity fines, yello gray, wet, fine sand  SAND (SM): rounded sa, light brown and yellowisand  CLAY (CL): rounded sa icity fines, light gray, fine fly-Graded SAND (SP): rounded sa icity fines, light gray, fine fly-Graded SAND (SP): rounded sand	and brownined sandowish brownish brownish browning and, mediae sandownded san	vnish d d, wn and plastic u, wet, um	S-17			120 in.	СН	23.1				51	30	UPPER CONFINING LAYER
G			\				JECT N		130226 KLW		i	BORI	NG I	_OG	CSE	3-37		
(	KLEINFELDER Bright People. Right Solutions.							BY:	DG 12/28/2013 12/29/2013			Pe	earce Earle	Creek ville, N				

Date Begin - End: **Drill Company:** 12/17/2012 **Boart Longyear BORING LOG CSB-37** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** MD State Plane - NAVD88 LS 600 Angle from Vert.: 0 degrees Exploration Method: Sonic Continuous Weather: Exploration Diameter: 6 in O.D./ 4 in. I.D. 50's, Foggy FIELD EXPLORATION LABORATORY RESULTS Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Liquid Limit (NV=No Value) Passing #200 Sieve (%) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 643,217.779 Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,585.816 Surveyed Surface Elevation (ft.): 34.79 Depth (feet) Graphical USCS Symbol Surface Condition: Bare Sand Fat CLAY (CH): medium to high plasticity fines, red, light gray and gray, wet, firm to hard, fine grained sand BORING/TEST PIT SOIL LOG S-20 PP=3.0 S-19 [KLF R:KLF\_STANDARD\_GINT\_LIBRARY\_SR.1.1.GLB 120 in. Sandy Lean CLAY (CL): rounded sand, medium plasticity fines, reddish gray, wet, LOWER SAND coarse to medium grained sand Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light gray and light brownish gray, wet, medium to fine grained sand -55 90 E:\company\projects\130226 Usace-Pearce Creek Slurry Wall Investigation\field Work\gint\130226.gpj S-21 -60 95 Silty SAND (SM): rounded sand, non-plastic S-22 fines, light gray, wet, medium to fine grained 120 in. Poorly-Graded SAND (SP): rounded sand, non-plastic fines, yellow and reddish brown, wet, medium to fine grained sand Lean CLAY (CL): rounded sand, medium plasticity fines, light gray, yellowish red and gray, wet, hard, fine grained sand -65 PROJECT NO.: 130226 **BORING LOG CSB-37** DRAWN BY: KLW CHECKED BY: DG EINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. gINT FILE: DATE: 12/28/2013 REVISED: 12/29/2013

Date	e Beg	jin - E	End:	12/17/2012	2		Drill Co	mpany	<b>/</b> :	Boart	Longy	ear							BORING LOG CSB-
Log	ged I	Зу:		D. Grahl			Drill Cr			R. Pa	arr				L				
Hor.	-Ver	t. Dat	um:	MD State F	Plane - N	4VD88	Drill Eq	uipme	nt:	LS 60	00								
Ang	le fro	om Ve	ert.:	0 degrees			-			od: Sonic									
Wea	ther	:		50's, Foggy					iam	eter: 6 in 0	D.D./ 4	in. I.D							
					FI	ELD EXP	LORATIO	N	_						LA	BORA	TORY		JLTS
Surveyed Elevation (feet)	Depth (feet)	Graphical Log		Easting Surveyed Surfa	ng: 643,217 j: 1,598,585 ace Elevatio ondition: Ba	5.816 on (ft.): 34.7	79	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
									M										
-	-		plasti	CLAY (CL): ro city fines, gra ed sand				S-23											Frequent Silty SAND (SM) partings less that 1/8 inch thick.
	-		-	SAND (SM): rum plasticity f					M										Frequent Lean CLAY (CL) nodules.
70	105-		Lean	cLAY (CL): rocity fines, wet	ounded sa		um												Frequent Silty SAND (SM) interbeds approximately 1/8 inc thick.
	-			CLAY (CL): ro				S-24			120 in.								tnick.
- 75 -	- 110-		Silty sines, graine SILT light g	es to light gra SAND (SM): r reddish yello ed sand (ML): rounded gray, yellowish ed sand	ounded sa w and ligh	t gray, fin	e ry fines,												
80	- - 115—		round gray a Silty s plastic Lean plastic sand	CLAY with Sed sand, medand white, we SAND (SM): recity fines, light CLAY (CL): recity fines, redicty fines, redicty fines, light SAND (SM): recity fines, light	dium plast t, fine grai ounded sa t gray and ounded sa dish gray, ounded sa	icity fines ned sand and, low yellowish ind, medii wet, fine and, low	n brown um grained	Γ	>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>										
-	-		Sand	ed sand  y SILT (ML): city fines, ligh um to fine gra	t gray and	white, we	et,				98								
-	-		Sand medit graine	y Lean CLAY um plasticity f ed sand	(CL): rour ines, light	nded sand gray, wet	, fine		· M		98 in.								
85	=		fines,	SAND (SM): r light gray and um to fine gra	d light yello	owish bro			× ×										
			_			- 4		JECT N		130226 KLW			BORI	NG I	OG	CSB	3-37		
(	KLEINFELDER Bright People. Right Solutions.						CHE	ECKED I	BY:	DG 12/28/2013 12/29/2013					Creek ville, N				

Date Begin - End: **Drill Company:** 12/17/2012 **Boart Longyear BORING LOG CSB-37** Logged By: D. Grahl **Drill Crew:** R. Parr Hor.-Vert. Datum: **Drill Equipment:** LS 600 MD State Plane - NAVD88 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 Recovery (NR=No Recovery) tsf Plasticity Index (NP=No Plasticity Liquid Limit (NV=No Value) Passing #200 Sieve (%) Dry Density (pcf) Surveyed Elevation (feet) Blow Counts (BC)= Uncorr. blows/6 in Pocket Pen(PP)= Passing No.4 Sieve (%) Northing: 643,217.779 Graphical Log Sample Type Other Tests/ Remarks Water Content (%) Easting: 1,598,585.816 Surveyed Surface Elevation (ft.): 34.79 Depth (feet) USCS Symbol Surface Condition: Bare Sand Silty SAND (SM): rounded sand, non-plastic fines, light gray and light yellowish brown, wet, S-25 medium to fine grained sand -90 125 120 in. Poorly-Graded SAND (SP): rounded sand, non-plastic fines, light brown, yellowish brown and yellowish red, wet, coarse to medium grained sand -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, LOWER CONFINING **LAYER** Sandy SILT (ML): gray and grayish red, wet Lean CLAY (CL): reddish gray and light gray, 120 in. Silty SAND (SM): gray, wet Lean CLAY (CL): grayish red and gray, wet, medium to fine grained sand -105 PROJECT NO.: 130226 **BORING LOG CSB-37** DRAWN BY: KLW CHECKED BY: DG EINFELDER Pearce Creek CDF Earleville, MD Bright People. Right Solutions. DATE: 12/28/2013 REVISED: 12/29/2013

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Date	е вес	jin - i	gged By: 12/17/2012  D. Grahl						y:	Doar	t Longy	ear							BORING LOG CSE
_	_	-					Drill Cr			R. Pa					L				
	Ver			MD State P	lane - NA	4VD88	Drill Eq			LS 6									
	le fro		ert.:	0 degrees						od: Sonic									
Wea	ather	:		50's, Foggy					iame	eter: 6 in 0	).D./ 4	in. I.D	<u>.                                      </u>			DOD *	TOP	/ DEC:	II TO
					FI	ELD EXF	LORATIO	אוי			-				LA	BORA	TORY		
Surveyed Elevation (feet)	Depth (feet)	Graphical Log		Northin Easting Surveyed Surfa Surface Co		i.816 n (ft.): 34.7	<b>7</b> 9	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
SШ		9	Silty	SAND (SM): ro	ounded sa	ınd, non-	plastic	űΖ	Š	<u> </u>	ŘΕ	⊃ \( \oldots \)	<b>≶</b> ∪	۵	<u>a</u> . <u>w</u>	<u>C</u> #	<u> </u>	<u> </u>	OK
-	-		Lear	s, light gray  n CLAY with Sa ium plasticity fi			sand,												
-	-		fines	r <b>SAND (SM)</b> : ro s, light gray and ned sand					Š										
				dy SILT (ML): r			sand	4	M										
- 110 -	- 145— -		Lear	n CLAY (CL): ro	unded sa	nd, medi	um												
	-		to lov		s, gray, w	et, fine g	rained				120 in.								
	150-			n CLAY (CL): ye w, red and redo					\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\										
	-		Silty sand	' SAND (SM): liq	ght gray, v	wet, fine (	grained	-											
120 -	155-		to lov grain	dy SILT (ML): r w plasticity fine ned sand	s, gray ar	nd light gr	ay, fine												
-	-		med	n CLAY with Sa ium plasticity fi grained sand					Š										
- - 125	-	-	appr The	exploration was eximately 157 f exploration was ember 17, 2012	t. below g s backfille	round su						⊻	surface	dwater e durin RAL N	was o g drilli OTES	bserve ng. :	ed at a <sub>l</sub>	pproxii	I <u>ON:</u> mately 7 ft. below grour were surveyed by Pola
-120								OJECT I		130226 KLW			BORI	NG I	_OG	CSB	3-37		
(	KLEINFELDER Bright People. Right Solutions.							ECKED	BY:	DG 12/28/2013				earce (		_			



Pearce Creek Dredged Material Containment Area, Maryland

410-538-8202 Geologist: Nelson Brooks Location: Pearce Creek Log of Boring: PCB-1 Name of Driller: Jay Blemmings Subcontractor: Uni-Tech Drilling Co., Inc. Drilling Method: Mud Rotary Model Drill Rig: CME55LC ATV Soil Boring 09/09/2008 Depth of Hole (ft): 50 Date Completed: Date Started: 09/09/2008 MD State Plane/NAD 83/NAVD 88 Easting (ft): 1598990.42 Northing (ft): 644797.87 Elevation (ft): 38.05 Surface Conditions: Soil and cleared brush Comments: Geotechnical Results Blow Core Recovery Sample Number nterval USCS per Depth Description of Materials 6 in. (fi) USCS % Gr/Sa/Si/Cl -0 ML: Dark brown (10YR 4/3), silt with trace organics 2 PCB-1-0-2 3 0-2 50 and iron staining, dry, medium stiff 4 5 -2 6 PCB-1-2-4 50 6 2-4 4 CL: Black (5Y 2.5/1), clay, moist, medium stiff, 4 homogeneous 4 5 58 PCB-1-4-6 4-6 SM: Very dark gray (5Y 3/1), silty fine grain sand, 2 moist, loose sand 1 -6 2 ML: Black (5Y 2.5/1), silt, wet, very soft, homogeneous 6-8 41 PCB-1-6-8 1 1 1 -8 1 87 PCB-1-8-10 8-10 10-12 79 PCB-1-10-12 1 2 -12 1 PCB-1-12-14 12-14 79 1 1 1 -14 R PCB-1-14-16 R 14-16 83 R 1 -16 J PCB-1-16-18 2 16-18 83 1 1 3 ML: Black (5Y 2.5/1), silt, wet, medium stiff, 4 PCB-1-18-20 18-20 79 homogeneous 3 2 -20 2 ML: Black (5Y 2.5/1), silt, wet, very soft, homogeneous 1 20-22 91 PCB-1-20-22 2 0.0 / 6.7 / 59.9 / 2 ML -22 33.4 R PCB-1-22-24 R 22-24 25 R

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Log of	Bo	ring: PCB-1	Location: PCB-	1				
			Geolechnical R	esults	Blows		Recovery	
Oepth (ft)	SCS Log	Description of Materials	% Gr/Su/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	Sample Number
24		ML: Black (5Y 2.5/1), silt, wet, very soft, homogeneous with poorly sorted sand laminations, medium grain subangular 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	1	SC-SM: Light olive brown (2.5Y 5/6), silty, clayey medium grain sand and trace coarse grained subrounded sand, wet, medium dense			9 9 14	26-28	70	PCB-1-26-28
28 30	/\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SP: Yellowish brown (10YR 5/6), poorly graded medium grain sand and trace coarse grained subrounded sand, wet, medium dense			16 12 11 9 13	28-30	50	PCB-1-28-30
32		SM; Olive brown (2.5Y 4/1), silty medium grain sand with little fine sub-rounded gravel (predominantly			9 10 13 18	30-32	41	PCB-1-30-32
		quartz), wet, medium dense  SP-SM: Dark gray (2.5Y 4/1), poorly graded medium			17 11 15	32-34	50	PCB-1-32-34
34		grained sand with silt and trace fine sub-rounded gravel (predominantly quartz), wet, medium dense sand			12 3 7 7	34-36	41	PCB-1-34-36
36		SP-SM: Dark gray (2.5Y 4/1), poorly graded medium grained sand with silt and dense sand, wet			9 7 14 8	36-38	75	PCB-1-36-38
38 - - 40					6 9 7 10 10	38-40	91	PCB-1-38-40
-40	1111				5 5 7	40-42	41	PCB-1-40-42
42					7 5 6 6 8	42-44	45	PCB-1-42-44
44					9 10 10	44-46	50	PCB-1-44-40
46 -		SP-SM: Dark gray (2.5Y 4/1), poorly graded fine grained sub-rounded sand with silt and gravel, wet, medium dense sand			10 9 10 9	46-48	75	PCB-1-46-48
48					8 5 9	48-50	62	PCB-1-48-50
-50		END OF BORING = 50 FT			9			



	nology.	ring: PCB-2			Location:	Pearce Cre	ek		Ge	ologist:	Nelson B	rooks
		: Uni-Tech Drill	ing Co.	, Inc.		Name o	f Driller: Jay F	Blemmings				
		ig: CME55LC A				Drillin	g Method: M	ud Rotary				
_		09/10/2008	100.5	Date	Completed:	09/10/200	B Depth of I	Hole (ft):	50		So	il Boring
	on (ft):	70. c.	North	ing (ft): 6	644710.70	Easting (ft)	: 1600133.14		М	State F	lane/NAI	D 83/NAVD 8
		ditions: Soil an	12.70		7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7							
	e con	ditions. Jon in		- P 8(0(0))								
							Geotechnical Re	esults	Blows	Core	Recovery	Sample Number
epth (ft)	USCS Log	Desc	criptio	n of Ma	terials	% C	r/Sa/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	Sample Pullic
-0		ML: Brown (10Y (disturbed soil fro	R 4/3), om site o	silt with tra clearing), di	ce organics ry, very soft, blo	ocky			1 1 1	0-2	33	PCB-2-0-2
2		ML: Brown (10)	sandy silt,	dry, stratified, s	ofi	l l		1 2 4	2-4	83	PCB-2-2-4	
4		ML: Very dark g homogeneous	110000						4 4 4	4-6	75	PCB-2-4-6
6		ML: Very dark g stiff, horizontal l matrix	Y 3/1), silt lor laminati	1			2 2 3 1	6-8	79	PCB-2-6-8		
8		ML: Very dark į	gray (5Y	′ 3/1), silt, v	vet, very soft, n	io			2 1	8-10	75	PCB-2-8-10
10		black lamination CL: Very dark g black lamination	ray (5Y	3/1), clay,	wet, very soft,	/			1 H H 2	10-12	58	PCB-2-10-1
1	2	CL: Very dark g	gray (5Y ns	3/1), clay,	wel, very soft,	no			H H H	12-14	50	PCB-2-12-1
1	4								H	14-16	75	PCB-2-14-1
1	6								H H t	16-18	67	PCB-2-16-1
	8	CL; horizontal bottom of spoo ML; Very dark	n gray (5'			/			2 H 1	18-20	50	PCB-2-18-2
2	20	black laminatio	ins						1 H H	20-22	92	PCB-2-20-
	22								H	22-24	79	PCB-2-22-

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Log of Bo	ring: PCB-2	Location: PCB-2	2				18
		Geotechnical Re	esults	Blows	Core	Recovery	and the same
Depth USCS (ft) Log	Description of Materials	% Gr/Sa/Si/Cl	USCS	per 6 in.	interval (ft)	(%)	Sample Number
24	ML: 2-in, sandy silt stratification with fine grained sand	0.0 / 12.7 / 60.2 / 27.1	ML	H . H 2	24-26	83	PCB-2-24-26
26	at 25.5 feet bgs, wet  CL: Very dark gray (5Y 3/1), clay, wet, very soft, no black laminations	200	4	1 H 2	26-28	83	PCB-2-26-28
28	CL: Strong brown (7.5YR 4/6), sandy clay laminations at approximately 27, 27.25, and 27.5 feet bgs, wet			H	28-30	67	PCB-2-28-30
30	CL: Very dark gray (5Y 3/1), clay, wet, very soft, no black laminations			5 7 2			
(1)	SW: Olive brown (2.5 Y 5/4), well graded medium grained sand, wet, medium dense			5	30-32	25	PCB-2-30-32
-32	SP: Olive brown (2.5Y 5/4), poorly graded medium grained sand with little coarse sand, moist, medium dense			5 5 7	32-34	33	PCB-2-32-34
34	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			7 7 9	34-36	46	PCB-2-34-36
36	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			9 5 7 5	36-38	50	PCB-2-36-38
38	nga, guy (2.3 t 2/1), we.			5 4 3 4 3	38-40	83	PCB-2-38-40
-40	CL: Reddish brown (5YR 4/3), clay, wet, soft			2 R 4	40-42	50	PCB-2-40-42
42	SC: Dark gray (5Y 4/1), clayey sand with wood fragments, moist			3 2 7	42-44	75	PCB-2-42-44
44	CL: Light olive brown (2.5Y 5/3), clay, wet, very stiff	3.1 / 57.3 / 30.0 / 9.6	SC	10 10	42-44	13	PCB-2-42-44
-46	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	8.0		7 9 8 6	44-46	58	PCB-2-44-46
	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			20 17 15	46-48	8	PCB-2-46-48
48	a coarse gravel stuck in the cutting shoe			20 12 7	48-50	8	PCB-2-48-50
50	END OF BORING = 50 FT			8			



#### Pearce Creek Dredged Material Containment Area, Maryland

EA Engineering, Science, 410-538-8202 Geologist: Nelson Brooks Location: Pearce Creek Log of Boring: PCB-3 Name of Driller: Jay Blemmings Subcontractor: Uni-Tech Drilling Co., Inc. Drilling Method: Mud Rotary Model Drill Rig: CME55LC ATV Soil Boring Depth of Hole (ft): 50 09/12/2008 Date Completed: Date Started: 09/12/2008 MD State Plane/NAD 83/NAVD 88 Easting (ft): 1598531.25 Northing (ft): 643856.43 Elevation (ft): 37.54 Surface Conditions: Soil and cleared brush Comments: Geotechnical Results Core Blows Recovery Sample Number Interval per USCS Description of Materials Depth (%) USCS 6 in (ft) % Gr/Sa/Si/Cl (ft) ML: Light olive brown (2.5Y 5/4), silt with few PCB-3-0-2 organics (disturbed soil from site clearing), dry, medium 0-2 75 2 3 -2 2 PCB-3-2-4 2-4 83 3 3 3 -4 SM: Light olive brown (2.5Y 5/4), silt with few fine 1 PCB-3-4-6 3 4-6 75 grain sand, moist, medium stiff, iron staining, trace 3 3 -6 3 PCB-3-6-8 50 6-8 3 2 3 CL: Black (5Y 2.5/1), clay, wet, -8 1 8-10 58 PCB-3-8-10 CL: Black (5Y 2.5/1), micaceous clay, wet, soft, 1 homogenous, trace organics 2 1 H CL: Black (5Y 2.5/1), micaceous clay, wet, very soft, PCB-3-10-12 10-12 75 homogenous, black laminations; 11'- 2" very dark gray H H (2.5Y 3/1), silty sand H -12 H 75 PCB-3-12-14 12-14 2 1 H ML: Very dark gray (5Y 3/1), clay with trace silt PCB-3-14-16 75 laminations, wet, very soft, trace organics, iron staining 14-16 H H H -16 CL: Very dark gray (5Y 3/1), clay, wet, medium stiff, 1 PCB-3-16-18 67 homogenous; 17'- 1" lignite lens with dark gray (2.5Y 2 16-18 4/1) medium grain angular sand 3 3 -18 4 SP: Yellowish brown (2.5Y 6/3), poorly graded medium PCB-3-18-20 18-20 50 4 grain angular sand, wet, medium dense 5 5 -20 H SW: Dark gray (2.5Y 4/1), well graded medium grain PCB-3-20-22 20-22 33 H sub-angular sand, wet, very loose, homogenous 2 1 -22 H CL: Very dark gray (5Y 3/1, micaceous clay, wet, soft; 58 PCB-3-22-24 22-24 23'- 1" lens of olive gray (5Y 5/2), clay

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Log of Bo	oring: PCB-3	Location: PCB-	3				
	August 1, 1 - Tom Care and a Tom	Geotechnical R	esults	Blows	Core	Recovery	257434145
Oepth USCS (ft) Log	Description of Materials	% Gr/Sa/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	Sample Number
24	CL: Black (5Y 2.5/1), clay with trace fine grain sand, wet, very soft, trace organics, black laminations			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	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), elay lamination, wet, very soft			H	28-30	42	PCB-3-28-30
32	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	30-32	67	PCB-3-30-32
		18.5		0 1	32-34	67	PCB-3-32-34
34	SM: Brown (10YR 5/3), silty fine grain sub-rounded sand, wet, medium dense			7 8	34-36	58	PCB-3-34-36
- 36	SM: Light olive brown (2.5Y 5/3), silty medium grain sub-rounded sand with trace coarse grain sand, wet, medium dense			8 11 5 12	36-38	75	PCB-3-36-38
38	SM: Yellowish brown (10YR 5/4), silty medium grain sub-rounded to sub-angular sand, wet, medium dense	3.3 / 77.4 / 10.9 / 8.4	SM	12 15 9			
	SM: Yellowish brown (10YR 5/4), silty fine grain sub- rounded to sub-angular sand, wet, medium dense			10 9	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			5 5	40-42	83	PCB-3-40-42
-42	ML: Yellowish brown (10YR 5/4), silt with few fine grain sand, wet, stiff			- 5 3			
44	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	4 4 5 2	42-44	83	PCB-3-42-44
		1		3 4	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			6 2 2 3	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 5	48-50	67	PCB-3-48-50
50	END OF BORING = 50 FT			6			



Logo	of Boi	ring: PCB-4			Location:	Pearce Cree			Ge	ologist:	Nelson B	rooks
_	_	: Uni-Tech Drilli	ng Co.	, Inc.		Name of	Driller: Jay E	Blemmings				
	-	ig: CME55LC A				Drilling	Method: M	ud Rotary				
V 25000	77.77	09/09/2008		Date	Completed:	09/09/2008	Depth of I	Hole (ft):	50	=//	So	il Boring
-	on (ft):		North	ning (ft): 6	644586.66	Easting (ft):	599660.30		МІ	State P	Plane/NAI	0 83/NAVD 8
7433174	7 2 10 10	ditions: Soil and			200 00 0000							
		uitions; 30ii aik	u cicii	ed tradi								
Comn					3.11.7		Scotechnical Ro	esults	Blows		Recovery	
Depth (ft)	USCS Log	Desc	riptio	n of Ma	terials	% Gr	/ Sa / Si / Cl	USCS	per 6 in.	Interval (ft)	(%)	Sample Number
Eo		ML: Dark grayish organics and iron clearing), dry, ver	staining	(10YR 4/3 g (disturbed	), silt with trace I soil from site				H 1 1	0-2	25	PCB-4-0-2
2	(1 to 1 to	SM: Olive brown moist, soft	(2.5Y	4/3), silty fi	ne grained sand,				1 1 2 2 2	2-4	58	PCB-4-2-4
4		ML: Dark brown	(2.5Y 3	3/2), silt, dr	y, medium stiff				3 4 4 5	4-6	83	PCB-4-4-6
6 - - 8		CL: Very dark gr	ny (5Y	3/1), clay,	moist, soft				5 3 3 2	6-8	75	PCB-4-6-8
2 .	4	SM: Dark olive g	gray (5)	Y 3/2), silty	medium grain s	and,			1 1 3	8-10	100	PCB-4-8-10
1		wet, very loose's	and, 2 1	in, enty ions					H 1	10-12	42	PCB-4-10-1
1	7	CL: Black (5Y 2	5/1), c	lay, wel, ve	ry soft, darker b	lack			H	12-14	92	PCB-4-12-1
		material observe	ed at 15	and 15.5 fe	et bgs				H H H	14-16	100	PCB-4-14-
1									H H H	16-18	100	PCB-4-16-
	18								H H 1	18-20	75	PCB-4-18-
	20	CL: Very dark §	gray (5°	Y 3/1), clay	, wet, very soft				H H 2	20-22	100	PCB-4-20-
	22	8							H	22-24	100	PCB-4-22-

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og c	of Bo	ring: PCB-4	Location: PCB-4					
			Geotechnical Res	sults	Blows	Core	Recovery	Carrata Stand
epth (ft)	USCS Log	Description of Materials	% Gr/Sa/Si/Cl	USCS	per 6 in,	Interval (ft)	(%)	Sample Number
24 -					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			н н н	28-30	83	PCB-4-28-30
30 -		CL: Very dark gray (2/5Y 3/1), clay, wet, very soft			H R R	30-32	83	PCB-4-30-32
32		CL: Dark gray (2/5Y 4/1), clay, wet, medium stiff			2 2 2 3	32-34	92	PCB-4-32-34
34 		SM: Very dark gray (5Y 3/1), silty fine grained sand, wet, very loose sand			3 R R	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	36-38	50	PCB-4-36-38
38 - -			1.7 / 12.4 / 55.3 /	ML	1 1 2 2 2	38-40	58	PCB-4-38-40
4( - -		ML: Dark gray (2.5Y 4/1), silt, wet, very soft	30.6	WILL	H 1 3 3	40-42	83	PCB-4-40-4
42	2	SC: Brown (2.5Y 5/2), clayey fine grained sand, wet,			3 4 3	42-44	83	PCB-4-42-4
44	4//	loose sand			3 3	44-46	58	PCB-4-44-4
- 40	6	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 4 4 8 10	46-48	50	PCB-4-46-4
4	8 ==	SP-SM: Light gray (2.5Y 7/1), poorly graded sand with silt, wet, medium dense			- 12 6 8 13	48-50	50	PCB-4-48-5
5	0===	END OF BORING = 50 FT			16		1	



#### Pearce Creek Dredged Material Containment Area, Maryland

410-538-8202 Geologist: Nelson Brooks Location: Pearce Creek Log of Boring: PCB-5 Name of Driller: Jay Blemmings Subcontractor: Uni-Tech Drilling Co., Inc. Drilling Method: Mud Rotary Model Drill Rig: CME55LC ATV Depth of Hole (ft): 50 Soil Boring 09/10/2008 Date Completed: Date Started: 09/10/2008 MD State Plane/NAD 83/NAVD 88 Easting (ft): 1600556.15 Northing (ft): 644123.43 Elevation (ft): 35.35 Surface Conditions: Soil and cleared brush Comments: Geotechnical Results Blows Core Recovery Sample Number nterval USCS Description of Materials per Depth (%) (ft) USCS 6 in. % Gr/Sa/Si/Cl (ft) ML: Dark brown (7.5YR 3/2), silt with trace fine grain sand (disturbed soil from site clearing), dry, soft 0-2 PCB-5-0-2 1 42 2 ı -2 2 PCB-5-2-4 2 2-4 50 1 ML: Very dark gray (5Y 3/1), silt, moist, soft, root 2 2 fragments, iron concretions PCB-5-4-6 1 4-6 83 2 2 -6 1 ML: Very dark gray (5Y 3/1), silt, wet, soft, root PCB-5-6-8 6-8 33 2 fragments, iron concretions 1 1 -8 1 2 8-10 75 PCB-5-8-10 1 1 H PCB-5-10-12 10-12 83 H H H -12 H PCB-5-12-14 12-14 50 H H H H PCB-5-14-16 14-16 96 H н H ML: Very dark gray (5Y 3/1), silt, wet, soft, root H 54 PCB-5-16-18 fragments, iron concretions, black laminations H 16-18 H 2 -18 H 18-20 75 PCB-5-18-20 H H H -20 R PCB-5-20-22 20-22 50 R R R R PCB-5-22-24 R 22-24 75 R 0.0/2.8/65.5/ ML



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Log of Bo	ring: PCB-5	Location: PCB-	5				
		Geotechnical R	esults	Blows		Recovery	
Depth USCS (ft) Log	Description of Materials	% Gr/Sa/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	Sample Number
24		31.7		H H H	24-26	33	PCB-5-24-26
26 - -				R R H	26-28	83	PCB-5-26-28
28				2 1 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	121122/212/		2 1 5 8	30-32	75	PCB-5-30-32
32	ML: Light olive brown (2.5Y 5/3), silt with little coarse grain sand, wet, hard	1.7 / 17.7 / 54.3 / 26.3	CL-ML	10 5 7 50/3	32-34	50	PCB-5-32-34
34	no recovery			4 4 3	34-36	0	N/A
-36	CL: Light olive brown (2.5 Y 5/3), clay, wet, medium stiff, iron staining			3 3 3	36-38	58	PCB-5-36-38
38	CL: Light olive brown (2.5Y 5/3), clay, wet, stiff, iron staining			5 4 6 7	38-40	67	PCB-5-38-40
40	CL: Light olive brown (2.5Y 5/3), clay, wet, soft, iron staining			5 H H	40-42	58	PCB-5-40-42
42	CL: Fine grain sand with sub-rounded fine grain gravel, wet  CL: Grayish brown (2.5Y 4/2), clay, wet, medium stiff			H 3 3 3	42-44	58	PCB-5-42-44
44	CL: Grayish brown (2.5Y 4/2), clay, wet, stiff	-		4 4 4 6	44-46	42	PCB-5-44-46
46				9 4 4 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			5 4 9	48-50	25	PCB-5-48-50
-50	END OF BORING = 50 FT			4			



#### Pearce Creek Dredged Material Containment Area, Maryland

410-538-8202 Geologist: Nelson Brooks Location: Pearce Creek Log of Boring: PCB-6 Name of Driller: Jay Blemmings Subcontractor: Uni-Tech Drilling Co., Inc. Drilling Method: Mud Rotary Model Drill Rig: CME55LC ATV Soil Boring Depth of Hole (ft): 50 09/11/2008 Date Completed: Date Started: 09/11/2008 MD State Plane/NAD 83/NAVD 88 Easting (ft): 1598307.21 Northing (ft): 643272,14 Elevation (ft): 34.65 Surface Conditions: Soil and cleared brush Comments: Geotechnical Results Blows Core Recovery Sample Number Depth USCS Interval p.er Description of Materials (ft) % Gr/Sa/Si/Cl USCS 6 in. (ft) -0 SW: Light yellowish brown (2.5 Y 6/4), well graded fine 50 PCB-6-0-2 grain sub-angular sand with silt (disturbed soil from 0-2 site clearing), dry, loose 1 3 -2 2 ML: Dark grayish brown (2.5Y 4/2), clayey silt with PCB-6-2-4 light gray laminations, moist, medium stiff, slight 2-4 67 plasticity, iron staining 2 3 ML: Gray (2.5Y 5/1), silt, wet, soft, high plasticity, 1 75 PCB-6-4-6 4-6 1 black laminations, iron staining 2 2 -6 2 ML: Very dark gray (5Y 3/1), silt, wet, high plasticity, 1 6-8 50 PCB-6-6-8 soft, homogenous 1 2 -8 1 ML: Very dark gray (5Y 3/1), silt with trace medium PCB-6-8-10 grain sub-rounded sand and sub-rounded quartz grains 2 8-10 50 and mica flakes, wet, soft, iron staining 1 2 SP: Light yellowish brown (2.5Y 6/4), medium grained H sand lamination, wet PCB-6-10-12 92 11 10-12 H ML: Very dark gray (5Y 3/1), clayey silt, wet, soft, black laminations, trace organics, iron staining 14 H 12-14 50 PCB-6-12-14 H H H H PCB-6-14-16 H 14-16 83 1 1 SM: Black (5Y 2.5/1), fine and medium grain sand, wet, -16 very loose PCB-6-16-18 50 16-18 SM: Black (5Y 2.5/1), fine and medium grain subangular sand, wet, very loose -18 SC: Light yellowish brown (2.5Y 6/3) sand, with gray 18-20 50 PCB-6-18-20 1 clay lamination, wet 0 SM; Black (5Y 2.5/1), fine and medium grain sub-0 -20angular sand, wet, very loose H PCB-6-20-22 20-22 50 H ML: Very dark gray (5Y 3/1), silt with fine grain sand H laminations, wet, very soft 11 -22 ML: Very dark gray (5Y 3/1), silt with fine grain sand H PCB-6-22-24 22-24 58 H laminations, wet, very soft, trace organic woody matter H 0.0 / 7.6 / 62.8 / ML

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410-538-8202

Logo	of Bo	ring: PCB-6	Location: PCB-6	5			~~	
	1 1	A CONTRACTOR OF THE PROPERTY O	Georechnical Re	esults	Blows		Recovery	
Depth (ft)	USCS Log	Description of Materials	% Gr/Sa/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	Sample Number
24		ML: Very dark gray (5Y 3/1), silt, wet, very soft, black laminations iron stainings	29.6		H H H	24-26	42	PCB-6-24-26
26 -					R R R	26-28	50	PCB-6-26-28
28 : -	ハハハ	SP: Light olive brown (2.5Y 5/3), poorly graded medium grain sand with trace sub-rounded fine gravel, wet, loose sand			R H H 2	28-30	50	PCB-6-28-30
30 - - 32		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	34-36	83	PCB-6-34-36
36  		CL: Dark gray (5Y 4/1), silty clay, wet, medium stiff, homogenous			5 2 2 5	36-38	50	PCB-6-36-38
38 - - - 40		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 /	ML	4 3 4 3 3	38-40	58	PCB-6-38-40
-40			17.2		2 2 5 6	40-42	50	PCB-6-40-42
-42		CL: Dark gray (2.5Y 4/1), clay with trace sub-angular coarse grain sand, wet, stiff, pungent hydrogen sulfate			4 5 6 7	42-44	67	PCB-6-42-44
44		odor			2 3 5	44-46	75	PCB-6-44-40
40		SM: Dark greenish gray (GLEY 1 4/1), fine and medium grain sub-angular silty sand, wet, medium dense, poorly graded			6 3 7 7	46-48	58	PCB-6-46-4
48	7///	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			10 3 8 7	48-50	50	PCB-6-48-5
50	0	END OF BORING = 50 FT			6			



Pearce Creek Dredged Material Containment Area, Maryland

Containment Area, Marylan
410-538-8202

og o	f Bor	ing: PCB-7			Loca		rce Creek	1			ologist:	Nelson B	TOOKS
_	_	Uni-Tech Drillin	g Co.,	Inc.			Name of I	Driller: Jay I	31emmings	1			
		ig: CME55LC AT					Drilling N	dethod: M	ud Rotary				
ite Sta	arted:	09/12/2008		Date	Complete	ed: 09/	12/2008	Depth of	Hole (ft):	50		So	il Boring
	on (ft):		North	ing (ft): 6	643507.9	9 Eas	ting (ft): I	599207.45		МІ	State P	lane/NAI	8 DVAN/8
		ditions: Soil and	cleare	d brush	-								9 THE 14
omm	7 17	dividual 4											
				17676	4 10 12		G	eotechnical R	esults	Blows	Core Interval	Recovery	Sample Numbe
epth (ft)	USCS Log	Descr	iptio	n of Ma	terials		% Gr /	Sa/Si/Cl	USCS	6 in.	(N)	(%)	11-1
-0		ML: Dark grayish l organics (disturbed	orown soil fr	(2.5Y 4/2) om site cle	silt with f earing), dr	few y, stiff				11 1	0-2	75	PCB-7-0-2
2 -		ML: Dark grayish l sands, wet, soft, tra	brown ace org	(2.5Y 4/2) ganies, iron	silt with in staining	few fine				1 1 1 1 1	2-4	83	PCB-7-2-4
4		SM: Very dark gra grain sand, wel, so	y (5Y ft, iron	3/1) silty s staining	ub-rounde	ed fine				2 2 1 2	4-6	67	PCB-7-4-6
6 -		ML: Very dark gra soft, black lamina	ıy (5Y tions, i	3/1) micac ron stainir	ceous silt, ng, homog	wet, very enous				1 0 1	6-8	75	PCB-7-6-8
8		ML: Very dark gra soft, black lamina homogenous	ay (5Y tions, t	3/I) mica trace organ	ceous silt, nics, iron s	wet, very staining,	4			H H H	8-10	83	PCB-7-8-10
10		CL: Very dark gra soft, black lamina	ny (5Y ations,	3/1) micac trace organ	ceous clay nics, home	, wet, very ogenous				H H H	10-12	75	PCB-7-10-1
13	2	CL: Very dark gra soft, black lamina homogenous	ay (5Y ations,	3/1) micae trace orga	ceous clay nics, trace	, wet, very lignites,	′			H H H	12-14	96	PCB-7-12-1
1	6	ML: Very dark gr soft, black lamin 15'- 2" black (5Y grains	ations.	trace orga	nics, hom	ogenous				Н Н Н	14-16	92	PCB-7-14-
-		ML: Very dark g soft, black lamin	ray (5) ations,	7 3/1) mics homogen	nceous silt ous	, wet, very				H H H	16-18	83	PCB-7-16-
-	8	CL: Very dark gr soft, black lamin 2.5/1) fine graine	nations,	, homogen	ous 19'- 2'	y, wet, ver " black (5	y Y			H H H	18-20	96	PCB-7-18-
	20	ML: Very dark g fine sand, wet, ve	gray (5' ery sof	Y 3/1) mic t, homoger	aceous sil nous, iron	t with trac stainings	e			H H H	20-23	2 58	PCB-7-20-
	22	ML: Very dark g fine sand, wet, se	gray (5' oft, ho	Y 3/1) mic nogenous,	aceous sil , iron stain	t with trac iings	е			H 1		4 8	PCB-7-22-



410-538-8202

Logo	f Bo	ring: PCB-7	Location; PCB-7							
			Geotechnical Re	esults	Blows	Core	Recovery	rosa inco		
epth (ft)	USCS Log	Description of Materials	% Gr/Su/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	Sample Number		
		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 /	МН	H H H	24-26	75	PCB-7-24-26		
8		MH: Very dark gray (5Y 3/1) micaceous elastic silt with black laminations, wet, very soft, homogenous	28.1	MIT	H H 1	26-28	83	PCB-7-26-28		
		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			- 1 Н Н Н	28-30	96	PCB-7-28-30		
		ML: Very dark gray (5Y 3/1) micaceous silt with black laminations, wet, very soft, homogenous			H H	30-32	58	PCB-7-30-32		
32 - 34		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		
		ML: Very dark gray (5Y 3/1) micaceous silt with black laminations, wet, very soft, homogenous, iron staining			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	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	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	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	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/	T T	H H H	44-46	67	PCB-7-44-40		
46 -		ML: Very dark gray (5Y 3/1) micaceous silt with trace fine sand, wet, very soft, homogenous, black laminations	21,5	ML	H H H	46-48	92	PCB-7-46-4		
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	48-50	75	PCB-7-48-5		
50		END OF BORING = 50 FT	)			_	1			



Pearce Creek Dredged Material Containment Area, Maryland

410-538-8202 and Technology, Inc. Geologist: Nelson Brooks Location: Pearce Creek Log of Boring: PCB-8 Name of Driller: Jay Blemmings Subcontractor: Uni-Tech Drilling Co., Inc. Drilling Method: Mud Rotary Model Drill Rig; CME55LC ATV Soil Boring Depth of Hole (ft): 50 09/11/2008 Date Completed: Date Started: 09/11/2008 MD State Plane/NAD 83/NAVD 88 Easting (ft): 1600139.09 Northing (ft): 643668.19 Elevation (ft): 32.97 Surface Conditions: Soil and cleared brush Comments: Geotechnical Results Blows Core Recovery Sample Number Interval per USCS Description of Materials Depth (ft) USCS 6 in. % Gr/Sa/Si/Cl (ft) -0 ML: Dark gray (2.5Y 4/1), silt (disturbed soil from site PCB-8-0-2 0-2 67 clearing), moist, soft, iron staining, trace organics 1 2 1 -2 2 ML: Dark gray (2.5Y 4/1), silt, moist, soft, iron staining, PCB-8-2-4 1 2-4 75 trace organics 2 ML: Very dark gray (5Y, 3/1), silt, moist, soft, iron 2 staining 1 PCB-8-4-6 50 0 4-6 ML: Very dark gray (5Y, 3/1), silt, wet, soft, 1 homogenous, black laminations, iron staining, trace 1 -6 1 ML: Very dark gray (5Y, 3/1), micaceous silt, wet, soft, PCB-8-6-8 6-8 50 1 homogenous, black laminations, iron staining 1 1 -8 1 PCB-8-8-10 8-10 96 1 1 -10 H CL: Very dark gray (5Y, 3/1), clay, wet, soft, PCB-8-10-12 homogenous, black laminations, iron staining, trace 10-12 96 H H organics H -12 H PCB-8-12-14 12-14 100 H Н H H CL: Very dark gray (5Y, 3/1), clay, wet, soft, PCB-8-14-16 H 14-16 96 homogenous H H -16 CL: Very dark gray (5Y, 3/1), clay, wet, soft, H PCB-8-16-18 16-18 96 H homogenous, trace organics, iron staining 1 -18 1 CL: Very dark gray (5Y, 3/1), clay, wet, soft, PCB-8-18-20 18-20 83 0 homogenous 0 -20 H MH: Very dark gray (5Y, 3/1), clastic silt, wet, soft, PCB-8-20-22 20-22 96 H homogenous, trace lignites H 0.3 / 4.1 / 58.8 / H MH -22 MH: Very dark gray (5Y, 3/1), elastic silt, wet, soft, H PCB-8-22-24 22-24 96 H homogenous, black laminations

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410-538-8202

Log of Bo	ring: PCB-8	Location: PCB-8							
		Geotechnical Re	esults	Blows	Core	Recovery	Sample Number		
Depth USCS (ft) Log	Description of Materials	% Gr/Sa/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	nample rumbes		
24				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 I	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	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	30-32	50	PCB-8-30-32		
32				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	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	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	38-40	67	PCB-8-38-40		
40		0.0/9.8/63.1/		H	40-42	83	PCB-8-40-42		
-42	ML: Very dark gray (5Y, 3/1), silt, wet, very soft, homogenous, black laminations, trace organies; 42.5'-0.5" fine grain sand lamination	27.1	ML	H H H	42-44	83	PCB-8-42-44		
44				H H H	44-46	67	PCB-8-44-40		
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	46-48	83	PCB-8-46-48		
48	ML: Very dark gray (5Y, 3/1), sill, wel, medium stiff, homogenous, black laminations, trace organics			2 2 2 2	48-50	.58	PCB-8-48-50		
50	END OF BORING = 50 FT	V		3					



#### Pearce Creek Dredged Material Containment Area, Maryland

410-538-8202 Geologist: Melissa Whitehead Location: Pearce Creck Log of Boring: PCB-9 Name of Driller: Jay Blemmings Subcontractor: Uni-Tech Drilling Co., Inc. Drilling Method: Mud Rotary Model Drill Rig: CME55LC ATV Soil Boring Depth of Hole (ft): 50 09/15/2008 Date Completed: Date Started: 09/15/2008 MD State Plane/NAD 83/NAVD 88 Easting (ft): 1600481.01 Northing (ft): 643517.12 Elevation (ft): 30.81 Surface Conditions: Soil and cleared brush Comments: Geotechnical Results Core Blow Recovery Sample Number nterval per USCS Depth Description of Materials (ft) 6 in. % Gr/Sa/Si/Cl USCS (ft) ML: Dark grayish brown (2.5Y 4/2), silt with few 75 PCB-9-0-2 organics (disturbed soil from site clearing), dry, soft 0 - 21 2 -2 1 ML: Dark grayish brown (2.5Y 4/2), silt with few PCB-9-2-4 2-4 58 1 organies, dry, soft 2 ML: Very dark gray (5Y 3/1), micaceous silt with black 2 laminations, dry 58 PCB-9-4-6 1 4-6 ML: Very dark gray (5Y 3/1), micaceous silt with black 2 laminations, trace root organics, wet, soft, homogenous 1 -6 H ML: Very dark gray (5Y 3/1), micaceous silt with black 75 PCB-9-6-8 6-8 н laminations, trace root organics, trace wood lignites, H iron staining, wet, very soft, homogenous H -8 H ML: Very dark gray (5Y 3/1), micaceous silt, wet, very PCB-9-8-10 92 H 8-10 soft, homogenous H H -10 H 75 PCB-9-10-12 10-12 H H H -12 ML: Very dark gray (5Y 3/1), micaceous silt with black H 75 PCB-9-12-14 12-14 laminations, wet, very soft, homogenous H H H H PCB-9-14-16 14-16 92 H H H -16 H PCB-9-16-18 67 16-18 H H 11 ML: Very dark gray (5Y 3/1), silt with some black -18 14 organic roots, wet PCB-9-18-20 58 H 18-20 ML: Very dark gray (5Y 3/1), micaceous silt with black H laminations, wet, very soft, trace organics, trace lignites; H 19.5'- 1" Grayish brown (10YR 5/2), clay stratification -20 H PCB-9-20-22 20-22 67 11 ML: Very dark gray (5Y 3/1), micaceous silt with black laminations, wet, very soft, trace lignites, homogenous H H -22 H ML: Very dark gray (5Y 3/1), micaceous silt with black PCB-9-22-24 laminations, wet, very soft, few lignites, homogenous H 22-24 67

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og o	f Bo	ring: PCB-9	Location: PCB-9							
			Geotechnical Re	esults	Blows		Recovery	d		
epth (ft)	USCS Log	CS Description of Materials	% Gr/Sa/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	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	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	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	28-30	96	PCB-9-28-30		
30 - -					H H H	30-32	83	PCB-9-30-32		
32		MH: Very dark gray (5Y 3/1), micaceous clastic silt with black laminations, wet, hard, trace lignites, homogenous			12 18 25	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/		34 H H	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	30.1	МН	4 1 2 2 2 3	36-38	92	PCB-9-36-38		
38		ML: Gray (5Y 4/1), micaceous silt with fine grain sand,			2 2 4	38-40	96	PCB-9-38-40		
40		wet, stiff, homogeneous, trace organics  ML: Gray (5Y 4/1), micaceous silt with fine grain sand, wet, very stiff, black laminations, iron staining, trace black organics			5 4 10 10	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	42-44	67	PCB-9-42-4		
44 		CL: Gray (2.5Y 5/1), micaceous clay, wet, medium stiff, iron staining, trace iron cementations, trace lignites			2 2 3	44-46	96	PCB-9-44-4		
40		CL: Gray (2.5Y 5/1), micaceous clay with fine grain sand, wet, soft, homogeneous, few organics			4 H H	46-48	50	PCB-9-46-4		
48		CL: Greenish gray (GLEY15/1), ckty, wet, soft, homogenous, iron staining, trace iron cementation			2 H H 2	48-50	83	PCB-9-48-5		
50	0//	END OF BORING = 50 FT			1					



#### Pearce Creek Dredged Material Containment Area, Maryland

410-538-8202 Geologist: Nelson Brooks Location: Pearce Creek Log of Boring: PCB-10 Name of Driller: Jay Blemmings Subcontractor: Uni-Tech Drilling Co., Inc. Drilling Method: Mud Rotary Model Drill Rig: CME55LC ATV Soil Boring Depth of Hole (ft): 50 09/08/2008 Date Completed: Date Started: 09/08/2008 MD State Plane/NAD 83/NAVD 88 Easting (ft): 1597983.03 Northing (ft): 642541.80 Elevation (ft): 34.37 Surface Conditions: Soil and cleared brush Comments: Geotechnical Results Blows Core Recovery Sample Number Interval per USCS Description of Materials Depth (fi) % Gr/Sa/Si/Cl USCS 6 in. (ft) -0 3 ML: Very dark gray (5Y 3/1), silt with trace organics PCB-10-0-2 25 2 0-2 (disturbed soil from site clearing), dry, stiff 3 4 3 ML: Very dark gray (5Y 3/1), clayey silt, dry, soft, PCB-10-2-4 4 2-4 29 homogeneous 3 2 2 ML: Black (5Y 2.5/1), silt, moist, very soft, high PCB-10-4-6 3 42 4-6 plasticity, homogeneous 3 8 SP: Dark gray (5Y 4/1), poorly graded medium grain -6 5 sand with trace coarse grained sub-rounded sand, wet, PCB-10-6-8 6-8 38 5 medium dense 6 4 -8 1 PCB-10-8-10 0 8-10 46 ML: Black (5Y, 2.5/1), silt, wet, very soft, 1 homogeneous 2 2 SP: Dark gray (5Y 4/1), poorly graded medium grain PCB-10-10-12 67 3 10-12 sand with trace coarse grained sand, wet, loose sand 5 3 -12 3 PCB-10-12-14 12-14 25 7 7 SP: Light olive brown (2.5Y 5/4) poorly graded medium 6 grain sand, wet, loose sand -14 2 PCB-10-14-16 2 14-16 38 2 SM: Light olive brown (2.5Y 5/3), silty fine grain sub-2 rounded sand, wet loose sand 2 SM; Light olive brown (2.5Y 5/4), silty fine grain sand PCB-10-16-18 50 3 16-18 with little sub-rounded fine gravel, wet, loose sand 3 3 SM: Light ofive brown (2.5Y 5/4), silty fine grain sand, -18 2 wet, loose sand PCB-10-18-20 18-20 33 3 7 SM: Black (5Y 2.5/1), silty medium and fine grain sand with little fine sub-rounded gravel, wet, loose sand 6 -205 GM: Light olive brown (2.5Y 5/4), silty fine grain PCB-10-20-22 20-22 38 5 gravel with few coarse grain sand, wet, loose sand, iron 5 staining becoming more apparent 6 -22 3 PCB-10-22-24 50 22-24 H CL: Dark olive gray (5Y 3/2), clay, wet, very soft

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.09 0	f Bo	ring: PCB-10	Location: PCB-10							
		B. Z. Z. Z.	Geotechnical R	esults	Blows	Core	Recovery	C. I. N.		
epth (ft)	USCS Log	Description of Materials	% Gr/Sa/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	Sample Number		
24 - -		SM: Light yellowish brown (2.5Y 6/4), silty sand, wet, medium dense	8.2 / 46.4 / 31.1 /	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	14.3	ac-am	9 15 15	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	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 -		(2.5V (2)) elliu (lag prais			12 18 25	32-34	75	PCB-10-32-34		
34	1	SM: Light yellowish brown (2.5Y 6/3), silty fine grain sand, wet, very loose sand, well sorted			34 19 24 32 38	34-36	50	PCB-10-34-36		
30					8 9 9	36-38	50	PCB-10-36-3		
38	3	SM: Light yellowish brown (2.5Y 6/3), silty fine grain sand, wet, very loose sand, well sorted with black laminations			10 10 18 25 26	38-40	17	PCB-10-38-4		
40	1	SP: Light gray (2.5Y 7/2), poorly graded medium grain sand, wet, very dense sand			29 34 38 41	40-42	50	PCB-10-40-4		
4					27 42 50/3	42-44	33	PCB-10-42-4		
4 -	4	SM: Light yellowish brown (2.5Y 6/3), silty medium	-		13 22 24	44-46	17	PCB-10-44-4		
4	6	grain sand with few fine grained gravel, wet, very dense sand			31 33 50/3	46-48	29	PCB-10-46-4		
4	8	GM; Pale olive (5Y 6/3), silty sub-angular fine grain gravel with trace silt, wet, well sorted and very dense								
		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-10-48-5		
5	0	END OF BORING = 50 FT	]	_	_	1				

#### 1319 Woodbridge Station Way, Suite 200 Edgewood, MD 21040

#### **Pearce Creek Dredged Material** Containment Area, Maryland

410-538-8202 Geologist: Melissa Whitehead Location: Pearce Creek Log of Boring: PCB-11 Name of Driller: Jay Blemmings Subcontractor: Uni-Tech Drilling Co., Inc. Drilling Method: Mud Rotary Model Drill Rig: CME55LC ATV Soil Boring Depth of Hole (ft): 50 09/16/2008 Date Completed: Date Started: 09/16/2008 MD State Plane/NAD 83/NAVD 88 Easting (ft): 1599281.83 Northing (ft): 642751.86 Elevation (ft): 33.50 Surface Conditions: Soil and cleared brush Comments: Geotechnical Results Blow Core Recovery Sample Number per nterval USCS Description of Materials Depth (ft) % Gr/Sa/Si/Cl USCS 6 in (ft) 0 ML; Dark grayish brown (2.5Y 4/2), silt with little fine PCB-11-0-2 33 grain sand and few organics (disturbed soil from site 0-2 clearing), dry, soft, iron staining 1 -2 11 SM: Gray (5Y 5/1), silty fine grain sub-rounded sand, PCB-11-2-4 2-4 58 moist, poorly graded, very loose sand, trace organics, 2 2 iron staining 2 2 ML: Black (GLEY1 5Y 3/1), micaceous silt with fine PCB-11-4-6 67 2 4-6 grain sand, wet, medium stiff, trace organics, iron 3 3 2 ML: Very dark gray (5Y 3/1), micaceous silt, wet, very PCB-11-6-8 2 6-8 soft, homogenous, black laminations, few organics 1 H -8 H ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, PCB-11-8-10 8-10 75 homogenous, black laminations, few organics 1 2 1 -10H ML: Very dark gray (5Y 3/1), micaceous silt, wet, very PCB-11-10-12 96 H 10-12 soft, homogenous, black laminations, few organics H H -12 H ML: Very dark gray (5Y 3/1), micaceous silt, wet, very 83 PCB-11-12-14 12-14 soft, black laminations, trace organics, trace lignites H H H -14 H ML: Very dark gray (5Y 3/1), micaceous silt, wet, very PCB-11-14-16 14-16 96 H soft, iron staining, few organics H H -16 H PCB-11-16-18 75 16-18 11 11 11 -18 ML: Very dark gray (5Y 3/1), micaceous silt, wet, very H PCB-11-18-20 18-20 75 11 soft, black laminations, trace organics H H -20 H ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, PCB-11-20-22 homogenous, iron staining;21'- 2" lens of mottled brown 20-22 75 н (7.5YR 5/3) silt from the Potomac formation 2 2.8 / 13.1 / 55.2 / ML ١ 28.9 -22 H ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, PCB-11-22-24 75 22-24 H homogenous, trace organics

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410-538-8202

f Bo	ring: PCB-11	Location: PCB-11							
7 25		Geotechnical Re	sults	Blows	Core	Dagovary	geret in present		
USCS Log	Description of Materials	% Gr/Sa/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	Sample Number		
	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	24-26	58	PCB-11-24-26		
				H H H	26-28	75	PCB-11-26-28		
****	ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous, black laminations, trace organics			H H 2	28-30	92	PCB-11-28-30		
	ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous			H H H	30-32	75	PCB-11-30-32		
	ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous, trace lignites			H H H	32-34	75	PCB-11-32-34		
	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 H 2	34-36	83	PCB-11-34-3		
	ML: Dark gray (2.5Y 4/I), silt with fine grain sub- angular sand, wet, stiff, trace lignites			1 H H	36-38	83	PCB-11-36-3		
	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	38-40	83	PCB-11-38-4		
,	ML; Gray (2.5Y 6/1), silt with trace organics, wet	$\lambda$ 1		5					
Щ	ML: Olive gray (5Y 4/2), silt with trace medium grain sub-angular sand, poorly graded, wet			6 8 9	40-42	75	PCB-11-40-4		
	SM: Gray (2.5Y 6/1), fine grain micaceous silty sand, wet, medium dense			4 5	42-44	33	PCB-11-42-4		
1	SM: Dark yellowish brown (10YR 4/6), medium grain angular silty sand, wet, medium dense	0.4 / 84.2 / 9.2 / 6.2	SM	9 5					
5	SM: Light offive brown (2.5Y 5/4), fine grain silty sand with trace sub-angular medium grain silty sand, wet, medium dense			6 11 10	44-46	58	PCB-11-44-4		
1	SM: Light gray (2.5Y 7/2), fine grain sub-rounded micaceous silty sand, wet			5 6 7	46-48	33	PCB-11-46-4		
B	SP: Light olive brown (2.5Y 5/3) medium grained angular sand, wet, medium dense	/		7 6 6	48-50	42	PCB-11-48-5		
0	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			6	10.50	1	, 32, 11.00		
	USCS Log	ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, mottled black (Gley 1 2.5/1) silt, trace organics  ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous, black laminations, trace organics  ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous  ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous, trace lignites  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  ML: Dark gray (2.5Y 4/1), silt with fine grain subangular sand, wet, stiff, trace lignites  ML: Dark gray (2.5Y 4/1), silt with fine grain sand, wet, stiff, poorly graded  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  SM: Gray (2.5Y 6/1), fine grain micaceous silty sand, wet, medium dense  SM: Light olive brown (2.5Y 5/4), fine grain silty sand with trace sub-angular medium grain angular silty sand, wet, medium dense  SM: Light olive brown (2.5Y 5/4), fine grain sub-rounded micaceous silty sand, wet medium grain angular sand, wet, medium dense  SW: Light olive brown (2.5Y 5/3) medium grained angular sand, wet, medium dense  SW: Light olive brown (2.5Y 5/6) well graded coarse erain angular sand, wet, medium dense  SW: Light olive brown (2.5Y 5/6) well graded coarse erain angular sand, wet, medium dense	USCS Log  Description of Materials  Geotechnical Re  ### ### ### ### ### ### ### ### ### #	USCS Log  Description of Materials  ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, mottled black (Gley 1 2.5/1) silt, trace organics  ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous, black laminations, trace organics  ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous  ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous  ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous, trace lignites  ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous, 35.5-1 lamination of lignite with brown (7.5Y 8/3) silt  ML: Dark gray (2.5Y 4/1), silt with fine grain subangular sand, wet, stiff, trace lignites  ML: Dark gray (2.5Y 4/1), silt with laminations of fine grain sub-angular sand with trace organics, wet  ML: Gray (2.5Y 6/1), silt with trace organics, wet  ML: Gray (2.5Y 6/1), silt with trace medium grain sub-angular sand, poorly graded, wet  SM: Gray (2.5Y 6/1), fine grain micaceous silty sand, wet, medium dense  SM: Light oflive brown (2.5Y 5/3), fine grain silty sand with trace sub-angular medium grain silty sand, wet, medium dense  SM: Light oflive brown (2.5Y 5/3), fine grain silty sand, wet, medium dense  SM: Light oflive brown (2.5Y 5/6) well graded coarse grain angular sand, wet, medium dense  SW: Light oflive brown (2.5Y 5/6) well graded coarse grain angular sand, wet, medium dense  SW: Light oflive brown (2.5Y 5/6) well graded coarse grain angular sand, wet, medium dense  SW: Light oflive brown (2.5Y 5/6) well graded coarse grain angular sand, wet, medium dense	USCS  Description of Materials  ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, mottled black (Gley 1 2.5/1) silt, trace organics  ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous, black laminations, trace organics  ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous, black laminations, trace organics  ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous, black laminations, trace organics  ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous, trace lignites  ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous, trace lignites  ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous, 35.5-1° lamination of lignite with brown (7.5Y 8/3) silt  ML: Dark gray (2.5Y 4/1), silt with fine grain subangular sand, wet, siff, trace lignites  ML: Dark gray (2.5Y 4/1), silt with laminations of fine grain sub-angular sand with trace coarse grain sand, wet, siff, poorly graded  ML: Giry (2.5Y 6/1), silt with trace medium grain sub-angular sand, noorly graded, wet, medium dense  SM: Gray (2.5Y 6/1), silt with trace organics, wet  ML: Olive gray (5Y 4/2), silt with trace organics, wet  ML: Olive gray (5Y 4/2), silt with trace organics, wet  ML: Glipt offive brown (2.5Y 5/3), fine grain silty sand, wet, medium dense  SM: Light offive brown (2.5Y 5/3) medium grain silty sand, wet, medium dense  SM: Light offive brown (2.5Y 5/3) medium grain silty sand, wet, medium dense  SM: Light offive brown (2.5Y 5/3) medium grained angular sand, wet, medium dense sand, wet, medium grain silty sand, wet, medium dense sand, wet, medium dense sand, wet, medium grain silty sand, wet, medium dense sand, wet,	USCS  Description of Materials  Description of Materials  Description of Materials  Description of Materials  ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, motified black (Gley 1 2.5/1) silt, trace organics  ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous, black laminations, trace organics  ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous, black laminations, trace organics  ML: Very dark gray (5Y 3/1), micaceous silt, wet, soft, homogenous  ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous, trace lignites  ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous, trace lignites  ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous, trace lignites  ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous, trace lignites  ML: Dark gray (2.5Y 3/1), silt with fine grain subangular sand, wet, siff, trace lignites  ML: Dark gray (2.5Y 4/1), silt with fine grain subangular sand, wet, siff, trace lignites  ML: Gray (2.5Y 6/1), silt with trace medium grain subangular sand, wet, medium dense  SM: Light offee brown (2.5Y 5/3), tine grain silty sand, wet, medium dense  SM: Light offee brown (2.5Y 5/3) medium grain silty sand, wet, medium dense  SM: Light offee brown (2.5Y 5/3) medium grain silty sand, wet, medium dense  SM: Light offee brown (2.5Y 5/3) medium grain silty sand, wet, medium dense  SM: Light offee brown (2.5Y 5/3) medium grain silty sand, wet, medium dense  SM: Light offee brown (2.5Y 5/3) medium grain silty sand, wet, medium dense  SM: Light offee brown (2.5Y 5/3) well graded coarse ering ansalar sand, wet, medium dense ering ansalar sand, wet, medium	USCS Description of Materials  Description of Materials  Description of Materials  ML: Very dark gray (SY 3/1), micaceous silt, wet, very soft, notiled black (Gley 1 2.5/1) silt, trace organics  ML: Very dark gray (SY 3/1), micaceous silt, wet, soft, homogenous, black liminations, trace organics  ML: Very dark gray (SY 3/1), micaceous silt, wet, soft, homogenous, black liminations, trace organics  ML: Very dark gray (SY 3/1), micaceous silt, wet, soft, homogenous, silt, wet, soft, homogenous, trace lignites  ML: Very dark gray (SY 3/1), micaceous silt, wet, very soft, homogenous, trace lignites  ML: Very dark gray (SY 3/1), micaceous silt, wet, very soft, homogenous, trace lignites  ML: Very dark gray (SY 3/1), micaceous silt, wet, very soft, homogenous, silt, wet in the soft silt with brown (7.5 YR 5/3) silt  ML: Dark gray (SY 3/1), micaceous silt, wet, very soft, homogenous, trace lignites  ML: Dark gray (SY 3/1), silt with fine grain subangular sand, wet, stiff, trace lignites  ML: Dark gray (2.5 Y 4/1), silt with fine grain subangular sand, wet, stiff, trace lignites  ML: Gray (2.5 Y 6/1), silt with trace organics, wet  ML: Gray (2.5 Y 6/1), silt with trace organics, wet  ML: Gray (2.5 Y 6/1), silt with trace organics, wet  ML: Gray (2.5 Y 6/1), fine grain micaceous silty sand, wet, medium dense  SM: Light ofive brown (2.5 Y 5/3) medium grain silty sand, wet, medium dense  SM: Light ofive brown (2.5 Y 5/3) medium grain silty sand, wet, medium dense  SM: Light ofive brown (2.5 Y 5/3) medium grained angular sand, wet, medium dense  SM: Light ofive brown (2.5 Y 5/3) medium grained angular sand, wet, medium dense  SM: Light ofive brown (2.5 Y 5/3) medium grained angular sand, wet, medium dense  SM: Light ofive brown (2.5 Y 5/3) medium grained angular sand, wet, medium dense  SM: Light ofive brown (2.5 Y 5/3) medium grained angular sand, wet, medium dense		



#### **Pearce Creek Dredged Material** Containment Area, Maryland

410-538-8202 Geologist: Melissa Whitehead Location: Pearce Creek Log of Boring: PCB-12 Name of Driller: Jay Blemmings Subcontractor: Uni-Tech Drilling Co., Inc. Drilling Method: Mud Rotary Model Drill Rig: CME55LC ATV Soil Boring Depth of Hole (ft): 50 Date Completed: 09/15/2008 Date Started: 09/15/2008 MD State Plane/NAD 83/NAVD 88 Easting (ft): 1599416.85 Northing (ft): 642439.55 Elevation (ft): 33.02 Surface Conditions: Soil and cleared brush Comments: Geotechnical Results Core Blows Recovery Sample Number Interval per USCS Description of Materials Depth 6 in (ft) USCS % Gr/Sa/Si/Cl (ft) -0 ML: Dark grayish brown (2.5Y 4/2), silt with little silt, PCB-12-0-2 0-2 58 few organics (disturbed soil from site clearing), dry, 3 2 2 -2 ML: Very dark gray (5Y 3/1), micaceous silt, moist, 2 PCB-12-2-4 67 3 2-4 medium stiff, trace organics, trace iron staining 3 3 2 ML: Very dark gray (5Y 3/1), micaceous silt with black PCB-12-4-6 2 4-6 laminations, wet, medium stiff, trace lignites, trace iron 3 staining 2 ML: Very dark gray (5Y 3/1), micaceous silt with black 2 PCB-12-6-8 laminations, wel, medium stiff, trace iron staining 2 6-8 58 3 2 -8 2 ML: Very dark gray (5Y 3/1), micaceous silt with black PCB-12-8-10 92 1 8-10 laminations, wet, soft, homogenous 2 Ì -10 H CL: Very dark gray (5Y 3/1), micaceous clay with black PCB-12-10-12 92 laminations, wet, very soft, homogenous H 10-12 H H -12 CL; Very dark gray (5Y 3/1), micaceous clay with black H PCB-12-12-14 92 H 12-14 laminations, wet, very soft, homogenous, trace lignites H H CL: Very dark gray (5Y 3/1), micaceous clay with black H PCB-12-14-16 67 11 14-16 laminations, wet, very soft, homogenous, iron staining H and concretions 11 ML: Very dark gray (5Y 3/1), micaecous silt with black H PCB-12-16-18 16-18 83 laminations, wet, very soft, homogenous, trace lignites, H iron staining and concretions H H -18 ML: Very dark gray (5Y 3/1), micaceous silt with trace Н 50 PCB-12-18-20 18-20 2 fine grain sand, wet, soft, trace organics 1 2 -20 2 ML: Gray (2.5Y 6/1), micaceous silt with few fine grain PCB-12-20-22 20-22 67 5 sand, wet, stiff, iron staining, trace organics 7 13.6 / 18.5 / 51.9 / 8 CL-ML -22 16.0 ML: Gray (2.5Y 6/1), micaceous silt with little fine 6 PCB-12-22-24 67 7 22-24 grain sand, wet, stiff, iron staining, trace iron

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Log of Boring: PCB-12			Location: PCB-12							
	1.00	B 22	Geotechnical R	Blows		Recovery	Consula Niconi			
epth (ft)	USCS Log	Description of Materials	% Gr/Sa/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	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	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/	SM.	7 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	12.1	SM	6 8 8	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 micaccous sand, wet, loose sand 35.5'- 1" dark gray clay lens			H H H	34-36	83	PCB-12-34-36		
36	5	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	36-38	58	PCB-12-36-38		
38	8	SM: Light gray (2.5Y 7/1), fine grain sub-angular micaceous sand with trace medium grain sand, wet, dense			17 13 13 14 14	38-40	58	PCB-12-38-40		
4(	0 / / /	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		
4:		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		
4	4//	SC: Light gray (2.5Y 7/1), medium grain sub-angular clayey sand, wet, dense			10 14 17	44-46	50	PCB-12-44-4		
4	6	SM: Olive yellow (2.5Y 6/6), fine grain sub-angular silty sand, wet, medium dense			7 16 10	46-48	50	PCB-12-46-4		
4	8	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	48-50	42	PCB-12-48-5		
5	50	END OF BORING = 50 FT	1		6					



	f Bor	ing: PCB-13	-538-8		Location:	Pearce C	Creek			Ge	ologist:	Melissa V	Vhitehead
		Uni-Tech Drilli		. Inc.		Namo	e of D	riller; Jay B	lemmings	3			
100000		ig: CME55LC A				Drill	ing M	ethod: M	nd Rotary				
-		09/22/2008		Date	Completed:	09/22/20		Depth of I			-1	So	il Boring
and the state of			North					00020.22		M	D State F	lane/NAI	0 83/NAVD 8
	on (ft):			1111111111111	712 (7 1.07		- 6						
		ditions: Soil an	d clear	ed brush			_						
Comm	ents:		-	_			Ge	otechnical Re	esults	Blows	Core	Recovery	
epth (ft)	USCS Log	Desc	riptic	n of Ma	terials	g	6 Gr / S	Sa/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	Sample Numbe
[-0		ML: Olive gray ( sand, trace organi dry, soft, iron sta	ics (dist	3), silt with urbed soil f	little fine grain rom site clearin	ng),				1 2 1	0-2	17	PCB-13-0-2
2		ML: Dark grayist organics, dry, iro	h brown n staini	(2.5Y 4/2) ng, mediun	, silt with few a stiff					3 2 2 3	2-4	67	PCB-13-2-4
4 -		ML: Very dark g moist, soft, trace	rayish l organic	orown (2.5) es	/ 3/2), clayey si	ilc,				3 2 2 2	4-6	50	PCB-13-4-0
6 -		ML: Dark grayis organics, wet, so	sh brown off	n (5¥ 3/1),	micaceous silt,	trace				2 2 1	6-8	50	PCB-13-6-
8		ML: Dark grayis black lamination very soft, homo	is, trace	n (5Y 3/I), organics, t	micaceous silt race lignites, we	with et,				1 1 1	8-10	50	PCB-13-8-1
1		ML: Dark grayi mottled black si silt, trace lignite	It, trace	dark grayis	micaceous silt sh brown (2.5Y	with 4/2)				H H H	10-12	58	PCB-13-10-
1	2	ML: Dark grayi organics, wet, s	sh brow oft	n (5Y 3/1).	micaceous silt,	, few				H 1 1	12-14	50	PCB-13-12-
	4	ML: Dark gray mottled black s very soft, home	ilt, trace	organics, i	, micaceous silt ron staining, we	with et,				H H H		96	PCB-13-14-
	16.									H	16-18	58	PCB-13-16
1	18	ML: Dark gray mottled black s staining, wet, v	ilt, trac	e lignites, ti	), micaceous silt race organics, ir ous	t with on				11		83	PCB-13-18
	20	ML: Dark gray black silt, trace wet, very soft	(5Y 4/ e lignite	1), micaceo s, trace orga	us silt with mot anics, iron stain	uled ing,				H	20-2	2 75	PCB-13-20
1 -	22	ML: Dark gray iron staining, v	y (5Y 4/ very sof	1), micaced t, wet, hom	ous silt, trace lig ogenous	inites,				1- 1-		4 58	PCB-13-22

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Log of Bo	ring: PCB-13	Location: PCB-13							
100		Geotechnical Re	Blows	Core	Recovery				
Depth USCS (ft) Log	Description of Materials	% Gr/Sa/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	Sample Number		
24	ML: Dark gray (5Y 4/1), silt, trace organics, wet, very soft, homogenous			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	26-28	50	PCB-13-26-28		
28	ML: Dark gray (5 Y 4/1), silt with black laminations, trace fine silt, trace organics, trace lignites, wet, very soft	0,1/3,6/63.7/		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	32.6		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			— Н Н Н	32-34	75	PCB-13-32-34		
34	ML: Dark gray (5Y 4/1), silt, wet, very soft, homogenous			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	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/		H H H	40-42	58	PCB-13-40-42		
42 -	PT: Dark gray (5Y 4/1), clay with some organies, few lignites, wet, soft, homogenous	22.8	МН	H	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			2 1 2 2 2 3	44-46	75	PCB-13-44-40		
46	SM: Gray (2.5Y 5/1), fine grain silty sand with trace clay, light ofive brown (2.5Y 5/4) fine grain sand laminations at 47' for 4", wet, soft, very loose			3 1 2 2 5	46-48	42	PCB-13-46-41		
48	SM: Offive yellow (2,5Y 6/6), medium grain sub-angular silty sand, trace sub-rounded fine grain gravel, wet			6 10 10	48-50	33	PCB-13-48-50		
50	SM: White (2.5Y 8/I), fine grain silty sand, wet			12					



**Pearce Creek Dredged Material** Containment Area, Maryland

410-538-8202 Geologist: Melissa Whitehead Location: Pearce Creek Log of Boring: PCB-14 Name of Driller: Jay Blemmings Subcontractor: Uni-Tech Drilling Co., Inc. Drilling Method: Mud Rotary Model Drill Rig: CME55LC ATV Depth of Hole (ft): 50 Soil Boring 09/19/2008 Date Completed: Date Started: 09/19/2008 MD State Plane/NAD 83/NAVD 88 Easting (ft): 1601058.87 Northing (ft): 642899,81 Elevation (ft): 30.17 Surface Conditions: Soil and cleared brush Comments: Geotechnical Results Core Blows Recovery Sample Number interval per Description of Materials Depth (ft) USCS 6 in. % Gr/Sa/Si/Cl (ft) -0 2 ML: Dark grayish brown (2.5Y 4/2), silt with little fine PCB-14-0-2 58 2 0-2 grain sand and little organics (disturbed soil from site 2 clearing), dry, medium stiff, iron staining 4 4 ML: Very dark gray (2.5Y 3/1), silt with trace clay, PCB-14-2-4 2-4 58 4 moist, stiff, iron staining 5 5 5 ML: Very dark gray (5Y 3/1), micaceous silt with PCB-14-4-6 4 4-6 75 mottled black silt, trace organics, wet, medium stiff, 5 homogenous 3 -6 2 ML: Very dark gray (5Y 3/1), micaceous silt with PCB-14-6-8 2 67 6-8 mottled black silt, trace organics, wet, soft, homogenous 2 1 -8 CL: Very dark gray (5Y 3/1), micaccous clay with 1 PCB-14-8-10 8-10 96 1 mottled black clay, trace lignites, trace organics, wet, 1 soft, homogenous 1 -10 H CL: Very dark gray (5Y 3/1), micaceous clay with trace PCB-14-10-12 10-12 96 H organics, wet, very soft, homogenous H H -12 H CL: Very dark gray (5Y 3/1), micaceous clay with PCB-14-12-14 96 mottled black clay, trace lignites, wet, very soft H 12-14 H H -14 11 CL: Very dark gray (5Y 3/1), micaceous clay with PCB-14-14-16 83 14-16 11 mottled black clay, trace organics, wet, very soft, H homogenous 11 -16 H CL: Very dark gray (5Y 3/1), micaceous clay with trace PCB-14-16-18 83 16-18 H organics, trace lignites, wet, very soft, homogenous H H -18 H CL: Very dark gray (5Y 3/1), micaceous clay with trace PCB-14-18-20 18-20 50 sub-angular fine grain sand, black mottled clay, trace H H organics, wet, very soft, homogenous H -20ML: Yellowish brown (10YR 5/4), sandy silt with trace PCB-14-20-22 20-22 42 mica, wet, medium stiff 2 30.2 / 28.5 / 27.9 / GC-GM 13.4 -22 ML: Yellowish brown (10YR 5/4), clayey silt with trace 75 PCB-14-22-24 22-24 3 medium grain sub-rounded sand, wet, medium dense

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Log of Bo	ring: PCB-14	Location: PCB-14							
Log of Bo	ring. I CD 14	Geotechnical Re	Blows	Core					
Depth USCS (ft) Log	Description of Materials	% Gr/Sa/Si/CI	USCS		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	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			8 1 1 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			2 1 2 2	30-32	83	PCB-14-30-32		
32	CL: Gray (2.5Y 5/1), micaccous clay, wet, soft, homogenous			3 1 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 still, homogenous			2 1 2 2	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			3 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			1 1 2	38-40	50	PCB-14-38-40		
40	CL: Dark gray silty clay (5Y 4/1) with trace organics, wet			1 2	40-42	58	PCB-14-40-42		
10	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	3					
42	SM: Greenish gray (GLEY 1 6/1), silty very fine grain sand, iron staining, with little dark grayish brown (2.5 Y 3/2) fine grain sand, iron staining, wet, loose			2 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	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			1 4 9 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	-		12 15 15 22	48-50	33	PCB-14-48-50		
50	END OF BORING = 50 FT			24		1			



### Pearce Creek Dredged Material Containment Area, Maryland

410-538-8202 Geologist: Melissa Whitehead Location: Pearce Creek Log of Boring: PCB-15 Name of Driller: Jay Blemmings Subcontractor: Uni-Tech Drilling Co., Inc. Drilling Method: Mud Rotary Model Drill Rig: CME55LC ATV Soil Boring Depth of Hole (ft): 50 09/17/2008 Date Completed: Date Started: 09/17/2008 MD State Plane/NAD 83/NAVD 88 Easting (ft): 1597344.06 Northing (ft): 642060.01 Elevation (ft): 34.41 Surface Conditions: Soil and cleared brush Comments: Geotechnical Results Core Blow Recovery Sample Number nerval per USCS Description of Materials Depth (%) (ft) 6 in. % Gr/Sa/Si/Cl USCS (f1) 2 ML: Dark gray (2.5Y 4/1), silt (disturbed soil from site PCB-15-0-2 clearing) with few organics, dry, medium stiff, iron 0-2 58 3 3 staining 4 -2 3 ML: Dark gray (2.5Y 4/1), clayey silt with few PCB-15-2-4 3 2-4 75 organics, moist, stiff, trace lignites 4 5 4 3 ML: Black (5Y 2.5/1), micaceous silt with black PCB-15-4-6 75 laminations, moist, medium stiff, trace lignites 4 4-6 3 3 -6 3 CL: Black (5Y 2.5/1), micaceous clay, wet, soft, 6-8 PCB-15-6-8 4 83 homogenous, trace lignites -8 CL: Very dark gray (5Y 3/1), micaceous clay with trace PCB-15-8-10 8-10 96 medium grain sub-rounded sand, wet, soft, little lignites 1 1 CL: Very dark gray (5Y 3/1), micaceous clay, wet, very H 10-12 PCB-15-10-12 96 11 soft, homogenous H H -12 H PCB-15-12-14 12-14 83 H H ML: Very dark gray (5Y 3/1), micaccous silt, wet, very H soft, homogenous 1 PCB-15-14-16 58 14-16 2 3 SP; Dark gray (5Y 4/1), poorly graded fine grain sub-5 angular sand, iron staining, wet, loose 2 PCB-15-16-18 SW: Dark gray (5Y 4/1), well graded fine grain sub-33 2 16-18 SM 3.4 / 84.3 / 6.3 / 6.0 angular sand, wet, loose 3 4 -18 2 PCB-15-18-20 18-20 50 CL: Very dark gray (5Y 3/1), micaceous clay, wet, soft, 1 homogenous -20 1 CL: Very dark gray (5Y 3/1), micaceous clay wet, soft, PCB-15-20-22 75 20-22 1 homogenous 1 ML: Dark gray (5Y 4/1), silt with black (GLEY 1 2.5/1) 1 -22 H laminations, wet 22-24 50 PCB-15-22-24 1 CL: Dark gray (5Y 4/1), micaceous silt with few fine grain sand, wet, soft, few organics, iron stainings



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og of Bo	ring: PCB-15	Location: PCB-15								
		Geotechnical Re	esults	Blows	Core	Recovery				
epth USCS (ft)	Description of Materials	% Gr/Sa/Si/Cl USCS		per 6 in,	Interval (ft)	(%)	Sample Number			
-24	CL: Very dark gray (5Y 3/1), micaceous clay wet, soft, homogenous			2 2 5	24-26	67	PCB-15-24-26			
26	CL: Light olive brown (2.5Y 5/3), silty clay, wet, stiff, trace organics, potential iron staining, homogenous	9.7 / 56.5 / 23.5 /		- 10 5	26.20	92	PCB-15-26-28			
28	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	10.3	SM	5 8 9 5	26-28	92	PCB-120-28			
	CL: Light greenish gray (Gley 1 7/1), clay with trace fine grain sand iron staining, wet			9 8 13	28-30	42	PCB-15-28-30			
30	SP; Light olive brown (2.5Y 5/3) poorly graded fine grain sub-angular sand, wet, medium dense			7 8	30-32	58	PCB-15-30-32			
-32	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 9 6 12	32-34	25	PCB-15-32-34			
34	ML; Light yellowish brown (2,5Y 6/3), silt with few fine grain sand and trace fine grain round gravel, wet, stiff, iron staining			15 23 41						
	SP: White (2.5Y 8/1), poorly graded fine grain sub- rounded to sub-angular sand, wet, dense			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	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), microceous clayey silt with trace			6 6 9	40-42	42	PCB-15-40-42			
-42	fine grain sand, wet, medium dense, iron staining 41'- 1" white (2.5Y 8/1), fine grain sand stratification			10 14 6	R: A	1.5	2000 25 10 1			
-44	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			13 9 6	42-44	33	PCB-15-42-44			
	SC: White (2.5 8/1), clayey fine grain sub-angular sand with trace medium grain sand, wet, very loose			H H	44-46	8	PCB-15-44-40			
46	GP: Angular coarse grain sand and sub-rounded fine grain gravel possible slush, wet			H H I H	46-48	17	PCB-15-46-4			
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 H	48-50	25	PCB-15-48-5			
50	END OF BORING = 50 FT			Н						



**Pearce Creek Dredged Material** Containment Area, Maryland

410-538-8202 Geologist: Melissa Whitehead Location: Pearce Creek Log of Boring: PCB-16 Name of Driller: Jay Blemmings Subcontractor: Uni-Tech Drilling Co., Inc. Drilling Method: Mud Rotary Model Drill Rig: CME55LC ATV Soil Boring Depth of Hole (ft): 50 09/17/2008 Date Completed: Date Started: 09/17/2008 MD State Plane/NAD 83/NAVD 88 Northing (ft): 641649.50 Easting (ft): 1598160.73 Elevation (ft): 32.08 Surface Conditions: Soil and cleared brush Comments: Comment Geotechnical Results Core Blows Recovery Sample Number Interval per USCS Description of Materials Depth (%) (ft) USCS 6 in. % Gr/Sa/Si/Cl (ft) -0ML: Dark grayish brown (2.5Y 4/2) silt with little fine PCB-16-0-2 0-2 58 silt, few organics (disturbed soil from site clearing), dry, 3 3 stiff, iron staining 2 -2 2 ML: Dark grayish brown (2.5Y 4/2) clayey silt with few PCB-16-2-4 2 2-4 67 organics, trace lignites, moist, stiff 2 2 2 ML: Micaceous black (Gley 1 2.5/) silt, wet, soft, PCB-16-4-6 2 4-6 75 homogenous 2 1 1 ML: Micaceous black (5Y 2.5/1) silt, wet, soft, 96 PCB-16-6-8 6-8 2 homogenous 2 1 -8 1 PCB-16-8-10 8-10 96 1 1 1 H ML: Very dark gray (5Y 3/1) micaceous silt with black PCB-16-10-12 10-12 96 laminations, very soft, wet, homogenous 11 H H -12 H ML: Very dark gray (5Y 3/1) micaceous silt with black PCB-16-12-14 96 12-14 laminations, very soft, wet, homogenous, trace organics H H H H ML: Very dark gray (5Y 3/1) micaceous silt with PCB-16-14-16 96 vertical black laminations, very soft, wet, homogenous, 14-16 H iron staining, trace organics H H H ML: Very dark gray (5Y 3/1) micaceous silt with few PCB-16-16-18 96 fine grained sand, wet, very soft, iron cementations H 16-18 H 11 ML: 17.5'- Pale olive (5Y 6/3) silt lamination, wet -18 14 PCB-16-18-20 ML: Very dark gray (5Y 3/1) micaceous silt with few 18-20 50 H fine grained sand, wet, very soft, homogenous H H -20 ML: Very dark gray (5Y 3/1) silt with mottled black H PCB-16-20-22 20-22 96 (5Y 2.5/1) silt, wet, very soft, trace organics H 14 0.1/5.3/68.5/ ML H 26.1 -22 H ML: Very dark gray (5Y 3/1) silt with trace fine sands, 75 PCB-16-22-24 22-24 black laminations wet, soft, iron staining

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og of Bo	oring: PCB-16	Location: PCB-16									
T T	Allig. I CD To	Geotechnical Re	esults	Blows	Core	Recovery	W. 1. W. 1. W. 1. W.				
epth USCS (ft)	Description of Materials	% Gr/Sa/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	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	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	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			14 14 17 13	28-30	33	PCB-16-28-30				
30	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			16 11 11 12	30-32	58	PCB-16-30-32				
32	SM: White (5Y 8/1) silty sand, very fine, wet, dense, homogenous  SM: Light gray (5Y 7/1) silty sand, very fine, wet, dense, homogenous	0.0 / 84.2 / 10.2 / 5.6	SM	18 11 12 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			15 2 4 6 6	34-36	58	PCB-16-34-30				
36	SW: White (5Y 8/I) sand, very fine grained, wet, dense, well graded, homogenous			6 5 11	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			15 13 15	38-40	50	PCB-16-38-4				
40	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 19 18 21	40-42	42	PCB-16-40-4				
42	SW: White (5Y 8/1) sand, very fine grained, thin black laminations, wet, very dense, well graded			38 33 10							
44	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			18 23 24 H	42-44	33	PCB-16-42-4				
	CL: Very dark gray (5Y 3/1) clay with some fine grained sand, wet, very soft, possible slush			11 0	44-46	8	PCB-16-44-4				
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		3 25	PCB-16-46-4				
48	SP: Brownish yellow (10 YR 6/6) sand, medium grained, with trace course grains, angular, wet, loose, poorly graded			2 3 5	tulla e	) 42	PCB-16-48-:				
50	END OF BORING = 50 FT			5							



og of Bor	ing: PCB-1'	7	Location	: Pearce Creel			Ge	ologist:	Melissa \	Whitehead	
	Uni-Tech Drill			Name of	Driller: Jay B	lemmings	;				
	ig: CME55LC A		*	Drilling	Method: Mu	ad Rotary					
			Date Completed:	09/18/2008	Depth of I-	fole (ft):	50		So	il Boring	
ate Started:			7.00	Easting (ft):				D State P	lane/NAI	D 83/NAVD 8	
levation (ft):		1245 000 20	(ft): 641708.85	Easting (II).	1,396620.01			D Dime !	140.40	200000000000000000000000000000000000000	
urface Cond	ditions: Soil an	nd cleared b	rush			_		_	_		
omments:				-	Castachnical Re	enlte	I no	Com	120		
epth USCS (ft)	Desc	cription o	f Materials	10.00	Geotechnical Results  Gr / Sa / Si / Cl USC		Blows per 6 in.	Core Interval (ft)	Recovery (%)	Sample Number	
0	ML: Dark gray ( sand, few organic dry, medium stif	cs (disturbed	I with little fine grain soil from site clearin g	g),			2 3 2 3	0-2	58	PCB-17-0-2	
2	SC: Dark gray (2 organics trace lig	2.5Y 4/1), sil gnites, dry, s	t with little fine sand, oft, iron staining	trace			2 1 2 2	2-4	42	PCB-17-2-4	
4	CL; Very dark g wet, homogenou	ray (5Y 3/1) is iron staini	, micaceous clay, ver 1g	y soft,			0 0 0	4-6	96	PCB-17-4-6	
6	PT: Very dark g wet, homogenou lignites, wet, so	is iron staini	, micaceous clay, ver ng, mostly organics, t peat	y soft, race			1 1 1	6-8	58	PCB-17-6-1	
8	ML: Very dark black clay, wet,	gray (5Y 3/1 very soft, fe	, micaceous silt, mott w organics	lled			1 0 1 0	8-10	67	PCB-17-8-1	
10	CL: Very dark a	gray (5Y 3/1 ery soft home	), micaceous clay, fev egenous	v			H H H	10-12	58	PCB-17-10-	
12	ML: Very dark lignites, trace o homogenous	gray (5Y 3/ organics, iron	l), micaceous silt, trae staining, wet, very se	ce oft,			H H H		83	PCB-17-12-	
14	CL; Very dark organics, wel,	gray (5Y 3/ very soft hor	), micaceous clay, tra nogenous	ice			H	14-16	96	PCB-17-14-	
16	CL: Very dark organics, trace	gray (5Y 3/ lignites, we	I), micaceous clay, fe , very soft, homogene	ous			H H H	16-18	96	PCB-17-16	
18	ML: Very dark mottled silt, tra	k gray (5Y 3) ace organics	(1), micaceous silt wi , wet, very soft, home	th black ogenous			H	18-20	83	PCB-17-18	
20	ML: Very dark	ry son,	2/6.1/67.1/		1- 1-	1 1 20-2	2 75	PCB-17-20			
22	-22 ML: Very dark gray (5Y 3/1), micaceous silt, trace lignites, wet, very soft, homogenous				26.6	ML	i i	1 22-2	4 96	96 PCB-17-2	

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DO Pe

0.00	of Bo	ring: PCB-17	Location: PCB-17										
LOG C	7 20,	ing. 1 oz 1	Geotechnical Re	esults	Blows		Recovery	Carranto Nicombos					
epth (ft)	USCS Log	Description of Materials	% Gr/Sa/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	Sample Number					
24 - -		ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous			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	26-28	83	PCB-17-26-28					
28 - -		ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous			H	28-30	58	PCB-17-28-30					
30 -					H H H H	30-32	75	PCB-17-30-33					
32 -					H H H	32-34	58	PCB-17-32-3					
34  -					H H H	34-36	67	PCB-17-34-3					
36		CL: Very dark gray (5Y 3/1), micaceous clay, trace lignites, trace organics, wet, very soft, homogenous			H	36-38	50	PCB-17-36-3					
38	3	PT: Very dark gray (5Y 3/1), micaceous mostly organic clay with few lignites, wet, soft, resembles peat			H 3 2	38-40	50	PCB-17-38-4					
40		OH: Very dark gray (5Y 3/I), micaceous organic silt, few organics, few lignites medium stiff, homogenous, wet	0.8 / 42,7 / 36.4 /	мн	2 1 2 3 3	40-42	67	PCB-17-40-4					
43	2 1 5	OH: Very dark gray (5Y 3/1), micaceous organic silt, little organics, trace lignites, wet, soft	20.1	WIN	2 2 2	42-44	58	PCB-17-42-4					
4		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-17-44-4					
4		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-17-46-4					
4	8	SM: Sub-angular medium grain sand with trace fine sub-rounded gravel yellowish brown (10 YR 5/6), poorly graded, wet			5 7 7	48-50	33	PCB-17-48-:					
5	0	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			9								
		END OF BORING = 50 FT	1										



### Pearce Creek Dredged Material Containment Area, Maryland

410-538-8202 Geologist: Melissa Whitehead Location: Pearce Creek Log of Boring: PCB-18 Name of Driller: Jay Blemmings Subcontractor: Uni-Tech Drilling Co., Inc. Drilling Method: Mud Rotary Model Drill Rig: CME55LC ATV Soil Boring Depth of Hole (ft): 50 09/16/2008 Date Completed: Date Started: 09/16/2008 MD State Plane/NAD 83/NAVD 88 Easting (ft): 1599469.63 Northing (ft): 641816.13 Elevation (ft): 31.49 Surface Conditions: Soil and cleared brush Comments: Geotechnical Results Core Blows Recovery Sample Number Interval per USCS Description of Materials Depth USCS 6 in. % Gr/Sa/Si/Cl (ft) 2 ML: Dark gray (2.5Y 4/1) silt with little fine silt, few PCB-18-0-2 2 0-2 42 organics (disturbed soil from site clearing), dry, stiff, 4 iron staining 3 -2 2 ML; Dark gray (2.5Y 4/1) micaceous clayey silt, moist, PCB-18-2-4 2 2-4 58 medium stiff, trace organics, trace lignites, iron staining 3 3 -4 3 ML: Very dark grayish brown (2.5Y 3/2) micaceous PCB-18-4-6 2 4-6 clayey silt, wet, medium dense, iron staining, few 2 organics 3 -6 2 ML: Very dark gray (5Y 3/1) micaceous silt, black PCB-18-6-8 3 6-8 92 laminations, wet, medium dense 3 2 -8 2 CL; Very dark gray (5Y 3/1) micaceous clay, mottled PCB-18-8-10 2 8-10 83 black clay, wet, soft, trace organics 2 1 -10 H ML: Very dark gray (5Y 3/1) micaceous silt, black 10-12 96 PCB-18-10-12 11 laminations, wet, very soft, iron stainings H H -12 ML: Very dark gray (5Y 3/1) micaceous silt, mottled 1 PCB-18-12-14 75 2 12-14 black clay, wet, soft, trace organics 1 1 H ML: Very dark gray (5Y 3/I) micaceous silt, mottled 67 PCB-18-14-16 black clay, wet, soft, trace organics, iron stainings, iron 14-16 H Н 1 -16 CL: Very dark gray (5Y 3/1) micaceous clay, wet, very 1 PCB-18-16-18 92 16-18 1 soft, homogenous 1 1 -18 H CL: Olive gray (5Y 4/2) micaeeous clay, wet, very soft, PCB-18-18-20 25 18-20 H homogenous trace organics H H -20 CL: Olive gray (5Y 4/2) micaceous clay, wet, very soft, PCB-18-20-22 20-22 75 3 homogenous 6 ML: 3" interlayered light olive brown (2.5Y 5/3) fine 7 sands and brown (7YR 4/4) fine sand laminations, wet -22 5 PCB-18-22-24 ML: Gray (2.5Y 5/1) silt with little fine sands, wet, 58 10 22-24 dense, poorly graded 1" lenses of grayish brown (2.5Y 14 6.9 / 40.1 / 39.5 / ML 5/2) clay with fine sand

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00 0	f Bo	ring: PCB-18	Location: PCB-18								
Ī		b Car	Geotechnical Re	esults	Blows	Core	Recovery	Library Con			
epth (fi)	JSCS Log	Description of Materials	% Gr/Sa/Si/Cl	uscs	per 6 in.	Interval (ft)	(%)	Sample Number			
F -24F			13.5		5						
		ML: Light olive brown (2.5 Y 5/3) silt with little fine grained sand, sub-rounded, wet, stiff			6 5	24-26	67	PCB-18-24-26			
26 -		ML: 25.5'- light olive brown (5Y 5/4) sand laminations, medium grained, angular, wet			8 14	26-28	42	PCB-18-26-28			
28		SW: Gray (2.5Y 7/1) very fine grained sand, wet, dense, homogenous well graded, sub-rounded			14 18 9						
	1	SP: White (2.5Y 8/1) very fine sand, wet, dense, homogenous, poorly graded, sub-rounded			20 23	28-30	50	PCB-18-28-30			
30	1111		0.2 / 90.2 / 5.3 / 4.3	SP-SM	23 10 23 21 20	30-32	92	PCB-18-30-32			
32	111				6 13 21	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			26 9 10 10	34-36	58	PCB-18-34-36			
36 - -					9 H 4 6	36-38	83	PCB-18-36-38			
38 					9 12 7	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			5 11 13 9	40-42	75	PCB-18-40-4			
42 -		SW: Gray (2.5Y 6/1) medium grained sand, sub- rounded, wet, medium dense, well graded, homogenous			7 6 9 11	42-44	42	PCB-18-42-4			
44 - -		SW: Light yellowish brown (2.5Y 6/4) medium grained sand, wet, medium dense, homogenous, sub-angular well graded, potential iron staining			7 8 9 7	44-46	42	PCB-18-44-4			
46	11/1/1	SP: Light yellowish brown (2.5Y 6/4) silt with few fine grained sand, wet, medium dense, sub-rounded, potential iron staining			7 8 5 5	46-48	42	PCB-18-46-4			
48 -	11/1/	SP: Light olive brown (2.5Y 5/4) sand, medium grained with trace fine grains, wet, very dense, poorly graded, sub-angular			8 8 22 38		42	PCB-18-48-5			
50		END OF BORING = 50 FT			50/	5					



### Pearce Creek Dredged Material Containment Area, Maryland

410-538-8202 Geologist: Melissa Whitehead Location: Pearce Creek Log of Boring: PCB-19 Name of Driller: Jay Blemmings Subcontractor: Uni-Tech Drilling Co., Inc. Drilling Method: Mud Rotary Model Drill Rig: CME55LC ATV Soil Boring Depth of Hole (ft): 50 09/18/2008 Date Completed: Date Started: 09/18/2008 MD State Plane/NAD 83/NAVD 88 Easting (ft): 1600009,60 Northing (ft): 641828.03 Elevation (ft): 31.91 Surface Conditions: Soil and cleared brush Comments: Geotechnical Results Blows Core Recovery Sample Number Interval USCS Description of Materials Depth (%) 6 in. (fi) USCS % Gr/Sa/Si/Cl (ft) 0 ML: Dark gray (2.5Y 4/1), silt with little fine sand, few PCB-19-0-2 2 0-2 58 organics (disturbed soil from site clearing), dry, stiff, 2 3 ML: Very dark gray (5Y 3/1), silt, trace organics, moist, 1 PCB-19-2-4 75 1 2-4 soft, iron staining 2 2 ML: Very dark gray (5Y 3/1), micaceous silt, moist, 83 PCB-19-4-6 1 4-6 soft, trace organics 1 ML: Very dark gray (5Y 3/1), micaccous silt, wet, soft 2 -6 1 ML: Very dark gray (5Y 3/1), micaceous silt with PCB-19-6-8 83 2 6-8 mottled black silt, trace lignites, wet, soft, homogenous ١ 1 -8 ML: Very dark gray (5Y 3/1), micaceous silt with 1 83 PCB-19-8-10 8-10 mottled black silt, trace lignites, trace organics, wet, 1 very soft, homogenous 1 2 H PCB-19-10-12 83 H 10-12 H H -12 H PCB-19-12-14 H 12-14 83 H H H ML: Very dark gray (5Y 3/1), micaceous silt with PCB-19-14-16 92 H 14-16 mottled black silt, few organics, homogenous, wet 0 -16 11 ML: Very dark gray (5Y 3/1), micaccous silt with trace PCB-19-16-18 16-18 96 fine sands, black laminations, iron staining, wet H H 14 -18 ML: Very dark gray (5Y 3/1) micaceous silt with trace Н 83 PCB-19-18-20 fine grain sand, iron staining, homogenous, wet 18-20 H H H -20 H ML: Very dark gray (5Y 3/1), micaceous silt with a thin PCB-19-20-22 20-22 96 H layer of trace organics, wet, very soft H H -22 Н ML: Very dark gray (5Y 3/1), micaceous silt with thin PCB-19-22-24 58 black laminations and mottled black silt, iron staining, 22-24 trace organics, wet, soft

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Log of Ro	ring: PCB-19	Location: PCB-19										
Log of Do	Ing. 1 Oz 17	Geotechnical Res	sults	Blows	Core	Recovery						
Depth USCS (ft)	Description of Materials	% Gr/Sn/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	Sample Number					
-24	ML: Very dark gray (5Y 3/1), micaceous silt, wet, very soft, homogenous trace lignites, trace organics			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/		1	26-28	50	PCB-19-26-28					
28		16.5	ML	1 2 1 1	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			0 H H	30-32	83	PCB-19-30-32					
32	ML: Very dark gray (5Y 2/3), silt, trace organics, iron staining, wet, very soft			0 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/I), 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	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		50	PCB-19-48-50					
50	END OF BORING = 50 FT			15			-					



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Pearce Creek Dredged Material Containment Area, Maryland

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Logo	f Bor	ing: PCB-2	0	Location: I	Pearce Creek Geologist: Melissa Whitehead											
		Uni-Tech Drill	and the second		Name of I	Name of Driller: Jay Blemmings										
		ig: CME55LC A			Drilling N	Method: Mu	id Rotary									
Gulfard and	-	09/19/2008		Date Completed:	09/19/2008	Depth of H	lole (ft):	50	Soil Boring							
Elevation		740-	Northing	(ft): 641906.46 E	Easting (ft): 1	600429.18		M	D State F	lane/NAI	0 83/NAVD 88					
	The Park	ditions: Soil ar	1000													
Comm	7 7	GI GOILLE THE TENT														
July V				A street	C	Seotechnical Re	sults	Blows	Core Interval	Recovery	Sample Number					
Depth (ft)					% Gr /	Sa/Si/Cl	USCS	per 6 in.	(B)	(%)						
-0		ML: Dark grayis organics and trac clearing), dry, st	e lignites (di	Y 4/2), silt with few sturbed soil from site ng				2 3 3 4	0-2	13	PCB-20-0-2					
2		ML: Dark grayis organics, dry, sti	sh brown (2.5 iff, iron staini	Y 4/2), silt with trace				2 3 3 3	2-4	58	PCB-20-2-4					
4		ML: Very dark a mottled black el staining, moist,	av, trace orga	, micaceous silt with nics, trace lignites, iron tous				2 2 2 2	4-6	58	PCB-20-4-6					
6		ML: Very dark mottled black cl	gray (5Y 3/1) ay, few organ	, micaceous silt with ies, wet, soft, homoger	ious			3 2 3 3	6-8	67	PCB-20-6-8					
8		ML: Very dark organics, wet, v	gray (5Y 3/1) ery soft home	, micaceous silt, trace ogenous				2 2 1	8-10	83	PCB-20-8-10					
10 								H	10-12	96	PCB-20-10-12					
-	2	CL: Very dark mottled black c	gray (5Y 3/1) day, very soft	, micaceous clay with , wel, homogenous				H H H	12-14	100	PCB-20-12-1					
1	4	CL: Very dark mottled black o soft, wet, home	day, trace org	, micaceous clay with anics, iron stainings, vo	ery			H H H	14-16	75	PCB-20-14-1					
-1	6	CL: Very dark angular fine gr	gray (5Y 3/1 ained sands,	), micaceous clay with vet, soft, iron staining	few			0	16-18	33	PCB-20-16-1					
1	8	CL: Very dark sub-rounded fi organics, wet,	ne grain sand	), micaceous clay with , black mottled clay, tra nogenous	trace			H H H	18-20	83	PCB-20-18-2					
	ML: Olive gray (5Y 5/2), silt with few fine grain sa trace sub-rounded medium grain sand, potential irostaining, wet, medium stiff					/ 36.5 / 43.5 / 15.6	ML	H 3 3 3	20-22	2 75	PCB-20-20-2					
	22	ML: Olive gra	ıy (5Y 5/2), si wet, soft	lt, trace organics, poter	ntial			2 2 2 2 2	22-24	4 67	PCB-20-22-2					

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og c	of Bo	ring: PCB-20	Location: PCB-20								
			Geotechnical R	esults	Blows	Core	Recovery				
epth (ft)	USCS Log	Description of Materials	% Gr/Sa/Si/Cl	USCS	per 6 in.	Interval (ft)	(%)	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/	SM	9 13 17 24	24-26	75	PCB-20-24-26			
26 - -			5.8		13 18 25	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			36 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 - - 34		SM: White (5Y 8/1), fine grain sub-rounded silty sand, wet, very dense, homogeneous			13 24 27 11	32-34	58	PCB-20-32-34			
34					33 50/5	34-36	33	PCB-20-34-3			
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-20-36-3			
38	3	SM: White (5Y 8/1), fine grain sub-angular silty sand, wet, very dense, homogeneous			50/4	38-40	25	PCB-20-38-4			
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-20-40-4			
43		SM: White (5Y 8/1), fine grain sub-rounded silty sand, wet, very dense, homogeneous			18 33 50/4	42-44	50	PCB-20-42-4			
44	4				42 50/3	44-46	25	PCB-20-44-4			
40	6	no recovery				46-48	0	N/A			
41		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	48-50	25	PCB-20-48-			
5	o	grain sand, wet, very dense, nomogeneous  END OF BORING = 50 FT			31						

Appendix B

**Soil Indices** 

							Atterb									Triaxial										
	Test Boring	Top of	Sample	Sample Elevation	Natural Water	Less Then No. 200	Limi	its	Void Ratio,	Specific Gravity,	Dry Density	Total Density	Unconfined Compressive	UU (Q)	C	U (R) Ф	Φ. CD (2)	Dire C'	ct Shear	Cons Pc	solidati	on Test	Conso	lidation	Approx.	Ko
USCS	#	Borehole	Depth (ft)	(ft)	Content (%)	Sieve (%)	LL	PI	eo .	Gs	(pcf)	(pcf)	strength, qu (ksf)	(ksf)	(ksf)	(degrees)	(degrees)	(ksf)	(degrees)	(ksf)	e'e	c' <sub>t</sub>	e,	c' <sub>t</sub>	c',	(cm/sec)
СН	CSB-5A	36.0	9.0	27.0	48.8	80.0	65	33			72.2	107.43		0.54	0.4	17.5										
СН	CSB-8A	38.0	41.0	-3.0	32.7	99.0	57	28			88.1	116.91			1.2	16										
СН	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	
СН	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				
СН	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
СН	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																		
МН	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				
МН	CSB-8	38.0	15.0	23.0	61.1	98.0	95	53			62.1	100.04		0.84												
МН	CSB-14	36.0	15.0	21.0	51.8	95.0	71	35			67.6	102.62		0.5	0.4	8										
МН	CSB-16	19.0	19.0	0.0	42.6	99.0	62	26			77.4	110.37	0.14		0.8	8										
МН	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	
МН	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
МН	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
МН	TB-1	47.4	11.0	36.4	39.2	92.7	59	26			79.4	110.52	2.02													
МН	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				
МН	TB-2	35.7	5.0	30.7	49.4	93.6	71	32			69.1	103.24		0.540												
МН	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				
МН	TB-3	50.2	25.0	25.2	50.2	89.0	58	23							0.91	9										
МН	TB-4	48.0	25.0	23.0	49.8	90.8					65.7	98.419		0.887												



Laboratory Testing Summary

Figure B.1

							Atterb									Triaxial										
	Test Boring	Top of	Sample	Sample Elevation	Natural Water	Less Then No. 200	Limi	ts	Void Ratio,	Specific Gravity,	Dry Density	Total Density	Unconfined Compressive	UU (Q)		U (R) Ф	Φ. Φ.	Dire C'	ct Shear	Cons	olidatio	on Test	Consol	idation /	Approx.	Ко
USCS	#	Borehole	Depth (ft)	(ft)	Content (%)	Sieve (%)	LL	PI	eo .	Gs	(pcf)	(pcf)	strength, qu (ksf)	(ksf)		(degrees)		(ksf)	(degrees)	(ksf)	c'c	c',	c'e	c'e	c',	(cm/sec)
МН	TB-4	48.0	51.0	-3.0	49.9	83.6	55	15						1.77												
МН	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				
МН	PCB-7	34.9	26	8.9	66.1	78.0	55	16																		
МН	PCB-8	33.0	22	11.0	71.3	95.6	51	15																		
МН	PCB-9	30.8	36	-5.2	104.8	63.7	73	12																		
МН	PCB-13	32.5	42	-9.5	92.0	79.9	54	11																		
МН	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				
ОН	CSS-3	40.0	12.4	27.6	44.3						73.2	105.63			0.13	32										
ОН	CSS-3	40.0	12.9	27.1	44.0	90.0	56	26			73.6	105.98			0.13	32										
ОН	CSS-3	40.0	13.4	26.6	46.1						72.7	106.21			0.13	32										
ОН	CSS-4	37.0	12.9	24.1	40.8						77.3	108.84	2.13													
ОН	CSS-4	37.0	13.2	23.8	48.3	93.5	53	24			70.4	104.4		0.79												
ОН	CSS-4	37.0	13.4	23.6	55.6						64.8	100.83														8.90E-07
ОН	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

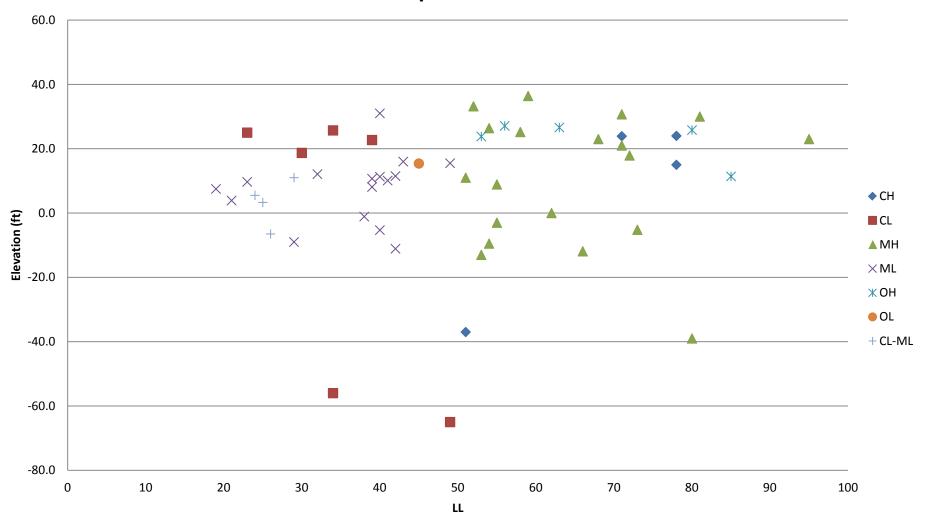
							Atterb	berg								Triaxial								-		
	Test			Sample	Natural	Less Then	Limi	iits	Void	Specific	Dry	Total	Unconfined			CU (R)	CD (5)		rect Shear	Con	solidati	on Test	Conso	lidation	n Approx.	
	Boring	Top of	Sample	Elevation	The state of the s	No. 200	I CO		Ratio,		100000000000000000000000000000000000000			UU (Q)			φ.	C.	φ.	Pc				Assi	Alle	Ко
USCS	#				Content (%)	) Sieve (%)	ш	PI	eo	Gs	(pcf)		strength, qu (ksf)			(degrees)	(degrees)	(kst)	(degrees)	s) (ksf)	1 60	¢',	E'c	ť,	E,	(cm/sec)
ОН	CSS-6	40.0	14.7	25.3	64.0						60.5	99.22		0.64												
ОН	CSS-6	40.0	28.6	11.4	67.5		85	36			60.5	101.34			0	45										
ОН	CSS-7	39.0	12.4	26.6	44.5		63	31			75	108.38														3.70E-07
ОН	CSS-7	39.0	12.8	26.2	36.1						81.8	111.33	0.77													
ОН	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	8 35.78				1.4	0.22	0.026	0.251	1 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

### **Liquid Limit**

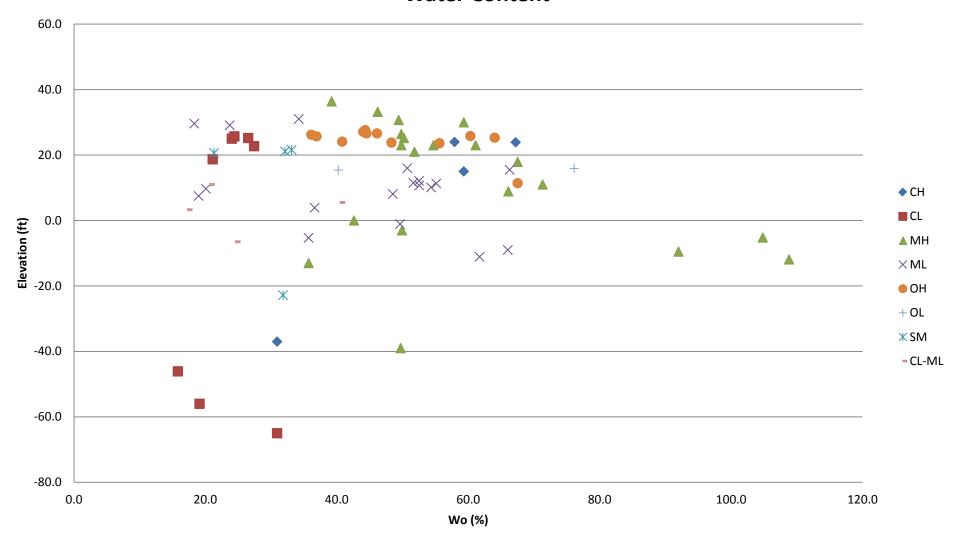




Liquid Limit Vs. Elevation

Figure B.2

#### **Water Content**

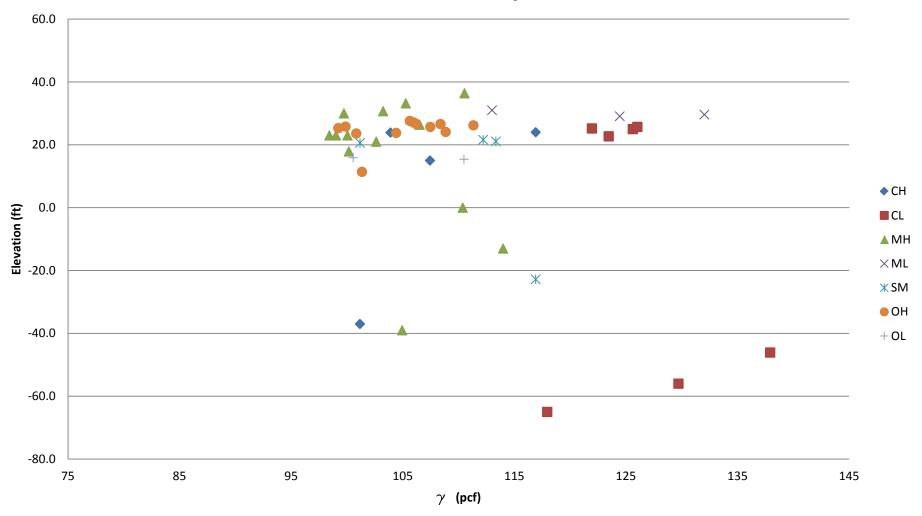




Water Content Vs. Elevation

Figure B.3

### **Total Density**

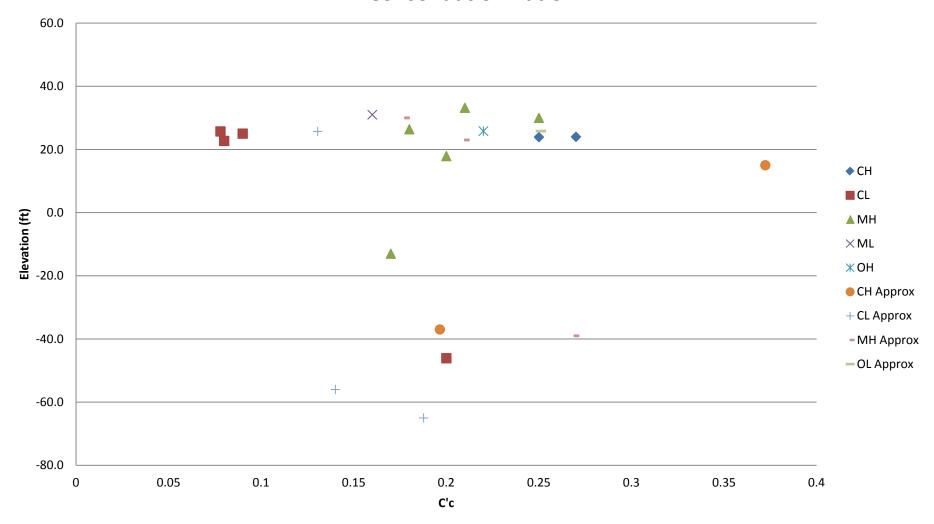




Total Density Vs. Elevation

Figure B.4

#### **Consolidation Ratio**

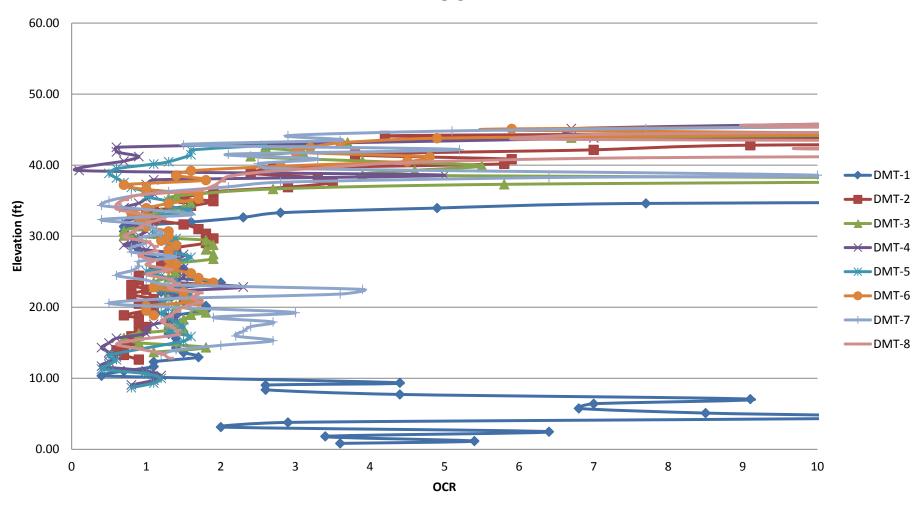




Consolidation Ratio Vs. Elevation

Figure B.5



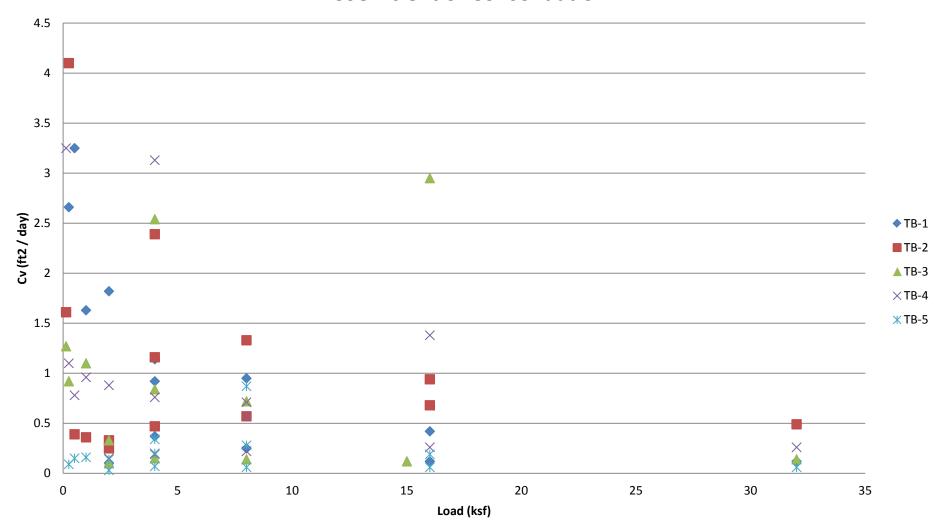




Overconsolidation Ratio of Dredged Materials Vs. Elevation

Figure B.6

### **Coefficient of Consolidation**





Time Rate of Consolidation Vs. Elevation

Figure B.7

### **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.

$$S = C_1 \, C_2 \, \Delta p \, \sum_0^{2B,4B} rac{l_Z}{E_S} \Delta z$$
 , (eq. B-1)

where:  $\Delta p$  = net foundation pressure = bearing pressure minus initial effective vertical stress

 $I_{_{7}}$  = vertical strain influence factor (from Figure B-1)

E<sub>s</sub> = soil modulus of deformation

 $\Delta z = \text{thickness of soil layer}$ 

C<sub>1</sub> = pressure change correction factor for effective overburden

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

 $\sigma'_{vo}$  = 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

$$E_s = 2.5q_c$$
, (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.

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

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

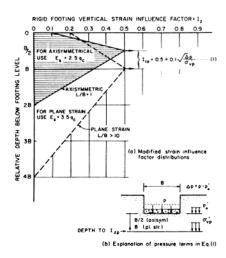


Figure B-1. Strain influence factor diagram (from Schmertmann et al., 1978).

#### **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.

$$\Delta e = C_c \log{(\frac{P_f}{P_p})}$$
, (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.

$$\Delta H = H_0 \frac{C_c}{1+e_0} \log \left(\frac{P_f}{P_p}\right)$$
, (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

$$\Delta H = C_c' \log \left(\frac{P_f}{P_p}\right)$$
, (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.

$$t = \frac{T_{\nu}H_0}{C_{\nu}} \text{ (eq. B-7)}$$

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

 $C_n$  = 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.

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

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

Material Type:

Soft Dredge

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

Areal Width (ft):	1000	boundry	
Areal Length (ft):	1000	5. Insert project information on lines 1-5	
Contact Pressure (psf);	4000	6. When immediate settlement of clay does	
ter Table Elevation (ft):	0	not apply, set v = 1	
oth of Embedment (ft):	0		
it Weight of Soil Above			
Embedment (psf):	120		

La	er Top Elevation (ft)	Thickness (ft)	Material Type	γ <sub>moist</sub> (psf)	C' <sub>c</sub>	C <sub>'r</sub>	C <sub>v</sub> (ft²/day)	Cα	P <sub>p</sub> (psf)	Кс	Cu (tsf)	Es (tsf)	٧	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 Para	ameters
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, <sub>bottom</sub> (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 <sub>moist</sub> (psf)	C'c	C <sub>r</sub>	C <sub>v</sub> (ft²/day)	Cα	P <sub>p</sub> (psf)	PI	Кс	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 <sub>moist</sub> (psf)	Es (tsf)	- 1	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 <sub>moist</sub> (psf)	C'c	C <sub>'r</sub>	P <sub>o,bottom</sub> (psf)	P <sub>o</sub> (psf)	P <sub>p</sub> (psf)	Δp (psf)	P <sub>f</sub> (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)	ΔΗ
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 1-56. When immediate settlement of clay does

not apply, set v = 1

Material Type:

Soft Dredge

Stiff Dredge

**Natural Sands** 

Natural Clays

Tidal Marsh

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)	<b>Material Type</b>	γmoist (psf)	C'c	C'r	Cv (ft2/day)	Cα	Pp (psf)	Кс	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	Material Type γ <sub>moist</sub> (psf)		ı	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 <sub>moist</sub> (psf)	C'c	C <sub>'r</sub>	P <sub>o,bottom</sub> (psf)	P <sub>o</sub> (psf)	P <sub>p</sub> (psf)	Δp (psf)	P <sub>f</sub> (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)	ΔΗ
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	<b>Natural Sands</b>	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

35
1000
1000
4000
0
0
120
100

Instructions:

- 1. All Input values appear in red
- 2. Refer to OCR vs PI plot for corresponding Kc
- 3. Reaply filters on each sheet after running new calculation
- 4. Water table elevation must be on a layer

Material Type:

Soft Dredge

Stiff Dredge Natural Clays Tidal Marsh

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

Areai width (it):	1000	boundry
Areal Length (ft):	1000	5. Insert project information on lines 1-5
ntact Pressure (psf);	4000	6. When immediate settlement of clay does not
Table Elevation (ft):	0	apply, set v = 1
of Embedment (ft):	0	оррлу, зест 1
Veight 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)	Cα	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 Inpu	it Parameters
Δp (tsf)	2.0
σod (tsf)	0.0
C1	1.0
Ct	1.6

	Layer	Top Elevation (ft)	Thickness (ft)	Material Type	γ <sub>moist</sub> (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 <sub>moist</sub> (psf)	C' <sub>c</sub>	C <sub>'r</sub>	P <sub>o,bottom</sub> (psf)	P <sub>o</sub> (psf)	P <sub>p</sub> (psf)	Δp (psf)	P <sub>f</sub> (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)	ΔΗ
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:

settlement angle mobiliting geomembrane tensiin

t= Jny (tando + tandi) Tallow (COSB-SINE tanfe) Eq. 5,19 Designing -/ Geosynthetics Vol2 6thEd, Robert Keerner

For maximum loading

On : (100 x 40) = 4,000 psf 3 192 & Pu

B = 450 (max.)

Assume LLDPE over nonwoven needs punch sectexhle

N = destunce to mobilize membrane determation

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

Si= angele below geomembrane

Using Table 5.6

geokethe non weven (medle general), f. 8°

Tallow - allowable sconembrane stress

Geomembrane allowable tensile stress based on typical wide-width tensule test (ASTM D4385) results presented in "Design w/ Geosynthetics", Vol2. (Fig. 5.15, p. 579)

Oallandle & 6, 400 kPa to 8,000 kPa for 40 mil LLDPE USE Oall= 6,000 kPa to be conservative

t - 192/0.05) (mn8+ fan8) 6,000 (ces 45 - sin 45 x fan8)

= 0.030 = 30 mils < proposed 40mil geomentian

.. OK

ANTOAD A

Check membrane strain

Equ. 5.5, Designing -/ Geogynthehes Volz 6 Medehin Releast Koerner

for S & 1/2 tun' in radians

L= diumeter of concern (mm)

8 = center point deflection (se Hament) (mm)

P= pressure en Membrane

E = geomembrane tensile strain (90)

15,240

8-10.3% & 30% for LLDPE 1. OK

#### Geomembrane Strain

44

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 ( $\epsilon$ ) for varying diameters of concern.

## Runaut/Anchor Trench

Calculate minimum length of geomembrane vuneut without anchor trench, LRO

Using eq. (5.26) from Derishing if Becsynthetics, Vol2. Koerner, pg. 596

Les Tallow (cos &- sin & tunde)
On (tun but tunde)

Tall: allowable force in scomembrane = out to, where

t= membrane thickness = 40mil

B = side slope angle = 3! 1 = 18,460

S: angle of sheaving resistance between textured membrane of adjacent material u(upper) illower) accent material on applied normal stress from cover suil

To, Tull = Oallowable & t For LLDPE, Oall= 6,000 lefte: Tull= 4,000 (0,001) t= 40 mil = 1 mm = 6.04 N/m

So Si=32° for textiled HOPE gnon wever geoterfly cover material above liner on 115(3)=345 2/12= 16.56Pa

120 - 6 (cos 18,4-sin 18,4x tan 8) 6 (0,9045) 18.5 (ton 0 + tan 25) = 1/8 (0,405)

= 0.7 meters

= 2.3 feet 4 10' actual runult ! OK

70FS 35500

## Side Slope Coure Stability - Finite Slope

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

$$N_{A} = W_{A} \cos \beta \tag{3.16}$$

$$N_{A} = W_{A} \cos \beta \qquad (3.16)$$

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

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

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

= unit weight of the cover soil,  $\geq$  100 pcf

= thickness of the cover soil,

= length of slope measured along the geomembrane, \$ 38 to 90 ft.

= soil slope angle beneath the geomembrane, 3! / s/pc = 18,46

= friction angle of the cover soil,

= interface friction angle between cover soil and sechenhle USC 250

 $C_a =$  adhesive force between cover soil of the active wedge and the geomembrane,  $\subseteq O$ 

 $c_a$  = adhesion between cover soil of the active wedge and the

 $a = (W_A - N_A \cos \beta) \cos \beta$ ,

 $= -[(\hat{W}_A - \hat{N}_A \cos \beta) \sin \beta \tan \varphi + (\hat{N}_A \tan \delta + \hat{C}_a)]$  $\sin \beta \cos \beta + \sin \beta (C + W_p \tan \phi)$ ], and

=  $(N_A \tan \delta + C_a) \sin^2 \beta \tan \varphi$ .

Pg. 588-589, Designing W/Geosynthetes, Voll 6th Edition

For L=38  $Wa = 100(1)^{2} \left( \frac{38}{1} - \frac{1}{\sin 18.4} - \frac{\sin 18.4}{2} \right)$  = 100(38 - 3.168 - 0.1663) = 2,466.6

Na = 2,466.6 \* cos/8.4 = 2,340.5

Wp = 100(1)2 = 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 fan 25 + (2,340.5 fan 25 + 0) sin 18.4 cos 18.4 t sin 18.4 (0+ 166.9 fan 25)]

= 36.2 + 326.9 +77.8 = -440.9

C = (2,340.5 tan 25 + 0) sin 184 tan 25 = 50.7

FS= + 440.9 + V(-440.9)2-4(232.6)50,7 2 (232.6)

FS= 1,77 (For 38 At slope)

SANTOAD

For 96 A stope Wo = 100(1) = ( 90 - sin/24 - ton 18.4) = 100/0,0-3.168-0.1663) = 8.666.6 Nu=8,666.6 \* cos/8.4 = 8,223.5 Wp= 166.9 u= (8,666.6 - 8,223.5 cos 18.4) cos 18.4 = 819.3 b= - [(8,666.6-8,223.5cos 18,4) sin 18.4 tun 25 + (8,223.5 tun 25 +0) SIN 18.4 COS 18.4 + SIN 18.4 (0 + 166.9 fun 25)] =-[258.6+ 1148.5 + 24.6] = -1,431.7 C=(8,223.5 tan 25 +0) sin 1814 tun 25 = 178.2 FS = + 1431.7+ V(-1431.7)2-4(819.3)/178.2 2/819.3

#5 = 16 (For 90 At slipe)

Check venting capacity of liner system.

Non-woven geotextile will allow lateral

g upward escape of water of gases.

No. Studies of research indicates
methan emmission fluxes for wetlands of
organic soils to range from 1,3×10°5 m³/m²-dy
to 2×10°8 m²/m²-dy

Assume gas generation of 1.3 ×10 3 m3/m2-day

Vmoistair = 0,0118 6N/m3 (Koerner, p. 572)

Gas Flow rute

= 0.0065 m3/day = 4,5 x10 6 m3/min

Air gradeent, assuming uniturn distribution of 7,6 kPa 2 center to zero 2 edge is:

q= ki H = ki/(\(\times\))

kt = Oregd = V/i \(\times\)

600 Synthetics, Vol 1

640 dither

640 dither

640 dither

640 dither

640 dither

650 dither

Based en 1 fest et soil cover a end

of construction &= 100pet = 5 le Pa

Thus for a normal stress of 5kPa and

air pressure of 7kPa Oullow = 0,2 m3/min-m

The 1FS = Oull Fig. 2.17a, p. 154

For 1602 geotextile

FS= 0.2 3.78×10-6

= 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

Prepared for:

U.S. Army Corps of Engineers, Philadelphia District Wanamaker Building 100 Penn Square East Philadelphia, Pennsylvania 19107-3390

Prepared by:

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James F. Cloonan, P.E Task Manager Deirdre S. Smith, P.E. Project Engineer

James F. Duffield, P.E. Project Manager

#### 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

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3.1	SLOPE STABILITY SUMMARY
C.1	SUMMARY OF PREVIOUS LABORATORY TEST (BY OTHERS)
D.1	LABORATORY TEST RESULTS SUMMARY

### **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

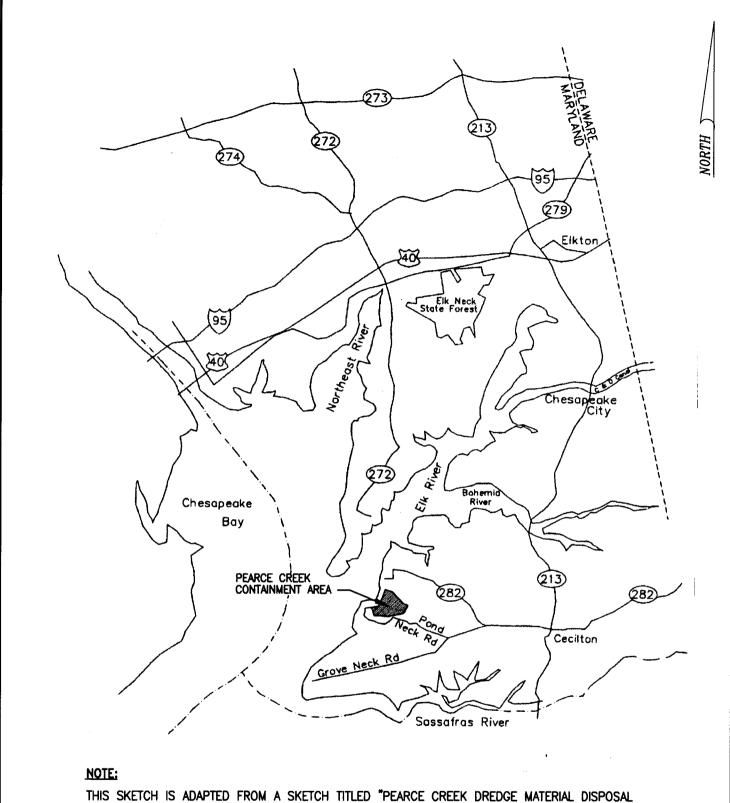
The Pearce Creek Dredged Material Containment Area is an existing facility utilized by the U.S. Army Corps of Engineers Philadelphia District as part of its ongoing Operation and Maintenance (O&M) dredging program for the Chesapeake and Delaware Canal. The containment area is located in the western part 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



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

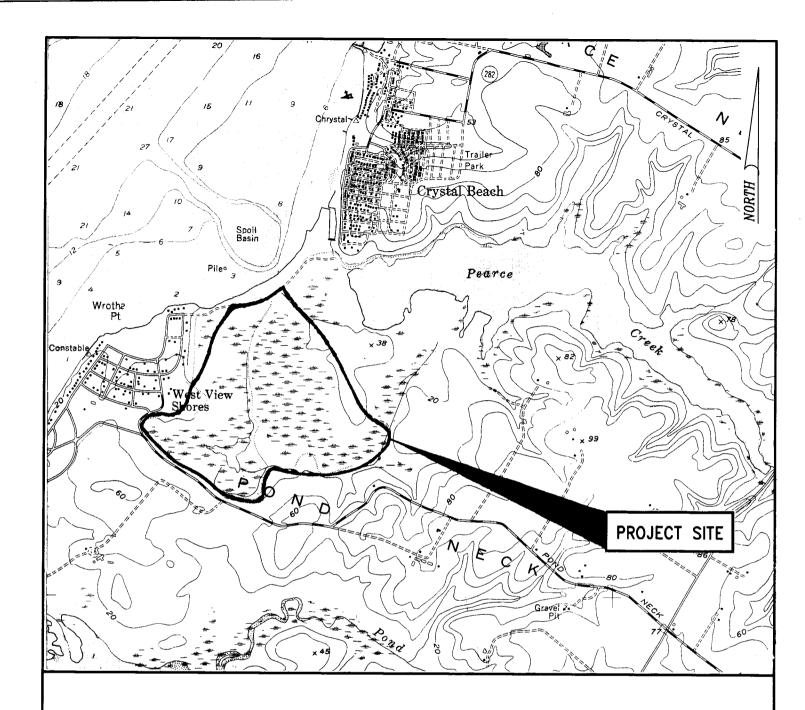
# PEARCE CREEK DREDGED MATERIAL CONTAINMENT AREA

CECIL COUNTY ~ MARYLAND

## **DUFFIELD** ASSOCIATES

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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

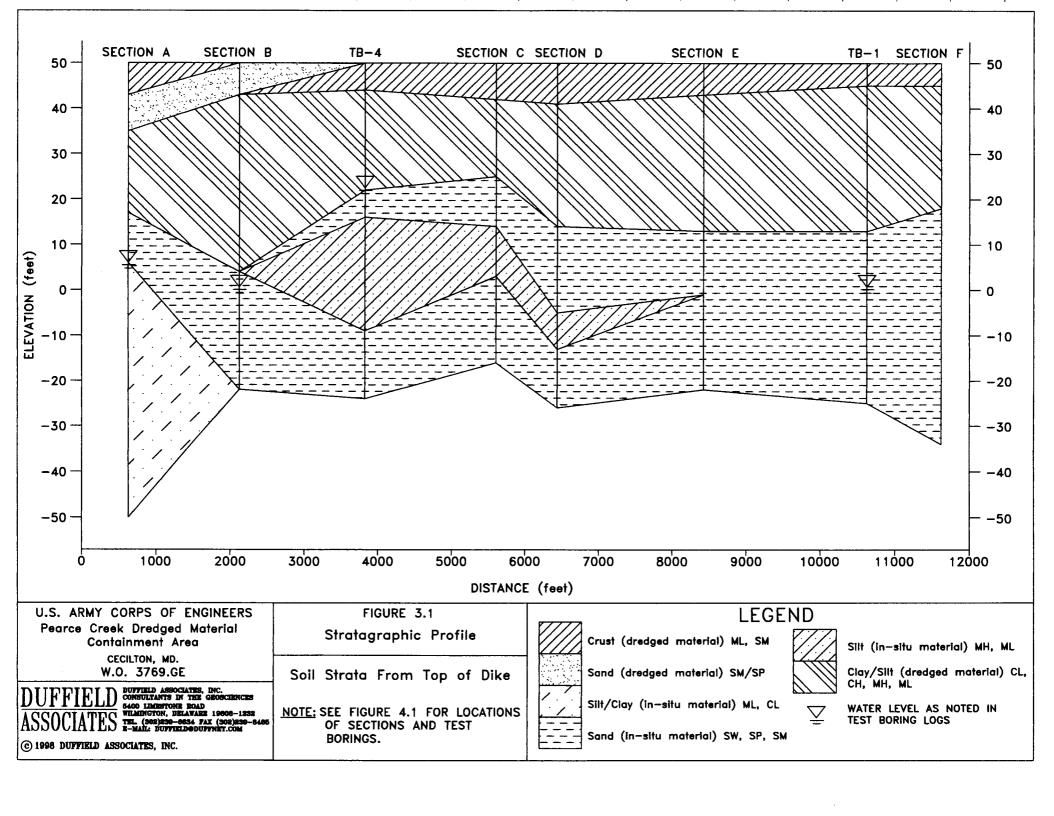
The subsurface conditions encountered by the SPT test borings and dilatometer soundings located along the perimeter dike as part of the feasibility study were consistent with those encountered in the test borings performed as part of previous subsurface explorations. The conditions along the perimeter 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  $52 \pm$ ) 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



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.

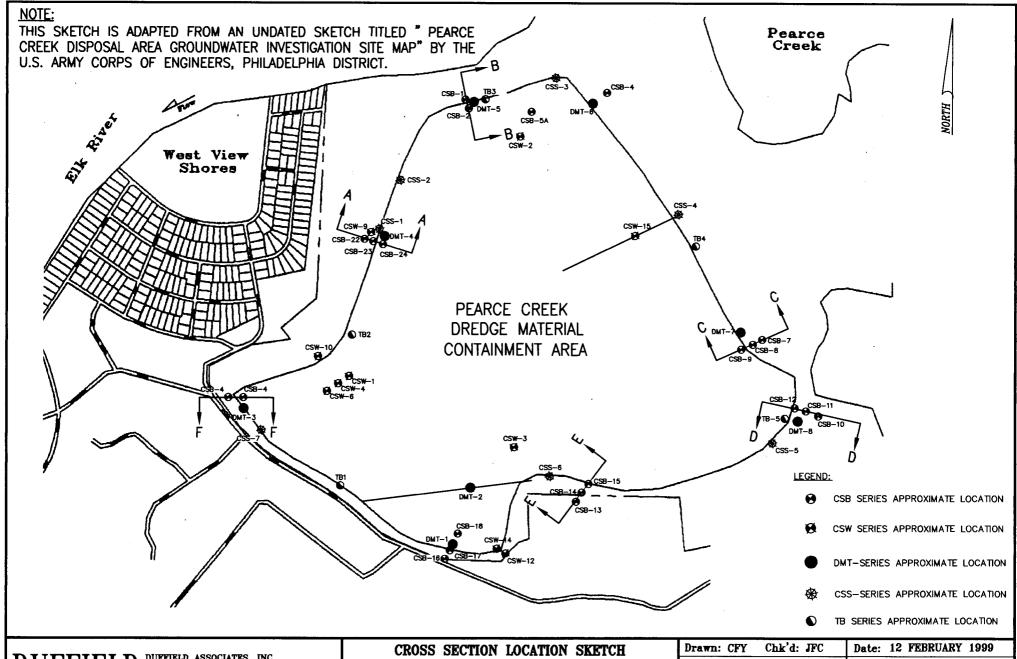
Since effective (perched or natural) groundwater levels will vary based on dredging operations and seasonal fluctuations, for the dike stability analyses groundwater elevations were conservatively assumed to extend from the dredged material surface on the interior slope of the dike, to the toe of the 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).



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PEARCE CREEK
DREDGED MATERIAL
CONTAINMENT AREA

CECIL COUNTY ~ MARYLAND

Drawn: Cl	FY Chk'd: JFC	Date: 12 FE	BRUARY 1999
Scale:	NONE	₩.0.:	3769.GE
File No:	A-3769GE-15	FIG	URE 4.1
No:	Rev	ision:	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,  $\phi$ ; cohesion, c; and unit weight,  $\gamma$ ). 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

				F	ACTORS OF	SAFETY (1)					
Existing Dike (~ Elevation 52 feet)			Raised Dike (Elevation 58 feet)								
Cross	Existing Dredged 2-Foot Freeboard Condition			d Condition	Ex. Dredged		Dred	ged Material	Elevation of	50 feet	
Section (2)	Material	Elevation	End-of-Construction	Steady State	Material El.		End-of-Co	nstruction		Steady State	
	Exterior	Interior	Exterior	Exterior	Interior (3)	Exte	rior	Inte		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



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### **GENERAL NOTES**

DUFFIELD ASSOCIATES uses the following definitions and terminology to classify and correlate the field and laboratory samples.

<u>VISUAL UNIFIED CLASSIFICATIONS</u>: 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

#### SIZE DESCRIPTION

F - Fine M - Medium C - Coarse G - Gravel

#### COLOR

Or - OrangeBlk - BlackYel - YellowGr - GrayBr - BrownR - Red

### **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

#### **FINE GRAINED SOILS**

ML - Silts of low plasticity

CL - Clays of low to medium plasticityOL - 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

#### MODIFIERS (PERCENTAGE)

Tr - Trace 1 - 10% Ltl - Little 11 - 20% Some 21 - 35% & - And 36 - 50%

Dk - Dark

Lt - Light

Vc - Varicolored

### 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

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.

## DUFFIELD MILMINGTON, DELAWARE 19808-1232 ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

### Log of Boring TB-1

(Page 1 - 2)

**Testing Method** Logged by:

: 140 lb. hammer falling 30"

: MSJ Surface Elevation : 47.4'

: MSPCS NAD 1983

Horizontal Datum Vertical Datum Northing

Easting

: NAVD 1988 : 641619 : 1597957

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

**Date Started** Date Completed Weather

**Drilling Agency** 

: November 11, 1998 : November 12, 1998 : Clear, 60's

: Walton

Driller : Kevin **Drilling Equipment** : CME-55

Depth Surf. in Elev. Feet 47.4'	ilev. S Id		DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
0 <del> </del> - 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			Same, trace gravel.	4	20	3-4-4-4
10 -			Same, nace graver.	5	20	1-2-2-2
36			Dark gray slavey Cli T trace fine and trace mice and	SH-1	21	
			Dark gray clayey SILT, trace fine sand, trace mica and organics.  Same (less plant material).	6	22	1-4-4-5
15 -			Same (less plant material).	7	24	1-1-2-3
- 31 ]	МН		Same (less plant material).	8	24	4-4-4-4
20 -	IVII		Same (less plant material).	9	23	2-2-2-2
20   26				SH-2	24	
			Come langue of fine could langue of plant material	10	23	3-2-3-2
25 -			Same, lenses of fine sand, lenses of plant material.	11	12	WR/12"-4-4
} 21			Same (less plant material).	12	24	2-2-2-2
30			Same, lenses of plant material.	13	24	4-5-4-5
- 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"
<u>}</u> 11	SM		Same (last 6" denser and damp).	17	10	40-50/4"

<sup>1.</sup> Wet on spoon at 46'.

<sup>2.</sup> Wash drilling started at 52'.

<sup>3.</sup> No bottom at 56', rods sunk, stopped wash.

<sup>4.</sup> No bottom at 60'.

<sup>5.</sup> Restart washing at 64'.

## DUFFIELD MILMINGTON, DELAWARE 19808-1232 ASSOCIATES 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 2 - 2)

**Date Started** 

: November 11, 1998

Date Completed Weather

: November 12, 1998 : Clear, 60's

**Drilling Agency** 

: Walton : Kevin

Driller **Drilling Equipment**  **Testing Method** 

Horizontal Datum

: 140 lb, hammer falling 30" : MSJ

Logged by: Surface Elevation

: 47.4

: MSPCS NAD 1983

Vertical Datum

: NAVD 1988

2, 1998	Northing	: 641619
	Easting	: 1597957
	1	

6. Borehole grouted with cement-bentonite grout after auger removal.

		Cecilton	, MD	Driller : Kevin Drilling Equipment : CME-55			
• .		•	O				
Depth in Feet	Surf. Elev. 47.4'	. sosn	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
40 -	- 6			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	SM			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			Light brown fine to medium SAND, trace silt, trace mica.			
-				No recovery.	27	24	WR-WR-WR
60 -		SP/SM					WR-WR-WR
- - -	14			Light-brown fine SAND, trace silt, trace mica.	28	8	WR-WR-WR-WR/5"
65 ·				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"
70 -		sw		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	2 <b>4</b>		<i>:</i>		32	10	5-25-46-40
•	<u> </u>			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	3					
80	}						
	L	<u> </u>					

1. Wet on spoon at 46'.

2. Wash drilling started at 52'.

<sup>3.</sup> No bottom at 56', rods sunk, stopped wash.

<sup>4.</sup> No bottom at 60'.

<sup>5.</sup> Restart washing at 64'.

## DUFFIELD S400 LIMESTONE ROAD WILMINGTON, DELAWARE 19808-1232 ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

U.S. Army Corps Of Engineers

Pearce Creek Dredged Material

### Log of Boring TB-2

(Page 1 - 2)

Date Started

: November 13, 1998 **Date Completed** : November 16, 1998

Weather Drilling Agency : Overcast, 50's : Walton

**Testing Method** 

Logged by: Surface Elevation Horizontal Datum

: MSJ : 35.7

: MSPCS NAD 1983

: 140 lb. hammer falling 30"

Vertical Datum Northing Easting

: NAVD 1988 : 642911 : 1598066

	Containme Ceciltor			Driller : Kevin Drilling Equipment : CME-55		<u> </u>	
epth Surf. in Elev. Feet 35.7	nscs	GRAPHIC		DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
0 - 34	ML		Brown mottled material.	SILT and fine sand, trace root and plant	1	10	4-8-12-10
1			Dark gray claye organics.	ey SILT, trace fine sand, trace mica and	2	9	5-5-4-4
5 -					SH-1	24	
- 29	MH				3	24	1/12"-1-1
4.			Same, trace pla	ant material.	4	24	WH/12"-1-2
10 -			Brown silty CL	AY and fine sand, trace plant material.	5A 5B	24	1-8-4-6
-					SH-2	23	
15			Gray/brown mo	ottled silty CLAY, trace fine sand.	6	24	5-6-9-10
19					7	24	11-11-13-14
20 -	CL				8	24	3-5-8-8
- - - 14					9	24	3-5-7-10
1			Gray/brown mo	ottled silty CLAY, some fine sand (wet).	10	24	6-9-9-11
25 -					11	22	5-4-6-7
- - - - -			Light-gray/ ligh	t-brown mottled fine SAND, little silt, trace	12A 12B	24	8-15-29-29
30 -			coarse sand.	s s s , s , s , s , s , s , s , s , s , s , s , s , s , s , s , s , s , s s , s , s , s , s s , s , s s , s.	13	18	10-13-14-15
- 4			Light-gray/light	-brown fine SAND, trace silt (begin wet).	14	20	6-12-19-23
-	SP/SM		Light-gray fine with gravel size	SAND, with 1" thick brown fine sand lens and 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 sitt.	18	11	22-42-50/3"

1. Wet on spoon at 29.8'.

2. Wash drilling started at 36'.

3. Mud rotary drilling began at 46'.

## DUFFIELD MILMINGTON, DELAWARE 19808-1232 ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

Log of Boring TB-2

(Page 2 - 2)

Easting

: 140 lb. hammer falling 30" : MSJ

**Testing Method** Logged by: Surface Elevation

: 35.7 : MSPCS NAD 1983

Horizontal Datum Vertical Datum Northing

: NAVD 1988 : 642911

: 1598066

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

Date Started Date Completed Weather

: November 13, 1998 : November 16, 1998 : Overcast, 50's

**Drilling Agency** 

: Walton : Kevin

Driller **Drilling Equipment** 

: CME-55

Depth in Feet	Surf. Elev. 35.7	sosn	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
40 - -	6			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
-		SP/SM		Light-orange/brown fine to coarse SAND, trace gravel, trace silt.	23	4	30-50/5"
50 - -	46				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	28A	19	16-22-30-38
60 - -				gray clay, trace fine sand. Orange/brown fine to medium SAND, trace coarse sand,trace gravel, trace silt.	28B 29A	20	13-10-10-25
-	26	sм		Light gray fine SAND, some silt, with lenses of light gray clay, trace fine sand.	29B 30	20	12-16-39-50/5"
65 <b>-</b>					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 - -	- <b>-3</b> 6	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 -			$\mathbb{Z}$		36	4	3-5

1. Wet on spoon at 29.8'.

3. Mud rotary drilling began at 46'.

<sup>2.</sup> Wash drilling started at 36'.

## DUFFIELD MILMINGTON, DELAWARE 19808-1232 ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

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 Weather

: November 23, 1998 : Variable sun, breezy, 50's

Drilling Agency Driller

: Walton : Kevin

ing Equipment : CME-5

Testing Method

Horizontal Datum

Easting

: 140 lb. hammer falling 30" : MSJ

Logged by: : MSJ Surface Elevation : 50.2'

: MSPCS NAD 1983

Vertical Datum : NAVD 1988 Northing : 644873

: 644873 : 1599097

				Drilling	Equipment : CME-55			
in	Surf. Elev. 50.2	nscs	GRAPHIC	DES	SCRIPTION	Sample Number/ (psi)	Rec'y (in)	No. Blows per 6 inches
0 -			Ī	Graded Aggregate.			20	10-12-14-16
<i>]</i> '	49			Brown fine SAND, some to	o and silt.	1		
+						2	23	9-9-17-23
5		SM		Brown fine to coarse SAN	D and gravel, little silt.	3	24	9-19-21-24
	44			Dark-gray clavey SILT so	me fine sand trace mica and	4	16	8-8-4-5
1				organics, with lenses of pl	me fine sand, trace mica and ant material.	5	16	1-1-2-2
10 -	_			Same, with trace fine sand	4	6		1-2-1-1
7;	39			Same, with trace line same	1.	6	18	1-2-1-1
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	мн				10	24	1-3-3-4
			Ш			11	24	5-6-6-4
25 -						SH-2	24	
<u></u> †:	24					12	24	1-2-2-3
1						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
1	14			Varicolored gray/brown fin trace coarse sand, some s	e SAND, trace medium sand, silt, with 1" thick lens of	16B		
1		SM		organic clay.		17	24	9-9-14-17
4						18	22	5-5-9-12

1. Wet on rods at 49.3'.

09-18-1999

2. Heave in augers at 52', began washing.

## DUFFIELD MILMINGTON, DELAWARE 19808-1232 TEL (302)239-6834 FAX (302)239-8485 E-MAIL: DUFFIELD@OUFFNET.COM

U.S. Army Corps Of Engineers

Pearce Creek Dredged Material

Containment Area

### Log of Boring TB-3

(Page 2 - 2)

**Date Started Date Completed**  : November 20, 1998 : November 23, 1998 : Variable sun. breezy, 50's

Weather Drilling Agency Driller

: Walton : Kevin

**Testing Method** 

Horizontal Datum

: 140 lb. hammer falling 30" : MSJ

Logged by: Surface Elevation : 50.2'

: MSPCS NAD 1983

Vertical Datum : NAVD 1988 Northing : 644873 Easting · 1599097

	ı	Cecilton,		Driller : Kevin Drilling Equipment : CME-55		, ,	
•							
Depth in Feet	Surf. Elev. 50.2	. sosn	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 - -	1			Same.	24		4-5-9-9
-					25		11-13-13-14
55 -				Gray fine to coarse SAND, some silt, trace peat.	26		
- -	6			Gray fine to coarse SAND, trace gravel.	27A 27B	24	8-15-19-20
- 60 -		SW/SM			28	16	6-10-12-17
- -	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 -	1				36	14	1-3

1. Wet on rods at 49.3'.

F:\boring logs\3769ge\tb-3.bor

09-18-1999

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

## DUFFIELD MILMINGTON, DELAWARE 19808-1232 ASSOCIATES TELL (302)299-6834 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-4

(Page 1 - 2)

**Date Started** Date Completed : November 18, 1998 : November 19, 1998 : Variable sun, breezy, 50's

Weather **Drilling Agency** Driller

: Walton : Kevin

Drilling Equipment · CME SE **Testing Method** 

Horizontal Datum

: 140 lb. hammer falling 30" Logged by: : MSJ

Surface Elevation : 48.0'

> : MSPCS NAD 1983 : NAVD 1988

Vertical Datum Northing : 643701 Easting 1600953

			<b>,</b>	Drilling Equipment : CME-55			200
Depth in Feet	Surf. Elev. 48.0	nscs	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
0 -	- 47			Brown mottled SILT, little fine sand.	1	14	4-5-6-8
4		ML			2	17	6-8-8-9
5			Ш	Dark-gray clayey SILT, some/and fine sand, trace plant material.	3	17	2-2-3-4
-	- 42				4	24	4-4-4-5
40		MH			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	- 32			Dark-gray clayey SILT, trace fine sand and organics.	8	24	2-1-3-4
	32				SH-1	24	
20 -		ML			9	24	2-2-2-3
-	- 27	2			10	24	2-2-2-3
-					11	24	3-3-2-2
25 -	- 22				SH-2	24	
-				Light-gray/brown fine to coarse SAND, trace gravel, trace silt.	12	24	9-20-20-19
30 -		SM			13	24	8-14-10-9
+	- 17				14	24	3-3-4-3
-				Light-gray/brown mottled clayey SILT and fine sand.	15	18	2-4-4-5
35 -	- 12	MH			16	24	2-4-2-3
- -					17	24	3-2-3-3
40 -			Ш		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.
  - 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.

U.S. Army Corps Of Engineers

Pearce Creek Dredged Material

Containment Area

Cecilton, MD

DUFFIELD MILMINGTON, DELAWARE 19808-1232
ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

### Log of Boring TB-4

(Page 2 - 2)

Date Started **Date Completed**  : November 18, 1998 : November 19, 1998

Weather **Drilling Agency** Driller

: Walton : Kevin

**Testing Method** 

Logged by: Surface Elevation

: MSJ : 48.0'

Horizontal Datum : MSPCS NAD 1983

: NAVD 1988 : 643701 : 1600953

: 140 lb. hammer falling 30"

Vertical Datum Northing : Variable sun. breezy, 50's Easting

Cecilton, MD			, IVID	Drilling Equipment : CME-55	<u> </u>		T
Depth in Feet	Surf. Elev. 48.0	nscs	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 -	- 2			Brown/gray clayey SILT, trace to little fine sand, trace mica.	21	24	2-4-5-6
-	- 2			Tillou.	22	24	7-8-6-8
- 50 -		MH			23	24	2-4-4-5
50	3				SH-3	24	
1					24	24	4-5-7-9
55 -					25	24	3-4-6-7
_	8			Gray fine to coarse SAND, little gravel, little silt.	26	24	6-5-24-17
-				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 -	40	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 -	- 00				•		
-	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.

gray/brown F/C SAND present in wash water. Spoon driven in attempt to

### remove

heaved material prior to drilling to next sampling increment.

## DUFFIELD MILMINGTON, DELAWARE 19808-1232 ASSOCIATES E-MAL: DUFFIELD@DUFFNET.COM

### Log of Boring TB-5

Logged by:

: 140 lb, hammer falling 30"

: Walton

**Testing Method** Surface Elevation

: MSJ : 28.9'

**Horizontal Datum** 

: MSPCS NAD 1983 : NAVD 1988

Date Started Date Completed

: November 17, 1998 : November 18, 1998 : Variable sun. breezy, 50's

(Page 1 - 2)

Vertical Datum Northing Easting

: 642338 : 1601791

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

Weather **Drilling Agency** Driller

: Kevin **Drilling Equipment** : CME-55

epth in eet	Surf. Elev. 28.9	nscs	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
0 1	27			Dark-gray mottled CLAY, trace fine sand, trace plant material.	1	12	1-1-1-2
1		СН			2	12	2-2-2-3
5 🚽				Dark-gray clayey SILT, trace fine sand, trace organics,	SH-1	14	
}	22			with lenses of plant material.	3	24	WH-WH-2-1
10 -					4	8	WH-1-1-1
4	17				SH-2	24	
}					5	9	WR-1-1-1
15		MH			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
20				Light-brown fine to coarse SAND and gravel, trace silt (saturated).	13	24	6-10-10-7
30 -	-3				14	12	6-11-10-12
]		SP/SM			15	13	15-14-14-15
35		SPISIVI			16	14	16-15-20-10
1	-8				17	7	14-14-10-6

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'

4. Reddish/gray CLAY observed on outside of spoon. Possibly losing sample

difficulties removing spoon from sample area.

## DUFFIELD MILMINGTON, DELAWARE 19808-1232 ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

U.S. Army Corps Of Engineers

Pearce Creek Dredged Material

Containment Area

### Log of Boring TB-5

(Page 2 - 2)

: November 17, 1998 : November 18, 1998 : Variable sun. breezy, 50's

**Drilling Agency** : Walton Driller : Kevin

Date Started

Weather

**Date Completed** 

**Testing Method** 

Horizontal Datum

: 140 lb. hammer falling 30" : MSJ

Logged by: Surface Elevation

: 28.9' : MSPCS NAD 1983

Vertical Datum Northing Easting

: NAVD 1988 : 642338 : 1601791

epth in eet	Surf. Elev. 28.9	USCS	GRAPHIC	DESCRIPTION	Sample Number	Rec'y (in)	No. Blows per 6 inches
40 -						<u>-                                    </u>	
1	-13	PT		Dark-gray/brown organic SILT and PEAT, little fine sand.	18	24	5-5-6-6
-				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
_		0,,,,			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"
1					27	20	24-20-27-35
60		SP/SM		No Recovery (60.0' to 60.6').		0	48-50/1"
}	-33	SF/SIVI			28	7	30-50/5"
65					29	4	40-50/2"
+	-38				30	20	25-35-40-34
1				Gray CLAY, little fine sand.	1	0	11-14-26-33
70				No Recovery (68.0' to 70.0'), see note #4.	24		
}	-43	CL		Red/light-gray/brown variegated CLAY, some to and fine sand.	31	1	6-8-11-16
1				Red/light-gray/brown variegated CLAY, trace to little fine	32	15	6-8-14-17
75				sand.	SH-3	18	

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

difficulties removing spoon from sample area.

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. D-1 PAGE 1

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

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

LO RANGE =10.00 BARS ROD DIAM. = 3.57 CM ANALYSIS PARAMETERS: 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-B = 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 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 (M)	THRUST	A (BAR)	B (BAR)	C (BAR)	DA (BAR)	DB (BAR)	ZMRNG (BAR)	ZMLO (BAR)	ZMHI (BAR)	ZMCAL (BAR)	PO (BAR)	P1 (BAR)	P2 (BAR)	UO (BAR)	GAMMA (T/M3)	SVP
****	*****	****	****	****	****	****	****	****	****	****	****		****	*****	*****	(BAR)
0.20	2400.	4 09	23.20		0.20	0.28	10.00	0.02	0.15	0.00	2 22	22 72		0.000		
0.40	1900.		12.00		0.20	0.28	10.00	0.02	0.15	0.00		22.77		0.000	2.00 1.90	0.035 0.073
0.60	980.	2.92	8.18		0.20	0.28	10.00	0.02	0.15	0.00	2.86			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			0.000	1.70	0.177
1.20 1.40	440. 390.	1.09 0.80	3.74 2.78		0.20	0.28 0.28	10.00	0.02	0.15	0.00	1.16			0.000	1.70	0.211
1.60	330.	0.72	2.45		0.20	0.28	10.00	0.02	0.15 0.15	0.00	0.90 0.84			0.000	1.60 1.60	0.243 0.274
1.80	250.	0.70	1.98		0.20	0.28	10.00	0.02	0.15	0.00	0.84			0.000	1.60	0.274
2.00	140.	0.38	1.10		0.20	0.28	10.00	0.02	0.15	0.00	0.55			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			0.000	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			0.000	1.50	0.395
2.60 2.80	90. 100.	0.62 0.62	1.36		0.20	0.28 0.28	10.00 10.00	0.02 0.02	0.15 0.15	0.00	0.79 0.78			0.000	1.50	0.425
3.00	110.	0.73	1.43		0.20	0.28	10.00	0.02	0.15	0.00	0.78			0.000	1.50 1.50	0.454 0.483
3.20	110.	0.84	1.64		0.20	0.28	10.00	0.02	0.15	0.00	1.00			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			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			0.000	1.60	0.606
4.00 4.20	200. 220.	1.46 1.53	2.48		0.20 0.20	0.28 0.28	10.00 10.00	0.02	0.15 0.15	0.00	1.61 1.69			0.000	1.60	0.638
4.40	250.	1.26	4.60		0.20	0.28	10.00	0.02	0.15	0.00	1.30			0.000	1.60 1.80	0.669 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			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			0.000	1.60	0.830
5.40 5.60	280. 300.	2.34 2.44	3.51 3.58		0.20	0.28 0.28	10.00	0.02	0.15	0.00	2.49	3.21		0.000	1.60	0.861
5.80	310.	2.14	3.36		0.20	0.28	10.00 10.00	0.02 0.02	0.15 0.15	0.00	2.59 2.28	3.28 3.06		0.000 0.000	1.60 1.60	0.893 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 7.00	390. 400.	2.48 2.63	3.64 3.81		0.20 0.20	0.28 0.28	10.00 10.00	0.02	0.15	0.00	2.63	3.34		0.000	1.60	1.081
7.20	420.	2.74	3.96		0.20	0.28	10.00	0.02 0.02	0.15 0.15	0.00 0.00	2.78 2.88	3.51 3.66		0.000 0.000	1.70 1.70	1.114 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	1.147
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 8.40	590. 600.	2.00 1.38	3.19 2.62		0.20 0.20	0.28 0.28	10.00	0.02	0.15	0.00	2.14	2.89		0.000	1.60	1.313
8.70	3130.	7.71			0.20	0.28	10.00 10.00	0.02 0.02	0.15 0.15	0.00 0.00	1.52	2.32 20.17		0.000 0.000	1.60 1.95	1.344 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					10.00				13.47			0.000		1.531
9.60	6980.	13.25				0.28		0.02	0.15	0.00	11.97			0.000		1.573
9.80 10.00	5840. 7380.	12.65 15.20			0.20 0.20	0.28 0.28	10.00	0.02	0.15	0.00	11.62			0.000	2.15	
10.00	6780.	17.20			0.20	0.28		0.02 0.02	0.15 0.15	0.00	13.85 15.93			0.000 0.000	2.15 2.10	
10.40	4340.	7.98			0.20		10.00	0.02	0.15	0.00		24.02		0.000	2.10	
10.60	4390.	6.78	24.35		0.20			0.02	0.15	0.00		23.92		0.000	2.00	
10.80	6490.	13.80			0.20		10.00	0.02	0.15	0.00				0.000	2.15	
11.00	6870.	10.50				0.28			0.15	0.00		31.02		0.000	2.15	
11.20	6560. 8300.	13.05 11.80				0.28		0.02		0.00				0.020	2.15	
11.30 END OF	SOUNDING		JJ.6U				10.00 SOIL				10.48	39.17		0.029	2.15	1.896
Or		_			, 24, 113			· · · · · · · · · · · · · · · · · · ·		. Honi	· AJE /					

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG, NO. D-1

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

LOCATION: As Planned -- Refusal at 11.3m

SNDG.BY: R. FAILMEZGER
ANAL.BY: R. FAILMEZGER
ANAL.DATE: 11-17-98
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

PAGE 2

Z	KD	ID	UD	ED (DAR)	ко	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 0.34					1.57	1.4	27.	CLAY
7.20	2.51	0.27 0.25	0.00	27. 27.	0.67 0.69	0.34					1.64 1.76	1.4	29. 30.	CLAY
7.40	2.59 2.77	0.23	0.00	27. 39.	0.74	0.40						1.5 1.7		CLAY
7.60 7.80	2.17	0.33	0.00	31.	0.74	0.30					2.02 1.42	1.1	46. 29.	CLAY 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	0.25	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		2.65		781.	0.80		167.2	40.3	2.45	40.1		4.4	1563.	SILTY SAND
9.40		2.55		1190.	1.14		237.2	41.3	2.54		13.91	9.1	2839.	SILTY SAND
9.60	7.61	2.33	0.00	968.	1.00		221.5	41.1	2.61		11.03	7.0	2179.	SILTY SAND
9.80	7.20	1.94	0.00	784.	1.00		179.2	39.8	2.65		10.94	6.8	1718.	SILTY SAND
10.00	8.36	2.12	0.00	1017.	1.10		228.3	40.7	2.74		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		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		11.61	6.4	1860.	SILTY SAND
11.00		2.26	0.00	746.	0.70		230.8	41.1	3.09	41.3	6.32	3.4	1406.	SILTY SAND
11.20		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	SOUNDI	NG												

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DEPTH, Z (meters)

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12

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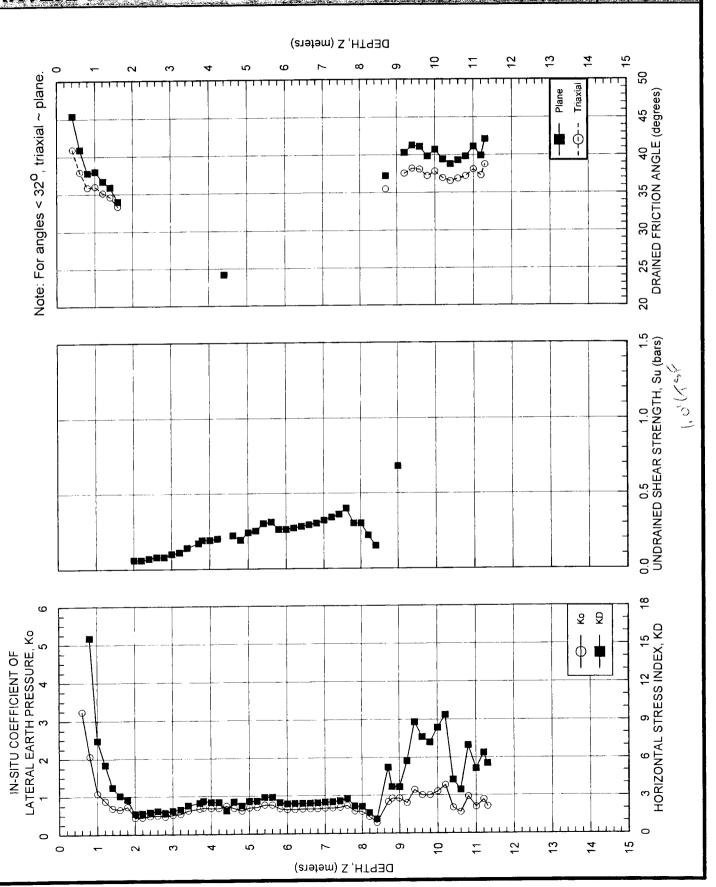
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5

Ground Sufface Eleve.
Water Depth: Not Found

# INTERPRETED DMT STRENGTH PARAMETERS

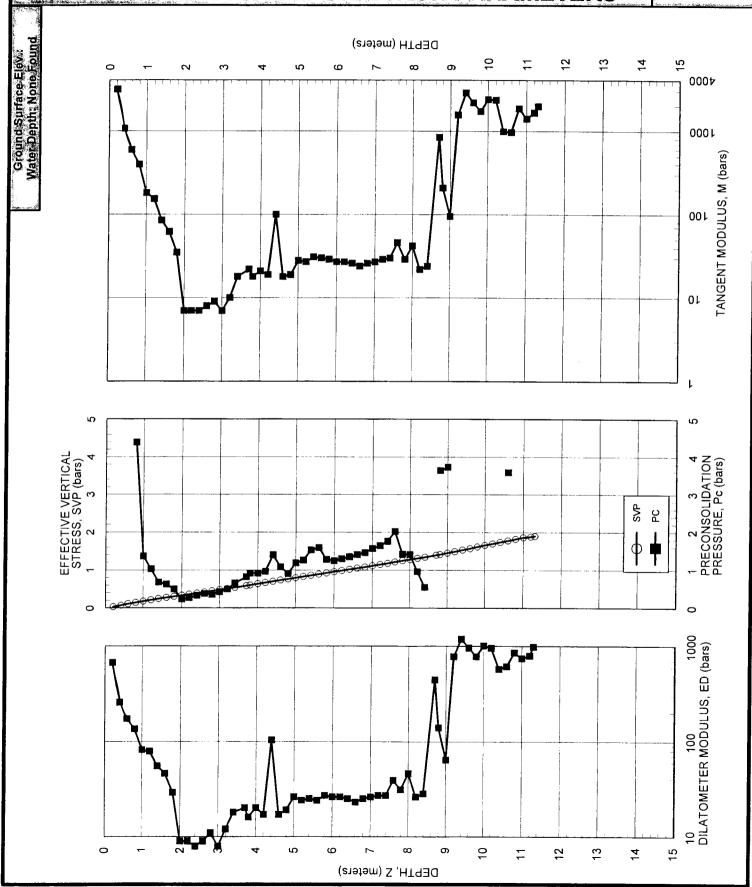


IN-SITU SOIL TESTING, L.C. ENGINEER: R. Failmezger SOUNDING DATE: 11-18-98

SOUNDING

D-1

## INTERPRETED DMT DEFORMATION PARAMETERS



DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. D-2

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

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 KO FACTOR = 1.00 UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

PAGE 1

Z (M)	THRUST (KGF)	A (BAR)	B (BAR)	C (BAR)	DA (BAR)	DB (BAR)	ZMRNG (BAR)	ZMLO (BAR)	ZMHI (BAR)	ZMCAL (BAR)	PO (BAR)	P1 (BAR)	P2 (BAR)	UO (BAR)	GAMMA	SVP (BAR)
****	*****	****	****	****	****	****	****	****	****	****	****	****	(DAR)	(DAR)	(T/M3)	(DAR)
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 0.80	1130. 910.	2.79	7.08		0.26 0.26	0.15 0.15	10.00	0.02	0.15 0.15	0.00 0.00	2.69 2.02	9.85		0.000	1.90	0.106
1.00	830.	1.06	5.56		0.26	0.15	10.00	0.02	0.15	0.00	1.10	6.91 5.39		0.000	1.80	0.142 0.177
1.20	940.		10.85		0.26	0.15	10.00	0.02	0.15	0.00		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	19.00	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	16.00	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 0.26	0.15	10.00	0.02	0.15	0.00	1.61	2.82		0.000	1.60	0.454
2.80 3.00	230. 290.	1.87 2.14	3.10 3.74		0.26	0.15 0.15	10.00 10.00	0.02	0.15 0.15	0.00 0.00	2.07	2.93 3.57		0.000	1.60 1.70	0.485 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	0.516
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 10.00	0.02	0.15	0.00	2.07	2.97		0.000	1.60	0.803
5.00 5.20	360. 450.	2.19 2.39	3.61 4.28		0.26 0.26	0.15 0.15	10.00	0.02 0.02	0.15 0.15	0.00	2.38 2.56	3.44 4.11		0.000 0.000	1.70 1.70	0.836
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	0.869 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 7.40	610. 520.	2.10 2.00	4.41		0.26 0.26	0.15 0.15	10.00 10.00	0.02 0.02	0.15 0.15	0.00 0.00	2.24 2.20	4.24 2.96		0.000 0.000	1.70 1.60	1.197 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			0.26		10.00		0.15		3.04			0.000	1.70	
9.40	530.	2.64					10.00				2.83			0.000		1.558
9.60 9.80	560. 550.	2.51 2.66					10.00	0.02	0.15	0.00	2.69 2.85			0.000 0.000		1.591 1.625
10.00	550.	2.48			0.26		10.00		0.15			3.46		0.000		1.658
10.20	510.	2.32				0.15		0.02		0.00	2.54	3.00		0.000		1.691
10.40	550.	2.62				0.15		0.02				3.79		0.000		1.723
10.60	5 <b>7</b> 0.	3.02					10.00					4.14		0.000		1.756
END OF	SOUNDING	}			(INTE	RPRETEI	SOIL	PARAME	TERS O	N NEXT	PAGE)					

SNDG. NO. D-2 DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

LOCATION: As Planned SNDG.BY : R. FAILMEZGER

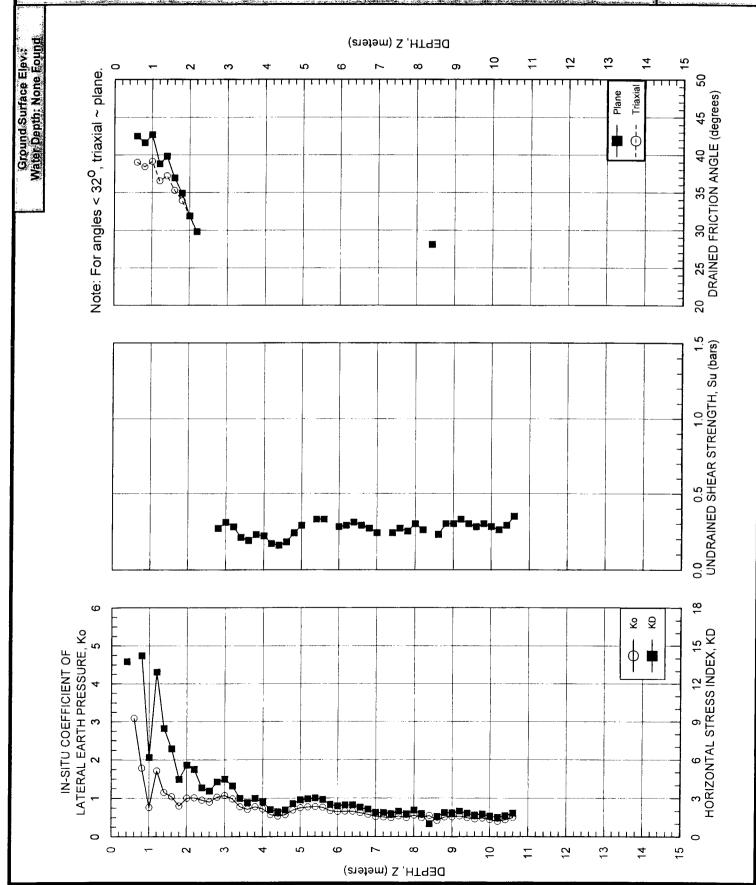
SNDG.DATE: 11-18-98 ANAL.BY : R. FAILMEZGER ANAL.DATE: 11-18-98

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 KO FACTOR = 1.00 UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

PAGE 2

Z (M)	KD	ID	UD	ED (BAR)	K0	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE
****	****	****	****	*****	****	****	****	****	*****	****	****	****	*****	******
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	0 00					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	0.24					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 0.25					1.24	1.0	21. 37.	CLAY
7.80	1.79 2.07	0.55	0.00	44. 31.	0.49 0.56	0.25					1.09 1.40	0.8 1.1	28.	SILTY CLAY CLAY
8.00	1.81	0.33	0.00	29.	0.49	0.36					1.16	0.9	24.	CLAY
8.20	1.01	2.06	0.00	100.	0.55	0.20	23.7	28.1	2.05	27.5	1.54	1.1	85.	SILTY SAND
8.40	1.57	0.39	0.00	30.	0.42	0.23	23.7	20.1	2.05	27.3	0.98	0.7	26.	SILTY CLAY
8.60	1.88	0.35	0.00	26.	0.42	0.30					1.33	0.7	20.	CLAY
8.80 9.00	1.87	0.27	0.00	26.	0.51	0.30					1.33	0.9	22.	CLAY
9.20	1.99	0.27	0.00	30.	0.54	0.33					1.52	1.0	26.	CLAY
		0.23	0.00	37.	0.49	0.30					1.34	0.9	31.	SILTY CLAY
9.40 9.60	1.62	0.44	0.00	41.	0.46	0.30					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	0.33	0.00	27.	0.44	0.30					1.19	0.7	23.	CLAY
10.00	1.50	0.18	0.00	16.	0.40	0.26					1.08	0.6	14.	CLAY
10.20	1.63	0.35	0.00	34.	0.44	0.29					1.26	0.7	29.	CLAY
10.40	1.83	0.33	0.00	32.	0.50	0.35					1.53	0.9	27.	CLAY
	SOUNDI		0.00	J	0.50	5.55							<b>-</b> ,.	
LILD OF	5551451													

### INTERPRETED DMT STRENGTH PARAMETERS

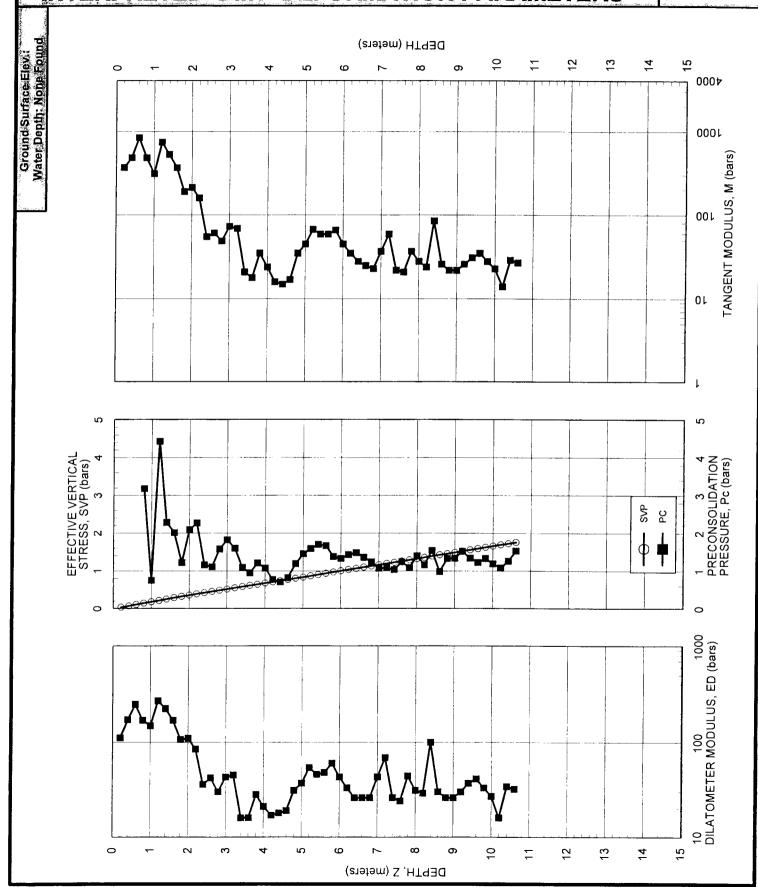


IN-SITU SOIL TESTING, L.C. ENGINEER: R. Failmezger SOUNDING DATE: 11-19-98

SOUNDING

D-2

## INTERPRETED DMT DEFORMATION PARAMETERS



DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

LOCATION: As Planned

SNDG. NO. D-3 PAGE 1

FILE NO. : IST-9863

SNDG.BY : R. FAILMEZGER SNDG.DATE: 11-18-98 ANAL.BY : R. FAILMEZGER ANAL.DATE: 11-18-98

LO RANGE =10.00 BARS ROD DIAM. = 3.57 CM ANALYSIS PARAMETERS: 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 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 (DAD)	В	C (D2D)	DA (DAD)	DB	ZMRNG		ZMHI	ZMCAL	P0	P1	P2	Ü0	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			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			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			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. 450.	1.79 1.23			0.27 0.27	0.13 0.13	10.00 10.00	0.02	0.15 0.15	0.00	1.90 1.37	4.79 3.61		0.000	1.70	0.176
1.20 1.40	450. 310.	0.84			0.27	0.13	10.00	0.02	0.15	0.00	1.03	2.28		0.000	1.70 1.60	0.210 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	0.242
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			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.		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 2.04	6.86 4.55		0.27 0.27	0.13 0.13	10.00 10.00	0.02 0.02	0.15 0.15	0.00	3.02 2.18	6.71 4.40		0.000	1.80 1.70	0.538
3.40 3.60	540. 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	0.573 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 6.00	430. 330.	2.64	3.87 3.99		0.27 0.27	0.13 0.13	10.00 10.00	0.02	0.15 0.15	0.00 0.00	2.85	3.72 3.84		0.000	1.70 1.70	0.954 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 8.20	960. 1440.	2.10	7.91 11.70		0.27 0.27	0.13 0.13	10.00 10.00	0.02 0.02	0.15 0.15	0.00 0.00	2.08	7.76 11.42		0.000	1.90 1.90	1.324 1.362
8.40	2220.		12.25		0.27	0.13	10.00	0.02	0.15	0.00		11.97		0.000	1.90	1.399
8.60	2390.		14.55		0.27	0.13	10.00	0.02	0.15	0.00		14.27		0.000	1.90	1.436
8.80	2260.		11.75		0.27	0.13	10.00	0.02	0.15	0.00		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.		14.20		0.27	0.13	10.00	0.02	0.15	0.00		13.92		0.000	1.90	1.648
10.00	4480.		14.50		0.27	0.13	10.00	0.02	0.15	0.00		14.22		0.000	1.90	1.686
10.20	2260.		12.65		0.27	0.13	10.00	0.02	0.15	0.00		12.37		0.000	1.80	1.722
10.40	1190.		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	,			(INTE	KPKETEI	SOIL	PAKAME	TERS O	N NEXT	PAGE)					

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. D-3

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

LOCATION: As Planned

SNDG.BY: R. FAILMEZGER

ANAL.BY: R. FAILMEZGER

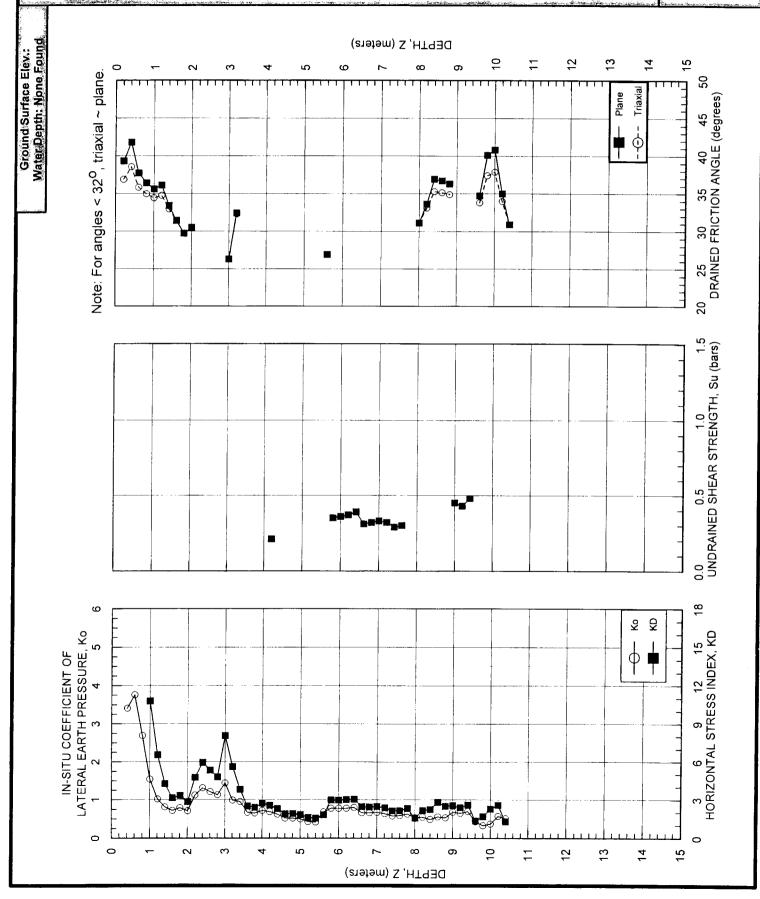
ANAL.DATE: 11-18-98

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 WITH CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

PAGE 2

Z (M)	KD	ID	υD	ED (BAR)	KO	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE
****	****	****	****	*****	****	****	****	****	*****	****	****	****	*****	*******
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		0.0	26.3	0.77	22.4	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 30.2	7.35	14.6	458.	SANDY SILT
3.20	5.62 3.81	1.22	0.00	128. 77.	0.99 0.95		18.6	32.4	0.83	30.2	3.14 1.57	5.8 2.7	247. 118.	SANDY SILT SILT
3.40	2.50	0.80	0.00	42.	0.55						0.86	1.4	46.	CLAYEY SILT
3.60 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	0.21					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	67 A	34.7	2 53	34 6	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 SILTY 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 30.9	2.71	34.9 30.8	3.07	1.8 1.1	334.	SANDY SILT SILTY SAND
10.40	1.29	2.32	0.00	183.	0.51		42.6	30.9	2.66	30.8	1.98	1.1	155.	SIDII SAND
END OF	SOUNDI	IAG												

## INTERPRETED DMT STRENGTH PARAMETERS

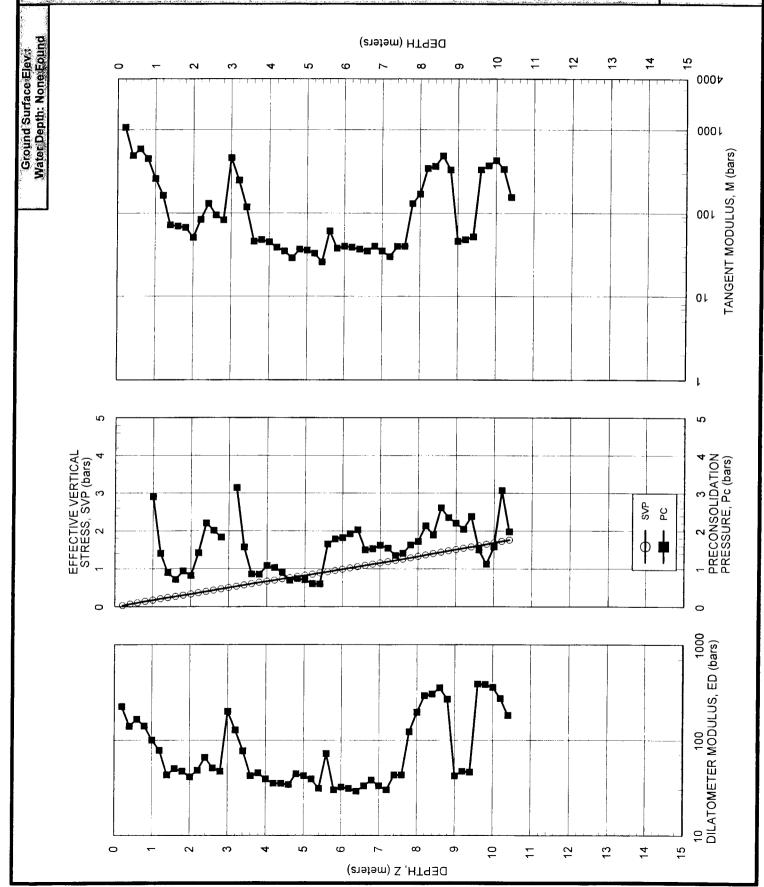


IN-SITU SOIL TESTING, L.C. ENGINEER: R. Fällmezger SOUNDING DATE: 11-19-98

SOUNDING

**D-3** 

## INTERPRETED DMT DEFORMATION PARAMETERS



DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. D-4

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

LOCATION: As Planned

SNDG.BY: R. FAILMEZGER
ANAL.BY: R. FAILMEZGER
ANAL.DATE: 11-17-98
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 SP.GR.WATER = 1.000 CAL GAGE 0 = 0.15 BARS LIN.ROD WT. = 6.50 KGF/M DELTA-A = 0.25 BARS OCR 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

PAGE 1

Z (M)	THRUST (KGF)	A (BAR)	B (BAR)	C (BAR)	DA (BAR)	DB (BAR)	ZMRNG (BAR)	ZMLO (BAR)	ZMHI (BAR)	ZMCAL (BAR)	PO (BAR)	P1 (BAR)	P2 (BAR)	UO (BAR)	GAMMA (T/M3)	SVP (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 1.70	0.245
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 3.40	340. 300.	0.14	1.52 0.57		0.25 0.25	0.19 0.19	10.00	0.02	0.15 0.15	0.00	0.32 0.25	1.31 0.36		0.000	1.70 1.50	0.520 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 5.00	190. 160.	1.30	2.45		0.25 0.25	0.19 0.19	10.00 10.00	0.02 0.02	0.15 0.15	0.00	1.49	2.24		0.000	1.60	0.811
5.20	170.	1.37	2.41		0.25	0.19	10.00	0.02	0.15	0.00	1.37 1.57	2.12		0.000	1.60 1.60	0.843 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	0.874
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 7.00	270. 330.	2.12	3.22 4.11		0.25 0.25	0.19 0.19	10.00	0.02 0.02	0.15	0.00	2.32	3.01		0.000	1.60	1.125
7.00	330.	2.78	4.11		0.25	0.19	10.00	0.02	0.15 0.15	0.00	2.99 2.97	3.90 3.88		0.000	1.70 1.70	1.158 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	1.191
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 9.00	450. 460.	3.52 3.27	5.81 5.59		0.25 0.25	0.19 0.19	10.00 10.00	0.02 0.02	0.15 0.15	0.00	3.66 3.41	5.60 5.38		0.000	1.70	1.460
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 0.000	1.70 1.70	1.493 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.		11.70		0.25	0.19	10.00	0.02	0.15	0.00	2.52			0.108	1.90	1.623
10.60	1220.	2.29			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.		3.27			0.19			0.15		2.34			0.147	1.60	
11.00 11.20	660. 670.	2.12	3.14 3.62				10.00		0.15	0.00 0.00	2.02 2.30			0.167 0.186		1.663 1.676
11.40	700.	2.56	3.67			0.19		0.02	0.15	0.00	2.76			0.186		1.689
11.60	620.		3.64			0.19		0.02	0.15	0.00	2.29			0.226	1.70	
11.80	910.		4.60			0.19		0.02	0.15	0.00	2.24			0.245		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		1.730
12.20	800.		6.71			0.19		0.02	0.15	0.00	4.17			0.285	1.80	1.745
12.40	530.		5.91				10.00	0.02	0.15		4.01			0.304	1.70	
12.60	500.		5.82				10.00				3.52	5.61		0.324	1.70	1.774
END OF	SOUNDING				(INTE	RPRETEI	SOIL	PAKAME'	LEKS ()	NEXT	PAGE)					

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

LOCATION: As Planned

SNDG.BY : R. FAILMEZGER ANAL.BY : R. FAILMEZGER FILE NO. : IST-9863

SNDG.DATE: 11-17-98

ANAL.DATE: 11-17-98

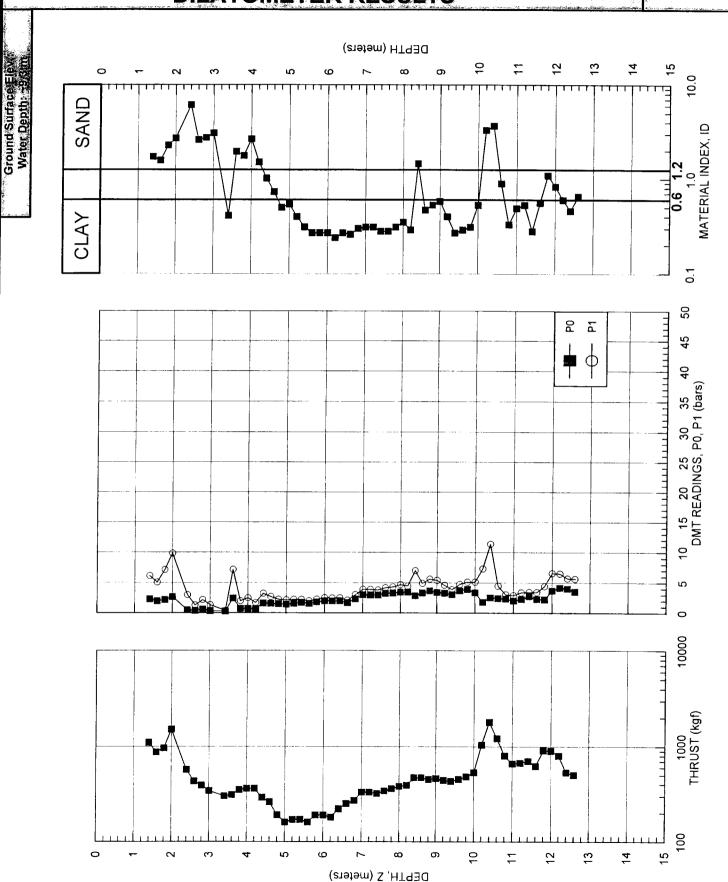
SNDG. NO. D-4

PAGE 2

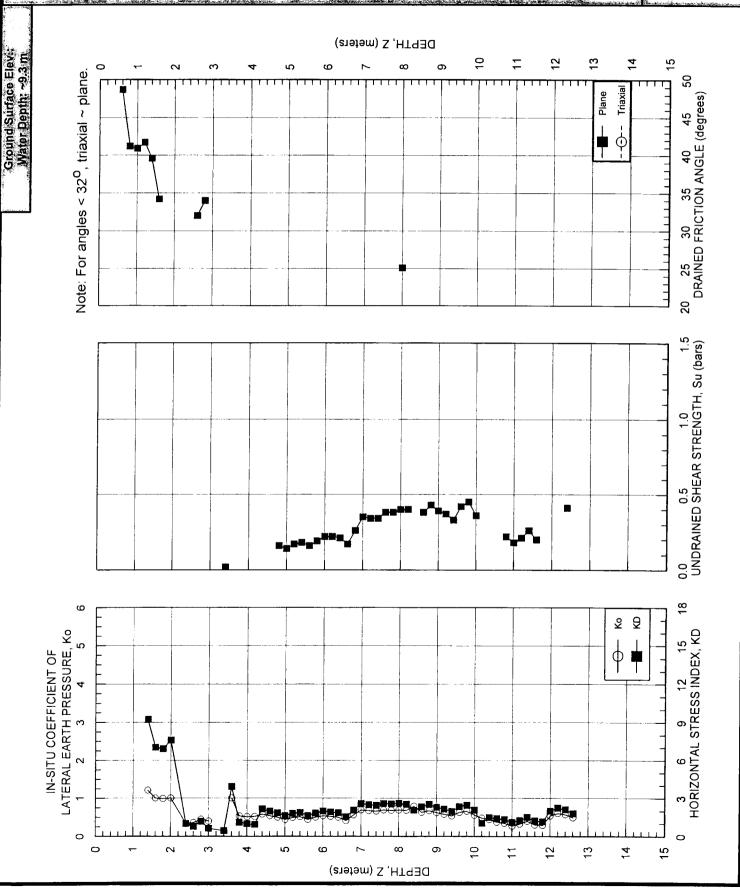
ANALYSIS PARAMETERS: LO RANGE =10.00 BARS ROD DIAM. = 3.57 CM BL.THICK. = 12.7 MM SU FACTOR = 1.00 SURF.ELEV. = 15.00 M LO GAGE 0 = 0.02 BARS WATER DEPTH = 9.30 M HI GAGE 0 = 0.15 BARS FR.RED.DIA. = 4.80 CM BL.WIDTH = 94.9 MM PHI FACTOR = 1.00 LIN.ROD WT. = 6.50 KGF/M DELTA-A = 0.25 BARS OCR FACTOR = 1.00 DELTA/PHI = 0.50 DELTA-B = 0.19 BARS M FACTOR = 1.00 SP.GR.WATER = 1.000 CAL GAGE 0 = 0.00 BARS DELTA/PHI = 0.50 MAX SU ID = 0.60 SU OPTION = MARCHETTI MIN PHI ID = 1.20 OCR OPTION= MARCHETTI KO FACTOR = 1.00 1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT UNIT CONVERSIONS:

Z (M)	KD	ID	UD	ED (BAR)	K0	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE
****	****	****	****	*****	****	****	****	****	*****	****	****	****	*****	*******
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 4.40	0.94	1.50 1.01	0.00	35.	0.52		13.8	29.1	1.06	27.2	0.72	1.0	30.	SANDY SILT
4.40	2.14 1.98	0.73	0.00	56. 39.	0.58 0.54						0.83	1.1	54.	SILT
4.80	1.84	0.73	0.00	26.	0.54	0.16					0.77 0.71	1.0	34.	CLAYEY SILT
5.00	1.63	0.54	0.00	26.	0.44	0.14					0.61	0.9	22.	SILTY CLAY
5.20	1.80	0.40	0.00	22.	0.49	0.17					0.01	0.7 0.8	22.	SILTY CLAY
5.40	1.87	0.31	0.00	18.	0.51	0.18					0.82	0.8	19. 15.	SILTY CLAY 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 9.20	2.28	0.58	0.00	68.	0.62	0.39					1.83	1.2	67.	SILTY CLAY
9.40	2.15 1.97	0.40 0.27	0.00 0.00	45. 29.	0.58 0.54	0.37 0.33					1.71	1.1	42.	SILTY CLAY
9.60	2.35	0.29	0.00	36.	0.63	0.42					1.51 2.01	1.0	24.	CLAY
9.80	2.45	0.31	0.00	41.	0.66	0.42					2.16	1.3	37.	CLAY
10.00	2.07	0.53	0.00	60.	0.56	0.36					1.67	1.4 1.1	44. 53.	CLAY SILTY CLAY
10.20	1.04	3.30	0.00	192.	0.48	0.50	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		0.00	<b>7</b> 3.	0.49						1.51	0.8	62.	CLAYEY SILT
END OF	SOUNDIN	IG												

## DILATOMETER RESULTS



### INTERPRETED DMT STRENGTH PARAMETERS

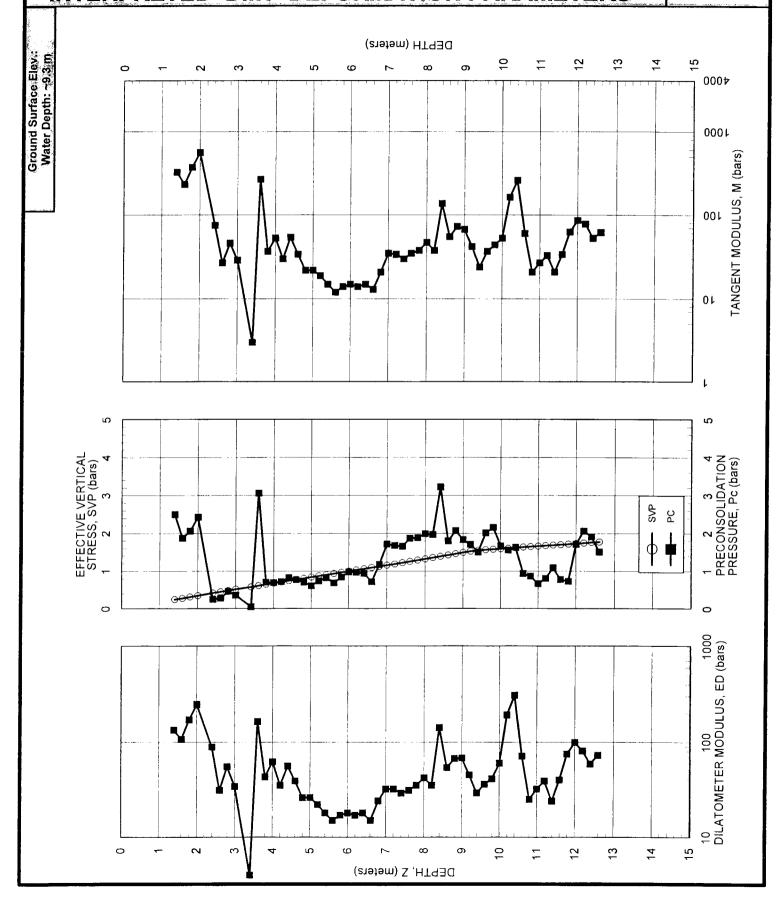


IN-SITU SOIL TESTING, L.C. ENGINEER: R. Failmezger SOUNDING DATE: 11-18-98

SOUNDING

**D-4** 

## INTERPRETED DMT DEFORMATION PARAMETERS



DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

LOCATION: As Planned

SNDG.BY : R. FAILMEZGER ANAL.BY : R. FAILMEZGER SNDG. NO. D-5

PAGE 1

FILE NO. : IST-9863

SNDG.DATE: 11-17-98 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 DIAM. = 3.2808 FT

Z (M)	THRUST	A (BAR)	B (BAR)	C (BAR)	DA (BAR)	DB (BAR)	ZMRNG (BAR)	ZMLO (BAR)	ZMHI (BAR)	ZMCAL (BAR)	PO (BAR)	P1 (BAR)	P2 (BAR)	UO (BAR)	GAMMA (T/M3)	SVP (BAR)
****	*****	****	****	****	****	****	****	****	****	****	****	****	****	*****	*****	*****
2 20	770		2 21		0.25	0.10	10.00	0.00	0.15							
2.20 2.40	770. 430.	1.31	3.71 2.32		0.25	0.18 0.18	10.00	0.02	0.15	0.00	1.44	3.51		0.000	1.70	0.385
2.40	330.	0.77	3.09		0.25	0.18	10.00	0.02	0.15 0.15	0.00	0.94 0.86	2.12 2.89		0.000	1.60	0.417
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	1.70 1.60	0.450 0.498
3.00	220.	0.34	1.57		0.25	0.18	10.00	0.02	0.15	0.00	0.53	1.70		0.000	1.60	0.498
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 8.00	470. 450.	2.76 3.09	4.31		0.25 0.25	0.18 0.18	10.00 10.00	0.02 0.02	0.15 0.15	0.00 0.00	2.93 3.26	4.11		0.000	1.70	1.284
8.20	440.	3.20	4.63		0.25	0.18	10.00	0.02	0.15	0.00	3.38	4.45 4.43		0.000 0.000	1.70 1.70	1.318 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		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				(INTE	RPRETE	D SOIL	PARAME	TERS O	N NEXT	PAGE)					

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

LOCATION: As Planned SNDG.BY : R. FAILMEZGER ANAL.BY : R. FAILMEZGER SNDG. NO. D-5

PAGE 2

FILE NO. : IST-9863

SNDG.DATE: 11-17-98 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 (M)	KD	ID	UD	ED (BAR)	KO	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE
****	****	****	****	*****	****	****	****	****	*****	****	****	****	*****	*****
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 8.00	2.28	0.40	0.00	41.	0.62 0.67	0.33					1.58	1.2	40.	SILTY CLAY
8.20	2.48 2.50	0.30	0.00	41. 36.	0.67	0.3B 0.39					1.84	1.4	44.	SILTY CLAY
8.40	2.23	0.35	0.00	38.	0.60	0.35					1.92	1.4	39.	CLAY
8.60	2.67	0.33	0.00	41.	0.80	0.35					1.64	1.2	36.	SILTY CLAY
8.80	2.34	0.43	0.00	50.	0.63	0.45					2.22	1.6	47.	CLAY
9.00	2.29	0.48	0.00	57.	0.62	0.39					1.86	1.3	51.	SILTY CLAY
9.20	2.36	0.38	0.00	47.	0.64	0.41					1.84	1.2	56.	SILTY CLAY
9.40	2.25	0.30	0.00	36.	0.64	0.41					1.97	1.3	48.	SILTY CLAY
9.60	2.36	0.30	0.00	41.	0.64	0.40					1.86	1.2	35.	CLAY
9.80	2.50	0.31	0.00	38.	0.67						2.06	1.3	42.	CLAY
10.00	2.60	0.27	0.00	36. 43.	0.70	0.47 0.51					2.31	1.4	42.	CLAY
10.20	2.40	0.32	0.00	45.	0.70	0.46					2.49	1.5	48.	CLAY
10.20	1.74	2.45	0.00	254.	0.63	V.40	30.9	20.2	2 54	20.2	2.23	1.3	46.	CLAY
10.40	1.65	1.31	0.00	132.	0.63		34.3	28.3 29.0	2.54 2.61	28.2 28.9	2.79	1.6	233.	SILTY SAND
END OF			0.00	132.	0.00		J72.J	23.0	2.01	20.7	2.64	1.5	112.	SANDY SILT
LITE OF	5504011	•••												

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DEPTH, Z (meters)

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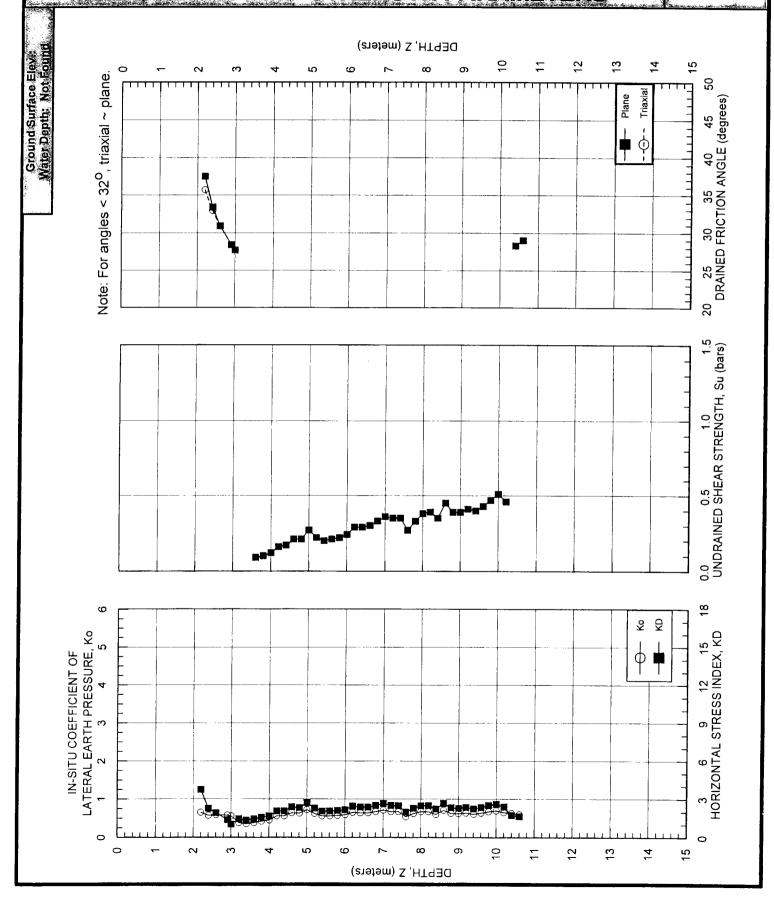
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## INTERPRETED DMT STRENGTH PARAMETERS

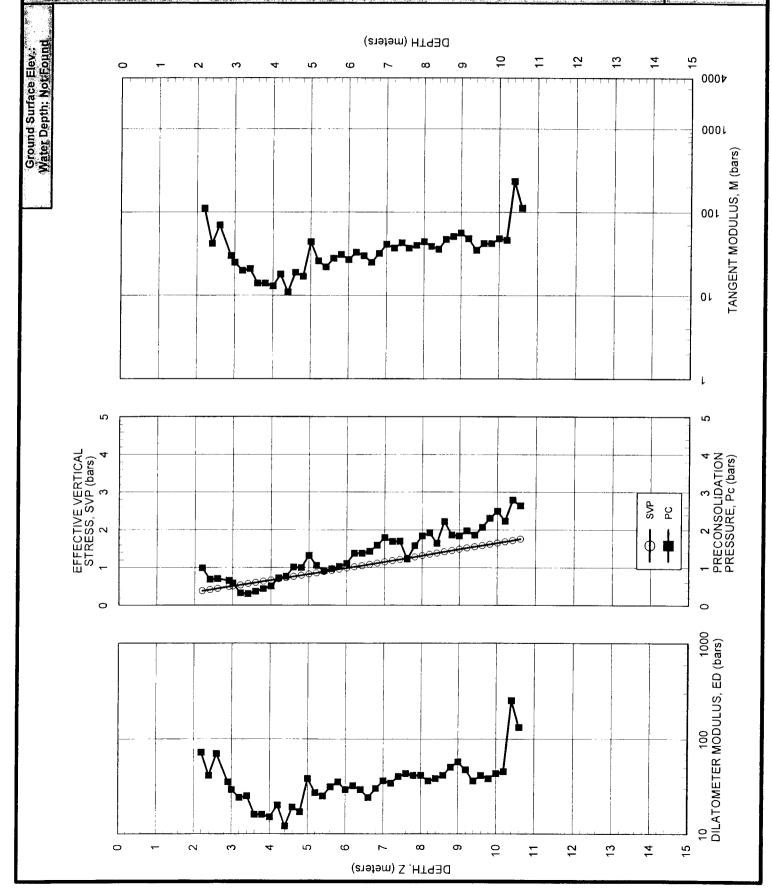


IN-SITU SOIL TESTING, L.C. ENGINEER: R. Failmezger SOUNDING DATE: 11-18-98

SOUNDING

**D-5** 

## INTERPRETED DMT DEFORMATION PARAMETERS



DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

LOCATION: As Planned -- Refusal at 9.5m

SNDG.BY : R. FAILMEZGER

SNDG.DATE: 11-17-98

SNDG. NO. D-6

FILE NO. : IST-9863

PAGE 1

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 OCF 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 (M)	THRUST	A (DAD)	B	C (DAD)	DA (DAD)	DB (DAD)	ZMRNG		ZMHI	ZMCAL	PO	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		11.91		0.000	1.90	0.033
0.60	1840.	2.07	12.15		0.24	0.19	10.00	0.02	0.15	0.00		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 3.00	730. <b>47</b> 0.	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	220.	1.87	3.93 2.29		0.24 0.24	0.19 0.19	10.00	0.02	0.15	0.00	2.01	3.72		0.000	1.70	0.520
3.40	170.	1.32	2.60		0.24	0.19	10.00	0.02 0.02	0.15 0.15	0.00	1.51	2.08		0.000	1.60	0.552
3.60	190.	1.62	3.29		0.24	0.19	10.00	0.02	0.15	0.00 0.00	1.46 1.78	2.39 3.08		0.000	1.60	0.584
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	0.615
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 1.60	0.646
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	0.678 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	0.741
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	0.772
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 8.20	450. 560.	2.20 2.51	6.48 4.22		0.24	0.19	10.00	0.02	0.15	0.00	2.23	6.27		0.167	1.80	1.159
8.40	410.	3.09	4.22		0.24	0.19 0.19	10.00	0.02	0.15 0.15	0.00	2.67	4.01		0.186	1.70	1.173
8.60	400.	3.18	4.51		0.24	0.19	10.00	0.02	0.15	0.00	3.26	4.23		0.206	1.70	1.187
8.80	420.	3.45	4.86		0.24	0.19	10.00	0.02	0.15	0.00	3.35 3.62	4.30		0.226	1.70	1.201
9.00	410.	2.53	3.85		0.24	0.19	10.00	0.02	0.15	0.00	3.62 2.71	4.65		0.245	1.70	1.215
9.20	410.	2.54	4.15		0.24	0.19	10.00	0.02	0.15	0.00	2.71	3.64 3.94		0.265	1.70	1.228
9.40	770.	2.88	4.52		0.24	0.19	10.00	0.02	0.15	0.00	3.04	4.31		0.285 0.304	1.70 1.70	1.242
	SOUNDING						SOIL I					* . JI		0.304	1.70	1.256
					,				110 01		+ AGE /					

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

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 ANALYSIS PARAMETERS: 10 KANGE = 10.00 BARS ROD DIAM. = 3.57 CM BL.HICK. = 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 MAX SU ID = 0.60 UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT KD ID UD ED KO SU QD PHI SIGFF PHIO PC OCR M SOIL TYPE

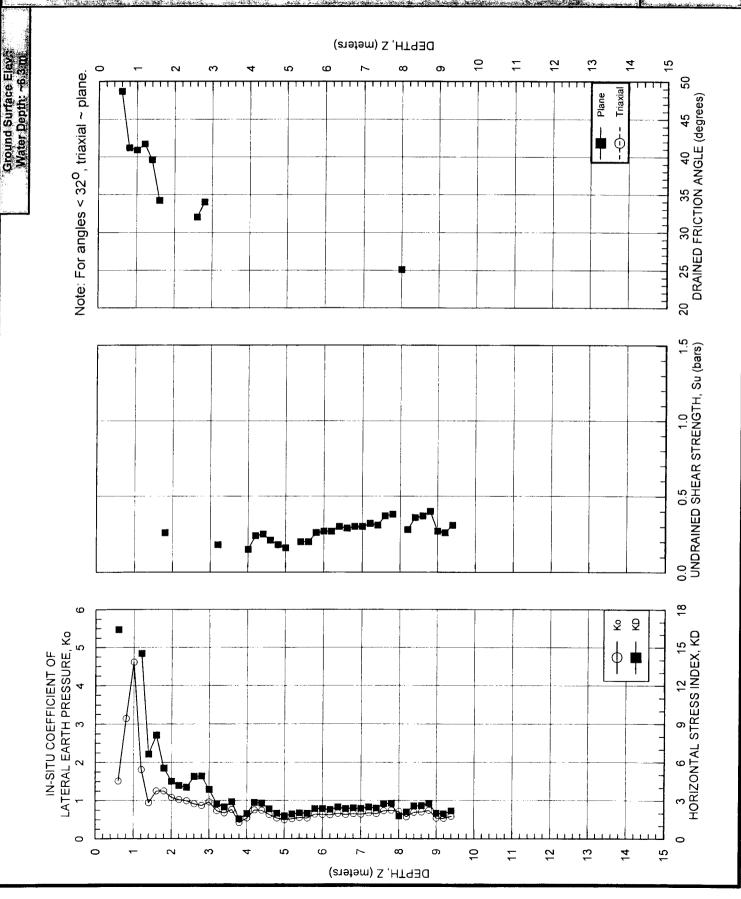
SNDG. NO. D-6

FILE NO. : IST-9863

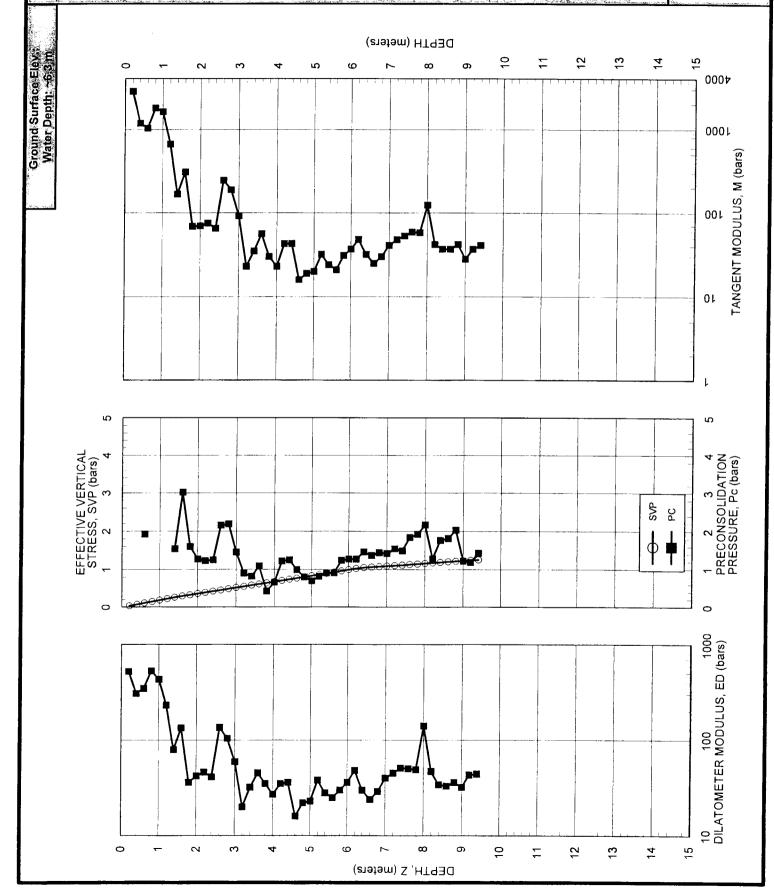
PAGE 2

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)	
****	****	****	****	*****	****	****	****	****	*****	****	****	****	*****	*****
	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		20.5	51.0	0.70	32.0	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.	
3.40	2.49	0.64	0.00	32.	0.67	0.10					0.82	1.4	25. 35.	SILTY CLAY
3.60	2.89	0.73	0.00	45.	0.76						1.09			CLAYEY SILT
3.80	1.55	1.01	0.00	35.	0.42							1.8	56.	CLAYEY SILT
	1.55	0.58	0.00	35. 27.		0 15					0.43	0.7	30.	SILT
4.00					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	28. 37.	SILTY CLAY
9.40	2.18	0.46	0.00	44.	0.59	0.31					1.43	1.1	37. 41.	SILTY CLAY
	SOUNDI		3.00	77.	0.55	3.31					1.73	1.1	41.	SIDII CLAI
END OF	3001401													

## INTERPRETED DIST STRENGTH PARAMETERS



# INTERPRETED DMT DEFORMATION PARAMETERS



DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. D-7

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

LOCATION: As Planned

SNDG.BY: R. FAILMEZGER
ANAL.BY: R. FAILMEZGER
ANAL.DATE: 11-18-98
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 KO FACTOR = 1.00 UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

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Z	THRUST	A	В	C (DAD)	DA (DAD)	DB	ZMRNG		ZMHI	ZMCAL	P0	P1	P2	UO	GAMMA	SVP
(M) ****	(KGF)	(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			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			0.26	0.17	10.00	0.02	0.15	0.00	1.23	6.50		0.000	1.80	0.162
1.00 1.20	450. 420.	0.94			0.26 0.26	0.17 0.17	10.00	0.02	0.15 0.15	0.00 0.00	1.05	3.83		0.000	1.70	0.179
1.40	360.	0.73			0.26	0.17	10.00	0.02	0.15	0.00	0.85 1.06	3.42 4.23		0.000	1.70 1.80	0.212 0.246
1.60	410.	0.58			0.26	0.17	10.00	0.02	0.15	0.00	0.66	3.98		0.000	1.70	0.240
1.80	410.	1.61			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			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			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.		16.75		0.26	0.17	10.00	0.02	0.15	0.00		16.43		0.000	2.00	0.500
3.00 3.20	1450. 1350.	2.17	14.20 5.29		0.26 0.26	0.17 0.17	10.00 10.00	0.02	0.15 0.15	0.00	2.28	13.88		0.000	1.90	0.519
3.40	700.	1.78			0.26	0.17	10.00	0.02	0.15	0.00	1.91	4.13		0.000	1.70 1.70	0.554 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			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			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 5.00	400. 360.	0.74 1.53	2.08 2.88		0.26 0.26	0.17 0.17	10.00 10.00	0.02	0.15 0.15	0.00 0.00	0.93 1.72	1.89		0.000	1.60	0.808
5.20	480.	1.65	3.78		0.26	0.17	10.00	0.02	0.15	0.00	1.72	2.69 3.59		0.000	1.60 1.70	0.840 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	0.872
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 7.00	560. 620.	0.65	3.45 2.68		0.26 0.26	0.17 0.17	10.00 10.00	0.02	0.15 0.15	0.00	0.77 0.69	3.26 2.49		0.000	1.70 1.70	1.139 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	1.1/2
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.		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.		14.55		0.26	0.17	10.00	0.02	0.15	0.00		14.23		0.000	1.90	1.420
8.60	5240. 6000.		23.45 28.75		0.26 0.26	0.17 0.17	10.00	0.02 0.02	0.15 0.15	0.00 0.00		23.13 28.43		0.000	2.00	1.458
8.80 9.00	5680.		24.30		0.26	0.17	10.00	0.02	0.15	0.00		23.98		0.000	2.00	1.497 1.536
9.20	5320.		25.90		0.26		10.00	0.02	0.15	0.00		25.58		0.000		1.536
9.40	4890.		24.80		0.26	0.17	10.00	0.02	0.15	0.00		24.48		0.000	2.00	1.615
9.60	4890.		23.45		0.26	0.17	10.00	0.02	0.15	0.00		23.13		0.000	2.00	1.654
9.80	5180.		25.10		0.26	0.17	10.00	0.02	0.15	0.00		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.		11.00		0.26	0.17	10.00	0.02	0.15	0.00		10.68		0.000	1.80	1.770
10.40	1080.		6.54		0.26	0.17	10.00	0.02	0.15	0.00		6.35		0.020	1.80	1.786
10.60	1320.		10.30		0.26		10.00	0.02		0.00		9.98		0.039	1.90	1.802
END OF	SOUNDING				(INTE	KPRETEI	SOIL :	PAKAME	TERS O	N NEXT	PAGE)					

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. D-7

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

LOCATION: As Planned

SNDG.BY: R. FAILMEZGER

ANAL.BY: R. FAILMEZGER

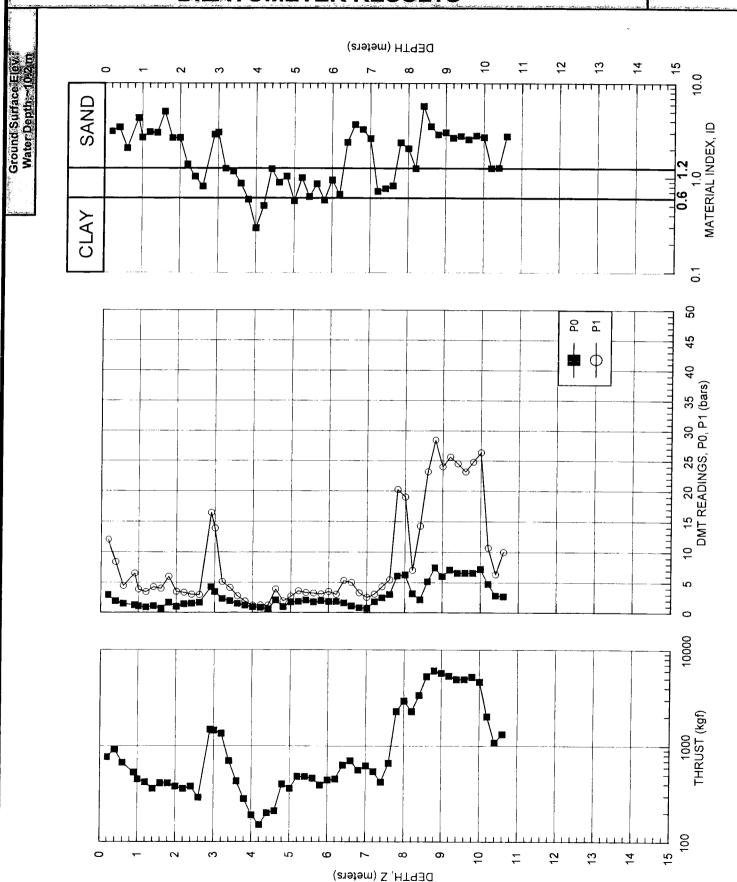
ANAL.DATE: 11-18-98

ANALYSIS PARAMETERS: LO RANGE = 10.00 BARS ROD DIAM. = 3.57 CM BL.THICK. = 12.7 MM SU FACTOR = 1.00 SURF. BLEV. = 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 WAX 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

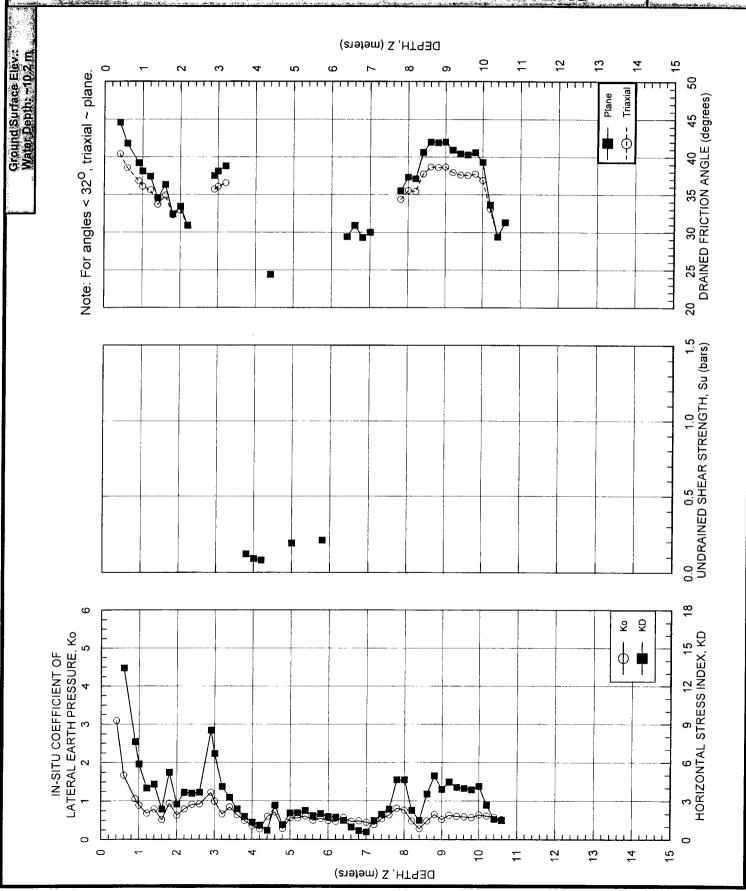
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z	KD	ID	UD	ED	K0	SU	QD	PHI	SIGFF	PHIO	PC	OCR	М	SOIL TYPE	
(M)				(BAR)		(BAR)	(BAR)	(DEG)	(BAR)	(DEG)	(BAR)		(BAR)	******	
****	****	****	****	*****	****	****	****	****	*****	****	****	****	****	******	
0.20	83.91	3.10	0.00	316.									1424.	SILTY 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			35 5	2 07	35.0	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		2.75		623.	0.60		166.9	40.4	2.66	40.3	3.88	2.4	1058.	SILTY SAND	
9.60		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		1.25	0.00	206.	0.61		64.1	33.6	2.75	33.6	3.51	2.0	249.	SANDY SILT	
10.40		1.26	0.00	122.	0.58		36.5	29.4	2.66	29.4	2.53	1.4	104.	SANDY SILT	
10.60		2.73	0.00	252.	0.52		46.1	31.3	2.74	31.3	2.20	1.2	215.	SILTY SAND	
END OF	SOUNDI	NG													

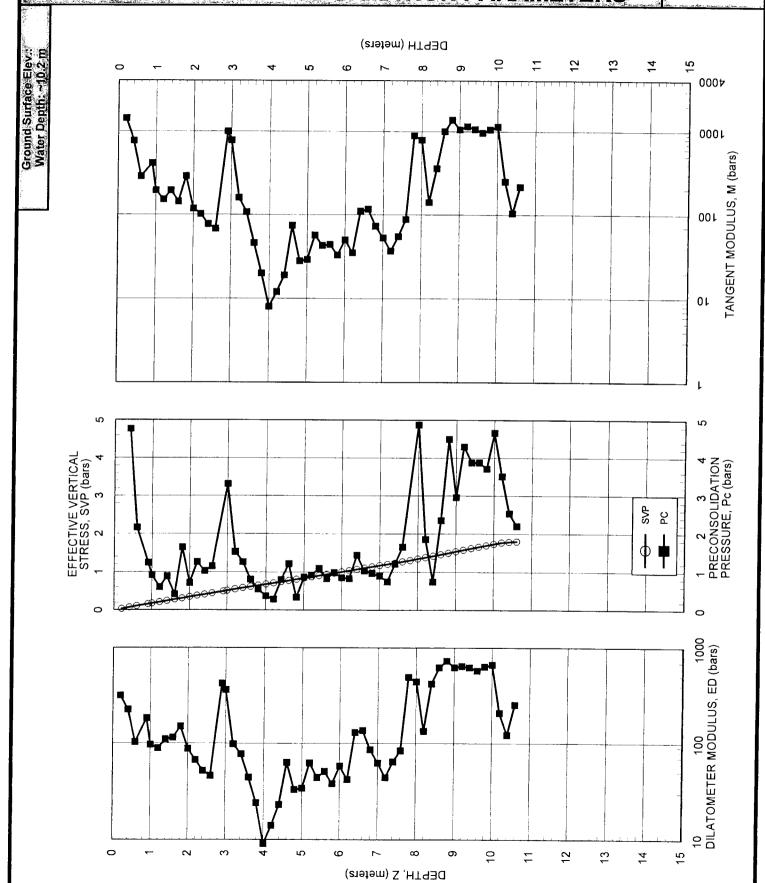
## **DILATOMETER RESULTS**



## INTERPRETED DMT STRENGTH PARAMETERS



## INTERPRETED DIMT DEFORMATION PARAMETERS



DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. D-8

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

LOCATION: As Planned

SNDG.BY: R. FAILMEZGER

ANAL.BY: R. FAILMEZGER

ANAL.DATE: 11-18-98

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 WAX 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

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z	THRUST	<b>A</b>	В	C	DA	DB	ZMRNG		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 1.60	670. 850.	3.09 2.40	7.97 8.68		0.27 0.27	0.15 0.15	10.00 10.00	0.02	0.15 0.15	0.00	3.12	7.80		0.000	1.80	0.243
1.80	780.	3.63	8.41		0.27	0.15	10.00	0.02	0.15	0.00	2.36	8.51 8.24		0.000	1.90 1.80	0.279 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	0.310
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 4.80	520. 490.	0.90 0.73	3.62 3.88		0.27 0.27	0.15 0.15	10.00 10.00	0.02 0.02	0.15 0.15	0.00 0.00	1.03 0.84	3.45 3.71		0.000	1.70	0.764
5.00	430.	0.75	3.48		0.27	0.15	10.00	0.02	0.15	0.00	0.67	3.31		0.000	1.70 1.70	0.798 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. 370.	3.45 3.45	6.11		0.27 0.27	0.15	10.00 10.00	0.02 0.02	0.15 0.15	0.00	3.59	5.94		0.000	1.80	1.291
8.00 8.20	460.	3.45	4.96 6.36		0.27	0.15 0.15	10.00	0.02	0.15	0.00 0.00	3.65 3.80	4.79 6.19		0.000	1.70 1.80	1.325
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	1.360 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		10.00	0.02	0.15	0.00	3.55			0.000	1.70	
9.40	500.	3.74	5.15		0.27	0.15	10.00	0.02	0.15	0.00	3.94			0.000		1.561
9.60	520.	3.76			0.27	0.15	10.00	0.02	0.15	0.00	3.96	5.07		0.000		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		10.00	0.02	0.15		3.92	5.30		0.000	1.70	1.728
10.60	520.	4.01	5.59		0.27		10.00		0.15		4.20	5.42		0.000	1.70	1.761
END OF	SOUNDING	;			(INTE	RPRETE	SOIL	PARAME	TERS O	N NEXT	PAGE)					

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. D-8

IN-SITU SOIL TESTING, L.C.

JOB FILE: Corps of Engineering Dredge Storage Area -- Cecilton, Delaware

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 KO FACTOR = 1.00 UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

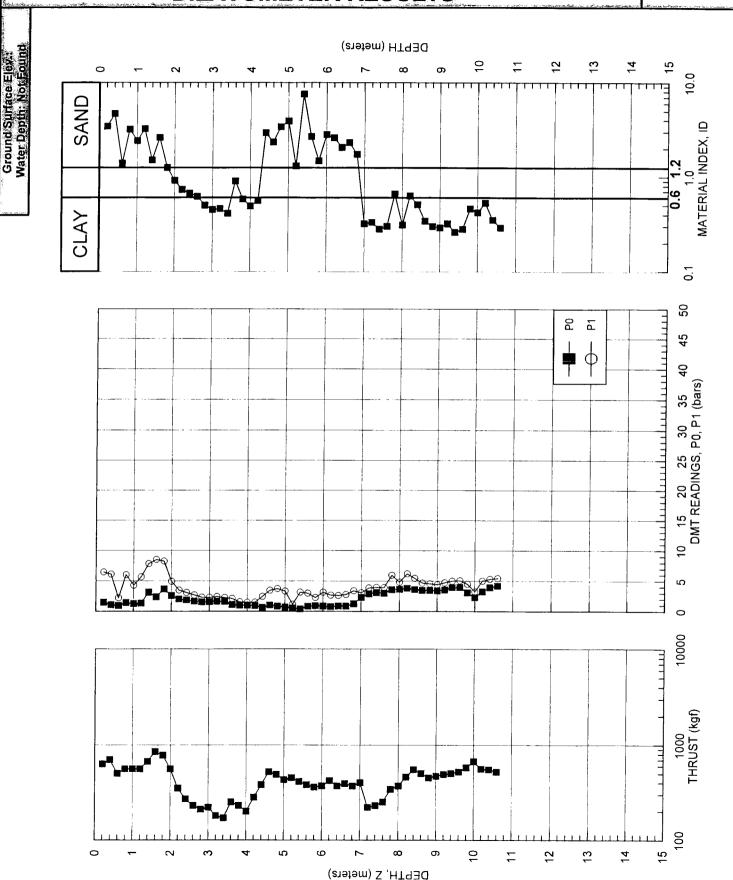
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FILE NO. : IST-9863

0.20 41.50 3.43 0.00 173. 0.20 41.50 3.43 0.00 174. 1.66 22.5 46.1 0.12 41.8 1.41 20.1 505. SAND 0.50 8.55 1.39 0.00 174. 1.10 22.5 46.1 0.12 41.8 1.41 20.1 505. SAND 0.50 8.55 1.39 0.00 155. 1.30 0.00 155. 1.30 31.5 34.5 0.12 35.4 1.56 1.70 107. SANDY SILT 1.20 6.42 3.22 0.00 155. 0.25 16.9 39.1 10.9 31.7 SANDY SILT 1.20 6.42 3.22 0.00 155. 0.95 16.9 39.3 41.6 1.24 6.0 31.7 SANDY SILT 1.20 6.42 3.22 0.00 159. 1.69 34.0 34.4 0.38 30.8 5.77 23.7 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. 1.69 16.3 33.9 0.49 30.7 6.29 19.9 41.9 SANDY SILT 2.00 7.34 0.91 0.00 81. 1.51 2.00 7.34 0.91 0.00 35. 1.10 1.20 1.20 1.20 1.20 1.20 1.20 1.2	Z (M)	KD	ID	UD	ED (BAR)	К0	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE
0.40	****	****	****	****	*****	****	****	****	****	*****	****	****	****	*****	******
0.40	0.20	41.50	3.43	0.00	173.									666.	SAND
0. 0. 0. 10. 46   3.1. 8   0.00   10.5.   1.02   1.02   1.01   1.03   0.28   3.5. 6   1.20   7.02   31. 5   SILTY SAND     1.00						1.66		22.5	46.1	0.12	41.8	1.41	20.1		
1.00 7.23 2.42 0.00 150. 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 34.4 1.24 6.0 3.7 31.TY SAND 1.40 12.82 1.50 0.00 150. 0.95 1.81 14.0 34.4 0.38 30.8 5.77 23.7 445. SANDY SILTY SAND 1.60 1.60 1.25 0.00 124. 1.20 23.7 37.9 0.45 34.8 2.72 9.7 50.1 SILTY SAND 1.60 1.60 1.25 0.00 124. 1.20 23.7 37.9 0.45 34.8 2.72 9.7 50.1 SILTY SAND 1.60 1.60 1.25 0.00 1.61 1.51 2.00 7.0 1.60 1.25 0.00 1.61 1.51 2.00 7.0 1.60 1.20 1.20 1.20 1.20 1.20 1.20 1.20 1.2			1.39	0.00	45.	1.13		15.8	41.9	0.17	37.6	0.95	9.1	107.	SANDY SILT
1.00	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
1.40   12.82   1.50   0.00   16.3   1.81   14.0   34.4   0.38   30.8   5.77   23.7   24.5   SANDY SILT   1.60   1.60   1.25   0.00   214.   1.20   22.7   37.9   0.45   34.8   2.72   27.9   50.1   SILTY SAND   1.60   1.50   0.00   81.   1.51   0.00   81.   1.51   0.00   81.   1.51   0.00   81.   1.51   0.00   81.   1.51   0.00   81.   1.51   0.00   81.   1.51   0.00   81.   1.51   0.00   81.   1.51   0.00   81.   1.51   0.00   81.   1.51   0.00   0.45   0.00   43.   1.07   0.45   0	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
1.60	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
1.60	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
2.40	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
2.40	2.00	7.34	0.91	0.00											
2.60    3.71															
2.80															
3.00   3.09   0.45   0.00   25.   0.80   0.19   0.20   1.015   1.09   34.   SILTY CLAY   3.40   2.79   0.41   0.00   23.   0.74   0.19   0.10   0.53   0.50   0.53   0.50   0.53   0.50   0.53   0.50   0.53   0.50   0.53   0.50   0.53   0.50   0.53   0.55   0.50   0.53   0.50   0.50   0.53   0.50   0.55   0.5															
3.40 3.05 0.46 0.00 27. 0.80 0.20															
3.60															
3.80 1.84 0.90 0.00 35. 0.50															
3.80							0.13								
4.00 1.46 0.49 0.00 17. 0.39 0.10   4.20 1.37 0.56 0.00 19. 0.39 0.10   4.20 1.37 0.56 0.00 19. 0.36 0.10   4.40 0.85 2.93 0.00 63. 0.49   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   4.60 1.35 2.33 0.00 84. 0.52 18.7 31.0 1.16 29.3 0.89 1.2 71. SILTY SAND   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 96. 0.45 18.3 30.0 1.29 28.5 0.66 0.8 19. SAND   5.40 0.41 7.53 0.00 96. 0.45 18.3 29.5 14.4 27.9 0.76 0.9 78. 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 0.87 2.68 0.00 75. 0.55 14.6 27.4 1.36 26.0 0.98 1.0 64. SILTY SAND   6.20 0.83 2.80 0.00 80. 0.56 14.3 26.7 1.44 25.3 1.55 1.1 68. SILTY SAND   6.20 0.83 2.80 0.00 67. 0.52 16.6 27.7 1.50 26.5 0.97 0.9 57. 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   6.80 1.10 1.73 0.00 74. 0.63 13.4 25.0 1.60 23.8 1.48 1.3 6.5 1.3 25. SILTY SAND   6.80 1.10 1.73 0.00 74. 0.65 0.35 13.4 25.0 1.60 23.8 1.48 1.3 6.7 SILTY SAND   6.80 1.10 1.73 0.00 74. 0.65 0.35 13.4 25.0 1.60 23.8 1.48 1.3 6.7 CLAY   7.20 2.42 0.33 0.00 26. 0.54 0.55 0.35 13.4 25.0 1.60 23.8 1.48 1.3 6.7 CLAY   7.80 2.78 0.66 0.00 82. 0.74 0.65 0.35 13.4 25.0 1.60 23.8 1.48 1.5 1.5 1.0 22. CLAY   7.80 2.78 0.63 0.00 37. 0.65 0.35 13.4 25.0 1.60 23.8 1.65 1.3 32. CLAY   7.80 2.79 0.63 0.00 37. 0.65 0.35 13.4 25.0 1.60 23.8 1.66 1.3 32. CLAY   7.80 2.79 0.63 0.00 37. 0.65 0.35 13.4 25.0 1.60 23.8 1.65 1.7 97. CLAYEY SILT   8.60 2.75 0.31 0.00 40. 0.73 0.43 1.4 1.5 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7							0 10								
4.20															
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 5.00 0.81 3.91 0.00 99. 0.49 18.4 30.6 1.20 28.9 0.80 1.0 85. SAND 5.20 0.88 1.30 0.00 23. 0.45 18.3 30.0 1.29 28.5 0.66 0.8 19. SAND 5.20 0.80 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 11.6 27.4 1.36 26.0 0.98 1.0 64. SILTY SAND 5.80 0.90 51. 48 0.00 47. 0.58 13.0 6.25 13.9 25.1 1.10 1.1 40. SANDY SILT SAND 6.20 0.75 0.95 1.48 0.00 47. 0.58 13.6 26.0 0.89 1.0 64. SILTY SAND 6.20 0.72 2.60 0.00 67. 0.56 14.3 26.7 1.44 25.3 1.05 1.1 68. SILTY SAND 6.20 0.77 2.31 0.00 61. 0.57 14.4 26.2 1.53 26.0 0.90 1.0 68. SILTY SAND 6.60 0.87 2.31 0.00 67. 0.56 15.3 26.4 1.58 25.3 1.12 1.0 57. SILTY SAND 6.60 0.87 2.31 0.00 67. 0.56 15.3 26.4 1.58 25.3 1.12 1.0 57. SILTY SAND 6.20 0.77 2.31 0.00 67. 0.56 15.3 26.4 1.58 25.3 1.12 1.0 57. SILTY SAND 6.60 0.87 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 1.53 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 0.55 0.33 1.2 1.5 1.5 1.0 22. CLAY 7.20 2.42 0.33 0.00 34. 0.65 0.33 1.2 1.2 1.0 57. SILTY SAND 7.40 2.51 0.28 0.00 30. 0.67 0.36 1.34 25.0 1.60 23.8 1.48 1.3 3.2 CLAY 7.20 2.42 0.33 0.00 35. 0.65 0.35 0.33 1.2 1.2 1.0 1.1 1.3 3.5 CLAY 7.20 2.42 0.33 0.00 35. 0.65 0.35 0.33 1.2 1.2 1.0 1.1 1.3 3.5 CLAY 7.20 2.42 0.33 0.00 35. 0.65 0.35 0.33 1.2 1.2 1.0 1.0 1.3 3.2 CLAY 7.20 2.42 0.33 0.00 35. 0.66 0.54 0.25 0.35 0.33 1.2 1.2 1.0 1.0 1.3 3.2 CLAY 7.20 2.42 0.33 0.00 35. 0.65 0.35 0.33 1.2 1.2 1.0 1.2 1.3 3.2 CLAY 7.20 2.42 0.33 0.00 35. 0.65 0.35 0.33 1.2 1.2 1.2 1.0 1.2 1.3 3.2 CLAY 7.20 2.42 0.33 0.00 35. 0.65 0.35 0.33 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2															
4.60								14.8	29.5	1.09	27.7				
4.80															
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.         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         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         67.         0.52         16.6         27.7         1.50         26.5         0.97         0.9         57.         SILTY SAND           6.60         0.77         2.31															
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         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         67.         0.52         16.6         26.7         1.44         25.3         1.05         1.1         68.         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         1.01					91.			16.8	29.5	1.24	27.9	0.76	0.9	78.	
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         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         67.         0.56         15.3         26.4         1.58         25.3         1.12         1.0         25.         SILTY SAND           6.80         1.10 <th< td=""><td>5.20</td><td>0.58</td><td>1.30</td><td>0.00</td><td>23.</td><td>0.45</td><td></td><td>18.3</td><td>30.0</td><td>1.29</td><td>28.5</td><td>0.66</td><td>0.8</td><td>19.</td><td>SANDY SILT</td></th<>	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
5.80         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           6.40         0.81         2.05         0.00         61.         0.57         14.4         26.2         1.53         24.9         1.13         1.1         52.         SILTY SAND           6.80         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         15.3         26.4         1.58         25.3         1.12         1.0         57.         SILTY SAND           6.80         1.10         1.73         0.00         26.         0.54         0.25         1.60         1.53         1.0         1.0         22.         CLAY           7.00         2.51         0.28         0.00 </td <td>5.40</td> <td>0.41</td> <td>7.53</td> <td>0.00</td> <td>96.</td> <td>0.45</td> <td></td> <td>17.3</td> <td>29.3</td> <td>1.33</td> <td>27.8</td> <td>0.64</td> <td>0.7</td> <td>82.</td> <td>SAND</td>	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
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           6.60         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         34.         0.65         0.33         1.61         1.5         1.0         22.         CLAY           7.20         2.42         0.33         0.00         35.         0.35         1.66         1.17         1.14         33.         CLAY           7.40         2.51         0.28         0.00         30.0         0.67         0.35         1.2	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
6.20	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
6.40 0.81 2.05 0.00 61. 0.57	6.00	0.83	2.80	0.00	80.	0.56								68.	
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 1.60 1.74 1.4 1.4 33. CLAY 7.40 2.51 0.28 0.00 30. 0.67 0.36 1.74 1.4 1.4 33. CLAY 7.60 2.39 0.30 0.00 31. 0.65 0.35 1.74 1.4 1.4 33. CLAY 7.80 2.78 0.66 0.00 82. 0.74 1.66 1.3 32. CLAY 7.80 2.79 0.63 0.00 82. 0.74 1.60 1.73 0.43 1.74 1.74 1.74 1.74 1.74 1.74 1.74 1.74	6.20	0.72													
6.80															
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           8.00         2.75         0.31         0.00         82.         0.74         2.16         1.7         97.         CLAYEY SILT           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           8.80         2.38         0.30         0.00         37.         0.64         0.40         1.96         1.4         43.         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         0.63         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           9.00         2.27         0.29         0.00         35.         0.62         0.39         1.82         1.2         34.         CLAY								13.4	25.0	1.60	23.8				
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         9.00       2.27       0.29       0.00       35.       0.62       0.39       1.82       1.2       34.       CLAY         9.40       2.52       0.26       0.00       36.       0.68       0.46       2.24 <td></td>															
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         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 <td></td>															
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         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         9.80       1.89       0.46       0.20       0.23       1.49       0.9       42.															
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         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         9.80       1.89       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							0.35								
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         9.80       1.89       0.46       0.20       39.       0.67       0.46       2.23       1.4       41.       CLAY         10.00       1.37       0.42       0.00       34.       0.36       0.23							0.43								
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         10.00       1.89       0.46       0.00       49.       0.51       0.33       1.49       0.9       42.       SILTY CLAY         10.20       1.93       0.53       0.00       60.       0.53							0.43								
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         10.40       2.27       0.35       0.00       48.       0.62							0.42								
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         10.40       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 <td></td>															
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.															
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															
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															
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															
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															
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															
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															
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															
10.60 2.39 0.29 0.00 42. 0.64 0.48 2.32 1.3 44. CLAY															
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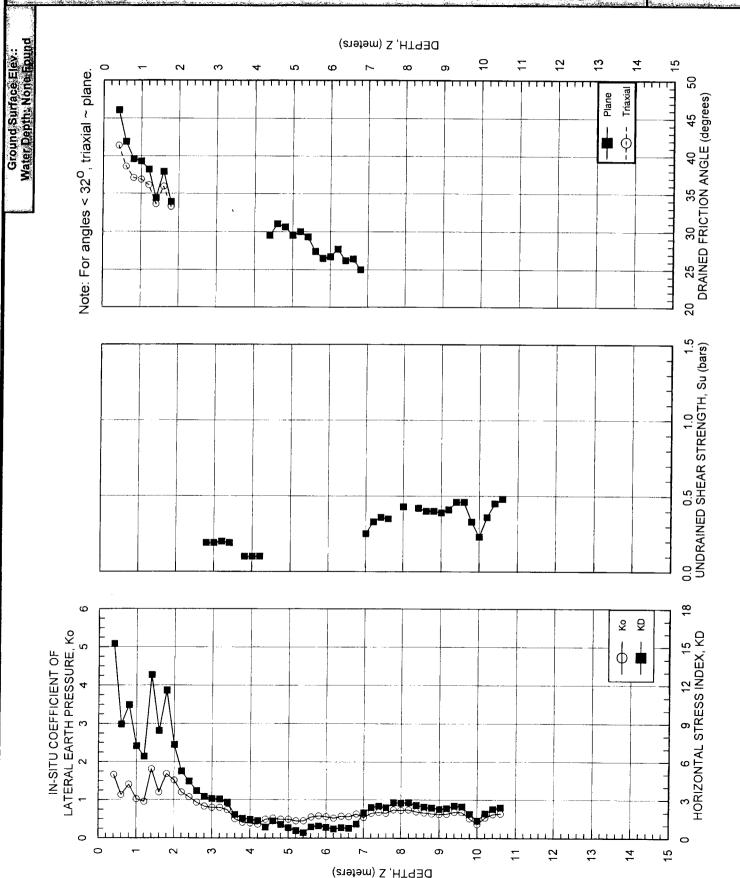
D-8

## **DILATOMETER RESULTS**



D-8

## INTERPRETED DMT STRENGTH PARAMETERS



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DEPTH, Z (meters)

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## **APPENDIX C**

# LABORATORY TEST RESULTS BY OTHER

			r	TABLE C-1	: SUM	MARY	OF PREVIO	OUS L	ABORATO	RY TESTS	[1]					
Test Boring	Sample Depth	Visual	Natural Water Content (ASTM D 2216)	Less Than No. 200 Sieve (ASTM D 1140)	Lii (ASTM Liquid	riberg mits D 4318) Plasticity	USCS Classification	Dry Density	Unconfined Compressive [1] Strength, qu (ASTM D 2487)	UU		xial CU M D 4767)	CD	Consolidation	(ASTM	n Size I D 422)
Number	(feet)	Description	%	%	Limit	Index	(ASTM D 2487)	(PCF)	(KSF)	(ASTM D 2850) (KSF)	(KSF),	φ (degrees)	φ' (degrees)	Test (ASTM D 2435)	Sieve	Hyd.
CSB-5A	8 - 10	Dark gray fat CLAY, some sand, trace mica, trace organics	45.8	80	65	33	СН	72.2		0.54	0.40	17.5	38.7	(NOTHER 2 100)	*	*
	22-24	Dark gray clayey SILT, inorganic, trace sand, trace mica, and organics	55.5	97	79	40	МН	64.5	0.70						*	*
CSB-7A	34-36	Dark gray clayey SILT, inorganic, trace mica, trace organics	35.7	99	53	22	МН	84.0	2.12					*	*	*
CSB-8	14-16	Dark gray clayey SILT, inorganic, trace mica, trace organics	61.1	98	95	53	МН	62.1		0.84					*	*
CSB-8A	40-42	Dark gray silty fat CLAY, trace mica and organics	32.7	99	57	28	СН	88.1			1.20	16	34		*	*
CSB-9	24-26	Dark gray clayey SILT, inorganic, trace mica, trace organics	36.4	99	56	23	МН	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	СН	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	МН	67.6		0.50	0.40	15	34		*	*

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.

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			Natural		Atte Lir	erberg mits D 4318)					STS <sup>[1]</sup>			Grain	Size	
Test Boring Number	Sample Depth (feet)	Visual Description	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)		CU M D 4767) 	CD	Consolidation Test		D 422)
										(KSF)	(KSF),	(degrees)	(degrees)	(ASTM D 2435)		
CSB-15	12-14	Gray fat CLAY, trace sand, mica, trace organics	57.9	97	78	46	СН	65.8	0.34					*	*	*
CSB-16	18-20	Dark gray clayey SILT, inorganic, trace mica, trace organics	42.6	99	62	26	МН	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	МН	70.3	0.23						*	*
CSB-18	6-8	Gray inorganic SILT, trace sand, mica, organics	59.3	98	81	43	МН	62.6	0.31					*	*	*

			<u></u>	TABLE C-1	: SUM	MARY	OF PREVIO	OUS L	ABORATO	RY TESTS	[1]					
			Natural Water	Less Than	Atte Lii	erberg mits D 4318)			Unconfined		Tria	xial				n Size D 422)
Test Boring	Sample Depth	Visual	Content (ASTM D 2216)	No. 200 Sieve (ASTM D 1140)	Liquid Limit	Plasticity	USCS Classification	Dry Density	Compressive [1] Strength, qu (ASTM D 2487)	UU (ACTA D 2050)		CU M D 4767)	CD	Consolidation		,
Number	(feet)	Description	%	%	Limit	Index	(ASTM D 2487)	(PCF)	(KSF)	(ASTM D 2850) (KSF)	(KSF),	φ (degrees)	φ' (degrees)	Test (ASTM D 2435)	Sieve	Hyd.
CSS-1	13.1 Dark g	ray lean CLAY,	76.1				OL	51.7		0.55	(1101),	(degrees)	(degrees)	(101W B 2400)		1
		c, with sand	40.2	74.5	45	32	OL	78.8		0.53					*	*
CSS-2		ray silty SAND,	33.1				SM	84.3								
	27.9 some o	organics	32.1	40	NP	NP	SM	85.8							*	*
	28.4		21.3				SM	93.4								
CSS-3		ray organic SILT	44.3				ОН	73.2								
	12.9		44.0	90	56	26	ОН	73.6			0.13	32			*	*
	13.4		46.1				ОН	72.7								
CSS-4		ray 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		gray/brown CLAY,	24.4	91	34	12	CL	101.3							*	*
	<u> </u>	ome organics	26.5				CL	96.4								1
CSS-6		ray organic SILT	60.3	100	80	39	OH	62.3		0.54				*	*	*
	14.7	· CI AI	64.0	0.6	0.5	40	OH	60.5		0.64					*	*
		ray organic CLAY	67.5	96	85	49	OH	60.5			0.25	21			*	*
	some o	gray clayey SILT, organics	23.7				ML	100.6			0.25	31				
	some o	gray clayey SILT, organics	18.3				ML	111.6	1.27							
CSS-7	12.4 Dark g	ray 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						

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**

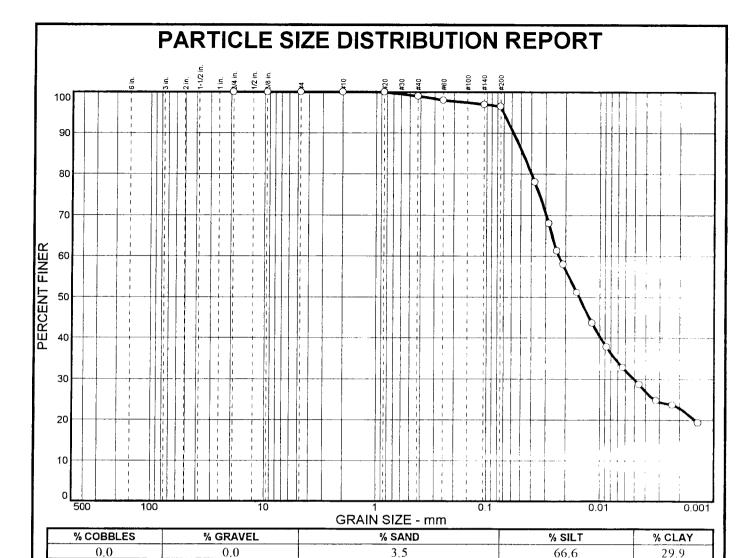
LABORATORY TEST RESULTS DUFFIELD ASSOCIATES, INC.

				TABLE	D.1 : I	LABOR.	ATORY TE	EST RE	ESULTS SU	MMAR	Y						
					Lir	rberg nits D 4318)					Triaxial <sup>[1]</sup>					Grain S	
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)	CU C (ASTM D 4767)		Direct Shear <sup>I</sup> (ASTM D 3	[1]	Consolidation [1] Test	(ASTM I	D 422) Hyd.
TB-1	8 - 10	Gray clayey SILT, trace sand and organics	56.8	96.5			МН			(KSF)	(KSF)	ф	C' (KSF)	φ΄	(ASTM D 2435)	*	*
	10 - 12	Gray and dark gray clayey SILT, trace sand and organics	39.2	92.7	59	26	МН	79.4	2.020								*
	20 - 22	Dark gray and brown clayey SILT, trace sand, mica and organics	49.8	91.0	54	23	МН	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	МН	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										
NOTE.	40 - 42	Light gray fine to medium SAND, trace gravel and silt	14.3	6.7			SP-SM									*	

	T	1	1	IADLE			TONI IE	OI KE	SULTS SU	ATTATUM	1		T		I	Т	
					Lir	rberg nits D 4318)					Triaxial <sup>[1]</sup>					Grain	
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 <sup>[1]</sup> Strength, qu (ASTM D 2487) (KSF)	UU (ASTM D 2850)	CU C (ASTM D 4767)		Direc Shear (ASTM D	. [1]	Consolidation <sup>[1]</sup> Test	(ASTM	D 422)
										(KSF)	(KSF)	ф	C' (KSF)	φ'	(ASTM D 2435)		
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			МН										
	16 - 18	Dark gray clayey SILT, trace to little sand, trace mica and organics	46.2	89.0	52	22	МН	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	МН				.910	9°					*
	32 - 34	Dark gray clayey SILT, trace sand, trace mica, trace organics	56.6	96.9			МН										
	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								

				TABLE	D.1 : I	LABOR	ATORY TI	EST RE	ESULTS SU	MMAR	Y						
			Notural		Lir	rberg mits D 4318)					Triaxial <sup>[1]</sup>					Grain	
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)	CU C (ASTM D 4767)		Direc Shear (ASTM D	[1]	Consolidation [1] Test	(ASTM	D 422)
										(KSF)	(KSF)	ф	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			МН	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	МН			1.77							
	60 - 62	Light gray fine to medium SAND, little silt	19.7	14.7													

#### TABLE D.1: LABORATORY TEST RESULTS SUMMARY Atterberg Limits Triaxial [1] Grain Size [1] (ASTM D 4318) (ASTM D 422) Less Than Unconfined Natural Compressive [1] CU No. 200 Water Strength, qu (ASTM D 2487) С USCS Test Sample Content Sieve Dry UU Direct Shear [1] Consolidation [1] (ASTM Boring Depth Visual (ASTM D 2216) (ASTM D 1140) Liquid Plasticity Classification Density (ASTM (ASTM D 2487) (KSF) D 2850) D 4767) (ASTM D 3080) Test Number (feet) Description % % Limit Index (PCF) Sieve Hyd. (KSF) C' (KSF) (KSF) (ASTM D 2435) Gray and dark gray silty **TB-5** 4 - 6 CLAY, trace fine sand 67.2 94.7 CH 71 38 0.370 56.6 and organics Gray clayey SILT, trace 10 - 12 \* mica and organics 67.5 99.2 72 36 MH 59.8 0.505 (plant stem) 20 - 22 Dark gray silty CLAY, 11.3 98.0 MH trace sand Light brown fine to 28 - 30 \* coarse SAND, some 13.1 11.6 SP-SM gravel, little silt 40 - 42 Dark gray SILT, little sand with organics and PT 257.0 59.2 peat Gray fine silty SAND, 44 - 46 \* trace coarse sand and 17.9 31.5 SM gravel Varicolored fine 54 - 56 \* 24.4 14.5 SMSAND, little silt Variegated red, light 72 - 74 gray and brown CLAY, 15.8 62.1 25 CL some/and fine sand 74 - 75.5 Variegated pink, light gray, brown and red 88.7 5.520 32° 15.8 CL 119.1 ---CLAY, little fine sand



SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
3/4 in. 3/8 in. #4 #10 #20 #40 #60 #140 #200	100.0 100.0 100.0 100.0 100.0 99.0 98.0 97.0 96.5		

	<b>Soil Description</b>	
Gray clayey SILT	, trace sand and organic	es.
	Attacks and the second	
PL=	Atterberg Limits LL=	PI=
D <sub>85</sub> = 0.0478 D <sub>30</sub> = 0.0050 C <sub>u</sub> =	<u>Coefficients</u> D <sub>60</sub> = 0.0229 D <sub>15</sub> = C <sub>c</sub> =	D <sub>50</sub> = 0.0152 D <sub>10</sub> =
USCS= MH	Classification AASHTO:	=
	<b>Remarks</b>	

Sample No.: S-5 Location:

Source of Sample: TB-1

**Date:** 12/28/98 Elev./Depth: 8'-10'

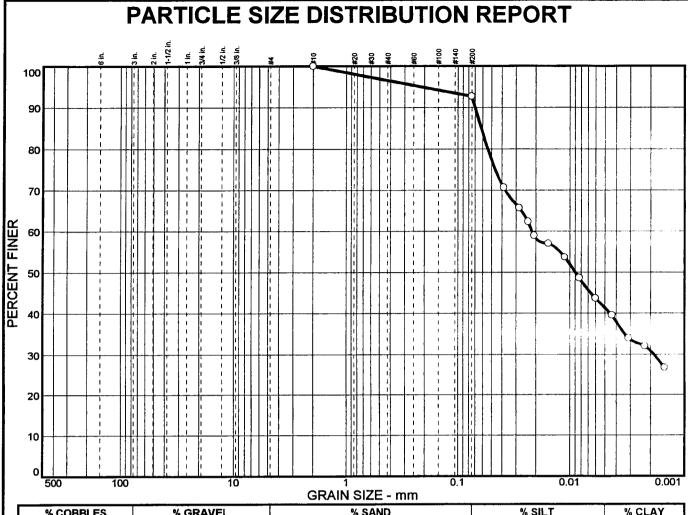
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WILMINGTON, DELAWARE 19808-1232
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Project: Pearce Creek

Project No: 3769.GE Reviewed by: JFC



		0.0		
% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	7.3	51.3	41.4

SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
#10 #200	100.0 92.7		

Gray/dark-gray с	Soil Description clayey SILT, trace sand	and organics.
PL= 33	Atterberg Limits LL= 59	<b>PI=</b> 26
D <sub>85</sub> = 0.0616 D <sub>30</sub> = 0.0019 C <sub>u</sub> =	<u>Coefficients</u> D <sub>60</sub> = 0.0216 D <sub>15</sub> = C <sub>c</sub> =	D <sub>50</sub> = 0.0090 D <sub>10</sub> =
USCS= MH	Classification AASHTO	)=
	Remarks	

Sample No.: SH-1 Location:

Source of Sample: TB-1

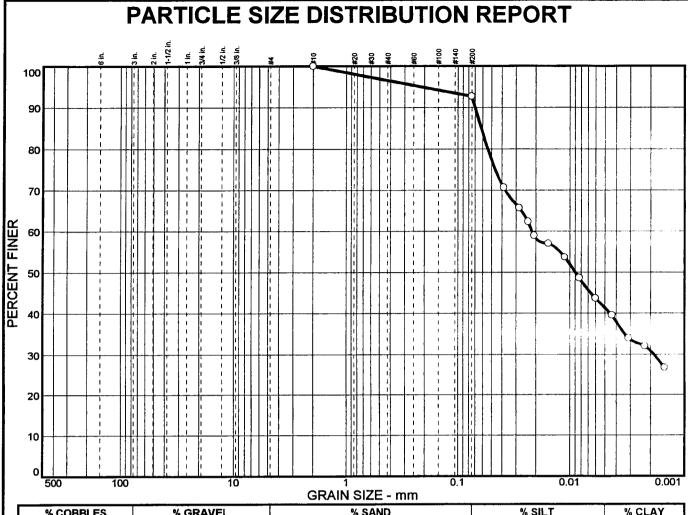
**Date:** 12/22/98 **Elev./Depth:** 10'-12'

Client: U.S. Army Corps of Engineers DUFFIELD

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Project: Pearce Creek

Project No: 3769.GE



0.0				
% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	7.3	51.3	41.4

SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
#10 #200	100.0 92.7		

Soil Description  Gray/dark-gray clayey SILT, trace sand and organics.						
PL= 33	Atterberg Limits LL= 59	<b>PI=</b> 26				
D <sub>85</sub> = 0.0616 D <sub>30</sub> = 0.0019 C <sub>u</sub> =	<u>Coefficients</u> D <sub>60</sub> = 0.0216 D <sub>15</sub> = C <sub>c</sub> =	D <sub>50</sub> = 0.0090 D <sub>10</sub> =				
USCS= MH	Classification AASHTO	)=				
	Remarks					

Sample No.: SH-1 Location:

Source of Sample: TB-1

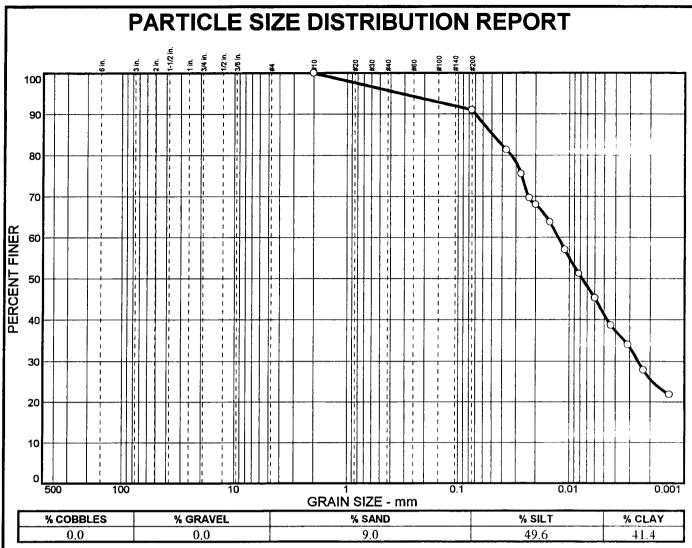
**Date:** 12/22/98 **Elev./Depth:** 10'-12'

Client: U.S. Army Corps of Engineers DUFFIELD

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Project: Pearce Creek

Project No: 3769.GE



SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10 #200	100.0 91.0		<i>[</i> ]
		: :	
:			

Soil Description  Dark-gray and brown clayey SILT, trace sand, mica and organics.					
PL= 31	Atterberg Limits LL= 54	PI= 23			
D <sub>85</sub> = 0.0490 D <sub>30</sub> = 0.0025 C <sub>u</sub> =	Coefficients D60= 0.0125 D15= C <sub>C</sub> =	D <sub>50</sub> = 0.0077 D <sub>10</sub> =			
USCS= MH	Classification AASHT	*O=			
<u>Remarks</u>					

Sample No.: SH-2 Location:

Source of Sample: TB-1

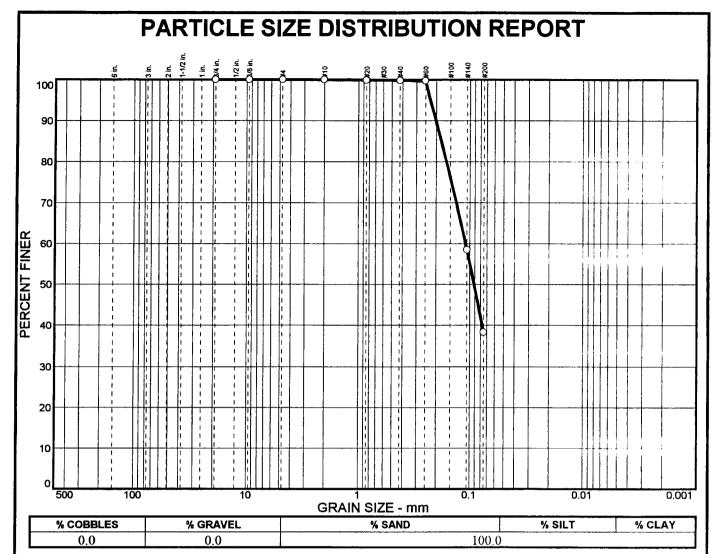
**Date:** 12/28/98 **Elev./Depth:** 20'-22'

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Project: Pearce Creek

Project No: 3769.GE



SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
3/4 in. 3/8 in. #4 #10 #20 #40 #60 #140 #200	100.0 100.0 100.0 100.0 99.9 99.8 99.7 58.5 38.3		

Gray silty fine SA	Soil Description  Gray silty fine SAND, trace mica and organics.				
PL=	Atterberg Limits LL=	Pl=			
D <sub>85</sub> = 0.180 D <sub>30</sub> = C <sub>u</sub> =	Coefficients D <sub>60</sub> = 0.109 D <sub>15</sub> = C <sub>c</sub> =	D <sub>50</sub> = 0.0913 D <sub>10</sub> =			
USCS= SM	Classification AASHT	O=			
	<u>Remarks</u>				

Sample No.: S-18 Location:

Source of Sample: TB-1

**Date:** 12/18/98 **Elev./Depth:** 38'-40'

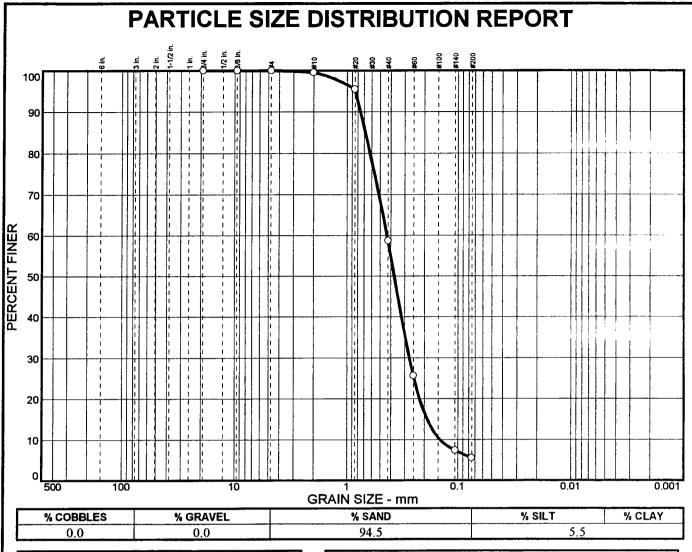
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Client: U.S. Army Corps of Engineers

Project: Pearce Creek

Project No: 3769.GE



SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
3/4 in. 3/8 in. #4 #10 #20 #40 #60 #140 #200	100.0 100.0 100.0 99.6 95.5 58.7 25.6 7.4 5.5		

Soil Description		
Light-brown fine to	o meidum SAND, tra	ice silt, trace mica.
	Atterberg Limits	
PL=	LL=	PI=
	Coefficients	
D <sub>85</sub> = 0.683	D <sub>60</sub> = 0.434	D <sub>50</sub> = 0.372
$D_{30}^{2} = 0.272$ $C_{u}^{2} = 3.02$	$D_{15} = 0.188$ $C_{c} = 1.18$	$D_{10} = 0.144$
	Classification	
USCS= SP-SM	AASHTO	)=
<u>Remarks</u>		

Sample No.: S-27 Location:

Source of Sample: TB-1

**Date:** 12/08/98

**Elev./Depth:** 56'-58'

Client: U.S. Army Corps of Engineers

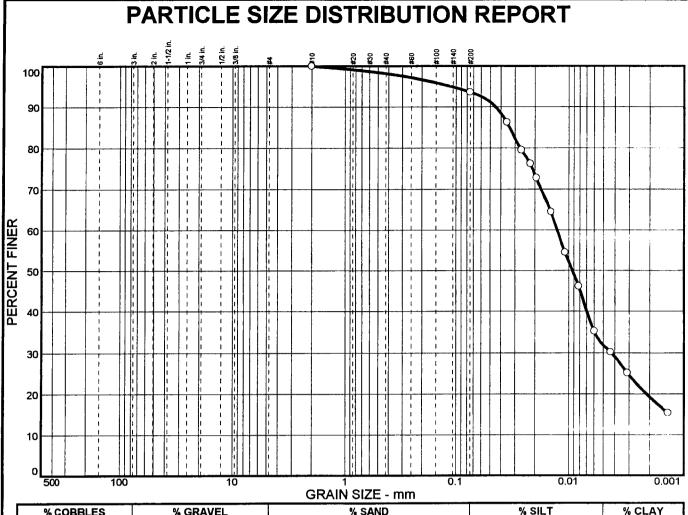
Project: Pearce Creek

Project No: 3769.GE

Reviewed by: JFC

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% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	6.4	61,7	31.9

SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
#10 #200	100.0 93.6	FLICENT	(X-100)

Dark-gray/black/gray SILT, some clay, trace fine sand, trace mica and organics.			
PL= 39	Atterberg Limits LL= 71	PI= 32	
D <sub>85</sub> = 0.0337 D <sub>30</sub> = 0.0043 C <sub>u</sub> =	Coefficients D <sub>60</sub> = 0.0127 D <sub>15</sub> = C <sub>c</sub> =	D <sub>50</sub> = 0.0093 D <sub>10</sub> =	
USCS= MH	Classification AASHT	O=	
	<u>Remarks</u>		

**Soil Description** 

(no specification provided)

Sample No.: SH-1

Source of Sample: TB-2

**Date:** 01/09/99

Location:

Elev./Depth: 4'-6'

Project: Pearce Creek

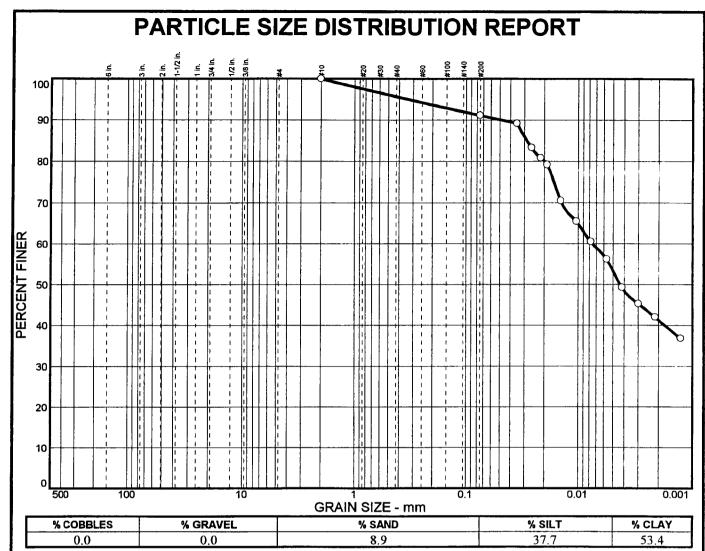
Project No: 3769.GE

Client: U.S. Army Corps of Engineers

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SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10 #200	100.0 91.1		(
	<u>.</u>		
	•		

Light-br./gray sil tr mica and organ	•	nd, trace medium sand,
PL= 24	Atterberg Limits LL= 39.0	PI= 15.0
D <sub>85</sub> = 0.0285 D <sub>30</sub> = C <sub>u</sub> =	Coefficients D60= 0.0075 D15= Cc=	D <sub>50</sub> = 0.0043 D <sub>10</sub> =
USCS= CL	Classification AASHTO	)=
	<u>Remarks</u>	

**Soil Description** 

\* (no specification provided)

Sample No.: SH-2 Location:

Source of Sample: TB-2

**Date:** 12/28/98

Elev./Depth: 12'-14'

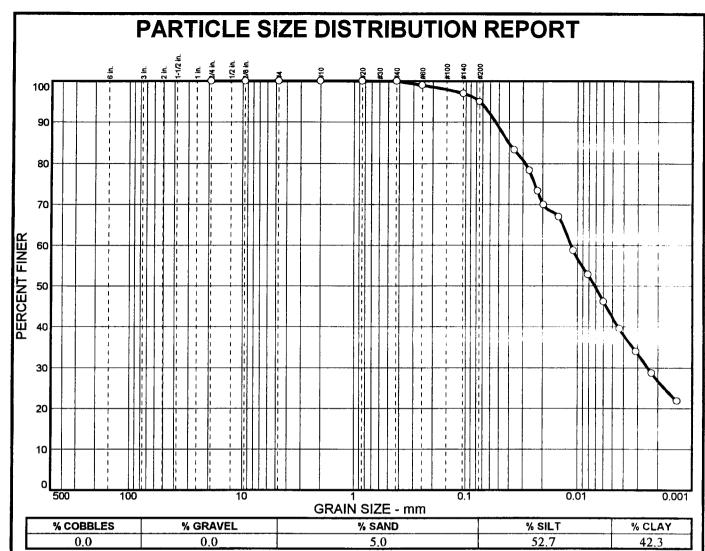
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ASSOCIATES

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Client: U.S. Army Corps of Engineers

Project: Pearce Creek

Project No: 3769.GE



,				
	SIEVE	PERCENT	SPEC.*	PASS?
	SIZE	FINER	PERCENT	(X=NO)
	3/4 in. 3/8 in. #4 #10 #20 #40 #60 #140 #200	100.0 100.0 100.0 100.0 100.0 99.0 97.0 95.0		
-	*			

Gray/brown mott	Soil Description Led silty CLAY, trace	fine sand.
PL= 18	Atterberg Limits LL= 30	PI= 12
D <sub>85</sub> = 0.0402 D <sub>30</sub> = 0.0025 C <sub>u</sub> =	Coefficients D <sub>60</sub> = 0.0113 D <sub>15</sub> = C <sub>c</sub> =	D <sub>50</sub> = 0.0071 D <sub>10</sub> =
USCS= CL	Classification AASHT	O=
	<u>Remarks</u>	

Sample No.: S-7

Source of Sample: TB-2

**Date:** 12/29/98

Location:

**Elev./Depth:** 16'-18'

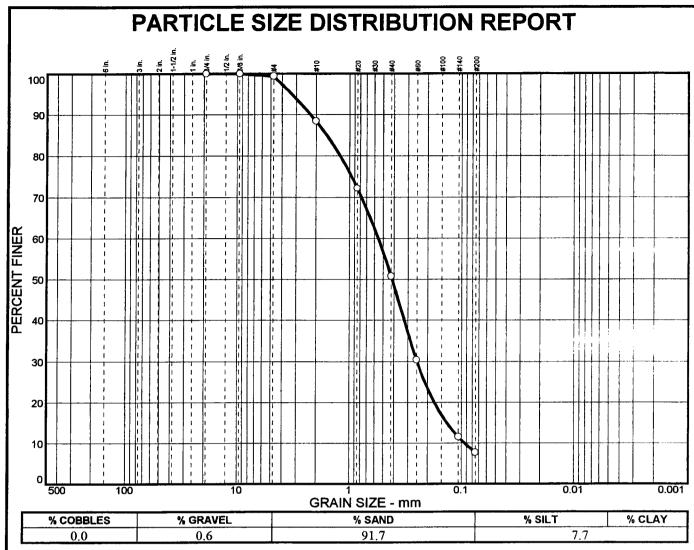
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Project: Pearce Creek

Project No: 3769.GE



SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
3/4 in. 3/8 in. #4 #10 #20 #40 #60 #140 #200	100.0 100.0 99.4 88.4 72.2 50.8 30.4 11.5 7.7		

	Atterberg Limits	
PL=	LL=	PI=
D <sub>85</sub> = 1.61 D <sub>30</sub> = 0.247 C <sub>u</sub> = 5.92	Coefficients D60= 0.553 D15= 0.134 Cc= 1.18	D <sub>50</sub> = 0.416 D <sub>10</sub> = 0.0934
USCS= SP-SM	Classification AASHTO	)=
	<b>Remarks</b>	

Sample No.: S-19 Location:

Source of Sample: TB-2

**Date:** 12/04/98 **Elev./Depth:** 40'-42'

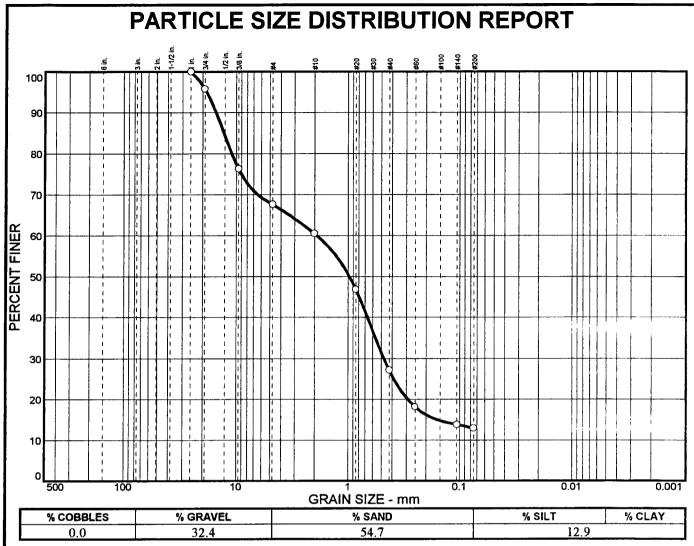
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Client: U.S. Army Corps of Engineers

Project: Pearce Creek

Project No: 3769.GE



SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
1 in. 3/4 in. 3/8 in. #4 #10 #20 #40 #60 #140 #200	100.0 95.8 76.3 67.6 60.5 46.9 27.1 18.1 13.8 12.9		

Brown medium trace coarse sand		l little fine sand, little silt,
PL=	Atterberg Limits	PI=
D <sub>85</sub> = 12.9 D <sub>30</sub> = 0.475 C <sub>u</sub> =	Coefficients D60= 1.90 D15= 0.160 Cc=	D <sub>50</sub> = 0.970 D <sub>10</sub> =
USCS= SM	Classification AASH	ГО=
	Remarks	

Sample No.: S-3

Source of Sample: TB-3

Date: 12/08/98

Location:

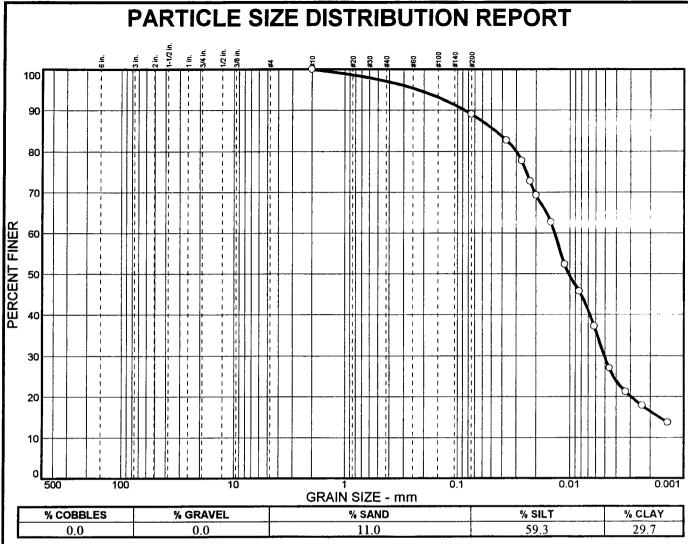
Elev./Depth: 4'-6'

Client: U.S. Army Corps of Engineers

Project: Pearce Creek

Project No: 3769.GE

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	,	·	r
SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
#10 #200	100.0 89.0		
L	L	<u> </u>	

#### **Soil Description** Dark gray clayey SILT, trace to little sand, trace mica and organics.

Atterberg Limits
LL= 58 PI= 23 PL= 35

Coefficients D<sub>85</sub>= 0.0460 D<sub>30</sub>= 0.0050 C<sub>u</sub>= D<sub>50</sub>= 0.0102  $D_{60} = 0.0136$ D<sub>15</sub>= 0.0017 C<sub>c</sub>= D10=

Classification AASHTO= USCS= MH

Remarks

\* (no specification provided)

Sample No.: SH-2 Location:

Source of Sample: TB-3

Date: 12/28/98 **Elev./Depth:** 24'-26'

Client: U.S. Army Corps of Engineers

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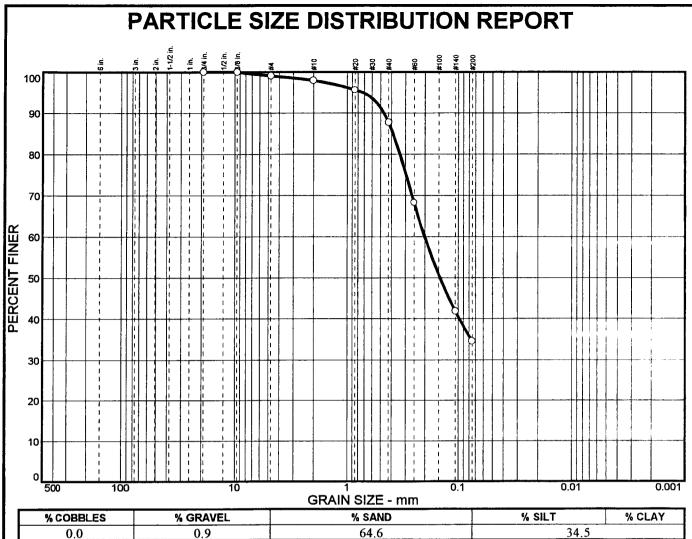
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Project: Pearce Creek

Project No: 3769.GE Reviewed by: JFC



ı	% COBBLES		% GRAVEL		% SAND % SILT %		% SAND % SILT		% SAND % SILT		% CLAY
I	0.0		0.9		64.6	34.5					
Ī	SIEVE	PERCENT	SPEC.*	PASS?	So	il Description					
ļ	SIZE	FINER	PERCENT	(X=NO)		D, some silt and clay, tra	ace medium				

SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
3/4 in. 3/8 in. #4 #10 #20 #40 #60 #140 #200	100.0 100.0 99.1 98.0 95.7 87.7 68.3 41.9 34.5		

	Atterberg Limits	
PL=	LL=	PI=
D <sub>85</sub> = 0.388 D <sub>30</sub> = C <sub>u</sub> =	<u>Coefficients</u> D <sub>60</sub> = 0.199 D <sub>15</sub> = C <sub>c</sub> =	D <sub>50</sub> = 0.145 D <sub>10</sub> =
USCS= SM	Classification AASHT	)=
	Remarks	

Sample No.: S-18

Source of Sample: TB-3

**Date:** 12/08/98

Location:

Elev./Depth: 38'-40'

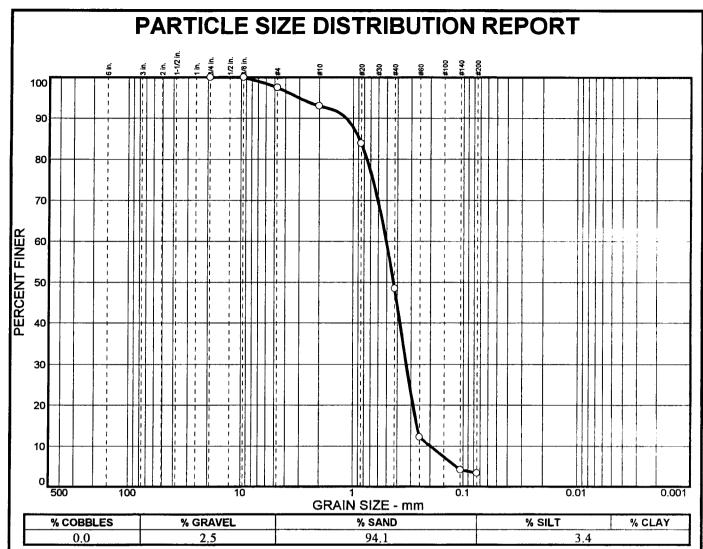
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Project: Pearce Creek

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SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
3/4 in. 3/8 in. #4 #10 #20 #40 #60 #140 #200	100.0 100.0 97.5 93.0 83.9 48.5 12.2 4.2 3.4		

PL=	Atterberg Limits LL=	Pl≃
D <sub>85</sub> = 0.885 D <sub>30</sub> = 0.332 C <sub>u</sub> = 2.56	Coefficients D60= 0.505 D15= 0.264 C <sub>c</sub> = 1.10	D <sub>50</sub> = 0.434 D <sub>10</sub> = 0.197
USCS= SP	Classification AASHTO	) <b>=</b>
	Remarks	

Sample No.: S-23

Source of Sample: TB-3

**Date:** 12/14/98

Location:

Elev./Depth: 48'-50'

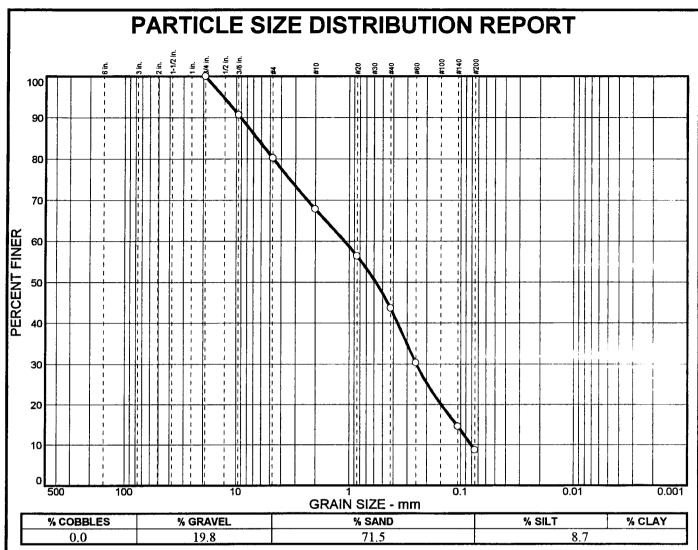
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Project: Pearce Creek

Project No: 3769.GE



SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
3/4 in. 3/8 in. #4 #10 #20 #40 #60 #140 #200	100.0 90.7 80.2 67.9 56.4 43.7 30.3 14.5 8.7		

Gray fine silt.	-	Soil Description SAND, little grave	! el, little coarse sand, tra
PL=	Ā	Atterberg Limits LL=	<u>s</u> PI=
D <sub>85</sub> = 6.5 D <sub>30</sub> = 0.2 C <sub>u</sub> = 13.5	247	Coefficients D <sub>60</sub> = 1.10 D <sub>15</sub> = 0.109 C <sub>c</sub> = 0.69	D <sub>50</sub> = 0.575 D <sub>10</sub> = 0.0810
USCS=	SW-SM	Classification AASH	ГО=
		<u>Remarks</u>	

Sample No.: S-31

Source of Sample: TB-3

Date: 12/08/98

Location:

**Elev./Depth:** 64'-66'

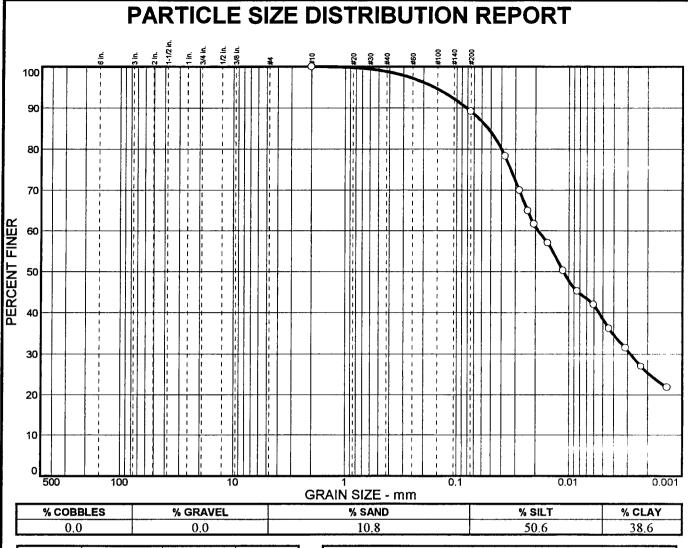
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SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
#10 #200	100.0 <b>89.2</b>		
200	٠,٠ <u>٠</u>		
	•		
1			

## **Soil Description** Dark-gray/light-gray clayey SILT, trace to little fine sand, trace

mica and organics. **Atterberg Limits** 

Coefficients D<sub>85</sub>= 0.0526 D<sub>30</sub>= 0.0028 C<sub>u</sub>=

 $D_{60} = 0.0188$ D<sub>15</sub>= C<sub>c</sub>=

 $D_{50}^{=0.0112}$   $D_{10}^{=0.0112}$ 

PI= 12.5

Classification USCS= ML AASHTO=

LL= 40

Remarks

\* (no specification provided)

Sample No.: SH-1

Source of Sample: TB-4

**Date:** 12/15/98

Elev./Depth: 16-18

Location:

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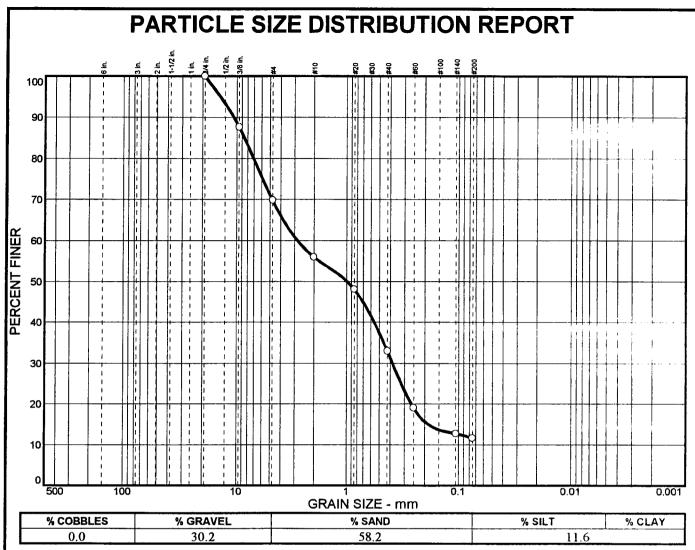
S400 LIMESTONE ROAD
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TEL. (302) 239-8634 FAX (302) 239-8495
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PL= 27.5

Project: Pearce Creek

Project No: 3769.GE



SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
3/4 in. 3/8 in. #4 #10 #20 #40 #60 #140 #200	100.0 87.6 69.8 56.0 48.1 33.0 19.0 12.7 11.6		

Soil Description  Light brown fine to coarse SAND, some gravel, little silt and clay.						
PL=	Atterberg Limits LL=	Pi=				
D <sub>85</sub> = 8.54 D <sub>30</sub> = 0.382 C <sub>u</sub> =	Coefficients D <sub>60</sub> = 2.81 D <sub>15</sub> = 0.187 C <sub>c</sub> =	D <sub>50</sub> = 0.986 D <sub>10</sub> =				
USCS= SP-SM	Classification AASHT	O=				
	<u>Remarks</u>					

Sample No.: S-13

Source of Sample: TB-5

**Date:** 12/08/98

Location:

Elev./Depth: 28'-30'

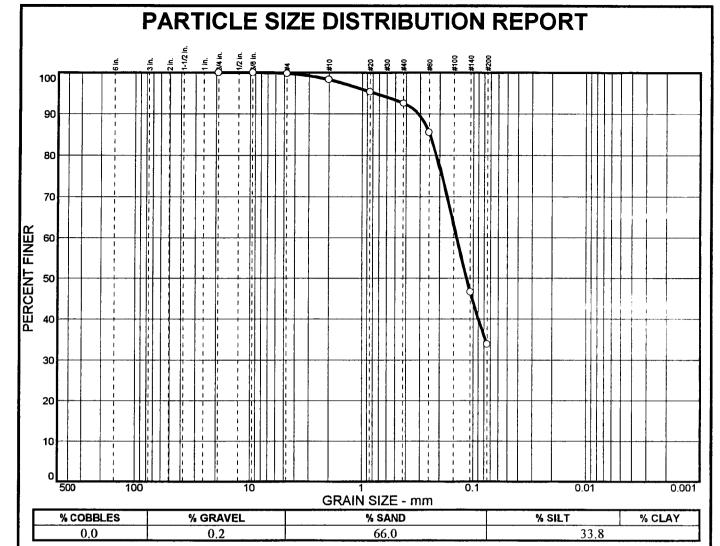
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Project: Pearce Creek

Project No: 3769.GE



SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
3/4 in. 3/8 in. #4 #10 #20 #40 #60 #140 #200	100.0 100.0 99.8 98.3 95.3 92.5 85.5 46.6 33.8		

Soil Description									
Gray fine silty SAND, trace medium sand, trace coarse sand, trace gravel.									
PL=	Atterberg Limits LL=	PI=							
D <sub>85</sub> = 0.246 D <sub>30</sub> = C <sub>u</sub> =	<u>Coefficients</u> D <sub>60</sub> = 0.140 D <sub>15</sub> = C <sub>c</sub> =	D <sub>50</sub> = () 114 D <sub>10</sub> =							
USCS= SM	Classification AASHTO	)=							
	Remarks								

Sample No.: S-20 Location:

Source of Sample: TB-5

**Elev./Depth:** 44'-46'

**Date:** 12/08/98

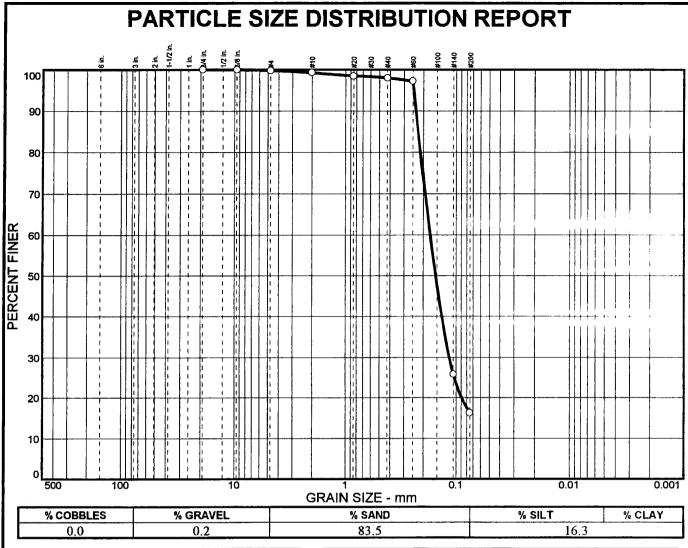
DUFFIELD

5400 LIMESTONE ROAD
WILLIAMINGTON, DELAWARE 19808-1232
TEL. (302) 239-6634 FAX (302) 239-8485
E-MAIL: DUFFIELD@DUFFNET.COM

Client: U.S. Army Corps of Engineers

Project: Pearce Creek

Project No: 3769.GE Reviewed by: JFC



SIEVE	PERCENT	SPEC.* PERCENT	PASS?
SIZE	FINER		(X=NO)
3/4 in. 3/8 in. #4 #10 #20 #40 #60 #140 #200	100.0 100.0 99.8 99.3 98.5 98.0 97.2 25.8 16.3		

Soil Description Varicolored fine SAND, little silt.							
PL=	Atterberg Limit	<u>ts</u> PI=					
D <sub>85</sub> = 0.222 D <sub>30</sub> = 0.115 C <sub>u</sub> =	Coefficients D60= 0.172 D15= C <sub>c</sub> =	D <sub>50</sub> = 0.153 D <sub>10</sub> =					
USCS= SM	<u>Classification</u> AASH						
	Remarks						

Sample No.: S-25

Source of Sample: TB-5

**Date:** 12/08/98

Location:

**Elev./Depth:** 54'-56'

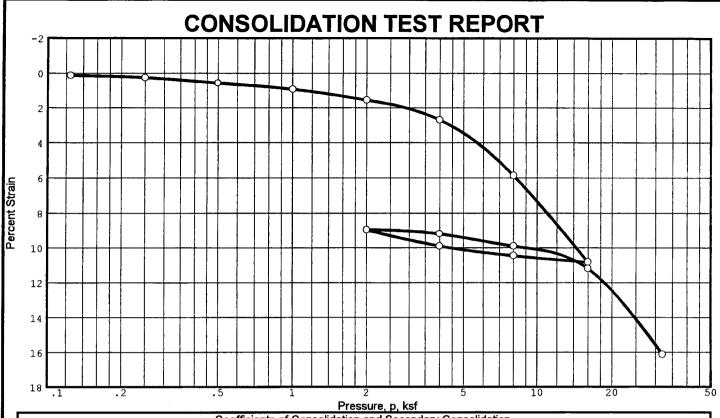
DUFFIELD

5400 LIMESTONE ROAD
WILLIAMSTON, DELAWARE 19908-1232
TEL. (302) 239-8634 FAX (302) 239-8495
E-MAIL: DUFFIELD@DUFFNET.COM

Client: U.S. Army Corps of Engineers

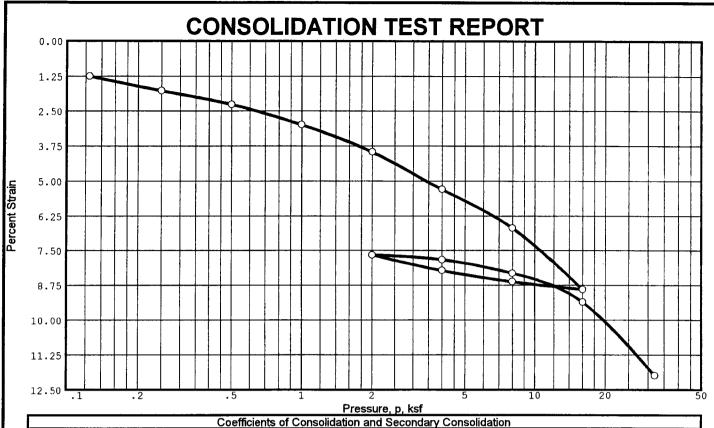
Project: Pearce Creek

Project No: 3769.GE



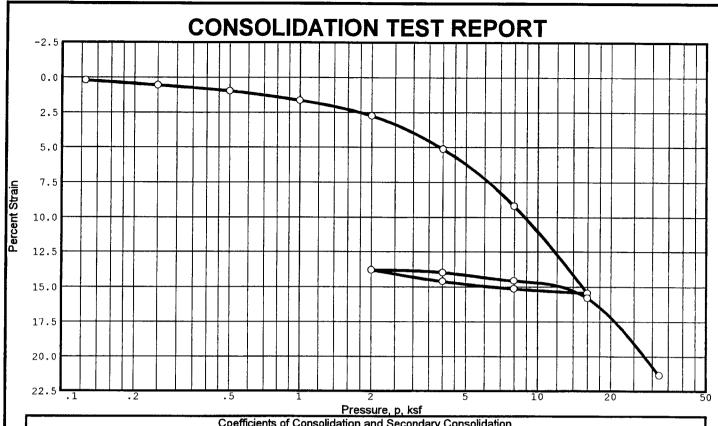
	Coefficients of Consolidation and Secondary Consolidation										
No.	Load (ksf)	C <sub>V</sub> (ft.2/day)	$C_{\alpha}$	No.	Load (ksf)	C <sub>V</sub> (ft.2/day)	$C_{\alpha}$	No.	Load (ksf)	C <sub>V</sub> (ft.2/day)	$c_{\alpha}$
2	0.25	2.66	0.000								
3	0.50	3.25	0.000								
4	1.00	1.63	0.001			İ		1 1		1	
5	2.00	1.82	0.001	1							
6	4.00	1.14	0.002	1				ŀ		1	
7	8.00	0.25	0.006								
8	16.00	0.12	0.009								
10	4.00	0.37		1 1							
11	2.00	0.10		l i		1		1 1		1	
12	4.00	0.92	0.000	1 1							
13	8.00	0.95	0.001	i l							
14	16.00	0.42	0.000								
15	32.00	0.12									

Materia	l Dark-gray a	and brown clayey	Before Test				After Test		
SILT,	trace sand, m	ica and organics.	Water Content, w <sub>o</sub>	49.8	8	٧f	ક		
Overbur	den Pressure,	P <sub>O</sub> (ksf)	Void Ratio, e <sub>o</sub>			ef			
Preconso	ol. Pressure,	P <sub>C</sub> <b>4.71</b> (ksf)	Saturation, $s_0$		8	s <sub>f</sub>	ક		
Compression Index, c <sub>C</sub>			Dry Density	71.1	(pcf)				
USCS	MH	AASHTO	Project No. 3769.GE Client U.S. Army Corps of Engineers						
LL	54	Gs	Project Pearce Cre	ek					
PL	31	D <sub>10</sub>							
Remarks			Boring No.	TB-1	Sample 1		SH-2 (20'-22')		
Compression Ratio, C'c = 0.18			Depth/El. 20.6'-20.8' Date			12/28/98			
Recompression Ratio, C'r = 0.02  Reviewed by:  JFC			DUI ASSO	CLATES	5400 LIMESTOR WILMINGTON, I TEL. (302) 239-I E-MAIL: DUFFIE	DELAWAR	RE 19808-1232 ( (302) 239-8485		



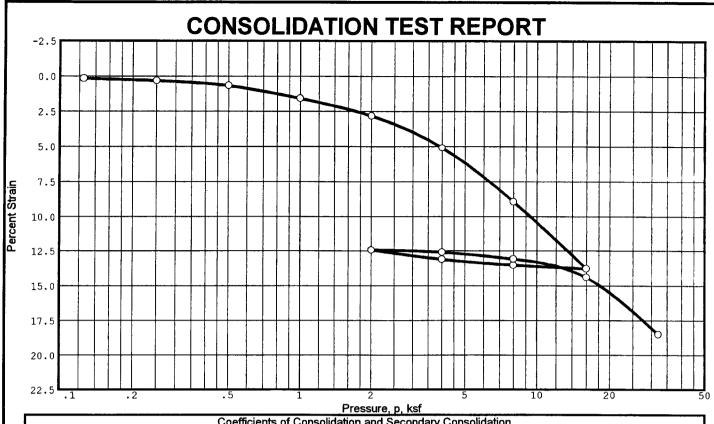
	Coefficients of Consolidation and Secondary Consolidation												
No.	Load (ksf)	C <sub>V</sub> (ft.2/day)	Cα	No.	Load (ksf)	C <sub>V</sub> (ft.2/day)	Cα	No.	Load (ksf)	C <sub>V</sub> (ft.2/day)	$C_{\alpha}$		
1	0.13	1.61	0.000	15	32.00	0.49	0.002						
2	0.25	4.10	0.001			]	Į	1					
3	0.50	0.39	0.001			1		1					
4	1.00	0.36	0.001										
5	2.00	0.33	0.001	1									
6	4.00	0.47	0.001					1					
7	8.00	0.57	0.001					1					
8	16.00	0.68	0.002										
10	4.00	1.16											
11	2.00	0.25											
12	4.00	2.39	0.000	1				1					
13	8.00	1.33	0.000					1					
14	16.00	0.94	0.001	1				<b>i</b>					

Materia	l Light-br./	gray silty CLAY,	Before Test				After Test		
trace	fine sand, tr	ace medium sand, tr	Water Content, w <sub>o</sub>	27.4	8	wf	26.0	ક	
Overbur	den Pressure,	P <sub>O</sub> (ksf)	Void Ratio, e <sub>O</sub>			ef			
Precons	ol. Pressure,	P <sub>C</sub> <b>5.49</b> (ksf)	Saturation, $s_0$		8	s <sub>f</sub>		8	
Compression Index, c <sub>C</sub>			Dry Density	97.0	(pcf)				
USCS	CL	AASHTO	Project No. 3769.GE Client U.S. Army Corps of Engineers						
LL	39	Gs	Project <b>Pearce Cre</b>	ek					
PL	24	D <sub>10</sub>			·				
Remarks			Boring No.	TB-2	Sample No.		SH-2 (12'-14')		
Compression Ratio C'c = 0.08			Depth/El. <b>13.2'-13.4'</b> Date				12/28/98		
Recompression Ratio C'r = 0.014  Reviewed by:  JFC				CLATES	5400 LIMESTON WILMINGTON, E TEL. (302) 239-4 E-MAIL: DUFFIE	DELAWAR 6634 FAX	(302) 239-8485		



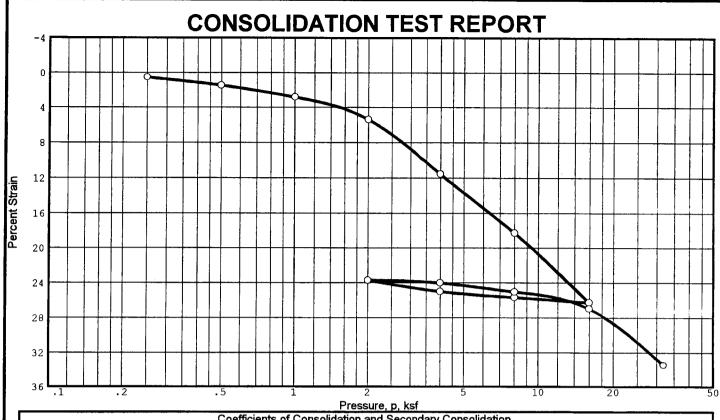
	Coefficients of Consolidation and Secondary Consolidation												
No.	Load (ksf)	C <sub>V</sub> (ft.2/day)	Cα	No.	Load (ksf)	C <sub>V</sub> (ft.2/day)	Cα	No.	Load (ksf)	C <sub>V</sub> (ft.2/day)	$C_{\alpha}$		
1	0.13	1.27	0.000							1			
2	0.25	0.92	0.001				ļ						
4	1.00	1.10	0.001			1	l	ł l					
5	2.00	0.33	0.001	1									
6	4.00	0.15	0.004	•						}			
7	8.00	0.14	0.006										
8	16.00	0.12	0.008	l i							i		
9	8.00	0.72								1			
10	4.00	0.84											
11	2.00	0.10					ļ	1 1					
12	4.00	2.54	0.000							ı			
14	16.00	2.95	0.003										
15	32.00	0.14	0.009										

							T			
Materia	al Dark-gray	clayey SILT, trace to	Before Test				After Test			
little	e fine sand,	trace mica and	Water Content, w <sub>o</sub>	46.2	8	wf	31.1	8		
Overbur	rden Pressure	e, p <sub>0</sub> (ksf)	Void Ratio, e <sub>o</sub>			ef				
Precons	sol. Pressure	e, p <sub>C</sub> <b>3.52</b> (ksf)	Saturation, so		8	sf		8		
Compression Index, c <sub>C</sub>			Dry Density	72.0	(pcf)			-		
USCS	МН	AASHTO	Project No. 3769.GE Client U.S. Army Corps of Engineers							
LL	52	Gs	Project Pearce Cree	ek						
PL	30	D <sub>10</sub>						7 8 7		
Remarks			Boring No.	TB-3	Sample N	lo.	SH-1 (16'-18')			
Compression Ratio, C'c = 0.21  Recompression Ratio, C'r = 0.034			Depth/El. 17.	0'-17.2'	Date		12/18/98			
			DUI		5400 LIMESTON WILMINGTON, D		E 19808-1232			
Reviewed by: JFC				CITATORIC	TEL. (302) 239-6 E-MAIL: DUFFIE	634 FAX	(302) 239-8485			



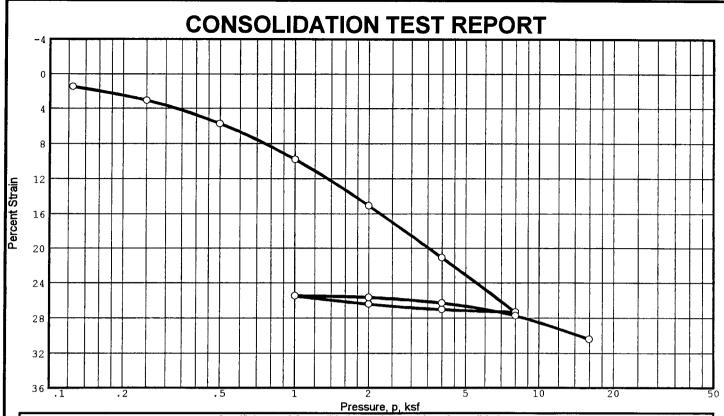
	Coefficients of Consolidation and Secondary Consolidation													
No.	Load (ksf)	C <sub>V</sub> (ft.2/day)	$c_{a}$	No.	Load (ksf)	C <sub>V</sub> (ft.2/day)	$c_{\pmb{lpha}}$	No.	Load (ksf)	C <sub>V</sub> (ft.2/day)	$C_{\pmb{lpha}}$			
1	0.13	3.25	0.000	14	16.00	1.38	0.003							
2	0.25	1.10	0.000	15	32.00	0.26	0.007	1		1				
3	0.50	0.78	0.001					1						
4	1.00	0.96	0.001					1						
5	2.00	0.88	0.002	1				li						
6	4.00	0.19	0.003					1						
7	8.00	0.22	0.005					1 1						
8	16.00	0.26	0.006	1 1				1						
9	8.00	0.71						1 1						
10	4.00	3.13						1						
11	2.00	0.15						1						
12	4.00	0.76	0.000					]						
13	8.00	0.57	0.001					1		1				

Material <b>Dar</b> l	k-gray/l	ight-gray clayey	Before Test				After Test		
SILT, trace	to littl	e fine sand, trace	Water Content, wo	34.2	8	wf		8	
Overburden Pr	essure,	Po (ksf)	Void Ratio, e <sub>o</sub>			ef			
Preconsol. Pr	essure,	P <sub>C</sub> <b>2.51</b> (ksf)	Saturation, so		8	s <sub>f</sub>		8	
Compression Index, c <sub>c</sub>			Dry Density	84.2	(pcf)				
USCS MI	<b>.</b>	AASHTO	Project No. 3769.GE Client U.S. Army Corps of Engineers						
LL 40		Gs	Project <b>Pearce C</b>	reek					
PL <b>27</b>		D <sub>10</sub>							
Remarks			Boring No.	Boring No. TB-4		lo.	SH-1 (16'-18')		
Compression Ratio, C'c = 0.16			Depth/El.	17.0'-17.2'	Date	•	12/15/98		
Recompression	on Ratio,	C'r = 0.014	DI		5400 LIMESTON WILMINGTON, D		19808-1232		
Reviewed by: JFC				COCIATES	TEL. (302) 239-6 E-MAIL: DUFFIE	634 FAX (	302) 239-8485		



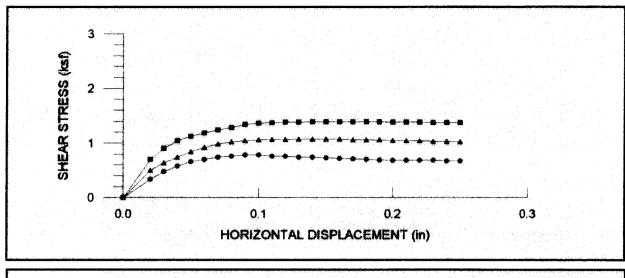
	Coefficients of Consolidation and Secondary Consolidation										
No.	Load (ksf)	C <sub>V</sub> (ft.2/day)	$C_{\alpha}$	No.	Load (ksf)	C <sub>V</sub> (ft.2/day)	$C_{\pmb{lpha}}$	No.	Load (ksf)	C <sub>V</sub> (ft.2/day)	$C_{\alpha}$
1	0.25	0.09	0.001	14	32.00	0.06	0.011				
2	0.50	0.15	0.002			!					
3	1.00	0.16	0.003					1 1			
4	2.00	0.14	0.007								
5	4.00	0.07	0.011	1				1			
6	8.00	0.06	0.018								
7	16.00	0.06	0.015								
8	8.00	0.87									
9	4.00	0.20								1	
10	2.00	0.03				1				1	
11	4.00	0.34	0.000								
12	8.00	0.28	0.002	l				1			
13	16.00	0.19	0.005								

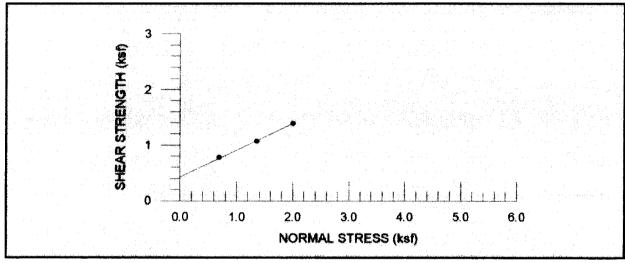
Materia	al Gray/dar	k-gray silty CLAY,	Before Test			After Test			
trace	fine sand a	and organics	Water Content, w <sub>o</sub>	67.2	ક	٧f	45.6	8	
Overbur	rden Pressur	ce, p <sub>o</sub> (ksf)	Void Ratio, e <sub>o</sub>			ef			
Precons	sol. Pressur	re, p <sub>C</sub> 2.10 (ksf)	Saturation, $s_{\mathrm{O}}$		8	sf		8	
Compression Index, c <sub>C</sub>			Dry Density	56.6	(pcf)				
USCS	СН	AASHTO	Project No. 3769.GE	Project No. 3769.GE Client U.S. Army Corp			rps of Engineers		
LL	71	Gs	Project Pearce Cree	k					
PL	33	D <sub>10</sub>							
Remarks	5		Boring No.	TB-5	Sample N	lo.	SH-1 (4'-6')		
Compression Ratio, C'c = 0.25			Depth/El. 5.1	L'-5.3'	Date		12/11/98		
Recompression Ratio, C'r = 0.03			DUF		5400 LIMESTON WILMINGTON, D				
Reviewed by: JFC				CTATEC		634 FA	X (302) 239-8485		



Coefficients of Consolidation and Secondary Consolidation C<sub>V</sub> (ft.2/day) C<sub>V</sub> (ft.2/day) C<sub>V</sub> (ft.2/day) Load Load Load  $\mathtt{C}_{\alpha}$ No. No.  $C_{\alpha}$ No.  $C_{\alpha}$ (ksf) (ksf) (ksf) 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 1.00 0.09 0.010 4 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 8.00 0.005

Material	Gray clayey	/ SILT, trace mica	Before Test			After Test		
and org	anics (plant	stem).	Water Content, w <sub>O</sub>	67.5	8	w <sub>f</sub>	49.2 %	
Overburd	en Pressure,	p <sub>O</sub> (ksf)	Void Ratio, e <sub>O</sub>			ef		
Preconso	l. Pressure,	P <sub>C</sub> 0.64 (ksf)	Saturation, s <sub>o</sub>		8	s <sub>f</sub>	. 8	
Compression Index, $c_{\rm C}$			Dry Density	59.8	(pcf)			
USCS	МН	AASHTO	Project No. 3769.GE Client U.S. Army Corps of Engineers			of Engineers		
LL	72	Gs	Project Pearce Cree	k				
PL	36	D <sub>10</sub>						
Remarks			Boring No.	TB-5	Sample N	lo.	SH-2 (10'-12')	
Consolidation Ratio, C'c = 0.20			Depth/El. 10.	1'-10.3'	Date		12/12/98	
Reconso	lidation Rat	io, C'r = 0.026	DUI	TILLU	5400 LIMESTON WILMINGTON, D	ELAWAR		
Reviewed by: JFC			ASSC		TEL. (302) 239-6 E-MAIL: DUFFIE			



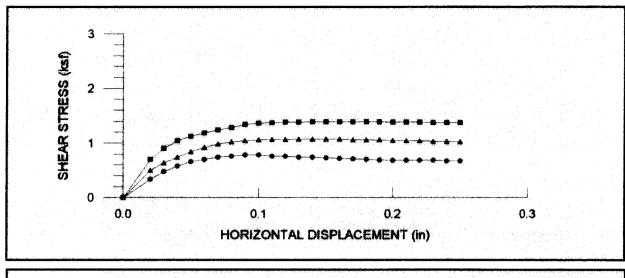


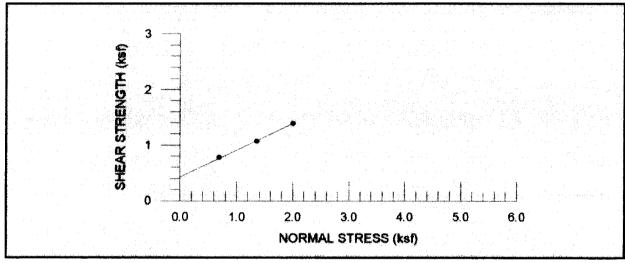
c'(ksf) = .46Sample Identification: TB-3 SH-1 (16'-18')  $\phi' = 25^{\circ}$ Sample Description: Dark-gray clayey SILT, trace to little fine sand, trace mica and organics. Initial Moisture Content (%): 46.2 % Passing No. 200 Sieve: 89.0 Test No. Dry Unit Weight (PCF): 72.0 2 3 Liquid Limit: 52 Plastic Limit: 30 Normal Stress (ksf): 0.69 2.0 1.35 Plastic Index: 22 Max. Shear Strength (ksf): .783 1.07 1.39 USCS Class: MH Rate of Strain (in/min): 0.02 0.02 0.02 Initial Height (in.): 1.00 1.00 1.00 Legend Sample Diameter (in.): 2.48 2.48 2.48 Test 1 (17.72' - 17.87') Test 2 (17.57' - 17.72') Test 3 (17.42' - 17.57') Remarks:



Project: Pearce Creek
Work Order Number: 3769.GD

Date: 01/99



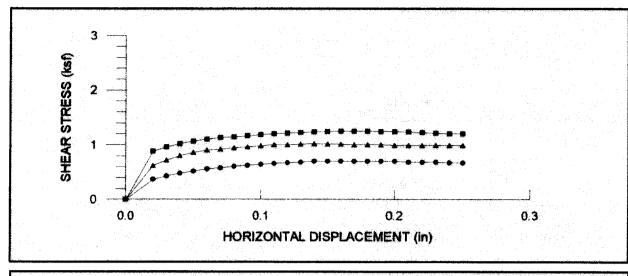


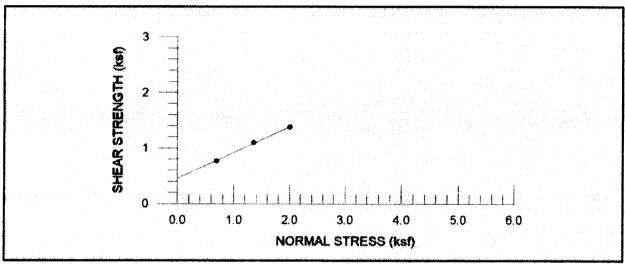
c'(ksf) = .46Sample Identification: TB-3 SH-1 (16'-18')  $\phi' = 25^{\circ}$ Sample Description: Dark-gray clayey SILT, trace to little fine sand, trace mica and organics. Initial Moisture Content (%): 46.2 % Passing No. 200 Sieve: 89.0 Test No. Dry Unit Weight (PCF): 72.0 2 3 Liquid Limit: 52 Plastic Limit: 30 Normal Stress (ksf): 0.69 2.0 1.35 Plastic Index: 22 Max. Shear Strength (ksf): .783 1.07 1.39 USCS Class: MH Rate of Strain (in/min): 0.02 0.02 0.02 Initial Height (in.): 1.00 1.00 1.00 Legend Sample Diameter (in.): 2.48 2.48 2.48 Test 1 (17.72' - 17.87') Test 2 (17.57' - 17.72') Test 3 (17.42' - 17.57') Remarks:



Project: Pearce Creek
Work Order Number: 3769.GD

Date: 01/99





c'(ksf) = .45φ' = 23° Test No. 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

Sample Identification: TB-4 SH-1 (16'-18')
Sample Description: Dark-gray/light gray clayey SILT, trace

Sample Description: Dark-gray/light gray dayey 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

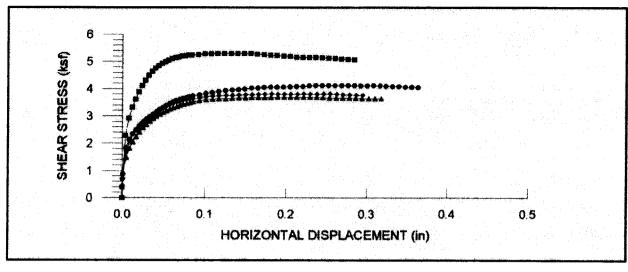
	Legend	
-	Test 1 (17.75' - 17.90'	)
	Test 2 (17.60' - 17.75'	)
	Test 3 (17.45' - 17.60'	)

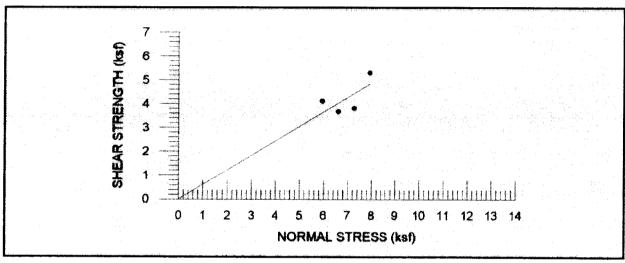
DUFFIELD 5400 LIMESTONE ROAD
WILMINGTON, DELAWARE 19809-1232
ASSOCIATES E-MAL: DUFFIELD@DUFFNET.COM

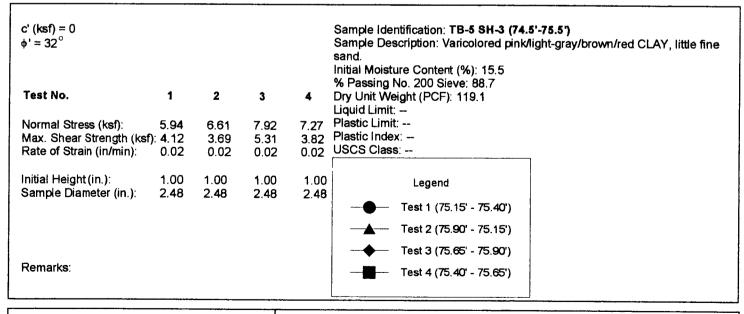
Remarks:

Project: Pearce Creek Work Order Number: 3769.GD

Date: 01/99



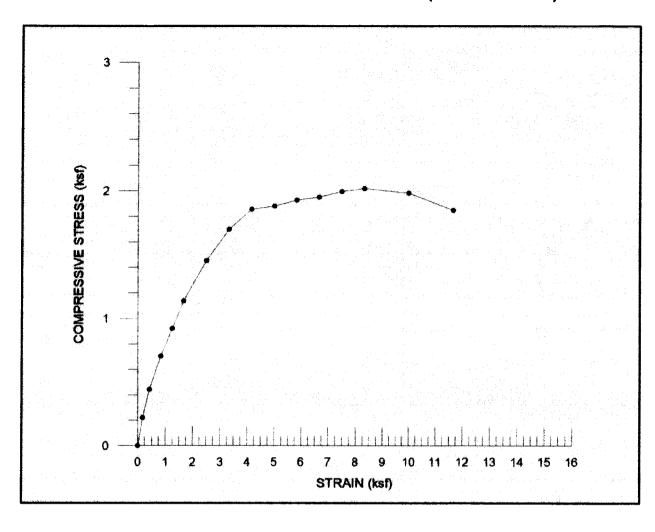




DUFFIELD 5400 LIMESTONE ROAD WILMINGTON, DELAWARE 19809-1222
ASSOCIATES ENAM: DUFFIELD@DUFFNET.COM

Project: Pearce Creek Work Order Number: 3769.GD

Date: 01/99



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

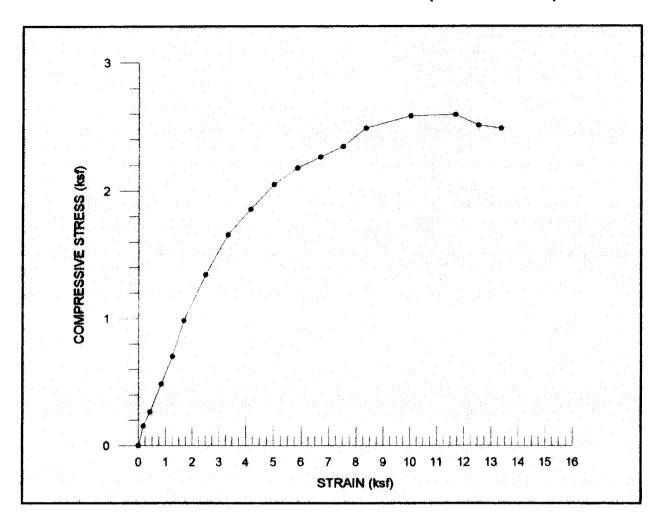
Liquid Limit: 59
Plastic Limit: 33
Plastic Index: 26
USCS Class: MH

Remarks:

DUFFIELD MILAMINGTON, DELAMARE 19808-1232
ASSOCIATES E-MAIL: DUFFIELD@CUFFNET.COM

Project: Pearce Creek Work Order Number: 3769.GE

Date: 11/24/98



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:

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: 39
Plastic Limit: 24
Plastic Index: 15
USCS Class: CL

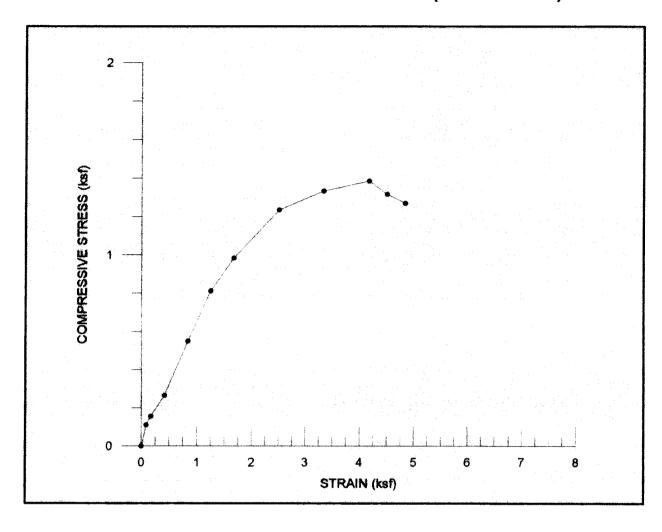
Remarks:

DUFFIELD SAGE LIMESTONE ROAD

ASSOCIATES E-MAIL: OUFFIELD@DUFFNET.COM

Project: Pearce Creek Work Order Number: 3769.GE

Date: 11/24/98



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: 52
Plastic Limit: 30
Plastic Index: 22
USCS Class: MH

Remarks:

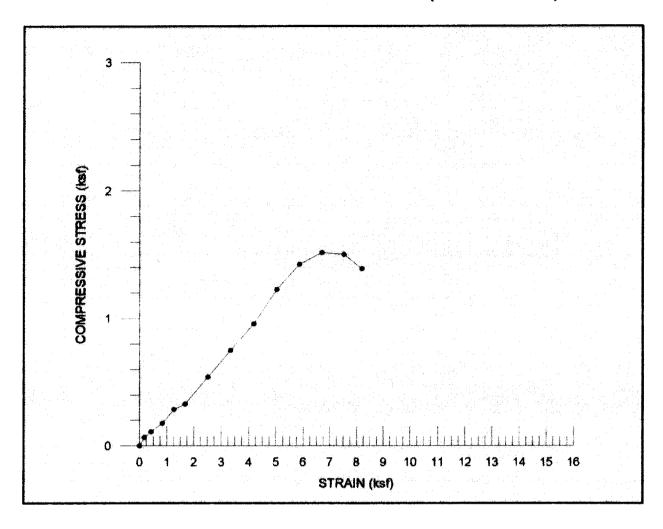
DUFFIELD MILMINGTON, DELAMARE 19505-1232

ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

Project: Pearce Creek

Work Order Number: 3769.GE

Date: 12/11/98



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

Failure Sketch:



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: --

Remarks:

ASSOCIATES

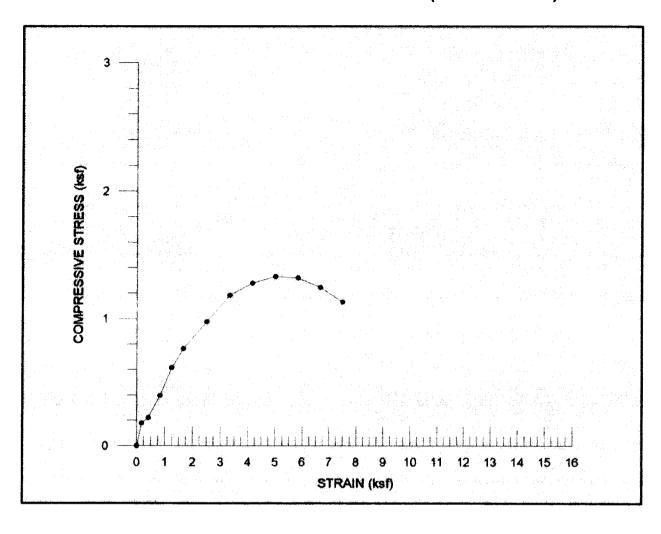
S400 LINESTON, DELAWARE 19208-1232

REL (302/230-030) FAX (302/239-9485
E-MAR.: DUFFIELD@OUFFNET.COM

Project: Pearce Creek

Work Order Number: 3769.GE

Date: 12/11/98



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

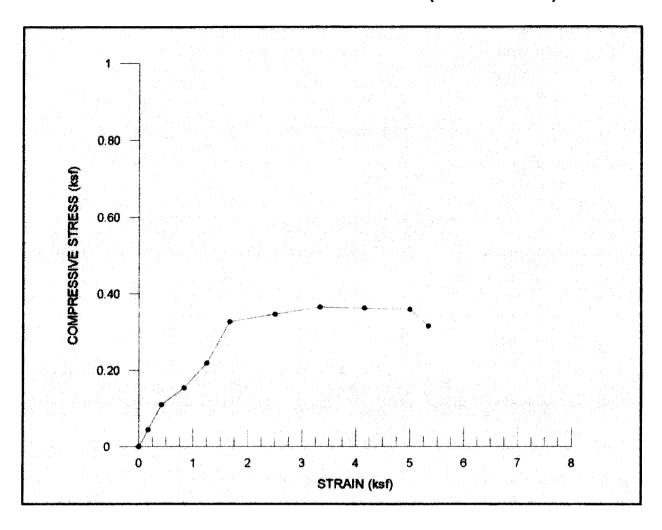
Liquid Limit: 40 Plastic Limit: 28 Plastic Index: 12 USCS Class: ML

Remarks:

DUFFIELD SHOO LIMESTONE ROAD
MILMINGTON, DELAMARE 19809-1232
ASSOCIATES E-MAIL: DUFFELO@DUFFNET.COM

Project: Pearce Creek Work Order Number: 3769.GE

Date: 11/24/98



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

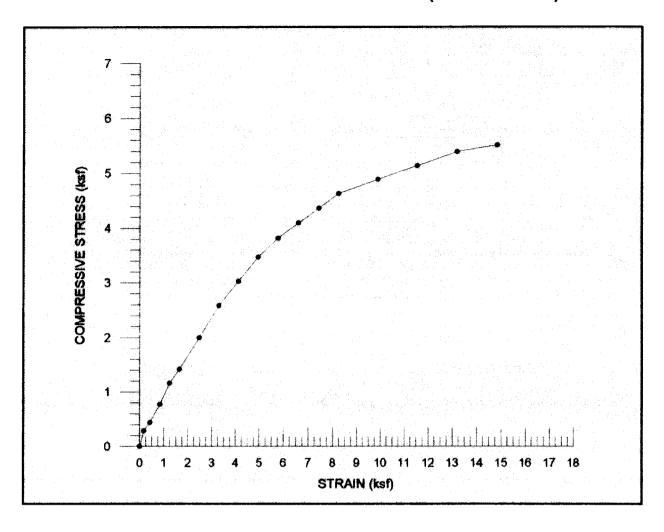
Liquid Limit: 71 Plastic Limit: 33 Plastic Index: 38 USCS Class: CH

Remarks:

DUFFIELD MILMINGTON, DELAMARE 18888-1232
ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

Project: Pearce Creek
Work Order Number: 3769.GE

Date: 12/03/98



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:

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: —

Remarks:

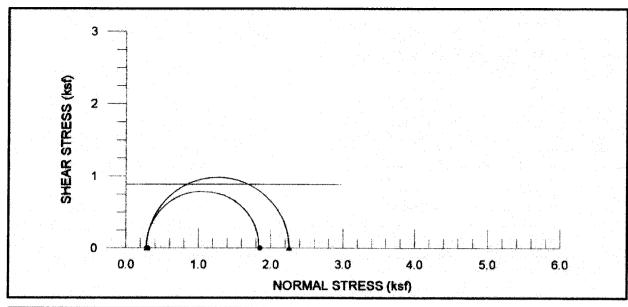
DUFFIELD MLANINGTON, DELAWARE 19309-1222
ASSOCIATES E-MAIL: DUFFRELD@DUFFNET.COM

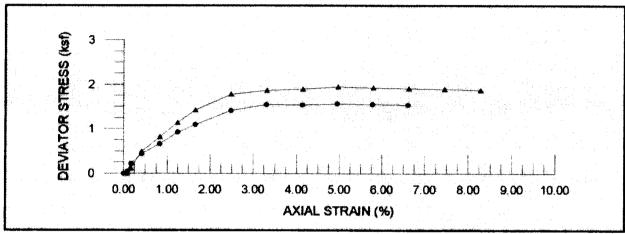
Project: Pearce Creek
Work Order Number: 3769.GE

Date: 12/13/98

#### 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.





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:

1 2

Remarks: Unable to obtain 3 complete samples, void in top part of tube due to piston sampler.

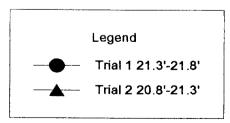
Sample Identification: TB-1 SH-2 (20'-22')

Sample Description: Dark-gray and brown dayey SILT, little sand, trace

mica and organics.

Initial Moisture Content (%): 49.8 % Passing No. 200 Sieve: 91.0 Dry Unit Weight (PCF): 71.7

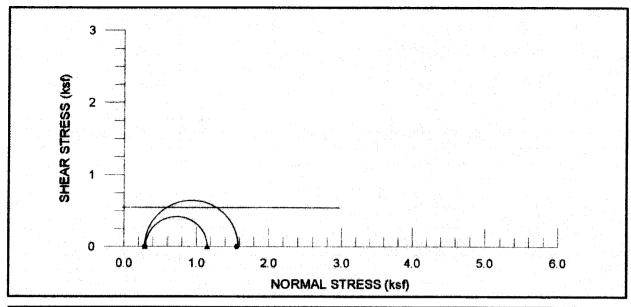
Liquid Limit: 54 Plastic Limit: 31 Plastic Index: 23 USCS Class: MH

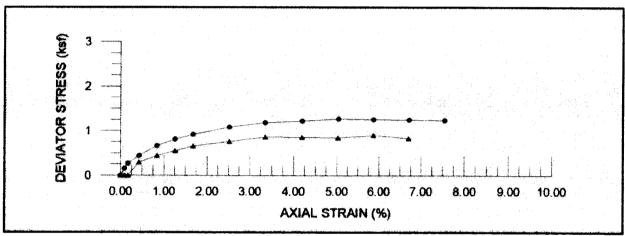


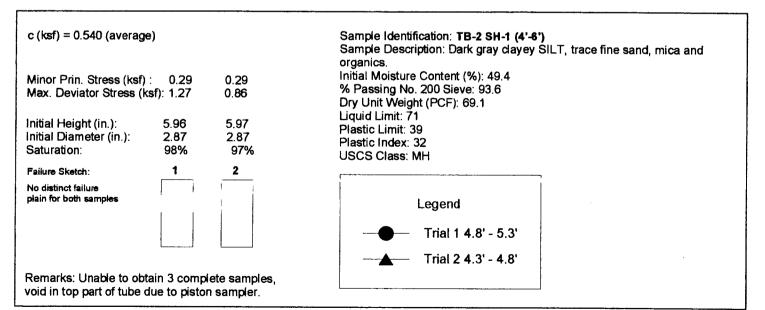
DUFFIELD MILHINGTON, DELANGARE 198904-1232
ASSOCIATES TELL (302/230-0434) FAX (302/230-0465) E-MAIL: DUFFRELD@DUFFRET.COM

Project: Pearce Creek
Work Order Number: 3769.GE

Date: 12/98







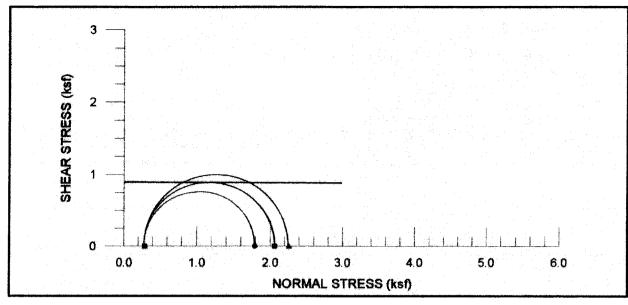
DUFFIELD 5400 LIMESTONE ROAD

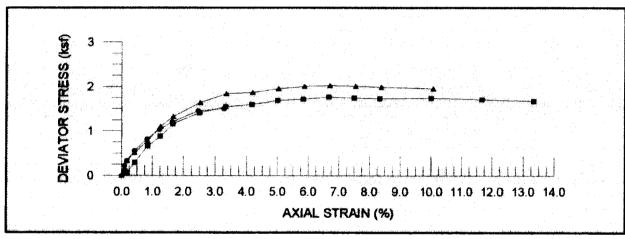
ASSOCIATES FAL (302)239-9453 FAX (302)239-9455

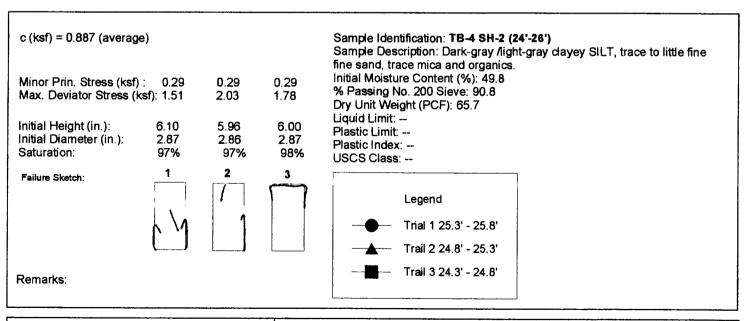
E-MAIL: DUFFIELD@DUFFIET.COM

Project: Pearce Creek Work Order Number: 3769.GE

Date: 1/99



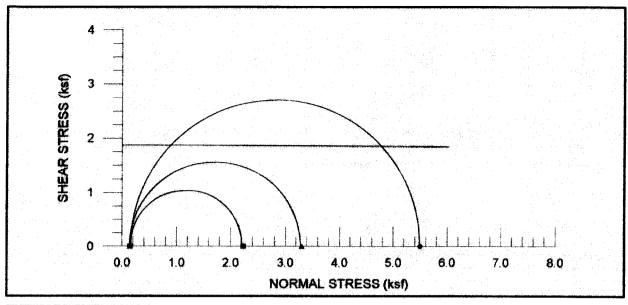


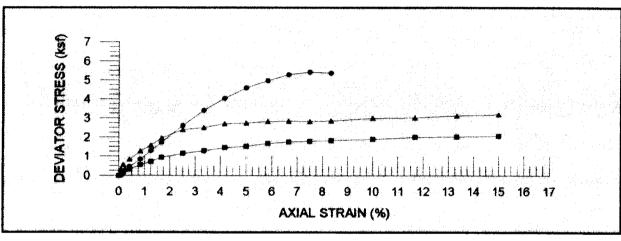


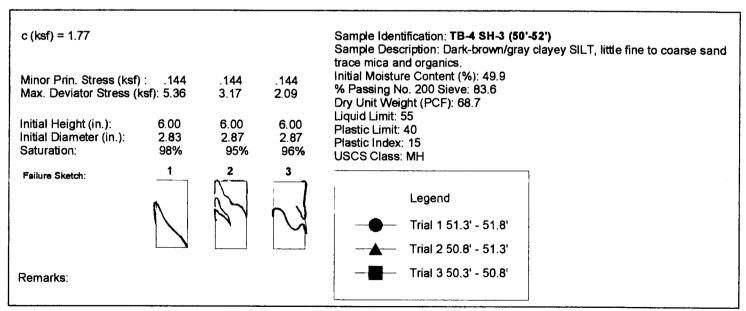
DUFFIELD MILMINGTON, DELAMARE 19898-1232
ASSOCIATES TELL (302)239-63455 E-MAIL: DUFFIELD@DUFFNET.COM

Project: Pearce Creek Work Order Number: 3769.GE

Date: 12/98







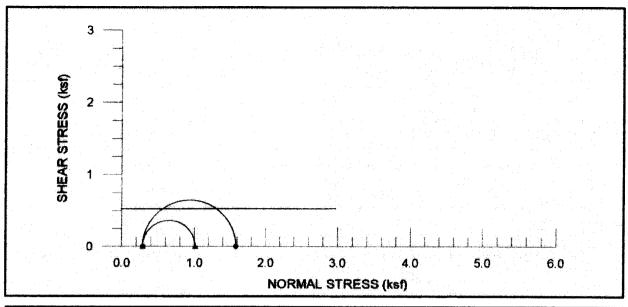
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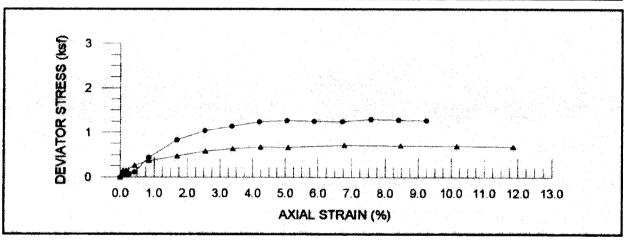
MILANISTON, DELAMARE 19898-1232

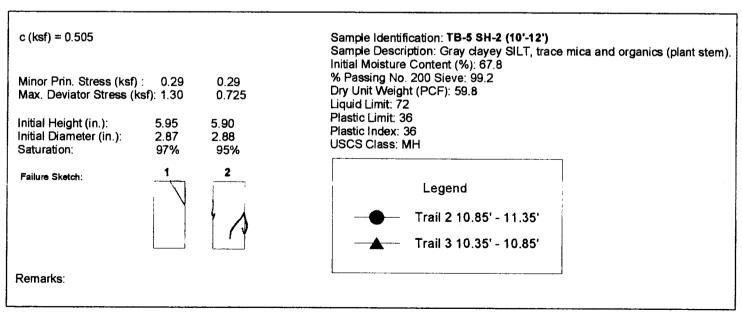
ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

Project: Pearce Creek Work Order Number: 3769.GE

Date: 12/98







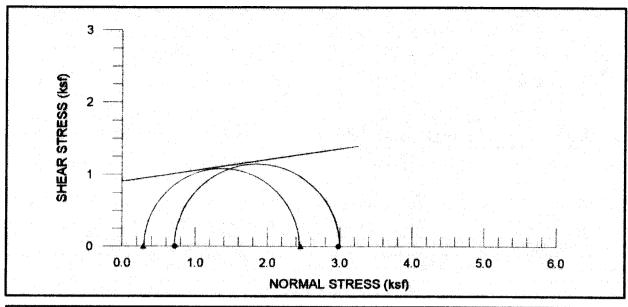
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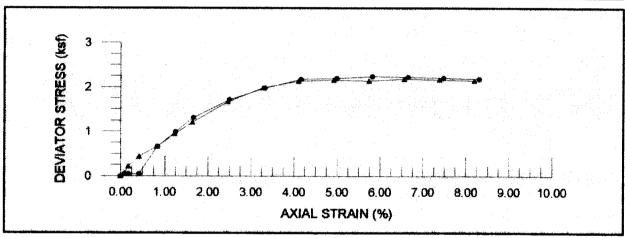
ASSOCIATES E-MAIL: DUFFRELD@DUFFNET.COM

Project: Pearce Creek Work Order Number: 3769.GE

Date: 12/98

### TRIAXIAL COMPRESSION TEST, R (ASTM: D4767)





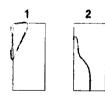
c (ksf) = 0.910

 $\phi = 9^{\circ}$ 

Minor Prin. Stress (ksf): 0.72 0.29 Max Deviator Stress (ksf): 2.26 2.17

Initial Height (in.): Initial Diameter (in.): Saturation: 6.02 6.10 2.87 2.87 96% 96%

Failure Sketch:



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'

Remarks:

DUFFIELD 5400 LIMESTONE ROAD WEARINGTON, DELAWARE 19899-1232 ASSOCIATES E-MAIL: DUFFIELD@DUFFNET.COM

Project: Pearce Creek
Work Order Number: 3769.GE

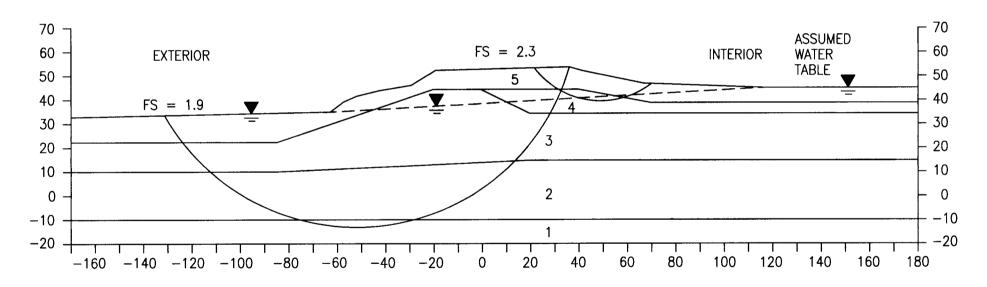
Date: 12/98

### **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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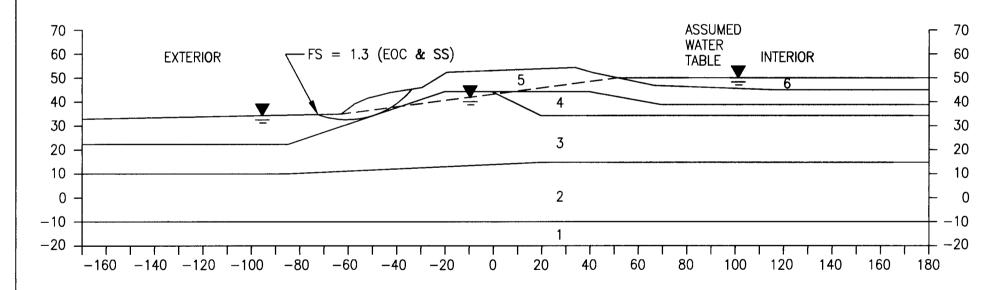
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Drawn: Cl	Y Chlk'd: DSS	Date:	29 JULY 19	99
Scale:	1" = 40'	W.O.:	3769.GL	
File No:	A-3769GL-01		FIGURE E.	1
No:	Rev	ision:		Date:

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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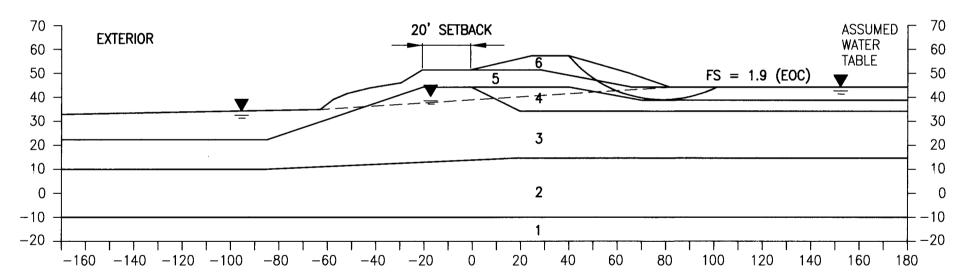
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Drawn: C	FY Chk'd: DSS	Date:	29 JULY	1999
Scale:	1" = 40'	W.O.:	3769.G	L
File No:	A-3769GL-02		FIGURE	E.2
No:	Rev	ision:		Date:

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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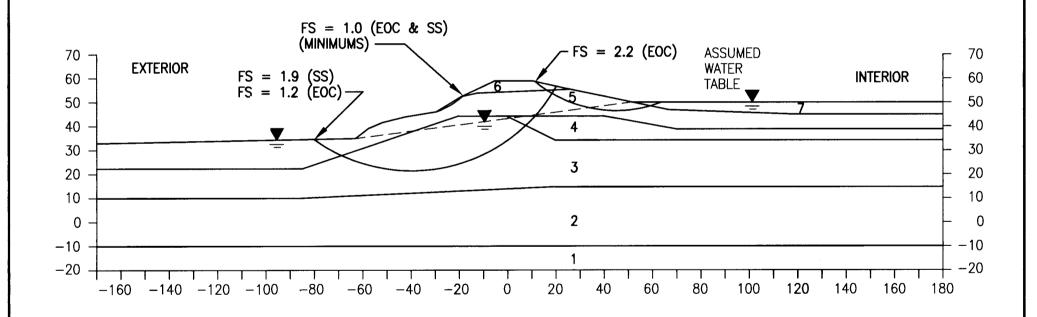
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Drawn: C	FY Chk'd: DSS	Date:	29 JULY	1999
Scale:	1" = 40'	W.O.:	3769.G	L
File No:	A-3769GL-21		FIGURE	E.3
No:	Rev	ision:		Date:

CROSS SECTION A-A
RAISED DIKE WITH DREDGED MATERIAL
ELEVATION OF 50 FEET AND NO SETBACK

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHE (PC		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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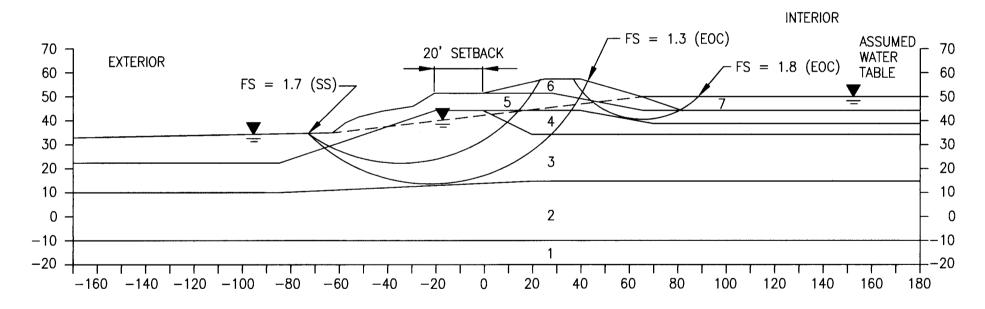
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File No:	A-3769GL-03	į	FIGURE 1	E.4		
No:	Rev	ision:	zion: Date:			

STRATA	DESCRIPTION	WET U	JNIT (PCF)	COHE (PC		FRIC ANGLE	TION E (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

CROSS SECTION A—A

RAISED DIKE WITH DREDGED MATERIAL
ELEVATION OF 50 FEET AND 20 FOOT SETBACK

EOC = END OF CONSTRUCTION SS = STEADY STATE SEEPAGE





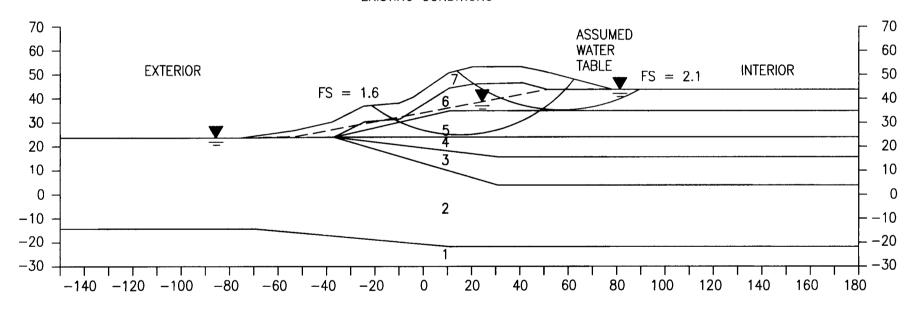
DUFFIELD ASSOCIATES, INC. CONSULTANTS IN THE GEOSCIENCES 5400 LIMESTONE ROAD WILMINGTON, DELAWARE 19808-1232 TEL. (302)239-8634 FAX (302)239-8485 E-MAIL: DUFFIELD@DUFFNET.COM

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Scale:       1" = 40'       W.O.:       3769.0         File No:       A-3769GL-04       FIGURE	Drawn: CFY Chk'd: DSS	Date: 29 J	ULY 1999
120 1101 12 010012 01	Scale: 1" = 40'	W.O.: 3'	769.GL
N	File No: A-3769GL-04	FIG	URE E.5
No: Kevision:	No: Re	vision:	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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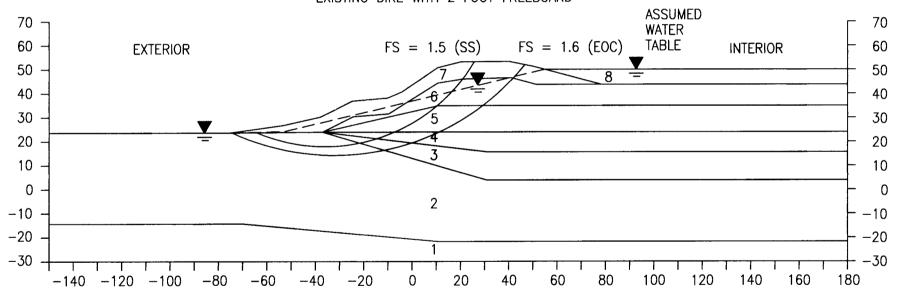
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Drawn: C	FY Chk'd: DSS	Date:	29 JULY 1999	
Scale:	1" = 40'	₩.0.:	3769.GL	
File No:	A-3769GL-05		FIGURE E.6	
No:	Revision:			te:

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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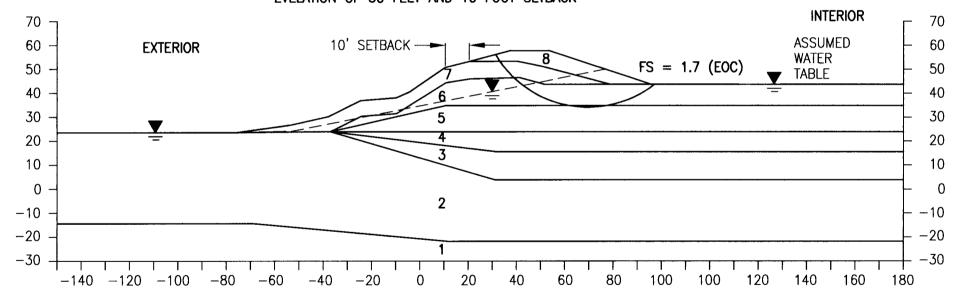
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Chk'd: DSS	Date:	29 JULY	TAAA
1" = 40'	₩.0.:	3769.0	3L
A-3769GL-06		FIGURE	E.7
Revision:			Date:
	A-3769GL-06	A-3769GL-06	A-3769GL-06 FIGURE

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
PEARCE CREEK
DREDGED MATERIAL
CONTAINMENT AREA
CECIL COUNTY ~ MARYLAND

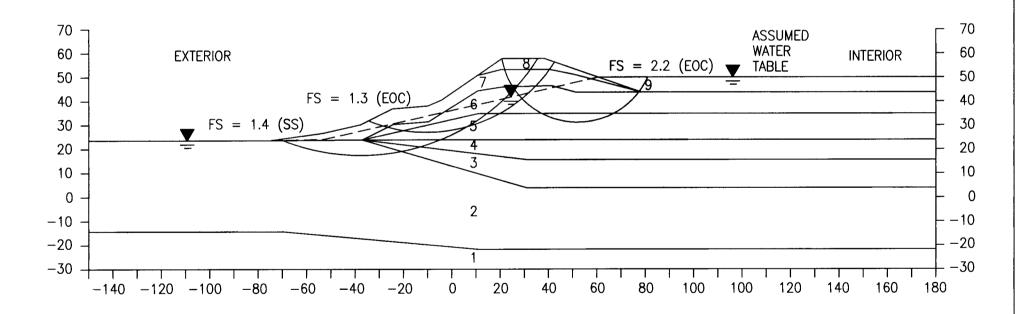
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Scale:	1" = 40'	W.O.: 3769.GL			
File No:	A-3769GL-22	FIGURE E.8			
No:	Revision: Da				

NO. REVISION. DAG

CROSS SECTION B-B
RAISED DIKE WITH DREDGED MATERIAL
ELEVATION OF 50 FEET AND NO SETBACK

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)				
		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



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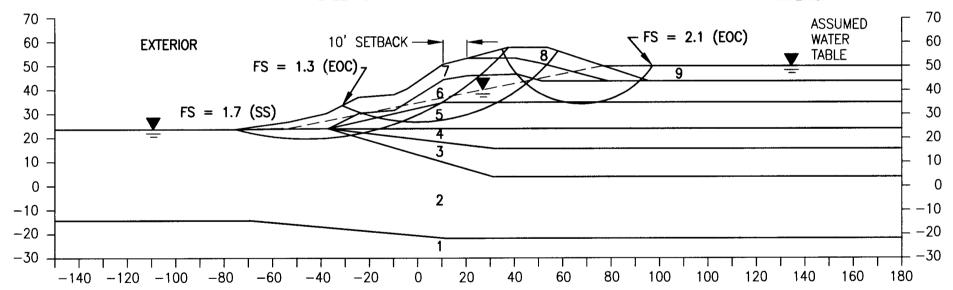
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Scale:	1" = 40'	₩.0.:	3769.G	L
File No:	A-3769GL-07		FIGURE	E.9
No:	c: Revision:			Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (PCF)		COHESION (PCF)		FRICTION ANGLE (deg.)	
	1	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

#### **INTERIOR**



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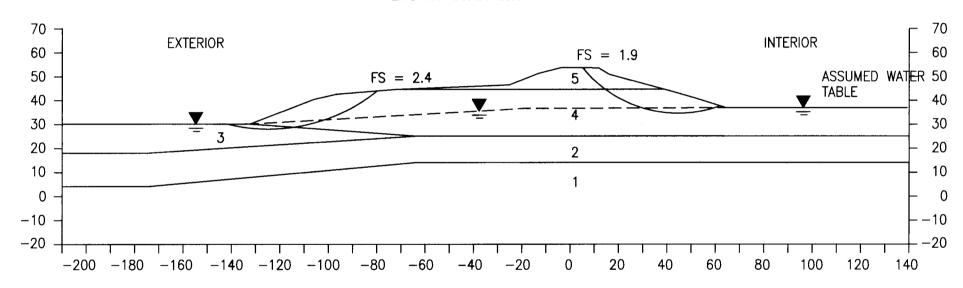
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File No:	A-3769GL-08		FIGURE 1	E.10
No:	Revision:			Date:

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





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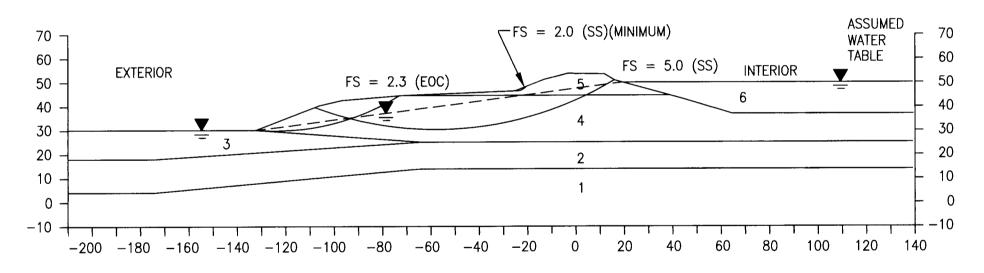
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File No:	A-3769GL-09		FIGURE	E.11
No:	Rev	ision:		Date:

STRATA	DESCRIPTION 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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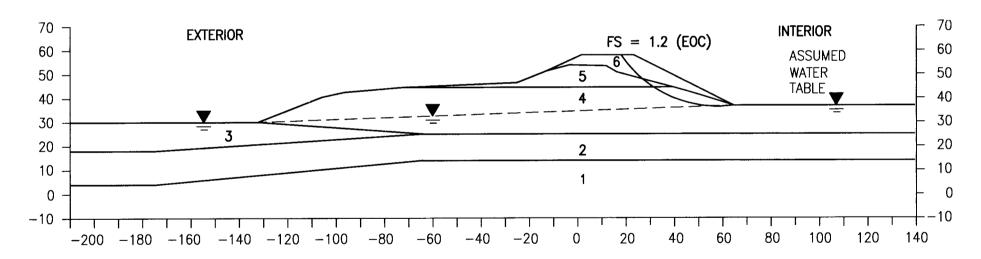
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Scale:	1" = 40'	₩.0.:	3769.GI	
File No:	A-3769GL-10		FIGURE E	.12
No:	Rev	ision:		Date:
			i	

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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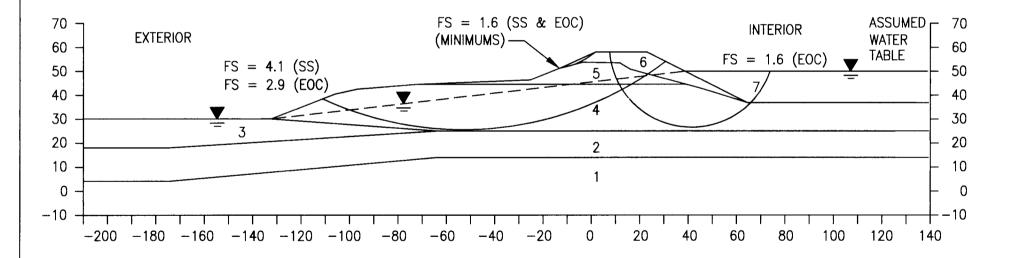
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File No: A-3769GL-23		FIGURE 1	E.13
No: Rev	ision:		Date:

STRATA	DESCRIPTION	WET UNIT WEIGHT (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	

CROSS SECTION C-C
RAISED DIKE WITH DREDGED MATERIAL
ELEVATION OF 50 FEET

EOC = END OF CONSTRUCTION SS = STEADY STATE SEEPAGE



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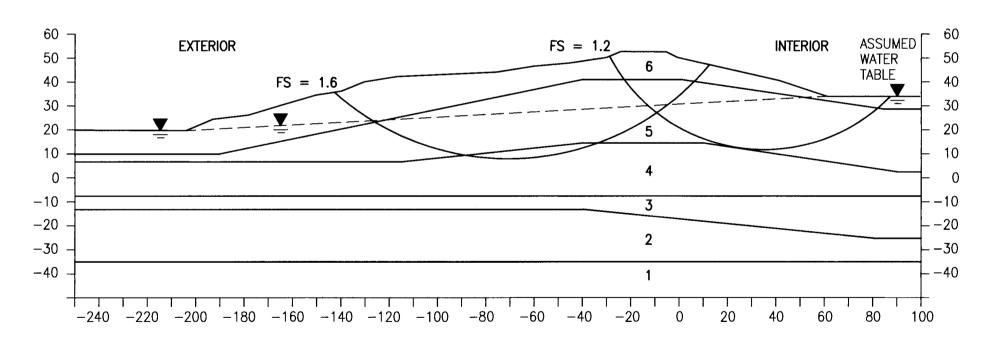
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File No:	A-3769GL-11		FIGURE 1	E.14
No:	Revis	ion:		Date:

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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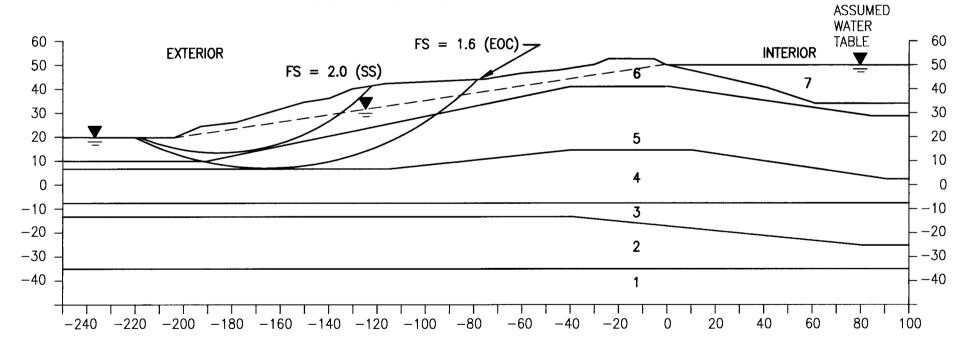
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Scale:	1" = 40'	W.O.:	3769.G	L
File No:	A-3769GL-12		FIGURE	E.15
No:	Revis	ion:		Date:

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	

#### CROSS SECTION D-D EXISTING DIKE WITH 2 FOOT FREEBOARD



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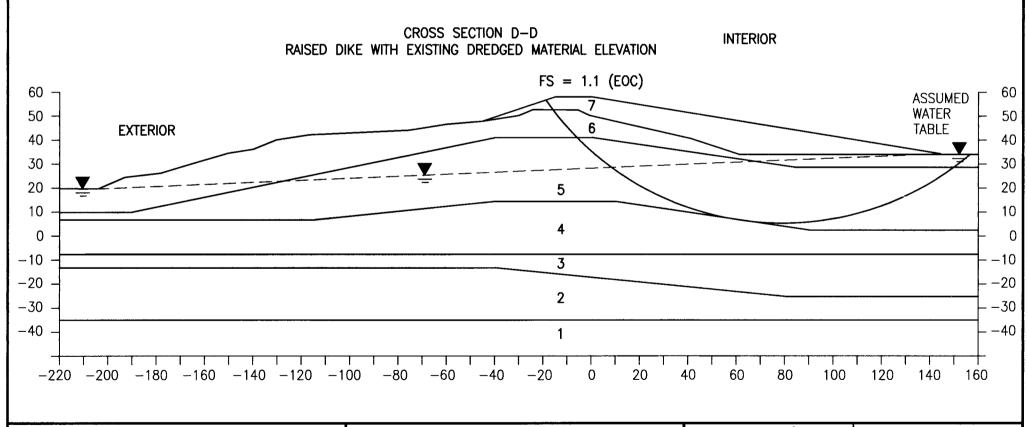
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	File No:	A-3769GL-13		FIGURE	E.16
Ì	No:	Revision:			Date:

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



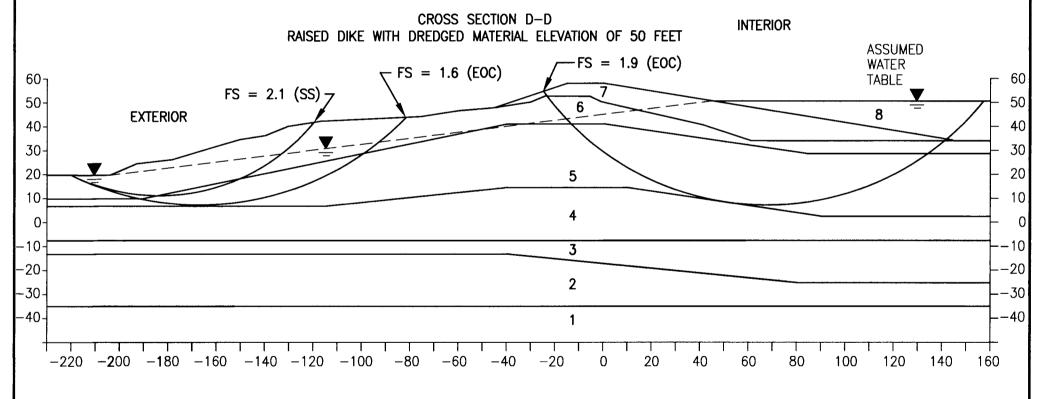
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No:	Kevi	ision:		Date:
	A-3769GL-14	<u> </u>	FIGURE E	
Scale:	1" = 40'	₩.0.:	3769.G	<u>.                                    </u>
Drawn: C	FY Chk'd: DSS	Date:	29 JULY 1	1999

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	



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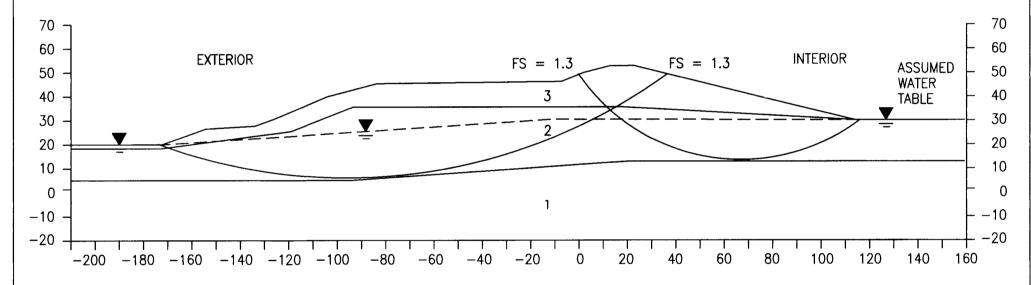
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Scale:	1" = 40'	W.O.:	3769.GL		
File No:	A-3769GL-24	FIGURE E.18			
No:	Revi	Date:			

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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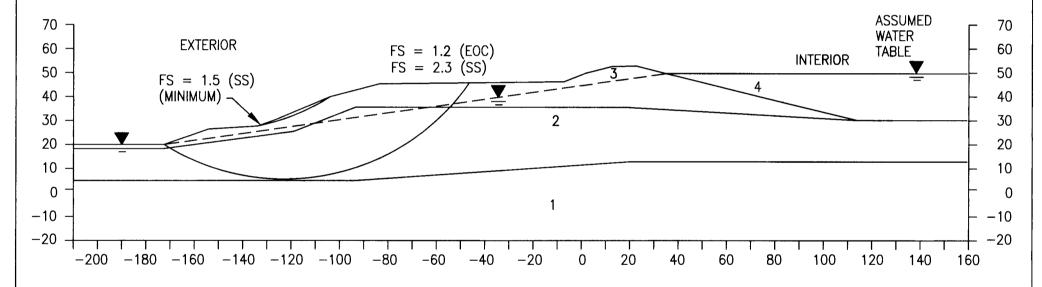
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Scale:	1" = 40'	₩.0.:	3769.GL	
File No:	A-3769GL-15		FIGURE E.19	
No:	Rev	Date	<b>:</b> :	

STRATA	DESCRIPTION	1	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	

### CROSS SECTION E-E EXISTING DIKE WITH 2 FOOT FREEBOARD



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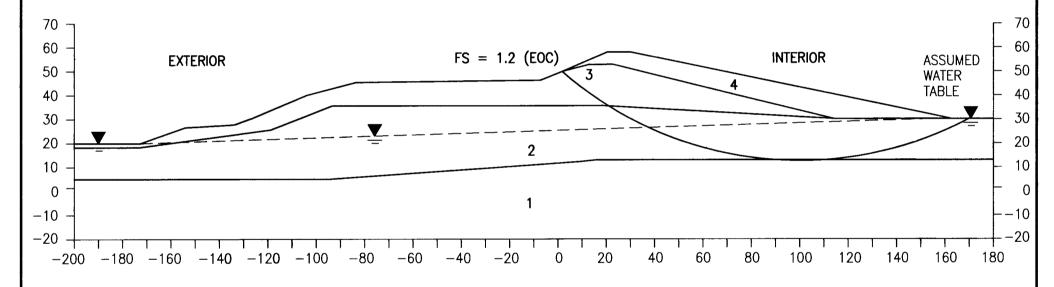
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Scale:	1" = 40'	₩.0.:	3769.GL
File No:	A-3769GL-16		FIGURE E.20
No:	Rev	Date:	

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



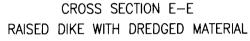
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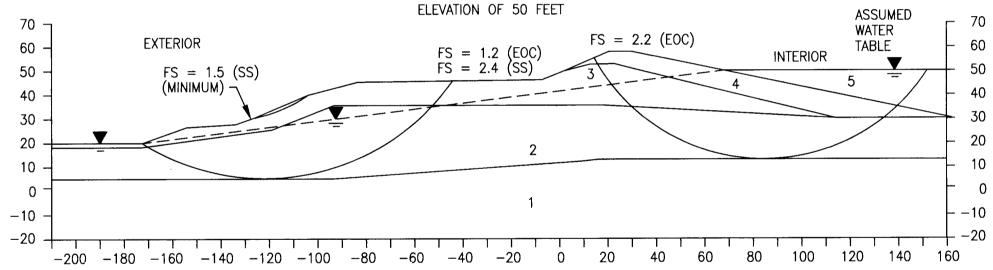
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Scale:	1" = 40'	₩.0.:	3769.G	L
File No:	A-3769GL-17		FIGURE	E.21
No:	Revi	sion:		Date:
•				

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





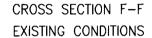
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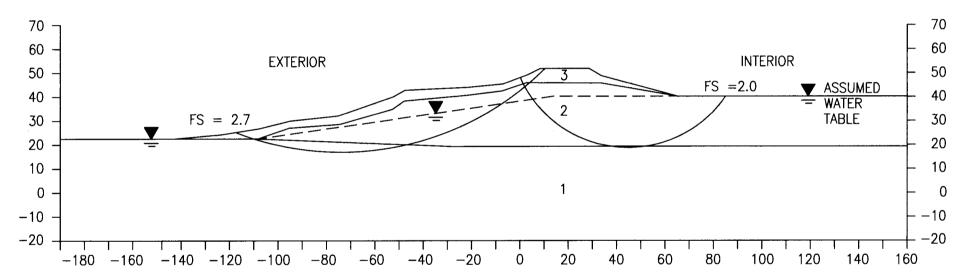
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Scale:	1" = 40'	W.O.:	3769.GL	
File No:	A-3769GL-25		FIGURE E	.22
No:	Rev	ision:		Date:

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





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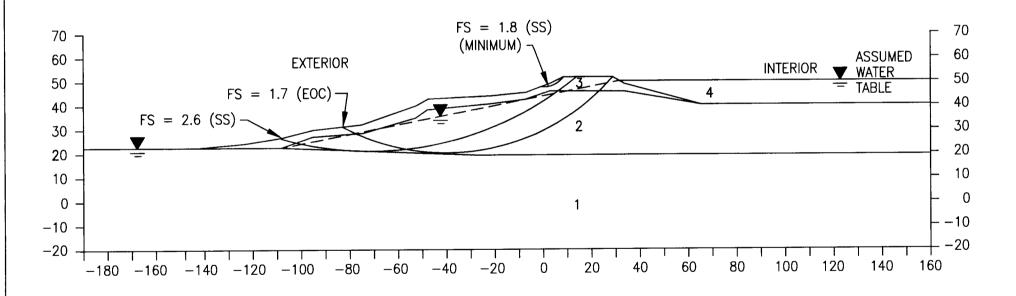
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Scale:	1" = 40'	₩.0.:	3769.GL	
File No:	A-3769GL-18		FIGURE E.23	
No:	Rev	ision:	Dat	e:

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

## CROSS SECTION F-F EXISTING DIKE WITH 2 FOOT FREEBOARD



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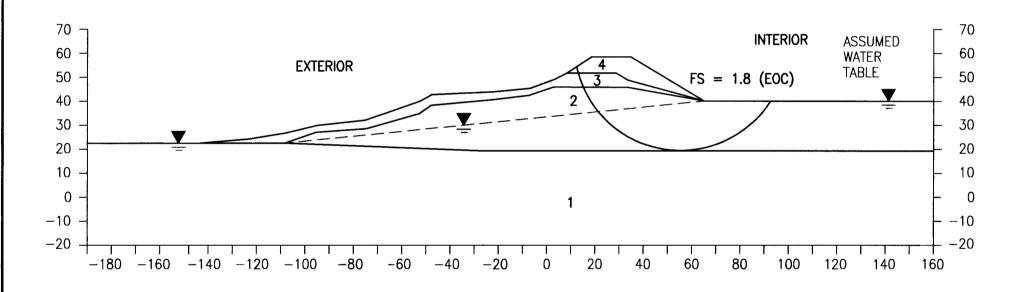
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Scale:	1" = 40'	₩.0.:	3769.GI	,
File No:	A-3769GL-19		FIGURE E	.24
No:	Rev	Revision:		

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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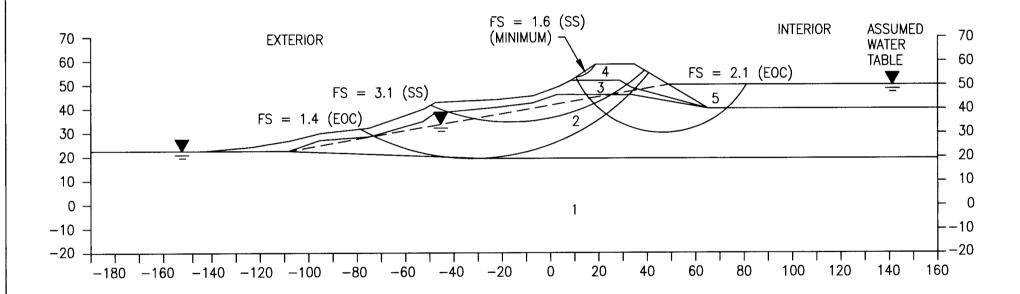
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Scale:	1" = 40'	₩.0.:	3769.0	L
File No:	A-3769GL-20		FIGURE	E.25
No:	Revision:			Date:

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

CROSS SECTION F-F
RAISED DIKE WITH DREDGED MATERIAL
ELEVATION OF 50 FEET

EOC = END OF CONSTRUCTION SS = STEADY STATE SEEPAGE



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Scale:	1" = 40'	₩.O.:	3769.GL	
File No: A-3769GL-26			FIGURE E.26	
No:	Rev	ision:		Date:

# **Appendix F**

**Chemical Resistance of Polyethylene** 

## Chemical Resistance of Polyethylenes

SABIC® LDPE

SABIC® LLDPE

SABIC® HDPE



#### **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 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
0	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
02		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!



A Acetaldehyde	Chemicals	Resista Chemic	nce to al attack	Resistance to Physical	Perm	eability	Remarks
Acetaldehyde       ++					+40°	C +60°C	
Acetanilide	A						
Acetic acid 5%	Acetaldehyde	++	++	0	0	-	V
Acetic acid 50%       ++       ++       +       +       V         Acetic anhydride       ++       ++       0       0       V         Acetone       ++       ++       0       0       -       V         Acetophenone       ++	Acetanilide	++	++	++	++	++	
Acetic anhydride       ++       ++       0       0       V         Acetone       ++       ++       0       0       -       V         Acetophenone       ++	Acetic acid 5%	++	++	+	++	++	
Acetone	Acetic acid 50%	++	++	+	+	+	V
Acetophenone       ++	Acetic anhydride	++	++	0	0	0	V
Acetylsalicylic acid ++ ++ ++ ++ ++ ++ ++    Acrylonitrile ++ ++ ++ ++ ++ ++ ++ ++ ++ ++    Adipic acid ++ ++ ++ ++ ++ ++ ++ ++ ++    Alcohol ++ ++ ++ ++ ++ ++ ++ ++ ++    Allylacohol ++ ++ ++ ++ ++ ++ ++ ++    Alum (all types) ++ ++ ++ ++ ++ ++ ++    Aluminium oxide ++ ++ ++ ++ ++ ++ ++    Aluminium salts	Acetone	++	++	0	0	-	V
Acrylonitrile       ++ <td>Acetophenone</td> <td>++</td> <td>++</td> <td>+</td> <td>0</td> <td>-</td> <td>V</td>	Acetophenone	++	++	+	0	-	V
Adipic acid ++ ++ ++ + + + + + +    Alcohol ++ ++ ++ 0 + + +    Allylacohol ++ ++ ++ ++ ++ ++ ++ ++    Alum (all types) ++ ++ ++ ++ ++ ++ ++    Aluminium oxide ++ ++ ++ ++ ++ ++    Aluminium salts	Acetylsalicylic acid	++	++	++	++	++	
Alcohol ++ ++ ++ 0 + +  Allylacohol ++ ++ ++ ++ 0 0 V  Alum (all types) ++ ++ ++ ++ ++  Aluminium oxide ++ ++ ++ ++ ++  Aluminium salts See page 24  Amino acids ++ ++ ++ ++ ++ ++  Ammonia ++ ++ ++ ++ ++ ++ CO2  Ammonium salts See page 24  Ammonium-nitrate lime ++ ++ ++ ++ ++  Amylacetate ++ ++ ++ 0 0 0 - V  Amylalcohol ++ ++ ++ ++ ++ V	Acrylonitrile	++	++	+	0	-	V
Allylacohol       ++	Adipic acid	++	++	+	+	+	
Alum (all types) ++ ++ ++ ++ ++ ++ ++ ++ ++    Aluminium oxide ++ ++ ++ ++ ++ ++ ++    Aluminium salts	Alcohol	++	++	0	+	+	
Aluminium oxide ++ ++ ++ ++ ++ ++ ++    Aluminium salts	Allylacohol	++	++	+	0	0	V
Aluminium salts       See page 24         Amino acids       ++       ++       ++       ++       ++       ++       ++       ++       CO2         Ammonium salts       See page 24       See page 24         Ammonium-nitrate lime       ++       ++       ++       ++       ++       ++       ++       ++       ++       ++       ++       ++       ++       ++       ++       ++       ++       V       Amylalcohol       ++       ++       ++       ++       ++       ++       ++       V       -       V	Alum (all types)	++	++	++	++	++	
Amino acids ++ ++ ++ ++ ++ ++ CO2  Ammonia ++ ++ ++ ++ ++ CO2  Ammonium salts See page 24  Ammonium-nitrate lime ++ ++ ++ ++ ++ ++ ++    Amylacetate ++ ++ ++    Amylalcohol ++ ++ ++ + + +    V	Aluminium oxide	++	++	++	++	++	
Ammonia       ++       ++       ++       ++       ++       CO2         Ammonium salts       See page 24         Ammonium-nitrate lime       ++       ++       ++       ++       ++         Amylacetate       ++       ++       +       +       V         Amylalcohol       ++       ++       +       +       V	Aluminium salts						See page 24
Ammonium salts         See page 24           Ammonium-nitrate lime         ++         ++         ++         ++         ++         ++         ++         V           Amylalcohol         ++         ++         ++         +         +         V	Amino acids	++	++	++	++	++	
Ammonium-nitrate lime       ++       ++       ++       ++       ++       ++       ++       ++       ++       ++       ++       ++       ++       V       Amylalcohol       ++       ++       ++       ++       ++       V       -       V        V        V         V         V  <	Ammonia	++	++	++	++	++	CO2
Amylacetate       ++       ++       0       0       -       V         Amylalcohol       ++       ++       +       +       V	Ammonium salts						See page 24
Amylalcohol ++ ++ + + V	Ammonium-nitrate lime	++	++	++	++	++	
	Amylacetate	++	++	0	0	-	V
Aniline ++ ++ 0 0 V	Amylalcohol	++	++	+	+	+	V
	Aniline	++	++	o	0	0	V



Chemicals	Resista	nce to al attack	Resistance to Physical	Perm	eability	Remarks
	+20°C	+60°C	attack	+40°	C +60°C	
Aniline dyes dry, -oil- soluble	++	++	+	+	+	
Aniline dyes dry, -water- soluble	++	++	++	+	+	
Aniline salts	++	++	+	+	+	
Aniseed oil	++	++	+	-	-	V
Anisole	++	++	0	0	-	V
Anthraquinone	++	++	+	++	++	
Antifreeze	++	++	+	++	++	
Antimony	++	++	++	++	++	
Antimony compounds						See page 24
Aqua regia	-	-	0	++	++	not recommended
Arsenic	++	++	++	++	++	
Arsenic trioxide	++	++	++	++	++	
Aspirin	++	++	++	++	++	
Atropine and its salts	++	++	++	++	++	
В						
Barium hydroxide	++	++	+	++	++	CO2
Barium salts						See page 24
Barium sulphide	++	++	++	+	++	
Battery acid	++	++	++	++	++	
Beer	++	++	++	+	+	CO2 (pressure)
Benzaldehyde	++	++	0	0	-	V
Benzene (benzole)	++	++	+	-	-	V
-						



Chemicals	Resistar Chemica	nce to al attack	Resistance to Physical	Perm	eability	Remarks
	+20°C	+60°C	attack	+40°	C +60°C	
Benzene hexachloride	++	++	+	+	+	V
Benzene sulphonic acid	++	++	0	++	++	
Benzoic acid	++	++	+	++	++	
Benzyl acetate	++	++	+	-	-	V
Benzyl Alcohol	++	++	0	+	+	V
Bicarburetted soda	++	++	++	++	++	
Bichromate sulphuric acid	0	-	+	++	++	
Bicycle oil	++	++	+	0	0	
Bismuth compounds						See page 24
Bismuth trichloride	++	++	0	+	+	
Bitumen	++	++	+	0	0	V
Blankite	++	++	++	++	++	02,C02
Bleaching liquor	+	-	++	++	++	
Bleaching lye	+	-	++	++	++	
Bleaching powder	++	+	++	++	++	
Blue ashes	++	++	++	++	++	
Borax	++	++	++	++	++	
Boric acid	++	++	++	++	++	
Boric acid solution	++	++	++	++	++	
Braking fluids	++	++	O	+	+	
Brass polish	++	++	+	++	++	
Brillantine	++	++	+	+	0	
Brine	++	++	++	++	++	



Chemicals	Resistar Chemica +20°C	nce to al attack +60°C	Resistance to Physical attack		eability C +60°C	Remarks
Bromine	-	-	-	-	-	
Bromobenzene(-benzole)	++	++	+	-	-	
Bromophorm	++	++	+	-	-	
Butane diol	++	++	+	++	++	
Butanol	++	++	+	+	+	V
Butter	++	++	+	+	0	CO2
Butyl acetate	++	++	0	-	-	V
Butyl alcohol	++	++	+	+	+	V
Butyl chloride	++	++	+	-	-	
Butyl phenol	++	++	0	+	0	
Butylraldehyde	++	++	0	0	0	
Butyric acid	++	++	o	+	+	V
С						
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	++	++	0	0	0	V
Camphor oil	++	++	+	0	0	V



Chemicals	Resistand Chemical +20°C		Resistance to Physical attack		eability C +60°C	Remarks
Caprolactam	++	++	+	++	++	
Carbazole	++	++	++	+	0	V
Carbolineum	++	++	0	0	-	V
Carbon black	++	++	++	++	++	
Carbon disulphide	++	++	+	-	-	
Carbon tetrachloride	++	++	+	-	-	
Carnauba wax	++	++	+	+	+	
Castor oil	++	++	0	+	0	
Cattle feed	++	++	++	++	++	
Caustic potash	++	++	+	++	++	CO2
Caustic soda	++	++	+	++	++	CO2
Cellosolve	++	++	+	+	0	
Cellulose varnish	++	++	0	-	-	
Cetyl alcohol	++	++	+	+	+	
Chloral (+chloral hydrate)	++	++	0	0	0	V
Chloro-acetic acids	++	++	0	++	++	V
Chloroamine	++	++	++	++	++	
Chlorobenzene (-benzole)	++	++	+	-	-	
Chloroform	++	++	+	-	-	
Chloronitrobenzene - liquid	++	++	O	0		V
Chloronitrobenzene - solid	++	++	+	+		V
Chlorophenol (mono, etc.)	++	++	+	0	-	V
Chloropropionic acid	++	++	0	++		



Chlorosulphonic acid	Chemicals	Resista Chemic	nce to al attack	Resistance to Physical	Perm	eability	Remarks
Chromate yellow					+40°	C +60°C	
Chromatic acid         +         -         +         ++         ++         ++         -         See page 24           Chromium salts         -         ++         ++         ++         +         +         V           Cinnamon oil         ++	Chlorosulphonic acid						not recommended
Chromium salts         See page 24           Cinnamon         ++         ++         ++         +         V           Cinnamon oil         ++         ++         +         ++	Chromate yellow	++	++	++	++	++	
Cinnamon oil ++ ++ ++ ++ ++ + +	Chromatic acid	+	-	+	++	++	
Cinnamon oil ++ ++ ++ ++ ++ ++ ++ ++ ++ ++    Citric acid ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++	Chromium salts						See page 24
Citric acid	Cinnamon	++	++	++	+	+	V
Citronel oil         ++         ++         ++         +-         -	Cinnamon oil	++	++	+	-	-	
Clove oil         ++         ++         ++         +         V           Cloves         ++         ++         ++         +         V           Cobalt salts         See page 24         See page 24           Coconut fat         ++         ++         +         ++         ++           Coconut oil         ++         ++         +         +         CO2           Coffee         ++         ++         ++         +         +         CO2           Colophonium(resin)         ++         ++         ++         ++         ++         ++           Copper green         ++         ++         ++         ++         ++         ++           Copper oxychloride         ++         ++         ++         ++         ++         ++         See page 24           Cotton-seed oil         ++         ++         +         +         +         +         +         +         +           Cream (face , hands)         ++         ++         +         +         +         +         +         +         +         +         +         +         +         +         +         +         +         +         +         +	Citric acid	++	++	++	++	++	
Cloves         ++         ++         ++         +         V           Cobalt salts         See page 24           Coconut fat         ++	Citronel oil	++	++	+	-	-	
Cobalt salts         See page 24           Coconut fat         ++          See page 24	Clove oil	++	++	+	0	0	V
Coconut fat       ++	Cloves	++	++	+	+	+	V
Coconut oil       ++       ++       +       +       +       +       +       +       CO2       CO2       CO3       V       CO2       CO6ffee       ++ <td>Cobalt salts</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>See page 24</td>	Cobalt salts						See page 24
Codliver oil       ++       ++       ++       +       +       CO2         Coffee       ++       ++       ++       0       0       V         Colophonium(resin)       ++       ++       ++       ++       ++       ++         Copper green       ++       ++       ++       ++       ++       ++         Copper oxide       ++       ++       ++       ++       ++       ++         Copper oxychloride       ++       ++       ++       ++       ++       ++       ++       See page 24         Cotton-seed oil       ++       ++       ++       +       +       +       +       +       ++ </td <td>Coconut fat</td> <td>++</td> <td>++</td> <td>+</td> <td>++</td> <td>++</td> <td></td>	Coconut fat	++	++	+	++	++	
Coffee       ++       ++       ++       o       o       V         Colophonium(resin)       ++ <td< td=""><td>Coconut oil</td><td>++</td><td>++</td><td>+</td><td>+</td><td>+</td><td></td></td<>	Coconut oil	++	++	+	+	+	
Colophonium(resin)       ++       +	Codliver oil	++	++	+	+	+	CO2
Copper green       ++	Coffee	++	++	++	0	0	V
Copper oxide         ++         +         ++         ++         ++         ++         ++         ++         ++         ++         ++	Colophonium(resin)	++	++	++	++	++	
Copper oxychloride         ++         ++         ++         ++         ++           Copper salts         See page 24           Cotton-seed oil         ++         ++         +         o           Cream (face , hands)         ++         ++         +         +	Copper green	++	++	++	++	++	
Copper salts         See page 24           Cotton-seed oil         ++         ++         +         o           Cream (face , hands)         ++         ++         +         +	Copper oxide	++	++	++	++	++	
Cotton-seed oil       ++       ++       +       +       o         Cream (face , hands)       ++       ++       +       +       +	Copper oxychloride	++	++	++	++	++	
Cream (face , hands) ++ ++ + + +	Copper salts						See page 24
	Cotton-seed oil	++	++	+	+	0	
Creolin ++ ++ o o - V	Cream (face , hands)	++	++	+	+	+	
	Creolin	++	++	O	0	-	V



Chemicals	Resista	nce to al attack	Resistance to Physical	Perme	eability	Remarks
	+20°C	+60°C	attack	+40°0	C +60°C	
Creosote	++	++	0	0	-	V
Cresol (ortho,meta,para)	++	++	0	0	0	V
Crude oils (minerals)	++	++	0	0	0	V
Cyanamide	++	++	++	++	++	
Cyclohexane	++	++	0	0	-	V
Cyclohexanol	++	++	0	+	+	V
Cyclohexanone	++	++	0	0	0	V
D						
DDT (powder)	++	++	+	++	++	
Decalin	++	++	+	-	-	
Detergents (liquid)	++	++	0	++	++	
Detergents (powder)	++	++	+	++	++	
Developer (phot.)	++	++	++	++	++	
Dextrin	++	++	++	++	++	
Dibutyl phthalate	++	++	0	+	++	
Dichlorobenzene (- benzole)	++	+	+	-	-	
Dichloroethylene	++	++	+	-	-	
Dichloromethane	++	++	+	-	-	
Diesel oil	++	++	+	0	0	V
Diethanol amine	++	++	+	++	++	CO2
Diethyl ether	++	++	++	-	-	
Diethyl Ketone	++	++	0	0	-	
Diethylene glycolether	++	++	0	+	+	V



Chemicals	Resistan Chemica +20°C		Resistance to Physical attack		eability C +60°C	Remarks
Dimethyl formamide	++	++	+	+	+	
Dioctyl phthalate	++	++	+	+	+	
Dioxane	++	++	0	0	0	V
Diphenyl amine	++	++	+	+	+	V
Diphenyl ether	++	++	+	0	-	V
Diphenyl oxide	++	++	+	0	-	V
Dolomite	++	++	++	++	++	
E						
Eau de cologne	++	++	+	0	0	V
Eau de Javelle	+	-	++	++	++	
Emulsion paint	++	++	++	++	++	
Engine oil	++	++	+	0	0	
Epsom salt	++	++	++	++	++	
Ether	++	++	0	-	-	V
Etheric oil	++	++	+	-	-	
Ethyl acetate	++	++	0	0	-	V
Ethyl alcohol	++	++	+	+	+	
Ethyl aniline	++	++	+	0	0	V
Ethyl benzene (-benzole)	++	++	+	-	-	
Ethyl benzoate	++	++	0	0	0	V
Ethyl chloride	++	++	+	-	-	
Ethylene chloride (mono,di)	++	++	+	-	-	
Ethylene chlorohydrine	++	++	+	-	-	



Chemicals	Resistance to Chemical attack		Resistance to Physical	Permeability		Remarks
	+20°C	+60°C	attack	+40°	C +60°C	
Ethylene diamine	++	++	+	+	+	V, CO2
Ethylene glycol	++	++	+	++	++	
Ethylene salicylate	++	++	+	0	0	V
F						
Ferric salts						See page 24
Ferrous salts						See page 24
Fertilizer	++	++	++	++	++	
Fir-needle oil	++	++	+	-	-	V
Fixative (phot)	++	++	++	++	++	
Floor wax	++	++	0	0	0	
Formaldehyde 40%	++	++	+	+	+	V
Formaline	++	++	+	+	+	V
Formamide	++	++	+	+	+	
Formic acid	++	++	+	++	++	V
Freon	++	++	+	-	-	
Frigen	++	++	+	-	-	
Fruit juice	++	++	++	++	++	
Fuel oil	++	++	+	0	0	
Fuel oil (domestic use)	++	++	+	0	0	V
fungicides	++	++	++	++	++	
Furfural	++	++	+	0	0	V
Furfuryl alcohol	++	++	0	-	-	
G						

Chemicals	Chemical attack to Physical			eability C +60°C	Remarks	
Gallic acid (tannic acid)	++	++	+	++	++	
Galvanizing liquor	++	++	++	++	++	
gas liquor	++	++	+	+	+	
gasoline	++	++	+	0	-	V, HD grades only
Glacial-acetic acid	++	++	0	0	0	V
Glauber salt	++	++	++	++	++	
Glucose	++	++	++	++	++	
Glue (fish,bone)	++	++	++	++	++	
Glycerine (glycerol)	++	++	++	++	++	
Glycol	++	++	+	++	++	
Gypsum	++	++	++	++	++	
н						
Heptane	++	++	+	-	-	
Hexachlorocyclohexane	++	++	+	+	+ v	
Hexane	++	++	+	-	-	
Hexanol	++	++	+	+	+	V
Hexylalcohol	++	++	+	+	+	V
Honey	++	++	++	++	++	
Hydrobromic acid	++	++	++	++	++	
Hydrochloric acid	++	++	++	++	+	
Hydrochloric acid (chem.pure)	++	++	++	++	++	
Hydrocyanic acid	++	++	+	0	0	V, CO2
Hydrofluoric acid	++	++	+	+	+	V,CO2



Chemicals	Resista Chemic	nce to al attack	Resistance to Physical	Perm	eability	Remarks
	+20°C	+60°C	attack	+40°	C +60°C	
Hydrogen peroxide (sol.)	+	+	++	++	0	
Hydroquinone	++	++	++	++	++	
Нуро	++	++	++	++	++	
I						
I cont.						
Ink (printing ink)	++	++	+	+	0	
Ink (writing ink)	++	++	++	++	++	
Insecticides (oilsolution)	++	++	0	-	-	
Insecticides (powder)	++	++	+	+	+	
Insecticides(aqueous dispersion)	++	++	+	++	++	
Iodine	++	++	+	0	O	
Iodine tincture	++	++	+	+	0	
Iron salts						See page 24
Isobutanol	++	++	+	+	+	V
Isobutyl alcohol	++	++	+	+	+	V
Iso-Octane	++	++	+	0	-	V, see gasoline
Isopropyl acetate	++	++	+	0	O	V
Isopropyl ether	++	++	+	-	-	
J						
Jam	++	++	++	++	++	
K						
Kerosene	++	++	+	0	-	V,see gasoline
Ketchup	++	++	++	++	++	

Chemicals		al attack	Resistance to Physical		eability	Remarks
	+20°C	+60°C	attack	+40°	C +60°C	
Lactic acid	++	++	+	++	++	
Lanolin	++	++	+	+	+	
Lard	++	++	+	+	0	
Latex	++	++	+	++	++	
Lauryl alcohol	++	++	+	+	+	
Lauryl sulphate	++	++	0	+	+	
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	++	++	+	+	0	
Lithium salts						See page 24
Liver of sulphur						see sodium sulphide
Lotion (hair, shaving)	++	++	+	+	0	
Lubricating oil	++	++	+	0	0	
М						
Magnesia	++	++	+	++	++	
Magnesium oxide	++	++	+	++	++	



Chemicals	Resistano Chemical	attack	to Physical			Remarks
	+20°C	+60°C	attack	+40°0	C +60°C	
Magnesium salts						See page 24
Maleic acid	++	++	+	++	++	
Manganese salts						See page 24
Margarine	++	++	+	+	0	
Mayonnaise	++	++	+	++	0	
Menthol	++	++	+	+	0	V
Mercuric salts						See page 24
Mercurochrome	++	++	++	++	++	
Mercurous salts						See page 24
Mercury (metal)	++	++	++	++	++	
Mercury oxide	++	++	++	++	++	
Mercury salts						See page 24
Methanol	++	++	0	+	+	
Methyl acetate	++	++	0	0	0	V
Methyl alcohol	++	++	0	+	+	
Methyl salicylate	++	++	+	0	0	V
Methylene chloride	++	++	+	-	-	
Methylethylene ketone	++	++	0	0	-	
Milk	++	++	++	++	++	
Mineral oil	++	++	+	+	0	
Minerals	++	++	++	++	++	
Mohr's salt	++	++	++	++	++	





Chemicals	Resistan Chemica +20°C		Resistance to Physical attack		ability +60°C	Remarks
Monochlorobenzene(- benzole)	++	++	+	-	-	
Morpholine	++	++	0	+	+	V
Mustard	++	++	++	++	++	
N						
Nail varnish	++	++	0	0	-	
Naphthalene	++	++	+	0	0	V
nickel oxide	++	++	++	++	++	
Nickel salts						See page 24
Nicotine	++	++	+	+	+	
Nitric acid (<=50%)	+	++	++			
Nitric acid (>50%)	-	-	0	+	+	
Nitrobenzene (-benzole)	++	++	0	0	0	V, not recommended
Nitrocresole	++	++	+	0	0	
Nitroglycerine	++	++	+	0	0	
Nonyl alcohol	++	++	+	0	0	V
Nutmeg	++	++	++	0	0	V
Nutmeg oil	++	++	+	-	-	
0						
Ochre	++	++	++	++	++	
Octane	++	++	+	0	-	V, see gasoline
Octanol	++	++	+	0	0	
Octyl alcohol	++	++	+	0	0	V
Oleic acid	++	++	+	+	0	



Chemicals	Resistance to Chemical attack		to Physical	Perm	eability	Remarks
	+20°C	+60°C	attack	+40°	C +60°C	
Oleum	0	-	0	+	+	not recommended
Olive oil	++	++	+	+	0	
Oxalic acid (solid or solution)	++	++	++	++	++	
P						
Paint						see terpentine, varnish & emulsion paint
Palm oil	++	++	+	+	0	
Palmitinic acid	++	++	+	++	++	
Paraffin (solid)	++	++	+	++	++	
Paraffin oil	++	++	+	0	-	
Patent potash	++	++	++	++	++	
Peanut butter	++	++	+	+	o	
Pentachlorophenol	++	++	++	0	0	V
Pentane	++	++	+	-	-	
Pepper	++	++	++	++	++	
Peppermint oil	++	++	+	-	-	V
Perchloric-acid solution	+	0	++	++	+	
Perchloroethylene	++	++	+	-	-	
Perfumes	++	++	+	0	-	V, not recommended
Petrol						see gasoline
Petroleum	++	++	+	0	-	V
Petroleum ether	++	++	+	0	-	V
Phenol	++	++	0	+	+	V



Phenol sulphonic acid         ++++++++++++++++++++++++++++++++++++	Chemicals	Resistan Chemica	l attack	Resistance to Physical		eability	Remarks
Phenoxy-acetic acid         ++ <th></th> <th>+20°C</th> <th>+60°C</th> <th>attack</th> <th>+40°</th> <th>C +60°C</th> <th></th>		+20°C	+60°C	attack	+40°	C +60°C	
Phenyl phenol         ++	Phenol sulphonic acid	++	++	+	++	++	
Phosphating liquor (for metal)  Phosphor chlorides (tri, penta, oxychloride)  Phosphoric acid (conc.) ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++	Phenoxy-acetic acid	++	++	+	++	++	
metal)           Phosphor chlorides (tri, penta, oxychloride)         ++         ++         + <td>Phenyl phenol</td> <td>++</td> <td>++</td> <td>+</td> <td>+</td> <td>+</td> <td></td>	Phenyl phenol	++	++	+	+	+	
Phosphoric acid (conc.) ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++		++	++	++	++	++	
Phthalic acid         ++							not recommended
Phthalic anhydride         ++	Phosphoric acid (conc.)	++	++	+	+	+	
Picrinic acid       ++ <td>Phthalic acid</td> <td>++</td> <td>++</td> <td>++</td> <td>++</td> <td>++</td> <td></td>	Phthalic acid	++	++	++	++	++	
Pigments, dryfor paints, plastics etc)         ++ <td>Phthalic anhydride</td> <td>++</td> <td>++</td> <td>++</td> <td>++</td> <td>++</td> <td></td>	Phthalic anhydride	++	++	++	++	++	
Pine oil       ++       ++       0       0       0       V         Pitch       ++	Picrinic acid	++	++	+	+	+	
Pitch       ++		++	++	++	++	++	
Polishing wax         ++         ++         ++         +         0         0           Potash         ++         ++         ++         ++         ++         ++           Potassium bromide         ++         ++         ++         ++         ++         ++           Potassium cyanide         ++         ++         +         ++         CO2, hazardous           Potassium hydroxide         ++         ++         ++         ++         ++         CO2           Potassium iodide         ++         ++         ++         ++         ++         ++         ++           Potassium permanganate         +         +         ++         ++         ++         ++         ++           Potassium salts         See page 24         See page 24         See page 24	Pine oil	++	++	0	0	0	V
Potash         ++ <td< td=""><td>Pitch</td><td>++</td><td>++</td><td>+</td><td>++</td><td>++</td><td></td></td<>	Pitch	++	++	+	++	++	
Potassium bromide         ++	Polishing wax	++	++	+	0	0	
Potassium cyanide ++ ++ ++ + + + + + + CO2, hazardous  Potassium hydroxide ++ ++ ++ ++ ++ ++ CO2  Potassium iodide ++ ++ ++ ++ ++ ++ ++  Potassium permanganate + + + ++ ++ ++ ++ ++  Potassium salts  Potassium sulphate See page 24  See page 24	Potash	++	++	++	++	++	
Potassium hydroxide ++ ++ ++ ++ ++ ++ CO2  Potassium iodide ++ ++ ++ ++ ++ ++  Potassium permanganate + + + ++ ++ ++ ++  Potassium salts See page 24  Potassium sulphate See page 24	Potassium bromide	++	++	++	++	++	
Potassium iodide ++ ++ ++ ++ ++ ++  Potassium permanganate + + + ++ ++ ++  Potassium salts  See page 24  Potassium sulphate  See page 24	Potassium cyanide	++	++	+	+	+	CO2, hazardous
Potassium permanganate + + + + ++ ++  Potassium salts  See page 24  Potassium sulphate  See page 24	Potassium hydroxide	++	++	+	++	++	CO2
Potassium salts  See page 24  Potassium sulphate  See page 24	Potassium iodide	++	++	++	++	++	
Potassium sulphate See page 24	Potassium permanganate	+	+	++	++	++	
	Potassium salts						See page 24
Potassium sulphide ++ ++ + + + + O2, CO2	Potassium sulphate						See page 24
	Potassium sulphide	++	++	+	+	++	O2, CO2



Chemicals	Resistan Chemica +20°C		Resistance to Physical attack		eability C +60°C	Remarks
Propanol	++	++	+	+	+	
Propargyl alcohol	++	++	+	+	+	
Propionic acid	++	++	0	++	++	V
Propulene glycol	++	++	+	++	++	
Propyl alcohol	++	++	+	+	+	
Prussic acid	++	++	+	0	0	V, very hazardous
Pyridine	+	++	0	0	0	V
Q						
Quinine ad its salts	++	++	++	++	++	
R						
Ratbane	++	++	++	++	++	
Red ochre						See page 24
Resorcine (resorcinol)	++	++	++	++	++	
Ricinus oil	++	++	0	+	0	
S						
Salad oil	++	++	+	+	0	
Salas sauce	++	++	+	++	0	
Salicyl aldehyde	++	++	+	0	0	V
Salicylic acid	++	++	++	++	++	
Salmiac	++	++	++	++	++	
Saltpetre (nitrate)						See page 24
Saponin	++	++	++	++	++	
Scouring powder	++	++	+	++	++	
Sesame oil	++	++	+	+	0	



Chemicals	Resistanc Chemical		Resistance to Physical	Perme	Remarks	
		+60°C	attack	+40°C	+60°C	
Shampoo	++	++	0	++	++	
Silicone oil	++	++	0	+	+	
Silver polish	++	++	+	++	++	
Silver salts						See page 24
Soap(soft, green & yellow)	++	++	0	++	++	
Soda	++	++	++	++	++	
Sodium cyanide	++	++	+	+	+	hazardous
Sodium hydroxide	++	++	+	++	++	CO2
Sodium hypochlorite	+	-	+	++	++	
Sodium salts						See page 24
Sodium sulphide	++	++	+	+	+	O2, CO2
Soldering fluid	++	++	++	++	++	
Solvent naphtha	++	++	+	-	-	
Soy oil	++	++	+	+	0	
Spermaceti	++	++	+	+	+	
Spindle oil	++	++	+	0	0	
Spirit	++	++	+	+	+	
Stannic salts (tin)						See page 24
Stannous salts (tin)						See page 24
Starch	++	++	++	++	++	
Stearic acid	++	++	++	++	++	
Strontium salts						See page 24
Styrene (styrol)	++	++	+	0	-	



Chemicals		al attack	Resistance to Physical		eability	Remarks
	+20°C	+60°C	attack		+60°C	
Sublimate	++	++	++	++	++	
Succinic acid	++	++	++	++	++	
Sucrose	++	++	++	++	++	
Sugar	++	++	++	++	++	
Sulphate of ammonia						See page 24
Sulphur	++	++	++	++	++	
Sulphur chloride						not recommended
Sulphur trioxide	0	-	0	+	0	V, not recommended
Sulphuric acid (50-90%)	+	+	+	++	++	
Sulphuric acid (90-100 %)	0	0	+	++	++	
Sulphuric acid (dilute)	++	++	++	++	++	
Sulphuryl chloride						not recommended
Superphosphate	++	++	++	++	++	
Syrup	++	++	++	++	++	
Т						
Talcum grease	++	++	+	+	0	
Talcum powder	++	++	++	++	++	
Tannic acid	++	++	+	++	++	
Tannin	++	++	+	++	++	
Tar oil	++	++	o	0	0	V
Tartaric acid	++	++	++	++	++	
Tea	++	++	++	++	++	
Tetra						see "carbon tetrachl



Chemicals	Resistar Chemica +20°C	nce to al attack +60°C	Resistance to Physical attack		eability C +60°C	Remarks
Tetra-ethyl lead						
Tetra-ethyl lead						
Tetrahychloroethane	++	++	+	-	-	
Tetrahydrofuran	++	++	0	-	-	
Tetralin	++	++	+	-	-	
Thallium salts						See page 24
Thio(sodium thiosulphate)						See page 24
Thioglycolic acid	++	++	+	0	0	V
Thionylchloride						not recommended
Thiophene	++	++	0	-	-	
Thomas meal	++	++	++	++	++	
Tin compounds						See page 24
Titanium tetrachloride						not recommended
Titanium white	++	++	++	++	++	
Toluene (toluol)	++	++	+	-	-	V
Tomato juice	++	++	++	++	++	
Toothpaste	++	++	+	+	+	
Transformer oil	++	++	+	0	0	
Trichloro-acetic acid	++	++	0	+0	V	
Trichlorobenzene (benzole)	++	++	+	-	-	
Trichloroethane	++	++	+	-	-	
Trichloroethylene	++	++	+	-	-	



Chemicals	Resista	nce to al attack	Resistance to Physical	Perme	Remarks	
	+20°C	+60°C	attack	+40°0	C +60°C	
Tricresylphosphate	++	++	0	+	+	
Triethanolamine (turkey red oil)	++	++	0	++	++	
Turkey red oil	++	++	+	+	+	
Turpentine	++	++	+	-	-	
Turpentine (synthetic)	++	++	+	0	-	
Turpentine varnish	++	++	+	0	-	O2, not recommended
U						
Urea	++	++	++	++	++	
V						
Vanilla extract	++	++	+	0	0	V
Varnish						see terpentine varnish
Vaselin	++	++	+	+	0	
Vinegar	++	++	++	++	++	
Vinylchloride	++	++	+	-	-	
w						
Waterglass	++	++	+	++	++	
Wax: beeswax	++	++	+	+	+	
Wax: carnauba wax	++	++	+	+	+	
Wax: mineral-oil wax	++	++	+	+	0	
White lead	++	++	++	++	++	
White spirit	++	++	+	0	-	
X						
Xylene (xylol)	++	++	+	-	-	
Υ						



Chemicals	Resistance to Chemical attack		Resistance to Physical	Perm	eability	Remarks
	+20°C	+60°C	attack	+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	

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