Draft Preliminary Geotechnical Engineering Report
Piscataway Drive Slope Failure

Fort Washington, Prince George's County, Maryland

Prepared For

Prince George's County Government, Maryland

THIS DRAFT REPORT WAS PREPARED FOR THE EXPRESS PURPOSES OF PROVIDING ADVICE AND TECHNICAL EXPERTISE TO THE COUNTY EXECUTIVE STAFF TO ASSIST IN THEIR DECISIONAL PROCESSES

Prepared By

KCI Technologies, Inc.

May 19, 2014

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May 19, 2014

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Subject: Draft Preliminary Geotechnical Engineering Report
Piscataway Drive Slope Failure
Fort Washington, MD, Prince George's County, Maryland
KCI Job. No.: 07100627.W

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Dear Mr. Majett:

KCI Technologies, Inc. (KCI) has completed the preliminary geotechnical exploration for the Piscataway Drive slope failure.

The attached report presents a description of the existing site, subsurface conditions encountered, and recommendations for stabilizing the failed slope.

We appreciate the opportunity to provide these services and look forward to serving as your geotechnical consultant throughout this project. Please contact us if you have any questions regarding the information presented.

Sincerely,

KCI TECHNOLOGIES, INC.

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"PROFESSIONAL CERTIFICATION: I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO.:_25981__ EXPIRATION DATE:__3/22/15___"

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EXECUTIVE SUMMARY

This report contains the results of our subsurface explorations and preliminary geotechnical evaluations for repairing the approximately 1,500-foot section of failing slopes and ground movements along Piscataway Drive, Fort Washington, Prince George's County, Maryland. We performed 15 soil test borings, 10 cone penetration tests; and installed one piezometer to explore the subsurface conditions at the site. Additionally, we installed six inclinometers to monitor ground movements.

The test borings and CPT data revealed a soil profile consisting of three distinct strata within their termination depths, consistent with published geology. Stratum I (Ta, Nangemoy Formation) generally consisted of moist, brown, light brown, dark gray, very loose to medium dense Silty Sand, Clayey Sand, Sand with Gravels, and interbedded with soft to stiff Sandy Silt and Sandy Clay layers. A 20 to 30-ft thick layer of Stratum II (Marlboro Clay, Tm) underlies Stratum Ta. It consisted of moist to wet, reddish brown, brown, light gray to gray, Lean Clay with occasional thin lenses of micaceous Silt. Locally, we encountered Fat Clays within this stratum. Beneath the Tm, we encountered Stratum III (Aquia Formation, Ta) which consisted of moist to wet, olive gray, greenish gray to dark gray, Silty Sand and Sandy Silt with mica and calcareous shell fragments scattered throughout the stratum.

Based on preliminary site evaluations, analyses and review of historic information, the existing Marlboro Clay stratum made the site susceptible to slope failures. The intense and rapid infiltration of rainfall that occurred prior to the slope failure created saturated soil conditions resulting in significant loss of shear strength. The exploration data provided evidence of a failure plane within the Marlboro Clay stratum.

KCI proposes three options to stabilize the slopes with each soil-structure system extending beyond the anticipated failure planes. They are: 1) Drilled Shaft foundation along the east and west slopes abutting the roadway and Micropile Anchors at the head scarp upslope; 2) Drilled Shaft Foundation for east slope and Micropiles for west slope; 3) Micropiles for both east and west slopes. We anticipate that the resulting ground movements indicated by the inclinometer readings will have significant implications for the slope rehabilitation options. We therefore recommend that additional detailed analyses and design, constructability evaluation and cost analyses be performed for each option as part of the design purposes.

Design and construction considerations should not be based solely on the executive summary without reading the entire report.

1.0 INTRODUCTION

1.1 PROJECT INFORMATION

The project is located in Prince George's County in the proximity of 13700 to 13816 Piscataway Drive, Fort Washington, Prince George's County, Maryland. The site is bordered by Piscataway Creek on the east and Pine Road to the west. The Piscataway Drive, which traverses the site, is bordered by steep slopes on both sides with homes perched above and below the roadway. Figure 1 illustrates the site.

Historically, the slopes above and below Piscataway Drive have been experiencing surficial movement over a long period of time, but on May 4, 2014, significant failure.

Cracks began appearing in the pavements on Piscataway Drive on May 2, 2014 and escalated into major slope failures and pavement distress on May 4, 2014. Prior to May 2, there were no visible cracks or fractures on the slopes. Cracks, however, appeared on the slopes and widened on May 4 resulting in continuous fracture and downward movement of the western slope for a distance of approximately 450 feet long. The depth of failure along the slopes ranged from about 4 feet to about 20 feet. The deeper failure depths were results of root bulbs from several toppled trees during the slope failure.

The slope failure has directly threatened six homes, disrupted power, water supply, communications and other services to an additional 22 homes along the Piscataway Drive. It has also jeopardized the use of most of roadway from 13700 Piscataway Drive to the southernmost part of the drive. The affected portion of Piscataway Drive remains closed and the County has determined and declared numerous homes in the vicinity of the slide unfit and/or unsafe for occupancy.

1.2 SCOPE OF SERVICES

The purpose of this study is to obtain specific subsurface data at the site, review existing site geologic data and assess the cause of the slope failure and develop recommendations for:

- Rehabilitating the slope failure;
- Reconstructing Piscataway Drive;
- Repairing the utilities; and
- Options for moving forward in the design and construction phases.

Assessments of site environmental conditions or the presence or absence of pollutants in the soil, rock, surface water, or groundwater of the site were beyond the proposed objectives of our studies.

The report for this study includes the following:

- A brief review of our field and laboratory test procedures and their results
- Evaluation of subsurface conditions to include:
  - Review of surface topographic features and site conditions
  - Review of site geologic conditions
  - Review of near surface soil conditions
  - Estimates of subsurface profiles, as necessary, to illustrate subsurface conditions
- A review of possible causes of slope failure
- Evaluation of various alternatives for stabilizing the slopes
- Recommendations for stabilizing the slopes, reconstructing the affected portions of the Piscataway Drive, repairing the damaged utilities, and
- Options for moving forward in the design and construction phases

2.0 EXISTING SITE AND SUBSURFACE CONDITIONS

2.1 EXISTING SITE CONDITIONS

KCI conducted a site reconnaissance on May 3rd and 4th, 2014. The purpose of the site reconnaissance was to observe and document existing surface conditions. Information gathered during the site visit and site GIS data provided to us by Messieurs Unmesh Patel and Dwight Joseph of Prince George's County were used to help us interpret the subsurface data and to detect conditions that could affect our evaluations and recommendations.

The site topography is generally hilly. Piscataway Drive traverses the site. The difference in elevations between the top of the hill and the Piscataway Drive is approximately 65 feet. The elevation difference between the highest and lowest point of the site is approximately 100 feet. There are several residential buildings east and west of the Piscataway Drive. The slopes west of the roadway are about 1.5 Horizontal to one Vertical (1H:1V) or steeper downwards towards the Piscataway Drive. The eastern slopes are generally 1.5H: 1V to 3H: 1V or gentler towards the Piscataway Creek. The slopes are generally covered with thick brush and large trees.

Soils when exposed appeared soft, moist and generally silty sands with organics. We did not observe any rock outcrops. Though it had rained the previous night, there was no evidence of surficial or ponded water except areas where underground water force main had cracked. Prior to the visit, the area had experienced high levels of precipitation over a short period of time.

We observed evidence of slope failure on both sides of the roadway. Additionally there were several cracks openings on the order of three to six inches in width in the pavement structure. The pavement edges had also settled several inches with the highest settlement of about four feet occurring around 13700 Piscataway Drive. The soil mass near the top of the hill had moved laterally downslope towards the roadway about two to three feet, and on the average, had settled approximately eight feet. Vertical cracks were visible due to this movement. Several trees had toppled, as a result of the slope failure, and had snapped the overhead utility lines. We observed evidence of past slope movement which appears to be surficial movement of the soil mass. At a nearby previously condemned two-story structure located at 13710 Piscataway Drive we observed evidence of lateral movement and settlement cracks. There were several fissures in the driveway and around the house. We observed several distresses in the foundation wall. We further observed that the driveway leading to the garages is no longer accessible due to ground movement.

Residents recall minor sloughing of the slopes which are consistent with our observations during the site reconnaissance. We, however, did not observe any evidence of past slope repairs nor were we provided any records indicating that. We did not observe any storm drainage system in the vicinity of the failed slopes.

Underground utilities consist of water and sewer mains with service power and other lines to the various premises within the site. There are overhead utility which consist of power, communications and cables lines.

2.2 GEOLOGIC SETTING

Based on a review of the Geologic Map of Prince George's County (2003), the site is underlain by unconsolidated sediments ranging in geologic times from Holocene to Lower Paleocene. It is dominated by relatively thick, tripartite Paleocene-Eocene section- the Aquia (Ta) and Nanjemoy (Tn) Formations separated by the 20 to 30 feet of Marlboro Clay (Tm) (Figures 3A & 3B, Appendix A). These three units have an aggregate thickness of about 300 feet in outcrop. Both the Aquia and Nanjemoy are variably muddy, fossiliferous greensands in contrast to the Marlboro which is a thin but persistent pinkish to gray plastic clay. The Paleocene-Eocene section includes about 500 ft. of sediment.

The Aquia is composed of sand, fine-to medium-grained, poorly sorted well sorted, containing as much as 40 percent glauconite. Thin layers of calcareous shelly sandstone are scattered through the unit giving it the "salt and pepper" speckled. It is generally greenish gray to medium gray in color.

The Nanjemoy consists of mostly quartz sand, fine-to coarse-grained, with a variable amount of interstitial silt-clay and as much as 50 percent of green glauconite, also imparting a “salt and pepper” aspect to the sediments. Poorer outcrops are found along the Piscataway Creek. The glauconite sand in this formation is medium-gray to dark greenish gray, where unweathered. The silty-clay is dark-gray to chocolate-brown in color.

The Marlboro Clay is a continuous stratum throughout Southern Maryland. It is poorly exposed, mostly because it is thin and covered by slumping of the overlying sediments. In the valleys of the Piscataway and Mattawoman Creeks, the clay is effectively buried Holocene alluvium. Scattered patches of typically brownish red Marlboro clays are exposed along MD 210 just north of Piscataway Creek in Prince Georges County. The Marlboro Clay is a thin but highly distinctive unit composed of dense, brittle clay, ranging from thickly-bedded to finely laminated, lenticular or hummocky in part, containing partings and thin lenses of micaceous and lignitic laminated silt. It is usually pale-red to silvery-gray, and contains minor interbedded silt which is yellowish gray to pale-gray in color.

2.3 SUBSURFACE EXPLORATIONS AND IN-SITU TESTING

KCI’s sub-contractors, CenKen Group, LLC (CenKen) and Hillis-Carnes Engineering Associates, Inc. (HCEA) performed emergency subsurface explorations in the areas of the failing slope. The exploration program consisted of 15 standard penetration test (SPT) borings and 10 cone penetrometer test (CPT) soundings. Additionally, we installed six inclinometers and one groundwater monitoring well (piezometer). We conducted the subsurface explorations from May 6 to May 15, 2014 in accordance to the procedures presented in Appendix B. The depth of the explorations ranged from 40 feet to 100 feet into natural soils. The approximate exploration boring and tests locations are shown on Figure 2 in Appendix A. The boring logs and CPT are included in Appendix B.

2.3.1 Standard Penetration Test

We drilled test borings in general accordance with ASTM D420 procedures presented in Appendix B. The borings were advanced using ATV drill rigs equipped with hollow stem augers (HSA) and mud-rotary drilling in cased holes in general accordance with ASTM D1452. We conducted continuous standard penetration tests (SPTs) in the borings in general accordance with ASTM D 1586.

We performed standard penetration tests (SPT) borings in accordance with ASTM D1586. The SPT method consisted of advancing a two-inch diameter sampling spoon to a depth of 18 inches by driving it with a 140-pound hammer falling 30 inches. The values reported on the boring logs are the blows required to advance three successive six-inch increments. The first six-inch increment is considered as seating. The sum of the number of blows for the second and third increments is the "N" value. The "N" value is used to infer the general indications relative density and compressibility of the soils. KCI obtained soil samples using the SPT method and sampling was performed at two and half-foot intervals to a depth of ten feet below existing ground surface (bgs) and every five feet thereafter to boring terminations depth. We obtained representative disturbed soil samples during these tests and used them to classify the soils encountered. We placed the recovered representative soil samples in six-inch glass jars and transported to the laboratory for testing.

KCI geotechnical engineers visually classified the recovered soil samples in general accordance with ASTM D 2488 Standard Practice for Description and Identification of Soils. We classified soil samples with respect to texture in accordance with the Unified Soil Classification System (USCS). Boring logs describing the subsurface soils and groundwater conditions encountered at each of the boring locations are presented in Appendix B. The existing ground surface elevations indicated on the logs are based on field survey information provided by KCI-Survey.

2.3.2 Cone Penetration Test

We performed cone penetration tests (CPT) soundings in general accordance with ASTM D5778 at ten locations within the general project area between May 9 and 13, 2014. We use the results of the soundings to characterize the existing subsurface conditions within the unstable ground and slope areas. In addition, we performed localized pore pressure dissipation tests at test locations CPT-1 and CPT-5. The approximate test locations are shown on the attached Figure 2. We have provided summary tables soundings of the CPT results in Appendix B. We terminated the sounding depths at pushing refusals between 38 and 75 feet below existing ground surface, typically in excess of about 55 feet. We inferred soils in general accordance to Soil Behavior Types proposed by Robterson (1990).

We performed CPT tests in general accordance with ASTM D5778. CPT permits continuous explorations and profiling of the subsurface conditions while minimizing retrieval of subsurface materials. This exploration method employs sensors that are pushed into the ground to infer the properties of both soils and pore fluids. Known as direct-push technology, this method can map out the vertical and lateral extents of stratigraphic layers, as well as the distribution of groundwater conditions.

In combination with the test boring information, we will use the CPT results to identify loose/soft and disturbed soils strata and weak zones, and predict or confirm the existing failure planes at depth. Also, it will provide soil and groundwater data for characterizing the stress history and shear strength parameters of in-situ soil materials. By using standard engineering correlations, the geotechnical properties of stratigraphic layers can be inferred. Inferred properties include constrained modulus, undrained shear strength, residual shear strength, friction angle, overconsolidation ratio, and the coefficient of consolidation.

2.3.3 Undisturbed Soil Sampling

Split-barrel samples are suitable for visual examination and classification tests but are not sufficiently intact for quantitative laboratory tests requiring undisturbed samples. Therefore, we obtained relatively undisturbed samples in selected borings by drilling to the desired depth and hydraulically forcing a section of 3-inch O.D., 16 gauge steel tubing into the soil. The sampling procedure is described by ASTM D 1587. We carefully removed each tube, together with the encased soil, from the ground, made airtight and transported to the laboratory. The appropriate test boring records show depths of undisturbed samples.

2.3.4 Soil Conditions

Figures 4A, 4B, and 4C in Appendix A depict generalized subsurface profiles at the project site across the slope failures. The subsurface conditions encountered at the boring locations are shown on the test boring records in Appendix B. Also, the inferred subsurface conditions at the CPT sounding locations are shown on the CPT records in Appendix C. These test boring records and profiles represent our interpretation of the subsurface conditions based on visual examination of field samples and laboratory tests. The lines designating the interfaces between various strata on the test boring records represent the approximate interface locations. The actual transitions between strata may be gradual.

Consistent with the published geologic mapping, the borings and CPT soundings encountered three major natural strata underlying existing 6-inch thick asphalt pavement structure and Fill materials. The natural soils include an upper sand stratum (Nanjemoy, Tn Stratum) overlying Marlboro Clay (Tm Stratum) and Aquaia Formation (Ta Stratum). These strata are briefly described in the following paragraphs.

Existing FILL (F):
This two to six feet thick stratum was encountered typically below the existing asphalt pavement (borings B-1 through B-10) and at borings B-14, B-15 and B-17 (within the vicinity of an abandoned building structure). Existing FILL materials consisted of a heterogeneous mixture of brown to reddish brown Silty Sand, Clayey Sand and Gravels with deleterious materials such as asphalt fragments, decomposed wood and organics. Soft silt and clay materials were locally encountered at boring B-15. The SPT N-values ranged from 3 to 19 blows per foot (bpf) indicating very loose to medium dense, typically loose relative density.

Stratum I: Natural Silty SAND, Clayey SAND, Sandy SILT (Tn Stratum)

This stratum was encountered below existing Fill or occurred as the top stratum in several test borings up to a depth of about 15 feet bgs in the elevated upslope areas. It appears to thin out towards the low lying and downslope areas towards the wetlands and stream (e.g., in the general area borings B-1 and B-4, and from B-13 towards B-16, etc.) It generally consisted of moist, brown, light brown, dark gray, very loose to medium dense Silty Sand (SM), Clayey Sand (SC), coarse Sand (SP) with Gravels, and interbedded with soft to stiff Sandy Silt (ML) and Sandy Clay (CL) layers. The SPT blow counts ranged from 3 to 12 bpf indicating very loose to medium dense, typically loose relative density. Soils appeared to be slightly plastic.

<u>Stratum II – CLAYS (Tm Stratum)</u>

Marlboro Clay stratum was encountered below the Tn Stratum at each of the exploration locations. It varied in thickness from 15 to 30 feet with the base typically at approximate El. 78 and El. 74; and locally at approximate El. 50 at the lower topographic areas, and up to El. 135 at the higher elevations. It generally consisted of moist to wet, reddish brown, brown, light gray to gray, Lean Clay (CL) with occasional thin lenses of micaceous Silt. Locally, we encountered occasional Fat Clays (CH) within this stratum. The SPT N-values ranged from 3 to 14 bpf indicating generally soft to stiff compactness, typically medium stiff. The moisture content of the tested samples ranged from 14 to 48 percent. The Liquid Limit ranged from 26 to 59 percent with Plasticity Index (PI) ranging between 10 and 30 percent, indicating typically high to very high plasticity soils. We noted, however, that the clay soils appeared to be brittle.

<u>Stratum III – SAND AND SILT (Ta Stratum)</u>

This stratum was encountered below the Marlboro Clay to the boring termination depths. It generally consisted of moist to wet, olive gray, greenish gray to dark gray, Silty Sand (SM) and Sandy Silt (ML) with mica and calcareous shell fragments scattered throughout the stratum. The SPT N-values ranged from 5 to over 100 bpf (characterized by spoon refusals in the cemented layers), indicating generally loose to very dense relative density. The loose zones appeared to occur at the interface with the Marlboro Clay. The relative density appears to be typically medium dense to dense compactness, and/or stiff to hard compactness. The moisture content of the tested samples ranged from 20 to 30 percent, with non-plastic to slight plasticity (PI less than 4 percent).

2.3.5 Groundwater and Cave-in Conditions

We observed and recorded groundwater and cave-in depth information in each boring during drilling (within the drill augers), and several hours after completion of drilling (and removal of the augers). In addition, we have installed a piezometer near Boring B-2 to record long term groundwater levels. Table 2-

1 below provides a summary of groundwater conditions and cave-in depths. Where encountered, groundwater and/or perched water conditions generally occurred at depths between 10 and 60 feet bgs.

Cave-in occurred at depth between 14 and 65 feet bgs following removal of the drill augers. Cave-in may be due to the collapse of soils after removing augers at the completion of drilling. However, in granular soils, cave-in depths may be due to the presence of saturated soil conditions arising from groundwater and/or perched-water conditions.

Because of the presence of clayey and silty nature (characterized by relatively impermeable conditions) within portions of the site soils, site soils have the potential of developing perched water conditions. In addition, seasonal and/or long-term fluctuations of the groundwater levels and/or perched water may occur due to variations in rainfall, evaporation, soil capillary, construction activity, ground conditions and surface runoff, and other site-specific factors, and should be anticipated.

Table 2.1: Summary of Groundwater Condition

Boring Nos.	**Groundwater Levels**				**Cave-in Depths (ft)**
	Depth (ft) (in augers)	**Depth (ft) (0 hr)**	**Depth (ft) (>24 hrs)**	**Elevation (ft)**	
B-1	43.8	57.8	-	11.8	14
B-2	31.2	11.1		63.3	21
Observation Well	-	36.7	37	37.6	-
B-3	48	42	10	69.7	18
B-4	-	59	34.3	63.3	36
B-6	Mud rotary drilling				
B-7	20.5	12	11	104.0	65
B-8	Mud rotary drilling				
B-9	18	17	15.5	105.2	
B-10	Mud rotary drilling				
B-11	Dry	-	-	-	92

Table 2.1: Summary of Groundwater Condition

Boring Nos.	**Groundwater Levels**				**Cave-in Depths (ft)**
	Depth (ft) (in augers)	**Depth (ft) (0 hr)**	**Depth (ft) (>24 hrs)**	**Elevation (ft)**	
B-13	Mud rotary drilling				
B-14	54.8	36	9.8	99.6	25
B-15	67.5	59	10.1	97.8	28
B-16	Mud rotary drilling				
B-17	Mud rotary drilling				

Piezometers

KCI subcontractor, CenKen, installed one piezometer near Boring B-2 on May 13, 2014 to monitor long term groundwater levels. The screen was installed at between 35 to 50 feet below the existing ground surface. A KCI engineer obtained the initial water-level reading on May 13, 2014 using a groundwater monitoring meter. We plan to perform daily readings to monitor the long-term fluctuations of the water table at that location.

We installed and have been monitoring the groundwater levels in general accordance with ASTM D5092. The details of general installation procedures are provided in Appendix B.

2.4 SLOPE MOVEMENT MONITORING

Our subcontractor, CenKen, installed six inclinometer casings from May 9 to May 13, 2014 to monitor further slope movements. We installed the casings at an average depth of 70 feet below the existing slope surface. A KCI engineer commenced obtaining the baseline inclinometer readings from May 12 and 13, 2014 using a probe-type inclinometer. We plan to perform daily inclinometer readings to determine potential progressive slope movements prior to the slope stabilization. We will provide the results of our slope monitoring along with final recommendations in a brief memorandum within two weeks from our last survey.

We are monitoring the slope movement in general accordance with ASTM D 6230. The details of general installation procedures and typical inclinometer survey procedures are provided in Appendix B.

2.5 LABORATORY TESTING

We performed laboratory testing on representative soil samples (from disturbed jar samples and undisturbed Shelby Tube samples) to confirm visual soils classifications and to determine physical properties of in-situ soils. The laboratory tests were conducted in general accordance with ASTM standards and included the following:

	No. of Tests
• Natural Moisture Content (ASTM D 2216)	42
• Classification Tests, including:	
- Atterberg Limits (ASTM D 4813)	29
- Sieve Analysis (ASTM D 422)	24
• Direct Shear Test (ASTM D 3080)	5
• CIU Triaxial Test (ASTM D 4767)	1
• One-Dimensional Consolidation Test (ASTM D 2435)	1

We have provided details of laboratory testing procedures and the laboratory test results in Appendix C. Due to the slope failure and unstable ground issues associated with the presence of the Marlboro Clay stratum at the project site, we performed laboratory testing to determine shear strength parameters (undrained direct shear, DS and consolidated undrained Triaxial, (CIU) and deformation characteristics (one dimensional consolidation) of the Tm stratum. Table 2-2 provides a summary of the shear strength test results.

Table 2-2: Summary of Shear Strength Results for Marlboro Clay (Tm)

Boring No.	Sample	Test Type	USCS	Cohesion c', (psf)	Friction Angle, ^{0}	Moisture Content, (%)	Unit Weight, (pcf)	LL %	PI %	Fines %
B-13	ST-1 (22'-24')	DS	ML	997	29.3	36	115	48	18	78
B-13	ST-2 (28'-30')	DS	CL	473	22.4	32	118	39	14	100
B-14	ST-1 26.5'-28.5')	DS	CL	650	14.2	27	122	38	16	100
B-15	ST-1 (22'-24')	DS	CL	11.3	31	35	117	40	16	90
B-15	ST-1 (22'-24')	CIUC	CL	130	18.4	33	121	40	16	90
B-17	ST-1 (22'-24')	DSR	CL	759	29.7	44	116	47	28	74

*DS=Direct shear testing conducted at 0.01 in/minute shearing rate without residual cycles

**DSR = Direct shear testing conducted at 0.01 in/minute shearing with residual cycles

3.0 GEOTECHNICAL EVALUATIONS

3.1 SLOPE STABILITY ANALYSES

KCI performed preliminary global stability analyses for the pre-existing failure conditions of the slopes. This enabled us to back-calculate the critical shear strength parameters of the Marlboro Clay (Tm Stratum) under marginal stability conditions (defined by Factor of safety, FS = 1.0 or less). Based on the results of the subsurface explorations, we developed a typical subsurface profile for a critical slope section for our analyses as depicted in Appendix D. We have assumed that the phreatic water level was developed in the upper Tn (Stratum I) during slope failure.

We selected preliminary design soil parameters based on the field and laboratory test results, and our experiences with similar soil materials. We used the General Limit Equilibrium/Morgenstein-Price (GLE) method for the slope stability analyses to satisfy both force balances and moment balances of soil slices in order to find the most critical slip surface and the minimum factor of safety (FS) of the slope. We utilized both circular slip search and block slip search for the back analyses. We conducted our slope stability analyses using the software Slide Version 6.029 developed by RocScience Inc. We have analyzed several slope scenarios as part of the back-calculation evaluations using the following laboratory soil parameters and slope conditions as summarized in Table 3.1.

Table 3.1: Definition of Back Analyses Cases

	Soil Properties: Marlboro Clay (Tm Stratum)	
Assumed Slope Conditions	**C' (psf)**	**ϕ' (°)**
A. Groundwater depth at 10 feet and rear tension cracks	130	18
B. Groundwater depth at 10 feet and no tension cracks	130	18
C. Groundwater depth at 5 feet and rear tension cracks	130	18
D. Groundwater depth at 5 feet and no tension cracks	130	18
E. Groundwater depth at 10 feet and rear tension cracks	130	14
F. Groundwater depth at 10 feet and no tension cracks	130	14

Table 3.1: Definition of Back Analyses Cases

	Soil Properties: Marlboro Clay (Tm Stratum)	
Assumed Slope Conditions	**C' (psf)**	**ϕ' (°)**
G. Groundwater depth at 5 feet and rear tension cracks	130	14
H. Groundwater depth at 5 feet and no tension cracks	130	14

We have provided detailed of our slope analyses in Appendix D. The results of our preliminary slope stability analyses are summarized in Table 3.2.

Table 3.2: Summary Results of Pre-Failure Slope Analyses

Case	**Hw**	**Tension Cracks Exist**	**ϕ' (°)**	**c' (psf)**	**FS**
A	10	Yes	18	130	1.02
B	10	No	18	130	1.13
C	5	Yes	18	130	0.91
D	5	No	18	130	0.98
E	10	Yes	14	130	0.84
F	10	No	14	130	0.97
G	5	Yes	14	130	0.77
H	5	No	14	130	0.78

H_w = Vertical height of water below the existing ground surface
FS = Minimum Factor of Safety

The results of our preliminary analyses confirmed that slope failure likely occurred under fully saturated slope conditions within the overburden Tn stratum and Marlboro Clay as indicated by the laboratory testing data. Pending additional testing, we recommend that residual soil shear strength from the CIUC test (cohesion, c'= 130 psf, friction angle = 18 degrees) be used for the Marlboro Clay in preliminary evaluations of slope stabilization options. Also the groundwater level should be set at 5 feet or less below grade for design stabilization efforts.

3.2 POTENTIAL CAUSES OF THE EXISTING LANDSLIDE

There are several causes such as, geological, morphological, physical and human activity that can render a site susceptible to landslide and ground movements. When such conditions exist, only one trigger is needed to cause the slope to fail/slide. Trigger is an external stimulus such as intense rainfall and storm water infiltration, earthquake shaking, volcanic eruption, storm waves, or rapid stream erosion that caused a near-immediate response in the form of a landslide by rapidly increasing the imposed stresses or by reducing the strength of slope materials due to significant pore pressure developments within saturated soils.

Based on our preliminary site evaluations and analysis and our review of historic information, the geology of the site, in particular the presence of the Marlboro Clay, made it susceptible to landslide and ground settlements. The trigger was intense and rapid infiltration of rainfall that occurred prior to the slope failure.

Our post-failure subsurface explorations confirmed that three geologic formations are present at the site. Of particular concern is the Marlboro Clay which is sandwiched between the upper Nanjemoy and the lower Aquia formations. Historic information (Pomeroy, 1988, *Map Showing Landslide Susceptibility in Maryland, USGS Miscellaneous Field Studies Map MF-2048*) suggests that Marlboro Clay is one of the Coastal Plain geologic formations highly susceptible to slope failures. Localized and mass ground movements associated with slumps and earthflows are known to be associated with Marlboro Clay with numerous slope failures having occurred in south-western and east-central Prince George's County.

During wet periods as rainfall percolates downward through the overlying permeable sandy and silty soils, it encounters the relatively impermeable Marlboro Clay layer. The microstructure of Marlboro clay makes it difficult for water to infiltrate. Thus, infiltrated water will move primarily along the surfaces of the clay layers. Over time, this water may gradually dissipate with little easing of the pore-pressures and causing little or no slope movements. However, during the recent intense and rapid rainfall recorded at the project site, the infiltrated water was not able to quickly dissipate in the Marlboro Clay and generated massive pore-pressure built up in the saturated sediments. These high pore pressures resulted in shear strength degradation and creating weak subsurface zones with significant reduction in the frictional resistance along the contacts between the saturated soil and the Marlboro Clay. This condition produced new slide surfaces and potentially regenerated existing failure planes leading to the on-going slope failures and landslide at Piscataway Drive.

As depicted on the Subsurface Profiles Figures 4A, 4B and 4C (Appendix A), we have estimated approximate depths of the landslide and slope failure planes based on the test borings and CPT soundings and the residual strengths from laboratory testing. Our visual examination of extracted undisturbed Shelby tube sample ST-1 from boring B-15 provided evidence of a near horizontal failure plane between depths of 23.2 and 23.6 feet bgs, corresponding to approximate El. 85 (See Figure No. 5 in Appendix A). In addition, during drilling at boring B-17, we encountered loss of drilling fluid mud between depth of 25 and 26 feet bgs (approximate El. 85). This may be indicative of a failure plane.

4.0 GEOTECHNICAL RECOMMENDATIONS

4.1 GENERAL

The material within the landslide area has been weakened by the movement of soil mass and has thus lost some amount of shear strength. Also, our test results indicate that pore-pressures have not dissipated, hence, the continual recorded movement. Furthermore, with lots of crack openings within the site, infiltration of water will generate more pore-pressure and further destabilizing the slopes and causing more movement. Thus, the failed slopes have to be repaired immediately.

4.2 SLOPE STABILIZATION OPTIONS

To stabilize the failed slopes, KCI examined several methods and have performed preliminary analyses on three. We are proposing three preliminary alternatives for stabilization of the failed slopes and landslide areas at the project site as presented in Table 4-1. The conceptual designs of the stabilization alternatives are also provided.

As discussed previously, the major geotechnical issue relates the presence of saturated overburden soils overlying the impermeable Marlboro Clay which is known to be susceptible to landslides and slope failures. The interface between the overburden soils and clay strata loses significant frictional resistance when subjected to undrained conditions due to water infiltration leading to pore pressure build-up. The resulting loss of shear strength indicates that there is insufficient resistance along the interface to resist driving forces thus leading to slope instability.

In order to stabilize the slope and mitigate ground movements, measures should be taken to provide additional resistance and reduce slope driving forces risk to minimize the risk to public properties and life. Note that the proposed slope stabilization schemes are designed to stabilize the upper slope portions above Piscataway Drive roadway and protect the roadway. Note that we did not provide stabilization for the slope portion further downhill toward the river due to the anticipated lower risk to public properties and lives.

Table 4.1: Summary of Proposed Preliminary Slope Stabilization Options

Option	Grade & Backfill	Structural Element Support
1	Backfill slopes (3H:1V) above roadway and support using an 8-foot high soldier-lagging wall	Drilled Shaft Foundation and Micropile (Mini-pile) Anchors
2	Limited Slope Regrading	Drilled Shaft and Micropile
3	Limited Slope Regrading	Micropile

Option 1: This alternative includes a combination of ground stabilization partial backfill and mid-slope stabilization and protection. This method involves the installation of two rows of drilled shaft foundations along both sides of the Piscataway Drive, a retaining wall with backfill, and two rows of micropiles (mini-piles) near the existing head scarp. These reinforcements will be extended beyond the failure surfaces. This stabilization is associated with the installation of structural elements with high strength, which introduce forces to oppose movement and support the sliding mass, resulting in stabilization of the landslide. Partial slope backfilling supported with a retaining wall along the roadway to stabilize the toe of slope. We have provided details of the conceptual design on Figure D-9 in Appendix D.

Option 2: This alternate involves ground stabilization using drilled shafts along the roadway and slope reinforcement using micropiles along the entire western side to reinforce the failed slopes with limited regrading. On the eastern slopes, we recommend one row drilled shafts installed beyond the failure surface and embedded in Ta Stratum. We have provided details of the conceptual design on Figure D-10 in Appendix D.

Option 3: This alternate is similar to Option 2; however, we use only micropiles for both ground stabilization and reinforcement with limited regrading. The method involves the installation of micropiles throughout the slopes on both sides of Piscataway Drive. The mini piles will be extended beyond the failure surface to a minimum depth of 50 feet into Ta Stratum. We have provided details of the conceptual design on Figure D-11 in Appendix D.

Our analyses indicate that each of the options will adequately stabilize the slopes and mitigate additional movements within the vicinity of improvement. However, the drilling and grouting equipment used for micropile installation is relatively small and can be mobilized in constrained and restrictive areas that would prohibit the entry of conventional heavy drilled shaft-installation equipment. In addition, micropile installation will not be impacted by overhead power lines or other obstructions as are conventional drilled shaft systems. The equipment can be mobilized up steep slopes and in remote locations. Also, drilling and grouting procedures associated with micropile installations will not cause significant site disturbance or damage to adjacent existing structures and buried utility mains when proper drilling and grouting procedures are used.

We anticipate that the resulting ground movements indicated by the inclinometer readings will have significant implications for the slope rehabilitation options. Therefore, we will revise the proposed stabilization options accordingly, and recommend that additional detail analyses and design, constructability evaluations and cost analyses be performed for each option as part of the final design purposes.

4.3 UTILITY COORDINATION AND RECONSTRUCTION RECOMMENDATIONS

The Utility Coordination efforts should continue and should include meeting and talking with each utility company to discuss the impacts to their facilities and potential mediation once the slope is stabilized.

WSSC Facilities: The existing eight-inch Ductile Iron Pipe (DIP) water main (12/20/02 Contract) and the eight-inch Concrete Sanitary Line (6/1/70 Built date) will need to be replaced within the proposed length of the roadway reconstruction (approximately 1,500 linear feet). KCI recommends that both lines be replaced within the existing footprint location in relation to the existing roadway. Prior to the soil failure the water and sanitary house connections ran under the failing slope; these connections collapsed during the failure event. KCI recommends that after the soil stabilization the replacement design should incorporate the use of a carrier pipe. A design will avoid the need to have the services running through the selected stabilized slope treatment.

KCI recommends the proposed water main and sanitary sewer replacement work be performed under the same construction contract.

Electric, Cable TV (CATV) and Telephone Facilities: PEPCO previously maintained a pole line along the southern edge of paving of Piscataway Drive which carried a single phase primary electric cables as well as third parties; COMCAST and Verizon cables. Temporarily the electric line has been de-energized and picked up from the broken poles and lifted to avoid danger to the crews working in the area. PEPCO is evaluating a temporary and permanent solution based upon the method and implementation of the slope stabilization.

Initially, it is anticipated that the impacted single phase pole line be reconstructed in a similar alignment and fashion as the system prior to the slope failure. The downstream and upstream poles should be evaluated in relation for vertical lift and tension impact sustained during the event and change pending line and grade. KCI recommends the collapsed service pole which was carrying the electric, CATV and telephone underground services be relocated along the common driveway of the impacted properties to avoid services running through the selected stabilized slope treatment.

4.4 ENVIRONMENTAL COORDINATION

On May 12, 2014, KCI performed wetland delineation within the vicinity of Piscataway Drive in Fort Washington, Maryland. KCI identified one palustrine forested wetland at the base of the slope below Piscataway Drive, as well as two associated stream channels, designated intermittent and perennial, respectively. KCI contacted the Maryland Department of the Environment (MDE) and the US Army Corps of Engineers on May 16, 2014 and the agencies concurred that the work constitutes an emergency.

MDE specified that if any access through regulated resources is needed in order to complete the repairs, a Joint Permit Application (JPA) must be submitted within 30 days. Impacts to wetlands and waterways should be minimized to the amount necessary to repair the slope. KCI contacted the Chesapeake Critical Areas Commission (CAC) on May 15, 2014 to make them aware of the ongoing emergency activities. A CAC letter will be prepared during final design.

4.5 ROADWAY RECONSTRUCTION AFTER THE SLOPE STABILIZATION PROCESS HAS BEEN COMPLETED

Utilizing the topographic survey, KCI will develop a baseline that will closely match the centerline of the existing roadway. This baseline will serve as the centerline for the reconstructed roadway. KCI will generate and evaluate the existing roadway profile since portions of the roadway have settled significantly. We will generate a revised roadway profile for the posted 25 mph per American Association of State Highway and Transportation Officials (AASHTO) – A policy on Geometric Design of Highways and Streets (Chapter 5: Local Roads and Streets). KCI will develop a typical Rural Secondary Residential roadway section for a 22-foot wide crowned roadway with 2% roadway cross-slopes. We will vary roadside grading to closely match the condition prior to the slope and roadway failure to reduce impacts to the existing residences. KCI will generate existing ground cross-sections with the proposed new roadway section superimposed to develop grading limits and earthwork requirements. We will place impermeable side ditches where necessary to divert the sheet flow of water away from the roadway into existing or proposed cross pipes.

KCI anticipates that during construction, once the slopes are stabilized (and all major construction equipment is no longer required to utilize the existing roadway), the existing pavement will be thoroughly broken up, scarified or removed. The embankment and subgrade will be placed along with any ditch and required cross pipes (existing cross pipes shall be cleaned). We will use the Prince George's County pavement section, or provide a recommended pavement design including a six-inch underdrain along both roadway edges. The underdrain will be outlet to the fill slopes. Guardrail will be required along the east side of the roadway for most if not the entire length of the reconstruction. Curbing may also be placed along the east side of the roadway to divert water away from the fill slopes to curb openings and stabilized slope channels.

5.0 STRATEGY FOR MOVING FORWARD

This report provides a preliminary concept design prepared after reviewing the feasibility of several options. We have developed the recommended concept to an approximate 20% design stage. KCI will now work with Prince George's County DPW&T to consider option for moving forward with the recommendation contained in this report.

6.0 BASIS OF RECOMMENDATIONS

General

1. This report has been prepared to aid in the evaluation for the proposed construction described in this report. Adequate recommendations have been provided to serve as a basis for design and preparation of plans and specifications. The opinions, conclusions, and recommendations contained in this report are based upon our professional judgment and generally accepted principles of geotechnical engineering. Inherent to these are the assumptions that the earthwork and foundation construction should be monitored and tested under the guidance of a geotechnical engineer licensed in the State of Maryland or his representative.

Explorations

2. The analyses and recommendations provided are, of necessity, based on project information available at the time of the actual writing of the report, including existing site, surface and subsurface conditions that existed at the time the exploratory borings were drilled. Further assumption has been made that the limited exploratory borings, in relation to both the lateral extent of the site and to depth, are representative of general conditions across the site. The nature and extent of variations between these explorations may not become evident until further explorations and construction. If variations from anticipated conditions then appear evident, it will be necessary to revise the recommendations in this report.

3. The soil strata described in the text and indicated on the subsurface profiles are intended to convey generalized trends in subsurface conditions. Boundaries between strata are approximate and idealized, and developed by interpretations of widely spaced explorations and sampling; actual soils transitions are probably more erratic. Refer to boring logs for specific information.

4. Groundwater level readings have been made in the drill holes at times and under conditions stated on the boring logs. These data have been reviewed and interpretations have been made in this report. Fluctuations in the level of the ground water may occur due to variations in rainfall, temperature, and other factors occurring since the time measurements were made.

Review

5. This report has been prepared based on plans and description of the proposed construction cited herein. In the event that any changes in the nature, design or location of the proposed construction, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by KCI. We recommend that KCI be provided the opportunity for a general review of design and specifications so that our recommendations may be properly interpreted and implemented in the design specifications.

Uses of Report

6. This final report has been prepared for the exclusive use of Prince Georges County Government and other members of the design team for specific application of the Engineering Design services for the **Piscataway Drive Slope Failure,** Fort Washington, Maryland. Our professional services were performed in accordance with generally accepted soil and foundation engineering principles and practices; no other warranty, expressed or implied, is made. KCI assumes no responsibility for interpretations made by others on the work performed by KCI.

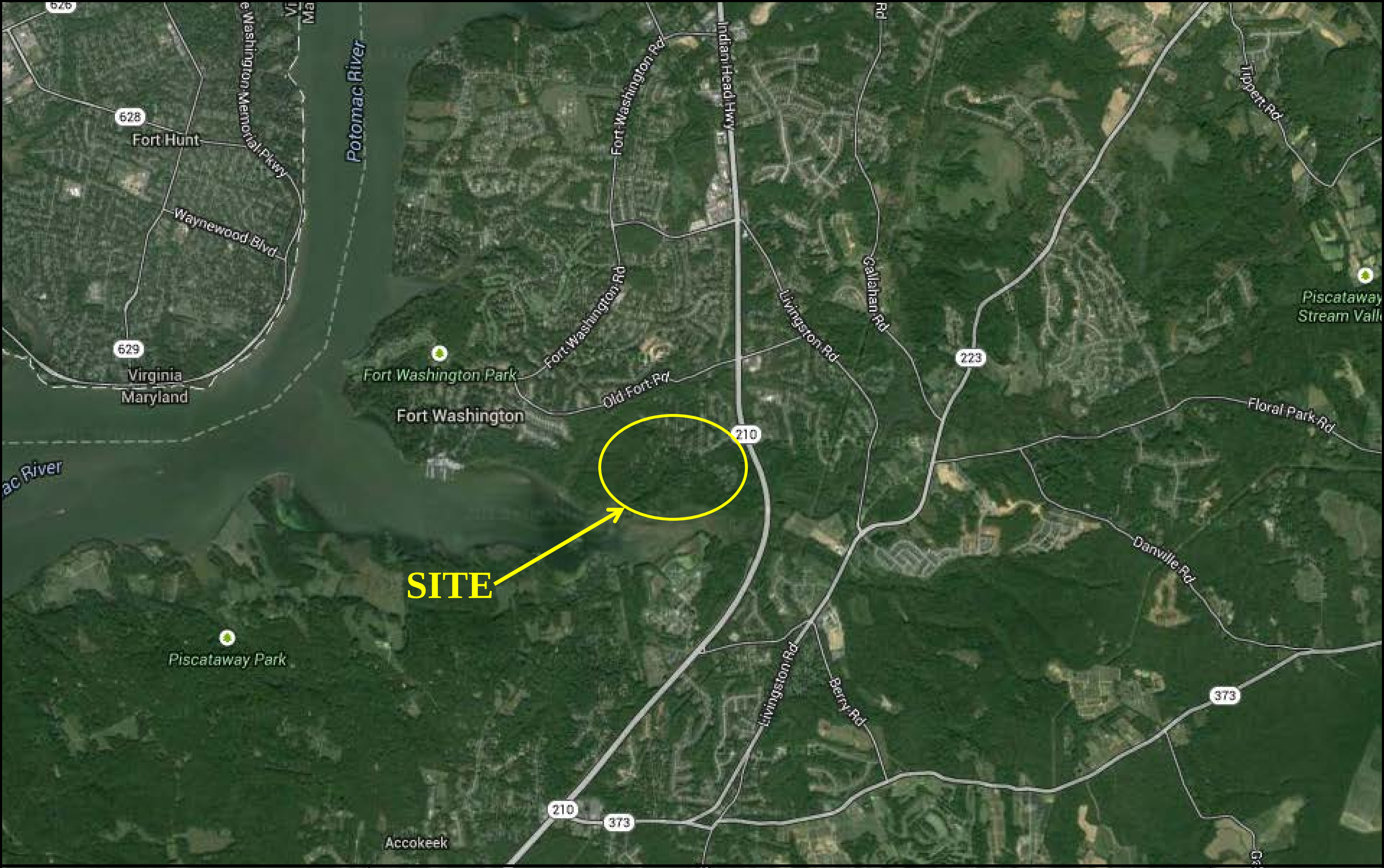
7. In the event the County proceeds forward with construction, this report is for design purposes only and is not sufficient to prepare an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to design considerations only. We recommend that this report be made available in its entirety including attachments and appendices to contractors for informational purposes only. The project plans or specifications should include the following note:

A geotechnical report has been prepared for this project by KCI Technologies, Inc. This report is for informational purposes only and shall not be considered as part of the contract documents. The opinions and conclusions of KCI represent our interpretation of the subsurface conditions and the planned construction at the time of the report preparation.

m:\2010\07100627.w\geotechnical\report\preliminary ger piscataway drive slope failure.docx

FIGURES:
SITE LOCATIONS PLAN, BORING LOCATION PLAN, SUBSURFACE PROFILES, AND ROADWAY PLANS AND CROSS SECTIONS

Appendix A



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SITE LOCATION MAP

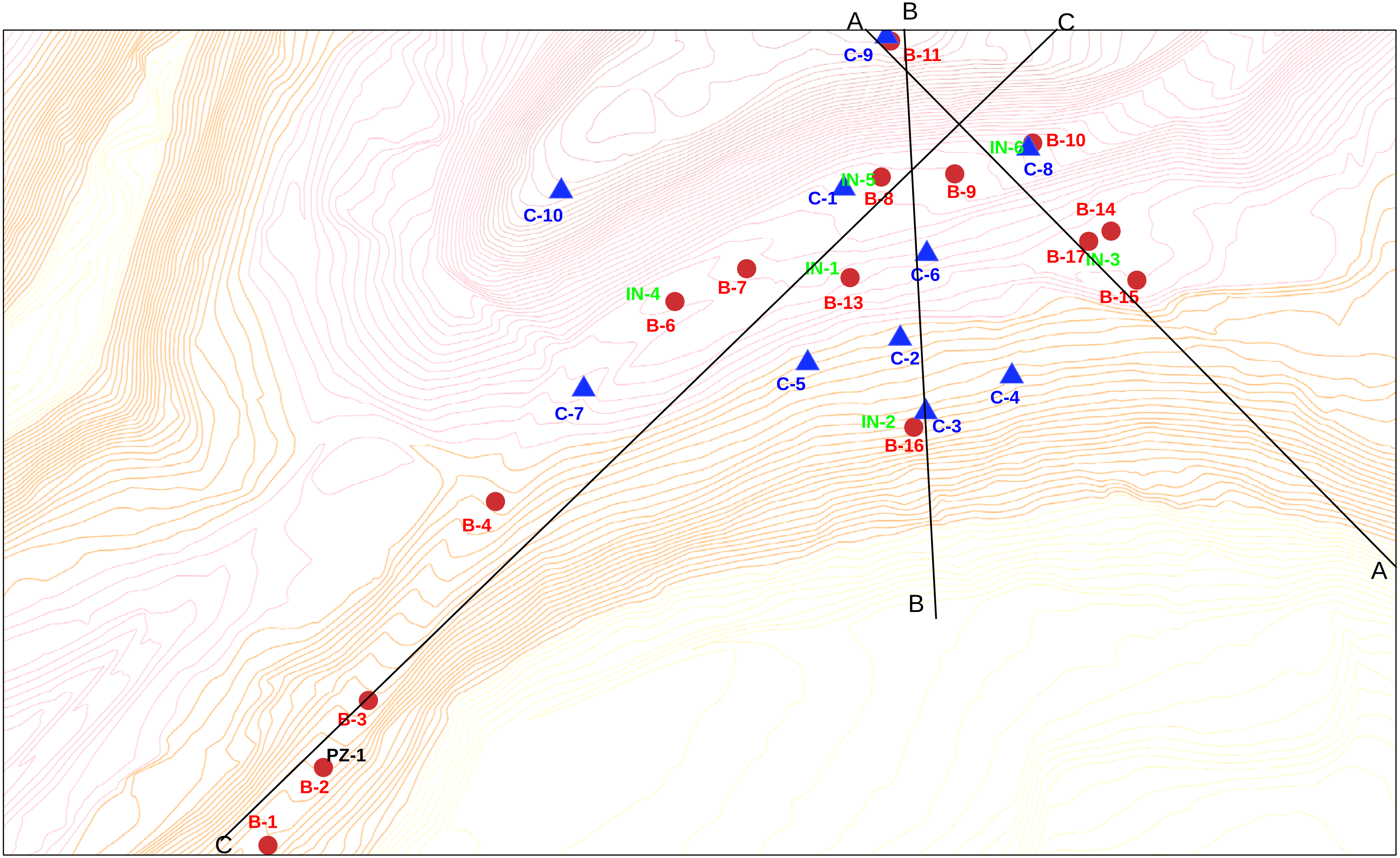
PISCATAWAY DRIVE SLOPE FAILURE

FORT WASHINGTON, PRINCE GEORGES COUNTY, MARYLAND

Figure No.

1

DRAWN BY	APPROVED BY	SCALE	DATE	KCI JOB NUMBER
LSG	KA	NTS	MAY 2014	07100627.W



Piscataway Drive Slope Failure

Figure 2: Exploration Plan

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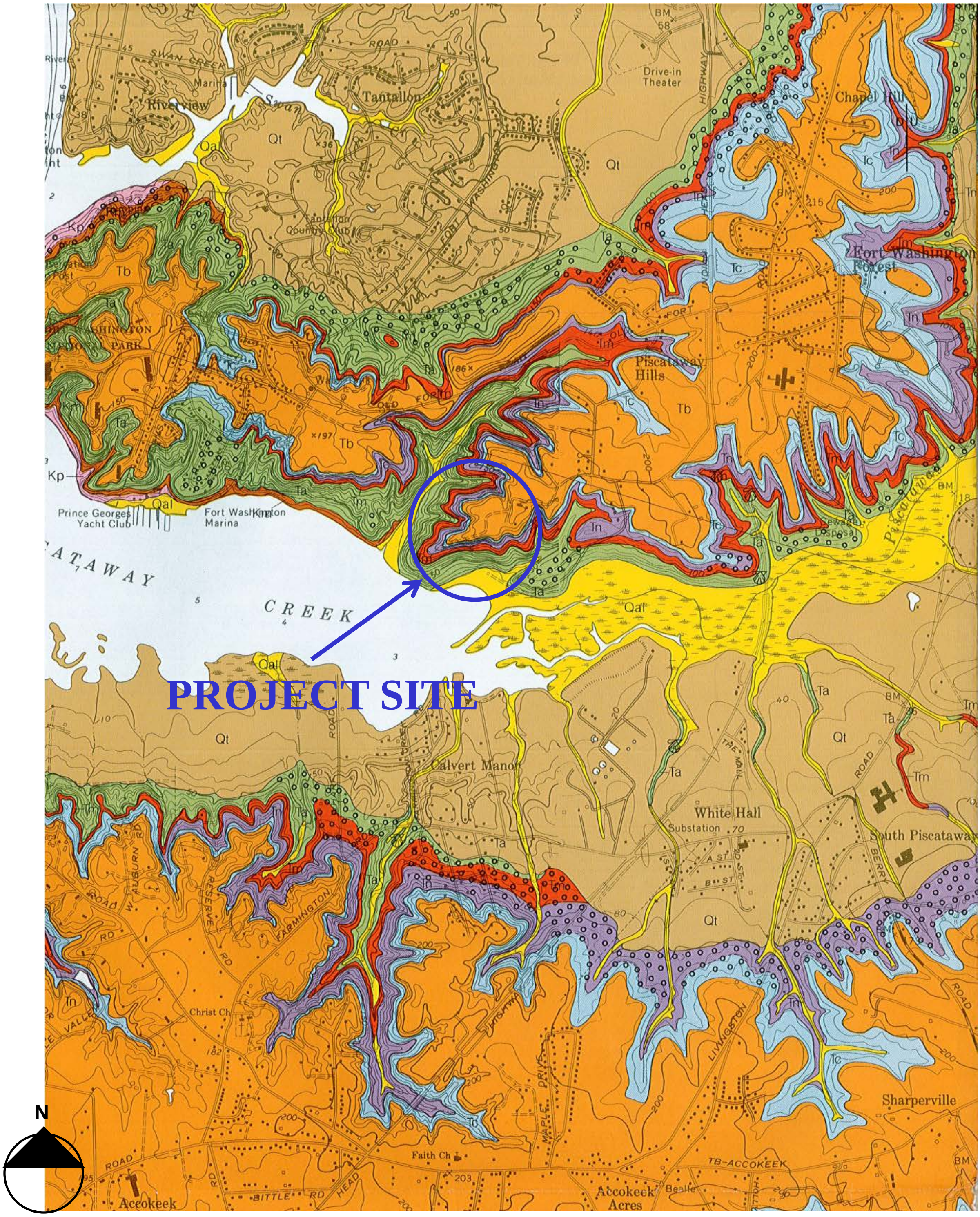
▲ CPT	**IN-1 Inclinometer Installation**
● SPT	**PZ-1 Piezometer Installation**

0 40 80 120 160
Feet

ArcGIS Online Microsoft Bing Maps Premium Subscription



PROJECT SITE

Engineers
Planners
Scientists
Construction Managers

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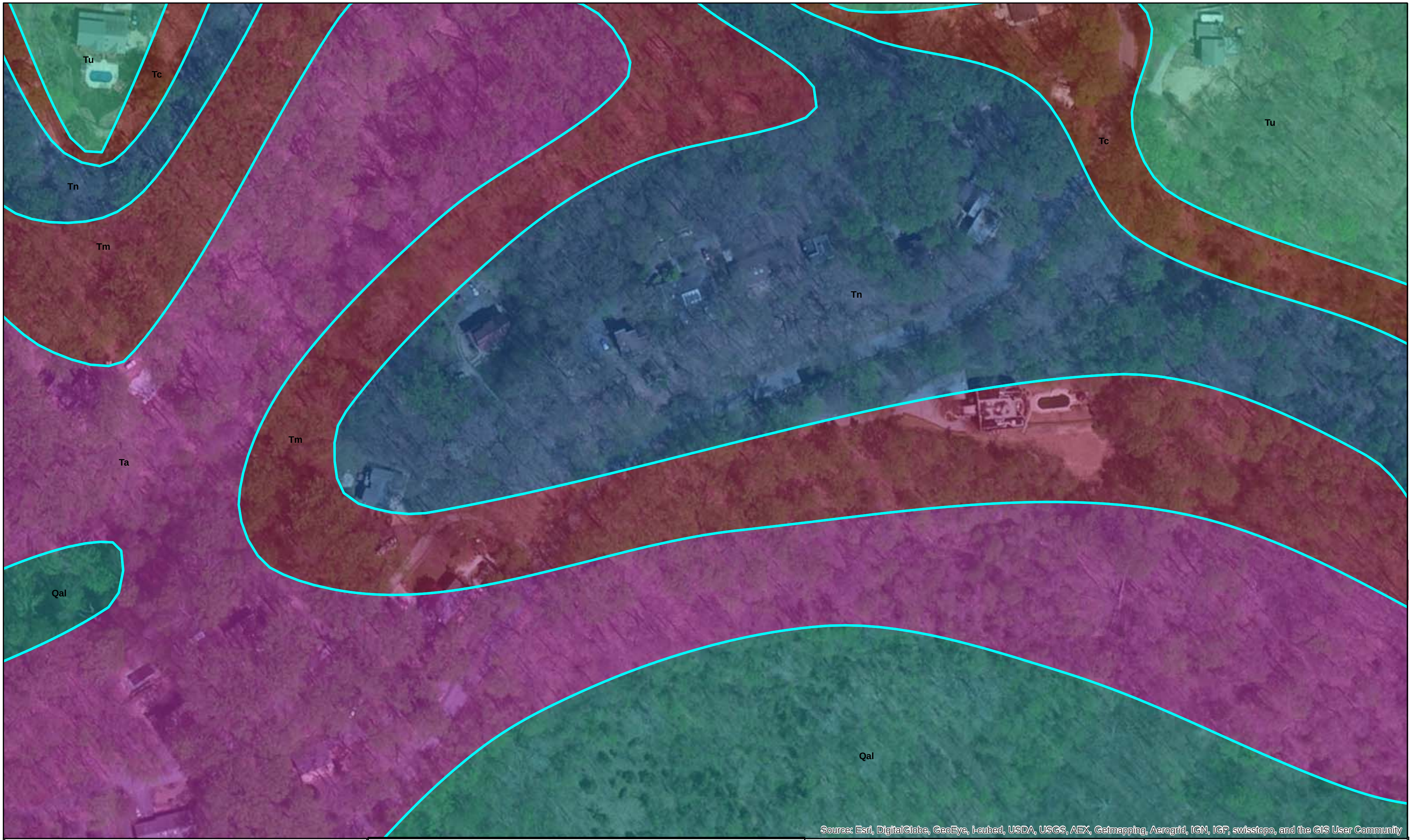
REGIONAL GEOLOGY MAP
PISCATAWAY DRIVE SLOPE FAILURE
PRINCE GEORGE'S COUNTY, MD

Figure No.

3A

DRAWN BY	APPROVED BY	SCALE	DATE	KCI JOB NUMBER
SS	KA	NTS	May 2014	07100627.W



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Piscataway Drive Slope Failure

Figure 3B: Site Geology Map

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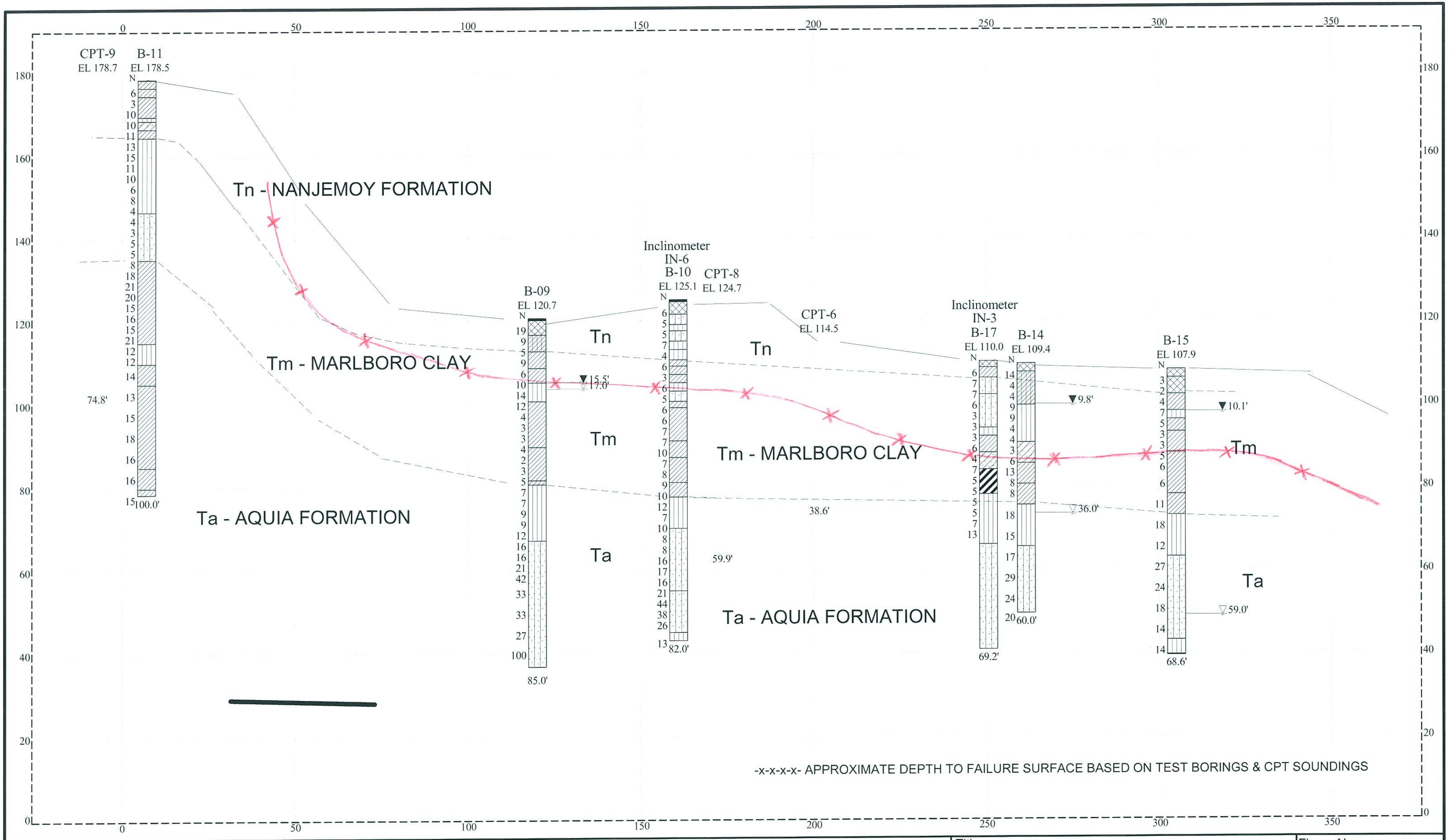
▨	▨	▨	▨	▨	▨
Qal	Ta	Tc	Tm	Tn	Tu

0 60 120 180 240
Feet

ArcGIS Online Microsoft Bing Maps Premium Subscription



USCS SOIL KEY

▨	GW	▨	SW	▨	ML	▨	OL
▨	GP	▨	SP	▨	MH	▨	OH
▨	GM	▨	SM	▨	CL	▨	FILL
▨	GC	▨	SC	▨	CH	▨	CWR

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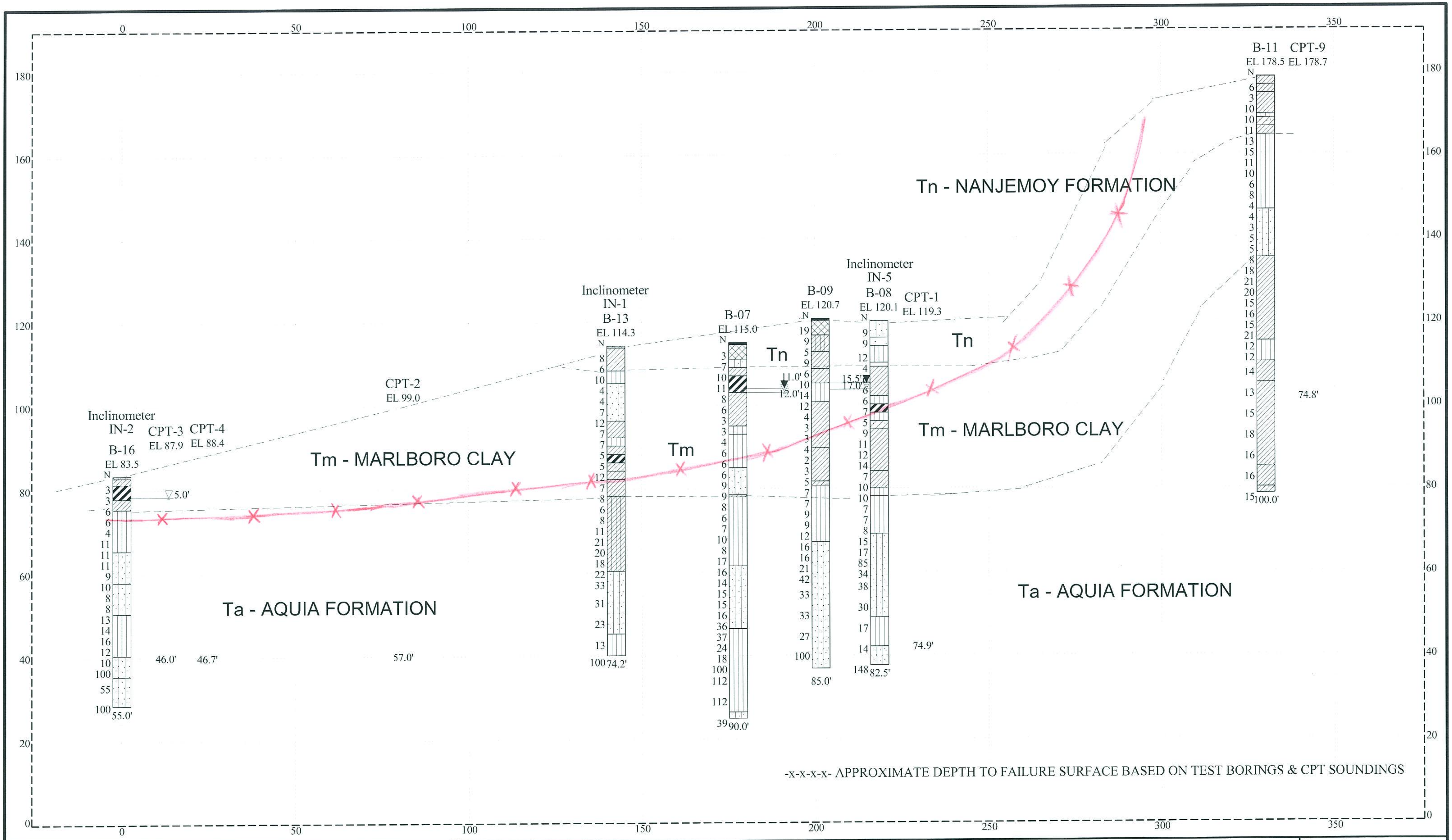
Title:
SUBSURFACE PROFILE A-A
PISCATAWAY DR SLOPE FAILURE

Drawn: KBA
Approved: KOA
Date: 5/18/14

Figure No.
4A

KCI Job No. 07100627W

KCI 11X17 W/LOGO2 PLOG PISCATAWAY DRIVE SLOPE FAILURE.GPJ MD SHA REVISED TEMPLATE.GDT 5/18/14



-x-x-x-x- APPROXIMATE DEPTH TO FAILURE SURFACE BASED ON TEST BORINGS & CPT SOUNDINGS

USCS SOIL KEY

▨	GW	▨	SW	▨	ML	▨	OL
▨	GP	▨	SP	▨	MH	▨	OH
▨	GM	▨	SM	▨	CL	▨	FILL
▨	GC	▨	SC	▨	CH	▨	CWR

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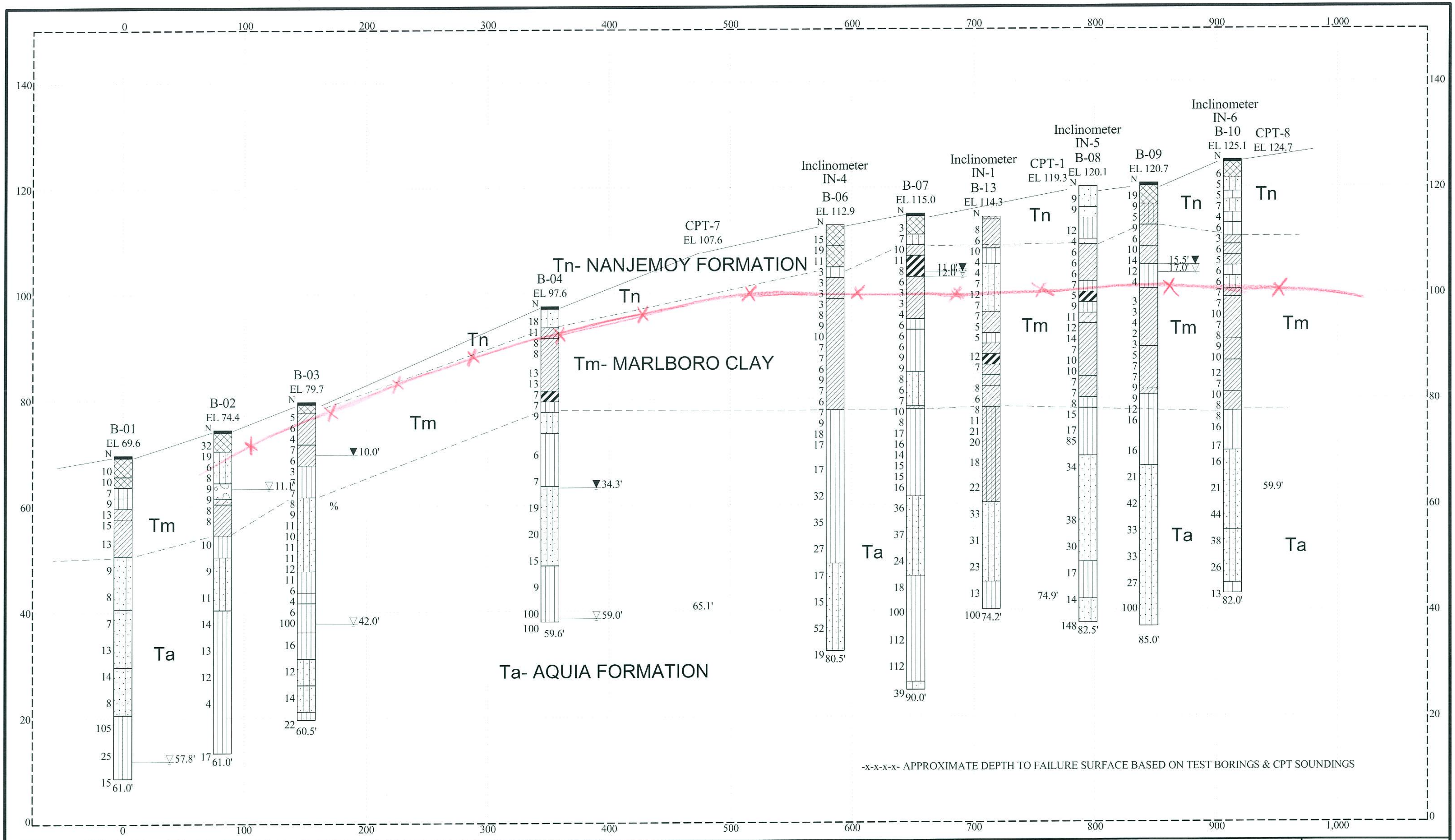
Title:
SUBSURFACE PROFILE B-B
PISCATAWAY DR SLOPE FAILURE

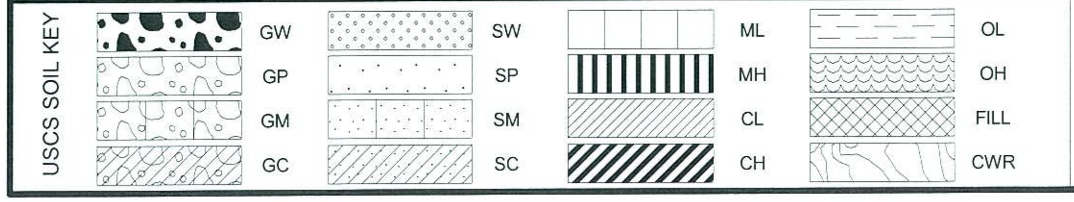
Drawn: KBA
Approved:
Date: 5/18/14

Figure No.
4B

KCI Job No. 07100627W

KCI 11X17 WLOGO2 PLOG PISCATAWAY DRIVE SLOPE FAILURE.GPJ MD SHA REVISED TEMPLATE.GDT 5/18/14





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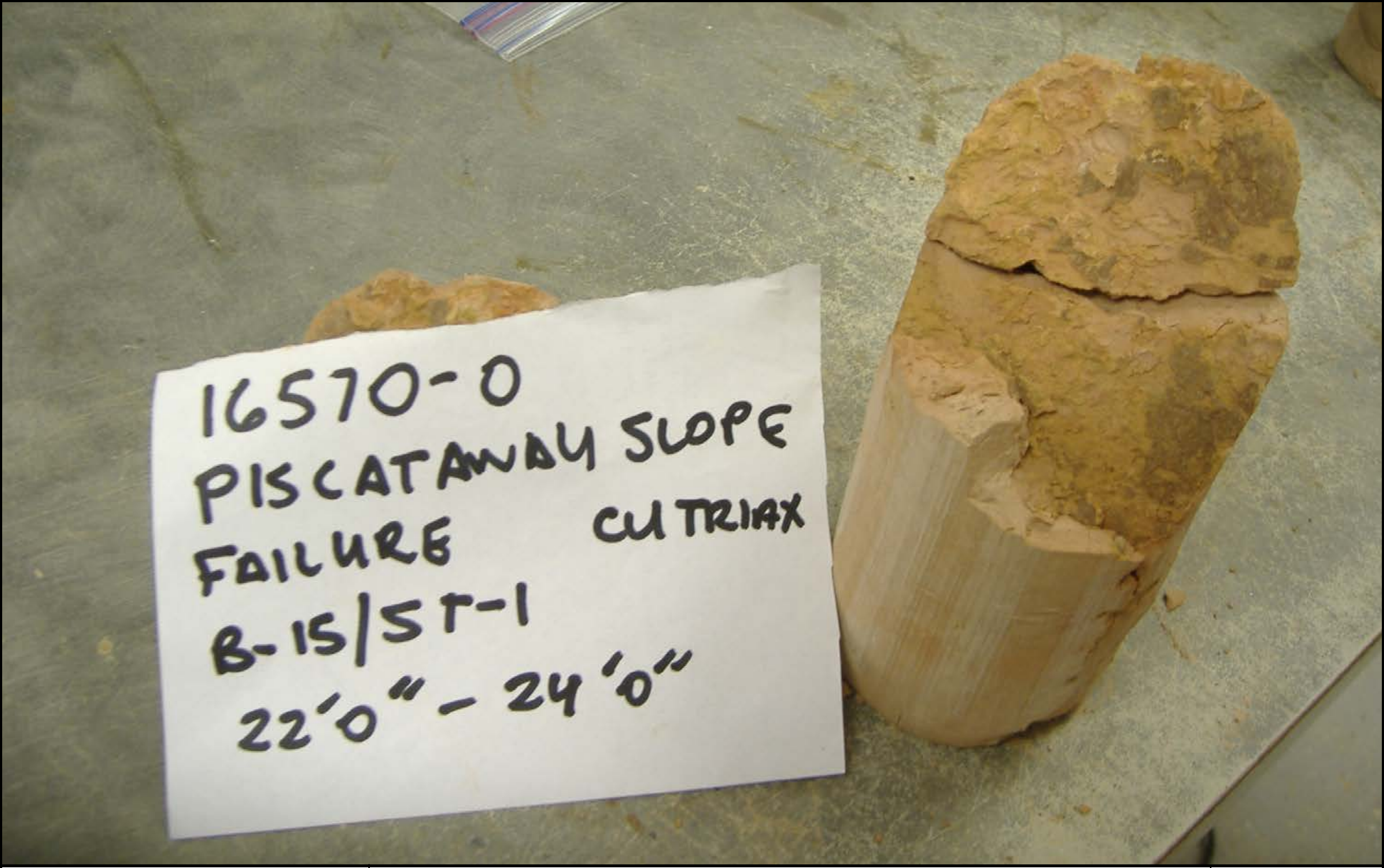
Title:
SUBSURAFACE PROFILE C-C
PISCATAWAY DR SLOPE FAILURE

Figure No.
4C

Drawn: KBA
Approved: KOA
Date: 5/18/14

KCI Job No. 07100627W



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POTENTIAL FAILURE PLANE IN BORING B-15

PISCATAWAY DRIVE SLOPE FAILURE

FORT WASHINGTON, PRINCE GEORGES COUNTY, MARYLAND

Figure No.

5

DRAWN BY	APPROVED BY	SCALE	DATE	KCI JOB NUMBER
LSG	KA	NTS	MAY 2014	07100627.W

TEST BORING LOGS & CPT SOUNDING RESULTS
FIELD OPERATIONS PROCEDURES, SLOPE AND WATER-LEVEL MONITORING PROCEDURES

Appendix B

KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **69.61 (ft)**

TEST BORING LOG

B-01

SHEET 1 OF 2

Driller: **Ron/CenKen**	Method: **HSA**	Casing Length: **59 ft**	Date Begun: **5/6/2014**
KCI Representative: **TA**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/7/2014**

Groundwater Levels (feet)

0 hour: 57.8 ▽

24 hours: ________

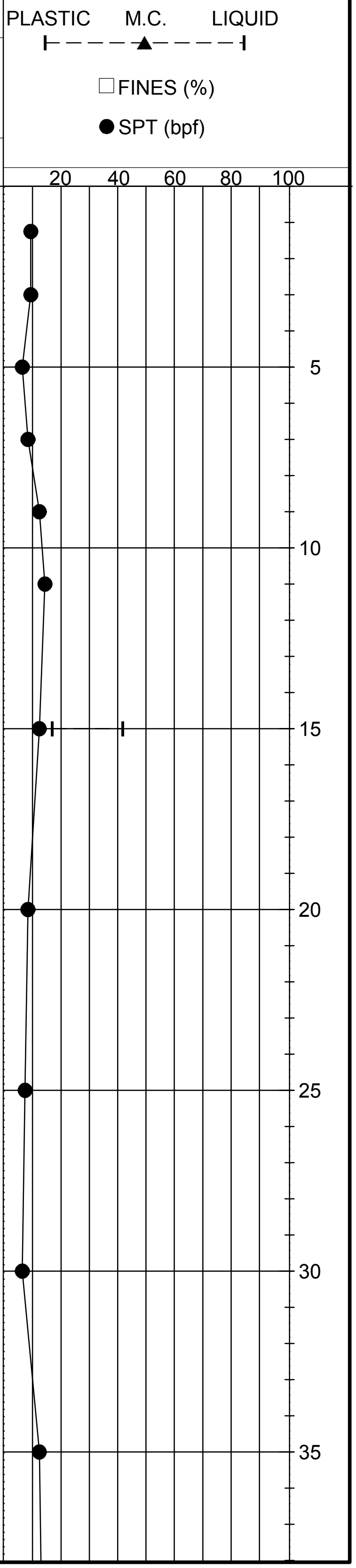
SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)
	6" ASPHALT	
	FILL Sampled As: Moist, light brown, loose, Silty SAND, trace Gravel, Asphalt fragments (SM)	
5	Possible FILL Sampled As: Moist, tan and brown, stiff, Sandy SILT, trace Gravel, decomposed wood and Organics at 6' (ML)	65
	Moist, light brown to gray, stiff, Sandy SILT (ML)	
	Moist, dark brown, stiff, Sandy SILT (ML)	
10	Moist, reddish brown, stiff, CLAY, trace Sand (CL)	60
	Moist, reddish brown, stiff, CLAY (CL)	
15		55
20	Moist, brown, loose to medium dense, Silty SAND, trace Gravel and Mica (SM)	50
25		45
30	Moist, gray, loose, Silty SAND, trace Mica (SM)	40
35	- becomes mottled	35

SAMPLES

IDNET	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
S-1	7-6-4 N = 10 REC=12"
S-2	3-4-6-5 N = 10 REC=12"
S-3	4-3-4-6 N = 7 REC=18"
S-4	2-5-4-4 N = 9 REC=12"
S-5	7-5-8-7 N = 13 REC=12"
S-6	3-6-9-10 N = 15 REC=12"
S-7	4-6-7-8 N = 13 REC=12"
S-8	4-4-5-5 N = 9 REC=12"
S-9	4-3-5-6 N = 8 REC=24"
S-10	4-3-4-5 N = 7 REC=24"
S-11	6-6-7-7 N = 13 REC=24"



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **69.61 (ft)**

TEST BORING LOG

B-01

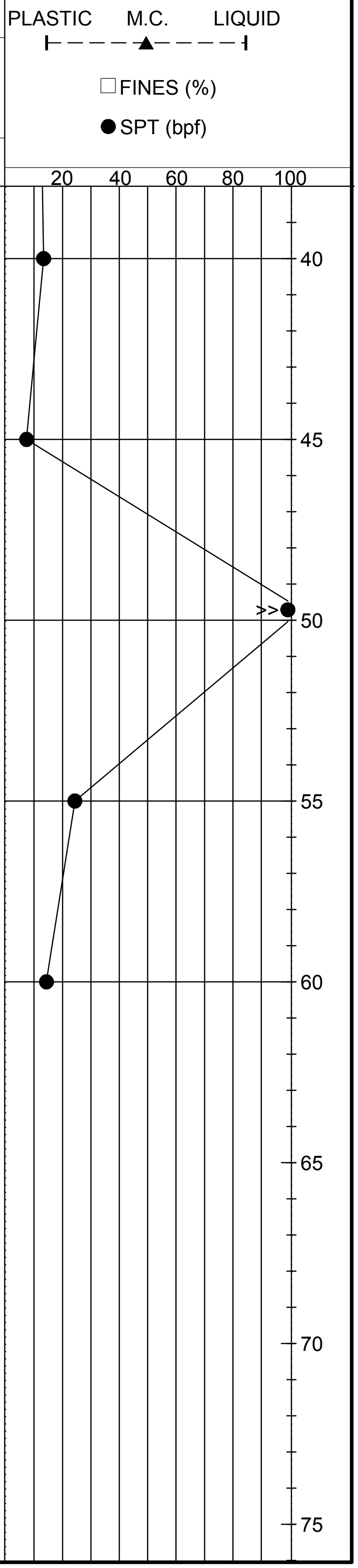
SHEET 2 OF 2

Driller: **Ron/CenKen**	Method: **HSA**	Casing Length: **59 ft**	Date Begun: **5/6/2014**
KCI Representative: **TA**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/7/2014**

Groundwater Levels (feet)
0 hour: 57.8 ▽
24 hours: ________

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	IDNET	TYPE	SAMPLES N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
	Moist, gray, loose, Silty SAND, trace Mica (SM)	SM				
40	Moist, brown, loose, Silty SAND, trace Gravel and Mica (SM)	SM	30	S-12	☒	6-7-7-10 N = 14 REC=24"
	- wet					
45			25	S-13	☒	3-5-3-6 N = 8 REC=24"
50	Moist, dark gray, stiff to hard, Sandy SILT, occasional Clay, with Shells and Mica (ML)	ML	20	S-14	☒	3-5-100/5" N = 105 REC=1"
55			15	S-15	☒	13-13-12-13 N = 25 REC=24"
▽						
60			10	S-16	☒	5-6-9-9 N = 15 REC=24"
65	Boring terminated at 61 ft. bgs		5			
70			0			
75			-5			

Notes:
1) Groundwater encountered in augers at 43.8 feet bgs during drilling on 5/6/14, and at 57.8 feet at completion of drilling on 5/7/14.
2) Cave-in occured at 13.2 feet after drilling; and at 14.3 feet bgs 24 hours after drilling.



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **74.38 (ft)**

TEST BORING LOG
B-02

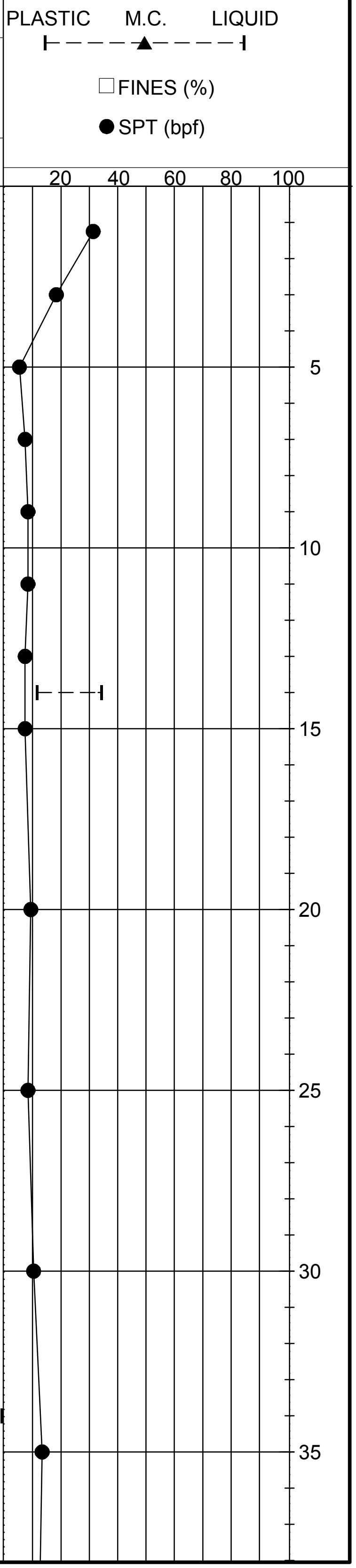
SHEET 1 OF 2

Driller: **Ron/CenKen**
Method: **HSA**
Casing Length: **59 ft**
Date Begun: **5/7/2014**
KCI Representative: **TA**
Hammer Type: **Automatic**
Casing Diameter: **3.25**
Date Completed: **5/9/2014**

Groundwater Levels (feet)
0 hour: 11.1 ▽
24 hours: ________

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	IDNET	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
	6" ASPHALT			
	FILL Sampled As: Moist, gray, medium dense, Sandy GRAVEL (GP)			46-19-13 N = 32
			S-1	10-10-9-6 N = 19 REC=12"
	Moist, reddish brown, loose, Silty SAND, with some fine Gravel (SM)	70		
5			S-2	4-3-3-3 N = 6 REC=12"
			S-3	3-3-5-4 N = 8 REC=12"
		65	S-4	3-4-5-6 N = 9 REC=12"
10	Wet, brown, loose, GRAVEL (GP)			
▽			S-5	5-5-4-3 N = 9 REC=12"
	Wet, reddish brown, loose, Clayey SAND, with fine Gravel (SC)		S-6	4-5-3-3 N = 8 REC=12"
15	Wet, mottled gray, medium stiff, Lean CLAY (CL)	60	S-7	6-3-5-6 N = 8 REC=12"
20	Wet, light brown, stiff, Sandy SILT (ML)	55	S-8	3-4-6-7 N = 10 REC=18"
25	Moist, light brown, loose to medium dense, Silty SAND, with Mica and Shell fragments (SM)	50	S-9	3-4-5-6 N = 9 REC=18"
30		45	S-10	3-5-6-8 N = 11 REC=18"
35	Moist, dark gray, medium dense to dense, Silty SAND, with Shell fragments (SM)	40	S-11	6-6-8-9 N = 14 REC=18"



PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **74.38 (ft)**

TEST BORING LOG

B-02

SHEET 2 OF 2

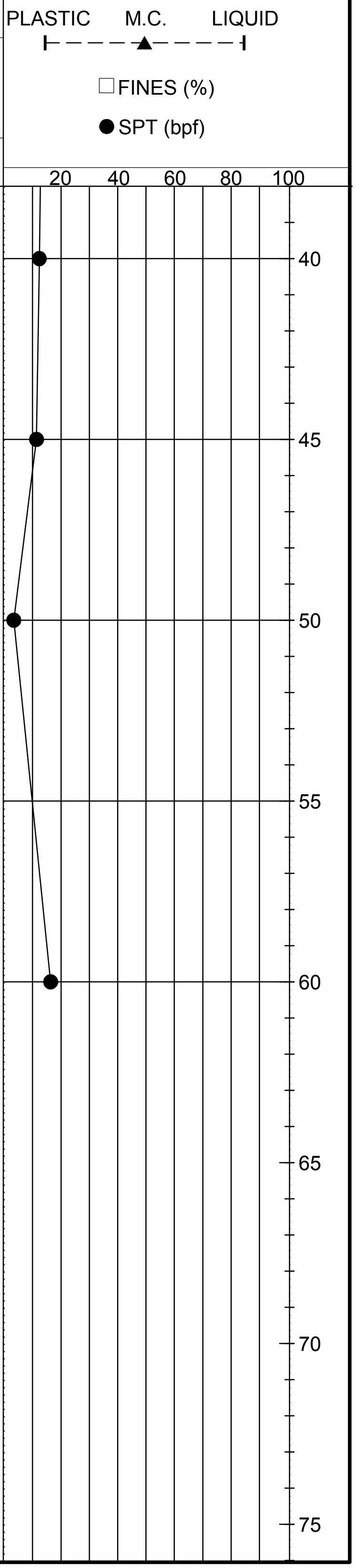
Driller:	Method:	Casing Length:	Date Begun:
Ron/CenKen	**HSA**	**59 ft**	**5/7/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
TA	**Automatic**	**3.25**	**5/9/2014**

Groundwater Levels (feet)
0 hour: 11.1 ▽
24 hours: ________

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)	IDNET	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
	Moist, dark gray, medium dense to dense, Silty SAND, with Shell fragments (SM)	35		
40			S-12	5-6-7-7 N = 13 REC=18"
45		30	S-13	4-6-6-8 N = 12 REC=18"
50		25	S-14	2-2-2-2 N = 4 REC=18"
	- With cemented Clay	20	S-15	100/5.8" REC=5"
55				
60		15	S-16	3-4-13-9 N = 17 REC=18"
65		10		
70		5		
75		0		

Boring terminated at 61 ft. bgs

Notes:
1) Water encountered in augers at 10 feet bgs during drilling on 5/7/14, and at 31.2 feet bgs after drilling on 5/9/14
2) Groundwater encountered at 11.1 feet bgs after pulling augers on 5/9/14.
2) Cave-in occurred at 21 feet bgs 48 hours after drilling.
3) 1-1/4" PVC groundwater observation welll (OW-1) installed on 5/13/14 at a 5-foot offset from B-2 to a depth of 50 feet.
4) Groundwater encounterd in observation well at 36.7 feet bgs after installation.



KCI-KOA PLOG PISCATAWAY DRIVE SLOPE FAILURE.GPJ MD SHA REVISED TEMPLATE.GDT 5/19/14

KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **79.66 (ft)**

TEST BORING LOG
B-03

SHEET 1 OF 2

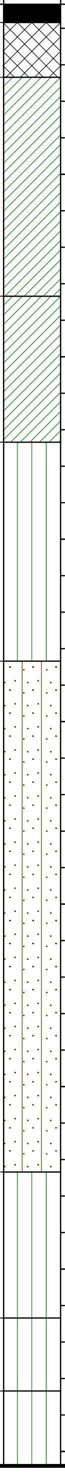
Driller: **Jerry/Hillis Carnes**	Method: **HSA**	Casing Length: **58.5 ft**	Date Begun: **5/8/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/8/2014**

Groundwater Levels (feet)
0 hour: 42 ▽
24 hours: 10 ▼

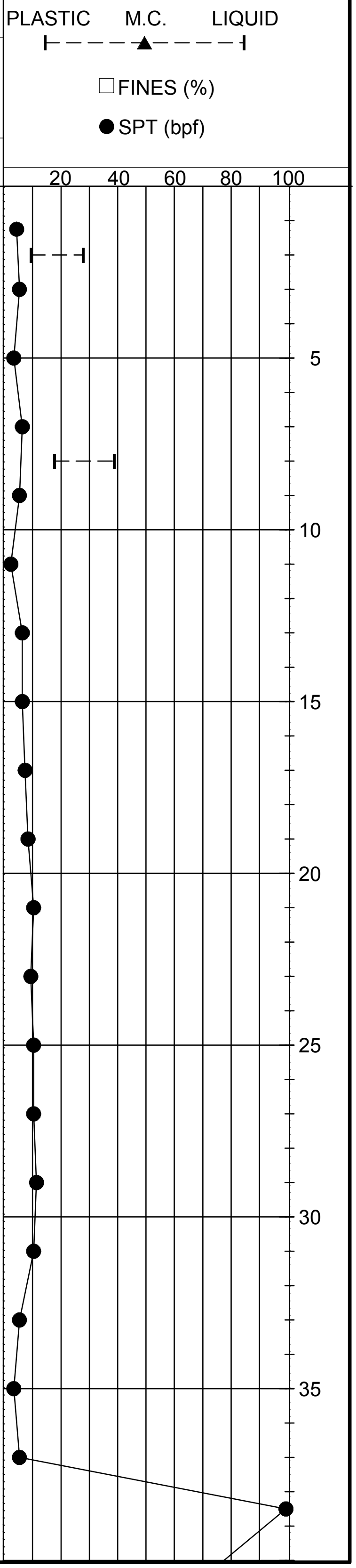
SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

- 6" ASPHALT
- FILL Sampled As: Moist, reddish brown, loose, Clayey SAND, with Gravel and Asphalt (SC)
- Moist, olive gray, dark brown, reddish brown, soft to medium stiff, Lean CLAY (CL)
- Moist, light brown to brown, soft to medium stiff, CLAY, with Mica (CL)
- Moist, light gray, medium stiff, Sandy SILT (ML)
- Moist, olive gray, loose to medium dense, Silty SAND (SM)
- Moist, olive gray to brown, soft to medium stiff, Sandy SILT (ML)
- Moist, olive gray, medium stiff, Sandy SILT, with Shells (ML)
- Moist, brown, hard, cemented SILT, with Shell fragments (ML)



IDNET	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6")	N	REC
S-1	2-2-3	N = 5	REC=8"
S-2	1-3-3-2	N = 6	REC=12"
S-3	1-2-2-3	N = 4	REC=11"
S-4	2-3-4-5	N = 7	REC=12"
S-5	1-3-3-5	N = 6	
S-6	1-2-1-3	N = 3	REC=8"
S-7	2-3-4-5	N = 7	REC=20"
S-8	2-3-4-5	N = 7	REC=20"
S-9	2-4-4-5	N = 8	
S-10	3-4-5-5	N = 9	REC=22"
S-11	3-5-6-6	N = 11	REC=21"
S-12	3-5-5-6	N = 10	REC=24"
S-13	4-5-6-7	N = 11	REC=22"
S-14	3-5-6-6	N = 11	REC=18"
S-15	3-6-6-7	N = 12	REC=24"
S-16	4-5-6-6	N = 11	REC=24"
S-17	2-3-3-4	N = 6	REC=20"
S-18	1-1-3-4	N = 4	REC=22"
S-19	1-2-4-5	N = 6	REC=24"
S-20	4-50/5"	N = 100	



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **79.66 (ft)**

TEST BORING LOG
B-03

SHEET 2 OF 2

Driller: **Jerry/Hillis Carnes**	Method: **HSA**	Casing Length: **58.5 ft**	Date Begun: **5/8/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/8/2014**

Groundwater Levels (feet)
0 hour: 42 ▽
24 hours: 10 ▼

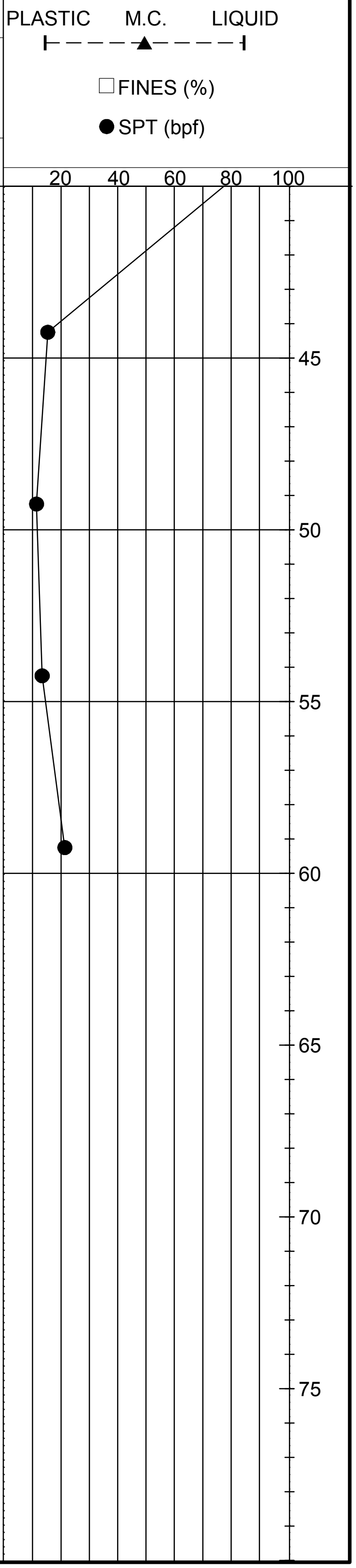
SOIL CLASSIFICATION AND REMARKS
SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

SOIL CLASSIFICATION AND REMARKS	IDNET	TYPE	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
Moist, brown, hard, cemented SILT, with Shell fragments (ML)			REC=8"
Moist, gray, very stiff, Sandy SILT, with Shells (ML) - with cemented Silt	S-21	☒	7-8-8 N = 16 REC=8"
Moist, olive gray, medium dense, Silty SAND, with Shells (SM)	S-22	☒	3-5-7 N = 12 REC=24"
Moist, dark gray, medium dense, Silty SAND, with Shells (SM)	S-23	☒	4-6-8 N = 14 REC=24"
Wet, olive gray and brown, very stiff, Sandy SILT, with Shells (ML)	S-24	☒	6-9-13 N = 22 REC=14"

DEPTH (ft): 45, 50, 55, 60, 65, 70, 75
ELEV (ft): 35, 30, 25, 20, 15, 10, 5, 0

Boring terminated at 60.5 ft. bgs

Notes:
1) Groundwater encountered in augers at 48 ft bgs during drilling, and 42 ft bgs after drilling.
2) Groundwater encountered at 10 ft bgs 48 hrs after drilling.
3) Cave-in occurred at 48 ft bgs after drilling and 17.6 ft bgs 48 hrs after drilling.



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **97.61 (ft)**

TEST BORING LOG
B-04

SHEET 1 OF 2

Driler: **James/CenKen**	Method: **HSA**	Casing Length: **59 ft**	Date Begun: **5/9/2014**
KCI Representative: **TA**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/9/2014**

Groundwater Levels (feet)
0 hour: 59 ▽
96 hours: 34.3 ▼

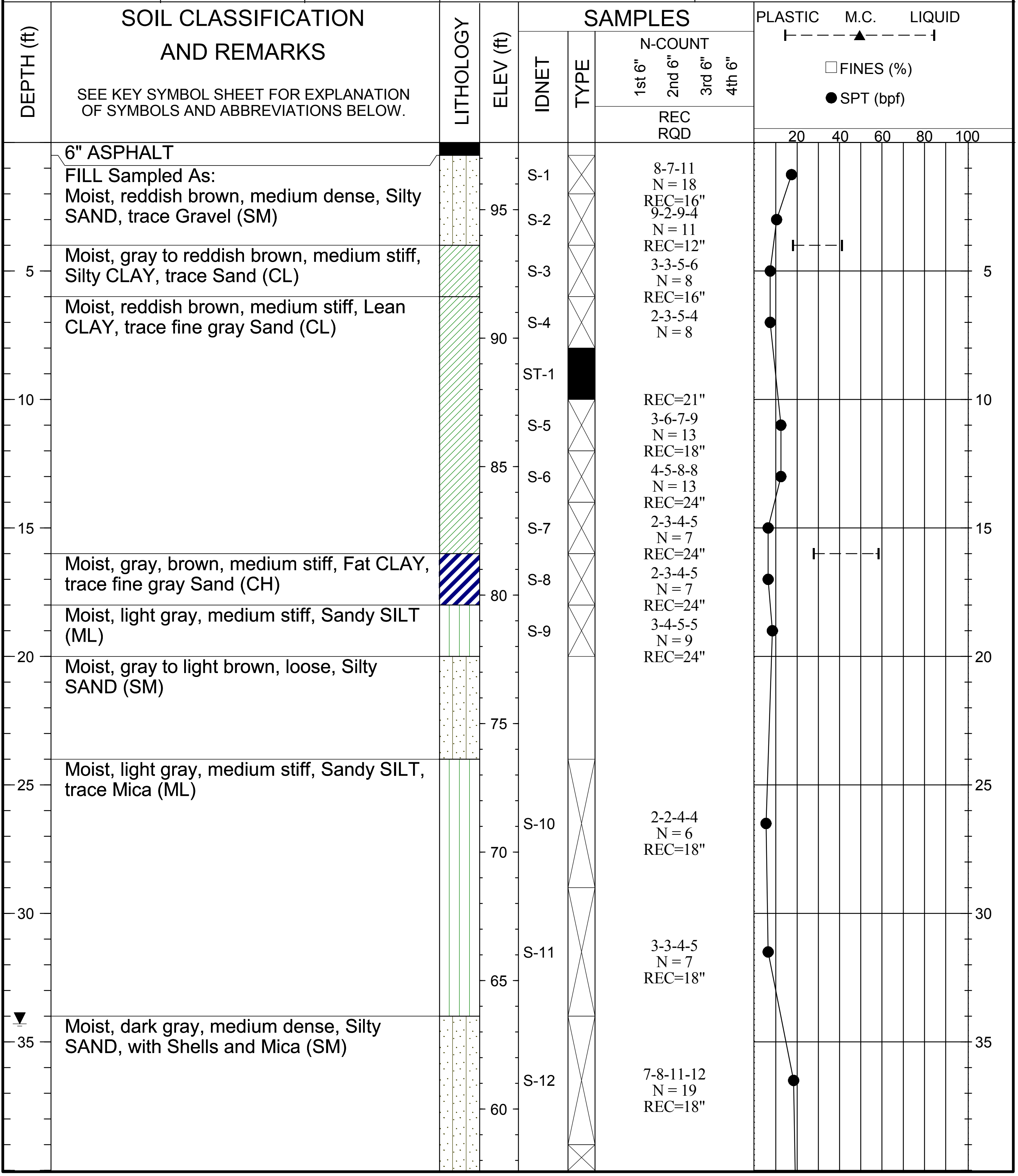
SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

- 6" ASPHALT
- FILL Sampled As: Moist, reddish brown, medium dense, Silty SAND, trace Gravel (SM)
- Moist, gray to reddish brown, medium stiff, Silty CLAY, trace Sand (CL)
- Moist, reddish brown, medium stiff, Lean CLAY, trace fine gray Sand (CL)
- Moist, gray, brown, medium stiff, Fat CLAY, trace fine gray Sand (CH)
- Moist, light gray, medium stiff, Sandy SILT (ML)
- Moist, gray to light brown, loose, Silty SAND (SM)
- Moist, light gray, medium stiff, Sandy SILT, trace Mica (ML)
- ▼ Moist, dark gray, medium dense, Silty SAND, with Shells and Mica (SM)

SAMPLES

IDNET	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6")	REC RQD
S-1	8-7-11 N = 18	REC=16"
S-2	9-2-9-4 N = 11	REC=12"
S-3	3-3-5-6 N = 8	REC=16"
S-4	2-3-5-4 N = 8	
ST-1		REC=21"
S-5	3-6-7-9 N = 13	REC=18"
S-6	4-5-8-8 N = 13	REC=24"
S-7	2-3-4-5 N = 7	REC=24"
S-8	2-3-4-5 N = 7	REC=24"
S-9	3-4-5-5 N = 9	REC=24"
S-10	2-2-4-4 N = 6	REC=18"
S-11	3-3-4-5 N = 7	REC=18"
S-12	7-8-11-12 N = 19	REC=18"



PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **97.61 (ft)**

TEST BORING LOG

B-04

SHEET 2 OF 2

Driller:	Method:	Casing Length:	Date Begun:
James/CenKen	**HSA**	**59 ft**	**5/9/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
TA	**Automatic**	**3.25**	**5/9/2014**

Groundwater Levels (feet)

0 hour: 59 ▽

96 hours: 34.3 ▼

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

Moist, dark gray, medium dense, Silty SAND, with Shells and Mica (SM)

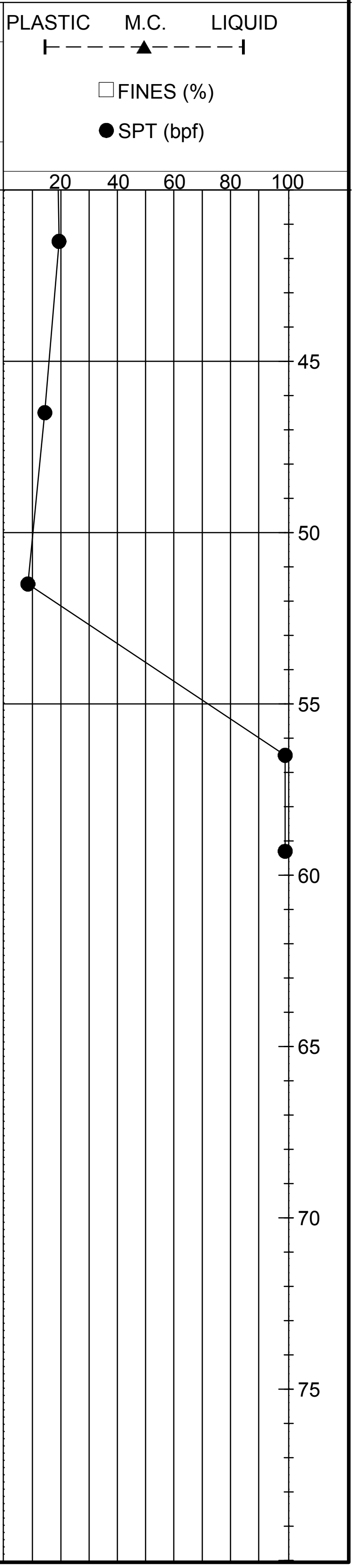
Moist, olive gray, stiff to hard, Sandy SILT, with Shells and Mica (ML)

- cemented Sand Lenses

- cemented soils at bottom

Boring terminated at 59.6 ft. bgs

IDNET	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
S-13	7-9-11-11 N = 20 REC=24"
S-14	5-7-8-11 N = 15 REC=24"
S-15	3-4-5-5 N = 9 REC=24"
S-16	6-100/5" N = 100 REC=11"
S-17	13-100/2" N = 100 REC=8"



Notes:

1) Groundwater encountered in augers at 59 ft bgs after drilling.

2) Groundwater encountered at 34.3ft bgs 96 hours after pulling augers.

3) Cave-in occurred at 48.5 ft bgs after drilling and 36.3 ft bgs 96 hourrs after drilling.

KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**	**TEST LOG**	
PROJECT NO. **07100627W**	**B-06**	
Surface Elevation **112.88 (ft)**	SHEET 1 OF 3	

Driller:	Method:	Casing Length:		
James/CenKen	**Mud Rotary**	**79 ft**	Date Begun: **5/9/2014**	**Groundwater Levels (feet)** 0 hour: ________
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **5**	Date Completed: **5/11/2014**	24 hours: ________

SOIL CLASSIFICATION AND REMARKS

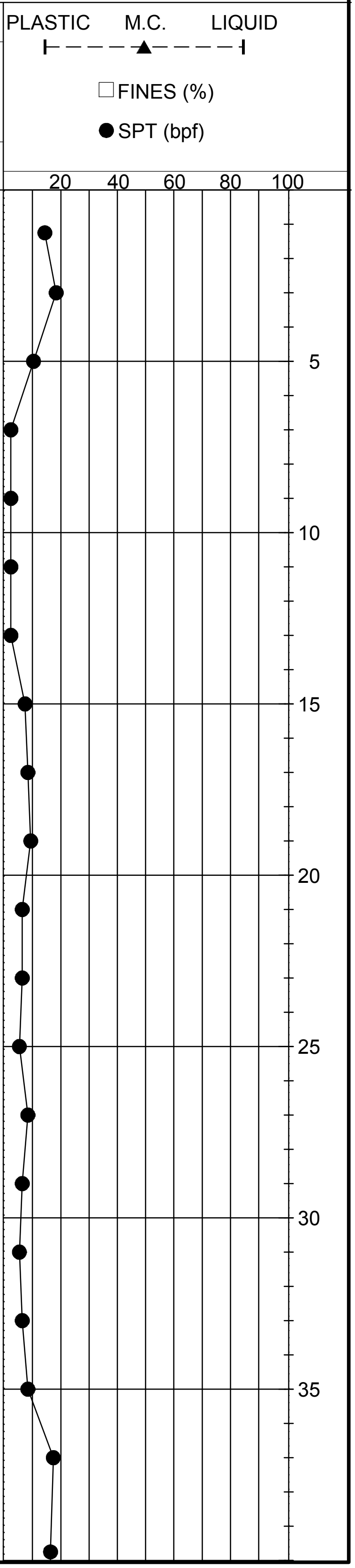
SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

- Moist, brown, medium dense, SAND, Silt, and Gravel (SM)
- Probable Fill Sampled As: Moist, brown, medium dense, Clayey SAND with Gravel (SC)
- Moist, brown, soft, SILT, trace Sand (ML)
- Wet, reddish brown, stiff, CLAY (CL)
- Moist, gray, medium stiff to stiff, CLAY (CL)
- Moist, olive gray to dark gray, stiff to hard, Sandy SILT with mica and Silty SAND layers (ML)

DEPTH (ft): 5, 10, 15, 20, 25, 30, 35

ELEV (ft): 110, 105, 100, 95, 90, 85, 80, 75

IDNET	N-COUNT (1st 6", 2nd 6", 3rd 6", 4th 6")	REC
S-1	6-6-9 N = 15	REC=18"
S-2	9-11-8-7 N = 19	REC=18"
S-3	5-5-6-5 N = 11	REC=18"
S-4	3-1-2-2 N = 3	REC=12"
S-5	1-1-2-2 N = 3	REC=18"
S-7	1-1-2-4 N = 3	REC=18"
S-8	1-1-2-3 N = 3	REC=22"
S-9	2-3-5-6 N = 8	REC=22"
S-10	2-3-6-9 N = 9	REC=22"
S-11	2-4-6-8 N = 10	REC=22"
S-12	2-3-4-5 N = 7	
S-13	2-3-4-5 N = 7	REC=24"
S-14	1-2-4-4 N = 6	
S-15	2-4-5-8 N = 9	REC=24"
S-16	2-3-4-7 N = 7	REC=24"
S-17	1-2-4-5 N = 6	REC=24"
S-18	2-3-4-6 N = 7	REC=24"
S-19	2-3-6-7 N = 9	REC=24"
S-20	4-7-11-18 N = 18	REC=22"
S-21	5-8-9	



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **112.88 (ft)**

TEST LOG

B-06

SHEET 2 OF 3

Driller:	Method:	Casing Length:	
James/CenKen	**Mud Rotary**	**79 ft**	Date Begun: **5/9/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	
SS	**Automatic**	**5**	Date Completed: **5/11/2014**

Groundwater Levels (feet)

0 hour: ________

24 hours: ________

DEPTH (ft)

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

LITHOLOGY | ELEV (ft) | SAMPLES: IDNET, TYPE, N-COUNT (1st 6", 2nd 6", 3rd 6", 4th 6"), REC RQD

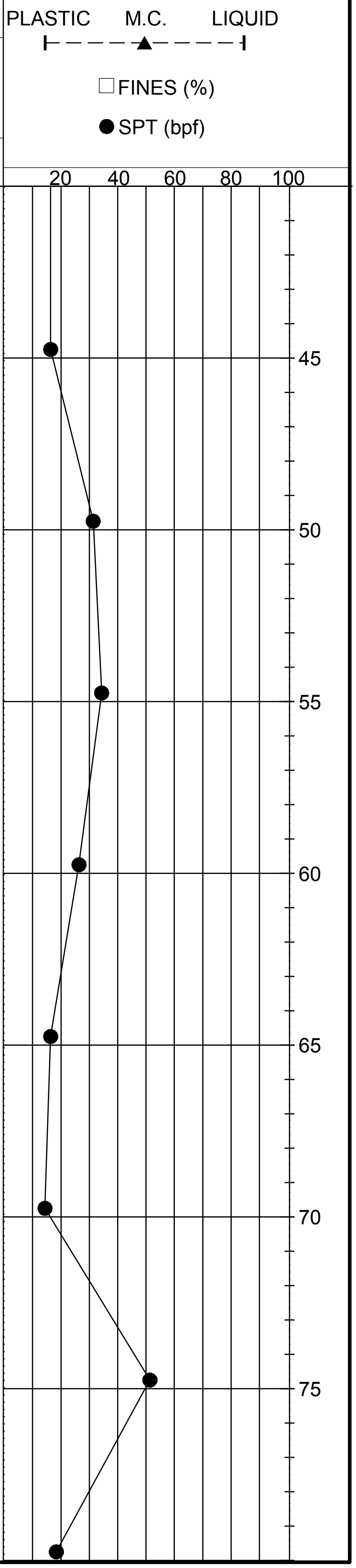
Moist, olive gray to dark gray, stiff to hard, Sandy SILT with mica and Silty SAND layers (ML)

Moist, olive gray, Silty SAND, with shells and mica (SM)

IDNET	N-COUNT / REC
	N = 17 REC=18"
S-22	4-7-10 N = 17 REC=18"
S-23	9-14-18 N = 32 REC=18"
S-24	10-15-20 N = 35 REC=18"
S-25	6-12-15 N = 27 REC=18"
S-26	5-7-10 N = 17 REC=18"
S-27	3-6-9 N = 15 REC=17"
S-28	14-23-29 N = 52 REC=18"
S-29	6-8-11

Depth (ft): 45, 50, 55, 60, 65, 70, 75

ELEV (ft): 70, 65, 60, 55, 50, 45, 40, 35



KCI TECHNOLOGIES	PROJECT **Piscataway Dr. Slope Failures** PROJECT NO. **07100627W**	**TEST LOG** **B-06**
	Surface Elevation **112.88 (ft)**	SHEET 3 OF 3

Driller: **James/CenKen**	Method: **Mud Rotary**	Casing Length: **79 ft**	Date Begun: **5/9/2014**	**Groundwater Levels (feet)**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **5**	Date Completed: **5/11/2014**	0 hour: _______ 24 hours: _______

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	IDNET	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6" REC RQD	PLASTIC M.C. LIQUID ☐ FINES (%) ● SPT (bpf) 20 40 60 80 100
					☒	N = 19 REC=18"	
	Boring terminated at 80.5 ft. bgs		30				
85	Notes: 1) Groundwater not recorded in borehole due to mud rotary drilling. 2) Inclinometer No. IN-4 installed in borehole to a depth of 80.5 feet.		25				85
90			20				90
95			15				95
100			10				100
105			5				105
110			0				110
115			-5				115

KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **115.01 (ft)**

TEST BORING LOG
B-07

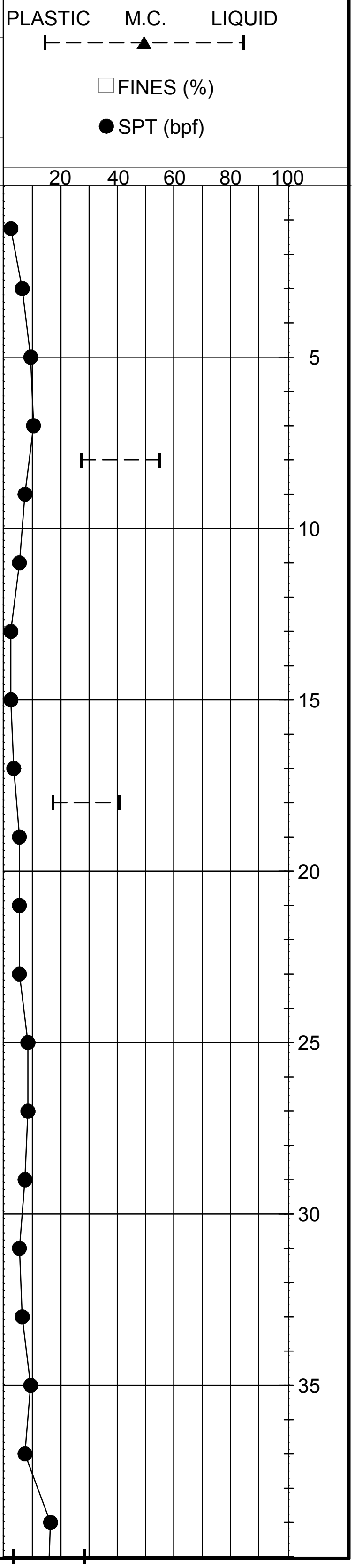
SHEET 1 OF 3

Driller: **Jerry/Hillis Carnes**	Method: **HSA**	Casing Length: **88.5 ft**	Date Begun: **5/9/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/9/2014**

Groundwater Levels (feet)
0 hour: 12 ▽
48 hours: 11 ▼

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	IDNET	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
	6" ASPHALT			
	FILL Sampled As: Moist, reddish brown, black, very loose to loose, SAND with Gravel and Asphalt Fragments (SP)		S-1	2-2-1 N = 3 REC=8
			S-2	2-4-3-3 N = 7 REC=8
5	Moist, reddish brown, loose, Silty SAND (SM)	110	S-3	6-6-4-6 N = 10 REC=6
	Moist, reddish brown, stiff, Sandy Lean CLAY, trace Gravel (CL)		S-4	3-5-6-6 N = 11 REC=15
	Moist, reddish brown and gray, medium stiff, FAT CLAY (CH)		S-5	3-4-4-6 N = 8 REC=13
10 ▼ ▽		105	S-6	3-3-3-5 N = 6 REC=15
	Moist to wet, light gray, soft to medium stiff, Lean CLAY (CL)		S-7	1-1-2-2 N = 3 REC=24
15		100	S-8	1-1-2-2 N = 3 REC=24
	PP = 0.25tsf		S-9	2-2-2-3 N = 4 REC=24
			S-10	2-3-3-3 N = 6 REC=16
20	Wet, light gray, medium stiff, Silty CLAY (CL)	95	S-11	3-4-2-4 N = 6 REC=24
	Moist, light gray, medium stiff to stiff, Sandy SILT (ML)		S-12	1-3-3-4 N = 6 REC=24
25		90	S-13	3-4-5-6 N = 9 REC=24
	Top sample is wet and very soft		S-14	4-4-5-6 N = 9 REC=19
			S-15	2-3-5-7 N = 8 REC=24
30	Moist, gray, loose, Silty SAND (SM) PP = 0.25tsf	85	S-16	2-3-3-4 N = 6 REC=24
			S-17	3-3-4-3 N = 7 REC=24
35		80	S-18	4-4-6-8 N = 10 REC=24
	Moist, gray, Lean CLAY (CL) PP = 2tsf			
	Moist, olive gray, stiff to very stiff, Sandy SILT, with shells and mica (ML)		S-19	3-4-4-7 N = 8 REC=24
			S-20	4-8-9-12 N = 17



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **115.01 (ft)**

TEST BORING LOG
B-07

SHEET 2 OF 3

Driller: **Jerry/Hillis Carnes**	Method: **HSA**	Casing Length: **88.5 ft**	Date Begun: **5/9/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/9/2014**

Groundwater Levels (feet)
0 hour: 12 ▽
48 hours: 11 ▼

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

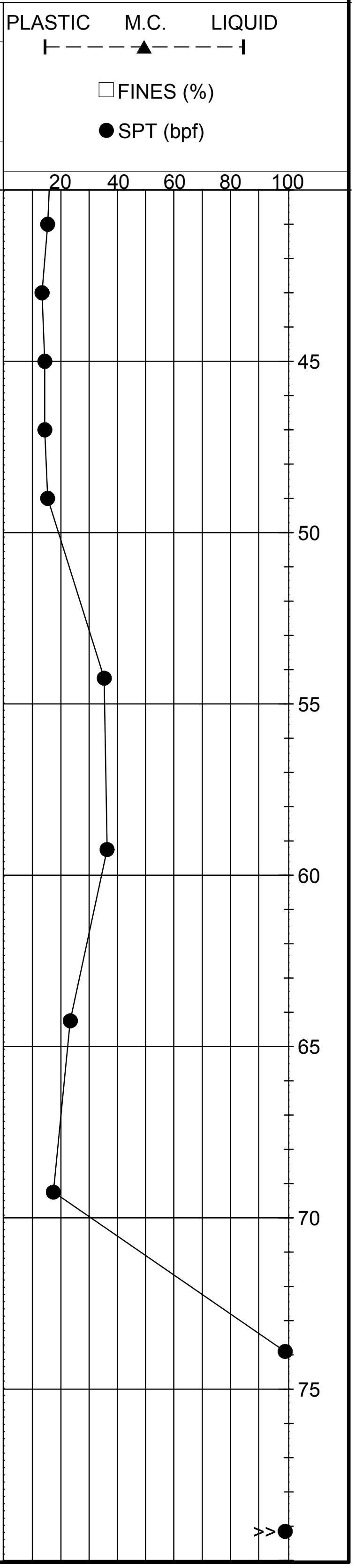
Moist, olive gray, stiff to very stiff, Sandy SILT, with shells and mica (ML)

Moist, olive gray, medium dense to dense, Silty SAND, with mica and shells (SM)

Moist, olive gray, very stiff to hard, Sandy SILT, with shell fragments and mica (ML)

IDNET	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6")	REC / RQD
		REC=24
S-21	4-7-9-10 N = 16	REC=24
S-22	4-6-8-9 N = 14	REC=24
S-23	4-7-8-10 N = 15	REC=24
S-24	4-6-9-10 N = 15	REC=24
S-25	5-8-8-12 N = 16	REC=24
S-26	9-16-20 N = 36	REC=18
S-27	10-15-22 N = 37	REC=18
S-28	6-10-14 N = 24	REC=18
S-29	6-8-10 N = 18	REC=18
S-30	5-50/3" N = 100	REC=9
S-31	10-12-50/5" N = 112	

DEPTH (ft): 45, 50, 55, 60, 65, 70, 75
ELEV (ft): 70, 65, 60, 55, 50, 45, 40



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **115.01 (ft)**

TEST BORING LOG
B-07

SHEET 3 OF 3

Driller: **Jerry/Hillis Carnes**	Method: **HSA**	Casing Length: **88.5 ft**	Date Begun: **5/9/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/9/2014**

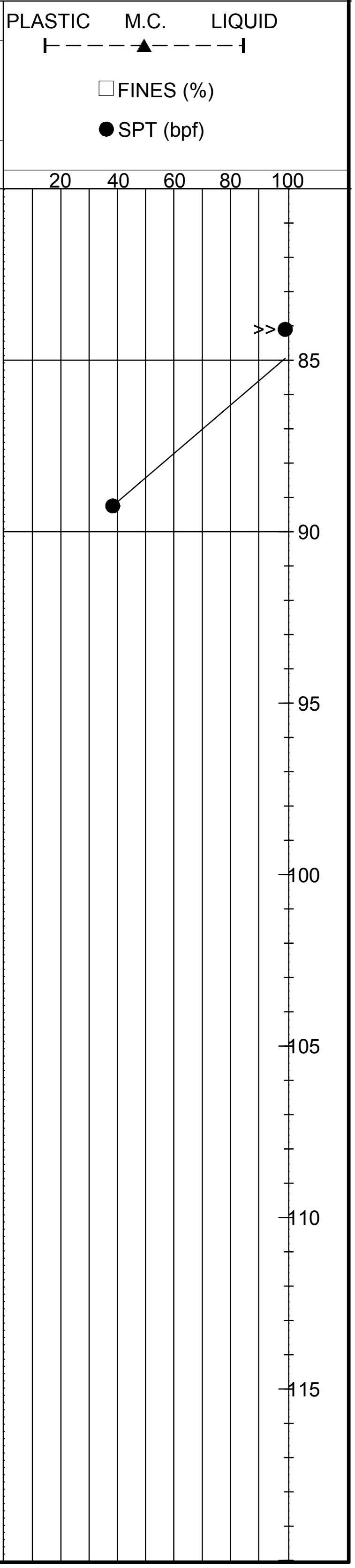
Groundwater Levels (feet)

0 hour: 12 ▽

48 hours: 11 ▼

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)	IDNET	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6" REC RQD
	Moist, olive gray, very stiff to hard, Sandy SILT, with shell fragments and mica (ML)				REC=9
			S-32	☒	10-12-50/4" N = 112 REC=9
85		30			
	Moist, olive gray, dense, Silty SAND, with mica and shells (SM)		S-33	☒	17-18-21 N = 39 REC=18
90		25			
	Boring terminated at 90 ft. bgs				
95		20			
100		15			
105		10			
110		5			
115		0			

Notes:
1) Water encountered at 20.5 feet bgs within auger after drilling, at 12 feet bgs after pulling augers.
2) Ground water encountered at 11 feet after 48hrs
3) Cave-in occurred at 65 feet bgs after drilling.



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **120.09 (ft)**

TEST LOG
B-08

SHEET 1 OF 3

Driller:	Method:	Casing Length:	
James/CenKen	**Mud Rotary**	**81 ft**	Date Begun: **5/13/2014**
KCI Representative: **TA**	Hammer Type: **Automatic**	Casing Diameter: **5**	Date Completed: **5/13/2014**

Groundwater Levels (feet)

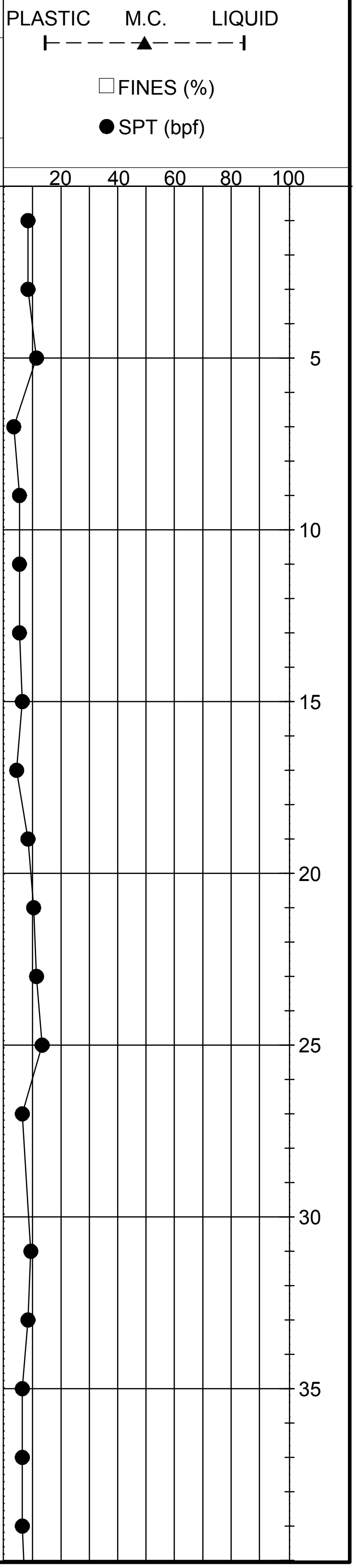
0 hour: _______

24 hours: _______

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	IDNET	TYPE	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
	Dry, light brown, loose, Silty SAND (SM)		S-1	☒	2-4-5-5 N = 9 REC=16"
			S-2	☒	5-4-5-6 N = 9 REC=16"
5	Dry, dark gray, loose, medium to coarse SAND, some fine Gravel (SP)	115	S-3	☒	5-6-6-7 N = 12 REC=10"
	Dry, gray, stiff to soft, Sandy SILT, some fine Gravel (ML)		S-4	☒	1-2-2-3 N = 4 REC=18"
			S-5	☒	2-3-3-3 N = 6 REC=18"
10	Moist, light brown to red brown, medium stiff, Sandy CLAY, trace Gravel (CL)	110	S-6	☒	2-2-4-4 N = 6 REC=18"
			S-7	☒	2-3-3-4 N = 6 REC=18"
15		105	S-8	☒	3-3-4-5 N = 7 REC=18"
			S-9	☒	1-2-3-5 N = 5 REC=20"
	Moist, light brown, stiff, Clayey SILT, some Gravel, Sand lenses (ML)		S-10	☒	3-4-5-5 N = 9 REC=20"
20	Moist, red brown, stiff, Fat CLAY (CH)	100	S-11	☒	3-4-7-10 N = 11 REC=20"
	Moist, red brown, stiff, Sandy SILT (ML)		S-12	☒	8-5-7-9 N = 12 REC=24"
25	Wet, light brown, medium dense, Clayey SAND, lenses of fine Gravel (SC)	95	S-13	☒	2-6-8-7 N = 14 REC=18"
	Moist, red brown, medium stiff to stiff, CLAY (CL)		S-14	☒	3-4-3-7 N = 7 REC=18"
			ST-1	■	REC=22"
30		90	S-15	☒	2-4-6-7 N = 10 REC=20"
			S-16	☒	2-4-5-6 N = 9 REC=20"
35		85	S-17	☒	3-3-4-5 N = 7 REC=20"
	Moist, dark gray, medium stiff, CLAY (CL)		S-18	☒	1-3-4-6 N = 7 REC=20"
			S-19	☒	2-3-4-7 N = 7



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **120.09 (ft)**

TEST LOG

B-08

SHEET 2 OF 3

Driller: **James/CenKen**	Method: **Mud Rotary**	Casing Length: **81 ft**	Date Begun: **5/13/2014**
KCI Representative: **TA**	Hammer Type: **Automatic**	Casing Diameter: **5**	Date Completed: **5/13/2014**

Groundwater Levels (feet)

0 hour: ________

24 hours: ________

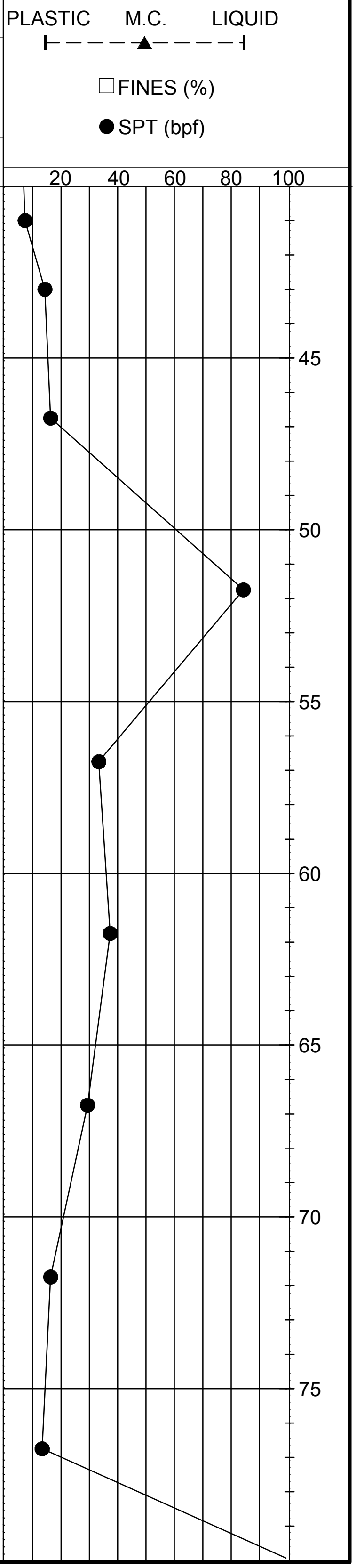
SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)
	Moist, dark gray, medium stiff, Sandy SILT, some Clay (ML)	
	Moist, dark gray, hard, micaceous, Sandy SILT (ML)	
45		75
50		70
	Moist, dark gray, dense to very dense Silty SAND, with Shells and cemented layers (SM)	
55		65
60		60
65		55
70		50
	Moist, dark gray, hard, Sandy SILT, with Shells (ML)	
75		45

SAMPLES

IDNET	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") / REC RQD
	REC=20"
S-20	3-3-5-8 N = 8 REC=24"
S-21	2-6-9-14 N = 15 REC=20"
S-22	100/.5" REC=.5"
S-23	4-7-10 N = 17 REC=18"
S-24	5-35-50 N = 85 REC=16"
S-25	9-14-20 N = 34 REC=18"
S-26	11-17-21 N = 38 REC=6"
S-27	8-13-17 N = 30 REC=18"
S-28	6-7-10 N = 17 REC=18"
S-29	5-7-7 N = 14 REC=18"



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **120.09 (ft)**

TEST LOG
B-08

SHEET 3 OF 3

Driller: **James/CenKen**	Method: **Mud Rotary**	Casing Length: **81 ft**	Date Begun: **5/13/2014**
KCI Representative: **TA**	Hammer Type: **Automatic**	Casing Diameter: **5**	Date Completed: **5/13/2014**

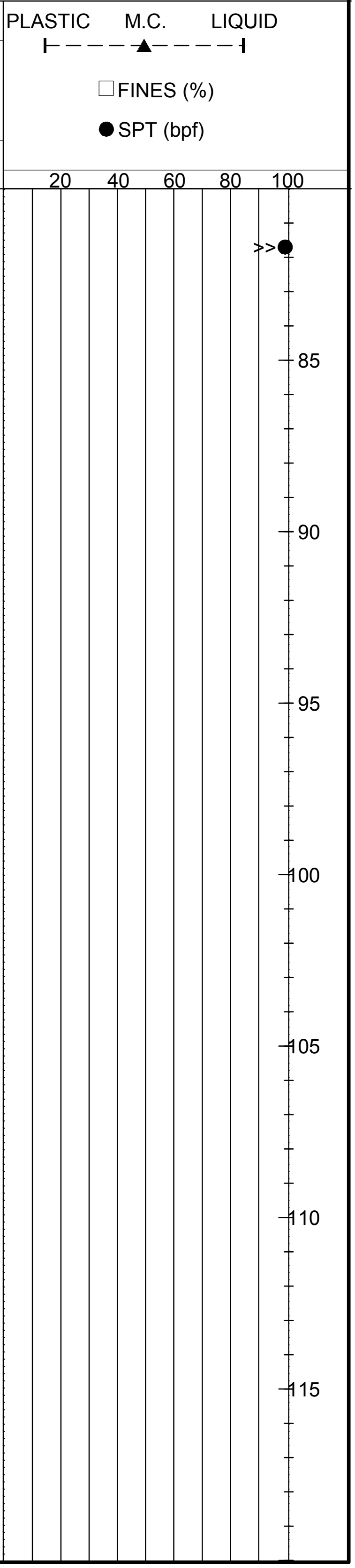
Groundwater Levels (feet)
0 hour: ________
24 hours: ________

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	IDNET	TYPE	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
	Moist, light to dark gray, very dense, Silty SAND, with Shells and cemented layers (SM)	▒		S-30	☒	13-48-50/5" N = 148 REC=17"
	Boring terminated at 82.5 ft. bgs Notes: 1) Groundwater not recorded in borehole due to mud rotary drilling. 2) Inclinometer No. IN-6 installed in borehole to a depth of 82.5 feet.					

DEPTH (ft)	ELEV (ft)
85	35
90	30
95	25
100	20
105	15
110	10
115	5



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **120.69 (ft)**

TEST BORING LOG

B-09

SHEET 1 OF 3

Driller:	Method:	Casing Length:	Date Begun:
Jerry/Hillis Carnes	**HSA**	**83.5 ft**	**5/12/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
SS	**Automatic**	**3.25**	**5/12/2014**

Groundwater Levels (feet)

0 hour: 17 ▽

24 hours: 15.5 ▼

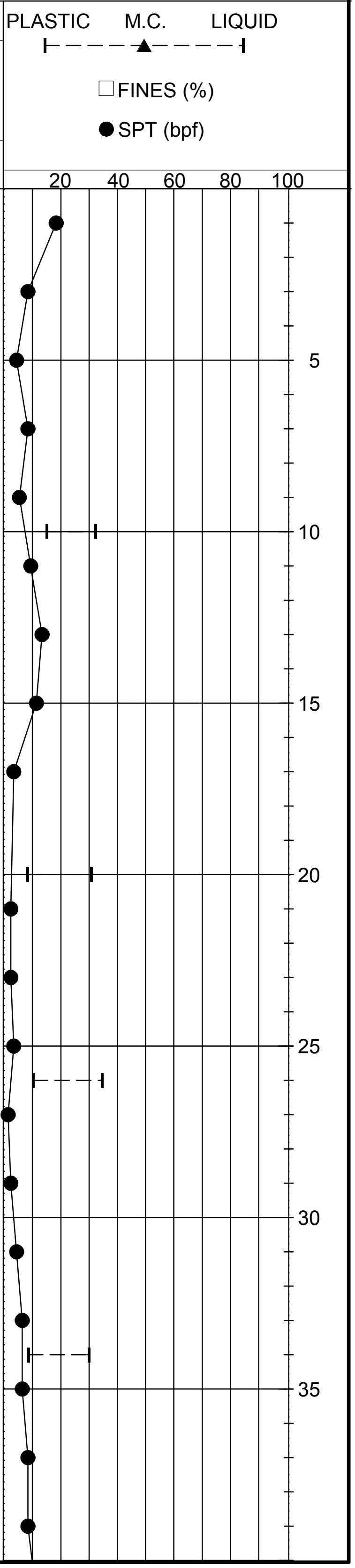
SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS
0	6" ASPHALT
	FILL Sampled As: Moist, brown, loose to medium dense, Silty SAND, with Gravel and Asphalt (SM)
4	Moist, dark brown, medium stiff to stiff, Silty CLAY, trace Gravel and Organics (CL-ML)
8	Moist, reddish brown, medium stiff to stiff, Lean CLAY, little Sand, trace Gravel (CL) PP = 1tsf PP = 2tsf
12	Moist, light gray, reddish brown, stiff, Lean CLAY (CL)
15.5	Moist, light gray and reddish brown, soft, Sandy SILT (ML)
20	Wet, light gray, very soft to soft, Lean CLAY with Sand (CL) PP = 0.25tsf PP = 0.25tsf PP = 0.5tsf PP = 0.25tsf
31	Wet, reddish brown, medium stiff to stiff, Lean CLAY (CL) PP = 0.75tsf PP = 1.75tsf PP = 1.25tsf PP = 1.5tsf
39	Wet, light gray, very stiff, CLAY (CL)

SAMPLES

IDNET	N-COUNT (1st 6", 2nd 6", 3rd 6", 4th 6")	REC RQD
S-1	8-9-10 N = 19	REC=3
S-2	9-6-3-4 N = 9	REC=3
S-3	6-3-2-4 N = 5	REC=18
S-4	3-5-4-5 N = 9	REC=0
S-5	2-3-3-5 N = 6	REC=24
S-6	1-4-6-8 N = 10	REC=24
S-7	4-6-8-9 N = 14	REC=24
S-8	4-5-7-8 N = 12	REC=24
S-9	2-2-2-4 N = 4	REC=24
ST-1		REC=23
S-10	1-1-2-2 N = 3	REC=15
S-11	1-1-2-2 N = 3	REC=24
S-12	1-2-2-2 N = 4	REC=24
S-13	1-1-1-1 N = 2	REC=15
S-14	1-1-2-2 N = 3	REC=24
S-15	2-2-3-4 N = 5	REC=24
S-16	2-3-4-5 N = 7	REC=15
S-17	2-3-4-5 N = 7	REC=24
S-18	3-4-5-5 N = 9	REC=24
S-19	3-4-5-8 N = 9	



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **120.69 (ft)**

TEST BORING LOG

B-09

SHEET 2 OF 3

Driller: **Jerry/Hillis Carnes**	Method: **HSA**	Casing Length: **83.5 ft**	Date Begun: **5/12/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/12/2014**

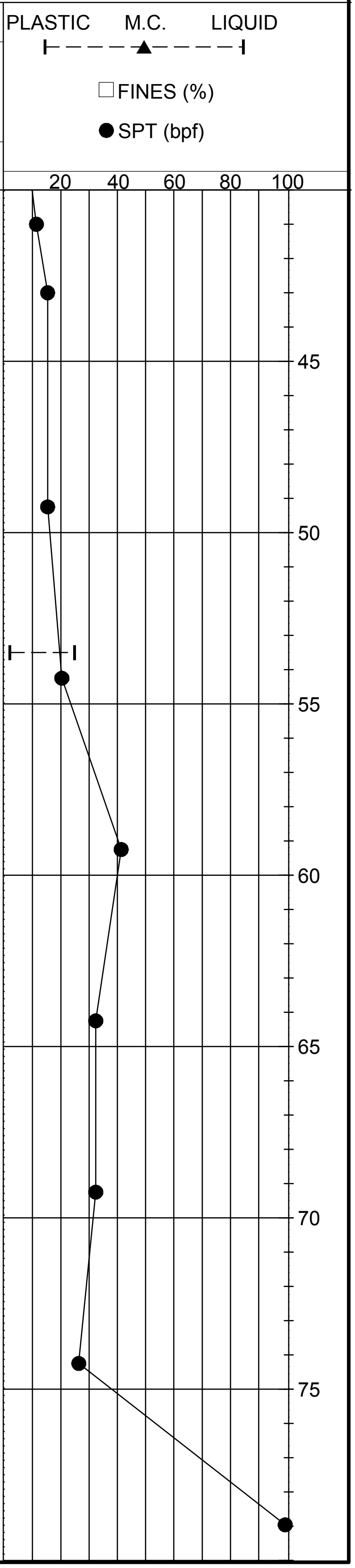
Groundwater Levels (feet)

0 hour: 17 ▽

24 hours: 15.5 ▼

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	IDNET	TYPE	N-COUNT (1st 6", 2nd 6", 3rd 6", 4th 6") REC RQD
	PP = 1.5tsf	80	S-20	☒	REC=24 4-5-7-8 N = 12 REC=24
	Moist, olive gray, stiff to very stiff, Sandy SILT, with Shells and Mica (ML)		S-21	☒	3-7-9-13 N = 16 REC=24
45		75			
50			S-22	☒	4-7-9-10 N = 16 REC=18
		70			
	Moist, olive gray, dense, Silty SAND, with Shells and Mica (SM)		S-23	☒	5-9-12 N = 21 REC=18
55		65			
60			S-24	☒	10-17-25 N = 42 REC=18
		60			
65			S-25	☒	8-15-18 N = 33 REC=18
		55			
70			S-26	☒	10-15-18 N = 33 REC=18
		50			
75			S-27	☒	8-10-17 N = 27 REC=18
		45			
			S-28	☒	5-50/5" N = 100



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **120.69 (ft)**

TEST BORING LOG
B-09

SHEET 3 OF 3

Driler: **Jerry/Hillis Carnes**	Method: **HSA**	Casing Length: **83.5 ft**	Date Begun: **5/12/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/12/2014**

Groundwater Levels (feet)
0 hour: 17 ▽
24 hours: 15.5 ▼

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	IDNET	TYPE	SAMPLES N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6" REC RQD	PLASTIC M.C. LIQUID ⊢ – – ▲ – – ⊣ ☐ FINES (%) ● SPT (bpf) 20 40 60 80 100
	Moist, olive gray, dense, Silty SAND, with Shells and Mica (SM)		40			REC=11	
				S-29	⊠	50/4" REC=4	
85	Boring terminated at 85 ft. bgs		35				85
90			30				90
95			25				95
100			20				100
105			15				105
110			10				110
115			5				115

Notes:
1) Water encountered at 18 ft bgs during drilling, 17 ft bgs after drilling, 15.5 ft bgs afterr 24 hrs at completion of drilling.
2) Cave-in occurred at 54.5 ft bgs after drilling, and at 46 ft bgs 24 hrs after drilling.

KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **125.07 (ft)**

TEST LOG
B-10

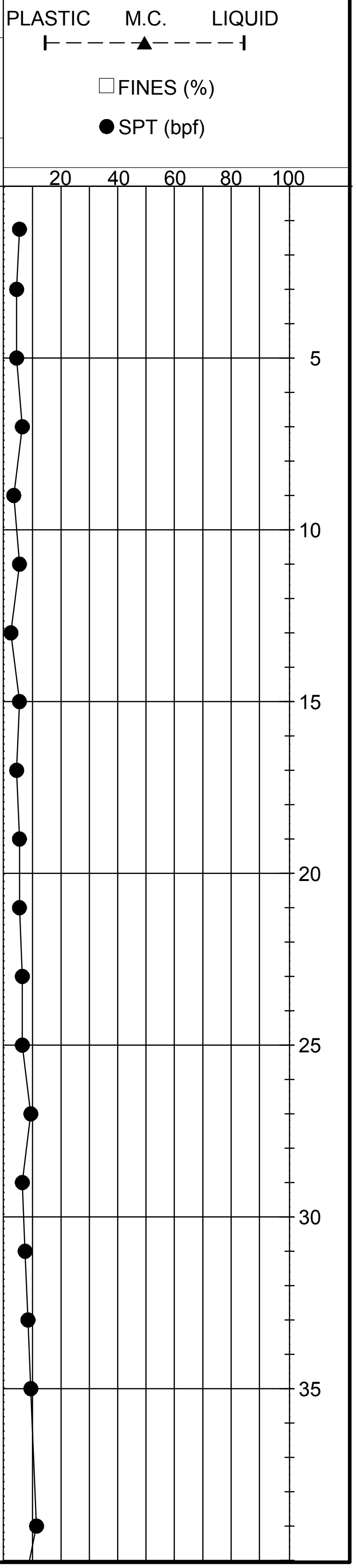
SHEET 1 OF 3

Driver:	Method:	Casing Length:		
Ron/CenKen	**Mud Rotary**	**80 ft**	Date Begun:	**5/14/2014**
KCI Representative:	Hammer Type:	Casing Diameter:		
TA	**Automatic**	**5**	Date Completed:	**5/14/2014**

Groundwater Levels (feet)
0 hour: ________
24 hours: ________

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	IDNET	N-COUNT (1st 6" / 2nd 6" / 3rd 6" / 4th 6") REC RQD
	6" ASPHALT FILL Sampled As: Dry, brown, loose, Silty SAND and GRAVEL, trace Organics (SM)		S-1	2-3-3 N = 6 REC=6"
			S-2	2-2-3-4 N = 5 REC=12"
5	Dry, light brown, medium stiff, Sandy CLAY (CL)	120	S-3	2-2-3-4 N = 5 REC=18"
	Dry, brown, medium stiff, Sandy SILT (ML)		S-4	3-3-4-4 N = 7 REC=18"
	Dry, tan, brown, loose, Silty SAND (SM)		S-5	1-2-2-3 N = 4 REC=18"
10	Dry, bown, medium stiff, Sandy SILT (ML)	115	S-6	3-3-3-2 N = 6 REC=10"
	Dry, gray, soft, Sandy SILT (ML)		S-7	1-1-2-3 N = 3 REC=20"
15	Moist, dark gray, medium stiff, CLAY, some Silt (CL)	110	S-8	1-3-3-4 N = 6 REC=20"
	Moist, brown to gray, medium stiff, CLAY, trace to little Sand lenses (CL)		S-9	2-2-3-4 N = 5 REC=20"
	Moist, mottled gray, medium stiff, Silty CLAY, fine Sand (CL)		S-10	1-2-4-4 N = 6 REC=20"
20	Moist, gray to brown, medium stiff, Sandy SILT (ML)	105	S-11	1-3-3-5 N = 6 REC=20"
	Moist, brown, loose, Silty SAND, some Gravel (SM)		S-12	2-3-4-4 N = 7 REC=20"
25	Moist, red brown, medium stiff, CLAY, occassional fine Sand (CL)	100	S-13	1-3-4-6 N = 7 REC=20"
	Moist, red brown, medium stiff to stiff, CLAY (CL)		S-14	2-4-6-6 N = 10 REC=24
			S-15	2-3-4-6 N = 7 REC=20"
30		95	S-16	3-3-5-8 N = 8 REC=24"
			S-17	2-4-5-7 N = 9 REC=20"
35	Moist, red brown, medium stiff, Silty CLAY (CL)	90	S-18	2-4-6-6 N = 10 REC=24"
			ST-1	REC=24
	Moist, gray, stiff to medium stiff, CLAY, with Sandy Silt layer (CL)		S-19	4-5-7-11 N = 12



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **125.07 (ft)**

TEST LOG
B-10

SHEET 2 OF 3

Driller: **Ron/CenKen**	Method: **Mud Rotary**	Casing Length: **80 ft**	Date Begun: **5/14/2014**
KCI Representative: **TA**	Hammer Type: **Automatic**	Casing Diameter: **5**	Date Completed: **5/14/2014**

Groundwater Levels (feet)

0 hour: ________

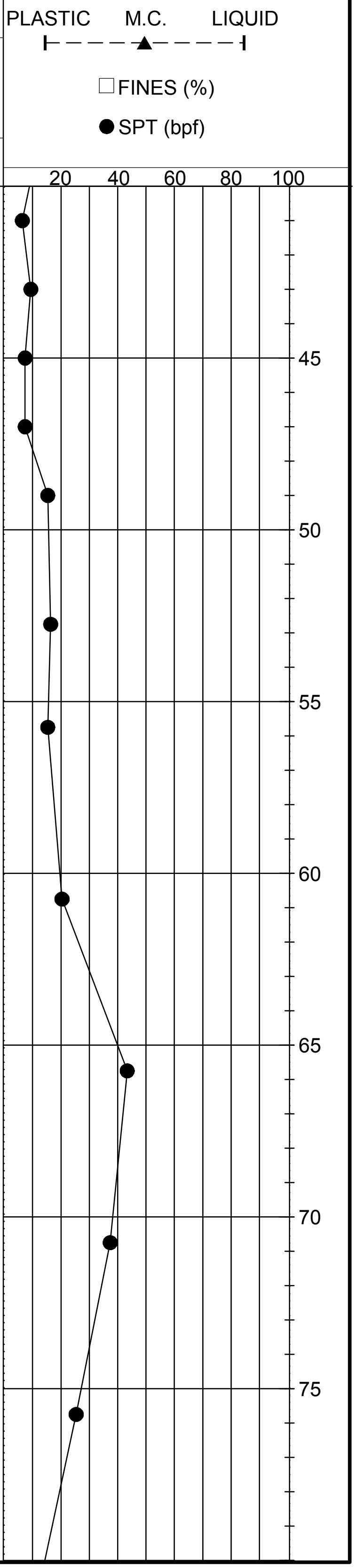
24 hours: ________

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)
	Moist, gray, stiff to medium stiff, CLAY, with Sandy Silt layer (CL)	
45	Moist, gray, medium stiff, Silty CLAY (CL)	80
	Sandy CLAY Moist, gray, very stiff to hard, Sandy SILT (ML)	
50		75
55	Moist, gray, medium dense to dense, Silty SAND, with Shells and Mica (SM)	70
60		65
65		60
70	Moist, olive dark gray to greenish gray, dense to medium dense, Silty SAND, with Shells and trace Mica (SP)	55
75		50

IDNET	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") / REC RQD
S-20	REC=20" 2-3-4-6 N = 7
S-21	REC=20" 2-4-6-7 N = 10
S-22	REC=24" 2-3-5-7 N = 8
S-23	REC=24" 2-3-5-7 N = 8
S-24	REC=24" 3-6-10-14 N = 16
S-25	REC=24" 4-7-10-13 N = 17 REC=24"
S-26	4-6-10 N = 16 REC=18"
S-27	5-7-14 N = 21 REC=18"
S-28	15-19-25 N = 44 REC=18"
S-29	12-19-19 N = 38 REC=18"
S-30	7-11-15 N = 26 REC=18"



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **125.07 (ft)**

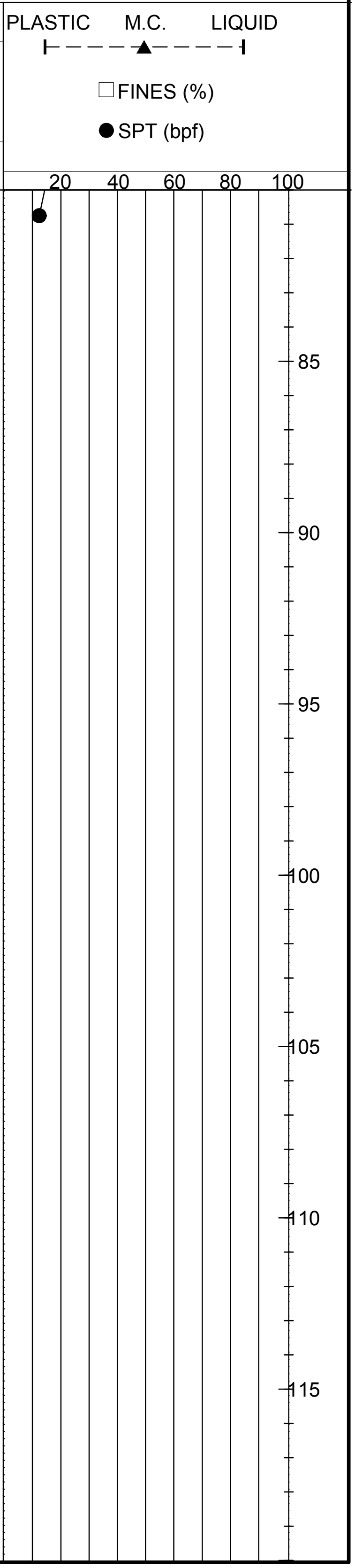
TEST LOG
B-10

SHEET 3 OF 3

Driller: **Ron/CenKen**	Method: **Mud Rotary**	Casing Length: **80 ft**	Date Begun: **5/14/2014**
KCI Representative: **TA**	Hammer Type: **Automatic**	Casing Diameter: **5**	Date Completed: **5/14/2014**

Groundwater Levels (feet)
0 hour: ________
24 hours: ________

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
	Moist, olive gray, stiff, Sandy SILT, with Shells and trace Mica (ML)			S-31	☒	4-6-7 N = 13 REC=18"
	Boring terminated at 82 ft. bgs Notes: 1) Groundwater not recorded in borehole due to mud rotary drilling. 2) Inclinometer No. IN-6 installed in borehole to a depth of 82 feet.					
85			40			
90			35			
95			30			
100			25			
105			20			
110			15			
115			10			



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **178.50 (ft)**

TEST BORING LOG
B-11

SHEET 1 OF 3

Driller: **Jerry/Hillis Carnes**	Method: **HSA**	Casing Length: **98.5 ft**	Date Begun: **5/13/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/13/2014**

Groundwater Levels (feet)

0 hour: Dry

24 hours: ________

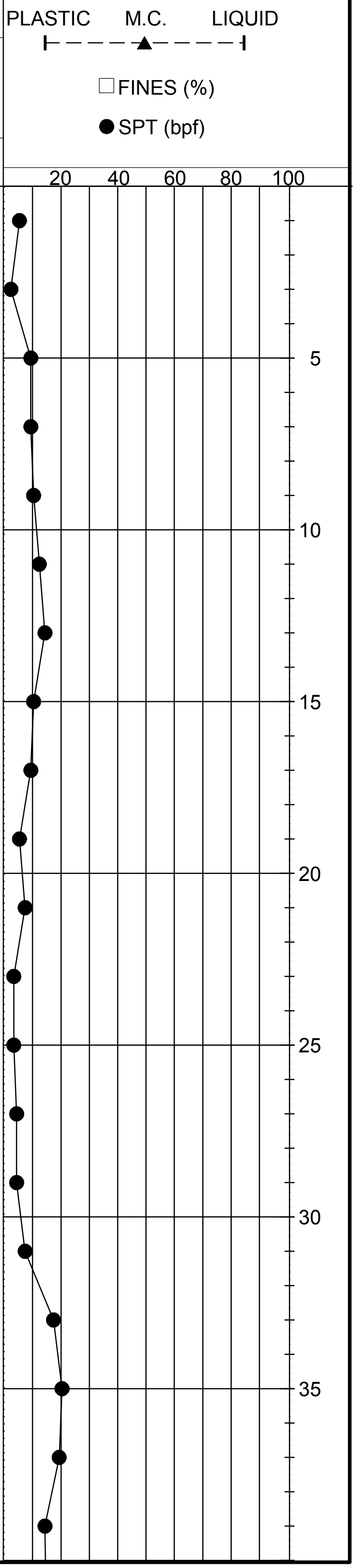
SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

- 1" TOPSOIL
- Dry to moist, gray and brown, medium stiff, Sandy CLAY, trace Gravel (CL)
- Damp, gray and brown, soft, Lean CLAY, trace Gravel (CL)
- Dry, reddish brown, stiff, Lean CLAY, trace Gravel and Sand (CL)
- Moist, light gray, stiff, Sandy SILT (ML)
- Damp, brown to reddish brown, medium dense, Clayey SAND with Gravel (SC)
- Damp, light gray with reddish brown, stiff, Lean CLAY (CL)
- Dry, light gray with yellowish brown, soft to stiff, Sandy SILT (ML)
  - Moist
  - With iron nodules
  - With Sand
- Moist, light brown, loose to medium dense, Silty SAND (SM)
  - Brown, trace Gravel

SAMPLES

IDNET	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6")	N	REC RQD
S-1	1-3-3-3	N = 6	REC=12
S-2	1-1-2-3	N = 3	REC=12
S-3	3-4-6-6	N = 10	REC=18
S-4	2-5-5-8	N = 10	REC=12
S-5	3-5-6-5	N = 11	REC=12
S-6	3-6-7-9	N = 13	REC=4
S-7	3-6-9-10	N = 15	REC=24
S-8	3-5-6-9	N = 11	REC=24
S-9	2-5-5-6	N = 10	REC=12
S-10	2-3-3-5	N = 6	REC=24
S-11	2-3-5-5	N = 8	REC=24
S-12	2-2-2-3	N = 4	REC=24
S-13	1-2-2-3	N = 4	REC=24
S-14	2-2-3-3	N = 5	REC=24
S-15	1-2-3-4	N = 5	REC=24
S-16	1-3-5-7	N = 8	REC=24
S-17	3-8-10-13	N = 18	REC=24
S-18	7-9-12-18	N = 21	REC=24
S-19	4-8-12-16	N = 20	REC=24
S-20	2-6-9-9	N = 15	



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **178.50 (ft)**

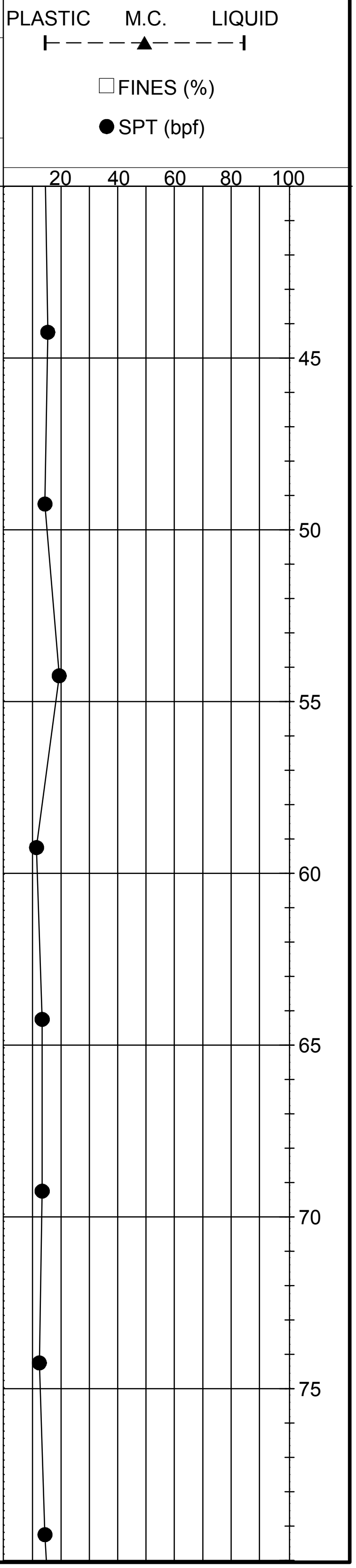
TEST BORING LOG
B-11

SHEET 2 OF 3

Driver:	Method:	Casing Length:	
Driller: **Jerry/Hillis Carnes**	Method: **HSA**	Casing Length: **98.5 ft**	Date Begun: **5/13/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/13/2014**

Groundwater Levels (feet)
0 hour: Dry
24 hours: ________

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)	IDNET	TYPE	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
	Moist, light brown, loose to medium dense, Silty SAND (SM)				REC=24
	Moist, dark gray and olive gray, stiff to very stiff, mciaceous, Sandy SILT (ML)	135	S-21	☒	5-7-9 N = 16 REC=18
45					
		130	S-22	☒	4-6-9 N = 15 REC=18
50					
	- With Shell fragments	125	S-23	☒	7-8-12 N = 20 REC=18
55					
		120	S-24	☒	4-5-7 N = 12 REC=18
60					
	Moist, olive gray, stiff, Sandy SILT, with Shell fragments and Mica (ML)	115	S-25	☒	4-5-9 N = 14 REC=18
65					
	Moist, dark gray, stiff, Lean CLAY and Mica (CL)	110	S-26	☒	4-5-9 N = 14 REC=18
70					
	Moist, reddish brown, stiff to very stiff, Lean CLAY (CL)	105	S-27	☒	4-5-8 N = 13 REC=18
75					
	- With Silt Seams	100	S-28	☒	4-6-9 N = 15



KCI-KOA PLOG PISCATAWAY DRIVE SLOPE FAILURE.GPJ MD SHA REVISED TEMPLATE.GDT 5/19/14

KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **178.50 (ft)**

TEST BORING LOG
B-11

SHEET 3 OF 3

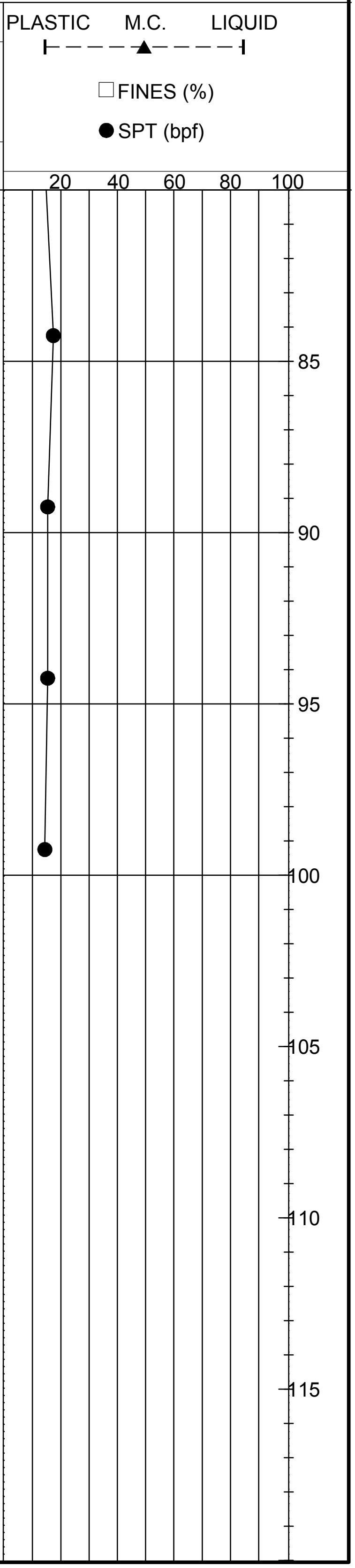
Driller: **Jerry/Hillis Carnes**	Method: **HSA**	Casing Length: **98.5 ft**	Date Begun: **5/13/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/13/2014**

Groundwater Levels (feet)
0 hour: Dry
24 hours: ________

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	IDNET	TYPE	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
						REC=18
	Moist, reddish brown, stiff to very stiff, Lean CLAY (CL)	▨				
			95	S-29	☒	6-9-9 N = 18 REC=10
85						
			90	S-30	☒	3-7-9 N = 16 REC=18
90						
	Moist, reddish gray, very stiff, Lean CLAY, with Silt seams (CL)	▨	85	S-31	☒	4-7-9 N = 16 REC=18
95						
	Moist, dark gray with reddish gray, very stiff, Lean CLAY, with cemented Clay Nodules (CL)	▨	80	S-32	☒	4-7-8 N = 15 REC=18
100						
	Boring terminated at 100 ft. bgs					
			75			
105						
			70			
110						
			65			
115						
			60			

Notes:
1) Water not encountered during drilling.
2) Cave-in occurred at 92 feet bgs after drilling.



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **114.34 (ft)**

TEST LOG

B-13

SHEET 1 OF 3

Driller: **Ron/CenKen**	Method: **Mud Rotary**	Casing Length: **73.5 ft**	Date Begun: **5/8/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **5**	Date Completed: **5/8/2014**

Groundwater Levels (feet)

0 hour: ________

24 hours: ________

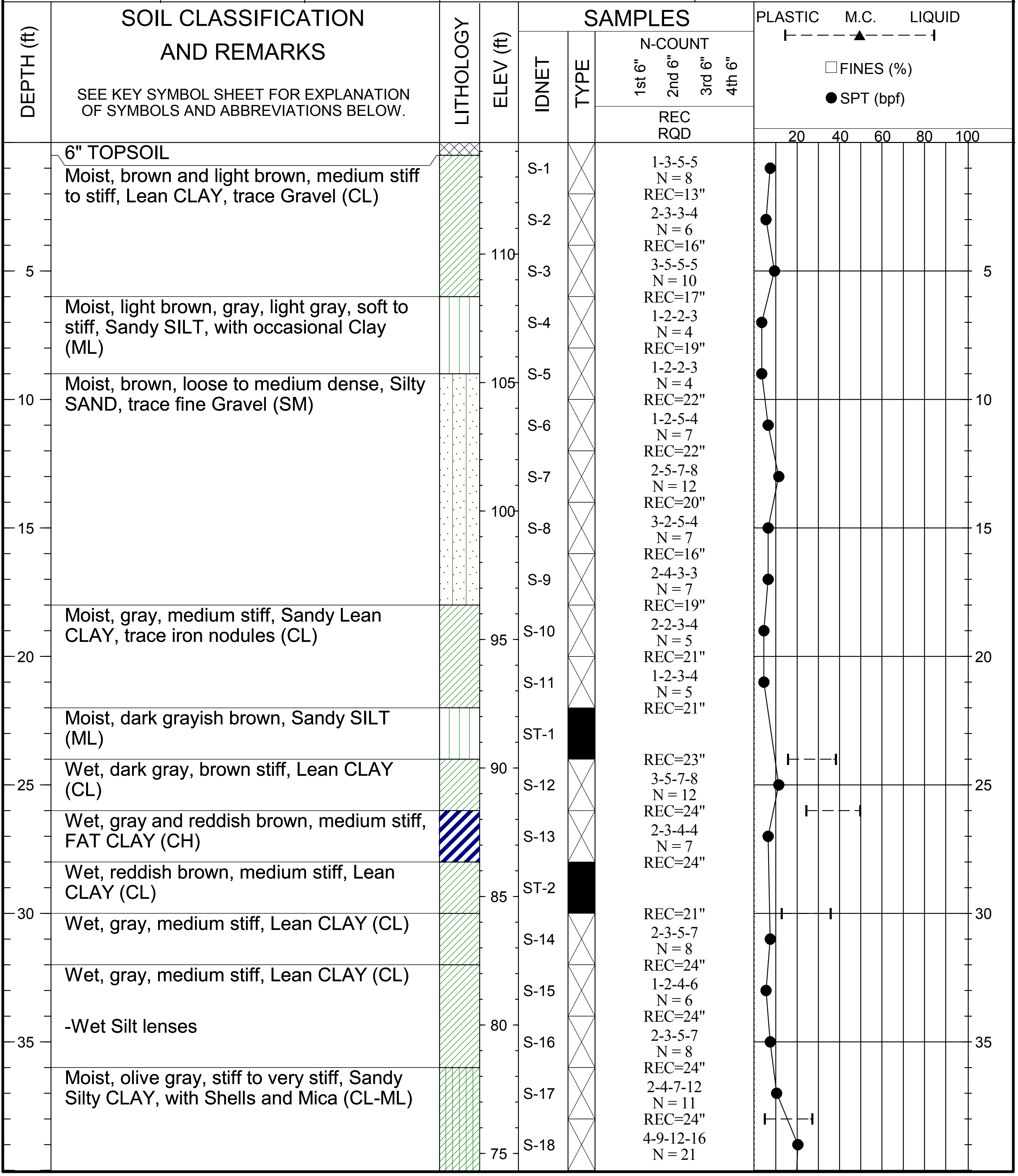
SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

- 6" TOPSOIL
- Moist, brown and light brown, medium stiff to stiff, Lean CLAY, trace Gravel (CL)
- Moist, light brown, gray, light gray, soft to stiff, Sandy SILT, with occasional Clay (ML)
- Moist, brown, loose to medium dense, Silty SAND, trace fine Gravel (SM)
- Moist, gray, medium stiff, Sandy Lean CLAY, trace iron nodules (CL)
- Moist, dark grayish brown, Sandy SILT (ML)
- Wet, dark gray, brown stiff, Lean CLAY (CL)
- Wet, gray and reddish brown, medium stiff, FAT CLAY (CH)
- Wet, reddish brown, medium stiff, Lean CLAY (CL)
- Wet, gray, medium stiff, Lean CLAY (CL)
- Wet, gray, medium stiff, Lean CLAY (CL)
  - -Wet Silt lenses
- Moist, olive gray, stiff to very stiff, Sandy Silty CLAY, with Shells and Mica (CL-ML)

SAMPLES

IDNET	TYPE	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
S-1	☒	1-3-5-5 N = 8 REC=13"
S-2	☒	2-3-3-4 N = 6 REC=16"
S-3	☒	3-5-5-5 N = 10 REC=17"
S-4	☒	1-2-2-3 N = 4 REC=19"
S-5	☒	1-2-2-3 N = 4 REC=22"
S-6	☒	1-2-5-4 N = 7 REC=22"
S-7	☒	2-5-7-8 N = 12 REC=20"
S-8	☒	3-2-5-4 N = 7 REC=16"
S-9	☒	2-4-3-3 N = 7 REC=19"
S-10	☒	2-2-3-4 N = 5 REC=21"
S-11	☒	1-2-3-4 N = 5 REC=21"
ST-1	■	REC=23"
S-12	☒	3-5-7-8 N = 12 REC=24"
S-13	☒	2-3-4-4 N = 7 REC=24"
ST-2	■	REC=21"
S-14	☒	2-3-5-7 N = 8 REC=24"
S-15	☒	1-2-4-6 N = 6 REC=24"
S-16	☒	2-3-5-7 N = 8 REC=24"
S-17	☒	2-4-7-12 N = 11 REC=24"
S-18	☒	4-9-12-16 N = 21



KCI-KOA PLOG PISCATAWAY DRIVE SLOPE FAILURE.GPJ MD SHA REVISED TEMPLATE.GDT 5/19/14

KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **114.34 (ft)**

TEST LOG

B-13

SHEET 2 OF 3

Driller: **Ron/CenKen**	Method: **Mud Rotary**	Casing Length: **73.5 ft**	Date Begun: **5/8/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **5**	Date Completed: **5/8/2014**

Groundwater Levels (feet)

0 hour: ________

24 hours: ________

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

Moist, olive gray, stiff to very stiff, Sandy Silty CLAY, with Shells and Mica (CL-ML)

Moist, olive gray, medium dense to dense, Silty SAND, with Shells and Mica (SM)

Wet, olive gray, stiff to hard, Sandy SILT, with Shells (ML)

-Cemented Sand

Boring terminated at 74.2 ft. bgs

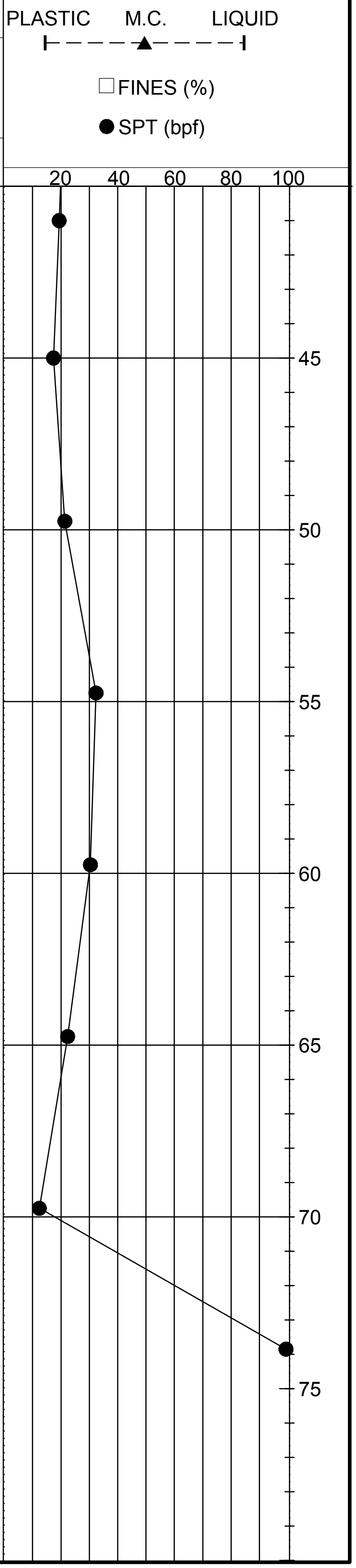
Notes:
1) Lost drilling mud between 21 to 22 feet bgs

SAMPLES

IDNET	N-COUNT (1st 6" / 2nd 6" / 3rd 6" / 4th 6") REC RQD
	REC=24"
S-19	5-8-12-15 N = 20 REC=23"
S-20	5-8-10-15 N = 18 REC=23"
S-21	6-9-13 N = 22 REC=19"
S-22	11-14-19 N = 33 REC=18"
S-23	9-13-18 N = 31 REC=17"
S-24	7-11-12 N = 23 REC=19"
S-25	4-5-8 N = 13 REC=19"
S-26	17-50/2.5" N = 100 REC=8.5"

DEPTH (ft): 45, 50, 55, 60, 65, 70, 75

ELEV (ft): 70, 65, 60, 55, 50, 45, 40, 35



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **114.34 (ft)**

TEST LOG

B-13

SHEET 3 OF 3

Driller: **Ron/CenKen**	Method: **Mud Rotary**	Casing Length: **73.5 ft**	Date Begun: **5/8/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **5**	Date Completed: **5/8/2014**

Groundwater Levels (feet)

0 hour: ________

24 hours: ________

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	SAMPLES TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6" REC RQD	PLASTIC ├ – – ▲ – – ┤ LIQUID M.C. ☐ FINES (%) ● SPT (bpf) 20 40 60 80 100
	2) Groundwater not recorded in borehole due to mud rotary drilling. 3) Inclinometer No. IN-1 installed in borehole to a depth of 74.2 feet.						
85			30				
90			25				
95			20				
100			15				
105			10				
110			5				
115			0				
			-5				

KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **109.39 (ft)**

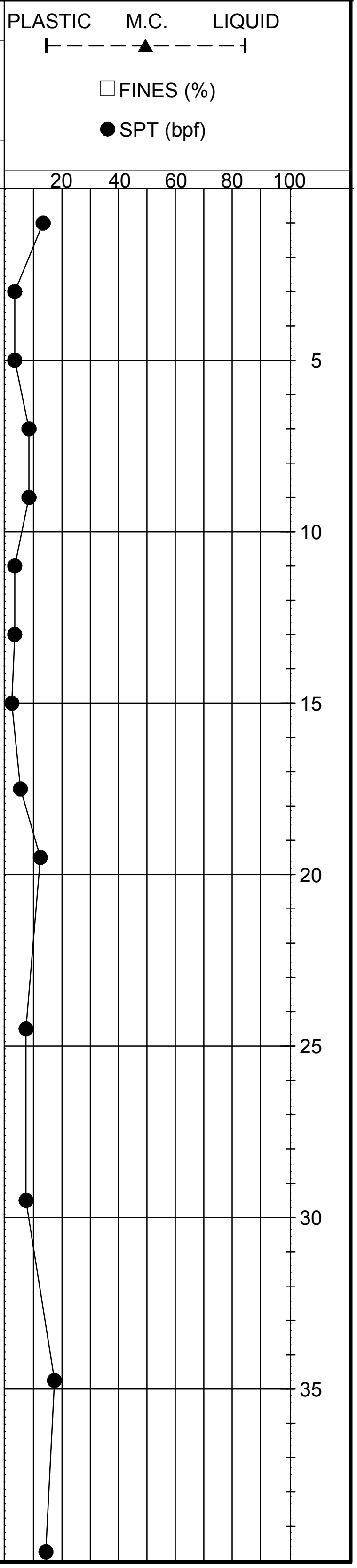
TEST BORING LOG
B-14

SHEET 1 OF 2

Driller: **Ron/CenKen**	Method: **HSA**	Casing Length: **58.5 ft**	Date Begun: **5/7/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/7/2014**

Groundwater Levels (feet)
0 hour: 36 ▽
24 hours: 9.8 ▼

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)	IDNE	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
	FILL Sampled As: Moist, brown, medium dense, GRAVEL and Sand (GM)		S-1	6-8-6-6 N = 14 REC=6
	Moist, brown, soft to stiff, Silty CLAY, trace Sand (CL-ML)		S-2	2-2-2-2 N = 4 REC=10
5		105	S-3	2-2-2-3 N = 4 REC=18
	-Trace Gravel 7.5 - 9.5 feet bgs		S-4	2-4-5-5 N = 9 REC=17
▼10		100	S-10	4-4-5-12 N = 9 REC=17
	Moist, gray, brown, soft to stiff, Sandy SILT, trace Gravel (ML)		S-11	3-2-2-2 N = 4 REC=19
			S-12	1-2-2-2 N = 4 REC=23
15	- Clayey	95	S-13	1-1-2-2 N = 3 REC=23
			S-14	2-2-4-5 N = 6 REC=24
20	Moist, gray, medium dense, Silty Clayey SAND (SC)	90	S-15	5-6-7-7 N = 13 REC=24
25	Moist, reddish brown, medium stiff, CLAY (CL)	85	S-16	2-3-5-5 N = 8 REC=24
			ST-1	REC=21
30	Moist, dark gray, medium stiff, Sandy SILT (ML)	80	S-17	2-4-4-6 N = 8 REC=24
35	Moist to wet, olive gray, stiff to very stiff, Sandy SILT, with Shells and Mica (ML)	75	S-18	4-8-10 N = 18 REC=18
▽				
		70	S-19	4-6-9



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **109.39 (ft)**

TEST BORING LOG

B-14

SHEET 2 OF 2

Driller: **Ron/CenKen**	Method: **HSA**	Casing Length: **58.5 ft**	Date Begun: **5/7/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/7/2014**

Groundwater Levels (feet)

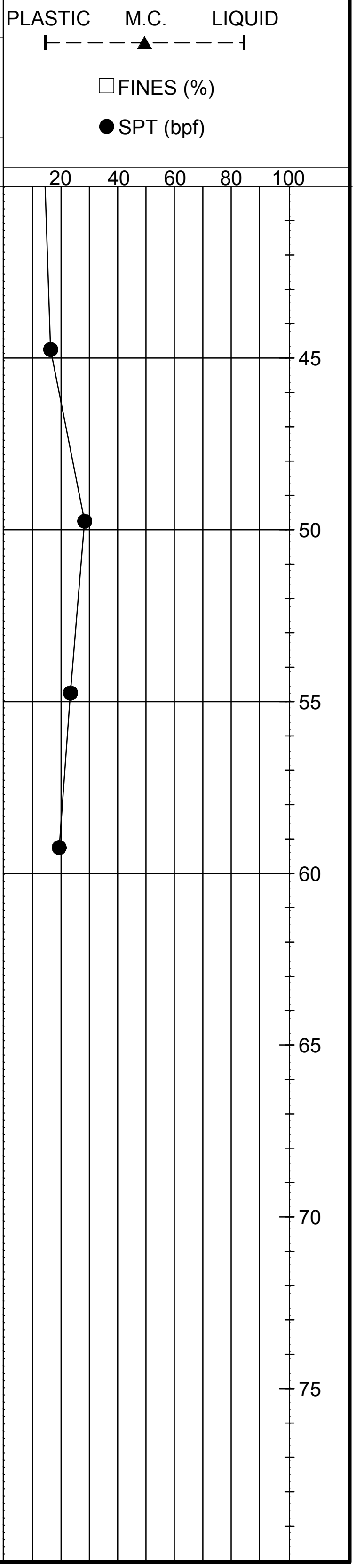
0 hour: 36 ▽

24 hours: 9.8 ▼

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)	IDNET	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6" REC RQD
	Moist to wet, olive gray, stiff to very stiff, Sandy SILT, with Shells and Mica (ML)			☒	N = 15 REC=18
45	Moist to wet, brown, olive gray, medium dense, Silty SAND with Shells and Mica (SM)	65	S-20	☒	4-7-10 N = 17 REC=18
50		60	S-21	☒	8-13-16 N = 29 REC=18
55		55	S-22	☒	7-11-13 N = 24 REC=18
60		50	S-23	☒	6-9-11 N = 20 REC=18
65		45			
70		40			
75		35			
		30			

Boring terminated at 60 ft. bgs

Notes:
1) Water encountered in augers at 16.5 feet bgs during drilling and 54.8 feet at completion of drilling; 36 feet bgs after pulling augers; and 9.8 feet bgs 24 hrs after drilling.
2) Cave-in occurred at 48.5 feet after drilling, and 25.5 feet bgs 24 hrs after drilling.



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **107.88 (ft)**

TEST BORING LOG

B-15

SHEET 1 OF 2

Driller: **Ron/CenKen**	Method: **HSA**	Casing Length: **68.5 ft**	Date Begun: **5/7/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/7/2014**

Groundwater Levels (feet)

0 hour: 59 ▽

24 hours: 10.1 ▼

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)
	FILL Sampled As: Moist, dark brown, soft, Sandy SILT, with Gravel (ML)	
	FILL Sampled As: Moist, dark brown, very soft to soft, Sandy CLAY, trace Gravel (CL) - with Wood fragments	105
5	Moist, dark brown to gray, medium stiff, Sandy Lean CLAY with Sand, trace Gravel (CL)	100
10 ▼	Moist to wet, brown, soft, Sandy SILT, trace Gravel (ML)	
	Moist to wet, gray to reddish brown, soft, Lean CLAY, with Silty SAND Layer (CL)	95
15	Moist, gray, medium stiff, Lean CLAY (CL)	90
20	Moist, reddish brown, medium stiff, Lean CLAY (CL) -Vertical cracks at top -Horizontal crack between 23.2'-23.8' -Sand lens	85
25		80
30	Moist, gray, stiff, Lean CLAY, with trace Sand (CL)	75
35	Moist, dark gray to black, stiff to very stiff, Sandy SILT, with Shell and Mica (ML)	70

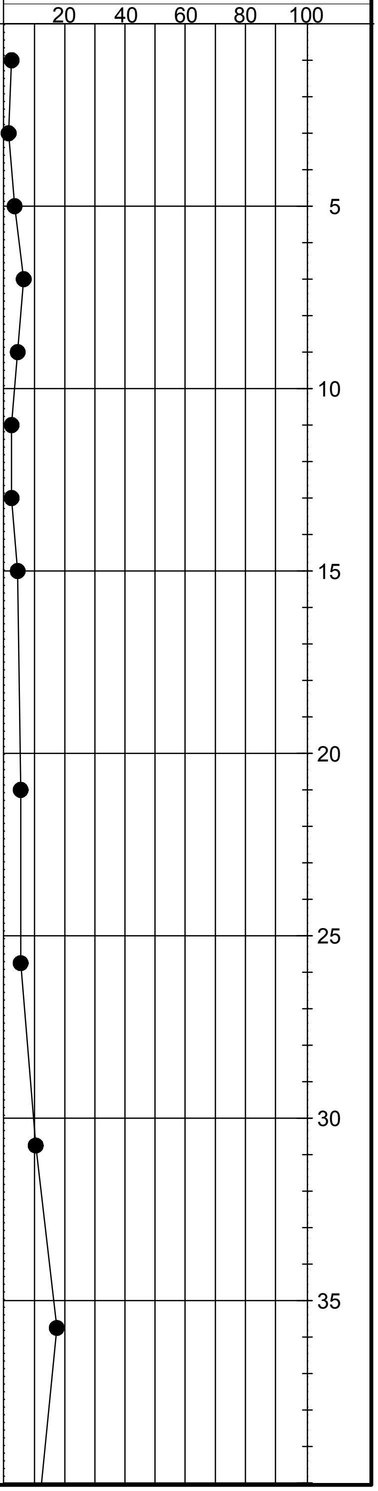
SAMPLES

IDNET	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
S-1	2-2-1-2 N = 3 REC=10
S-2	1-1-1-2 N = 2 REC=16
S-3	2-2-2-3 N = 4 REC=10
S-4	2-4-3-4 N = 7 REC=23
S-5	1-3-2-3 N = 5 REC=18
S-6	1-1-2-2 N = 3 REC=16
S-7	1-1-2-3 N = 3 REC=24
S-8	1-2-3-3 N = 5 REC=20
S-9	2-2-4-4 N = 6 REC=24
ST-1	REC=16
S-10	2-3-3 N = 6 REC=18
S-11	2-4-7 N = 11 REC=18
S-12	4-9-9 N = 18 REC=18

PLASTIC M.C. LIQUID

☐ FINES (%)

● SPT (bpf)



TEST BORING LOG
B-15

KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **107.88 (ft)**

SHEET 2 OF 2

Driler: **Ron/CenKen**	Method: **HSA**	Casing Length: **68.5 ft**	Date Begun: **5/7/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **3.25**	Date Completed: **5/7/2014**

Groundwater Levels (feet)

0 hour: 59 ▽

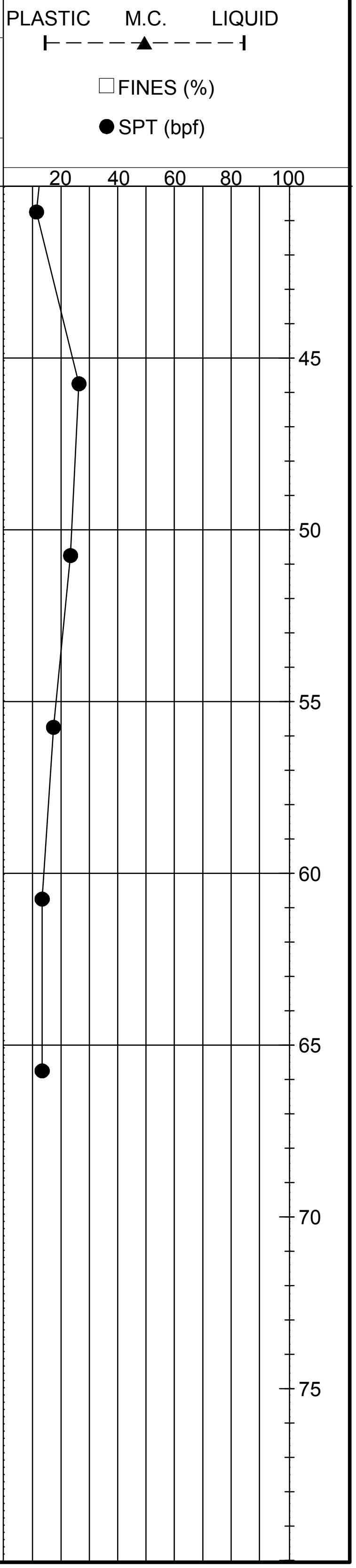
24 hours: 10.1 ▼

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	IDNET	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6") REC RQD
	Moist, dark gray to black, stiff to very stiff, Sandy SILT, with Shell and Mica (ML)	65	S-13	4-5-7 N = 12 REC=18
45	Moist, olive gray, medium dense, Silty SAND, with Shell and Mica (SM)	60	S-14	8-12-15 N = 27 REC=18
50		55	S-15	9-11-13 N = 24 REC=18
55		50	S-16	5-8-10 N = 18 REC=18
60		45	S-17	5-6-8 N = 14 REC=18
65	Moist, dark gray, stiff, Sandy SILT, with Shell and Mica (ML)	40	S-18	3-6-8 N = 14 REC=18
	Dry, dark gray, hard, cemented CLAY (CL)		S-19	50/1" REC=1
70	Boring terminated at 68.6 ft. bgs	35		
75		30		

Notes:
1) Water encountered in augers at 67.5 feet bgs during drilling; 59 feet bgs after pulling augers; 10.1 feet bgs 24 hrs after drilling.
2) Cave-in occurred at 61 feet bgs after drilling; 27.8 feet bgs 24 hrs after drilling.



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **83.48 (ft)**

TEST LOG
B-16

SHEET 1 OF 2

Driler: **Ron/CenKen**	Method: **Mud Rotary**	Casing Length: **53 ft**	Date Begun: **5/9/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **5**	Date Completed: **5/9/2014**

Groundwater Levels (feet)

0 hour: 5 ▽

24 hours: ________

SOIL CLASSIFICATION AND REMARKS

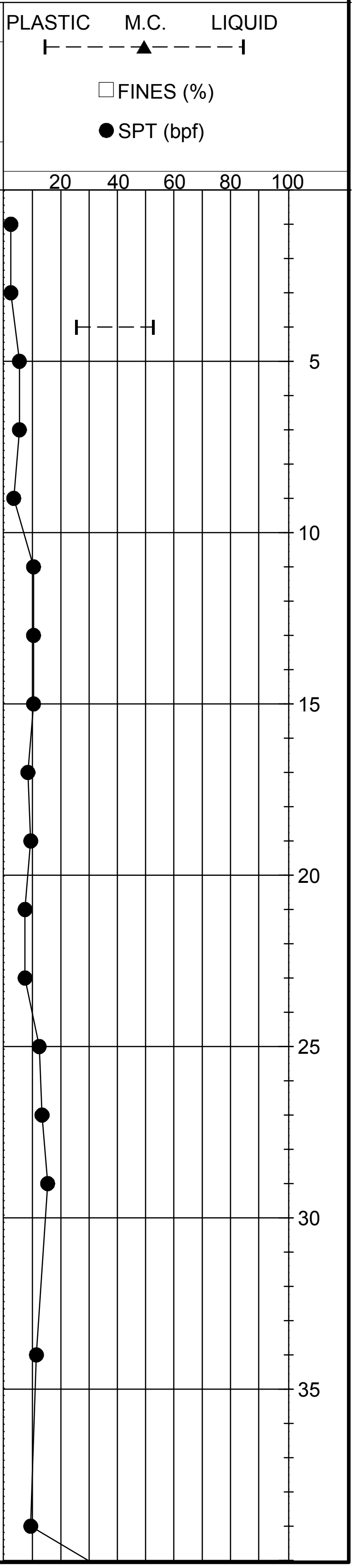
SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

SOIL CLASSIFICATION AND REMARKS
6" TOPSOIL
Moist, dark brown to brown, soft, Lean CLAY, trace Gravel and Organics (CL)
Moist, brown to reddish brown, soft, Fat CLAY, trace Sand at top (CH)
Moist, gray, medium stiff, Lean CLAY, trace fine Gravel (CL)
Moist, gray and brown, soft to stiff, Sandy SILT, with Mica (ML) - more sandy
Moist, gray to brown, loose to medium dense, Silty SAND, trace Gravel, with Mica (SM)
Moist, olive gray, medium dense, Silty SAND, with Mica, trace Shell fragments (SM)
Moist, brown, stiff, Sandy SILT, with Shells (ML)

DEPTH (ft): ▽5, 10, 15, 20, 25, 30, 35

ELEV (ft): 80, 75, 70, 65, 60, 55, 50, 45

IDNET	N-COUNT (1st 6" - 2nd 6" - 3rd 6" - 4th 6")	N	REC
S-1	1-1-2-3	N = 3	REC=16
S-2	1-1-2-3	N = 3	REC=13
S-3	2-3-3-5	N = 6	REC=19
S-4	2-3-3-4	N = 6	REC=20
S-5	1-2-2-4	N = 4	REC=20
S-6	3-5-6-6	N = 11	REC=17
S-7	4-5-6-8	N = 11	REC=19
S-8	4-5-6-7	N = 11	REC=19
S-9	4-4-5-7	N = 9	REC=19
S-10	4-5-5-5	N = 10	REC=13
S-11	2-4-4-4	N = 8	REC=17
S-12	2-4-4-6	N = 8	REC=18
S-13	4-6-7-9	N = 13	REC=19
S-14	5-6-8-10	N = 14	REC=19
S-15	6-7-9-11	N = 16	REC=19
S-16	4-5-7-8	N = 12	REC=21
S-17	3-4-6-8	N = 10	



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **83.48 (ft)**

TEST LOG
B-16

SHEET 2 OF 2

Driller: **Ron/CenKen**	Method: **Mud Rotary**	Casing Length: **53 ft**	Date Begun: **5/9/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **5**	Date Completed: **5/9/2014**

Groundwater Levels (feet)
0 hour: 5 ▽
24 hours: ________

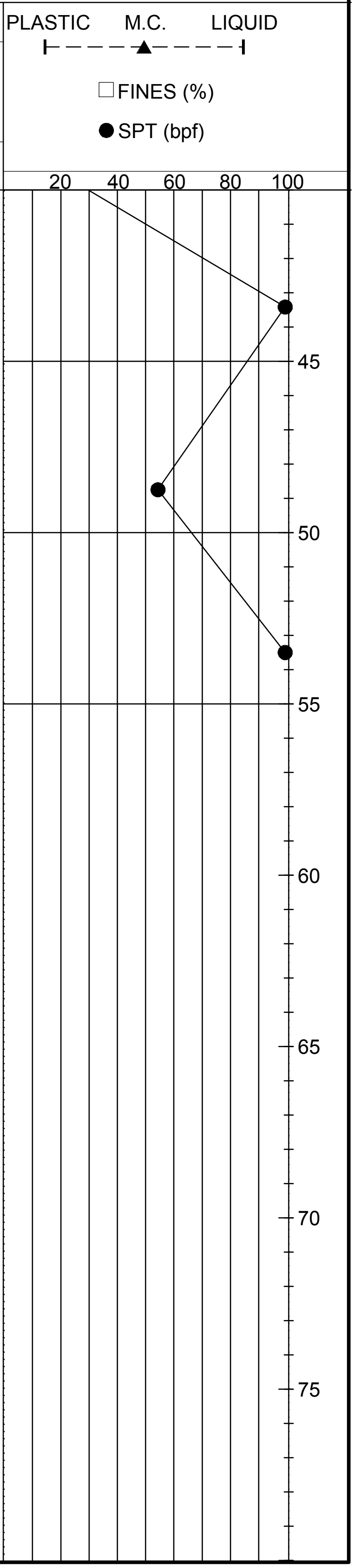
SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	IDNET	TYPE	N-COUNT / REC / RQD
41–44	Moist, brown, stiff, Sandy SILT, with Shells (ML)				REC=24
44–48	Dry, brown and dark gray, very dense Silty SAND, with Shells (SM)	40	S-18	☒	24-100/3" N = 100 REC=9
48–55	Moist, dark gray, very dense Silty SAND, with Shells amd Mica (SM)	35	S-19	☒	6-34-21 N = 55 REC=18
		30	S-20	☒	6-100/6" N = 100 REC=9

Boring terminated at 55 ft. bgs

Notes:
1) Groundwater encountered incasing at 5 feet bgs at completion of drilling.
2) Inclinometer No. IN-2 installed in borehole to a depth of 55.
3) Cave-in occured at 55 feet bgs.



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**

PROJECT NO. **07100627W**

Surface Elevation **109.97 (ft)**

TEST LOG

B-17

SHEET 1 OF 2

Driller:	Method:	Casing Length:	Date Begun:
Ron/CenKen	**Mud Rotary**	**69.2 ft**	**5/9/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
SS	**Automatic**	**5**	**5/9/2014**

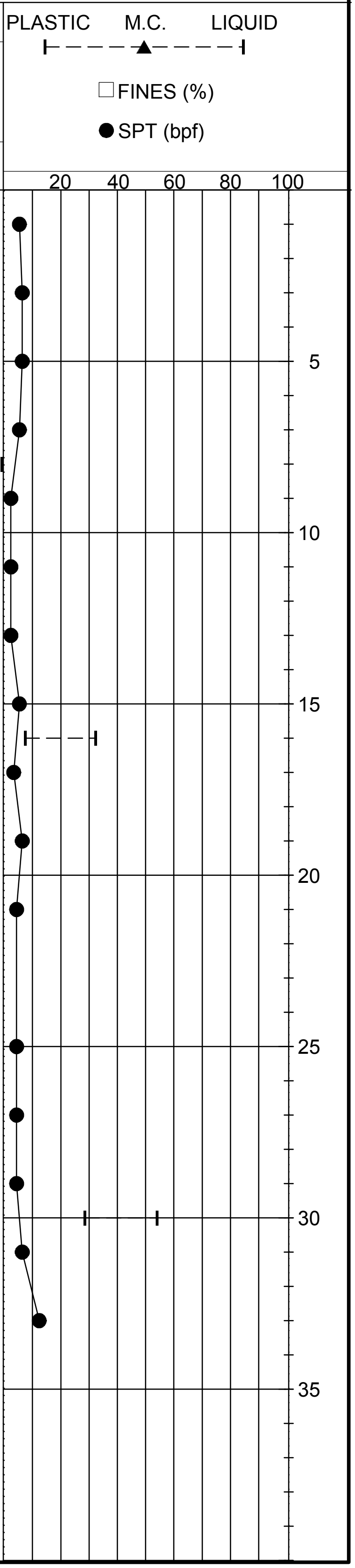
Groundwater Levels (feet)

0 hour: ________

24 hours: ________

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	SAMPLES IDNT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6" REC RQD
	FILL Sampled As: Moist, brown, loose SAND and GRAVEL (SP)		S-1	⊠	3-3-3-3 N = 6 REC=19
	Moist, light brown to reddish brown, medium stiff, Sandy CLAY (CL)		S-2	⊠	2-3-4-4 N = 7 REC=18
5	Moist, brown, loose, Silty SAND (SM)	105	S-3	⊠	3-3-4-5 N = 7 REC=18
			S-4	⊠	3-3-3-2 N = 6 REC=17
	Moist, gray, brown, very loose to loose, Silty SAND (SM)		S-5	⊠	1-1-2-2 N = 3 REC=24
10		100	S-6	⊠	1-1-2-2 N = 3 REC=24
			S-7	⊠	WOH-1-2-2 N = 3 REC=16
15		95	S-8	⊠	2-3-3-4 N = 6 REC=13
	Moist, gray, soft, Sandy Clayey SILT (ML)		S-9	⊠	2-2-2-5 N = 4 REC=20
	Moist, gray, medium stiff, Sandy CLAY, with iron nodules (CL)		S-10	⊠	2-3-4-5 N = 7 REC=24
20	- Sandy Silt lens	90	S-11	⊠	2-2-3-5 N = 5 REC=24
	Moist, mottled greensih gray, reddish brown, loose Clayey SAND (SC)		ST-1	■	REC=24
25		85	S-12	⊠	2-2-3-4 N = 5 REC=24
	Moist, reddish brown, medium stiff, FAT CLAY (CH)		S-13	⊠	2-2-3-5 N = 5 REC=19
			S-14	⊠	1-2-3-5 N = 5 REC=24
30		80	S-15	⊠	2-3-4-6 N = 7 REC=24
	Moist, olive gray, stiff to hard, Sandy SILT, with Shells and Mica, with Silty Sand Layers (ML)		S-16	⊠	2-5-8-10 N = 13 REC=24
35		75			



KCI TECHNOLOGIES

PROJECT **Piscataway Dr. Slope Failures**
PROJECT NO. **07100627W**
Surface Elevation **109.97 (ft)**

TEST LOG
B-17

SHEET 2 OF 2

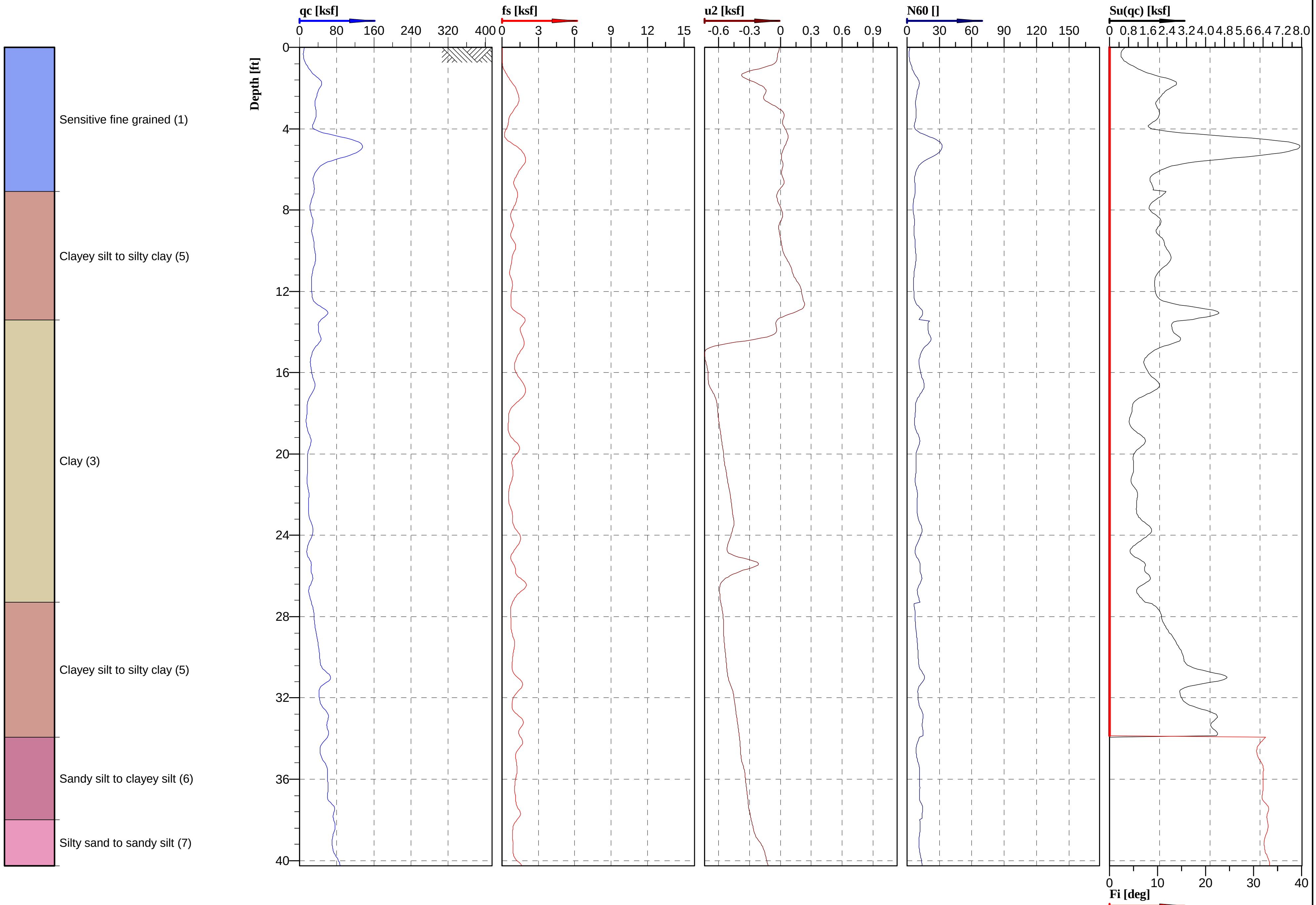
Driler: **Ron/CenKen**	Method: **Mud Rotary**	Casing Length: **69.2 ft**	Date Begun: **5/9/2014**
KCI Representative: **SS**	Hammer Type: **Automatic**	Casing Diameter: **5**	Date Completed: **5/9/2014**

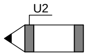
Groundwater Levels (feet)
0 hour: ________
24 hours: ________

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	SAMPLES TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6" REC RQD	PLASTIC M.C. LIQUID ☐FINES (%) ●SPT (bpf) 20 40 60 80 100
	Moist, olive gray, stiff to hard, Sandy SILT, with Shells and Mica, with Silty Sand Layers (ML)						
45	Moist, olive gray, Silty SAND with Shells and Mica (SM)		65				
50			60				
55			55				
60			50				
65			45				
70	Boring terminated at 69.2 ft. bgs		40				
75			35				

Boring terminated at 69.2 ft. bgs

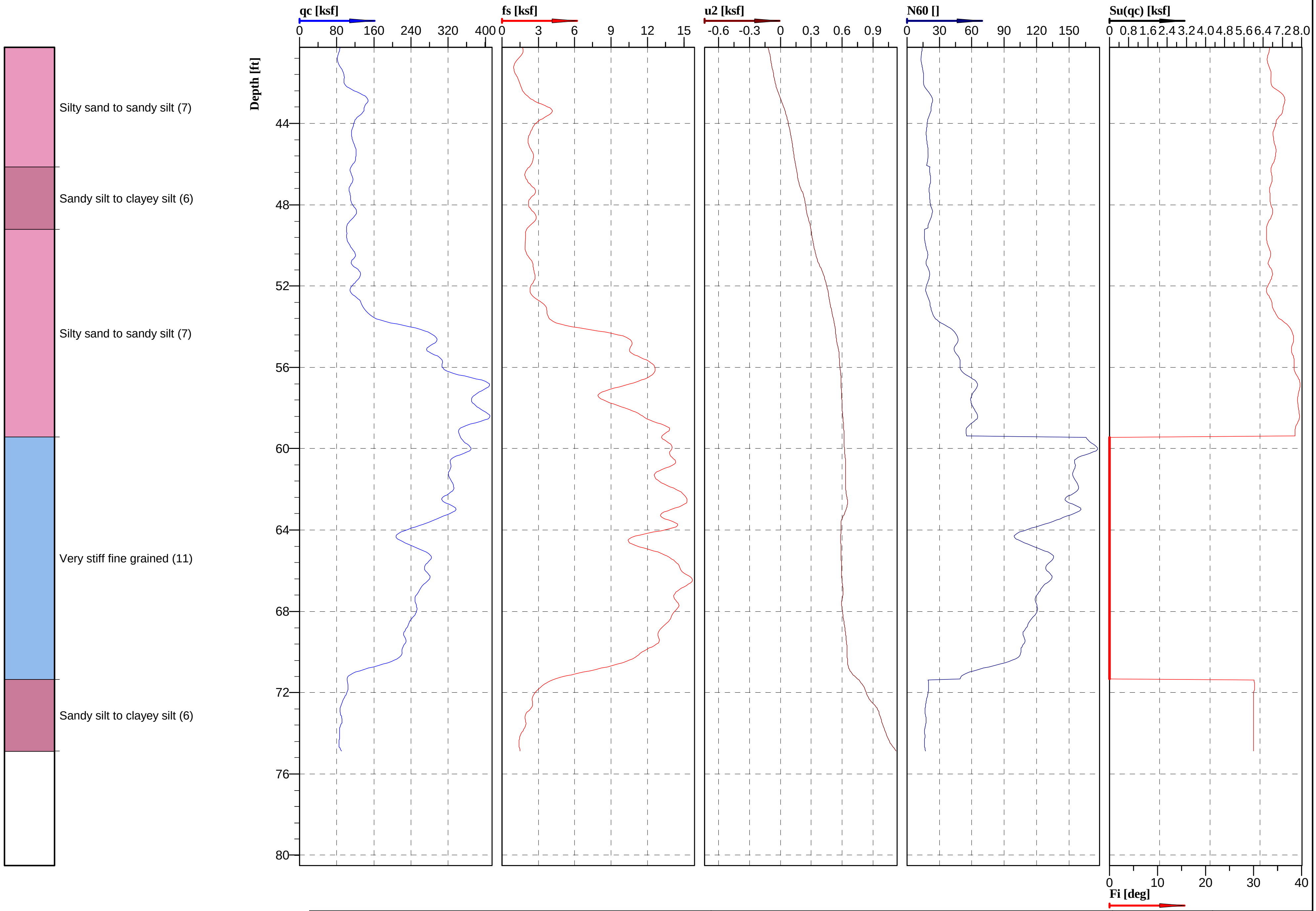
Note:
1) Lost drilling mud fluid at 7.5 feet and between 25 and 26 feet.
2) Soil samples not taken after 32 and 69.2 feet bgs.
3) Groundwater not recorded in borehole due to mud rotary drilling.
4) Inclinometer No. IN-3 installed in borehole to a depth of 69.2 feet.



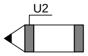


Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland
Position:
Ground level:
Test no: CPT-1
Project ID: S14103
Client: KCI
Date: 5/13/14
Scale: 1 : 75
Project: Fort Washington Slope
Page: 1/2
Fig:
File: SLOPE KCI CPT-1.CSV

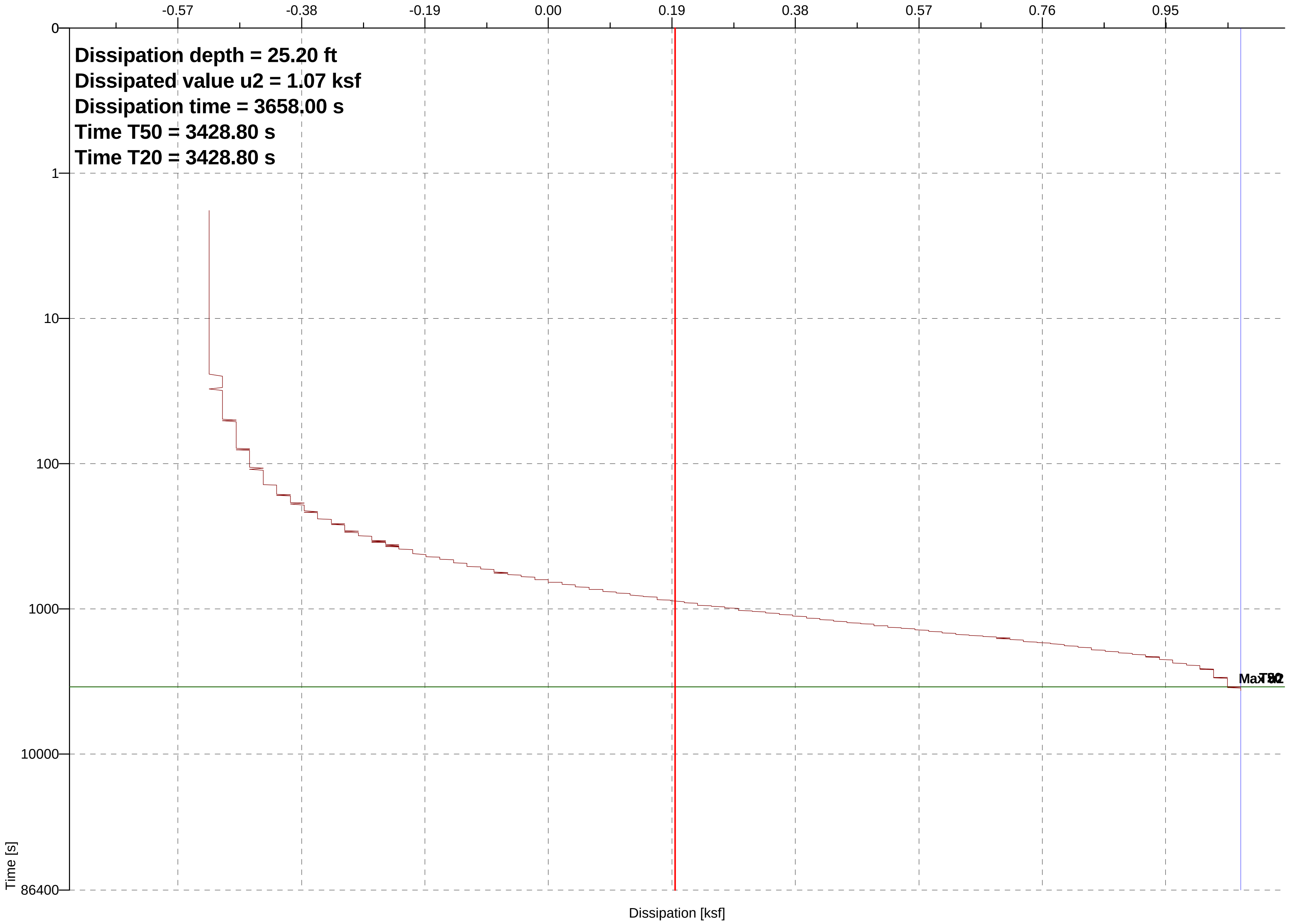


HILLIS-CARNES
ENGINEERING ASSOCIATES

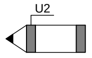


Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position:	Ground level:	Test no: CPT-1
Project ID: S14103	Client: KCI	Date: 5/13/14	Scale: 1 : 75
Project: Fort Washington Slope		Page: 2/2	Fig:
		File: SLOPE KCI CPT-1.CSV	

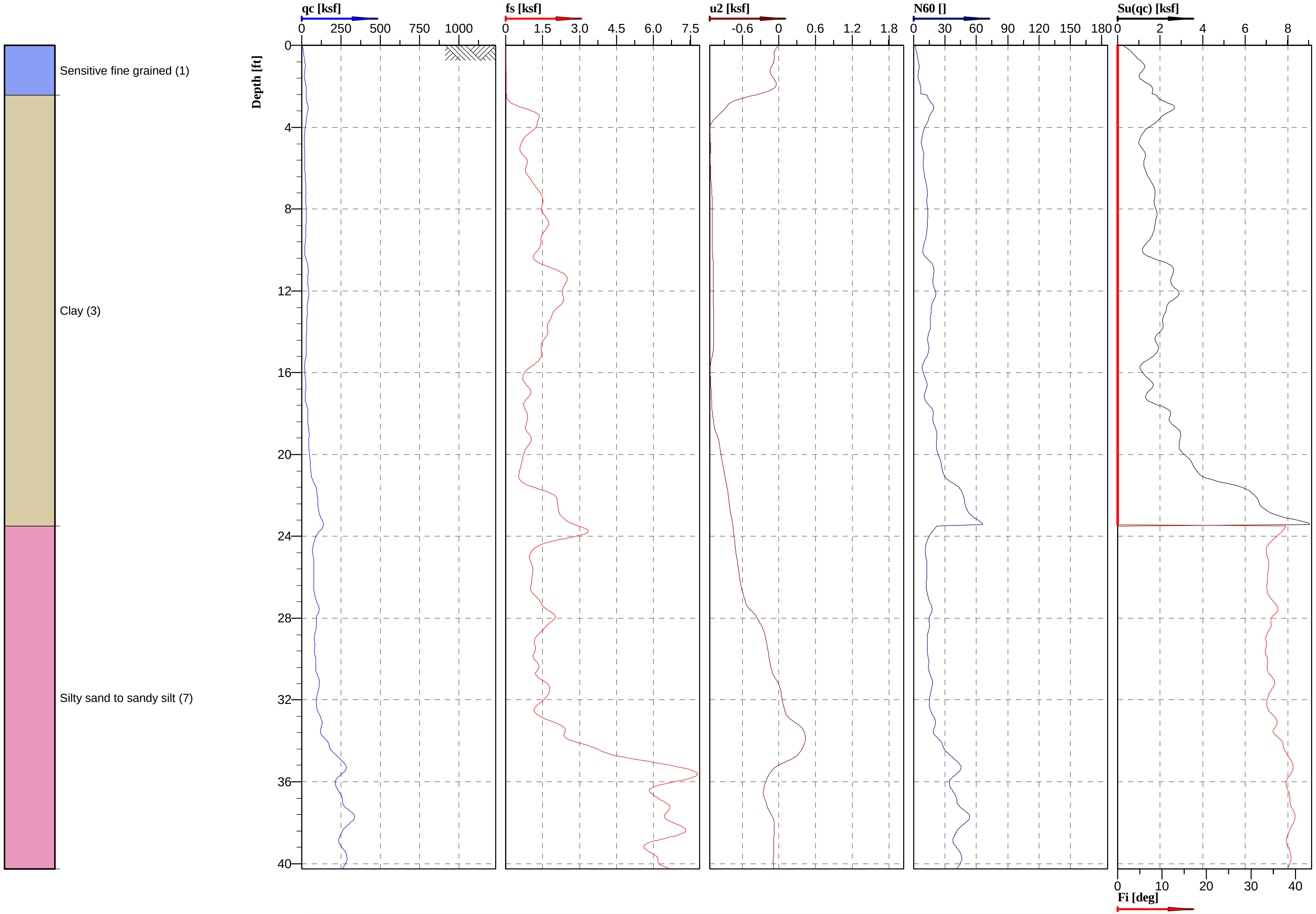

Dissipation depth = 25.20 ft
Dissipated value u2 = 1.07 ksf
Dissipation time = 3658.00 s
Time T50 = 3428.80 s
Time T20 = 3428.80 s

HILLIS-CARNES
ENGINEERING ASSOCIATES

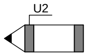


Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position:	Ground level:	Test no: CPT-1
Project ID: S14103	Client: KCI	Date: 5/13/14	Scale: 1 : 75
Project: Fort Washington Slope		Page: 1/2	Fig:
		File: SLOPE KCI CPT-1.cpd	

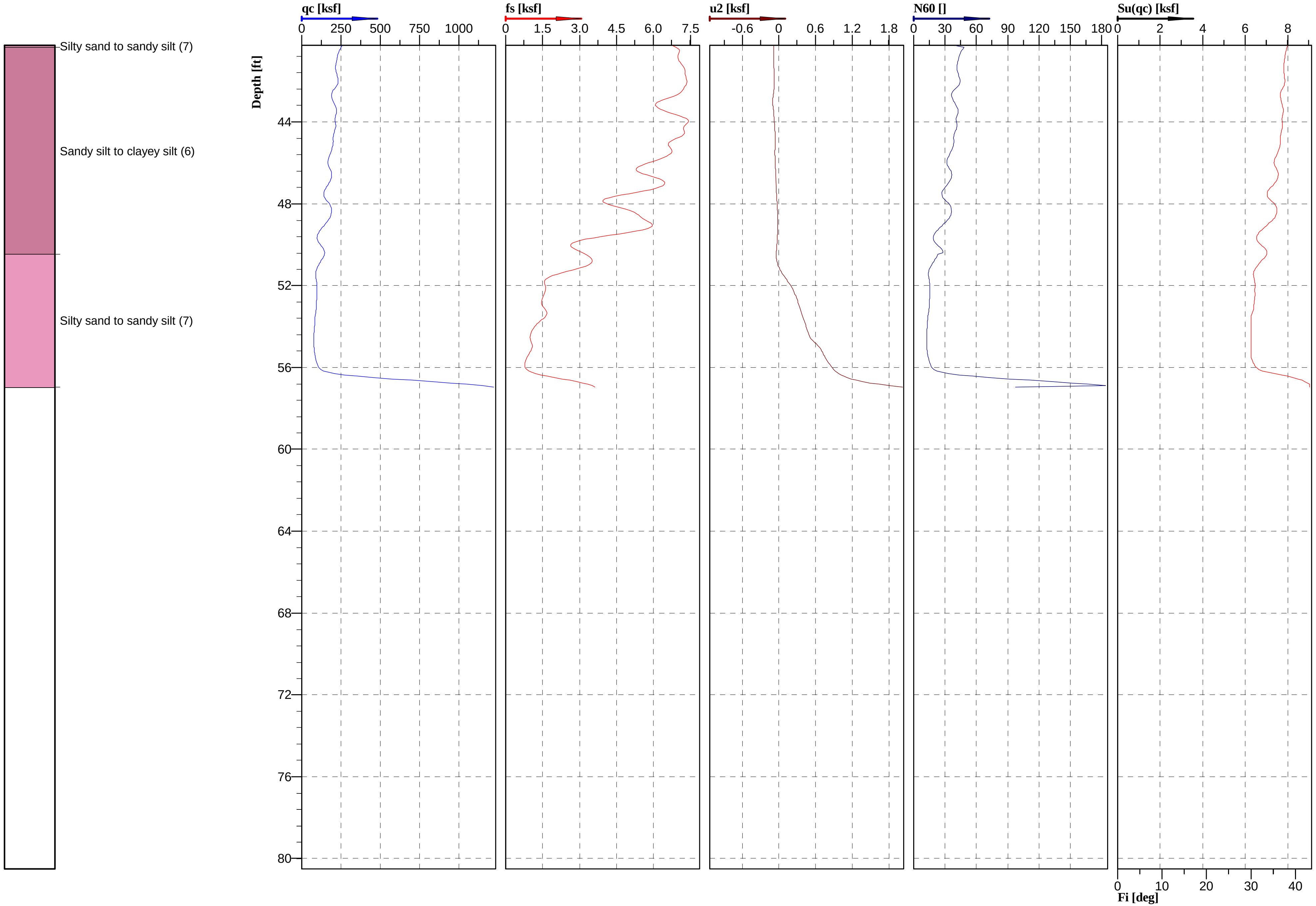


HILLIS-CARNES ENGINEERING ASSOCIATES

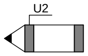


Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland
Position: X: 0.00 ft, Y: 0.00 ft
Ground level: 0.00
Test no: CPT-2
Project ID: S14103
Client: KCI Technologies
Date: 5/9/2014
Scale: 1 : 75
Project: Fort Washington Slope
Page: 1/2
Fig:
File: SLOPE KCI CPT-2.CPT

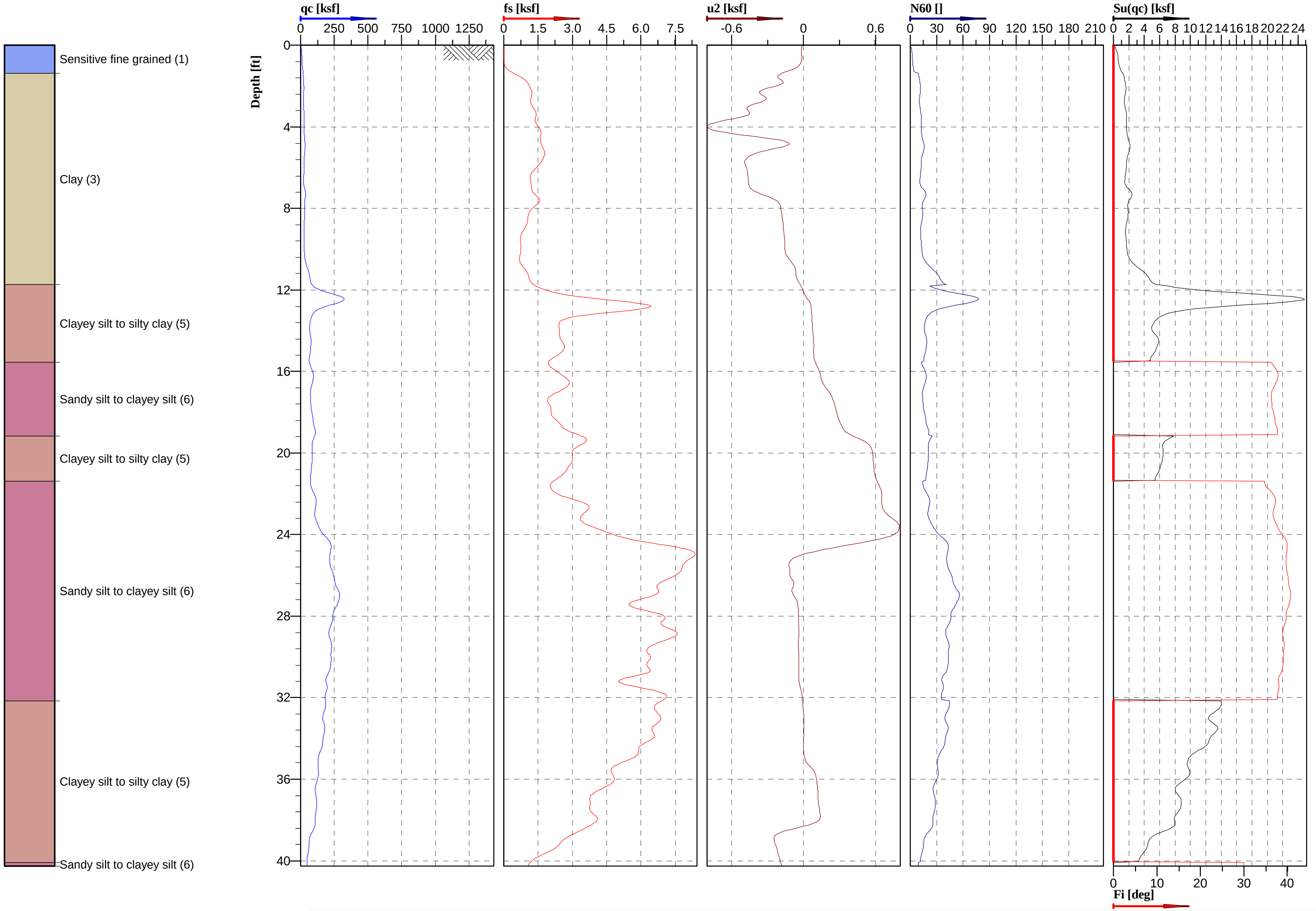


HILLIS-CARNES
ENGINEERING ASSOCIATES

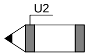


Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-2
Project ID: S14103	Client: KCI Technologies	Date: 5/9/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 2/2	Fig:
		File: SLOPE KCI CPT-2.CPT	

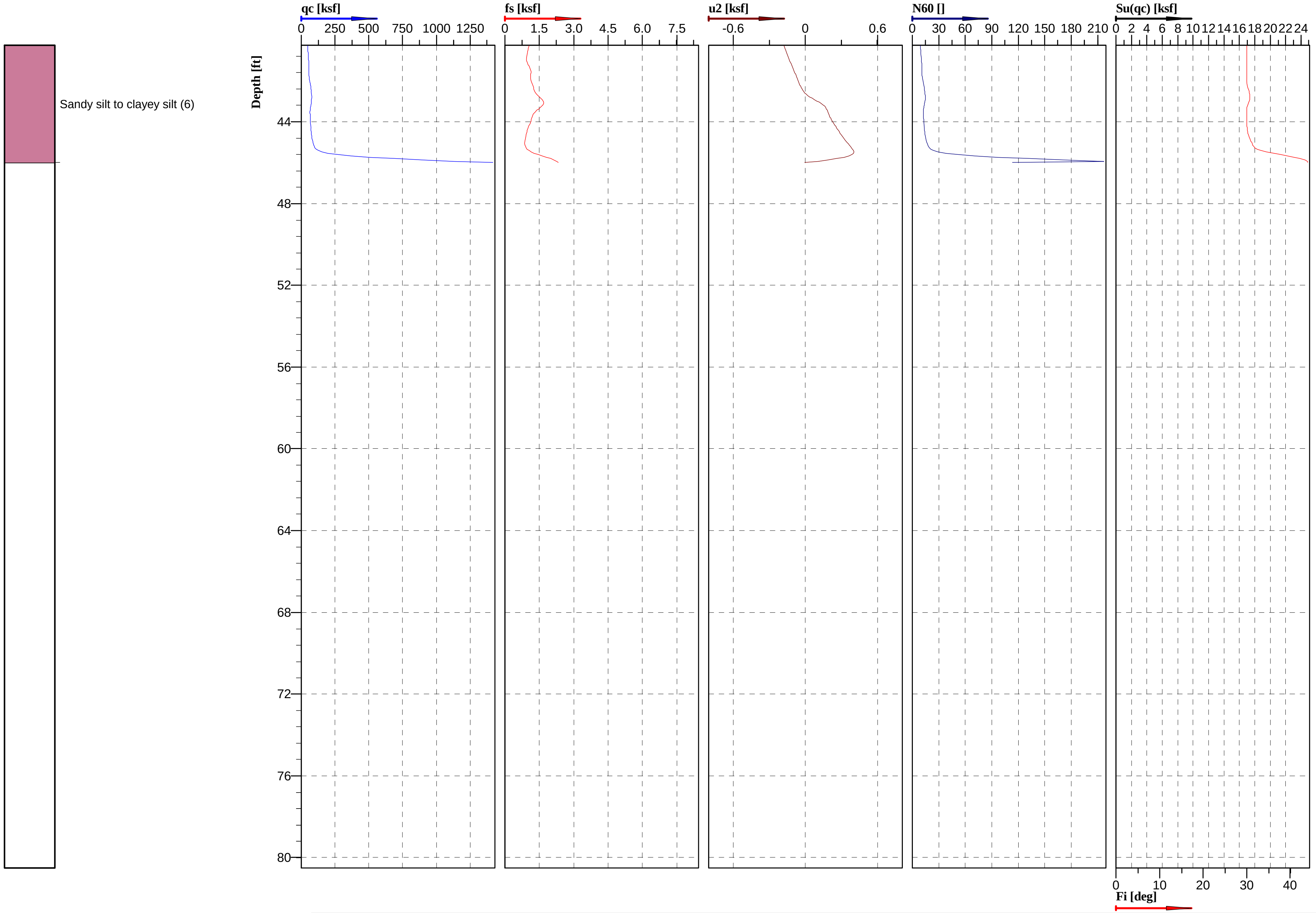


HILLIS-CARNES
ENGINEERING ASSOCIATES

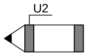


Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-3
Project ID: S14103	Client: KCI Technologies	Date: 5/9/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 1/2	Fig:
		File: SLOPE KCI CPT-3.cpd	

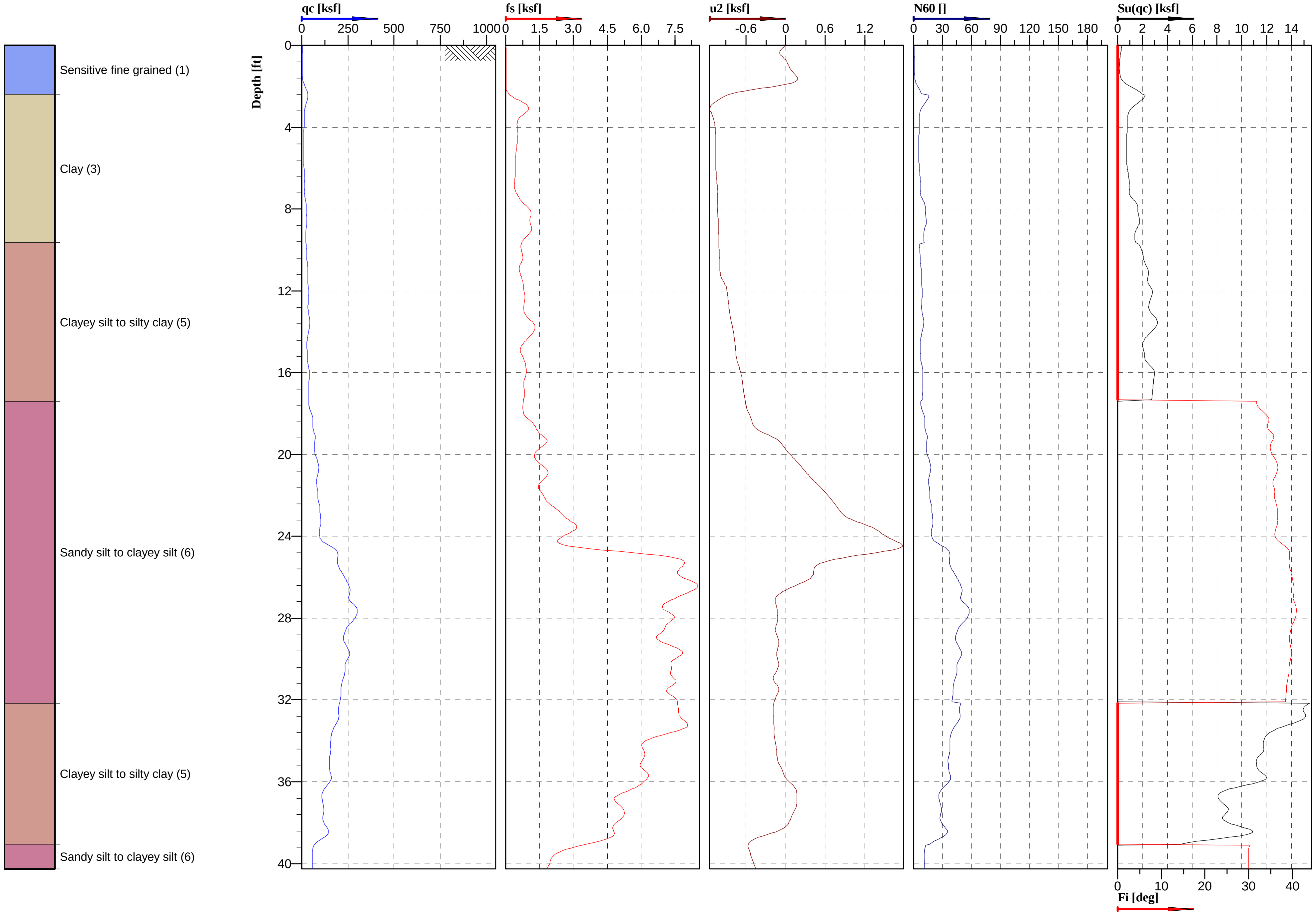


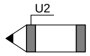
HILLIS-CARNES
ENGINEERING ASSOCIATES



Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-3
Project ID: S14103	Client: KCI Technologies	Date: 5/9/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 2/2	Fig:
		File: SLOPE KCI CPT-3.cpd	

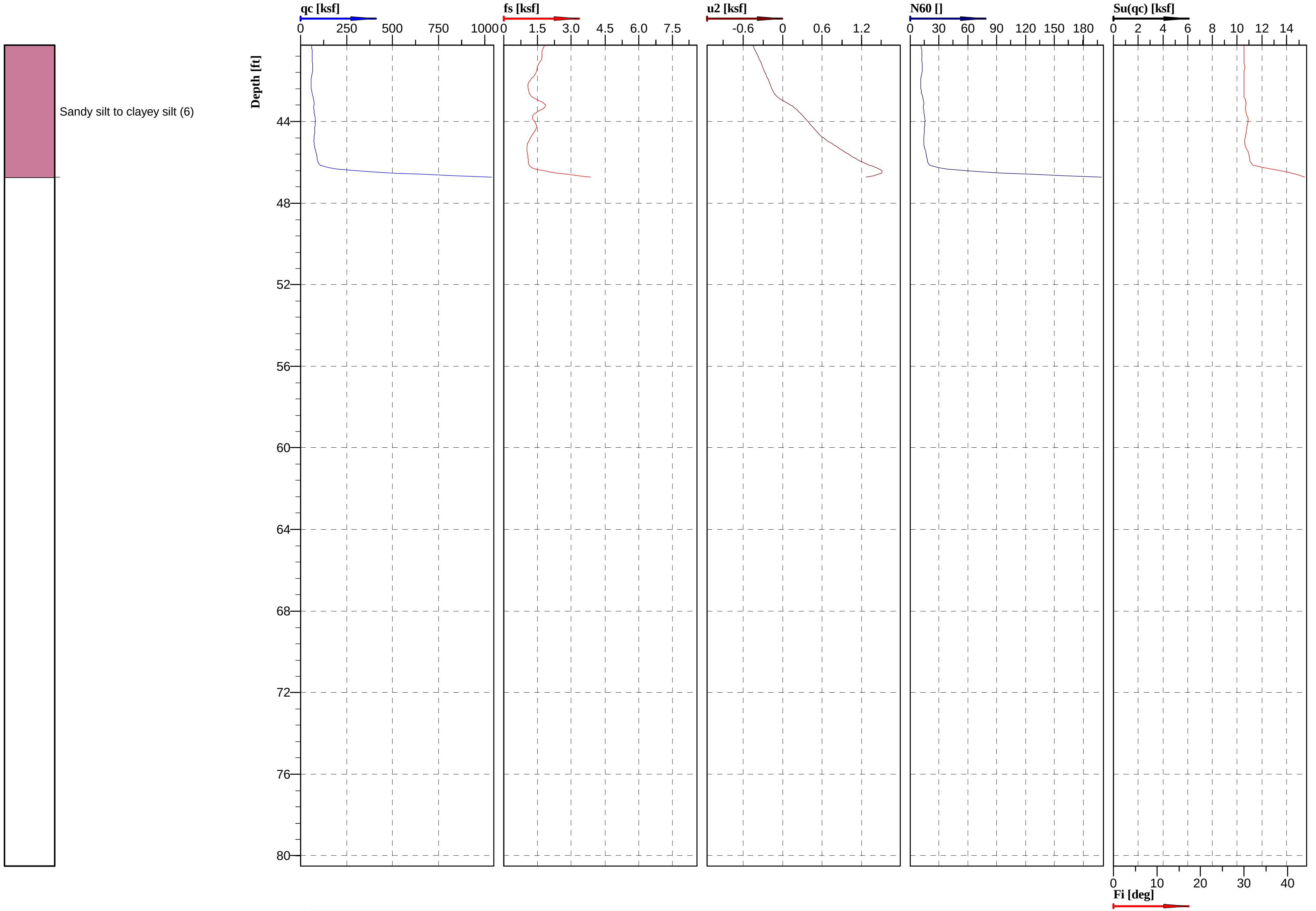




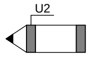
HILLIS-CARNES
ENGINEERING ASSOCIATES

Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-4
Project ID: S14103	Client: KCI Technologies	Date: 5/9/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 1/2	Fig:
		File: SLOPE KCI CPT-4.cpd	

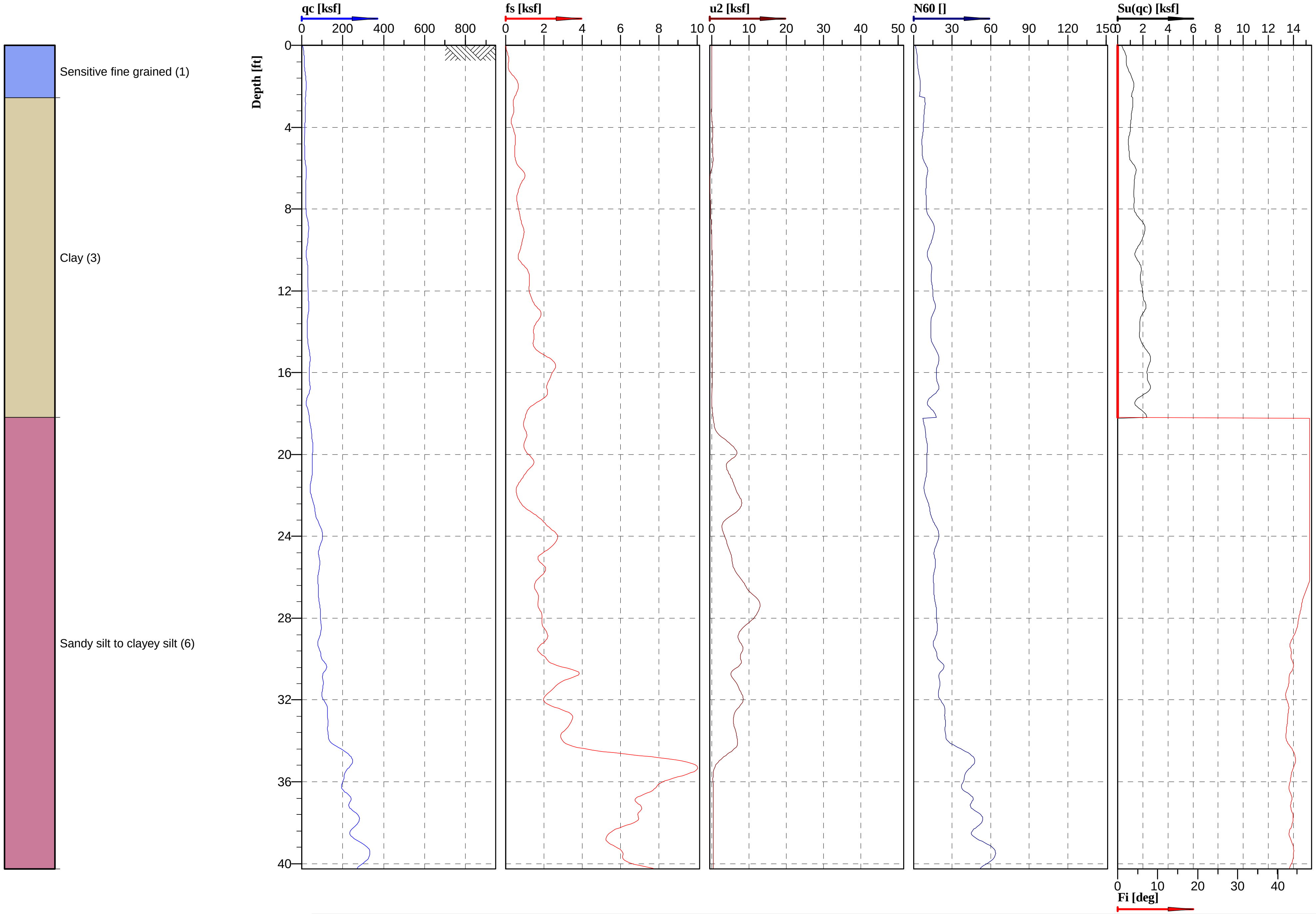


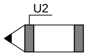
HILLIS-CARNES ENGINEERING ASSOCIATES



Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland
Position: X: 0.00 ft, Y: 0.00 ft
Ground level: 0.00
Test no: CPT-4
Project ID: S14103
Client: KCI Technologies
Date: 5/9/2014
Scale: 1 : 75
Project: Fort Washington Slope
Page: 2/2
Fig:
File: SLOPE KCI CPT-4.cpd





HILLIS-CARNES
ENGINEERING ASSOCIATES

Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-5
Project ID: S14103	Client: KCI Technologies	Date: 5/9/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 1/2	Fig:
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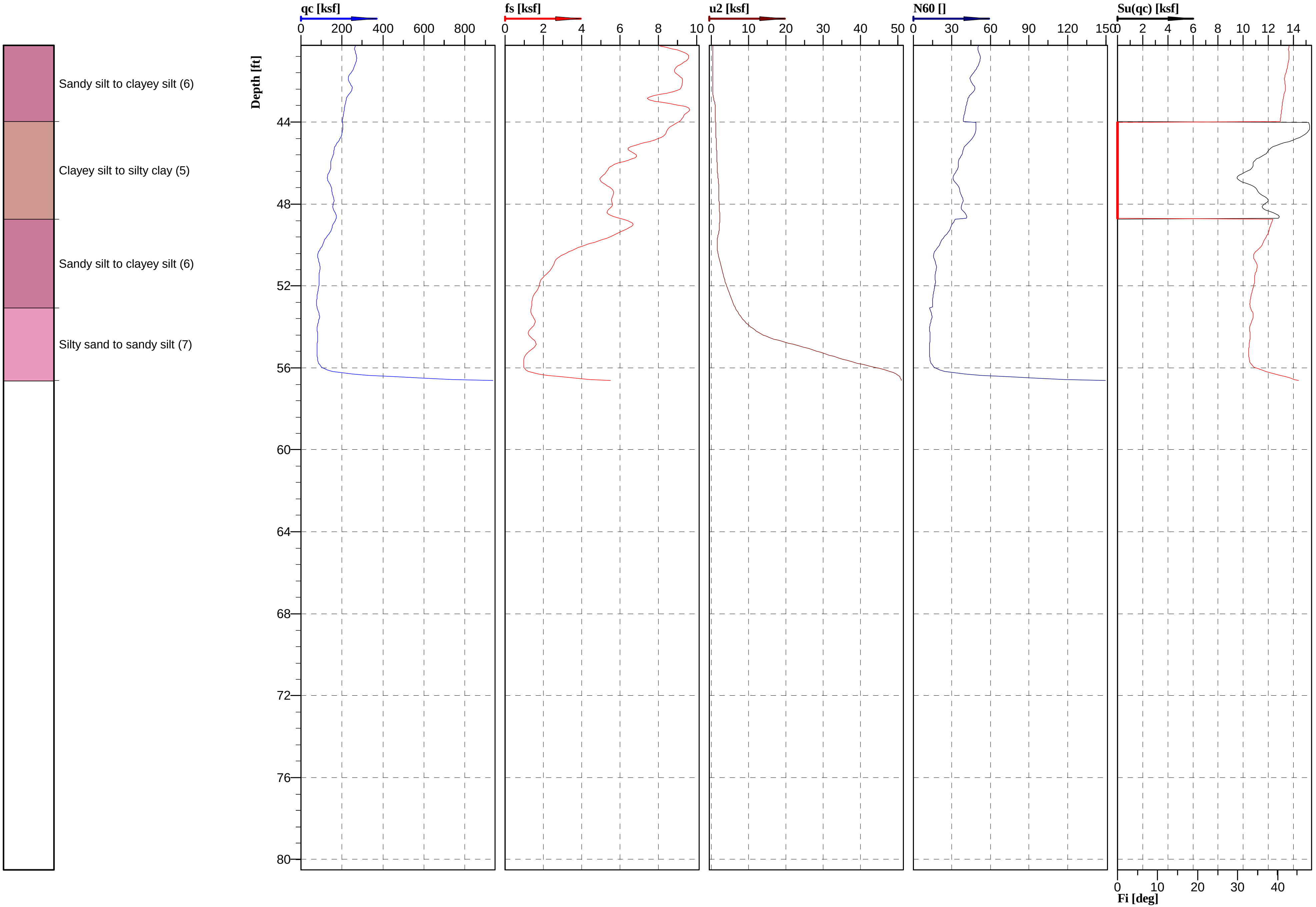
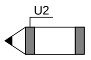
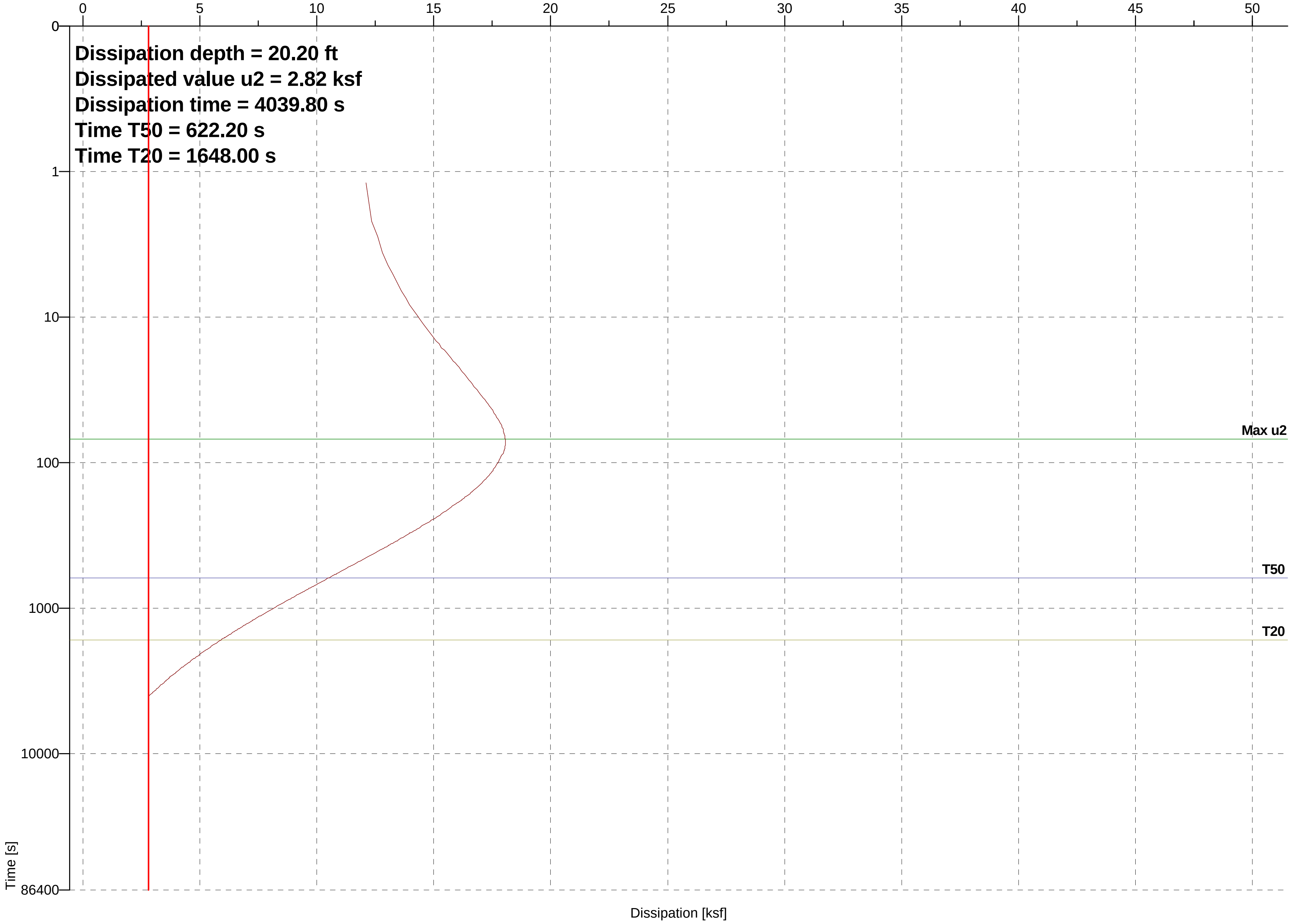




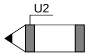
Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-5
Project ID: S14103	Client: KCI Technologies	Date: 5/9/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 2/2	Fig:
		File: SLOPE KCI CPT-5.cpd	



Dissipation depth = 20.20 ft
Dissipated value u2 = 2.82 ksf
Dissipation time = 4039.80 s
Time T50 = 622.20 s
Time T20 = 1648.00 s

HILLIS-CARNES
ENGINEERING ASSOCIATES



Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-5
Project ID: S14103	Client: KCI Technologies	Date: 5/9/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 1/2	Fig:
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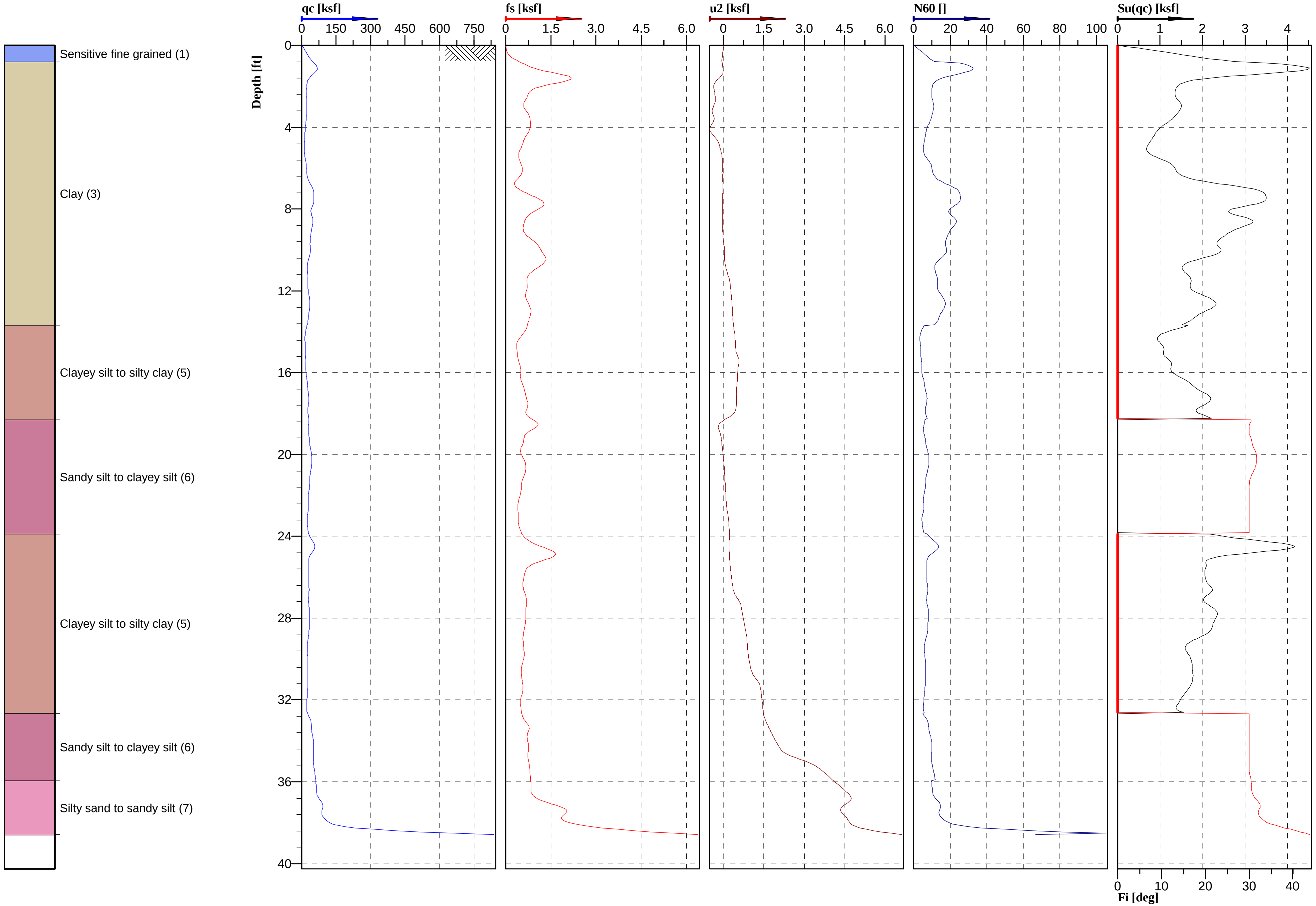
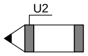
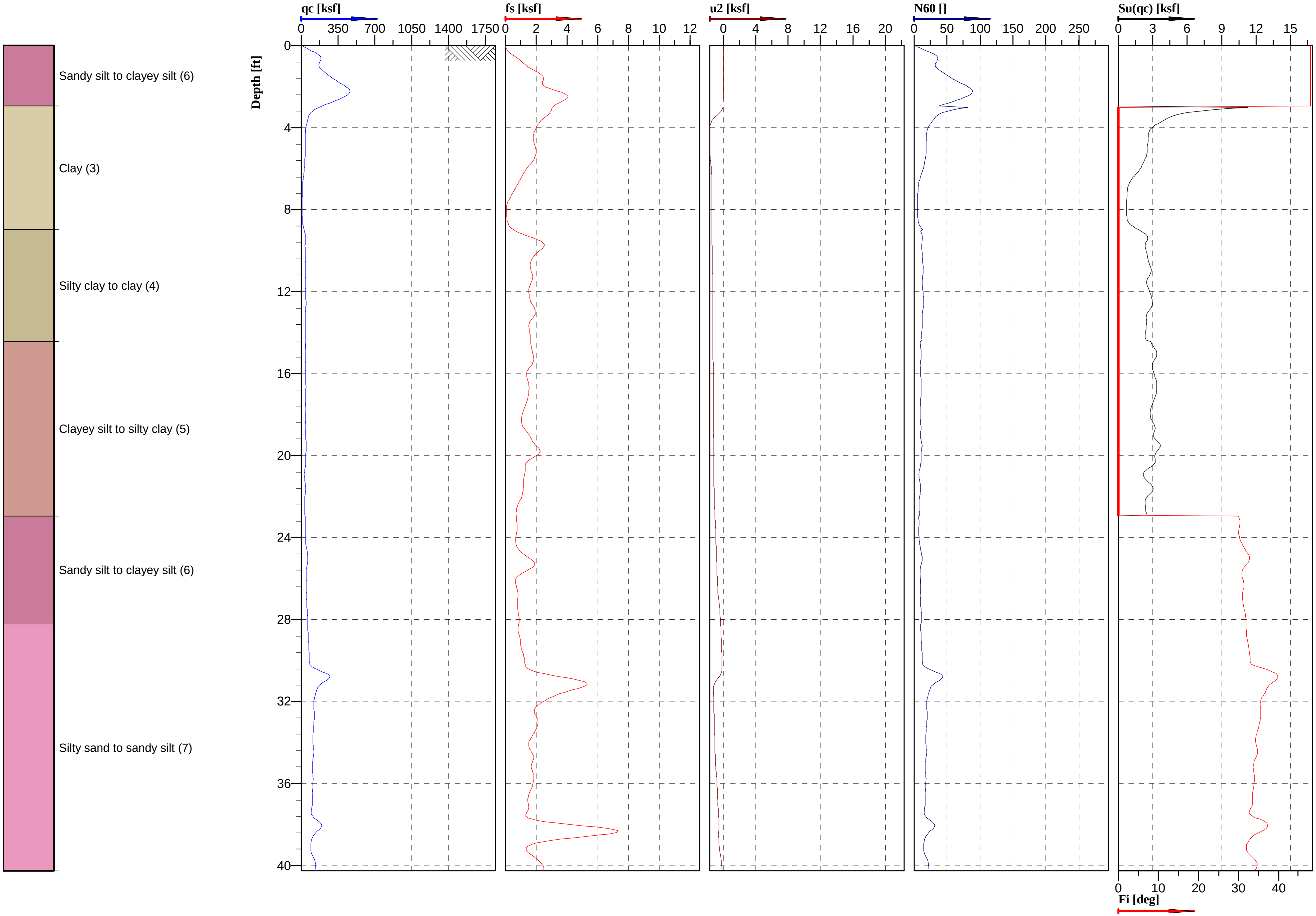


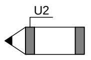
HILLIS-CARNES
ENGINEERING ASSOCIATES



Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-6
Project ID: S14103	Client: KCI Technologies	Date: 5/13/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 1/1	Fig:
		File: SLOPE KCI CPT-6.cpd	





HILLIS-CARNES
ENGINEERING ASSOCIATES

Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-7
Project ID: S14103	Client: KCI Technologies	Date: 5/13/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 1/2	Fig:
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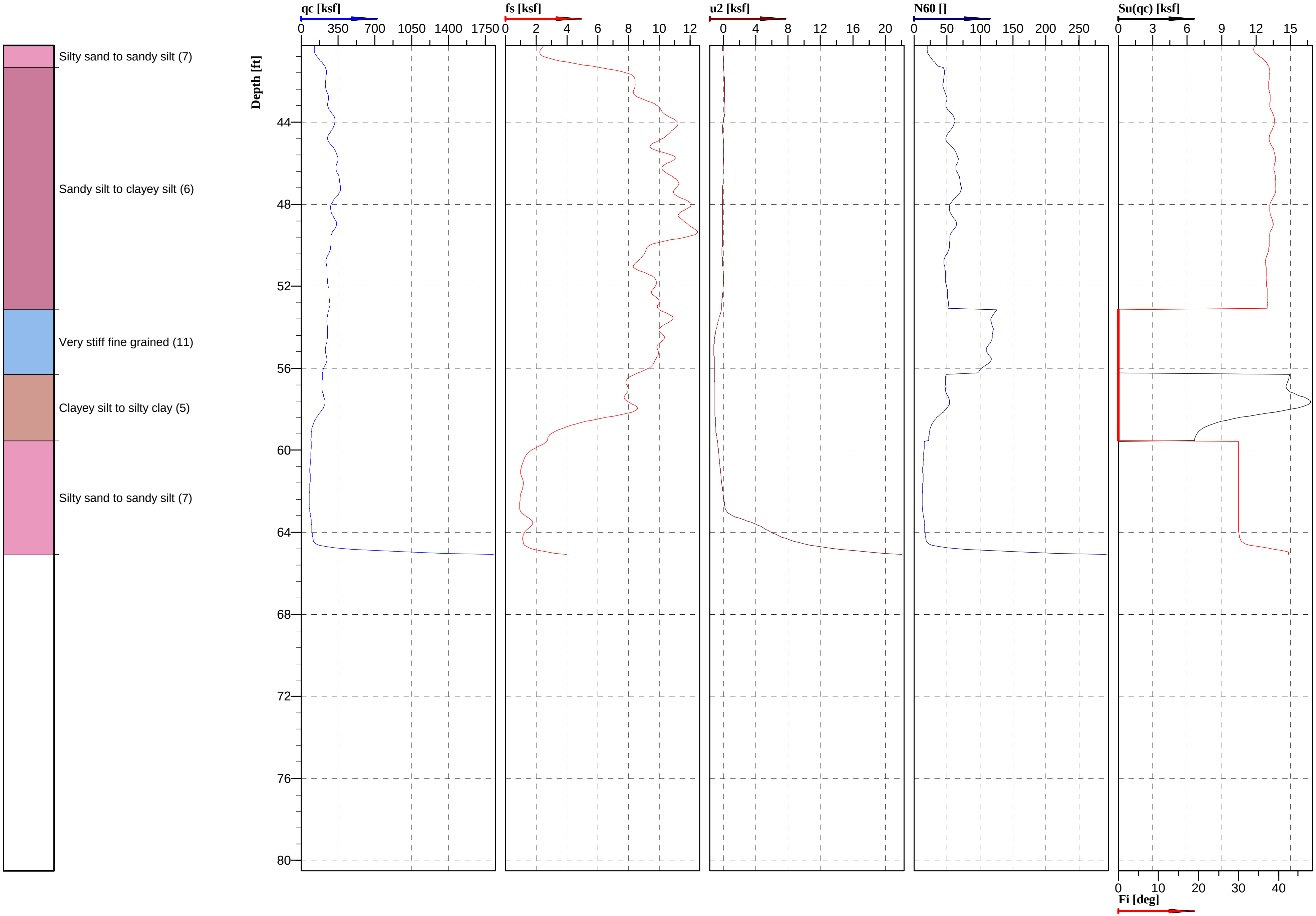
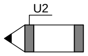


HILLIS-CARNES
ENGINEERING ASSOCIATES



Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-7
Project ID: S14103	Client: KCI Technologies	Date: 5/13/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 2/2	Fig:
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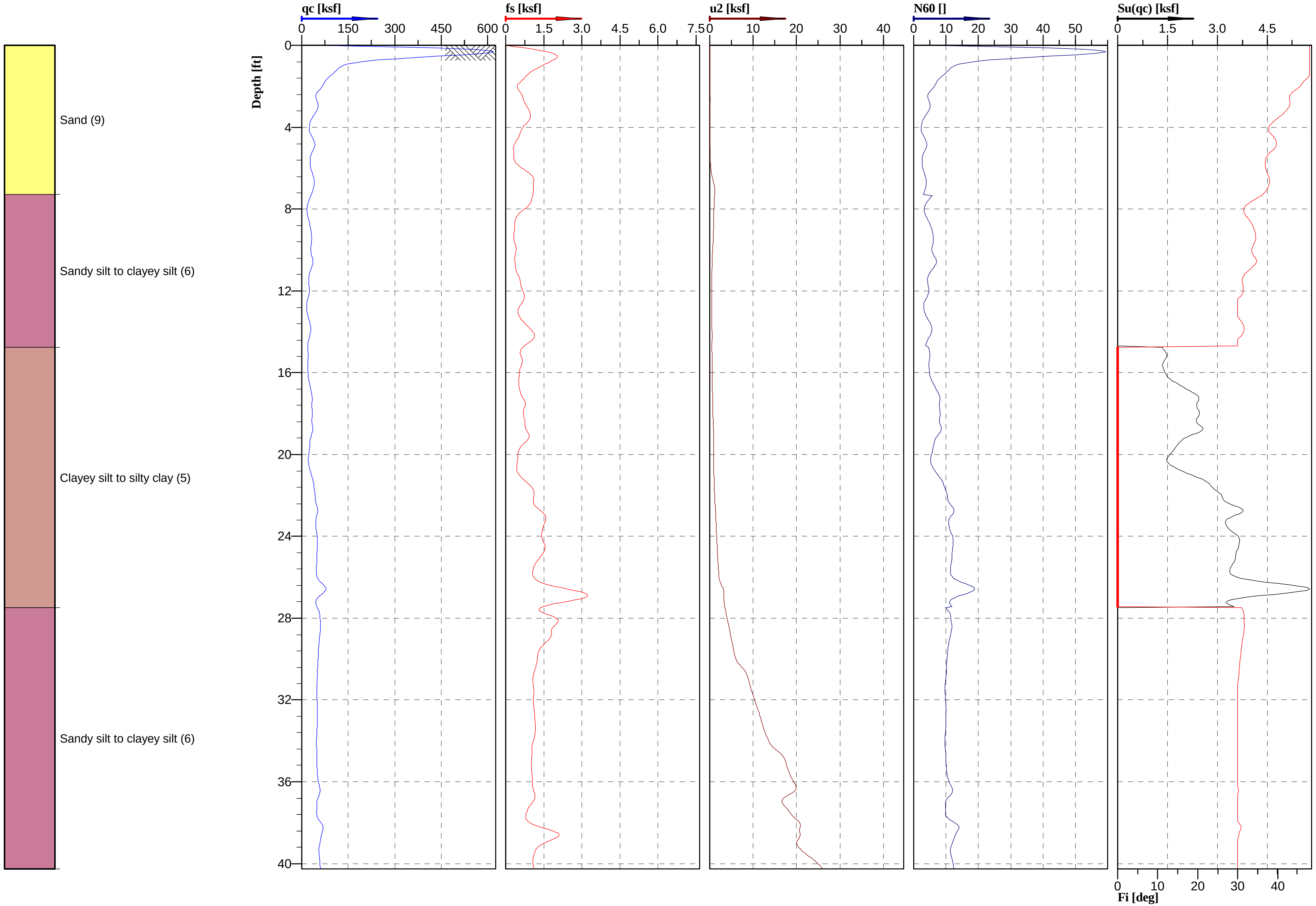
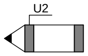
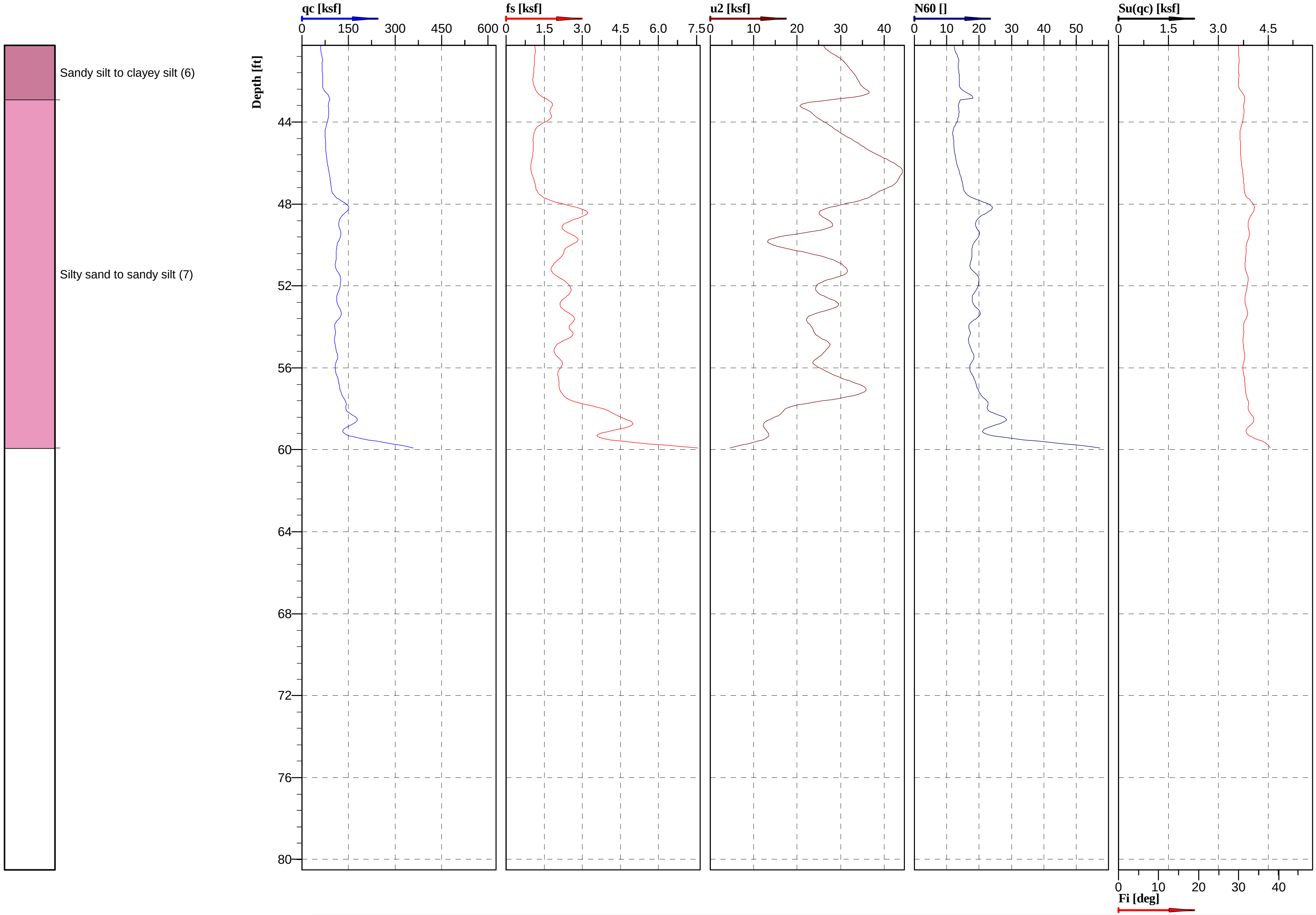


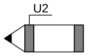
HILLIS-CARNES
ENGINEERING ASSOCIATES



Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington Slope	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-8
Project ID: S14103	Client: KCI Technologies	Date: 5/13/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 1/2	Fig:
		File: SLOPE KCI CPT-8.cpd	

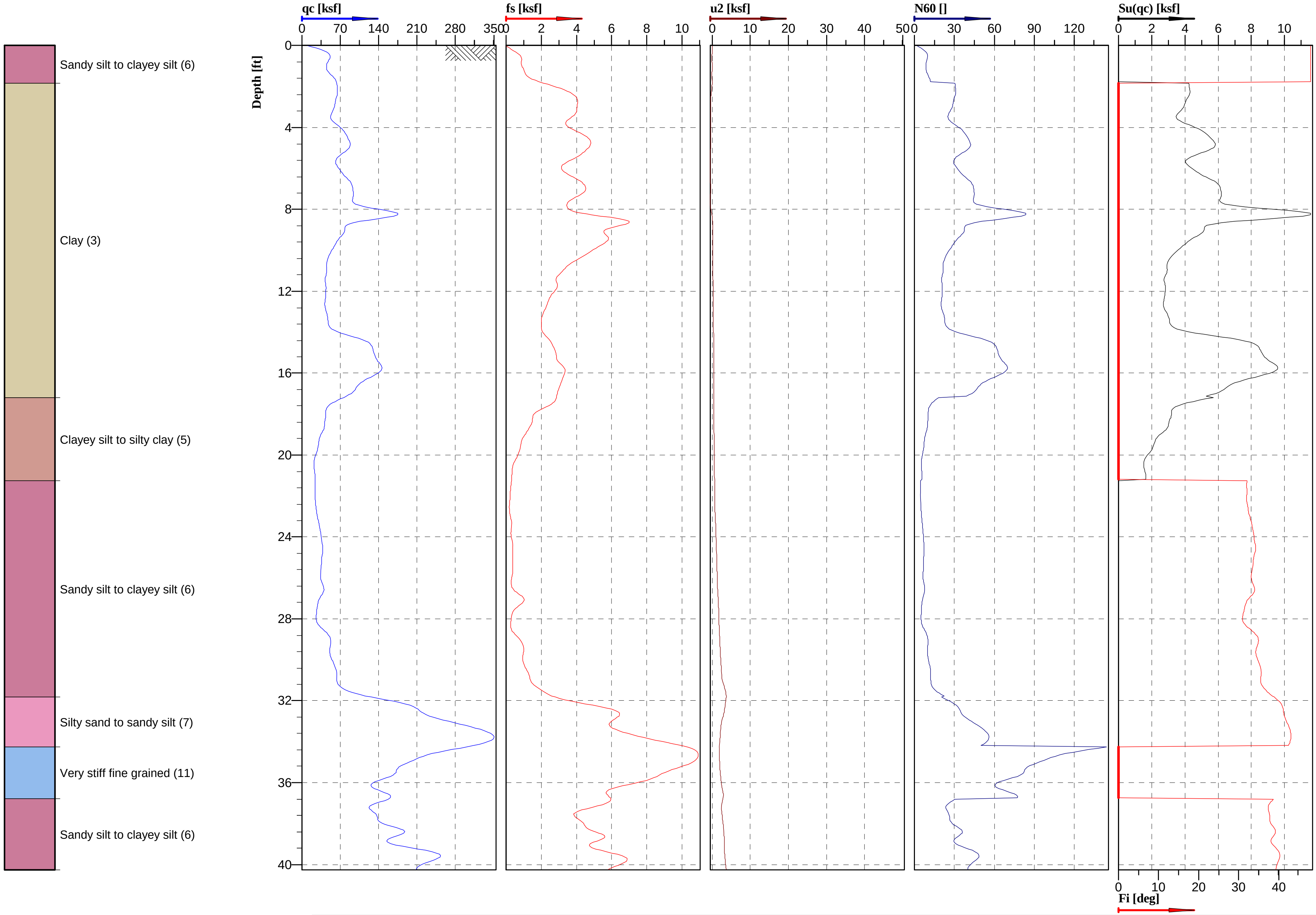




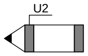
HILLIS-CARNES
ENGINEERING ASSOCIATES

Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington Slope	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-8
Project ID: S14103	Client: KCI Technologies	Date: 5/13/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 2/2	Fig:
		File: SLOPE KCI CPT-8.cpd	

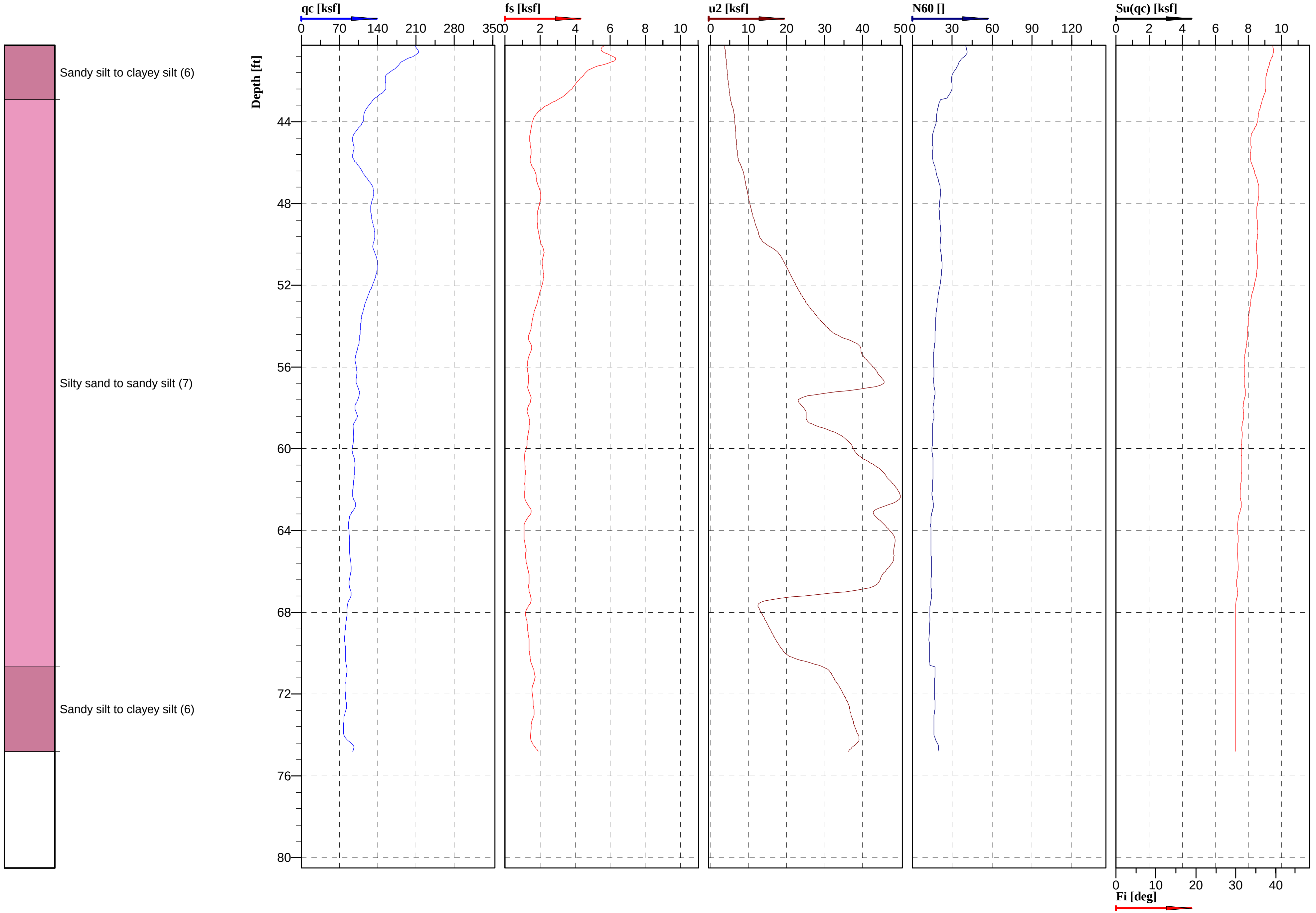


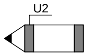
HILLIS-CARNES
ENGINEERING ASSOCIATES



Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-9
Project ID: S14103	Client: KCI Technologies	Date: 5/13/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 1/2	Fig:
		File: SLOPE KCI CPT-9.cpd	

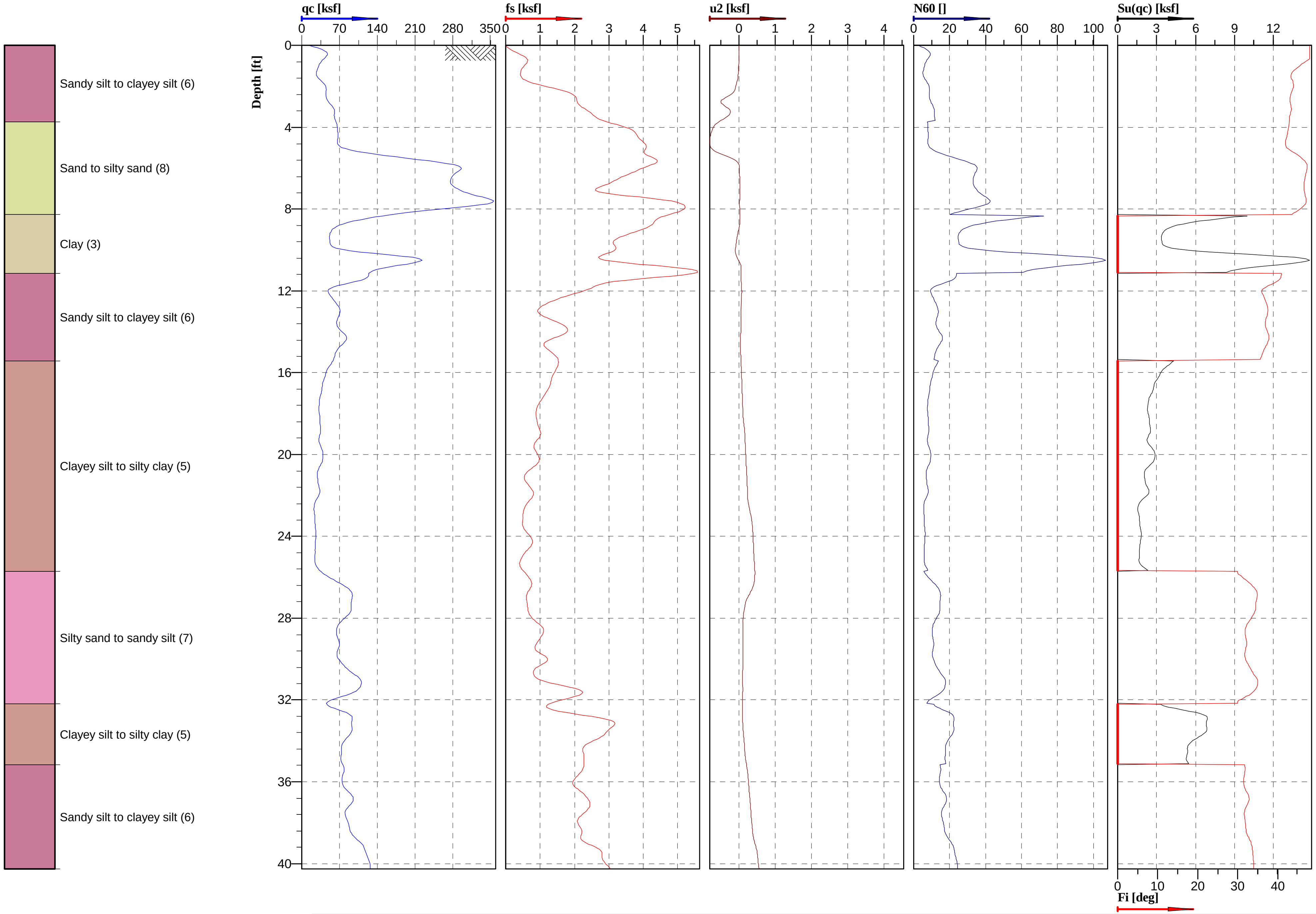




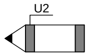
HILLIS-CARNES
ENGINEERING ASSOCIATES

Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-9
Project ID: S14103	Client: KCI Technologies	Date: 5/13/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 2/2	Fig:
		File: SLOPE KCI CPT-9.cpd	

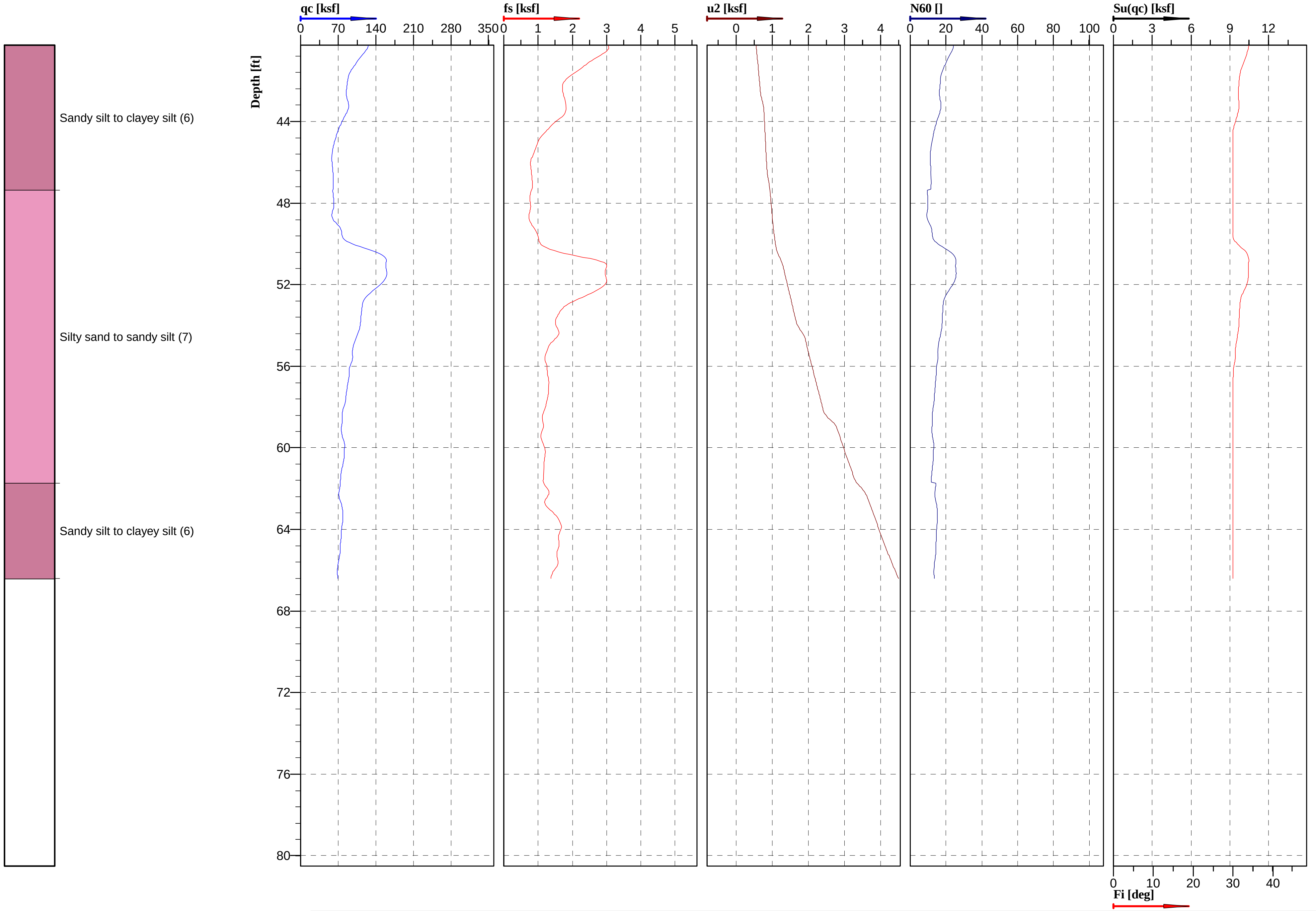


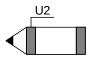
HILLIS-CARNES
ENGINEERING ASSOCIATES



Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-10
Project ID: S14103	Client: KCI Technologies	Date: 5/13/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 1/2	Fig:
		File: SLOPE KCI CPT-10.cpd	





HILLIS-CARNES
ENGINEERING ASSOCIATES

Cone No: NEW2014
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Fort Washington, Maryland	Position: X: 0.00 ft, Y: 0.00 ft	Ground level: 0.00	Test no: CPT-10
Project ID: S14103	Client: KCI Technologies	Date: 5/13/2014	Scale: 1 : 75
Project: Fort Washington Slope		Page: 2/2	Fig:
		File: SLOPE KCI CPT-10.cpd	

FIELD EXPLORATORY PROCEDURES

Standard Penetration Tests

The general field procedures employed by KCI are summarized in ASTM specification D 420 entitled “Investigating and Sampling Soils and Rocks for Engineering Purposes.” This recommended practice lists recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in-situ borings.

Borings are advanced to obtain subsurface samples using one of several techniques depending upon the site and subsurface conditions. These techniques are:

1. Continuous hollow-stem augers;
2. Wash borings using roller cone or drag bits (mud or water);
3. Continuous flight augers (ASTM D 1452);
4. Continuous sampling using a Tripod-mounted drill rig.

These drilling methods are not capable of penetrating through material designated as “refusal materials.” Refusal may result from hard cemented soil, soft watered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

The Driller reports the subsurface conditions encountered during drilling on a field test boring record. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observation of ground water. It also contains the driller’s interpretation of the soil conditions between samples. Therefore, these boring records contain both factual and interpretive information.

A geotechnical engineer reviews the soils and rock samples plus the field boring records. The engineer classifies the soils in general accordance with the procedures outlined in ASTM Specification D 2488 and prepares the final boring records, which are the basis for all evaluations and recommendations. The final test boring records represent our interpretation of the contents of the field records based on the results of the engineering examination and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designating the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The actual transition between materials may be gradual. The final Test Boring Records are included in Appendix B.

Cone Penetration Test

The standardized cone-penetrometer test (CPT) involves pushing a 1.41-inch diameter 55 to 60 cone through the underlying ground at a rate of 1 to 2 cm/sec. CPT soundings can be very effective in site characterization, especially sites with discrete stratigraphic horizons or discontinuous lenses. Cone penetrometer testing, or CPT (ASTM D-3441), is a valuable method of assessing subsurface stratigraphy associated with soft materials, discontinuous lenses, organic materials (peat), potentially liquefiable materials (silt, sands and granular gravel) and landslides.

Cone rigs can usually penetrate normally consolidated soils and colluvium, but have also been employed to characterize weathered Quaternary and Tertiary-age strata. Cemented or unweathered horizons, such as sandstone, conglomerate or massive volcanic rock can impede advancement of the probe The cone is able to delineate even the smallest (0.64 mm/1/4-inch thick) low strength horizons, easily missed in conventional (small-diameter) sampling programs.

Most of the commercially-available CPT rigs operate electronic friction cone and piezocone penetrometers, whose testing procedures are outlined in ASTM D-5778. These devices produce a computerized log of tip and sleeve resistance, the ratio between the two, induced pore pressure just behind the cone tip, pore pressure ratio (change in pore pressure divided by measured pressure) and lithologic interpretation of each 2 cm interval are continuously logged and printed out.

Tip Resistance

The tip resistance is measured by load cells located just behind the tapered cone. The tip resistance is theoretically related to undrained shear strength of a saturated cohesive material, while the sleeve friction is theoretically related to the friction of the horizon being penetrated. The tapered cone head forces failure of the soil about 15 inches ahead of the tip and the resistance is measured with an embedded load cell in tons/ft^2 (tsf).

Local Friction

The local friction is measured by tension load cells embedded in the sleeve for a distance of 4 inches behind the tip. They measure the average skin friction as the probe is advanced through the soil. If cohesive soils are partially saturated, they may exert appreciable skin friction, negating the interpretive program.

Friction ratio

The friction ratio is given in percent. It is the ratio of skin friction divided by the tip resistance (both in tsf). It is used to classify the soil, by its behavior, or reaction to the cone being forced through the soil. High ratios generally indicate clayey materials (high c, low Ø) while lower ratios are typical of sandy materials (or dry desiccated clays). Typical skin friction to tip friction ratios are 1 % to 10%. The ratio seldom, if ever, exceeds 15%. Sands are generally identified by exhibiting a ratio < 1%.

Pore Pressure

Piezocones also measure in-situ pore pressure (in psi), in either dynamic (while advancing the cone) or static (holding the cone stationary) modes. Piezocones employ a porous plastic insert just behind the tapered head that is made of hydrophilic polypropylene, with a nominal particle size of 120 microns (Figure 5). The piezocell must be saturated with glycerin prior to its employment. The filter permeability is about 0.01 cm/sec (1 x 10-2 cm/sec). When using the cone to penetrate dense layers, such as cemented siltstone, sandstone or conglomerate, the piezo filter element can become compressed, thereby inducing high positive pore pressures. But, the plastic filters do not exhibit this tendency, though they do become brittle with time and may need to be replaced periodically. In stiff over-consolidated clays the pore pressure gradient around the cone may be quite high. This pore pressure gradient often results in dissipations recorded behind the CPT tip that initially increase before decreasing to the equilibrium value.

Differential Pore Pressure

The Differential Pore Pressure Ratio is used to aid in soil classification according to the Unified Soil Classification System (USCS). When the cone penetrates dense materials like sand, the sand dilates and the pore pressure drops. In clayey materials high pore pressures may be induced by the driving of the cone head. If transient pore pressures are being recorded that seem non-hydrostatic, most experienced operators will ask that the penetration be halted and allowed at least 5minutes to equilibrate, so a quasi-static pore pressure reading can be recorded. Sometimes equilibration can take 10 to 30 minutes, depending on the soil. In practice experienced operators try to stop the advance and take pore pressure measurements in recognized aquifers and just above or adjacent to indicated aquacludes.

Piezometer

Water-level readings taken during the field operations do not provide information on the long-term fluctuations of the water table. When this information is required, observation wells/piezometers are necessary to prevent the borings from caving. Observation wells are constructed in accordance to ASTM D5092 by inserting PVC plastic pipe to the desired depths. A closed end slotted portion of PVC pipe is attached to the bottom of the plastic pipe to allow subsurface water to enter the observation well. Clean sand is backfilled around the bottom slotted portion of the well. The remainder of the hole is backfilled with an impervious material, using a bentonite or mortar cap to seal out surface water. The top of the PVC pipe has a removable cover to seal out rainwater.

SLOPE AND WATER-LEVEL MONITORING PROCEDURES

Inclinometer

The general slope monitoring procedures employed by KCI are summarized in ASTM specification D 6230 entitled "Standard Test Method for Monitoring Ground Movement Using Probe-Type Inclinometers". The apparatus, casing installation procedures, deflection survey procedures, and data reduction method are described in this standard.

The inclinometer casing is a pipe with two sets of grooves running inside the pipe throughout its length. The two sets of grooves are oriented perpendicular to each other, and facilitate inclinometer surveys in mutually perpendicular directions. The pipe may be made up of plastic, aluminum alloy or fiberglass. We used a three inche inside diameter Polyvinyl Chloride (PVC) pipe to perform the deflection survey. The pipe is capped at it bottom end and sealed to prevent the inflow of soil or water. The probe type inclinometer uses sensors inside the probe to indicate the orientation of the probe. The sensors are force balance accelerometers which give voltage outputs proportional to inclination of the probe. A portable readout unit with power supplies for sensors and display records the data. The inclinometer probe and readout unit are connected to each other with a cable having distance markings.

After drilling the borehole, the driller inserts the casing to desired depths. The casings are usually available in 10 feet long pieces and are connected on site. The rubber "O-ring" is sometimes used at connections to seal the joint. The casing is oriented in such a way that one set of grooves aligns with the direction of maximum anticipated movement. This orientation is commonly referred as A direction. The other set of grooves is referred as B direction. The driller may add water inside the casing to overcome buoyancy. The annular space between the casing and the borehole is backfilled using cement-sand grout.

For defection survey, a geotechnical engineer inserts a calibrated inclinometer probe to the bottom of the casing. The probe is aligned in A direction. The engineer makes a measurement traverse by holding the probe stationary at each depth interval and records depth and reading. The reading interval is usually equal to the wheel spacing on the probe. After each reading, the probe is raised by the reading interval and next set of readings taken. The procedure is repeated to the top of the casing to complete the traverse. The probe is then rotated by 180° and the above procedure is repeated. For uniaxial probes, two more traverses are made in B direction in the same way as for the A direction. The deflection surveys may be performed at desired intervals of time depending upon project requirements.

The recorded data are reduced using the software compatible with the probe. Two plots consisting of movements in A and B directions with respect to the elevations are usually drawn to indicate the ground movements. We will provide our slope monitoring results in a separate memorandum within two weeks from our last deflection survey.

Piezometer

Water-level readings taken during the field operations do not provide information on the long-term fluctuations of the water table. When this information is required, observation wells/piezometers are necessary to prevent the borings from caving. Observation wells were constructed in accordance to ASTM D5092 by inserting PVC plastic pipe to the desired depths. A closed end slotted portion of PVC pipe is attached to the bottom of the plastic pipe to allow subsurface water to enter the observation well. Clean sand is backfilled around the bottom slotted portion of the well. The remainder of the hole is backfilled with an impervious material, using a bentonite or mortar cap to seal out surface water. The top of the PVC pipe has a removable cover to seal out rainwater.

LABORATORY TESTING RESULTS

Appendix C

Sheet 1 of 2

Boring	Depth (ft)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% < #4 Sieve	% < #200 Sieve	Classification	Water Content (%)
B-01	6.0 - 8.0				98	71		28.6
B-01	15.0 - 17.0	43	25	18				27.1
B-01	29.0 - 31.0				100	21		9.7
B-02	2.0 - 4.0							8.4
B-02	12.0 - 14.0				83	29		14.0
B-02	14.0 - 16.0	35	23	12				26.2
B-02	34.0 - 35.5	NP	NP	NP	100	24	SM	20.1
B-03	2.0 - 4.0	29	18	11				18.2
B-03	8.0 - 10.0	39	21	18				27.3
B-03	18.0 - 20.0				100	26		12.4
B-03	30.0 - 32.0				100	31		12.8
B-03	48.5 - 50.0				92	27		30.7
B-04	4.0 - 6.0	42	23	19				27.3
B-04	16.0 - 18.0	59	30	29				36.3
B-04	34.0 - 36.0				100	21		17.1
B-07	8.0 - 10.0	56	28	28				30.5
B-07	18.0 - 20.0	41	24	17				41.4
B-07	30.0 - 32.0				100	33		48.0
B-07	40.0 - 42.0	29	25	4				24.0
B-09	10.0 - 12.0	33	17	16				18.9
B-09	20.0 - 22.0	32	23	9	100	82	CL	34.9
B-09	26.0 - 28.0	35	24	11	100	71	CL	45.0
B-09	34.0 - 36.0	31	21	10				24.4
B-09	53.5 - 55.0	26	23	3	100	45	SM	27.2
B-13	16.0 - 18.0				100	28		28.5
B-13	24.0 - 26.0	39	23	16				34.4
B-13	26.0 - 28.0	51	25	26				34.9

CKG_LAB_SUMMARY_BASIC_LAB.GPJ CKG 2012.GDT 5/15/14

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Geotechnical Engineering Consultants
Beltsville, MD 20705

Summary of Laboratory Results

Piscataway Drive Slope Stabilization

Fort Washington, MD

Project Number: 14-008

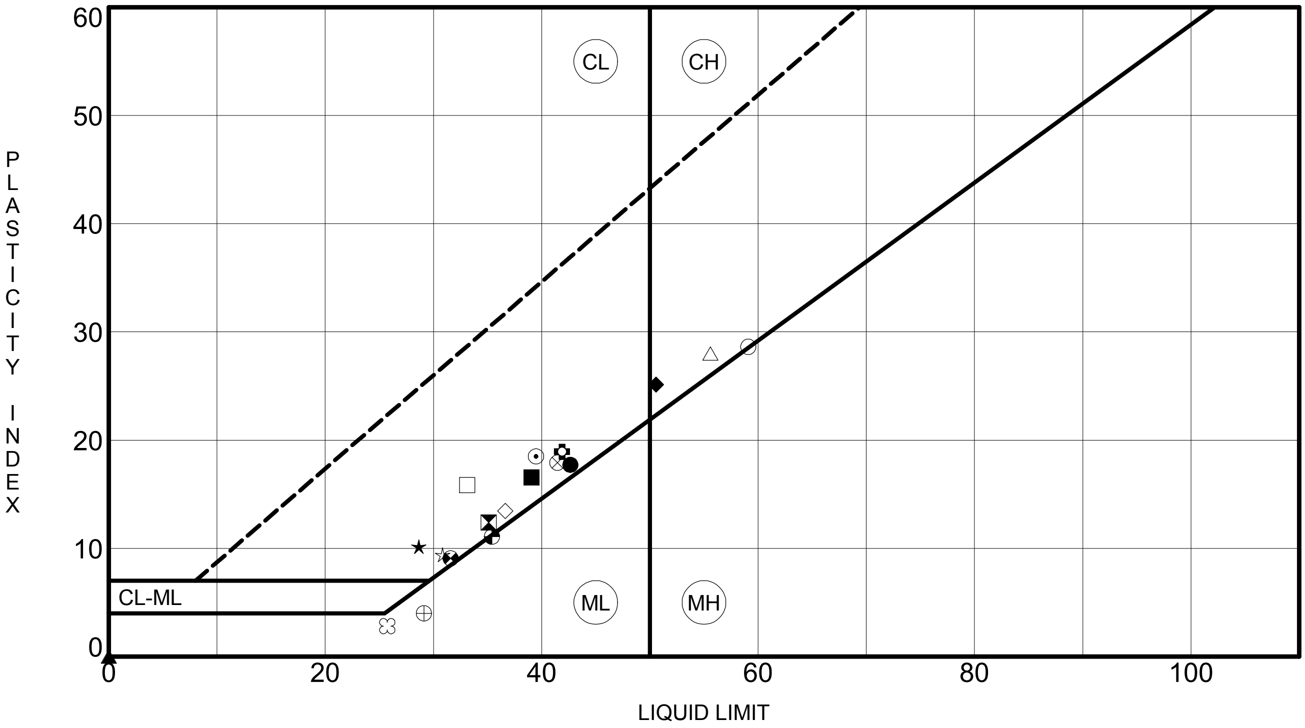
Boring	Depth (ft)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% < #4 Sieve	% < #200 Sieve	Classification	Water Content (%)
B-13	30.0 - 32.0	37	23	14				32.7
B-13	38.0 - 40.0	28	22	6	100	54	CL-ML	26.1
B-16	4.0 - 6.0	54	27	27				31.2
B-16	12.0 - 14.0				100	56		16.2
B-16	22.0 - 24.0				100	26		17.8
B-16	33.0 - 35.0				100	80		23.4
B-17	8.0 - 10.0	NP	NP	NP	100	34	SM	43.7
B-17	16.0 - 18.0	33	25	8				29.0
B-17	30.0 - 32.0	55	25	30				35.3
Shear Plane	0.0 - 0.0	37	27	10	100	77	ML	36.4

Summary of Laboratory Results

Piscataway Drive Slope Stabilization

Fort Washington, MD

Project Number: 14-008



	Boring	Depth	LL	PL	PI	Fines	Classification
●	B-01	15.0 - 17.0	43	25	18		Brown **CLAY**
⧗	B-02	14.0 - 16.0	35	23	12		Brownish gray **CLAY**
▲	B-02	34.0 - 35.5	NP	NP	NP	24	Gray, silty **SAND [SM]**
★	B-03	2.0 - 4.0	29	18	11		Brownish gray **CLAY**
⊙	B-03	8.0 - 10.0	39	21	18		Brown **CLAY**
✿	B-04	4.0 - 6.0	42	23	19		Brown to gray **CLAY**
○	B-04	16.0 - 18.0	59	30	29		Gray fat **CLAY**
△	B-07	8.0 - 10.0	56	28	28		Brown fat **CLAY**
⊗	B-07	18.0 - 20.0	41	24	17		Grayish brown **CLAY**
⊕	B-07	40.0 - 42.0	29	25	4		Dark gray **SILT**
□	B-09	10.0 - 12.0	33	17	16		Brown, **CLAY** with little sand
◑	B-09	20.0 - 22.0	32	23	9	82	Tan, lean **CLAY** with sand **[CL]**
◕	B-09	26.0 - 28.0	35	24	11	71	Light gray, lean **CLAY** with sand **[CL]**
☆	B-09	34.0 - 36.0	31	21	10		Brown **CLAY**
ꕤ	B-09	53.5 - 55.0	26	23	3	45	Dark gray, silty **SAND [SM]**
■	B-13	24.0 - 26.0	39	23	16		Brown **CLAY**
◆	B-13	26.0 - 28.0	51	25	26		Brown, fat **CLAY**
◇	B-13	30.0 - 32.0	37	23	14		Brown **CLAY**

Test Method: ASTM D4318

Tested By: Ian

Date: 5/11/2014

CKG CENKEN GROUP, LLC
Geotechnical Engineering Consultants

Beltsville, MD 20705

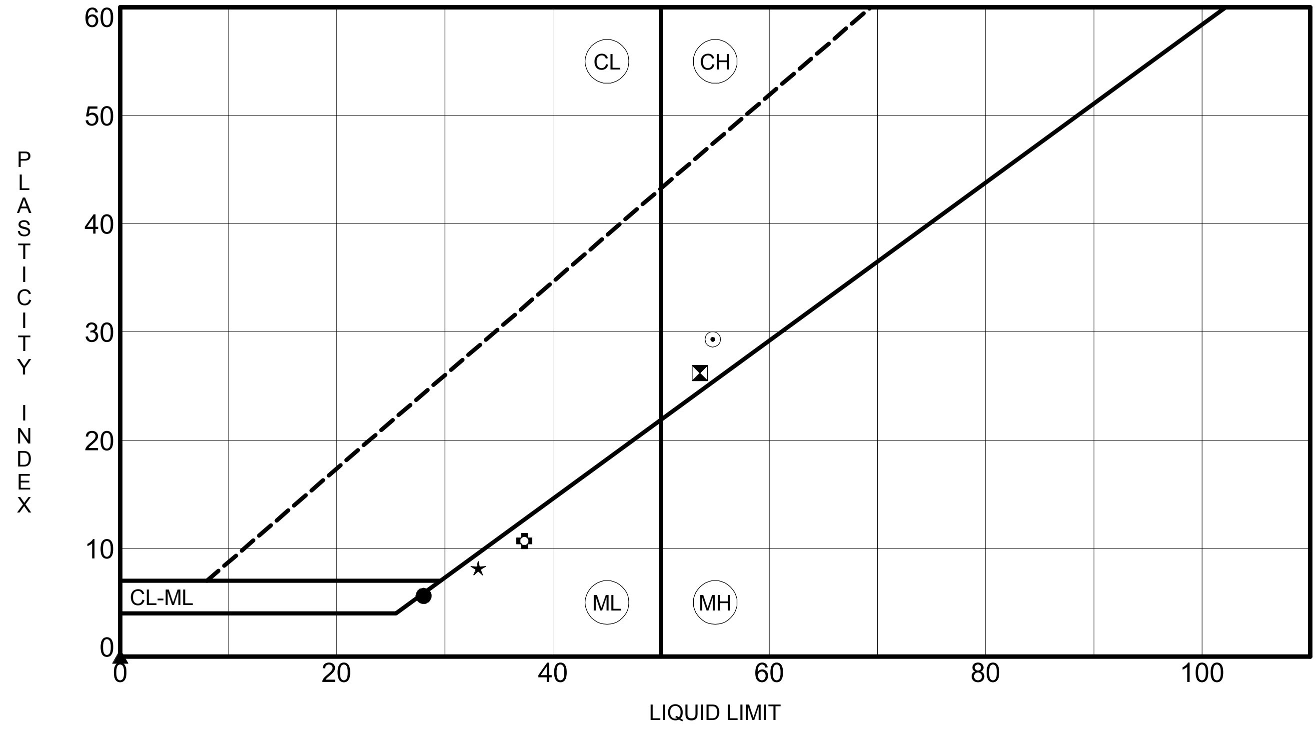
ATTERBERG LIMITS' RESULTS

Project: Piscataway Drive Slope Stabilization

Location: Fort Washington, MD

Project Number: 14-008

CENKEN_ATTERBERG_LIMITS LAB.GPJ CKG 2012.GDT 5/15/14



	Boring	Depth	LL	PL	PI	Fines	Classification
●	B-13	38.0 - 40.0	28	22	6	54	Dark gray, sandy silty **CLAY** **[CL-ML]**
⧗	B-16	4.0 - 6.0	54	27	27		Tan to gray, fat **CLAY**
▲	B-17	8.0 - 10.0	NP	NP	NP	34	Brown, silty **SAND** **[SM]**
★	B-17	16.0 - 18.0	33	25	8		Gray, sandy clayey **SILT**
⊙	B-17	30.0 - 32.0	55	25	30		Dark gray fat **CLAY**
✿	Shear Plane	0.0 - 0.0	37	27	10	77	Gray, **SILT** with sand **[ML]**

Test Method: ASTM D4318

Tested By: Ian

Date: 5/13/2014

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Beltsville, MD 20705

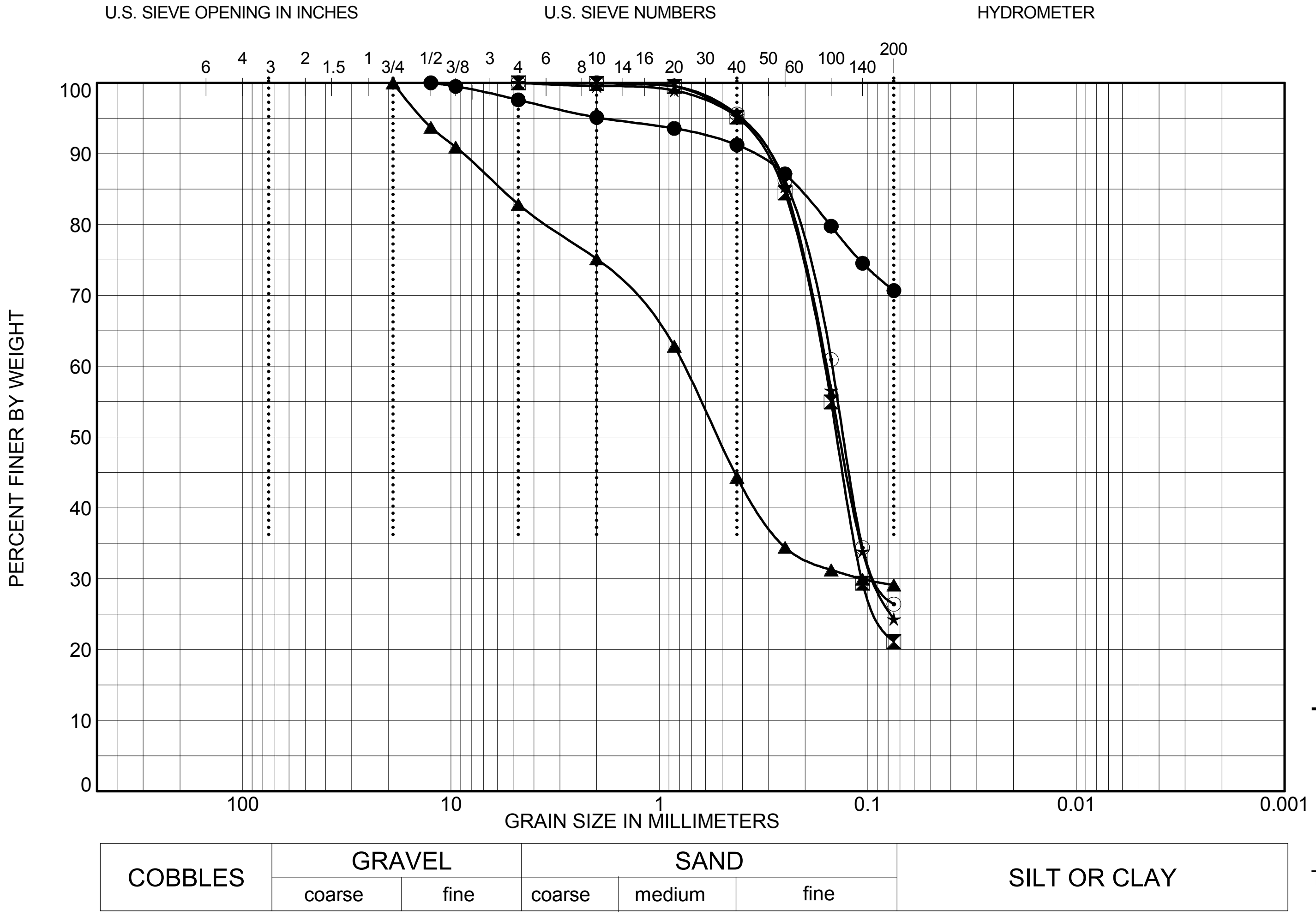
ATTERBERG LIMITS' RESULTS

Project: Piscataway Drive Slope Stabilization

Location: Fort Washington, MD

Project Number: 14-008

CENKEN_ATTERBERG_LIMITS LAB.GPJ CKG 2012.GDT 5/15/14



	D10	D30	D60	D100
●				12.5
⧗		0.107	0.164	4.76
▲		0.108	0.764	19
★		0.092	0.159	4.76
☉		0.088	0.148	4.76

Test Method: ASTM D422

Tested By: Ian

Date: 5/11/2014

	Boring	S No.	Depth	%Gravel	%Sand	%Silt	%Clay	LL	PI	MC(%)	Classification
●	B-01	3	6.0 - 8.0	2.4	26.9	70.7				28.6	Brown, sandy **SILT**
⧗	B-01	10	29.0 - 31.0	0.0	78.9	21.1				9.7	Gray silty **SAND**
▲	B-02	6	12.0 - 14.0	17.2	53.7	29.1				14.0	Brown, clayey **SAND**
★	B-02	10	34.0 - 35.5	0.0	75.7	24.3		NP	NP	20.1	Gray, silty **SAND [SM]**
☉	B-03	10	18.0 - 20.0	0.0	73.6	26.4				12.4	Gray silty **SAND**

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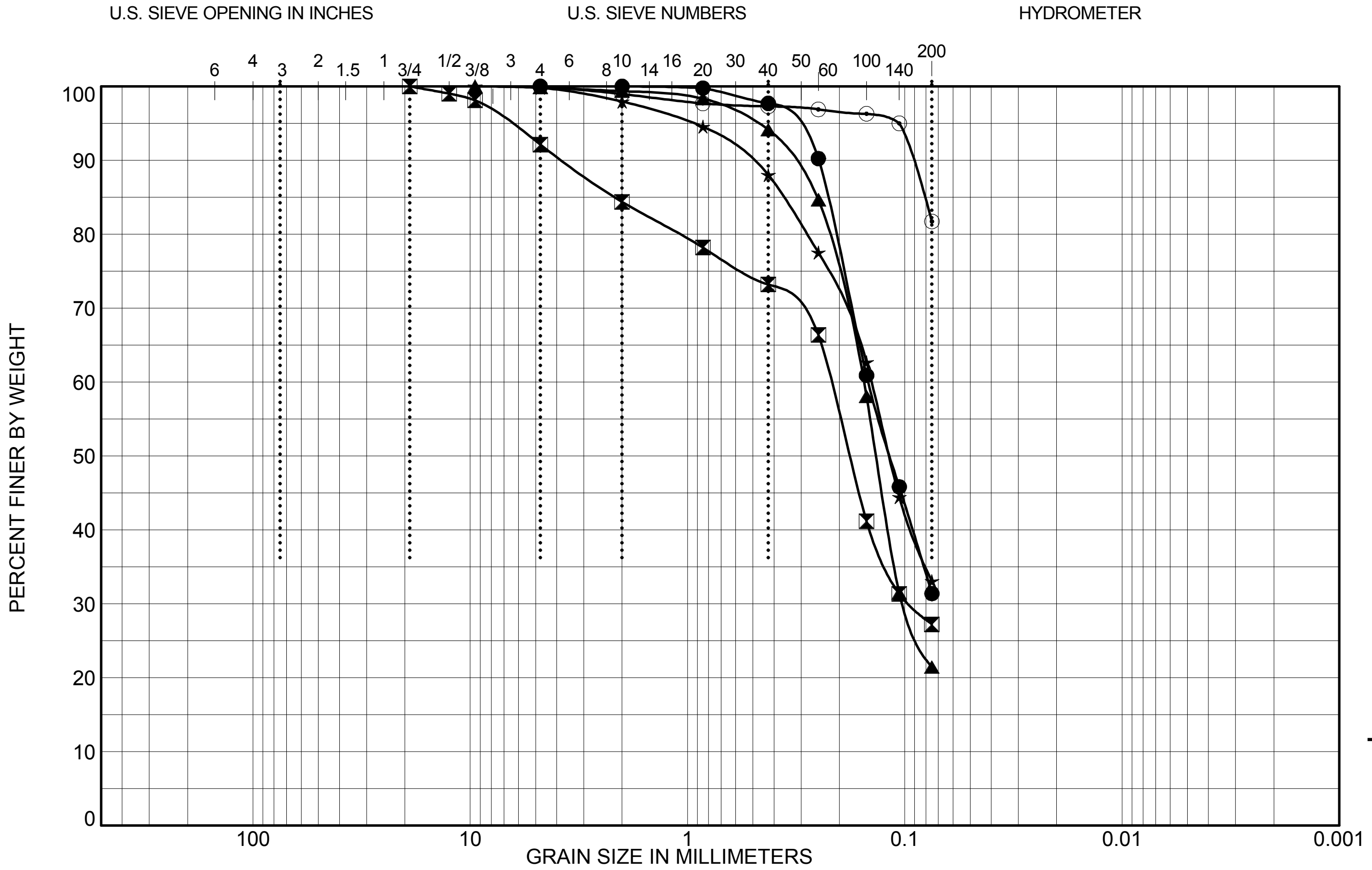
GRAIN SIZE DISTRIBUTION

Piscataway Drive Slope Stabilization

Fort Washington, MD

Project Number: 14-008

Sheet 1 of 4



	D10	D30	D60	D100
●			0.147	4.76
⧗		0.095	0.22	19
▲		0.101	0.156	9.5
★			0.142	9.5
⊙				4.76

Test Method: ASTM D422

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Tested By: Ian

Date: 5/13/2014

	Boring	S No.	Depth	%Gravel	%Sand	%Silt	%Clay	LL	PI	MC(%)	Classification
●	B-03	16	30.0 - 32.0	0.0	68.6	31.4				12.8	Gray, silty **SAND**
⧗	B-03	22	48.5 - 50.0	7.9	64.9	27.2				30.7	Gray silty **SAND** with organics
▲	B-04	12	34.0 - 36.0	0.1	78.5	21.4				17.1	Gray, silty **SAND**
★	B-07	16	30.0 - 32.0	0.2	66.7	33.1				48.0	Gray silty **SAND**
⊙	B-09	10	20.0 - 22.0	0.0	18.3	81.7		32	9	34.9	Tan, lean **CLAY** with sand **[CL]**

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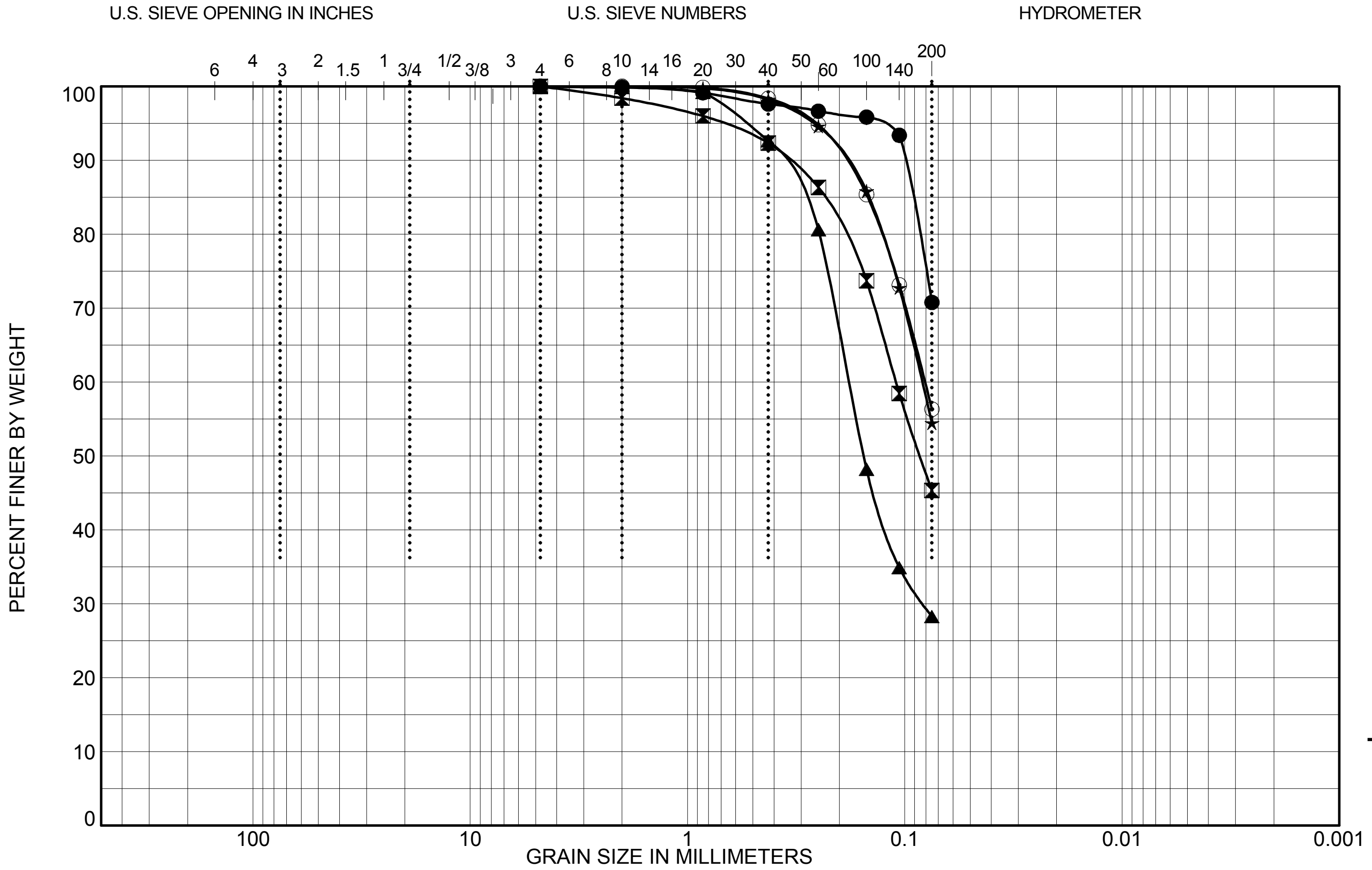
GRAIN SIZE DISTRIBUTION

Piscataway Drive Slope Stabilization

Fort Washington, MD

Project Number: 14-008



	D10	D30	D60	D100
●				4.76
⧗			0.11	4.76
▲		0.082	0.181	4.76
★			0.083	4.76
☉			0.081	4.76

Test Method: ASTM D422

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Tested By: Ian

Date: 5/11/2014

	Boring	S No.	Depth	%Gravel	%Sand	%Silt	%Clay	LL	PI	MC(%)	Classification
●	B-09	13	26.0 - 28.0	0.0	29.2	70.8		35	11	45.0	Light gray, lean **CLAY** with sand **[CL]**
⧗	B-09	24	53.5 - 55.0	0.0	54.7	45.3		26	3	27.2	Dark gray, silty **SAND** **[SM]**
▲	B-13	9	16.0 - 18.0	0.0	71.7	28.3				28.5	Gray silty **SAND**
★	B-13	19	38.0 - 40.0	0.0	45.5	54.5		28	6	26.1	Dark gray, sandy silty **CLAY** **[CL-ML]**
☉	B-16	7	12.0 - 14.0	0.0	43.7	56.3				16.2	Brownish gray, sandy **SILT**

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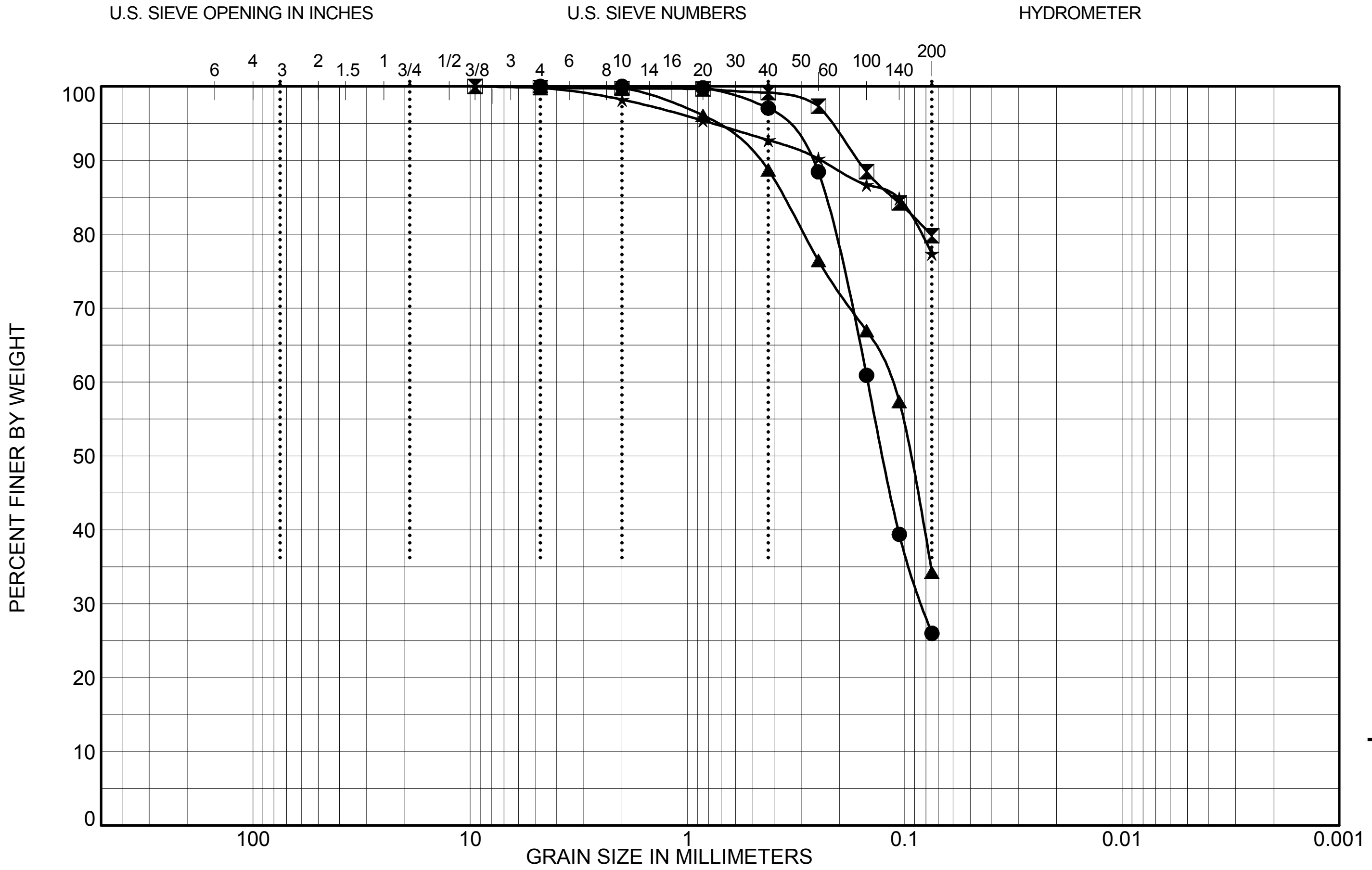
GRAIN SIZE DISTRIBUTION

Piscataway Drive Slope Stabilization

Fort Washington, MD

Project Number: 14-008



	D10	D30	D60	D100
●		0.083	0.148	4.76
⧗				9.5
▲			0.117	4.76
★				9.5

Test Method: ASTM D422

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Tested By: Ian

Date: 5/13/2014

	Boring	S No.	Depth	%Gravel	%Sand	%Silt	%Clay	LL	PI	MC(%)	Classification
●	B-16	12	22.0 - 24.0	0.0	74.0	26.0				17.8	Gray, silty **SAND**
⧗	B-16	16	33.0 - 35.0	0.2	20.0	79.8				23.4	Gray, sandy **SILT**
▲	B-17	5	8.0 - 10.0	0.0	65.7	34.3		NP	NP	43.7	Brown, silty **SAND [SM]**
★	Shear Plane	Bag	0.0 - 0.0	0.2	22.4	77.4		37	10	36.4	Gray, **SILT** with sand **[ML]**

CKG **CENKEN GROUP, LLC**
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Beltsville, MD 20705

GRAIN SIZE DISTRIBUTION

Piscataway Drive Slope Stabilization

Fort Washington, MD

Project Number: 14-008

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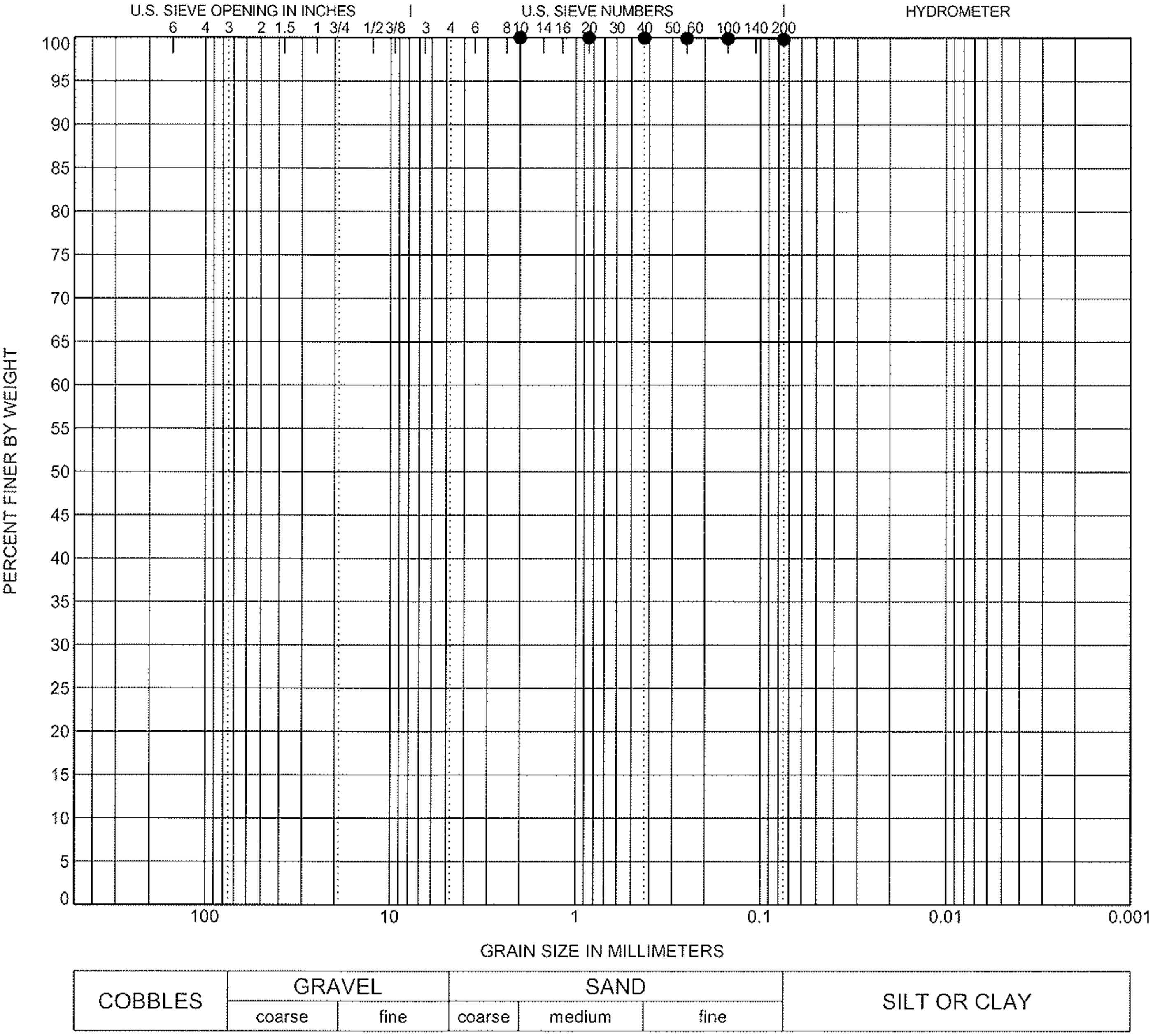
GRAIN SIZE DISTRIBUTION
TEST METHOD ASTM D422

CLIENT KCI Technologies **PROJECT NAME** Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD **PROJECT NUMBER** **DATE TESTED**



	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	B-14, ST-1 @ 26.5' - 28.5',	Reddish Brown (4/4) LEAN CLAY(CL)	38	22	16		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-14, ST-1 @ 26.5' - 28.5',	2				0.0	0.2	99.8	

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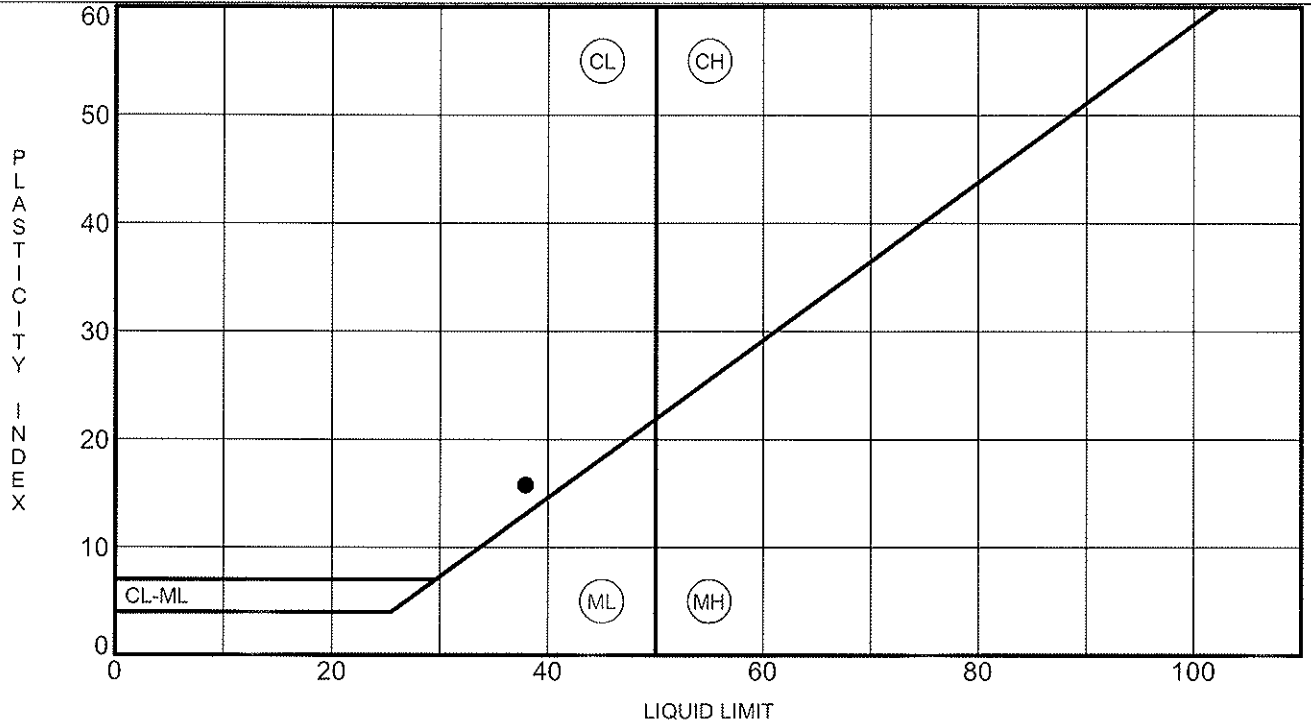
ATTERBERG LIMITS' RESULTS
TEST METHOD ASTM D4318

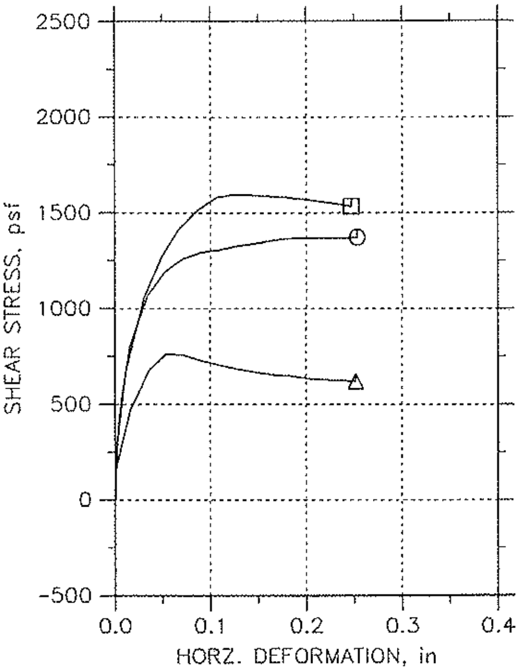
CLIENT KCI Technologies
PROJECT NAME Piscataway Dr. Slope & Road Failures
PROJECT LOCATION Fort Washington, MD
PROJECT NUMBER
DATE TESTED

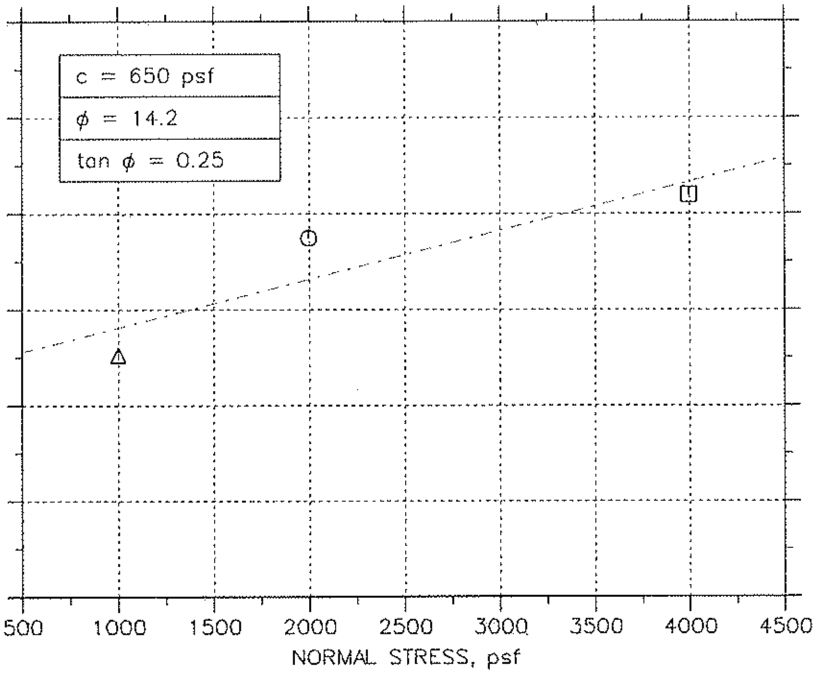


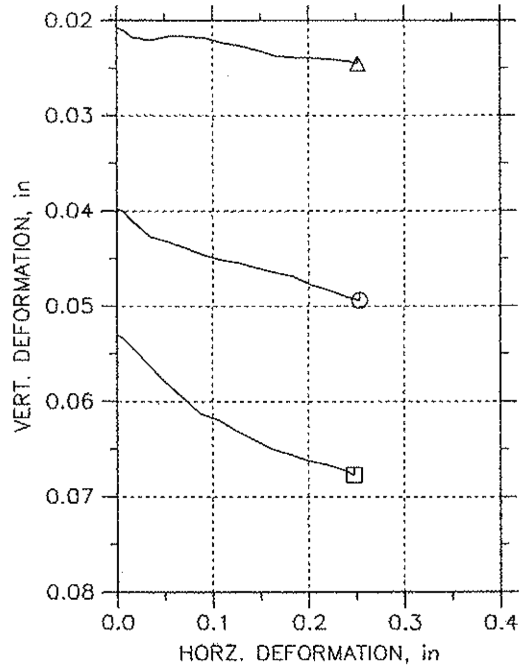
	Specimen Identification	LL	PL	PI	Fines	Classification
●	B-14, ST-1 @ 26.5' - 28.5',	38	22	16	100	Reddish Brown (4/4) LEAN CLAY(CL)

ATTERBERG LIMITS 16570-0 PISCATAWAY SLOPE FAILURE.GPJ MTA REDLINE.GDT 5/20/14

DIRECT SHEAR TEST REPORT







	Symbol	○	△	□	
	Test No.	1	2	3	
	Sample No.	ST-1	ST-1	ST-1	
	Shape	Circular	Circular	Circular	
Initial	Dimension, in	2.5	2.5	2.5	
	Area, in^2	4.9087	4.9087	4.9087	
	Height, in	1	1	1	
	Water Content, %	27.16	31.63	27.33	
	Dry Density, pcf	95.567	91.019	97.189	
	Saturation, %	92.93	97.37	97.16	
	Void Ratio	0.80947	0.89988	0.77927	
	Consol. Height, in	0.96025	0.97948	0.94706	
	Consol. Void Ratio	0.73755	0.8609	0.68508	
Final	Water Content, %	28.09	33.48	26.87	
	Dry Density, pcf	100.54	93.308	104.26	
	Saturation, %	108.06	108.70	113.01	
	Void Ratio	0.72003	0.85327	0.65865	
	Normal Stress, psf	1996.6	999.8	3996.2	
	Max. Shear Stress, psf	1371.3	761.14	1593.8	
	Ult. Shear Stress, psf	1371.3	618.12	1531.8	
	Time to Failure, min	27.331	6.0034	14.003	
	Disp. Rate, in/min	0.01	0.01	0.01	
	Estimated Specific Gravity	2.77	2.77	2.77	
	Liquid Limit	38	38	38	
	Plastic Limit	22	22	22	
	Plasticity Index	16	16	16	

Project: Piscataway Slope Failure
Location: Ft. Washington, MD
Project No.: 16570-0
Boring No.: B-14
Sample Type: Undisturbed
Description: Reddish Brown (4/4) LEAN CLAY(CL)
Remarks: Sample Location: 16570-0 Piscataway Dr. Slope & Road Failures B-14 / ST-1 26.5 - 28.5 - 1.0 TSF

Fri, 16-MAY-2014 14:08:58

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GRAIN SIZE DISTRIBUTION

TEST METHOD ASTM D422

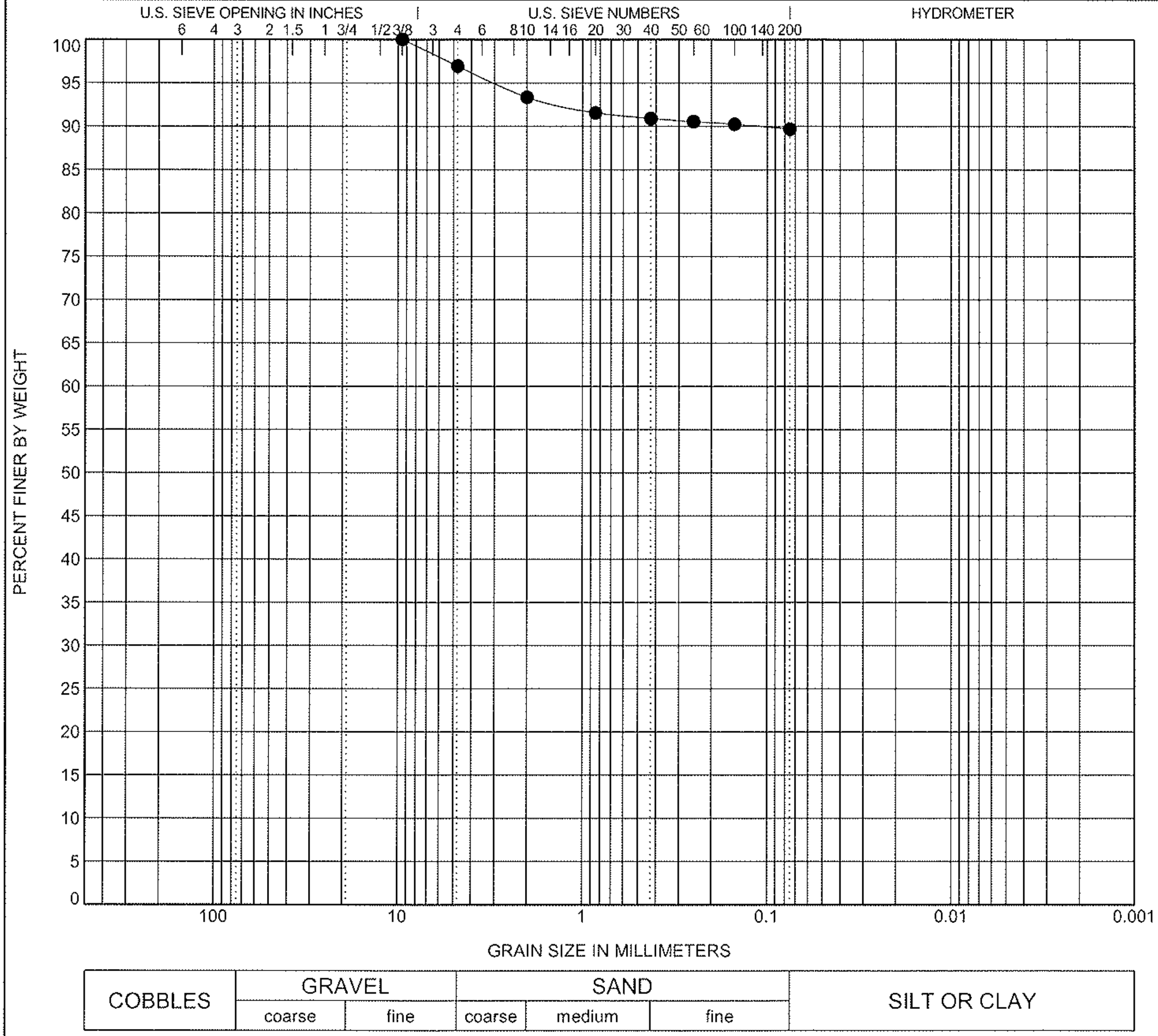
CLIENT KCI Technologies

PROJECT NAME Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD

PROJECT NUMBER

DATE TESTED



	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	B-15, ST-1 @ 22.0' - 24.0',	Yellowish Red (4/6) LEAN CLAY(CL)	40	24	16		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-15, ST-1 @ 22.0' - 24.0',	9.5				3.1	7.3	89.7	

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ATTERBERG LIMITS' RESULTS

TEST METHOD ASTM D4318

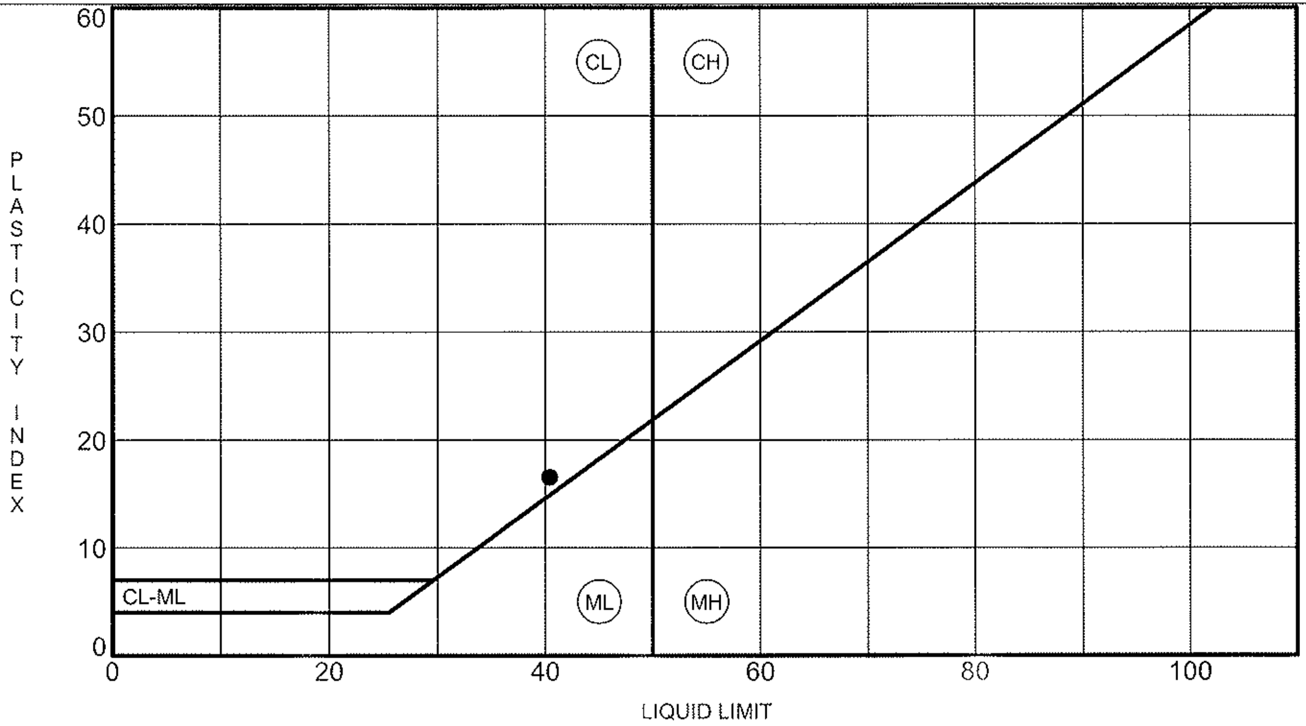
CLIENT KCI Technologies

PROJECT NAME Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD

PROJECT NUMBER

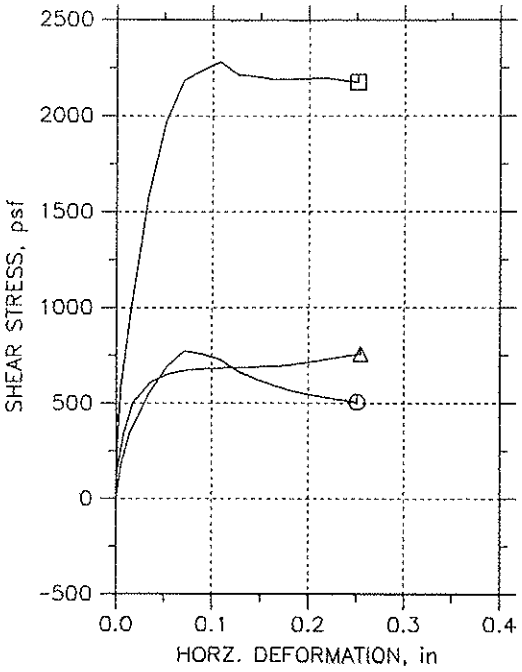
DATE TESTED

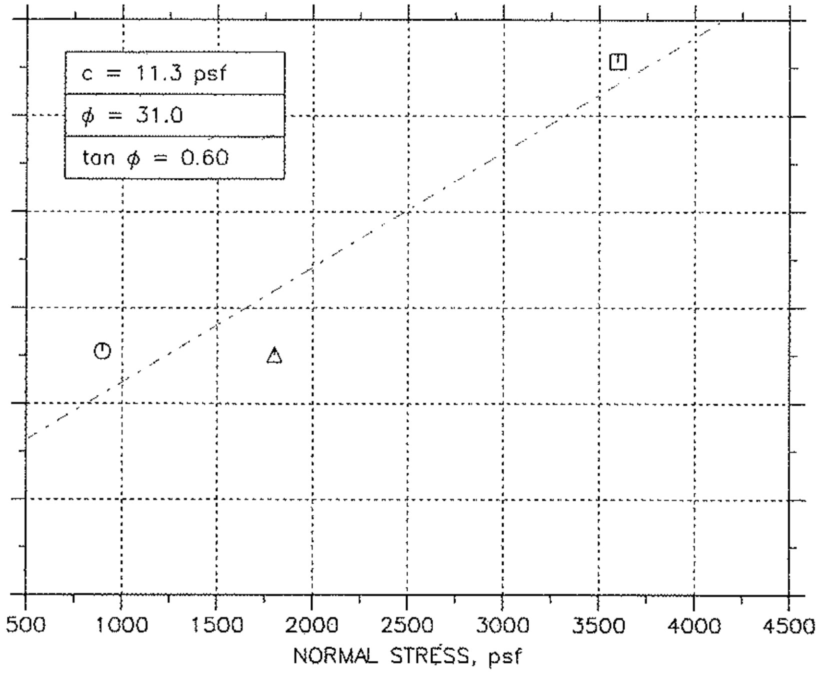


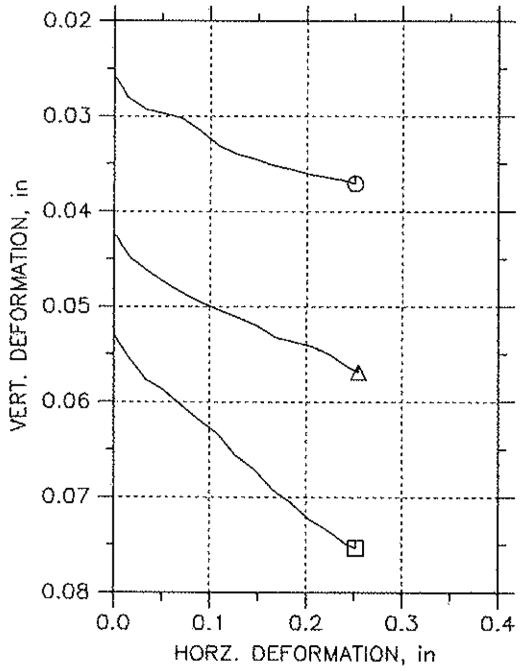
	Specimen Identification	LL	PL	PI	Fines	Classification
●	B-15, ST-1 @ 22.0' - 24.0',	40	24	16	90	Yellowish Red (4/6) LEAN CLAY(CL)

ATTERBERG LIMITS 16570-0 PISCATAWAY SLOPE FAILURE.GPJ MTA REDLINE.GDT 5/20/14

DIRECT SHEAR TEST REPORT





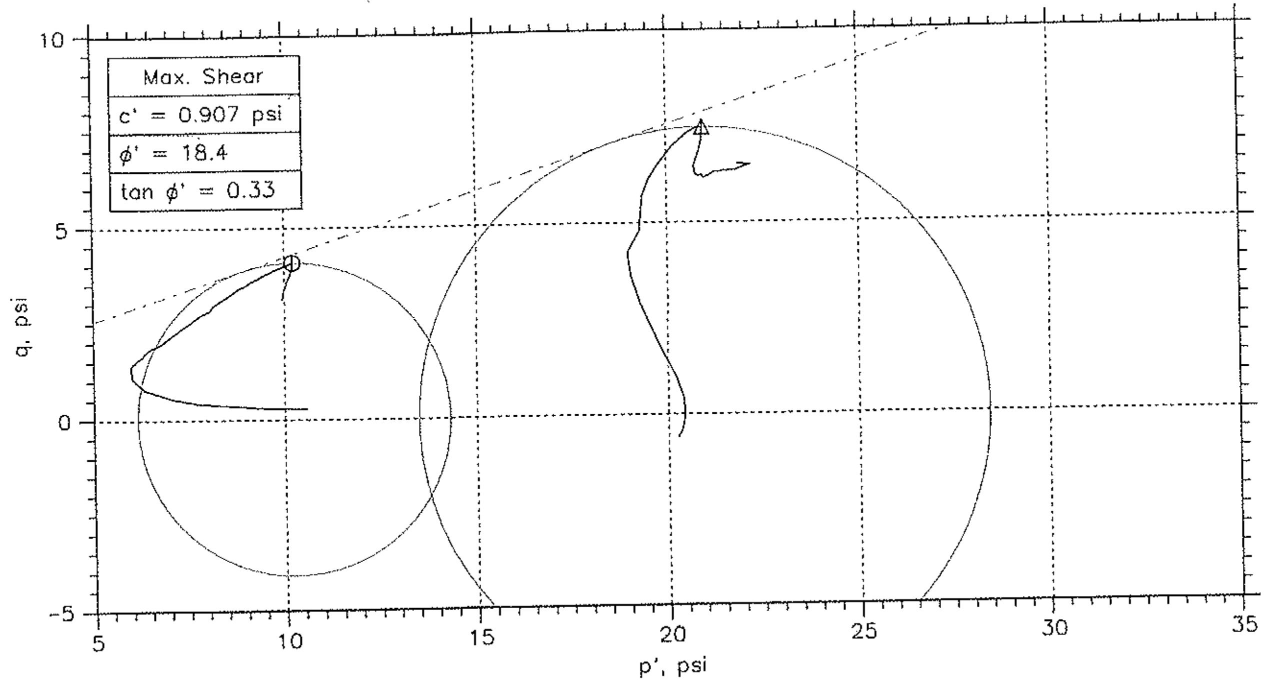


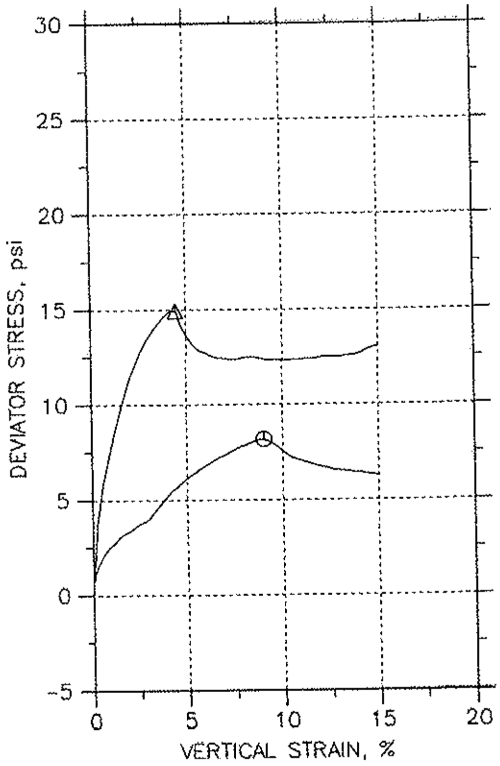
	Symbol	○	△	□
	Test No.	1	2	3
	Sample No.	ST-1	ST-1	ST-1
	Shape	Circular	Circular	Circular
Initial	Dimension, in	2.5	2.5	2.5
	Area, in^2	4.9087	4.9087	4.9087
	Height, in	1	1	1
	Water Content, %	34.73	31.78	27.92
	Dry Density, pcf	86.859	93.014	96.304
	Saturation, %	97.09	102.47	97.22
	Void Ratio	0.99087	0.85914	0.79562
	Consol. Height, in	0.97489	0.95793	0.94724
	Consol. Void Ratio	0.94088	0.78093	0.70089
Final	Water Content, %	36.22	31.04	26.93
	Dry Density, pcf	90.207	98.626	104.16
	Saturation, %	109.42	114.13	112.99
	Void Ratio	0.91698	0.75334	0.66026
	Normal Stress, psf	896.27	1798.5	3595.4
	Max. Shear Stress, psf	772.26	754.78	2280.2
	Ult. Shear Stress, psf	503.72	754.78	2175.4
	Time to Failure, min	8.0034	27.152	12.003
	Disp. Rate, in/min	0.01	0.01	0.01
	Estimated Specific Gravity	2.77	2.77	2.77
	Liquid Limit	40	40	40
	Plastic Limit	24	24	24
	Plasticity Index	16	16	16

Project: Piscataway Slope Failure
Location: Ft. Washington, MD
Project No.: 16570-0
Boring No.: B-15
Sample Type: Undisturbed
Description: Yellowish Red (4/6) LEAN CLAY(CL)
Remarks: Sample Location: 16570-0 Piscataway Dr. Slope & Road Failures B-15 / ST-1 22.0 - 24.0 - 0.45 TSF

Fri, 16-MAY-2014 14:03:53

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		⦶	Δ		
Sample No.		ST-1	ST-1		
Test No.		1	2		
Depth		22'8"-23'2	23'2"-23'8"		
Initial	Diameter, in	2.82	2.867		
	Height, in	5.57	5.775		
	Water Content, %	33.1	32.8		
	Dry Density, pcf	90.73	89.26		
	Saturation, %	104.3	99.6		
	Void Ratio	0.858	0.888		
Before Shear	Water Content, %	34.4	33.0		
	Dry Density, pcf	87.4	89.09		
	Saturation*, %	100.0	100.0		
	Void Ratio	0.929	0.892		
	Back Press., psi	54.	83.98		
Ver. Eff. Cons. Stress, psi		10.35	20.84		
Shear Strength, psi		4.082	7.462		
Strain at Failure, %		9	4.49		
Strain Rate, %/min		0.03	0.03		
B-Value		0.95	0.95		
Estimated Specific Gravity		2.7	2.7		
Liquid Limit		40	40		
Plastic Limit		24	24		

Project: Piscataway Slope Failure
Location: Ft. Washington, MD
Project No.: 16570-0
Boring No.: B-15
Sample Type: Undisturbed
Description: Color: Yellowish Red (4/6) LEAN CLAY(CL)
Remarks: Sample Location: 16570-0 Piscataway Dr. Slope & Road Failure B-15 / ST-1 - 22.0' - 24.0' 0.7

Phase calculations based on start of test.

* Saturation is set to 100% for phase calculations.

Fri, 16-MAY-2014 13:59:52

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GRAIN SIZE DISTRIBUTION
TEST METHOD ASTM D422

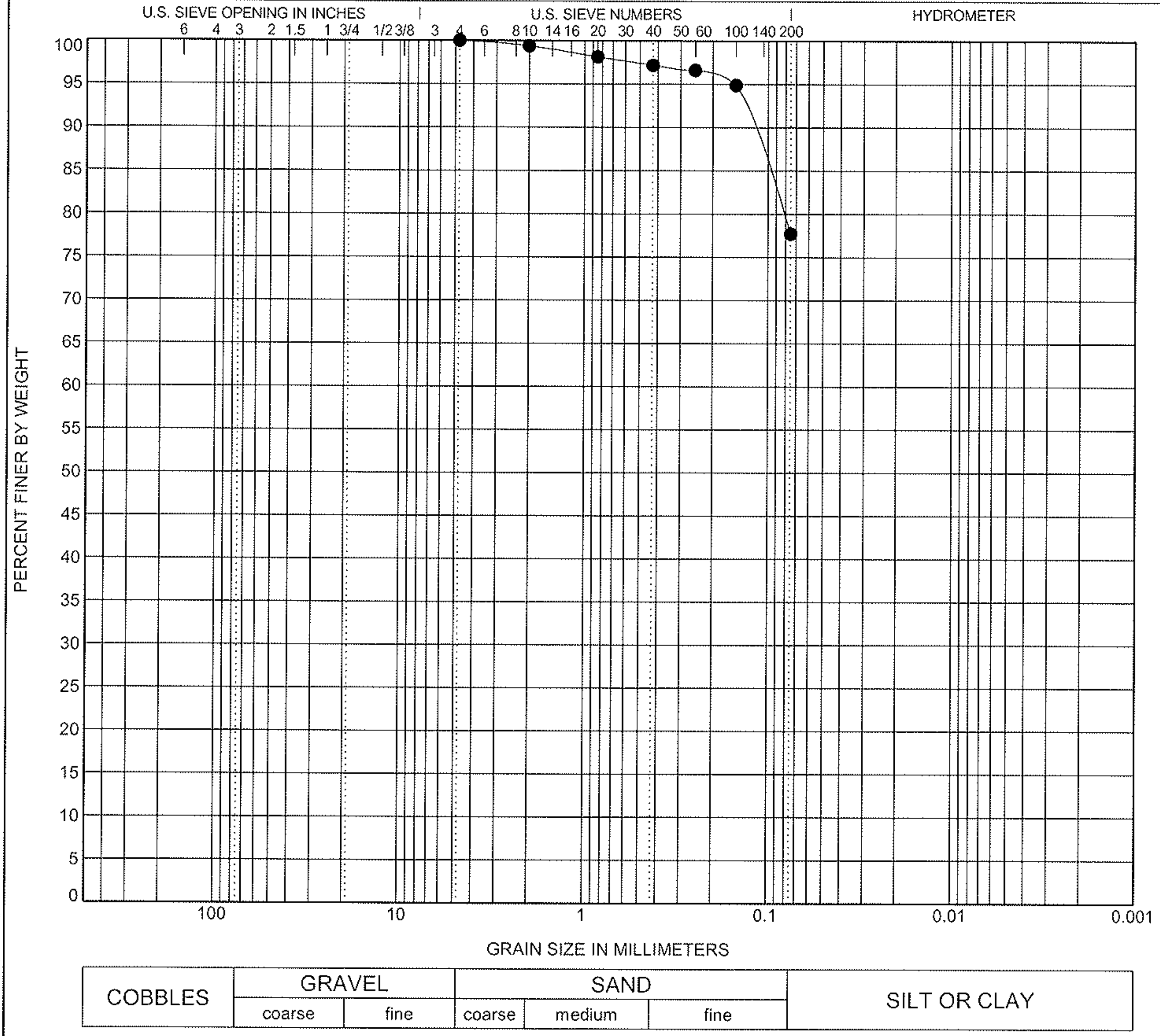
CLIENT KCI Technologies

PROJECT NAME Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD

PROJECT NUMBER

DATE TESTED



	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	B-13, ST-1 @ 22.0' - 24.0',	Very Dark Grayish Brown (3/2) SILT with SAND(ML)	48	30	18		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-13, ST-1 @ 22.0' - 24.0',	4.75				0.0	22.3	77.7	

GRAIN SIZE 16570-0 PISCATAWAY SLOPE FAILURE.GPJ MTA REDLINE.GDT 5/20/14

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ATTERBERG LIMITS' RESULTS

TEST METHOD ASTM D4318

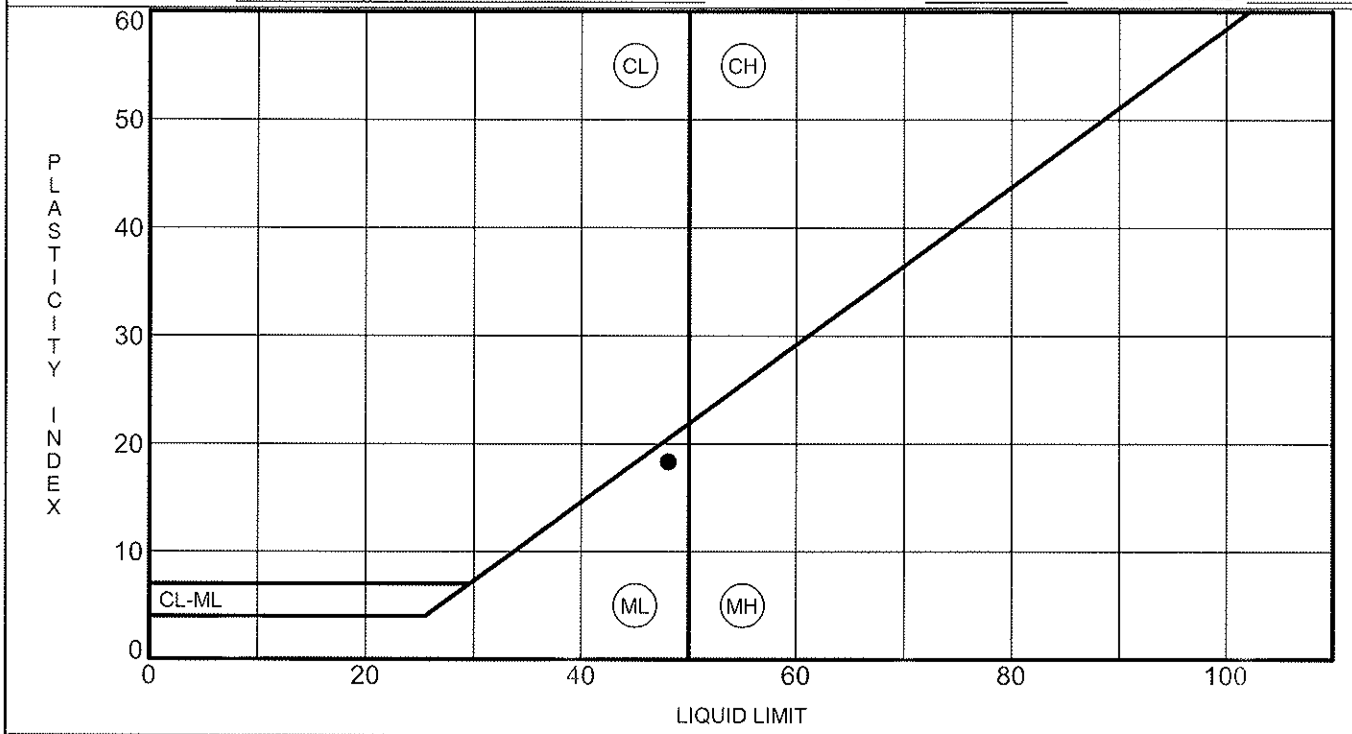
CLIENT KCI Technologies

PROJECT NAME Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD

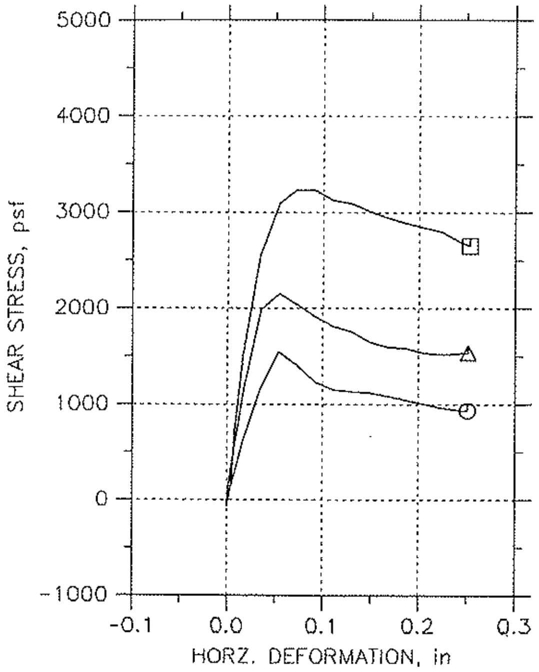
PROJECT NUMBER ____________

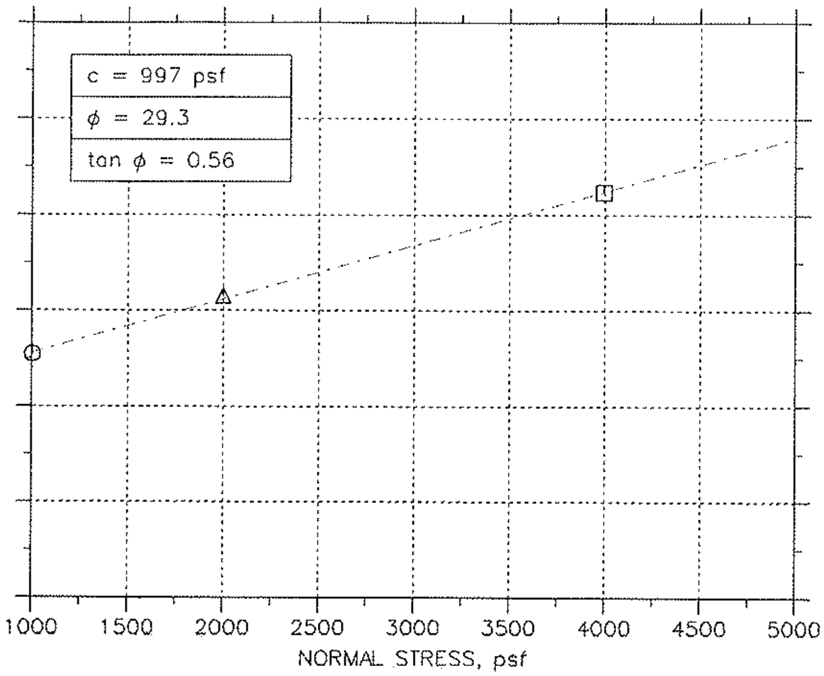
DATE TESTED ____________

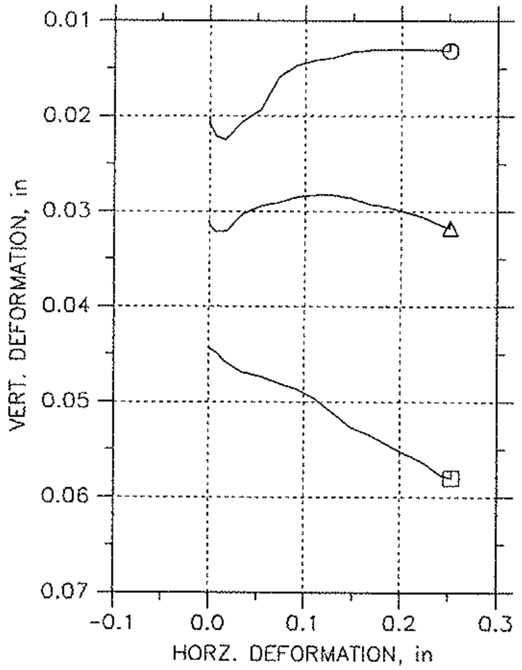


	Specimen Identification	LL	PL	PI	Fines	Classification
●	B-13, ST-1 @ 22.0' - 24.0',	48	30	18	78	Very Dark Grayish Brown (3/2) SILT with SAND(ML)

DIRECT SHEAR TEST REPORT







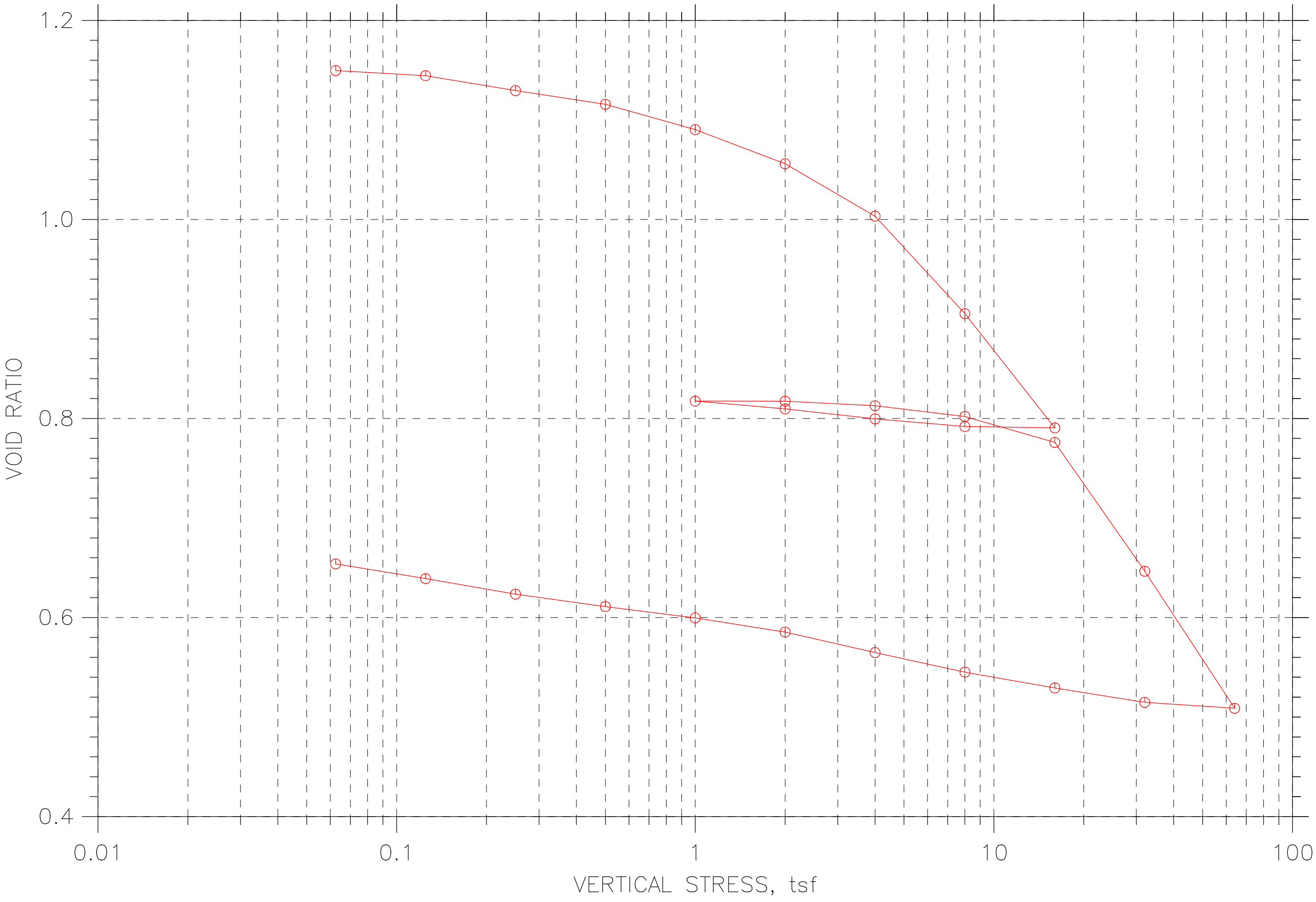
Symbol		○	△	□	
Test No.		1	2	3	
Sample No.		ST-1	ST-1	ST-1	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.5	2.5	2.5	
	Area, in^2	4.9087	4.9087	4.9087	
	Height, in	1	1	1	
	Water Content, %	36.55	35.18	35.28	
	Dry Density, pcf	84.415	85.765	84.725	
	Saturation, %	96.54	95.89	93.86	
	Void Ratio	1.0485	1.0163	1.041	
Consol. Height, in		0.97957	0.96906	0.95582	
Consol. Void Ratio		1.0067	0.95389	0.95085	
Final	Water Content, %	37.23	36.20	36.07	
	Dry Density, pcf	85.539	88.581	89.946	
	Saturation, %	100.96	105.33	108.31	
	Void Ratio	1.0216	0.95216	0.92255	
Normal Stress, psf		1002.8	2001.1	3996.2	
Max. Shear Stress, psf		1542.9	2146.8	3232	
Ult. Shear Stress, psf		932.75	1536.6	2652.1	
Time to Failure, min		6.0034	6.0035	8.0033	
Disp. Rate, in/min		0.01	0.01	0.01	
Estimated Specific Gravity		2.77	2.77	2.77	
Liquid Limit		48	48	48	
Plastic Limit		30	30	30	
Plasticity Index		18	18	18	

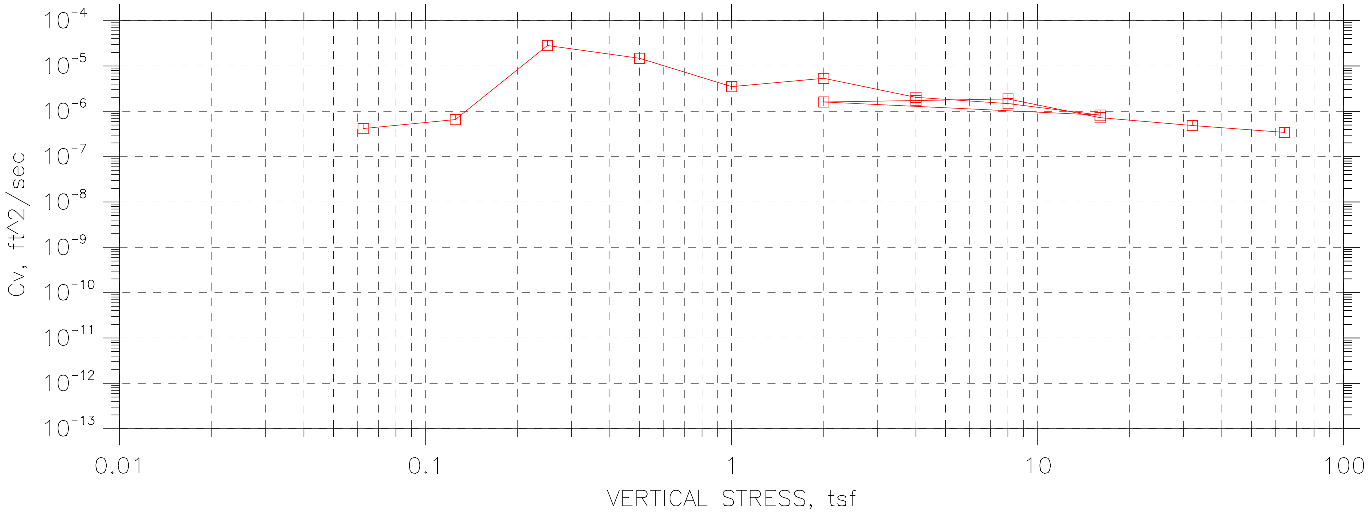
Project: Piscataway Slope Failure
Location: Ft. Washington, MD
Project No.: 16570-0
Boring No.: B-13
Sample Type: Undisturbed
Description: Very Dark Grayish Brown (3/2) SILT with SAND(ML)
Remarks: Sample Location: 16570-0 Piscataway Dr. Slope & Road Failures B-13/ ST-1 22.0' - 24.0' - 0.50 TSF

Fri, 16-MAY-2014 14:06:20

CONSOLIDATION TEST DATA

SUMMARY REPORT



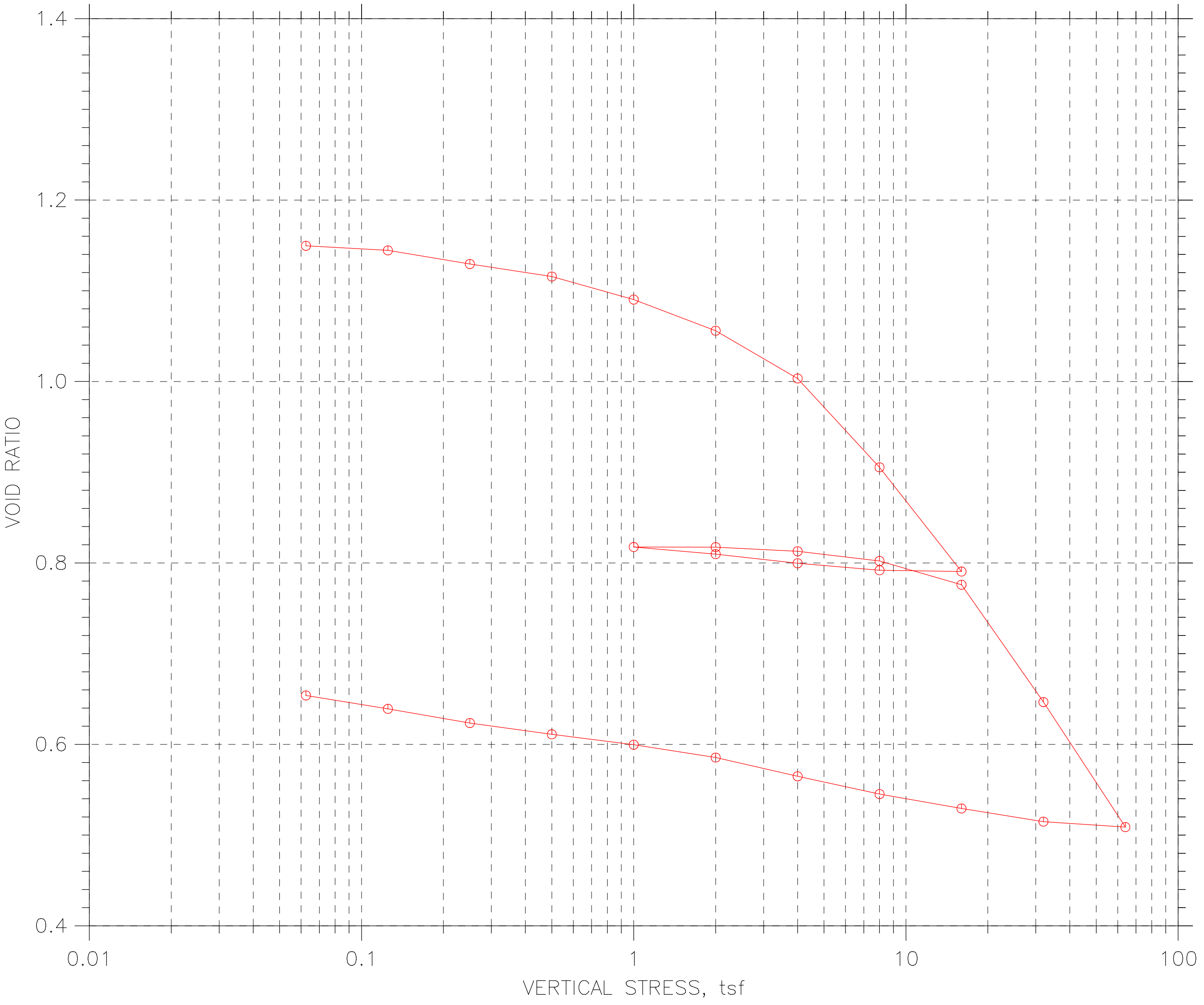


Project: Piscataway Slope Failure	Location: Ft. Washington, MD	Project No.: 16570-0
Boring No.: B-13	Tested By: Jason	Checked By: Jeremy
Sample No.: ST-1	Test Date: 05/12/2014	Depth: 22'6"-22'7"
Test No.: 1	Sample Type: Undisturbed	Elevation:
Description: Color: Very Dark Grayish Brown (3/2) SILT with SAND(ML)		
Remarks: ASTM D2435. Location: B-13 / ST-1 (22.0' - 24.0') 64 TSF		

Wed, 21-MAY-2014 16:45:53

CONSOLIDATION TEST DATA

SUMMARY REPORT



					Before Test	After Test
Overburden Pressure: 1.21 tsf				Water Content, %	34.08	23.01
Preconsolidation Pressure: 5.5 tsf				Dry Unit Weight, pcf	80.31	104.7
Compression Index: 0.48				Saturation, %	81.78	97.59
Diameter: 2 in		Height: 1 in		Void Ratio	1.16	0.65
LL: 48	PL: 30	PI: 18	GS: 2.77			

	Project: Piscataway Slope Failure	Location: Ft. Washington, MD	Project No.: 16570-0
	Boring No.: B-13	Tested By: Jason	Checked By: Jeremy
	Sample No.: ST-1	Test Date: 05/12/2014	Depth: 22'6"-22'7"
	Test No.: 1	Sample Type: Undisturbed	Elevation:
	Description: Color: Very Dark Grayish Brown (3/2) SILT with SAND(ML)		
	Remarks: ASTM D2435. Location: B-13 / ST-1 (22.0' - 24.0') 64 TSF		

Wed, 21-MAY-2014 16:45:53

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GRAIN SIZE DISTRIBUTION

TEST METHOD ASTM D422

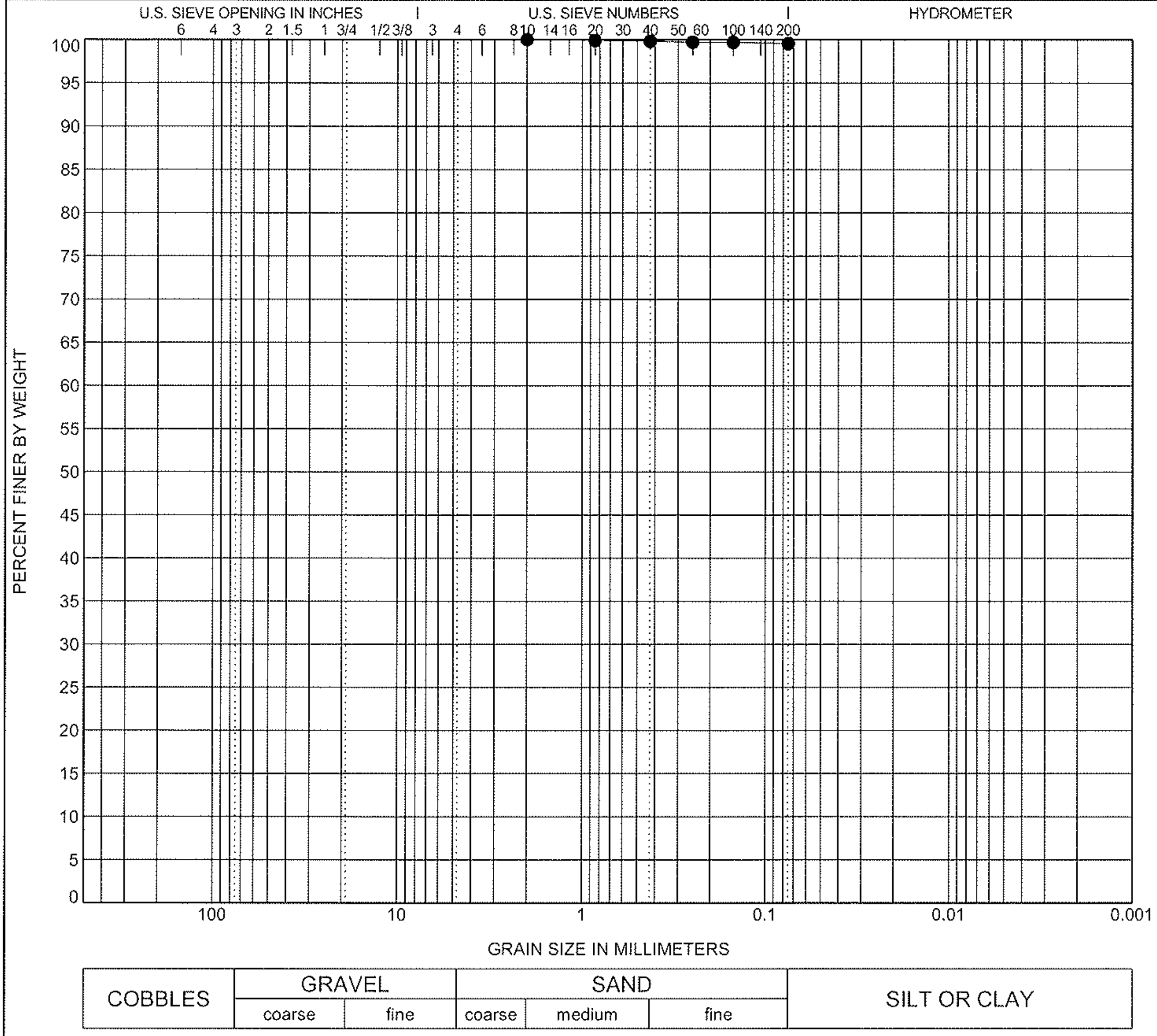
CLIENT KCI Technologies

PROJECT NAME Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD

PROJECT NUMBER ____________

DATE TESTED ____________



	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	B-13, ST-2 @ 28.0' - 30.0',	**Weak Red (4/4) LEAN CLAY(CL)**	**39**	**25**	**14**		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-13, ST-2 @ 28.0' - 30.0',	2				0.0	0.5	99.5	

GRAIN SIZE 16570-0 PISCATAWAY SLOPE FAILURE.GPJ MTA REDLINE.GDT 5/20/14

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ATTERBERG LIMITS' RESULTS

TEST METHOD ASTM D4318

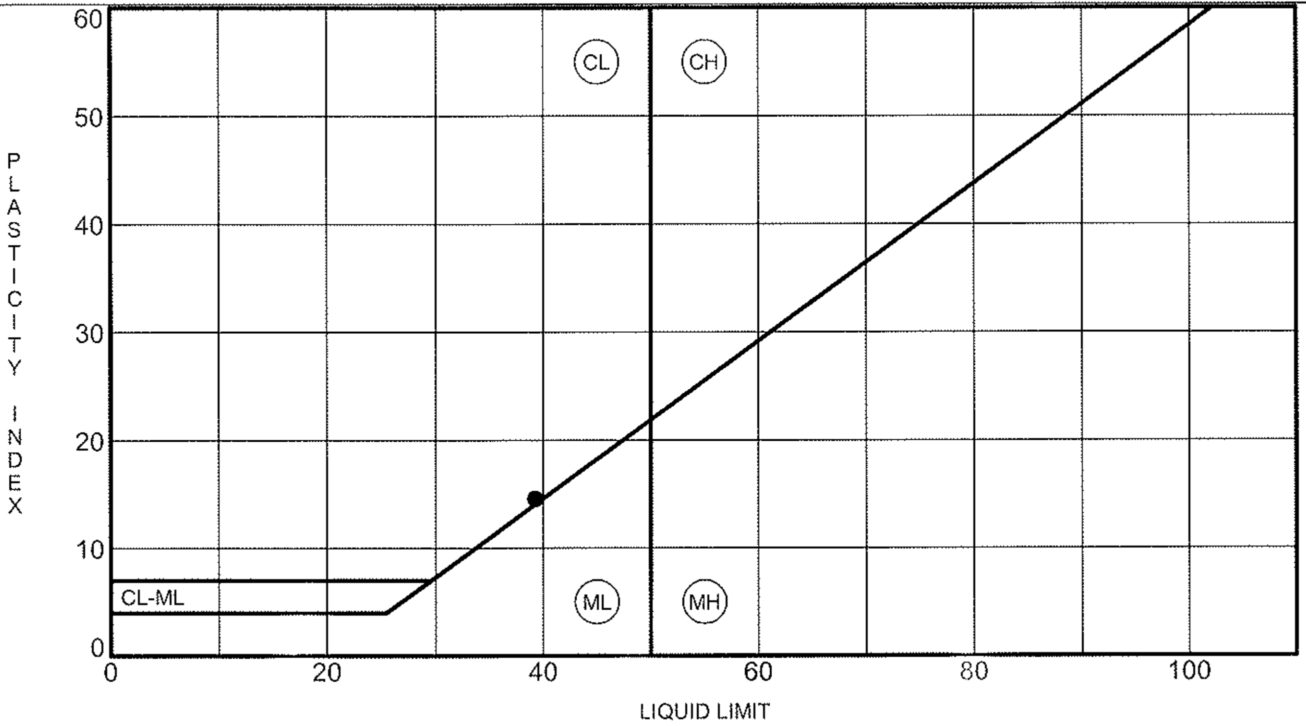
CLIENT KCI Technologies

PROJECT NAME Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD

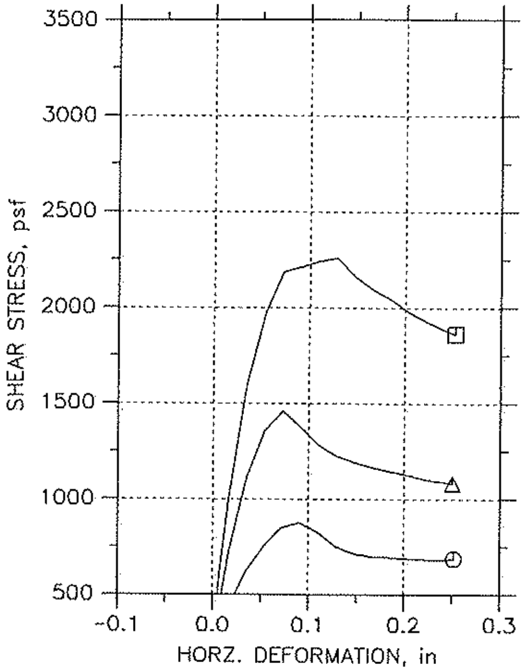
PROJECT NUMBER

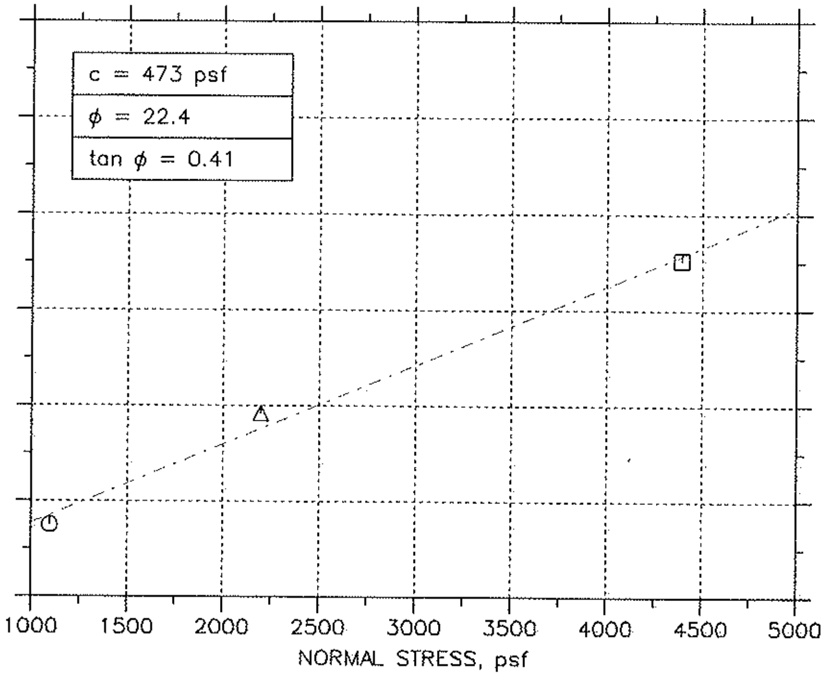
DATE TESTED

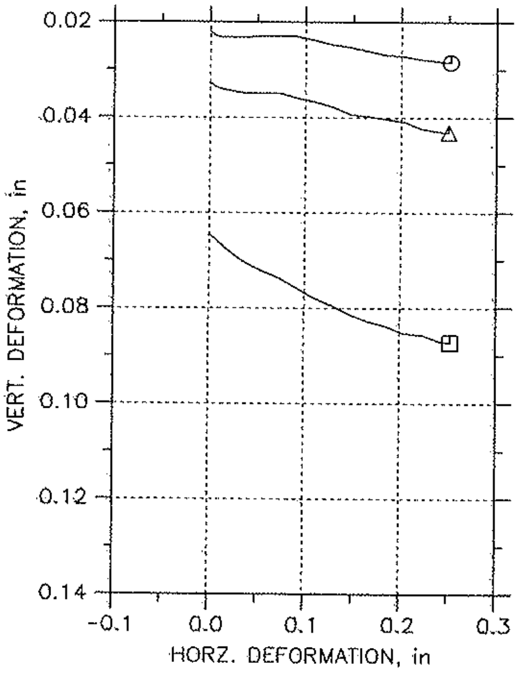


	Specimen Identification	LL	PL	PI	Fines	Classification
●	B-13, ST-2 @ 28.0' - 30.0',	39	25	14	100	Weak Red (4/4) LEAN CLAY(CL)

DIRECT SHEAR TEST REPORT







Symbol		○	△	□	
Test No.		1	2	3	
Sample No.		ST-2	ST-2	ST-2	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.5	2.5	2.5	
	Area, in^2	4.9087	4.9087	4.9087	
	Height, in	1	1	1	
	Water Content, %	31.82	30.48	31.46	
	Dry Density, pcf	89.467	91.741	89.288	
	Saturation, %	94.48	95.41	93.05	
	Void Ratio	0.93284	0.88494	0.93671	
Consol. Height, in		0.97823	0.96713	0.93517	
Consol. Void Ratio		0.89077	0.82298	0.81116	
Final	Water Content, %	34.10	32.01	31.10	
	Dry Density, pcf	92.082	95.882	97.831	
	Saturation, %	107.59	110.35	112.23	
	Void Ratio	0.87794	0.80352	0.76759	
Normal Stress, psf		1097.4	2197.8	4392.6	
Max. Shear Stress, psf		873.96	1457.1	2259.6	
Ult. Shear Stress, psf		688.04	1082.1	1860.7	
Time to Failure, min		10.003	8.0033	14.003	
Disp. Rate, in/min		0.01	0.01	0.01	
Estimated Specific Gravity		2.77	2.77	2.77	
Liquid Limit		39	39	39	
Plastic Limit		25	25	25	
Plasticity Index		14	14	14	

Project: Piscataway Slope Failure
Location: Ft. Washington, MD
Project No.: 16570-0
Boring No.: B-13
Sample Type: Undisturbed
Description: Dark Reddish Brown
Remarks: Sample Location: 16570-0 Piscataway Dr. Slope & Road Failures B-13/ ST-2 28.0' - 30.0' - 0.55 TSF

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GRAIN SIZE DISTRIBUTION

TEST METHOD ASTM D422

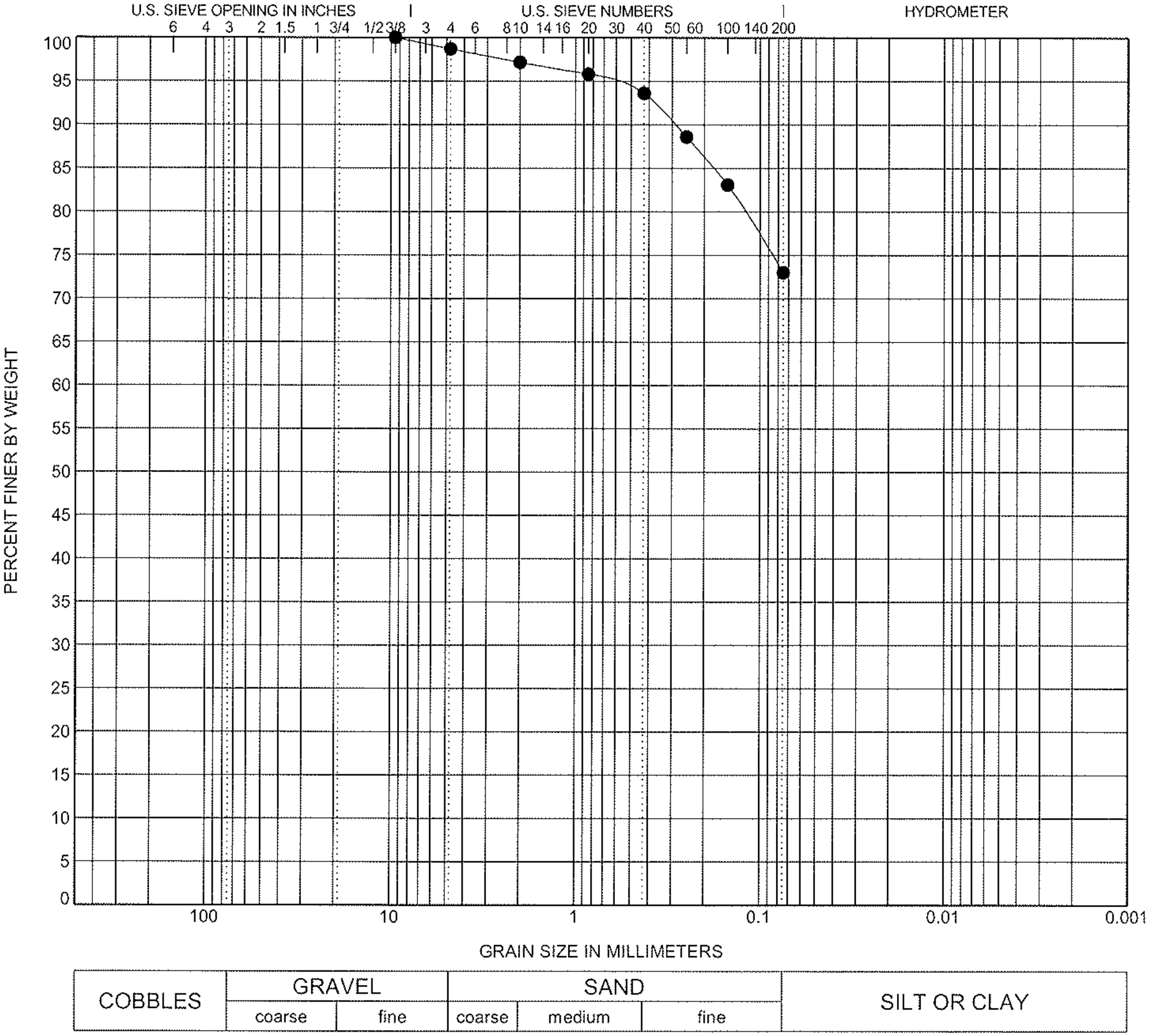
CLIENT KCI Technologies

PROJECT NAME Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD

PROJECT NUMBER

DATE TESTED



	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	B-13, S-2 @ 2.0' - 4.0',	Strong Brown (5/8) LEAN CLAY with SAND(CL)	35	17	18		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-13, S-2 @ 2.0' - 4.0',	9.5				1.3	25.7	73.0	

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ATTERBERG LIMITS' RESULTS

TEST METHOD ASTM D4318

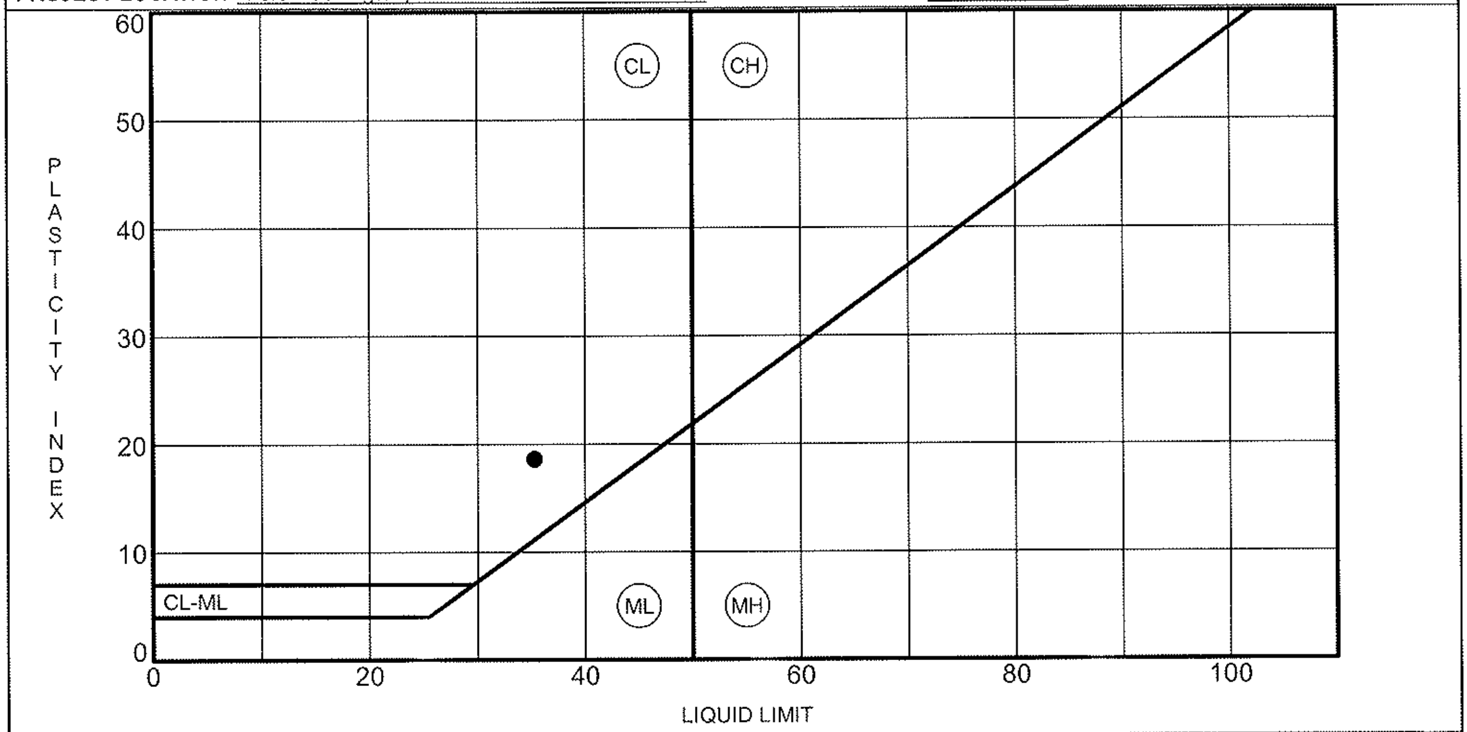
CLIENT KCI Technologies

PROJECT NAME Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD

PROJECT NUMBER

DATE TESTED



	Specimen Identification	LL	PL	PI	Fines	Classification
●	B-13, S-2 @ 2.0' - 4.0',	35	17	18	73	Strong Brown (5/8) LEAN CLAY with SAND(CL)

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PROJECT NUMBER

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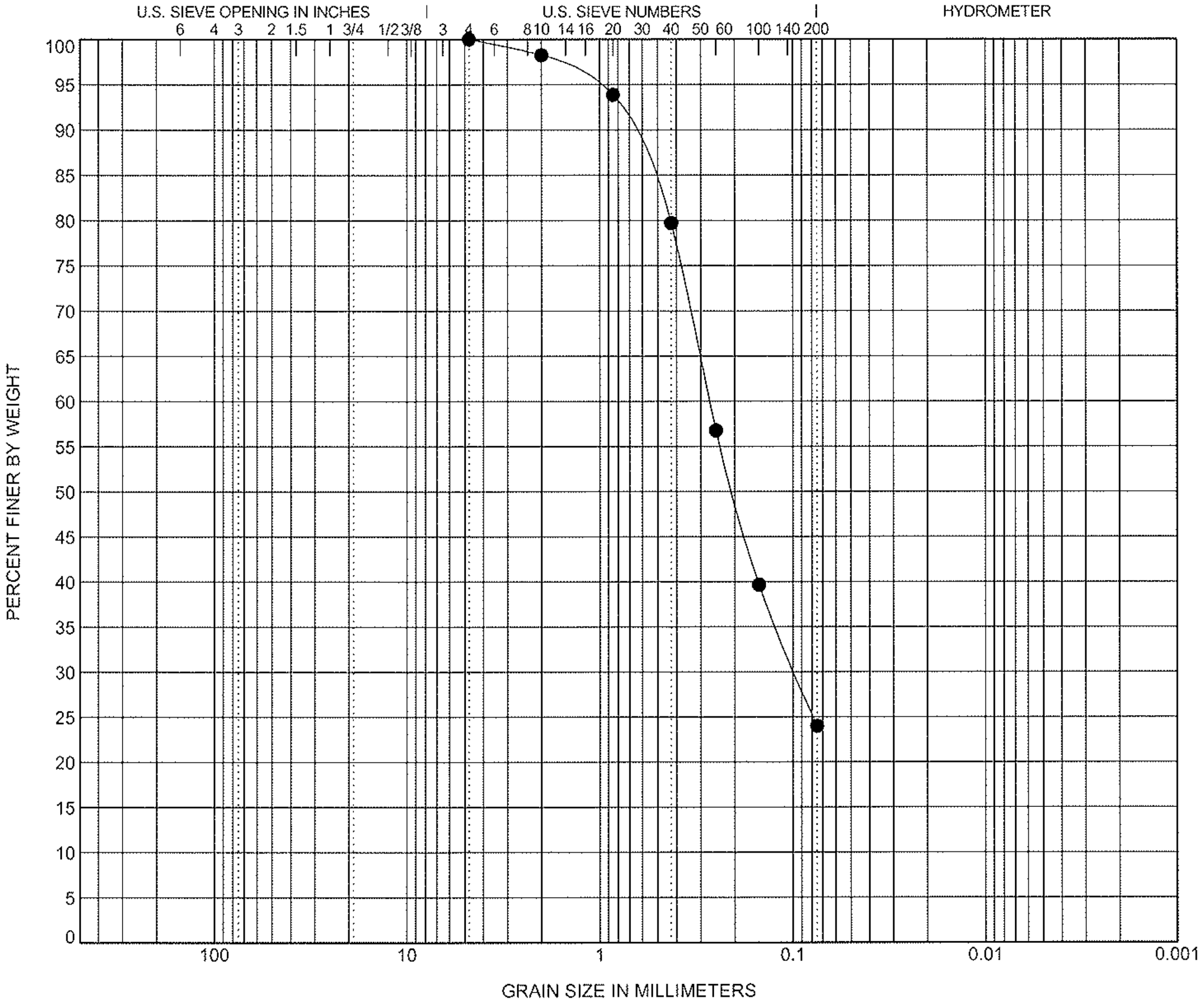

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	B-13, S-6 @ 10.0' - 12.0',	Pale Brown (6/3) SILTY SAND(SM)	NP	NP	NP		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-13, S-6 @ 10.0' - 12.0',	4.75	0.269	0.098		0.0	76.0	24.0	

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ATTERBERG LIMITS' RESULTS
TEST METHOD ASTM D4318

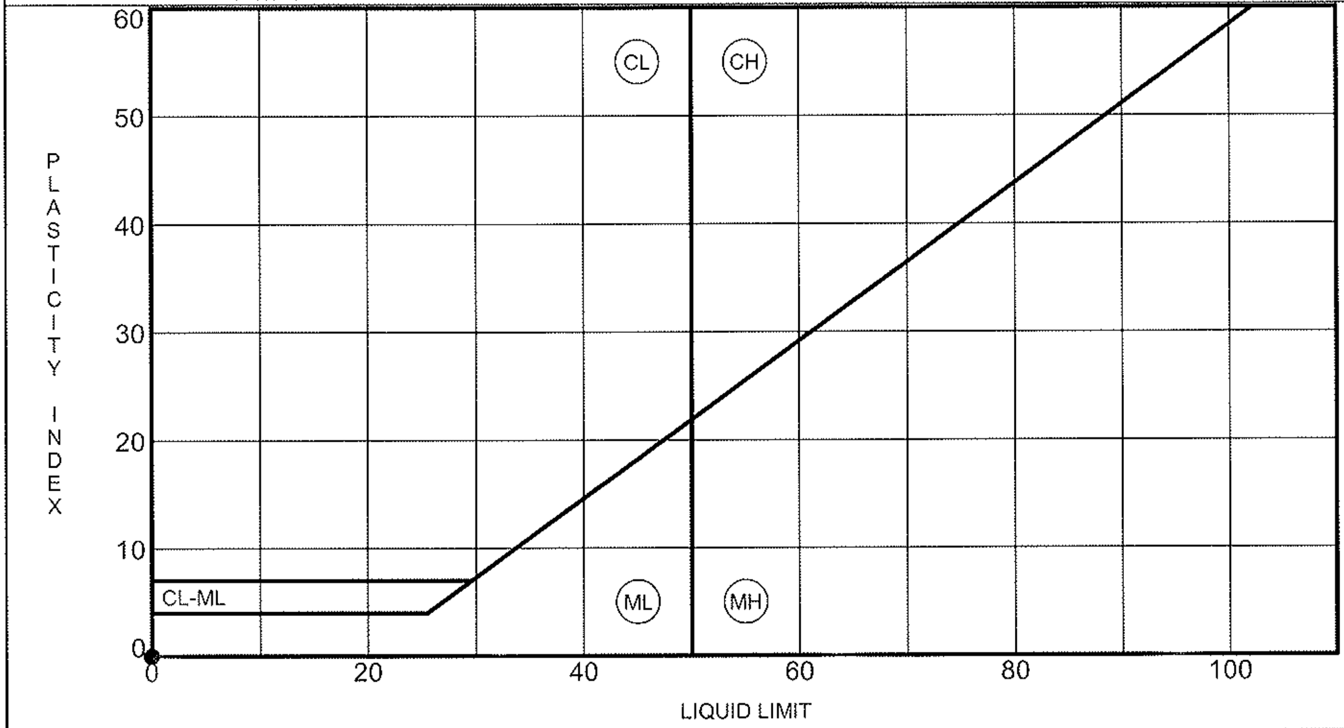
CLIENT KCI Technologies

PROJECT NAME Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD

PROJECT NUMBER ____________

DATE TESTED ____________



	Specimen Identification	LL	PL	PI	Fines	Classification
●	B-13, S-6 @ 10.0' - 12.0',	NP	NP	NP	24	Pale Brown (6/3) SILTY SAND(SM)

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TEST METHOD ASTM D422

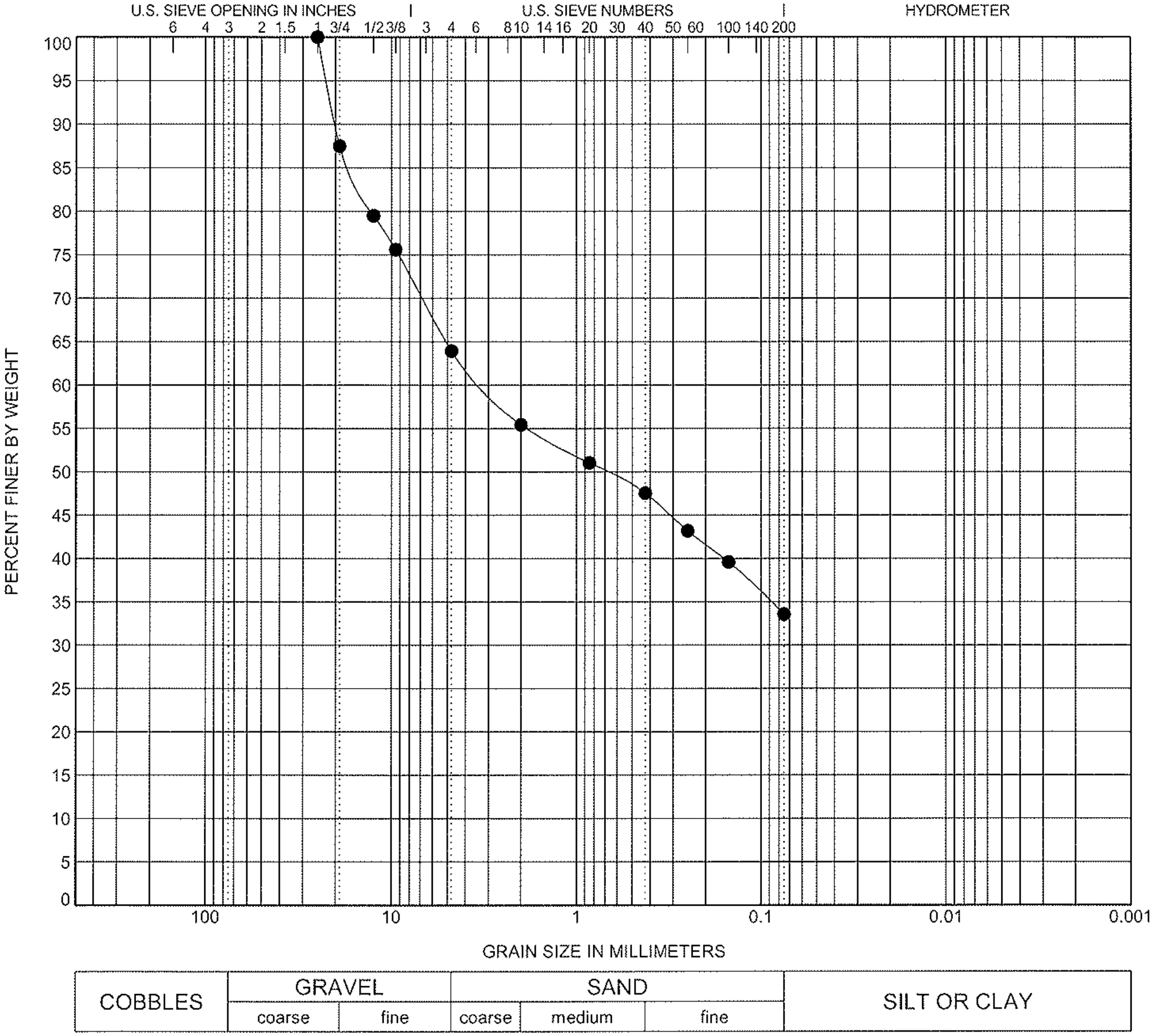
CLIENT KCI Technologies

PROJECT NAME Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD

PROJECT NUMBER

DATE TESTED



	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	B-14, S-5 @ 8.0' - 10.0',	Reddish Yellow (6/8) CLAYEY GRAVEL with SAND(GC)	34	15	19		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-14, S-5 @ 8.0' - 10.0',	25	3.186			36.1	30.4	33.6	

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ATTERBERG LIMITS' RESULTS

TEST METHOD ASTM D4318

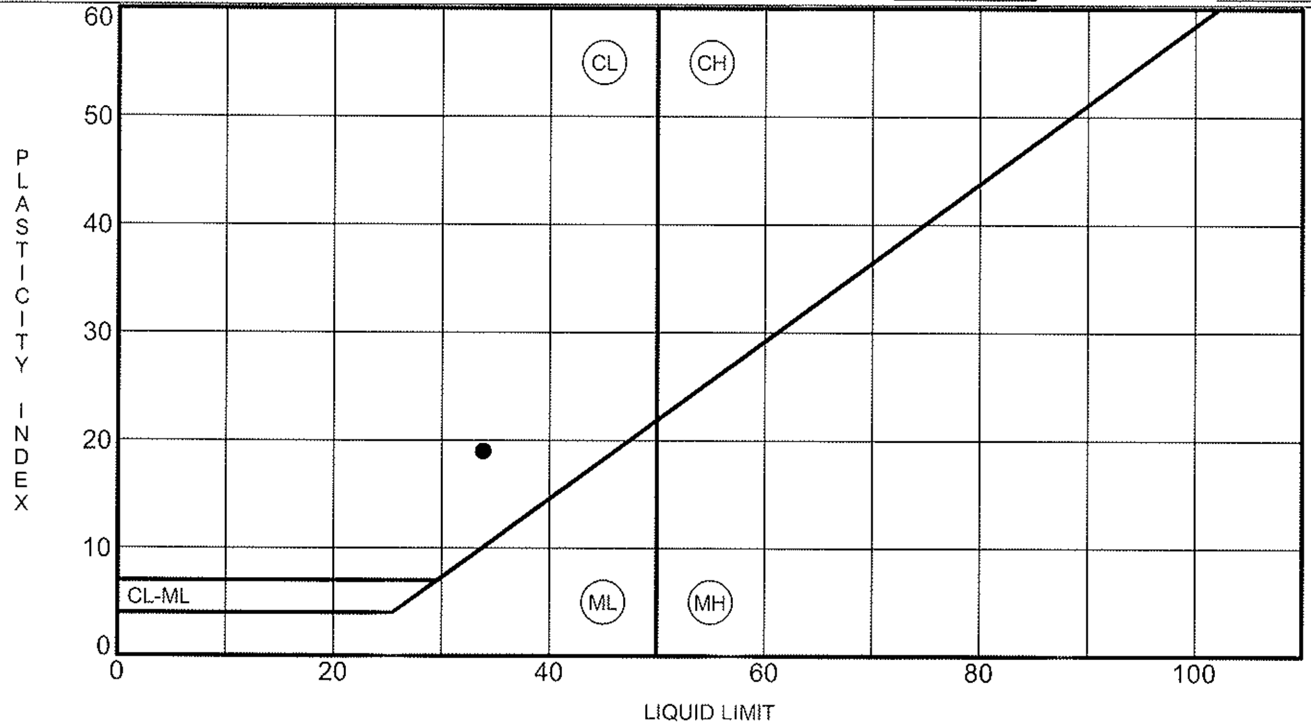
CLIENT KCI Technologies

PROJECT NAME Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD

PROJECT NUMBER

DATE TESTED



	Specimen Identification	LL	PL	PI	Fines	Classification
●	B-14, S-5 @ 8.0' - 10.0',	34	15	19	34	Reddish Yellow (6/8) CLAYEY GRAVEL with SAND(GC)

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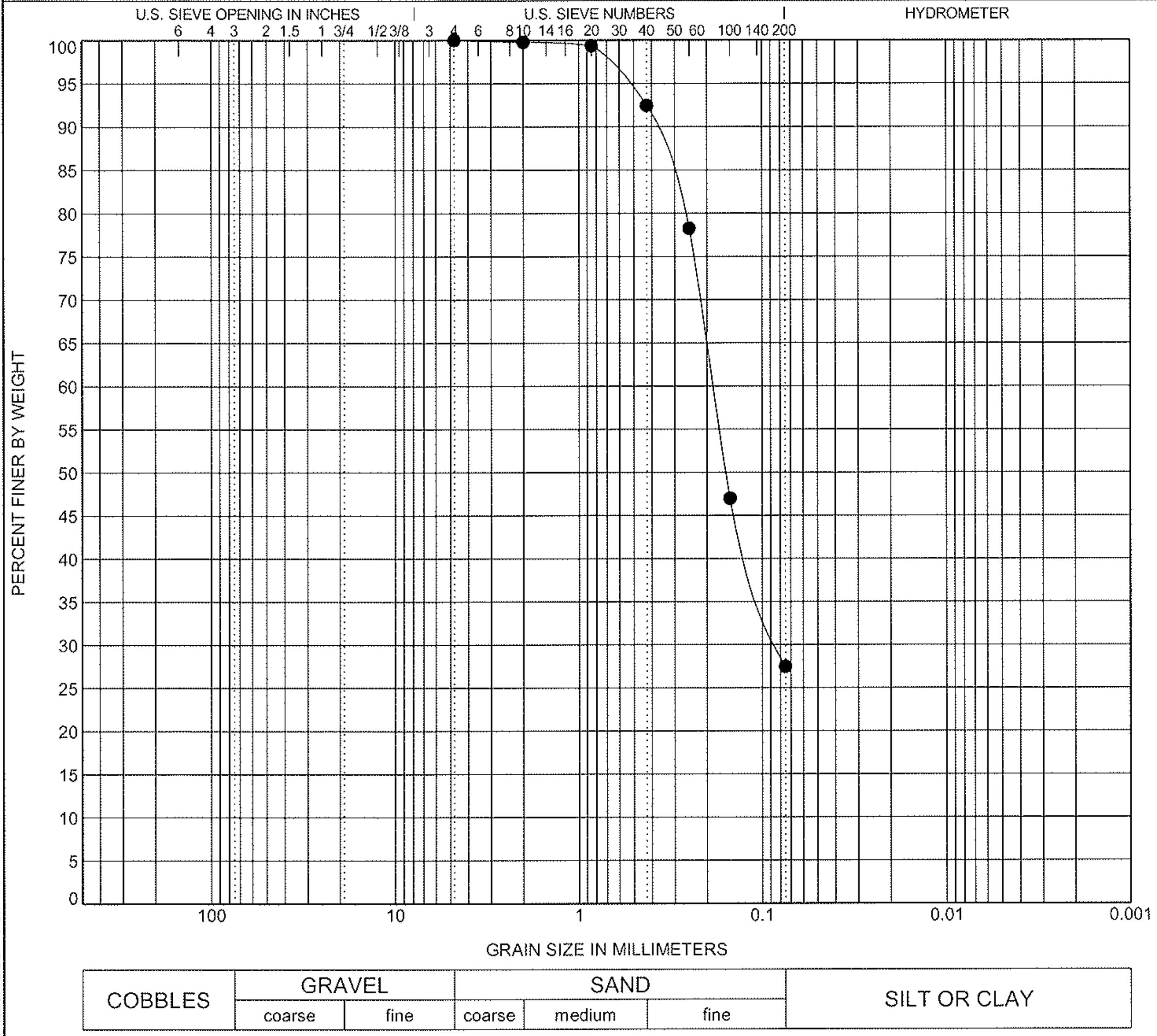
GRAIN SIZE DISTRIBUTION

TEST METHOD ASTM D422

CLIENT KCI Technologies **PROJECT NAME** Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD **PROJECT NUMBER** **DATE TESTED**



	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	B-14, S-10 @ 19.0' - 21.0',	Light Olive Brown (5/3) CLAYEY SAND(SC)	35	20	15		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-14, S-10 @ 19.0' - 21.0',	4.75	0.186	0.082		0.0	72.5	27.5	

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ATTERBERG LIMITS' RESULTS

TEST METHOD ASTM D4318

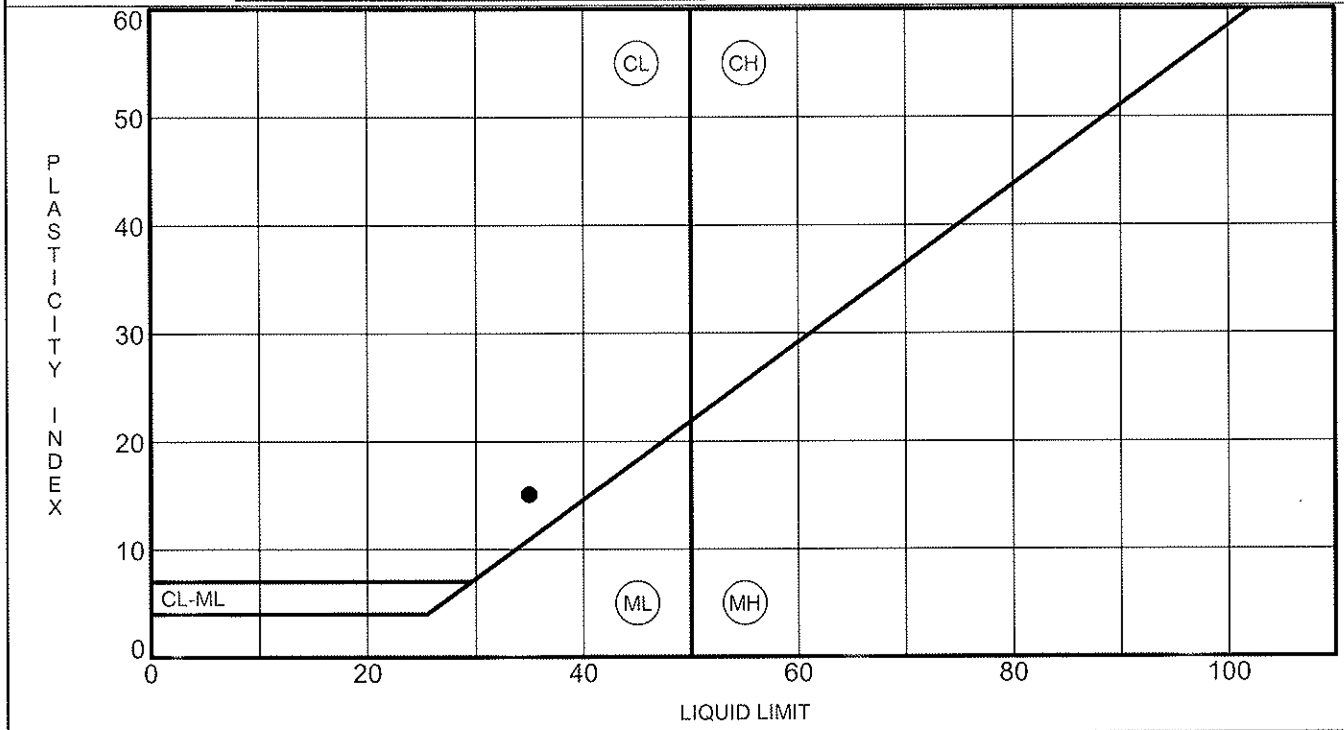
CLIENT KCI Technologies

PROJECT NAME Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD

PROJECT NUMBER

DATE TESTED



	Specimen Identification	LL	PL	PI	Fines	Classification
●	B-14, S-10 @ 19.0' - 21.0',	35	20	15	27	Light Olive Brown (5/3) CLAYEY SAND(SC)

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GRAIN SIZE DISTRIBUTION

TEST METHOD ASTM D422

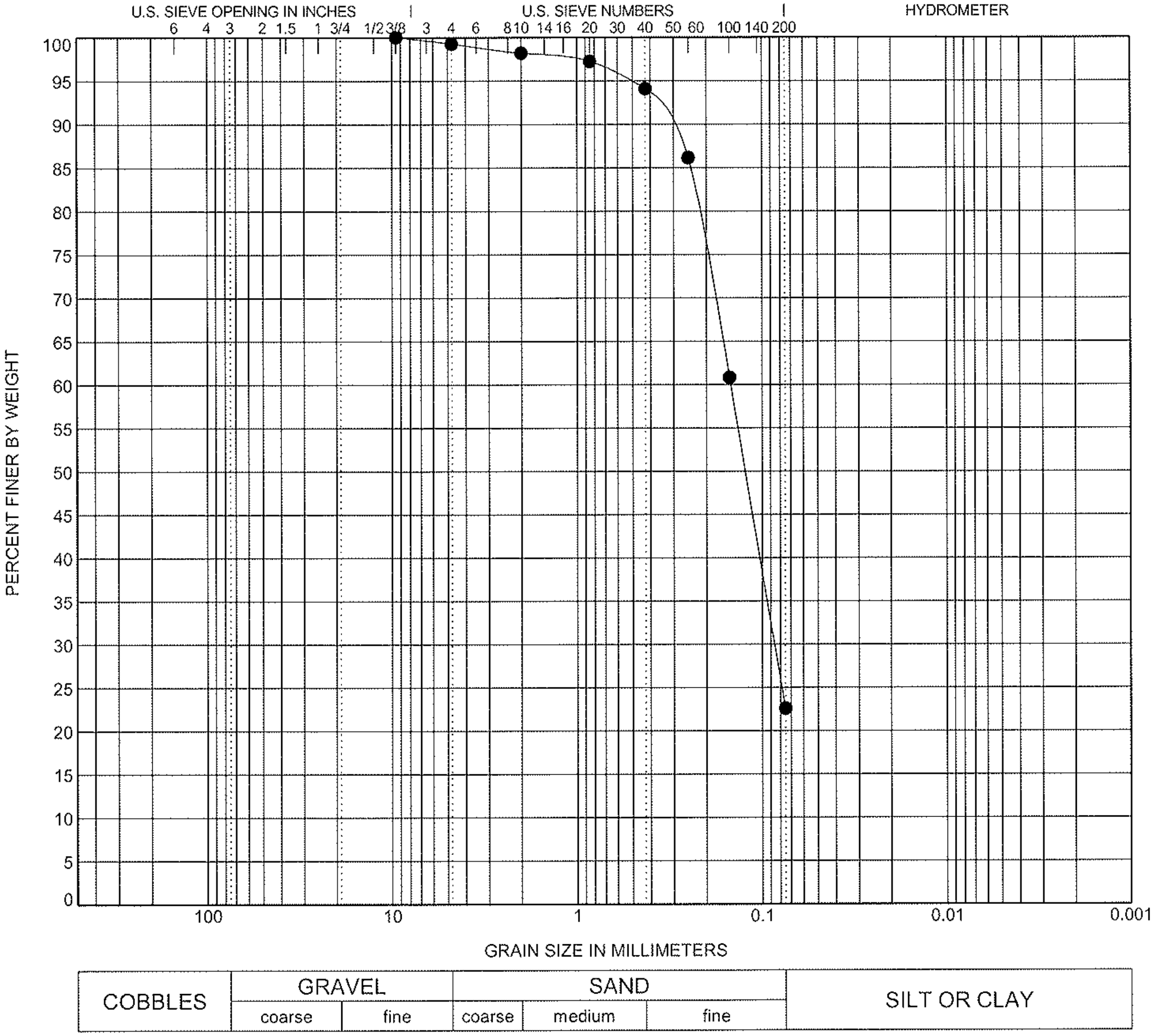
CLIENT KCI Technologies

PROJECT NAME Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD

PROJECT NUMBER

DATE TESTED



	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	B-14, S-16 @ 49.0' - 50.5',	**Blueish Black (5B) SILTY SAND(SM)**	**NP**	**NP**	**NP**		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-14, S-16 @ 49.0' - 50.5',	9.5	0.148	0.086		0.7	76.7	22.6	

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ATTERBERG LIMITS' RESULTS

TEST METHOD ASTM D4318

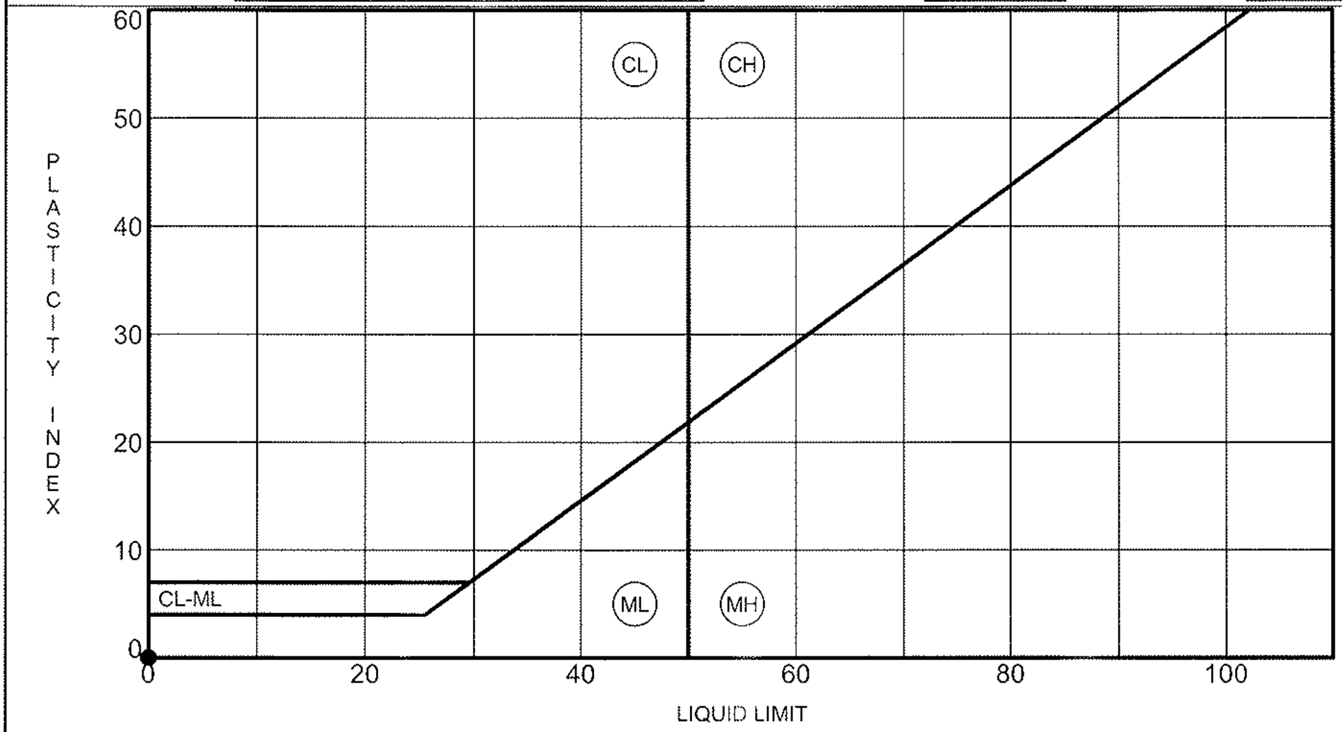
CLIENT KCI Technologies

PROJECT NAME Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD

PROJECT NUMBER ____________

DATE TESTED ____________



	Specimen Identification	LL	PL	PI	Fines	Classification
●	B-14, S-16 @ 49.0' - 50.5',	NP	NP	NP	23	Blueish Black (5B) SILTY SAND(SM)

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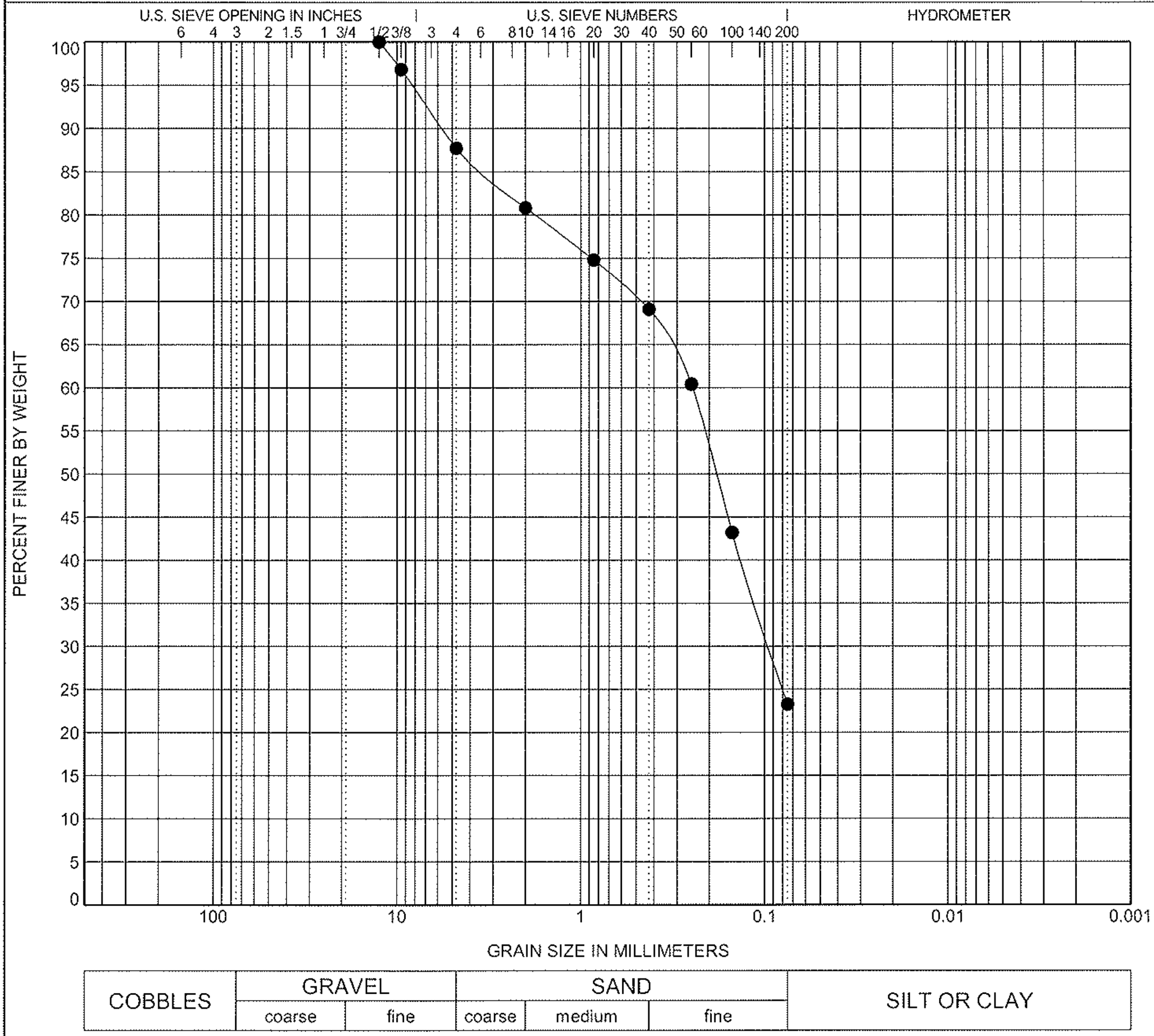
TEST METHOD ASTM D422

CLIENT KCI Technologies **PROJECT NAME** Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD **PROJECT NUMBER** **DATE TESTED**



	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	B-15, S-6 @ 10.0' - 12.0',	**Strong Brown (4/6) CLAYEY SAND(SC)**	**38**	**22**	**16**		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-15, S-6 @ 10.0' - 12.0',	12.5	0.247	0.095		12.3	64.5	23.3	

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ATTERBERG LIMITS' RESULTS

TEST METHOD ASTM D4318

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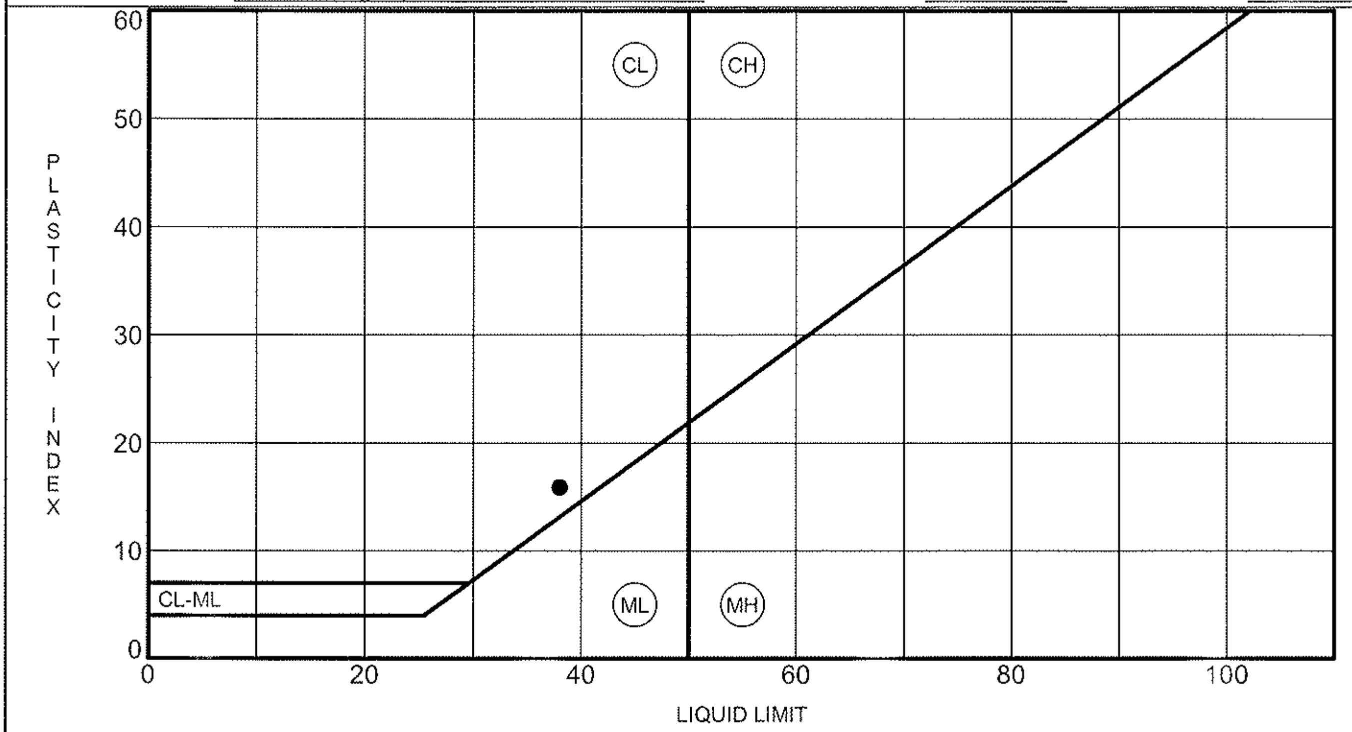
PROJECT LOCATION Fort Washington, MD

PROJECT NUMBER

DATE TESTED



	Specimen Identification	LL	PL	PI	Fines	Classification
●	B-15, S-6 @ 10.0' - 12.0',	38	22	16	23	Strong Brown (4/6) CLAYEY SAND(SC)

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TEST METHOD ASTM D422

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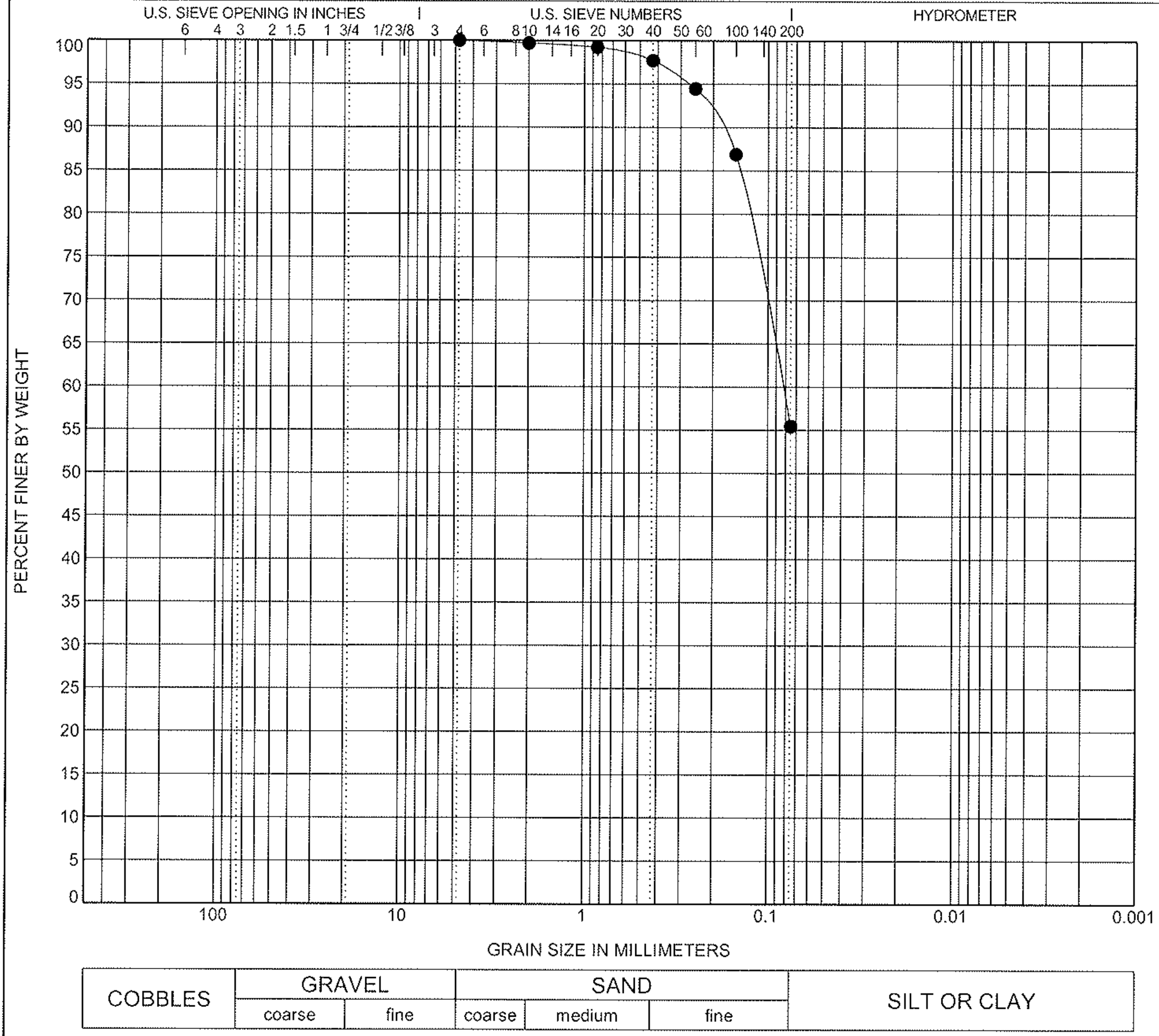
PROJECT LOCATION Fort Washington, MD
PROJECT NUMBER
DATE TESTED



	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	B-15, S-12 @ 35.0' - 36.5',	Greenish Black (10BG) SANDY SILT(ML)	31	23	8		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-15, S-12 @ 35.0' - 36.5',	4.75	0.083			0.0	44.6	55.4	

GRAIN SIZE 16570-0 PISCATAWAY SLOPE FAILURE.GPJ MTA REDLINE.GDT 5/20/14

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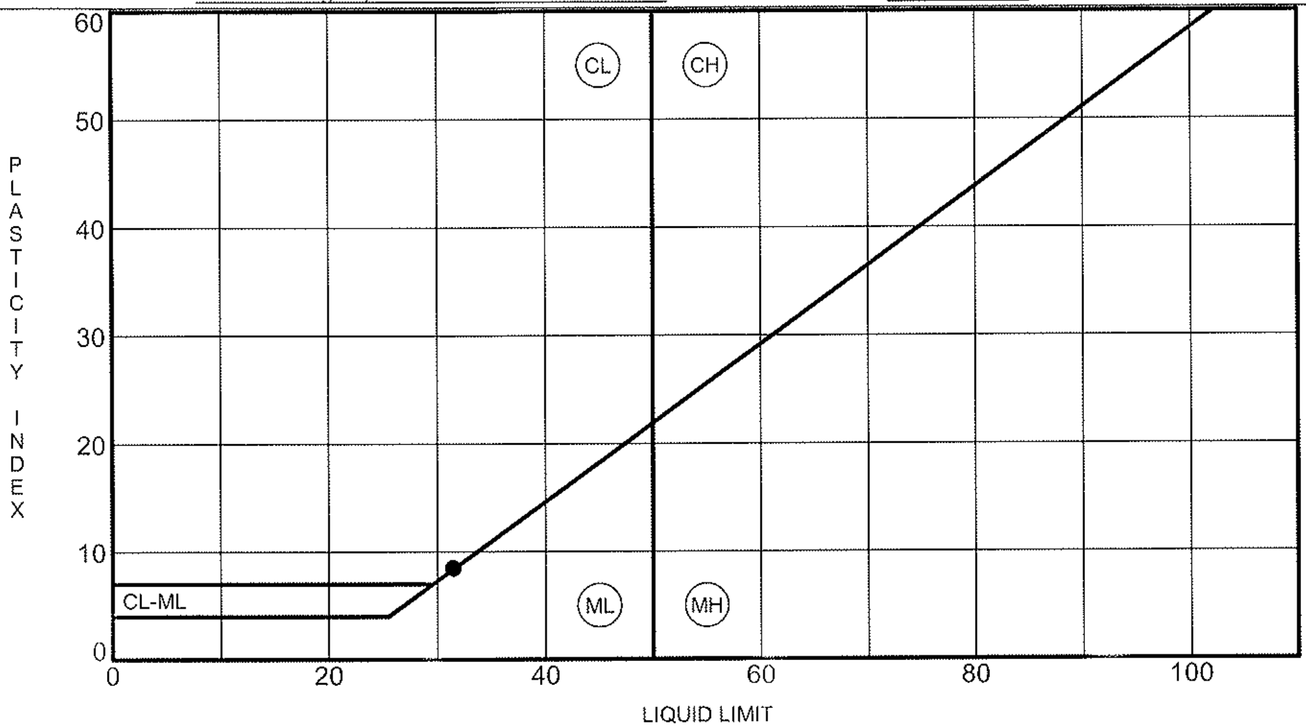
PROJECT NAME Piscataway Dr. Slope & Road Failures

PROJECT LOCATION Fort Washington, MD

PROJECT NUMBER

DATE TESTED



	Specimen Identification	LL	PL	PI	Fines	Classification
●	B-15, S-12 @ 35.0' - 36.5',	31	23	8	55	Greenish Black (10BG) SANDY SILT(ML)

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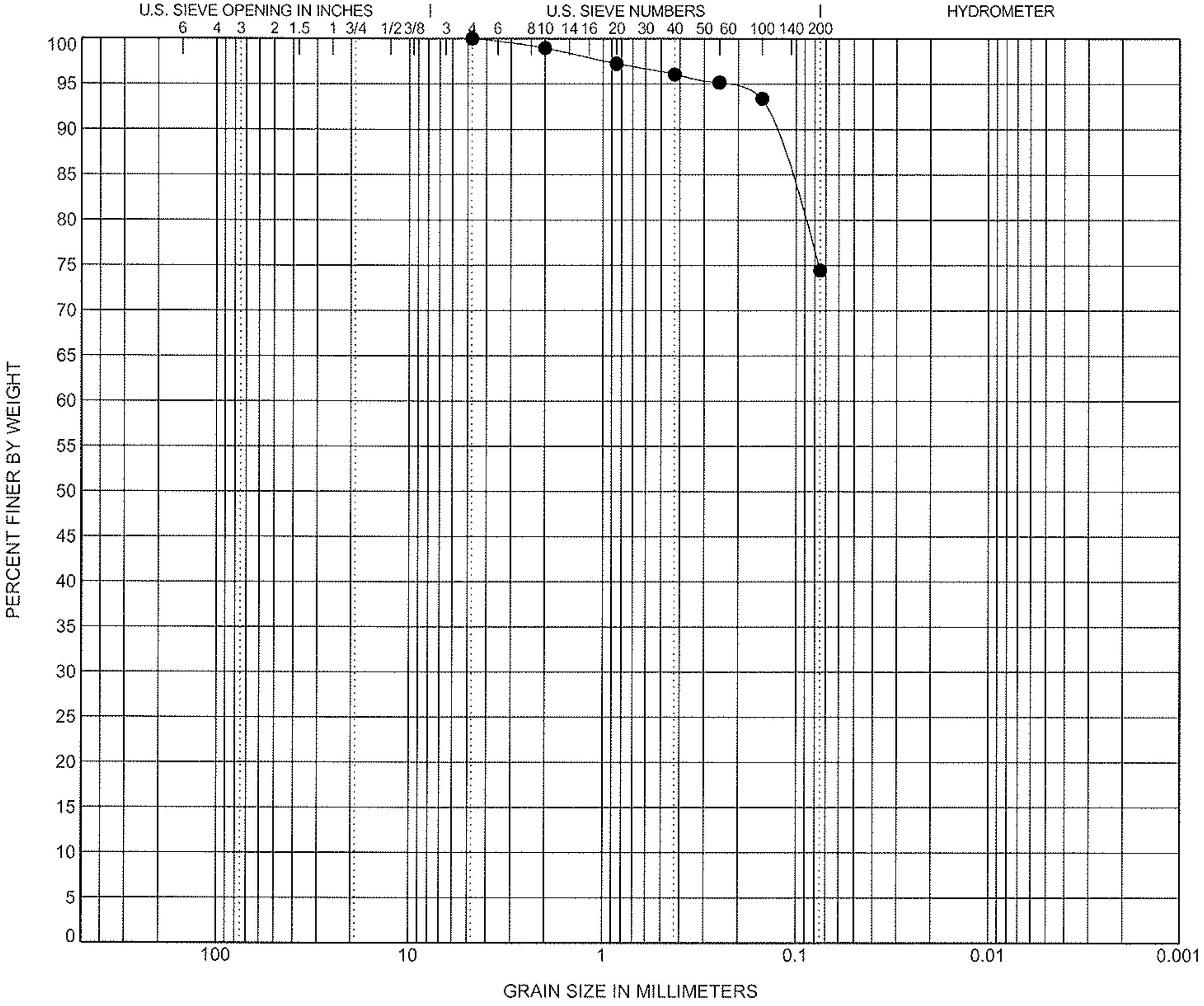
TEST METHOD ASTM D422

CLIENT KCI Technologies
PROJECT NAME Piscataway Dr. Slope & Road Failures
PROJECT LOCATION Fort Washington, MD
PROJECT NUMBER
DATE TESTED



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	B-17, ST-1 @ 22.0' - 24.0',	Mottled Greenish Gray / Dark Reddish Brown (2.5/4) LEAN CLAY with SAND(CL)	47	19	28		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-17, ST-1 @ 22.0' - 24.0',	4.75				0.0	25.6	74.4	

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ATTERBERG LIMITS' RESULTS

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PROJECT NUMBER

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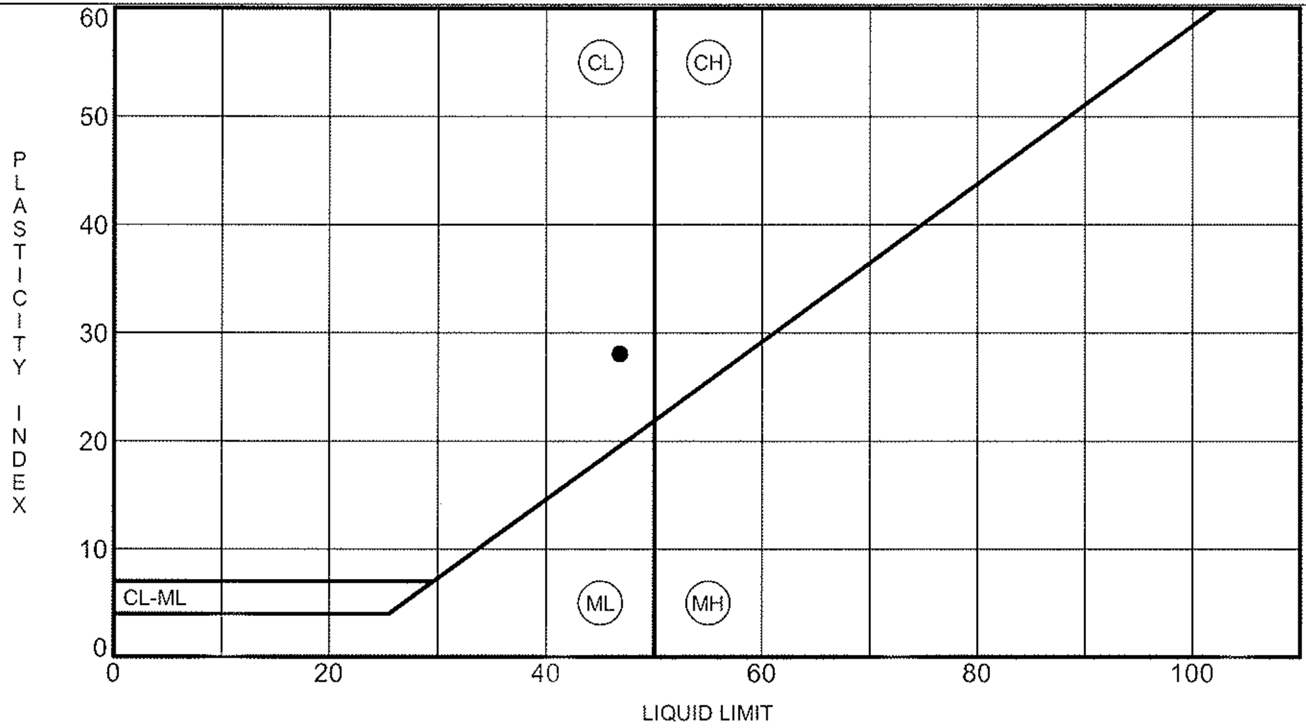
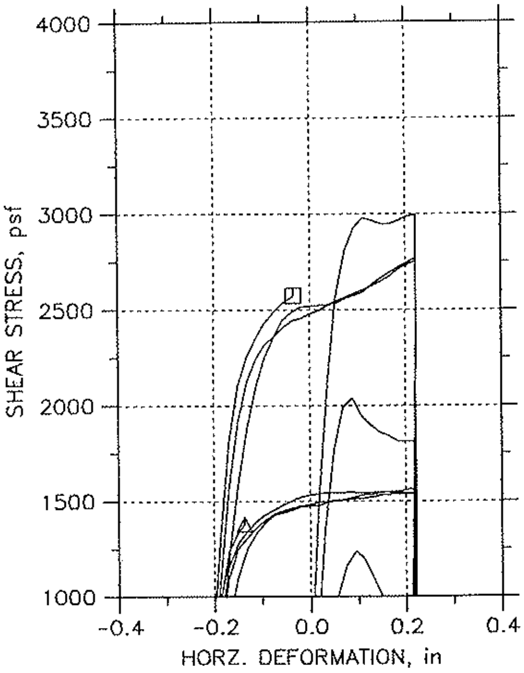
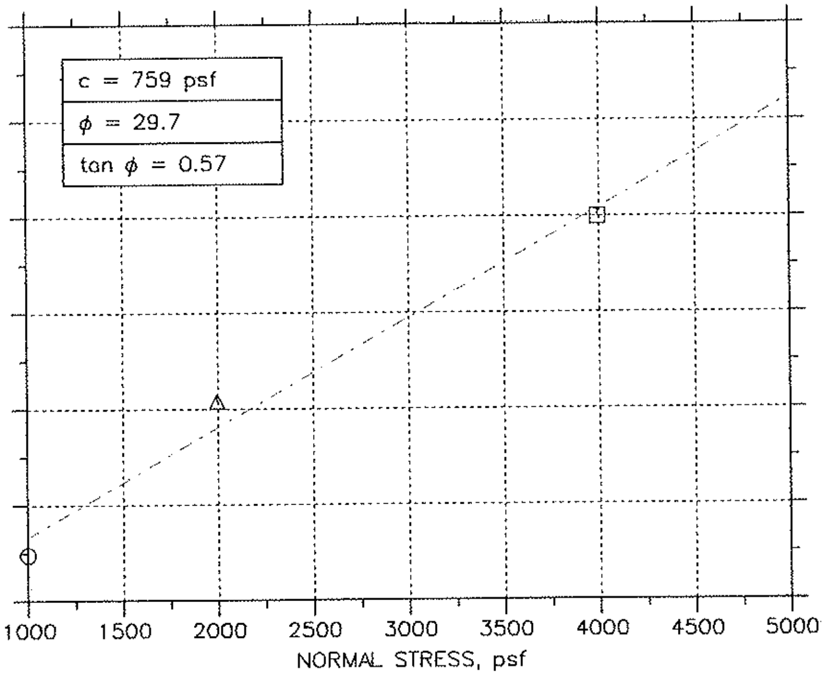
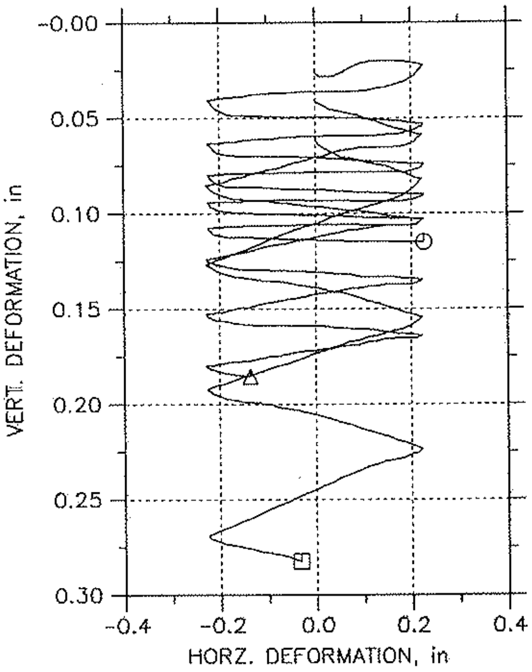


	Specimen Identification	LL	PL	PI	Fines	Classification
●	B-17, ST-1 @ 22.0' - 24.0',	47	19	28	74	Mottled Greenish Gray / Dark Reddish Brown (2.5/4) LEAN CLAY with SAND(CL)

DIRECT SHEAR TEST REPORT







Symbol		⌽	△	⊡	
Test No.		1	2	3	
Sample No.		ST-1	ST-1	ST-1	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.5	2.5	2.5	
	Area, in^2	4.9087	4.9087	4.9087	
	Height, in	1	1	1	
	Water Content, %	44.11	47.97	59.94	
	Dry Density, pcf	80.619	77.406	71.485	
	Saturation, %	106.71	107.69	117.00	
	Void Ratio	1.145	1.234	1.419	
Consol. Height, in		0.97372	0.95915	0.9382	
Consol. Void Ratio		1.0886	1.1427	1.2696	
Final	Water Content, %	34.59	33.47	31.27	
	Dry Density, pcf	91.104	95.037	99.625	
	Saturation, %	106.68	113.11	117.71	
	Void Ratio	0.89811	0.81957	0.73576	
Normal Stress, psf		1001.3	1996.6	3993.3	
Max. Shear Stress, psf		1239.4	2037.1	2995.3	
Ult. Shear Stress, psf		730.94	1379.3	2571	
Time to Failure, min		10.003	10.003	23.931	
Disp. Rate, in/min		0.01	0.01	0.01	
Estimated Specific Gravity		2.77	2.77	2.77	
Liquid Limit		47	47	47	
Plastic Limit		19	19	19	
Plasticity Index		28	28	28	

Project: Piscataway Slope Failure
Location: Ft. Washington, MD
Project No.: 16570-0
Boring No.: B-17
Sample Type: Undisturbed
Description: Dark Brownish Gray
Remarks: Sample Location: 16570-0 Piscataway Dr. Slope & Road Failures B-17/ ST-1 22.0' - 24.0' - 0.5 TSF (Residual Shear

Sat, 17-MAY-2014 11:27:25

LABORATORY TESTING

Natural Moisture Content

The natural moisture content of selected samples was determined in accordance with ASTM D 2216. The moisture content of the soil is the ratio, expressed as a percentage, of the weight of water in a given mass of soil to the weight of the soil particles. The results are summarized in the table following this section of the report.

Grain Size Distribution

Grain size tests were performed on representative soil samples. The samples were washed over a U. S. standard No. 200 sieve to remove the fines (particles finer than a No. 200 mesh sieve). The samples were then dried and sieved through a standard set of nested sieves. This test was performed in a manner similar to that described be ASTM D 1140. The results are presented as percent finer by weight versus particle size curves on the attached Grain Size Distribution sheets.

Soil Plasticity

Representative samples of the site soils were selected for Atterberg Limits testing to determine their soil plasticity characteristics. The soil's Plasticity Index (PI) is representative of this characteristic and is bracketed by the Liquid Limit (LL) and the Plastic Limit (PL). These characteristics are determined in accordance with ASTM D 4318. The LL is the moisture content at which the soil will flow as a heavy viscous fluid. The PL is the moisture content at which the soil begins to lose its plasticity. The data obtained are presented on the attached Grain Size Distribution sheets and summarized in the table following this section of the report.

Certain soils swell and shrink with increases and decreases in soil moisture. The PI is related to this potential volume change ability. When such volume changes occur in soils confined beneath foundations, floor slabs and pavements, structural deformations can be produced. Past experience has shown that soils having a PI of less than 30 are only slightly susceptible to volume changes. Soils having a PI greater than 50 are generally very susceptible to this volume changes. Soils with a PI between these limits have moderate volume change potential. The soils tested at this site are moderately susceptible to volume change.

Percent Fines

The percentage of fine-grained particles present in selected samples was determined by passing the samples through a No. 200 mesh sieve. The percent by weight passing the sieve is the percentage of fines or portion of the sample in the silt and clay size range. This test was conducted in accordance with ASTM D 1140. The results are shown on the attached Grain Size Distribution sheets.

Direct Shear (DS) Test

The consolidated drained strength properties of the selected samples were determined in general accordance with ASTM 3080. The results of the Modified Procter test were utilized in compacting the test samples to the desired density and moisture content for the Direct Shear test. The test method is generally performed in following steps:

1. Place the test specimen in the direct shear device.
2. Apply a predetermined stress, providing for wetting or draining of the test specimen.
3. Consolidate the specimen under normal stress.
4. Unlock the frames that hold the specimen.
5. Displace one frame horizontally with respect to the other at a constant rate of shearing deformation and measure the shearing force and horizontal displacements as the specimen is sheared.
6. Plot the shear stress at failure as a function of normal stress termed as “Mohr-Coulomb diagram”.

A series of such tests at different normal stresses are performed and Mohr-Coulomb diagrams drawn. A failure envelope is drawn with the help of these diagrams and effective stress shearing strength parameters, cohesion (c’) and internal friction angle (ϕ’) determined. The results of direct shear tests are summarized in the table following this section.

Triaxial Shear

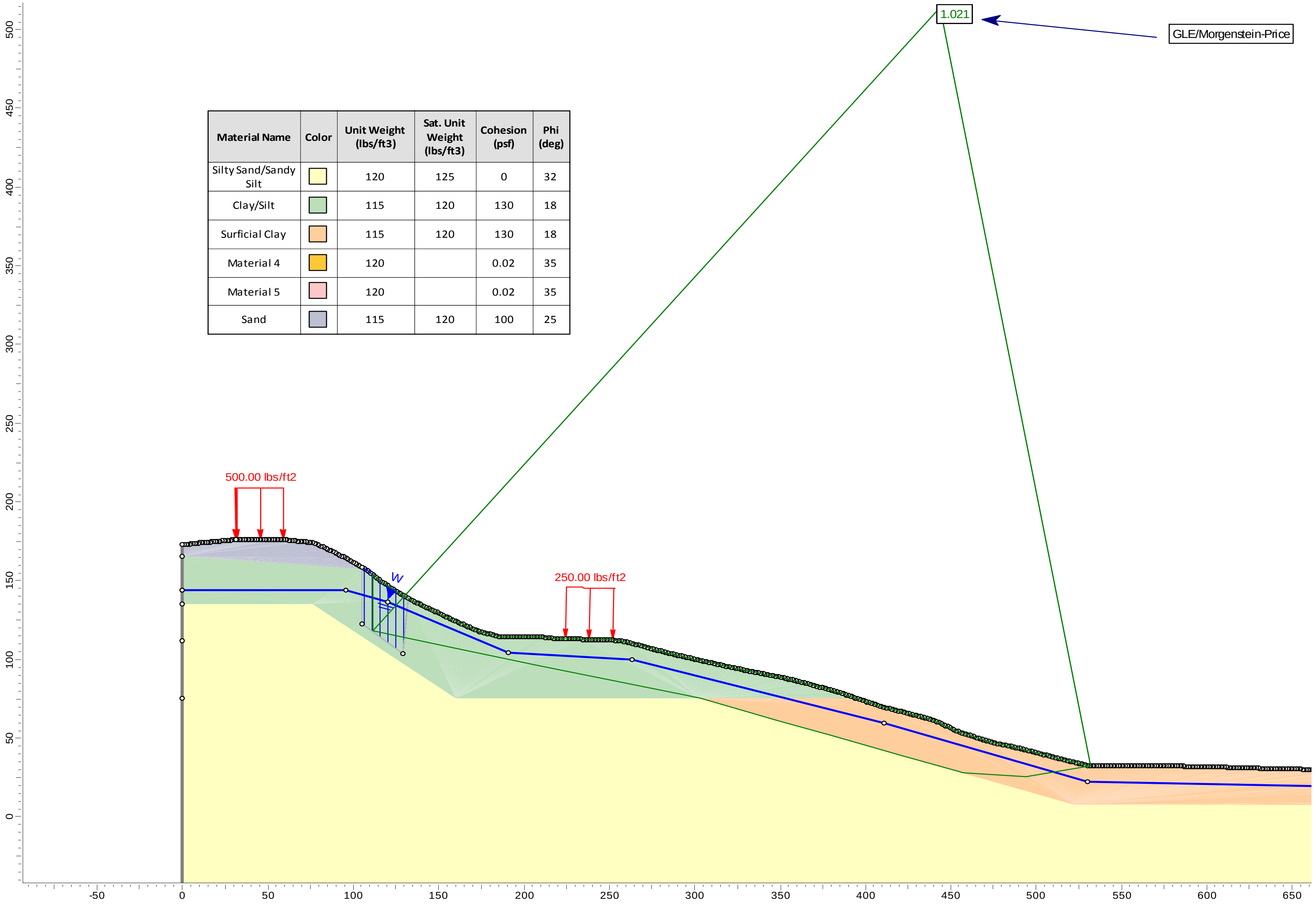
Undisturbed samples are extruded from their sampling tubes for triaxial shear testing. The sections are then trimmed into cylinders 2.4 inches in diameter and encased in rubber membranes. Each is then placed in a compression chamber and confined by all-around water pressure. An increasing axial load is then applied until the sample failed in shear. The test results are presented in the form of Stress-Strain Curves and Mohr Diagrams on the accompanying Triaxial Shear Test sheets.

Consolidation

A single section of the undisturbed sample is extruded from its sampling tube for consolidation testing. The sample is then trimmed into a disc 2.4 inches in diameter and 1-inch thick. The disc is confined in a stainless steel ring and sandwiched between porous plates. It is then subjected to incrementally increasing vertical loads and the resulting deformations measured with a micrometer dial gauge. The test results are presented in the form of a pressure versus percent strain curve on the accompanying consolidation test sheet.

SLOPE STABILITY ANALYSES

Appendix D



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Silty Sand/Sandy Silt	🟨	120	125	0	32
Clay/Silt	🟩	115	120	130	18
Surficial Clay	🟧	115	120	130	18
Material 4	🟨	120		0.02	35
Material 5	🟥	120		0.02	35
Sand	🟪	115	120	100	25

Project Mgr:	KOA
Prepared by:	SS
Checked by:	KA
Approved by:	KOA

Project No.
07100627.W

Scale: n/a

Date: 5/19/2014

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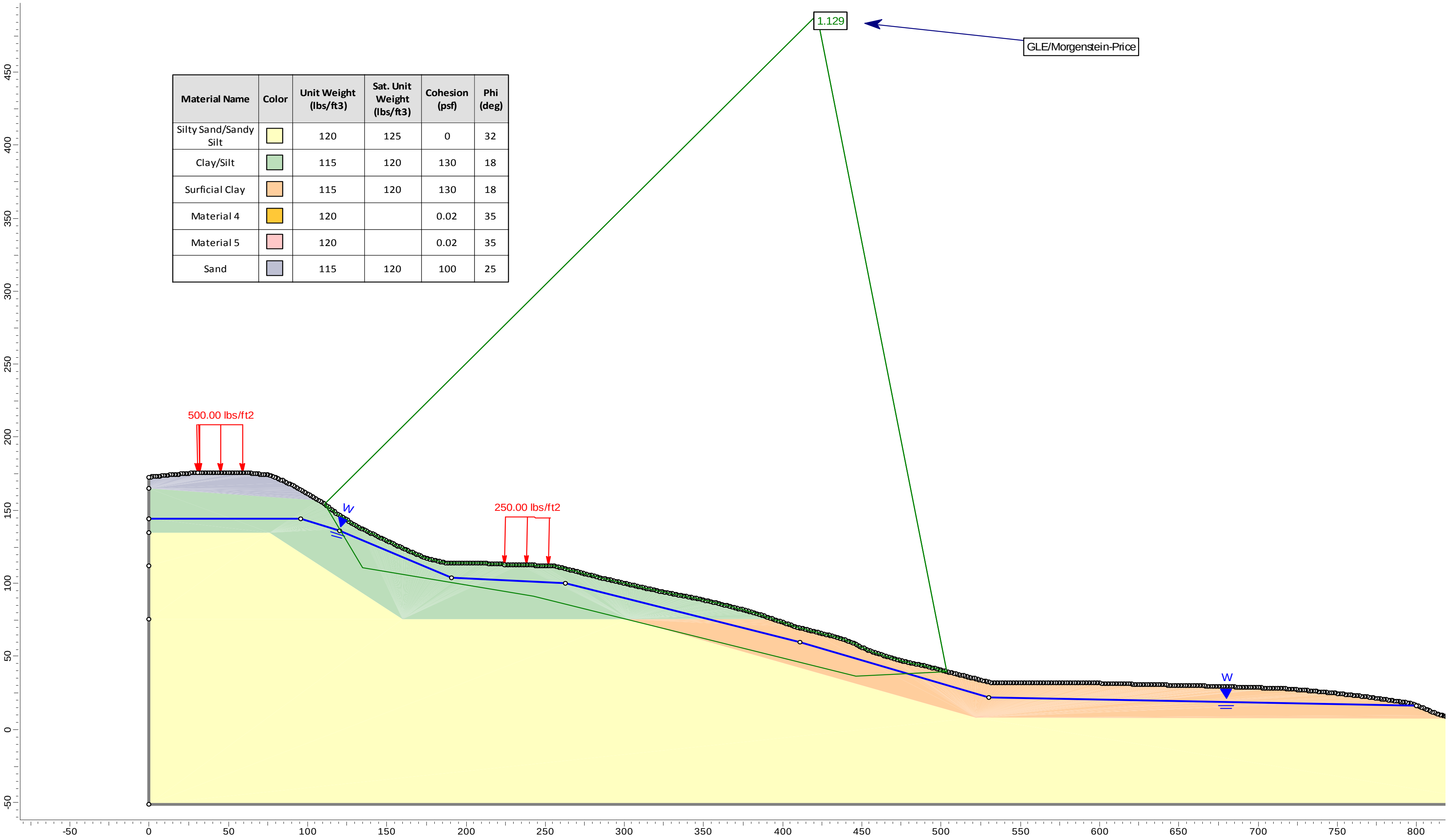
SLOPE STABILITY BACK CALCULATION- CASE A

PISCATAWAY DRIVE SLOPE FAILURE
PRINCE GEORGE'S COUNTY, MARYLAND

FIGURE

D-1



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Silty Sand/Sandy Silt	🟨	120	125	0	32
Clay/Silt	🟩	115	120	130	18
Surficial Clay	🟧	115	120	130	18
Material 4	🟨	120		0.02	35
Material 5	🟥	120		0.02	35
Sand	🟪	115	120	100	25

Project Mgr:	KOA
Prepared by:	SS
Checked by:	KA
Approved by:	KOA

Project No.
07100627.W

Scale: n/a

Date: 5/19/2014

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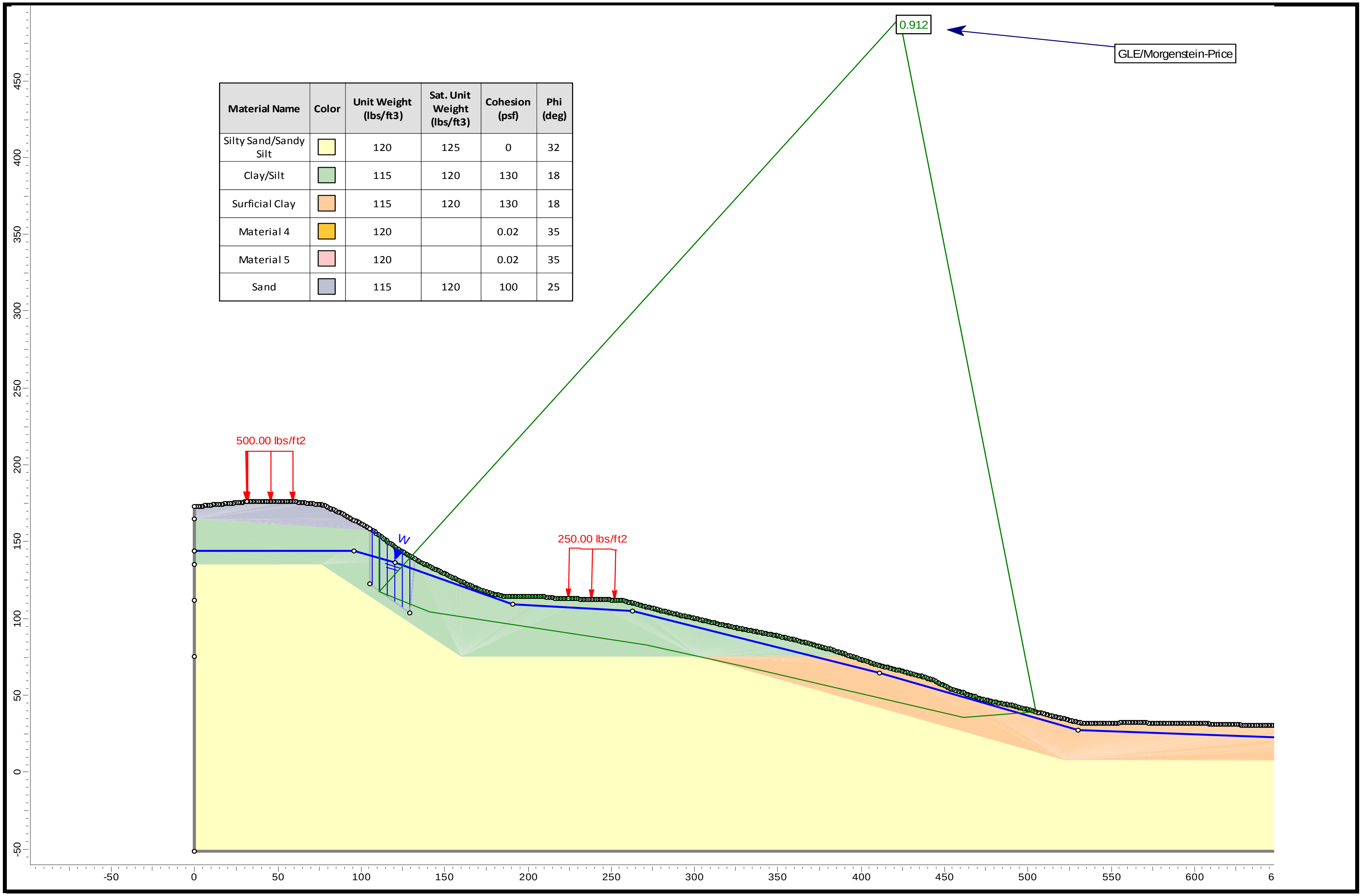
SLOPE STABILITY BACK CALCULATION- CASE B

PISCATAWAY DRIVE SLOPE FAILURE
PRINCE GEORGE'S COUNTY, MARYLAND

FIGURE

D-2



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Silty Sand/Sandy Silt	🟨	120	125	0	32
Clay/Silt	🟩	115	120	130	18
Surficial Clay	🟧	115	120	130	18
Material 4	🟨	120		0.02	35
Material 5	🟥	120		0.02	35
Sand	🟪	115	120	100	25

Project Mgr:	KOA
Prepared by:	SS
Checked by:	KA
Approved by:	KOA

Project No.
07100627.W

Scale: n/a

Date: 5/19/2014

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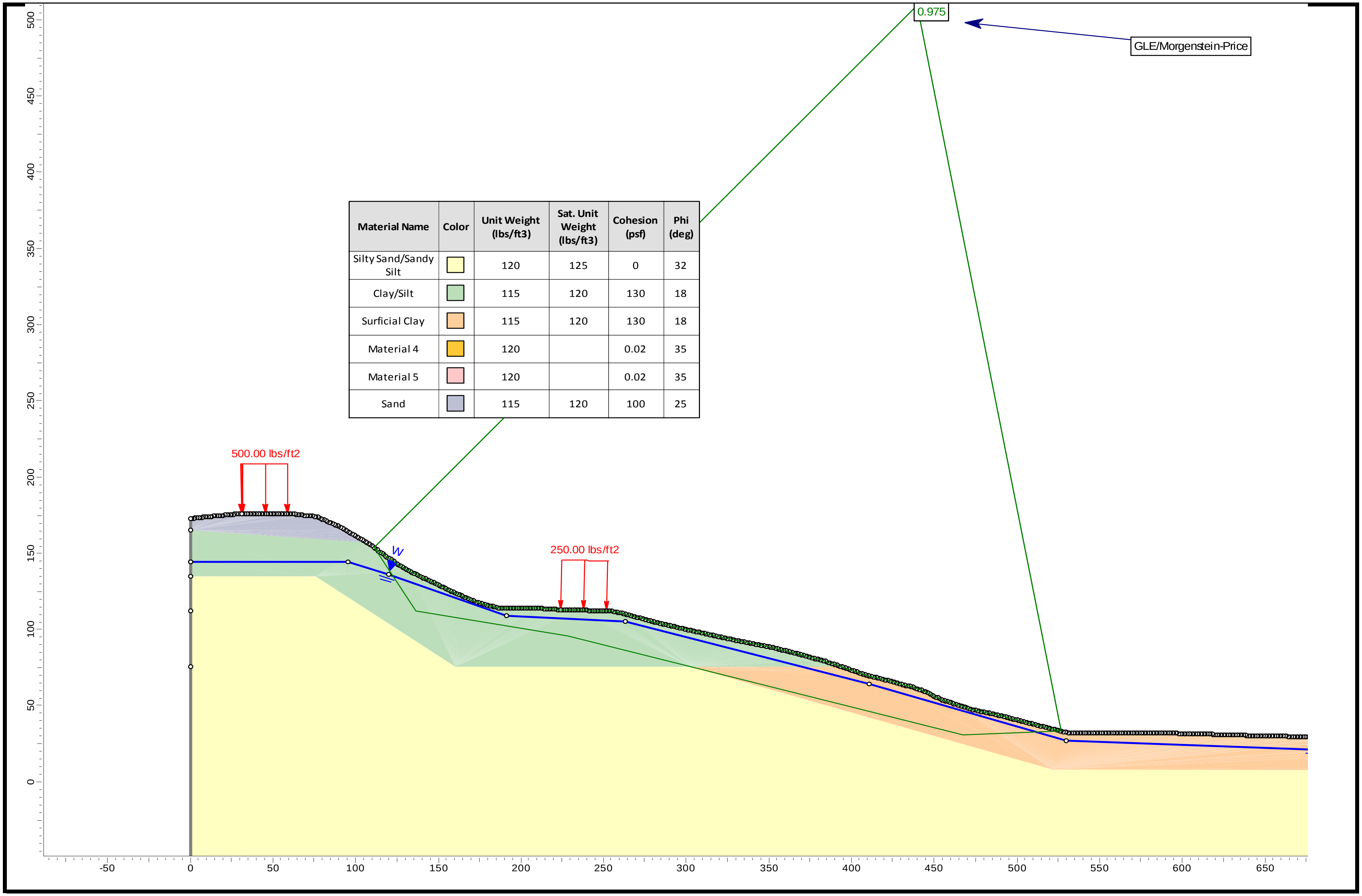
SLOPE STABILITY BACK CALCULATION- CASE C

PISCATAWAY DRIVE SLOPE FAILURE
PRINCE GEORGE'S COUNTY, MARYLAND

FIGURE

D-3



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Silty Sand/Sandy Silt	🟨	120	125	0	32
Clay/Silt	🟩	115	120	130	18
Surficial Clay	🟧	115	120	130	18
Material 4	🟨	120		0.02	35
Material 5	🟥	120		0.02	35
Sand	🟪	115	120	100	25

Project Mgr:	KOA
Prepared by:	SS
Checked by:	KA
Approved by:	KOA

Project No. 07100627.W

Scale: n/a

Date: 5/19/2014

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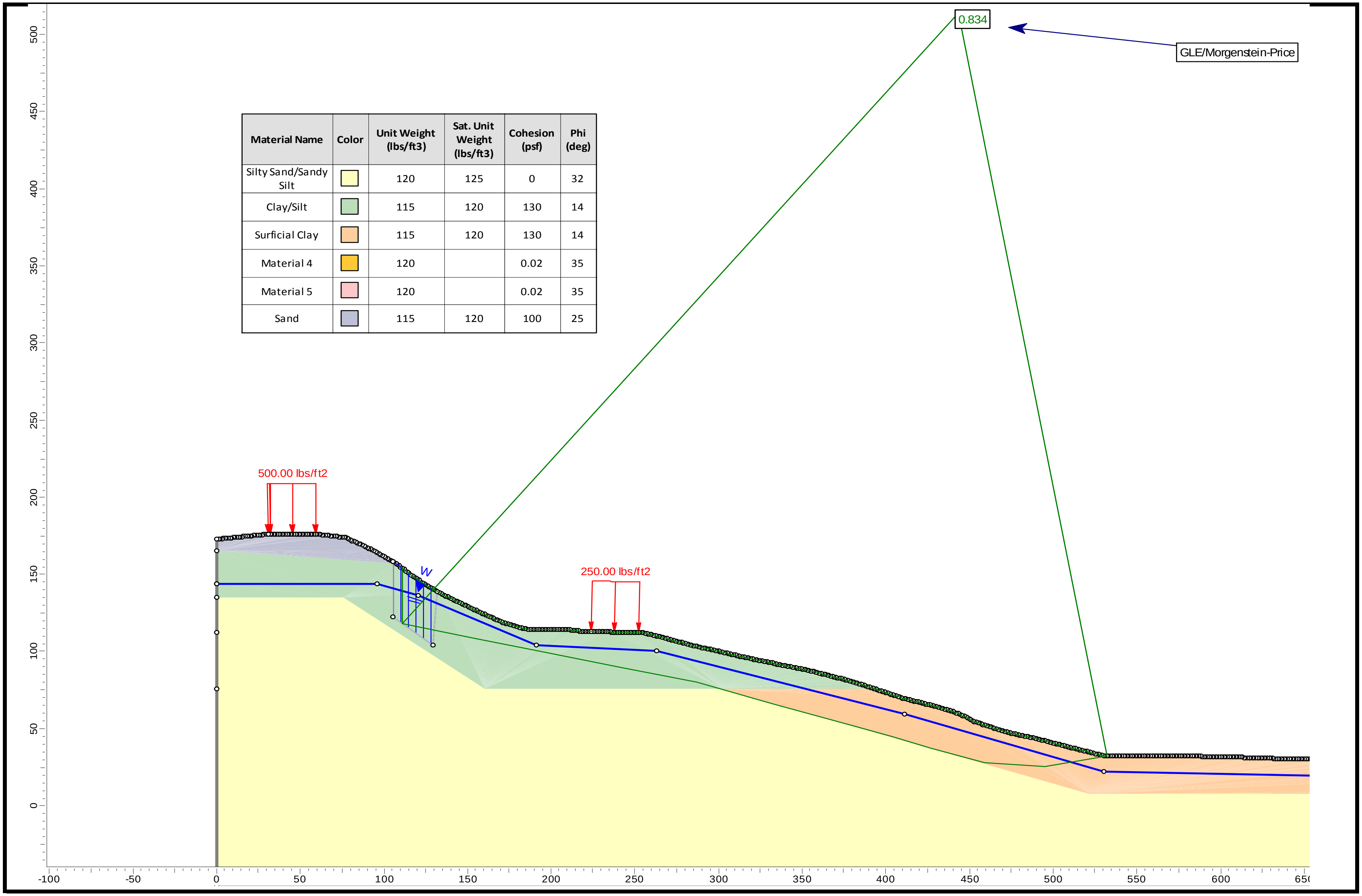
SLOPE STABILITY BACK CALCULATION- CASE D

PISCATAWAY DRIVE SLOPE FAILURE
PRINCE GEORGE'S COUNTY, MARYLAND

FIGURE

D-4



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Silty Sand/Sandy Silt	🟨	120	125	0	32
Clay/Silt	🟩	115	120	130	14
Surficial Clay	🟧	115	120	130	14
Material 4	🟨	120		0.02	35
Material 5	🟥	120		0.02	35
Sand	▨	115	120	100	25

Project Mgr:	KOA
Prepared by:	SS
Checked by:	KA
Approved by:	KOA

Project No.
07100627.W

Scale: n/a

Date: 5/19/2014

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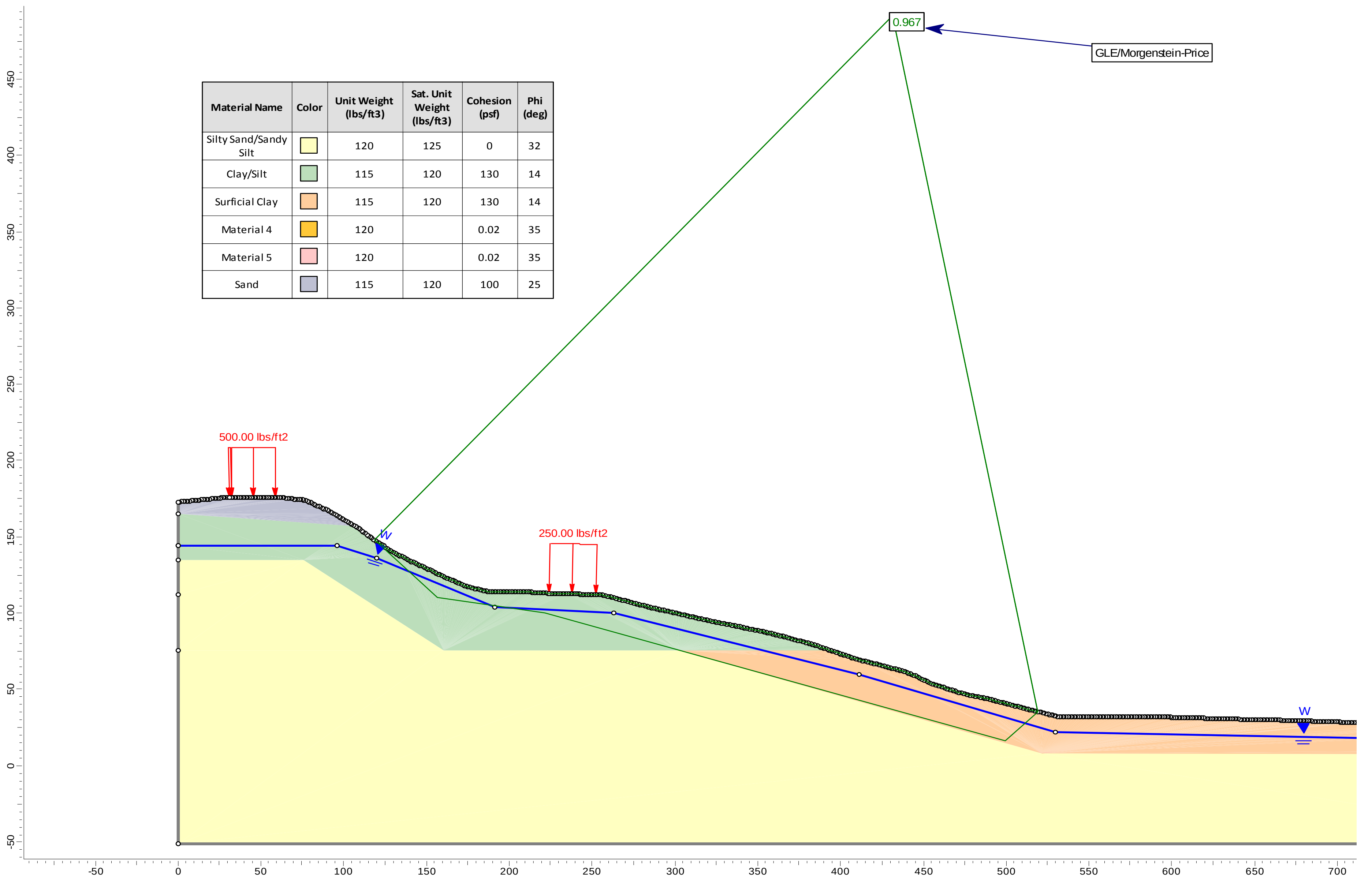
SLOPE STABILITY BACK CALCULATION- CASE E

PISCATAWAY DRIVE SLOPE FAILURE
PRINCE GEORGE'S COUNTY, MARYLAND

FIGURE
D-5



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Silty Sand/Sandy Silt	⬜	120	125	0	32
Clay/Silt	🟩	115	120	130	14
Surficial Clay	🟧	115	120	130	14
Material 4	🟨	120		0.02	35
Material 5	🟥	120		0.02	35
Sand	🟪	115	120	100	25

Project Mgr:	KOA
Prepared by:	SS
Checked by:	KA
Approved by:	KOA

Project No.
07100627.W

Scale: n/a

Date: 5/19/2014

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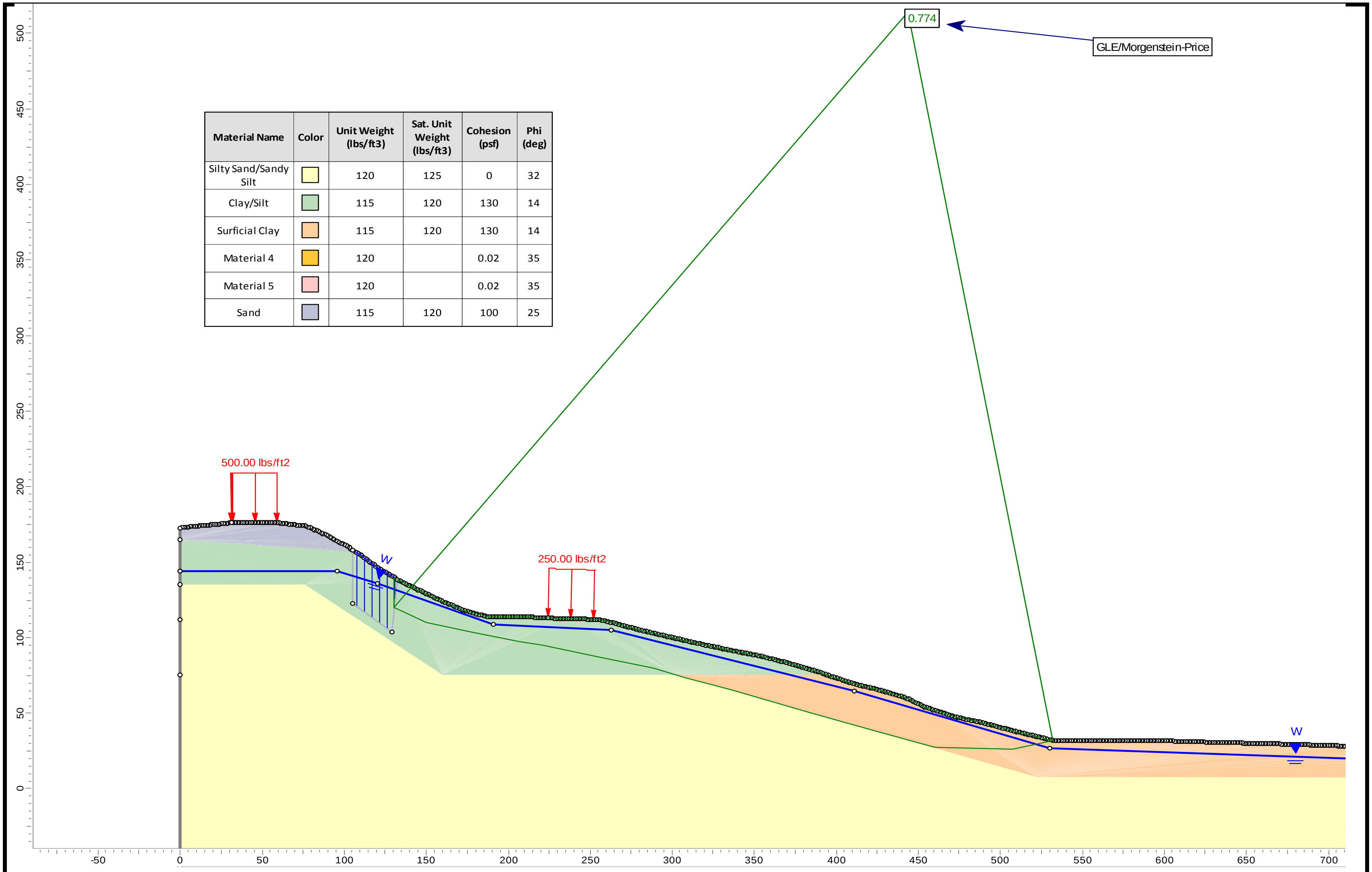
SLOPE STABILITY BACK CALCULATION- CASE F

PISCATAWAY DRIVE SLOPE FAILURE
PRINCE GEORGE'S COUNTY, MARYLAND

FIGURE
D-6



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Silty Sand/Sandy Silt	🟨	120	125	0	32
Clay/Silt	🟩	115	120	130	14
Surficial Clay	🟧	115	120	130	14
Material 4	🟨	120		0.02	35
Material 5	🟥	120		0.02	35
Sand	▨	115	120	100	25

Project Mgr:	KOA
Prepared by:	SS
Checked by:	KA
Approved by:	KOA

Project No.
07100627.W

Scale: n/a

Date: 5/19/2014

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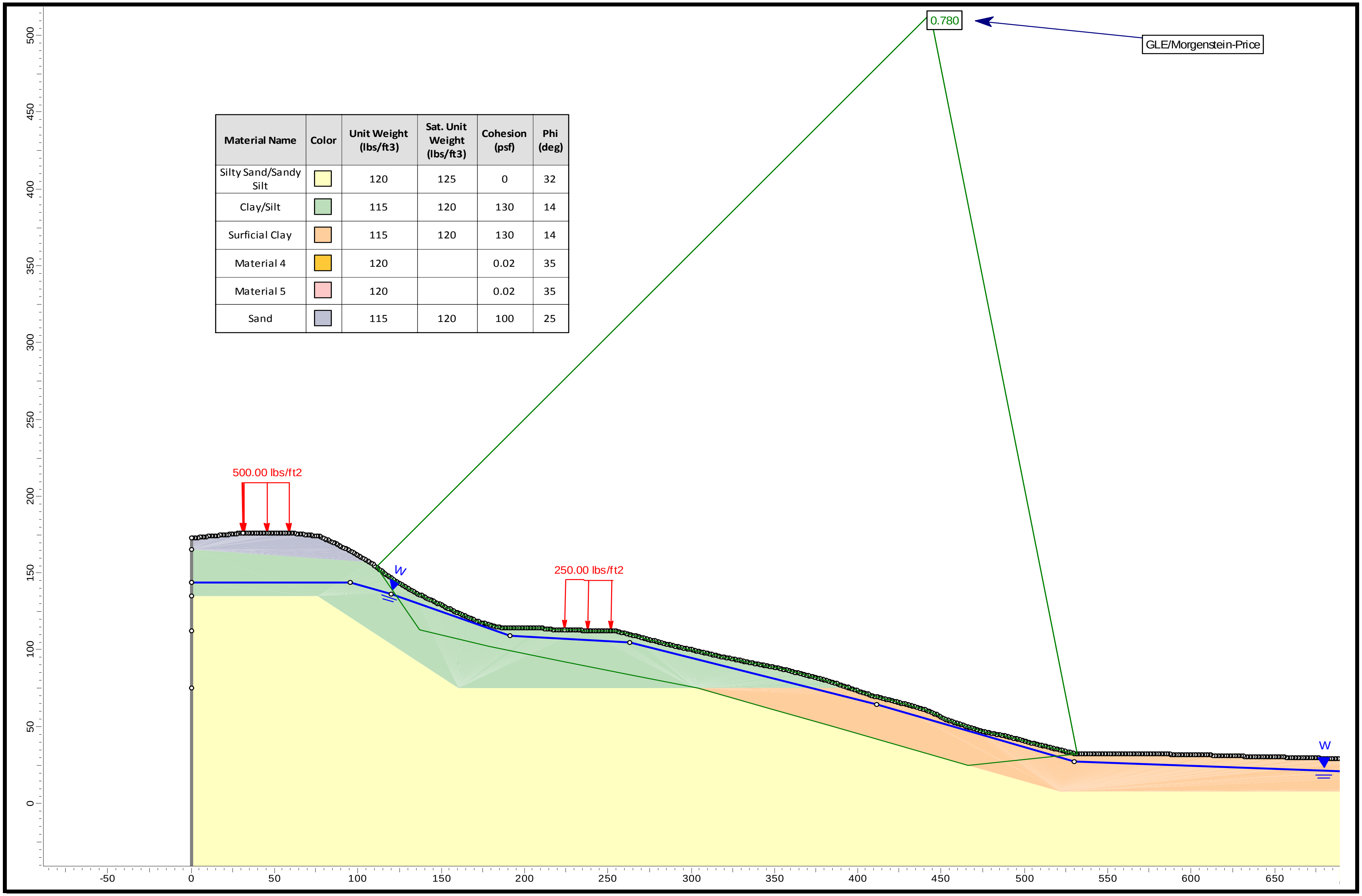
SLOPE STABILITY BACK CALCULATION- CASE G

PISCATAWAY DRIVE SLOPE FAILURE
PRINCE GEORGE'S COUNTY, MARYLAND

FIGURE

D-7



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Silty Sand/Sandy Silt	🟨	120	125	0	32
Clay/Silt	🟩	115	120	130	14
Surficial Clay	🟧	115	120	130	14
Material 4	🟨	120		0.02	35
Material 5	🟥	120		0.02	35
Sand	🟪	115	120	100	25

Project Mgr:	KOA
Prepared by:	SS
Checked by:	KA
Approved by:	KOA
Project No.	07100627.W
Scale:	n/a
Date:	5/19/2014

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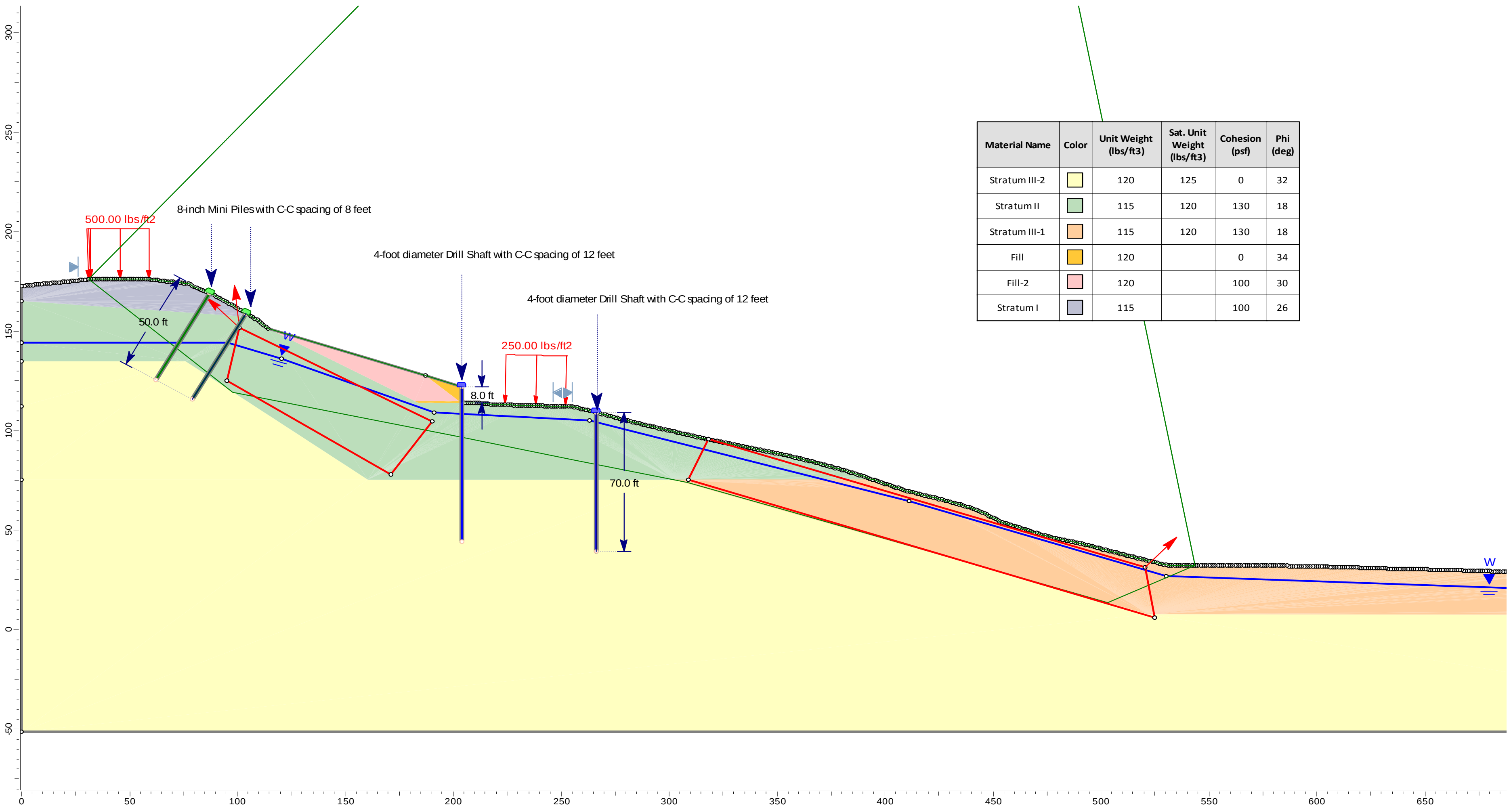
SLOPE STABILITY BACK CALCULATION- CASE H

PISCATAWAY DRIVE SLOPE FAILURE
PRINCE GEORGE'S COUNTY, MARYLAND

FIGURE

D-8

FS=1.51 GLE/Morgenstein-Price



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Stratum III-2	🟨	120	125	0	32
Stratum II	🟩	115	120	130	18
Stratum III-1	🟧	115	120	130	18
Fill	🟨	120		0	34
Fill-2	🟥	120		100	30
Stratum I	🟦	115		100	26

Project Mgr:	RSE
Prepared by:	SS
Checked by:	KJS
Approved by:	KJS

Project No.
07100627.W

Scale: n/a

Date: 5/19/2014

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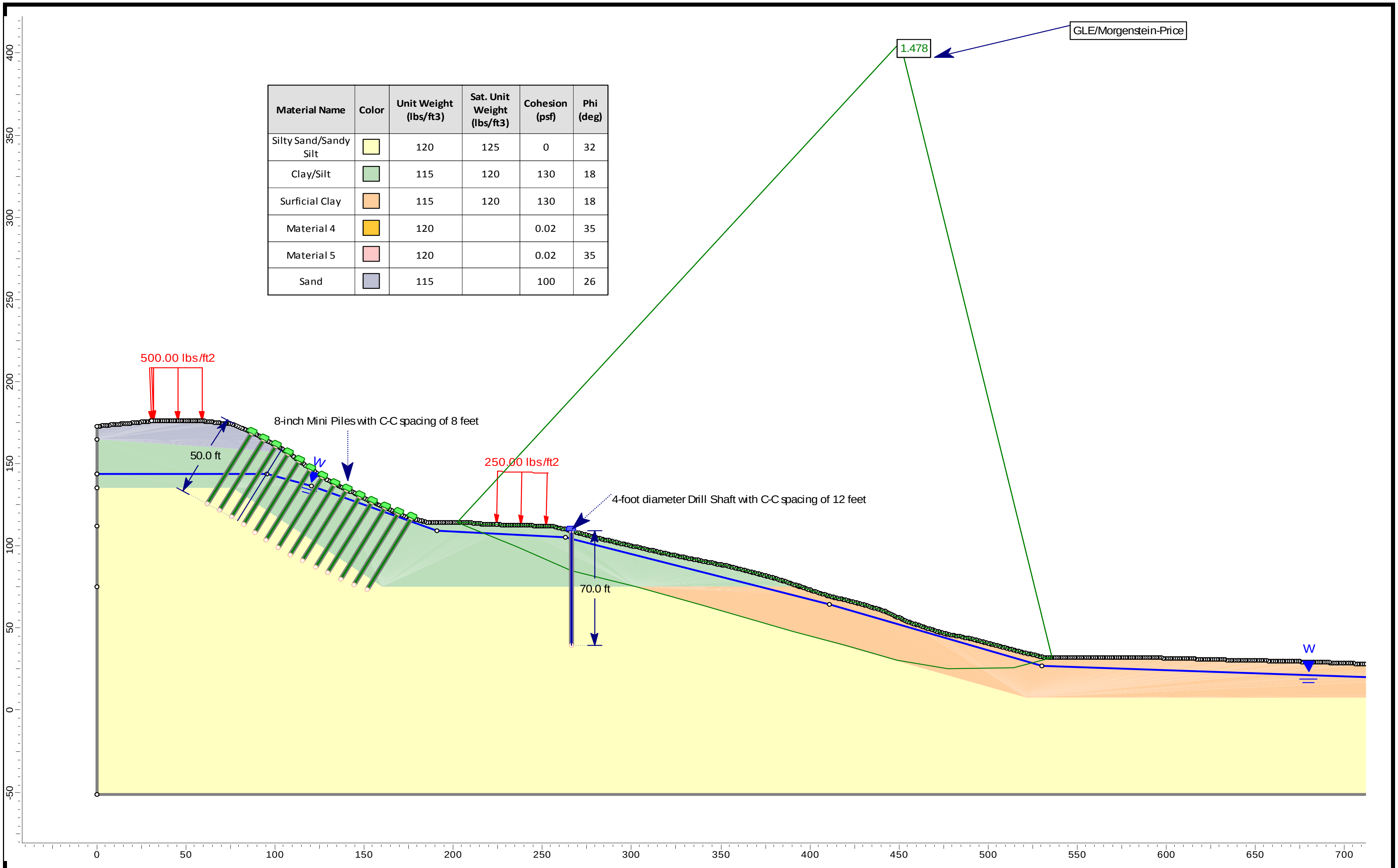
SLOPE STABILIZATION- OPTION 1

PISCATAWAY DRIVE SLOPE FAILURE
PRINCE GEORGE'S COUNTY, MARYLAND

FIGURE
D-9



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Silty Sand/Sandy Silt	🟨	120	125	0	32
Clay/Silt	🟩	115	120	130	18
Surficial Clay	🟧	115	120	130	18
Material 4	🟧	120		0.02	35
Material 5	🟥	120		0.02	35
Sand	🟪	115		100	26

Project Mgr:	KOA
Prepared by:	SS
Checked by:	KA
Approved by:	KOA

Project No. 07100627.W

Scale: n/a

Date: 5/19/2014

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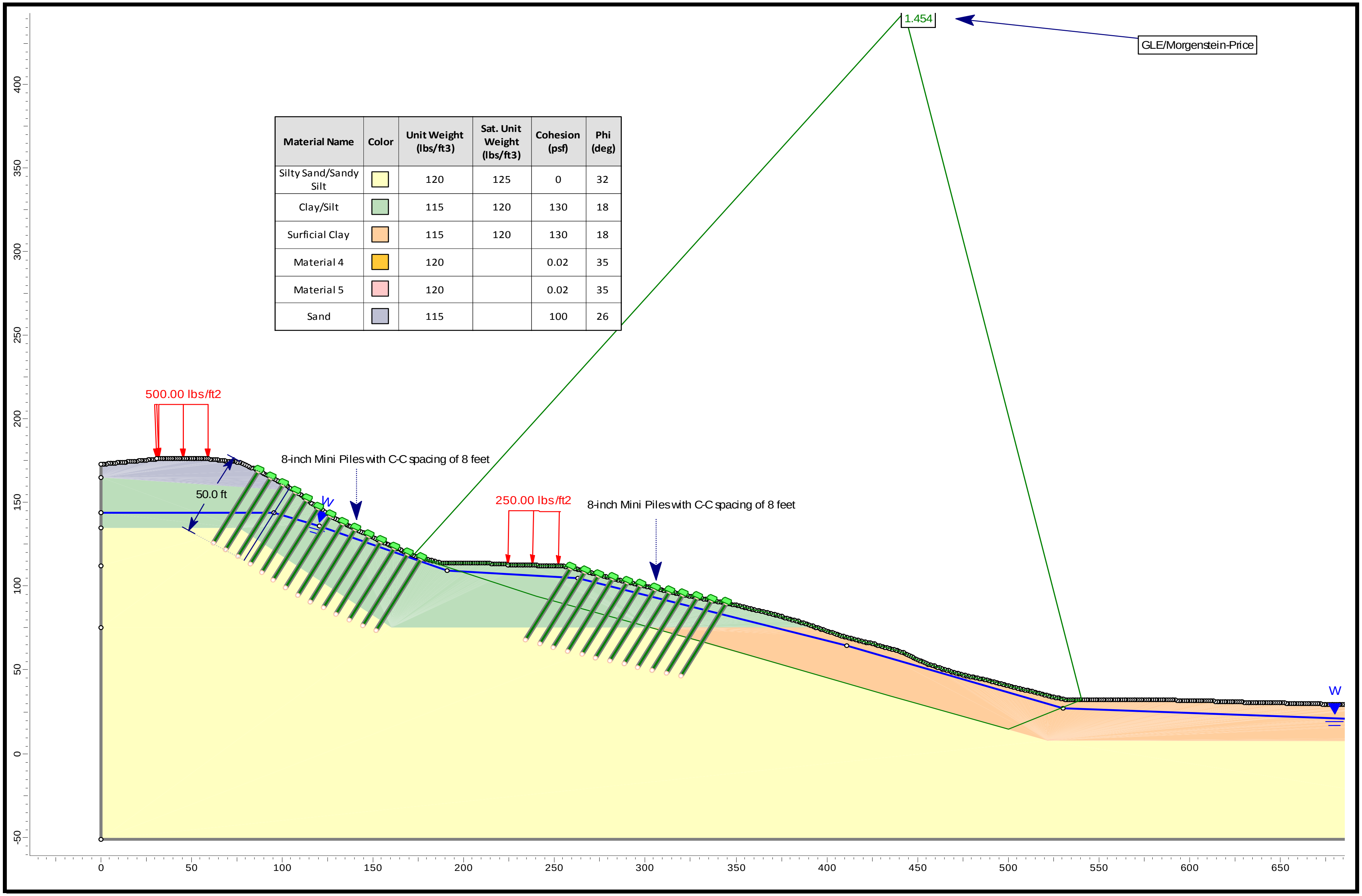
SLOPE STABILIZATION- OPTION 2

PISCATAWAY DRIVE SLOPE FAILURE
PRINCE GEORGE'S COUNTY, MARYLAND

FIGURE

D-10



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Silty Sand/Sandy Silt	🟨	120	125	0	32
Clay/Silt	🟩	115	120	130	18
Surficial Clay	🟧	115	120	130	18
Material 4	🟨	120		0.02	35
Material 5	🟥	120		0.02	35
Sand	🟪	115		100	26

Project Mgr:	KOA
Prepared by:	SS
Checked by:	KA
Approved by:	KOA

Project No.	07100627.W
Scale:	n/a
Date:	5/19/2014

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SLOPE STABILIZATION- OPTION 3

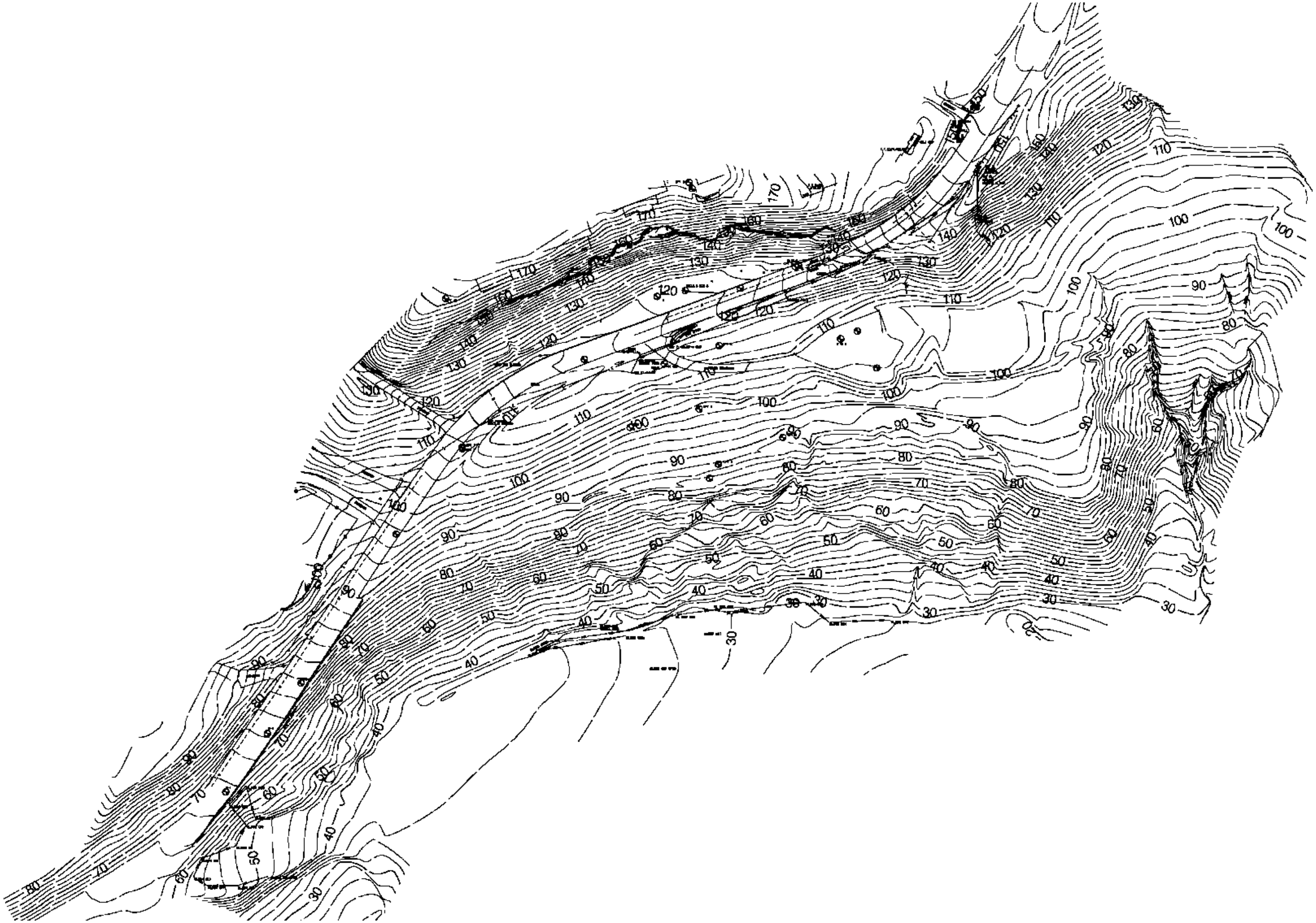
PISCATAWAY DRIVE SLOPE FAILURE
PRINCE GEORGE'S COUNTY, MARYLAND

FIGURE

D-11

SLIDE FEATURES

Appendix E



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EXISTING SITE CONTOURS

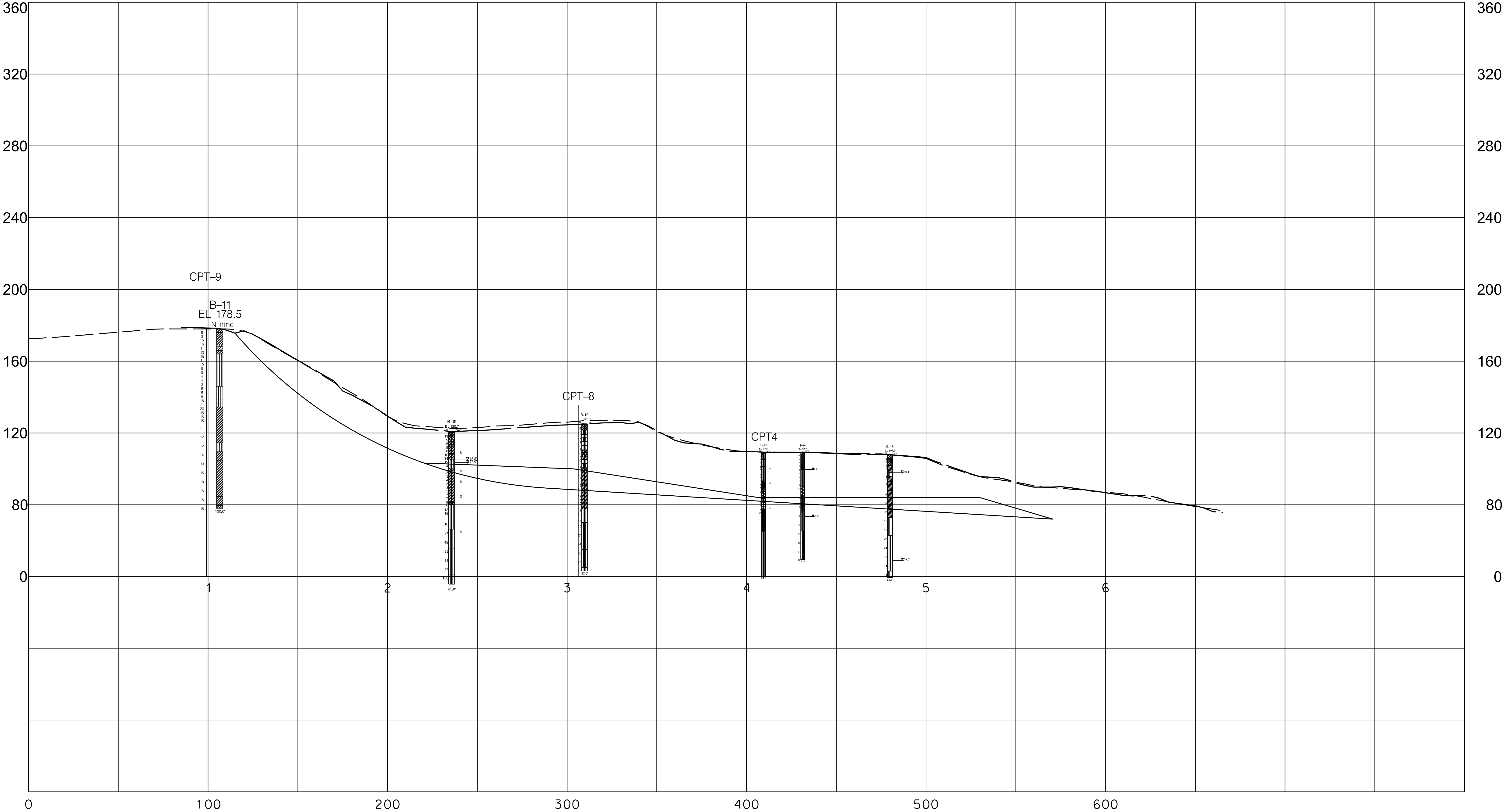
PISCATAWAY DRIVE SLOPE FAILURE

FORT WASHINGTON, PRINCE GEORGES COUNTY, MARYLAND

Figure No.

E-1

DRAWN BY	APPROVED BY	SCALE	DATE	KCI JOB NUMBER
LSG	KA	NTS	MAY 2014	07100627.W



USCS SOIL KEY

▨	GW	▨	SW	▥	ML	▤	OL
▨	GP	▨	SP	▥	MH	▨	OH
▨	GM	▨	SM	▨	CL	▦	FILL
▨	GC	▨	SC	▨	CH	▨	SANDSTONE

Title:

Piscataway Dr. Slope Failures

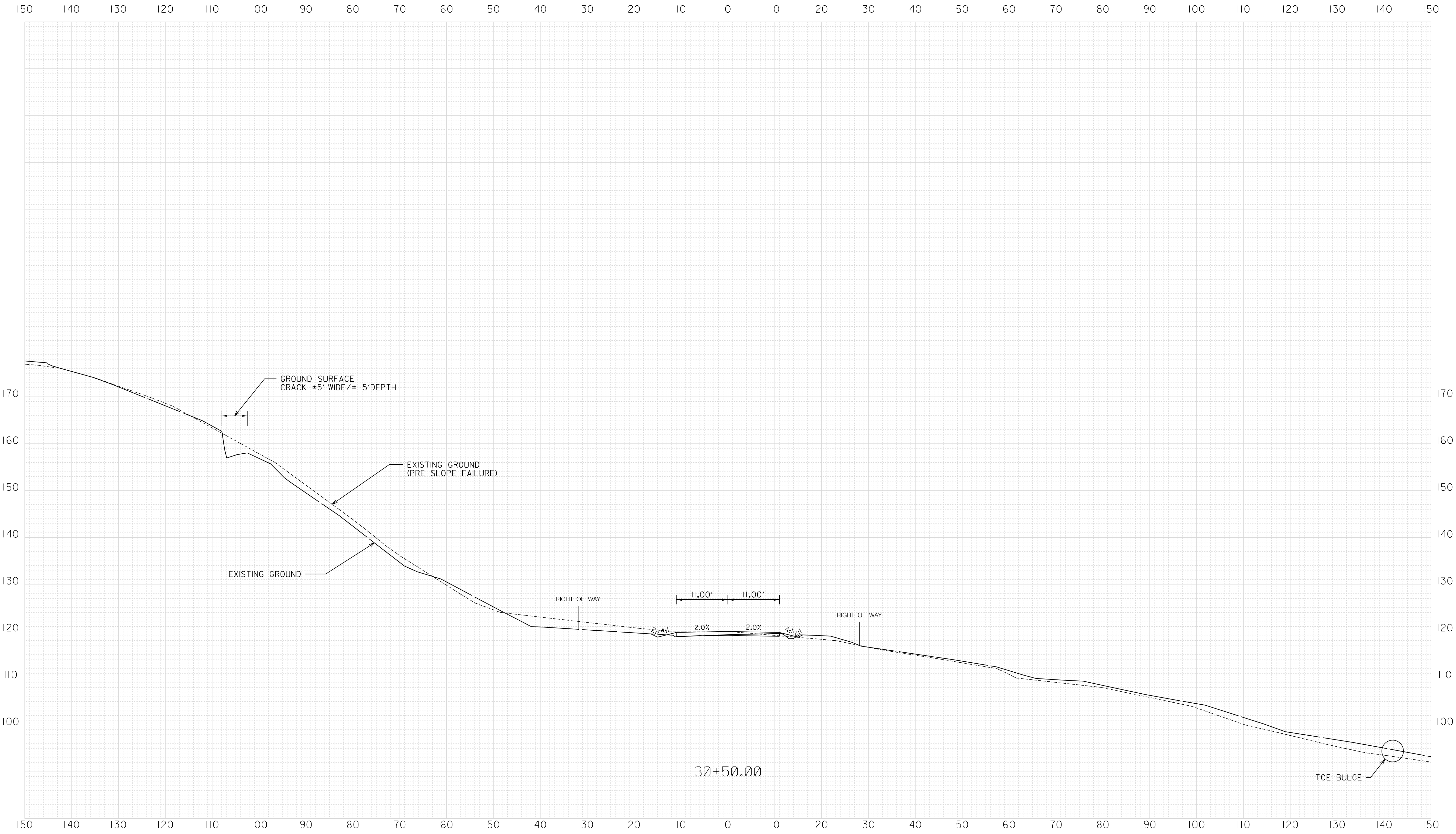
Figure No.

Drawn:

Approved:

Date: 5/18/14

KCI Job No. 07100627W



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FAX: (410) 316-7818

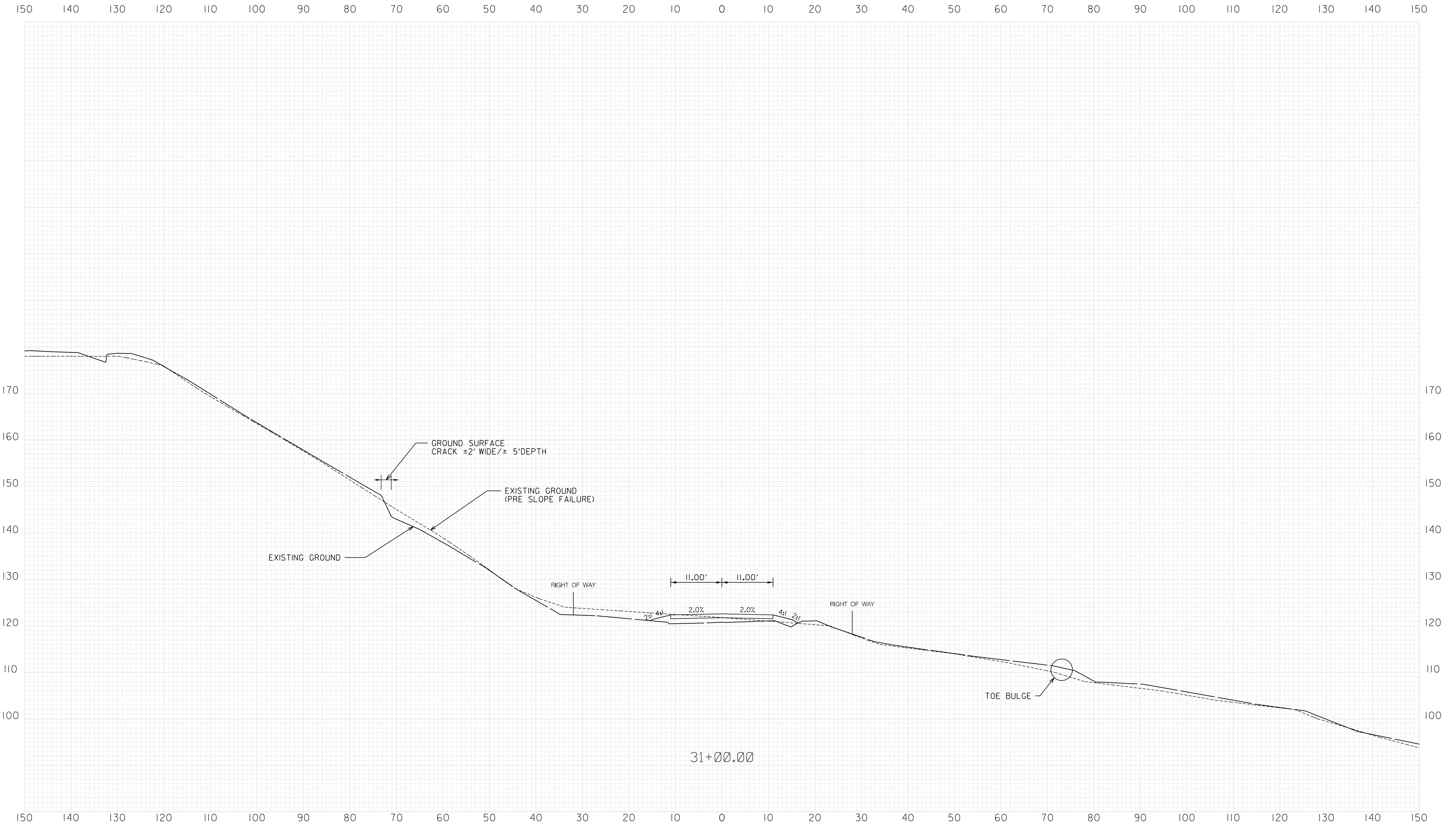
DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
PRINCE GEORGE'S COUNTY, MARYLAND

PISCATAWAY DRIVE
CS-1
CROSS SECTIONS

SCALE: 1"=10′
DWG. 1 OF 6
APPROVED
DATE
FOR DARRELL B. MOBLEY, DIRECTOR
DESIGNED: DKH
DRAWN: BBB
CHECKED: KTB
APPROVED:
CHIEF, DIV. OF HIGHWAYS & BRIDGES
DATE
CONTRACT NO.
XXX-XXX
ROAD NO.
JOB NO.
FILE NO.

Monday, May 19, 2014 AT 09:41 AM
M:\2010\07100627.W\Drawings\Roadway\pHC-X001_piscataway.dgn

PLOTTED: Monday, May 19, 2014 AT 09:41 AM
FILE: M:\2010\07100627.W\Drawings\Roadway\pHC-X001_piscataway.dgn



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Fax: (410) 316-7818

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

PRINCE GEORGE'S COUNTY, MARYLAND

PISCATAWAY DRIVE

CROSS SECTIONS

CS-2

SCALE: 1"=10'

DWG. 2 OF 6

APPROVED ____ DATE ____ FOR DARRELL B. MOBLEY, DIRECTOR

DESIGNED: DKH
DRAWN: BBB
CHECKED: KTB
APPROVED:
____ CHIEF, DIV. OF HIGHWAYS & BRIDGES ____ DATE

CONTRACT NO.
XXX-XXX

ROAD NO.
JOB NO.
FILE NO.

PLOTTED: Monday, May 19, 2014 AT 09:41 AM
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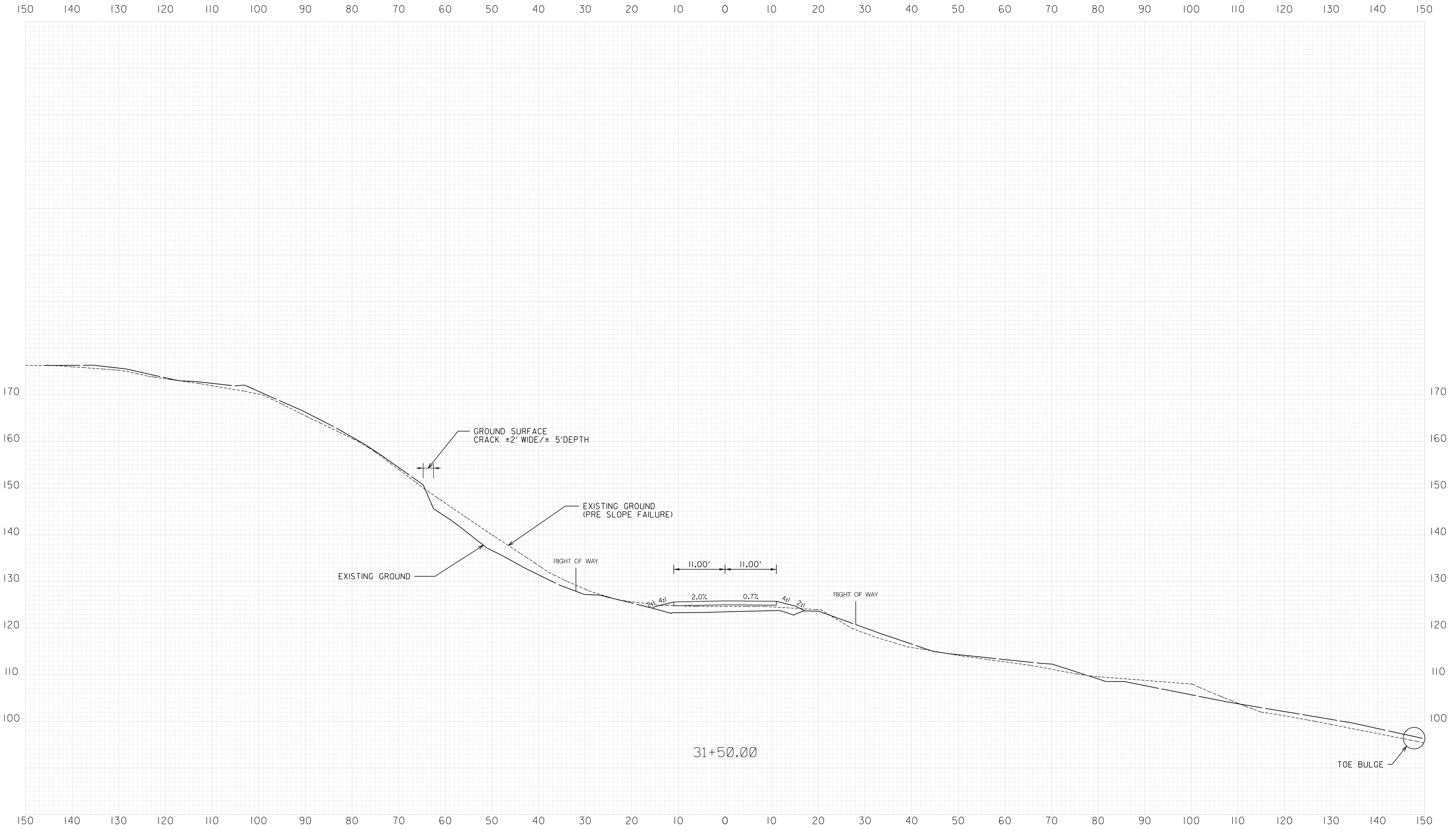

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PRINCE GEORGE'S COUNTY, MARYLAND

PISCATAWAY DRIVE
CROSS SECTIONS
CS-3

SCALE: 1"=10'
DWG. 3 OF 6

APPROVED
DATE
FOR DARRELL B. MOBLEY, DIRECTOR

DESIGNED: DKH
DRAWN: BBB
CHECKED: KTB
APPROVED:
CHIEF, DIV. OF HIGHWAYS & BRIDGES
DATE

CONTRACT NO.
XXX-XXX
ROAD NO.
JOB NO.
FILE NO.

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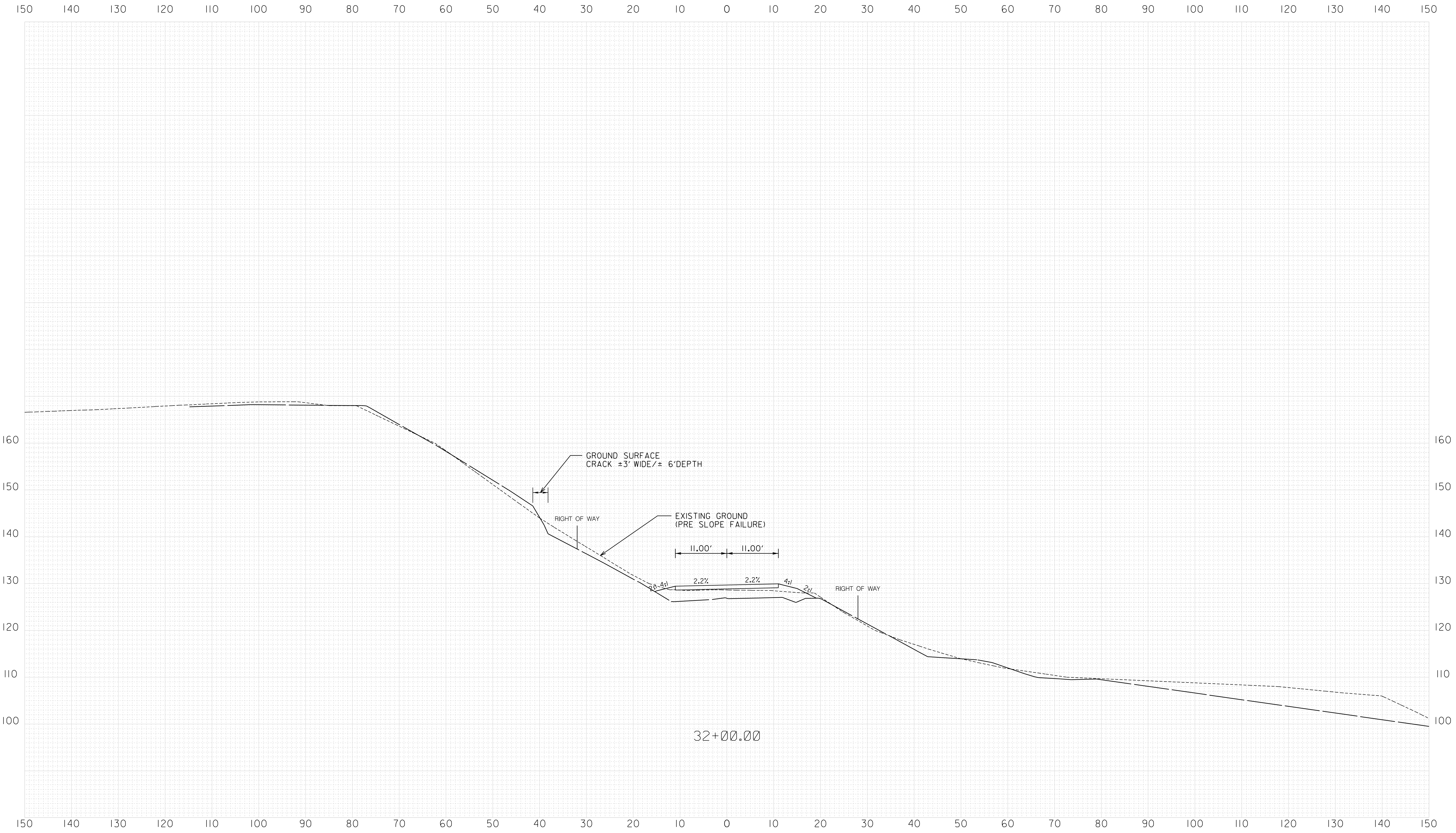

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Monday, May 19, 2014 AT 09:41 AM
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DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
PRINCE GEORGE'S COUNTY, MARYLAND

PISCATAWAY DRIVE
CS-4
CROSS SECTIONS

SCALE: 1"=10'
DWG. 4 OF 6

APPROVED
DATE
FOR DARRELL B. MOBLEY, DIRECTOR

DESIGNED: DKH
DRAWN: BBB
CHECKED: KTB
APPROVED:
CHIEF, DIV. OF HIGHWAYS & BRIDGES
DATE

CONTRACT NO.
XXX-XXX
ROAD NO.
JOB NO.
FILE NO.

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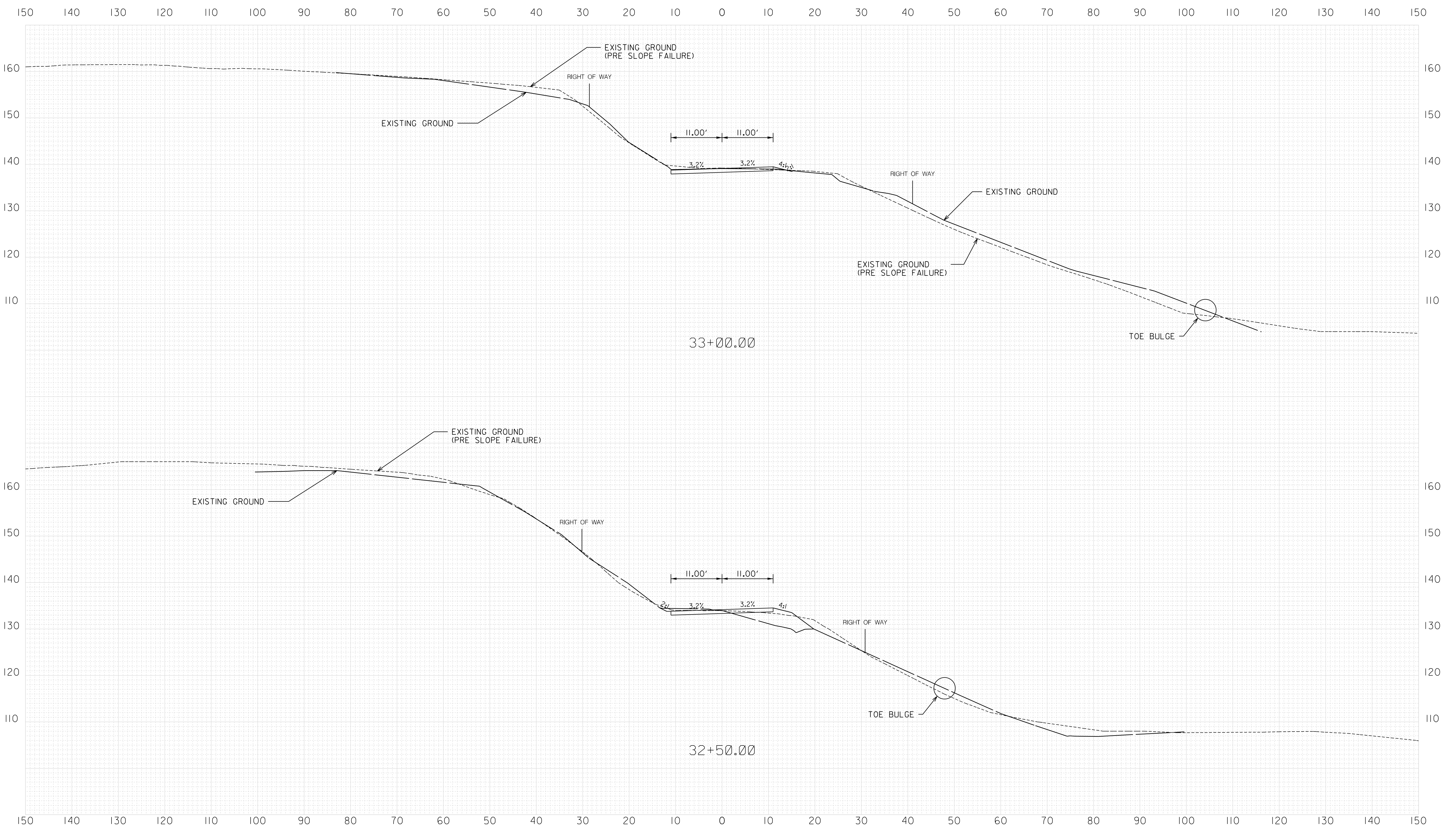

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DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
PRINCE GEORGE'S COUNTY, MARYLAND

PISCATAWAY DRIVE
CROSS SECTIONS
CS-5

SCALE: 1"=10'
DWG. 5 OF 6

APPROVED
DATE
FOR DARRELL B. MOBLEY, DIRECTOR

DESIGNED: DKH
DRAWN: BBB
CHECKED: KTB
APPROVED:
CHIEF, DIV. OF HIGHWAYS & BRIDGES
DATE

CONTRACT NO.
XXX-XXX
ROAD NO.
JOB NO.
FILE NO.

PLOTTED: Monday, May 19, 2014 AT 09:41 AM
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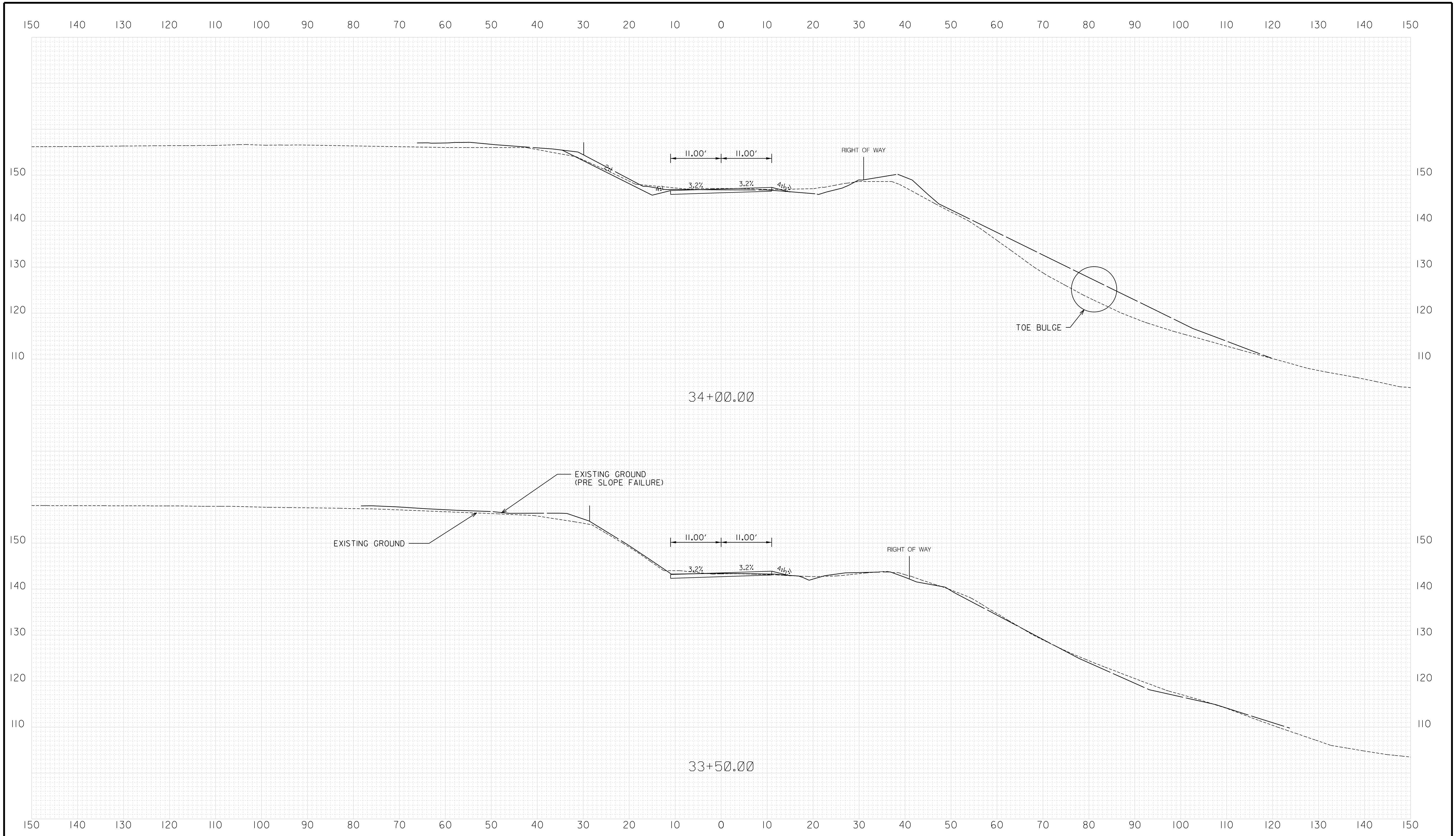

Monday, May 19, 2014 AT 09:42 AM
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DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
PRINCE GEORGE'S COUNTY, MARYLAND

PISCATAWAY DRIVE
CROSS SECTIONS

CS-6

SCALE: 1"=10'

DWG. 6 OF 6

APPROVED
DATE
FOR DARRELL B. MOBLEY, DIRECTOR

DESIGNED: DKH
DRAWN: BBB
CHECKED: KTB
APPROVED:
CHIEF, DIV. OF HIGHWAYS & BRIDGES
DATE

CONTRACT NO.
XXX-XXX
ROAD NO.
JOB NO.
FILE NO.

PLOTTED: Monday, May 19, 2014 AT 09:42 AM
FILE: M:\2010\07100627.W\Drawings\Roadway\pHC-X001_piscataway.dgn

ROADWAY PLANS

Appendix F

INDEX OF SHEETS

1	T–1	TITLE SHEET
2	AB–1	ABBREVIATIONS SHEET
3	TS–1	ROADWAY DETAIL&TYPICAL SECTION
4	GS–1	GEOMETRY SHEET
5–6	PS–1 TO PS–2	ROADWAY PLANS
7–8	PR–1 TO PR–2	ROADWAY PROFILES
1–6	CS–1 TO CS–6	ROADWAY CROSS SECTIONS

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
PRINCE GEORGE'S COUNTY, MARYLAND

ROADWAY IMPROVEMENTS
TO
PISCATAWAY DRIVE

CONTRACT NO.

PROJECT NO. XXX-XXX-XX
F.A.P. NO. BRF - XXXX (X) X

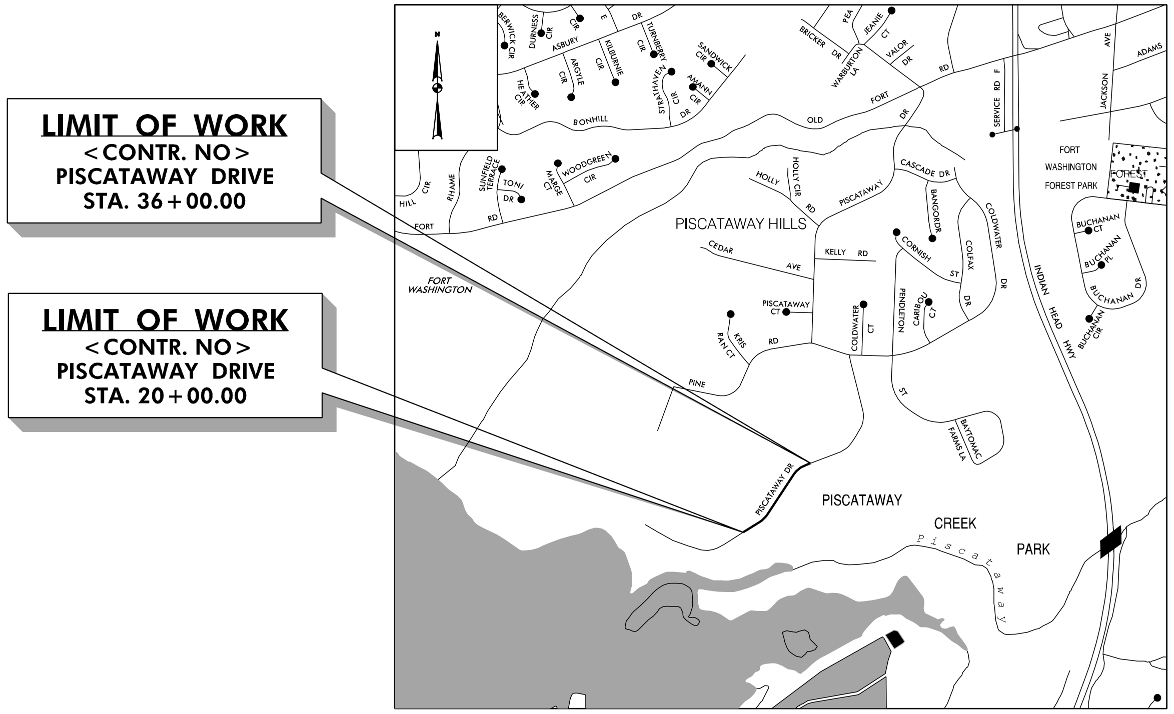
OWNER'S/DEVELOPER'S/APPLICANT INFORMATION

NAME:	PRINCE GEORGE'S COUNTY GOVERNMENT DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
ADDRESS:	INGLEWOOD CENTER 3 9400 PEPPERCORN PLACE, SUITE 310 LARGO, MD 20774
REPRESENTATIVE:	EDWARD J. BINSEEL CHIEF, HIGHWAYS & BRIDGES
PHONE:	(301) 883-5642

UTILITY CERTIFICATION

I HEREBY CERTIFY THAT THE EXISTING AND/OR PROPOSED UNDERGROUND UTILITY INFORMATION SHOWN HEREON HAS BEEN CORRECTLY DUPLICATED FROM UTILITY COMPANY RECORDS. FURTHER, THAT THIS PROJECT HAS BEEN CAREFULLY COORDINATED WITH EACH INVOLVED UTILITY COMPANY AND ALL AVAILABLE UNDERGROUND UTILITY INFORMATION RELATIVE TO THE PLAN HAS BEEN SOLICITED FROM THEM.

SIGNATURE: ____________________________ DATE: ___________________________



LOCATED IN PRINCE GEORGES COUNTY

LENGTH OF PROJECT = X.XXX MILES

VICINITY MAP
SCALE: 1"=1000'

ERROSION AND SEDIMENT CONTROL REGULATIONS WILL BE STRICTLY ENFORCED DURING CONSTRUCTION

	INSPECTION BY DPW&T
STORM DRAIN SYSTEM *S.D.PIPES* *S.D.FLOOD CONTROL* *WATER QUALITY SYSTEM* *INFILTRATION* *RETENTION POND* *BIORETENTION* *LOW IMPACT DEVELOPMENT* *EXT.DET.POND* *UNDERGROUND STORAGE* *GRASS SWALE W/ CHECK DAMS* *OTHERS*	

*SD * XXXXX - XXXX - XX*

PROJECT NAME ______________________

PRINCE GEORGE'S COUNTY, MD.

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION, OFFICE OF ENGINEERING

APPROVED for Stormwater Management and Storm Drain Only

______________________ *Date*

(✓) *Public stormdrain/SWM system permits required prior to construction*

( ) *Private stormdrain/SWM system A recorded maintenance agreement is required*

(✓) *Preconstruction meeting is required for all DPW&T inspected stormwater management/storm drain systems. Call (301) 952-4914 to arrange.*

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.

License No. ______________, Expiration Date: _________.

HORIZONTAL DATUM	NAD 83 /91
VERTICAL DATUM	NAVD 88

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T – 1

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
PRINCE GEORGE'S COUNTY, MARYLAND

PISCATAWAY DRIVE

TITLE SHEET

SCALE: AS SHOWN DWG. 1 OF 8

APPROVED ____________ DATE ____________ FOR Darrell B. Mobley, DIRECTOR

DESIGNED: DKH		CONTRACT NO. xxx–x(x)	
DRAWN: BBB			
CHECKED: KTB		ROAD NO.	JOB NO.
APPROVED:		FILE NO.	
CHIEF, HIGHWAYS AND BRIDGES	DATE		

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ABBREVIATIONS

A.A.S.H.T.O.	American Association of State Highway Transportation Officials
ADT	Average Daily Traffic
AHD	Ahead
APPROX.	Approximate
BL or B/L	Baseline
BK	Back /Book
BIT.	Bituminous
B.C.	Bituminous Concrete
B.M.	Bench Mark
BOT.	Bottom
C.C.	Center of Curve
CATV	Cable Television
C.B.R.	California Bearing Ratio
℄ or C/L	Centerline
CL.	Class
CLF	Chainlink Fence
CMP	Corrugated Metal Pipe
C.O.	Cleanout
COMB.	Combination
CONC.	Concrete
CONSTR.	Construction
COR.	Corner
CORR.	Correction
C.Y.	Cubic Yard
DC	Degree of Curve
D.H.V.	Design Hourly Volume
D.I.	Drop Inlet
DIA.	Diameter
D.O.	Double Opening
E	East
E	Electric
E	External Distance
EA.	Each
E.B.	Eastbound
ELEV.	Elevation
E.R.C.C.P.	Elliptical Reinforced Cement Concrete Pipe
ES	End Section
EX. or EXIST.	Existing
FT.	Feet
F or FL	Flowline
F.B.D.	Flat Bottom Ditch
F.H.	Fire Hydrant
FWD.	Forward
G	Gas
G.V.	Gas Valve
H.B.	Handbox
H.D.P.	High Density Polyetheylene
HDWL.	Headwall
H.E.R.C.P.	Horizontal Ellipitical Reinforced Concrete Pipe
HP	High Point
IN	Inch
I.S.T.	Inlet Sediment Trap
INV.	Invert
J.B.	Junction Box
K	K Inlet
L	Length
L.F.	Linear Feet
L.L.	Liquid Limit
LP	Low Point
L.P.	Light Pole
LT.	Left
MAC.	Macadam
M.C.	Moisture Content
MAX.	Maximum
M.D.D.	Maximum Dry Content
MOD.	Modified
MIN.	Minimum
N	North
N.B.	Northbound
N.E.	Northeast
N.P.	Non–Plastic
O.C.	On Center
OHE	Overhead Electric
O.M.	Optimum Moisture
PAV'T.	Pavement
P.C.	Point of Curvature
P.C.C.	Point of Compound Curvature
P/C	Point of Crown
P/GE	Profile Grade Elevation
P.G.E.	Profile Ground Elevation
P.G.L.	Profile Grade Line
P/GL	Profile Ground Line
P/R	Point of Rotation
P.I.	Plasticity Index
P.I.	Point of Intersection
P.O.B.	Point of Beginning
P.O.C.	Point On Curve
P.O.E.	Point of End
P.O.T.	Point On Tangent
PROP.	Proposed
P.R.C.	Point of Reverse Curve
PT.	Point
P.T.	Point of Tangency
P.V.C.	Point of Vertical Curve
PVC	Polyvinyl Chloride
PVI	Point of Vertical Intersection
PVRC	Point of Vertical Reverse Curve
PVT	Point of Vertical Tangency
R	Radius
R.F.	Rock Fragments
RT.	Right
RW or R/W	Right of Way
R.C.P.	Reinforced Cement Pipe
R.C.C.P.	Reinforced Cement Concrete Pipe
R.Q.D.	Rock Quality Designation
R.M.	Rootmat
S	South
SAN.	Sanitary Sewer
SB or S/B	Southbound
S.D.	Storm Drain
S.D.D.	Surface Drain Ditch
S/E	Super Elevation
SF	Silt Fence
S.F.	Square Feet
SHT.	Sheet
S.P.P.	Structural Plate Pipe
S.P.T.	Standard Penetration Testing
SSD	Stopping Sight Distance
SSF	Super Silt Fence
STD.	Standard
STA.	Station
SO.	Single Opening
S.Y.	Square Yards
SWM	Stormwater Management
T	Tangent
T	Telephone
T.C.	Top of Cover
T.G.	Top of Grate
T or TL	Traverse Line
T.M.	Top of Manhole
TRAV.	Traverse
TS	Temporary Swale
T.S.	Top of Slab
T.S.	Topsoil
TYP.	Typical
U.D.	Under Drain
U.G.	Underground
U.P.	Utility Pole
U.S.D.A.	United States Department of Agriculture
VCL	Vertical Clearance
V.C.L.	Vertical Curve Length
W	Water
W	West
W.B.	Westbound
WB	Wetland Buffer
W.M.	Water Meter
W.S.	Wrapped Steel
WUS	Waters of the United States
W.V.	Water Valve

SOILS LEGEND

SOILS LEGEND

⁙	A-3 SAND
⁘	A-2 SAND & FINES
▨	A-2-4 SILTY SAND
▨	A-4-2 SANDY SILT
⁘	A-2-7 CLAYEY SAND
⁘	A-7-2 SANDY CLAY
▨	A-4 SILT
▨	A-4-7 CLAYEY SILT
▨	A-7-4 SILTY CLAY
⊞	A-7 CLAY
⊞	A-6 COLLOIDAL CLAY
▧	A-5 MICA, DIATOMS

◕ PLAN LOCATION OF SOIL BORINGS

BORING TARGETS AND PROFILES SCALE:
HORIZONTAL - NONE
VERTICAL - SEE PROFILE SHEETS

AO-ABOVE OPTIMUM
SAT-SATURATED
LIQ-LIQUEFIED

TS-TOPSOIL
RM-ROOT MAT
BC-BITUMINOUS CONCRETE
SB-STONE BASE
PCC-PORTLAND CEMENT CONCRETE
RPPSA - ROCK PENETRATED BY POWER SOIL AUGER

LL-LIQUID LIMIT (%)
PI-PLASTICITY INDEX (%)
NP-NON-PLASTIC
MDD-MAXIMUM DRY DENSITY (pcf)
OMC-OPTIMUM MOISTURE CONTENT (%)
USC-UNIFIED SOIL CLASSIFICATION
USDA-UNITED STATES DEPARTMENT OF AGRICULTURE CLASSIFICATION

w/GR-WITH GRAVEL
w/RF-WITH ROCK FRAGMENTS

NOTES: SOIL SYMBOLS DENOTE MSMT CLASSIFICATIONS

ALL DIMENSIONS, DEPTHS AND ELEVATIONS ARE NOTED IN FEET

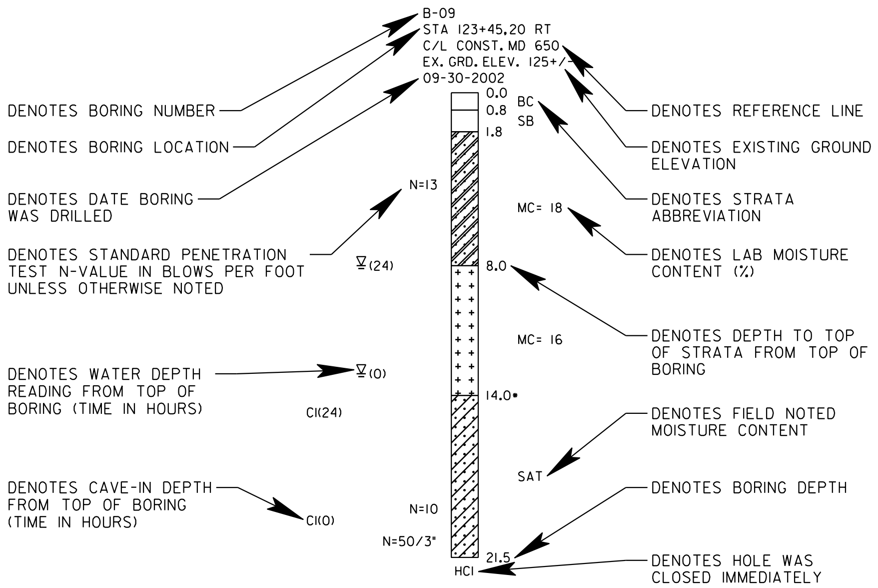
AN ASTERISK AT THE TOP DEPTH OF STRATA INDICATES THAT STRATA WAS VISUALLY CLASSIFIED BY DRILLER

MDD & OMC PER A.A.S.H.T.O. DESIGNATION T-180

N PER A.A.S.H.T.O. DESIGNATION T-206

UNLESS OTHERWISE NOTED ON PLANS, ALL SOIL SURVEY BORINGS FOR ROADWAY CONSTRUCTION WERE LEFT OPEN FOR 24 HOURS WITH NO EXCESS MOISTURE OR FREE WATER ENCOUNTERED DURING TIME OF SOIL SURVEY (SOIL AND SWM BORINGS IN SEPTEMBER 2012)

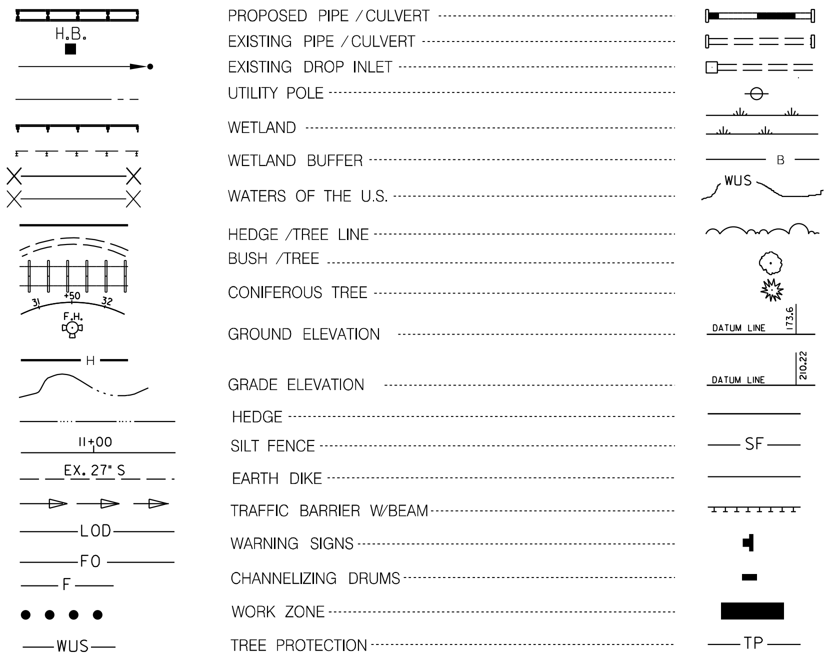
EXAMPLE SOIL BORING PROFILE



SOILS TEST DATA								
BORING NUMBER	SAMPLE DEPTH	LL	PI	USDA	USC	MDD	OMC	REMARKS
B-09	1.8 - 8.0	18	NP	SANDY LOAM	-	-	-	w/GR
B-09	8.0 - 14.0	41	22	SILTY CLAY LOAM	CL	121	12	-

CONVENTIONAL SIGNS

(SAMPLES)



PROPOSED MEDIAN BARRIER	PROPOSED PIPE / CULVERT
ELECTRICAL HAND BOX – SIGNALS	EXISTING PIPE / CULVERT
FLOW LINE	EXISTING DROP INLET
STATE, COUNTY OR CITY LINES	UTILITY POLE
PROPOSED TRAFFIC BARRIER	WETLAND
EXISTING TRAFFIC BARRIER	WETLAND BUFFER
PROPOSED FENCE LINE	WATERS OF THE U.S.
EXISTING FENCE LINE	HEDGE /TREE LINE
RIGHT OF WAY LINE	BUSH /TREE
EXISTING ROADWAY	CONIFEROUS TREE
RAILROAD	GROUND ELEVATION
BASE LINE OR SURVEY LINE	GRADE ELEVATION
FIRE HYDRANT	HEDGE
HISTORIC BOUNDARY	SILT FENCE
WATERS OF THE U.S.	EARTH DIKE
PROPERTY LINE	TRAFFIC BARRIER W/BEAM
BASELINE CONSTRUCTION	WARNING SIGNS
EXISTING SEWER LINE	CHANNELIZING DRUMS
DRY SWALE	WORK ZONE
LIMIT OF DISTURBANCE	TREE PROTECTION
FIBER OPTIC CABLE	
FILL	
WETLAND BOUNDARY	
WUS BOUNDARY	

LEGEND

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REVISIONS

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
PRINCE GEORGE'S COUNTY, MARYLAND

PISCATAWAY DRIVE
AB-1

ABBREVIATIONS SHEET

SCALE: N/A
DWG. 2 OF 8

APPROVED
DATE
FOR DARRELL B. MOBLEY, DIRECTOR

DESIGNED: DKH
DRAWN: BBB
CHECKED: KTB
APPROVED:
CHIEF, DIV. OF HIGHWAYS & BRIDGES
DATE

CONTRACT NO.
XXX-XXX
ROAD NO.
JOB NO.
FILE NO.

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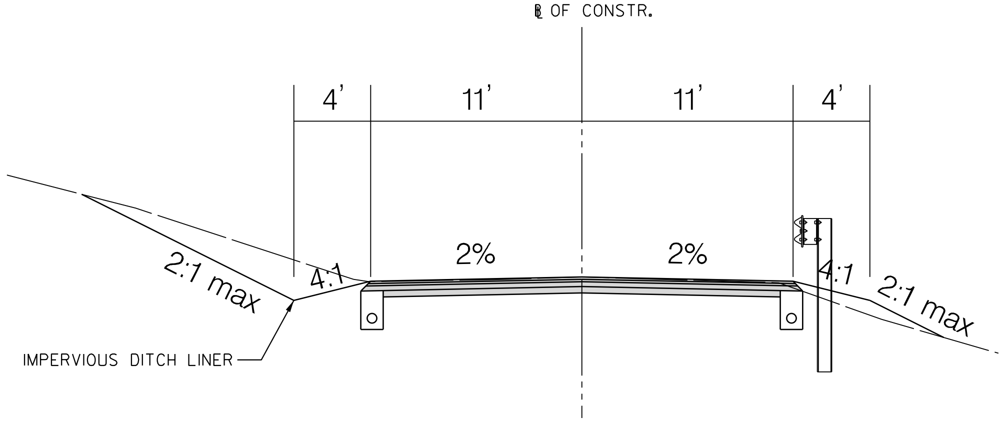
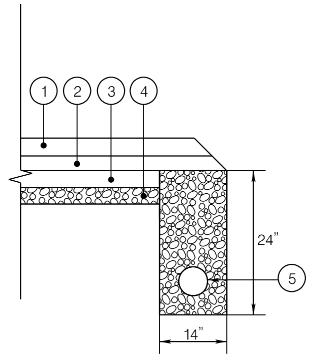


TYPICAL SECTION
PISCATAWAY DRIVE

STA. 20+00.00 TO STA. 35+00.00

NOTE:
EXISTING BITUMINOUS CURB IS PRESENT IN SOME AREAS AND A 4' SHOULDER FROM APPROXIMATLY STA. 21+50 TO 25+00.



PAVEMENT DETAIL

PAVEMENT LEGEND

①	1.5"	HOT–MIX ASPHALT SUPERPAVE 9.5mm FOR SURFACE, PG 64–22, LEVEL–2
②	1.5"	HOT–MIX ASPHALT SUPERPAVE 9.5mm, PG 64–22, LEVEL–2
③	3.0"	HOT–MIX ASPHALT SUPERPAVE BASE, 19.0mm, PG 64–22, LEVEL–2
④	4.0"	GRADED AGGREGATE SUBBASE
⑤		6" LONGITUDINAL UNDERDRAIN (STD. 300.14, GEOTEXTILE FABRIC TO BE MSMT CLASS SD TYPE II OR APPROVED EQUAL.

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
PRINCE GEORGE'S COUNTY, MARYLAND

PISCATAWAY DRIVE
TS–1

TYPICAL SECTIONS

SCALE: N.T.S.
DWG. 3 OF 8

APPROVED
DATE
FOR DARRELL B. MOBLEY, DIRECTOR

DESIGNED: DKH
DRAWN: BBB
CHECKED: KTB
APPROVED:
CHIEF, DIV. OF HIGHWAYS & BRIDGES
DATE

CONTRACT NO.
XXX-XXX
ROAD NO.
JOB NO.
FILE NO.

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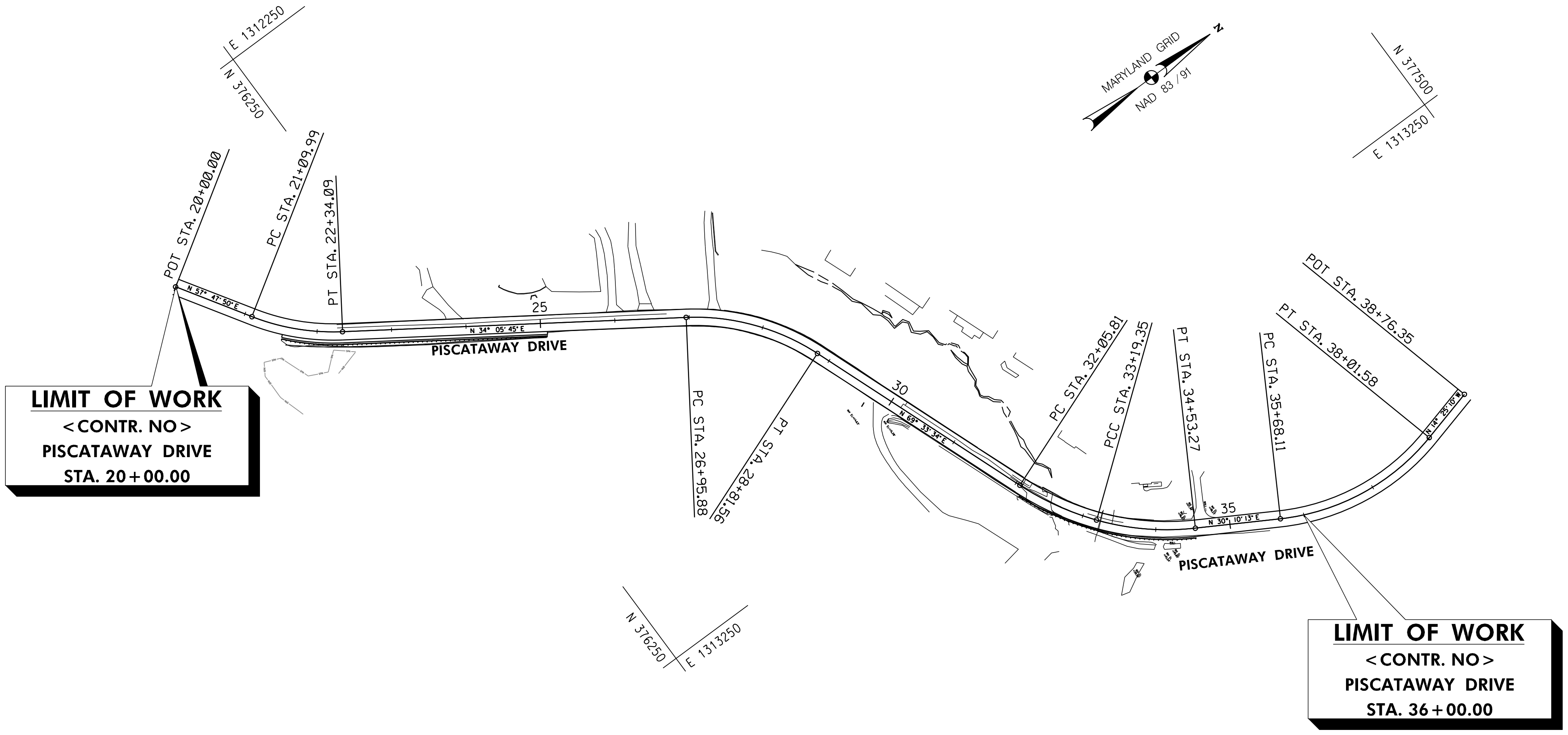

CURVE DATA

CURVE	DELTA	Dc	RADIUS	TANGENT	LENGTH	EXTERNAL
PISC-1	23° 42'04.96"	19° 05'54.94"	300.0000'	62.9503'	124.1001'	6.5334
PISC-2	35° 27'48.56"	19° 05'54.94"	300.0000'	95.9254'	185.6864'	14.9630'
PISC-3	17° 20'47.70"	14° 41'28.41"	390.0000	115.0324'	223.7210"	16.6109"
PISC-4	22° 02'33.23"	16° 27'33.821"	348.1038'	57.2042'	113.5331'	4.3380'
PISC-5	44° 35'22.67"	19° 05'54.94"	300.0000'	123.0073'	233.4708'	24.2388'

LOCATION	CURVE	STATION		NORTH	EAST	BEARING
PISCATAWAY DRIVE	PISC-1	POT	20+00.00	376,006.4903	1,312,449.6269	N57° 47'50.00"E
		PC	21+09.99	376,065.1084	1,312,542.7008	
		PI	21+72.95	376,098.6557	1,312,595.9673	
		PT	22+34.09	376,150.7849	1,312,631.2559	
	PISC-2	PC	26+95.88	376,533.1885	1,312,890.1222	N34° 05'45.04"E
		PI	27+91.80	376,612.6244	1,312,943.8959	
		PT	28+81.56	376,646.1251	1,313,033.7813	
	PISC-3	PC	32+05.81	376,759.3651	1,313,337.6144	N69° 33'33.60"E
		PI	32+63.02	376,779.3430	1,313,391.2167	
		PT	33+19.35	376,814.3937	1,313,436.4246	
	PISC-4	PC	33+19.35	376,814.3937	1,313,436.4246	N52° 12'45.91"E
		PI	33+87.15	376,855.9361	1,313,490.0054	
		PT	34+53.27	376,914.5506	1,313,524.0790	
	PISC-5	PC	35+68.11	377,013.8360	1,313,581.7953	N30° 10'12.67"E
		PI	36+91.12	377,120.1803	1,313,643.6151	
		PT	38+01.58	377,239.3126	1,313,612.9840	S76° 19'25"E
		POT	38+76.35	377,311.7291	1,313,594.3644	

0 100 200

SCALE: 1" = 100'

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
PRINCE GEORGE'S COUNTY, MARYLAND

PISCATAWAY DRIVE
GS-1

GEOMETRIC LAYOUT SHEET

SCALE: 1" = 100'
DWG. 4 OF 8

APPROVED
DATE
FOR DARRELL B. MOBLEY, DIRECTOR

DESIGNED: DKH
DRAWN: BBB
CHECKED: KTB
APPROVED:
CHIEF, DIV. OF HIGHWAYS & BRIDGES
DATE

CONTRACT NO.
XXX-XXX
ROAD NO.
JOB NO.
FILE NO.

REVISIONS

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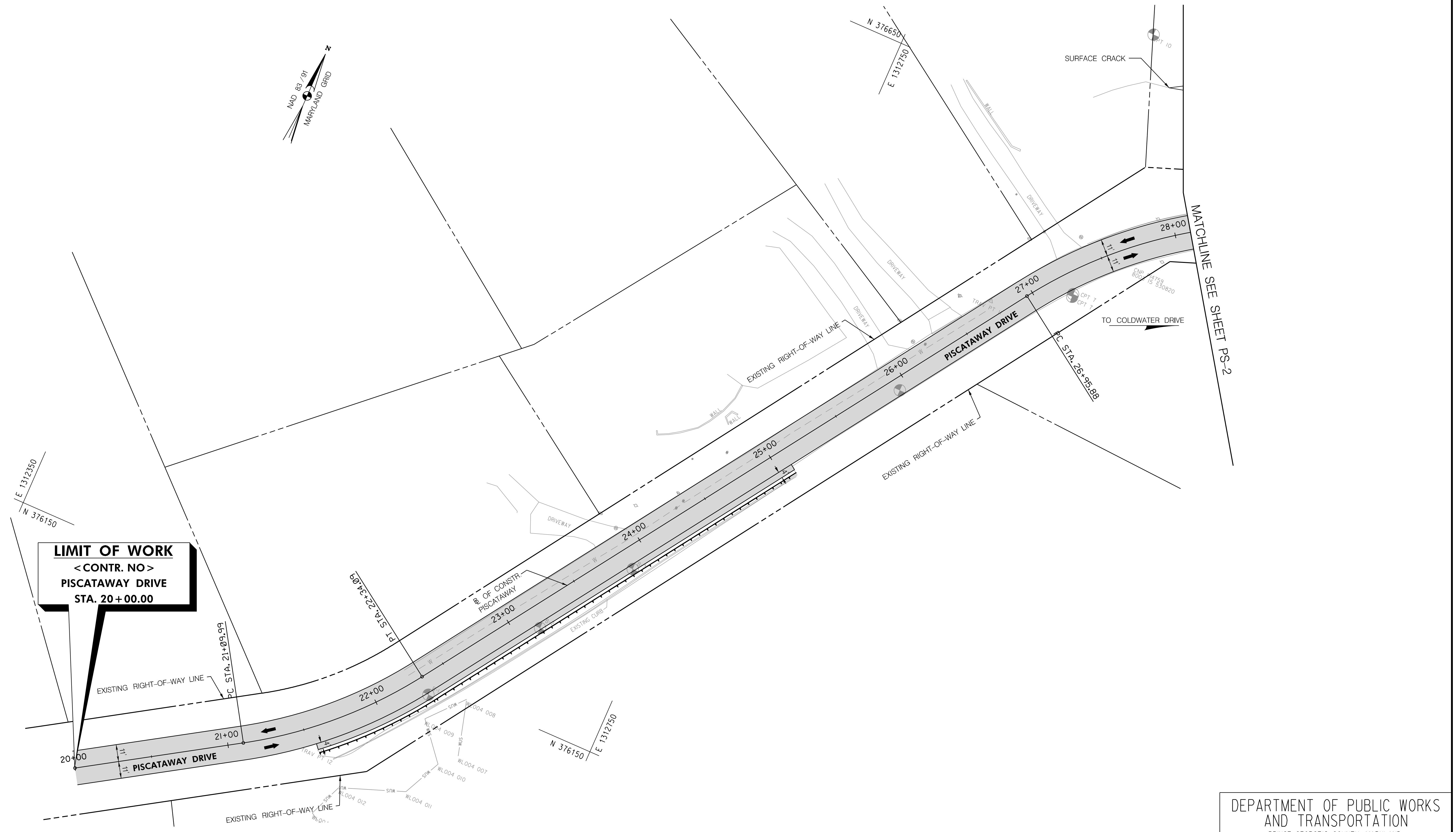

LEGEND

▩ FULL DEPTH
▨ MILL AND OVERLAY
➡ PROPOSED TRAFFIC FLOW

NOTE:
1. MULTIPLE LONGITUDINAL CRACKING OCCURS WITHIN THE PROJECT LIMITS.

0 15 30 60

SCALE: 1" = 30'

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
PRINCE GEORGE'S COUNTY, MARYLAND

PISCATAWAY DRIVE
PS-1

ROADWAY PLAN SHEETS

SCALE: 1" = 30'
DWG. 5 OF 8

APPROVED
DATE
FOR DARRELL B. MOBLEY, DIRECTOR

DESIGNED: DKH
DRAWN: BBB
CHECKED: KTB
APPROVED:
CHIEF, DIV. OF HIGHWAYS & BRIDGES
DATE

CONTRACT NO.
XXX-XXX
ROAD NO.
JOB NO.
FILE NO.

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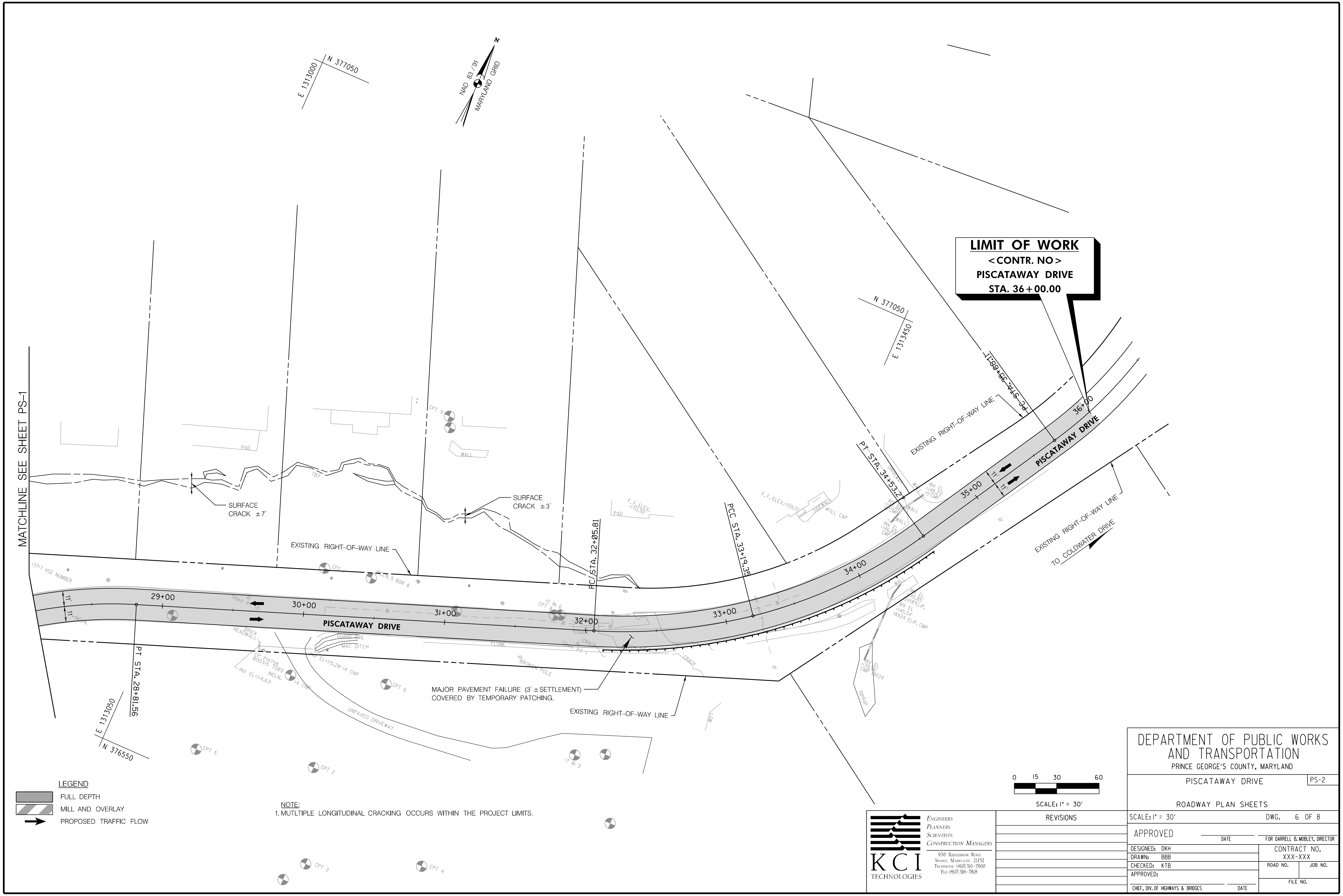

LEGEND

■ FULL DEPTH

▨ MILL AND OVERLAY

→ PROPOSED TRAFFIC FLOW

NOTE:

1. MUTLTIPLE LONGITUDINAL CRACKING OCCURS WITHIN THE PROJECT LIMITS.

0 15 30 60

SCALE: 1" = 30'

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PRINCE GEORGE'S COUNTY, MARYLAND

PISCATAWAY DRIVE

PS-2

ROADWAY PLAN SHEETS

SCALE: 1" = 30'

DWG. 6 OF 8

APPROVED

DATE

FOR DARRELL B. MOBLEY, DIRECTOR

DESIGNED: DKH
DRAWN: BBB
CHECKED: KTB
APPROVED:

CHIEF, DIV. OF HIGHWAYS & BRIDGES

DATE

CONTRACT NO.
XXX-XXX

ROAD NO.

JOB NO.

FILE NO.

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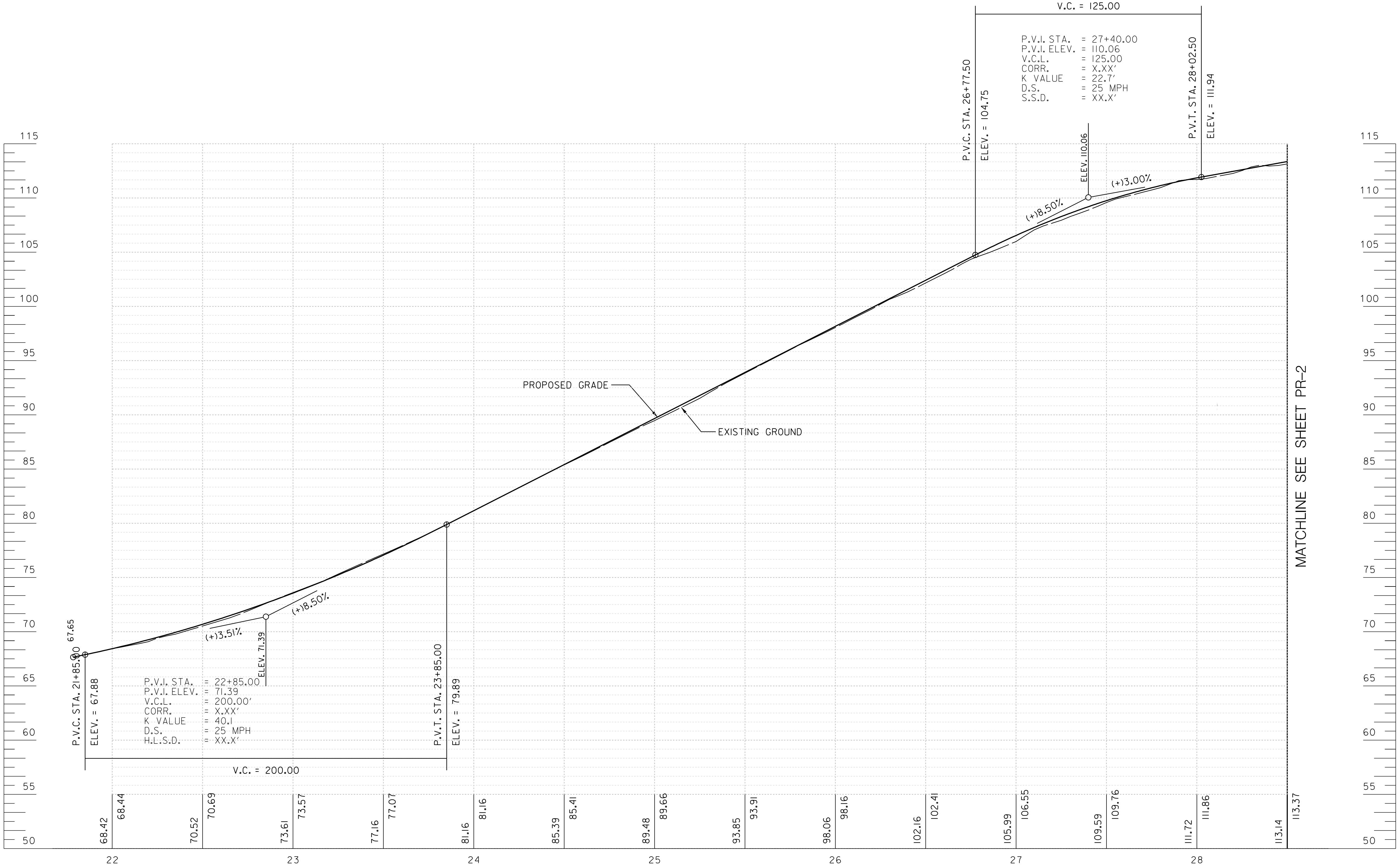

PISCATAWAY DRIVE PROFILE GRADE LINE

HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 5'

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DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
PRINCE GEORGE'S COUNTY, MARYLAND

PISCATAWAY DRIVE
PR-1
ROADWAY PROFILE

SCALE: AS SHOWN
DWG. 7 OF 8

APPROVED
DATE
FOR DARRELL B. MOBLEY, DIRECTOR

DESIGNED: DKH
DRAWN: BBB
CHECKED: KTB
APPROVED:
CHIEF, DIV. OF HIGHWAYS & BRIDGES
DATE

CONTRACT NO.
XXX-XXX
ROAD NO.
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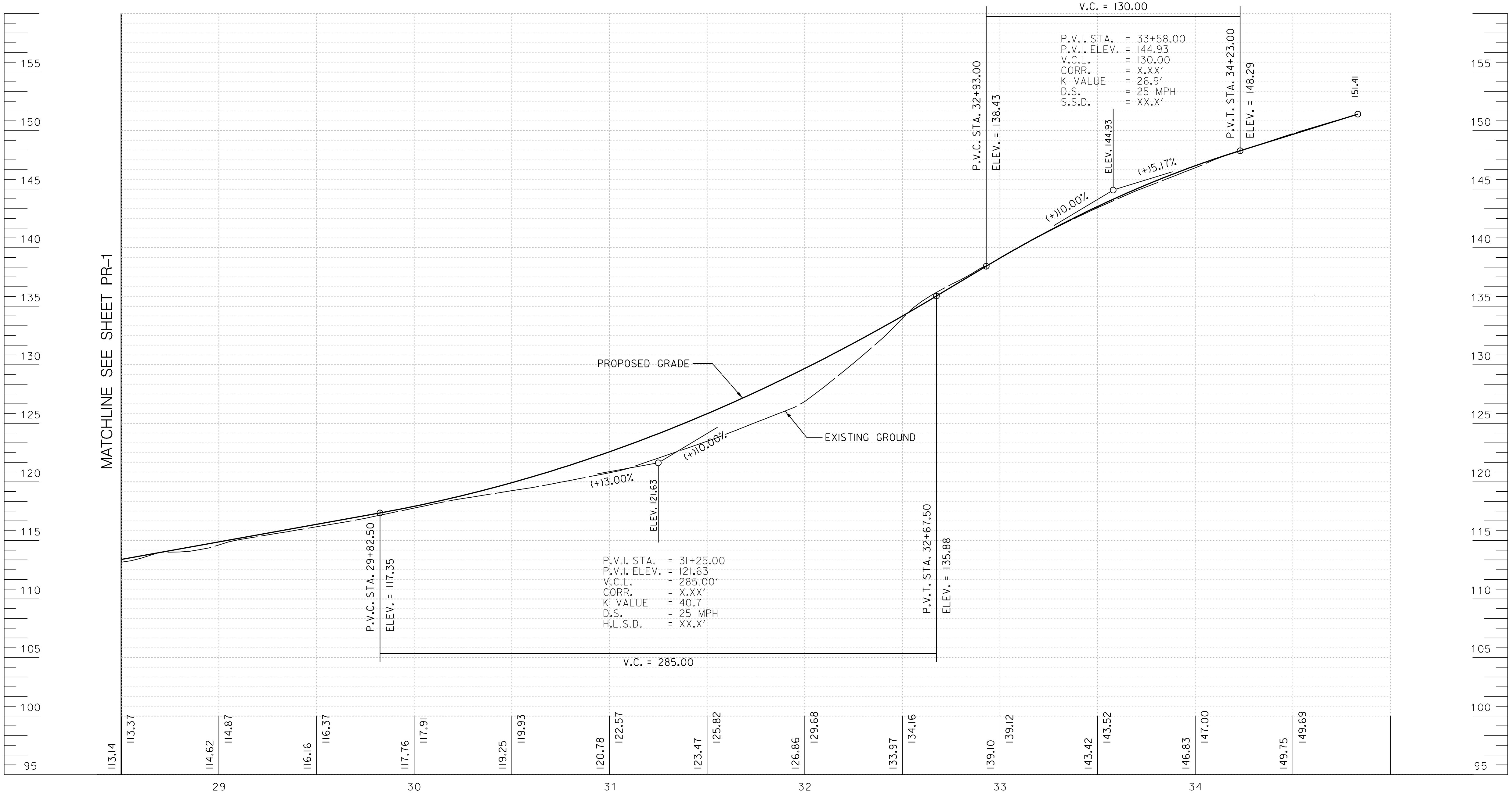

PISCATAWAY DRIVE PROFILE GRADE LINE

HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 5'

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REVISIONS

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
PRINCE GEORGE'S COUNTY, MARYLAND

PISCATAWAY DRIVE
ROADWAY PROFILE
PR-2

SCALE: AS SHOWN
DWG. 8 OF 8
APPROVED
DATE
FOR DARRELL B. MOBLEY, DIRECTOR
DESIGNED: DKH
DRAWN: BBB
CHECKED: KTB
APPROVED:
CHIEF, DIV. OF HIGHWAYS & BRIDGES
DATE
CONTRACT NO.
XXX-XXX
ROAD NO.
JOB NO.
FILE NO.

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