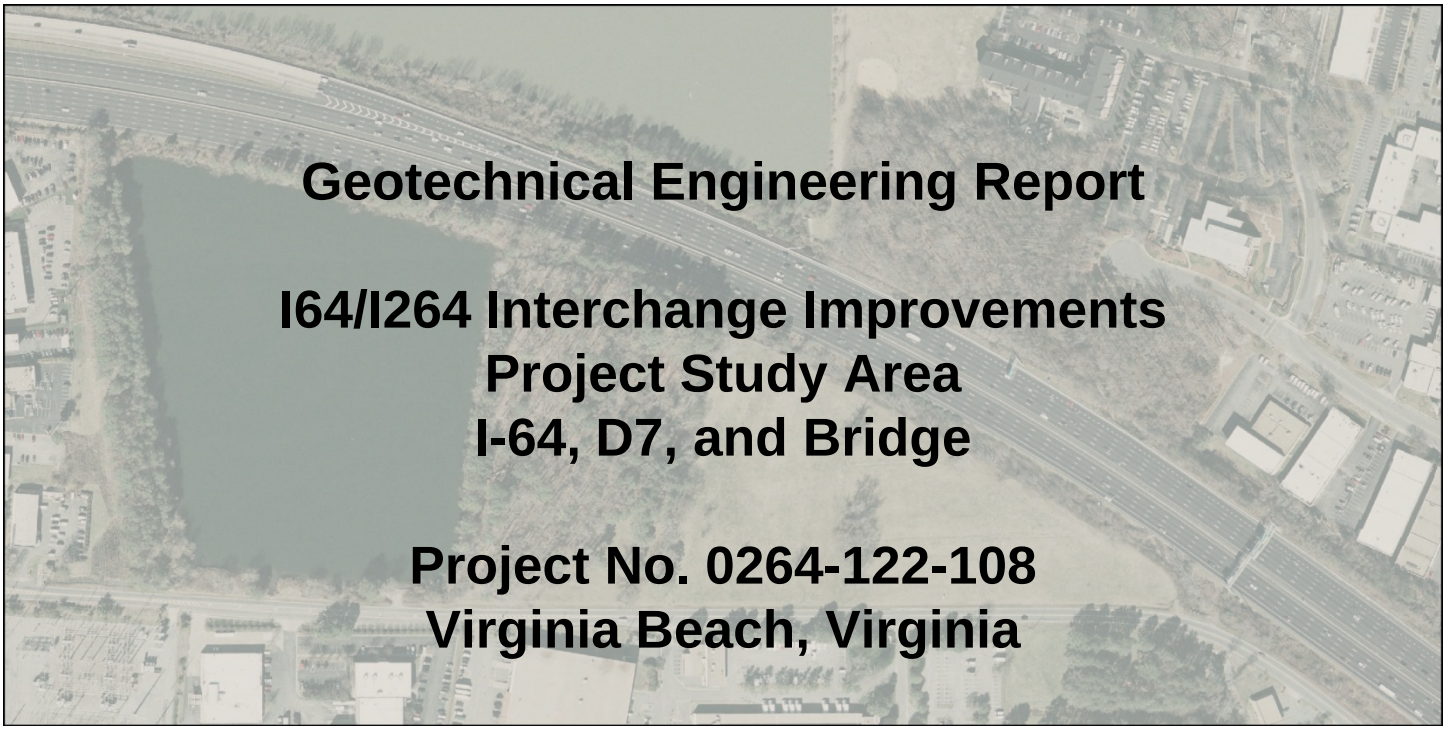

Geotechnical Engineering Report

I64/I264 Interchange Improvements
Project Study Area
I-64, D7, and Bridge

Project No. 0264-122-108
Virginia Beach, Virginia

Prepared for:
Virginia Department of Transportation

Prepared by:
HDR Engineering, Inc.
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September 20, 2013

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EXECUTIVE SUMMARY

The PSA I-64, D7, and Bridge is one of seven project study areas (PSAs) in the I-64/I-264 Interchange Improvements Project comprised primarily of the westbound lanes of existing I-64 from the north end of the existing bridge over the East Branch of the Elizabeth River to the north end of the existing bridge over commuter rail line/Curlew Drive. Embankment heights up to approximately 25 feet are proposed to accommodate the existing bridge over commuter rail line / Curlew Drive. The embankments will be supported by Mechanically Stabilized Earth (MSE) walls.

HDR Engineering, Inc. (HDR) executed a subsurface exploration at the project site for PSA I-64, D7, and Bridge to characterize the subsurface conditions and collect data for geotechnical design of the proposed improvements. Forty-three explorations were conducted within PSA I-64, D7, and Bridge, consisting of SPT explorations and CPT soundings. Laboratory testing was conducted to aid in the classification of subsurface soils and estimate strength and settlement properties for use in geotechnical analyses.

Soft compressible soils of the Tabb formation were encountered during the subsurface explorations along the proposed alignment with thicknesses of 40 feet or greater.

HDR performed global stability and settlement analyses at selected sections to evaluate short- and long-term stability for the proposed embankment heights planned within PSA I-64, D7, and Bridge. For embankment heights greater than 8 feet along Ramp D7, the minimum required factors of safety (FS) against stability failure were not achieved. Methods that can be considered to improve the stability include constructing embankments with lightweight fill and installing aggregate columns prior to construction.

Total settlements were calculated to be between approximately 9 and 12 inches at the center of the embankment along Ramp D7. A majority of the settlement will occur as consolidation settlement over time. Estimated time rates for less than an inch of settlement are on the order of 1 to 2.7 years without improvement. Below ground improvement, such as PV drains or aggregate columns, will be required for embankment heights of greater than 22 feet along Ramp D7 to accelerate the time rate of settlement. Significant differential settlement is anticipated between the center of embankment and toe of slope or vertical face. Differences in total settlement between the center of embankment and vertical face were estimated to be up to approximately 5 inches.

Overexcavation will be required of unsuitable material within the culvert/headwall footprints to improve bearing capacity and reduce potential for differential settlement. Overexcavated materials are likely not suitable for embankment fill.

Laboratory testing of selected samples within PSA I-64, D7, and Bridge found them to be potentially corrosive based on criteria specified by AASHTO and FHWA. The final designer will need to evaluate the site conditions and determine the appropriate corrosion protection related to cost impacts for major and minor structures within an environment of moderate to high corrosion potential.

Design and construction considerations related to geotechnical impacts to major structures are discussed in Section 11 for designer's information. Geotechnical design and recommendations for major structures are not part of our scope and are not included in this report.

1.0 AUTHORIZATION, OBJECTIVES, AND SCOPE

HDR is pleased to submit this Geotechnical Engineering Report (GER) to the Virginia Department of Transportation (VDOT) Hampton Roads District for the proposed improvements to PSA I-64, D7, and Bridge (PSA I-64, D7, and Bridge) within the I-64/I-264 Interchange Improvements Project. The work discussed herein was performed as a Task Order under HDR's On-Call Limited Service Geotechnical Design Contract II – Statewide (Contract No. 30816).

HDR's geotechnical study was performed in support of the proposed improvements to PSA I-64, D7, and Bridge. The objectives of this study included the following:

- Evaluate subsurface conditions with an exploration and laboratory testing program.
- Conduct geotechnical analyses of proposed embankments, including global stability and settlement.
- Complete supplemental explorations and testing to verify strength and settlement parameters.
- Develop geotechnical recommendations for design and construction of the roadway improvements that include earthwork, embankments, cut slopes, soil corrosion potential, stormwater management basins, and minor structures.
- Develop geotechnical considerations and potential impacts to the design and construction of major structures, such as the proposed bridge and retaining wall.

This work was completed in general accordance with our current proposal (Revision 3) for PSA I-64, D7, and Bridge dated August 23, 2010, and the supplemental scope dated April 20, 2011. Limitations on the use of this report and the geotechnical data provided herein are discussed in Section 12.

The scope of work included separate submissions of a Geotechnical Data Report (GDR) and Soil Survey Report (SSR). As requested by VDOT's Central Office Materials Division, this GER was

prepared and serves as a single source geotechnical submission for PSA I-64, D7, and Bridge that meets the defined scope of both the GDR and SSR.

2.0 SITE DESCRIPTION

Drawing 1 in Appendix A illustrates the project vicinity, as well as the location of PSA I-64, D7, and Bridge in relation to the entire project. The existing site of PSA I-64, D7, and Bridge is comprised of the westbound lanes of existing I-64 from the north end of the existing bridge over the East Branch of the Elizabeth River to the north end of the existing bridge over Curlew Drive. The westbound (WB) lane of I-64 is currently a four-lane facility at the south end of the PSA, which reduces to three lanes and then two lanes at the north end. The plans provided indicate the pavement and shoulders are asphalt. The total width of existing I-64 WB varies between approximately 44 and 75 feet, depending on the number of lanes.

The locations of the proposed widening of the I-64 WB lanes and the associated proposed soundwall are generally open grass areas. The sites of two proposed stormwater management (SWM) ponds are just east of the I-64 WB lanes and are currently open grass fields. An existing soundwall is located along the east side of I-64 WB from the beginning of the PSA (station 100+00) to approximate station 114+50. The segment of the proposed Ramp D7 alignment within this PSA is located on and directly adjacent to the existing I-64 WB embankment slope. It is generally heavily wooded and contains some wetland areas near the toe. The existing I-64 WB / Ramp D7 embankment has a maximum height of approximately 25 feet within the limits of this PSA. Two historic cultural resource sites have been identified in the vicinity of station 112+00 just to the east of I-64 WB.

Other than developed site features (i.e., roadway embankments and drainage channels), the terrain is relatively flat with limited topographic relief along the length of the study area, with approximate surface elevations ranging from El. +5 to +40 feet.

3.0 PROJECT DESCRIPTION

Based on preliminary plans and cross sections provided by URS on July 18, 2011, the proposed construction at PSA I-64, D7, and Bridge consists of the following elements:

- <u>I-64 West Bound Lanes</u> – Two l2-foot wide travel lanes and a 12-foot shoulder will be added to the east side of existing lanes of I-64 WB. The proposed construction will utilize the existing shoulder area and embankment slope. Fills along the embankment slope will be necessary, and the existing soundwall will be removed to accommodate the new lanes and shoulder.

- Ramp D7 – The portion of Ramp D7 within this PSA will begin at approximate station 126+00 of the I-64 WB lanes and end at the north end of the bridge over Curlew Drive. The ramp will consist of two 12-foot travel lanes and a 12-foot shoulder. A retaining wall will support grade changes along Ramp D7 from approximate station 13+00 to the beginning of the proposed bridge.
- Retaining Wall - A MSE wall is proposed along the right side of Ramp D7 to support grade changes associated with the bridge approach embankment. The wall begins at approximate station 13+00 and ends at the south abutment of the proposed bridge. The wall will have a maximum exposed height up to approximately 25 feet.
- Ramp D7 Bridge over Curlew Drive - At the time of this writing, the location of western abutment of the Ramp D7 Bridge over Curlew Drive has not been determined. The bridge was initially planned as a multi-span structure with a length of 270 feet and a width of 45 feet.
- Stormwater Management Ponds - Two SWM ponds are planned within this PSA. Both are to be located just east of the proposed I-64 WB lanes. SWM Pond #4 will be located near the center of the PSA between stations 127+00 and 129+25 of I-64 WB. SWM Pond #5 will be located at the south end of the PSA between stations 100+00 and 103+50 of the I-64 WB lanes. Both ponds will be less than 7 feet deep.
- Soundwall – A new soundwall will be constructed approximately 10 to 25 feet behind the existing soundwall between stations 101+50 and 114+50 of I-64 WB.
- Culverts – The following culverts of 36-inch diameter or greater are planned for this PSA as summarized below:
    - Ramp D7 and I-64 WB, approximate I-64 WB Station 130+50: Minor Structure 5-16, 10-foot long 48” RCP (extension)
    - Ramp D7 and I-64 WB, approximate I-64 WB Station 129+50: Minor Structure 5-17 to 5-18, 28-foot long twin 36” RCP

  Improvements and/or additions to the existing double box culvert along Curlew Drive and beneath I-64 are planned, but they are not included in this PSA as several design options are still being evaluated.

4.0 PROJECT GEOLOGY

The project site is located in the Coastal Plain Physiographic Province. The Coastal Plain is characterized by poorly to well-sorted unconsolidated marine to fluvial sediments, varying from clay to gravel with lateral variation in thickness. These sediments generally increase in thickness towards the east. Vertical variation within the geologic formations of the Coastal Plain is often controlled by cyclic transgression and regression depositional sequences that coarsen with depth.

Regionally, the stratigraphy of the Coastal Plain can be generalized as a wedge of sediments composed of fluvial and coastal plain sands and gravels of Quaternary and upper Tertiary age, underlain by marine, deltaic, and fluvial clays, silts, and sands of lower Tertiary age, underlain by fluvial-deltaic to shallow-shelf sands and clays of Cretaceous age, underlain by crystalline bedrock.

The project site is underlain by the Tabb and Yorktown formations based on available published sources. The upper clay units of the Tabb Formation are commonly and historically referred to as the Norfolk formation locally in the vicinity of the project site. The Tabb formation was previously mapped as the Sand Bridge, Kempsville, and/or Norfolk formations by Oaks and Coach (1973), Mixon (1976), and Darby (1983).

The Quaternary-age (Upper Pleistocene) Tabb formation consists of the Lynnhaven and Sedgefield members. The member lithologies are similar in that they consist of a fining upward sedimentary sequence; however, the Lynnhaven member generally is finer and is non-fossiliferous. The members are separated by a nonconformity and typically exhibit a non-conformable relationship with older deposits (Chowan and Yorktown formations).

The Lynnhaven member (Qtl) consists of pebbly and cobbly, fine to coarse gray sand that grades upward into clayey and silty fine sand and sandy silt. Locally, at base of unit, medium to coarse cross-bedded sand and clayey silt containing abundant plant material fill channels cut into underlying stratigraphic units. Unit is surficial deposit of broad swale that is traceable southward from Norfolk, Va. Thickness of the Lynnhaven member varies from 0 to 20 feet.

The Sedgefield member (Qts) consists of pebbly to bouldery, clayey sand and fine to medium, shelly sand that grades upward into sandy and clayey silt. Locally channel fill at base of unit includes as much as 50 feet of fine to coarse, cross-bedded sand and clayey silt and peat containing in-situ tree stumps. The thickness of the Sedgefield member varies from 0 to 50 feet.

The Tabb formation is underlain by the Pliocene-aged Yorktown formation, consisting of bluish-gray and brownish-yellow fine- to coarse-grained sand, partly glauconitic and phosphatic, commonly very shelly, interbedded with sandy and silty blue-gray clay. The thickness of the Yorktown formation ranges from 0 to 150 feet.

The surficial soil at PSA I-64, D7, and Bridge generally consists of the Urban Fill and Tomotley loam (USDA, 1985), which is characterized as deep, nearly level, and poorly drained. It is on broad inland flats and in shallow drainage ways. Slopes range from 0 to 2 percent. The permeability is moderate, and surface runoff is slow. The USDA soil survey further describes the Tomotley loam as poor for development of local roads and streets for roadway fill due to high moisture contents. pH values are typically in the range of 3.5 to 5.5 pH units. The corrosion potential is high for both uncoated steel and concrete.

5.0 SUBSURFACE EXPLORATION

HDR planned and executed a subsurface exploration at the project site for PSA I-64, D7, and Bridge to collect data for geotechnical design of the proposed improvements. The exploration began on September 13, 2010, and was completed on June 28, 2011. Table 1 provides a summary of HDR's exploration subconsultants and their general scope of services.

Table 1 – Exploration Team for PSA I-64, D7, and Bridge

Subconsultant	Office Location	General Scope of Services
GET Solutions, Inc. (GET)	Virginia Beach, VA	31 SPT explorations, exploration inspection, laboratory testing
S&ME, Inc. (S&ME)	Knoxville, TN / Richmond, VA	5 SPT explorations, exploration inspection, laboratory testing
Mid-Atlantic Drillers, Inc. (M-AD)	Carolina Beach, NC	7 CPT soundings
NXL Construction Services, Inc. (NXL)	Newport News / Richmond, VA	Survey of exploration locations, determine surface elevations

Exploration locations and depths were determined by HDR based on a review of the preliminary project plans and cross-sections, as well as review comments received by VDOT. In general, explorations were completed at accessible locations to support geotechnical design of new pavements, bridge approach fills (consisting of slopes and/or retaining structures), bridge abutment and structure foundations, and drainage structure improvements.

The following sections describe our subsurface exploration in more detail. Exploration locations are shown on Drawing 2 in Appendix A. Table A-1 provides a summary of the completed explorations, including location, surface elevation, depth, driller, and date completed.

5.1 Explorations

GET and S&ME drillers completed 36 Standard Penetration Test (SPT) explorations at the project site from mid-September to early October 2010. GET completed 29 explorations ranging in depth from approximately 10 feet to 165 feet below the existing ground surface. S&ME completed five explorations ranging in depth from approximately 20 feet to 60 feet. GET completed two supplemental explorations in mid-June 2011 to a depth of approximately 130 feet below the existing ground surface. Table 2 summarizes the rig types and the drilling and sampling methods used by the two subconsultants.

Table 2 – Summary of Exploration Drilling Equipment

Driller	Rig Type	Drilling Method	SPT Hammer Type
GET	CME 550X Rubber Tire ATV Mounted	Hollow Stem Auger / Mud Rotary	Automatic
	CME 55 Rubber Track Mounted	Hollow Stem Auger / Mud Rotary	Automatic
	CME 45C Truck Mounted	Hollow Stem Auger / Mud Rotary	Automatic
S&ME	CME 550 ATV Mounted	Hollow Stem Auger	Automatic

The HDR team personnel monitored the explorations in the field and prepared logs of the explorations. Monitoring included overall coordination of activities, daily safety briefings, visual-manual classification of disturbed soil samples, preparation of field exploration logs, determining drilling depths, monitoring conformance with sampling criteria established for each boring, and observing general site conditions.

The explorations were advanced with hollow stem auger or mud rotary drilling techniques, depending on the depth. Hollow stem augers were typically used for shallow explorations completed for pavements (less than about 10 feet deep). Explorations deeper than about 10 to 15 feet typically required using 3-inch stand pipe inserted 3 feet into the ground and mud rotary drilling techniques due to subsurface conditions consisting of relatively clean sands and a shallow water table. A bentonite or polymer drilling additive was mixed with fresh water to form "drilling mud," when necessary, to stabilize the open boreholes.

SPTs with split-barrel spoon sampling of soils were conducted in general accordance with ASTM D1556 using automatic hammers. Typically, samples were obtained continuously to a depth of 10 feet and at 5-foot intervals thereafter. The soil samples were classified in the field by the HDR geotechnical team in accordance with VDOT procedures. Exploration logs prepared by HDR are provided in Appendix B.

Pocket penetrometer tests were typically performed on cohesive soil samples at the time of sample collection. In addition to disturbed split spoon samples, 20, 3-inch-diameter "undisturbed" Shelby Tube samples of cohesive soils were obtained for the purpose of triaxial compression and consolidation testing. Bulk samples of near-surface soils were collected at 10 locations for the purpose of laboratory Proctor and California Bearing Ratio testing.

SPT samples were placed in glass jars and labeled with the exploration and sample number, depth of sample, recovery, and SPT blow counts. The jar samples were transported to GET's office in Virginia Beach for further testing and analysis. Shelby tube samples were waxed,

sealed, and labeled with the exploration number, date of sample collection, depth of sample, and recovery. The Shelby tubes were transported to S&ME's office in Richmond for testing.

Subsurface water level measurements were taken in open boreholes at the completion of drilling and at least 24 hours later. Explorations through existing pavements were backfilled immediately after completion for safety reasons, thus preventing 24-hour water level measurements at those locations. It should be noted that, at most locations, water was introduced into the boreholes as part of the drilling process, which may have influenced the water level measurements obtained in those explorations. Table 3 summarizes the subsurface water observations for each design element discussed in Sections 7.1 through 7.5.

Table 3 – Subsurface Water Observations

Station Range	Description	Approximate Depth to Water (feet) in SPT Explorations	Approximate Elevation of Water (feet) in SPT Explorations
100+00 to 137+50	I-64 WB	3 to 10	2 to 22
Ramp D7 9+93 to 22+00	Ramp D7 and Retaining Wall	6 to 11	-1 to 2
Ramp D7 22+22 to 25+27	Ramp D7 Bridge over Curlew Drive	8 to 22	0 to 18
100+00 to 103+00, 126+00 to 129+75	SWM Ponds	4 to 6	2 to 3
101+00 to 114+75	Soundwall	6 to 8	1 to 2

Three 1.25-inch-diameter PVC piezometers were installed in explorations SWM4-1, SWM5-1, and D7-10W to obtain post-exploration subsurface water level measurements. Table 4 summarizes the piezometer measurements taken at these locations.

Table 4 – Subsurface Water Measurements in Piezometers

Piezometer and Depth	Installation Date	Depth at Time of Drilling (feet)	Date of Reading	Depth at Time of Reading (feet)
SWM4-1 (17 feet)	9/16/2010	4.5	9/20/2010	2.2
			10/1/2010	1.8
			10/13/2010	2.2
			11/22/2010	2.4
			1/31/2011	1.7
SWM5-1 (18 feet)	9/16/2010	5.5	9/20/2010	6.8
			10/1/2010	5.8

Piezometer and Depth	Installation Date	Depth at Time of Drilling (feet)	Date of Reading	Depth at Time of Reading (feet)
			10/13/2010	6.4
			11/22/2010	7.2
			1/31/2011	6.7
D7-10W (10 feet)	9/23/2010	1.0	9/29/2010	9.4
			10/1/2010	9.0
			10/13/2010	8.4
			11/22/2010	8.3
			1/31/2010	7.9

5.2 Cone Penetrometer Test Soundings

M-AD completed six Cone Penetrometer Test (CPT) soundings to depths ranging from 50 feet to 130 feet below existing ground surface on October 27 and October 28, 2010. M-AD completed one supplemental CPT sounding to a depth of approximately 120 feet below existing ground surface on June 28, 2011.

A Hogentogler electronic subtraction cone with a 10 cm^2 tip and a 150 cm^2 friction sleeve was used for the soundings. The cone is designed with an equal end area friction sleeve and a tip end area ratio of 0.80. At the beginning of the sounding, the cone was outfitted with a vacuum-saturated, five-millimeter-thick, porous plastic pore pressure element that is located just behind the cone tip (the U2 location). The cone was advanced using a 10-ton track-mounted cone penetration rig. As the cone was advanced into the ground, tip resistance (q_c), sleeve friction (f_s), and dynamic pore water pressure (U) were recorded every five centimeters (approximately every two inches). CPT logs are provided in Appendix B.

5.3 Exploration Location and Survey

NXL surveyed and staked the exploration locations and determined surface elevations prior to the field event using station and offset data provided by HDR. Field adjustment of some exploration locations was necessary due to access constraints. Where a location was moved, the location, elevation, and offset were modified and labeled as the as-drilled location and elevation on the exploration log. Since one of the final exploration location was offset significantly (D7-3W), it was resurveyed.

As-drilled exploration locations are shown on Drawing A-2 in Appendix A. Station, offset, and latitude and longitude are provided on the exploration logs in Appendix B. VDOT project

coordinate locations (Easting "X" and Northing "Y") are provided in Table A-1 in Appendix A. Surface elevations at the exploration locations are shown on the logs and in Table A-1 and are referenced to the North American Vertical Datum (NAVD) 88.

6.0 LABORATORY TESTING

GET and S&ME completed soils laboratory testing on jar, bulk, and undisturbed soil samples collected from the subsurface explorations. HDR personnel evaluated the subsurface data and assigned specific samples for testing. Testing was performed to aid in the classification of soils encountered in the explorations and to estimate typical engineering parameters for on-site soils. Table 5 provides a summary of the laboratory testing completed for PSA I-64, D7, and Bridge. Table A-3 in Appendix A provides the summary of laboratory tests completed per exploration.

Table 5 – Summary of Laboratory Testing for PSA I-64, D7, and Bridge

Laboratory Test	Number of Tests	Laboratory
Natural Moisture Content	92	GET / S&ME
Grain Size Analysis	50	GET / S&ME
Atterberg Limits	35	GET / S&ME
Specific Gravity	4	S&ME
Standard Proctor / CBR	4	GET
1-D Consolidation	4	GET
UU Triaxial Compression	5	S&ME
Undisturbed Tube Extrusion / Logging	9	S&ME
Corrosivity Series	2	GET
Organic Content	0	S&ME

The laboratory tests were performed in general accordance with ASTM, VTM, and AASHTO test methods. The results of the laboratory tests are presented in Appendix C.

7.0 SUBSURFACE CONDITIONS

In general, six distinct subsurface strata in subsurface explorations completed for PSA I-64, D7, and Bridge were observed:

- Pavements / Fill
- Very soft to soft, gray clays and clayey sands (Norfolk Formation),
- Upper Tabb clays (Tabb Formation),
- Medium dense to dense, clean sands (Norfolk Formation),
- Lower gray, firm to stiff clays (Norfolk Formation), and
- And green-gray, Yorktown Formation sands and clays.

Table A-2 in Appendix A provides HDR's interpretation of the stratum boundaries at the exploration locations, based on the exploration logs and CPT soundings. Drawings 5A through 5D in Appendix A provide cross sections depicting subsurface conditions at locations parallel to the proposed alignment. Exploration data were projected onto baselines selected by HDR to form the cross sections, as shown on Appendix A, Drawing 4. The cross sections show exploration designations, USCS soil types and graphics, SPT N-values, and stations/offsets. Interpreted stratum boundaries are not shown.

The following sections summarize interpreted subsurface conditions within five zones along the proposed alignment for PSA I-64, D7, and Bridge. Exploration locations are shown on Drawing 2 in Appendix A; exploration logs are provided in Appendix B.

7.1 Station 100+00 to Station 137+50 (I-64 WB)

This segment of the alignment comprises the portions of existing I-64 WB.

Seventeen SPT explorations (I64WB-1 to I64WB-11 and I64WB-P1 to I64WB-P6) were performed in this segment. The explorations were generally advanced to depths of 10 to 12 feet.

In the explorations, either low plasticity clays (CL) or poorly-graded (SP) and silty (SM) sands were generally observed to the termination depths. SPT N-values in the clays ranged from 5 to 7 blows per foot (bpf) indicating firm consistencies. SPT N-values in the sands ranged from 4 to 56 bpf, indicating loose to very dense conditions.

Seventeen explorations were drilled through existing pavement sections in this section. Table 6 summarizes the range of pavement and subbase aggregate thickness observations in these explorations.

Table 6 – Existing Pavement Section Thickness

Exploration	Baseline	Station	Offset (feet)	Asphalt Thickness (inches)	Concrete Thickness (inches)	Subbase Notes
I64WB-1	I-64 WBL	102+50	20 RT	8.0	n/a	Sandy fill
I64WB-2	I-64 WBL	106+50	20 RT	8.0	n/a	Sandy fill
I64WB-3	I-64 WBL	110+50	20 RT	10.5	n/a	Sandy fill
I64WB-4	I-64 WBL	114+50	20 RT	9.5	n/a	Sandy fill
I64WB-5	I-64 WBL	118+50	20 RT	15.5	n/a	Sandy fill
I64WB-6	I-64 WBL	122+50	20 RT	11.0	n/a	Sandy fill
I64WB-7	I-64 WBL	126+50	20 RT	16.0	n/a	Sandy fill
I64WB-8	I-64 WBL	130+50	20 RT	10.0	n/a	Sandy fill
I64WB-9	I-64 WBL	132+50	18 RT	9.5	n/a	Native sandy soil
I64WB-10	I-64 WBL	134+50	18 RT	9.0	n/a	Native sandy soil
I64WB-11	I-64 WBL	136+50	20 RT	7.5	n/a	7.0 inches aggregate subbase
I64WB-P1	I-64 WBL	100+50	10 RT	13.0	n/a	Sandy and gravelly fill
I64WB-P2	I-64 WBL	101+50	10 RT	11.6	9.5	5.0 inches aggregate subbase
I64WB-P3	I-64 WBL	109+50	6 RT	16.5	6.5	Native sandy soil
I64WB-P4	I-64 WBL	117+50	17 RT	9.5	n/a	n/a
I64WB-P5	I-64 WBL	125+50	10 RT	18.0	n/a	Native sandy soil
I64WB-P6	I-64 WBL	133+50	10 RT	14.0	n/a	Native sandy soil
Note: Refer to Section 7.2 and 7.3 for pavement details in test borings D7-1W and CUR-4B, respectively.						

7.2 Station 9+93 to Station 22+00 (Ramp D7 and Retaining Wall)

This segment consists of the proposed west approach embankment to the Ramp D7 Bridge and Retaining Wall. Thirteen explorations (D7-1W to D7-14W), including nine SPT explorations and four CPT soundings, were performed for the Ramp D7 approach and Retaining Wall. The explorations were advanced to depths between 12 to 130 feet. Soil conditions observed in the CPT soundings were generally consistent with those of the SPT explorations.

Only D7-1W was drilled through pavement (I-64 WBL). A pavement thickness of 15.5 inches of asphalt underlain by sandy fill was observed. These observations are generally consistent with the observations of the pavement explorations shown in Table 6.

Table 7 summarizes the observed subsurface conditions within the explorations at this location.

Table 7 – Subsurface Conditions at Ramp D7 and Retaining Wall

Stratum Description	Elevation Range Top of Stratum (feet)	Stratum Thickness Range (feet)	USCS Soil Types	SPT N-values (bpf)	Relative Density / Consistency	Comments
Suspected Fill	11 to 6	0 to 5	SM, SP, SP-SC	16 to 35	Medium Dense to Dense	Fill not observed in all explorations
Upper Sand Interbedded with Soft Clay	12 to 4	22 to 46	SC, SM, SP, SP-SC, CH, CL, ML, OH	WOH to 32	Soft to Hard Clay and Very Loose to Medium Dense Sand	Trace amounts of organics and trace shells observed
Upper Tabb Clays	-15 to -37	19 to 44	CH, CL	WOH to 4	Very Soft to Soft Clays	
Medium Dense to Dense Clean Sands	-53 to -62	20 to 32	SM, SP	7 to 19	Loose to Medium Dense Sands	
Lower Gray, Firm to Stiff Clays	-83 to -88	0 to 23	CH, CL	1 to 21	Very Soft to Very Stiff Clays	
Green-Gray Yorktown Formation	-69 to -110	--	SC, SM, SW	10 to 21	Medium Dense Sands	

7.3 Bridge Widening (Ramp D7 Bridge over Curlew Drive)

This segment comprises the Ramp D7 Bridge Widening over Curlew Drive and the Commuter Rail Line. Three explorations were performed in this segment to obtain data (CUR-1B, CUR-2B, and CUR-4B). The explorations were advanced to depths between 125 and 165 feet. CUR-2B was drilled through a sidewalk, and CUR-4B was drilled through the pavement in Curlew Drive. The pavement in Curlew Drive was 6 inches thick. No subbase was observed.

Table 8 summarizes the observed subsurface conditions within the explorations at this location.

Table 8– Subsurface Conditions at Ramp D7 Bridge

Stratum Description	Elevation Range Top of Stratum (feet)	Stratum Thickness Range (feet)	USCS Soil Types	SPT N-values (bpf)	Relative Density / Consistency	Comments
Suspected Fill	39	4	SW	24	Medium Dense Sand	Fill only in CUR-4B
Upper Sand Interbedded with Soft Clay	10 to 5	28 to 30	SC, SP, SW, CL, CH, OL	WOH to 31	Very Soft to Soft Clays and Loose to Dense Sands	Trace amounts of organics and trace shells observed
Upper Tabb Clays	-20 to -23	41 to 42	CH, CL, SC, SP	WOH to 26	Very Soft to Stiff Clays and Loose to Medium Dense Sands	Occasional sand lens
Medium Dense to Dense Clean Sands	-61 to -65	21 to 25	SP, SW, SC	9 to 24	Loose to Medium Dense Sands	Trace amounts of shells and shell fragments observed
Lower Gray, Firm to Stiff Clays	-83 to -87	15 to 20	CH	3 to 11	Soft to Stiff Clay	Occasional sand lens
Green-Gray Yorktown Formation	-101 to -104	--	SC, SM, SW	12 to 37	Loose to Dense Sands	Trace amounts of shells and shell fragments observed

7.4 Stormwater Management Ponds (Stations 100+00 to 103+00 and 126+00 to 129+75)

This segment comprises SWM Pond #4 and SWM Pond #5, which are located from Station 100+00 to 103+00 and Station 126+00 to 129+75 on I-64 WBL, respectively. Four explorations (SWM4-1, SWM4-2, SWM5-1, and SWM5-2) were performed in this segment with two explorations coming from the proposed site of SWM Pond #4 and two explorations coming from the proposed site of SWM Pond #5. The explorations were advanced to a depth of 20 feet.

In the explorations at SWM Pond #5, sandy fill underlain by a soft to firm low plasticity clay (CL) and very loose to medium dense sands (SC, SM, SP, or SP-SM) were observed to the termination depth of the explorations. In the explorations at SWM #4, no fill layer was observed. Firm to stiff low plasticity clay (CL) overlying loose sands (SC or SP) were observed to the termination depth of the explorations. Overall, SPT N-values for both locations ranged from 6 to 9 bpf for both the clays and sands.

7.5 Station 101+00 to Station 114+75 (Soundwall)

This segment comprises the location where a new soundwall will be constructed 10 to 25 ft behind an existing soundwall. Seven explorations (I64SB-1 to I64SB-7) were performed in this segment, including four SPT explorations and three CPT soundings. The explorations were advanced to depths of between 30 and 50 feet.

Table 9 summarizes the subsurface conditions observed in the explorations within the northern bridge approach.

Table 9 – Subsurface Conditions at Station 101+00 to Station 114+75 (Soundwall)

Stratum Description	Elevation Range Top of Stratum (feet)	Stratum Thickness Range (feet)	USCS Soil Types	SPT N-values (bpf)	Relative Density / Consistency	Comments
Suspected Fill	8	0 to 2	SM	10 to 22	Medium Dense	Fill not observed in all explorations
Upper Sand Interbedded with Soft Clay	9 to 6	16 to 24	SC, SM, SP, SP-SM, CL	2 to 32	Soft to Very Stiff Clay and Very Loose to Dense Sand	Trace amounts of organics and trace shells observed
Upper Norfolk Clays	-8 to -15	--	CH, CL	WOH to 4	Very Soft to Soft Clays	

8.0 GEOTECHNICAL ANALYSES

HDR performed global stability and settlement analyses to evaluate short- and long-term stability of the proposed embankments within PSA I-64, D7, and Bridge. Sections for analysis were identified by HDR based on embankment heights shown in the Public Hearing plans and the encountered subsurface conditions. The subsurface conditions considered for analyses are depicted on the subsurface profiles in Appendix A.

Table 10 provides a summary of analyses completed for the sections within PSA I-64, D7, and Bridge. Analyses were also performed to determine the approximate extents of ground improvement (lightweight fill, aggregate columns, etc.) that might be required to meet the minimum required factor of safety or an acceptable magnitude of settlement within a specific timeframe. The global stability and settlement analyses, as well as a summary of the results, are discussed further in the following sections.

At the time of this writing, the location of the western abutment of the Ramp D7 Bridge over the commuter rail line / Curlew Drive has not been determined. Thus, we analyzed slope stability and settlement over a wide range of embankment heights and fill weights (expressed as fill

pressure). Although the current cross sections show a maximum height of 25 feet at Ramp D7 Station 22+00, we utilized a maximum embankment fill height of 28 feet for stability analyses, as shown in Table 10.

Table 10 – Summary of Geotechnical Analyses Completed for Final Design

Station Location	Fill Geometry	Fill Height (feet)	Total Wall / Slope Height (feet)	Critical Slope or Wall?	Slope Stability Analysis	Settlement Analysis
18+00	Retaining Wall	17	17	Yes		X
22+00	Retaining Wall	28	28	Yes	X	

8.1 Global Stability

The computer program Slope/W (2007, Version 7, Geo-Slope International) was used to complete the global stability analyses. Strength parameters for the on-site soils were based on the explorations, CPT soundings, laboratory test results, and our experience with similar soils in the area. Based on experience with similar transportation projects, factors of safety (FS) against global stability failure of FS = 1.3 and FS = 1.5 are recommended for non-critical and critical applications, respectively. The strength parameters used in the analyses are summarized in Table 11. The laboratory test results are summarized in Table C-1 in Appendix C.

At PSA I-64, D7, and Bridge, the proposed embankment and bridge widening will generally be constructed against the existing soil slopes and require vertical-faced MSE walls on the eastbound side. Embankment heights analyzed were the maximum proposed vertical face heights as shown on the cross-sections. The embankment heights extended from existing grade to the top of the backfill behind the wall. HDR evaluated slip surfaces located behind the anticipated reinforced zone of the MSE wall, which extends to a minimum distance of approximately 0.7H behind the face (where H = total wall height).

8.2 Settlement

HDR completed magnitude and time rate of settlement analyses for the proposed embankment fills summarized in Table 10. Consolidation parameters presented in Table 11 for the on-site soils were based on laboratory one-dimensional consolidation tests and our experience with similar soils in the area. The magnitude and time rate analyses using the computer program CONSOL (version 3.0, CGPR, Virginia Tech) and internally-developed spreadsheets were completed. The magnitude and time rate analyses results were used to develop estimates of approximate waiting periods following fill placement to aid in the construction planning process.

Table 11: Global Stability and Settlement Parameters Used in Analyses

Stratum Description	Unit Weight, γ_m (pcf)	Effective Friction Angle, ϕ'(degrees)	Undrained Shear Strength, s_u (psf)	Max. Past Pressure, p'_c (psf)	CR[3]	RR[3]	c_v[4] (ft^2 / day)	c_{vr}[4] (ft^2 / day)
Existing Fill	125	32	--	--	--	--	--	--
Proposed Fill[1]	130	34	--	--	--	--	--	--
Clay with high organic content	105	20[2]	400	1,500 to 1,600	0.20 to 0.30	0.025 to 0.030	0.05 to 0.14	0.60 to 1.00
Upper Sands	115	32	--	--	--	--	--	--
Upper Norfolk (Gray) Clays	105	28[2]	1,000 + 25 psf/ft of depth below top of layer	3,600 to 3,800	0.20 to 0.24	0.025 to 0.032	0.08 to 0.14	0.70 to 1.00
Lower Sands	125	34	--	--	--	--	--	--
Lower Norfolk (Gray) Clays	110	28[2]	1,750 + 25 psf/ft of depth below top of layer	7,600	0.38	0.038	0.08	0.65
Green-Gray Yorktown Formation	125	34	--[5]	--[5]	--[5]	--[5]	--[5]	--[5]

Notes:

[1] Generally, the Proposed Fill and Wall Backfill were considered to be normal weight fill (Unit Weight =130 pcf). To improve stability, the Proposed Fill was also treated as lightweight fill (Unit weight = 110 or 70 pcf and Friction Angle = 38 degrees).

[2] Effective friction angle for fine-grained soils is used for long-term, drained analyses only. For short-term, undrained analyses, the undrained shear strength (s_u) and friction angle (φ) = 0 degrees are used.

[3] CR (compression ratio) and RR (recompression ratio) are strain-based compression parameters (derived from strain vs. log pressure consolidation plot).

[4] c_v = coefficient of consolidation and c_{vr} = coefficient of consolidation (recompression of overconsolidated material).

[5] Parameters were not estimated for the Yorktown formation, because they do not impact the analyses.

9.0 GEOTECHNICAL DISCUSSION OF RESULTS AND CONCLUSIONS

The following sections discuss the results and conclusions of this geotechnical study as it relates to the design and construction of subgrade, embankments, and minor structures of PSA I-64, D7, and Bridge.

9.1 Earthwork

9.1.1 Soil Excavation and Temporary Support

Installation of utilities will typically require soil excavation greater than several feet deep. Native soils encountered during the site investigation within the anticipated excavation depths typically consist of loose to medium dense sands with varying amounts of silt and clay interbedded with soft to very stiff clays. Subsurface water was generally observed at shallow depths (average of about 6 feet) across the project site outside the existing embankment fill areas. These soils were identified as Type C, as defined by OSHA 1926.650 Excavation Standard. All excavations, including open excavations where shoring is not required, should be completed in accordance with applicable OSHA regulations. Temporary lateral support may be required to facilitate construction in excavations.

9.1.2 Temporary Dewatering

Subsurface water was typically observed outside large fill areas at shallow depths (2 to 11 feet below ground surface, average depth of 6 feet and elevation of 5 feet) in the subsurface explorations after a stabilization period. As such, dewatering will most likely be required for most excavations at the project site extending deeper than several feet. Based on the relatively granular nature of the upper soils at the project site, relatively rapid water infiltration during excavation should be anticipated. This condition may make it difficult to stabilize excavations without adequate dewatering.

Refer to Table A-2 in Appendix A and the exploration logs in Appendix B for specific observations of subsurface water at exploration locations at the time of drilling and after a stabilization period in many of the explorations. Water levels at the time of construction may differ from what was observed during our investigation. The field investigation was conducted during a period of moderate drought. The implemented dewatering approach must be developed based on site conditions prevalent at the time of construction.

9.1.3 Subgrade Preparation

Most of the proposed embankment fills will be constructed to widen and/or raise the existing embankment fill to meet the proposed roadway grade. The existing pavement along I-64 EB will be demolished, and the subgrade preparation for new fill or pavement for I-64 and Ramp D7 will

occur largely within the existing embankment fill. The existing embankment fill is primarily medium dense to dense granular soil (SP, SM, and SC); however, there may be localized subgrade soils that are unsuitable once exposed.

Up to 6 inches of topsoil were observed in our explorations along the proposed Ramp D7. The project site is generally clear along the I-64 WB baseline, but is generally heavily vegetated along the Ramp D7 baseline. Stripping and grubbing of wooded sites typically results in significant disturbance of near-surface soils, particularly during periods of wet weather.

Up to 24 inches of soil could be disturbed during stripping and grubbing in wooded or heavily vegetated areas, requiring removal or recompaction prior to placement of any additional fill or structures. Root balls from large trees may result in even deeper disturbance and require specific limited areas to be backfilled with controlled structural fill.

Soft subgrade soils were encountered during the subsurface exploration program along the Ramp D7 baseline that may be unsuitable for support of minor structures, controlled structural fill, or utility backfill. Stabilization options might include undercut and replacement with controlled structural fill, use of geotextiles, blending of undercut material with suitable on-site material, and/or stabilization with lime or cement.

9.1.4 Undercut and Overexcavation Potential

For purposes of this study, undercut refers to undefined and unplanned areas of unsuitable materials that will require removal and replacement with suitable materials. Undercut depths and lateral extents will be determined at the time of construction and verified by a qualified geotechnical engineer. Based on the conditions encountered during the subsurface exploration program, undercut will be required in some areas to achieve stable subgrade.

Overexcavation refers to defined areas of unsuitable or organic material that will be removed and replaced with suitable materials. Overexcavation depths and lateral extents are shown on the plans and will be verified in the field by a qualified geotechnical engineer at the time of construction.

For the PSA I-64, D7, and Bridge, the proposed cuts are less than approximately 5 feet and are proposed for drainage ditches adjacent to the roadway section. Generally, medium dense and loose granular soils (SC, SM, and SP) were encountered within anticipated depths of cuts. Loose sandy soils can typically be recompacted without requiring undercut, provided they are properly moisture conditioned and above the subsurface water or properly dewatered. Along the proposed drainage ditch adjacent to the Ramp D7, stiff to very stiff, highly organic cohesive soils were encountered at shallow depths. As such, localized areas of subgrade may still require partial undercut/overexcavation and replacement with properly compacted fill. This typically applies between stations 14+00 to 22+00 of the Ramp D7 baseline.

There are a number of minor culverts proposed to handle roadway drainage. Each of these areas will likely require dewatering and subgrade stabilization prior to placing the culvert bedding and backfill. This is discussed further in Section 10.6.

9.1.5 Reuse of On-Site Soil

Although planned cuts on the site will produce a limited quantity of soil, the granular soils (SC, SM, and SP) generally encountered within the anticipated excavation depths are expected to be suitable for reuse as embankment fill.

9.2 Embankments

Embankment design and construction requires attention to issues that include, but are not limited to, global stability, foundation soil settlement, and compression of the embankment material. For purposes of this study, an embankment refers to any unreinforced soil slope or fill, including the zone of material behind and/or between the anticipated reinforced zones of the MSE walls.

Based on review of the Public Hearing cross sections, fill embankments will be required to accommodate proposed grade changes for I-64 WB and the eastern approaches to Ramp D7. For I-64 WB, a 2H:1V slope on the right east side of the baseline will be up to approximately 14 feet tall (with up to approximately 6 feet of proposed sliver fill). Fill embankments along I-64 WB tie into the east approach to Ramp D7 at approximately I-64 WB Station 126+00. For the east approach to Ramp D7, a 2H:1V slope on the right east side of the baseline will be up to approximately 8 feet tall from Ramp D7 Stations 10+00 to 14+00. Beyond Station 14+00, a retaining structure is proposed that will range in height from approximately 8 feet to 25 feet.

9.2.1 Global Stability of Embankments

For “critical” VDOT embankment and wall applications (walls of 15 feet or greater and slopes of 25 feet or greater), the minimum required factor of safety for global stability is 1.5. For non-critical applications, the minimum required factor of safety is 1.3. For the purposes of the analyses, we considered potential failure surfaces located behind the anticipated reinforced zone of the MSE wall, which extends a minimum distance of approximately 0.7H behind the face (where H = total wall height). We assumed a unit weight for embankment fill of 130 pcf, and both short-term and long-term conditions in our analyses were evaluated. Table 12 summarizes the results of our global stability analyses.

Table 12: Summary of Global Stability Analyses for Embankment Fills

Location	Geometry	Fill Height (feet)	Total Slope/Wall Height (feet)	Short-Term FS	Long-Term FS	Acceptable FS?
I-64 WB 106+50 Right	2H:1V Slope	5	12	1.5	1.5	Yes
Ramp D7 22+00 Right	MSE Wall	28	28	<1	1.2	No

As shown in Table 12, the proposed embankment fill at Ramp D7 Station 22+00 does not result in satisfactory factors of safety with respect to slope stability. Analyses show that potential shear failure surfaces pass through a shallow, weak layer of clay with high organic content. Based on discussions with VDOT, this layer was likely overexcavated and replaced within the prism of the existing roadway alignment during original construction to limit the potential for settlement and stability issues. Deeper, recent explorations completed through the existing embankments generally show the absence of the layer, as anticipated. However, the layer was observed outside the extents of the existing embankments and will present challenges to the stability of embankment widenings.

Due to generally consistent subsurface conditions along the proposed Ramp D7, only one representative subsurface profile, at Ramp D7 Station 22+00, was modeled for analysis. Fill heights were altered to represent fill pressures applied at other stations.

Several mitigation options were analyzed to address global stability at Ramp D7 Station 22+00. Since potential shear failure surfaces pass through a shallow, weak layer of clay with high organic content, we considered removal and replacement of the layer. However, up to 15 feet of soils may be required to be removed to undercut and replace the weak clay layer. This option is most likely cost prohibitive.

A second option is to construct the embankments with lightweight fill. Global stability was analyzed with fill weights of 70, 110, and 130 pcf at varying fill pressures (corresponding to different fill heights). A summary of our analyses at Station 22+00 is presented in Table 13. Long-term analyses at Station 22+00 are also presented as Plot D-1 in Appendix D. A summary of our short-term analyses at varying fill pressures is presented as Plot D-2 in Appendix D. The results indicate that lightweight fill improves global stability, but it does not satisfy the recommended factors of safety at higher fill heights.

Another mitigation option is to construct stability berms in front of the MSE wall. We analyzed a 5-foot tall and 10-foot wide berm constructed at varying fill pressures. A summary of the long-term analyses at varying fill pressures is presented as Plot D-3 in Appendix D. Additionally, at Ramp D7 Station 22+00, we analyzed global stability with fill weights of 70, 110, and 130 pcf. A summary of our long-term analyses is presented as Plot D-1 in Appendix D. The results

indicate construction of a stability berm improves global stability (particularly with lightweight fill), but does not satisfy the required factor of safety at higher fill heights.

Table 13: Summary of Global Stability Analyses with Lightweight Fill and Construction of Berm in Front of Retaining Walls

Ramp D7 Station	Assumed Fill Height (feet)	Short-Term Factor of Safety			Long-Term Factor of Safety		
		Fill Wt. = 130 pcf	Fill Wt. = 110 pcf	Fill Wt. = 70 pcf	Fill Wt. = 130 pcf	Fill Wt. = 110 pcf	Fill Wt. = 70 pcf
22+00 (without stability berm)	28	0.7	0.7	1.0	1.2	1.2	1.4
22+00 (with stability berm)	28	0.7	0.8	1.2	1.4	1.5	1.8

Another mitigation option is construction of aggregate columns to strengthen weak foundation soil layers. For this project, aggregate columns would be used primarily to increase the factor of safety against rotational instability through upper soft, organic clay layers. The columns would also decrease total settlements and increase the time rate of settlement by providing additional vertical stiffness and increased drainage through the permeable stone. Embankment settlement is addressed in Section 9.2.2.

Aggregate columns will likely be required to meet required factors of safety where the fill load exceeds about 1,000 psf. This is equivalent to a fill height of about 14 feet of 70 pcf material. If there is a stability berm planned, this fill height increases to about 20 feet. In places where PV drains are required for settlement concerns and stone columns are required for stability concerns, the aggregate columns will offer the same advantages as PV drains, and PV drains are not required.

For this project, we considered the aggregate columns to be installed to 25-foot depths at an area replacement ratio of approximately 0.4. Fill directly overlying the aggregate columns is assumed to be normal weight material.

The results of our analyses indicate a combination of lightweight fill and aggregate columns can provide the improvement required to meet minimum factors of safety for global stability. Table 14 provides a summary of recommended improvements. A detailed summary is provided in Table A-4 in Appendix A.

Table 14: Summary of Improvements for Global Stability

I-64 WB Station Range	Range of Embankment Heights (feet)	Recommended Improvement	
		Lightweight Fill? (70 pcf)	Aggregate Columns?
100+00 to 129+50	0 to 8	No	No
130+00 to 133+00	11 to 14	Yes	No
133+50 to 137+50	16 to 25	No	Yes

9.2.2 Foundation Soil Settlement

The foundation soils at the project site will consolidate as a result of the increased vertical stresses beneath the proposed embankment fills. HDR completed settlement analyses at two embankment fill locations to evaluate the magnitude and time-dependent characteristics of the anticipated consolidation settlement. The subsurface conditions considered for the analyses are summarized in Table 15 and are presented graphically on the subsurface profiles in Appendix A.

HDR characterized the compressibility of the different soil layers at the project site. We completed 13 one-dimensional consolidation tests on "undisturbed" soil specimens collected from our explorations to aid in the estimation of compression parameters, including compression and recompression ratio, preconsolidation pressure, and time rate of consolidation parameters. Table 16 summarizes the relative compressibility characteristics of the soil layers identified in Table 15 and modeled in our analyses.

Table 15: Summary of Subsurface Conditions Considered for Settlement Analyses

Analysis Location	Representative Explorations	Soil Layer (USCS)	Typical Encountered Elevations (feet)	Thickness (feet)
Ramp D7 Station 18+00	D7-6W	Upper Sand (SM)	8 to 3	5
		Organic Clay (CL,OL)	3 to -1	4
		Upper Sand	-1 to -18	17
		Upper Clay (CL, CH)	-18 to -55	37
		Lower Sand (SP, SP-SC)	-55 to -86	31
		Lower Clay (CH)	-86 to -94	8
		Yorktown (SC)	Below -94	N/A

Table 16: Summary of Soil Layer Settlement Characteristics

Soil Layer	Thickness Range[1]	Settlement Magnitude Comments	Settlement Time Rate Comments
Sands (Upper and Lower)	53 feet total	Low Compressibility	Rapid Consolidation
Organic Clay	4 feet	High Compressibility Preconsolidated to 0.8 ksf	-Slow Consolidation -Higher potential for increased secondary compression in organic soils
Upper Clay	37 feet	Moderate Compressibility Preconsolidated to 3.6 to 3.8 ksf Typical OCR = 1.6 to 2.1	-Slow Consolidation -Vertical stress from embankments greater than 10 to 15 ft in height push this layer into normally consolidated stress range when constructed with normal weight fill
Lower Clay	8 feet	High Compressibility Preconsolidated to 7.6 ksf to 8.0 ksf Typical OCR = 1.8 to 2.3	Rapid Consolidation as clay remains in overconsolidated range
Yorktown	N/A	Low Compressibility Heavily Overconsolidated – N/A	Rapid Consolidation – N/A

[1] Thickness ranges are based on encountered elevations provided in Table 15
N/A – Not Applicable or no influence on analyses.

HDR completed settlement analyses using internally developed spreadsheets and the computer program CONSOL (version 3.0, CGPR, Virginia Tech). We modeled the layer thicknesses shown in Table 15 and the compression parameters shown in Section 9.2 of this report. Table 17 and Plot D-4 in Appendix D summarize the results of our primary consolidation settlement magnitude and time rate analyses. The results assume no improvements are implemented such as lightweight fill or aggregate columns, as discussed in Section 9.2.1.

Due to generally consistent subsurface conditions along the proposed Ramp D7, only one representative subsurface profile, at Ramp D7 Station 18+00, was modeled for analysis. Fill heights were altered to represent fill pressures applied at other stations.

Table 17: Results of Primary Consolidation Settlement Analysis

Station	Proposed Fill Geometry	Calculated Settlement at Centerline of Fill (Fill Wt = 130 pcf)	Estimated Time Rate of Settlement (No Improvement)
Ramp D7 Station 18+00	Fill Height = 17 feet Width of Fill = 40 feet Wall	9 inches total 5 inches rapid 4 inches over time	t < 3 in = 1 month t < 1 in = 6 months
Ramp D7 Station 18+00	Fill Height = 25 feet Width of Fill = 45 feet Wall	15 inches total 7 inches rapid 8 inches over time	t < 3 in = 7 months t < 1 in > 1 year

For a given fill height, less settlement will occur towards the toe of the embankment slope or near the vertical face of a retaining wall, away from centerline. Our settlement analyses, summarized in Table 18, show potential for differential settlement between the center of embankment and the outer vertical face.

Table 18: Estimated Differential Settlement

Station	Location	Total Settlement (inches)	Differential Settlement (inches)[1]
Ramp D7 Station 18+00	Centerline of Fill	12	--
	Back of Reinforcements (0.7H = 14 ft behind wall face, where H = 25 ft)	12	0
	Wall Face	7	5

[1] Differential Settlement = Total settlement at Centerline minus Total Settlement at Back of Reinforcement

9.2.2.1 Acceleration of Primary Consolidation Settlement

Based on the analyses, the time necessary to reach less than 1 inch of settlement for station 18+00 with a fill height of 17 and 25 feet are approximately 6 months and 2 years, respectively, for 130 pcf weight embankment fill constructed on unimproved ground. If construction schedules cannot be developed to support the anticipated phasing and wait times necessary to meet required settlement tolerances, below ground improvement or lightweight fill will be required. Prefabricated vertical (PV or Wick) drains were evaluated to accelerate the consolidation settlement by providing a shorter lateral drainage path for the consolidating clay layers. For analyses purposes, the PV drains were modeled at lengths of approximately 65 feet through the upper clay of the Tabb formation with a 5-foot triangular pattern spacing. Table 19 shows the results of the PV drain analyses.

Table 19: Results of PV Drain Analyses

Location	Estimated Maximum Settlement (Fill Wt = 130 pcf)	Time to < 3 inches		Time to < 1 inch	
		No PV Drains	With PV Drains 5 ft spacing	No PV Drains	With PV Drains 5 ft spacing
Ramp D7 Station 18+00 (17 Feet Fill)	9 inches total 5 inches rapid 4 inches over time	1 month	1 month	6 months	3 months
Ramp D7 Station 18+00 (25 Feet Fill)	15 inches total 7 inches rapid 8 inches over time	7 months	1 month	2 years	3 months

PV Drains can be installed through the upper clays at a reasonable spacing of about 5 feet to accelerate the time rate of settlement. The time to less than 3 inches of settlement should be less than about 1 month. The time to less than 1 inch of settlement might be less than about 3 months.

9.2.2.2 Secondary Consolidation Settlement

After primary consolidation settlement has completed, secondary consolidation settlement of the clay layers will continue throughout the service life of the proposed approach embankments. It is expected the organic clay and upper clay layers to contribute most of the anticipated secondary compression. We estimated the coefficient of secondary compression, c_α, for the different layers based on the results of a number of consolidation tests completed with selected 24-hour loading cycles. For our calculations, we assumed a 6 month period for completion of primary consolidation settlement and a total design life of 75 years. As shown in Table 20, we estimate approximately 5 inches of secondary compression (in addition to the primary consolidation settlement) for the fill embankments analyzed over a 75-year time period.

Table 20 – Summary of Secondary Compression Calculations

Clay Layer	Coefficient Of Secondary Compression, c_α	Ramp D7 Station 18+00	
		Layer Thickness (feet)	Secondary Compression in 75 years (inches)
Organic Clay	0.013	4	1.4
Upper Clay	0.003	37	2.9
Lower Clay	0.0003	8	0.1
		Total	**4.4**

9.2.2.3 Embankment Soil Compression

Assuming proper controlled structural fill placement, we anticipate compression of the embankment soils resulting from the proposed embankment loads will have magnitudes substantially less than the underlying foundation soils, as well as occur during the construction of the embankments. It is not anticipated the compression of properly placed embankment soils to significantly impact the design or construction of the embankments.

9.2.2.4 Field Monitoring of Embankment Settlement

It should be noted that, for a number of factors, the magnitude and time rate of settlement are difficult to predict accurately. These factors include site conditions that vary from those observed in our explorations, the variation of actual compression characteristics from those we modeled, the presence of undetected sand seams within clay layers, and scaling and other three-dimensional effects.

Settlement plates should be used to measure actual deformations in the field, if desired, based on the anticipated construction schedule. If settlement plates are installed correctly and monitored regularly, the time necessary to complete primary consolidation settlement can be more accurately predicted and might result in more efficient construction scheduling.

9.3 Cut Slopes

For the PSA I-64, D7, and Bridge, the proposed cuts are less than approximately 5 feet and are proposed for drainage ditches adjacent to the roadway section. Subsurface water may be encountered in some cut areas.

9.4 Soil Corrosion Potential

According to the USDA soil survey, the PSA I-64, D7, and Bridge is primarily located within the Tomotley loam. Based on the survey, soils comprising the Tomotley loam are likely to have moisture, grain size, acidity, and electric conductivity properties that support corrosion of steel and concrete. pH values are typically in the range of 3.5 to 5.5.

Corrosivity testing was performed on three samples collected from the subsurface investigation. The results are summarized in Table 21 below:

Table 21: Summary of Corrosion Testing

Exploration	Depth (feet)	pH	Resistivity	Sulfide (ppm)	Chloride (ppm)
SWM4-1	4-6	5.1	143,000 ohms-cm	BQL[1]	BQL[1]
SWM4-2	4-6	5.1	120,000 ohms-cm		
SWM4-2	6-8			BQL[1]	19
[1] BQL – Below the Quantifiable Limit					

Structure foundations on PSA I-64, D7, and Bridge will consist of reinforced concrete. The Ramp D7 Bridge will likely be supported by concrete piles. In addition, several reinforced concrete culverts are proposed within the project limits.

These laboratory test results were compared with the potential soil corrosion criteria in accordance with Section 10.7.5 of AASHTO Bridge Design Manual, 5th Ed, and corrosion criteria for MSE reinforcement as specified in the FHWA NHI-10-024 - Design and Construction of MSE Walls and Reinforced Soil Slopes. The corrosion criteria from AASHTO and FHWA are summarized in Tables 22 and 23, respectively.

Table 22: AASHTO Corrosion Criteria for Steel and Concrete

Property	Criteria for Corrosive Soils
Resistivity	< 2,000 ohms-cm
Sulfate	> 1,000 ppm
pH	< 5.5, For highly organic soils: < 5.8 and > 8.5
Environment	Mixture of highly resistivity soils and low resistivity high alkaline soils; and/or in fill or marine environments

Table 23: FHWA Corrosion Criteria for MSE Walls

Steel Reinforcement	
Property	**Criteria for Corrosive Soils**
Resistivity	< 3000 ohms-cm
pH	< 5 and > 10
Chloride	> 100 ppm
Sulfate	> 200 ppm
Organic Content	1% max.
Geosynthetic Reinforcement	
Base Polymer	**Criteria**
Polyester (PET)	pH < 3 and pH > 9
Polyolefin (PP & HDPE)	pH < 3

Two soil samples were analyzed for resistivity; neither met the criteria for corrosion potential for steel and concrete per AASHTO or steel reinforcement per FHWA. Both samples tested for pH value met the criteria for corrosion potential per AASHTO (< 5.5), but did not meet the corrosion potential criteria per FHWA (< 5). Two soil samples were tested for sulfide and chloride

concentrations. Chloride concentrations were less than 100 ppm and did not meet the corrosive criteria for steel per FHWA. Sulfide concentrations were below the quantifiable limit.

The project soils have a moderate corrosion potential based on these test results and subsurface conditions, in our opinion. Based on our previous conversations with John Deusebio, the VDOT Suffolk District Senior Geologist, corrosion potential of the on-site soils is also a function of the saline environment and the acidic industrial pollution. It is understand VDOT typically restricts the use of metal pipe to inland rural areas and uses reinforced concrete and some high density plastic pipes in coastal areas.

A majority of the proposed MSE walls will be constructed above the existing ground surface and with borrow material. The excavation required for the embedment depth and leveling pad construction will remove all unsuitable or organic materials prior to placement of reinforcement or backfill. Therefore, the corrosivity of the buried elements into natural ground is not expected to be a major concern. However, the borrow material used to construct the reinforced backfill zone should be tested and meet required electro-chemical properties shown above.

9.5 Stormwater Management Basins

Four explorations were drilled (two explorations per pond) to evaluate subsurface conditions at proposed stormwater management ponds. Additionally, standpipe piezometers were installed at two of the locations to measure post-exploration subsurface water levels. Water level observations in the explorations and piezometers are provided in Table 4 and in Appendix A, Table A-1.

At the time of this writing, final plans for the SWM ponds were not available. Based on details provided in the Public Hearing plans, we assume side slopes will not exceed 10 feet in height and will not be steeper than 3H:1V. Provided these assumptions are correct, we believe the required factors of safety for global stability will be satisfied.

9.6 Pipe/Box Culverts

9.6.1 Culvert Design

Culverts and end walls should be founded on firm and stable subgrade. Below-grade walls for drainage structures and junction boxes must be designed to resist lateral earth pressures exerted by the wall backfill, in situ soils, and hydrostatic water pressures. It is assumed perimeter walls for junction boxes will be relatively rigid and will experience at-rest soil conditions. It is also assumed head walls for culverts will be free to move horizontally and will experience active soil conditions.

Walls should also be designed to resist adjacent service loads, traffic loads, and appropriate surcharge pressures (σ_s) as determined by NAVFAC Design Manual 7.1. The design should consider lateral stresses on below-grade walls due to compaction induced earth pressures. The contractor may also have to add stresses for concentrated and other temporary construction loads.

Design below-grade structures against uplift pressures generated by the shallow subsurface water. Submerged foundations should be designed as structural slabs to resist buoyant forces. Typically, resistance will be supplied by the dead weight of the structure and any overlying soil. If resistance from the structure's weight and overlying soil is not enough, additional weight can be added by thickening the slab and/or walls of the structure. Alternatively, an oversized slab that extends beyond the perimeter walls will engage surrounding buoyant soil to add uplift resistance.

9.6.2 Overexcavation Potential

In general, medium dense silty sands (SM) and stiff clays (CL) were encountered in explorations at or near the proposed culverts 36 inches or greater. Table 24 summarizes the subsurface conditions at the proposed culverts.

Table 24: Summary of Subsurface Conditions and Proposed Construction at Culvert Locations

Culvert	Approx. Station	Encountered Soil Conditions Below Invert Elevation	Applicable Exploration	Anticipated Earthwork Construction[1]	Invert Elevation[1] (EL.)
Minor Structure 5-16, 10-foot long 48" RCP (extension)	I-64 WB 130+50	Medium Dense Silty Sand (SM)	D7-3W, I64WB-8	2 to 5-foot deep excavation to bottom of culvert, Temporary shoring and dewatering	1.5 to 1.4
Minor Structure 5-17 to 5-18, 28-foot long twin 36" RCP	I-64 WB 129+50	Stiff Clay (CL)	SWM4-2	5 to 6-foot deep excavation to bottom of culvert, Temporary shoring and dewatering	2.75 to 2.5

[1] Anticipated earthwork construction and invert elevations based on Public Hearing Plans and Cross-sections.

Each of the areas listed in Table 23 will require dewatering and subgrade stabilization prior to placing the culvert bedding and backfill. Overexcavation of unsuitable material may be required for Minor Structure 5-17 to 5-18 to minimize differential settlement concerns and provide adequate bearing capacity of the culvert and its headwall. Additionally, the subgrade clays at the proposed invert elevation (below the observed subsurface water) are highly sensitive to moisture and may be difficult to stabilize without overexcavation.

9.6.3 Pipe Bedding and Backfill

Pipe bedding and haunch backfill should consist of No. 57-sized aggregate, and woven geotextile should be used. The initial trench backfill and trench backfill should consist of select granular material (SC, SM, SP, and SW) within pavement or structure areas. If the culvert is not installed under pavement section or other structure, the overexcavation material may be used for trench backfill (12 inches above pipe to subgrade). Overexcavation material will not be suitable for use as overexcavation backfill or bedding, haunch, and initial pipe bedding of the culvert. Typical backfill of overexcavation should consist of VDOT No. 3-sized aggregate.

9.6.4 Construction Sequence

We conducted settlement analyses for both the existing and proposed Minor Structure 5-16, a 10-foot long 48" RCP extension located at approximate I-64 WB Station 129+50, to estimate approximate settlement profiles along the pipes. The settlement analyses were conducted for an embankment fill height overlying the structures of approximately 14 feet. We calculated a maximum settlement beneath the proposed fill of approximately 3.5 inches, with differential settlement longitudinally along the pipe axis up to approximately 3 inches, or about ¼ inch per foot of length. If the embankment is constructed with lightweight fill as discussed in Section 9.2.1, smaller settlement magnitudes can be expected. We calculated maximum settlements of less than 2.5 inches with maximum differential settlements up to 2 inches, or approximately 0.15 inches per foot of length. Plot D-5 in Appendix D provides an estimate of settlement magnitude beneath the embankment. Given the generally overconsolidated nature of the on-site soils beneath the fill, it is expected that settlements will occur relatively quickly as the fill is placed.

9.7 Pavement Subgrade

The pavement explorations along I-64 WB encountered 8 to 18 inches of asphalt concrete pavement. Pavement exploration I64WB-11 encountered asphalt concrete pavement underlain by 7 inches of aggregate subbase. The subgrade soils consisted primarily of loose to dense fine poorly graded sand fill, poorly graded sand, and silty sand (FL, SP, and SM). Pavement explorations I64WB-P2 and I64WB-P3 encountered asphalt concrete pavement underlain by 6 to 10 inches of concrete subbase. The concrete subbase was underlain by 5 inches of aggregate subbase in pavement exploration I64WB-P3. The subgrade soils consisted primarily of medium dense to dense fine poorly graded sand (SP). Four bulk samples of the subgrade soils were tested in the laboratory for California Bearing Ratio (CBR) within PSA I-64, D7, and Bridge. CBR test results are summarized in Table 25 below. Specific laboratory test results are presented in Appendix C.

Table 25: CBR Test Results

Exploration	Sample Depth (feet)	Classification (USCS)	Standard Proctor		CBR Results			
			Max. Dry Density (pcf)	Opt. Water Content (%)	Dry Density (pcf) / MDD	Water Content (%)	CBR Value (%)	% Swell
I64WB-2/ I64WB-4	1.0-4.0	SP-SM	103.1	14.1	106.2 / 103.0	16.5	30.8	0
I64WB-P3/ I62WB-P5	0.0-10.0	SM	105.8	12.7	107.6 / 101.7	16.1	29.9	0
SWM4-1	3.0-15.0	SP-SM	111.9	13.2	113.7 / 101.6	13.7	24.8	0
SWM5-2	0.0-10.0	CL	118.7	12.1	120.1 / 101.2	15.4	8.5	0.7

10.0 GEOTECHNICAL RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

10.1 Earthwork

10.1.1 Soil Excavation and Temporary Support

Where temporary shoring is required in accordance with OSHA 1926.650 Excavation Standard:

- Contractor shall be responsible for design of temporary lateral support systems.
- Design shall be completed by a qualified, registered Professional Engineer licensed in the Commonwealth of Virginia.
- Design shall be comprehensive and conducive to review by the Owner. Calculations shall be clearly documented.

10.1.2 Temporary Dewatering

- When required, install dewatering systems in advance of excavation.
- Maintain piezometric water level a minimum of 2 feet below bottom of excavation at all times.
- The selected dewatering system shall provide dry and stable subgrade and prevent piping, boiling, or heaving of the excavation during all stages of construction.
- Outlet the dewatering system to limit disturbance to subgrade soils. Sump pits only may not be adequate.

- Use lean concrete mud mats as necessary to protect finished subgrade.

10.1.3 Undercut and Overexcavation Potential

Localized areas of weak or unsuitable subgrade are anticipated within PSA I-64, D7, and Bridge. Where undercut is required, the following is recommended:

- Inspect all subgrades immediately prior to controlled structural fill. Inspection shall be performed by a qualified representative from VDOT. Identification of unsuitable material should be in general accordance with the VDOT Road and Bridge Specifications and special provisions.
- Undercut unsuitable soils encountered within a minimum of 1 vertical foot of finished subgrade in accordance with VDOT Road and Bridge Specifications, Section 303.06(a)3.
- Replace undercut with controlled structural fill in accordance with the specifications.

10.1.4 Reuse of On-Site Soil

Any on-site material to be used as controlled structural fill should be granular and free from contamination, organic, or other deleterious matter per VDOT Road and Bridge Specifications, Sections 303.04 and 106.04. On-site soils for reuse as structural fill shall classify as SC, SM, SW, SP, GC, GM, GW, or GP in accordance with the Unified Classification System. Fine-grained soils and soil containing organics that classify as CL, CH, ML, MH, OL, OH, or PT should not be reused as structural fill. Off-site borrow material should classify as SC, SM, SW, SP, GC, GM, GW, or GP. On-site and borrow material shall be tested by an accredited AASHTO Materials Reference Laboratory (AMRL) and shall meet the following requirements for structural fill:

- Liquid Limit: 30% max
- Plasticity Index: 15 max
- Percentage of fines (minus 200 sieve – 0.075 mm): 30% max

Soils considered for use as embankment fill should meet the requirements of controlled structural fill as specified above but can also include soils classified as ML and CL with up to 60% fines. The ML and CL soils will require additional effort to moisture condition in the field and should not be used within four vertical or horizontal feet of final pavement subgrade. Highly plastic and organic soils (CH, MH, OL, OH, or PT) should not be used as embankment fill. Off-site borrow material should classify as SC, SM, SW, SP, GC, GM, GW, GP, CL, or ML for embankment fill. On-site and borrow material shall be tested by an accredited AMRL and shall meet the following requirements for embankment fill:

- Liquid Limit: 30% max

- Plasticity Index: 15 max
- Percentage of fines (minus 200 sieve – 0.075 mm): 60% max

Highly plastic and organic soils (CH, MH, OL, OH, or PT) can be placed in "green" areas only or areas that will not impact positive drainage. These soils will be very difficult to compact and may require blending or lime stabilization to meet the required compaction effort according to project specifications.

On-site soils considered for reuse as structural or embankment fill shall be approved by a qualified representative of VDOT.

10.2 Embankments

Recommendations for the design and construction of proposed unreinforced soil embankments for the PSA I-64, D7, and Bridge are as follows:

10.2.1 Global Stability of Embankments

The following recommendations for embankments are offered:

- Construct all embankments at a slope of 2H:1V or flatter. Currently, the proposed embankment slopes along I-64 WB prior to tying into Ramp D7 at approximately I-64 WB station 126+00, are less than 15 feet in height. If slope heights of 15 feet or greater are required south of I-64 WB station 126+00, the global stability should be re-evaluated by the geotechnical engineer. Lighter weight fills and/or flatter slopes should be considered to improve global stability.
- Embankments greater than 8 feet in height along Ramp D7 require improvement to meet the minimum requirements for factor of safety for global stability. Based on review of the Public Hearing cross sections, a 2H:1V slope on the right east side of the baseline will be up to approximately 8 feet tall from Ramp D7 stations 10+00 to 14+00. Beyond station 14+00, MSE walls are proposed that will range in height from approximately 8 feet to 25 feet.
- Above- and below-ground improvement recommendations for the embankments located along the eastern approach of Ramp D7 are provided in Table A-4 in Appendix A. The most cost-efficient method of improvement may be combination of lightweight fill and aggregate columns.

10.2.2 Foundation Soil Settlement

The following for field monitoring of embankment settlement are recommended:

- Install settlement plates at the locations shown in Table 25. Vary the settlement plate locations as necessary to avoid damage by construction equipment. At the time of this writing, the location of western abutment of the Ramp D7 Bridge over the commuter rail line / Curlew Drive has not been determined. Thus, the settlement plate locations proposed in Table 26 must be reevaluated after the location of the abutment is determined.
- Survey and record data from the settlement plates on a regular basis to track settlement during construction. Frequency of monitoring shall be in accordance with Chapter 10 of the VDOT Geotechnical Manual for Structures.
- A qualified Geotechnical Engineer should interpret the time rate of settlement data to evaluate the time required to complete primary consolidation settlement.

Table 26 – Proposed Settlement Plate Locations

Location	Settlement Plate No.	Station	Offset Centerline (feet)	Fill Height (feet)
Ramp D7	1	22+00	3 Left	25
	2	21+00	1 Left	23
	3	20+00	1 Right	21
	4	19+00	5 Right	17
	5	18+00	6 Right	16
	6	17+00	8 Right	14
	7	16+00	9 Right	13
	8	15+00	8 Right	14
Note: Proposed settlement plate locations shown in this table are located a distance of approximately H + 5 feet behind the wall face, where H is the total wall height. The settlement plates should be located behind the reinforced zone of the wall, in a position that will limit their exposure to damage by construction equipment.				

10.2.3 Embankment Soil Compression

Place embankment materials in accordance with VDOT Section 303.04 to limit settlement of embankment materials.

10.2.4 Subgrade Preparation

Prepare subgrades that support controlled structural fill, embankments, pavements, utilities, or minor structures in accordance with VDOT Section 305.

10.3 Cut Slopes

Construct all cut slopes with a maximum 2H:1V geometry. If proposed cut slopes exceed 10 feet in height, the global stability shall be reevaluated by the Geotechnical Engineer.

10.4 Soil Corrosion Potential

10.4.1 Foundations and Culverts

Organic soils were encountered throughout the site, which is within a marine environment and has tidal influence. Laboratory testing of select samples within the PSA I-64, D7, and Bridge found them to be corrosive based on the criteria (Section 8.4) specified by AASHTO and FHWA. The corrosion potential of the on-site soils is also a function of the saline environment and potential acidic industrial pollution. VDOT typically restricts the use of metal pipe to inland rural areas and uses reinforced concrete and some high density plastic pipes in coastal areas.

In general, we believe that buried reinforced concrete pipes will perform sufficiently in the moderately corrosive environment indicated by the tested soil samples.

10.5 Stormwater Management Ponds

At the time of this writing, final plans for the SWM ponds are not available. Based on details provided in the Public Hearing plans, we assume side slopes will not exceed 10 feet in height and will not be steeper than 3H:1V. Provided these assumptions are correct, we expect minimum required factors of safety for global stability are satisfied. The SWM ponds should be evaluated for global stability when final plans are drafted.

10.6 Pipe/Box Culverts

10.6.1 Culvert Design

Box culverts and head wall foundations shall be designed in accordance with the following recommendations:

- Design foundations for a maximum allowable net bearing capacity of 2,000 psf.
- The bottom of the foundations shall bear a minimum of 12 inches below final exterior grade to protect against damage from freeze-thaw cycles.
- Design foundations using a coefficient of sliding along the base of 0.35.
- Design for lateral earth pressure using an at rest pressure coefficient (K_o) of 0.50 and equivalent fluid unit weight (γ_{eq}) of 95 pcf. This fluid unit weight assumes a saturated condition with water located at the ground surface.
- Design for uplift using a buoyant unit weight (γ_b) of 50 pcf for the overlying soil and overburden resistance calculation.
- Design for a minimum Factor of Safety of 1.1 against uplift, and assume the water table is located at the ground surface.

10.6.2 Overexcavation

Based on the proposed culvert locations and the subsurface conditions observed in the explorations, overexcavation recommendations at each culvert location are provided in Table 27. The overexcavation is required to limit differential settlement and improve bearing capacity.

- Install temporary shoring and dewatering measures as necessary to perform the overexcavation.
- Overexcavate a minimum of 18 inches below the bottom elevation of the culvert. Lateral extents of the overexcavation shall be a minimum of 1 foot beyond the outer limits of the culvert in all directions.
- Place woven geotextile along the bottom and sides of the excavation (either parallel or perpendicular to the pipe) prior to placement of overexcavation backfill.
- Backfill overexcavation uniformly with 12 inches of VDOT No. 3 stone followed by 6 inches of VDOT No. 57, or as directed in Table 27 for deeper overexcavations.

Table 27: Summary of Overexcavation Recommendations for Culverts

Culvert	Begin Station	End Station	Overexcavation Depth (inches)	VDOT No. 3 (inches)	VDOT No. 57 (inches)
Minor Structure 5-17 to 5-18, 28-foot long twin 36" RCP	I-64 WB 129+20	I-64 WB 129+50	18	12	6

10.6.3 Pipe Bedding and Backfill

Pipe bedding and backfill should be placed in accordance with the 2007 VDOT Road and Bridge Specifications and the following recommendations:

- Pipe bedding and haunching backfill shall consist of VDOT No. 57 size aggregate or comparable open-graded coarse aggregate material.
- Pipe bedding should be a minimum of 4 inches thick for pipe culverts and 6 inches for box culverts.
- Place haunching material from the invert to the midpoint of the pipe in 6 inch lifts at equal rates on both sides of the pipe. Haunching backfill should be shovel-sliced around the pipe to insure there are no voids under the pipe and compacted with small hand operated compactors.

- Place initial pipe backfill over the haunching material in 6 inch lifts to 12 inches above pipe and compact with hand-operated compactors. Initial pipe backfill shall consist of granular material.
- Place trench backfill from over the initial backfill to subgrade elevation and compact to 95% of the maximum dry density, as per Standard Proctor (VTM-1).

10.6.4 Construction Sequence

As stated in Section 9.6.4, we conducted settlement analyses for both the existing and proposed Minor Structure 5-16, a 10-foot long 48" RCP extension located at approximate I-64 WB Station 129+50, to estimate approximate settlement profiles along the pipes. We calculated maximum settlements beneath the proposed embankment fill of approximately 3.5 inches. We also calculated differential settlement longitudinally along the pipe axis. It is expected maximum differential settlement up to 3 inches, or up to 0.23 inches per foot of length. If the embankment is constructed with lightweight fill as discussed in Section 9.2.1, smaller settlement magnitudes can be expected. We calculated maximum settlements of less than 2.5 inches with maximum differential settlements up to 2 inches, or up to 0.15 inches per foot of length. Plot D-5 in Appendix D provides an estimate of settlement magnitude beneath the embankment. Given the generally overconsolidated nature of the on-site soils beneath the fill, it is expected that settlements will occur relatively quickly as the fill is placed.

Based on our experience with similar projects, we anticipate the predicted differential settlements are within tolerable limits for reinforced concrete pipes of this diameter. We recommend evaluating the hydraulic properties of the pipe extension given the potential for differential settlement across its length.

10.7 Pavement Subgrade and Design

Prepare pavement subgrade in accordance with Section 305 of the VDOT Road and Bridge Specifications. Unsuitable materials shall be undercut in accordance with the recommendations provided in Section 10.1.3 of this report.

VDOT is responsible for the pavement design(s) for PSA I-64, D7, and Bridge. Existing pavement section thickness and CBR laboratory test results are summarized in Sections 7.1 and 9.7 of this report, respectively.

11.0 GEOTECHNICAL CONSIDERATIONS FOR MAJOR STRUCTURES

Development of geotechnical design recommendations for major structures, including bridge abutment walls, bridge foundations, and retaining walls, is beyond the scope of HDR's geotechnical study for PSA I-64, D7, and Bridge. However, HDR's scope of work includes

evaluation of settlement and global stability for embankments. The results of the analyses for embankment fills are pertinent to the design of the major structures, and our geotechnical design recommendations will impact the development of recommendations by others.

The purpose of the following sections is to provide geotechnical considerations for design of the major structures, specifically as they relate to our evaluation of settlement and global stability of fill embankments at PSA I-64, D7, and Bridge.

11.1 Global Stability and MSE Walls

The designer responsible for major structures must complete external stability evaluations for the MSE walls, including bearing capacity, sliding, overturning, global stability, and settlement. HDR completed global stability and settlement analyses for the embankments, which, as stated in Section 9.0 of this report, comprises the zone of fill between the MSE walls supporting the eastern approach embankments to Ramp D7. As such, stability analyses were limited to evaluation of potential failure surfaces behind the reinforced zone of the MSE walls. The reinforced zone extends to a minimum distance of approximately 0.7H behind the wall face, where H is the total wall height including embedment.

Based on the results of the analyses, some form of improvement is required to meet the minimum required factor of safety for global stability for the Ramp D7 approach embankment. In our opinion, the most cost-efficient method of improvement may be a combination of lightweight fill and aggregate columns. The final design team must confirm the reinforcement strap length for compliance with both internal and external stability evaluations, including those performed by the MSE wall designer.

11.2 Settlement Impacts on Walls and Bridge Foundations

As part of our study, HDR estimated the magnitude of settlement resulting from the embankment fills for the Ramp D7 approach. Typically, we estimated settlement at the centerline of the fill where the settlement should be at its maximum value. Less settlement will occur towards the edge of the fill near the toe of a slope or the face of a MSE wall. This could impact the spacing of differential slip joints within the wall face. There is also potential for substantial differential movement between the wall face and the end of the reinforcement zone. This might impact the construction schedule for the wall, which may require multiple stage construction to limit distress to wall face panels as the foundation soils consolidate. We have provided Plot D-4 in Appendix D of this report to aid in quick evaluation of maximum settlement with different embankment heights.

In addition to differential wall movements, settlement will also affect design of the bridge foundations. We expect that deep foundation elements, most likely driven piles, will be used for support of the bridge abutments. Downward movement of the foundation soils and the overlying

embankment fill relative to the piles will cause negative shaft resistance, or downdrag forces, to be exerted on the piles. In our experience, downdrag loads on the piles could be substantial. The design team must account for negative shaft resistance in their estimation of nominal pile capacities for the bridge abutments.

12.0 LIMITATIONS

This report has been prepared to discuss the finding of the subsurface and laboratory testing programs, and to facilitate preparation of final design of embankments and minor structures. Geotechnical considerations have been discussed for the purposes of identifying potential impacts to major structures. A design level geotechnical investigation must be performed by the final designer to verify and augment the information included in this report for the major structures.

The exploration logs included in this report depict the subsurface soil, ground water, and existing pavement conditions at the specific locations where the explorations were performed. These conditions may vary at other locations beyond, or between, these specific locations. In addition, the ground water levels recorded on the exploration logs indicate the ground water conditions that existed at the time of the investigation. Ground water levels may vary considerably, with time, according to prevailing climate, rainfall, surface run-off, evaporation, construction and other factors.

The discussion of geotechnical considerations as presented in this report are based on the information revealed by our exploration. We attempted to provide for normal contingencies, but the possibility remains that unexpected conditions may be encountered during subsequent site explorations and construction. The final designer must perform additional explorations and laboratory testing to develop the design for this project and to meet the minimum requirements outlined in Chapter 3 of the current VDOT Material Division's Manual of Instructions and the current AASHTO Standard Specifications for the Design of Highway Bridges, 1996, 1997, and 1998 Interim Specifications.

We have endeavored to complete the services identified herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions as this project.

13.0 REFERENCES

AASHTO, Standard Specifications for the Design of Highway Bridges, 2007.

FHWA, *Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes – Volume I,* by Ryan R. Berg, P.E.; Barry R. Christopher, Ph.D., P.E. and Naresh C. Samtani, Ph.D., P.E., FHWA-NHI-10-024, November, 2009.

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APPENDIX A
TABLES and DRAWINGS

Table A-1: Summary of Subsurface Exploration
Table A-2: Interpreted Stratigraphy
Table A-3: Laboratory Test Assignment
Table A-4: Design Tables for Global Stability and Settlement Improvements

Drawing 1: Vicinity Map
Drawing 2: Exploration Location Plan
Drawing 3: Aerial Photo and Parcel Boundaries Plan
Drawing 4: Subsurface Profiles and Cross Section Location Plan
Drawing 5A-D: Subsurface Profiles and Cross-Sections

TABLE A-1: SUMMARY OF SUBSURFACE EXPLORATIONS
PROJECT STUDY AREA I64, D7, AND BRIDGE

Reference Baseline	Exploration Designation	Purpose of Exploration	Station	Offset	"Z" Elevation (ft)	"Y" VDOT Northing (ft)	"X" VDOT Easting (ft)	Driller	Proposed Depth (ft)	Depth Drilled (ft)	Date Started	Date Completed
I64 WBL	I64WB-1	Pavement	102+50	20 ft RT	23.2	189432.8	3955250.9	GET	10	10	9/13/2010	9/13/2010
	I64WB-2	Pavement	106+50	20 ft RT	18.5	189830.6	3955208.3	GET	10	10	9/13/2010	9/13/2010
	I64WB-3	Pavement	110+50	20 ft RT	13.8	190228.3	3955165.8	GET	10	12	9/13/2010	9/13/2010
	I64WB-4	Pavement	114+50	20 ft RT	11.8	190626.0	3955123.2	GET	10	10	9/13/2010	9/13/2010
	I64WB-5	Pavement	118+50	20 ft RT	12.0	191023.8	3955080.7	GET	10	10	9/13/2010	9/13/2010
	I64WB-6	Pavement	122+50	20 ft RT	11.7	191421.5	3955038.1	GET	10	10	9/13/2010	9/13/2010
	I64WB-7	Pavement	126+50	20 ft RT	12.0	191819.2	3954995.6	GET	10	10	9/13/2010	9/13/2010
	I64WB-8	Pavement	130+50	20 ft RT	16.4	192216.9	3954953.2	GET	10	10	9/13/2010	9/13/2010
	I64WB-9	Pavement	132+50	18 ft RT	22.0	192415.5	3954932.6	GET	10	10	9/13/2010	9/13/2010
	I64WB-10	Pavement	134+50	18 ft RT	27.2	192614.6	3954917.5	GET	10	10	9/13/2010	9/13/2010
	I64WB-11	Pavement	136+50	20 ft RT	32.3	192814.0	3954907.9	GET	10	10	9/13/2010	9/13/2010
	I64SB-1	Sound Wall	101+50	70 ft RT	8.8	189338.7	3955311.2	GET	30	30	9/16/2010	9/16/2010
	I64SB-2	Sound Wall	103+50	85 ft RT	8.5	189539.2	3955304.8	MAD	30	50	10/28/2010	10/28/2010
	I64SB-3	Sound Wall	105+50	70 ft RT	8.4	189736.4	3955268.7	GET	30	30	9/16/2010	9/16/2010
	I64SB-4	Sound Wall	107+50	70 ft RT	8.2	189935.1	3955247.4	MAD	30	50	10/28/2010	10/28/2010
	I64SB-5	Sound Wall	109+50	70 ft RT	8.8	190134.2	3955226.1	GET	30	30	9/16/2010	9/16/2010
	I64SB-6	Sound Wall	111+50	70 ft RT	8.8	190333.0	3955204.9	MAD	30	50	10/28/2010	10/28/2010
	I64SB-7	Sound Wall	113+50	70 ft RT	8.6	190531.9	3955183.6	GET	30	55	9/16/2010	9/16/2010
	SWM4-1	Stormwater Pond 4	128+25	130 ft RT	4.3	192001.3	3955086.2	GET	20	20	9/16/2010	9/16/2010
	SWM4-2	Stormwater Pond 4	129+00	105 ft RT	6.8	192072.7	3955053.4	GET	20	20	9/16/2010	9/16/2010
	SWM5-1	Stormwater Pond 5	100+50	110 ft RT	7.1	189243.5	3955361.6	GET	20	20	9/16/2010	9/16/2010
	SWM5-2	Stormwater Pond 5	102+50	130 ft RT	8.7	189444.5	3955360.2	GET	20	20	9/16/2010	9/16/2010
Ramp D7	D7-1W	Retaining Wall	13+00	25 ft RT	11.9	192034.9	3954995.2	GET	10	12	9/13/2010	9/13/2010
	D7-2W	Retaining Wall	14+07	35 ft RT	6.6	192142.4	3954998.8	S&ME	20	20	9/24/2010	9/24/2010
	D7-3W	Retaining Wall	15+14	55 ft RT	9.0	192249.7	3955012.5	MAD	30	130	10/28/2010	10/28/2010
	D7-4W	Retaining Wall	16+00	45 ft RT	6.2	192334.4	3955002.1	GET	35	45	9/27/2010	9/27/2010
	D7-5W	Retaining Wall	17+10	15 ft RT	7.1	192443.3	3954966.5	S&ME	35	35	9/22/2010	9/22/2010
	D7-6W	Retaining Wall	17+99	44 ft RT	10.0	192532.8	3954993.1	MAD	35	130	10/28/2010	10/28/2010
	D7-7W	Retaining Wall	18+00	50 ft RT	10.1	192533.6	3954999.5	MAD	35	Eliminated		
	D7-8W	Retaining Wall	19+15	25 ft RT	8.5	192648.1	3954972.6	S&ME	35	42	9/24/2010	9/24/2010
	D7-9W	Retaining Wall	20+00	15 ft RT	9.0	192732.9	3954960.6	S&ME	45	47	9/23/2010	9/24/2010
	D7-10W	Retaining Wall	21+04	19 ft RT	11.1	192836.6	3954962.7	S&ME	50	60	9/22/2010	9/23/2010
	D7-11W	Retaining Wall	21+00	50 ft RT	11.7	192833.6	3954993.7	MAD	50	130	10/28/2010	10/28/2010
	CUR-1B	Bridge D7/Curlew	22+23	23 ft RT	10.2	192956.1	3954966.3	GET	130	135	9/23/2010	9/23/2010
	CUR-2B	Bridge D7/Curlew	22+97	18 ft LT	8.0	193029.2	3954921.9	GET	100	125	10/4/2010	10/4/2010
	CUR-3B	Bridge D7/Curlew						GET	100	On Hold		
	CUR-4B	Bridge D7/Curlew	24+79	46 ft LT	39.7	193216.0	3954899.9	GET	100	165	10/6/2010	10/7/2010

TABLE A-1: SUMMARY OF SUBSURFACE EXPLORATIONS
PROJECT STUDY AREA I64, D7, AND BRIDGE

Reference Baseline	Exploration Designation	Purpose of Exploration	Station	Offset	"Z" Elevation (ft)	"Y" VDOT Northing (ft)	"X" VDOT Easting (ft)	Driller	Proposed Depth (ft)	Depth Drilled (ft)	Date Started	Date Completed
I64 WBL	I64WB-P1	Pavement	100+50	10 ft RT	25.2	189232.3	3955263.6	GET	10	10	9/14/2010	9/14/2010
	I64WB-P2	Pavement	101+50	10 ft RT	24.4	189332.2	3955252.0	GET	10	11	9/14/2010	9/14/2010
	I64WB-P3	Pavement	109+50	6 ft RT	15.4	190127.4	3955162.5	GET	10	10	9/15/2010	9/15/2010
	I64WB-P4	Pavement	117+50	17 ft RT	12.0	190923.2	3955088.5	GET	10	1	9/15/2010	9/15/2010
	I64WB-P5	Pavement	125+50	10 ft RT	12.3	191718.7	3954996.3	GET	10	10	9/15/2010	9/15/2010
	I64WB-P6	Pavement	133+50	10 ft RT	25.0	192514.3	3954916.8	GET	10	10	10/5/2010	10/5/2010
	I64WB-P7	Pavement	141+50	20 ft RT	-	193312.7	3954895.3	GET	10	Eliminated		
								TOTAL:	**1,280**	**1,615**		

TABLE A-2: INTERPRETED STRATIGRAPHY
PROJECT STUDY AREA I64, D7, AND BRIDGE

Exploration Designation	CPT	Total Depth	Station	Offset	Subsurface Water		Top of Fill, Layer 1*		Top of Upper Sand Interbedded with Soft Clay, Layer 2*		Top of Clay Interbedded with Clayey Sand, Layer 3*		Top of Med Dense Sand, Layer 4*		Top of Lower Gray Clay, Layer 5*		Top of Yorktown Formation, Layer 6	
		(ft)			Depth (ft)	Elevation (ft)	Depth (ft)	Elevation (ft)	Depth (ft)	Elevation (ft)	Depth (ft)	Elevation (ft)	Depth (ft)	Elevation (ft)	Depth (ft)	Elevation (ft)	Depth (ft)	Elevation (ft)
I64WB-1		10	102+50	20 ft RT			0.7	22.5										
I64WB-2		10	106+50	20 ft RT	10.0	8.5	0.7	17.8										
I64WB-3		12	110+50	20 ft RT	5.0	8.8	0.9	12.9	7.5	6.3								
I64WB-4		10	114+50	20 ft RT			0.8	11.0	2.6	9.2								
I64WB-5		10	118+50	20 ft RT	2.5	9.5	1.3	10.7	5.0	7.0								
I64WB-6		10	122+50	20 ft RT	6.0	5.8	0.9	10.9	5.5	6.3								
I64WB-7		10	126+50	20 ft RT	10.0	2.0	1.3	10.7	5.5	6.5								
I64WB-8		10	130+50	20 ft RT	8.0	8.4	0.8	15.6										
I64WB-9		10	132+50	18 ft RT			0.8	21.2										
I64WB-10		10	134+50	18 ft RT	5.5	21.7	0.8	26.4										
I64WB-11		10	136+50	20 ft RT			0.6	31.7										
I64SB-1		30	101+50	70 ft RT	7.5	1.2	0.5	8.2	2.0	6.7								
I64SB-2	Y	49	103+50	85 ft RT					0.0	8.5	20.0	-11.5						
I64SB-3		30	105+50	70 ft RT	6.0	2.4	0.1	8.3	2.0	6.4								
I64SB-4	Y	49	107+50	70 ft RT					0.0	8.2	22.0	-13.8						
I64SB-5		30	109+50	70 ft RT					0.4	8.4	16.5	-7.7						
I64SB-6	Y	49	111+50	70 ft RT					0.0	8.8	24.0	-15.2						
I64SB-7		55	113+50	70 ft RT					0.4	8.2	26.5	-17.9						
SWM4-1		20	128+25	130 ft RT					0.4	3.9								
SWM4-2		20	129+00	105 ft RT	4.4	2.4			0.4	6.4								
SWM5-1		20	100+50	110 ft RT	5.5	1.5	0.4	6.6	1.0	6.0								
SWM5-2		20	102+50	130 ft RT	6.0	2.7	0.2	8.5	2.0	6.7								
D7-1W		12	13+00	25 ft RT	11.0	0.9	1.3	10.6	3.0	8.9								
D7-2W		20	14+07	35 ft RT	3.8	2.8			0.3	6.3								
D7-3W	Y	130	15+14	55 ft RT	7.0	2.0			0.0	9.0	39.0	-30.0	58.0	-49.0			78.0	-69.0
D7-4W		45	16+00	45 ft RT	6.0	0.2	0.5	5.7	2.0	4.2	26.5	-20.3						
D7-5W		35	17+10	15 ft RT	7.8	-0.7	0.6	6.5	2.0	5.1	24.1	-17.0						
D7-6W	Y	130	17+99	44 ft RT					0.0	10.0	26.0	-16.0	63.0	-53.0	93.0	-83.0	102.0	-92.0
D7-8W		42	19+15	25 ft RT	6.0	2.5			0.3	8.2	23.8	-15.3						
D7-9W		47	20+00	15 ft RT	8.5	0.5	0.3	8.7	5.5	3.5	26.5	-17.5						
D7-10W		60	21+04	19 ft RT	9.4	1.7	0.3	10.8	2.0	9.1	36.0	-24.9						
D7-11W	Y	130	21+00	50 ft RT	8.0	3.7			0.0	11.7	30.0	-18.3	67.0	-55.3	99.0	-87.3	117.0	-105.3
D7-12W		130	16+62	49 ft RT	10.0	-0.6			0.2	9.2	46.5	-37.1	71.5	-62.1			91.5	-82.1
D7-13W		130	19+59	47 ft RT	9.0	2.0			1.4	9.6	29.0	-18.0	69.0	-58.0	98.5	-87.5	121.5	-110.5
D7-14W	Y	120	22+13	74 ft RT					0.0	11.5	28.0	-16.5	72.0	-60.5	99.0	-87.5	114.0	-102.5
CUR-1B		135	22+23	23 ft RT	7.5	2.7			0.0	10.2	31.5	-21.3	71.5	-61.3	96.5	-86.3	111.5	-101.3
CUR-2B		125	22+97	18 ft LT	8.2	-0.2			0.5	7.5	28.4	-20.4	76.5	-68.5	91.5	-83.5	111.5	-103.5
CUR-4B		165	24+79	46 ft LT	21.5	18.2	0.5	39.2	35.0	4.7	63.0	-23.3	104.3	-64.6	126.5	-86.8	143.4	-103.7
I64WB-P1		10	100+50	10 ft RT	3.5	21.7	1.1	24.1										
I64WB-P2		11	101+50	10 ft RT	8.5	15.9	1.8	22.6										
I64WB-P3		10	109+50	6 ft RT	3.5	11.9	2.0	13.4	8.0	7.4								
I64WB-P4		1	117+50	17 ft RT														
I64WB-P5		10	125+50	10 ft RT	3.0	9.3	1.5	10.8	5.0	7.3								
I64WB-P6		10	133+50	10 ft RT	2.9	22.1	1.2	23.8										

* See Sheet No. 6A-D for soil profile.

TABLE A-3: SUMMARY OF LABORATORY TESTING
PROJECT STUDY AREA I64, D7, AND BRIDGE

Exploration Designation	Station	Offset	Depth Drilled (ft)	Natural Moisture	Grain Size Analysis	Atterberg Limits	Organic Content	Specific Gravity	Standard Proctor / CBR	I-D Consolidation	Corrosivity Series	Undisturbed Tube Sample	UU Triaxial Compression
I64WB-1	102+50	20 ft RT	10										
I64WB-2	106+50	20 ft RT	10	1	1	1			1				
I64WB-4	114+50	20 ft RT	10										
I64WB-3	110+50	20 ft RT	12										
I64WB-5	118+50	20 ft RT	10										
I64WB-6	122+50	20 ft RT	10										
I64WB-7	126+50	20 ft RT	10										
I64WB-8	130+50	20 ft RT	10										
I64WB-9	132+50	18 ft RT	10										
I64WB-10	134+50	18 ft RT	10										
I64WB-11	136+50	20 ft RT	10										
I64SB-1	101+50	70 ft RT	30										
I64SB-3	105+50	70 ft RT	30										
I64SB-5	109+50	70 ft RT	30										
I64SB-7	113+50	70 ft RT	55	8	3	3							
SWM4-1	128+25	130 ft RT	20	7	3	2			1		1		
SWM4-2	129+00	105 ft RT	20	4	2	1					1		
SWM5-1	100+50	110 ft RT	20	6	2	2							
SWM5-2	102+50	130 ft RT	20	5	3	2			1				
D7-1W	13+00	25 ft RT	12										
D7-2W	14+07	35 ft RT	20										
D7-4W	16+00	45 ft RT	45										
D7-5W	17+10	15 ft RT	35	2	1	1							
D7-8W	19+15	25 ft RT	42	4	3	3		1		1		2	2
D7-9W	20+00	15 ft RT	47	5	2	2		1		1		1	1
D7-10W	21+04	19 ft RT	60	7	4	4		1		1		1	1
CUR-1B	22+23	23 ft RT	135	20	9	7						2	
CUR-2B	22+97	18 ft LT	125										
CUR-3B													
CUR-4B	24+79	46 ft LT	165	20	15	5		1		1		2	
I64WB-P1	100+50	10 ft RT	10										
I64WB-P2	101+50	10 ft RT	11										
I64WB-P3	109+50	6 ft RT	10										
I64WB-P4	117+50	17 ft RT	1	1	1	1			1				
I64WB-P5	125+50	10 ft RT	10										
I64WB-P6	133+50	10 ft RT	10										

TABLE A-4: DESIGN TABLES FOR GLOBAL STABILITY AND SETTLEMENT IMPROVEMENTS: I-64, D7, AND BRIDGE

I64, D7, and Bridge: I64WB-Station 100+00 to 107+00

				Stability Issues						Settlement Issues			
Sta.	Fill[1]		Planned Structures	MSE Wall Planned	Required Fill for Stability[2]		Stone Columns Required[3]			PV Drains[4]			Comments
	Ht	Width			Unit Wt	Width	Required?	Width	Depth	Required?	Width	Depth	
	(ft)	(ft)		(Yes/No)	pcf	(ft)	(Yes/No)	(ft)	(ft)	(Yes/No)	(ft)	(ft)	
100+00	0	0	SWM Pond/ Soundwall	No	130	0	No	n/a	n/a	No	n/a	n/a	No improvement required.
100+50	0	0	SWM Pond/ Soundwall	No	130	0	No	n/a	n/a	No	n/a	n/a	No improvement required.
101+00	0	0	SWM Pond/ Soundwall	No	130	0	No	n/a	n/a	No	n/a	n/a	No improvement required.
101+50	1	30	SWM Pond/ Soundwall	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
102+00	2	30	SWM Pond/ Soundwall	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
102+50	3	30	SWM Pond/ Soundwall	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
103+00	4	30	SWM Pond/ Soundwall	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
103+50	5	30	SWM Pond/ Soundwall	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
104+00	6	35	Soundwall	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
104+50	6	30	Soundwall	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
105+00	6	30	Soundwall	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
105+50	6	30	Soundwall	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
106+00	5	30	Soundwall	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
106+50	6	30	Soundwall	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
107+00	6	30	Soundwall	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.

[1]Geometry of fill was obtained from plan set provided by VDOT on January 3, 2012.
[2] Calculated with stability design charts developed from analysis of PSA I64, D7, and Bridge and PSA Ramps and Channel. Lightweight fills extend a distance of 2.5 x (Wall Height) behind the face of the wall.
[3]Stone columns to be placed underneath and extend 20 feet in front of the retaining wall with a replacement ratio (a_s) of 0.4. Normal weight fill is assumed to be used with stone columns.
[4]Settlement is estimated based on settlement analysis at Sta. 18+00 in PSA I64, D7, and Bridge. PV drains are required if the time it takes for the settlement < 1 inches is equal to or greater than 6 months and drains were assumed to be spaced at 5 ft intervals. In areas where stone columns are used, no PV drains are necessary.

I64, D7, and Bridge: I64WB-Station 107+50 to 120+00

				Stability Issues						Settlement Issues			Comments
Sta.	Fill[1]		Planned Structures	MSE Wall Planned	Required Fill for Stability[2]		Stone Columns Required[3]			PV Drains[4]			
	Ht	Width			Unit Wt	Width	Required?	Width	Depth	Required?	Width	Depth	
	(ft)	(ft)		(Yes/No)	pcf	(ft)	(Yes/No)	(ft)	(ft)	(Yes/No)	(ft)	(ft)	
107+50	6	35	Soundwall	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
108+00	6	35	Soundwall	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
108+50	5	35	Soundwall	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
109+00	5	35	Soundwall	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
109+50	4	35	Soundwall	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
110+00	4	40	Soundwall	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
110+50	3	40	Soundwall	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
111+00	3	40	Soundwall	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
111+50	2	40	Soundwall	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
112+00	2	40	Soundwall	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
112+50	2	40	Soundwall	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
113+00	2	40	Soundwall	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
113+50	2	40	Soundwall	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
114+00	1	40	Soundwall	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
114+50	1	40	Soundwall	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
115+00	1	40	n/a	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
115+50	1	40	n/a	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
116+00	1	40	n/a	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
116+50	1	40	n/a	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
117+00	2	40	n/a	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
117+50	2	40	n/a	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
118+00	2	40	n/a	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
118+50	3	35	n/a	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
119+00	3	35	n/a	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
119+50	4	35	n/a	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
120+00	4	35	n/a	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.

[1] Geometry of fill was obtained from plan set provided by VDOT on January 3, 2012.
[2] Calculated with stability design charts developed from analysis of PSA I64, D7, and Bridge and PSA Ramps and Channel. Lightweight fills extend a distance of 2.5 x (Wall Height) behind the face of the wall.
[3] Stone columns to be placed underneath and extend 20 feet in front of the retaining wall with a replacement ratio (a_s) of 0.4. Normal weight fill is assumed to be used with stone columns.
[4] Settlement is estimated based on settlement analysis at Sta. 18+00 in PSA I64, D7, and Bridge. PV drains are required if the time it takes for the settlement < 1 inches is equal to or greater than 6 months and drains were assumed to be spaced at 5 ft intervals. In areas where stone columns are used, no PV drains are necessary.

I64, D7, and Bridge: I64WB-Station 120+50 to 125+00 and I64WB-Station 125+50 to 130+00 (Adjacent to Ramp D7-Station 10+00 to 15+00)

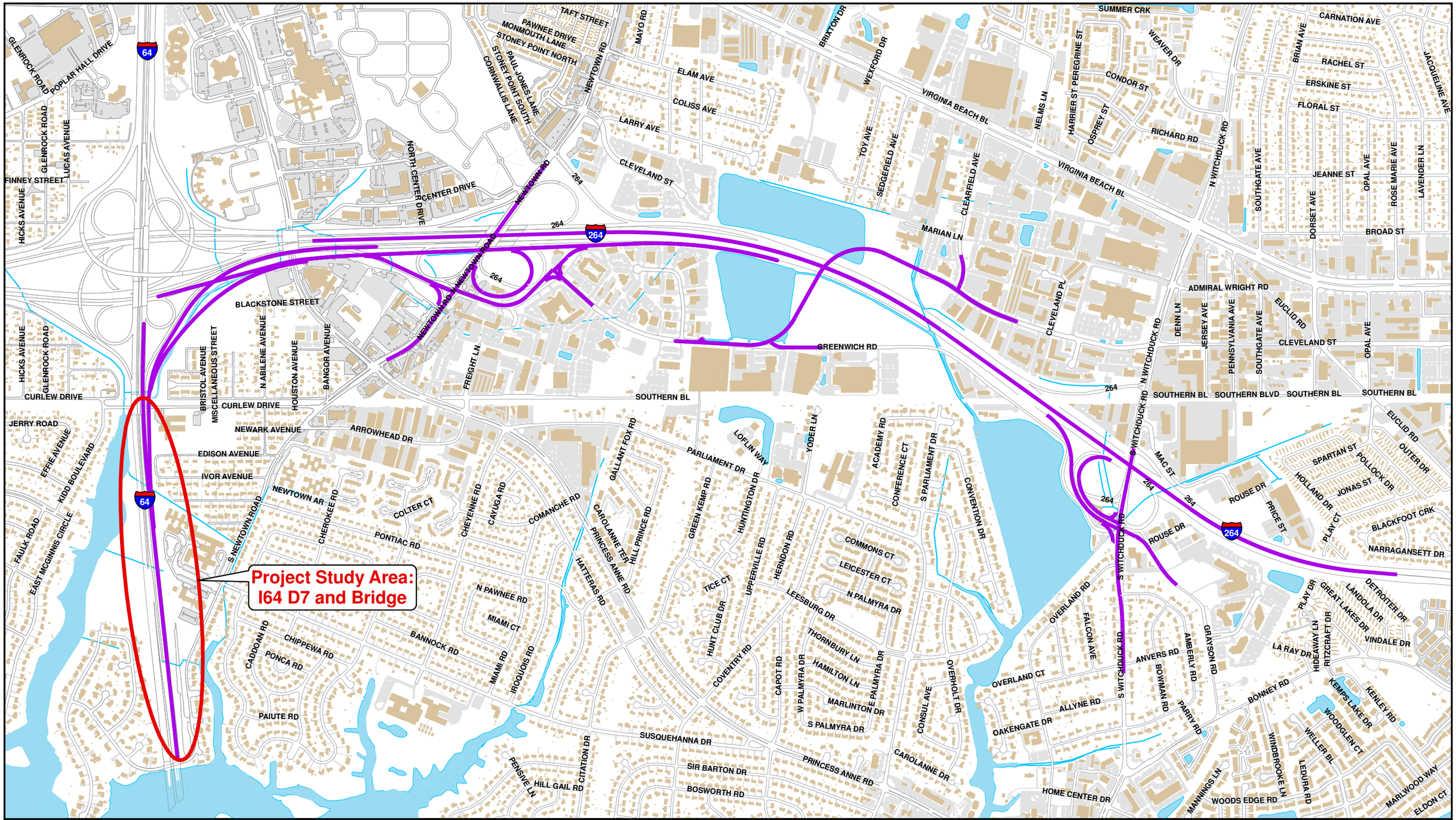
				Stability Issues						Settlement Issues			
Sta.	Fill[1]		Planned Structures	MSE Wall Planned	Required Fill for Stability[2]		Stone Columns Required[3]			PV Drains[4]			Comments
	Ht	Width			Unit Wt	Width	Required?	Width	Depth	Required?	Width	Depth	
	(ft)	(ft)		(Yes/No)	pcf	(ft)	(Yes/No)	(ft)	(ft)	(Yes/No)	(ft)	(ft)	
120+50	5	35	n/a	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
121+00	5	35	n/a	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
121+50	5	35	n/a	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
122+00	5	35	n/a	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
122+50	5	30	n/a	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
123+00	5	30	n/a	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
123+50	5	30	n/a	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
124+00	5	30	n/a	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
124+50	5	30	n/a	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
125+00	5	30	n/a	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
125+50	5	30	n/a	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
126+00	4	30	n/a	No	130	30	No	n/a	n/a	No	n/a	n/a	No improvement required.
126+50	3	35	n/a	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
127+00	4	35	SWM Pond	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
127+50	5	35	SWM Pond	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
128+00	4	35	SWM Pond	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
128+50	5	35	SWM Pond	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
129+00	7	35	SWM Pond	No	130	35	No	n/a	n/a	No	n/a	n/a	No improvement required.
129+50	8	40	n/a	No	130	40	No	n/a	n/a	No	n/a	n/a	No improvement required.
130+00	11	25	n/a	Yes	70	25	No	n/a	n/a	No	n/a	n/a	Only lightweight fill required.
130+50	14	25	n/a	Yes	70	25	No	n/a	n/a	No	n/a	n/a	Only lightweight fill required.

[1] Geometry of fill was obtained from plan set provided by VDOT on January 3, 2012.
[2] Calculated with stability design charts developed from analysis of PSA I64, D7, and Bridge and PSA Ramps and Channel. Lightweight fills extend a distance of 2.5 x (Wall Height) behind the face of the wall.
[3] Stone columns to be placed underneath and extend 20 feet in front of the retaining wall with a replacement ratio (a_s) of 0.4. Normal weight fill is assumed to be used with stone columns.
[4] Settlement is estimated based on settlement analysis at Sta. 18+00 in PSA I64, D7, and Bridge. PV drains are required if the time it takes for the settlement < 1 inches is equal to or greater than 6 months and drains were assumed to be spaced at 5 ft intervals. In areas where stone columns are used, no PV drains are necessary.

I64, D7, and Bridge: I64WB-Station 130+50 to 137+50 (Adjacent to Ramp D7-Station 15+50 to 22+00)

				Stability Issues						Settlement Issues			
Sta.	Fill[1]		Planned Structures	MSE Wall Planned	Required Fill for Stability[2]		Stone Columns Required[3]			PV Drains[4]			Comments
	Ht	Width			Unit Wt	Width	Required?	Width	Depth	Required?	Width	Depth	
	(ft)	(ft)		(Yes/No)	pcf	(ft)	(Yes/No)	(ft)	(ft)	(Yes/No)	(ft)	(ft)	
131+00	11	25	n/a	Yes	70	25	No	n/a	n/a	No	n/a	n/a	Only lightweight fill required.
131+50	13	30	n/a	Yes	70	30	No	n/a	n/a	No	n/a	n/a	Only lightweight fill required.
132+00	15	35	n/a	Yes	70	35	No	n/a	n/a	No	n/a	n/a	Only lightweight fill required.
132+50	14	35	n/a	Yes	70	35	No	n/a	n/a	No	n/a	n/a	Only lightweight fill required.
133+00	14	40	n/a	Yes	70	40	No	n/a	n/a	No	n/a	n/a	Only lightweight fill required.
133+50	16	45	n/a	Yes	130	45	Yes	32	25	No	n/a	n/a	Requires stone columns for stability
134+00	16	45	n/a	Yes	130	45	Yes	33	25	No	n/a	n/a	Requires stone columns for stability.
134+50	16	45	n/a	Yes	130	50	Yes	34	25	No	n/a	n/a	Requires stone columns for stability.
135+00	19	45	n/a	Yes	130	50	Yes	34	25	No	n/a	n/a	Requires stone columns for stability
135+50	21	55	n/a	Yes	130	55	Yes	37	25	No	n/a	n/a	Requires stone columns for stability.
136+00	22	55	n/a	Yes	130	55	Yes	38	25	No	n/a	n/a	Requires stone columns for stability/settlement.
136+50	23	55	n/a	Yes	130	50	Yes	38	25	No	n/a	n/a	Requires stone columns for stability/settlement.
137+00	25	55	n/a	Yes	130	50	Yes	40	25	No	n/a	n/a	Requires stone columns for stability/settlement.
137+50	25	55	n/a	Yes	130	50	Yes	40	25	No	n/a	n/a	Requires stone columns for stability/settlement.

[1] Geometry of fill was obtained from plan set provided by VDOT on January 3, 2012.
[2] Calculated with stability design charts developed from analysis of PSA I64, D7, and Bridge and PSA Ramps and Channel. Lightweight fills extend a distance of 2.5 x (Wall Height) behind the face of the wall.
[3] Stone columns to be placed underneath and extend 20 feet in front of the retaining wall with a replacement ratio (a_s) of 0.4. Normal weight fill is assumed to be used with stone columns.
[4] Settlement is estimated based on settlement analysis at Sta. 18+00 in PSA I64, D7, and Bridge. PV drains are required if the time it takes for the settlement < 1 inches is equal to or greater than 6 months and drains were assumed to be spaced at 5 ft intervals. In areas where stone columns are used, no PV drains are necessary.



N

0 500 1,000 Feet

Project Baselines
Roads
Parking Lots/Driveways
Buildings/Structures
Water Bodies

Source: GIS data from City of Virginia Beach and City of Norfolk

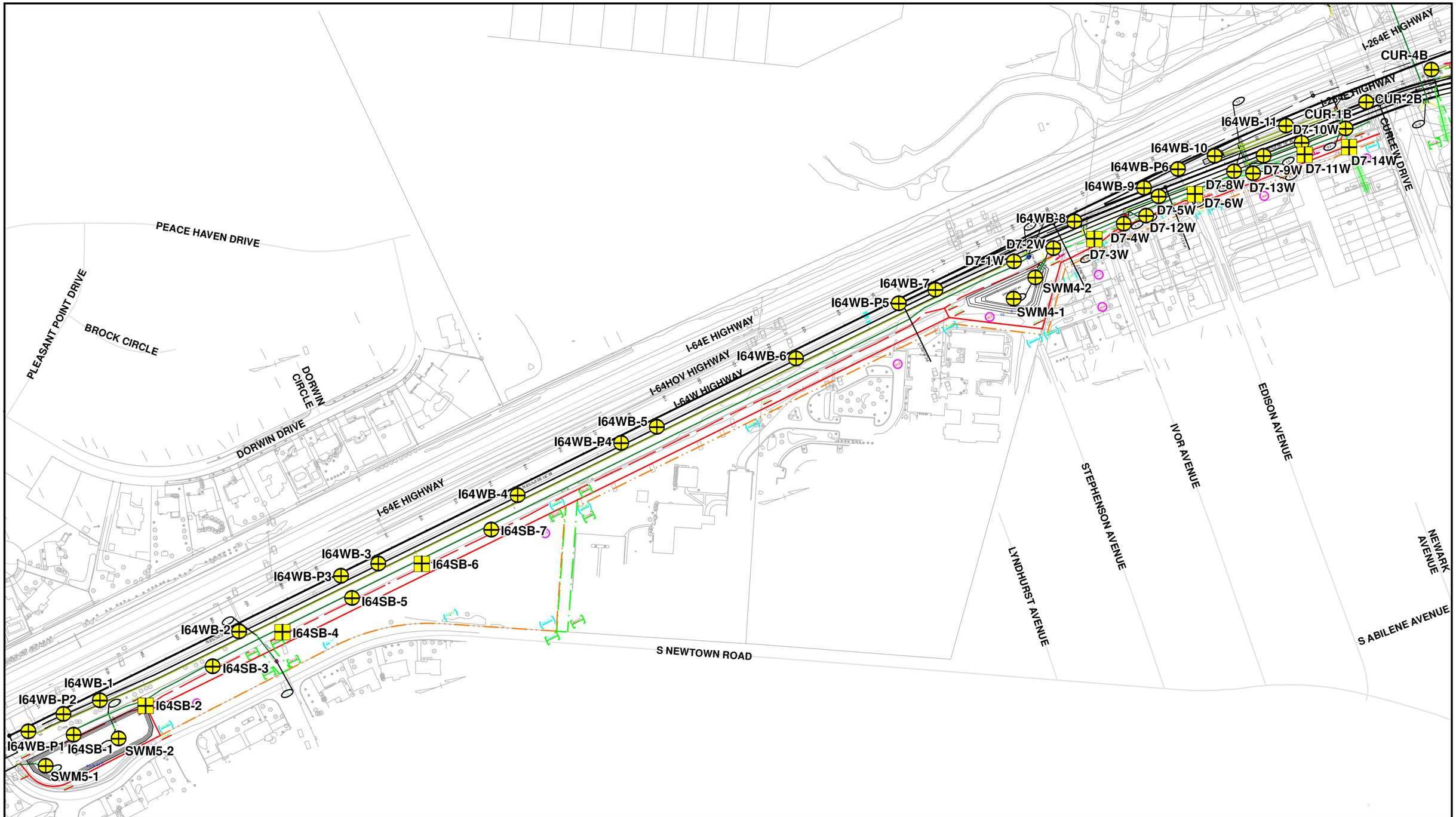
Prepared by: HDR Date: July 7, 2010

VDOT Virginia Department of Transportation

Project 0264-122-108
City of Norfolk

Project Study Area
I64 D7 and Bridge

Drawing 1:
Vicinity Map



0 100 200 Feet

Scale: 1" = 200'

I64, D7, and Bridge Borings

SPT Exploration

CPT Exploration

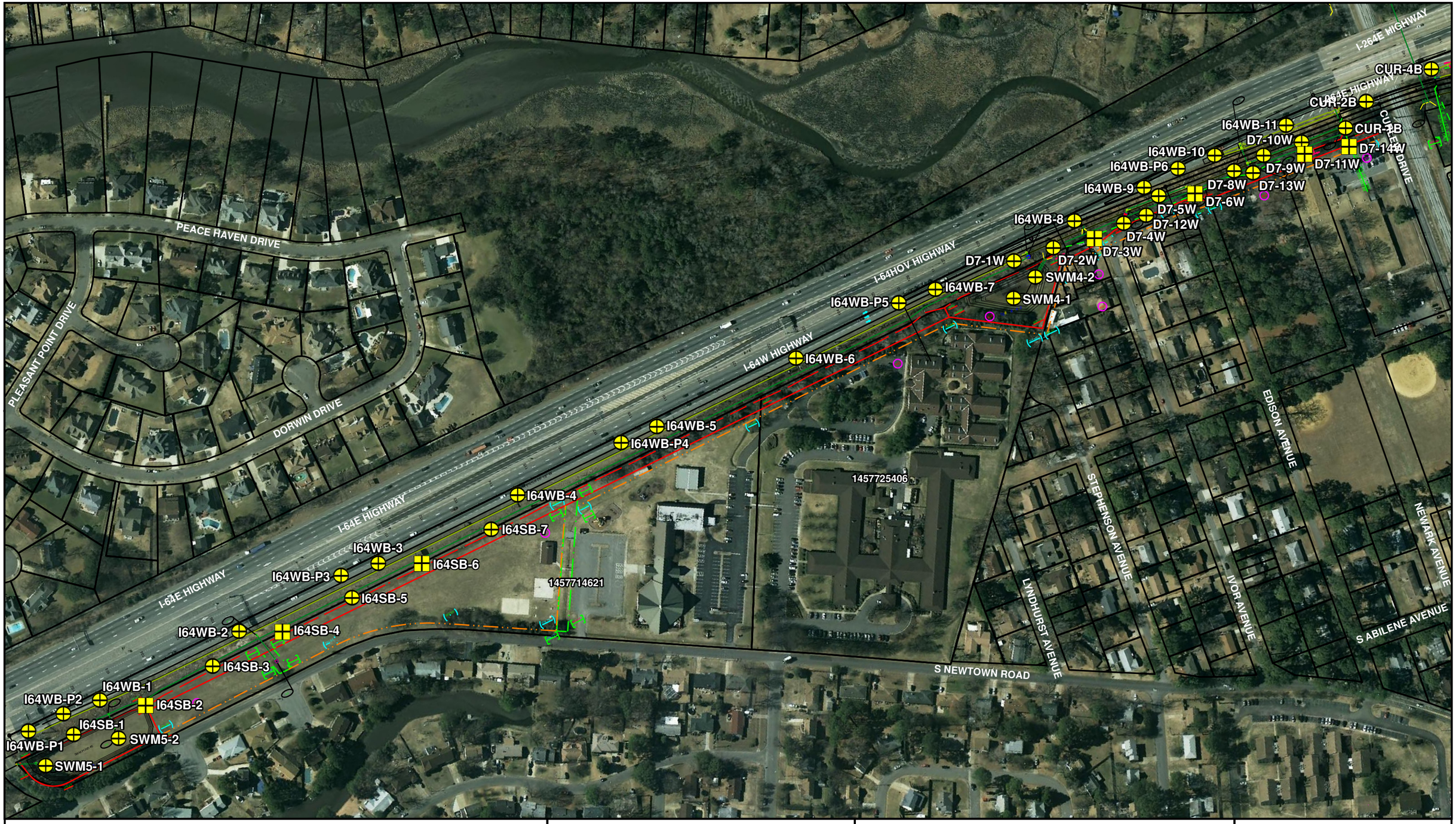
Prepared by: HDR Date: December 17, 2012

VDOT Virginia Department of Transportation

Project 0264-122-108
City of Norfolk

Project Study Area
I64, D7, and Bridge

Drawing 2:
Exploration Location Plan



0 100 200 Feet

Scale: 1" = 200'

I64, D7, and Bridge Borings

SPT Exploration

CPT Exploration

Source: GIS data from City of Norfolk,
Aerial Imagery © Commonwealth of Virginia

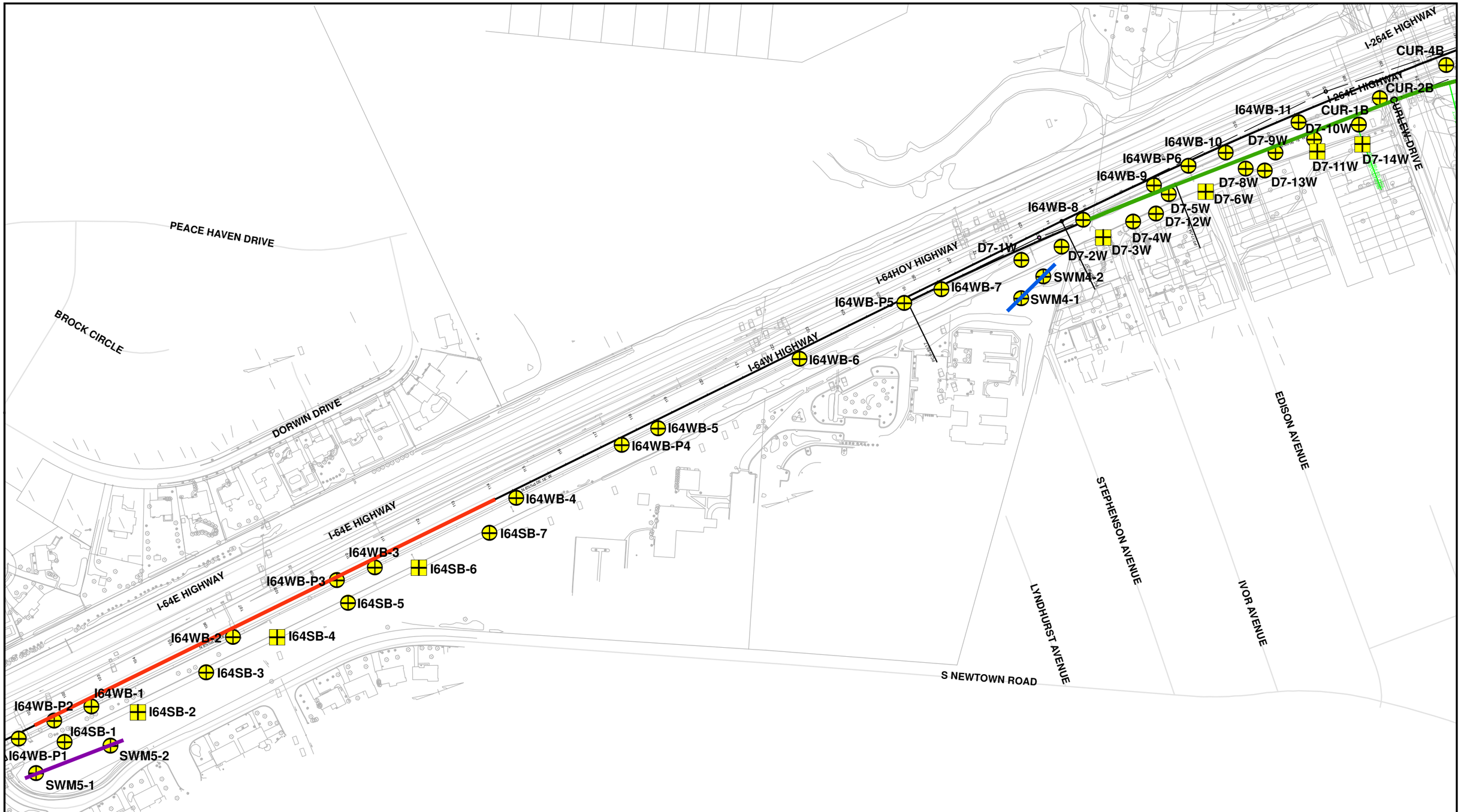
Prepared by: HDR Date: December 17, 2012

VDOT Virginia Department of Transportation

Project 0264-122-108
City of Norfolk

Project Study Area
I64, D7, and Bridge

Drawing 3: Aerial and Parcel Boundaries



0 100 200 Feet

Scale: 1" = 200'

- I64 WBL Sound Wall Sta. 101+00 to 114+00
- Ramp D7 Wall and Bridge Sta. 15+00 to 25+00
- SWM Pond 4
- SWM Pond 5
- SPT Exploration
- CPT Exploration

Prepared by: HDR Date: December 17, 2012

VDOT Virginia Department of Transportation

Project 0264-122-108
City of Norfolk

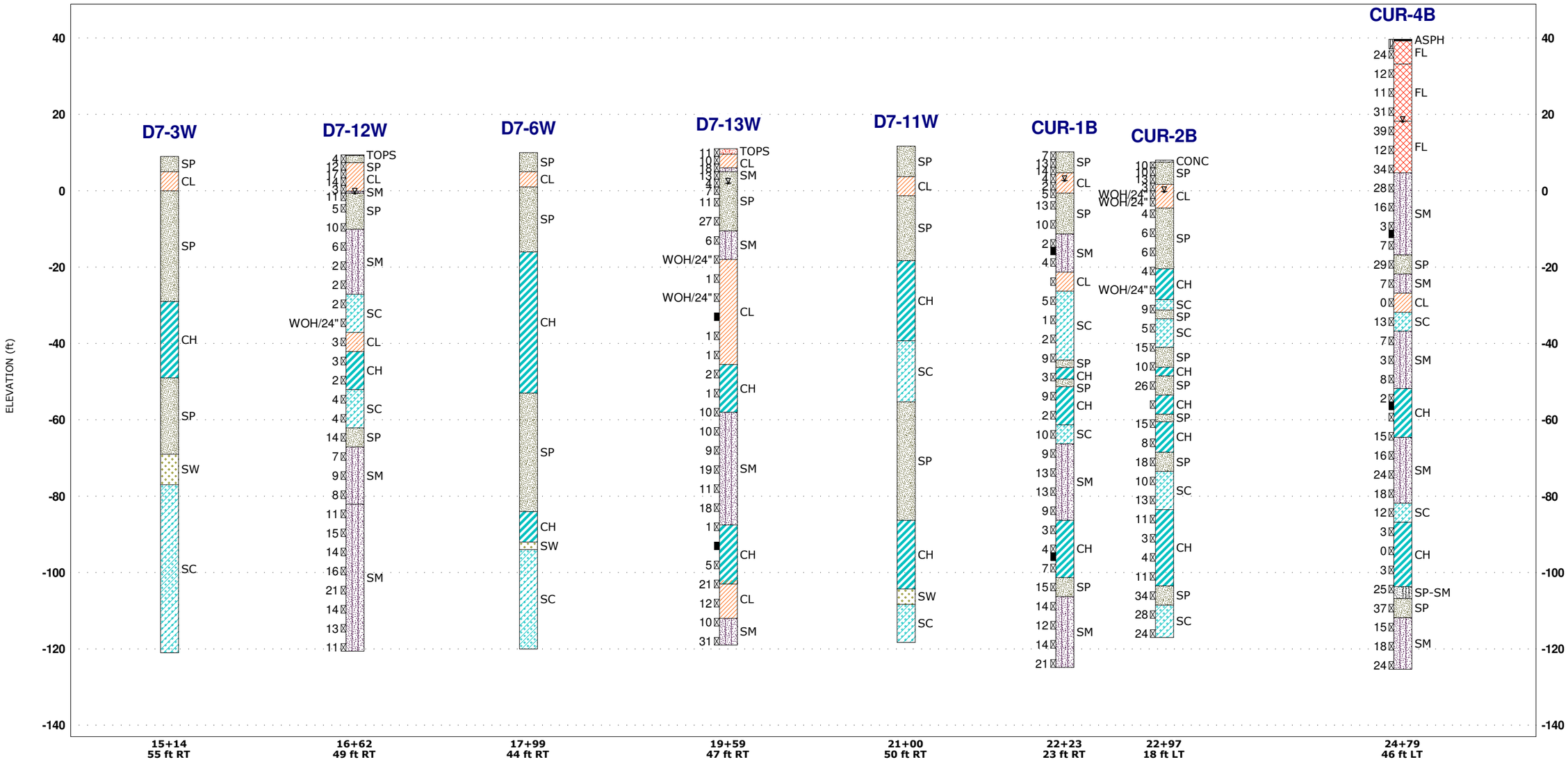
Project Study Area
I64, D7, and Bridge

Drawing 4: Subsurface Cross Section Locations

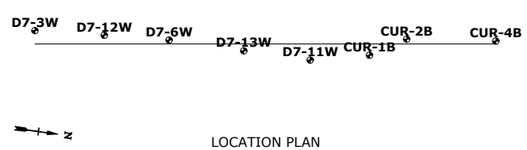
FHWA REGION	STATE	FEDERAL AID ROUTE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
3	VA.	--	NH-264-6(098)	--	0264-122-108	5-A

PSA I64, D7, AND BRIDGE

D7 WALL AND BRIDGE



Notes: See borehole logs for complete data
See Material and Sample Symbols List



LOCATION PLAN
(not to scale)

The subsurface information shown on the boring logs in these plans was obtained with reasonable care and recorded in good faith solely for use by the Department in establishing design controls for the project. The Department has no reason to suspect that such information is not reasonably accurate as an approximate indication of the subsurface conditions at the sites where the borings were taken. The Department does not in any way warrant or guarantee that such data can be projected as indicative of conditions beyond the limits of the borings shown; and any such projections by bidders are purely interpretive and altogether speculative. Further, the Department does not in any way guarantee, either expressly or by implication, the sufficiency of the information for bid purposes.

The boring logs are made available to bidders in order that they may have access to subsurface data identical to that which is possessed by the Department, and are not intended as a substitute for personal investigation, interpretation and judgment by the bidders.

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No.	Description	Date
	Revisions	

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF TRANSPORTATION

MATERIALS DIVISION

0264-122-108
ENGINEERING GEOLOGY

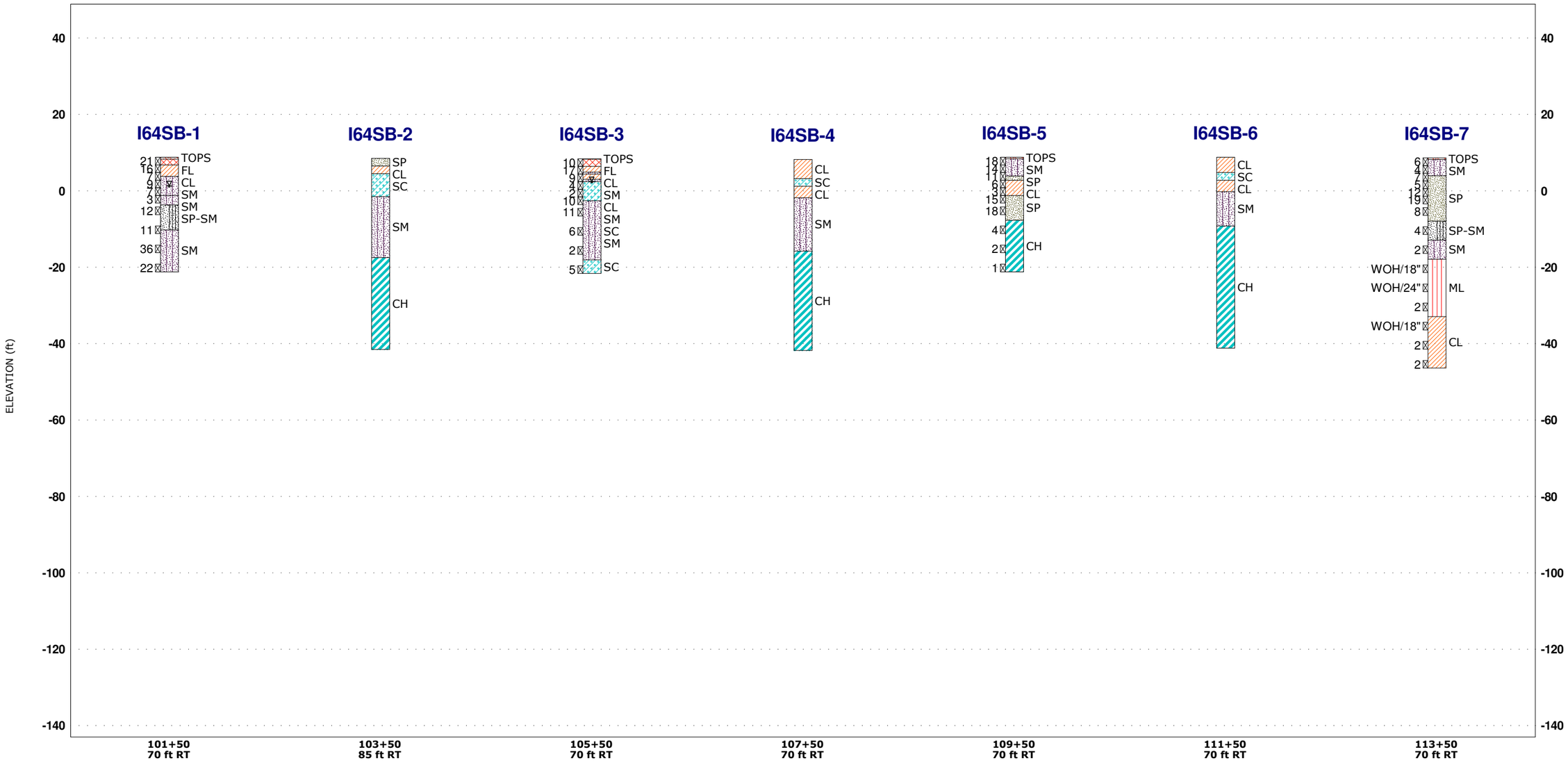
Data:		Date	Plan No.	Sheet No.
Drawn:	MJS	1/25/13	D7	5-A
Checked:	TJW			

SPT_FENCEAB:PSA RAMPS AND CHANNEL BORING LOGS_MJS.GPJ.8.30.003.061810.12513

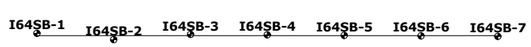
FHWA REGION	STATE	FEDERAL AID ROUTE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
3	VA.	--	NH-264-6(098)	--	0264-122-108	5-B

PSA I64, D7, AND BRIDGE

I64 SB SOUNDWALL



Notes: See borehole logs for complete data
See Material and Sample Symbols List



LOCATION PLAN
(not to scale)

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No.	Description	Date
	Revisions	

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF TRANSPORTATION

MATERIALS DIVISION

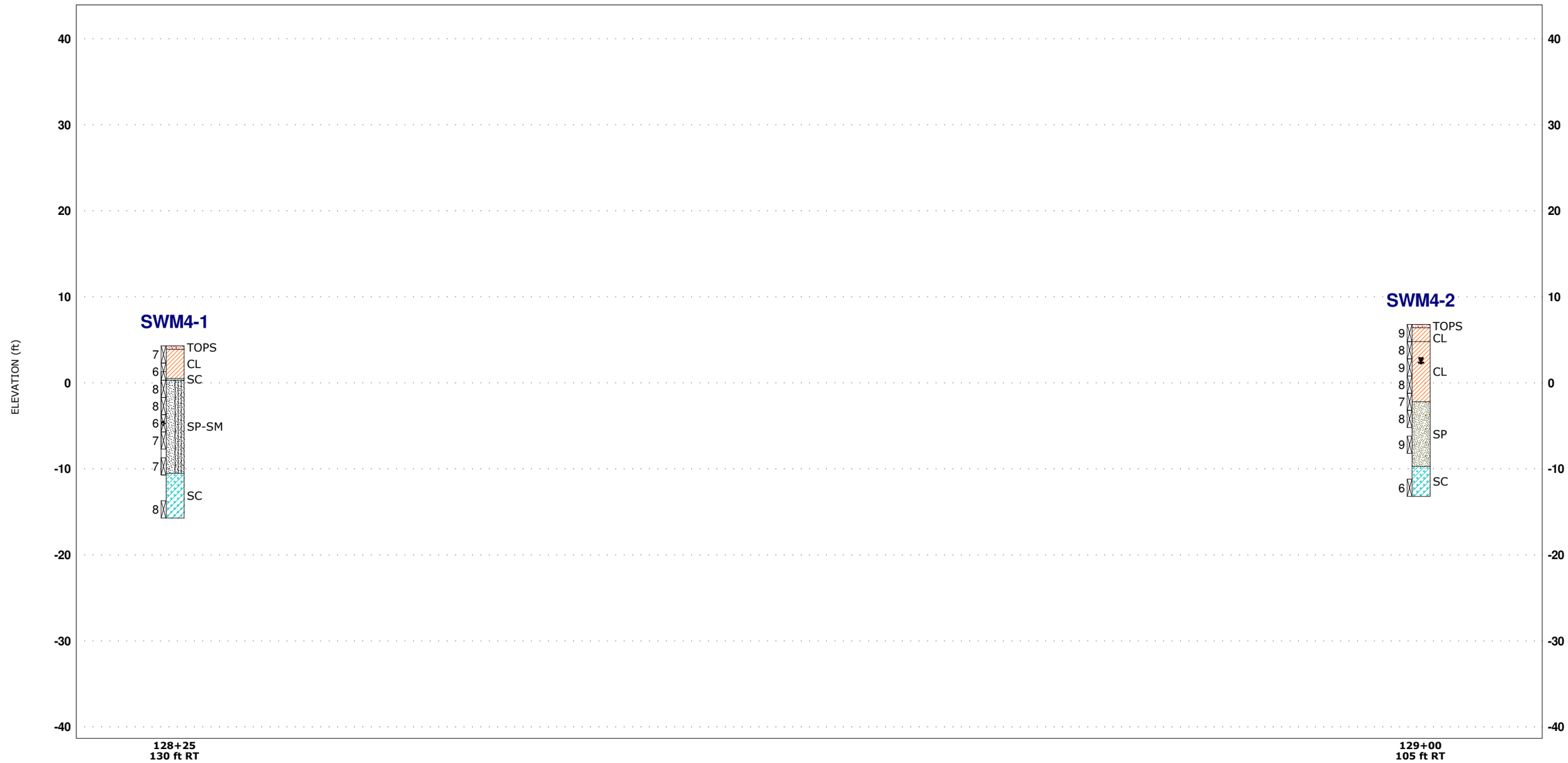
0264-122-108
ENGINEERING GEOLOGY

Data:		Date	Plan No.	Sheet No.
Drawn:	MJS	1/25/13	I64 SB	5-B
Checked:	TJW			

SPT_FENCEA-PSA RAMPS AND CHANNEL BORING LOGS_MJS.GPJ:8.30.003:06181011:25/13

FHWA REGION	STATE	FEDERAL AID ROUTE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
3	VA.	--	NH-264-6(098)	--	0264-122-108	5-C

PSA I64, D7, AND BRIDGE
STORMWATER MANAGEMENT POND 4



Notes: See borehole logs for complete data
See Material and Sample Symbols List

LOCATION PLAN
(not to scale)

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DEPARTMENT OF TRANSPORTATION

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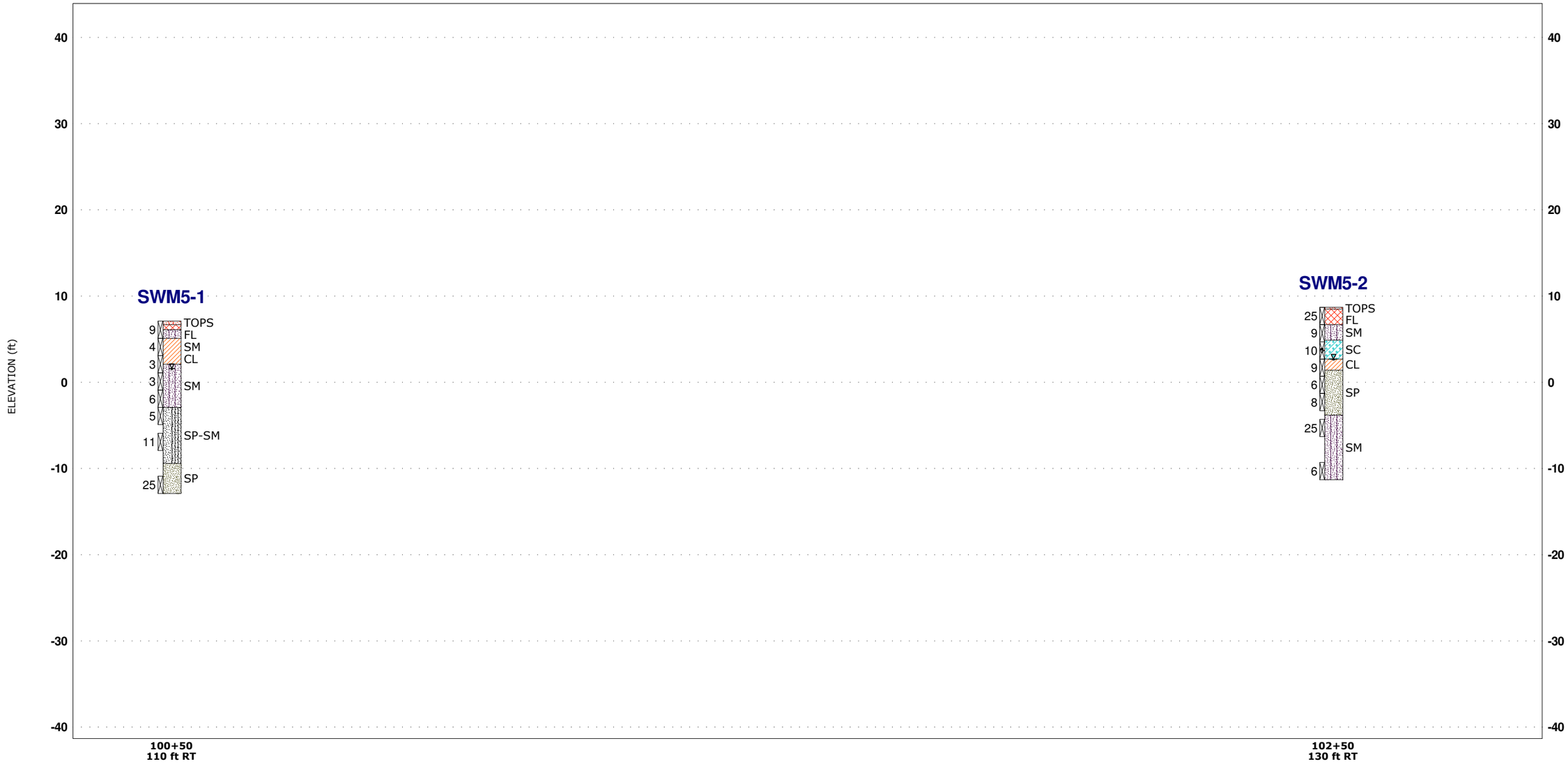
0264-122-108
ENGINEERING GEOLOGY

Data:	Date	Plan No.	Sheet No.
Drawn: MJS Checked: TJW	1/25/13	SWM 4	5-C

SPT_FENCEAB-PSA RAMPS AND CHANNEL BORING LOGS_MJS.GPJ:8.30.003:061810:1/25/13

FHWA REGION	STATE	FEDERAL AID ROUTE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
3	VA.	--	NH-264-6(098)	--	0264-122-108	5-D

PSA I64, D7, AND BRIDGE
STORMWATER MANAGEMENT POND 5



Notes: See borehole logs for complete data
See Material and Sample Symbols List

N

LOCATION PLAN
(not to scale)

The subsurface information shown on the boring logs in these plans was obtained with reasonable care and recorded in good faith solely for use by the Department in establishing design controls for the project. The Department has no reason to suspect that such information is not reasonably accurate as an approximate indication of the subsurface conditions at the sites where the borings were taken. The Department does not in any way warrant or guarantee that such data can be projected as indicative of conditions beyond the limits of the borings shown; and any such projections by bidders are purely interpretive and altogether speculative. Further, the Department does not in any way guarantee, either expressly or by implication, the sufficiency of the information for bid purposes.

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No.	Description	Date
	Revisions	

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF TRANSPORTATION

MATERIALS DIVISION

0264-122-108
ENGINEERING GEOLOGY

Data:		Date	Plan No.	Sheet No.
Drawn:	MJS	1/25/13	SWM 5	5-D
Checked:	TJW			

SPT_FENCEAB-PSA RAMPS AND CHANNEL BORING LOGS_MJS.GP-18.30.003 06 18 10: 1/25/13

APPENDIX B
EXPLORATION LOGS

Field Soil Descriptions – VDOT Soil Logging
Standard Penetration Test Logs
Cone Penetrometer Test Logs

FIELD SOIL DESCRIPTIONS
VDOT SOIL LOGGING
(USCS)

DESCRIPTION FORMAT:
Color, primary grain size adjective, secondary component, PRIMARY COMPONENT, with... or trace... , contains... , relative density, moisture, expanded terms.

COLOR:
The color description should use commonly recognized colors. Identify primary colors. Use a single color, a combination color (i.e.green-gray) or multiple colors (i.e. red-brown, white, and light gray)

- *Mottled*, indicates splotches of various colors.
- *Variegated,* indicates thin layers of various colors.

SAND AND GRAVEL GRAIN SIZE ADJECTIVES

SIZE:	3"	¾"	¼"	No.10	No.40	No. 200	
SIZE DESCRIPTION:	GRAVEL		SAND				SILT TO CLAY
RANGE:	**coarse**	**fine**	**coarse**	**medium**	**fine**		

- *Cobbles* are +3 inches to 12 inches.
- *Boulders* are +12 inches.

SECONDARY AND PRIMARY COMPONENTS

Primary Component (>50%) is to be written in ALL CAPITAL LETTERS

Primary Component: SAND or GRAVEL		Primary Component: SILT or CLAY			
>12% fines	**'silty'** or **'clayey'** will be the secondary component	≥ 30% (one third) sand/gravel	more sand than gravel, **'sandy'** will be the secondary component	≥15% gravel	add 'with gravel'
				<15% gravel	add 'trace gravel'
5% to 12%	add 'with silt' or 'with clay' to description		more gravel than sand, **'gravelly'** will be the secondary component	≥15% sand	add 'with sand'
				<15% sand	add 'trace sand'
< 5% fines	add 'trace silt' or 'trace clay' to description	< 30% sand/gravel	15 % to 29% sand/gravel	'with sand' or 'with gravel'	
			< 15% sand/gravel	'trace sand' or 'trace gravel'	

NOTE: Judgment and experience are required to effectively determine the appropriate grain-size description. If a soil is predominately of one grain size, with traces of another size, it can be described as such. Example: Gray fat CLAY, trace fine sand (notice that there is no "y"-ending secondary component).

PLASTICITY OF CLAYS AND SILTS

- A *clay* that can be consistently palm-rolled (and rerolled without additional wetting) to less than 1/16" to 1/32"diameter is described as a **fat** clay.
- A *clay* that can be palm-rolled with ease (and partially rerolled without additional wetting) to less than 1/8" diameter is described as a **lean** clay.
- A *silt* that can be palm-rolled with ease (and partially rerolled without additional wetting) to less than 1/8" diameter is described as an **elastic** silt.

GRAVEL/FRAGMENT DESCRIPTION:

Shape	Description
No sharp corners, no straight lines	Rounded
A few blunted corners with very few straight lines	Sub-rounded
A few sharp corners with some straight lines	Sub-angular
Many sharp corners with many straight lines	Angular

NOTE:
Fragments refers to broken pieces of rock from the parent source of the soil; fragments have the same mineralogy as the surrounding soil.

Gravel refers to gravel-sized pieces that were combined into the soil (such as sediments); the soil and gravel may not be from the same source.

CONTAINS: Note the presence of unusual odors, organics, type/condition of organics (roots, branches, leaves, grass/decomposed, fresh, etc.), contamination by other items (construction material, concrete, asphalt pavement debris, wire, brick, etc.). When noting **mica content**, eliminate the word 'contains' and use one of the following three expressions: *slightly micaceous* (few shiny flakes), *micaceous* (common throughout soil), or *highly micaceous* (soil is almost all mica).

RELATIVE DENSITY

Primary Component

SAND and **GRAVEL**		**SILT** and **CLAY**	
SPT(bpf)	**Density Description**	**SPT(bpf)**	**Density Description**
0 – 3	Very loose	0 – 1	Very soft
4 – 9	Loose	2 – 4	Soft
10 – 29	Medium dense	5 – 8	Firm
30 – 50	Dense	9 – 15	Stiff
> 50	Very dense	16 – 30	Very stiff
		31 – 50	Hard
		> 50	Very hard

For samples which display ***Rock Structure and Parent Rock Mineralogy***, the material is described as a soil and followed by a reference to the parent rock type. The parent rock description follows the soil description (in parentheses).

SPT (bpf)	Appearance of Soil	Density Description
20 – 60	Relic rock structure/mineralogy present but can be molded or crumbled by hand; generally easy to penetrate with hollow stem augers; none to moderate grinding by augers.	(Decomposed [rock])
+60	Rock mass discolored; alteration of nearly all of the rock mineralogy. May contain pockets of slightly weathered rock; some minerals leached away. Difficult to penetrate with hollow stem augers; moderate to significant grinding by augers.	(Highly Weathered [rock])

EXAMPLE: Dark Grey f-c silty SAND, with fine angular rock fragments, micaceous and contains schistosity in all samples, very dense, dry (decomposed SCHIST)

MOISTURE:

Characteristic	Description
Dusty, dry to touch	Dry
Moisture can be felt, but none visible on sample	Moist
Moisture visible	Wet

EXPANDED TERMS:
The presence of FILL (can be "FILL" or "possible FILL") or unusual conditions or issues that should be recorded on the log.

SPT RESISTANCE IN SOFT SOIL CONDITIONS:
WOR – Weight of rods
WOH – Weight of hammer

EXAMPLE: Red brown f-c clayey SAND, with fine rounded gravel, contains mica , medium dense, moist , FILL

Virginia Department of Transportation

PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

CUR-1B

STATION: 22+23 OFFSET: 23 ft RT
LATITUDE: 36.840709° N LONGITUDE: 76.196121° W
SURFACE ELEVATION: 10.2 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 9/23/10 - 9/23/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 7.5 ft DEPTH

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
		10	2 3 4 6	50								0.0 / 10.2 Brown, fine poorly graded SAND, contains trace shells and trace organics, loose, dry **SP**				
	2	8	7 8 5 7	70		2						Brown gray, fine poorly graded SAND, medium dense, dry				
	4	6	8 8 6 5	100		4						Contains heavy concentration of roots between 5.0 and 5.5 feet				
2	6	4	2 2 2 3	100		6						5.5 / 4.7 Brown and dark gray, fine sandy lean CLAY, contains trace organics, soft, moist **CL**				
0.5	8	2	1 1 1 2	100		8						Moisture increases to wet below a depth of 8.0 feet				
0.5	10	0	WOH 2 3 4	100		10						10.8 / -0.6 Brown gray, fine poorly graded SAND, wet **SP**				
0.5	12	-2	4 6 7 7	70		12						Light gray, fine poorly graded SAND, medium dense, wet				
	14	-4				13										
	16	-6				15										
	18	-8	6 5 5 5	75		18										
	20	-10				20										
	22	-12										21.5 / -11.3 **SM**				
2.25	24	-14	2 1 1 1	100		23						Gray, fine silty SAND, contains trace shells, very loose, wet				

REMARKS: Rig Type: Rubber tire CME ATV. REFERENCE BASELINE: Ramp D7
Shelby tube samples collected between depths of 25.0 and 27.0 feet and 105.0 and 107.0 feet.

SPT_LOGAB:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13
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Virginia Department of Transportation

PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

CUR-1B

STATION: 22+23 OFFSET: 23 ft RT
LATITUDE: 36.840709° N LONGITUDE: 76.196121° W
SURFACE ELEVATION: 10.2 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/23/10 - 9/23/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 7.5 ft DEPTH

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND / SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
1	26	-16		95	25–27						Gray, fine silty SAND, contains trace shells, very loose, wet Fine silty sand. Shelby Tube collected between a depth of 25.0 and 27.0 feet. S&ME Lab # 17236		NP	30.5	33.1
	28	-18	2 2 2 2	100	28–30						Gray, fine silty SAND, loose, wet			28.9	
	30	-20													
	32	-22									31.5 / -21.3 **CL**				
0.25	34	-24	WOH/12" 1 1	100	33–35						Gray brown, sandy lean CLAY, contains trace organics, very soft, wet	46	23	32.2	60.5
	36	-26									36.5 / -26.3 **SC**				
	38	-28	1 3 2 2	100	38–40						Gray, fine clayey SAND, loose, wet			27.3	
	40	-30													
	42	-32													
0.25	44	-34	1 0 1 0	100	43–45						Gray, fine clayey SAND, very loose, moist	33	13	26.4	48.1
	46	-36													
0.25	48–50	-38	WOH 1 1 1	100	48									26.5	

REMARKS: Rig Type: Rubber tire CME ATV. REFERENCE BASELINE: Ramp D7
Shelby tube samples collected between depths of 25.0 and 27.0 feet and 105.0 and 107.0 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

CUR-1B

STATION: 22+23 OFFSET: 23 ft RT
LATITUDE: 36.840709° N LONGITUDE: 76.196121° W
SURFACE ELEVATION: 10.2 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/23/10 - 9/23/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 7.5 ft DEPTH

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
		-40				50						Gray, fine clayey SAND, very loose, moist				
	52	-42														
			1 5 4 5	100		53										
0.25	54	-44				55						54.5 / -44.3 Gray, fine poorly graded SAND, wet **SP**				
	56	-46										56.5 / -46.3 **CH**				
	58	-48	WOH 1 2 5	100		58						Gray, fat CLAY, soft, wet				
0	60	-50				60						59.5 / -49.3 Gray, fine poorly graded SAND, wet **SP**				
	62	-52										61.5 / -51.3 **CH**				
			5 6 3 3	100		63						Gray brown, fat CLAY, stiff, wet Fine sand layer at a depth of 63.5 feet				
0.25	64	-54				65							72	42	56.9	93.3
	66	-56														
	68	-58	WOH 1 1 2	100		68						Gray, fine sandy fat CLAY, contains occasional fine sand lenses, soft, wet			52.2	
2.25	70	-60				70										
	72	-62										71.5 / -61.3 **SC**				
			3 5 5 5	100		73						Gray, fine clayey SAND, medium dense, wet			41.8	
	74	-64														

REMARKS: Rig Type: Rubber tire CME ATV. REFERENCE BASELINE: Ramp D7
Shelby tube samples collected between depths of 25.0 and 27.0 feet and 105.0 and 107.0 feet.

SPT_LOGAB:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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VDOT Virginia Department of Transportation	**PROJECT #:** 0264-122-108 **LOCATION:** Norfolk: PSA I64, D7, and Bridge **STRUCTURE:** BRIDGE D7/CURLEW	**CUR-1B** **PAGE 4 OF 6**

STATION: 22+23 OFFSET: 23 ft RT
LATITUDE: 36.840709° N LONGITUDE: 76.196121° W
SURFACE ELEVATION: 10.2 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/23/10 - 9/23/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 7.5 ft DEPTH

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
						75						Gray, fine clayey SAND, medium dense, wet				
	76	-66										76.5 / -66.3 **SM**				
	78	-68	2 4 5 6	100		78						Gray, fine silty SAND, loose, wet			30.2	20.5
	80	-70				80										
	82	-72														
	84	-74	4 4 9 7	100		83 85						Gray, fine silty SAND, medium dense, wet				
	86	-76														
	88	-78	5 6 7 8	100		88									37.7	41.3
	90	-80				90										
	92	-82														
	94	-84	3 5 4 6	100		93 95						Gray, fine silty SAND, contains occasional layers of fat clay, loose, wet			40.3	
	96	-86														
	98	-88	1 1 2 3	100		98						96.5 / -86.3 **CH** Gray, fat CLAY, soft, moist			61.5	
0.75	100															

REMARKS: Rig Type: Rubber tire CME ATV. REFERENCE BASELINE: Ramp D7
Shelby tube samples collected between depths of 25.0 and 27.0 feet and 105.0 and 107.0 feet.

SPT_LOGAB:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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Virginia Department of Transportation

PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

CUR-1B

STATION: 22+23 OFFSET: 23 ft RT
LATITUDE: 36.840709° N LONGITUDE: 76.196121° W
SURFACE ELEVATION: 10.2 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/23/10 - 9/23/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 7.5 ft DEPTH

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND / SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
		-90			100						Gray, fat CLAY, soft, moist				
	102	-92													
			1 2 2 3		103										
0.5	104	-94		100										55.6	
					105						Gray, fat CLAY. Shelby Tube collected between a depth of 105.0 and 107.0 feet. S&ME Lab # 17237.				
0.75	106	-96		90								77	43	58.4	93.3
					107										
	108	-98	2 3 4 4		108						Gray, fat CLAY, firm, moist				
0.75				100								74	42	54.1	92.5
	110	-100			110										
	112	-102									111.5 / -101.3 **SP**				
			6 7 8 14		113						Gray, fine to coarse poorly graded SAND, medium dense, wet				
	114	-104		95											
					115										
	116	-106									116.5 / -106.3 **SM**				
	118	-108	4 5 9 13		118						Green gray, silty SAND, contains trace shells, medium dense, moist				
				100										35.4	
	120	-110			120										
	122	-112													
			4 5 7 9		123										
	124	-114		100								30	6	37.2	30.2

REMARKS: Rig Type: Rubber tire CME ATV. REFERENCE BASELINE: Ramp D7
Shelby tube samples collected between depths of 25.0 and 27.0 feet and 105.0 and 107.0 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

STATION: 22+23 OFFSET: 23 ft RT
LATITUDE: 36.840709° N LONGITUDE: 76.196121° W
SURFACE ELEVATION: 10.2 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/23/10 - 9/23/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 7.5 ft DEPTH

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
						125						Green gray, silty SAND, contains trace shells, medium dense, moist				
	126	-116														
	128	-118	4 5 9 18	100		128									32.7	
	130	-120				130										
	132	-122														
			5 8 13 17			133										
	134	-124		100											29.2	
						135						Boring terminated at a depth of 135.0 feet				

REMARKS: Rig Type: Rubber tire CME ATV. REFERENCE BASELINE: Ramp D7
Shelby tube samples collected between depths of 25.0 and 27.0 feet and 105.0 and 107.0 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

CUR-2B

STATION: 22+97 OFFSET: 18 ft LT
LATITUDE: 36.840913° N LONGITUDE: 76.196266° W
SURFACE ELEVATION: 8.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 10/4/10 - 10/4/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 8.2 ft DEPTH

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	LAB: LIQUID LIMIT (LL)	LAB: PLASTICITY INDEX (PI)	LAB: MOISTURE CONTENT (%)
			3 5 5	100		0.5								
	2	6	4 5 5 4	100		2								
	4	4	8 10 3 2	85		4								
	6	2	2 2 1 1	100		6								
0	8 ∇	0	WOH/24"	75		8								
0	10	-2	WOH/24"	75		10								
0	12	-4				12								
	14	-6	1 1 3 2	80		13 15								
	16	-8												
	18	-10	3 3 3 3	70		18								
	20	-12				20								
	22	-14												
	24	-16	1 3 3 4	65		23								

FIELD DESCRIPTION OF STRATA

0.0 / 8.0
Concrete 6" **CONC**

0.5 / 7.5
Tan brown, fine poorly graded SAND, medium dense, moist **SP**

Gray, fine poorly graded SAND, contains trace shells, medium dense, moist

6.3 / 1.7
Brown and gray mottled, fine sandy lean CLAY, contains trace organics, soft, wet **CL**

Brown and gray mottled, fine sandy lean CLAY, contains trace organics, very soft, wet

12.5 / -4.5
SP
Gray, fine poorly graded SAND, contains trace organics, loose, moist

Gray, fine to coarse poorly graded SAND, loose, wet

Gray, fine poorly graded SAND, contains trace organics (wood fragments), loose, wet

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: Ramp D7
4-inch casing set to a depth of 4.0 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

CUR-2B

STATION: 22+97 OFFSET: 18 ft LT
LATITUDE: 36.840913° N LONGITUDE: 76.196266° W
SURFACE ELEVATION: 8.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 10/4/10 - 10/4/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 8.2 ft DEPTH

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LAB DATA: LIQUID LIMIT (LL)	LAB DATA: PLASTICITY INDEX (PI)	LAB DATA: MOISTURE CONTENT (%)
						25						Gray, fine poorly graded SAND, contains trace organics (wood fragments), loose, wet			
	26	-18													
	28	-20	1 2 2 2	100		28						28.4 / -20.4 Gray, fine sandy fat CLAY, soft, wet **CH**			
0.5	30	-22				30									
	32	-24													
			WOH/24"			33						Gray, fine sandy fat CLAY, very soft, wet			
0.25	34	-26		100		35									
	36	-28										36.5 / -28.5 **SC**			
	38	-30	1 2 7 5	100		38						Gray, fine clayey SAND, moist			
	40	-32				40						39.2 / -31.2 Gray, fine poorly graded SAND, wet **SP**			
	42	-34										41.5 / -33.5 **SC**			
	44	-36	2 2 3 3	100		43 45						Gray, fine clayey SAND, loose, moist			
	46	-38													
	48	-40	2 5 10 11	100		48						49.0 / -41.0 Gray, fine poorly graded SAND, wet **SP**			
	50	-42													

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: Ramp D7
4-inch casing set to a depth of 4.0 feet.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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Virginia Department of Transportation

PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

CUR-2B

STATION: 22+97 OFFSET: 18 ft LT
LATITUDE: 36.840913° N LONGITUDE: 76.196266° W
SURFACE ELEVATION: 8.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 10/4/10 - 10/4/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 8.2 ft DEPTH

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
						50						Gray, fine poorly graded SAND, wet			
	52	-44													
			1			53									
0.25	54	-46	7 3 3	100								54.2 / -46.2 Gray, fine sandy fat CLAY, wet **CH**			
						55									
	56	-48										56.5 / -48.5 **SP**			
	58	-50	5			58						Gray, fine poorly graded SAND, medium dense, wet			
			13 13 9	95											
	60	-52				60									
	62	-54										61.5 / -53.5 **CH**			
			WOH/12"			63						Gray, fat CLAY, soft, moist			
0.25	64	-56	3 3	100											
						65									
	66	-58										66.5 / -58.5 **SP**			
	68	-60	3			68						Gray, fine poorly graded SAND, wet			
			5 10 15	100								68.5 / -60.5 Gray, fine sandy fat CLAY, stiff, moist **CH**			
	70	-62				70									
	72	-64													
			3			73						Gray, fine sandy fat CLAY, firm, moist			
0.5	74	-66	3 5 6	100											

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: Ramp D7
4-inch casing set to a depth of 4.0 feet.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

CUR-2B

STATION: 22+97 OFFSET: 18 ft LT
LATITUDE: 36.840913° N LONGITUDE: 76.196266° W
SURFACE ELEVATION: 8.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 10/4/10 - 10/4/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 8.2 ft DEPTH

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
						75						Gray, fine sandy fat CLAY, firm, moist			
	76	-68										76.5 / -68.5 **SP**			
	78	-70	4 6 12 10	90		78						Gray, fine poorly graded SAND, medium dense, wet			
	80	-72				80									
	82	-74										81.5 / -73.5 **SC**			
	84	-76	4 3 7 10	100		83 85						Gray, fine clayey SAND, medium dense, moist			
	86	-78													
	88	-80	4 5 8 7	90		88									
	90	-82				90									
	92	-84										91.5 / -83.5 **CH**			
0.75	94	-86	2 5 6 5	100		93 95						Gray, fat CLAY, contains occasional sand lenses, stiff, moist Medium fine sand layer at depth of 93.3 feet			
	96	-88													
0.75	98	-90	WOH 1 2 3	100		98						Gray, fat CLAY, contains occasional sand lenses, soft, moist			
	100	-92													

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: Ramp D7
4-inch casing set to a depth of 4.0 feet.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

CUR-2B

STATION: 22+97 OFFSET: 18 ft LT
LATITUDE: 36.840913° N LONGITUDE: 76.196266° W
SURFACE ELEVATION: 8.0 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 10/4/10 - 10/4/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 8.2 ft DEPTH

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
						100						Gray, fat CLAY, contains occasional sand lenses, soft, moist			
	102	-94													
			WOH 2 2 4			103									
0.75	104	-96		100		105									
	106	-98													
	108	-100	1 6 5 8			108						Gray, fat CLAY, contains occasional sand lenses, stiff, moist Fine sand layer at a depth of 108.4 feet			
0.5				100											
	110	-102				110									
	112	-104										111.5 / -103.5 **SP**			
			12 18 16 14			113						Gray, fine to coarse poorly graded SAND, dense, wet			
	114	-106		70		115									
	116	-108										116.5 / -108.5 **SC**			
	118	-110	5 10 18 24	100		118						Greenish gray, fine clayey SAND, contains trace shells, medium dense, moist			
	120	-112				120									
	122	-114													
			5 8 16 23			123									
	124	-116													

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: Ramp D7
4-inch casing set to a depth of 4.0 feet.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

CUR-2B
PAGE 6 OF 6

STATION: 22+97 OFFSET: 18 ft LT
LATITUDE: 36.840913° N LONGITUDE: 76.196266° W
SURFACE ELEVATION: 8.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 10/4/10 - 10/4/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 8.2 ft DEPTH

FIELD DATA													LAB DATA		
			SOIL				ROCK								
									DIP °						
PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	STANDARD PENETRATION TEST HAMMER BLOWS	SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	CORE RECOVERY (%)	ROCK QUALITY DESIGNATION	STRATA	JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
						125						Boring terminated at a depth of 125.0 feet			

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: Ramp D7
4-inch casing set to a depth of 4.0 feet.

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CUR-2B

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

CUR-4B
PAGE 1 OF 7

STATION: 24+79 OFFSET: 46 ft LT
LATITUDE: 36.841427° N LONGITUDE: 76.196326° W
SURFACE ELEVATION: 39.7 ft COORD. DATUM: NAD 83

Date(s) Drilled: 10/6/10 - 10/7/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 21.5 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND / SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
											0.0 / 39.7 Asphalt concrete 6" **ASPH**				
	2	38			2.5						0.5 / 39.2 Orange brown, fine to coarse poorly graded SAND with rounded quartz gravel FILL, wet **FL**				
	4	36	11 12 12 11	100	3 5						Light brown, fine poorly graded SAND FILL, medium dense, moist Switch to mud rotary drilling at a depth of 4.0 feet				
	6	34													
	8	32	4 6 6 7	95	8 10						6.5 / 33.2 **FL** Gray, fine silty SAND FILL, contains trace shells, medium dense, moist			20.4	29.4
	10	30													
	12	28													
	14	26	3 4 7 7	80	13 15										
	16	24													
	18	22	9 12 19 20	100	18 20						Gray, fine silty SAND FILL, contains trace shells, dense, moist				
	20	20													
	22	18									21.5 / 18.2 **FL**				
	24	16	10 20 19 16	80	23						Light brown, fine to coarse poorly graded SAND with silt, dense, moist			6.5	7.3

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: Ramp D7. Borehole offset approximately 28.0 left of original location.
4-inch casing set to a depth of 4.0 feet. Backfilled with plastic hole plug and non-shrink grout.
Shelby tube collected between depths of 50.0 and 52.0 feet and 75.0 and 77.0 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

CUR-4B

STATION: 24+79 OFFSET: 46 ft LT
LATITUDE: 36.841427° N LONGITUDE: 76.196326° W
SURFACE ELEVATION: 39.7 ft COORD. DATUM: NAD 83

Date(s) Drilled: 10/6/10 - 10/7/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 21.5 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND / SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
	25										Light brown, fine to coarse poorly graded SAND with silt, medium dense, moist				
	26	14													
	28	12	4 6 6 14	70	28						Light brown, fine poorly graded SAND with silt, medium dense, moist				
	30	10			30										
	32	8													
	33				33						Light brown with orange streaks, fine poorly graded SAND with silt, dense, moist				
	34	6	9 14 20 26	70											
	35				35						35.0 / 4.7 Gray and brown mottled, silty SAND, contains trace organics, very loose, wet **SM**				
	36	4													
	38	2	9 13 15 14	65	38						Gray, fine poorly graded SAND with silt, contains trace shells, medium dense, moist			18.5	7.7
	40	0			40										
	42	-2													
	43				43										
	44	-4	4 7 9 10	70											
	45				45										
	46	-6													
	48	-8			48										
1			1 2 1 2	100										44.8	
	50	-10													

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: Ramp D7. Borehole offset approximately 28.0 left of original location.
4-inch casing set to a depth of 4.0 feet. Backfilled with plastic hole plug and non-shrink grout.
Shelby tube collected between depths of 50.0 and 52.0 feet and 75.0 and 77.0 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

STATION: 24+79 OFFSET: 46 ft LT
LATITUDE: 36.841427° N LONGITUDE: 76.196326° W
SURFACE ELEVATION: 39.7 ft COORD. DATUM: NAD 83

Date(s) Drilled: 10/6/10 - 10/7/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 21.5 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL RECOVERY (%)	SAMPLE LEGEND / SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK QUALITY DESIGNATION	DIP ° STRATA	DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
0.25	52	-12		85	50–52						Gray and brown mottled, silty SAND, contains trace organics, very loose, wet. Shelby tube collected between a depth of 50.0 and 52.0 feet. S&ME Lab #17363	18	1	22.6	31.0
0.75	54	-14	4 4 3 5	60	53–55						Brown, fine to medium silty SAND, contains heavy concentrations of organics, loose, moist			36.0	37.0
	56	-16													
	58	-18	11 14 15 16	65	58–60						56.5 / -16.8 **SP** Gray, fine to coarse poorly graded SAND, medium dense, wet			21.5	
	60	-20													
	62	-22									61.5 / -21.8 **SM** Gray, fine silty SAND, loose, wet				
	64	-24	1 3 4 4	100	63–65									23.5	42.6
	66	-26									66.5 / -26.8 **CL** Gray, fine sandy lean CLAY, very soft, wet				
0.25	68	-28	WOH WOH 1 3	90	68–70							48	27	33.9	68.5
	70	-30													
	72	-32									71.5 / -31.8 **SC** Gray, fine clayey SAND, medium dense, wet				
	74	-34	5 5 8 9	80	73										

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: Ramp D7. Borehole offset approximately 28.0 left of original location.
4-inch casing set to a depth of 4.0 feet. Backfilled with plastic hole plug and non-shrink grout.
Shelby tube collected between depths of 50.0 and 52.0 feet and 75.0 and 77.0 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

CUR-4B

STATION: 24+79 OFFSET: 46 ft LT
LATITUDE: 36.841427° N LONGITUDE: 76.196326° W
SURFACE ELEVATION: 39.7 ft COORD. DATUM: NAD 83

Date(s) Drilled: 10/6/10 - 10/7/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 21.5 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND / SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
	75										Gray, fine clayey SAND, medium dense, wet				
	76	-36									76.5 / -36.8 **SM**				
	78	-38	2 2 5 6	85	78						Gray, fine silty SAND, loose, wet			30.6	46.9
	80	-40			80										
	82	-42													
	83		1 2 1 3	100	83						Gray, fine silty SAND, very loose, wet				
	84	-44			85										
	86	-46													
	88	-48	2 2 6 6	100	88						Gray, fine silty SAND, loose, wet				
	90	-50			90										
	92	-52									91.5 / -51.8 **CH**				
0.5	93		WOH 1 1 1	100	93						Gray, fat CLAY, contains trace shells, soft, wet			49.5	
	94	-54			95										
1	96	-56		100	97						Gray, fat CLAY. Shelby Tube collected between a depth of 95.0 and 97.0 feet. S&ME Lab #17364	95	64	60.1	97.2
	98	-58			98										
0.5	100	-60		100							Driller slipped the rods, no blow counts between a depth of 98.0 and 100.00 feet depth since rods fell and drove the sampler 2.0+ feet.	70	37	55.2	88.8

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: Ramp D7. Borehole offset approximately 28.0 left of original location.
4-inch casing set to a depth of 4.0 feet. Backfilled with plastic hole plug and non-shrink grout.
Shelby tube collected between depths of 50.0 and 52.0 feet and 75.0 and 77.0 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

CUR-4B

STATION: 24+79 OFFSET: 46 ft LT
LATITUDE: 36.841427° N LONGITUDE: 76.196326° W
SURFACE ELEVATION: 39.7 ft COORD. DATUM: NAD 83

Date(s) Drilled: 10/6/10 - 10/7/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 21.5 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL RECOVERY (%)	SAMPLE LEGEND / SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK QUALITY DESIGNATION	DIP °: STRATA	DIP °: JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
					100						Gray, fat CLAY, contains trace shells, soft, wet				
	102	-62													
			1		103										
0.75	104	-64	7 8 14	100										17.8	
					105						104.3 / -64.6 Gray, fine to medium silty SAND, wet **SM**				
	106	-66													
	108	-68			108										
			5								Gray, fine to medium silty SAND, contains occasional gray fat clay layers, medium dense, wet				
			7 9 10	85										25.8	14.8
	110	-70			110										
	112	-72													
			5		113						Dark gray to gray, fine silty SAND, medium dense, wet				
	114	-74	10 14 15	80											
					115										
	116	-76													
	118	-78			118										
			4												
			7 11 14	80										23.1	13.2
	120	-80			120										
	122	-82									121.5 / -81.8 **SC**				
			3		123						Gray, fine clayey SAND, medium dense, wet				
	124	-84	4 8 7	100											

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: Ramp D7. Borehole offset approximately 28.0 left of original location.
4-inch casing set to a depth of 4.0 feet. Backfilled with plastic hole plug and non-shrink grout.
Shelby tube collected between depths of 50.0 and 52.0 feet and 75.0 and 77.0 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

STATION: 24+79 OFFSET: 46 ft LT
LATITUDE: 36.841427° N LONGITUDE: 76.196326° W
SURFACE ELEVATION: 39.7 ft COORD. DATUM: NAD 83

Date(s) Drilled: 10/6/10 - 10/7/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 21.5 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND / SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
					125						Gray, fine clayey SAND, medium dense, wet				
	126	-86									126.5 / -86.8 **CH**				
	128	-88	WOH 1 2 3	100	128						Gray, fat CLAY, contains occasional fine sand lenses, soft, wet				
1												93	60	61.6	97.5
	130	-90			130										
	132	-92													
			WOH WOH 3 4	100	133										
0.75	134	-94												59.3	
					135										
	136	-96													
	138	-98	WOH 1 2 3	100	138										
0.75														42.3	
	140	-100			140										
	142	-102													
			6 12 13 19	95	143						143.4 / -103.7 Gray, fine to coarse poorly graded SAND with silt, medium dense, wet **SP-SM**				
0.25	144	-104												23.6	10.9
					145										
	146	-106													
											146.5 / -106.8 **SP**				
	148	-108	9 16 21 21	95	148						Greenish gray, fine poorly graded SAND, dense, wet				
	150	-110													

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: Ramp D7. Borehole offset approximately 28.0 left of original location.
4-inch casing set to a depth of 4.0 feet. Backfilled with plastic hole plug and non-shrink grout.
Shelby tube collected between depths of 50.0 and 52.0 feet and 75.0 and 77.0 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: BRIDGE D7/CURLEW

STATION: 24+79 OFFSET: 46 ft LT
LATITUDE: 36.841427° N LONGITUDE: 76.196326° W
SURFACE ELEVATION: 39.7 ft COORD. DATUM: NAD 83

Date(s) Drilled: 10/6/10 - 10/7/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 21.5 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK QUALITY DESIGNATION	DIP °: STRATA	DIP °: JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
						150						Greenish gray, fine poorly graded SAND, dense, wet				
	152	-112										151.5 / -111.8 **SM**				
			3			153						Green gray, fine silty SAND, contains trace shells, medium dense, moist				
	154	-114	5 10 25	100		155									36.1	31.9
	156	-116														
	158	-118	4 7 11 17	100		158										
	160	-120				160										
	162	-122														
			6			163										
	164	-124	9 15 26	100		165						Boring terminated at a depth of 165.0 feet				

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: Ramp D7. Borehole offset approximately 28.0 left of original location.
4-inch casing set to a depth of 4.0 feet. Backfilled with plastic hole plug and non-shrink grout.
Shelby tube collected between depths of 50.0 and 52.0 feet and 75.0 and 77.0 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-1W
PAGE 1 OF 1

STATION: 13+00 OFFSET: 25 ft RT
LATITUDE: 36.838178° N LONGITUDE: 76.196099° W
SURFACE ELEVATION: 11.9 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/13/10 - 9/13/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Sara Phillips/GET

GROUND WATER
FIRST ENCOUNTERED AT 11.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA | **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
				35								0.0 / 11.9 Asphalt concrete 15.5" **ASPH**			
	2	10	5 6 9 11	100		2						1.3 / 10.6 Brown, fine silty sand FILL, moist **FL**			
	4	8	7 11 15 16	75		4						3.0 / 8.9 **SM** Tan brown, fine silty SAND, medium dense, moist			
	6	6	6 12 11 7	71		6						Gray below a depth of 6.0 feet			
1.75	8	4	2 3 4 4	75		8						8.0 / 3.9 Brown orange, sandy lean CLAY, firm, moist **CL**			
	10	2	2 3 3 3	65		10						Gray and orange brown below a depth of 10.0 feet			
0.5												Moisture increases to wet below a depth of 11.0 feet			
	12	0				12						Boring terminated at a depth of 12.0 feet			

REMARKS: Rig Type: Track mounted CME 45. REFERENCE BASELINE: Ramp D7
Backfilled upon completion for safety considerations.

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D7-1W

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-2W
PAGE 1 OF 1

STATION: 14+07 OFFSET: 35 ft RT
LATITUDE: 36.838473° N LONGITUDE: 76.196078° W
SURFACE ELEVATION: 6.6 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/24/10 - 9/24/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: David Hedges/S&ME
Logger: Matthew Thornton/S&ME

GROUND WATER
- FIRST ENCOUNTERED AT 7.4 ft DEPTH
- STABILIZED AT 3.8 ft AFTER 24 HOURS

FIELD DATA | **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
4		6	3 5 5 6	70										
	2	4	14 10 12 12	75		2								
3	4					4								
1		2	6 5 4 6	100										
	6	0	4 7 10 10	100		6								
1	8	-2	4 5 5 8	50		8								
	10	-4	6 7 10 11	70		10								
	12	-6	6 7 13 11	100		12								
	14	-8				13								
	16	-10				15								
	18	-12	2 2 2 4	25		18								
	20					20								

FIELD DESCRIPTION OF STRATA

0.0 / 6.6
Topsoil 3" **TOPS**

0.3 / 6.3
Light gray mottled with yellow brown, sandy fat CLAY, stiff to very stiff, moist **CH**

7.4 / -0.8
SC
Light gray mottled with yellow brown, fine to medium clayey SAND, medium dense, wet

10.0 / -3.4
Light gray mottled with yellow brown, fine to medium poorly graded SAND with clay, medium dense, wet
SP-SC

16.5 / -9.9
SP

Light brown, fine to medium poorly graded SAND, loose, wet

Boring terminated at a depth of 20.0 feet

REMARKS: Rig Type: CME 550 ATV. REFERENCE BASELINE: Ramp D7
Borehole offset approximately 8.0 feet north and 10.0 feet east of staked location.
Running sands at a depth of 18.0 feet. Caved to a depth of 5.0 feet after 24 hours.

PAGE 1 OF 1
D7-2W

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108 **LOCATION:** Norfolk: PSA I64, D7, and Bridge **STRUCTURE:** RETAINING WALL	**D7-4W**	**PAGE 1 OF 2**

STATION: 16+00 OFFSET: 45 ft RT
LATITUDE: 36.839000° N LONGITUDE: 76.196051° W
SURFACE ELEVATION: 6.2 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 9/27/10 - 9/27/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Derek Simms/GET
Logger: Sara Phillips/GET

GROUND WATER
FIRST ENCOUNTERED AT 6.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
		6	6 8 8 7	80								0.0 / 6.2 Topsoil 6" **TOPS**			
	2	4	4 4 6 8	80		2						0.5 / 5.7 Brown, fine silty sand FILL, contains trace organics (grass roots), medium dense, moist **FL**			
	4	2	5 5 7 10	75		4						2.0 / 4.2 Tan brown and orange brown, fine clayey SAND, medium dense, moist **SC**			
	6 ∇	0	2 2 2 2	92		6						4.0 / 2.2 Brown and orange brown, lean CLAY with fine sand, stiff, moist **CL**			
	8	-2	1 2 2 2	88		8						6.0 / 0.2 Tan brown, fine silty SAND, loose, wet **SM**			
	10	-4	3 3 4 5	50		10									
	12	-6				12									
	14	-8	6 6 4 3	65		13 15						Tan brown, fine silty SAND, medium dense, wet			
	16	-10													
	18	-12	4 4 6 5	65		18									
	20	-14				20									
	22	-16													
	24	-18	4 3 5 6	65		23						Gray, fine silty SAND, contains trace marine shell fragments, loose, wet			

REMARKS: Rig Type: Track mounted CME 45. REFERENCE BASELINE: Ramp D7
Borehole offset approximately 1.0 ft north and 23.0 feet east of original location.
Backfilled upon completion for safety considerations.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-4W

STATION: 16+00 OFFSET: 45 ft RT
LATITUDE: 36.839000° N LONGITUDE: 76.196051° W
SURFACE ELEVATION: 6.2 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/27/10 - 9/27/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Derek Simms/GET
Logger: Sara Phillips/GET

GROUND WATER
FIRST ENCOUNTERED AT 6.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LAB DATA: LIQUID LIMIT (LL)	LAB DATA: PLASTICITY INDEX (PI)	LAB DATA: MOISTURE CONTENT (%)
	26	-20				25						Gray, fine silty SAND, contains trace marine shell fragments, loose, wet			
												26.5 / -20.3 **CL**			
	28	-22	1 2 2 2	100		28						Gray, lean CLAY, contains trace marine shell fragments, soft, wet			
3.5	30	-24				30									
	32	-26													
			1 1 2 1	100		33									
3	34	-28				35									
	36	-30													
	38	-32	1 1 2 1	100		38									
3.5	40	-34				40									
	42	-36													
			1 1 1 1	100		43									
3	44	-38				45									
												Boring terminated at a depth of 45.0 feet			

REMARKS: Rig Type: Track mounted CME 45. REFERENCE BASELINE: Ramp D7
Borehole offset approximately 1.0 ft north and 23.0 feet east of original location.
Backfilled upon completion for safety considerations.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-5W

STATION: 17+10 OFFSET: 15 ft RT
LATITUDE: 36.839301° N LONGITUDE: 76.196163° W
SURFACE ELEVATION: 7.1 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/22/10 - 9/22/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: David Hedges/S&ME
Logger: Matthew Thornton/S&ME

GROUND WATER
- FIRST ENCOUNTERED AT 8.5 ft DEPTH
- STABILIZED AT 7.8 ft AFTER 24 HOURS

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
		6	6 10 12 12	85											
	2		4 11 8 10			2									
4.5		4		75											
	4		4 7 9 11			4									
4.5		2		95											
	6		4 4 4 5			6									
0.5		0		90											
	8		2 3 3 4			8									
0		-2		100											
	10		2 1 1 1			10									
0		-4		90											
	12					12									
		-6	2 7 8 7			13									
	14			70											
		-8				15									
	16														
		-10													
	18		5 8 5 5			18									
		-12		75											
	20					20									
		-14													
	22														
		-16	3 4 2 3			23									
	24			75											

FIELD DESCRIPTION OF STRATA

0.0 / 7.1
Forest litter 4" **TOPS**
Topsoil 3"

0.6 / 6.5
Light brown, fine to medium clayey sand FILL, medium dense, dry **FL**

2.0 / 5.1
CH
Light gray mottled with yellow brown, sandy fat CLAY, very stiff, moist

Light gray mottled with yellow brown, sandy fat CLAY, firm, moist

Moisture increases to wet below a depth of 8.5 feet

Light gray mottled with yellow brown, sandy fat CLAY, soft, wet

12.5 / -5.4
SC
Light gray and orange brown, fine to coarse clayey SAND, medium dense, wet

24.1 / -17.0
Gray, fat CLAY, wet **CH**

REMARKS: Rig Type: CME 550 ATV. REFERENCE BASELINE: Ramp D7
Borehole offset approximately 10.0 feet west and 10.0 feet north of staked loaction. Caved to a depth of 10.6 feet after 24 hours.

SPT_LOGAB:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-5W

STATION: 17+10 OFFSET: 15 ft RT
LATITUDE: 36.839301° N LONGITUDE: 76.196163° W
SURFACE ELEVATION: 7.1 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/22/10 - 9/22/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: David Hedges/S&ME
Logger: Matthew Thornton/S&ME

GROUND WATER
- FIRST ENCOUNTERED AT 8.5 ft DEPTH
- STABILIZED AT 7.8 ft AFTER 24 HOURS

FIELD DATA														LAB DATA			
PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
	25											Gray, fat CLAY, wet				
	26	-20														
	28		1 1 1 2	90		28						Gray, fat CLAY with sand, soft, wet				
0		-22											68	39	50.8	83.0
	30					30										
		-24														
	32															
		-26	1 2 2 1			33										
0	34			100											49.7	
						35										

Boring terminated at a depth of 35.0 feet

REMARKS: Rig Type: CME 550 ATV. REFERENCE BASELINE: Ramp D7
Borehole offset approximately 10.0 feet west and 10.0 feet north of staked loaction. Caved to a depth of 10.6 feet after 24 hours.

SPT_LOGAB:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-8W
PAGE 1 OF 2

STATION: 19+15 | OFFSET: 25 ft RT
LATITUDE: 36.839863° N | LONGITUDE: 76.196125° W
SURFACE ELEVATION: 8.5 ft | COORD. DATUM: NAD 83

Date(s) Drilled: 9/24/10 - 9/24/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: David Hedges/S&ME
Logger: Matthew Thornton/S&ME

GROUND WATER
FIRST ENCOUNTERED AT 6.0 ft DEPTH
DRY AFTER 24 HRS

FIELD DATA | **LABORATORY DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)	TRIAXIAL (psf:deg)
		8	2 5 8 9	75								0.0 / 8.5 Topsoil 4" **TOPS**					
	2	6	13 11 13 15	80		2						0.3 / 8.2 Gray and yellow brown, fine to medium clayey SAND, medium dense, moist **SC**					
	4	4	18 8 8 6	80		4											
	6 ∇	2	15 11 10 13	95		6						Light gray and yellow brown, fine to medium clayey SAND, medium dense, wet					
	8	0	5 3 4 3	40		8						Orange brown, fine to medium clayey SAND, loose, wet					
	10	-2	11 9 8 15	100		10						Orange brown to light gray, fine to medium clayey SAND, medium dense, wet					
	12	-4				12						12.5 / -4.0 **SP-SC** Light brown and orange brown, fine to coarse poorly graded SAND with clay, wet					
	14	-6	10 12 14 9	100		13 15						14.0 / -5.5 Orange brown, fine to coarse clayey SAND, wet **SC**					
	16	-8															
	18	-10	4 5 6 5	50		18						Gray, fine to medium clayey SAND, medium dense, wet					
	20	-12				20											
	22	-14															
0	24	-16	WOH 1 1 3	100		23						Contains shells between a depth of 23.0 and 23.8 feet 23.8 / -15.3 Gray, sandy fat CLAY, moist **CH**					

REMARKS: Rig Type: CME 550 ATV. REFERENCE BASELINE: Ramp D7
Borehole offset approximately 15 feet north of staked location. Caved at a depth of 7.2 feet after 24 hours.
Shelby Tubes collected between depths of 28.0 and 30.0 feet and 38.0 and 40.0 feet.

PAGE 1 OF 2
D7-8W

SPT_LOGABC:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

STATION: 19+15 OFFSET: 25 ft RT
LATITUDE: 36.839863° N LONGITUDE: 76.196125° W
SURFACE ELEVATION: 8.5 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/24/10 - 9/24/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: David Hedges/S&ME
Logger: Matthew Thornton/S&ME

GROUND WATER
FIRST ENCOUNTERED AT 6.0 ft DEPTH
DRY AFTER 24 HRS

FIELD DATA / **LABORATORY DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND / SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT #200 (%)	TRIAXIAL (psf:deg)
					25						Gray, sandy fat CLAY, soft, moist					
	26	-18														
	28	-20			28						Gray, fat CLAY, moist. Shelby Tube collected between a depth of 28.0 and 30.0 feet. S&ME Lab #17239.					
0				100								55	28	40.6	85.7	1428
	30	-22			30											
	32	-24														
			WOH		33						Gray, fat CLAY, soft, moist					
			1													
0	34	-26	2	100								70	44	40.9	86.4	
			2		35											
	36	-28														
											36.5 / -28.0 **CL**					
	38	-30			38						Gray, sandy lean CLAY, soft, moist. Shelby Tube collected between a depth of 38.0 and 40.0 feet. S&ME Lab #17240.					
0				100								41	20	33.2	68.4	1148
	40	-32	2		40											
			1													
0			2	100										39.3		
			2													
	42				42						Boring terminated at a depth of 42.0 feet					

REMARKS: Rig Type: CME 550 ATV. REFERENCE BASELINE: Ramp D7
Borehole offset approximately 15 feet north of staked location. Caved at a depth of 7.2 feet after 24 hours.
Shelby Tubes collected between depths of 28.0 and 30.0 feet and 38.0 and 40.0 feet.

SPT_LOGABC:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-9W

STATION: 20+00 OFFSET: 15 ft RT
LATITUDE: 36.840097° N LONGITUDE: 76.196159° W
SURFACE ELEVATION: 9.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/23/10 - 9/24/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: David Hedges/S&ME
Logger: Matthew Thornton/S&ME

GROUND WATER
- FIRST ENCOUNTERED AT 10.0 ft DEPTH
- STABILIZED AT 8.5 ft AFTER 48 HOURS

FIELD DATA / **LABORATORY DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)	TRIAXIAL (psf:deg)
		8	2 7 17 22	100		2						0.0 / 9.0 Topsoil 4" **TOPS**					
	2	6	12 16 19 19	80		4						0.3 / 8.7 Brown, fine to medium poorly graded sand with clay FILL, medium dense, dry **FL** Brown, fine to medium poorly graded sand with clay FILL, dense, dry					
	4	4	6 13 11 12	100		6						Brown, fine to medium poorly graded sand with clay FILL, medium dense, dry					
	6	2	7 6 5 6	80		8						5.5 / 3.5 Light gray mottled with yellow brown, fine to medium clayey SAND, medium dense, moist **SC**					
	8	0	6 2 3 3	20		10						Yellow brown, fine to medium clayey SAND, loose, moist					
	10	-2	8 3 4 6	80		12						Moisture increases to wet at a depth of 10.0 feet					
	12	-4	2 4 7 11	65		13						Light gray mottled with yellow brown, fine to medium clayey SAND, medium dense, wet					
	14	-6				15											
	16	-8															
	18	-10	3 6 8 9	100		18											
	20	-12				20											
	22	-14	WOH 3 2 3	75		23						Gray, fine to medium clayey SAND, loose, wet Contains shells below a depth of 24.0 feet					
	24	-16															

REMARKS: Rig Type: CME 550 ATV. REFERENCE BASELINE: Ramp D7
Borehole offset approximately 10.0 feet west of staked location. Cave to a depth of 9.5 feet after 24 hours.
Shelby tube collected between a depth of 43.0 and 45.0 feet.

SPT_LOGABC:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

STATION: 20+00 OFFSET: 15 ft RT
LATITUDE: 36.840097° N LONGITUDE: 76.196159° W
SURFACE ELEVATION: 9.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/23/10 - 9/24/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: David Hedges/S&ME
Logger: Matthew Thornton/S&ME

GROUND WATER
FIRST ENCOUNTERED AT 10.0 ft DEPTH
STABILIZED AT 8.5 ft AFTER 48 HOURS

FIELD DATA / **LABORATORY DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND / SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)	TRIAXIAL (psf:deg)
					25						Gray, fine to medium clayey SAND, contains shells, loose, wet					
	26	-18									26.5 / -17.5 **CH**					
0	28	-20	1 1 1 2	100	28						Gray, sandy fat CLAY, soft, moist			27.3		
	30	-22			30											
	32	-24														
0	34	-26	WOH WOH 1 2	100	33 35						Gray brown, fat CLAY, very soft, wet	74	45	42.8	88.5	
	36	-28									36.5 / -27.5 **CL**					
0	38	-30	1 1 1 2	100	38 40						Gray, sandy lean CLAY, soft, wet			34.2		
	40	-32														
	42	-34														
0.5	44	-36		100	43 45						Shelby tube collected between a depth of 43.0 and 45.0 feet. S&ME Lab # 17241	39	17	34.3	51.4	1207
0	46	-38	2 2 2 2	100	47						Gray, sandy lean CLAY, soft, wet			36.0		
											Boring terminated at a depth of 47.0 feet					

REMARKS: Rig Type: CME 550 ATV. REFERENCE BASELINE: Ramp D7
Borehole offset approximately 10.0 feet west of staked location. Cave to a depth of 9.5 feet after 24 hours.
Shelby tube collected between a depth of 43.0 and 45.0 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-10W

STATION: 21+04 OFFSET: 19 ft RT
LATITUDE: 36.840381° N LONGITUDE: 76.196143° W
SURFACE ELEVATION: 11.1 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 9/22/10 - 9/23/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: David Hedges/S&ME
Logger: Matthew Thornton/S&ME

GROUND WATER
FIRST ENCOUNTERED AT 10.0 ft DEPTH
STABILIZED AT 9.4 ft AFTER 48 HOURS

LABORATORY DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)	TRIAXIAL (psf:deg)
		10	2 2 5 12	80								0.0 / 11.1 Topsoil 3" **TOPS**					
	2					2						0.3 / 10.8 Light brown mottled with yellow brown, fine to medium sand with clay FILL, loose, dry **FL**					
4.5		8	3 16 16 15	55								2.0 / 9.1 Light gray mottled with yellow brown, sandy fat CLAY, hard, dry **CH**					
	4					4						Light gray, mottled with yellow brown, sandy fat CLAY, very stiff, moist					
3		6	4 8 9 11	60													
	6					6						6.0 / 5.1 Light gray mottled with yellow brown, fine to coarse poorly graded SAND with clay, medium dense, moist **SP-SC**					
		4	5 7 8 8	85													
	8					8						8.0 / 3.1 Orange brown, fine to medium clayey SAND, loose, moist **SC**					
		2	3 3 4 4	25													
	10					10						Light gray and orange brown, fine to coarse clayey SAND, loose, wet					
		0	3 3 3 3	45													
	12					12											
		-2	2 3 5 9	80		13											
	14																
		-4				15											
	16																
		-6															
	18		3 9 12 16	100		18						Brown mottled with orange brown, fine to medium clayey SAND, medium dense, wet					
		-8															
	20					20											
		-10															
	22																
		-12	1 3 3 3	80		23						Gray, fine to medium clayey SAND, loose, wet					
	24																

REMARKS: Rig Type: CME 550 ATV. REFERENCE BASELINE: Ramp D7. Borehole offset approximately 3.5 feet north and 6.0 feet west of staked location.
Caved to a depth of 10.0 feet after 24 hours. Running sands at a depth of 58.0 feet. Piezometer installed to a depth of 10.0 feet.
Shelby tube collected between a depth of 37.0 and 39.0 feet.

SPT_LOGABC:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13
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Virginia Department of Transportation

PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-10W

STATION: 21+04 OFFSET: 19 ft RT
LATITUDE: 36.840381° N LONGITUDE: 76.196143° W
SURFACE ELEVATION: 11.1 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/22/10 - 9/23/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: David Hedges/S&ME
Logger: Matthew Thornton/S&ME

GROUND WATER
FIRST ENCOUNTERED AT 10.0 ft DEPTH
STABILIZED AT 9.4 ft AFTER 48 HOURS

FIELD DATA / **LABORATORY DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND / SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)	TRIAXIAL (psf:deg)
					25						Gray, fine to medium clayey SAND, loose, wet					
	26	-16														
	28		1 1 2 2	75	28						Gray brown, fine to medium clayey SAND, very loose, moist	36	15	27.1	44.5	
0		-18														
	30				30											
		-20														
	32															
		-22	WOH 2 1 3	85	33											
0	34													35.0		
		-24			35											
	36										36.0 / -24.9					
		-26			37						**CL** Gray, lean CLAY with sand. Shelby Tube collected between a depth of 37.0 and 39.0 feet. S&ME Lab #17238					
	38			100								48	24	39.4	79.7	377
		-28	1 1 2 1		39						Gray, lean CLAY with sand, soft, moist					
0	40			75										31.0		
		-30			41											
	42															
		-32	WOH 1 2 2	80	43						Gray brown, sandy lean CLAY, soft, moist					
0	44											41	22	30.8	69.5	
		-34			45											
	46															
		-36			47.5											
	48		1 1 1 1	100												
0.25		-38			49.5									30.5		
	50															

REMARKS: Rig Type: CME 550 ATV. REFERENCE BASELINE: Ramp D7. Borehole offset approximately 3.5 feet north and 6.0 feet west of staked location.
Caved to a depth of 10.0 feet after 24 hours. Running sands at a depth of 58.0 feet. Piezometer installed to a depth of 10.0 feet.
Shelby tube collected between a depth of 37.0 and 39.0 feet.

PAGE 2 OF 3
D7-10W

SPT_LOGABC:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13
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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-10W

STATION: 21+04 OFFSET: 19 ft RT
LATITUDE: 36.840381° N LONGITUDE: 76.196143° W
SURFACE ELEVATION: 11.1 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/22/10 - 9/23/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: David Hedges/S&ME
Logger: Matthew Thornton/S&ME

GROUND WATER
- FIRST ENCOUNTERED AT 10.0 ft DEPTH
- STABILIZED AT 9.4 ft AFTER 48 HOURS

FIELD DATA / **LABORATORY DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)	TRIAXIAL (psf:deg)
		-40										Gray, sandy lean CLAY, soft, moist					
	52																
		-42	2			53						Gray, lean CLAY with sand, firm, moist					
0	54		2 4 4	100									45	25	36.7	76.0	
		-44				55											
	56																
		-46										56.5 / -45.4 **SP-SC**					
	58		5			58						Gray, fine to medium poorly graded SAND with clay, medium dense, wet					
		-48	6 10 14	100													
	60					60						Boring terminated at a depth of 60.0 feet					

REMARKS: Rig Type: CME 550 ATV. REFERENCE BASELINE: Ramp D7. Borehole offset approximately 3.5 feet north and 6.0 feet west of staked location.
Caved to a depth of 10.0 feet after 24 hours. Running sands at a depth of 58.0 feet. Piezometer installed to a depth of 10.0 feet.
Shelby tube collected between a depth of 37.0 and 39.0 feet.

PAGE 3 OF 3
D7-10W

SPT_LOGABC:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13
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PROJECT #: 0264-122-108 **LOCATION:** Norfolk: PSA I64, D7, and Bridge **STRUCTURE:** RETAINING WALL		**D7-12W** **PAGE 1 OF 6**
STATION: 16+62 LATITUDE: 36.839169° N SURFACE ELEVATION: 9.4 ft	OFFSET: 49 ft RT LONGITUDE: 76.196046° W COORD. DATUM: NAD 83	

FIELD DATA

Date(s) Drilled: 6/15/11 - 6/15/11
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Joseph Robinson/GET

GROUND WATER
FIRST ENCOUNTERED AT 10.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
			1 2 2 2	70								0.0 / 9.4 2" Topsoil **TOPS**			
	2	8	4 5 7 6	65		2						0.2 / 9.2 Tan, fine to medium poorly graded SAND, loose, moist **SP**			
4.5	4	6	5 7 10 9	85		4						2.0 / 7.4 Mottled orange to gray, lean CLAY, stiff, moist **CL** Mottled orange to gray, lean CLAY, very stiff, moist			
1.6	6	4	8 7 7 6	95		6						Mottled orange to gray, lean CLAY, stiff, moist			
0.5	8	2	1 1 2 3	95		8						Mottled orange to gray, lean CLAY, soft, moist			
0.9	10 ∇	0	1 4 7 7	70		10						9.5 / -0.1 Mottled orange to gray, fine to medium silty SAND, moist **SM** 10.0 / -0.6 Tan to gray, fine to coarse poorly graded SAND, medium dense, wet **SP**			
	12	-2	1 1 4 4	90		12 13 15						Tan to gray, fine to coarse poorly graded SAND, loose, wet			
	14	-4	4 5 5 3	65		18 20						Tan to gray, fine to coarse poorly graded SAND, medium dense, wet 19.5 / -10.1 Mottled orange to gray, fine to medium silty SAND, wet **SM**			
	16	-6	2 3 3 1	75		23						Mottled orange to gray, fine to medium silty SAND, loose, wet Contains marine shell fragments at a depth of 24.5 feet			
	18	-8													
	20	-10													
	22	-12													
	24	-14													

REMARKS: Rig Type: Rubber tired CME550x ATV. REFERENCE BASELINE: RAMP D7.
Boring backfilled with sand-grout mix upon completion.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-12W

STATION: 16+62 OFFSET: 49 ft RT
LATITUDE: 36.839169° N LONGITUDE: 76.196046° W
SURFACE ELEVATION: 9.4 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 6/15/11 - 6/15/11
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Joseph Robinson/GET

GROUND WATER
FIRST ENCOUNTERED AT 10.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
		-16				25						Gray, fine to medium silty SAND, contains marine shell fragments, very loose, wet			
	26														
		-18													
	28		WOH/12"			28									
0.5		-20	1	100											
	30		1			30									
		-22													
	32														
		-24	WOH/12"			33									
0.5	34		1	100											
			1			35									
		-26													
	36											36.5 / -27.1 **SC**			
		-28													
	38		WOH/12"			38						Gray, fine clayey SAND, very loose, wet			
0.5		-30	1	100											
	40		1			40									
		-32													
	42														
		-34	WOH/24"			43									
	44			100											
						45									
		-36													
	46														
		-38										46.5 / -37.1 **CL**			
	48		WOH/12"			48						Gray, fine sandy lean CLAY, very soft, wet			
		-40	1	15											
	50		2												

REMARKS: Rig Type: Rubber tired CME550x ATV. REFERENCE BASELINE: RAMP D7.
Boring backfilled with sand-grout mix upon completion.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-12W

STATION: 16+62 OFFSET: 49 ft RT
LATITUDE: 36.839169° N LONGITUDE: 76.196046° W
SURFACE ELEVATION: 9.4 ft COORD. DATUM: NAD 83

Date(s) Drilled: 6/15/11 - 6/15/11
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Joseph Robinson/GET

GROUND WATER
FIRST ENCOUNTERED AT 10.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
						50						Gray, fine sandy lean CLAY, very soft, wet			
	52	-42										51.5 / -42.1 Gray, fat CLAY, soft, wet **CH**			
0.5	54	-44	WOH 1 2 WOH	85		53 55									
	56	-46													
	58	-48	1 1 1 2	20		58 60									
0.5	60	-50													
	62	-52										61.5 / -52.1 **SC** Gray, fine clayey SAND, loose, wet			
	64	-54	2 2 2 3	45		63 65									
	66	-56													
	68	-58	2 2 2 4	70		68 70									
	70	-60													
	72	-62										71.5 / -62.1 **SP** Gray, fine to medium poorly graded SAND, medium dense, wet			
	74	-64	10 9 5 9	45		73									

REMARKS: Rig Type: Rubber tired CME550x ATV. REFERENCE BASELINE: RAMP D7.
Boring backfilled with sand-grout mix upon completion.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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VDOT Virginia Department of Transportation	**PROJECT #:** 0264-122-108 **LOCATION:** Norfolk: PSA I64, D7, and Bridge **STRUCTURE:** RETAINING WALL	**D7-12W** **PAGE 4 OF 6**

STATION: 16+62 OFFSET: 49 ft RT
LATITUDE: 36.839169° N LONGITUDE: 76.196046° W
SURFACE ELEVATION: 9.4 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 6/15/11 - 6/15/11
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Joseph Robinson/GET

GROUND WATER
FIRST ENCOUNTERED AT 10.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
						75						Gray, fine to medium poorly graded SAND, medium dense, wet			
	76	-66										76.5 / -67.1 **SM**			
		-68										Gray, fine to medium silty SAND, contains clay lenses, loose, wet			
	78		3 4 3 6	85		78									
		-70													
	80					80									
		-72													
	82					83									
		-74	4 5 4 6	65											
	84					85									
		-76													
	86														
		-78													
	88		4 4 4 5	30		88									
		-80													
	90					90									
		-82										91.5 / -82.1 **SM**			
	92					93						Gray, fine to medium silty SAND, contains marine shell fragments, medium dense, wet			
		-84	4 4 7 11	100											
	94					95									
		-86													
	96														
		-88													
	98		5 5 10 11	100		98									
		-90													
	100														

REMARKS: Rig Type: Rubber tired CME550x ATV. REFERENCE BASELINE: RAMP D7.
Boring backfilled with sand-grout mix upon completion.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-12W

STATION: 16+62 OFFSET: 49 ft RT
LATITUDE: 36.839169° N LONGITUDE: 76.196046° W
SURFACE ELEVATION: 9.4 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 6/15/11 - 6/15/11
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Joseph Robinson/GET

GROUND WATER
FIRST ENCOUNTERED AT 10.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
						100						Gray, fine to medium silty SAND, contains trace marine shell fragments, medium dense, wet			
	102	-92													
		-94	4 5 9 11	0		103 105									
	104														
		-96													
	106														
		-98													
	108		7 7 9 13	90		108 110									
		-100													
	110														
		-102													
	112														
		-104	5 8 13 16	100		113 115									
	114														
		-106													
	116														
		-108													
	118		4 5 9 13	100		118 120									
		-110													
	120														
		-112													
	122														
		-114	5 5 8 16	100		123									
	124														

REMARKS: Rig Type: Rubber tired CME550x ATV. REFERENCE BASELINE: RAMP D7.
Boring backfilled with sand-grout mix upon completion.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-12W

STATION: 16+62 OFFSET: 49 ft RT
LATITUDE: 36.839169° N LONGITUDE: 76.196046° W
SURFACE ELEVATION: 9.4 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 6/15/11 - 6/15/11
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Joseph Robinson/GET

GROUND WATER
FIRST ENCOUNTERED AT 10.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
		-116				125						Gray, fine to medium silty SAND, contains trace marine shell fragments, medium dense, wet			
	126														
		-118													
	128		4			128									
			4	100											
		-120	7												
			16												
	130					130						Boring terminated at a depth of 130.0 feet			

REMARKS: Rig Type: Rubber tired CME550x ATV. REFERENCE BASELINE: RAMP D7.
Boring backfilled with sand-grout mix upon completion.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-13W

STATION: 19+59 OFFSET: 47 ft RT
LATITUDE: 36.839982° N LONGITUDE: 76.196049° W
SURFACE ELEVATION: 11.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 6/14/11 - 6/14/11
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: Joseph Robinson/GET

GROUND WATER
FIRST ENCOUNTERED AT 9.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA | **LABORATORY DATA**

DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
	10	3 6 5 8	70								0.0 / 11.0 17" Topsoil **TOPS**				
2	8	3 4 6 6	100		2						1.4 / 9.6 **CL** Mottled orange to gray, lean CLAY, contains fibrous organics, stiff, moist				
4	6	8 10 8 9	50		4						5.0 / 6.0 Mottled orange to gray, fine to medium silty SAND, moist **SM**				
6	4	6 7 6 5	90		6						6.0 / 5.0 Mottled orange to gray, fine to medium poorly graded SAND, medium dense, moist **SP**				
8	2	2 2 2 4	50		8						Mottled orange to gray, fine to medium poorly graded SAND, loose, moist				
10	0	3 3 4 5	45		10										
12	-2	2 4 7 7	50		12										
14	-4				13						Mottled orange to gray, fine to medium poorly graded SAND, medium dense, moist				
16	-6				15										
18	-8	6 13 14 16	50		18										
20	-10				20										
22	-12	2 4 2 4	50		23						21.5 / -10.5 **SM** Gray, fine to medium silty SAND, loose, wet				
24	-14														

REMARKS: Rig Type: Truck-mounted CME 55. REFERENCE BASELINE: RAMP D7.
4-inch casing set to a depth of 4.0 feet. Shelby tube collected between a depth of 43.0 and 45.0 feet.
Boring backfilled with sand-grout mix upon completion

SPT_LOGBC:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

STATION: 19+59 OFFSET: 47 ft RT
LATITUDE: 36.839982° N LONGITUDE: 76.196049° W
SURFACE ELEVATION: 11.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 6/14/11 - 6/14/11
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: Joseph Robinson/GET

GROUND WATER
FIRST ENCOUNTERED AT 9.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LABORATORY DATA**

DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)	
					25						Gray, fine to medium silty SAND, loose, wet					
26																
	-16															
28		WOH/24"			28						Gray, fine to medium silty SAND, very loose, wet					
	-18		100								29.0 / -18.0					
30					30						Gray, lean CLAY, wet **CL**					
	-20															
32																
	-22	WOH/18"			33						Gray, sandy lean CLAY, very soft, wet					
34		1	45													
	-24				35											
36																
	-26															
38		WOH/24"			38											
	-28		100													
40					40											
	-30															
42																
	-32				43						Gray, sandy lean CLAY. Shelby tube collected between a depth of 43.0 and 45.0 feet. S&ME Lab #17935	36	13	32.7	66.7	994
44																
	-34				45											
46																
	-36															
48		WOH/18"			48											
	-38	1	100													
50																

REMARKS: Rig Type: Truck-mounted CME 55. REFERENCE BASELINE: RAMP D7.
4-inch casing set to a depth of 4.0 feet. Shelby tube collected between a depth of 43.0 and 45.0 feet.
Boring backfilled with sand-grout mix upon completion

SPT_LOGBC:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-13W

STATION: 19+59 OFFSET: 47 ft RT
LATITUDE: 36.839982° N LONGITUDE: 76.196049° W
SURFACE ELEVATION: 11.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 6/14/11 - 6/14/11
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: Joseph Robinson/GET

GROUND WATER
FIRST ENCOUNTERED AT 9.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LABORATORY DATA**

DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
					50						Gray, sandy lean CLAY, very soft, wet				
52	-40														
54	-42	WOH/18" 1	100		53										
56	-44				55										
58	-46										56.5 / -45.5 **CH**				
60	-48	WOH/18" 2	100		58						Gray, fat CLAY, contains marine shell fragments, very soft, wet				
62	-50				60										
64	-52	WOH/18" 1	100		63										
66	-54				65										
68	-56	3 5 5 7	60		68										
70	-58				70						69.0 / -58.0 Gray, fine to medium silty SAND, contains clay lenses, wet **SM**				
72	-60														
74	-62	3 4 6 9	90		73						Gray, fine to medium silty SAND, contains clay lenses, medium dense, wet				
	-64														

REMARKS: Rig Type: Truck-mounted CME 55. REFERENCE BASELINE: RAMP D7.
4-inch casing set to a depth of 4.0 feet. Shelby tube collected between a depth of 43.0 and 45.0 feet.
Boring backfilled with sand-grout mix upon completion

SPT_LOGBC:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

STATION: 19+59 OFFSET: 47 ft RT
LATITUDE: 36.839982° N LONGITUDE: 76.196049° W
SURFACE ELEVATION: 11.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 6/14/11 - 6/14/11
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: Joseph Robinson/GET

GROUND WATER
FIRST ENCOUNTERED AT 9.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LABORATORY DATA**

DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
					75						Gray, fine to medium silty SAND, contains clay lenses, medium dense, wet				
76															
	-66														
78		3 3 6 7	100		78						Gray, fine to medium silty SAND, contains trace clay lenses, loose, wet				
	-68														
80					80										
	-70														
82															
	-72	5 9 10 12	50		83						Gray, fine to medium silty SAND, contains trace clay lenses, medium dense, wet				
84															
	-74				85										
86															
	-76														
88		2 5 6 10	100		88										
	-78														
90					90										
	-80														
92															
	-82	5 8 10 10	85		93										
94															
	-84				95										
96															
	-86														
98		WOH/18"			98										
	-88	1	75								98.5 / -87.5 Gray, fat CLAY, very soft, wet **CH**				
100															

REMARKS: Rig Type: Truck-mounted CME 55. REFERENCE BASELINE: RAMP D7.
4-inch casing set to a depth of 4.0 feet. Shelby tube collected between a depth of 43.0 and 45.0 feet.
Boring backfilled with sand-grout mix upon completion

SPT_LOGBC:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

STATION: 19+59 OFFSET: 47 ft RT
LATITUDE: 36.839982° N LONGITUDE: 76.196049° W
SURFACE ELEVATION: 11.0 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 6/14/11 - 6/14/11
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: Joseph Robinson/GET

GROUND WATER
FIRST ENCOUNTERED AT 9.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

LABORATORY DATA

DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
					100						Gray, fat CLAY, very soft, wet				
102	-90														
104	-92				103						Shelby Tube collected between a depth of 103.0 and 105.0 feet.				
106	-94				105										
108	-96														
110	-98	WOH/12" 2 3	100		108 110						Gray, fat CLAY, soft, wet				
112	-100														
114	-102	5 8 13 19	0		113						113.0 / -102.0 No recovery **CL**				
116	-104				115										
118	-106	4 4 8 15	15		118						Gray, lean CLAY, stiff, wet				
120	-108				120										
122	-110														
124	-112	2 5 5 10	100		123						123.0 / -112.0 Gray, fine to medium silty SAND, contains marine shell fragments, medium dense, wet **SM**				
	-114														

REMARKS: Rig Type: Truck-mounted CME 55. REFERENCE BASELINE: RAMP D7.
4-inch casing set to a depth of 4.0 feet. Shelby tube collected between a depth of 43.0 and 45.0 feet.
Boring backfilled with sand-grout mix upon completion

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: RETAINING WALL

D7-13W

STATION: 19+59 OFFSET: 47 ft RT
LATITUDE: 36.839982° N LONGITUDE: 76.196049° W
SURFACE ELEVATION: 11.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 6/14/11 - 6/14/11
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: Joseph Robinson/GET

GROUND WATER
FIRST ENCOUNTERED AT 9.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LABORATORY DATA**

DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
					125						Gray, fine to medium silty SAND, contains marine shell fragments, medium dense, wet				
126															
	-116														
128		5			128						Gray, fine to medium silty SAND, contains marine shell fragments, dense, wet				
	-118	10	100												
		21													
		23													
130					130						Boring terminated at a depth of 130.0 feet.				

REMARKS: Rig Type: Truck-mounted CME 55. REFERENCE BASELINE: RAMP D7.
4-inch casing set to a depth of 4.0 feet. Shelby tube collected between a depth of 43.0 and 45.0 feet.
Boring backfilled with sand-grout mix upon completion

SPT_LOGBC:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: SOUND WALL

I64SB-1

STATION: 101+50 OFFSET: 70 ft RT
LATITUDE: 36.830754° N LONGITUDE: 76.195244° W
SURFACE ELEVATION: 8.8 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 9/16/10 - 9/16/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Derek Simms/GET
Logger: Sara Phillips/GET

GROUND WATER
FIRST ENCOUNTERED AT 7.5 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK QUALITY DESIGNATION	DIP °: STRATA	DIP °: JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
		8	4 8 13 11	100								0.0 / 8.8 Topsoil 6" **TOPS**			
	2		9			2						0.5 / 8.3 Orange brown, fine silty sand FILL, contains trace fine organics (grass roots), medium dense, moist **FL**			
1.5		6	8 8 8	75								2.0 / 6.8 Orange brown, fine sandy lean CLAY, very stiff, moist **CL**			
	4		4			4									
1.5		4	4 3 5	100								5.0 / 3.8 Orange brown, fine silty SAND, loose, moist **SM**			
	6		4			6									
		2	4 5 4	80											
	8		3			8						Moisture increases to wet below a depth of 7.5 feet			
		0	3 4 3	42											
	10		2			10						10.0 / -1.2 Orange brown, fine to medium silty SAND, very loose, wet **SM**			
		-2	1 2 3	42											
	12					12									
		-4	5			13						12.5 / -3.7 **SP-SM** Orange brown, fine poorly graded SAND with silt, medium dense, wet			
	14		6 6 7	30											
		-6				15									
	16														
		-8													
	18		6			18									
		-10	6 5 7	40								19.0 / -10.2 Orange brown, fine silty SAND, wet **SM** Contains fine gravel between a depth of 19.0 and 20.0 feet			
	20					20									
		-12													
	22														
		-14	11			23						Orange brown, fine silty SAND, dense, wet			
	24		16 20 16	58											
		-16													

REMARKS: Rig Type: Track mounted CME 45. REFERENCE BASELINE: I64 WBL
Backfilled upon completion for safety considerations.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: SOUND WALL

I64SB-1

STATION: 101+50 OFFSET: 70 ft RT
LATITUDE: 36.830754° N LONGITUDE: 76.195244° W
SURFACE ELEVATION: 8.8 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/16/10 - 9/16/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Derek Simms/GET
Logger: Sara Phillips/GET

GROUND WATER
FIRST ENCOUNTERED AT 7.5 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA													LAB DATA		
PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
						25						Orange brown, fine silty SAND, dense, wet			
	26	-18													
	28	-20	12 11 11 9	50		28						Orange brown to gray, fine silty SAND, medium dense, wet			
	30					30						Boring terminated at a depth of 30.0 feet			

REMARKS: Rig Type: Track mounted CME 45. REFERENCE BASELINE: I64 WBL
Backfilled upon completion for safety considerations.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: SOUND WALL

I64SB-3

STATION: 105+50 OFFSET: 70 ft RT
LATITUDE: 36.831848° N LONGITUDE: 76.195356° W
SURFACE ELEVATION: 8.4 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 9/16/10 - 9/16/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Derek Simms/GET
Logger: Sara Phillips/GET

GROUND WATER
FIRST ENCOUNTERED AT 6.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
		8	4 5 5 6	88								0.0 / 8.4 Topsoil 1" **TOPS**			
	2	6	8 7 10 8	92		2						0.1 / 8.3 Gray brown mottled, fine silty sand FILL, contains trace fine organics (grass roots), medium dense, moist **FL**			
2												2.0 / 6.4 Orange brown, fine sandy lean CLAY, very stiff, moist **CL**			
	4	4	4 4 5 6	100		4						3.5 / 4.9 Gray, orange, and brown mottled, fine silty SAND, moist **SM**			
1												4.0 / 4.4 Brown orange, fine sandy lean CLAY, stiff, moist **CL**			
	6 ∇	2	2 2 2 2	100		6						5.4 / 3.0 Tan orange mottled, fine silty SAND, moist **SM**			
	8	0	1 1 1 1	100		8						6.0 / 2.4 Orange brown, fine clayey SAND, very loose to loose, wet **SC**			
	10	-2	2 5 5 8	80		10						11.0 / -2.6 **SM**			
	12	-4				12									
	14	-6	8 5 6 8	42		13 15						Tan brown, fine silty SAND, medium dense, wet			
	16	-8													
	18	-10	3 3 3 2	80		18						Gray, fine silty SAND, loose, wet			
	20	-12				20									
	22	-14													
	24	-16	2 1 1 2	100		23						Dark gray, fine silty SAND, contains trace marine shell fragments, very loose, wet			

REMARKS: Rig Type: Track mounted CME 45. REFERENCE BASELINE: I64 WBL
Backfilled upon completion for safety considerations.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13
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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: SOUND WALL

I64SB-3

STATION: 105+50 OFFSET: 70 ft RT
LATITUDE: 36.831848° N LONGITUDE: 76.195356° W
SURFACE ELEVATION: 8.4 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/16/10 - 9/16/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Derek Simms/GET
Logger: Sara Phillips/GET

GROUND WATER
FIRST ENCOUNTERED AT 6.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA													LAB DATA		
PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
						25						Dark gray, fine silty SAND, contains trace marine shell fragments, very loose, wet			
	26	-18										26.5 / -18.1 **SC**			
	28	-20	3 2 3 2	100		28						Dark gray, fine clayey SAND, contains trace marine shell fragments, loose, wet			
	30					30						Boring terminated at a depth of 30.0 feet			

REMARKS: Rig Type: Track mounted CME 45. REFERENCE BASELINE: I64 WBL
Backfilled upon completion for safety considerations.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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VDOT Virginia Department of Transportation	**PROJECT #:** 0264-122-108 **LOCATION:** Norfolk: PSA I64, D7, and Bridge **STRUCTURE:** SOUND WALL	**I64SB-5** **PAGE 1 OF 2**

STATION: 109+50 OFFSET: 70 ft RT
LATITUDE: 36.832943° N LONGITUDE: 76.195469° W
SURFACE ELEVATION: 8.8 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 9/16/10 - 9/16/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Sue Young/HDR

GROUND WATER
NOT ENCOUNTERED DURING DRILLING
NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
		8	7 9 9 7	100								0.0 / 8.8 Topsoil 5" **TOPS**			
	2					2						0.4 / 8.4 Brown, fine silty SAND, contains roots, medium dense, dry **SM**			
		6	9 7 7 7	100											
	4					4									
		4	7 5 6 5	100								4.9 / 3.9 Orange brown, fine poorly graded SAND, moist **SP**			
	6					6						6.0 / 2.8 Brown, fine sandy lean CLAY, firm, wet **CL**			
0.5		2	4 3 3 3	100											
	8					8						Brown with tan mottles, fine sandy lean CLAY, soft, wet			
		0	1 1 2 2	65								Switched to mud rotary drilling below a depth of 8.0 feet			
	10					10						10.0 / -1.2 Orange brown, fine poorly graded SAND, medium dense, wet **SP**			
		-2	5 6 9 9	65											
	12					12									
		-4	8 9 9 10	65		13									
	14														
		-6				15									
	16														
		-8										16.5 / -7.7 **CH**			
	18		1 2 2 2	60		18						Dark gray, fine sandy fat CLAY, soft, wet			
0		-10													
	20					20									
		-12													
	22														
		-14	1 1 1 1	100		23									
0	24														
		-16													

REMARKS: Rig Type: Rubber tired CME550x ATV. REFERENCE BASELINE: I64 WBL
Caved to a depth of 9.0 feet at 0 hours.
Backfilled upon completion due to safety concerns.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: SOUND WALL

I64SB-5

STATION: 109+50 OFFSET: 70 ft RT
LATITUDE: 36.832943° N LONGITUDE: 76.195469° W
SURFACE ELEVATION: 8.8 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/16/10 - 9/16/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Sue Young/HDR

GROUND WATER
NOT ENCOUNTERED DURING DRILLING
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA													LAB DATA		
PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
	25											Dark gray, fine sandy fat CLAY, soft, wet			
	26	-18													
	28	-20	1 0 1 0	100		28						Dark gray, fat CLAY, contains shell fragments, very soft, wet			
0	30					30						Boring terminated at a depth of 30.0 feet			

REMARKS: Rig Type: Rubber tired CME550x ATV. REFERENCE BASELINE: I64 WBL
Caved to a depth of 9.0 feet at 0 hours.
Backfilled upon completion due to safety concerns.

SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: SOUND WALL

I64SB-7

STATION: 113+50 OFFSET: 70 ft RT
LATITUDE: 36.834038° N LONGITUDE: 76.195581° W
SURFACE ELEVATION: 8.6 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/16/10 - 9/16/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Sue Young/HDR

GROUND WATER

NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
2.5		8	4 4 2 3	95								0.0 / 8.6 Topsoil 5" **TOPS**				
	2	6	2 2 2 3	95		2						0.4 / 8.2 Brown, fine silty SAND, contains roots, loose, dry **SM** Moisture increases to moist at a depth of 2.0 feet				
	4	4	3 3 4 3	100		4						4.6 / 4.0 Tan, fine poorly graded SAND, wet **SP**				
	6	2	2 2 3 4	100		6						Tan to brown, fine poorly graded SAND, loose, wet				
	8	0	3 5 7 9	75		8						Brown, fine poorly graded SAND, medium dense, wet				
	10	-2	7 8 11 9	100		10						Switched to mud rotary drilling below a depth of 8.0 feet				
	12	-4				12										
	14	-6	5 5 3 6	65		13 15						Orange brown, fine poorly graded SAND, loose, wet				
	16	-8										16.5 / -7.9 **SP-SM**				
0	18	-10	2 2 2 2	70		18						Dark gray, fine poorly graded SAND with silt, contains trace shell fragments, loose, wet		NP	23.9	11.2
	20	-12				20										
	22	-14										21.5 / -12.9 **SM**				
0	24	-16	3 1 1 2	100		23						Dark gray, fine silty SAND, contains shell fragments, very loose, wet			27.5	

REMARKS: Rig Type: Rubber tired CME550x ATV. REFERENCE BASELINE: I64 WBL
Driller filled in boring before water level obtained. Backfilled upon completion due to safety concerns.

SPT_LOGAB:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: SOUND WALL

I64SB-7

STATION: 113+50 OFFSET: 70 ft RT
LATITUDE: 36.834038° N LONGITUDE: 76.195581° W
SURFACE ELEVATION: 8.6 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 9/16/10 - 9/16/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Sue Young/HDR

GROUND WATER

NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
						25						Dark gray, fine silty SAND, contains shell fragments, very loose, wet				
	26	-18										26.5 / -17.9 **ML**				
0	28	-20	WOH/18"	100		28						Dark gray, sandy SILT, contains trace shell fragments, very soft, wet	38	11	44.3	65.3
	30	-22	2			30										
	32	-24														
0	34	-26	WOH/24"	100		33 35						Contains increased number of shell fragments between 33.0 and 35.0 feet			46.4	
	36	-28														
0	38 40	-30 -32	1 1 1 1	100		38 40						Dark gray, sandy SILT, contains trace shell fragments, soft, wet			42.1	
	42	-34										41.5 / -32.9 **CL**				
0	44	-36	WOH/18" 1	100		43 45						Dark gray, lean CLAY, contains trace shell fragments, very soft, wet	43	19	38.0	91.6
	46	-38														
0	48 50	-40	1 1 1 1	100		48						Dark gray, lean CLAY, contains trace shell fragments, soft, wet			36.1	

REMARKS: Rig Type: Rubber tired CME550x ATV. REFERENCE BASELINE: I64 WBL
Driller filled in boring before water level obtained. Backfilled upon completion due to safety concerns.

SPT_LOGAB:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: SOUND WALL

I64SB-7

STATION: 113+50 OFFSET: 70 ft RT
LATITUDE: 36.834038° N LONGITUDE: 76.195581° W
SURFACE ELEVATION: 8.6 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/16/10 - 9/16/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Sue Young/HDR

GROUND WATER

NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA													LAB DATA			
PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
		-42				50						Dark gray, lean CLAY, contains trace shell fragments, soft, wet				
	52	-44	1			53										
0	54	-46	1 1 1	100		55									43.6	
												Boring terminated at a depth of 55.0 feet				

REMARKS: Rig Type: Rubber tired CME550x ATV. REFERENCE BASELINE: I64 WBL
Driller filled in boring before water level obtained. Backfilled upon completion due to safety concerns.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

I64WB-1
PAGE 1 OF 1

STATION: 102+50 OFFSET: 20 ft RT
LATITUDE: 36.631016° N LONGITUDE: 76.195443° W
SURFACE ELEVATION: 23.2 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/13/10 - 9/13/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Sara Phillips/GET

GROUND WATER
NOT ENCOUNTERED DURING DRILLING
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA | **LAB DATA**

DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
											0.0 / 23.2 Asphalt concrete 8" **ASPH**			
	22										0.7 / 22.5 Gray, fine silty sand FILL, moist **FL** Contains trace asphalt fragments between a depth of 0.7 and 2.0 feet			
2		8 14 18 22	100		2									
	20										Dark gray, fine silty sand FILL, dense, moist			
4		23 25 26 25	100		4						Dark gray, fine silty sand FILL, very dense, moist			
	18													
6		8 10 14 13	100		6						Tan between a depth of 5.6 feet and 6.0 feet Gray, fine silty sand FILL, contains trace marine shell fragments, medium dense, moist			
	16													
8		17 23 33 49	100		8						8.0 / 15.2 Tan, fine silty SAND, very dense, moist **SM**			
	14													
10					10						Boring terminated at a depth of 10.0 feet			

REMARKS: Rig Type: Track mounted CME 45. REFERENCE BASELINE: I64 WBL
Backfilled upon completion for safety considerations.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

I64WB-2
PAGE 1 OF 1

STATION: 106+50 OFFSET: 20 ft RT
LATITUDE: 36.832111° N LONGITUDE: 76.195555° W
SURFACE ELEVATION: 18.5 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 9/13/10 - 9/13/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Sara Phillips/GET

GROUND WATER
FIRST ENCOUNTERED AT 10.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
	18				1						0.0 / 18.5 Asphalt concrete 8" **ASPH**				
2	16	7 11 15 17	65		2						0.7 / 17.8 Brown, fine silty sand FILL, moist **FL**				
											2.0 / 16.5 Tan, fine poorly graded SAND with silt, medium dense, moist **SP-SM**		NP		8.0
4	14	7 10 13 14	75		4						4.0 / 14.5 Tan and orange brown, fine silty SAND, medium dense, moist **SM**				
6	12	5 7 13 17	65		6						Light gray and orange brown below a depth of 6.0 feet				
8	10	6 11 14 17	63		8										
10					10						Boring terminated at a depth of 10.0 feet				

REMARKS: Rig Type: Track mounted CME 45. REFERENCE BASELINE: I64 WBL
Bulk sample collected between a depth of 1.0 and 4.0 feet.
Backfilled upon completion for safety considerations.

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SPT_LOGB:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

I64WB-3

STATION: 110+50 OFFSET: 20 ft RT
LATITUDE: 36.833206° N LONGITUDE: 76.195667° W
SURFACE ELEVATION: 13.8 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/13/10 - 9/13/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Sara Phillips/GET

GROUND WATER
FIRST ENCOUNTERED AT 5.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
	2	12	5 9 8 8	58		2								
	4	10	3 3 4 5	75		4								
	6	8	2 3 2 4	92		6								
3	8	6	3 2 3 5	96		8								
0.75	10	4	1 1 4 5	96		10								
0.5	12	2				12								

FIELD DESCRIPTION OF STRATA

0.0 / 13.8
Asphalt concrete 10.5" **ASPH**

0.9 / 12.9
Brown, fine silty sand FILL, moist **FL**

2.0 / 11.8
Light gray, fine silty SAND, medium dense, moist **SM**

Light gray, fine silty SAND, loose, moist

Tan brown and moisture increases to wet below a depth of 5.0 feet

7.5 / 6.3
Brown and orange brown, fine sandy lean CLAY, firm, wet **CL**

11.5 / 2.3
Tan and orange brown, fine silty SAND, wet **SM**

Boring terminated at a depth of 12.0 feet

REMARKS: Rig Type: Track mounted CME 45. REFERENCE BASELINE: I64 WBL
Backfilled upon completion for safety considerations.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

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STATION: 114+50 OFFSET: 20 ft RT
LATITUDE: 36.834301° N LONGITUDE: 76.195779° W
SURFACE ELEVATION: 11.8 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/13/10 - 9/13/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: Sue Young/HDR

GROUND WATER
NOT ENCOUNTERED DURING DRILLING
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
												0.0 / 11.8 Asphalt concrete 9.5" **ASPH**				
						1						0.8 / 11.0 **FL** Tan, fine poorly graded sand FILL, wet				
	2	10	3 10 12 13	75		2						2.6 / 9.2 **SM** Brown, fine silty SAND, loose, moist		NP		8.0
	4	8	3 3 3 5	75		4										
1	6	6	2 2 4 5	100		6										
1.75	8	4	2 2 4 6	90		8						8.0 / 3.8 Orange brown, fine poorly graded SAND, loose, wet **SP**				
	10	2				10						Boring terminated at a depth of 10.0 feet				

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: I64 WBL
4-inch casing set to a depth of 4.0 feet. Backfilled with non-shrink grout upon completion.
Bulk sample collected between a depth of 0.8 and 4.0 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

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STATION: 118+50 OFFSET: 20 ft RT
LATITUDE: 36.835395° N LONGITUDE: 76.195891° W
SURFACE ELEVATION: 12.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/13/10 - 9/13/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: Sue Young/HDR

GROUND WATER
FIRST ENCOUNTERED AT 2.5 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
	2	10	3 7 7 7	80		2								
	4	8	8 5 4 5	75		4								
1.25	6	6	1 2 4 6	40		6								
	8	4	1 1 3 5	85		8								
0.75	10	2				10								

FIELD DESCRIPTION OF STRATA

0.0 / 12.0
Asphalt concrete 15.5" **ASPH**

1.3 / 10.7
Tan, fine poorly graded sand FILL, moist **FL**

3.8 / 8.2
Tan and orange mottled, fine poorly graded SAND FILL, wet **FL**
Switched to mud rotary drilling below a depth of 4.0 feet

5.0 / 7.0
Brown and orange mottled, lean CLAY, moist **CL**

6.0 / 6.0
Light brown, poorly graded SAND, loose, wet **SP**

8.0 / 4.0
Brown, elastic SILT, soft, moist **MH**

Boring terminated at a depth of 10.0 feet

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: I64 WBL
4-inch casing set to a depth of 4.0 feet. Backfilled with non-shrink grout upon completion.
Caved to 3.0 feet at 0.0 hr.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

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STATION: 122+50 OFFSET: 20 ft RT
LATITUDE: 36.836490° N LONGITUDE: 76.196004° W
SURFACE ELEVATION: 11.7 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 9/13/10 - 9/13/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Sara Phillips/GET

GROUND WATER
FIRST ENCOUNTERED AT 6.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
	2	10	5 8 13 16	67		2								
	4	8	5 6 3 4	67		4								
1.5	6 ∇	6	1 2 3 3	100		6								
1.5	8	4	2 3 3 3	100		8								
0.5	10	2				10								

FIELD DESCRIPTION OF STRATA

0.0 / 11.7
Asphalt concrete 11" **ASPH**

0.9 / 10.8
Brown, fine silty sand FILL, moist **FL**

2.0 / 9.7
Tan and orange brown, fine silty SAND FILL, medium dense, moist **FL**

Tan and orange brown, fine silty SAND, loose, moist

5.5 / 6.2
Gray, fine sandy lean CLAY, moist **CL**
Brown and orange brown, fine sandy lean CLAY, firm, wet

Contains sand lenses at a depth of 9.0 feet

Boring terminated at a depth of 10.0 feet

REMARKS: Rig Type: Track mounted CME 45. REFERENCE BASELINE: I64 WBL
Backfilled upon completion for safety considerations.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

I64WB-7

STATION: 126+50 OFFSET: 20 ft RT
LATITUDE: 36.837585° N LONGITUDE: 76.196116° W
SURFACE ELEVATION: 12.0 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 9/13/10 - 9/13/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Sara Phillips/GET

GROUND WATER
FIRST ENCOUNTERED AT 10.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
	2	10	6 11 13 14	65		2								
	4	8	6 8 5 4	71		4								
2.25	6	6	2 2 5 4	80		6								
1.75	8	4	2 3 3 4	100		8								
1	10 ∇	2				10								

FIELD DESCRIPTION OF STRATA

0.0 / 12.0
Asphalt concrete 16" **ASPH**

1.3 / 10.7
Brown, fine silty sand FILL, moist **FL**

2.0 / 10.0
Tan and orange brown, fine silty SAND FILL, medium dense, moist **FL**

5.5 / 6.5
Gray, lean CLAY with fine sand, firm, moist **CL**

9.8 / 2.2
Tan and orange brown, fine silty SAND, moist **SM**

Boring terminated at a depth of 10.0 feet

REMARKS: Rig Type: Track mounted CME 45. REFERENCE BASELINE: I64 WBL
Backfilled upon completion for safety considerations.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

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STATION: 130+50 OFFSET: 20 ft RT
LATITUDE: 36.838680° N LONGITUDE: 76.196227° W
SURFACE ELEVATION: 16.4 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/13/10 - 9/13/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Sara Phillips/GET

GROUND WATER
FIRST ENCOUNTERED AT 8.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA | **LAB DATA**

DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
	16										0.0 / 16.4 Asphalt concrete 10" **ASPH**			
2	14	5 6 6 7	75		2						0.8 / 15.6 Brown, fine silty sand FILL, moist **FL**			
4	12	5 8 6 7	79		4						2.0 / 14.4 Brown tan, fine silty SAND FILL, medium dense, moist **FL** Contains clay lenses between a depth of 4.0 and 8.0 feet			
6	10	6 9 10 10	80		6									
8	8	4 5 5 8	75		8						Moisture increases to wet below a depth of 8.0 feet			
10					10						Boring terminated at a depth of 10.0 feet			

REMARKS: Rig Type: Track mounted CME 45. REFERENCE BASELINE: I64 WBL
Backfilled upon completion for safety considerations.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

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STATION: 132+50 OFFSET: 18 ft RT
LATITUDE: 36.839227° N LONGITUDE: 76.196281° W
SURFACE ELEVATION: 22.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/13/10 - 9/13/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: Sue Young/HDR

GROUND WATER
NOT ENCOUNTERED DURING DRILLING
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA | **LAB DATA**

DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
											0.0 / 22.0 Asphalt concrete 9.5" **ASPH**			
2	20	3 2 2 3	100		2						0.8 / 21.2 **FL** Brown to tan, fine poorly graded sand FILL, loose, wet			
4	18	6 3 2 2	80		4						Switch to mud rotary drilling below a depth of 4.0 feet			
6	16	1 3 8 12	40		6						6.0 / 16.0 Gray, fine silty sand FILL, contains shell fragments, medium dense, moist **FL**			
8	14	10 16 17 14	75		8						8.0 / 14.0 Brown, fine poorly graded sand FILL, dense, moist **FL**			
10	12				10						Boring terminated at a depth of 10.0 feet			

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: I64 WBL
4-inch casing set to a depth of 4.0 feet. Backfilled with non-shrink grout upon completion.
Caved to a depth of 3.5 feet at 0 hours.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

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STATION: 134+50 OFFSET: 18 ft RT
LATITUDE: 36.839775° N LONGITUDE: 76.196316° W
SURFACE ELEVATION: 27.2 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/13/10 - 9/13/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: Sue Young/HDR

GROUND WATER
FIRST ENCOUNTERED AT 5.5 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA | **LAB DATA**

DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
											0.0 / 27.2 Asphalt concrete 9" **ASPH**			
2	26	3 5 4 3	90		2						0.8 / 26.4 **SP** Tan to orange brown, fine poorly graded SAND, loose, moist			
4	24	3 2 2 2	75		4						Rust colored mottles at a depth of 3.8 feet Switch to mud rotary drilling at a depth of 4.0 feet			
6	22	1 2 2 2	60		6						Tan to brown, fine poorly graded SAND, loose, moist			
8	20	1 2 3 4	60		8						Contains iron staining at a depth of 8.0 feet			
10	18				10						Boring terminated at a depth of 10.0 feet			

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: I64 WBL
4-inch casing set to a depth of 4.0 feet. Caved to a depth of 5.5 feet at 0 hours.
Backfilled with non-shrink grout upon completion. Bulk sample collected at a depth of 0.8 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

I64WB-11

STATION: 136+50 OFFSET: 20 ft RT
LATITUDE: 36.840323° N LONGITUDE: 76.196332° W
SURFACE ELEVATION: 32.3 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/13/10 - 9/13/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: Sue Young/HDR

GROUND WATER
NOT ENCOUNTERED DURING DRILLING
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA | **LAB DATA**

DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
	32										0.0 / 32.3 Asphalt concrete 7.5" **ASPH**			
											0.6 / 31.7 Aggregate subbase 7" **FL**			
2	30	2 3 4 3	75		2						1.2 / 31.1 **FL** Tan to brown, fine poorly graded sand FILL, loose, moist Switched to mud rotary drilling below a depth of 4.0 feet			
4	28	14 9 7 8	75		4						Tan to brown, fine poorly graded sand FILL, medium dense, moist Rust staining between a depth of 4.0 and 6.0 feet			
6	26	2 8 8 10	80		6						Contains clay lenses between a depth of 6.0 and 8.0 feet			
8	24	2 2 9 10	80		8									
10					10						FILL			
											Boring terminated at a depth of 10.0 feet			

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: I64 WBL
4-inch casing set to a depth of 4.0 feet. Caved to a depth of 5.0 feet at 0 hours.
Backfilled with non-shrink grout upon completion.

SPT_LOG:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

I64WB-P1
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STATION: 100+50 OFFSET: 10 ft RT
LATITUDE: 36.830466° N LONGITUDE: 76.195421° W
SURFACE ELEVATION: 25.2 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/14/10 - 9/14/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: Sue Young/HDR

GROUND WATER
FIRST ENCOUNTERED AT 3.5 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA | **LAB DATA**

DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
	24										0.0 / 25.2 Asphalt concrete 13" **ASPH**			
2		6 13 12 11	90		2						1.1 / 24.1 Cuttings of fine sand and fine gravel **FL**			
	22										2.0 / 23.2 Tan, fine poorly graded sand FILL, medium dense, moist **FL**			
4		11 22 23 23	90		4						Tan, fine poorly graded sand FILL, dense, moist			
	20										Switched to mud rotary drilling below a depth of 4.0 feet			
6		7 18 23 24	95		6						Orange, fine poorly graded sand FILL, dense, wet			
	18													
8		17 22 25 27	90		8									
	16										FILL			
10					10						Boring terminated at a depth of 10.0 feet			

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: I64 WBL
4-inch casing set to depth of 4.0 feet. Backfilled with non-shrink grout upon completion.
Caved to a depth of 3.5 feet at 0 hours.

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SPT_LOG:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

I64WB-P2

STATION: 101+50 OFFSET: 10 ft RT
LATITUDE: 36.830740° N LONGITUDE: 76.195449° W
SURFACE ELEVATION: 24.4 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/14/10 - 9/14/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: Sue Young/HDR

GROUND WATER
FIRST ENCOUNTERED AT 8.5 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
	24										0.0 / 24.4 Asphalt concrete 11.6" **ASPH**			
											1.0 / 23.4 Concrete 9.5" **CONC**			
2	22										1.8 / 22.6 Aggregate subbase 5" **FL**			
		4 14 17 18	100		3						2.2 / 22.2 **FL** Tan to light tan, fine poorly graded sand FILL, dense, dry Switched to mud rotary drilling below a depth of 3.0 feet Moisture increases to moist between a depth of 5.0 and 9.0 feet			
4	20				5									
		7 17 22 24	80											
6	18				7									
		8 20 26 25	95											
8	16				9						Moisture increases to wet below a depth of 9.0 feet			
		7 22 21 23	100											
10	14				11						FILL			
											Boring terminated at a depth of 11.0 feet			

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: I64 WBL
4-inch casing set to a depth of 4.0 feet. Backfilled with non-shrink grout upon completion.
Caved to a depth of 8.5 feet at 0 hours.

SPT_LOG:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

I64WB-P3
PAGE 1 OF 1

STATION: 109+50 OFFSET: 6 ft RT
LATITUDE: 36.832929° N LONGITUDE: 76.195687° W
SURFACE ELEVATION: 15.4 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 9/15/10 - 9/15/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: Sue Young/HDR

GROUND WATER
FIRST ENCOUNTERED AT 3.5 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
		14										0.0 / 15.4 Asphalt concrete 16.5" **ASPH**			
	2		6			2						1.4 / 14.0 Concrete 6.5" **CONC**			
		12	12	95								2.0 / 13.4 Tan, fine poorly graded sand FILL, medium dense, moist **FL**			
			13												
	4		13			4						Switch to mud rotary below a depth of 4.0 feet			
			11												
			12	80											
		10	13									FILL			
	6		13			6									
			2									6.0 / 9.4 Gray, fine silty SAND, medium dense, wet **SM**			
			9	80											
		8	13												
			14												
	8		1			8						8.0 / 7.4 Brown, fine sandy lean CLAY, firm, moist **CL**			
1.5			3	85											
		6	4												
			5												
	10					10						Boring terminated at a depth of 10.0 feet			

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: I64 WBL
Borehole offset 6.0 feet west and 1.0 feet south of staked location to get into pavement. 4-inch casing set to a depth of 4.0 ft.
Backfilled with non-shrink grout upon completion. Caved to 3.5 ft at 0 hours.
Bulk sample collected between a depth of 2.0 and 10.0 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

I64WB-P4

STATION: 117+50 OFFSET: 17 ft RT
LATITUDE: 36.835119° N LONGITUDE: 76.195873° W
SURFACE ELEVATION: 12.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/15/10 - 9/15/10
Drilling Method(s): Asphalt Coring
SPT Method:
Other Test(s):
Driller: Will Reddick/GET
Logger: Sue Young/HDR

GROUND WATER
NOT ENCOUNTERED DURING DRILLING
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA											LAB DATA		
		SOIL				ROCK							
								DIP °					
DEPTH (ft)	ELEVATION (ft)	STANDARD PENETRATION TEST HAMMER BLOWS	SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	CORE RECOVERY (%)	ROCK QUALITY DESIGNATION	STRATA	JOINTS	STRATA LEGEND	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)
											LL	PI	

FIELD DESCRIPTION OF STRATA

0.0 / 12.0
Asphalt concrete 9.5" **ASPH** (0.8)
Coring terminated at a depth of 0.8 feet

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: I64 WBL
Due to time constraints with lane closures, only the pavement was cored. No soil exploration was completed.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

I64WB-P5

STATION: 125+50 OFFSET: 10 ft RT
LATITUDE: 36.837309° N LONGITUDE: 76.196122° W
SURFACE ELEVATION: 12.3 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/15/10 - 9/15/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: Sue Young/HDR

GROUND WATER
FIRST ENCOUNTERED AT 3.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
		12										0.0 / 12.3 Asphalt concrete 18" **ASPH**			
	2	10	4 9 9 8	90		2						1.5 / 10.8 **FL** Light brown to gray, fine poorly graded SAND FILL, medium dense, moist Switch to mud rotary drilling below a depth of 4.0 feet Contains rust color staining between a depth of 4.0 to 5.0 feet			
	4	8	4 5 5 6	70		4									
3	6	6	1 2 3 4	60		6						5.0 / 7.3 **CL** Brown gray, lean CLAY, firm, dry			
1.5	8	4	1 4 10 11	80		8									
1.23	10					10						9.0 / 3.3 Tan, fine poorly graded SAND, moist **SP**			
												Boring terminated at a depth of 10.0 feet			

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: I64 WBL. Borehole offset approximately 2.0 feet west to get into travel lane.
Backfilled with non-shrink grout upon completion. Caved to a depth of 3.0 feet at 0 hours.
Bulk sample collected between a depth of 2.0 and 10.0 feet.

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: PAVEMENT

I64WB-P6
PAGE 1 OF 1

STATION: 133+50 OFFSET: 10 ft RT
LATITUDE: 36.839499° N LONGITUDE: 76.196328° W
SURFACE ELEVATION: 25.0 ft COORD. DATUM: NAD 83

Date(s) Drilled: 10/5/10 - 10/5/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Will Reddick/GET
Logger: John Budner/HDR

GROUND WATER
FIRST ENCOUNTERED AT 2.9 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)
		24												
	2		3 6 4 4	100		2								
		22												
	4		4 4 3 4	85		4								
		20												
	6		1 2 4 5	55		6								
		18												
	8		3 3 5 7	100		8								
0.75		16												
	10					10								

FIELD DESCRIPTION OF STRATA

0.0 / 25.0
Asphalt concrete 14" **ASPH**

1.2 / 23.8
FL
Light brown to brown, fine poorly graded SAND FILL, medium dense, moist

Light brown to brown, fine poorly graded SAND FILL, loose, moist
Switched to mud rotary drilling below a depth of 4.0 feet
Iron staining observed throughout soil

Orange, fine poorly graded SAND FILL, wet

8.2 / 16.8
Orange brown mottled, sandy fat CLAY FILL, firm, wet **FL**

Boring terminated at a depth of 10.0 feet

REMARKS: Rig Type: Truck-mounted CME 45C. REFERENCE BASELINE: I64 WBL
4-inch casing set to a depth of 4.0 feet.
Backfilled with cuttings and plastic hole plug and grouted the top 4.0 feet with non-shrink grout.

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SPT_LOGA:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: STORMWATER POND 4

SWM4-1
PAGE 1 OF 1

STATION: 128+25 OFFSET: 130 ft RT
LATITUDE: 36.838089° N LONGITUDE: 76.195790° W
SURFACE ELEVATION: 4.3 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/16/10 - 9/16/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Sue Young/HDR

GROUND WATER
NOT ENCOUNTERED DURING DRILLING
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
		4	2 3 4 3	100								0.0 / 4.3 Topsoil 5" **TOPS**				
2	2	2	3 3 3 4	100		2 3 4						0.4 / 3.9 Brown, lean CLAY, micaceous, firm, dry **CL** Mottled gray, brown and rust, lean CLAY, firm, moist				
1.5	4	0	2 3 5 5	95		6						3.8 / 0.5 Brown, clayey SAND, wet **SC** 4.0 / 0.3 Gray brown, fine poorly graded SAND with silt, loose, wet **SP-SM** Contains occasional clay layers no more than 0.1 feet thick between a depth of 6.0 and 10.0 feet	40	17	29.1 17.6 17.0	86.6 3.6
	6	-2	2 3 5 5	95		8						Switched to mud rotary drilling below a depth of 8.0 feet		NP	5.0 20.8	12.4
	8	-4	2 3 3 4	80		10									18.6	
	10	-6	2 3 4 3	75		12						Sand becomes slightly coarser at a depth of 11.8 feet				
	12	-8	5 4 3 4	50		13 15						Contains trace of rust color staining at a depth of 13.0 feet 14.8 / -10.5 Brown, fine clayey SAND, wet **SC**			21.8	
	14	-10														
	16	-12														
	18	-14	3 2 6 6	80		18 20						Brown, fine clayey SAND, loose, wet Boring terminated at a depth of 20.0 feet				
	20															

REMARKS: Rig Type: Rubber tire CME ATV. REFERENCE BASELINE: I64 WBL
Backfilled with cuttings from offset boring.
Bulk sample collected between a depth of 3.0 and 15.0 feet. Piezometer installed in offset location.

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SPT_LOGAB:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: STORMWATER POND 4

SWM4-2
PAGE 1 OF 1

STATION: 129+00 OFFSET: 105 ft RT
LATITUDE: 36.838289° N LONGITUDE: 76.195896° W
SURFACE ELEVATION: 6.8 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/16/10 - 9/16/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Dave Wikoff/GET
Logger: Sue Young/HDR

GROUND WATER
FIRST ENCOUNTERED AT 4.5 ft DEPTH
STABILIZED AT 4.4 ft AFTER 24 HOURS

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK QUALITY DESIGNATION	DIP °: STRATA	DIP °: JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
												0.0 / 6.8 Topsoil with roots 5" **TOPS**				
4.5		6	4 4 5 5	100								0.4 / 6.4 Brown, fine sandy lean CLAY, stiff, dry **CL**				
	2		4 4 4 5			2						2.0 / 4.8 Gray and brown mottled, lean CLAY, micaceous, firm, moist **CL**				
2.5		4		80												
	4		5 4 5 6			4						Gray and brown mottled, lean CLAY, micaceous, stiff, moist				
1.25		2		100									43	20	29.6	94.3
	6		4 4 4 5			6						Gray and brown mottled, lean CLAY, micaceous, firm, moist				
1.25		0		100											24.1	
	8		2 3 4 5			8						Switched to mud rotary drilling below a depth of 8.0 feet				
2		-2		75											24.3	
	10		2 3 5 6			10						9.0 / -2.2 **SP** Brown, fine poorly graded SAND, loose, wet				
		-4		65											19.9	4.6
	12					12						Contains trace of rust colored staining between a depth of 10.0 and 12.0 feet				
		-6	2 4 5 5			13						Sand becomes slightly coarser at a depth of 13.0 feet				
	14			70												
		-8				15										
	16															
		-10										16.5 / -9.7 **SC**				
	18		3 3 3 4	70		18						Brown, fine clayey SAND, loose, wet				
		-12														
	20					20						Boring terminated at a depth of 20.0 feet				

REMARKS: Rig Type: Rubber tire CME ATV. REFERENCE BASELINE: I64 WBL
Caved to a depth of 14.8 feet at 0 hours.

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SWM4-2

SPT_LOGAB:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: STORMWATER POND 5

SWM5-1
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STATION: 100+50 OFFSET: 110 ft RT
LATITUDE: 36.830489° N LONGITUDE: 76.195080° W
SURFACE ELEVATION: 7.1 ft COORD. DATUM: NAD 83

Date(s) Drilled: 9/16/10 - 9/16/10
Drilling Method(s): HSA/SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Derek Simms/GET
Logger: Sara Phillips/GET

GROUND WATER
FIRST ENCOUNTERED AT 5.5 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA / **LAB DATA**

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK QUALITY DESIGNATION	DIP °: STRATA	DIP °: JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
		6	3 4 5 5	100								0.0 / 7.1 Topsoil 5" **TOPS**				
	2					2						0.4 / 6.7 Brown, fine silty sand FILL, contains trace organics (grass roots) and brick fragments, moist **FL**				
1		4	3 2 2 4	71								1.0 / 6.1 Brown, fine silty SAND, contains trace organics (grass roots), moist **SM**	31	14	14.6	55.0
	4					4						2.0 / 5.1 Brown orange, fine sandy lean CLAY, soft, moist **CL**				
1		2	2 2 1 1	88											18.3	
	6					6						5.0 / 2.1 Orange brown, fine silty SAND, very loose to loose, wet **SM**				
		0	1 1 2 1	75										NP	20.0	26.1
	8					8										
		-2	1 2 4 3	100											13.3	
	10					10						10.0 / -2.9 Orange brown, fine poorly graded SAND with silt and fine gravel, loose, wet **SP-SM** Switched to mud rotary drilling below a depth of 10.0 feet				
		-4	2 2 3 4	63											19.7	
	12					12										
		-6	4 5 6 7	50		13						Orange brown, fine poorly graded SAND with silt and fine gravel, medium dense, wet				
	14														15.6	
		-8				15										
	16															
		-10										16.5 / -9.4 **SP**				
	18		7 10 15 14	58		18						Orange brown, fine poorly graded SAND, medium dense, wet				
		-12														
	20					20						Boring terminated at a depth of 20.0 feet				

REMARKS: Rig Type: Track mounted CME 45. REFERENCE BASELINE: I64 WBL
Backfilled upon completion for safety considerations.

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SPT_LOGAB:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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PROJECT #: 0264-122-108
LOCATION: Norfolk: PSA I64, D7, and Bridge
STRUCTURE: STORMWATER POND 5

SWM5-2
PAGE 1 OF 1

STATION: 102+50 OFFSET: 130 ft RT
LATITUDE: 36.831041° N LONGITUDE: 76.195068° W
SURFACE ELEVATION: 8.7 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 9/16/10 - 9/16/10
Drilling Method(s): Mud Rotary with SPTs
SPT Method: Automatic Hammer
Other Test(s):
Driller: Derek Simms/GET
Logger: Sara Phillips/GET

GROUND WATER
FIRST ENCOUNTERED AT 6.0 ft DEPTH
NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

PKT. PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SOIL: STANDARD PENETRATION TEST HAMMER BLOWS	SOIL: SOIL RECOVERY (%)	SAMPLE LEGEND	SAMPLE INTERVAL	ROCK: CORE RECOVERY (%)	ROCK: ROCK QUALITY DESIGNATION	ROCK: DIP ° STRATA	ROCK: DIP ° JOINTS	STRATA LEGEND	FIELD DESCRIPTION OF STRATA	LIQUID LIMIT (LL)	PLASTICITY INDEX (PI)	MOISTURE CONTENT (%)	FINES CONTENT -#200 (%)
		8	7 15 10 5	100								0.0 / 8.7 Topsoil 2" **TOPS**				
	2	6	5 4 5 5	80		2						0.2 / 8.5 Brown and orange brown, fine silty sand FILL, contains trace organics (grass roots), medium dense, moist **FL**				
1	4	4	3 5 5 5	100		4						2.0 / 6.7 Orange brown, fine silty SAND, loose, moist **SM**				
0.5	6 ▽	2	2 5 4 3	100		6						3.8 / 4.9 Tan, fine clayey SAND, medium dense, moist **SC**	27 28	12	2.0 14.6	66.7 36.0
1	8	0	2 2 4 5	63		8						6.0 / 2.7 Orange brown, fine sandy lean CLAY, wet **CL**			14.8	
	10	-2	3 3 5 6	42		10						7.3 / 1.4 Orange brown, fine poorly graded SAND, loose, wet **SP**			18.8 18.3	2.8
	12	-4	5 8 17 15	65		12 13 15						12.5 / -3.8 **SM** Orange brown, fine silty SAND, medium dense, wet				
	14	-6														
	16	-8														
	18	-10	2 3 3 2	50		18						Gray, fine silty SAND, loose, wet				
	20					20						Boring terminated at a depth of 20.0 feet				

REMARKS: Rig Type: Track mounted CME 45. REFERENCE BASELINE: I64 WBL
Bulk sample collected between a depth of 0.0 and 10.0 feet.
Backfilled upon completion for safety considerations.

PAGE 1 OF 1
SWM5-2

SPT_LOGAB:BORING LOGS I64 D7 AND BRIDGE.GPJ:8.30.003:061810:1/11/13

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CONE PENETROMETER TEST LOG

Virginia Department of Transportation

PROJECT #: 0264-122-108

LOCATION: Norfolk: PSA I64, D7, and Bridge

I64SB-2

PAGE 1 OF 1

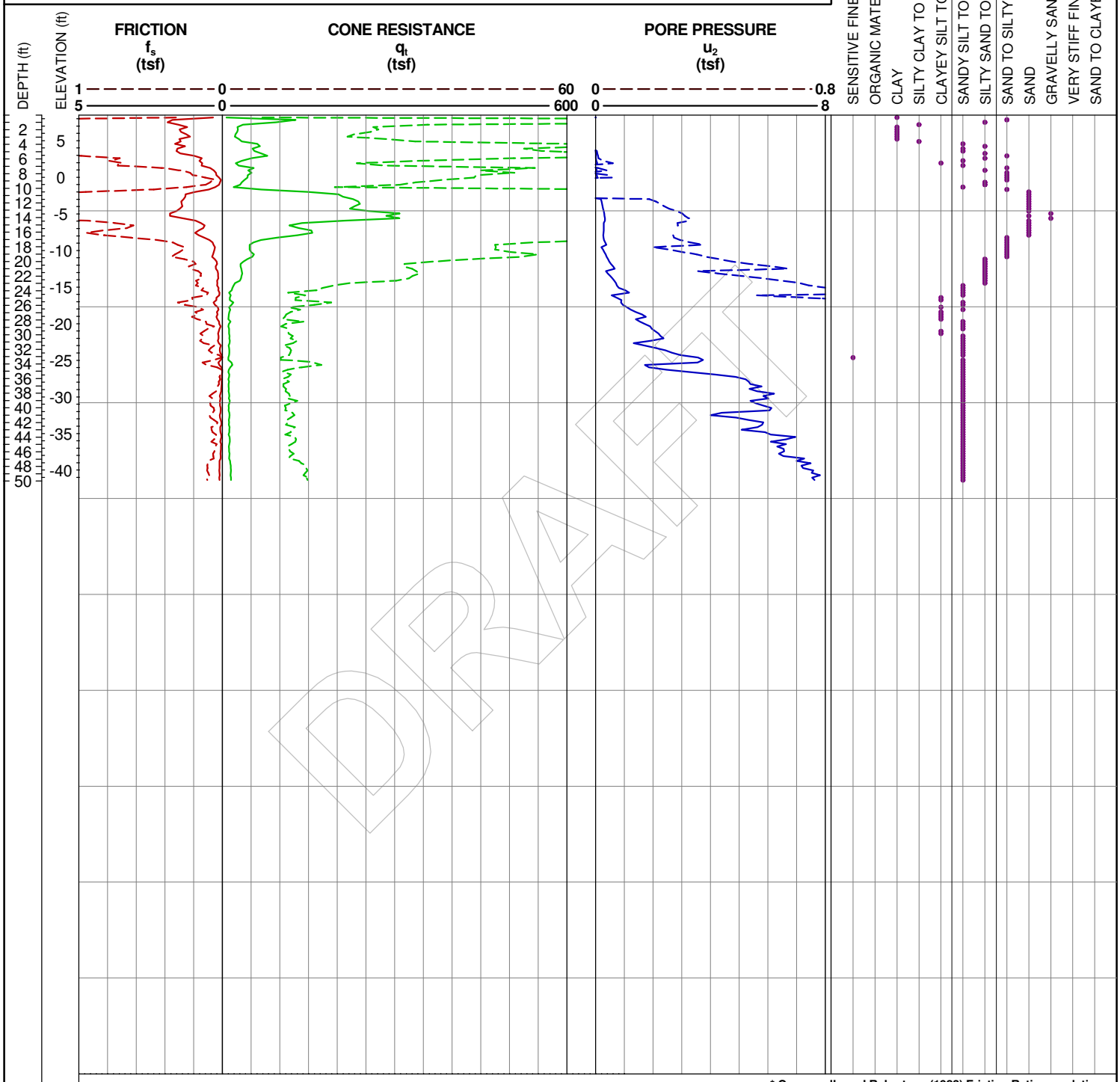
STATION: 103+50
LATITUDE: 36.831304° N
SURFACE ELEVATION: 8.5
BENCHMARK LOCATION:

OFFSET: 85 ft RT
LONGITUDE: 76.195249° W
COORD. DATUM: NAD 83

DRILLER: Ron Stewart/MAD
CONE TYPE: Hogentogler Elec. Sub. Cone
CONE SIZE: 10 sq. cm
CONE ID No.: DSG0867

DATE(S) DRILLED:
10/28/2010 - 10/28/2010

LOGGER: HDR



* Campanella and Robertson (1983) Friction Ratio correlation

REMARKS: REFERENCE BASELINE: I64 WBL

PAGE 1 OF 1

I64SB-2

CPT_LOG:I64 D7 AND BRIDGE CPT LOGS.GPJ:8.2.004:061810:12/16/10

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CONE PENETROMETER TEST LOG

Virginia Department of Transportation

PROJECT #: 0264-122-108

LOCATION: Norfolk: PSA I64, D7, and Bridge

I64SB-4

PAGE 1 OF 1

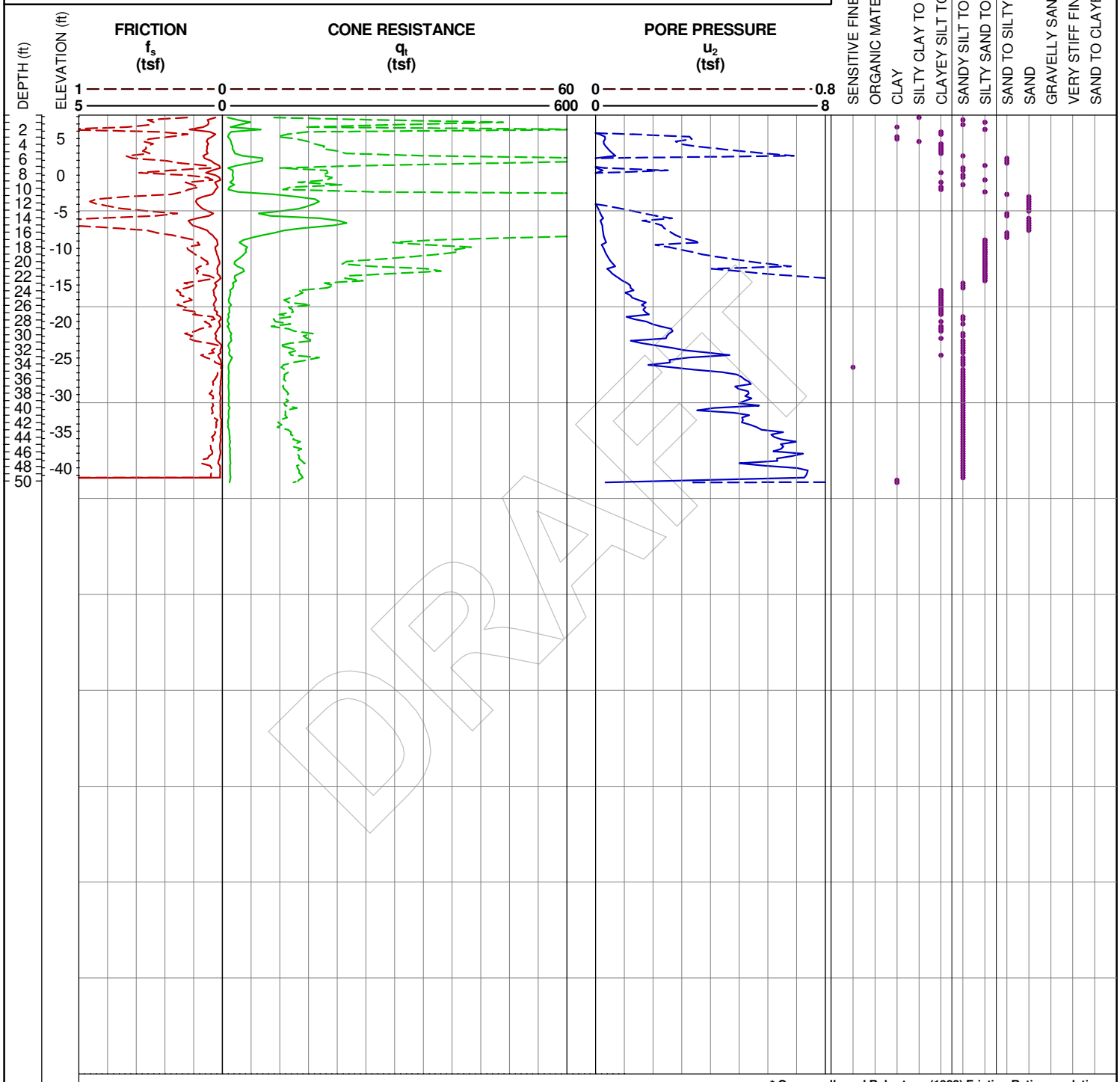
STATION: 107+50
LATITUDE: 36.832396° N
SURFACE ELEVATION: 8.2
BENCHMARK LOCATION:

OFFSET: 70 ft RT
LONGITUDE: 76.195413° W
COORD. DATUM: NAD 83

DRILLER: Ron Stewart/MAD
CONE TYPE: Hogentogler Elec. Sub. Cone
CONE SIZE: 10 sq. cm
CONE ID No.: DSG0867

DATE(S) DRILLED:
10/28/2010 - 10/28/2010

LOGGER: HDR



* Campanella and Robertson (1983) Friction Ratio correlation

REMARKS: REFERENCE BASELINE: I64 WBL

PAGE 1 OF 1

I64SB-4

CPT_LOG:I64 D7 AND BRIDGE CPT LOGS.GPJ:8.2.004:061810:12/16/10

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CONE PENETROMETER TEST LOG

Virginia Department of Transportation

PROJECT #: 0264-122-108

LOCATION: Norfolk: PSA I64, D7, and Bridge

I64SB-6

PAGE 1 OF 1

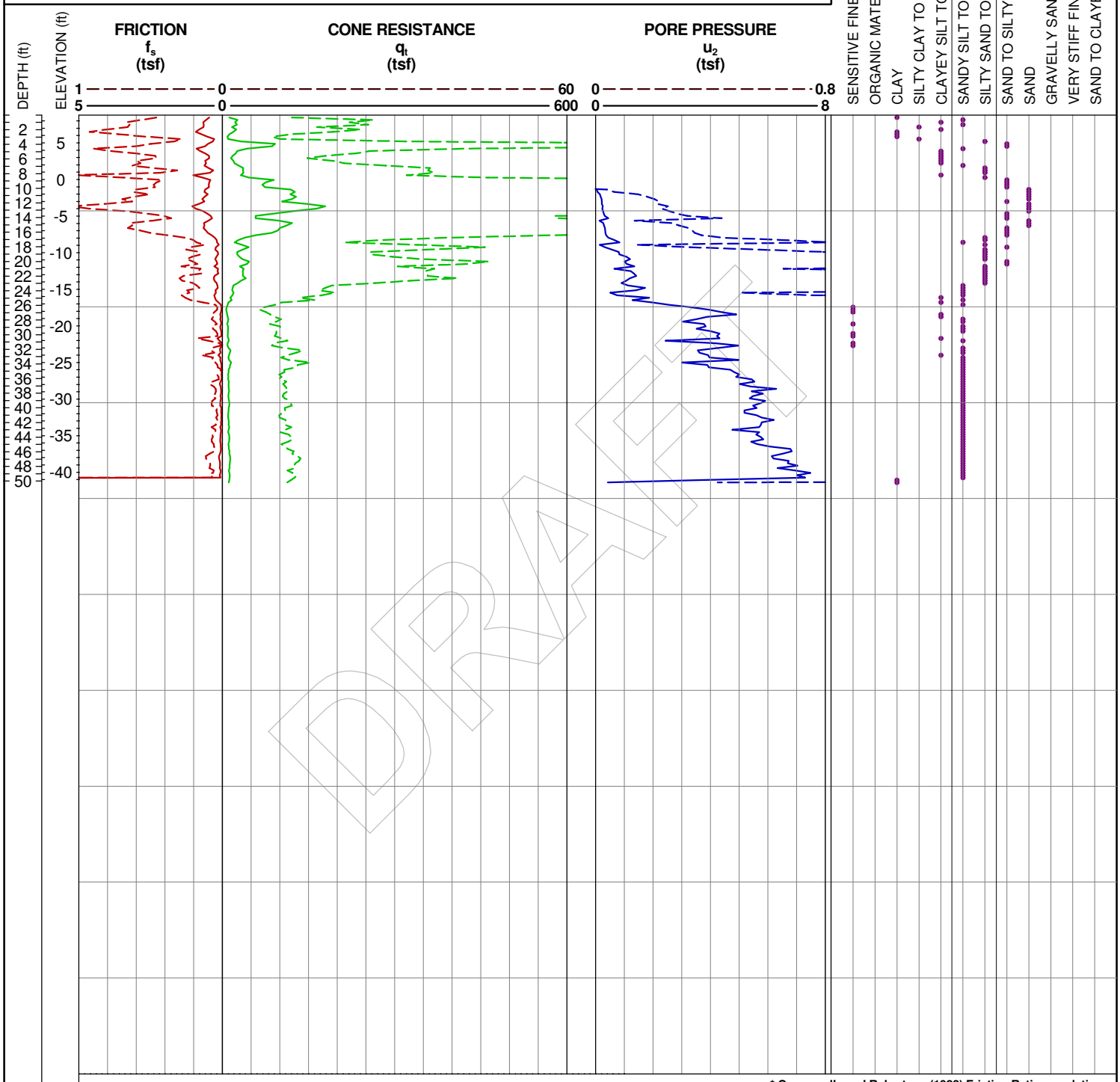
STATION: 111+50
LATITUDE: 36.833490° N
SURFACE ELEVATION: 8.8
BENCHMARK LOCATION:

OFFSET: 70 ft RT
LONGITUDE: 76.195525° W
COORD. DATUM: NAD 83

DRILLER: Ron Stewart/MAD
CONE TYPE: Hogentogler Elec. Sub. Cone
CONE SIZE: 10 sq. cm
CONE ID No.: DSG0867

DATE(S) DRILLED:
10/28/2010 - 10/28/2010

LOGGER: HDR



* Campanella and Robertson (1983) Friction Ratio correlation

REMARKS: REFERENCE BASELINE: I64 WBL

PAGE 1 OF 1

I64SB-6

CPT_LOG:I64 D7 AND BRIDGE CPT LOGS.GPJ:8.2.004:061810:12/16/10

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CONE PENETROMETER TEST LOG

Virginia Department of Transportation

PROJECT #: 0264-122-108

LOCATION: Norfolk: PSA I64, D7, and Bridge

D7-3W

PAGE 1 OF 1

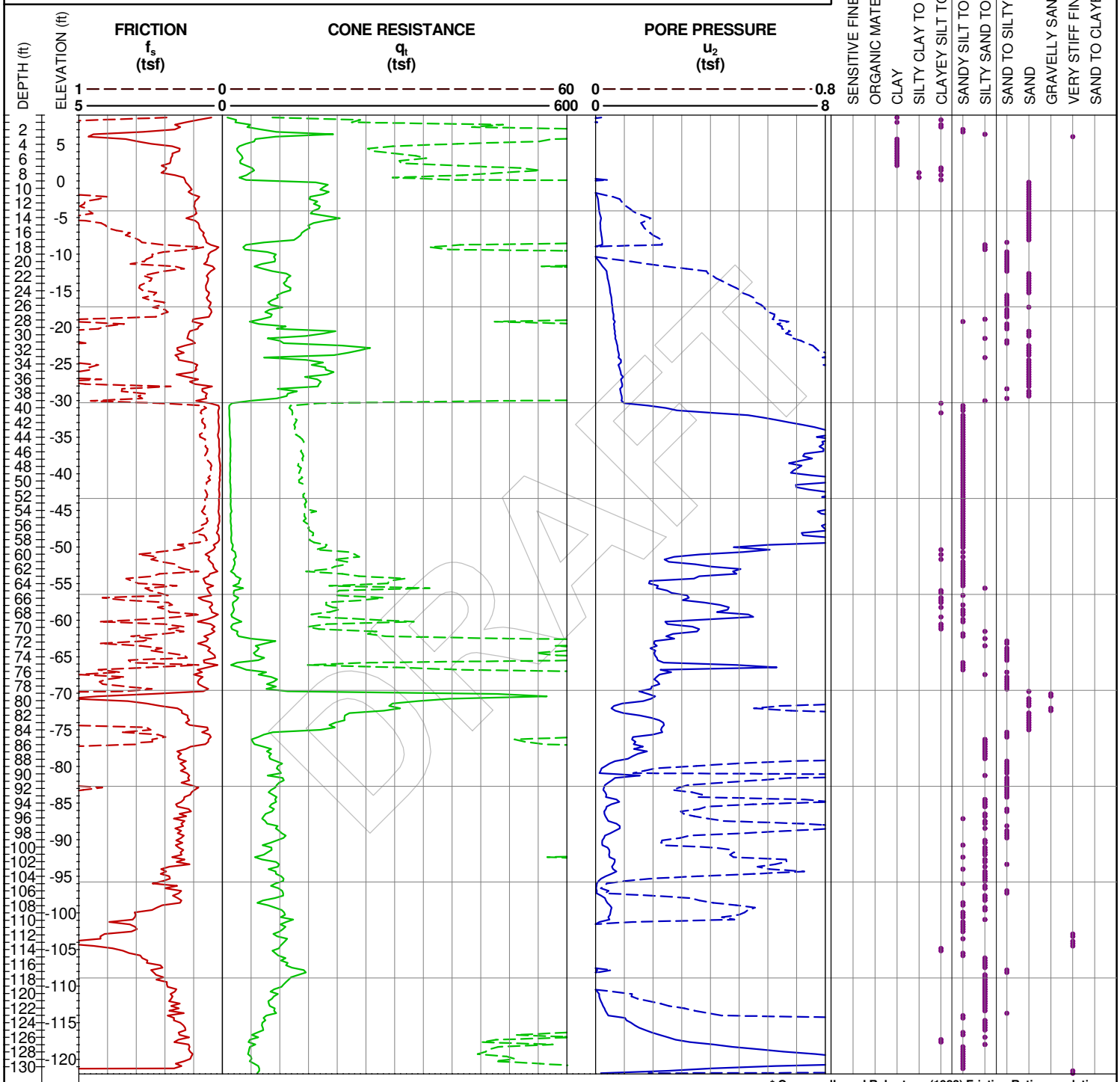
STATION: 15+14
LATITUDE: 36.838766° N
SURFACE ELEVATION: 9.0
BENCHMARK LOCATION:

OFFSET: 55 ft RT
LONGITUDE: 76.196022° W
COORD. DATUM: NAD 83

DRILLER: Ron Stewart/MAD
CONE TYPE: Hogentogler Elec. Sub. Cone
CONE SIZE: 10 sq. cm
CONE ID No.: DSG0867

DATE(S) DRILLED:
10/28/2010 - 10/28/2010

LOGGER: HDR



* Campanella and Robertson (1983) Friction Ratio correlation

REMARKS: REFERENCE BASELINE: RAMP D7

PAGE 1 OF 1

D7-3W

CPT_LOG:I64 D7 AND BRIDGE CPT LOGS.GPJ:8.2.004:061810:12/16/10

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CONE PENETROMETER TEST LOG

Virginia Department of Transportation

PROJECT #: 0264-122-108

LOCATION: Norfolk: PSA I64, D7, and Bridge

D7-6W

PAGE 1 OF 1

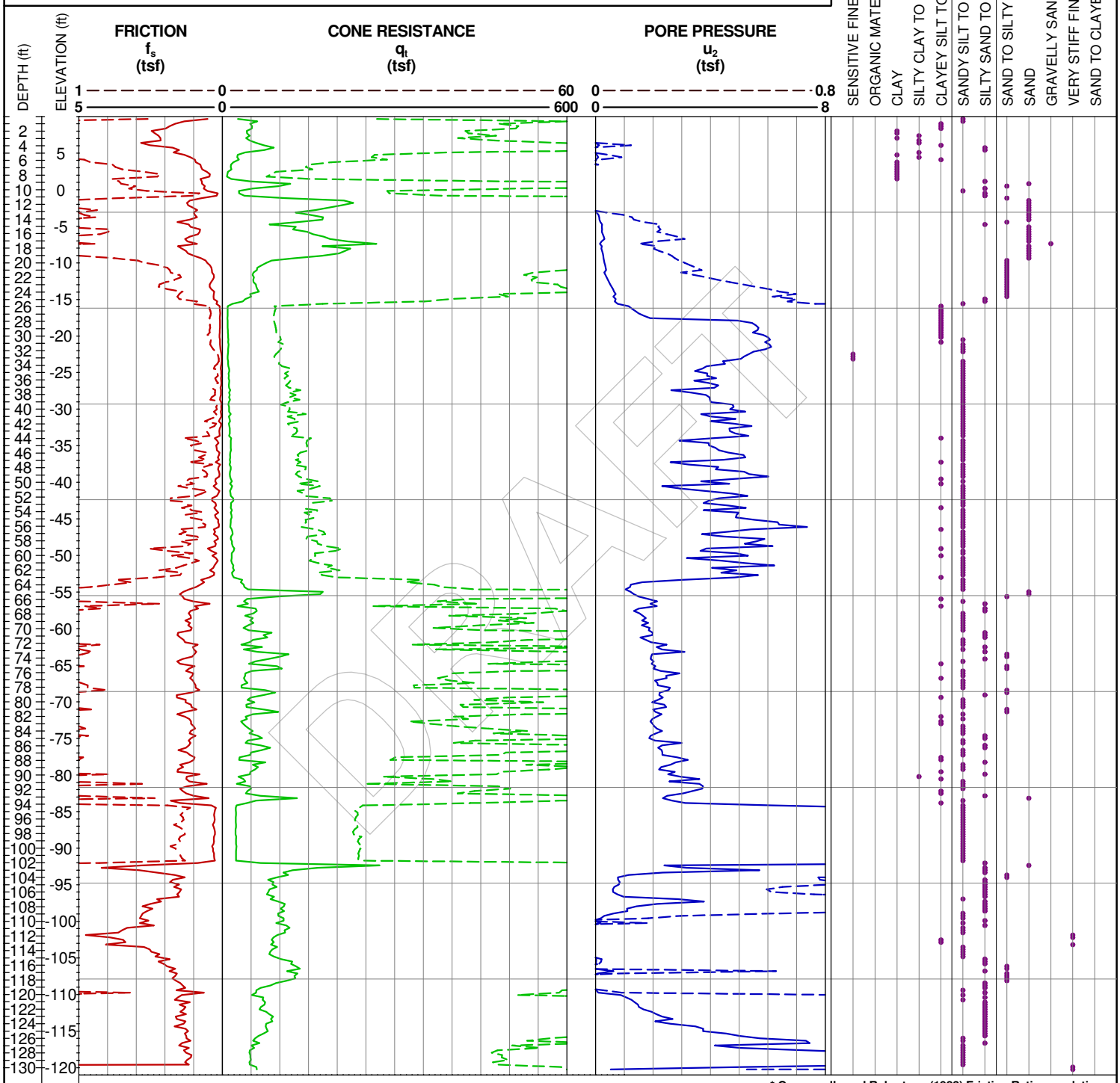
STATION: 17+99
LATITUDE: 36.839545° N
SURFACE ELEVATION: 10.0
BENCHMARK LOCATION:

OFFSET: 44 ft RT
LONGITUDE: 76.196064° W
COORD. DATUM: NAD 83

DRILLER: Ron Stewart/MAD
CONE TYPE: Hogentogler Elec. Sub. Cone
CONE SIZE: 10 sq. cm
CONE ID No.: DSG0867

DATE(S) DRILLED:
10/28/2010 - 10/28/2010

LOGGER: HDR



* Campanella and Robertson (1983) Friction Ratio correlation

REMARKS: REFERENCE BASELINE: RAMP D7

PAGE 1 OF 1

D7-6W

CPT_LOG:I64 D7 AND BRIDGE CPT LOGS.GPJ:8.2.004:061810:12/16/10

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CONE PENETROMETER TEST LOG

PROJECT #: 0264-122-108

LOCATION: Norfolk: PSA I64, D7, and Bridge

D7-11W

PAGE 1 OF 1

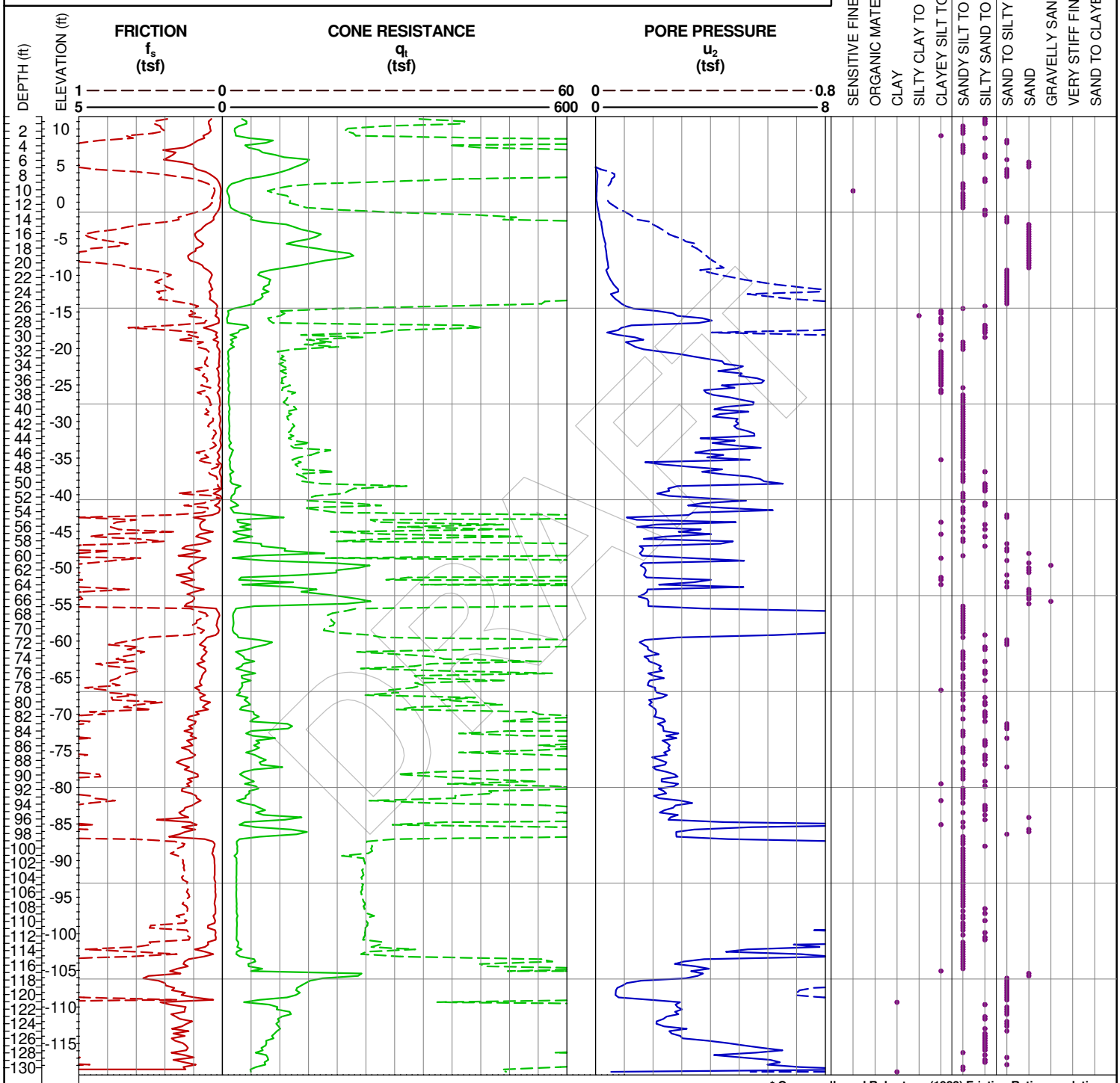
STATION: 21+00
LATITUDE: 36.840371° N
SURFACE ELEVATION: 11.7
BENCHMARK LOCATION:

OFFSET: 50 ft RT
LONGITUDE: 76.196038° W
COORD. DATUM: NAD 83

DRILLER: Ron Stewart/MAD
CONE TYPE: Hogentogler Elec. Sub. Cone
CONE SIZE: 10 sq. cm
CONE ID No.: DSG0867

DATE(S) DRILLED:
10/27/2010 - 10/27/2010

LOGGER: HDR



* Campanella and Robertson (1983) Friction Ratio correlation

REMARKS: REFERENCE BASELINE: RAMP D7

PAGE 1 OF 1

D7-11W

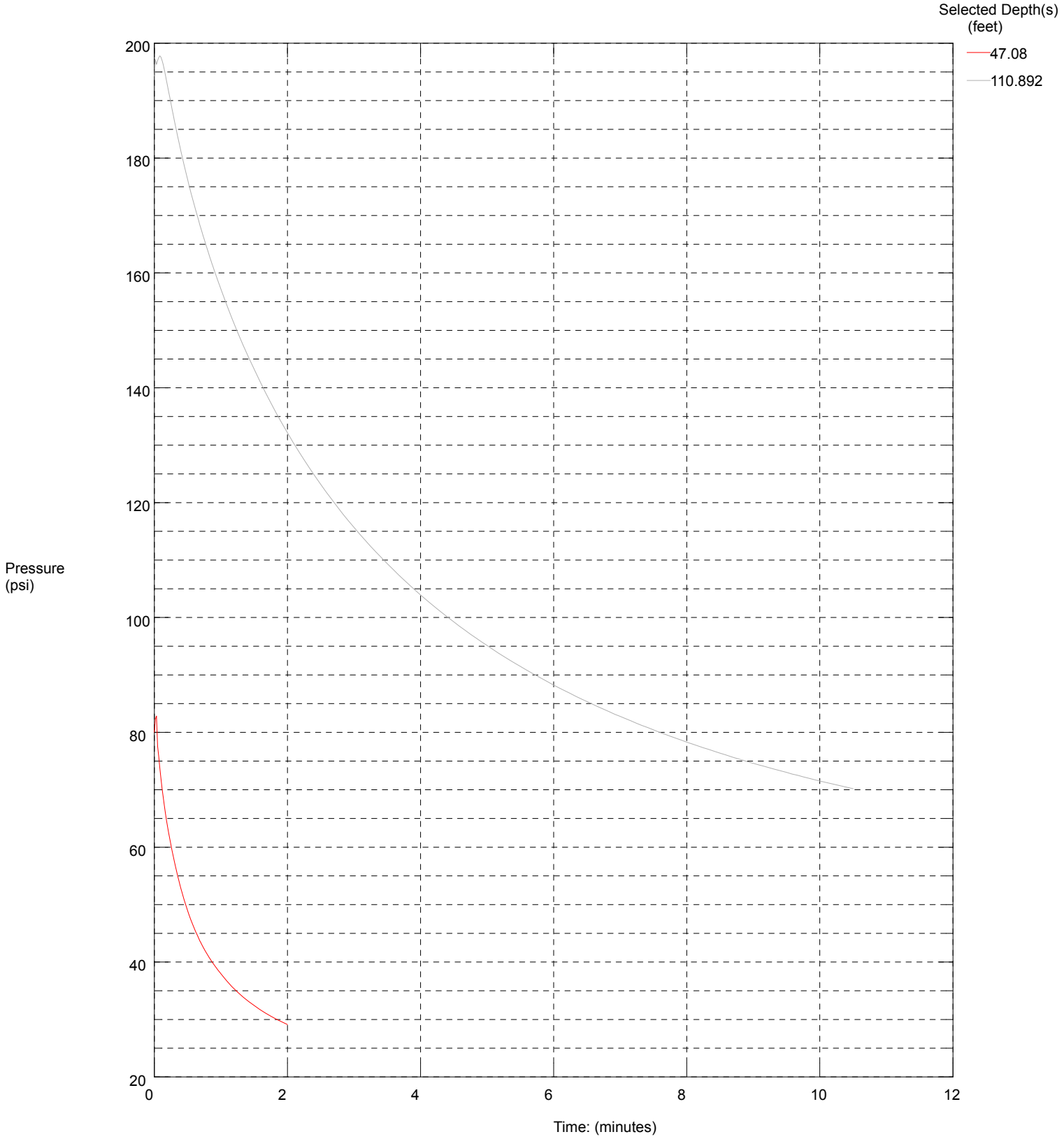
CPT_LOG:I64 D7 AND BRIDGE CPT LOGS.GPJ:8.2.004:061810:12/16/10

Copyright 2010, Commonwealth of Virginia

HDR

Operator Ron Stewart
Sounding: D7-11W
Cone Used: DSG0867

CPT Date/Time: 10/27/2010 3:47:56 PM
Location: Norfolk Va.
Job Number: I-64



Maximum Pressure = 197.779 psi
Hydrostatic Pressure = 48.127 psi

CONE PENETROMETER TEST LOG

Virginia Department of Transportation

PROJECT #: 0264-122-108
LOCATION: Norfolk

D7-14W
PAGE 1 OF 1

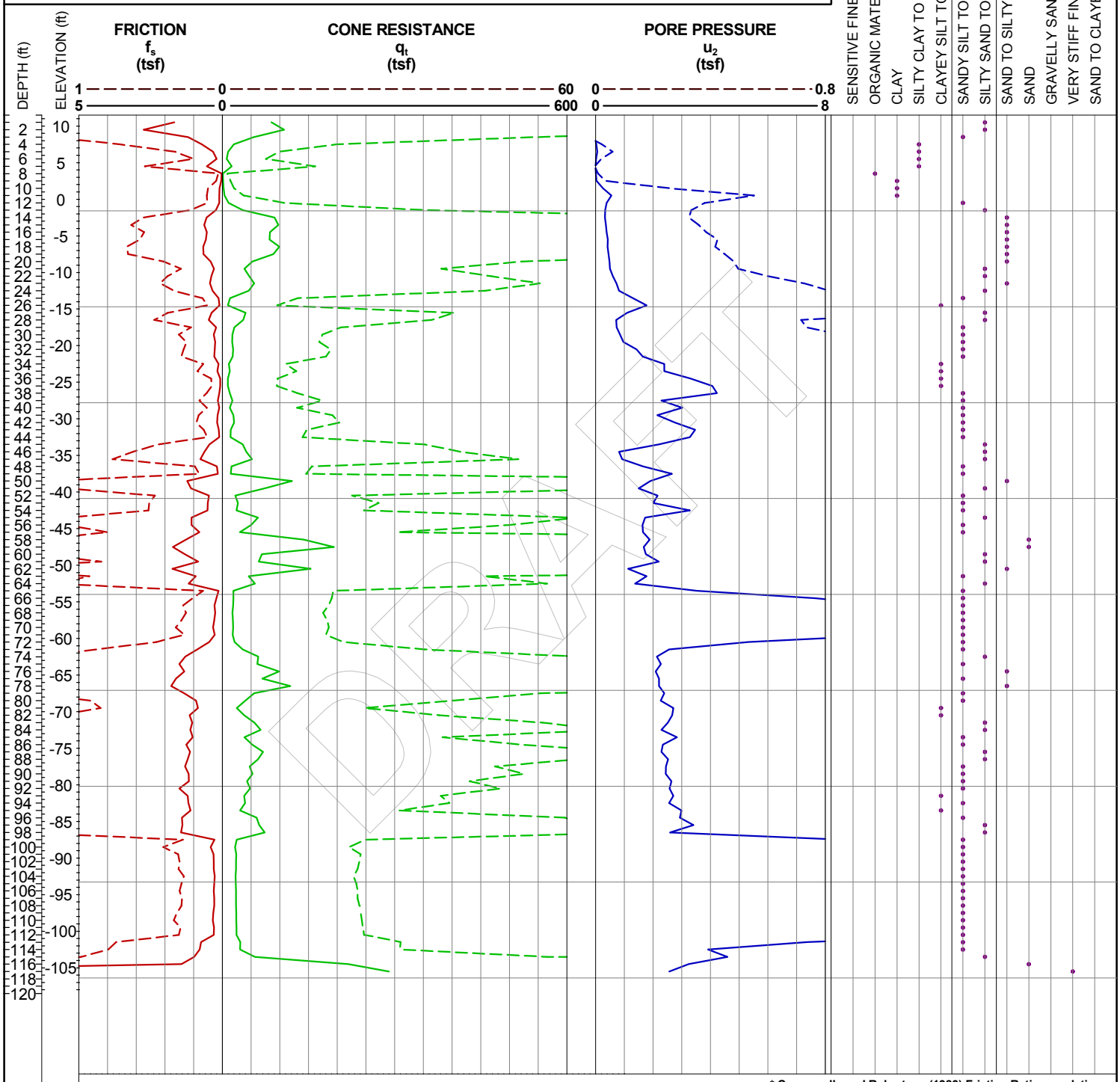
STATION: 22+13
NORTHING:
SURFACE ELEVATION: 11.5
BENCHMARK LOCATION: VA

OFFSET: 74 ft RT
EASTING:
COORD. DATUM:

DRILLER: Ron Stewart/MAD
CONE TYPE: Hogentogler Elec. Sub. Cone
CONE SIZE: 10 sq. cm
CONE ID No.: DSG0867

DATE(S) DRILLED:
6/28/2011 - 6/28/2011

LOGGER: HDR



* Campanella and Robertson (1983) Friction Ratio correlation

REMARKS: REFERENCE BASELINE: RAMP D7

PAGE 1 OF 1
D7-14W

CPT_LOG:I64 D7 AND BRIDGE CPT LOGS.GPJ:8.30.003:061810:12/17/12

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APPENDIX C
LABORATORY TEST DATA

Table C-1: Summary of Laboratory Testing
Test Data and Moisture Content Summary Tables
Classification Test (Grain Size Analysis and Atterberg Limits) Results
Standard Proctor and CBR Test Results
Corrosivity and pH Test Results
Consolidation Test Results
Triaxial Test Results
Shelby Tube Extraction Logs

TEST DATA AND MOISTURE CONTENT SUMMARY TABLES

Sample Location	CUR-1B	CUR-1B	CUR-4B	CUR-4B	D7-10W	D7-8W	D7-8W	D7-9W
S&ME Lab Number	**17236**	**17237**	**17363**	**17364**	**17238**	**17239**	**17240**	**17241**
Sample Interval (ft)	**25.0 - 27.0**	**105.0 - 107.0**	**50.0 - 52.0**	**95.0 - 97.0**	**37.0 - 39.0**	**28.0 - 30.0**	**38.0 - 40.0**	**43.0 - 45.0**
Sample Type	**3 in. Tube**	**3 in. Tube**	**3 in. Tube**	**3 in. Tube**	**3 in. Tube**	**3 in. Tube**	**3 in. Tube**	**3 in. Tube**
Natural Moisture Content (%)	30.5	58.4	22.6	60.1	39.4	40.6	33.2	34.3
Atterberg Limits								
Liquid Limit	NP	77	18	95	48	55	41	39
Plastic Limit	NP	34	17	31	24	27	21	22
Plasticity Index	NP	43	1	64	24	28	20	17
Gradation Analysis								
% Finer by Weight								
Sieve: 2.0 inch								
1.5 inch								
1 inch								
3/4 inch								
1/2 inch								
3/8 inch								
No. 4			100.0	100.0				
No. 10	100.0	100.0	99.9	99.9	100.0	100.0	100.0	100.0
No. 40	99.8	99.5	96.8	98.9	99.6	99.5	99.7	99.7
No. 100	92.9	97.3	39.5	98.1	96.7	97.7	96.3	95.7
No. 200	33.1	93.3	31.0	97.2	79.7	85.7	68.4	51.4
USCS Soil Classification	**SM**	**CH**	**SM**	**CH**	**CL**	**CH**	**CL**	**CL**
AASHTO Soil Classification	**A-2-4 (0)**	**A-7-5 (48)**	**A-2-4 (0)**	**A-7-5 (74)**	**A-7-6 (20)**	**A-7-6 (27)**	**A-7-6 (12)**	**A-6 (6)**

S&ME
8211 Hermitage Road
Richmond, Virginia 23228
Telephone: (804) 266-2199
Fax: (804) 261-5569

LABORATORY SUMMARY TABLE

Project: I-64/I-264 Interchange - PSA: I-64, D7, and Bridge

Location: Virginia Beach, Virginia

Number: 1081-10-2757

Sample Location	**D7-13W**
S&ME Lab Number	**17935**
Sample Interval (ft)	**43.0 - 45.0**
Sample Type	**3 in. Tube**
Natural Moisture Content (%)	32.7

Atterberg Limits

Liquid Limit	36
Plastic Limit	23
Plasticity Index	13

Gradation Analysis

% Finer by Weight

Sieve:	
2.0 inch	
1.5 inch	
1 inch	
3/4 inch	
1/2 inch	
3/8 inch	
No. 4	100.0
No. 10	99.9
No. 40	97.3
No. 100	89.3
No. 200	66.7

USCS Soil Classification	**CL**
AASHTO Soil Classification	**A-6 (7)**

S&ME
8211 Hermitage Road
Richmond, Virginia 23228
Telephone: 804.266.2199
Fax: 804.261.5569

LABORATORY SUMMARY TABLE

Project: I-64/I-264 Interchange PSA I-64, D7, and Bridge

Location: Cities of Norfolk and Virginia Beach, Virginia

Number: 1081-10-2757

Sample Location	D7-5W	D7-8W	D7-9W	D7-10W	D7-10W	D7-10W	CUR-1B	CUR-1B	CUR-1B	CUR-1B
GET Lab Number	**G1**	**G2**	**G3**	**G4**	**G5**	**G6**	**G7**	**G8**	**G9**	**G10**
Sample Depth (ft)	**28.0-30.0**	**33.0-35.0**	**33.0-35.0**	**28.0-30.0**	**43.0-45.0**	**53.0-55.0**	**33.0-35.0**	**43.0-45.0**	**63.0-65.0**	**78.0-80.0**
Sample Type	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**
Natural Moisture Content (%)	50.8	40.9	42.8	27.1	30.8	36.7	32.2	26.4	56.9	30.2
Atterberg Limits										
Liquid Limit	66	70	74	36	41	45	46	33	72	NT
Plastic Limit	29	26	29	21	19	20	23	20	30	NT
Plasticity Index	39	44	45	15	22	25	23	13	42	NT
Gradation Analysis										
% Finer by Weight										
Sieve: 3/4 inch										
3/8 inch										
No. 4	100								100	
No. 10	99.9	100	100	100	100		100		99.9	100
No. 20	99.6	99.6	99.9	99.9	100	100	99.9	100	99.4	99.8
No. 40	99	98.2	99.7	99.7	99.9	99.9	99.9	99.8	98.8	99
No. 60	97.2	96.6	99.4	97.9	99.5	94.3	99.6	98.9	97.9	87.9
No. 80	95.8	96.6	99	94.7	96.8	82.4	98.9	94	96.8	62.8
No. 100	94.8	95.8	98.6	90.1	93.2	80.2	96	85.5	96.1	47.1
No. 200	83	86.4	88.5	44.5	69.5	76	60.5	48.1	93.2	20.5
USCS Soil Cassification	**CH**	**CH**	**CH**	**SC**	**CL**	**CL**	**CL**	**SC**	**CH**	**SM**
AASHTO Soil Classification	**A-7-6(36)**	**A-7-6(42)**	**A-7-6(45)**	**A-6(3)**	**A-7-6(14)**	**A-7-6(18)**	**A-7-6(12)**	**A-6(3)**	**A-7-5(46)**	**A-2-4(0)**

Laboratory Summary Table
GET Solutions Inc.
Virginia Beach, Virginia

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Location Virginia Beach, Virginia
G E T Project No. VB10-238G

Sample Location	CUR-1B	CUR-1B	CUR-1B	I64SB-7	SWM4-1	SWM4-1	SWM4-2	SWM4-2	SWM5-1	SWM5-1
GET Lab Number	**G11**	**G12**	**G13**	**G14**	**G15**	**G16**	**G17**	**G18**	**G19**	**GR20**
Sample Depth (ft)	**88.0-90.0**	**108.0-110.0**	**123.0-125.0**	**18.0-20.0**	**2.0-4.0**	**6.0-8.0**	**4.0-6.0**	**10.0-12.0**	**2.0-4.0**	**6.0-8.0**
Sample Type	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**
Natural Moisture Content (%)	37.7	54.1	37.2	23.9	29.1	17	29.6	19.9	14.6	20
Atterberg Limits										
Liquid Limit	NT	74	30	NV	40	NT	43	NT	31	NV
Plastic Limit	NT	32	24	NP	23	NT	23	NT	17	NP
Plasticity Index	NT	42	6	NP	17	NT	20	NT	14	NP
Gradation Analysis										
% Finer by Weight										
Sieve: 3/4 inch										
3/8 inch					100					
No. 4	100		100	100	98.8	100	100	100		
No. 10	99.9		99.8	99.9	97.9	99.8	99.5	99.9	100	100
No. 20	99.7	100	99.5	99.7	97.5	96.5	99.5	98.4	99.7	99.1
No. 40	99.5	99.8	99.3	98.9	96.8	83.1	99.1	87.9	96.8	91.3
No. 60	97.7	99	98.7	86.7	93.7	32.9	98.2	24.3	74.6	39.3
No. 80	77.6	98.1	96.6	53.1	92.3	6.8	97.5	7.5	59.5	29.1
No. 100	58.4	97.5	91.5	43.2	91.7	4.6	97.2	5.8	57	27.8
No. 200	41.3	92.5	30.2	11.2	86.6	3.6	94.3	4.6	55	26.1
USCS Soil Cassification	**SM**	**CH**	**SM**	**SP-SM**	**CL**	**SP**	**CL**	**SP**	**CL**	**SM**
AASHTO Soil Classification	**A-4(0)**	**A-7-5(46)**	**A-2-4(0)**	**A-2-4(0)**	**A-6(15)**	**A-3**	**A-7-6(21)**	**A-3**	**A-6(5)**	**A-2-4(0)**

Laboratory Summary Table
GET Solutions Inc.
Virginia Beach, Virginia

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Location Virginia Beach, Virginia
G E T Project No. VB10-238G

Sample Location	SWM5-2	SWM5-2	CUR-4B	CUR-4B	CUR-4B	CUR-4B	CUR-4B	CUR-4B	CUR-4B	CUR-4B
GET Lab Number	**G21**	**G22**	**G23**	**G24**	**G25**	**G26**	**G27**	**G28**	**G29**	**G30**
Sample Depth (ft)	**4.0-6.0**	**8.0-12.0**	**8.0-10.0**	**23.0-25.0**	**38.0-40.0**	**53.0-55.0**	**63.0-65.0**	**68.0-70.0**	**78.0-80.0**	**98.0-100.0**
Sample Type	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**
Natural Moisture Content (%)	14.6	18.8	20.4	6.5	18.5	36	23.5	33.9	30.6	55.2
Atterberg Limits										
Liquid Limit	28	NT	NT	NT	NT	NT	NT	48	NT	70
Plastic Limit	16	NT	NT	NT	NT	NT	NT	21	NT	33
Plasticity Index	12	NT	NT	NT	NT	NT	NT	27	NT	37
Gradation Analysis										
% Finer by Weight										
Sieve: 3/4 inch										
3/8 inch		100	100	100						
No. 4	100	96.4	99.2	92.6	100	100				
No. 10	99.8	91.5	98.1	83.9	99.6	96.6	100	100		100
No. 20	97.2	84.5	96.3	73.9	98.9	93.6	99.9	99.8	100	99.9
No. 40	86.5	40.9	92.9	61.8	95.3	89.2	99.7	99.4	99.9	99.7
No. 60	50.3	12.3	80.3	33	68.7	71.9	97.9	98.3	99.2	99.1
No. 80	39.3	5.1	63.2	15.6	34.2	49.8	88	97.1	97.8	98.3
No. 100	37.9	3.6	54.5	11.4	22.5	43.4	77.9	96	94.2	97
No. 200	36	2.8	29.4	7.3	7.7	37	42.6	68.5	46.9	88.8
USCS Soil Cassification	**SC**	**SP**	**SM**	**SP-SM**	**SP-SM**	**SM**	**SM**	**CL**	**SM**	**CH**
AASHTO Soil Classification	**A-6(1)**	**A-1-b**	**A-2-4(0)**	**A-3**	**A-3**	**A-4(0)**	**A-4(0)**	**A-7-6(17)**	**A-4(0)**	**A-7-5(39)**

Laboratory Summary Table
GET Solutions Inc.
Virginia Beach, Virginia

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Location Virginia Beach, Virginia
G E T Project No. VB10-238G

Sample Location	**CUR-4B**	**CUR-4B**	**CUR-4B**	**CUR-4B**	**CUR-4B**
GET Lab Number	**G31**	**G32**	**G33**	**G34**	**G35**
Sample Depth (ft)	**108.0-110.0**	**118.0-120.0**	**128.0-130.0**	**143.0-145.0**	**153.0-155.0**
Sample Type	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**	**STB Jar**
Natural Moisture Content (%)	25.8	23.1	61.6	23.6	36.1
Atterberg Limits					
Liquid Limit	NT	NT	93	NT	NT
Plastic Limit	NT	NT	33	NT	NT
Plasticity Index	NT	NT	60	NT	NT
Gradation Analysis					
% Finer by Weight					
Sieve: 3/4 inch					
3/8 inch					
No. 4		100		100	100
No. 10	100	99.9		99.1	99.8
No. 20	98.5	93.8	100	94.2	99.6
No. 40	84.3	67	99.9	79.5	99.3
No. 60	61.3	45.1	99.8	69.1	98.8
No. 80	49.1	29.1	99.4	55.3	96.7
No. 100	40.1	21.2	99	40.5	91.7
No. 200	14.8	13.2	97.5	10.9	31.9
USCS Soil Cassification	**SM**	**SM**	**CH**	**SP-SM**	**SM**
AASHTO Soil Classification	**A-2-4(0)**	**A-2-4(0)**	**A-7-5(71)**	**A-2-4(0)**	**A-2-4(0)**

Laboratory Summary Table
GET Solutions Inc.
Virginia Beach, Virginia

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Location Virginia Beach, Virginia
G E T Project No. VB10-238G

Natural Moisture Content Determination Sheet
VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
G E T Project No. VB10-238G
Prepared for: HDR, Inc.

Date of Test: November, 2010
Test Performed by: P. Bierman
Test Results Checked by: J. Robinson, E.I.T.

Boring ID	Sample ID	Depth (ft.)	Tare Wt. (g)	Tare + Wet (g)	Tare + Dry (g)	Water (g)	Dry Soil (g)	% Moisture
D7-5W	S-10	28-30	132.18	335.09	266.73	68.36	134.55	50.8
D7-5W	S-11	33-35	40.90	103.35	82.62	20.73	41.72	49.7
D7-8W	S-10	33-35	136.70	364.08	298.05	66.03	161.35	40.9
D7-8W	S-11	40-42	40.78	133.14	107.07	26.07	66.29	39.3
D7-9W	S-10	28-30	41.36	114.93	99.17	15.76	57.81	27.3
D7-9W	S-11	33-35	142.37	326.82	271.50	55.32	129.13	42.8
D7-9W	S-12	38-40	40.76	134.12	110.34	23.78	69.58	34.2
D7-9W	S-13	45-45	41.33	117.91	97.63	20.28	56.30	36.0
D7-10W	S-10	28-30	129.72	348.95	302.24	46.71	172.52	27.1
D7-10W	S-11	33-35	15.69	52.14	42.69	9.45	27.00	35.0
D7-10W	S-12	39-41	15.79	50.19	42.05	8.14	26.26	31.0
D7-10W	S-13	43-45	153.31	375.49	323.14	52.35	169.83	30.8
D7-10W	S-14	47.5-49.5	15.70	58.54	48.52	10.02	32.82	30.5
D7-10W	S-15	53-55	134.54	335.81	281.80	54.01	147.26	36.7

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Natural Moisture Content Determination Sheet
VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
G E T Project No. VB10-238G
Prepared for: HDR, Inc.

Date of Test: November, 2010
Test Performed by: P. Bierman
Test Results Checked by: J. Robinson, E.I.T.

Boring ID	Sample ID	Depth (ft.)	Tare Wt. (g)	Tare + Wet (g)	Tare + Dry (g)	Water (g)	Dry Soil (g)	% Moisture
CUR-1B	S-10	28-30	49.96	159.96	135.32	24.64	85.36	28.9
CUR-1B	S-11	33-35	148.33	248.01	223.71	24.30	75.38	32.2
CUR-1B	S-12	38-40	122.53	236.98	212.47	24.51	89.94	27.3
CUR-1B	S-13	43-45	128.56	237.65	214.86	22.79	86.30	26.4
CUR-1B	S-14	48-50	129.41	261.03	233.45	27.58	104.04	26.5
CUR-1B	S-17	63-65	135.10	234.58	198.52	36.06	63.42	56.9
CUR-1B	S-18	68-70	131.08	221.76	190.65	31.11	59.57	52.2
CUR-1B	S-19	73-75	15.78	56.28	44.34	11.94	28.56	41.8
CUR-1B	S-20	78-80	142.77	247.61	223.28	24.33	80.51	30.2
CUR-1B	S-21	83-85	No Sample in Jar					
CUR-1B	S-22	88-90	134.46	233.99	206.72	27.27	72.26	37.7

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VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
G E T Project No. VB10-238G
Prepared for: HDR, Inc.

Date of Test: November, 2010
Test Performed by: P. Bierman
Test Results Checked by: J. Robinson, E.I.T.

Boring ID	Sample ID	Depth (ft.)	Tare Wt. (g)	Tare + Wet (g)	Tare + Dry (g)	Water (g)	Dry Soil (g)	% Moisture
CUR-1B	S-23	93-95	15.69	53.42	42.59	10.83	26.90	40.3
CUR-1B	S-24	98-100	15.69	49.20	36.44	12.76	20.75	61.5
CUR-1B	S-25	103-105	15.77	49.39	37.38	12.01	21.61	55.6
CUR-1B	S-26	108-110	117.16	214.49	180.33	34.16	63.17	54.1
CUR-1B	S-28	118-120	15.81	52.01	42.55	9.46	26.74	35.4
CUR-1B	S-29	123-125	130.22	257.27	222.84	34.43	92.62	37.2
CUR-1B	S-30	128-130	15.77	56.43	46.40	10.03	30.63	32.7
CUR-1B	S-31	133-135	15.70	67.88	56.09	11.79	40.39	29.2
I64SB-7	S-8	18-20	124.81	266.69	239.28	27.41	114.47	23.9
I64SB-7	S-9	23-25	118.96	185.39	171.05	14.34	52.09	27.5
I64SB-7	S-10	28-30	123.71	190.81	170.20	20.61	46.49	44.3
I64SB-7	S-11	33-35	121.64	170.80	155.21	15.59	33.57	46.4
I64SB-7	S-12	38-40	119.71	160.21	148.21	12.00	28.50	42.1
I64SB-7	S-13	43-45	122.20	177.05	161.95	15.10	39.75	38.0
I64SB-7	S-14	48-50	121.57	156.41	147.16	9.25	25.59	36.1
I64SB-7	S-15	53-55	121.40	162.14	149.78	12.36	28.38	43.6

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Natural Moisture Content Determination Sheet
VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
G E T Project No. VB10-238G
Prepared for: HDR, Inc.

Date of Test: November, 2010
Test Performed by: P. Bierman
Test Results Checked by: J. Robinson, E.I.T.

Boring ID	Sample ID	Depth (ft.)	Tare Wt. (g)	Tare + Wet (g)	Tare + Dry (g)	Water (g)	Dry Soil (g)	% Moisture
SWM4-1	S-2	2-4	131.70	236.57	212.96	23.61	81.26	29.1
SWM4-1	S-3	4-6	15.69	40.81	37.05	3.76	21.36	17.6
SWM4-1	S-4	6-8	135.76	237.20	222.43	14.77	86.67	17.0
SWM4-1	S-5	8-10	15.79	49.72	43.87	5.85	28.08	20.8
SWM4-1	S-6	10-12	15.70	43.65	39.26	4.39	23.56	18.6
SWM4-1	S-7	13-15	15.78	47.05	41.45	5.60	25.67	21.8
SWM4-2	S-3	4-6	122.54	216.51	195.07	21.44	72.53	29.6
SWM4-2	S-4	6-8	15.68	44.84	39.17	5.67	23.49	24.1
SWM4-2	S-5	8-10	15.69	37.48	33.22	4.26	17.53	24.3
SWM4-2	S-6	10-12	131.08	265.20	242.90	22.30	111.82	19.9

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Natural Moisture Content Determination Sheet
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Virginia Beach, Virginia
G E T Project No. VB10-238G
Prepared for: HDR, Inc.

Date of Test: November, 2010
Test Performed by: P. Bierman
Test Results Checked by: J. Robinson, E.I.T.

Boring ID	Sample ID	Depth (ft.)	Tare Wt. (g)	Tare + Wet (g)	Tare + Dry (g)	Water (g)	Dry Soil (g)	% Moisture
SWM5-1	S-2	2-4	121.75	203.18	192.81	10.37	71.06	14.6
SWM5-1	S-3	4-6	15.82	36.13	32.99	3.14	17.17	18.3
SWM5-1	S-4	6-8	122.85	215.58	200.15	15.43	77.30	20.0
SWM5-1	S-5	8-10	15.78	37.73	35.15	2.58	19.37	13.3
SWM5-1	S-6	10-12	15.78	36.47	33.06	3.41	17.28	19.7
SWM5-1	S-7	13-15	15.70	42.90	39.23	3.67	23.53	15.6
SWM5-2	S-3	4-6	118.34	200.29	189.82	10.47	71.48	14.6
SWM5-2	S-4	6-8	15.76	40.48	37.29	3.19	21.53	14.8
SWM5-2	S-5	8-10	136.69	252.35	234.07	18.28	97.38	18.8
SWM5-2	S-6	10-12	15.83	40.21	36.44	3.77	20.61	18.3

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Natural Moisture Content Determination Sheet
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Virginia Beach, Virginia
G E T Project No. VB10-238G
Prepared for: HDR, Inc.

Date of Test: November, 2010
Test Performed by: P. Bierman
Test Results Checked by: J. Robinson, E.I.T.

Boring ID	Sample ID	Depth (ft.)	Tare Wt. (g)	Tare + Wet (g)	Tare + Dry (g)	Water (g)	Dry Soil (g)	% Moisture
CUR-4B	S-2	8-10	129.72	265.21	242.25	22.96	112.53	20.4
CUR-4B	S-5	23-25	153.32	290.13	281.74	8.39	128.42	6.5
CUR-4B	S-8	38-40	132.16	261.57	241.33	20.24	109.17	18.5
CUR-4B	S-10	48-50	15.69	42.70	34.34	8.36	18.65	44.8
CUR-4B	S-11	53-55	142.37	267.12	234.07	33.05	91.70	36.0
CUR-4B	S-12	58-60	15.79	53.55	46.88	6.67	31.09	21.5
CUR-4B	S-13	63-65	134.51	292.93	262.82	30.11	128.31	23.5
CUR-4B	S-14	68-70	135.09	232.06	207.51	24.55	72.42	33.9
CUR-4B	S-16	78-80	148.32	265.23	237.83	27.40	89.51	30.6
CUR-4B	S-19	93-95	15.70	40.80	32.49	8.31	16.79	49.5
CUR-4B	S-20	98-100	128.54	241.13	201.07	40.06	72.53	55.2
CUR-4B	S-21	103-105	15.79	46.30	41.69	4.61	25.90	17.8
CUR-4B	S-22	108-110	117.17	230.13	206.94	23.19	89.77	25.8
CUR-4B	S-24	118-120	142.78	284.65	258.05	26.60	115.27	23.1
CUR-4B	S-26	128-130	130.24	217.84	184.46	33.38	54.22	61.6
CUR-4B	S-27	133-135	15.69	38.14	29.78	8.36	14.09	59.3
CUR-4B	S-28	138-140	15.69	46.02	37.00	9.02	21.31	42.3
CUR-4B	S-29	143-145	134.45	294.91	264.27	30.64	129.82	23.6
CUR-4B	S-31	153-155	122.87	253.34	218.74	34.60	95.87	36.1

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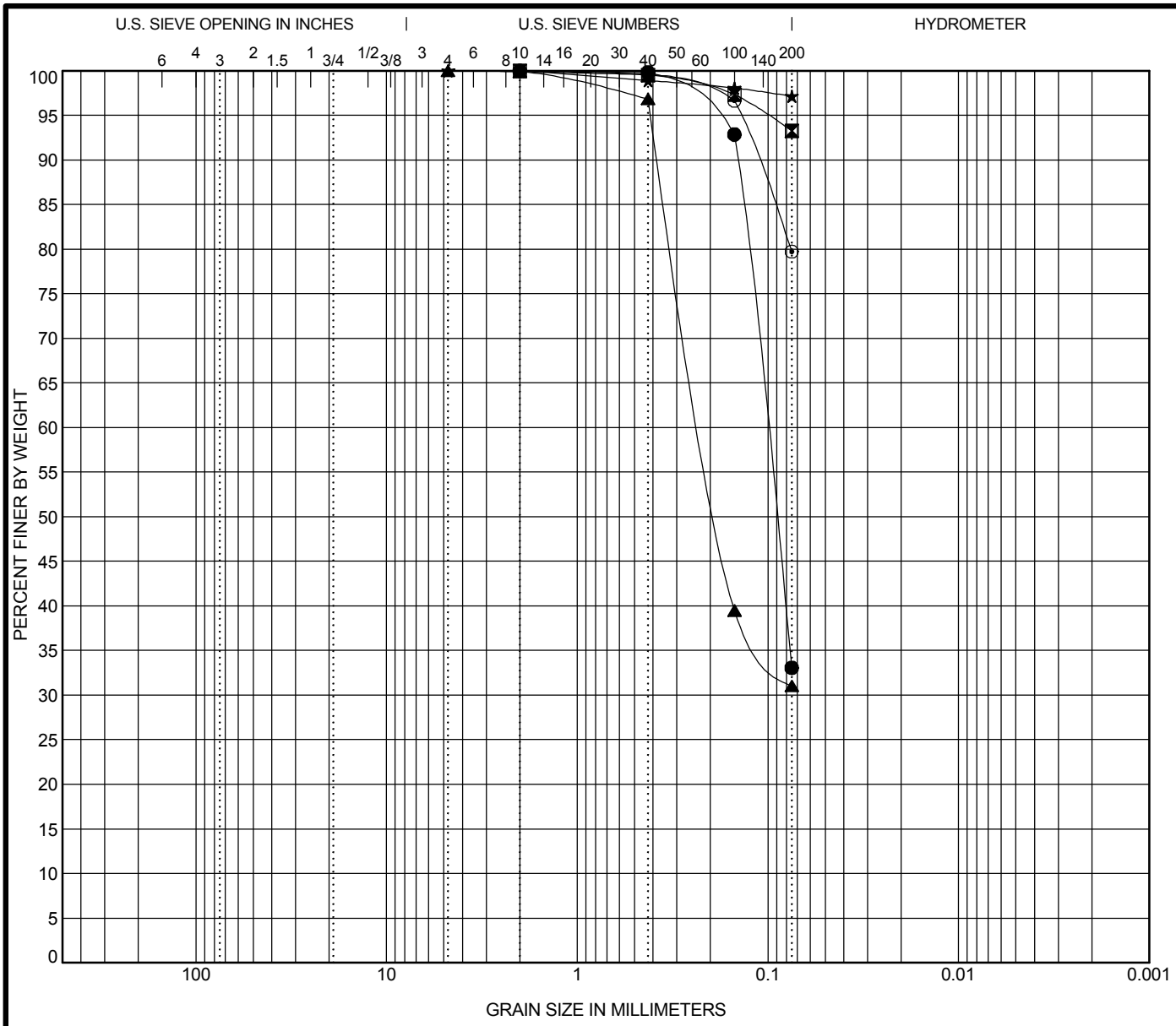
CLASSIFICATION TEST (GRAIN SIZE ANALYSIS AND ATTERBERG LIMITS) RESULTS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

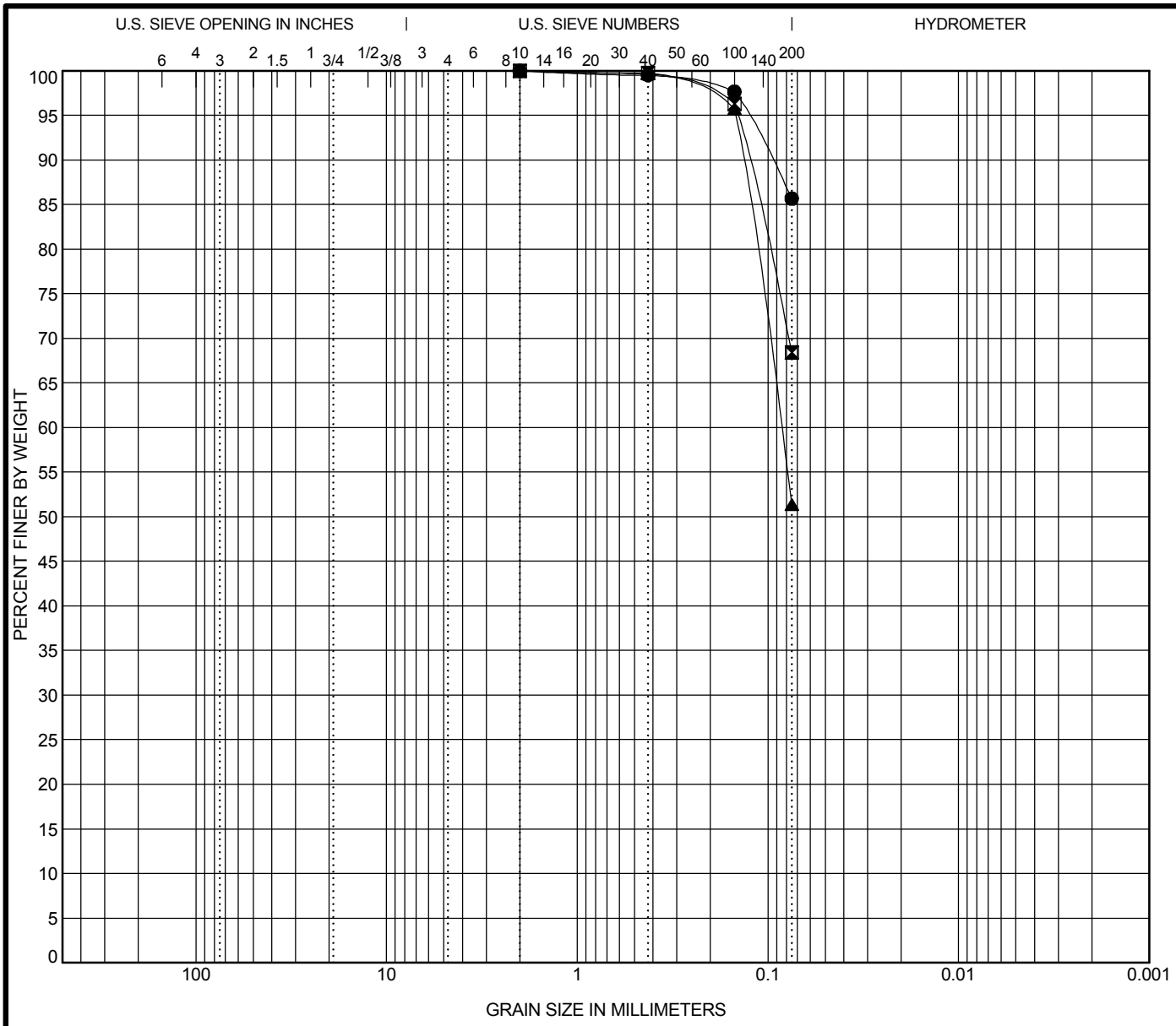
	Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	CUR-1B	17236	25.0 ft	SILTY SAND SM	NP	NP	NP		
⊠	CUR-1B	17237	105.0 ft	FAT CLAY CH	77	34	43		
▲	CUR-4B	17363	50.0 ft	SILTY SAND SM	18	17	1		
★	CUR-4B	17364	95.0 ft	FAT CLAY CH	95	31	64		
⊙	D7-10W	17238	37.0 ft	LEAN CLAY with SAND CL	48	24	24		

	Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	CUR-1B	17236	25.0 ft	2	0.102			0.0	66.9	33.1	
⊠	CUR-1B	17237	105.0 ft	2				0.0	6.7	93.3	
▲	CUR-4B	17363	50.0 ft	4.75	0.218			0.0	69.0	31.0	
★	CUR-4B	17364	95.0 ft	4.75				0.0	2.8	97.2	
⊙	D7-10W	17238	37.0 ft	2				0.0	20.3	79.7	

S&ME
8211 Hermitage Road
Richmond, Virginia 23228
Telephone: (804) 266-2199
Fax: (804) 261-5569

GRAIN SIZE DISTRIBUTION

Project: I-64/I-264 Interchange - PSA: I-64, D7, and Bridge
Location: Virginia Beach, Virginia
Number: 1081-10-2757



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	D7-8W	17239	28.0 ft	FAT CLAY CH	55	27	28		
⊠	D7-8W	17240	38.0 ft	SANDY LEAN CLAY CL	41	21	20		
▲	D7-9W	17241	43.0 ft	SANDY LEAN CLAY CL	39	22	17		

	Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	D7-8W	17239	28.0 ft	2				0.0	14.3	85.7	
⊠	D7-8W	17240	38.0 ft	2				0.0	31.6	68.4	
▲	D7-9W	17241	43.0 ft	2	0.086			0.0	48.6	51.4	

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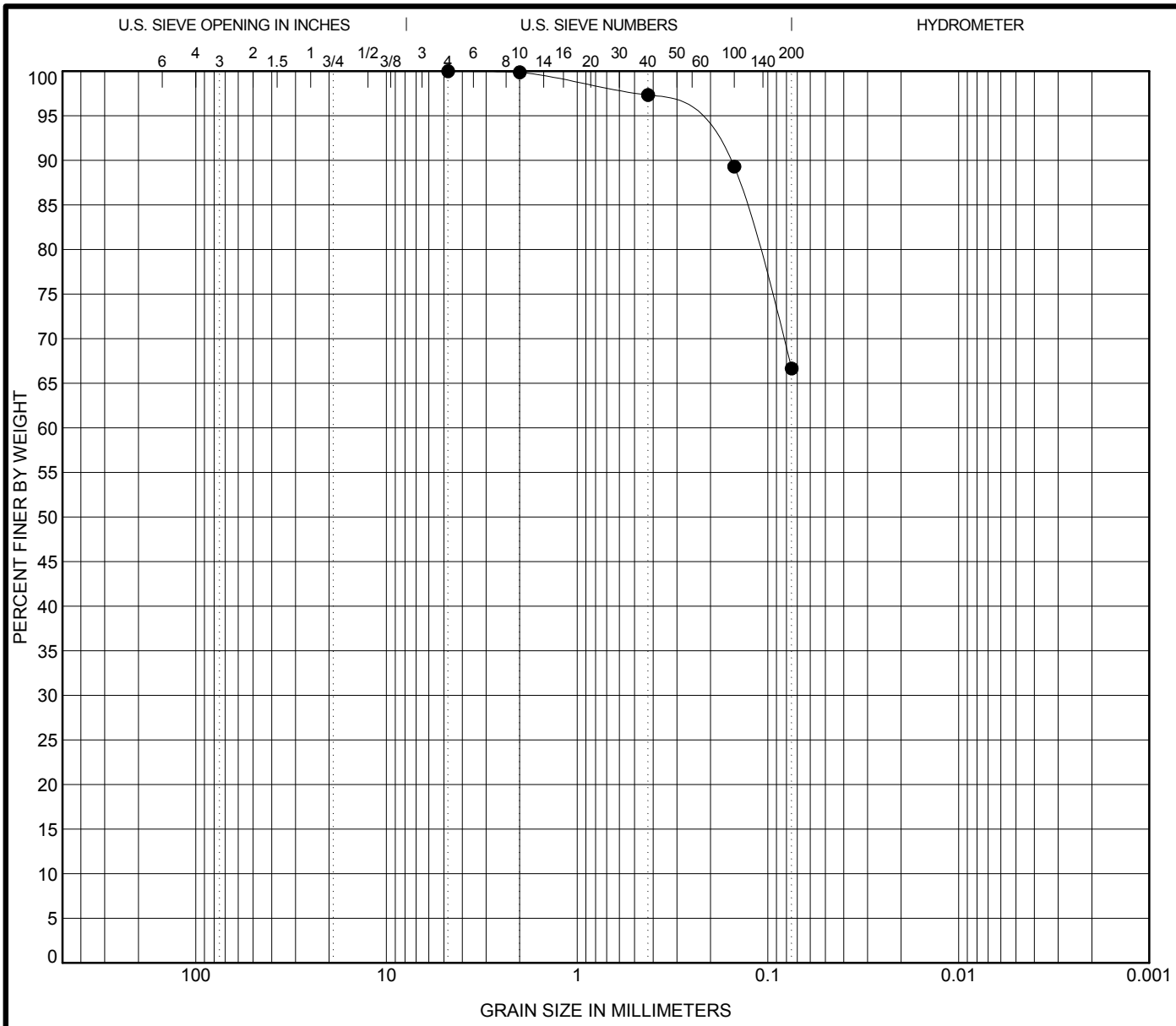
Richmond, Virginia 23228
Telephone: (804) 266-2199
Fax: (804) 261-5569

GRAIN SIZE DISTRIBUTION

Project: I-64/I-264 Interchange - PSA: I-64, D7, and Bridge
Location: Virginia Beach, Virginia
Number: 1081-10-2757

GSA (HYDROM = 0.002) GT2757 - I-64 D7 AND BRIDGE LAB.GPJ 12/2/10



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	D7-13W	17935	43.0 ft	**SANDY LEAN CLAY CL**	**36**	**23**	**13**		

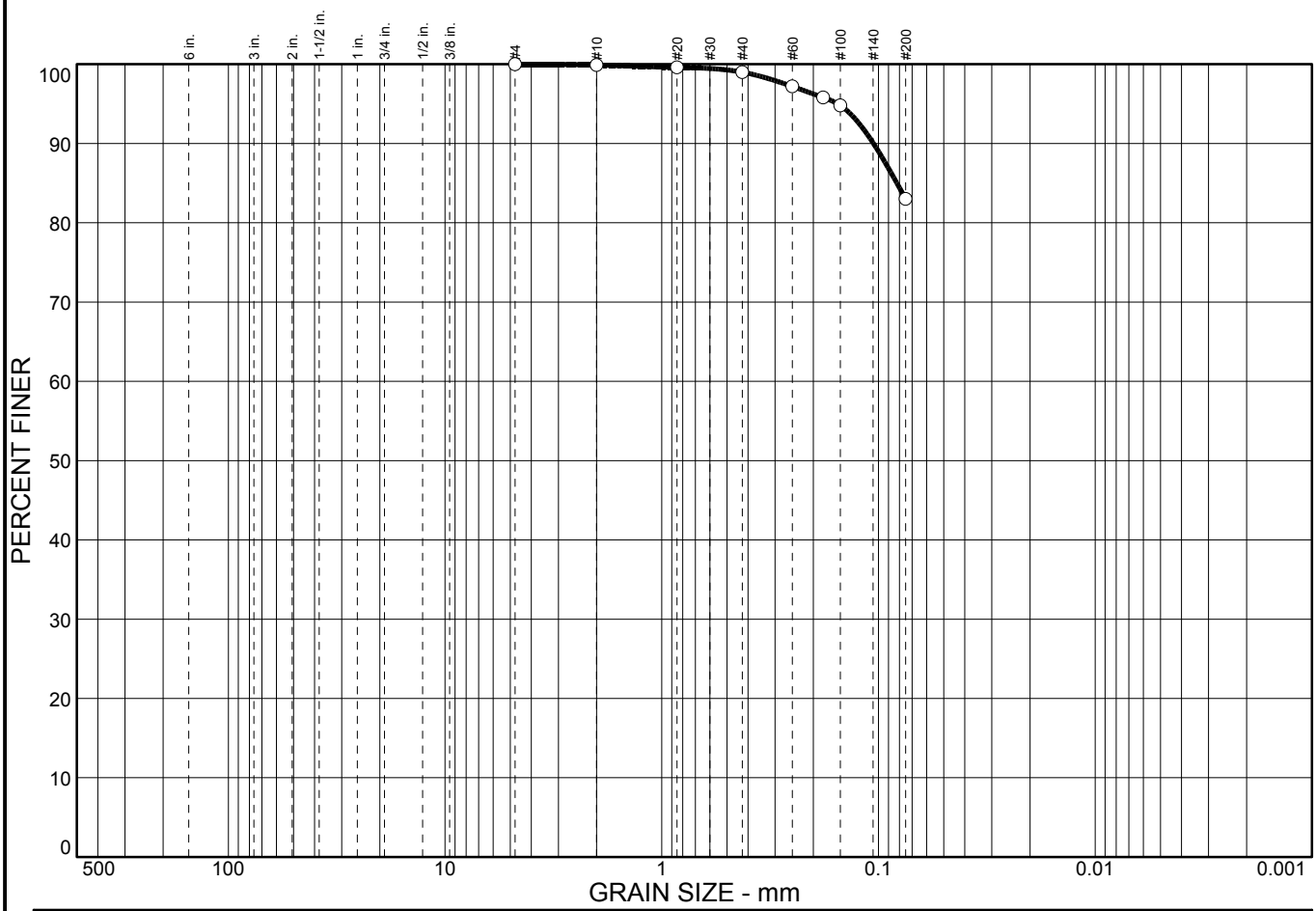
	Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	D7-13W	17935	43.0 ft	**4.75**				**0.0**	**33.3**	**66.7**	

S&ME
8211 Hermitage Road
Richmond, Virginia 23228
Telephone: 804.266.2199
Fax: 804.261.5569

GRAIN SIZE DISTRIBUTION

Project: I-64/I-264 Interchange PSA I-64, D7, and Bridge
Location: Cities of Norfolk and Virginia Beach, Virginia
Number: 1081-10-2757

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	17.0	83.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.6		
#40	99.0		
#60	97.2		
#80	95.8		
#100	94.8		
#200	83.0		

* (no specification provided)

Soil Description

Gray-Brown, Fat CLAY with Sand

Atterberg Limits

PL= 29 LL= 68 PI= 39

Coefficients

D_{85}= 0.0823 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(36)

Remarks

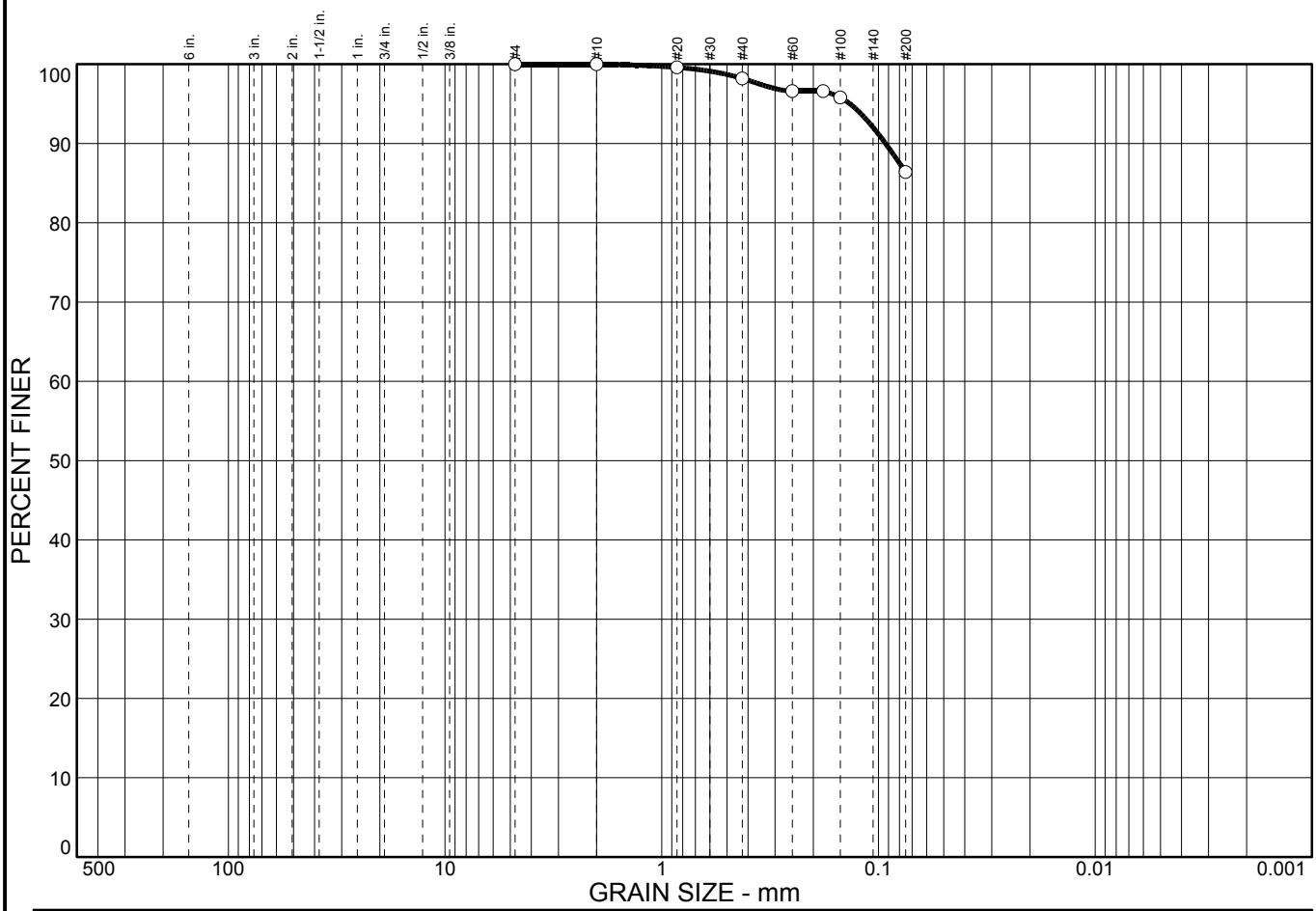
Gradation No. 1
Sample Obtained 10/5/10

Sample No.: Gradation No. 1 **Source of Sample:** **Date:** 10/5/10
Location: D7-5W **Elev./Depth:** 28.0-30.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G1

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	13.6	86.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.6		
#40	98.2		
#60	96.6		
#80	96.6		
#100	95.8		
#200	86.4		

* (no specification provided)

Soil Description

Gray-Brown, Fat CLAY

Atterberg Limits

PL= 26 LL= 70 PI= 44

Coefficients

D_{85}= D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(42)

Remarks

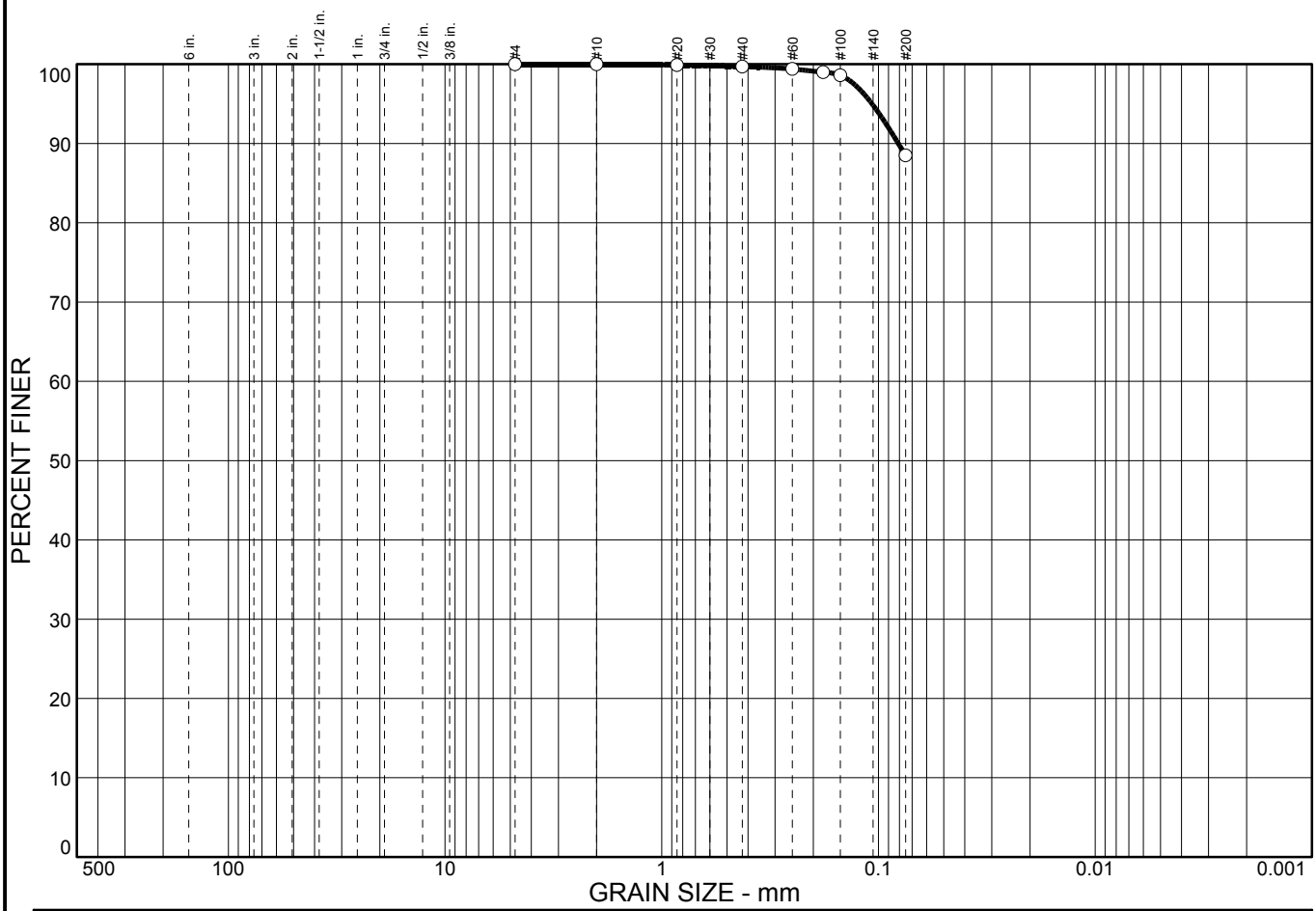
Gradation No. 2
Sample Obtained 10/5/10

Sample No.: Gradation No. 2 **Source of Sample:** **Date:** 10/5/10
Location: D7-8W **Elev./Depth:** 33.0-35.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G2

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	11.5	88.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.7		
#60	99.4		
#80	99.0		
#100	98.6		
#200	88.5		

* (no specification provided)

Soil Description

Gray-Brown, Fat CLAY

Atterberg Limits

PL= 29 LL= 74 PI= 45

Coefficients

D_{85}= D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(45)

Remarks

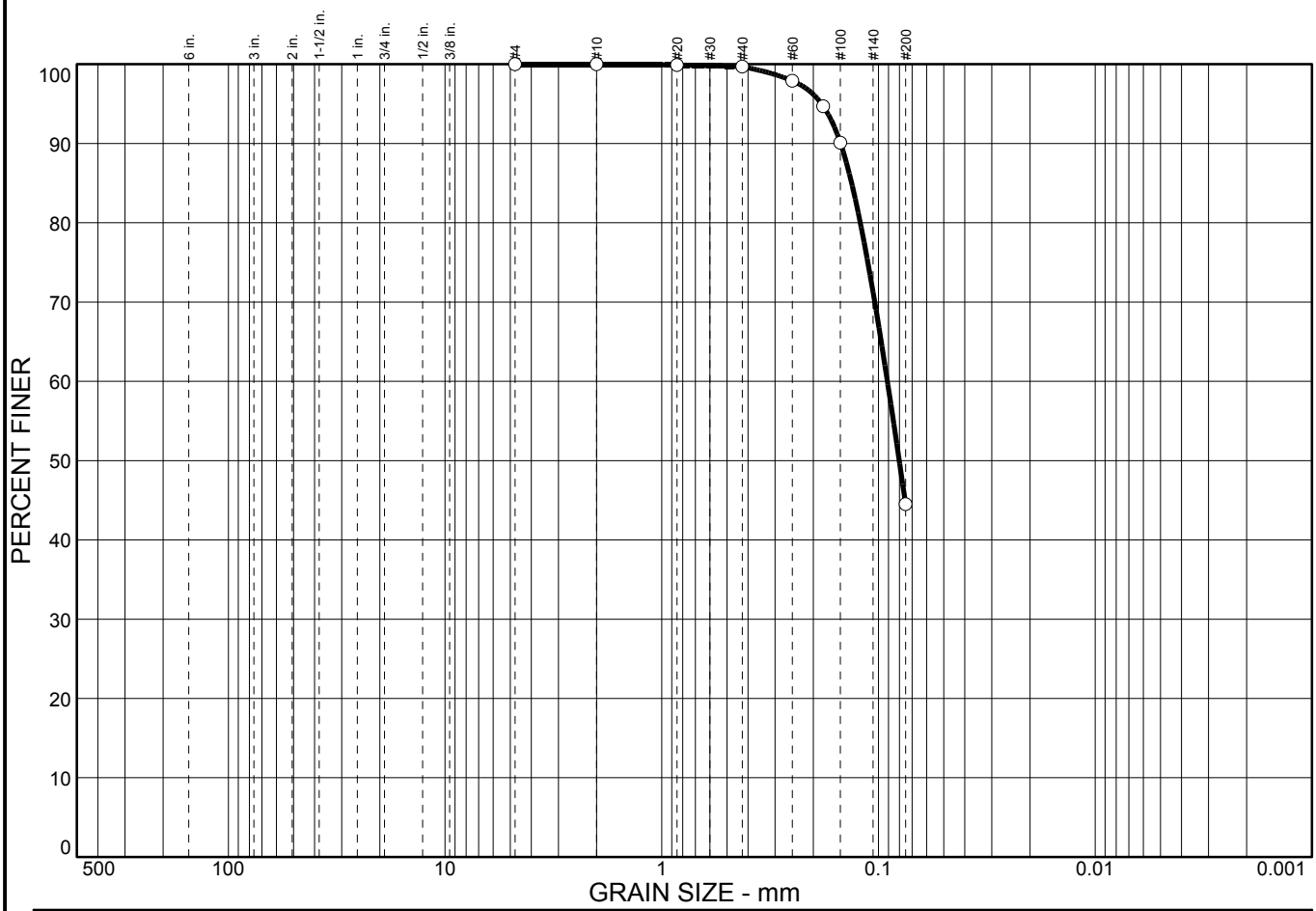
Gradation No. 3
Sample Obtained 10/5/10

Sample No.: Gradation No. 3 **Source of Sample:** **Date:** 10/5/10
Location: D7-9W **Elev./Depth:** 33.0-35.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G3

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	55.5	44.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.7		
#60	97.9		
#80	94.7		
#100	90.1		
#200	44.5		

* (no specification provided)

Soil Description

Gray-Brown, Clayey SAND

Atterberg Limits

PL= 21 LL= 36 PI= 15

Coefficients

D_{85}= 0.133 D_{60}= 0.0911 D_{50}= 0.0803
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-6(3)

Remarks

Gradation No. 4
Sample Obtained 10/5/10

Sample No.: Gradation No. 4 **Source of Sample:** **Date:** 10/5/10
Location: D7-10W **Elev./Depth:** 28.0-30.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G4

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	30.5	69.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	100.0		
#40	99.9		
#60	99.5		
#80	96.8		
#100	93.2		
#200	69.5		

* (no specification provided)

Soil Description

Gray-Brown, Sandy Lean CLAY

Atterberg Limits

PL= 19 LL= 41 PI= 22

Coefficients

D_{85}= 0.114 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(14)

Remarks

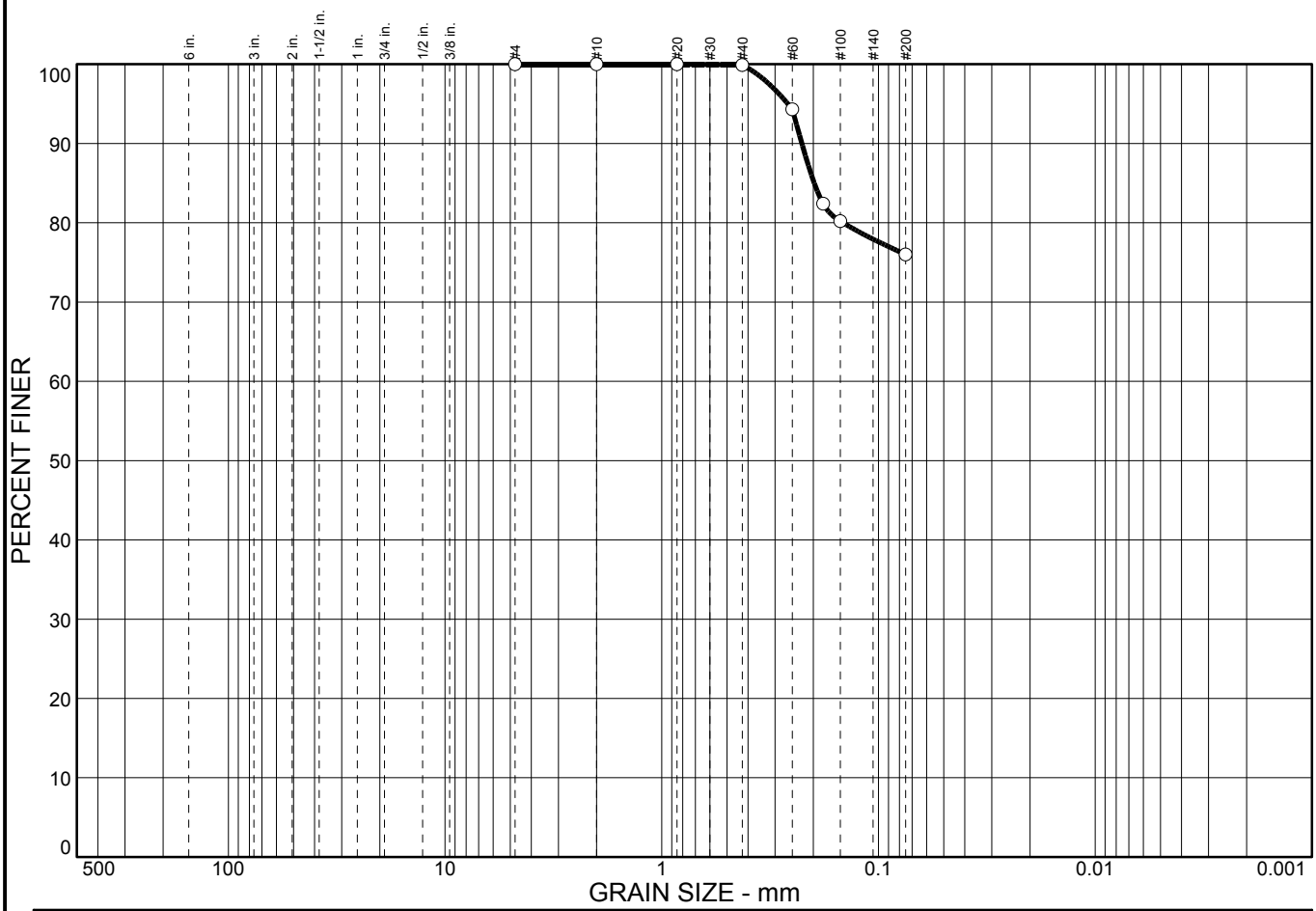
Gradation No. 5
Sample Obtained 10/5/10

Sample No.: Gradation No. 5 **Source of Sample:** **Date:** 10/5/10
Location: D7-10W **Elev./Depth:** 43.0-45.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G5

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	24.0	76.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	100.0		
#40	99.9		
#60	94.3		
#80	82.4		
#100	80.2		
#200	76.0		

* (no specification provided)

Soil Description

Gray-Brown, Lean CLAY with Sand

Atterberg Limits

PL= 20 LL= 45 PI= 25

Coefficients

D_{85}= 0.198 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(18)

Remarks

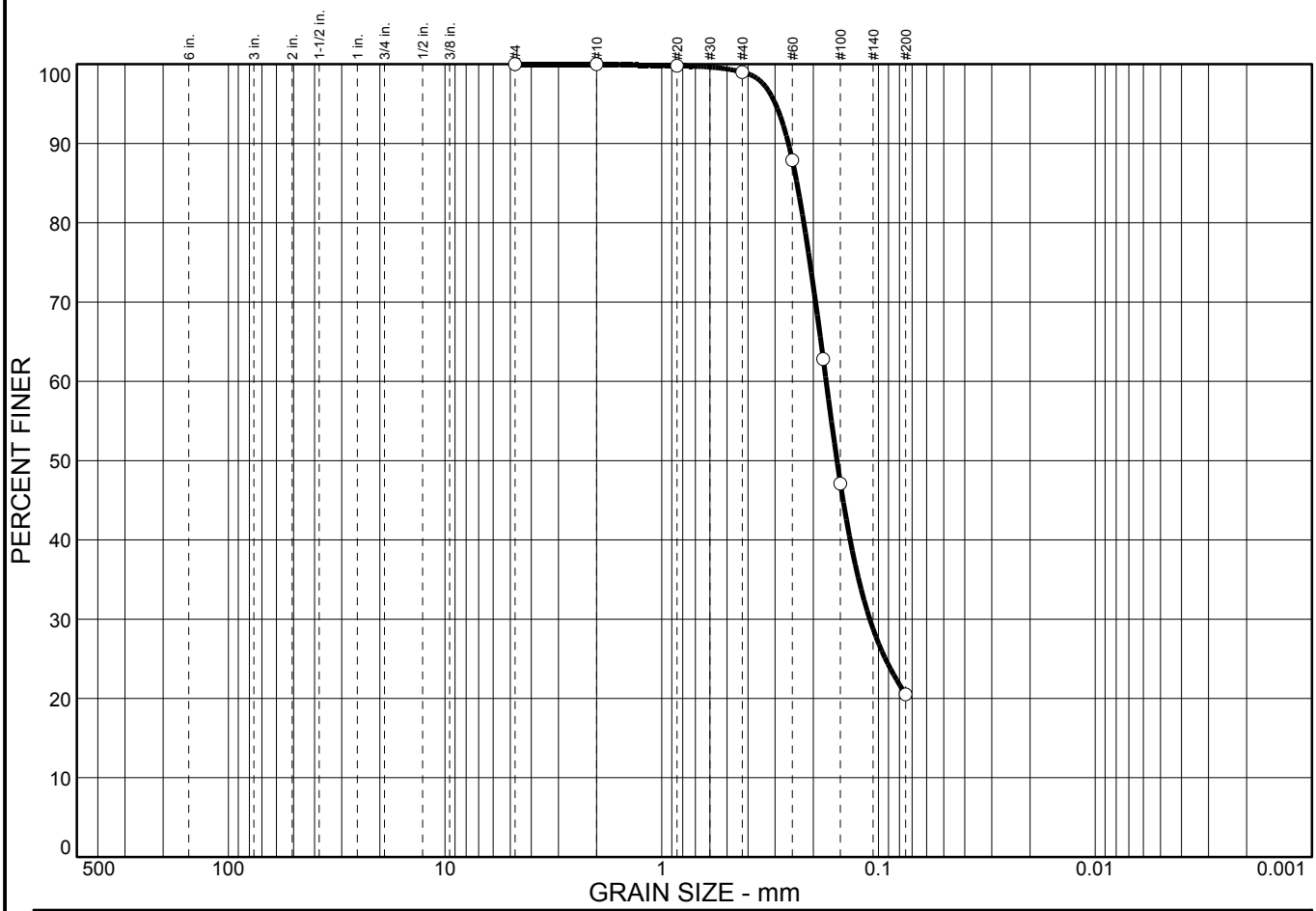
Gradation No. 6
Sample Obtained 10/5/10

Sample No.: Gradation No. 6 **Source of Sample:** **Date:** 10/5/10
Location: D7-10W **Elev./Depth:** 53.0-55.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G6

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	79.5	20.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.8		
#40	99.0		
#60	87.9		
#80	62.8		
#100	47.1		
#200	20.5		

* (no specification provided)

Soil Description

Gray-Brown, Silty Sand

Atterberg Limits

PL= NT LL= NT PI= NT

Coefficients

D_{85}= 0.238 D_{60}= 0.174 D_{50}= 0.156
D_{30}= 0.110 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Gradation No. 10
Sample Obtained 10/5/10

Sample No.: Gradation No. 10 **Source of Sample:** **Date:** 10/5/10
Location: CUR-1B **Elev./Depth:** 78.0-80.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G10

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	58.7	41.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.7		
#40	99.5		
#60	97.7		
#80	77.6		
#100	58.4		
#200	41.3		

* (no specification provided)

Soil Description

Gray-Brown, Silty Sand

Atterberg Limits

PL= NT LL= NT PI= NT

Coefficients

D_{85}= 0.197 D_{60}= 0.152 D_{50}= 0.107
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

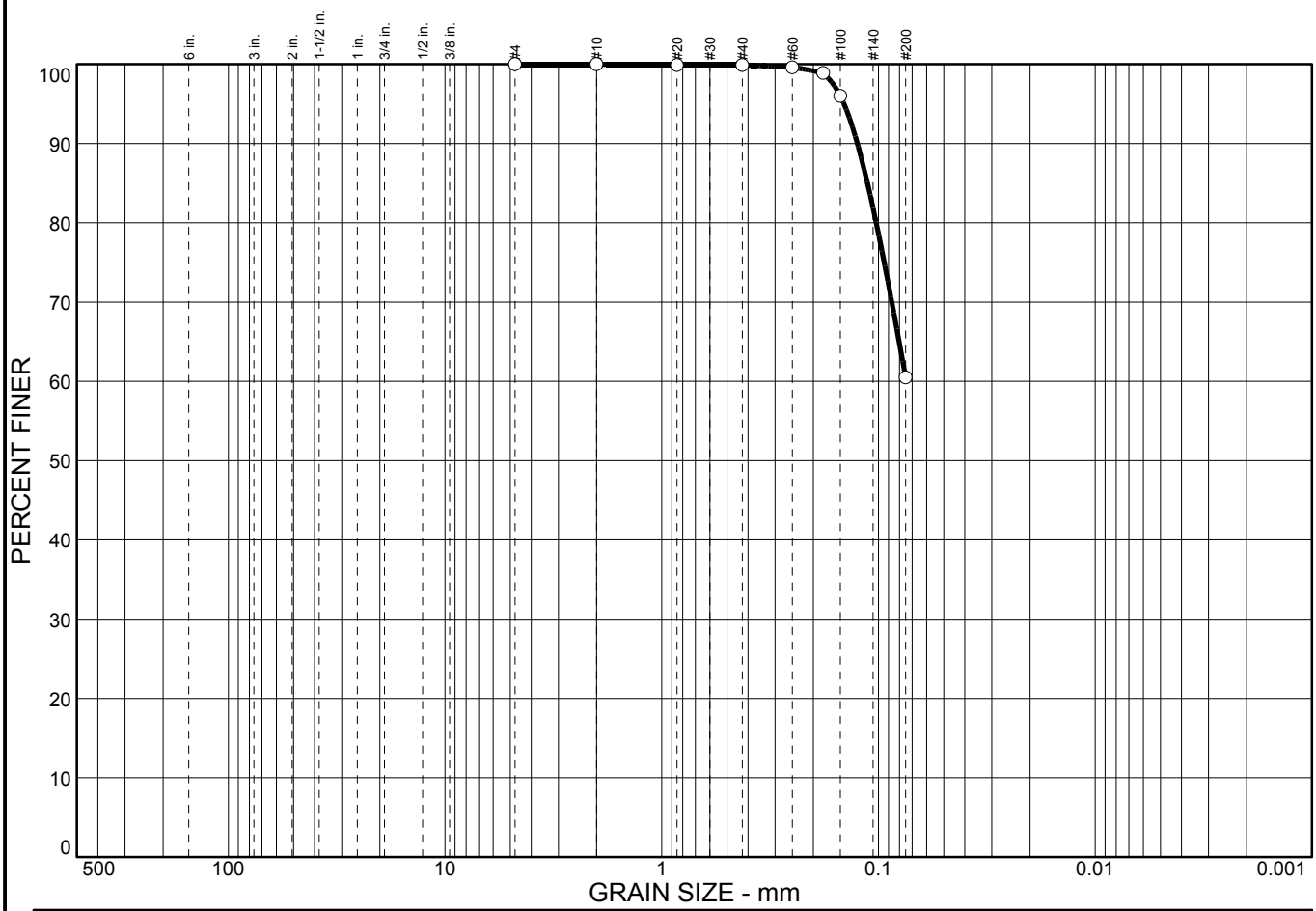
Gradation No. 11
Sample Obtained 10/5/10

Sample No.: Gradation No. 11 **Source of Sample:** **Date:** 10/5/10
Location: CUR-1B **Elev./Depth:** 88.0-90.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G11

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	39.5	60.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.9		
#60	99.6		
#80	98.9		
#100	96.0		
#200	60.5		

* (no specification provided)

Soil Description

Gray-Brown, Sandy Lean CLAY

Atterberg Limits

PL= 23 LL= 46 PI= 23

Coefficients

D_{85}= 0.113 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(12)

Remarks

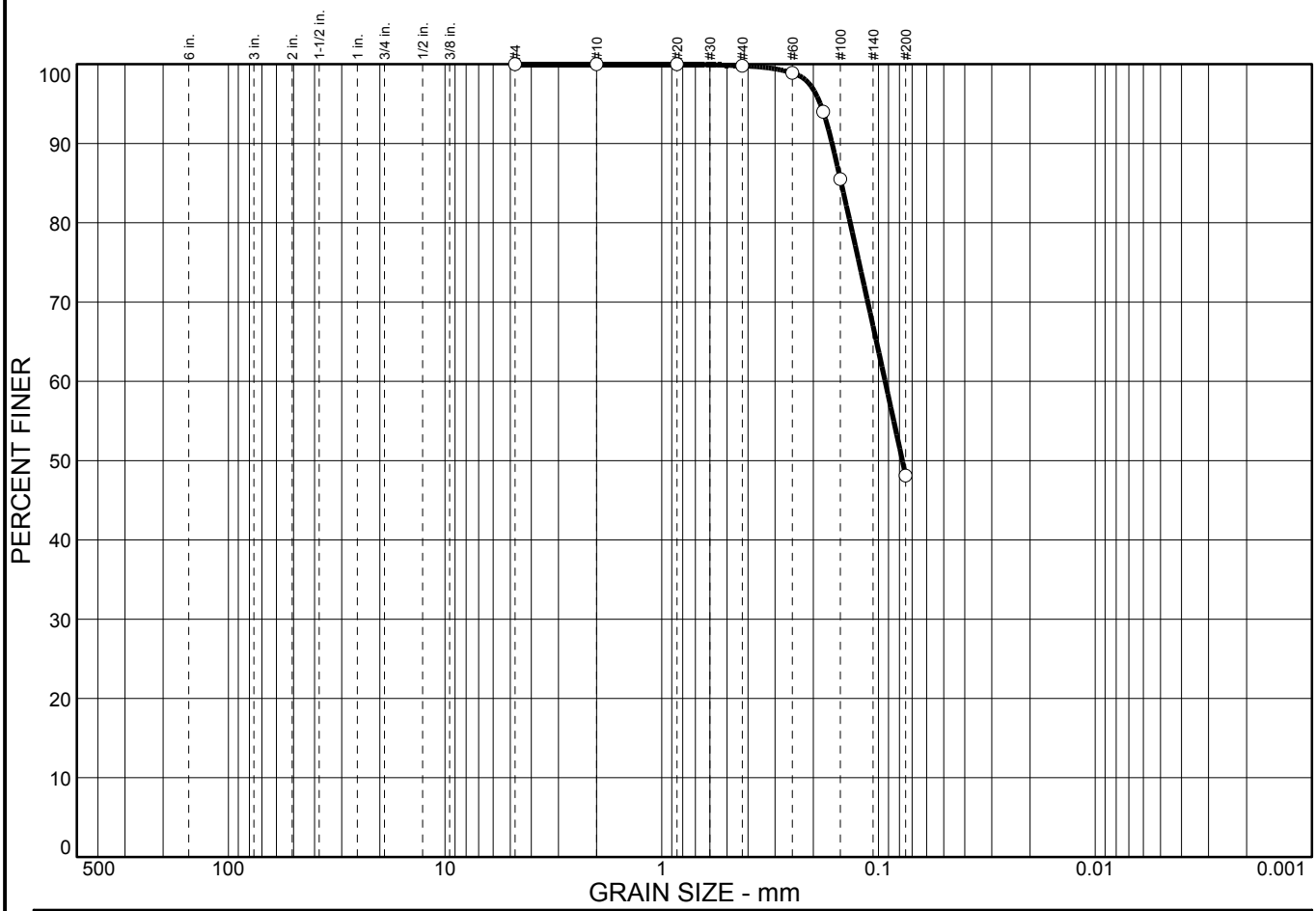
Gradation No. 7
Sample Obtained 10/5/10

Sample No.: Gradation No. 7 **Source of Sample:** **Date:** 10/5/10
Location: CUR-1B **Elev./Depth:** 33.0-35.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G7

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	51.9	48.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	100.0		
#40	99.8		
#60	98.9		
#80	94.0		
#100	85.5		
#200	48.1		

* (no specification provided)

Soil Description

Gray-Brown, Clayey Sand

Atterberg Limits

PL= 20 LL= 33 PI= 13

Coefficients

D_{85}= 0.149 D_{60}= 0.0933 D_{50}= 0.0777
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-6(3)

Remarks

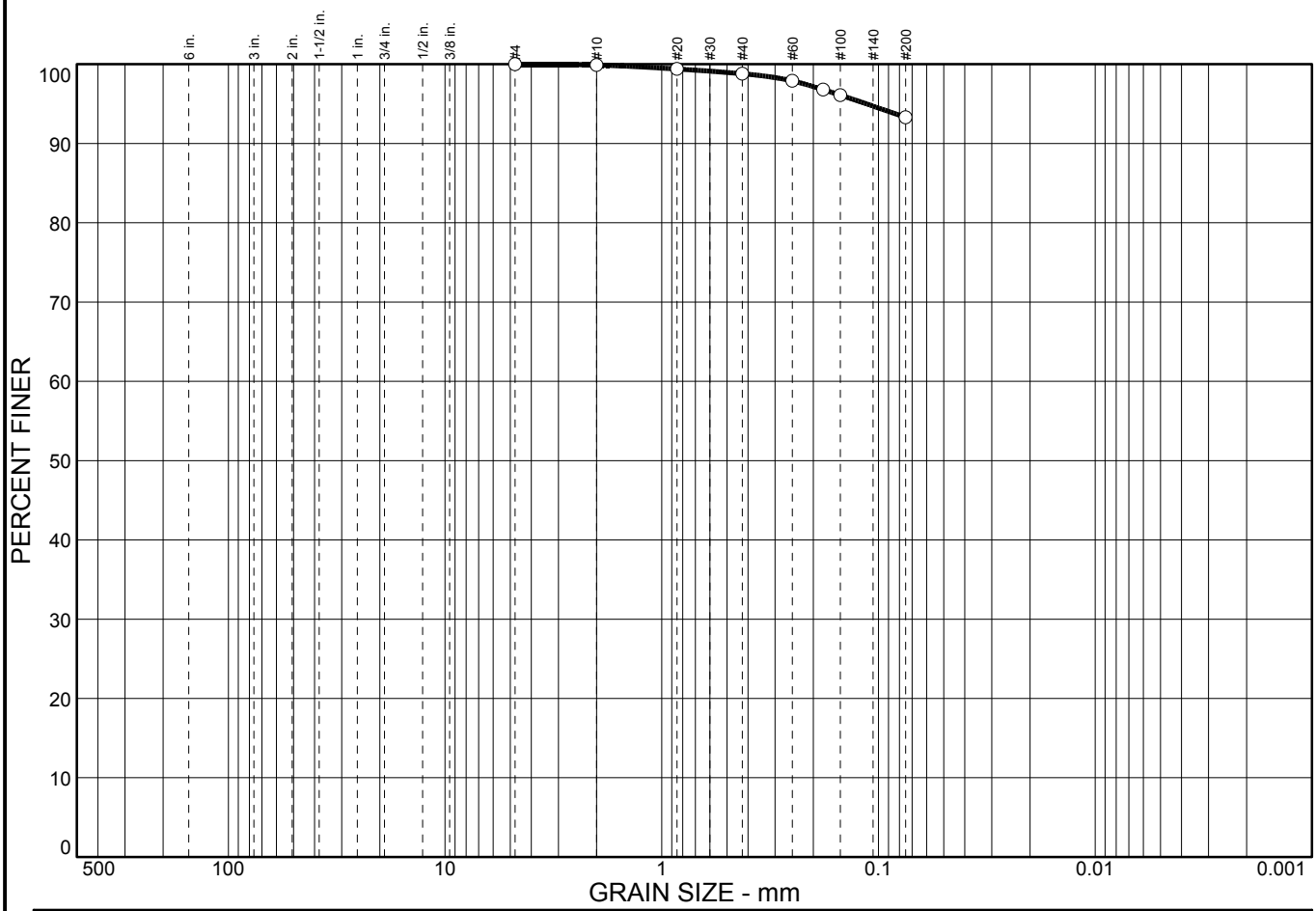
Gradation No. 8
Sample Obtained 10/5/10

Sample No.: Gradation No. 8 **Source of Sample:** **Date:** 10/5/10
Location: CUR-1B **Elev./Depth:** 43.0-45.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G8

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	6.7	93.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.4		
#40	98.8		
#60	97.9		
#80	96.8		
#100	96.1		
#200	93.3		

* (no specification provided)

Soil Description

Gray-Brown, Lean CLAY with Sand

Atterberg Limits

PL= 30 LL= 72 PI= 42

Coefficients

D_{85}= D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(18)

Remarks

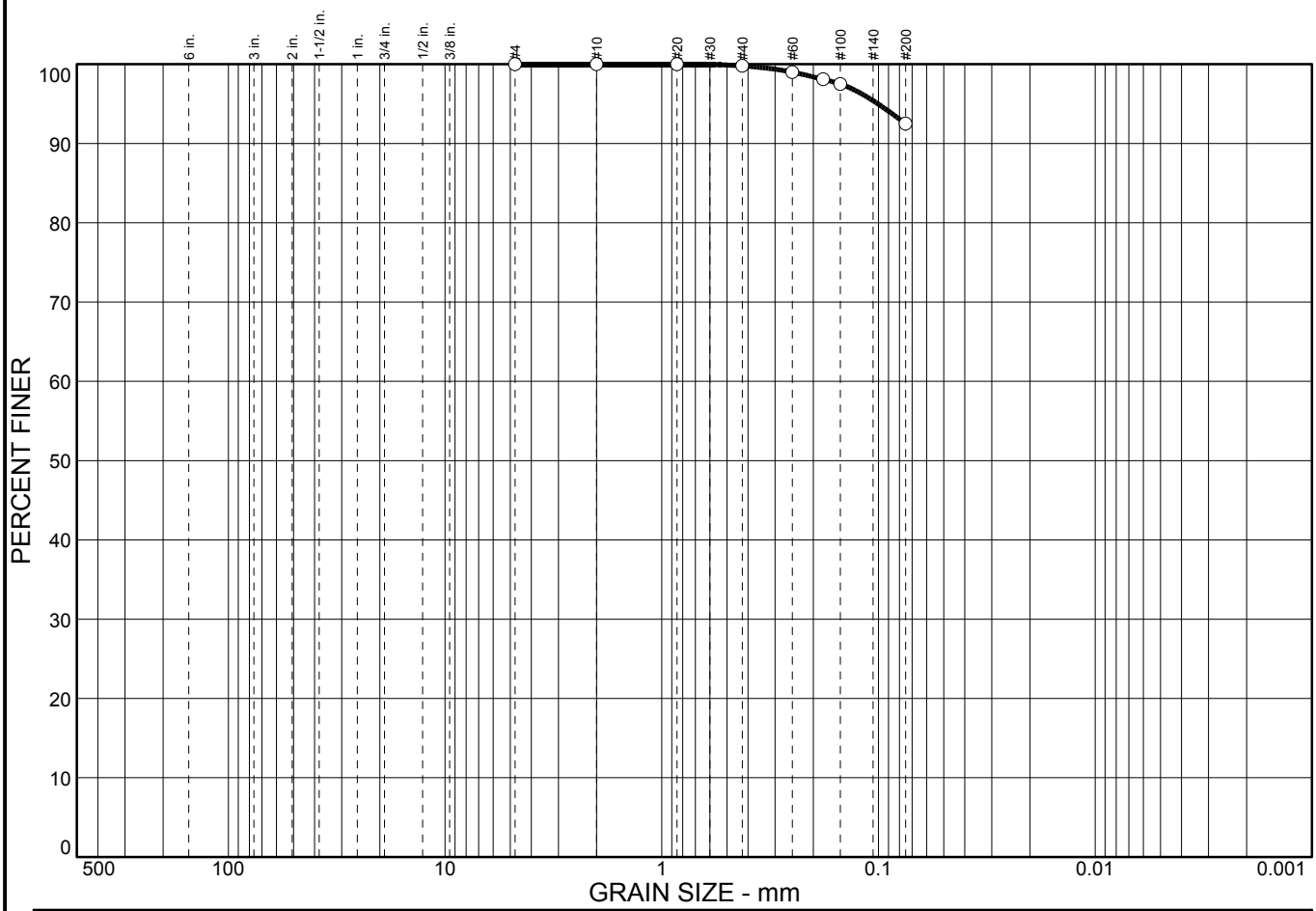
Gradation No. 9
Sample Obtained 10/5/10

Sample No.: Gradation No. 9 **Source of Sample:** **Date:** 10/5/10
Location: CUR-1B **Elev./Depth:** 63.0-65.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G9

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	7.5	92.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	100.0		
#40	99.8		
#60	99.0		
#80	98.1		
#100	97.5		
#200	92.5		

* (no specification provided)

Soil Description

Gray-Brown, Fat CLAY

Atterberg Limits

PL= 32 LL= 74 PI= 42

Coefficients

D_{85}= D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(46)

Remarks

Gradation No. 12
Sample Obtained 10/5/10

Sample No.: Gradation No. 12 **Source of Sample:** **Date:** 10/5/10
Location: CUR-1B **Elev./Depth:** 108.0-110.0

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G12

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	69.8	30.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	99.5		
#40	99.3		
#60	98.7		
#80	96.6		
#100	91.5		
#200	30.2		

* (no specification provided)

Soil Description

Gray-Brown, Silty Sand

Atterberg Limits

PL= 24 LL= 30 PI= 6

Coefficients

D_{85}= 0.133 D_{60}= 0.0989 D_{50}= 0.0898
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

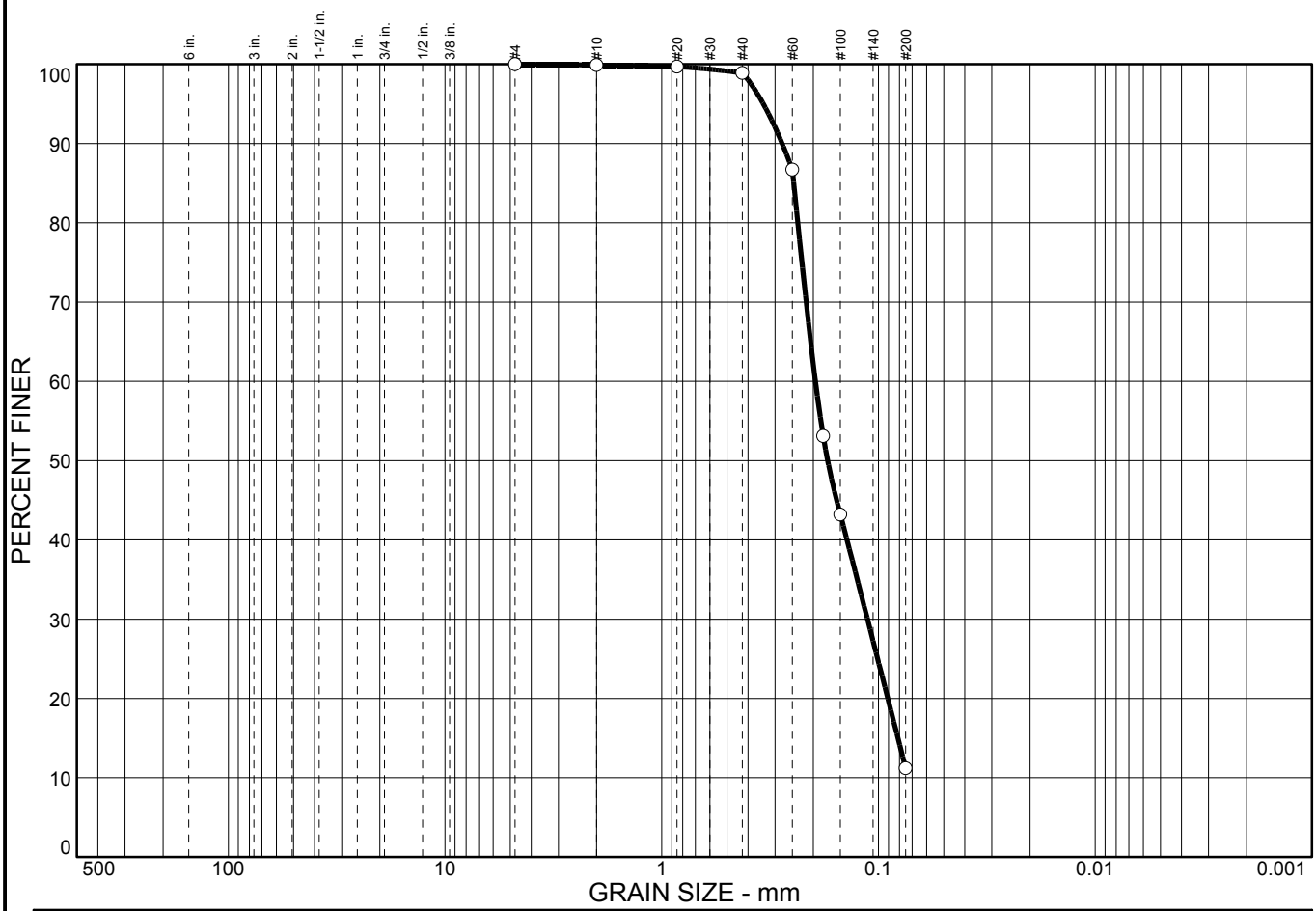
Gradation No. 13
Sample Obtained 10/5/10

Sample No.: Gradation No. 13 **Source of Sample:** **Date:** 10/5/10
Location: CUR-1B **Elev./Depth:** 123.0-125.0

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G13

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	88.8	11.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.7		
#40	98.9		
#60	86.7		
#80	53.1		
#100	43.2		
#200	11.2		

* (no specification provided)

Soil Description

Gray-Orange, Poorly Graded SAND with Silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.246 D_{60}= 0.196 D_{50}= 0.172
D_{30}= 0.112 D_{15}= 0.0814 D_{10}=
C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-2-4(0)

Remarks

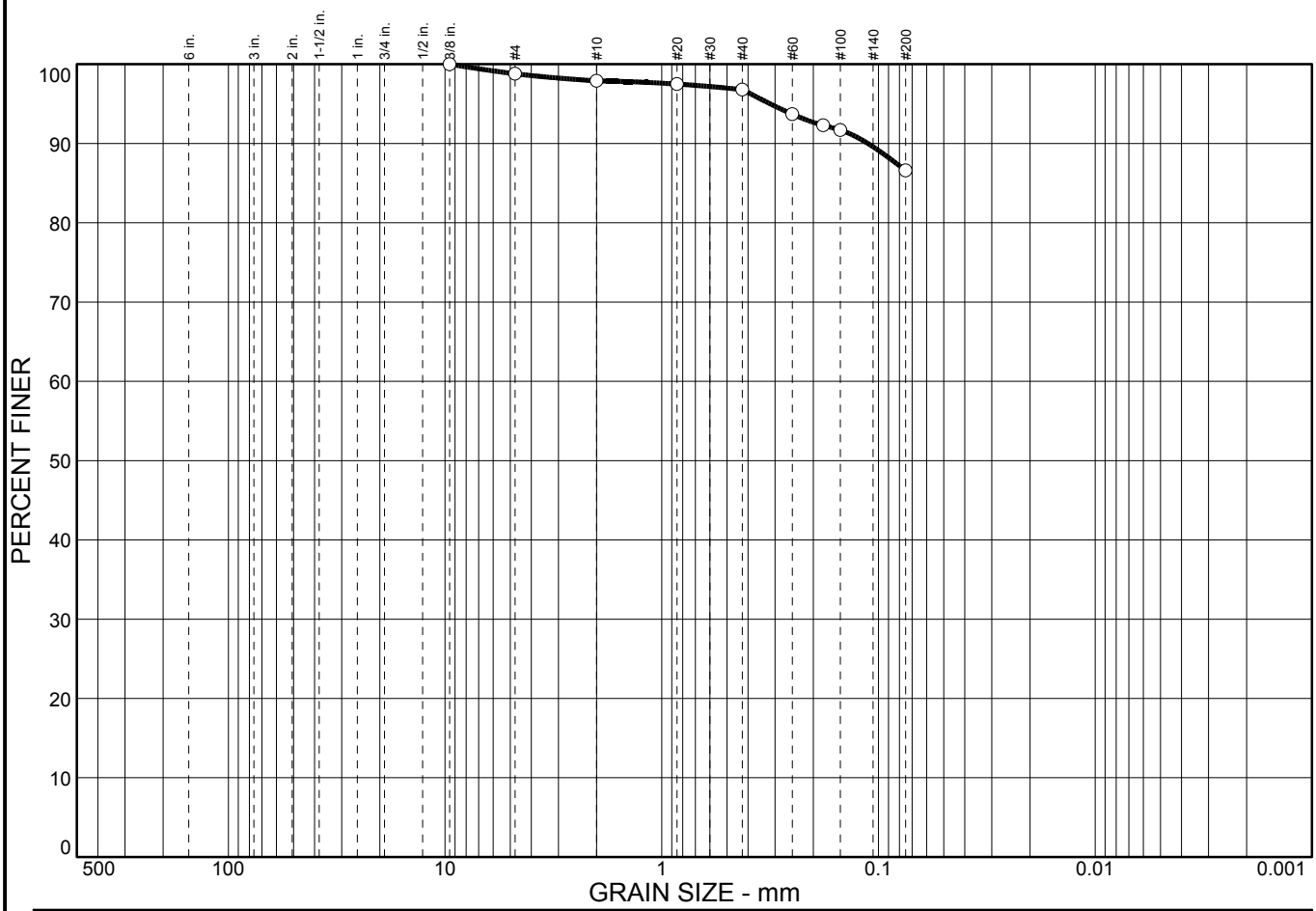
Gradation No. 14
Sample Obtained 10/5/10

Sample No.: Gradation No. 14 **Source of Sample:** **Date:** 10/5/10
Location: 164SB-7 **Elev./Depth:** 18.0-20.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G14

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.2	12.2	86.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	98.8		
#10	97.9		
#20	97.5		
#40	96.8		
#60	93.7		
#80	92.3		
#100	91.7		
#200	86.6		

* (no specification provided)

Soil Description

Tan, Lean CLAY

Atterberg Limits

PL= 23 LL= 40 PI= 17

Coefficients

D_{85}= D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(15)

Remarks

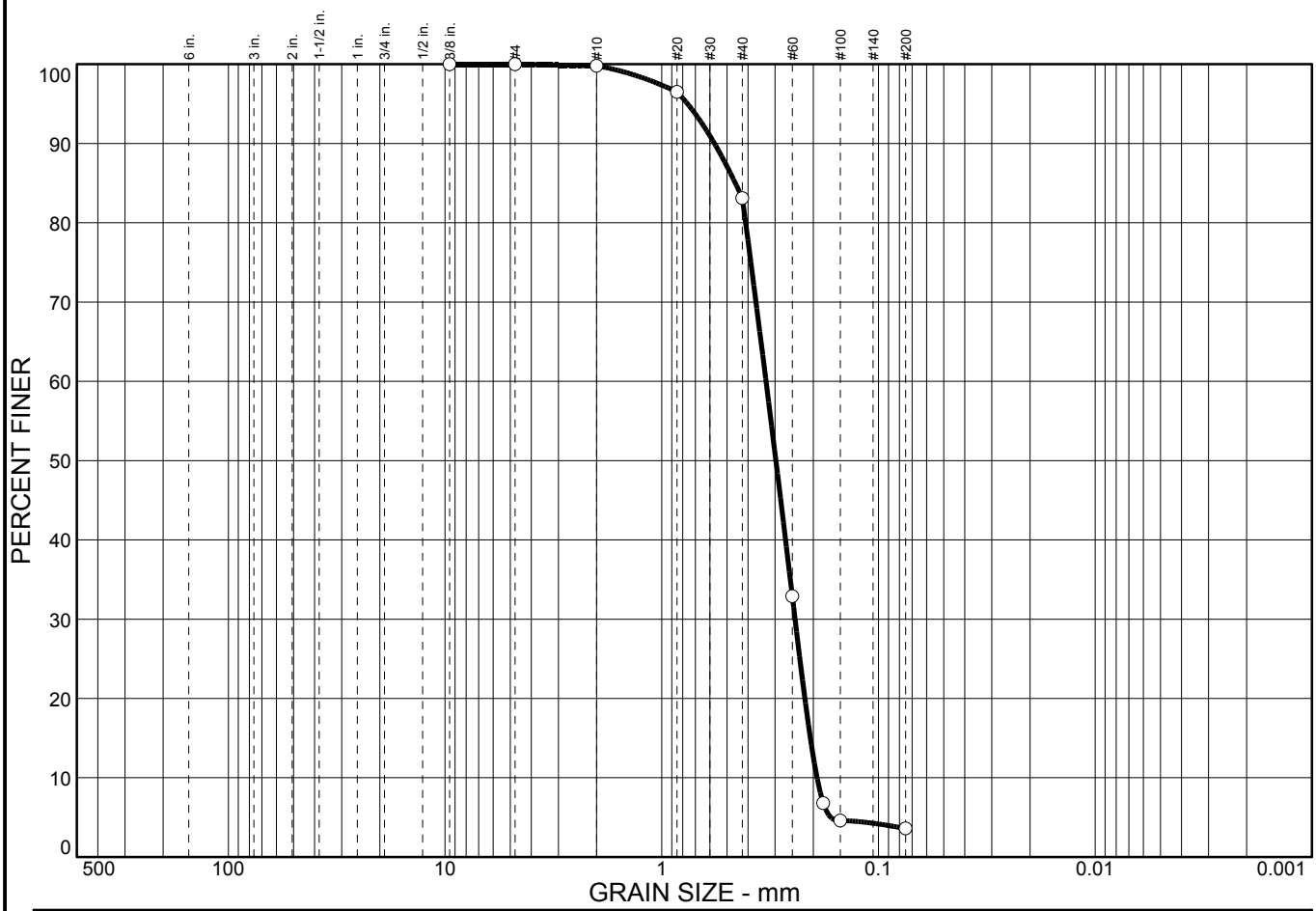
Gradation No. 15
Sample Obtained 10/5/10

Sample No.: Gradation No. 15 **Source of Sample:** **Date:** 10/5/10
Location: SWM4-1 **Elev./Depth:** 2.0-4.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G15

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	96.4	3.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	99.8		
#20	96.5		
#40	83.1		
#60	32.9		
#80	6.8		
#100	4.6		
#200	3.6		

* (no specification provided)

Soil Description

Brown, Poorly Graded SAND

Atterberg Limits

PL= NT LL= NT PI= NP

Coefficients

D_{85}= 0.458 D_{60}= 0.331 D_{50}= 0.298
D_{30}= 0.243 D_{15}= 0.206 D_{10}= 0.192
C_u= 1.72 C_c= 0.93

Classification

USCS= SP AASHTO= A-3

Remarks

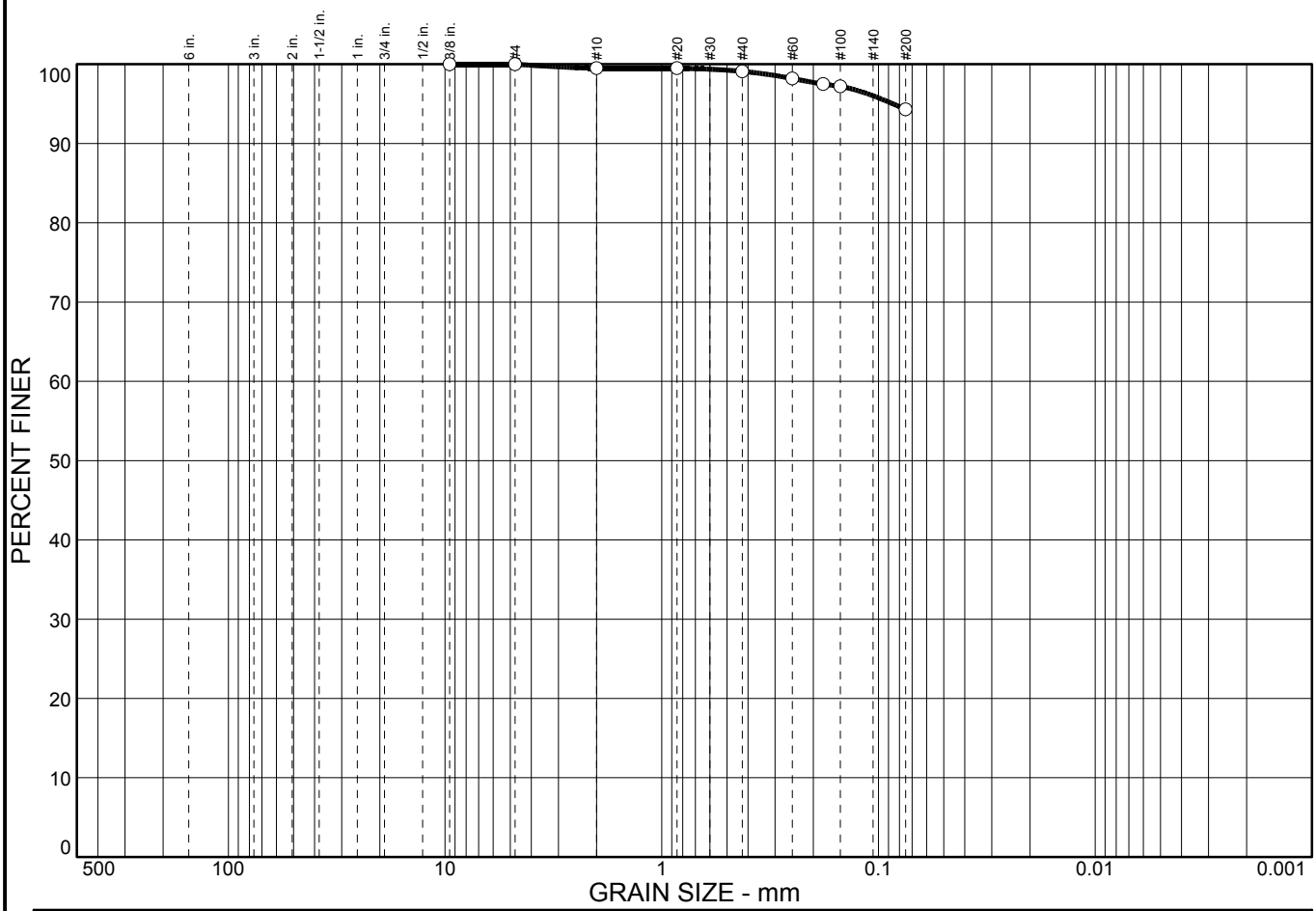
Gradation No. 16
Sample Obtained 10/5/10

Sample No.: Gradation No. 16 **Source of Sample:** **Date:** 10/5/10
Location: SWM4-1 **Elev./Depth:** 6.0-8.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G16

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	5.7	94.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	99.5		
#20	99.5		
#40	99.1		
#60	98.2		
#80	97.5		
#100	97.2		
#200	94.3		

* (no specification provided)

Soil Description

Tan, Lean CLAY

Atterberg Limits

PL= 23 LL= 43 PI= 20

Coefficients

D_{85}= D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(21)

Remarks

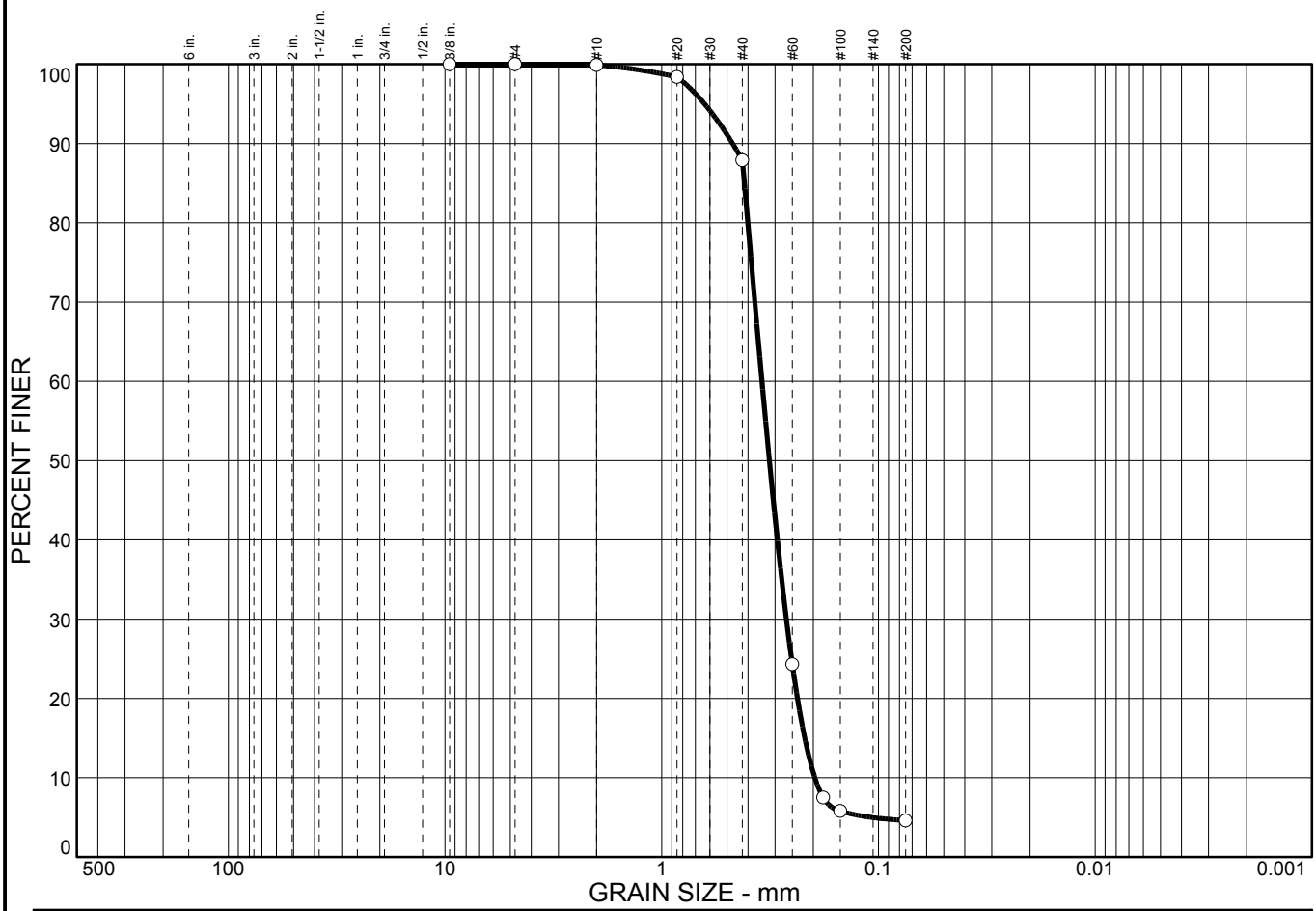
Gradation No. 17
Sample Obtained 10/5/10

Sample No.: Gradation No. 17 **Source of Sample:** **Date:** 10/5/10
Location: SWM4-2 **Elev./Depth:** 4.0-6.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G17

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	95.4	4.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	99.9		
#20	98.4		
#40	87.9		
#60	24.3		
#80	7.5		
#100	5.8		
#200	4.6		

* (no specification provided)

Soil Description

Brown, Poorly Graded SAND with Silt

Atterberg Limits

PL= NT LL= NT PI= NP

Coefficients

D_{85}= 0.416 D_{60}= 0.345 D_{50}= 0.319
D_{30}= 0.266 D_{15}= 0.219 D_{10}= 0.197
C_u= 1.76 C_c= 1.04

Classification

USCS= SP-SM AASHTO= A-3

Remarks

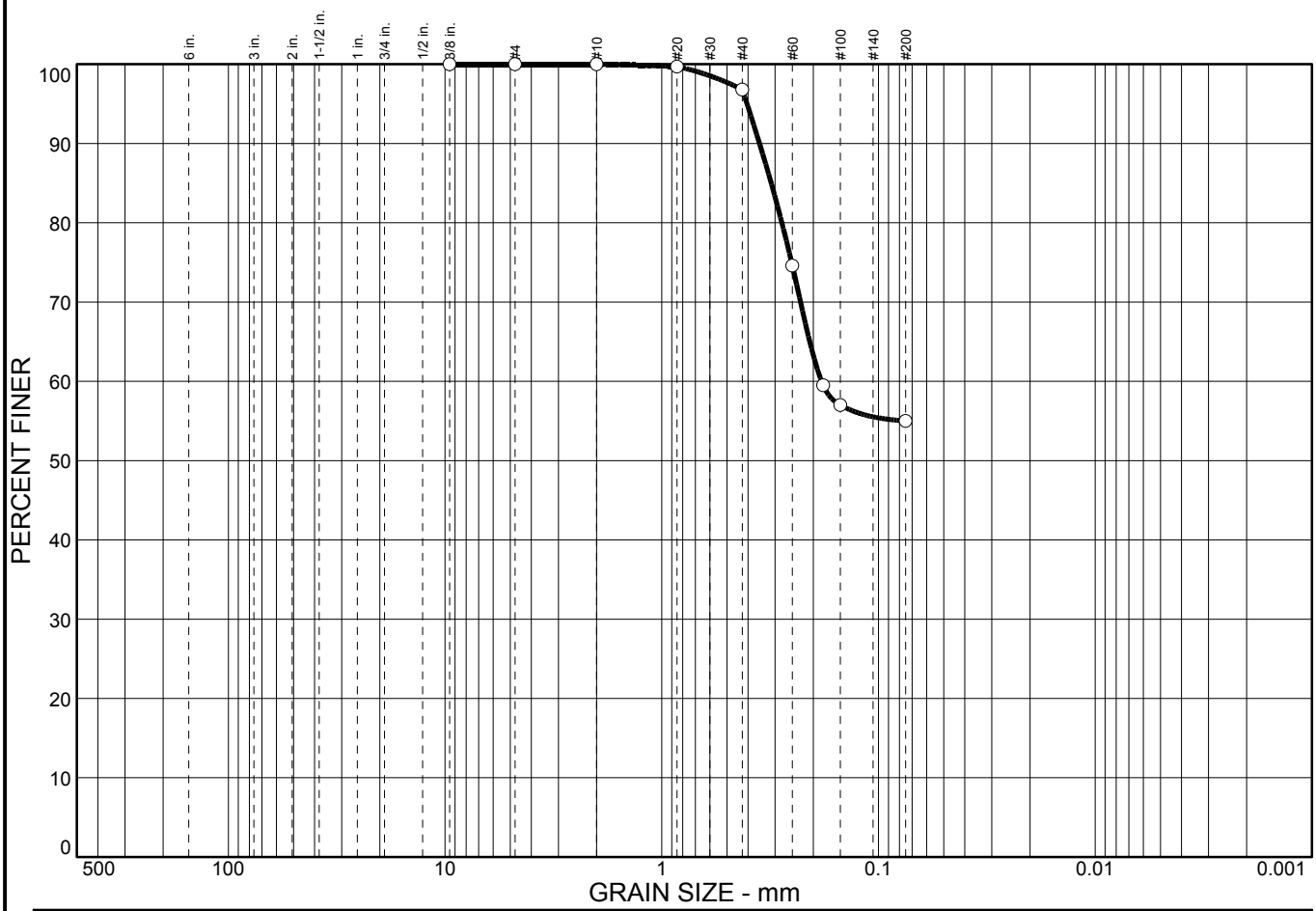
Gradation No. 18
Sample Obtained 10/5/10

Sample No.: Gradation No. 18 **Source of Sample:** **Date:** 10/5/10
Location: SWM4-2 **Elev./Depth:** 10.0-12.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G18

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	45.0	55.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	100.0		
#20	99.7		
#40	96.8		
#60	74.6		
#80	59.5		
#100	57.0		
#200	55.0		

* (no specification provided)

Soil Description

Tan, Sandy Lean CLAY

Atterberg Limits

PL= 17 LL= 31 PI= 14

Coefficients

D_{85}= 0.313 D_{60}= 0.183 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(5)

Remarks

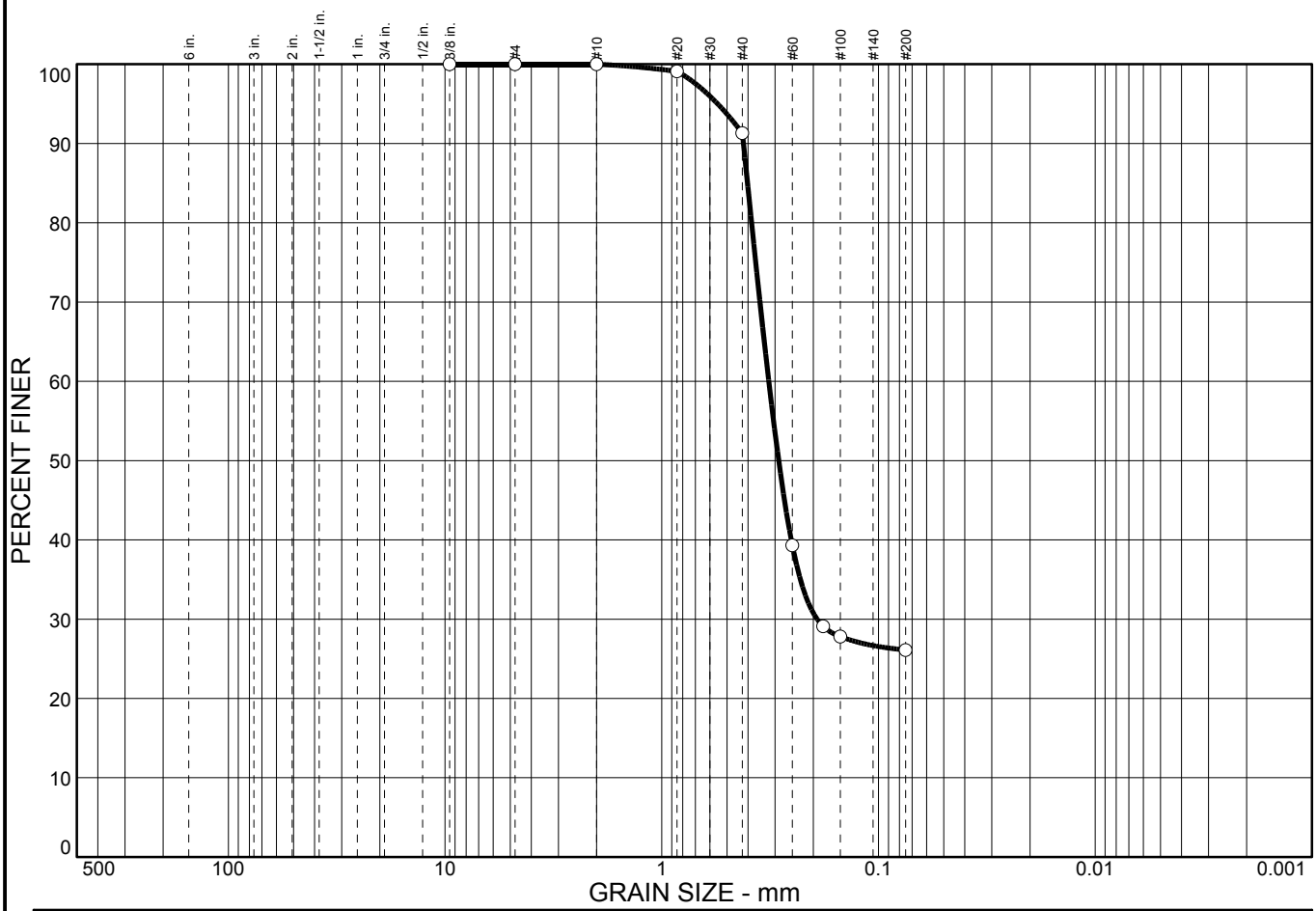
Gradation No. 19
Sample Obtained 10/5/10

Sample No.: Gradation No. 19 **Source of Sample:** **Date:** 10/5/10
Location: SWM5-1 **Elev./Depth:** 2.0-4.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G19

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	73.9	26.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	100.0		
#20	99.1		
#40	91.3		
#60	39.3		
#80	29.1		
#100	27.8		
#200	26.1		

* (no specification provided)

Soil Description

Tan, Silty SAND

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.402 D_{60}= 0.321 D_{50}= 0.289
D_{30}= 0.192 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

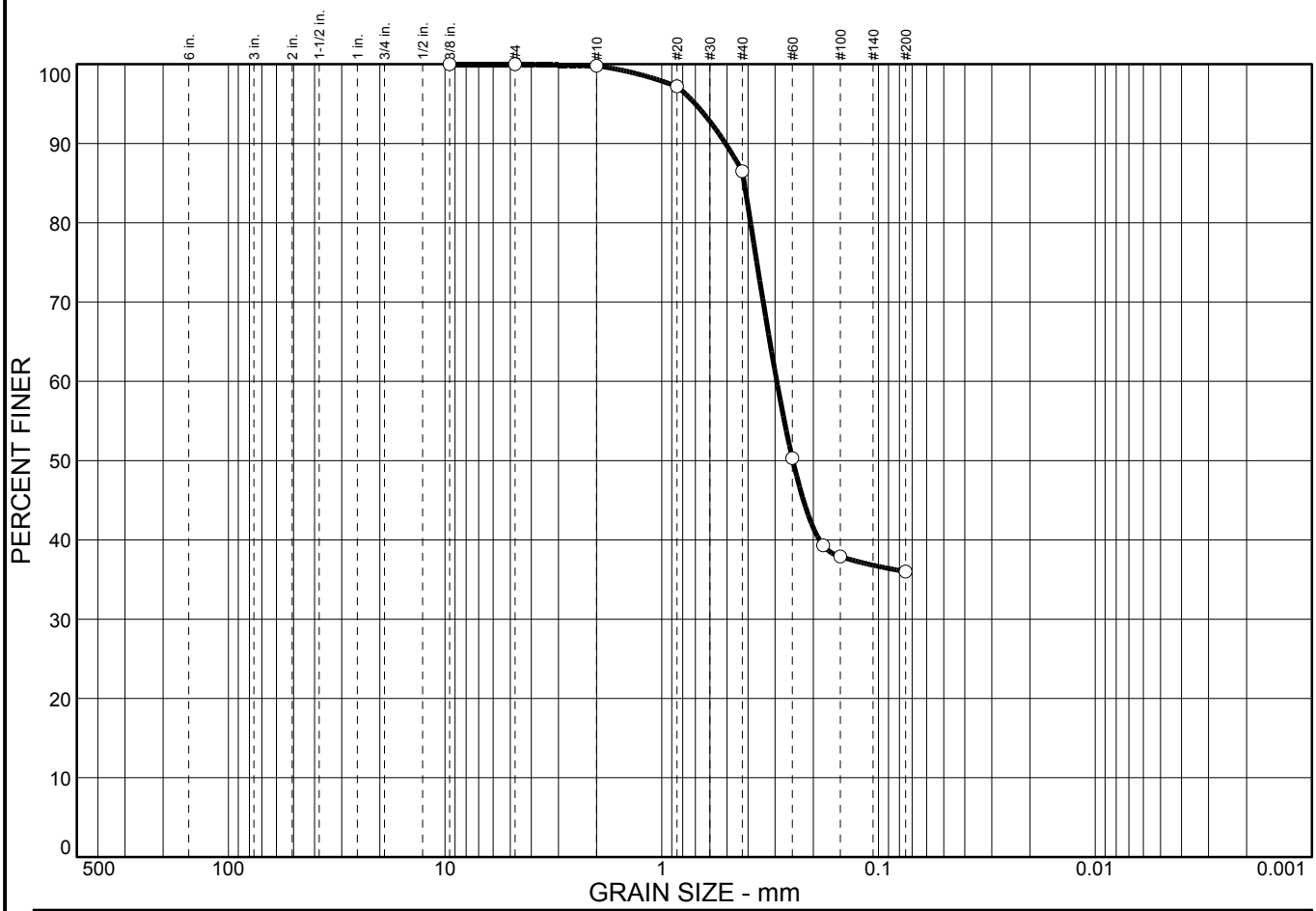
Gradation No. 20
Sample Obtained 10/5/10

Sample No.: Gradation No. 20 **Source of Sample:** **Date:** 10/5/10
Location: SWM5-1 **Elev./Depth:** 6.0-8.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G20

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	64.0	36.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	99.8		
#20	97.2		
#40	86.5		
#60	50.3		
#80	39.3		
#100	37.9		
#200	36.0		

* (no specification provided)

Soil Description

Tan, Clayey SAND

Atterberg Limits

PL= 16 LL= 28 PI= 12

Coefficients

D_{85}= 0.417 D_{60}= 0.295 D_{50}= 0.249
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-6(1)

Remarks

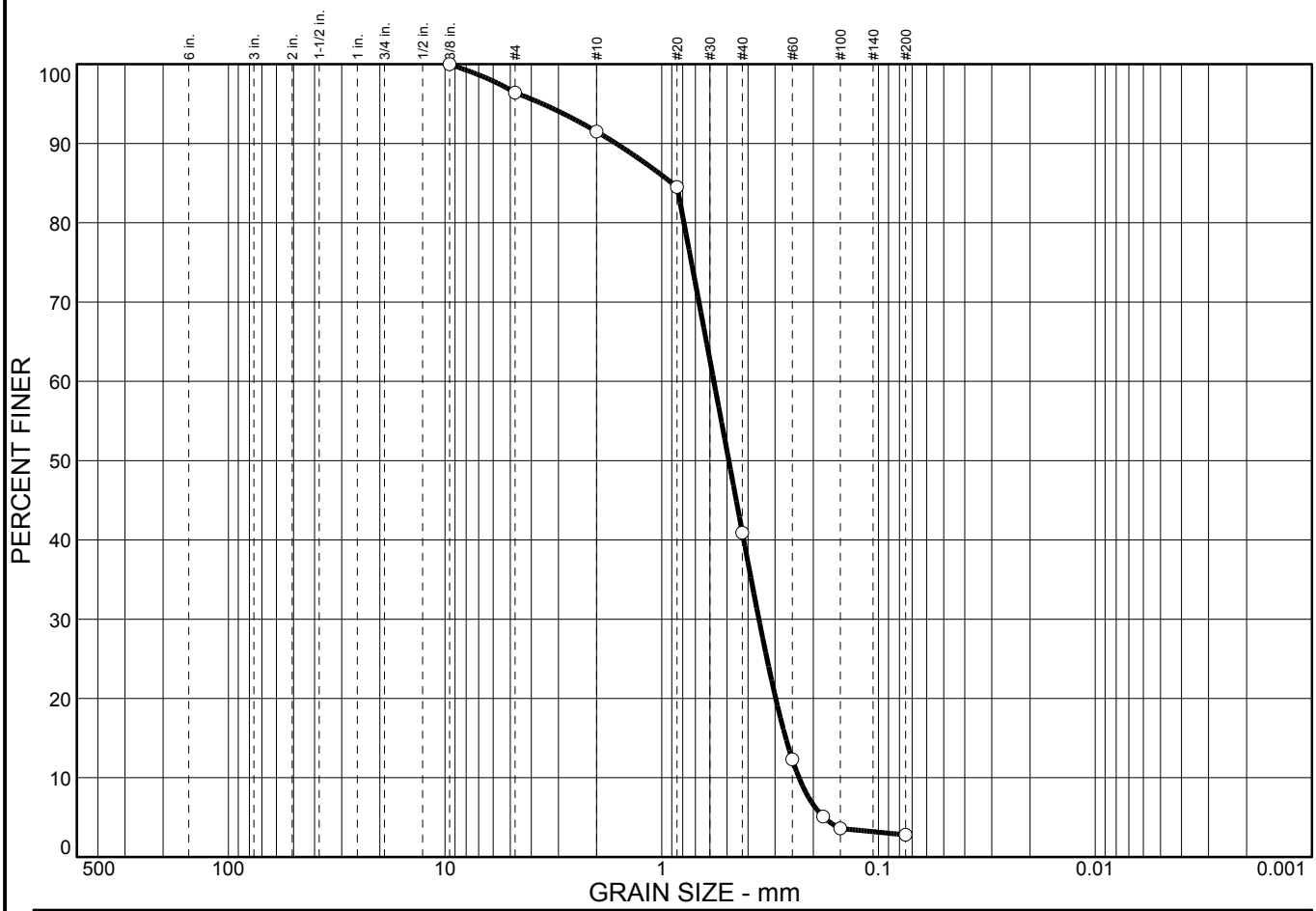
Gradation No. 21
Sample Obtained 10/5/10

Sample No.: Gradation No. 21 **Source of Sample:** **Date:** 10/5/10
Location: SWM5-2 **Elev./Depth:** 4.0-6.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G21

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.6	93.6	2.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	96.4		
#10	91.5		
#20	84.5		
#40	40.9		
#60	12.3		
#80	5.1		
#100	3.6		
#200	2.8		

* (no specification provided)

Soil Description

Brown, Poorly Graded SAND

Atterberg Limits

PL= NT LL= NT PI=

Coefficients

D_{85}= 0.897 D_{60}= 0.575 D_{50}= 0.491
D_{30}= 0.357 D_{15}= 0.268 D_{10}= 0.233
C_u= 2.47 C_c= 0.95

Classification

USCS= SP AASHTO= A-1-b

Remarks

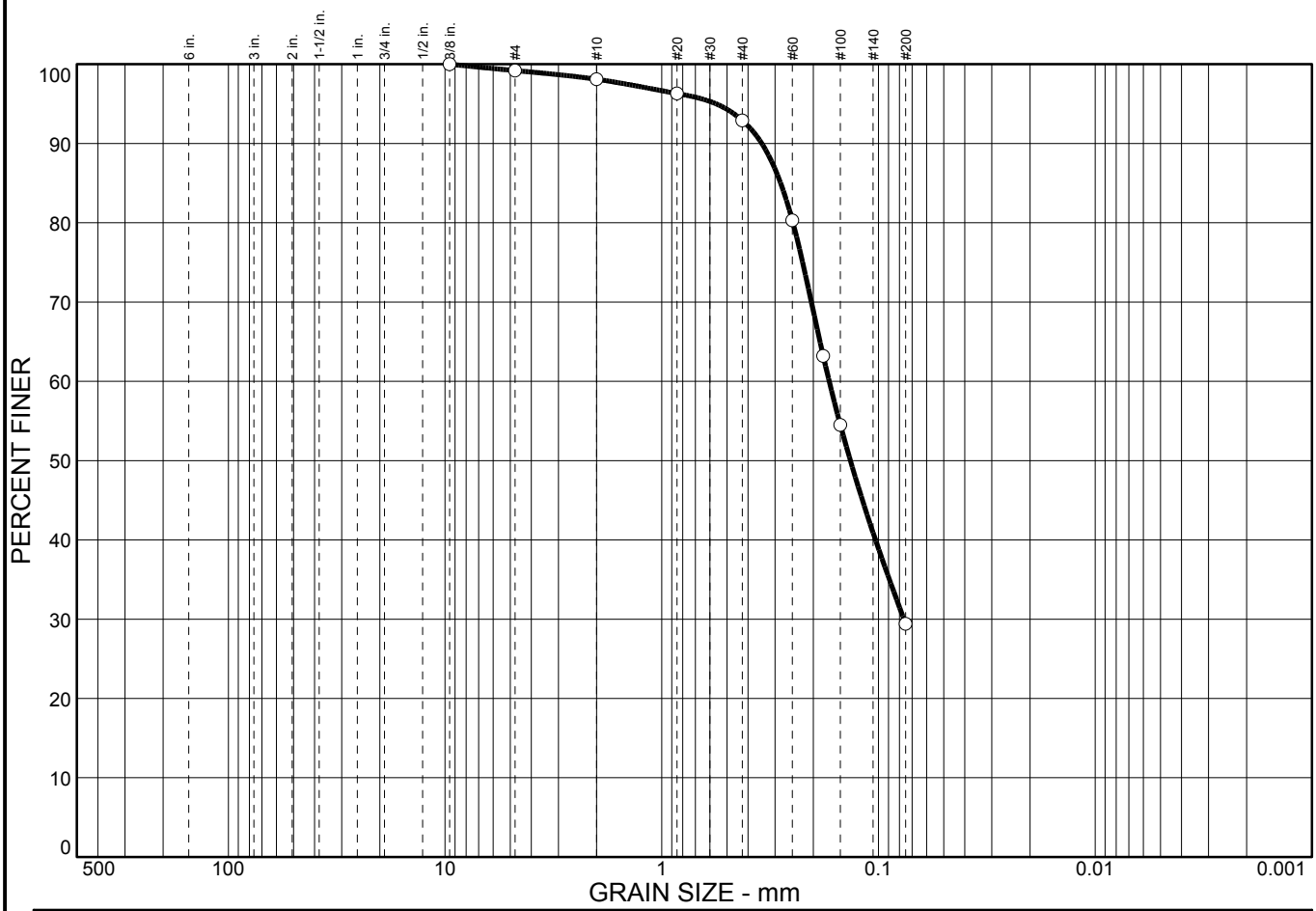
Gradation No. 22
Sample Obtained 10/5/10

Sample No.: Gradation No. 22 **Source of Sample:** **Date:** 10/5/10
Location: SWM5-2 **Elev./Depth:** 8.0-10.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G22

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.8	69.8	29.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.2		
#10	98.1		
#20	96.3		
#40	92.9		
#60	80.3		
#80	63.2		
#100	54.5		
#200	29.4		

* (no specification provided)

Soil Description

Gray, Silty SAND

Atterberg Limits

PL= NT LL= NT PI= NP

Coefficients

D_{85}= 0.283 D_{60}= 0.169 D_{50}= 0.135
D_{30}= 0.0764 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

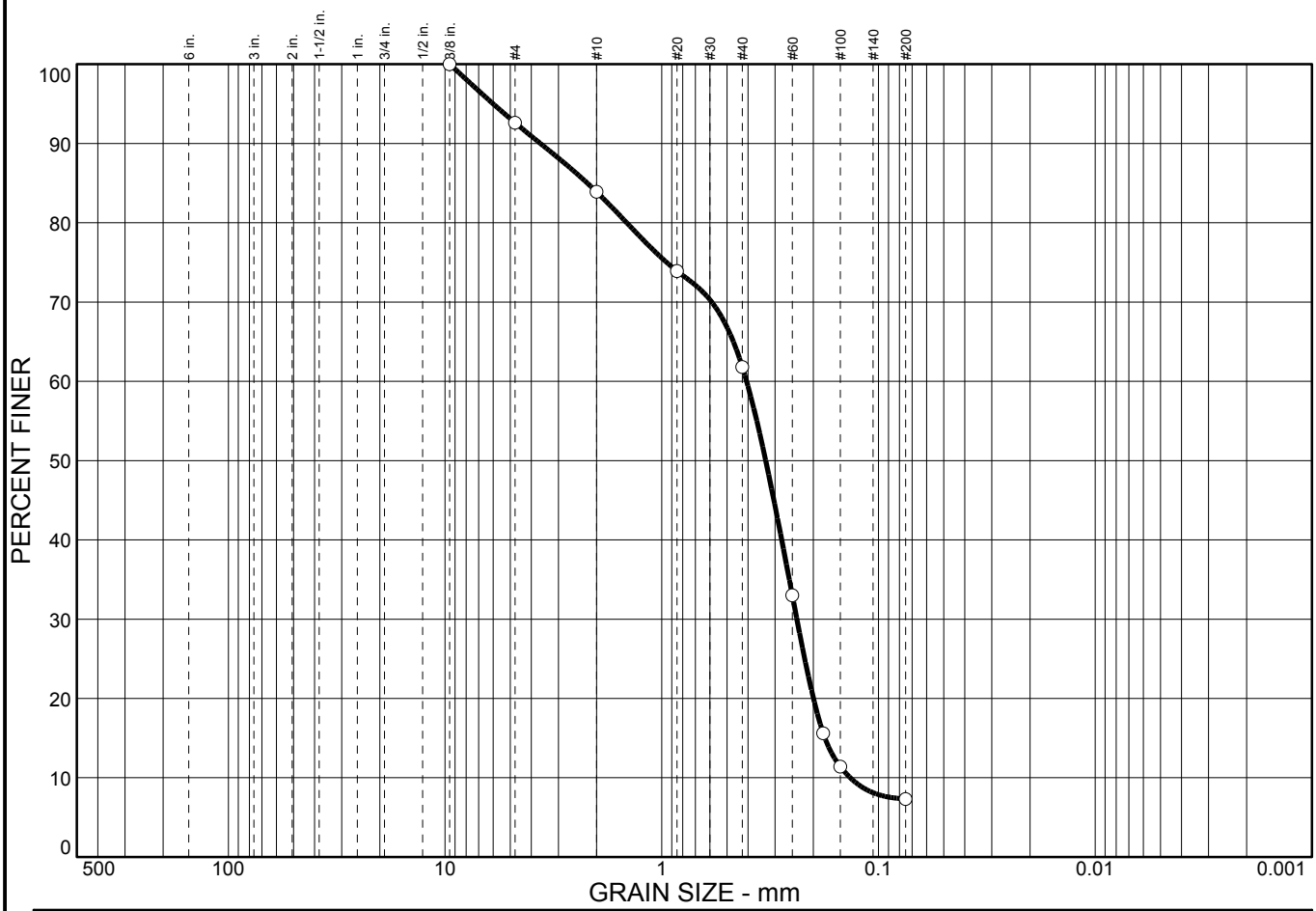
Gradation No. 23
Sample Obtained 10/5/10

Sample No.: Gradation No. 23 **Source of Sample:** **Date:** 10/5/10
Location: CUR-4B **Elev./Depth:** 8.0-10.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G23

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	7.4	85.3	7.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	92.6		
#10	83.9		
#20	73.9		
#40	61.8		
#60	33.0		
#80	15.6		
#100	11.4		
#200	7.3		

* (no specification provided)

Soil Description

Tan, Poorly Graded SAND with Silt

Atterberg Limits

PL= NT LL= NT PI=

Coefficients

D_{85}= 2.21 D_{60}= 0.406 D_{50}= 0.332
D_{30}= 0.238 D_{15}= 0.177 D_{10}= 0.135
C_u= 3.01 C_c= 1.03

Classification

USCS= SP-SM AASHTO= A-3

Remarks

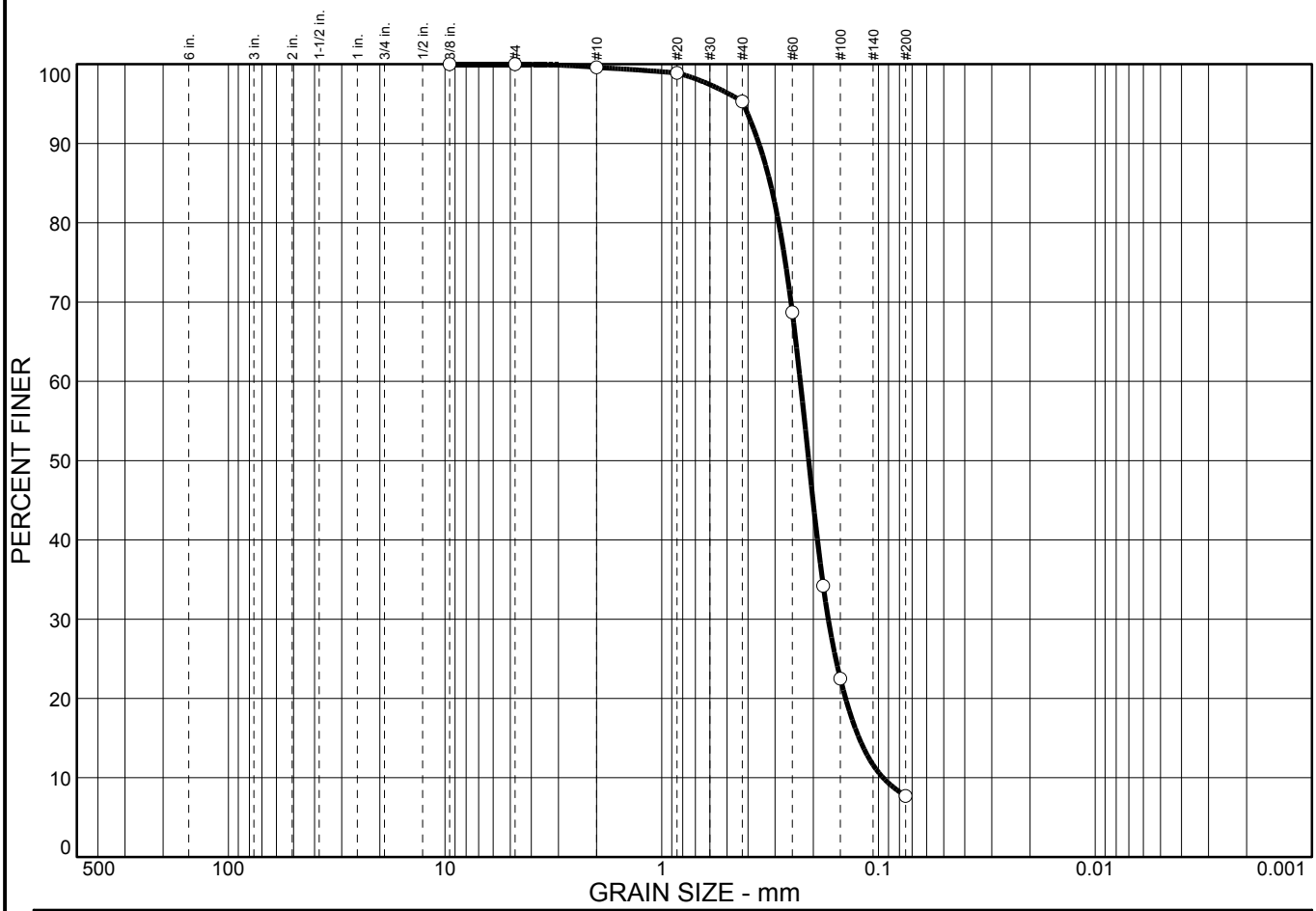
Gradation No. 24
Sample Obtained 10/5/10

Sample No.: Gradation No. 24 **Source of Sample:** **Date:** 10/5/10
Location: CUR-4B **Elev./Depth:** 23.0-25.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G24

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	92.3	7.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	99.6		
#20	98.9		
#40	95.3		
#60	68.7		
#80	34.2		
#100	22.5		
#200	7.7		

* (no specification provided)

Soil Description

Gray, Poorly Graded SAND with Silt

Atterberg Limits

PL= NT LL= NT PI=

Coefficients

D_{85}= 0.316 D_{60}= 0.230 D_{50}= 0.210
D_{30}= 0.171 D_{15}= 0.123 D_{10}= 0.0953
C_u= 2.41 C_c= 1.33

Classification

USCS= SP-SM AASHTO= A-3

Remarks

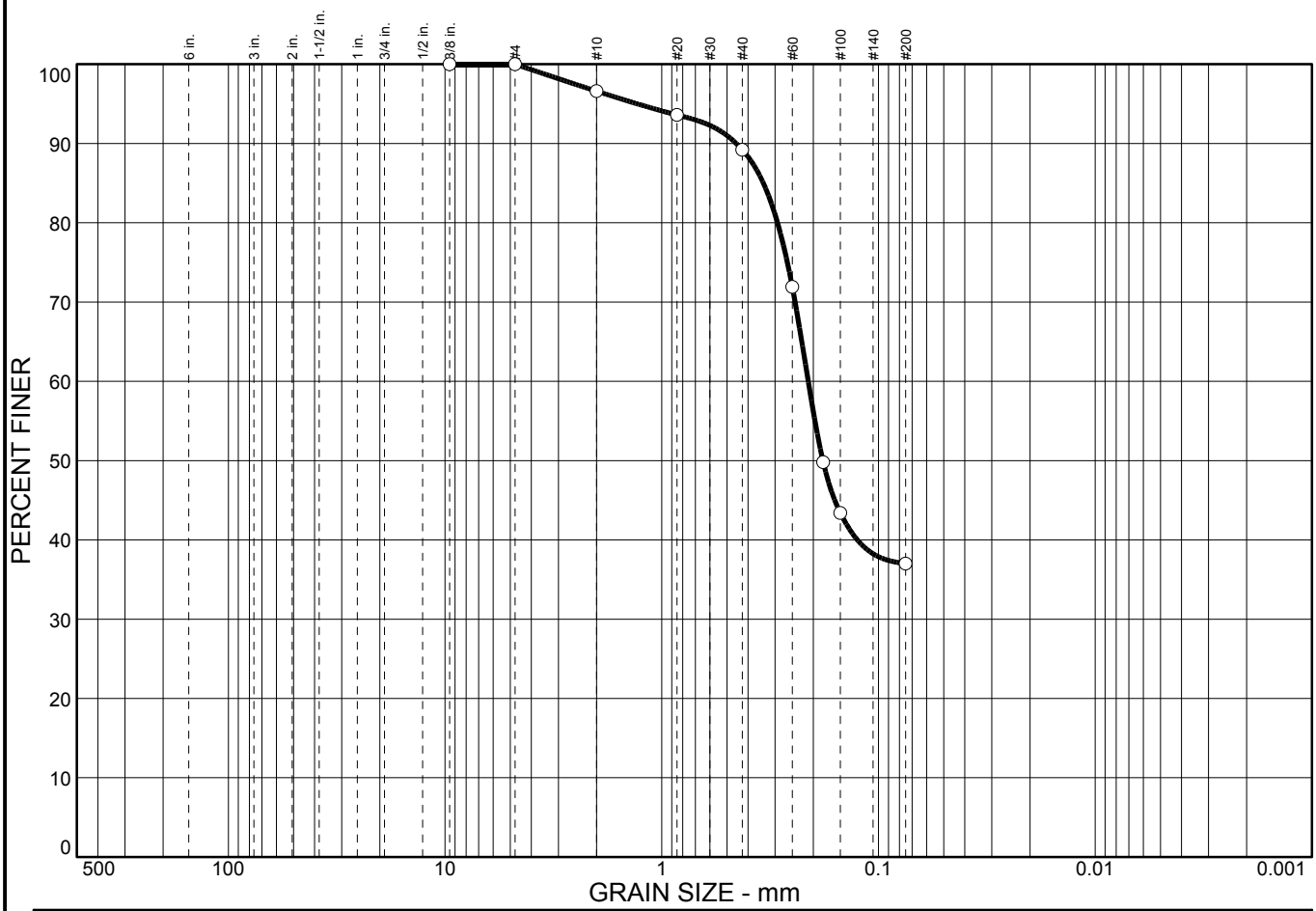
Gradation No. 25
Sample Obtained 10/5/10

Sample No.: Gradation No. 25 **Source of Sample:** **Date:** 10/5/10
Location: CUR-4B **Elev./Depth:** 38.0-40.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G25

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	63.0	37.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	96.6		
#20	93.6		
#40	89.2		
#60	71.9		
#80	49.8		
#100	43.4		
#200	37.0		

* (no specification provided)

Soil Description

Gray, Silty SAND

Atterberg Limits

PL= NT LL= NT PI= NP

Coefficients

D_{85}= 0.340 D_{60}= 0.211 D_{50}= 0.181
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

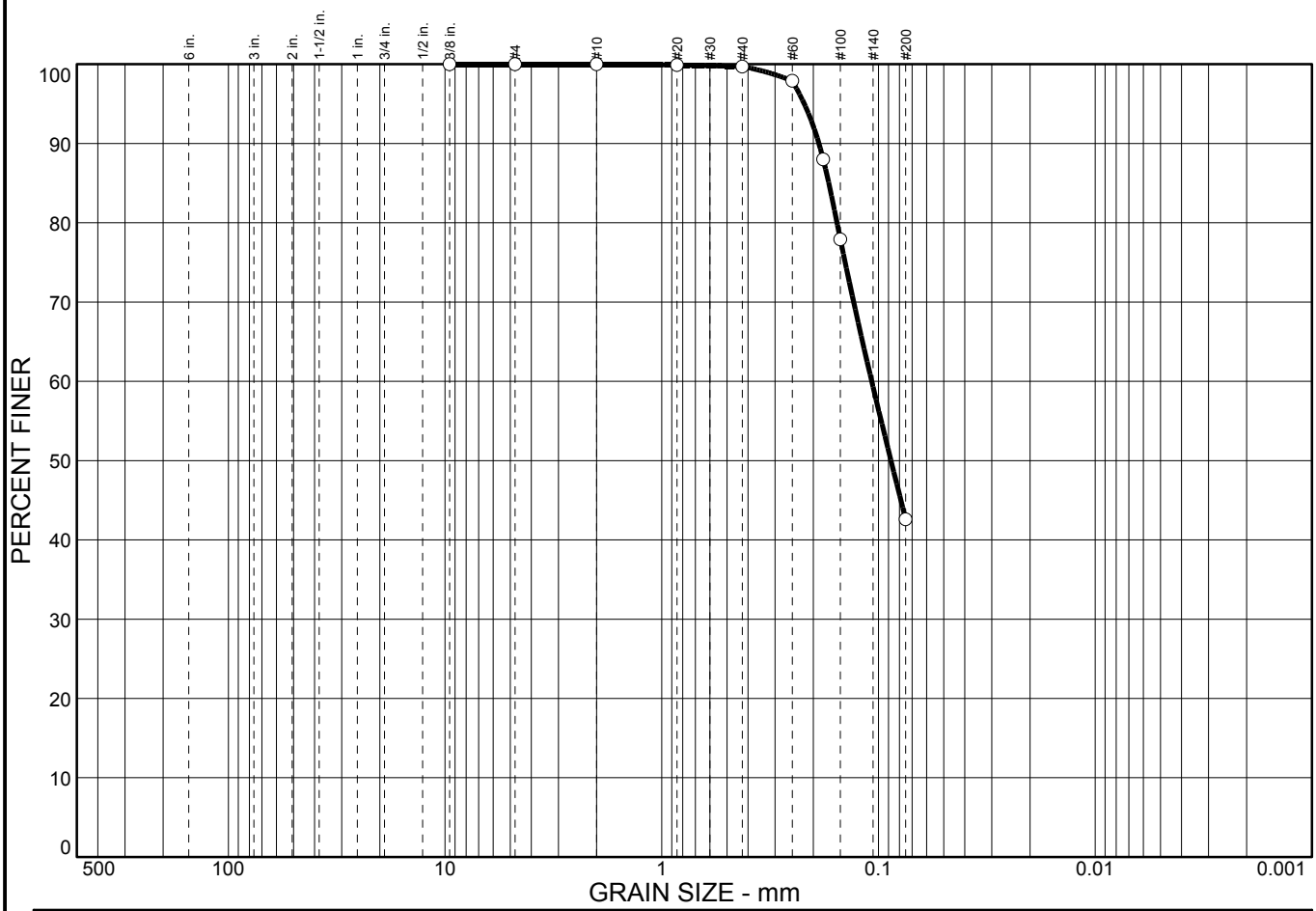
Gradation No. 26
Sample Obtained 10/5/10

Sample No.: Gradation No. 26 **Source of Sample:** **Date:** 10/5/10
Location: CUR-4B **Elev./Depth:** 53.0-55.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G26

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	57.4	42.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.7		
#60	97.9		
#80	88.0		
#100	77.9		
#200	42.6		

* (no specification provided)

Soil Description

Gray, Silty SAND

Atterberg Limits

PL= NT LL= NT PI=

Coefficients

D_{85}= 0.170 D_{60}= 0.108 D_{50}= 0.0876
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

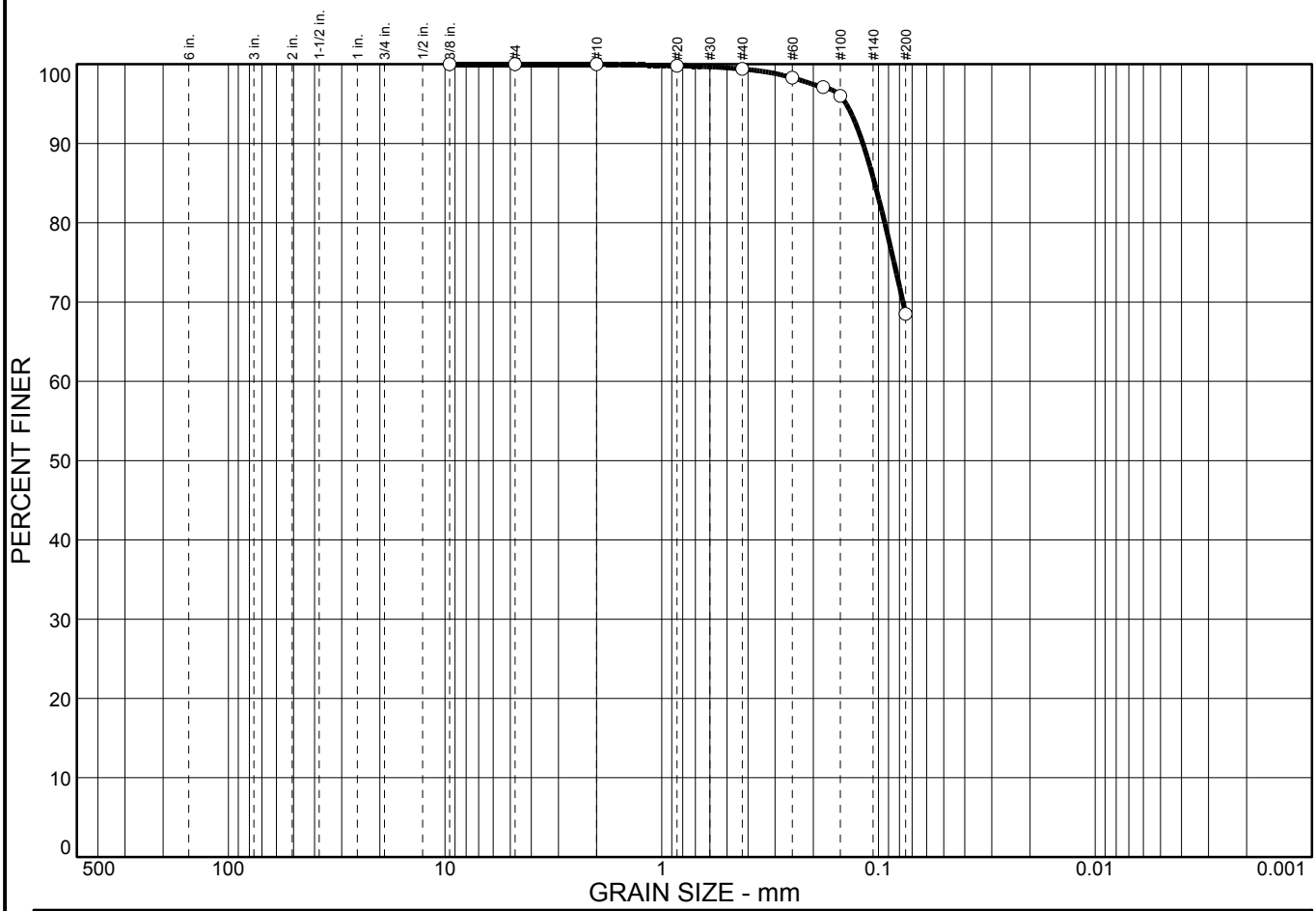
Gradation No. 27
Sample Obtained 10/5/10

Sample No.: Gradation No. 27 **Source of Sample:** **Date:** 10/5/10
Location: CUR-4B **Elev./Depth:** 63.0-65.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G27

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	31.5	68.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	100.0		
#20	99.8		
#40	99.4		
#60	98.3		
#80	97.1		
#100	96.0		
#200	68.5		

* (no specification provided)

Soil Description

Gray, Sandy Lean CLAY

Atterberg Limits

PL= 21 LL= 48 PI= 27

Coefficients

D_{85}= 0.104 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(17)

Remarks

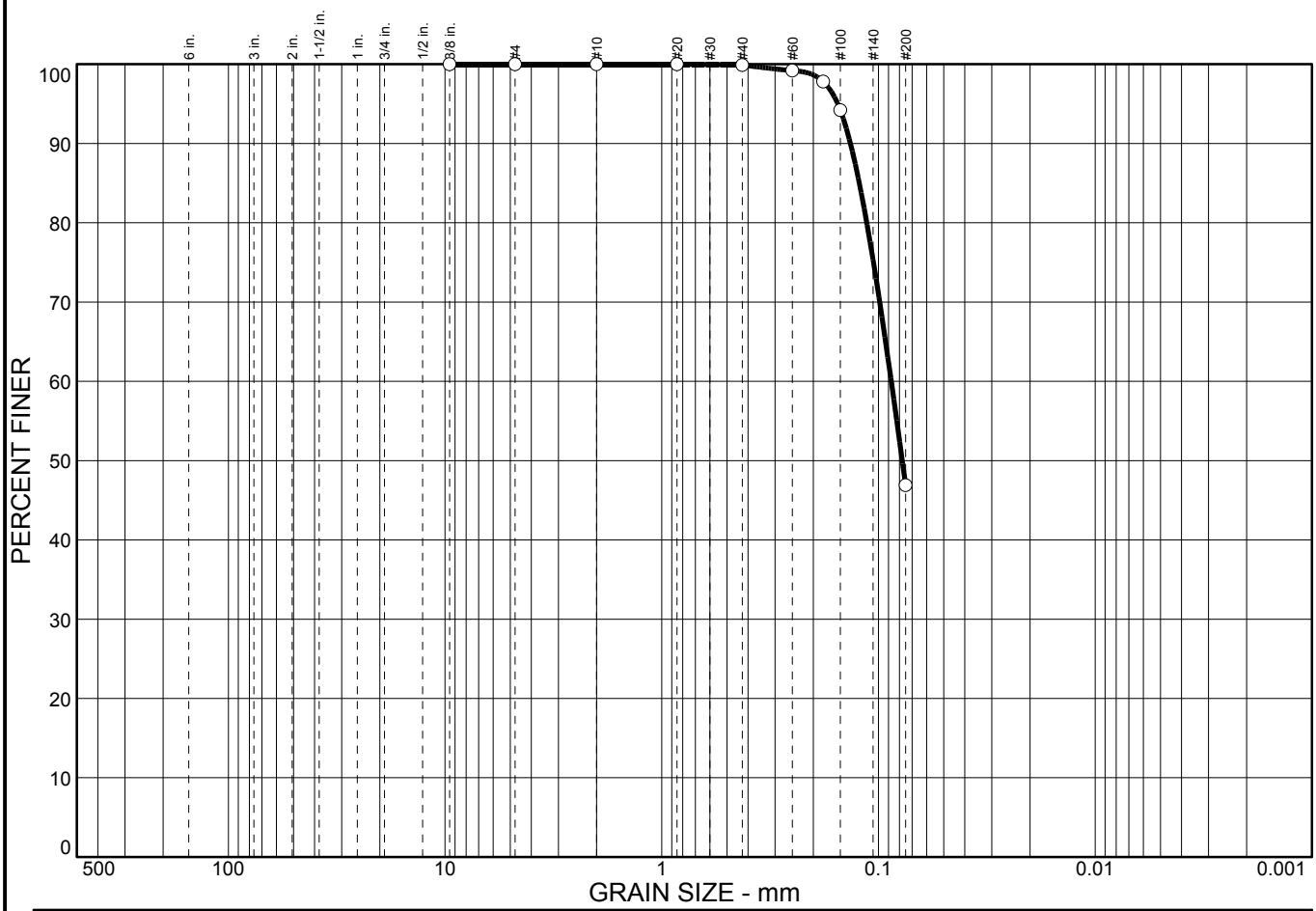
Gradation No. 28
Sample Obtained 10/5/10

Sample No.: Gradation No. 28 **Source of Sample:** **Date:** 10/5/10
Location: CUR-4B **Elev./Depth:** 68.0-70.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G28

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	53.1	46.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	100.0		
#20	100.0		
#40	99.9		
#60	99.2		
#80	97.8		
#100	94.2		
#200	46.9		

* (no specification provided)

Soil Description

Gray, Silty SAND

Atterberg Limits

PL= NT LL= NT PI=

Coefficients

D_{85}= 0.123 D_{60}= 0.0874 D_{50}= 0.0777
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

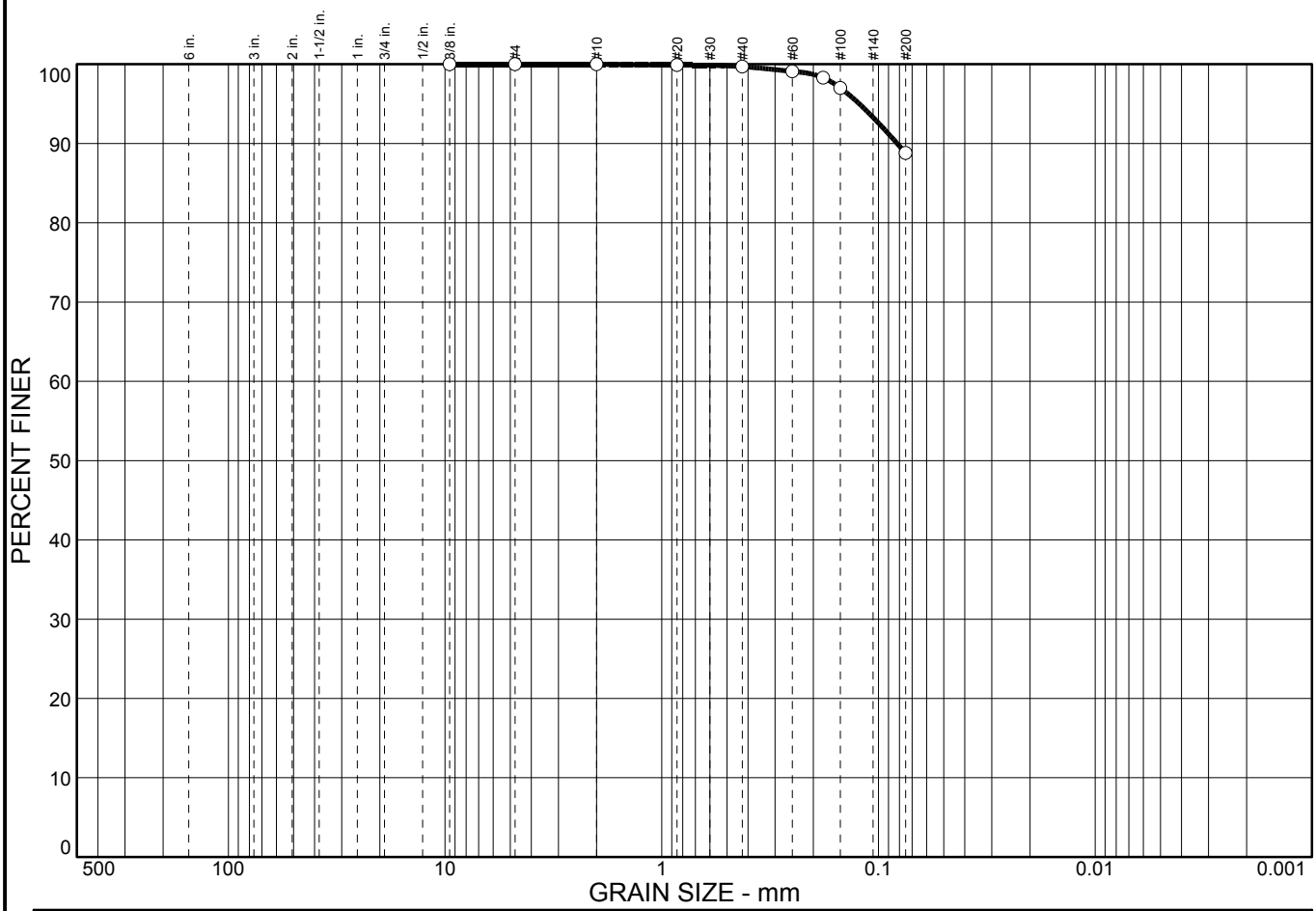
Gradation No. 29
Sample Obtained 10/5/10

Sample No.: Gradation No. 29 **Source of Sample:** **Date:** 10/5/10
Location: CUR-4B **Elev./Depth:** 78.0-80.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G29

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	11.2	88.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.7		
#60	99.1		
#80	98.3		
#100	97.0		
#200	88.8		

* (no specification provided)

Soil Description

Gray, Fat CLAY

Atterberg Limits

PL= 33 LL= 70 PI= 37

Coefficients

D_{85}= D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(39)

Remarks

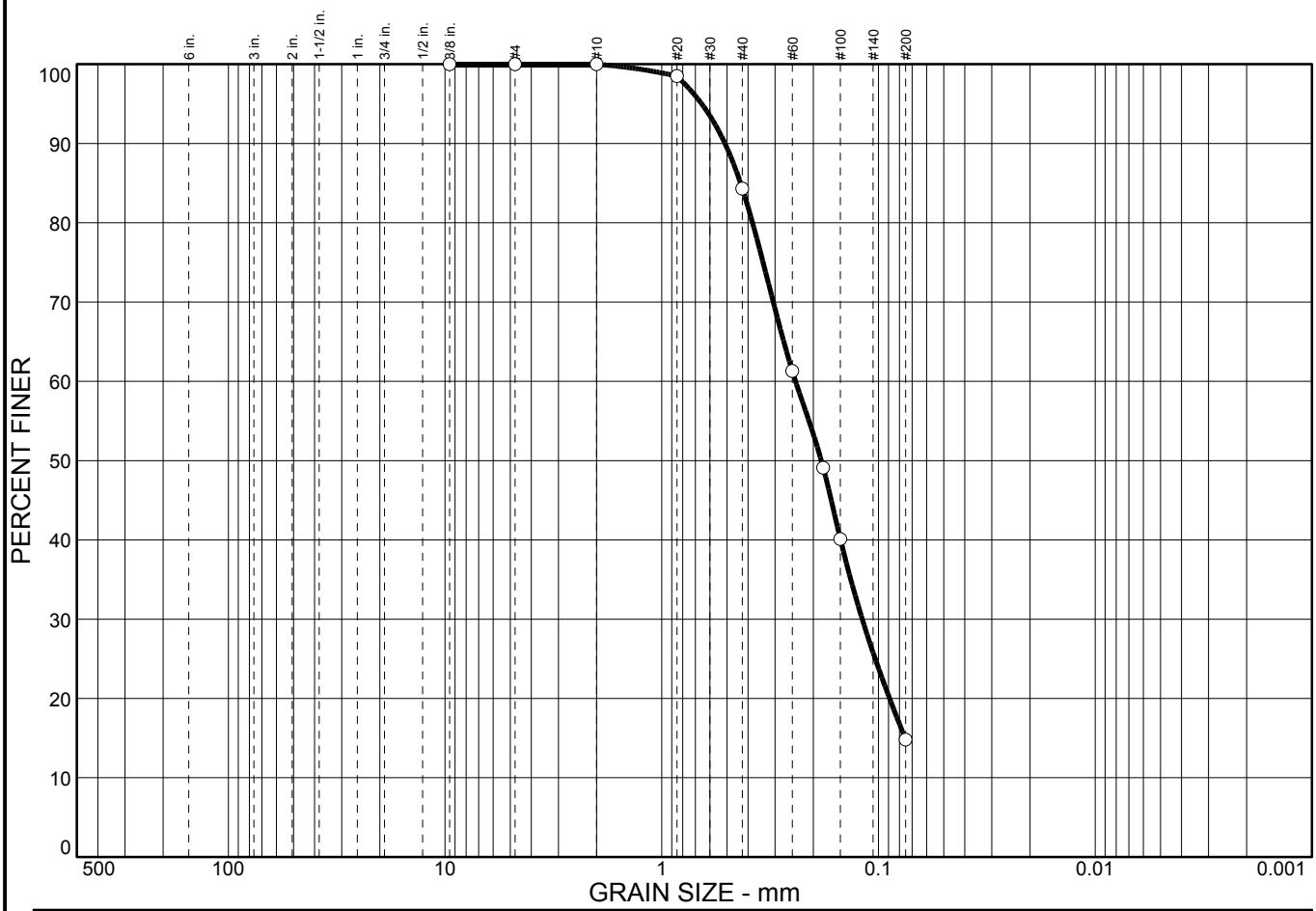
Gradation No. 30
Sample Obtained 10/5/10

Sample No.: Gradation No. 30 **Source of Sample:** **Date:** 10/5/10
Location: CUR-4B **Elev./Depth:** 98.0-100.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G30

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	85.2	14.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	100.0		
#20	98.5		
#40	84.3		
#60	61.3		
#80	49.1		
#100	40.1		
#200	14.8		

* (no specification provided)

Soil Description

Gray, Silty SAND

Atterberg Limits

PL= NT LL= NT PI= NP

Coefficients

D_{85}= 0.433 D_{60}= 0.241 D_{50}= 0.184
D_{30}= 0.119 D_{15}= 0.0755 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

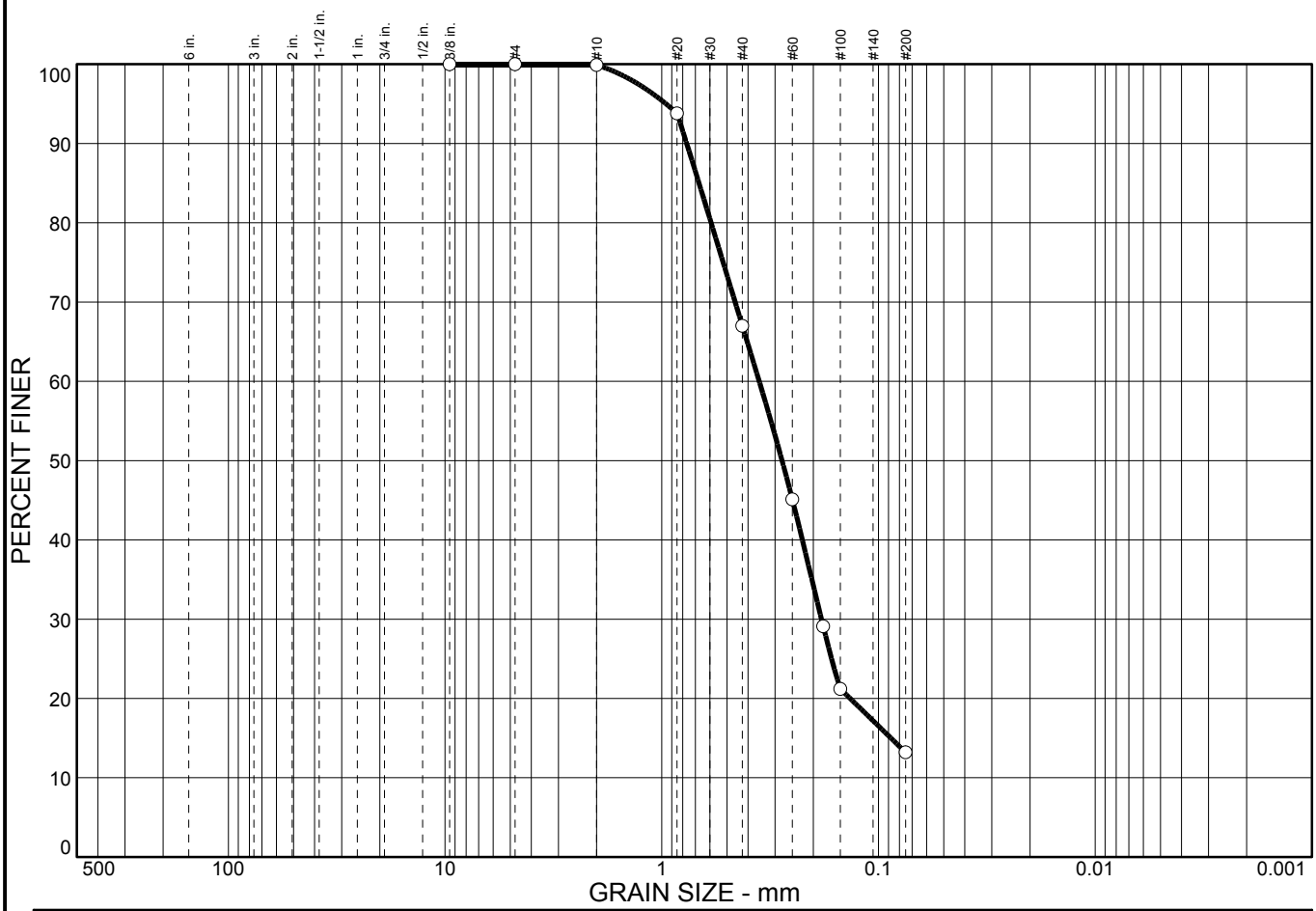
Gradation No. 31
Sample Obtained 10/5/10

Sample No.: Gradation No. 31 **Source of Sample:** **Date:** 10/5/10
Location: CUR-4B **Elev./Depth:** 108.0-110.0

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G31

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	86.8	13.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	99.9		
#20	93.8		
#40	67.0		
#60	45.1		
#80	29.1		
#100	21.2		
#200	13.2		

* (no specification provided)

Soil Description

Gray, Silty SAND

Atterberg Limits

PL= NT LL= NT PI= NP

Coefficients

D_{85}= 0.674 D_{60}= 0.355 D_{50}= 0.279
D_{30}= 0.183 D_{15}= 0.0877 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

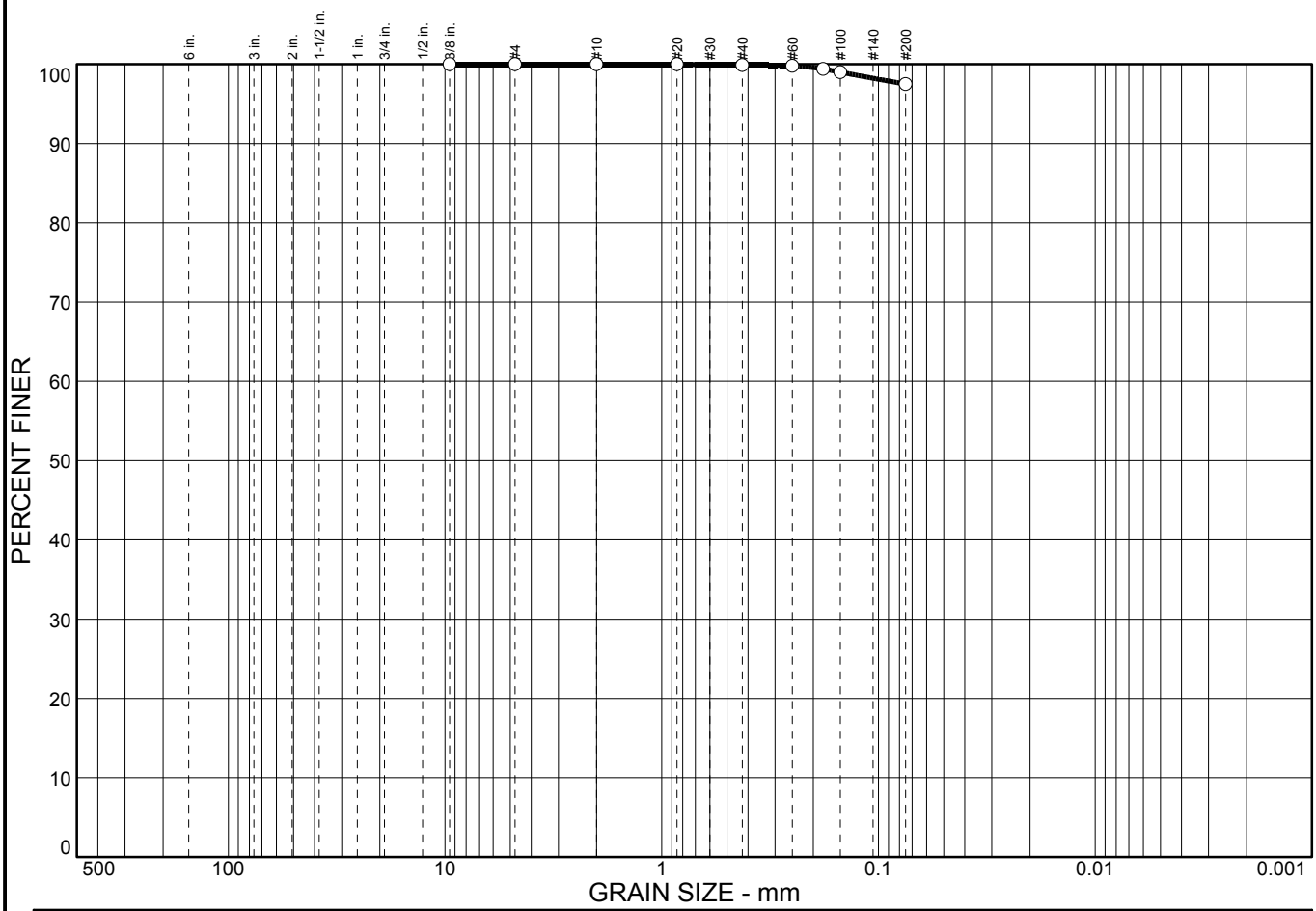
Gradation No. 32
Sample Obtained 10/5/10

Sample No.: Gradation No. 32 **Source of Sample:** **Date:** 10/5/10
Location: CUR-4B **Elev./Depth:** 118.0-120.0

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G32

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	2.5	97.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	100.0		
#20	100.0		
#40	99.9		
#60	99.8		
#80	99.4		
#100	99.0		
#200	97.5		

* (no specification provided)

Soil Description

Gray, Fat CLAY

Atterberg Limits

PL= 33 LL= 93 PI= 60

Coefficients

D_{85}= D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(71)

Remarks

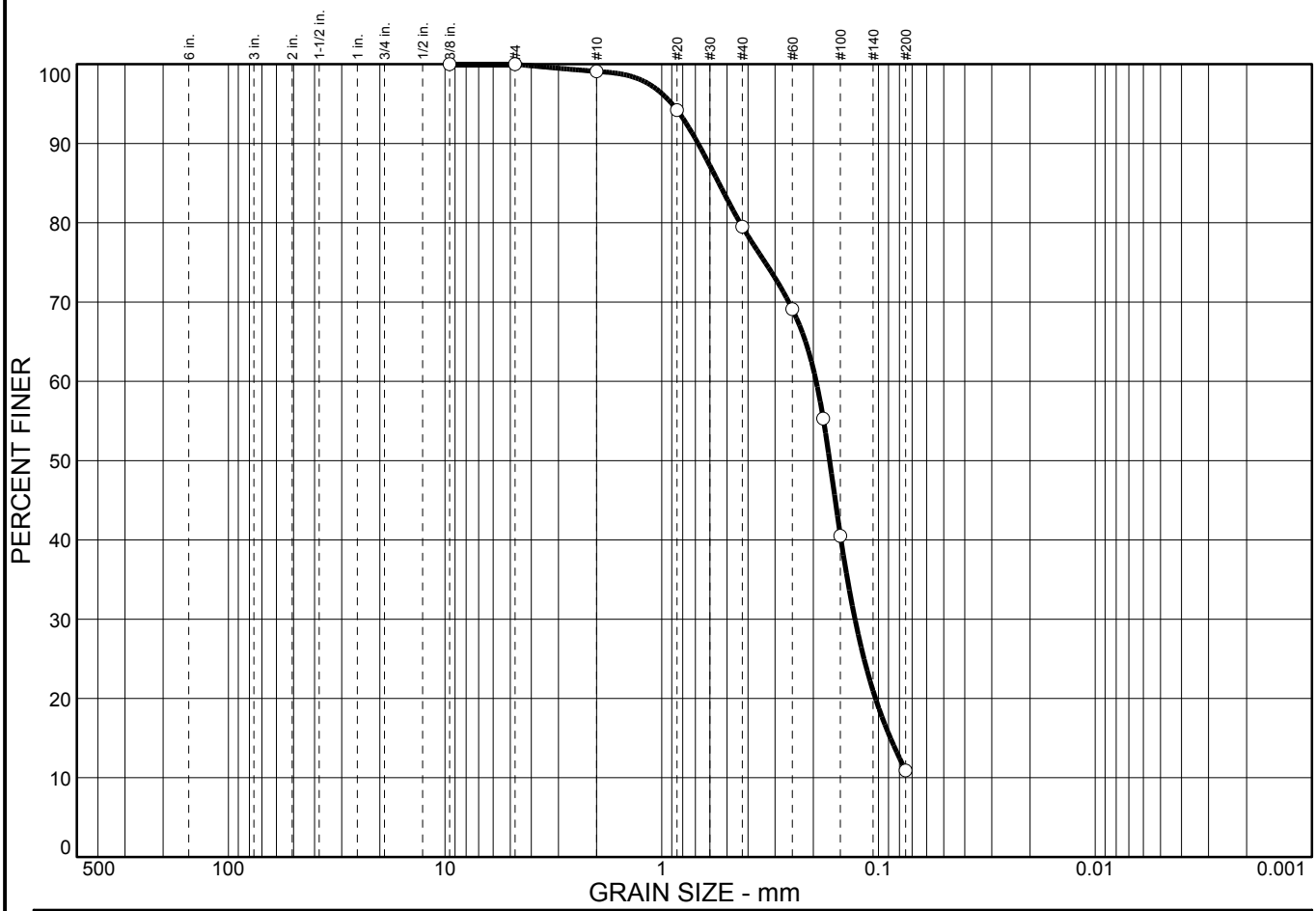
Gradation No. 33
Sample Obtained 10/5/10

Sample No.: Gradation No. 33 **Source of Sample:** **Date:** 10/5/10
Location: CUR-4B **Elev./Depth:** 128.0-130.0

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G33

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	89.1	10.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	99.1		
#20	94.2		
#40	79.5		
#60	69.1		
#80	55.3		
#100	40.5		
#200	10.9		

* (no specification provided)

Soil Description

Gray, Poorly Graded SAND with Silt

Atterberg Limits

PL= NT LL= NT PI= NP

Coefficients

D_{85}= 0.545 D_{60}= 0.194 D_{50}= 0.168
D_{30}= 0.128 D_{15}= 0.0881 D_{10}=
C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-2-4(0)

Remarks

Gradation No. 34
Sample Obtained 10/5/10

Sample No.: Gradation No. 34 **Source of Sample:** **Date:** 10/5/10
Location: CUR-4B **Elev./Depth:** 143.0-145.0

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G34

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	68.1	31.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	99.8		
#20	99.6		
#40	99.3		
#60	98.8		
#80	96.7		
#100	91.7		
#200	31.9		

* (no specification provided)

Soil Description

Gray, Silty SAND

Atterberg Limits

PL= NT LL= NT PI=

Coefficients

D_{85}= 0.132 D_{60}= 0.0980 D_{50}= 0.0888
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

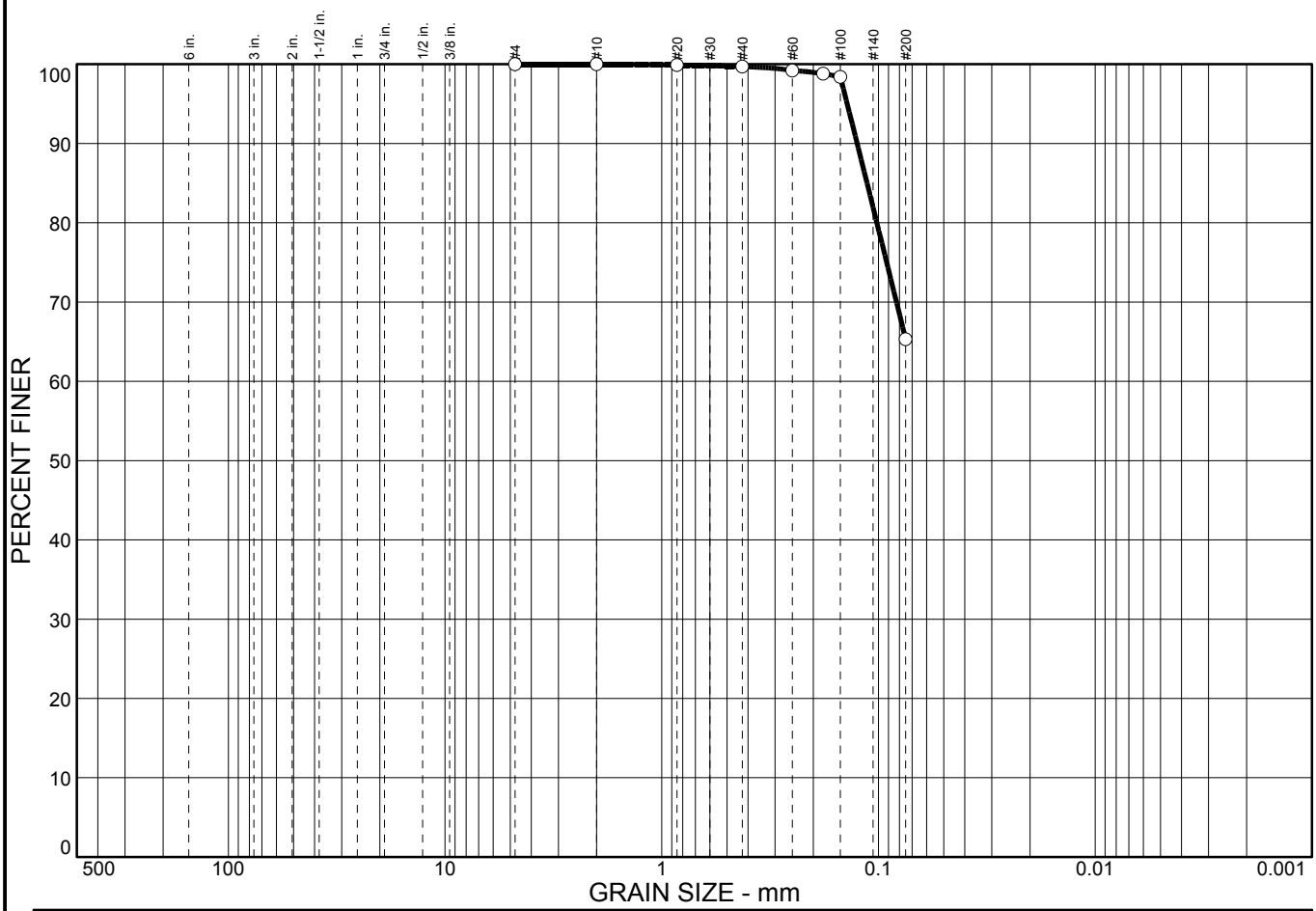
Gradation No. 35
Sample Obtained 10/5/10

Sample No.: Gradation No. 35 **Source of Sample:** **Date:** 10/5/10
Location: CUR-4B **Elev./Depth:** 153.0-155.0

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G35

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	34.7	65.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.7		
#60	99.2		
#80	98.8		
#100	98.4		
#200	65.3		

* (no specification provided)

Soil Description

Gray, Sandy SILT

Atterberg Limits

PL= 27 LL= 38 PI= 11

Coefficients

D_{85}= 0.113 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO= A-6(6)

Remarks

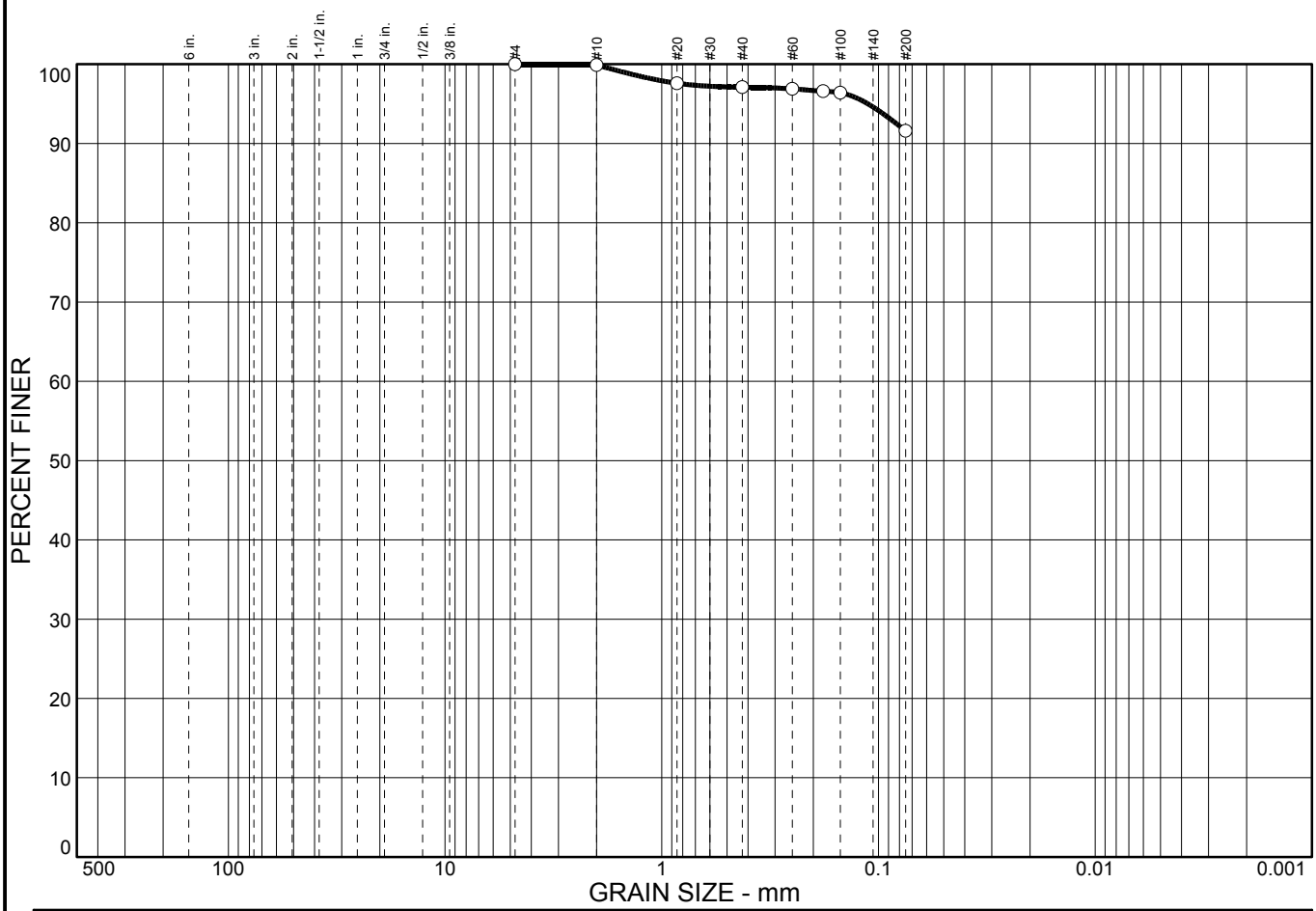
Gradation No. 36
Sample Obtained 10/5/10

Sample No.: Gradation No. 36 **Source of Sample:** **Date:** 10/5/10
Location: 164SB-7 **Elev./Depth:** 28.0-30.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G36

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	8.4	91.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	97.6		
#40	97.1		
#60	96.9		
#80	96.6		
#100	96.4		
#200	91.6		

* (no specification provided)

Soil Description

Gray, Lean CLAY

Atterberg Limits

PL= 24 LL= 43 PI= 19

Coefficients

D_{85}= D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(19)

Remarks

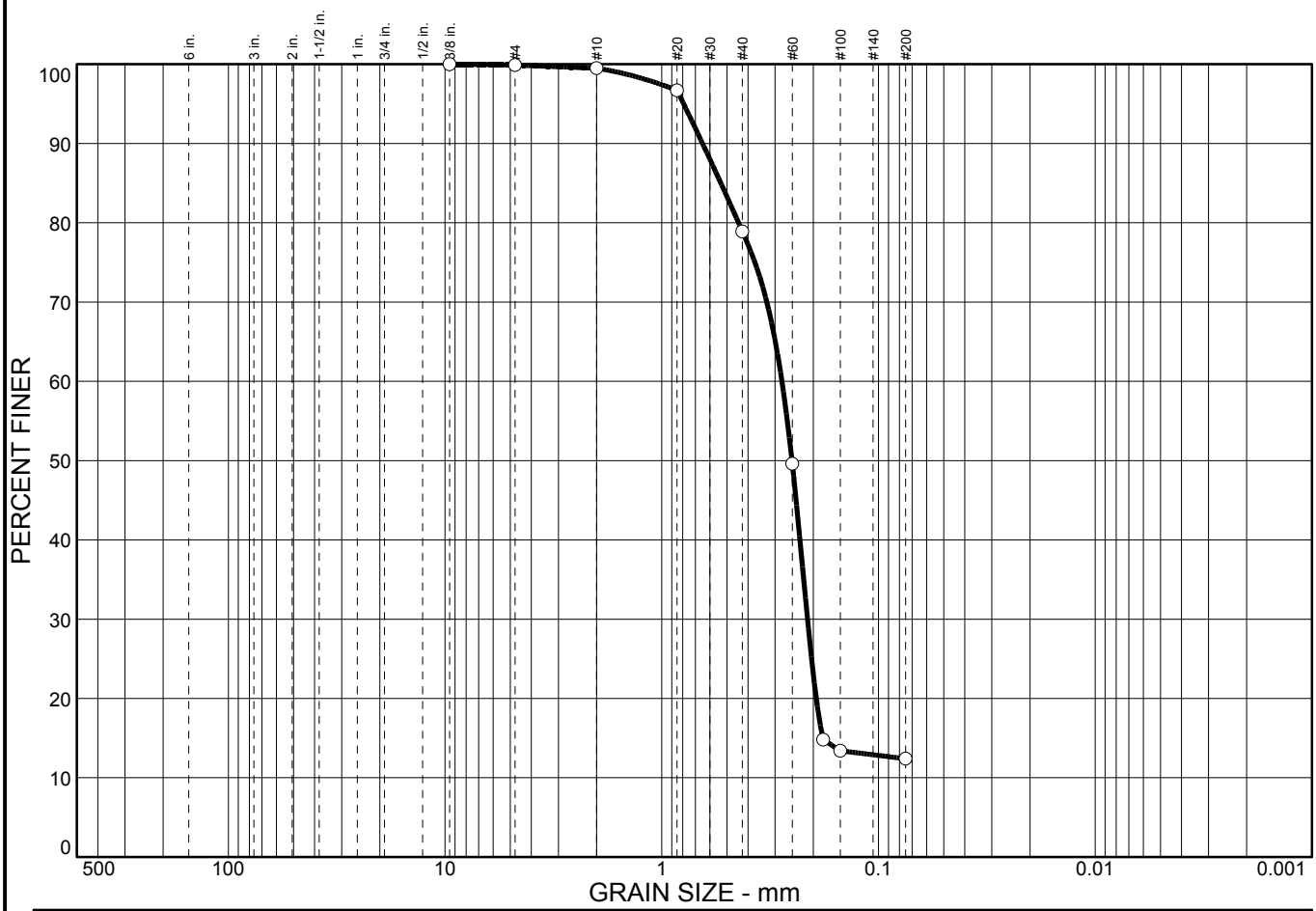
Gradation No. 37
Sample Obtained 10/5/10

Sample No.: Gradation No. 37 **Source of Sample:** **Date:** 10/5/10
Location: 164SB-7 **Elev./Depth:** 43.0-45.0 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** G37

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	87.5	12.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.9		
#10	99.5		
#20	96.7		
#40	78.9		
#60	49.6		
#80	14.8		
#100	13.4		
#200	12.4		

* (no specification provided)

Soil Description

Tan-Orange, Poorly Graded SAND with Silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.534 D_{60}= 0.279 D_{50}= 0.251
D_{30}= 0.213 D_{15}= 0.181 D_{10}=
C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-2-4(0)

Remarks

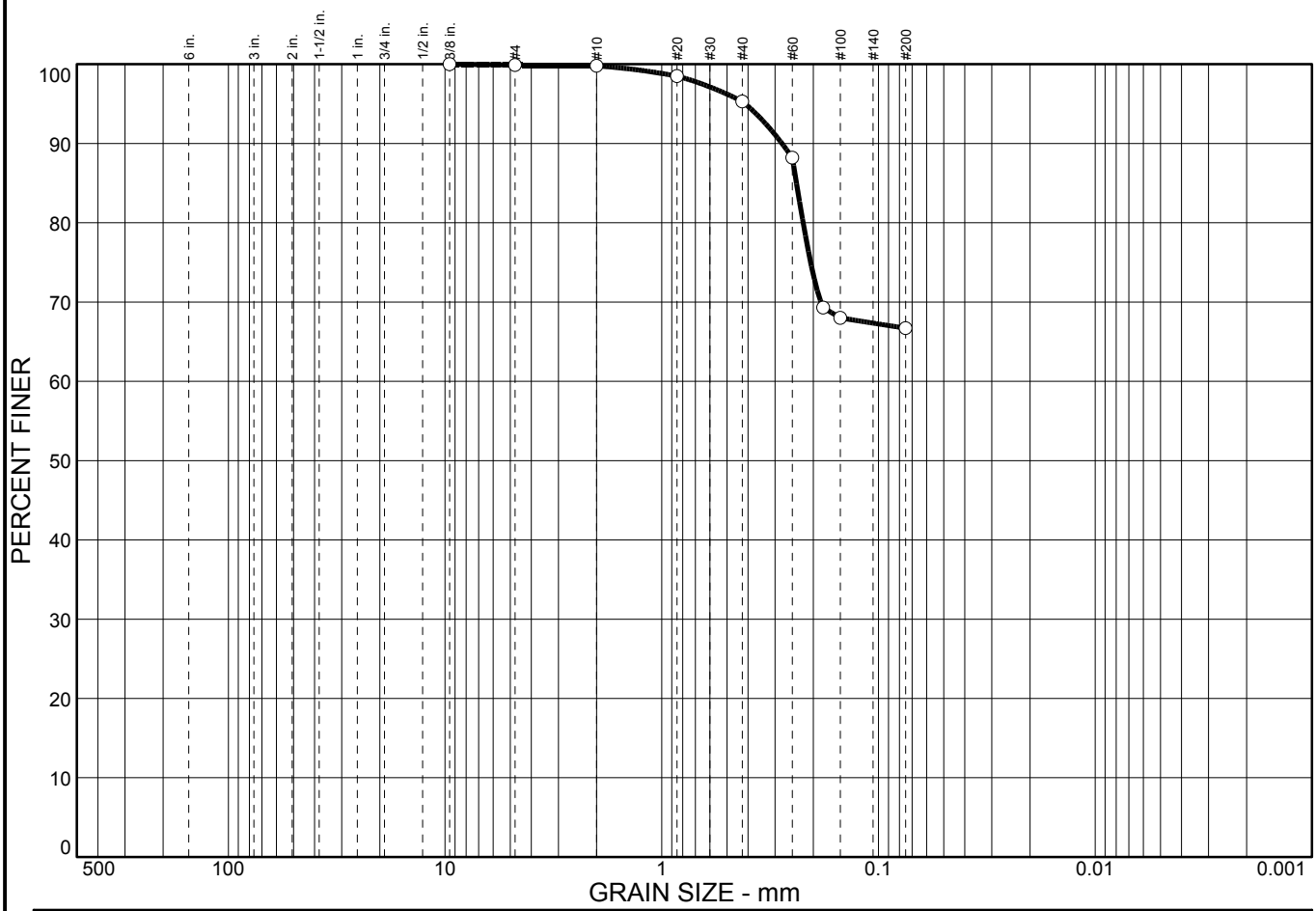
CBR-SWM4-1
Sample Obtained 9/16/10

Sample No.: CBR-SWM4-1 **Source of Sample:** **Date:** 9/16/10
Location: SWM4-1 (See Plans) **Elev./Depth:** 3-15 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** SWM4-1a

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	33.2	66.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.9		
#10	99.8		
#20	98.5		
#40	95.3		
#60	88.2		
#80	69.3		
#100	68.0		
#200	66.7		

* (no specification provided)

Soil Description

Tan, Sandy Lean CLAY

Atterberg Limits

PL= 15 LL= 27 PI= 12

Coefficients

D_{85}= 0.239 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(5)

Remarks

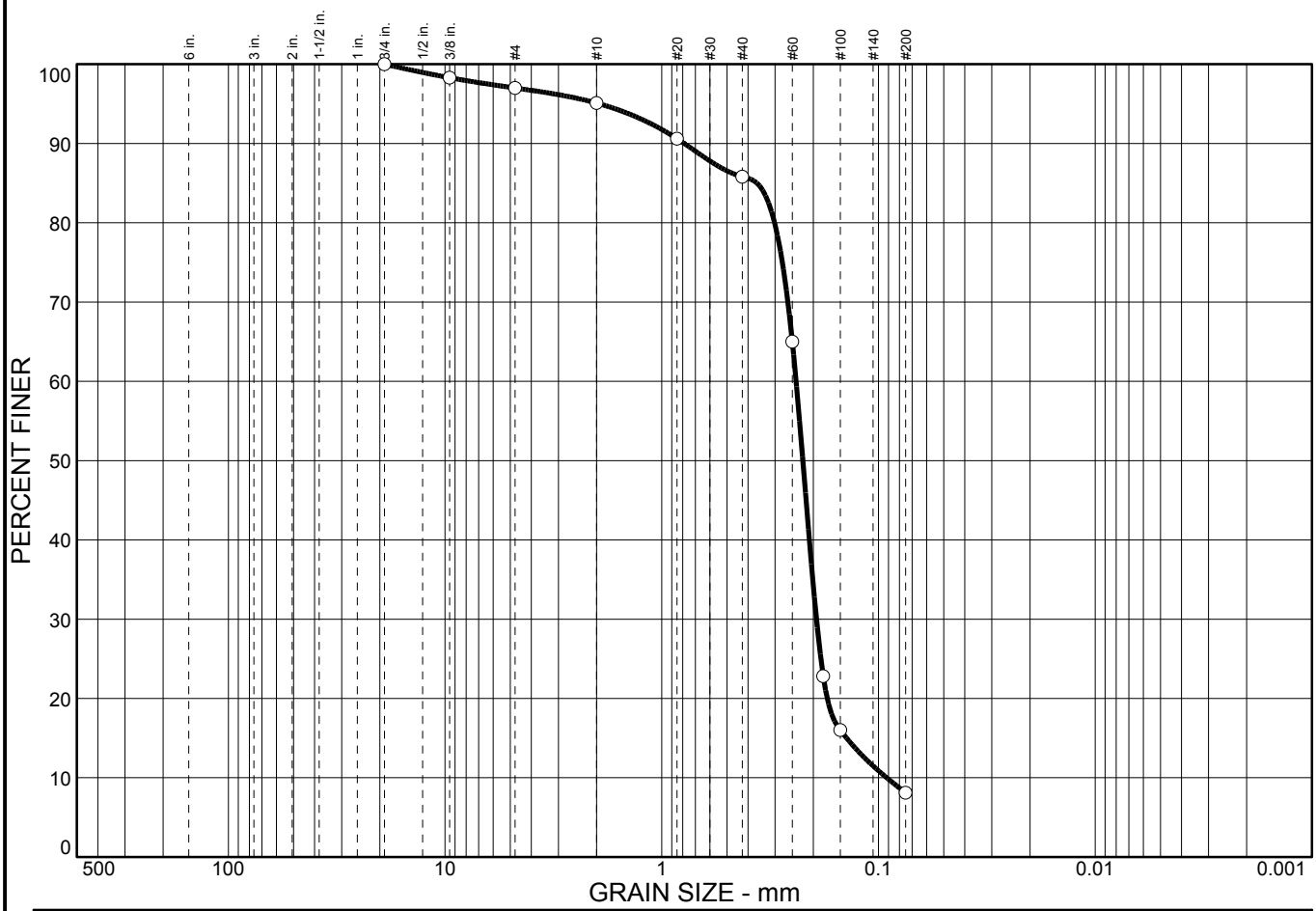
CBR-SWM52
Sample Obtained 10/20/10

Sample No.: CBR-SWM5-2 **Source of Sample:** **Date:** 10/20/10
Location: SWM5-2 (See Plans) **Elev./Depth:** 0-10 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** SWM5-2a

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.0	88.9	8.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	98.3		
#4	97.0		
#10	95.1		
#20	90.6		
#40	85.8		
#60	65.0		
#80	22.8		
#100	16.0		
#200	8.1		

* (no specification provided)

Soil Description

Tan, Poorly Graded SAND with Silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.364 D_{60}= 0.240 D_{50}= 0.224
D_{30}= 0.193 D_{15}= 0.140 D_{10}= 0.0917
C_u= 2.62 C_c= 1.70

Classification

USCS= SP-SM AASHTO= A-3

Remarks

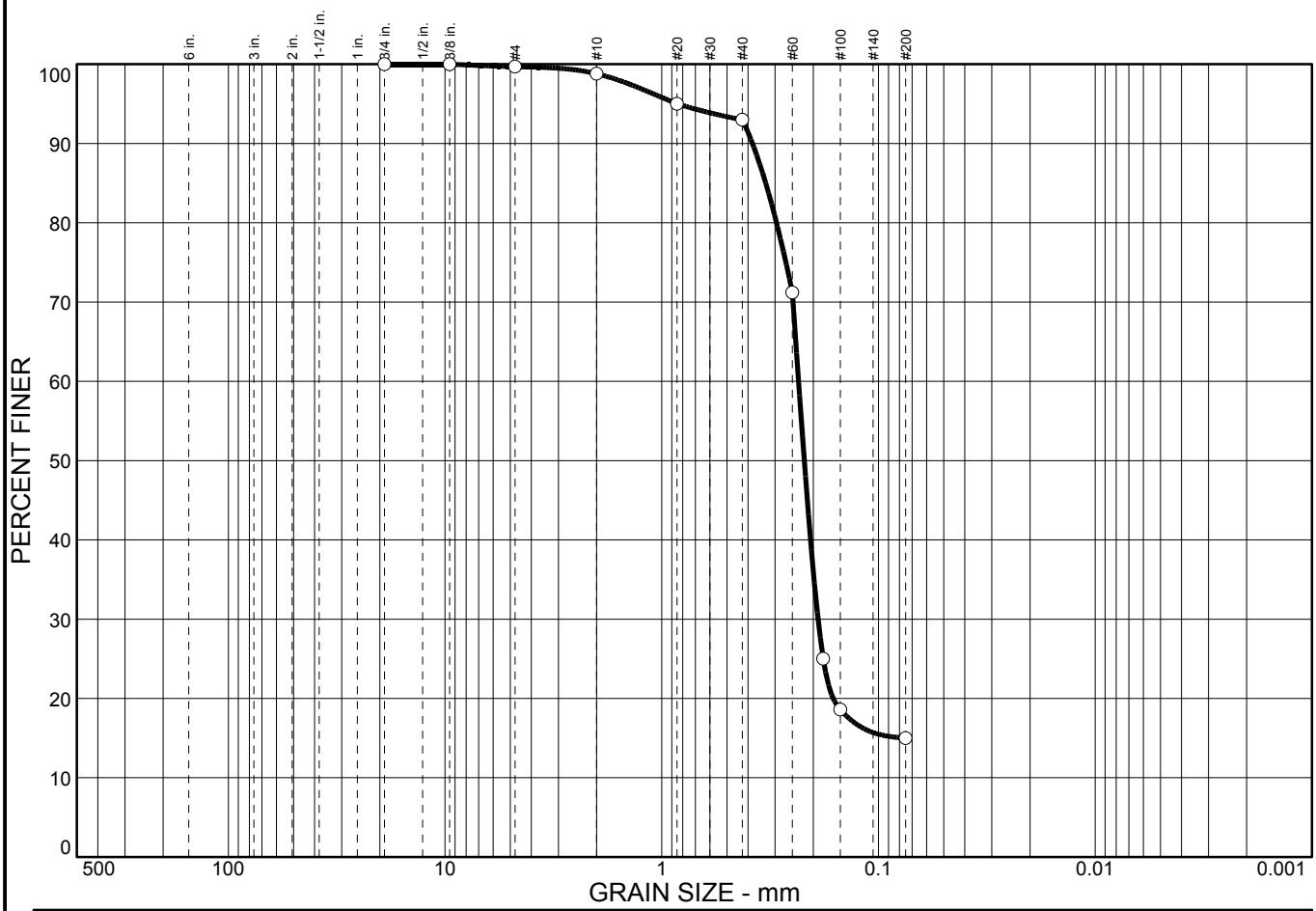
CBR-WB-2 & 4
Sample Obtained 9/13/10

Sample No.: CBR-WB-2 **Source of Sample:** **Date:** 9/13/10
Location: I64WB-2 & 4 Combined (See Plans) **Elev./Depth:** 1-4 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** WB-2&4a

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	84.7	15.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	100.0		
#4	99.7		
#10	98.8		
#20	95.0		
#40	93.0		
#60	71.2		
#80	25.0		
#100	18.6		
#200	15.0		

* (no specification provided)

Soil Description

Tan, Silty SAND

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.332 D_{60}= 0.234 D_{50}= 0.220
D_{30}= 0.190 D_{15}= 0.0750 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

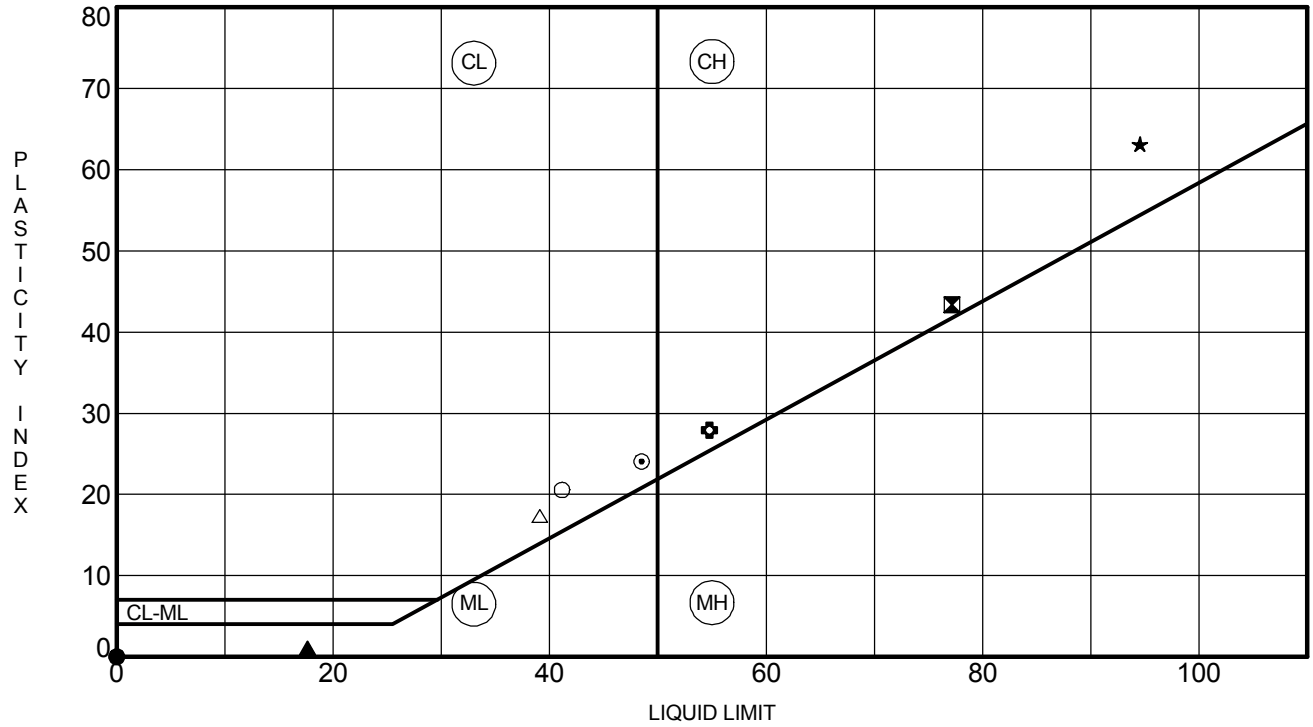
Remarks

CBR-WB-P3 & P5
Sample Obtained 10/20/10

Sample No.: CBR-WB-P3 & P5 **Source of Sample:** **Date:** 10/20/10
Location: I64WB-P3 & P5 Combined(See Plans) **Elev./Depth:** 0-10 ft.

GET SOLUTIONS, INC.

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project No: VB10-238G **Figure** WB-P4&P5a

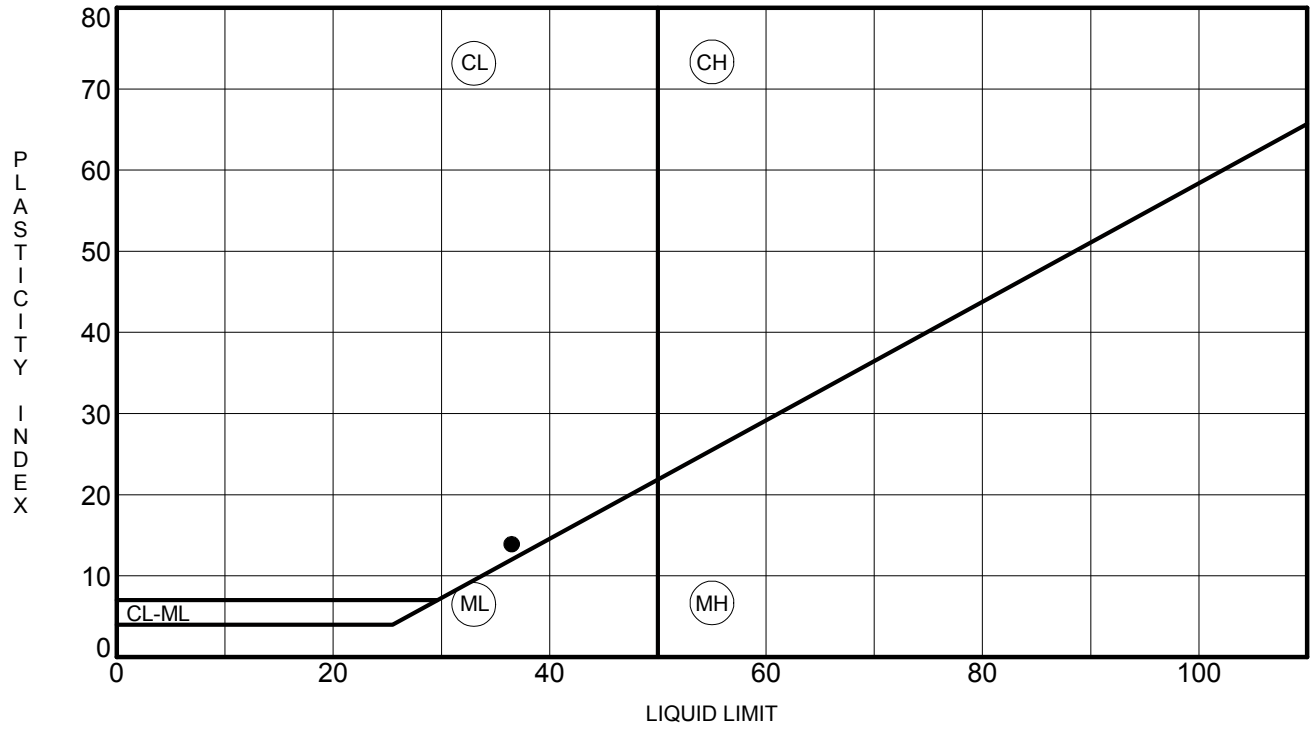


	Specimen Identification			LL	PL	PI	Fines	MC	Classification
●	CUR-1B	17236	25.0 ft	NP	NP	NP	33	30.5	SILTY SAND SM
⊠	CUR-1B	17237	105.0 ft	77	34	43	93	58.4	FAT CLAY CH
▲	CUR-4B	17363	50.0 ft	18	17	1	31	22.6	SILTY SAND SM
★	CUR-4B	17364	95.0 ft	95	31	64	97	60.1	FAT CLAY CH
⊙	D7-10W	17238	37.0 ft	48	24	24	80	39.4	LEAN CLAY with SAND CL
✿	D7-8W	17239	28.0 ft	55	27	28	86	40.6	FAT CLAY CH
○	D7-8W	17240	38.0 ft	41	21	20	68	33.2	SANDY LEAN CLAY CL
△	D7-9W	17241	43.0 ft	39	22	17	51	34.3	SANDY LEAN CLAY CL

S&ME
8211 Hermitage Road
Richmond, Virginia 23228
Telephone: (804) 266-2199
Fax: (804) 261-5569

ATTERBERG LIMITS RESULTS

Project: I-64/I-264 Interchange - PSA: I-64, D7, and Bridge
Location: Virginia Beach, Virginia
Number: 1081-10-2757



	Specimen Identification			LL	PL	PI	Fines	MC	Classification
●	D7-13W	17935	43.0 ft	36	23	13	67	32.7	SANDY LEAN CLAY CL

S&ME
8211 Hermitage Road
Richmond, Virginia 23228
Telephone: 804.266.2199
Fax: 804.261.5569

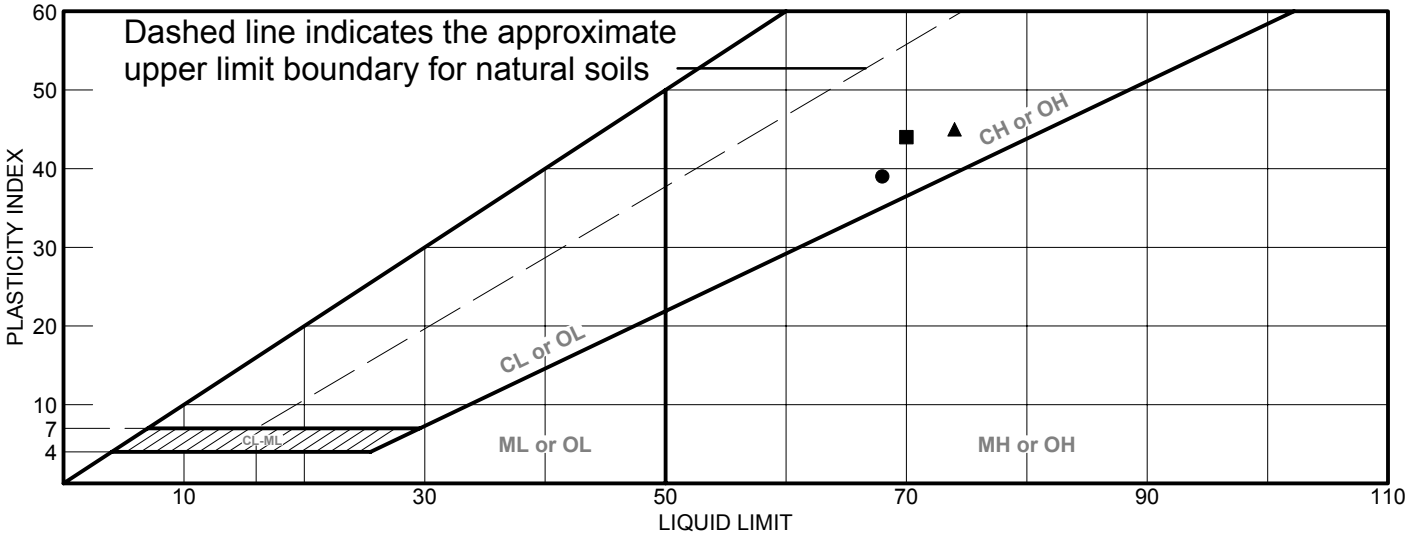
ATTERBERG LIMITS RESULTS

Project: I-64/I-264 Interchange PSA I-64, D7, and Bridge

Location: Cities of Norfolk and Virginia Beach, Virginia

Number: 1081-10-2757

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray-Brown, Fat CLAY with Sand	68	29	39	99	83	CH
■	Gray-Brown, Fat CLAY	70	26	44	98	86	CH
▲	Gray-Brown, Fat CLAY	74	29	45	100	88	CH

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

● **Location:** D7-5W

■ **Location:** D7-8W

▲ **Location:** D7-9W

Remarks:

● Gradation No. 1
Sample Obtained 10/5/10

■ Gradation No. 2
Sample Obtained 10/5/10

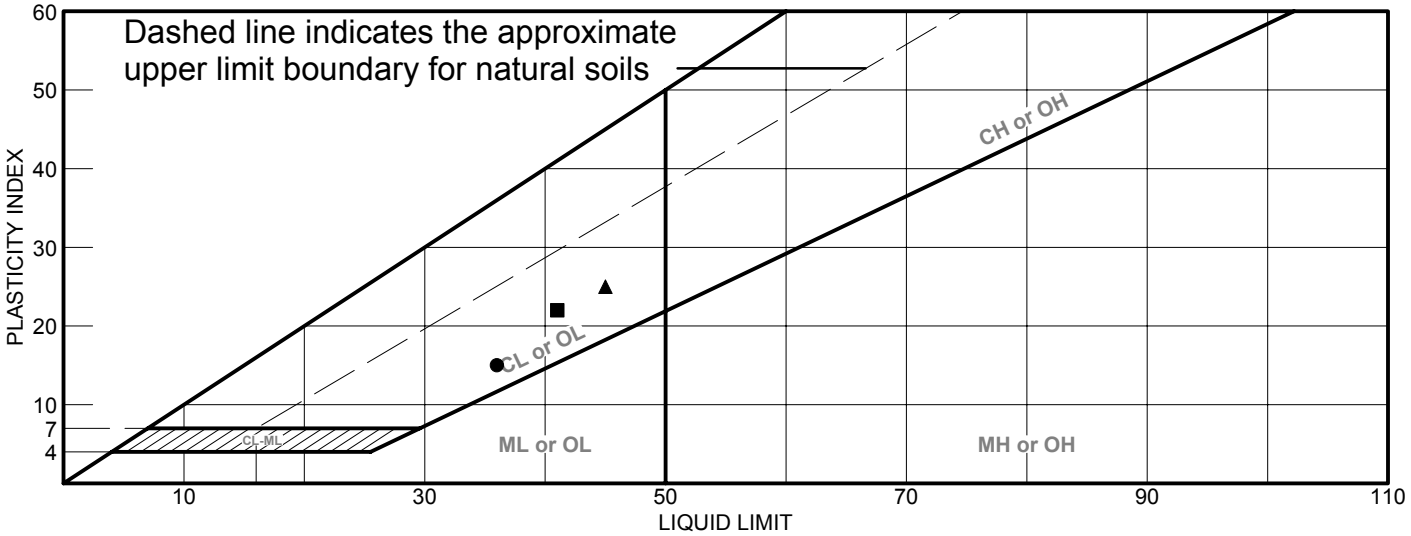
▲ Gradation No. 3
Sample Obtained 10/5/10

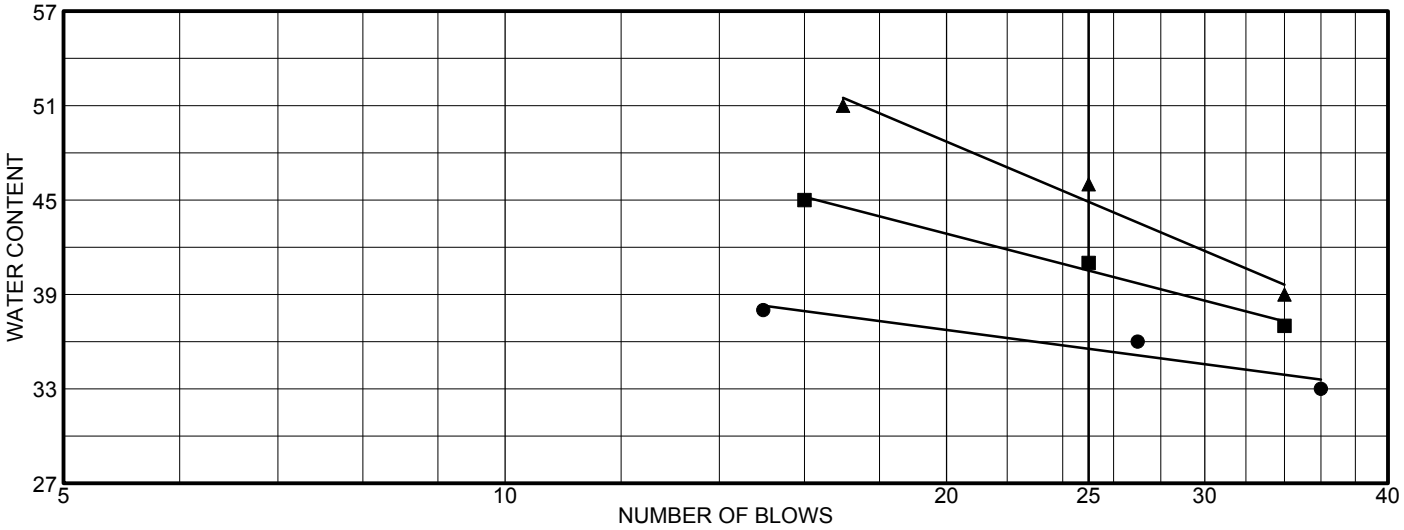
LIQUID AND PLASTIC LIMITS TEST REPORT

GET SOLUTIONS, INC.

Figure Set 1a

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray-Brown, Clayey SAND	36	21	15	100	44	SC
■	Gray-Brown, Sandy Lean CLAY	41	19	22	100	70	CL
▲	Gray-Brown, Lean CLAY with Sand	45	20	25	100	76	CL

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

● **Location:** D7-10W

■ **Location:** D7-10W

▲ **Location:** D7-10W

Remarks:

● Gradation No. 4
Sample Obtained 10/5/10

■ Gradation No. 5
Sample Obtained 10/5/10

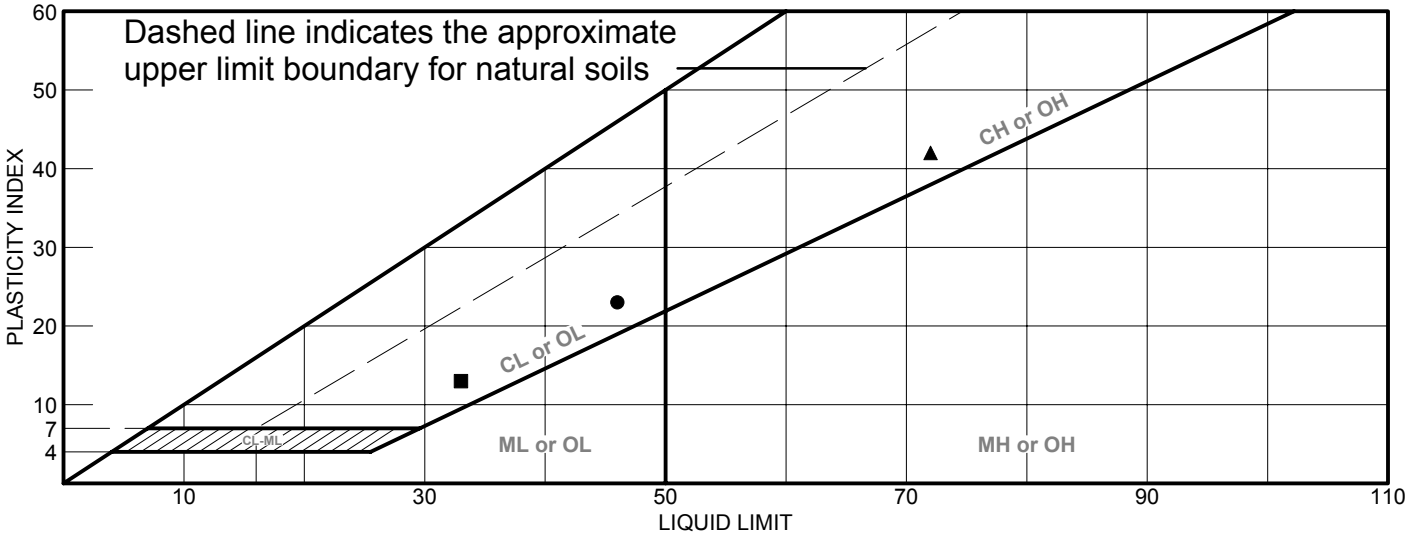
▲ Gradation No. 6
Sample Obtained 10/5/10

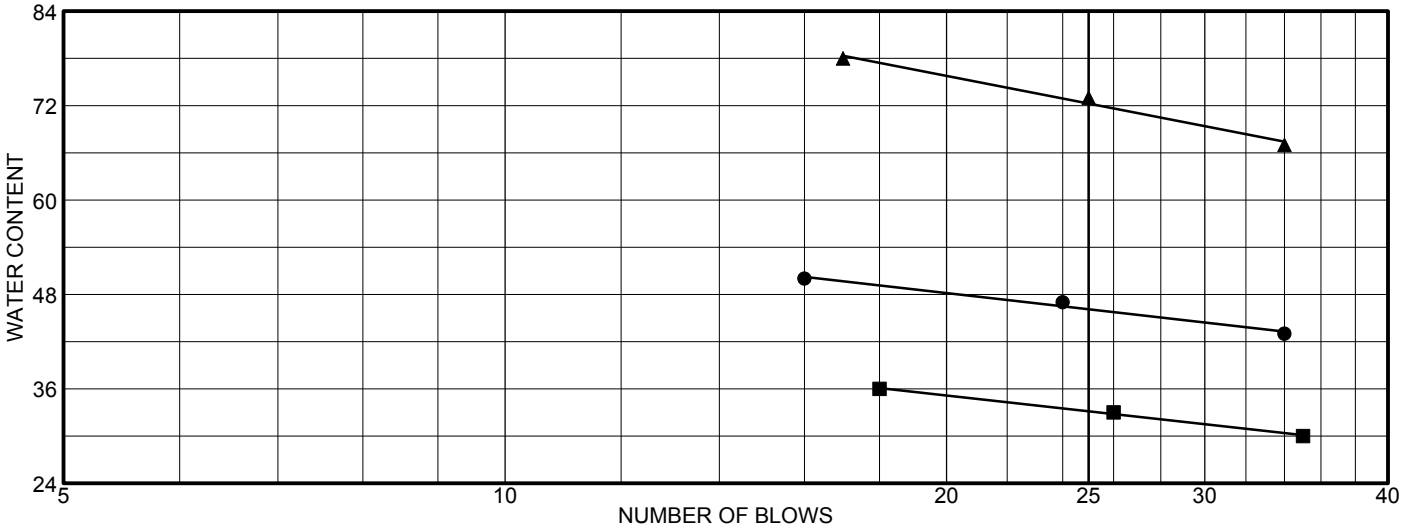
LIQUID AND PLASTIC LIMITS TEST REPORT

GET SOLUTIONS, INC.

Figure Set 1b

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray-Brown, Sandy Lean CLAY	46	23	23	100	60	CL
■	Gray-Brown, Clayey Sand	33	20	13	100	48	SC
▲	Gray-Brown, Lean CLAY with Sand	72	30	42	98.8	93.3	CL

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

● **Location:** CUR-1B

■ **Location:** CUR-1B

▲ **Location:** CUR-1B

Remarks:

● Gradation No. 7
Sample Obtained 10/5/10

■ Gradation No. 8
Sample Obtained 10/5/10

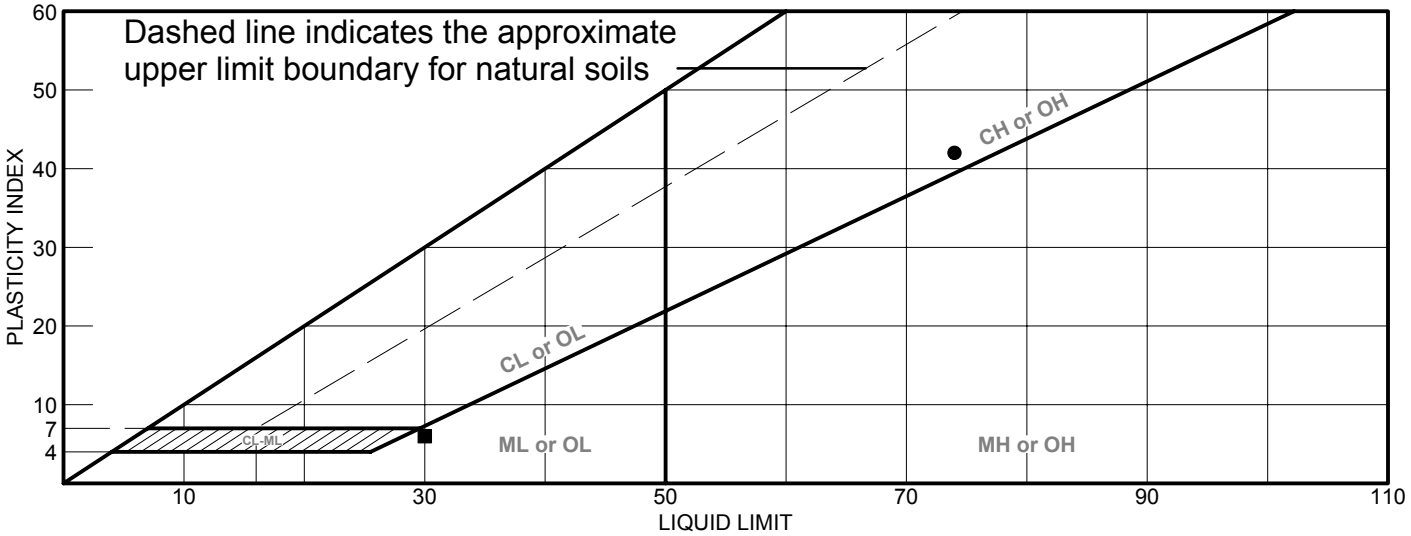
▲ Gradation No. 9
Sample Obtained 10/5/10

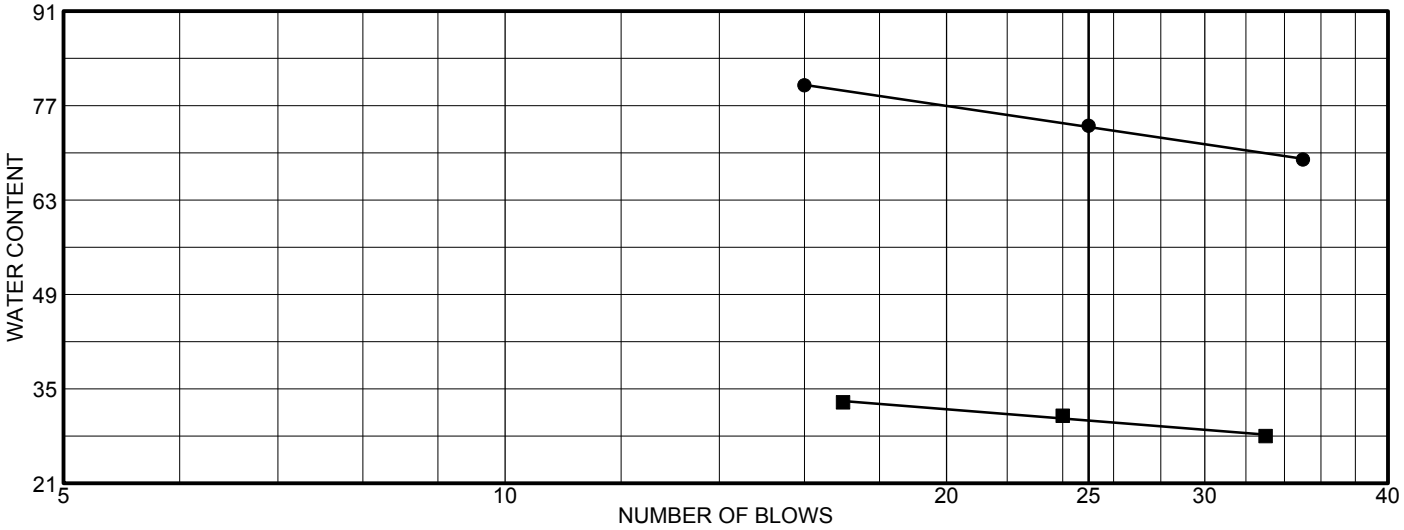
LIQUID AND PLASTIC LIMITS TEST REPORT

GET SOLUTIONS, INC.

Figure Set 2

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray-Brown, Fat CLAY	74	32	42	100	92	CH
■	Gray-Brown, Silty Sand	30	24	6	99	30	SM
▲	Gray-Orange, Poorly Graded SAND with Silt	NV	NP	NP	99	11	SP-SM

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

● **Location:** CUR-1B

■ **Location:** CUR-1B

▲ **Location:** 164SB-7

Remarks:

● Gradation No. 12
Sample Obtained 10/5/10

■ Gradation No. 13
Sample Obtained 10/5/10

▲ Gradation No. 14
Sample Obtained 10/5/10

LIQUID AND PLASTIC LIMITS TEST REPORT

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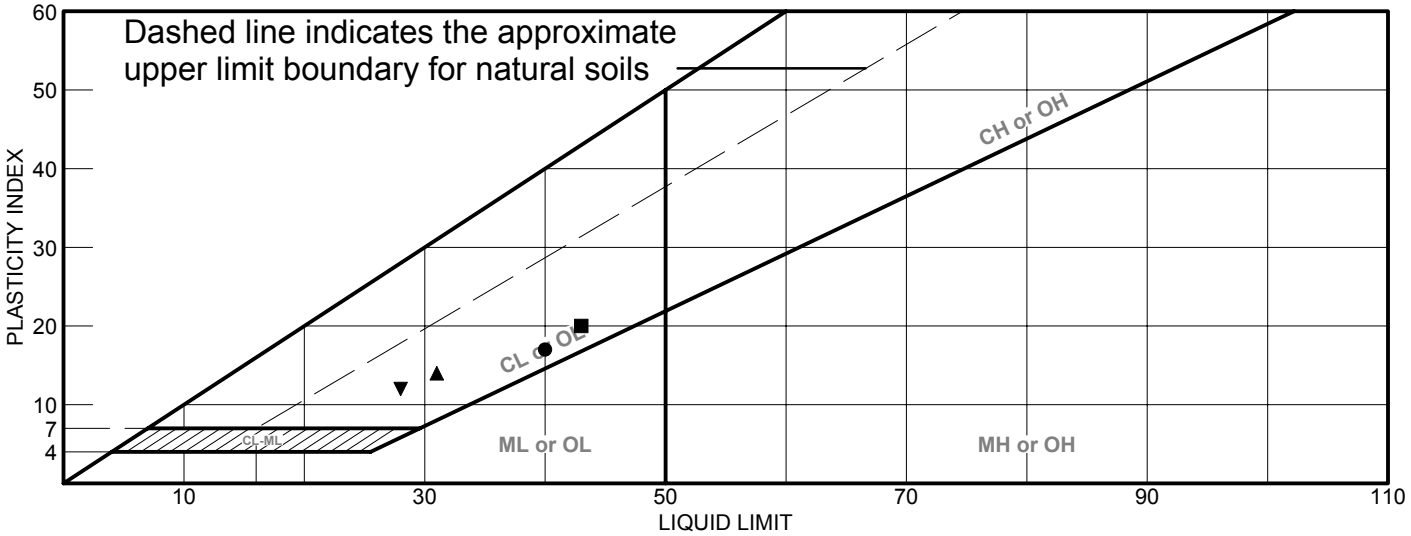
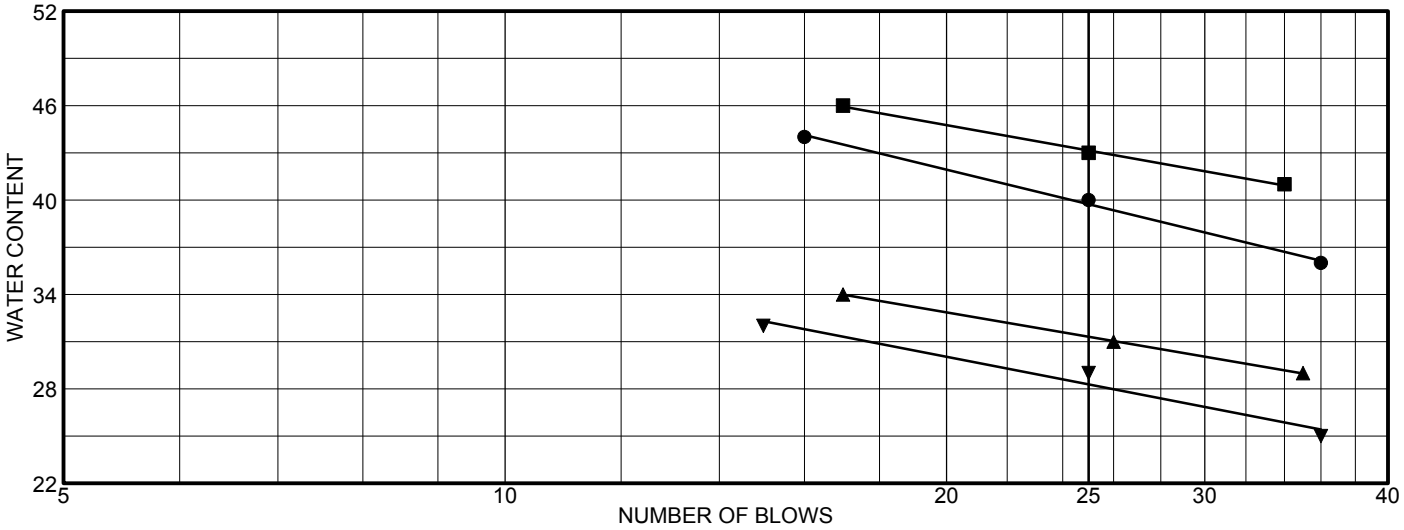
Figure Set 3

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Tan, Lean CLAY	40	23	17	97	87	CL
■	Tan, Lean CLAY	43	23	20	99	94	CL
▲	Tan, Sandy Lean CLAY	31	17	14	97	55	CL
◆	Tan, Silty SAND	NV	NP	NP	91	26	SM
▼	Tan, Clayey SAND	28	16	12	86	36	SC

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

● **Location:** SWM4-1
■ **Location:** SWM4-2
▲ **Location:** SWM5-1
◆ **Location:** SWM5-1
▼ **Location:** SWM5-2

Remarks:

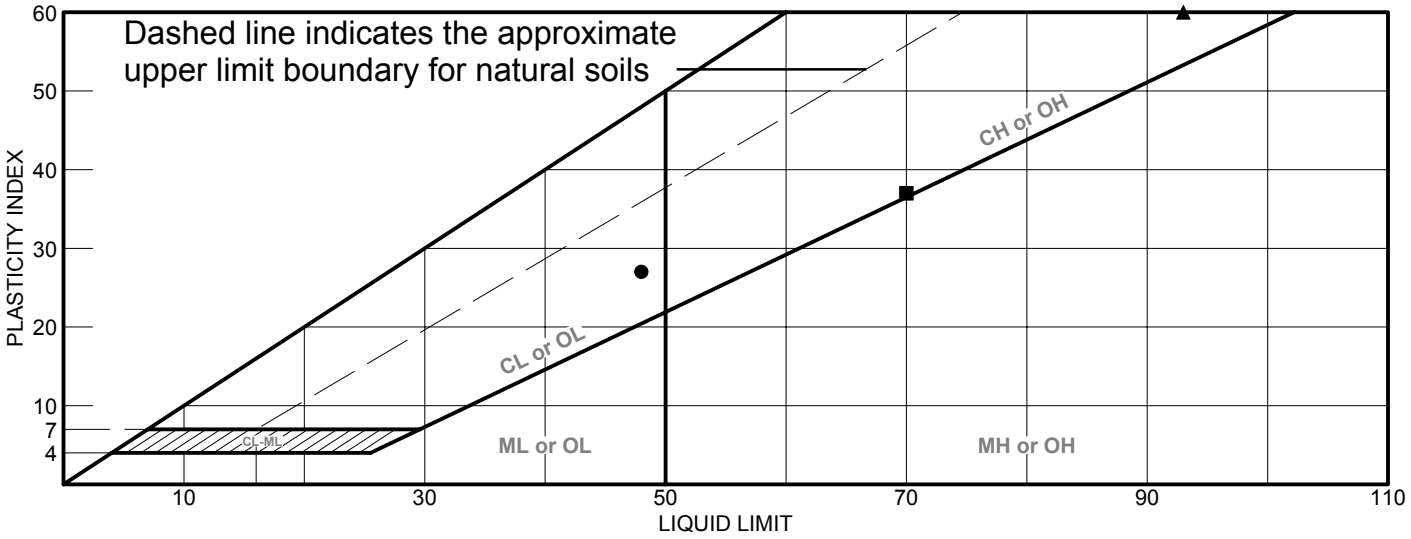
● Gradation No. 15
Sample Obtained 10/5/10
■ Gradation No. 17
Sample Obtained 10/5/10
▲ Gradation No. 19
Sample Obtained 10/5/10
◆ Gradation No. 20
Sample Obtained 10/5/10
▼ Gradation No. 21
Sample Obtained 10/5/10

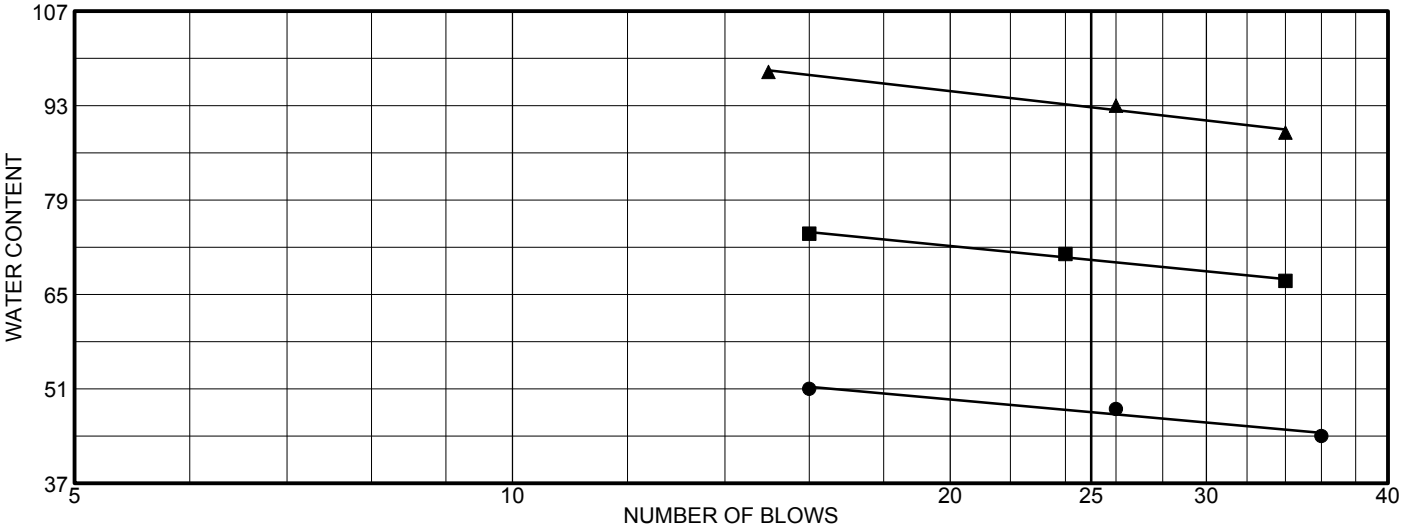
LIQUID AND PLASTIC LIMITS TEST REPORT

GET SOLUTIONS, INC.

Figure Set 4

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray, Sandy Lean CLAY	48	21	27	99.4	68	CL
■	Gray, Fat CLAY	70	33	37	100	89	CH
▲	Gray, Fat CLAY	93	33	60	100	98	CH

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

● **Location:** CUR-4B

■ **Location:** CUR-4B

▲ **Location:** CUR-4B

Remarks:

● Gradation No. 28
Sample Obtained 10/5/10

■ Gradation No. 21
Sample Obtained 10/5/10

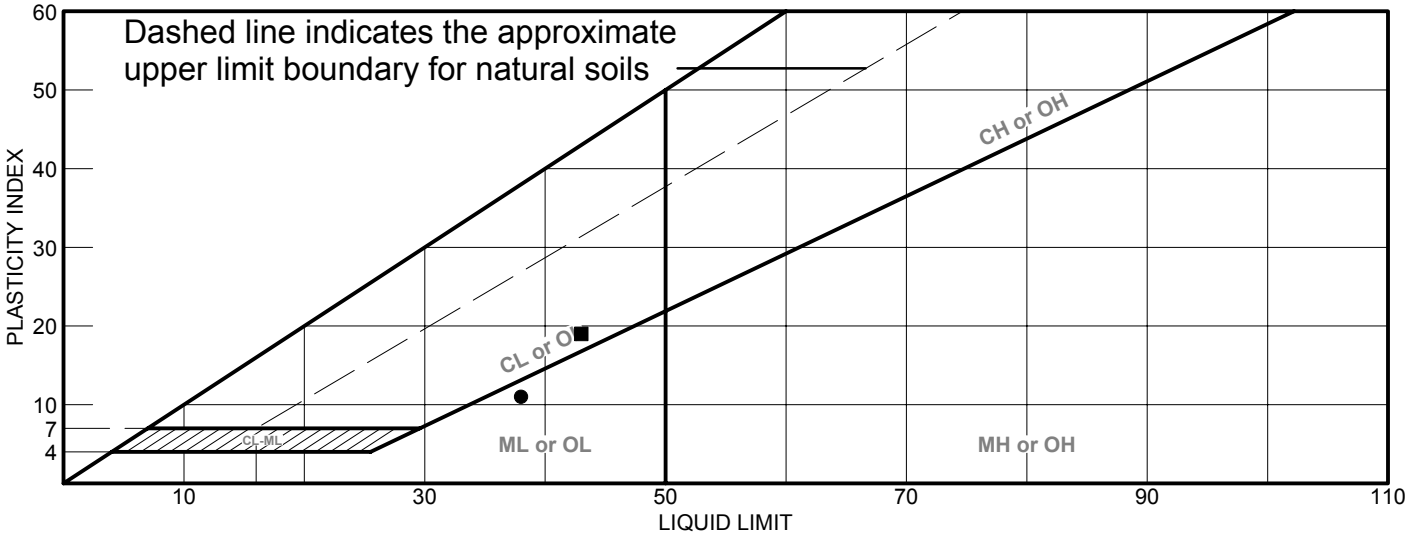
▲ Gradation No. 33
Sample Obtained 10/5/10

LIQUID AND PLASTIC LIMITS TEST REPORT

GET SOLUTIONS, INC.

Figure Set 5

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray, Sandy SILT	38	27	11	100	65	ML
■	Gray, Lean CLAY	43	24	19	97	92	CL

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

● **Location:** 164SB-7

■ **Location:** 164SB-7

Remarks:

● Gradation No. 36
Sample Obtained 10/5/10

■ Gradation No. 37
Sample Obtained 10/5/10

LIQUID AND PLASTIC LIMITS TEST REPORT

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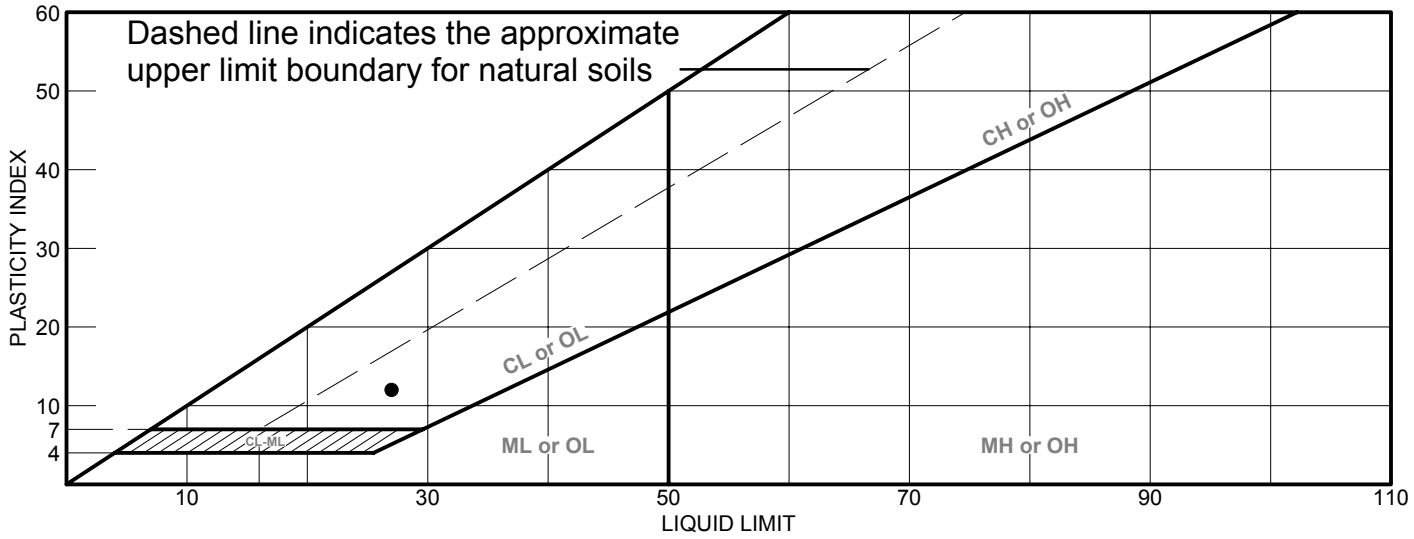
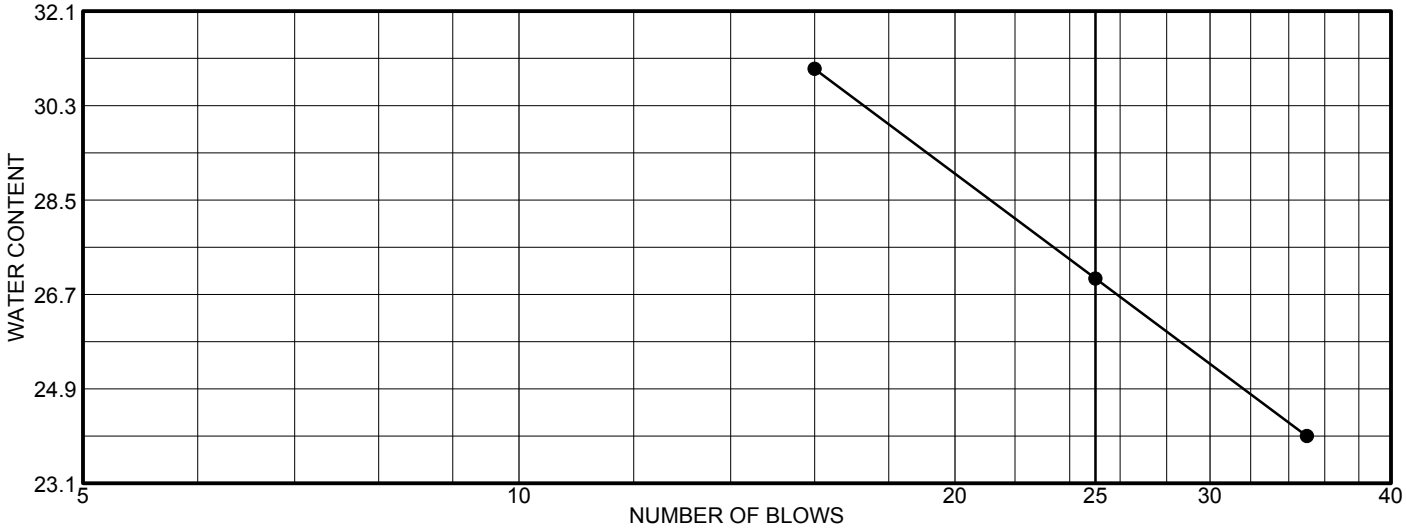
Figure Set 6

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Tan, Sandy Lean CLAY	27	15	12	95.3	66.7	CL

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

● **Location:** SWM5-2 (See Plans)

Remarks:

● CBR-SWM5-2
Sample Obtained 10/20/10

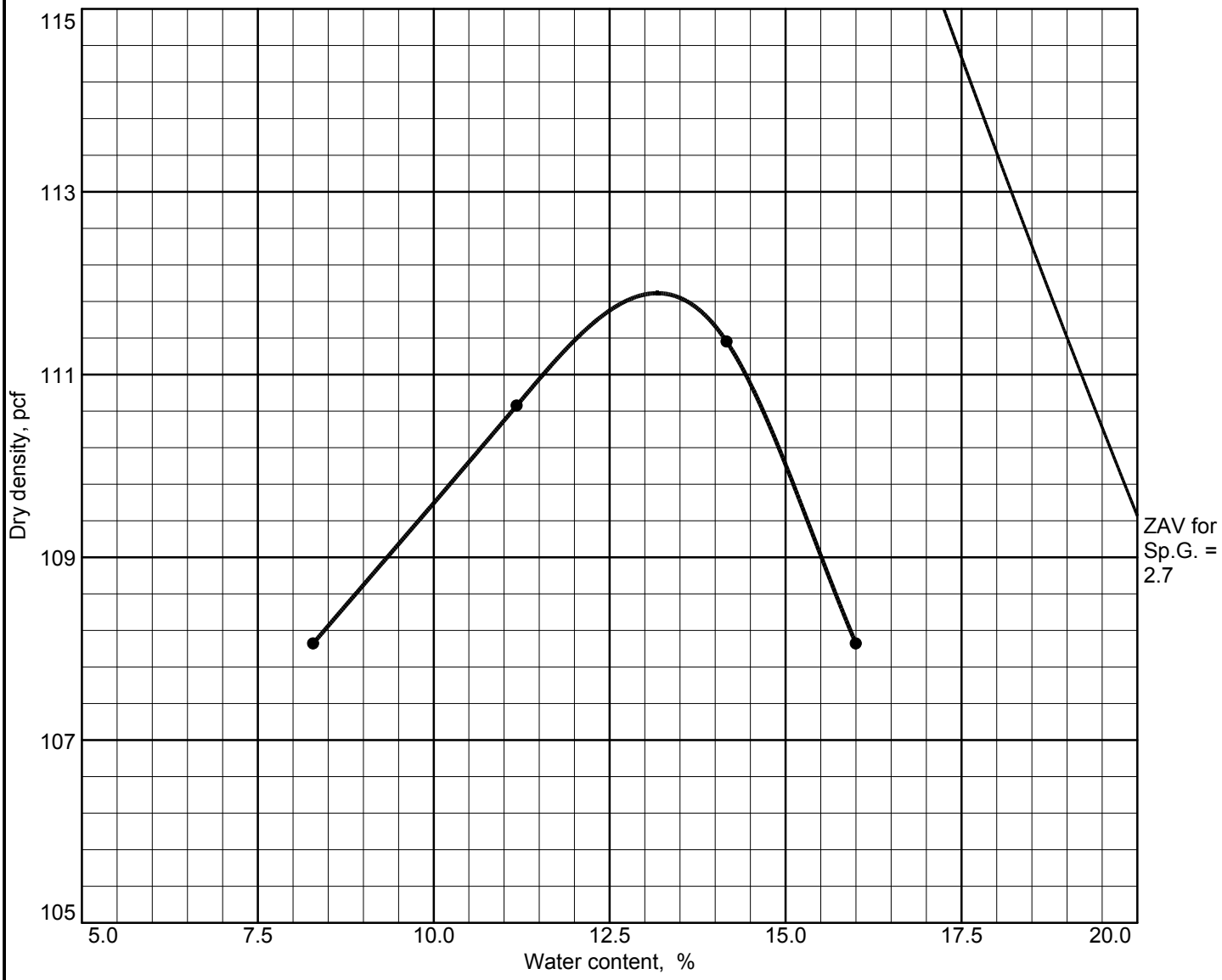
LIQUID AND PLASTIC LIMITS TEST REPORT

GET SOLUTIONS, INC.

Figure CBR-SWM5-

STANDARD PROCTOR AND CBR TEST RESULTS

Moisture Density Relationship (Proctor Curve)



Test specification: VTM-1 Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
3-15 ft.	SP-SM	A-2-4(0)	5		NP	NP	0.0	12

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 111.9 pcf Optimum moisture = 13.2 %	Tan-Orange, Poorly Graded SAND with Silt

Project No. VB10-238G **Client:** HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
● **Location:** SWM4-1 (See Plans)

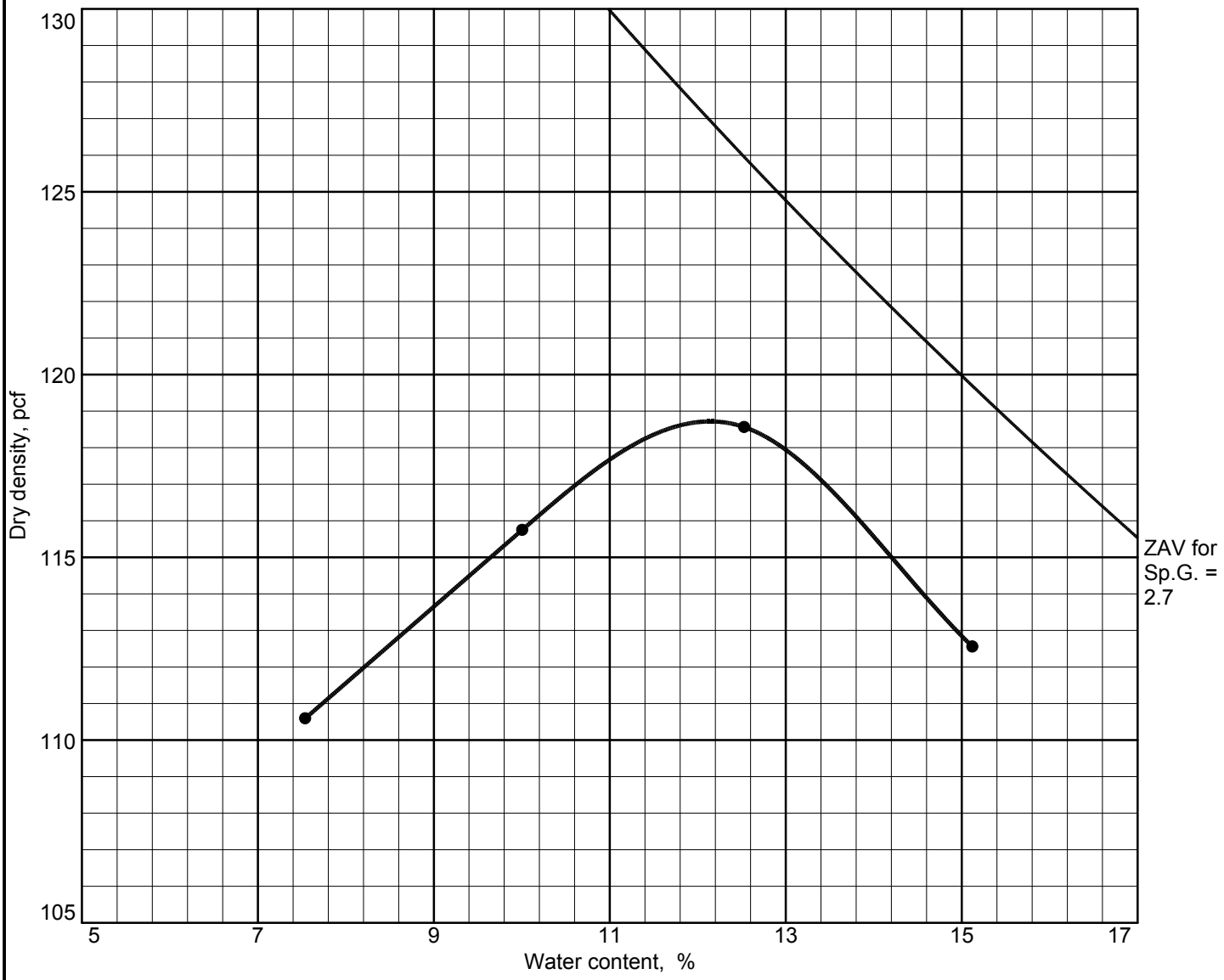
Remarks:
CBR-SWM4-2
Sample Obtained 9/16/10

Moisture Density Relationship (Proctor Curve)

GET SOLUTIONS, INC.

Figure SWM4-1

Moisture Density Relationship (Proctor Curve)



Test specification: VTM-1 Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
0-10 ft.	CL	A-6(5)	2		27	12	0.1	66.7

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 118.7 pcf Optimum moisture = 12.1 %	Tan, Sandy Lean CLAY

Project No. VB10-238G **Client:** HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
● **Location:** SWM5-2 (See Plans)

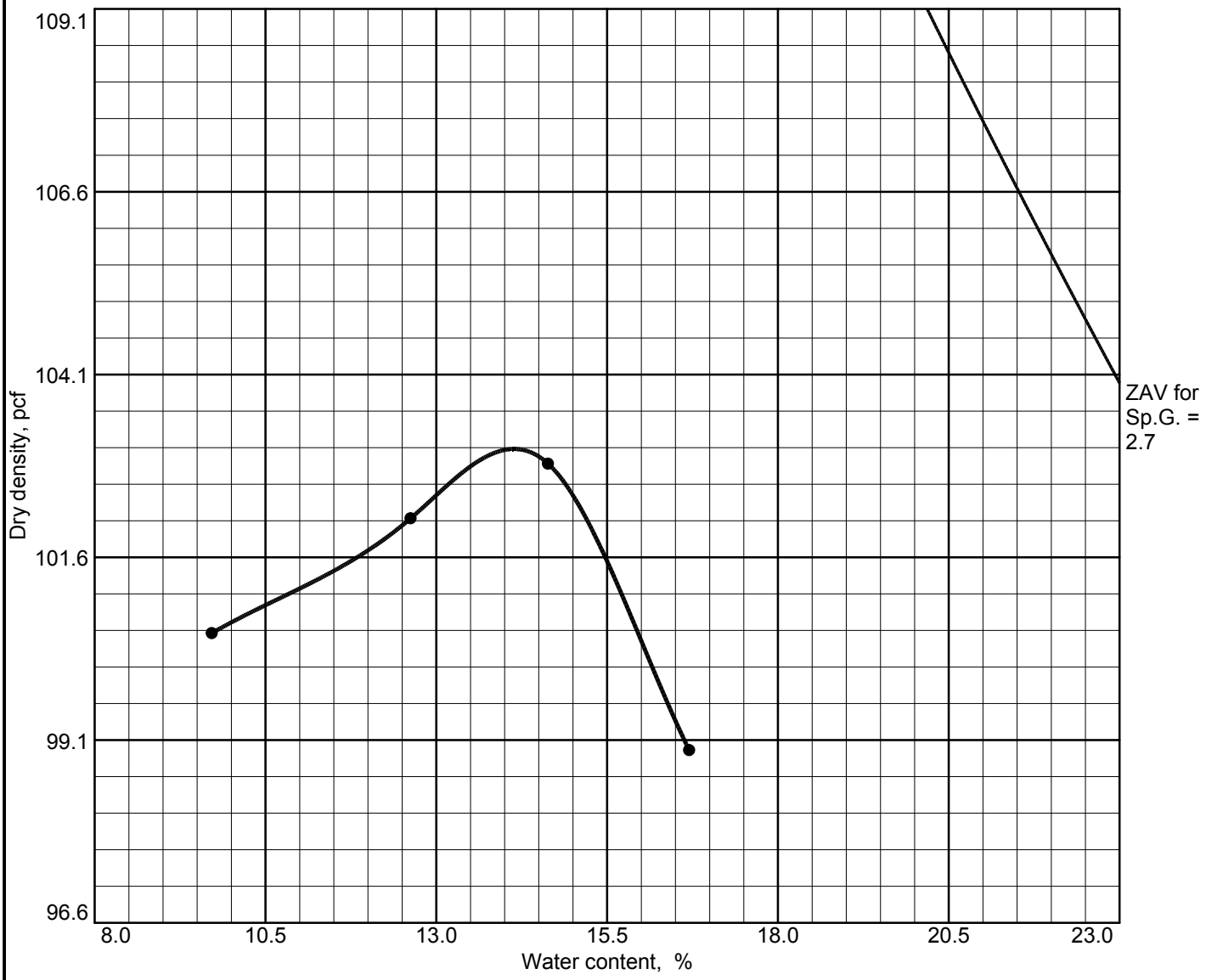
Remarks:
CBR-SWM5-2
Sample Obtained 10/20/10

Moisture Density Relationship (Proctor Curve)

GET SOLUTIONS, INC.

Figure SWM5-2

Moisture Density Relationship (Proctor Curve)



Test specification: VTM-1 Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
1-4 ft.	SP-SM	A-3	2		NP	NP	3.0	8

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 103.1 pcf Optimum moisture = 14.1 %	Tan, Poorly Graded SAND with Silt

Project No. VB10-238G **Client:** HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
● **Location:** I64WB-2 & 4 Combined (See Plans)

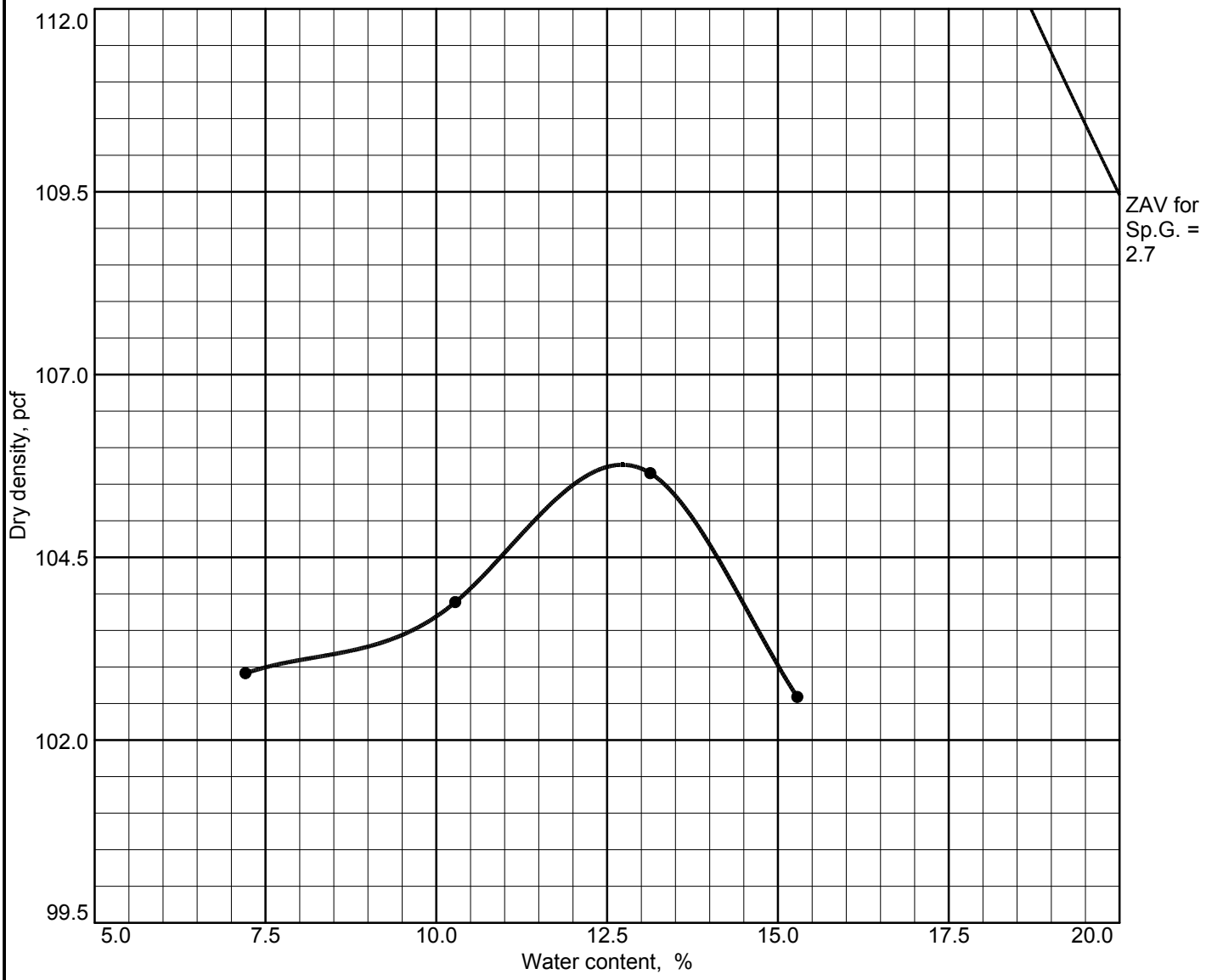
Remarks:
CBR-WB-2 & 4
Sample Obtained 9/13/10

Moisture Density Relationship (Proctor Curve)

GET SOLUTIONS, INC.

Figure WB-2&4

Moisture Density Relationship (Proctor Curve)



Test specification: VTM-1 Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
0-10 ft.	SM	A-2-4(0)	6		NP	NP	0.0	15

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 105.8 pcf Optimum moisture = 12.7 %	Tan, Silty SAND

Project No. VB10-238G **Client:** HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
● **Location:** I64WB-P3 & P5 Combined(See Plans)

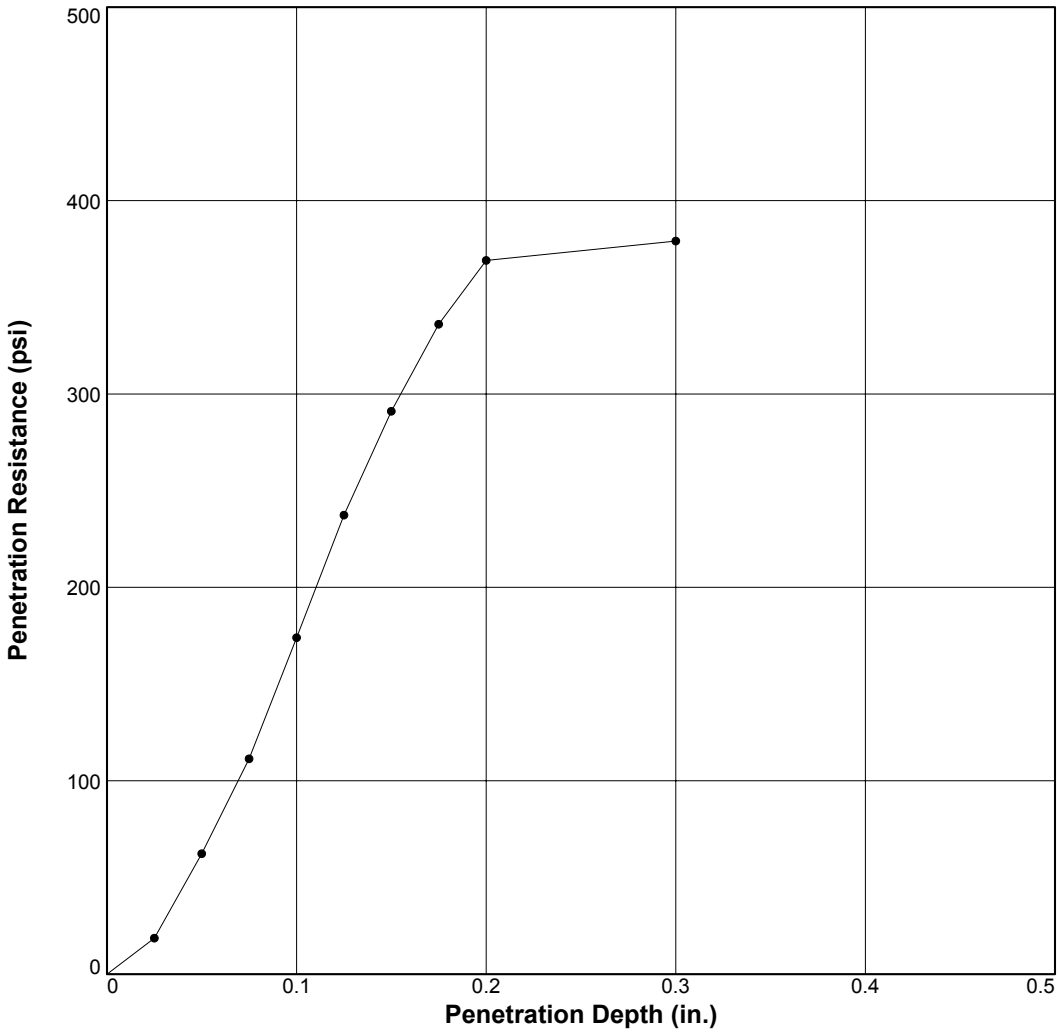
Remarks:
CBR-WB-P3 & P5
Sample Obtained 10/20/10

Moisture Density Relationship (Proctor Curve)

GET SOLUTIONS, INC.

Figure WB-P3&P5

BEARING RATIO TEST REPORT
AASHTO T 193-99



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	113.7	101.6	12.9	113.7	101.6	13.7	24.8	24.8	0.030	10	0
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Tan-Orange, Poorly Graded SAND with Silt	SP-SM	111.9	13.2	NP	NP

Project No: VB10-238G

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge Virginia Beach, Virginia

Location: SWM4-1

Sample Number: CBR-SWM4-1 **Depth:** 3-15 ft.

Date: 9/16/10

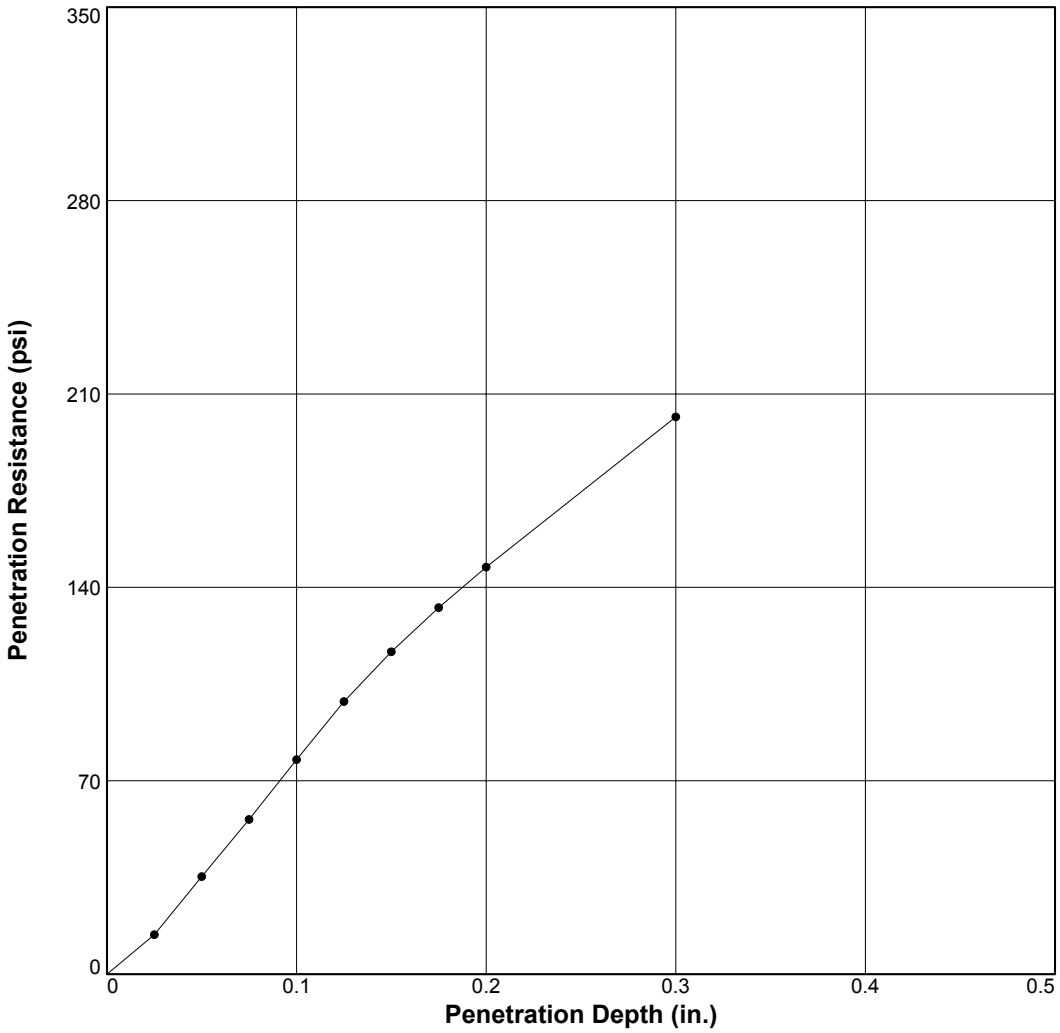
Test Description/Remarks:

BEARING RATIO TEST REPORT

GET SOLUTIONS, INC.

Figure CBR-SWM4-1

BEARING RATIO TEST REPORT
AASHTO T 193-99



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	120.9	101.9	11.6	120.1	101.2	15.4	8.5	10.1	0.009	10	0.7
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Tan, Sandy Lean CLAY	CL	118.7	12.1	27	12

Project No: VB10-238G

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge Virginia Beach, Virginia

Location: SWM5-2 (See Plans)

Sample Number: CBR-SWM5-2 **Depth:** 0-10 ft.

Date: 10/20/10

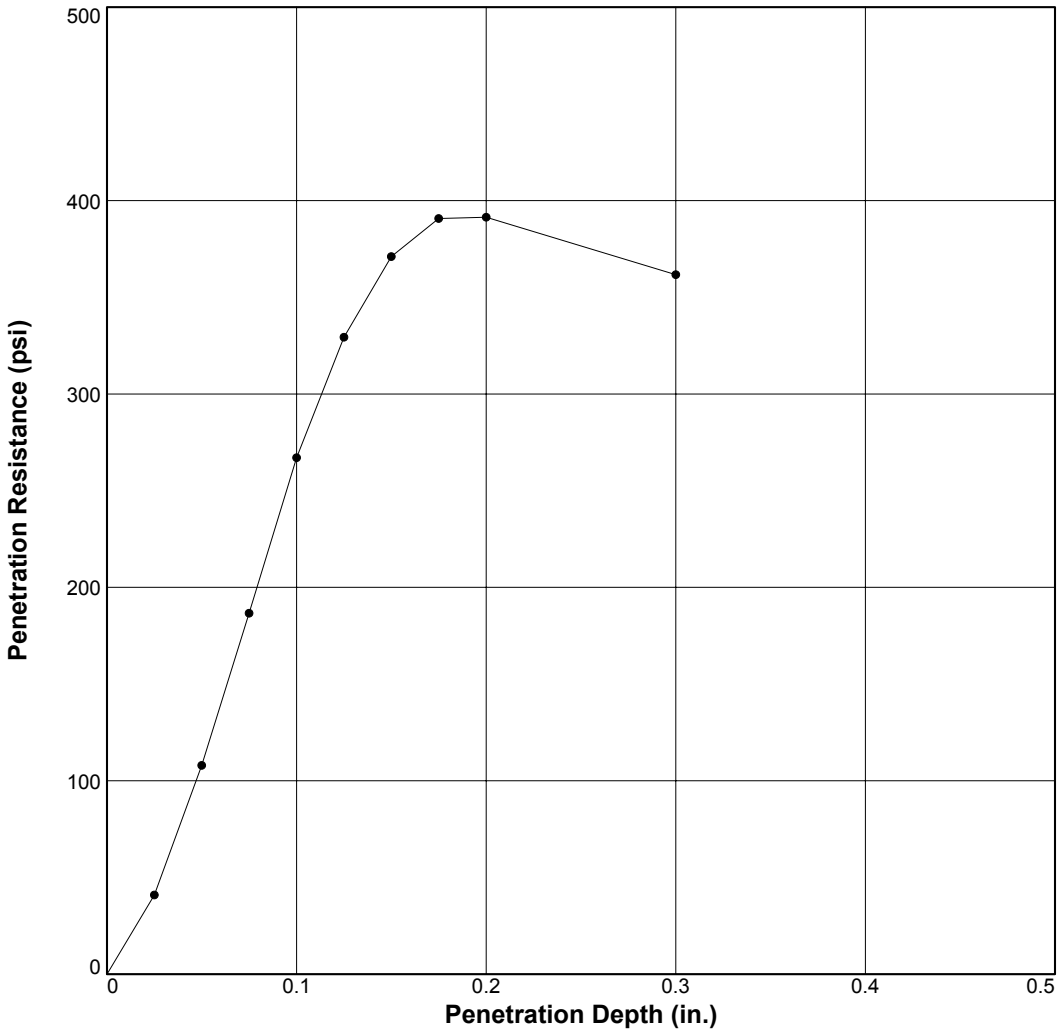
Test Description/Remarks:

BEARING RATIO TEST REPORT

GET SOLUTIONS, INC.

Figure CBR-SWM5-2

BEARING RATIO TEST REPORT
VTM-008 (2005)



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ●	106.2	103	12.9	106.2	103	16.5	30.8	25.8	0.016	10	0
2 ▲											
3 ■											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Tan, Poorly Graded SAND with Silt	SP-SM	103.1	14.1	NP	NP

Project No: VB10-238G

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge Virginia Beach, Virginia

Location: I64WB-2 & 4 Combined (See Plans)

Sample Number: CBR-WB-2 **Depth:** 1-4 ft.

Date: 9/13/10

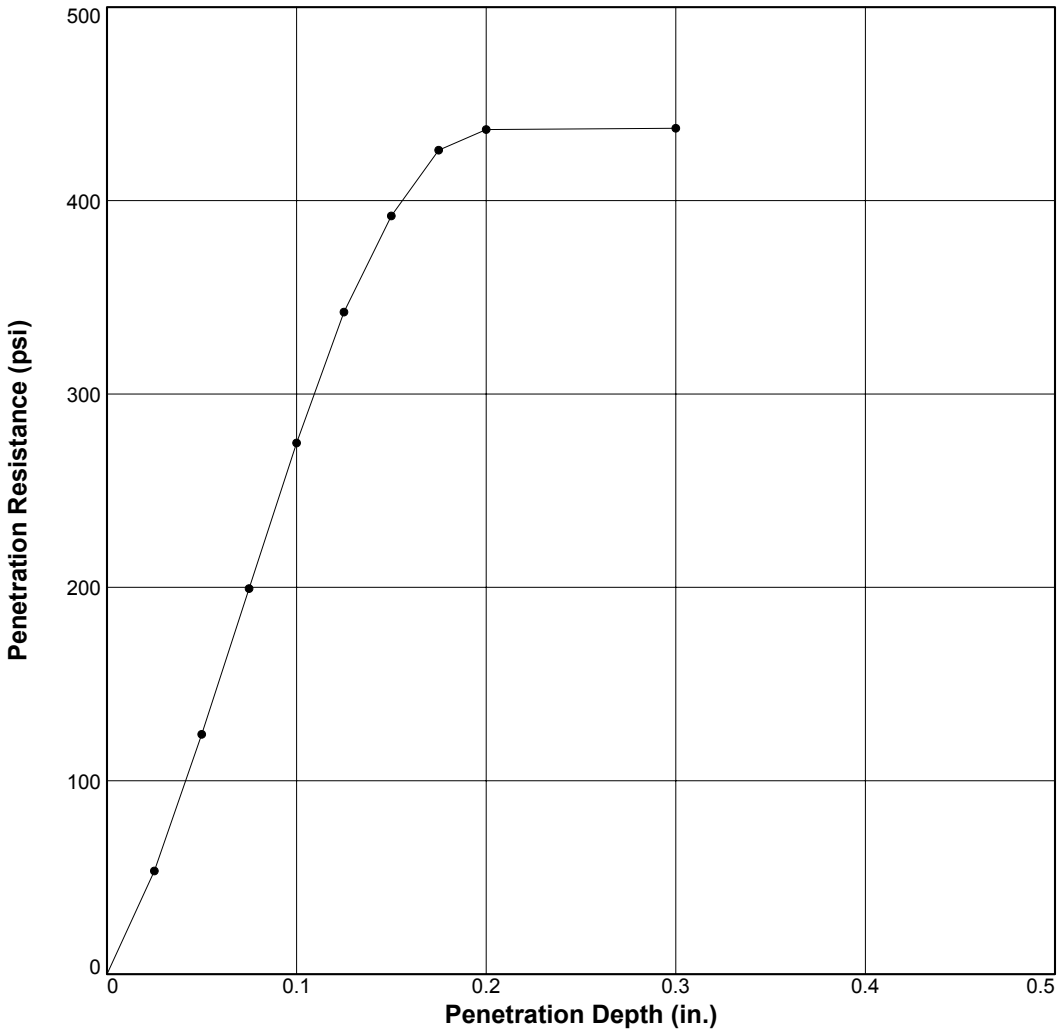
Test Description/Remarks:

BEARING RATIO TEST REPORT

GET SOLUTIONS, INC.

Figure CBR-WB-2&4

BEARING RATIO TEST REPORT
AASHTO T 193-99



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	107.6	101.7	12.3	107.6	101.7	16.1	29.9	29.1	0.009	10	0
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Tan, Silty SAND	SM	105.8	12.7	NP	NP

Project No: VB10-238G

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge Virginia Beach, Virginia

Location: I64WB-P3 & P5 Combined(See Plans)

Sample Number: CBR-WB-P3 & P5 **Depth:** 0-10 ft.

Date: 10/20/10

Test Description/Remarks:

BEARING RATIO TEST REPORT

GET SOLUTIONS, INC.

Figure CBR-WB-P3&P5

CORROSIVITY AND pH TEST RESULTS

GET Solutions, Inc.

Geotechnical • Environmental • Testing

pH & Resistivity Data Sheet

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge

Job #:VB10-238G

Boring	Depth (FT.)	pH	Resistivity
SWM 4-1	4-6	5.1	21500 ohm
SWM 4-2	4-6	5.1	18000 ohm

Enviro Compliance Laboratories, Inc.
816 Kiwanis Street
Hampton, Virginia 23661
(757) 244-3424
Fax: (757) 244-3243
www.envirocompliance.com
eclhampton@envirocompliance.com

Analytical Summary

GET Solutions, Inc.
Attn: Pat
204B Grayson Road
Virginia Beach, Virginia 23462

Date Received: December 07, 2010
Date Sampled : December 07, 2010
Date Issued : December 13, 2010

Lab # 1(A)/Sample ID : SWM4-1 (4')

Parameter	Result	Units	QL	Date/Time Prepared	Date/Time Analyzed	Method	Analyst
Sulfide	BQL	mg/kg	30.0	12-09/0830	12-13/1000	4500S	GBH
Chloride	BQL	mg/kg	5	12-10/1430	12-10/1430	4500Cl C	PEJ

Lab # 2(A)/Sample ID : SWM4-2 (6')

Parameter	Result	Units	QL	Date/Time Prepared	Date/Time Analyzed	Method	Analyst
Sulfide	BQL	mg/kg	30.0	12-09/0830	12-13/1000	4500S	GBH
Chloride	19	mg/kg	5	12-10/1430	12-10/1430	4500Cl C	PEJ

Lab # 3(A)/Sample ID : D7CD-11BC (10')

Parameter	Result	Units	QL	Date/Time Prepared	Date/Time Analyzed	Method	Analyst
Sulfide	BQL	mg/kg	30.0	12-09/0830	12-13/1000	4500S	GBH
Chloride	688	mg/kg	5	12-10/1430	12-10/1430	4500Cl C	PEJ

Lab # 4(A)/Sample ID : 1264CD-2 (2')

Parameter	Result	Units	QL	Date/Time Prepared	Date/Time Analyzed	Method	Analyst
Sulfide	BQL	mg/kg	30.0	12-09/0830	12-13/1000	4500S	GBH
Chloride	35	mg/kg	5	12-10/1430	12-10/1430	4500Cl C	PEJ

Lab # 5(A)/Sample ID : 1264CD-6 (6')

Parameter	Result	Units	QL	Date/Time Prepared	Date/Time Analyzed	Method	Analyst
Sulfide	BQL	mg/kg	30.0	12-09/0830	12-13/1000	4500S	GBH
Chloride	20	mg/kg	5	12-10/1430	12-10/1430	4500Cl C	PEJ

Lab # 6(A)/Sample ID : D7-28 (6')

Parameter	Result	Units	QL	Date/Time Prepared	Date/Time Analyzed	Method	Analyst
Sulfide	BQL	mg/kg	30.0	12-09/0830	12-13/1000	4500S	GBH
Chloride	34	mg/kg	5	12-10/1430	12-10/1430	4500Cl C	PEJ

BQL = Below Quantitation Limit
All methods are 40 CFR 136 March 12, 2007, Table IB approved.
Reference to Standard Methods is 18th ed.
VELAC ID#: 460130

Enviro Compliance Laboratories, Inc.
816 Kiwanis Street
Hampton, Virginia 23661
(757) 244-3424
Fax: (757) 244-3243
www.envirocompliance.com
eclhampton@envirocompliance.com

Analytical Summary

GET Solutions, Inc.
Attn: Pat
204B Grayson Road
Virginia Beach, Virginia 23462

Date Received: December 07, 2010
Date Sampled : December 07, 2010
Date Issued : December 13, 2010

Lab # 7(A)/Sample ID : D7-P2 (2')

Parameter	Result	Units	QL	Date/Time Prepared	Date/Time Analyzed	Method	Analyst
Sulfide	BQL	mg/kg	30.0	12-09/0830	12-13/1000	4500S	GBH
Chloride	39	mg/kg	5	12-10/1430	12-10/1430	4500Cl C	PEJ

BQL = Below Quantitation Limit
All methods are 40 CFR 136 March 12, 2007, Table IB approved.
Reference to Standard Methods is 18th ed.
VELAC ID#: 460130

Anamarie E. McKinley
Laboratory Manager

CONSOLIDATION TEST RESULTS

CONSOLIDATION TEST DATA

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project Number: VB10-238G

Sample Data

Source:
Sample No.: Shelby Tube
Elev. or Depth: 28-30 ft. **Sample Length(in./cm.):** 1 in.
Location: D7-8W
Description: Gray, Fat CLAY
Sample Date: **Liquid Limit:** **Plasticity Index:**
USCS: **AASHTO:**
Preparation Process:
Condition of Test:
Test Method: **Final Density:** **Figure No.:** 1
Testing Remarks: Boring D7-8W
Sample Obtained 10/15/10
Tested By: **Test Date:**
Checked By: **Title:**

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 296.16 g.	**Consolidometer #** = 1	**Wet w+t** = 285.91 g.
Dry w+t = 256.96 g.		**Dry w+t** = 256.96 g.
Tare Wt. = 145.32 g.	**Spec. Gravity** = 2.71	**Tare Wt.** = 145.32 g.
Height = 1.00 in.	**Height** = 1.00 in.	
Diameter = 2.50 in.	**Diameter** = 2.50 in.	
Weight = 150.84 g.	**Defl. Table** = Reference Set (inches/tsf)	
Moisture = 35.1 %	**Ht. Solids** = 0.5121 in.	**Moisture** = 25.9 %
Wet Den. = 117.1 pcf	**Dry Wt.** = 111.64 g.	**Dry Wt.** = 111.64 g.*
Dry Den. = 86.6 pcf	**Void Ratio** = 0.953	**Void Ratio** = 0.711
Ovrbrdn. = 1.00 tsf	**Saturation** = 99.9 %	

*** Final dry weight used in calculations**

End-of-Load Summary

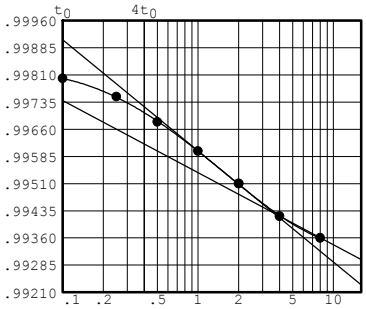
Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
start	1.00000				0.953	
0.13	0.99360	0.00000	0.81	0.002	0.940	0.6 Comprs.
0.25	0.98680	0.00040	0.92	0.001	0.928	1.3 Comprs.
0.50	0.97800	0.00080	1.75	0.002	0.911	2.1 Comprs.
1.00	0.96680	0.00160	1.89	0.002	0.891	3.2 Comprs.
0.50	0.96860	0.00080	1.32	0.000	0.893	3.1 Comprs.
0.25	0.97120	0.00040	2.37		0.897	2.8 Comprs.
0.13	0.97390	0.00000	1.71		0.902	2.6 Comprs.

Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
0.25	0.97250	0.00040	2.84	0.000	0.900	2.7 Comprs.
0.50	0.96970	0.00080	3.14	0.001	0.895	3.0 Comprs.
1.00	0.96510	0.00160	2.59	0.001	0.888	3.3 Comprs.
2.00	0.94830	0.00240	1.61	0.002	0.856	4.9 Comprs.
4.00	0.91670	0.00000	0.96	0.005	0.790	8.3 Comprs.
8.00	0.87500	0.00000	1.08	0.005	0.709	12.5 Comprs.
16.00	0.83290	0.00000	1.50	0.005	0.626	16.7 Comprs.
8.00	0.83740	0.00000	1.57		0.635	16.3 Comprs.
4.00	0.84420	0.00000	0.20		0.648	15.6 Comprs.
1.00	0.85220	0.00160	1.96		0.667	14.6 Comprs.
0.25	0.86550	0.00040	0.03		0.691	13.4 Comprs.
0.13	0.87640	0.00000	0.06		0.711	12.4 Comprs.

C_c = 0.27 **P_c =** 2.21 tsf **C_r =** 0.03

Pressure: 0.13 tsf **TEST READINGS** **Load No. 1**

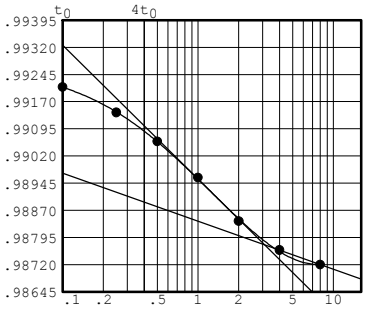
No.	Elapsed Time	Dial Reading
1	0.00	1.00000
2	0.10	0.99800
3	0.25	0.99750
4	0.50	0.99680
5	1.00	0.99600
6	2.00	0.99510
7	4.00	0.99420
8	8.00	0.99360



Void Ratio = 0.940 **Compression =** 0.6 %
D_0 = 0.99895 **D_{50} =** 0.99661 **D_{100} =** 0.99428
C_v at 0.6 min. = 0.81 ft.^{2}/day **C_α =** 0.002

Pressure: 0.25 tsf **TEST READINGS** **Load No. 2**

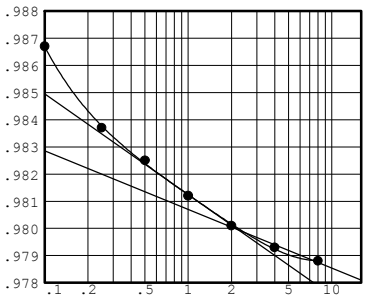
No.	Elapsed Time	Dial Reading
1	0.00	0.99360
2	0.10	0.99170
3	0.25	0.99100
4	0.50	0.99020
5	1.00	0.98920
6	2.00	0.98800
7	4.00	0.98720
8	8.00	0.98680



Void Ratio = 0.928 **Compression =** 1.3 %
D_0 = 0.99331 **D_{50} =** 0.99053 **D_{100} =** 0.98775
C_v at 0.5 min. = 0.92 ft.^{2}/day **C_α =** 0.001

Pressure: 0.50 tsf **TEST READINGS** **Load No. 3**

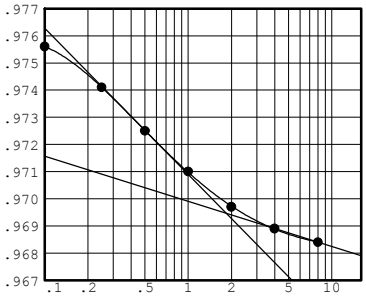
No.	Elapsed Time	Dial Reading
1	0.00	0.98680
2	0.10	0.98590
3	0.25	0.98290
4	0.50	0.98170
5	1.00	0.98040
6	2.00	0.97930
7	4.00	0.97850
8	8.00	0.97800



Void Ratio = 0.911 **Compression =** 2.1 %
D_0 = 0.98720 **D_{50} =** 0.98357 **D_{100} =** 0.97995
C_v at 0.3 min. = 1.75 ft.^{2}/day **C_α =** 0.002

Pressure: 1.00 tsf **TEST READINGS** **Load No. 4**

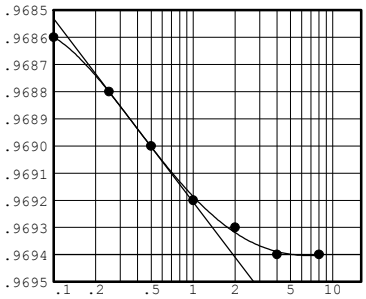
No.	Elapsed Time	Dial Reading
1	0.00	0.97800
2	0.10	0.97400
3	0.25	0.97250
4	0.50	0.97090
5	1.00	0.96940
6	2.00	0.96810
7	4.00	0.96730
8	8.00	0.96680



Void Ratio = 0.891 **Compression =** 3.2 %
D_0 = 0.97880 **D_{50} =** 0.97413 **D_{100} =** 0.96946
C_v at 0.2 min. = 1.89 ft.^{2}/day **C_α =** 0.002

Pressure: 0.50 tsf **TEST READINGS** **Load No. 5**

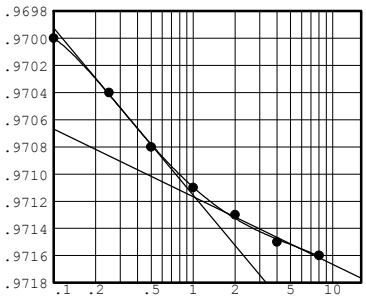
No.	Elapsed Time	Dial Reading
1	0.00	0.96680
2	0.10	0.96780
3	0.25	0.96800
4	0.50	0.96820
5	1.00	0.96840
6	2.00	0.96850
7	4.00	0.96860
8	8.00	0.96860



Void Ratio = 0.893 **Compression =** 3.1 %
D_0 = 0.96840 **D_{50} =** 0.96890 **D_{100} =** 0.96940
C_v at 0.4 min. = 1.32 ft.^{2}/day **C_α =** 0.000

Pressure: 0.25 tsf **TEST READINGS** **Load No. 6**

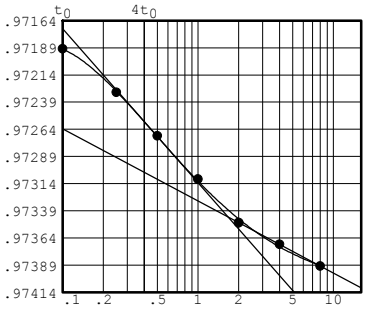
No.	Elapsed Time	Dial Reading
1	0.00	0.96860
2	0.10	0.96960
3	0.25	0.97000
4	0.50	0.97040
5	1.00	0.97070
6	2.00	0.97090
7	4.00	0.97110
8	8.00	0.97120



Void Ratio = 0.897 **Compression =** 2.8 %
D_0 = 0.96940 **D_{50} =** 0.97029 **D_{100} =** 0.97117
C_v at 0.2 min. = 2.37 ft.^{2}/day

Pressure: 0.13 tsf **TEST READINGS** **Load No. 7**

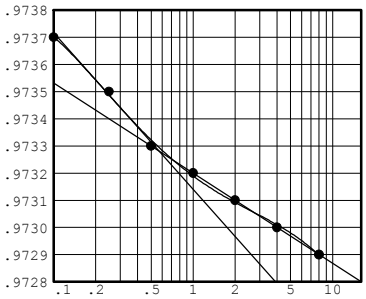
No.	Elapsed Time	Dial Reading
1	0.00	0.97120
2	0.10	0.97190
3	0.25	0.97230
4	0.50	0.97270
5	1.00	0.97310
6	2.00	0.97350
7	4.00	0.97370
8	8.00	0.97390



Void Ratio = 0.902 **Compression =** 2.6 %
D_0 = 0.97123 **D_{50} =** 0.97234 **D_{100} =** 0.97345
C_v at 0.3 min. = 1.71 ft.^{2}/day

Pressure: 0.25 tsf **TEST READINGS** **Load No. 8**

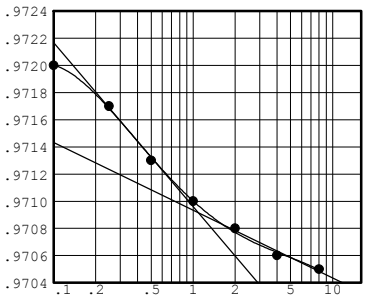
No.	Elapsed Time	Dial Reading
1	0.00	0.97390
2	0.10	0.97330
3	0.25	0.97310
4	0.50	0.97290
5	1.00	0.97280
6	2.00	0.97270
7	4.00	0.97260
8	8.00	0.97250



Void Ratio = 0.900 **Compression =** 2.7 %
D_0 = 0.97390 **D_{50} =** 0.97359 **D_{100} =** 0.97328
C_v at 0.2 min. = 2.84 ft.^{2}/day **C_α =** 0.000

Pressure: 0.50 tsf **TEST READINGS** **Load No. 9**

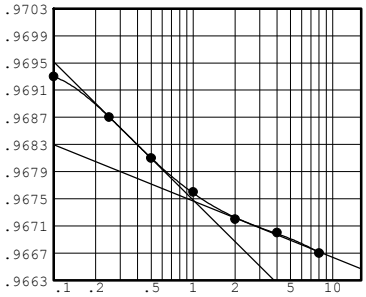
No.	Elapsed Time	Dial Reading
1	0.00	0.97250
2	0.10	0.97120
3	0.25	0.97090
4	0.50	0.97050
5	1.00	0.97020
6	2.00	0.97000
7	4.00	0.96980
8	8.00	0.96970



Void Ratio = 0.895 **Compression =** 3.0 %
D_0 = 0.97290 **D_{50} =** 0.97191 **D_{100} =** 0.97091
C_v at 0.1 min. = 3.14 ft.^{2}/day **C_α =** 0.001

Pressure: 1.00 tsf **TEST READINGS** **Load No. 10**

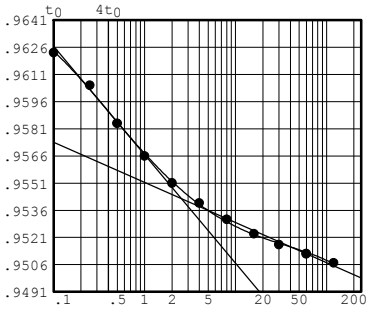
No.	Elapsed Time	Dial Reading
1	0.00	0.96970
2	0.10	0.96770
3	0.25	0.96710
4	0.50	0.96650
5	1.00	0.96600
6	2.00	0.96560
7	4.00	0.96540
8	8.00	0.96510



Void Ratio = 0.888 **Compression =** 3.3 %
D_0 = 0.97050 **D_{50} =** 0.96898 **D_{100} =** 0.96746
C_v at 0.2 min. = 2.59 ft.^{2}/day **C_α =** 0.001

Pressure: 2.00 tsf **TEST READINGS** **Load No. 11**

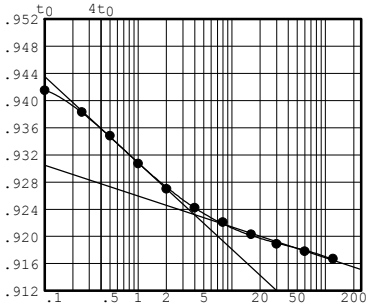
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.96510	11	60.00	0.94880
2	0.10	0.95990	12	120.00	0.94830
3	0.25	0.95810			
4	0.50	0.95600			
5	1.00	0.95420			
6	2.00	0.95270			
7	4.00	0.95160			
8	8.00	0.95070			
9	16.00	0.94990			
10	30.00	0.94930			



Void Ratio = 0.856 **Compression =** 4.9 %
D_0 = 0.96570 **D_{50} =** 0.95997 **D_{100} =** 0.95424
C_v at 0.3 min. = 1.61 ft.^{2}/day **C_α =** 0.002

Pressure: 4.00 tsf **TEST READINGS** **Load No. 12**

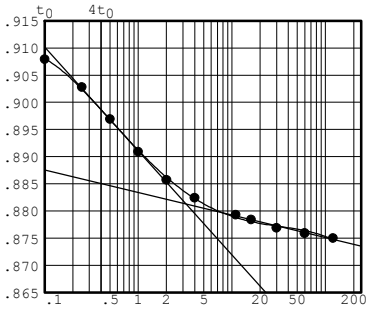
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.94830	11	60.00	0.91780
2	0.10	0.94150	12	120.00	0.91670
3	0.25	0.93830			
4	0.50	0.93480			
5	1.00	0.93070			
6	2.00	0.92700			
7	4.00	0.92420			
8	8.00	0.92210			
9	16.00	0.92030			
10	30.00	0.91890			



Void Ratio = 0.790 **Compression =** 8.3 %
D_0 = 0.94726 **D_{50} =** 0.93523 **D_{100} =** 0.92321
C_v at 0.4 min. = 0.96 ft.^{2}/day **C_α =** 0.005

Pressure: 8.00 tsf **TEST READINGS** **Load No. 13**

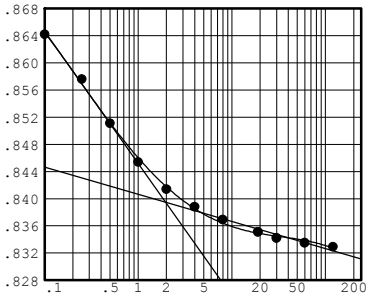
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.91670	11	60.00	0.87590
2	0.10	0.90790	12	120.00	0.87500
3	0.25	0.90280			
4	0.50	0.89690			
5	1.00	0.89090			
6	2.00	0.88570			
7	4.00	0.88240			
8	11.00	0.87930			
9	16.00	0.87840			
10	30.00	0.87690			



Void Ratio = 0.709 **Compression =** 12.5 %
D_0 = 0.91751 **D_{50} =** 0.89938 **D_{100} =** 0.88125
C_v at 0.4 min. = 1.08 ft.^{2}/day **C_α =** 0.005

Pressure: 16.00 tsf **TEST READINGS** **Load No. 14**

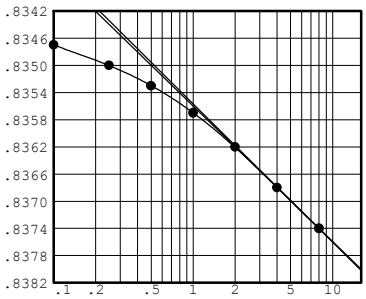
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.87500	11	60.00	0.83350
2	0.10	0.86420	12	120.00	0.83290
3	0.25	0.85760			
4	0.50	0.85110			
5	1.00	0.84540			
6	2.00	0.84140			
7	4.00	0.83880			
8	8.00	0.83690			
9	19.00	0.83510			
10	30.00	0.83420			



Void Ratio = 0.626 **Compression =** 16.7 %
D_0 = 0.87500 **D_{50} =** 0.85724 **D_{100} =** 0.83947
C_v at 0.2 min. = 1.50 ft.^{2}/day **C_α =** 0.005

Pressure: 8.00 tsf **TEST READINGS** **Load No. 15**

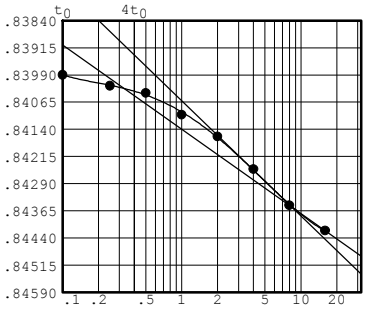
No.	Elapsed Time	Dial Reading
1	0.00	0.83290
2	0.10	0.83470
3	0.25	0.83500
4	0.50	0.83530
5	1.00	0.83570
6	2.00	0.83620
7	4.00	0.83680
8	8.00	0.83740



Void Ratio = 0.635 **Compression =** 16.3 %
D_0 = 0.83290 **D_{50} =** 0.83496 **D_{100} =** 0.83701
C_v at 0.2 min. = 1.57 ft.^{2}/day

Pressure: 4.00 tsf **TEST READINGS** **Load No. 16**

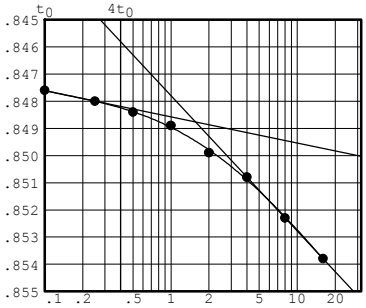
No.	Elapsed Time	Dial Reading
1	0.00	0.83740
2	0.10	0.83990
3	0.25	0.84020
4	0.50	0.84040
5	1.00	0.84100
6	2.00	0.84160
7	4.00	0.84250
8	8.00	0.84350
9	16.00	0.84420



Void Ratio = 0.648 **Compression =** 15.6 %
D_0 = 0.83945 **D_{50} =** 0.84150 **D_{100} =** 0.84354
C_v at 1.8 min. = 0.20 ft.^{2}/day

Pressure: 1.00 tsf **TEST READINGS** **Load No. 17**

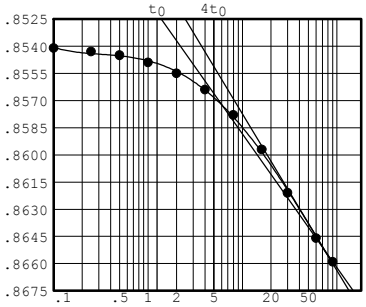
No.	Elapsed Time	Dial Reading
1	0.00	0.84420
2	0.10	0.84600
3	0.25	0.84640
4	0.50	0.84680
5	1.00	0.84730
6	2.00	0.84830
7	4.00	0.84920
8	8.00	0.85070
9	16.00	0.85220



Void Ratio = 0.667 **Compression =** 14.6 %
D_0 = 0.84696 **D_{50} =** 0.84786 **D_{100} =** 0.84876
C_v at 0.2 min. = 1.96 ft.^{2}/day

Pressure: 0.25 tsf **TEST READINGS** **Load No. 18**

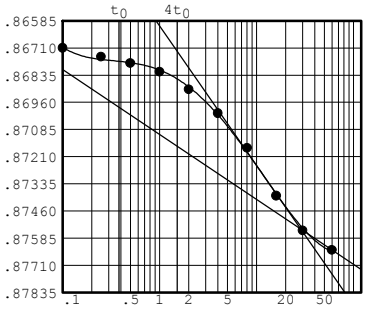
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.85220	11	60.00	0.86420
2	0.10	0.85370	12	90.00	0.86550
3	0.25	0.85390			
4	0.50	0.85410			
5	1.00	0.85450			
6	2.00	0.85510			
7	4.00	0.85600			
8	8.00	0.85740			
9	16.00	0.85930			
10	30.00	0.86170			



Void Ratio = 0.691 **Compression =** 13.4 %
D_0 **=** 0.85307 D_{50} **=** 0.85917 D_{100} **=** 0.86528
C_v **at 12.8 min. =** 0.03 ft.^{2}/day

Pressure: 0.13 tsf **TEST READINGS** **Load No. 19**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.86550	11	60.00	0.87640
2	0.10	0.86710			
3	0.25	0.86750			
4	0.50	0.86780			
5	1.00	0.86820			
6	2.00	0.86900			
7	4.00	0.87010			
8	8.00	0.87170			
9	16.00	0.87390			
10	30.00	0.87550			



Void Ratio = 0.711 **Compression =** 12.4 %
D_0 **=** 0.86690 D_{50} **=** 0.87117 D_{100} **=** 0.87544
C_v **at 6.1 min. =** 0.06 ft.^{2}/day

CONSOLIDATION TEST DATA

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project Number: VB10-238G

Sample Data

Source:
Sample No.: Shelby Tube
Elev. or Depth: 43-45 ft. **Sample Length(in./cm.):** 1 in.
Location: D7-9W
Description: Gray, Fat CLAY
Sample Date: **Liquid Limit:** **Plasticity Index:**
USCS: **AASHTO:**
Preparation Process:
Condition of Test:
Test Method: **Final Density:** **Figure No.:** 1
Testing Remarks: Boring D7-9W
Sample Obtained 10/15/10
Tested By: **Test Date:**
Checked By: **Title:**

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 327.68 g.	**Consolidometer #** = 1	**Wet w+t** = 319.84 g.
Dry w+t = 289.15 g.		**Dry w+t** = 289.15 g.
Tare Wt. = 174.46 g.	**Spec. Gravity** = 2.74	**Tare Wt.** = 174.46 g.
Height = 1.00 in.	**Height** = 1.00 in.	
Diameter = 2.50 in.	**Diameter** = 2.50 in.	
Weight = 153.22 g.	**Defl. Table** = Reference Set (inches/tsf)	
Moisture = 33.6 %	**Ht. Solids** = 0.5204 in.	**Moisture** = 26.8 %
Wet Den. = 118.9 pcf	**Dry Wt.** = 114.69 g.	**Dry Wt.** = 114.69 g.*
Dry Den. = 89.0 pcf	**Void Ratio** = 0.922	**Void Ratio** = 0.725
Ovrbrdn. = 1.00 tsf	**Saturation** = 99.9 %	

*** Final dry weight used in calculations**

End-of-Load Summary

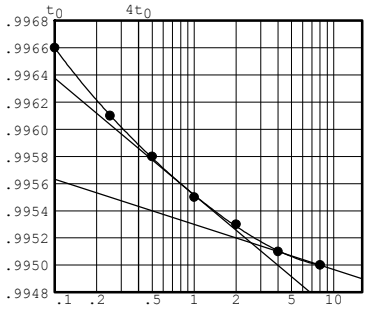
Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
start	1.00000				0.922	
0.13	0.99500	0.00000	2.57	0.000	0.912	0.5 Comprs.
0.25	0.99160	0.00040	2.17	0.001	0.906	0.8 Comprs.
0.50	0.98290	0.00080		0.001	0.890	1.6 Comprs.
1.00	0.97050	0.00160	3.43	0.002	0.868	2.8 Comprs.
0.50	0.97230	0.00080	3.30		0.870	2.7 Comprs.
0.25	0.97380	0.00040	2.46		0.872	2.6 Comprs.
0.13	0.97580	0.00000	1.69		0.875	2.4 Comprs.

Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
0.25	0.97430	0.00040	2.47	0.000	0.873	2.5 Comprs.
0.50	0.97290	0.00080	2.47	0.000	0.871	2.6 Comprs.
1.00	0.96940	0.00160	2.54	0.000	0.866	2.9 Comprs.
2.00	0.95200	0.00240	1.75	0.002	0.834	4.6 Comprs.
4.00	0.92770	0.00000	0.39	0.002	0.783	7.2 Comprs.
8.00	0.89720	0.00000	0.19	0.003	0.724	10.3 Comprs.
16.00	0.86090	0.00000	0.73	0.004	0.654	13.9 Comprs.
8.00	0.86540	0.00000	1.67		0.663	13.5 Comprs.
4.00	0.87020	0.00000	0.20		0.672	13.0 Comprs.
1.00	0.87420	0.00160			0.683	12.4 Comprs.
0.25	0.88650	0.00040	0.05		0.704	11.3 Comprs.
0.13	0.89740	0.00000	0.50		0.725	10.3 Comprs.

C_c = 0.23 **P_c =** 2.77 tsf **C_r =** 0.02

Pressure: 0.13 tsf **TEST READINGS** **Load No. 1**

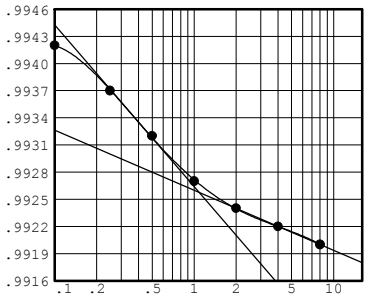
No.	Elapsed Time	Dial Reading
1	0.00	1.00000
2	0.10	0.99660
3	0.25	0.99610
4	0.50	0.99580
5	1.00	0.99550
6	2.00	0.99530
7	4.00	0.99510
8	8.00	0.99500



Void Ratio = 0.912 **Compression =** 0.5 %
D_0 = 0.99731 **D_{50} =** 0.99624 **D_{100} =** 0.99516
C_v at 0.2 min. = 2.57 ft.^{2}/day **C_α =** 0.000

Pressure: 0.25 tsf **TEST READINGS** **Load No. 2**

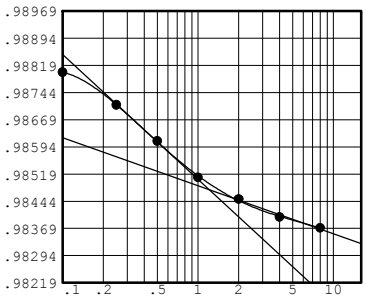
No.	Elapsed Time	Dial Reading
1	0.00	0.99500
2	0.10	0.99380
3	0.25	0.99330
4	0.50	0.99280
5	1.00	0.99230
6	2.00	0.99200
7	4.00	0.99180
8	8.00	0.99160



Void Ratio = 0.906 **Compression =** 0.8 %
D_0 = 0.99500 **D_{50} =** 0.99379 **D_{100} =** 0.99258
C_v at 0.2 min. = 2.17 ft.^{2}/day **C_α =** 0.001

Pressure: 0.50 tsf **TEST READINGS** **Load No. 3**

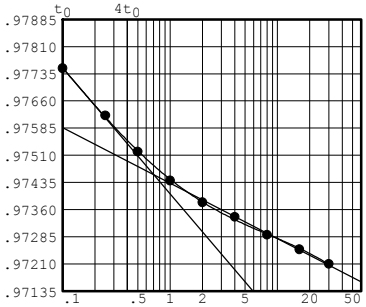
No.	Elapsed Time	Dial Reading
1	0.00	0.99160
2	0.10	0.98720
3	0.25	0.98630
4	0.50	0.98530
5	1.00	0.98430
6	2.00	0.98370
7	4.00	0.98320
8	8.00	0.98290



Void Ratio = 0.890 **Compression =** 1.6 %

Pressure: 1.00 tsf **TEST READINGS** **Load No. 4**

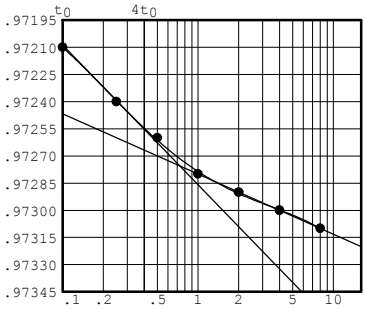
No.	Elapsed Time	Dial Reading
1	0.00	0.98290
2	0.10	0.97590
3	0.25	0.97460
4	0.50	0.97360
5	1.00	0.97280
6	2.00	0.97220
7	4.00	0.97180
8	8.00	0.97130
9	16.00	0.97090
10	30.00	0.97050



Void Ratio = 0.868 **Compression =** 2.8 %
D_0 = 0.97952 **D_{50} =** 0.97704 **D_{100} =** 0.97456
C_v at 0.1 min. = 3.43 ft.^{2}/day **C_α =** 0.002

Pressure: 0.50 tsf **TEST READINGS** **Load No. 5**

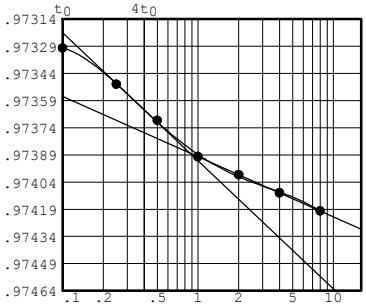
No.	Elapsed Time	Dial Reading
1	0.00	0.97050
2	0.10	0.97130
3	0.25	0.97160
4	0.50	0.97180
5	1.00	0.97200
6	2.00	0.97210
7	4.00	0.97220
8	8.00	0.97230



Void Ratio = 0.870 **Compression =** 2.7 %
D_0 = 0.97166 **D_{50} =** 0.97221 **D_{100} =** 0.97276
C_v at 0.1 min. = 3.30 ft.^{2}/day

Pressure: 0.25 tsf **TEST READINGS** **Load No. 6**

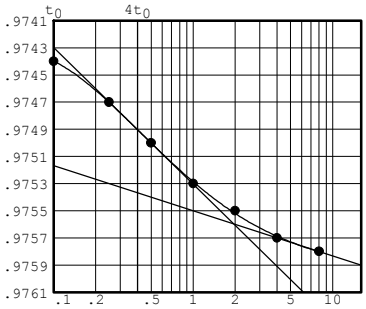
No.	Elapsed Time	Dial Reading
1	0.00	0.97230
2	0.10	0.97290
3	0.25	0.97310
4	0.50	0.97330
5	1.00	0.97350
6	2.00	0.97360
7	4.00	0.97370
8	8.00	0.97380



Void Ratio = 0.872 **Compression =** 2.6 %
D_0 = 0.97296 **D_{50} =** 0.97342 **D_{100} =** 0.97388
C_v at 0.2 min. = 2.46 ft.^{2}/day

Pressure: 0.13 tsf **TEST READINGS** **Load No. 7**

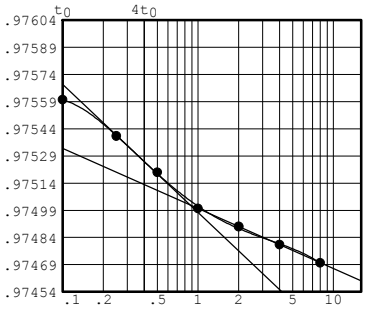
No.	Elapsed Time	Dial Reading
1	0.00	0.97380
2	0.10	0.97440
3	0.25	0.97470
4	0.50	0.97500
5	1.00	0.97530
6	2.00	0.97550
7	4.00	0.97570
8	8.00	0.97580



Void Ratio = 0.875 **Compression =** 2.4 %
D_0 = 0.97389 **D_{50} =** 0.97475 **D_{100} =** 0.97560
C_v at 0.3 min. = 1.69 ft.^{2}/day

Pressure: 0.25 tsf **TEST READINGS** **Load No. 8**

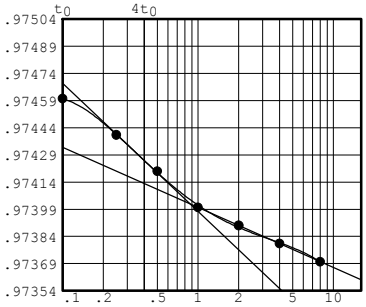
No.	Elapsed Time	Dial Reading
1	0.00	0.97580
2	0.10	0.97520
3	0.25	0.97500
4	0.50	0.97480
5	1.00	0.97460
6	2.00	0.97450
7	4.00	0.97440
8	8.00	0.97430



Void Ratio = 0.873 **Compression =** 2.5 %
D_0 = 0.97594 **D_{50} =** 0.97548 **D_{100} =** 0.97502
C_v at 0.2 min. = 2.47 ft.^{2}/day **C_α =** 0.000

Pressure: 0.50 tsf **TEST READINGS** **Load No. 9**

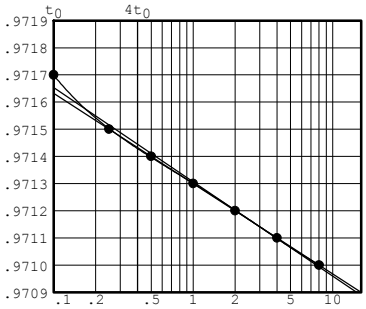
No.	Elapsed Time	Dial Reading
1	0.00	0.97430
2	0.10	0.97380
3	0.25	0.97360
4	0.50	0.97340
5	1.00	0.97320
6	2.00	0.97310
7	4.00	0.97300
8	8.00	0.97290



Void Ratio = 0.871 **Compression =** 2.6 %
D_0 = 0.97494 **D_{50} =** 0.97448 **D_{100} =** 0.97402
C_v at 0.2 min. = 2.47 ft.^{2}/day **C_α =** 0.000

Pressure: 1.00 tsf **TEST READINGS** **Load No. 10**

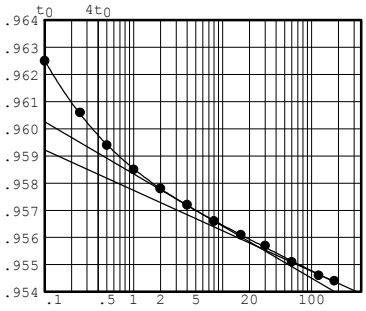
No.	Elapsed Time	Dial Reading
1	0.00	0.97290
2	0.10	0.97010
3	0.25	0.96990
4	0.50	0.96980
5	1.00	0.96970
6	2.00	0.96960
7	4.00	0.96950
8	8.00	0.96940



Void Ratio = 0.866 **Compression =** 2.9 %
D_0 = 0.97197 **D_{50} =** 0.97156 **D_{100} =** 0.97115
C_v at 0.2 min. = 2.54 ft.^{2}/day **C_α =** 0.000

Pressure: 2.00 tsf **TEST READINGS** **Load No. 11**

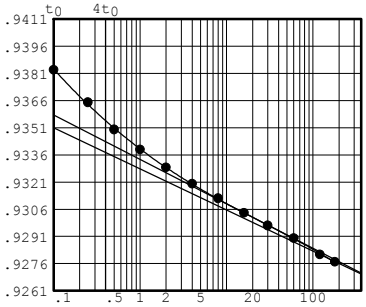
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.96940	11	60.00	0.95270
2	0.10	0.96010	12	120.00	0.95220
3	0.25	0.95820	13	180.00	0.95200
4	0.50	0.95700			
5	1.00	0.95610			
6	2.00	0.95540			
7	4.00	0.95480			
8	8.00	0.95420			
9	16.00	0.95370			
10	30.00	0.95330			



Void Ratio = 0.834 **Compression =** 4.6 %
D_0 = 0.96528 **D_{50} =** 0.96047 **D_{100} =** 0.95565
C_v at 0.3 min. = 1.75 ft.^{2}/day **C_α =** 0.002

Pressure: 4.00 tsf **TEST READINGS** **Load No. 12**

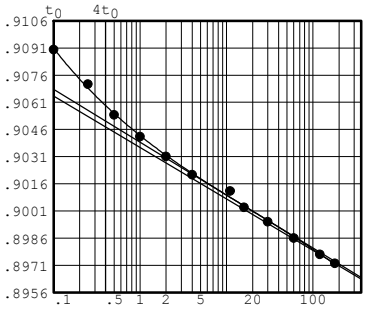
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.95200	11	60.00	0.92900
2	0.10	0.93830	12	120.00	0.92810
3	0.25	0.93650	13	180.00	0.92770
4	0.50	0.93500			
5	1.00	0.93390			
6	2.00	0.93290			
7	4.00	0.93200			
8	8.00	0.93120			
9	16.00	0.93040			
10	30.00	0.92970			



Void Ratio = 0.783 **Compression =** 7.2 %
D_0 **=** 0.94118 D_{50} **=** 0.93376 D_{100} **=** 0.92634
C_v **at 1.1 min. =** 0.39 ft.^{2}/day C_α **=** 0.002

Pressure: 8.00 tsf **TEST READINGS** **Load No. 13**

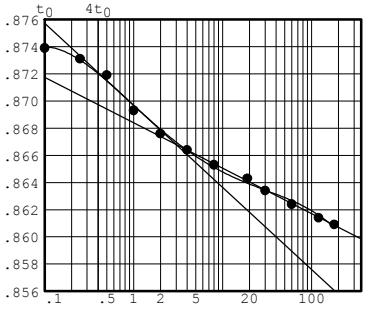
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.92770	11	60.00	0.89860
2	0.10	0.90900	12	120.00	0.89770
3	0.25	0.90710	13	180.00	0.89720
4	0.50	0.90540			
5	1.00	0.90420			
6	2.00	0.90310			
7	4.00	0.90210			
8	11.00	0.90120			
9	16.00	0.90030			
10	30.00	0.89950			



Void Ratio = 0.724 **Compression =** 10.3 %
D_0 **=** 0.91223 D_{50} **=** 0.90305 D_{100} **=** 0.89388
C_v **at 2.2 min. =** 0.19 ft.^{2}/day C_α **=** 0.003

Pressure: 16.00 tsf **TEST READINGS** **Load No. 14**

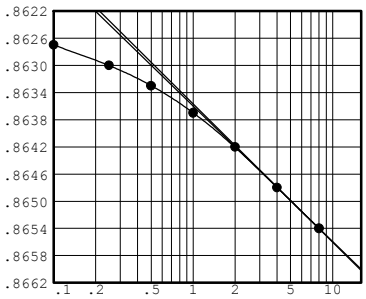
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.89720	11	60.00	0.86240
2	0.10	0.87390	12	120.00	0.86140
3	0.25	0.87310	13	180.00	0.86090
4	0.50	0.87190			
5	1.00	0.86930			
6	2.00	0.86760			
7	4.00	0.86640			
8	8.00	0.86530			
9	19.00	0.86430			
10	30.00	0.86340			



Void Ratio = 0.654 **Compression =** 13.9 %
D_0 **=** 0.87597 D_{50} **=** 0.87138 D_{100} **=** 0.86680
C_v **at 0.5 min. =** 0.73 ft.^{2}/day C_α **=** 0.004

Pressure: 8.00 tsf **TEST READINGS** **Load No. 15**

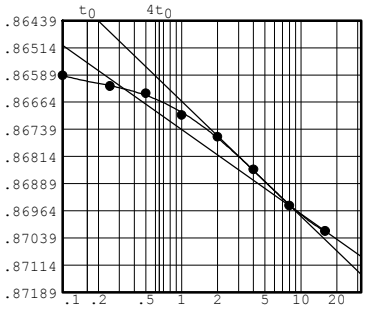
No.	Elapsed Time	Dial Reading
1	0.00	0.86090
2	0.10	0.86270
3	0.25	0.86300
4	0.50	0.86330
5	1.00	0.86370
6	2.00	0.86420
7	4.00	0.86480
8	8.00	0.86540



Void Ratio = 0.663 **Compression =** 13.5 %
D_0 = 0.86090 **D_{50} =** 0.86296 **D_{100} =** 0.86501
C_v at 0.2 min. = 1.67 ft.^{2}/day

Pressure: 4.00 tsf **TEST READINGS** **Load No. 16**

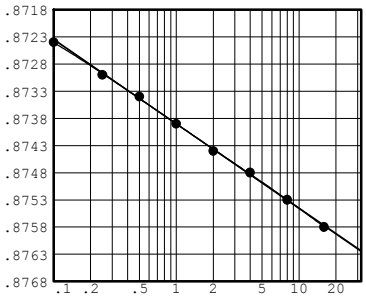
No.	Elapsed Time	Dial Reading
1	0.00	0.86540
2	0.10	0.86590
3	0.25	0.86620
4	0.50	0.86640
5	1.00	0.86700
6	2.00	0.86760
7	4.00	0.86850
8	8.00	0.86950
9	16.00	0.87020



Void Ratio = 0.672 **Compression =** 13.0 %
D_0 = 0.86553 **D_{50} =** 0.86754 **D_{100} =** 0.86954
C_v at 1.8 min. = 0.20 ft.^{2}/day

Pressure: 1.00 tsf **TEST READINGS** **Load No. 17**

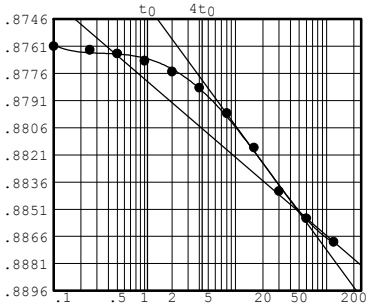
No.	Elapsed Time	Dial Reading
1	0.00	0.87020
2	0.10	0.87080
3	0.25	0.87140
4	0.50	0.87180
5	1.00	0.87230
6	2.00	0.87280
7	4.00	0.87320
8	8.00	0.87370
9	16.00	0.87420



Void Ratio = 0.683 **Compression =** 12.4 %

Pressure: 0.25 tsf **TEST READINGS** **Load No. 18**

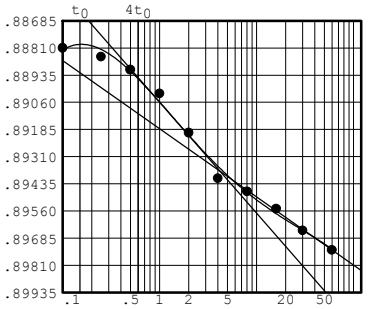
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.87420	11	60.00	0.88520
2	0.10	0.87570	12	120.00	0.88650
3	0.25	0.87590			
4	0.50	0.87610			
5	1.00	0.87650			
6	2.00	0.87710			
7	4.00	0.87800			
8	8.00	0.87940			
9	16.00	0.88130			
10	30.00	0.88370			



Void Ratio = 0.704 **Compression =** 11.3 %
D_0 **=** 0.87502 D_{50} **=** 0.88011 D_{100} **=** 0.88520
C_v **at 8.4 min. =** 0.05 ft.^{2}/day

Pressure: 0.13 tsf **TEST READINGS** **Load No. 19**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.88650	11	60.00	0.89740
2	0.10	0.88810			
3	0.25	0.88850			
4	0.50	0.88910			
5	1.00	0.89020			
6	2.00	0.89200			
7	4.00	0.89410			
8	8.00	0.89470			
9	16.00	0.89550			
10	30.00	0.89650			



Void Ratio = 0.725 **Compression =** 10.3 %
D_0 **=** 0.88634 D_{50} **=** 0.89007 D_{100} **=** 0.89379
C_v **at 0.8 min. =** 0.50 ft.^{2}/day

CONSOLIDATION TEST DATA

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project Number: VB10-238G

Sample Data

Source:
Sample No.: Shelby Tube
Elev. or Depth: 37-39 ft. **Sample Length(in./cm.):** NA
Location: D7-10W
Description: Gray, Fat CLAY
Sample Date: **Liquid Limit:** **Plasticity Index:**
USCS: **AASHTO:**
Preparation Process:
Condition of Test:
Test Method: **Final Density:** **Figure No.:** 1
Testing Remarks: Boring D7-10W
Sample Obtained 10/15/10
Tested By: **Test Date:**
Checked By: **Title:**

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 289.86 g.	**Consolidometer #** = 1	**Wet w+t** = 271.89 g.
Dry w+t = 248.81 g.		**Dry w+t** = 248.81 g.
Tare Wt. = 145.30 g.	**Spec. Gravity** = 2.63	**Tare Wt.** = 145.30 g.
Height = 1.00 in.	**Height** = 1.00 in.	
Diameter = 2.50 in.	**Diameter** = 2.50 in.	
Weight = 143.26 g.	**Defl. Table** = Reference Set (inches/tsf)	
Moisture = 39.7 %	**Ht. Solids** = 0.4893 in.	**Moisture** = 22.3 %
Wet Den. = 111.2 pcf	**Dry Wt.** = 102.58 g.	**Dry Wt.** = 103.51 g.*
Dry Den. = 79.6 pcf	**Void Ratio** = 1.044	**Void Ratio** = 0.651
Ovrbrdn. = 1.25 tsf	**Saturation** = 99.9 %	

*** Final dry weight used in calculations**

End-of-Load Summary

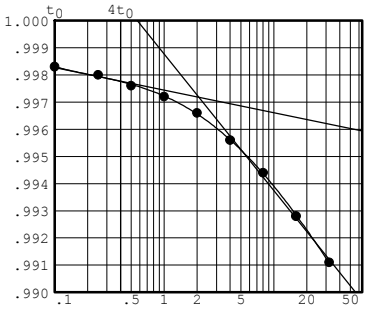
Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
start	1.00000				1.044	
0.13	0.99110	0.00000	2.43	0.005	1.026	0.9 Comprs.
0.25	0.97530	0.00040	1.87	0.010	0.994	2.4 Comprs.
0.50	0.95570	0.00080	0.09	0.012	0.955	4.3 Comprs.
1.00	0.92540	0.00160	0.10	0.011	0.895	7.3 Comprs.
0.50	0.92770	0.00080	0.62		0.898	7.2 Comprs.
0.25	0.93140	0.00040	0.42		0.904	6.8 Comprs.
0.13	0.93780	0.00000	0.10		0.917	6.2 Comprs.

Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
0.25	0.93640	0.00040	0.47	0.001	0.915	6.3 Comprs.
0.50	0.93180	0.00080	1.01	0.002	0.906	6.7 Comprs.
1.00	0.92350	0.00160	0.29	0.004	0.891	7.5 Comprs.
2.00	0.88570	0.00240	0.11	0.013	0.815	11.2 Comprs.
4.00	0.84100	0.00000	0.09	0.005	0.719	15.9 Comprs.
8.00	0.79640	0.00000	0.00	0.027	0.628	20.4 Comprs.
16.00	0.75320	0.00000	0.11	0.014	0.539	24.7 Comprs.
8.00	0.75860	0.00000	2.62		0.550	24.1 Comprs.
4.00	0.76350	0.00000	0.89		0.560	23.6 Comprs.
1.00	0.76940	0.00160	0.08		0.576	22.9 Comprs.
0.25	0.78810	0.00040	0.02		0.612	21.1 Comprs.
0.13	0.80780	0.00000	0.29		0.651	19.2 Comprs.

C_c = 0.32 **P_c =** 0.97 tsf **C_r =** 0.04

Pressure: 0.13 tsf **TEST READINGS** **Load No. 1**

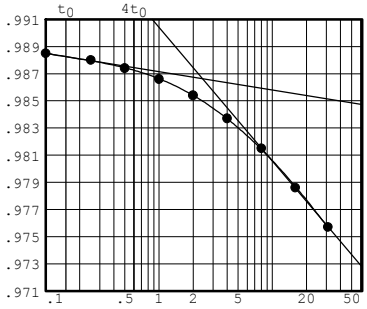
No.	Elapsed Time	Dial Reading
1	0.00	1.00000
2	0.10	0.99830
3	0.25	0.99800
4	0.50	0.99760
5	1.00	0.99720
6	2.00	0.99660
7	4.00	0.99560
8	8.00	0.99440
9	16.00	0.99280
10	32.00	0.99110



Void Ratio = 1.026 **Compression =** 0.9 %
D_0 = 0.99887 **D_{50} =** 0.99802 **D_{100} =** 0.99718
C_v at 0.2 min. = 2.43 ft.^{2}/day **C_α =** 0.005

Pressure: 0.25 tsf **TEST READINGS** **Load No. 2**

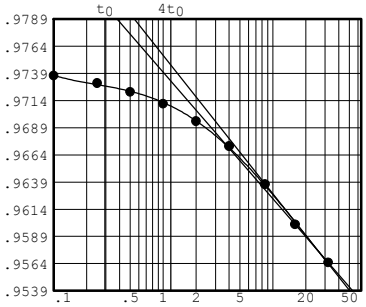
No.	Elapsed Time	Dial Reading
1	0.00	0.99110
2	0.10	0.98810
3	0.25	0.98760
4	0.50	0.98700
5	1.00	0.98620
6	2.00	0.98500
7	4.00	0.98330
8	8.00	0.98110
9	16.00	0.97820
10	31.00	0.97530



Void Ratio = 0.994 **Compression =** 2.4 %
D_0 = 0.98925 **D_{50} =** 0.98794 **D_{100} =** 0.98663
C_v at 0.3 min. = 1.87 ft.^{2}/day **C_α =** 0.010

Pressure: 0.50 tsf **TEST READINGS** **Load No. 3**

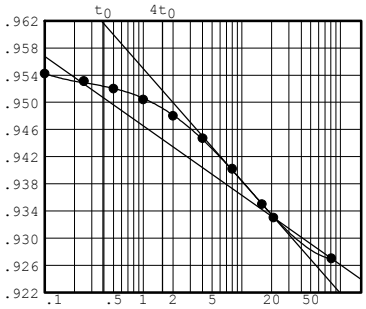
No.	Elapsed Time	Dial Reading
1	0.00	0.97530
2	0.10	0.97290
3	0.25	0.97220
4	0.50	0.97140
5	1.00	0.97030
6	2.00	0.96870
7	4.00	0.96640
8	8.50	0.96290
9	16.00	0.95920
10	32.00	0.95570



Void Ratio = 0.955 **Compression =** 4.3 %
D_0 **=** 0.97458 D_{50} **=** 0.96610 D_{100} **=** 0.95761
C_v **at 5.0 min. =** 0.09 ft.^{2}/day C_α **=** 0.012

Pressure: 1.00 tsf **TEST READINGS** **Load No. 4**

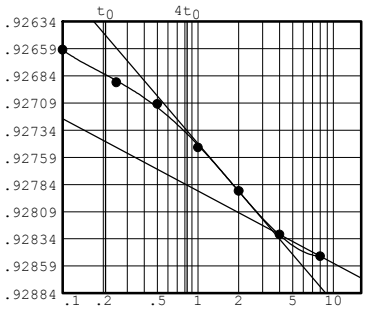
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.95570	11	81.00	0.92540
2	0.10	0.95260			
3	0.25	0.95150			
4	0.50	0.95040			
5	1.00	0.94880			
6	2.00	0.94640			
7	4.00	0.94310			
8	8.00	0.93860			
9	16.00	0.93340			
10	21.00	0.93140			



Void Ratio = 0.895 **Compression =** 7.3 %
D_0 **=** 0.95564 D_{50} **=** 0.94425 D_{100} **=** 0.93286
C_v **at 4.2 min. =** 0.10 ft.^{2}/day C_α **=** 0.011

Pressure: 0.50 tsf **TEST READINGS** **Load No. 5**

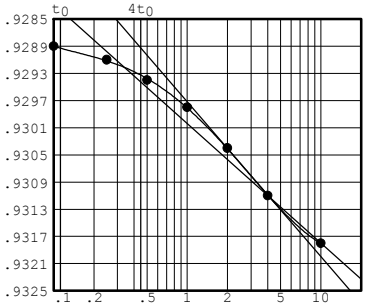
No.	Elapsed Time	Dial Reading
1	0.00	0.92540
2	0.10	0.92580
3	0.25	0.92610
4	0.50	0.92630
5	1.00	0.92670
6	2.00	0.92710
7	4.00	0.92750
8	8.00	0.92770



Void Ratio = 0.898 **Compression =** 7.2 %
D_0 **=** 0.92629 D_{50} **=** 0.92728 D_{100} **=** 0.92826
C_v **at 0.7 min. =** 0.62 ft.^{2}/day

Pressure: 0.25 tsf **TEST READINGS** **Load No. 6**

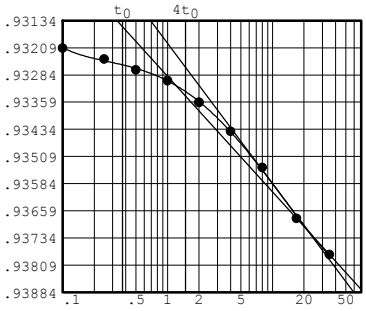
No.	Elapsed Time	Dial Reading
1	0.00	0.92770
2	0.10	0.92850
3	0.25	0.92870
4	0.50	0.92900
5	1.00	0.92940
6	2.00	0.93000
7	4.00	0.93070
8	10.00	0.93140



Void Ratio = 0.904 **Compression =** 6.8 %
D_0 = 0.92853 **D_{50} =** 0.92983 **D_{100} =** 0.93112
C_v at 1.0 min. = 0.42 ft.^{2}/day

Pressure: 0.13 tsf **TEST READINGS** **Load No. 7**

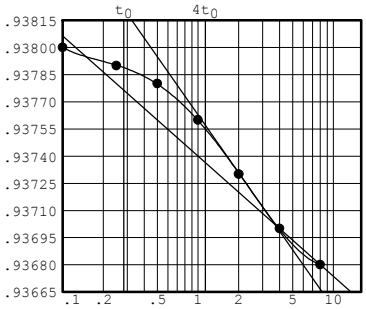
No.	Elapsed Time	Dial Reading
1	0.00	0.93140
2	0.10	0.93210
3	0.25	0.93240
4	0.50	0.93270
5	1.00	0.93300
6	2.00	0.93360
7	4.00	0.93440
8	8.00	0.93540
9	17.00	0.93680
10	35.00	0.93780



Void Ratio = 0.917 **Compression =** 6.2 %
D_0 = 0.93182 **D_{50} =** 0.93448 **D_{100} =** 0.93714
C_v at 4.2 min. = 0.10 ft.^{2}/day

Pressure: 0.25 tsf **TEST READINGS** **Load No. 8**

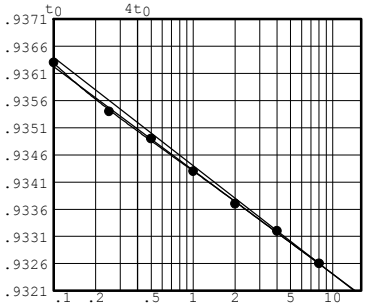
No.	Elapsed Time	Dial Reading
1	0.00	0.93780
2	0.10	0.93760
3	0.25	0.93750
4	0.50	0.93740
5	1.00	0.93720
6	2.00	0.93690
7	4.00	0.93660
8	8.00	0.93640



Void Ratio = 0.915 **Compression =** 6.3 %
D_0 = 0.93823 **D_{50} =** 0.93763 **D_{100} =** 0.93702
C_v at 0.9 min. = 0.47 ft.^{2}/day **C_α =** 0.001

Pressure: 0.50 tsf **TEST READINGS** **Load No. 9**

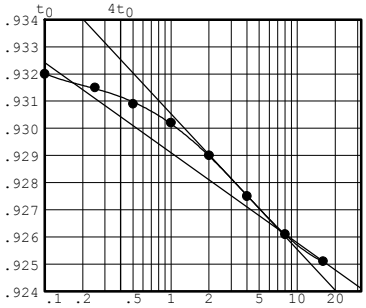
No.	Elapsed Time	Dial Reading
1	0.00	0.93640
2	0.10	0.93550
3	0.25	0.93460
4	0.50	0.93410
5	1.00	0.93350
6	2.00	0.93290
7	4.00	0.93240
8	8.00	0.93180



Void Ratio = 0.906 **Compression =** 6.7 %
D_0 = 0.93755 **D_{50} =** 0.93498 **D_{100} =** 0.93242
C_v at 0.4 min. = 1.01 ft.^{2}/day **C_α =** 0.002

Pressure: 1.00 tsf **TEST READINGS** **Load No. 10**

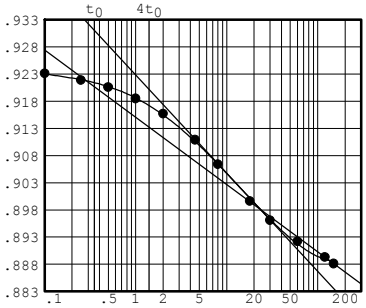
No.	Elapsed Time	Dial Reading
1	0.00	0.93190
2	0.10	0.93040
3	0.25	0.92990
4	0.50	0.92930
5	1.00	0.92860
6	2.00	0.92740
7	4.00	0.92590
8	8.00	0.92450
9	16.00	0.92350



Void Ratio = 0.891 **Compression =** 7.5 %
D_0 = 0.93286 **D_{50} =** 0.92955 **D_{100} =** 0.92625
C_v at 1.5 min. = 0.29 ft.^{2}/day **C_α =** 0.004

Pressure: 2.00 tsf **TEST READINGS** **Load No. 11**

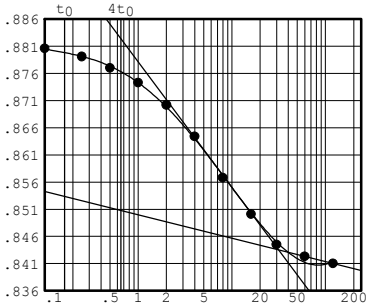
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.92450	11	60.00	0.88980
2	0.10	0.92070	12	120.00	0.88690
3	0.25	0.91950	13	150.00	0.88570
4	0.50	0.91820			
5	1.00	0.91610			
6	2.00	0.91330			
7	4.50	0.90850			
8	8.00	0.90400			
9	18.00	0.89720			
10	30.00	0.89370			



Void Ratio = 0.815 **Compression =** 11.2 %
D_0 = 0.92565 **D_{50} =** 0.91188 **D_{100} =** 0.89812
C_v at 3.7 min. = 0.11 ft.^{2}/day **C_α =** 0.013

Pressure: 4.00 tsf **TEST READINGS** **Load No. 12**

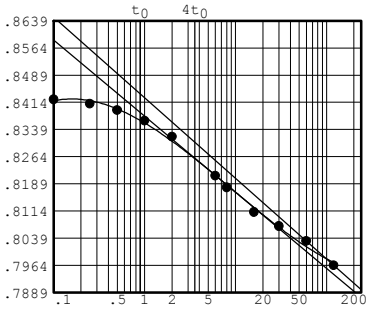
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.88570	11	60.00	0.84230
2	0.10	0.88060	12	120.00	0.84100
3	0.25	0.87910			
4	0.50	0.87700			
5	1.00	0.87430			
6	2.00	0.87020			
7	4.00	0.86440			
8	8.00	0.85680			
9	16.00	0.85010			
10	30.00	0.84450			



Void Ratio = 0.719 **Compression =** 15.9 %
D_0 **=** 0.88332 D_{50} **=** 0.86341 D_{100} **=** 0.84351
C_v **at 4.2 min. =** 0.09 ft.^{2}/day C_α **=** 0.005

Pressure: 8.00 tsf **TEST READINGS** **Load No. 13**

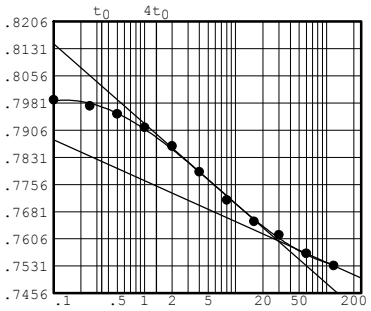
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.83570	11	60.00	0.80310
2	0.10	0.84220	12	120.00	0.79640
3	0.25	0.84100			
4	0.50	0.83920			
5	1.00	0.83630			
6	2.00	0.83190			
7	6.00	0.82110			
8	8.00	0.81790			
9	16.00	0.81110			
10	30.00	0.80720			



Void Ratio = 0.628 **Compression =** 20.4 %
D_0 **=** 0.84703 D_{50} **=** 0.79984 D_{100} **=** 0.75265
C_v **at 76.9 min. =** 0.00 ft.^{2}/day C_α **=** 0.027

Pressure: 16.00 tsf **TEST READINGS** **Load No. 14**

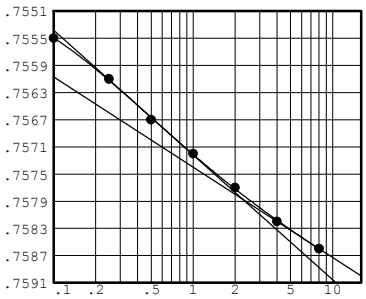
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.80040	11	60.00	0.75660
2	0.10	0.79900	12	120.00	0.75320
3	0.25	0.79730			
4	0.50	0.79510			
5	1.00	0.79140			
6	2.00	0.78620			
7	4.00	0.77910			
8	8.00	0.77130			
9	16.00	0.76540			
10	30.00	0.76170			



Void Ratio = 0.539 **Compression =** 24.7 %
D_0 **=** 0.80547 D_{50} **=** 0.78285 D_{100} **=** 0.76024
C_v **at 2.7 min. =** 0.11 ft.^{2}/day C_α **=** 0.014

Pressure: 8.00 tsf **TEST READINGS** **Load No. 15**

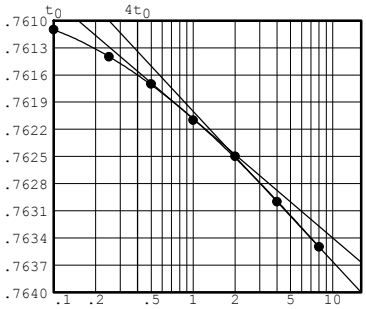
No.	Elapsed Time	Dial Reading
1	0.00	0.75320
2	0.10	0.75550
3	0.25	0.75610
4	0.50	0.75670
5	1.00	0.75720
6	2.00	0.75770
7	4.00	0.75820
8	8.00	0.75860



Void Ratio = 0.550 **Compression =** 24.1 %
D_0 = 0.75320 **D_{50} =** 0.75554 **D_{100} =** 0.75787
C_v at 0.1 min. = 2.62 ft.^{2}/day

Pressure: 4.00 tsf **TEST READINGS** **Load No. 16**

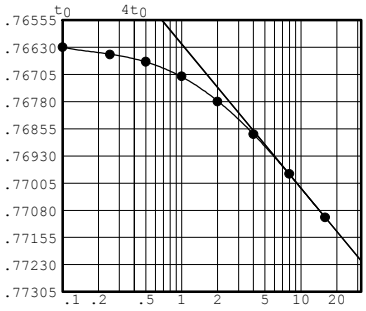
No.	Elapsed Time	Dial Reading
1	0.00	0.75860
2	0.10	0.76110
3	0.25	0.76140
4	0.50	0.76170
5	1.00	0.76210
6	2.00	0.76250
7	4.00	0.76300
8	8.00	0.76350



Void Ratio = 0.560 **Compression =** 23.6 %
D_0 = 0.76060 **D_{50} =** 0.76150 **D_{100} =** 0.76240
C_v at 0.3 min. = 0.89 ft.^{2}/day

Pressure: 1.00 tsf **TEST READINGS** **Load No. 17**

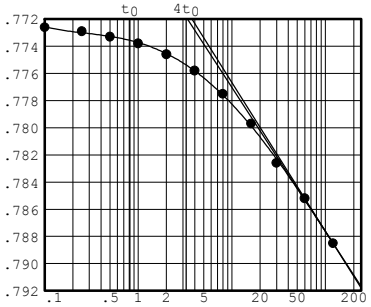
No.	Elapsed Time	Dial Reading
1	0.00	0.76350
2	0.10	0.76470
3	0.25	0.76490
4	0.50	0.76510
5	1.00	0.76550
6	2.00	0.76620
7	4.00	0.76710
8	8.00	0.76820
9	16.00	0.76940



Void Ratio = 0.576 **Compression =** 22.9 %
D_0 = 0.76599 **D_{50} =** 0.76854 **D_{100} =** 0.77109
C_v at 3.6 min. = 0.08 ft.^{2}/day

Pressure: 0.25 tsf **TEST READINGS** **Load No. 18**

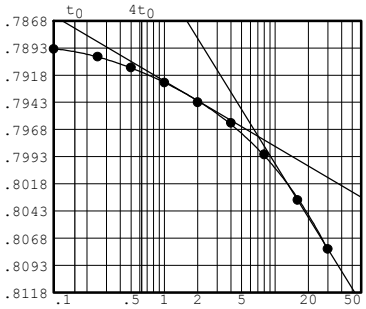
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.76940	11	60.00	0.78480
2	0.10	0.77220	12	120.00	0.78810
3	0.25	0.77250			
4	0.50	0.77290			
5	1.00	0.77340			
6	2.00	0.77420			
7	4.00	0.77540			
8	8.00	0.77710			
9	16.00	0.77930			
10	30.00	0.78220			



Void Ratio = 0.612 **Compression =** 21.1 %
D_0 = 0.77175 **D_{50} =** 0.78001 **D_{100} =** 0.78827
C_v at 16.7 min. = 0.02 ft.^{2}/day

Pressure: 0.13 tsf **TEST READINGS** **Load No. 19**

No.	Elapsed Time	Dial Reading
1	0.00	0.78610
2	0.10	0.78940
3	0.25	0.79010
4	0.50	0.79110
5	1.00	0.79250
6	2.00	0.79430
7	4.00	0.79620
8	8.00	0.79910
9	16.00	0.80330
10	30.00	0.80780



Void Ratio = 0.651 **Compression =** 19.2 %
D_0 = 0.78776 **D_{50} =** 0.79260 **D_{100} =** 0.79743
C_v at 1.1 min. = 0.29 ft.^{2}/day

CONSOLIDATION TEST DATA

Client: HDR, Inc.
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Project Number: VB10-238G

Sample Data

Source:
Sample No.: Shelby Tube
Elev. or Depth: 95-97 ft. **Sample Length(in./cm.):** 1 in.
Location: CUR-4B
Description: Gray, Fat CLAY
Sample Date: **Liquid Limit:** **Plasticity Index:**
USCS: **AASHTO:**
Preparation Process:
Condition of Test:
Test Method: **Final Density:** **Figure No.:** 1
Testing Remarks: CUR-4B
Sample Obtained 10/15/10
Tested By: **Test Date:**
Checked By: **Title:**

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 309.47 g.	**Consolidometer #** = 1	**Wet w+t** = 290.95 g.
Dry w+t = 260.95 g.		**Dry w+t** = 260.95 g.
Tare Wt. = 174.48 g.	**Spec. Gravity** = 2.71	**Tare Wt.** = 174.48 g.
Height = 1.00 in.	**Height** = 1.00 in.	
Diameter = 2.50 in.	**Diameter** = 2.50 in.	
Weight = 124.99 g.	**Defl. Table** = Reference Set (inches/tsf)	
Moisture = 56.1 %	**Ht. Solids** = 0.3967 in.	**Moisture** = 34.7 %
Wet Den. = 97.0 pcf	**Dry Wt.** = 80.06 g.	**Dry Wt.** = 86.47 g.*
Dry Den. = 62.1 pcf	**Void Ratio** = 1.521	**Void Ratio** = 0.889
Ovrbrdn. = 2.70 tsf	**Saturation** = 100.0 %	

*** Final dry weight used in calculations**

End-of-Load Summary

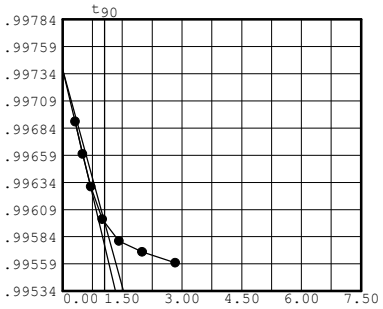
Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
start	1.00000				1.521	
0.13	0.99560	0.00000	1.90		1.510	0.4 Comprs.
0.25	0.98910	0.00040	0.46		1.495	1.1 Comprs.
0.50	0.97300	0.00080	0.16		1.455	2.6 Comprs.
1.00	0.94320	0.00160	0.11		1.382	5.5 Comprs.
2.00	0.91470	0.00240	0.20		1.312	8.3 Comprs.
1.00	0.91690	0.00160	1.11		1.316	8.1 Comprs.
0.50	0.91990	0.00080	2.84		1.321	7.9 Comprs.

Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
0.25	0.92360	0.00040	1.10		1.329	7.6 Comprs.
0.13	0.92920	0.00000	0.47		1.343	7.1 Comprs.
0.25	0.92690	0.00040	1.91		1.338	7.3 Comprs.
0.50	0.92420	0.00080	2.40		1.332	7.5 Comprs.
1.00	0.92170	0.00160	1.03		1.328	7.7 Comprs.
2.00	0.91300	0.00300	1.83		1.309	8.4 Comprs.
4.00	0.85700	0.00000	0.03		1.161	14.3 Comprs.
8.00	0.78830	0.00000	0.10		0.987	21.2 Comprs.
16.00	0.70660	0.00000	0.08		0.781	29.3 Comprs.
32.00	0.65310	0.00000	0.19		0.646	34.7 Comprs.
8.00	0.66600	0.00000	0.56		0.679	33.4 Comprs.
4.00	0.67410	0.00000	1.66		0.699	32.6 Comprs.
1.00	0.68700	0.00160	0.14		0.736	31.1 Comprs.
0.25	0.72070	0.00040	0.02		0.818	27.9 Comprs.
0.13	0.74920	0.00000	0.04		0.889	25.1 Comprs.

C_c = 0.70 **P_c =** 3.31 tsf **C_r =** 0.06

Pressure: 0.13 tsf **TEST READINGS** **Load No. 1**

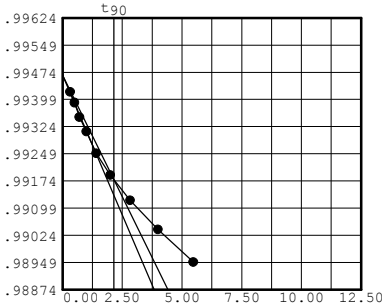
No.	Elapsed Time	Dial Reading
1	0.00	1.00000
2	0.10	0.99690
3	0.25	0.99660
4	0.50	0.99630
5	1.00	0.99600
6	2.00	0.99580
7	4.00	0.99570
8	8.00	0.99560



Void Ratio = 1.510 **Compression =** 0.4 %
D_0 = 0.99738 **D_{90} =** 0.99597 **D_{100} =** 0.99582
C_v at 1.1 min. = 1.90 ft.^{2}/day

Pressure: 0.25 tsf **TEST READINGS** **Load No. 2**

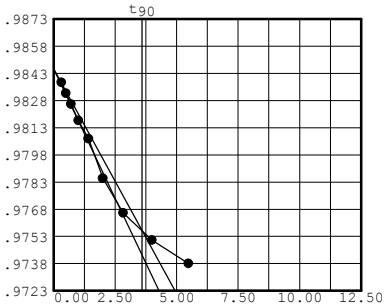
No.	Elapsed Time	Dial Reading
1	0.00	0.99560
2	0.10	0.99380
3	0.25	0.99350
4	0.50	0.99310
5	1.00	0.99270
6	2.00	0.99210
7	4.00	0.99150
8	8.00	0.99080
9	16.00	0.99000
10	30.00	0.98910



Void Ratio = 1.495 **Compression =** 1.1 %
D_0 = 0.99466 **D_{90} =** 0.99178 **D_{100} =** 0.99146
C_v at 4.6 min. = 0.46 ft.^{2}/day

Pressure: 0.50 tsf **TEST READINGS** **Load No. 3**

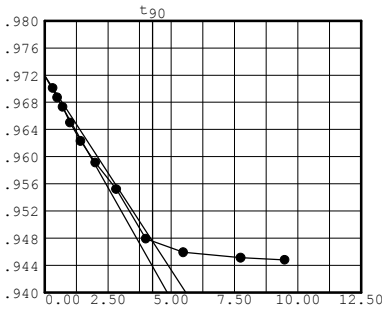
No.	Elapsed Time	Dial Reading
1	0.00	0.98910
2	0.10	0.98300
3	0.25	0.98240
4	0.50	0.98180
5	1.00	0.98090
6	2.00	0.97990
7	4.00	0.97770
8	8.00	0.97580
9	16.00	0.97430
10	30.00	0.97300



Void Ratio = 1.455 **Compression =** 2.6 %
D_0 **=** 0.98455 D_{90} **=** 0.97563 D_{100} **=** 0.97463
C_v **at 12.9 min. =** 0.16 ft.^{2}/day

Pressure: 1.00 tsf **TEST READINGS** **Load No. 4**

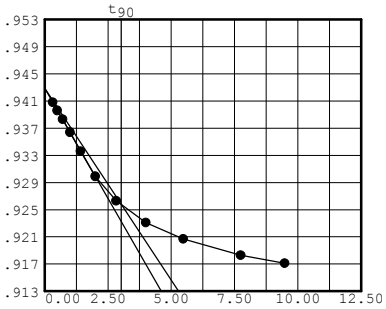
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.97300	11	60.00	0.94350
2	0.10	0.96850	12	90.00	0.94320
3	0.25	0.96710			
4	0.50	0.96570			
5	1.00	0.96340			
6	2.00	0.96070			
7	4.00	0.95750			
8	8.00	0.95360			
9	16.00	0.94630			
10	30.00	0.94430			



Void Ratio = 1.382 **Compression =** 5.5 %
D_0 **=** 0.97193 D_{90} **=** 0.94755 D_{100} **=** 0.94484
C_v **at 18.1 min. =** 0.11 ft.^{2}/day

Pressure: 2.00 tsf **TEST READINGS** **Load No. 5**

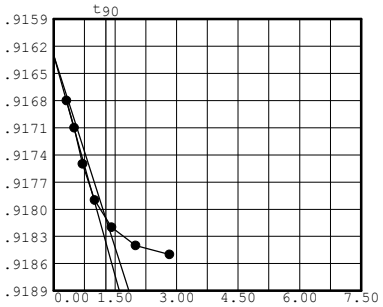
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.94320	11	60.00	0.91590
2	0.10	0.93840	12	90.00	0.91470
3	0.25	0.93720			
4	0.50	0.93590			
5	1.00	0.93400			
6	2.00	0.93120			
7	4.00	0.92750			
8	8.00	0.92390			
9	16.00	0.92070			
10	30.00	0.91830			



Void Ratio = 1.312 **Compression =** 8.3 %
D_0 **=** 0.94286 D_{90} **=** 0.92575 D_{100} **=** 0.92385
C_v **at 9.2 min. =** 0.20 ft.^{2}/day

Pressure: 1.00 tsf **TEST READINGS** **Load No. 6**

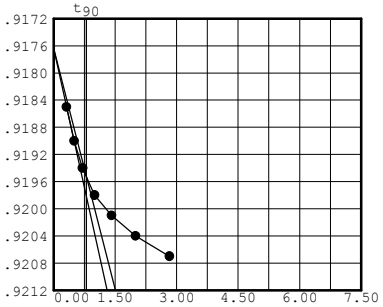
No.	Elapsed Time	Dial Reading
1	0.00	0.91470
2	0.10	0.91520
3	0.25	0.91550
4	0.50	0.91590
5	1.00	0.91630
6	2.00	0.91660
7	4.00	0.91680
8	8.00	0.91690



Void Ratio = 1.316 **Compression =** 8.1 %
D_0 = 0.91630 **D_{90} =** 0.91810 **D_{100} =** 0.91830
C_v at 1.6 min. = 1.11 ft.^{2}/day

Pressure: 0.50 tsf **TEST READINGS** **Load No. 7**

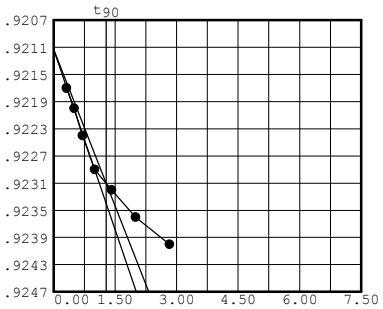
No.	Elapsed Time	Dial Reading
1	0.00	0.91690
2	0.10	0.91770
3	0.25	0.91820
4	0.50	0.91860
5	1.00	0.91900
6	2.00	0.91930
7	4.00	0.91960
8	8.00	0.91990



Void Ratio = 1.321 **Compression =** 7.9 %
D_0 = 0.91764 **D_{90} =** 0.91952 **D_{100} =** 0.91973
C_v at 0.6 min. = 2.84 ft.^{2}/day

Pressure: 0.25 tsf **TEST READINGS** **Load No. 8**

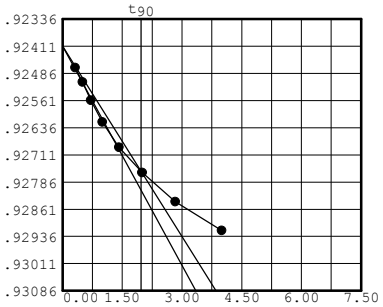
No.	Elapsed Time	Dial Reading
1	0.00	0.91990
2	0.10	0.92130
3	0.25	0.92160
4	0.50	0.92200
5	1.00	0.92250
6	2.00	0.92280
7	4.00	0.92320
8	8.00	0.92360



Void Ratio = 1.329 **Compression =** 7.6 %
D_0 = 0.92113 **D_{90} =** 0.92310 **D_{100} =** 0.92332
C_v at 1.6 min. = 1.10 ft.^{2}/day

Pressure: 0.13 tsf **TEST READINGS** **Load No. 9**

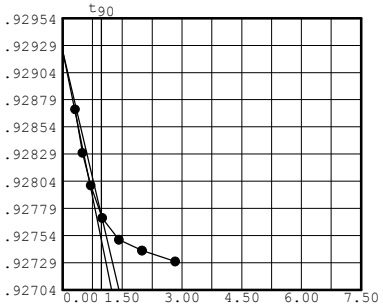
No.	Elapsed Time	Dial Reading
1	0.00	0.92360
2	0.10	0.92470
3	0.25	0.92510
4	0.50	0.92560
5	1.00	0.92620
6	2.00	0.92690
7	4.00	0.92760
8	8.00	0.92840
9	16.00	0.92920



Void Ratio = 1.343 **Compression =** 7.1 %
D_0 = 0.92411 **D_{90} =** 0.92756 **D_{100} =** 0.92794
C_v at 3.9 min. = 0.47 ft.^{2}/day

Pressure: 0.25 tsf **TEST READINGS** **Load No. 10**

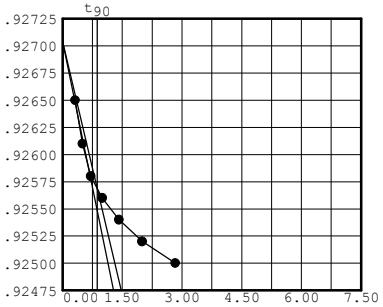
No.	Elapsed Time	Dial Reading
1	0.00	0.92920
2	0.10	0.92830
3	0.25	0.92790
4	0.50	0.92760
5	1.00	0.92730
6	2.00	0.92710
7	4.00	0.92700
8	8.00	0.92690



Void Ratio = 1.338 **Compression =** 7.3 %
D_0 = 0.92924 **D_{90} =** 0.92772 **D_{100} =** 0.92755
C_v at 1.0 min. = 1.91 ft.^{2}/day

Pressure: 0.50 tsf **TEST READINGS** **Load No. 11**

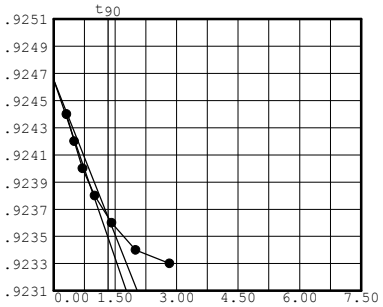
No.	Elapsed Time	Dial Reading
1	0.00	0.92690
2	0.10	0.92570
3	0.25	0.92530
4	0.50	0.92500
5	1.00	0.92480
6	2.00	0.92460
7	4.00	0.92440
8	8.00	0.92420



Void Ratio = 1.332 **Compression =** 7.5 %
D_0 = 0.92704 **D_{90} =** 0.92569 **D_{100} =** 0.92554
C_v at 0.8 min. = 2.40 ft.^{2}/day

Pressure: 1.00 tsf **TEST READINGS** **Load No. 12**

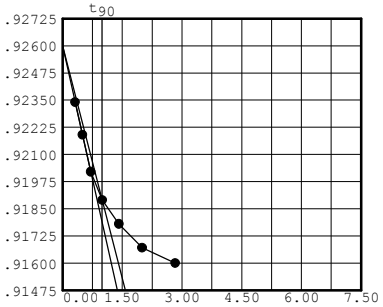
No.	Elapsed Time	Dial Reading
1	0.00	0.92420
2	0.10	0.92280
3	0.25	0.92260
4	0.50	0.92240
5	1.00	0.92220
6	2.00	0.92200
7	4.00	0.92180
8	8.00	0.92170



Void Ratio = 1.328 **Compression =** 7.7 %
D_0 = 0.92465 **D_{90} =** 0.92364 **D_{100} =** 0.92353
C_v at 1.8 min. = 1.03 ft.^{2}/day

Pressure: 2.00 tsf **TEST READINGS** **Load No. 13**

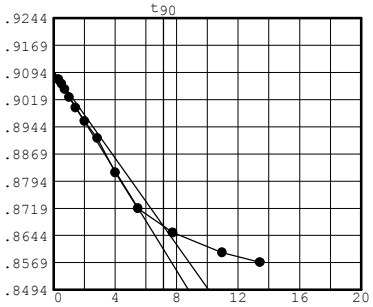
No.	Elapsed Time	Dial Reading
1	0.00	0.92170
2	0.10	0.92040
3	0.25	0.91890
4	0.50	0.91720
5	1.00	0.91590
6	2.00	0.91480
7	4.00	0.91370
8	8.00	0.91300



Void Ratio = 1.309 **Compression =** 8.4 %
D_0 = 0.92599 **D_{90} =** 0.91895 **D_{100} =** 0.91816
C_v at 1.0 min. = 1.83 ft.^{2}/day

Pressure: 4.00 tsf **TEST READINGS** **Load No. 14**

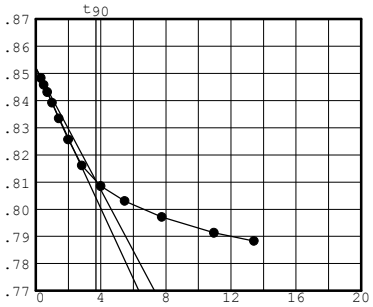
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.91300	11	60.00	0.86520
2	0.10	0.90750	12	120.00	0.85970
3	0.25	0.90630	13	180.00	0.85700
4	0.50	0.90480			
5	1.00	0.90260			
6	2.00	0.89970			
7	4.00	0.89600			
8	8.00	0.89130			
9	16.00	0.88180			
10	30.00	0.87190			



Void Ratio = 1.161 **Compression =** 14.3 %
D_0 = 0.90970 **D_{90} =** 0.86696 **D_{100} =** 0.86221
C_v at 51.1 min. = 0.03 ft.^{2}/day

Pressure: 8.00 tsf **TEST READINGS** **Load No. 15**

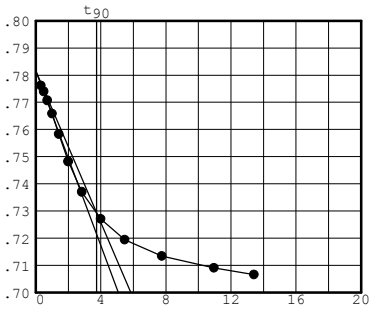
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.85700	11	60.00	0.79710
2	0.10	0.84830	12	120.00	0.79130
3	0.25	0.84580	13	180.00	0.78830
4	0.50	0.84310			
5	1.00	0.83920			
6	2.00	0.83340			
7	4.00	0.82560			
8	8.00	0.81610			
9	16.00	0.80850			
10	30.00	0.80300			



Void Ratio = 0.987 **Compression =** 21.2 %
D_0 **=** 0.85215 D_{90} **=** 0.81041 D_{100} **=** 0.80578
C_v **at 13.7 min. =** 0.10 ft.^{2}/day

Pressure: 16.00 tsf **TEST READINGS** **Load No. 16**

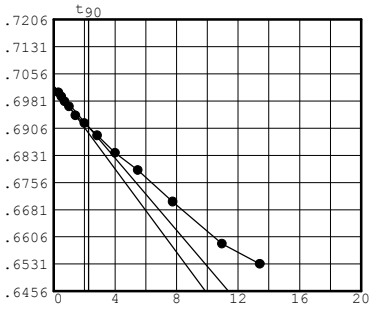
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.78830	11	60.00	0.71340
2	0.10	0.77620	12	120.00	0.70900
3	0.25	0.77400	13	180.00	0.70660
4	0.50	0.77070			
5	1.00	0.76580			
6	2.00	0.75830			
7	4.00	0.74820			
8	8.00	0.73700			
9	16.00	0.72710			
10	30.00	0.71940			



Void Ratio = 0.781 **Compression =** 29.3 %
D_0 **=** 0.78159 D_{90} **=** 0.72929 D_{100} **=** 0.72348
C_v **at 14.0 min. =** 0.08 ft.^{2}/day

Pressure: 32.00 tsf **TEST READINGS** **Load No. 17**

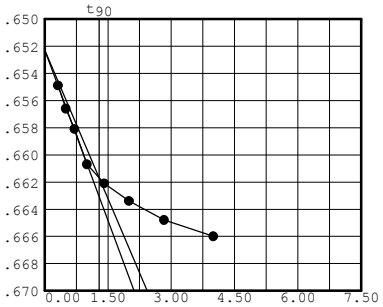
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.70660	11	60.00	0.67030
2	0.10	0.70050	12	120.00	0.65870
3	0.25	0.69930	13	180.00	0.65310
4	0.50	0.69800			
5	1.00	0.69660			
6	2.00	0.69410			
7	4.00	0.69200			
8	8.00	0.68860			
9	16.00	0.68380			
10	30.00	0.67900			



Void Ratio = 0.646 **Compression =** 34.7 %
D_0 **=** 0.70221 D_{90} **=** 0.69085 D_{100} **=** 0.68959
C_v **at 5.2 min. =** 0.19 ft.^{2}/day

Pressure: 8.00 tsf **TEST READINGS** **Load No. 18**

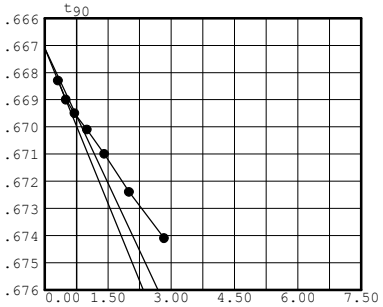
No.	Elapsed Time	Dial Reading
1	0.00	0.65310
2	0.10	0.65490
3	0.25	0.65660
4	0.50	0.65810
5	1.00	0.66070
6	2.00	0.66210
7	4.00	0.66340
8	8.00	0.66480
9	16.00	0.66600



Void Ratio = 0.679 **Compression =** 33.4 %
D_0 = 0.65229 **D_{90} =** 0.66167 **D_{100} =** 0.66272
C_v at 1.7 min. = 0.56 ft.^{2}/day

Pressure: 4.00 tsf **TEST READINGS** **Load No. 19**

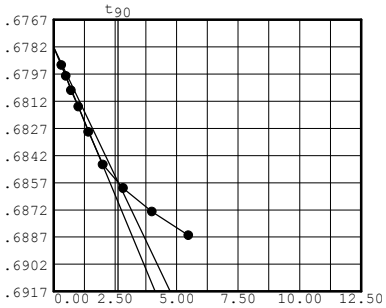
No.	Elapsed Time	Dial Reading
1	0.00	0.66600
2	0.10	0.66830
3	0.25	0.66900
4	0.50	0.66950
5	1.00	0.67010
6	2.00	0.67100
7	4.00	0.67240
8	8.00	0.67410



Void Ratio = 0.699 **Compression =** 32.6 %
D_0 = 0.66710 **D_{90} =** 0.66960 **D_{100} =** 0.66988
C_v at 0.6 min. = 1.66 ft.^{2}/day

Pressure: 1.00 tsf **TEST READINGS** **Load No. 20**

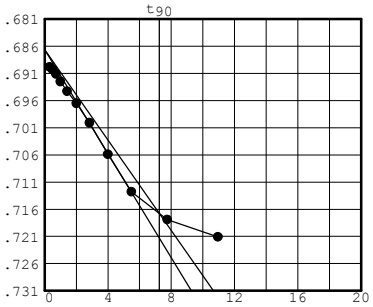
No.	Elapsed Time	Dial Reading
1	0.00	0.67410
2	0.10	0.67760
3	0.25	0.67820
4	0.50	0.67900
5	1.00	0.67990
6	2.00	0.68130
7	4.00	0.68310
8	8.00	0.68440
9	16.00	0.68570
10	30.00	0.68700



Void Ratio = 0.736 **Compression =** 31.1 %
D_0 = 0.67821 **D_{90} =** 0.68568 **D_{100} =** 0.68651
C_v at 6.9 min. = 0.14 ft.^{2}/day

Pressure: 0.25 tsf **TEST READINGS** **Load No. 21**

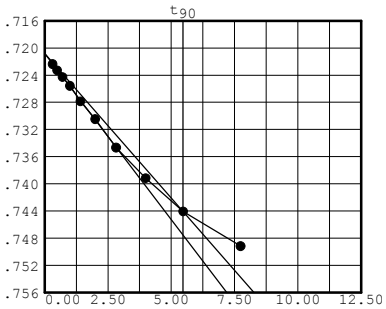
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.68700	11	60.00	0.71750
2	0.10	0.68940	12	120.00	0.72070
3	0.25	0.68990			
4	0.50	0.69070			
5	1.00	0.69210			
6	2.00	0.69390			
7	4.00	0.69610			
8	8.00	0.69970			
9	16.00	0.70550			
10	30.00	0.71240			



Void Ratio = 0.818 **Compression =** 27.9 %
D_0 = 0.68662 **D_{90} =** 0.71675 **D_{100} =** 0.72010
C_v at 52.3 min. = 0.02 ft.^{2}/day

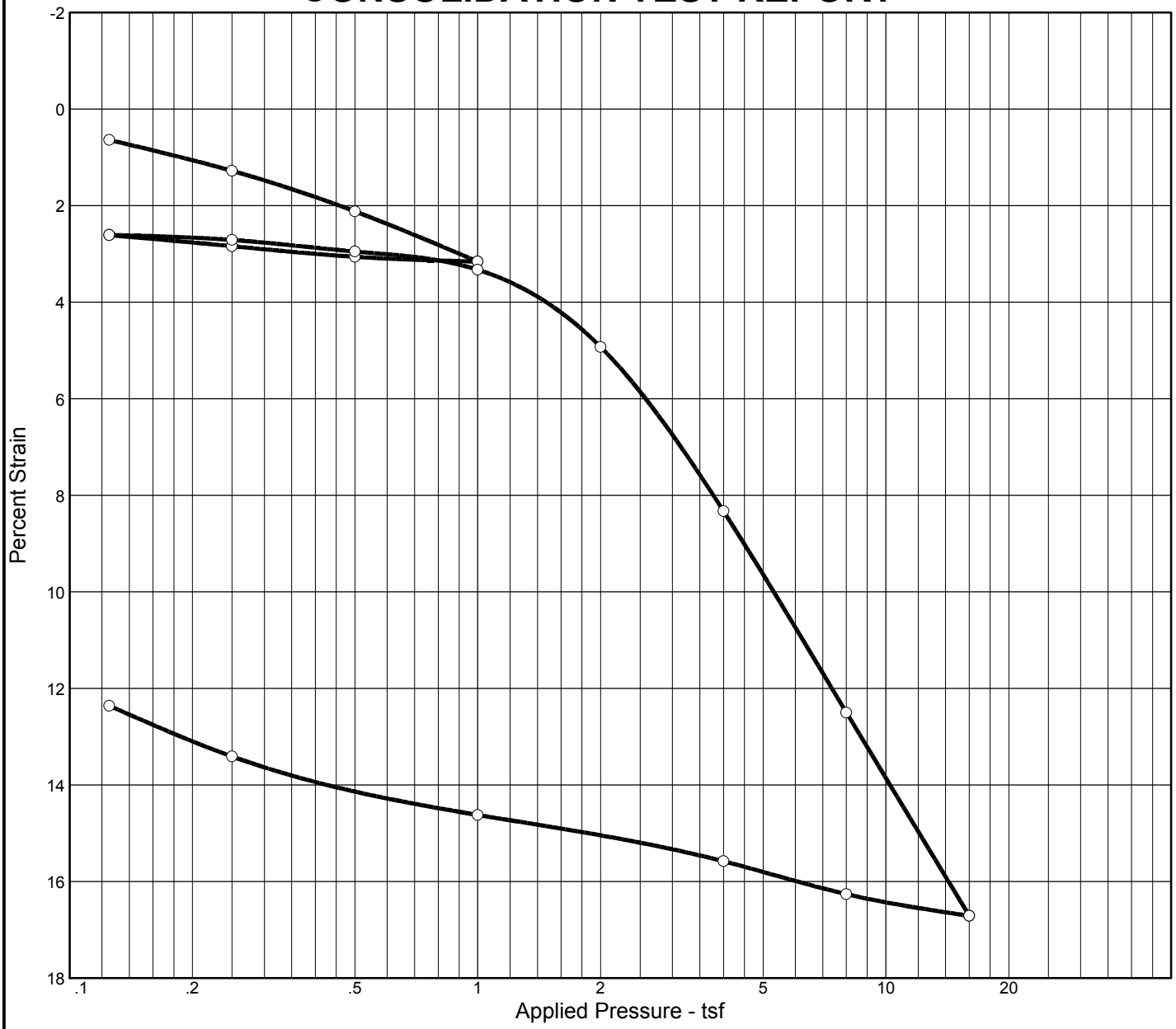
Pressure: 0.13 tsf **TEST READINGS** **Load No. 22**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.72070	11	60.00	0.74920
2	0.10	0.72240			
3	0.25	0.72330			
4	0.50	0.72430			
5	1.00	0.72560			
6	2.00	0.72790			
7	4.00	0.73050			
8	8.00	0.73470			
9	16.00	0.73920			
10	30.00	0.74410			



Void Ratio = 0.889 **Compression =** 25.1 %
D_0 = 0.72084 **D_{90} =** 0.74405 **D_{100} =** 0.74663
C_v at 29.8 min. = 0.04 ft.^{2}/day

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Gray, Fat CLAY		

LL	PI	Sp. Gr.	Overburden (tsf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (tsf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.71	1.00	86.6		35.1 %	25.9 %	99.9 %	98.8 %	0.953	0.711	2.21	0.27

Preparation Process:	D2435 Method	C_r	Swell Press. (tsf)	Heave %
Condition of Test:		0.03		

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

Location: D7-8W

Remarks:
Boring D7-8W
Sample Obtained 10/15/10

Checked By:

Title:

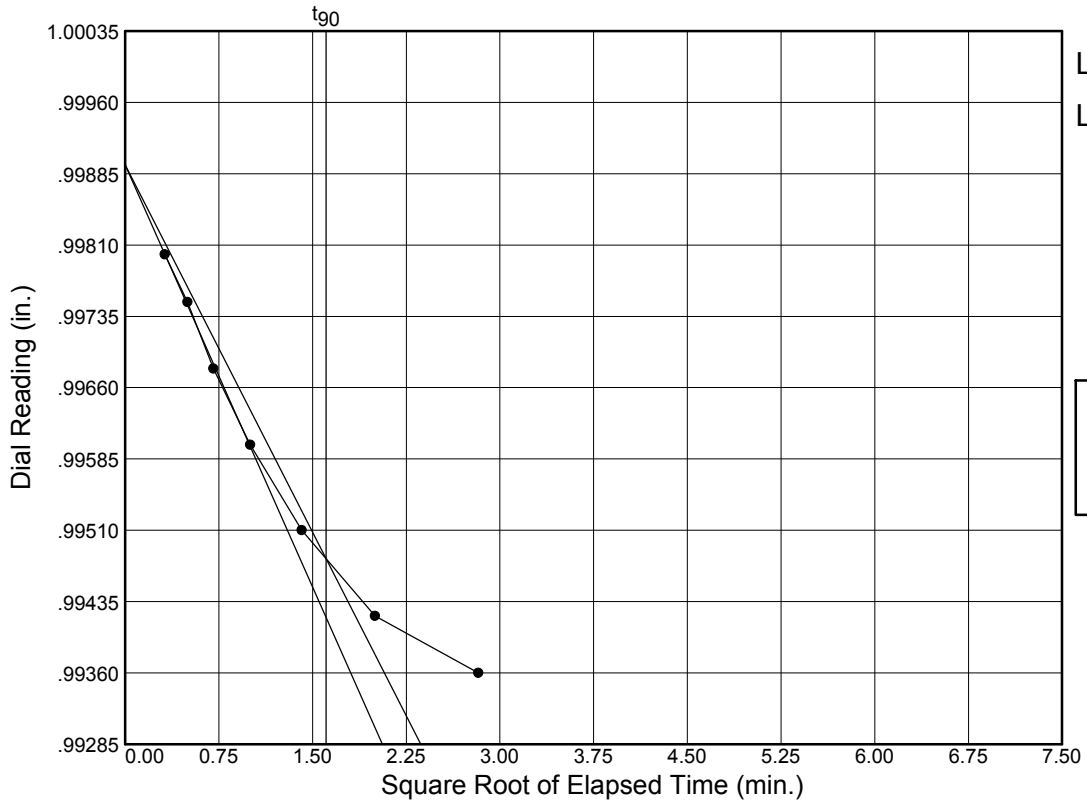
CONSOLIDATION TEST REPORT

GET SOLUTIONS, INC.

Figure 1

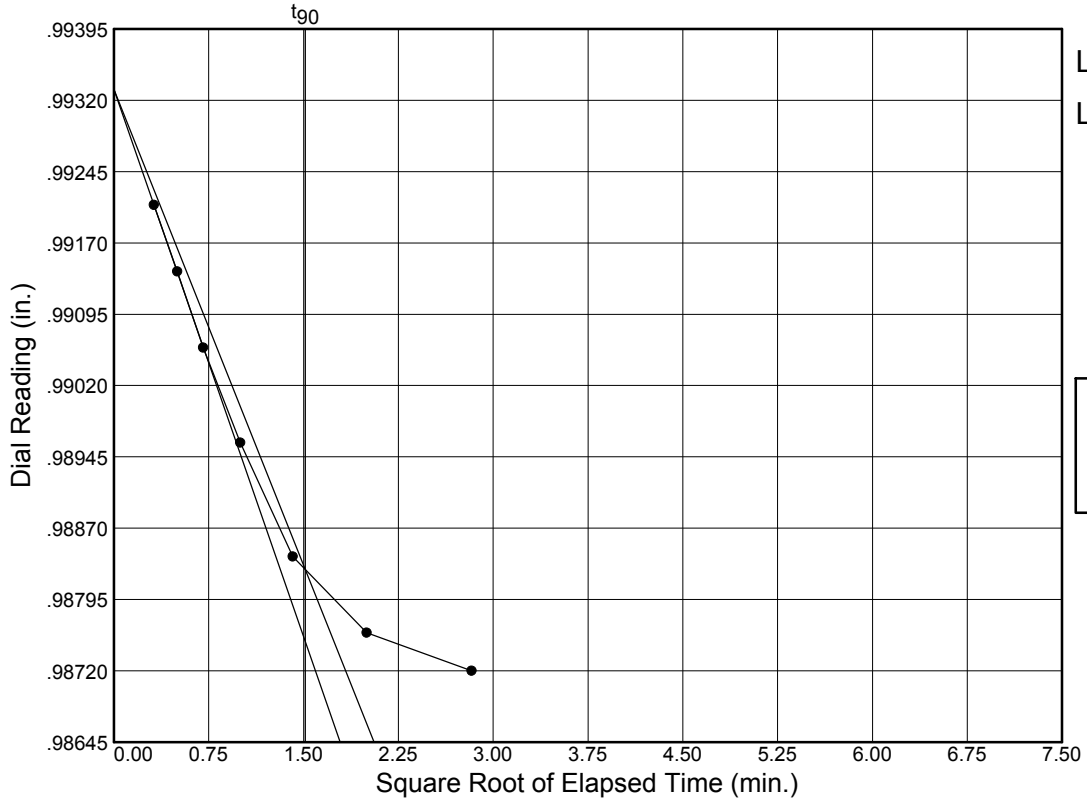
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 1
Load= 0.13 tsf
D_0 = 0.99894
D_{90} = 0.99480
D_{100} = 0.99434
T_{90} = 2.59 min.

C_v @ T_{90}
0.81 ft.^{2}/day



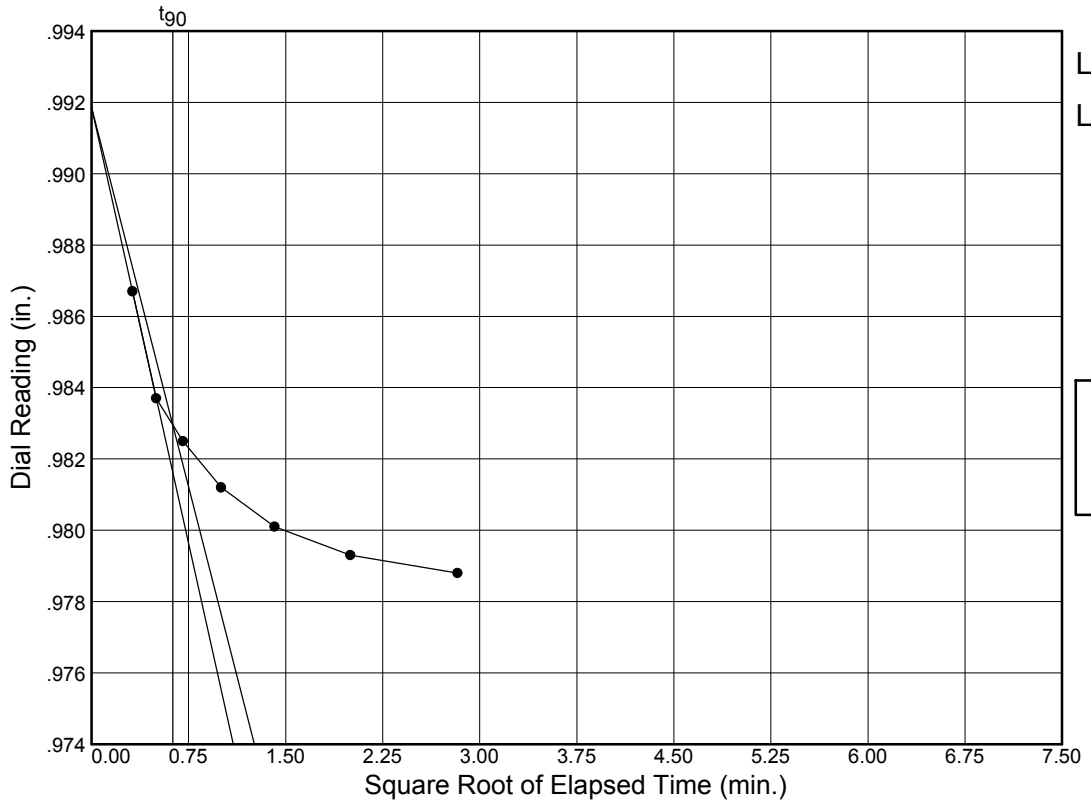
Load No.= 2
Load= 0.25 tsf
D_0 = 0.99332
D_{90} = 0.98826
D_{100} = 0.98770
T_{90} = 2.29 min.

C_v @ T_{90}
0.91 ft.^{2}/day

Figure 2

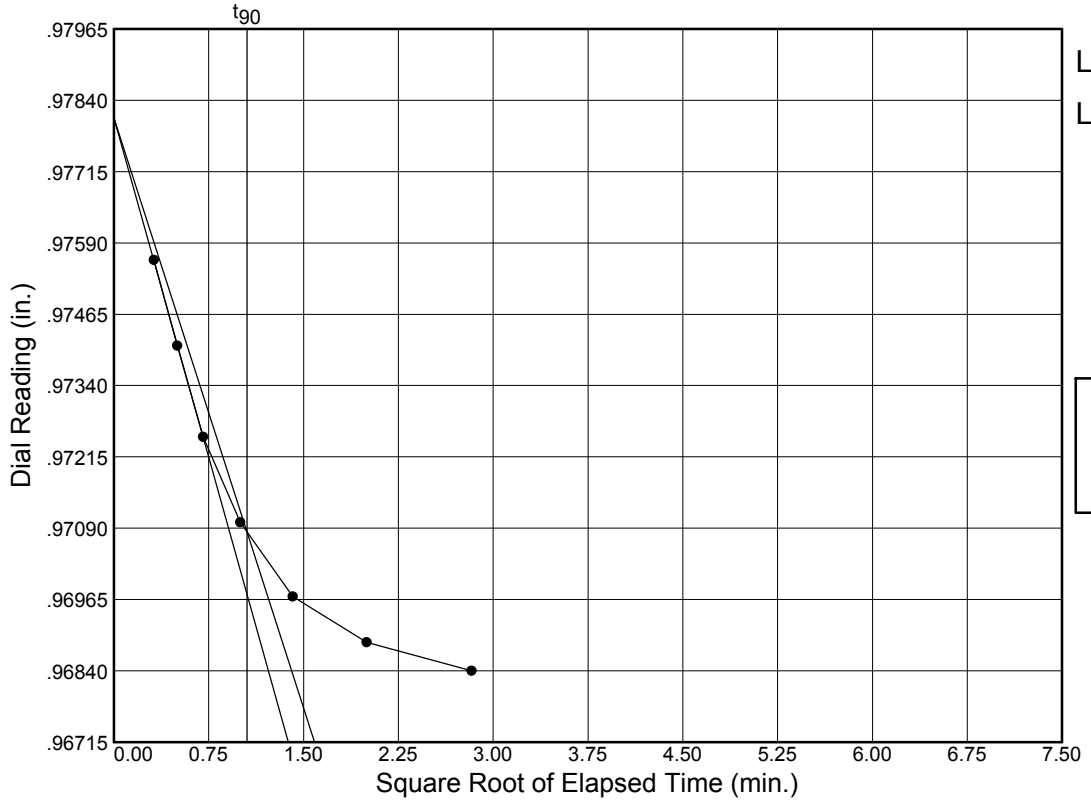
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 3
Load= 0.50 tsf
D_0 = 0.99186
D_{90} = 0.98297
D_{100} = 0.98198
T_{90} = 0.39 min.

C_v @ T_{90}
5.22 ft.^{2}/day



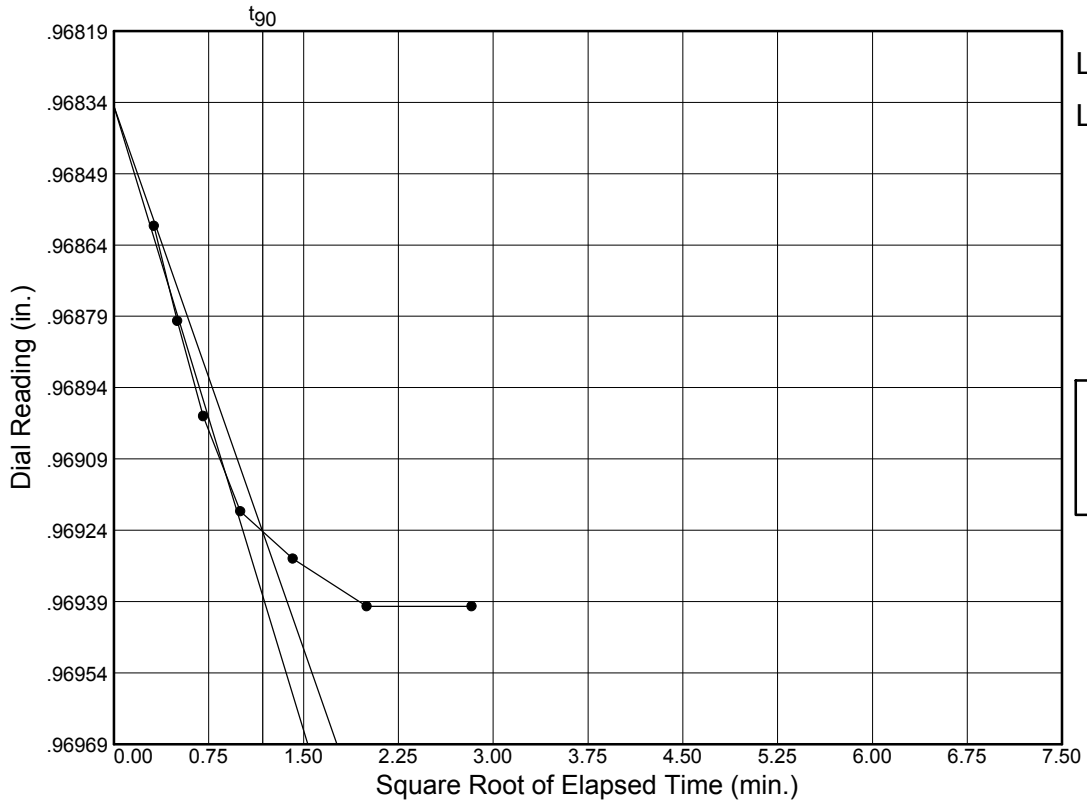
Load No.= 4
Load= 1.00 tsf
D_0 = 0.97809
D_{90} = 0.97083
D_{100} = 0.97003
T_{90} = 1.11 min.

C_v @ T_{90}
1.81 ft.^{2}/day

Figure 3

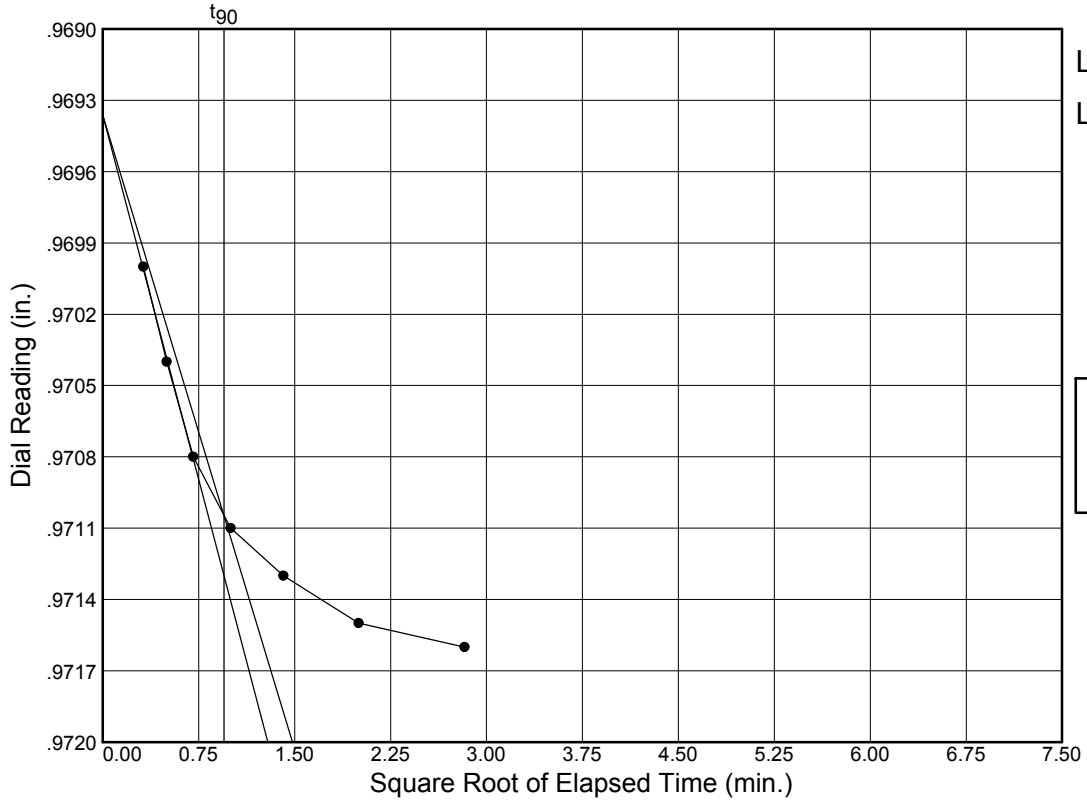
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 5
Load= 0.50 tsf
D_0 = 0.96835
D_{90} = 0.96924
D_{100} = 0.96934
T_{90} = 1.38 min.

C_v @ T_{90}
1.44 ft.^{2}/day



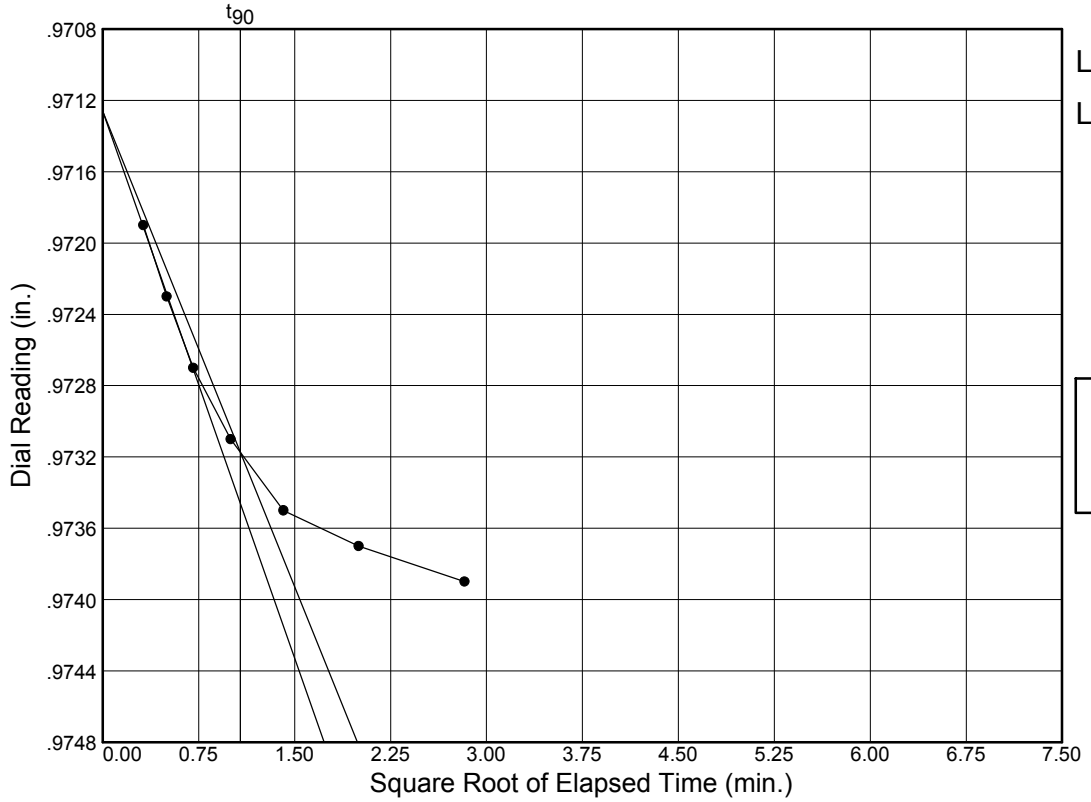
Load No.= 6
Load= 0.25 tsf
D_0 = 0.96936
D_{90} = 0.97105
D_{100} = 0.97123
T_{90} = 0.90 min.

C_v @ T_{90}
2.22 ft.^{2}/day

Figure 4

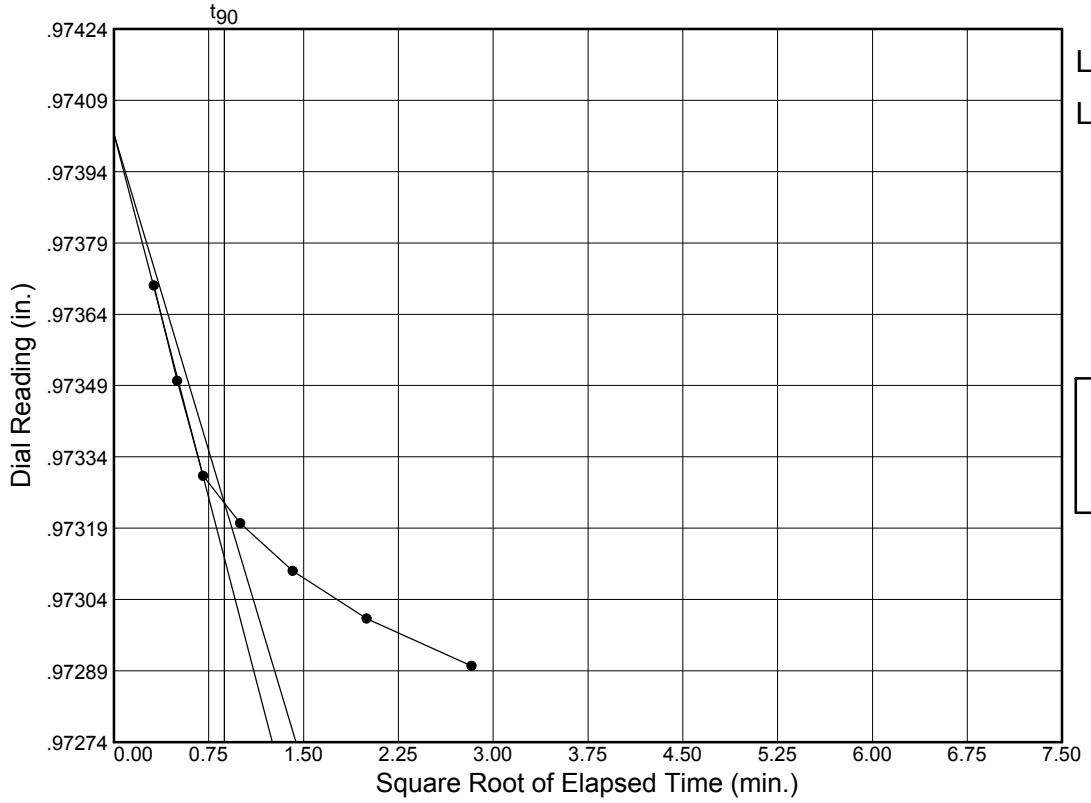
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 7
Load= 0.13 tsf
D_0 = 0.97126
D_{90} = 0.97317
D_{100} = 0.97338
T_{90} = 1.15 min.

C_v @ T_{90}
1.74 ft.^{2}/day



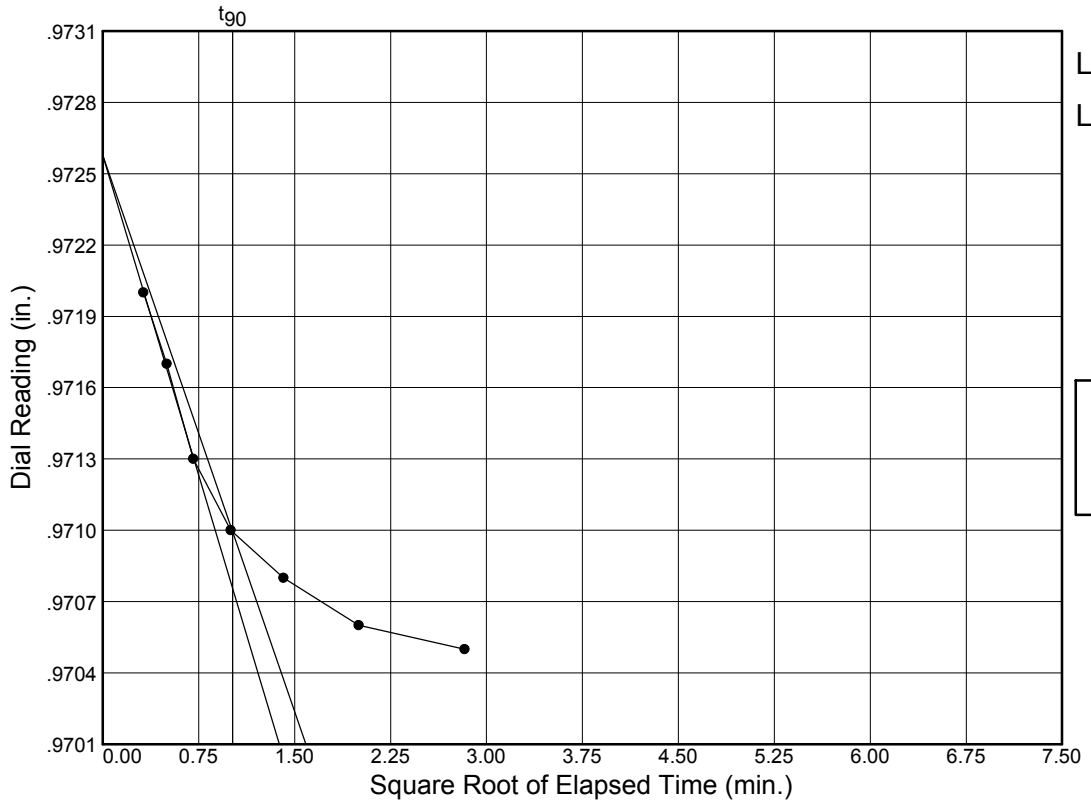
Load No.= 8
Load= 0.25 tsf
D_0 = 0.97402
D_{90} = 0.97324
D_{100} = 0.97316
T_{90} = 0.76 min.

C_v @ T_{90}
2.64 ft.^{2}/day

Figure 5

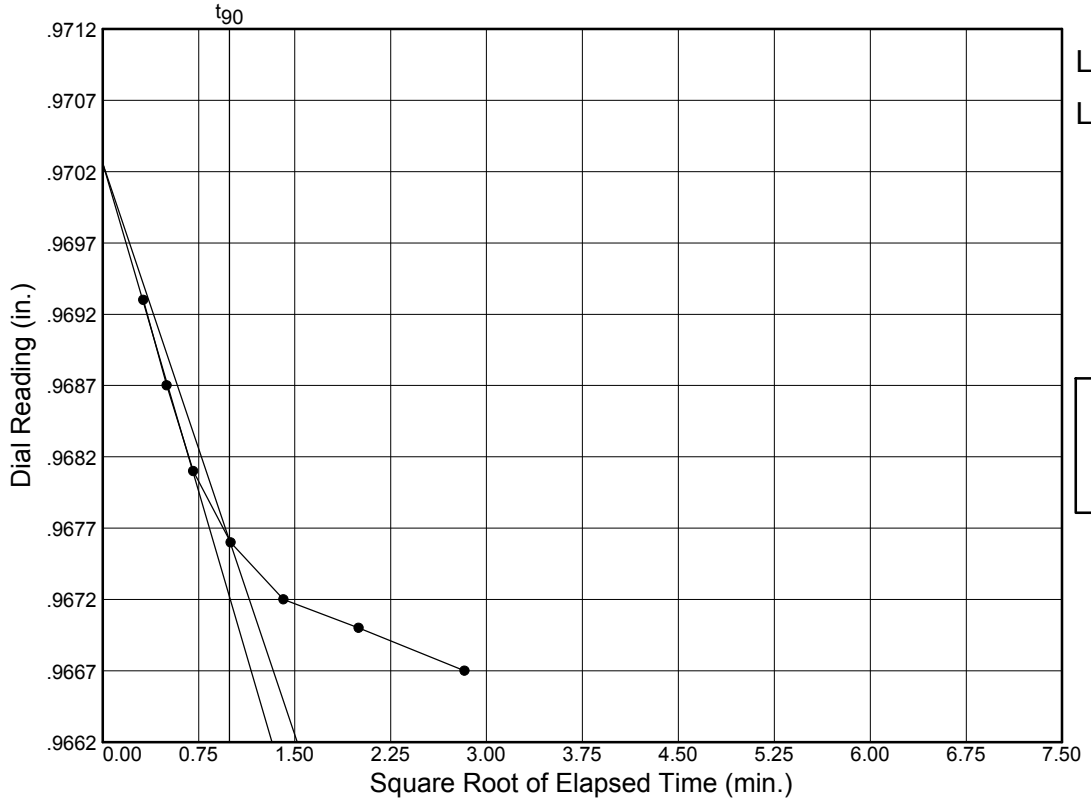
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 9
Load= 0.50 tsf
D_0 = 0.97258
D_{90} = 0.97099
D_{100} = 0.97082
T_{90} = 1.03 min.

C_v @ T_{90}
1.94 ft.^{2}/day



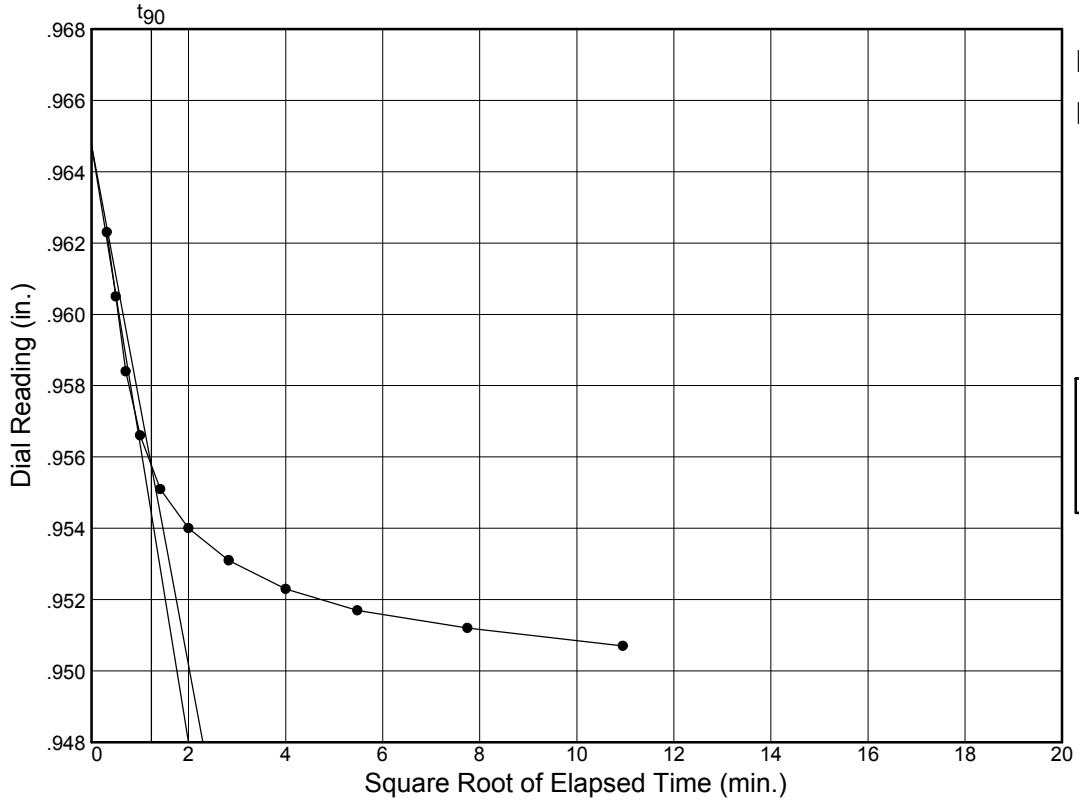
Load No.= 10
Load= 1.00 tsf
D_0 = 0.97026
D_{90} = 0.96762
D_{100} = 0.96732
T_{90} = 0.98 min.

C_v @ T_{90}
2.03 ft.^{2}/day

Figure 6

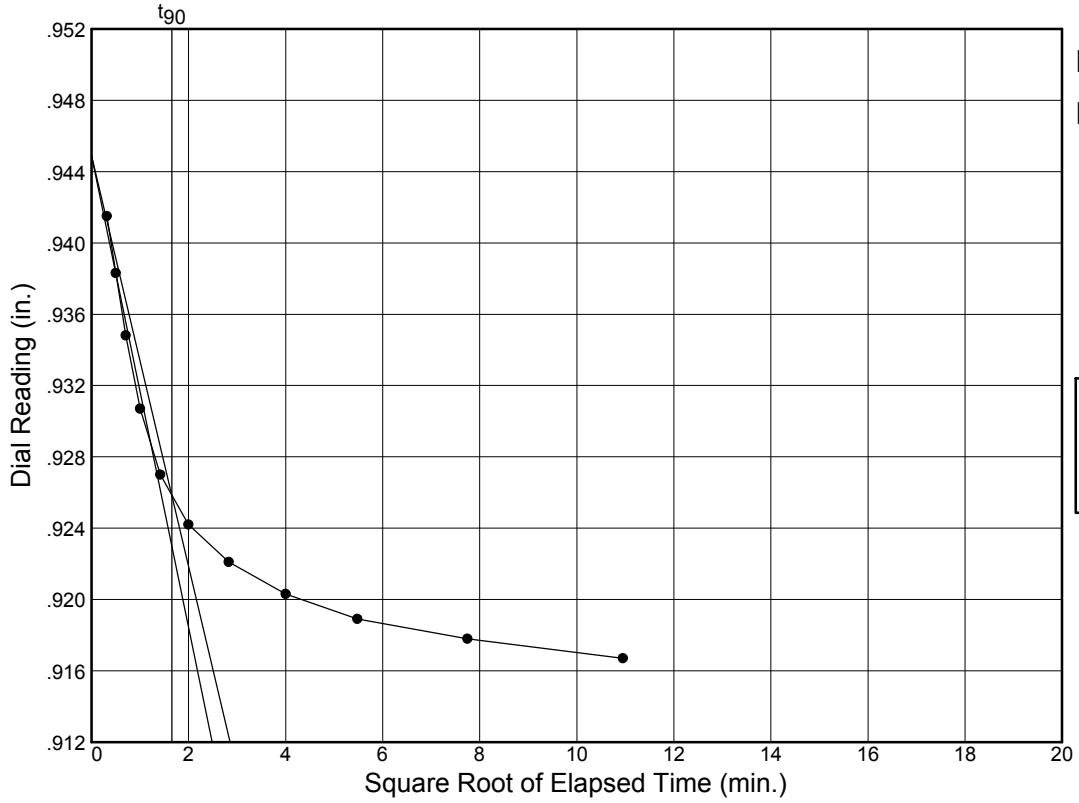
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 11
Load= 2.00 tsf
D_0 = 0.96474
D_{90} = 0.95577
D_{100} = 0.95477
T_{90} = 1.51 min.

C_v @ T_{90}
1.29 ft.^{2}/day



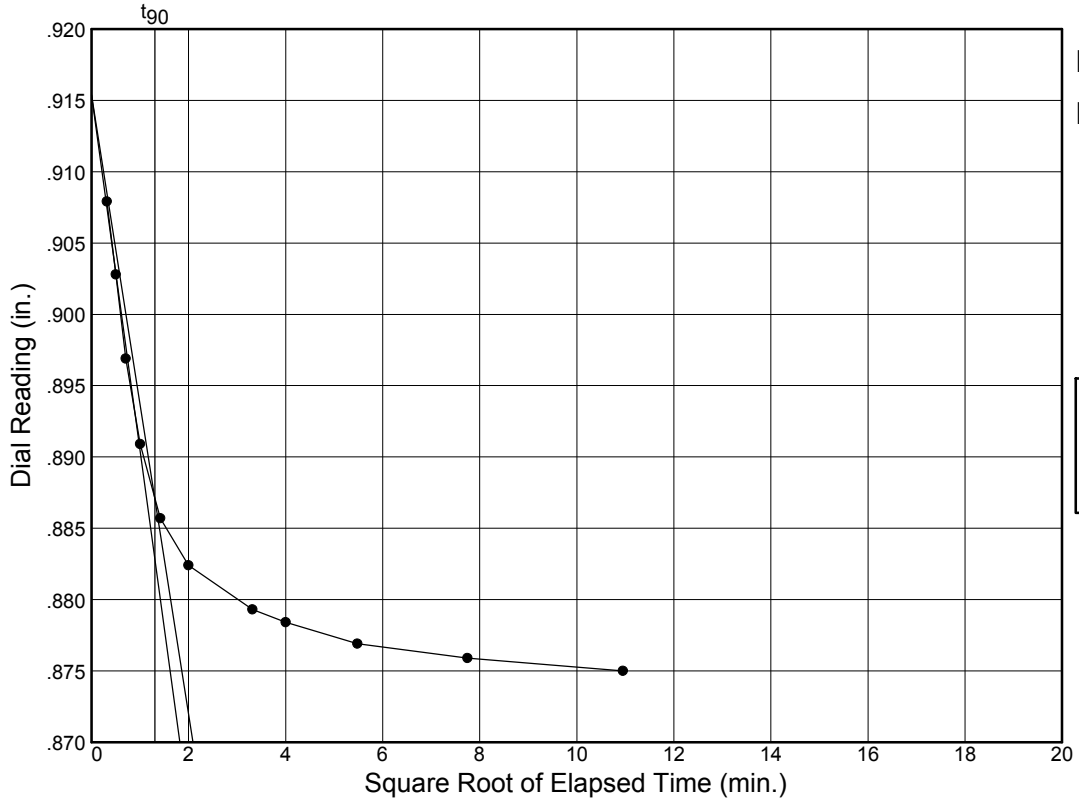
Load No.= 12
Load= 4.00 tsf
D_0 = 0.94489
D_{90} = 0.92586
D_{100} = 0.92375
T_{90} = 2.73 min.

C_v @ T_{90}
0.68 ft.^{2}/day

Figure 7

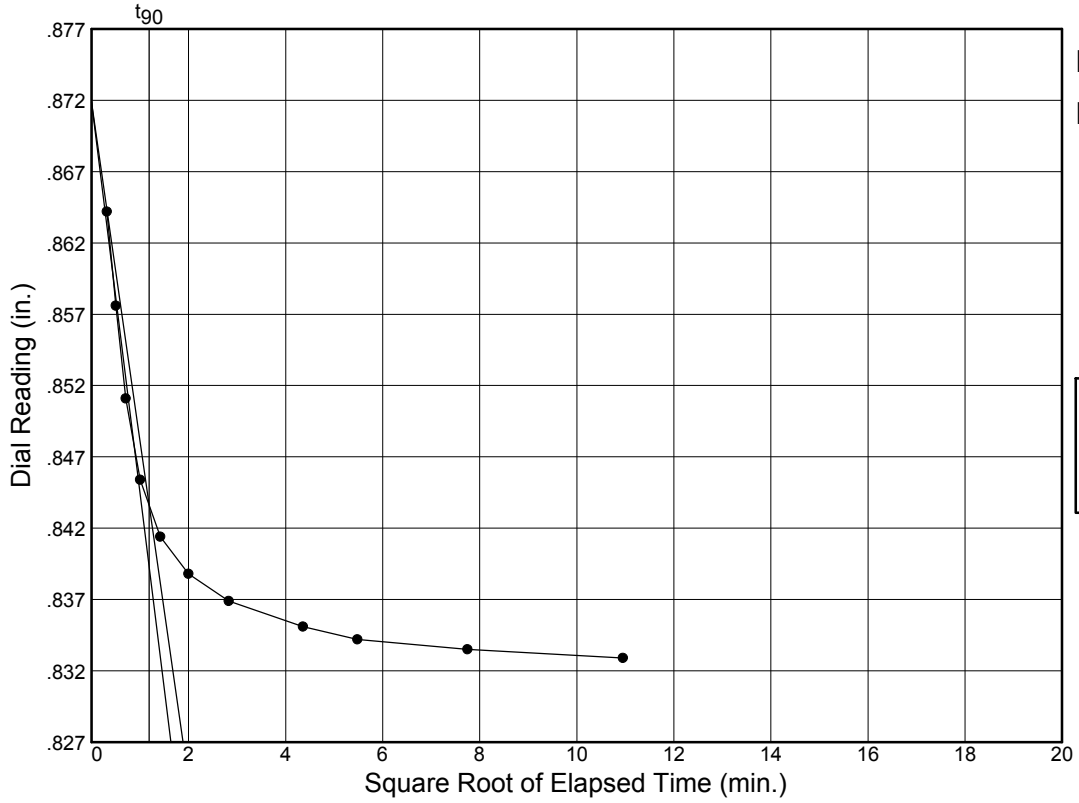
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 13
Load= 8.00 tsf
D_0 = 0.91538
D_{90} = 0.88711
D_{100} = 0.88397
T_{90} = 1.69 min.

C_v @ T_{90}
1.00 ft.^{2}/day



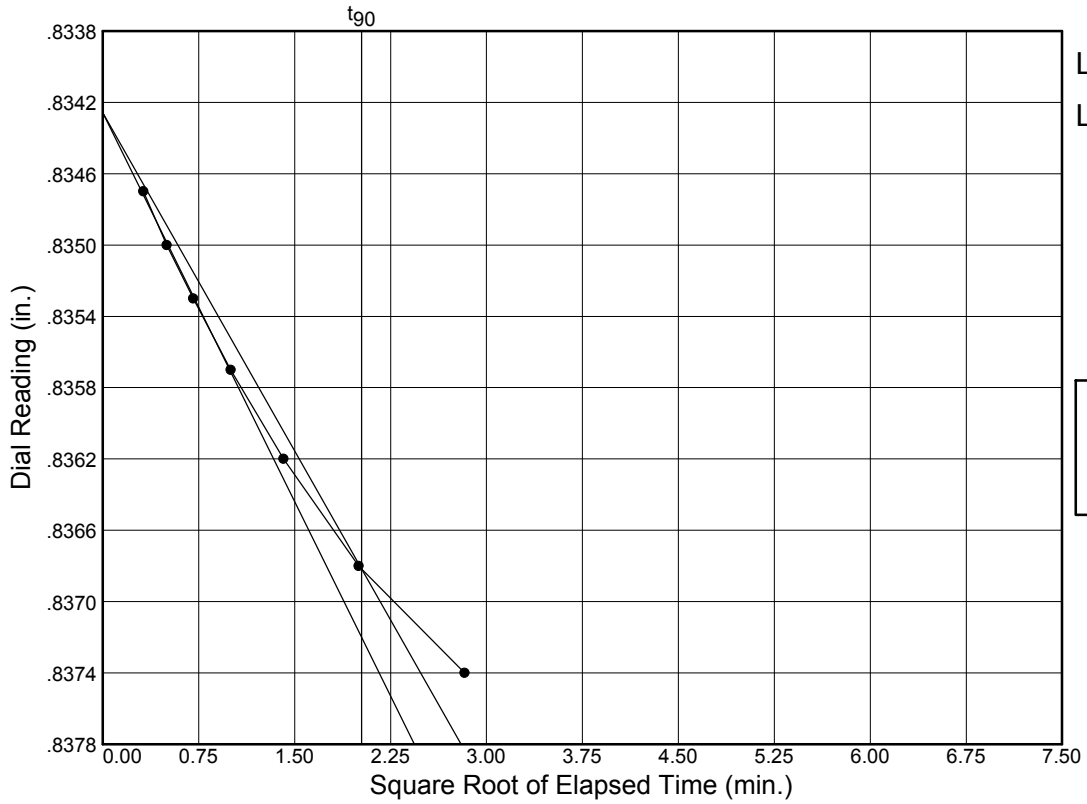
Load No.= 14
Load= 16.00 tsf
D_0 = 0.87186
D_{90} = 0.84361
D_{100} = 0.84047
T_{90} = 1.41 min.

C_v @ T_{90}
1.10 ft.^{2}/day

Figure 8

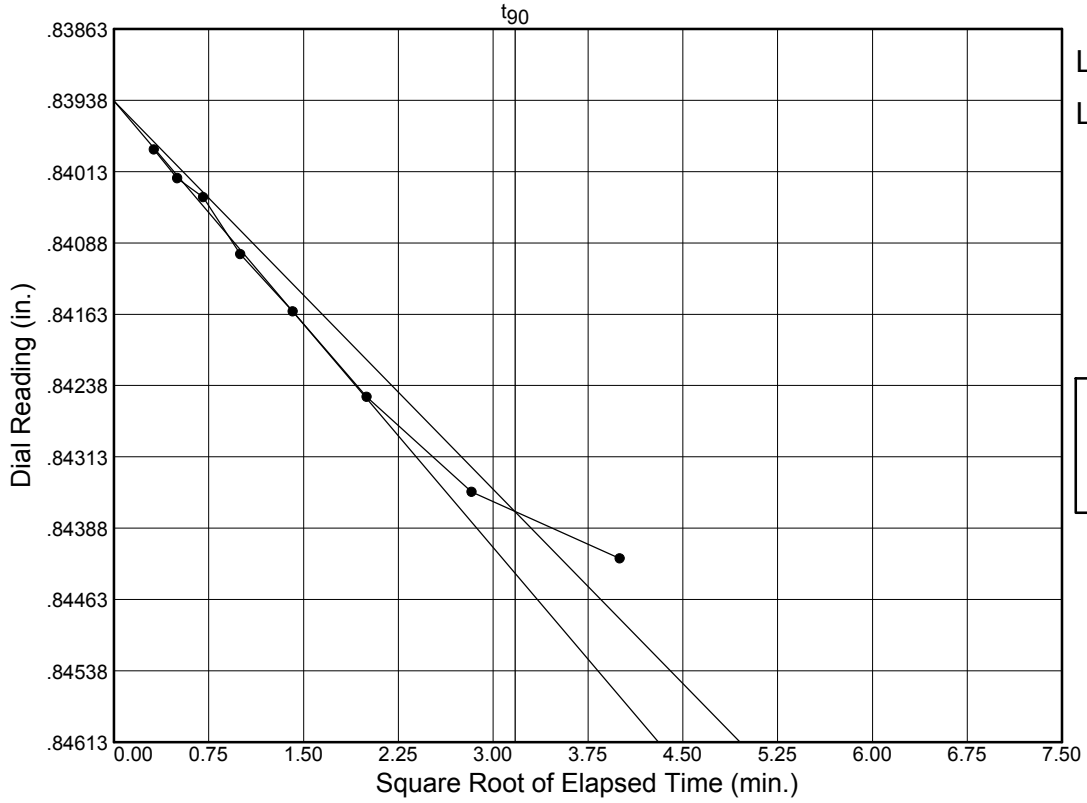
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 15
Load= 8.00 tsf
D_0 = 0.83426
D_{90} = 0.83682
D_{100} = 0.83710
T_{90} = 4.09 min.

C_v @ T_{90}
0.36 ft.^{2}/day



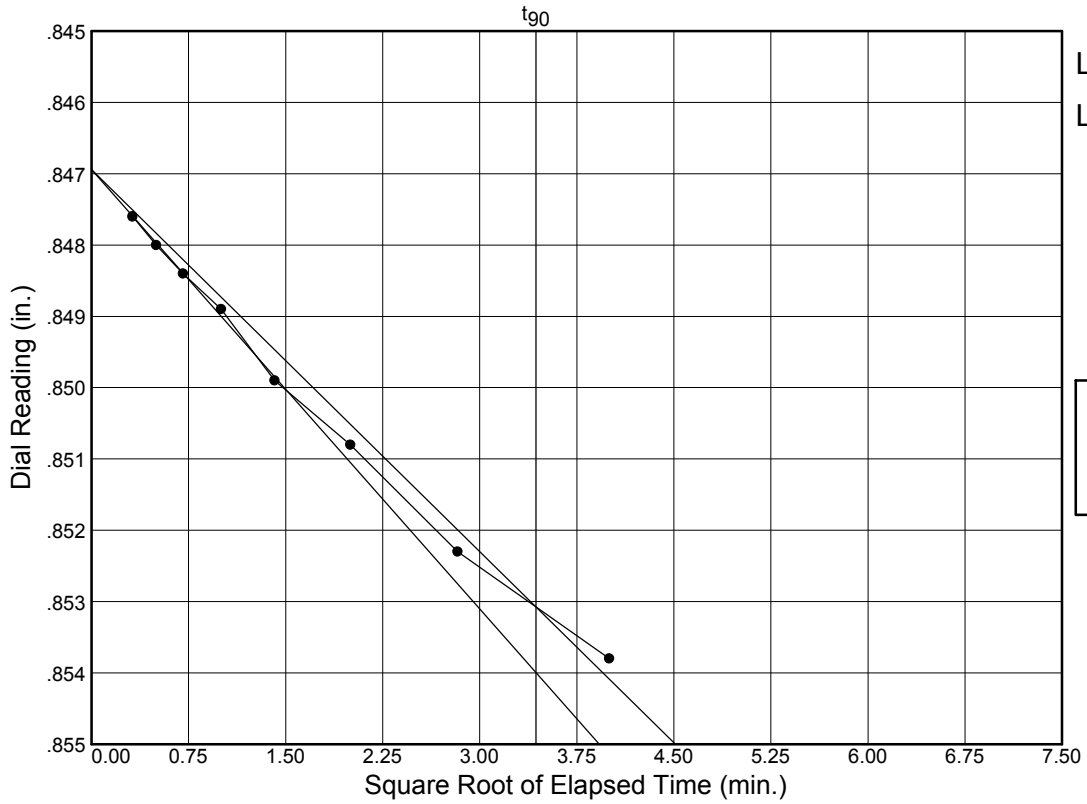
Load No.= 16
Load= 4.00 tsf
D_0 = 0.83939
D_{90} = 0.84371
D_{100} = 0.84419
T_{90} = 10.06 min.

C_v @ T_{90}
0.15 ft.^{2}/day

Figure 9

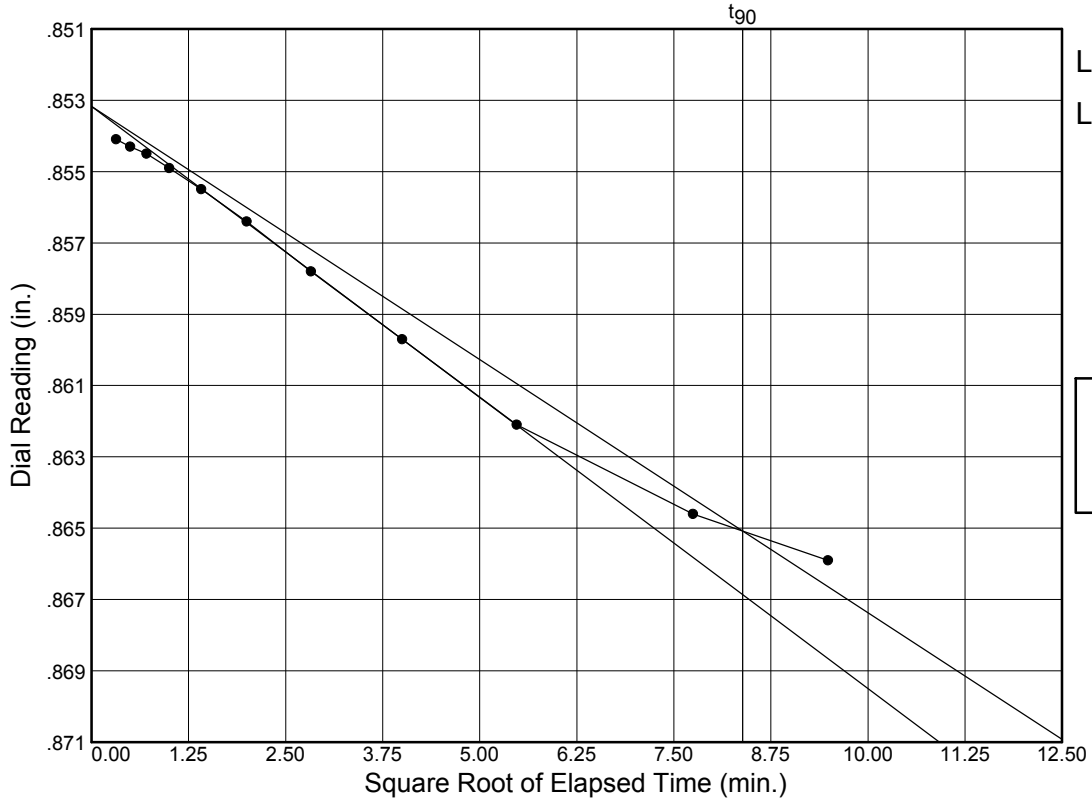
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 17
Load= 1.00 tsf
D_0 = 0.84694
D_{90} = 0.85308
D_{100} = 0.85376
T_{90} = 11.80 min.

C_v @ T_{90}
0.13 ft.^{2}/day



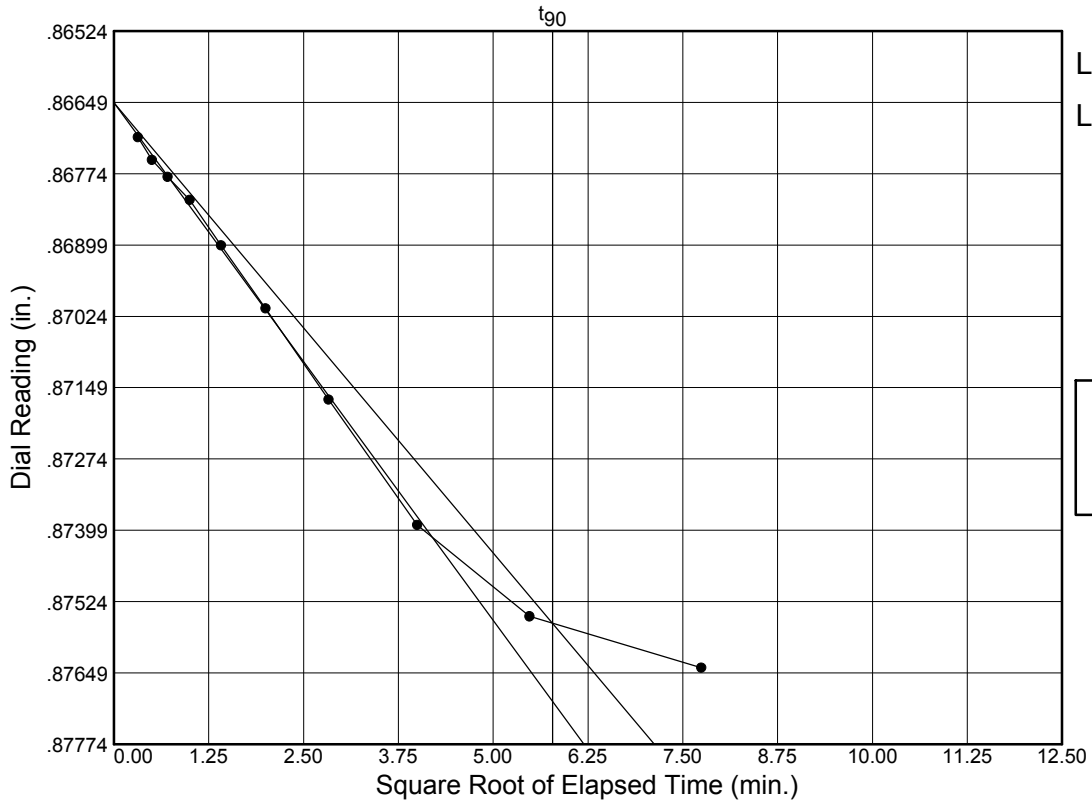
Load No.= 18
Load= 0.25 tsf
D_0 = 0.85317
D_{90} = 0.86508
D_{100} = 0.86640
T_{90} = 70.31 min.

C_v @ T_{90}
0.02 ft.^{2}/day

Figure 10

Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 19

Load= 0.13 tsf

D_0 = 0.86650

D_{90} = 0.87562

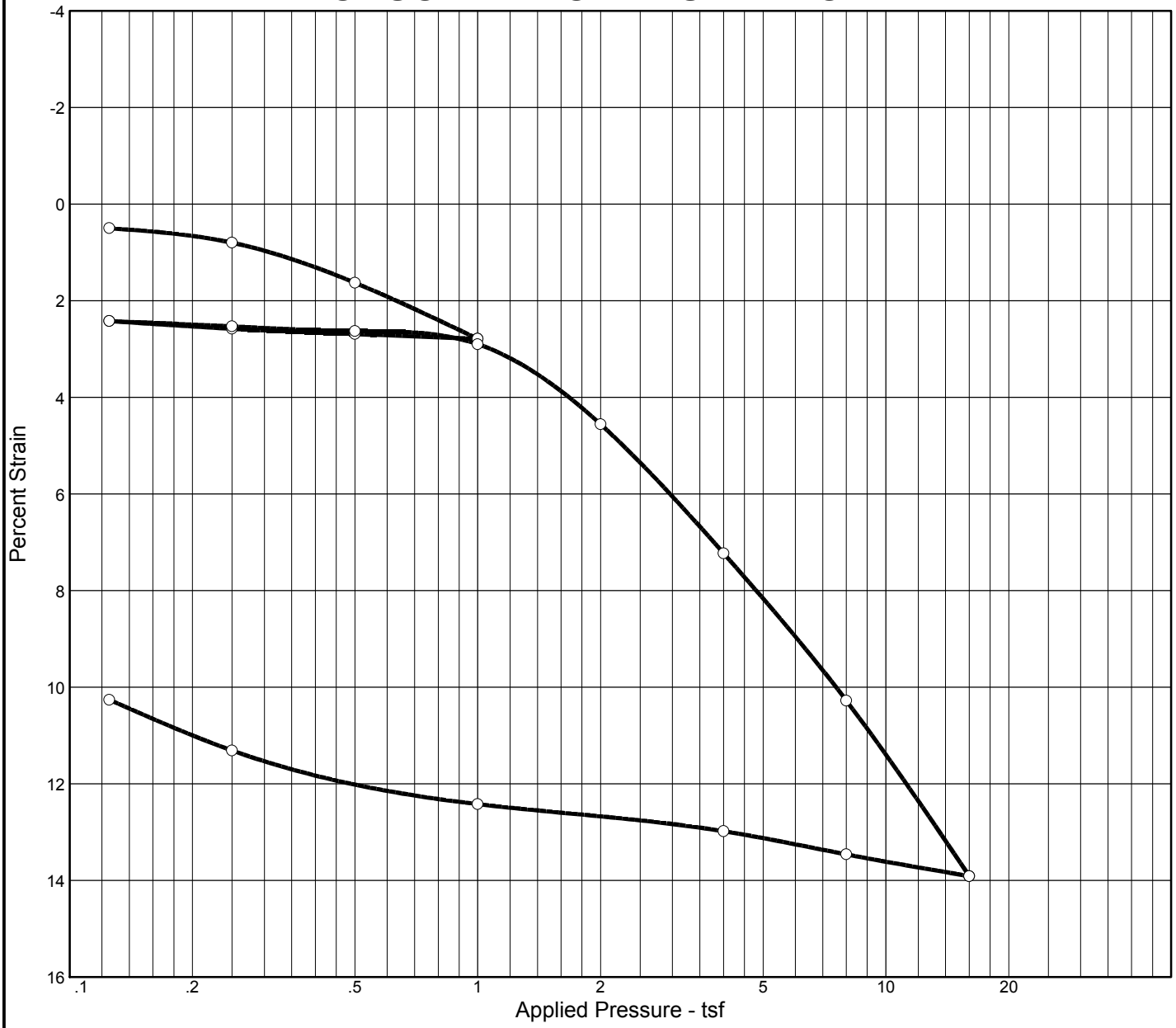
D_{100} = 0.87663

T_{90} = 33.42 min.

C_v @ T_{90}
0.05 ft.^{2}/day

Figure 11

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Gray, Fat CLAY		

LL	PI	Sp. Gr.	Overburden (tsf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (tsf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.74	1.00	89.0		33.6 %	26.8 %	99.9 %	100.0 %	0.922	0.725	2.77	0.23

Preparation Process:	D2435 Method	C_r	Swell Press. (tsf)	Heave %
Condition of Test:		0.02		

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

Location: D7-9W

Remarks:
Boring D7-9W
Sample Obtained 10/15/10

Checked By:

Title:

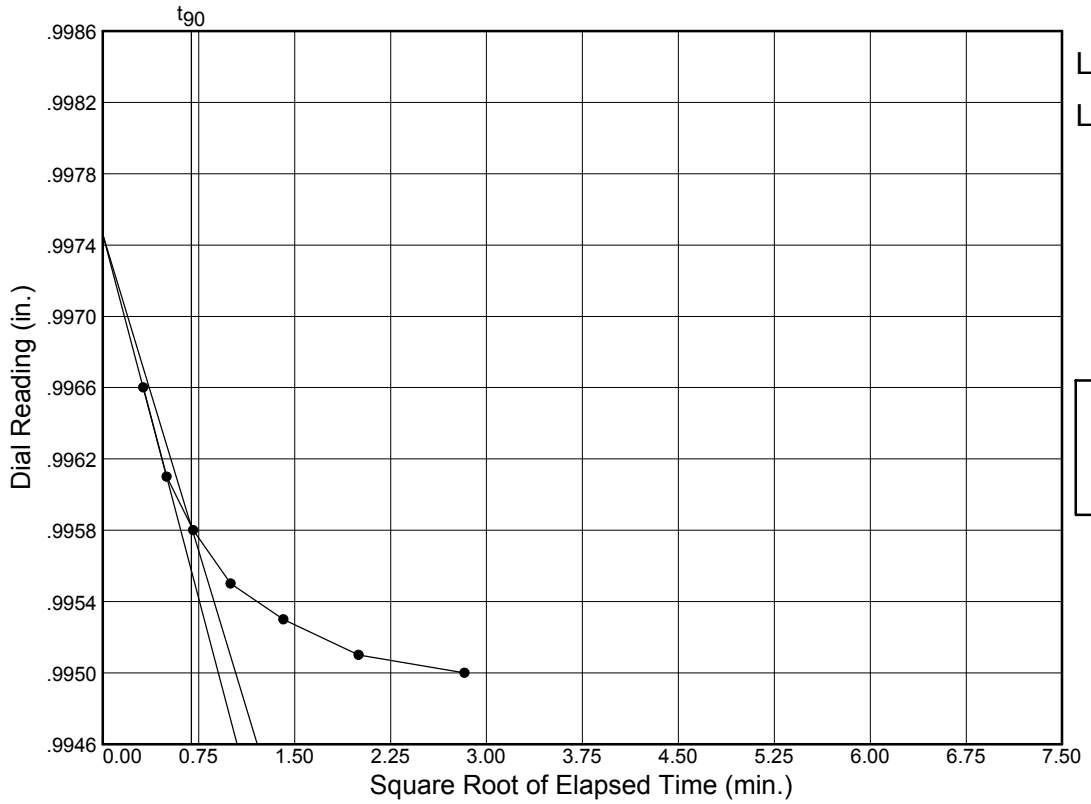
CONSOLIDATION TEST REPORT

GET SOLUTIONS, INC.

Figure 1

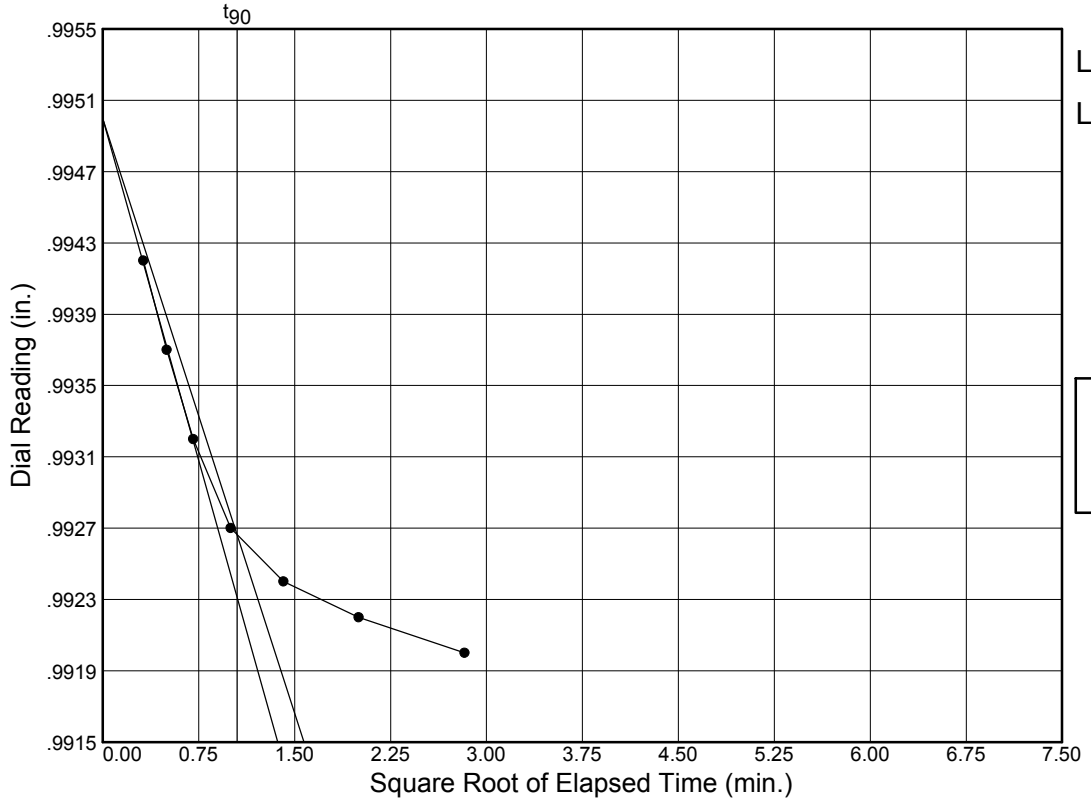
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 1
Load= 0.13 tsf
D_0 = 0.99746
D_{90} = 0.99582
D_{100} = 0.99564
T_{90} = 0.48 min.

C_v @ T_{90}
4.39 ft.^{2}/day



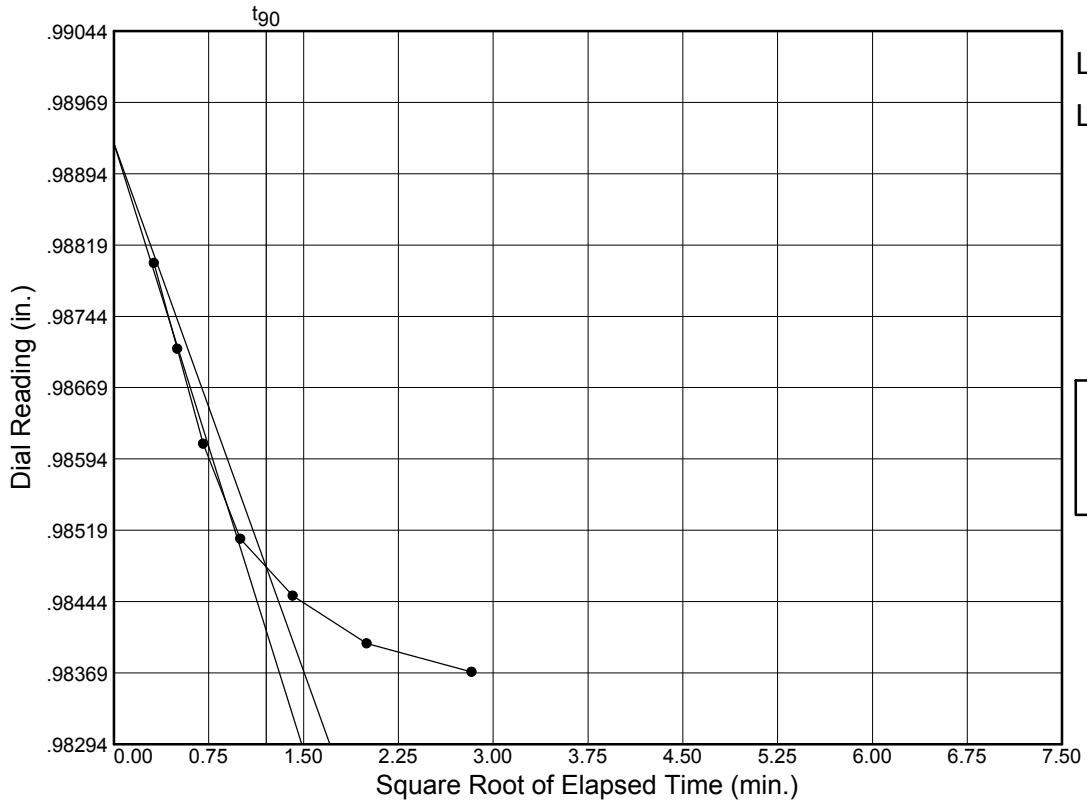
Load No.= 2
Load= 0.25 tsf
D_0 = 0.99500
D_{90} = 0.99266
D_{100} = 0.99240
T_{90} = 1.10 min.

C_v @ T_{90}
1.90 ft.^{2}/day

Figure 2

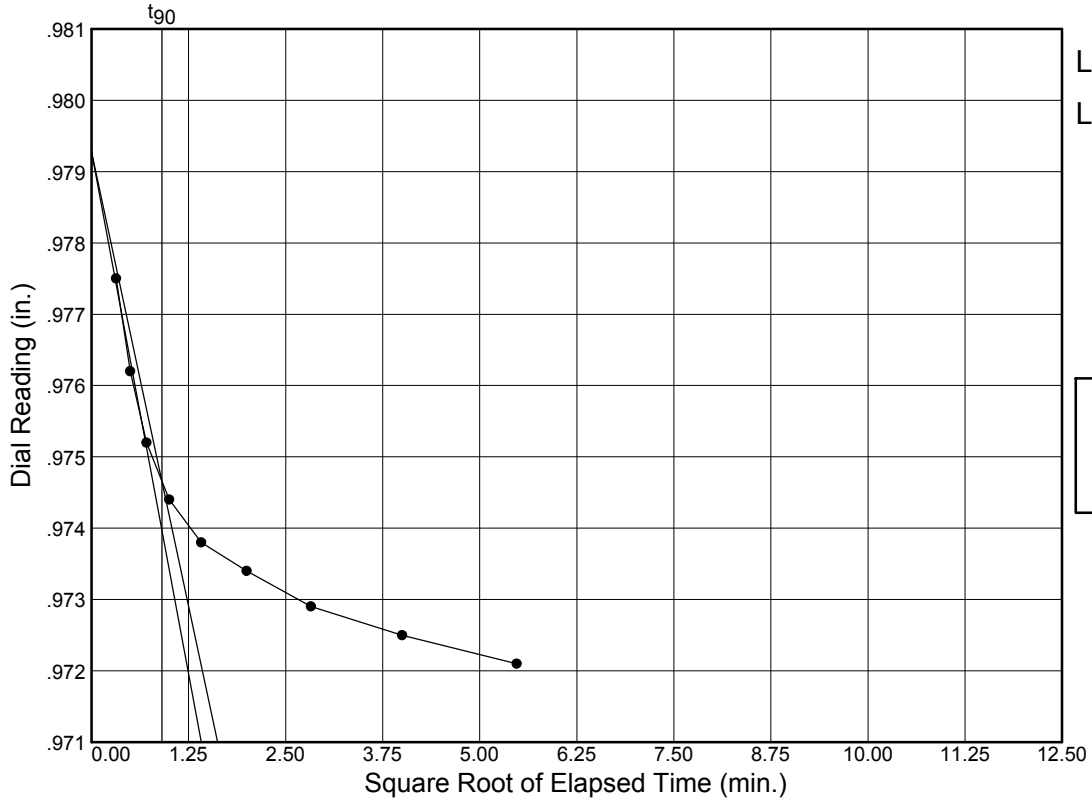
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 3
Load= 0.50 tsf
D_0 = 0.98926
D_{90} = 0.98480
D_{100} = 0.98431
T_{90} = 1.45 min.

C_v @ T_{90}
1.43 ft.^{2}/day



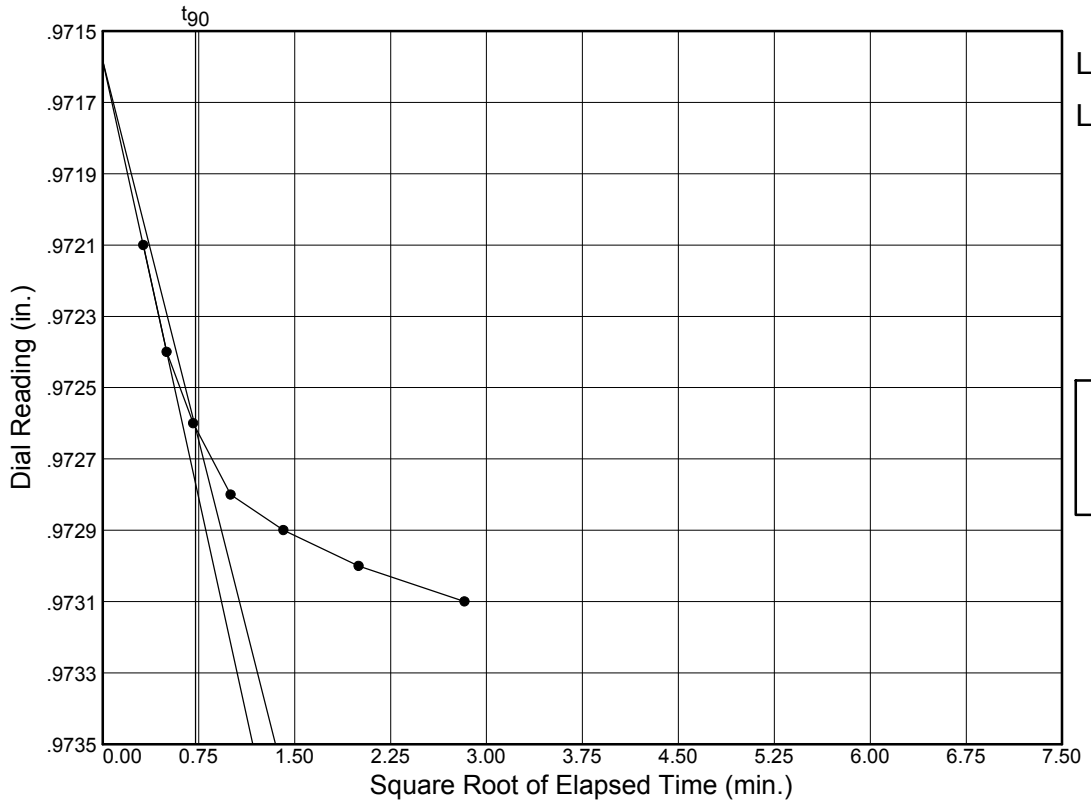
Load No.= 4
Load= 1.00 tsf
D_0 = 0.97928
D_{90} = 0.97465
D_{100} = 0.97414
T_{90} = 0.82 min.

C_v @ T_{90}
2.47 ft.^{2}/day

Figure 3

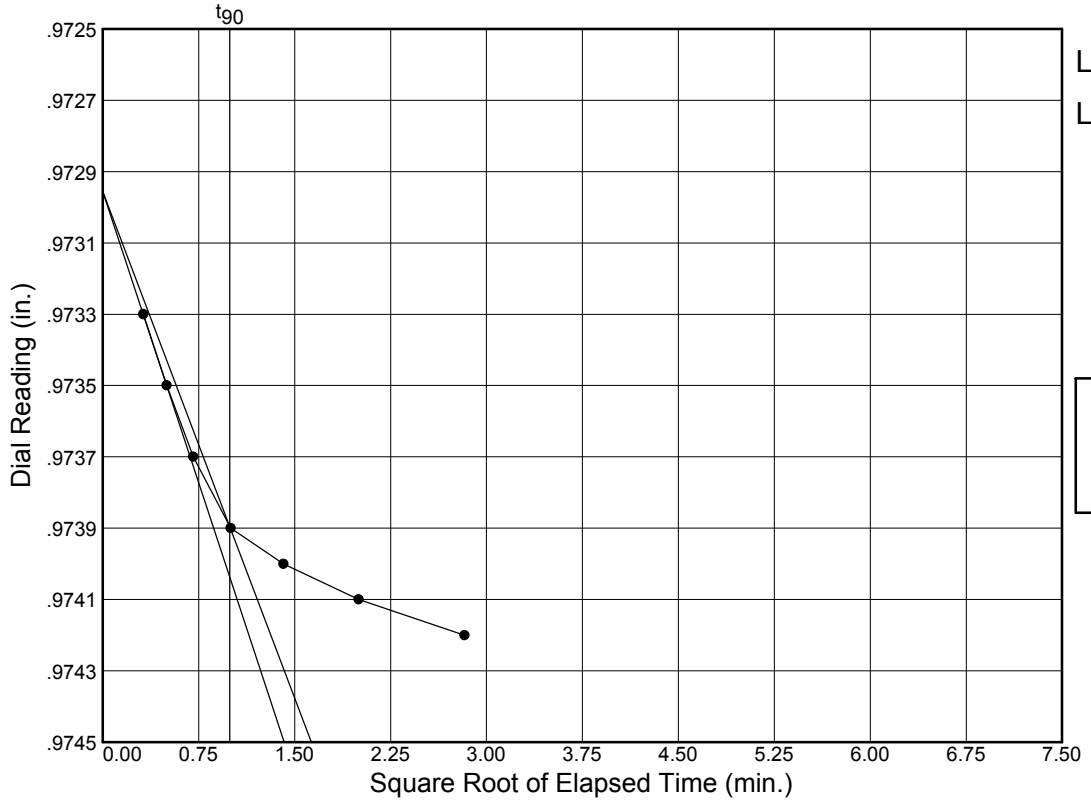
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 5
Load= 0.50 tsf
D_0 = 0.97158
D_{90} = 0.97261
D_{100} = 0.97273
T_{90} = 0.52 min.

C_v @ T_{90}
3.83 ft.^{2}/day



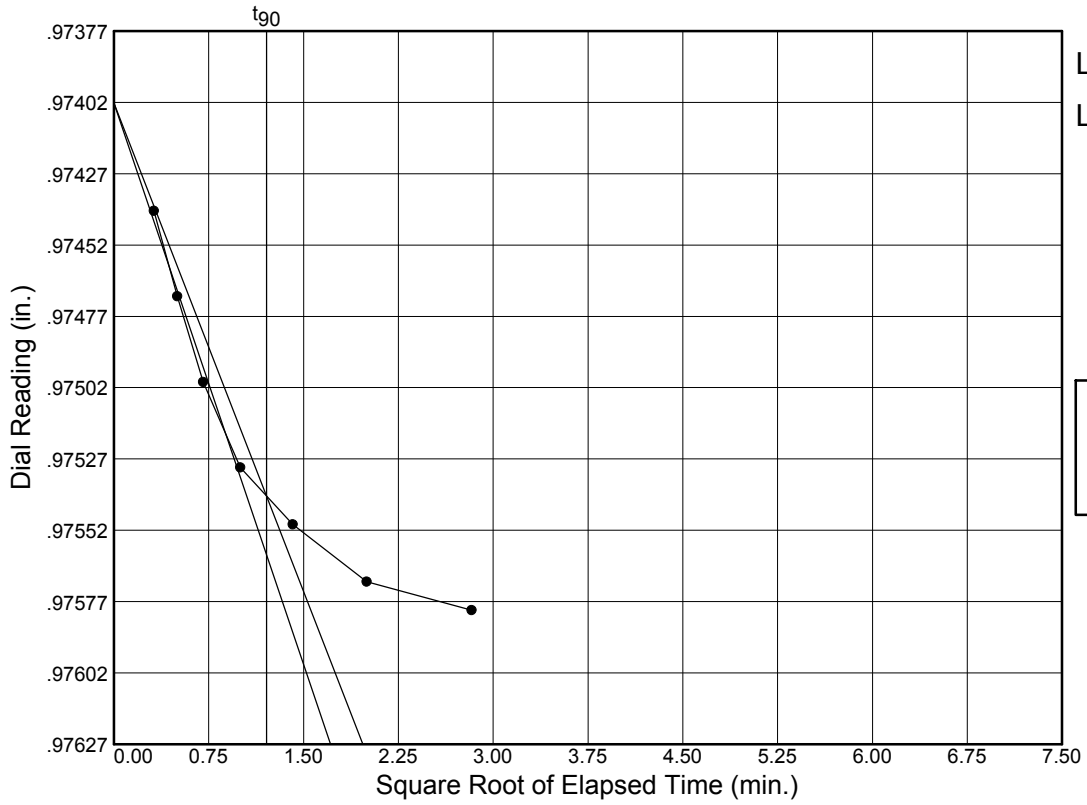
Load No.= 6
Load= 0.25 tsf
D_0 = 0.97296
D_{90} = 0.97389
D_{100} = 0.97400
T_{90} = 0.98 min.

C_v @ T_{90}
2.04 ft.^{2}/day

Figure 4

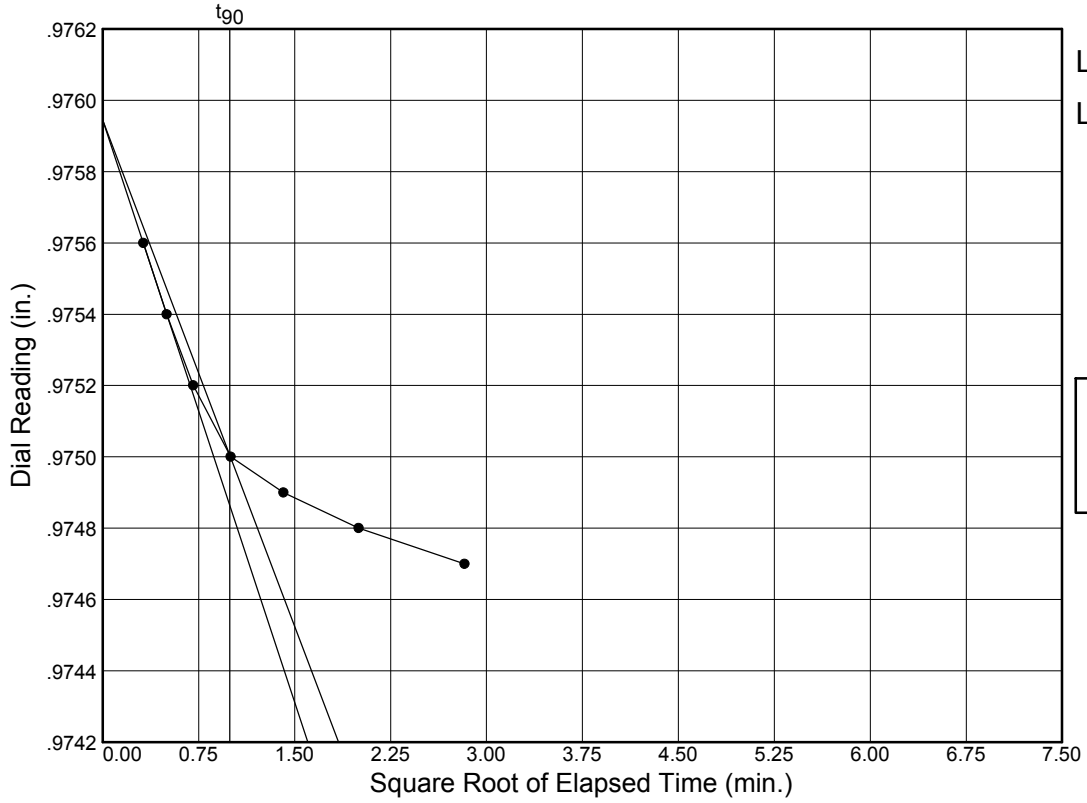
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 7
Load= 0.13 tsf
D_0 = 0.97402
D_{90} = 0.97540
D_{100} = 0.97555
T_{90} = 1.46 min.

C_v @ T_{90}
1.38 ft.^{2}/day



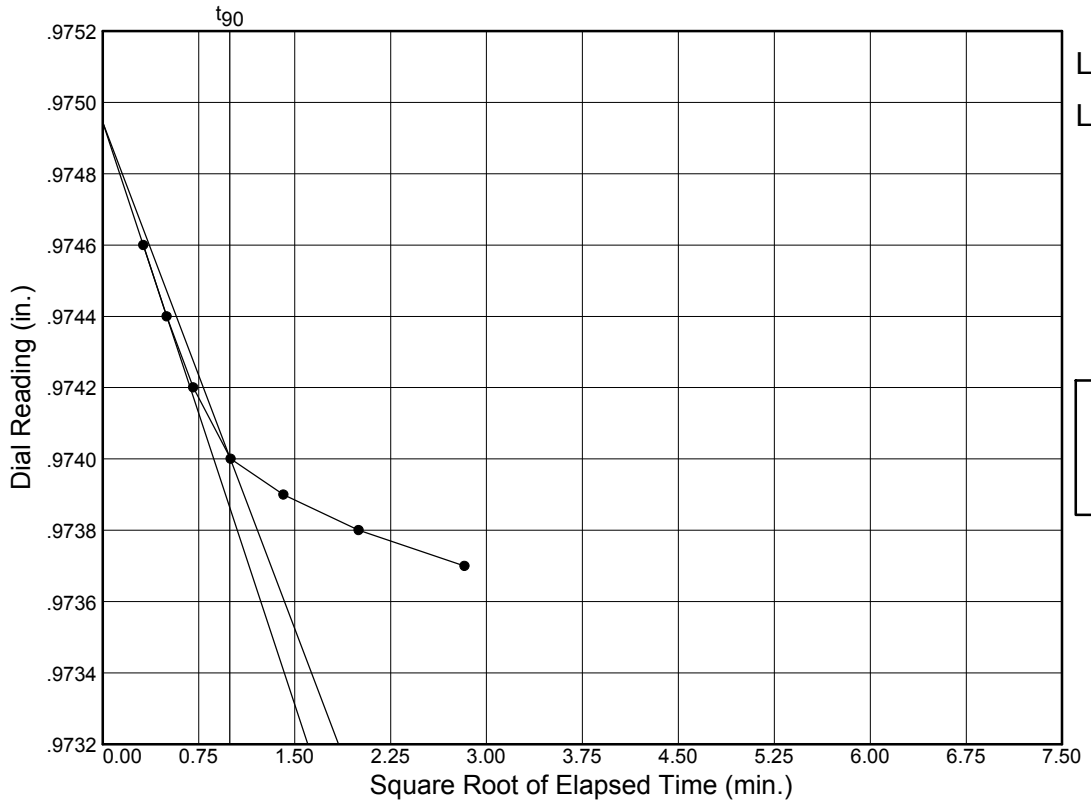
Load No.= 8
Load= 0.25 tsf
D_0 = 0.97594
D_{90} = 0.97501
D_{100} = 0.97490
T_{90} = 0.98 min.

C_v @ T_{90}
2.05 ft.^{2}/day

Figure 5

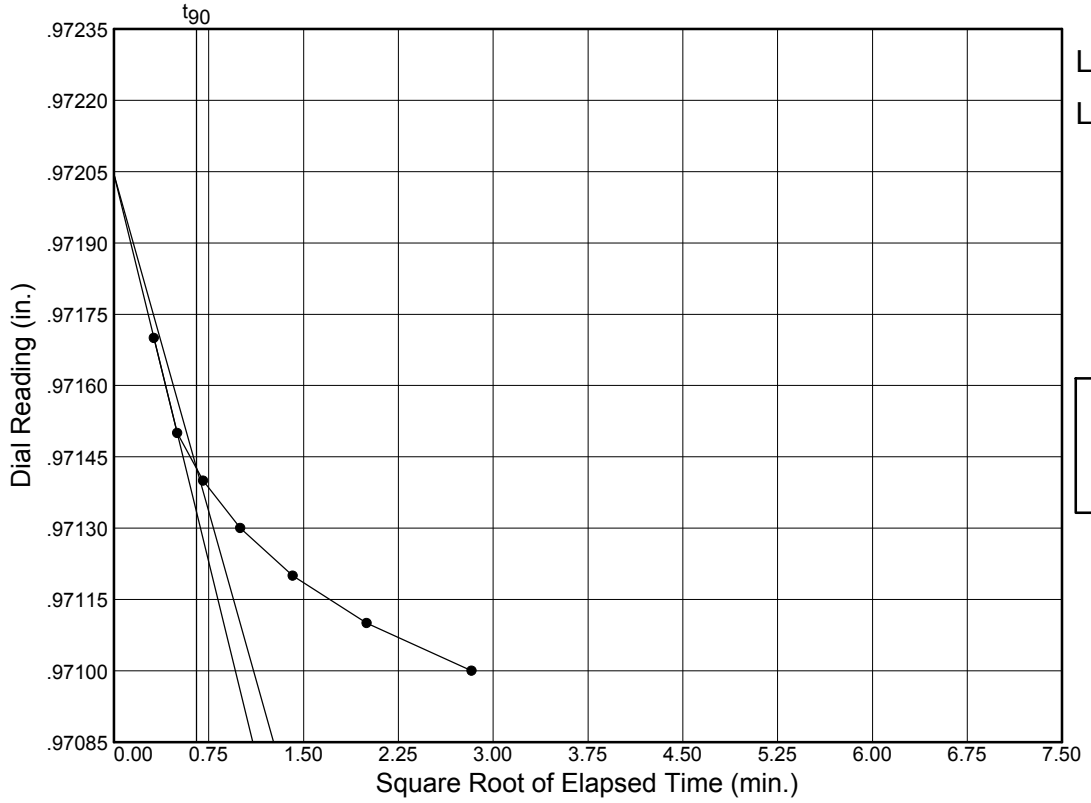
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 9
Load= 0.50 tsf
D_0 = 0.97494
D_{90} = 0.97401
D_{100} = 0.97390
T_{90} = 0.98 min.

C_v @ T_{90}
2.05 ft.^{2}/day



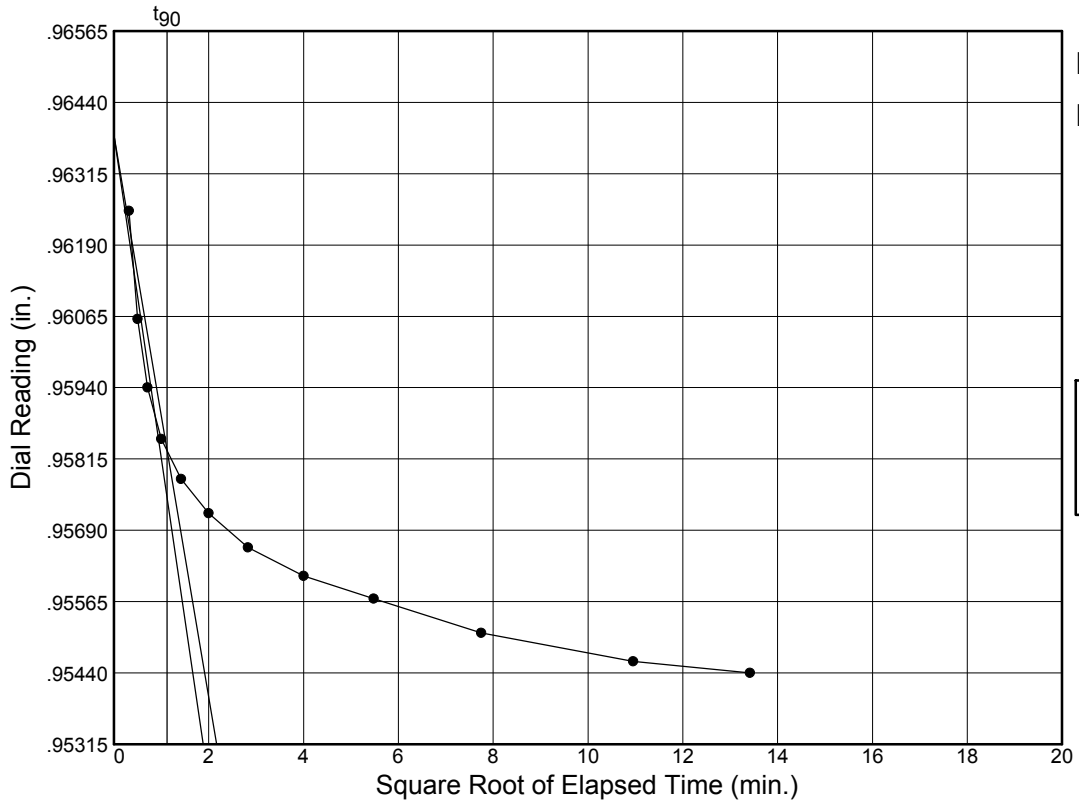
Load No.= 10
Load= 1.00 tsf
D_0 = 0.97204
D_{90} = 0.97143
D_{100} = 0.97136
T_{90} = 0.43 min.

C_v @ T_{90}
4.70 ft.^{2}/day

Figure 6

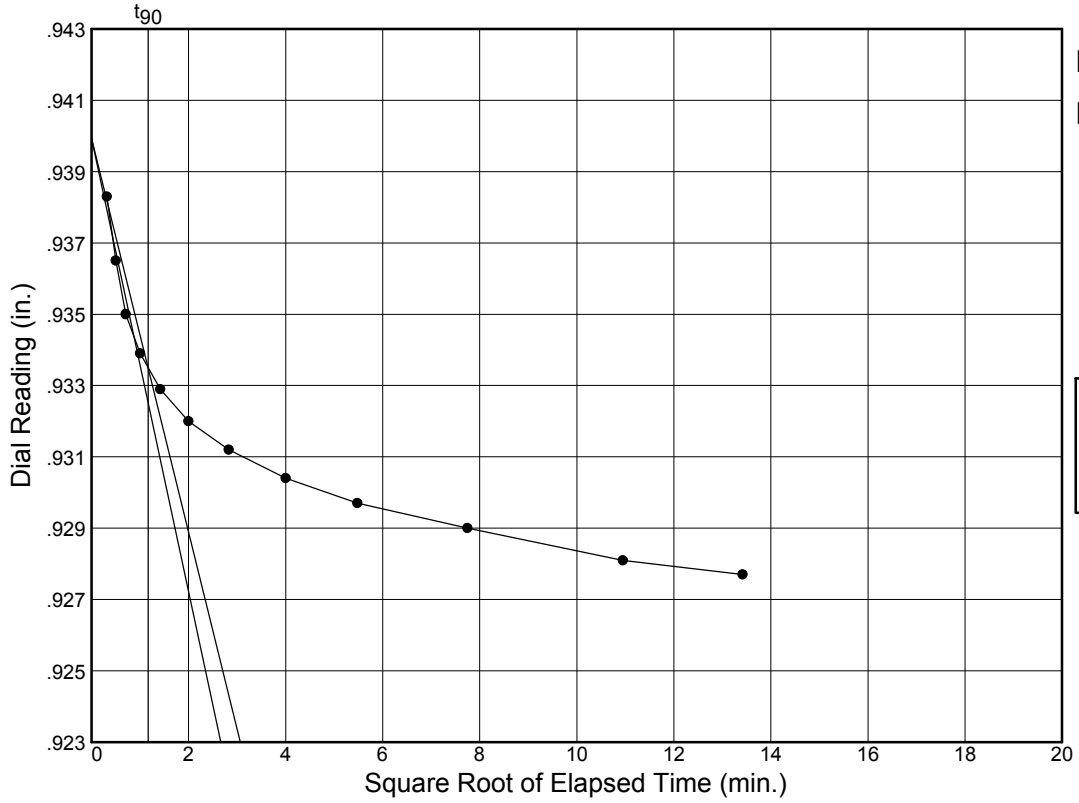
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 11
Load= 2.00 tsf
D_0 = 0.96383
D_{90} = 0.95829
D_{100} = 0.95768
T_{90} = 1.26 min.

C_v @ T_{90}
1.56 ft.^{2}/day



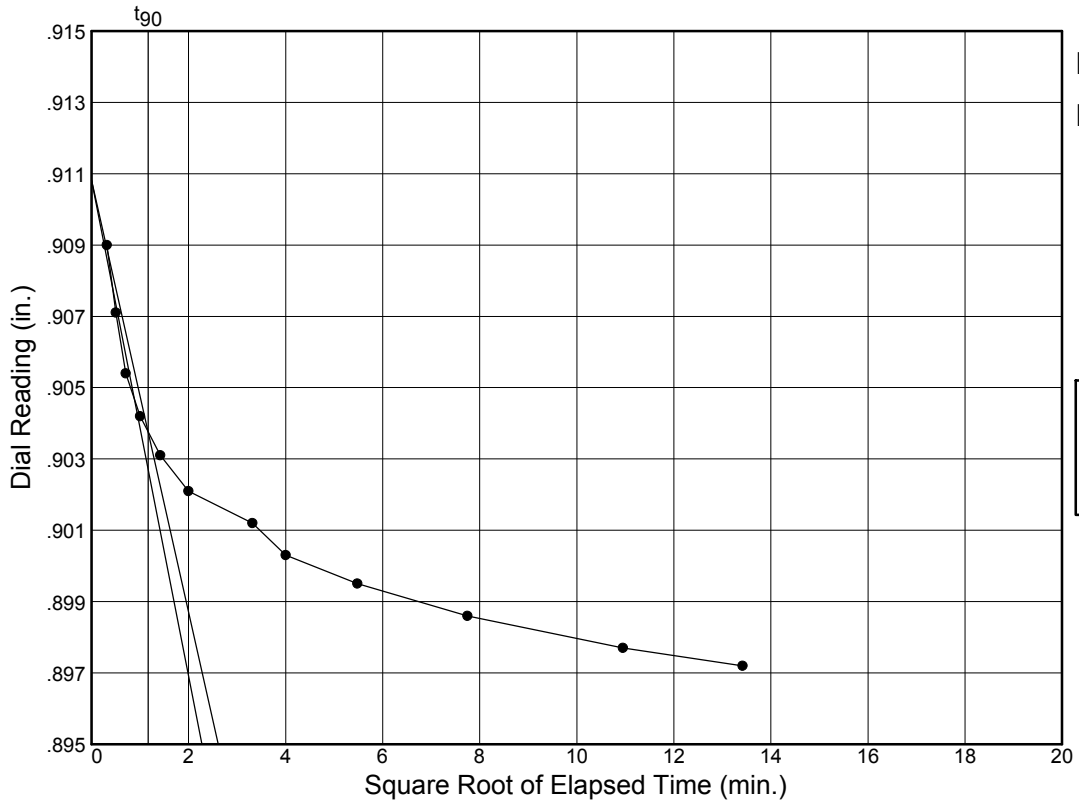
Load No.= 12
Load= 4.00 tsf
D_0 = 0.93993
D_{90} = 0.93351
D_{100} = 0.93279
T_{90} = 1.35 min.

C_v @ T_{90}
1.39 ft.^{2}/day

Figure 7

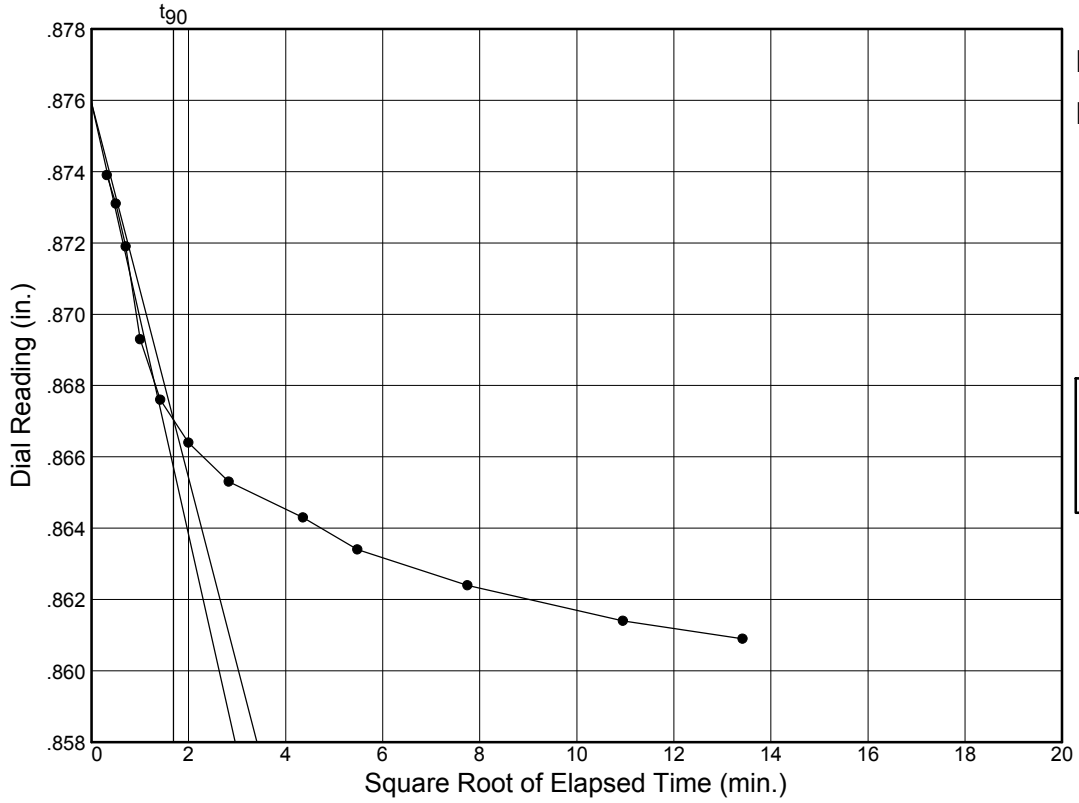
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 13
Load= 8.00 tsf
D_0 = 0.91082
D_{90} = 0.90376
D_{100} = 0.90298
T_{90} = 1.36 min.

C_v @ T_{90}
1.30 ft.^{2}/day



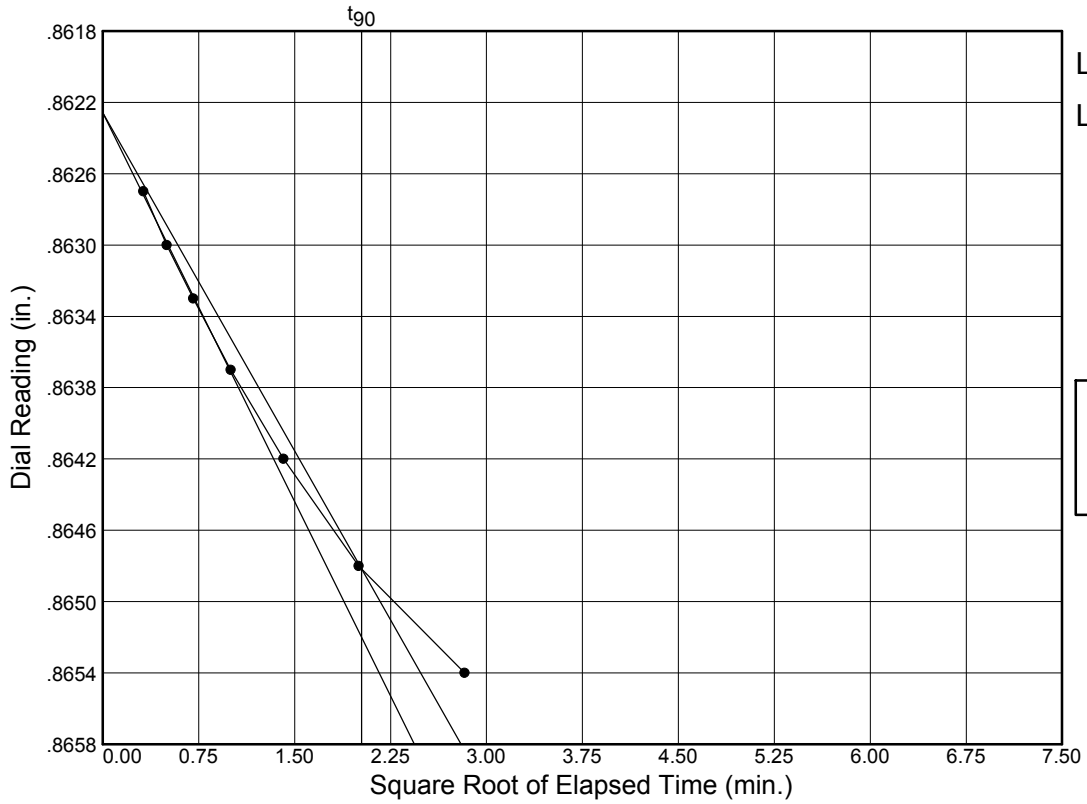
Load No.= 14
Load= 16.00 tsf
D_0 = 0.87593
D_{90} = 0.86704
D_{100} = 0.86605
T_{90} = 2.85 min.

C_v @ T_{90}
0.57 ft.^{2}/day

Figure 8

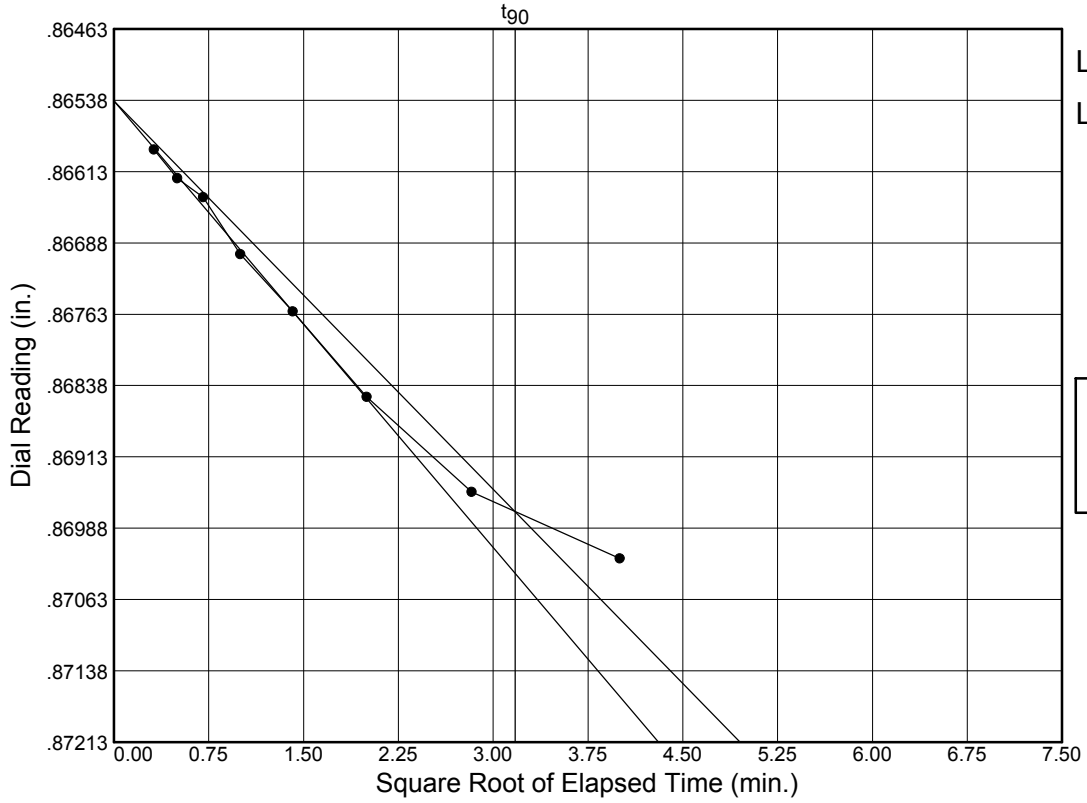
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 15
Load= 8.00 tsf
D_0 = 0.86226
D_{90} = 0.86482
D_{100} = 0.86510
T_{90} = 4.09 min.

C_v @ T_{90}
0.39 ft.^{2}/day



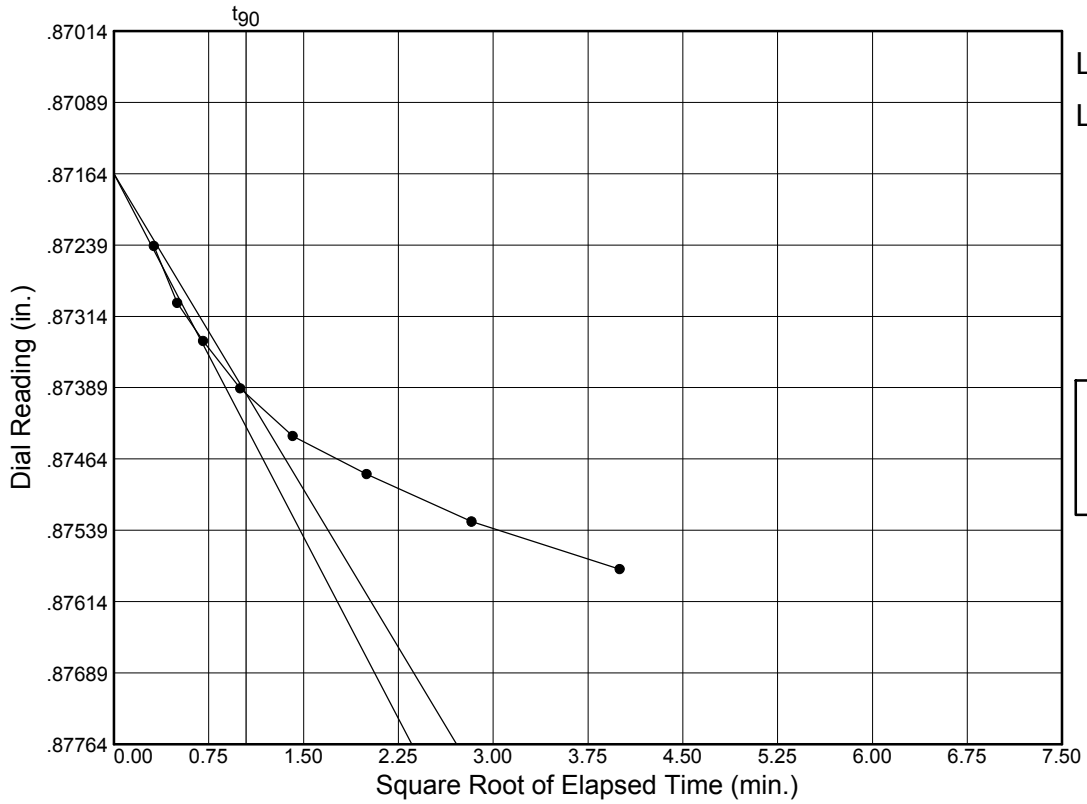
Load No.= 16
Load= 4.00 tsf
D_0 = 0.86539
D_{90} = 0.86971
D_{100} = 0.87019
T_{90} = 10.06 min.

C_v @ T_{90}
0.16 ft.^{2}/day

Figure 9

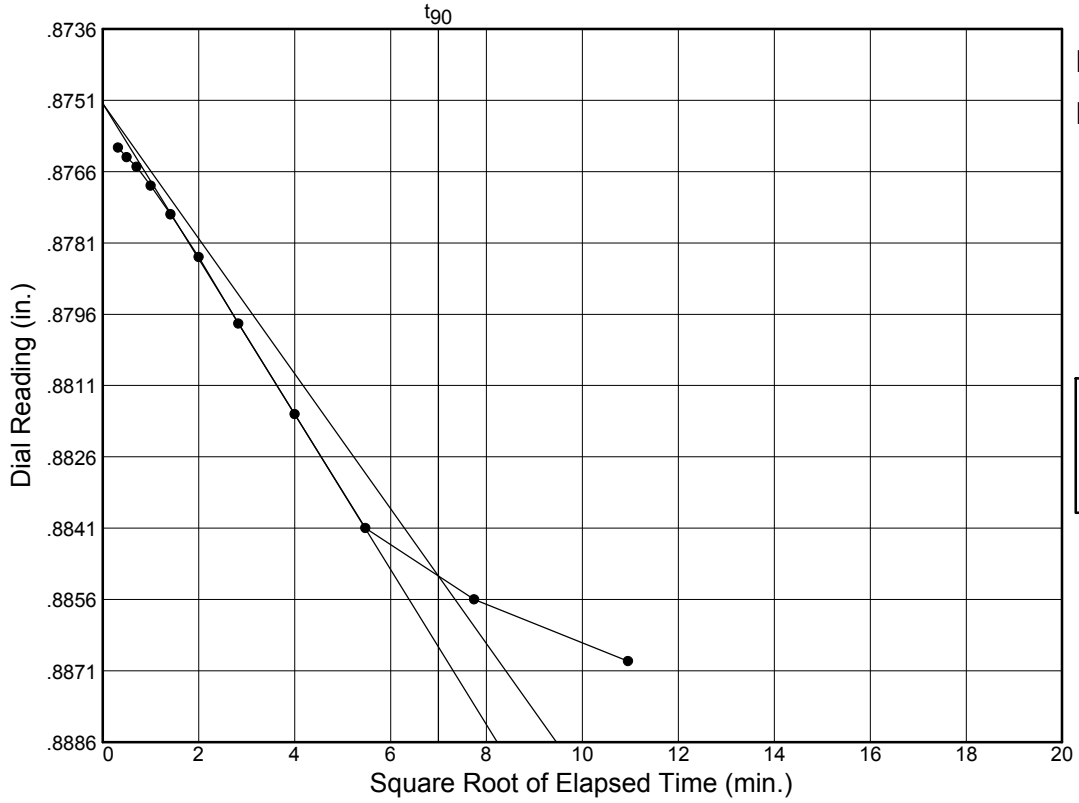
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 17
Load= 1.00 tsf
D_0 = 0.87164
D_{90} = 0.87396
D_{100} = 0.87421
T_{90} = 1.09 min.

C_v @ T_{90}
1.48 ft.^{2}/day



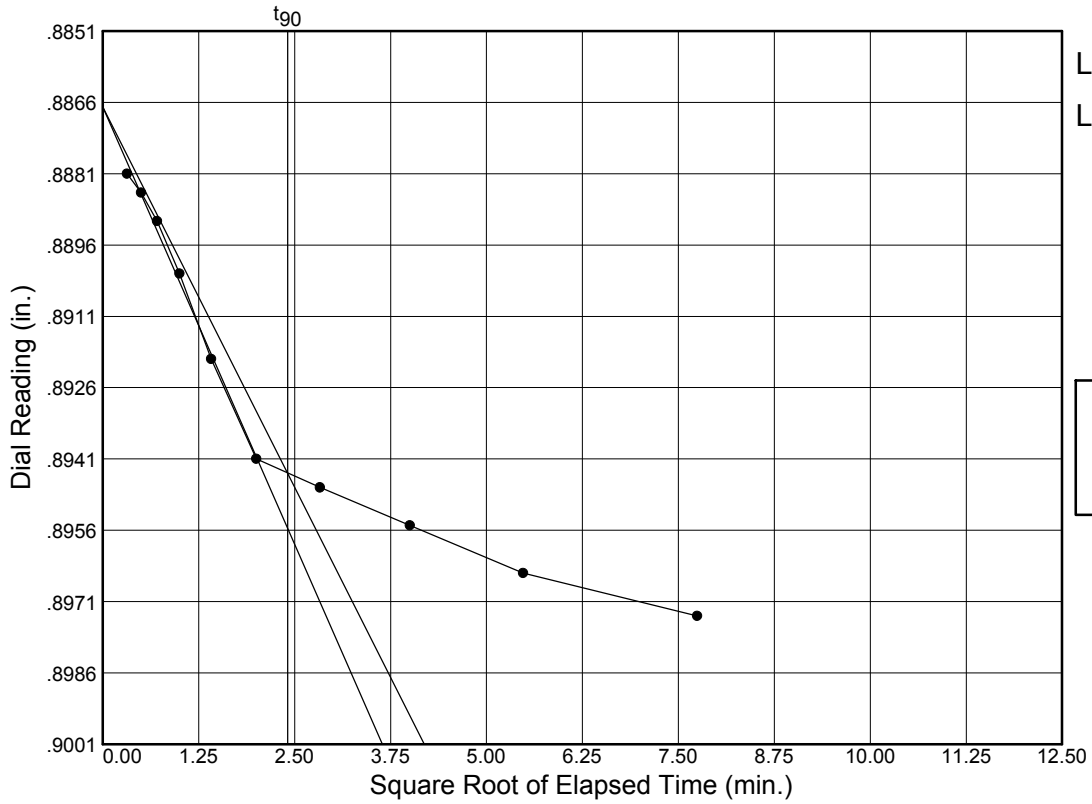
Load No.= 18
Load= 0.25 tsf
D_0 = 0.87517
D_{90} = 0.88510
D_{100} = 0.88621
T_{90} = 48.93 min.

C_v @ T_{90}
0.03 ft.^{2}/day

Figure 10

Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 19

Load= 0.13 tsf

D_0 = 0.88669

D_{90} = 0.89440

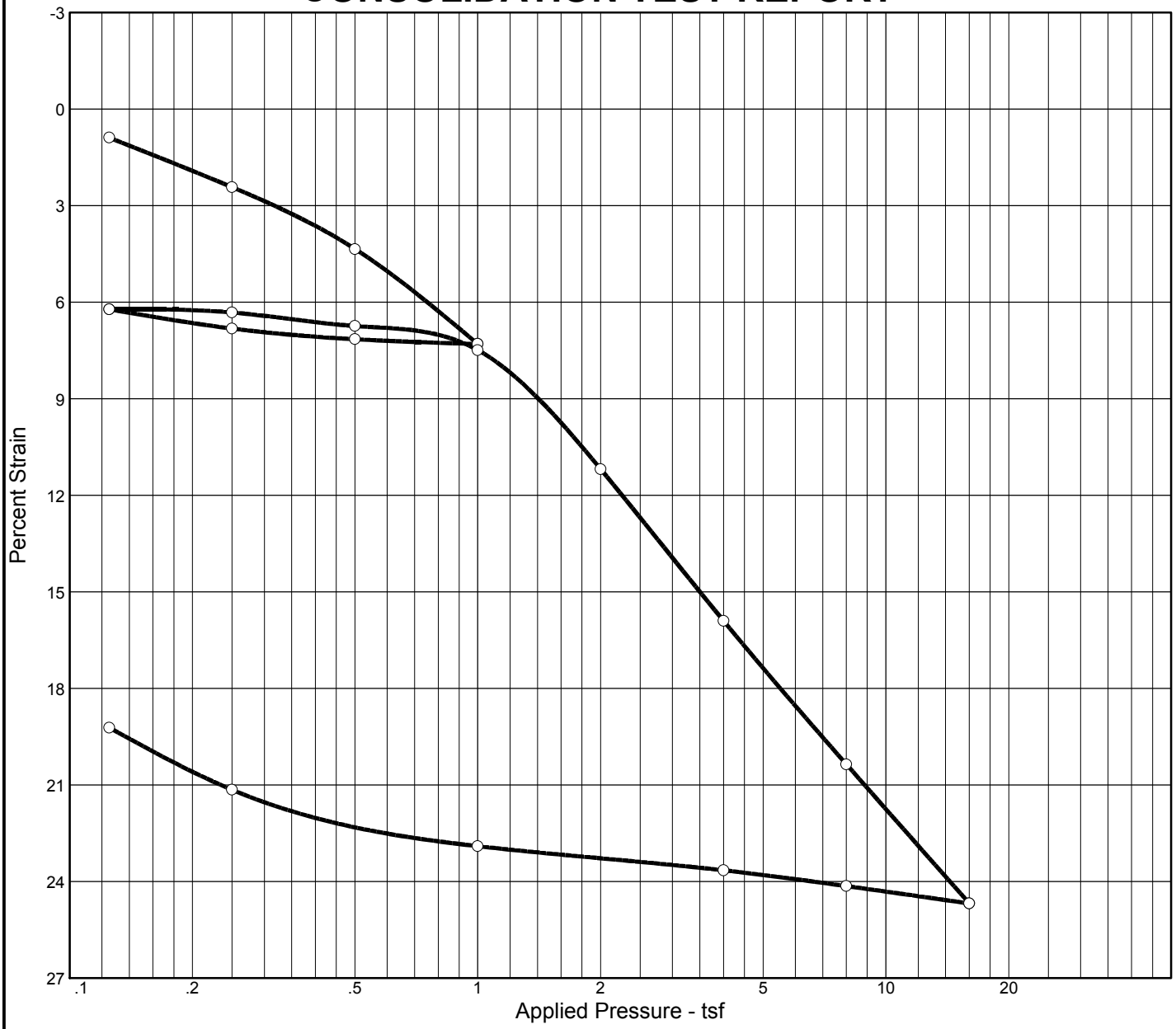
D_{100} = 0.89525

T_{90} = 5.80 min.

C_v @ T_{90}
0.29 ft.^{2}/day

Figure 11

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Gray, Fat CLAY		

LL	PI	Sp. Gr.	Overburden (tsf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (tsf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.63	1.25	79.6		39.7 %	22.3 %	99.9 %	90.1 %	1.044	0.651	0.97	0.32

Preparation Process:	D2435 Method	C_r	Swell Press. (tsf)	Heave %
Condition of Test:		0.04		

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

Location: D7-10W

Remarks:
Boring D7-10W
Sample Obtained 10/15/10

Checked By:

Title:

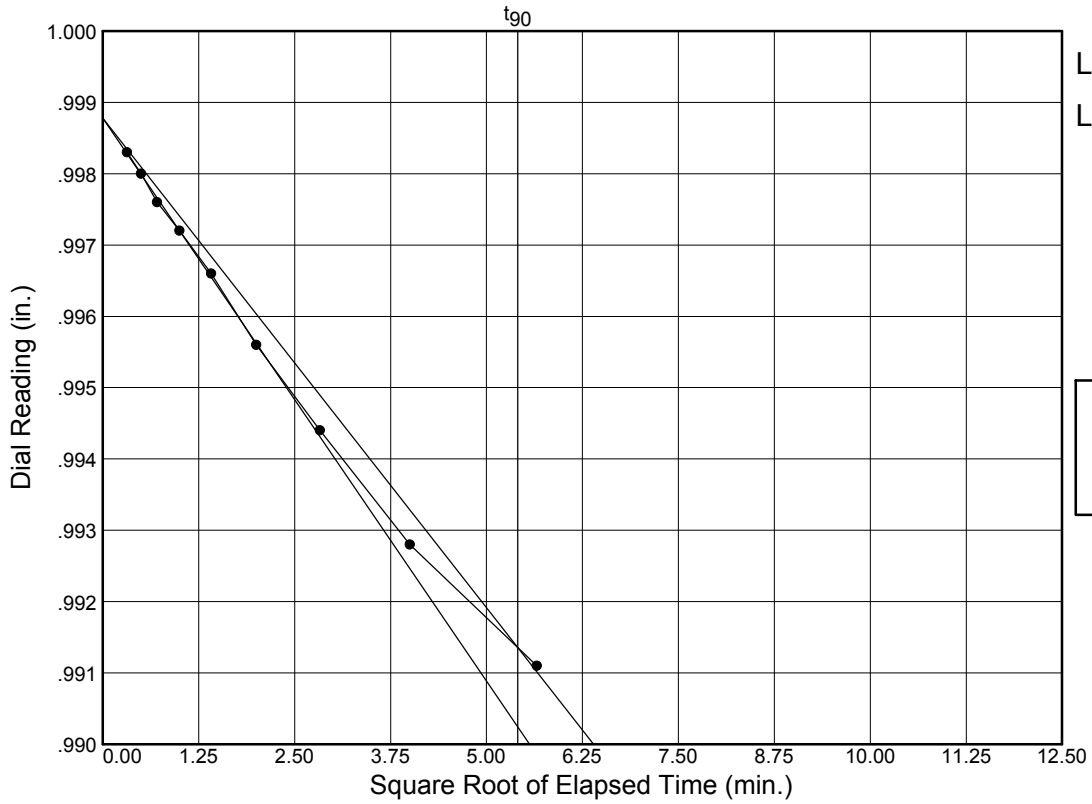
CONSOLIDATION TEST REPORT

GET SOLUTIONS, INC.

Figure 1

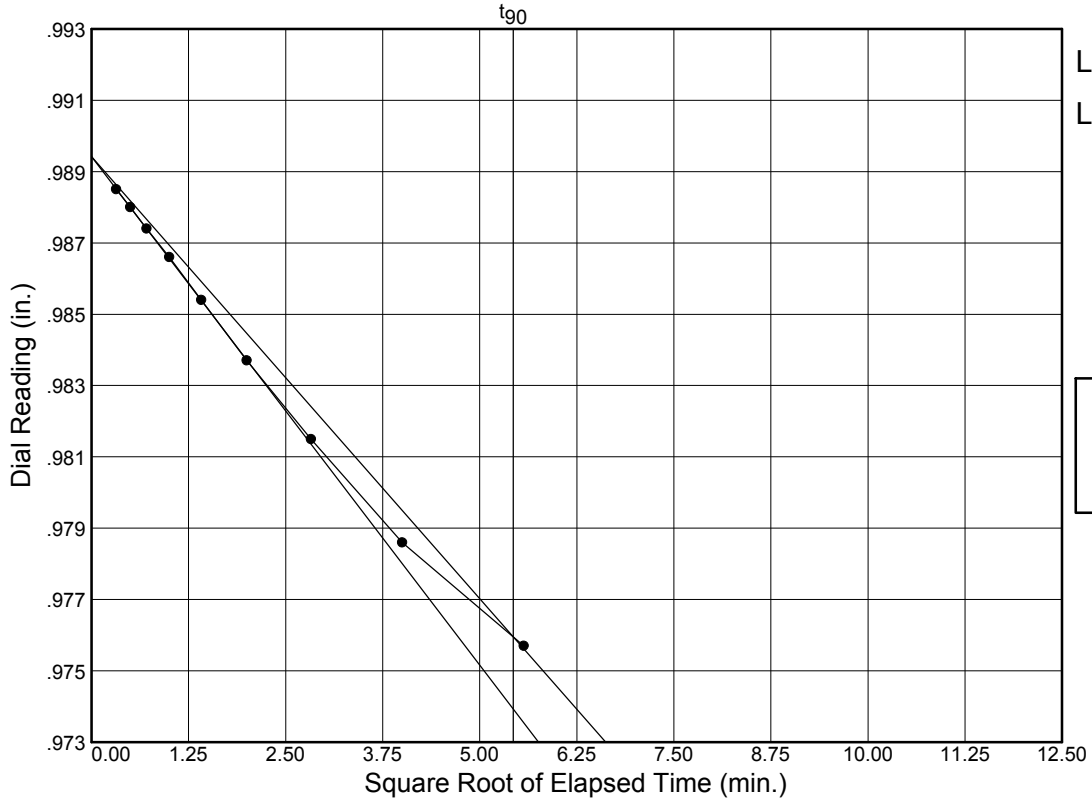
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 1
Load= 0.13 tsf
D_0 = 0.99878
D_{90} = 0.99136
D_{100} = 0.99053
T_{90} = 29.23 min.

C_v @ T_{90}
0.07 ft.^{2}/day



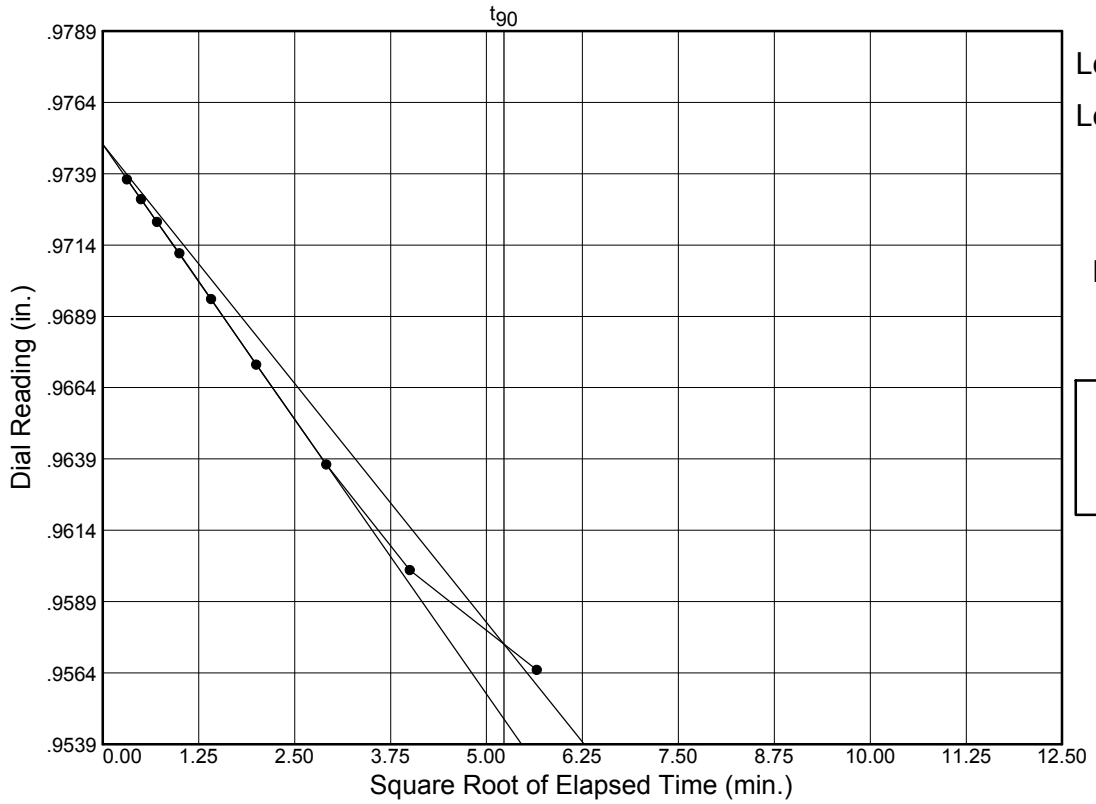
Load No.= 2
Load= 0.25 tsf
D_0 = 0.98942
D_{90} = 0.97595
D_{100} = 0.97445
T_{90} = 29.50 min.

C_v @ T_{90}
0.07 ft.^{2}/day

Figure 2

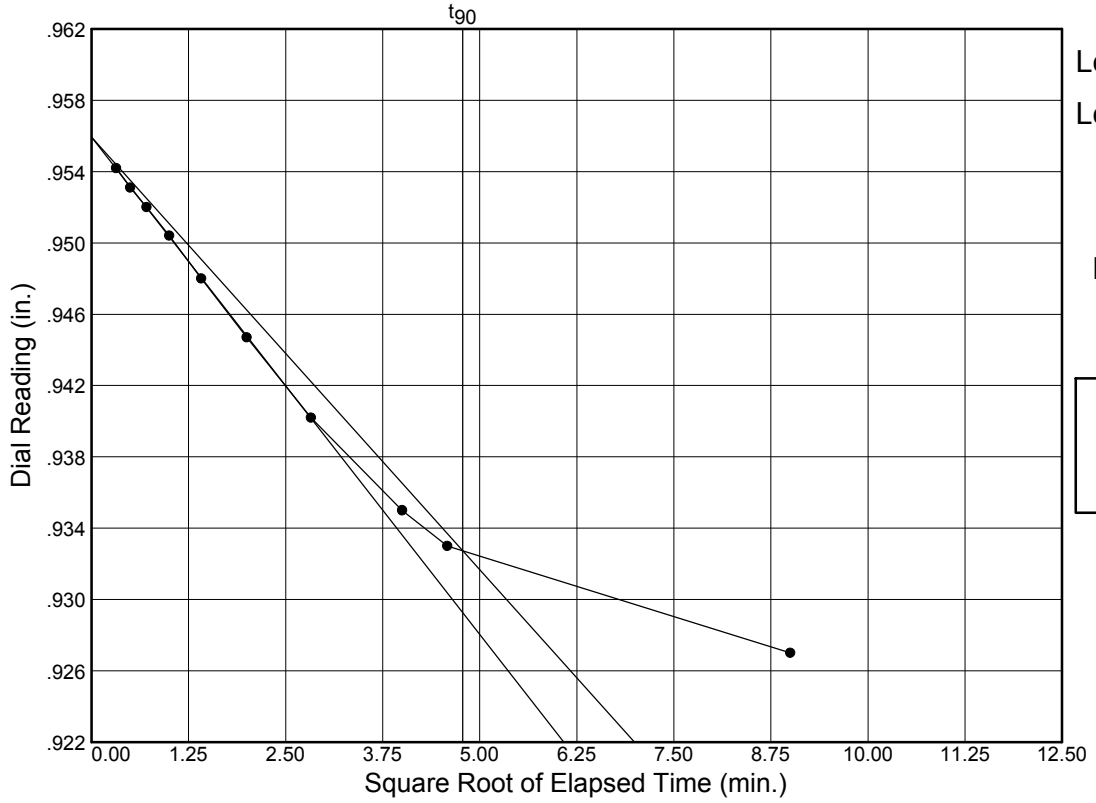
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 3
Load= 0.50 tsf
D_0 = 0.97493
D_{90} = 0.95741
D_{100} = 0.95546
T_{90} = 27.32 min.

C_v @ T_{90}
0.07 ft.^{2}/day



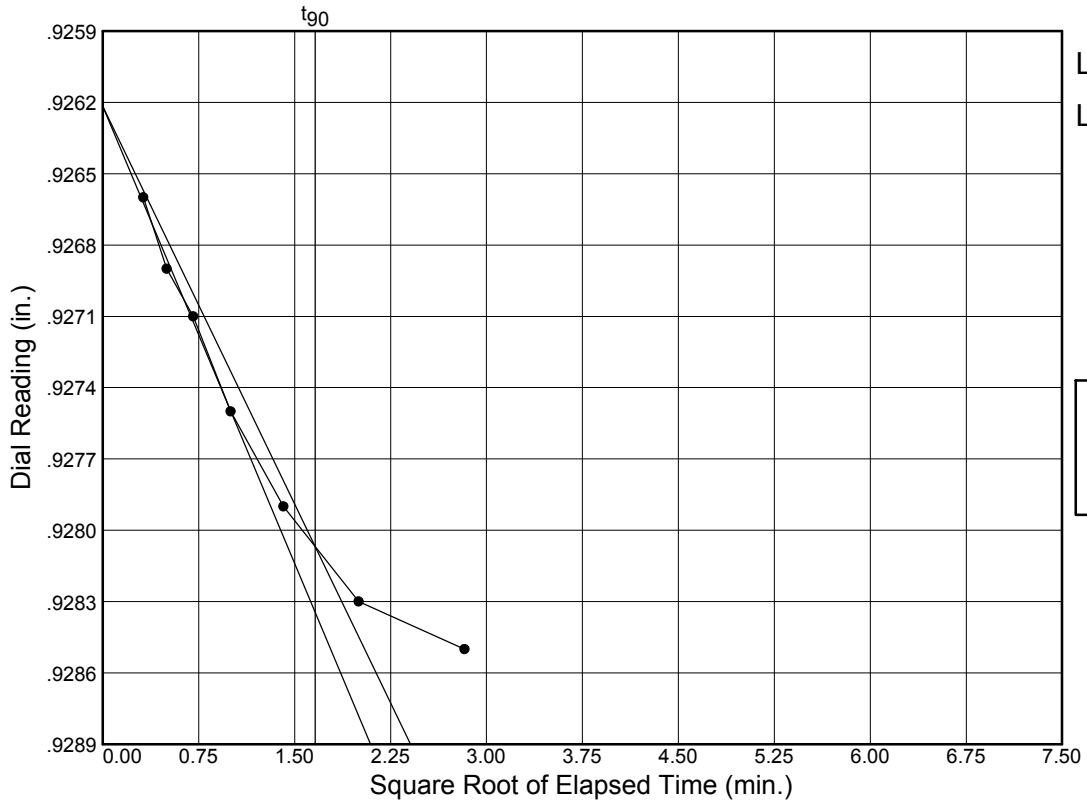
Load No.= 4
Load= 1.00 tsf
D_0 = 0.95593
D_{90} = 0.93273
D_{100} = 0.93015
T_{90} = 22.86 min.

C_v @ T_{90}
0.08 ft.^{2}/day

Figure 3

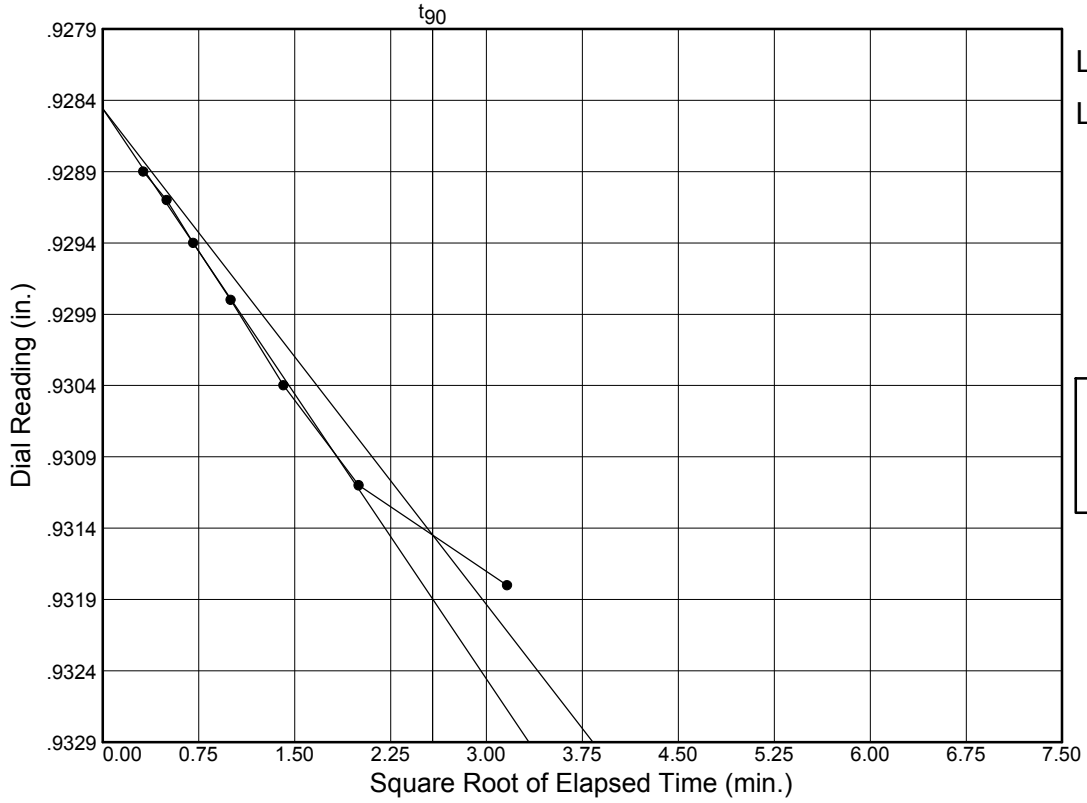
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 5
Load= 0.50 tsf
D_0 = 0.92622
D_{90} = 0.92807
D_{100} = 0.92827
T_{90} = 2.76 min.

C_v @ T_{90}
0.66 ft.^{2}/day



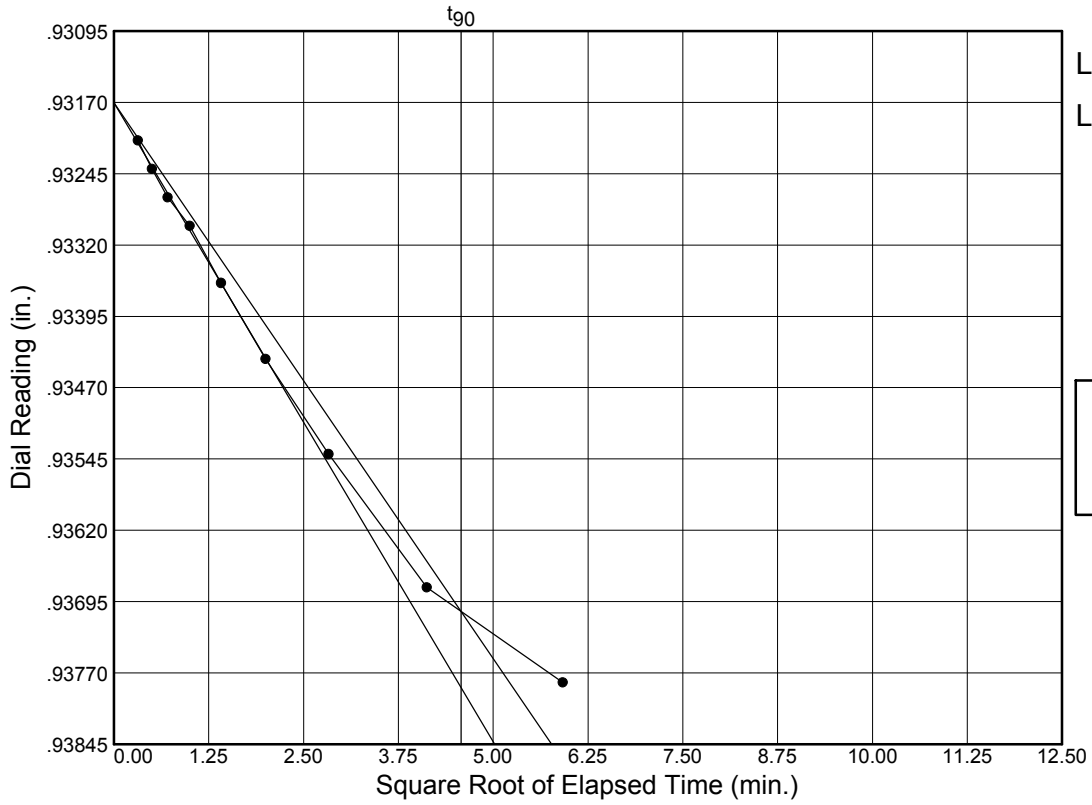
Load No.= 6
Load= 0.25 tsf
D_0 = 0.92846
D_{90} = 0.93145
D_{100} = 0.93178
T_{90} = 6.65 min.

C_v @ T_{90}
0.28 ft.^{2}/day

Figure 4

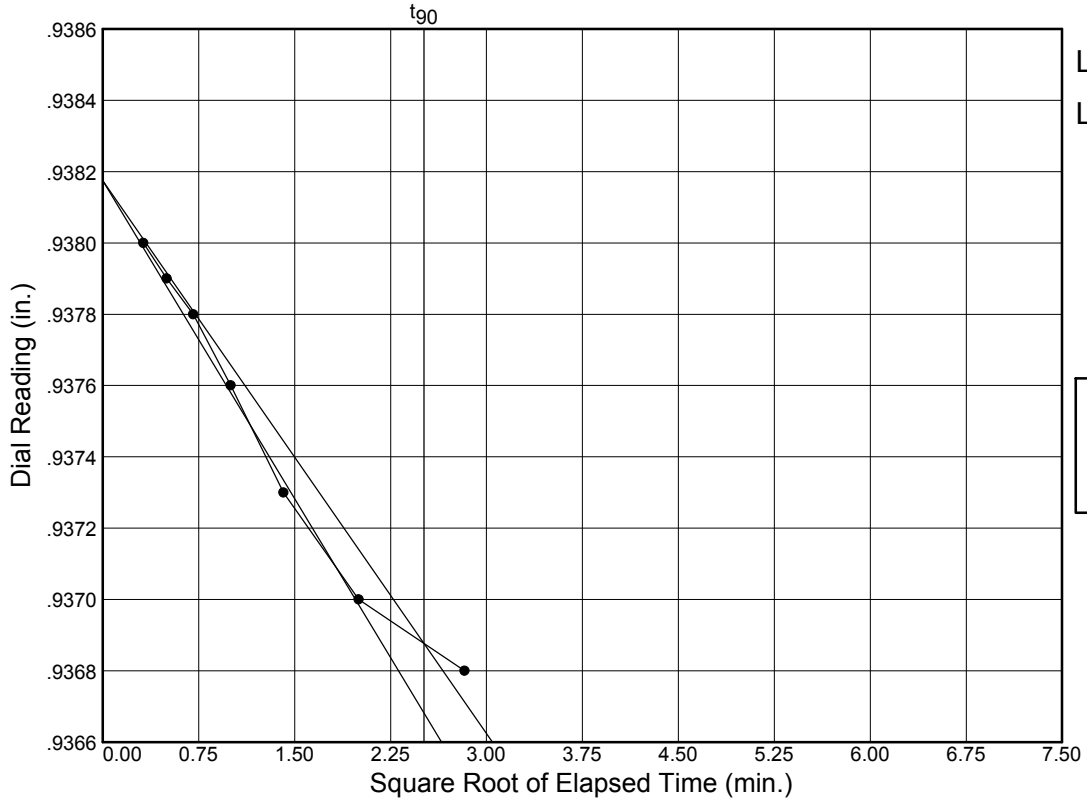
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 7
Load= 0.13 tsf
D_0 = 0.93170
D_{90} = 0.93705
D_{100} = 0.93765
T_{90} = 20.95 min.

C_v @ T_{90}
0.09 ft.^{2}/day



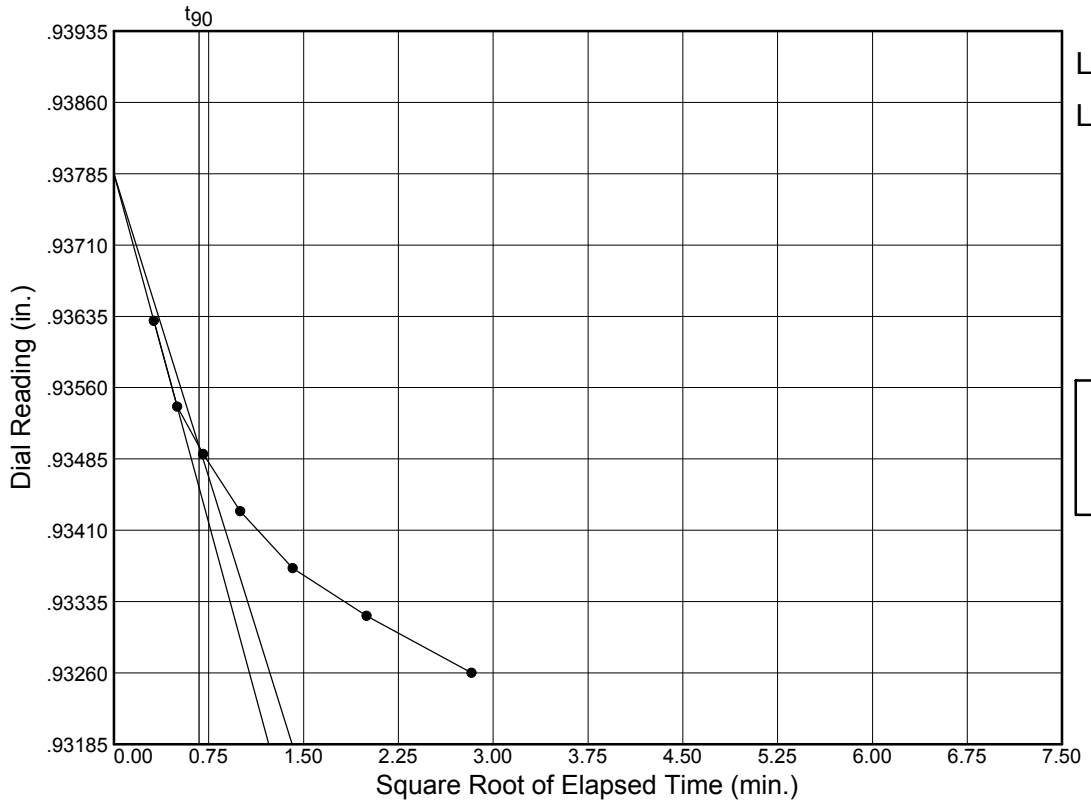
Load No.= 8
Load= 0.25 tsf
D_0 = 0.93817
D_{90} = 0.93688
D_{100} = 0.93673
T_{90} = 6.31 min.

C_v @ T_{90}
0.30 ft.^{2}/day

Figure 5

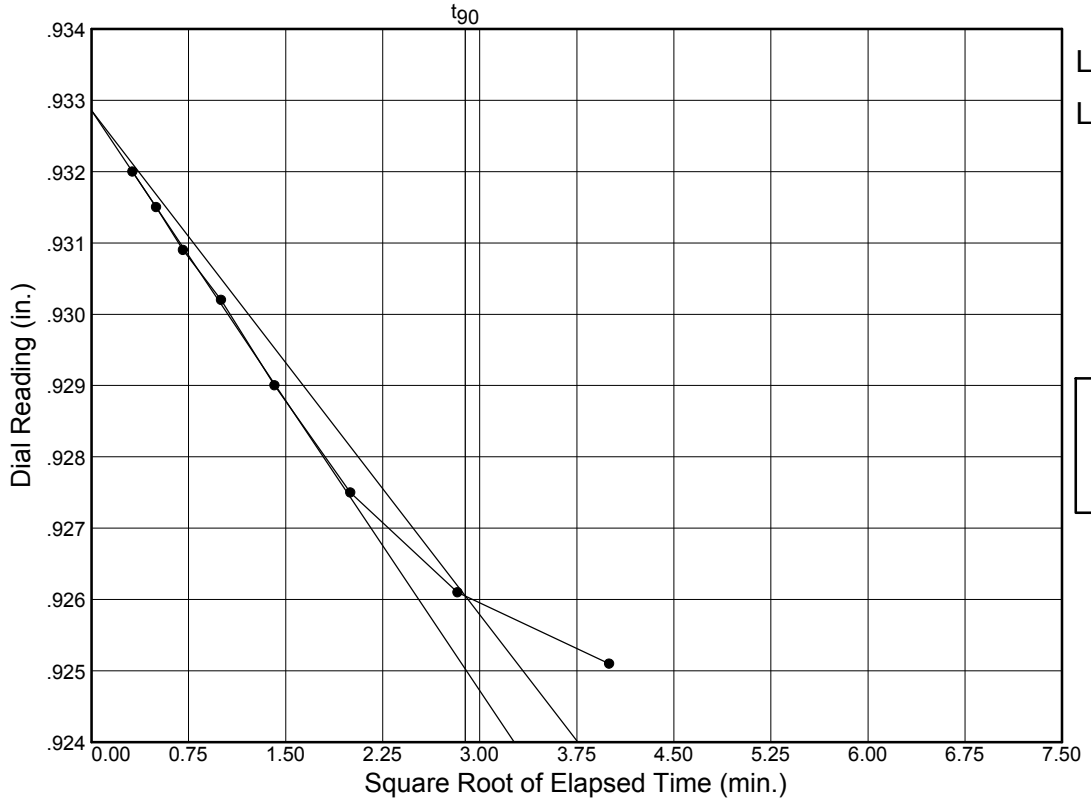
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 9
Load= 0.50 tsf
D_0 = 0.93785
D_{90} = 0.93498
D_{100} = 0.93466
T_{90} = 0.45 min.

C_v @ T_{90}
4.09 ft.^{2}/day



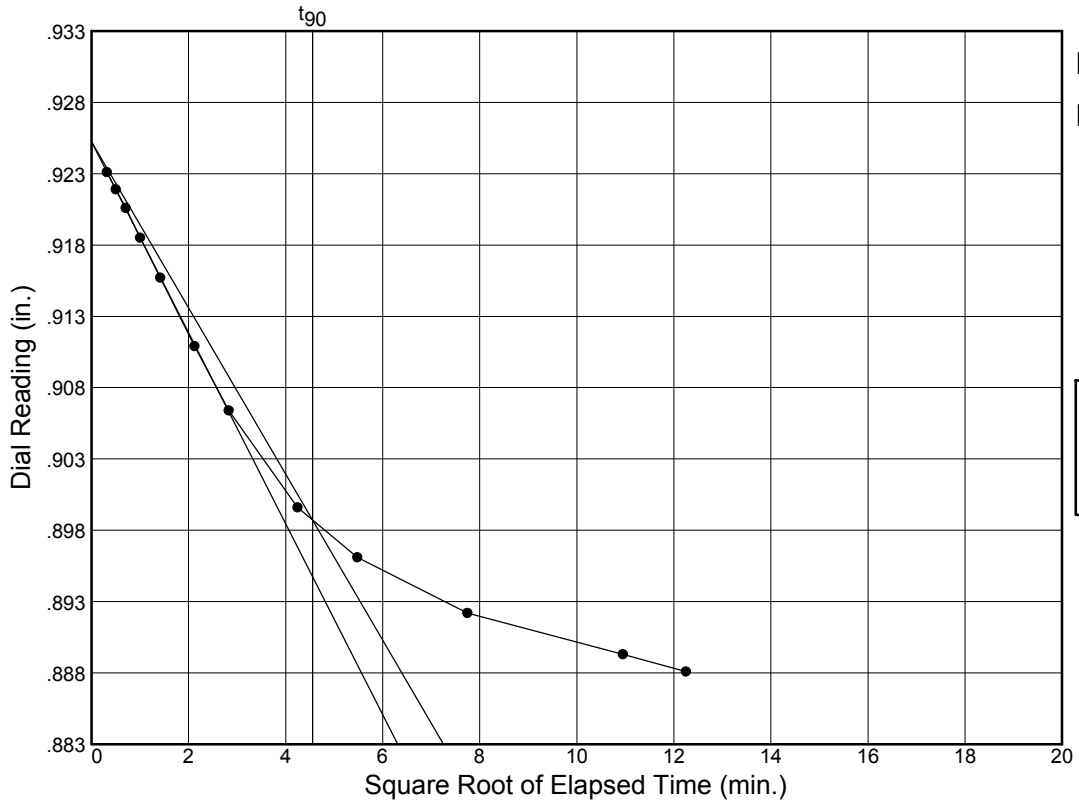
Load No.= 10
Load= 1.00 tsf
D_0 = 0.93285
D_{90} = 0.92605
D_{100} = 0.92529
T_{90} = 8.34 min.

C_v @ T_{90}
0.22 ft.^{2}/day

Figure 6

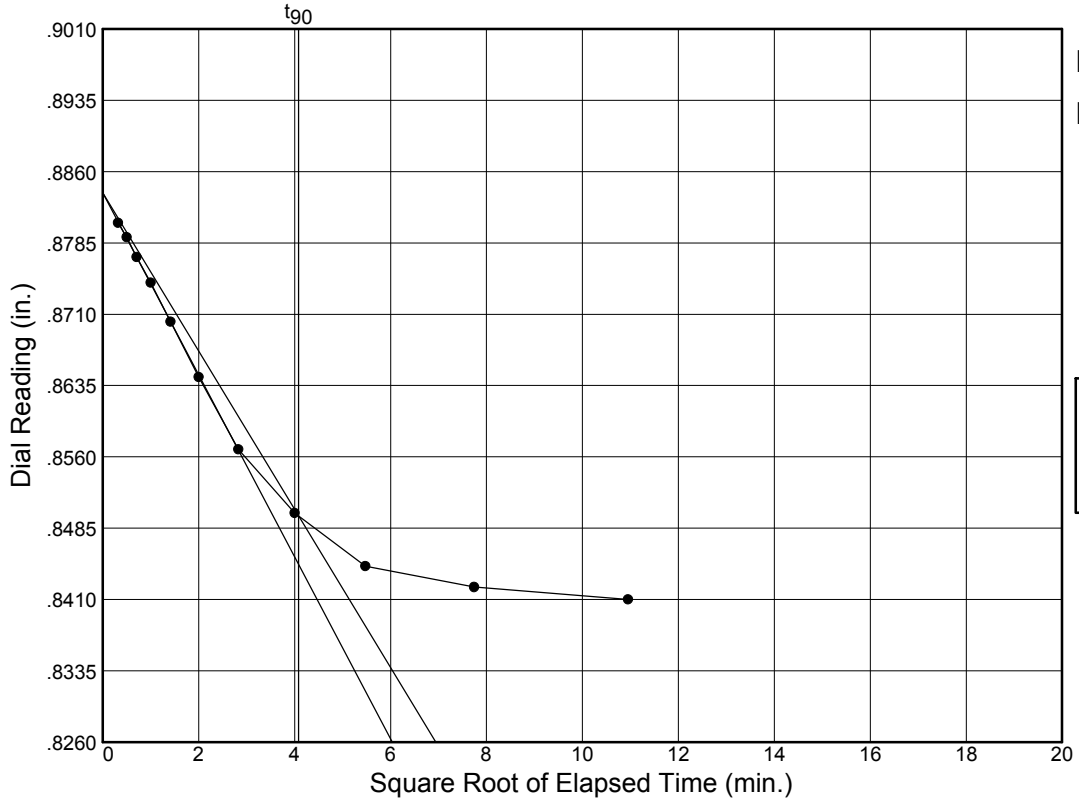
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 11
Load= 2.00 tsf
D_0 = 0.92523
D_{90} = 0.89872
D_{100} = 0.89577
T_{90} = 20.73 min.

C_v @ T_{90}
0.08 ft.^{2}/day



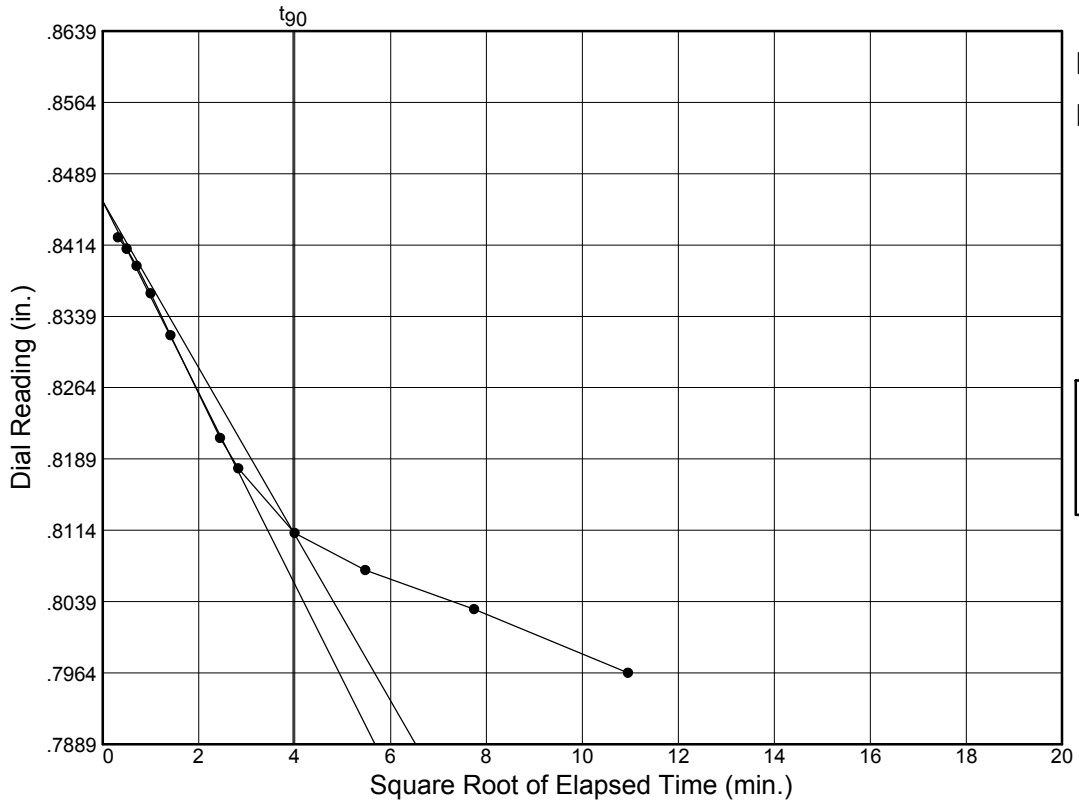
Load No.= 12
Load= 4.00 tsf
D_0 = 0.88376
D_{90} = 0.84979
D_{100} = 0.84602
T_{90} = 16.66 min.

C_v @ T_{90}
0.10 ft.^{2}/day

Figure 7

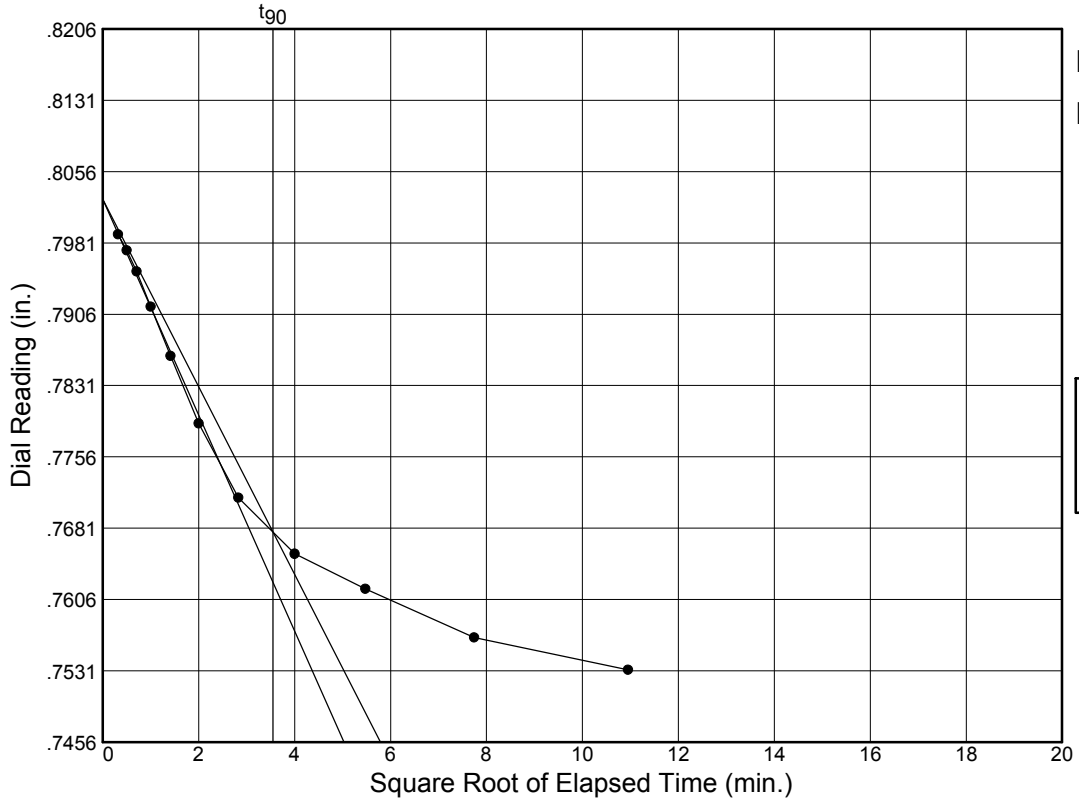
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 13
Load= 8.00 tsf
D_0 = 0.84599
D_{90} = 0.81130
D_{100} = 0.80744
T_{90} = 15.73 min.

C_v @ T_{90}
0.09 ft.^{2}/day



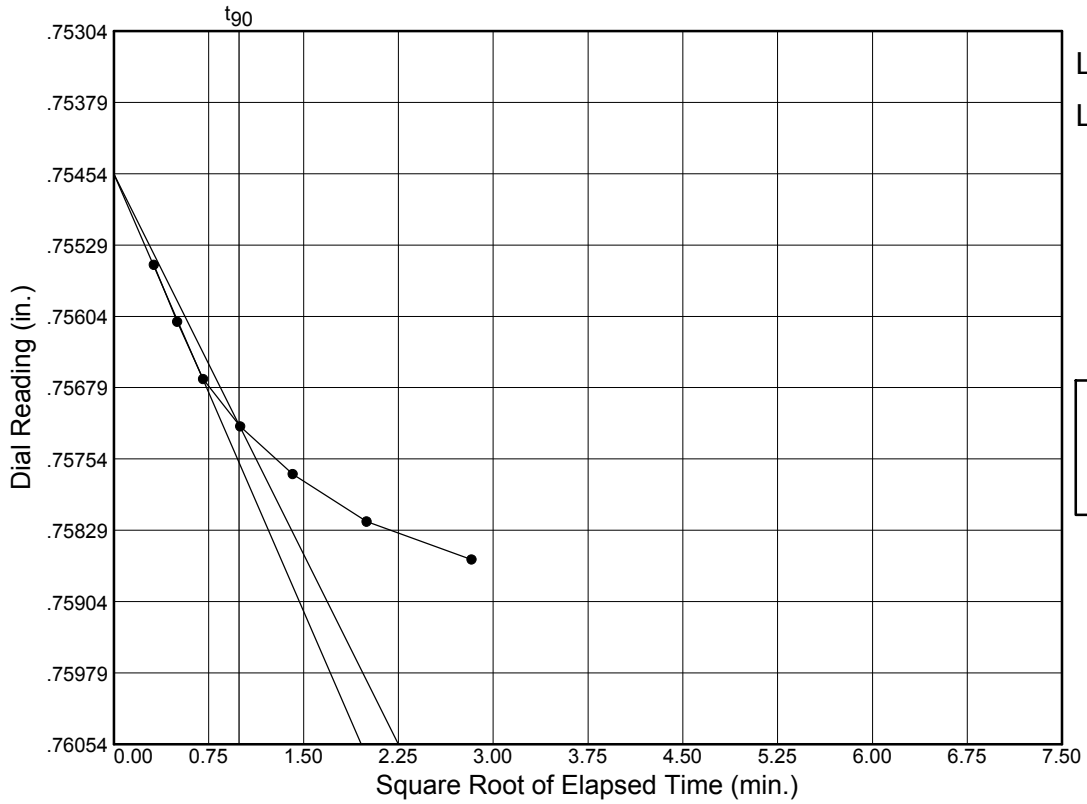
Load No.= 14
Load= 16.00 tsf
D_0 = 0.80270
D_{90} = 0.76766
D_{100} = 0.76377
T_{90} = 12.60 min.

C_v @ T_{90}
0.10 ft.^{2}/day

Figure 8

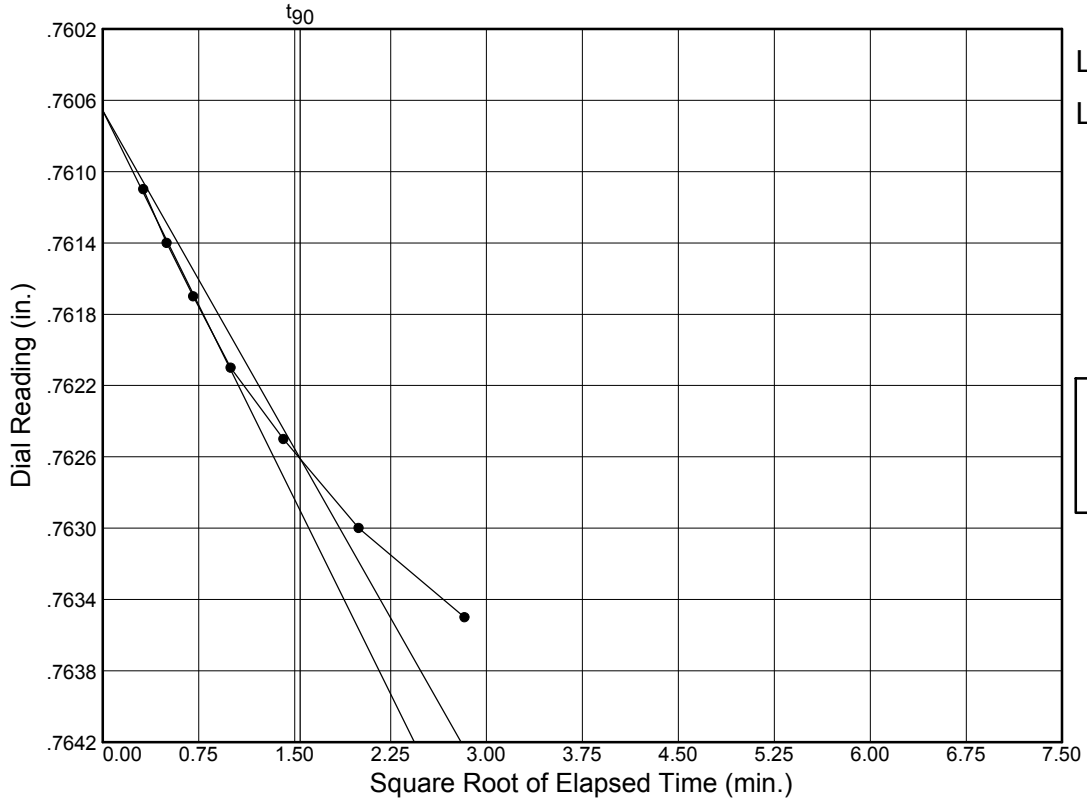
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 15
Load= 8.00 tsf
D_0 = 0.75454
D_{90} = 0.75718
D_{100} = 0.75748
T_{90} = 0.98 min.

C_v @ T_{90}
1.24 ft.^{2}/day



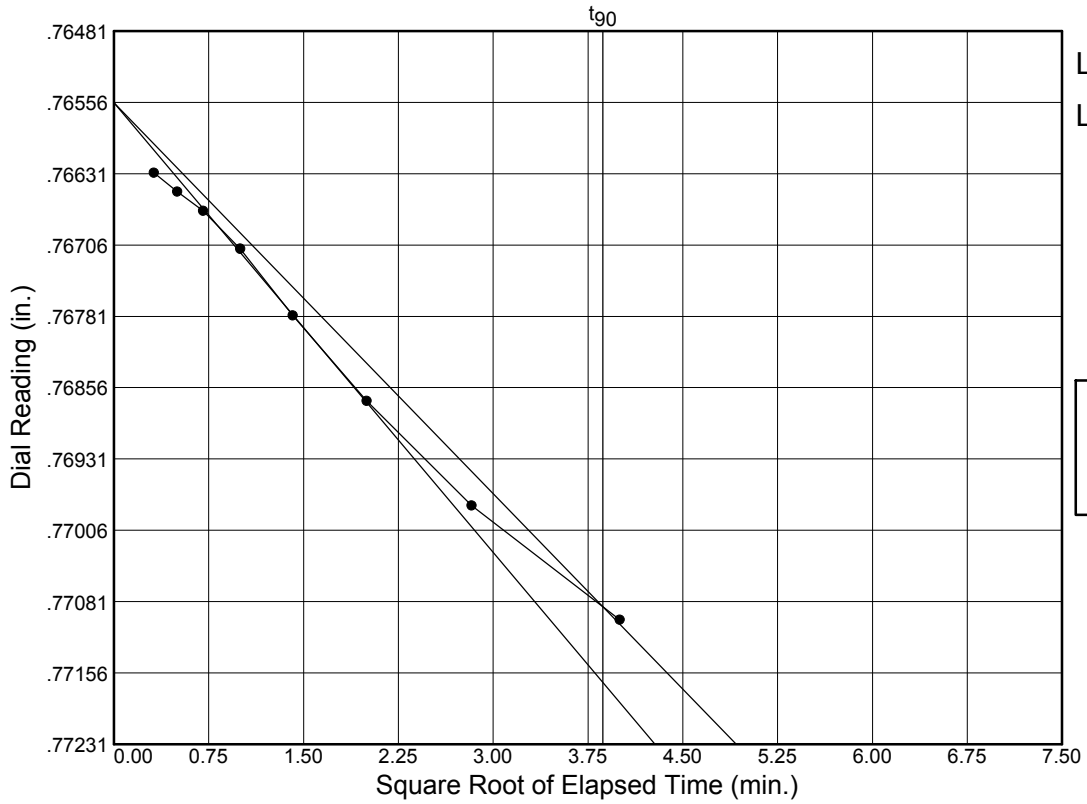
Load No.= 16
Load= 4.00 tsf
D_0 = 0.76066
D_{90} = 0.76261
D_{100} = 0.76283
T_{90} = 2.38 min.

C_v @ T_{90}
0.51 ft.^{2}/day

Figure 9

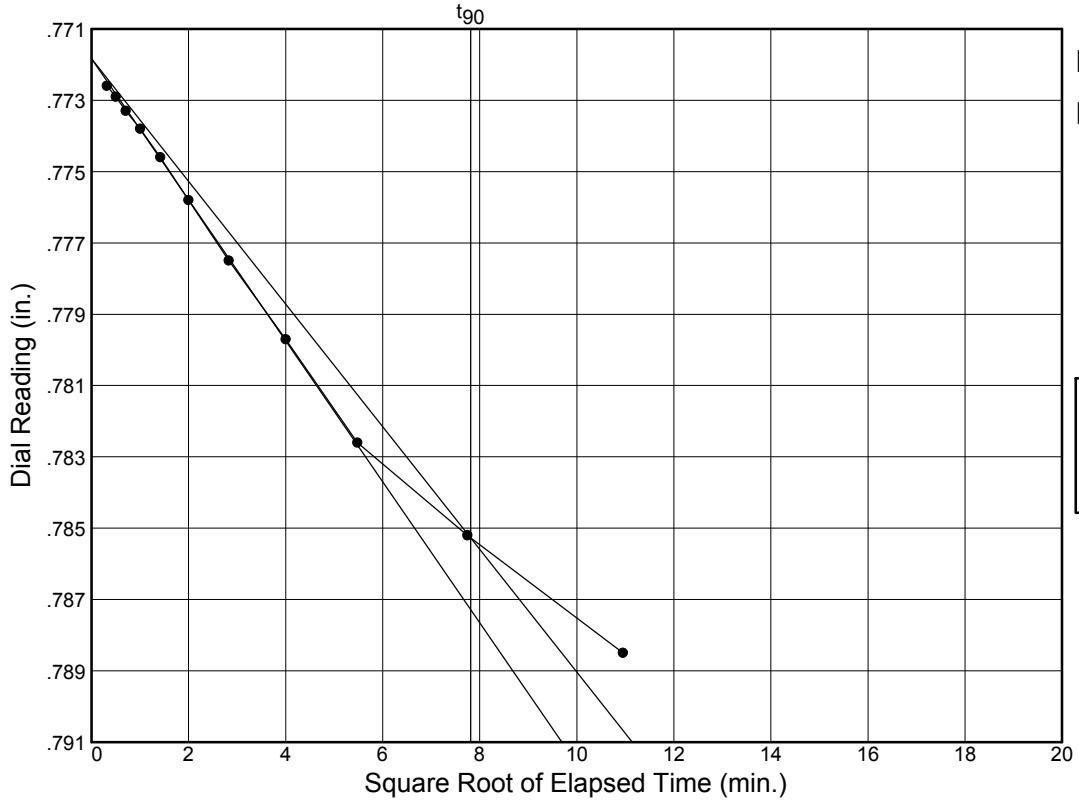
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 17
Load= 1.00 tsf
D_0 = 0.76556
D_{90} = 0.77086
D_{100} = 0.77145
T_{90} = 14.96 min.

C_v @ T_{90}
0.08 ft.^{2}/day



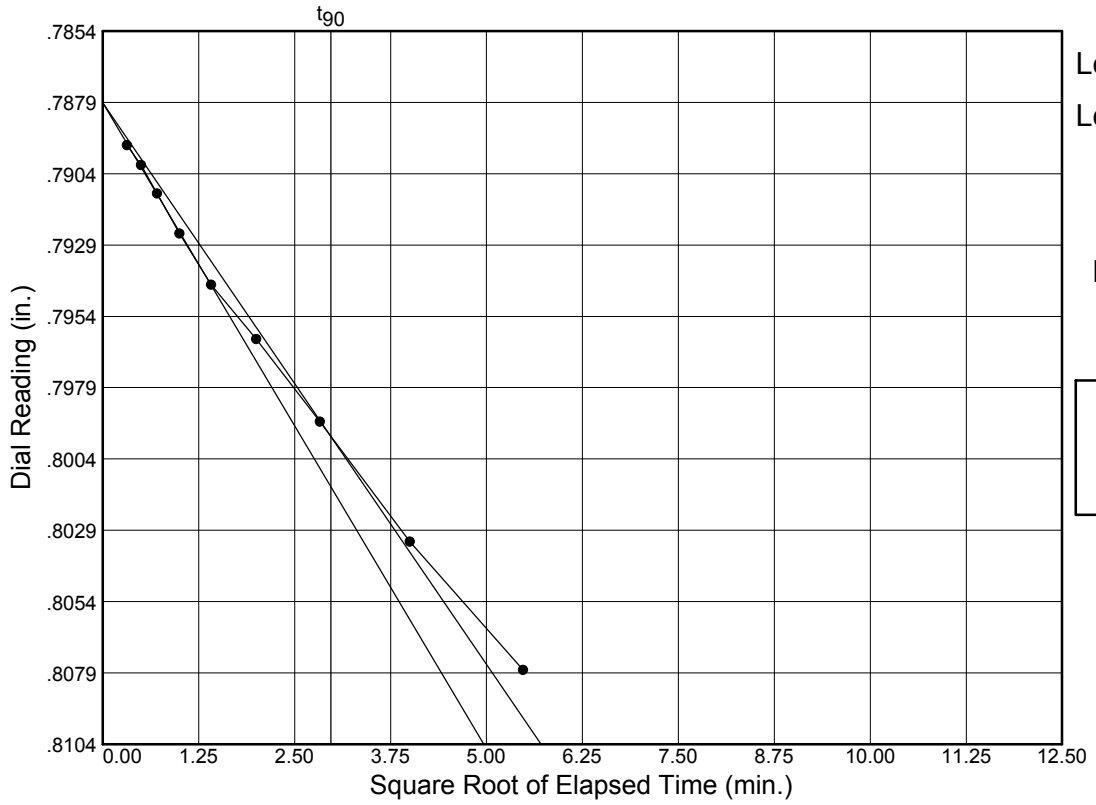
Load No.= 18
Load= 0.25 tsf
D_0 = 0.77184
D_{90} = 0.78527
D_{100} = 0.78676
T_{90} = 61.01 min.

C_v @ T_{90}
0.02 ft.^{2}/day

Figure 10

Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 19

Load= 0.13 tsf

D_0 = 0.78791

D_{90} = 0.79961

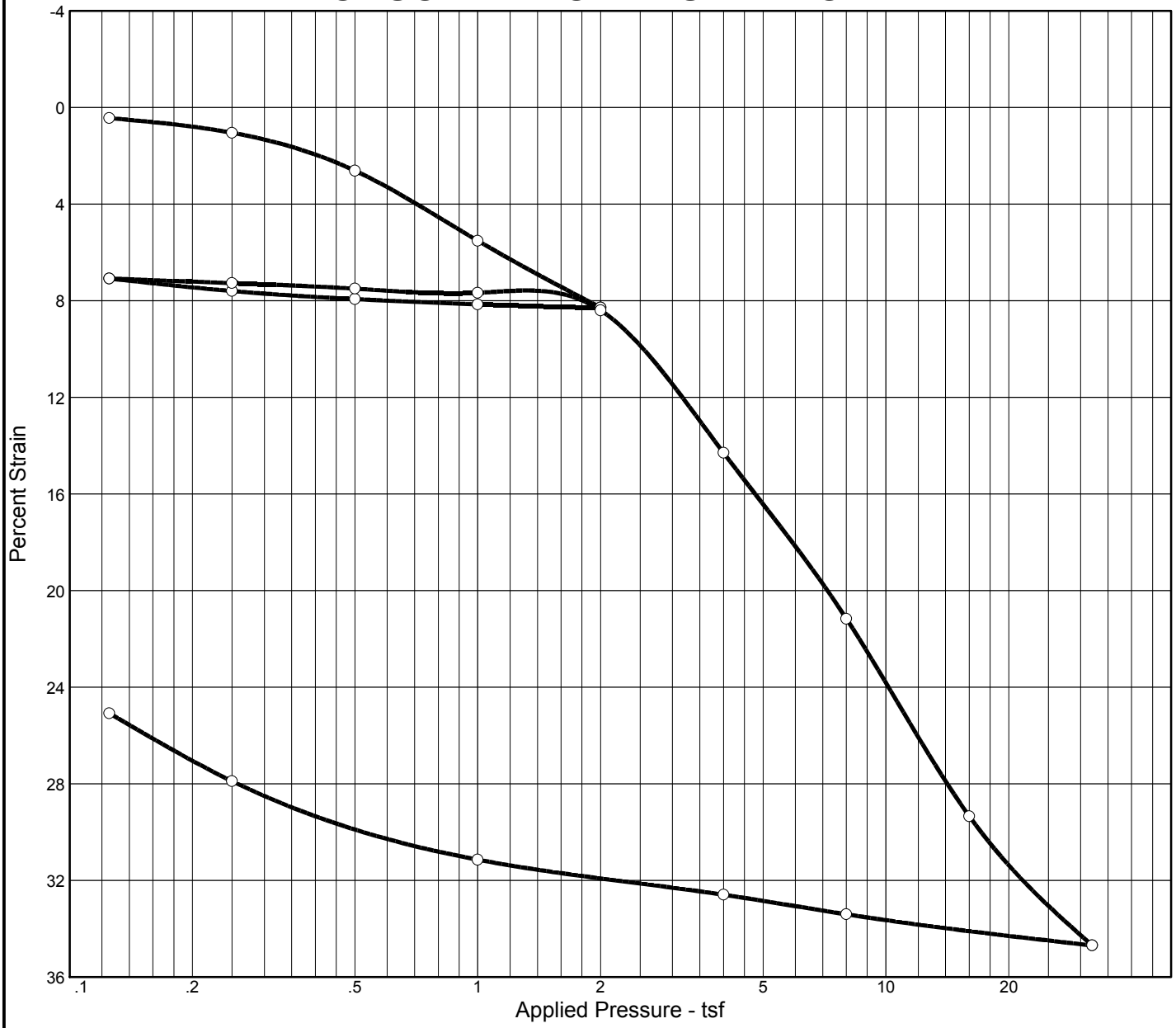
D_{100} = 0.80091

T_{90} = 8.83 min.

C_v @ T_{90}
0.15 ft.^{2}/day

Figure 11

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Gray, Fat CLAY		

LL	PI	Sp. Gr.	Overburden (tsf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (tsf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.71	2.70	62.1		56.1 %	34.7 %	100.0 %	100.0 %	1.521	0.889	0.49	0.43

Preparation Process:	D2435 Method	C_r	Swell Press. (tsf)	Heave %
Condition of Test:		0.06		

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

Location: CUR-4B

Remarks:
CUR-4B
Sample Obtained 10/15/10

Checked By:

Title:

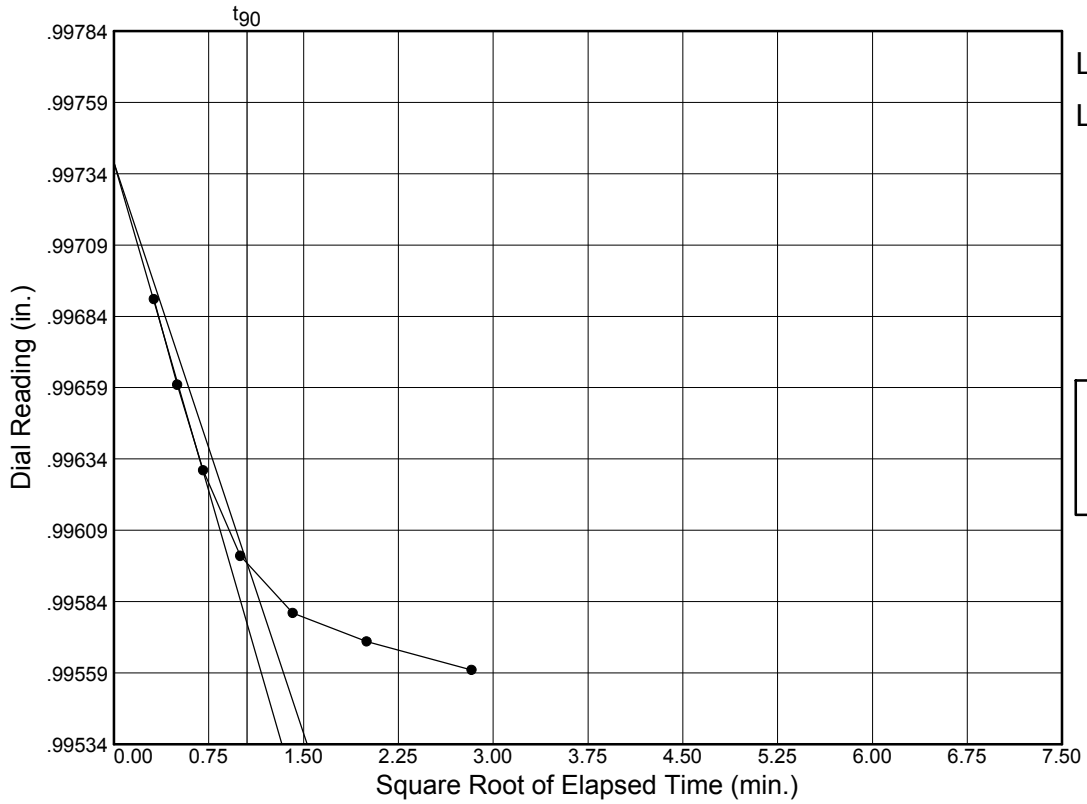
CONSOLIDATION TEST REPORT

GET SOLUTIONS, INC.

Figure

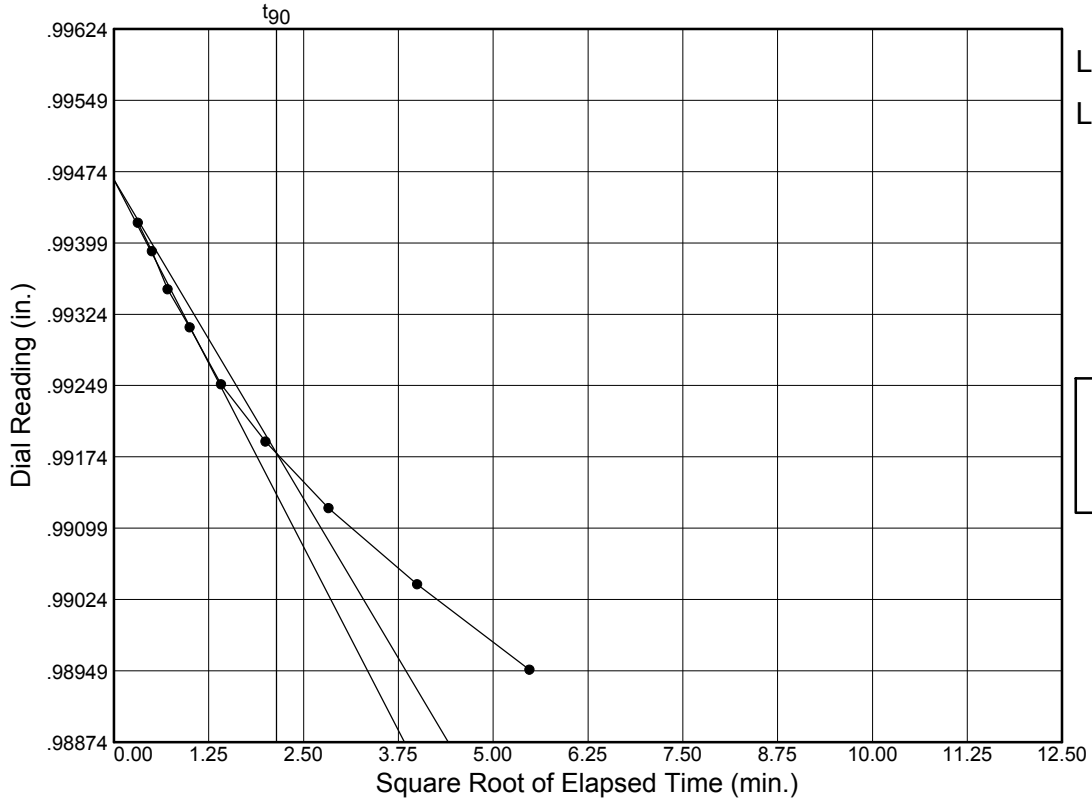
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 1
Load= 0.13 tsf
D_0 = 0.99738
D_{90} = 0.99597
D_{100} = 0.99582
T_{90} = 1.11 min.

C_v @ T_{90}
1.90 ft.^{2}/day



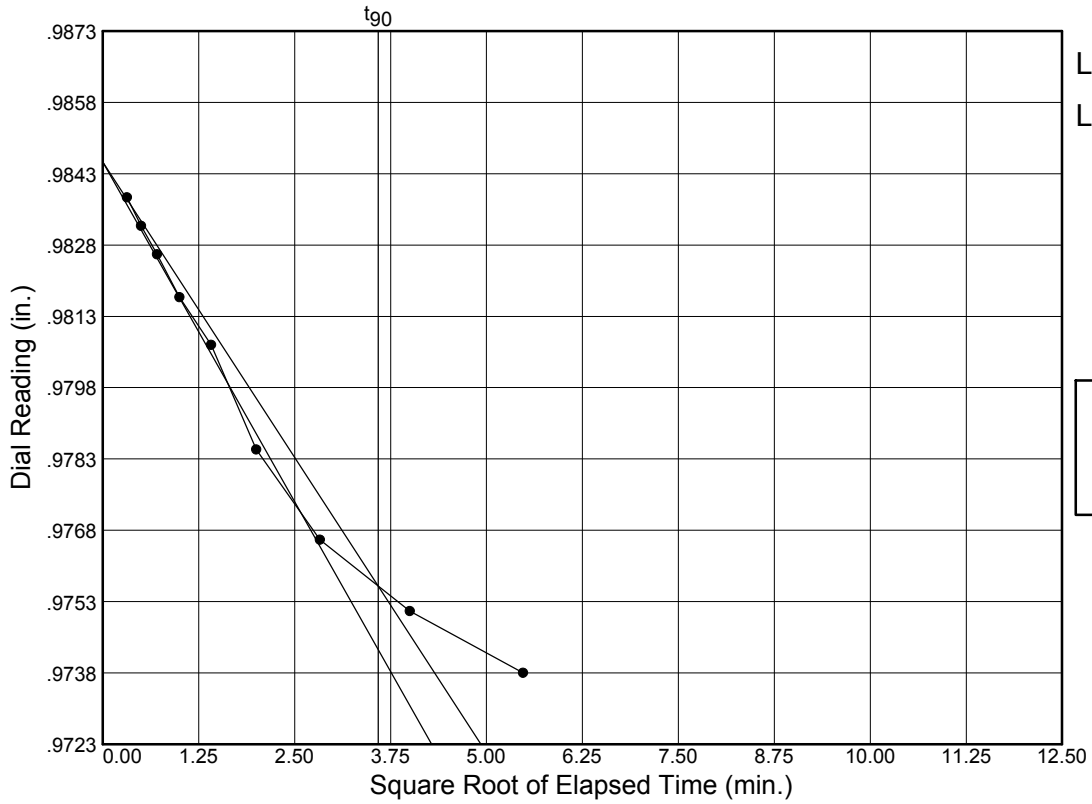
Load No.= 2
Load= 0.25 tsf
D_0 = 0.99466
D_{90} = 0.99178
D_{100} = 0.99146
T_{90} = 4.59 min.

C_v @ T_{90}
0.46 ft.^{2}/day

Figure

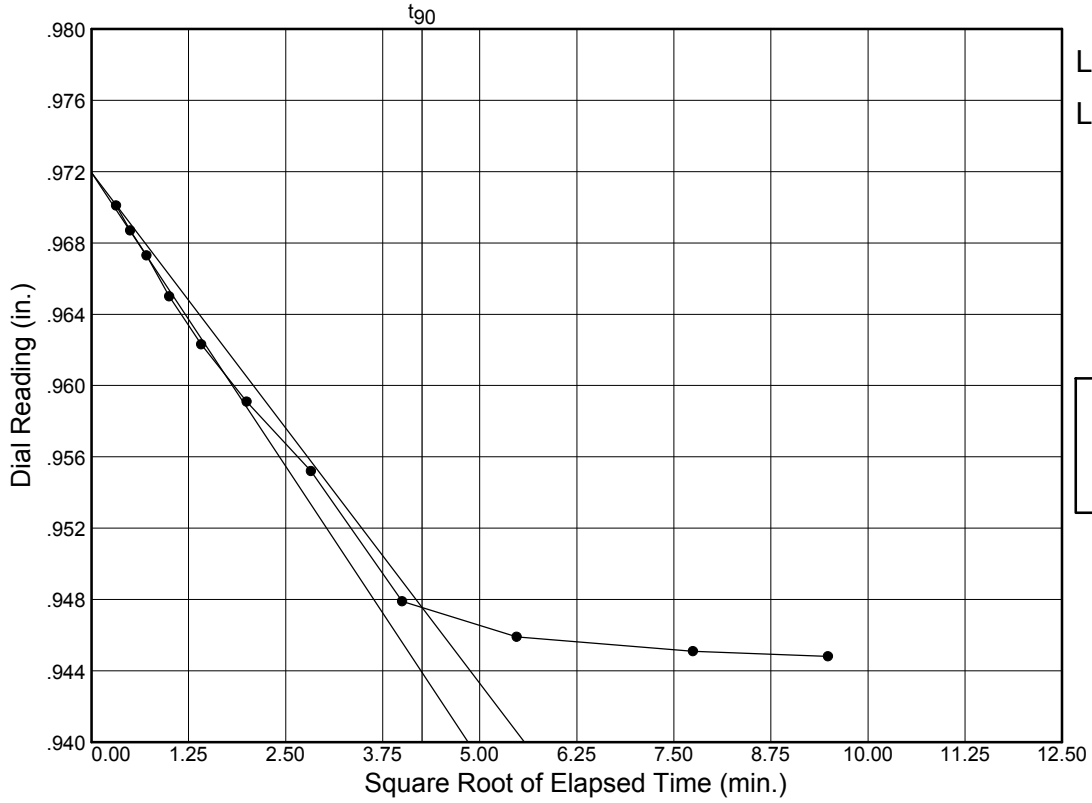
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 3
Load= 0.50 tsf
D_0 = 0.98455
D_{90} = 0.97563
D_{100} = 0.97463
T_{90} = 12.88 min.

C_v @ T_{90}
0.16 ft.^{2}/day



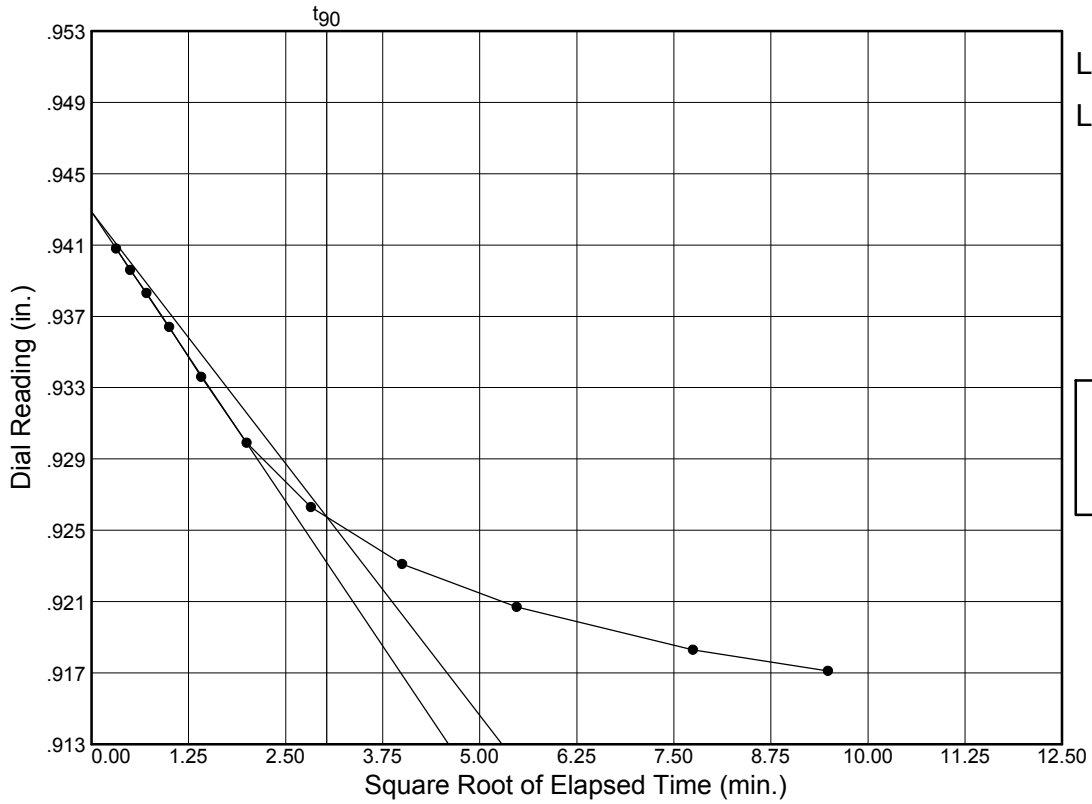
Load No.= 4
Load= 1.00 tsf
D_0 = 0.97193
D_{90} = 0.94755
D_{100} = 0.94484
T_{90} = 18.12 min.

C_v @ T_{90}
0.11 ft.^{2}/day

Figure

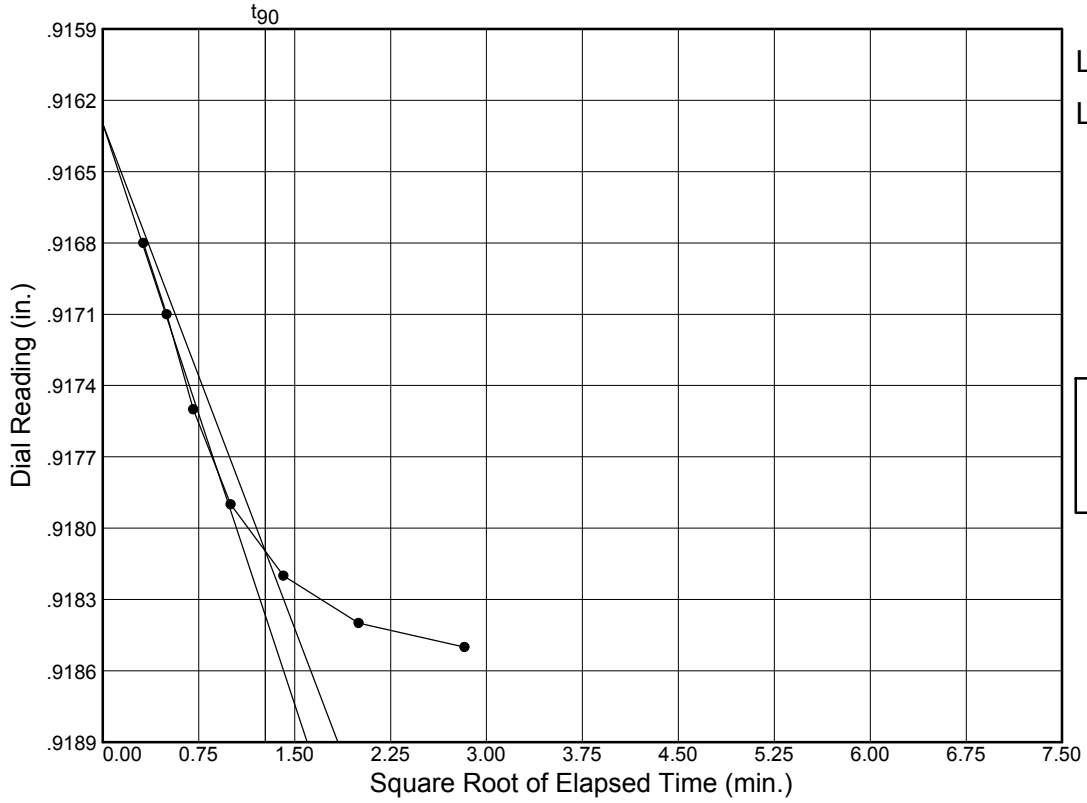
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 5
Load= 2.00 tsf
D_0 = 0.94286
D_{90} = 0.92575
D_{100} = 0.92385
T_{90} = 9.18 min.

C_v @ T_{90}
0.20 ft.^{2}/day



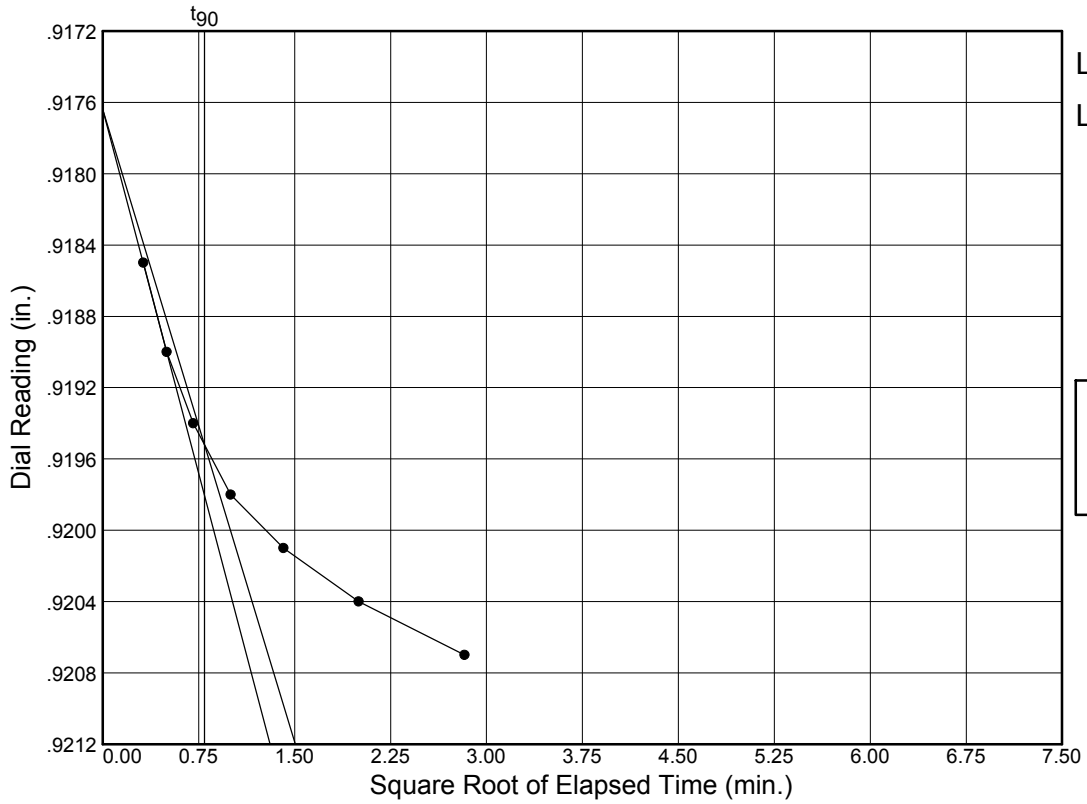
Load No.= 6
Load= 1.00 tsf
D_0 = 0.91630
D_{90} = 0.91810
D_{100} = 0.91830
T_{90} = 1.61 min.

C_v @ T_{90}
1.11 ft.^{2}/day

Figure

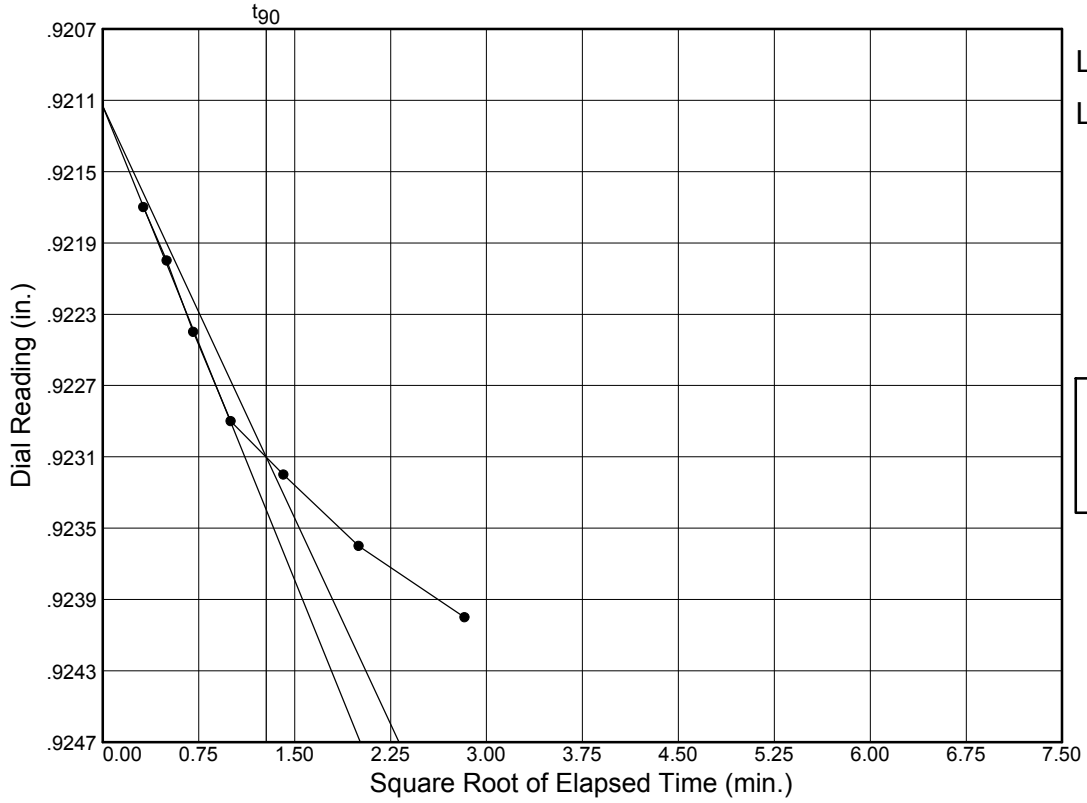
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 7
Load= 0.50 tsf
D_0 = 0.91764
D_{90} = 0.91952
D_{100} = 0.91973
T_{90} = 0.63 min.

C_v @ T_{90}
2.84 ft.^{2}/day



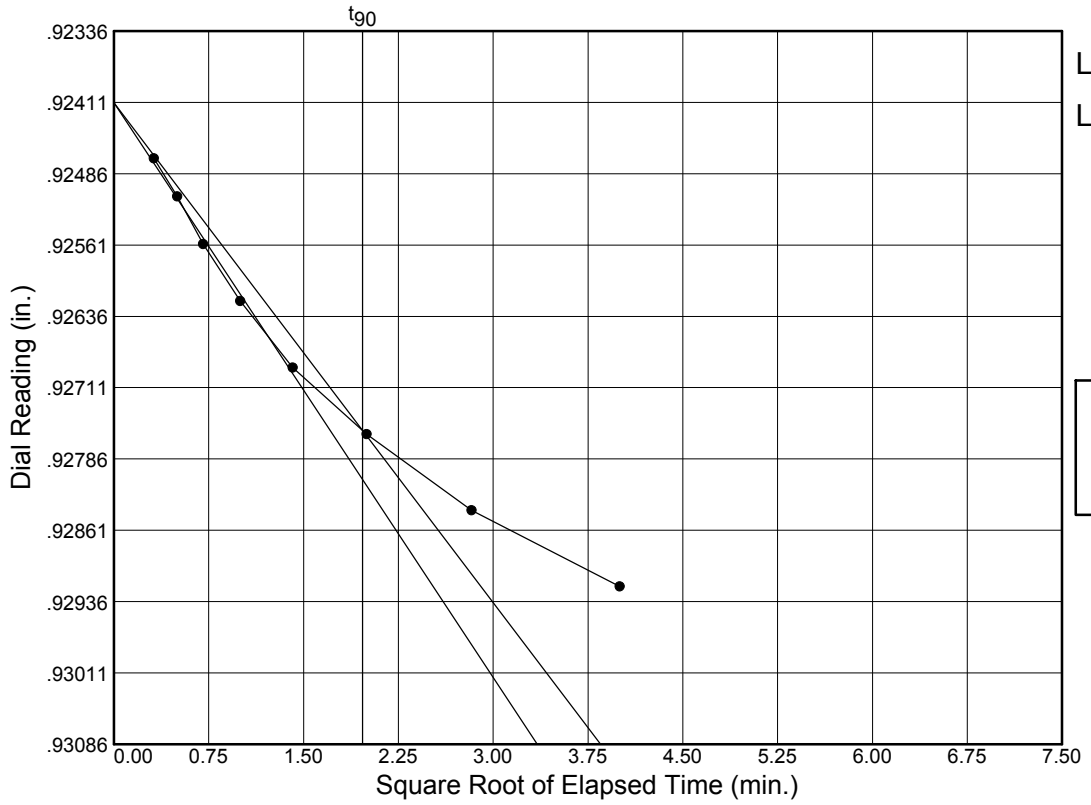
Load No.= 8
Load= 0.25 tsf
D_0 = 0.92113
D_{90} = 0.92310
D_{100} = 0.92332
T_{90} = 1.64 min.

C_v @ T_{90}
1.10 ft.^{2}/day

Figure

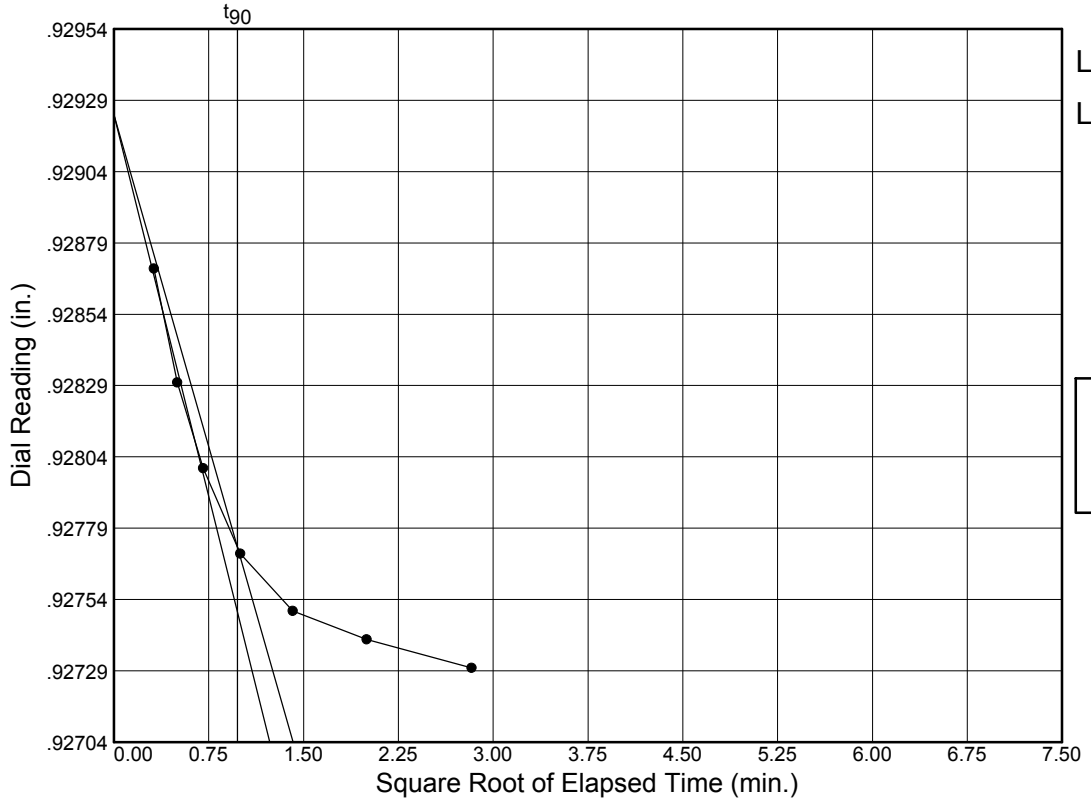
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 9
Load= 0.13 tsf
D_0 = 0.92411
D_{90} = 0.92756
D_{100} = 0.92794
T_{90} = 3.87 min.

C_v @ T_{90}
0.47 ft.^{2}/day



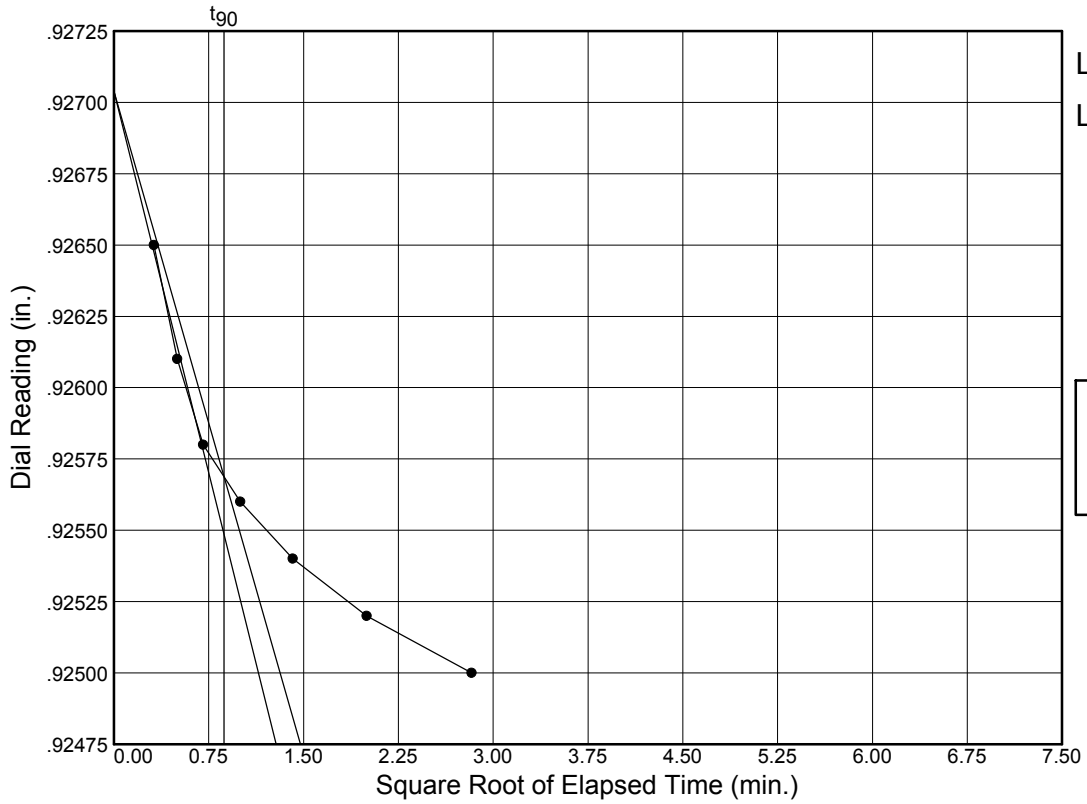
Load No.= 10
Load= 0.25 tsf
D_0 = 0.92924
D_{90} = 0.92772
D_{100} = 0.92755
T_{90} = 0.96 min.

C_v @ T_{90}
1.91 ft.^{2}/day

Figure

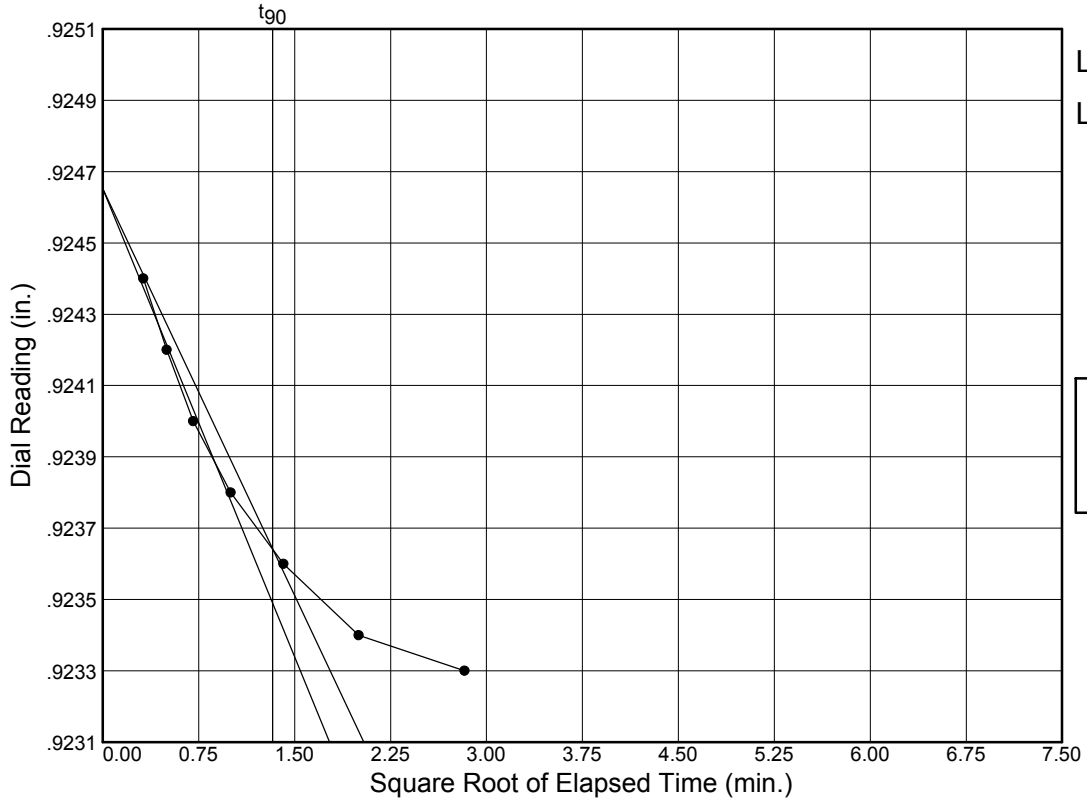
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 11
Load= 0.50 tsf
D_0 = 0.92704
D_{90} = 0.92569
D_{100} = 0.92554
T_{90} = 0.76 min.

C_v @ T_{90}
2.40 ft.^{2}/day



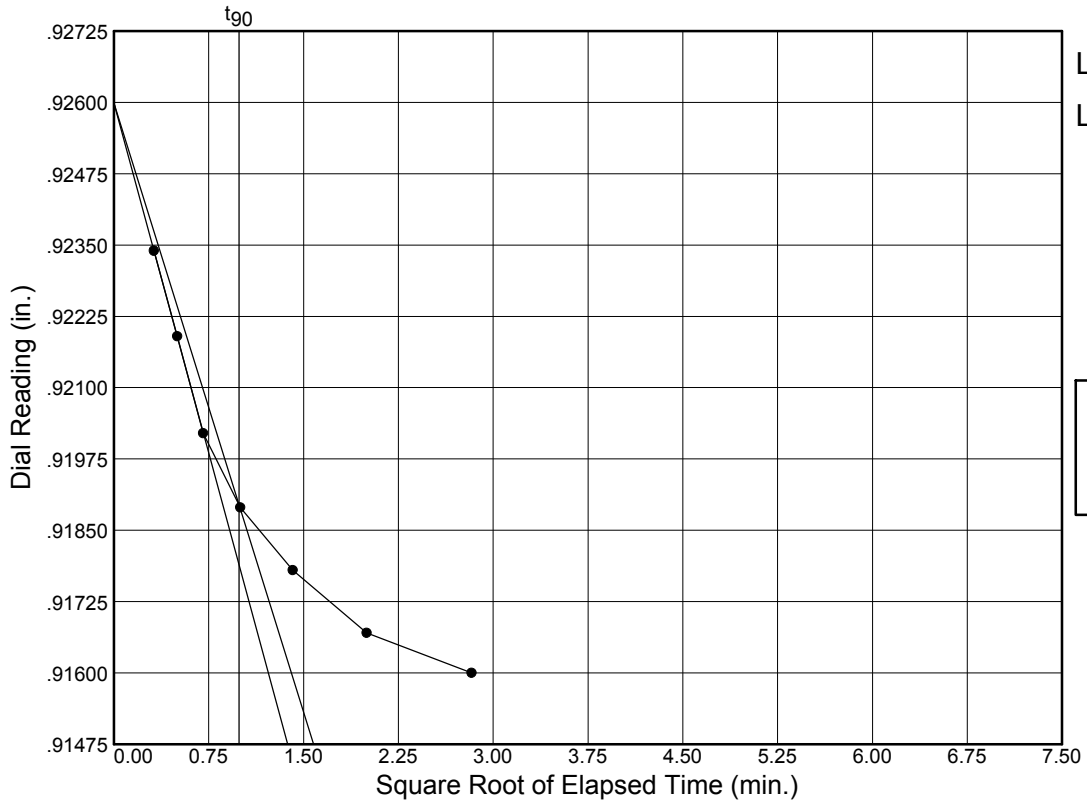
Load No.= 12
Load= 1.00 tsf
D_0 = 0.92465
D_{90} = 0.92364
D_{100} = 0.92353
T_{90} = 1.76 min.

C_v @ T_{90}
1.03 ft.^{2}/day

Figure

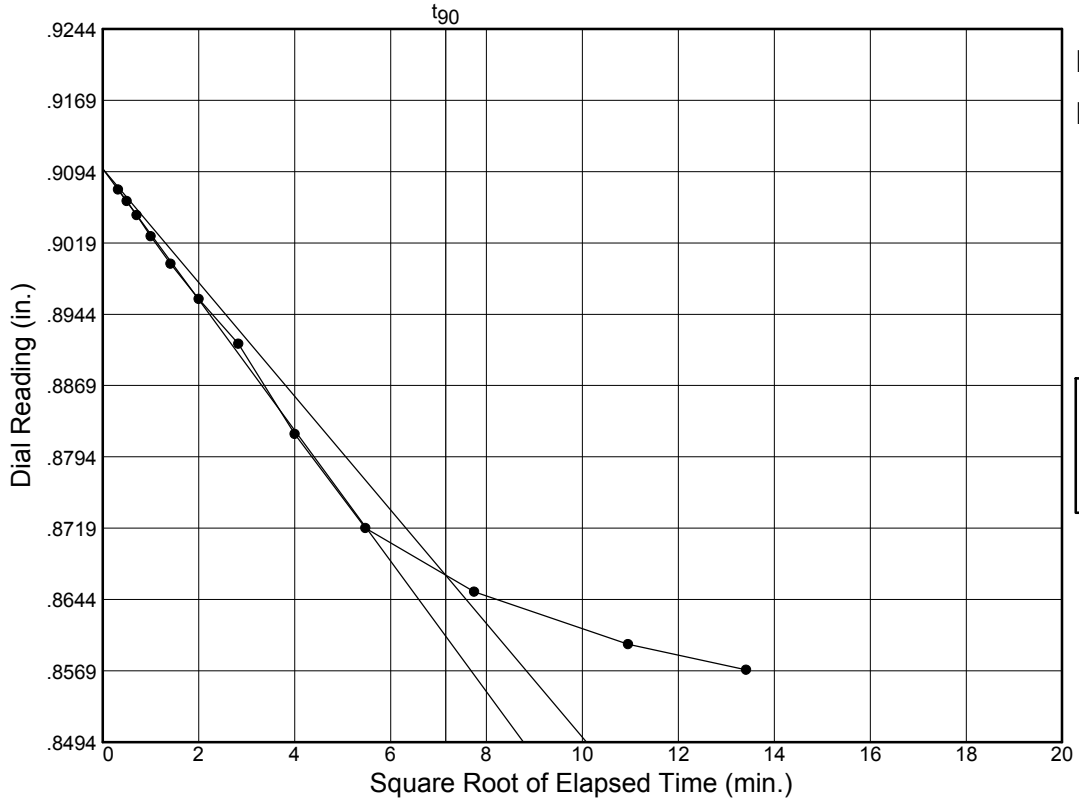
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 13
Load= 2.00 tsf
D_0 = 0.92599
D_{90} = 0.91895
D_{100} = 0.91816
T_{90} = 0.98 min.

C_v @ T_{90}
1.83 ft.^{2}/day



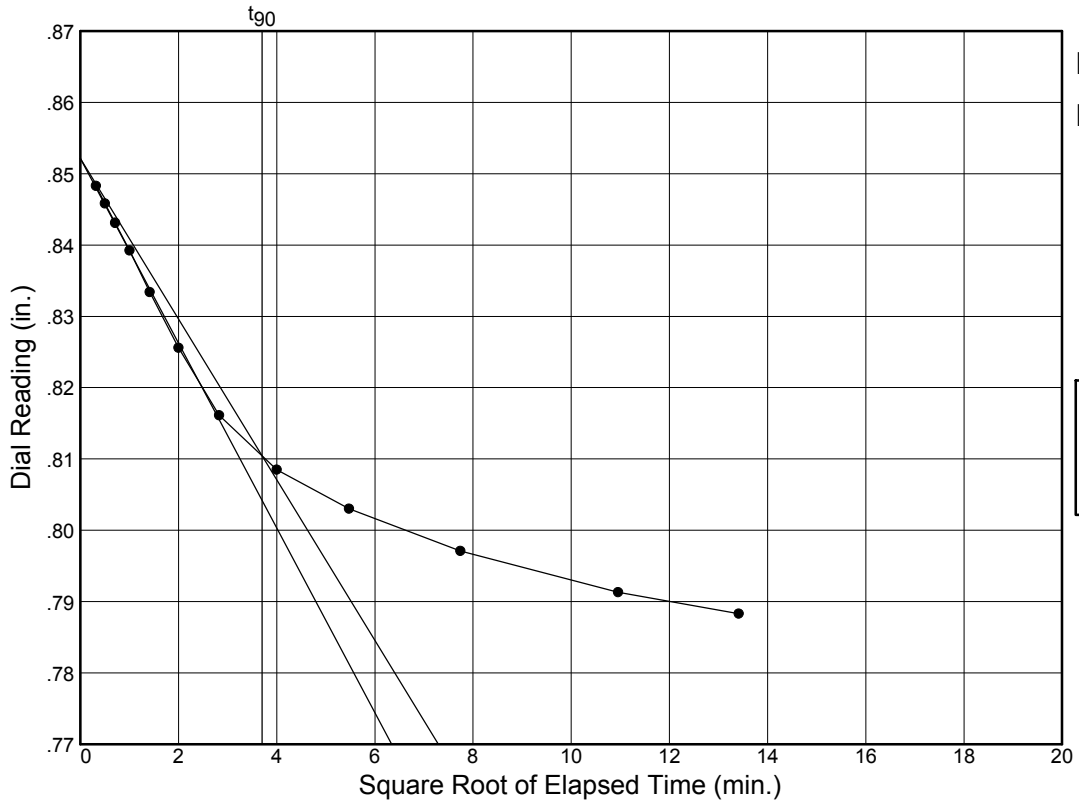
Load No.= 14
Load= 4.00 tsf
D_0 = 0.90970
D_{90} = 0.86696
D_{100} = 0.86221
T_{90} = 51.10 min.

C_v @ T_{90}
0.03 ft.^{2}/day

Figure

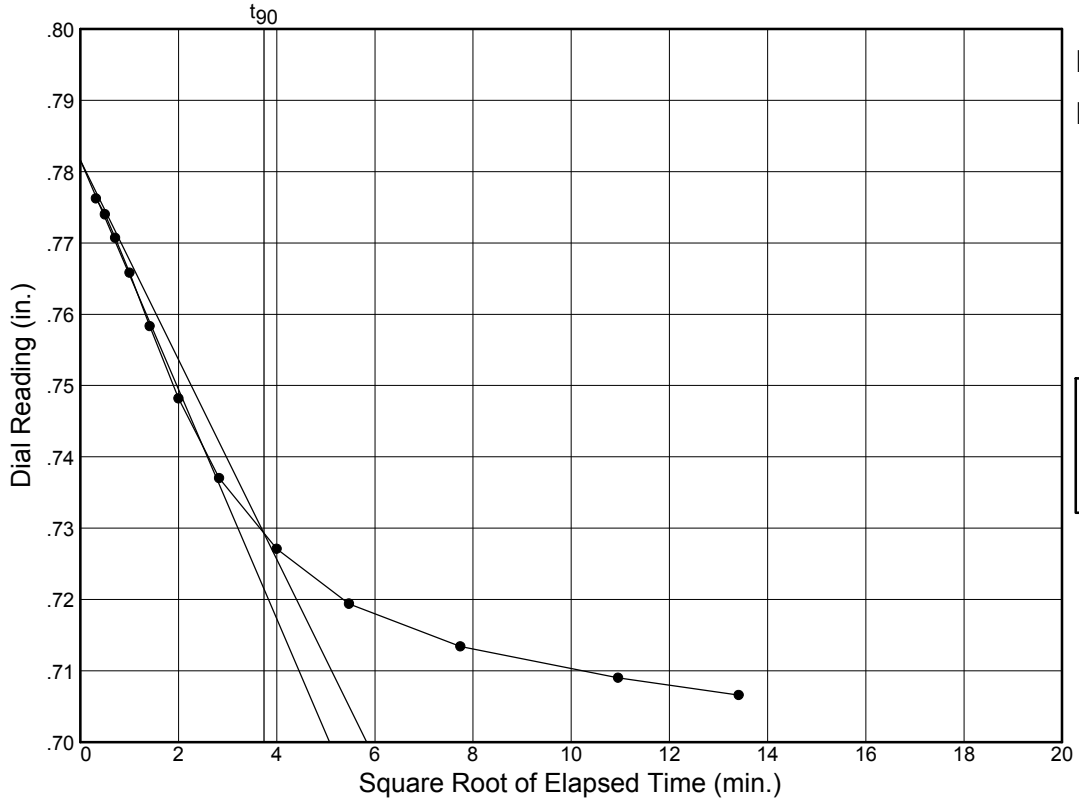
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 15
Load= 8.00 tsf
D_0 = 0.85215
D_{90} = 0.81041
D_{100} = 0.80578
T_{90} = 13.73 min.

C_v @ T_{90}
0.10 ft.^{2}/day



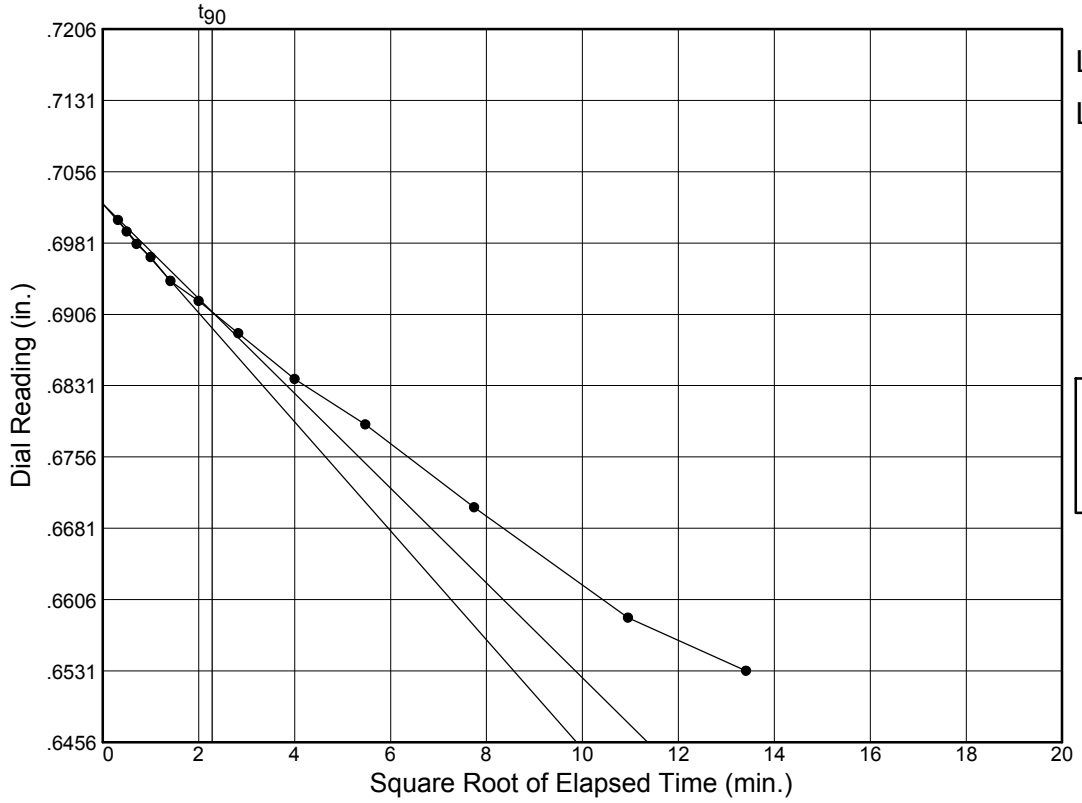
Load No.= 16
Load= 16.00 tsf
D_0 = 0.78159
D_{90} = 0.72929
D_{100} = 0.72348
T_{90} = 13.99 min.

C_v @ T_{90}
0.08 ft.^{2}/day

Figure

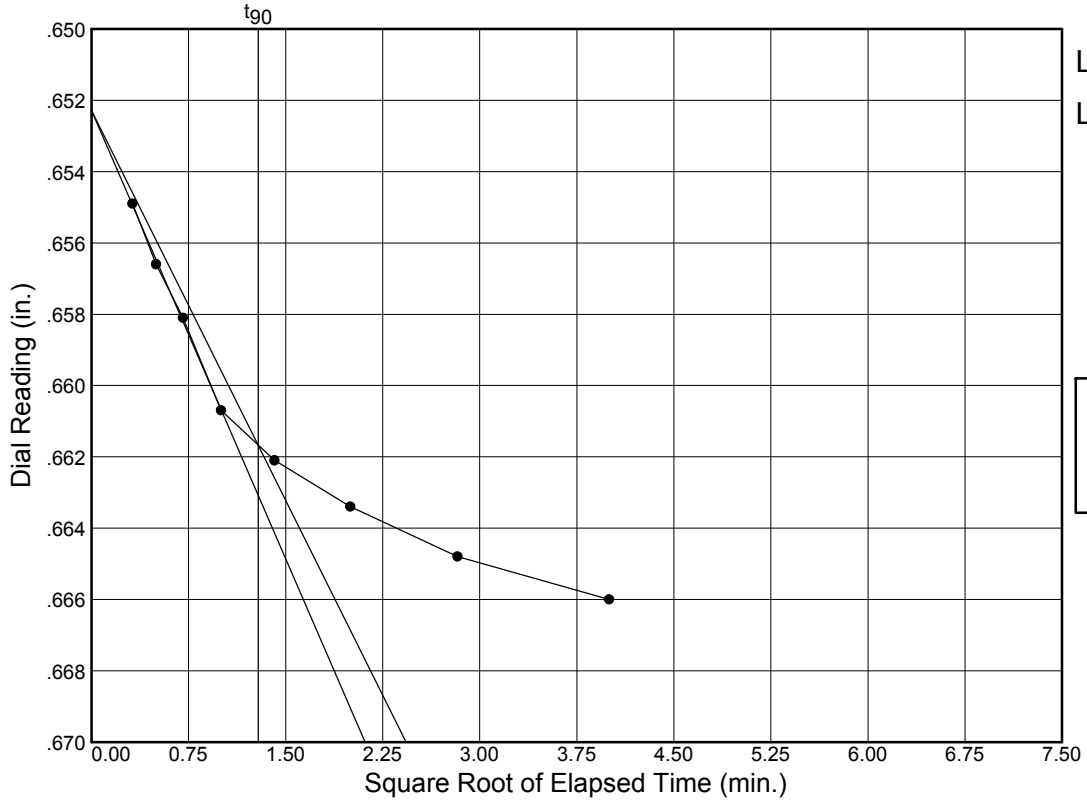
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 17
Load= 32.00 tsf
D_0 = 0.70221
D_{90} = 0.69085
D_{100} = 0.68959
T_{90} = 5.20 min.

C_v @ T_{90}
0.19 ft.^{2}/day



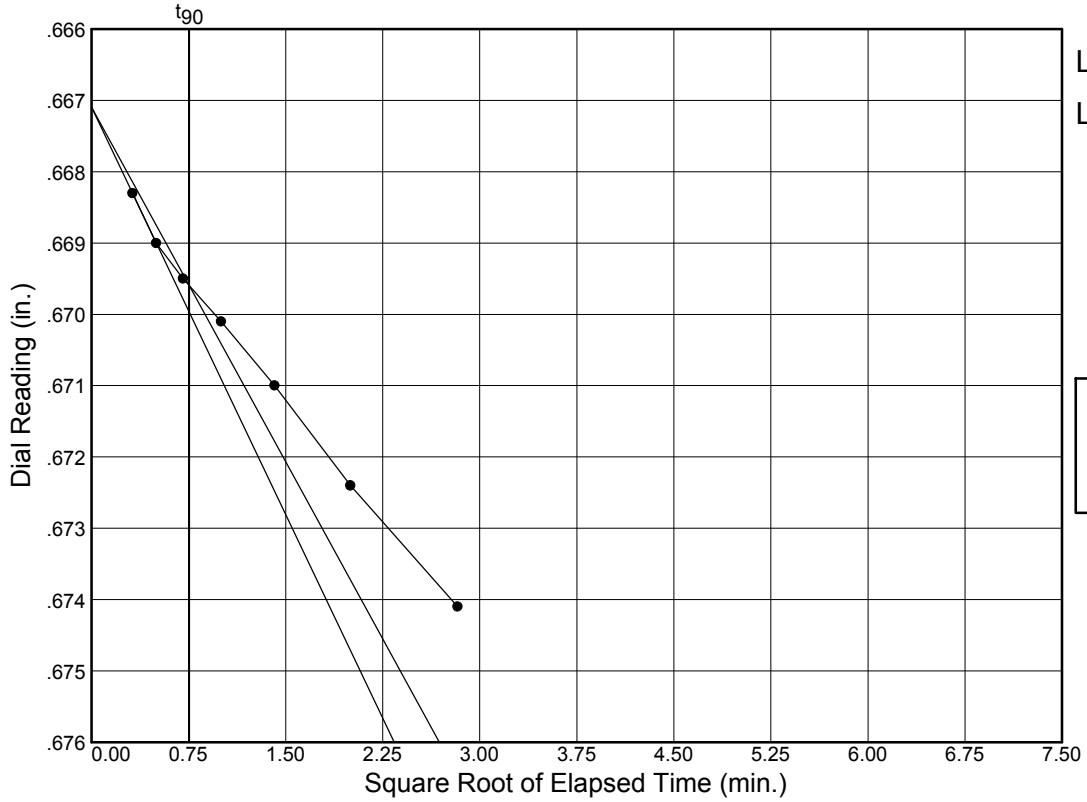
Load No.= 18
Load= 8.00 tsf
D_0 = 0.65229
D_{90} = 0.66167
D_{100} = 0.66272
T_{90} = 1.66 min.

C_v @ T_{90}
0.56 ft.^{2}/day

Figure

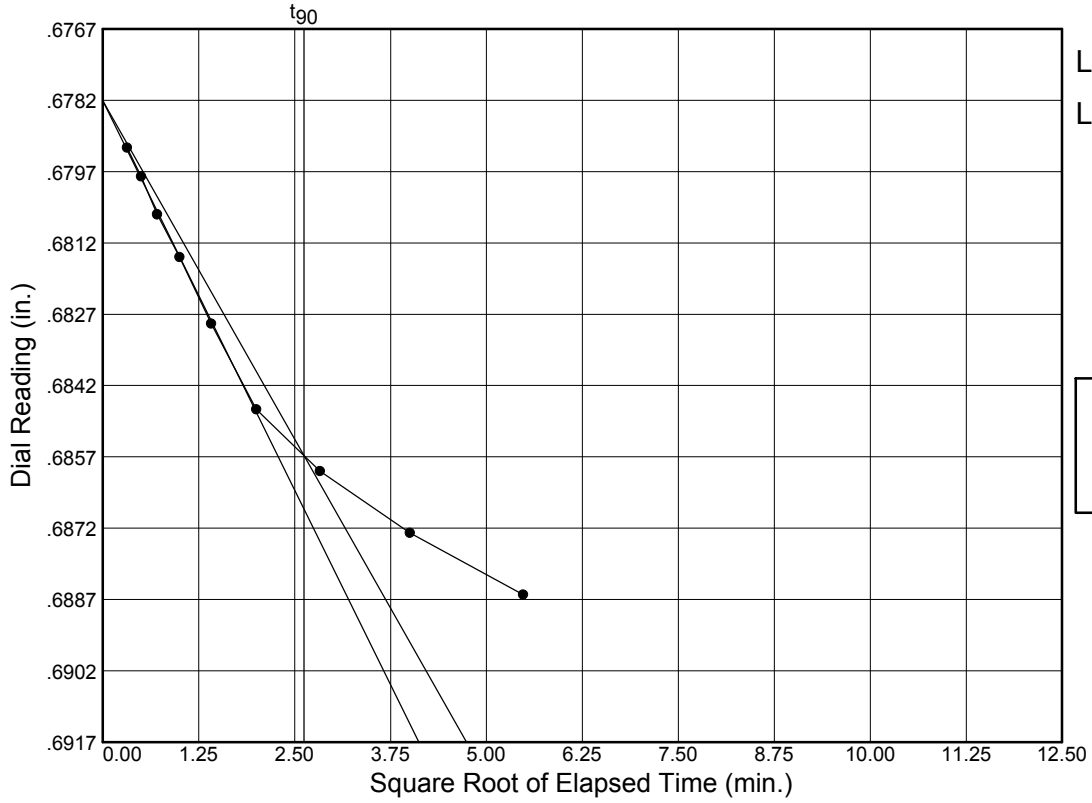
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 19
Load= 4.00 tsf
D_0 = 0.66710
D_{90} = 0.66960
D_{100} = 0.66988
T_{90} = 0.57 min.

C_v @ T_{90}
1.66 ft.^{2}/day



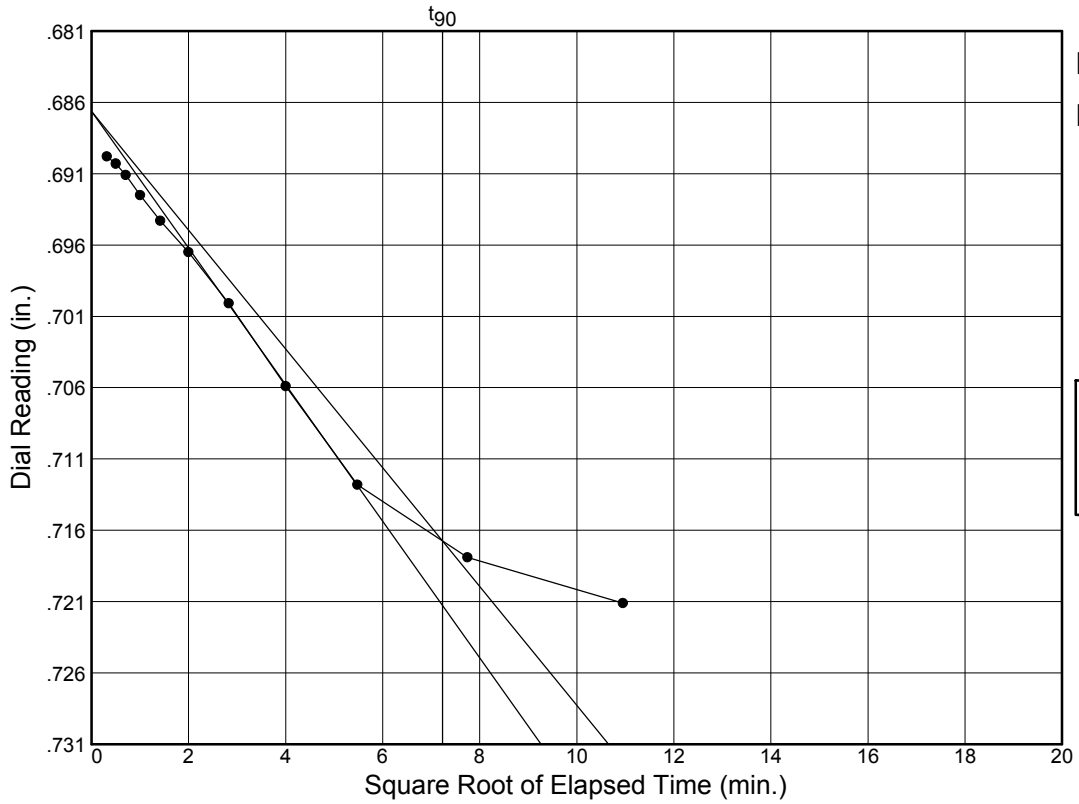
Load No.= 20
Load= 1.00 tsf
D_0 = 0.67821
D_{90} = 0.68568
D_{100} = 0.68651
T_{90} = 6.88 min.

C_v @ T_{90}
0.14 ft.^{2}/day

Figure

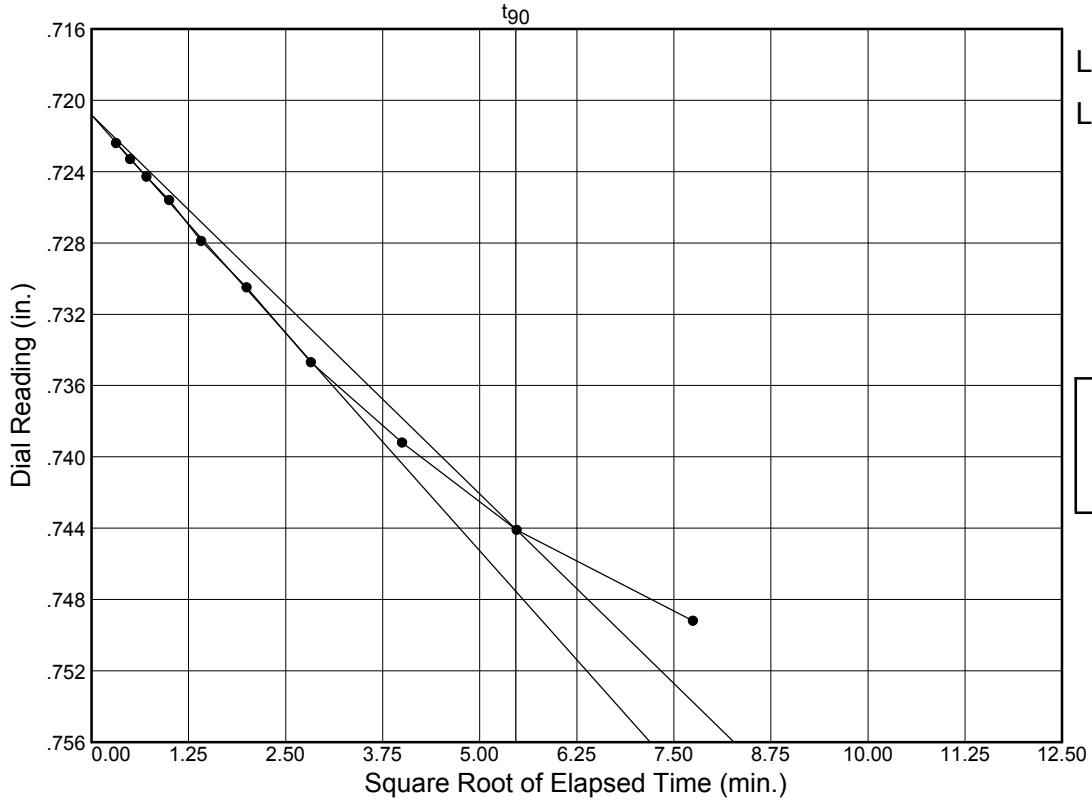
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 21
Load= 0.25 tsf
D_0 = 0.68662
D_{90} = 0.71675
D_{100} = 0.72010
T_{90} = 52.34 min.

C_v @ T_{90}
0.02 ft.^{2}/day

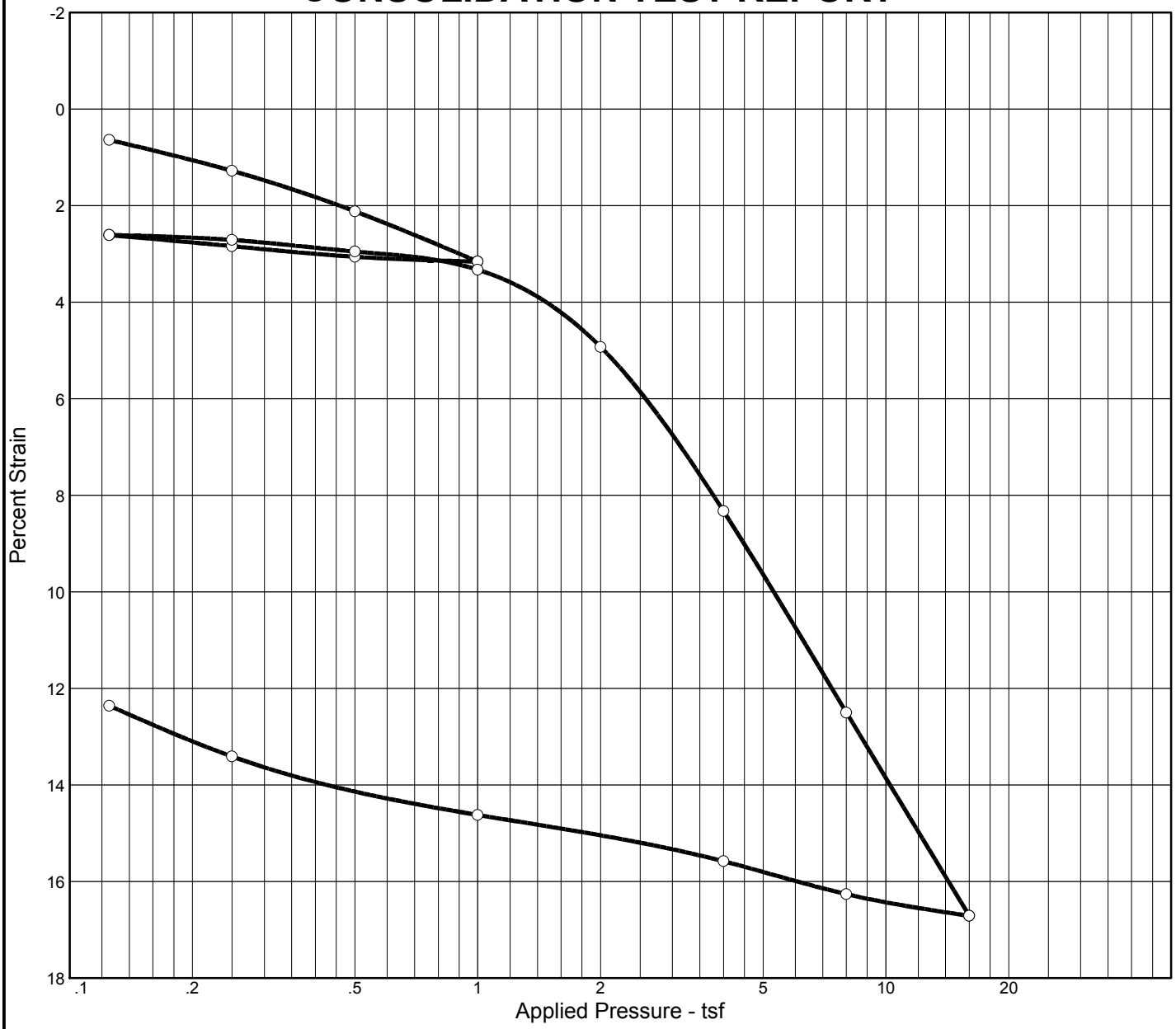


Load No.= 22
Load= 0.13 tsf
D_0 = 0.72084
D_{90} = 0.74405
D_{100} = 0.74663
T_{90} = 29.83 min.

C_v @ T_{90}
0.04 ft.^{2}/day

Figure

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Gray, Fat CLAY		

LL	PI	Sp. Gr.	Overburden (tsf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (tsf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.71	1.00	86.6		35.1 %	25.9 %	99.9 %	98.8 %	0.953	0.711	2.21	0.27

Preparation Process:	D2435 Method	C_r	Swell Press. (tsf)	Heave %
Condition of Test:		0.03		

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

Location: D7-8W

Remarks:
Boring D7-8W
Sample Obtained 10/15/10

Checked By:

Title:

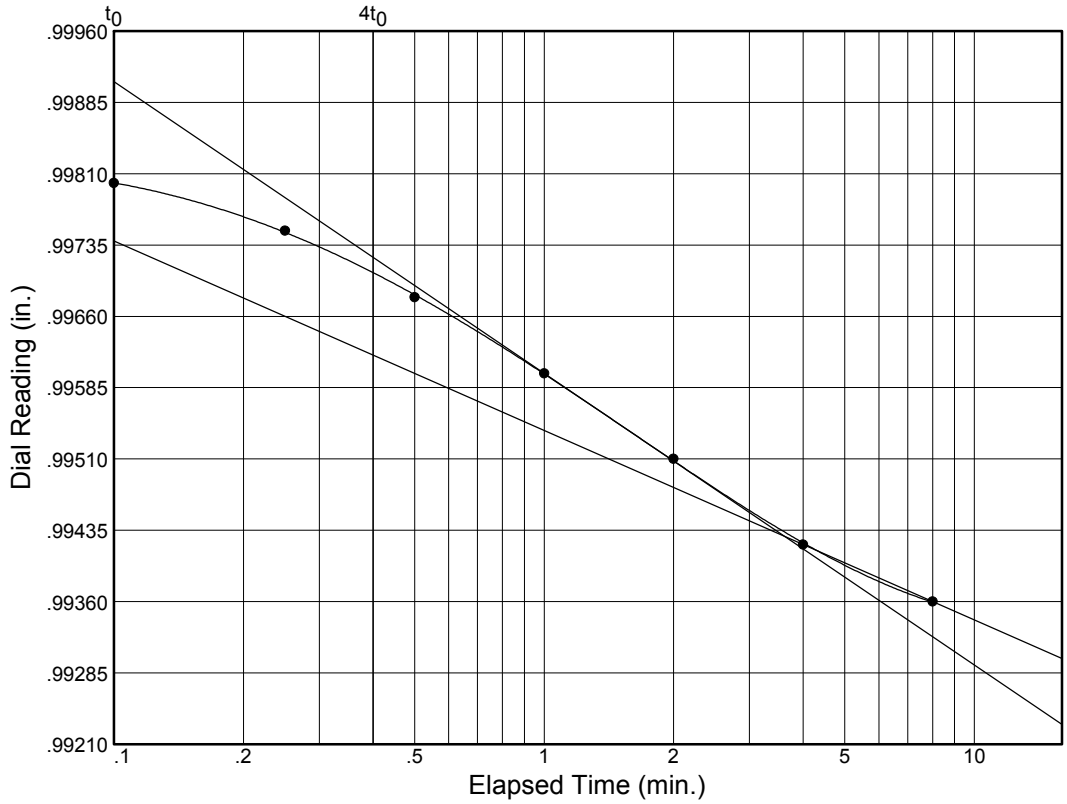
CONSOLIDATION TEST REPORT

GET SOLUTIONS, INC.

Figure 1

Dial Reading vs. Time

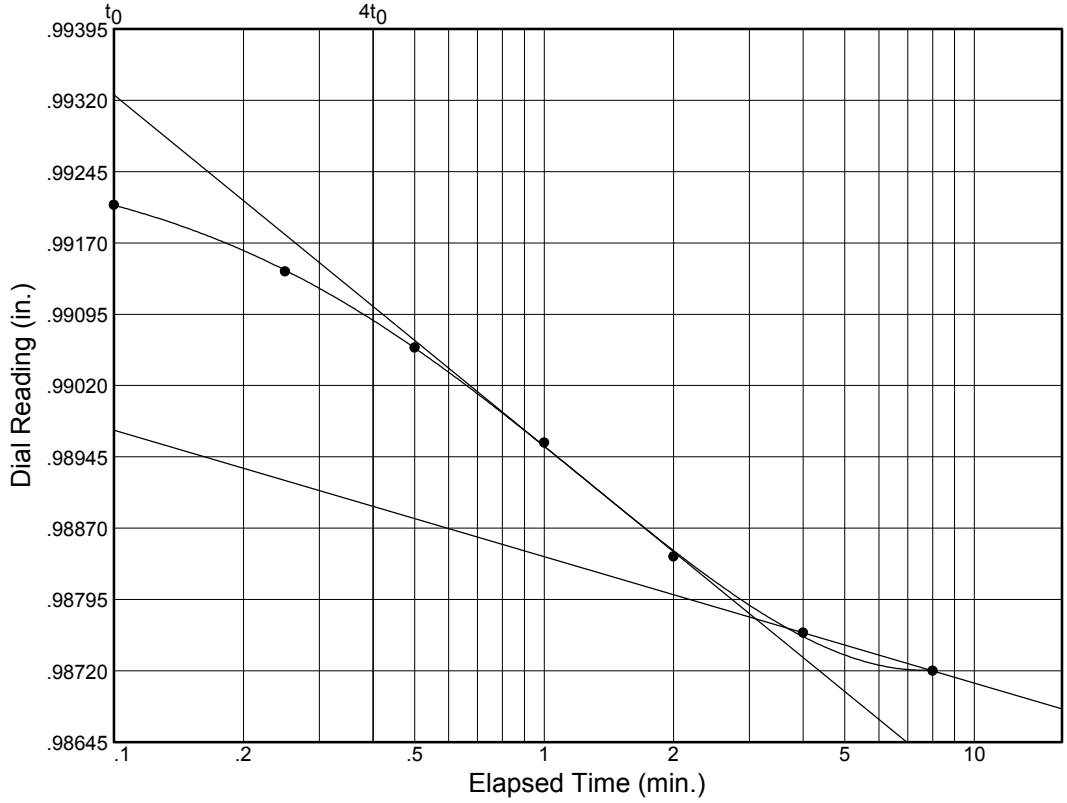
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 1
Load= 0.13 tsf
D_0 = 0.99895
D_{50} = 0.99661
D_{100} = 0.99428
T_{50} = 0.60 min.

C_v @ T_{50}
0.81 ft.^{2}/day

C_α = 0.002



Load No.= 2
Load= 0.25 tsf
D_0 = 0.99331
D_{50} = 0.99053
D_{100} = 0.98775
T_{50} = 0.53 min.

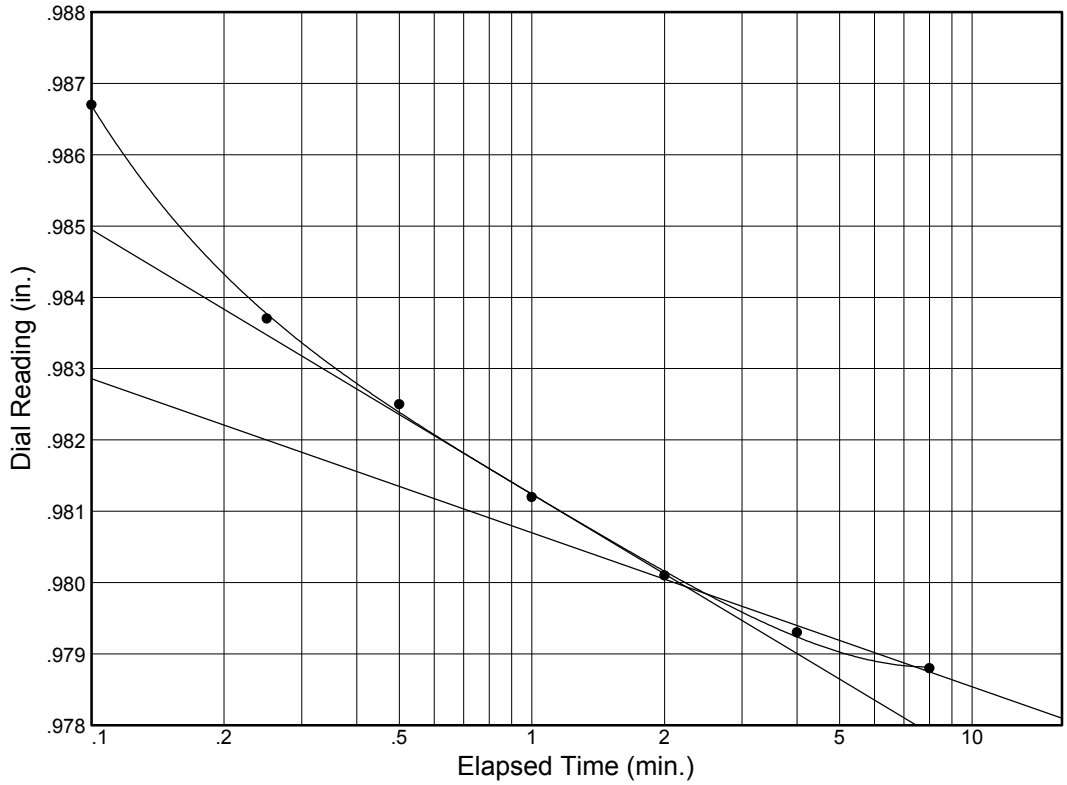
C_v @ T_{50}
0.92 ft.^{2}/day

C_α = 0.001

Figure 2

Dial Reading vs. Time

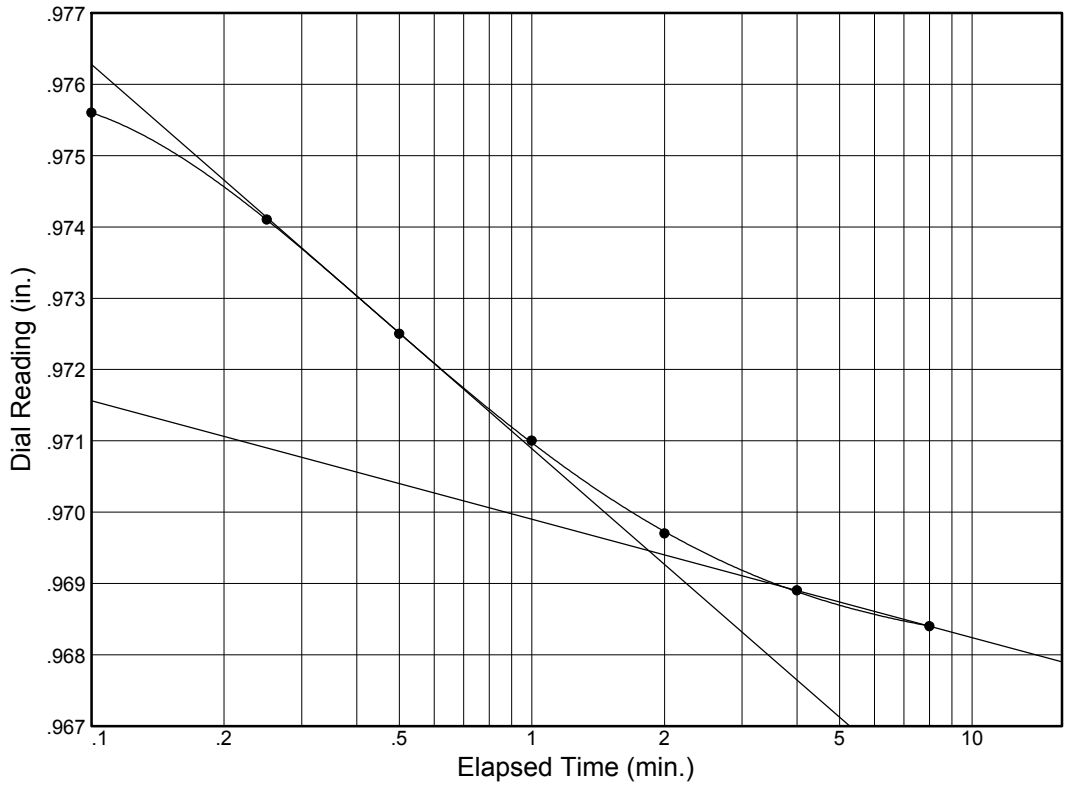
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 3
Load= 0.50 tsf
D_0 = 0.98720
D_{50} = 0.98357
D_{100} = 0.97995
T_{50} = 0.27 min.

C_v @ T_{50}
1.75 ft.^{2}/day

C_α = 0.002



Load No.= 4
Load= 1.00 tsf
D_0 = 0.97880
D_{50} = 0.97413
D_{100} = 0.96946
T_{50} = 0.25 min.

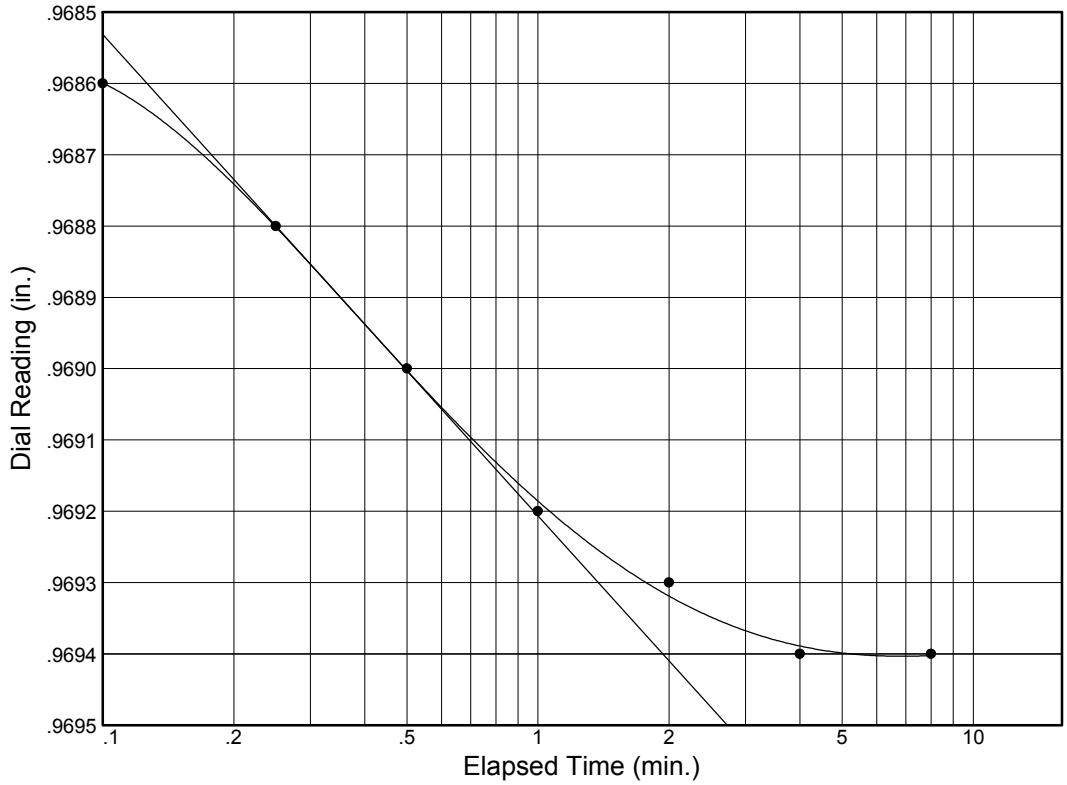
C_v @ T_{50}
1.89 ft.^{2}/day

C_α = 0.002

Figure 3

Dial Reading vs. Time

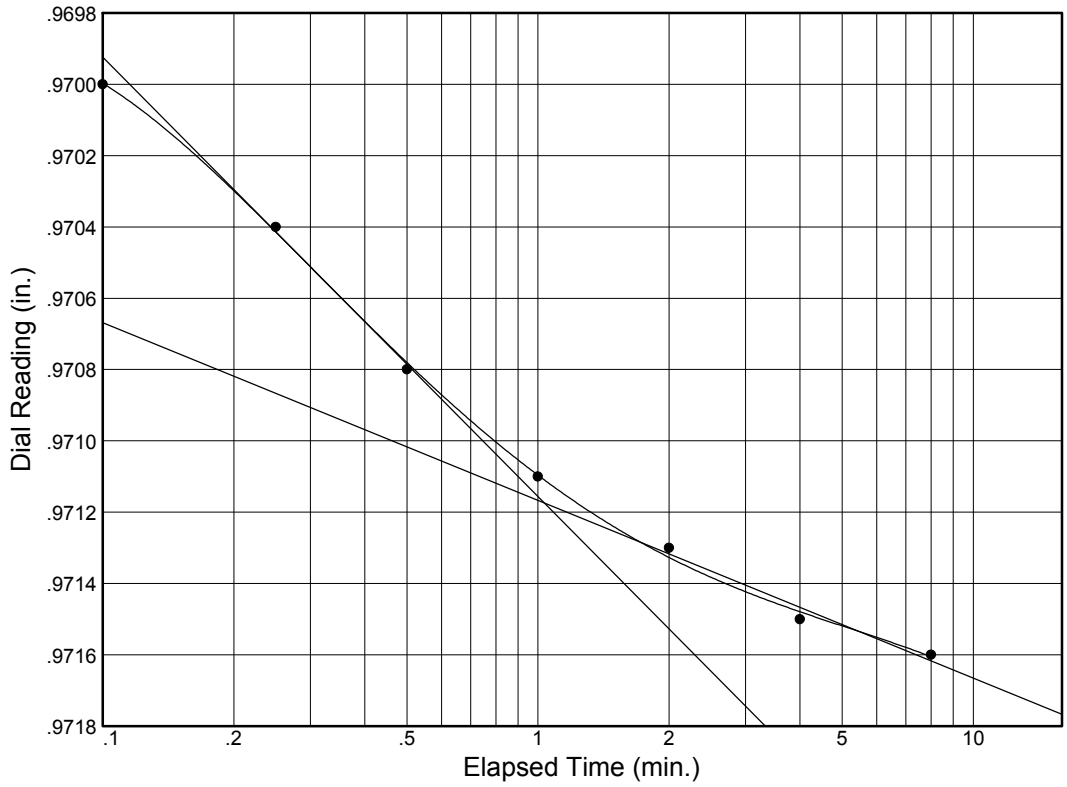
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 5
Load= 0.50 tsf
D_0 = 0.96840
D_{50} = 0.96890
D_{100} = 0.96940
T_{50} = 0.35 min.

C_v @ T_{50}
1.32 ft.^{2}/day

C_α = 0.000



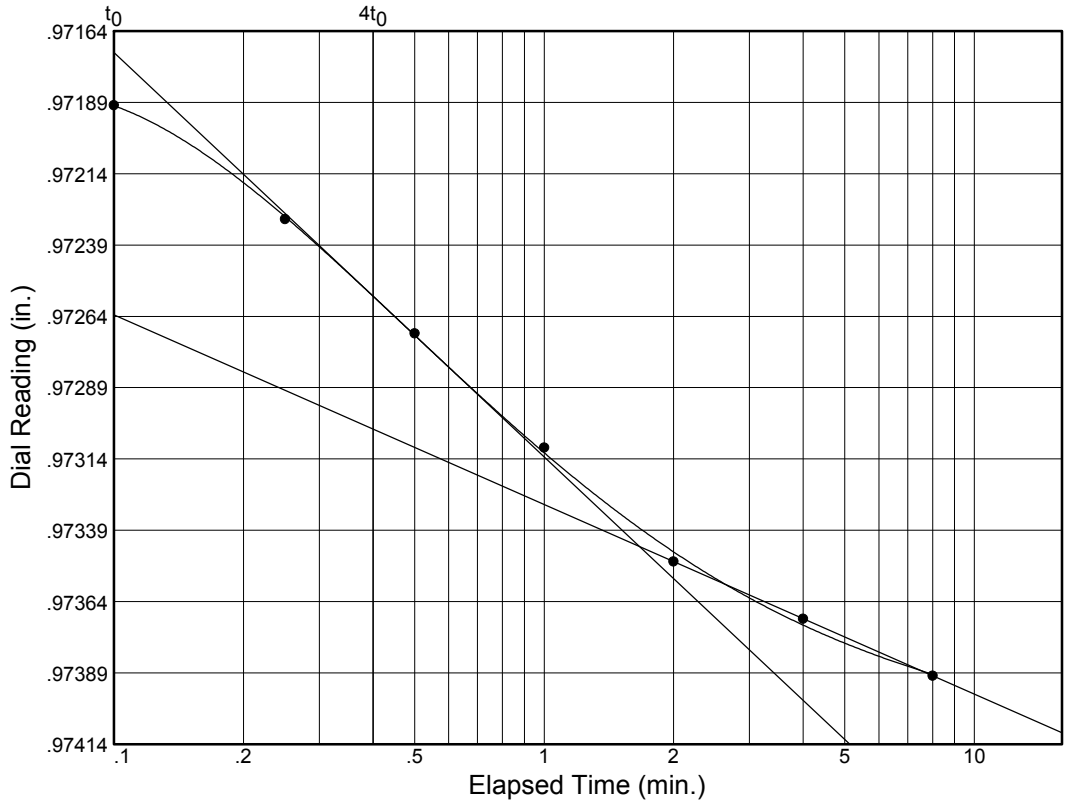
Load No.= 6
Load= 0.25 tsf
D_0 = 0.96940
D_{50} = 0.97029
D_{100} = 0.97117
T_{50} = 0.20 min.

C_v @ T_{50}
2.37 ft.^{2}/day

Figure 4

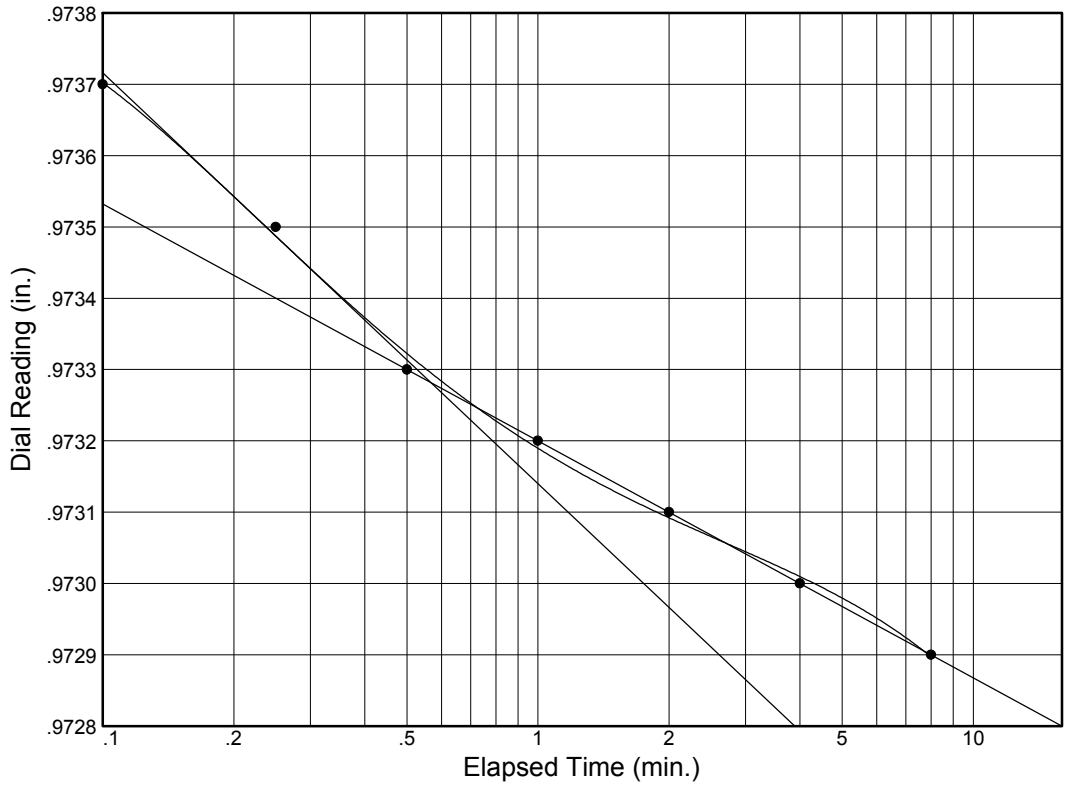
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 7
Load= 0.13 tsf
D_0 = 0.97123
D_{50} = 0.97234
D_{100} = 0.97345
T_{50} = 0.27 min.

C_v @ T_{50}
1.71 ft.^{2}/day



Load No.= 8
Load= 0.25 tsf
D_0 = 0.97390
D_{50} = 0.97359
D_{100} = 0.97328
T_{50} = 0.16 min.

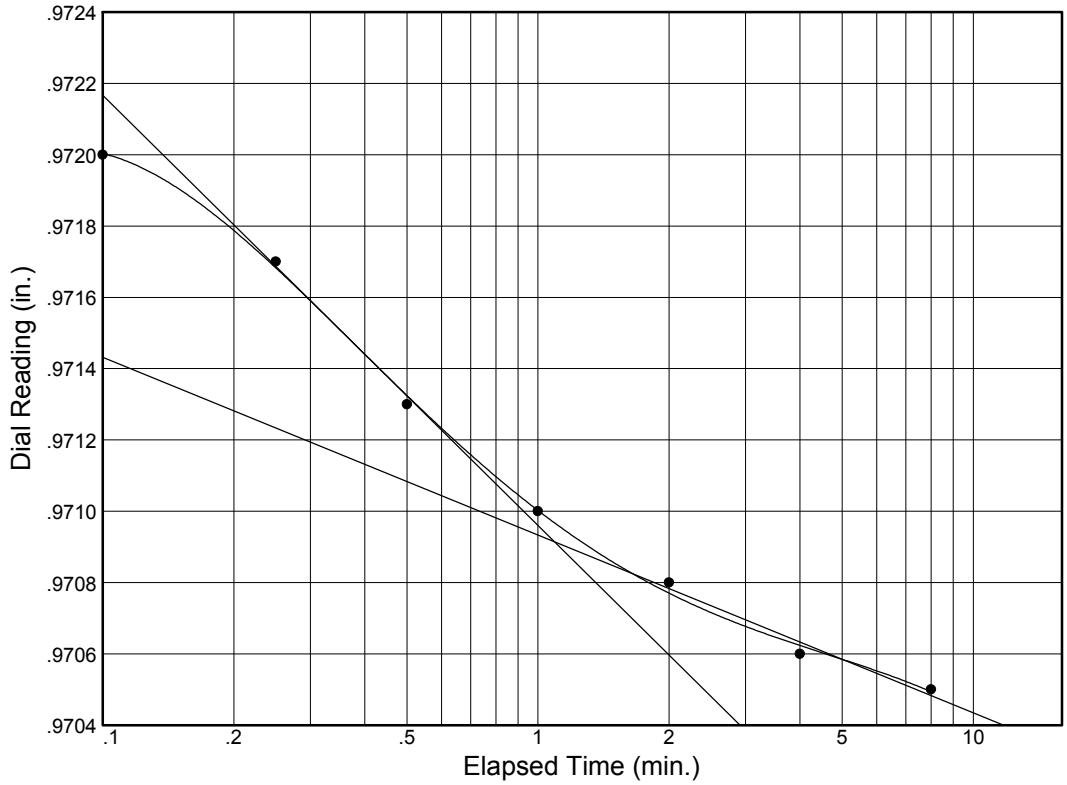
C_v @ T_{50}
2.84 ft.^{2}/day

C_α = 0.000

Figure 5

Dial Reading vs. Time

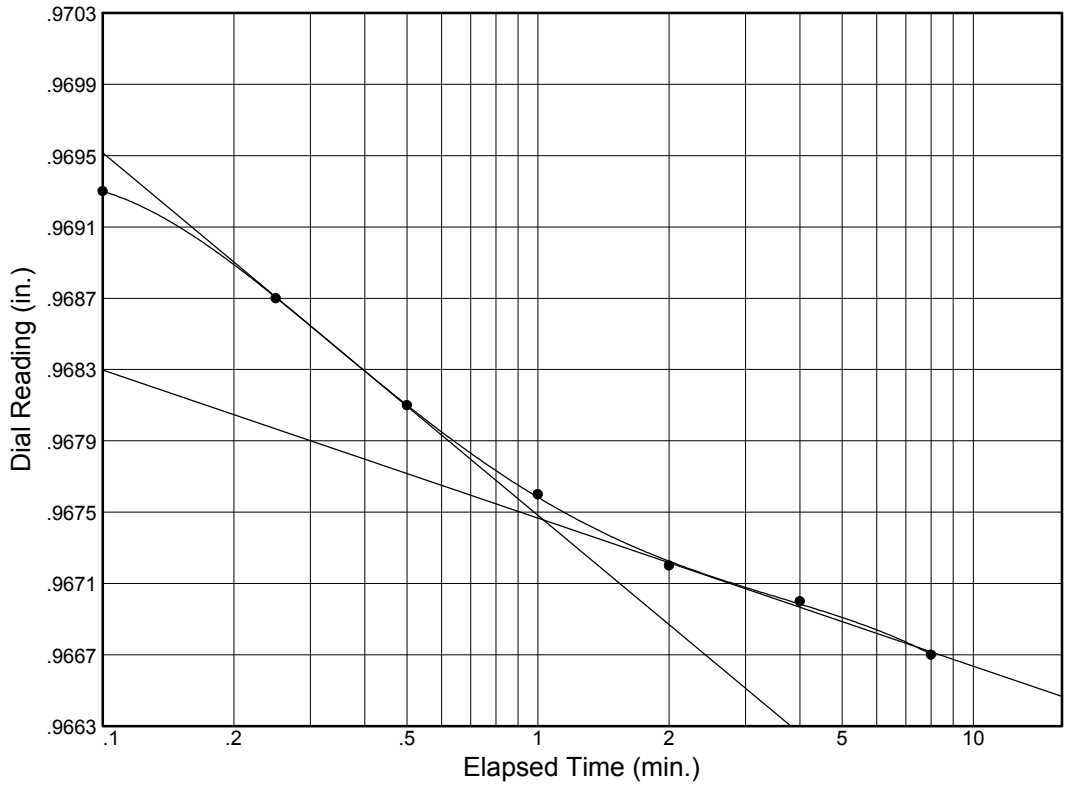
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 9
Load= 0.50 tsf
D_0 = 0.97290
D_{50} = 0.97191
D_{100} = 0.97091
T_{50} = 0.15 min.

C_v @ T_{50}
3.14 ft.^{2}/day

C_α = 0.001



Load No.= 10
Load= 1.00 tsf
D_0 = 0.97050
D_{50} = 0.96898
D_{100} = 0.96746
T_{50} = 0.18 min.

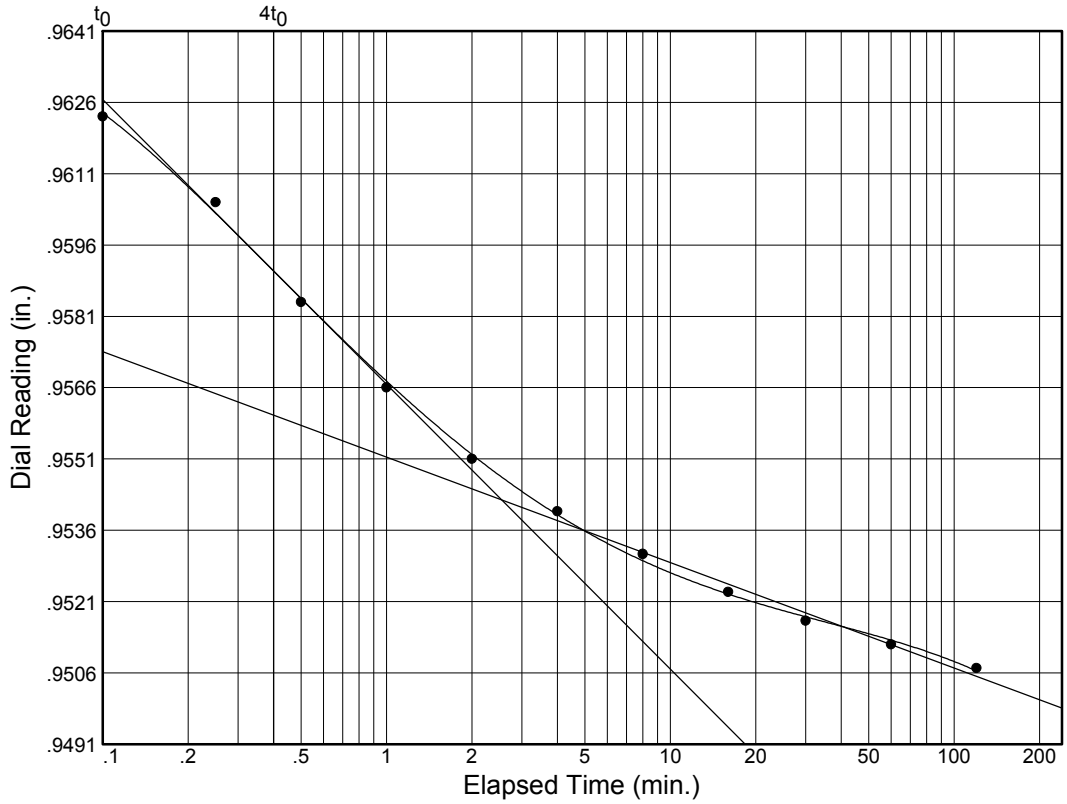
C_v @ T_{50}
2.59 ft.^{2}/day

C_α = 0.001

Figure 6

Dial Reading vs. Time

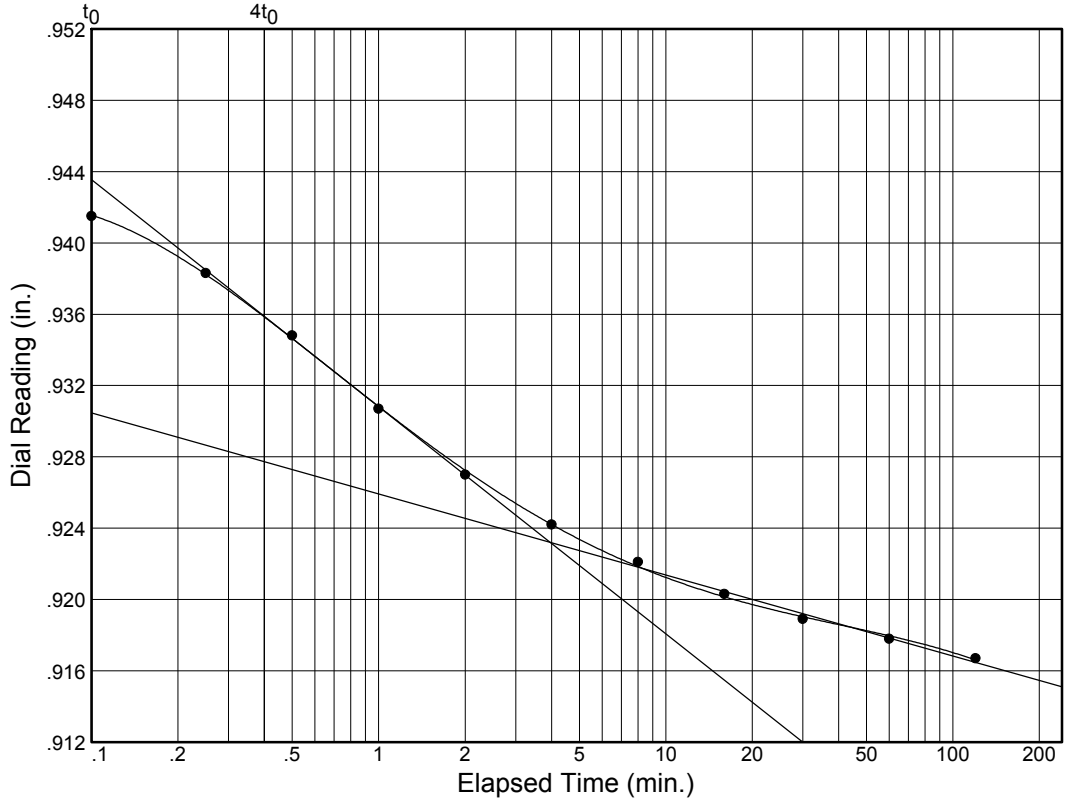
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 11
Load= 2.00 tsf
D_0 = 0.96570
D_{50} = 0.95997
D_{100} = 0.95424
T_{50} = 0.28 min.

C_v @ T_{50}
1.61 ft.^{2}/day

C_α = 0.002



Load No.= 12
Load= 4.00 tsf
D_0 = 0.94726
D_{50} = 0.93523
D_{100} = 0.92321
T_{50} = 0.45 min.

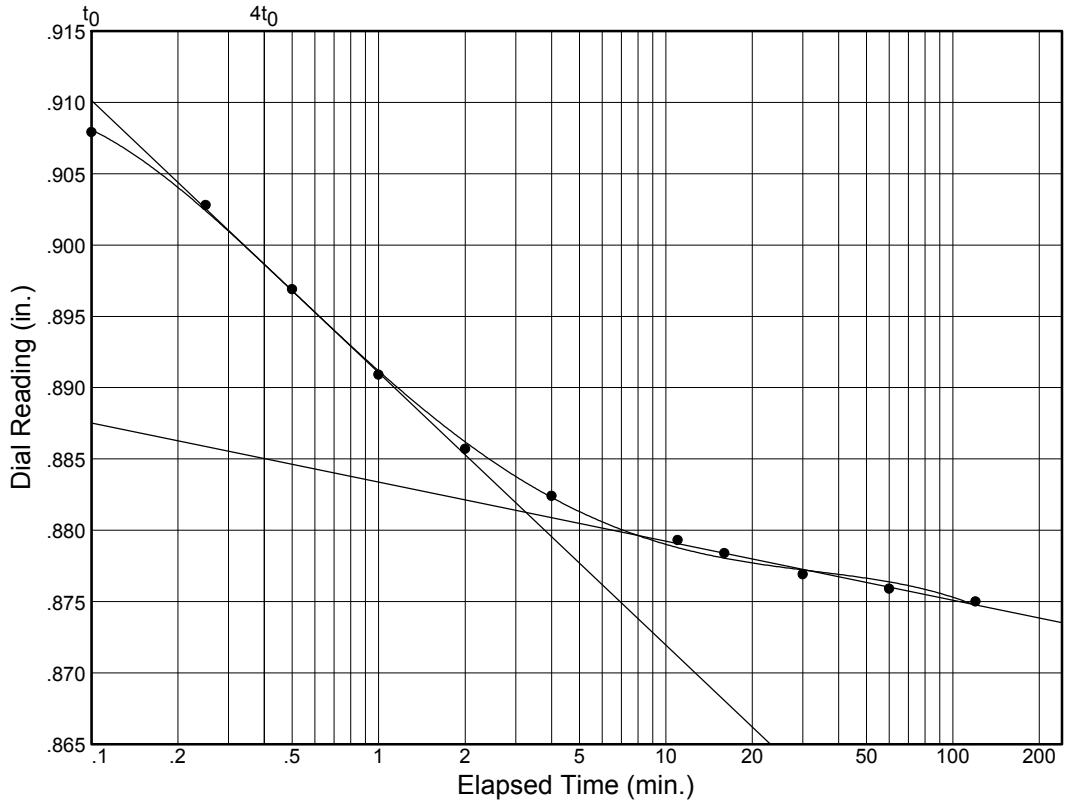
C_v @ T_{50}
0.96 ft.^{2}/day

C_α = 0.005

Figure 7

Dial Reading vs. Time

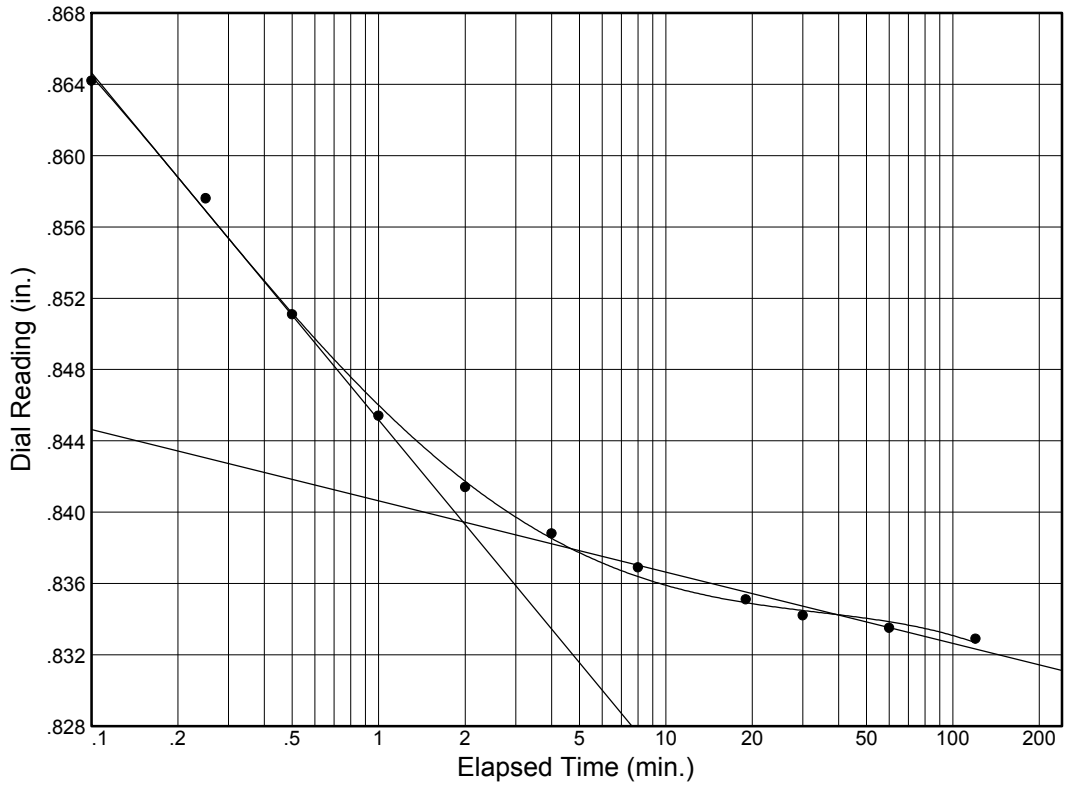
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 13
Load= 8.00 tsf
D_0 = 0.91751
D_{50} = 0.89938
D_{100} = 0.88125
T_{50} = 0.37 min.

C_v @ T_{50}
1.08 ft.^{2}/day

C_α = 0.005



Load No.= 14
Load= 16.00 tsf
D_0 = 0.87500
D_{50} = 0.85724
D_{100} = 0.83947
T_{50} = 0.24 min.

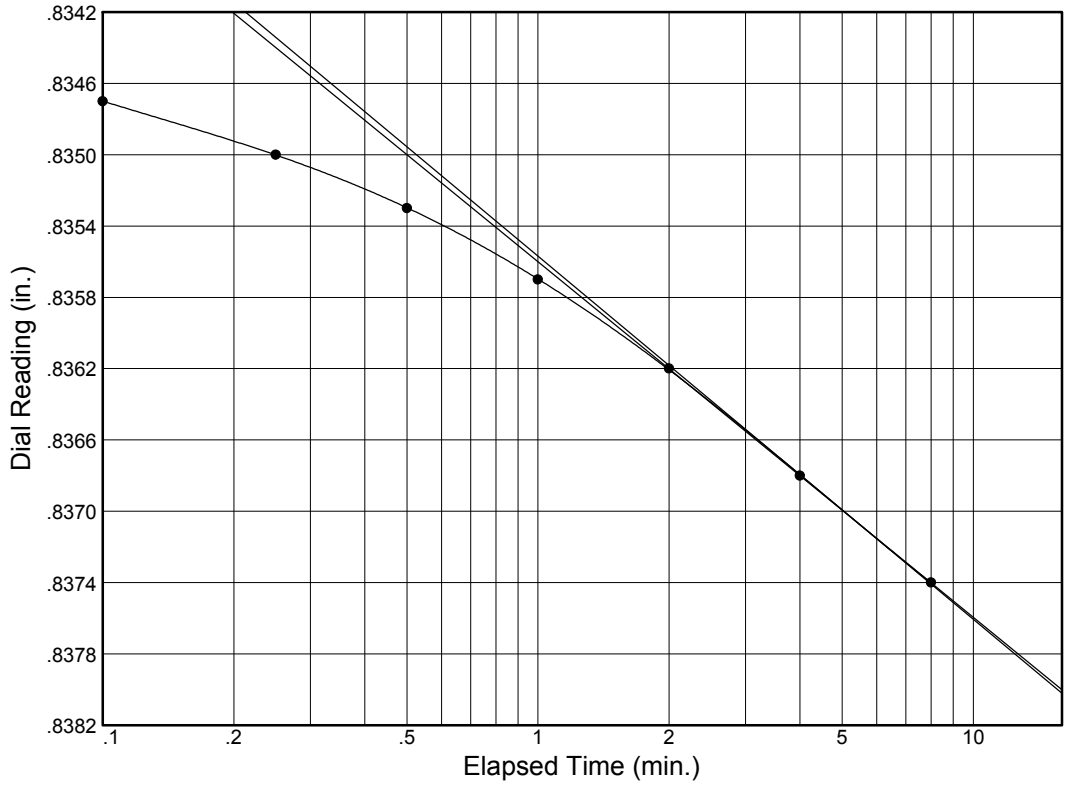
C_v @ T_{50}
1.50 ft.^{2}/day

C_α = 0.005

Figure 8

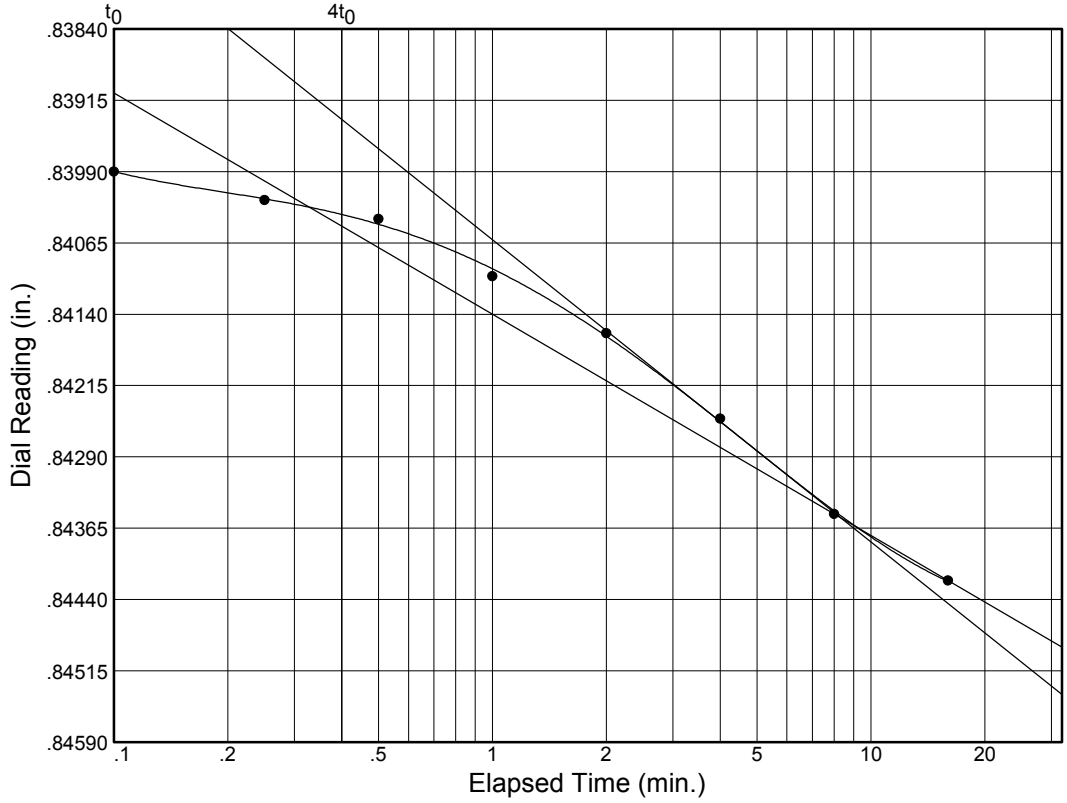
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 15
Load= 8.00 tsf
D_0 = 0.83290
D_{50} = 0.83496
D_{100} = 0.83701
T_{50} = 0.22 min.

C_v @ T_{50}
1.57 ft.^{2}/day



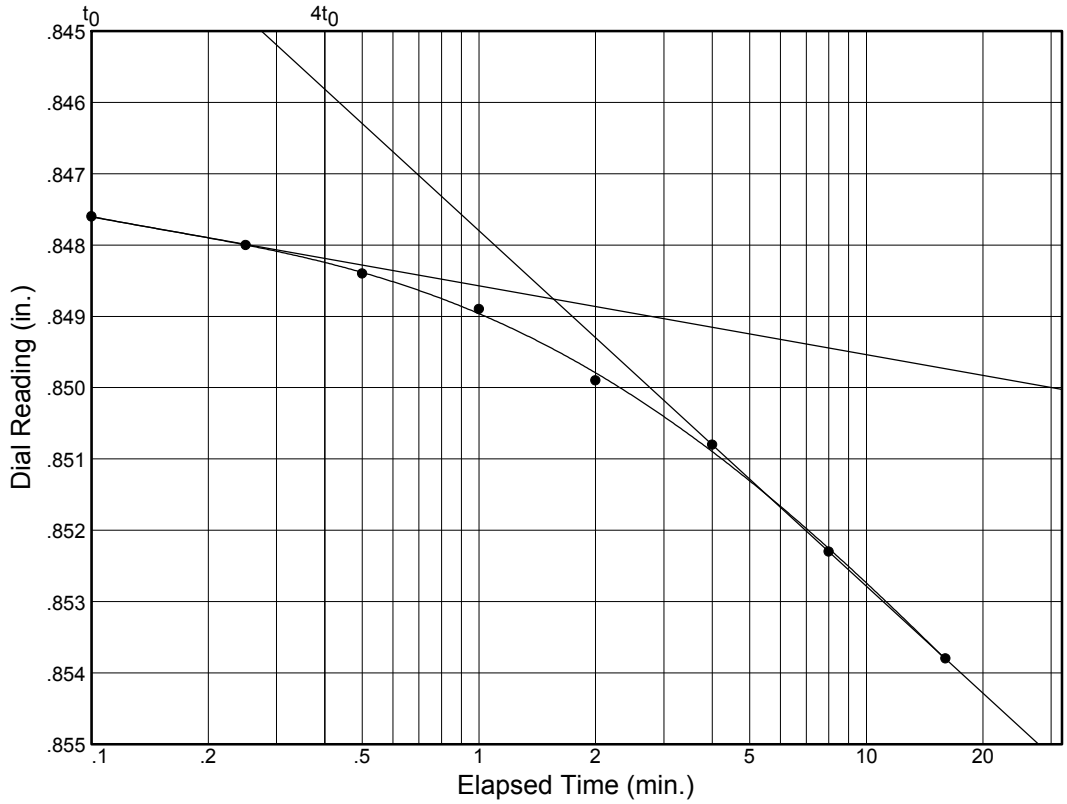
Load No.= 16
Load= 4.00 tsf
D_0 = 0.83945
D_{50} = 0.84150
D_{100} = 0.84354
T_{50} = 1.78 min.

C_v @ T_{50}
0.20 ft.^{2}/day

Figure 9

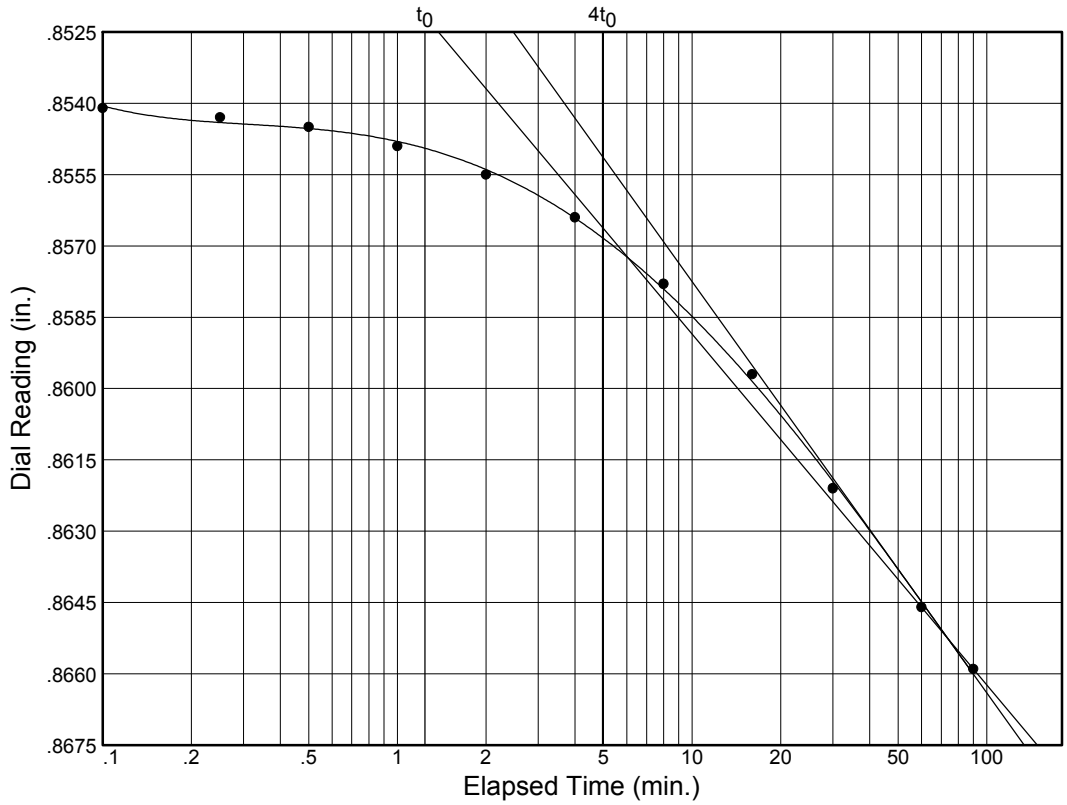
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 17
Load= 1.00 tsf
D_0 = 0.84696
D_{50} = 0.84786
D_{100} = 0.84876
T_{50} = 0.18 min.

C_v @ T_{50}
1.96 ft.^{2}/day



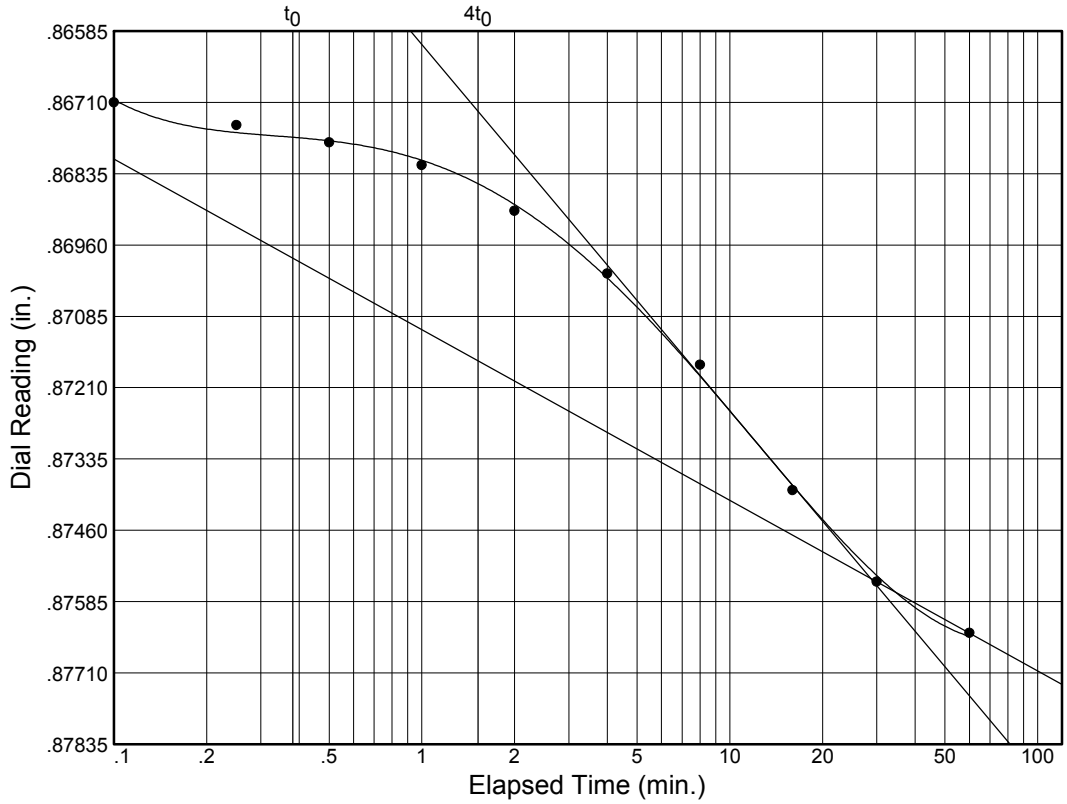
Load No.= 18
Load= 0.25 tsf
D_0 = 0.85307
D_{50} = 0.85917
D_{100} = 0.86528
T_{50} = 12.76 min.

C_v @ T_{50}
0.03 ft.^{2}/day

Figure 10

Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-8W



Load No.= 19

Load= 0.13 tsf

D_0 = 0.86690

D_{50} = 0.87117

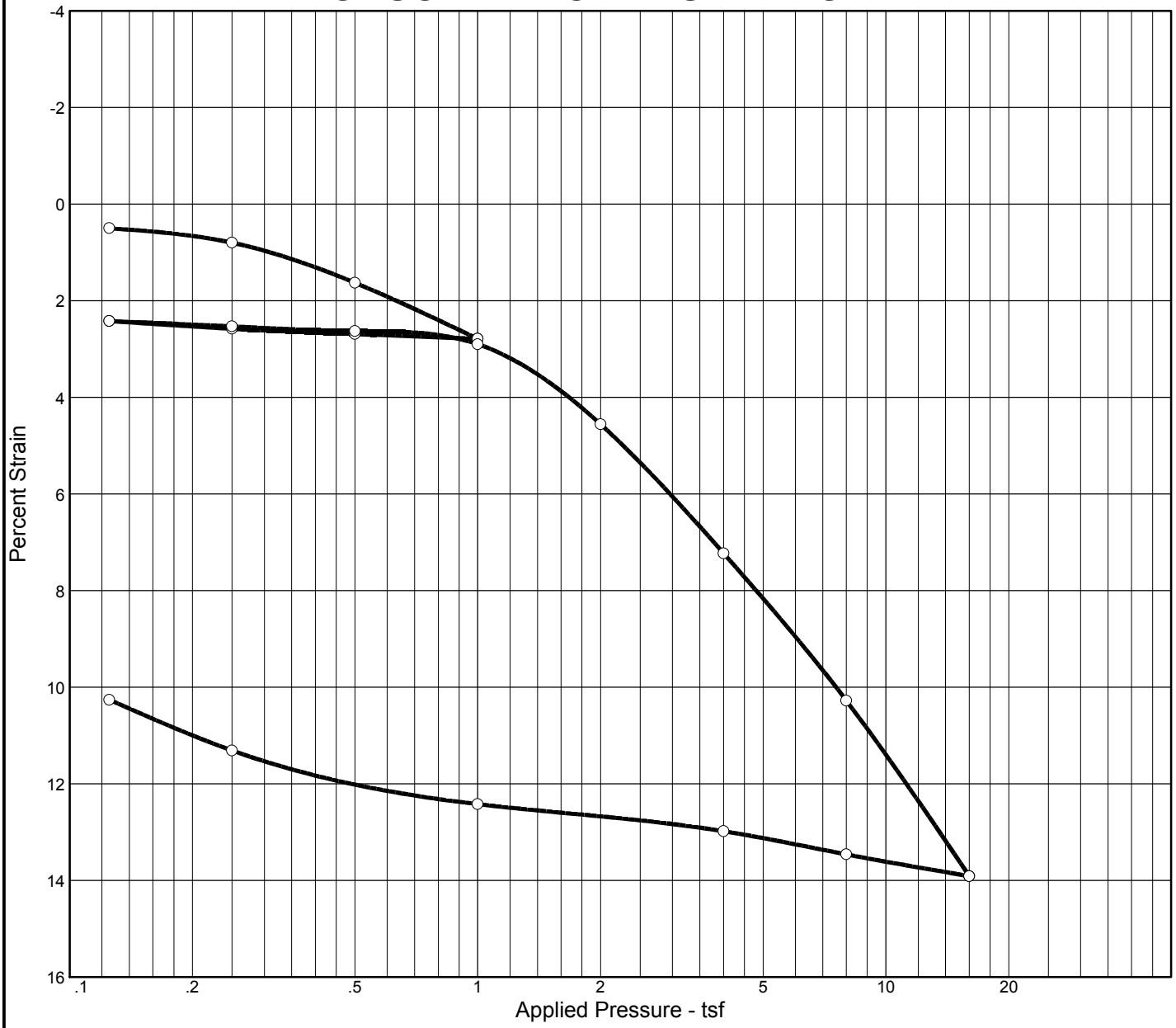
D_{100} = 0.87544

T_{50} = 6.07 min.

C_v @ T_{50}
0.06 ft.^{2}/day

Figure 11

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Gray, Fat CLAY		

LL	PI	Sp. Gr.	Overburden (tsf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (tsf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.74	1.00	89.0		33.6 %	26.8 %	99.9 %	100.0 %	0.922	0.725	2.77	0.23

Preparation Process:	D2435 Method	C_r	Swell Press. (tsf)	Heave %
Condition of Test:		0.02		

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

Location: D7-9W

Remarks:
Boring D7-9W
Sample Obtained 10/15/10

Checked By:

Title:

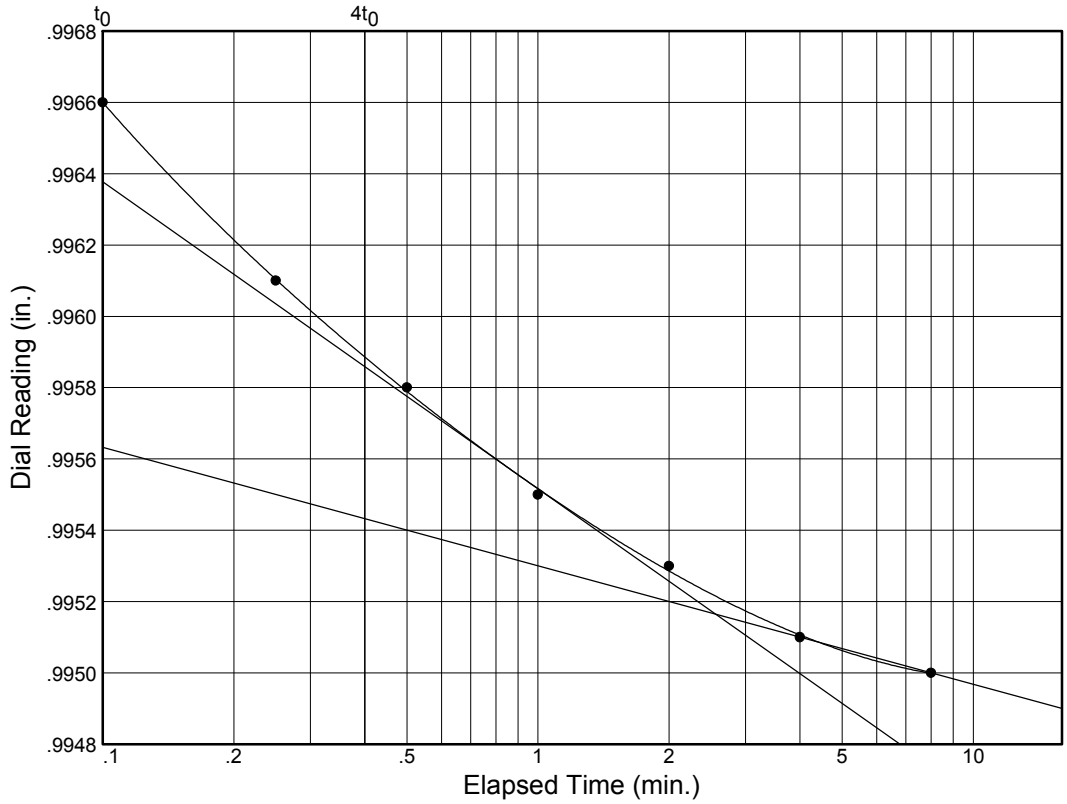
CONSOLIDATION TEST REPORT

GET SOLUTIONS, INC.

Figure 1

Dial Reading vs. Time

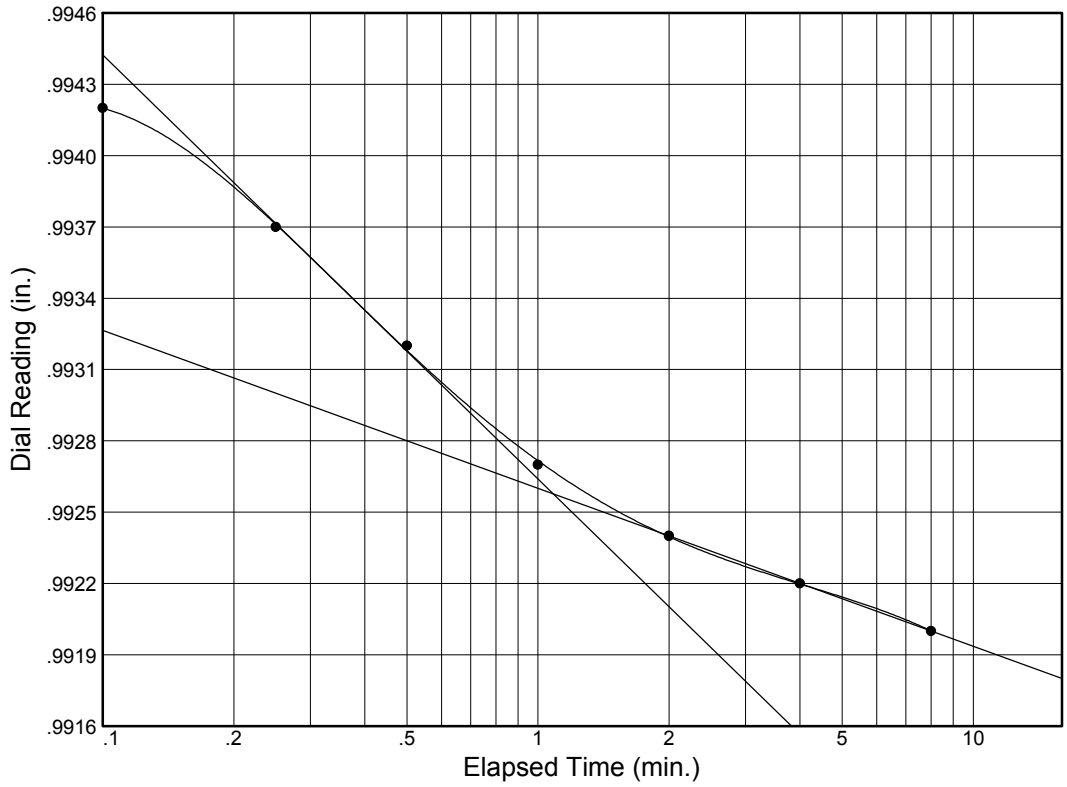
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 1
Load= 0.13 tsf
D_0 = 0.99731
D_{50} = 0.99624
D_{100} = 0.99516
T_{50} = 0.19 min.

C_v @ T_{50}
2.57 ft.^{2}/day

C_α = 0.000



Load No.= 2
Load= 0.25 tsf
D_0 = 0.99500
D_{50} = 0.99379
D_{100} = 0.99258
T_{50} = 0.22 min.

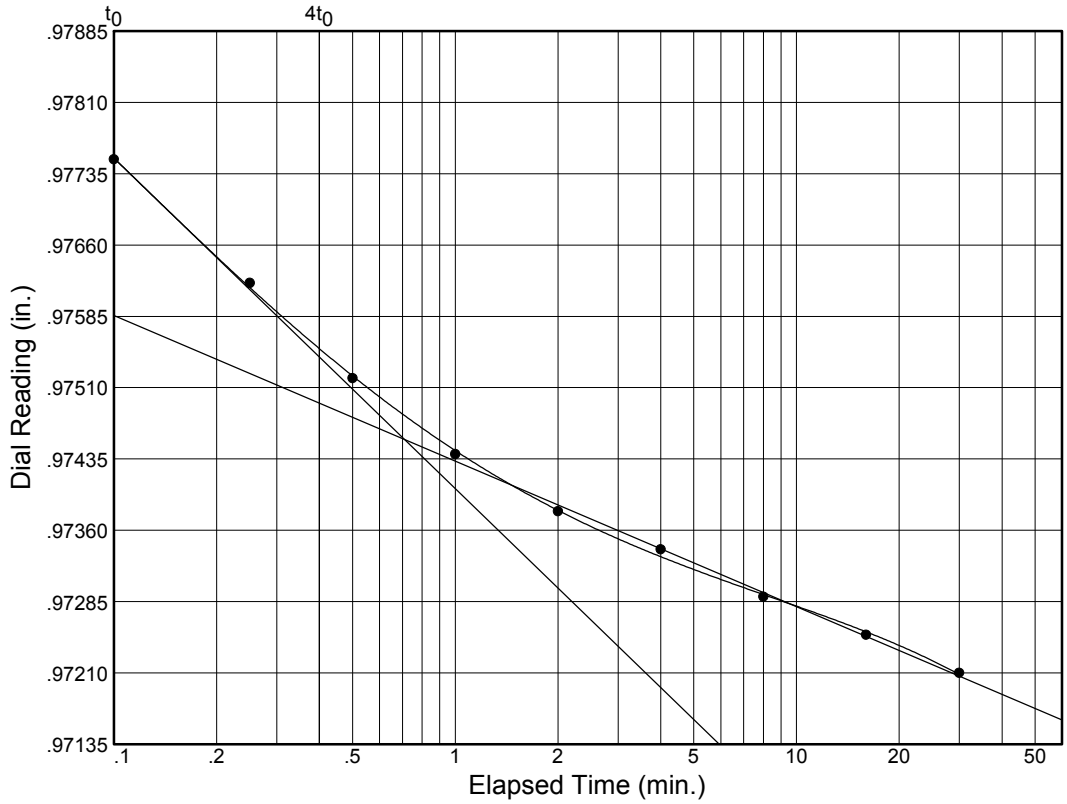
C_v @ T_{50}
2.17 ft.^{2}/day

C_α = 0.001

Figure 2

Dial Reading vs. Time

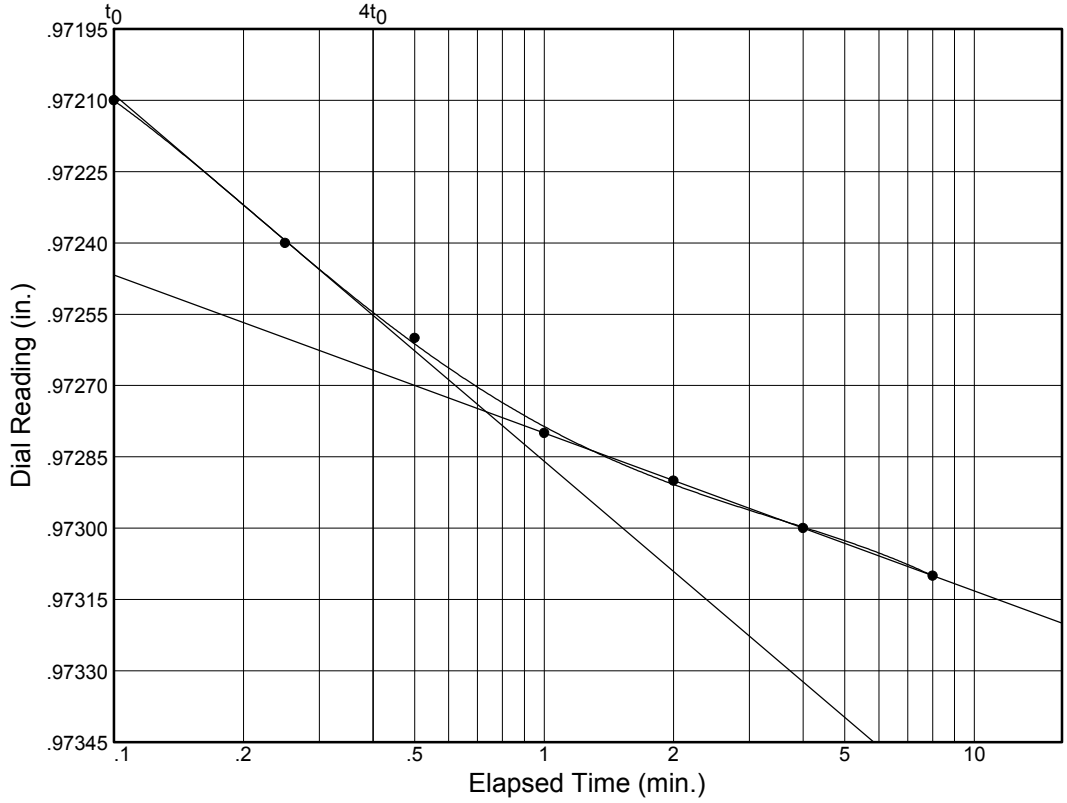
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 4
Load= 1.00 tsf
D_0 = 0.97952
D_{50} = 0.97704
D_{100} = 0.97456
T_{50} = 0.14 min.

C_v @ T_{50}
3.43 ft.^{2}/day

C_α = 0.002



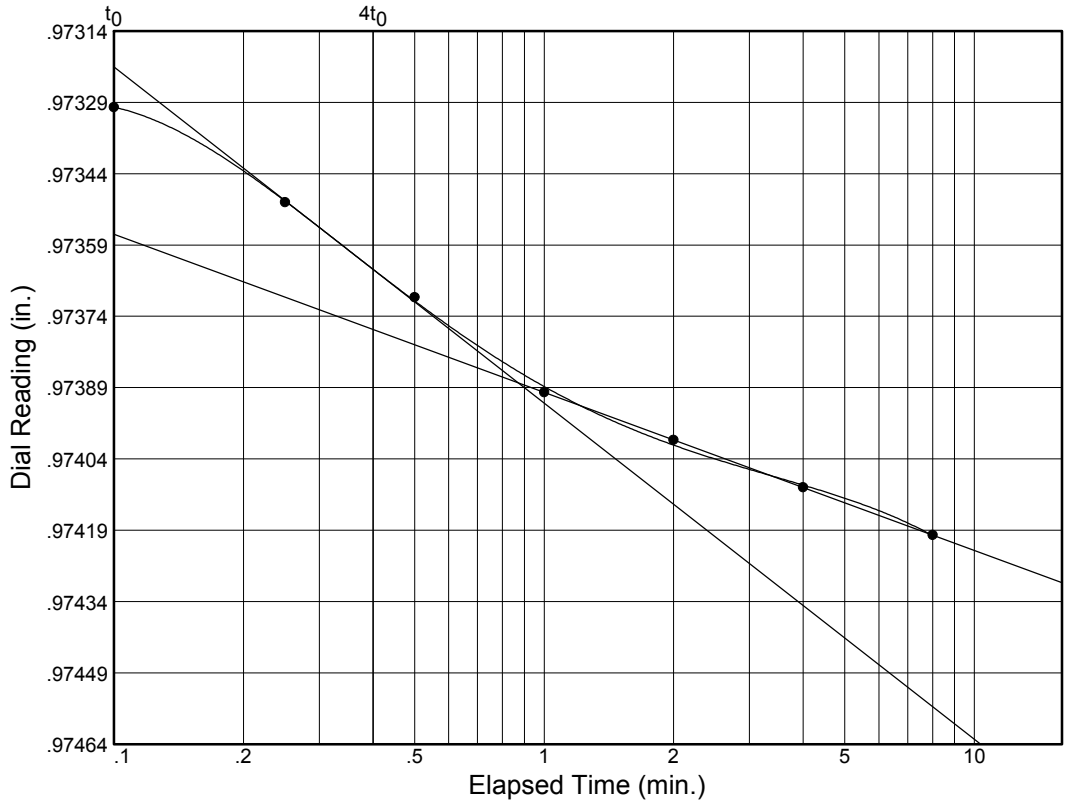
Load No.= 5
Load= 0.50 tsf
D_0 = 0.97166
D_{50} = 0.97221
D_{100} = 0.97276
T_{50} = 0.14 min.

C_v @ T_{50}
3.30 ft.^{2}/day

Figure 3

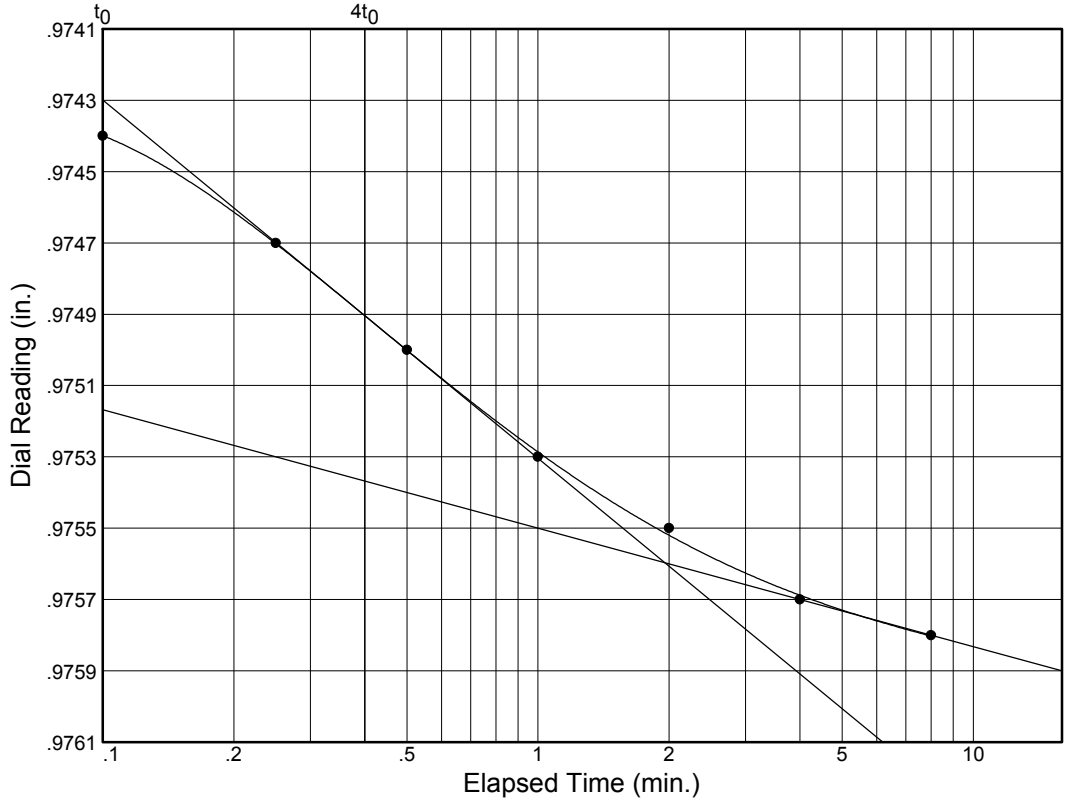
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 6
Load= 0.25 tsf
D_0 = 0.97296
D_{50} = 0.97342
D_{100} = 0.97388
T_{50} = 0.19 min.

C_v @ T_{50}
2.46 ft.^{2}/day



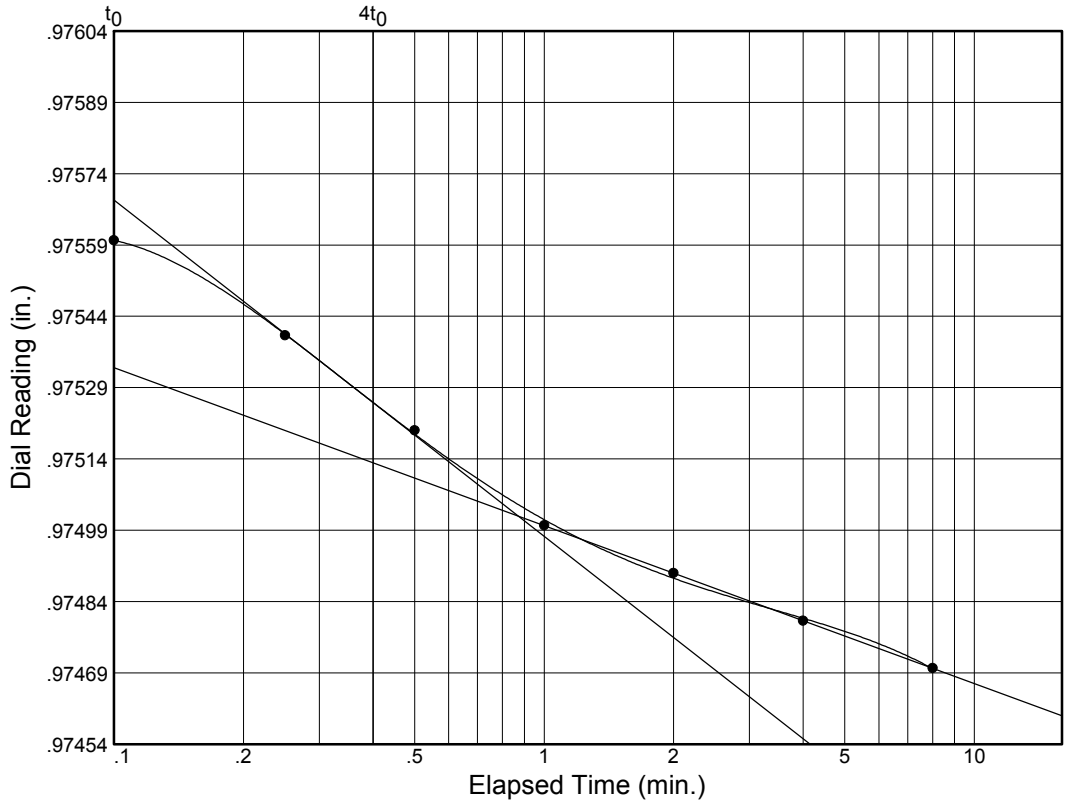
Load No.= 7
Load= 0.13 tsf
D_0 = 0.97389
D_{50} = 0.97475
D_{100} = 0.97560
T_{50} = 0.28 min.

C_v @ T_{50}
1.69 ft.^{2}/day

Figure 4

Dial Reading vs. Time

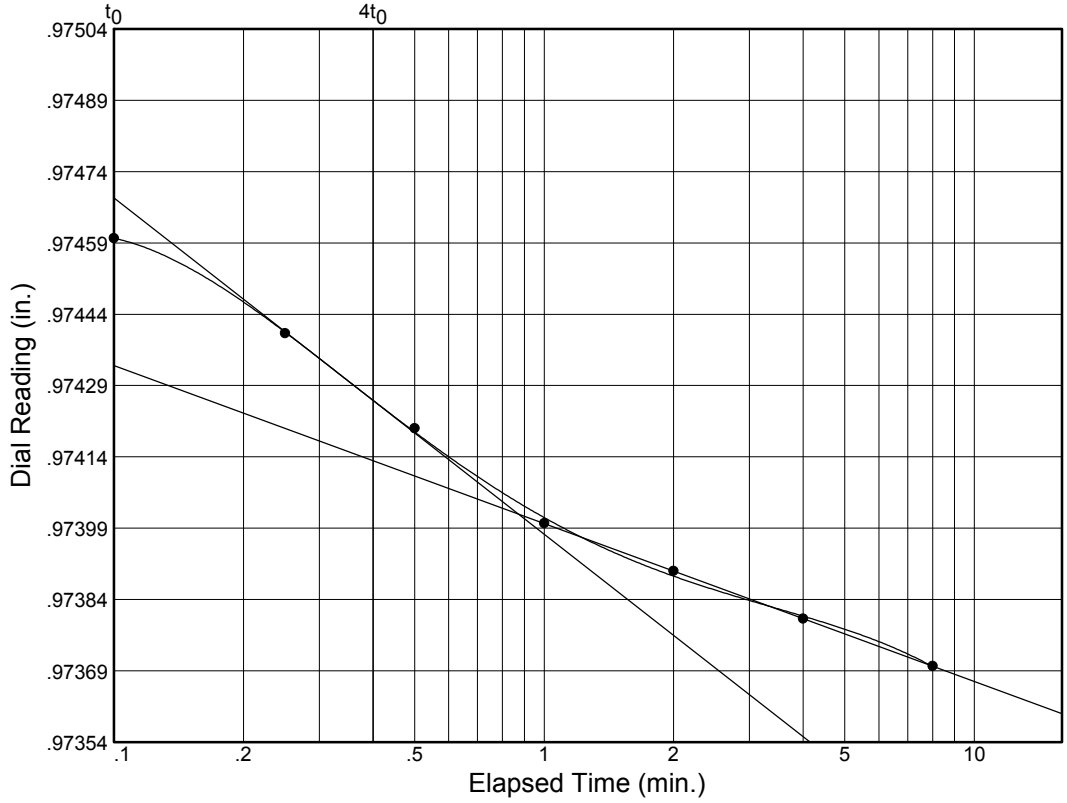
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 8
Load= 0.25 tsf
D_0 = 0.97594
D_{50} = 0.97548
D_{100} = 0.97502
T_{50} = 0.19 min.

C_v @ T_{50}
2.47 ft.^{2}/day

C_α = 0.000



Load No.= 9
Load= 0.50 tsf
D_0 = 0.97494
D_{50} = 0.97448
D_{100} = 0.97402
T_{50} = 0.19 min.

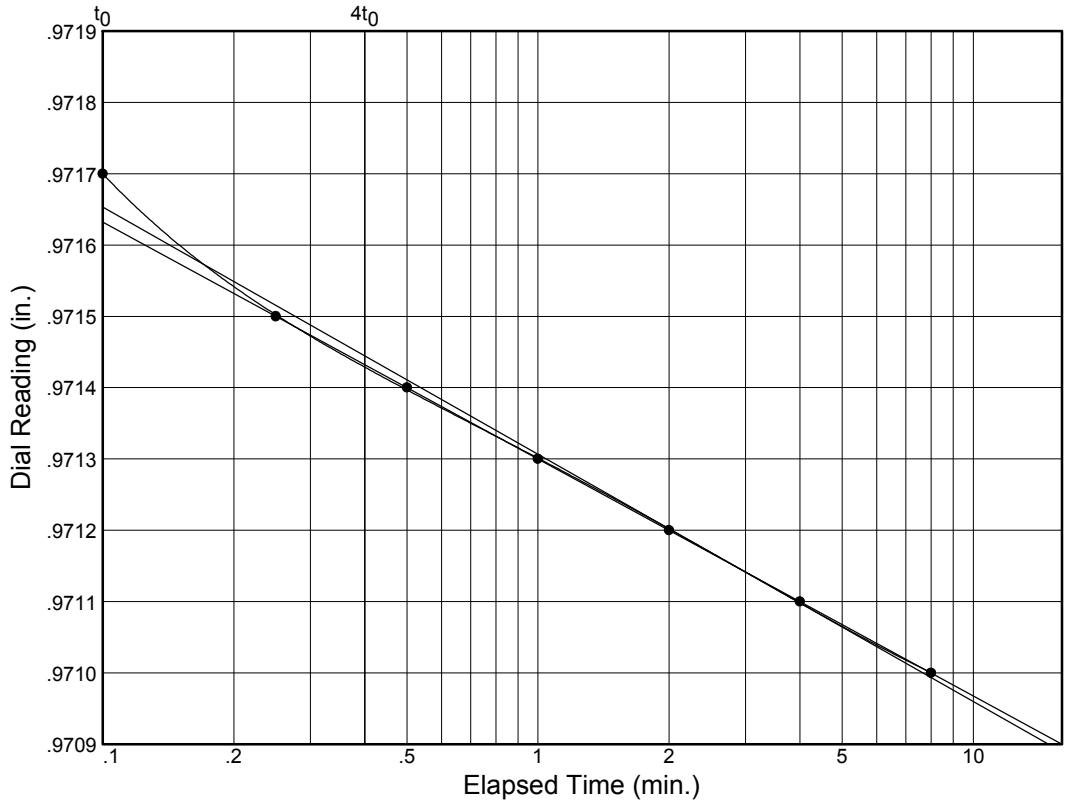
C_v @ T_{50}
2.47 ft.^{2}/day

C_α = 0.000

Figure 5

Dial Reading vs. Time

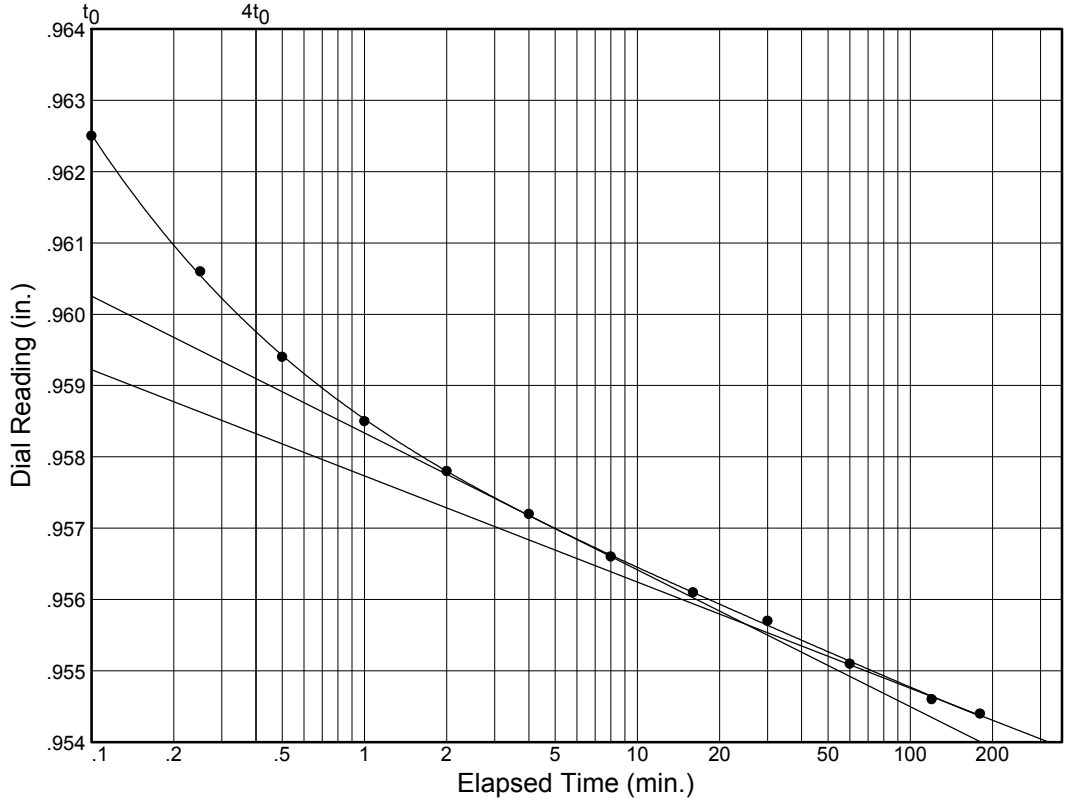
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 10
Load= 1.00 tsf
D_0 = 0.97197
D_{50} = 0.97156
D_{100} = 0.97115
T_{50} = 0.18 min.

C_v @ T_{50}
2.54 ft.^{2}/day

C_α = 0.000



Load No.= 11
Load= 2.00 tsf
D_0 = 0.96528
D_{50} = 0.96047
D_{100} = 0.95565
T_{50} = 0.26 min.

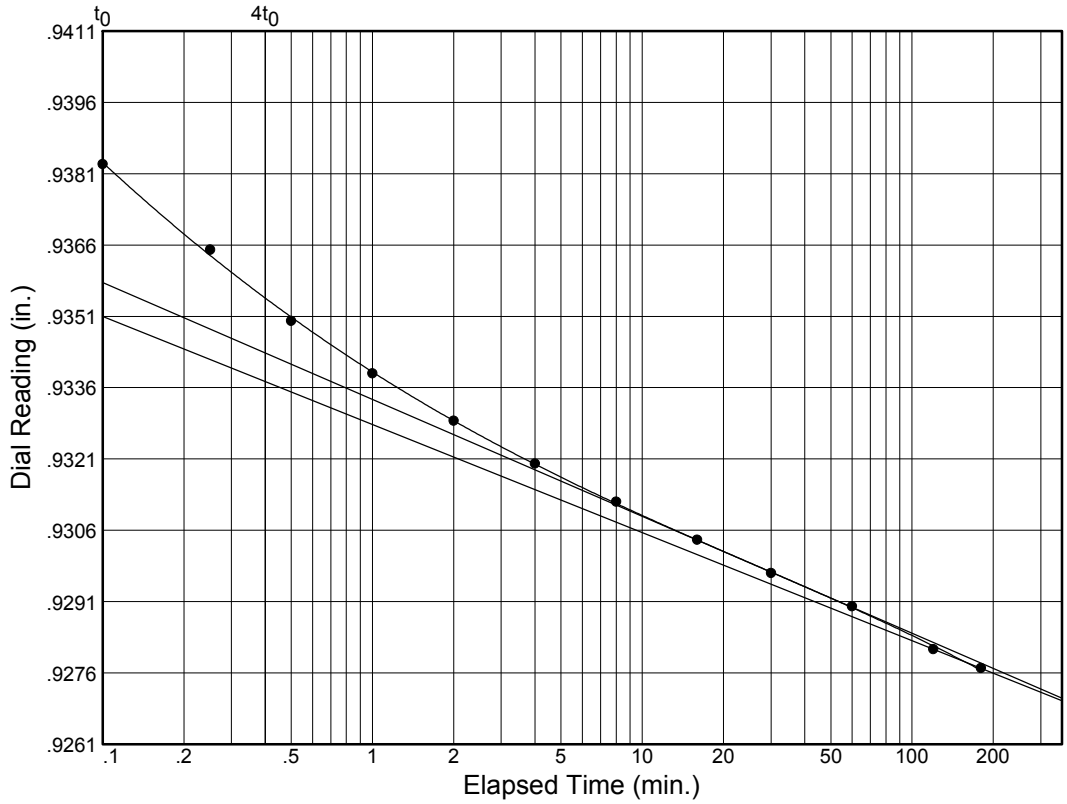
C_v @ T_{50}
1.75 ft.^{2}/day

C_α = 0.002

Figure 6

Dial Reading vs. Time

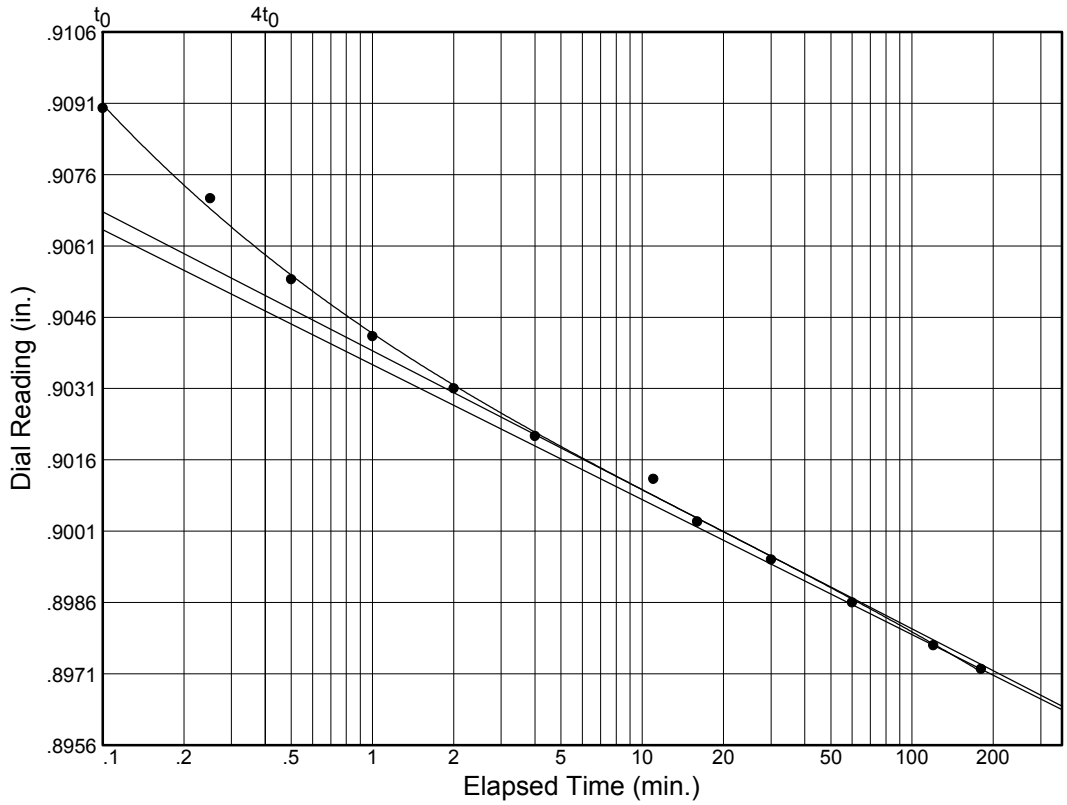
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 12
Load= 4.00 tsf
D_0 = 0.94118
D_{50} = 0.93376
D_{100} = 0.92634
T_{50} = 1.11 min.

C_v @ T_{50}
0.39 ft.^{2}/day

C_α = 0.002



Load No.= 13
Load= 8.00 tsf
D_0 = 0.91223
D_{50} = 0.90305
D_{100} = 0.89388
T_{50} = 2.17 min.

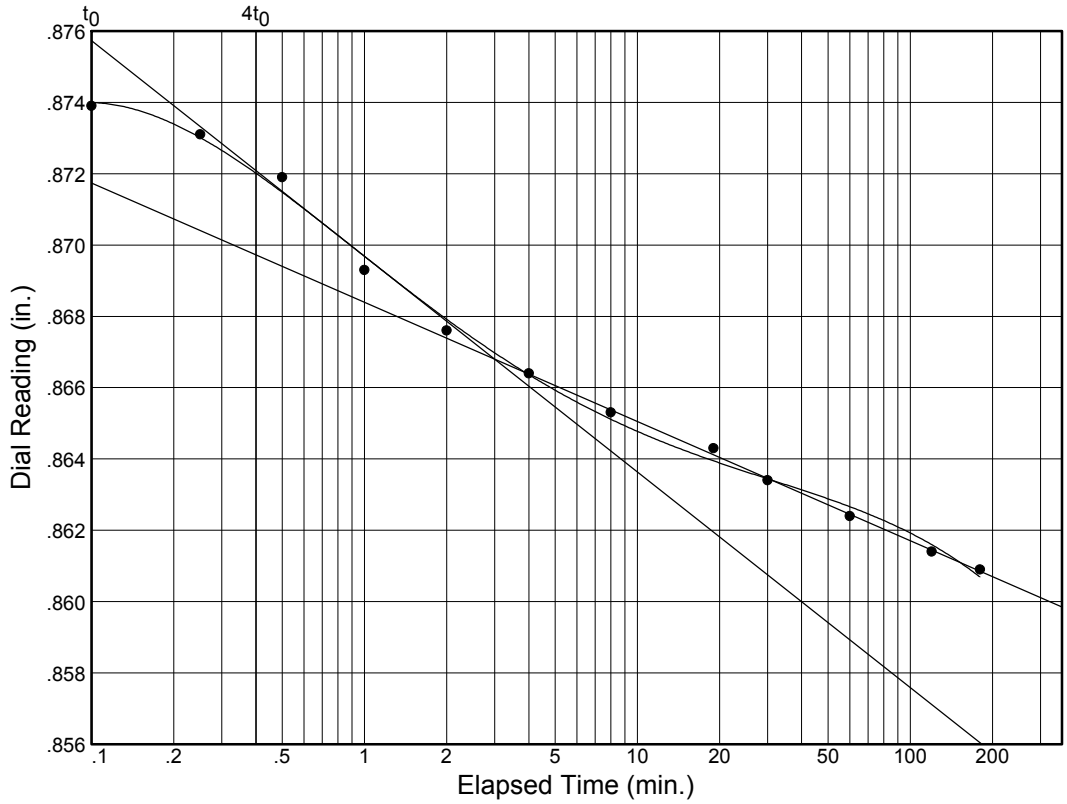
C_v @ T_{50}
0.19 ft.^{2}/day

C_α = 0.003

Figure 7

Dial Reading vs. Time

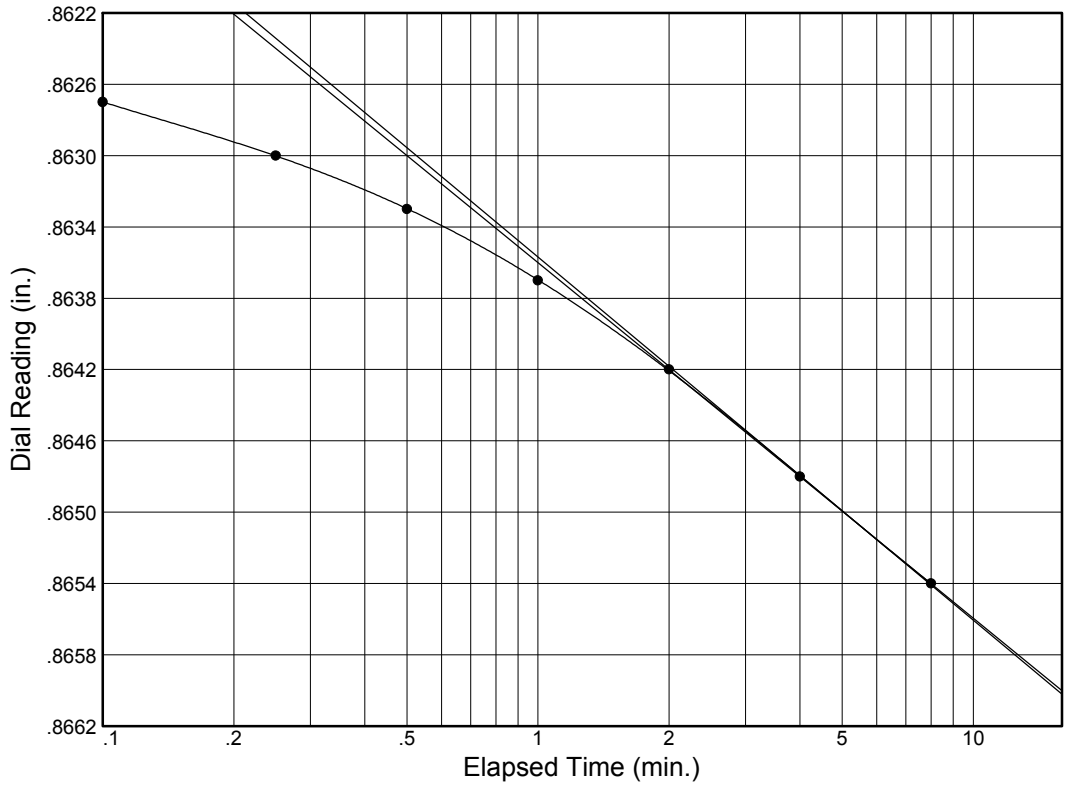
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 14
Load= 16.00 tsf
D_0 = 0.87597
D_{50} = 0.87138
D_{100} = 0.86680
T_{50} = 0.52 min.

C_v @ T_{50}
0.73 ft.^{2}/day

C_α = 0.004



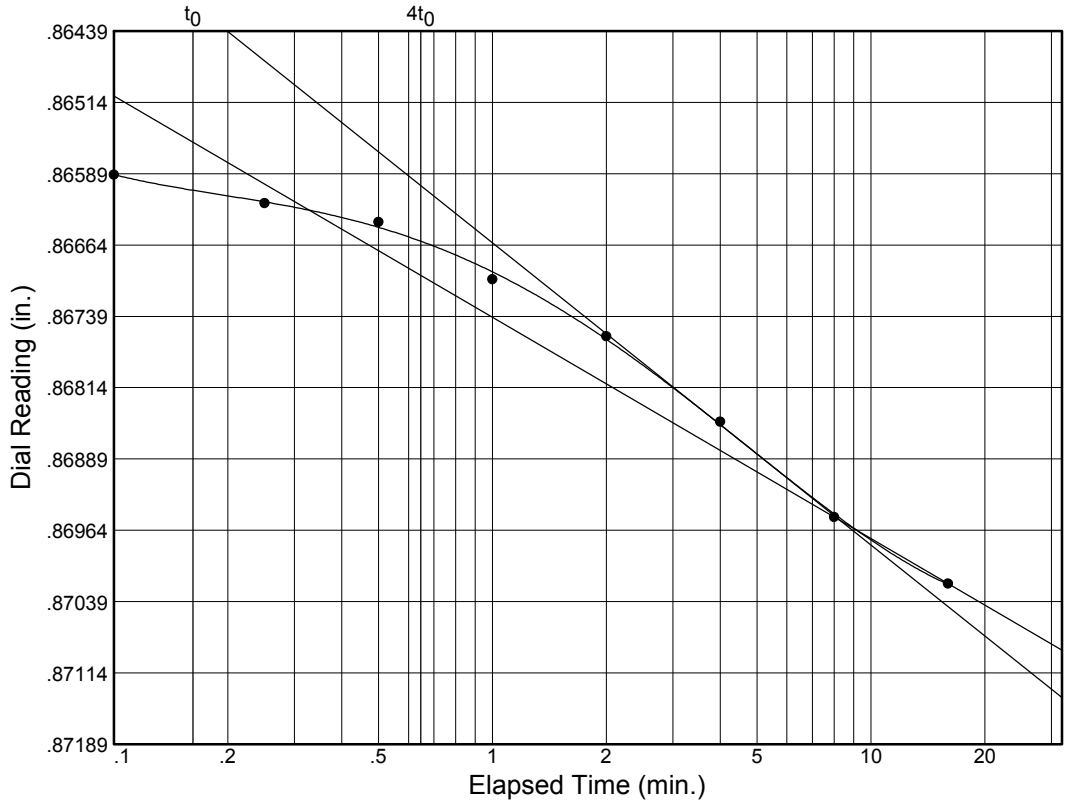
Load No.= 15
Load= 8.00 tsf
D_0 = 0.86090
D_{50} = 0.86296
D_{100} = 0.86501
T_{50} = 0.22 min.

C_v @ T_{50}
1.67 ft.^{2}/day

Figure 8

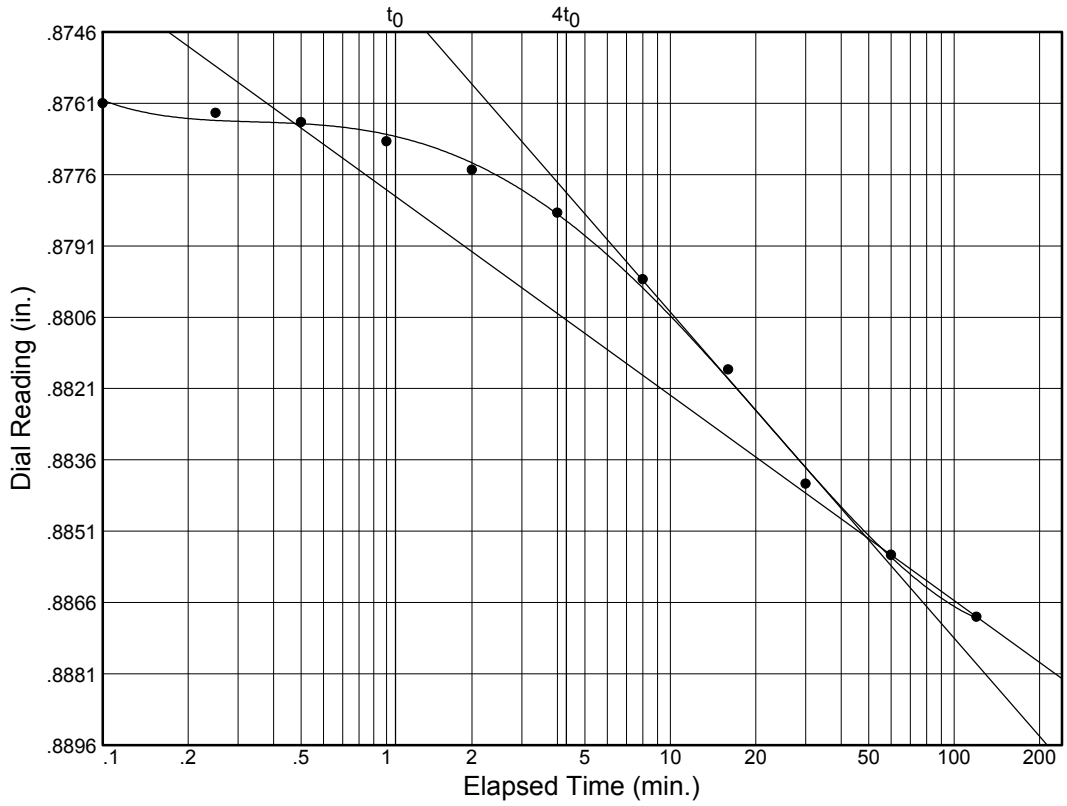
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 16
Load= 4.00 tsf
D_0 = 0.86553
D_{50} = 0.86754
D_{100} = 0.86954
T_{50} = 1.84 min.

C_v @ T_{50}
0.20 ft.^{2}/day



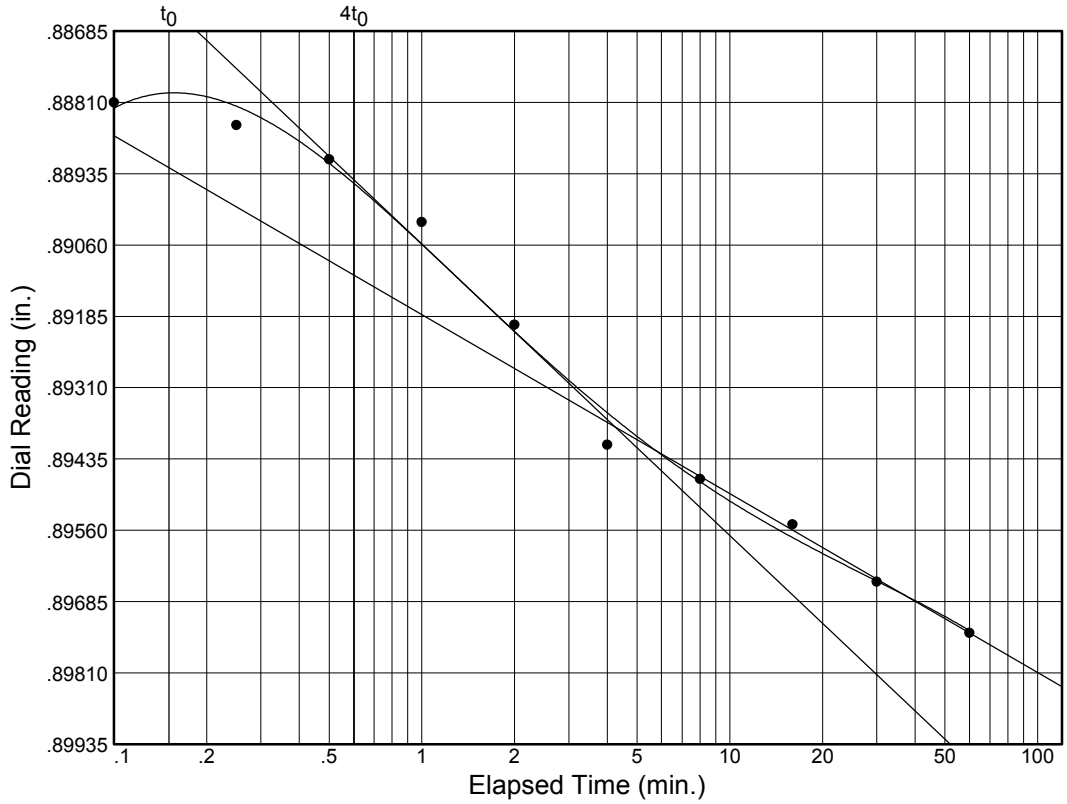
Load No.= 18
Load= 0.25 tsf
D_0 = 0.87502
D_{50} = 0.88011
D_{100} = 0.88520
T_{50} = 8.40 min.

C_v @ T_{50}
0.05 ft.^{2}/day

Figure 9

Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-9W



Load No.= 19

Load= 0.13 tsf

D_0 = 0.88634

D_{50} = 0.89007

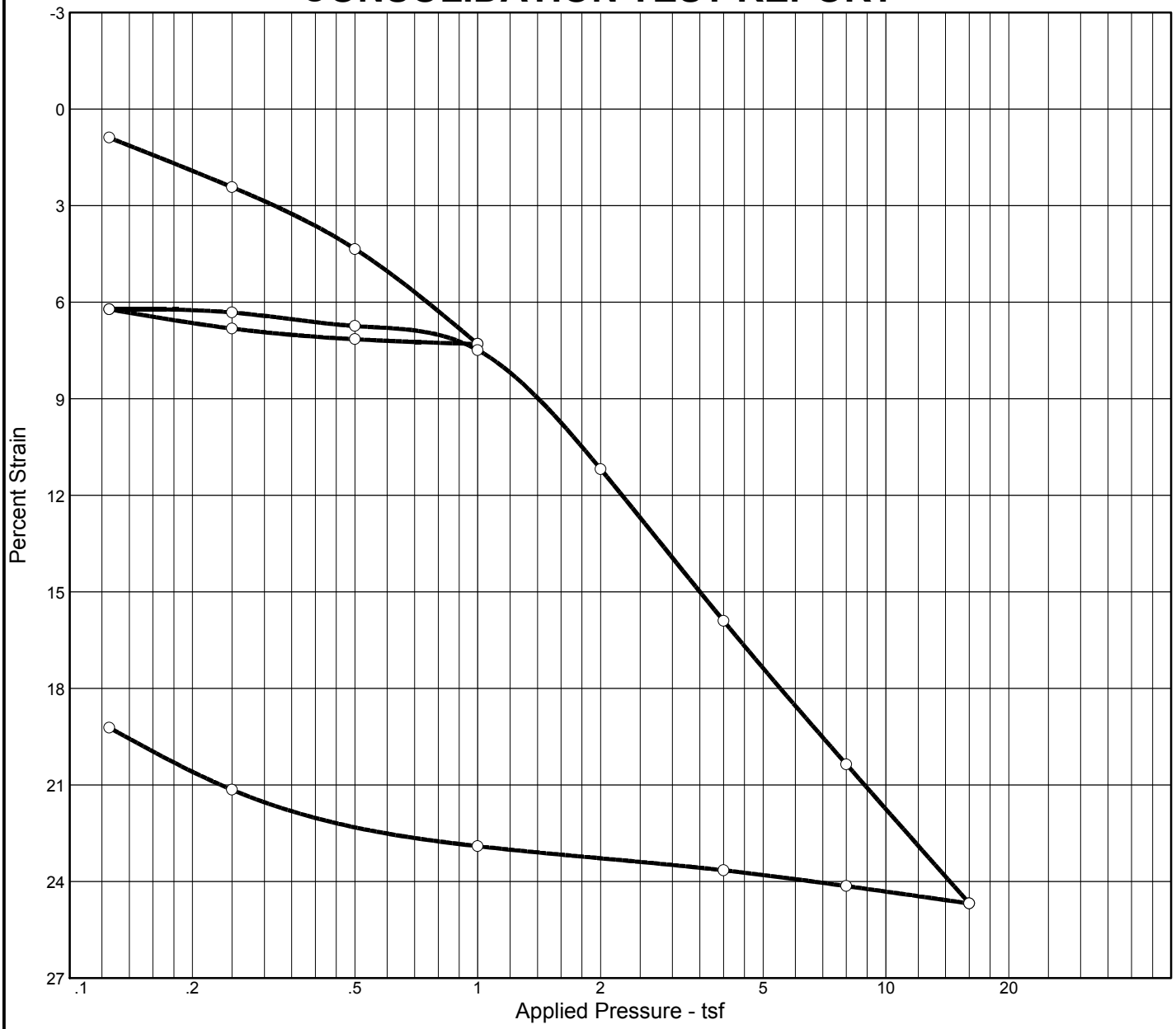
D_{100} = 0.89379

T_{50} = 0.78 min.

C_v @ T_{50}
0.50 ft.^{2}/day

Figure 10

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Gray, Fat CLAY		

LL	PI	Sp. Gr.	Overburden (tsf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (tsf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.63	1.25	79.6		39.7 %	22.3 %	99.9 %	90.1 %	1.044	0.651	0.97	0.32

Preparation Process:	D2435 Method	C_r	Swell Press. (tsf)	Heave %
Condition of Test:		0.04		

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

Location: D7-10W

Remarks:
Boring D7-10W
Sample Obtained 10/15/10

Checked By:

Title:

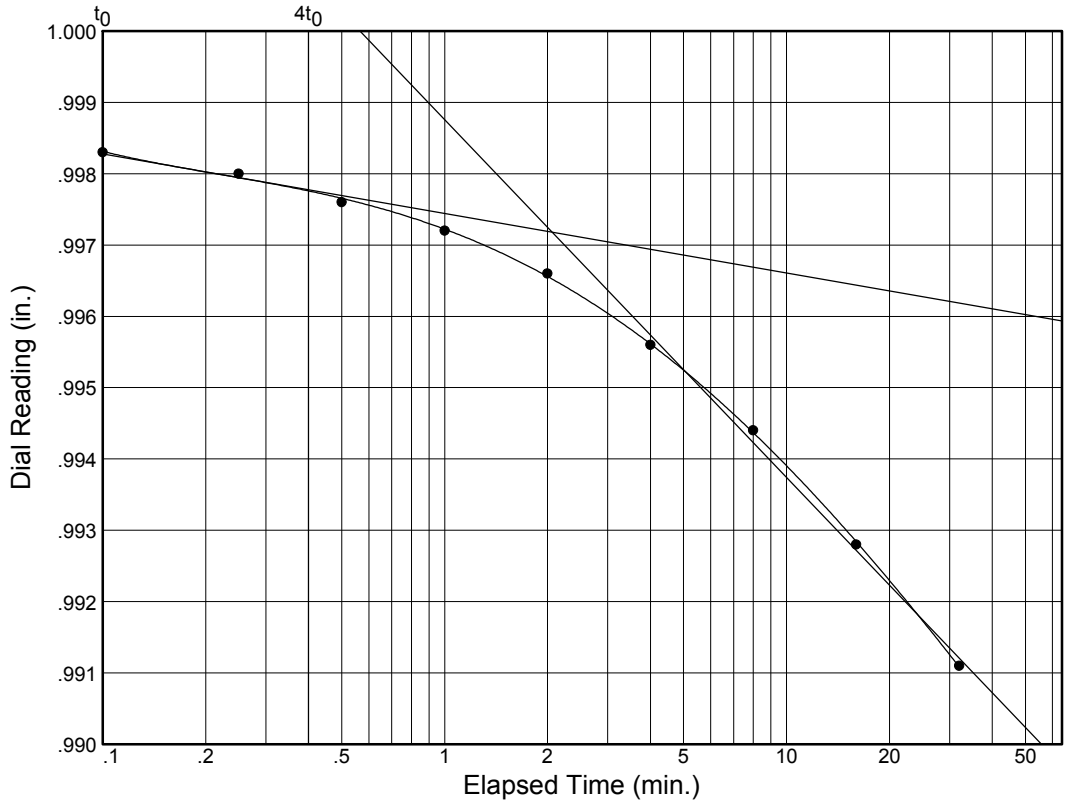
CONSOLIDATION TEST REPORT

GET SOLUTIONS, INC.

Figure 1

Dial Reading vs. Time

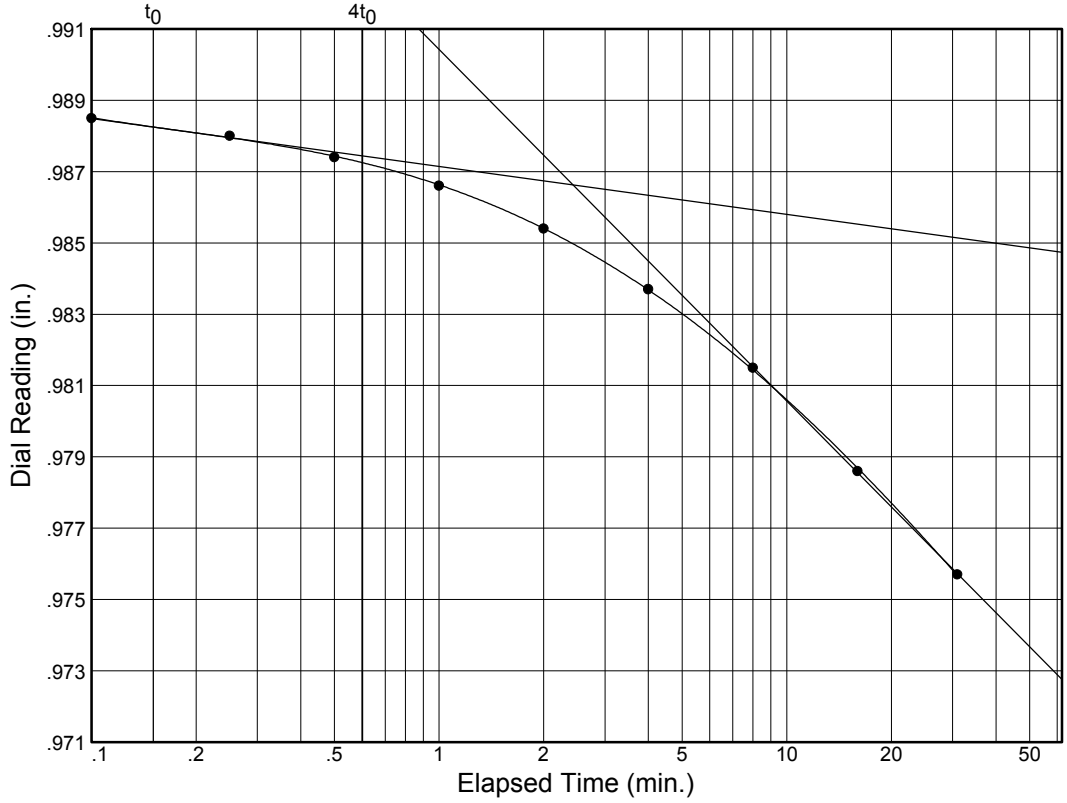
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 1
Load= 0.13 tsf
D_0 = 0.99887
D_{50} = 0.99802
D_{100} = 0.99718
T_{50} = 0.20 min.

C_v @ T_{50}
2.43 ft.^{2}/day

C_α = 0.005



Load No.= 2
Load= 0.25 tsf
D_0 = 0.98925
D_{50} = 0.98794
D_{100} = 0.98663
T_{50} = 0.25 min.

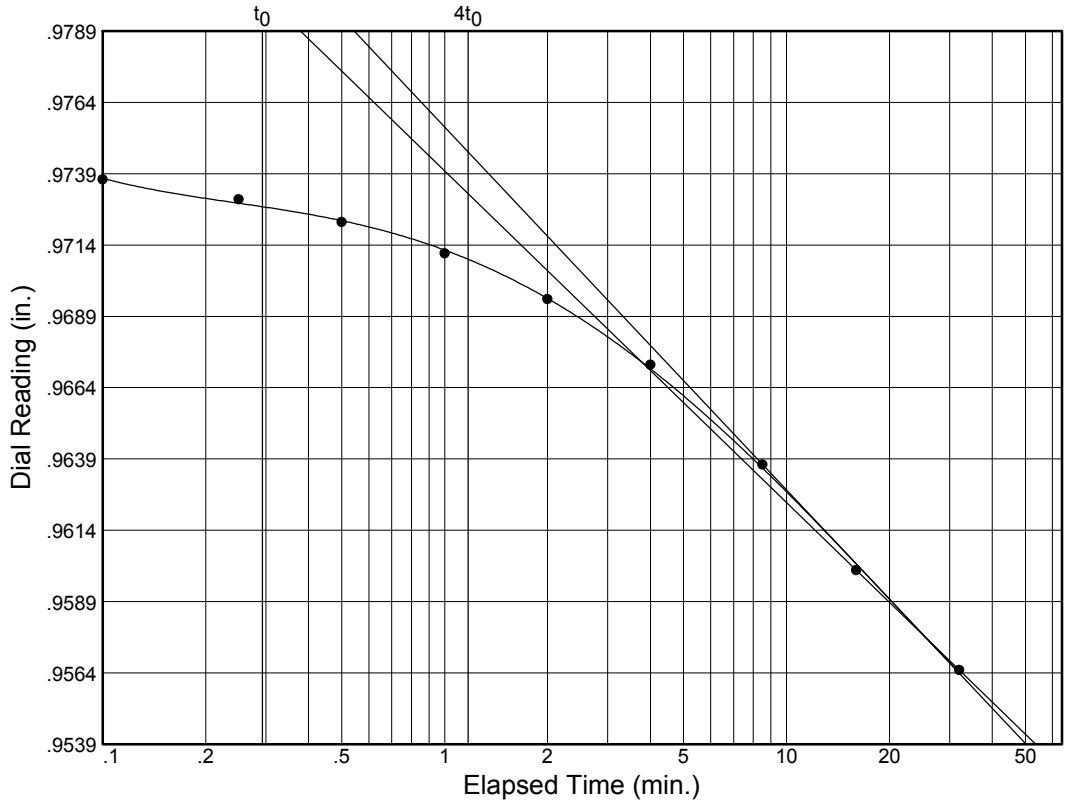
C_v @ T_{50}
1.87 ft.^{2}/day

C_α = 0.010

Figure 2

Dial Reading vs. Time

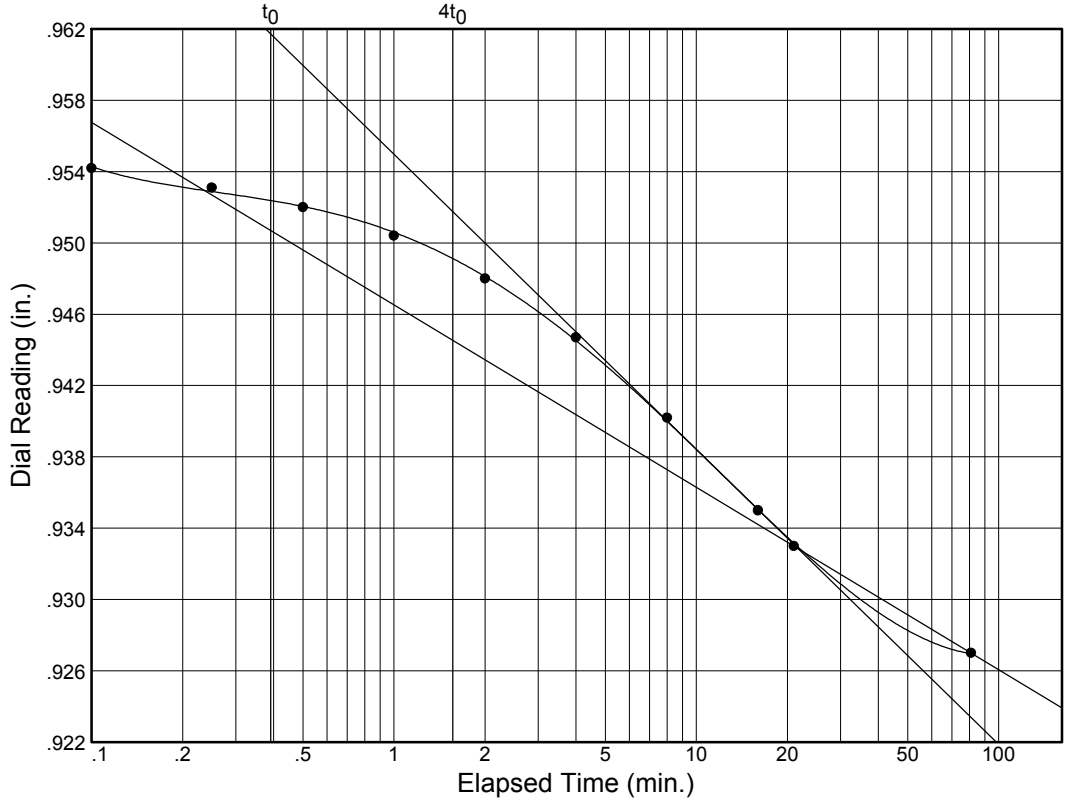
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 3
Load= 0.50 tsf
D_0 = 0.97458
D_{50} = 0.96610
D_{100} = 0.95761
T_{50} = 5.02 min.

C_v @ T_{50}
0.09 ft.^{2}/day

C_α = 0.012



Load No.= 4
Load= 1.00 tsf
D_0 = 0.95564
D_{50} = 0.94425
D_{100} = 0.93286
T_{50} = 4.19 min.

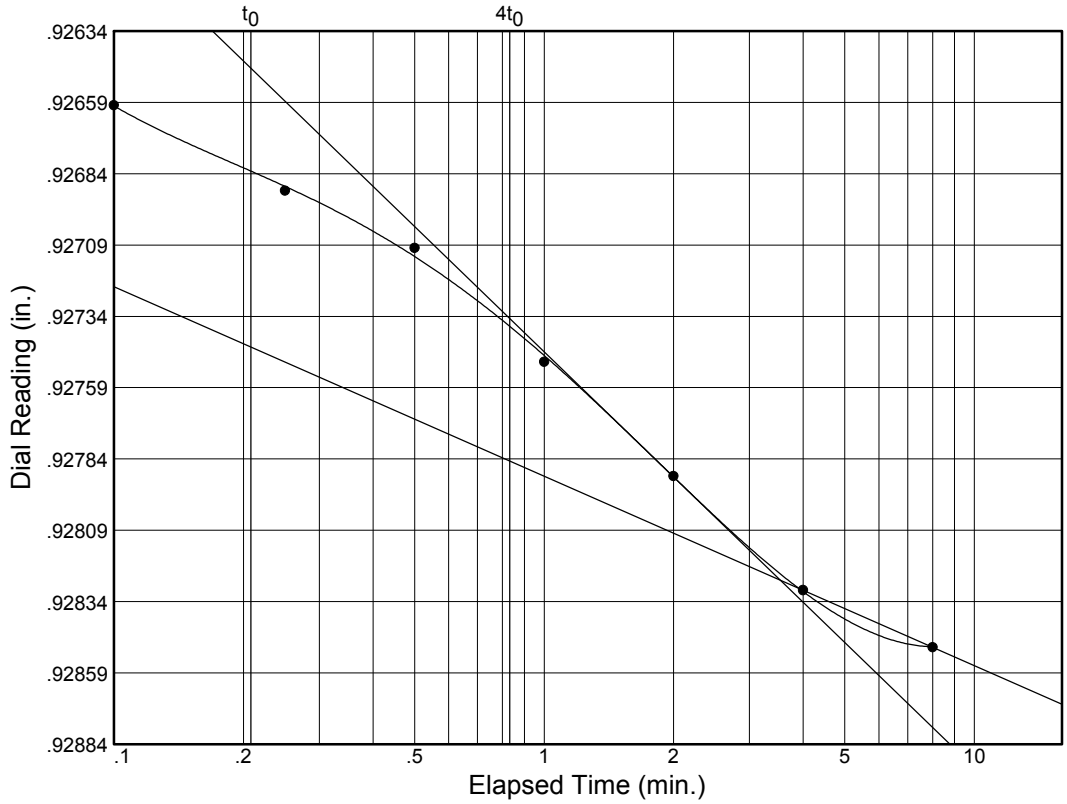
C_v @ T_{50}
0.10 ft.^{2}/day

C_α = 0.011

Figure 3

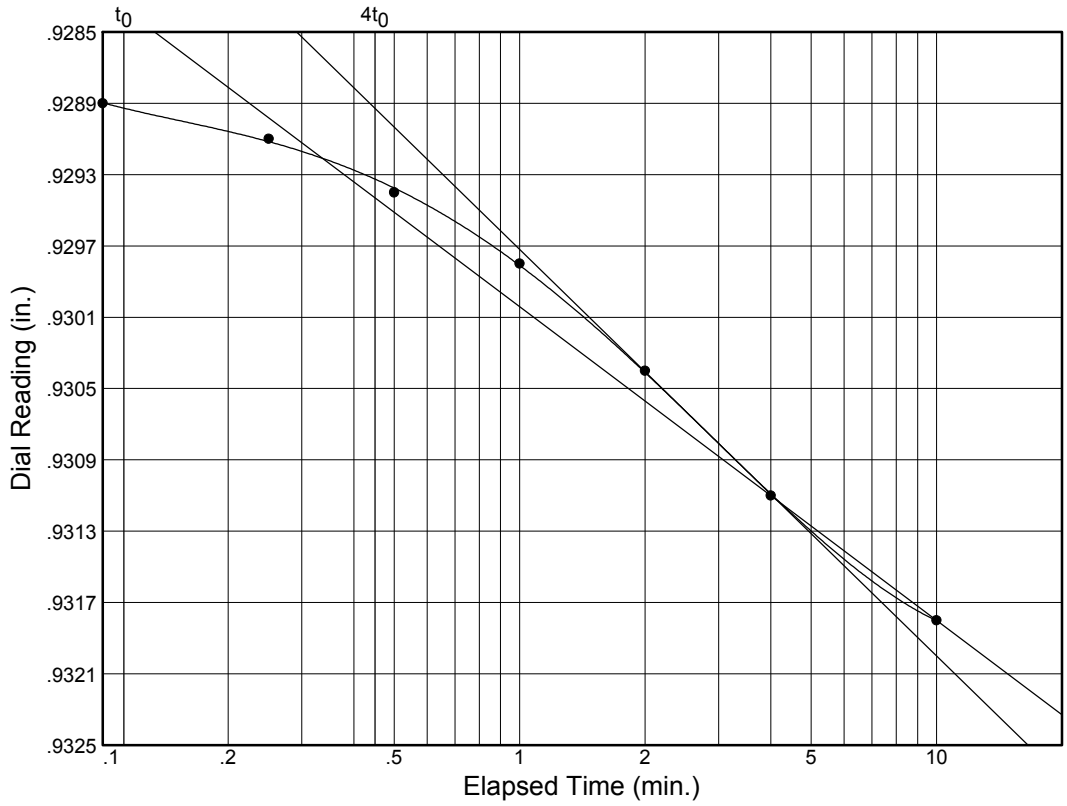
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 5
Load= 0.50 tsf
D_0 = 0.92629
D_{50} = 0.92728
D_{100} = 0.92826
T_{50} = 0.69 min.

C_v @ T_{50}
0.62 ft.^{2}/day



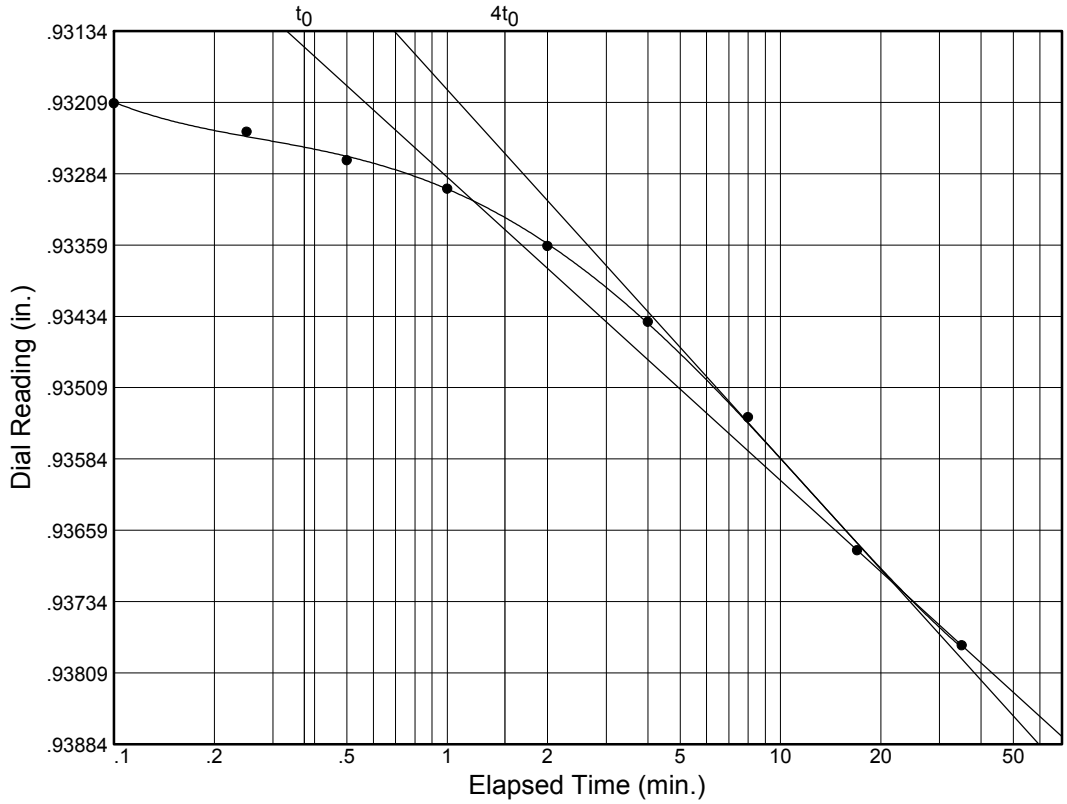
Load No.= 6
Load= 0.25 tsf
D_0 = 0.92853
D_{50} = 0.92983
D_{100} = 0.93112
T_{50} = 1.02 min.

C_v @ T_{50}
0.42 ft.^{2}/day

Figure 4

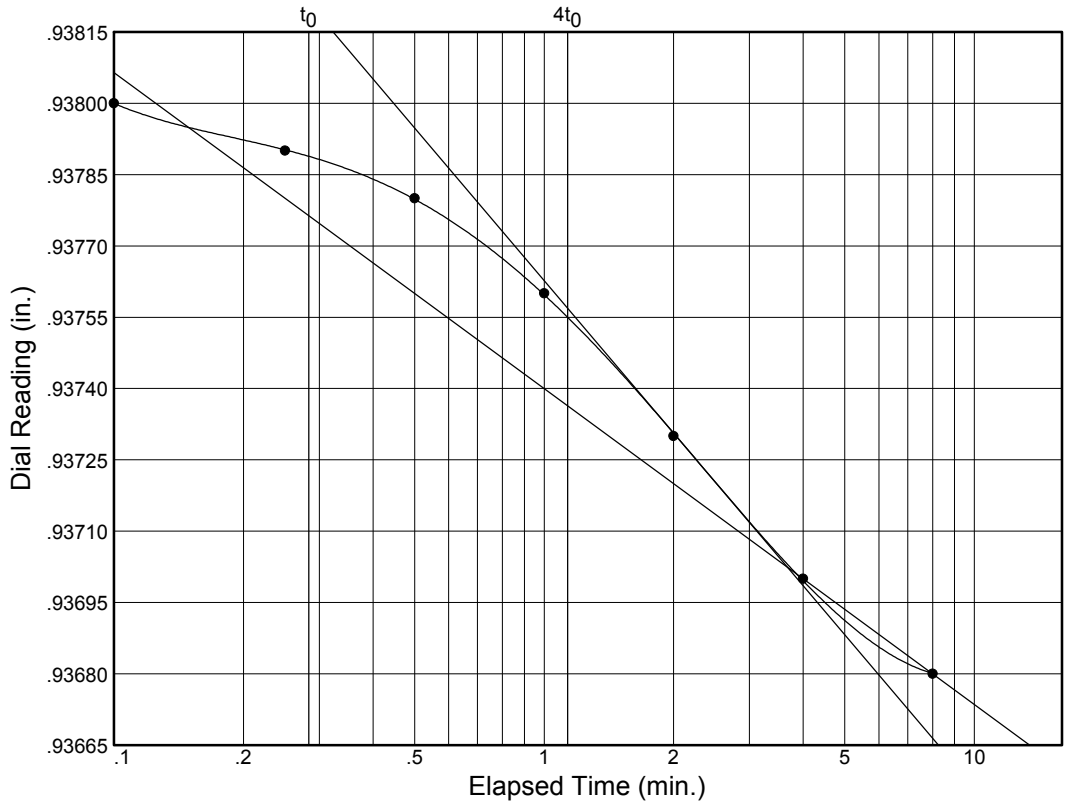
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 7
Load= 0.13 tsf
D_0 = 0.93182
D_{50} = 0.93448
D_{100} = 0.93714
T_{50} = 4.19 min.

C_v @ T_{50}
0.10 ft.^{2}/day



Load No.= 8
Load= 0.25 tsf
D_0 = 0.93823
D_{50} = 0.93763
D_{100} = 0.93702
T_{50} = 0.92 min.

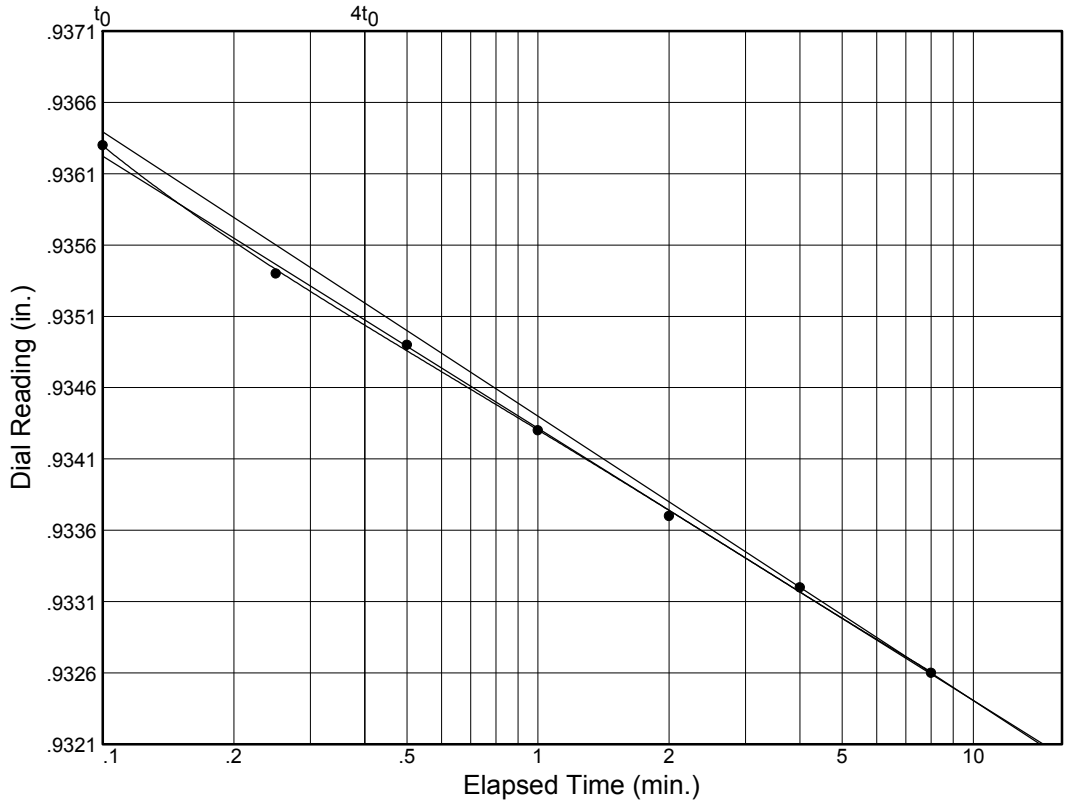
C_v @ T_{50}
0.47 ft.^{2}/day

C_α = 0.001

Figure 5

Dial Reading vs. Time

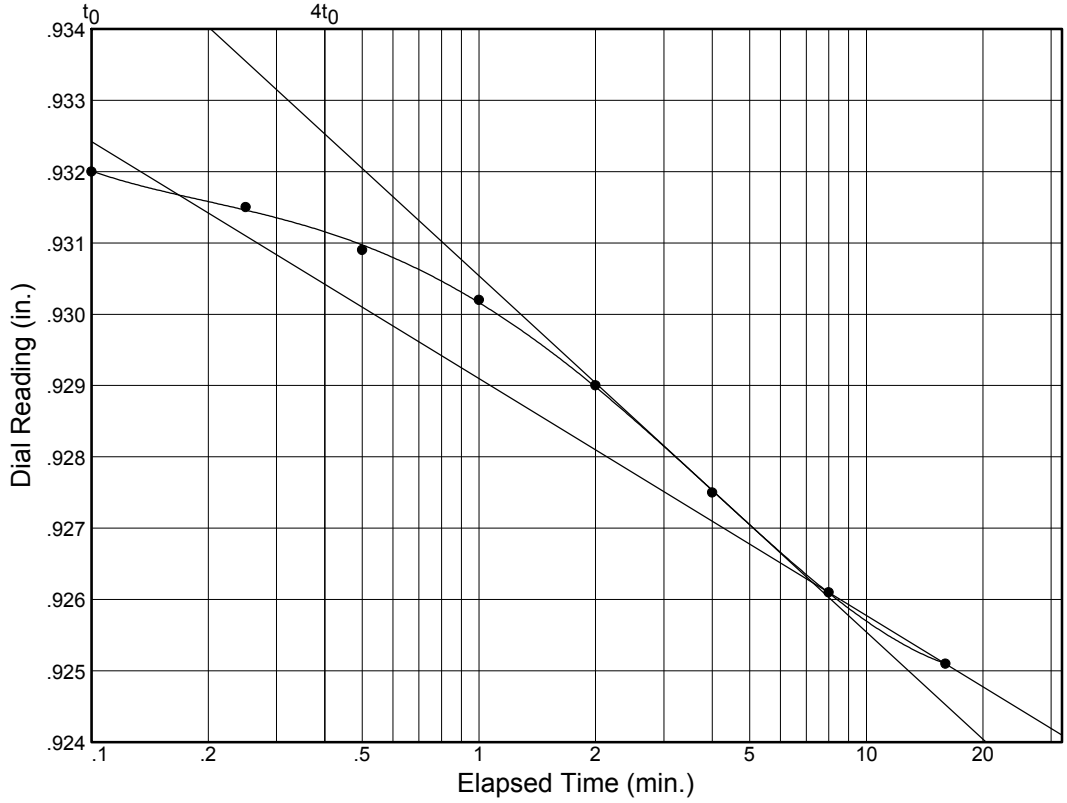
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 9
Load= 0.50 tsf
D_0 = 0.93755
D_{50} = 0.93498
D_{100} = 0.93242
T_{50} = 0.43 min.

C_v @ T_{50}
1.01 ft.^{2}/day

C_α = 0.002



Load No.= 10
Load= 1.00 tsf
D_0 = 0.93286
D_{50} = 0.92955
D_{100} = 0.92625
T_{50} = 1.47 min.

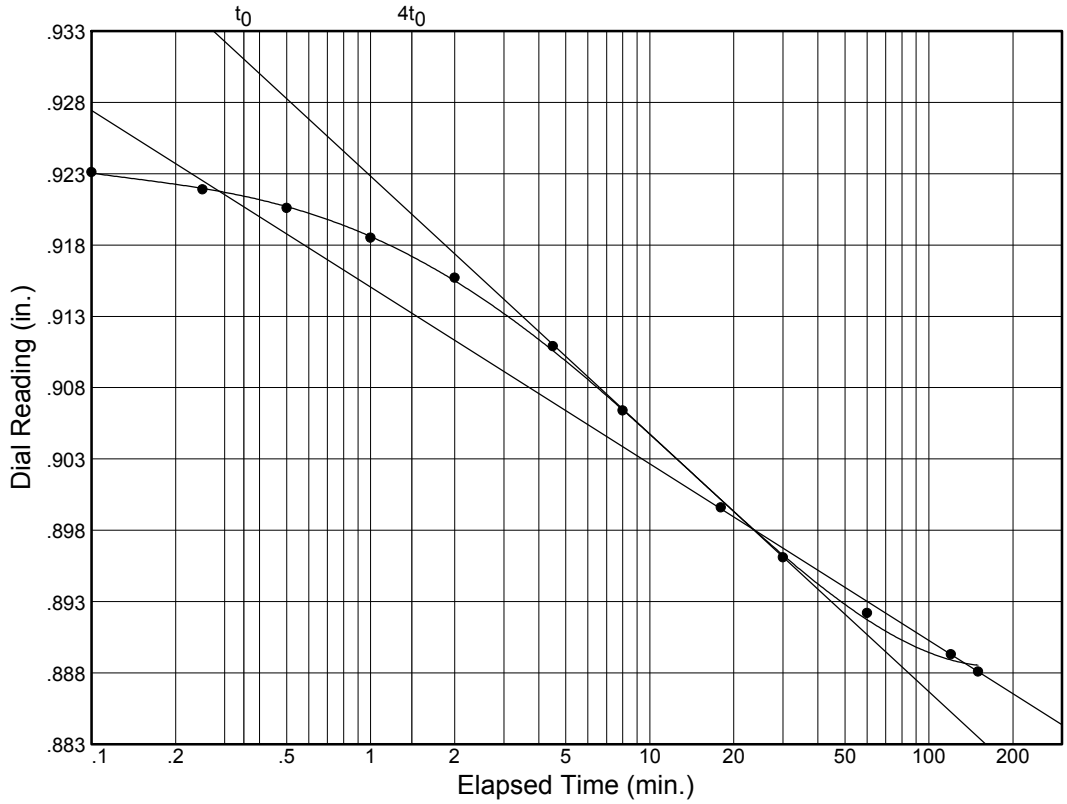
C_v @ T_{50}
0.29 ft.^{2}/day

C_α = 0.004

Figure 6

Dial Reading vs. Time

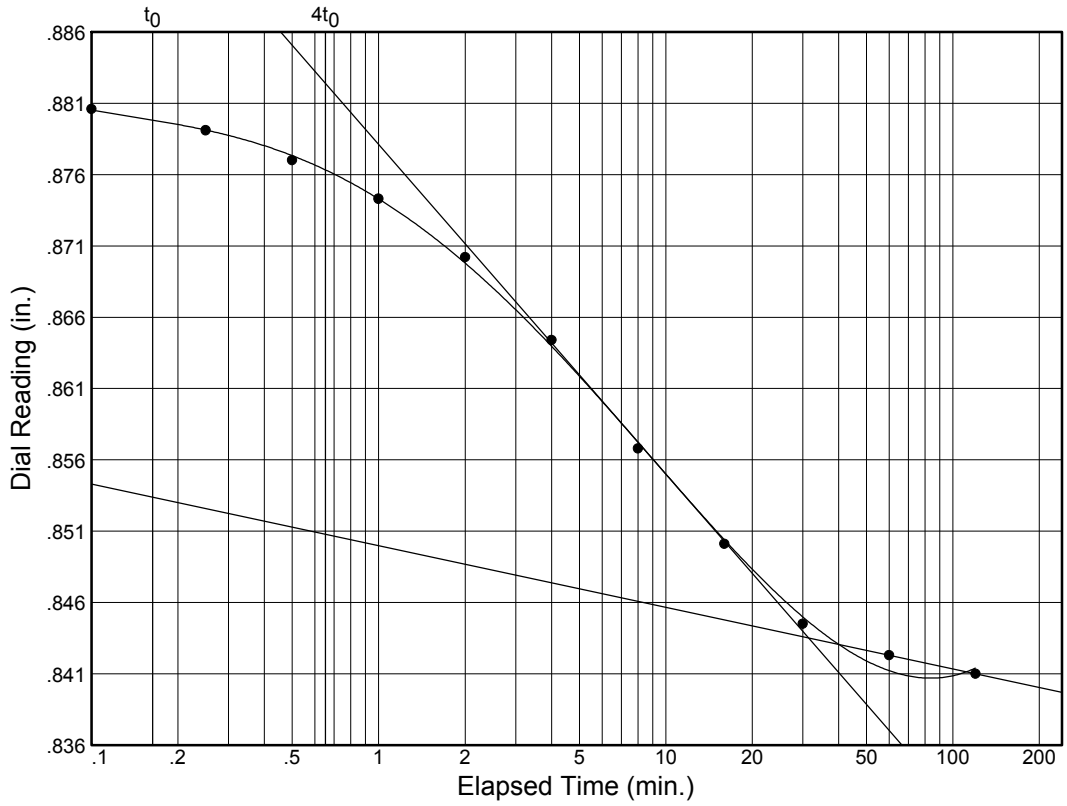
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 11
Load= 2.00 tsf
D_0 = 0.92565
D_{50} = 0.91188
D_{100} = 0.89812
T_{50} = 3.70 min.

C_v @ T_{50}
0.11 ft.^{2}/day

C_α = 0.013



Load No.= 12
Load= 4.00 tsf
D_0 = 0.88332
D_{50} = 0.86341
D_{100} = 0.84351
T_{50} = 4.25 min.

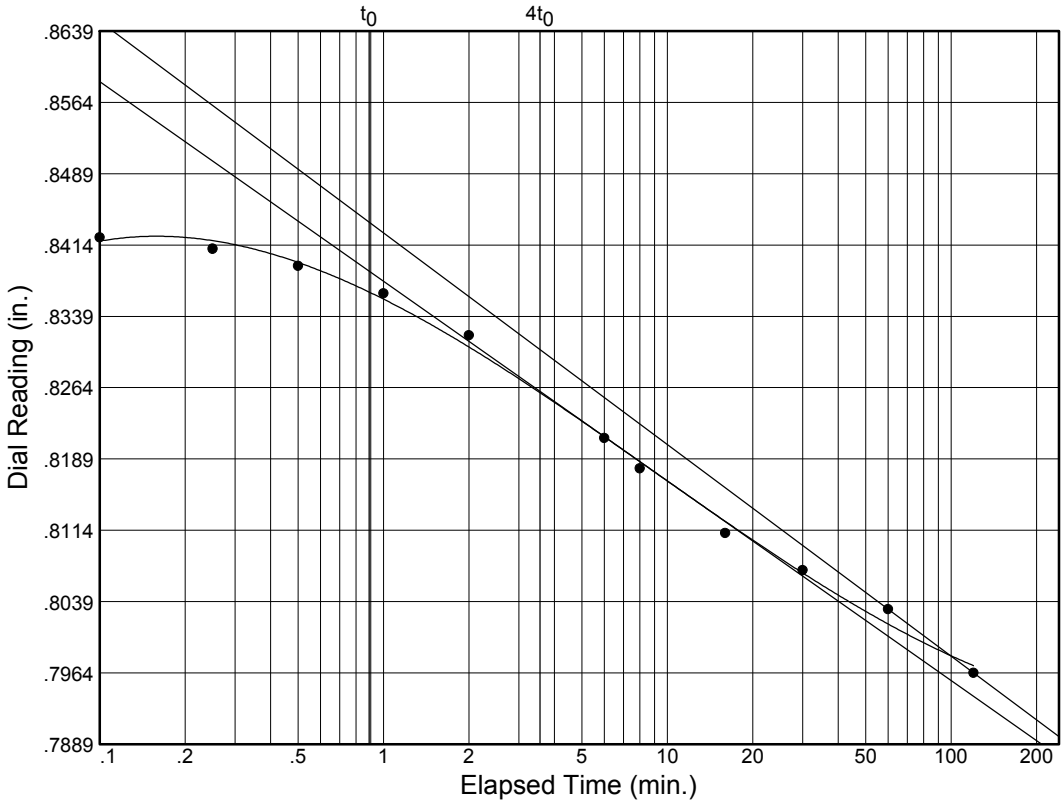
C_v @ T_{50}
0.09 ft.^{2}/day

C_α = 0.005

Figure 7

Dial Reading vs. Time

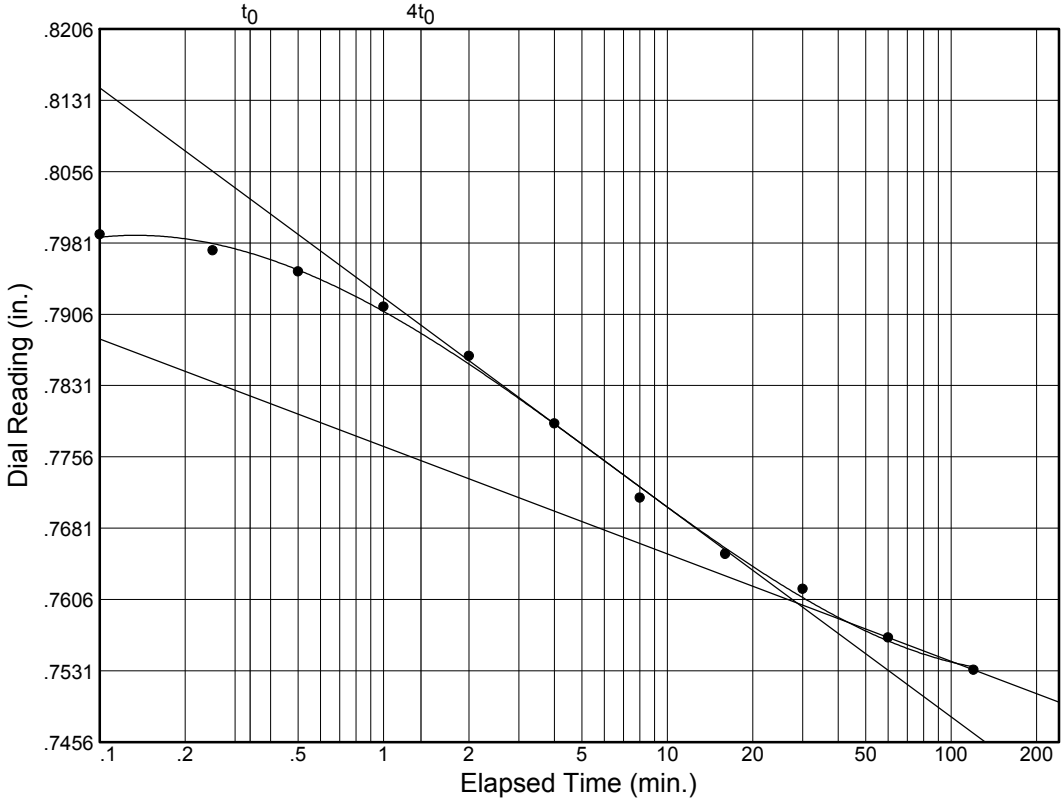
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 13
Load= 8.00 tsf
D_0 = 0.84703
D_{50} = 0.79984
D_{100} = 0.75265
T_{50} = 76.93 min.

C_v @ T_{50}
0.00 ft.^{2}/day

C_α = 0.027



Load No.= 14
Load= 16.00 tsf
D_0 = 0.80547
D_{50} = 0.78285
D_{100} = 0.76024
T_{50} = 2.65 min.

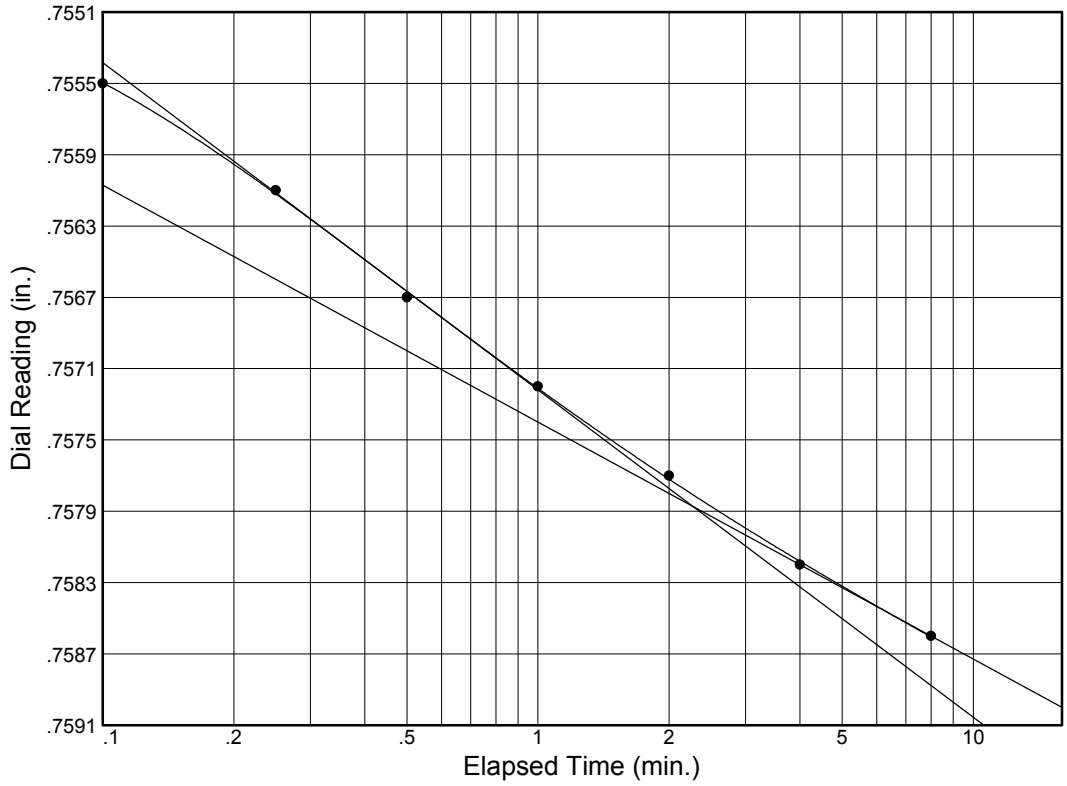
C_v @ T_{50}
0.11 ft.^{2}/day

C_α = 0.014

Figure 8

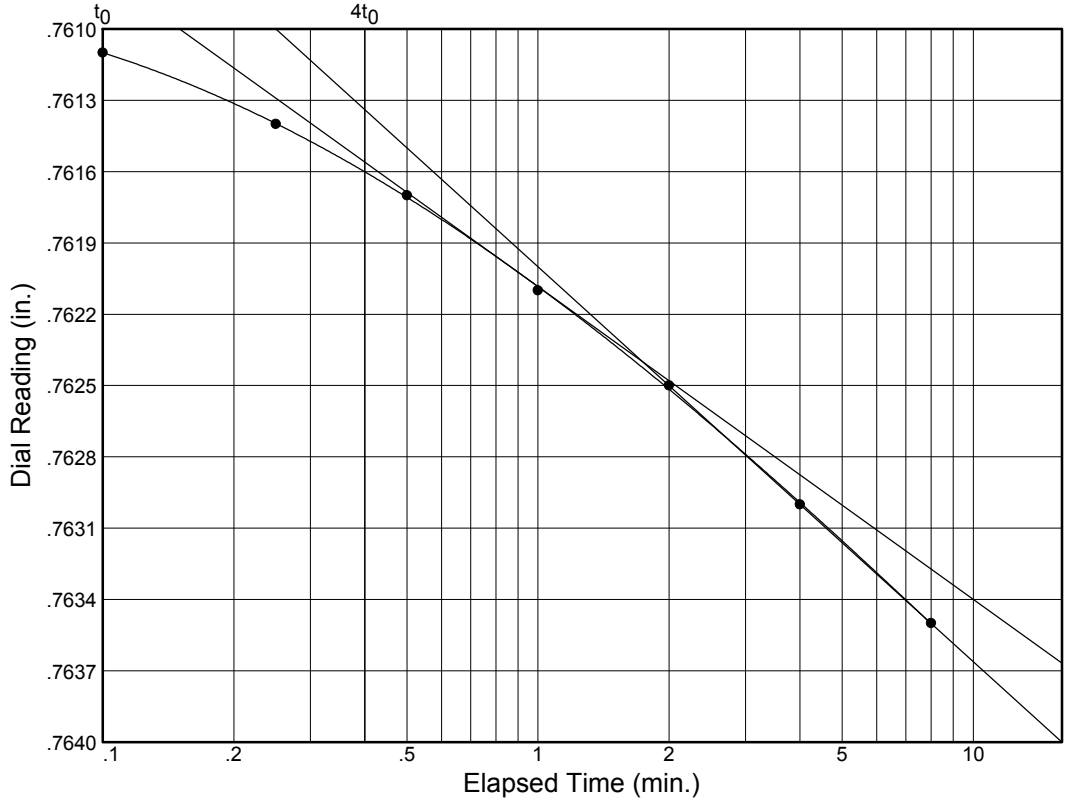
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 15
Load= 8.00 tsf
D_0 = 0.75320
D_{50} = 0.75554
D_{100} = 0.75787
T_{50} = 0.11 min.

C_v @ T_{50}
2.62 ft.^{2}/day



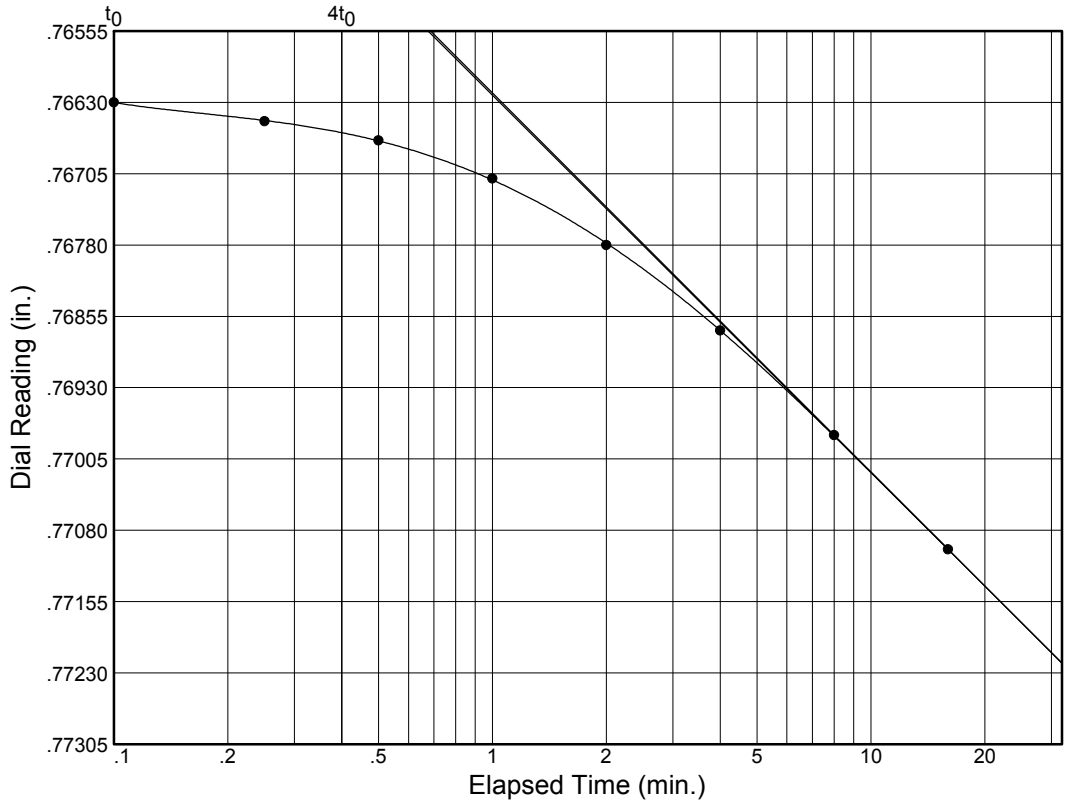
Load No.= 16
Load= 4.00 tsf
D_0 = 0.76060
D_{50} = 0.76150
D_{100} = 0.76240
T_{50} = 0.32 min.

C_v @ T_{50}
0.89 ft.^{2}/day

Figure 9

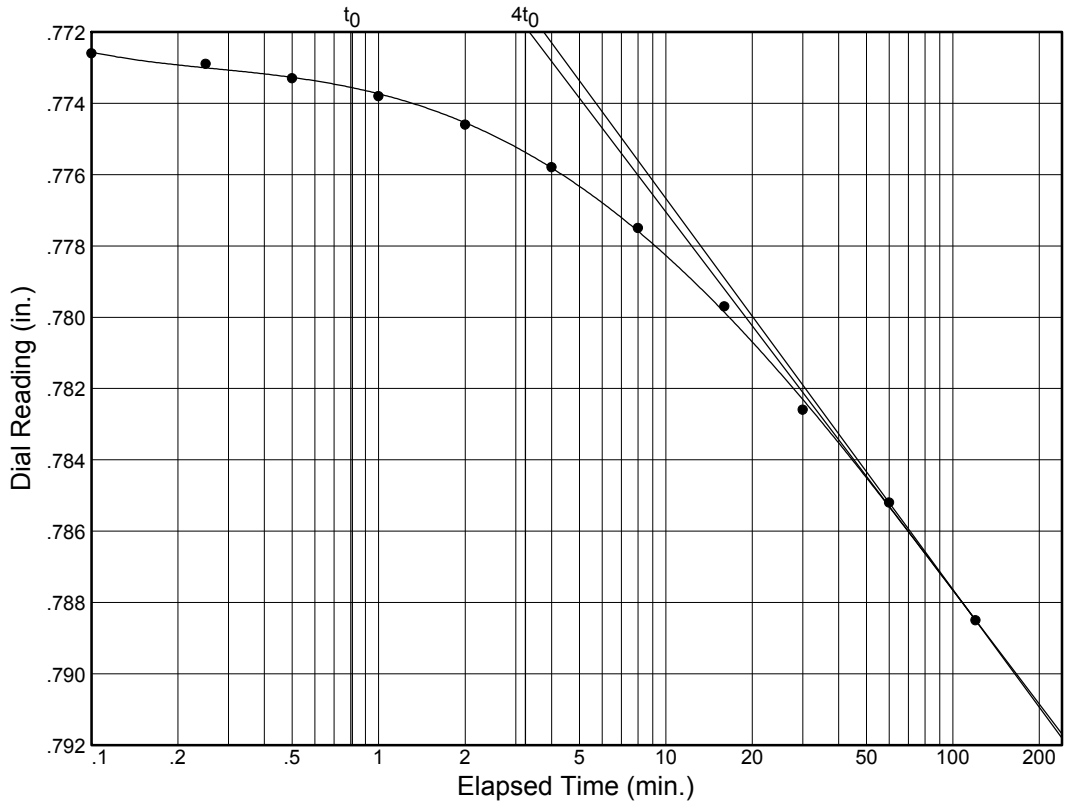
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 17
Load= 1.00 tsf
D_0 = 0.76599
D_{50} = 0.76854
D_{100} = 0.77109
T_{50} = 3.58 min.

C_v @ T_{50}
0.08 ft.^{2}/day



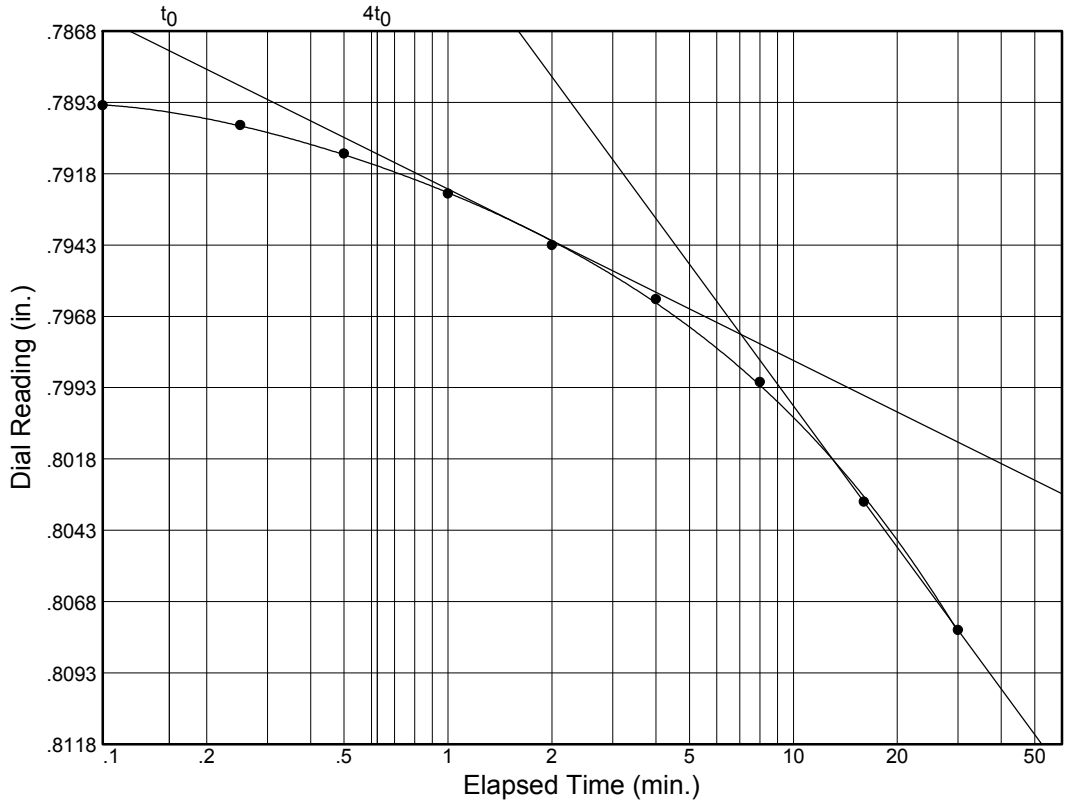
Load No.= 18
Load= 0.25 tsf
D_0 = 0.77175
D_{50} = 0.78001
D_{100} = 0.78827
T_{50} = 16.67 min.

C_v @ T_{50}
0.02 ft.^{2}/day

Figure 10

Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: D7-10W



Load No.= 19

Load= 0.13 tsf

D_0 = 0.78776

D_{50} = 0.79260

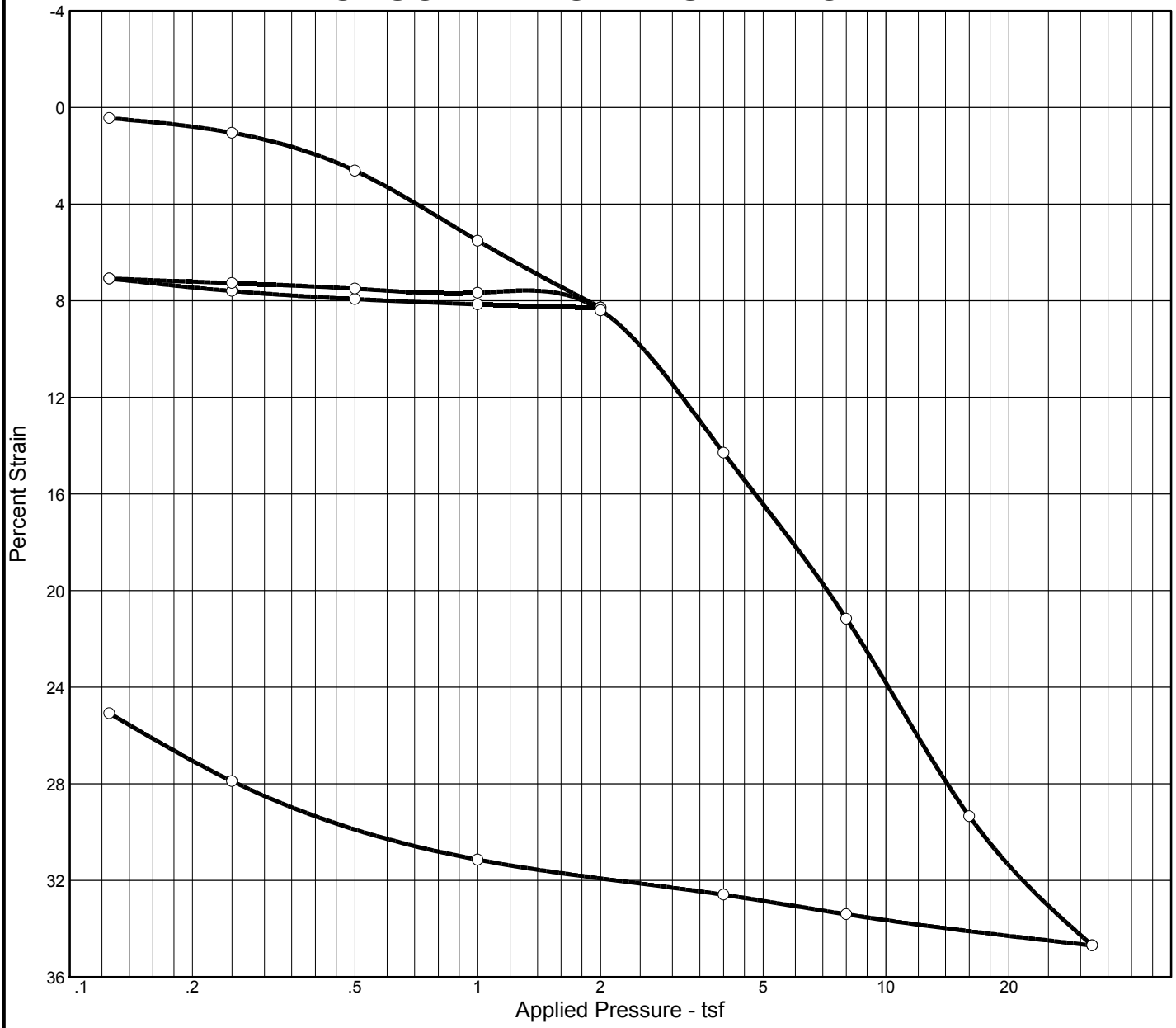
D_{100} = 0.79743

T_{50} = 1.06 min.

C_v @ T_{50}
0.29 ft.^{2}/day

Figure 11

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Gray, Fat CLAY		

LL	PI	Sp. Gr.	Overburden (tsf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (tsf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.71	2.70	62.1		56.1 %	34.7 %	100.0 %	100.0 %	1.521	0.889	0.49	0.43

Preparation Process:	D2435 Method	C_r	Swell Press. (tsf)	Heave %
Condition of Test:		0.06		

Project No. VB10-238G **Client:** HDR, Inc.

Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia

Location: CUR-4B

Remarks:
CUR-4B
Sample Obtained 10/15/10

Checked By:

Title:

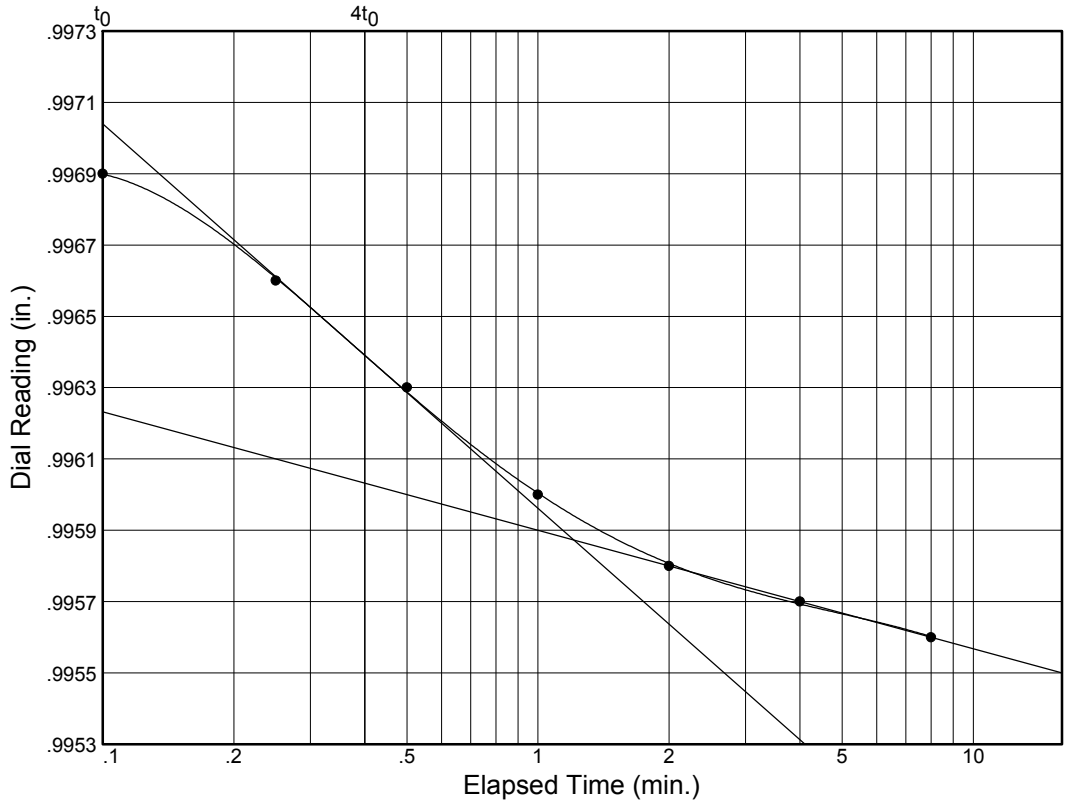
CONSOLIDATION TEST REPORT

GET SOLUTIONS, INC.

Figure

Dial Reading vs. Time

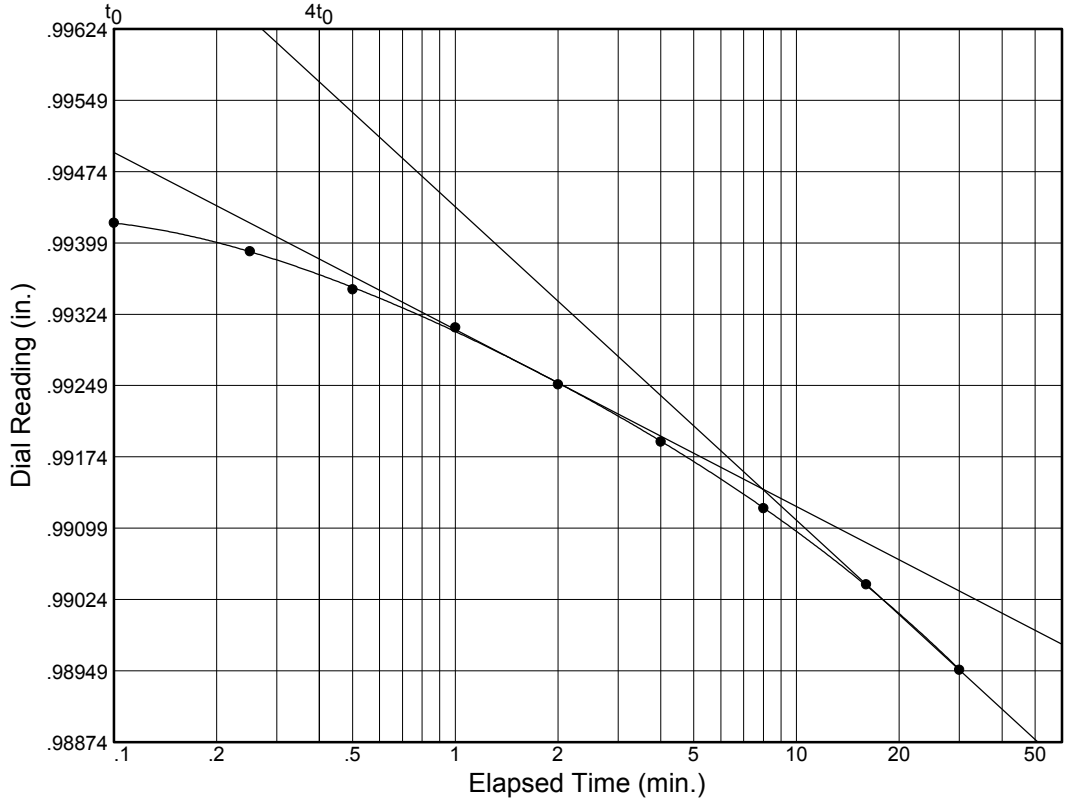
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 1
Load= 0.13 tsf
D_0 = 0.99741
D_{50} = 0.99664
D_{100} = 0.99587
T_{50} = 0.23 min.

C_v @ T_{50}
2.11 ft.^{2}/day

C_α = 0.000



Load No.= 2
Load= 0.25 tsf
D_0 = 0.99474
D_{50} = 0.99308
D_{100} = 0.99141
T_{50} = 0.98 min.

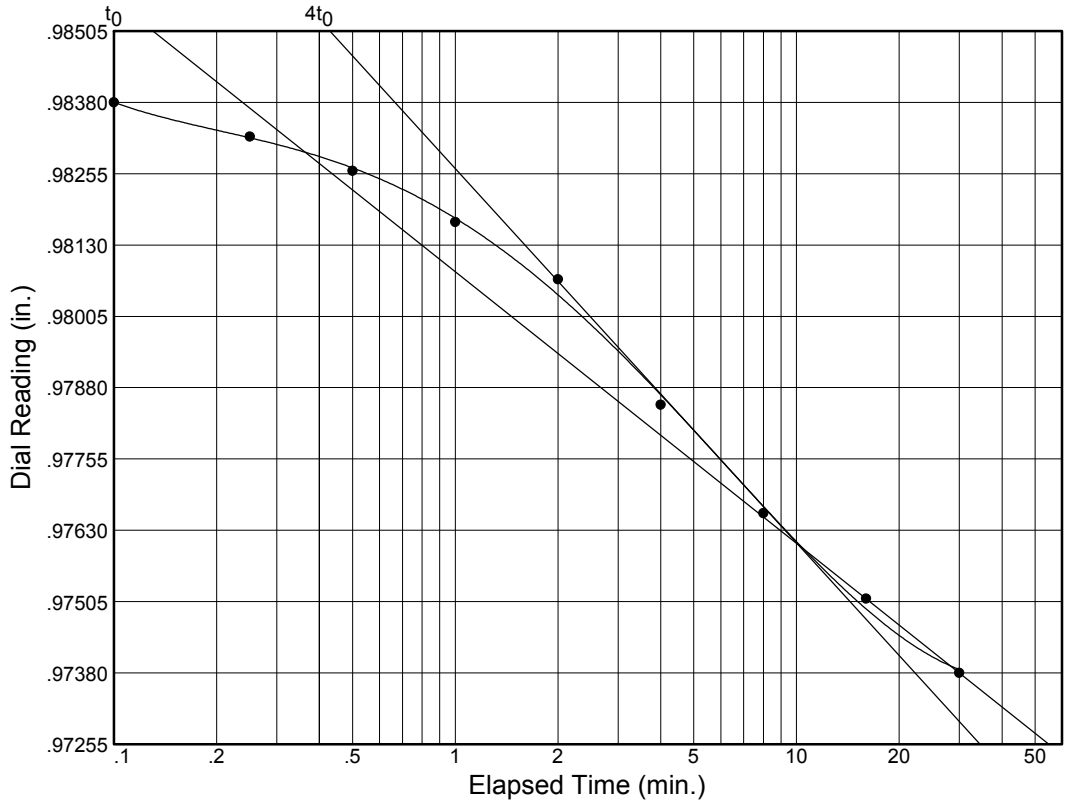
C_v @ T_{50}
0.50 ft.^{2}/day

C_α = 0.003

Figure

Dial Reading vs. Time

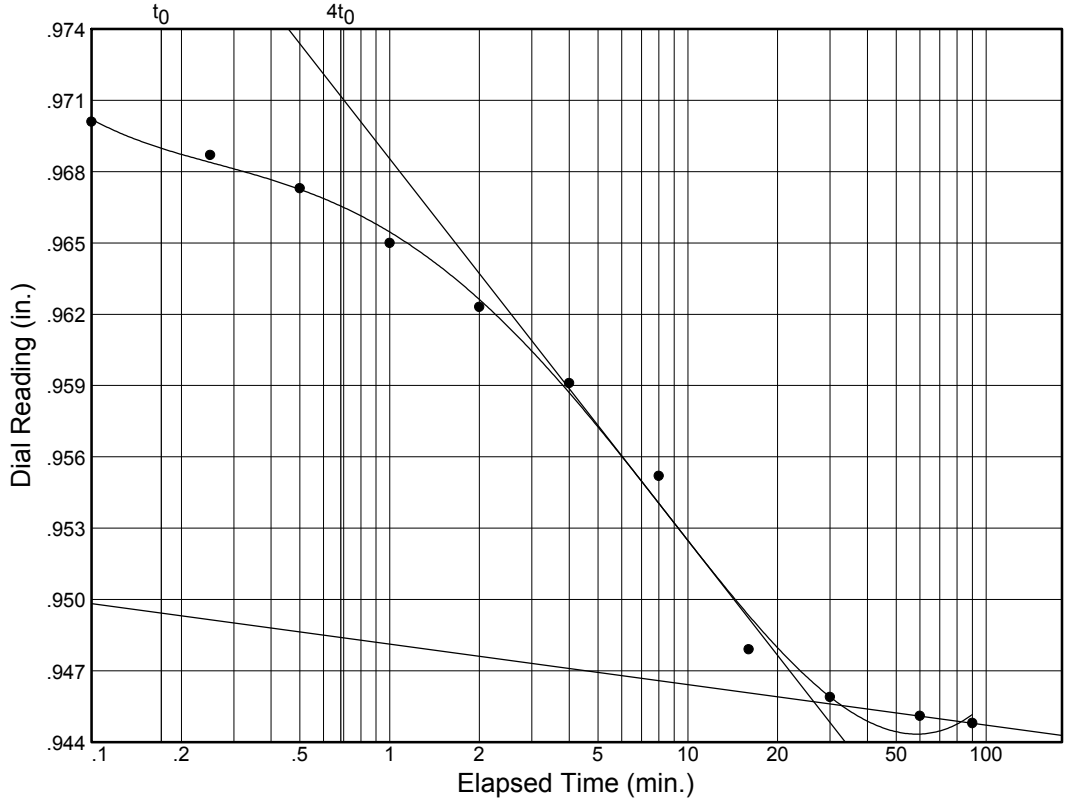
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 3
Load= 0.50 tsf
D_0 = 0.98475
D_{50} = 0.98040
D_{100} = 0.97605
T_{50} = 2.03 min.

C_v @ T_{50}
0.23 ft.^{2}/day

C_α = 0.005



Load No.= 4
Load= 1.00 tsf
D_0 = 0.97141
D_{50} = 0.95856
D_{100} = 0.94571
T_{50} = 4.09 min.

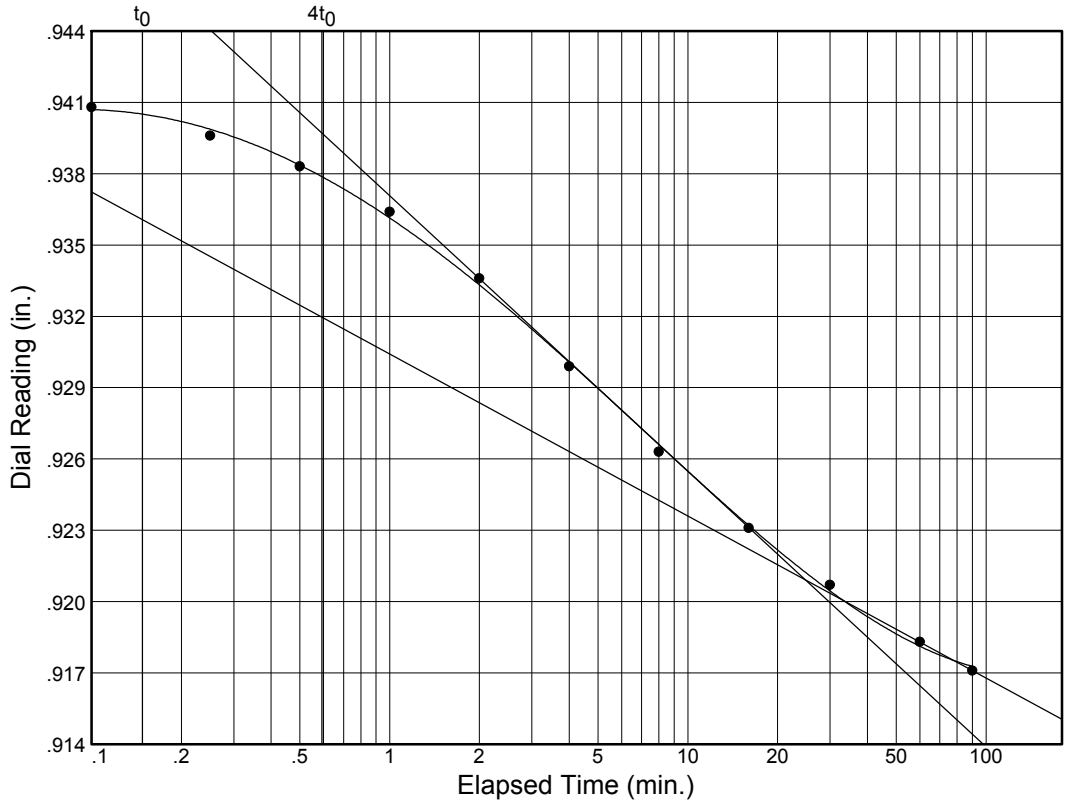
C_v @ T_{50}
0.11 ft.^{2}/day

C_α = 0.002

Figure

Dial Reading vs. Time

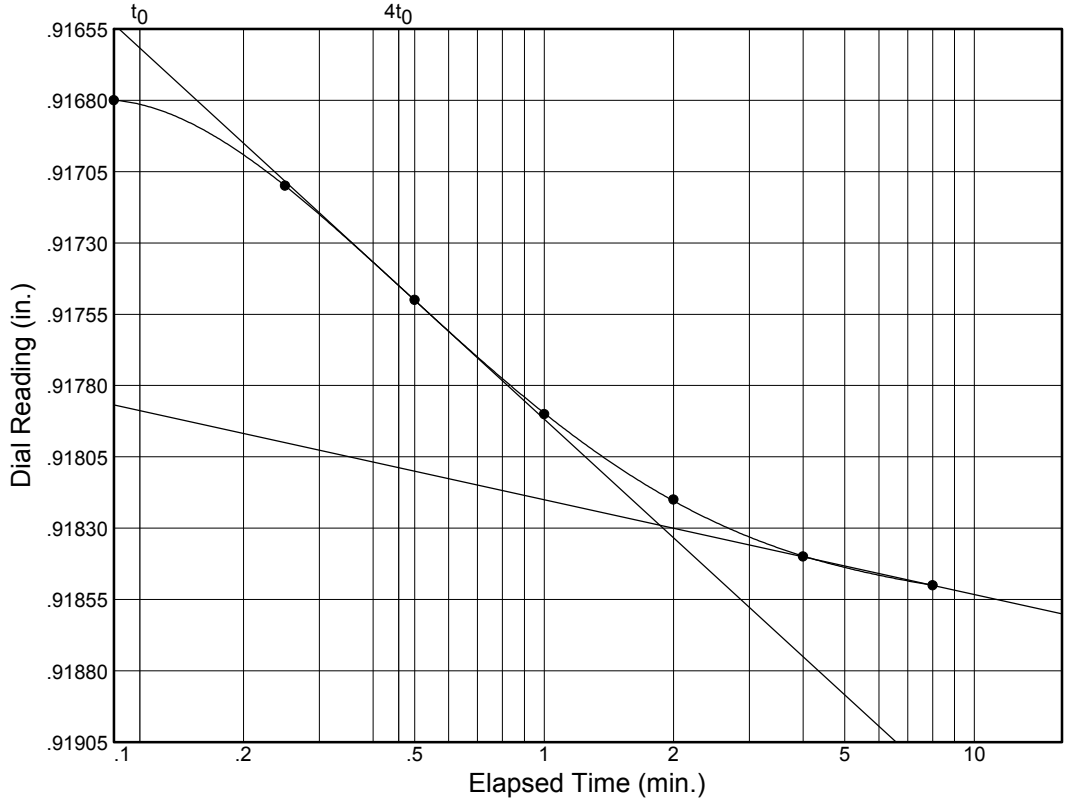
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 5
Load= 2.00 tsf
D_0 = 0.94314
D_{50} = 0.93203
D_{100} = 0.92092
T_{50} = 2.66 min.

C_v @ T_{50}
0.16 ft.^{2}/day

C_α = 0.007



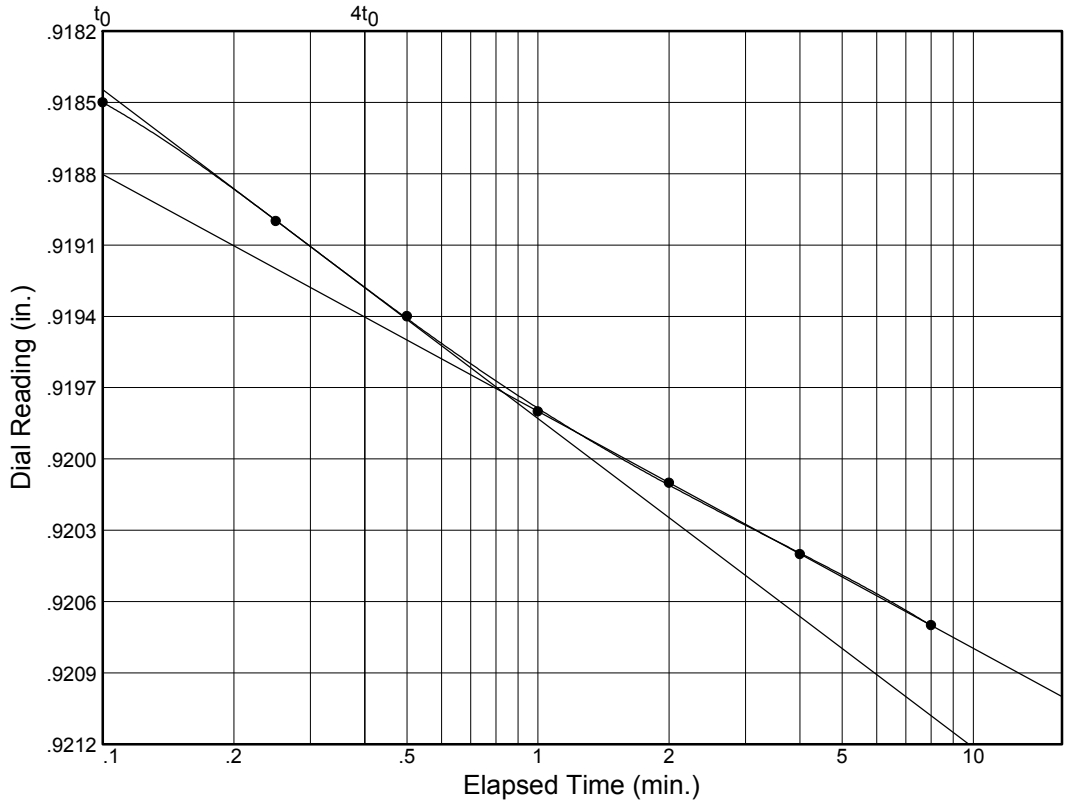
Load No.= 6
Load= 1.00 tsf
D_0 = 0.91618
D_{50} = 0.91723
D_{100} = 0.91829
T_{50} = 0.32 min.

C_v @ T_{50}
1.30 ft.^{2}/day

Figure

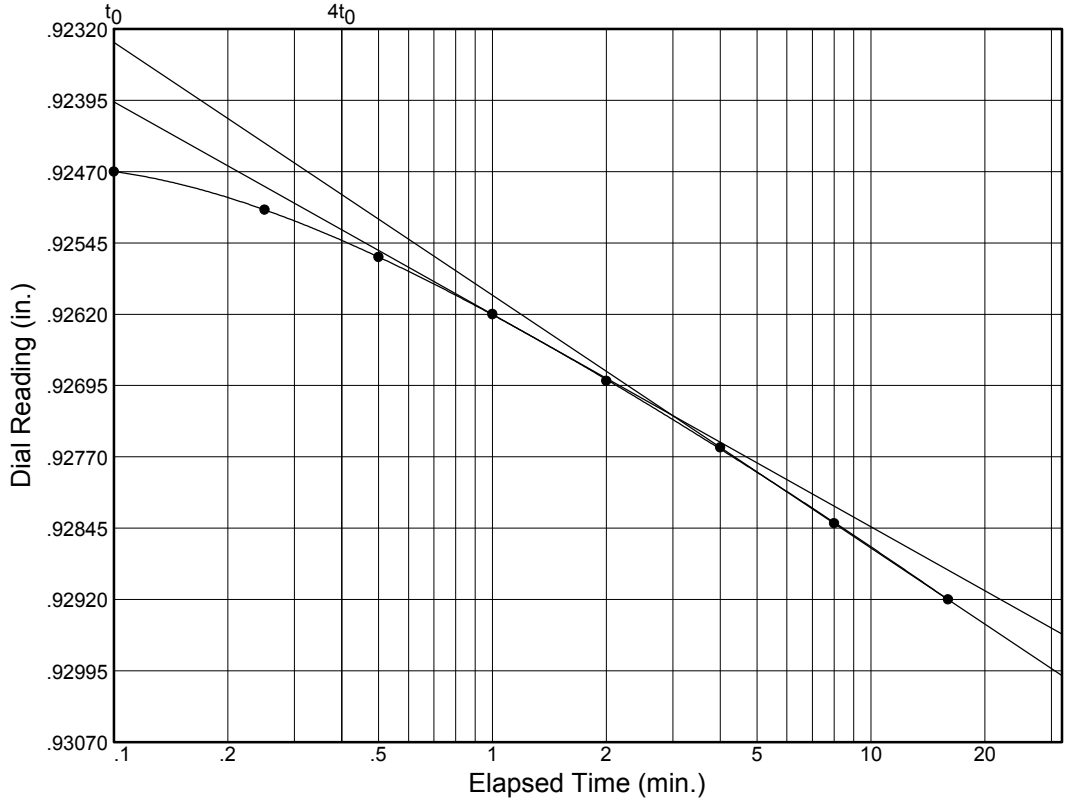
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 7
Load= 0.50 tsf
D_0 = 0.91772
D_{50} = 0.91872
D_{100} = 0.91972
T_{50} = 0.16 min.

C_v @ T_{50}
2.67 ft.^{2}/day



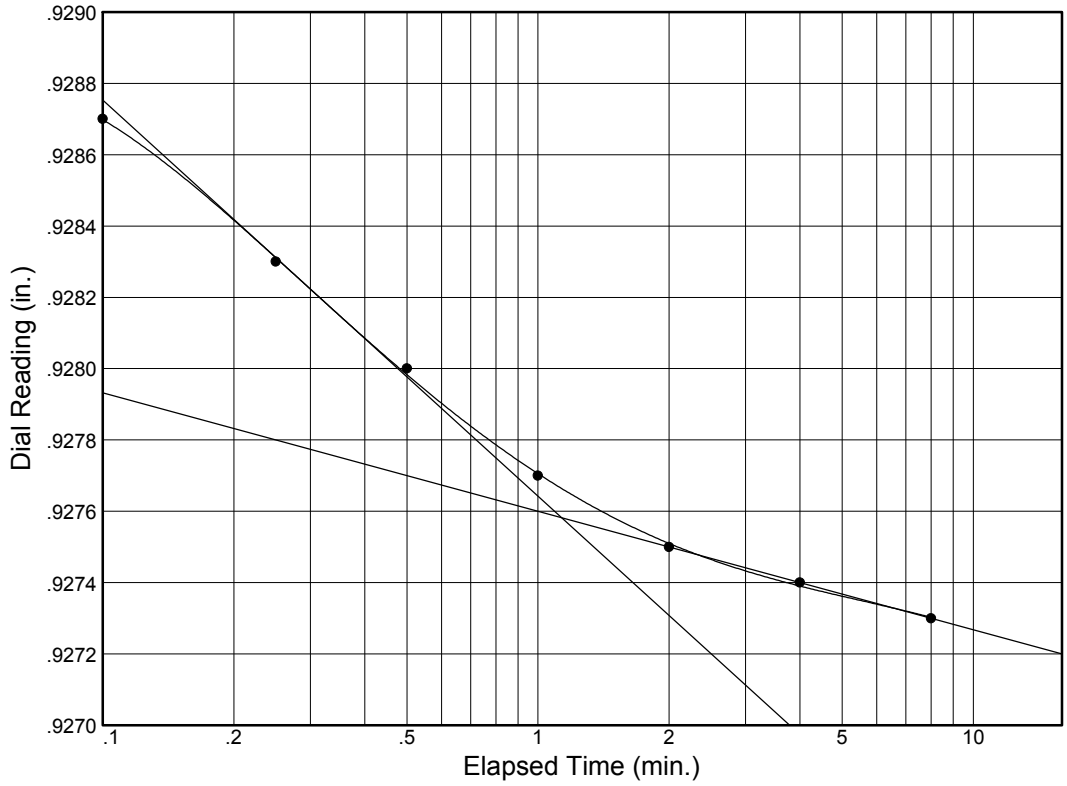
Load No.= 9
Load= 0.13 tsf
D_0 = 0.92398
D_{50} = 0.92562
D_{100} = 0.92726
T_{50} = 0.51 min.

C_v @ T_{50}
0.83 ft.^{2}/day

Figure

Dial Reading vs. Time

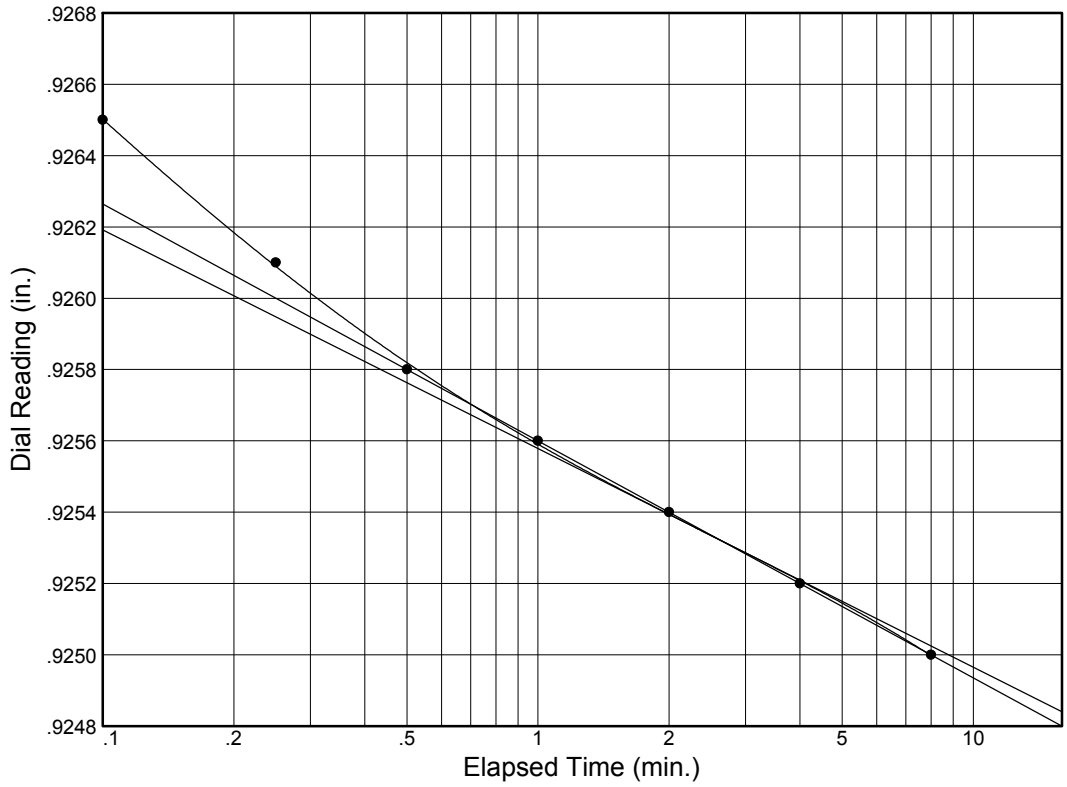
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 10
Load= 0.25 tsf
D_0 = 0.92920
D_{50} = 0.92839
D_{100} = 0.92758
T_{50} = 0.21 min.

C_v @ T_{50}
2.01 ft.^{2}/day

C_α = 0.000



Load No.= 11
Load= 0.50 tsf
D_0 = 0.92730
D_{50} = 0.92631
D_{100} = 0.92532
T_{50} = 0.15 min.

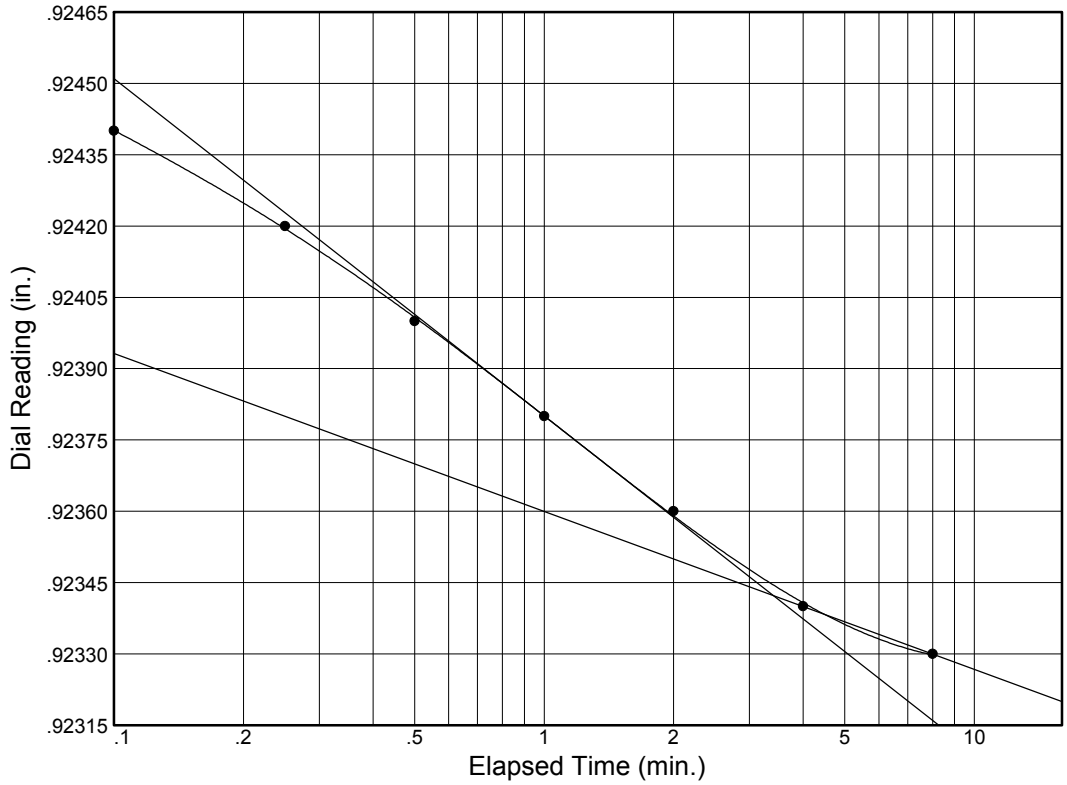
C_v @ T_{50}
2.80 ft.^{2}/day

C_α = 0.001

Figure

Dial Reading vs. Time

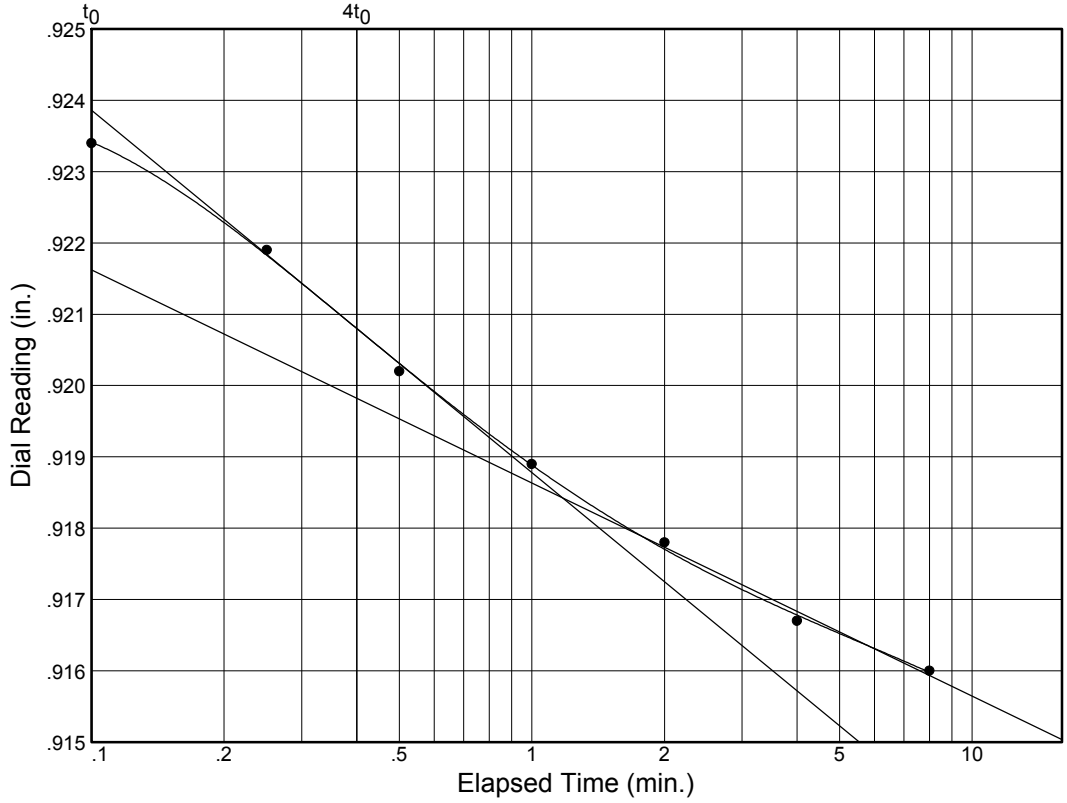
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 12
Load= 1.00 tsf
D_0 = 0.92500
D_{50} = 0.92421
D_{100} = 0.92342
T_{50} = 0.23 min.

C_v @ T_{50}
1.80 ft.^{2}/day

C_α = 0.000



Load No.= 13
Load= 2.00 tsf
D_0 = 0.92602
D_{50} = 0.92222
D_{100} = 0.91842
T_{50} = 0.21 min.

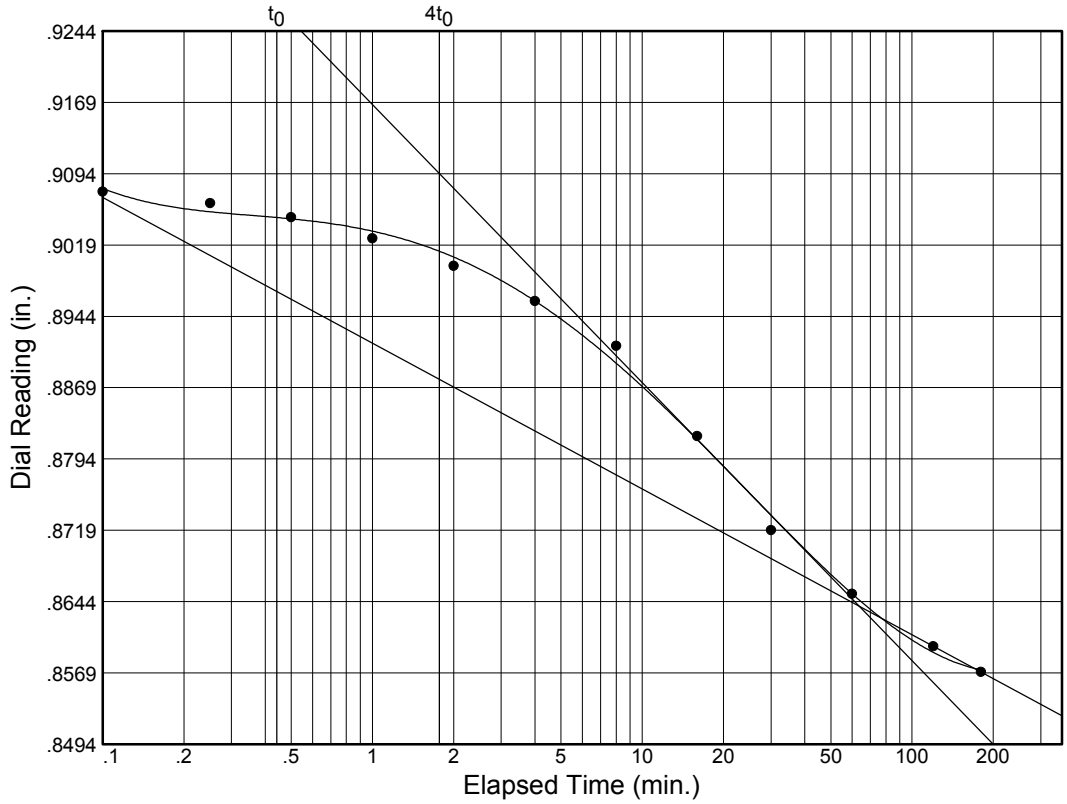
C_v @ T_{50}
2.02 ft.^{2}/day

C_α = 0.003

Figure

Dial Reading vs. Time

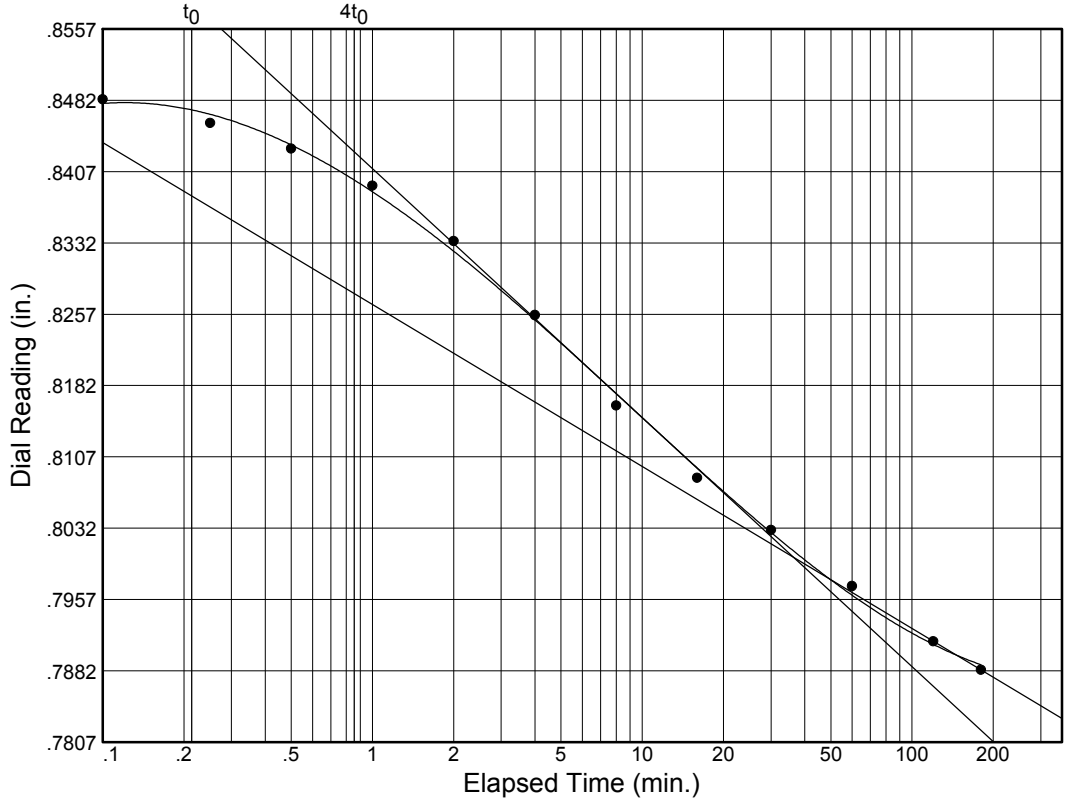
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 14
Load= 4.00 tsf
D_0 = 0.90833
D_{50} = 0.88612
D_{100} = 0.86390
T_{50} = 10.82 min.

C_v @ T_{50}
0.04 ft.^{2}/day

C_α = 0.017



Load No.= 15
Load= 8.00 tsf
D_0 = 0.85455
D_{50} = 0.82733
D_{100} = 0.80011
T_{50} = 3.25 min.

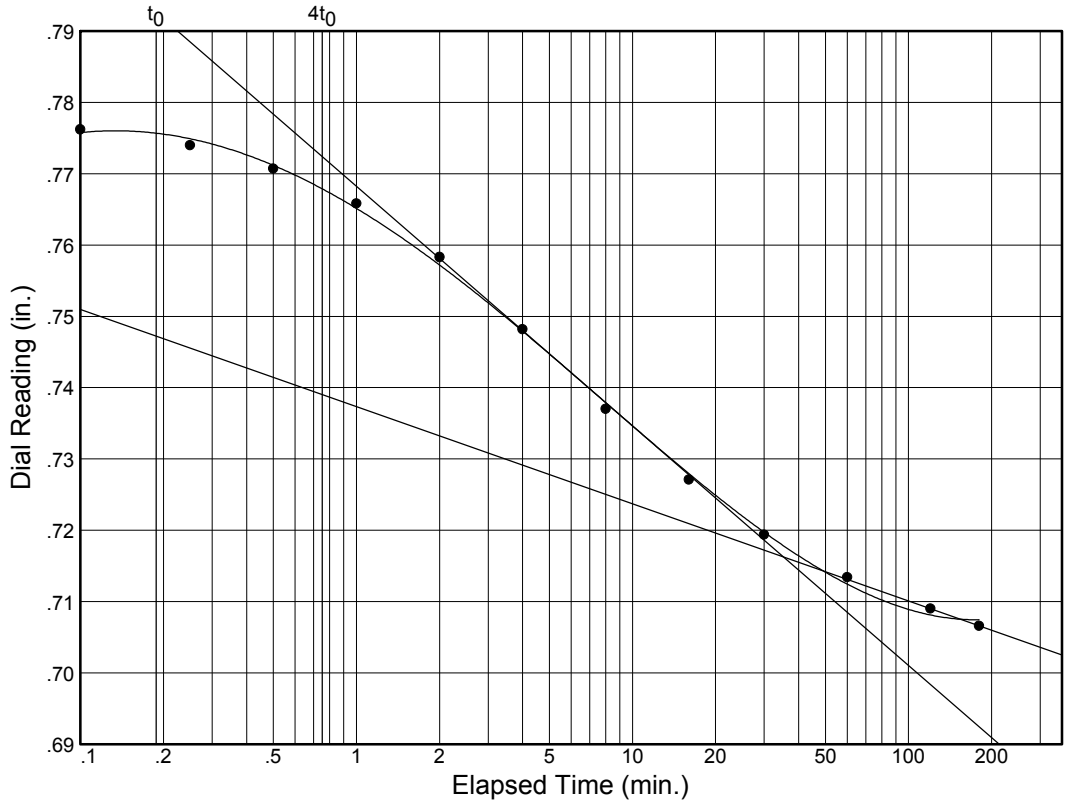
C_v @ T_{50}
0.10 ft.^{2}/day

C_α = 0.020

Figure

Dial Reading vs. Time

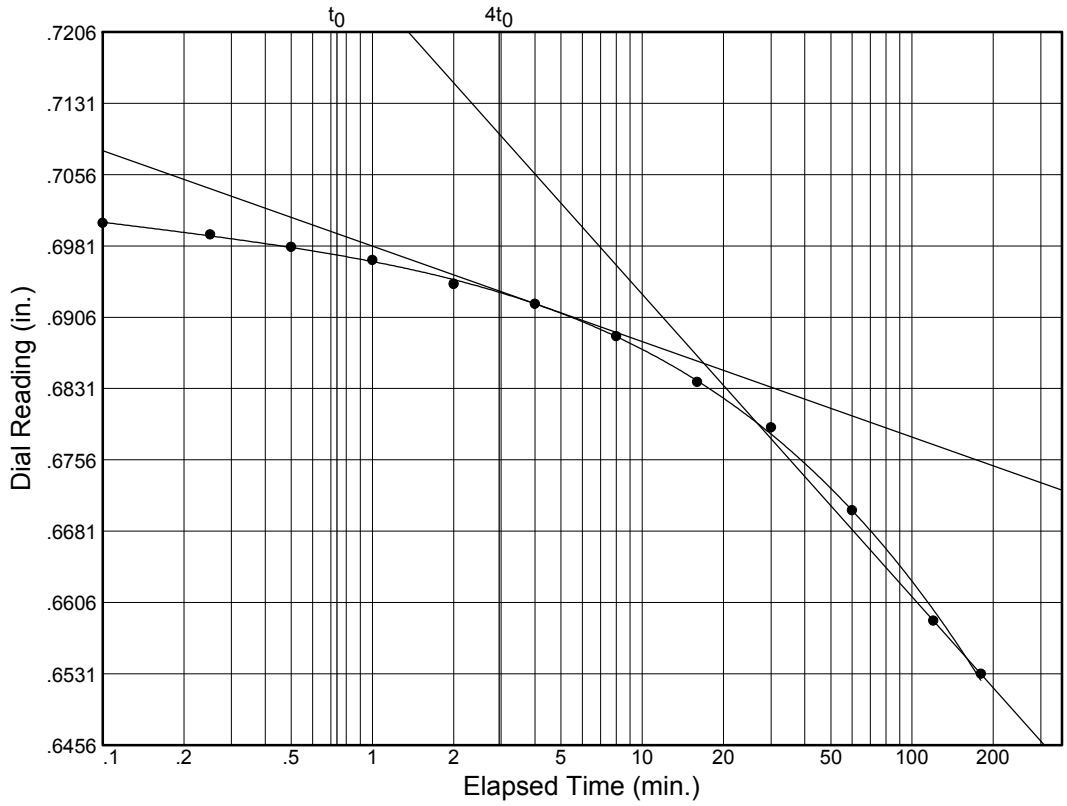
Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 16
Load= 16.00 tsf
D_0 = 0.78348
D_{50} = 0.74987
D_{100} = 0.71625
T_{50} = 3.48 min.

C_v @ T_{50}
0.08 ft.^{2}/day

C_α = 0.017



Load No.= 17
Load= 32.00 tsf
D_0 = 0.70106
D_{50} = 0.69339
D_{100} = 0.68572
T_{50} = 2.82 min.

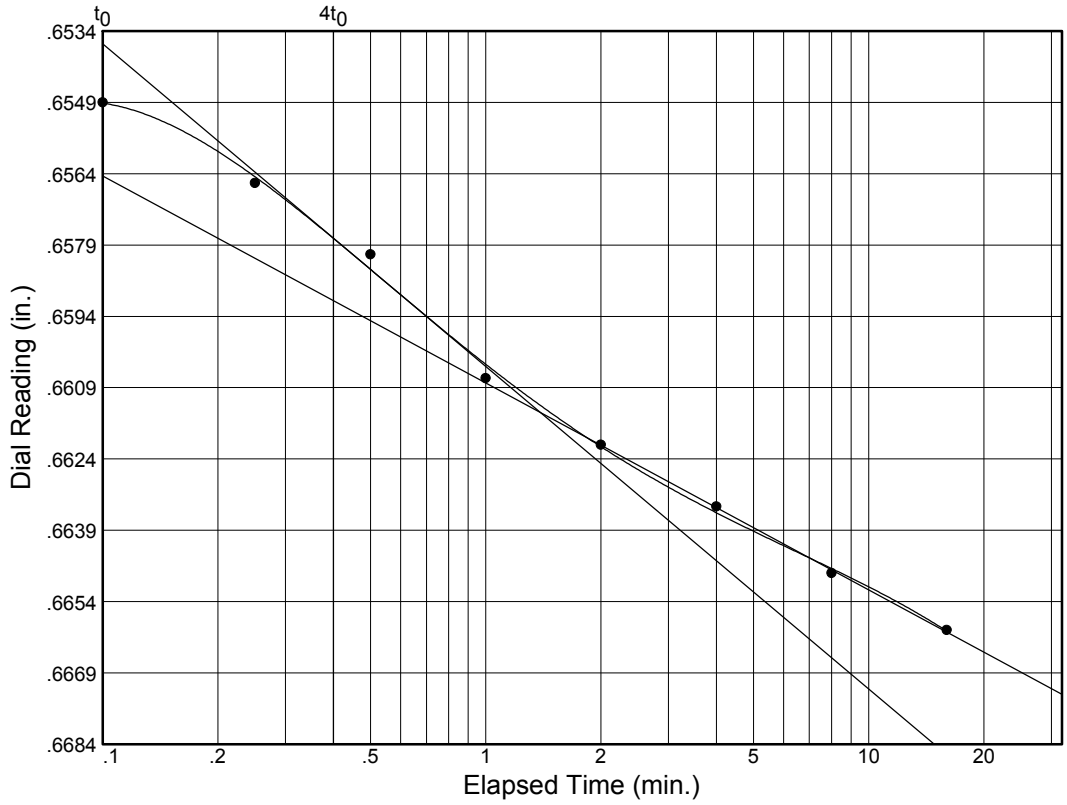
C_v @ T_{50}
0.08 ft.^{2}/day

C_α = 0.045

Figure

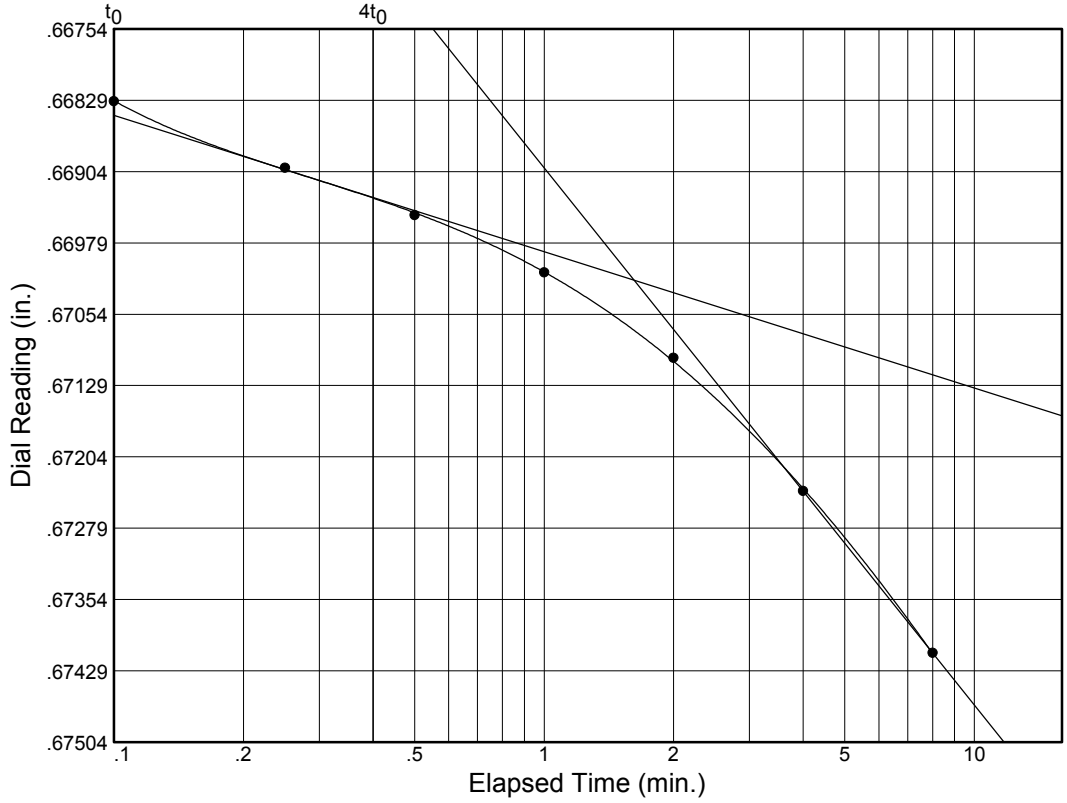
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 18
Load= 8.00 tsf
D_0 = 0.65207
D_{50} = 0.65675
D_{100} = 0.66142
T_{50} = 0.28 min.

C_v @ T_{50}
0.77 ft.^{2}/day



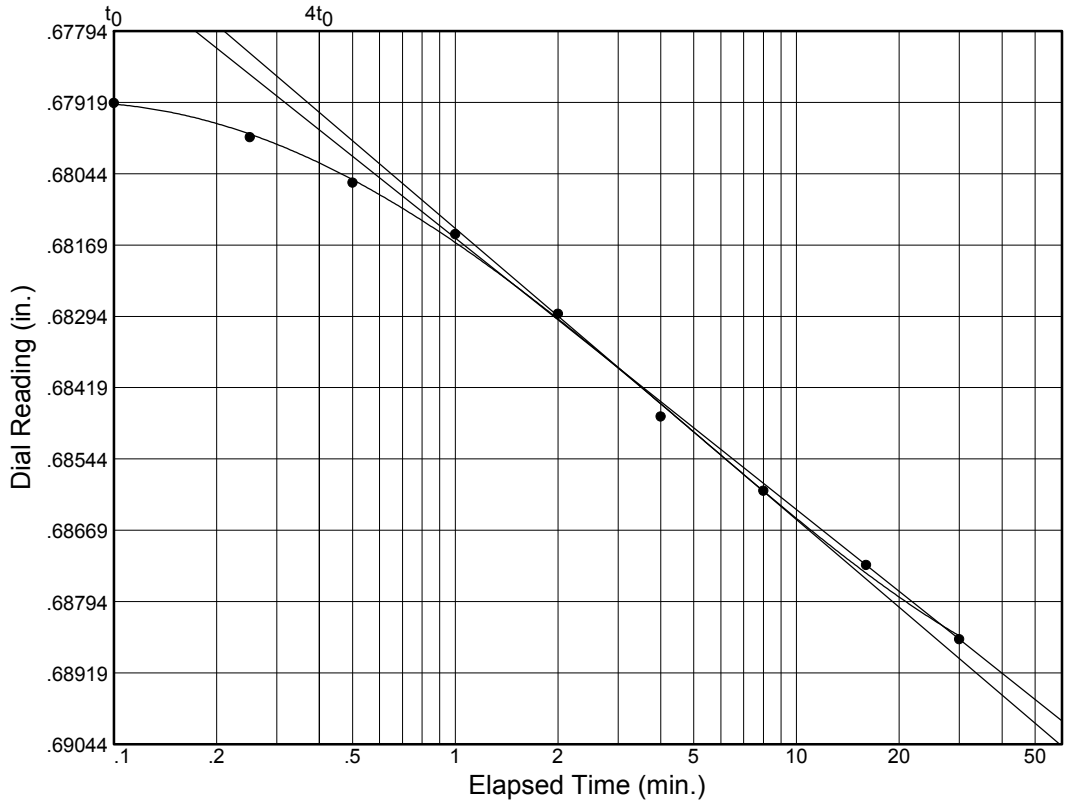
Load No.= 19
Load= 4.00 tsf
D_0 = 0.66727
D_{50} = 0.66873
D_{100} = 0.67018
T_{50} = 0.16 min.

C_v @ T_{50}
1.36 ft.^{2}/day

Figure

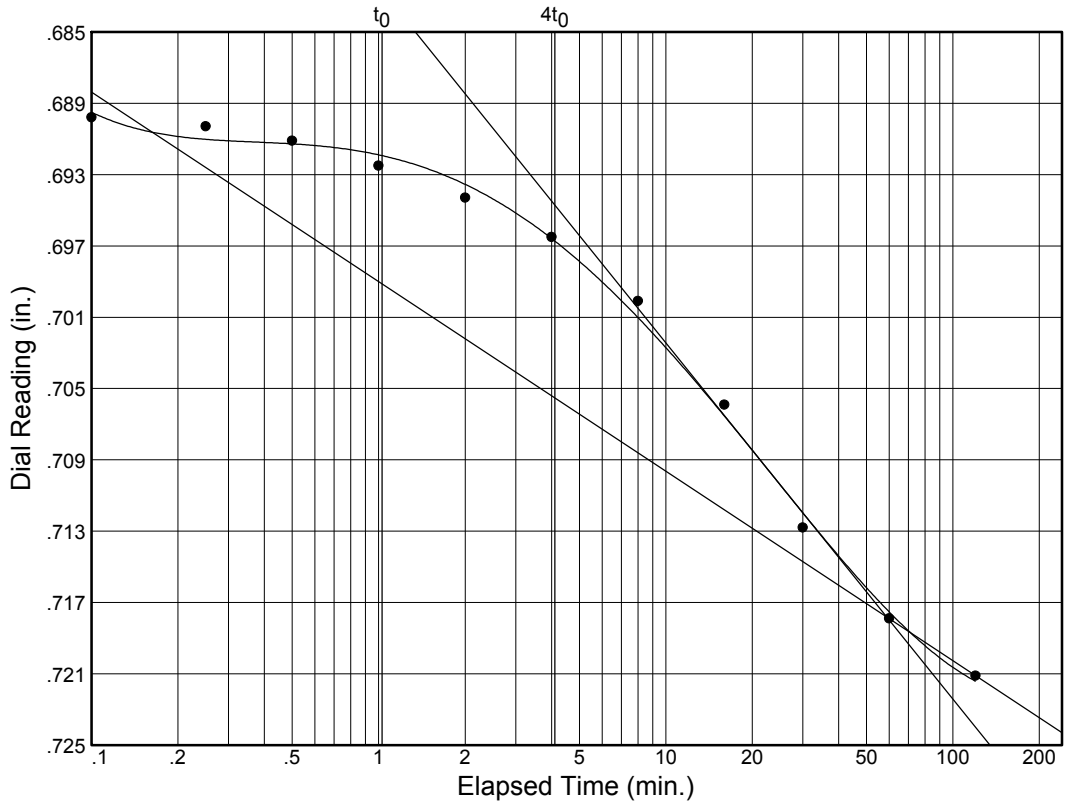
Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 20
Load= 1.00 tsf
D_0 = 0.67819
D_{50} = 0.68104
D_{100} = 0.68390
T_{50} = 0.70 min.

C_v @ T_{50}
0.33 ft.^{2}/day



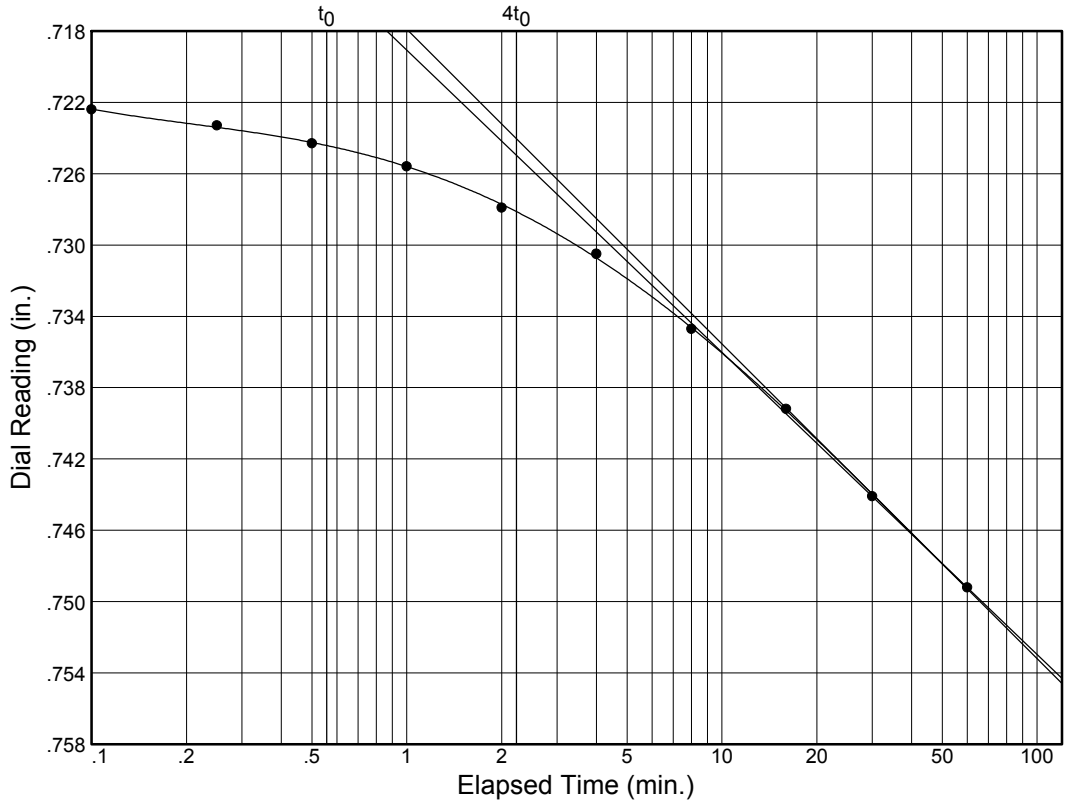
Load No.= 21
Load= 0.25 tsf
D_0 = 0.68714
D_{50} = 0.70247
D_{100} = 0.71779
T_{50} = 9.70 min.

C_v @ T_{50}
0.03 ft.^{2}/day

Figure

Dial Reading vs. Time

Project No.: VB10-238G
Project: VDOT I-64 to I-264 PSA 3 I-64 D7 and Bridge
Virginia Beach, Virginia
Location: CUR-4B



Load No.= 22

Load= 0.13 tsf

D_0 = 0.72071

D_{50} = 0.73409

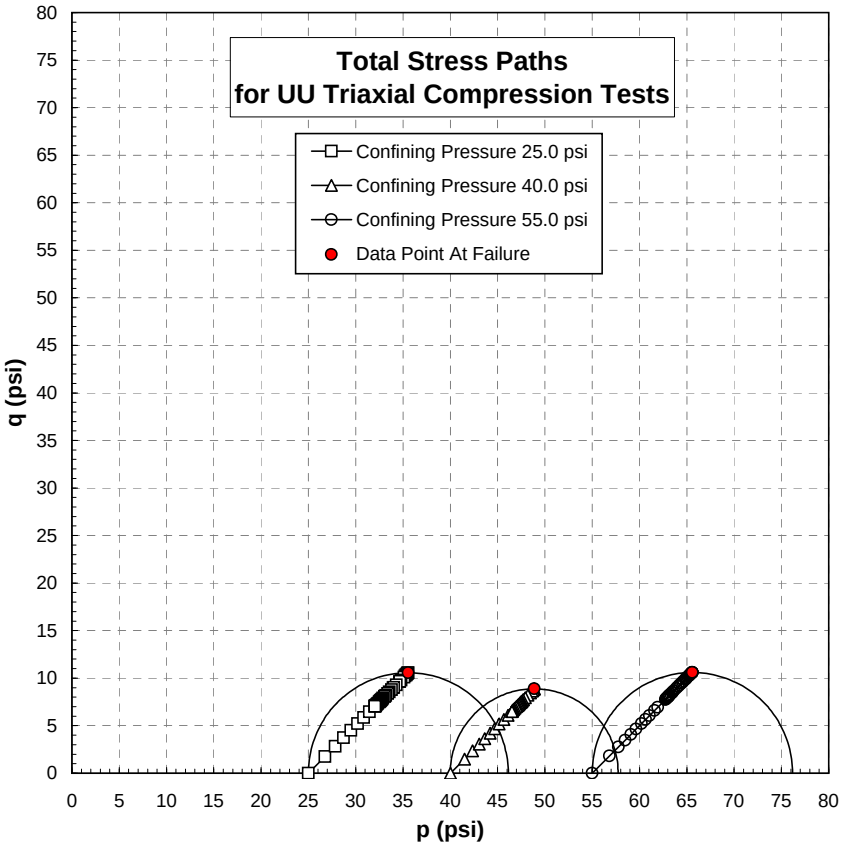
D_{100} = 0.74746

T_{50} = 7.32 min.

C_v @ T_{50}
0.04 ft.^{2}/day

Figure

TRIAXIAL TEST RESULTS



SAMPLE ID

Sample No.:	17239
Exploration No.:	D7-8W
Sample Depth:	28 to 30 feet
USCS Description:	Gray, fat CLAY (CH)

SAMPLE INFORMATION

Sample Number	A	B	C
Wet Weight, g	136.7	137.3	129.5
Dry Weight, g	94.5	95.9	88.7
Water Content, %	44.7	43.2	46.1
Wet Density, pcf	110.6	112.4	109.5
Dry Density, pcf	76.4	78.5	74.9
Saturation, %	100.0	100.0	99.7
Void Ratio	1.21	1.17	1.25
Diameter, in	1.398	1.387	1.396
Height, in	3.069	3.082	2.945
Area, in^2	1.534	1.510	1.530

* Water content data obtained using entire sample

CLASSIFICATION

Sieve Size	%-Passing
3/8-in (9.5-mm)	
No. 4 (4.75-mm)	
No. 10 (2.0-mm)	100.0
No. 40 (0.425-mm)	99.5
No. 100 (0.150-mm)	97.7
No. 200 (0.075-mm)	85.7

Atterberg Limits & Gs	
Liquid Limit, %	55
Plastic Limit, %	27
Plasticity Index, %	28
Group Symbol	CH
Estimated Gs	2.70

Notes:

TEST SUMMARY

Sample Number	A	B	C
Strain Rate, %/min	1.00	1.00	1.00
Confining Pressure, psi	25.0	40.0	55.0
Failure Criteria	σ_{DMAX}	σ_{DMAX}	σ_{DMAX}
σ_D At Failure, psi*	21.1	17.7	21.2
Axial Strain at Failure, %	2.4	2.8	3.3
σ_{1F}, psi	46.1	57.7	76.2
σ_{3F}, psi	25.0	40.0	55.0

* Membrane correction subtracted from deviator stress for Samples A-C

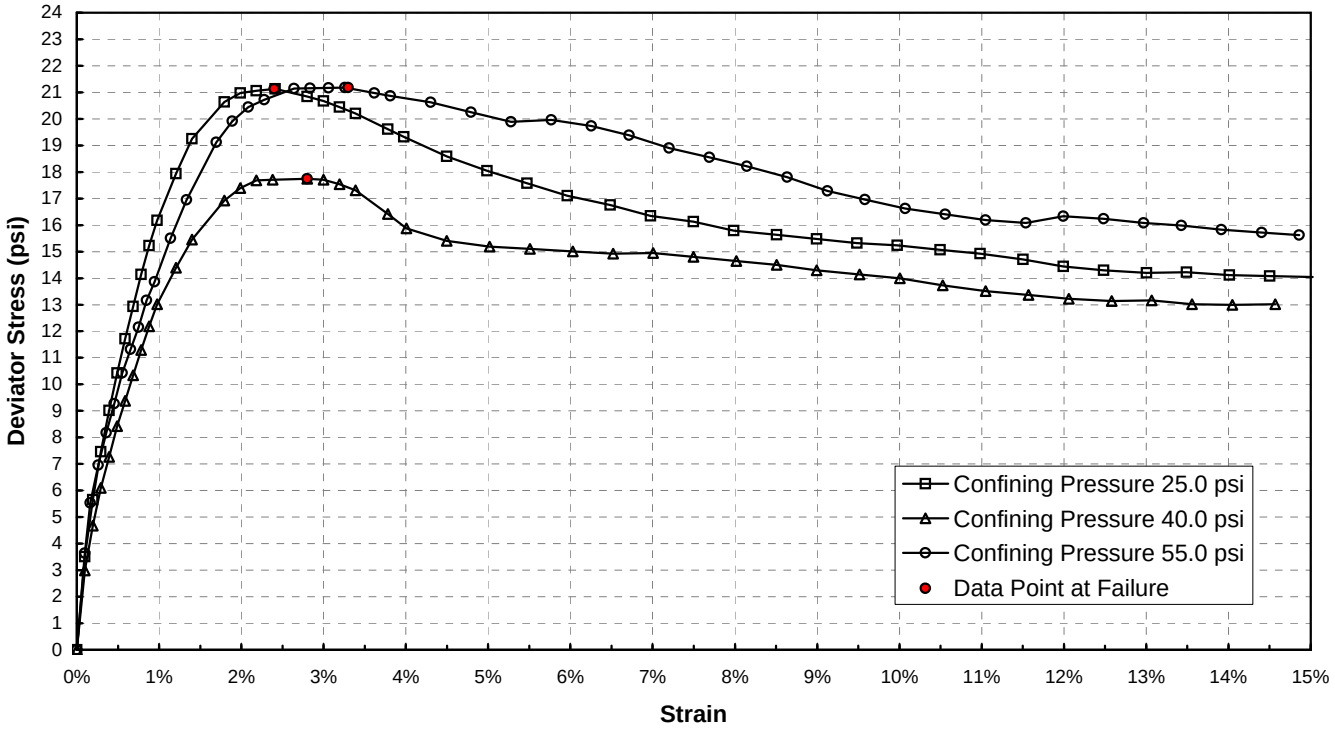
REMARKS

S&ME
8211 Hermitage Road
Richmond, Virginia 23228
Tel: 804.266.2199
Fax: 804.261.5569

UNCONSOLIDATED UNDRAINED (UU) TRIAXIAL TEST

Project:	I-64/I-264 Interchange: PSA - Ramps and Channels
Client:	HDR Engineering, Inc.
Location:	Virginia Beach, Virginia
Project No.:	1081-10-2757

Sample No.: 17239
Exploration No.: D7-8W
Sample I.D. / Depth: 28 to 30 feet



SPECIMEN PHOTOGRAPHS (AFTER SHEARING)

A

B

C

S&ME
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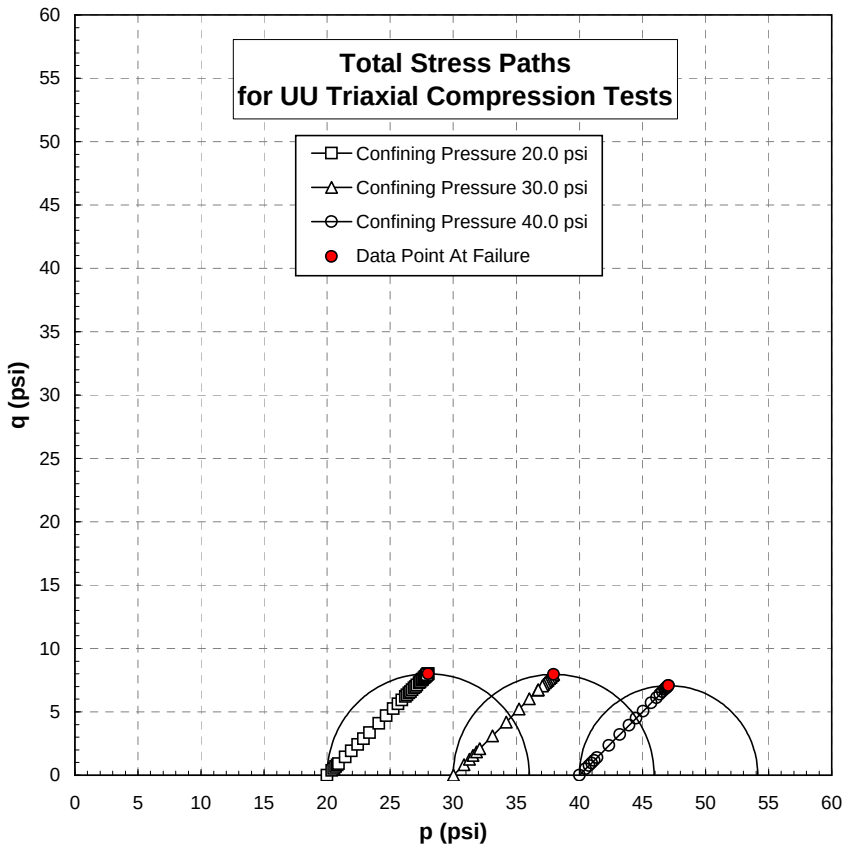
Fax: 804.261.5569

UNCONSOLIDATED UNDRAINED (UU) TRIAXIAL TEST

Project: I-64/I-264 Interchange: PSA - Ramps and Channels
Client: HDR Engineering, Inc.
Location: Virginia Beach, Virginia
Project No.: 1081-10-2757



SAMPLE ID

Sample No.:	17240
Exploration No.:	D7-8W
Sample Depth:	38 to 40 feet
USCS Description:	Gray, sandy lean CLAY (CL)

SAMPLE INFORMATION

Sample Number	A	B	C
Wet Weight, g	141.8	136.9	137.0
Dry Weight, g	107.1	98.3	101.8
Water Content, %	32.5	39.3	34.5
Wet Density, pcf	120.2	112.8	117.2
Dry Density, pcf	90.7	81.0	87.2
Saturation, %	100.0	98.1	99.9
Void Ratio	0.88	1.08	0.93
Diameter, in	1.377	1.395	1.381
Height, in	3.019	3.025	2.973
Area, in^2	1.489	1.528	1.497

* Water content data obtained using entire sample

CLASSIFICATION

Sieve Size	%-Passing	Atterberg Limits & Gs	
3/8-in (9.5-mm)		Liquid Limit, %	41
No. 4 (4.75-mm)		Plastic Limit, %	21
No. 10 (2.0-mm)	100.0	Plasticity Index, %	20
No. 40 (0.425-mm)	99.7	Group Symbol	CL
No. 100 (0.150-mm)	96.3		
No. 200 (0.075-mm)	68.4	Estimated Gs	2.70

Notes:

TEST SUMMARY

Sample Number	A	B	C
Strain Rate, %/min	0.50	0.50	0.50
Confining Pressure, psi	20.0	30.0	40.0
Failure Criteria	σ_{DMAX}	σ_{DMAX}	σ_{DMAX}
σ_D At Failure, psi*	16.0	15.9	14.1
Axial Strain at Failure, %	14.5	6.0	13.8
σ_{1F}, psi	36.0	45.9	54.1
σ_{3F}, psi	20.0	30.0	40.0

* Membrane correction subtracted from deviator stress for Samples A-C

REMARKS

S&ME
8211 Hermitage Road
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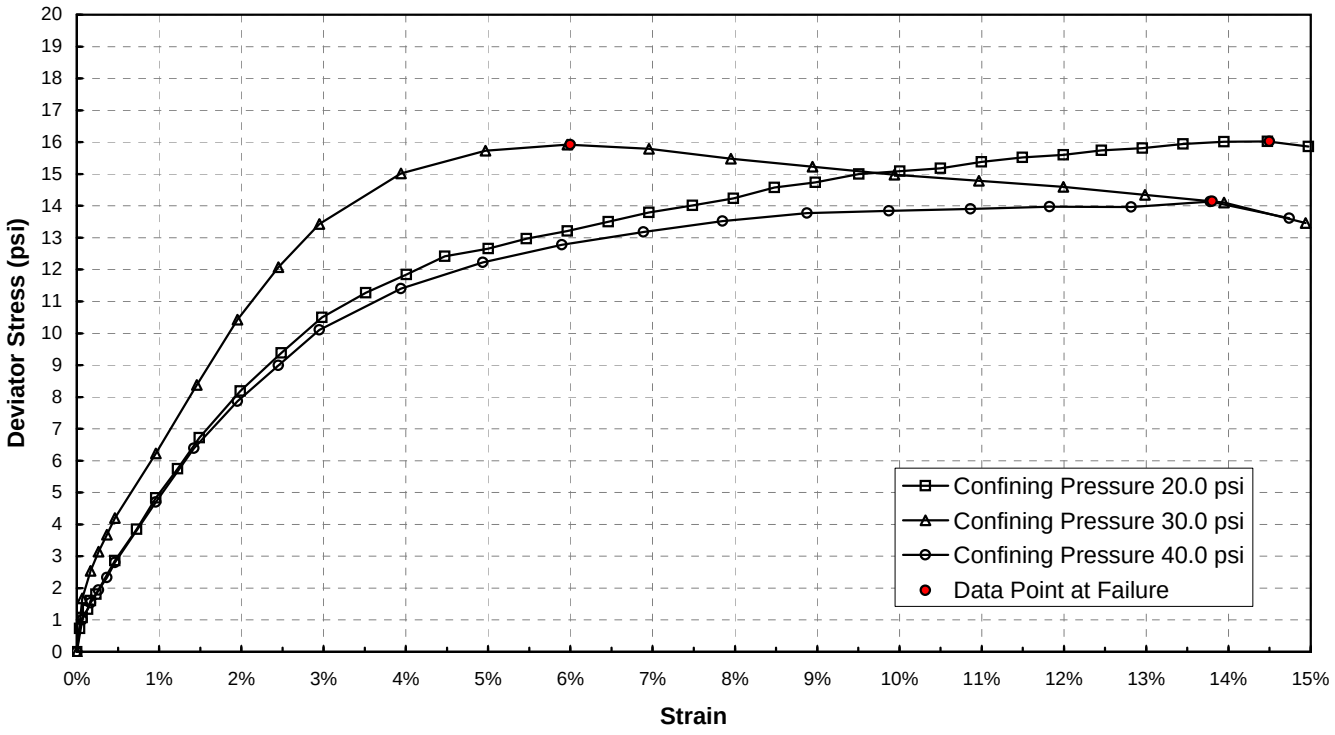
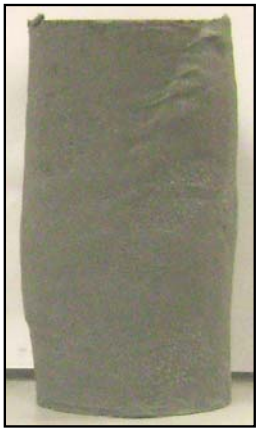
UNCONSOLIDATED UNDRAINED (UU) TRIAXIAL TEST

Project:	I-64/I-264 Interchange: PSA - I-64, D7, and Bridge
Client:	HDR Engineering, Inc.
Location:	Virginia Beach, Virginia
Project No.:	1081-10-2757

Sample No.: 17240
Exploration No.: D7-8W
Sample I.D. / Depth: 38 to 40 feet



SPECIMEN PHOTOGRAPHS (AFTER SHEARING)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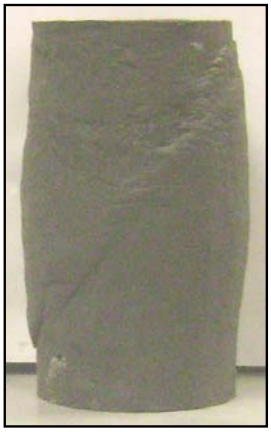
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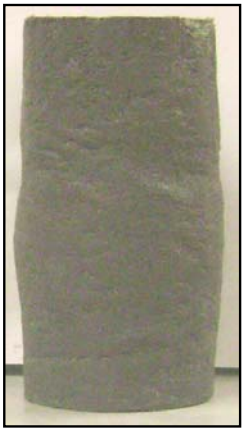
C

S&ME
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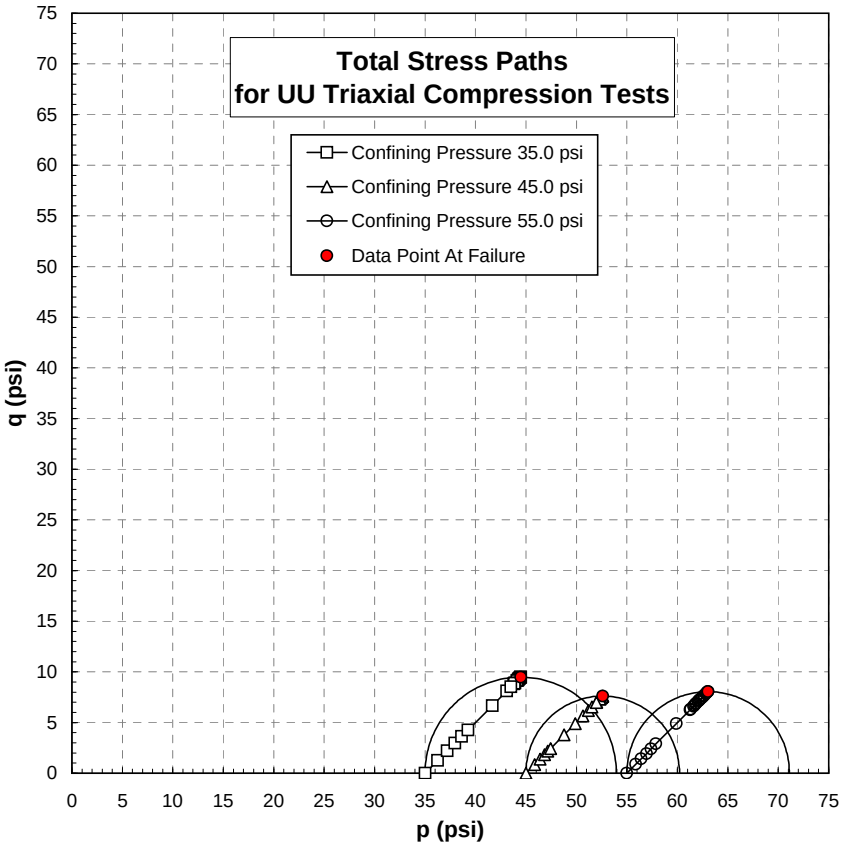
Fax: 804.261.5569

UNCONSOLIDATED UNDRAINED (UU) TRIAXIAL TEST

Project: I-64/I-264 Interchange: PSA - I-64, D7, and Bridge
Client: HDR Engineering, Inc.
Location: Virginia Beach, Virginia
Project No.: 1081-10-2757



SAMPLE ID

Sample No.:	17241
Exploration No.:	D7-9W
Sample Depth:	43 to 45 feet
USCS Description:	Gray, sandy lean CLAY (CL)

SAMPLE INFORMATION

Sample Number	A	B	C
Wet Weight, g	124.2	135.7	137.6
Dry Weight, g	90.7	98.2	98.2
Water Content, %	36.9	38.2	40.1
Wet Density, pcf	114.0	115.5	113.9
Dry Density, pcf	83.3	83.5	81.3
Saturation, %	97.4	100.0	100.0
Void Ratio	1.02	1.03	1.08
Diameter, in	1.387	1.373	1.389
Height, in	2.745	3.026	3.035
Area, in^2	1.511	1.480	1.515

* Water content data obtained using entire sample

CLASSIFICATION

Sieve Size	%-Passing	Atterberg Limits & Gs	
3/8-in (9.5-mm)		Liquid Limit, %	39
No. 4 (4.75-mm)		Plastic Limit, %	22
No. 10 (2.0-mm)	100.0	Plasticity Index, %	17
No. 40 (0.425-mm)	99.7	Group Symbol	CL
No. 100 (0.150-mm)	95.7		
No. 200 (0.075-mm)	51.4	Estimated Gs	2.70

Notes:

TEST SUMMARY

Sample Number	A	B	C
Strain Rate, %/min	0.50	0.50	0.50
Confining Pressure, psi	35.0	45.0	55.0
Failure Criteria	σ_{DMAX}	σ_{DMAX}	σ_{DMAX}
σ_D At Failure, psi*	19.0	15.2	16.1
Axial Strain at Failure, %	5.0	8.8	4.4
σ_{1F}, psi	54.0	60.2	71.1
σ_{3F}, psi	35.0	45.0	55.0

* Membrane correction subtracted from deviator stress for Samples A-C

REMARKS

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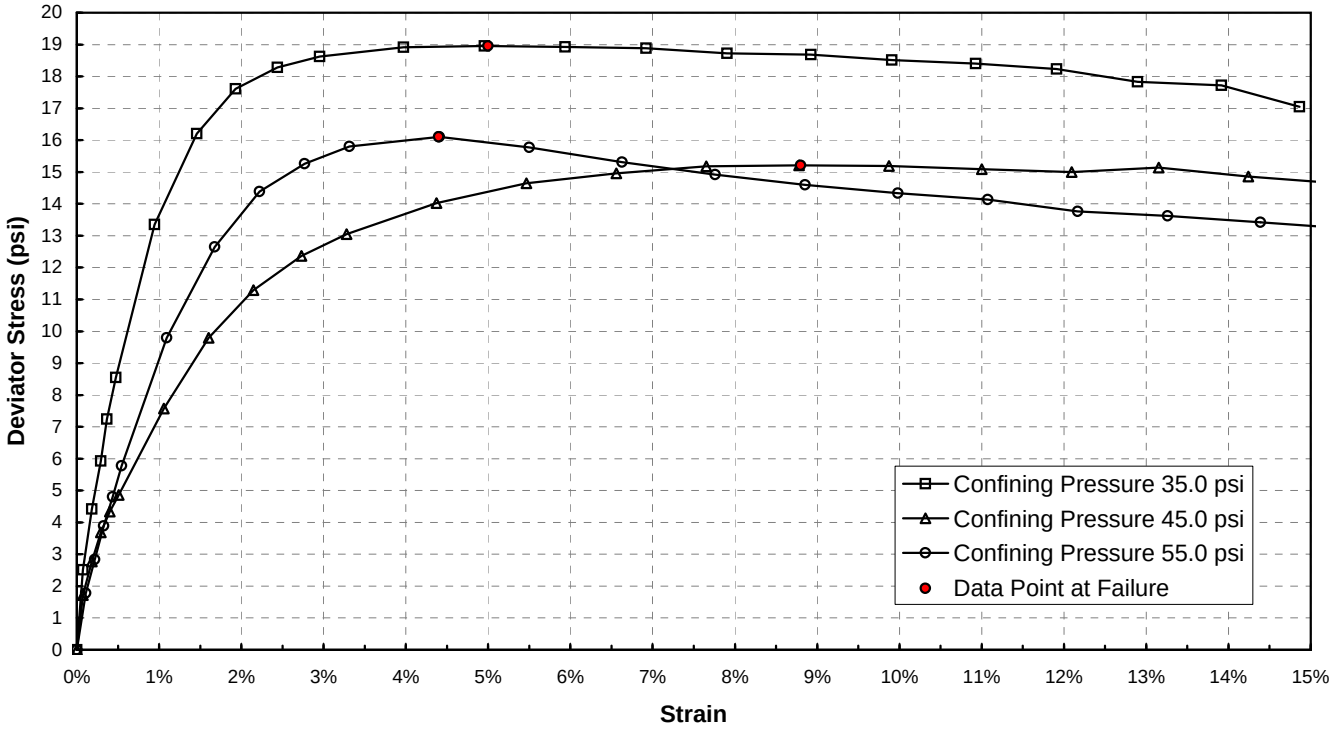
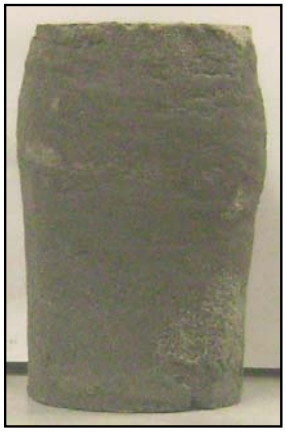
UNCONSOLIDATED UNDRAINED (UU) TRIAXIAL TEST

Project:	I-64/I-264 Interchange: PSA - I-64, D7, and Bridge
Client:	HDR Engineering, Inc.
Location:	Virginia Beach, Virginia
Project No.:	1081-10-2757

Sample No.: 17241
Exploration No.: D7-9W
Sample I.D. / Depth: 43 to 45 feet



SPECIMEN PHOTOGRAPHS (AFTER SHEARING)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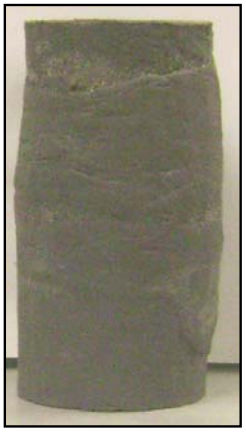
B

C

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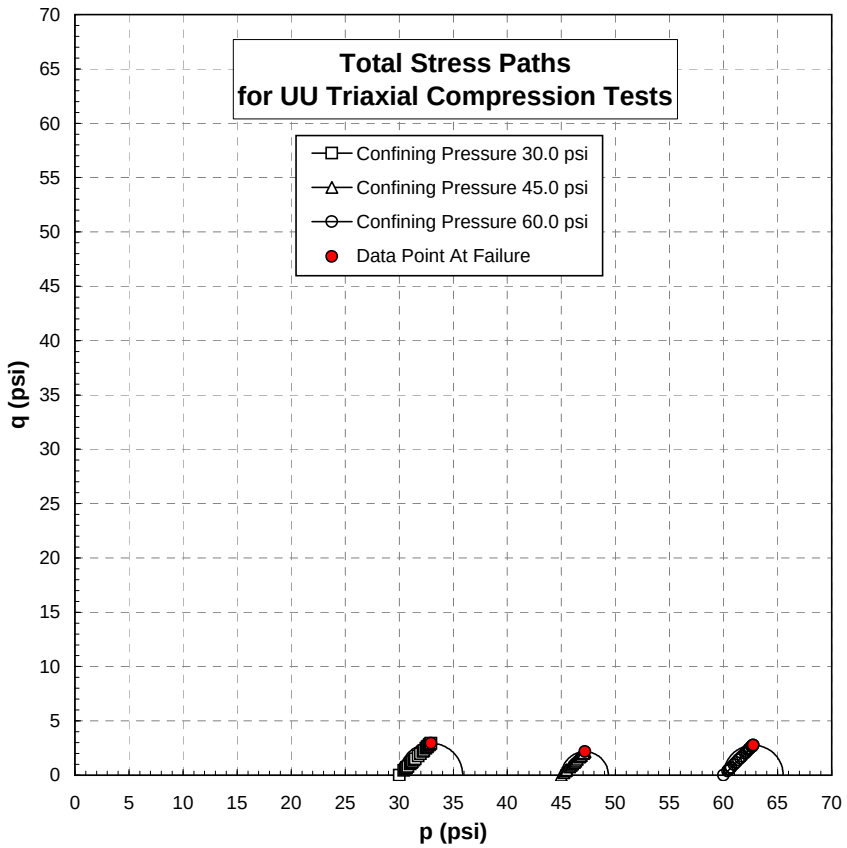
UNCONSOLIDATED UNDRAINED (UU) TRIAXIAL TEST

Project: I-64/I-264 Interchange: PSA - I-64, D7, and Bridge
Client: HDR Engineering, Inc.
Location: Virginia Beach, Virginia
Project No.: 1081-10-2757



SAMPLE ID

Sample No.:	17238
Exploration No.:	D7-10W
Sample Depth:	37 to 39 feet
USCS Description:	Gray, lean CLAY with sand (CL)

SAMPLE INFORMATION

Sample Number	A	B	C
Wet Weight, g	136.7	134.4	133.0
Dry Weight, g	100.7	95.4	93.9
Water Content, %	35.7	40.8	41.7
Wet Density, pcf	118.4	115.1	113.0
Dry Density, pcf	87.3	81.7	79.7
Saturation, %	100.0	100.0	100.0
Void Ratio	0.96	1.10	1.13
Diameter, in	1.374	1.372	1.384
Height, in	2.964	3.008	2.984
Area, in^2	1.483	1.478	1.504

* Water content data obtained using entire sample

CLASSIFICATION

Sieve Size	%-Passing	Atterberg Limits & Gs	
3/8-in (9.5-mm)		Liquid Limit, %	48
No. 4 (4.75-mm)		Plastic Limit, %	24
No. 10 (2.0-mm)	100.0	Plasticity Index, %	24
No. 40 (0.425-mm)	99.6	Group Symbol	CL
No. 100 (0.150-mm)	96.7		
No. 200 (0.075-mm)	79.7	Estimated Gs	2.70

Notes:

TEST SUMMARY

Sample Number	A	B	C
Strain Rate, %/min	1.00	1.00	1.00
Confining Pressure, psi	30.0	45.0	60.0
Failure Criteria	σ_{DMAX}	σ_{DMAX}	σ_{DMAX}
σ_D At Failure, psi*	5.9	4.3	5.5
Axial Strain at Failure, %	13.9	14.2	14.0
σ_{1F}, psi	35.9	49.3	65.5
σ_{3F}, psi	30.0	45.0	60.0

* Membrane correction subtracted from deviator stress for Samples A-C

REMARKS

S&ME
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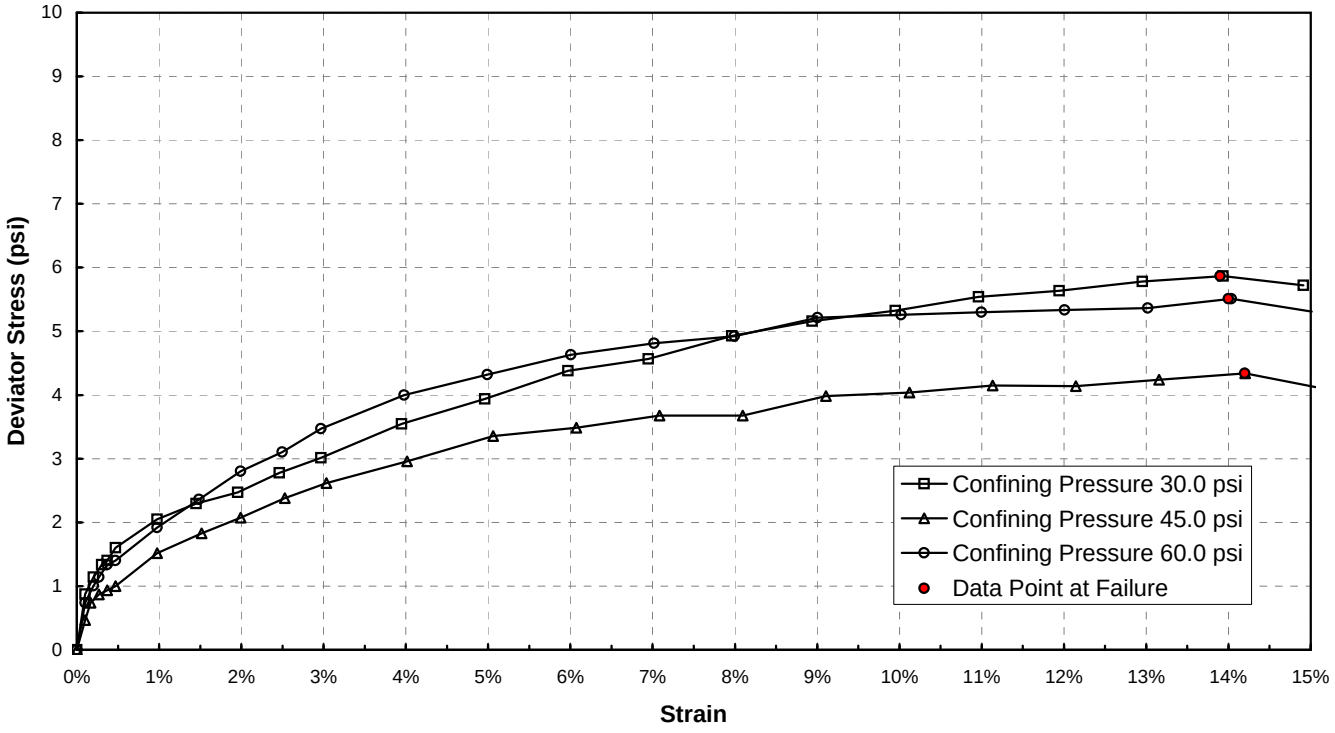
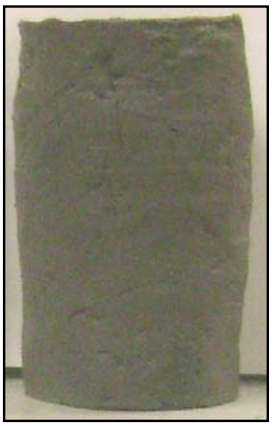
UNCONSOLIDATED UNDRAINED (UU) TRIAXIAL TEST

Project:	I-64/I-264 Interchange: PSA - I-64, D7, and Bridge
Client:	HDR Engineering, Inc.
Location:	Virginia Beach, Virginia
Project No.:	1081-10-2757

Sample No.: 17238
Exploration No.: D7-10W
Sample I.D. / Depth: 37 to 39 feet



SPECIMEN PHOTOGRAPHS (AFTER SHEARING)



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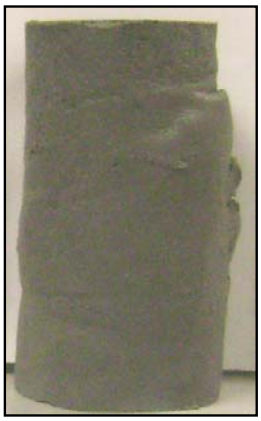

B

C

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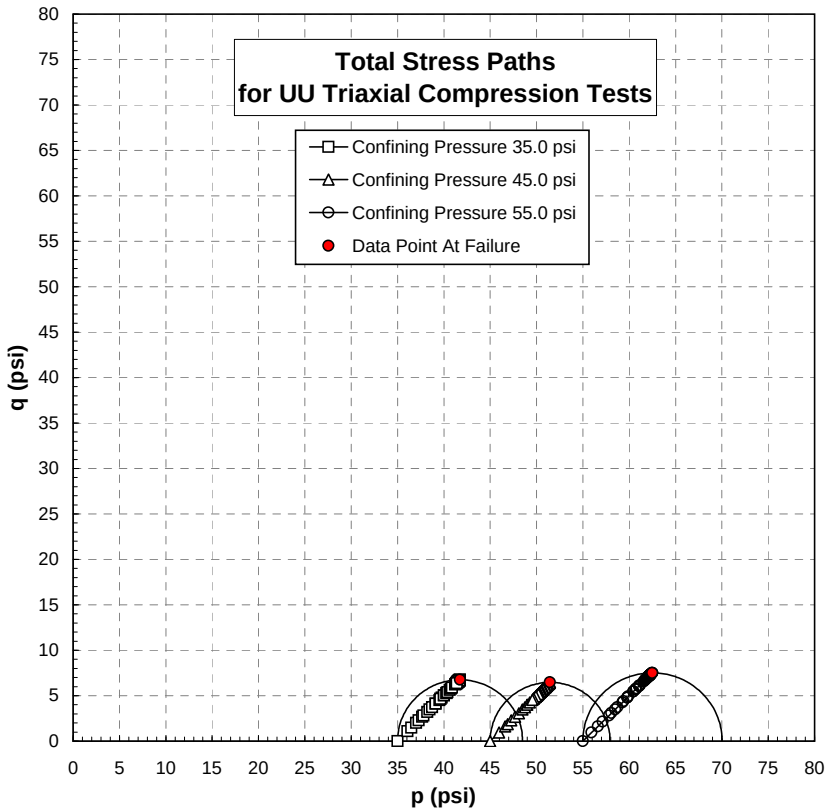
UNCONSOLIDATED UNDRAINED (UU) TRIAXIAL TEST

Project: I-64/I-264 Interchange: PSA - I-64, D7, and Bridge
Client: HDR Engineering, Inc.
Location: Virginia Beach, Virginia
Project No.: 1081-10-2757

S:\GT\GT2701 to 2800\GT2757 - I-64_I-264 Interchange\PSA - I-64 D7 and Bridge\Lab\UU\[D7-10W 37-39 ft UU Report - 17238.xls]Report Page 2



SAMPLE ID

Sample No.:	17935
Exploration No.:	D7-13W
Sample Depth:	43 to 45 feet
USCS Description:	Gray, sandy LEAN CLAY (CL)

SAMPLE INFORMATION

Sample Number	A	B	C
Wet Weight, g	130.2	131.4	134.0
Dry Weight, g	93.8	94.4	100.0
Water Content, %	38.9	39.3	34.0
Wet Density, pcf	112.4	113.1	116.6
Dry Density, pcf	81.0	81.2	87.0
Saturation, %	98.8	100.0	100.0
Void Ratio	1.04	1.04	0.90
Diameter, in	1.385	1.393	1.386
Height, in	2.929	2.908	2.902
Area, in^2	1.507	1.523	1.509

* Water content data obtained using entire sample

CLASSIFICATION

Sieve Size	%-Passing	Atterberg Limits & Gs	
		Liquid Limit, %	36
No. 4 (4.75-mm)	100.0	Plastic Limit, %	23
No. 10 (2.0-mm)	99.9	Plasticity Index, %	13
No. 40 (0.425-mm)	97.3	Plasticity Group	CL
No. 100 (0.150-mm)	89.3		
No. 200 (0.075-mm)	66.7	Estimated Gs	2.65

Notes:

TEST SUMMARY

Sample Number	A	B	C
Strain Rate, %/min	0.50	0.50	0.50
Confining Pressure, psi	35.0	45.0	55.0
Failure Criteria	σ_{DMAX}	σ_{DMAX}	σ_{DMAX}
σ_D At Failure, psi*	13.5	12.9	15.0
Axial Strain at Failure, %	5.0	3.7	11.7
σ_{1F}, psi	48.5	57.9	70.0
σ_{3F}, psi	35.0	45.0	55.0

* Membrane correction subtracted from deviator stress for Samples A-C

REMARKS

σ_{DMAX} = Maximum deviator stress.

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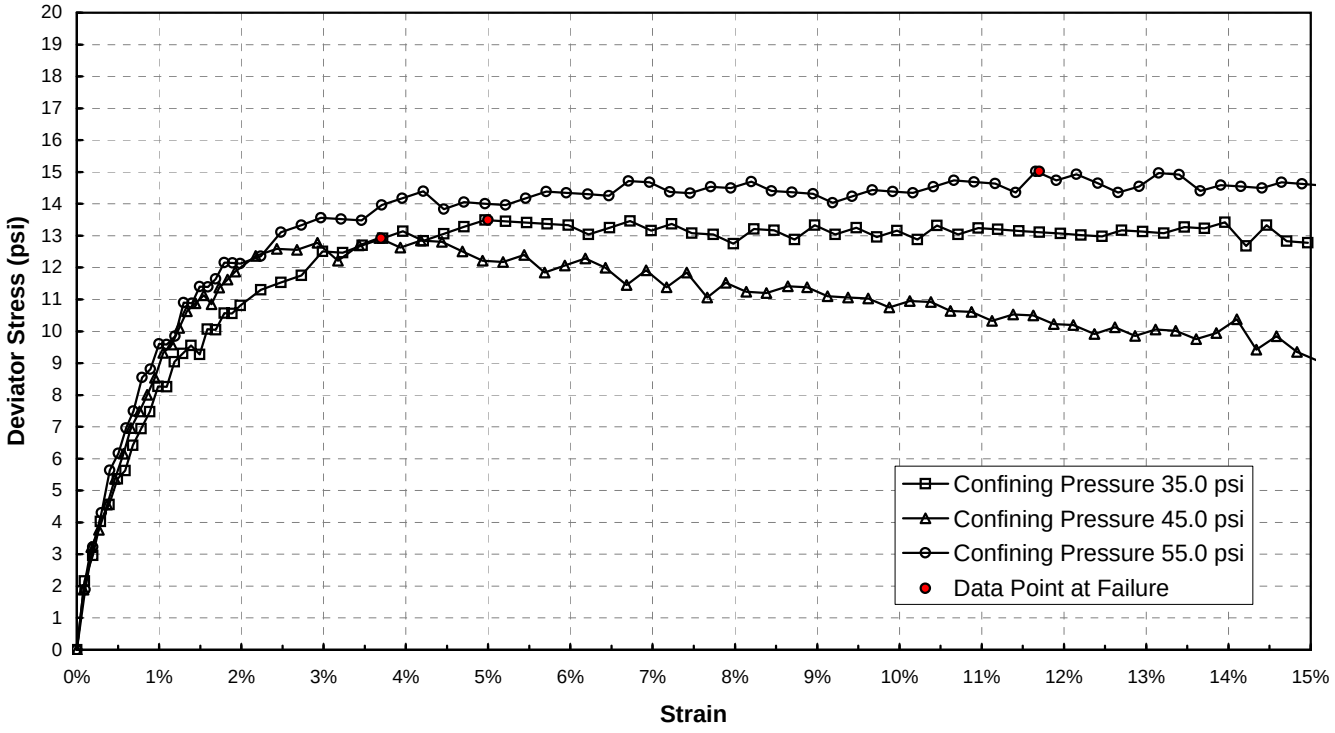
UNCONSOLIDATED UNDRAINED (UU) TRIAXIAL TEST

Project:	I-64/I-264 Interchange: PSA I-64, D7, and Bridge
Client:	HDR Engineering, Inc.
Location:	Cities of Norfolk and Virginia Beach, Virginia
Project No.:	1081-10-2757

Laboratory No.: 17935
Exploration No.: D7-13W
Sample Depth: 43 to 45 feet



SPECIMEN PHOTOGRAPHS (AFTER SHEARING)

A

B

C

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UNCONSOLIDATED UNDRAINED (UU) TRIAXIAL TEST

Project: I-64/I-264 Interchange: PSA I-64, D7, and Bridge
Client: HDR Engineering, Inc.
Location: Cities of Norfolk and Virginia Beach, Virginia
Project No.: 1081-10-2757

SHELBY TUBE EXTRACTION LOGS

Project: I-64/I-264 Interchange Phase: I-64, D7, AND BRIDGE Location: Virginia Beach, Virginia

Job No.: 1081-10-2757 Client: HDR, Inc.

Inspector: MATTHEW THORNTON Date: 9-28-2010

Boring: CUR-1B Lab No.: 17236

Tube No.: U-1 Depth (ft.): 25-27

Rec. (ft.): 1.8 Date Collected: 9-23-2010

Length (ft.)	Depth (ft.)	DESCRIPTION	REMARKS	PICTURE
0	25	Gray, sandy Fat CLAY, contains shells, moist (CH)	wet	
0.5	25.5			
1.0	26	Gray, fine to medium silty SAND, moist (SM)	UU A MC, CLASS	
1.5	26.5	Gray, fine to medium SAND, with silt, moist (SM)	UU B UU C	
2.0	27	END OF SAMPLE		

S:\GT\GT2701 to 2800\GT2757 - I-64_I-264 Interchange\PSA - I-64 D7 and Bridge\Lab\Tubes\[Tube Extraction Logs.xls]CUR-1B 25 ft

S&ME

Project: I-64/I-264 Interchange Phase: I-64, D7, AND BRIDGE

Location: Virginia Beach, Virginia

Job No.: 1081-10-2757

Client: HDR, Inc.

Inspector: MATTHEW THORNTON

Date: 9-28-2010

Boring: CUR-1B

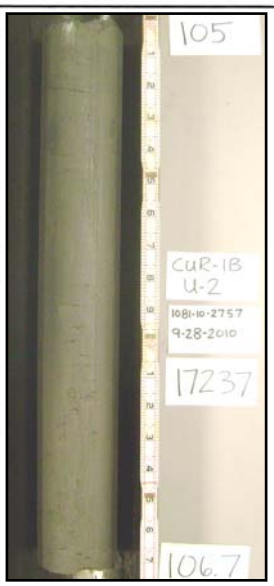
Lab No.: 17237

Tube No.: U-2

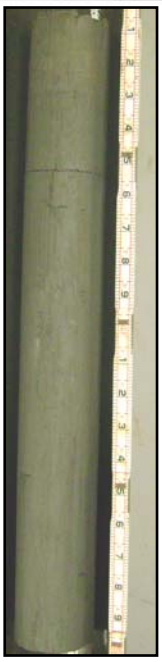
Depth (ft.): 105 to 107

Rec. (ft.): 1.7

Date Collected: 9-23-2010

Length (ft.)	Depth (ft.)	DESCRIPTION	REMARKS	PICTURE
0	105	Gray, fat CLAY, trace of sand, moist (CH)	FREQUENT SAND PARTINGS CAUSING PERPENDICULAR CRACKS THROUGHOUT SAMPLE	
0.5	105.5			
1.0	106	SAME AS ABOVE (CH)		
1.5	106.5	SAME AS ABOVE (CH)	3 MC, CLASS	
		END OF SAMPLE		
2.0	107			

Project: I-64/I-264 Interchange Phase: I64, D7, AND BRIDGE
Location: Virginia Beach, Virginia
Job No.: 1081-10-2757
Client: HDR, Inc.
Inspector: Matthew L. Thornton
Date: November 3, 2010
Boring: CUR-4B
Lab No.: 17364
Tube No.: ST-2
Depth (ft.): 95 to 97
Rec. (ft.): 2.0
Date Collected: 10-6-2010

Length (ft.)	Depth (ft.)	DESCRIPTION	REMARKS	PICTURE
0	95	Blue-gray, Fat CLAY, trace of sand, contains frequent sand partings, contains trace of shells, moist (CH)	cracks	
0.5	95.5		crack (sand parting)	
1.0	96		crack	
			crack	
1.5	96.5	SAME AS ABOVE (CH)	crack	
			MC, CLASS	
2.0	97	END OF SAMPLE		

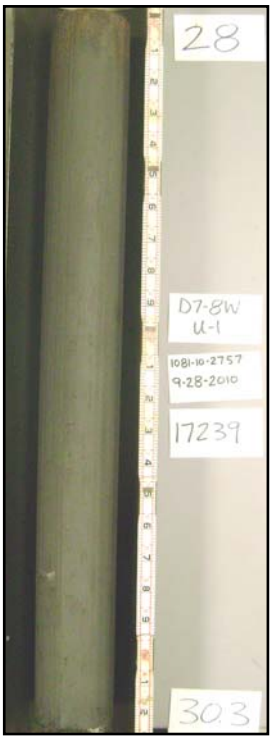
S&ME

Project: I-64/I-264 Interchange Phase: I64, D7, AND BRIDGE
Location: Virginia Beach, Virginia
Job No.: 1081-10-2757
Client: HDR, Inc.
Inspector: Matthew L. Thornton
Date: November 3, 2010
Boring: CUR-4B
Lab No.: 173363
Tube No.: ST-1
Depth (ft.): 50 to 52
Rec. (ft.): 1.7
Date Collected: 10-6-2010

Length (ft.)	Depth (ft.)	DESCRIPTION	REMARKS	PICTURE
0	50	Light gray, Fine to medium SAND, with clay, wet (SC)	Gray sandy CLAY	
0.5	50.5	Gray, fine to coarse, SAND, some silt, moist (SM)	crack mm	
1.0	51			
1.5	51.5	SAME AS ABOVE (SM)	MC, CLASS	
		END OF SAMPLE		
2.0	52			

S&ME

Project: I-64/I-264 Interchange Phase: I-64, D7, AND BRIDGE
Location: Virginia Beach, Virginia
Job No.: 1081-10-2757
Client: HDR, Inc.
Inspector: MATTHEW THORNTON
Date: 9-28-2010
Boring: D7-8W
Lab No.: 17239
Tube No.: U-1
Depth (ft.): 28 to 30
Rec. (ft.): 2.25
Date Collected: 9-24-2010

Length (ft.)	Depth (ft.)	DESCRIPTION	REMARKS	PICTURE
0	28	Gray, fat CLAY, trace of sand, moist (CH)		
0.5	28.5			
1.0	29	SAME AS ABOVE (CH)		
1.5	29.5			
2.0	30	SAME AS ABOVE (CH)		
			3 MC, CLASS	
		END OF SAMPLE		

Project: I-64/I-264 Interchange Phase: I-64, D7, AND BRIDGE

Location: Virginia Beach, Virginia

Job No.: 1081-10-2757

Client: HDR, Inc.

Inspector: MATTHEW THORNTON

Date: 9-28-2010

Boring: D7-8W

Lab No.: 17240

Tube No.: U-2

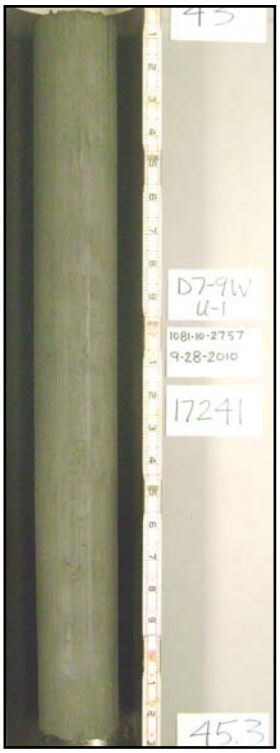
Depth (ft.): 38 to 40

Rec. (ft.): 2.3

Date Collected: 9-24-2010

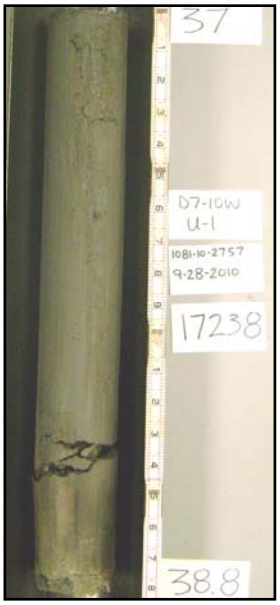
Length (ft.)	Depth (ft.)	DESCRIPTION	REMARKS	PICTURE
0	38	Gray, sandy lean CLAY, moist (CL)		
0.5	38.5			
1.0	39	SAME AS ABOVE (CL)	UUA	
1.5	39.5		UUB UUC	
2.0	40	SAME AS ABOVE (CL)	CONSOL MC, CLASS	
		END OF SAMPLE		

Project: I-64/I-264 Interchange Phase: I-64, D7, AND BRIDGE
Location: Virginia Beach, Virginia
Job No.: 1081-10-2757
Client: HDR, Inc.
Inspector: MATTHEW THORNTON
Date: 9-28-2010
Boring: D7-9W
Lab No.: 17241
Tube No.: U-1
Depth (ft.): 43 to 45
Rec. (ft.): 2.3
Date Collected: 9-24-2010

Length (ft.)	Depth (ft.)	DESCRIPTION	REMARKS	PICTURE
0	43	Gray, sandy lean CLAY, moist (CL)		
0.5	43.5			
1.0	44	SAME AS ABOVE (CL)	UU A	
1.5	44.5		UU B	
			UU C	
2.0	45	SAME AS ABOVE (CL)	CONSOL	
			MC, CLASS	
		END OF SAMPLE		

S&ME

Project: I-64/I-264 Interchange Phase: I-64, D7, AND BRIDGE
Location: Virginia Beach, Virginia
Job No.: 1081-10-2757
Client: HDR, Inc.
Inspector: MATTHEW THORNTON
Date: 9-28-2010
Boring: D7-10W
Lab No.: 17238
Tube No.: U-1
Depth (ft.): 37 to 39
Rec. (ft.): 1.8
Date Collected: 9-22-2010

Length (ft.)	Depth (ft.)	DESCRIPTION	REMARKS	PICTURE
0	37	Gray, lean CLAY, with sand, moist (CL)	UUA	
0.5	37.5		UUB UUC	
1.0	38	SAME AS ABOVE (CL)	CONSOL MC, CLASS	
1.5	38.5		crack, organic seam	
		Gray, f-m SAND w/clay		
		END OF SAMPLE		
2.0	39			

S:\GT\GT2701 to 2800\GT2757 - I-64_I-264 Interchange\PSA - I-64 D7 and Bridge\Lab\Tubes\[Tube Extraction Logs.xls]D7-10W 37 ft

Form No. 1081-TR-TEL
Revision No. : 0
Revision Date: 6/17/2011

Tube Extraction Log

S&ME, Inc. - Richmond 8211 Hermitage Road Richmond, VA 23228

Project No.:	1081-10-2757	Report Date:	8/1/2011
Project Name:	I-64 / I-264 Interchange PSA I-64, D7, and Bridge	Extrusion Date:	7/28/2011
Client Name:	HDR Engineering, Inc.		
Client Address:	Glen Allen, Virginia		

Boring #:	D7-13W	Depth:	43 to 45 feet	Sample Date:	6/14/2011
Station:	-----	Tube #:	-----	Lab Sample #:	17935
Offset:	-----	Recovery:	1.9 feet	Inspector:	MLT

Length (feet)	Depth (feet)	DESCRIPTION	REMARKS
0	43	**Gray, sandy LEAN CLAY, moist (CL)**	
0.5	43.5	**SAME AS ABOVE (CL)**	
1.0	44	**SAME AS ABOVE (CL)**	**UU Point A**
			UU Point B
1.5	44.5	**SAME AS ABOVE (CL)**	**UU Point C** **moisture, classification**
2.0	45	**END OF SAMPLE**	

PICTURE

References / Comments / Deviations:

Technical Responsibility	Signature	Position	Date

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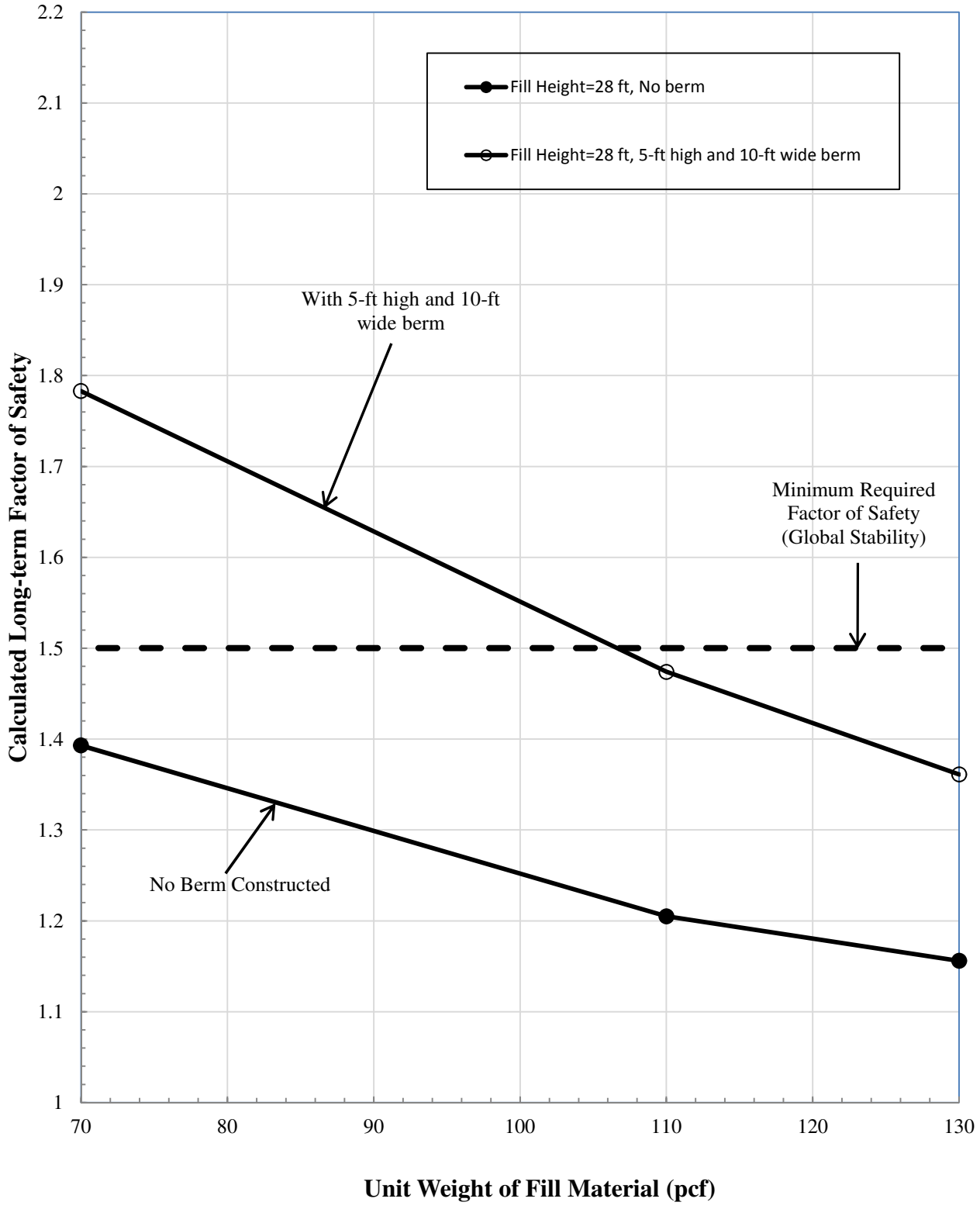
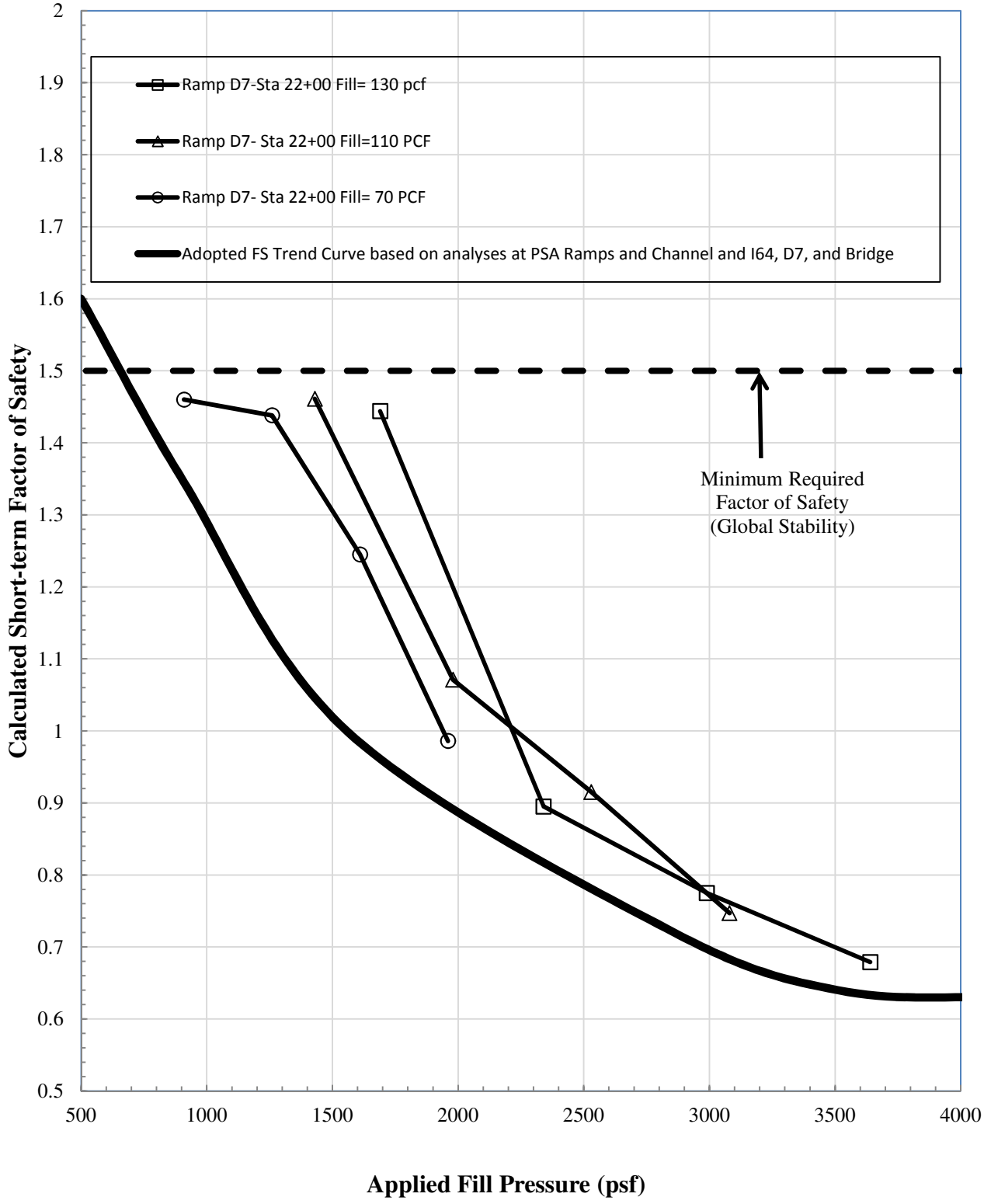
APPENDIX D
STABILITY and SETTLEMENT GRAPHS

Plot D-1: Long-Term Stability of MSE Retaining Wall at Station 22+00
Plot D-2: Short-Term Stability of MSE Retaining Wall Versus Applied Fill Pressure
Plot D-3: Long-Term Stability of MSE Retaining Wall Versus Applied Fill Pressure
Plot D-4: Time Rate and Magnitude of Settlement Analysis, Station 18+00
Plot D-5: Magnitude of Settlement Analysis for Minor Structure 5-16

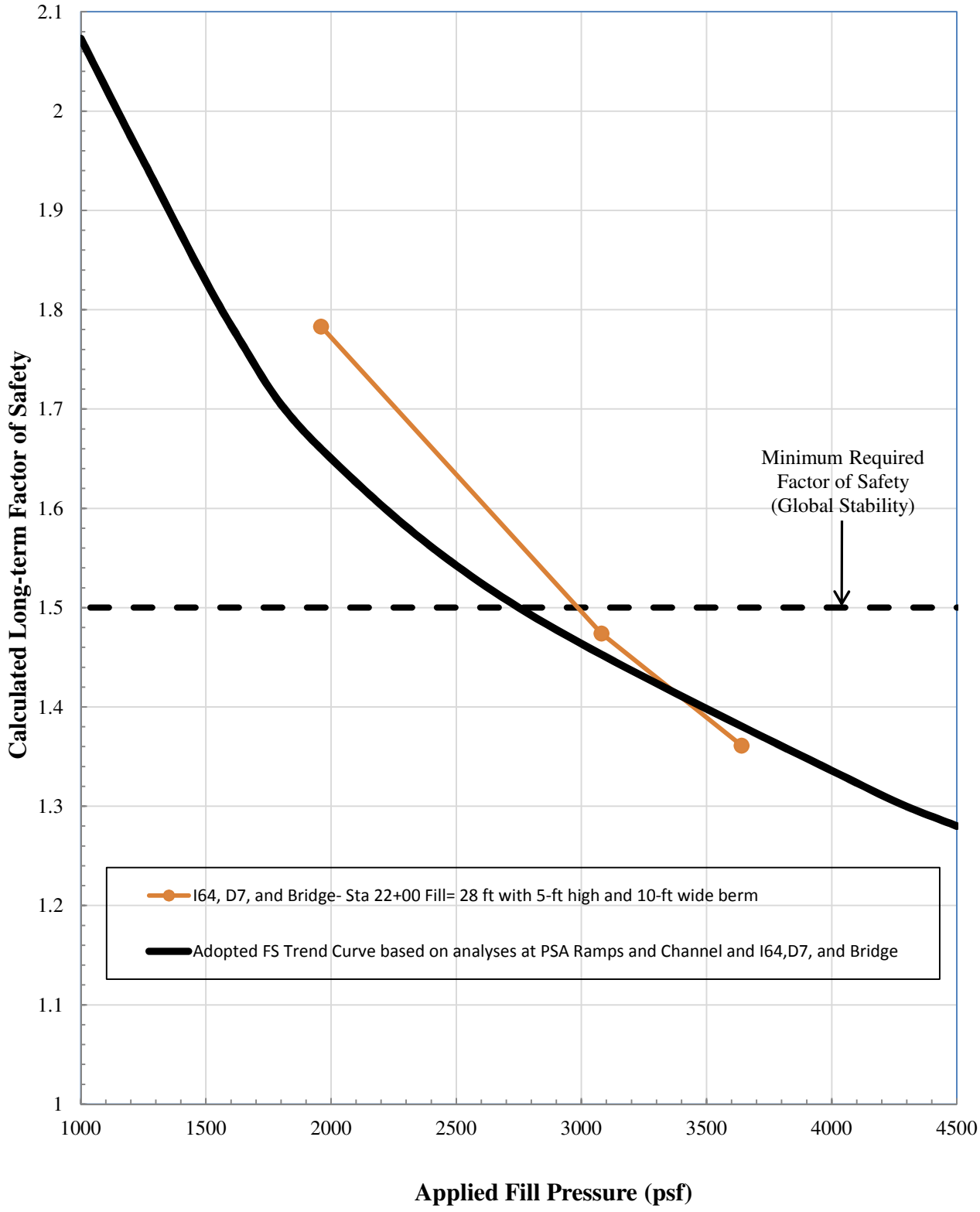
Plot D-1: PSA I64, D7, and Bridge-
Long-term Stability of MSE Retaining Wall (Vertical Face) at Ramp
D7 Station 22+00



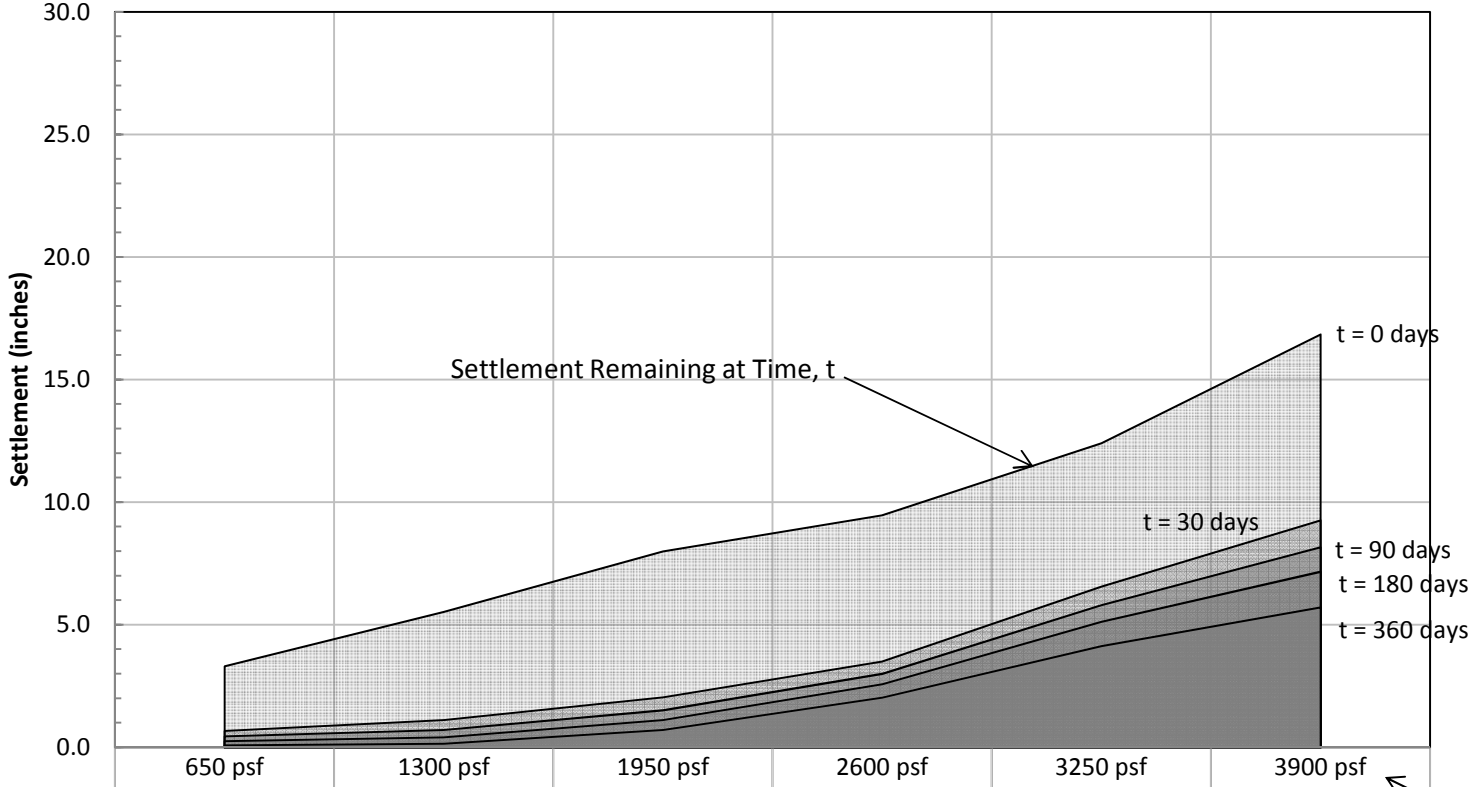
Plot D-2: PSA I64, D7, and Bridge- Short-term Stability of MSE Retaining Wall (Vertical Face) Versus Applied Fill Pressure



Plot D-3: PSA I64, D7, and Bridge-
Long-term Stability of MSE Retaining Wall (Vertical Face) Versus Applied Fill Pressure



Plot D-4: Time Rate and Magnitude of Settlement Analysis
PSA I-64, D7, and Bridge / Ramp D7, Station 18+00

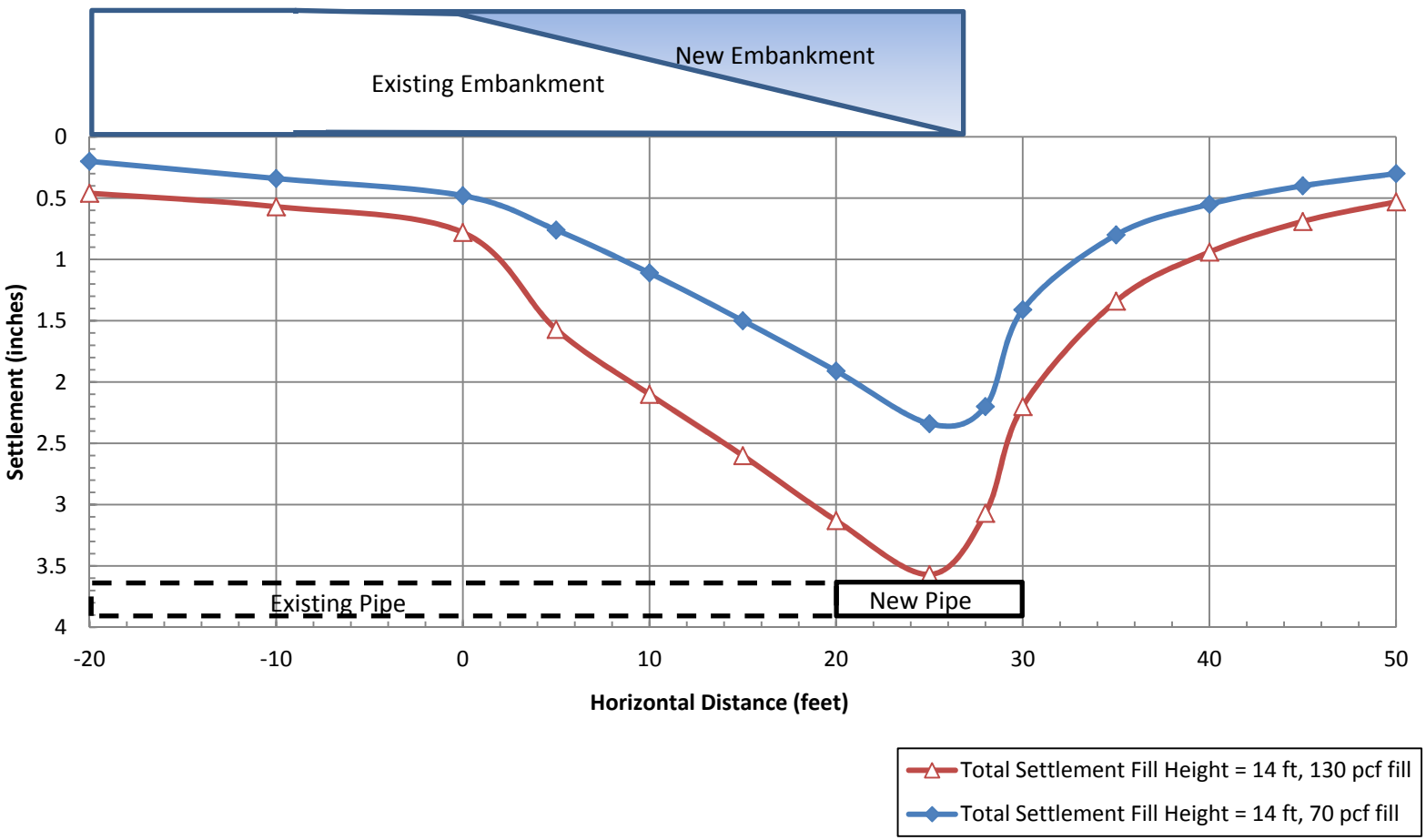


	650 psf	1300 psf	1950 psf	2600 psf	3250 psf	3900 psf
t = 0 days	3.3	5.5	8.0	9.5	12.4	16.8
t = 30 days	0.7	1.1	2.0	3.5	6.6	9.3
t = 90 days	0.4	0.7	1.5	3.0	5.8	8.2
t = 180 days	0.3	0.4	1.1	2.6	5.1	7.2
t = 360 days	0.1	0.1	0.7	2.0	4.1	5.7

Embankment Height x Unit Wt

Plot D-5: Magnitude of Settlement Analysis

PSA I64, D7, and Bridge

Effect of Widening on Settlement of Minor Structure 5-16 at I-64 WB Station 129+50

Height of Fill = 14 feet, Width of Widening = 28 feet