Final Geotechnical Design Report

Replacement of Tuttle Road over I-295, RTE US 1 & MCRR – Cumberland, Maine

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Submitted to:

Maine Department of Transportation

Submitted by:

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1.0 Introduction

The following presents the geotechnical design report for the replacement of the proposed Tuttle Road Bridge over I-295 (Bridge #5801), Rt US1, and MCRR in Cumberland, Maine. This report has been prepared by H&H, LLC based on current AASHTO LRFD and Maine Department of Transportation (MaineDOT) guidelines. The results of the subsurface exploration conducted in 2022 and 2024 are the basis of our foundation design and recommendations.

1.1 Project Understanding

The existing bridge was originally constructed in 1958 and was rehabilitated in 1990. The general bridge location is shown in Figure 1. This existing bridge is nine-spans comprised of rolled steel beams with a composite concrete decking. The deck is currently in fair condition and the superstructure and substructure are in poor condition. The superstructure has damage from a vehicle impact and the substructure shows signs of advanced deterioration. Stub abutments as well as concrete pier columns are founded on CIP concrete piles. Stub abutments/backwalls have staining, large cracking and deterioration to breast wall areas. Concrete pier columns and pier caps exhibit moderate to heavy staining/cracking/delamination and isolated spalling areas adjacent to bearing areas.

Figure 1: Project Location
<u>Source: Google Earth</u>

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The existing bridge will be replaced to eliminate the structural and operational deficiencies of the bridge while providing a safe, low maintenance, cost-effective, two-way crossing for current and projected traffic.

The replacement bridge will consist of 4-span 550-ft long structure extending from approximately Sta. 15+23.75 to Sta. 20+46.50 as shown on Sheets 13 and 14 in Appendix A, Boring Location Plan and Interpretive Subsurface Profiles.

1.2 Purpose and Scope

This report presents an assessment of the geotechnical site conditions and evaluations based on both the initial and final geotechnical subsurface investigations, as well as the associated geotechnical design, analysis, and recommendations. H&H completed the following scope of work for this report:

- Provided a general description of the project and the geotechnical site exploration programs conducted
- Reviewed the available existing subsurface data
- Provided an overview of the regional geologic and seismic context
- Assigned laboratory testing to assess the engineering and index properties of site soils
- Performed geotechnical engineering analyses, including assessment of soil and bedrock properties, proposed embankment stability and settlement, frost susceptibility, AASHTO LRFD load and resistance factors for geotechnical design elements, pile foundation nominal resistance, downdrag effects, pile drivability, and seismic design considerations
- Developed geotechnical engineering recommendations, including foundation design for driven piles, seismic design parameters, embankment settlement mitigation, and geotechnical construction considerations
- Compiled this report to present a summary of the findings and geotechnical engineering recommendations

2.0 Subsurface Conditions

2.1 Geology

The Tuttle Road Bridge is located in southern-central Maine within the Seaboard Lowland Section of the New England Physiographic Province. Regional surficial geologic mapping indicates the surficial soils consist of Holocene (Recent) wetland/saltwater marsh deposits overlying Pleistocene Presumpscot Formation fine grained sediments, which overlie Pleistocene glacial till deposits. The wetland/saltwater marsh deposits consist of peat, clay, silt, and sand deposited in low-lying areas adjacent to tidal inlets, tidal channels, and tidal flats. The Presumpscot Formation consists of fine-grained marine deposits such as silt, clay, sand, and minor amounts of gravel; layer commonly considered a clayey silt. The till was directly deposited by glacial ice and consists of a light to dark gray, heterogeneous poorly sorted mixture of gravel, sand, silt and clay, rarely stratified. The till consists of two varieties: a basal (or lodgment) till, fine grained and very dense; and an overlying ablation (or melt-out) till, coarser grained, stony, and relatively loose. Regional mapping indicates the overburden thickness ranges between 5 feet and 200 feet below ground surface in the Cumberland area.

Regional bedrock geologic mapping indicates the bedrock beneath the site consists of the late Silurian- early Ordovician Vassalboro Group. The lithology consists of medium gray, fine- to medium-grained, quartz-plagioclase-biotite-hornblende gneiss, interlayered with subordinate amounts of calc-silicate gneiss. Layer thickness ranges from 1 to 4 inches, and pegmatite lenses, boudins and sills are common. This formation is interpreted to have been initially deposited as sediments in a marine basin, which subsequently underwent diagenesis to form sedimentary rocks. This formation was then metamorphosed by heat and pressure under miles of younger rocks, forming a layered foliation, and then underwent ductile deformation by several tectonic events dating back to at least Devonian time starting with the Acadian orogeny. This compressional stress created additional foliation textures, and at least three-fold sets. This in turn was followed by post-metamorphic brittle deformation forming numerous northeast trending thrust faults and joints, with the emplacement of non-metamorphosed discordant pegmatite dikes and layer diabase dikes during the Mesozoic Era.

2.2 Subsurface Exploration Program

Subsurface information from the original construction of the Tuttle Road Bridge was made available by the MaineDOT. However, since the original subsurface exploration program only provided subsurface information along the original alignment and used non-standard practices to obtain the subsurface information, a preliminary and final subsurface exploration programs were conducted to better understand the subsurface conditions along the proposed alignment conforming to current standard practices.

The preliminary subsurface exploration program, conducted in 2022, was designed to obtain general subsurface design parameters for engineering analyses of the new bridge foundations and embankments. The final exploration program, carried out in 2024, supplemented the preliminary findings, providing a more detailed assessment of subsurface conditions, particularly in the areas of the proposed embankments.

A summary of both subsurface exploration programs for the Tuttle Road Bridge project is provided below.

2.2.1 Subsurface Exploration Program

This section presents a generalized description of the subsurface investigations performed with test borings for the proposed replacement of the Tuttle Road Bridge. New England Boring Contractors (NEBC) were retained by Hardesty and Hanover, LLC (H&H) to perform the 100-series field subsurface exploration that was completed in October of 2022 while Seaboard Drilling, LLC was subcontracted by H&H to perform the 200-series subsurface exploration program that was completed in April of 2024. The subsurface exploration programs included Standard Penetration Test (SPT), Cone Penetration Tests (CPTs), Field Vane Shear Tests (FVT), soil sampling, rock coring, observation wells installation and geotechnical lab testing. Borings were located and drilled upon MaineDOT's approval.

The locations of the borings are shown on the Boring Location Plan provided in Appendix A. The top of boring elevations was provided from the survey performed by MaineDOT personnel. Refer to Table 1 below for the test boring summary.

Table 1: Test Boring Summary

Test Boring	Ground Surface Elevation (ft)	Boring/CPT Termination Depth (ft)	Depth to Bedrock (ft)	Date Drilled
BB-C295-101	86.47	46.5	36.5	10/18/2022
BB-C295-102	88.59	41.5	31.1	10/13/2022 10/17/2022
BB-C295-103	89.43	58.0	49.0	10/12/2022 10/13/2022
BB-C295-104	90.68	37.5	27.5	10/11/2022
BB-C295-201 (OW)	89.68	28.8	28.8	4/3/2024
BB-C295-202	81.20	39.0	29.0	4/17/2024
BB-C295-203	108.63	66.8	56.8	4/2/2024

BB-C295-204	90.56	57.5	47.5	4/14/2024
BB-C295-205	106.20	52.5	43.5	4/1/2024
BB-C295-206 (OW)	92.08	26.83	26.83	4/14/2024
BB-C295-207	92.45	23.5	23.5	4/18/2024
CPT-C294-201	89.68	28.5	-	4/3/2024
CPT-C294-202	81.13	15.2	-	4/17/2024
CPT-C294-203	89.93	26.3	-	4/14/2024

Standard Penetration Test (SPT): NEBC performed all the 100-series SPT borings which comprised of four (4) land borings. The drilling contractor utilized a track-mounted drilling rig as appropriate to access various locations. All borings were advanced with drilling techniques using a combination of casing and water to maintain an open borehole. The NEBC drill rig was equipped with an automatic hammer for driving the split spoon. The hammer was calibrated per ASTM D4633 in April, 2023. The N-values provided in this report are corrected values, computed by applying an average energy transfer of 0.742 to the raw N-values. This hammer efficiency factor (0.742), along with both the raw field N-values and corrected N-values (N60) are shown on the boring logs. The sampling procedure, referred to as the Standard Penetration Test (SPT) sampling, was carried out using the techniques and equipment specified in ASTM Standard D1586. SPT samples were collected continuously until a depth of 12 feet, and every 5 feet thereafter. The maximum depth of the 100-series subsurface exploration was 58 ft. Rock Cores were taken at all boring locations where bedrock was encountered. Rock coring was performed with an NX core barrel and diamond bit in 5 -foot core lengths. All 100-series borings obtained 9 to 10-foot of rock core.

In April 2024, a comprehensive subsurface exploration program was carried out following the selection of the new bridge alternative during the final design phase of the project. Seaboard Drilling, LLC performed seven (7) borings as part of the 200-series SPT borings. These borings were located to gather geotechnical data at the proposed approaches, abutments, and pier location. The borings were advanced using a DIEDRICH D-50 ATM drill rig with an automatic hammer, which was calibrated in November 2023 in accordance with ASTM D4633, the Standard Test Method for Energy Measurements for Dynamic Penetrometers. The N-values presented in this report are corrected values, calculated by applying an average energy transfer of 1.07 to the raw N-values. Initially, solid stem auger (SSA) drilling methods were employed in the upper 5 to 10 ft of each borehole. Afterward, Seaboard Drilling, LLC utilized cased wash boring techniques, driving 4-inch inside diameter casing in 5-ft increments using an automatic safety hammer, and washing out the soil inside the casing with a roller bit and water to the depth where samples were collected or where field vane shear tests (FVT) were performed. Rock coring was conducted with an NQ core barrel and diamond bit, producing 5 -foot core lengths. 200-series borings obtained 9 to 10-foot of rock core.

All split spoon samples from the 100-series and 200-series borings were classified in the field by a qualified inspector according to the Modified Burmister Classification System per the MaineDOT Key to Soil and Rock Descriptions and Terms that can be found in Appendix B. The boring logs, which detail the subsurface soil and rock stratigraphy encountered, along with sample numbers, types, recovery lengths, raw field and corrected N-values, and rock-quality designations (RQD) are included in Appendix B. An Interpretive Subsurface Profile can be found in Appendix A.

<u>CONE PENETRATION TEST (CPT):</u> Seaboard Drilling, LLC performed three (3) cone penetration tests, CPT-C295-201 through CPT-C295-203. The CPT explorations were advanced adjacent to previously drilled test boring locations as shown on the Boring Location Plan in Appendix A. The CPTs were advanced using a Diedrich D-50 track mounted drill rig utilizing Vertek piezocone equipment. The CPT explorations were performed in accordance with ASTM D5778. Pre-augering was required through fill materials to a depth of 10.0' before advancement of CPT-201. The CPT exploration program included the following:

- Three CPT explorations advanced to depths ranging from 15.2 to 28.5 feet below the existing ground surface. The parameters obtained in all CPT soundings included cone tip resistance, sleeve friction, and pore pressure measurements for material characterization.

- Porewater dissipation tests were performed in CPT-202 and CPT-203 at depths selected by the inspector to identify the hydrostatic groundwater level at the time of CPT testing

<u>FIELD VANE SHEAR TESTS (FVT):</u> Seaboard Drilling, LLC conducted in situ field vane shear tests (FVT), in general accordance with the MaineDOT testing procedure, utilizing a Geonor vane set. Tests were performed within the fine-grained layers. Based on the soil conditions, field vane shear tests were conducted with Geonor 25.4x50.8mm, 55x110 mm or 65x130 mm rectangular vanes with all procedures and rods conforming to MaineDOT guidelines. Vane types used for each test are documented on the boring logs. Both peak and remolded torque values were measured and converted to undrained shear strength values using the MaineDOT correlation charts and equations. For detailed results from the in-situ field vane shear tests refer to Appendix B.

<u>SHELBY TUBE SAMPLING:</u> Seaboard Drilling, LLC collected nine (9) undisturbed Shelby tube samples to further characterize the compressible clay and silt strata for stability and settlement analysis. Shelby tube sampling, as described in ASTM D1587/D1587M-15,

involves using thin-walled steel tubes, also known as Shelby tubes, to obtain relatively undisturbed soil samples for geotechnical testing and analysis. This method is particularly effective for sampling cohesive soils, which retain their structure when extracted. A piston sampler was used to minimize soil disturbance during sampling. The piston inside the tube reduces soil entry until the tube reaches the desired depth. Afterward, the tubes were carefully withdrawn, capped, and sealed to preserve the sample's in-situ moisture content and structure.

More details of the sampling methods used, field data obtained, and soil, bedrock and groundwater conditions encountered are presented on the boring logs included in Appendix B and cone penetration testing report is included in Appendix E.

2.2.2 Historic Subsurface Exploration Program

The original construction of the Tuttle Road Bridge included 14 borings. The historic boring logs and boring plan were obtained from available plans and are attached in Appendix A. The historic boring logs depict the general stratigraphy and rock profile of the subsurface. However, the sampling procedure does not conform to current ASTM standards, and the soil descriptions do not conform to any recognized classification standard, such as Unified Soil Classification System (USCS).

2.2.3 Lab Testing

A laboratory testing program on select soil and rock samples was developed to characterize the subsurface properties across the project site. Laboratory testing was performed in accordance with applicable AASHTO and American Society for Testing Materials (ASTM) testing procedures by GeoTesting Express (GTX) of Acton, Massachusetts. The list of combined testing completed on select soil and rock samples from the preliminary and final investigations is provided below.

The laboratory-testing program included:

- Moisture Content (ASTM D2216)
- Grain Size Analysis (ASTM D422)
- Grain Size Analysis with Hydrometer (ASTM D7928)
- Atterberg Limits (ASTM D4318)
- Corrosion Potential (pH) (ASTM G51)
- Sulfate (ASTM D516)
- Chloride (ASTM D512B)
- Soil Resistivity Laboratory Soil Box (ASTM G57)
- Specific Gravity (ASTM D854)

- Uniaxial Compressive Strength of Rock (ASTM D7012C)
- Incremental Consolidation (ASTM 2435)
- UU Triaxial (ASTM D2850)

All complete geotechnical laboratory test results can be found in Appendix D.

2.4 Stratigraphy

This section summarizes the general subsurface conditions within the project limits. The subsurface stratigraphy determined from the borings along the project alignment is consistent with the regional geology. The general strata descriptions are summarized in the order they were encountered.

For engineering purposes, the subsurface stratigraphy has been generalized and divided into three (3) distinct soil strata overlying bedrock based on soil classification, index properties and engineering design properties.

FILL: At the ground surface, or immediately underlying the road surface, a heterogenous layer of man-made fill was encountered. According to the Modified Burmister Soil Classification System, the fill stratum comprised of fine to coarse SAND with "trace" gravel fractions and silt fractions ranging from “some” to "trace". The relative density varies from very loose to medium dense per corrected SPT data. The thickness of the fill layer ranged from 1.5 feet and 19.5 feet thick with the top 0.5 to 2 feet being topsoil or 6 inches of pavement at BB-C295-203, and -205.

PRESUMPSCOT FORMATION: The Presumpscot Formation underlies the Fill stratum and is comprised of Clayey SILT and Silty Clays with sand lenses and varying amounts of gravel ranging from “some” to “trace”. The layer was observed to be between 4.0 feet and 25.0 feet thick. SPT corrected values ranged from 0 to 52 indicating a consistency of very soft to hard.

GLACIAL TILL: The Glacial Till stratum underlies the Presumpscot Formation and was encountered throughout the project limits with an observed thickness ranging between 2.5 feet and 39.5 feet. The stratum consists of fine to coarse sand with "some" to "trace" gravel fractions and silt fractions ranging from “some” to “trace”. The relative density varies from medium dense to very dense per corrected SPT data. At a few locations, an interbedded very stiff Silty Clay and Sandy SILT layer was encountered between 25 feet to 35 feet bgs.

BEDROCK: Bedrock was encountered in all borings that were performed in October of 2022, April of 2024, and in the 11 historic borings. Top of the bedrock was encountered between 25 feet bgs to 56.8 feet bgs at elevations ranging from EL.40.43 to EL.65.25. Rock core intervals of 10 feet were collected in borings where the substructures are proposed in up to 5-foot runs. The predominant bedrock lithology encountered was gray, coarse-grained, fresh to moderately weathered gneiss, interpreted to be part of the Vassalboro Formation with medium to coarse quartz inclusions observed in a few retrieved rock cores. A slightly weathered Quartzite layer was encountered on top of gneiss in borings BB- C295-104, and -202. The RQD (rock quality designation) ranged from very poor (7%) to excellent (97.5%). The Recovery ranged between 63% and 100%. The eight unconfined compressive strength tests conducted on rock core samples yielded unconfined compression strength (UCS) values ranging from 839 ksf to 2523 ksf. Results of the Rock Core testing can be found in the Appendix D.

2.5 Geotechnical Engineering Parameters

The geotechnical engineering parameters required for the design and analyses have been developed based on the corrected SPT (N_{60}) and/or laboratory testing results applicable to the entire project site, along with our professional engineering judgement. These parameters are presented in Table 1 below:

Table 2: Soil Parameters

Stratum		Total Unit Weight (pcf)	Shear Strength		Unconfined Compressive Strength (ksf)
			Undrained Shear Strength (psf)	Friction Angle (deg)	
Fill		112-115	-	29-30	-
Presumpscot Formation	Very Soft to Soft Cohesive	90-95	250-375	-	-
	Medium Stiff to Hard Cohesive	115-130	1000-3500	-	-
Glacial Till	Cohesionless	125-130	-	30-38	-
	Cohesive	115-135	3000-4000	-	-
Bedrock		160	-	40	360

2.6 Groundwater

Two observation wells were installed in the boreholes BB-C295-201, and -206 to monitor groundwater levels at the site. The wells were positioned to capture water level variations across the area, one on the west side and the other on the east side. Upon completion of the installation, water level readings were taken on a weekly basis for the first month, providing data to monitor initial trends. After this initial monitoring period, the frequency of readings was adjusted to a bi-weekly schedule for the subsequent month to maintain ongoing observation while accommodating any potential changes in the water levels over time. Groundwater level measurement in boring BB-C295-101 was measured upon completion of the boreholes and prior to removal of the casing. Groundwater level measurements in borings BB-C295-102, and -103 were measured the next day before drilling continued. Groundwater level measurement in boring BB-C295-104 did not take place. Groundwater elevations measured in the 100-series borings were between elevations 83.73 feet and 84.87 feet. Throughout the monitoring period, the water levels were observed to fluctuate within a specific range, with measurements indicating that the water level on the west side was consistently around EL. +81.3, while on the east side, the water level was noted to be higher, approximately at EL. +89.0. Groundwater levels shown on the Interpretive Subsurface Profile (Appendix A) were interpreted based on these water level meter measurements. These observations represent groundwater conditions at two exploration locations and may not be indicative at other locations. Groundwater levels are expected to fluctuate due to seasonal changes, precipitation, and ongoing construction activity in the area. As a result, water levels during and after construction may differ from those recorded in the borings at the time of the initial observations.

2.7 Corrosion Potential and Rates

A soil corrosivity suite of collected soil samples from the 100-series and 200-series borings were performed to classify the corrosive nature of the in-situ soils. Laboratory test results from the 100-series borings indicated an average pH value of 6.88, resistivity value of 2,686 ohm-cm, sulfate concentration of 10 ppm and chloride content of 22 ppm. Similarly, lab test results from the 200-series subsurface exploration indicated a soil pH of 7.7 in distilled water and 6.4 in calcium chloride, a resistivity value of 1176 ohm-cm, a sulfate concentration of 10 ppm, and a chloride concentration of 131 ppm. As per AASHTO section 10.7.5 laboratory corrosivity results do not indicate a potential corrosive environment. In any case, the design section considered 1/16-inch sacrificial thickness.

2.8 Frost Consideration

Based on the site location and soil conditions observed from the subsurface exploration program, frost penetration depths of 4 to 6.5 ft can be expected below the ground surface. It is recommended that the bottom of the proposed footings to be placed below the frost line at minimum to prevent any frost heave. The depth of frost penetration is derived based on Table 5-1 which has been developed by utilizing Modified Berggren Equation and Figure 5-1 Maine Design Freezing Index Map per Section 5.2.1 of Maine Bridge Design Guide manual. Please refer to Table below for the anticipated depth of frost penetration.

Table 3: Frost Penetration Depths

Location	Soil Type	Water Content	Design Freezing Index	Frost Penetration (interpolated)
West Abutment Footing (1)	Coarse Grained	12.3%	1300 (Cumberland)	73.2 in., use 6.5 ft
East Abutment footing (1)	Coarse Grained	12.3%	1300 (Cumberland)	73.2 in., use 6.5 ft
Pier-1 Footing (2)	Fine Grained	25.4%	1300 (Cumberland)	44.2 in., use 4 ft
Pier-2 Footing (2)	Fine Grained	20.0%	1300 (Cumberland)	46.6 in., use 4 ft
Pier-3 Footing (2)	Fine Grained	25.8%	1300 (Cumberland)	44 in., use 4 ft

Notes:
(1) East and West Abutments – Frost penetration depth below the proposed finished rip-rap grade.
(2) Pier 1,2, and 3 – Frost penetration depth below the existing thin layer of surficial fill/topsoil.

3.0 Seismic Design Considerations

The project site classification has been determined by following the procedure outlined in AASHTO Table C3.10.3.1-1 and utilizing Method B to analyze the recorded average SPT N-values from the geotechnical subsurface investigation program. The majority of the 100-series borings conducted classified the project location as Site Class D. However, softer/looser soils were observed in boring BB-104 suggesting Site Class E conditions. A subsequent investigation, involving 200-series borings, indicated that three (3) of the borings confirmed the project location as Site Class D, while four (4) of the borings identified conditions consistent with Site Class E.

Site seismicity was analyzed utilizing procedures outlined in AASHTO 3.10.3.2 referencing USGS map data presented in the same section. The site class adjusted spectral horizontal acceleration coefficients are 0.27 for 0.2 seconds (S_{DS}) and 0.1056 for 1 second (S_{D1}) for Site Class D, and 0.425 for 0.2 seconds (S_{DS}) and 0.154 for 1 second (S_{D1}) for Site Class E. Per FHWA-NHI-11-032 Table 8-2, one second period horizontal coefficients S_{D1}, for site class D and E identifies the project location as Seismic Zone 1. In accordance with AASHTO 10.5.4.2 liquefaction assessment is required only for Seismic Zones 3 and 4, and for loose to very loose saturated sands in Seismic Zone 2. Additionally, the available subsurface data indicates that the soil encountered below the groundwater table exhibits non-liquefiable characteristics in accordance with AASHTO LRFD guidelines since the soils are sufficiently cohesive or dense.

The site class analysis for each boring location, along with the evaluation of each seismic design parameter, is provided in Appendix F.

Table 4: Seismic Design Parameters

	PGA	**A_S**	**S_{DS}**	**S_{D1}**	**Seismic Zone**
Site Class D	0.088	0.14	0.27g	0.11g	1
Site Class E	0.088	0.22	0.43g	0.15g	1

4.0 Bridge Foundations

This section summarizes the geotechnical analyses and provides foundation recommendations for the proposed Tuttle Road Bridge over I-295 and Rt US 1, based on the available subsurface information from the two subsurface exploration programs performed in 2022 and 2024. The design philosophy follows the current AASHTO LRFD Bridge Design Specifications and MaineDOT guidelines.

4.1 Selection of Foundation Type

Based on the findings from the subsurface exploration programs, our subsequent engineering evaluation, the structural bridge loads, and our experience, we recommend that all new substructures be supported by deep foundations comprised of H-piles driven to bedrock. The selection of driven H-piles is due to several advantages, including high load carrying capacities when driven to competent bedrock, ability to drive through difficult subsurface conditions, ability to potentially displace obstructions that may be encountered during installation, no need for a specialty contractor, cost and time efficiency compared to drilled piles, and smaller displacement volume to help minimize the disturbance of the soil when driving adjacent to existing structures.

4.2 Design Procedures and Assumptions

The design of the driven pile foundations is based on the following procedures and assumptions:

- H-piles will be driven to refusal on or near competent bedrock; therefore, foundation settlement is not a concern, and the axial compressive capacity will be governed by structural limit state as per AASHTO article 10.7.3.2.3.
- H-pile design considers resistance factor of 0.5 for axial structural resistance in compression (severe driving conditions).
- H-piles designed considering resistance factor of 0.5 for uplift resistance of single piles.
- H-piles designed considering the nominal axial resistance calculated by dividing the maximum factored axial load by a geotechnical resistance factor of 0.65.
- No reduction for group interaction in axial compression was considered since the piles will gain support largely in end bearing and the pile cap will be in firm contact with the ground.
- Piles are spaced at least three diameter-widths apart, center-to-center and corresponding P-multipliers for evaluation of lateral capacity of pile groups was considered.
- If required, use battered piles not exceeding 1 (horizontal) to 6 (vertical) to resist horizontal force.
- Number of piles at each substructure unit was estimated using FB-MultiPier.
- Minimum tip elevations were established through FB-MultiPier analyses and with consideration to the requirements of AASHTO 10.7.6.

- Nominal uplift capacity was estimated by utilizing the Nordlund/Thurman method to compute pile resistance for cohesionless soils and α-method for pile resistance in cohesive soils.
- Pile drivability analyses performed utilizing GRLWEAP considering locally available hammer systems.
- At least two (2) piles per substructure unit, but no less than 2%, of the production piles, and 5% when there are more than 20 piles, will undergo dynamic testing with signal matching for end of driving (EOD) and beginning of restrike (BOR) occurring a minimum 24 hours after initial driving to confirm pile capacities and develop pile driving criteria.
- The pile installation criteria for the production piles shall be established considering the results from the dynamic testing with signal matching.

4.3 Foundation Design and Recommendations

Based on the subsurface conditions, structural bridge loads, our experience and preferred HP pile sections as listed in Table 5-7 of the MaineDOT Bridge Design Guide, HP 14x89 steel sections, conforming to ASTM A572, Grade 50 standards, are recommended for this project.

4.3.1 Axial Pile Resistance

4.3.1.1 Axial Compression Pile Resistance

As determined in section 4.1 all new proposed pier and abutment foundations are to be supported by driven H-piles bearing directly on competent bedrock, hence, the axial compressive capacity will be governed by its' structural limit state as per AASHTO article 10.7.3.2.3. The structural resistance factor for the axial capacity of piles in compression, particularly when exposed to potential damage from severe driving conditions (such as bearing on "hard" rock), is 0.5, as specified in AASHTO Section 6.5.4.2. Additionally, the resistance factors for Service and Extreme Limit State loads are set at 1.0. Even though lab results did not indicate a corrosion potential, the structural nominal resistance was conservatively calculated considering a potential section loss of 1/16" due to corrosion. Consequently, the nominal and factored structural resistances of HP14x89 steel H-pile under the Service, Strength, and Extreme Event Limit States are outlined in the following table:

Table 5: Axial Compression Pile Resistance

Steel H-pile Section	Nominal Structural Resistance (kips)	Factored Compression Resistance (kips)		
		SER	STR	EXT
HP14x89	1025	1025	512.5	1025

4.3.1.2 Axial Uplift Pile Resistance

Axial uplift pile resistance will primarily derive its capacity by friction along the embedded length of the pile. For this project, the nominal uplift resistance of the piles was assessed utilizing DrivenPiles software using the applicable resistance factors for the Service, Strength, and Extreme Event limit states listed in AASHTO Article 10.5.5. The resistance factor of single piles for Strength Limit State is set to 0.5 according to AASHTO Table 10.5.5.2.3-1. Additionally, the resistance factors for Service and Extreme Limit State loads are set at 1.0 and 0.8, respectively. The factored uplift resistances of an HP 14x89 steel H-pile at each substructure location are summarized below:

Table 6: Axial Uplift Pile Resistance

Substructure Location	Factored Uplift Resistance (kips)		
	SER	STR	EXT
West Abutment	230	115	184
Pier 1	164	82	131
Pier 2	276	138	221
Pier 3	278	139	222
East Abutment	142	71	114

*Values assume piles are driven to top of estimated top of rock based on the adjacent borings.

Considering this, the factored uplift resistances all exceed the anticipated max factored pile uplift demand for each respective limit state at each substructure location. Please refer to Table 7 for the max factored pile uplift loads and Appendix H-1 for the pile uplift resistance analyses.

4.3.2 Pile Group Evaluation

H&H conducted pile group evaluations for each proposed bridge substructure considering bridge structural loads and subsurface conditions. Pile group analyses were carried out using FB MultiPier (FBMP), a nonlinear finite-element analysis program that simulates soil-structure interactions. This program combines nonlinear structural finite-element analysis with static soil models to assess axial, lateral, and torsional soil behavior, providing a comprehensive analysis of the bridge pier structures and foundation systems. H&H developed the FBMP models, incorporating substructure loading data and pile group geometry, such as pile cap dimensions and pile layout. These models also accounted for subsurface soil, rock, and groundwater conditions based on findings from both the Preliminary Phase and Phase II subsurface investigation, as well as the static axial compressive pile resistances presented in this report. Multiple iterations were performed at each substructure location to determine the most efficient pile type and size needed to resist the applied loads and moments. The program's outputs were reviewed and summarized, with the pile group evaluation results provided below. Refer to Appendix H-2 for the FBMP analyses.

Table 7: Pile Group Evaluation Results

Substructure Location	Max. Factored Pile Compressive Load (kips)			Max. Factored Pile Uplift Load (kips)			Max. Lateral Pile Head Displacement (inches) (1)	
	SER	STR	EXT	SER	STR	EXT	Longitudinal	Transverse
West Abutment	193	277	262	0	4	53	0.14	0.11
Pier 1	258	295	237	0	12	0	0.04	0.19
Pier 2	262	306	241	0	3	0	0.05	0.19
Pier 3	262	311	298	21	0	74	0.05	0.23
East Abutment	188	263	242	0	3	47	0.11	0.09

Notes:
(1) Values shown are from the service limit state.

4.3.3 Downdrag Loading

According to AASHTO LRFD, Article 3.11.8, downdrag can fully develop along the length of a pile when settlement reaches 0.4 inches or more. Settlement analyses at Abutments 1 and 2 indicate that the piles will be subjected to downdrag forces due to surrounding soil settlement. H&H calculated the maximum downdrag loads at the cross-sections nearest to the abutments, where the embankment settlement is most prominent and conservatively assumed that downdrag extended to the bottom of each respective clay layer.

The shaft resistance contributing to downdrag loads was calculated using the DrivenPiles software, which incorporates the FHWA method for modeling unit load transfer and axial pile capacity. For cohesionless soils, the Nordlund method was applied to estimate unit shaft resistance, while in cohesive soils, the alpha method was used to assess the unit shaft resistance.

H&H calculated downdrag loads in accordance with AASHTO LRFD Article 10.7.3.7. For Abutment 1 (West), the factored downdrag loads were 111 kips under Strength I loading and 79 kips under Service I loading. For Abutment 2 (East), the factored downdrag loads were 63 kips under Strength I loading and 45 kips under Service I loading.

The following downdrag load factors were applied based on soil type and according to AASHTO Tables 3.4.1-1 and 3.4.1-2:

- **Cohesionless soils**: 1.05 (Strength I) and 1.00 (Service I)
- **Cohesive soils**: 1.40 (Strength I) and 1.00 (Service I)

For detailed calculations refer to Appendix G-1.

4.3.4 Pile Design Summary

The recommendations for the pile foundation design considered several factors discussed in detail in the preceding sections which included the structural bridge loads, axial piles resistances, pile group evaluations, downdrag forces due to settlement at the abutments, and the listed design procedures and assumptions. Please refer to Table 9 below for the Pile Design Summary.

Table 8: Pile Design Summary

Substructure Unit	Pile Type	Minimum Factored Individual Pile Load (kips)[1]	Minimum Required Nominal Axial Driving Resistance (kips)[2]	Minimum Pile Tip Elevation (ft)	Estimated Pile Tip Elevation[3] (ft)
Abutments					
Abutment 1 (West)	HP14x89	388	597	73	47
Abutment 2 (East)	HP14x89	326	502	74	58
Piers					
Pier 1	HP14x89	295	454	56	45
Pier 2	HP14x89	306	471	64	38
Pier 3	HP14x89	311	479	58	35.5

Notes:
(1) Values for the abutments include the respective factored downdrag loads.
(2) Values determined by dividing the Minimum Factored Individual Pile Load by a geotechnical resistance factor of 0.65.
(3) Estimated Pile Tip Elevation includes an additional 5 ft to account for variations in bedrock depth.

4.3.5 Pile Driveability

H&H conducted driveability analyses utilizing GRLWEAP for the steel HP14x89 at each proposed foundation location. The objective of the analyses was to evaluate the range of rated energy necessary to install the piles to a nominal resistance without exceeding the allowable driving stress.

The driveability analyses considered the following:

- A limiting allowable pile stress of 45 ksi, which is 90% of the 50 ksi pile steel yield stress
- GRLWEAP's recommended quake and damping input values for impact driven piles
- Resistance distribution of 10% shaft resistance and 90% toe resistance at end of driving
- Hammer blows between 3 to 15 blows per inch in accordance with MaineDOT Standard Spec. Section 501.042 to achieve the minimum required nominal axial driving resistance
- Locally available hammer systems

Results from the driveability analyses indicated satisfactory driveability using a Delmag D30 with a ram weight of 6600 kips and a rated energy of 59.73 (kip-ft) operating at a fuel setting 3 (80%). The results are summarized below:

Table 9: Wave Equation Analysis Results

Pile Location and Type	Embedded Pile Length	Driving System Rated Energy (kip-ft)	Minimum Required Nominal Axial Driving Resistance (kips)	Max Driving Stress (ksi)	Final Penetration Resistance (blows per inch)
West Abutment HP 14X89	48	59.73	597	37	8.7
East Abutment HP 14X89	35	59.73	502	34	5.8
PIER 1 HP 14X89	37	59.73	454	33	4.5
PIER 2 HP 14X89	47	59.73	471	33	5.1
PIER 3 HP 14X89	49	59.73	479	33	5.6

Please note that the final driveability analyses shall be conducted by the awarded contractor considering their selected hammer system. Please refer to Appendix G-4 for detailed GRLWEAP analysis results.

5.0 Roadway Approach Embankment

The proposed off-line alignment for the west and east approach roadways require embankment widening from the existing alignment to support the new roadways. The embankment will be constructed using engineered fill materials to achieve the required raised grade. The fill height of the new embankment will vary but it is at the highest by the new abutments and taper as it extends away, ensuring a gradual transition to the existing ground surface. The design approach requires embankment side slopes to be constructed at a 2H:1V ratio to provide stability and maintain slope integrity. Provided that the existing Tuttle Road Bridge is planned to be in service during construction of the proposed embankment expansion, conventional soil surcharge method and consolidating the in-situ subgrade soils below the proposed approach embankments will introduce differential settlement posing potential risks to the existing adjacent structure and its approach embankments. Settlement mitigation alternatives otherwise known as ground modification was considered to mitigate potential risks and beneficial to the project schedule in lieu of traditional preloading.

Therefore, we recommend Ultra-light Foamed Glass Aggregate (ULFGA), an engineered fill material made from 100% recycled glass as select fill, in composite with common borrow fill to construct the proposed embankments. Its lightweight nature, durability, and environmental benefits make it an ideal material for use in complex construction conditions, such as when active traffic must remain in service during construction. Primary advantage of the ULFGA is having low unit weight which minimizes the stress placed on the underlying compressible soils, and generating less vertical stress that settlement due to soil consolidation is considerably reduced. Ultra-lightweight foamed glass aggregate is commonly used in applications such as lightweight fill for road embankments, retaining wall backfill, and various ground improvement projects.

There are specific stations within the project limit requiring implementation of ULFGA with borrow fill, per our design approach and drawings. These profiles from the drawing have ULFGA to be partially or fully installed above the existing ground surface and along the slope of existing embankments, depending on the condition of underlying compressible layers. When ULFGA is partially placed, borrow fill is placed above and for the remaining section of the proposed embankments. When installing the ULFGA, it must be fully encapsulated with a non-woven separation geotextile, in accordance with MaineDOT Standard Specification 722.04. The installation of ULFGA should follow the guidelines outlined in Special Provision Section 203, Excavation and Embankment (Ultra-Lightweight Foamed Glass Aggregate).

5.1 Embankment Design Parameters

H&H developed design parameters for the proposed widened embankments at West and East approaches. The recommended geotechnical design parameters of the in-situ soils can be found in section 2.5, as these parameters are based on the subsurface data and laboratory and in-situ testing and are incorporated into both settlement and global stability analysis. This section describes engineering parameters required for the construction of the embankment and embankment performance analysis.

5.1.1 Recommended Construction Fill Material Parameters

For our embankment design, we have established the geotechnical design parameters for construction fill material that served as a basis for our embankment performance analysis. The selected fill consists of well-graded granular borrow material, ULFGA, aggregate subbase material, pavement, and riprap. These parameters are designed to ensure the long-term performance and stability of the embankment under varying load conditions. Table 5-1 provides a summary of design parameters.

Table 10: Recommended Fill Material Design Parameters

Type of Fill	Total Unit Weight (pcf)	Friction Angle	K_a
Borrow Fill	120	32	0.47
ULFGA	20	40	0.36
Aggregate Subbase	135	36	0.41
Asphalt	140	40	0.36
Riprap	140	40	0.36

5.1.2 Recommended Consolidation Parameters

As mentioned in Section 2.4, the Presumpscot Formation which is comprised of compressible material was encountered throughout the project limits underlying the fill stratum. Consolidation tests were performed on the in-situ undisturbed samples of the Presumpscot clays taken during the subsurface exploration program. A total of 5 one-dimensional consolidation test (ASTM D2435 – method B) was performed by the laboratory.

The OCR was calculated by dividing the pre-consolidation pressure by the current vertical effective stress from the consolidation curve. The compression index (C_c) and recompression index (C_R) values were calculated from the consolidation curve by assessing the change in void ratio relative to the logarithm of the effective stress increase. The secondary compression coefficient ($C\alpha$) was derived from the consolidation data and considering the typical values for normally consolidated and over consolidated clays per NAVFAC DM 7.01 and FHWA-GEC-No.5. Also, a range of coefficient of consolidation values (C_v), were obtained from the consolidation test results.

Based on the laboratory and in-situ testing results H&H interpreted the index and compressibility properties as follows:

Table 11: Recommended Consolidation Parameters

Location		C_c	C_R	C_v (ft^2 /day)	C_α/C_c	Estimated OCR
West Approach	Upper Stratum	0.087	0.01	0.26	0.021 – 0.032	3.5
	Lower Stratum	0.131 – 0.369	0.015 – 0.011	17.28 – 25.92	0.035 – 0.050	1-3.5
East Approach	Upper Stratum	0.087-0.369	0.010-0.011	0.26	0.035	3
	Lower Stratum	0.154 – 0.369	0.009 – 0.011	0.06 – 0.25	0.050	1.1

5.2 Embankment Performance Criteria

This section outlines the required criteria for the settlement and slope stability for the embankment constructions, in accordance with AASHTO LRFD guidelines and MaineDOT specifications

Settlement Requirements

- Settlement magnitude less than 2 inches at pavement level within 100 feet of the abutment in the first 5 years post-construction.
- Settlement magnitude of 2 inches at pavement level within 100 feet of the abutment in the following 5 years. (10 years post-construction)
- Additional settlement magnitude of 2 inches at pavement level within 100 feet of the abutment over the remaining service life of 75 years after the first 10 years.

Global Stability Requirements

- Minimum safety factor of 1.3 for embankment under Service I Load Combination.
- Minimum safety factor of 1.5 where slope supports or contains a structural element under Service I Load Combination.

- Minimum safety factor of 1.1 for embankment/bridge abutments under Extreme Limit State.

5.3 Settlement Analysis

H&H has assessed the total estimated settlement caused by the proposed widening of the existing embankment for the off-line project alignment. The analysis was performed at various stations along the proposed west and east approaches to provide a general estimate of the settlement magnitudes throughout the project site. We utilized ADAMA Engineering Inc's software Foundation Stress and Settlement Analysis (FOSSA) to generate 2D soil and embankment models for the settlement evaluation. Multiple FOSSA models were created at different Stations based on the height of the proposed embankment, composition of fill material, and corresponding nearest completed borings.

Based on the details provided in the drawings, the proposed embankment widening has 2H:1V side slopes with various fill heights consisting of common borrow fill and ultra-lightweight foamed glass aggregate (ULFGA), with 20 inches of crushed gravel subbase and 4 inches of pavement cover at top. Table-12 below shows the stations along the proposed approaches where change in composition of fill and soil strata occurs at the cross sections provided in the drawing, starting from the project limit STA 11+00 and ending at STA 26+00. Our FOSSA models reflect each cross sections from below Table 12 to closely evaluate anticipated settlement and accommodate the changing conditions.

Table 12: Embankment Sections

West Approach			
STATION	**Type of Fill**	**Approximate Maximum Height of Fill**	**Referenced Borings**
STA 13+75	Borrow	22 ft	BB-C295-201
STA 14+50	Borrow + ULFGA	26 ft	BB-C295-201
STA 15+00	Borrow + ULFGA	29 ft	BB-C295-202 BB-C295-203
East Approach			

STATION	Type of Fill	Approximate Maximum Height of Fill	Referenced Borings
STA 20+75	Borrow + ULFGA	18 ft	BB-C295-206 BB-C295-205
STA 21+50	ULFGA	16 ft	BB-C295-206 BB-C295-205
STA 22+25	ULFGA	14 ft	BB-C295-207

Embankments from stations 11+00 to 13+75 and 22+25 to 26+00 were not analyzed due to the tapering height of the fill along these stations. It is assumed that total settlement within these ranges will be less than the anticipated total settlement estimated at the specified sections in Table 13 of this section. Furthermore, our approach does not consider the elastic settlement within the coarse grained in-situ materials near the existing ground surface as this will occur during the construction period and is expected to be negligible.

For our FOSSA analyses, embankments were modeled in accordance with the detailed dimensions provided in the drawings with a portion of the borrow fill replaced with approximately 50 to 100 percent of ULFGA in the bottom layer of proposed embankment fill depending on the stations. We assumed a typical embankment borrow fill unit weight of 120 pounds per cubic foot (pcf), ULFGA unit weight of 20 pcf, and crushed stone subbase with pavement combined unit weight of 135 pcf. Subsurface conditions in each model considered nearest completed borings within the proximity of these stations. Where necessary, the subsurface conditions were interpolated or extrapolated between or beyond the test borings. In a unique instance, test borings BB-C295-206 and BB-C295-207 exhibited considerable differences in their consolidation parameters within the Presumpscot Formation making interpolating between the two borings challenging especially when considering the distance between them. To address the uncertainty of the consolidation parameters between the two mentioned borings, the ULFGA was conservatively proposed to gradually taper up from the east abutment to full height at approximately STA 21+50.

Considering the subsurface conditions, the Presumpscot formation was identified as the compressible layer subject to consolidation. Both primary consolidation and secondary compression of the Presumpscot Formation were evaluated considering the proposed raised embankments. Provided that the stratum was generally sandwiched between cohesionless strata, drainage at the top and bottom of the Presumpscot formation was considered and the groundwater table modeled considered the measurements from the observation wells.

Based on the recommended settlement criteria, our analyses evaluated settlement within 100-ft of the abutment 5 years post-construction, then 5 to 10 years, then 10 to 75 years. Based on the results, total settlement is estimated to be approximately between 1 to 2 inches over the first 5 years, 0 to 0.5 inches over the following 5 years (10 years post construction), and up to 1 inch during the remaining service life span of the bridge. This satisfies the MaineDOT settlement criteria within 100 feet of the abutments. The estimated settlement due to the proposed raised embankment at each respective station is summarized in Table 13 below. Please see Appendix I for detailed FOSSA models and analysis results.

Table 13: FOSSA Summary of Settlement Results Post-Construction

STATION	Primary Consolidation (in.)		Secondary Compression (Creep) (in.)		Total Settlement (in.)	
	0 to 5 years	5 to 10 years	0 to 5 years	5 to 10 years	0 to 5 years	5 to 10 years
STA 13+75*	1.79	-	0.24	0.13	2.03	0.13
STA 14+50	1.77	-	0.19	0.12	1.96	0.12
STA 15+00	0.57	-	0.41	0.12	0.98	0.12
STA 20+75	0.99	-	0.96	0.24	1.96	0.24
STA 21+50*	0.48	-	1.16	0.29	1.64	0.29
STA 22+25*	1.52	0.35	-	0.01	1.52	0.36

Settlement over 75-year Service Life after 10-year post construction			
	Primary Consolidation (in)	Secondary Compression (Creep) (in)	Total Settlement (in)

STA 13+75*	-	0.41	0.41
STA 14+50	-	0.34	0.34
STA 15+00	-	0.37	0.37
STA 20+75	-	0.70	0.70
STA 21+50*	-	0.85	0.85
STA 22+25*	0.18	0.73	0.91

*These Stations are beyond 100 ft from the abutments.

It's important to note, estimated settlements summarized above assume the pavement and traffic will immediately be placed on the raised embankments as soon as they are constructed when based on the anticipated construction schedule, the raised embankments could be in place for up to 12 months prior to installation of the subgrade and pavement. Therefore, the values summarized in Table 13 are likely conservative.

5.4 Global Stability Analysis

H&H evaluated the global stability of the proposed abutments and embankments, using the industry standard software Slide 2 by Rocscience. Analyses were performed in the transverse and longitudinal sections of embankments and abutments.

We created six embankment models at different stations specified in Table 5-2 and the details of the cross sections were from the provided drawings. Two additional models were created for each west and east abutment. Same subsurface stratigraphy that was created for settlement analysis was implemented into our Slide models. A typical traffic surcharge load of 250 psf was applied as distributed load at top of the embankments and abutments. The models were analyzed using the Spencer and Bishop simplified limit equilibrium methods with an auto refine search for circular failure planes, sliding block failure, and the lowest factor of safety was selected from the software searched results.

A pseudostatic analysis was conducted to evaluate the embankment slope stability under seismic loading conditions. The analysis incorporated earthquake loading by applying a horizontal seismic coefficient (k_h) based on half of the maximum peak ground acceleration (PGA), determined to be 0.105g. This resulted in a k_h value of 0.044 (0.0525g), accounting for horizontal seismic forces acting on the slope, in accordance with the pseudostatic approach outlined in the AASHTO LRFD section 11.6.5.2.2. guidelines.

Table 14 below shows the result of factor of safety of proposed embankments and abutments at specified stations. Please see Appendix H for detailed SLIDE models and analysis results.

Table 14: Minimum Factors of Safety

Roadway Embankments (Transverse)		
Station	**FS: Static**	**FS: Seismic**
STA 13+75	1.36	1.22
STA 14+50	1.38	1.24
STA 15+00	1.36	1.22
STA 20+75	1.83	1.65
STA 21+50	2.54	2.29
STA 22+25	1.92	1.64
Abutments (Longitudinal)		
Location	**FS: Static**	**FS: Seismic**
West Abutment	5.230	4.377
East Abutment	3.993	3.302

5.5 Lateral Squeeze Potential

Potential for lateral squeeze was evaluated in accordance with FHWA NHI-16-009. Lateral squeeze due to unbalanced fill load above compressible cohesive soil could occur causing bridge abutments supported on driven piles to tilt. As per section 7.3.8 Eq 7-74, the rule of thumb for determining whether tilting will occur is if the surcharge pressure due to the raised embankment exceeds 3 times the undrained shear strength of the compressible cohesive soil.

$$\gamma_f H_f > 3s_u \qquad \text{(FHWA-NHI-16-009 equation 7-74)}$$

Where:

- γ_f = unit weight of fill (pcf).
- h_f = height of fill (feet).
- s_u = undrained sear strength of soft cohesive soil (psf).

Considering the recommended rule of thumb above, potential for lateral squeeze at both proposed abutments is not a concern.

6.0 Construction Considerations

6.1 General Earthwork

Prior to fill placement clearing the area of topsoil, soft or very loose soils, debris, frozen soil, or any other deleterious materials shall be performed. Areas to be filled should be proof rolled, undercuts due to soft soils during embankment widening may be necessary along the alignment. All fill to be used within the project limits should be free of debris and organics and consist of approved material according to Section 203.02 of MaineDOT Standard Specifications.

6.2 Protection of Utilities

Underground utilities require protection during demolition of the existing bridge and the construction of the new bridge. Utilities should be protected or relocated during excavation. Overhead wires and their supporting poles may be in conflict with the proposed work and should be protected or relocated during construction. All underground utilities, if identified, should be relocated outside of the zone of influence of the footings.

6.3 Construction Monitoring

During construction of the proposed bridge structure, the existing bridge, as well as any adjacent structure(s) and utility(s) need to be protected from damage during planned construction work specifically from installation of the new pile foundations and bridge demolition. The contractor shall exercise caution while selecting the means and methods of construction and retain the services of an experienced vibration specialist who can install, operate, read, and interpret vibration and displacement monitors. Additionally, a pre-construction and post-construction survey are recommended of all structures and properties within 100 feet of planned construction activity.

6.4 Pile Quality Control

The contractor is responsible for the means and methods chosen for the installation of pile foundations and is required to submit a wave equation analysis for each pile-hammer combination demonstrating that the chosen system is capable of achieving the required pile nominal resistance within the driving criteria in Section 501 of the Standard Specifications without overstressing and/or damaging the pile. In addition, all test piles shall be driven and dynamically tested with signal matching to monitor driving stresses and pile integrity, as well as to assist in the verification of pile capacity.

Moreover, since piles with be driven to achieve nearing at the top of bedrock, all piles should be fitted with standard prefabricated driving shoes meeting MaineDOT Standard Specification 501.048 to reduce potential for damaging the piles during driving. We also recommend that MaineDOT's typical refusal criteria of 10 blows per 0.5 inches be implemented to reduce structural damage to the piles

6.5 Determination of Pile Bearing Resistance

As mentioned in section 4.2 of the report, at least two (2) piles per substructure unit, but no less than 2%, of the production piles, and 5% when there are more than 20 piles, will undergo dynamic testing with signal matching for end of driving (EOD) and beginning of restrike (BOR) occurring a minimum 24 hours after initial driving. Test piles will be designated on the plans at each substructure unit. They shall be driven with the same type of equipment that is proposed for the corresponding production piles at the same footing location. Test piles shall be driven at the locations designated on the plans to both the minimum tip elevation and the required nominal driving resistance that is shown on the plans or as directed by the engineer. The engineer shall be the sole judge in determining the driving resistance and the length of the pile to be driven and will provide production-pile order lengths and driving criteria for each substructure unit location after receiving all test-pile driving logs, PDA and CAPWAP data for the respective location.

6.6 Excavation Stability and Support

Excavation stability is the responsibility of the Contractor and should be in accordance with all OSHA regulations. Excavation must be shored and appropriately laid back in accordance with OSHA Regulations 29 CRF Part 1926, latest edition. Any sloping of the sides of the excavations shall maintain adequate cover for the existing utilities in accordance with the requirements of the respective utility owner. In general, temporary soil slopes of 1V:1.5H (Soil Profile Type C), or flatter, appear appropriate but should be confirmed during construction based on conditions at the time of excavation.

Any required excavation support should be designed by a professional engineer licensed in the state of Maine engaged by the contractor.

6.7 Reuse of On-site Materials

If the contractor intends to reuse excavated material as embankment fill or in other areas, we recommend that the material be stockpiled and tested for grain size distribution. Stockpiled materials that meet the appropriate MaineDOT specifications may be reused on the project.

6.7 Ultra-Light Weight Fill Placement

ULFGA material can generally be handled and placed similarly to granular borrow. However, a key consideration during construction is the need for controlled compaction to prevent particle breakage. This requires the use of vibratory plate compactors to place and compact the material in lifts, while avoiding the use of heavy construction equipment directly on the surface.

We recommend using a nonwoven geotextile fabric as a separator between ULFGA and any surrounding materials. This will involve placing the geotextile along prepared subgrade surfaces, wrapping it around the edges of the ULFGA, and accommodating any irregularities caused by features like underdrain piping, catch basins, and guardrails.

To prevent damage, equipment traffic on the exposed ULFGA surface should be strictly prohibited. Construction equipment, other than that used for ULFGA placement and compaction, should not be allowed on the material until at least a 12-inch layer of granular cover is in place. The cover material should be applied and compacted within 48 hours after the final lift of ULFGA is compacted in an area. Until then, only light-duty equipment with rubber tires should be permitted on the surface. The contractor should be required to submit a detailed plan for protecting exposed ULFGA and for their method of placing the ULFGA fill.

Lastly, to promote maximizing estimated settlement prior to asphalt placement, it is recommended to place asphalt shortly before traffic is moved to the new approaches. In doing so, the contractor shall survey the top of the embankment prior to placing the asphalt and adjust the subbase as necessary.

7.0 Geotechnical Report Limitations

This report has been prepared on behalf of and for the exclusive use of the client for specific application to the named project as described herein. If this report is provided to prospective contractors, the client should make it clear that the information is provided for factual data only and not as a warranty of subsurface conditions included in this report.

Hardesty & Hanover, LLC has attempted to conduct the services reported herein in a manner consistent with the 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. The recommendations and conclusions contained in this report are professional opinions. No other representation, expressed or implied, is included or intended in this document.

The conclusions and recommendations given in this report are based on interpretation of subsurface exploration data and Hardesty & Hanover's experience. The client must recognize that variations may occur from conditions observed in the borings, particularly within existing fills or previously developed areas. Design recommendations are based on data from borings, sampling, and related procedures. Actual subsurface conditions may vary from those encountered in the borings. Therefore, design recommendations are subject to adjustment in the field, based on subsurface conditions encountered during construction. Hardesty & Hanover, LLC is not responsible for the conclusions, opinions or recommendations made by others based on these data.

The analyses, conclusions, and recommendations contained in this report are based on the data obtained from the subsurface exploration. The field exploration methods used indicate subsurface conditions only at specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Discrete sampling cannot be relied on to accurately reflect natural variations in stratigraphy that may exist between sample locations. The recommendations included in this report have been based in part on assumptions about natural variations in site stratigraphy that may only be completely evaluated during earthwork and foundation construction. Unanticipated soil or rock conditions may require that additional expense be incurred to attain a properly constructed project.

The conclusions or recommendations in this report should not be used if the nature, design or location of the facilities is changed or if there is a substantial lapse in time between the submittal of this report and the start of work at the site. If changes are contemplated, or significant time lapse occurs, Hardesty & Hanover, LLC must review them to assess their impact on this report's findings, conclusions, and/or design recommendations. Hardesty & Hanover, LLC will not be responsible for any claims, damages, or liability associated with any other party's interpretations of this report's subsurface data or reuse of this report's subsurface data or engineering analyses.

The geotechnical assessment, discussion, and recommendations contained herein do not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic material in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors noted or unusual or suspicious items or conditions observed are strictly for the information of our client.

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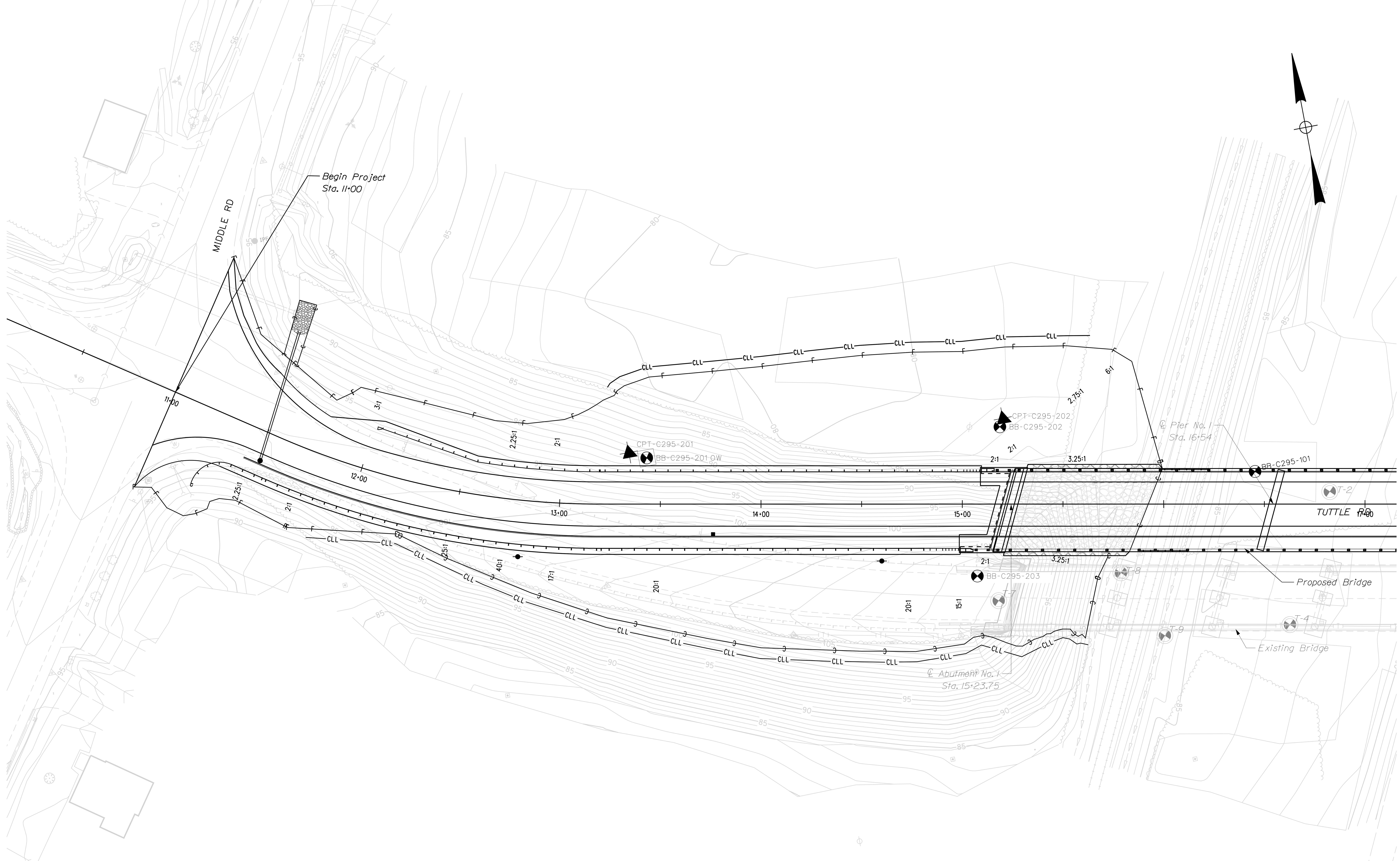
Appendix A
Boring Location Plan and
Subsurface Interpretive Profile



PLAN

25 0 25 50
Scale of Feet

LEGEND:

- Subsurface Exploration Boring*
- Subsurface Exploration Boring with Observation Well
- Historical Subsurface Exploration Boring from 1957
- Cone Penetration Test (CPT) Location from Phase II

*100-Series Borings from Preliminary Design Report in 2022
200-Series Borings from Phase II in 2024

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

2516100

WIN
25161.00

BRIDGE NO. 5801

BRIDGE PLANS

	BY	DATE
PROJ. MANAGER Andrew Lathe, PE		
DESIGN-DETAILED	AS	LNH 07/2024
CHECKED-REVIEWED	AG	RF 07/2024
DESIGN2-DETAILED2		
DESIGN3-DETAILED3		
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

SIGNATURE

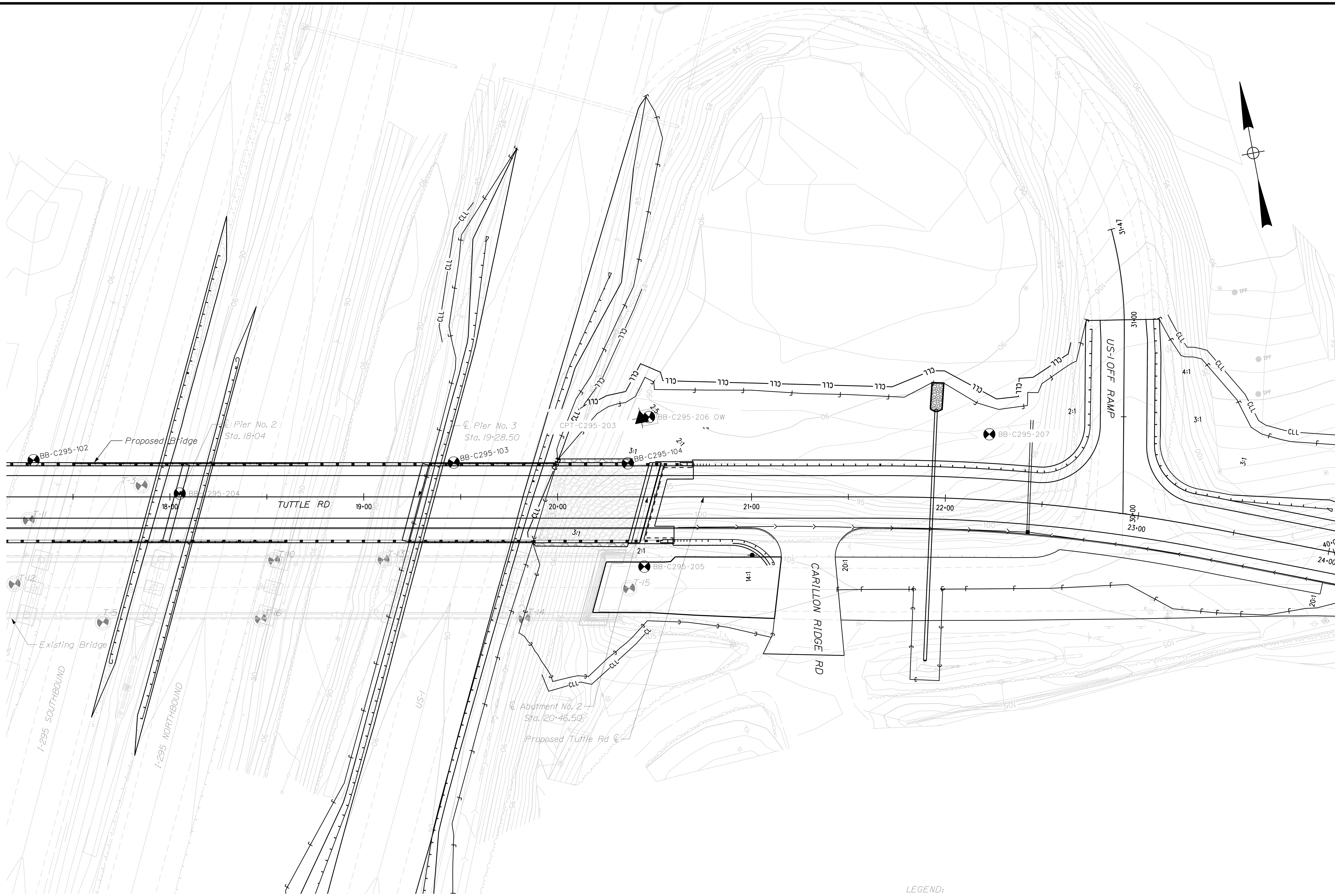
P.E. NUMBER

DATE

TUTTLE ROAD BRIDGE
INTERSTATE 295, RTE US 1 & MCRR
CUMBERLAND CUMBERLAND COUNTY

BORING LOCATION PLAN

SHEET NUMBER
13
OF 71



PLAN

25 0 25 50

Scale of Feet

LEGEND:

- Subsurface Exploration Boring*
- Subsurface Exploration Boring with Observation Well
- Historical Subsurface Exploration Boring from 1957
- Cone Penetration Test (CPT) Location from Phase II

*100-Series Borings from Preliminary Design Report in 2022
200-Series Borings from Phase II in 2024

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

2516100

WIN 25161.00

BRIDGE NO. 5801

BRIDGE PLANS

	BY	DATE
PROJ. MANAGER Andrew Lathe, PE		
DESIGN-DETAILED	AS	LNH	07/2024
CHECKED-REVIEWED	AG	RF	07/2024
DESIGN2-DETAILED2		
DESIGN3-DETAILED3		
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

SIGNATURE

P.E. NUMBER

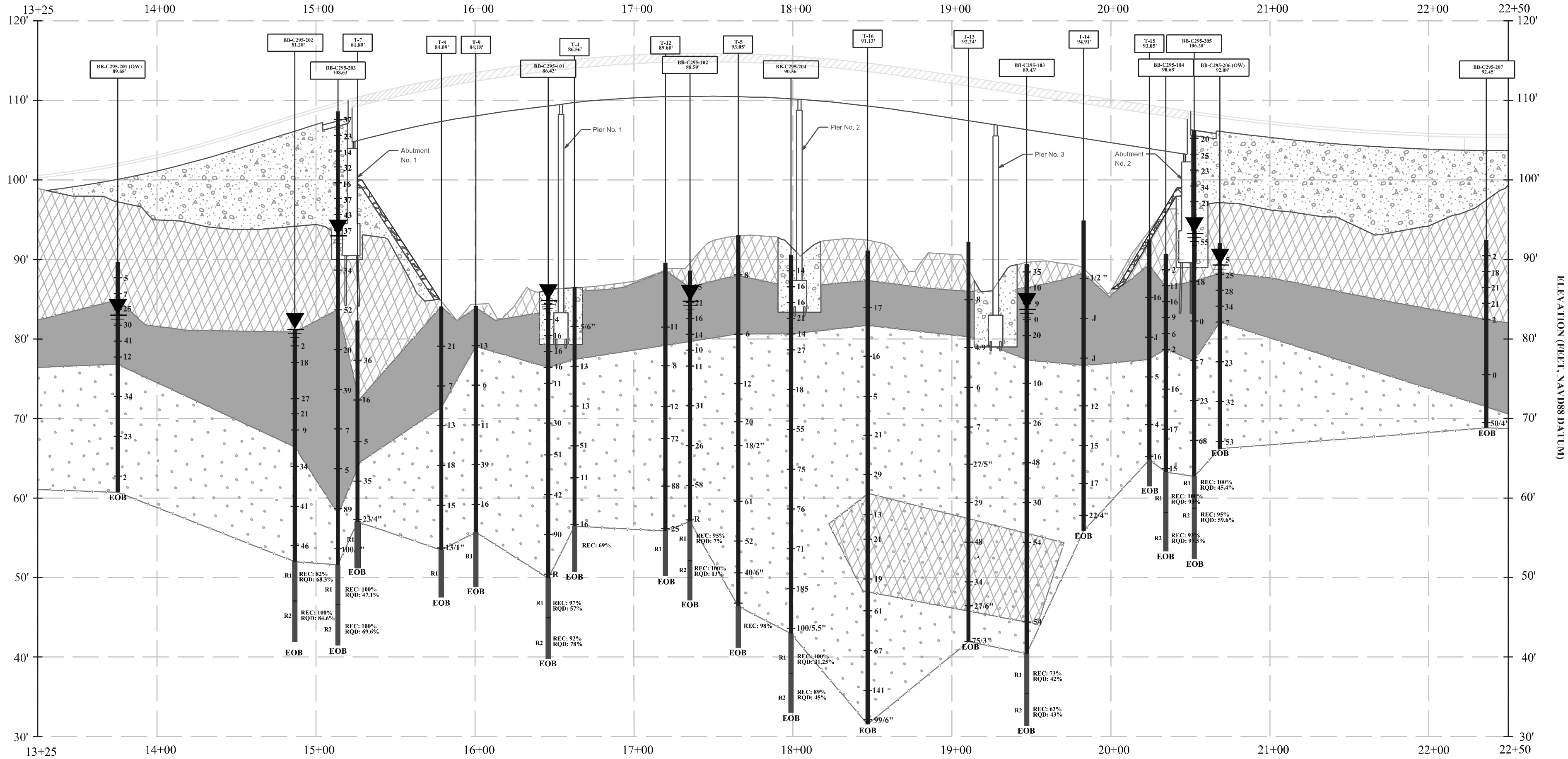
DATE

TUTTLE ROAD BRIDGE
INTERSTATE 295, RTE US 1 & MCRR
CUMBERLAND CUMBERLAND COUNTY

BORING LOCATION PLAN

SHEET NUMBER
14
OF 71

Filename: ...\GEOTECH\014_GeoPlan.dgn Division: BRIDGE Username: common Date:7/11/2024



PROFILE

100 0 100 200

HORIZONTAL SCALE 1" = 100'

20 0 20 40

VERTICAL SCALE 1" = 20'

LEGEND

FILL: Fine to coarse SAND, trace gravel, some to trace silt.

PRESUMPSCOT FORMATION: Clayey SILT and Silty clay, some to trace gravel.

GLACIAL TILL: Fine to coarse SAND, some to trace gravel, some to trace silt.

INTERBEDDED COHESIVE DEPOSITS: layer of silty sand, fine sand, and clayey silt.

BEDROCK: Coarse grained GNEISS with medium to coarse quartzite intrusions.

GRANULAR BORROW

RIP RAP

BORING NO.
ELEV. (ft)

T-X BORINGS SERIES: FIELD SPT VALUES (BLOWS/FOOT)

BB-C295-X0X SERIES:ENERGY CORRECTED SPTN60 VALUE (BLOWS/FOOT)

X

X/XX": INDICATES BLOWS/INCHES

INDICATES SAMPLE DEPTH

R: SPLIT SPOON REFUSAL (>50 BLOWS FOR 1" PENETRATION

J: SAMPLER DRIVEN BY STATIC LOAD NOT EXCEEDING 1/2 TON

WOH: INDICATES WEIGHT OF HAMMER

ENCOUNTERED GROUD WATER LEVEL

RX: RUN NUMBER

REC: RECOVERY OF BEDROCK CORE SAMPLE

RQD: ROCK QUALITY DESIGNATION OF BEDROCK CORE SAMPLE

EOB: INDICATES END OF BORING

NOTES:

1. THE AS-DRILLED BORING LOCATIONS WERE SURVEYED BY A MAINEDOT SURVEY CREW AND PROVIDED TO H&H IN AN ELECTRONIC FILE (BORINGS 110722.DGN).

2. BB-C295-100 SERIES BRIDGE BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS AND OBSERVED BY HARDESTY AND HANOVER PERSONNEL IN SEPTEMBER, 2022.

3. BB-C295-200 SERIES BRIDGE BORINGS WERE PERFORMED BY SEABOARD DRILLING, LLC AND OBSERVED BY HARDESTY AND HANOVER PERSONNEL IN APRIL, 2024.

4. T-X SERIES BRIDGE BORINGS ARE HISTORICAL AND WERE MADE BY THE MAINE STATE HIGHWAY COMMISION APRIL AND MAY 1957. BORINGS PRE-DATE ASTM STANDARDS AND WERE PERFORMED USING A HAMMER WEIGHT OF 310 LBS AT A DROP HEIGHT OF 16 INCHES.

5. THIS GENERALIZED INTERPRETIVE SOIL PROFILE IS INTENDED TO CONVEY TRENDS IN SUBSURFACE CONDITIONS. THE BOUNDARIES BETWEEN STRATA ARE APPROXIMATE AND IDEALIZED, AND HAVE BEEN DEVELOPED BY INTERPRETATIONS OF WIDELY SPACED EXPLORATIONS AND SAMPLES. ACTUAL SOIL AND BEDROCK TRANSITIONS MAY VARY AND ARE PROBABLY MORE ERRATIC. FOR MORE SPECIFIC INFORMATION REFER TO THE EXPLORATION LOGS.

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

2516100

WIN 25161.00

BRIDGE PLANS

BIN 5801

PROJ. MANAGER	$PROJMANAGER	BY	DATE
DESIGN DETAILED			
CHECKED-REVIEWED			
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
PREVISIONS 1			
PREVISIONS 2			
PREVISIONS 3			
PREVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

DATE

TUTTLE ROAD BRIDGE

CUMBERLAND

CUMBERLAND COUNTY

INTERPRETIVE SUBSURFACE PROFILE

SHEET NUMBER

15

Appendix B

Boring Logs and MaineDOT Key To
Soil and Rock Descriptions

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS (more than half of material is larger than No. 200 sieve size)	GRAVELS (more than half of coarse fraction is larger than No. 4 sieve size)	CLEAN GRAVELS (little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly-graded gravels, gravel sand mixtures, little or no fines.
		GRAVEL WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (more than half of coarse fraction is smaller than No. 4 sieve size)	CLEAN SANDS (little or no fines)	SW	Well-graded sands, Gravelly sands, little or no fines
			SP	Poorly-graded sands, Gravelly sand, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (more than half of material is smaller than No. 200 sieve size)	SILTS AND CLAYS (liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, Silty or Clayey fine sands, or Clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, Gravelly clays, Sandy clays, Silty clays, lean clays.
			OL	Organic silts and organic Silty clays of low plasticity.
	SILTS AND CLAYS (liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine Sandy or Silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
	HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.

Desired Soil Observations (in this order, if applicable):

Color (Munsell color chart)
Moisture (dry, damp, moist, wet)
Density/Consistency (from above right hand side)
Texture (fine, medium, coarse, etc.)
Name (Sand, Silty Sand, Clay, etc., including portions - trace, little, etc.)
Gradation (well-graded, poorly-graded, uniform, etc.)
Plasticity (non-plastic, slightly plastic, moderately plastic, highly plastic)
Structure (layering, fractures, cracks, etc.)
Bonding (well, moderately, loosely, etc.,)
Cementation (weak, moderate, or strong)
Geologic Origin (till, marine clay, alluvium, etc.)
Groundwater level

Maine Department of Transportation
Geotechnical Section
Key to Soil and Rock Descriptions and Terms
Field Identification Information

MODIFIED BURMISTER SYSTEM

Descriptive Term	Portion of Total (%)
trace	0 - 10
little	11 - 20
some	21 - 35
adjective (e.g. Sandy, Clayey)	36 - 50

TERMS DESCRIBING DENSITY/CONSISTENCY

Coarse-grained soils (more than half of material is larger than No. 200 sieve): Includes (1) clean gravels; (2) Silty or Clayey gravels; and (3) Silty, Clayey or Gravelly sands. Density is rated according to standard penetration resistance (N-value).

Density of Cohesionless Soils	Standard Penetration Resistance N-Value (blows per foot)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

Fine-grained soils (more than half of material is smaller than No. 200 sieve): Includes (1) inorganic and organic silts and clays; (2) Gravelly, Sandy or Silty clays; and (3) Clayey silts. Consistency is rated according to undrained shear strength as indicated.

Consistency of Cohesive soils	SPT N-Value (blows per foot)	Approximate Undrained Shear Strength (psf)	Field Guidelines
Very Soft	WOH, WOR, WOP, <2	0 - 250	Fist easily penetrates
Soft	2 - 4	250 - 500	Thumb easily penetrates
Medium Stiff	5 - 8	500 - 1000	Thumb penetrates with moderate effort
Stiff	9 - 15	1000 - 2000	Indented by thumb with great effort
Very Stiff	16 - 30	2000 - 4000	Indented by thumbnail
Hard	>30	over 4000	Indented by thumbnail with difficulty

Rock Quality Designation (RQD):

$$\text{RQD (\%)} = \frac{\text{sum of the lengths of intact pieces of core* > 4 inches}}{\text{length of core advance}}$$

*Minimum NQ rock core (1.88 in. OD of core)

Rock Quality Based on RQD

Rock Quality	RQD (%)
Very Poor	≤25
Poor	26 - 50
Fair	51 - 75
Good	76 - 90
Excellent	91 - 100

Desired Rock Observations (in this order, if applicable):

Color (Munsell color chart)
Texture (aphanitic, fine-grained, etc.)
Rock Type (granite, schist, sandstone, etc.)
Hardness (very hard, hard, mod. hard, etc.)
Weathering (fresh, very slight, slight, moderate, mod. severe, severe, etc.)
Geologic discontinuities/jointing:
- -dip (horiz - 0-5 deg., low angle - 5-35 deg., mod. dipping - 35-55 deg., steep - 55-85 deg., vertical - 85-90 deg.)
- -spacing (very close - <2 inch, close - 2-12 inch, mod. close - 1-3 feet, wide - 3-10 feet, very wide >10 feet)
- -tightness (tight, open, or healed)
- -infilling (grain size, color, etc.)

Formation (Waterville, Ellsworth, Cape Elizabeth, etc.)
RQD and correlation to rock quality (very poor, poor, etc.)
ref: ASTM D6032 and FHWA NHI-16-072 GEC 5 - Geotechnical Site Characterization, Table 4-12
Recovery (inch/inch and percentage)
Rock Core Rate (X.X ft - Y.Y ft (min:sec))

Sample Container Labeling Requirements:

WIN	Blow Counts
Bridge Name / Town	Sample Recovery
Boring Number	Date
Sample Number	Personnel Initials
Sample Depth	

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR Location: Cumberland, Maine	Boring No. : BB-C295-101 WIN: 25161.00

Driller:	New England Boring Contractors	**Elevation:**	86.42'	**Auger ID/OD:**	2.5 inches SSA
Operator:	T. Shaffer	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	J. Slattery	**Rig Type:**	Mobile B-53 Track Rig	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	10/18/2022	**Drilling method:**	Rotary Wash	**Core Barrel:**	NX
Boring Location:	1029517.3229E, 341242.9480N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	1.6' bgs
Hammer Efficiency Factor:	0.742**	**Hammer Type:**	☑ Automatic	☐ Hydraulic	☐ Rope & Cathead

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/14	0-2	WOR-3-3-4	6	7	SSA			Brown Gray, moist, loose, fine to coarse SAND, little silty clay, (tree roots present).	
								84.97		1.5	
	2D	24/12	2-4	1-2-1-2	3	4				Gray, moist, soft, Clayey SILT, little sand, trace gravel, (Presumpscot Formation) (PP=0.5 tsf).	A-7-6 (11), ML WC=32.3% LL=42 PI=13
	3D	24/18	4-6	3-5-8-9	13	16				Gray, moist, very stiff, Clayey SILT, little sand, (Presumpscot Formation) (PP=1.0 tsf).	
5											
	4D	24/17	6-8	3-5-8-6	13	16				Gray, moist, very stiff, CLAY, trace sand, trace gravel, (Presumpscot Formation).	A-6 (12), CL WC=25.4% LL=34 PI=13
								78.47		8.0	
	5D	24/20	8-10	3-8-5-10	13	16				Gray, moist, medium dense, fine to coarse SAND, little clayey silt, trace gravel.	A-2-4 (0) WC=15.0%
							22				
10	6D	24/16	10-12	4-4-5-8	9	11	7			Gray, moist, medium dense, fine to coarse SAND, some silt, some gravel.	
							11				
							18				
							26				
							70				
15	7D	24/18	15-17	10-12-12-10	24	30	22			Gray, moist, medium dense, fine to coarse SAND, some silt, some gravel.	
							40				
							62				
							150				
							40				
20	8D	24/12	20-22	8-21-20-9	41	51	42			Gray, moist, very dense, fine to coarse SAND, little gravel, little silt.	
							23				
							24				
							50				
							24				

Remarks:

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

**Calibration from 4/2023

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project:	Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR	Boring No. :	BB-C295-101
	Location:	Cumberland, Maine	WIN:	25161.00

Driller:	New England Boring Contractors	Elevation:	86.42'	Auger ID/OD:	2.5 inches SSA
Operator:	T. Shaffer	Datum:	NAVD 88	Sampler:	Standard Split Spoon
Logged by:	J. Slattery	Rig Type:	Mobile B-53 Track Rig	Hammer Wt./Fall:	140lbs/30in
Date Start/Finish:	10/18/2022	Drilling method:	Rotary Wash	Core Barrel:	NX
Boring Location:	1029517.3229E, 341242.9480N	Casing ID/OD:	3.5/4.0 inches	Water Level*:	1.6' bgs
Hammer Efficiency Factor:	0.742**	Hammer Type:	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
25	9D	24/24	25-27	15-21-13-40	34	42	15			Gray, moist, dense, fine to coarse SAND, little clayey silt, little gravel.	
							13				
							30				
							40				
							22				
30	10D	24/24	30-32	9-18-55-72	73	90	12			Gray, moist, very dense, fine to coarse SAND, some clayey silt, trace gravel.	A-4 (0) WC=20.8%
							18				
							55				
							121				
35	11D	15/4	35-36.25	35-70-95/3	REF	REF				Gray, moist, very dense, fine to coarse GRAVEL, some sand (decomposed/weathered rock fragments).	
	R1	60/58	36.5-41.5	RQD=57%				49.97		36.5 R1: Gray, fine to coarse grained, moderately fractured, GNEISS, hard rock, fresh - slightly weathered. 97% Recovery	q_u=5824 psi
40											
	R2	60/55	41.5-46.5	RQD=78%						R2: Gray, fine to coarse grained, slightly fractured, GNEISS, hard rock, fresh - non weathered. 92% Recovery	
45											
								39.97		46.5 **Bottom of Exploration at 46.5 feet below ground surface.**	

Remarks:

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

**Calibration from 4/2023

Boring No. : BB-C295-101

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR Location: Cumberland, Maine	Boring No. : BB-C295-102 WIN: 25161.00

Driller:	New England Boring Contractors	**Elevation:**	88.59'	**Auger ID/OD:**	2.5 inches SSA
Operator:	T. Shaffer	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	J. Slattery	**Rig Type:**	Mobile B-53 Track Rig	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	10/13/2022 - 10/17/2022	**Drilling method:**	Rotary Wash	**Core Barrel:**	NX
Boring Location:	1029600.6840E, 341230.0768N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	4.0' bgs
Hammer Efficiency Factor:	0.742**	**Hammer Type:**	☑ Automatic	☐ Hydraulic	☐ Rope & Cathead

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
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R = Rock Core Sample
SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
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N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
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WC = Water Content, percent
LL = Liquid Limit
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PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/8	0-2	4-6-6-8	12	15	SSA			Brown, moist, medium dense, fine to medium SAND, trace gravel, trace silt, (topsoil, roots, FILL). Top 6": Similar to above.	
	2D	24/16	2-4	4-8-9-11	17	21				Bottom 10": Gray, moist, very stiff, Sandy SILT, little gravel (roots, FILL).	
								85.29		3.3	
5	3D	24/24	4-6	3-6-7-8	13	16				Gray Brown, moist, very stiff, CLAY, trace sand, (Presumpscot Formation) (PP=3 tsf).	A-6 (12), CL WC=24.6% LL=33 PI=12
	4D	24/24	6-8	4-5-6-8	11	14				Gray Brown, moist, stiff, CLAY, trace sand, (Presumpscot Formation) (trace organics) (PP=3 tsf).	A-4 (0) WC=25.0%
	5D	24/24	8-10	2-3-5-5	8	10				Top 12" (Jar A): Similar to above.	
								79.59		9.0	
										Bottom 12" (Jar B): Gray, moist, loose, fine to coarse SAND, some silt, trace gravel.	
10	6D	24/22	10-12	4-4-5-8	9	11	34			Gray Brown, moist, medium dense, fine to coarse SAND, some silt, little gravel.	
							38				
							28				
							24				
							26				
15	7D	24/15	15-17	12-15-10-7	25	31	58			Gray, moist, dense, fine to coarse SAND, some silt, little gravel.	
							54				
							73				
							145				
							109				
20	8D	24/16	20-22	15-12-9-13	21	26	15			Gray, moist, medium dense, fine to coarse SAND, some clayey silt, some gravel.	
							19				
							52				
							34				
							41				

Remarks:

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

**Calibration from 4/2023

Boring No. : BB-C295-102

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR Location: Cumberland, Maine	Boring No. : BB-C295-102 WIN: 25161.00

Driller:	New England Boring Contractors	**Elevation:**	88.59'	**Auger ID/OD:**	2.5 inches SSA
Operator:	T. Shaffer	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	J. Slattery	**Rig Type:**	Mobile B-53 Track Rig	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	10/13/2022 - 10/17/2022	**Drilling method:**	Rotary Wash	**Core Barrel:**	NX
Boring Location:	1029600.6840E, 341230.0768N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	4.0' bgs
Hammer Efficiency Factor:	0.742**	**Hammer Type:**	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
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MV = Unsuccessful Field Vane Shear Test Attempt
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SSA = Solid Stem Auger
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WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
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q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
25	9D	24/18	25-27	20-23-24-50	47	58	24			Gray, moist, very dense, fine to coarse SAND, some silt, some gravel.	A-2-4 (0) WC=16.1%
							30				
							39				
							37				
30	10D	24/13	30-31.1	8-21-50/1	REF	REF		57.49		Gray, moist, hard, Clayey SILT, trace gravel. 31.1	
	R1	60/57	31.5-36.5	RQD=7%						R1: Gray, fine to coarse grained, intensely fractured, GNEISS, moderately hard - hard rock, fresh - slightly weathered. 95% Recovery	
35											
	R2	60/57	36.5-41.5	RQD=13%						R2: Gray, fine to coarse grained, intensely - moderately fractured, GNEISS, hard rock, fresh - slightly weathered. 100% Recovery	
40											
								47.09		41.5	
										Bottom of Exploration at 41.5 feet below ground surface.	
45											

Remarks:

(1) 10/13/22 @ 3pm C. Scarafile completed, J. Slattery started @ 9D on 10/15/22

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

**Calibration from 4/2023

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR Location: Cumberland, Maine	Boring No. : BB-C295-103 WIN: 25161.00

Driller:	New England Boring Contractors	**Elevation:**	89.43'	**Auger ID/OD:**	2.5 inches SSA
Operator:	T. Shaffer	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Iqbal	**Rig Type:**	Mobile B-53 Track Rig	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	10/12/2022 - 10/13/2022	**Drilling method:**	Rotary Wash	**Core Barrel:**	NX
Boring Location:	1029813.5111E, 341188.9326N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	5.7' bgs
Hammer Efficiency Factor:	0.742**	**Hammer Type:**	☑ Automatic	☐ Hydraulic	☐ Rope & Cathead

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA				
	1D	24/4	1-3	18-18-10-10	28	35				Brown, moist, dense, fine to coarse SAND, trace gravel (topsoil material).	
								86.43		3.0	
	2D	24/24	3-5	2-4-4-5	8	10				Gray, moist, stiff, Sandy Clayey SILT, (Presumpscot Formation).	
5											
	3D	24/24	5-7	4-4-3-4	7	9				Gray, moist, stiff, Clayey SILT, trace sand, (Presumpscot Formation) (PP=1.5 tsf).	WC=25.8% LL=33 PL=19 PI=14 SG=2.80
	4D	24/24	7-9	WOR-WOR-WHO-1	0	0				Gray, moist, very soft, Silty CLAY, trace sand, (Presumpscot Formation) (PP=1.5 tsf).	WC=36.3% LL=39 PL=18 PI=21 SG=2.69
							15				
	5D	24/2	9-11	4-8-8-6	16	20	3			Gray, moist, very siff, Silty CLAY, trace sand, (Presumpscot Formation) (PP=1.5 tsf).	
10							4				
							4				
							11	77.43		12.0	
							15				
							4				
15	6D	24/16	15-17	3-4-4-5	8	10	5			Gray, moist, loose, fine to coarse SAND, some silt, trace gravel.	
							6				
							7				
							15				
							13				
20	7D	24/16	20-22	5-11-10-10	21	26	11			Gray, moist, medium dense, fine to coarse SAND, some silt, little gravel.	A-2-4 (0) WC=9.8%
							7				
							5				
							15				
							10				

Remarks:

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

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**Calibration from 4/2023

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR Location: Cumberland, Maine	Boring No. : BB-C295-103 WIN: 25161.00

Driller:	New England Boring Contractors	**Elevation:**	89.43'	**Auger ID/OD:**	2.5 inches SSA
Operator:	T. Shaffer	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Iqbal	**Rig Type:**	Mobile B-53 Track Rig	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	10/12/2022 - 10/13/2022	**Drilling method:**	Rotary Wash	**Core Barrel:**	NX
Boring Location:	1029813.5111E, 341188.9326N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	5.7' bgs
Hammer Efficiency Factor:	0.742**	**Hammer Type:**	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
25	8D	24/16	25-27	12-22-17-17	39	48	15			Gray, moist, dense, fine to coarse SAND, some gravel, trace silt.	
							6				
							7				
							8				
							9	59.43		30.0	
30	9D	24/20	30-32	6-14-10-10	24	30	11			Gray, moist, very stiff, Sandy Silty CLAY, trace gravel (Presumpscot Formation).	A-4 (0), CL-ML WC=16.3% LL=17 PL=13 PI=4
							10				
							10	56.43		33.0	
							7				
							8				
35	10D	24/22	35.5-37.5	14-19-25-33	44	54	10			Gray, moist, very dense, fine to coarse SAND, some gravel, trace silt.	
							7				
							8			Hitting hard material @ 37.7 feet	
							10			Cored from 38 to 38.5 - retrieved soil + rock pieces. Extracted material: Gray, moist, fine to coarse SAND, trace gravel and 3" cobble.	
							15				
40							10			Drilled to 45 feet.	
							11				
							12				
							18				
							8				
45	11D	24/24	45-47	11-19-24-45	44	54	39			Gray Brown, moist, very dense, fine to coarse SAND, trace gravel, trace silt.	
										Hitting Rock at 49 ft. E.O.D. 10/12/22	
								40.43		49.0	
	R1	60/46	49-52.8	RQD=42%						See next page	

Remarks:

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**Calibration from 4/2023

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR Location: Cumberland, Maine	Boring No. : BB-C295-103 WIN: 25161.00

Driller:	New England Boring Contractors	**Elevation:**	89.43'	**Auger ID/OD:**	2.5 inches SSA
Operator:	T. Shaffer	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Iqbal	**Rig Type:**	Mobile B-53 Track Rig	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	10/12/2022 - 10/13/2022	**Drilling method:**	Rotary Wash	**Core Barrel:**	NX
Boring Location:	1029813.5111E, 341188.9326N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	5.7' bgs
Hammer Efficiency Factor:	0.742**	**Hammer Type:**	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
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V = Field Vane Shear PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
50										R1: Gray/Green, fine to coarse grained, intensely fractured, GNEISS, moderately fractured soft rock, highly weathered. (Medium to coarse Quartz inclusions) 73% Recovery	
	R2	60/38	54-58	RQD=43%						R2: Gray/Green, fine to coarse grained, moderately fractured, GNEISS, moderately fractured hard to very hard rock, moderately weathered. (Medium to coarse Quartz inclusions) 63% Recovery	
55											
								31.43		58.0 **Bottom of Exploration at 58 feet below ground surface.**	
60											
65											
70											

Remarks:

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

**Calibration from 4/2023

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR Location: Cumberland, Maine	Boring No. : BB-C295-104 WIN: 25161.00

Driller:	New England Boring Contractors	**Elevation:**	90.68'	**Auger ID/OD:**	2.5 inches SSA
Operator:	T. Shaffer	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Iqbal	**Rig Type:**	Mobile B-53 Track Rig	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	10/11/2022	**Drilling method:**	Rotary Wash	**Core Barrel:**	NX
Boring Location:	1029901.6709E, 341172.6709N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	See notes
Hammer Efficiency Factor:	0.742**	**Hammer Type:**	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:

D = Split Spoon Sample	R = Rock Core Sample	S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)	Tv = Pocket Torvane Shear Strength (psf)
MD = Unsuccessful Split Spoon Sample Attempt	SSA = Solid Stem Auger	$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)	WC = Water Content, percent
U = Thin Wall Tube Sample	HAS = Hollow Stem Auger	q_p = Unconfined Compressive Strength (ksf)	LL = Liquid Limit
MU = Unsuccessful Thin Wall Tube Sample Attempt	RC = Roller Core	N-uncorrected = Raw Field SPT N-value	PL = Plastic Limit
V = Field Vane Shear PP = Pocket Penetrometer	WOH = Weight of 140lb. Hammer	Hammer Efficiency Factor = Rig Specific Annual Calibration Value	PI = Plasticity Index
MV = Unsuccessful Field Vane Shear Test Attempt	WOR/C = Weight of Rods or Casing	N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency	G = Grain Size Analysis
	WO1P = Weight of One Person	N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected	C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/20	0-2	1-1-1-4	2	2	SSA			Black, moist, very loose, fine to coarse SAND, trace silt (rooots, topsoil material, FILL).	
								88.68		2.0	
	2D	24/24	2-4	3-4-5-7	9	11				Gray, moist, stiff, CLAY, trace sand (Presumpscot Formation) (PP=2.0 tsf).	A-7-6 (21), CL WC=29.4% LL=44 PL=24 PI=20
5	3D	24/28	4-6	5-6-7-10	13	16				Gray, moist, very stiff, CLAY, trace sand (Presumpscot Formation) (PP=3.0 tsf).	
	4D	24/24	6-8	5-4-3-7	7	9				Gray, moist, stiff, CLAY, trace sand (Presumpscot Formation) (PP=3.0 tsf).	WC=24.0% LL=34 PL=20 PI=14 SG=2.79
	5D	24/24	8-10	1-2-3-2	5	6				Gray, moist, medium stiff, CLAY, trace sand, (Presumpscot Formation) (PP=0.5 tsf).	WC=28.7% LL=30 pL=18 PI=12 SG=2.67
10	6D	24/24	10-12	1-1-1-2	2	2				Gray, moist, soft, Clayey SILT, trace sand, (Presumpscot Formation).	
							WOH	76.68		14.0	
							34				
15	7D	24/8	15-17	6-6-7-9	13	16	37			Brown, moist, medium dense, fine to coarse SAND, some gravel, trace silt.	
							42				
							42				
							42				
							48				
20	8D	24/14	20-22	5-7-7-10	14	17	32			Brown, moist, medium dense, find to coarse SAND, trace gravel.	
							45				
							63				
							65				
							70				

Remarks:

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

**Calibration from 4/2023

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project:	Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR	Boring No. :	BB-C295-104
	Location:	Cumberland, Maine	WIN:	25161.00

Driller:	New England Boring Contractors	**Elevation:**	90.68'	**Auger ID/OD:**	2.5 inches SSA
Operator:	T. Shaffer	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Iqbal	**Rig Type:**	Mobile B-53 Track Rig	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	10/11/2022	**Drilling method:**	Rotary Wash	**Core Barrel:**	NX
Boring Location:	1029901.6709E, 341172.6709N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	See notes
Hammer Efficiency Factor:	0.742**	**Hammer Type:**	☑ Automatic	☐ Hydraulic	☐ Rope & Cathead

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
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SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
25	9D	24/10	25-27	7-6-6-10	12	15	62			Brown/Gray, moist, stiff, Clayey SILT, some sand, trace gravel.	A-4 (0) WC=17.5%
							60				
							70	63.18		27.5	
	R1	60/60	28.2-32.5	RQD=93%						R1: (28.2' - 30.7'): Gray, fine to coarse grained, slightly to very slightly fractured, QUARTZITE, hard rock, slightly weathered. (30.7' - 32.5'): Gray, fine to coarse grained, slightly to very slightly fractured, GNEISS, very hard rock, slightly weathered. 100% Recovery	q_u=16297 psi
30											
	R2	60/58	32.5-37.5	RQD=97.5%						R2: Gray, fine to coarse grained, slightly to very slightly fractured, GNEISS, very hard rock, slightly weathered. 93% Recovery	
35											
								53.18		37.5	
										Bottom of Exploration at 37.5 feet below ground surface	
40											
45											

Remarks:

(1) Continuous up to 12' - Driller did not have any shelby tubes
(2) During first rock coring attempt refusal encountered @ 27.5 ft. Rock coring started at 28 ft.
(3) Groundwater measurement not taken

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**Calibration from 4/2023

Boring No. : BB-C295-104

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR Location: Cumberland, Maine	Boring No. : BB-C295-201 (OW) WIN: 25161.00

Driller:	SEABOARD DRILLING	**Elevation:**	89.68'	**Auger ID/OD:**	2.5 inches SSA
Operator:	Kevin Hanscomb	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Sajewska	**Rig Type:**	DIEDRICH D-50 SN:367	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	4/3/2024	**Drilling method:**	Cased Wash Boring	**Core Barrel:**	NQ
Boring Location:	1029213.37E, 341809.52N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	See Remarks
Hammer Efficiency Factor:	1.07	**Hammer Type:**	☑ Automatic	☐ Hydraulic	☐ Rope & Cathead

Definitions:
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V = Field Vane Shear PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N-value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/8	0-2	1-1-2-2	3	5	SSA			Dark brown, moist, medium stiff, Sandy SILT, (roots, topsoil, FILL).	
	2D	24/20	2-4	2-2-2-3	4	7				Dark brown, moist, loose, fine to medium Silty SAND, (FILL).	
								85.68		4.0	
5	3D	24/6	4-6	1-6-8-5	14	25				Brown, moist, medium dense, fine to coarse SAND, little silt, trace gravel.	
							4				
	4D	24/12	6-8	1-4-13-19	17	30	18			Dark brown, moist, medium dense, fine to coarse Gravely SAND, trace silt.	A-1-b (0) WC=7.7%
							18				
	5D	24/4	8-10	24-17-6-7	23	41	20			4 pieces of rock.	
							24				
10	6D	24/5	10-12	7-6-1-1	7	12	40			Dark brown, wet, medium dense, fine to coarse Sandy GRAVEL, trace silt.	
							27	77.68		12.0	
							43				
							100				
							81				
15	7D	24/18	15-17	9-9-10-14	19	34	70			Dark gray, hard, CLAY, (Presumpscot Formation) (PP=3.25 tsf).	A-7-6 (26), CL WC=28% LL=45 PL=21 PI=24 SG=2.72
							64				
							113				
							121				
							119				
20	8D	24/2	20-22	8-7-6-6	13	23	100			Piece of rock in the spoon, Dark gray CLAY in the spoon's bit. (1) See remarks	
							112				
							89				
							70				
							42				

Remarks:

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Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project:	Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR	Boring No. :	BB-C295-201 (OW)
	Location:	Cumberland, Maine	WIN:	25161.00

Driller:	SEABOARD DRILLING	Elevation:	89.68'	Auger ID/OD:	2.5 inches SSA
Operator:	Kevin Hanscomb	Datum:	NAVD 88	Sampler:	Standard Split Spoon
Logged by:	A. Sajewska	Rig Type:	DIEDRICH D-50 SN:367	Hammer Wt./Fall:	140lbs/30in
Date Start/Finish:	4/3/2024	Drilling method:	Cased Wash Boring	Core Barrel:	NQ
Boring Location:	1029213.37E, 341809.52N	Casing ID/OD:	3.5/4.0 inches	Water Level*:	See Remarks
Hammer Efficiency Factor:	1.07	Hammer Type:	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N-value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
25	9D	24/24	25-27	WHO-WOR-1-1	1	2				Dark gray, soft CLAY, trace sand, (Presumpscot Formation) (PP = 0.0 tsf).	A-6 (16), CL WC=36% LL=35 PL=19 PI=16 SG=2.73
	1U	16/14	27-29	PUSH						Dark gray, CLAY, (Presumpscot Formation). (2) See remarks (3) See remarks	WC=34% LL=37 PL=24 PI=13 SG=2.76
								60.88		28.8 **Top of Bedrock at Elev. 60.88 ft.** **Bottom of Exploration at 28.8 feet below ground surface.**	
30											
35											
40											
45											

Remarks:

Water Readings:
6.7' bgs - April 16, 2024; 8'-1" bgs - April 25, 2024; 8'-1" bgs - May 9, 2024; 8'-6" bgs - May 16, 2024
(1) Blow count may be affected by the rock in the spoon.
(2) Driller was able to push the tube 16"
(3) Vane shear tests not taken due to the change of material at the bottom of the shelby tube.

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No. : BB-C295-201 (OW)

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project:	Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR	Boring No. :	BB-C295-202
	Location:	Cumberland, Maine	WIN:	25161.00

Driller:	SEABOARD DRILLING	**Elevation:**	81.20'	**Auger ID/OD:**	2.5 inches SSA
Operator:	Kevin Hanscomb	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Sajewska	**Rig Type:**	DIEDRICH D-50 SN:367	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	4/17/2024	**Drilling method:**	Cased Wash Boring	**Core Barrel:**	NQ
Boring Location:	1029396.87E, 341289.02N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	0' bgs after boring completed
Hammer Efficiency Factor:	1.07	**Hammer Type:**	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:
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SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person

S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected

Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information							Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows				
0	1D	24/16	0-2	WOR-WOR-1-2	1	2	SSA			Dark gray, wet, soft, Clayey SILT, little sand, (Presumpscot Formation).	
	2D	24/24	2-4	3-4-6-6	10	18				Dark gray, wet, very stiff, Clayey SILT, (Presumpscot Formation) (PP = 2.5 tsf).	WC=24% LL=45 PL=21 PI=24 SG=2.75
	MV		4.33-4.5	No Rotation						Failed 25.4 x 50.8mm vane attempt (45 ft-lbs - no rotation).	
	1U	24/24	4.5-6.5	PUSH						Dark gray, wet, Clayey SILT, (Presumpscot Formation).	WC=28% LL=44 PL=22 PI=22 SG=2.79
5							11				
	3D	24/24	6.5-8.5	4-7-8-9	15	27	26			Dark gray, wet, very stiff, Clayey SILT, (Presumpscot Formation) (PP = 3.5tsf).	WC=35% LL=41 PL=18 PI=23 SG=2.74
	MV		8.83-9.0	No Rotation			43			Failed 25.4 x 50.8 mm vane attempt (35 ft-lbs - no rotation).	
	4D	24/24	8.5-10.5	8-6-6-4	12	21	43			Dark gray, wet, very stiff, CLAY, trace sand, (Presumpscot Formation)(PP = 1.0 tsf).	A-6 (14), CL WC=29% LL=34 PL=20 PI=14 SG=2.85
							42				
10	5D	24/24	10.5-12.5	3-3-2-4	5	9	18			Dark gray, wet, stiff, Silty CLAY, seams of sand, (Presumpscot Formation)(PP = 0.75 tsf).	A-4 (0) WC=26.9%
	MV		12.83-13.19	No Rotation			22			Failed 55 x 110 mm vane attempt (50 ft-lbs - no rotation). (1) See remarks	
							24				
							31				
							32	66.20		(2) See remarks 15.0	
15	6D	24/10	15-17	10-9-10-15	19	34	37			Dark gray, wet, dense, fine to medium SAND, little silt, trace gravel.	
							43				
							71				
							82				
							77				
20	7D	24/6	20-22	10-12-11-10	23	41	56			Dark gray, wet, dense, fine to coarse SAND, some silt, trace gravel.	A-2-4 (0) WC=9%
							74				
							96				
							124				
							160				

Remarks:

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No. : BB-C295-202

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project:	Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR	Boring No. :	BB-C295-202
	Location:	Cumberland, Maine	WIN:	25161.00

Driller:	SEABOARD DRILLING	Elevation:	81.20'	Auger ID/OD:	2.5 inches SSA
Operator:	Kevin Hanscomb	Datum:	NAVD 88	Sampler:	Standard Split Spoon
Logged by:	A. Sajewska	Rig Type:	DIEDRICH D-50 SN:367	Hammer Wt./Fall:	140lbs/30in
Date Start/Finish:	4/17/2024	Drilling method:	Cased Wash Boring	Core Barrel:	NQ
Boring Location:	1029396.87E, 341289.02N	Casing ID/OD:	3.5/4.0 inches	Water Level*:	0' bgs after boring completed
Hammer Efficiency Factor:	1.07	Hammer Type:	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
25	8D	24/6	25-27	12-12-14-17	26	46	OPEN HOLE			Dark gray, wet, dense, fine to coarse SAND, some silt, trace gravel.	
								52.2		29.0	
	R1	60/49	29-34	RQD = 68.3%			NQ			Top of Bedrock at Elev. 52.2 ft. R1: Gray, fine to coarse grained, slightly fractured, GNEISS, hard rock, fresh to moderately weathered. Rock Quality = Fair R1: Core Times (min:sec) 29.0-30.0 ft (2:12) 30.0-31.0 ft (1:45) 31.0-32.0 ft (2:07) 32.0-33.0 ft (2:54) 33.0-34.0 ft (4:56) 82% Recovery	R1: qu= 14887psi
30											
35	R2	60/60	34-39	RQD = 84.6%						R2: (34-35'): Gray, fine to coarse grained, very slightly fractured, QUARTZITE, hard rock, fresh, non-weathered. (35-39'): Gray, fine to coarse grained, slightly fractured, GNEISS, hard rock, fresh, non-weathered. Rock Quality = Good R2: Core Times (min:sec) 34.0-35.0 ft (4:09) 35.0-36.0 ft (2:23) 36.0-37.0 ft (2:35) 37.0-38.0 ft (2:56) 38.0-39.0 ft (2:37) 100% Recovery	
								42.2			
40											
45										39.0 **Bottom of Exploration at 39.0 feet below ground surface.**	

Remarks:

(1) After retrieving vane from the hole, the clay was still attached to the vane blades
(2) Gravel at 14.9' (driller's observation during drilling)

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* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No. : BB-C295-202

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR Location: Cumberland, Maine	Boring No. : BB-C295-203 WIN: 25161.00

Driller:	SEABOARD DRILLING	**Elevation:**	108.63'	**Auger ID/OD:**	2.5 inches SSA
Operator:	Kevin Hanscomb	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Sajewska	**Rig Type:**	DIEDRICH D-50 SN:367	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	4/2/2024	**Drilling method:**	Cased Wash Boring	**Core Barrel:**	NQ
Boring Location:	1029372.22E, 341218.23N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	15.65' bgs after boring completed
Hammer Efficiency Factor:	1.07	**Hammer Type:**	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:
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SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	108.13		6" PAVEMENT 0.5	
	1D	24/12	1-3	12-12-9-7	21	37				Brown, moist, medium dense, fine to coarse SAND, trace silt, trace gravel, (FILL).	
	2D	24/14	3-5	7-7-6-9	13	23				Dark brown, moist, medium dense, fine to coarse SAND, little silt, trace gravel, (brick, FILL).	
5	3D	24/18	5-7	3-4-4-2	8	14				Dark brown, wet, Clayey SAND, little silt, (FILL).	
							30				
	4D	24/24	7-9	6-9-9-7	18	32	42			Brown, moist, medium dense, fine to coarse SAND, trace gravel, trace silt, (FILL).	
							22				
	5D	24/20	9-11	3-3-6-8	9	16	36			Brown, moist, medium dense, fine to coarse SAND, little gravel, trace silt, (FILL).	
10							13				
	6D	24/18	11-13	8-10-11-9	21	37	30			Dark gray, wet, dense, fine to medium SAND, some clayey silt, trace gravel, (roots, FILL).	A-2-4 (0) WC=12.3%
							41	95.63		13.0	
	7D	24/18	13-15	13-12-12-12	24	43	62			Brown, wet, dense, fine to coarse SAND, little gravel, trace silt.	
							43				
15	8D	24/10	15-17	6-7-14-18	21	37	32			Brown, wet, dense, fine to coarse SAND, some clayey silt, trace gravel.	A-2-4 (0) WC=13.6%
							88				
							111				
							103				
20							133				
	9D	24/12	20-22	10-8-11-19	19	34	72			Brown, wet, dense, fine to coarse SAND, some silt.	
							115				
							122				
							150				
							133				

Remarks:

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Boring No. : BB-C295-203

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project:	Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR	Boring No. :	BB-C295-203
	Location:	Cumberland, Maine	WIN:	25161.00

Driller:	SEABOARD DRILLING	Elevation:	108.63'	Auger ID/OD:	2.5 inches SSA
Operator:	Kevin Hanscomb	Datum:	NAVD 88	Sampler:	Standard Split Spoon
Logged by:	A. Sajewska	Rig Type:	DIEDRICH D-50 SN:367	Hammer Wt./Fall:	140lbs/30in
Date Start/Finish:	4/2/2024	Drilling method:	Cased Wash Boring	Core Barrel:	NQ
Boring Location:	1029372.22E, 341218.23N	Casing ID/OD:	3.5/4.0 inches	Water Level*:	15.65' bgs after boring completed
Hammer Efficiency Factor:	1.07	Hammer Type:	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:
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WOR/C = Weight of Rods or Casing
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S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
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N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
25	10D	24/13	25-27	11-13-16-22	29	52	73	83.63		Brown, wet, hard, CLAY, some sand, (Presumpscot Formation).	
							95				
							118				
							100				
							81				
30	11D	24/24	30-32	4-5-6-6	11	20	70			Dark gray, very stiff, Clayey SILT, (Presumpscot Formation) (PP=2.5 tsf).	A-6 (7) WC=23% LL=28 PL=16 PI=12 SG=2.73
							106				
							112				
							117				
							136				
35	12D	24/24	35-37	6-9-13-15	22	39	65			Dark gray, hard, Silty CLAY, (Presumpscot Formation) (PP=4.5 tsf). 25.4 x 50.8 mm vane raw torque readings: V1 = 13 / 4 ft-lbs	
	V1		37.33 - 37.49	Su=6129/1886psf			90				
							102				
	1U	8/8	37-39	PUSH			134			Dark gray, Silty CLAY, (Presumpscot Formation). (1) See remarks.	WC=25.6% Su=38.88 psi
							113				
40	13D	24/24	40-42	2-2-2-2	4	7	84			Dark gray, medium stiff, CLAY, trace sand, (Presumpscot Formation) (PP=0.25 tsf).	A-6 (15), CL WC=28% LL=36 PL=21 LI=15
							70				
	2U	24/24	42-44	PUSH			81			Dark gray, CLAY, (Presumpscot Formation).	WC=29.1% LL=31 PL=26 PI=5 Su=8.686 psi
	MV		45-45.43	No Rotation			86			Failed 65 x 130 mm vane attempt (48 ft-lbs - no rotation).	
							82				
45	14D	24/24	45-47	1-1-2-5	3	5	63			Dark gray, Sandy SILT, (Presumpscot Formation).	
							88				
							108				
							161				
							126/6"				

Remarks:

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Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project:	Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR	Boring No. :	BB-C295-203
	Location:	Cumberland, Maine	WIN:	25161.00

Driller:	SEABOARD DRILLING	**Elevation:**	108.63'	**Auger ID/OD:**	2.5 inches SSA
Operator:	Kevin Hanscomb	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Sajewska	**Rig Type:**	DIEDRICH D-50 SN:367	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	4/2/2024	**Drilling method:**	Cased Wash Boring	**Core Barrel:**	NQ
Boring Location:	1029372.22E, 341218.23N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	15.65' bgs after boring completed
Hammer Efficiency Factor:	1.07	**Hammer Type:**	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

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WC = Water Content, percent
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C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
50	15D	24/12	50-52	27-30-20-20	50	89	OPEN HOLE			Dark gray, very dense, fine to coarse SAND, little silt, some gravel.	A-1-b (0) WC=8.9%
55	16D	5/5	55-57	100/5"				51.83		Dark gray, wet, very dense, fine to coarse SAND, little silt, little gravel, (Pieces of fractured rock). 56.8	
	R1	60/60	56.8-61.8	RQD = 47.1%			NQ			Top of Bedrock at Elev. 51.83 ft. R1: Bedrock; Gray, fine to coarse grained, slightly to moderately fractured, GNEISS, hard rock, fresh to slightly weathered. Rock Quality = Poor R1: Core Times (min:sec) 56.8-57.8 ft (3:18) 57.8-58.8 ft (3:20) 58.8-59.8 ft (3:25) 59.8-60.8 ft (3:09) 60.8-61.8 ft (3:28) 100% Recovery	qu= 7202psi
60	R2	60/60	61.8-66.8	RQD = 69.6%						R2: Bedrock; Gray, fine to coarse grained, moderately fractured, GNEISS, hard rock, fresh to slightly weathered. Rock Quality = Fair R2: Core Times (min:sec) 61.8-62.8 ft (3:41) 62.8-63.8 ft (2:59) 63.8-64.8 ft (3:16) 64.8-65.8 ft (2:58) 65.8-66.8 ft (4:06) 100% Recovery	
65								41.83		66.8	
70										**Bottom of Exploration at 66.8 feet below ground surface.**	

Remarks:

(1) Driller was able to push shelby tube only 8".

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Boring No. : BB-C295-203

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR Location: Cumberland, Maine	Boring No. : BB-C295-204 WIN: 25161.00

Driller:	SEABOARD DRILLING	**Elevation:**	90.56'	**Auger ID/OD:**	2.5 inches SSA
Operator:	Kevin Hanscomb	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Sajewska	**Rig Type:**	DIEDRICH D-50 SN:367	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	4/14/2024	**Drilling method:**	Cased Wash Boring	**Core Barrel:**	NQ
Boring Location:	1029671.63E, 341199.30N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	See Remarks
Hammer Efficiency Factor:	1.07	**Hammer Type:**	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/24	0-2	2-2-6-5	8	14	SSA			Dark brown, medium dense, fine to medium SAND, little silt, (FILL).	
								88.56		2.0	
	2D	24/19	2-4	4-4-5-6	9	16				Dark gray, very stiff, CLAY, little sand, (Presumpscot Formation) (PP=2.75 tsf).	
	3D	24/24	4-6	3-4-5-6	9	16				Dark gray, very stiff, CLAY, little sand, (Presumpscot Formation) (PP=2.75 tsf).	WC=20% LL=31 PL=17 PI=14 SG=2.75
5											
	4D	24/24	6-8	6-6-6-6	12	21				Dark gray, very stiff, Silty CLAY, little sand, (Presumpscot Formation) (PP=3.5 tsf).	
								82.56		8.0	
	5D	24/24	8-10	2-4-4-9	8	14				Dark brown, wet, medium dense, fine to coarse SAND, little silt, trace gravel.	
							32				
10	6D	24/24	10-12	6-8-7-6	15	27	59			Dark brown, wet, medium dense, fine to coarse SAND, little silt, trace gravel.	
							49				
							42				
							24				
							39				
15	7D	24/16	15-17	2-5-5-4	10	18	47			Dark gray, wet, medium dense, fine to coarse SAND, some clayey silt, little gravel.	A-2-4 (0) WC=9.5%
							37				
							45				
							63				
							OPEN HOLE				
20	8D	24/8	20-22	45-18-13-8	31	55				Dark gray, wet, very dense, fine to coarse SAND, little silt, little gravel.	

Remarks:

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No. : BB-C295-204

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project:	Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR	Boring No. :	BB-C295-204
	Location:	Cumberland, Maine	WIN:	25161.00

Driller:	SEABOARD DRILLING	**Elevation:**	90.56'	**Auger ID/OD:**	2.5 inches SSA
Operator:	Kevin Hanscomb	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Sajewska	**Rig Type:**	DIEDRICH D-50 SN:367	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	4/14/2024	**Drilling method:**	Cased Wash Boring	**Core Barrel:**	NQ
Boring Location:	1029671.63E, 341199.30N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	See Remarks
Hammer Efficiency Factor:	1.07	**Hammer Type:**	☑ Automatic	☐ Hydraulic	☐ Rope & Cathead

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
25	9D	24/20	25-27	19-18-24-24	42	75				Dark gray, wet, very dense, fine to coarse SAND, some silt, trace gravel.	
30	10D	24/24	30-32	12-16-27-39	43	76				Dark gray, wet, very dense, fine to coarse SAND, some silt, trace gravel.	
35	11D	24/24	35-37	11-16-24-44	40	71				Dark gray, hard, Clayey SILT, some sand, trace gravel (PP>4.75 tsf).	A-4 (0) WC=16.6%
40	12D	24/24	40-42	47-52-52-72	104	185				Dark gray, moist, very dense, fine SAND, little silt.	
45	13D	11.5/11.5	45-47	72-100/5.5"						Dark gray, moist, very dense, fine to coarse SAND, little silt, some gravel.	
								43.06		47.5	
	R1	60/60	47.5-52.5	RQD = 31.25%						Top of Bedrock at Elev. 43.06 ft. R1: Gray, fine to coarse grained, intensely to moderately fractured, GNEISS, hard rock, fresh to slightly weathered.	

Remarks:

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No. : BB-C295-204

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR Location: Cumberland, Maine	Boring No. : BB-C295-204 WIN: 25161.00

Driller:	SEABOARD DRILLING	**Elevation:**	90.56'	**Auger ID/OD:**	2.5 inches SSA
Operator:	Kevin Hanscomb	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Sajewska	**Rig Type:**	DIEDRICH D-50 SN:367	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	4/14/2024	**Drilling method:**	Cased Wash Boring	**Core Barrel:**	NQ
Boring Location:	1029671.63E, 341199.30N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	See Remarks
Hammer Efficiency Factor:	1.07	**Hammer Type:**	☑ Automatic	☐ Hydraulic	☐ Rope & Cathead

Definitions:
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MV = Unsuccessful Field Vane Shear Test Attempt
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SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
50										R1: Core Times (min:sec) Rock Quality = Poor 47.5-48.5 ft (4:59) 48.5-49.5 ft (4:02) 49.5-50.5 ft (3:02) 50.5-51.5 ft (2:41) 51.5-52.5 ft (3:07) 100% Recovery	qu=8830psi
	R2	60/53.5	52.5-57.5	RQD = 45%							
55										R2: Gray, fine to coarse grained, intensely to moderately fractured, GNEISS, hard rock, fresh to slightly weathered. Rock Quality = Poor R2: Core Times (min:sec)	
								33.06		52.5-53.5 ft (3:29) 53.5-54.5 ft (3:02) 54.5-55.5 ft (3:25) 55.5-56.5 ft (2:36) 56.5-57.5 ft (3:15) 89% Recovery	
60										57.5 **Bottom of Exploration at 57.5 feet below ground surface**	
65											
70											

Remarks:

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No. : BB-C295-204

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR Location: Cumberland, Maine	Boring No. : BB-C295-205 WIN: 25161.00

Driller:	SEABOARD DRILLING	**Elevation:**	106.20'	**Auger ID/OD:**	2.5 inches SSA
Operator:	Kevin Hanscomb	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Sajewska	**Rig Type:**	DIEDRICH D-50 SN:367	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	4/1/2024	**Drilling method:**	Cased Wash Boring	**Core Barrel:**	NQ
Boring Location:	1029900.22E, 341118.99N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	13' bgs after boring completed
Hammer Efficiency Factor:	1.07	**Hammer Type:**	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:
D = Split Spoon Sample
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SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							2	105.7		6" PAVEMENT 0.5	
	1D	24/14	1-3	7-4-7-7	11	20	2			Dark brown, moist, medium dense, fine to coarse SAND, trace gravel, trace silt, (FILL).	
							10				
	2D	24/12	3-5	5-6-8-8	14	25	12			Dark brown, moist, medium dense, fine to coarse SAND, trace gravel, trace silt, (FILL).	
							6				
5	3D	24/20	5-7	4-5-8-9	13	23	6			Dark brown, moist, medium dense, fine to coarse SAND, trace gravel, trace silt, (FILL).	
							4				
	4D	24/24	7-9	7-9-10-12	19	34	8			Brown, moist, dense, fine to coarse SAND, trace silt, (FILL).	
							21				
	5D	24/16	9-11	4-6-6-6	12	21	35			Brown, moist, medium dense, fine to coarse SAND, trace gravel, trace silt, (FILL).	
10							38				
							54				
							60				
							60				
							23			Very top of the sample (1.5") Dark gray CLAY	
15	6D	24/18	15-17	1-16-15-8	31	55	28			Brown, moist, very dense, fine to coarse gravely SAND, trace silt.	A-1-b (1) WC=12.3%
							62				
							62				
							72				
							69	86.2		20.0	
20	7D	24/24	20-22	2-4-6-6	10	18	46			Dark gray, very stiff, CLAY, trace silt, (Presumpscot Formation) (PP=4.5 tsf).	WC=28% LL=35 PL=21 PI=14 SG=2.78
	V1		22.33-22.5	Su=2357/943psf			45			25.4 x 50.8 mm vane raw torque readings: V1 = 60 / 24 in-lbs	
	1U	24/21	22.3-24.3	PUSH			47			Dark gray, CLAY, trace silt.	WC=31.3% Su=6.559 psi
							60				
	8D	24/24	24.5-26.5	WOR-WOR-WOH-1	0	0	55			Dark gray, wet, very soft CLAY, (Presumpscot Formation) (PP=0 tsf).	

Remarks:

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* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No. : BB-C295-205

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	**Project:**	Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR	**Boring No. :**	BB-C295-205
	Location:	Cumberland, Maine	**WIN:**	25161.00

Driller:	SEABOARD DRILLING	**Elevation:**	106.20'	**Auger ID/OD:**	2.5 inches SSA
Operator:	Kevin Hanscomb	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Sajewska	**Rig Type:**	DIEDRICH D-50 SN:367	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	4/1/2024	**Drilling method:**	Cased Wash Boring	**Core Barrel:**	NQ
Boring Location:	1029900.22E, 341118.99N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	13' bgs after boring completed
Hammer Efficiency Factor:	1.07	**Hammer Type:**	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
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V = Field Vane Shear PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
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WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
25							41				
	2U	24/19	26.5-28.5	PUSH			41			Dark gray, CLAY.	
							43				
	MV		29.5-29.5	No Rotation			51			Failed 55 x 110 mm vane attempt.	
							50				
30	9D/A	24/24	30-32	WOH-1-3-4	4	7	34	74.7		9D (30-31.5'): Gray, wet, medium stiff, CLAY, little sand, trace silt, (Presumpscot Formation). 31.5	A-6 (11), CL WC=38% LL=36 PL=24 PI=12 SG=2.80
							33			9D/A (31.5-32'): Dark Brown, fine to coarse SAND, some clayey silt.	
							36				
							52				
							52				
35	10D	24/24	35-37	5-5-8-5	13	23	56			Dark gray, wet, very stiff, Sandy SILT, trace gravel.	A-4 (0) WC=13%
							66				
							95				
							139				
							103				
40	11D	24/18	40-42	13-18-20-15	38	68	89			Light brown, wet, very dense, fine to medium SAND, trace silt.	
							101				
							86	62.7		43.5	
	R1	60/60	43.5-48.5	RQD = 45.4%						Top of Bedrock at Elev. 62.7 ft. R1: Gray, fine to coarse grained, moderately fractured, GNEISS, hard rock, fresh to slightly weathered. Rock Quality = Poor	R1: qu=17524psi
45											
	R2	60/57	48.5-53.5	RQD = 59.6%							

Remarks:

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Boring No. : BB-C295-205

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project:	Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR	Boring No. :	BB-C295-205
	Location:	Cumberland, Maine	WIN:	25161.00

Driller:	SEABOARD DRILLING	**Elevation:**	106.20'	**Auger ID/OD:**	2.5 inches SSA
Operator:	Kevin Hanscomb	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Sajewska	**Rig Type:**	DIEDRICH D-50 SN:367	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	4/1/2024	**Drilling method:**	Cased Wash Boring	**Core Barrel:**	NQ
Boring Location:	1029900.22E, 341118.99N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	13' bgs after boring completed
Hammer Efficiency Factor:	1.07	**Hammer Type:**	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:
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SSA = Solid Stem Auger
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RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
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Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
50										R1: Core Times (min:sec) 43.5-44.5 ft (3:53) 44.5-45.5 ft (3:06) 43.5-44.5 ft (3:53) 44.5-45.5 ft (3:06) 44.5-45.5 ft (3:06) 100% Recovery	
								53.7		R2: Gray, fine to coarse grained, moderately fractured, GNEISS, hard rock, fresh to slightly weathered. Rock Quality = Fair R2: Core Times (min:sec) 48.5-49.5 ft (5:23) 49.5-50.5 ft (4:50) 50.5-51.5 ft (6:09) 51.5-52.5 ft (5:13) 95% Recovery	
55											
60										52.5	
										Bottom of Exploration at 52.5 feet below ground surface.	
65											
70											

Remarks:

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No. : BB-C295-205

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project:	Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR	Boring No. :	BB-C295-206 (OW)
	Location:	Cumberland, Maine	WIN:	25161.00

Driller:	SEABOARD DRILLING	**Elevation:**	92.08'	**Auger ID/OD:**	2.5 inches SSA
Operator:	Kevin Hanscomb	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Sajewska	**Rig Type:**	DIEDRICH D-50 SN:367	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	4/14/2024	**Drilling method:**	Cased Wash Boring	**Core Barrel:**	NQ
Boring Location:	1029916.79E, 341194.50N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	See Remarks
Hammer Efficiency Factor:	1.07	**Hammer Type:**	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:

D = Split Spoon Sample	R = Rock Core Sample	S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)	Tv = Pocket Torvane Shear Strength (psf)
MD = Unsuccessful Split Spoon Sample Attempt	SSA = Solid Stem Auger	$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)	WC = Water Content, percent
U = Thin Wall Tube Sample	HAS = Hollow Stem Auger	q_p = Unconfined Compressive Strength (ksf)	LL = Liquid Limit
MU = Unsuccessful Thin Wall Tube Sample Attempt	RC = Roller Core	N-uncorrected = Raw Field SPT N-value	PL = Plastic Limit
V = Field Vane Shear	WOH = Weight of 140lb. Hammer	Hammer Efficiency Factor = Rig Specific Annual Calibration Value	PI = Plasticity Index
MV = Unsuccessful Field Vane Shear Test Attempt	WOR/C = Weight of Rods or Casing	N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency	G = Grain Size Analysis
PP = Pocket Penetrometer	WO1P = Weight of One Person	N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected	C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/16	0-2	2-1-2-2	3	5	SSA			Brown, moist, loose, fine SAND, some silt.	
										2.0	
	2D	24/16	2-4	2-5-9-9	14	25		90.8		Dark gray, moist, very stiff, CLAY, trace sand, (Presumpscot Formation) (PP=4.5 tsf).	
	3D	24/24	4-6	4-6-10-10	16	28				Dark gray, moist, very stiff, CLAY, trace sand, (Presumpscot Formation) (PP=4.5 tsf).	A-6 (15),CL WC=8% LL=33 PL=18 PI=15 SG=2.83
5											
	4D	24/24	6-8	6-10-9-10	19	34				Gray, moist, hard, CLAY, trace sand, (Presumpscot Formation) (PP=2.5 tsf).	A-6 (18), CL WC=22% LL=37 PL=19 PI=18
	MV		6.33-6.5	No Rotation						Failed 25.4 x 50.8 mm vane attempt (40 in-lbs - no rotation).	
	1U	24/22	8-10	PUSH						Gray, CLAY, (Presumpscot Formation).	WC=38% LL=37 PL=22 PI=15 SG=2.76
										5D (10-11.75'): Dark gray, medium stiff, CLAY, little sand, (Presumpscot Formation)	
10	5D/A	24/24	10-12	1-1-3-3	4	7	5	80.33		(PP=0 tsf). 11.75	A-4 (0) WC=35.9%
							12			5D/A (11.75-12'): Dark gray, wet, fine to coarse SAND, little clayey silt, trace gravel.	
							35				
							48				
							30				
15	6D	24/16	15-17	8-8-5-7	13	23	34			Dark gray, wet, medium dense, fine to coarse SAND, little silt, trace gravel.	
							39				
							50				
							36				
							33				
20	7D	24/12	20-22	4-9-9-8	18	32	32			Dark gray, wet, dense, fine to coarse SAND, little silt, trace gravel.	A-1-b (0) WC=8.9%
							44				
							64				
							71				
							56				

Remarks:

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project:	Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR	Boring No. :	BB-C295-206 (OW)
	Location:	Cumberland, Maine	WIN:	25161.00

Driller:	SEABOARD DRILLING	**Elevation:**	92.08'	**Auger ID/OD:**	2.5 inches SSA
Operator:	Kevin Hanscomb	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged by:	A. Sajewska	**Rig Type:**	DIEDRICH D-50 SN:367	**Hammer Wt./Fall:**	140lbs/30in
Date Start/Finish:	4/14/2024	**Drilling method:**	Cased Wash Boring	**Core Barrel:**	NQ
Boring Location:	1029916.79E, 341194.50N	**Casing ID/OD:**	3.5/4.0 inches	**Water Level*:**	See Remarks
Hammer Efficiency Factor:	1.07	**Hammer Type:**	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person

S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected

Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
25	8D	20/20	25-27	4-11-19-52/4"	30	53				Dark gray, wet, dense, fine SAND, some clayey silt.	
								65.25		26.83	
										Top of Bedrock at Elev. 65.25 ft. **Bottom of Exploration at 26.83' below ground surface.**	
30											
35											
40											
45											

Remarks:

Water Readings:
2.8' bgs - April 16, 2024; 2'-9" bgs - April 25, 2024; 2'-10" bgs - May 9, 2024; 2'-11.5" bgs - May 16, 2024

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No. : BB-C295-206 (OW)

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Tuttle Road Bridge/I295 #5801 over I-295, Rte US1 & MCRR Location: Cumberland, Maine	Boring No. : BB-C295-207 WIN: 25161.00

Driller:	SEABOARD DRILLING	Elevation:	92.45'	Auger ID/OD:	2.5 inches SSA
Operator:	Kevin Hanscomb	Datum:	NAVD 88	Sampler:	Standard Split Spoon
Logged by:	A. Sajewska	Rig Type:	DIEDRICH D-50 SN:367	Hammer Wt./Fall:	140lbs/30in
Date Start/Finish:	4/18/2024	Drilling method:	Cased Wash Boring	Core Barrel:	NQ
Boring Location:	1030087.75E, 341153.30N	Casing ID/OD:	3.5/4.0 inches	Water Level*:	See Remarks
Hammer Efficiency Factor:	1.07	Hammer Type:	☑ Automatic ☐ Hydraulic ☐ Rope & Cathead		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HAS = Hollow Stem Auger
RC = Roller Core
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60}= (Hammer Efficiency Factor/60%)*N-Uncorrected
Tv = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec/ (in.)	Sample Depth (ft.)	Blows (/6in.) Shear Strength (psf) or RQD (%)	N- value	N60	Casing Blows	Elevation	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/6	0-2	WOR-WOR-1-2	1	2	SSA			6" Topsoil: Dark gray, moist, very soft, Clayey SILT, trace sand.	
	2D	24/16	2-4	2-4-6-5	10	18				Dark gray, wet, very stiff, Clayey SILT, (PP = 1.5 tsf).	
	3D	24/0	4-6	4-6-6-6	12	21				No recovery.	
5											
	4D	24/6	6-8	5-6-6-5	12	21				Dark gray, wet, medium dense, fine SAND, little clayey silt, trace gravel.	
								84.45		8.0	
	5D	24/24	8-10	WOR-1-WOR-1	1	2				Dark gray, wet, very soft, CLAY, trace sand, (Presumpscot Formation) (PP = 0 tsf).	A-6 (20), CL WC=37% LL=37 PL=17 PI=20 SG=2.77
10	1U	24/20	10-12	PUSH			WOH			Dark gray, CLAY, (Presumpscot Formation). 65 x 130 mm vane raw torque readings: V1 = 14.0 / 2.7 ft - lbs V2 = 14.7 / 1.1 ft-lbs	WC=30% LL=26 PL=16 PI=10 SG=2.75
	V1		13.0-13.43	Su = 384/74psf			5				
	V2		14.0-14.43	Su = 404/30psf			5				
							6				
							4				
15	6D	24/24	15-17	WOR-WOR-WOR-WOR	0	0	WOH			Dark gray, wet, very soft, CLAY, trace sand, (Presumpscot Formation) (PP = 0 tsf).	A-6 (12), CL WC=35% LL=30 PL=16 PI=14 SG=2.88
							3				
	2U	24/0	17-19	PUSH			2			No recovery, (Clay on the sides of the tube).	
							1				
	3U	24/6	19-21	PUSH			WOH			Shelby tube pushed from 19 - 21 ft for 10 min to set. (1) See remarks	
20							16	71.45		21.0	
	7D	16/16	21-23	1-1-50/4"						Dark gray, wet, very dense, SAND, little silty clay, some gravel, (Decomposed Rock).	
								68.95		23.5	
										Top of Bedrock at Elev. 68.95 ft. **Bottom of Exploration at 23.5 feet from below surface.**	

Remarks:

Water measurement not taken
(1) Bottom of clay at 19.8' (driller's observation).

Stratification lines represent approximate boudaries between soil types; transitions may be gradual

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No. : BB-C295-207

Appendix C

Rock Core Photographs

Replacement of Tuttle Road Bridge over I-295
RTE US 1 & MCRR
Cumberland, Maine
WIN 025161.00

Boring No.	Run	Depth (ft)	Penetration (in)	Recovery (in)	RQD (in)	RQD (%)	Rock Type	Box Row
BB-C295-102	R1	31.5 - 36.5	60	57	4	7	GNEISS	1
BB-C295-102	R2	36.5 - 41.5	60	60	8	13	GNEISS	2
BB-C295-101	R1	36.5 - 41.5	60	58	34.25	57	GNEISS	3
BB-C295-101	R2	41.5 - 46.5	60	55	47	78	GNEISS	4

Notes: 1. "Box row" indicates the section of the box where the core run is contained: 1 = top, 4 = bottom.
2. Top of core run at left. Increasing depth left to right.

Replacement of Tuttle Road Bridge over I-295
RTE US 1 & MCRR
Cumberland, Maine
WIN 025161.00

Boring No.	Run	Depth (ft)	Penetration (in)	Recovery (in)	RQD (in)	RQD (%)	Rock Type	Box Row
BB-C295-104	R1	28.2 - 32.5	52.5	52.5	49	93	QUARTZITE	1
BB-C295-104	R2	32.5 - 37.5	60	58.5	58.5	98	GNEISS	2
BB-C295-103	R1	49.0 - 54.0	60	44	25	42	GNEISS	3
BB-C295-103	R2	54.0 - 59.0	60	38	26	43	GNEISS	4

Notes: 1. "Box row" indicates the section of the box where the core run is contained: 1 = top, 4 = bottom.
2. Top of core run at left. Increasing depth left to right.

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Replacement of Tuttle Road Bridge over I-295
RTE US 1 & MCRR
Cumberland, Maine
WIN 025161.00

Boring No.	Run	Depth (ft)	Penetration (in)	Recovery (in)	RQD (in)	RQD (%)	Rock Type	Box Row
BB-C295-205	R1	43.5-48.5	60	60	27.25	45.4	GNEISS	1
BB-C295-205	R2	48.5-53.5	60	57	35.75	59.6	GNEISS	2
BB-C295-203	R1	56.8-61.8	60	60	28.25	47.1	GNEISS	3
BB-C295-203	R2	61.8-66.8	60	60	41.75	69.6	GNEISS	4

Notes: 1. "Box row" indicates the section of the box where the core run is contained: 1 = top, 4 = bottom.
2. Top of core run at left. Increasing depth left to right.

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Replacement of Tuttle Road Bridge over I-295
RTE US 1 & MCRR
Cumberland, Maine
WIN 025161.00

Boring No.	Run	Depth (ft)	Penetration (in)	Recovery (in)	RQD (in)	RQD (%)	Rock Type	Box Row
BB-C295-204	R1	47.5-52.5	60	60	18.75	31.25	GNEISS	1
BB-C295-204	R2	52.5-57.5	60	53.5	27	45	GNEISS	2
BB-C295-202	R1	29.0-34.0	60	49	41	68.3	GNEISS	3
BB-C295-202	R2	34.0-39.0	60	60	50.75	84.6	GNEISS	4

Notes: 1. "Box row" indicates the section of the box where the core run is contained: 1 = top, 4 = bottom.
2. Top of core run at left. Increasing depth left to right.

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Appendix D
Laboratory Testing Results

Preliminary Subsurface Exploration Program Lab Test Results, 2022

Designed to Amaze,
Engineered to Last®

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland, ME				
Location:	Cumberland, ME			Project No:	GTX-316280
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	11/03/22	Checked By:	ank
Depth :	---	Test Id:	691797		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
BB-C295-101	2D	2'-4'	Moist, very dark grayish brown silt with sand	32.3
BB-C295-101	4D	6'-8'	Moist, olive brown clay	25.4
BB-C295-101	5D	8'-10'	Moist, grayish brown silty sand with gravel	15.0
BB-C295-101	10D	30'-32'	Moist, dark gray clayey sand	20.8
BB-C295-102	3D	4'-6'	Moist, olive brown clay	24.6
BB-C295-102	4D	6'-8'	Moist, olive brown clay	25.0
BB-C295-102	9D	25'-27'	Moist, gray silty sand with gravel	16.1
BB-C295-103	3D	5'-7'	Moist, dark gray clay	25.8
BB-C295-103	4D	7'-9'	Moist, gray clay with sand	36.3
BB-C295-103	7D	20'-22'	Moist, gray silty sand and gravel	9.8

Notes: Temperature of Drying : 110º Celsius

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland, ME		
Location:	Cumberland, ME	Project No:	GTX-316280

Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	11/03/22	Checked By:	ank
Depth :	---	Test Id:	691802		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
BB-C295-103	9D	30'-32'	Moist, gray sandy silty clay	16.3
BB-C295-104	2D	2'-4'	Moist, dark grayish brown clay	29.4
BB-C295-104	4D	6'-8'	Moist, dark gray clay	24.0
BB-C295-104	5D	8'-10'	Moist, gray clay	28.7
BB-C295-104	9D	25'-27'	Moist, light brownish gray silt with sand	17.5

Notes: Temperature of Drying : 110º Celsius

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland, ME				
Location:	Cumberland, ME			Project No:	GTX-316280
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	11/07/22	Checked By:	ank
Depth :	---	Test Id:	691810		

Specific Gravity of Soils by ASTM D854

Boring ID	Sample ID	Depth	Visual Description	Specific Gravity	Comment
BB-C295-103	3D	5'-7'	Moist, dark gray clay	2.80	
BB-C295-103	4D	7'-9'	Moist, gray clay with sand	2.69	
BB-C295-104	4D	6'-8'	Moist, dark gray clay	2.79	
BB-C295-104	5D	8'-10'	Moist, gray clay	2.67	

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854
Moisture Content determined by ASTM D2216.

Client:	Hardesty & Hanover
Project Name:	Tuttle Rd, Cumberland, ME
Project Location:	Cumberland, ME
GTX #:	316280
Test Date:	10/31/22
Tested By:	nlb
Checked By:	ank

Laboratory pH of Soil by ASTM G51

Boring ID	Sample ID	Depth, ft	Description	Soil Temperature, ° C	Average pH Reading
BB-C295-102	5D, 6D, 7D	8'-17'	Moist, gray silt with sand	20.8	6.88

Notes:

Client:	Hardesty & Hanover
Project:	Tuttle Rd, Cumberland, ME
Location:	Cumberland, ME
GTX#:	316280
Test Date:	11/10/22
Tested By:	nlb
Checked By:	ank

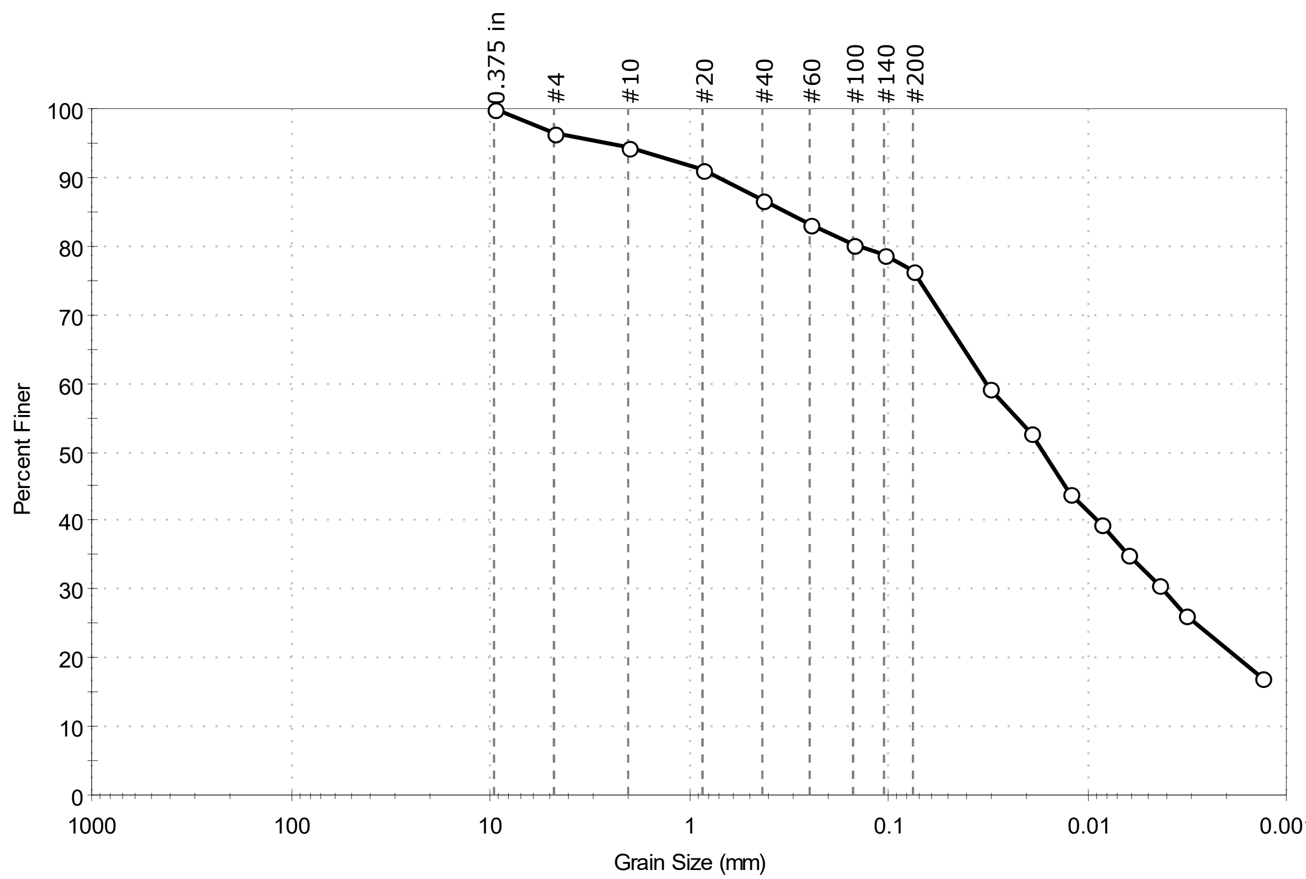
Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, $(\text{ohm-cm})^{-1}$
BB-C295-102	5D, 6D, 7D	8'-17'	Moist, gray silt with sand	2,686	3.72E-04

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box
Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)
Test conducted in standard laboratory atmosphere: 68-73 F

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland, ME		
Location:	Cumberland, ME	Project No:	GTX-316280
Boring ID:	BB-C295-101	Sample Type: jar	Tested By: ckg
Sample ID:	2D	Test Date: 11/10/22	Checked By: ank
Depth :	2'-4'	Test Id: 691777	
Test Comment:	---		
Visual Description:	Moist, very dark grayish brown silt with sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	3.7	19.9	76.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	96		
#10	2.00	94		
#20	0.85	91		
#40	0.42	87		
#60	0.25	83		
#100	0.15	80		
#140	0.11	79		
#200	0.075	76		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0308	59		
---	0.0192	53		
---	0.0121	44		
---	0.0086	39		
---	0.0063	35		
---	0.0044	31		
---	0.0032	26		
---	0.0013	17		

Coefficients

D_{85} =0.3333 mm D_{30} =0.0043 mm

D_{60} =0.0319 mm D_{15} =N/A

D_{50} =0.0167 mm D_{10} =N/A

C_u =N/A C_c =N/A

Classification

ASTM SILT with Sand (ML)

AASHTO Clayey Soils (A-7-6 (11))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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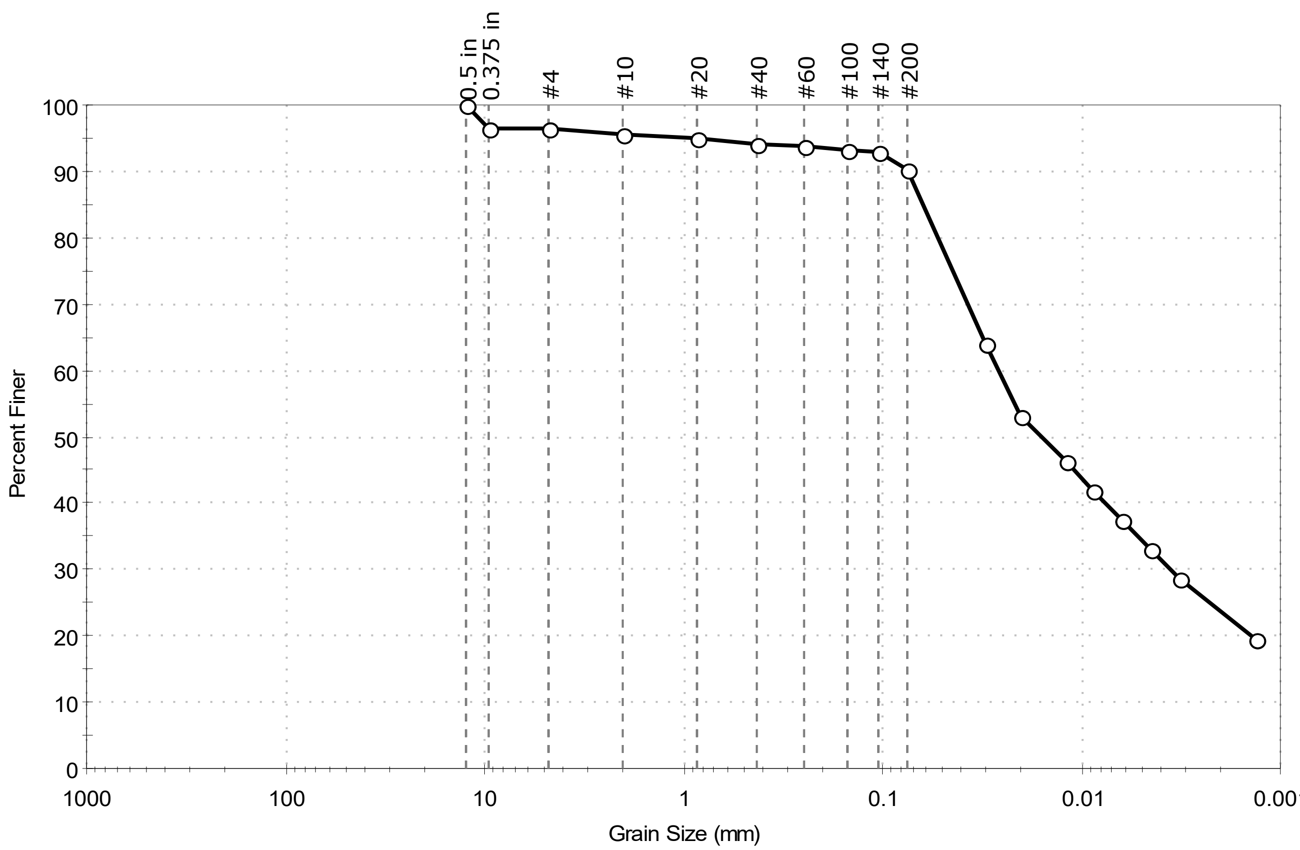
Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland, ME		
Location:	Cumberland, ME	Project No:	GTX-316280
Boring ID:	BB-C295-101	Sample Type: jar	Tested By: ckg
Sample ID:	4D	Test Date: 11/10/22	Checked By: ank
Depth :	6'-8'	Test Id: 691778	
Test Comment:	---		
Visual Description:	Moist, olive brown clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	3.5	6.2	90.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	96		
#4	4.75	96		
#10	2.00	96		
#20	0.85	95		
#40	0.42	94		
#60	0.25	94		
#100	0.15	93		
#140	0.11	93		
#200	0.075	90		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0305	64		
---	0.0201	53		
---	0.0120	46		
---	0.0087	42		
---	0.0062	37		
---	0.0045	33		
---	0.0032	28		
---	0.0013	20		

Coefficients

D_{85} =0.0626 mm — D_{30} =0.0036 mm

D_{60} =0.0261 mm — D_{15} =N/A

D_{50} =0.0160 mm — D_{10} =N/A

C_u =N/A — C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (12))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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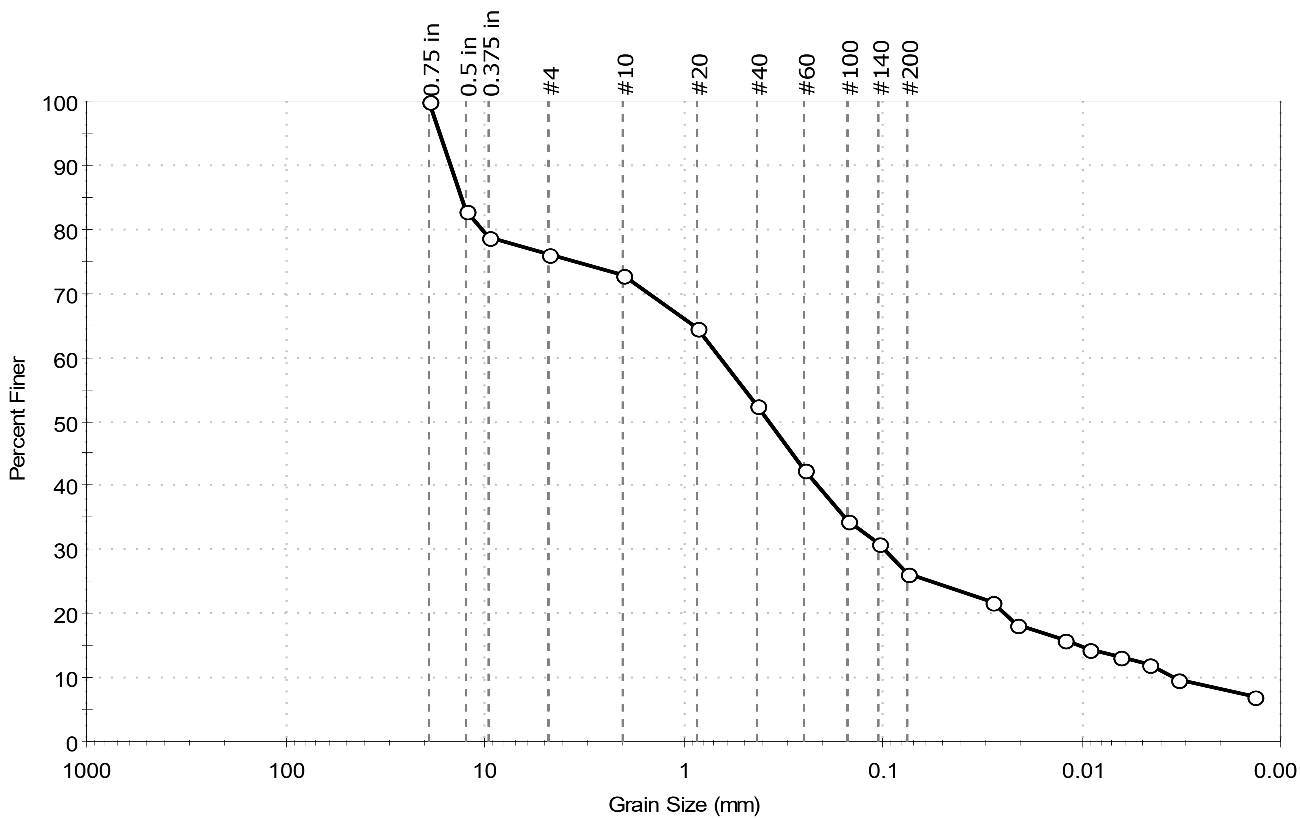
Client:	Hardesty & Hanover
Project:	Tuttle Rd, Cumberland, ME
Location:	Cumberland, ME
Project No:	GTX-316280
Boring ID:	BB-C295-101
Sample ID:	5D
Depth :	8'-10'
Sample Type:	jar
Test Date:	11/11/22
Test Id:	691779
Tested By:	ckg
Checked By:	ank
Test Comment:	---
Visual Description:	Moist, grayish brown silty sand with gravel
Sample Comment:	---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	23.8	50.0	26.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	83		
0.375 in	9.50	79		
#4	4.75	76		
#10	2.00	73		
#20	0.85	65		
#40	0.42	53		
#60	0.25	42		
#100	0.15	35		
#140	0.11	31		
#200	0.075	26		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0281	22		
---	0.0210	18		
---	0.0124	16		
---	0.0091	15		
---	0.0065	13		
---	0.0046	12		
---	0.0033	10		
---	0.0014	7		

Coefficients

D_{85} =13.1903 mm
D_{30} =0.0991 mm
D_{60} =0.6496 mm
D_{15} =0.0102 mm
D_{50} =0.3708 mm
D_{10} =0.0035 mm
C_u =185.600
C_c =4.319

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

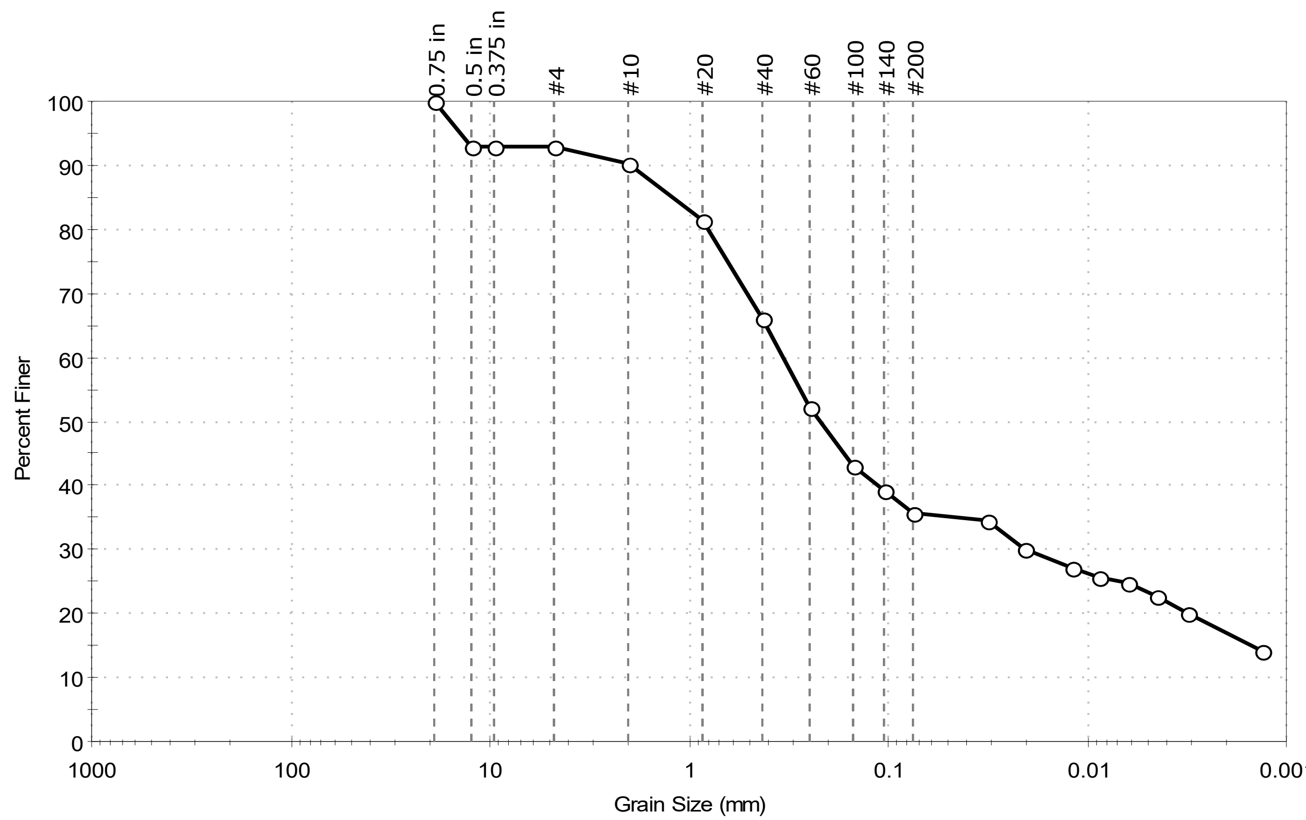
Separation of Sample: #200 Sieve

GeoTesting EXPRESS

5D

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland, ME		
Location:	Cumberland, ME	Project No:	GTX-316280
Boring ID:	BB-C295-101	Sample Type: jar	Tested By: ckg
Sample ID:	10D	Test Date: 11/10/22	Checked By: ank
Depth :	30'-32'	Test Id: 691780	
Test Comment:	---		
Visual Description:	Moist, dark gray clayey sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	7.2	57.0	35.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	93		
0.375 in	9.50	93		
#4	4.75	93		
#10	2.00	90		
#20	0.85	81		
#40	0.42	66		
#60	0.25	52		
#100	0.15	43		
#140	0.11	39		
#200	0.075	36		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0321	34		
---	0.0206	30		
---	0.0121	27		
---	0.0087	26		
---	0.0062	25		
---	0.0045	23		
---	0.0032	20		
---	0.0013	14		

Coefficients

D_{85} =1.2052 mm	D_{30} =0.0202 mm
D_{60} =0.3373 mm	D_{15} =0.0015 mm
D_{50} =0.2204 mm	D_{10} =N/A
C_u =N/A	C_c =N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

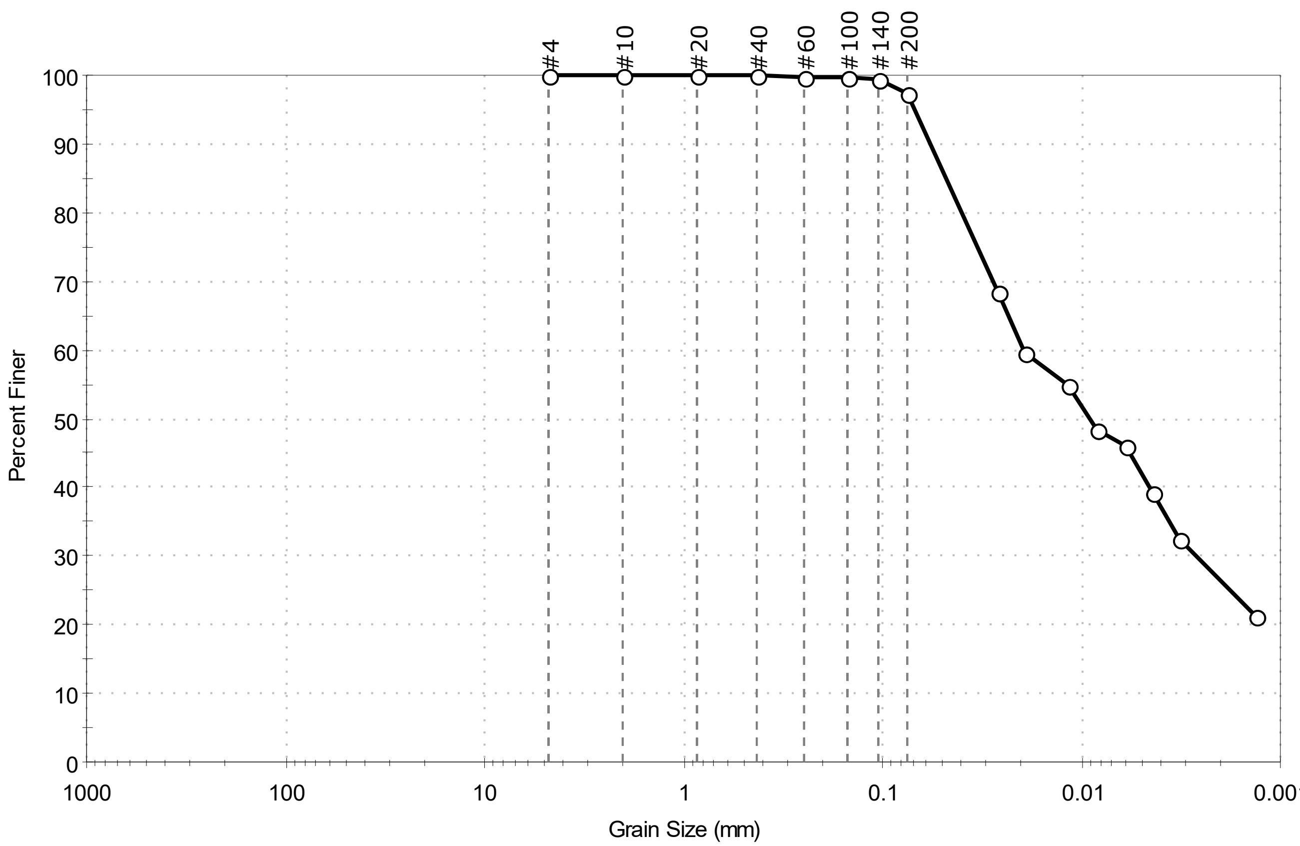
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 11/11/2022 9:44:39 AM

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland, ME		
Location:	Cumberland, ME	Project No:	GTX-316280
Boring ID:	BB-C295-102	Sample Type: jar	Tested By: ckg
Sample ID:	3D	Test Date: 11/10/22	Checked By: ank
Depth :	4'-6'	Test Id: 691781	
Test Comment:	---		
Visual Description:	Moist, olive brown clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	2.7	97.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	99		
#200	0.075	97		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0261	68		
---	0.0193	59		
---	0.0118	55		
---	0.0084	48		
---	0.0060	46		
---	0.0044	39		
---	0.0032	33		
---	0.0013	21		

Coefficients

D_{85} =0.0478 mm
D_{30} =0.0026 mm
D_{60} =0.0196 mm
D_{15} =N/A
D_{50} =0.0092 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (12))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

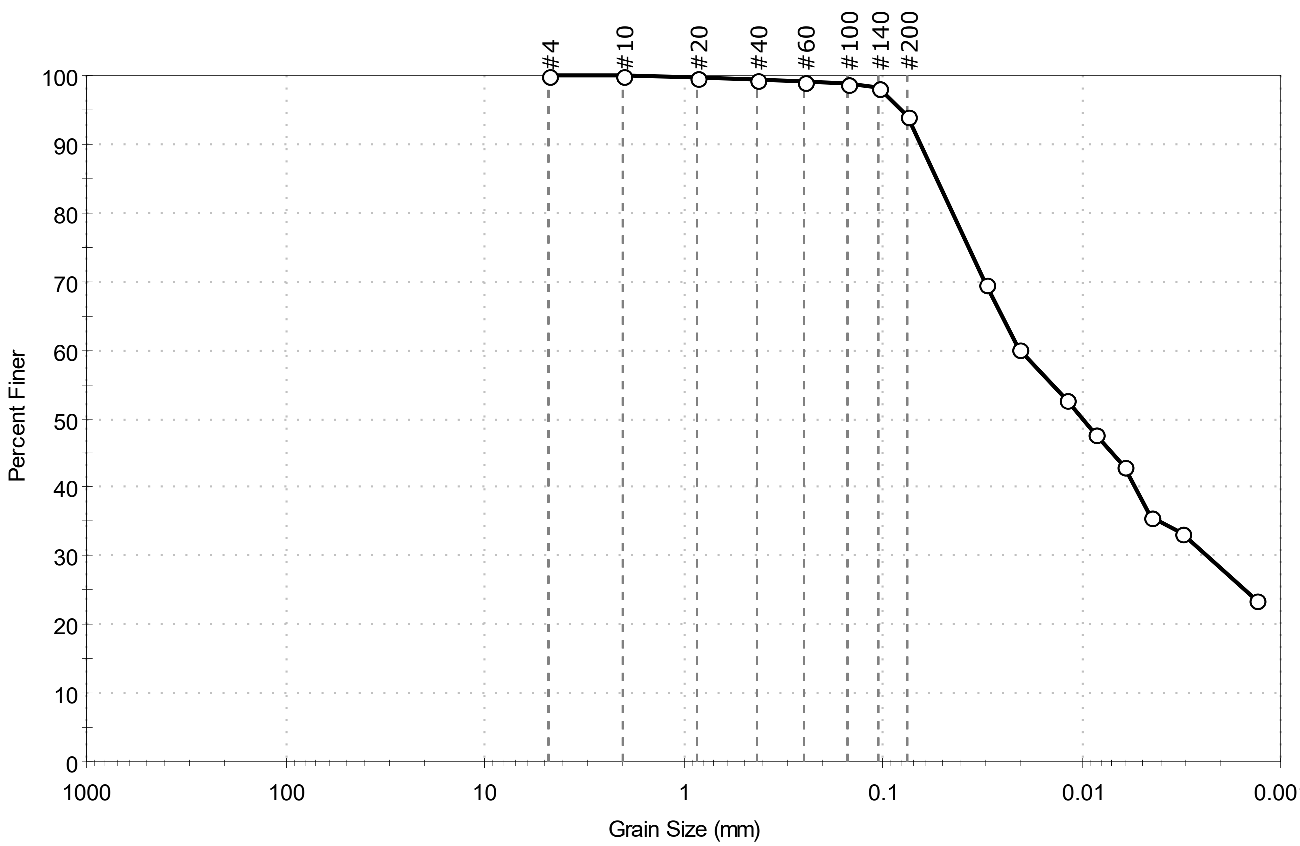
Separation of Sample: #200 Sieve

printed 11/11/2022 9:44:41 AM

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland, ME		
Location:	Cumberland, ME	Project No:	GTX-316280
Boring ID: BB-C295-102	Sample Type: jar	Tested By:	ckg
Sample ID: 4D	Test Date: 11/10/22	Checked By:	ank
Depth : 6'-8'	Test Id: 691782		

Test Comment: ---
Visual Description: Moist, olive brown clay
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	5.9	94.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	99		
#100	0.15	99		
#140	0.11	98		
#200	0.075	94		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0306	70		
---	0.0207	60		
---	0.0120	53		
---	0.0085	48		
---	0.0062	43		
---	0.0045	36		
---	0.0032	33		
---	0.0013	24		

Coefficients

D_{85} = 0.0536 mm | D_{30} = 0.0023 mm
D_{60} = 0.0207 mm | D_{15} = N/A
D_{50} = 0.0099 mm | D_{10} = N/A
C_u = N/A | C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

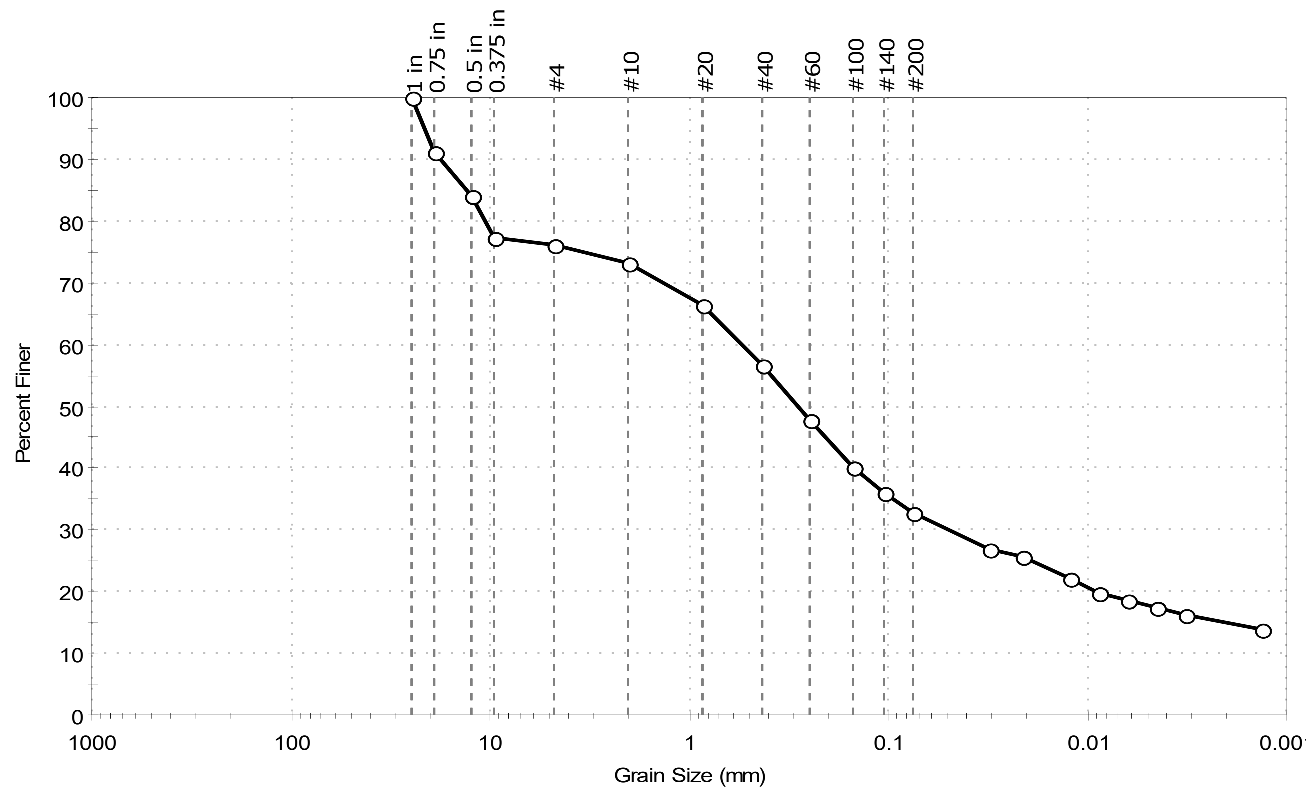
Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

GeoTesting EXPRESS

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland, ME		
Location:	Cumberland, ME	Project No:	GTX-316280
Boring ID: BB-C295-102	Sample Type: jar	Tested By:	ckg
Sample ID: 9D	Test Date: 11/10/22	Checked By:	ank
Depth : 25'-27'	Test Id: 691783		

Test Comment: ---
Visual Description: Moist, gray silty sand with gravel
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	23.9	43.3	32.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	91		
0.5 in	12.50	84		
0.375 in	9.50	77		
#4	4.75	76		
#10	2.00	73		
#20	0.85	66		
#40	0.42	57		
#60	0.25	48		
#100	0.15	40		
#140	0.11	36		
#200	0.075	33		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0311	27		
---	0.0213	26		
---	0.0122	22		
---	0.0087	20		
---	0.0063	19		
---	0.0044	17		
---	0.0032	16		
---	0.0013	14		

Coefficients

D_{85} = 13.1423 mm
D_{30} = 0.0491 mm
D_{60} = 0.5423 mm
D_{15} = 0.0021 mm
D_{50} = 0.2873 mm
D_{10} = N/A
C_u = N/A
C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

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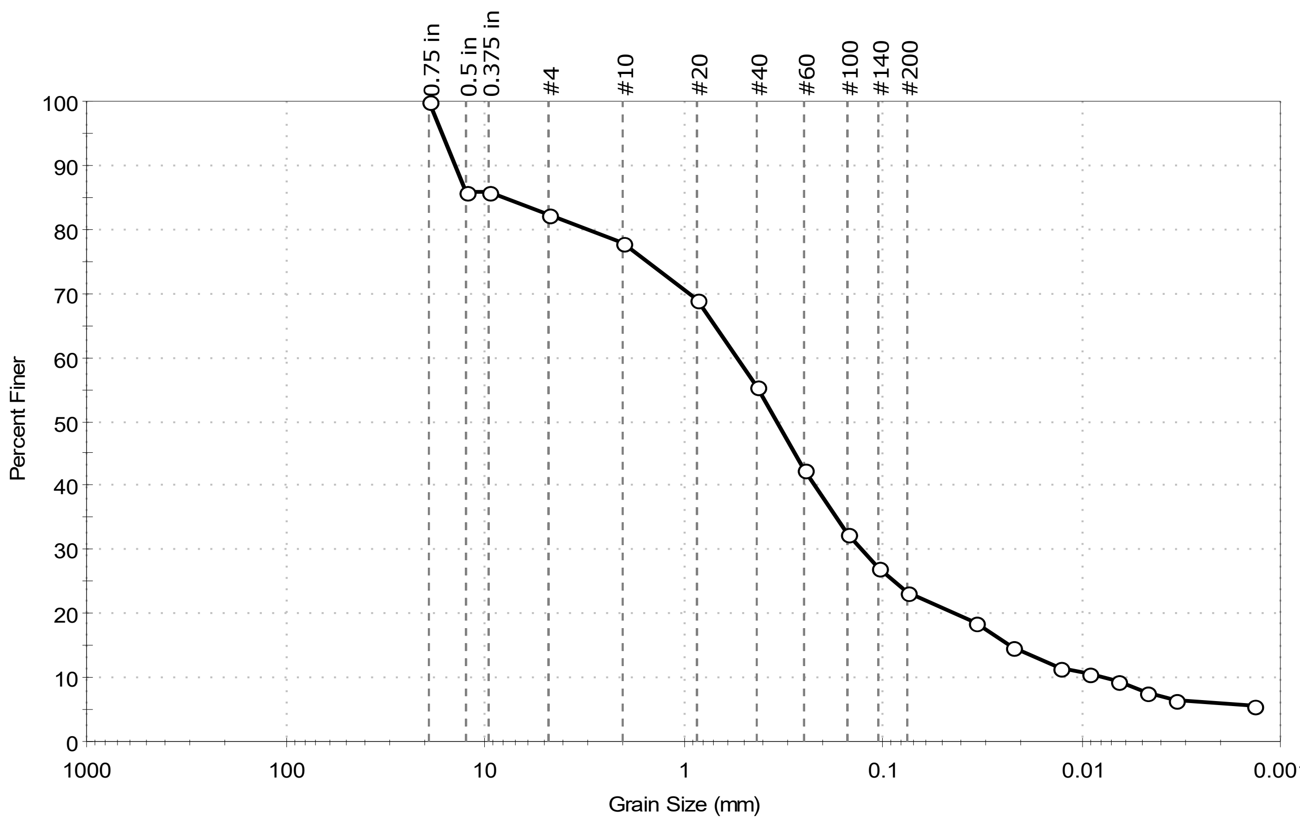
Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland, ME		
Location:	Cumberland, ME	Project No:	GTX-316280
Boring ID: BB-C295-103	Sample Type: jar	Tested By:	ckg
Sample ID: 7D	Test Date: 11/10/22	Checked By:	ank
Depth : 20'-22'	Test Id: 691784		

Test Comment: ---

Visual Description: Moist, gray silty sand with gravel

Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	17.6	59.0	23.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	86		
0.375 in	9.50	86		
#4	4.75	82		
#10	2.00	78		
#20	0.85	69		
#40	0.42	56		
#60	0.25	43		
#100	0.15	32		
#140	0.11	27		
#200	0.075	23		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0342	19		
---	0.0220	15		
---	0.0127	12		
---	0.0091	11		
---	0.0066	10		
---	0.0047	8		
---	0.0033	7		
---	0.0014	6		

Coefficients

D_{85} =7.9425 mm	D_{30} =0.1286 mm
D_{60} =0.5347 mm	D_{15} =0.0230 mm
D_{50} =0.3386 mm	D_{10} =0.0075 mm
C_u =71.293	C_c =4.124

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

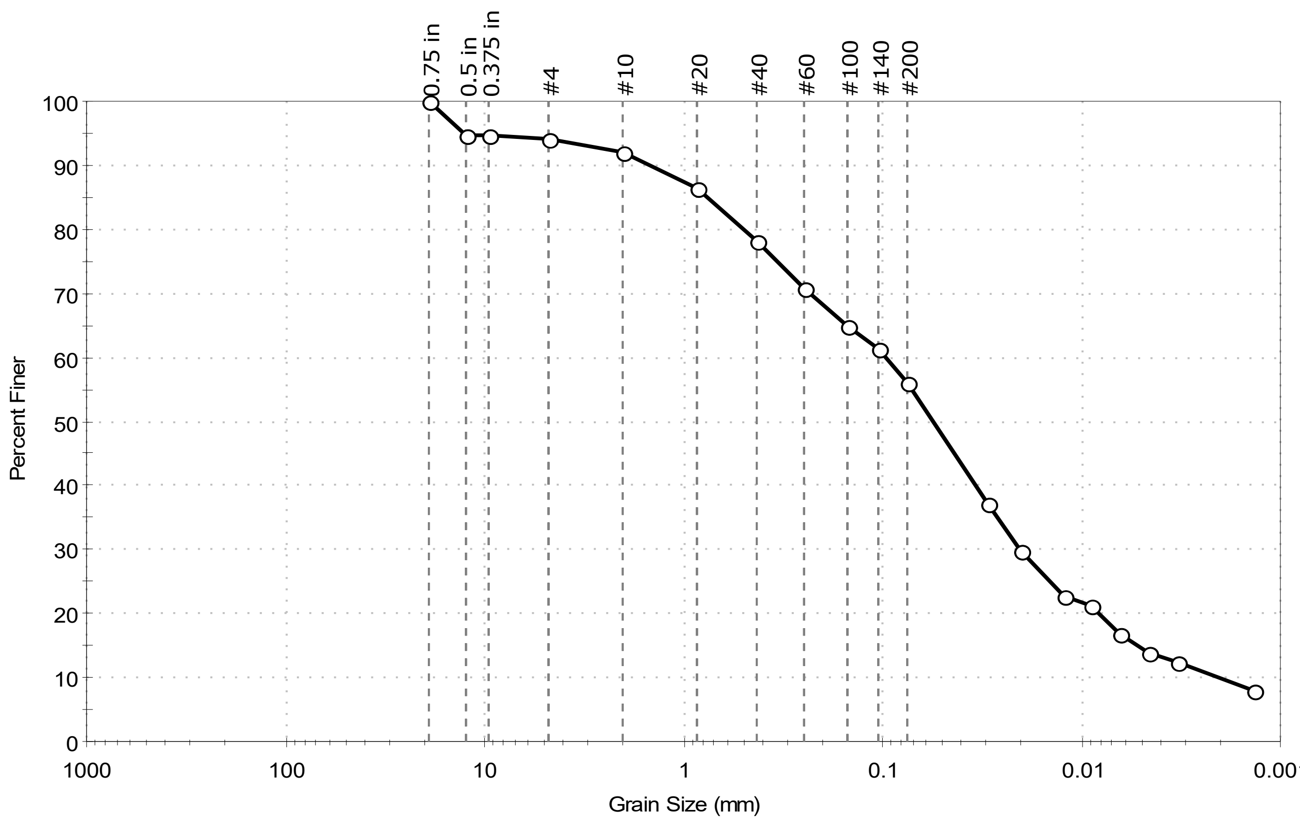
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 11/11/2022 9:44:47 AM

Client:	Hardesty & Hanover
Project:	Tuttle Rd, Cumberland, ME
Location:	Cumberland, ME
Project No:	GTX-316280
Boring ID:	BB-C295-103
Sample Type:	jar
Tested By:	ckg
Sample ID:	9D
Test Date:	11/10/22
Checked By:	ank
Depth :	30'-32'
Test Id:	691785
Test Comment:	---
Visual Description:	Moist, gray sandy silty clay
Sample Comment:	---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	5.9	38.0	56.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	95		
0.375 in	9.50	95		
#4	4.75	94		
#10	2.00	92		
#20	0.85	86		
#40	0.42	78		
#60	0.25	71		
#100	0.15	65		
#140	0.11	61		
#200	0.075	56		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0296	37		
---	0.0204	30		
---	0.0122	23		
---	0.0090	21		
---	0.0064	17		
---	0.0046	14		
---	0.0033	12		
---	0.0014	8		

Coefficients

D_{85} =0.7583 mm	D_{30} =0.0205 mm
D_{60} =0.0972 mm	D_{15} =0.0052 mm
D_{50} =0.0555 mm	D_{10} =0.0020 mm
C_u =48.600	C_c =2.162

Classification

ASTM Sandy Silty CLAY (CL-ML)

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

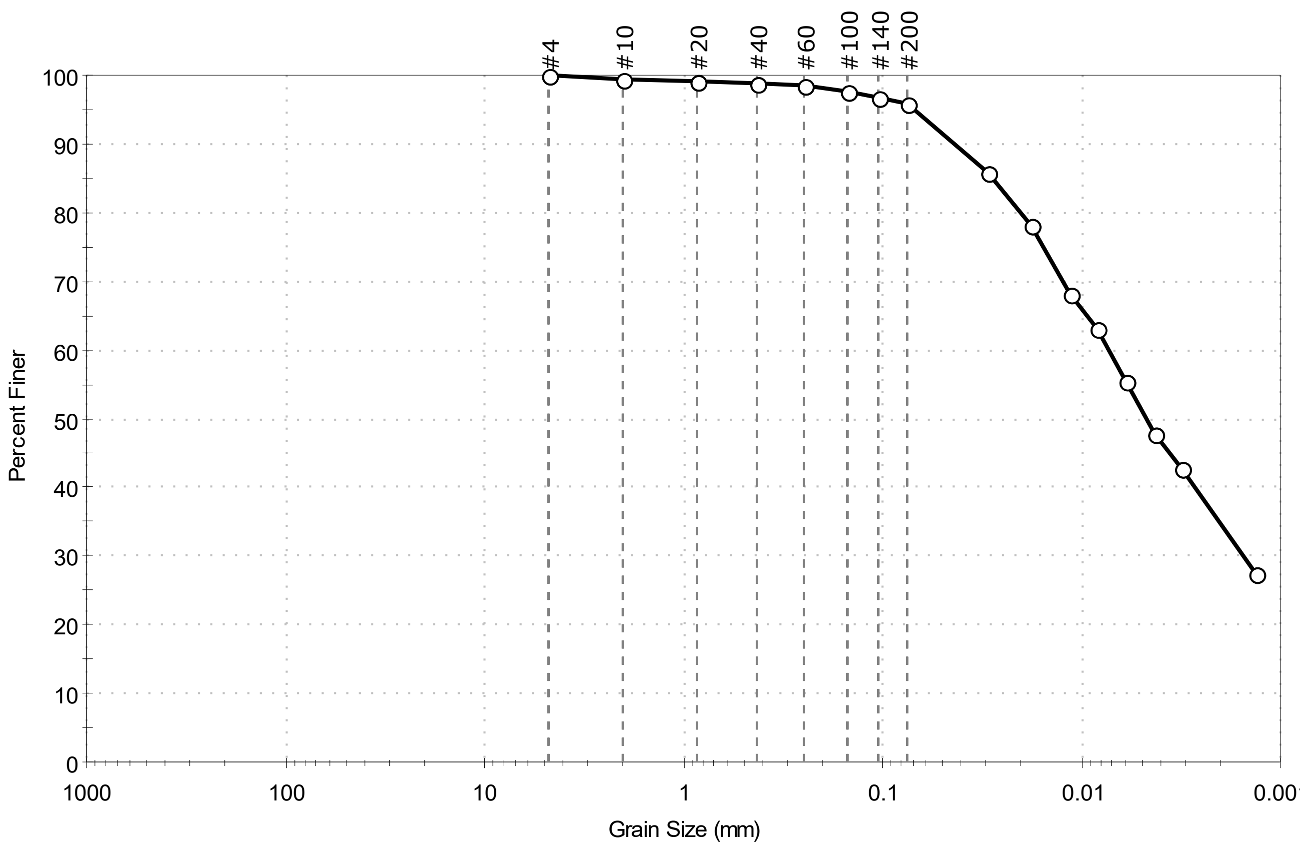
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 11/11/2022 9:44:50 AM

Client:	Hardesty & Hanover
Project:	Tuttle Rd, Cumberland, ME
Location:	Cumberland, ME
Project No:	GTX-316280
Boring ID:	BB-C295-104
Sample Type:	jar
Tested By:	ckg
Sample ID:	2D
Test Date:	11/10/22
Checked By:	ank
Depth :	2'-4'
Test Id:	691786
Test Comment:	---
Visual Description:	Moist, dark grayish brown clay
Sample Comment:	---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	4.3	95.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	99		
#20	0.85	99		
#40	0.42	99		
#60	0.25	98		
#100	0.15	98		
#140	0.11	97		
#200	0.075	96		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0295	86		
---	0.0178	78		
---	0.0113	68		
---	0.0083	63		
---	0.0060	55		
---	0.0043	48		
---	0.0031	43		
---	0.0013	27		

Coefficients

D_{85} =0.0279 mm
D_{30} =0.0015 mm
D_{60} =0.0073 mm
D_{15} =N/A
D_{50} =0.0047 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-7-6 (21))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

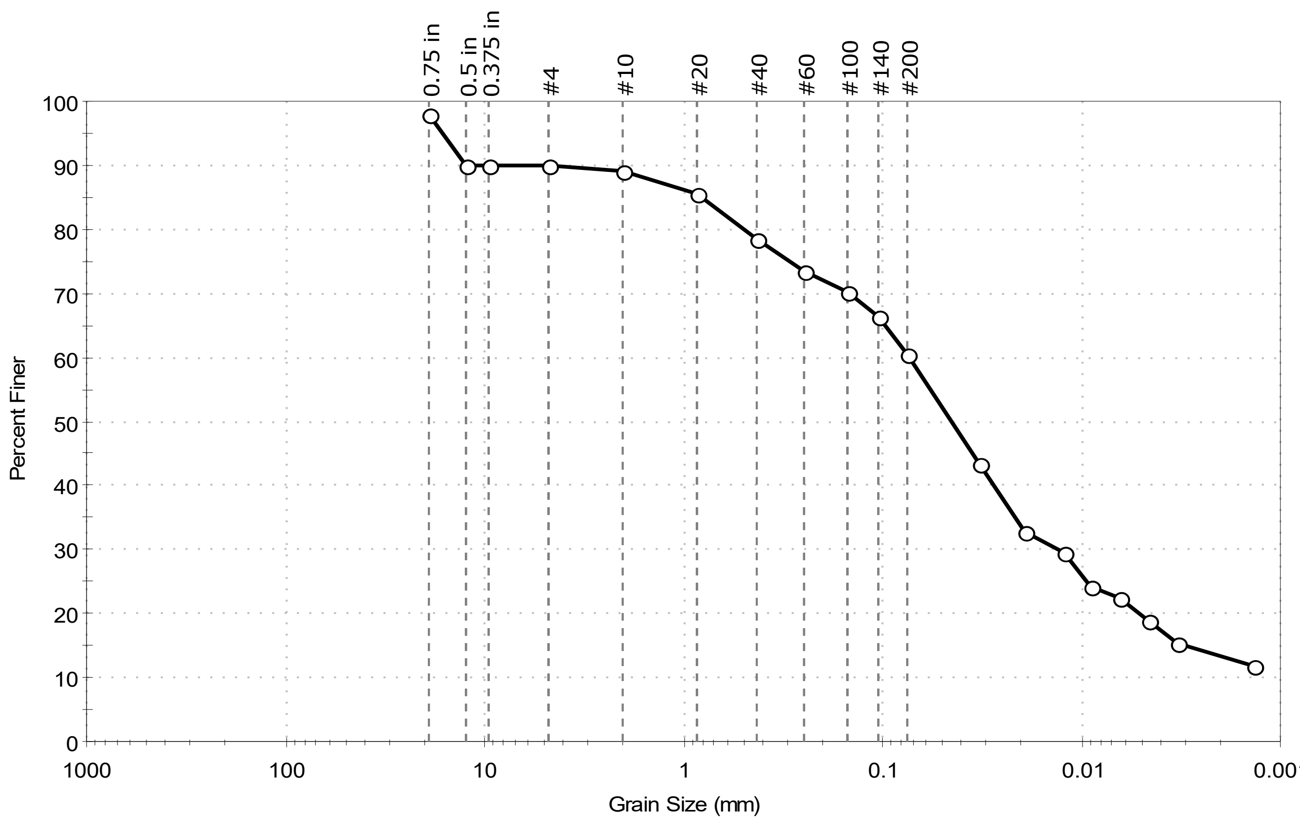
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 11/11/2022 9:44:52 AM

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland, ME		
Location:	Cumberland, ME	Project No:	GTX-316280
Boring ID:	BB-C295-104	Sample Type: jar	Tested By: ckg
Sample ID:	9D	Test Date: 11/10/22	Checked By: ank
Depth :	25'-27'	Test Id: 691787	
Test Comment:	---		
Visual Description:	Moist, light brownish gray silt with sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	9.9	29.7	60.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	98		
0.5 in	12.50	90		
0.375 in	9.50	90		
#4	4.75	90		
#10	2.00	89		
#20	0.85	86		
#40	0.42	79		
#60	0.25	73		
#100	0.15	70		
#140	0.11	67		
#200	0.075	60		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0324	43		
---	0.0191	33		
---	0.0121	29		
---	0.0090	24		
---	0.0064	22		
---	0.0046	19		
---	0.0033	15		
---	0.0013	12		

Coefficients

D_{85} =0.8022 mm	D_{30} =0.0132 mm
D_{60} =0.0736 mm	D_{15} =0.0030 mm
D_{50} =0.0450 mm	D_{10} =N/A
C_u =N/A	C_c =N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

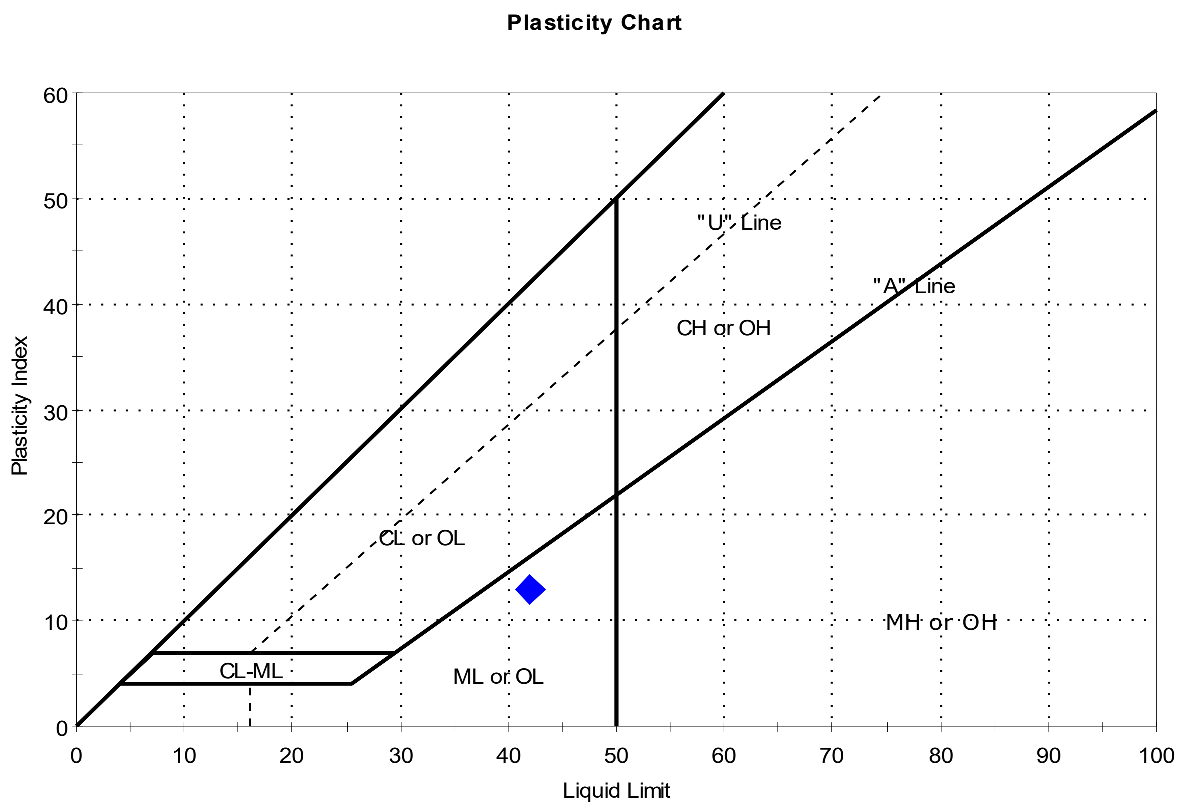
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 11/11/2022 9:44:54 AM

Client:	Hardesty & Hanover			
Project:	Tuttle Rd, Cumberland, ME			
Location:	Cumberland, ME		Project No:	GTX-316280
Boring ID: BB-C295-101		Sample Type: jar	Tested By:	cam
Sample ID: 2D		Test Date: 11/10/22	Checked By:	ank
Depth : 2'-4'		Test Id: 691768		
Test Comment:	---			
Visual Description:	Moist, very dark grayish brown silt with sand			
Sample Comment:	---			

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-2	BB-101	2'-4'	32	42	29	13	0.3	SILT with Sand (ML)

Sample Prepared using the WET method

13% Retained on #40 Sieve

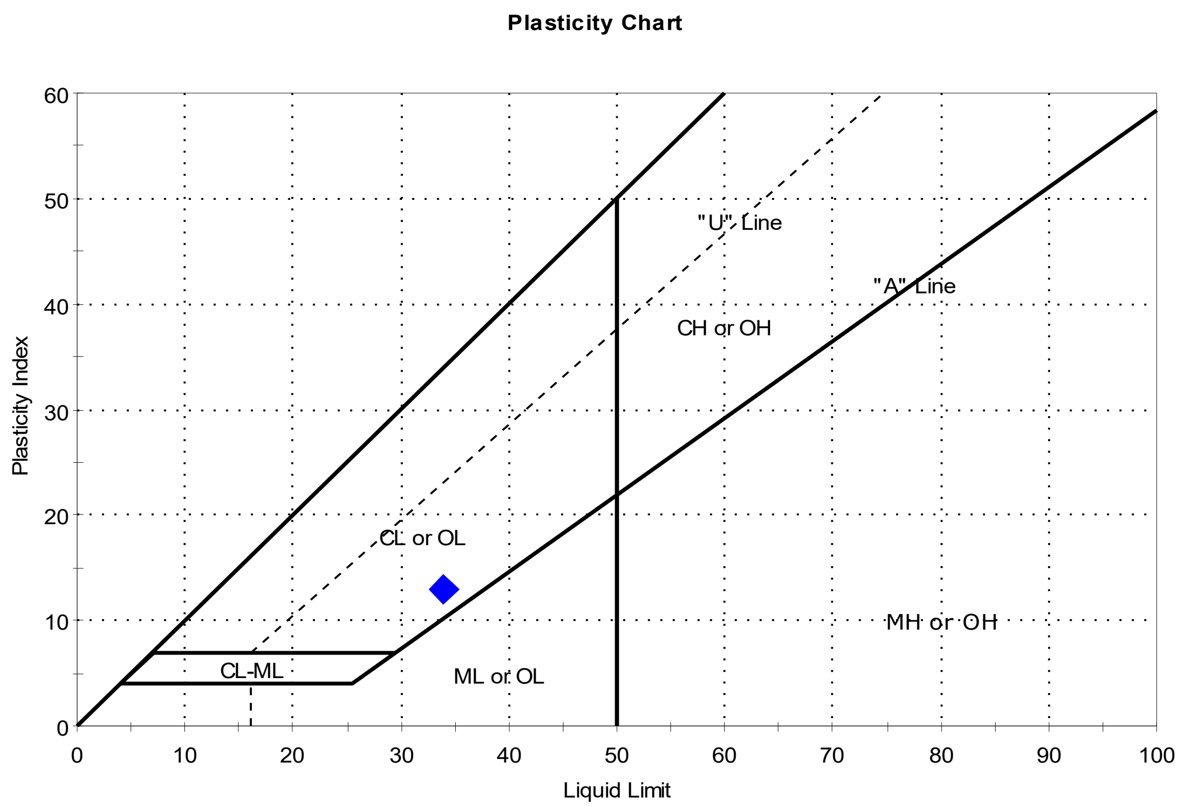
Dry Strength: HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Hardesty & Hanover
Project:	Tuttle Rd, Cumberland, ME
Location:	Cumberland, ME
Project No:	GTX-316280
Boring ID:	BB-C295-101
Sample Type:	jar
Tested By:	cam
Sample ID:	4D
Test Date:	11/10/22
Checked By:	ank
Depth :	6'-8'
Test Id:	691769
Test Comment:	---
Visual Description:	Moist, olive brown clay
Sample Comment:	---

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-4	BB-101	6'-8'	25	34	21	13	0.3	Lean CLAY (CL)

Sample Prepared using the WET method

6% Retained on #40 Sieve

Dry Strength: VERY HIGH

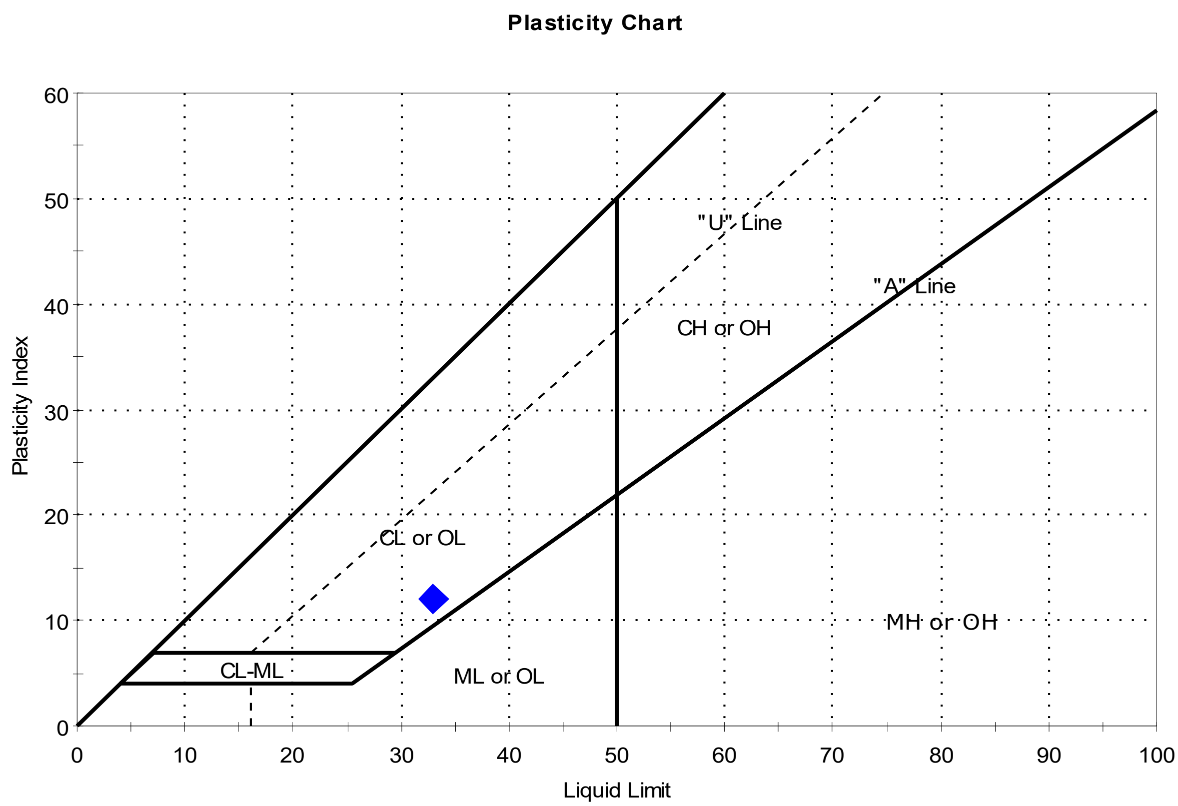
Dilatancy: SLOW

Toughness: LOW

printed 11/11/2022 9:43:04 AM

Client: Hardesty & Hanover			
Project: Tuttle Rd, Cumberland, ME			
Location: Cumberland, ME		Project No:	GTX-316280
Boring ID: BB-C295-102	Sample Type: jar	Tested By:	cam
Sample ID: 3D	Test Date: 11/10/22	Checked By:	ank
Depth : 4'-6'	Test Id: 691770		
Test Comment: ---			
Visual Description: Moist, olive brown clay			
Sample Comment: ---			

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-3	BB-102	4'-6'	25	33	21	12	0.3	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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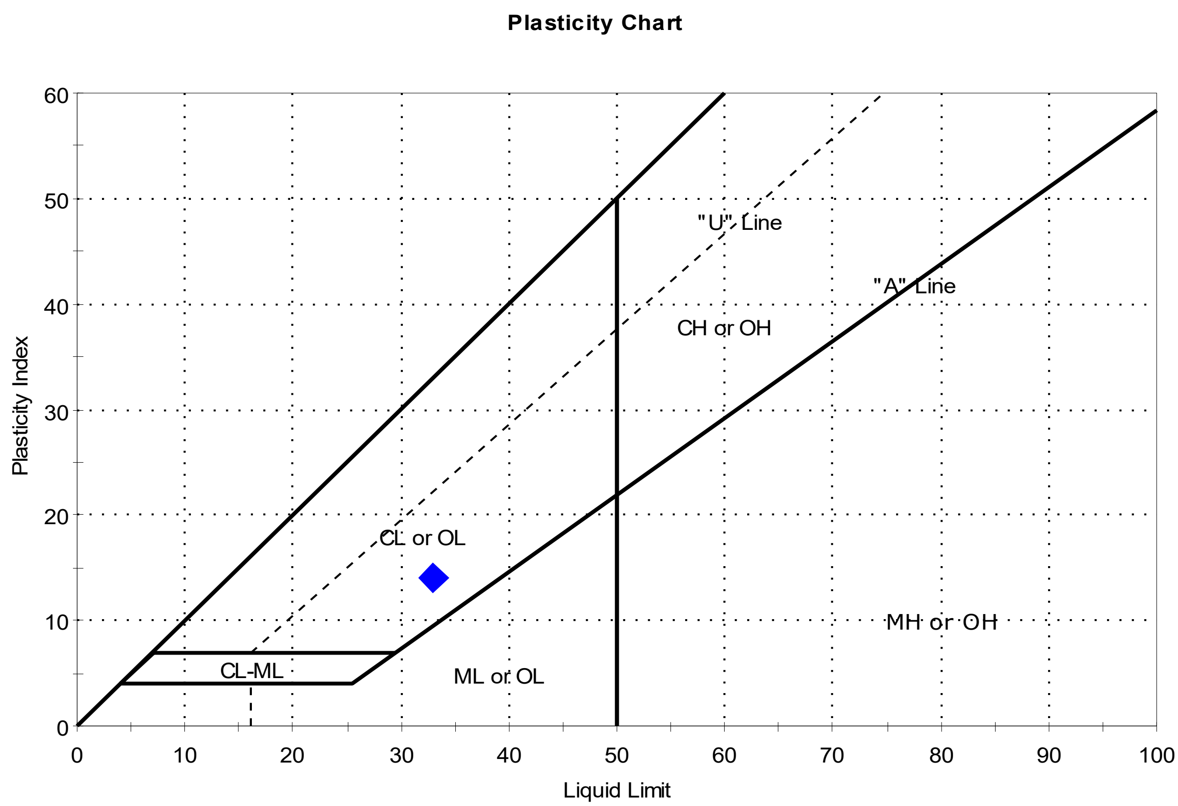
Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland, ME				
Location:	Cumberland, ME			Project No:	GTX-316280
Boring ID:	BB-C295-103	Sample Type:	jar	Tested By:	cam
Sample ID:	3D	Test Date:	11/10/22	Checked By:	ank
Depth :	5'-7'	Test Id:	691771		
Test Comment:	---				
Visual Description:	Moist, dark gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-3	BB-103	5'-7'	26	33	19	14	0.5	

Sample Prepared using the WET method

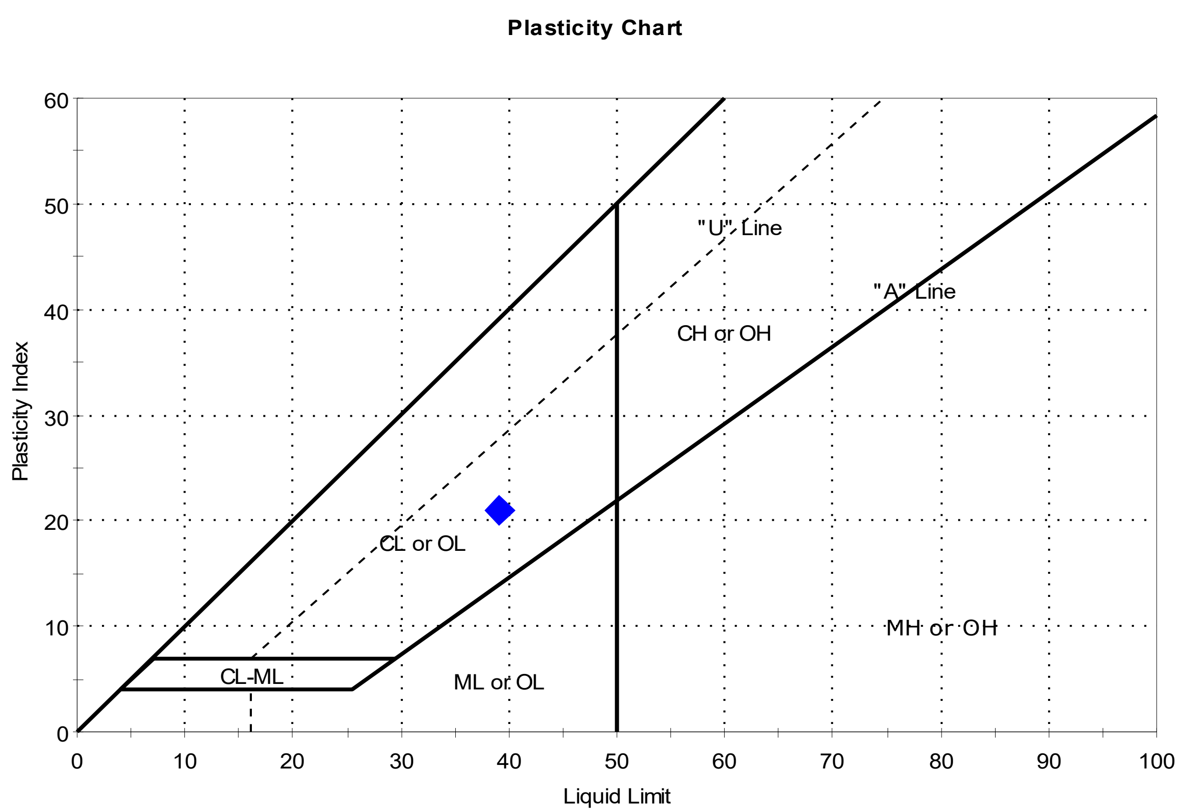
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland, ME		
Location:	Cumberland, ME	Project No:	GTX-316280
Boring ID: BB-C295-103	Sample Type: jar	Tested By:	cam
Sample ID: 4D	Test Date: 11/10/22	Checked By:	ank
Depth : 7'-9'	Test Id: 691772		
Test Comment:	---		
Visual Description:	Moist, gray clay with sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-4	BB-103	7'-9'	36	39	18	21	0.9	

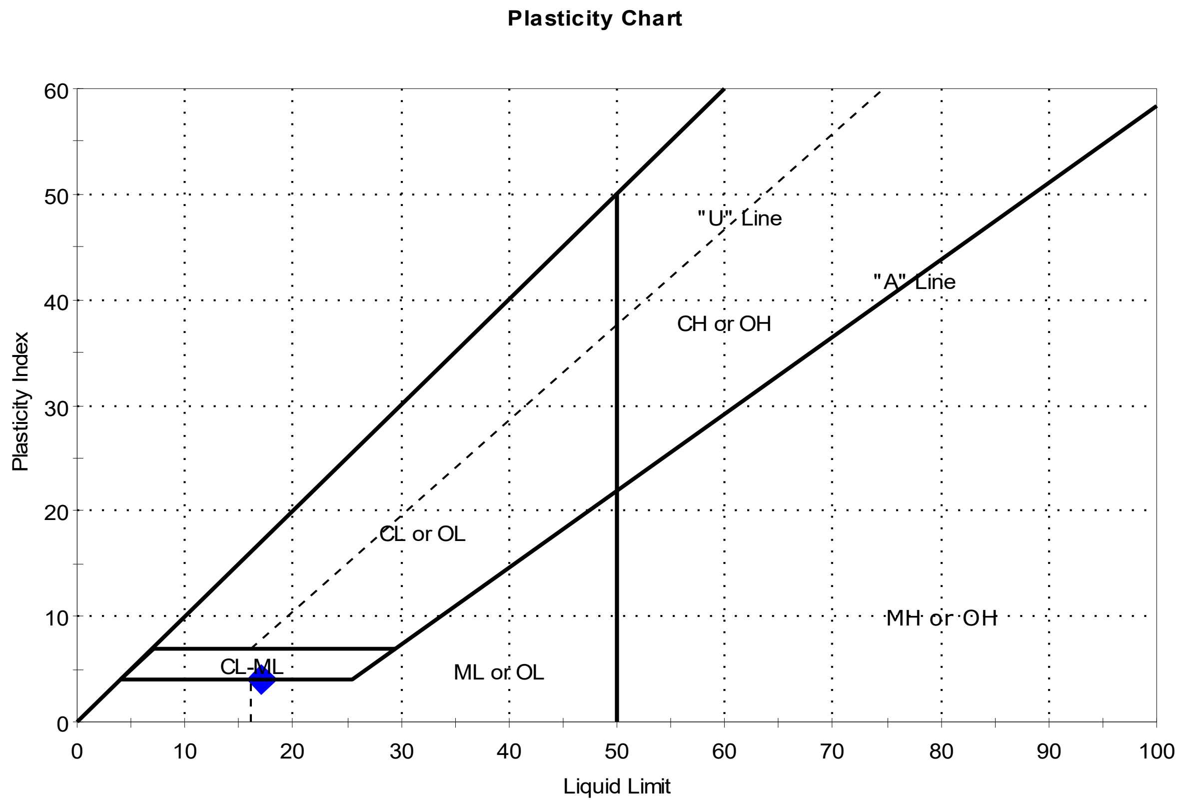
Sample Prepared using the WET method

Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland, ME				
Location:	Cumberland, ME			Project No:	GTX-316280
Boring ID:	BB-C295-103	Sample Type:	jar	Tested By:	cam
Sample ID:	9D	Test Date:	11/10/22	Checked By:	ank
Depth :	30'-32'	Test Id:	691773		

Test Comment: ---
Visual Description: Moist, gray sandy silty clay
Sample Comment: ---

Atterberg Limits - ASTM D4318



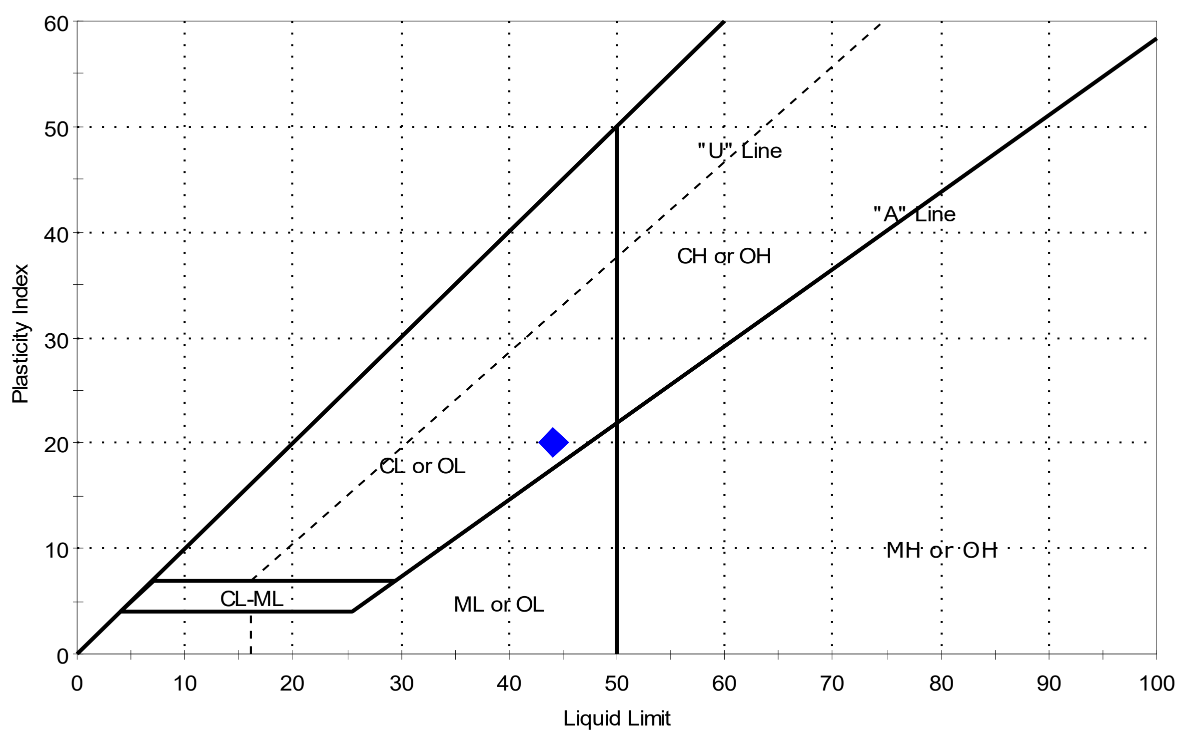
Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-9	BB-103	30'-32'	16	17	13	4	0.8	Sandy Silty CLAY (CL-ML)

Sample Prepared using the WET method
22% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

GeoTesting EXPRESS

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland, ME		
Location:	Cumberland, ME	Project No:	GTX-316280
Boring ID: BB-C295-104	Sample Type: jar	Tested By:	cam
Sample ID: 2D	Test Date: 11/10/22	Checked By:	ank
Depth : 2'-4'	Test Id: 691774		
Test Comment:	---		
Visual Description:	Moist, dark grayish brown clay		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-2	BB-104	2'-4'	29	44	24	20	0.3	Lean CLAY (CL)

Sample Prepared using the WET method

1% Retained on #40 Sieve

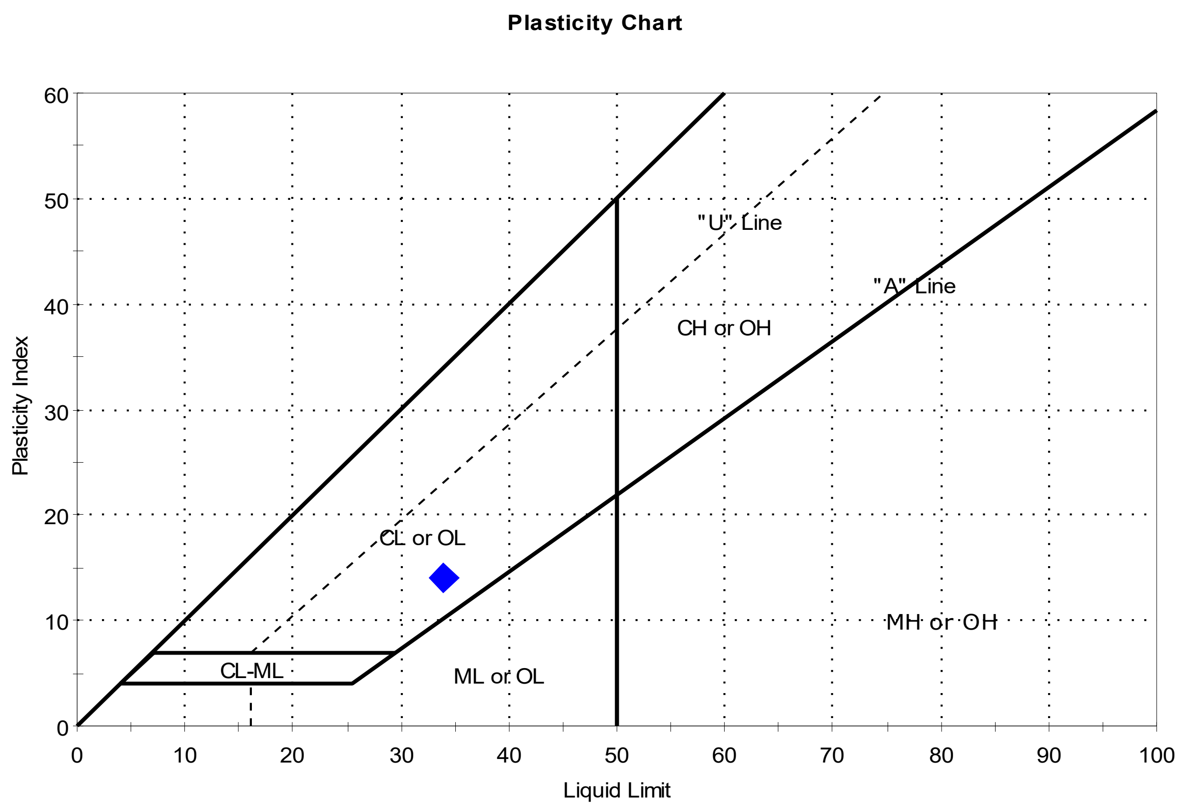
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Hardesty & Hanover
Project:	Tuttle Rd, Cumberland, ME
Location:	Cumberland, ME
Project No:	GTX-316280
Boring ID:	BB-C295-104
Sample Type:	jar
Tested By:	cam
Sample ID:	4D
Test Date:	11/10/22
Checked By:	ank
Depth :	6'-8'
Test Id:	691775
Test Comment:	---
Visual Description:	Moist, dark gray clay
Sample Comment:	---

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-4	BB-104	6'-8'	24	34	20	14	0.3	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

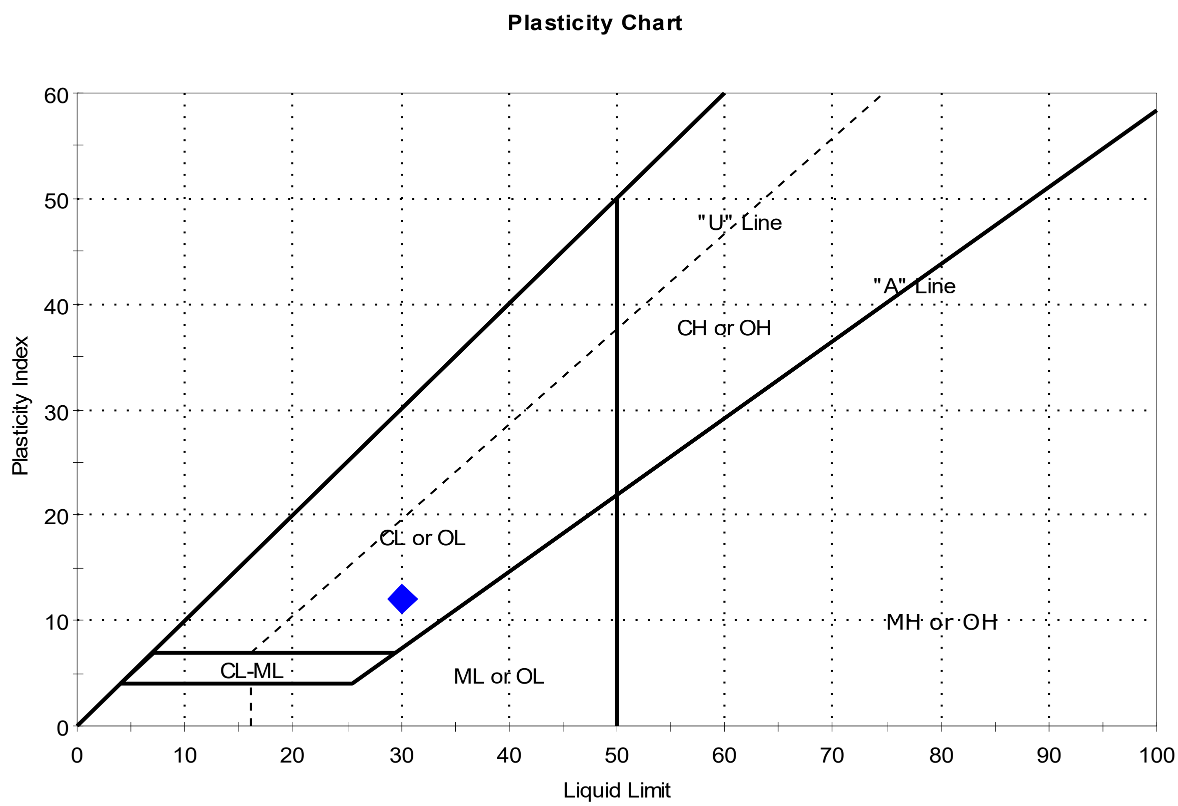
Dilatancy: SLOW

Toughness: LOW

printed 11/11/2022 9:43:11 AM

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland, ME				
Location:	Cumberland, ME			Project No:	GTX-316280
Boring ID:	BB-C295-104	Sample Type:	jar	Tested By:	cam
Sample ID:	5D	Test Date:	11/10/22	Checked By:	ank
Depth :	8'-10'	Test Id:	691776		
Test Comment:	---				
Visual Description:	Moist, gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-5	BB-104	8'-10'	29	30	18	12	0.9	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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GEOTESTING EPXRESS INCORPORATED
125 NAGOG PARK
ACTON MA 01720-3451
USA

Analysis No.	TS-A2210666
Report Date	09 November 2022
Date Sampled	31 October 2022
Date Received	07 November 2022
Where Sampled	Acton, MA USA
Sampled By	Client

This is to attest that we have examined: Soil: Project: Tuttle Road Cumberland, ME; Site Location: - — -; Job Number: GTX-316280

When examined to the applicable requirements of:

ASTM D 512-12*	“Standard Test Methods for Chloride Ion in Water” Method B
ASTM D 516-16	“Standard Test Method for Sulfate Ion in Water”

Results:

ASTM D 512 – Chloride Method B

Sample		Results		Detection Limit
		ppm (mg/kg)	%[1]	
BB-C295-102		22.	0.0022	10.
5D, 6D, 7D	8 – 17’			

NOTE: [1]Percent by weight after drying and prepared as per the Standard. *Withdrawn 2021 without Replacement

ASTM D 516 – Sulfates (Soluble)

Sample		Results		Detection Limit
		ppm (mg/kg)	%[1]	
BB-C295-102		10.	0.0010	10.
5D, 6D, 7D	8 – 17’			

NOTE: [1]Percent by weight after drying and prepared as per the Standard.

END OF ANALYSIS

USEPA Laboratory ID UT00930

Merrill Gee

Merrill Gee P.E. – Engineer in Charge

GeoTesting EXPRESS

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland, ME				
Location:	Cumberland, ME			Project No:	GTX-316280
Boring ID:	---	Sample Type:	---	Tested By:	tlm
Sample ID:	---	Test Date:	11/18/22	Checked By:	jsc
Depth :	---	Test Id:	692490		

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample Number	Depth	Bulk Density, pcf	Compressive strength, psi	Failure Type	Meets ASTM D4543	Note(s)
BB-C295-101	R1	39.18-39.56 ft	177	5824	3	Yes	---
BB-C295-103	R1	49-54	157	6647	2	No	2,*
BB-C295-104	R1	28.24-28.62 ft	162	16297	1	No	2,*

Notes: Density determined on core samples by measuring dimensions and weight and then calculating.

All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.

The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure
(See attached photographs)

1: Best effort end preparation. See Tolerance report for details.
2: The as-received core did not meet the ASTM side straightness tolerance due to irregularities in the sample as cored.
3: Specimen L/D < 2.
4: The as-received core did not meet the ASTM minimum diameter tolerance of 1.875 inches.
5: Specimen diameter is less than 10 times maximum particle size.
6: Specimen diameter is less than 6 times maximum particle size.

*Because the indicated tested specimens did not meet the ASTM D4543 standard tolerances, the results reported here may differ from those for a test specimen within tolerances.

Client:	Hardesty & Hanover	Test Date:	11/17/2022
Project Name:	Tuttle Rd, Cumberland, ME	Tested By:	jab
Project Location:	Cumberland, ME	Checked By:	smd
GTX #:	316280		
Boring ID:	BB-C295-101		
Sample ID:	R1		
Depth:	39.18'-39.56'		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average		
Specimen Length, in:	4.59	4.59	4.59		
Specimen Diameter, in:	1.98	1.99	1.99		
Specimen Mass, g:	660.54				
Bulk Density, lb/ft^3	177			**Minimum Diameter Tolerence Met?**	**YES**
Length to Diameter Ratio:	2.3			**Length to Diameter Ratio Tolerance Met?**	**YES**

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:
Is the maximum gap $\leq$ 0.02 in.? YES

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? **YES**

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00030
Diameter 2, in (rotated 90°)	-0.00060	-0.00050	-0.00040	-0.00030	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00010	0.00010

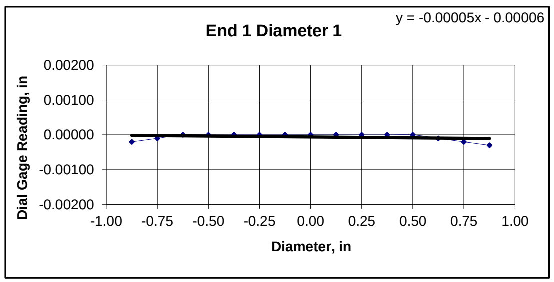
Difference between max and min readings, in:
0° = 0.00030 90° = 0.00070

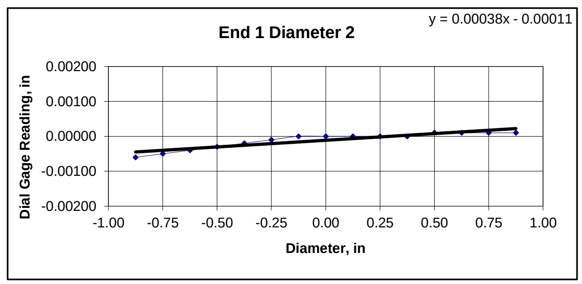
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010
Diameter 2, in (rotated 90°)	0.00050	0.00040	0.00040	0.00030	0.00020	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00030	-0.00030

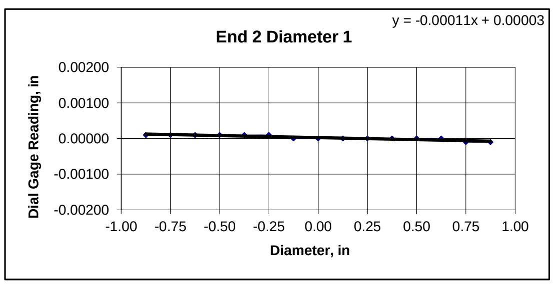
Difference between max and min readings, in:
0° = 0.0002 90° = 0.0008

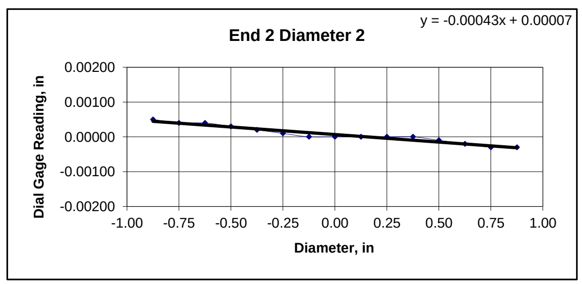
Maximum difference must be < 0.0020 in. Difference = $\pm$ 0.00040

Flatness Tolerance Met? **YES**









DIAMETER 1

End 1:	Slope of Best Fit Line	0.00005
	Angle of Best Fit Line:	0.00295
End 2:	Slope of Best Fit Line	0.00011
	Angle of Best Fit Line:	0.00655
Maximum Angular Difference:		0.00360

Parallelism Tolerance Met? **YES**
Spherically Seated

DIAMETER 2

End 1:	Slope of Best Fit Line	0.00038
	Angle of Best Fit Line:	0.02194
End 2:	Slope of Best Fit Line	0.00043
	Angle of Best Fit Line:	0.02488
Maximum Angular Difference:		0.00295

Parallelism Tolerance Met? **YES**
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00030	1.985	0.00015	0.009	YES
Diameter 2, in (rotated 90°)	0.00070	1.985	0.00035	0.020	YES
END 2					
Diameter 1, in	0.00020	1.985	0.00010	0.006	YES
Diameter 2, in (rotated 90°)	0.00080	1.985	0.00040	0.023	YES

Maximum angle of departure must be $\leq$ 0.25°

Perpendicularity Tolerance Met? **YES**

Client:	Hardesty & Hanover
Project Name:	Tuttle Rd, Cumberland, ME
Project Location:	Cumberland, ME
GTX #:	316280
Test Date:	11/18/2022
Tested By:	bp
Checked By:	smd
Boring ID:	BB-C295-101
Sample ID:	R1
Depth, ft:	39.18'-39.56'

After cutting and grinding

After break

GeoTesting EXPRESS

Client:	Hardesty & Hanover	Test Date:	11/17/2022
Project Name:	Tuttle Rd, Cumberland, ME	Tested By:	jab
Project Location:	Cumberland, ME	Checked By:	smd
GTX #:	316280		
Boring ID:	BB-C295-103		
Sample ID:	R1		
Depth:	49'-54'		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average		
Specimen Length, in:	4.47	4.47	4.47		
Specimen Diameter, in:	1.99	1.99	1.99		
Specimen Mass, g:	574.32				
Bulk Density, lb/ft^3	157			**Minimum Diameter Tolerence Met?**	**YES**
Length to Diameter Ratio:	2.2			**Length to Diameter Ratio Tolerance Met?**	**YES**

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:

Is the maximum gap $\leq$ 0.02 in.? NO

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? **NO**

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00010	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00020	-0.00020	-0.00010
Diameter 2, in (rotated 90°)	-0.00040	-0.00030	-0.00020	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00020	0.00020	0.00020

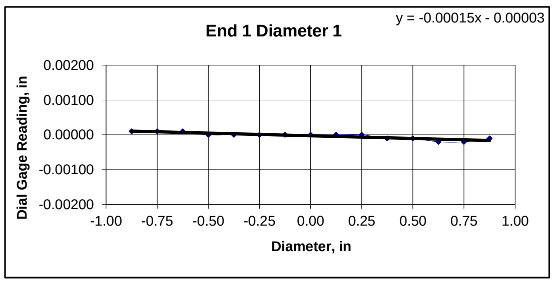
Difference between max and min readings, in:
0° = 0.00030 90° = 0.00060

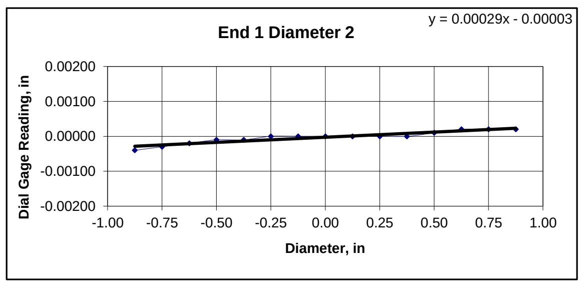
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00010	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010
Diameter 2, in (rotated 90°)	0.00010	0.00010	0.00010	0.00010	0.00010	0.00001	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00020	-0.00020	-0.00020	-0.00020

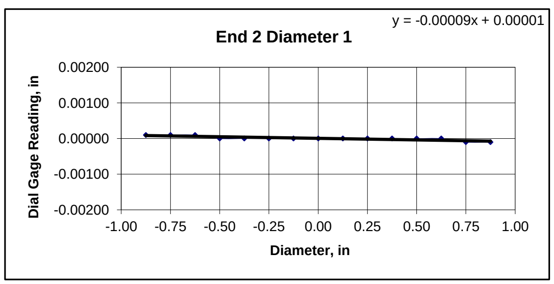
Difference between max and min readings, in:
0° = 0.0002 90° = 0.0003

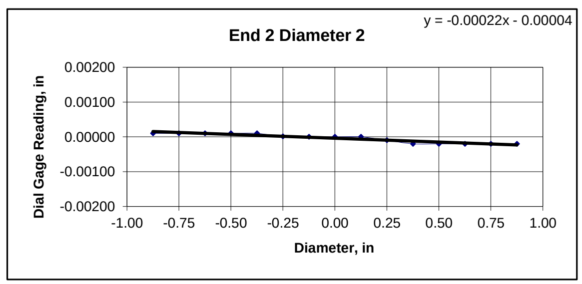
Maximum difference must be < 0.0020 in. Difference = $\pm$ 0.00030

Flatness Tolerance Met? **YES**









DIAMETER 1

End 1:
Slope of Best Fit Line 0.00015
Angle of Best Fit Line: 0.00884

End 2:
Slope of Best Fit Line 0.00009
Angle of Best Fit Line: 0.00507

Maximum Angular Difference: 0.00377

Parallelism Tolerance Met? **YES**
Spherically Seated

DIAMETER 2

End 1:
Slope of Best Fit Line 0.00029
Angle of Best Fit Line: 0.01686

End 2:
Slope of Best Fit Line 0.00022
Angle of Best Fit Line: 0.01264

Maximum Angular Difference: 0.00422

Parallelism Tolerance Met? **YES**
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00030	1.990	0.00015	0.009	YES
Diameter 2, in (rotated 90°)	0.00060	1.990	0.00030	0.017	YES
END 2					
Diameter 1, in	0.00020	1.990	0.00010	0.006	YES
Diameter 2, in (rotated 90°)	0.00030	1.990	0.00015	0.009	YES

Maximum angle of departure must be $\leq$ 0.25°

Perpendicularity Tolerance Met? **YES**

Client:	Hardesty & Hanover
Project Name:	Tuttle Rd, Cumberland, ME
Project Location:	Cumberland, ME
GTX #:	316280
Test Date:	11/18/2022
Tested By:	bp
Checked By:	smd
Boring ID:	BB-C295-103
Sample ID:	R1
Depth, ft:	49'-54'

After cutting and grinding

After break

Client:	Hardesty & Hanover	Test Date:	11/17/2022
Project Name:	Tuttle Rd, Cumberland, ME	Tested By:	jab
Project Location:	Cumberland, ME	Checked By:	smd
GTX #:	316280		
Boring ID:	BB-C295-104		
Sample ID:	R1		
Depth:	28.24'-28.62'		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.37	4.37	4.37
Specimen Diameter, in:	1.99	1.99	1.99
Specimen Mass, g:	578.4		
Bulk Density, lb/ft^3	162	**Minimum Diameter Tolerence Met?**	**YES**
Length to Diameter Ratio:	2.2	**Length to Diameter Ratio Tolerance Met?**	**YES**

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:

Is the maximum gap $\leq$ 0.02 in.? NO

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? **NO**

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00020
Diameter 2, in (rotated 90°)	-0.00020	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Difference between max and min readings, in:

0° = 0.00020 90° = 0.00020

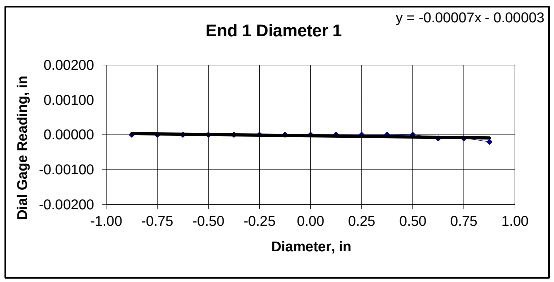
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00010	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00030
Diameter 2, in (rotated 90°)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010

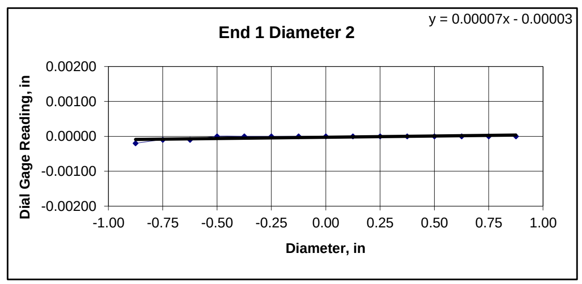
Difference between max and min readings, in:

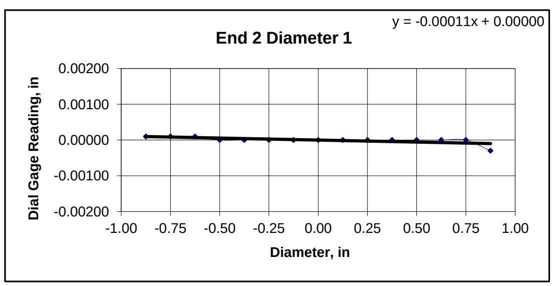
0° = 0.0004 90° = 0.0001

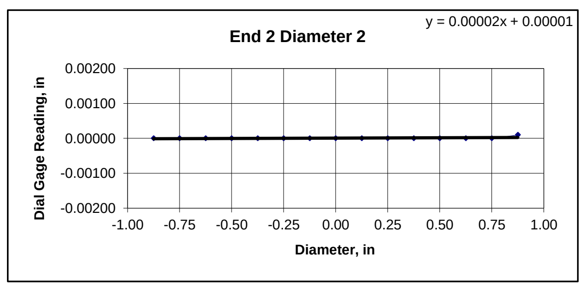
Maximum difference must be < 0.0020 in. Difference = $\pm$ 0.00020

Flatness Tolerance Met? **YES**









DIAMETER 1

End 1:	
Slope of Best Fit Line	0.00007
Angle of Best Fit Line:	0.00409
End 2:	
Slope of Best Fit Line	0.00011
Angle of Best Fit Line:	0.00638
Maximum Angular Difference:	0.00229

Parallelism Tolerance Met? **YES**
Spherically Seated

DIAMETER 2

End 1:	
Slope of Best Fit Line	0.00007
Angle of Best Fit Line:	0.00409
End 2:	
Slope of Best Fit Line	0.00002
Angle of Best Fit Line:	0.00115
Maximum Angular Difference:	0.00295

Parallelism Tolerance Met? **YES**
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00020	1.990	0.00010	0.006	YES
Diameter 2, in (rotated 90°)	0.00020	1.990	0.00010	0.006	YES
END 2					
Diameter 1, in	0.00040	1.990	0.00020	0.012	YES
Diameter 2, in (rotated 90°)	0.00010	1.990	0.00005	0.003	YES

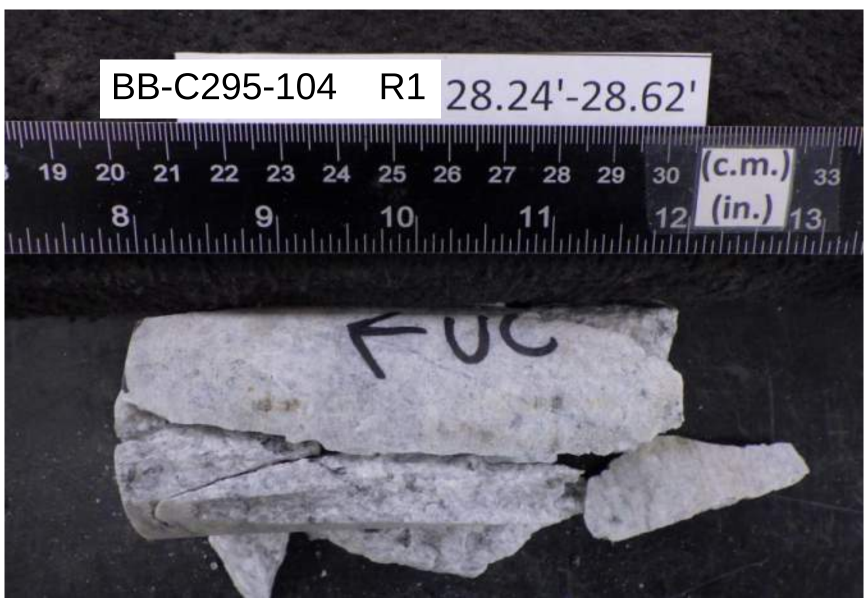
Maximum angle of departure must be $\leq$ 0.25°

Perpendicularity Tolerance Met? **YES**

GeoTesting EXPRESS

Client:	Hardesty & Hanover
Project Name:	Tuttle Rd, Cumberland, ME
Project Location:	Cumberland, ME
GTX #:	316280
Test Date:	11/18/2022
Tested By:	bp
Checked By:	smd
Boring ID:	BB-C295-104
Sample ID:	R1
Depth, ft:	28.24'-28.62'

After cutting and grinding



After break

Final Subsurface Exploration Program
Lab Test Results, 2024

H&H Designed to Amaze, Engineered to Last®

Client:	Hardesty & Hanover			
Project:	Tuttle Rd, Cumberland ME			
Location:	Cumberland, ME		Project No:	GTX-318928
Boring ID: ---		Sample Type: ---	Tested By:	ckg
Sample ID: ---		Test Date: 04/22/24	Checked By:	ank
Depth : ---		Test Id: 765698		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
BB-C295-201	4D	6-8'	Moist, dark brown sand with silt and gravel	7.7
BB-C295-203	6D	11-13'	Moist, olive brown silty sand	12.3
BB-C295-203	8D	15-17'	Moist, olive brown silty sand	13.6
BB-C295-203	15D	50-52'	Moist, gray silty sand with gravel	8.9
BB-C295-203	U1	37-39'	Moist, dark olive gray clay	25.6
BB-C295-205	6D	15-17'	Moist, olive yellow sand with silt and gravel	12.3
BB-C295-205	9D	30-31.5'	Moist, grayish brown clay	38.4
BB-C295-205	10D	35-37'	Moist, olive gray sandy silt	13.0

Notes: Temperature of Drying : 110º Celsius

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	---	Sample Type:	---	Tested By:	ajl
Sample ID:	---	Test Date:	05/06/24	Checked By:	ank
Depth :	---	Test Id:	768008		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
BB-C295-202	5D	10.5-12.5'	Moist, gray silty clay	26.9
BB-C295-202	7D	20-22'	Moist, gray silty sand	9.0
BB-C295-204	7D	15-17'	Moist, grayish brown silty sand with gravel	9.5
BB-C295-204	11D	35-37'	Moist, olive gray silt with sand	16.6
BB-C295-206	5D	10-11.75'	Moist, grayish brown silt with sand	35.9
BB-C295-206	7D	20-22'	Moist, brownish gray silty sand with gravel	8.9

Notes: Temperature of Drying : 110° Celsius

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	04/20/24	Checked By:	ank
Depth :	---	Test Id:	765703		

Specific Gravity of Soils by ASTM D854

Boring ID	Sample ID	Depth	Visual Description	Specific Gravity	Comment
BB-C295-201	7D	15-17'	Moist, light brownish gray clay	2.72	
BB-C295-201	9D	25-27'	Moist, gray clay	2.73	
BB-C295-203	11D	30-32'	Moist, gray clay with sand	2.73	
BB-C295-205	7D	20-22'	Moist, light gray clay	2.78	
BB-C295-205	9D	30-31.5'	Moist, grayish brown clay	2.80	

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854
Moisture Content determined by ASTM D2216.

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	---	Sample Type:	---	Tested By:	ajl
Sample ID:	---	Test Date:	05/04/24	Checked By:	ank
Depth :	---	Test Id:	768011		

Specific Gravity of Soils by ASTM D854

Boring ID	Sample ID	Depth	Visual Description	Specific Gravity	Comment
BB-C295-202	2D	2-4'	Moist, grayish brown silt with clay	2.75	
BB-C295-202	3D	6.5-8.5'	Moist, light gray silty clay	2.74	
BB-C295-202	4D	8.5-10.5'	Moist, brownish gray clay	2.85	
BB-C295-204	3D	4-6'	Moist, dark yellowish brown clay	2.75	
BB-C295-206	3D	4-6'	Moist, olive gray clay	2.83	
BB-C295-207	5D	8-10'	Moist, gray clay	2.77	
BB-C295-207	6D	15-17'	Moist, gray clay	2.88	

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854
Moisture Content determined by ASTM D2216.

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-204	Sample Type:	Jar	Tested By:	ajl
Sample ID:	4D, 5D, 6D	Test Date:	05/03/24	Checked By:	ank
Depth :	6-12'	Test Id:	767986		

Test Comment: ---
Visual Description: Moist, grayish brown clay
Sample Comment: ---

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
BB-C295-204	4D, 5D, 6D	6-12'	Moist, grayish brown clay	7.7	6.4

Notes: Sample Preparation: screened through #10 sieve
Method A, pH meter used

PO Box 572455 / Salt Lake City UT 84157-2455 / USA
TEL +1 801 262 2448 · FAX +1 801 262 9870 · www.TEi-TS.com

GEOTESTING EXPRESS INCORPORATED
125 NAGOG PARK
ACTON MA 01720-3451
USA

Analysis No.	TS-A2411873
Report Date	08 May 2024
Date Sampled	02 May 2024
Date Received	06 May 2024
Where Sampled	Acton, MA USA
Sampled By	Client

This is to attest that we have examined: Soil: Project: Tuttle Road, Cumberland, ME; Site Location: Cumberland, ME; Job Number: GTX-318928

When examined to the applicable requirements of:

ASTM D 512-12*	"Standard Test Methods for Chloride Ion in Water" Method B
ASTM D 516-16	"Standard Test Method for Sulfate Ion in Water"

Results:

ASTM D 512 - Chloride Method B

Sample		Results		Minimum Detection Limit
		ppm (mg/kg)	%[1]	
BB-C295-204		131.	0.0131	10.
4D, 5D, 6D	6 – 12'			

NOTE: [1]Percent by weight after drying and prepared as per the Standard. *Withdrawn 2021 without Replacement

ASTM D 516 – Sulfates (Soluble)

Sample		Results		Minimum Detection Limit
		ppm (mg/kg)	%[1]	
BB-C295-204		10.	0.0010	10.
4D, 5D, 6D	6 – 12'			

NOTE: [1]Percent by weight after drying and prepared as per the Standard.

END OF ANALYSIS

USEPA Laboratory ID UT00930

Merrill Gee P.E. – Engineer in Charge

Client:	Hardesty & Hanover
Project:	Tuttle Rd, Cumberland, ME
Location:	Cumberland, ME
GTX#:	318928
Test Date:	05/07/24
Due Date:	05/15/24
Tested By:	nmk
Checked By:	ank

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, $(\text{ohm-cm})^{-1}$
BB-C295-204	4D, 5D, 6D	6-12	Moist, grayish brown clay	1,176	8.50E-04

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box

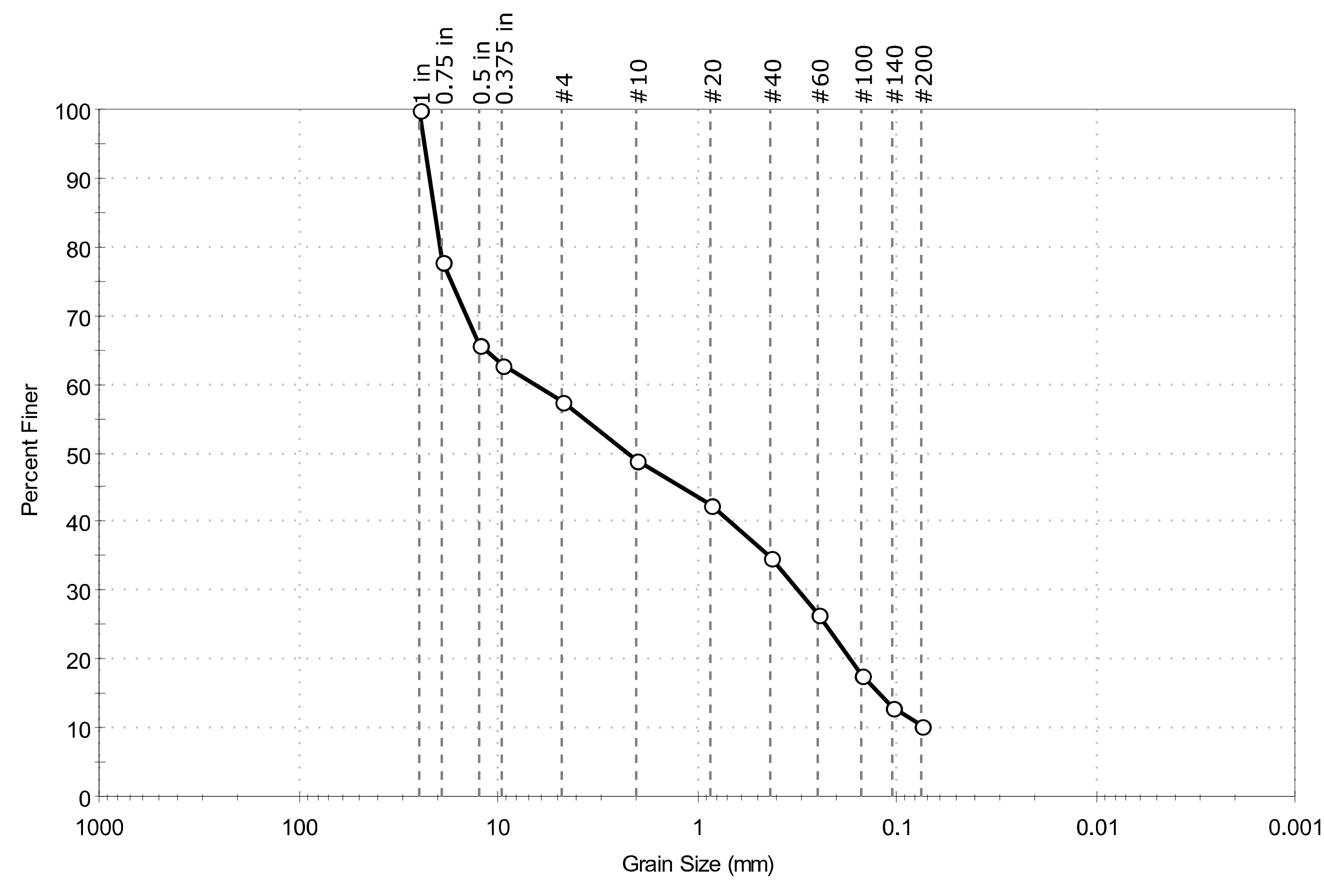
Water added to sample to create a thick slurry prior to testing (saturated condition).

Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)

Test conducted in standard laboratory atmosphere: 68-73 F

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland ME		
Location:	Cumberland, ME	Project No:	GTX-318928
Boring ID: BB-C295-201	Sample Type: Jar	Tested By:	ckg
Sample ID: 4D	Test Date: 04/27/24	Checked By:	ank
Depth : 6-8'	Test Id: 765680		
Test Comment:	---		
Visual Description:	Moist, dark brown sand with silt and gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	42.5	47.3	10.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	78		
0.5 in	12.50	66		
0.375 in	9.50	63		
#4	4.75	57		
#10	2.00	49		
#20	0.85	42		
#40	0.42	35		
#60	0.25	26		
#100	0.15	18		
#140	0.11	13		
#200	0.075	10		

Coefficients

D_{85} =20.7458 mm　　D_{30} =0.3133 mm

D_{60} =6.5657 mm　　D_{15} =0.1222 mm

D_{50} =2.2211 mm　　D_{10} =N/A

C_u =N/A　　C_c =N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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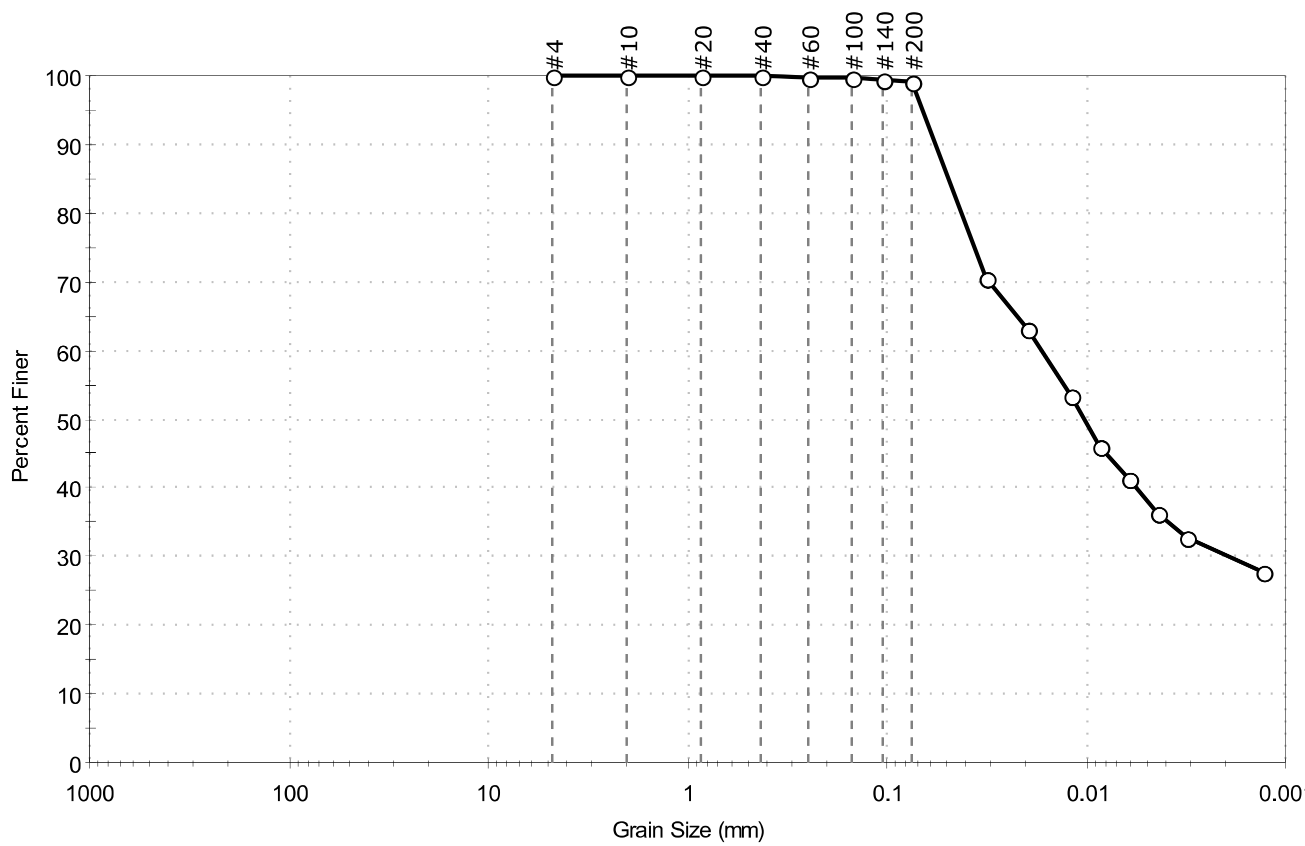
Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland ME		
Location:	Cumberland, ME	Project No:	GTX-318928
Boring ID: BB-C295-201	Sample Type: Jar	Tested By:	ckg
Sample ID: 7D	Test Date: 04/27/24	Checked By:	ank
Depth : 15-17'	Test Id: 765686		
Test Comment:	---		
Visual Description:	Moist, light brownish gray clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
–	0.0	0.9	99.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	99		
#200	0.075	99		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0319	70		
---	0.0197	63		
---	0.0119	53		
---	0.0086	46		
---	0.0061	41		
---	0.0044	36		
---	0.0031	33		
---	0.0013	28		

Coefficients

D_{85} =0.0493 mm | D_{30} =0.0019 mm
D_{60} =0.0168 mm | D_{15} =N/A
D_{50} =0.0103 mm | D_{10} =N/A
C_u =N/A | C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-7-6 (26))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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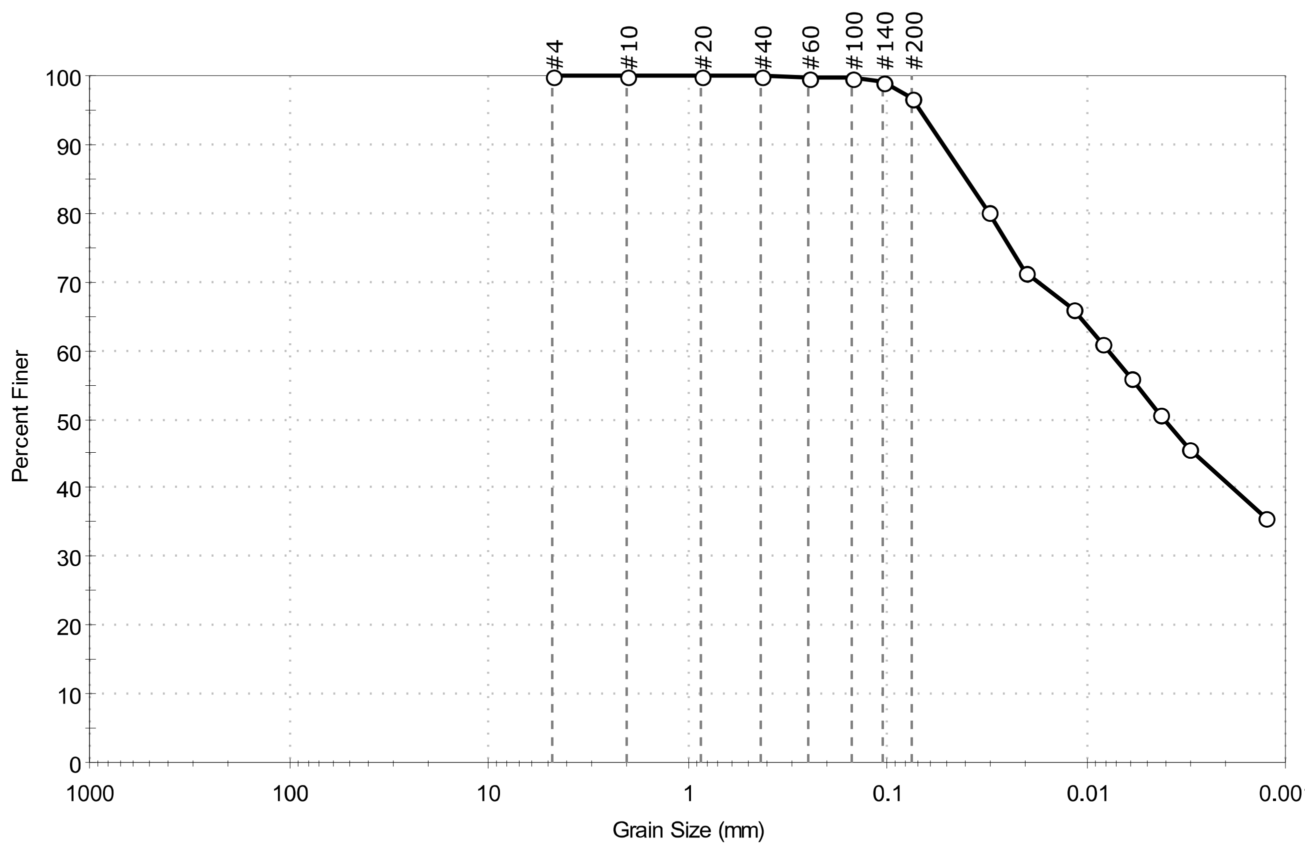
Client:	Hardesty & Hanover
Project:	Tuttle Rd, Cumberland ME
Location:	Cumberland, ME
Project No:	GTX-318928
Boring ID:	BB-C295-201
Sample Type:	Jar
Tested By:	ckg
Sample ID:	9D
Test Date:	04/27/24
Checked By:	ank
Depth :	25-27'
Test Id:	765687
Test Comment:	---
Visual Description:	Moist, gray clay
Sample Comment:	---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
–	0.0	3.3	96.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	99		
#200	0.075	97		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0309	80		
---	0.0201	71		
---	0.0117	66		
---	0.0083	61		
---	0.0060	56		
---	0.0043	51		
---	0.0031	46		
---	0.0013	36		

Coefficients

D_{85} =0.0399 mm D_{30} =N/A
D_{60} =0.0078 mm D_{15} =N/A
D_{50} =0.0040 mm D_{10} =N/A
C_u =N/A C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (16))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

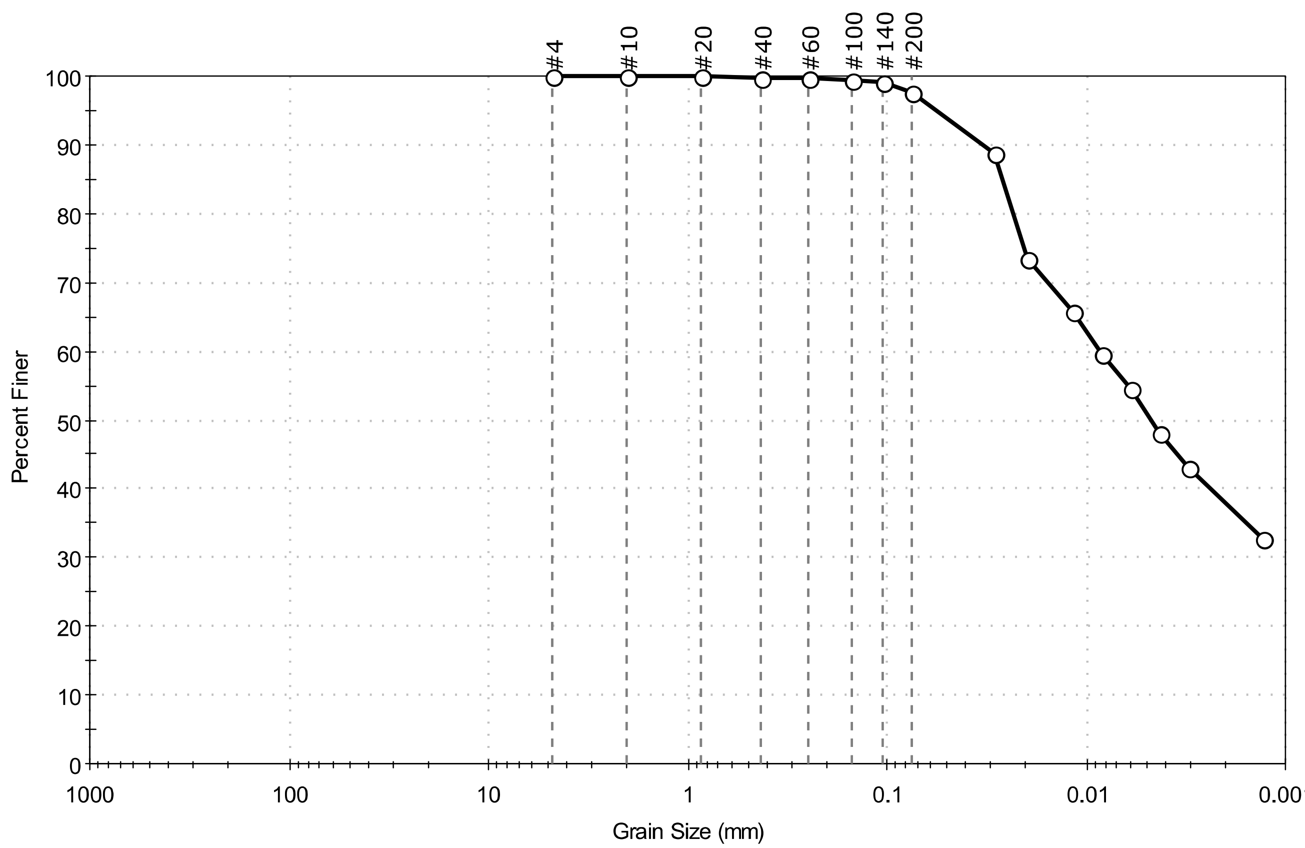
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	Hardesty & Hanover
Project:	Tuttle Rd, Cumberland ME
Location:	Cumberland, ME
Project No:	GTX-318928
Boring ID:	BB-C295-202
Sample Type:	Jar
Tested By:	ajl
Sample ID:	4D
Test Date:	05/07/24
Checked By:	ank
Depth :	8.5-10.5'
Test Id:	767977
Test Comment:	---
Visual Description:	Moist, brownish gray clay
Sample Comment:	---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
–	0.0	2.4	97.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	99		
#140	0.11	99		
#200	0.075	98		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0289	89		
---	0.0199	74		
---	0.0117	66		
---	0.0084	60		
---	0.0060	54		
---	0.0043	48		
---	0.0031	43		
---	0.0013	33		

Coefficients

D_{85} =0.0264 mm D_{30} =N/A

D_{60} =0.0086 mm D_{15} =N/A

D_{50} =0.0047 mm D_{10} =N/A

C_u =N/A C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (14))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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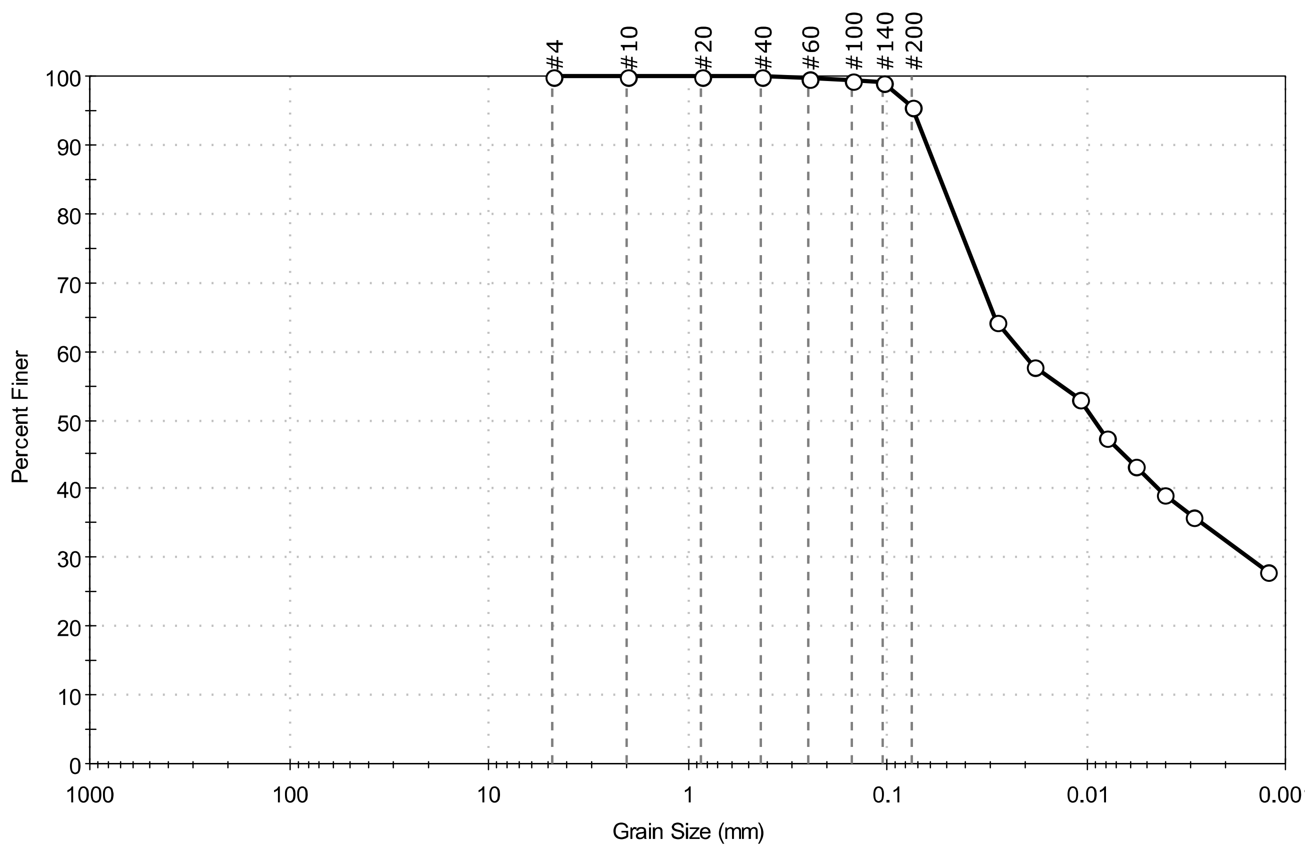
Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-202	Sample Type:	Jar	Tested By:	ajl
Sample ID:	5D	Test Date:	05/07/24	Checked By:	ank
Depth :	10.5-12.5'	Test Id:	767978		
Test Comment:	---				
Visual Description:	Moist, gray silty clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
–	0.0	4.4	95.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	99		
#200	0.075	96		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0285	64		
---	0.0183	58		
---	0.0110	53		
---	0.0080	47		
---	0.0057	43		
---	0.0041	39		
---	0.0029	36		
---	0.0012	28		

Coefficients

D_{85} =0.0540 mm
D_{30} =0.0015 mm
D_{60} =0.0210 mm
D_{15} =N/A
D_{50} =0.0092 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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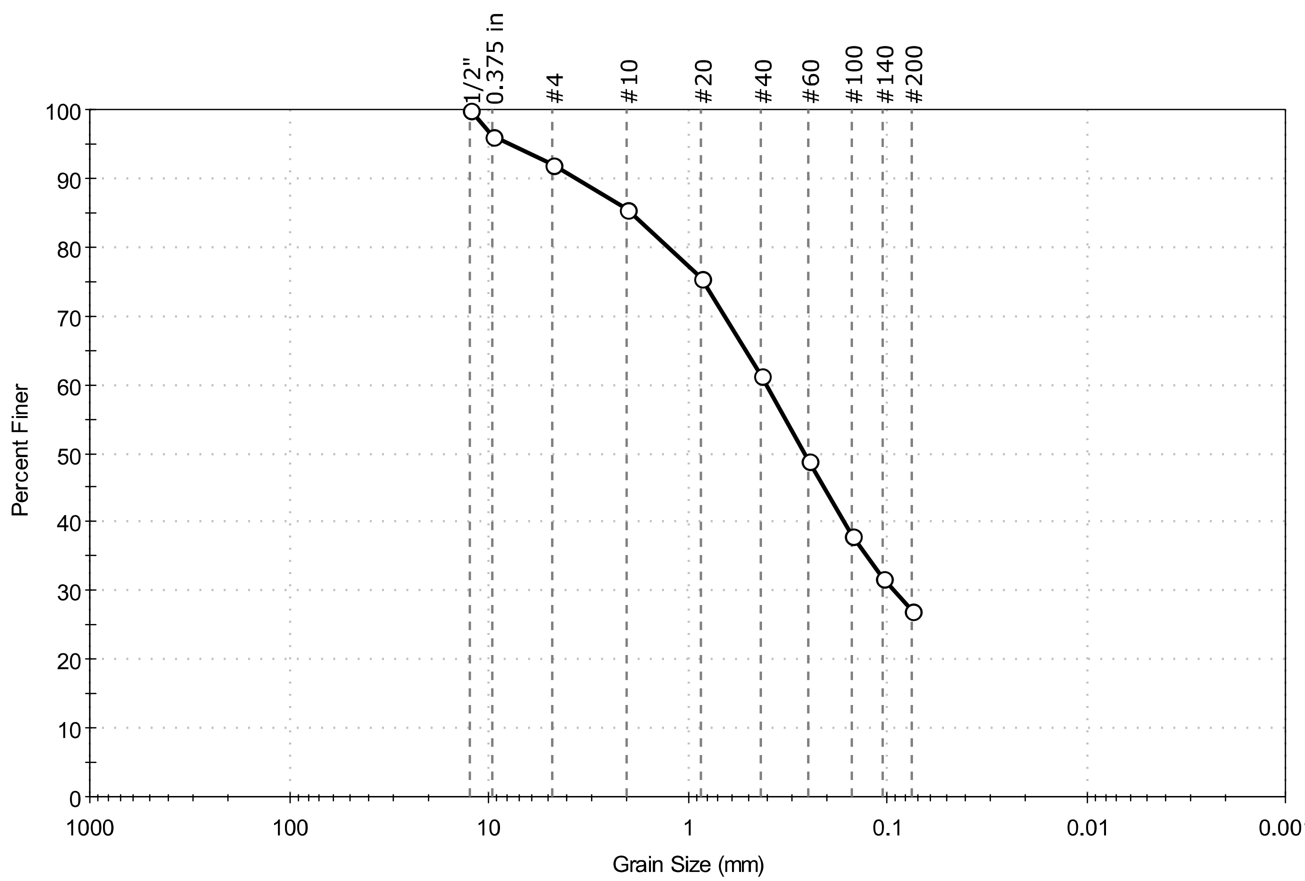
Client:	Hardesty & Hanover
Project:	Tuttle Rd, Cumberland ME
Location:	Cumberland, ME
Project No:	GTX-318928
Boring ID:	BB-C295-202
Sample Type:	Jar
Tested By:	ajl
Sample ID:	7D
Test Date:	05/07/24
Checked By:	ank
Depth :	20-22'
Test Id:	767981
Test Comment:	---
Visual Description:	Moist, gray silty sand
Sample Comment:	---

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	8.0	64.9	27.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1/2"	12.50	100		
0.375 in	9.50	96		
#4	4.75	92		
#10	2.00	86		
#20	0.85	75		
#40	0.42	61		
#60	0.25	49		
#100	0.15	38		
#140	0.11	32		
#200	0.075	27		

Coefficients

D_{85} =1.8896 mm
D_{30} =0.0928 mm
D_{60} =0.4002 mm
D_{15} =N/A
D_{50} =0.2600 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

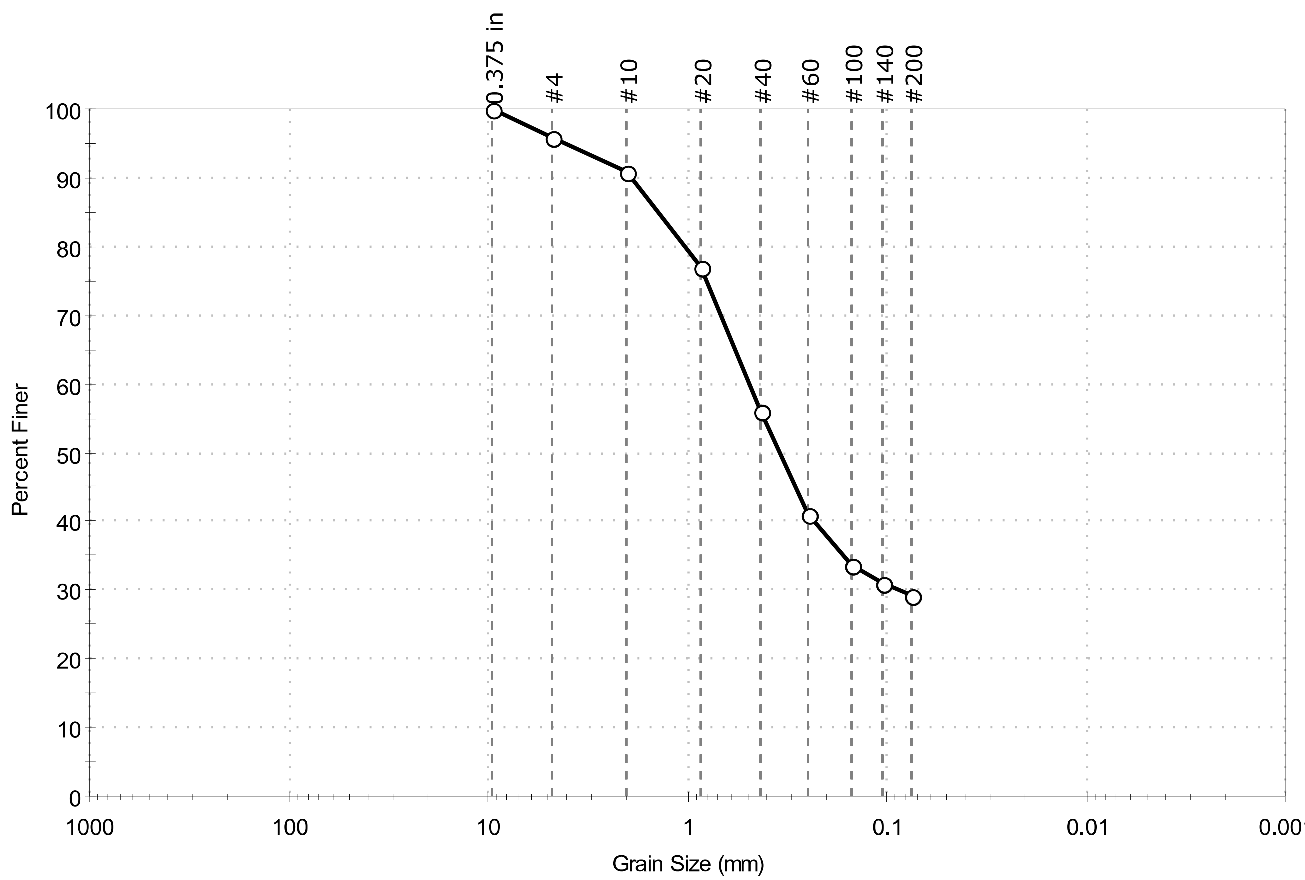
Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

printed 5/15/2024 9:19:35 AM

Client:	Hardesty & Hanover
Project:	Tuttle Rd, Cumberland ME
Location:	Cumberland, ME
Project No:	GTX-318928
Boring ID:	BB-C295-203
Sample Type:	Jar
Tested By:	ckg
Sample ID:	6D
Test Date:	04/27/24
Checked By:	ank
Depth :	11-13'
Test Id:	765681
Test Comment:	---
Visual Description:	Moist, olive brown silty sand
Sample Comment:	---

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	4.0	66.8	29.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	96		
#10	2.00	91		
#20	0.85	77		
#40	0.42	56		
#60	0.25	41		
#100	0.15	34		
#140	0.11	31		
#200	0.075	29		

Coefficients

D_{85} =1.3855 mm
D_{30} =0.0878 mm
D_{60} =0.4859 mm
D_{15} =N/A
D_{50} =0.3450 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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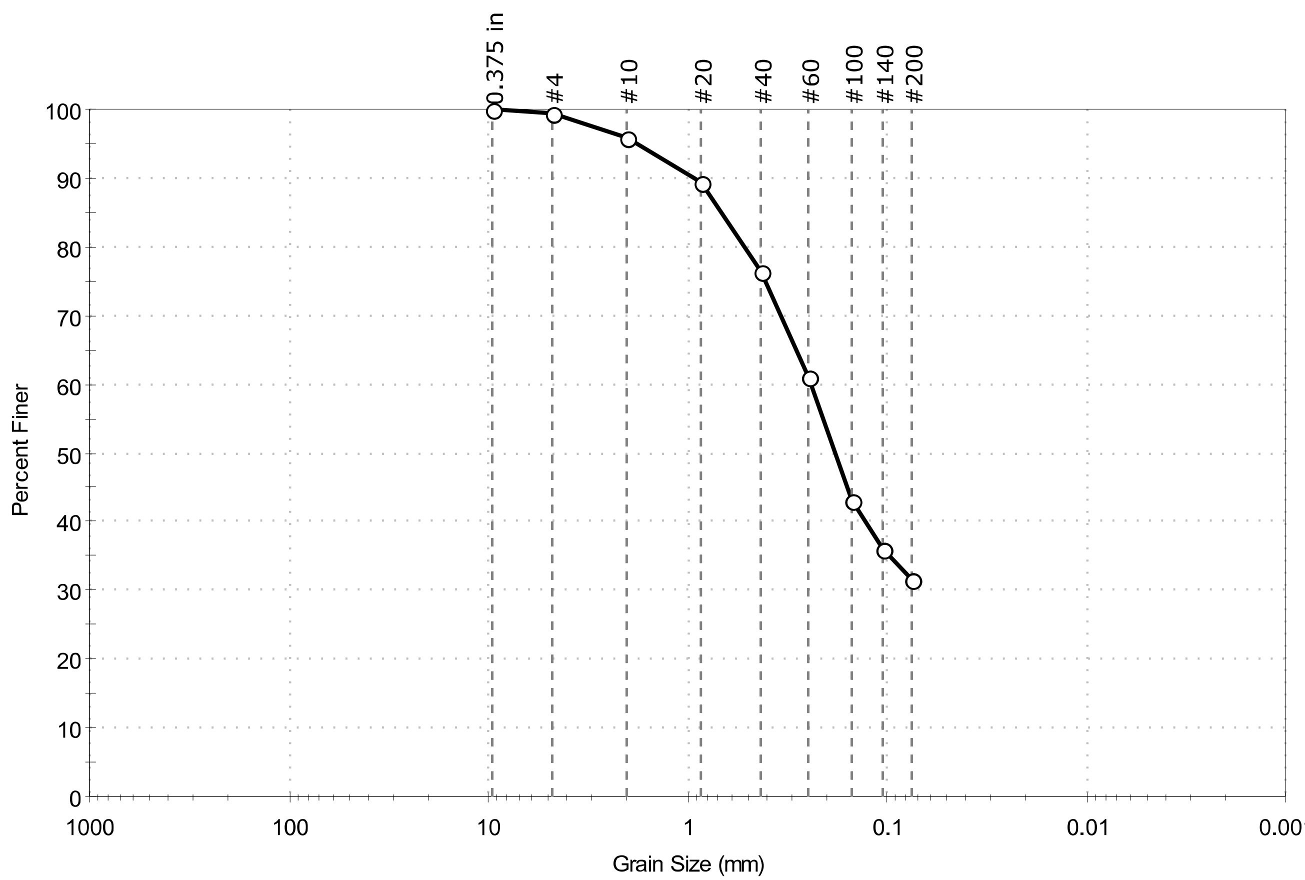
Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland ME		
Location:	Cumberland, ME	Project No:	GTX-318928
Boring ID: BB-C295-203	Sample Type: Jar	Tested By:	ckg
Sample ID: 8D	Test Date: 04/27/24	Checked By:	ank
Depth : 15-17'	Test Id: 765682		
Test Comment:	---		
Visual Description:	Moist, olive brown silty sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.7	67.7	31.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	96		
#20	0.85	89		
#40	0.42	77		
#60	0.25	61		
#100	0.15	43		
#140	0.11	36		
#200	0.075	32		

Coefficients

D_{85} =0.6715 mm — D_{30} =N/A

D_{60} =0.2432 mm — D_{15} =N/A

D_{50} =0.1833 mm — D_{10} =N/A

C_u =N/A — C_c =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

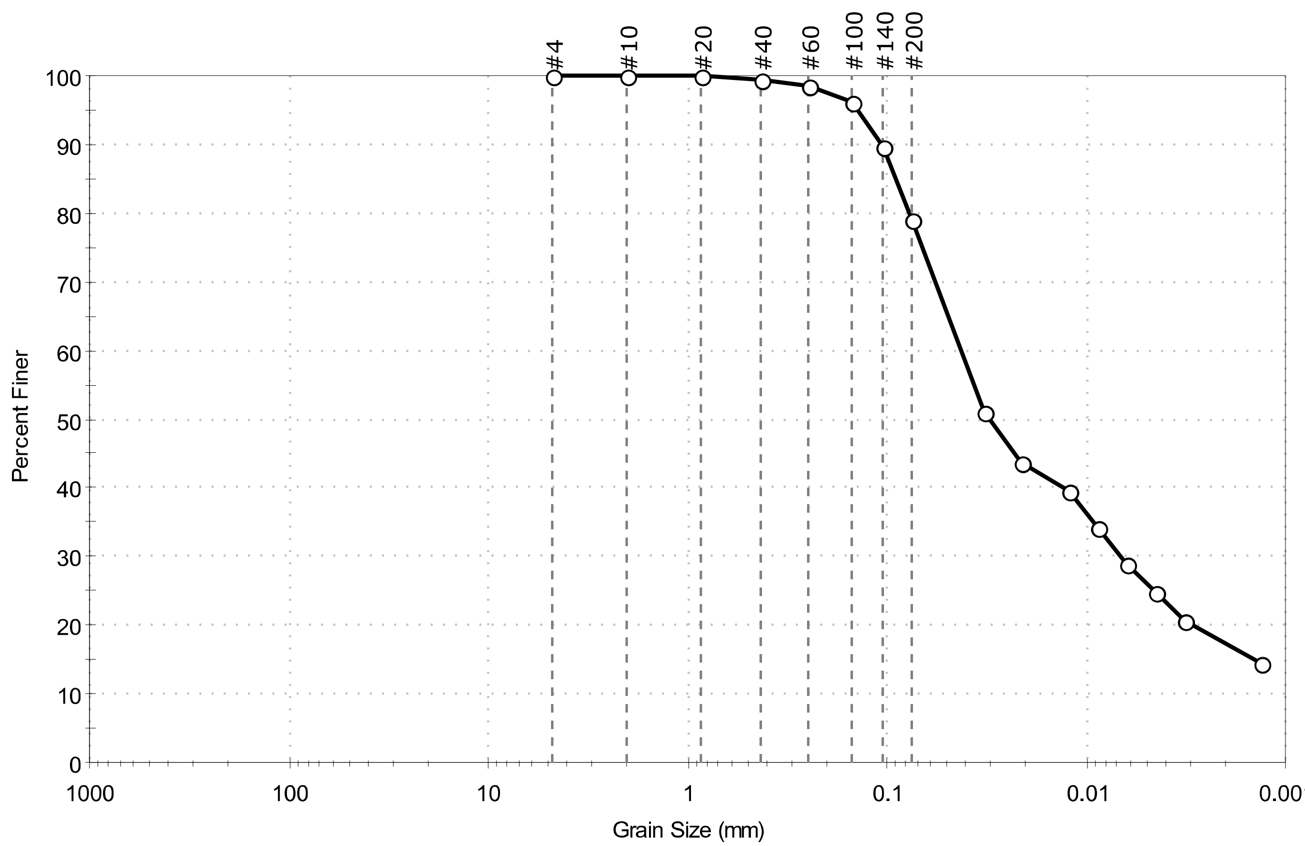
Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

printed 4/30/2024 10:54:49 AM

Client:	Hardesty & Hanover
Project:	Tuttle Rd, Cumberland ME
Location:	Cumberland, ME
Project No:	GTX-318928
Boring ID:	BB-C295-203
Sample Type:	Jar
Tested By:	ckg
Sample ID:	11D
Test Date:	04/26/24
Checked By:	ank
Depth :	30-32'
Test Id:	765688
Test Comment:	---
Visual Description:	Moist, gray clay with sand
Sample Comment:	---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	21.1	78.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	98		
#100	0.15	96		
#140	0.11	90		
#200	0.075	79		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0327	51		
---	0.0211	44		
---	0.0122	39		
---	0.0087	34		
---	0.0063	29		
---	0.0045	25		
---	0.0032	21		
---	0.0013	14		

Coefficients

D_{85} =0.0914 mm
D_{30} =0.0067 mm
D_{60} =0.0428 mm
D_{15} =0.0014 mm
D_{50} =0.0310 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY with Sand (CL)

AASHTO Clayey Soils (A-6 (7))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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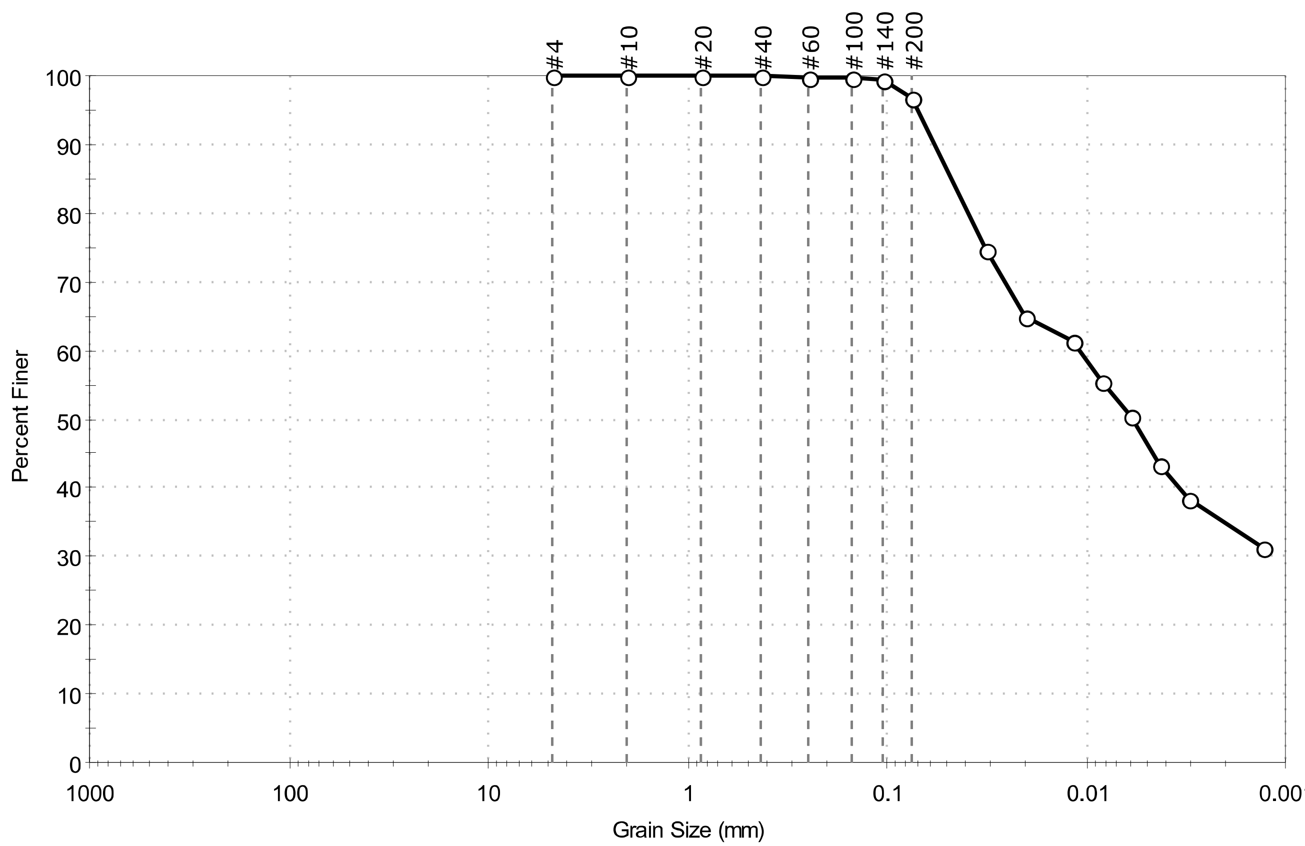
Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland ME		
Location:	Cumberland, ME	Project No:	GTX-318928
Boring ID: BB-C295-203	Sample Type: Jar	Tested By:	ckg
Sample ID: 13D	Test Date: 04/27/24	Checked By:	ank
Depth : 40-42'	Test Id: 765689		
Test Comment:	---		
Visual Description:	Moist, gray clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
–	0.0	3.3	96.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	99		
#200	0.075	97		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0318	75		
---	0.0202	65		
---	0.0117	61		
---	0.0084	55		
---	0.0060	51		
---	0.0043	43		
---	0.0031	38		
---	0.0013	31		

Coefficients

D_{85} =0.0476 mm　D_{30} =N/A
D_{60} =0.0108 mm　D_{15} =N/A
D_{50} =0.0059 mm　D_{10} =N/A
C_u =N/A　C_c =N/A

Classification

ASTM　Lean CLAY (CL)

AASHTO　Clayey Soils (A-6 (15))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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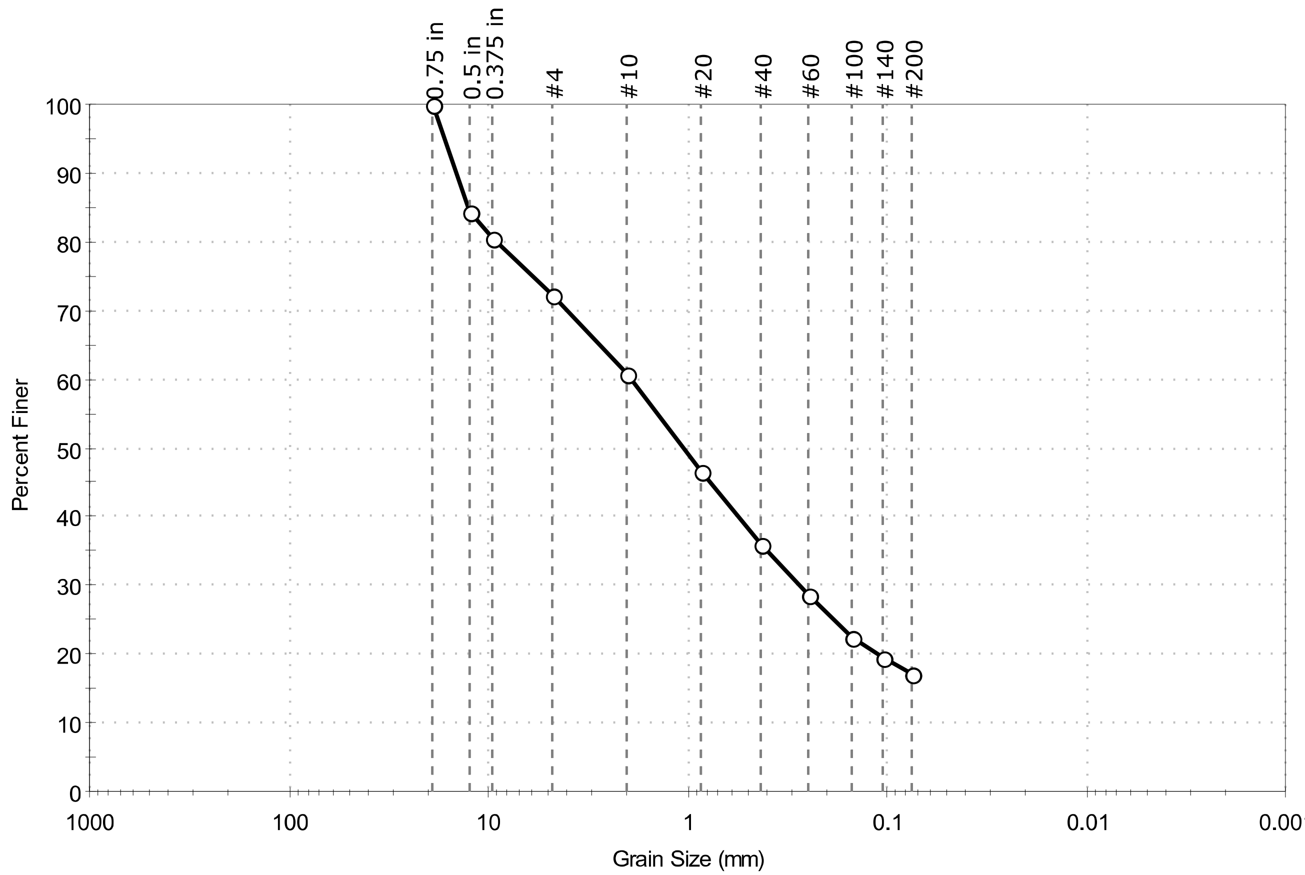
Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland ME		
Location:	Cumberland, ME	Project No:	GTX-318928
Boring ID: BB-C295-203	Sample Type: Jar	Tested By:	ckg
Sample ID: 15D	Test Date: 04/27/24	Checked By:	ank
Depth : 50-52'	Test Id: 765683		
Test Comment:	---		
Visual Description:	Moist, gray silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
–	27.9	55.0	17.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	84		
0.375 in	9.50	81		
#4	4.75	72		
#10	2.00	61		
#20	0.85	46		
#40	0.42	36		
#60	0.25	29		
#100	0.15	22		
#140	0.11	19		
#200	0.075	17		

Coefficients

D_{85} =12.7122 mm
D_{30} =0.2743 mm
D_{60} =1.8961 mm
D_{15} =N/A
D_{50} =1.0476 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

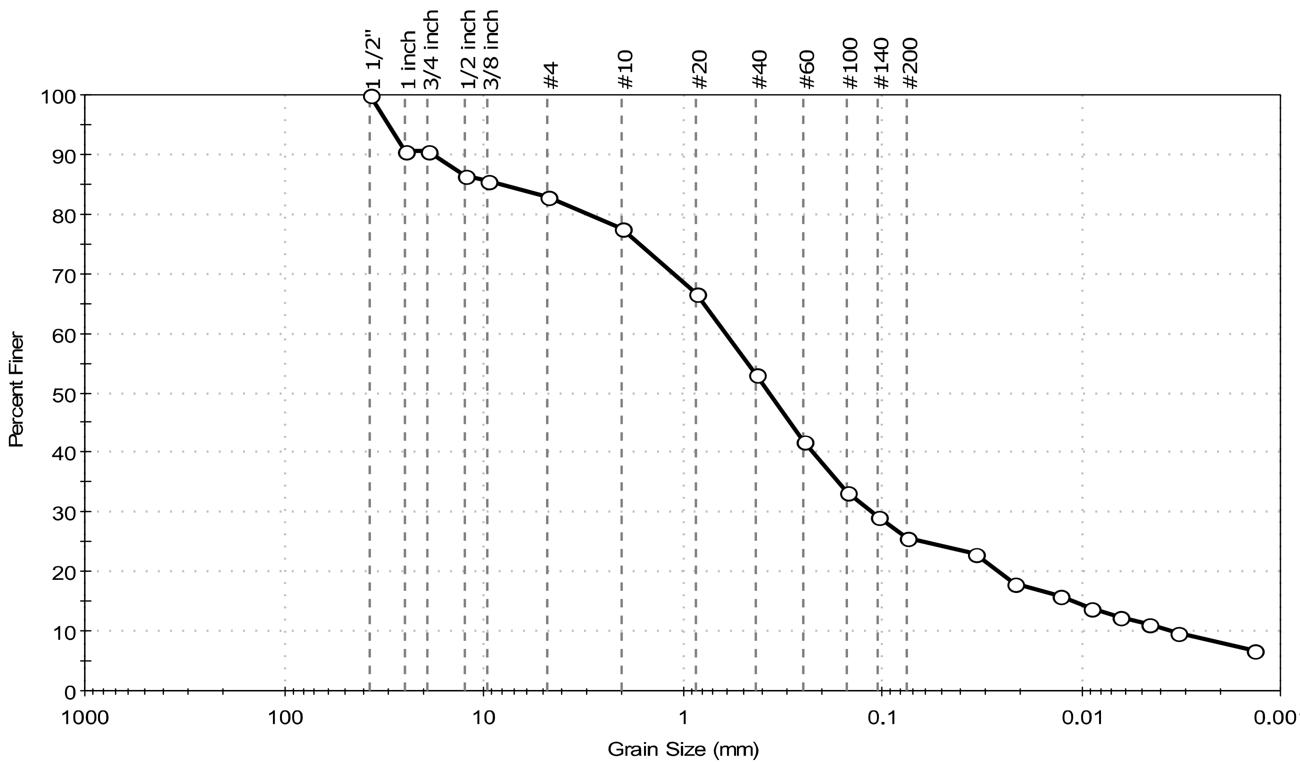
Sand/Gravel Hardness : HARD

printed 4/30/2024 10:54:49 AM

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-204	Sample Type:	Jar	Tested By:	ajl
Sample ID:	7D	Test Date:	05/07/24	Checked By:	ank
Depth :	15-17'	Test Id:	767979		

Test Comment: ---
Visual Description: Moist, grayish brown silty sand with gravel
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	17.3	57.2	25.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2"	37.50	100		
1 inch	25.00	91		
3/4 inch	19.00	91		
1/2 inch	12.50	86		
3/8 inch	9.50	86		
#4	4.75	83		
#10	2.00	78		
#20	0.85	67		
#40	0.42	53		
#60	0.25	42		
#100	0.15	33		
#140	0.11	29		
#200	0.075	26		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0345	23		
---	0.0215	18		
---	0.0128	16		
---	0.0091	14		
---	0.0065	12		
---	0.0046	11		
---	0.0033	10		
---	0.0014	7		

Coefficients

D_{85} =8.3353 mm	D_{30} =0.1137 mm
D_{60} =0.6058 mm	D_{15} =0.0109 mm
D_{50} =0.3663 mm	D_{10} =0.0035 mm
C_u =173.086	C_c =6.097

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

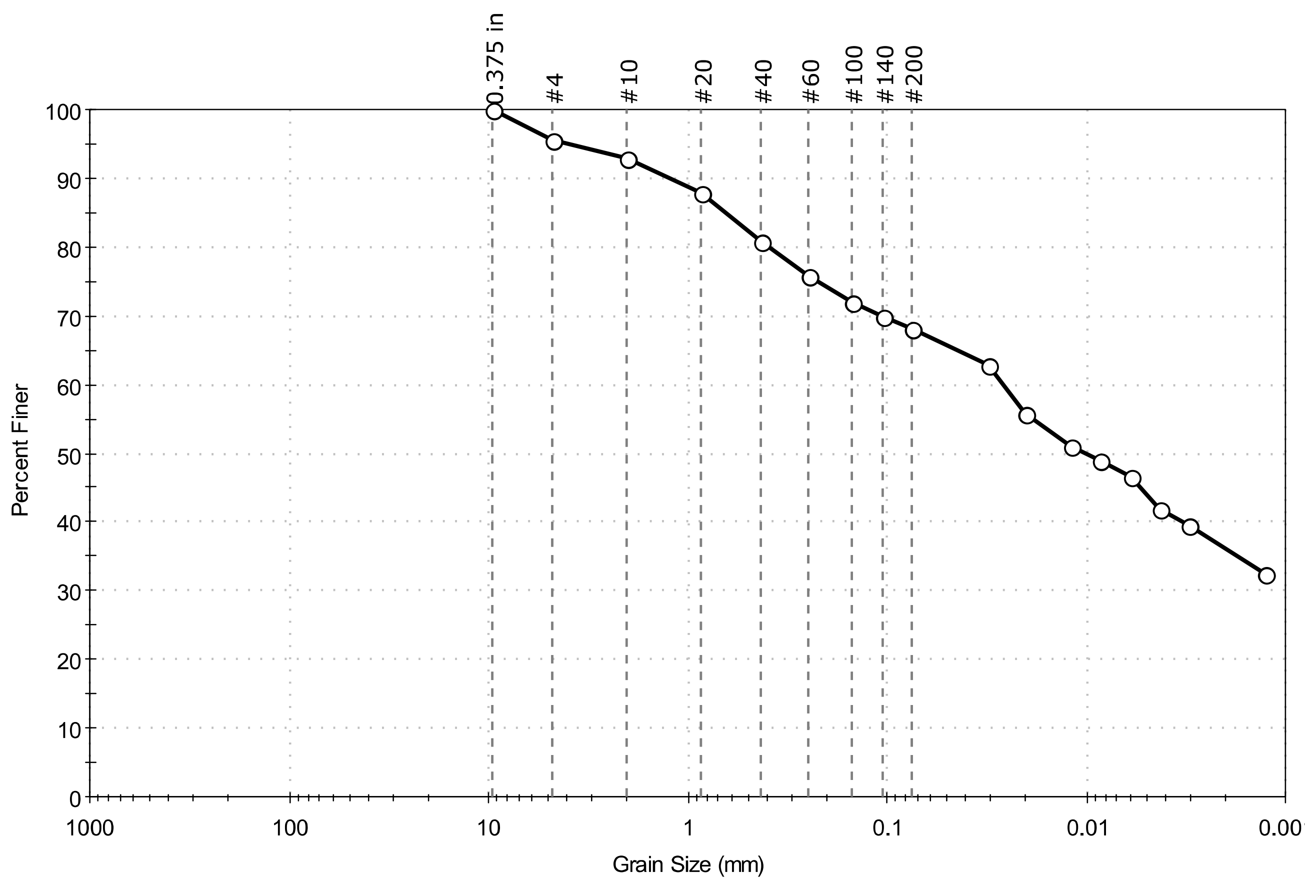
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

GeoTesting EXPRESS
A SERCEL COMPANY

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland ME		
Location:	Cumberland, ME	Project No:	GTX-318928
Boring ID: BB-C295-204	Sample Type: Jar	Tested By:	ajl
Sample ID: 11D	Test Date: 05/07/24	Checked By:	ank
Depth : 35-37'	Test Id: 767980		
Test Comment:	---		
Visual Description:	Moist, olive gray silt with sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	4.6	27.3	68.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	95		
#10	2.00	93		
#20	0.85	88		
#40	0.42	81		
#60	0.25	76		
#100	0.15	72		
#140	0.11	70		
#200	0.075	68		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0308	63		
---	0.0203	56		
---	0.0119	51		
---	0.0085	49		
---	0.0061	47		
---	0.0043	42		
---	0.0031	40		
---	0.0013	33		

Coefficients

D_{85} =0.6388 mm D_{30} =N/A
D_{60} =0.0260 mm D_{15} =N/A
D_{50} =0.0100 mm D_{10} =N/A
C_u =N/A C_c =N/A

Classification

ASTM N/A

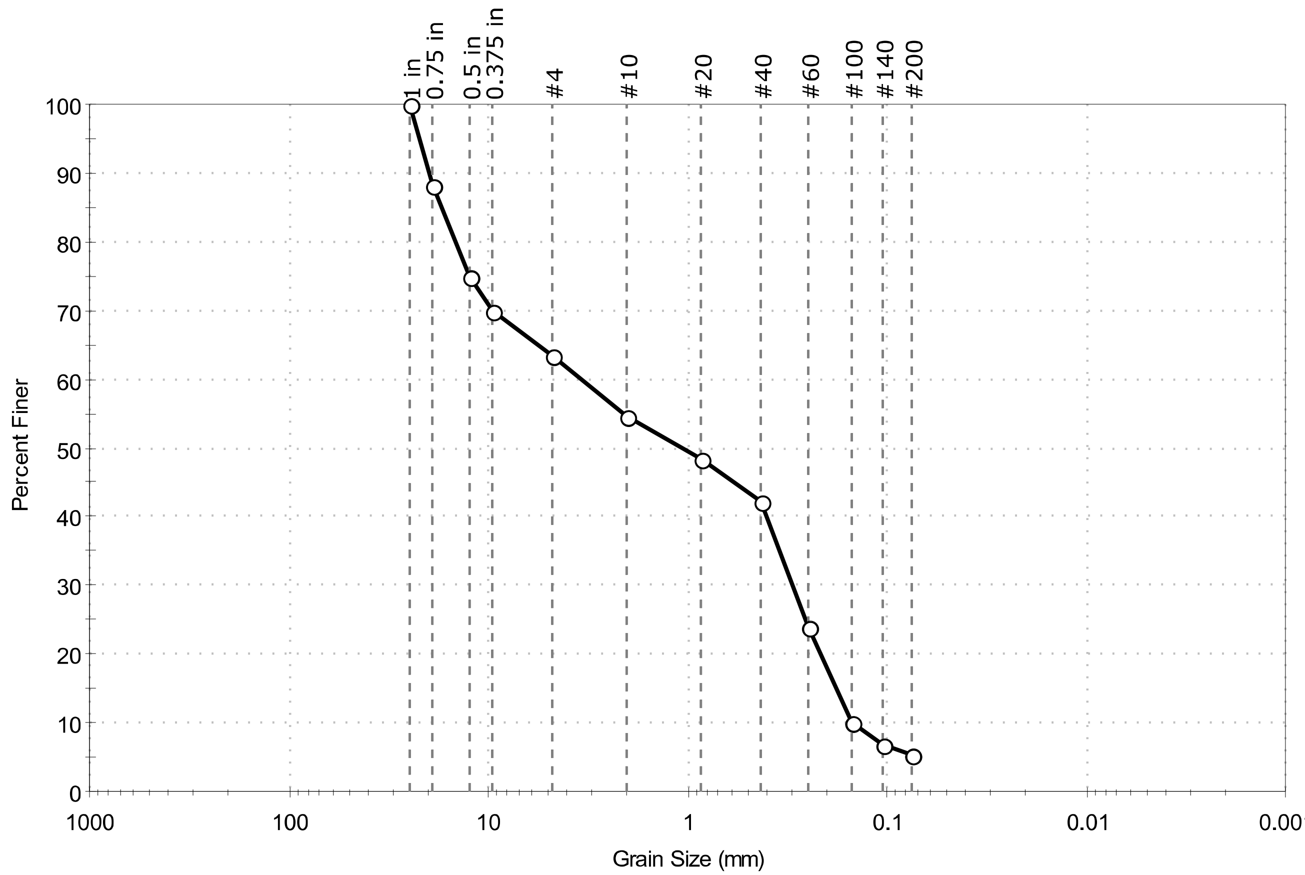
AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR
Sand/Gravel Hardness : HARD
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-205	Sample Type:	Jar	Tested By:	ckg
Sample ID:	6D	Test Date:	04/27/24	Checked By:	ank
Depth :	15-17'	Test Id:	765684		
Test Comment:	---				
Visual Description:	Moist, olive yellow sand with silt and gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	36.5	58.1	5.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	88		
0.5 in	12.50	75		
0.375 in	9.50	70		
#4	4.75	63		
#10	2.00	55		
#20	0.85	48		
#40	0.42	42		
#60	0.25	24		
#100	0.15	10		
#140	0.11	7		
#200	0.075	5.4		

Coefficients

D_{85} =17.1839 mm D_{30} =0.2978 mm

D_{60} =3.3949 mm D_{15} =0.1793 mm

D_{50} =1.0498 mm D_{10} =0.1474 mm

C_u =23.032 C_c =0.177

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (1))

Sample/Test Description

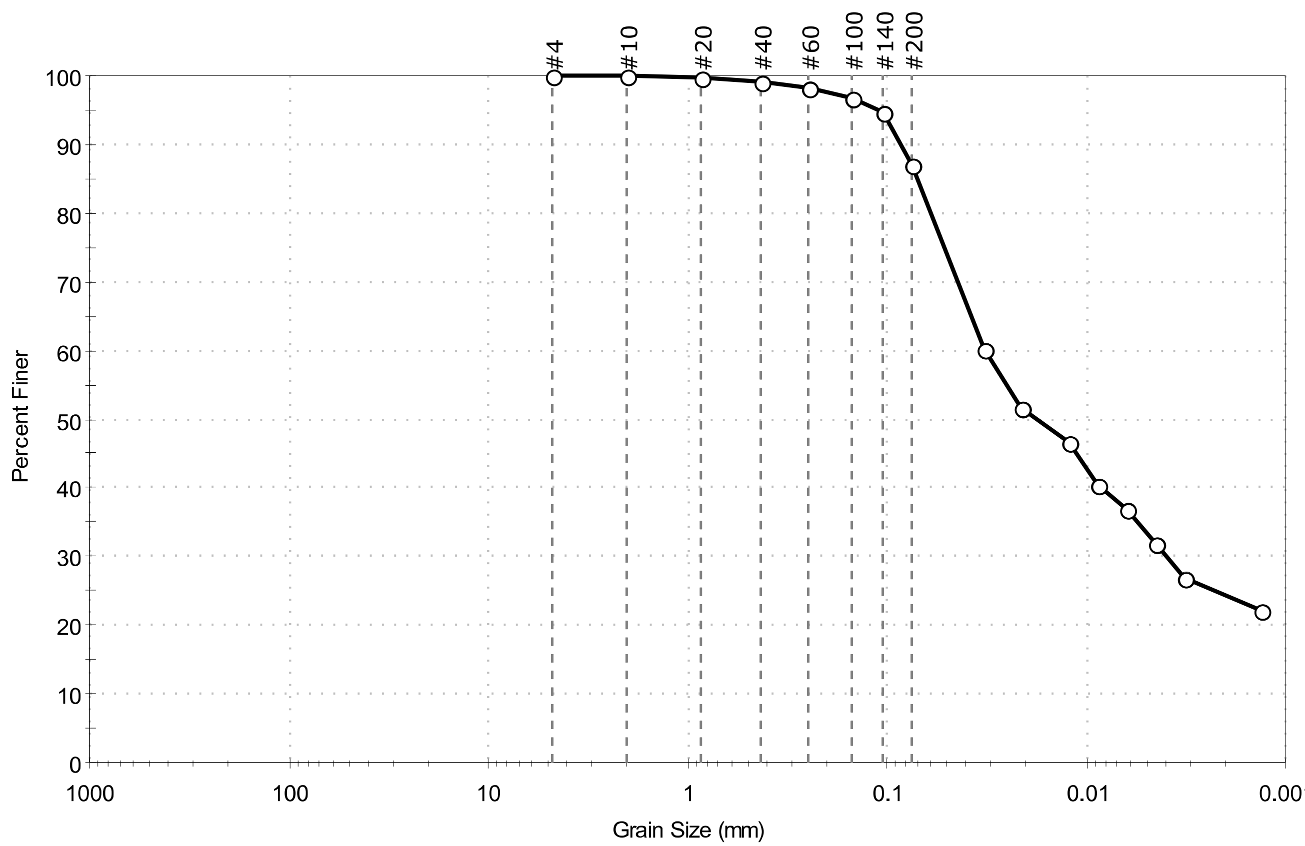
Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

printed 4/30/2024 10:54:50 AM

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland ME		
Location:	Cumberland, ME	Project No:	GTX-318928
Boring ID: BB-C295-205	Sample Type: Jar	Tested By:	ckg
Sample ID: 9D	Test Date: 04/27/24	Checked By:	ank
Depth : 30-31.5'	Test Id: 765690		
Test Comment:	---		
Visual Description:	Moist, grayish brown clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	13.0	87.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	98		
#100	0.15	97		
#140	0.11	95		
#200	0.075	87		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0325	60		
---	0.0211	52		
---	0.0122	47		
---	0.0088	41		
---	0.0062	37		
---	0.0045	32		
---	0.0032	27		
---	0.0013	22		

Coefficients

D_{85} =0.0704 mm | D_{30} =0.0039 mm

D_{60} =0.0320 mm | D_{15} =N/A

D_{50} =0.0175 mm | D_{10} =N/A

C_u =N/A | C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (11))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

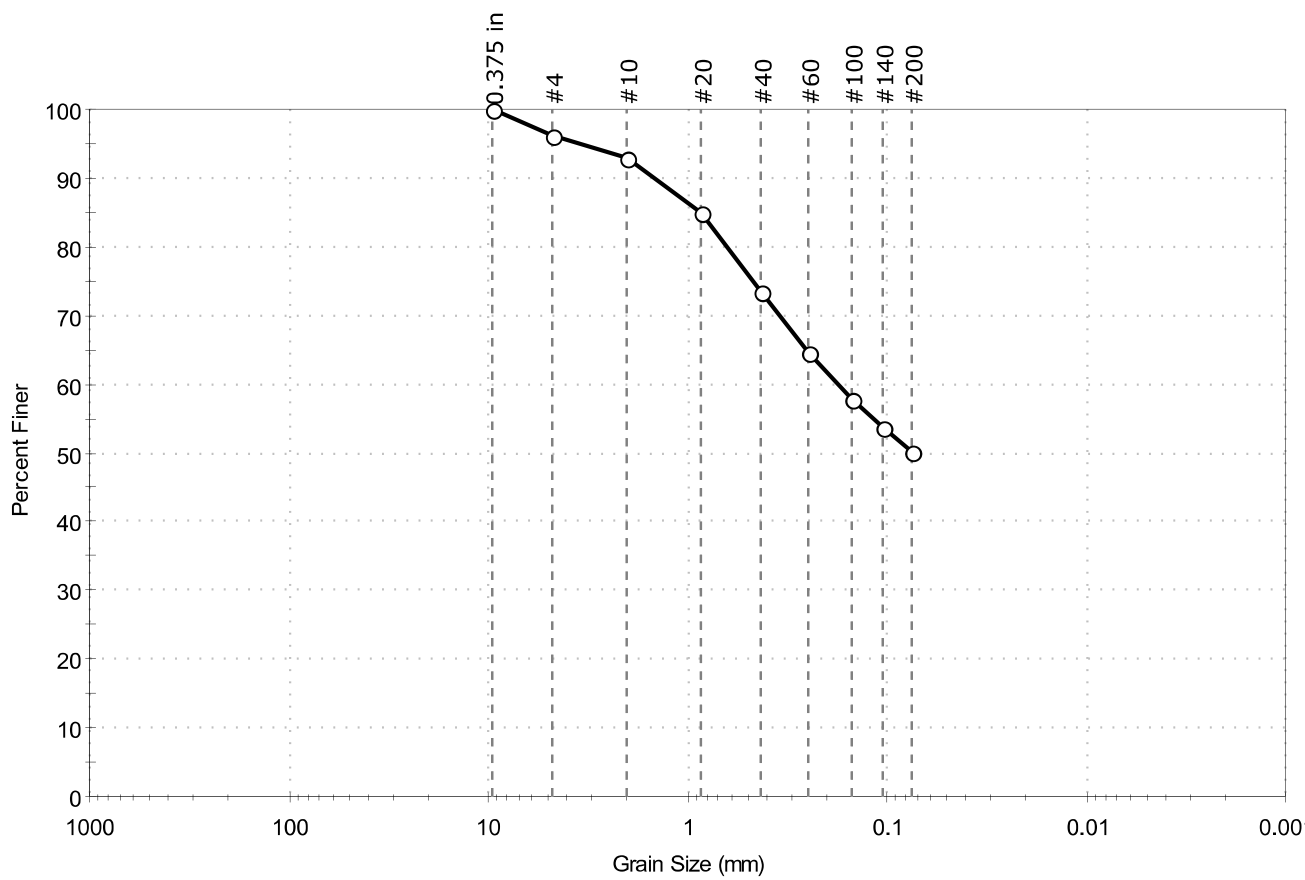
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 4/30/2024 10:54:51 AM

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland ME		
Location:	Cumberland, ME	Project No:	GTX-318928
Boring ID: BB-C295-205	Sample Type: Jar	Tested By:	ckg
Sample ID: 10D	Test Date: 04/27/24	Checked By:	ank
Depth : 35-37'	Test Id: 765685		
Test Comment:	---		
Visual Description:	Moist, olive gray sandy silt		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	3.7	46.0	50.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	96		
#10	2.00	93		
#20	0.85	85		
#40	0.42	73		
#60	0.25	64		
#100	0.15	58		
#140	0.11	54		
#200	0.075	50		

Coefficients

D_{85} =0.8661 mm D_{30} =N/A

D_{60} =0.1778 mm D_{15} =N/A

D_{50} =N/A D_{10} =N/A

C_u =N/A C_c =N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

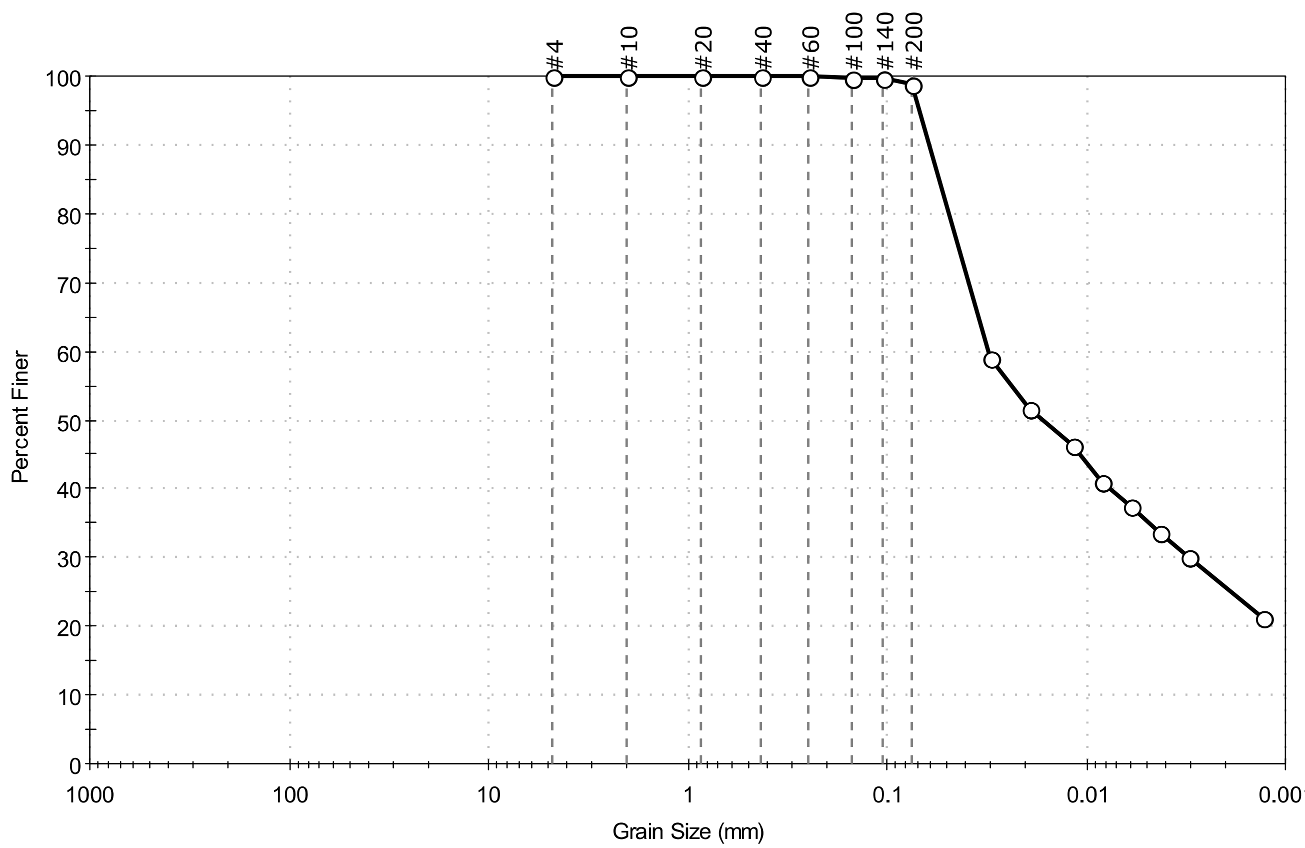
Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

printed 4/30/2024 10:54:50 AM

Client:	Hardesty & Hanover			
Project:	Tuttle Rd, Cumberland ME			
Location:	Cumberland, ME		Project No:	GTX-318928
Boring ID:	BB-C295-206	Sample Type: Jar	Tested By:	ajl
Sample ID:	3D	Test Date: 05/07/24	Checked By:	ank
Depth :	4-6'	Test Id: 768001		
Test Comment:	---			
Visual Description:	Moist, olive gray clay			
Sample Comment:	---			

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	1.2	98.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	99		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0301	59		
---	0.0193	52		
---	0.0116	46		
---	0.0083	41		
---	0.0060	37		
---	0.0042	34		
---	0.0031	30		
---	0.0013	21		

Coefficients

D_{85} =0.0547 mm — D_{30} =0.0030 mm

D_{60} =0.0309 mm — D_{15} =N/A

D_{50} =0.0164 mm — D_{10} =N/A

C_u =N/A — C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (15))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

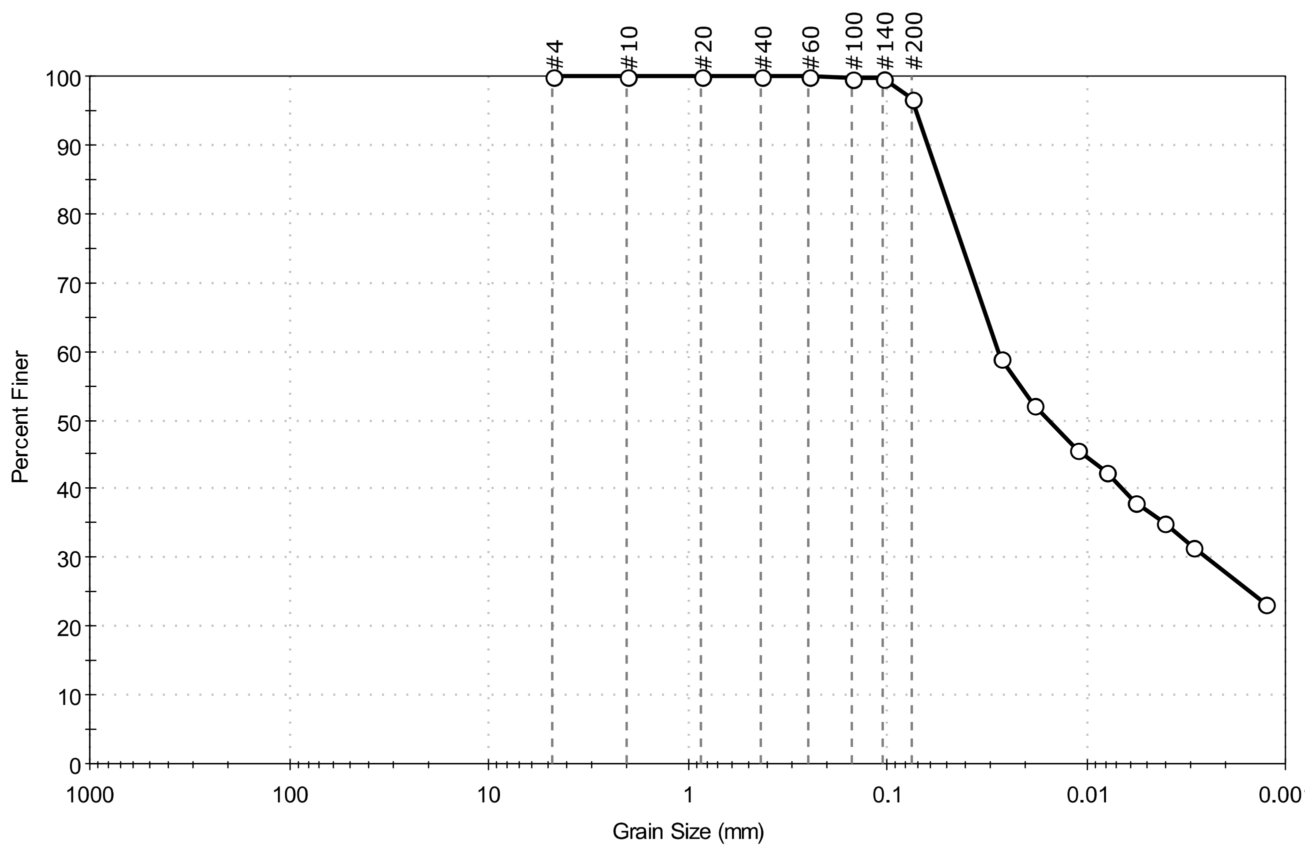
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 5/15/2024 9:19:36 AM

Client:	Hardesty & Hanover			
Project:	Tuttle Rd, Cumberland ME			
Location:	Cumberland, ME		Project No:	GTX-318928
Boring ID:	BB-C295-206	Sample Type: Jar	Tested By:	ajl
Sample ID:	4D	Test Date: 05/08/24	Checked By:	ank
Depth :	6-8'	Test Id: 768002		
Test Comment:	---			
Visual Description:	Moist, dark gray clay			
Sample Comment:	---			

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	3.2	96.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	97		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0272	59		
---	0.0184	52		
---	0.0111	46		
---	0.0080	43		
---	0.0058	38		
---	0.0041	35		
---	0.0030	32		
---	0.0013	23		

Coefficients

D_{85} =0.0546 mm D_{30} =0.0025 mm

D_{60} =0.0279 mm D_{15} =N/A

D_{50} =0.0155 mm D_{10} =N/A

C_u =N/A C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (18))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

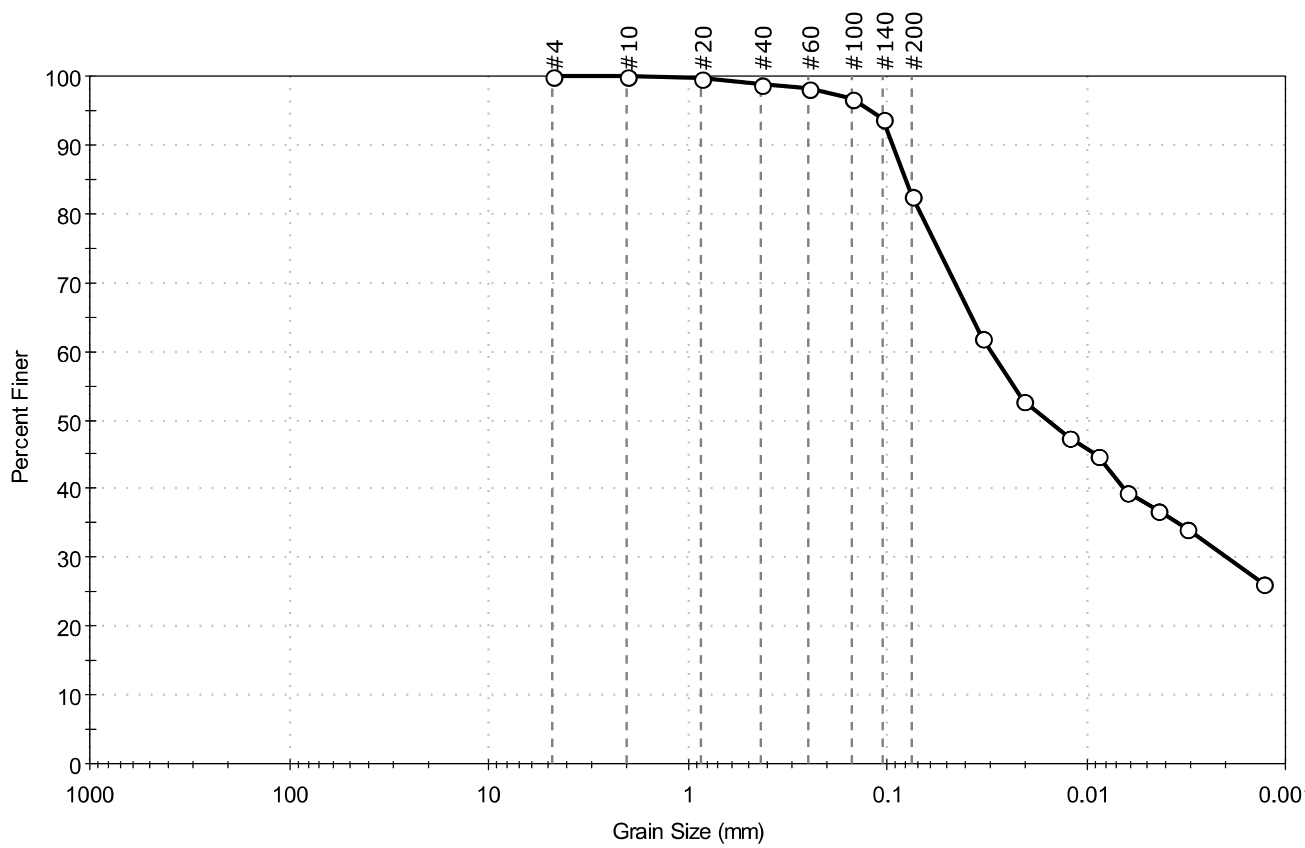
Separation of Sample: #200 Sieve

printed 5/15/2024 9:19:36 AM

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland ME		
Location:	Cumberland, ME	Project No:	GTX-318928
Boring ID: BB-C295-206	Sample Type: Jar	Tested By:	ajl
Sample ID: 5D	Test Date: 05/07/24	Checked By:	ank
Depth : 10-11.75'	Test Id: 768003		

Test Comment: ---
Visual Description: Moist, grayish brown silt with sand
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	17.4	82.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	98		
#100	0.15	97		
#140	0.11	94		
#200	0.075	83		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0334	62		
---	0.0209	53		
---	0.0123	47		
---	0.0087	45		
---	0.0062	39		
---	0.0044	37		
---	0.0032	34		
---	0.0013	26		

Coefficients

D_{85} =0.0808 mm
D_{30} =0.0020 mm
D_{60} =0.0303 mm
D_{15} =N/A
D_{50} =0.0160 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

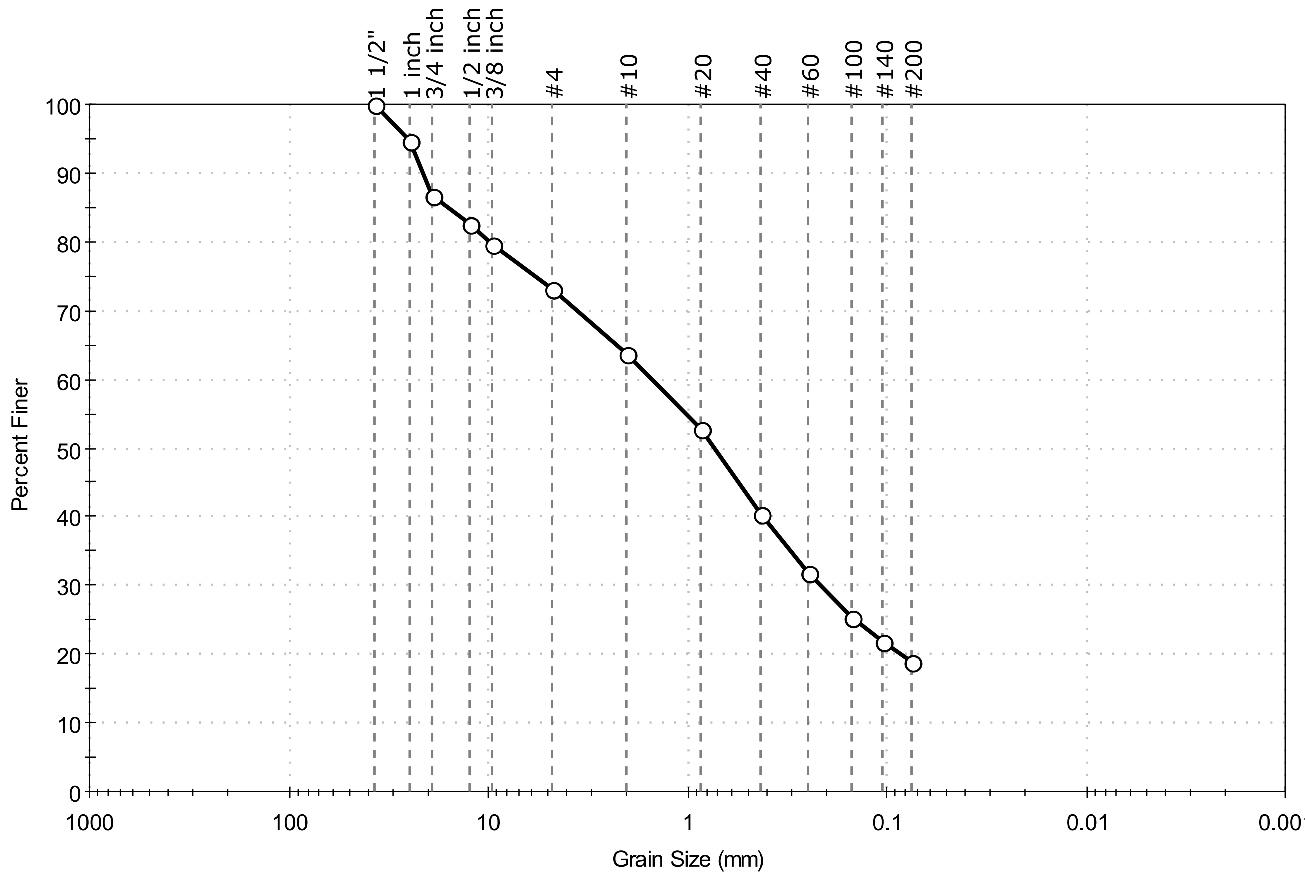
Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

printed 5/15/2024 9:19:37 AM

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-206	Sample Type:	Jar	Tested By:	ajl
Sample ID:	7D	Test Date:	05/07/24	Checked By:	ank
Depth :	20-22'	Test Id:	768006		

Test Comment: ---
Visual Description: Moist, brownish gray silty sand with gravel
Sample Comment: ---

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	26.9	54.1	19.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2"	37.50	100		
1 inch	25.00	95		
3/4 inch	19.00	87		
1/2 inch	12.50	83		
3/8 inch	9.50	80		
#4	4.75	73		
#10	2.00	64		
#20	0.85	53		
#40	0.42	40		
#60	0.25	32		
#100	0.15	25		
#140	0.11	22		
#200	0.075	19		

Coefficients

D_{85} =15.9337 mm
D_{30} =0.2183 mm
D_{60} =1.5042 mm
D_{15} =N/A
D_{50} =0.7248 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

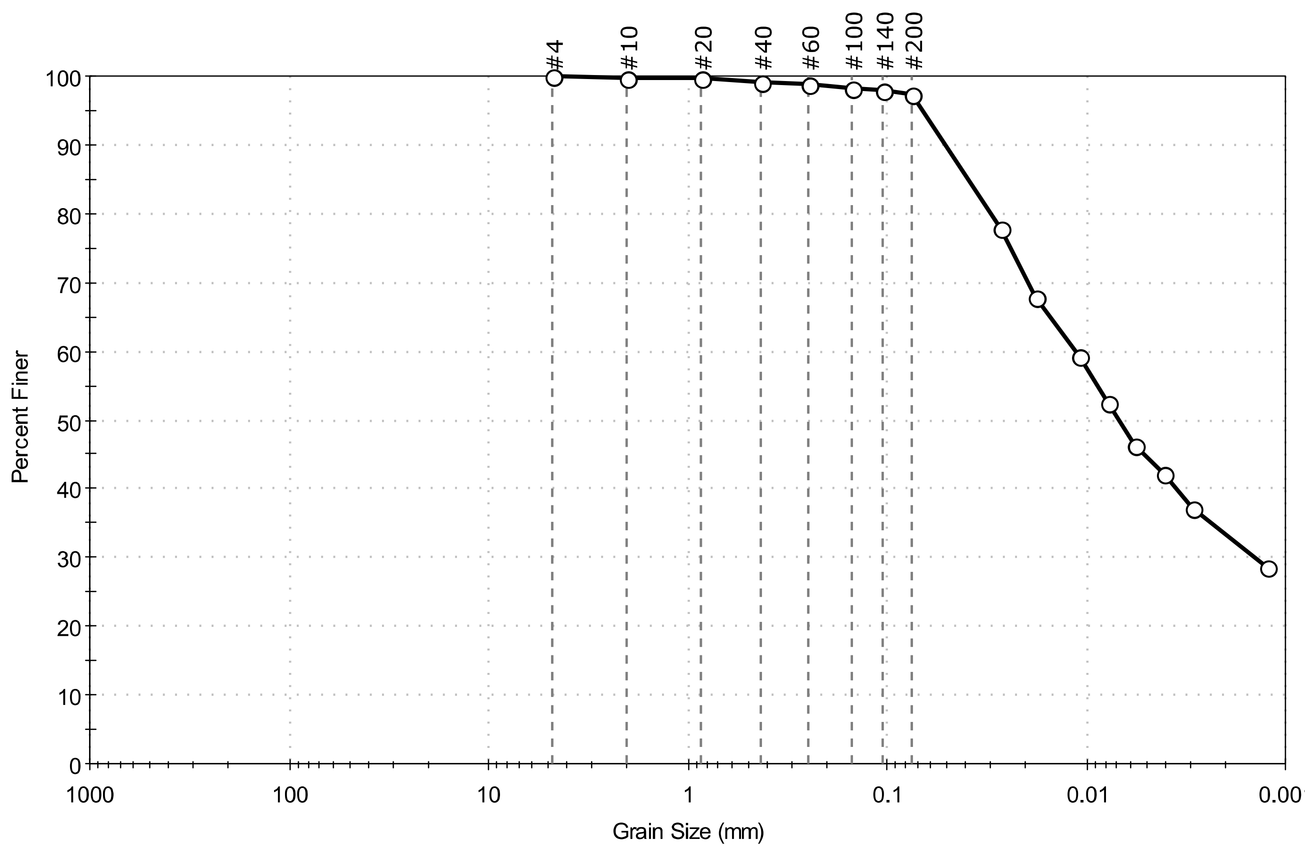
Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

printed 5/15/2024 9:19:39 AM

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-207	Sample Type:	Jar	Tested By:	ajl
Sample ID:	5D	Test Date:	05/07/24	Checked By:	ank
Depth :	8-10'	Test Id:	768004		
Test Comment:	---				
Visual Description:	Moist, gray clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	2.8	97.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	99		
#100	0.15	98		
#140	0.11	98		
#200	0.075	97		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0268	78		
---	0.0178	68		
---	0.0108	59		
---	0.0079	52		
---	0.0057	46		
---	0.0041	42		
---	0.0030	37		
---	0.0012	29		

Coefficients

D_{85} =0.0390 mm
D_{30} =0.0014 mm
D_{60} =0.0113 mm
D_{15} =N/A
D_{50} =0.0069 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (20))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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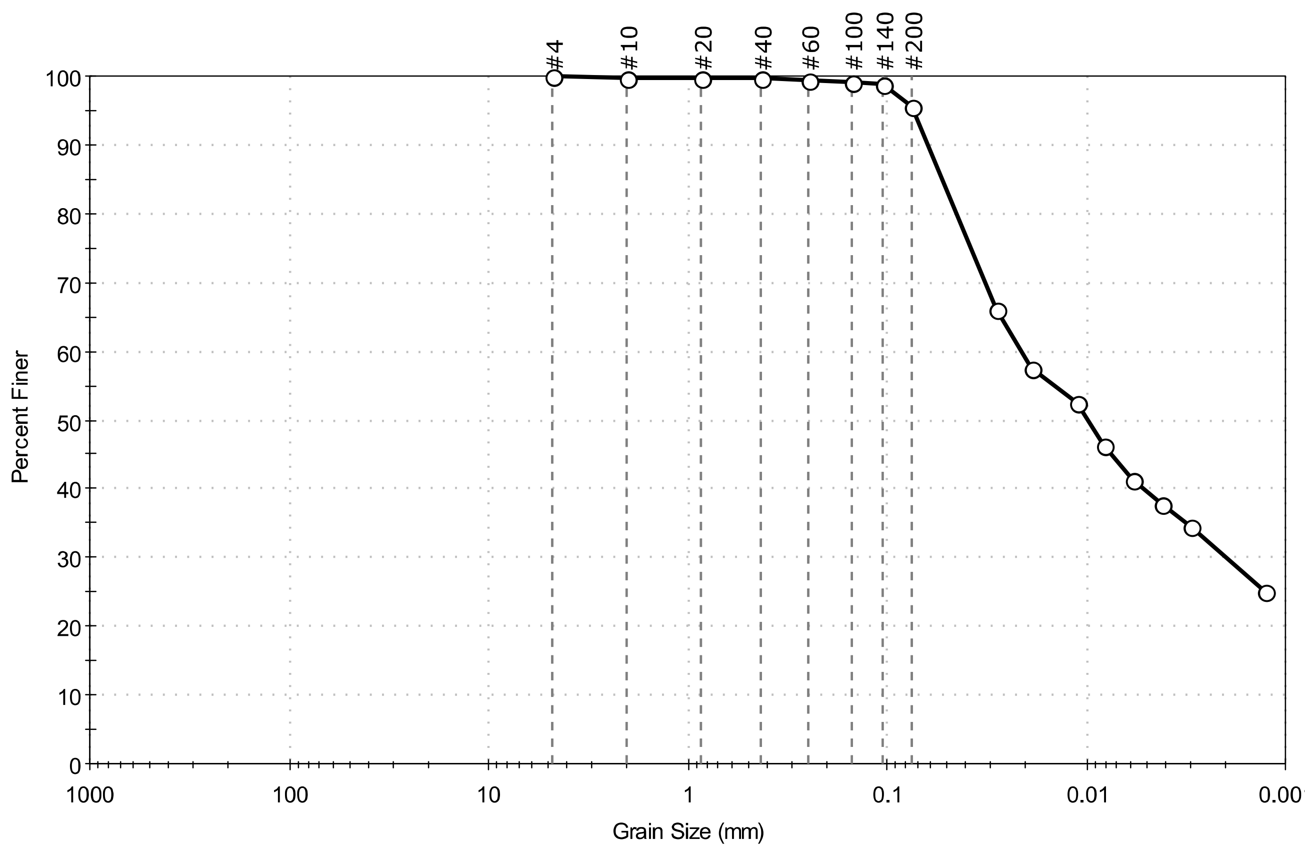
Client:	Hardesty & Hanover
Project:	Tuttle Rd, Cumberland ME
Location:	Cumberland, ME
Project No:	GTX-318928
Boring ID:	BB-C295-207
Sample Type:	Jar
Tested By:	ajl
Sample ID:	6D
Test Date:	05/07/24
Checked By:	ank
Depth :	15-17'
Test Id:	768005
Test Comment:	---
Visual Description:	Moist, gray clay
Sample Comment:	---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	4.5	95.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	99		
#100	0.15	99		
#140	0.11	99		
#200	0.075	96		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0284	66		
---	0.0188	57		
---	0.0111	52		
---	0.0081	46		
---	0.0058	41		
---	0.0041	38		
---	0.0030	34		
---	0.0013	25		

Coefficients

D_{85} =0.0531 mm
D_{30} =0.0020 mm
D_{60} =0.0212 mm
D_{15} =N/A
D_{50} =0.0098 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (12))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

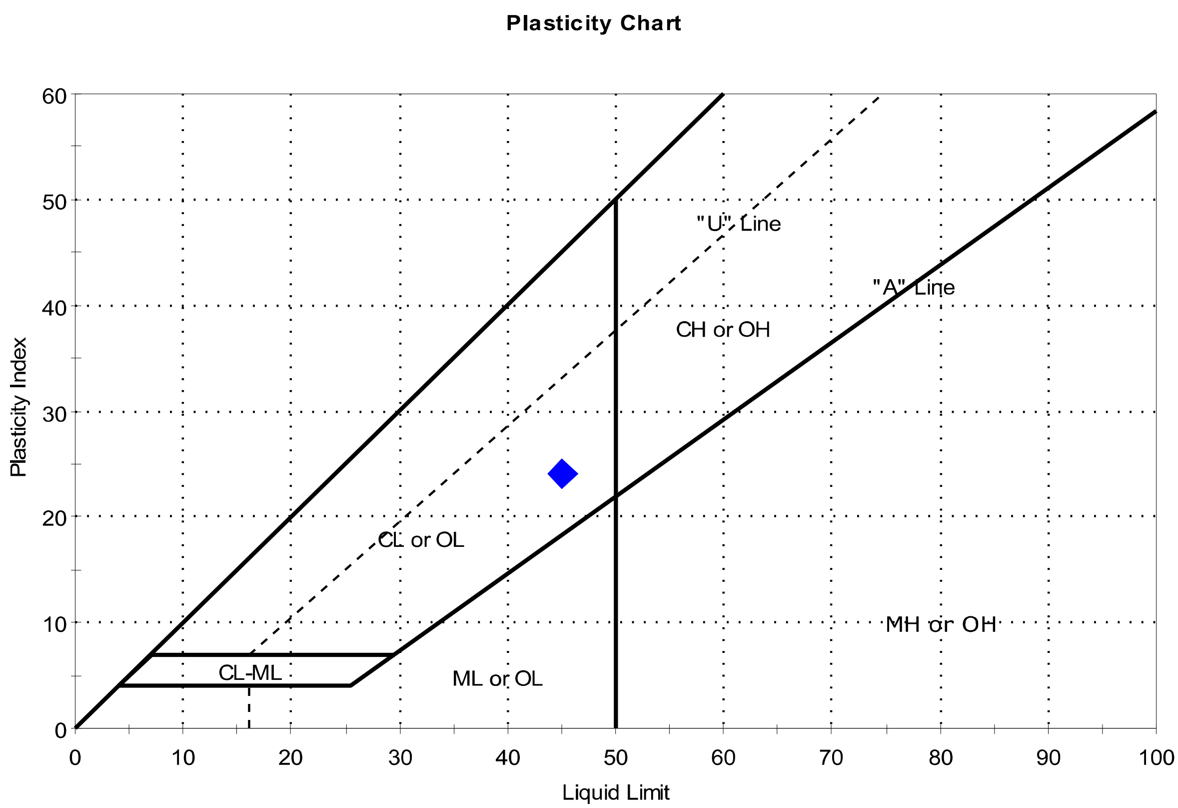
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-201	Sample Type:	Jar	Tested By:	cam
Sample ID:	7D	Test Date:	04/25/24	Checked By:	ank
Depth :	15-17'	Test Id:	765672		

Test Comment:	---
Visual Description:	Moist, light brownish gray clay
Sample Comment:	---

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	7D	3-C295-2(	15-17'	28	45	21	24	0.3	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

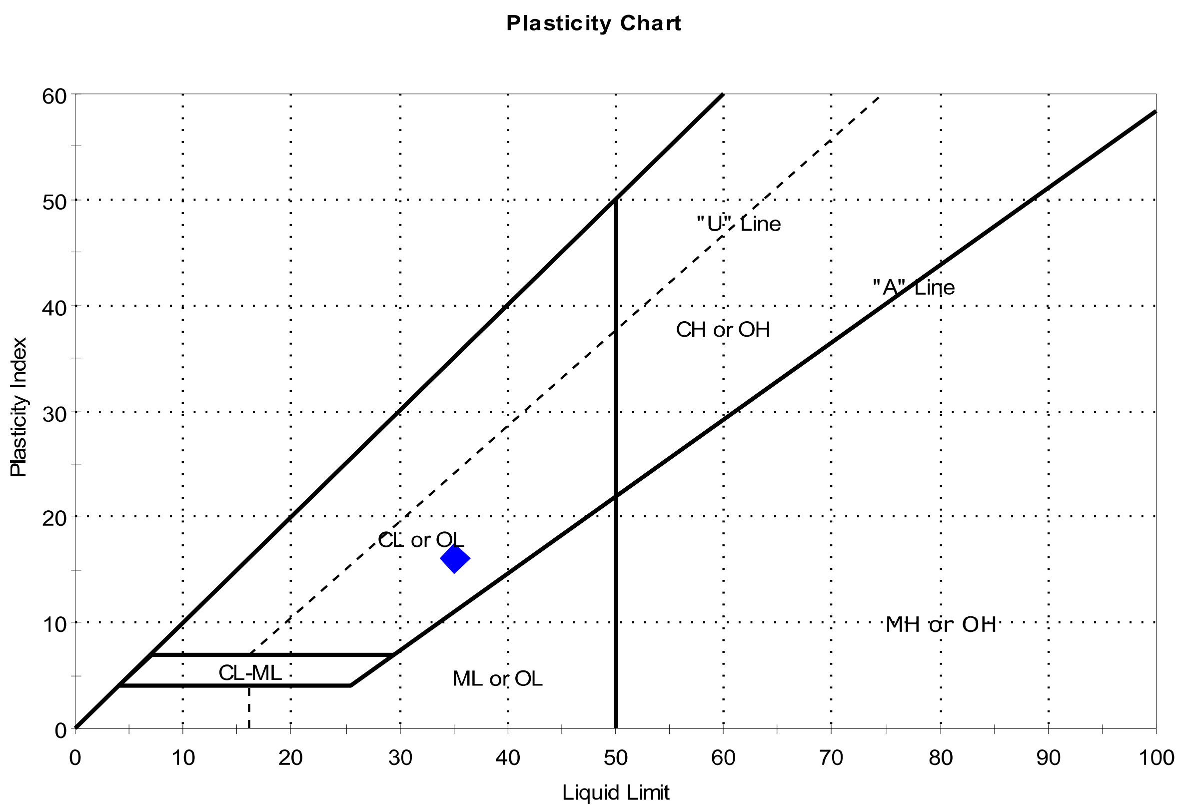
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-201	Sample Type:	Jar	Tested By:	cam
Sample ID:	9D	Test Date:	04/24/24	Checked By:	ank
Depth :	25-27'	Test Id:	765673		
Test Comment:	---				
Visual Description:	Moist, gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	9D	3-C295-2(	25-27'	36	35	19	16	1.1	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

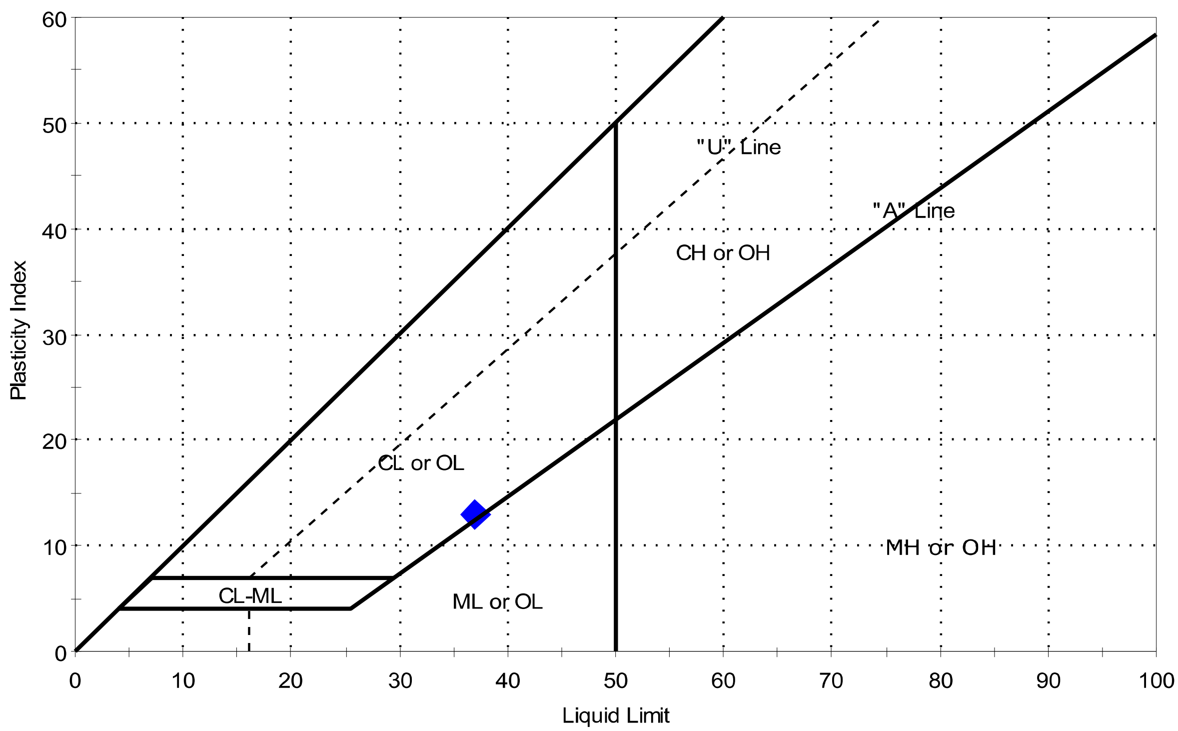
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-201	Sample Type:	Tube	Tested By:	cam
Sample ID:	U1	Test Date:	04/25/24	Checked By:	ank
Depth :	27-29'	Test Id:	765674		
Test Comment:	---				
Visual Description:	Moist, gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	U1	3-C295-2(	27-29'	34	37	24	13	0.8	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

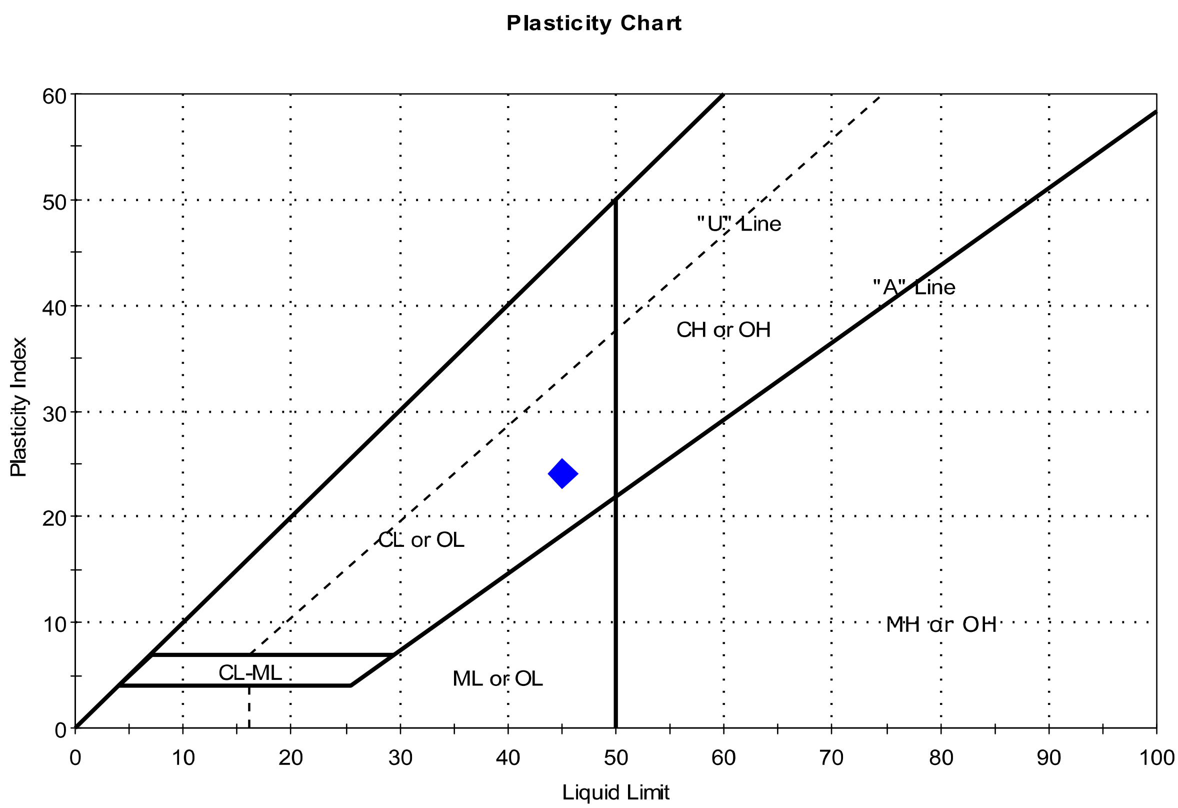
Dilatancy: SLOW

Toughness: LOW

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-202	Sample Type:	Jar	Tested By:	cam
Sample ID:	2D	Test Date:	05/10/24	Checked By:	ank
Depth :	2-4'	Test Id:	767972		

Test Comment: ---
Visual Description: Moist, grayish brown clay
Sample Comment: ---

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	2D	3-C295-2(	2-4'	24	45	21	24	0.1	

Sample Prepared using the WET method

Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

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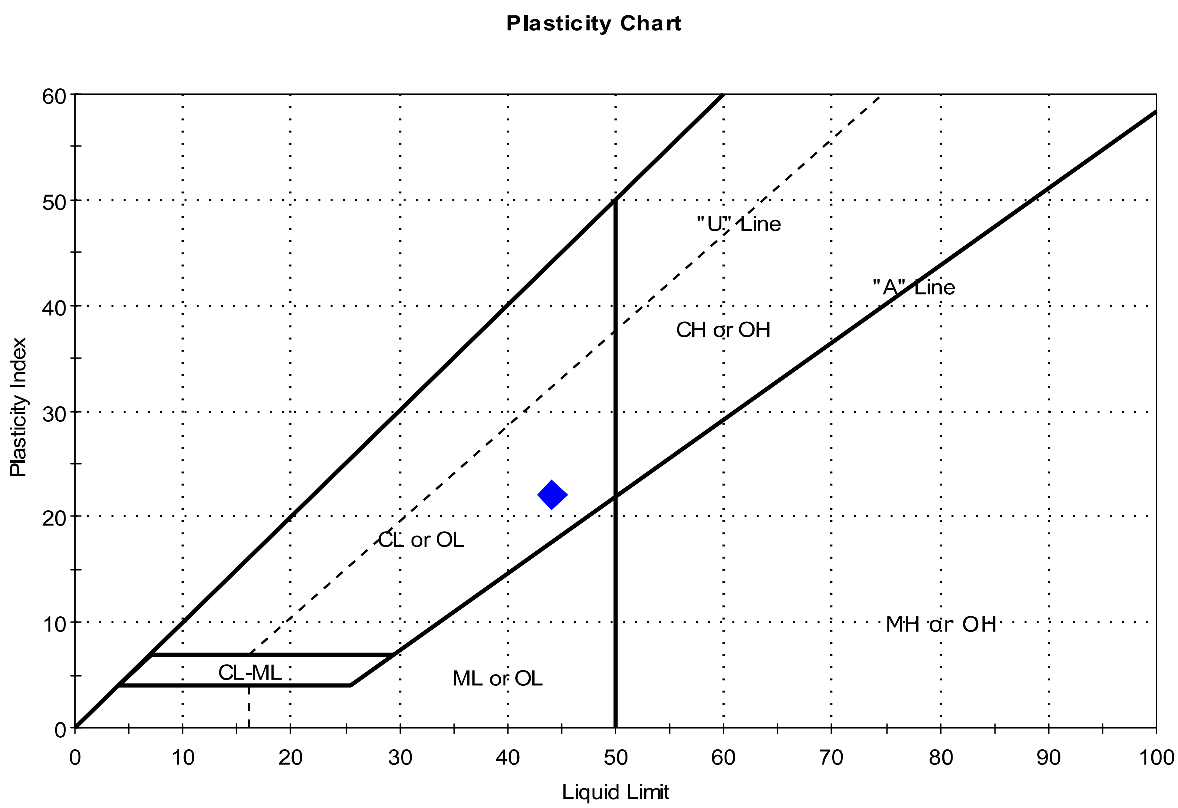
Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-202	Sample Type:	Tube	Tested By:	cam
Sample ID:	U1	Test Date:	05/10/24	Checked By:	ank
Depth :	4.5-6.5'	Test Id:	767973		
Test Comment:	---				
Visual Description:	Moist, gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	U1	3-C295-20	4.5-6.5'	28	44	22	22	0.3	

Sample Prepared using the WET method

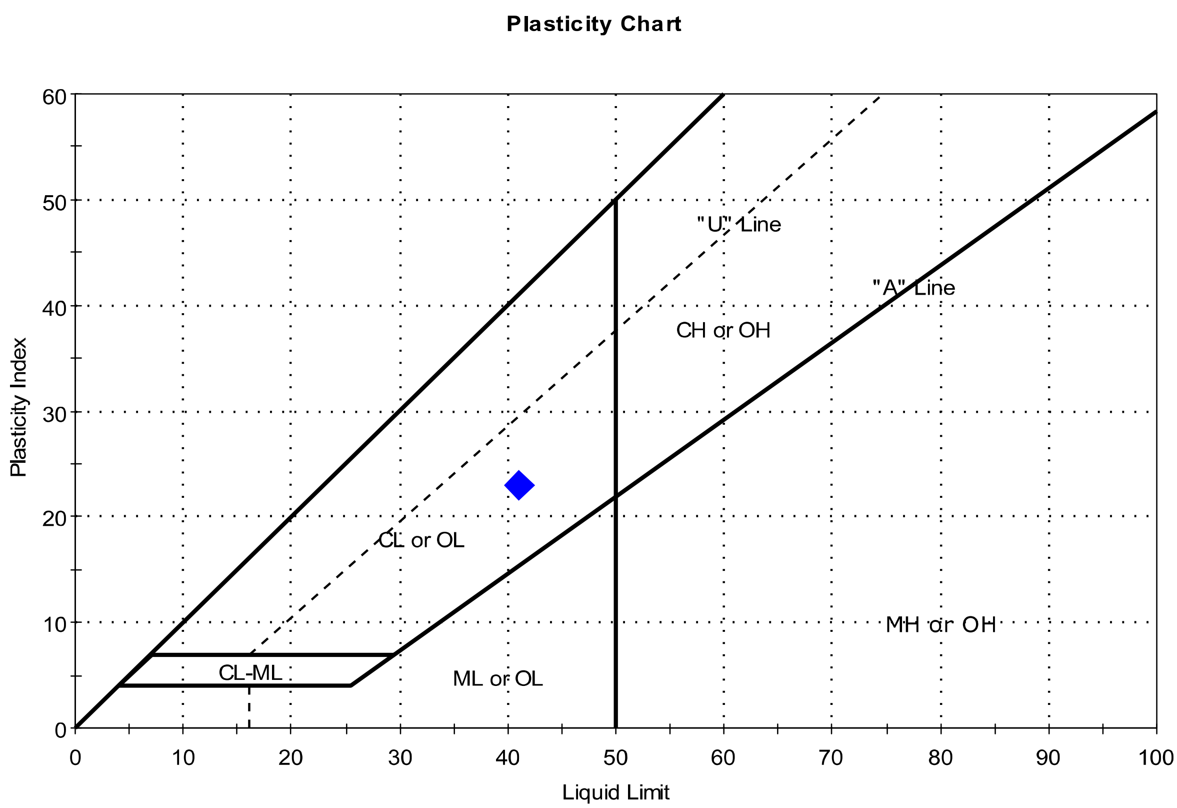
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland ME		
Location:	Cumberland, ME	Project No:	GTX-318928
Boring ID: BB-C295-202	Sample Type: Jar	Tested By:	cam
Sample ID: 3D	Test Date: 05/10/24	Checked By:	ank
Depth : 6.5-8.5'	Test Id: 767974		
Test Comment:	---		
Visual Description:	Moist, light gray clay		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	3D	3-C295-2(	6.5-8.5'	35	41	18	23	n/a	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

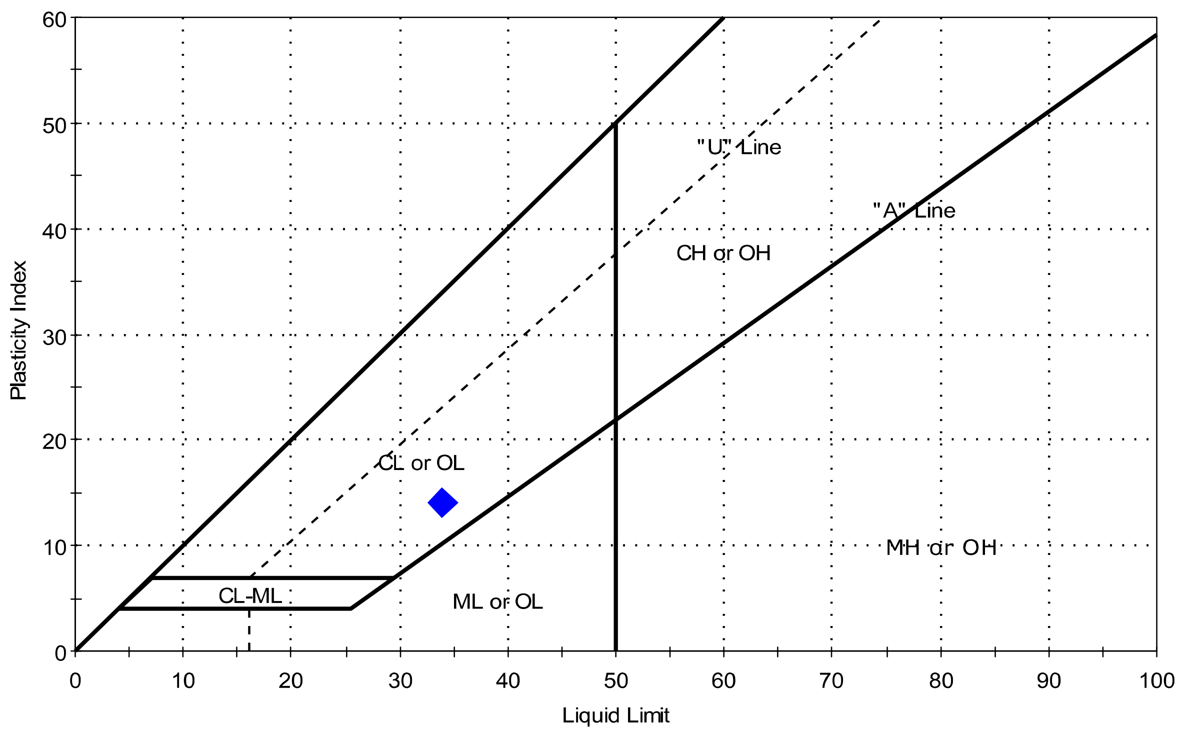
Dilatancy: SLOW

Toughness: LOW

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-202	Sample Type:	Jar	Tested By:	cam
Sample ID:	4D	Test Date:	05/10/24	Checked By:	ank
Depth :	8.5-10.5'	Test Id:	767975		

Test Comment: ---
Visual Description: Moist, brownish gray clay
Sample Comment: ---

Atterberg Limits - ASTM D4318

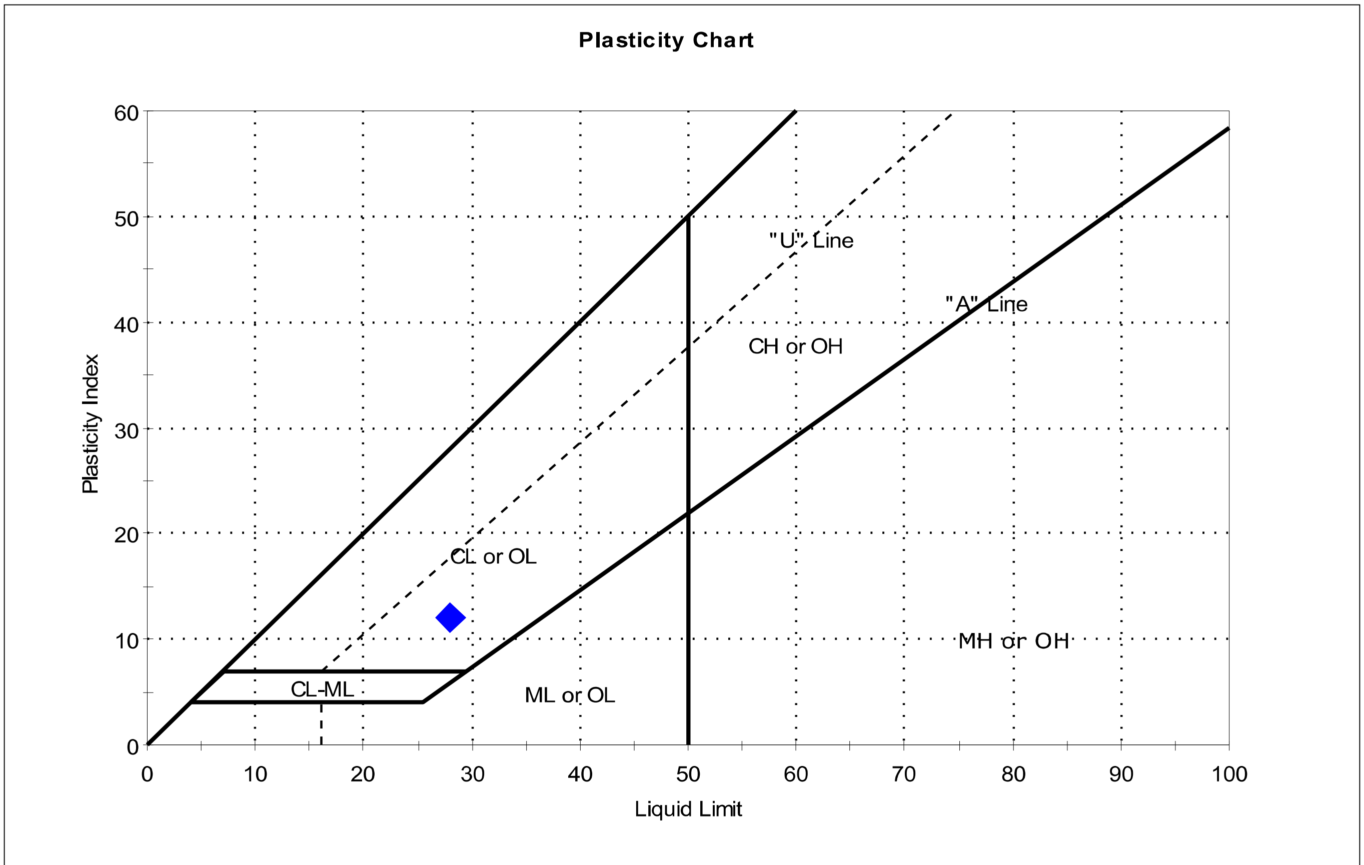


Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	4D	3-C295-2(	8.5-10.5'	29	34	20	14	0.6	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-203	Sample Type:	Jar	Tested By:	cam
Sample ID:	11D	Test Date:	04/25/24	Checked By:	ank
Depth :	30-32'	Test Id:	765675		
Test Comment:	---				
Visual Description:	Moist, gray clay with sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	11D	3-C295-2(	30-32'	23	28	16	12	0.6	Lean CLAY with Sand (CL)

Sample Prepared using the WET method

1% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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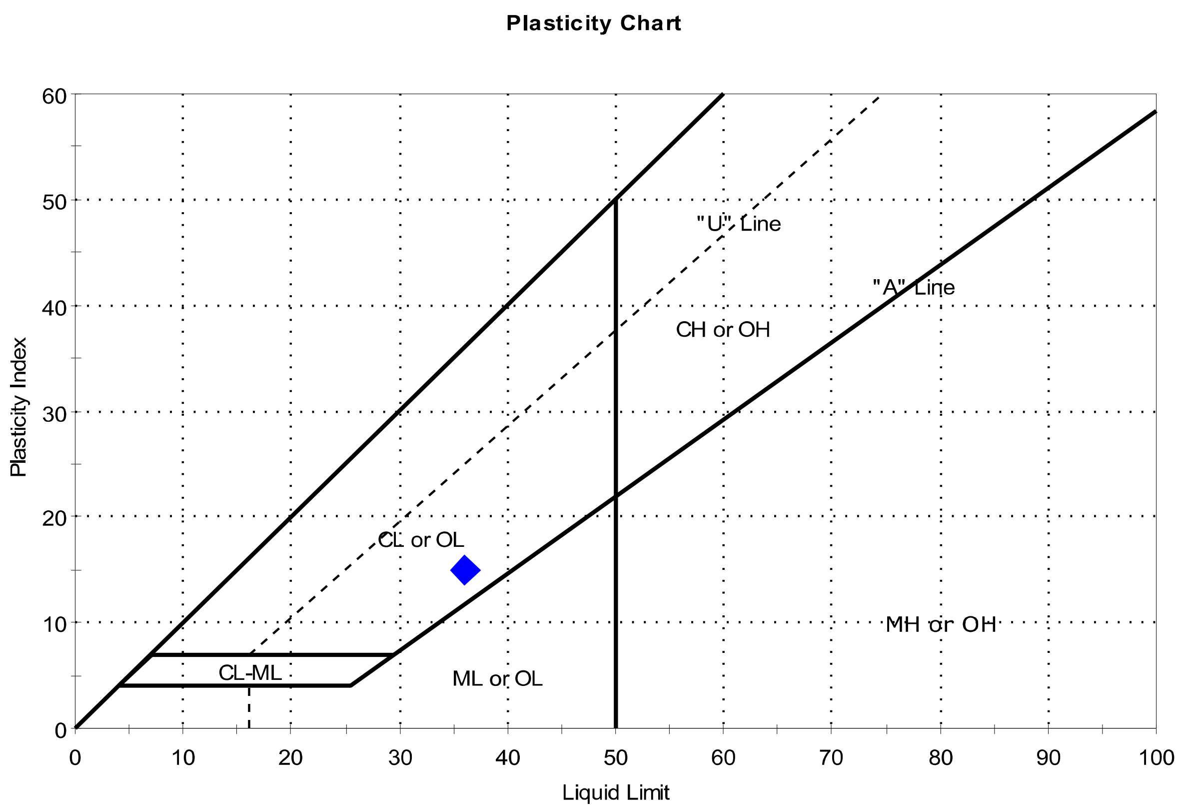
Client:	Hardesty & Hanover
Project:	Tuttle Rd, Cumberland ME
Location:	Cumberland, ME
Project No:	GTX-318928
Boring ID:	BB-C295-203
Sample Type:	Jar
Tested By:	cam
Sample ID:	13D
Test Date:	04/24/24
Checked By:	ank
Depth :	40-42'
Test Id:	765676
Test Comment:	---
Visual Description:	Moist, gray clay
Sample Comment:	---

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	13D	3-C295-2(	40-42'	28	36	21	15	0.4	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

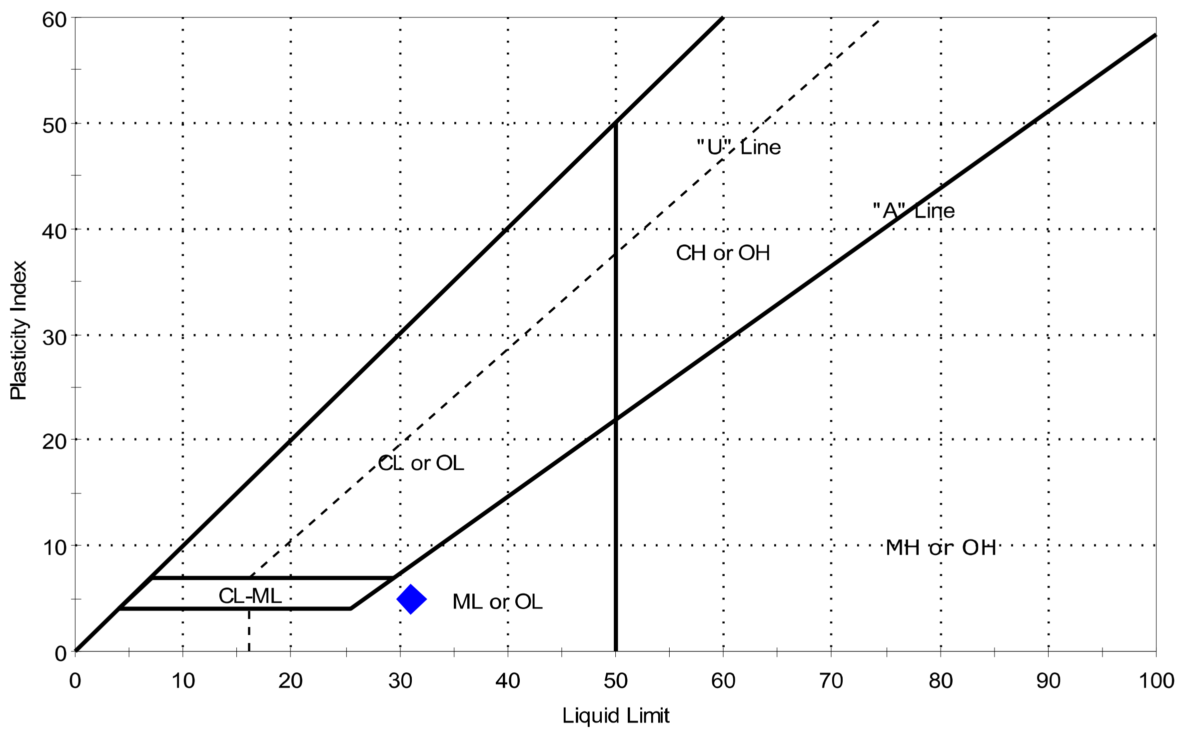
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Hardesty & Hanover
Project:	Tuttle Rd, Cumberland ME
Location:	Cumberland, ME
Project No:	GTX-318928
Boring ID:	BB-C295-203
Sample Type:	Tube
Tested By:	cam
Sample ID:	U2
Test Date:	04/25/24
Checked By:	ank
Depth :	42-44'
Test Id:	765677
Test Comment:	---
Visual Description:	Moist, gray silt
Sample Comment:	---

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	U2	3-C295-2(	42-44'	29	31	26	5	0.6	

Sample Prepared using the WET method

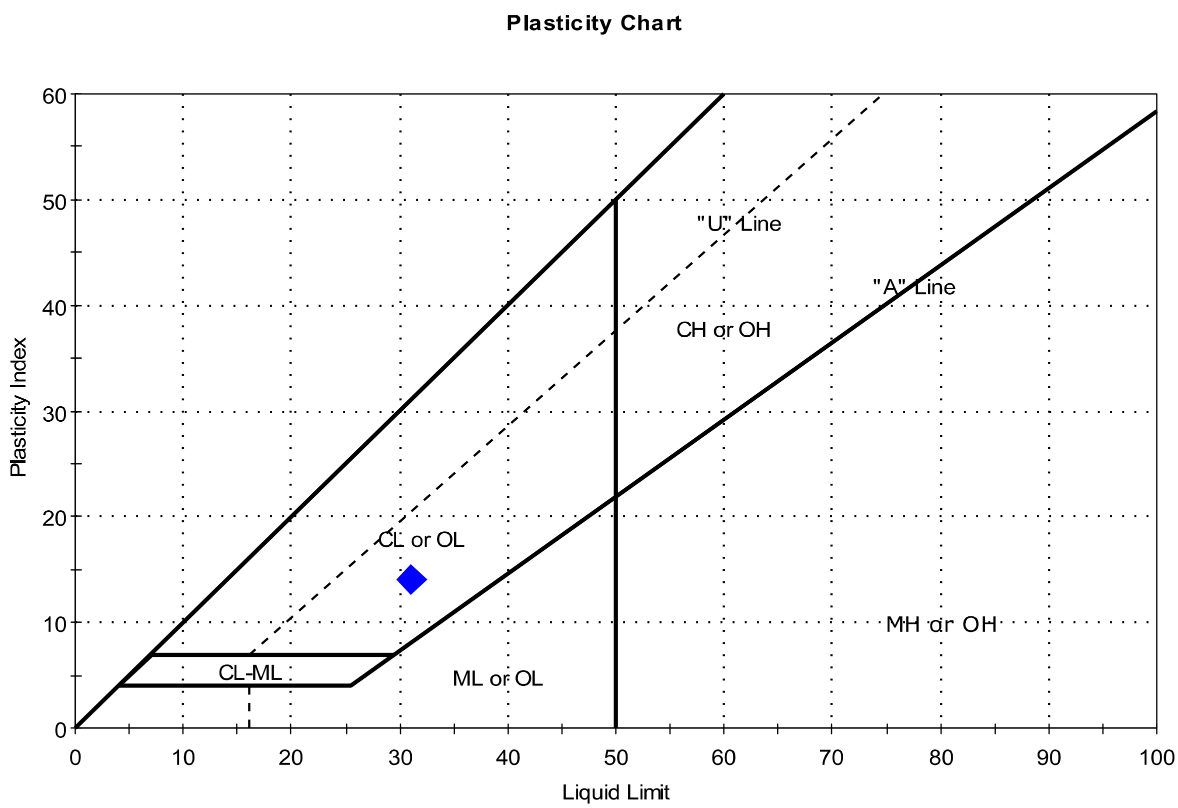
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-204	Sample Type:	Jar	Tested By:	cam
Sample ID:	3D	Test Date:	05/10/24	Checked By:	ank
Depth :	4-6'	Test Id:	767976		
Test Comment:	---				
Visual Description:	Moist, dark yellowish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	3D	3-C295-20	4-6'	20	31	17	14	0.2	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

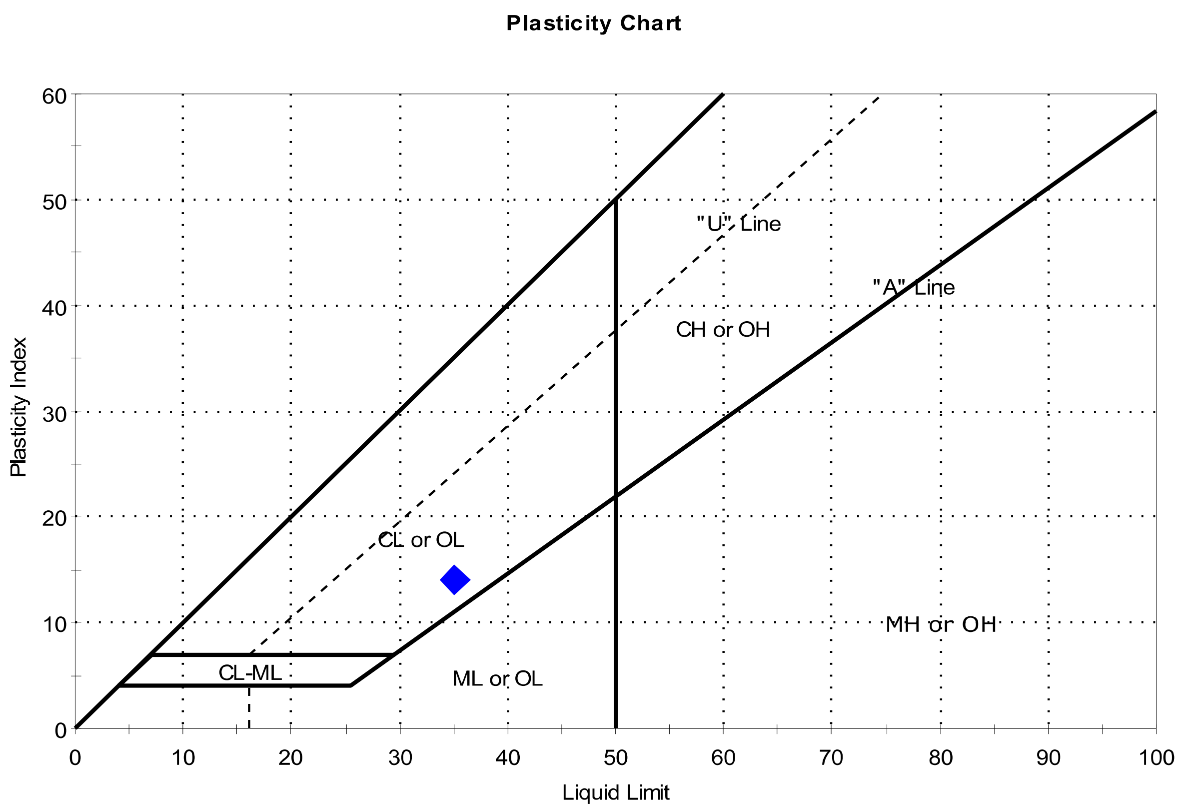
Toughness: LOW

printed 5/15/2024 9:32:09 AM

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-205	Sample Type:	Jar	Tested By:	cam
Sample ID:	7D	Test Date:	04/25/24	Checked By:	ank
Depth :	20-22'	Test Id:	765678		

Test Comment: ---
Visual Description: Moist, light gray clay
Sample Comment: ---

Atterberg Limits - ASTM D4318



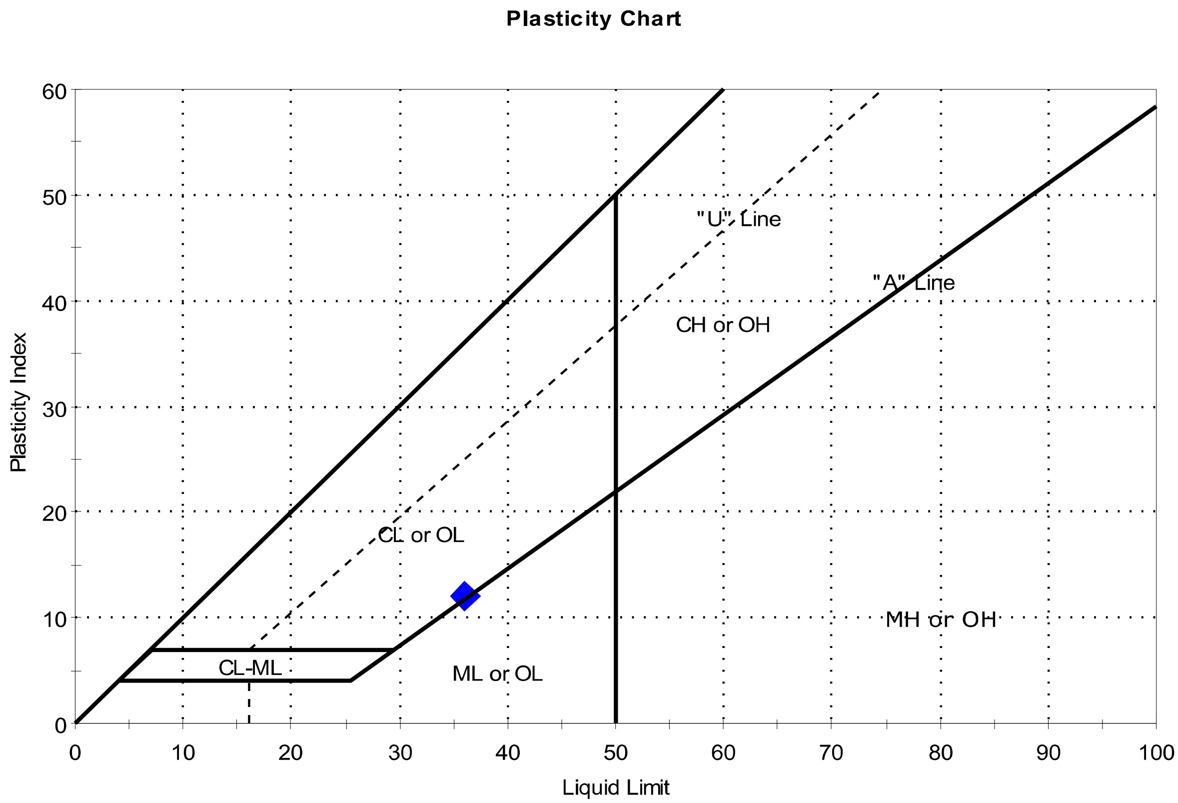
Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	7D	3-C295-2(	20-22'	28	35	21	14	0.5	

Sample Prepared using the WET method

Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-205	Sample Type:	Jar	Tested By:	cam
Sample ID:	9D	Test Date:	04/24/24	Checked By:	ank
Depth :	30-31.5'	Test Id:	765679		
Test Comment:	---				
Visual Description:	Moist, grayish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	9D	3-C295-2(	30-31.5'	38	36	24	12	1.2	Lean CLAY (CL)

Sample Prepared using the WET method

1% Retained on #40 Sieve

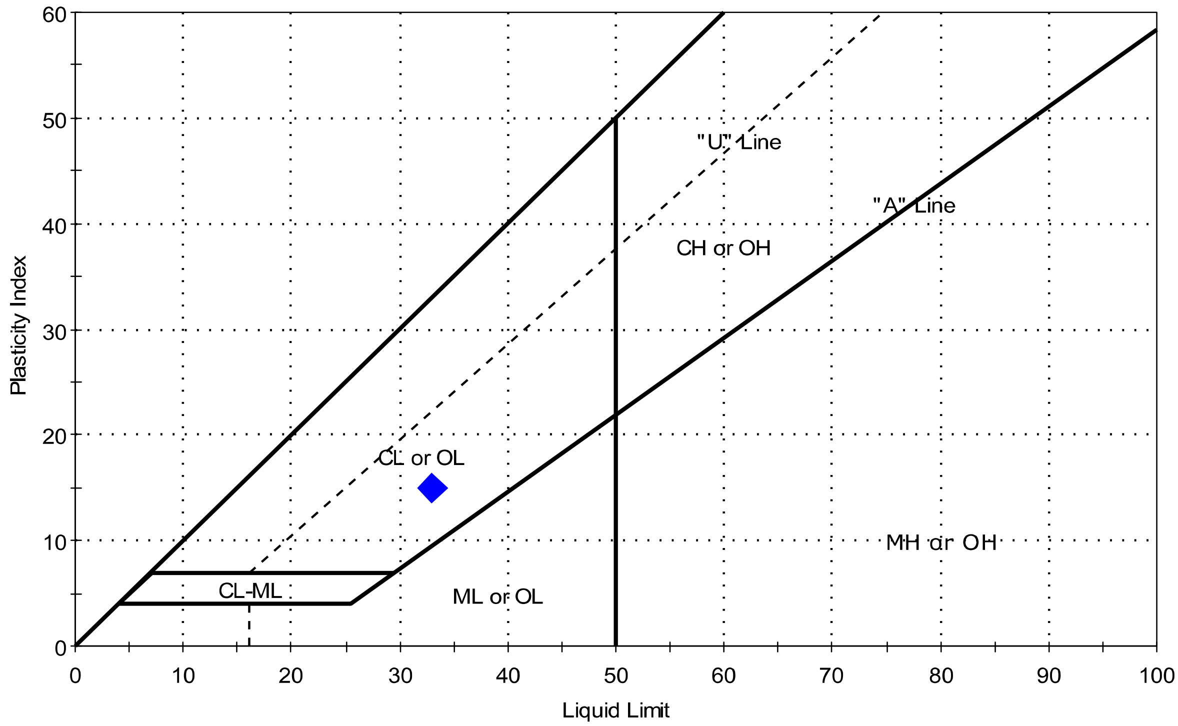
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client: Hardesty & Hanover			
Project: Tuttle Rd, Cumberland ME			
Location: Cumberland, ME		Project No:	GTX-318928
Boring ID: BB-C295-206	Sample Type: Jar	Tested By:	cam
Sample ID: 3D	Test Date: 05/10/24	Checked By:	ank
Depth : 4-6'	Test Id: 767995		
Test Comment: ---			
Visual Description: Moist, olive gray clay			
Sample Comment: ---			

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	3D	3-C295-2(	4-6'	8	33	18	15	-0.6	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

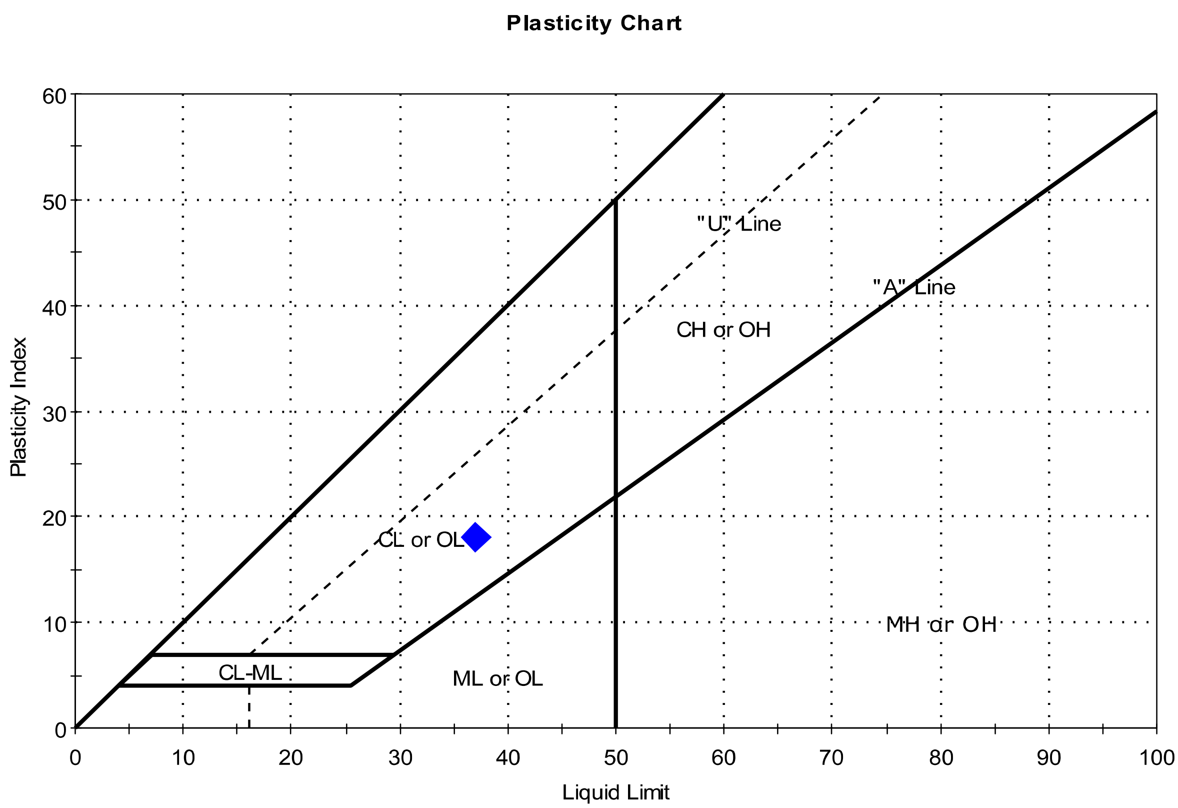
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-206	Sample Type:	Jar	Tested By:	cam
Sample ID:	4D	Test Date:	05/10/24	Checked By:	ank
Depth :	6-8'	Test Id:	767996		
Test Comment:	---				
Visual Description:	Moist, dark gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	4D	3-C295-2(	6-8'	22	37	19	18	0.2	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

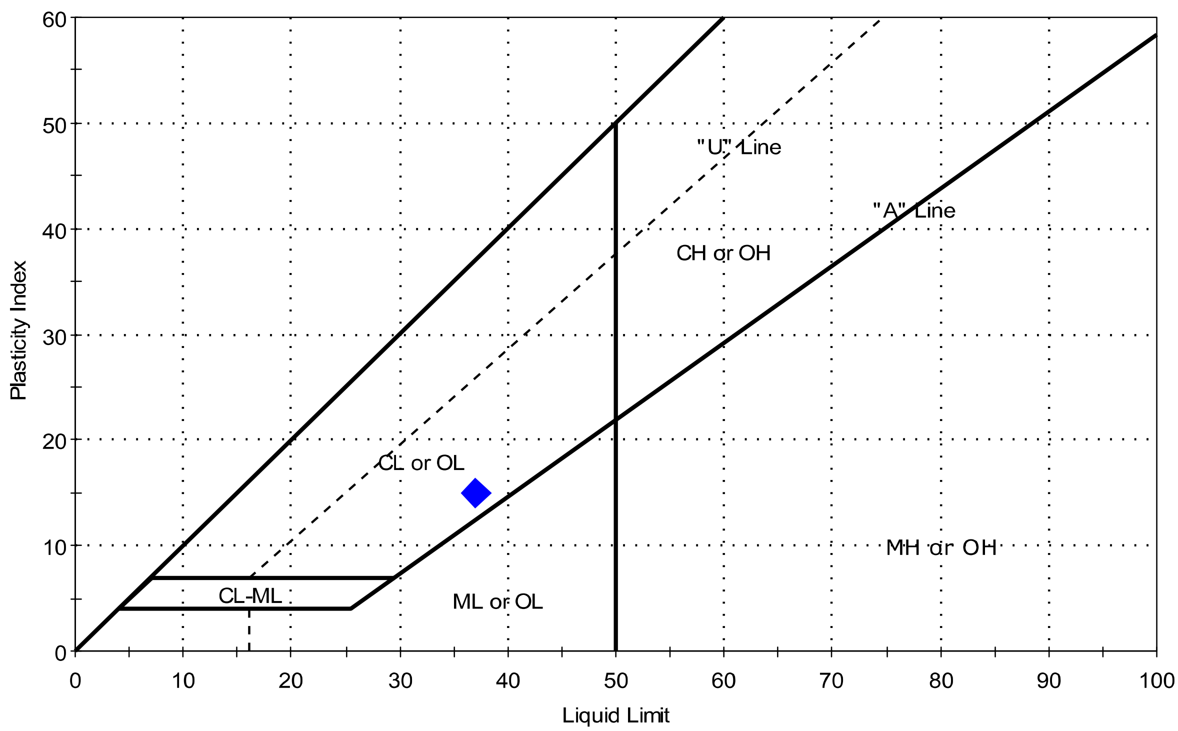
Dilatancy: SLOW

Toughness: LOW

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-206	Sample Type:	Tube	Tested By:	cam
Sample ID:	U1	Test Date:	05/10/24	Checked By:	ank
Depth :	8-10'	Test Id:	767997		

Test Comment: ---
Visual Description: Moist, gray clay
Sample Comment: ---

Atterberg Limits - ASTM D4318



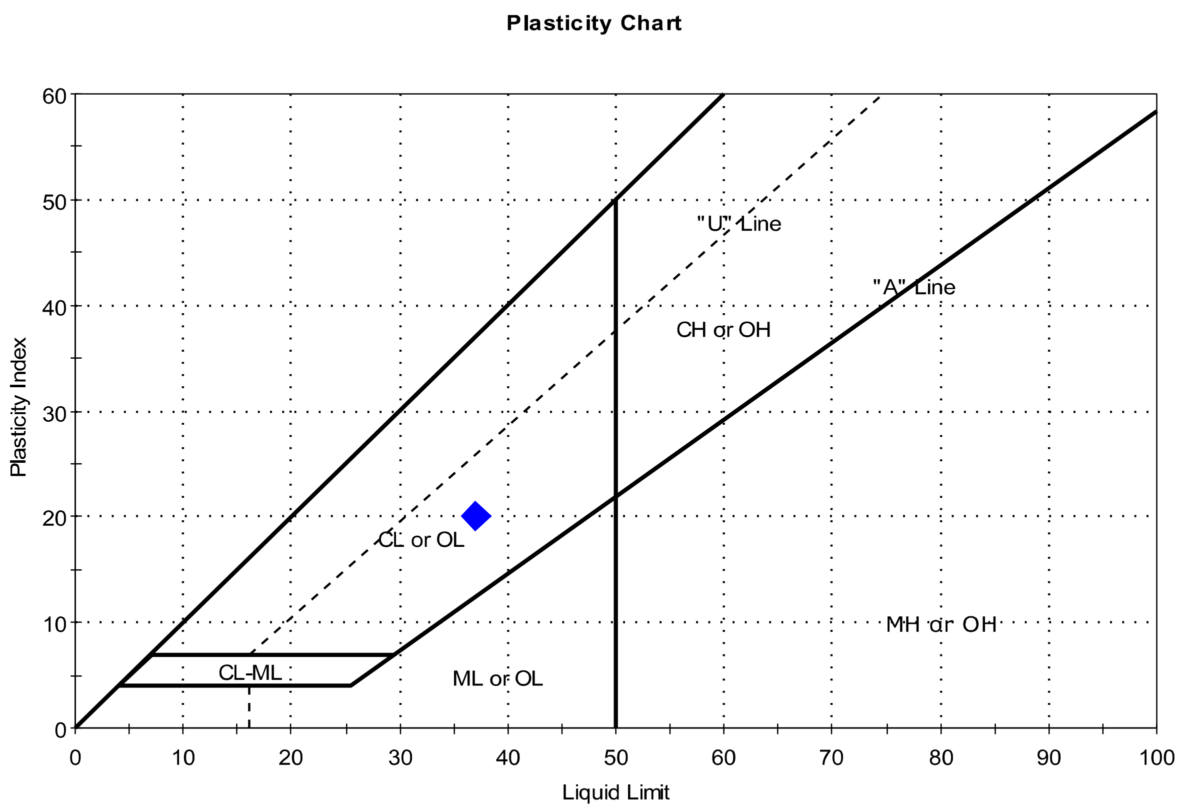
Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	U1	3-C295-2(	8-10'	38	37	22	15	1.1	

Sample Prepared using the WET method

Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-207	Sample Type:	Jar	Tested By:	cam
Sample ID:	5D	Test Date:	05/13/24	Checked By:	ank
Depth :	8-10'	Test Id:	767998		
Test Comment:	---				
Visual Description:	Moist, gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	5D	3-C295-2(	8-10'	37	37	17	20	1	Lean CLAY (CL)

Sample Prepared using the WET method

1% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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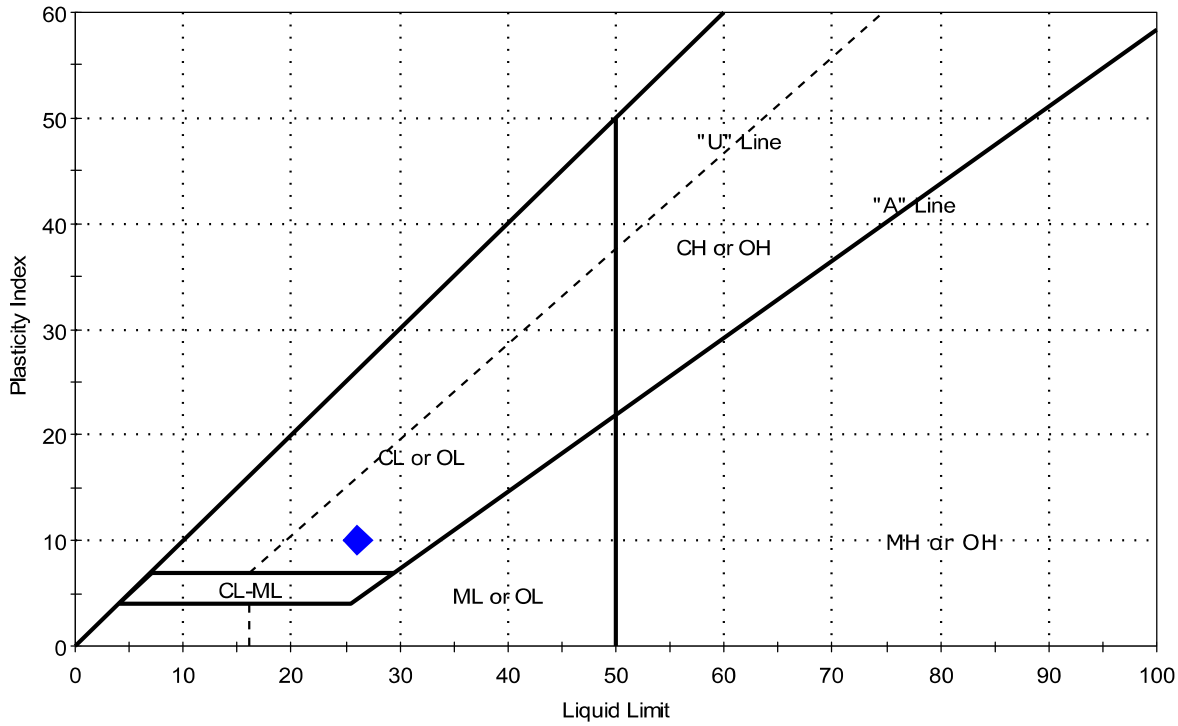
Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-207	Sample Type:	Tube	Tested By:	cam
Sample ID:	U1	Test Date:	05/10/24	Checked By:	ank
Depth :	10-12'	Test Id:	767999		
Test Comment:	---				
Visual Description:	Moist, gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	U1	3-C295-2(	10-12'	30	26	16	10	1.4	

Sample Prepared using the WET method

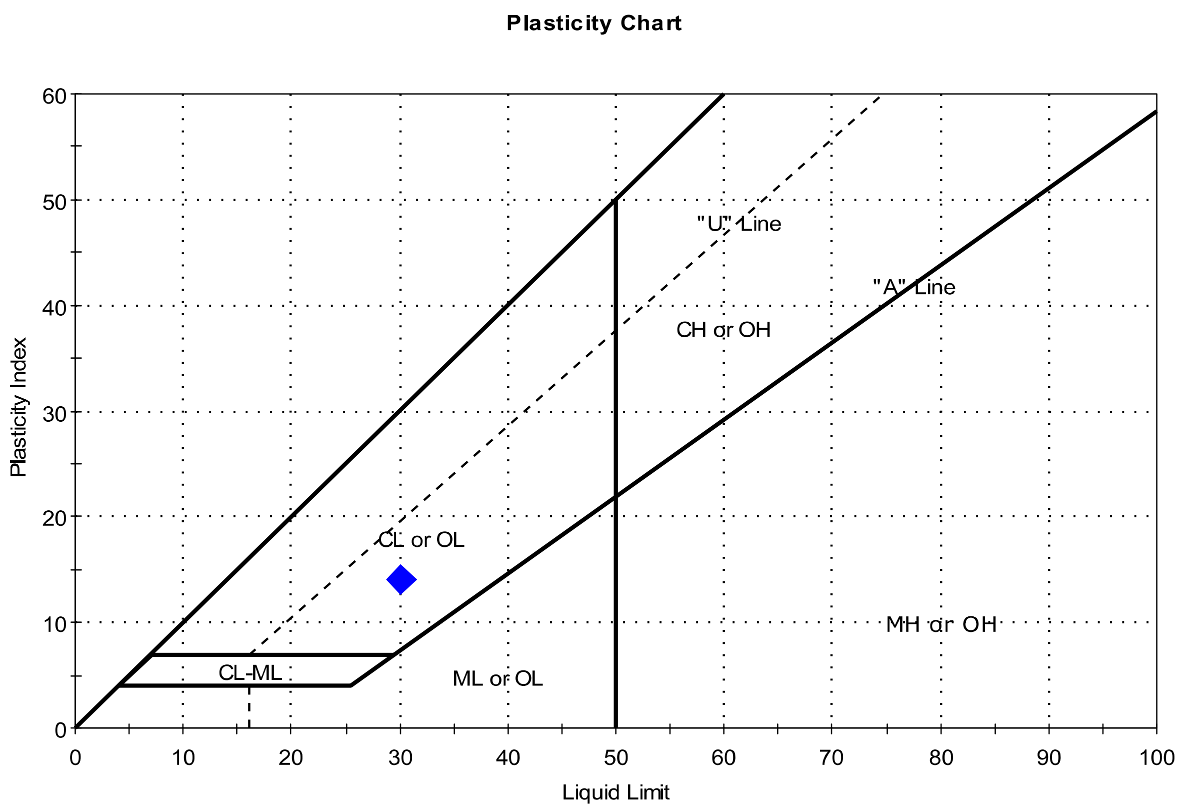
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	BB-C295-207	Sample Type:	Jar	Tested By:	cam
Sample ID:	6D	Test Date:	05/10/24	Checked By:	ank
Depth :	15-17'	Test Id:	768000		
Test Comment:	---				
Visual Description:	Moist, gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	6D	3-C295-2(	15-17'	35	30	16	14	1.4	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

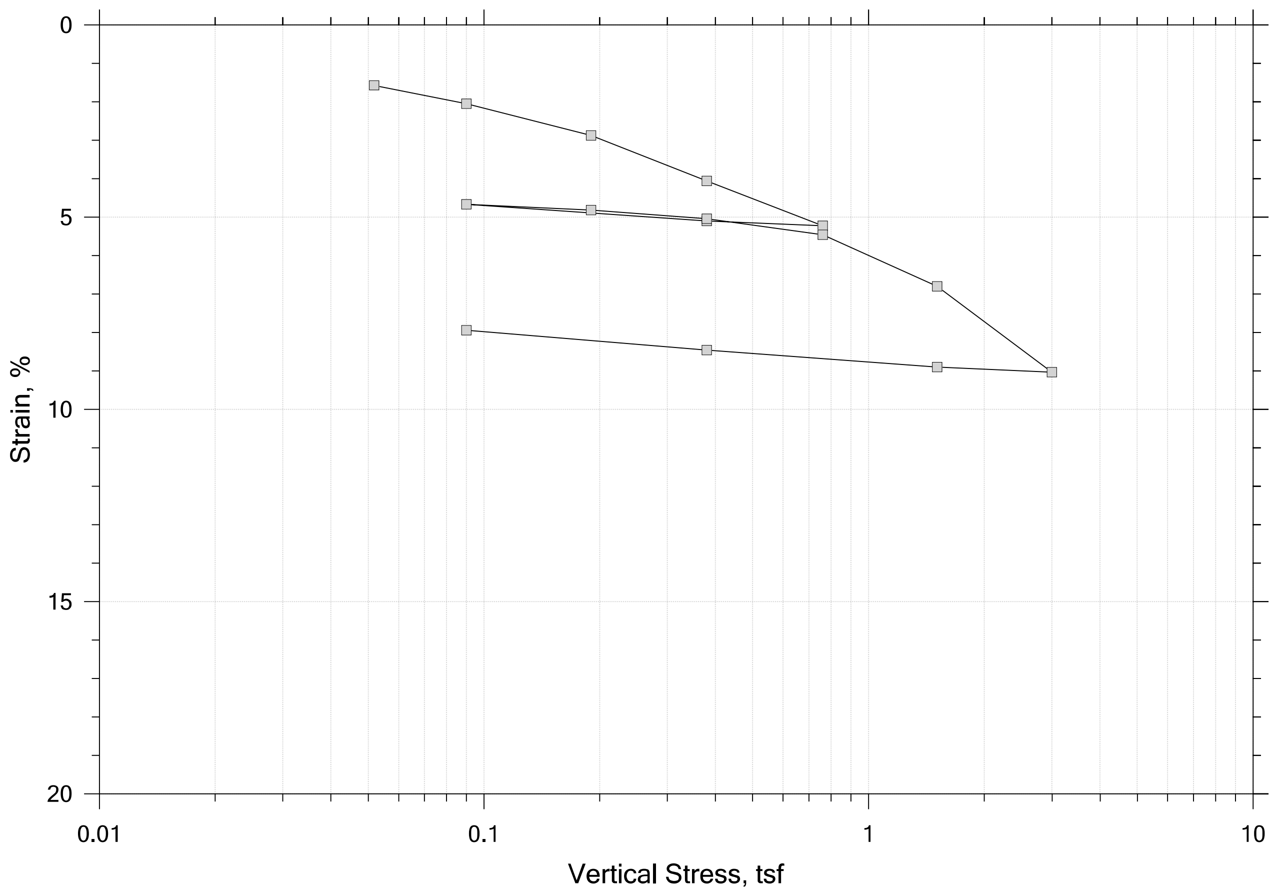
Dry Strength: VERY HIGH

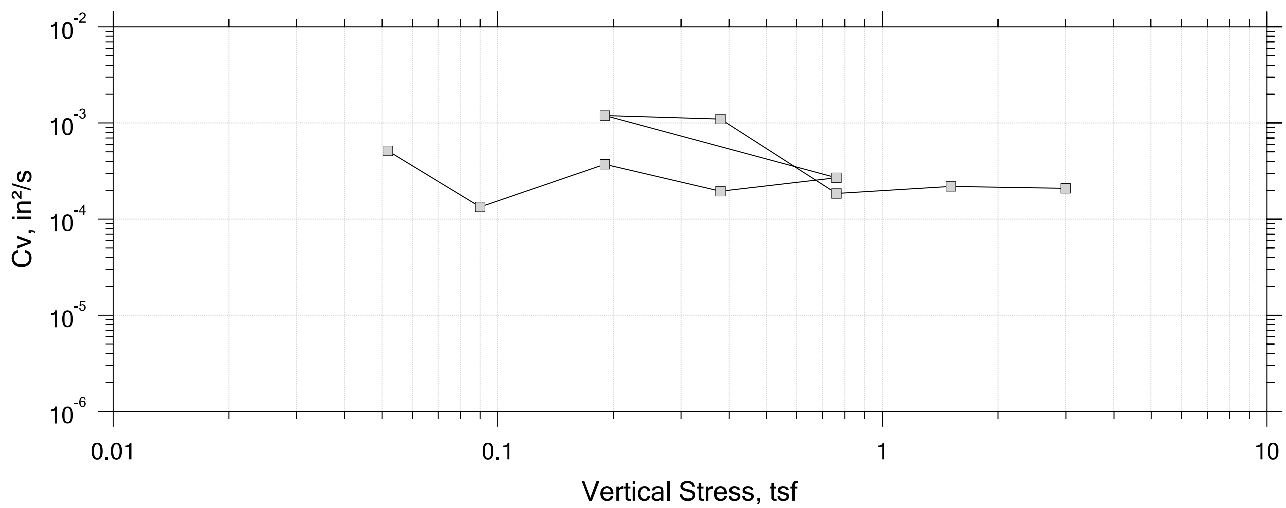
Dilatancy: SLOW

Toughness: LOW

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report

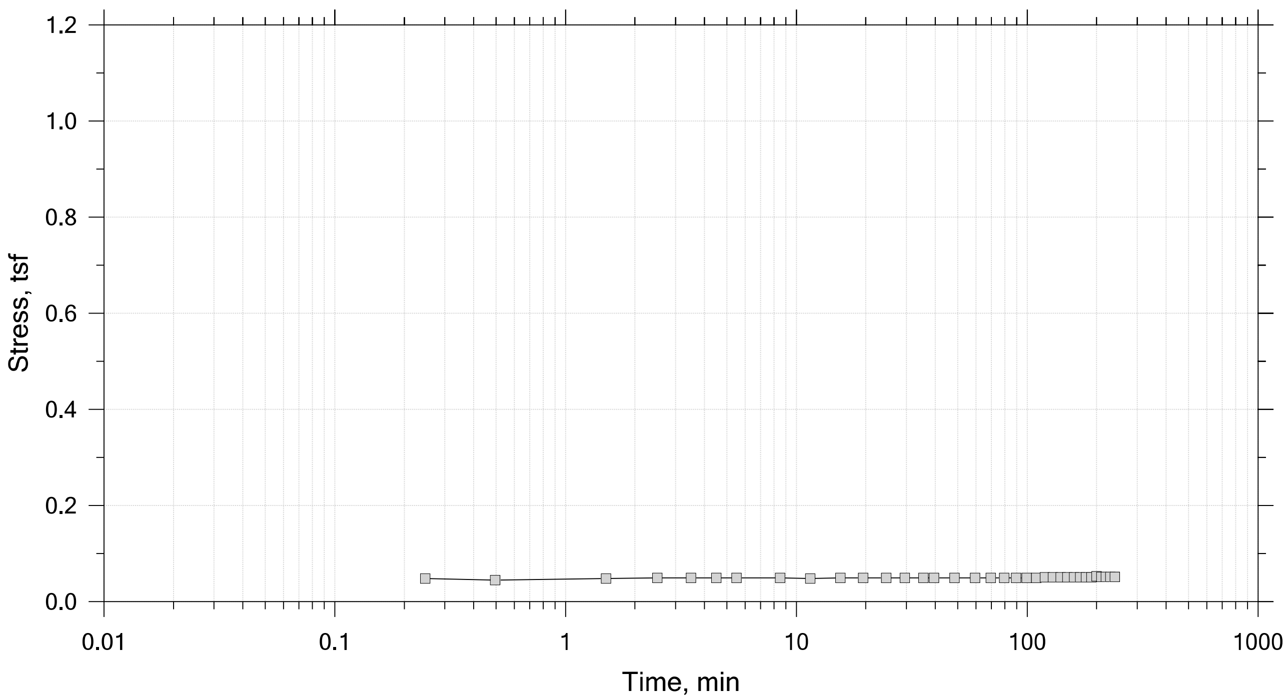


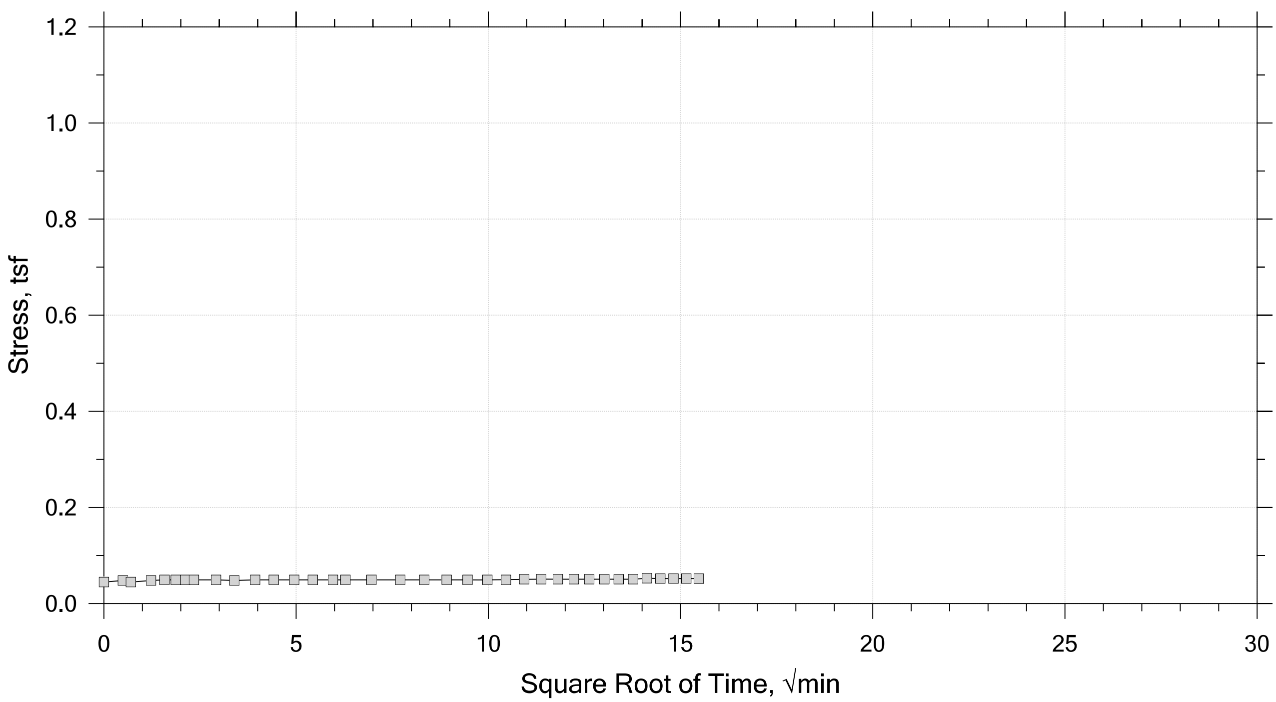


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15
Constant Volume Step
Stress: 0.0518 tsf

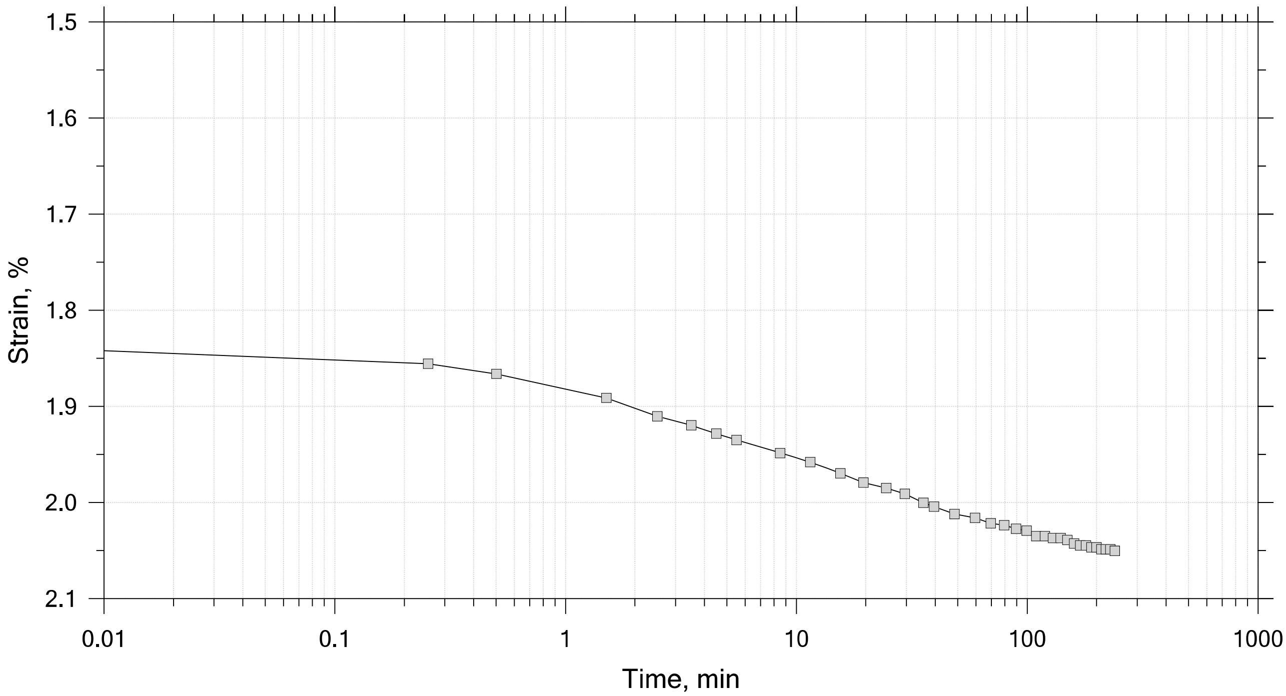


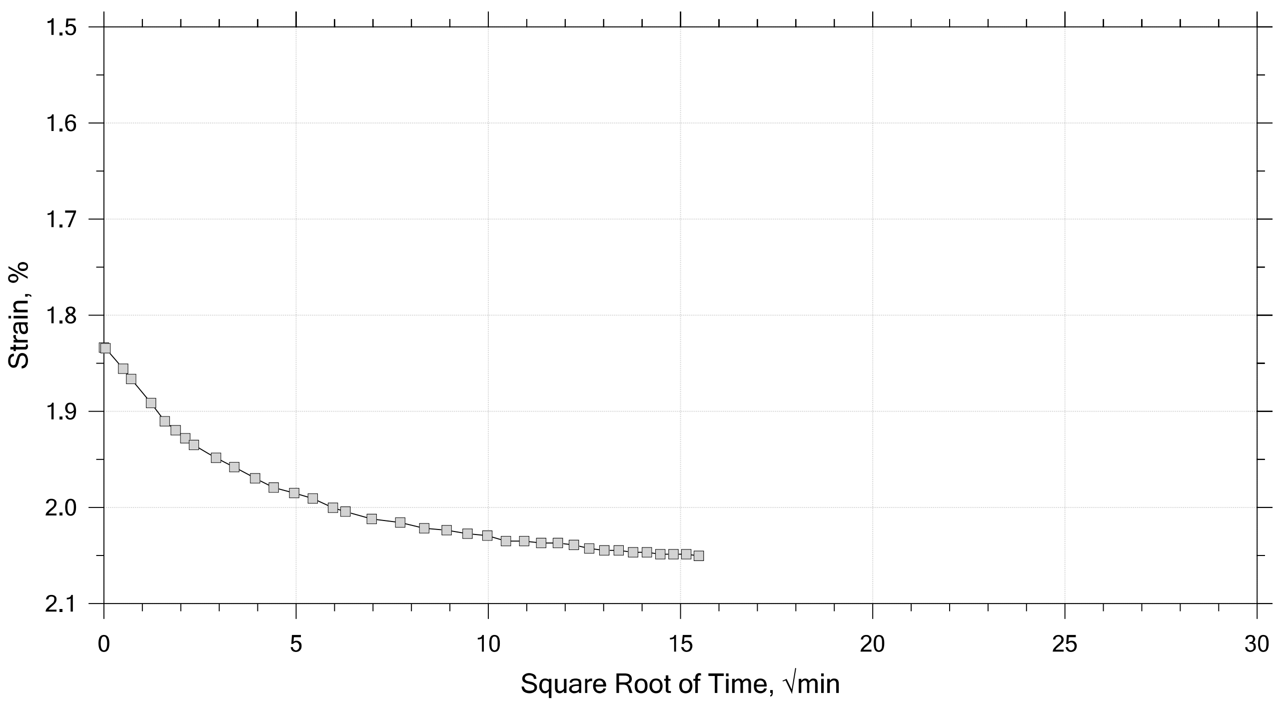


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15
Constant Load Step
Stress: 0.09 tsf





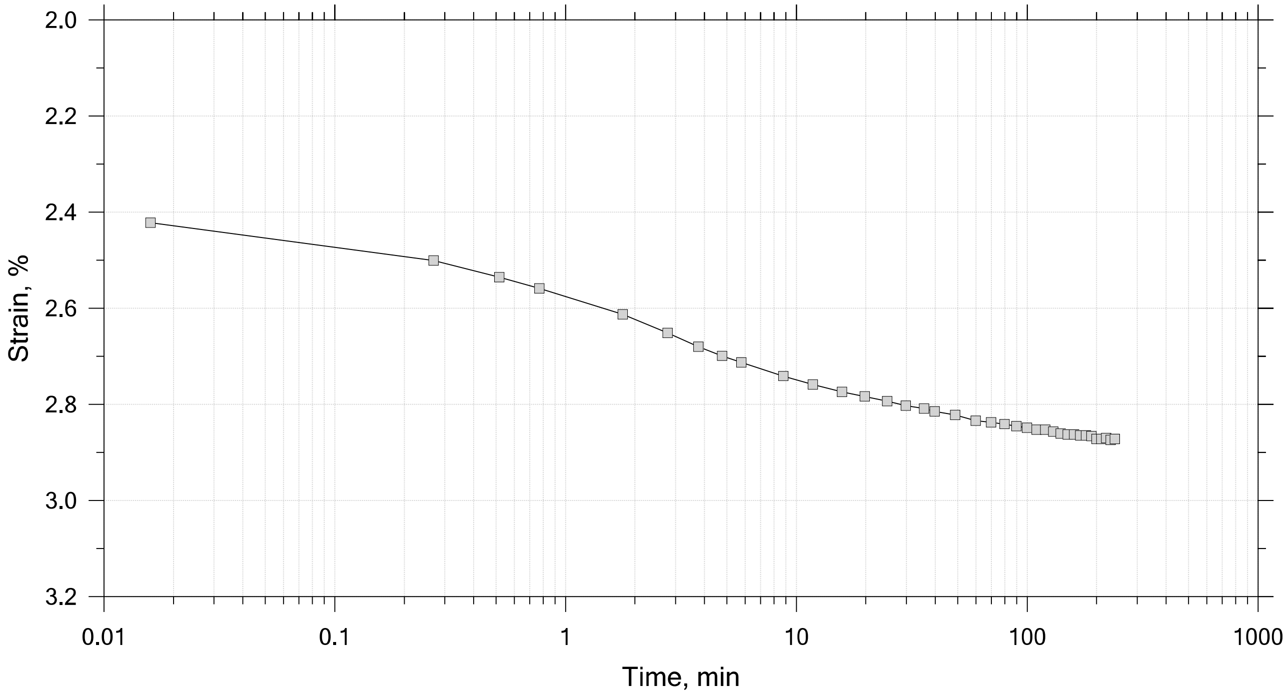
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

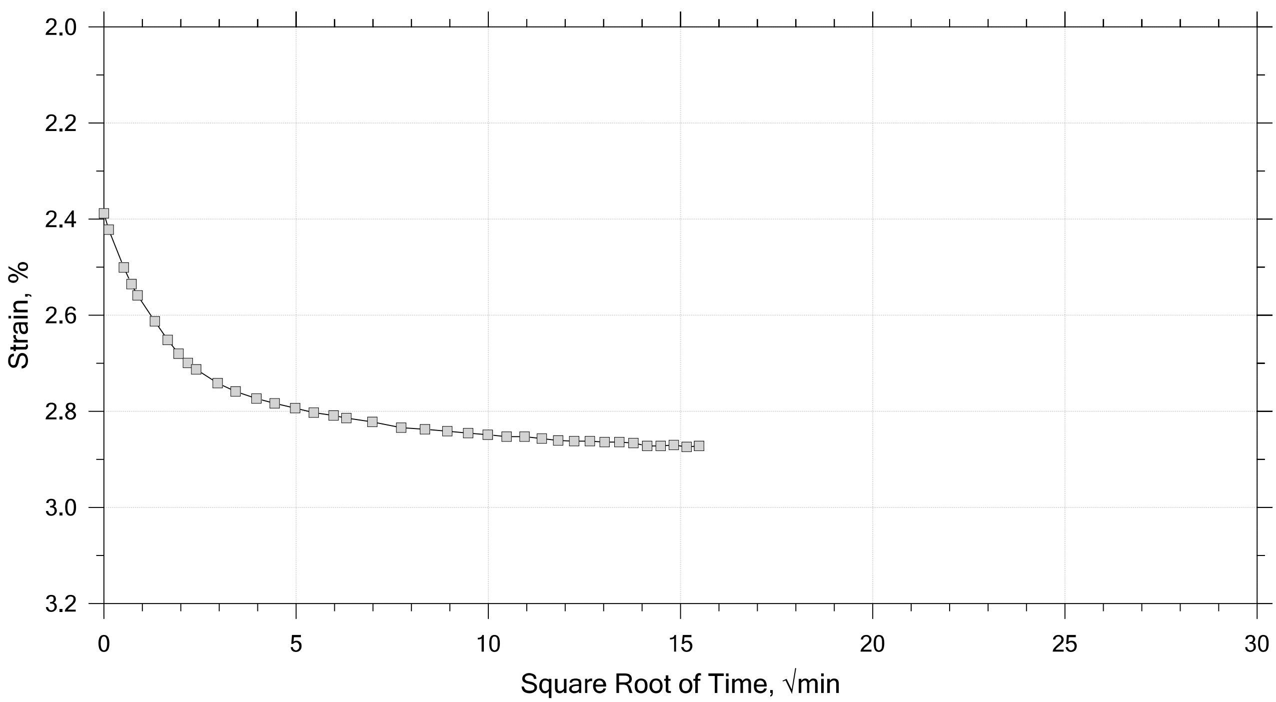
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15

Constant Load Step

Stress: 0.19 tsf

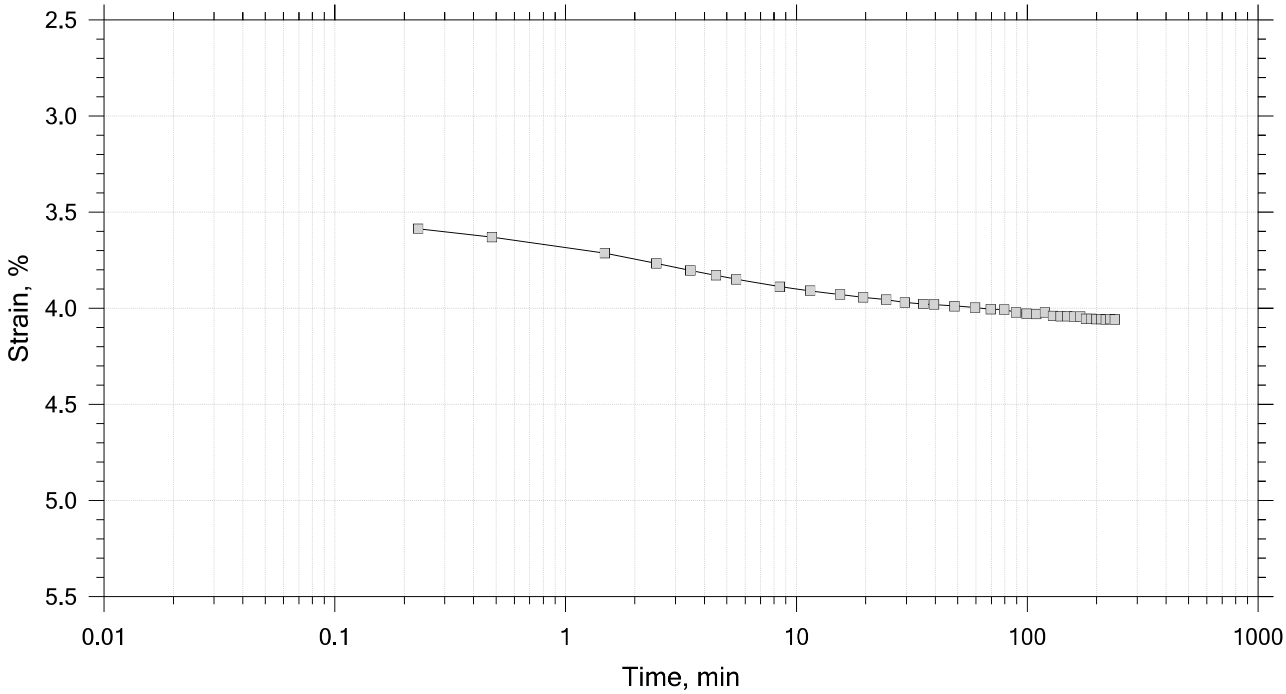


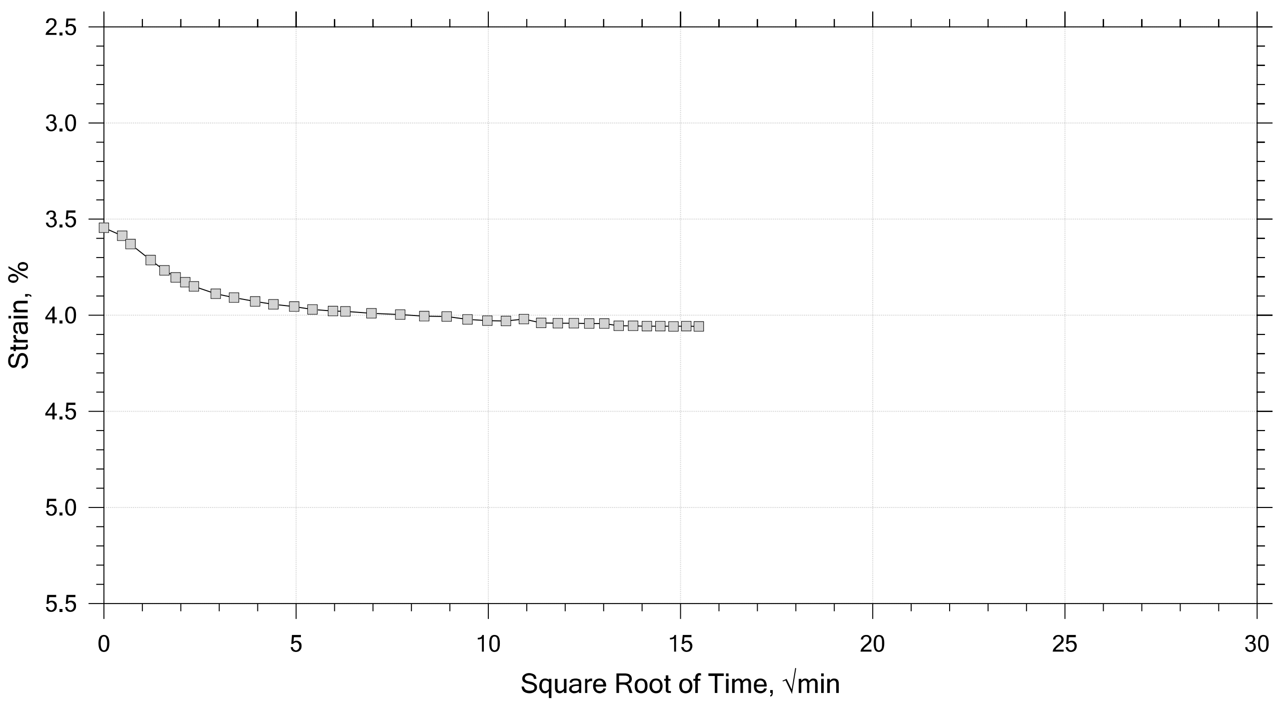


GeoTesting EXPRESS			
	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15
Constant Load Step
Stress: 0.38 tsf





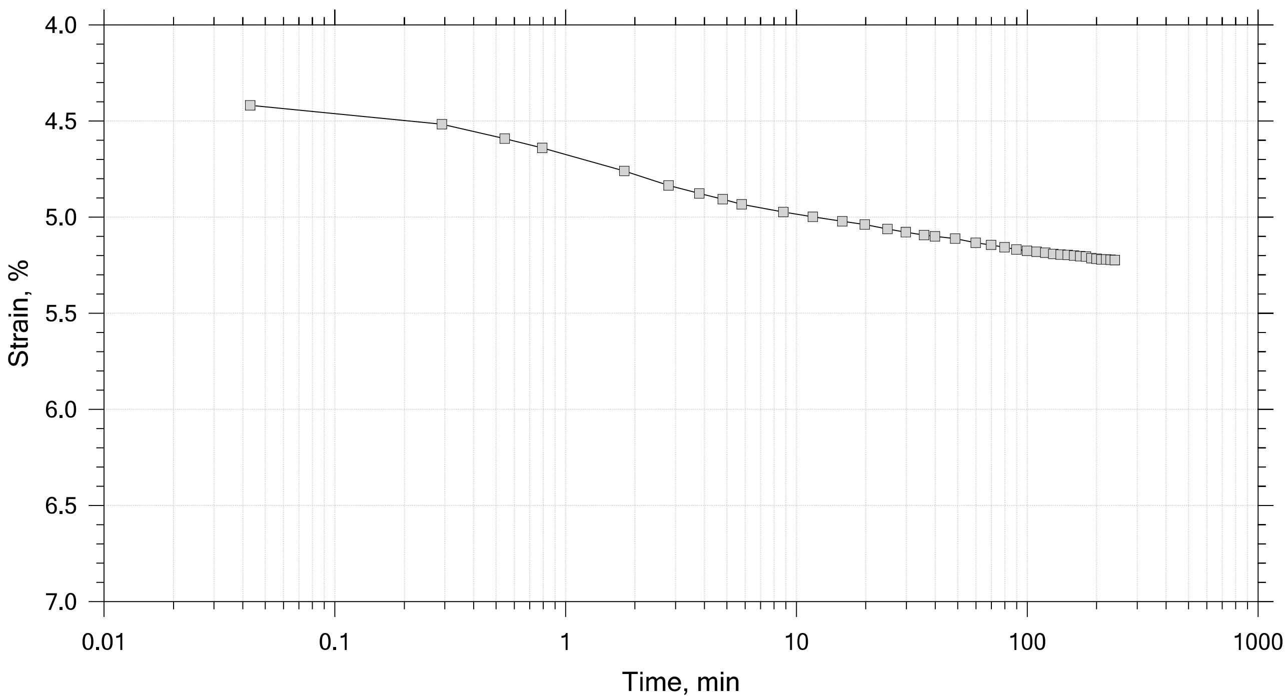
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

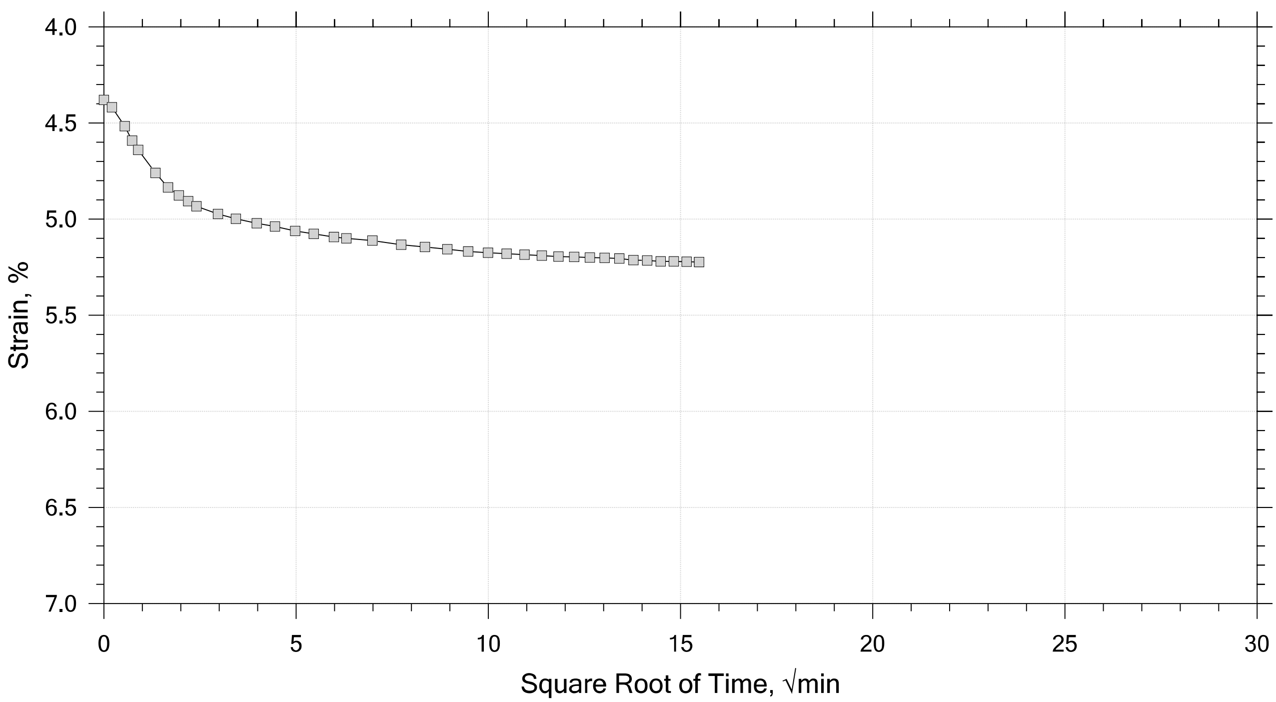
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15

Constant Load Step

Stress: 0.76 tsf





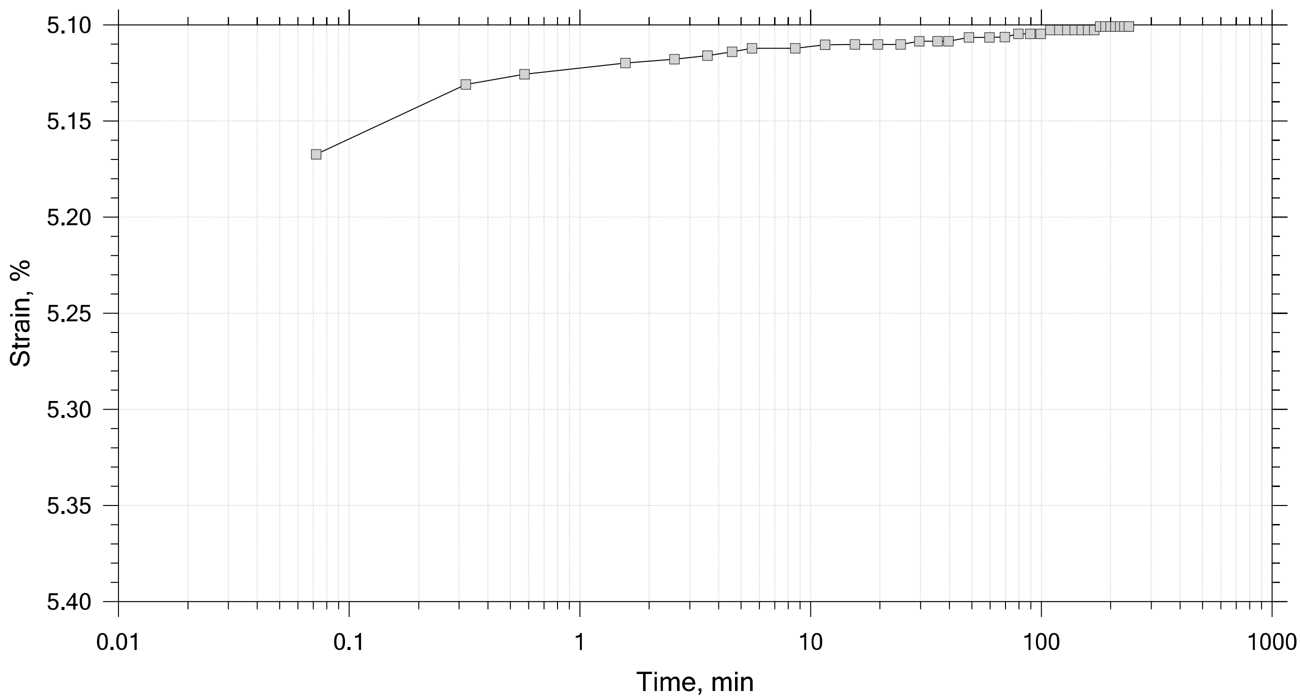
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

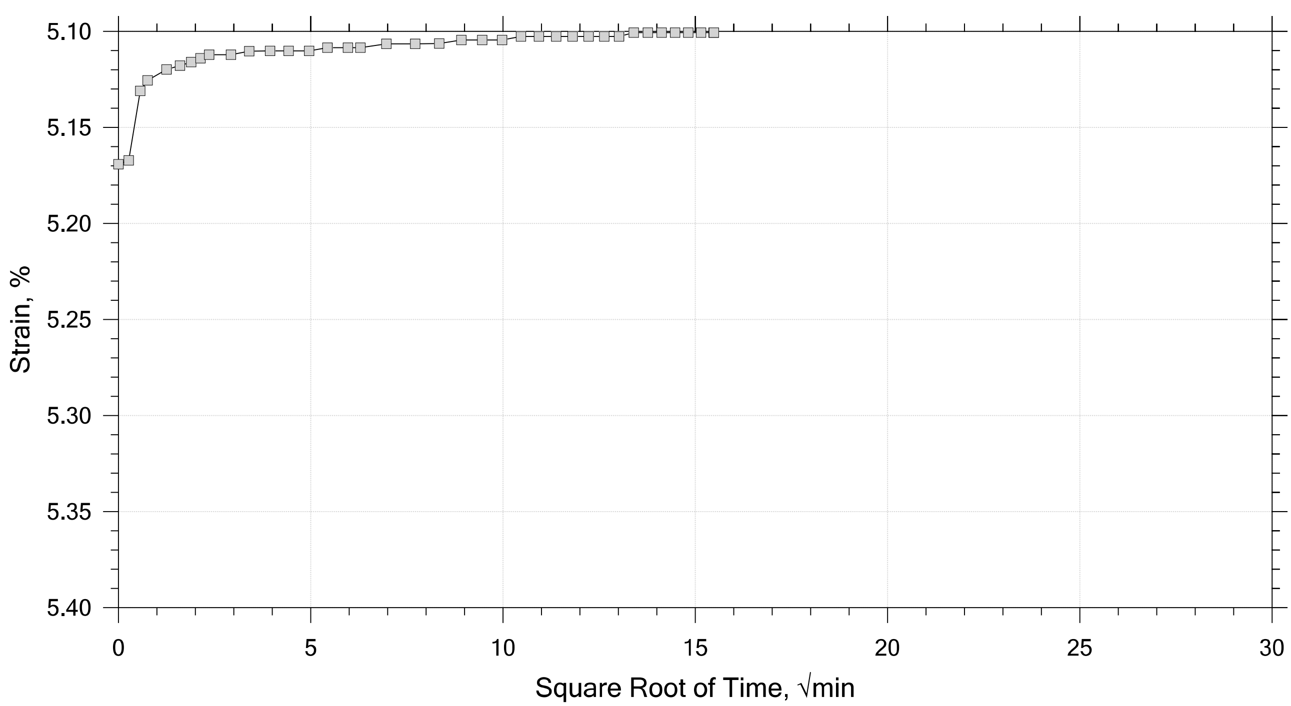
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15

Constant Load Step

Stress: 0.38 tsf





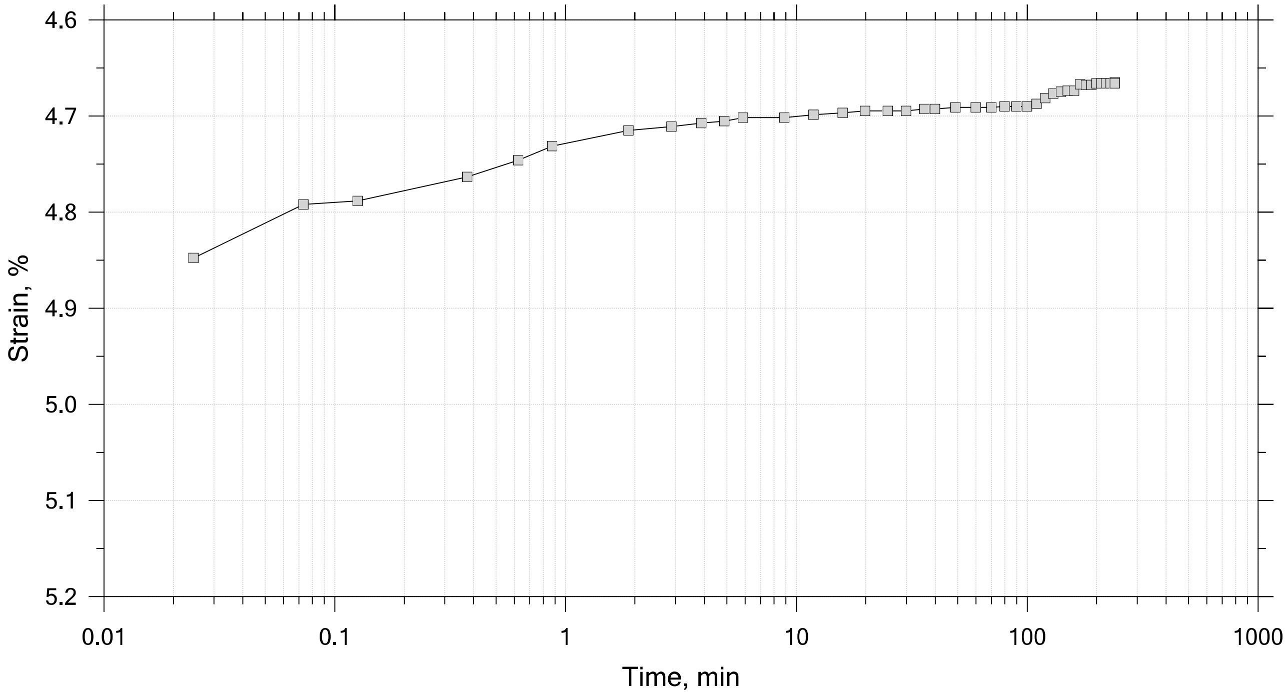
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

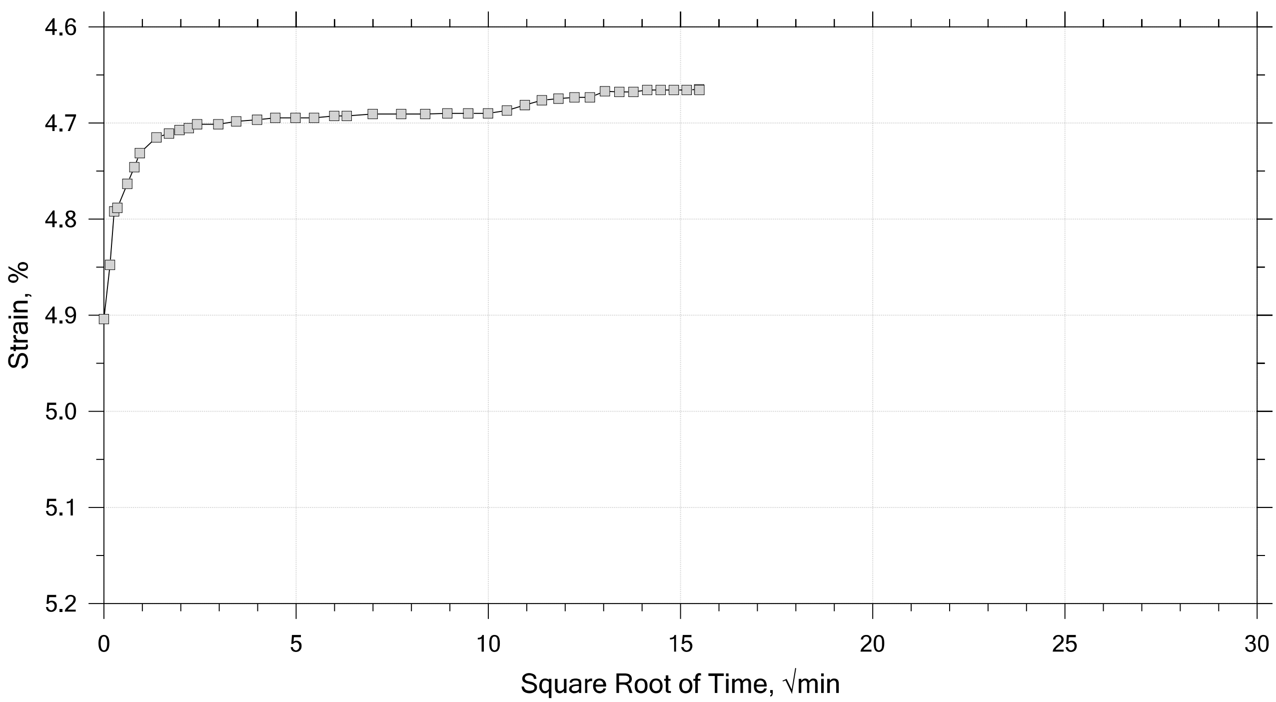
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15

Constant Load Step

Stress: 0.09 tsf





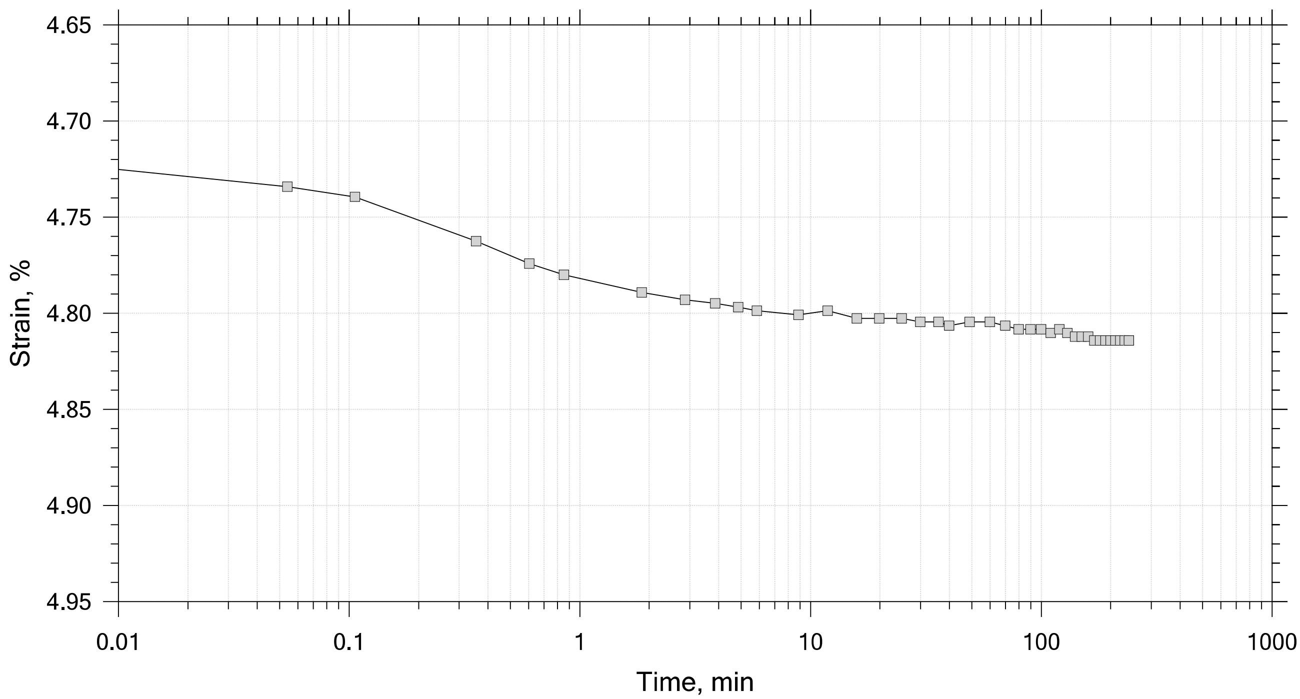
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

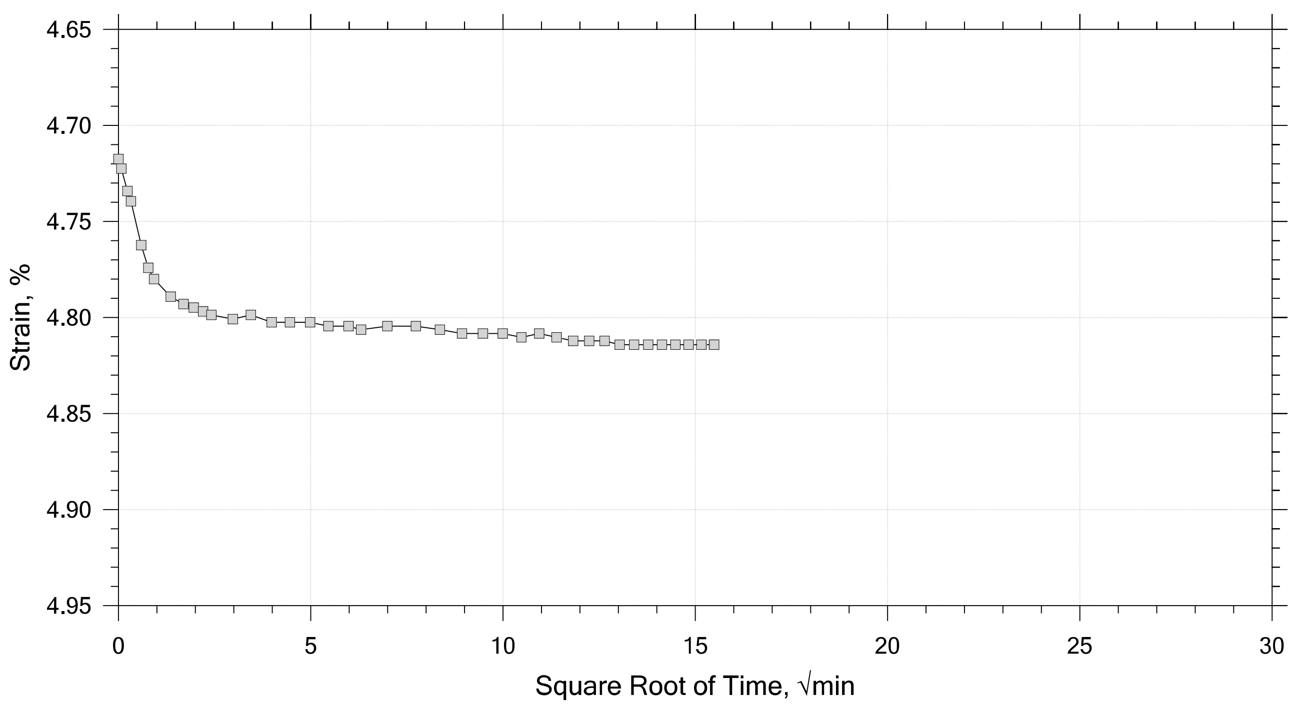
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15

Constant Load Step

Stress: 0.19 tsf

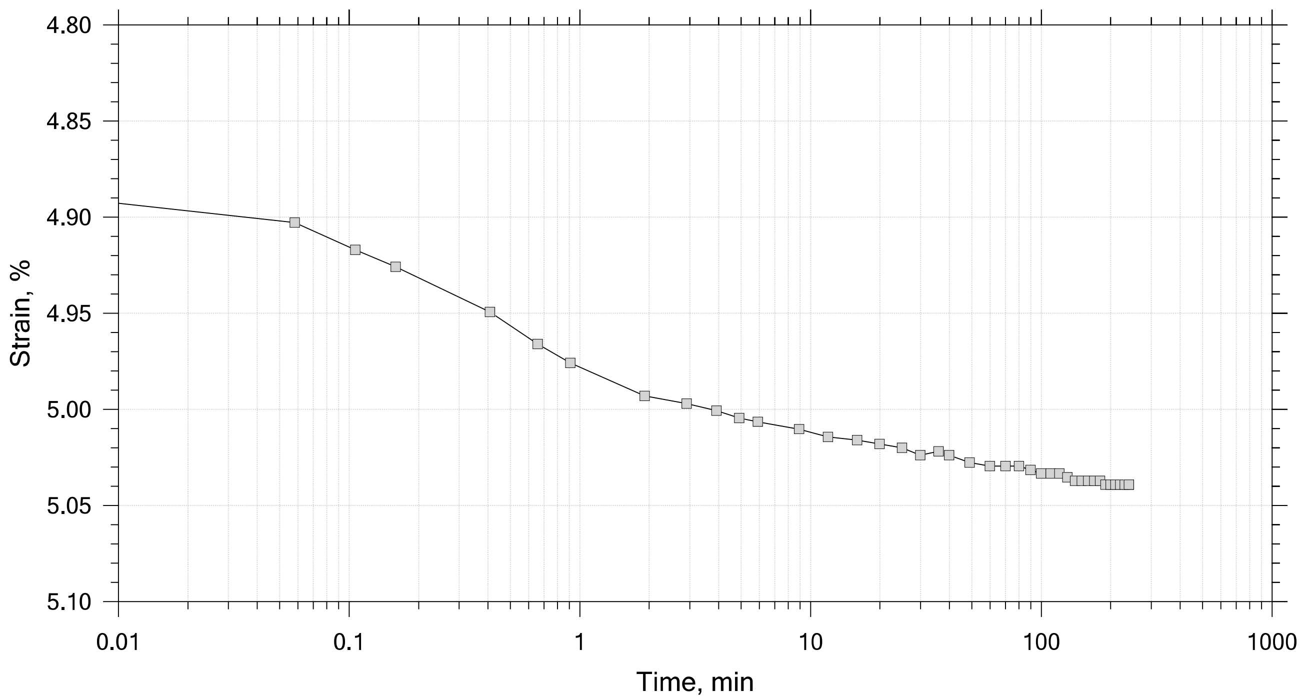


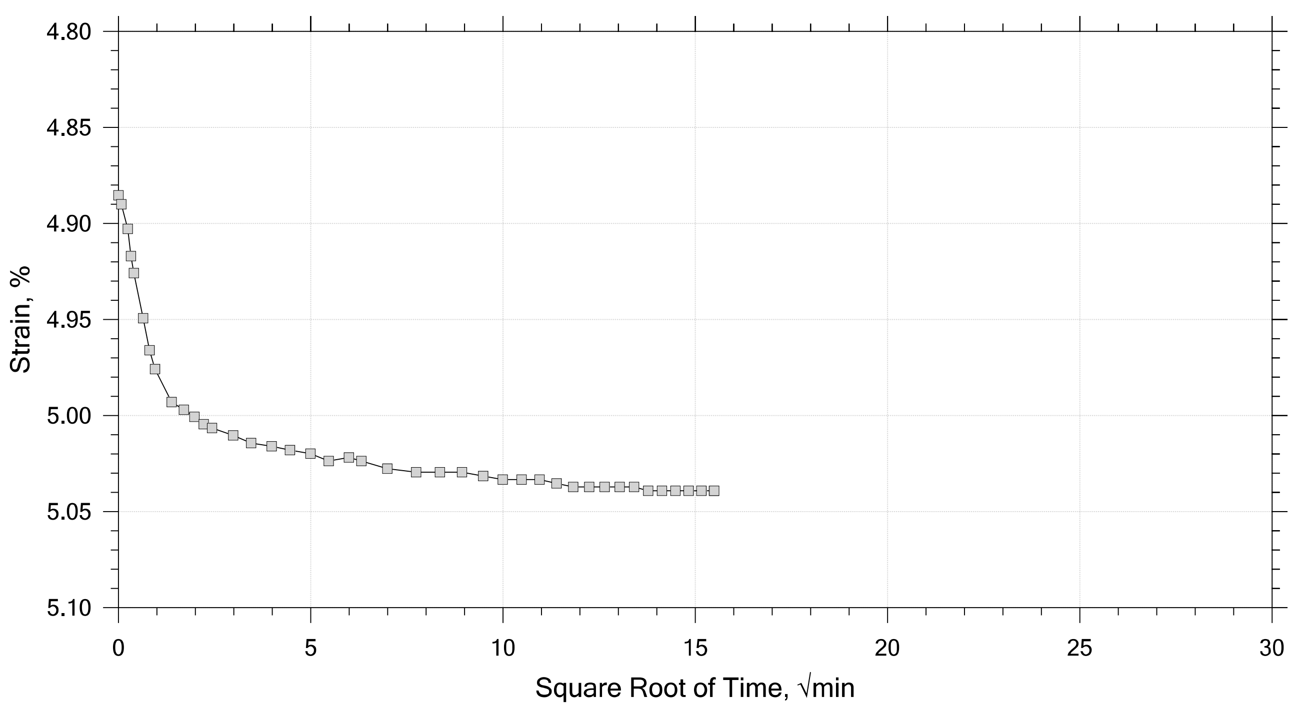


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15
Constant Load Step
Stress: 0.38 tsf

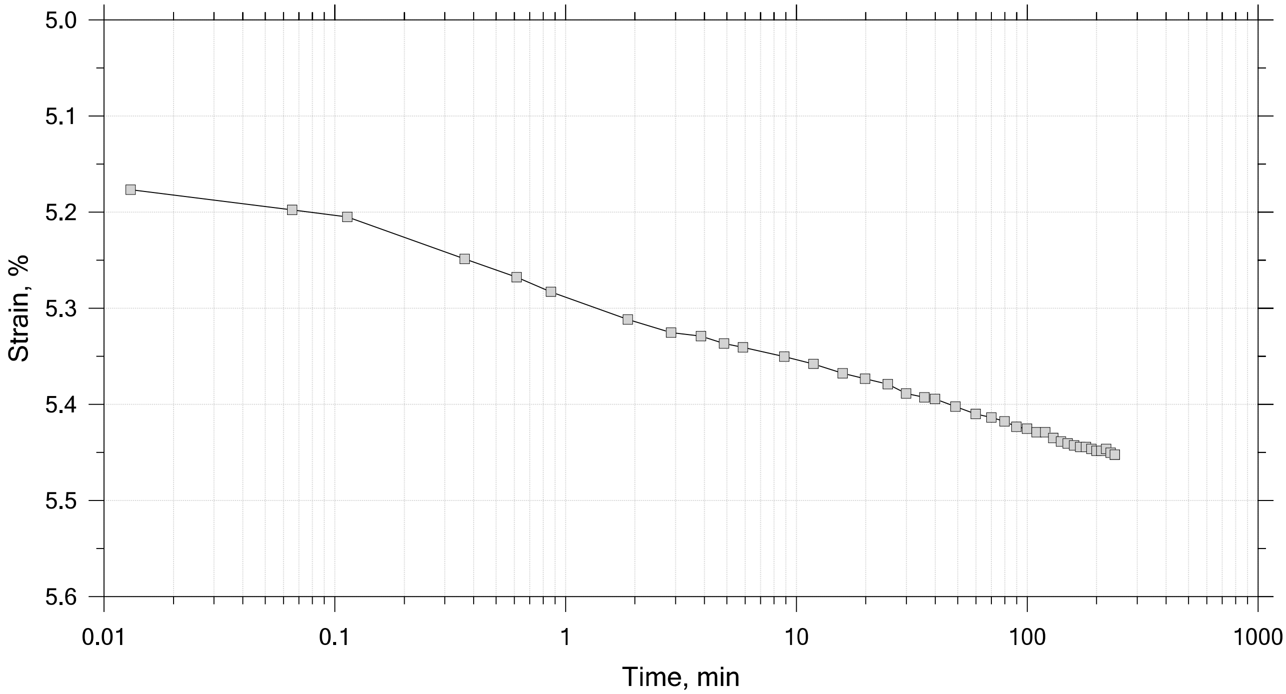


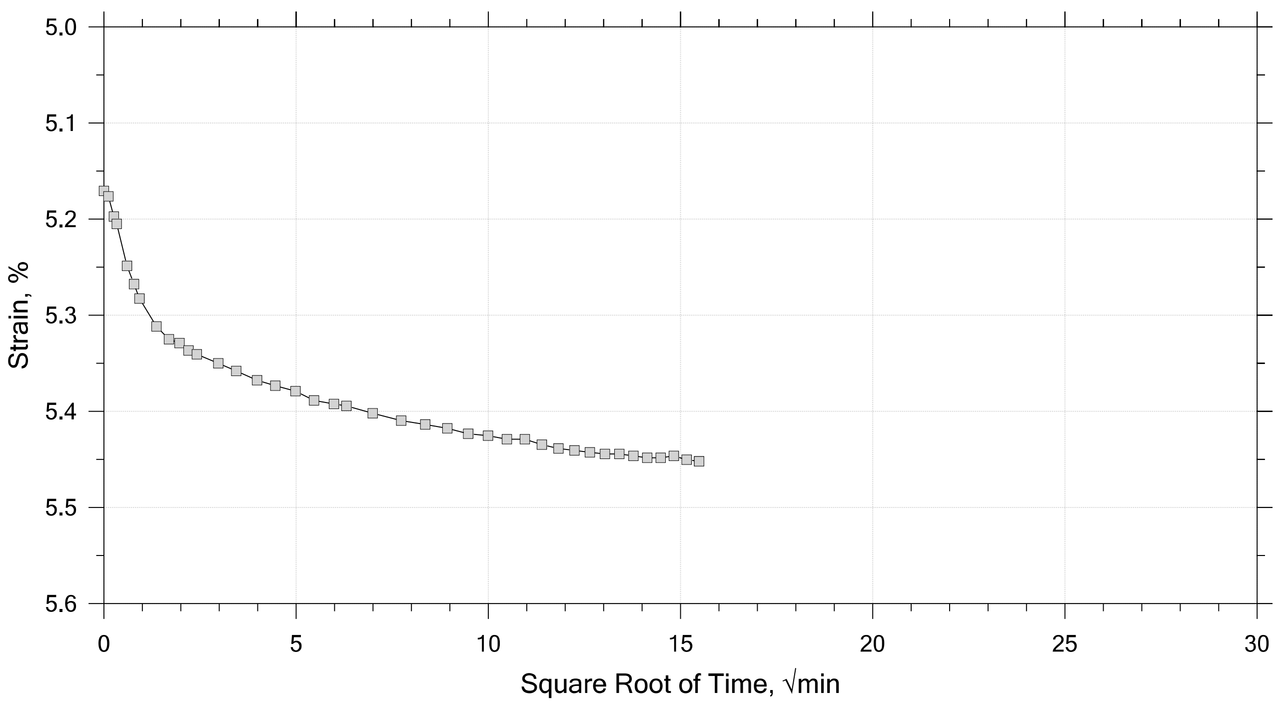


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15
Constant Load Step
Stress: 0.76 tsf

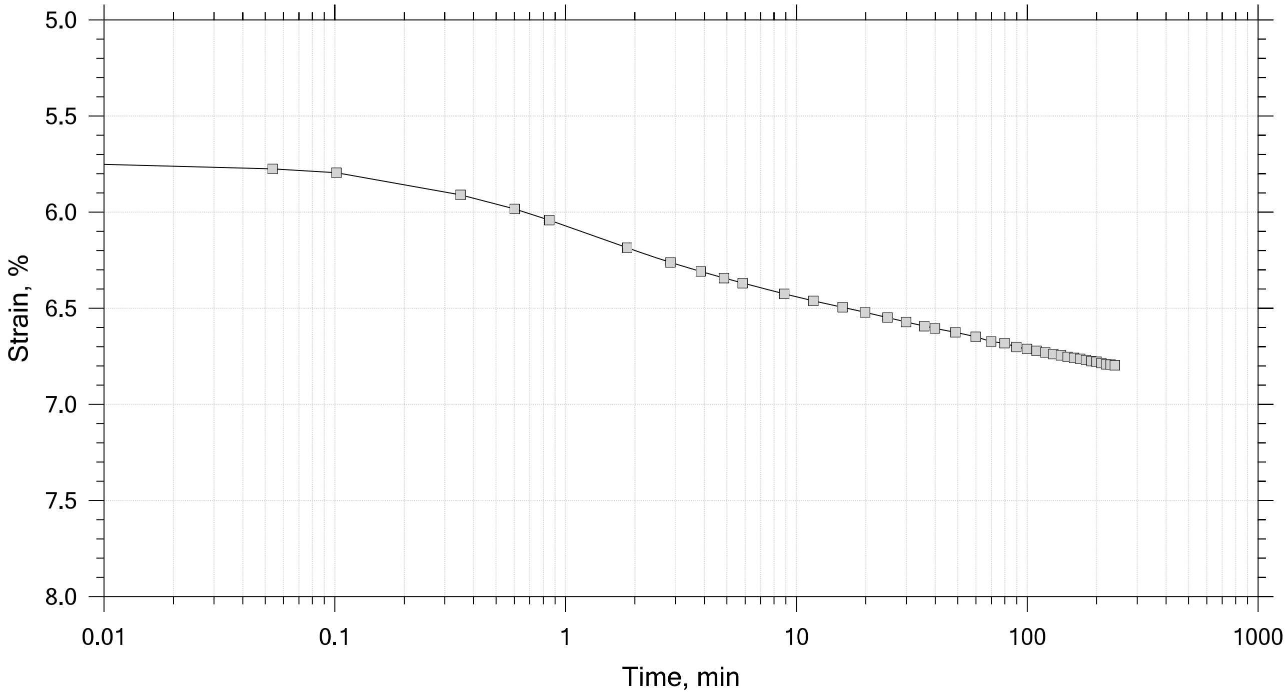


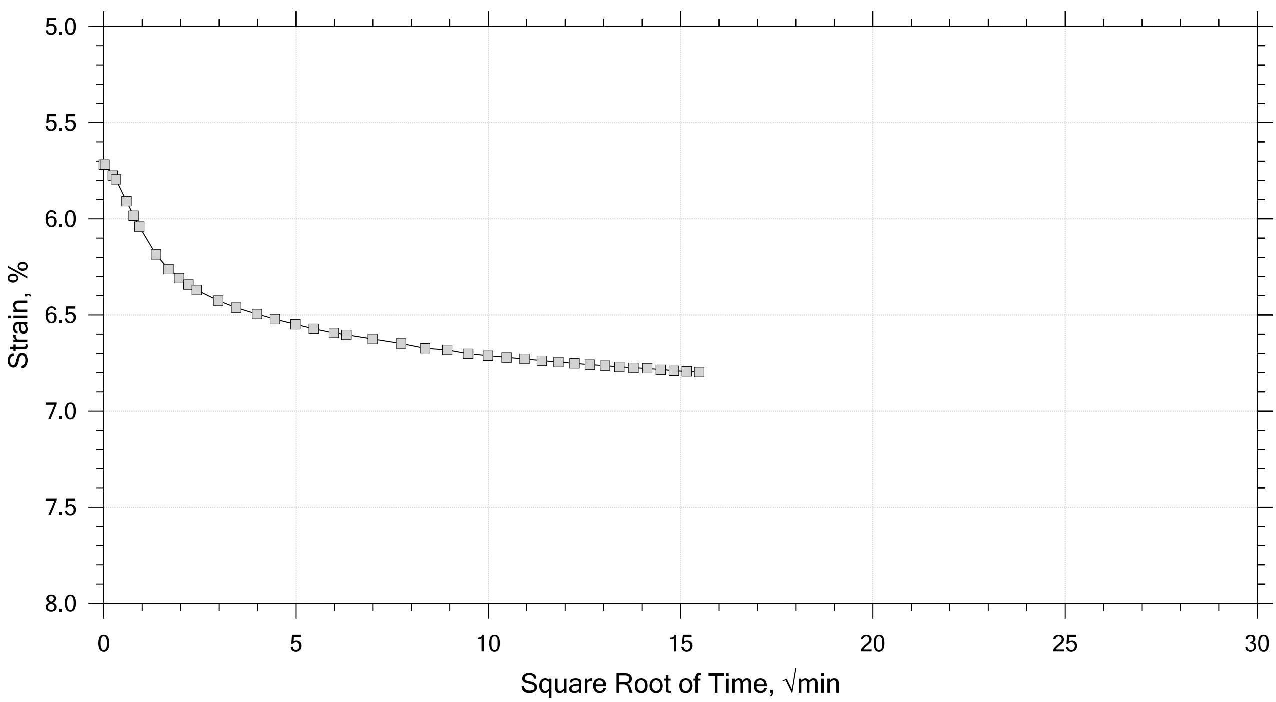


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15
Constant Load Step
Stress: 1.51 tsf

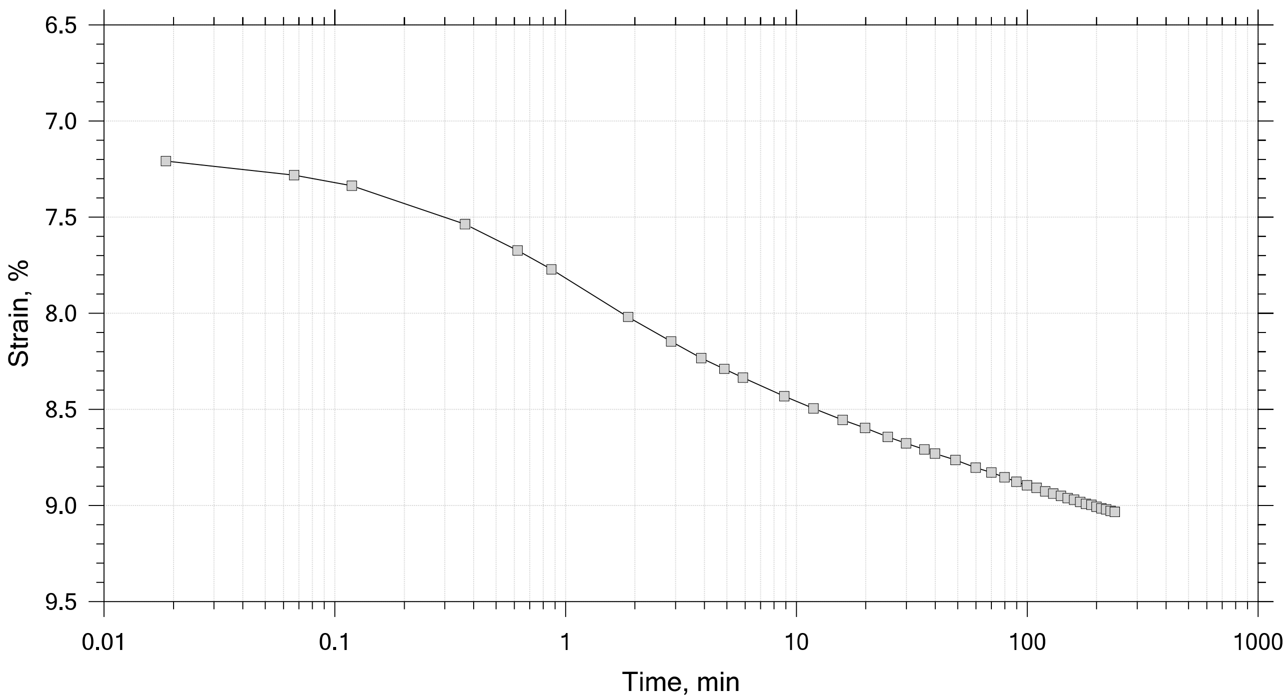


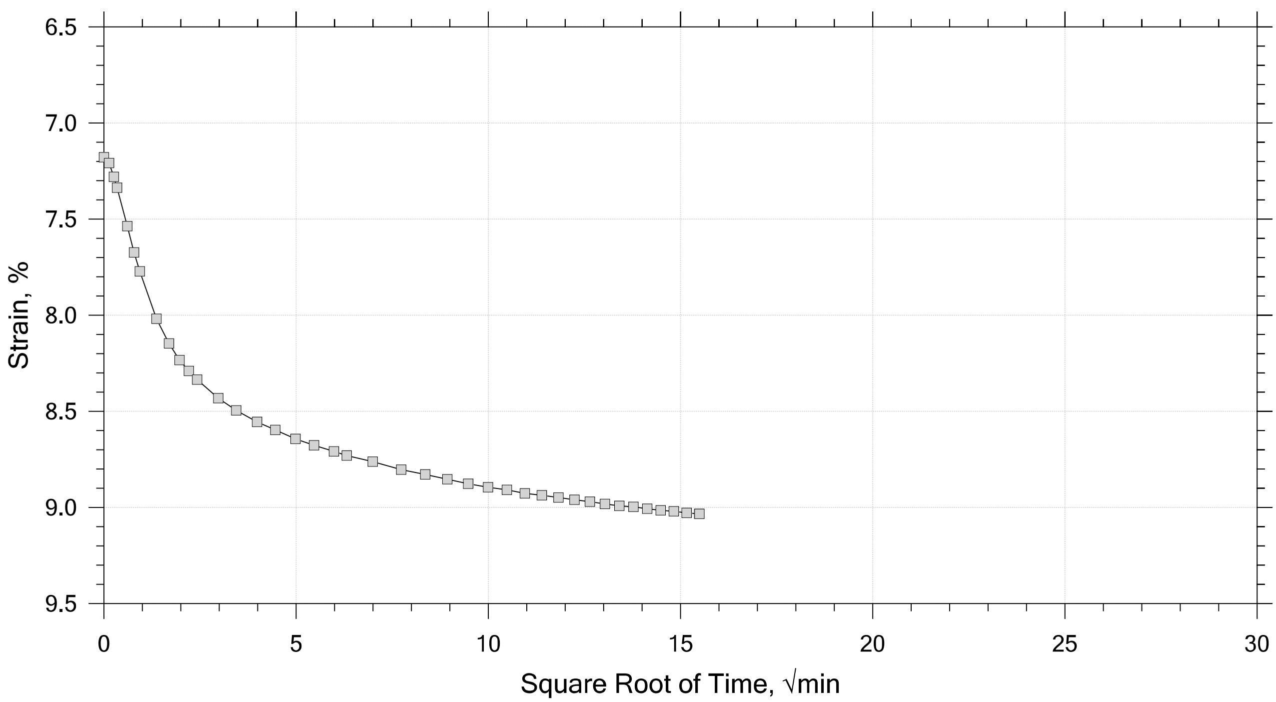


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15
Constant Load Step
Stress: 3 tsf





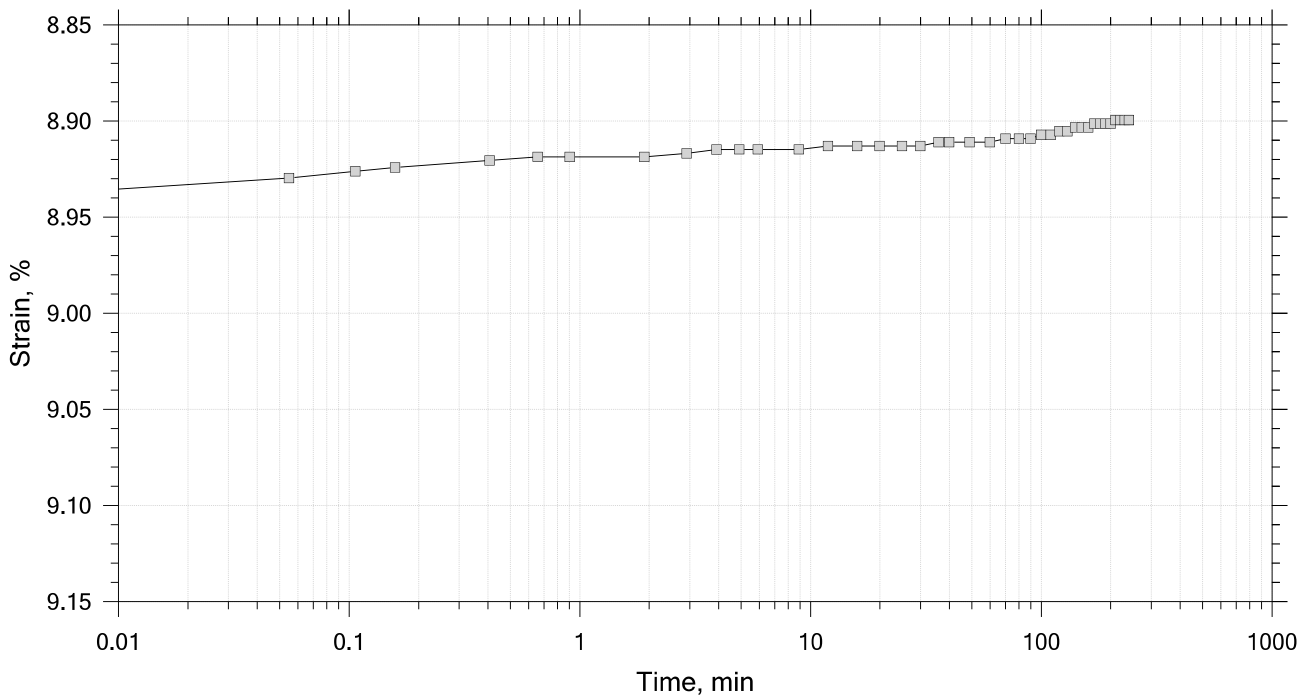
	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
GeoTesting EXPRESS	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

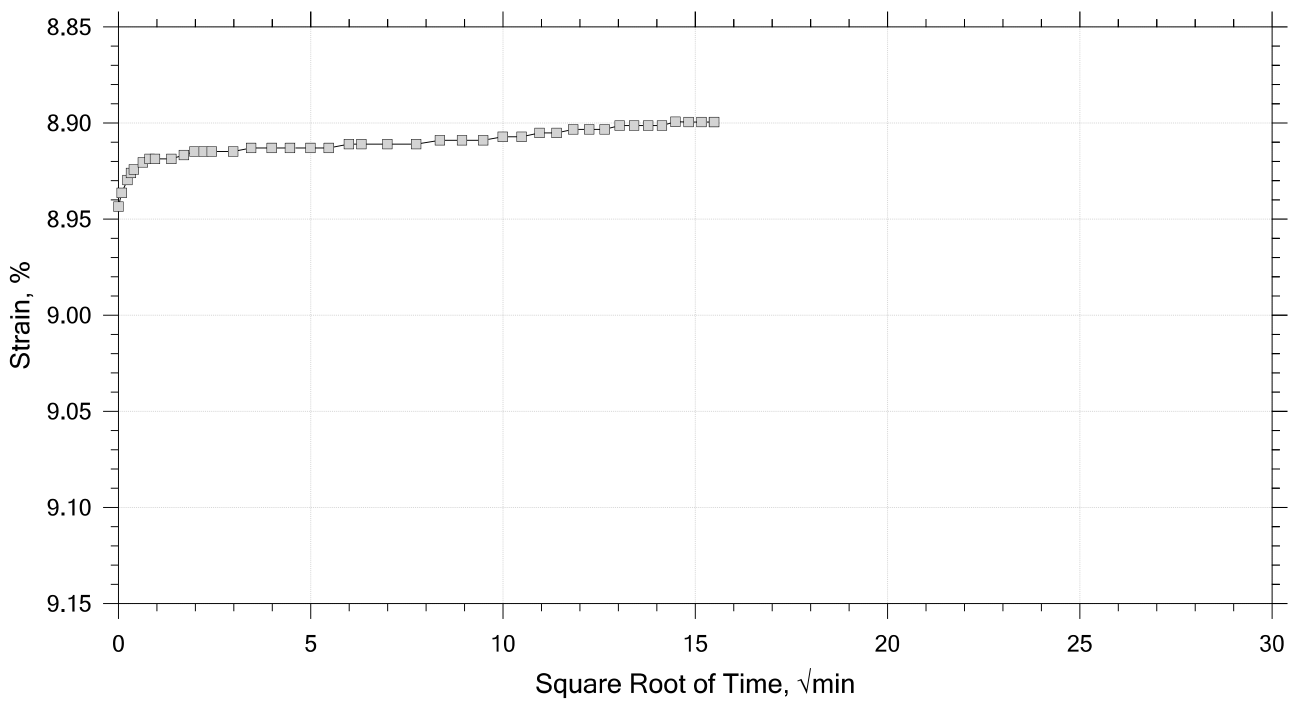
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15

Constant Load Step

Stress: 1.51 tsf

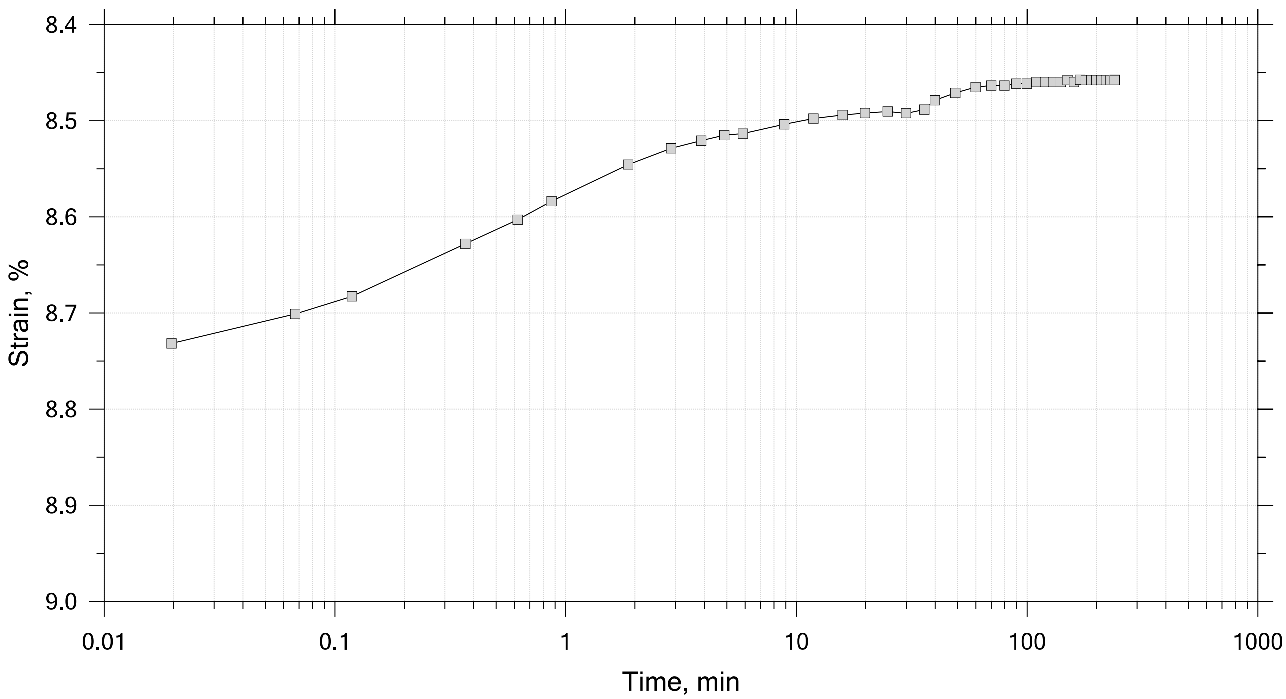


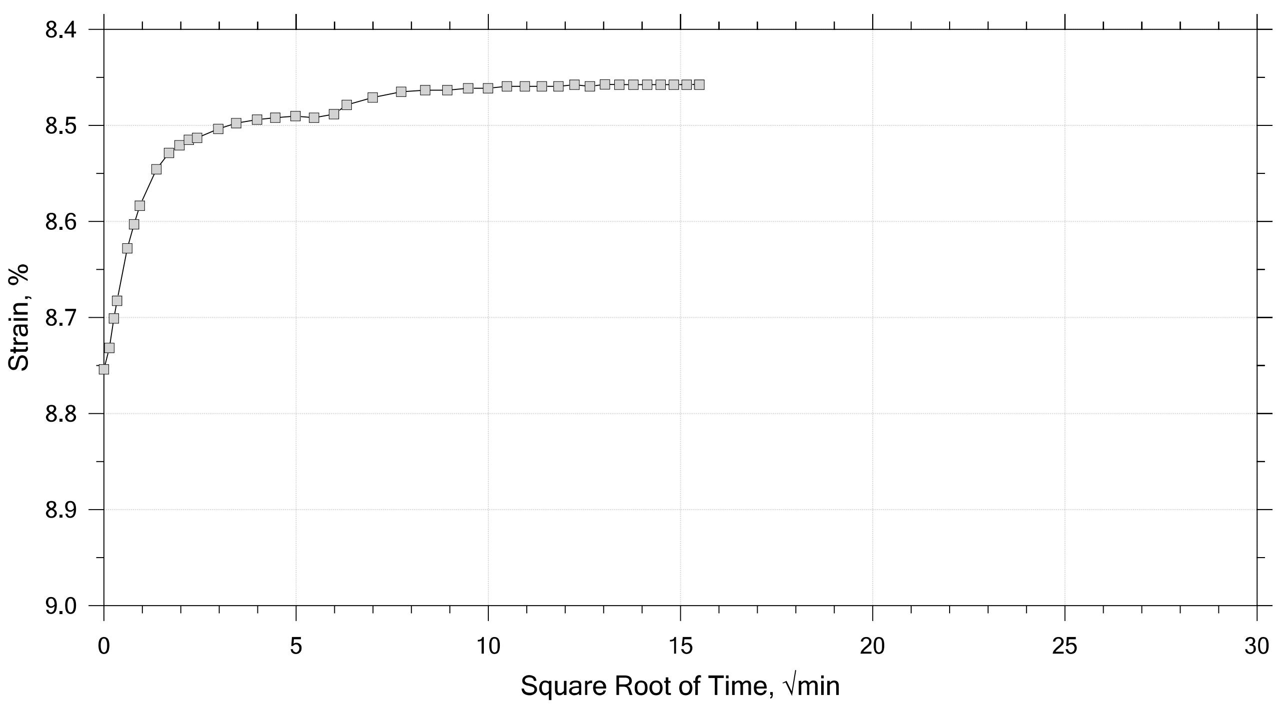


	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
GeoTesting EXPRESS A SOVEZL COMPANY	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15
Constant Load Step
Stress: 0.38 tsf





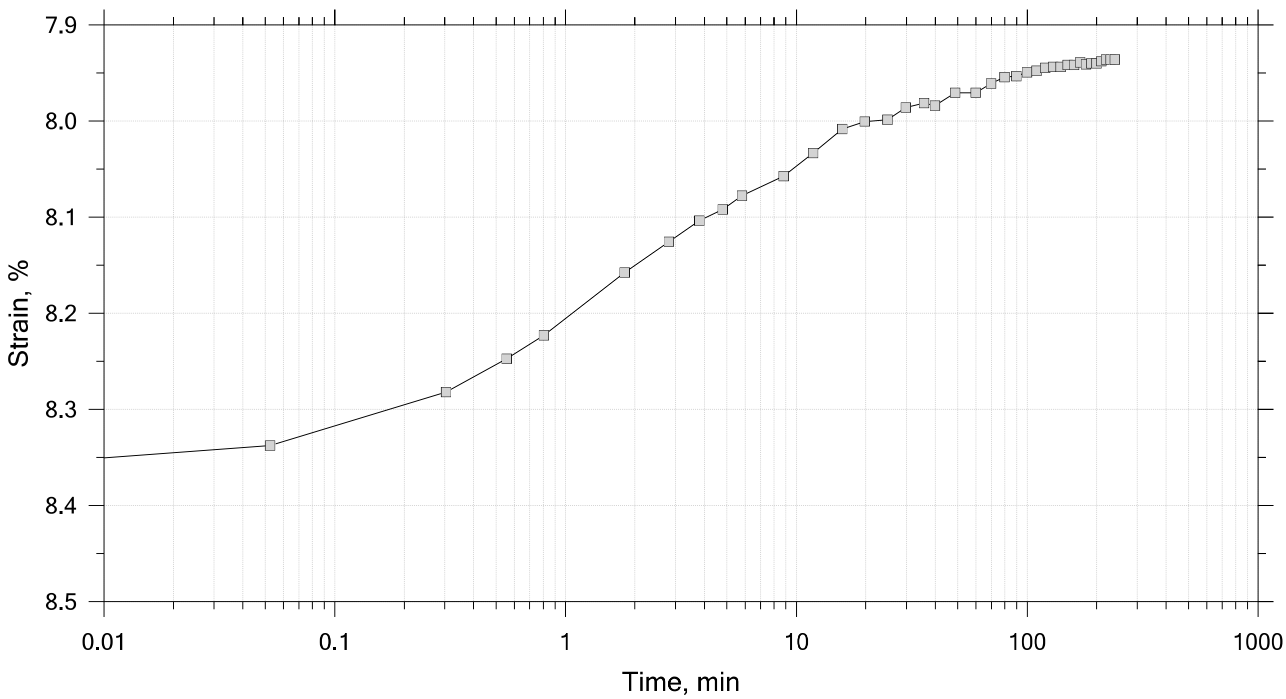
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

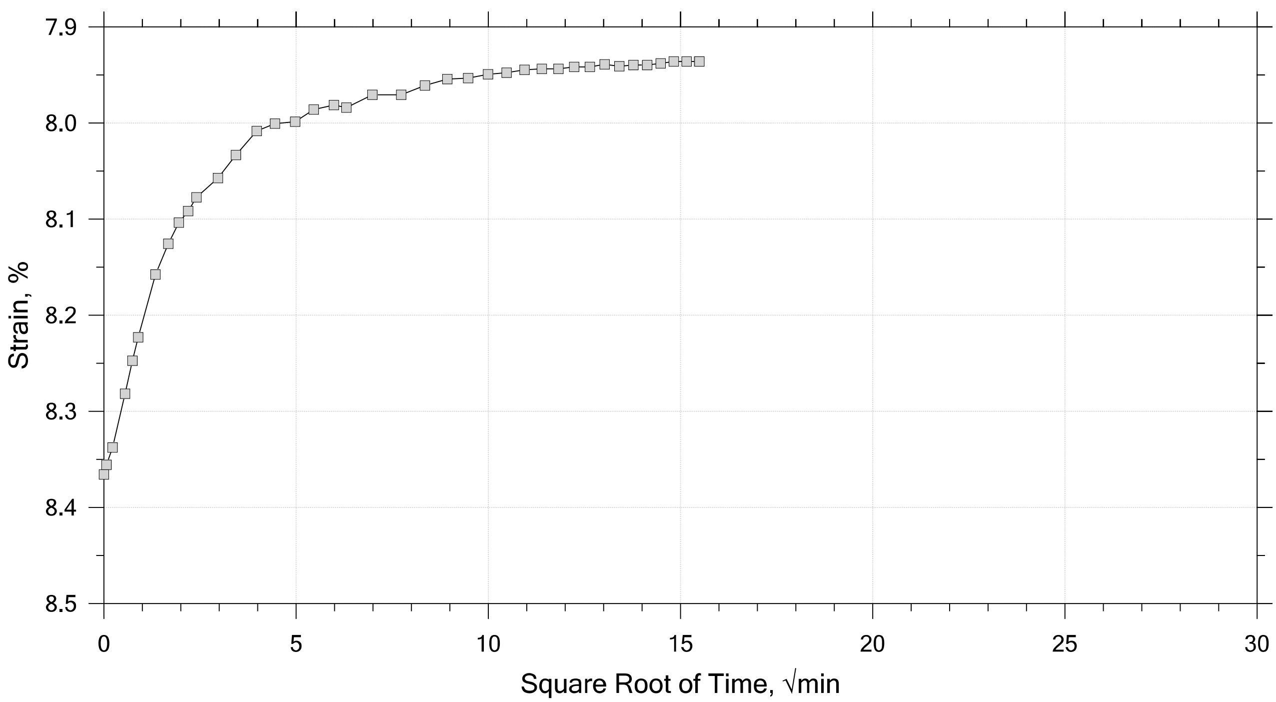
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15

Constant Load Step

Stress: 0.09 tsf





GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.76	Liquid Limit: 37
Initial Height: 1.00 in	Initial Void Ratio: 0.756	Plastic Limit: 24
Final Height: 0.88 in	Final Void Ratio: 0.545	Plasticity Index: 13

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	E9867	RING		E9726
Mass Container, gm	8.32	108.52	108.52	8.29
Mass Container + Wet Soil, gm	181.35	268.35	260	163.39
Mass Container + Dry Soil, gm	147.18	235.02	235.02	137.81
Mass Dry Soil, gm	138.86	126.5	126.5	129.52
Water Content, %	24.61	26.35	19.75	19.75
Void Ratio	---	0.76	0.55	---
Degree of Saturation, %	---	96.24	100.00	---
Dry Unit Weight, pcf	---	98.172	111.56	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS			
	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-201	Tested By: te	Checked By: anm
	Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

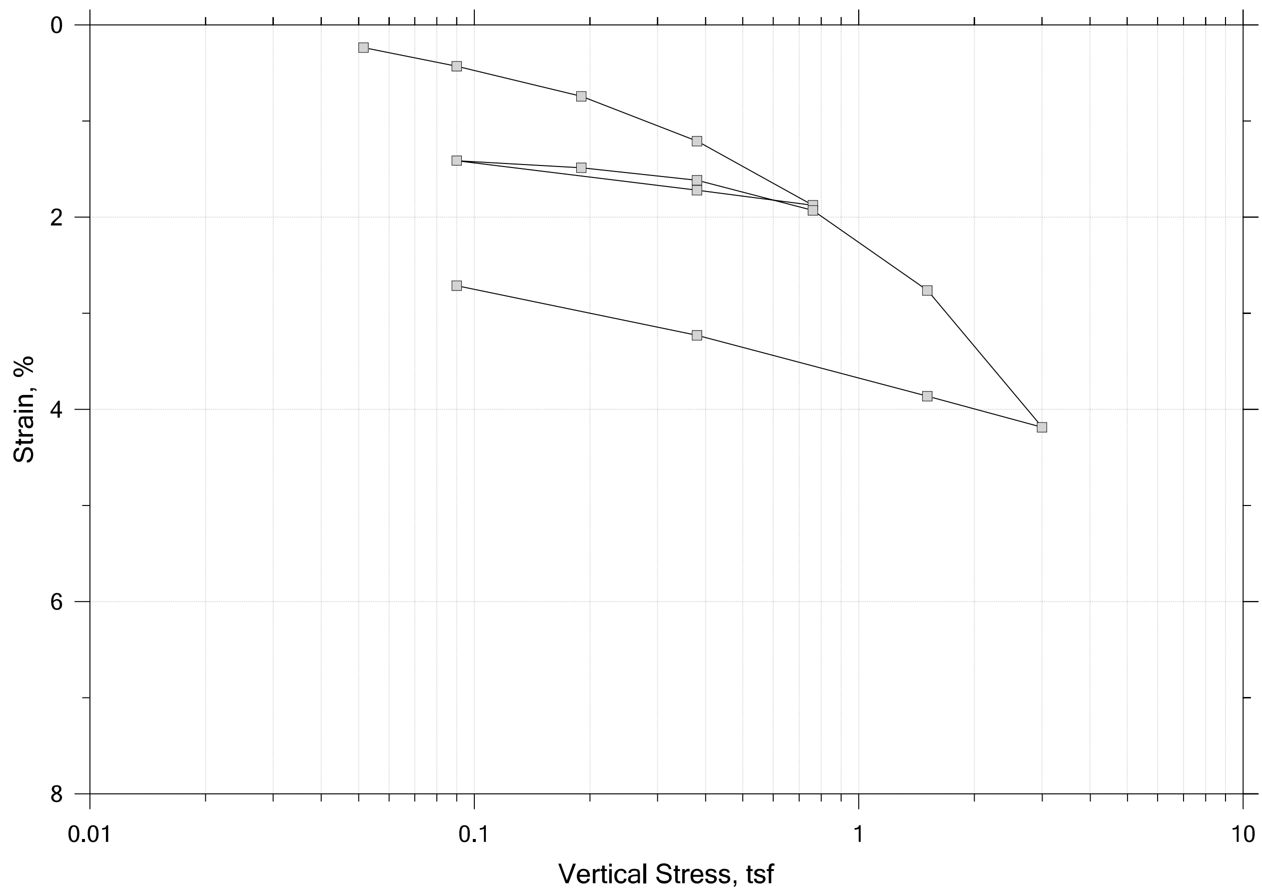
Square Root of Time Coefficients

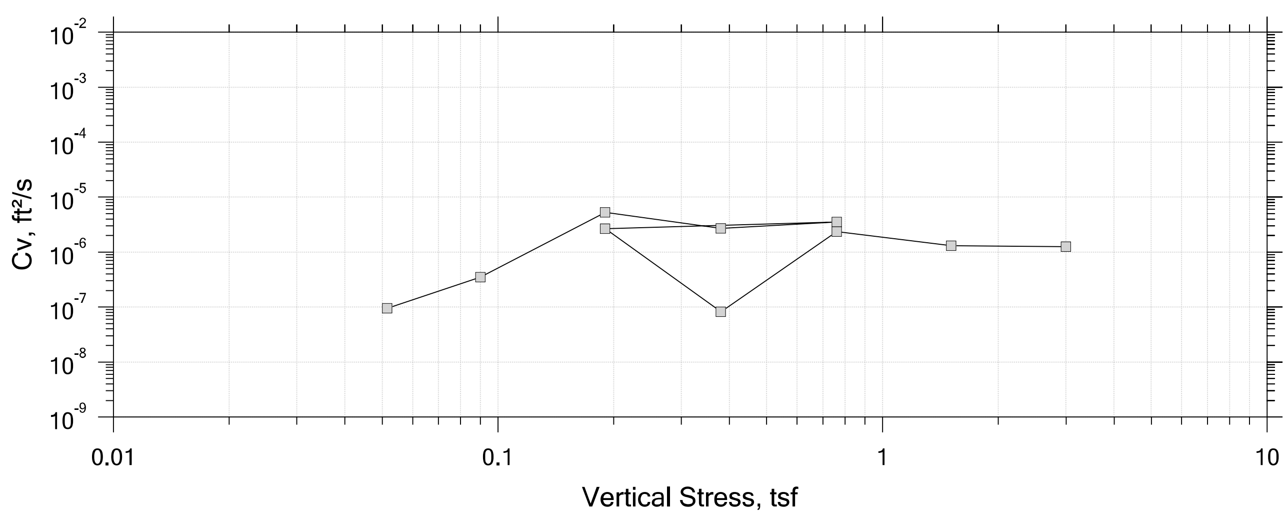
Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv in²/s	Mv 1/tsf	k in/s
1	0.0518	0.01569	0.729	1.57	6.787	5.12e-04	3.03e-01	4.04e-07
2	0.0900	0.02050	0.720	2.05	25.414	1.34e-04	1.26e-01	4.39e-08
3	0.190	0.02872	0.706	2.87	9.050	3.71e-04	8.21e-02	7.94e-08
4	0.380	0.04058	0.685	4.06	16.918	1.95e-04	6.24e-02	3.16e-08
5	0.760	0.05223	0.664	5.22	11.964	2.69e-04	3.07e-02	2.14e-08
6	0.380	0.05101	0.667	5.10	3.362	9.45e-04	3.22e-03	7.92e-09
7	0.0900	0.04666	0.674	4.67	2.673	1.20e-03	1.50e-02	4.67e-08
8	0.190	0.04814	0.672	4.81	2.689	1.19e-03	1.48e-02	4.60e-08
9	0.380	0.05039	0.668	5.04	2.898	1.10e-03	1.18e-02	3.39e-08
10	0.760	0.05452	0.660	5.45	17.163	1.85e-04	1.09e-02	5.23e-09
11	1.51	0.06796	0.637	6.80	14.163	2.20e-04	1.79e-02	1.02e-08
12	3.00	0.09034	0.598	9.03	14.340	2.09e-04	1.50e-02	8.16e-09
13	1.51	0.08899	0.600	8.90	202.966	1.44e-05	9.00e-04	3.38e-11
14	0.380	0.08457	0.608	8.46	3.056	9.64e-04	3.91e-03	9.81e-09
15	0.0900	0.07936	0.617	7.94	8.057	3.70e-04	1.80e-02	1.73e-08

Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
Boring No.: BB-C295-201	Tested By: te	Checked By: anm
Sample No.: U1	Test Date: 4/22/24	Depth: 27-29'
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, gray clay		
Remarks: System LTIII-A, Swell Pressure = 0.0518 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report





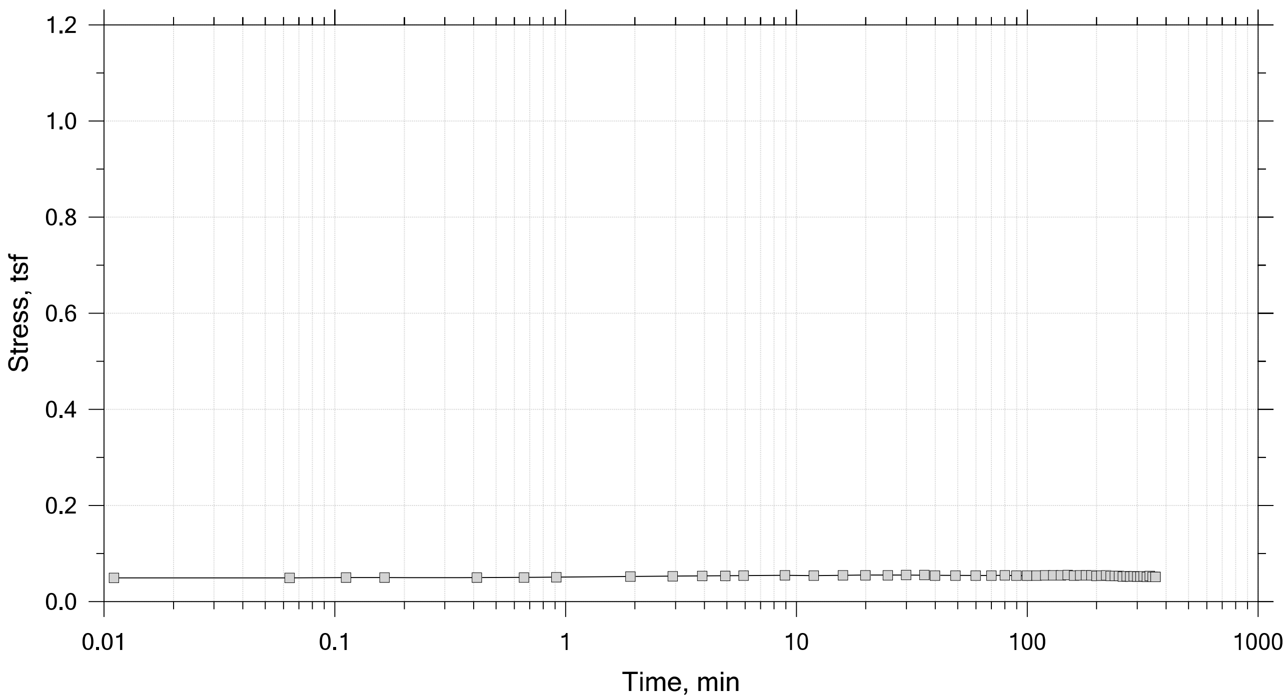
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		
	Displacement at End of Increment		

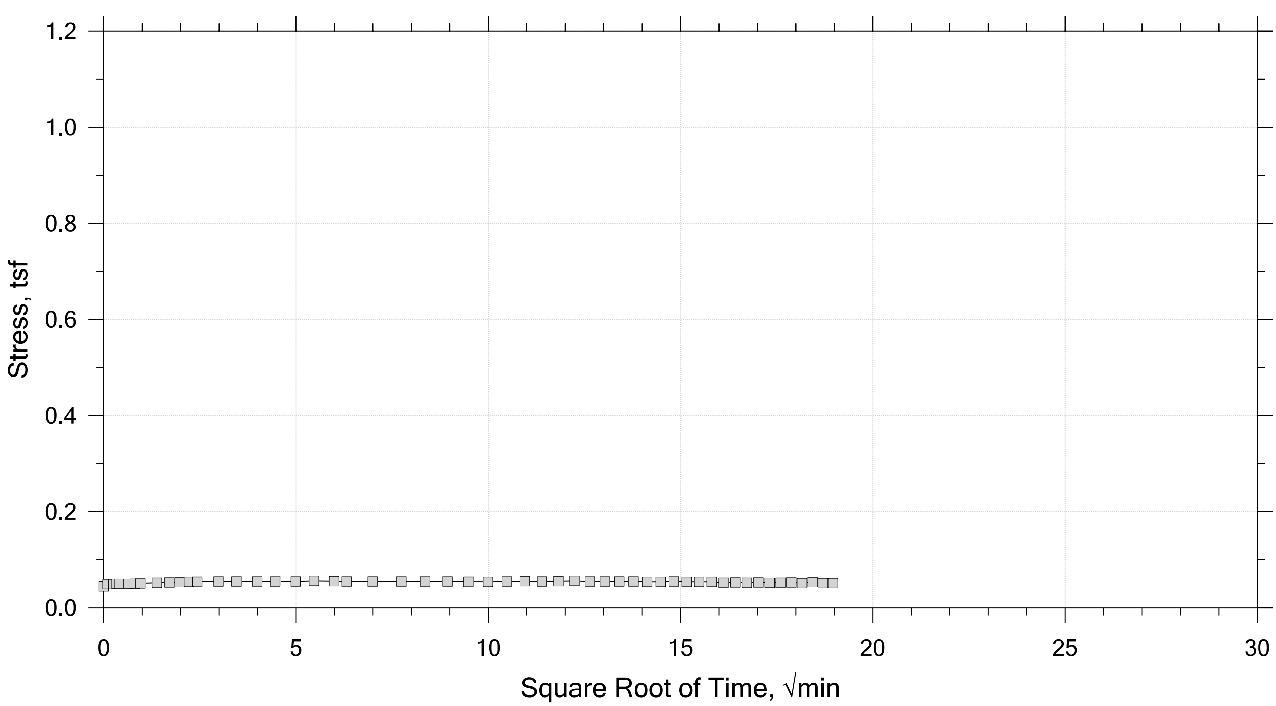
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15

Constant Volume Step

Stress: 0.0515 tsf





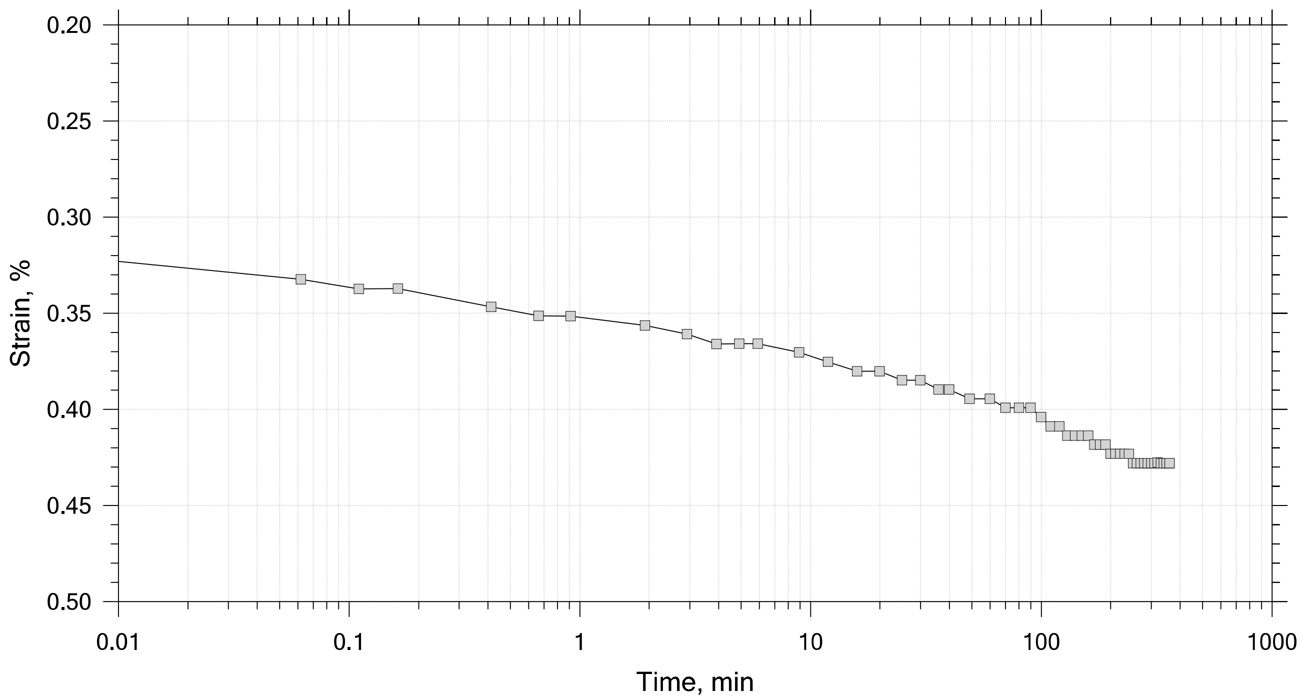
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

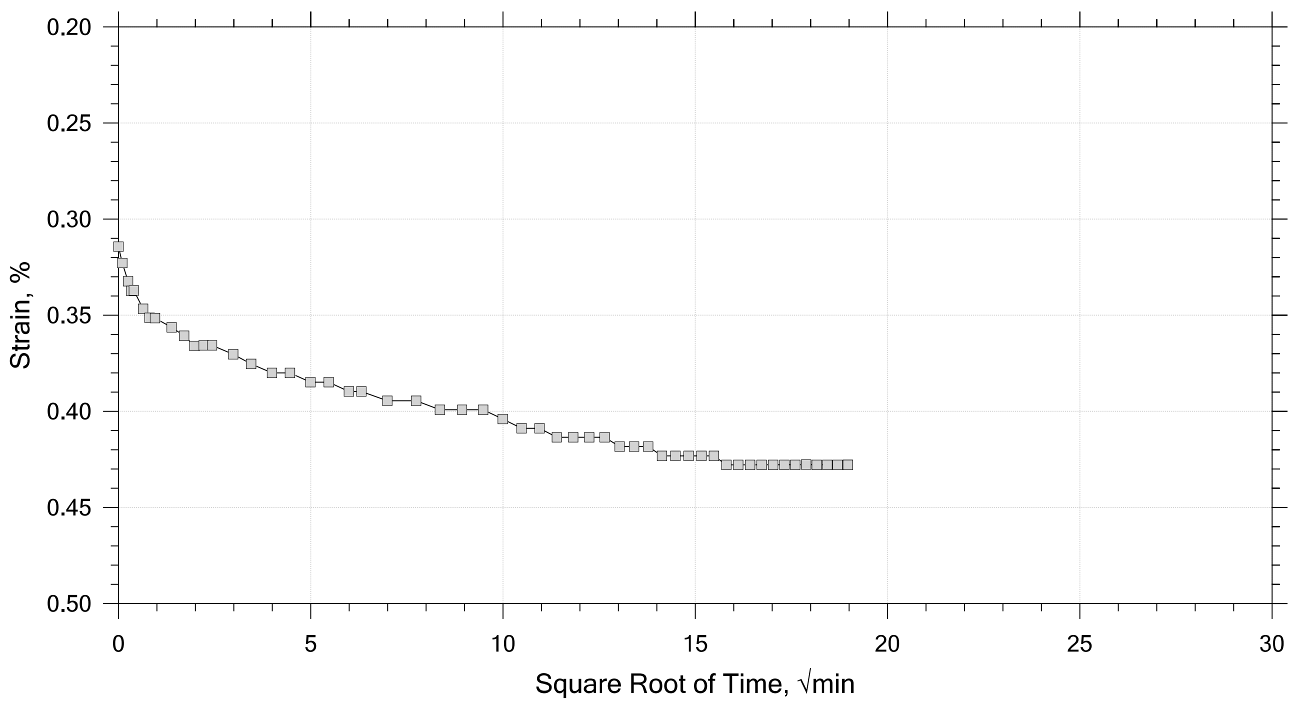
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15

Constant Load Step

Stress: 0.09 tsf





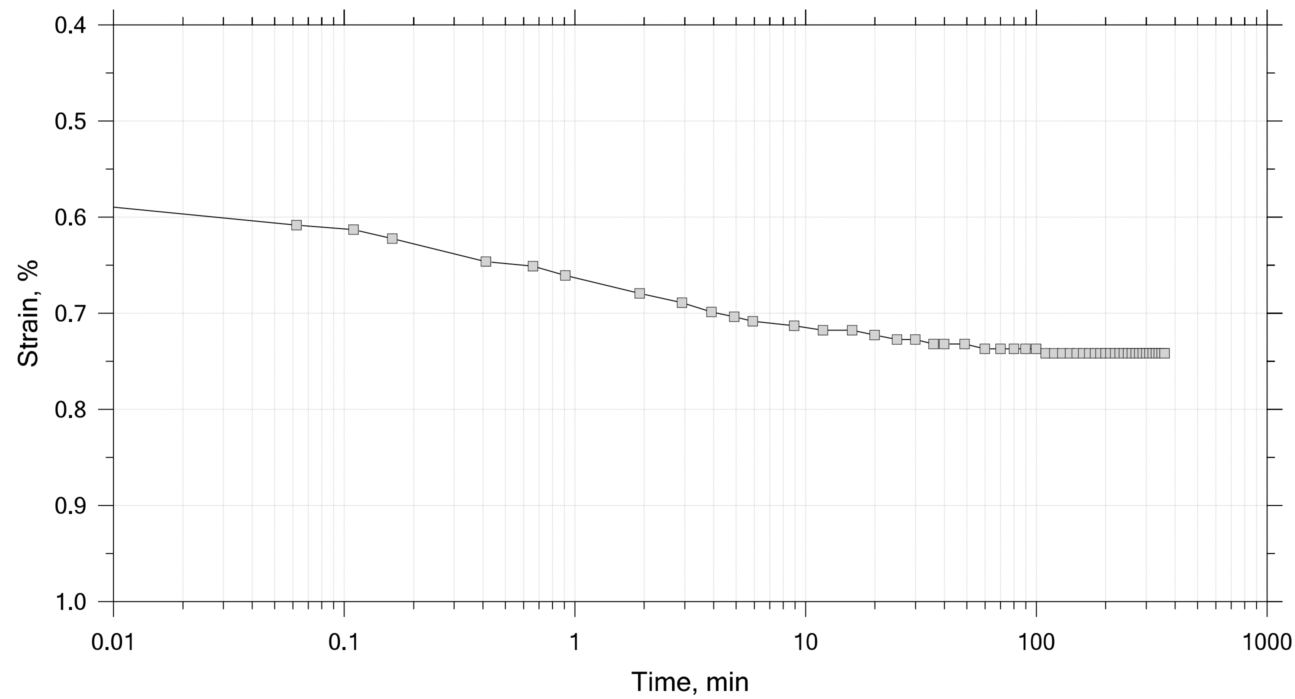
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

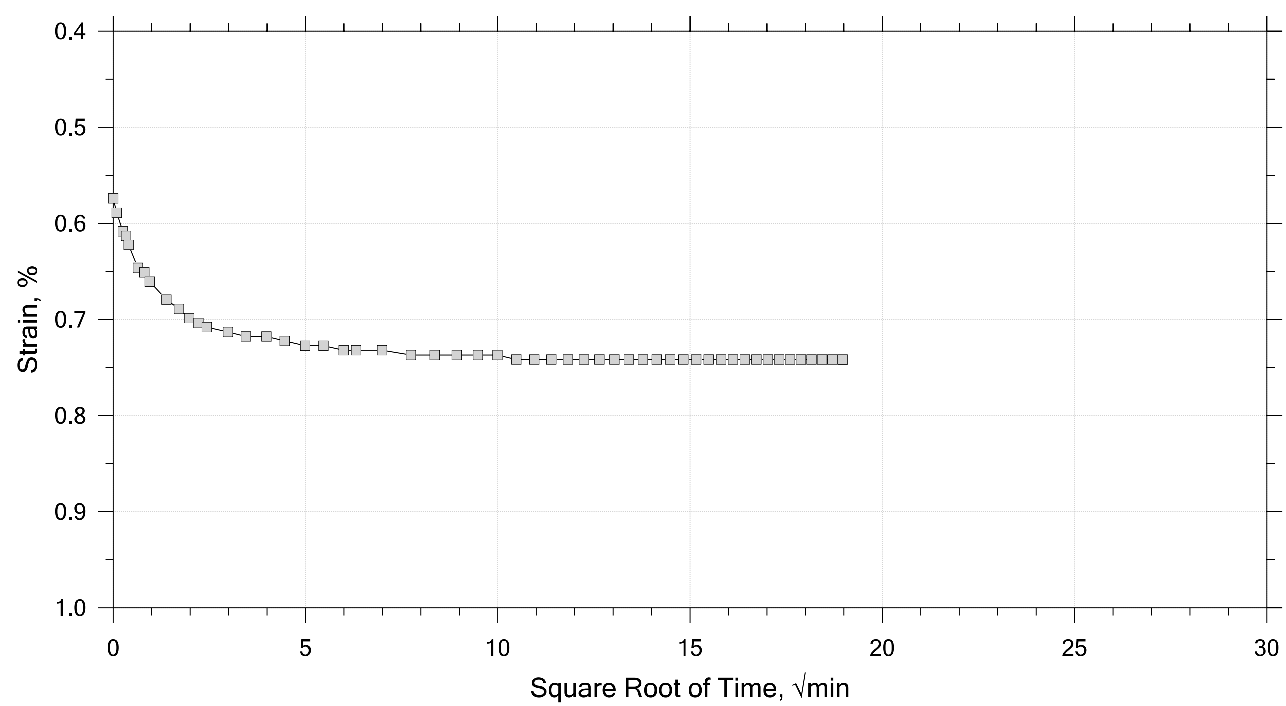
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15

Constant Load Step

Stress: 0.19 tsf





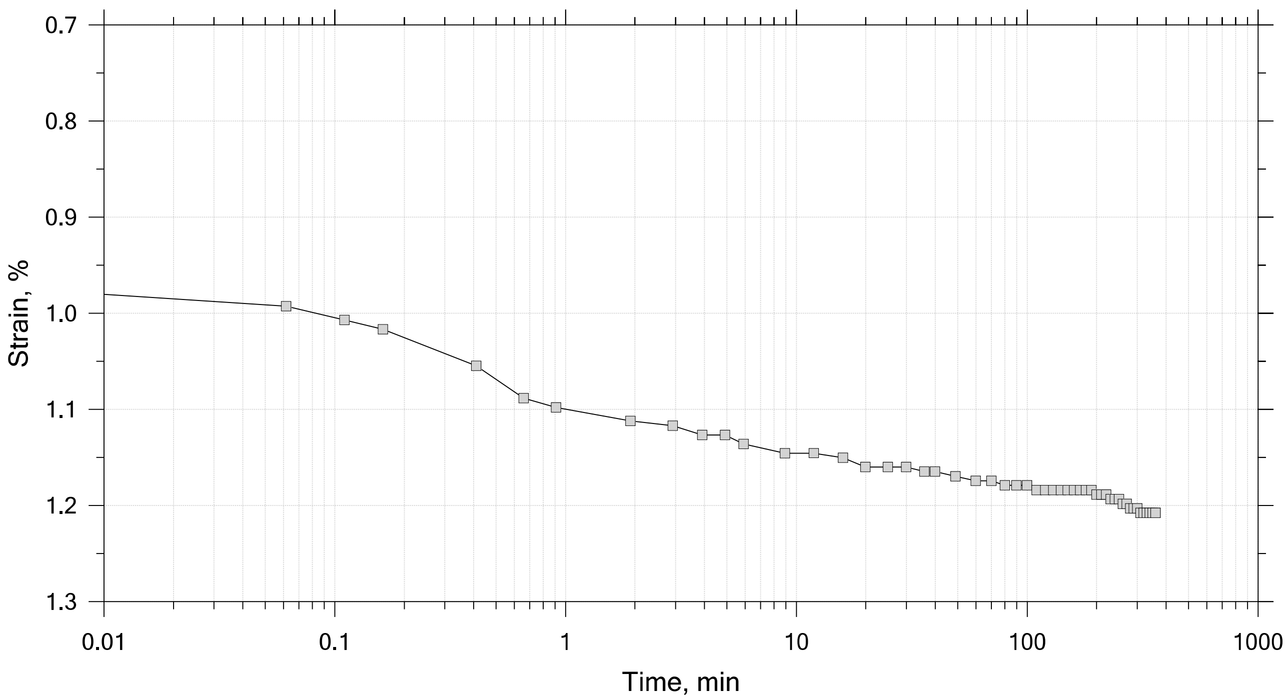
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

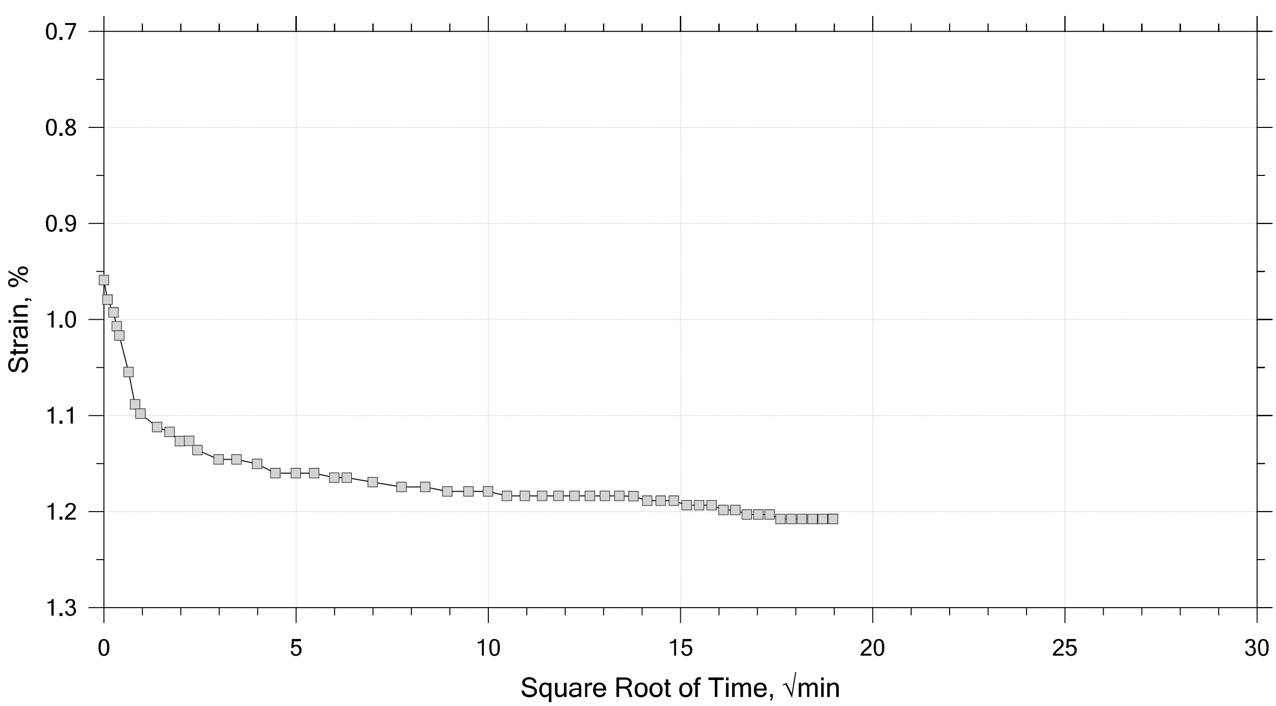
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15

Constant Load Step

Stress: 0.38 tsf

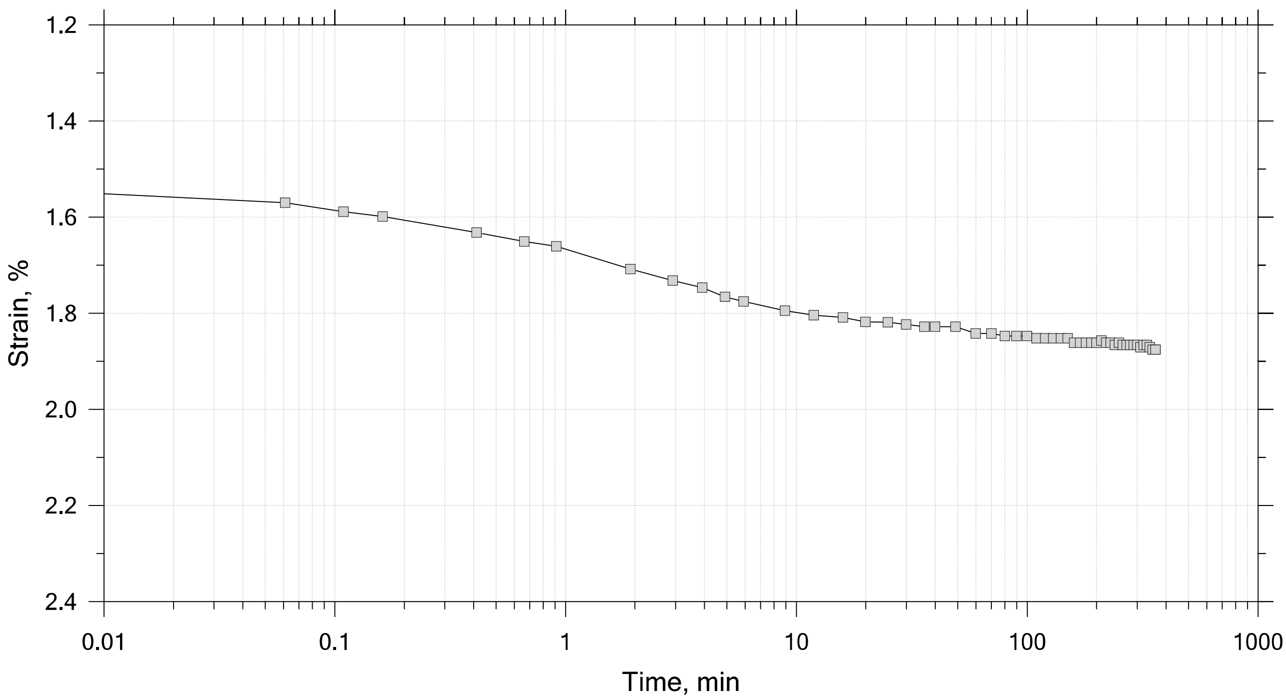


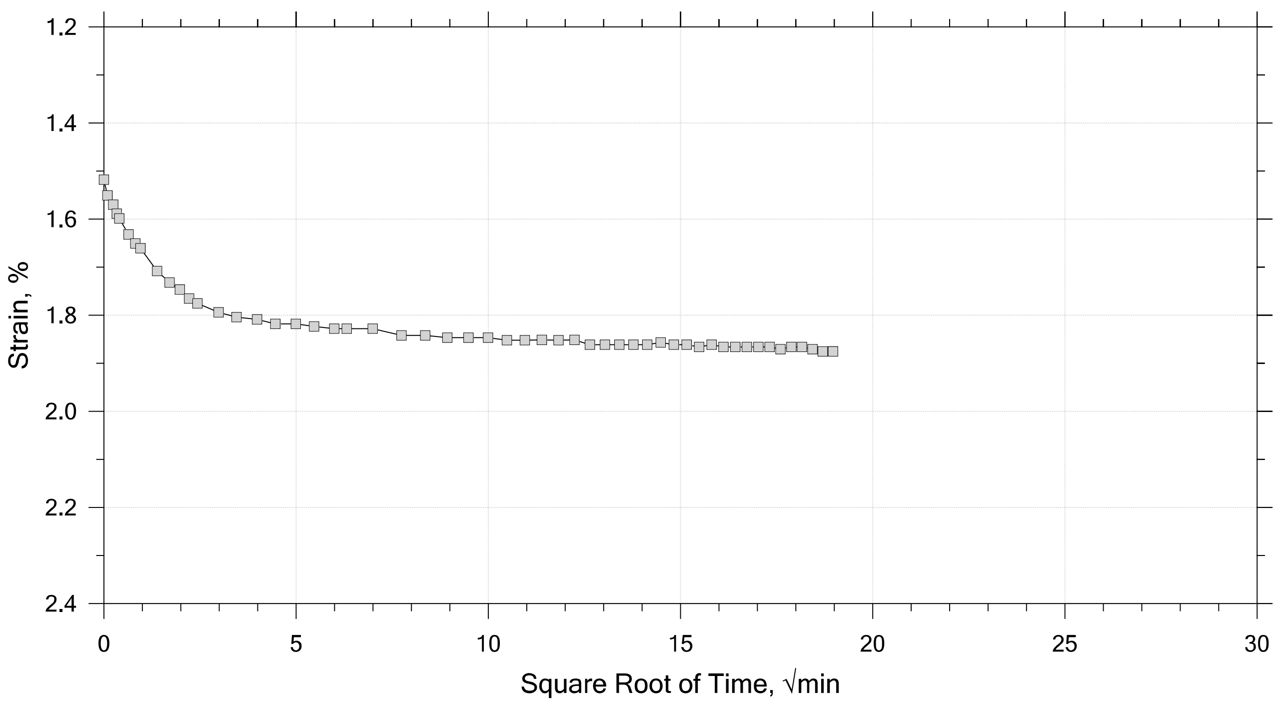


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15
Constant Load Step
Stress: 0.76 tsf





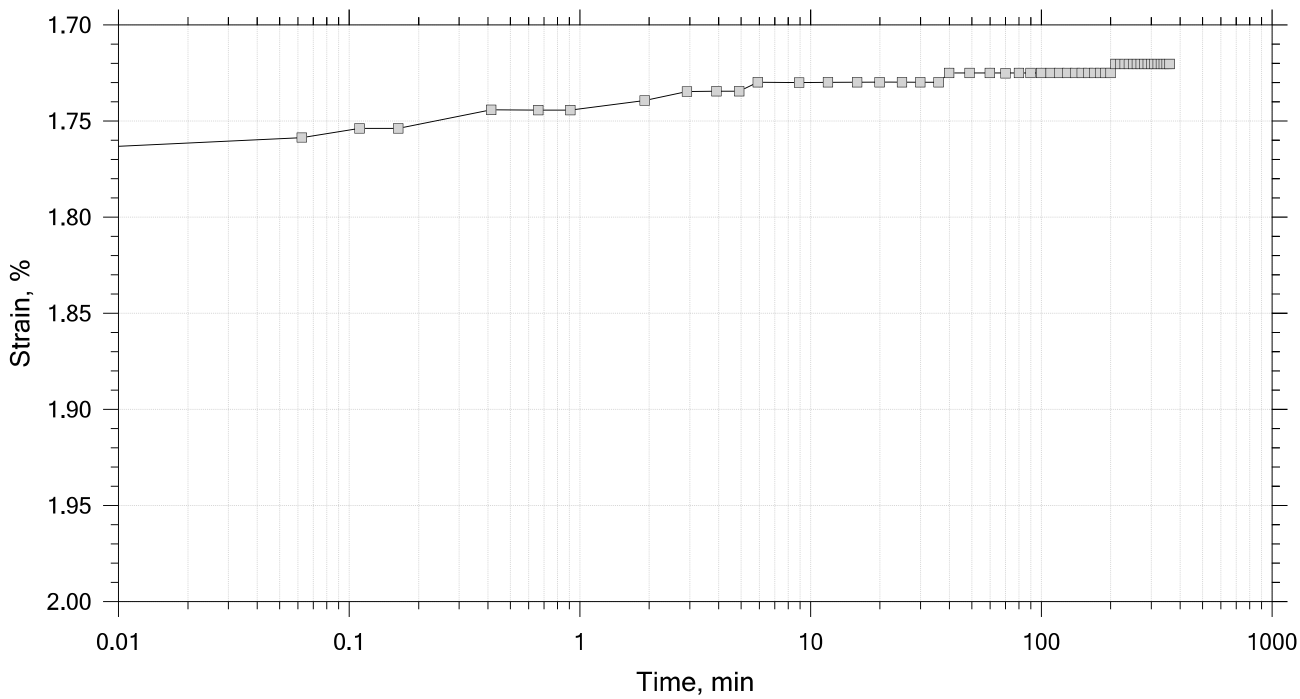
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

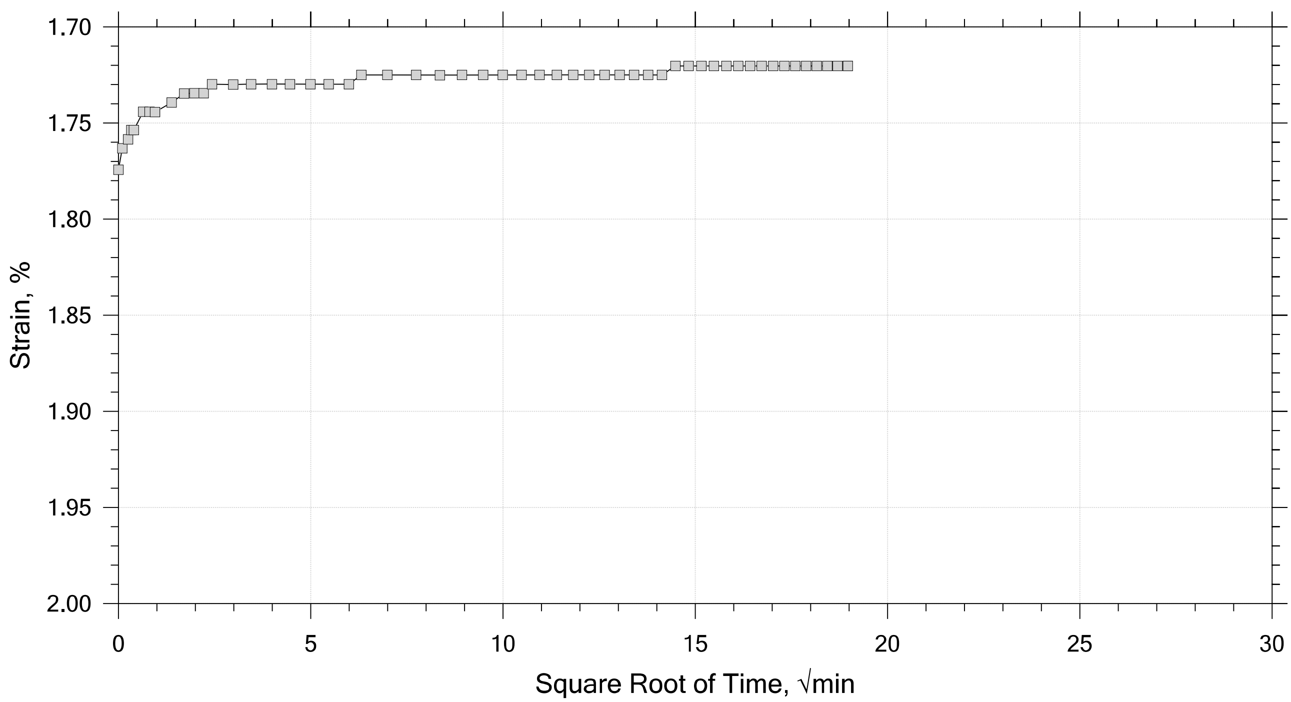
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15

Constant Load Step

Stress: 0.38 tsf





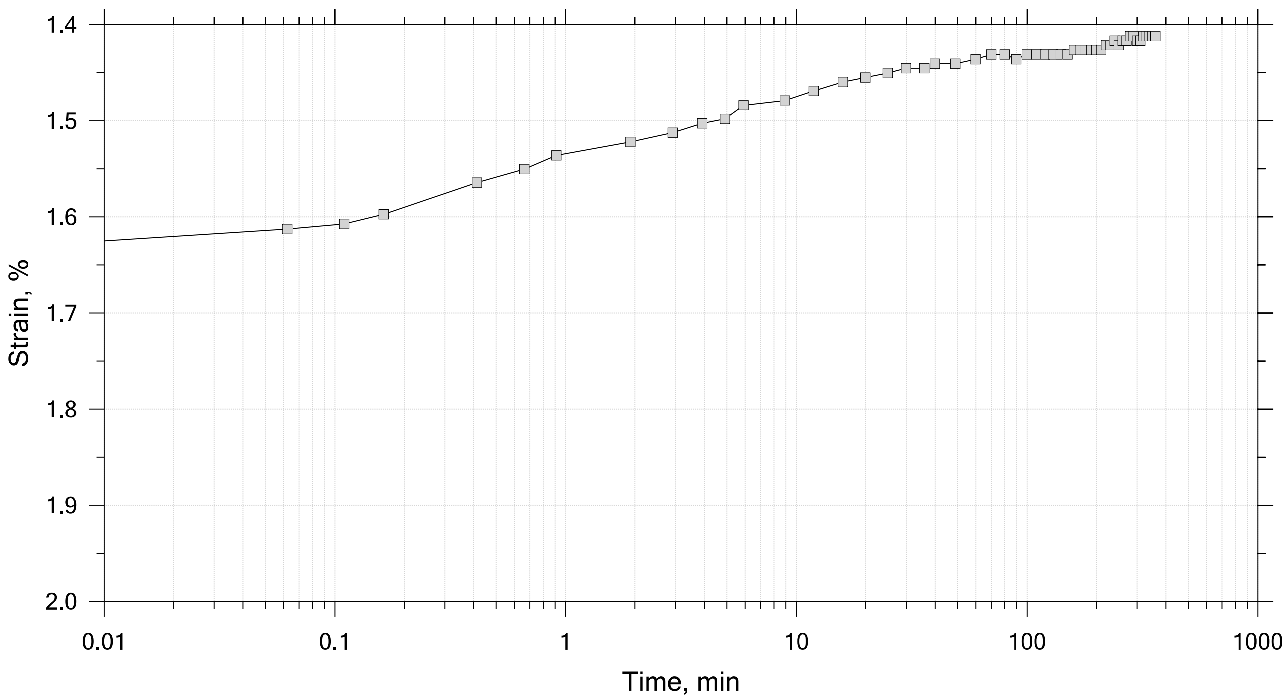
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

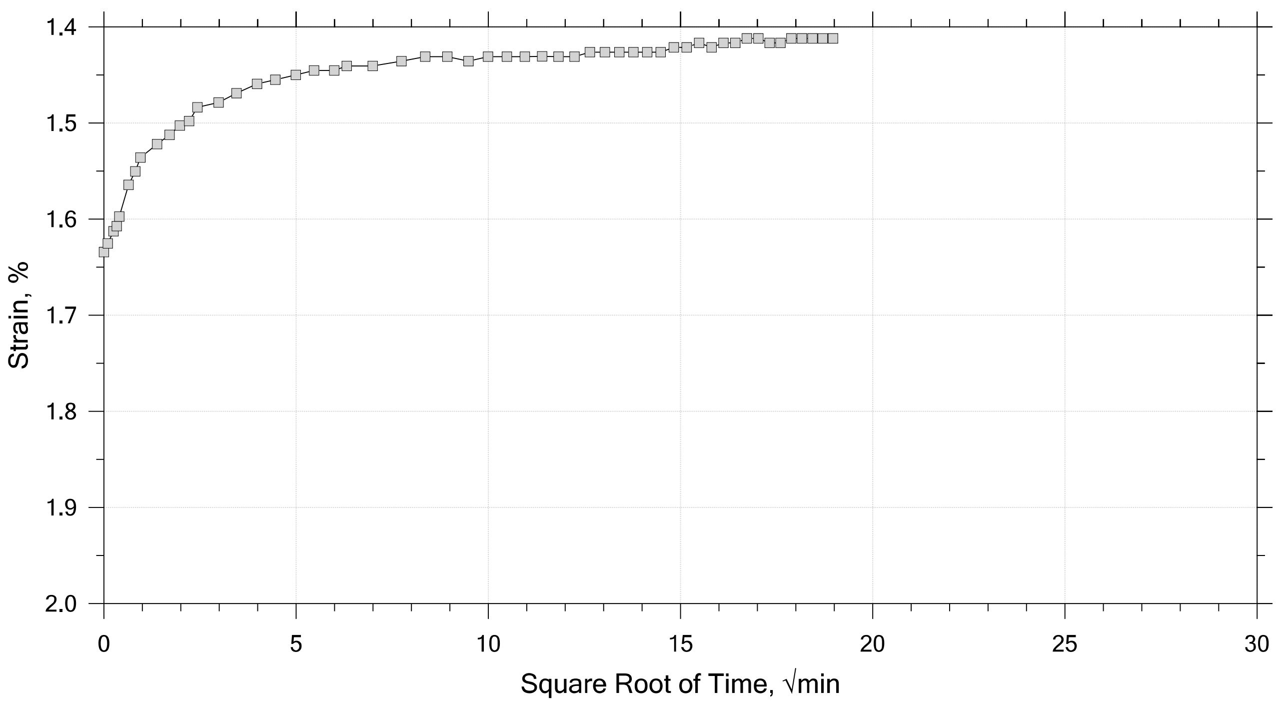
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15

Constant Load Step

Stress: 0.09 tsf





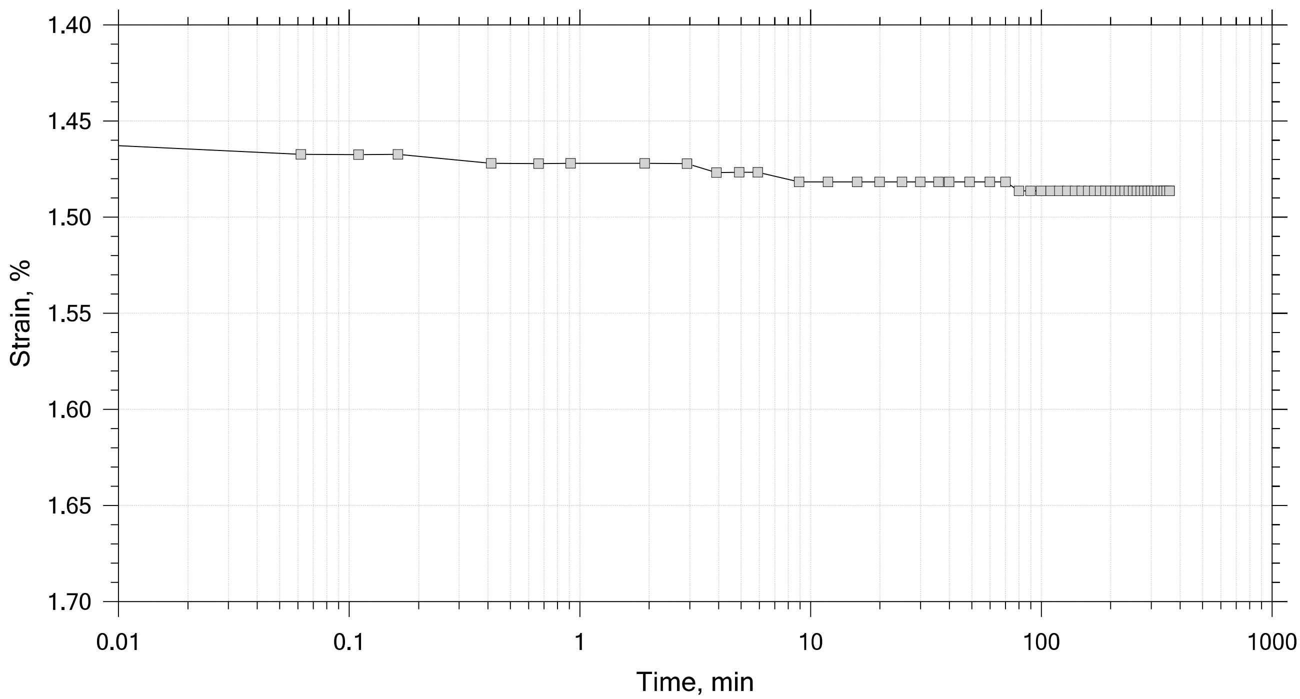
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

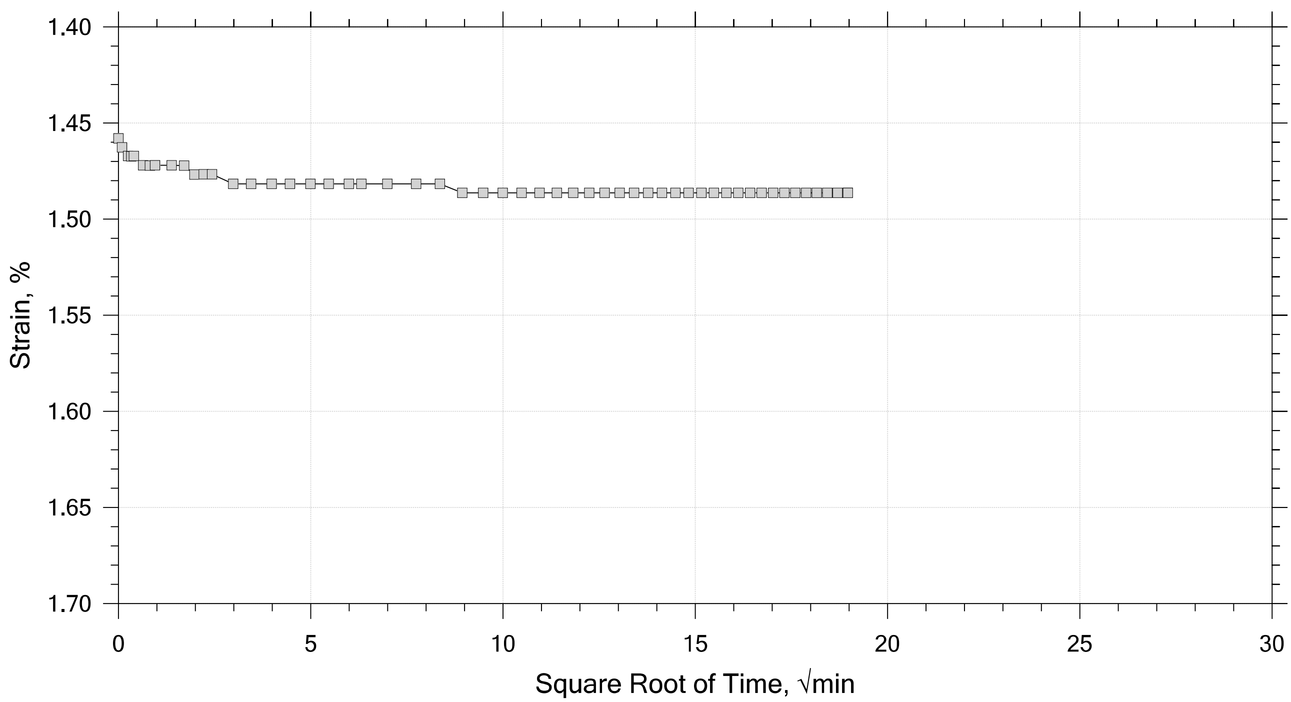
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15

Constant Load Step

Stress: 0.19 tsf





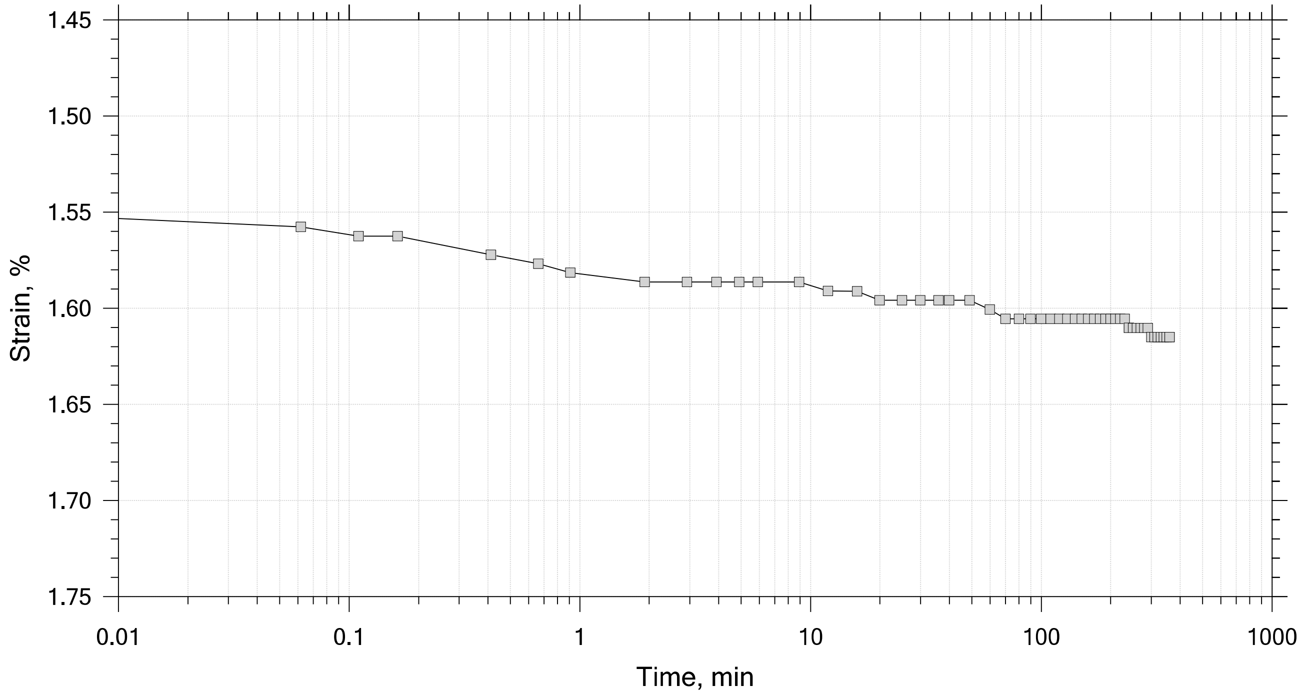
	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

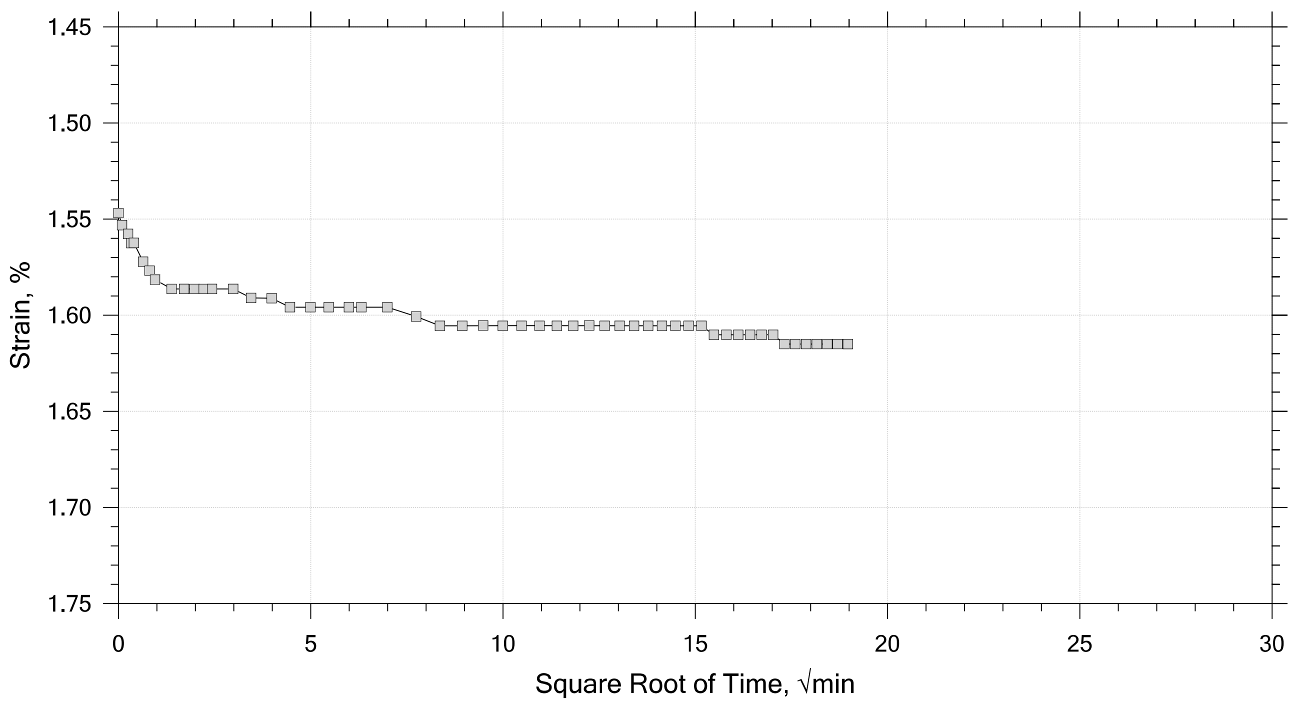
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15

Constant Load Step

Stress: 0.38 tsf





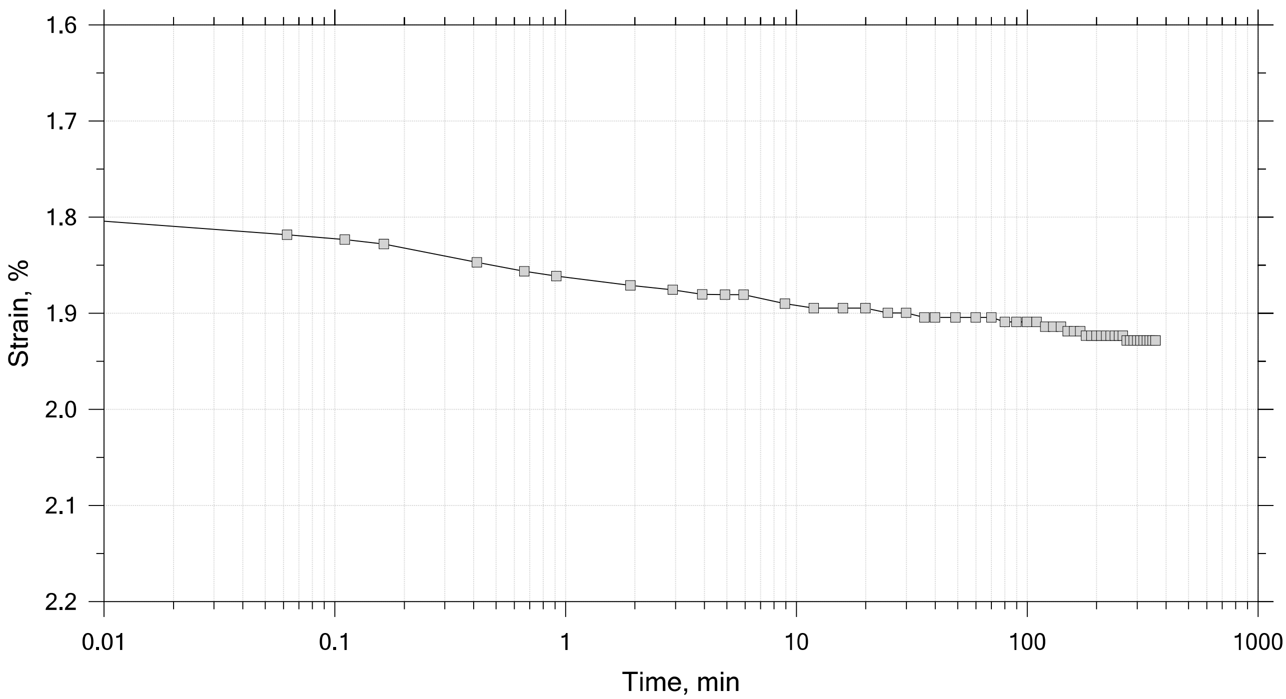
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

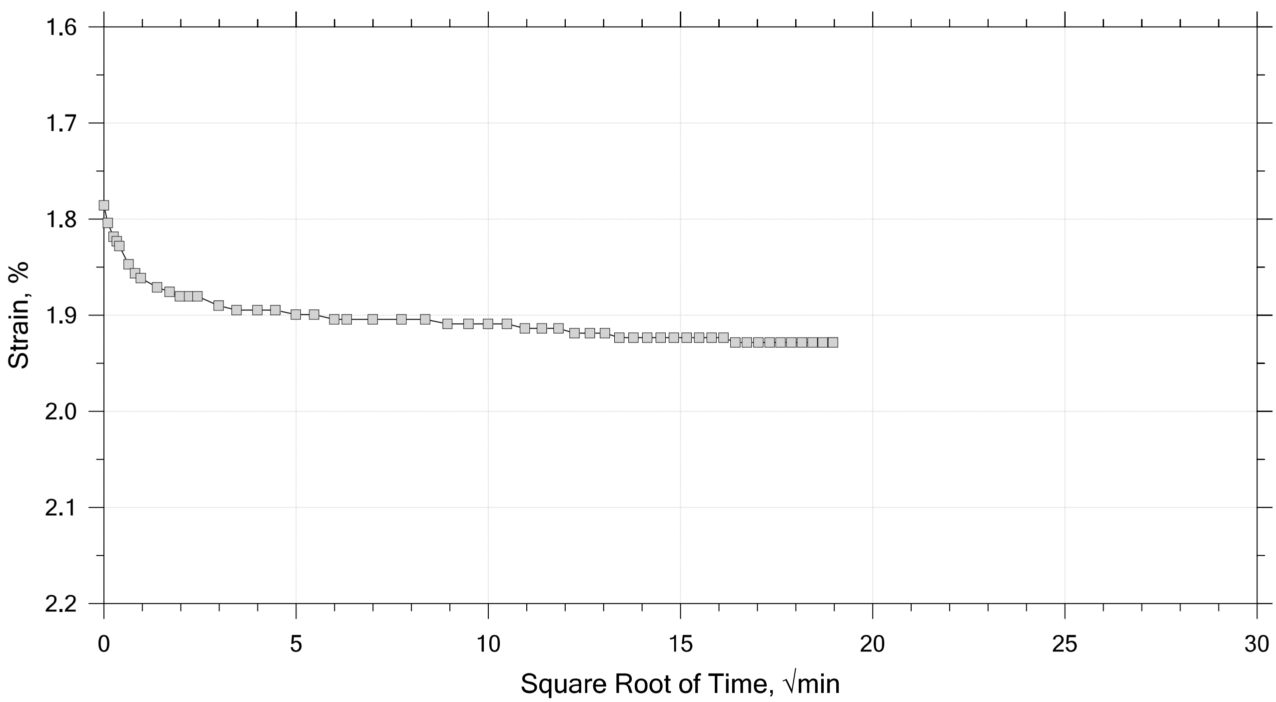
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15

Constant Load Step

Stress: 0.76 tsf





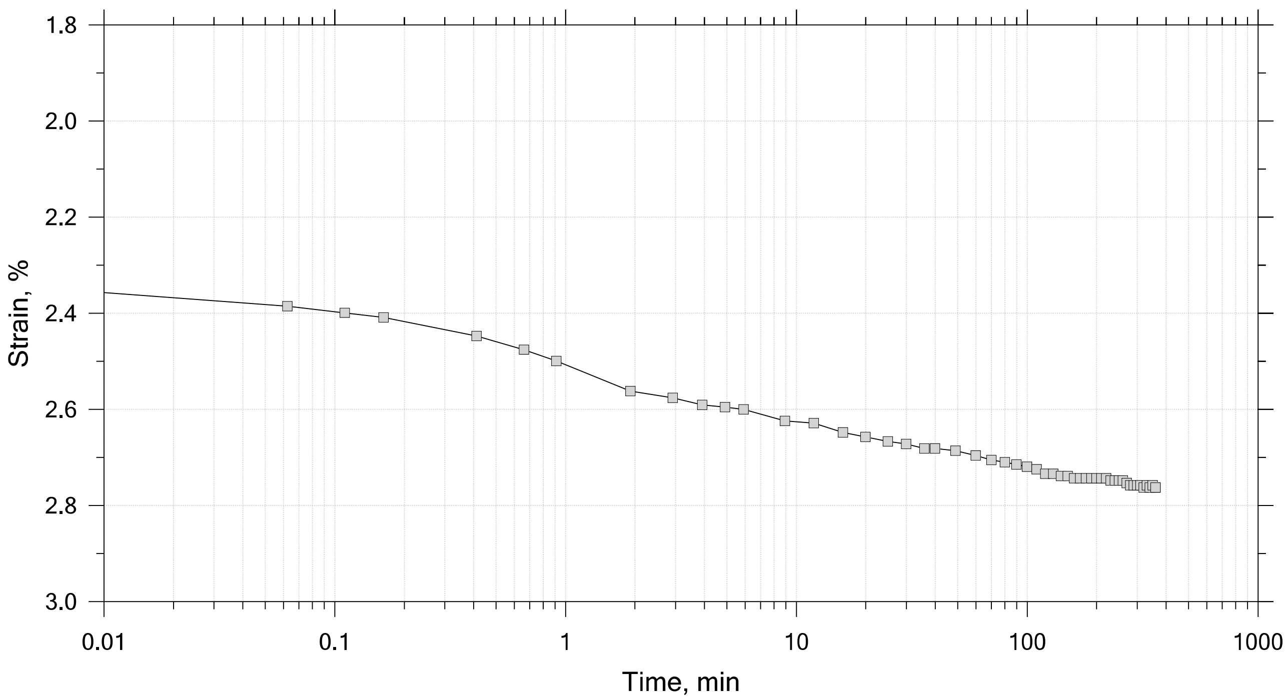
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

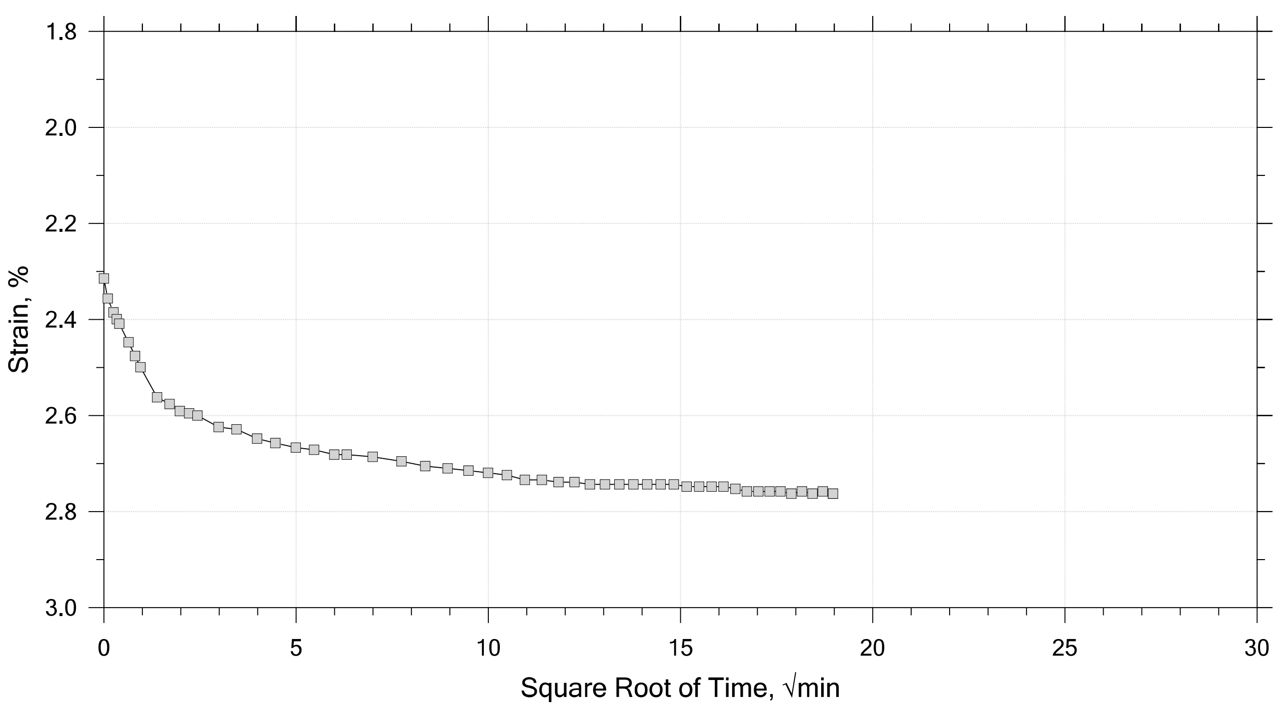
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15

Constant Load Step

Stress: 1.51 tsf





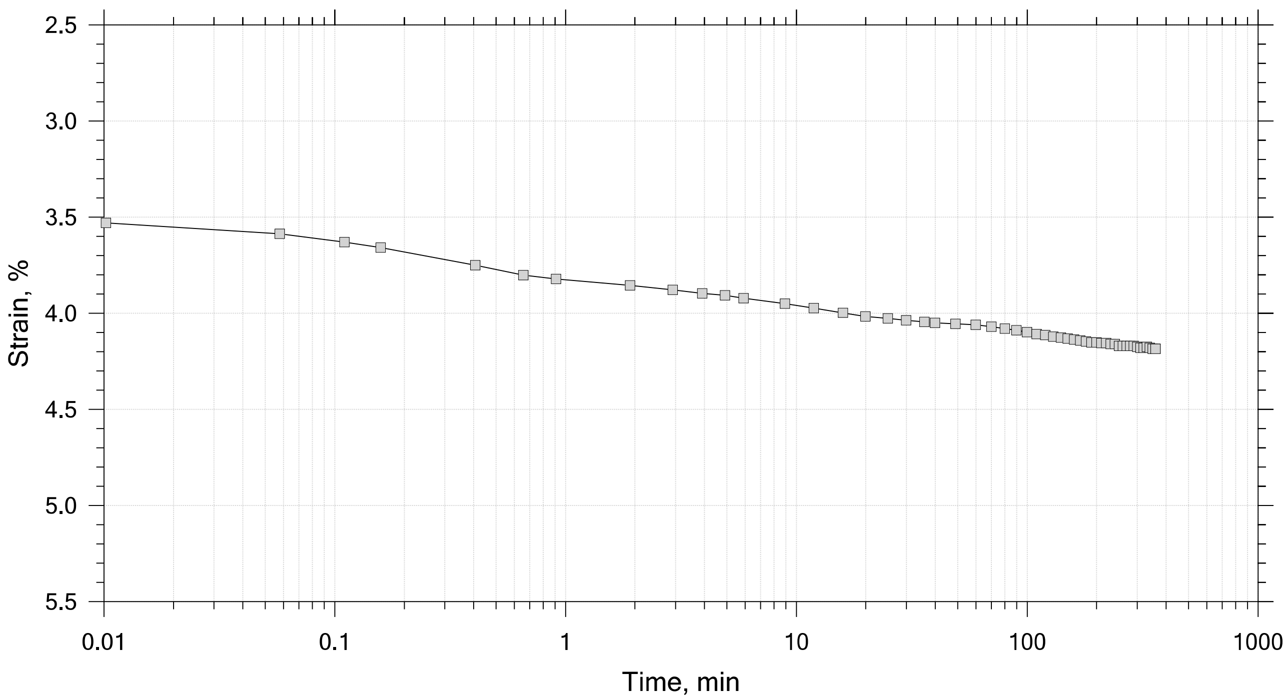
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

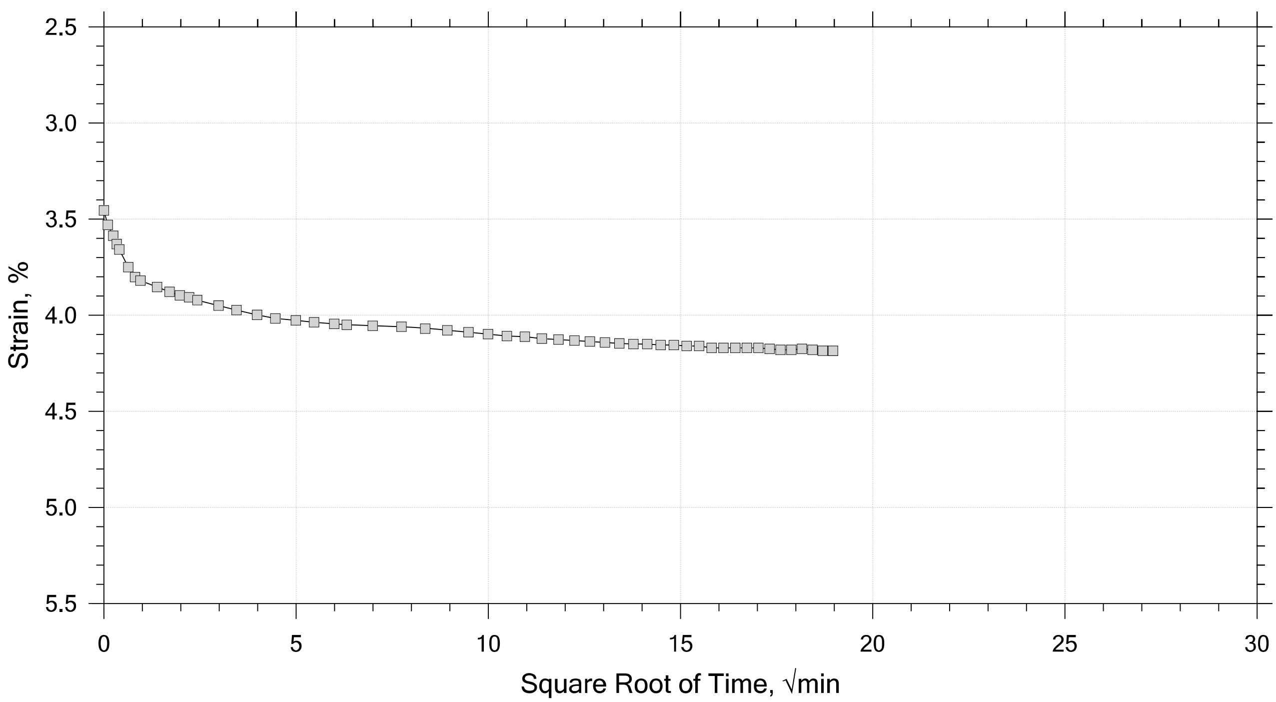
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15

Constant Load Step

Stress: 3 tsf

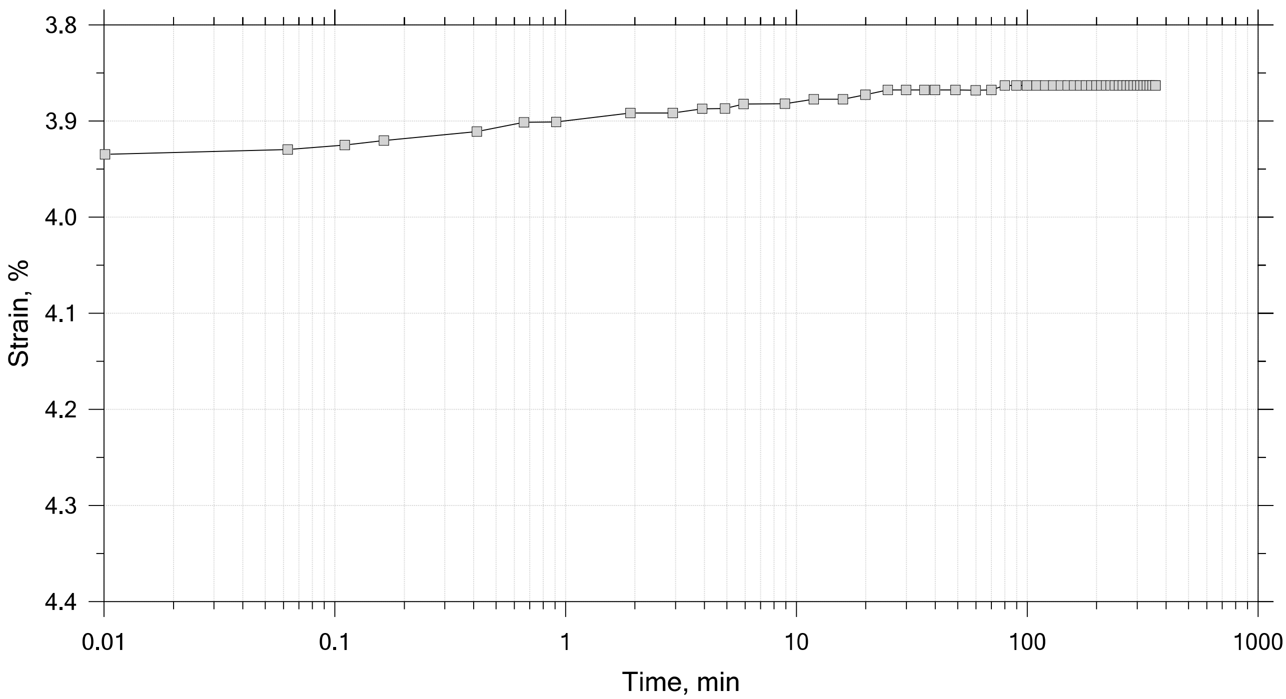


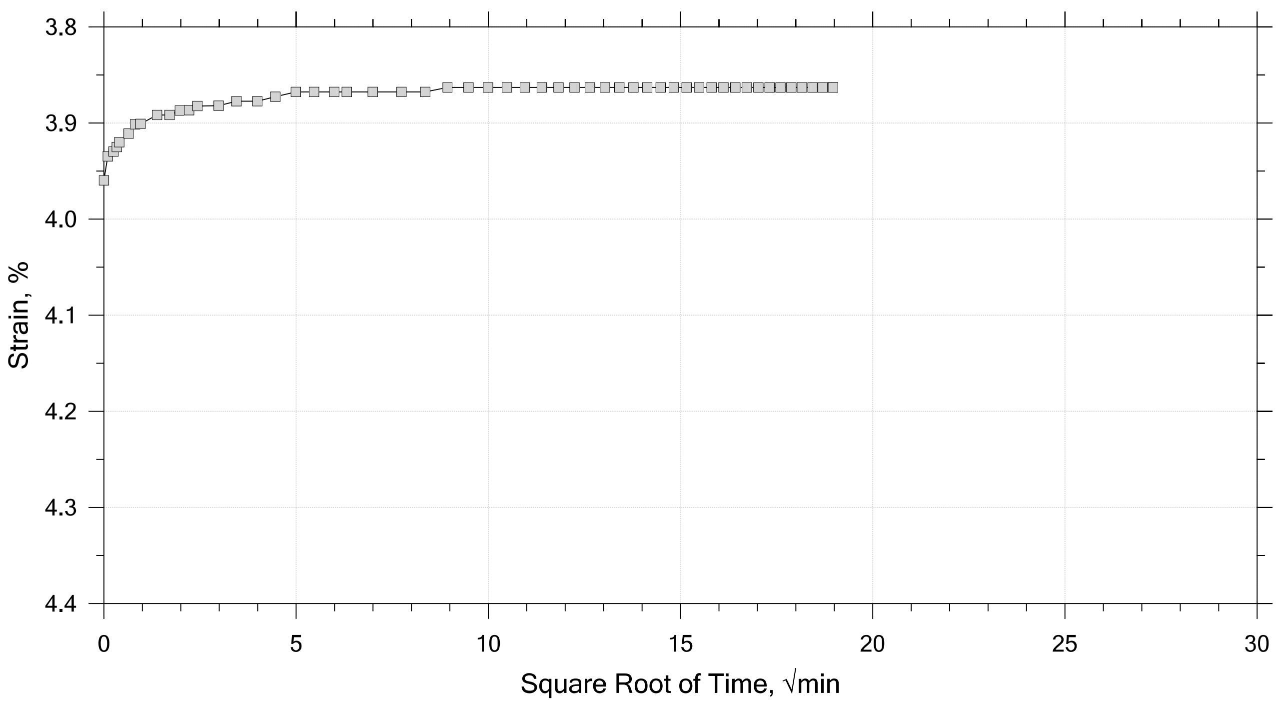


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15
Constant Load Step
Stress: 1.51 tsf

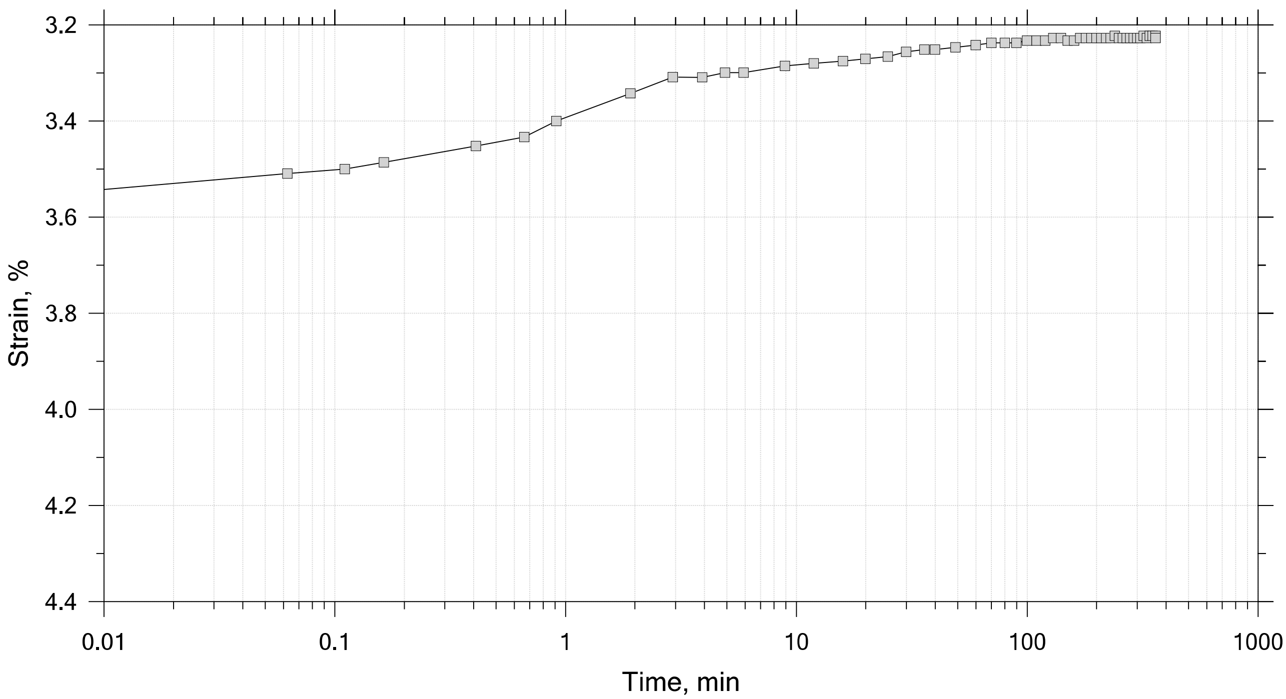


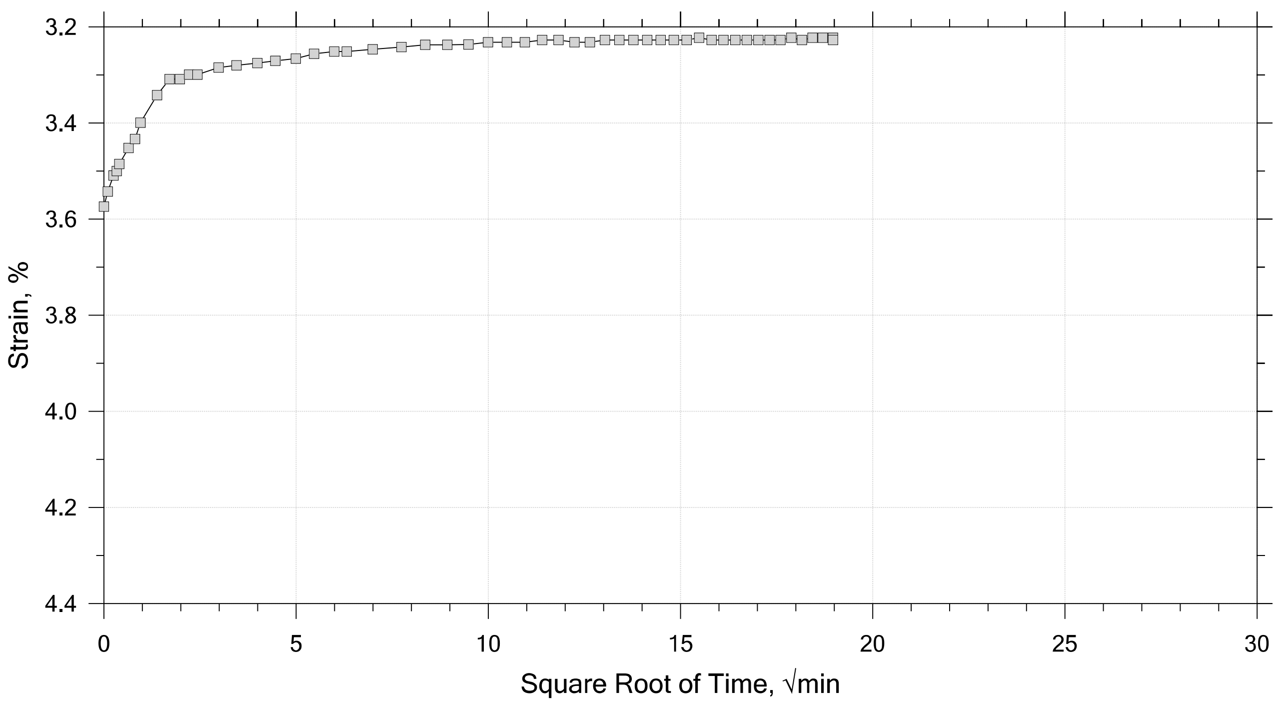


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15
Constant Load Step
Stress: 0.38 tsf

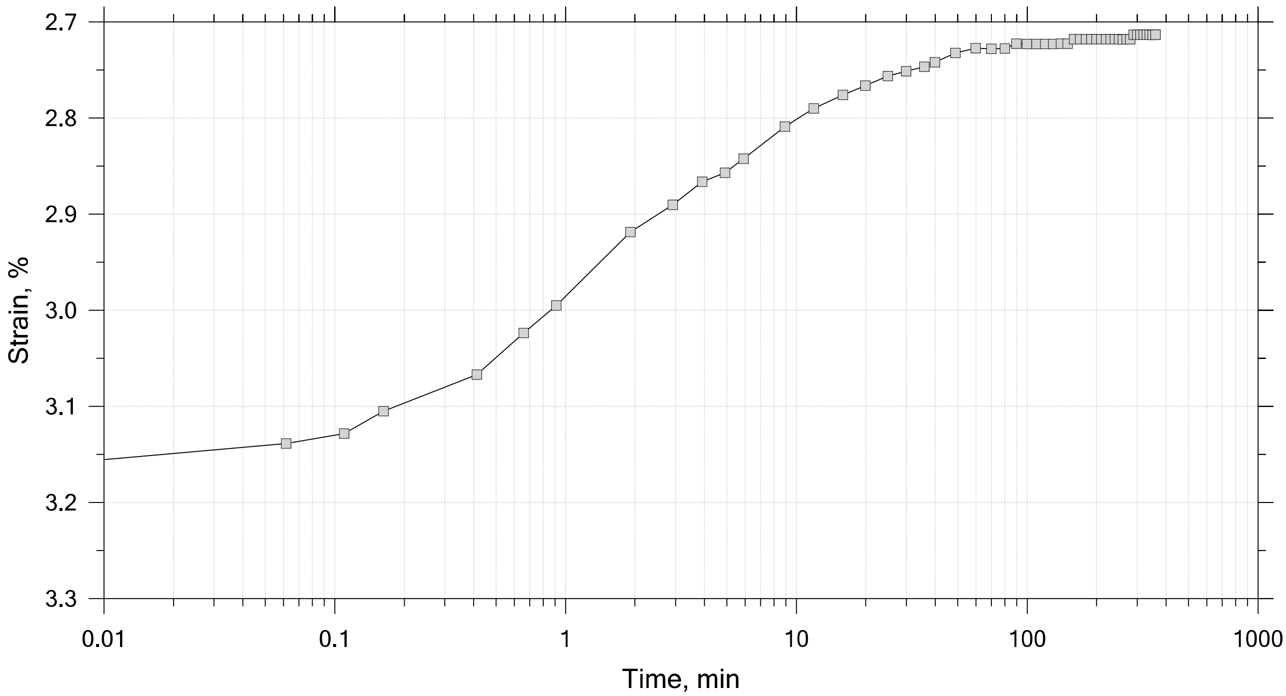


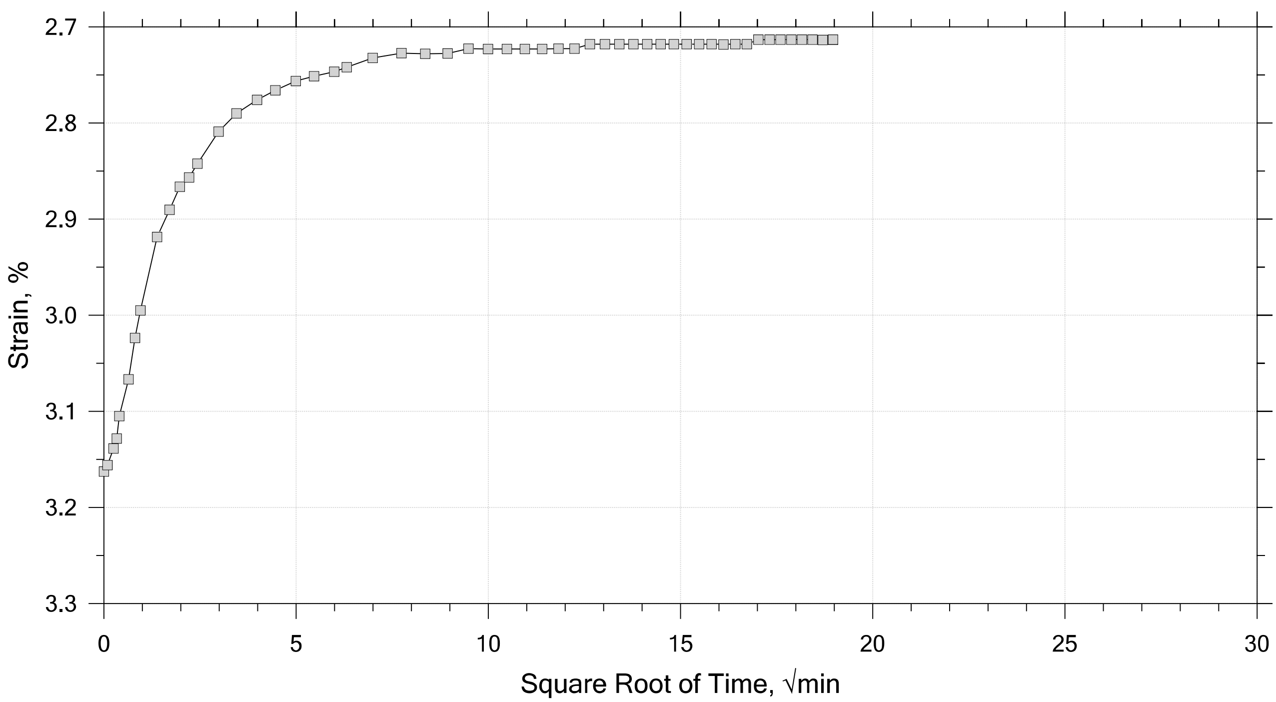


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15
Constant Load Step
Stress: 0.09 tsf





GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.79	Liquid Limit: 44
Initial Height: 1.00 in	Initial Void Ratio: 0.838	Plastic Limit: 22
Final Height: 0.97 in	Final Void Ratio: 0.783	Plasticity Index: 22

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	E890	RING		E9486
Mass Container, gm	8.48	110.79	110.79	8.21
Mass Container + Wet Soil, gm	214.47	266.92	267	165.03
Mass Container + Dry Soil, gm	169.54	232.73	232.73	130.63
Mass Dry Soil, gm	161.06	121.94	121.94	122.42
Water Content, %	27.90	28.03	28.10	28.10
Void Ratio	---	0.84	0.78	---
Degree of Saturation, %	---	93.20	100.00	---
Dry Unit Weight, pcf	---	94.638	97.565	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
GeoTesting EXPRESS	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

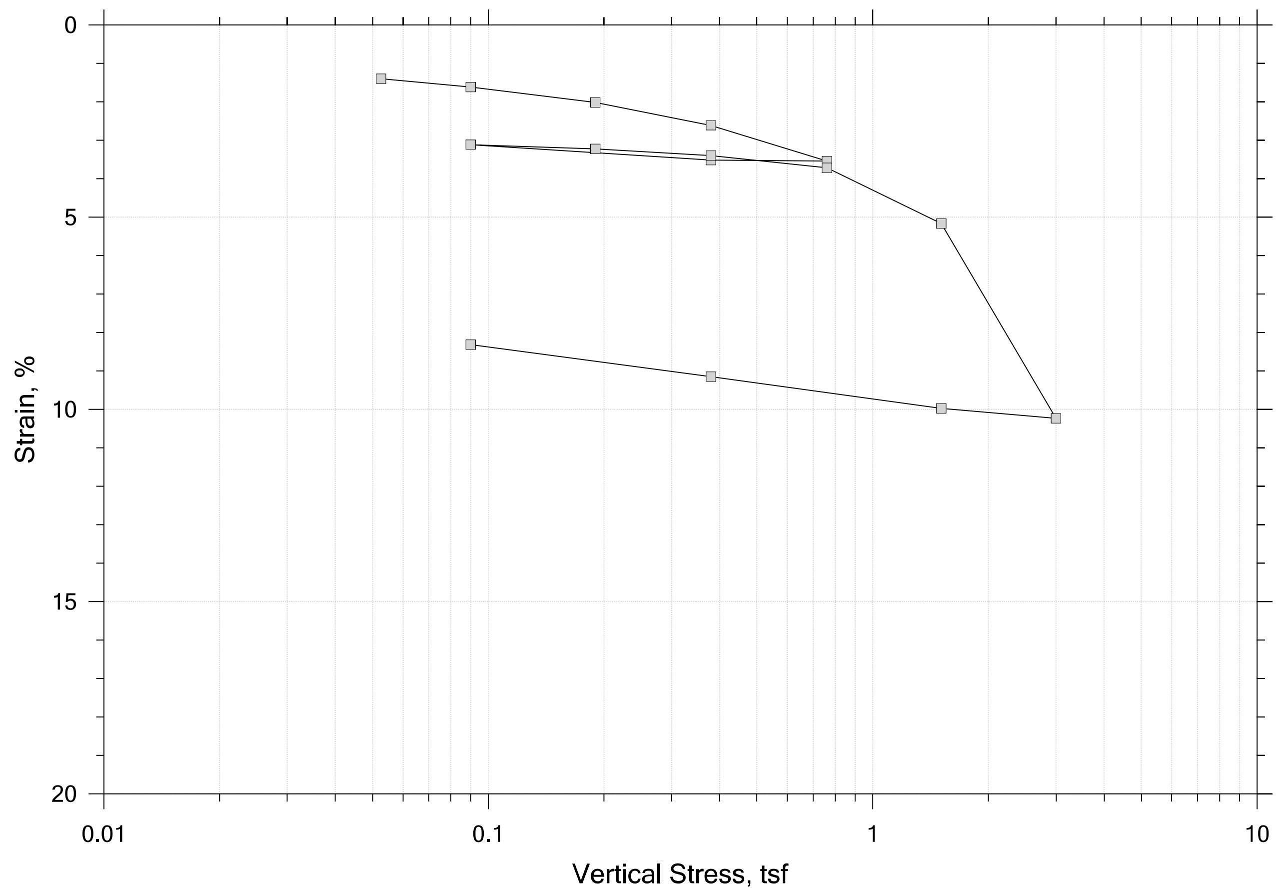
Square Root of Time Coefficients

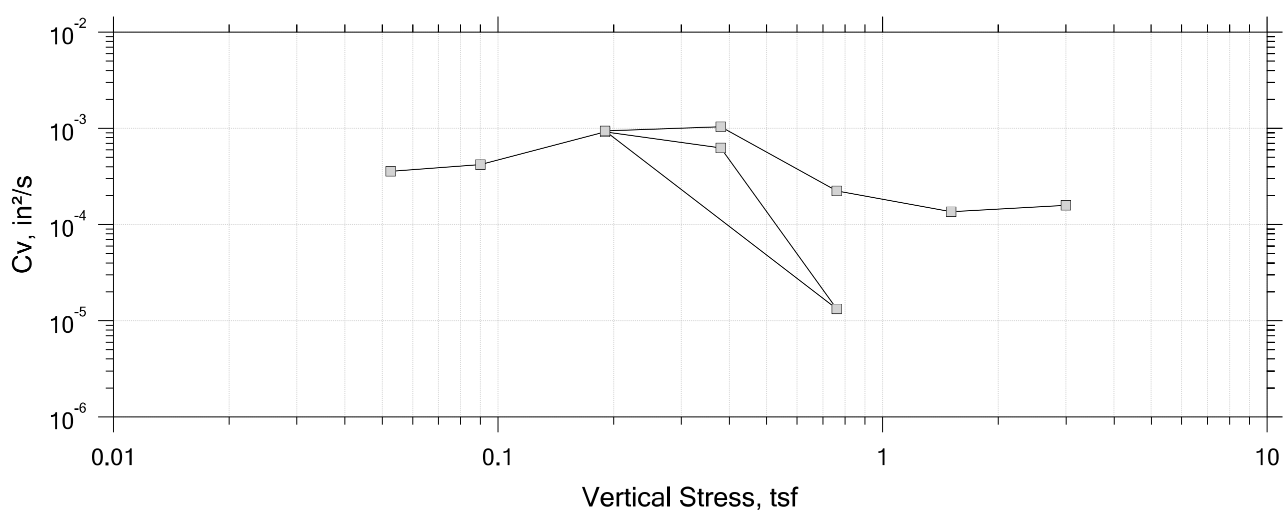
Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.0515	0.002356	0.834	0.236	258.408	9.47e-08	4.57e-02	1.17e-05
2	0.0900	0.004279	0.830	0.428	69.911	3.49e-07	5.00e-02	4.70e-05
3	0.190	0.007416	0.825	0.742	4.608	5.26e-06	3.14e-02	4.45e-04
4	0.380	0.01208	0.816	1.21	8.893	2.71e-06	2.45e-02	1.79e-04
5	0.760	0.01876	0.804	1.88	6.763	3.52e-06	1.76e-02	1.67e-04
6	0.380	0.01720	0.807	1.72	5.904	4.01e-06	4.09e-03	4.42e-05
7	0.0900	0.01412	0.812	1.41	9.607	2.47e-06	1.06e-02	7.10e-05
8	0.190	0.01486	0.811	1.49	8.912	2.67e-06	7.45e-03	5.38e-05
9	0.380	0.01615	0.808	1.61	291.434	8.16e-08	6.77e-03	1.49e-06
10	0.760	0.01928	0.803	1.93	10.103	2.34e-06	8.24e-03	5.21e-05
11	1.51	0.02762	0.787	2.76	18.001	1.30e-06	1.11e-02	3.90e-05
12	3.00	0.04184	0.761	4.18	18.209	1.26e-06	9.54e-03	3.23e-05
13	1.51	0.03863	0.767	3.86	6.002	3.77e-06	2.15e-03	2.19e-05
14	0.380	0.03227	0.779	3.23	4.269	5.35e-06	5.62e-03	8.11e-05
15	0.0900	0.02713	0.788	2.71	6.994	3.30e-06	1.77e-02	1.58e-04

GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-202	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 4.5-6.5'
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-001, Swell Pressure = 0.0515 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report

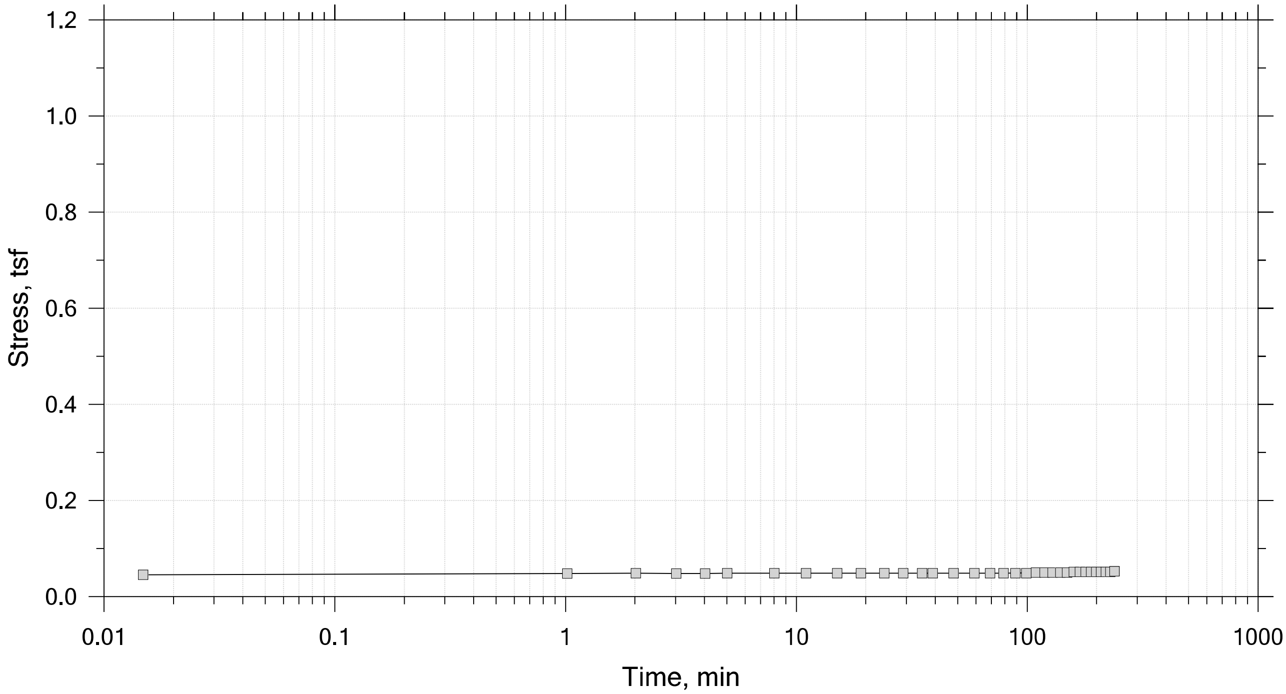


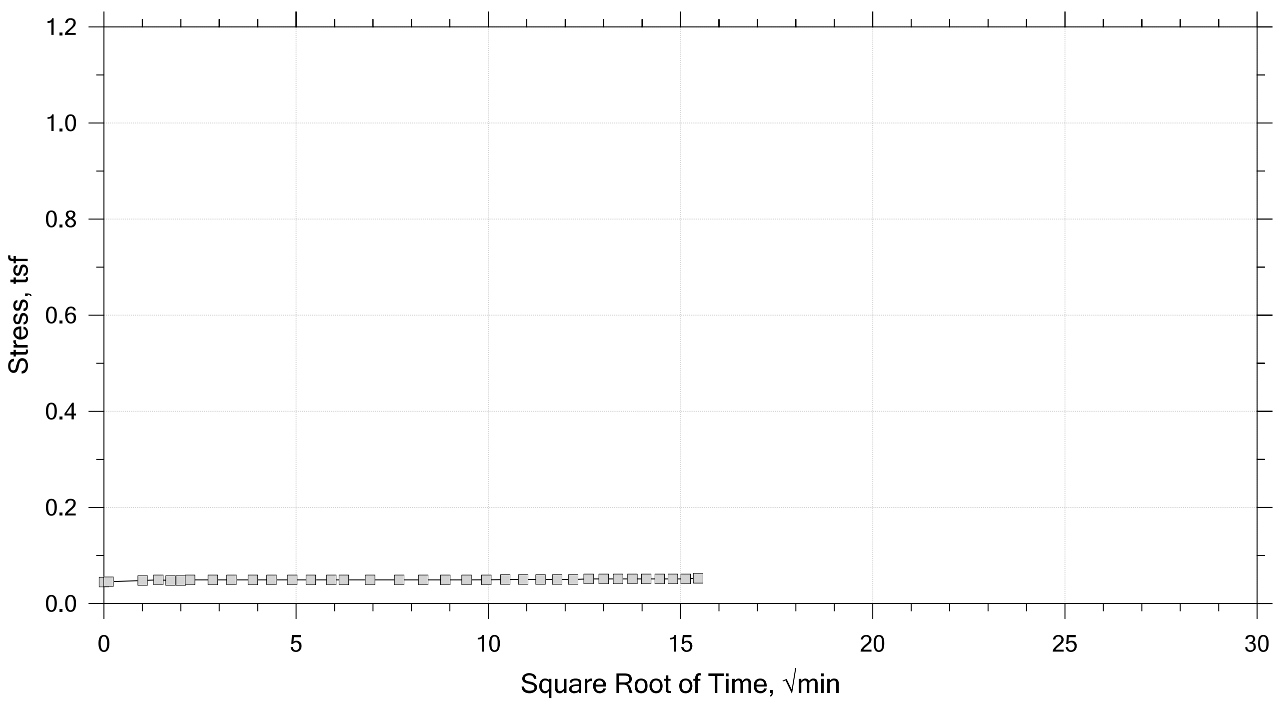


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-205	Tested By: te	Checked By: anm
	Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15
Constant Volume Step
Stress: 0.0526 tsf





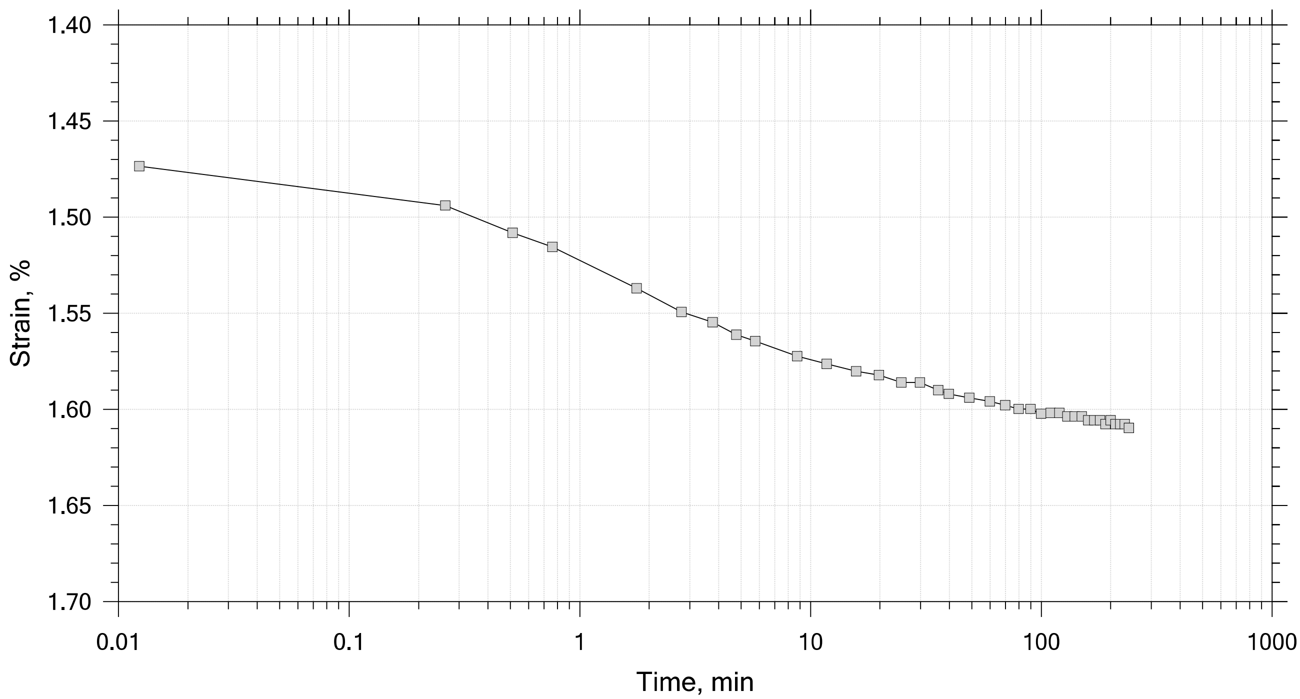
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-205	Tested By: te	Checked By: anm
	Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

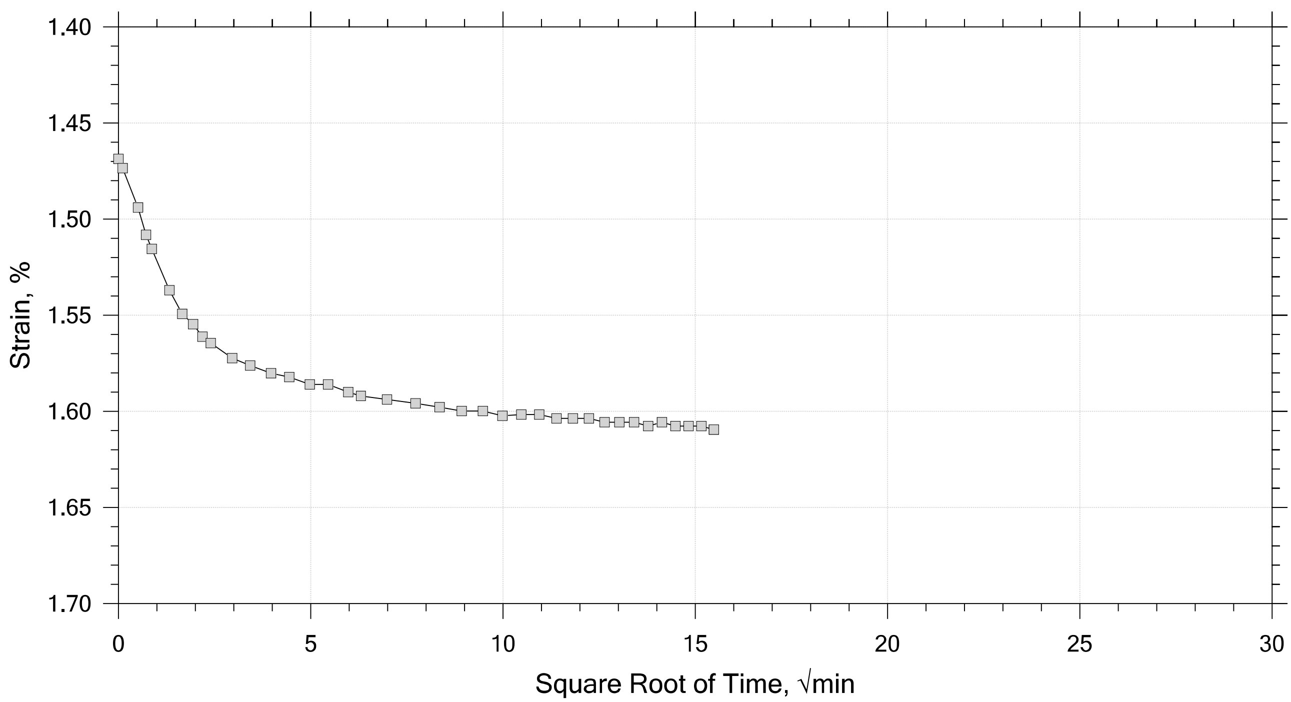
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15

Constant Load Step

Stress: 0.09 tsf





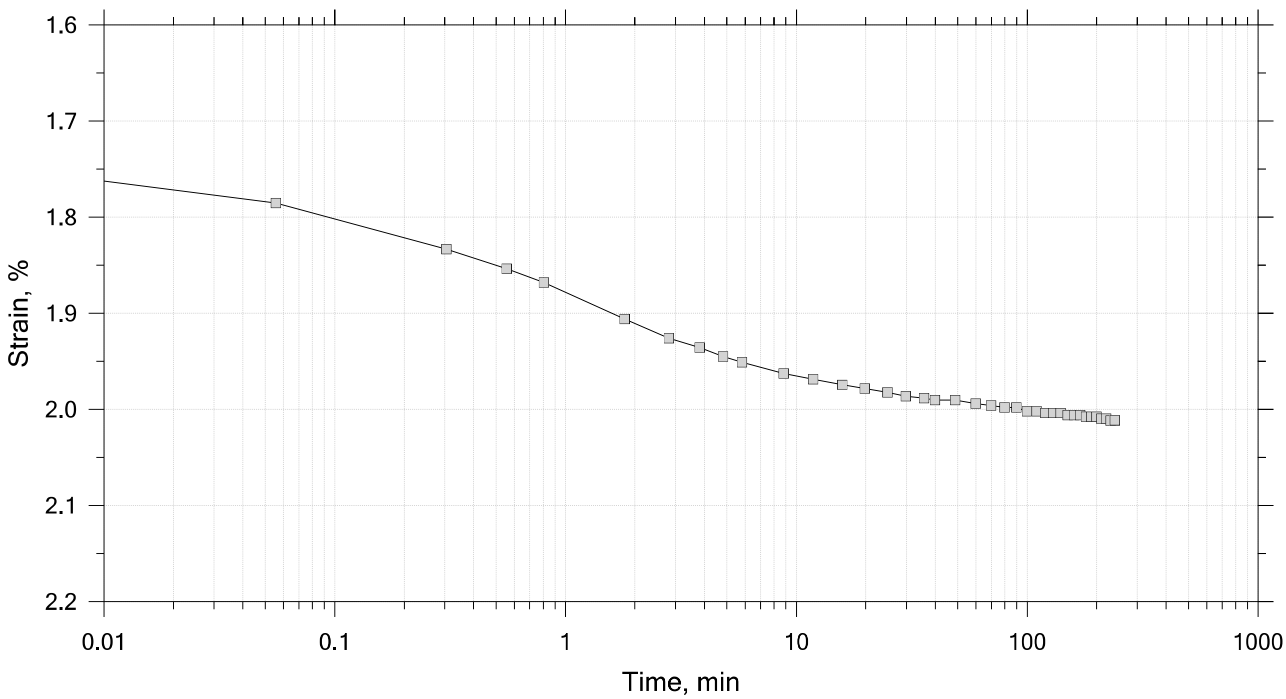
Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
Boring No.: BB-C295-205	Tested By: te	Checked By: anm
Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, gray clay with sand		
Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

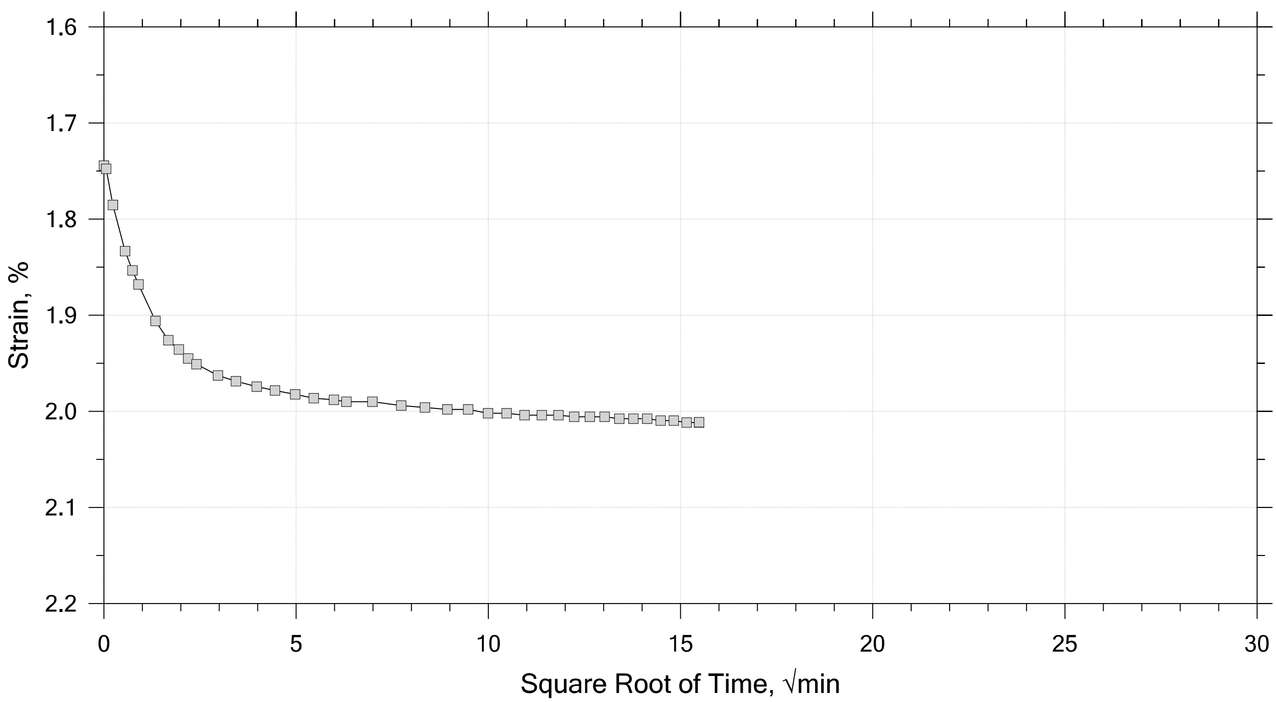
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15

Constant Load Step

Stress: 0.19 tsf

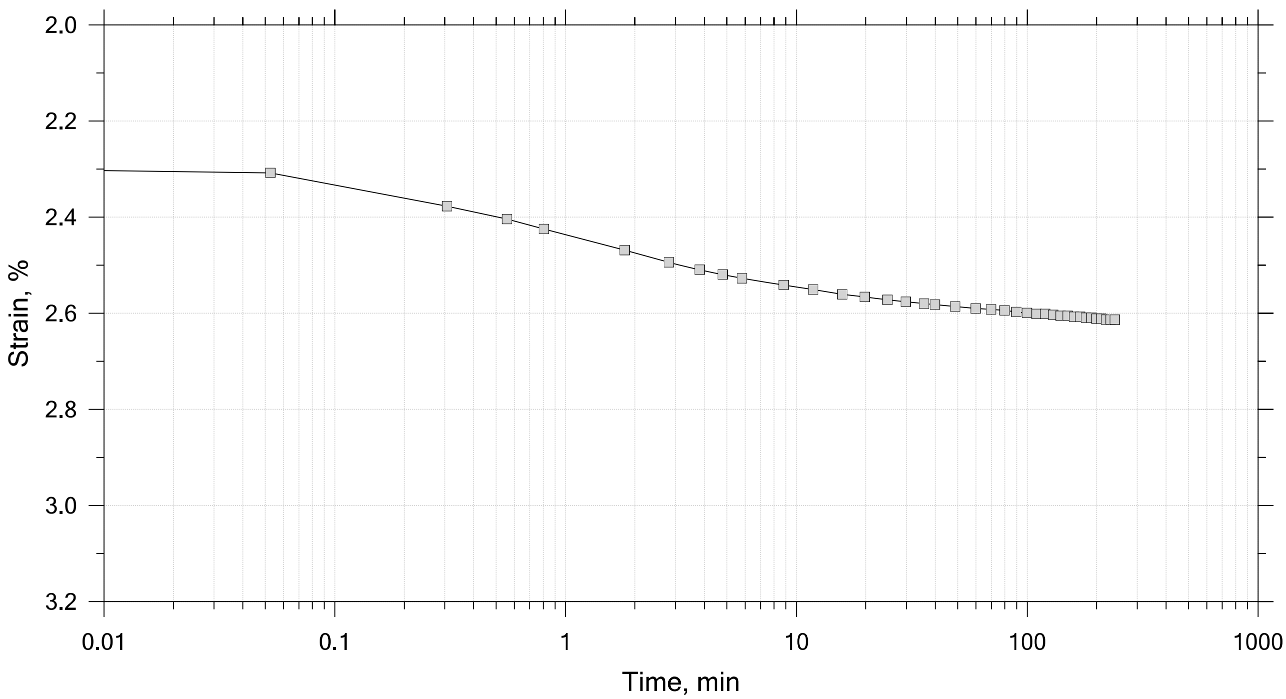


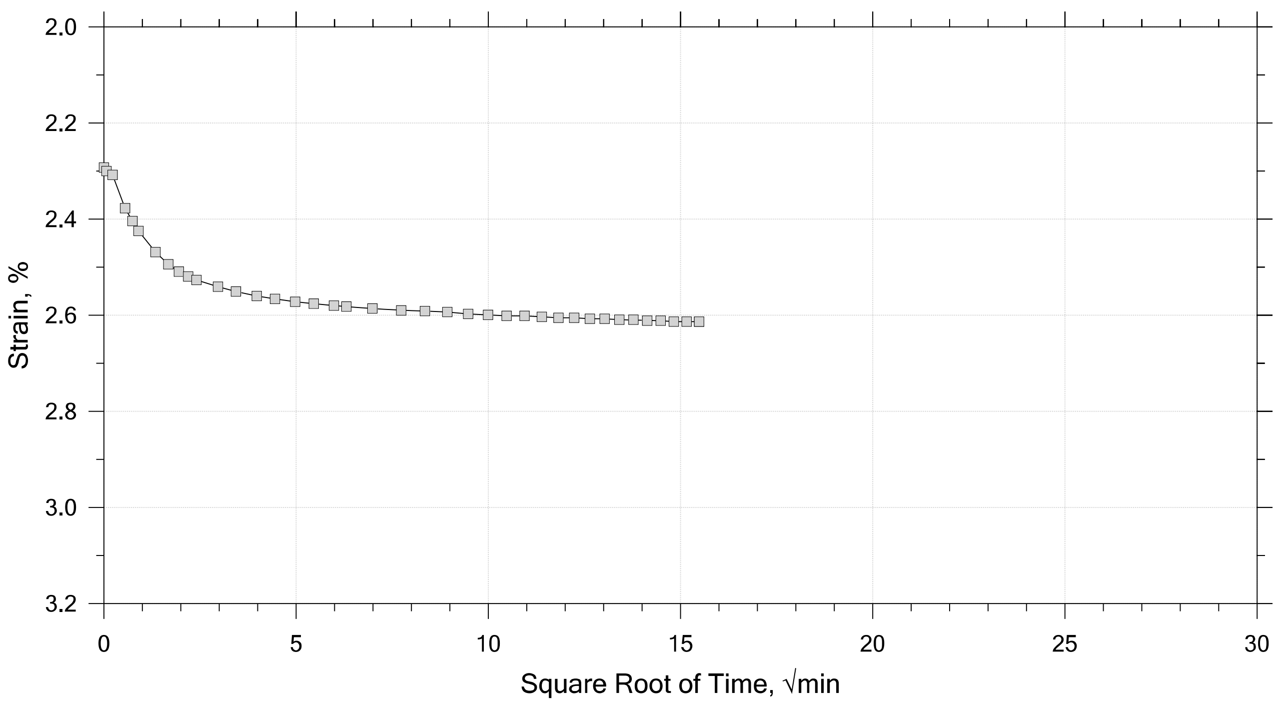


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-205	Tested By: te	Checked By: anm
	Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15
Constant Load Step
Stress: 0.38 tsf





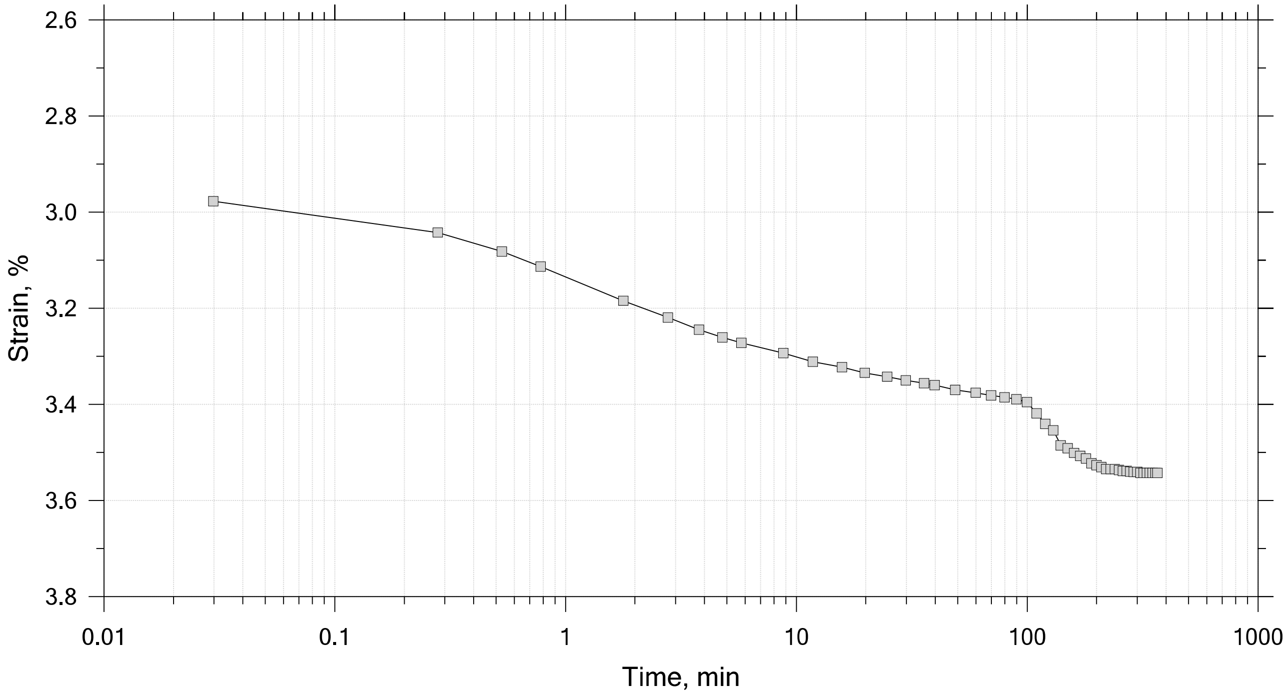
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-205	Tested By: te	Checked By: anm
	Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

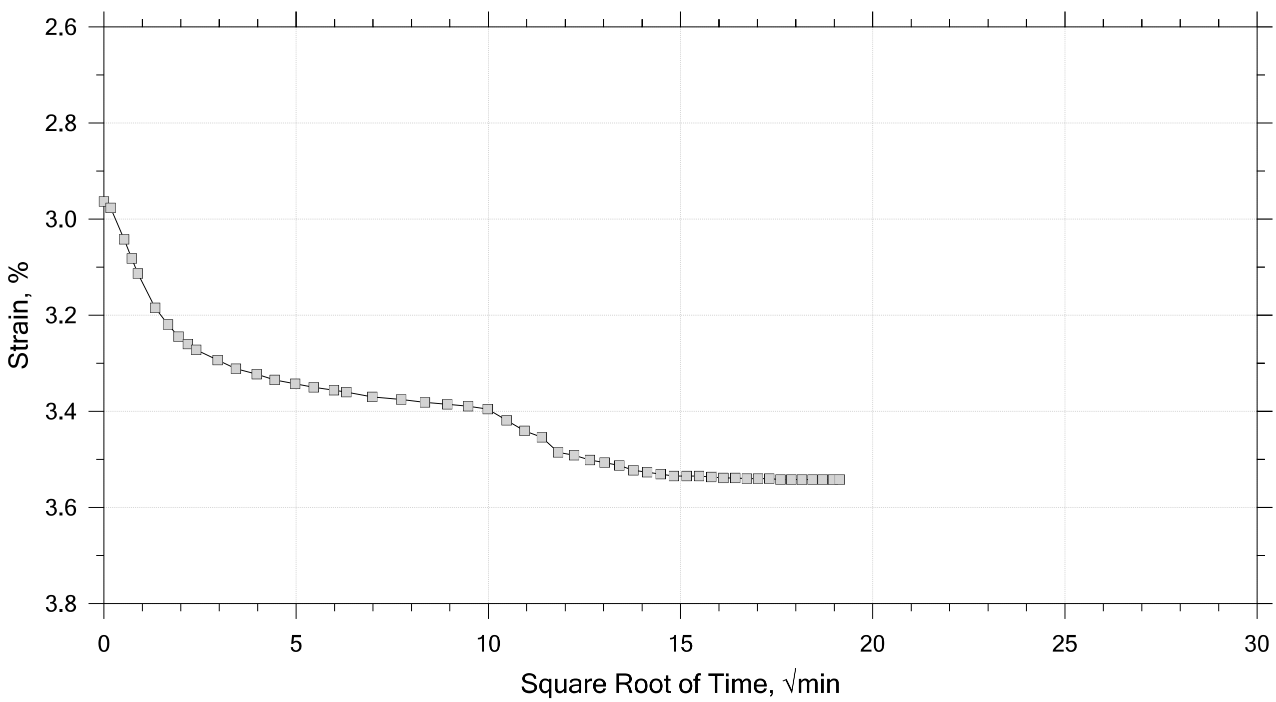
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15

Constant Load Step

Stress: 0.76 tsf

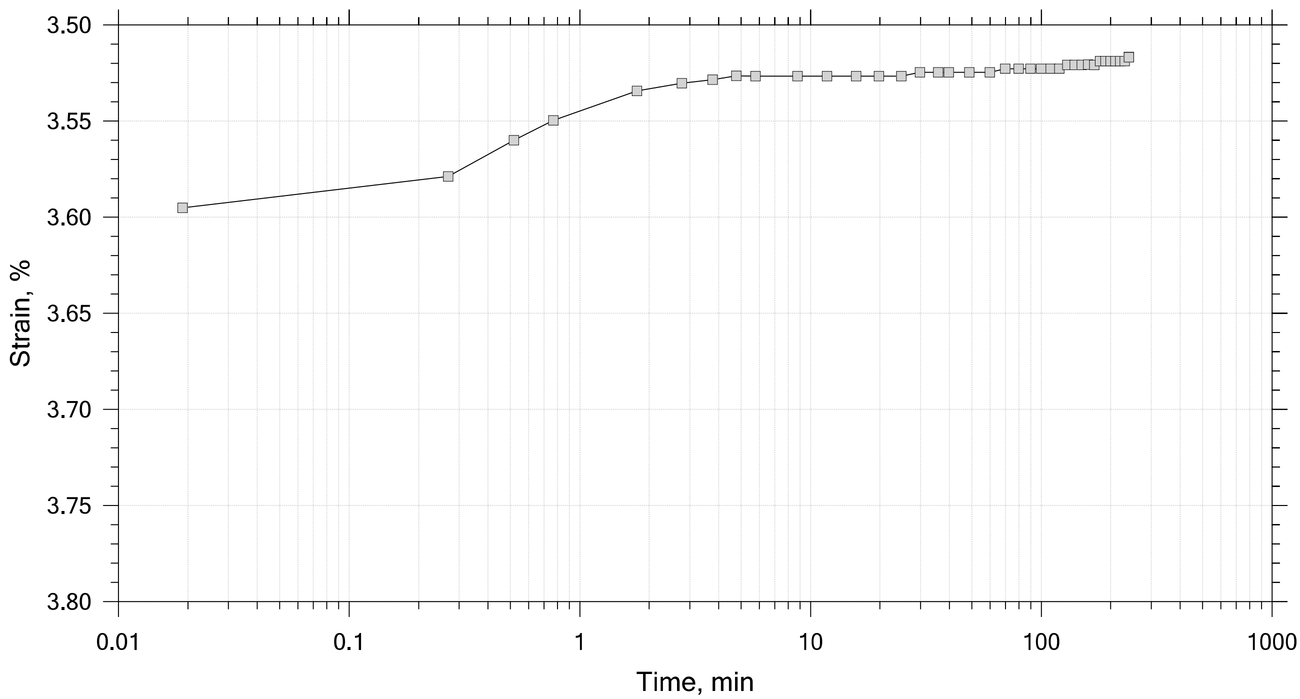


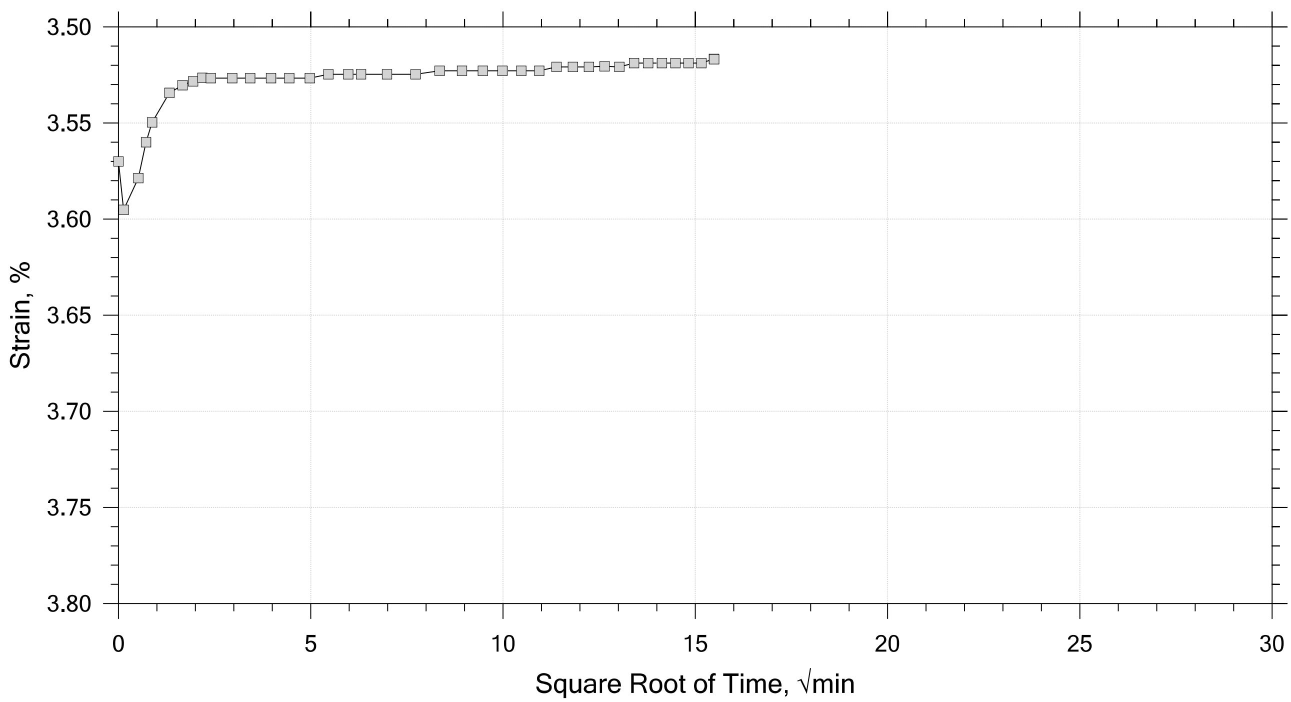


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-205	Tested By: te	Checked By: anm
	Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15
Constant Load Step
Stress: 0.38 tsf

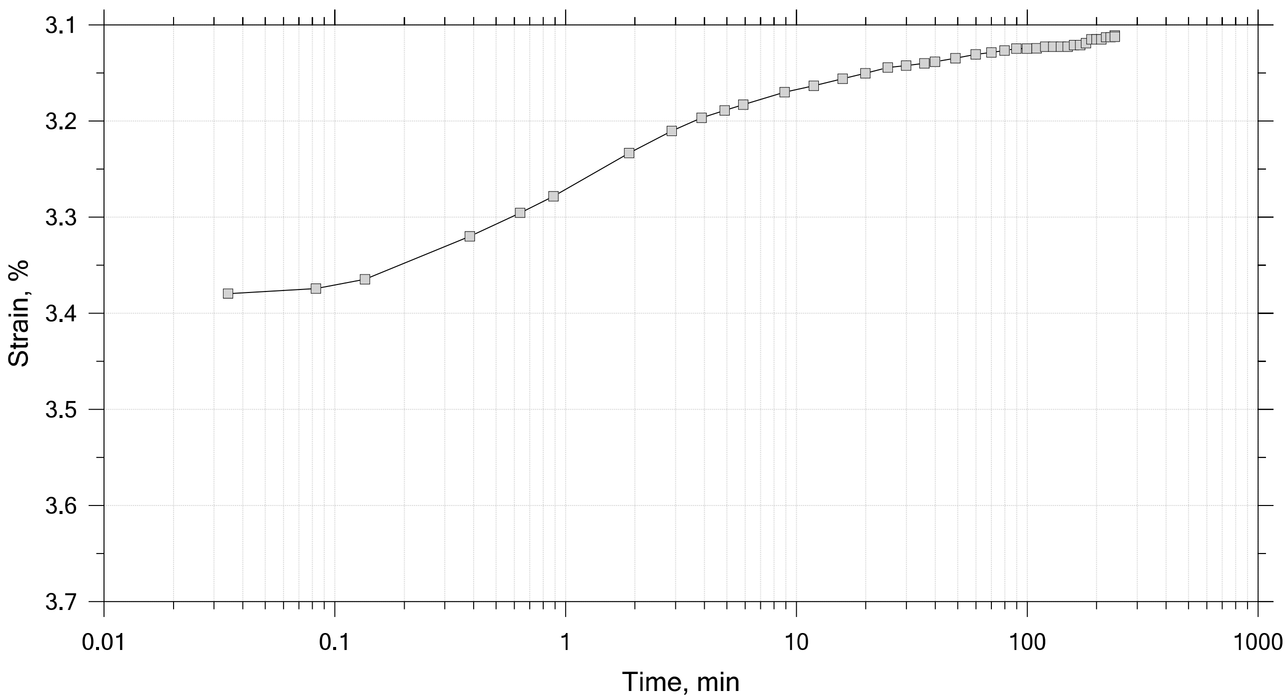


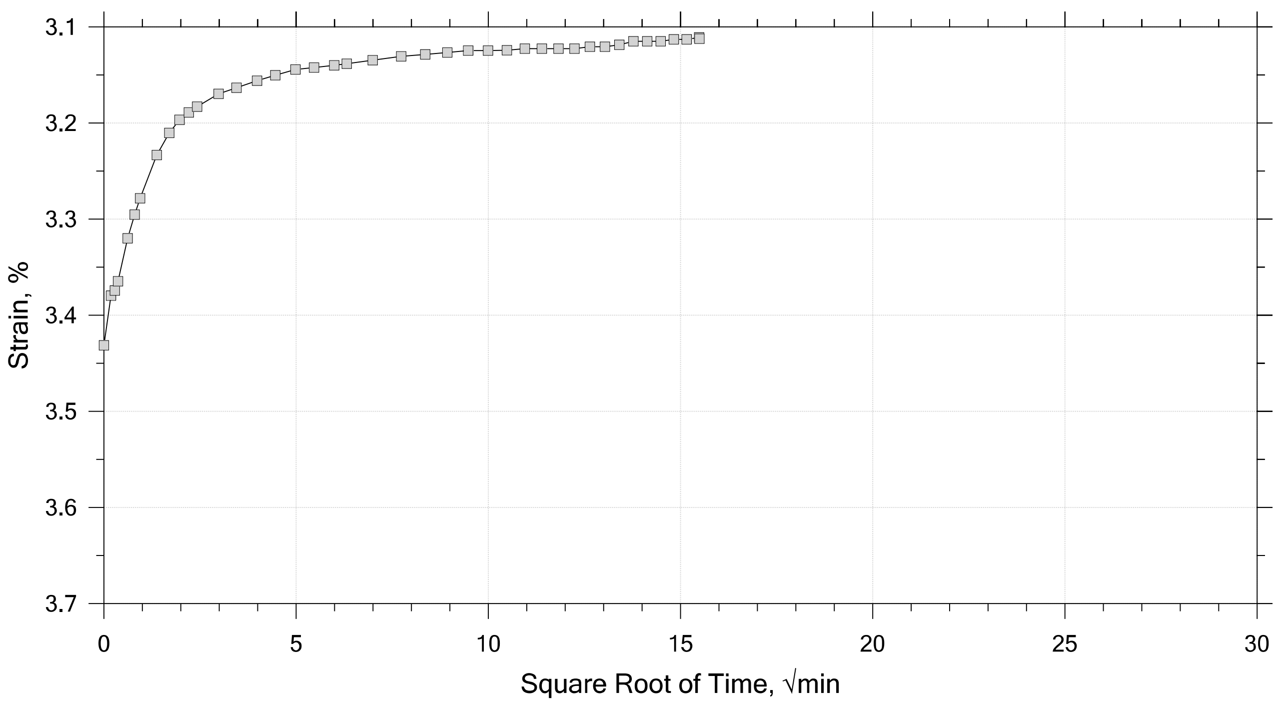


GeoTesting EXPRESS			
	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-205	Tested By: te	Checked By: anm
	Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15
Constant Load Step
Stress: 0.09 tsf





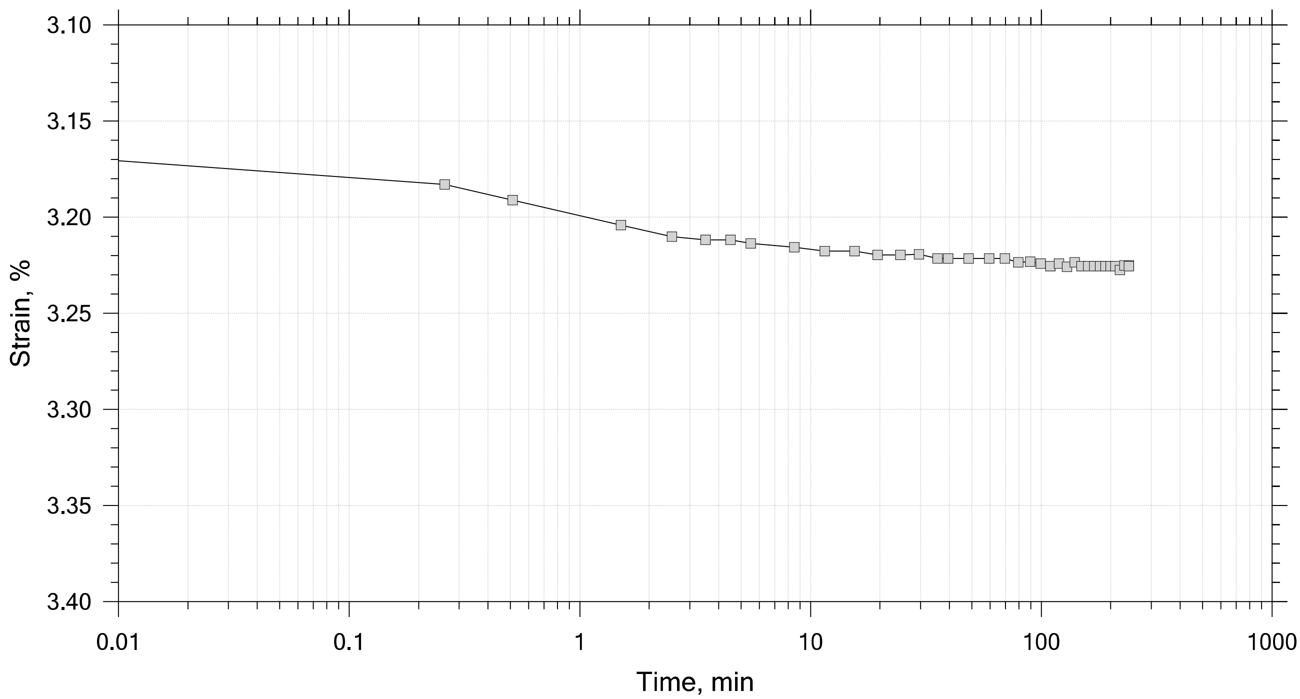
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-205	Tested By: te	Checked By: anm
	Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

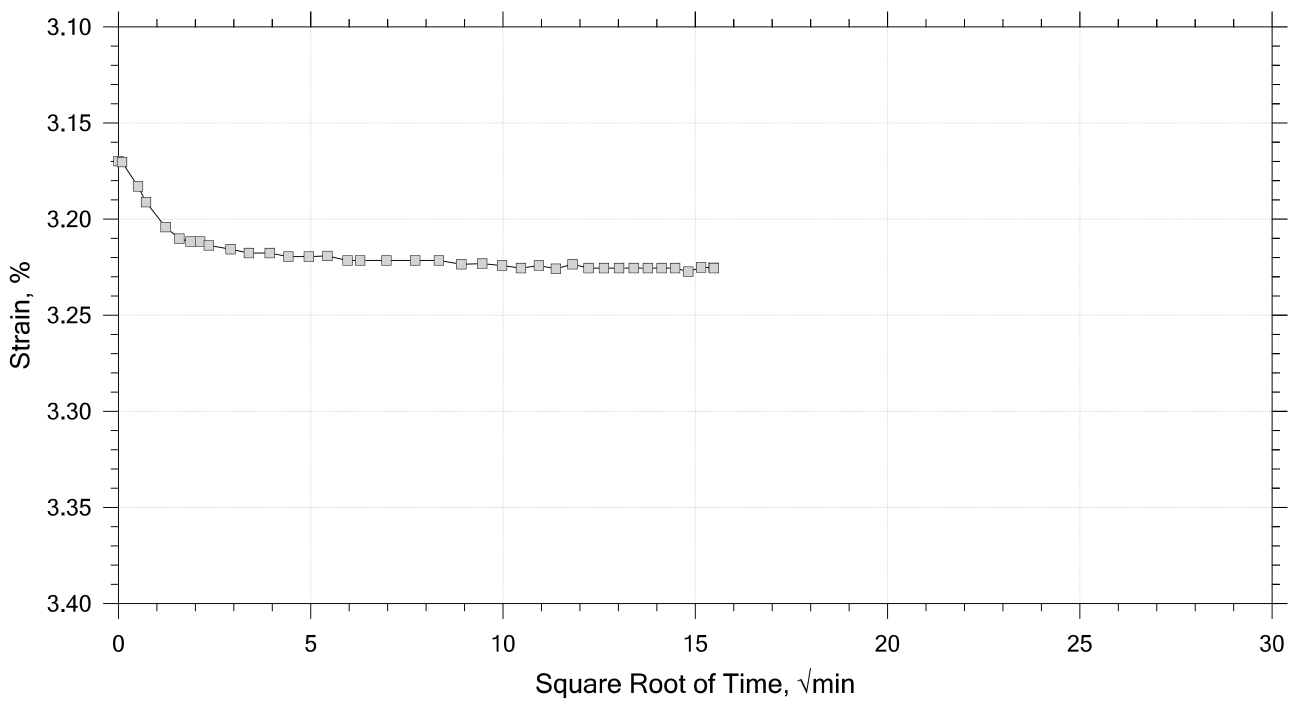
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15

Constant Load Step

Stress: 0.19 tsf

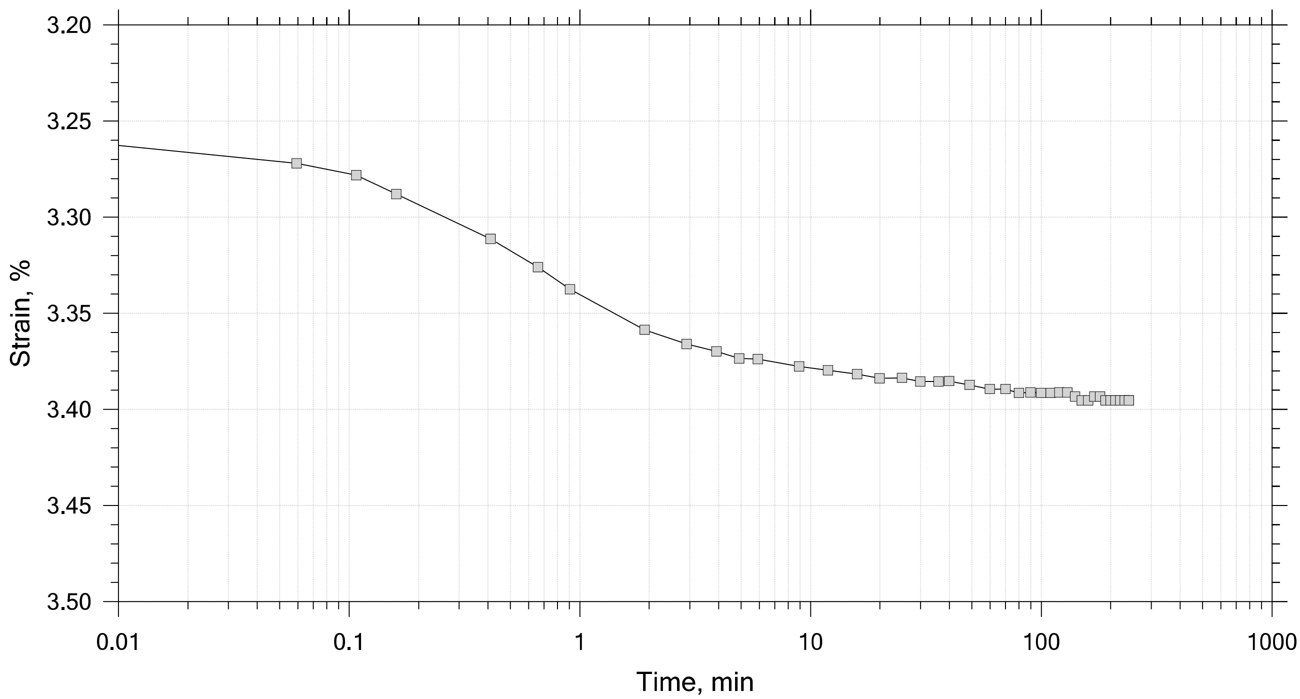


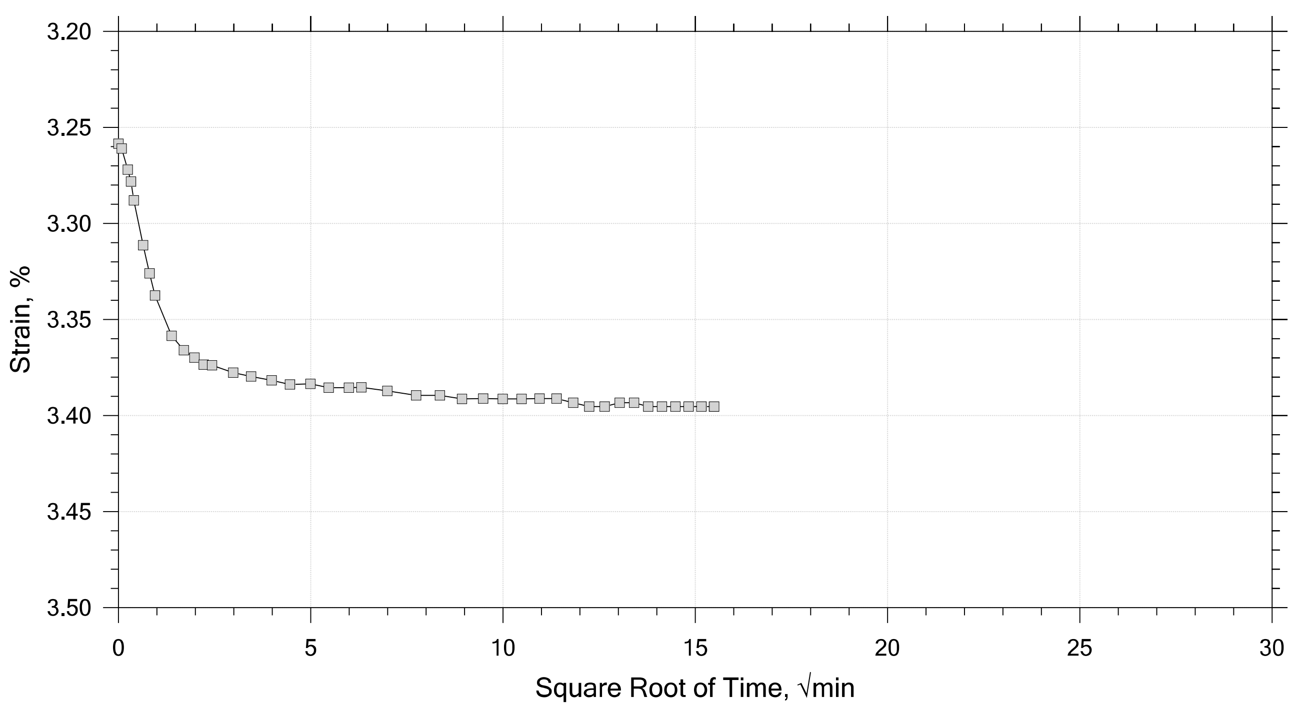


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-205	Tested By: te	Checked By: anm
	Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15
Constant Load Step
Stress: 0.38 tsf

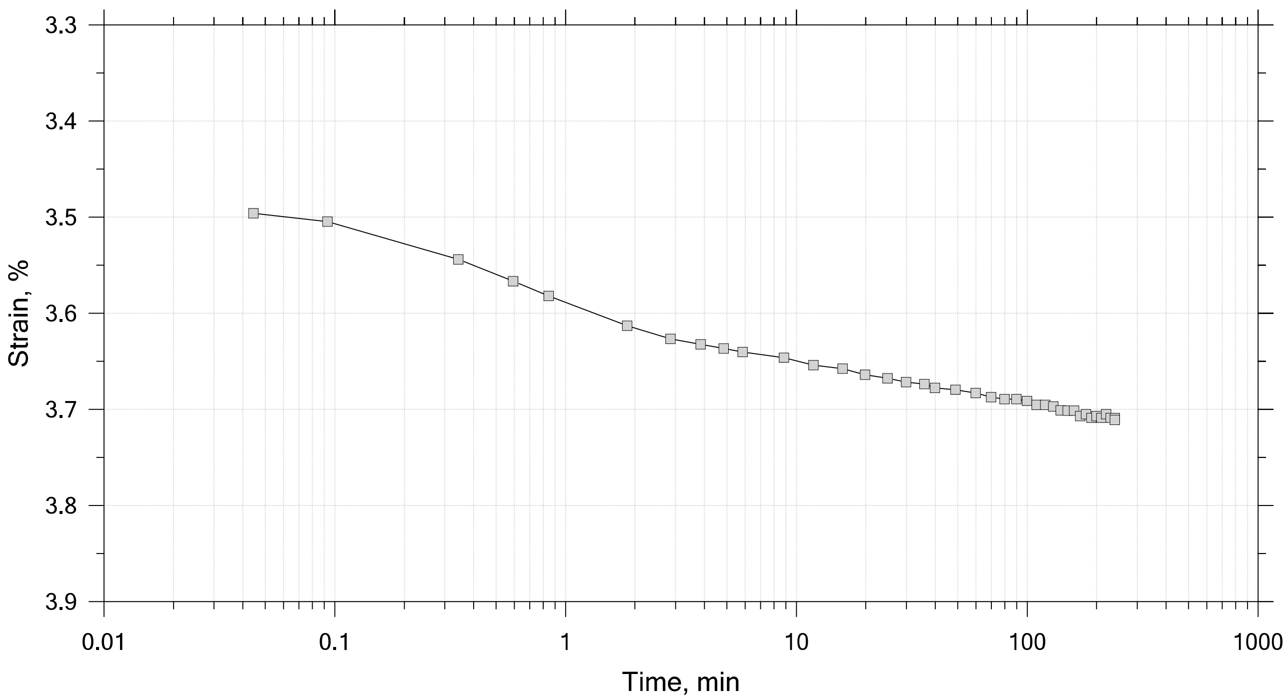


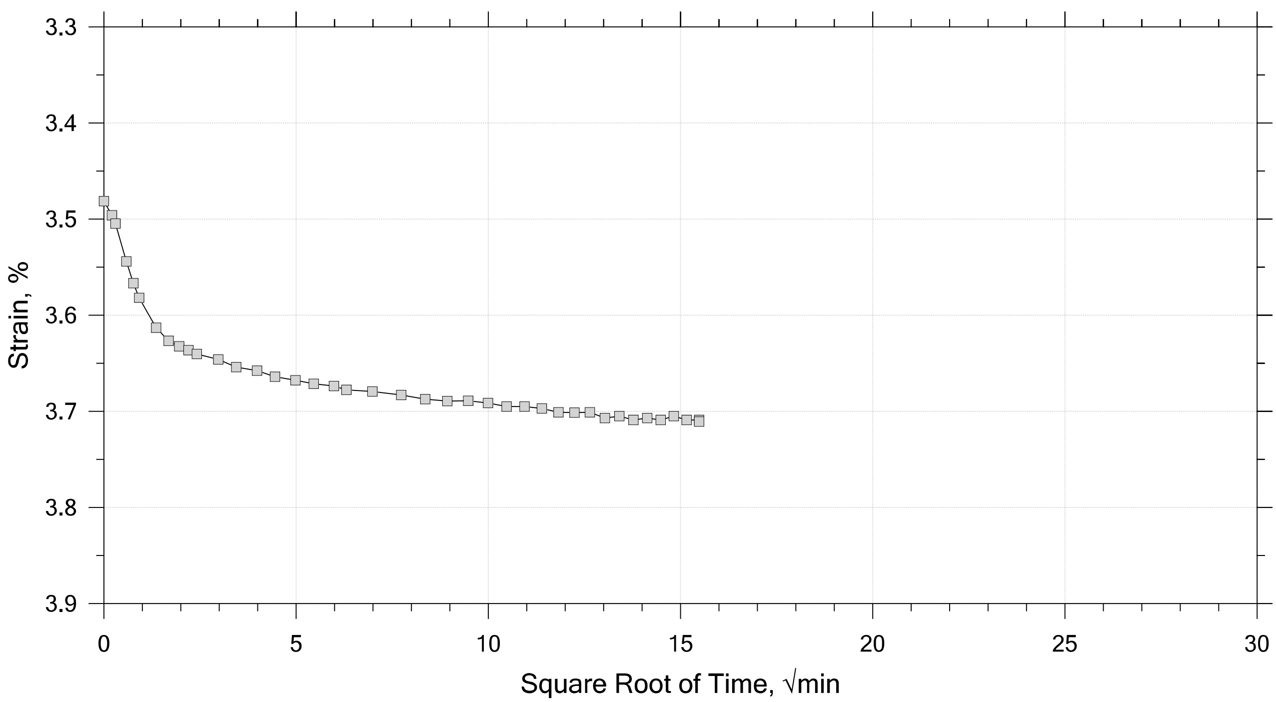


Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
Boring No.: BB-C295-205	Tested By: te	Checked By: anm
Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, gray clay with sand		
Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15
Constant Load Step
Stress: 0.76 tsf





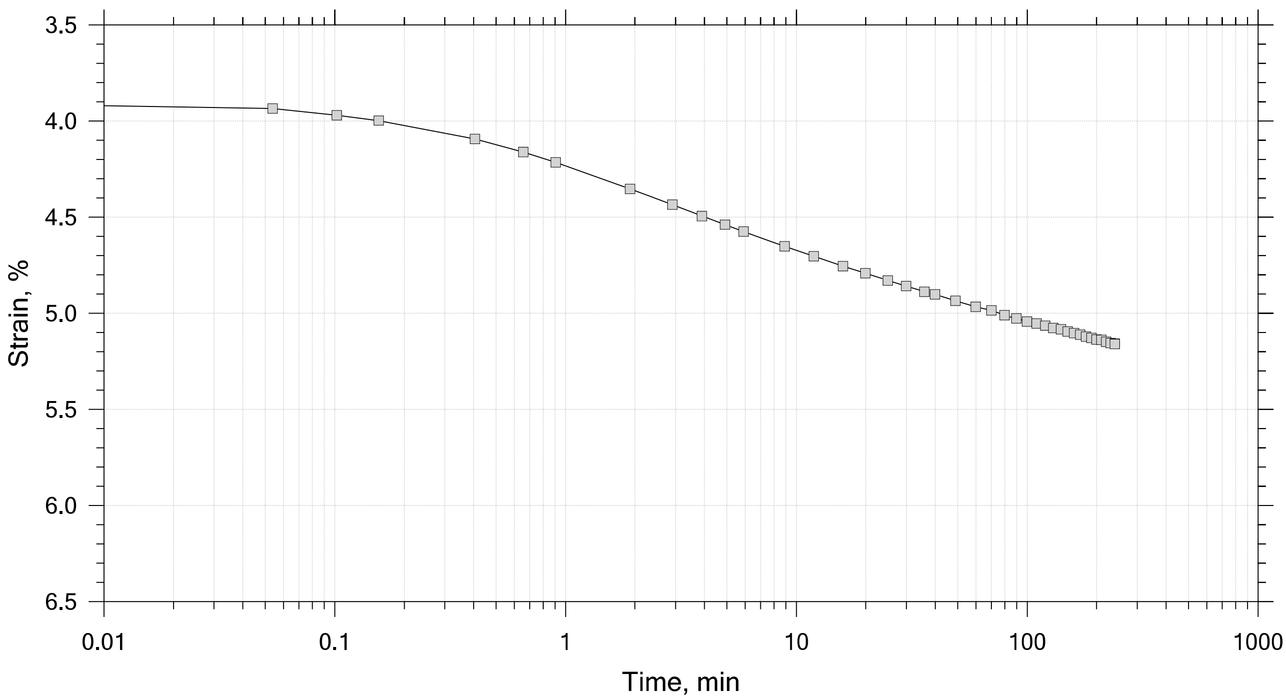
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-205	Tested By: te	Checked By: anm
	Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

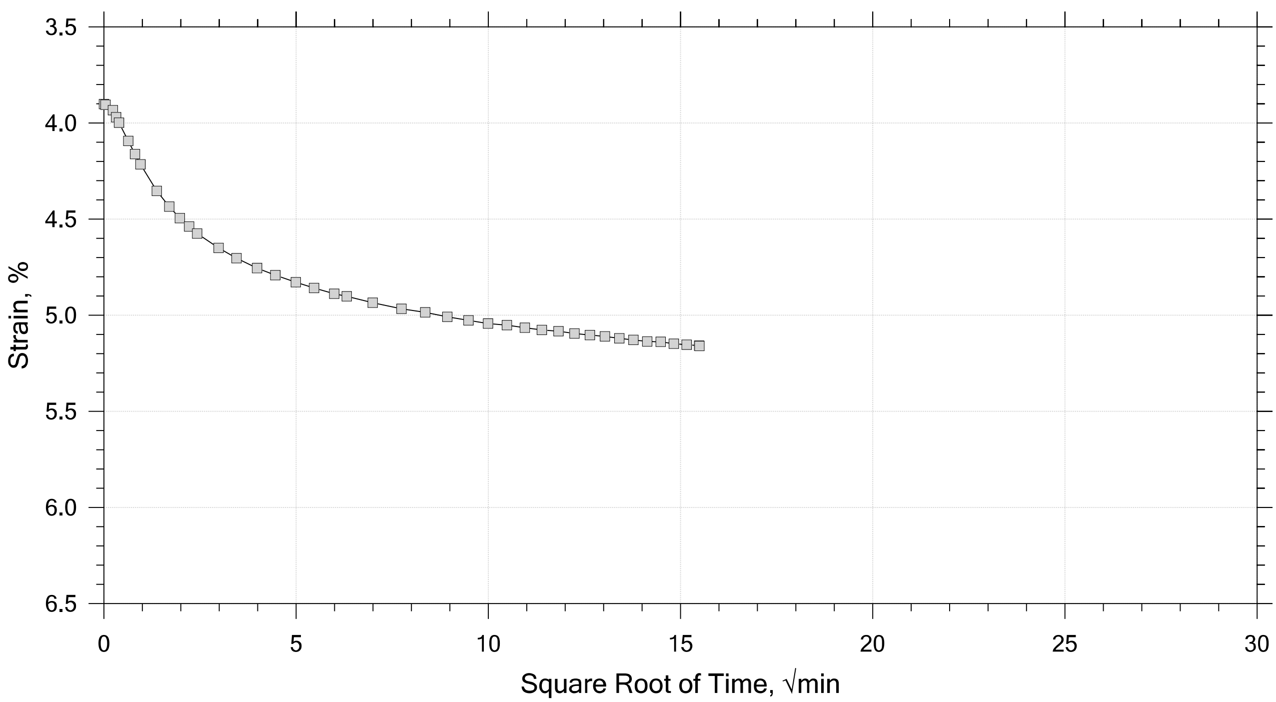
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15

Constant Load Step

Stress: 1.51 tsf





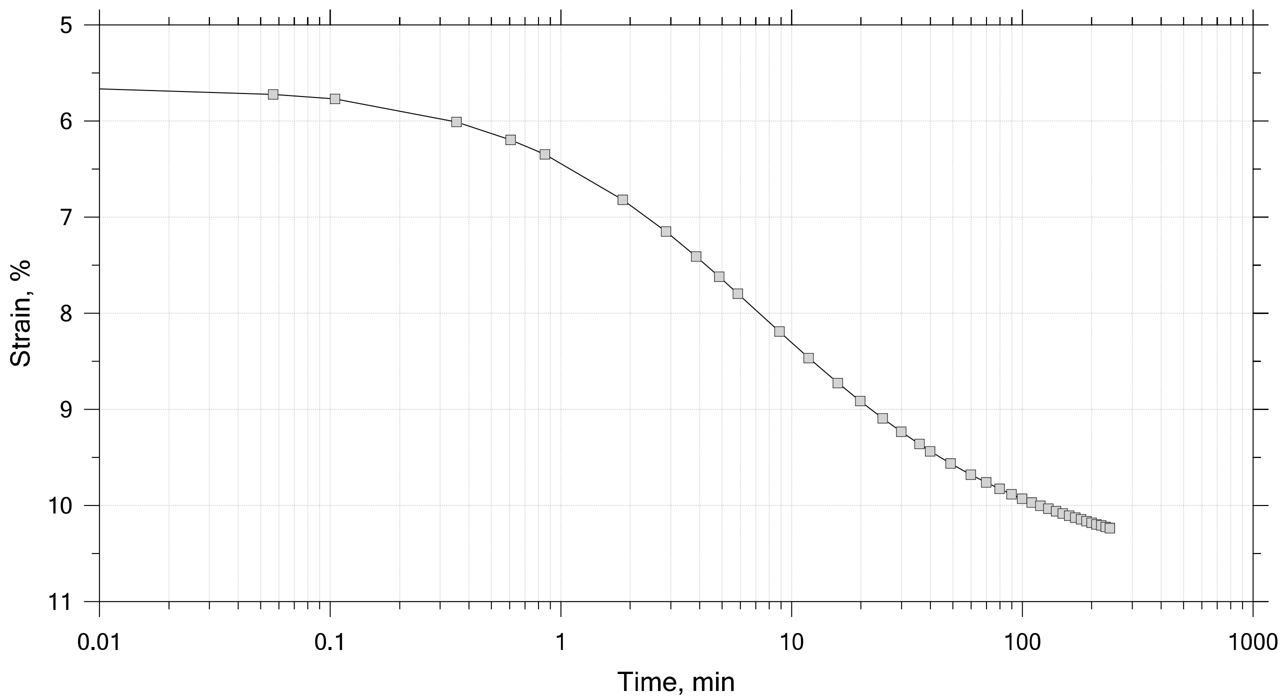
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-205	Tested By: te	Checked By: anm
	Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

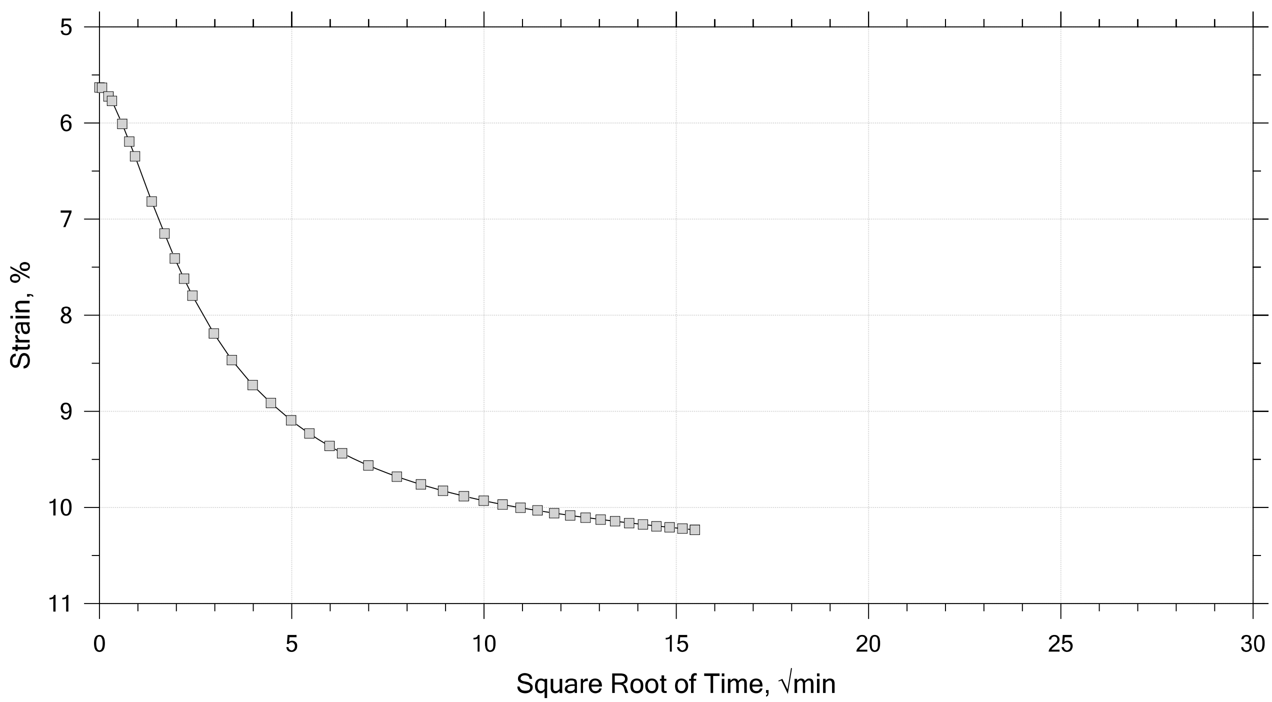
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15

Constant Load Step

Stress: 3 tsf





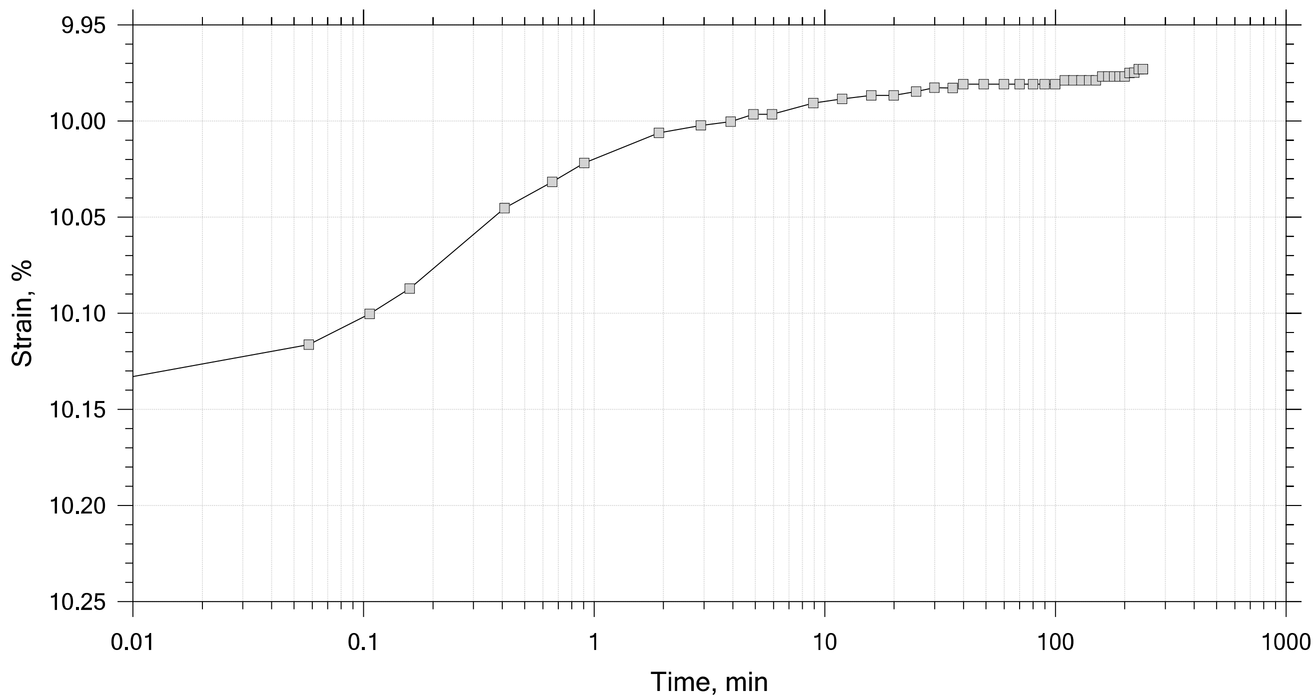
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-205	Tested By: te	Checked By: anm
	Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

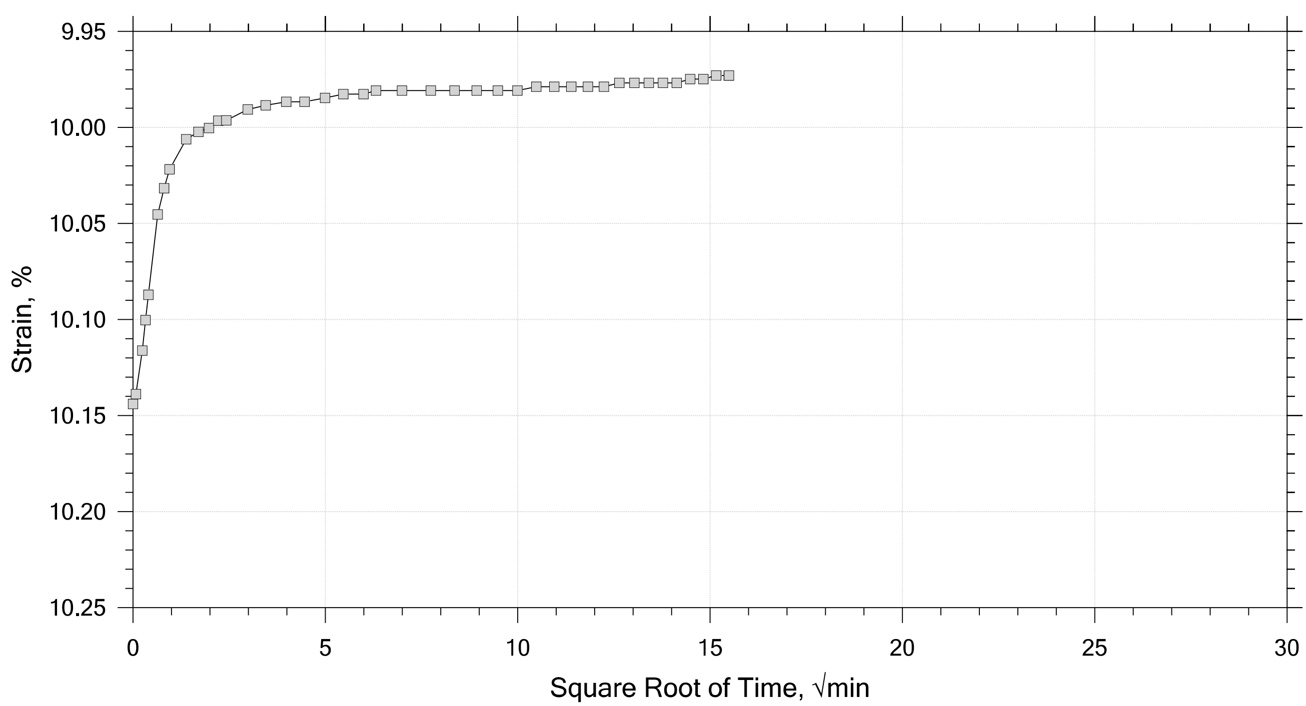
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15

Constant Load Step

Stress: 1.51 tsf

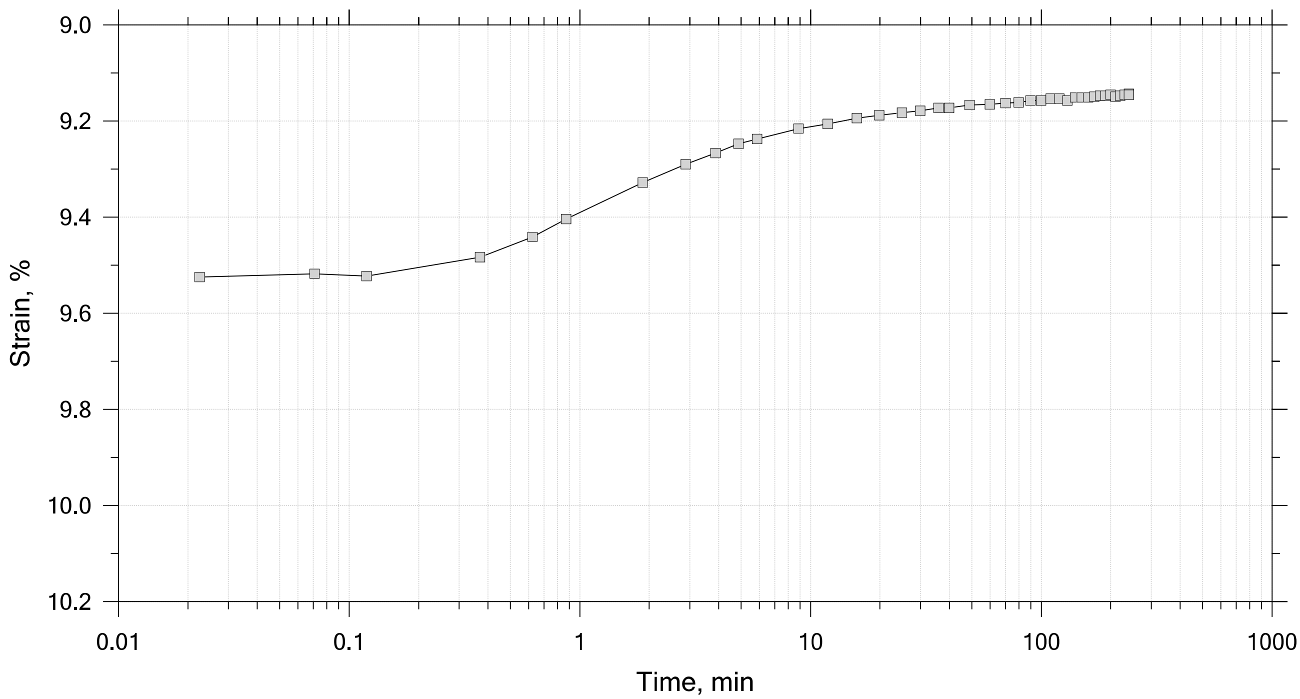


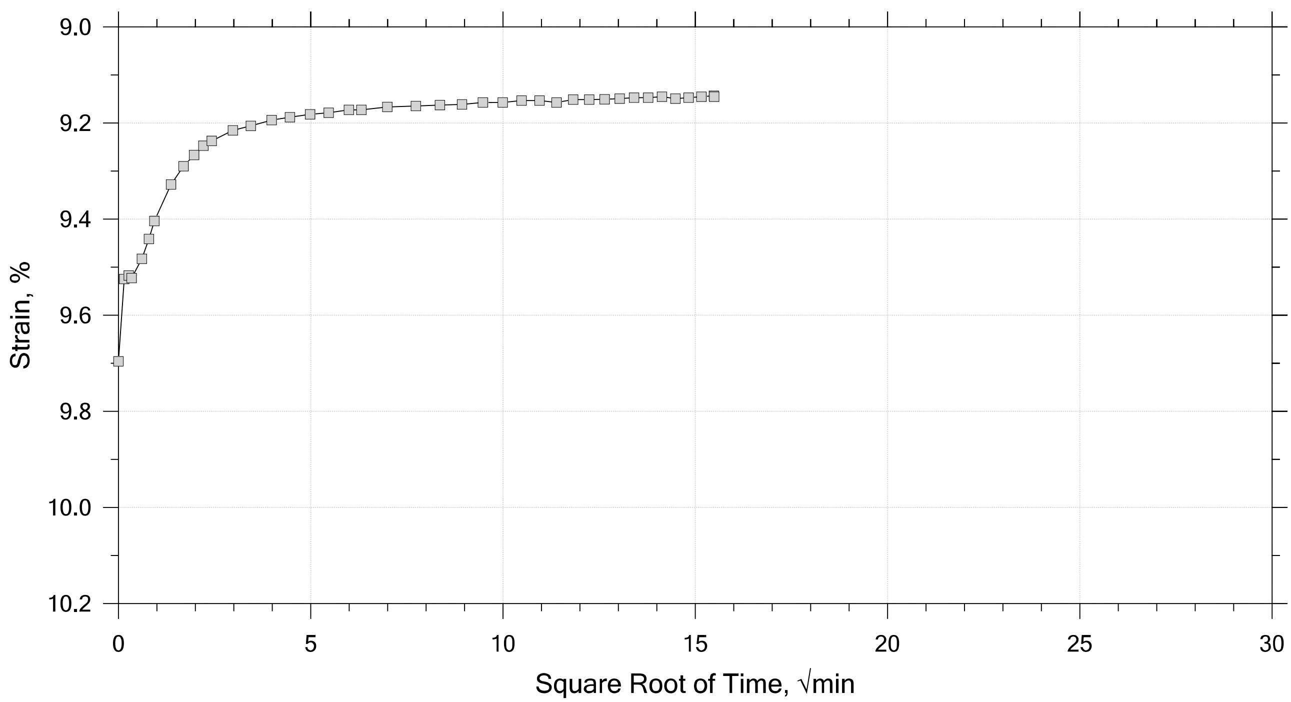


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-205	Tested By: te	Checked By: anm
	Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15
Constant Load Step
Stress: 0.38 tsf

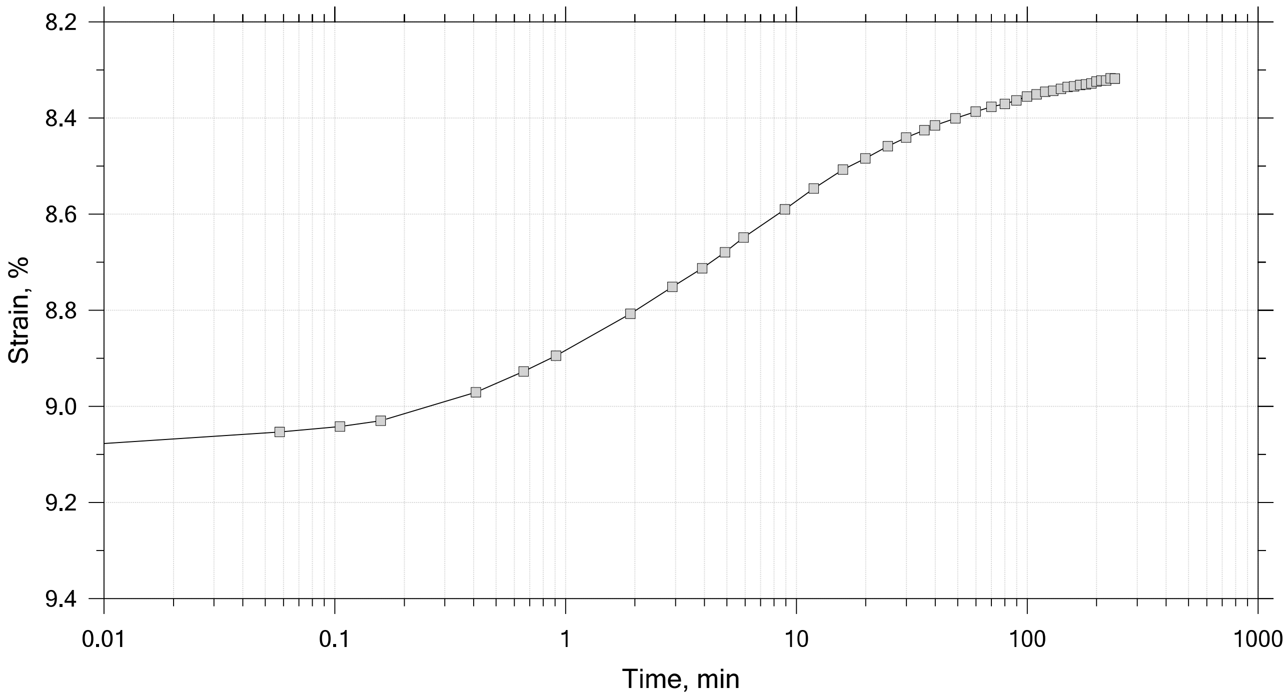


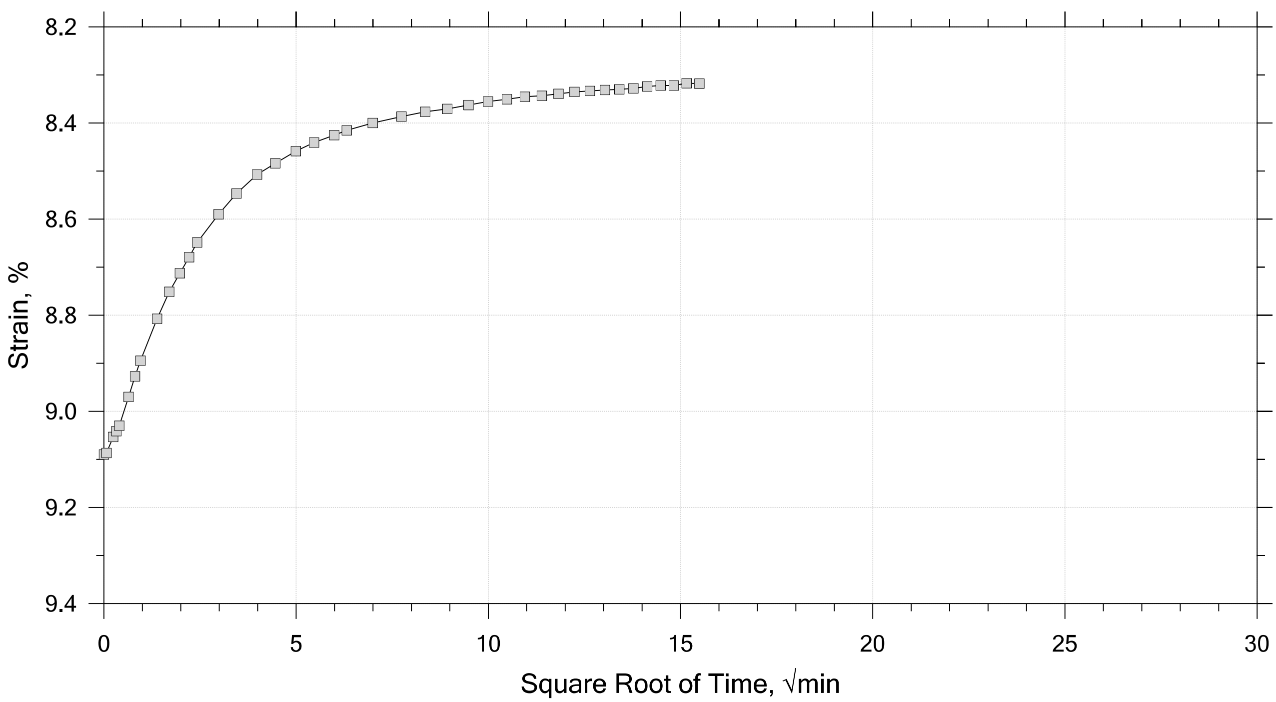


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-205	Tested By: te	Checked By: anm
	Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15
Constant Load Step
Stress: 0.09 tsf





GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-205	Tested By: te	Checked By: anm
	Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.75	Liquid Limit: ---
Initial Height: 1.00 in	Initial Void Ratio: 0.948	Plastic Limit: ---
Final Height: 0.88 in	Final Void Ratio: 0.714	Plasticity Index: ---

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	E2680	RING		E3151
Mass Container, gm	8.35	110.03	110.03	8.29
Mass Container + Wet Soil, gm	207.16	262.54	253	155.63
Mass Container + Dry Soil, gm	158.16	223.5	223.5	125.23
Mass Dry Soil, gm	149.81	113.47	113.47	116.94
Water Content, %	32.71	34.40	26.00	26.00
Void Ratio	---	0.95	0.71	---
Degree of Saturation, %	---	99.71	100.00	---
Dry Unit Weight, pcf	---	88.063	100.07	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-205	Tested By: te	Checked By: anm
	Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

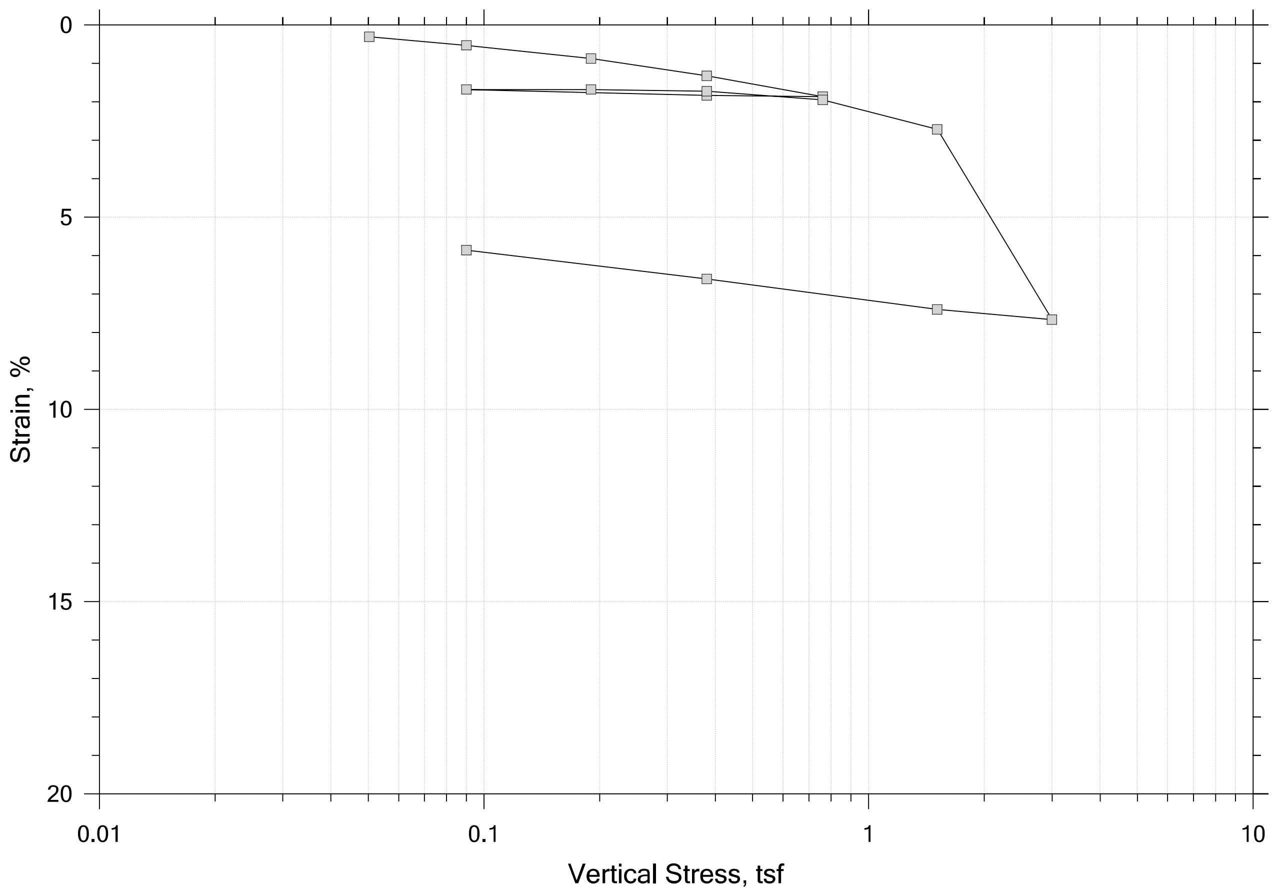
Square Root of Time Coefficients

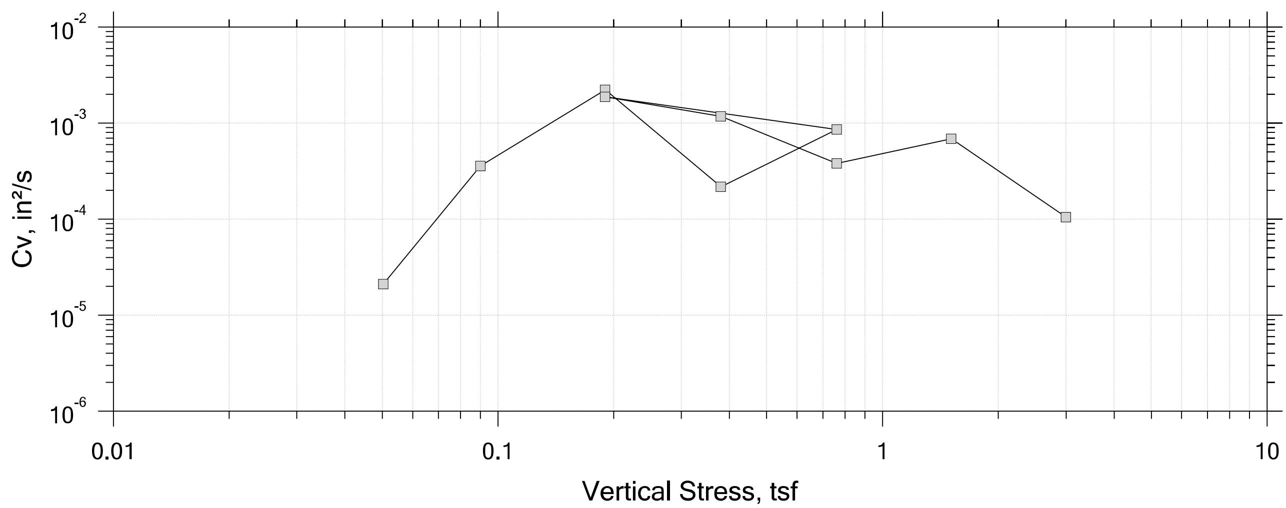
Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv in²/s	Mv 1/tsf	k in/s
1	0.0526	0.01400	0.921	1.40	9.724	3.58e-04	2.66e-01	2.48e-07
2	0.0900	0.01610	0.917	1.61	8.180	4.19e-04	5.61e-02	6.11e-08
3	0.190	0.02011	0.909	2.01	3.695	9.22e-04	4.02e-02	9.63e-08
4	0.380	0.02613	0.897	2.61	5.392	6.25e-04	3.17e-02	5.15e-08
5	0.760	0.03542	0.879	3.54	249.987	1.33e-05	2.44e-02	8.44e-10
6	0.380	0.03517	0.880	3.52	4.081	8.06e-04	6.67e-04	1.40e-09
7	0.0900	0.03112	0.888	3.11	5.692	5.80e-04	1.39e-02	2.11e-08
8	0.190	0.03225	0.885	3.23	3.508	9.44e-04	1.13e-02	2.78e-08
9	0.380	0.03395	0.882	3.40	3.176	1.04e-03	8.94e-03	2.42e-08
10	0.760	0.03711	0.876	3.71	14.656	2.24e-04	8.30e-03	4.84e-09
11	1.51	0.05160	0.848	5.16	23.639	1.37e-04	1.93e-02	6.86e-09
12	3.00	0.1023	0.749	10.2	18.948	1.59e-04	3.41e-02	1.41e-08
13	1.51	0.09973	0.754	9.97	1.800	1.59e-03	1.76e-03	7.25e-09
14	0.380	0.09145	0.770	9.15	9.347	3.09e-04	7.33e-03	5.89e-09
15	0.0900	0.08318	0.786	8.32	13.791	2.13e-04	2.85e-02	1.58e-08

Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
Boring No.: BB-C295-205	Tested By: te	Checked By: anm
Sample No.: U2	Test Date: 4/22/24	Depth: 26.5-28.5'
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, gray clay with sand		
Remarks: System LTIII-E, Swell Pressure = 0.0526 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report

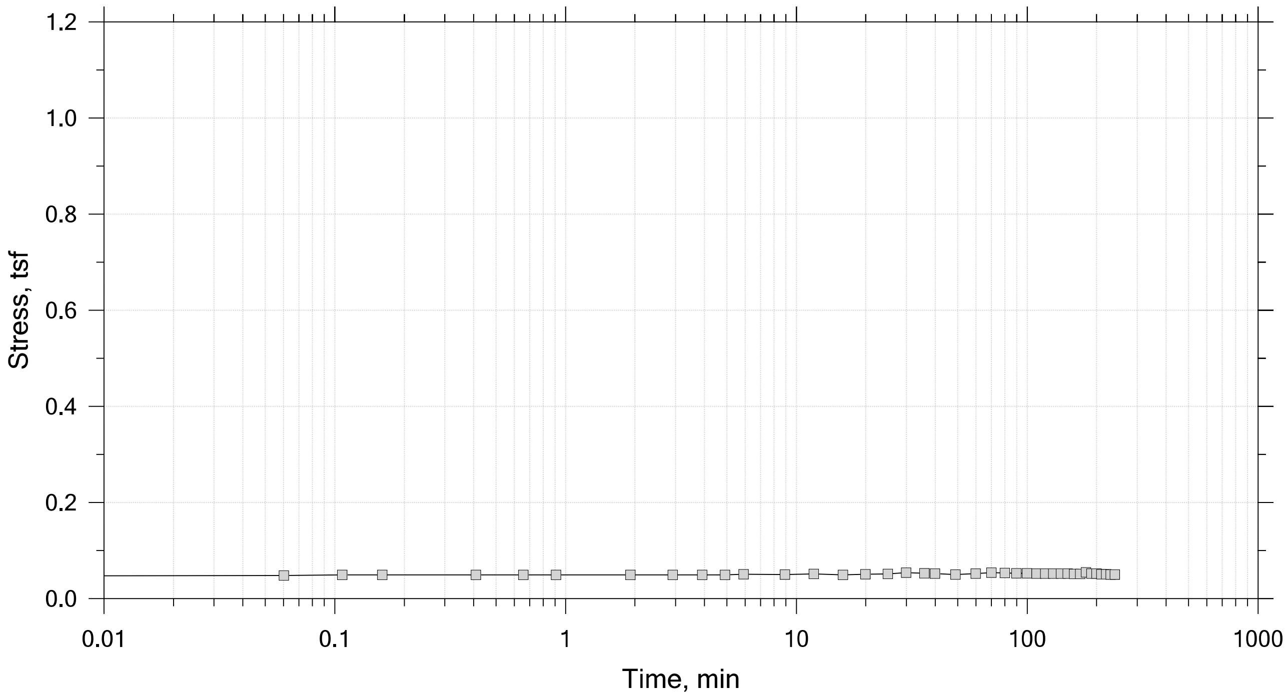


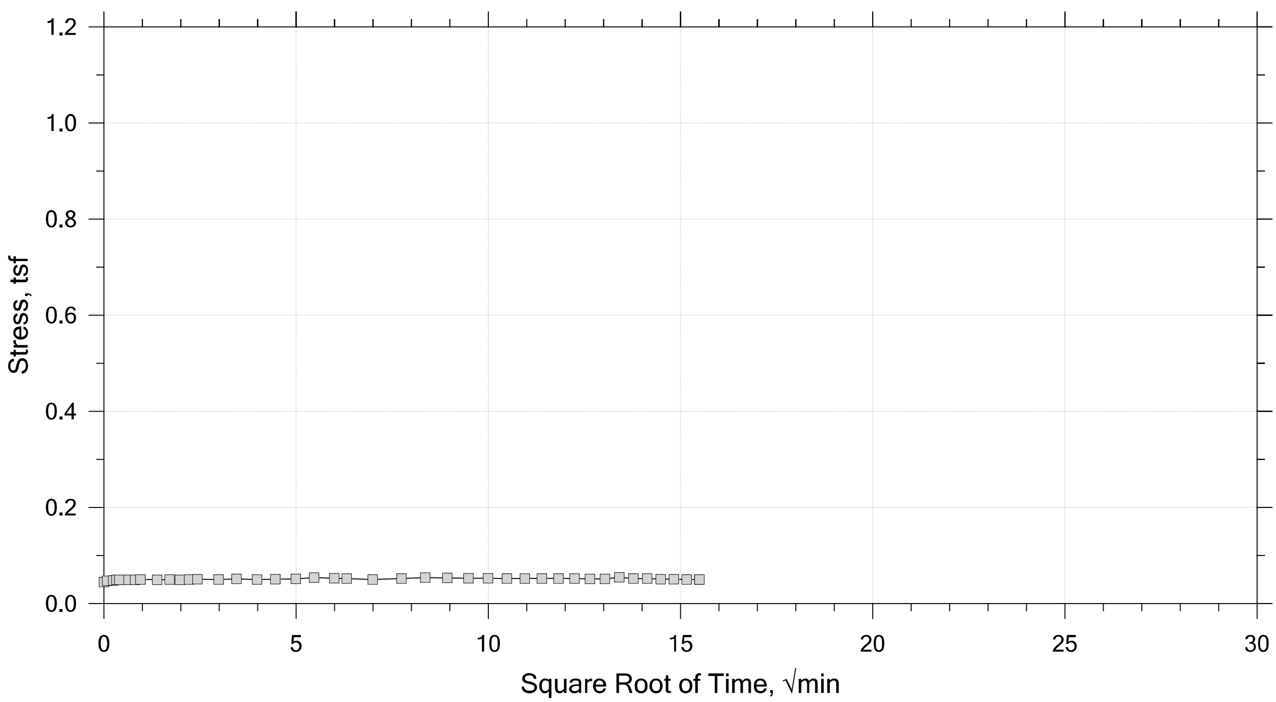


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15
Constant Volume Step
Stress: 0.0503 tsf





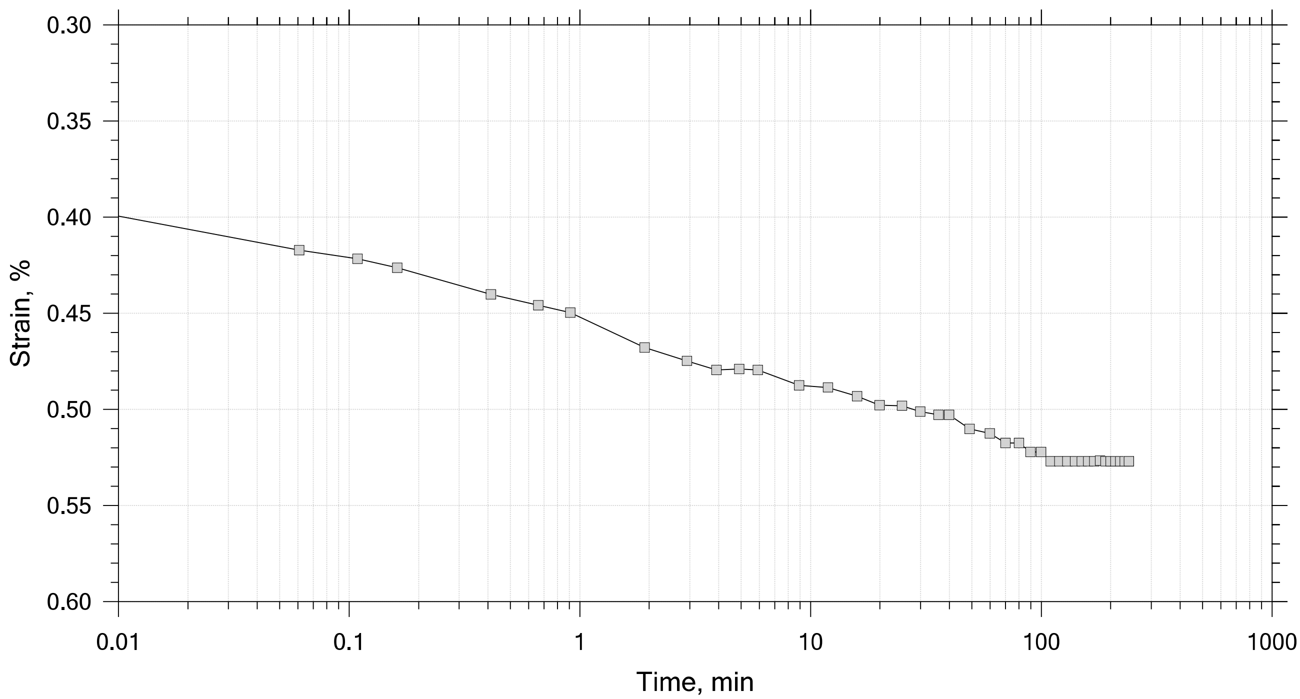
	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

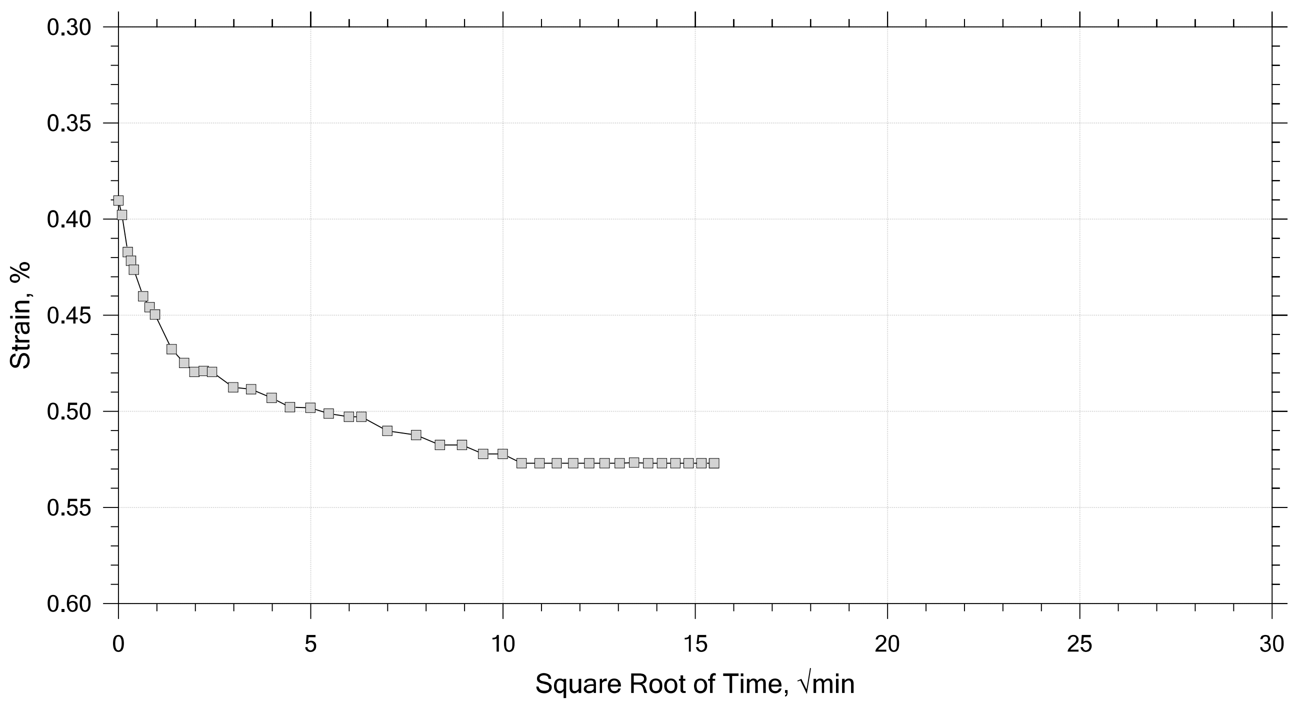
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15

Constant Load Step

Stress: 0.09 tsf





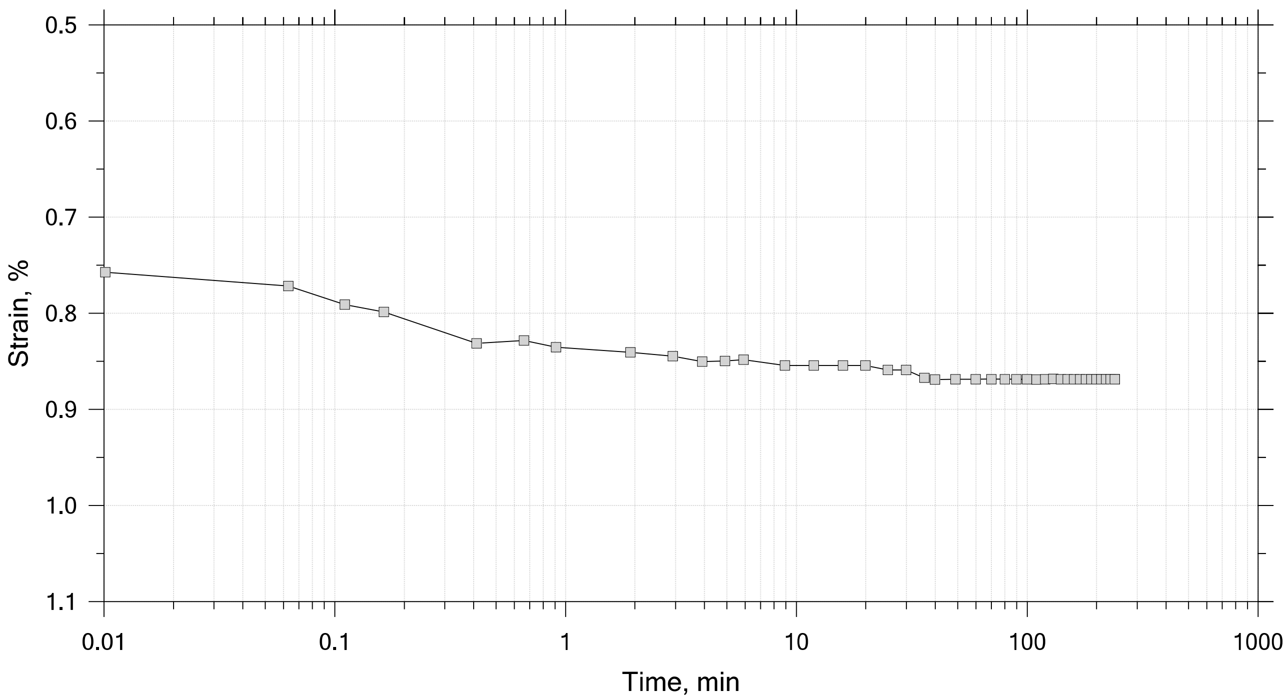
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

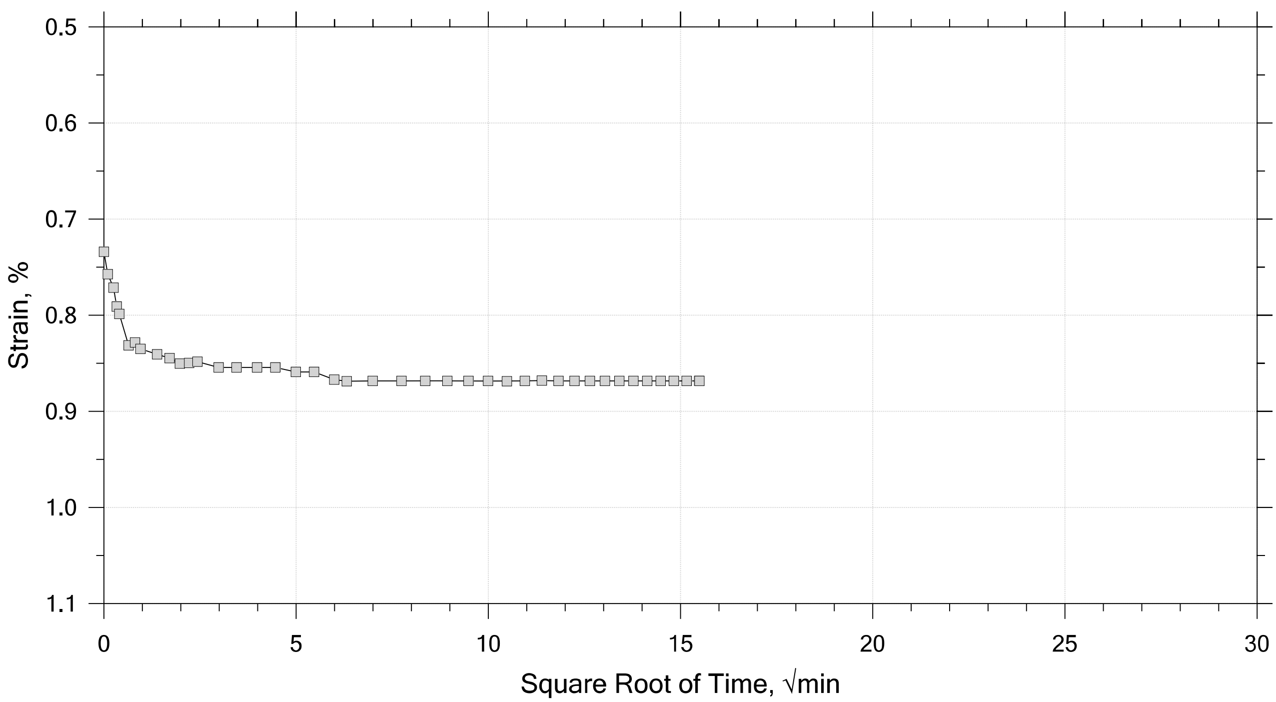
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15

Constant Load Step

Stress: 0.19 tsf





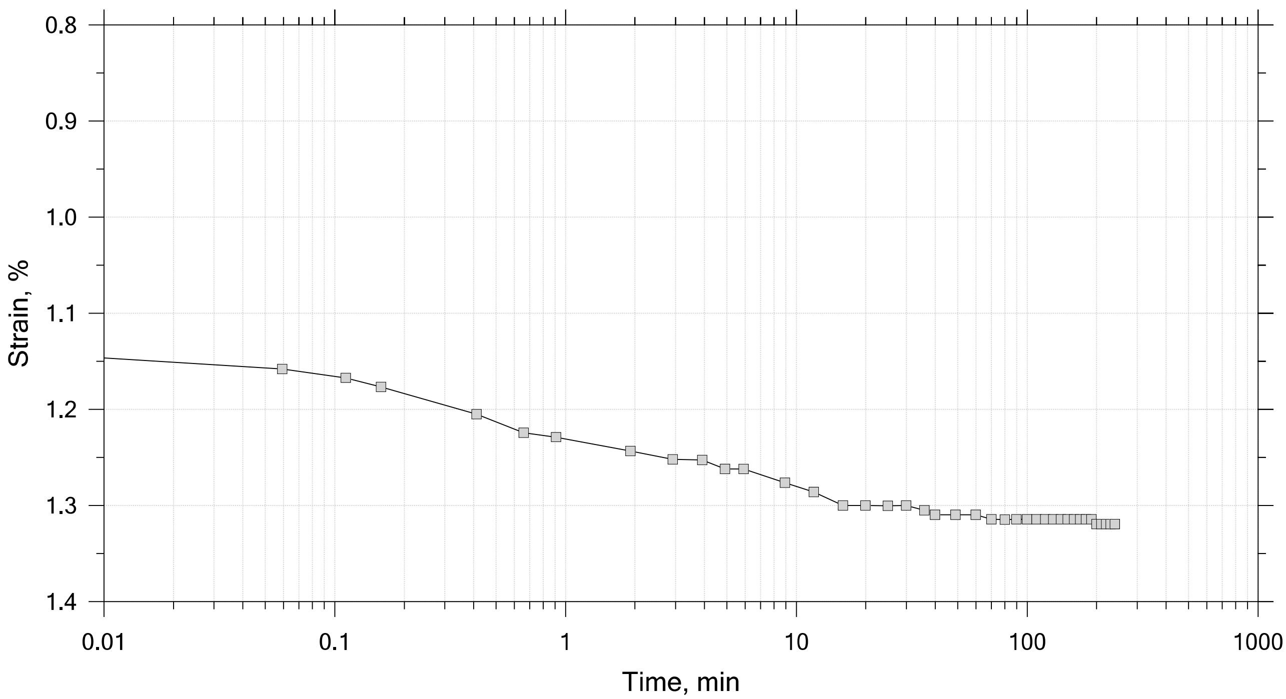
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

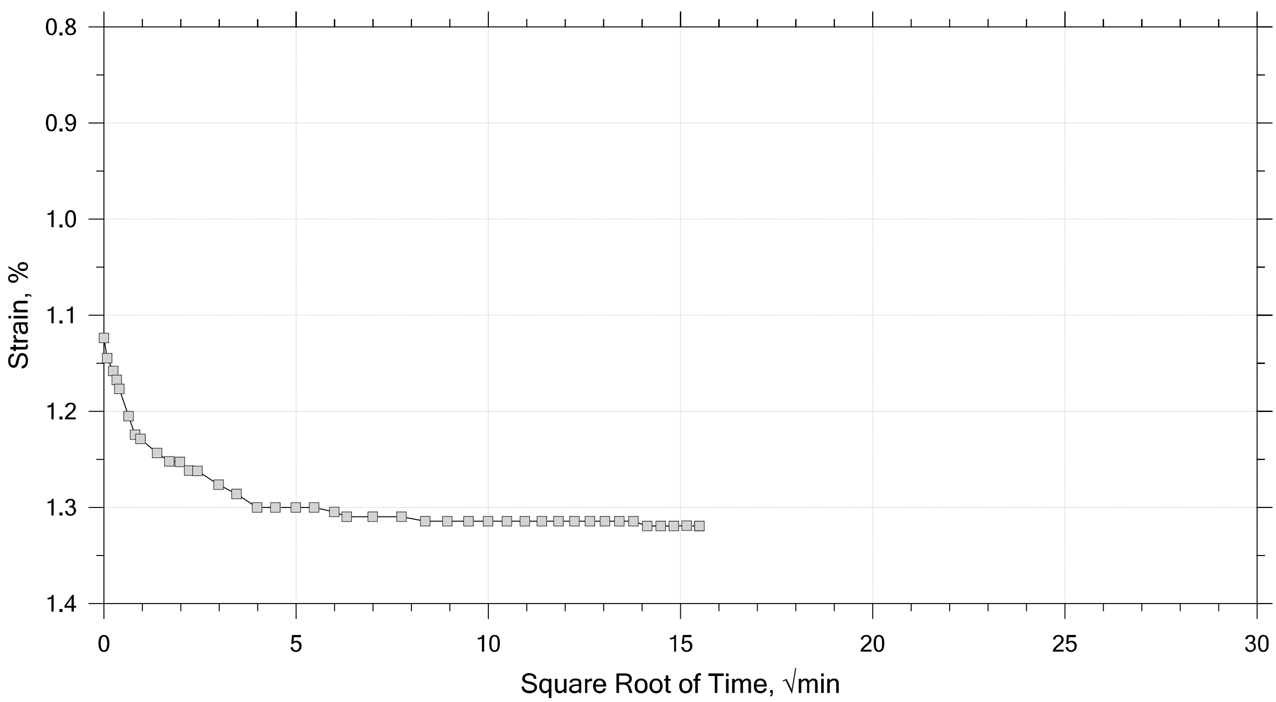
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15

Constant Load Step

Stress: 0.38 tsf





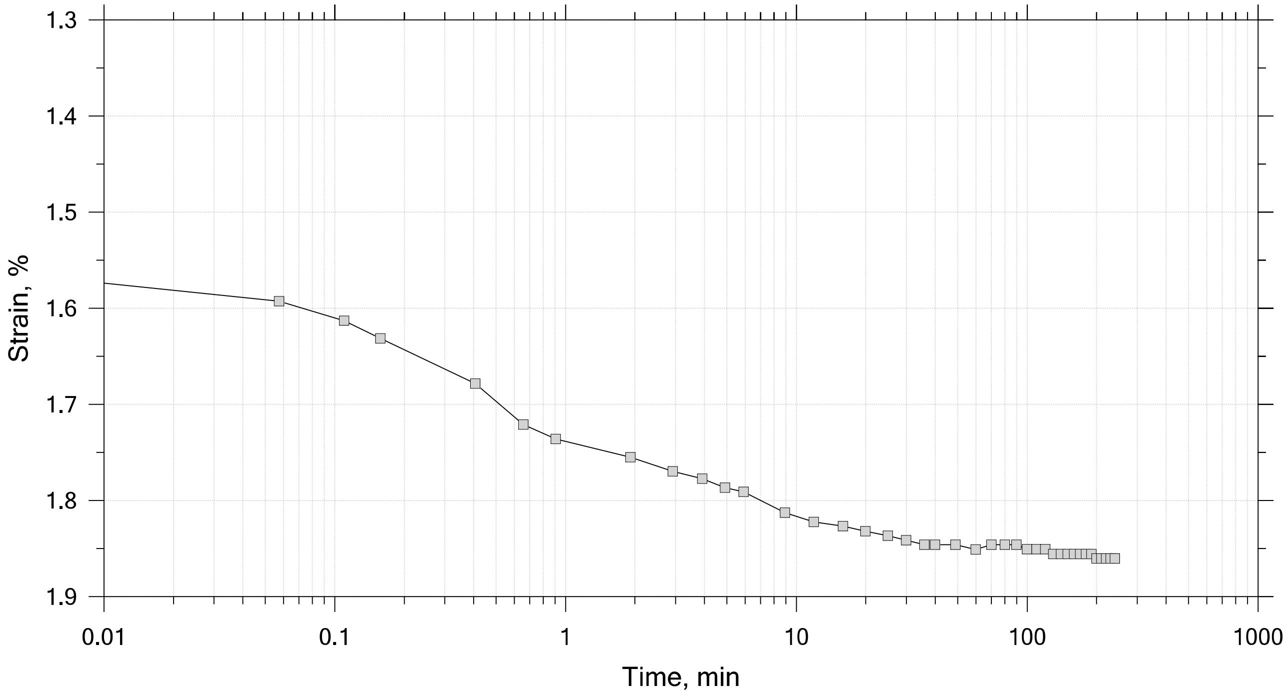
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

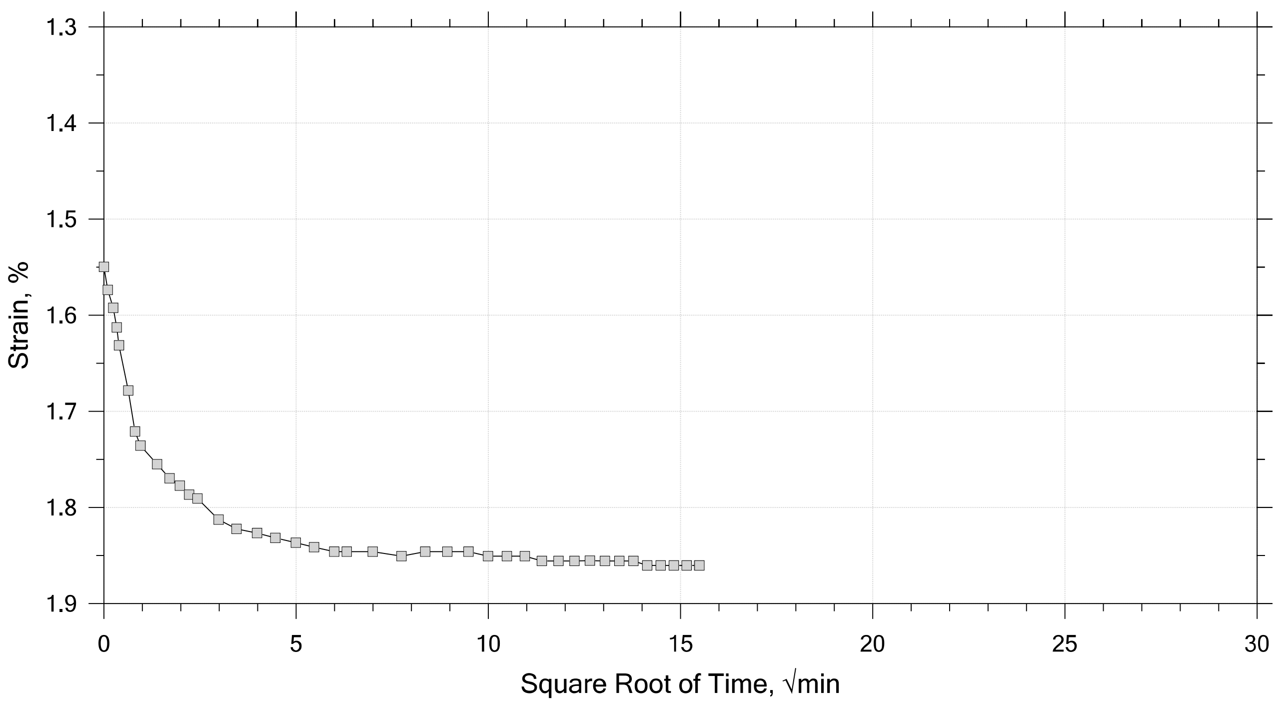
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15

Constant Load Step

Stress: 0.76 tsf





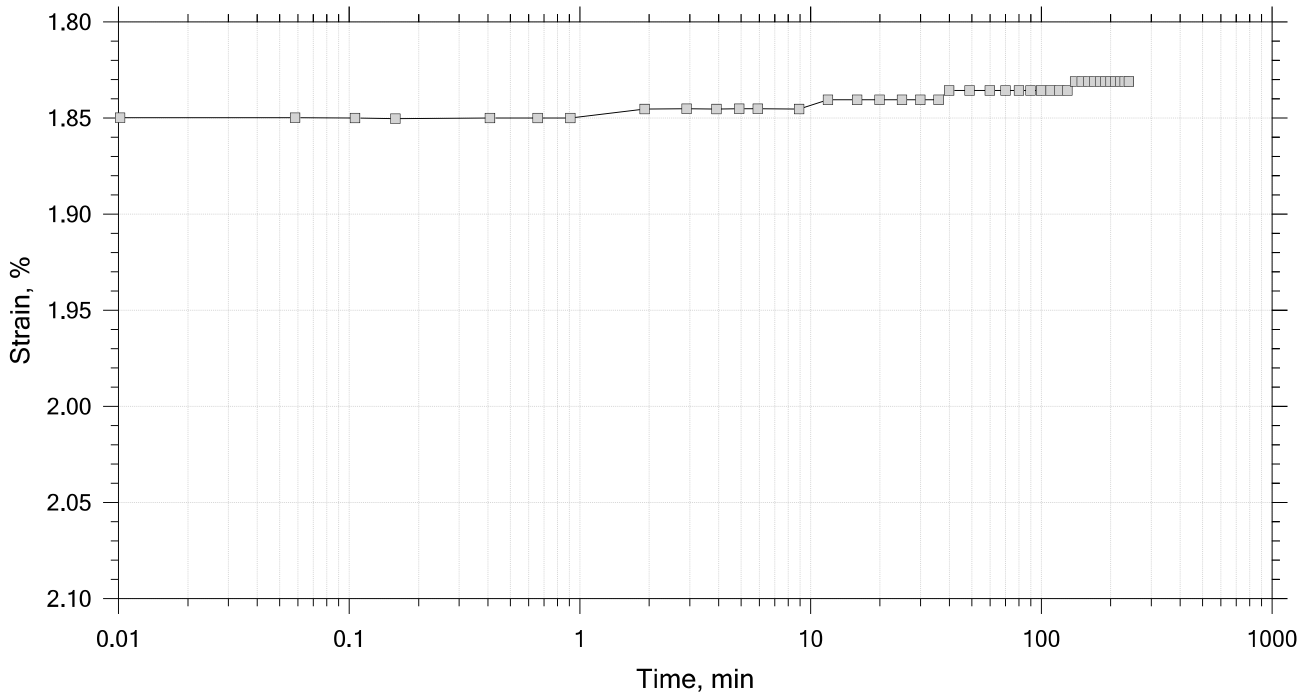
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

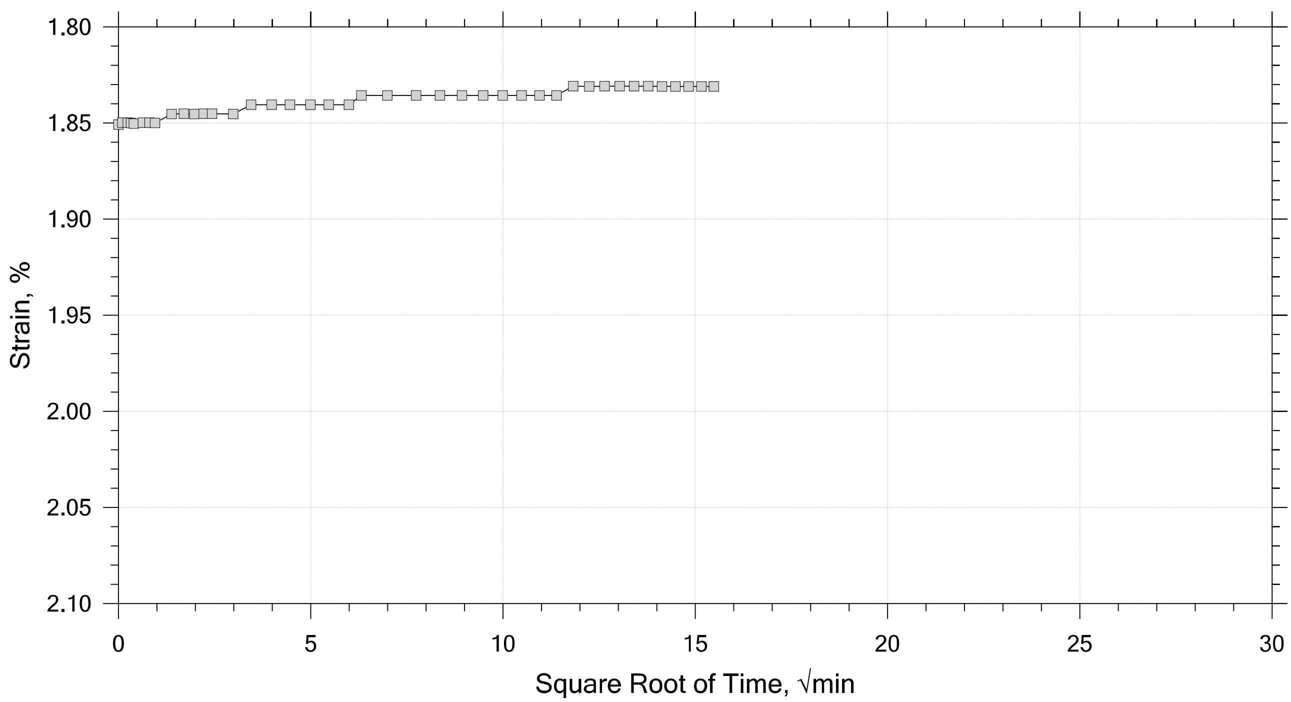
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15

Constant Load Step

Stress: 0.38 tsf





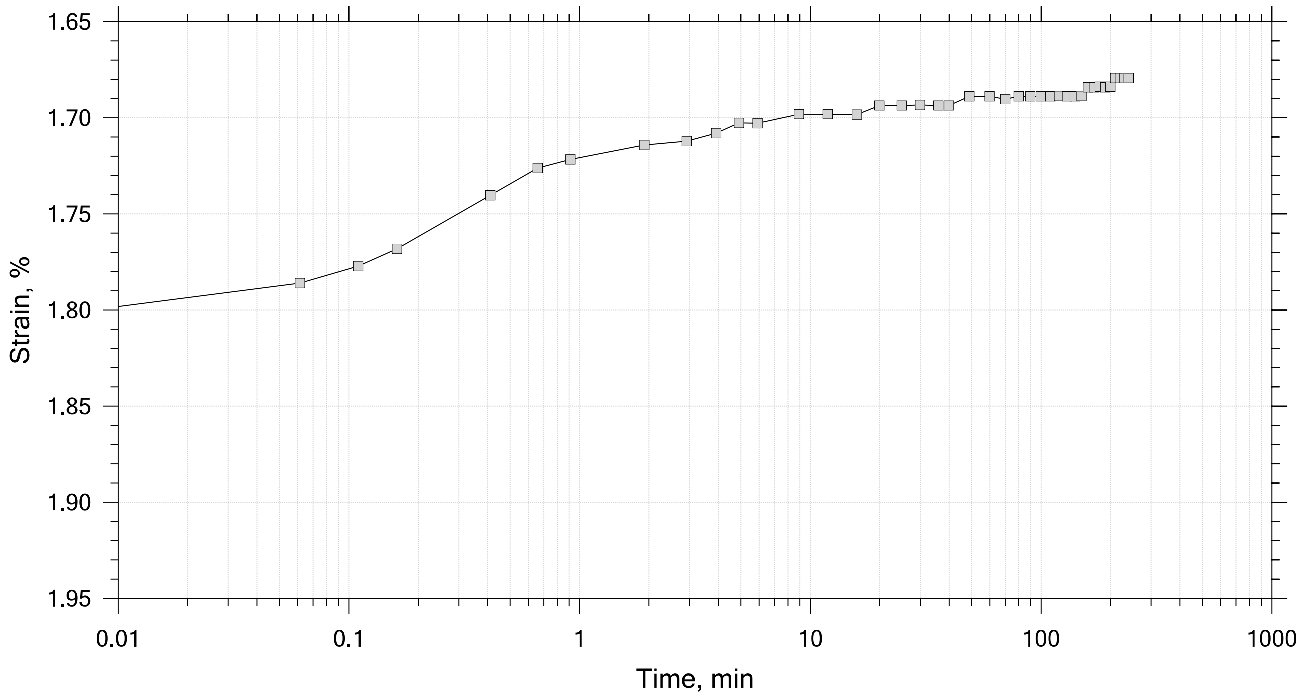
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

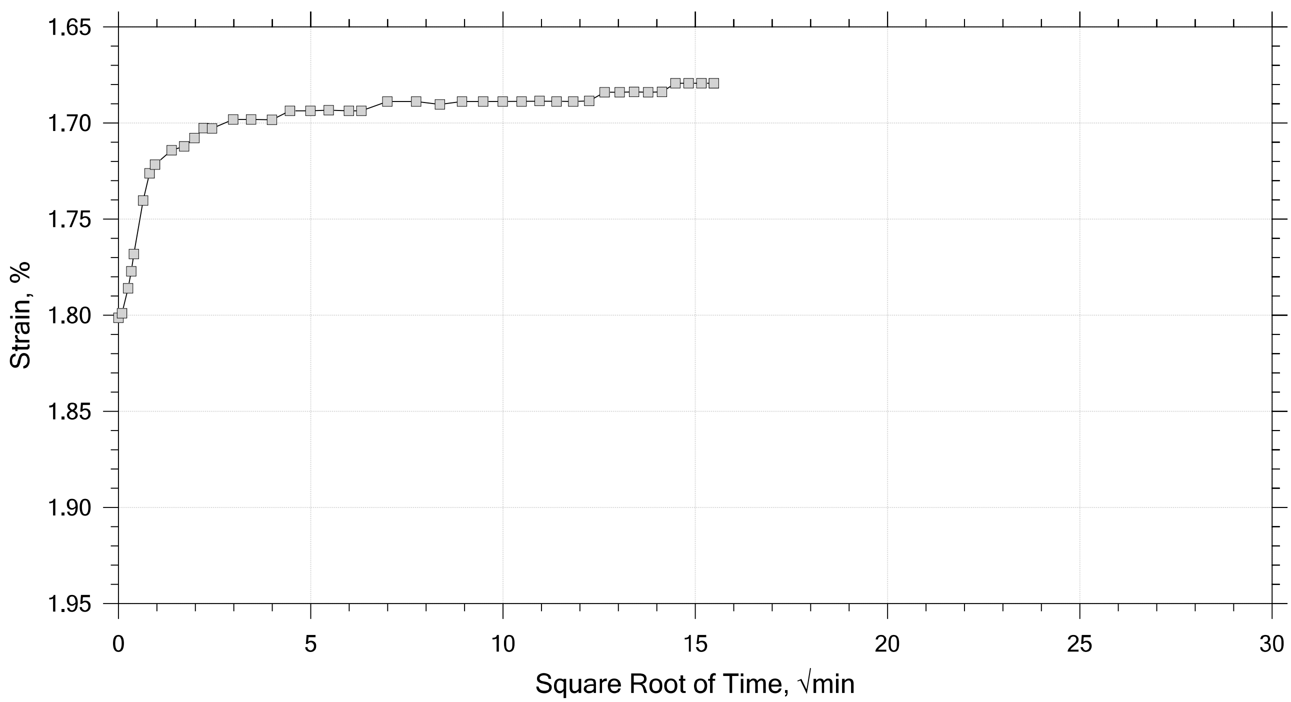
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15

Constant Load Step

Stress: 0.09 tsf

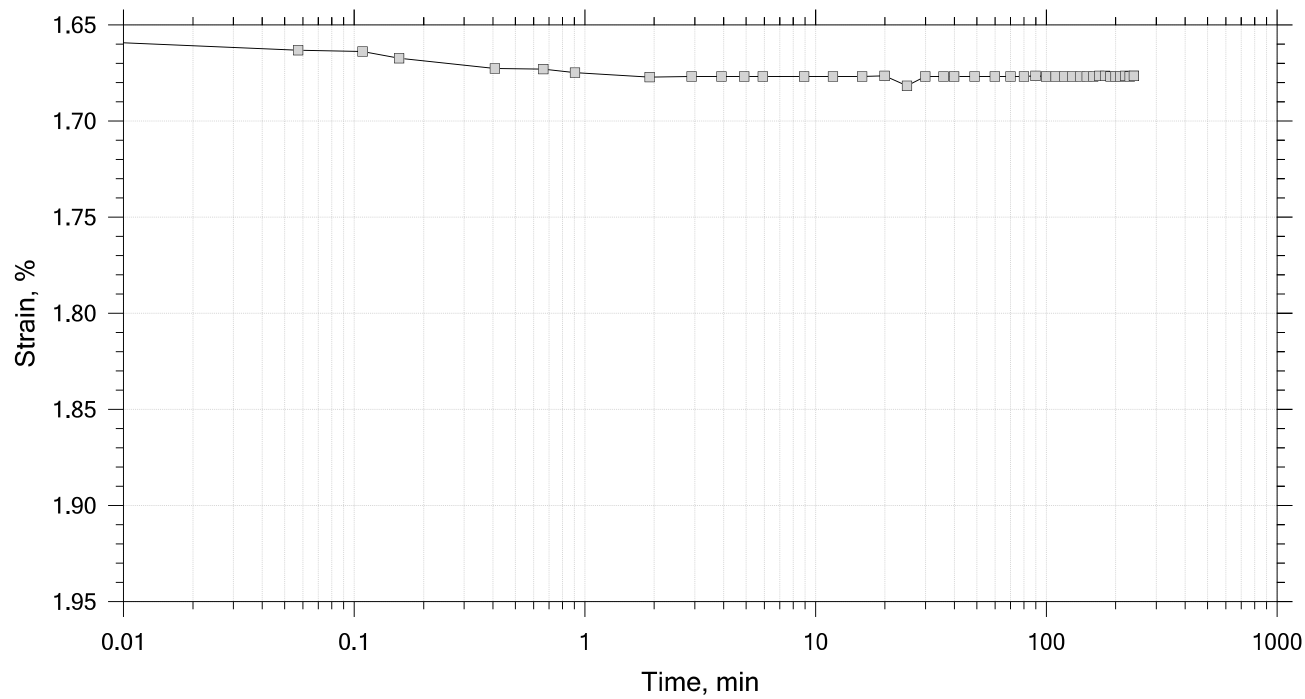


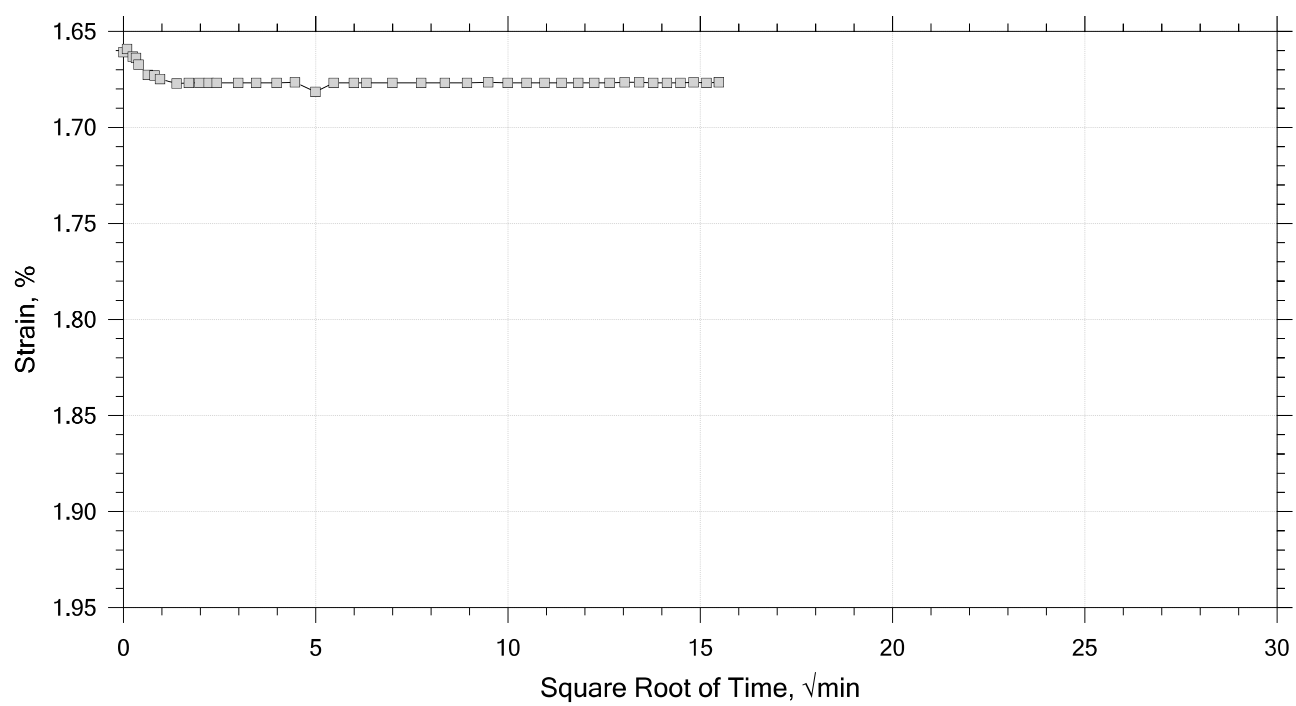


	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15
Constant Load Step
Stress: 0.19 tsf





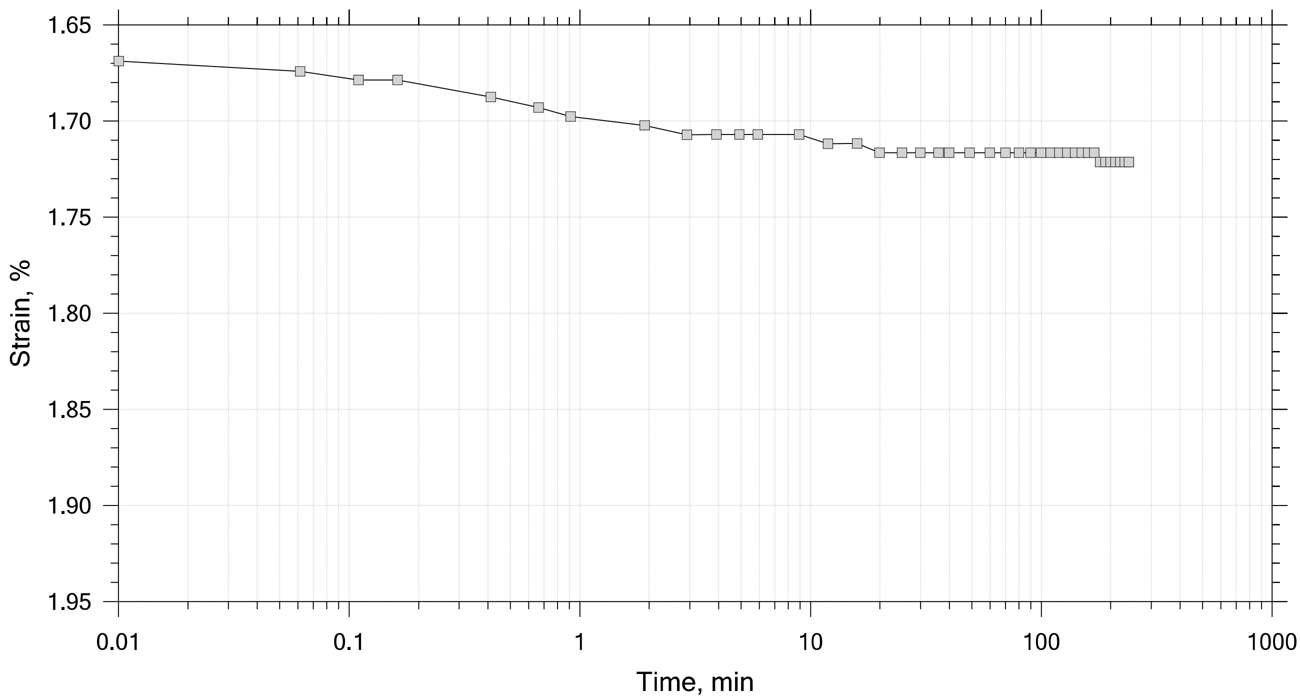
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

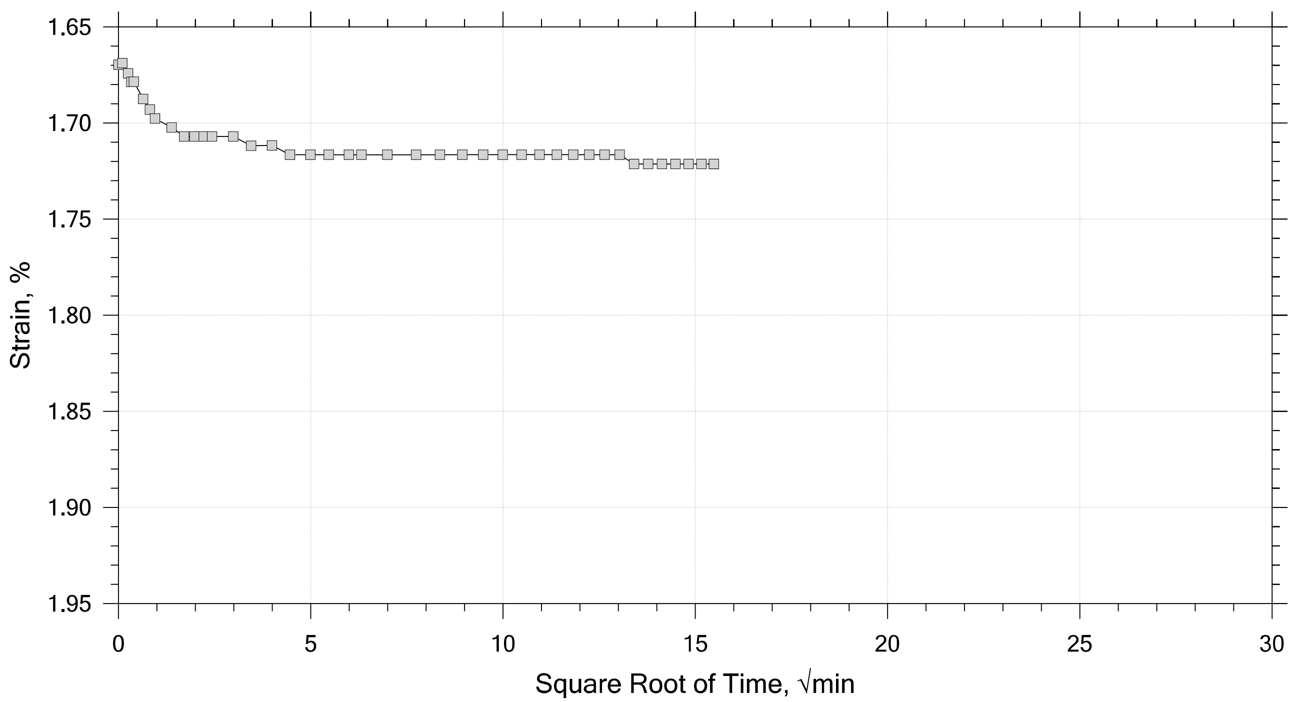
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15

Constant Load Step

Stress: 0.38 tsf





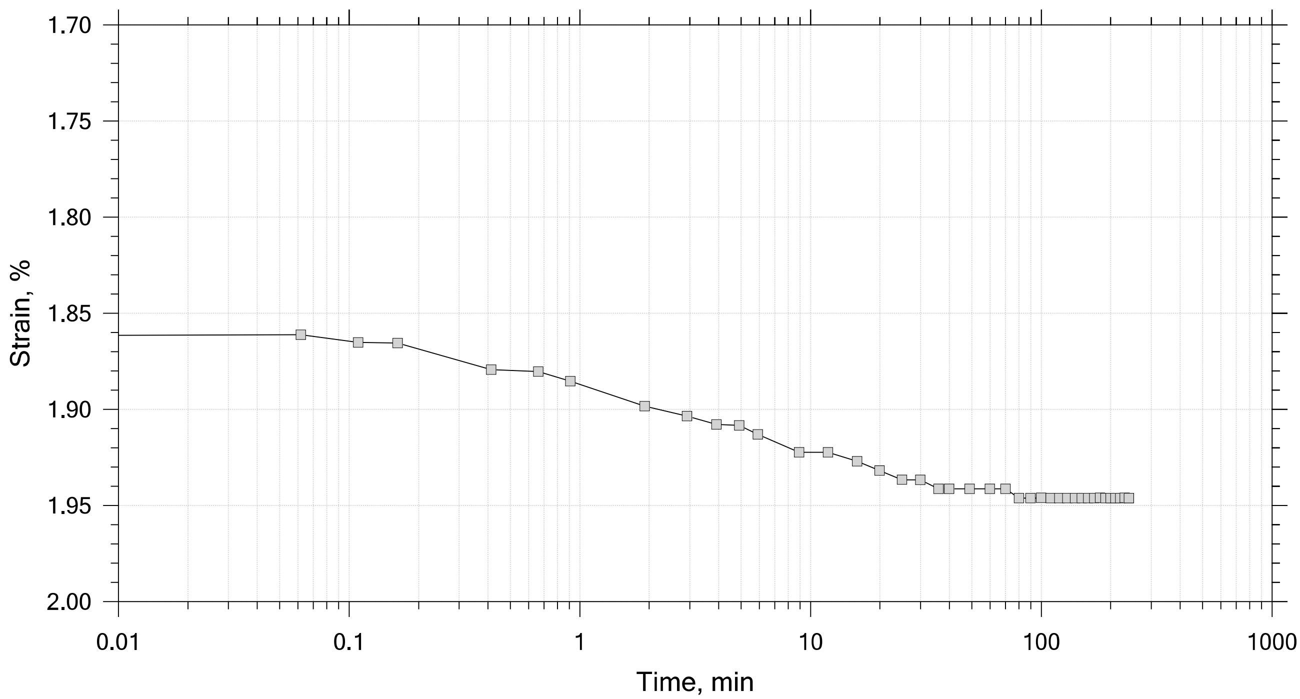
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

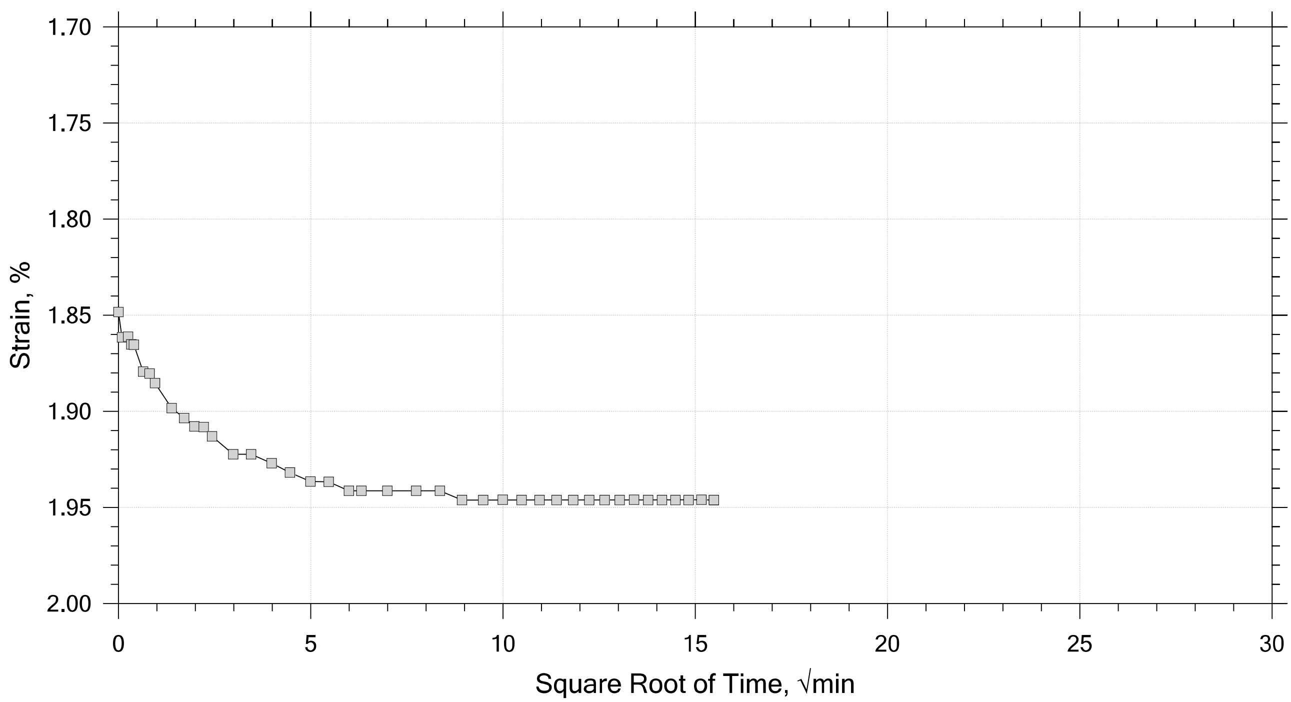
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15

Constant Load Step

Stress: 0.76 tsf

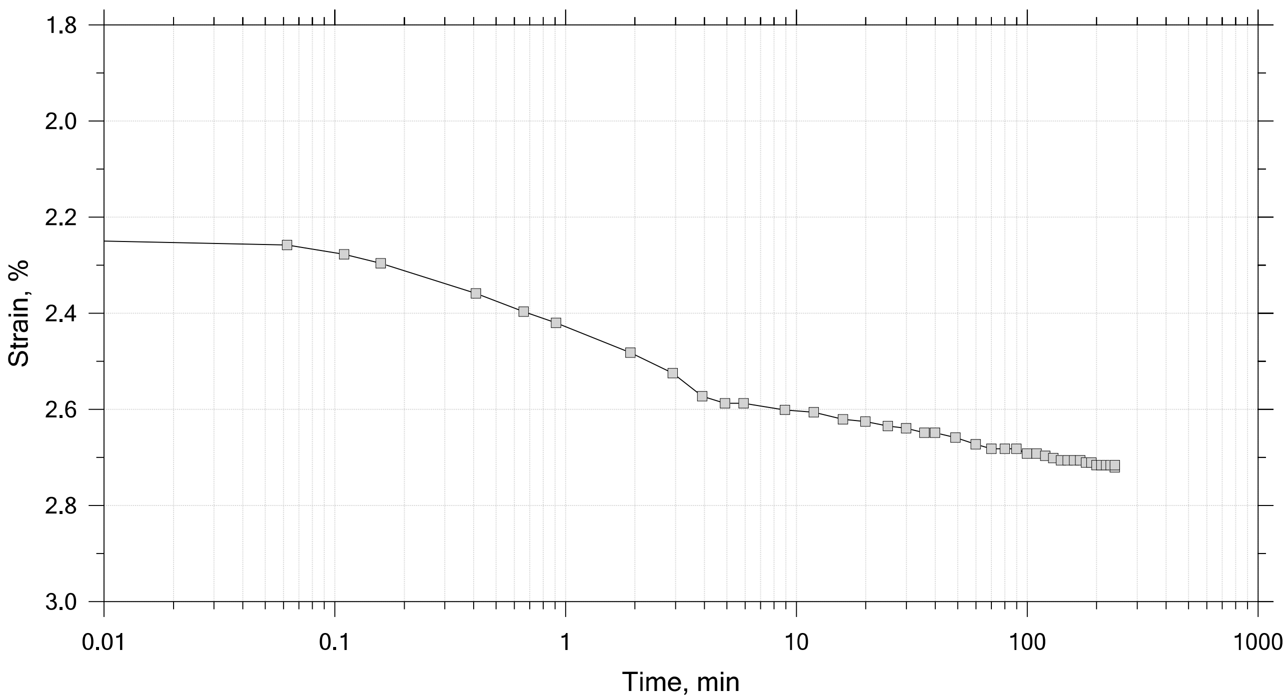


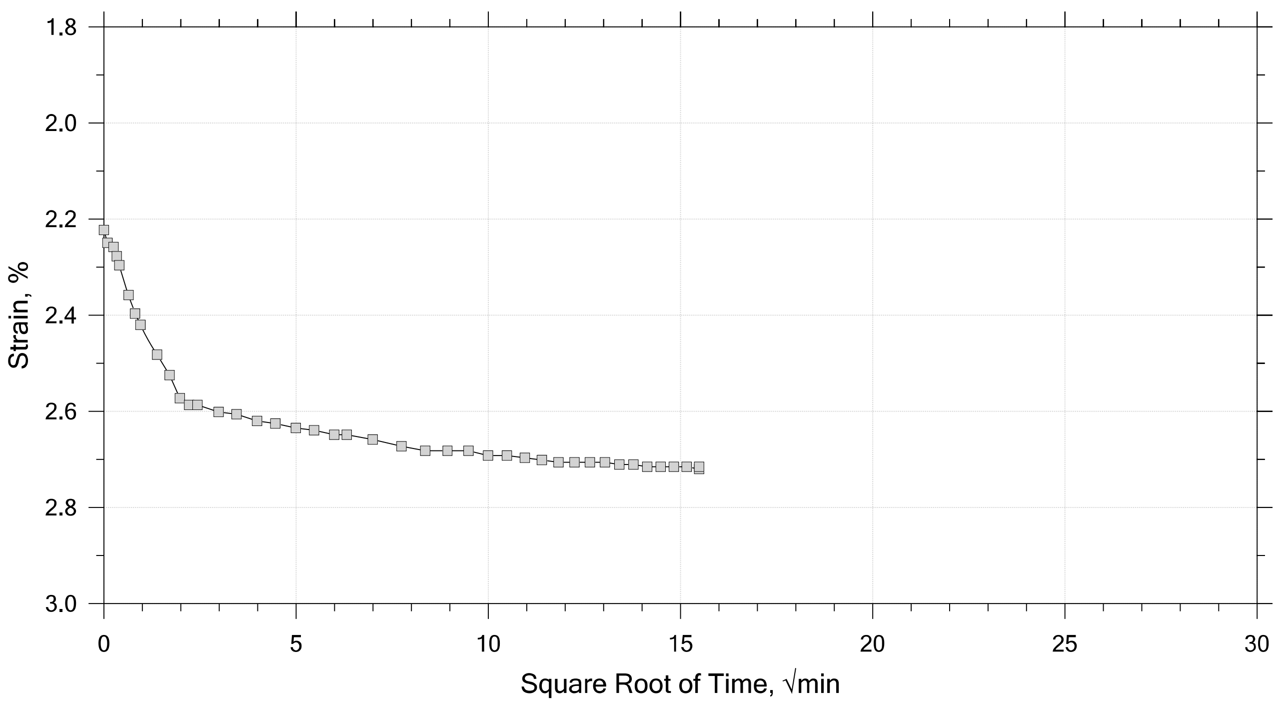


	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
GeoTesting EXPRESS	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15
Constant Load Step
Stress: 1.51 tsf





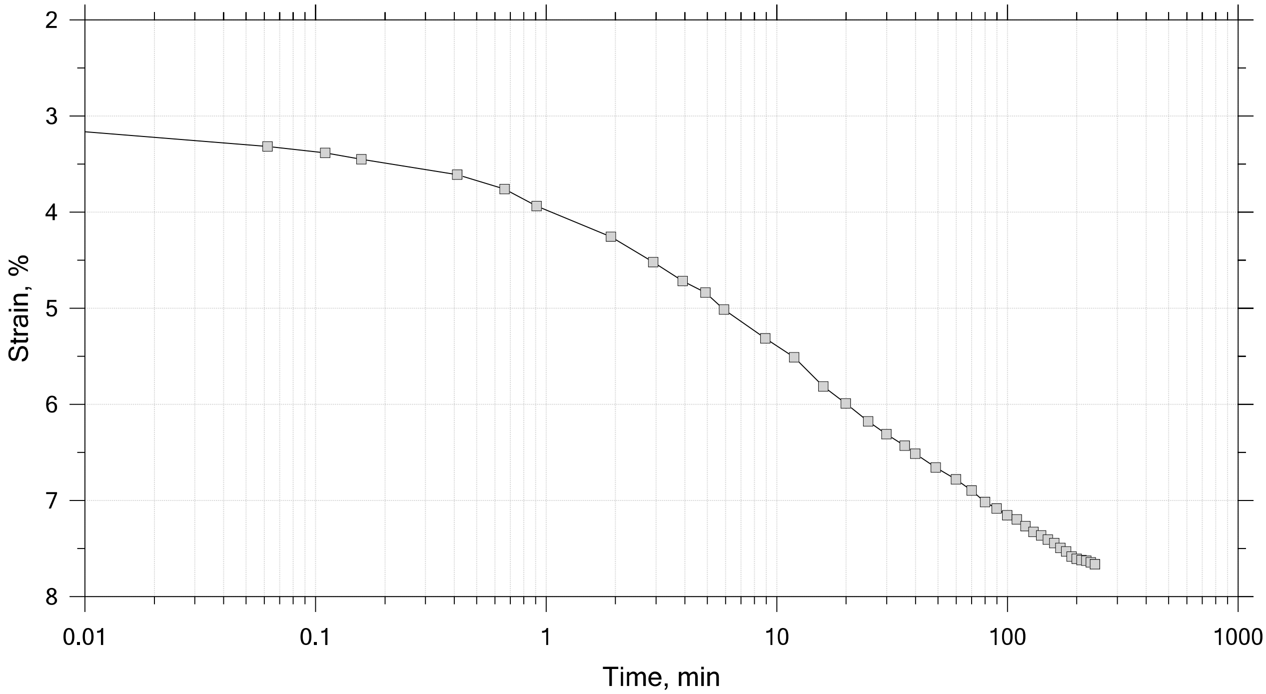
	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
GeoTesting EXPRESS	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

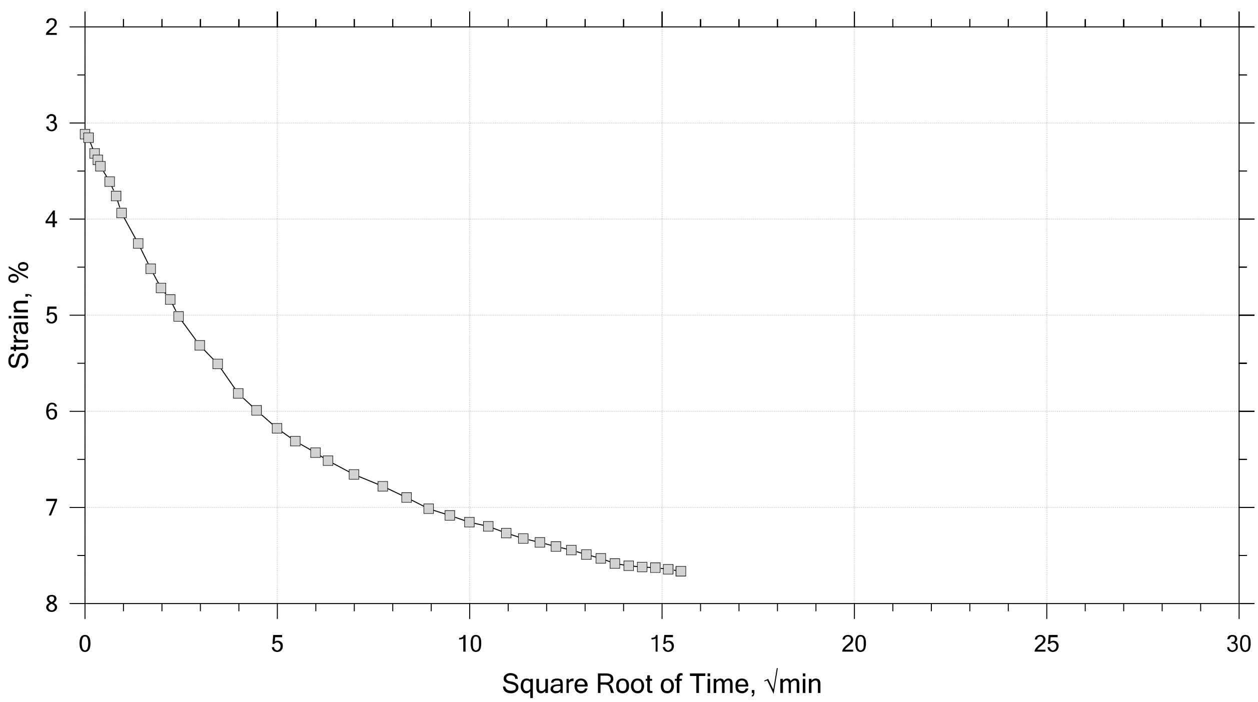
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15

Constant Load Step

Stress: 3 tsf

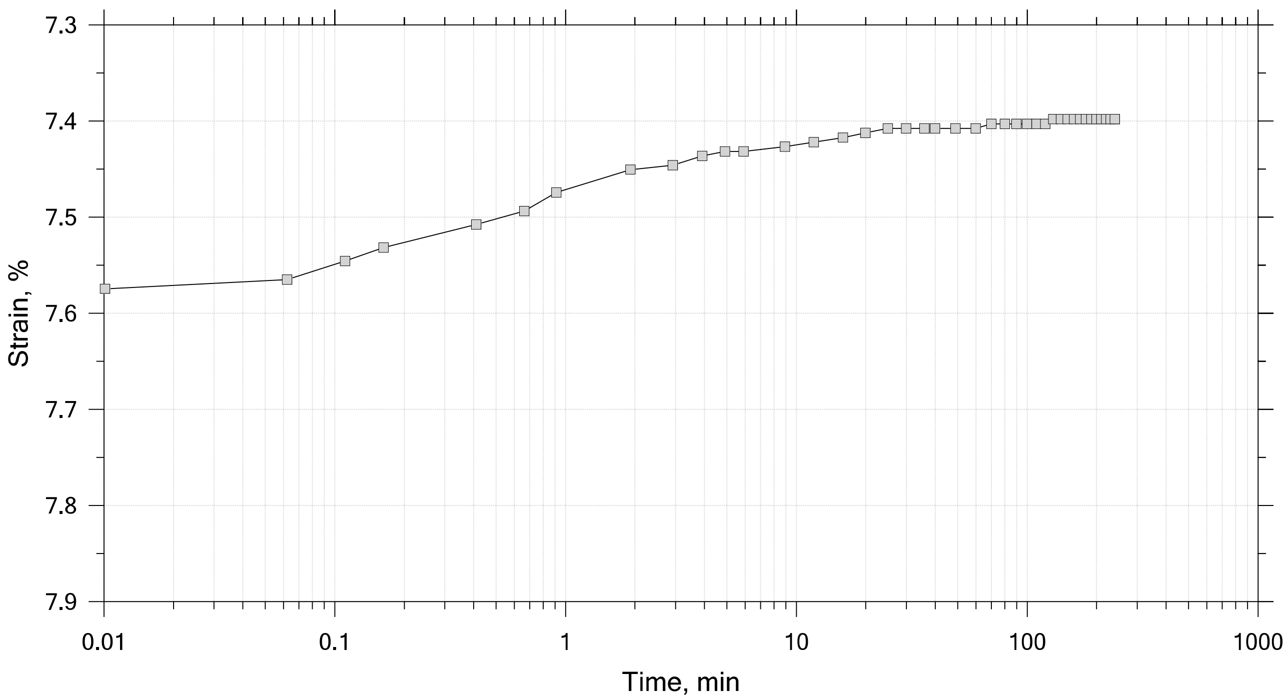


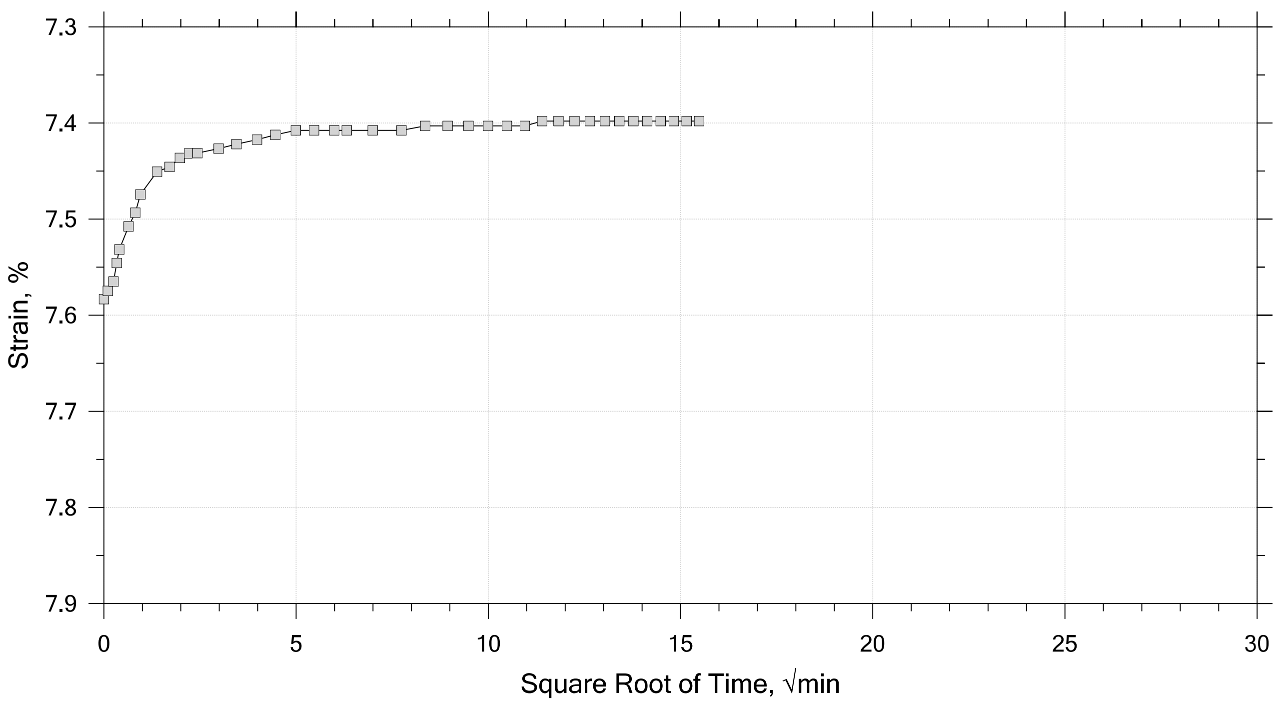


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15
Constant Load Step
Stress: 1.51 tsf





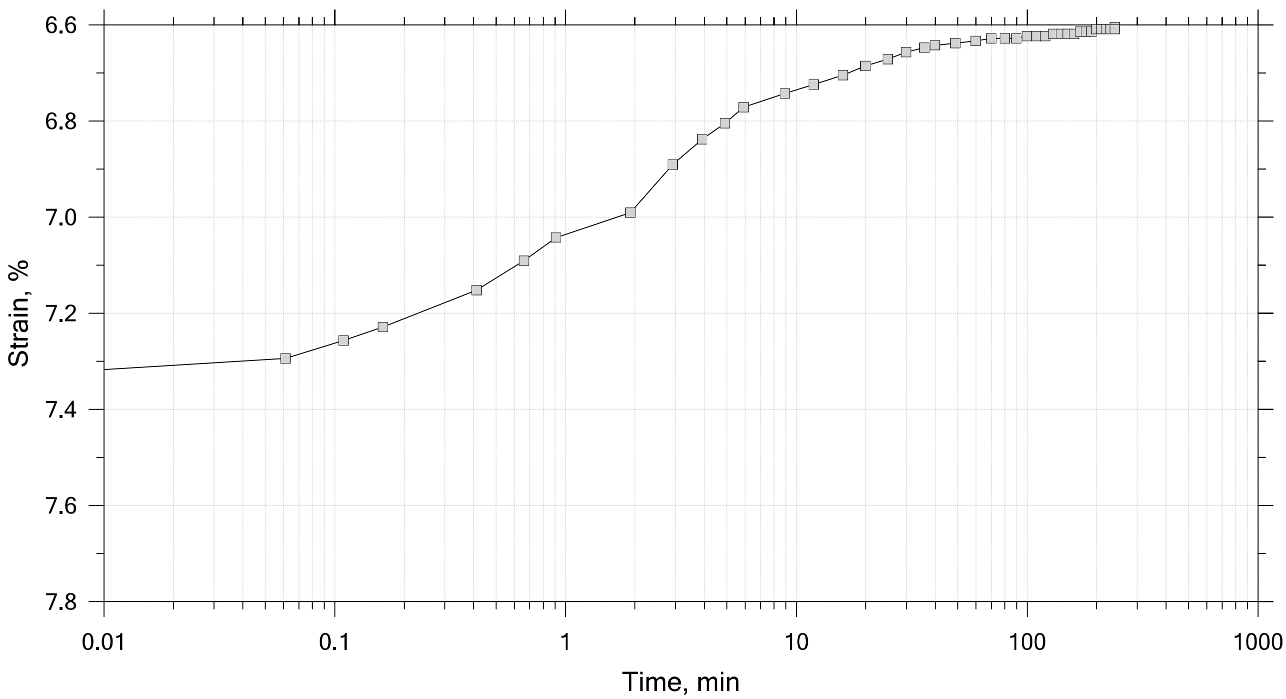
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

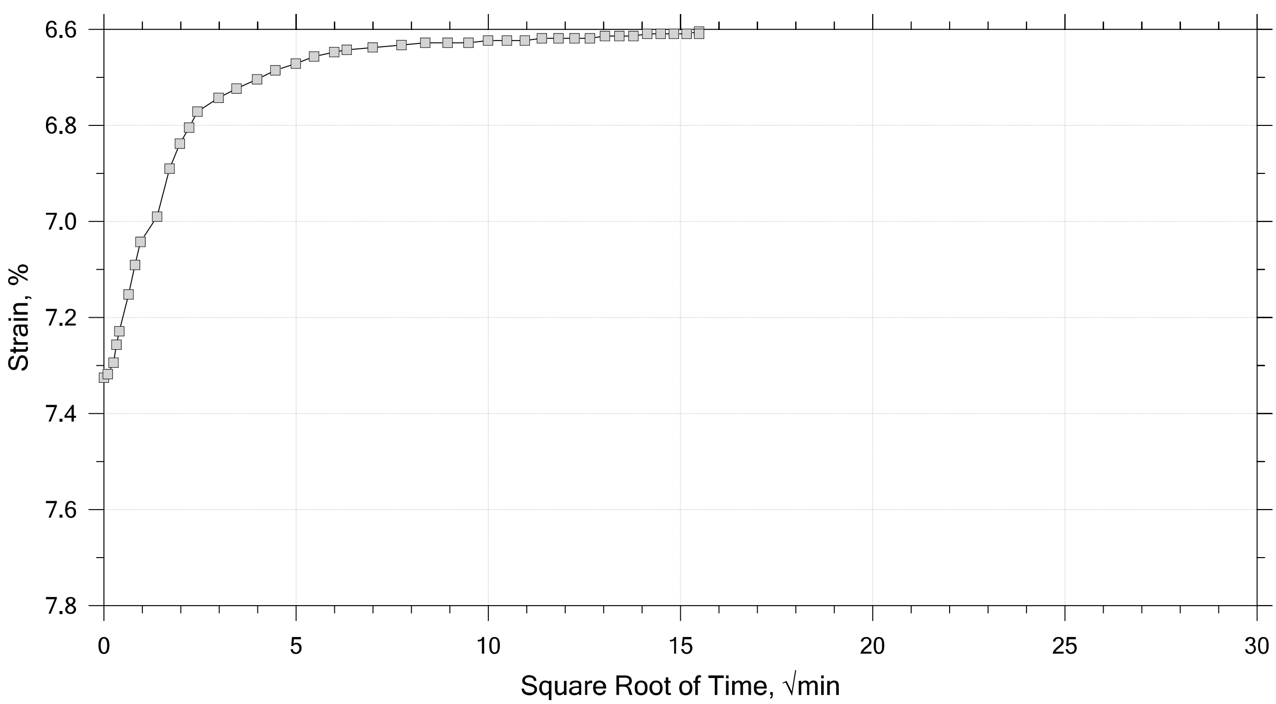
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15

Constant Load Step

Stress: 0.38 tsf





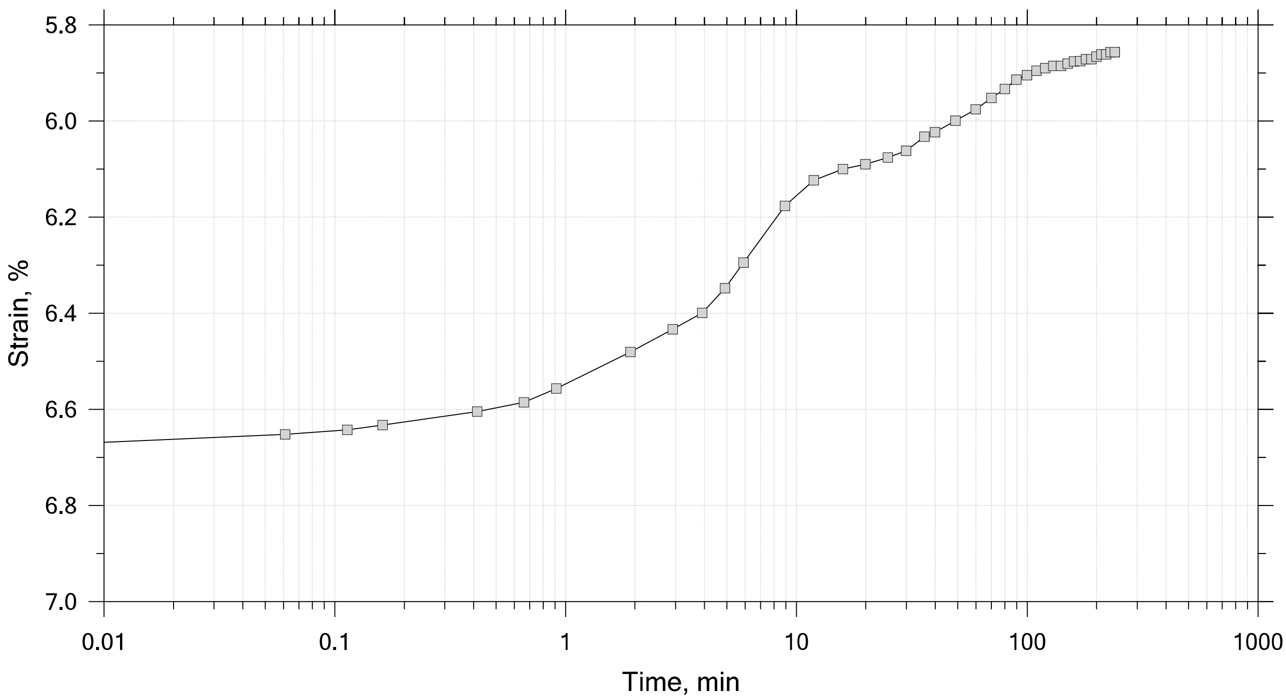
	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
GeoTesting EXPRESS	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

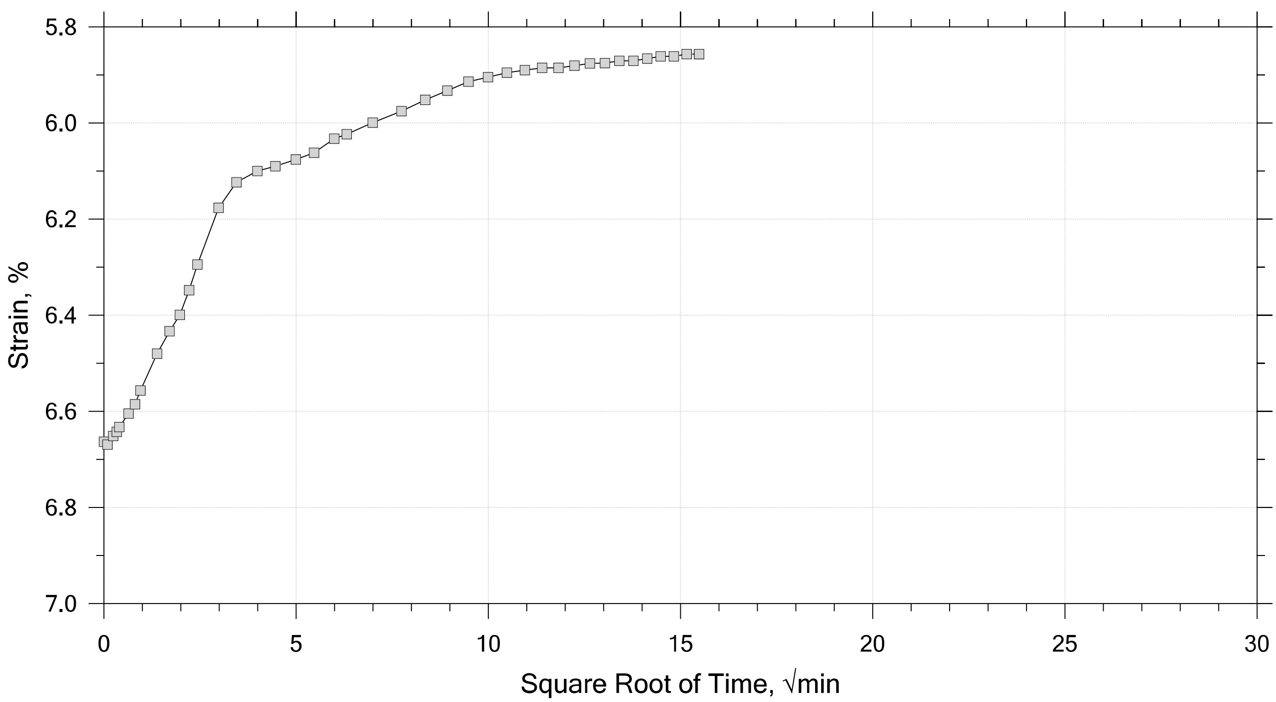
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15

Constant Load Step

Stress: 0.09 tsf





GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.76	Liquid Limit: 37
Initial Height: 1.00 in	Initial Void Ratio: 1.34	Plastic Limit: 22
Final Height: 0.95 in	Final Void Ratio: 1.22	Plasticity Index: 15

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	E8820	RING		E9465
Mass Container, gm	8.35	108.03	108.03	8.26
Mass Container + Wet Soil, gm	161.97	244.68	245	141.59
Mass Container + Dry Soil, gm	117.03	202.98	202.98	100.69
Mass Dry Soil, gm	108.68	94.953	94.953	92.43
Water Content, %	41.35	43.91	44.25	44.25
Void Ratio	---	1.34	1.22	---
Degree of Saturation, %	---	90.57	100.00	---
Dry Unit Weight, pcf	---	73.692	77.57	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-018, Swell Pressure = 0.0503 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

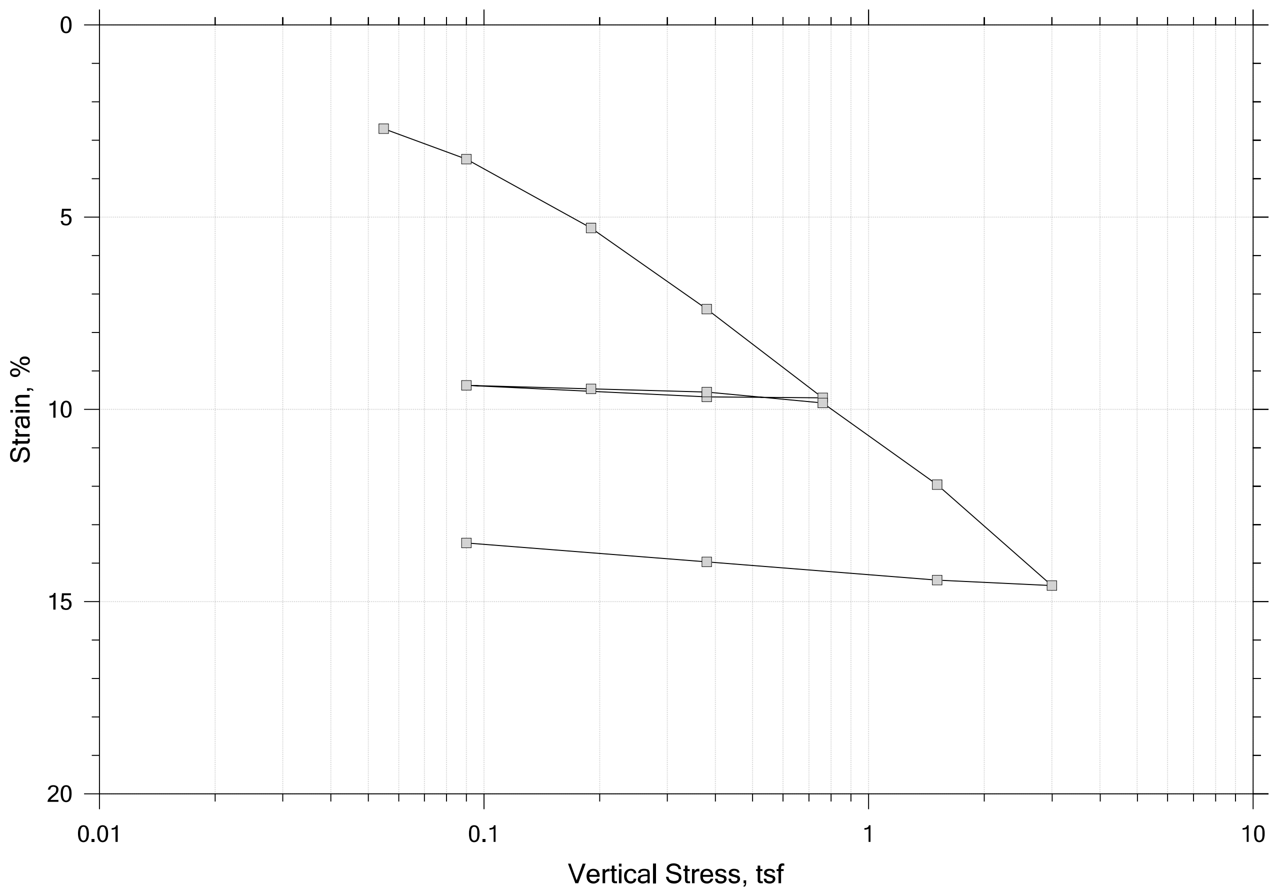
Square Root of Time Coefficients

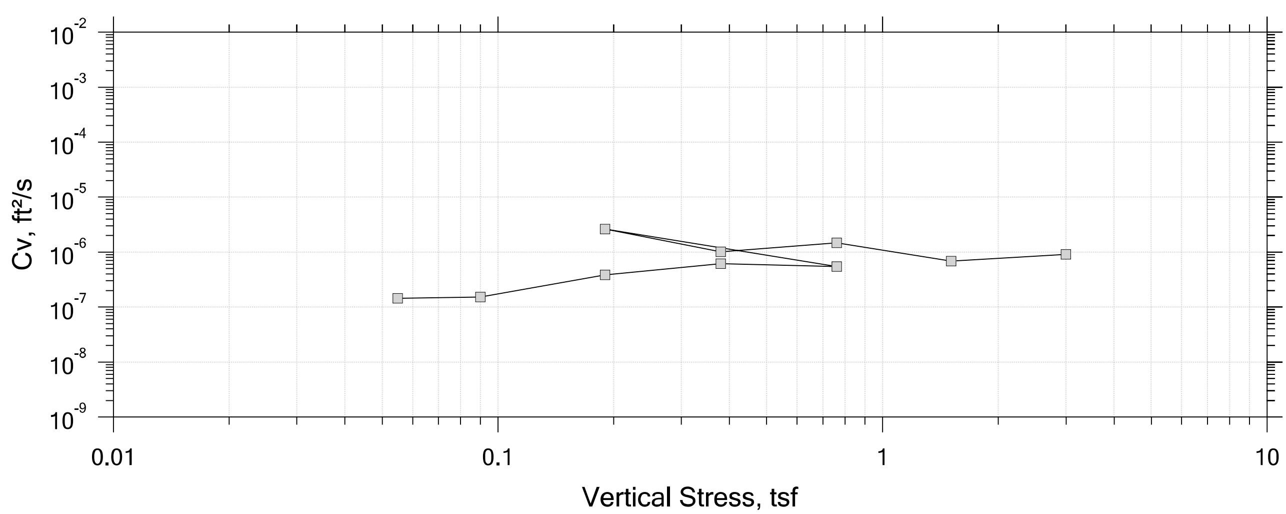
Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv in²/s	Mv 1/tsf	k ft/day
1	0.0503	0.003083	1.33	0.308	167.333	2.11e-05	6.13e-02	2.42e-05
2	0.0900	0.005269	1.33	0.527	9.814	3.57e-04	5.51e-02	3.68e-04
3	0.190	0.008684	1.32	0.868	1.568	2.22e-03	3.41e-02	1.42e-03
4	0.380	0.01319	1.31	1.32	15.908	2.17e-04	2.37e-02	9.65e-05
5	0.760	0.01860	1.29	1.86	3.996	8.56e-04	1.42e-02	2.28e-04
6	0.380	0.01831	1.30	1.83	139.821	2.43e-05	7.70e-04	3.51e-07
7	0.0900	0.01679	1.30	1.68	1.731	1.97e-03	5.23e-03	1.93e-04
8	0.190	0.01676	1.30	1.68	1.814	---	---	---
9	0.380	0.01721	1.30	1.72	2.904	1.18e-03	2.36e-03	5.19e-05
10	0.760	0.01946	1.29	1.95	8.911	3.82e-04	5.92e-03	4.23e-05
11	1.51	0.02715	1.27	2.72	4.910	6.86e-04	1.03e-02	1.32e-04
12	3.00	0.07663	1.16	7.66	30.274	1.05e-04	3.32e-02	6.52e-05
13	1.51	0.07398	1.17	7.40	3.050	9.91e-04	1.78e-03	3.30e-05
14	0.380	0.06609	1.18	6.61	6.558	4.66e-04	6.98e-03	6.09e-05
15	0.0900	0.05856	1.20	5.86	22.260	1.40e-04	2.60e-02	6.78e-05

Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
Boring No.: BB-C29-206	Tested By: sjt	Checked By: anm
Sample No.: U1	Test Date: 05/02/24	Depth: 8-10'
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, gray clay		
Remarks: TX-018, Swell Pressure = 0.0503 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report





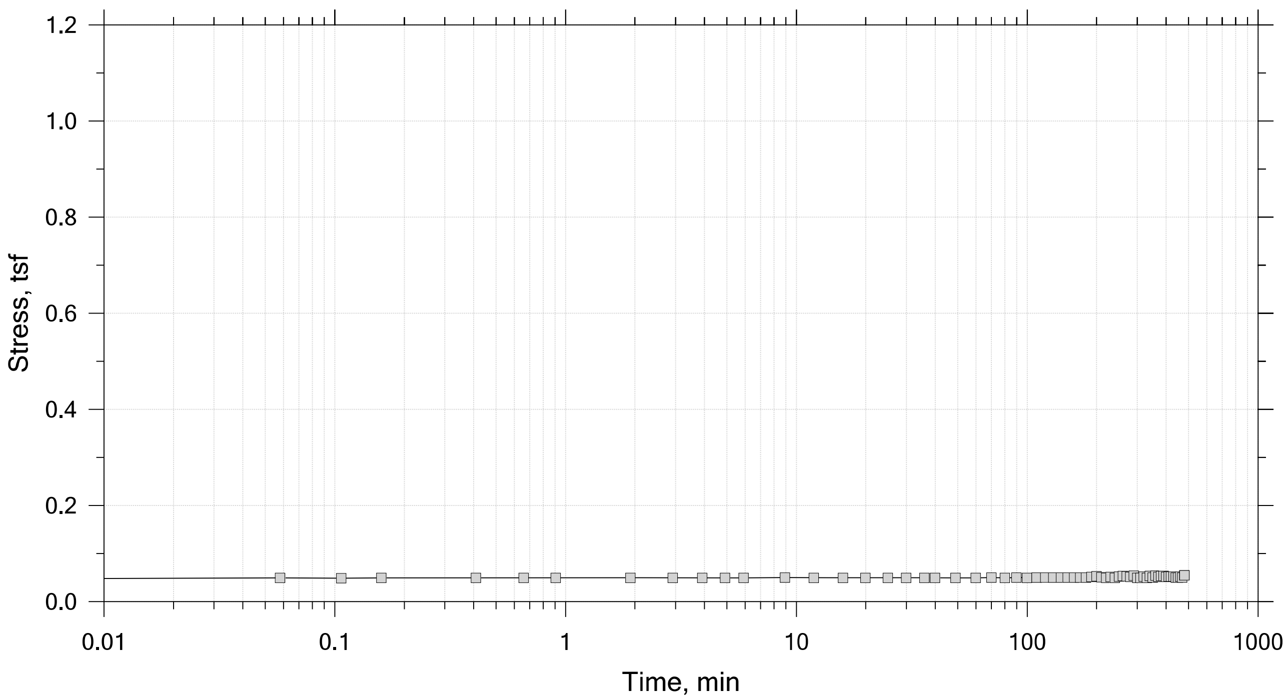
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
	Test No.: IP-5	Sample Type: Intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-002, Swell Pressure = 0.0548 tsf		
	Displacement at End of Increment		

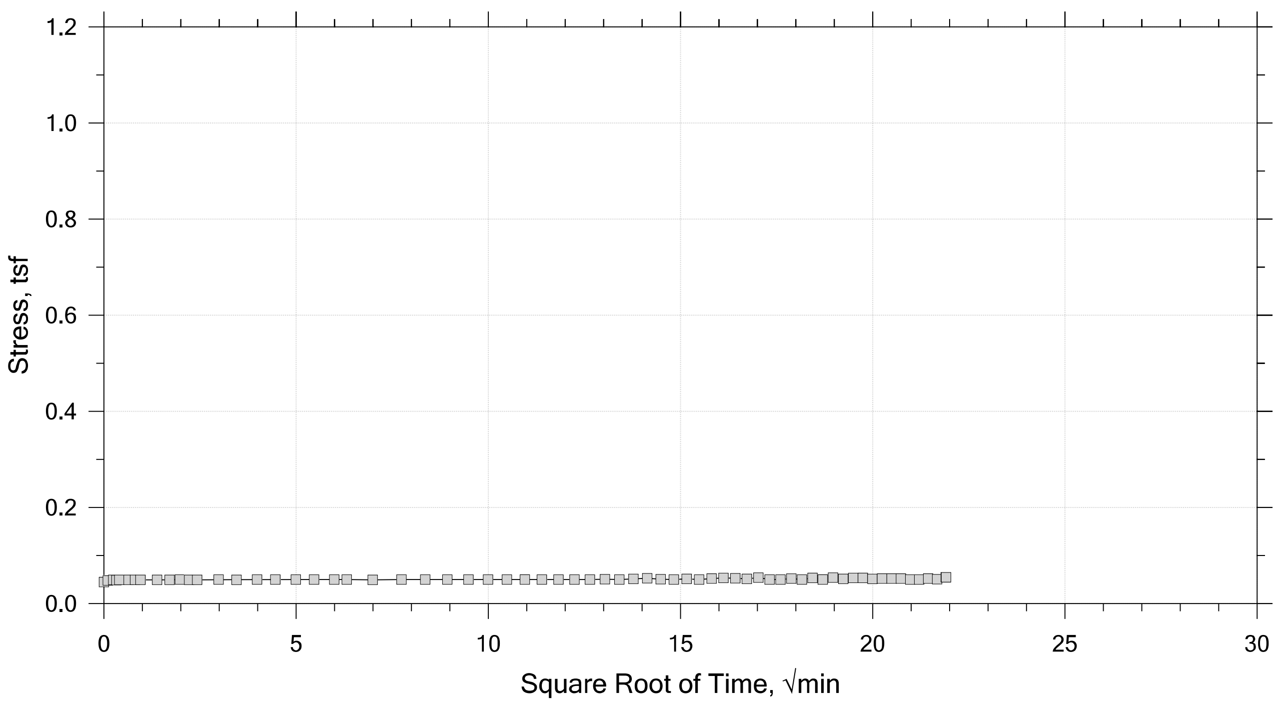
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15

Constant Volume Step

Stress: 0.0548 tsf





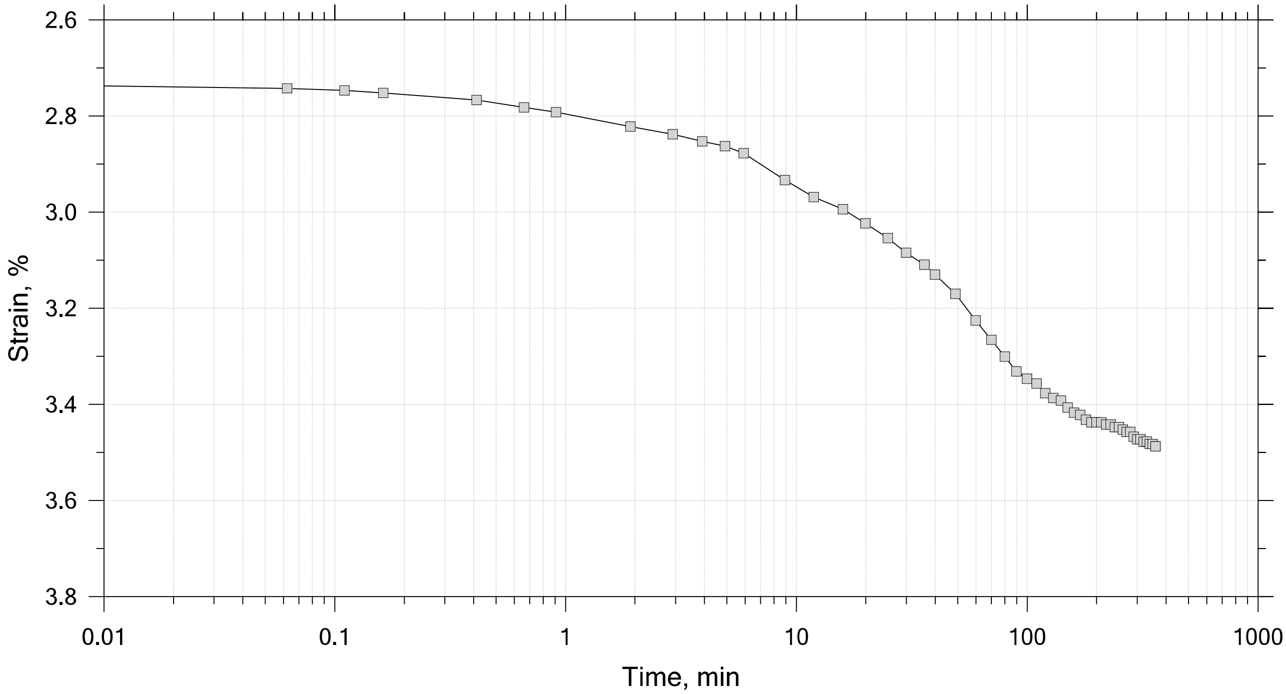
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
	Test No.: IP-5	Sample Type: Intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-002, Swell Pressure = 0.0548 tsf		

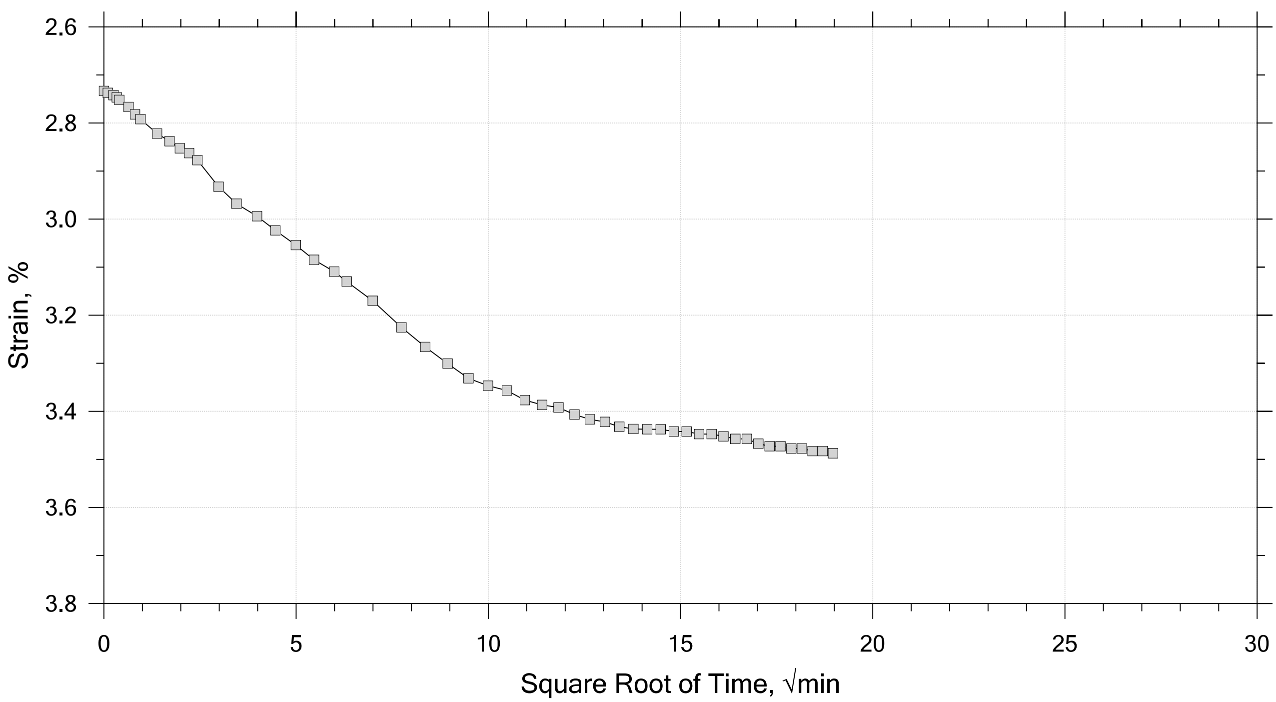
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15

Constant Load Step

Stress: 0.09 tsf

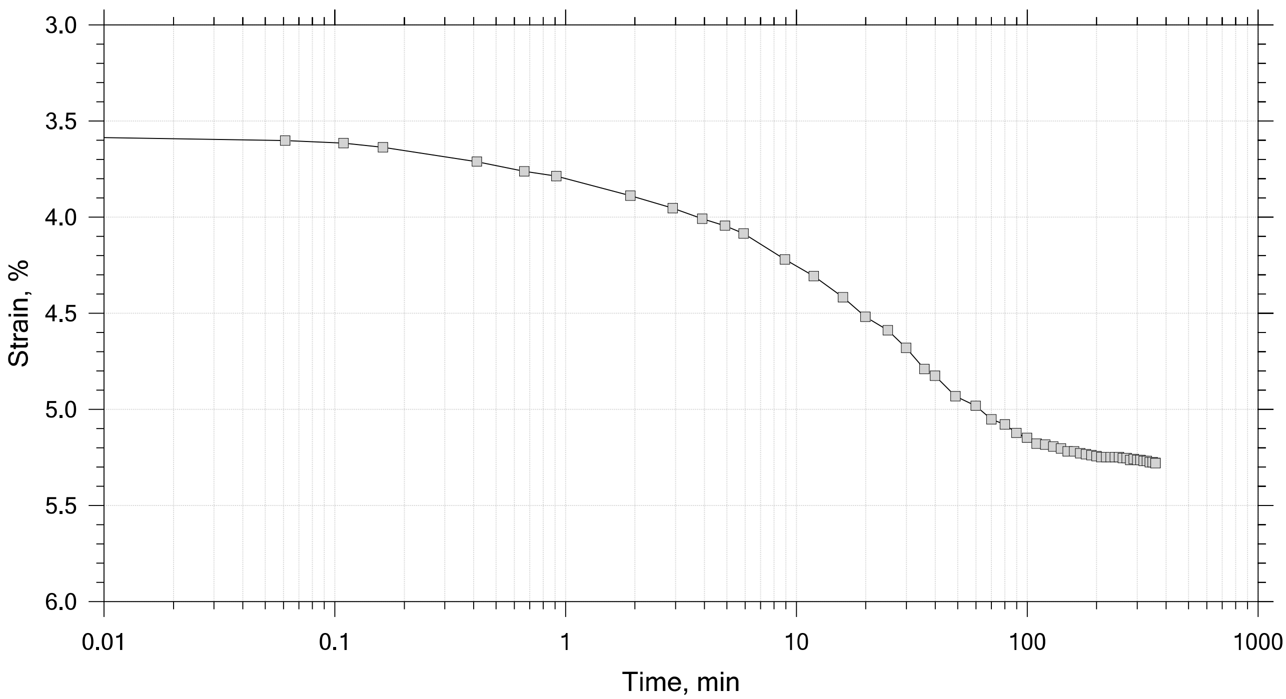


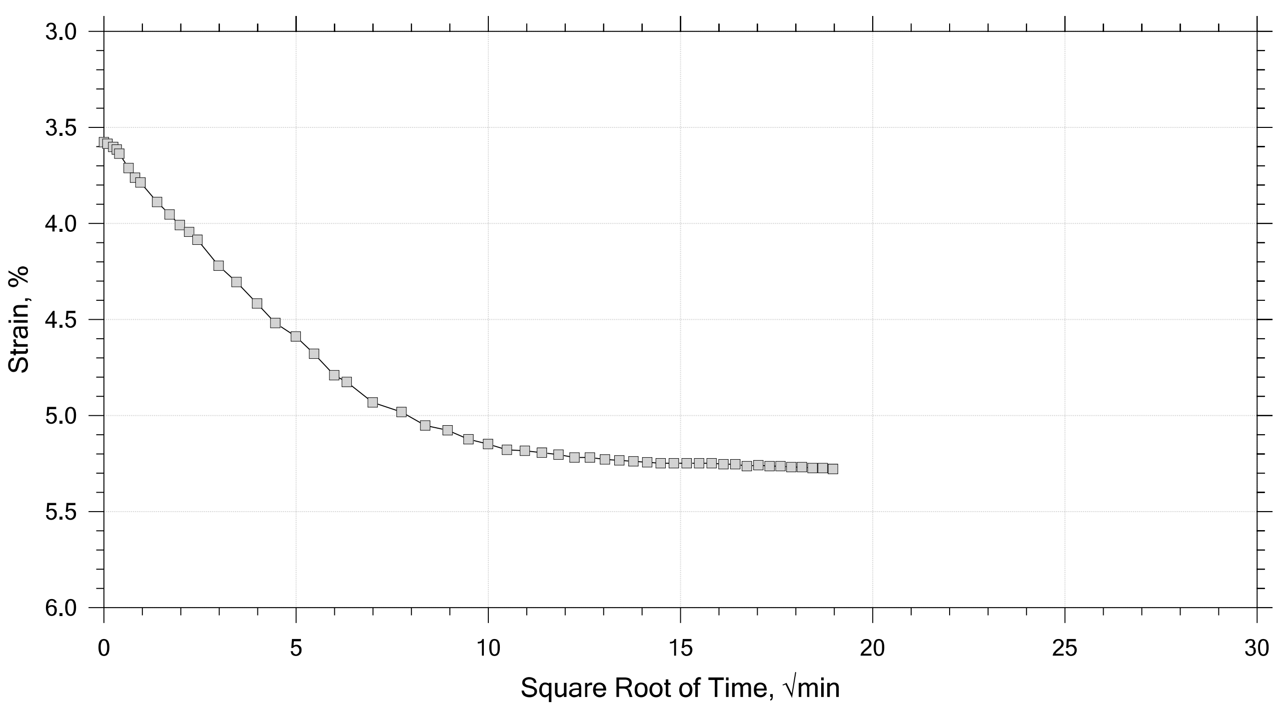


Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
Test No.: IP-5	Sample Type: Intact	Elevation: ---
Description: Moist, gray clay		
Remarks: TX-002, Swell Pressure = 0.0548 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15
Constant Load Step
Stress: 0.19 tsf





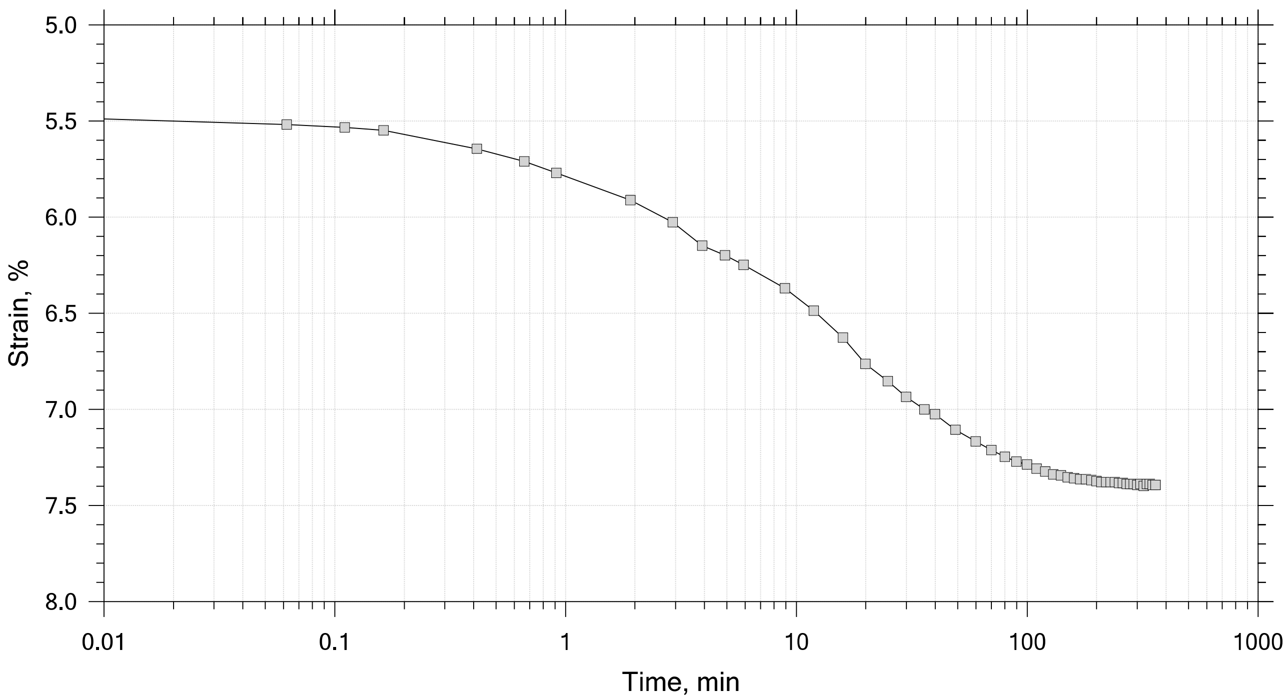
	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
GeoTesting EXPRESS	Test No.: IP-5	Sample Type: Intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-002, Swell Pressure = 0.0548 tsf		

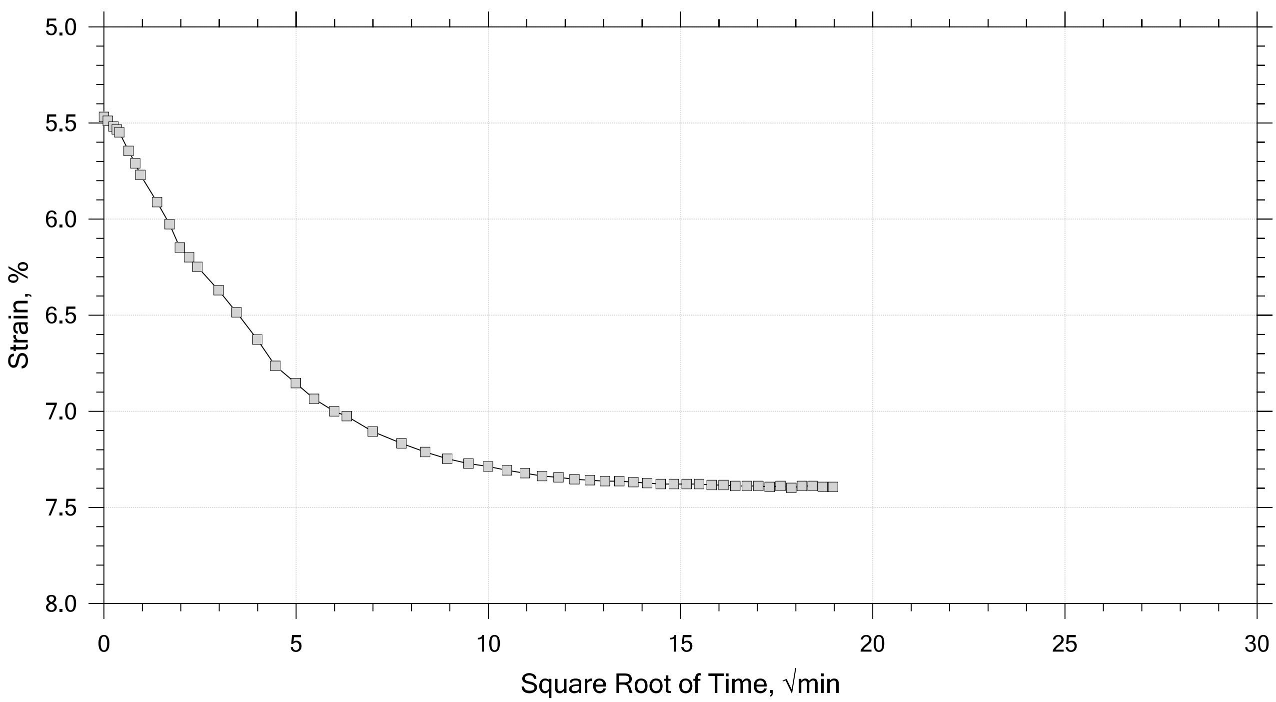
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15

Constant Load Step

Stress: 0.38 tsf





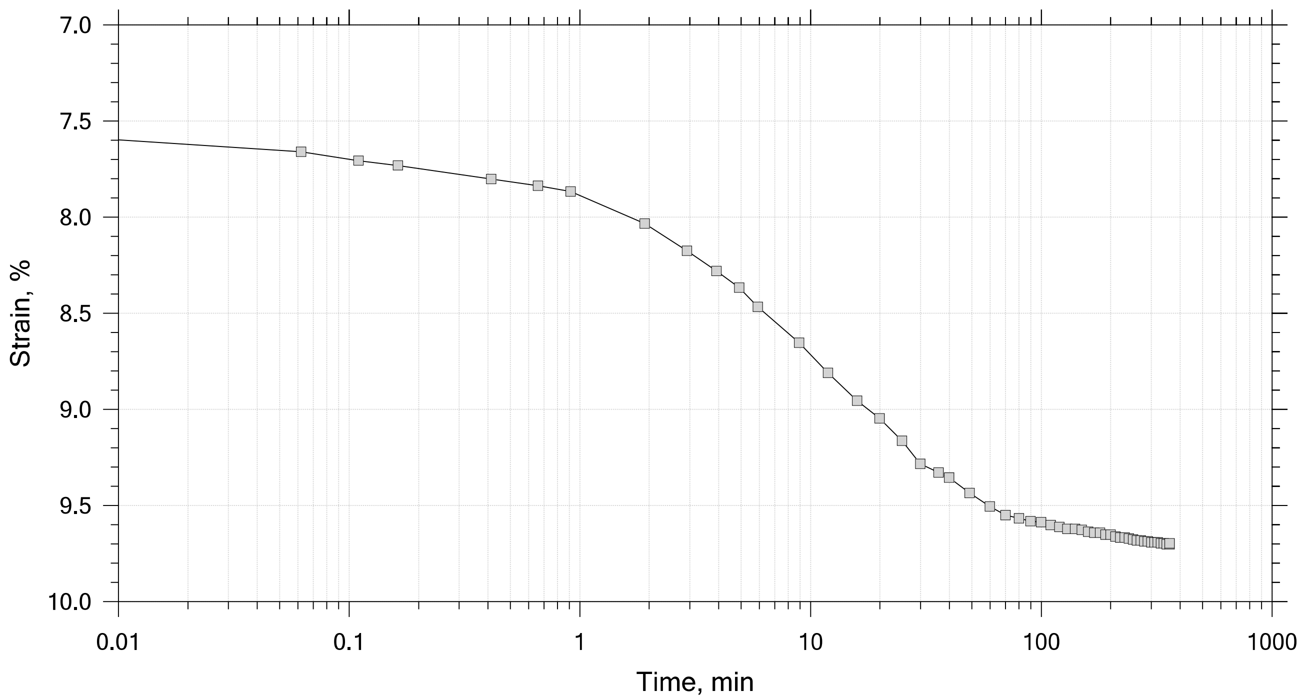
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
	Test No.: IP-5	Sample Type: Intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-002, Swell Pressure = 0.0548 tsf		

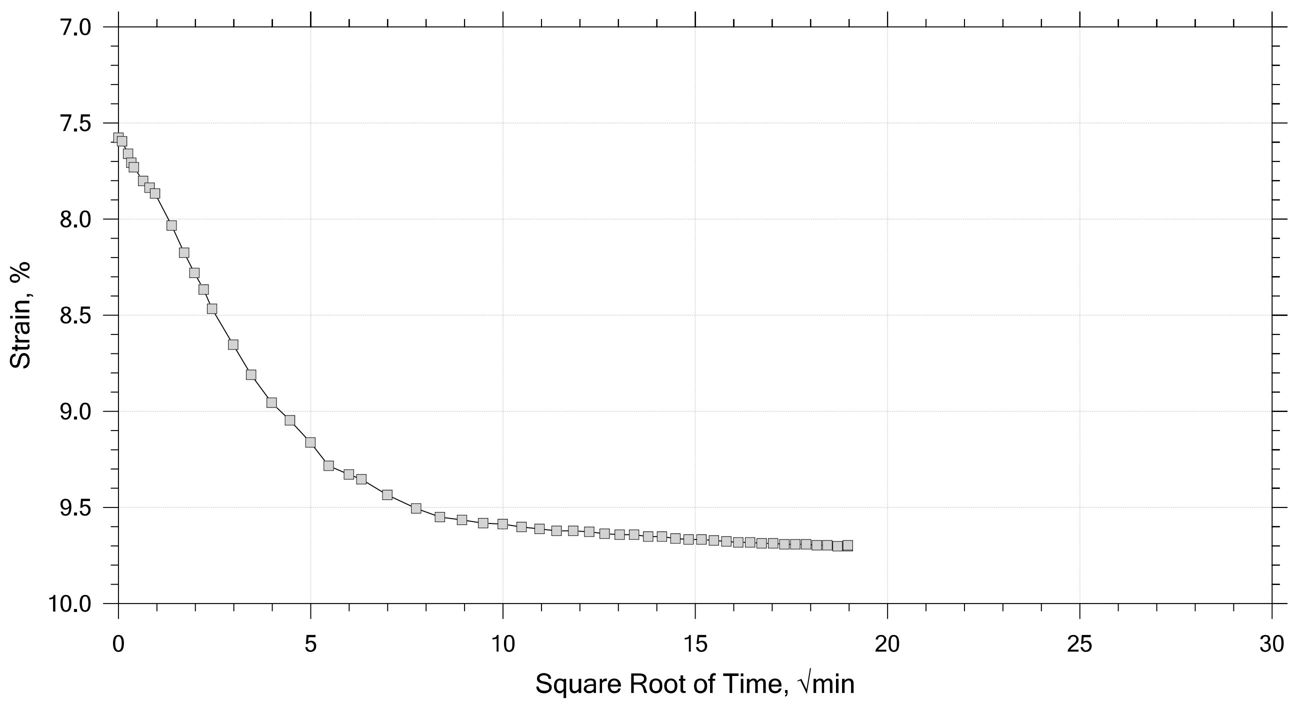
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15

Constant Load Step

Stress: 0.76 tsf

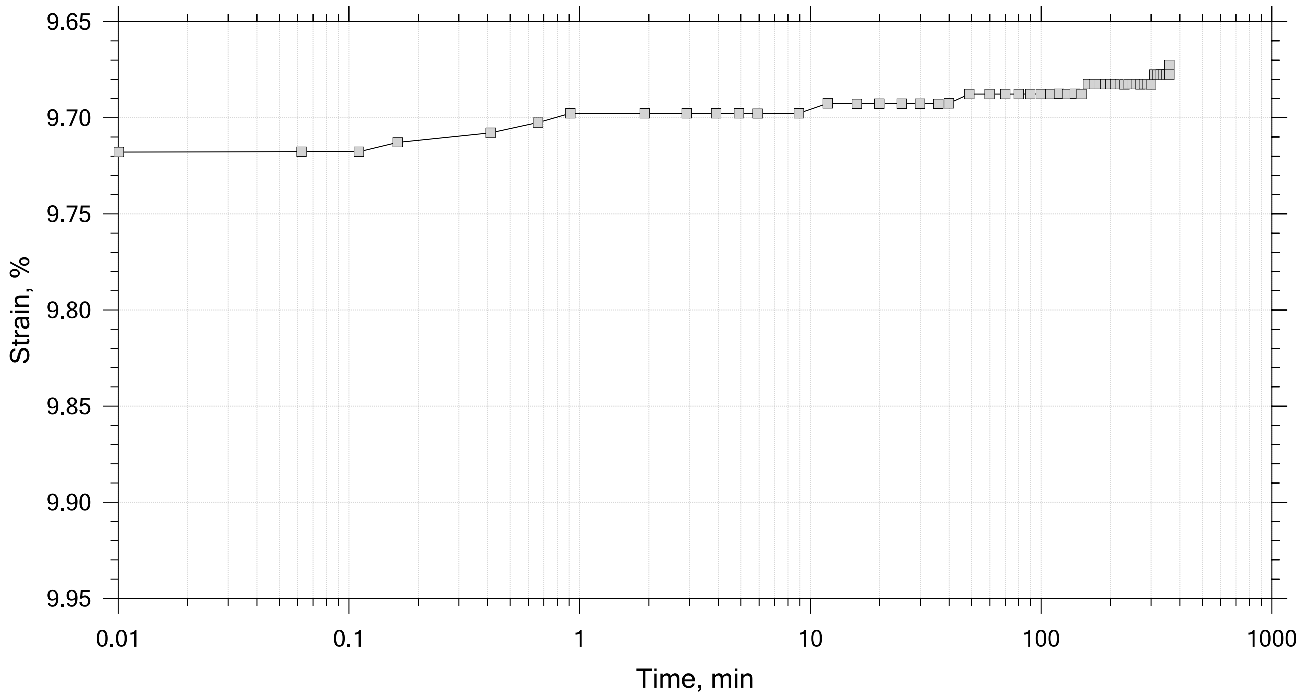


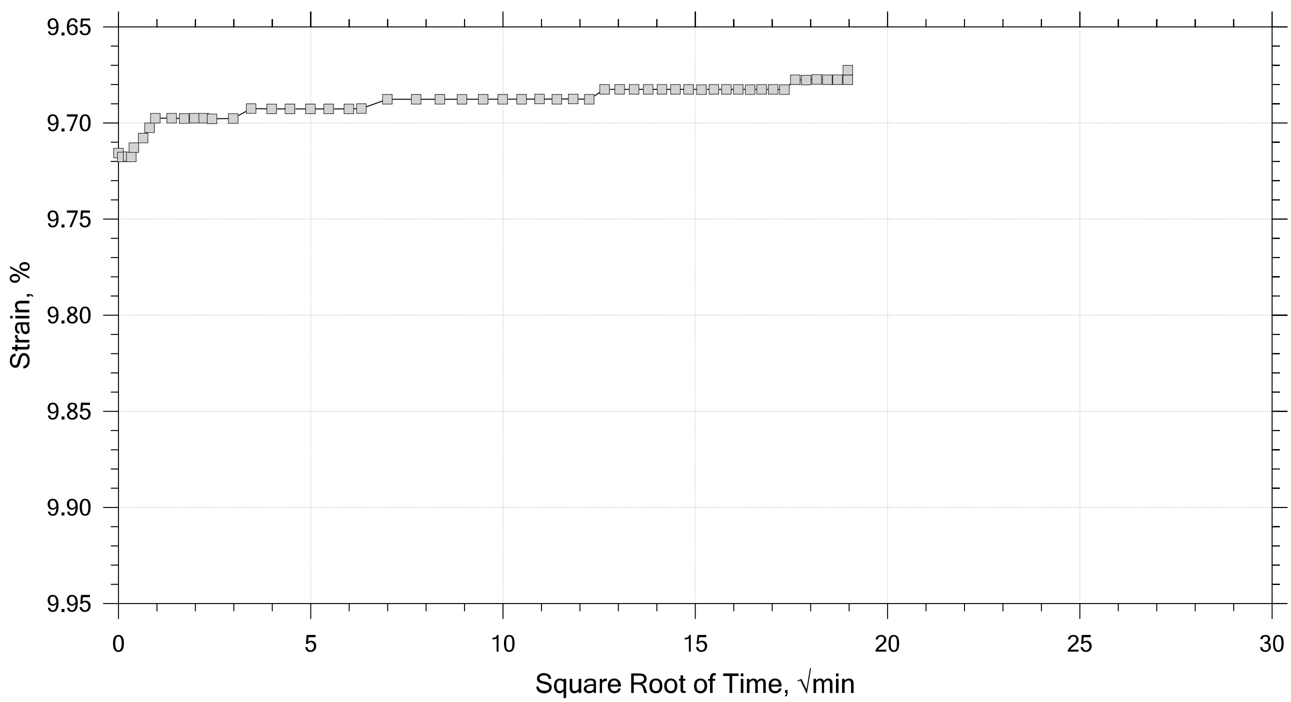


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
	Test No.: IP-5	Sample Type: Intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-002, Swell Pressure = 0.0548 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15
Constant Load Step
Stress: 0.38 tsf





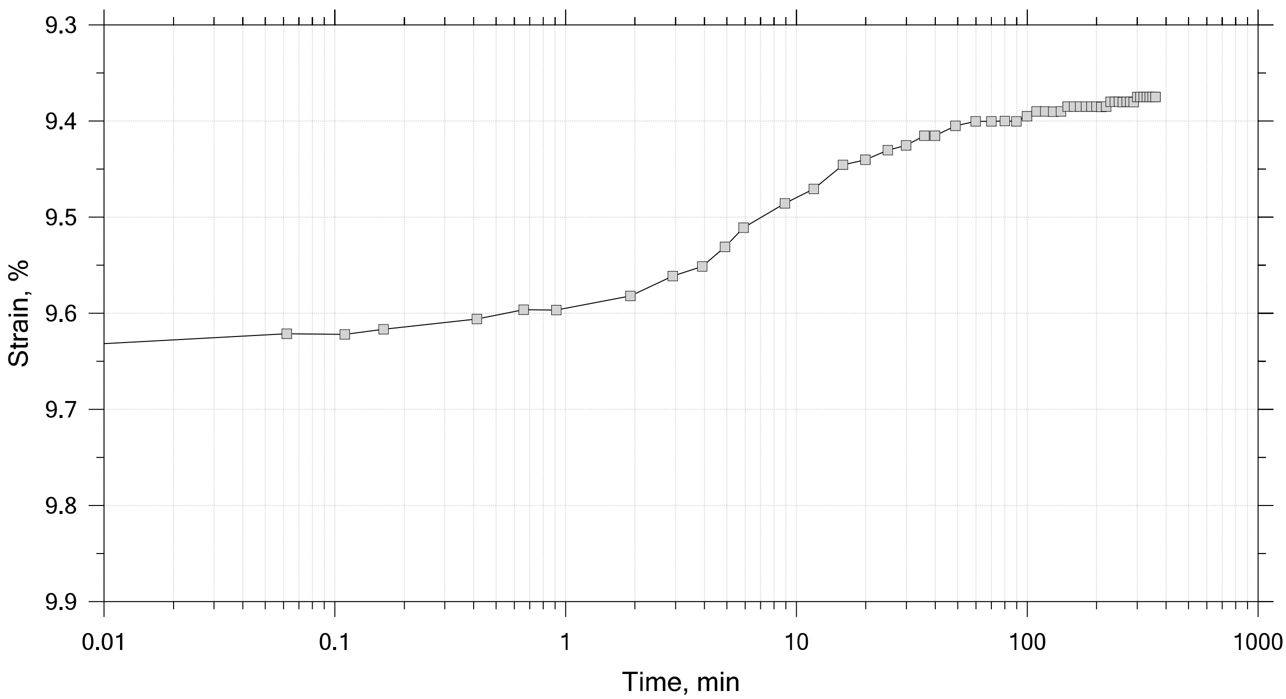
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
	Test No.: IP-5	Sample Type: Intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-002, Swell Pressure = 0.0548 tsf		

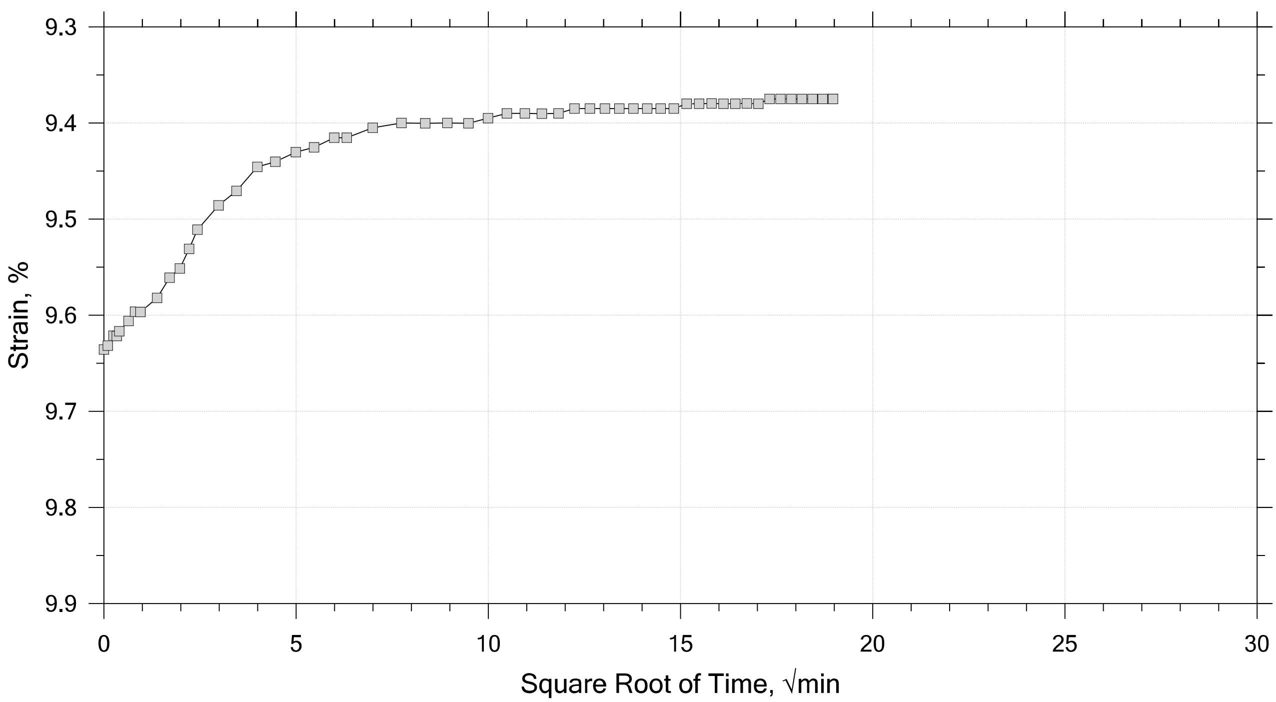
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15

Constant Load Step

Stress: 0.09 tsf





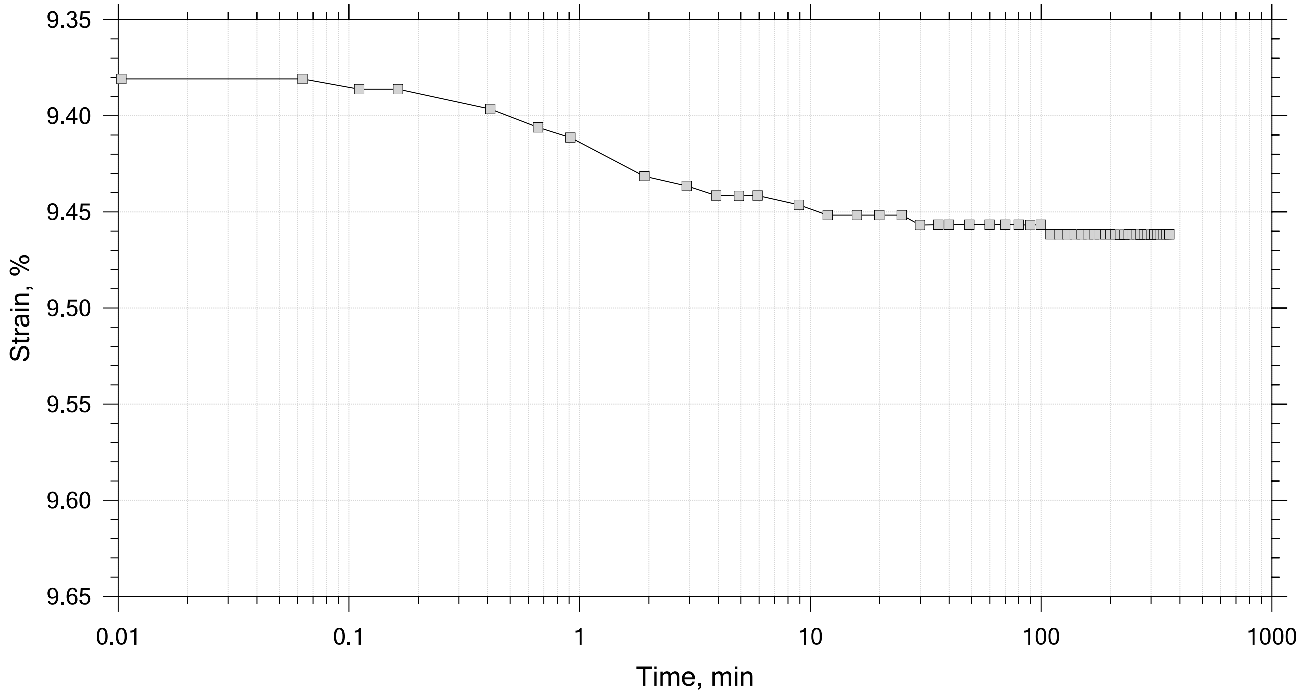
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
	Test No.: IP-5	Sample Type: Intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-002, Swell Pressure = 0.0548 tsf		

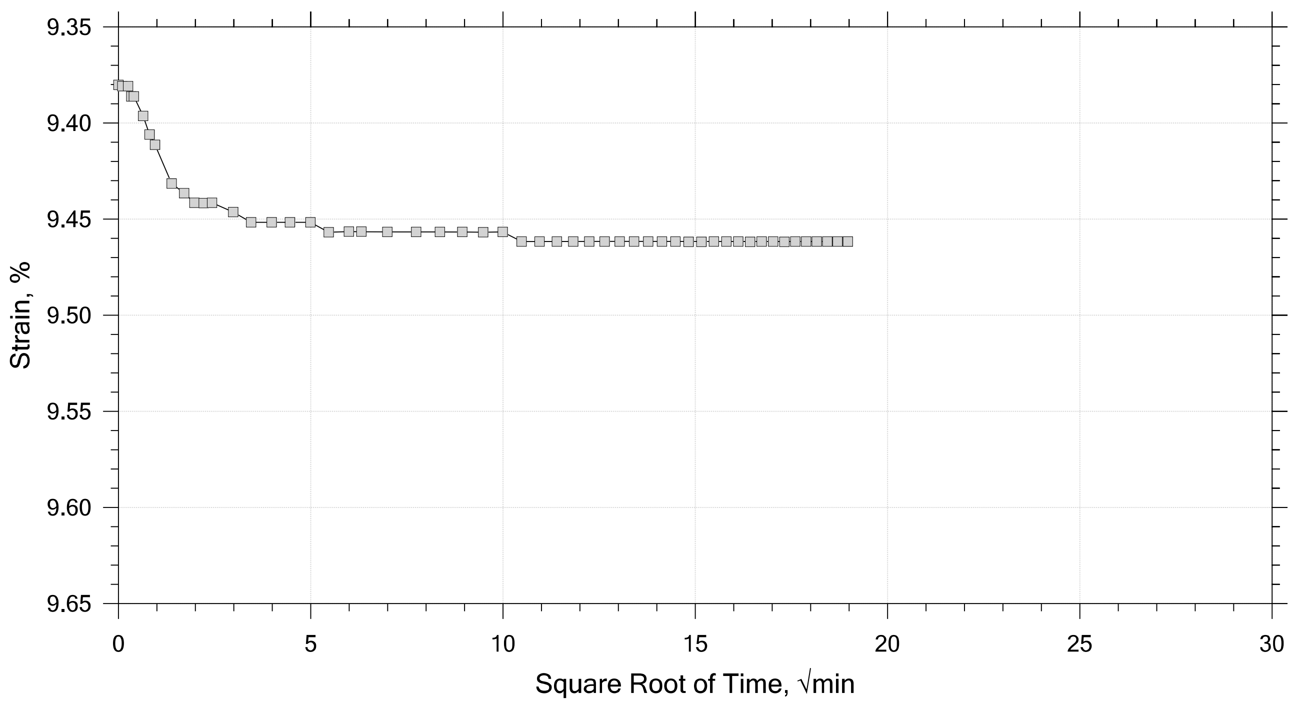
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15

Constant Load Step

Stress: 0.19 tsf





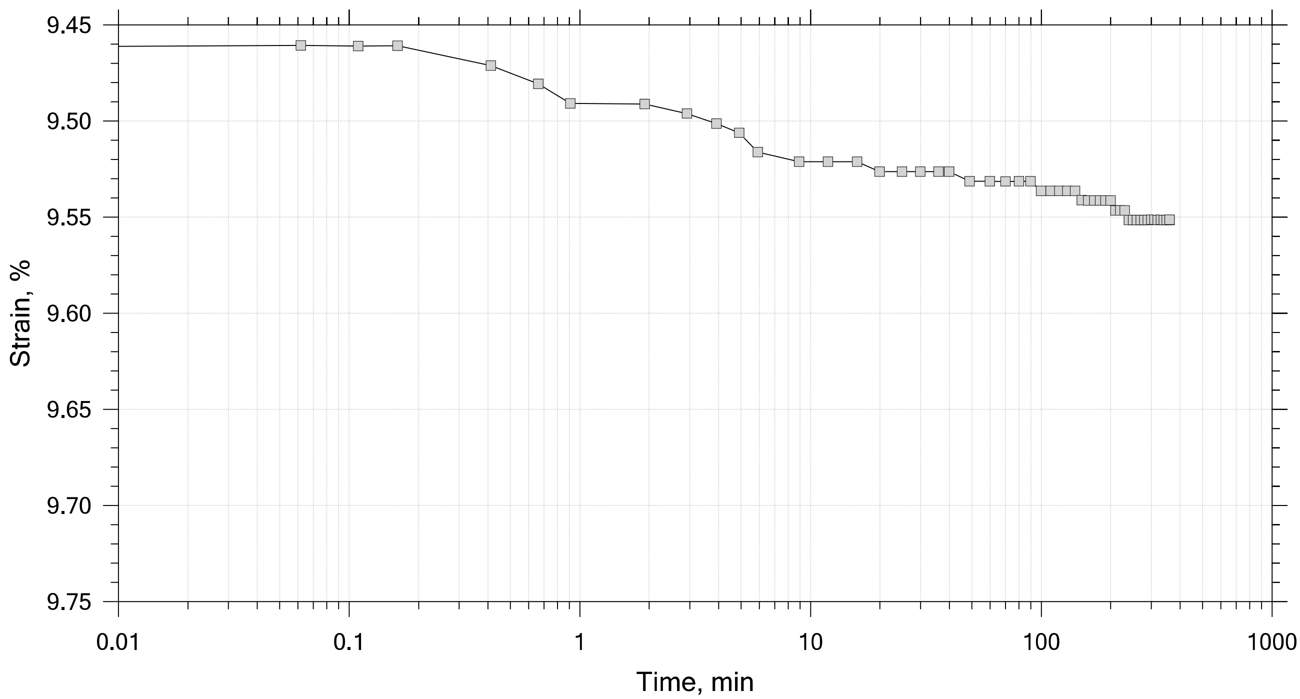
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
	Test No.: IP-5	Sample Type: Intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-002, Swell Pressure = 0.0548 tsf		

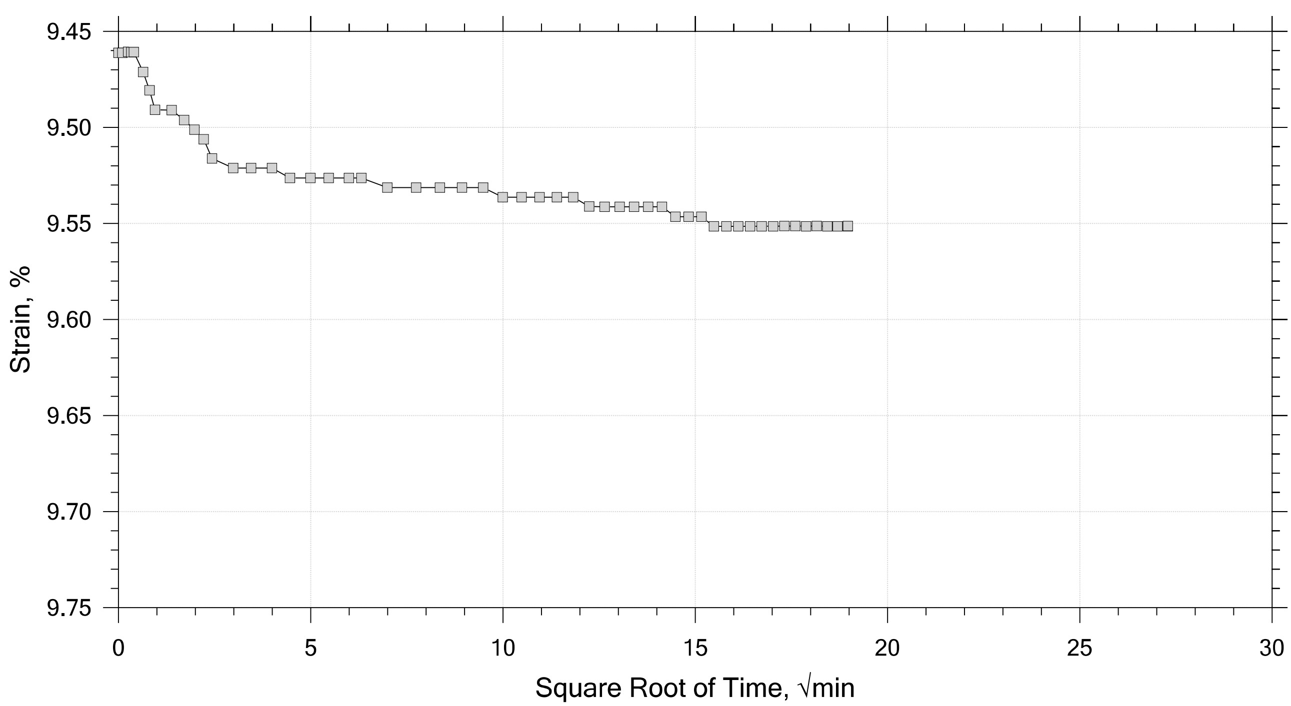
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15

Constant Load Step

Stress: 0.38 tsf

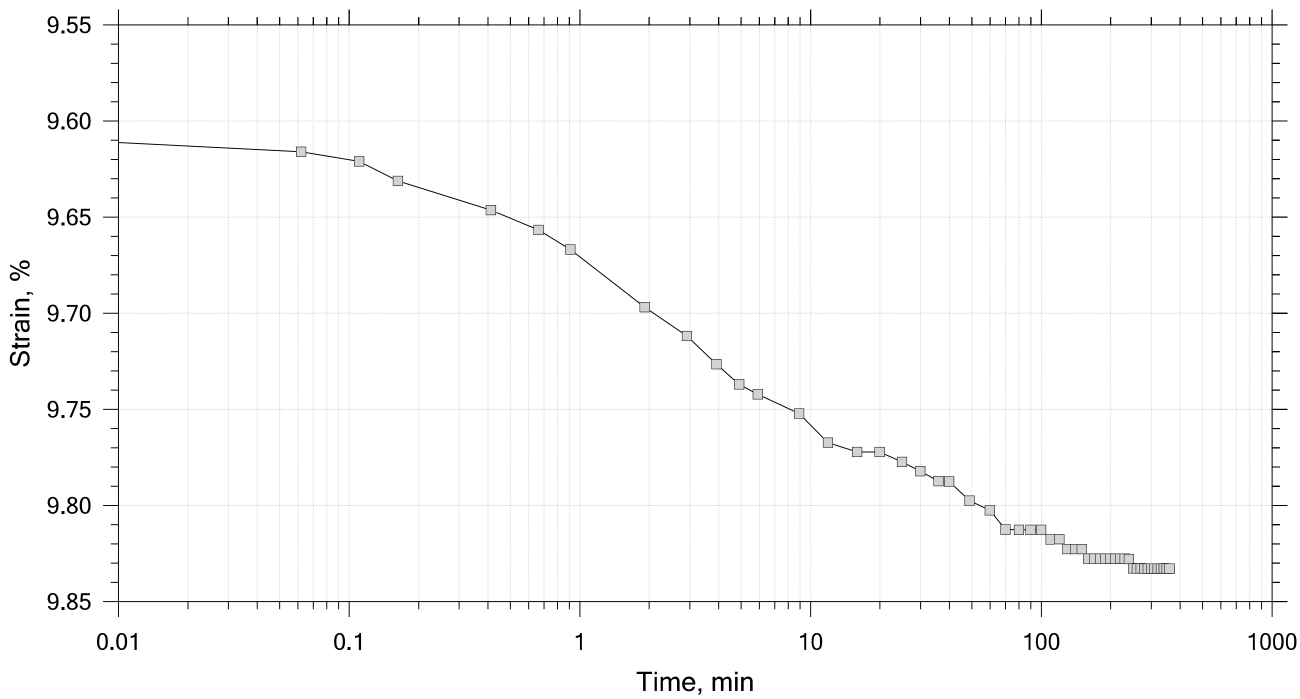


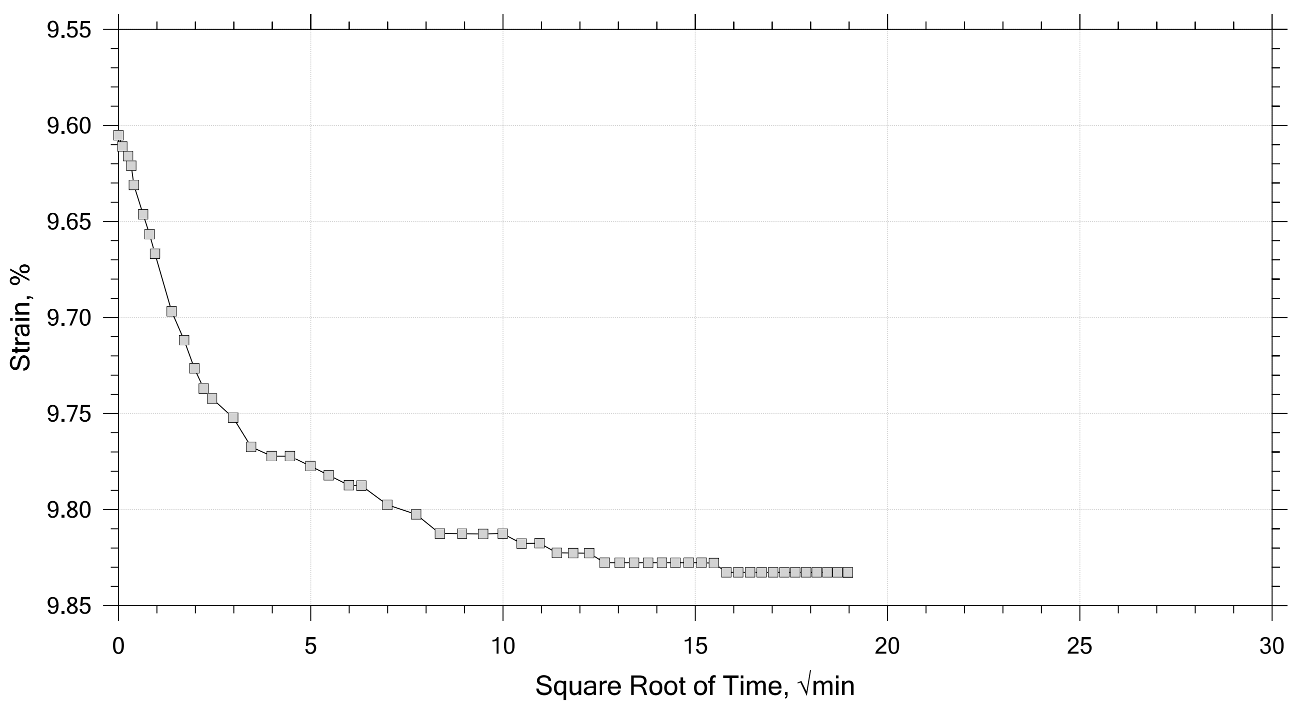


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
	Test No.: IP-5	Sample Type: Intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-002, Swell Pressure = 0.0548 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15
Constant Load Step
Stress: 0.76 tsf





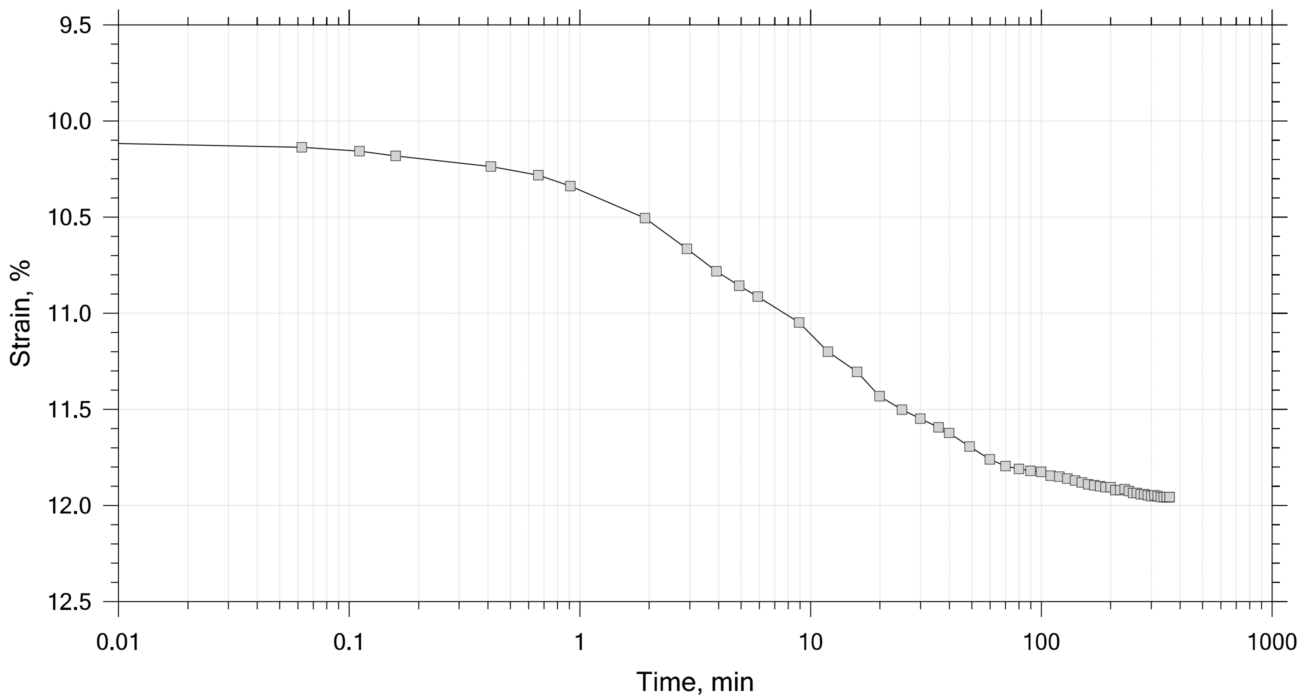
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
	Test No.: IP-5	Sample Type: Intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-002, Swell Pressure = 0.0548 tsf		

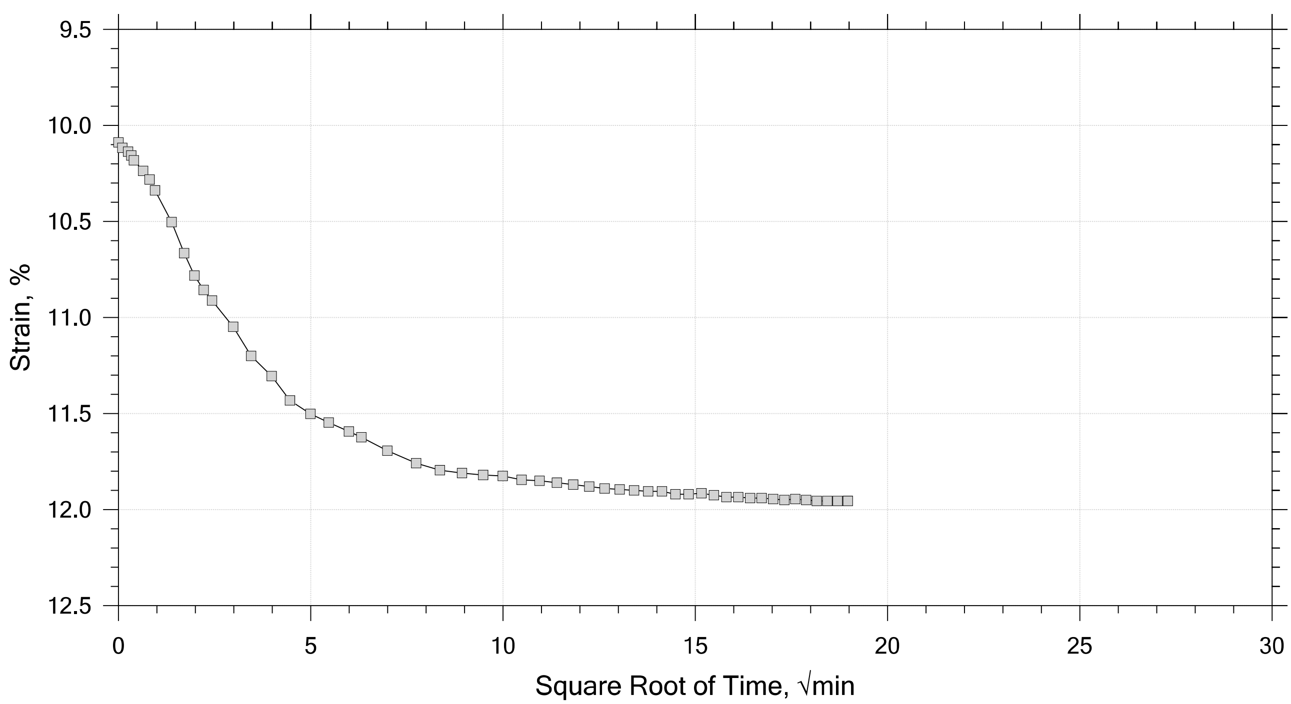
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15

Constant Load Step

Stress: 1.51 tsf





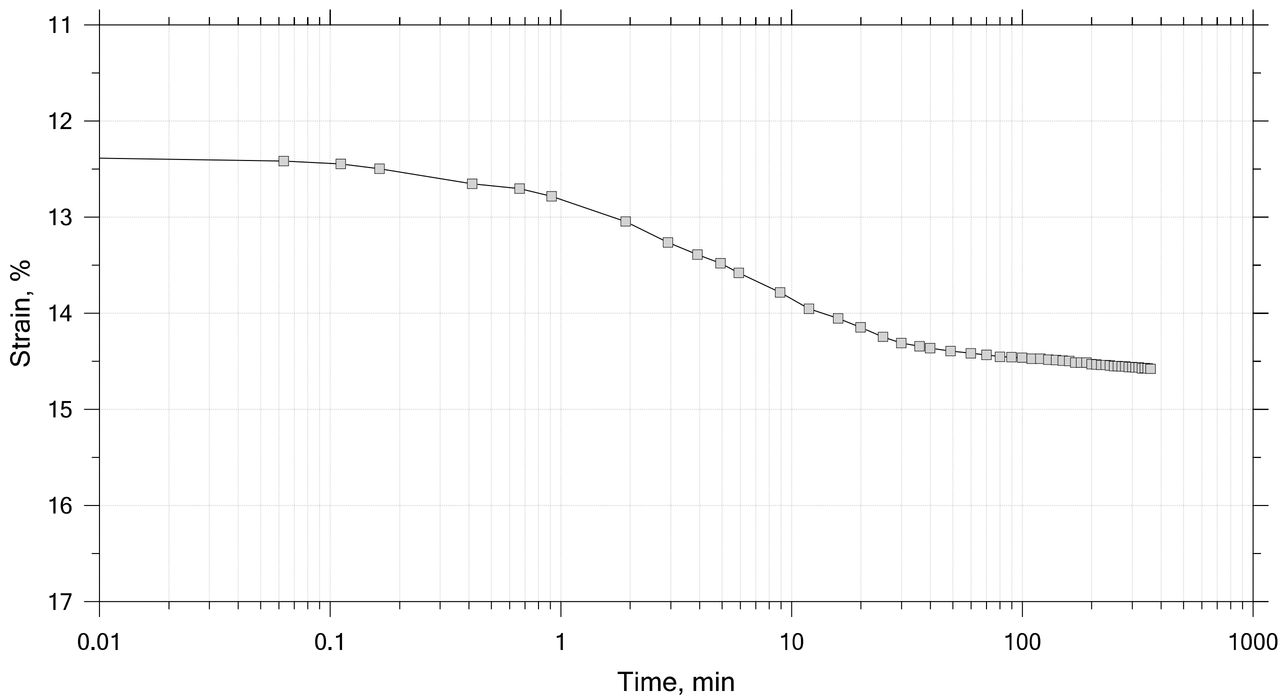
GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
	Test No.: IP-5	Sample Type: Intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-002, Swell Pressure = 0.0548 tsf		

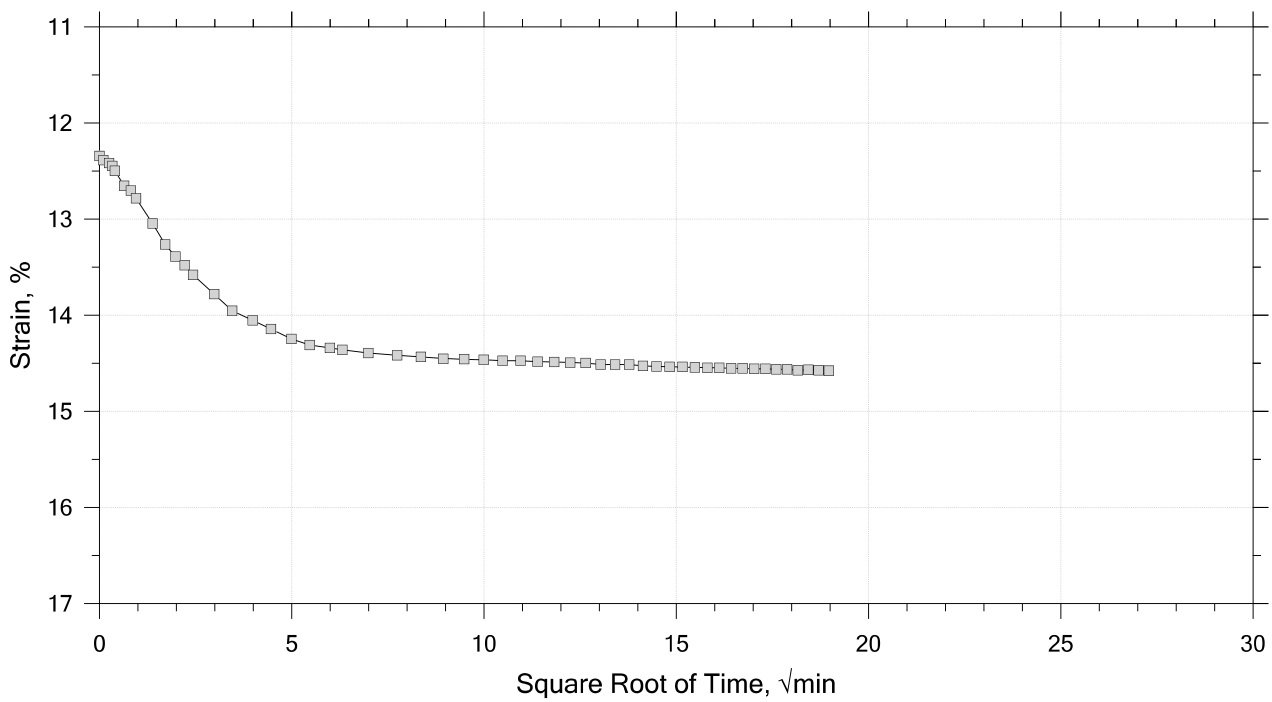
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15

Constant Load Step

Stress: 3 tsf

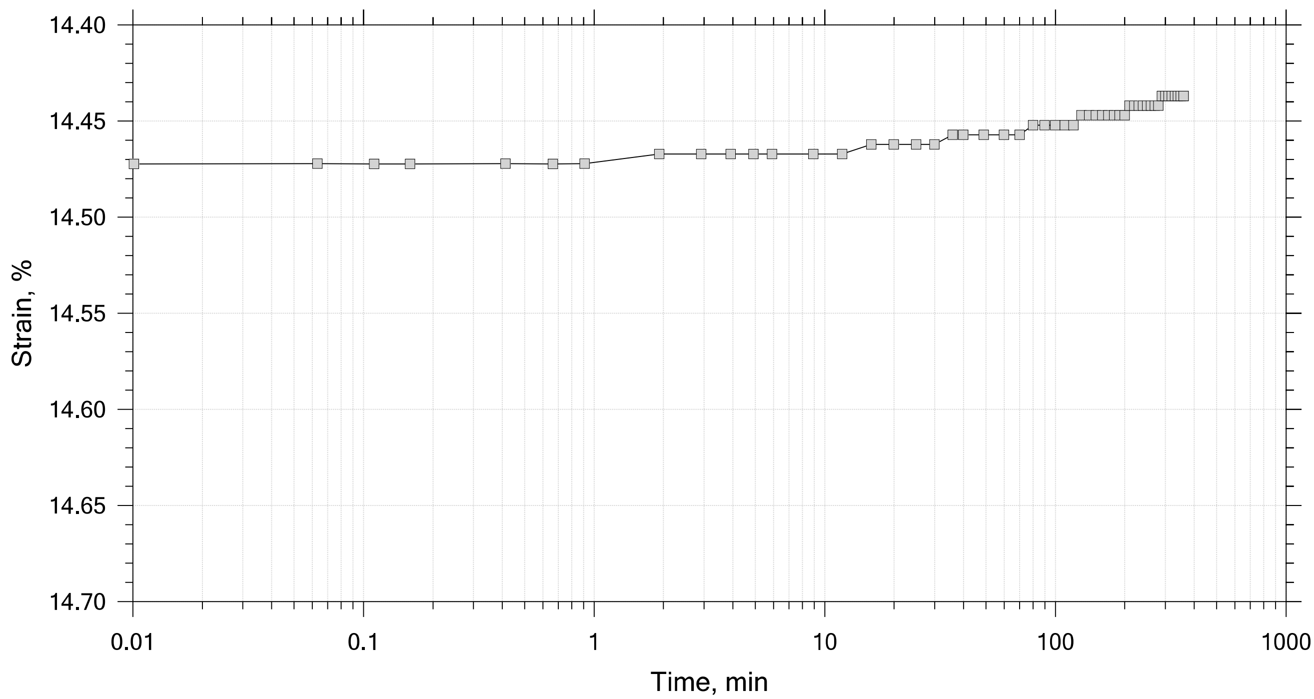


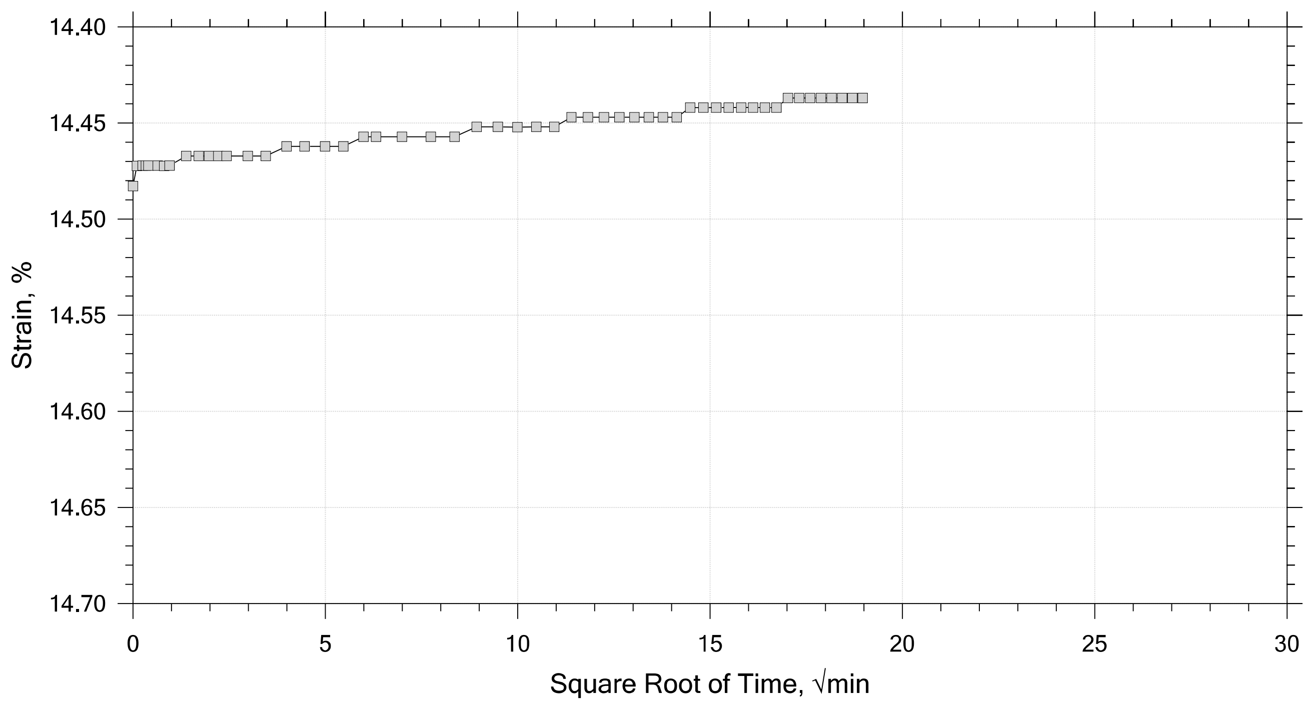


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
	Test No.: IP-5	Sample Type: Intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-002, Swell Pressure = 0.0548 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15
Constant Load Step
Stress: 1.51 tsf

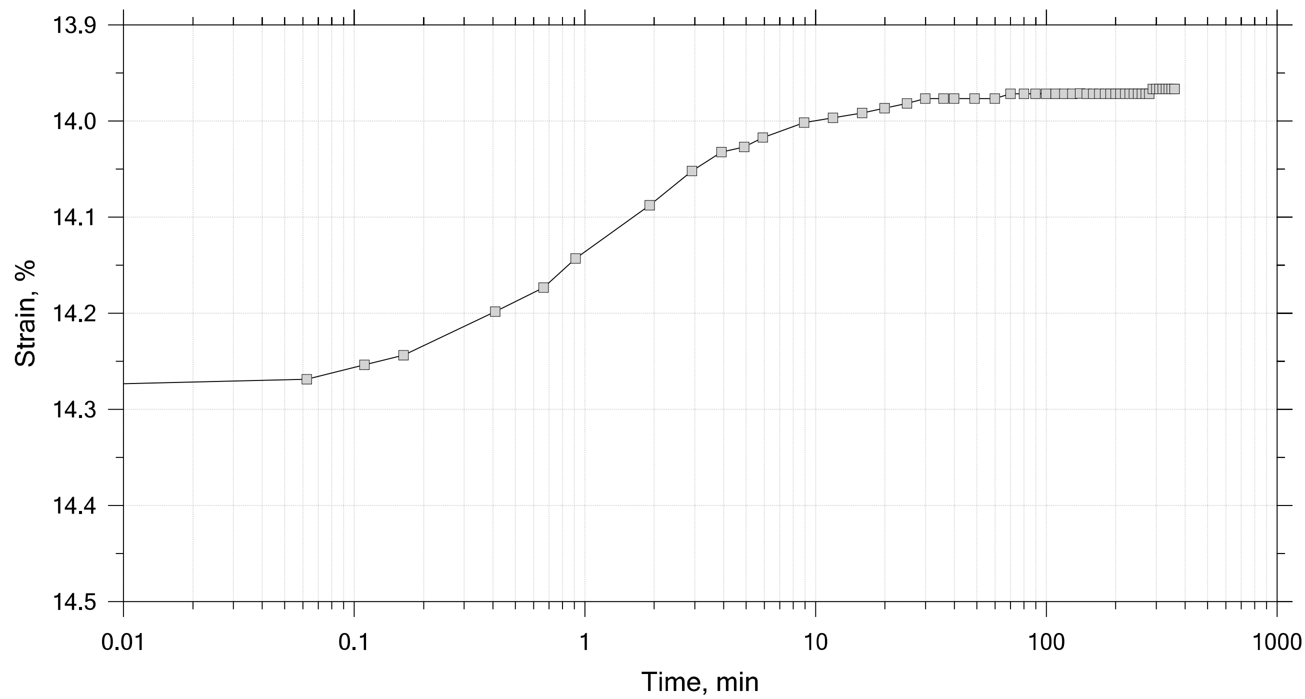


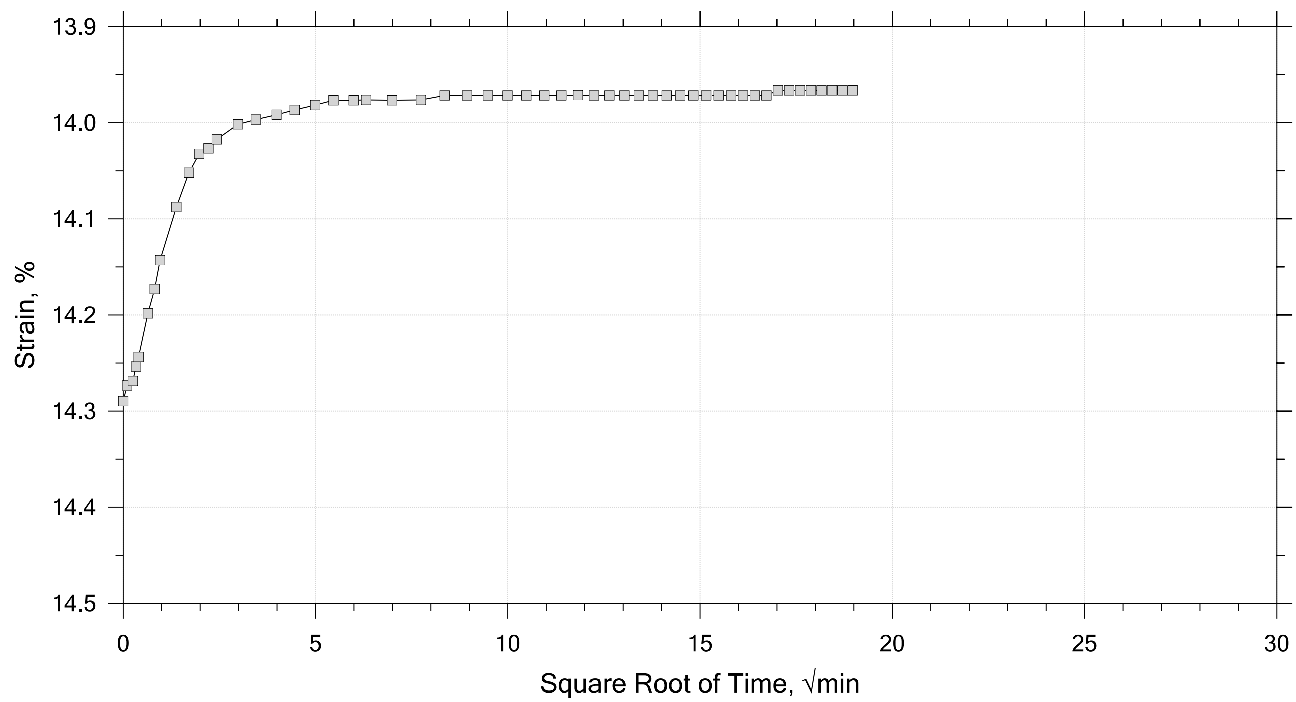


Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
Test No.: IP-5	Sample Type: Intact	Elevation: ---
Description: Moist, gray clay		
Remarks: TX-002, Swell Pressure = 0.0548 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15
Constant Load Step
Stress: 0.38 tsf

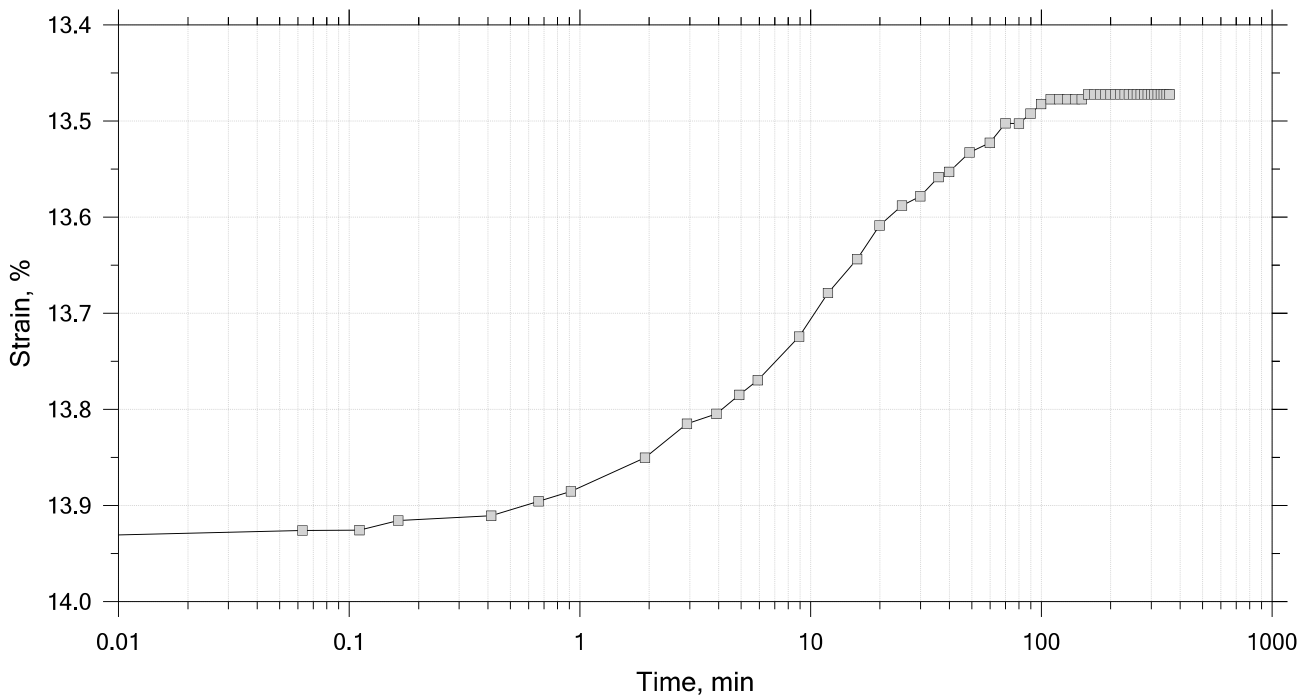


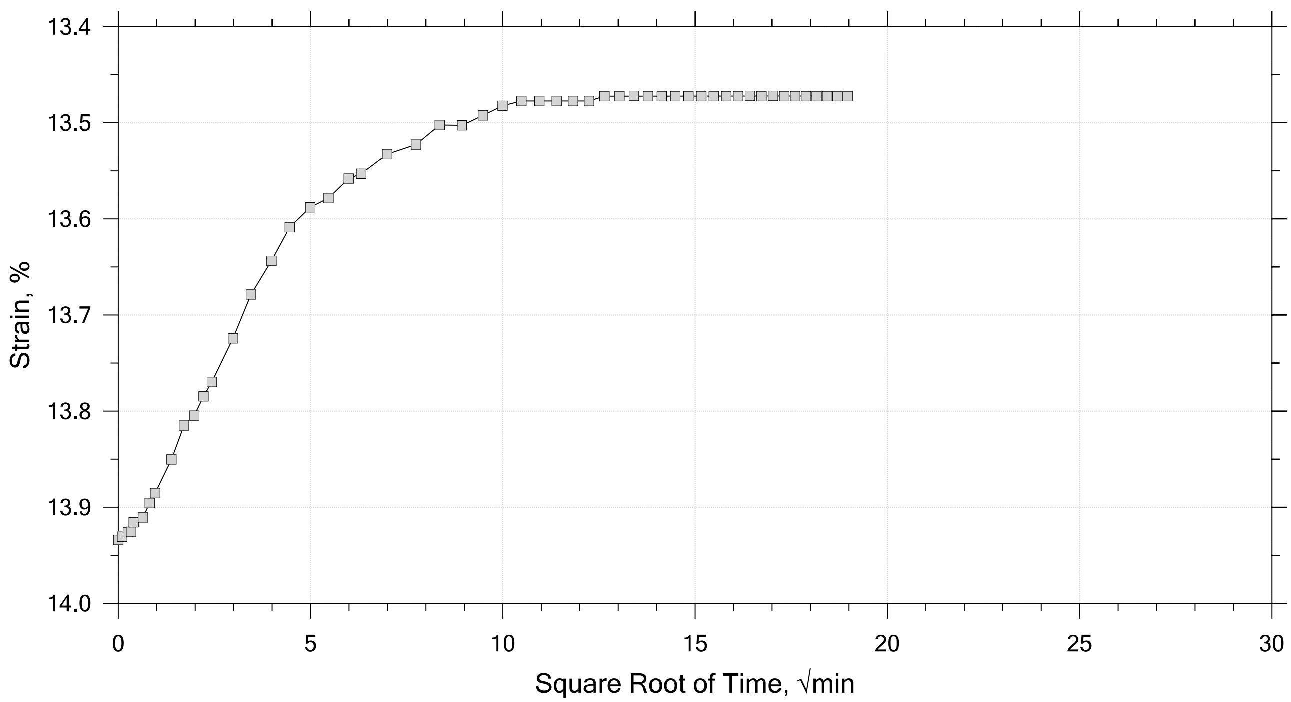


GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
	Test No.: IP-5	Sample Type: Intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-002, Swell Pressure = 0.0548 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15
Constant Load Step
Stress: 0.09 tsf





GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
	Test No.: IP-5	Sample Type: Intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-002, Swell Pressure = 0.0548 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.75	Liquid Limit: 26
Initial Height: 1.00 in	Initial Void Ratio: 0.776	Plastic Limit: 16
Final Height: 0.85 in	Final Void Ratio: 0.509	Plasticity Index: 10

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	E9770	RING		E8576
Mass Container, gm	8.22	107.59	107.59	8.23
Mass Container + Wet Soil, gm	354.81	264.96	255.35	155.8
Mass Container + Dry Soil, gm	278.94	232.28	232.28	132.76
Mass Dry Soil, gm	270.72	124.69	124.69	124.53
Water Content, %	28.03	26.21	18.50	18.50
Void Ratio	---	0.78	0.51	---
Degree of Saturation, %	---	93.01	100.00	---
Dry Unit Weight, pcf	---	96.77	113.85	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
Test No.: IP-5	Sample Type: Intact	Elevation: ---
Description: Moist, gray clay		
Remarks: TX-002, Swell Pressure = 0.0548 tsf		

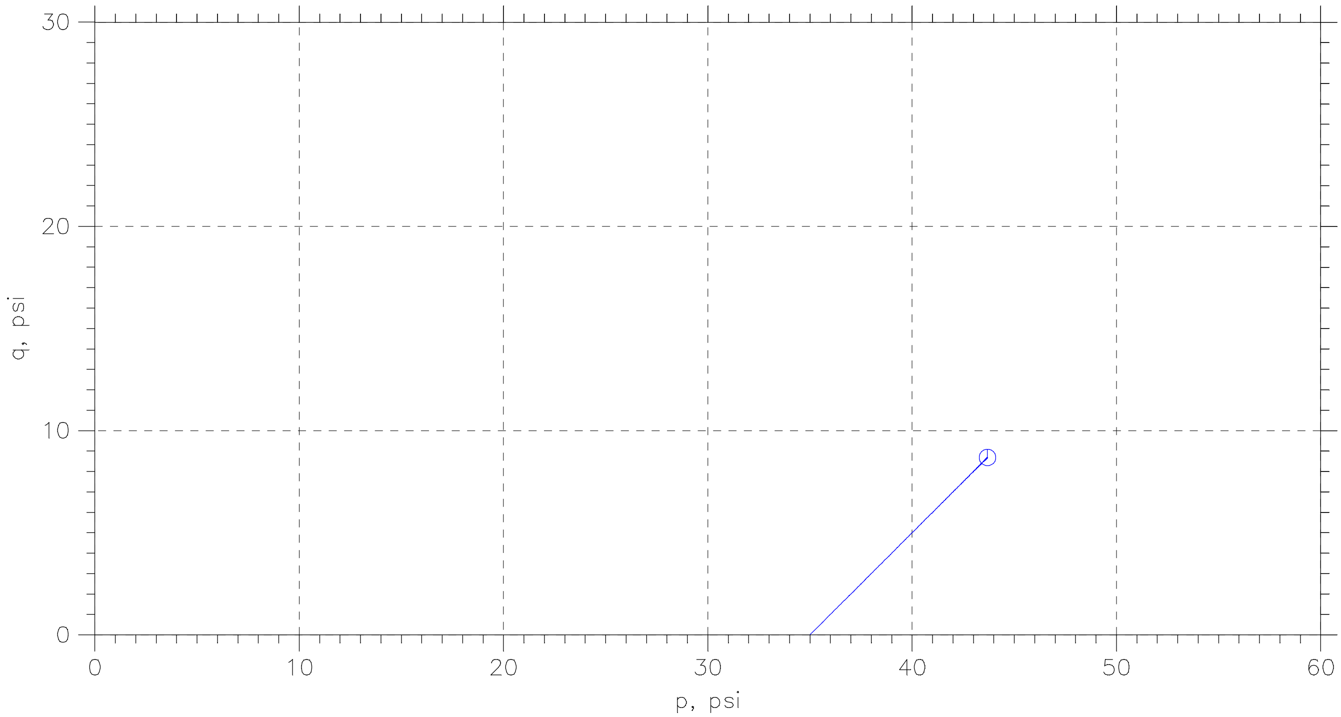
One-Dimensional Consolidation by ASTM D2435 - Method B

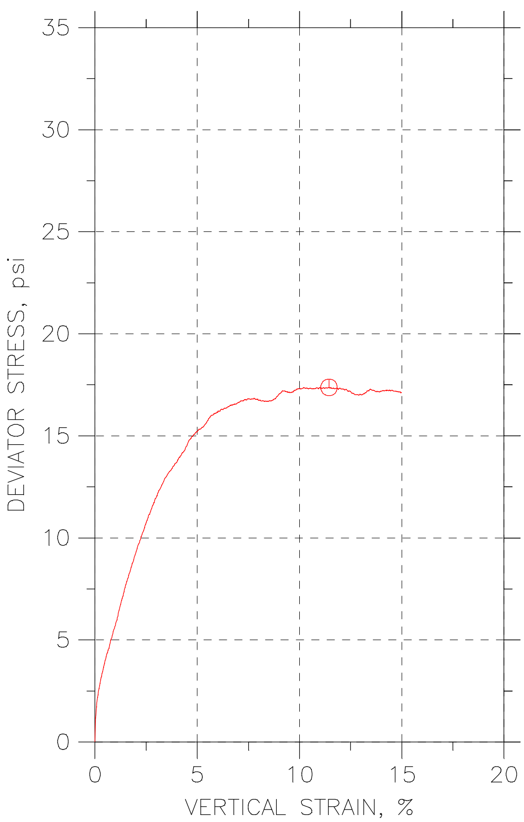
Square Root of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.0548	0.02698	0.728	2.70	166.640	1.43e-07	4.92e-01	1.90e-04
2	0.0900	0.03487	0.714	3.49	152.025	1.52e-07	2.24e-01	9.17e-05
3	0.190	0.05279	0.682	5.28	58.126	3.86e-07	1.79e-01	1.86e-04
4	0.380	0.07393	0.644	7.39	34.996	6.15e-07	1.11e-01	1.85e-04
5	0.760	0.09697	0.603	9.70	37.395	5.49e-07	6.06e-02	8.97e-05
6	0.380	0.09672	0.604	9.67	---	---	---	---
7	0.0900	0.09375	0.609	9.37	29.012	6.92e-07	1.03e-02	1.92e-05
8	0.190	0.09462	0.608	9.46	7.707	2.61e-06	8.68e-03	6.12e-05
9	0.380	0.09551	0.606	9.55	19.914	1.01e-06	4.72e-03	1.28e-05
10	0.760	0.09833	0.601	9.83	13.568	1.47e-06	7.40e-03	2.95e-05
11	1.51	0.1196	0.563	12.0	28.447	6.85e-07	2.83e-02	5.23e-05
12	3.00	0.1458	0.517	14.6	20.186	9.14e-07	1.76e-02	4.34e-05
13	1.51	0.1444	0.519	14.4	283.606	6.32e-08	9.45e-04	1.61e-07
14	0.380	0.1397	0.528	14.0	6.507	2.78e-06	4.16e-03	3.12e-05
15	0.0900	0.1347	0.536	13.5	46.080	3.96e-07	1.70e-02	1.82e-05

GeoTesting EXPRESS	Project: Tuttle Rd, Cumberland, ME	Location: Cumberland, ME	Project No.: GTX-318928
	Boring No.: BB-C295-207	Tested By: sjt	Checked By: anm
	Sample No.: U1	Test Date: 05/02/24	Depth: 10-12'
	Test No.: IP-5	Sample Type: Intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: TX-002, Swell Pressure = 0.0548 tsf		
	Displacement at End of Increment		

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





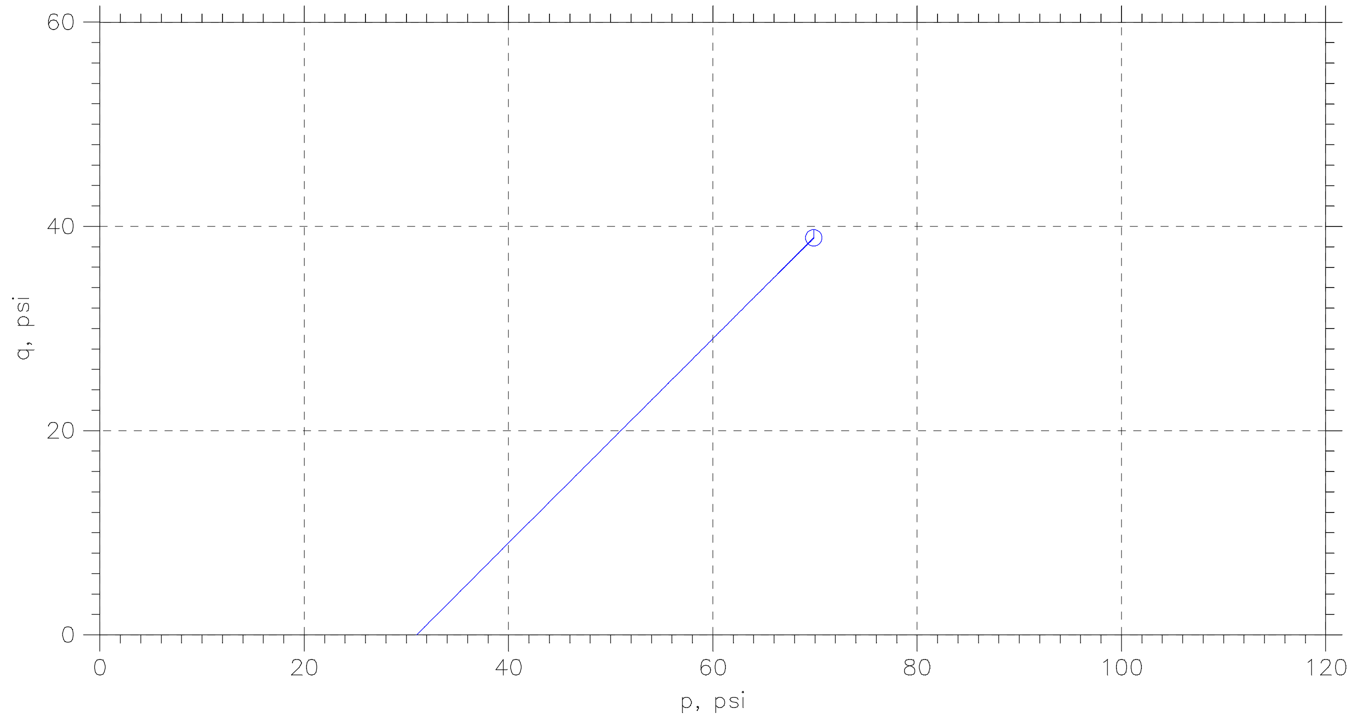
Symbol	⏀			
Sample No.	U2			
Test No.	UU-1			
Depth	42-44'			
Tested by	te			
Test Date	4/24/24			
Checked by	anm			
Check Date	4/30/24			
Diameter, in	2.04			
Height, in	4.61			
Water Content, %	29.1			
Dry Density, pcf	93.19			
Saturation, %	97.2			
Void Ratio	0.809			
Confining Stress, psi	35			
Undrained Strength, psi	8.686			
Max. Dev. Stress, psi	17.37			
Strain at Failure, %	11.4			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.7			
Liquid Limit	31			
Plastic Limit	26			
Plasticity Index	5			

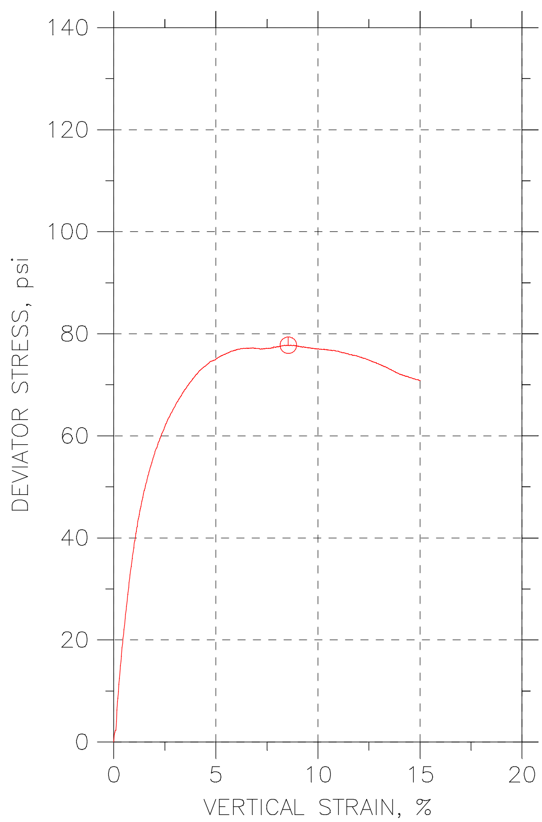
Project: Tuttle Rd, Cumberland ME
Location: Cumberland, ME
Project No.: GTX-318928
Boring No.: BB-C295-203
Sample Type: intact
Description: Moist, gray silt
Remarks: TX-027

Phase calculations based on start of test.

Tue, 30-APR-2024 15:28:16

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





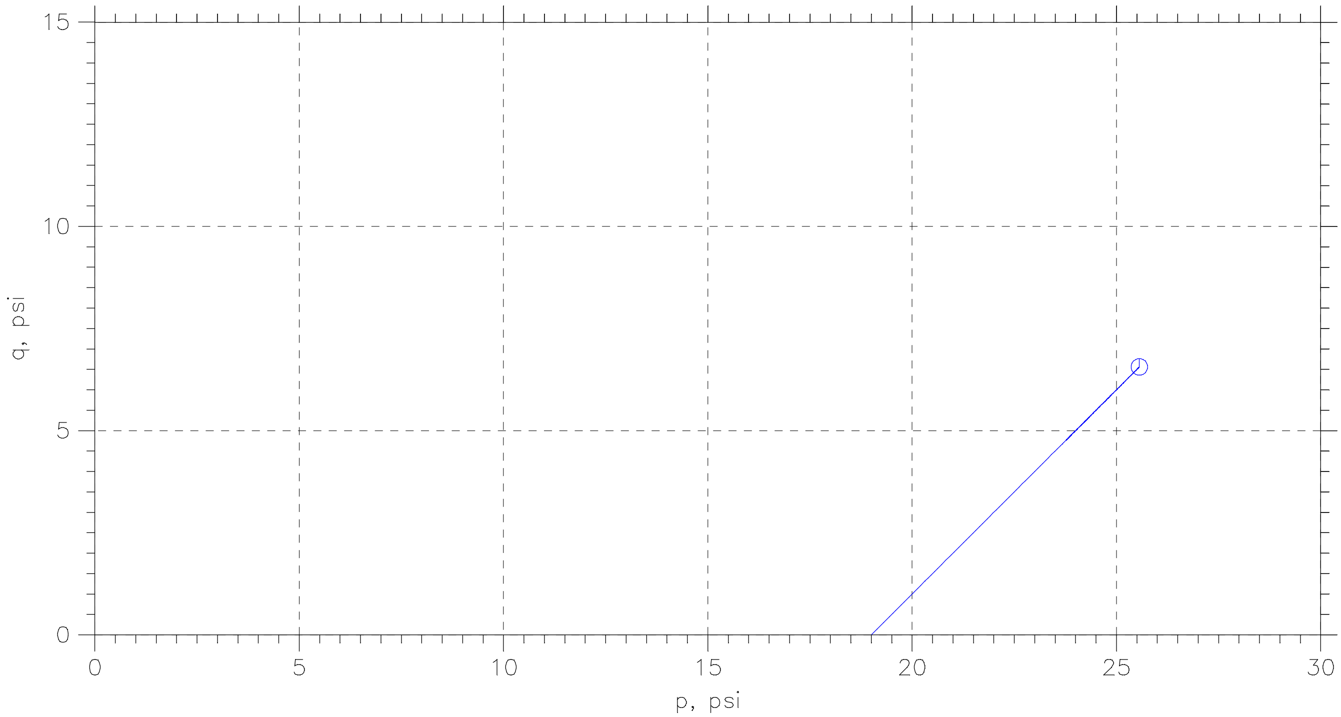
Symbol	○			
Sample No.	U1			
Test No.	UU-2			
Depth	37-39'			
Tested by	te			
Test Date	4/24/24			
Checked by	anm			
Check Date	4/30/24			
Diameter, in	1.98			
Height, in	4.53			
Water Content, %	25.6			
Dry Density, pcf	98.07			
Saturation, %	96.3			
Void Ratio	0.719			
Confining Stress, psi	31			
Undrained Strength, psi	38.88			
Max. Dev. Stress, psi	77.75			
Strain at Failure, %	8.55			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.7			
Liquid Limit	---			
Plastic Limit	---			
Plasticity Index	---			

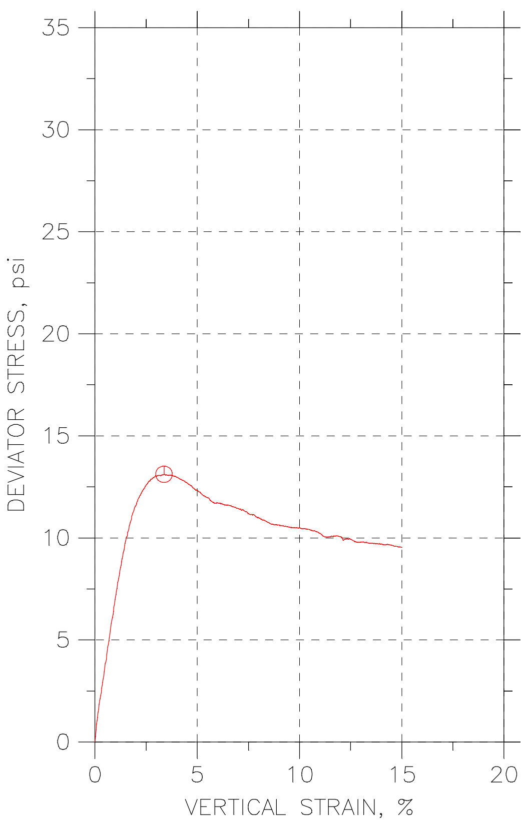
GeoTesting EXPRESS

Project: Tuttle Rd, Cumberland ME
Location: Cumberland, ME
Project No.: GTX-318928
Boring No.: BB-C295-203
Sample Type: intact
Description: Moist, dark olive gray clay
Remarks: TX-027 , dense clay near bottom of sample
Phase calculations based on start of test.

Tue, 30-APR-2024 15:39:57

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏀			
Sample No.	U1			
Test No.	UU-3			
Depth	22.3-24.3'			
Tested by	te			
Test Date	4/24/24			
Checked by	anm			
Check Date	4/30/24			
Diameter, in	2.03			
Height, in	4.52			
Water Content, %	31.3			
Dry Density, pcf	88.22			
Saturation, %	92.7			
Void Ratio	0.911			
Confining Stress, psi	19			
Undrained Strength, psi	6.559			
Max. Dev. Stress, psi	13.12			
Strain at Failure, %	3.38			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.7			
Liquid Limit	---			
Plastic Limit	---			
Plasticity Index	---			

GeoTesting EXPRESS

Project: Tuttle Rd, Cumberland ME

Location: Cumberland, ME

Project No.: GTX-318928

Boring No.: BB-C295-205

Sample Type: intact

Description: Moist, dark gray clay

Remarks: TX-027

Phase calculations based on start of test.

Tue, 30-APR-2024 16:09:46

Client:	Hardesty & Hanover				
Project:	Tuttle Rd, Cumberland ME				
Location:	Cumberland, ME			Project No:	GTX-318928
Boring ID:	---	Sample Type:	---	Tested By:	te
Sample ID:	---	Test Date:	04/30/24	Checked By:	smd
Depth :	---	Test Id:	765671		

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample Number	Depth	Bulk Density, pcf	Compressive strength, psi	Failure Type	Meets ASTM D4543	Note(s)
BB-C925-203	R1	57.67-57.98 ft	170	7202	1	No	1,*
BB-C925-205	R1	44.71-45.08 ft	179	17524	1	No	1,*

Notes: Density determined on core samples by measuring dimensions and weight and then calculating.

All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.

The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure (See attached photographs)

1: Best effort end preparation. See Tolerance report for details.
2: The as-received core did not meet the ASTM side straightness tolerance due to irregularities in the sample as cored.
3: Specimen L/D < 2.
4: The as-received core did not meet the ASTM minimum diameter tolerance of 1.875 inches.
5: Specimen diameter is less than 10 times maximum particle size.
6: Specimen diameter is less than 6 times maximum particle size.

*Because the indicated tested specimens did not meet the ASTM D4543 standard tolerances, the results reported here may differ from those for a test specimen within tolerances.

Client:	Hardesty & Hanover	Test Date:	4/29/2024
Project Name:	Tuttle Rd, Cumberland, ME	Tested By:	rik
Project Location:	Cumberland, ME	Checked By:	smd
GTX #:	318928		
Boring ID:	BB-C925-203		
Sample ID:	R1		
Depth (ft):	57.67-57.98		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average	
Specimen Length, in:	3.93	3.93	3.93	
Specimen Diameter, in:	1.99	1.99	1.99	
Specimen Mass, g:	546.54			
Bulk Density, lb/ft^3	170	**Minimum Diameter Tolerence Met?**	**YES**	
Length to Diameter Ratio:	2.0	**Length to Diameter Ratio Tolerance Met?**	**YES**	

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:
Is the maximum gap $\leq$ 0.02 in.? YES

Maximum difference must be < 0.020 in.
Straightness Tolerance Met? **YES**

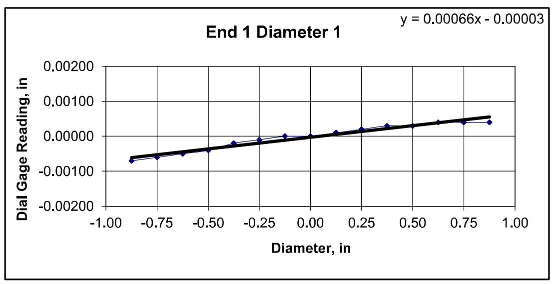
END FLATNESS AND PARALLELISM (Procedure FP1)

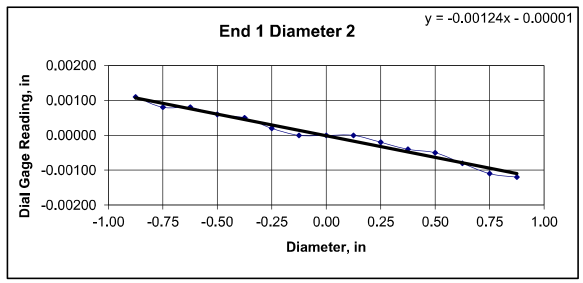
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00070	-0.00060	-0.00050	-0.00040	-0.00020	-0.00010	0.00000	0.00000	0.00010	0.00020	0.00030	0.00030	0.00040	0.00040	0.00040
Diameter 2, in (rotated 90°)	0.00110	0.00080	0.00080	0.00060	0.00050	0.00020	0.00000	0.00000	0.00000	-0.00020	-0.00040	-0.00050	-0.00080	-0.00110	-0.00120

Difference between max and min readings, in:
0° = 0.00110 90° = 0.00230

END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00040	-0.00040	-0.00040	-0.00040	-0.00020	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010
Diameter 2, in (rotated 90°)	-0.00150	-0.00120	-0.00110	-0.00070	-0.00070	-0.00040	-0.00010	0.00000	0.00030	0.00050	0.00070	0.00080	0.00090	0.00120	0.00130

Difference between max and min readings, in:
0° = 0.0005 90° = 0.0028
Maximum difference must be < 0.0020 in. Difference = $\pm$ 0.00140
Flatness Tolerance Met? **NO**





DIAMETER 1

End 1:

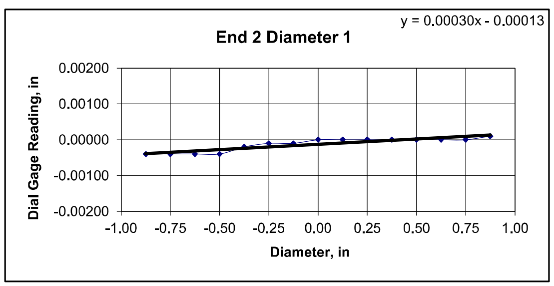
Slope of Best Fit Line	0.00066
Angle of Best Fit Line:	0.03798

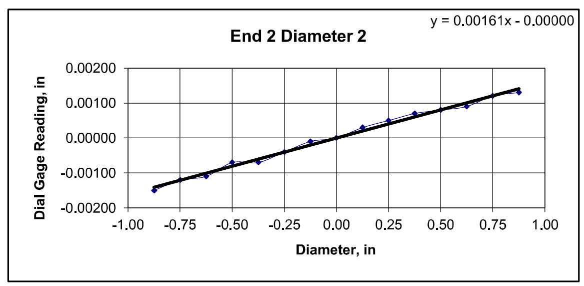
End 2:

Slope of Best Fit Line	0.00030
Angle of Best Fit Line:	0.01703

Maximum Angular Difference: 0.02095

Parallelism Tolerance Met? **NO**
Spherically Seated





DIAMETER 2

End 1:

Slope of Best Fit Line	0.00124
Angle of Best Fit Line:	0.07105

End 2:

Slope of Best Fit Line	0.00161
Angle of Best Fit Line:	0.09233

Maximum Angular Difference: 0.02128

Parallelism Tolerance Met? **NO**
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00110	1.990	0.00055	0.032	YES
Diameter 2, in (rotated 90°)	0.00230	1.990	0.00116	0.066	YES
END 2					
Diameter 1, in	0.00050	1.990	0.00025	0.014	YES
Diameter 2, in (rotated 90°)	0.00280	1.990	0.00141	0.081	YES

Maximum angle of departure must be $\leq$ 0.25°
Perpendicularity Tolerance Met? **YES**

Client:	Hardesty & Hanover	Test Date:	4/29/2024
Project Name:	Tuttle Rd, Cumberland, ME	Tested By:	rik
Project Location:	Cumberland, ME	Checked By:	smd
GTX #:	318928		
Boring ID:	BB-C925-203	Reliable dial gauge measurements could not be performed on this rock type. Tolerance measurements were performed using a machinist straightedge and feeler gauges to ASTM specifications.	
Sample ID:	R1		
Depth (ft):	57.67-57.98		
Visual Description:	See photographs		

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

END FLATNESS

END 1

Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90^o)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

END 2

Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90^o)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

End Flatness Tolerance Met? YES

Client:	Hardesty & Hanover
Project Name:	Tuttle Rd, Cumberland ME
Project Location:	Cumberland, ME
GTX #:	318928
Test Date:	4/30/2024
Tested By:	gp
Checked By:	smd
Boring ID:	BB-C925-203
Sample ID:	R1
Depth, ft:	57.67-57.98

After cutting and grinding

After break

Client:	Hardesty & Hanover	Test Date:	4/29/2024
Project Name:	Tuttle Rd, Cumberland, ME	Tested By:	rik
Project Location:	Cumberland, ME	Checked By:	smd
GTX #:	318928		
Boring ID:	BB-C925-205		
Sample ID:	R1		
Depth (ft):	44.71-45.08		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average		
Specimen Length, in:	4.31	4.31	4.31		
Specimen Diameter, in:	1.99	1.99	1.99		
Specimen Mass, g:	631.07				
Bulk Density, lb/ft^3	179	**Minimum Diameter Tolerence Met?**		**YES**	
Length to Diameter Ratio:	2.2	**Length to Diameter Ratio Tolerance Met?**		**YES**	

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:
Is the maximum gap ≤ 0.02 in.? YES

Maximum difference must be < 0.020 in.
Straightness Tolerance Met? **YES**

END FLATNESS AND PARALLELISM (Procedure FP1)

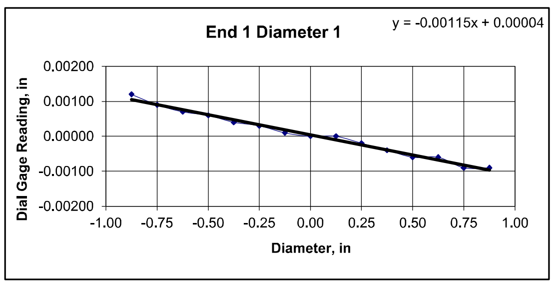
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00120	0.00090	0.00070	0.00060	0.00040	0.00030	0.00010	0.00000	0.00000	-0.00020	-0.00040	-0.00060	-0.00060	-0.00090	-0.00090
Diameter 2, in (rotated 90°)	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

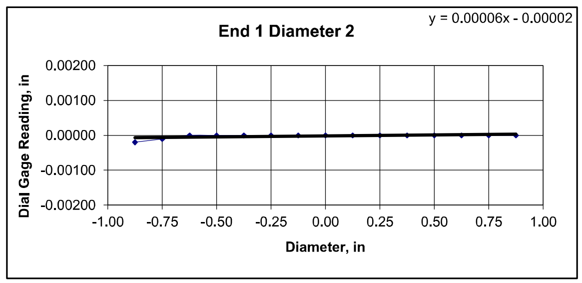
Difference between max and min readings, in:
0° = 0.00210 90° = 0.00020

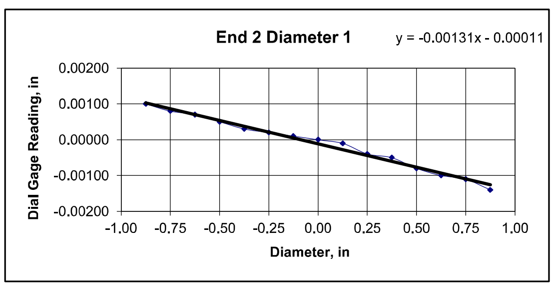
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00100	0.00080	0.00070	0.00050	0.00030	0.00020	0.00010	0.00000	-0.00010	-0.00040	-0.00050	-0.00080	-0.00100	-0.00110	-0.00140
Diameter 2, in (rotated 90°)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

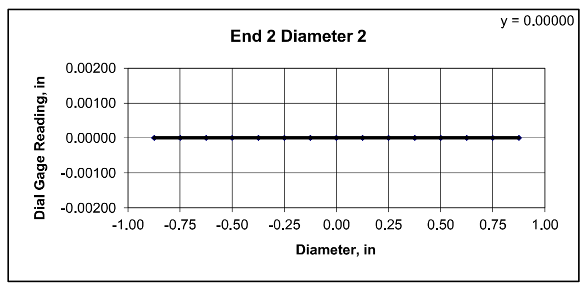
Difference between max and min readings, in:
0° = 0.0024 90° = 0

Maximum difference must be < 0.0020 in. Difference = ± 0.00120
Flatness Tolerance Met? **NO**









DIAMETER 1

End 1:		
	Slope of Best Fit Line	0.00115
	Angle of Best Fit Line:	0.06597
End 2:		
	Slope of Best Fit Line	0.00131
	Angle of Best Fit Line:	0.07481
Maximum Angular Difference:		0.00884

Parallelism Tolerance Met? **NO**
Spherically Seated

DIAMETER 2

End 1:		
	Slope of Best Fit Line	0.00006
	Angle of Best Fit Line:	0.00327
End 2:		
	Slope of Best Fit Line	0.00000
	Angle of Best Fit Line:	0.00000
Maximum Angular Difference:		0.00327

Parallelism Tolerance Met? **YES**
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00210	1.990	0.00106	0.060	YES
Diameter 2, in (rotated 90°)	0.00020	1.990	0.00010	0.006	YES
END 2					
Diameter 1, in	0.00240	1.990	0.00121	0.069	YES
Diameter 2, in (rotated 90°)	0.00000	1.990	0.00000	0.000	YES

Maximum angle of departure must be ≤ 0.25°
Perpendicularity Tolerance Met? **YES**

Client:	Hardesty & Hanover	Test Date:	4/29/2024
Project Name:	Tuttle Rd, Cumberland, ME	Tested By:	rik
Project Location:	Cumberland, ME	Checked By:	smd
GTX #:	318928		
Boring ID:	BB-C925-205	Reliable dial gauge measurements could not be performed on this rock type. Tolerance measurements were performed using a machinist straightedge and feeler gauges to ASTM specifications.	
Sample ID:	R1		
Depth (ft):	44.71-45.08		
Visual Description:	See photographs		

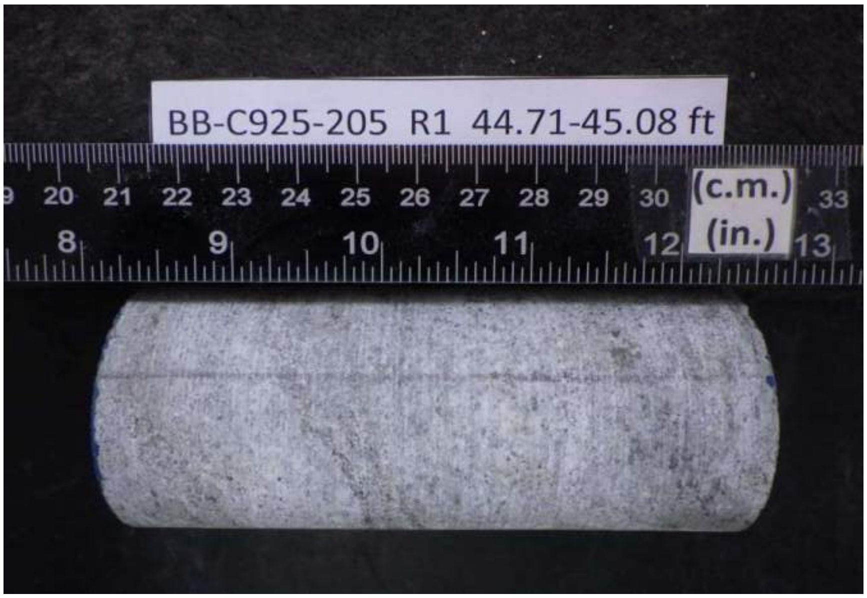
BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

END FLATNESS

END 1		
Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90^o)	Is the maximum gap $\leq \pm 0.001$ in.?	YES
END 2		
Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90^o)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

End Flatness Tolerance Met? YES

Client:	Hardesty & Hanover
Project Name:	Tuttle, Rd, Cumberland ME
Project Location:	Cumberland, ME
GTX #:	318928
Test Date:	4/30/2024
Tested By:	gp
Checked By:	smd
Boring ID:	BB-C925-205
Sample ID:	R1
Depth, ft:	44.71-45.08



After cutting and grinding

After break

Client:	Hardesty & Hanover		
Project:	Tuttle Rd, Cumberland ME		
Location:	Cumberland, ME	Project No:	GTX-318928

Boring ID: ---	Sample Type: ---	Tested By: te
Sample ID: ---	Test Date: 05/10/24	Checked By: smd
Depth : ---	Test Id: 768015	

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample Number	Depth	Bulk Density, pcf	Compressive strength, psi	Failure Type	Meets ASTM D4543	Note(s)
BB-C295-202	R1	30.43-30.80 ft	171	14887	1	No	1,*
BB-C295-204	R1	47.5-52.5 ft	169	8830	1	No	1 , 2,*

Notes: Density determined on core samples by measuring dimensions and weight and then calculating.

All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.

The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure
(See attached photographs)

1: Best effort end preparation. See Tolerance report for details.
2: The as-received core did not meet the ASTM side straightness tolerance due to irregularities in the sample as cored.
3: Specimen L/D < 2.
4: The as-received core did not meet the ASTM minimum diameter tolerance of 1.875 inches.
5: Specimen diameter is less than 10 times maximum particle size.
6: Specimen diameter is less than 6 times maximum particle size.

*Because the indicated tested specimens did not meet the ASTM D4543 standard tolerances, the results reported here may differ from those for a test specimen within tolerances.

Client:	Hardesty & Hanover	Test Date:	5/8/2024
Project Name:	Tuttle Rd, Cumberland ME	Tested By:	rik
Project Location:	Cumberland, ME	Checked By:	smd
GTX #:	318928		
Boring ID:	BB-C295-202		
Sample ID:	R1		
Depth (ft):	30.43-30.80		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average	
Specimen Length, in:	4.29	4.29	4.29	
Specimen Diameter, in:	1.99	1.99	1.99	
Specimen Mass, g:	600.08			
Bulk Density, lb/ft^3	171	**Minimum Diameter Tolerence Met?**		YES
Length to Diameter Ratio:	2.2	**Length to Diameter Ratio Tolerance Met?**		YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:
Is the maximum gap $\leq$ 0.02 in.? YES

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00070	-0.00070	-0.00050	-0.00050	-0.00040	-0.00010	0.00000	0.00000	0.00000	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020
Diameter 2, in (rotated 90°)	0.00110	0.00080	0.00080	0.00060	0.00050	0.00030	0.00020	0.00000	0.00000	-0.00020	-0.00030	-0.00070	-0.00080	-0.00110	-0.00120

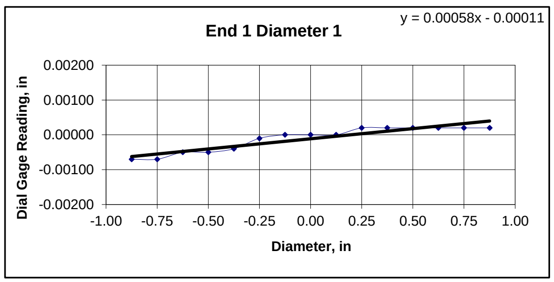
Difference between max and min readings, in:
0° = 0.00090 90° = 0.00230

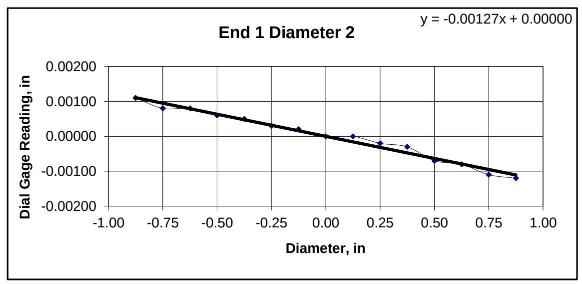
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00070	-0.00070	-0.00060	-0.00040	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00010	0.00020	0.00020	0.00030	0.00040	0.00040
Diameter 2, in (rotated 90°)	-0.00120	-0.00100	-0.00080	-0.00070	-0.00050	-0.00020	-0.00010	0.00000	0.00010	0.00030	0.00060	0.00080	0.00090	0.00110	0.00110

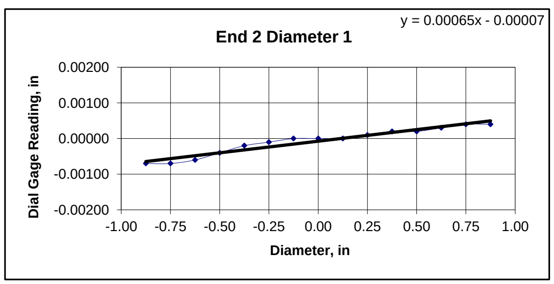
Difference between max and min readings, in:
0° = 0.0011 90° = 0.0023

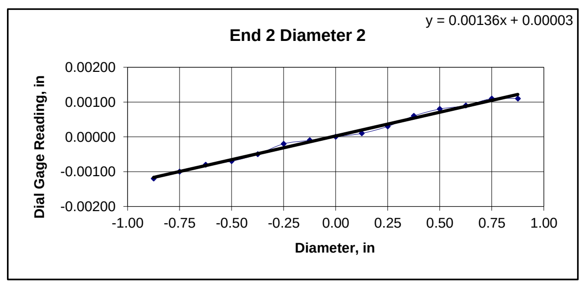
Maximum difference must be < 0.0020 in. Difference = $\pm$ 0.00115

Flatness Tolerance Met? NO









DIAMETER 1

End 1:	Slope of Best Fit Line	0.00058
	Angle of Best Fit Line:	0.03340
End 2:	Slope of Best Fit Line	0.00065
	Angle of Best Fit Line:	0.03732
Maximum Angular Difference:		0.00393

Parallelism Tolerance Met? YES
Spherically Seated

DIAMETER 2

End 1:	Slope of Best Fit Line	0.00127
	Angle of Best Fit Line:	0.07252
End 2:	Slope of Best Fit Line	0.00136
	Angle of Best Fit Line:	0.07809
Maximum Angular Difference:		0.00557

Parallelism Tolerance Met? NO
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00090	1.990	0.00045	0.026	YES
Diameter 2, in (rotated 90°)	0.00230	1.990	0.00116	0.066	YES
END 2					
Diameter 1, in	0.00110	1.990	0.00055	0.032	YES
Diameter 2, in (rotated 90°)	0.00230	1.990	0.00116	0.066	YES

Maximum angle of departure must be $\leq$ 0.25°

Perpendicularity Tolerance Met? YES

Client:	Hardesty & Hanover	Test Date:	5/8/2024
Project Name:	Tuttle Rd, Cumberland, ME	Tested By:	rik
Project Location:	Cumberland, ME	Checked By:	smd
GTX #:	318928		
Boring ID:	BB-C925-202	Reliable dial gauge measurements could not be performed on this rock type. Tolerance measurements were performed using a machinist straightedge and feeler gauges to ASTM specifications.	
Sample ID:	R1		
Depth (ft):	30.43-30.80		
Visual Description:	See photographs		

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

END FLATNESS

END 1

Diameter 1	Is the maximum gap $\leq \pm$0.001 in.?	YES
Diameter 2 (rotated 90^{o})	Is the maximum gap $\leq \pm$0.001 in.?	YES

END 2

Diameter 1	Is the maximum gap $\leq \pm$0.001 in.?	YES
Diameter 2 (rotated 90^{o})	Is the maximum gap $\leq \pm$0.001 in.?	YES

End Flatness Tolerance Met? YES

Client:	Hardesty & Hanover
Project Name:	Tuttle Rd, Cumberland, ME
Project Location:	Cumberland, ME
GTX #:	318928
Test Date:	5/10/2024
Tested By:	gp
Checked By:	smd
Boring ID:	BB-C295-202
Sample ID:	R-1
Depth, ft:	30.43-30.80

After cutting and grinding

After break

Client:	Hardesty & Hanover	Test Date:	5/8/2024
Project Name:	Tuttle Rd, Cumberland ME	Tested By:	rik
Project Location:	Cumberland, ME	Checked By:	smd
GTX #:	318928		
Boring ID:	BB-C295-204		
Sample ID:	R1		
Depth (ft):	47.5-52.5		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.05	4.05	4.05
Specimen Diameter, in:	1.98	1.98	1.98
Specimen Mass, g:	554.37		
Bulk Density, lb/ft^3	169	**Minimum Diameter Tolerence Met?**	**YES**
Length to Diameter Ratio:	2.0	**Length to Diameter Ratio Tolerance Met?**	**YES**

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:

Is the maximum gap $\leq$ 0.02 in.? NO

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? **NO**

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00080	0.00070	0.00050	0.00030	0.00010	0.00010	0.00000	0.00000	-0.00010	-0.00030	-0.00040	-0.00080	-0.00100	-0.00110	-0.00120
Diameter 2, in (rotated 90°)	-0.00070	-0.00060	-0.00040	-0.00030	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00010	0.00030	0.00030	0.00030	0.00030	0.00040

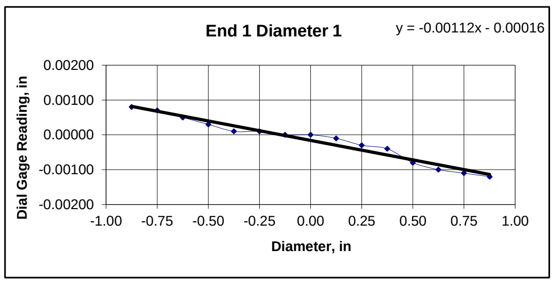
Difference between max and min readings, in:
0° = 0.00200 90° = 0.00110

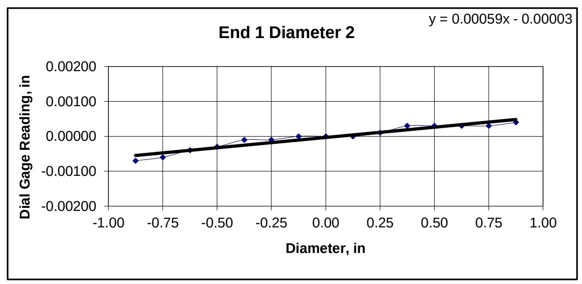
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00050	0.00050	0.00030	0.00020	0.00010	0.00000	0.00000	0.00000	-0.00010	-0.00040	-0.00070	-0.00080	-0.00090	-0.00120	-0.00130
Diameter 2, in (rotated 90°)	0.00050	0.00040	0.00040	0.00040	0.00030	0.00010	0.00000	0.00000	-0.00010	-0.00020	-0.00030	-0.00040	-0.00050	-0.00060	-0.00080

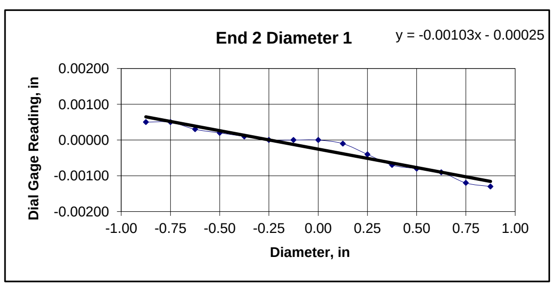
Difference between max and min readings, in:
0° = 0.0018 90° = 0.0013

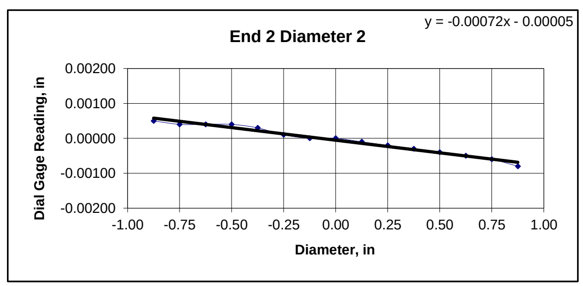
Maximum difference must be < 0.0020 in. Difference = $\pm$ 0.00100

Flatness Tolerance Met? **NO**









DIAMETER 1

End 1:	
Slope of Best Fit Line	0.00112
Angle of Best Fit Line:	0.06401
End 2:	
Slope of Best Fit Line	0.00103
Angle of Best Fit Line:	0.05910
Maximum Angular Difference:	0.00491

Parallelism Tolerance Met? **NO**
Spherically Seated

DIAMETER 2

End 1:	
Slope of Best Fit Line	0.00059
Angle of Best Fit Line:	0.03372
End 2:	
Slope of Best Fit Line	0.00072
Angle of Best Fit Line:	0.04142
Maximum Angular Difference:	0.00769

Parallelism Tolerance Met? **NO**
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

Maximum angle of departure must be $\leq$ 0.25°

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00200	1.980	0.00101	0.058	YES
Diameter 2, in (rotated 90°)	0.00110	1.980	0.00056	0.032	YES
END 2					
Diameter 1, in	0.00180	1.980	0.00091	0.052	YES
Diameter 2, in (rotated 90°)	0.00130	1.980	0.00066	0.038	YES

Perpendicularity Tolerance Met? **YES**

Client:	Hardesty & Hanover	Test Date:	5/8/2024
Project Name:	Tuttle Rd, Cumberland, ME	Tested By:	rik
Project Location:	Cumberland, ME	Checked By:	smd
GTX #:	318928		
Boring ID:	BB-C925-204	Reliable dial gauge measurements could not be performed on this rock type. Tolerance measurements were performed using a machinist straightedge and feeler gauges to ASTM specifications.	
Sample ID:	R1		
Depth (ft):	47.5-52.5		
Visual Description:	See photographs		

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

END FLATNESS

END 1		
Diameter 1	Is the maximum gap $\leq \pm$0.001 in.?	YES
Diameter 2 (rotated 90^{o})	Is the maximum gap $\leq \pm$0.001 in.?	YES
END 2		
Diameter 1	Is the maximum gap $\leq \pm$0.001 in.?	YES
Diameter 2 (rotated 90^{o})	Is the maximum gap $\leq \pm$0.001 in.?	YES

End Flatness Tolerance Met? YES

Client:	Hardesty & Hanover
Project Name:	Tuttle Rd, Cumberland, ME
Project Location:	Cumberland, ME
GTX #:	318928
Test Date:	5/10/2024
Tested By:	gp
Checked By:	smd
Boring ID:	BB-C295-204
Sample ID:	R-1
Depth, ft:	47.5-52.5

After cutting and grinding

After break

Appendix E
Cone Penetration Test Report

S-24-0014

April 20, 2024

Hardesty & Hannover
Attention: Rebecca Frein
500 Route 1, Suite 105
Yarmouth, ME 04096

Subject: CPT Exploration Findings
Proposed Bridge Replacement
MaineDOT Bridge #5801
Tuttle Road
Cumberland, Maine

Dear Rebecca:

In accordance with our Proposal dated January 9, 2024, we completed test boring and piezocone penetration testing (CPT) explorations at MaineDOT Bridge #5801 in Cumberland. The test borings were observed and logged by Hardesty & Hannover personnel. This report summarizes and provides data relative to the CPT explorations.

CPT EXPLORATION PROGRAM

Three CPT explorations (CPT-201 through CPT-203) were advanced adjacent to previously drilled test boring locations on April 16 & 17, 2024. The exploration locations were selected at the site by H&H personnel. The CPTs were advanced using a Diedrich D-50 track mounted drill rig utilizing Vertek piezocone equipment. The CPT exploration program included the following:

- Three CPT explorations advanced to depths ranging from 15.2 to 28.5 feet below the existing ground surface.
- Porewater dissipation tests were performed in CPT-202 and CPT-203 at depths selected by H&H personnel.

The CPT explorations were performed in accordance with ASTM D5778. Pre-augering was required through fill materials to a depth of 10.0’ before advancement of CPT-201.

SUBSURFACE CONDITIONS

The following is a summary of subsurface findings in each of the CPT explorations.

CPT-201		
Depth (feet)	**Predominant Soil Type**	**Soil Description**
10-11	Types 8 & 9	Sand to silty sand
11-12	Types 3 & 4	Clays
12-23	Types 6 & 7	Layered sandy silt to clayey silt and silty sand to sandy silt
23-24		Probable silty clay
24-25	Type 9	Sand
25-27.7	Type 4	Silty clay to clay
27.7-28.5*	Type 8	Sand to silty sand

*push refusal

CPT-202		
Depth (feet)	**Predominant Soil Type**	**Soil Description**
0-1	Type 1	Sensitive fine grained
1-2.5	Types 5 & 6	Clayey silt to silty clay and sandy silt to clayey silt
2.5-6	Type 5	Clayey silt to silty clay
6-12.5	Type 6	Sandy silt to clayey silt
12.5-14.2	Types 5 & 6	Layered clayey silt to silty clay and sandy silt to clayey silt
14.2-15.2*	Types 8 & 10	Sand to silty sand and gravelly sand to sand

*push refusal

CPT-203		
Depth (feet)	**Predominant Soil Type**	**Soil Description**
0-9.6	Types 5 & 6	Layered silt to silty clay and sandy silt to clayey silt
9.6-26.3*	Various	Frequent layering of sand, silt, and clay

*push refusal

Soil behavior type profiling is based on normalized cone penetration resistance, Robertson 1986. Detailed soil type behavior is presented on the attached logs.

DISSIPATION TESTING

Dissipation tests were performed in CPT-202 and CPT-203. Plots of the dissipation tests are attached. A summary of the results is presented below:

DISSIPATION TEST SUMMARY					
Location	**Depth (ft)**	**U_0 (psi)**	**U_{100} (psi)**	**U_{50} (psi)**	**T_{50} (sec)**
CPT-202	7.0	142.1	0.0	71.0	312.4
CPT-203	9.4	1.1	61.4	31.2	918.4

CLOSURE

It has been a pleasure to be of assistance to you on this project. Please let us know if you have any questions.

Sincerely,

Seaboard Drilling, LLC

Kevin J Hanscom

Kevin J. Hanscom
Driller

CONE PENETRATION TEST PLOTS

CPT-201

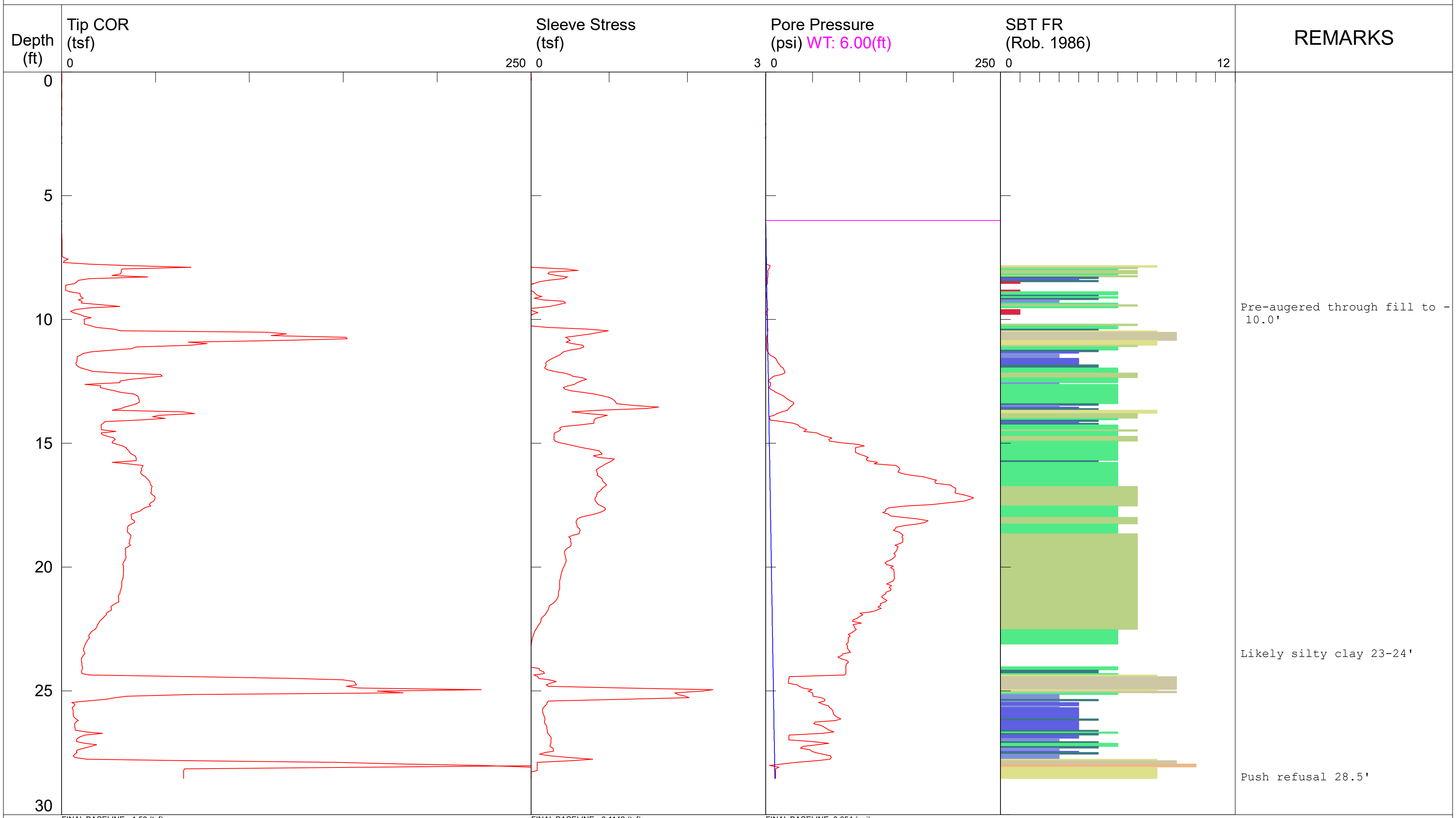
SEABOARD DRILLING

COMPANY: Seaboard Drilling, LLC
PROJECT: MaineDOT Bridge #5801 Replacement
SITE: Tuttle Road
LOCATION: Cumberland, ME
CLIENT: Hardesty & Hanover

OPERATOR: Kevin Hanscom

FILENAME: CPT-201.DAT

TEST ID: CPT-201
TEST DATE: Tue 16/Apr/2024
GROUND SURFACE ELEV.: 000 +/-
TOTAL DEPTH: 28.543 ft



PROBE ID: 4644.163XX

1 Sensitive fine grained
2 Organic material
3 Clays
4 Silty clay to clay
5 Clayey silt to silty clay
6 Sandy silt to clayey silt
7 Silty sand to sandy silt
8 sand to silty sand
9 Sand
10 Gravelly sand to sand
11 Very stiff fine grained **
12 Sand to clayey sand **

*SBT: Robertson 1986; **Overconsolidated or Cemented; *SBT/SPT CORRELATION: UBC-1983

CPT-202

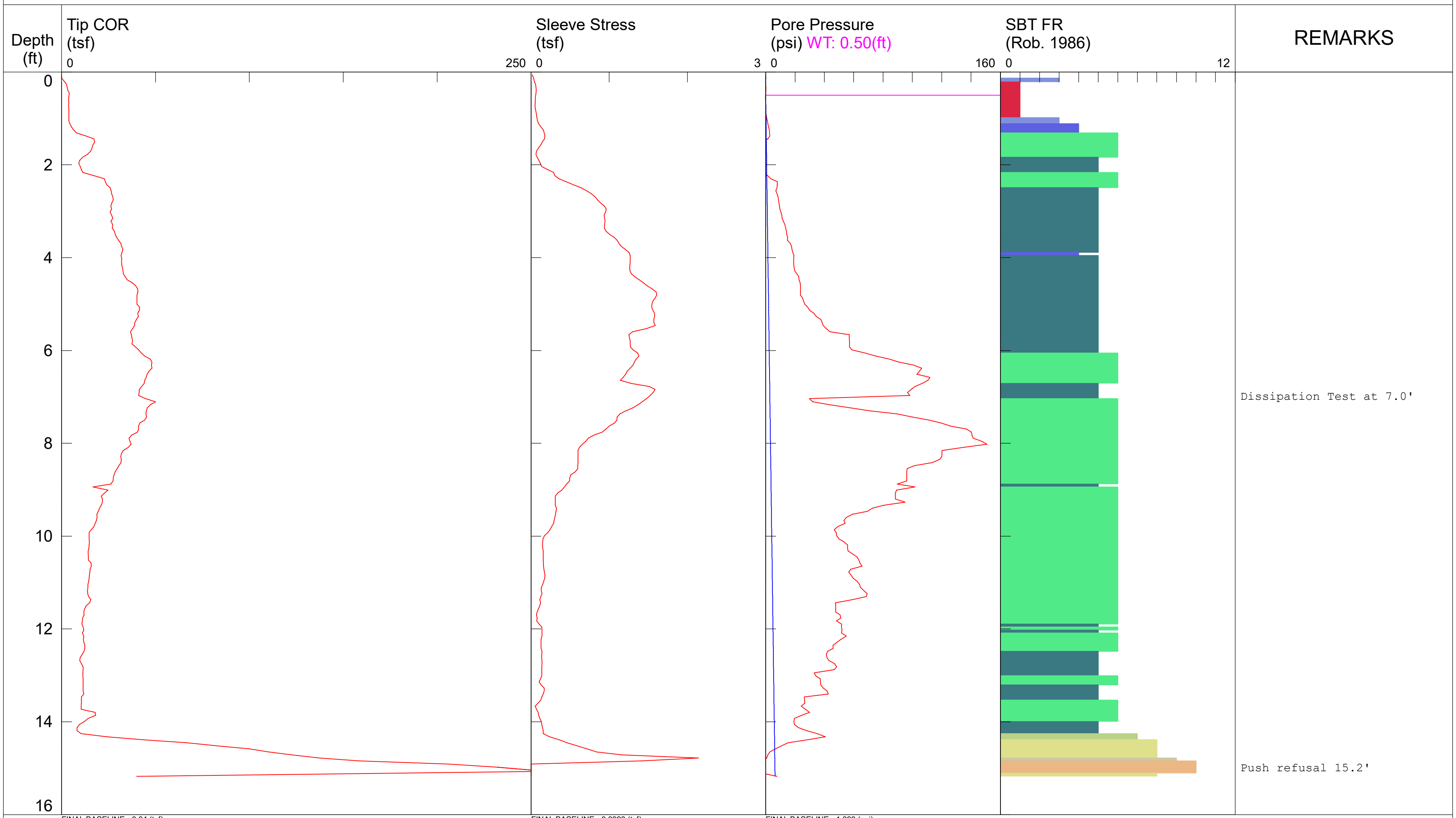
SEABOARD DRILLING

COMPANY: Seaboard Drilling, LLC
PROJECT: MaineDOT Bridge #5801 Replacement
SITE: Tuttle Road
LOCATION: Cumberland, ME
CLIENT: Hardesty & Hanover

OPERATOR: Kevin Hanscom

FILENAME: CPT-202.DAT

TEST ID: CPT-202
TEST DATE: Wed 17/Apr/2024
GROUND SURFACE ELEV.: 000 +/-
TOTAL DEPTH: 15.174 ft



PROBE ID: 4644.163XX

1 Sensitive fine grained	4 Silty clay to clay	7 Silty sand to sandy silt	10 Gravelly sand to sand
2 Organic material	5 Clayey silt to silty clay	8 sand to silty sand	11 Very stiff fine grained **
3 Clays	6 Sandy silt to clayey silt	9 Sand	12 Sand to clayey sand **

*SBT: Robertson 1986; **Overconsolidated or Cemented; *SBT/SPT CORRELATION: UBC-1983

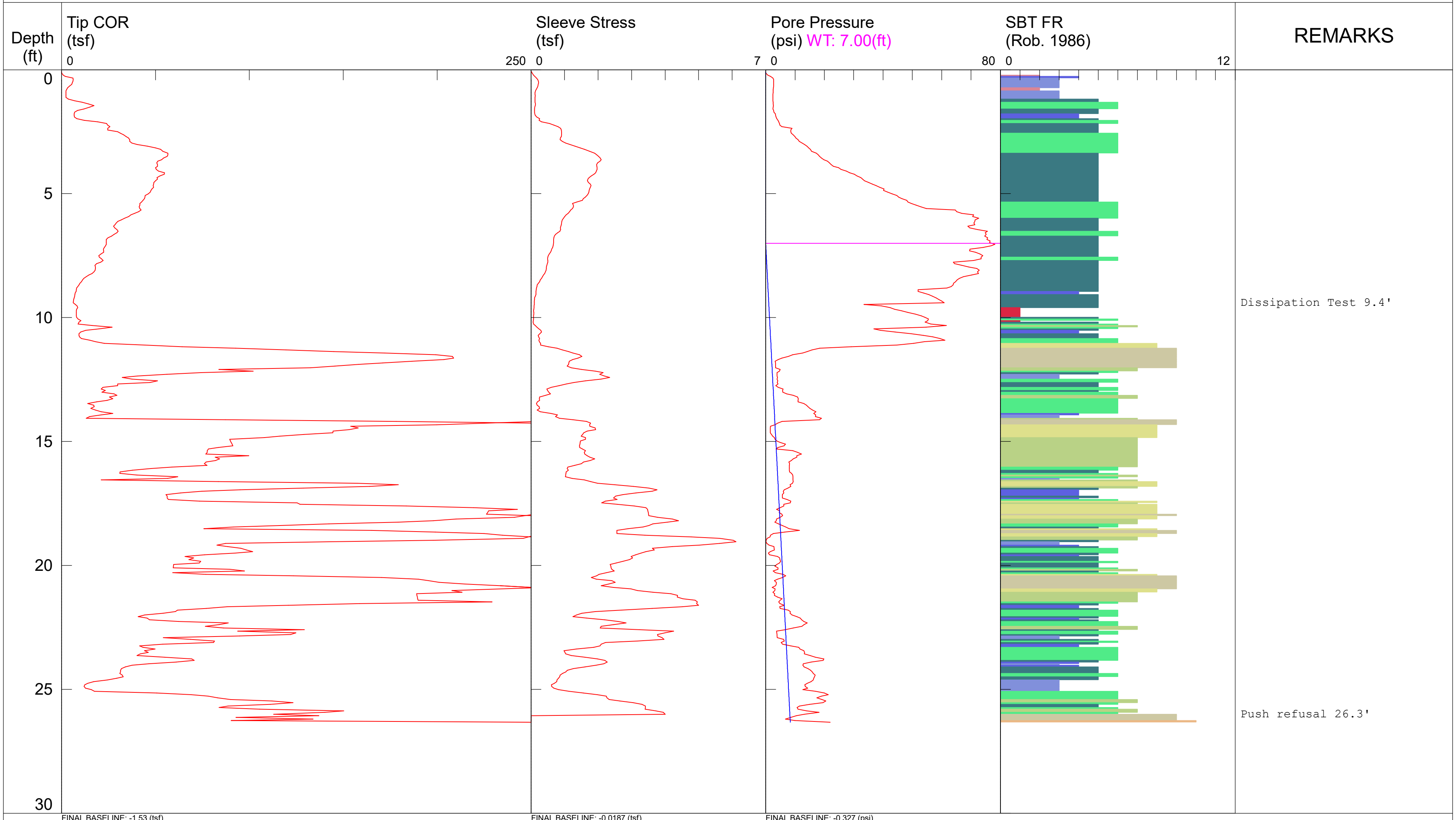
CPT-203

COMPANY: Seaboard Drilling, LLC
PROJECT: MaineDOT Bridge #5801 Replacement
SITE: Tuttle Road
LOCATION: Cumberland, ME
CLIENT: Hardesty & Hanover

OPERATOR: Kevin Hanscom

FILENAME: CPT-203.DAT

TEST ID: CPT-203
TEST DATE: Tue 16/Apr/2024
GROUND SURFACE ELEV.: 000 +/-
TOTAL DEPTH: 26.329 ft



PROBE ID: 4644.163XX

1 Sensitive fine grained
2 Organic material
3 Clays
4 Silty clay to clay
5 Clayey silt to silty clay
6 Sandy silt to clayey silt
7 Silty sand to sandy silt
8 sand to silty sand
9 Sand
10 Gravelly sand to sand
11 Very stiff fine grained **
12 Sand to clayey sand **

*SBT: Robertson 1986; **Overconsolidated or Cemented; *SBT/SPT CORRELATION: UBC-1983

PORE PRESSURE DISSIPATION PLOTS

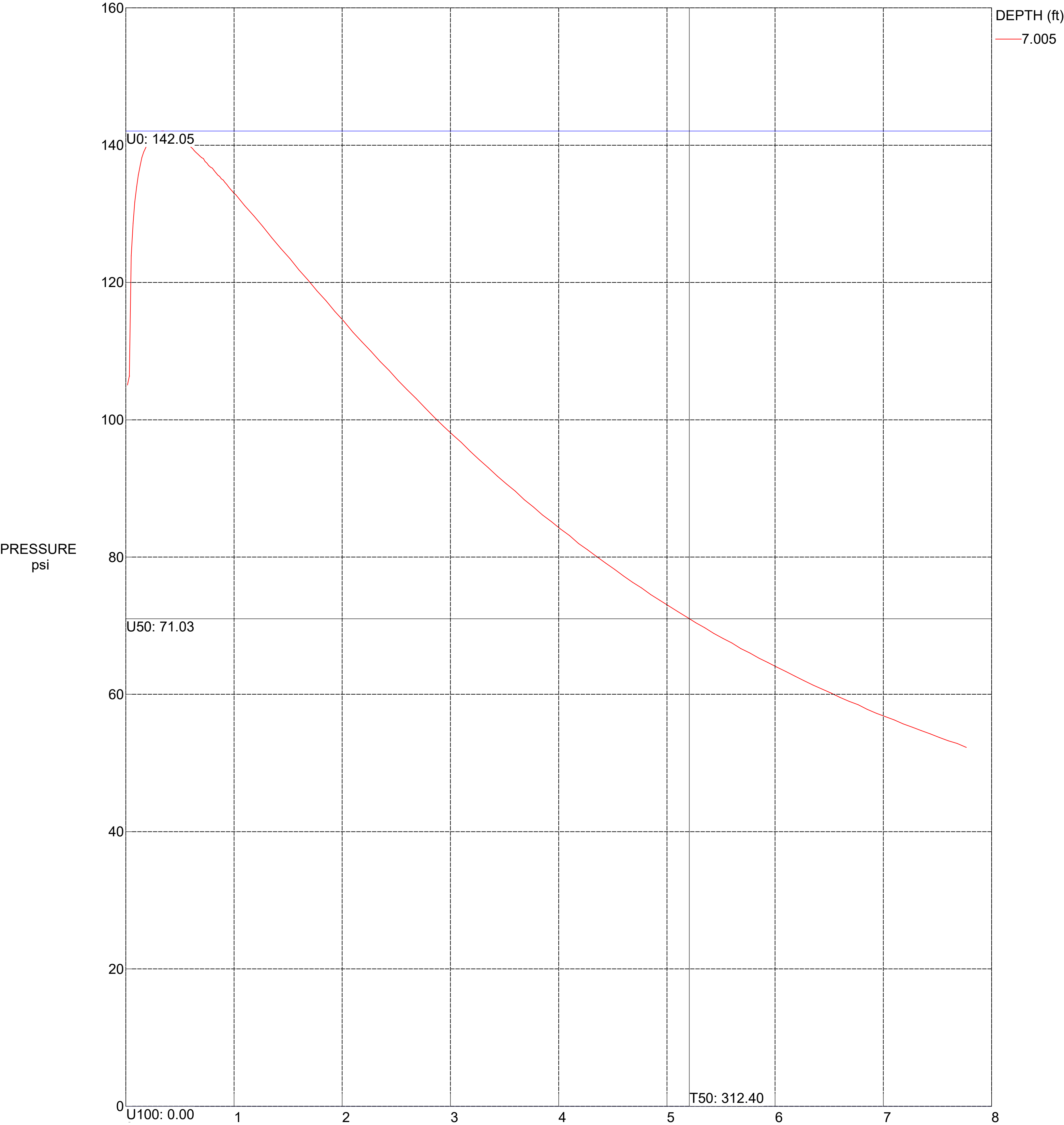
DISSIPATION

COMPANY: Seaboard Drilling LLC
PROJECT: MaineDOT Bridge #5801 Replacement
SITE: Tuttle Road
LOCATION: Cumberland, ME
CLIENT: Hardesty & Hanover

OPERATOR: Kevin Hanscom

FILENAME: CPT-202.DIS

TEST ID: CPT-202
TEST DATE: Wed 17/Apr/2024



MAXIMUM PRESSURE = 142.047 psi
HYDROSTATIC PRESSURE = 0.002 psi, WATER TABLE: 7.00 ft
PROBE ID: 4644.163XX

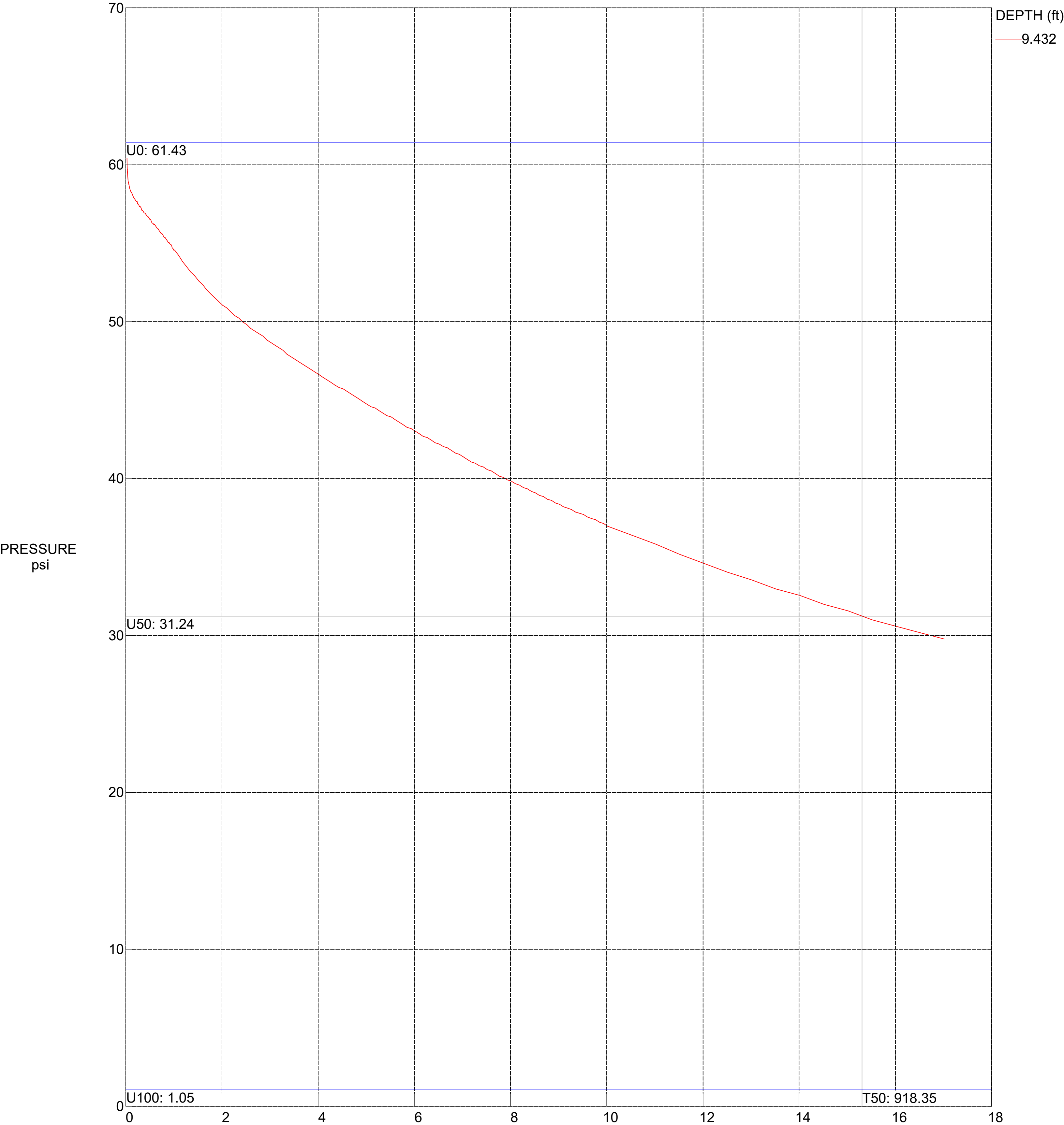
DISSIPATION

COMPANY: Seaboard Drilling LLC
PROJECT: MaineDOT Bridge #5801 Replacement
SITE: Tuttle Road
LOCATION: Cumberland, ME
CLIENT: Hardesty & Hanover

OPERATOR: Kevin Hanscom

FILENAME: CPT-203.DIS

TEST ID: CPT-203
TEST DATE: Tue 16/Apr/2024



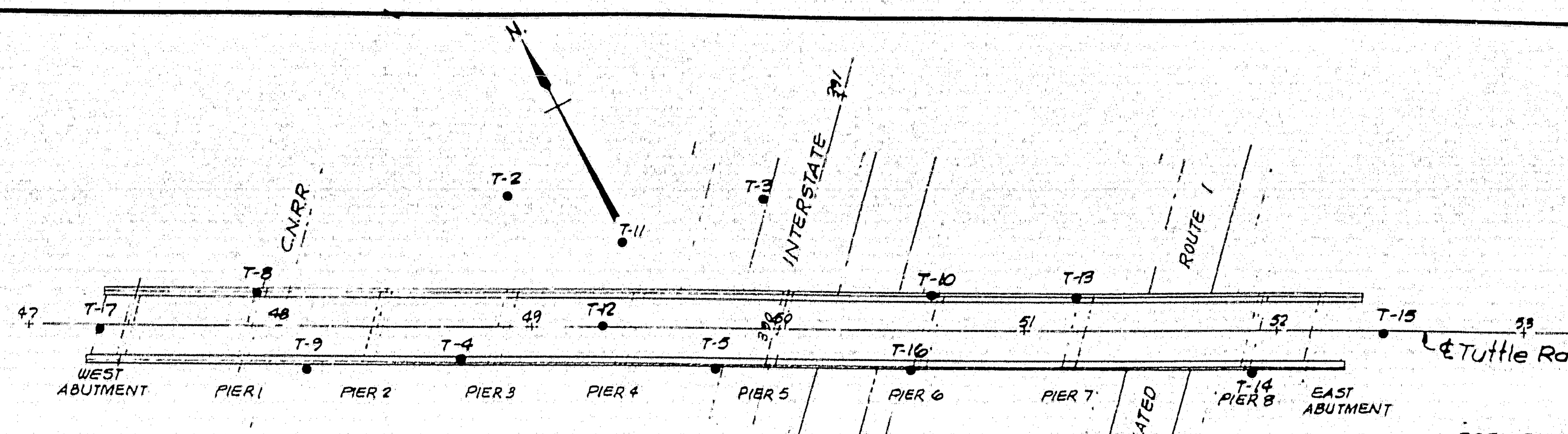
MAXIMUM PRESSURE = 61.429 psi
HYDROSTATIC PRESSURE = 1.054 psi, WATER TABLE: 7.00 ft
PROBE ID: 4644.163XX

Appendix F

Historic Boring Information

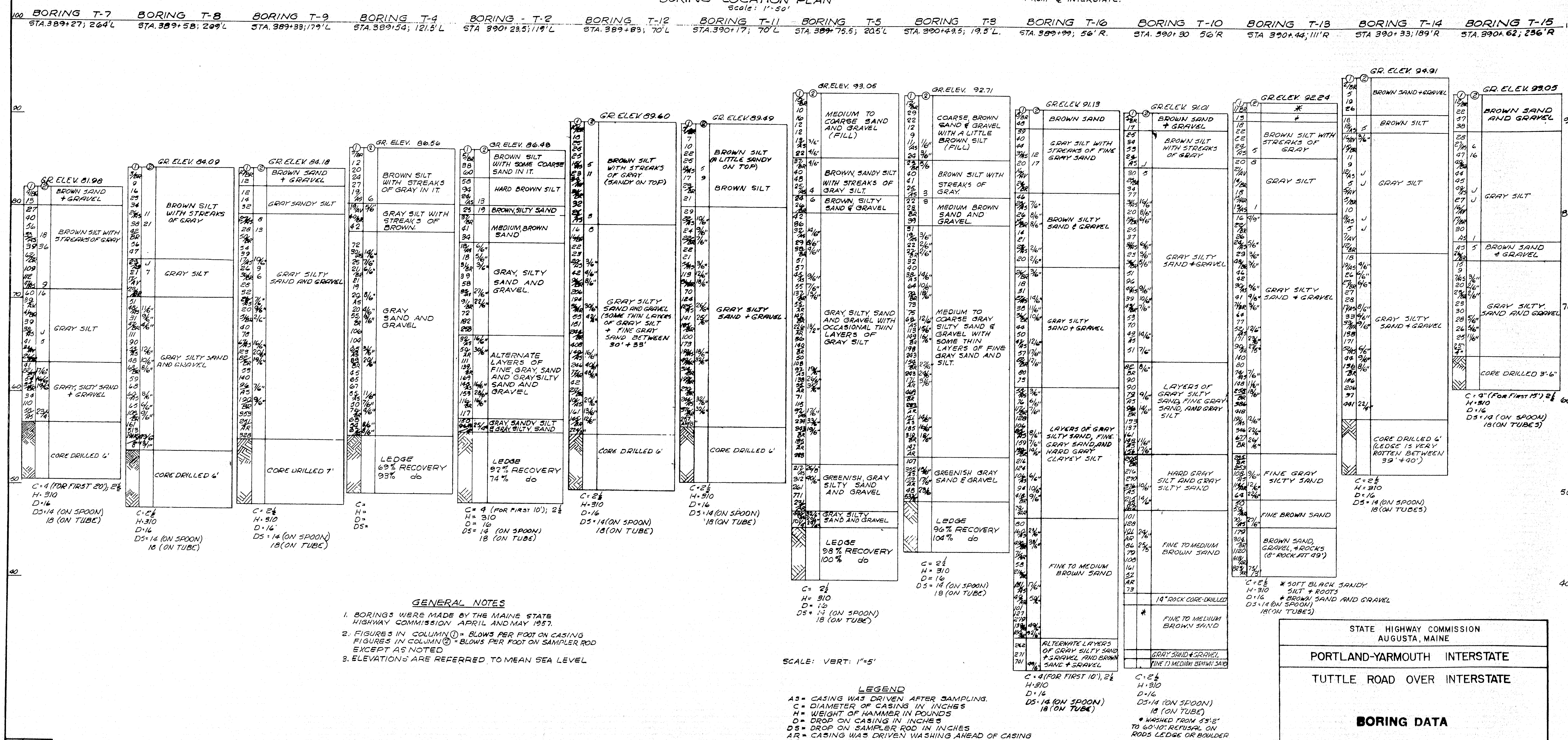
B.P.R. REGION	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
1	MAINE	I-080-4(6)	30	103

CUMBERLAND



BORING LOCATION PLAN
Scale: 1"=50'

BORING LOCATIONS SHOWN THUS.... T-15
BORING NO.'S T-1 & T-6 OMITTED
BORING LOCATION OFFSETS ARE TAKEN FROM ℄ INTERSTATE.



GENERAL NOTES

1. BORINGS WERE MADE BY THE MAINE STATE HIGHWAY COMMISSION APRIL AND MAY 1957.
2. FIGURES IN COLUMN ① = BLOWS PER FOOT ON CASING. FIGURES IN COLUMN ② = BLOWS PER FOOT ON SAMPLER ROD EXCEPT AS NOTED.
3. ELEVATIONS ARE REFERRED TO MEAN SEA LEVEL.

SCALE: VERT: 1"=5'

LEGEND

AS = CASING WAS DRIVEN AFTER SAMPLING.
C = DIAMETER OF CASING IN INCHES
H = WEIGHT OF HAMMER IN POUNDS
D = DROP ON CASING IN INCHES
DS = DROP ON SAMPLER ROD IN INCHES
AR = CASING WAS DRIVEN WASHING AHEAD OF CASING
BR =
AY =
J = SAMPLER DRIVEN BY STATIC LOAD NOT EXCEEDING ⅛ TON

STATE HIGHWAY COMMISSION
AUGUSTA, MAINE

PORTLAND-YARMOUTH INTERSTATE

TUTTLE ROAD OVER INTERSTATE

BORING DATA

SHEET NO. 30 OF 103 | SCALE: AS NOTED

FAY, SPOFFORD & THORNDIKE, INC. ENGINEERS BOSTON, MASS.

Qm-14
43

DES. —
DR. J.M.G.
TR. —
CHK. R.F.C.
APP'D H.J.W.

Boston Blue Print-300-4-57

M-1084

Appendix G
Seismic Site Class and Coefficients

H&H conducted an assessment of the seismic site class and seismic performance zone for all soil borings encountered at the proposed Tuttle Road Bridge replacement over I-295 (#5801), US Route 1, and the MCRR in Cumberland, Maine. The procedures outlined in AASHTO LRFD Articles 3.10.2 through 3.10.6 were followed to determine the seismic site class and performance zone.

<u>Procedure:</u>

- Classified the site using AASHTO Table C3.10.3.1-1.
- Determined the Site Class at each boring location using Method B (N-method).
- Identified the Acceleration Coefficients per AASHTO Article 3.10.2.1:
    - Peak Ground Acceleration Coefficient (PGA) based on Figure 3.10.2.1-1.
    - Short-period Spectral Acceleration Coefficient (S_S) based on Figure 3.10.2.1-2.
    - Long-period Spectral Acceleration Coefficient (S_1) based on Figure 3.10.2.1-3.
- Established Site Factors per Article 3.10.3.2:
    - F_{PGA} from Table 3.10.3.2-1.
    - F_a from Table 3.10.3.2-2.
    - F_v from Table 3.10.3.2-3.
- Developed the Design Response Spectrum per Article 3.10.4.1:
    - A_s from Equation 3.10.4.2-2.
    - S_{DS} from Equation 3.10.4.2-3.
    - S_{D1} from Equation 3.10.4.2-6.
- Determined the Seismic Performance Zones per Article 3.10.6.

This ensures compliance with AASHTO standards for seismic design.

Note: shaded cells are data to be input (Expect Project Information)

Designed to Amaze, Engineered to Last®

Computations For	**Tuttle Bridge Road**	Made By	JS	Date	11/3/2022
	Maine DOT	Checked By	AS	Date	11/3/2022
	Seismic Site Class	Back Checked By	AG	Date	11/7/2022

Job No. 4462.07

Boring No. BB-C295-101 Hammer Type Automatic

Ground El: 90.00 (ft)

Ground Water El: 85.00 (ft)

Depth of Ground water 5

Unit Weight of Soil Below Ground Water Table: 0.12 ksf

I.D	Depth (ft)	Elev (ft)	Soil Type	SPT (uncorrected)
	0.00	90.0		
1D	2.00	88.0	Cohesive	6
2D	4.00	86.0	Cohesive	3
3D	6.00	84.0	Cohesive	13
4D	8.00	82.0	Cohesive	13
5D	10.00	80.0	Cohesionless	13
6D	15.50	74.5	Cohesionless	9
7D	20.00	70.0	Cohesionless	24
8D	25.00	65.0	Cohesionless	41
9D	30.00	60.0	Cohesionless	34
10D	35.00	55.0	Cohesionless	100

A3.10.3.1 - For more highly fractured and weathered rock, the shear wave velocity shall be directly measured; otherwise, it shall be assumed that the rock surface has not yet been reached and the highly fractured and weathered rock shall be considered to be a soil layer above the rock surface.

A3.10.3.3 - Profiles containing distinctly different soil layers shall be subdivided into those layers designated by a number that ranges from 1 to *n* at the bottom, where there are a total of *n* distinct layers down to the depth *r H* or down to a depth of 100 feet, depending on the case.

Layer #	Description	Thickness (ft)	Avg. N (bl/ft)	Method B: Ṅ d_i (ft)	N_i (bl/ft)	d_i/N_i
1	Cohesive	8.00	7	8.00	7	1.08
2	Silty Sand	24.00	27	24.00	27	0.89

32.00 $\sum d_i/N_i =$ 1.96

ASHTO C3.10.3.1- Method B: Ṅ = 16 ← **SITE CLASS D**

Note: shaded cells are data to be input (Expect Project Information)

H&H Designed to Amaze, Engineered to Last®

Computations For	**Tuttle Bridge Road**	Made By	JS	Date	11/3/2022	Job No. 4462.07
	Maine DOT	Checked By	AS	Date	11/3/2022	
	Seismic Site Class	Back Checked By	AG	Date	11/7/2022	

Boring No. BB-C295-102 Hammer Type Automatic

Ground El: 90.00 (ft)

Ground Water El: 85.00 (ft)

Depth of Ground water 5

Unit Weight of Soil Below Ground Water Table: 0.12 ksf

I.D	Depth (ft)	Elev (ft)	Soil Type	SPT (uncorrected)
	0.00	90.0		
1D	2.00	88.0	Fill	12
2D	4.00	86.0	Cohesive	17
3D	6.00	84.0	Cohesive	13
4D	8.00	82.0	Cohesive	11
5D	10.00	80.0	Cohesionless	8
6D	15.50	74.5	Cohesionless	9
7D	20.00	70.0	Cohesionless	25
8D	25.00	65.0	Cohesionless	21
9D	30.00	60.0	Cohesionless	47
10D	35.00	55.0	Cohesionless	100

A3.10.3.1 - For more highly fractured and weathered rock, the shear wave velocity shall be directly measured; otherwise, it shall be assumed that the rock surface has not yet been reached and the highly fractured and weathered rock shall be considered to be a soil layer above the rock surface.

A3.10.3.3 - Profiles containing distinctly different soil layers shall be subdivided into those layers designated by a number that ranges from 1 to *n* at the bottom, where there are a total of *n* distinct layers down to the depth *r H* or down to a depth of 100 feet, depending on the case.

				Method B: Ṅ		
Layer #	Description	Thickness (ft)	Avg. N (bl/ft)	d_i (ft)	N_i (bl/ft)	d_i/N_i
1	Fill	3.00	13	3.00	13	0.23
2	Cohesive	6.00	13	25.00	13	1.86
3	Cohesionless	26.00	24	26.00	24	1.10
				54.00	$\sum d_i/N_i =$	3.19

AASHTO C3.10.3.1- Method B: N = 17 ← **SITE CLASS D**

Note: shaded cells are data to be input (Expect Project Information)

H&H Designed to Amaze, Engineered to Last®

Computations For	**Tuttle Bridge Road**	Made By	JS	Date	11/3/2022	Job No.	4462.07
	Maine DOT	Checked By	AS	Date	11/3/2022		
	Seismic Site Class	Back Checked By	AG	Date	11/7/2022		

Boring No. BB-C295-103 Hammer Type Automatic

Ground El: 90.00 (ft)

Ground Water El: 85.00 (ft)

Depth of Ground water 5

Unit Weight of Soil Below Ground Water Table: 0.12 ksf

I.D	Depth (ft)	Elev (ft)	Soil Type	SPT (uncorrected)
	0.00	90.0		
1D	2.00	88.0	Fill	28
2D	4.00	86.0	Cohesive	8
3D	6.00	84.0	Cohesive	7
4D	8.00	82.0	Cohesive	0
5D	10.00	80.0	Cohesive	16
6D	15.50	74.5	Sand	8
7D	20.00	70.0	Sand	21
8D	25.00	65.0	Sand	39
9D	30.00	60.0	Silt	24
10D	35.00	55.0	Cohesionless	44
11D	45.00	45.0	Cohesionless	44

A3.10.3.1 - For more highly fractured and weathered rock, the shear wave velocity shall be directly measured; otherwise, it shall be assumed that the rock surface has not yet been reached and the highly fractured and weathered rock shall be considered to be a soil layer above the rock surface.

A3.10.3.3 - Profiles containing distinctly different soil layers shall be subdivided into those layers designated by a number that ranges from 1 to *n* at the bottom, where there are a total of *n* distinct layers down to the depth *r H* or down to a depth of 100 feet, depending on the case.

				Method B: Ṅ		
Layer #	Description	Thickness (ft)	Avg. N (bl/ft)	d_i (ft)	N_i (bl/ft)	d_i/N_i
1	Fill	3.00	28	3.00	28	0.11
2	Cohesive	10.00	10	25.00	10	2.42
3	Sand	15.00	11	26.00	11	2.30
4	Silt & Clay	5	24	27.00	24	1.13
5	Cohesionless	12	44	28.00	44	0.64

109.00 $\sum d_i / N_i =$ 6.59

AASHTO C3.10.3.1- Method B: Ṅ = 17 ← **SITE CLASS D**

Note: shaded cells are data to be input (Expect Project Information)

Designed to Amaze, Engineered to Last®

Computations For	**Tuttle Bridge Road**	Made By	JS	Date	11/3/2022	Job No.	4462.07
	Maine DOT	Checked By	AS	Date	11/3/2022		
	Seismic Site Class	Back Checked By	AG	Date	11/7/2022		

Boring No.	BB-C295-104		Hammer Type	Automatic
Ground El:	90.00	(ft)		
Ground Water El:	85.00	(ft)		
Depth of Ground water	5			
Unit Weight of Soil Below Ground Water Table:	0.12	ksf		

I.D	Depth (ft)	Elev (ft)	Soil Type	SPT (uncorrected)
	0.00	90.0		
1D	2.00	88.0	Fill	2
2D	4.00	86.0	Cohesive	9
3D	6.00	84.0	Cohesive	13
4D	8.00	82.0	Cohesive	7
5D	10.00	80.0	Cohesive	5
6D	15.50	74.5	Cohesive	2
7D	20.00	70.0	Sand	13
8D	25.00	65.0	Sand	14
9D	30.00	60.0	Sand	12

A3.10.3.1 - For more highly fractured and weathered rock, the shear wave velocity shall be directly measured; otherwise, it shall be assumed that the rock surface has not yet been reached and the highly fractured and weathered rock shall be considered to be a soil layer above the rock surface.

A3.10.3.3 - Profiles containing distinctly different soil layers shall be subdivided into those layers designated by a number that ranges from 1 to *n* at the bottom, where there are a total of *n* distinct layers down to the depth *r H* or down to a depth of 100 feet, depending on the case.

				Method B: $\dot{N}$		
Layer #	Description	Thickness (ft)	Avg. N (bl/ft)	d_i (ft)	N_i (bl/ft)	d_i/N_i
1	Fill	2.00	2	2.00	2	1.00
2	Cohesive	10.00	6	25.00	6	4.12
3	Sand	18.00	13	26.00	13	2.00
				53.00	$\sum d_i/N_i =$	7.13

.ASHTO C3.10.3.1- Method B: $\dot{N}$ = 7 **SITE CLASS E**

Note: shaded cells are data to be input (Expect Project Information)

H&H Designed to Amaze, Engineered to Last®

Computations For	Tuttle Bridge Road Phase 2	Made By	MK	Date	6/4/2024	Job No.	4462.07
	Maine DOT	Checked By	AS	Date	6/10/2024		
	Seismic Site Class	Back Checked By	AG	Date	8/16/2024		

Boring No. BB-C295-201 (OW) Hammer Type Automatic

Ground El: 89.68 (ft)

Ground Water El: 82.98 (ft)

Depth of Ground water 7

Unit Weight of Soil Below Ground Water Table: varies ksf

I.D	Depth (ft)	Elev (ft)	Soil Type	SPT (uncorrected)
1D	0.00	89.7	Fill	3
2D	2.00	87.7	Fill	4
3D	4.00	85.7	Sand	14
4D	6.00	83.7	Sand	17
5D	8.00	81.7	Sand	23
6D	10.00	79.7	Sand	7
7D	15.00	74.7	Cohesive	19
8D	20.00	69.7	Cohesive	13
9D	27.00	62.7	Cohesive	1
	28.80	60.9	TOR	43

A3.10.3.1 - For more highly fractured and weathered rock, the shear wave velocity shall be directly measured; otherwise, it shall be assumed that the rock surface has not yet been reached and the highly fractured and weathered rock shall be considered to be a soil layer above the rock surface.

A3.10.3.3 - Profiles containing distinctly different soil layers shall be subdivided into those layers designated by a number that ranges from 1 to *n* at the bottom, where there are a total of *n* distinct layers down to the depth *r H* or down to a depth of 100 feet, depending on the case.

				Method B: Ṅ		
Layer #	Description	Thickness (ft)	Avg. N (bl/ft)	d_i (ft)	N_i (bl/ft)	d_i/N_i
1	Fill	4.00	4	4.00	4	1.14
2	Sand	8.00	15	8.00	15	0.52
3	Cohesive	16.80	11	16.80	11	1.53

28.80 $\sum d_i / N_i =$ 3.19

ASHTO C3.10.3.1- Method B: Ṅ = 9 **SITE CLASS E**

Note: shaded cells are data to be input (Expect Project Information)

H&H Designed to Amaze, Engineered to Last®

Computations For	Tuttle Bridge Road Phase 2	Made By	MK	Date	6/4/2024	Job No.	4462.07
	Maine DOT	Checked By	AS	Date	8/13/2024		
	Seismic Site Class	Back Checked By	AG	Date	8/16/2024		

Boring No. BB-C295-202 Hammer Type Automatic
Ground El: 81.20 (ft)
Ground Water El: 81.20 (ft)
Depth of Ground water 0
Unit Weight of Soil Below Ground Water Table: varies ksf

I.D	Depth (ft)	Elev (ft)	Soil Type	SPT (uncorrected)
1D	0.00	81.2	Cohesive	1
2D	2.00	79.2	Cohesive	10
3D	6.50	74.7	Cohesive	15
4D	8.50	72.7	Cohesive	12
5D	10.50	70.7	Cohesive	23
6D	15.00	66.2	Sand	19
7D	20.00	61.2	Sand	23
8D	25.00	56.2	Sand	26
9D	29.00	52.2	TOR	

A3.10.3.1 - For more highly fractured and weathered rock, the shear wave velocity shall be directly measured; otherwise, it shall be assumed that the rock surface has not yet been reached and the highly fractured and weathered rock shall be considered to be a soil layer above the rock surface.

A3.10.3.3 - Profiles containing distinctly different soil layers shall be subdivided into those layers designated by a number that ranges from 1 to *n* at the bottom, where there are a total of *n* distinct layers down to the depth *r H* or down to a depth of 100 feet, depending on the case.

				Method B: Ṅ		
Layer #	Description	Thickness (ft)	Avg. N (bl/ft)	d_i (ft)	N_i (bl/ft)	d_i/N_i
1	Fill	12.50	12	12.50	12	1.02
2	Sand	16.50	23	16.50	23	0.73

29.00 $\sum d_i/N_i =$ 1.75

AASHTO C3.10.3.1- Method B: Ṅ = 17 ← **SITE CLASS D**

Note: shaded cells are data to be input (Expect Project Information)

H&H Designed to Amaze, Engineered to Last®

Computations For	**Tuttle Bridge Road Phase 2**		Made By	MK	Date	6/4/2024	Job No.	4462.07
Maine DOT			Checked By	AS	Date	8/13/2024		
Seismic Site Class			Back Checked By	AG	Date	8/16/2024		

Boring No. BB-C295-203 Hammer Type Automatic

Ground El: 108.63 (ft)

Ground Water El: 92.98 (ft)

Depth of Ground water 16

Unit Weight of Soil Below Ground Water Table: varies ksf

I.D	Depth (ft)	Elev (ft)	Soil Type	SPT (uncorrected)
1D	1.00	107.6	Fill	21
2D	3.00	105.6	Fill	13
3D	5.00	103.6	Fill	8
4D	7.00	101.6	Fill	18
5D	9.00	99.6	Fill	9
6D	11.00	97.6	Fill	21
7D	13.00	95.6	Sand	24
8D	15.00	93.6	Sand	21
9D	20.00	88.6	Sand	19
10D	25.00	83.6	Cohesive	29
11D	30.00	78.6	Cohesive	11
12D	35.00	73.6	Cohesive	22
13D	40.00	68.6	Cohesive	4
14D	45.00	63.6	Cohesive	3
15D	50.00	58.6	Sand	50
16D	55.00	53.6	Sand	50
	56.80	51.8	TOR	

A3.10.3.1 - For more highly fractured and weathered rock, the shear wave velocity shall be directly measured; otherwise, it shall be assumed that the rock surface has not yet been reached and the highly fractured and weathered rock shall be considered to be a soil layer above the rock surface.

A3.10.3.3 - Profiles containing distinctly different soil layers shall be subdivided into those layers designated by a number that ranges from 1 to *n* at the bottom, where there are a total of *n* distinct layers down to the depth *r H* or down to a depth of 100 feet, depending on the case.

				Method B: $\dot{N}$		
Layer #	Description	Thickness (ft)	Avg. N (bl/ft)	d_i (ft)	N_i (bl/ft)	d_i/N_i
1	Fill	13.00	15	13.00	15	0.87
2	Sand	9.00	21	9.00	21	0.42
3	Cohesive	25.00	14	25.00	14	1.81
4	Sand	9.80	50	9.80	50	0.20

56.80 $\sum d_i / N_i =$ 3.30

.ASHTO C3.10.3.1- Method B: $\dot{N}$ = 17 **SITE CLASS D**

Note: shaded cells are data to be input (Expect Project Information)

Designed to Amaze, Engineered to Last®

Computations For	Tuttle Bridge Road Phase 2	Made By	MK	Date	6/4/2024	Job No.	4462.07
	Maine DOT	Checked By	AS	Date	8/13/2024		
	Seismic Site Class	Back Checked By	AG	Date	8/16/2024		

Boring No. BB-C295-204 Hammer Type Automatic

Ground El: 90.56 (ft)

Ground Water El: 81.50 (ft)

Depth of Ground water 9

Unit Weight of Soil Below Ground Water Table: varies ksf

I.D	Depth (ft)	Elev (ft)	Soil Type	SPT (uncorrected)
1D	0.00	90.6	Fill	8
2D	2.00	88.6	Cohesive	9
3D	4.00	86.6	Cohesive	9
4D	6.00	84.6	Cohesive	12
5D	8.00	82.6	Sand	8
6D	10.00	80.6	Sand	15
7D	15.00	75.6	Sand	10
8D	20.00	70.6	Sand	31
9D	25.00	65.6	Sand	42
10D	30.00	60.6	Sand	43
11D	35.00	55.6	Cohesive	40
12D	40.00	50.6	Sand	50
13D	45.00	45.6	Sand	50
	47.50	43.1	TOR	

A3.10.3.1 - For more highly fractured and weathered rock, the shear wave velocity shall be directly measured; otherwise, it shall be assumed that the rock surface has not yet been reached and the highly fractured and weathered rock shall be considered to be a soil layer above the rock surface.

A3.10.3.3 - Profiles containing distinctly different soil layers shall be subdivided into those layers designated by a number that ranges from 1 to *n* at the bottom, where there are a total of *n* distinct layers down to the depth *r H* or down to a depth of 100 feet, depending on the case.

				Method B: Ṅ		
Layer #	Description	Thickness (ft)	Avg. N (bl/ft)	d_i (ft)	N_i (bl/ft)	d_i/N_i
1	Fill	2.00	8	2.00	8	0.25
2	Cohesive	6.00	10	6.00	10	0.60
3	Sand	24.00	25	24.00	25	0.97
4	Cohesive	5.00	40	5.00	40	0.13
5	Sand	10.00	50	10.00	50	0.20

47.00 $\sum d_i / N_i =$ 2.14

ASHTO C3.10.3.1- Method B: Ṅ = 22 **SITE CLASS D**

Note: shaded cells are data to be input (Expect Project Information)

Designed to Amaze, Engineered to Last®

Computations For	Tuttle Bridge Road Phase 2	Made By	MK	Date	6/4/2024	Job No.	4462.07
	Maine DOT	Checked By	AS	Date	8/13/2024		
	Seismic Site Class	Back Checked By	AG	Date	8/16/2024		

Boring No. BB-C295-205 Hammer Type Automatic

Ground El: 106.20 (ft)

Ground Water El: 93.20 (ft)

Depth of Ground water 13

Unit Weight of Soil Below Ground Water Table: varies ksf

I.D	Depth (ft)	Elev (ft)	Soil Type	SPT (uncorrected)
1D	1.00	105.2	Fill	11
2D	3.00	103.2	Fill	14
3D	5.00	101.2	Fill	13
4D	7.00	99.2	Fill	19
5D	9.00	97.2	Fill	12
6D	15.00	91.2	Fill	31
7D	20.00	86.2	Cohesive	10
8D	24.50	81.7	Cohesive	0
9D	30.00	76.2	Cohesive	4
10D	35.00	71.2	Sand	13
11D	40.00	66.2	Sand	38
	43.50	62.7	TOR	

A3.10.3.1 - For more highly fractured and weathered rock, the shear wave velocity shall be directly measured; otherwise, it shall be assumed that the rock surface has not yet been reached and the highly fractured and weathered rock shall be considered to be a soil layer above the rock surface.

A3.10.3.3 - Profiles containing distinctly different soil layers shall be subdivided into those layers designated by a number that ranges from 1 to *n* at the bottom, where there are a total of *n* distinct layers down to the depth *r H* or down to a depth of 100 feet, depending on the case.

				Method B: Ṅ		
Layer #	Description	Thickness (ft)	Avg. N (bl/ft)	d_i (ft)	N_i (bl/ft)	d_i/N_i
1	Fill	17.00	17	17.00	17	1.02
2	Cohesive	15.00	5	15.00	5	3.21
3	Sand	11.50	26	11.50	26	0.45

43.50 $\sum d_i / N_i =$ 4.69

.ASHTO C3.10.3.1- Method B: Ṅ = 9 ← **SITE CLASS E**

Note: shaded cells are data to be input (Expect Project Information)

H&H Designed to Amaze, Engineered to Last®

Computations For	**Tuttle Bridge Road Phase 2**	Made By	MK	Date	6/4/2024
	Maine DOT	Checked By	AS	Date	8/13/2024
	Seismic Site Class	Back Checked By	AG	Date	8/16/2024

Job No. 4462.07

Boring No. BB-C295-206 Hammer Type Automatic

Ground El: 92.08 (ft)

Ground Water El: 89.28 (ft)

Depth of Ground water 3

Unit Weight of Soil Below Ground Water Table: varies ksf

I.D	Depth (ft)	Elev (ft)	Soil Type	SPT (uncorrected)
1D	0.00	92.1	Fill	3
2D	2.00	90.1	Cohesive	14
3D	4.00	88.1	Cohesive	16
4D	6.00	86.1	Cohesive	19
5D	10.00	82.1	Cohesive	4
6D	15.00	77.1	Sand	13
7D	20.00	72.1	Sand	18
8D	25.00	67.1	Sand	30
	26.83	65.3	TOR	

A3.10.3.1 - For more highly fractured and weathered rock, the shear wave velocity shall be directly measured; otherwise, it shall be assumed that the rock surface has not yet been reached and the highly fractured and weathered rock shall be considered to be a soil layer above the rock surface.

A3.10.3.3 - Profiles containing distinctly different soil layers shall be subdivided into those layers designated by a number that ranges from 1 to *n* at the bottom, where there are a total of *n* distinct layers down to the depth *r H* or down to a depth of 100 feet, depending on the case.

				Method B: Ṅ		
Layer #	Description	Thickness (ft)	Avg. N (bl/ft)	d_i (ft)	N_i (bl/ft)	d_i/N_i
1	Fill	2.00	3	2.00	3	0.67
2	Cohesive	10.00	13	10.00	13	0.75
3	Sand	14.83	20	14.83	20	0.73

26.83 $\sum d_i / N_i$ = 2.15

ASHTO C3.10.3.1- Method B: Ṅ = 12 ← **SITE CLASS E**

Note: shaded cells are data to be input (Expect Project Information)

H&H Designed to Amaze, Engineered to Last®

Computations For	Tuttle Bridge Road Phase 2	Made By	MK	Date	6/4/2024	Job No.	4462.07
	Maine DOT	Checked By	AS	Date	8/13/2024		
	Seismic Site Class	Back Checked By	AG	Date	8/16/2024		

Boring No. BB-C295-207 Hammer Type Automatic

Ground El: 92.45 (ft)

Ground Water El: 89.65 (ft)

Depth of Ground water 3

Unit Weight of Soil Below Ground Water Table: varies ksf

I.D	Depth (ft)	Elev (ft)	Soil Type	SPT (uncorrected)
1D	0.00	92.5	Cohesive	1
2D	2.00	90.5	Cohesive	10
3D	4.00	88.5	Sand	12
4D	6.00	86.5	Sand	12
5D	8.00	84.5	Cohesive	1
6D	15.00	77.5	Cohesive	0
7D	21.00	71.5	Sand	50
	23.50	69.0	TOR	

A3.10.3.1 - For more highly fractured and weathered rock, the shear wave velocity shall be directly measured; otherwise, it shall be assumed that the rock surface has not yet been reached and the highly fractured and weathered rock shall be considered to be a soil layer above the rock surface.

A3.10.3.3 - Profiles containing distinctly different soil layers shall be subdivided into those layers designated by a number that ranges from 1 to *n* at the bottom, where there are a total of *n* distinct layers down to the depth *r H* or down to a depth of 100 feet, depending on the case.

				Method B: Ṅ		
Layer #	Description	Thickness (ft)	Avg. N (bl/ft)	d_i (ft)	N_i (bl/ft)	d_i/N_i
1	Cohesive	2.00	6	2.00	6	0.36
2	Sand	10.00	12	10.00	12	0.83
3	Cohesive	14.83	1	14.83	1	29.66
4	Sand	15.83	50	15.83	50	0.32

42.66 $\sum d_i / N_i =$ 31.17

AASHTO C3.10.3.1- Method B: Ṅ = 1 ← **SITE CLASS E**

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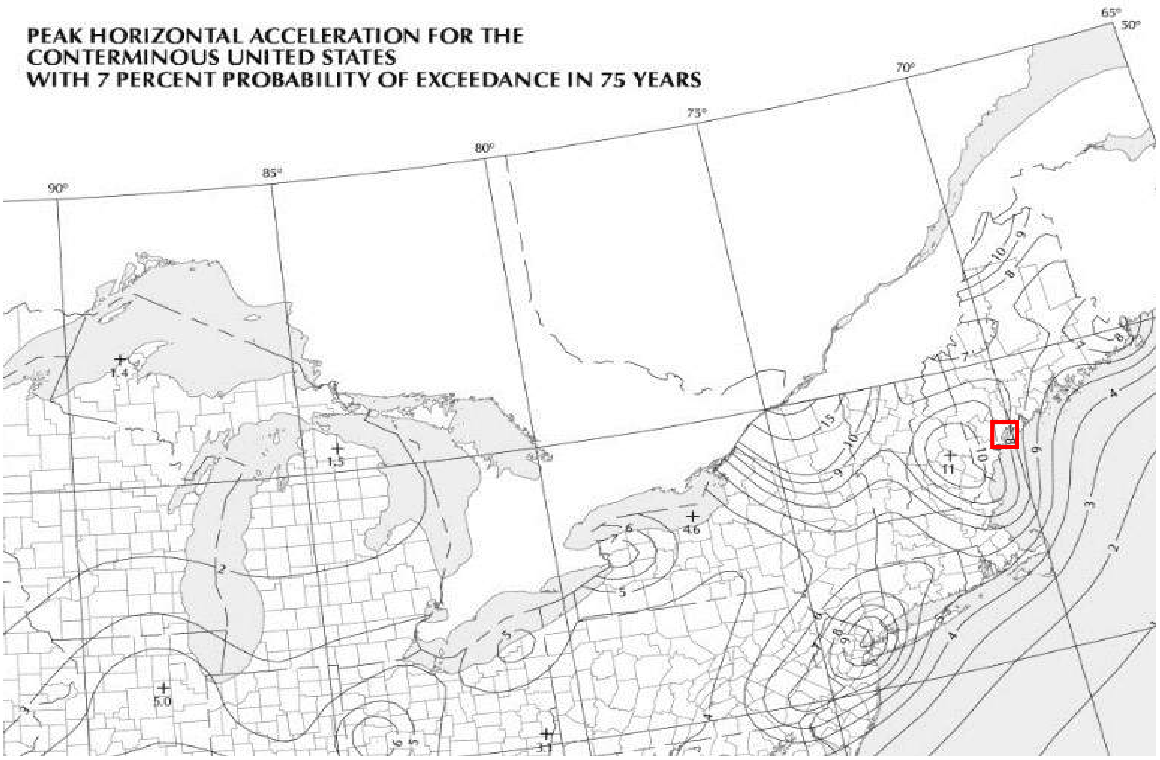
		Made By	JS	Date	11/17/2022	Job No.	4462.07
Location :	Tuttle Road Bridge	Checked By	AS	Date	8/19/2024	Sec. No.	
Calculations :	Seismic Coefficient S_{DS}	Back Checked By	AG	Date	8/20/2024	Sheet No.	

Peak Ground Acceleration (1000 yr event) **PGA** 0.088 AASHTO Figure 3.10.2.1-1 (below)



$$A_S = F_{pga}\,PGA \tag{3.10.4.2-2}$$

Site Class	Peak Ground Acceleration Coefficient $(PGA)^1$ $PGA <$ 0.10	$PGA =$ 0.20	$PGA =$ 0.30	$PGA =$ 0.40	$PGA >$ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F^2	*	*	*	*	*

Notes:

AASHTO Table 3.10.3.2-1

	Site Class D	Site Class E
Acceleration Coefficient As	0.1408	0.22

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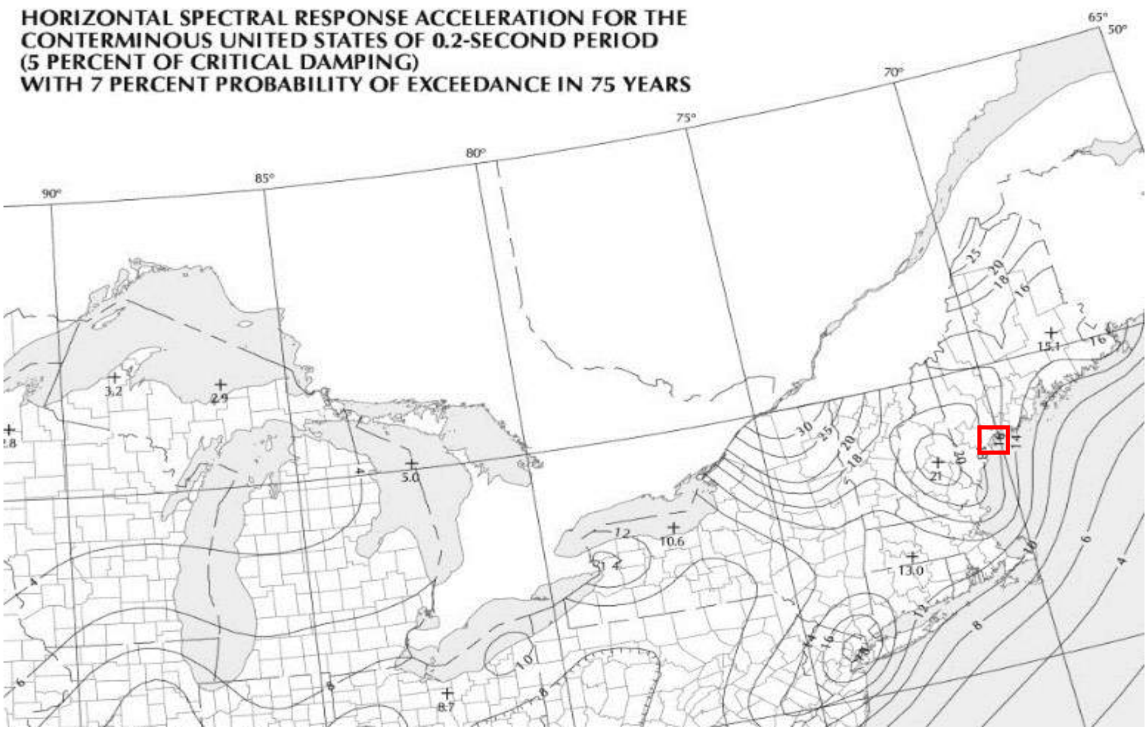
		Made By	JS	Date	11/17/2022	Job No.	4462.07
Location :	Tuttle Road Bridge	Checked By	AS	Date	8/19/2024	Sec. No.	
Calculations :	Seismic Coefficient S_{DS}	Back Checked By	AG	Date	8/20/2024	Sheet No.	

Horizontal specteral response for .2 sec period (1000 yr event) **Ss** | 0.17 | AASHTO Figure 3.10.2.1-2 (below)



$$S_{DS} = F_a S_S \quad (3.10.4.2\text{-}3)$$

Table 3.10.3.2-2—Values of Site Factor, F_a, for Short-Period Range of Acceleration Spectrum

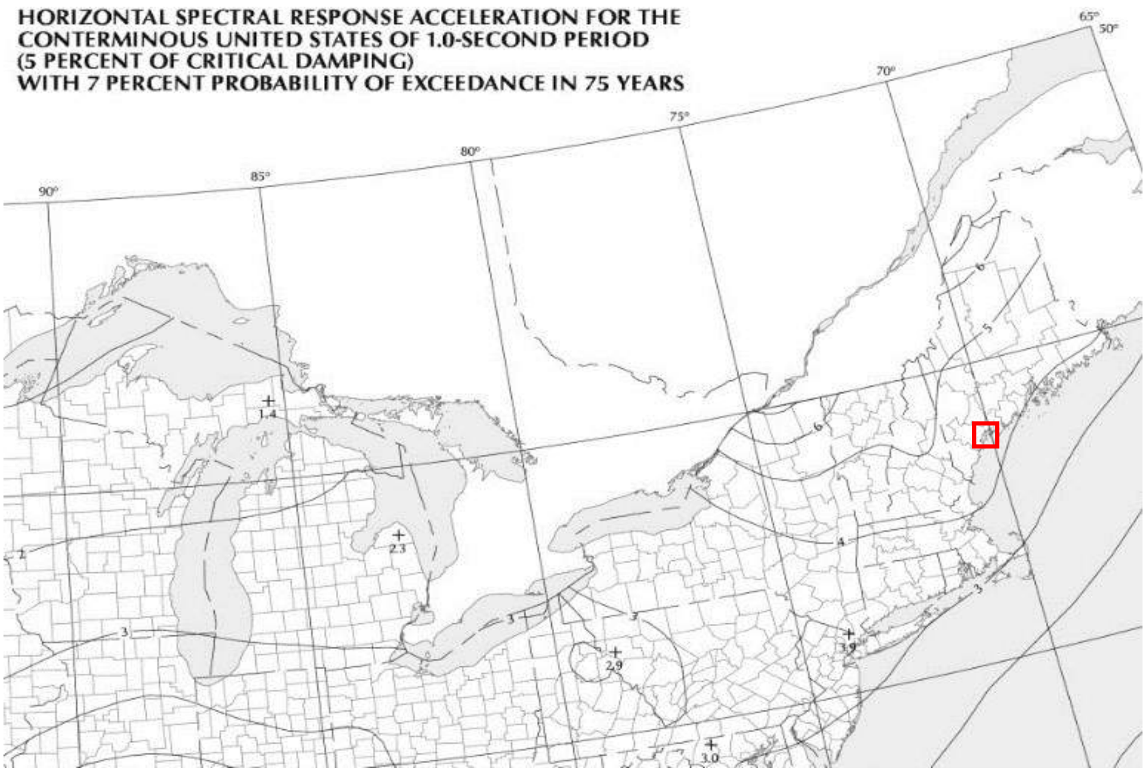
Site Class	Spectral Acceleration Coefficient at Period 0.2 sec (S_S)[1] $S_S <$ 0.25	$S_S =$ 0.50	$S_S =$ 0.75	$S_S =$ 1.00	$S_S >$ 1.25
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F[2]	*	*	*	*	*

AASHTO Table 3.10.3.2-2

	Site Class D	Site Class E
Acceleration Coefficient S_{DS}	0.272	0.425

		Made By	JS	Date	11/17/2022	Job No.	4462.07
Location :	Tuttle Road Bridge	Checked By	AS	Date	11/18/2022	Sec. No.	
Calculation:	Seismic Coefficient S_{D1}	Back Checked By	AG	Date	11/21/2022	Sheet No.	

Horizontal specteral response for 1 sec period (1000 yr event) $\mathbf{S_1}$ | 0.044 | AASHTO Figure 3.10.2.1- 3 (below)



$$S_{D1} = F_v S_1 \quad (3.10.4.2\text{-}6)$$

Table 3.10.3.2-3—Values of Site Factor, F_v, for Long-Period Range of Acceleration Spectrum

Site Class	Spectral Acceleration Coefficient at Period 1.0 sec (S_1)[1]				
	$S_1 <$ 0.1	$S_1 =$ 0.2	$S_1 =$ 0.3	$S_1 =$ 0.4	$S_1 >$ 0.5
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F[2]	*	*	*	*	*

AASHTO Table 3.10.3.2-3

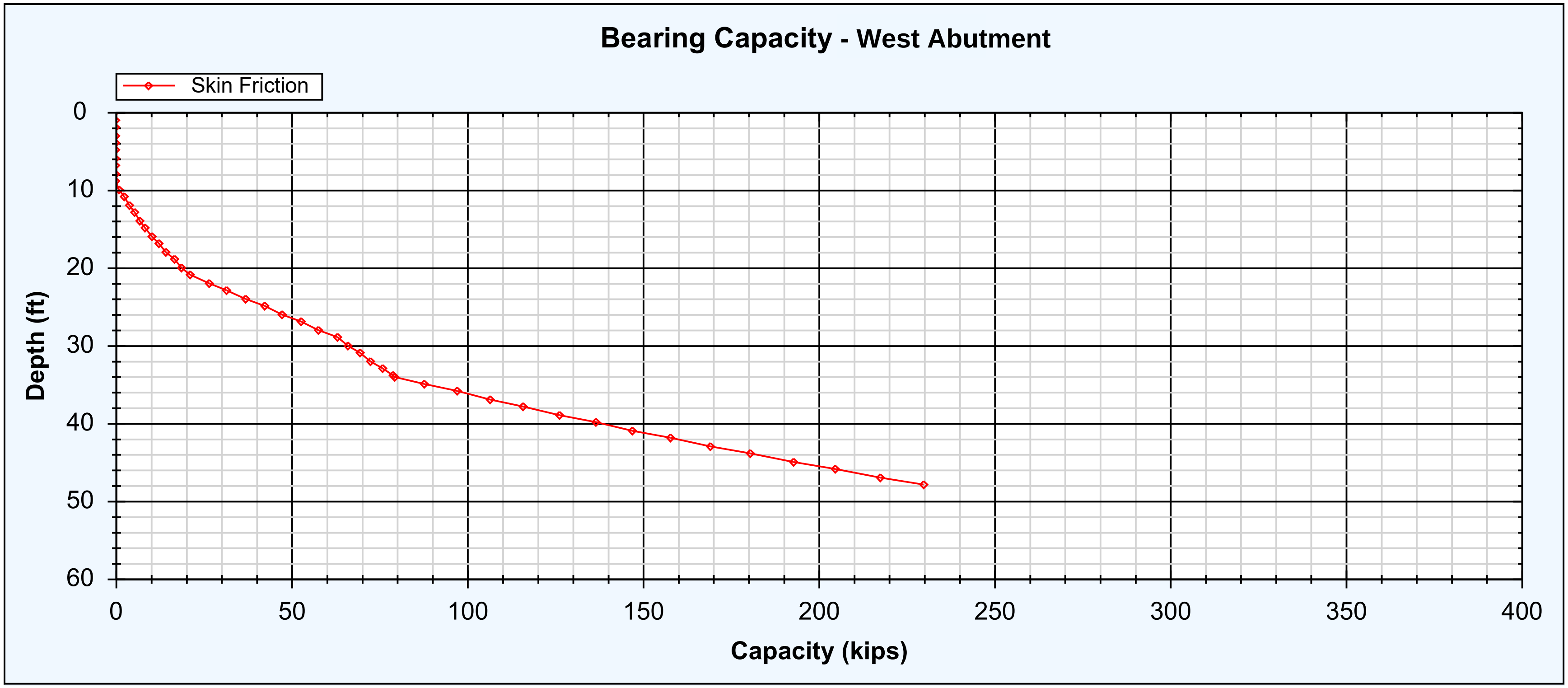
	Site Class D	Site Class E
Acceleration Coefficient $\mathbf{S_{D1}}$	0.1056	0.154

Appendix H

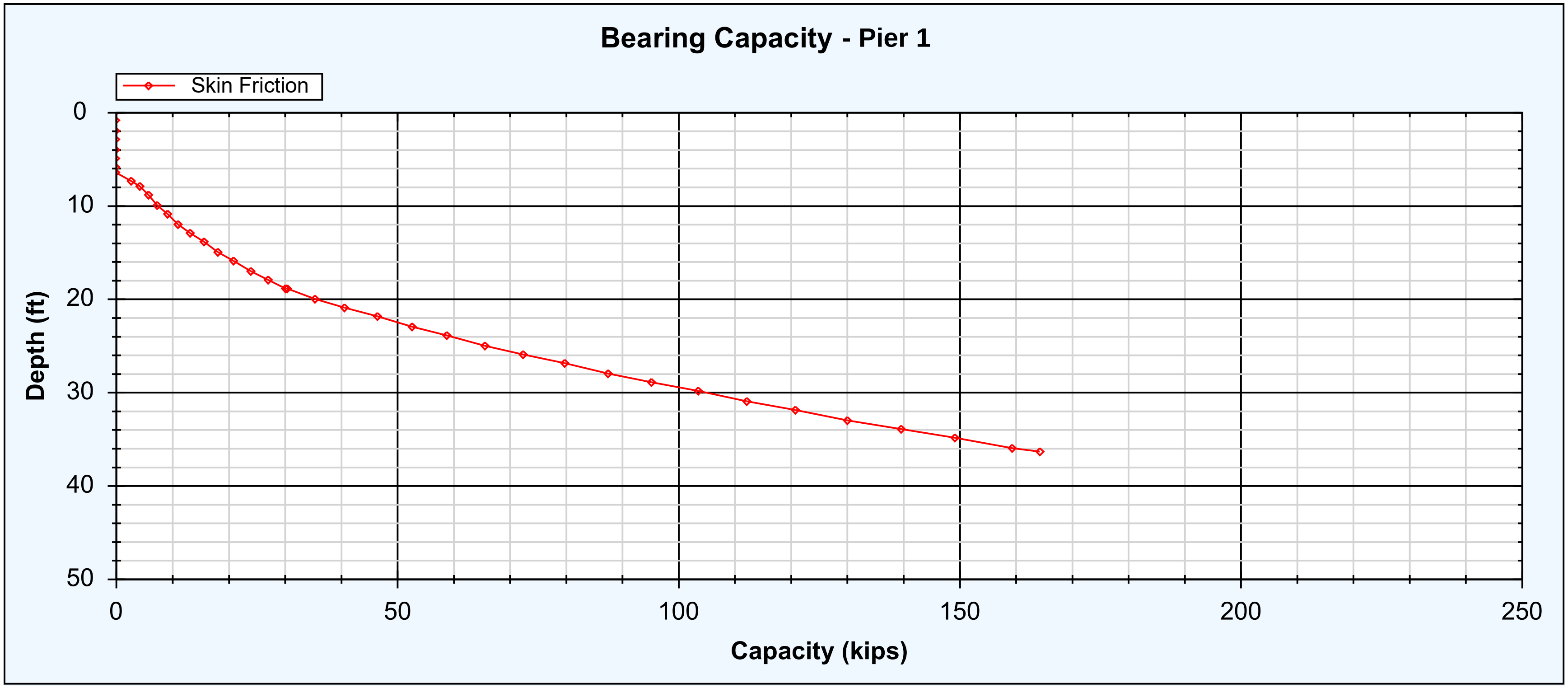
Foundation Evaluation

Appendix H-1

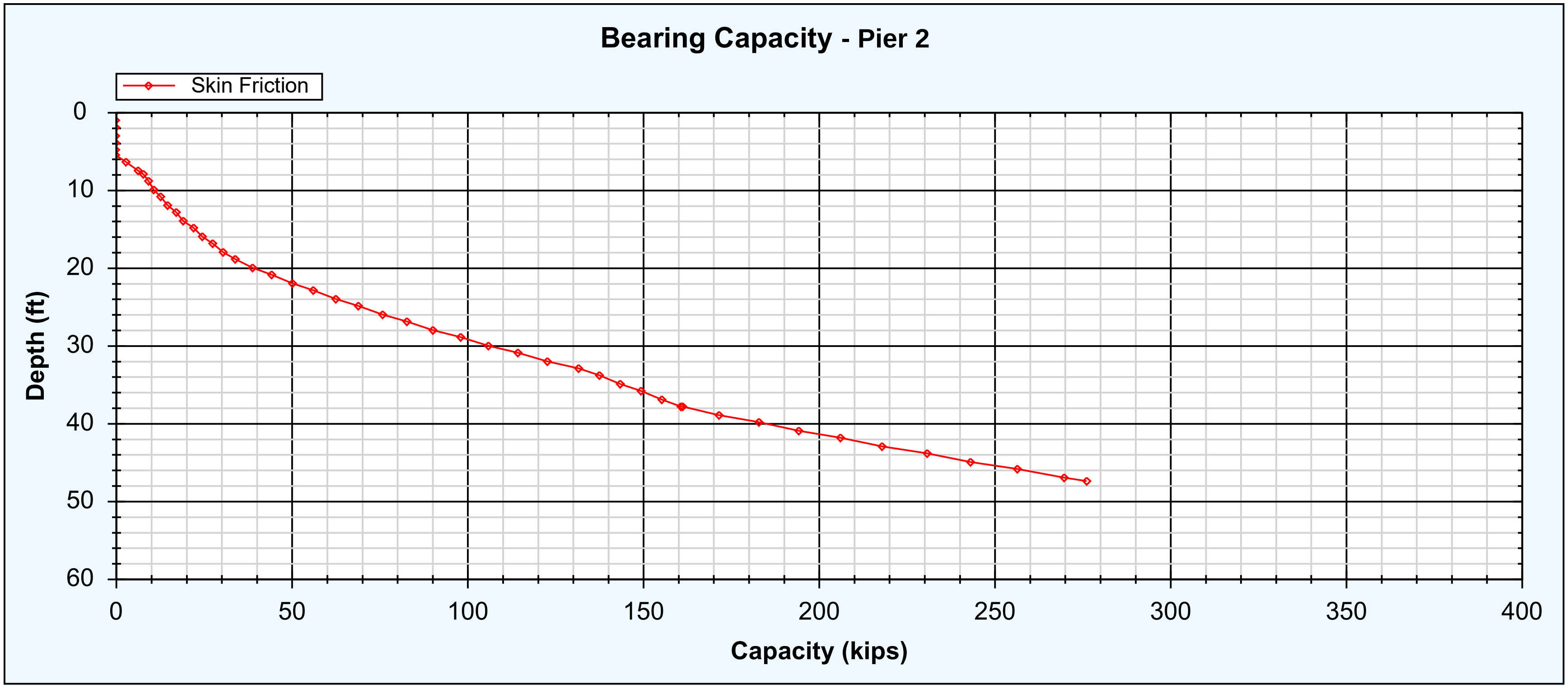
Uplift Pile Resistance

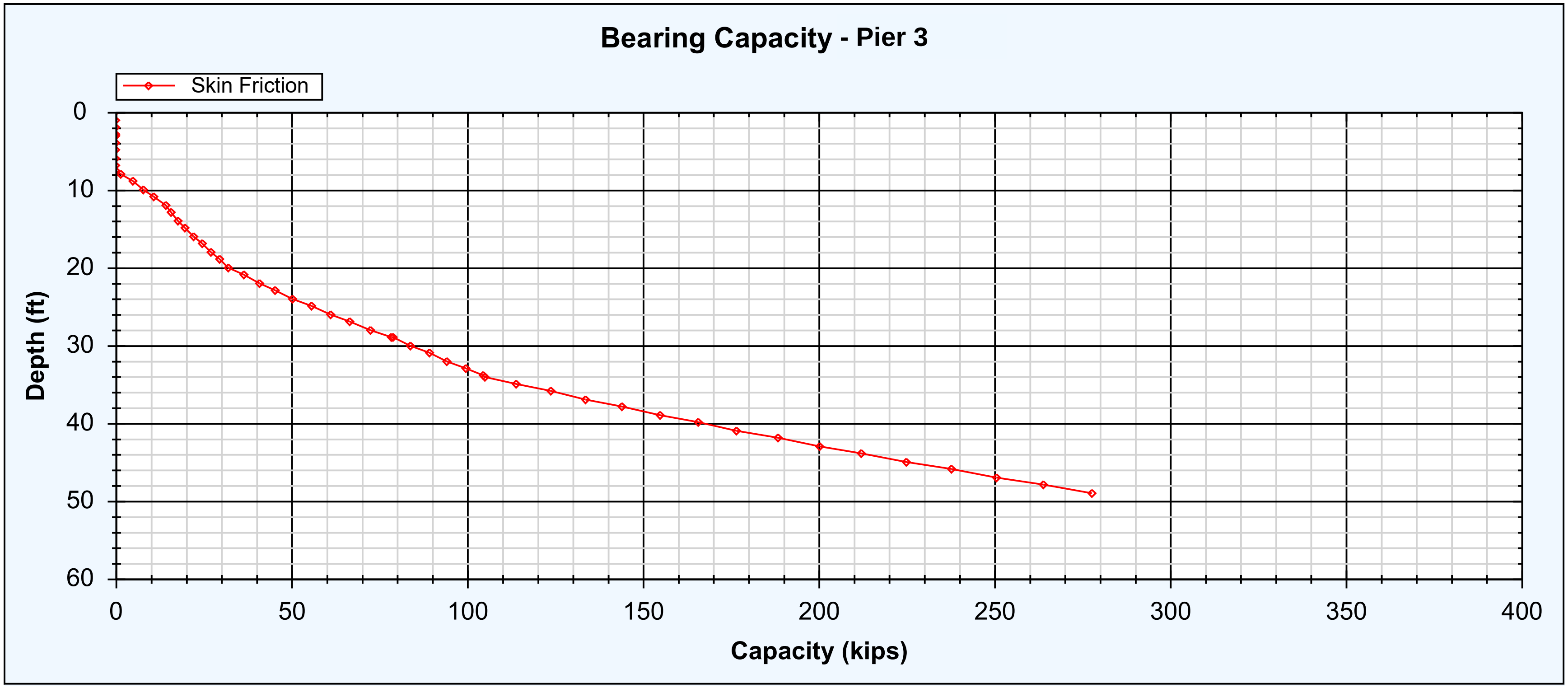


Bearing Capacity - West Abutment
Skin Friction
Depth (ft)
0
10
20
30
40
50
60
0
50
100
150
200
250
300
350
400
Capacity (kips)

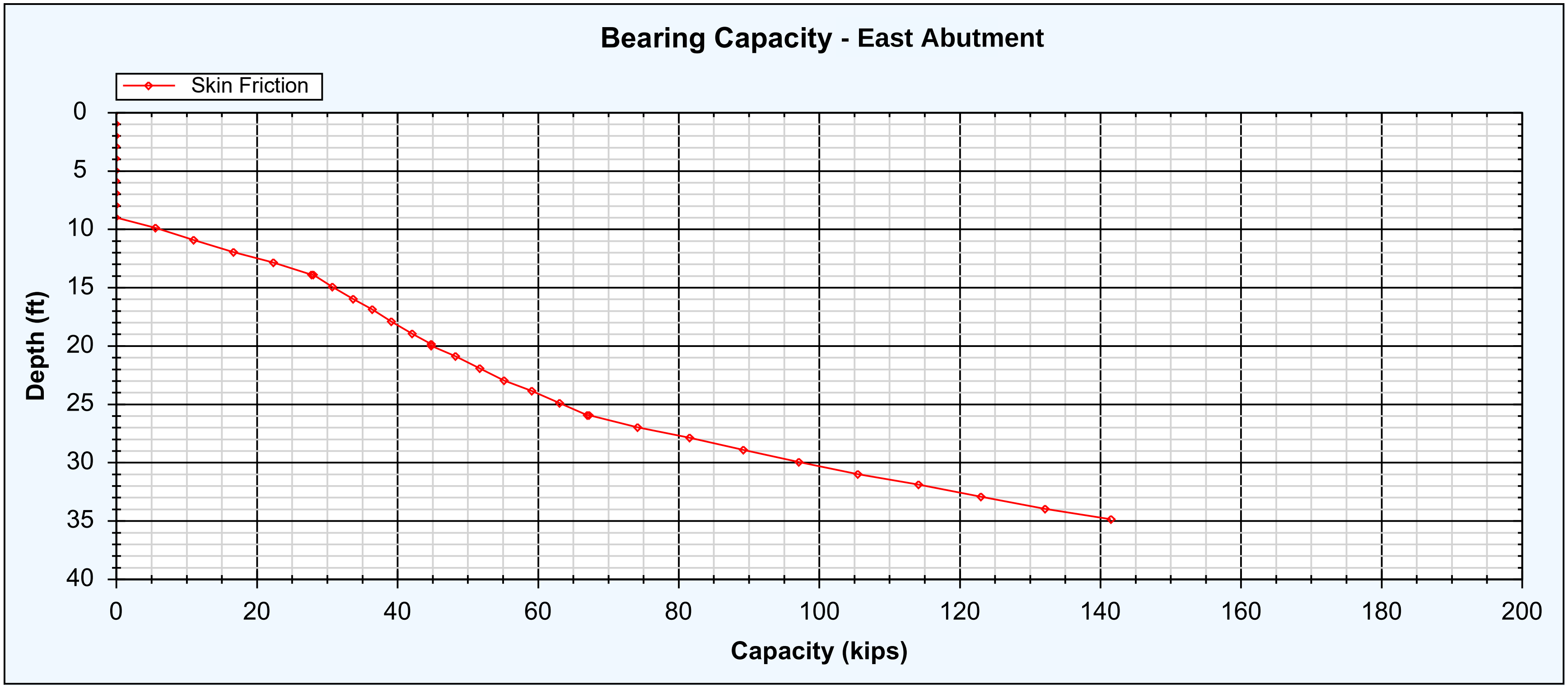


Bearing Capacity - Pier 1
Skin Friction
Depth (ft)
0
10
20
30
40
50
0
50
100
150
200
250
Capacity (kips)


Bearing Capacity - Pier 2
Skin Friction
Depth (ft)
0
10
20
30
40
50
60
0
50
100
150
200
250
300
350
400
Capacity (kips)



Bearing Capacity - Pier 3
Skin Friction
Depth (ft)
0
10
20
30
40
50
60
0
50
100
150
200
250
300
350
400
Capacity (kips)


Bearing Capacity - East Abutment
Skin Friction
Depth (ft)
0
5
10
15
20
25
30
35
40
0
20
40
60
80
100
120
140
160
180
200
Capacity (kips)

Appendix H-2

FBMP Group Analyses

Section Properties

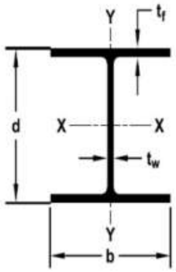
Note: shaded cells are data to be input (Expect Project Information)

H&H Designed to Amaze, Engineered to Last®

Computations For	**Tuttle Bridge Road Phase 2**	Made By	AS	Date	9/9/2024	Job No.	4462.07
	Maine DOT	Checked By	MCK	Date	9/10/2024		
	HP14x89 Section Properties after Section Loss due to Corrosion	Back Checked By	AG	Date	9/13/2024		

W-Shape and/or HP Section Properties and Corrosion Loss

Note:
Calculations in this sheet are just for evaluating sections.



Pile	Corrosion Loss	b	d	tf	tw	Area	Ix	Sx	Iy	Sy
Type	(in)	(in)	(in)	(in)	(in)	(in2)	(in4)	(in3)	(in4)	(in3)
HP14X89	0	14.70	13.83	0.62	0.62	25.82	892.22	129.03	325.51	44.30
HP14X89	0.0625	14.57	13.71	0.49	0.49	20.51	707.81	103.29	252.72	34.69

Subsurface Parameters

Computations for	**Tuttle Bridge Road Phase 2**	Made By	AS	Date	5/27/2024
	Maine DOT	Checked By	MCK	Date	5/30/2024
	Subsurface Parameters	Back Checked By	AG	Date	6/6/2024

Job No. 4462.07

Substructure Location: Abutment 1 (West)

Borings Referred: BB-C295-202

FB-MultiPier General Soil Properties for Driven Piles[1]

Layer	Lateral		Axial		Torsional		Tip	
Cohesionless Fill	Sand (Reese)		Driven Pile (McVay)		Hyperbolic		N/A	
	Internal Friction Angle ϕ (deg)	29	Shear Modulus (ksi)	3.5	Total Unit Weight γ (pcf)	112		
	Total Unit Weight γ (pcf)	112						
	k above GWT (pci)	38	Poisson's Ratio	0.25	Shear Modulus (ksi)	3.5		
	k below GWT (pci)	28	Nominal Unit Skin Friction (psf)	50	Torsional Shear Stress (psf)	50		
Very Stiff Cohesive Soil	Clay (Stiff with free water)		Driven Pile (McVay)		Hyperbolic			
	Total Unit Weight γ (pcf)	130	Shear Modulus (ksi)	6.4	Total Unit Weight γ (pcf)	130		
	Undrained Shear Strength (psf)	3000						
	Major Principal Strain @ 50%	0.005	Poisson's Ratio	0.5	Shear Modulus (ksi)	6.4		
			Nominal Unit Skin Friction (psf)	1500	Torsional Shear Stress (psf)	1500		
Medium Stiff Cohesive Soil	Clay (Stiff with free water)		Driven Pile (McVay)		Hyperbolic			
	Total Unit Weight γ (pcf)	120	Shear Modulus (ksi)	4	Total Unit Weight γ (pcf)	120		
	Undrained Shear Strength (psf)	1250						
	Major Principal Strain @ 50%	0.007	Poisson's Ratio	0.45	Shear Modulus (ksi)	4.0		
			Nominal Unit Skin Friction (psf)	625	Torsional Shear Stress (psf)	625		
Dense Cohesionless Soil	Sand (Reese)		Driven Pile (McVay)		Hyperbolic			
	Internal Friction Angle ϕ (deg)	36	Shear Modulus (ksi)	15	Total Unit Weight γ (pcf)	130		
	Total Unit Weight γ (pcf)	130						
	k above GWT (pci)	171	Poisson's Ratio	0.35	Shear Modulus (ksi)	15.0		
	k below GWT (pci)	100	Nominal Unit Skin Friction (psf)	900	Torsional Shear Stress (psf)	900		
Rock	Limestone (McVay)		Driven Pile (McVay)		Hyperbolic		Driven Pile (McVay)	
	Unconfined Compressive Strength q_u (psf)	360,000	Nominal Unit Skin Friction (psf)	30,000	Total Unit Weight γ (pcf)	160	Nominal Tip Resistance (kips)	150
					Shear Modulus (ksi)	400		
					Torsional Shear Stress (psf)	30,000		

[1] Parameters have been based on avaialble lab data and correlations to in-situ data.

Computations for	Tuttle Bridge Road Phase 2	Made By	AS	Date	5/27/2024	Job No.	4462.07
	Maine DOT	Checked By	MCK	Date	5/30/2024		
	Subsurface Parameters	Back Checked By	AG	Date	6/6/2024		

Substructure Location: Abutment 2 (East)

Borings Referred: BB-C295-104,-206 (OW)

FB-MultiPier General Soil Properties for Driven Piles[1]

Layer	Lateral		Axial		Torsional		Tip	
Cohesionless Fill	Sand (Reese)		Driven Pile (McVay)		Hyperbolic		N/A	
	Internal Friction Angle ϕ (deg)	29	Shear Modulus (ksi)	3.5	Total Unit Weight γ (pcf)	112		
	Total Unit Weight γ (pcf)	112						
	k above GWT (pci)	38	Poisson's Ratio	0.25	Shear Modulus (ksi)	3.5		
	k below GWT (pci)	28	Nominal Unit Skin Friction (psf)	50	Torsional Shear Stress (psf)	50		
Very Stiff Cohesive Soil	Clay (Stiff with free water)		Driven Pile (McVay)		Hyperbolic			
	Total Unit Weight γ (pcf)	130	Shear Modulus (ksi)	3	Total Unit Weight γ (pcf)	130		
	Undrained Shear Strength (psf)	3500						
	Major Principal Strain @ 50%	0.005	Poisson's Ratio	0.45	Shear Modulus (ksi)	3.0		
			Nominal Unit Skin Friction (psf)	550	Torsional Shear Stress (psf)	550		
Medium Stiff Cohesive Soil	Clay (Stiff with free water)		Driven Pile (McVay)		Hyperbolic			
	Total Unit Weight γ (pcf)	115	Shear Modulus (ksi)	3	Total Unit Weight γ (pcf)	115		
	Undrained Shear Strength (psf)	1000						
	Major Principal Strain @ 50%	0.005	Poisson's Ratio	0.45	Shear Modulus (ksi)	3.0		
			Nominal Unit Skin Friction (psf)	450	Torsional Shear Stress (psf)	450		
Medium Dense Cohesionless Soil	Sand (Reese)		Driven Pile (McVay)		Hyperbolic			
	Internal Friction Angle ϕ (deg)	31	Shear Modulus (ksi)	1.5	Total Unit Weight γ (pcf)	125		
	Total Unit Weight γ (pcf)	125						
	k above GWT (pci)	64	Poisson's Ratio	0.3	Shear Modulus (ksi)	1.5		
	k below GWT (pci)	44	Nominal Unit Skin Friction (psf)	250	Torsional Shear Stress (psf)	250		
Dense Cohesionless Soil	Sand (Reese)		Driven Pile (McVay)		Hyperbolic			
	Internal Friction Angle ϕ (deg)	36	Shear Modulus (ksi)	15	Total Unit Weight γ (pcf)	130		
	Total Unit Weight γ (pcf)	130						
	k above GWT (pci)	171	Poisson's Ratio	0.35	Shear Modulus (ksi)	15.0		
	k below GWT (pci)	100	Nominal Unit Skin Friction (psf)	900	Torsional Shear Stress (psf)	900		
Rock	Limestone (McVay)		Driven Pile (McVay)		Hyperbolic		Driven Pile (McVay)	
	Unconfined Compressive Strength q_u (psf)	360,000	Nominal Unit Skin Friction (psf)	30,000	Total Unit Weight γ (pcf)	160	Nominal Tip Resistance (kips)	150
					Shear Modulus (ksi)	400		
					Torsional Shear Stress (psf)	30,000		

[1] Parameters have been based on avaialble lab data and correlations to in-situ data.

Computations for	Tuttle Bridge Road Phase 2	Made By	AS	Date	5/27/2024	Job No. 4462.07
	Maine DOT	Checked By	MCK	Date	5/30/2024	
	Subsurface Parameters	Back Checked By	AG	Date	6/6/2024	

Substructure Location: Pier 1

Borings Referred: BB-C295-101

FB-MultiPier General Soil Properties for Driven Piles[1]

Layer	Lateral		Axial		Torsional		Tip	
Soft to Medium Stiff Cohesive Soil	Clay (Soft; Matlock)		Driven Pile (McVay)		Hyperbolic		N/A	
	Total Unit Weight γ (pcf)	110	Shear Modulus (ksi)	2	Total Unit Weight γ (pcf)	110		
	Undrained Shear Strength (psf)	400						
	Major Principal Strain @ 50%	0.02	Poisson's Ratio	0.45	Shear Modulus (ksi)	2.0		
			Nominal Unit Skin Friction (psf)	200	Torsional Shear Stress (psf)	200		
Stiff Cohesive Soil	Clay (Stiff with free water)		Driven Pile (McVay)		Hyperbolic			
	Total Unit Weight γ (pcf)	125	Shear Modulus (ksi)	4	Total Unit Weight γ (pcf)	125		
	Undrained Shear Strength (psf)	1000						
	Major Principal Strain @ 50%	0.005	Poisson's Ratio	0.5	Shear Modulus (ksi)	4.0		
			Nominal Unit Skin Friction (psf)	500	Torsional Shear Stress (psf)	500		
Medium Dense Cohesionless Soil	Sand (Reese)		Driven Pile (McVay)		Hyperbolic			
	Internal Friction Angle ϕ (deg)	32	Shear Modulus (ksi)	8.5	Total Unit Weight γ (pcf)	120		
	Total Unit Weight γ (pcf)	120						
	k above GWT (pci)	77	Poisson's Ratio	0.3	Shear Modulus (ksi)	8.5		
	k below GWT (pci)	52	Nominal Unit Skin Friction (psf)	250	Torsional Shear Stress (psf)	250		
Dense Cohesionless Soil	Sand (Reese)		Driven Pile (McVay)		Hyperbolic			
	Internal Friction Angle ϕ (deg)	36	Shear Modulus (ksi)	15	Total Unit Weight γ (pcf)	130		
	Total Unit Weight γ (pcf)	130						
	k above GWT (pci)	171	Poisson's Ratio	0.35	Shear Modulus (ksi)	15.0		
	k below GWT (pci)	100	Nominal Unit Skin Friction (psf)	900	Torsional Shear Stress (psf)	900		
Rock	Limestone (McVay)		Driven Pile (McVay)		Hyperbolic		Driven Pile (McVay)	
	Unconfined Compressive Strength q_u (psf)	360,000	Nominal Unit Skin Friction (psf)	30,000	Total Unit Weight γ (pcf)	160	Nominal Tip Resistance (kips)	150
					Shear Modulus (ksi)	400		
					Torsional Shear Stress (psf)	30,000		

[1] Parameters have been based on avaialble lab data and correlations to in-situ data.

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Computations for	**Tuttle Bridge Road Phase 2**	Made By	AS	Date	5/27/2024	Job No.	4462.07
	Maine DOT	Checked By	MCK	Date	5/30/2024		
	Subsurface Parameters	Back Checked By	AG	Date	6/6/2024		

Substructure Location: Pier 2

Borings Referred: BB-C295-204

FB-MultiPier General Soil Properties for Driven Piles[1]

Layer	Lateral		Axial		Torsional		Tip	
Cohesionless Fill	Sand (Reese)		Driven Pile (McVay)		Hyperbolic		N/A	
	Internal Friction Angle ϕ (deg)	29	Shear Modulus (ksi)	3.5	Total Unit Weight γ (pcf)	112		
	Total Unit Weight γ (pcf)	112						
	k above GWT (pci)	38	Poisson's Ratio	0.25	Shear Modulus (ksi)	3.5		
	k below GWT (pci)	28	Nominal Unit Skin Friction (psf)	50	Torsional Shear Stress (psf)	50		
Stiff Cohesive Soil	Clay (Stiff with free water)		Driven Pile (McVay)		Hyperbolic			
	Total Unit Weight γ (pcf)	120	Shear Modulus (ksi)	4	Total Unit Weight γ (pcf)	120		
	Undrained Shear Strength (psf)	1200						
	Major Principal Strain @ 50%	0.01	Poisson's Ratio	0.45	Shear Modulus (ksi)	4.0		
			Nominal Unit Skin Friction (psf)	450	Torsional Shear Stress (psf)	450		
Medium Dense Cohesionless Soil	Sand (Reese)		Driven Pile (McVay)		Hyperbolic			
	Internal Friction Angle ϕ (deg)	32	Shear Modulus (ksi)	8.5	Total Unit Weight γ (pcf)	120		
	Total Unit Weight γ (pcf)	120						
	k above GWT (pci)	77	Poisson's Ratio	0.3	Shear Modulus (ksi)	8.5		
	k below GWT (pci)	52	Nominal Unit Skin Friction (psf)	250	Torsional Shear Stress (psf)	250		
Dense Cohesionless Soil	Sand (Reese)		Driven Pile (McVay)		Hyperbolic			
	Internal Friction Angle ϕ (deg)	36	Shear Modulus (ksi)	15	Total Unit Weight γ (pcf)	125		
	Total Unit Weight γ (pcf)	125						
	k above GWT (pci)	171	Poisson's Ratio	0.35	Shear Modulus (ksi)	15.0		
	k below GWT (pci)	100	Nominal Unit Skin Friction (psf)	900	Torsional Shear Stress (psf)	900		
Hard Cohesive Soil	Clay (Stiff with free water)		Driven Pile (McVay)		Hyperbolic			
	Total Unit Weight γ (pcf)	135	Shear Modulus (ksi)	7.5	Total Unit Weight γ (pcf)	135		
	Undrained Shear Strength (psf)	4000						
	Major Principal Strain @ 50%	0.004	Poisson's Ratio	0.5	Shear Modulus (ksi)	7.5		
			Nominal Unit Skin Friction (psf)	1250	Torsional Shear Stress (psf)	1250		
Very Dense Cohesionless Soil	Sand (Reese)		Driven Pile (McVay)		Hyperbolic			
	Internal Friction Angle ϕ (deg)	38	Shear Modulus (ksi)	18.5	Total Unit Weight γ (pcf)	130		
	Total Unit Weight γ (pcf)	130						
	k above GWT (pci)	225	Poisson's Ratio	0.35	Shear Modulus (ksi)	18.5		
	k below GWT (pci)	125	Nominal Unit Skin Friction (psf)	1500	Torsional Shear Stress (psf)	1500		
Rock	Limestone (McVay)		Driven Pile (McVay)		Hyperbolic		Driven Pile (McVay)	
	Unconfined Compressive Strength q_u (psf)	360,000	Nominal Unit Skin Friction (psf)	30,000	Total Unit Weight γ (pcf)	160	Nominal Tip Resistance (kips)	150
					Shear Modulus (ksi)	400		
					Torsional Shear Stress (psf)	30,000		

[1] Parameters have been based on avaialble lab data and correlations to in-situ data.
[2] Torsional Shear Stress for cohensionless soils calculated as σ' tan 14°

Computations for	Tuttle Bridge Road Phase 2	Made By	AS	Date	5/27/2024
	Maine DOT	Checked By	MCK	Date	5/30/2024
	Subsurface Parameters	Back Checked By	AG	Date	6/6/2024

Job No. 4462.07

Substructure Location: Pier 3

Borings Referred: BB-C295-103

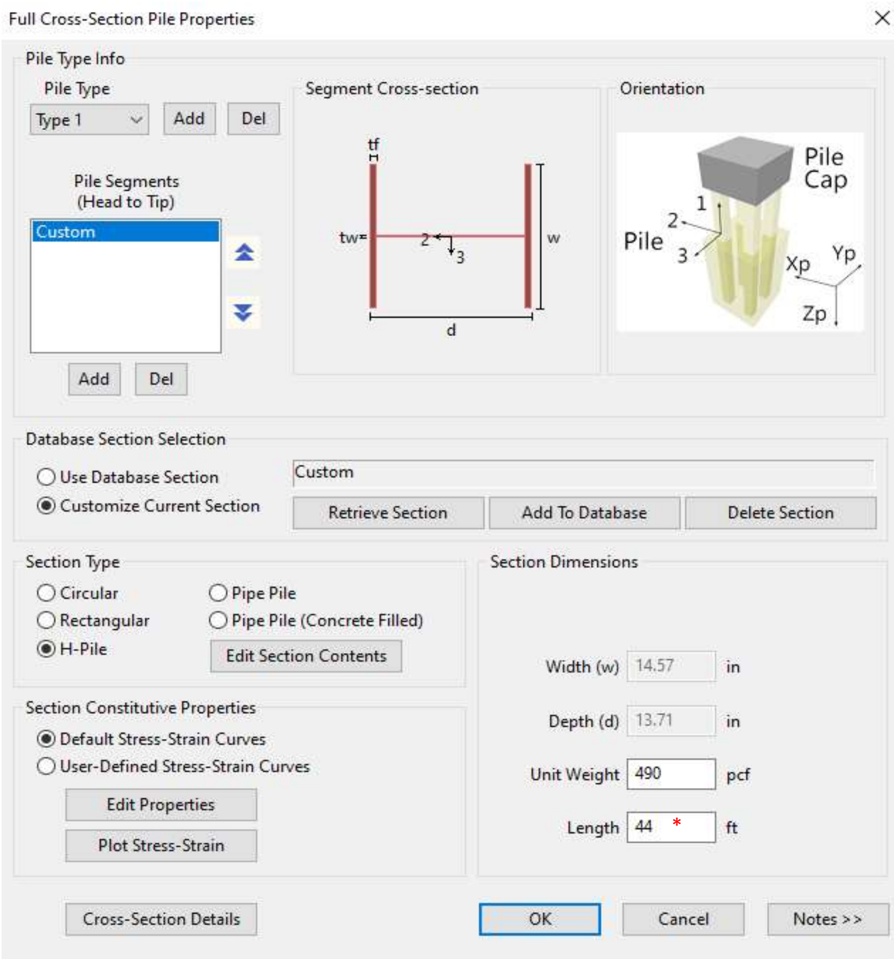
FB-MultiPier General Soil Properties for Driven Piles[1]

Layer	Lateral		Axial		Torsional		Tip	
Cohesionless Fill	Sand (Reese)		Driven Pile (McVay)		Hyperbolic		N/A	
	Internal Friction Angle ϕ (deg)	30	Shear Modulus (ksi)	5	Total Unit Weight γ (pcf)	115		
	Total Unit Weight γ (pcf)	115						
	k above GWT (pci)	51	Poisson's Ratio	0.25	Shear Modulus (ksi)	5.0		
	k below GWT (pci)	36	Nominal Unit Skin Friction (psf)	75	Torsional Shear Stress (psf)	75		
Stiff Cohesive Soil	Clay (Stiff with free water)		Driven Pile (McVay)		Hyperbolic			
	Total Unit Weight γ (pcf)	120	Shear Modulus (ksi)	4	Total Unit Weight γ (pcf)	120		
	Undrained Shear Strength (psf)	1200						
	Major Principal Strain @ 50%	0.01	Poisson's Ratio	0.45	Shear Modulus (ksi)	4.0		
			Nominal Unit Skin Friction (psf)	450	Torsional Shear Stress (psf)	450		
Medium Dense Cohesionless Soil	Sand (Reese)		Driven Pile (McVay)		Hyperbolic			
	Internal Friction Angle ϕ (deg)	30	Shear Modulus (ksi)	5	Total Unit Weight γ (pcf)	115		
	Total Unit Weight γ (pcf)	115						
	k above GWT (pci)	51	Poisson's Ratio	0.3	Shear Modulus (ksi)	5.0		
	k below GWT (pci)	36	Nominal Unit Skin Friction (psf)	300	Torsional Shear Stress (psf)	300		
Dense Cohesionless Soil	Sand (Reese)		Driven Pile (McVay)		Hyperbolic			
	Internal Friction Angle ϕ (deg)	34	Shear Modulus (ksi)	11.5	Total Unit Weight γ (pcf)	125		
	Total Unit Weight γ (pcf)	125						
	k above GWT (pci)	117	Poisson's Ratio	0.3	Shear Modulus (ksi)	11.5		
	k below GWT (pci)	73	Nominal Unit Skin Friction (psf)	600	Torsional Shear Stress (psf)	600		
Hard Cohesive Soil	Clay (Stiff with free water)		Driven Pile (McVay)		Hyperbolic			
	Total Unit Weight γ (pcf)	130	Shear Modulus (ksi)	6.4	Total Unit Weight γ (pcf)	130		
	Undrained Shear Strength (psf)	3000						
	Major Principal Strain @ 50%	0.005	Poisson's Ratio	0.5	Shear Modulus (ksi)	6.4		
			Nominal Unit Skin Friction (psf)	1000	Torsional Shear Stress (psf)	1000		
Very Dense Cohesionless Soil	Sand (Reese)		Driven Pile (McVay)		Hyperbolic			
	Internal Friction Angle ϕ (deg)	36	Shear Modulus (ksi)	15	Total Unit Weight γ (pcf)	130		
	Total Unit Weight γ (pcf)	130						
	k above GWT (pci)	171	Poisson's Ratio	0.35	Shear Modulus (ksi)	15.0		
	k below GWT (pci)	100	Nominal Unit Skin Friction (psf)	1250	Torsional Shear Stress (psf)	1250		
Rock	Limestone (McVay)		Driven Pile (McVay)		Hyperbolic		Driven Pile (McVay)	
	Unconfined Compressive Strength q_u (psf)	360,000	Nominal Unit Skin Friction (psf)	30,000	Total Unit Weight γ (pcf)	160	Nominal Tip Resistance (kips)	150
					Shear Modulus (ksi)	400		
					Torsional Shear Stress (psf)	30,000		

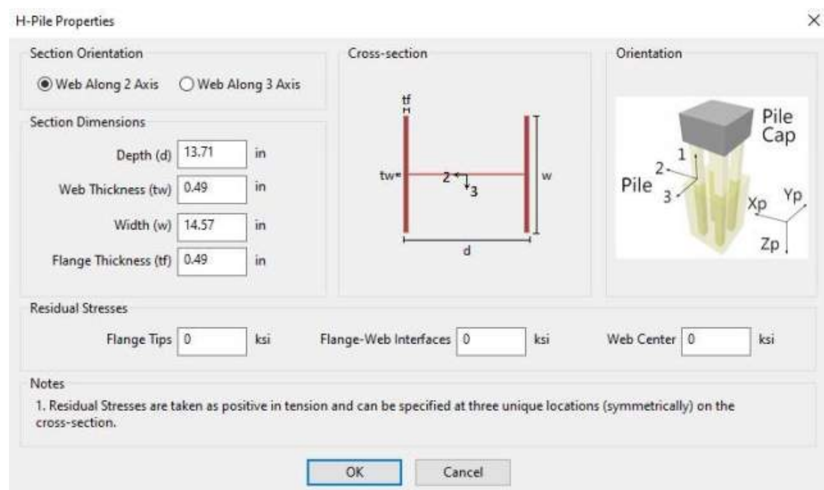
[1] Parameters have been based on avaialble lab data and correlations to in-situ data.

FB-MultiPier Input Overview

Graphics For	Tuttle Bridge Road Phase 2	Made By	AS	Date	9/9/2024	Job No.	4462.07
	Maine DOT	Checked By	MCK	Date	9/10/2024		
	HP14x89 Pile Properties in FB-Pier Modeling	Back Checked By	AG	Date	9/13/2024		

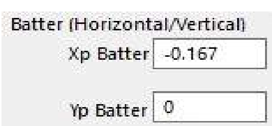


Substructure Location	Estimated Pile Length* (feet)
West Abutment	43
East Abutment	30
Pier 1	33
Pier 2	45
Pier 3	44



Pile Batter:

1/6=0.167



Note: Batter is negative (-) or positive (+) based on the orientation of specific pile. X axis is longitudinal direction. Pile batter direction is indicated on DWG Sheets 41 and 50.

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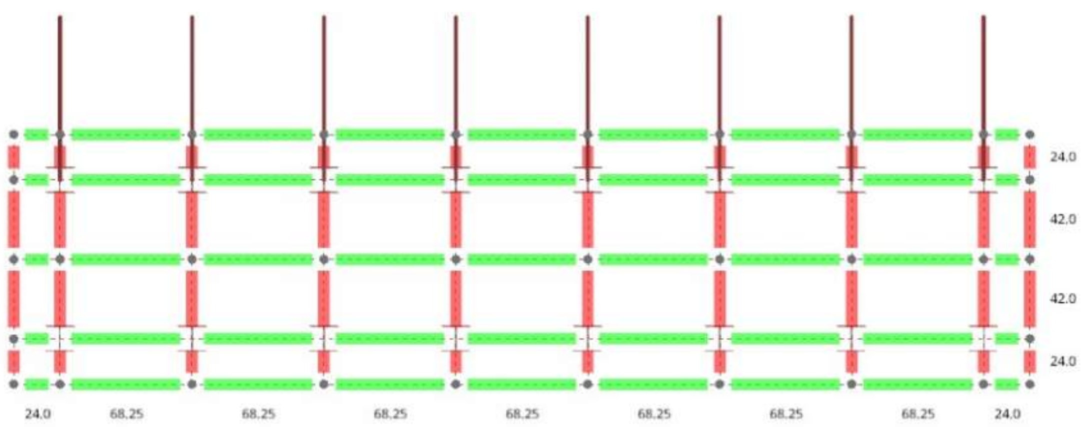
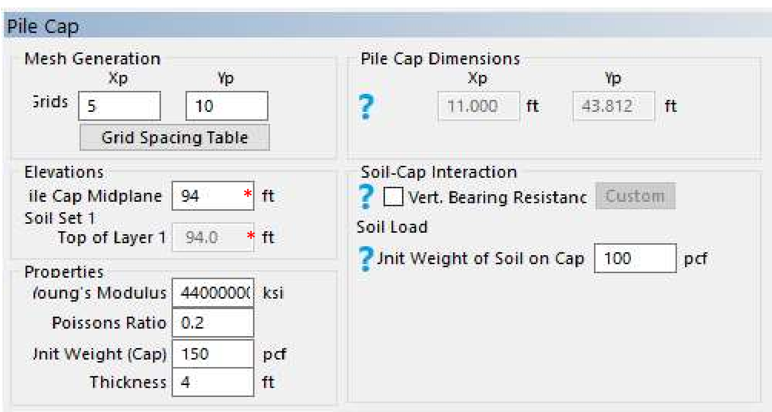
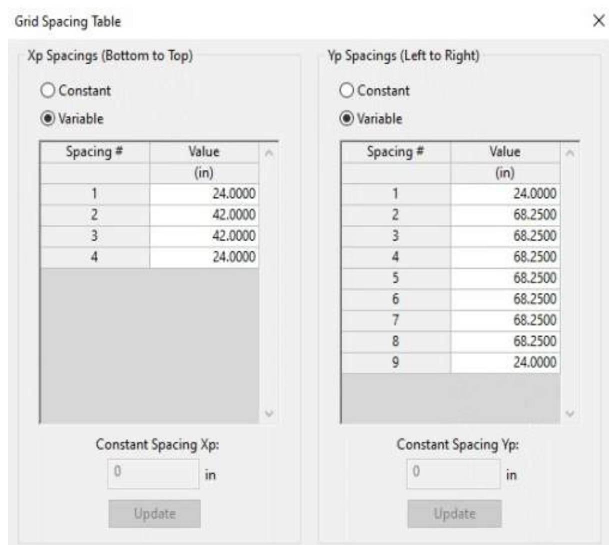
Graphics For	Tuttle Bridge Road Phase 2	Made By	AS	Date	9/9/2024	Job No.	4462.07
	Maine DOT	Checked By	MCK	Date	9/10/2024		
	Typical Foundation Configuration - Abutments	Back Checked By	AG	Date	9/13/2024		

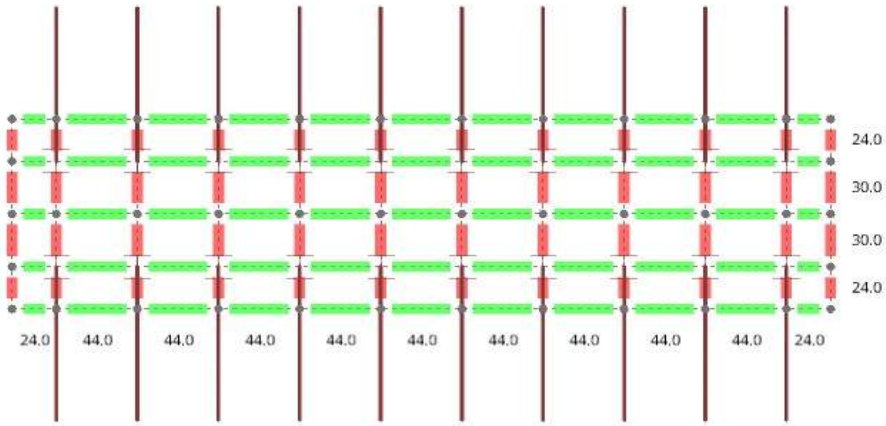


Substructure Location	Midplane Elevation *1 (ft)	Ground Elevation *2 (ft)
West Abutment	94	94
East Abutment	92	92

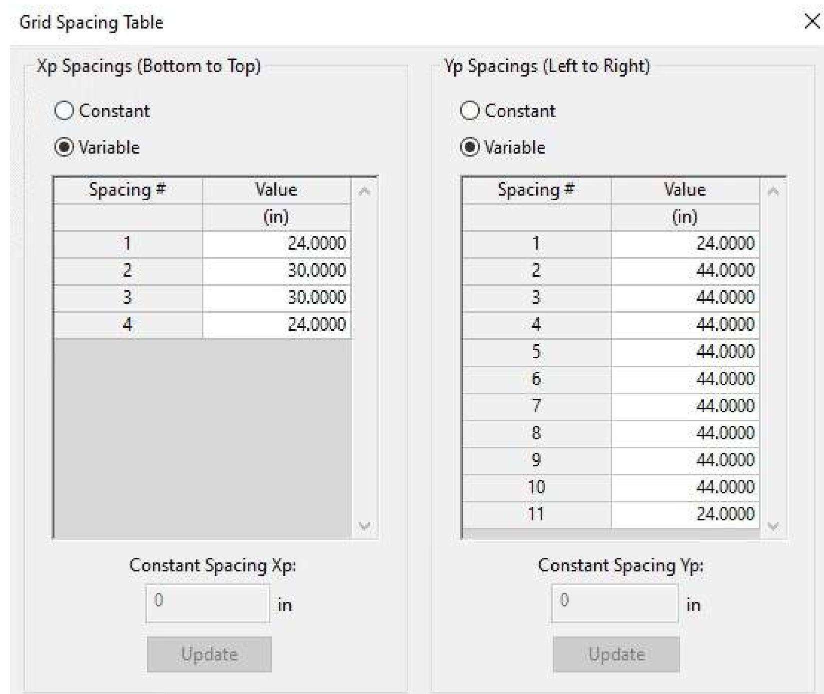


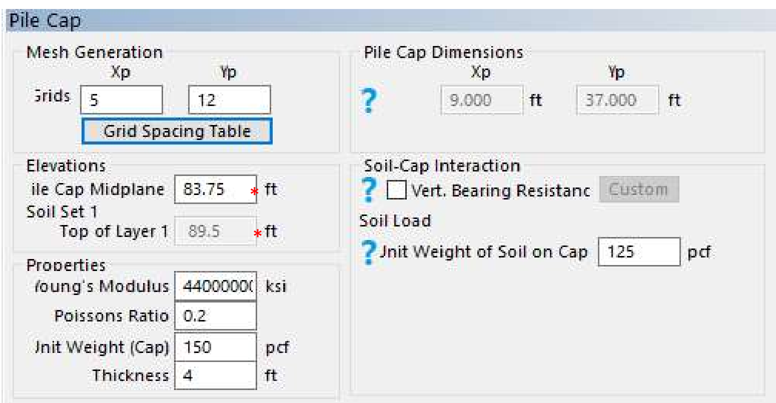


Graphics For	Tuttle Bridge Road Phase 2	Made By	AS	Date	9/9/2024	Job No.	4462.07
	Maine DOT	Checked By	MCK	Date	9/10/2024		
	Typical Foundation Configuration - Piers	Back Checked By	AG	Date	9/13/2024		



Substructure Location	Midplane Elevation *1 (ft)	Ground Elevation *2 (ft)
Pier 1	82.25	86.5
Pier 2	87.25	90.5
Pier 3	83.75	89.75





Loading

Abutment 1

Coordinates: z is the longitudinal axis/normal to face of substructure and x is the transverse axis/transverse to substructure

L = longitudinal
T= Transverse
V= Vertical
F = Force (kips)
M = Moment (k-ft)

	P	H_z	H_x	M_x	M_z	*Reference from Mathcad
	F_V	F_L	F_T	M_L	M_T	
Str I Construction (min)	0	0	0	0	0	(not applicable)
Str I Construction (max)	0	0	0	0	0	
Str Ia & Ib (min)	1869.3	619.2	40.5	5642.8	114.3	
Str Ia & Ib (max)	2452.6	619.2	97.3	5675.1	274.2	
Str III (min)	0	0	0	0	0	(not applicable)
Str III (max)	0	0	0	0	0	
Str IV (min)	0	0	0	0	0	(not applicable)
Str IV (max)	0	0	0	0	0	
Str V (min)	0	0	0	0	0	(not applicable)
Str V (max)	0	0	0	0	0	
Ser I (min)	0	0	0	0	0	
Ser I (max)	1809	401.9	115.4	3588.5	434.5	
Ext I	1662.5	834.9	73.3	5810.9	1392.9	

UPDATES ON 8/23/2024
UPDATES ON 9/18/2024

Computations For	Tuttle Road	**Made By**	F. Fischer	**Date**	5/6/2024	**Job No.**	4462.07
		Checked By	R. Frein	**Date**	5/6/2024	**Client No.**	25161
Abutment Loads		**Back Checked By**	F. Fischer	**Date**	5/6/2024	**Sheet No.**	

Abutment 2

Coordinates: z is the longitudinal axis/normal to face of substructure and x is the transverse axis/transverse to substructure

L = longitudinal
T= Transverse
V= Vertical
F = Force (kips)
M = Moment (k-ft)

	P	H_z	H_x	M_x	M_z	*Reference from Mathcad
	F_V	F_L	F_T	M_L	M_T	
Str I Construction (min)	0	0	0	0	0	(not applicable)
Str I Construction (max)	0	0	0	0	0	
Str Ia & Ib (min)	1821.3	610.8	40.5	5507.9	112.3	
Str Ia & Ib (max)	2386.5	610.8	97.3	5527	269.5	
Str III (min)	0	0	0	0	0	(not applicable)
Str III (max)	0	0	0	0	0	
Str IV (min)	0	0	0	0	0	(not applicable)
Str IV (max)	0	0	0	0	0	
Str V (min)	0	0	0	0	0	(not applicable)
Str V (max)	0	0	0	0	0	
Ser I (min)	0	0	0	0	0	
Ser I (max)	1759.8	396.3	115.4	3487.8	426.5	
Ext I	1615.8	808.2	72	5559.2	1356.1	

UPDATES ON 8/23/2024
UPDATES ON 9/18/2024

Computations For	Tuttle Road	Made By	F. Fischer	Date	5/6/2024	Job No.	4462.07
		Checked By	R. Frein	Date	5/6/2024	Client No.	25161
Pier Loads		Back Checked By	F. Fischer	Date	5/6/2024	Sheet No.	

Pier 1 (Applies to Pier 2 as well)

Coordinates: z is the longitudinal axis/normal to face of substructure and x is the transverse axis/transverse to substructure

L = longitudinal
T= Transverse
V= Vertical
F = Force (kips)
M = Moment (k-ft)

	P	H_z	H_x	M_x	M_z
	F_V	F_L	F_T	M_L	M_T
Str I Construction (min)	1227.2	0	0	0	0
Str I Construction (max)	1227.2	0	0	0	0
Str Ia & Ib (min)	2930.8	26	97	2610	699.4
Str Ia & Ib (max)	3920.7	62.4	232.9	6264	1678.4
Str III (min)	2221.7	97.7	186.5	3422.8	3049.5
Str III (max)	3211.7	134.1	322.3	7076.8	4028.6
Str IV (min)	2221.7	26	97	2610	699.4
Str IV (max)	3211.7	62.4	232.9	6264	1678.4
Str V (min)	2768.7	57.8	114.4	3339.2	841.4
Str V (max)	3758.7	94.2	250.2	6993.2	1820.5
Ser I (min)	2932.3	77.3	210.9	5876.5	1532.7
Ser I (max)	2932.3	87.7	249.8	6919.6	1812.4
Ext I	2932.3	0	437	0	11755.1

*Reference from Mathcad

UPDATES ON 8/23/2024
UPDATES ON 9/18/2024

Computations For	Tuttle Road	Made By	F. Fischer	Date	5/6/2024	Job No.	4462.07
		Checked By	R. Frein	Date	5/6/2024	Client No.	25161
Pier Loads		Back Checked By	F. Fischer	Date	5/6/2024	Sheet No.	

Pier 3

Coordinates: z is the longitudinal axis/normal to face of substructure and x is the transverse axis/transverse to substructure

L = longitudinal
T= Transverse
V= Vertical
F = Force (kips)
M = Moment (k-ft)

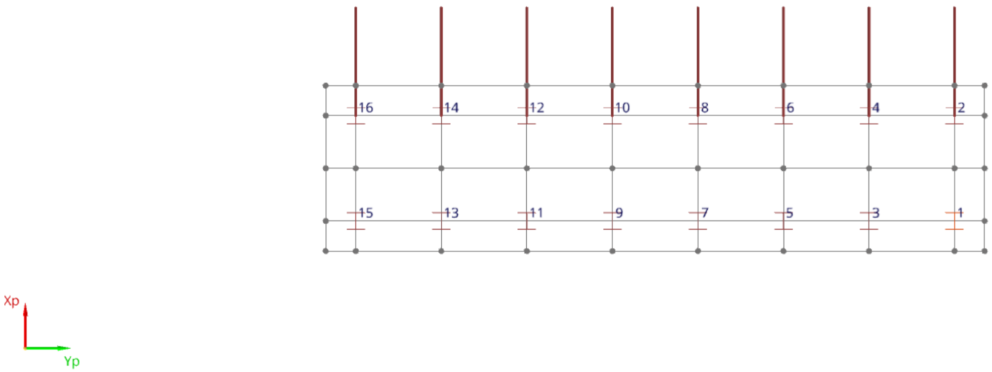
*Reference from Mathcad

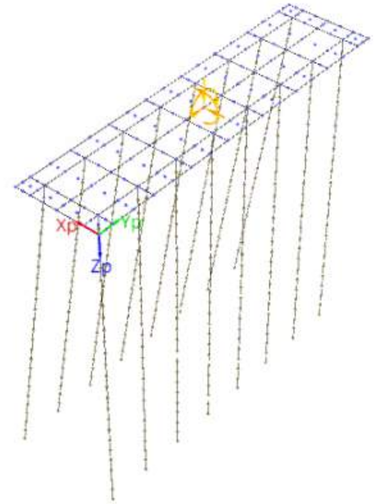
	P	H_z	H_x	M_x	M_z
	F_V	F_L	F_T	M_L	M_T
Str I Construction (min)	1260.6	0	0	0	0
Str I Construction (max)	1260.6	0	0	0	0
Str Ia & Ib (min)	2681.9	46.4	173.1	4970.3	1331.8
Str Ia & Ib (max)	3569.6	82.8	308.9	8140.7	2181.3
Str III (min)	2014.8	88	193.9	2860.3	2828.3
Str III (max)	2902.5	124.4	329.8	6030.7	3677.8
Str IV (min)	2014.8	26	97	2264.6	606.8
Str IV (max)	2902.5	62.4	232.9	5435	1456.3
Str V (min)	2529.4	89.3	204.3	5006.3	2413.3
Str V (max)	3417.1	125.7	340.2	8176.6	3262.8
Ser I (min)	2668.3	105.6	279	6675.8	2711.3
Ser I (max)	2668.3	116	317.8	7581.7	2954.1
Ext I	2668.3	300	367.3	7002	8572.8

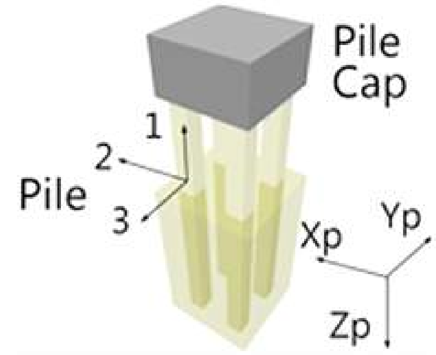
UPDATES ON 8/23/2024
UPDATES ON 9/18/2024

Results

Abutment 1 (West)







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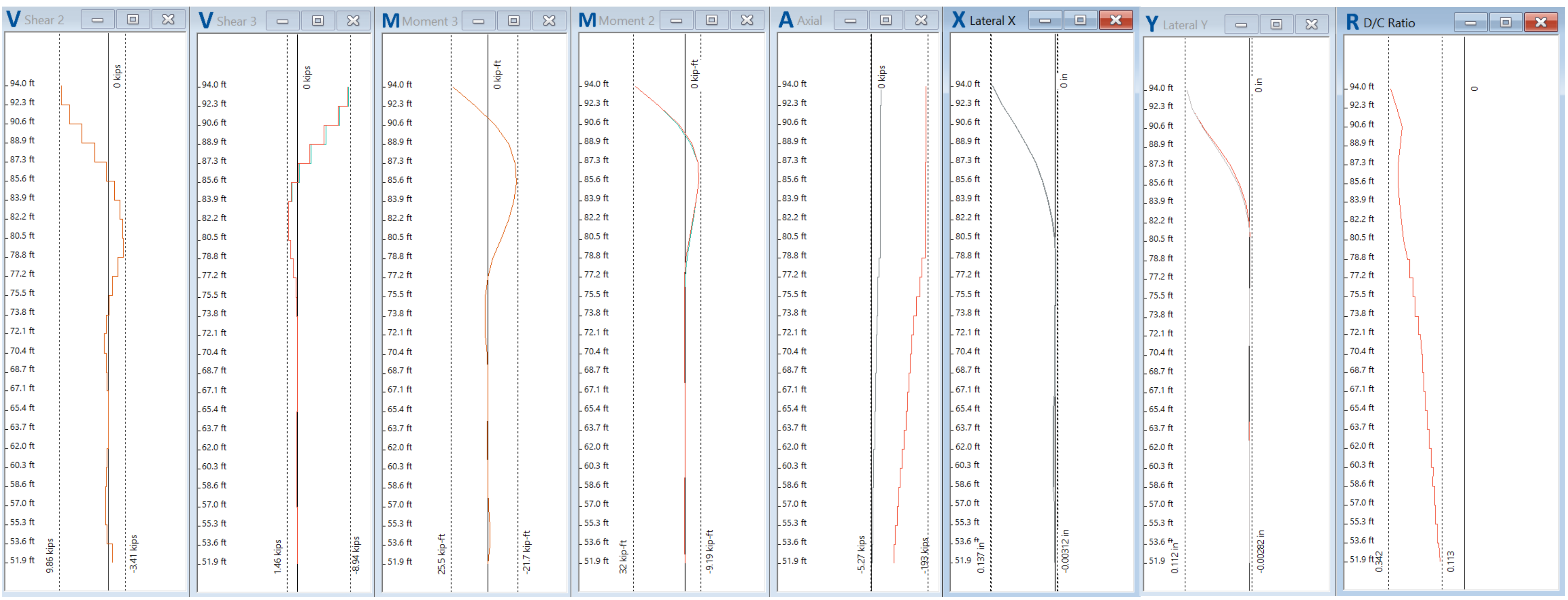

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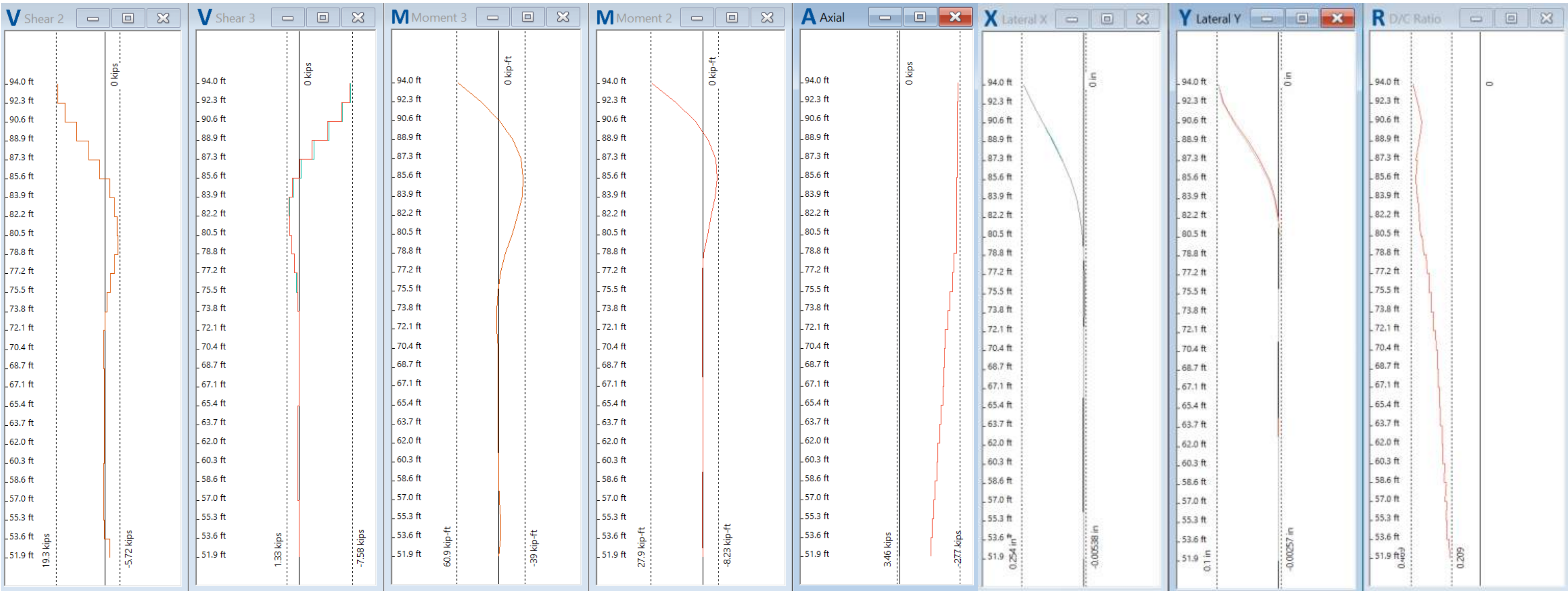
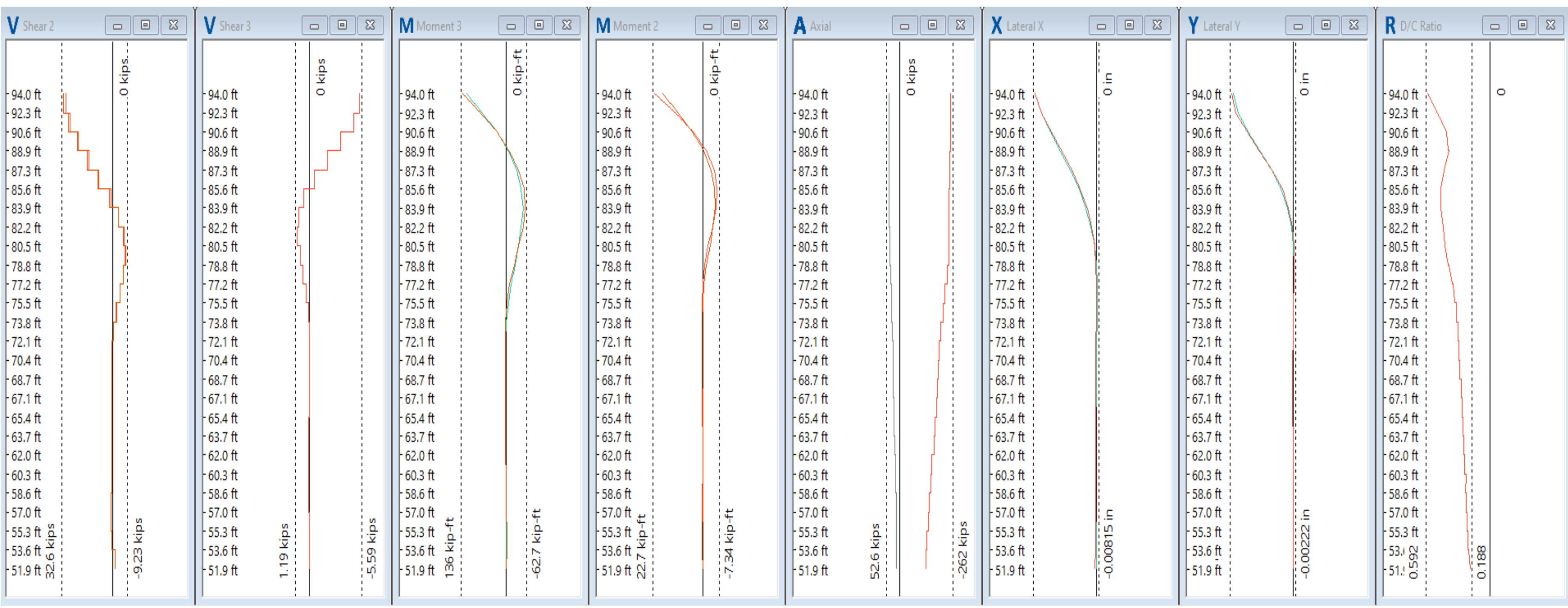


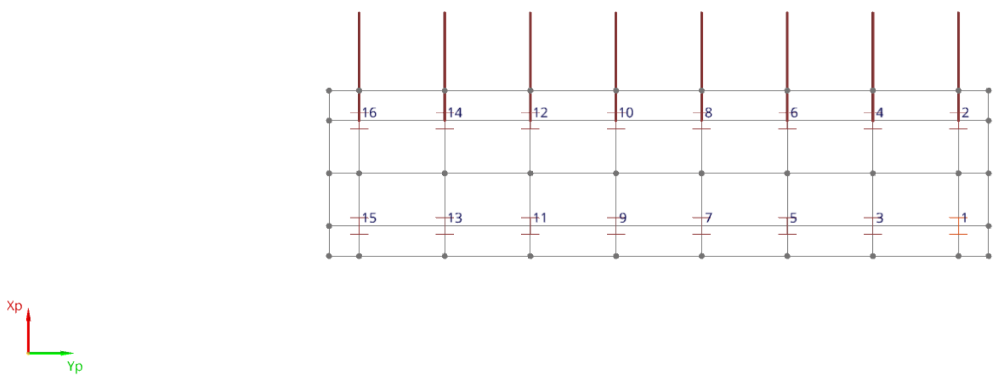
V Shear 2
V Shear 3
M Moment 3
M Moment 2
A Axial
X Lateral X
Y Lateral Y
R D/C Ratio
94.0 ft
92.3 ft
90.6 ft
88.9 ft
87.3 ft
85.6 ft
83.9 ft
82.2 ft
80.5 ft
78.8 ft
77.2 ft
75.5 ft
73.8 ft
72.1 ft
70.4 ft
68.7 ft
67.1 ft
65.4 ft
63.7 ft
62.0 ft
60.3 ft
58.6 ft
57.0 ft
55.3 ft
53.6 ft
51.9 ft
0 kips
19.3 kips
-5.72 kips
1.33 kips
-7.58 kips
0 kip-ft
60.9 kip-ft
-39 kip-ft
27.9 kip-ft
-8.23 kip-ft
3.46 kips
-277 kips
0 in
0.254 in
-0.00538 in
0.1 in
-0.00257 in
0
0.209

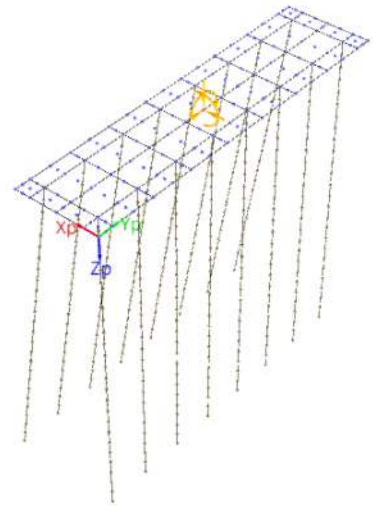
EXT:

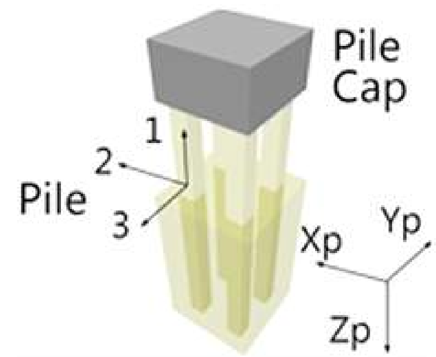


V Shear 2
V Shear 3
M Moment 3
M Moment 2
A Axial
X Lateral X
Y Lateral Y
R D/C Ratio
94.0 ft
92.3 ft
90.6 ft
88.9 ft
87.3 ft
85.6 ft
83.9 ft
82.2 ft
80.5 ft
78.8 ft
77.2 ft
75.5 ft
73.8 ft
72.1 ft
70.4 ft
68.7 ft
67.1 ft
65.4 ft
63.7 ft
62.0 ft
60.3 ft
58.6 ft
57.0 ft
55.3 ft
53.6 ft
51.9 ft
0 kips
32.6 kips
-9.23 kips
1.19 kips
-5.59 kips
0 kip-ft
136 kip-ft
-62.7 kip-ft
22.7 kip-ft
-7.34 kip-ft
52.6 kips
-262 kips
0 in
-0.00815 in
-0.00222 in
0
0.592
0.188

Abutment 2 (East)







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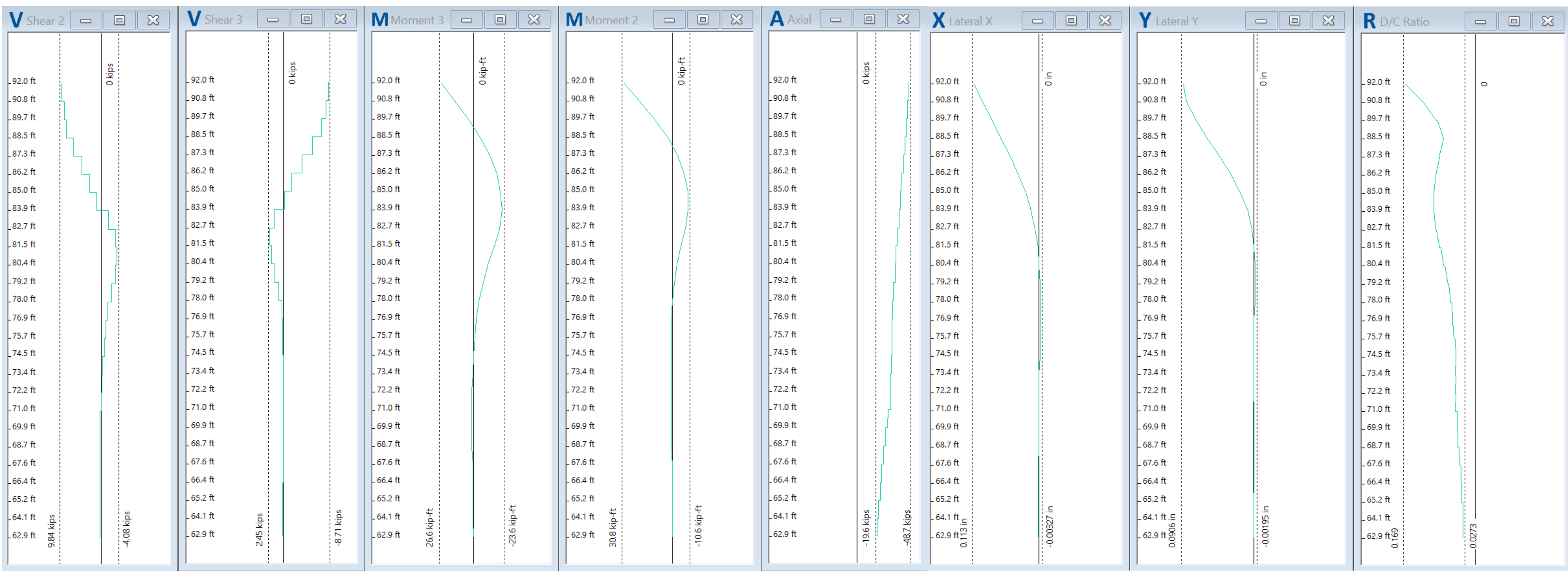

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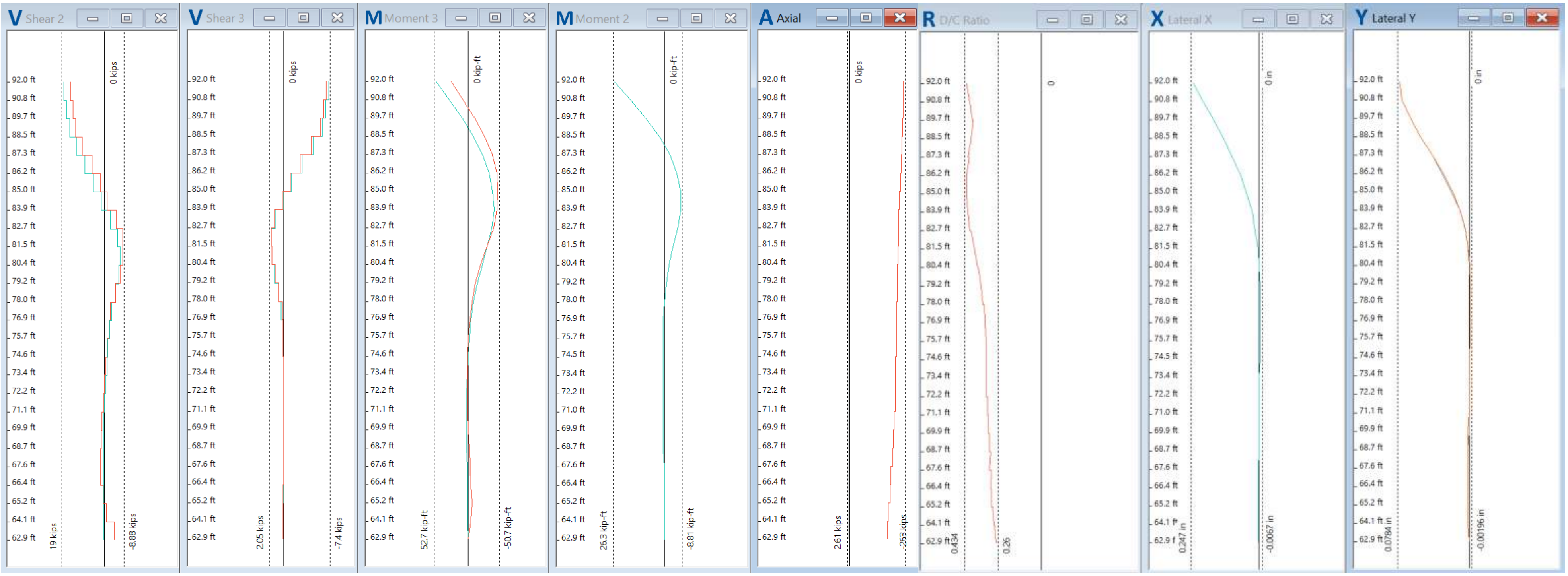
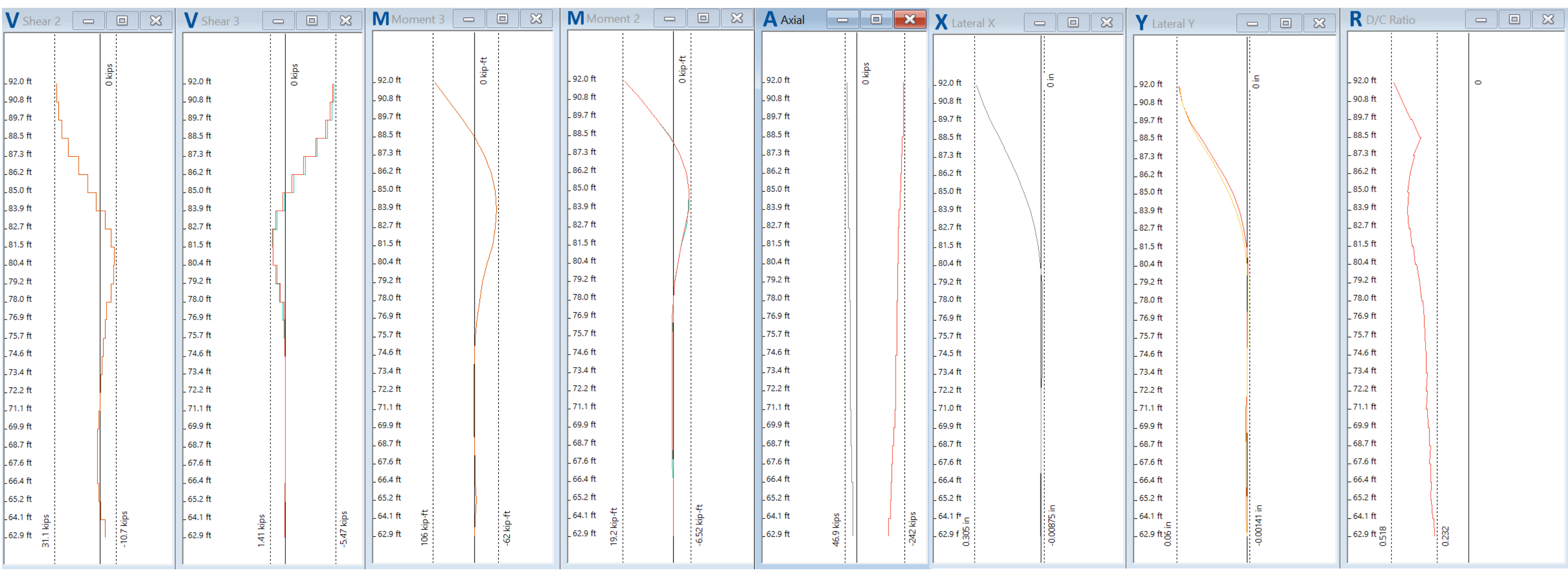


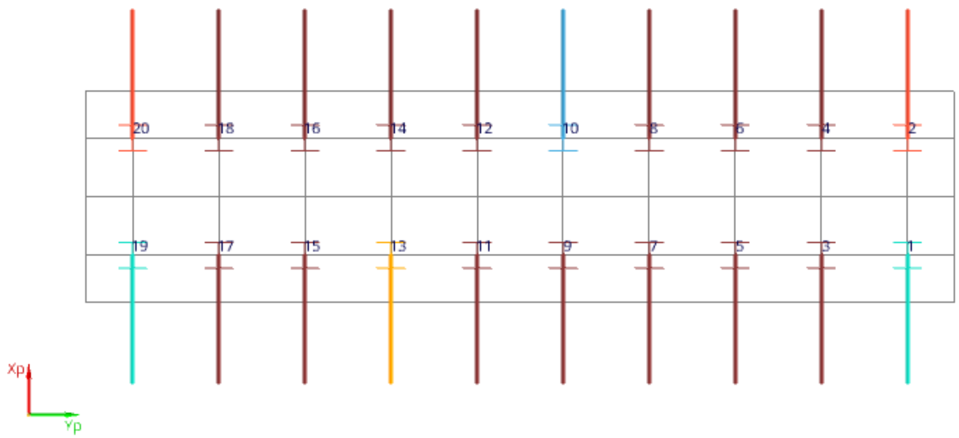
V Shear 2
19 kips
0 kips
-8.88 kips
V Shear 3
2.05 kips
0 kips
-7.4 kips
M Moment 3
52.7 kip-ft
0 kip-ft
-50.7 kip-ft
M Moment 2
26.3 kip-ft
0 kip-ft
-8.81 kip-ft
A Axial
2.61 kips
0 kips
-263 kips
R D/C Ratio
0.434
0.26
0
X Lateral X
0.247 in
0 in
-0.0067 in
Y Lateral Y
0.0784 in
0 in
-0.00196 in
92.0 ft
62.9 ft

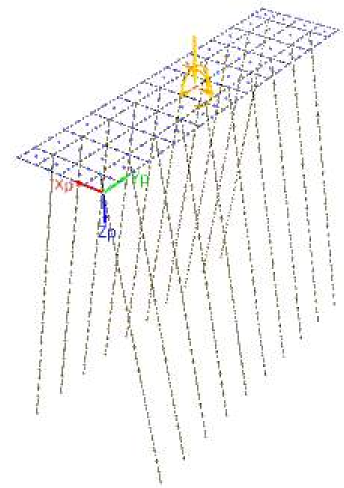
EXT:

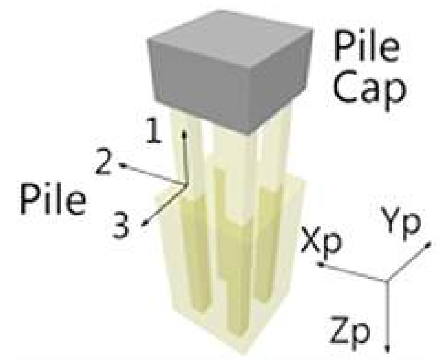


V Shear 2
31.1 kips
0 kips
-10.7 kips
V Shear 3
1.41 kips
0 kips
-5.47 kips
M Moment 3
106 kip-ft
0 kip-ft
-62 kip-ft
M Moment 2
19.2 kip-ft
0 kip-ft
-6.52 kip-ft
A Axial
46.9 kips
0 kips
-242 kips
X Lateral X
0.305 in
0 in
-0.00875 in
Y Lateral Y
0.06 in
0 in
-0.00141 in
R D/C Ratio
0.518
0.232
0
92.0 ft
62.9 ft

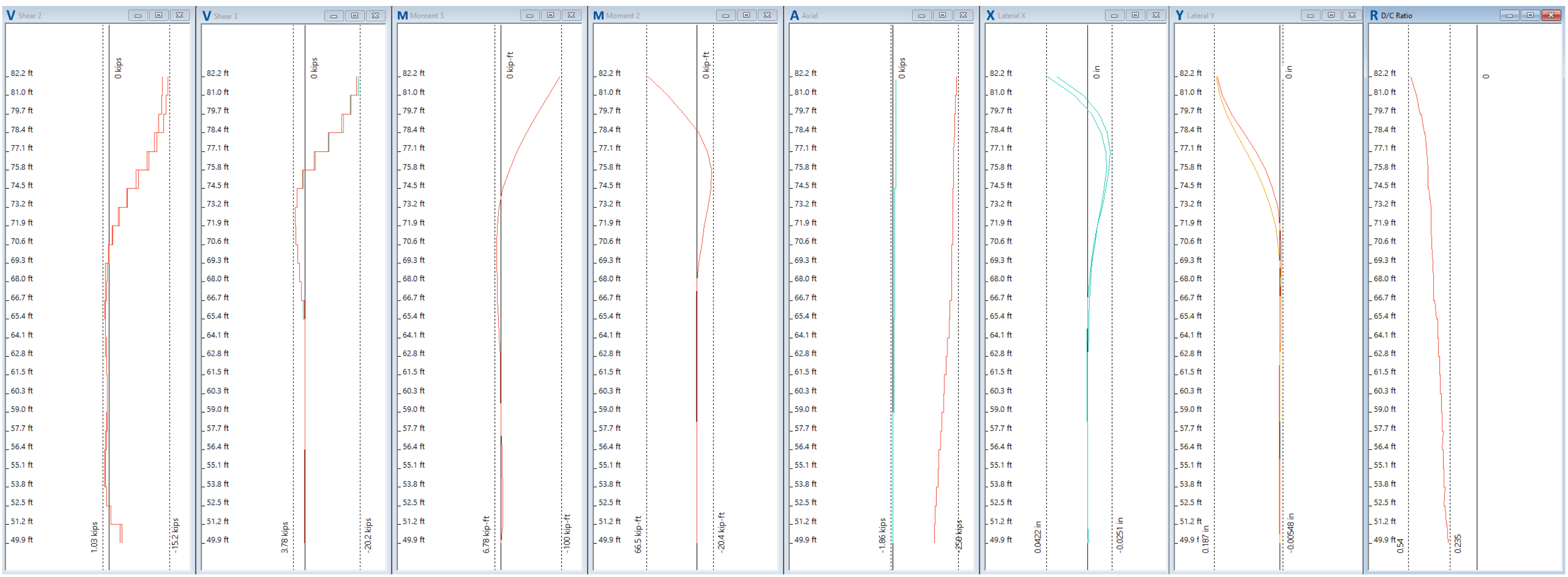
Pier 1


20
18
16
14
12
10
8
6
4
2
19
17
15
13
11
9
7
5
3
1
Xp
Yp

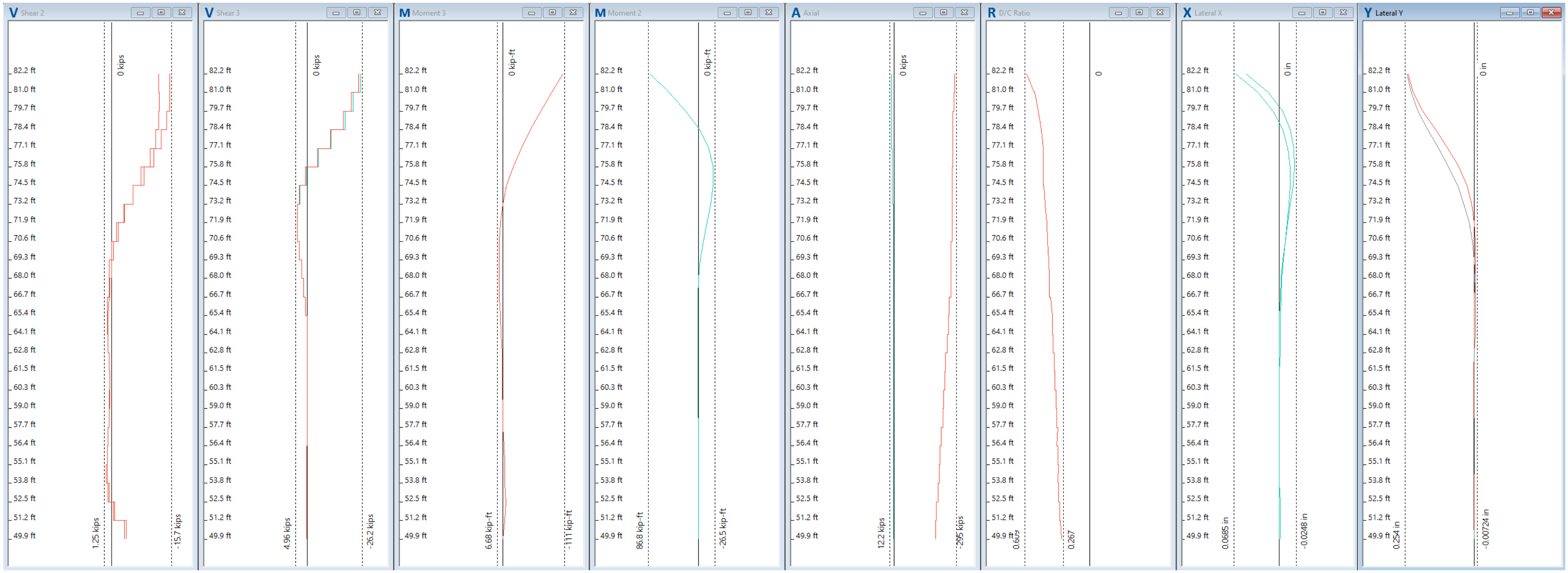

Xp
Yp
Zp


Pile Cap
Pile
1
2
3
Xp
Yp
Zp

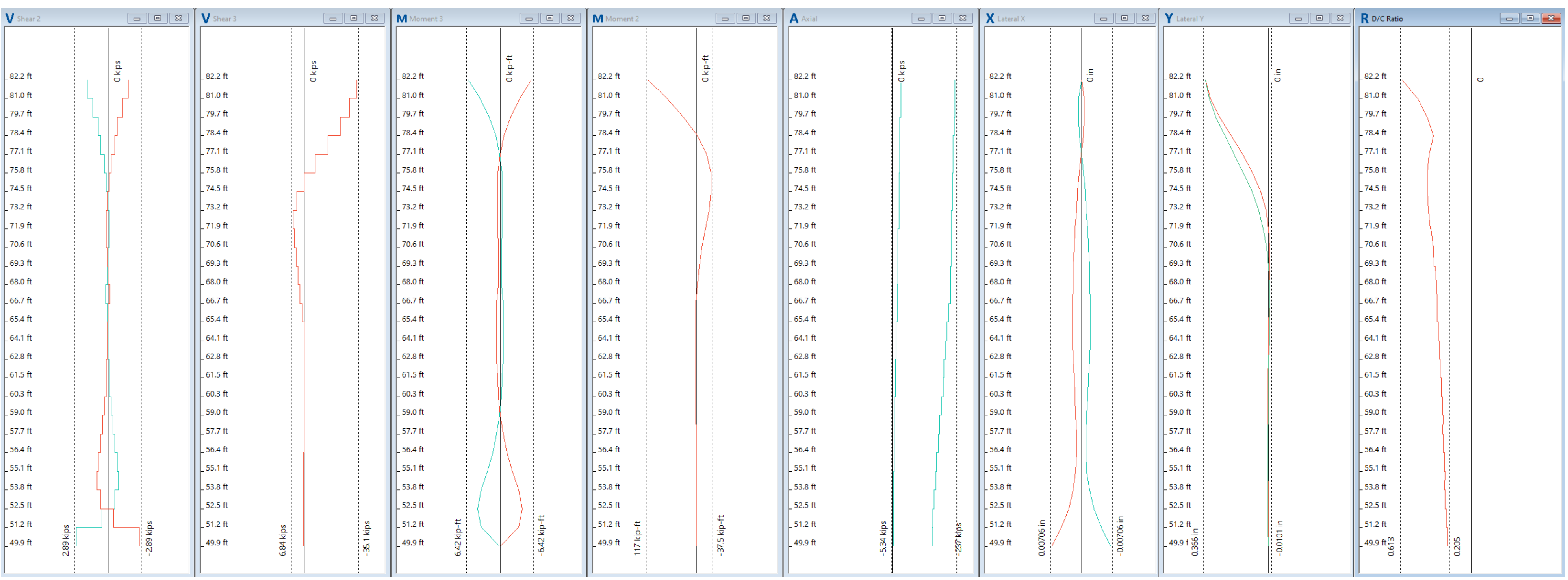
SER:


Shear 2
Shear 3
Moment 3
Moment 2
Axial
Lateral X
Lateral Y
D/C Ratio
82.2 ft
81.0 ft
79.7 ft
78.4 ft
77.1 ft
75.8 ft
74.5 ft
73.2 ft
71.9 ft
70.6 ft
69.3 ft
68.0 ft
66.7 ft
65.4 ft
64.1 ft
62.8 ft
61.5 ft
60.3 ft
59.0 ft
57.7 ft
56.4 ft
55.1 ft
53.8 ft
52.5 ft
51.2 ft
49.9 ft
0 kips
1.03 kips
-15.2 kips
3.78 kips
-20.2 kips
0 kip-ft
6.78 kip-ft
-100 kip-ft
66.5 kip-ft
-20.4 kip-ft
-1.86 kips
-259 kips
0 in
0.0422 in
-0.0251 in
0.187 in
-0.00548 in
0
0.54
0.235

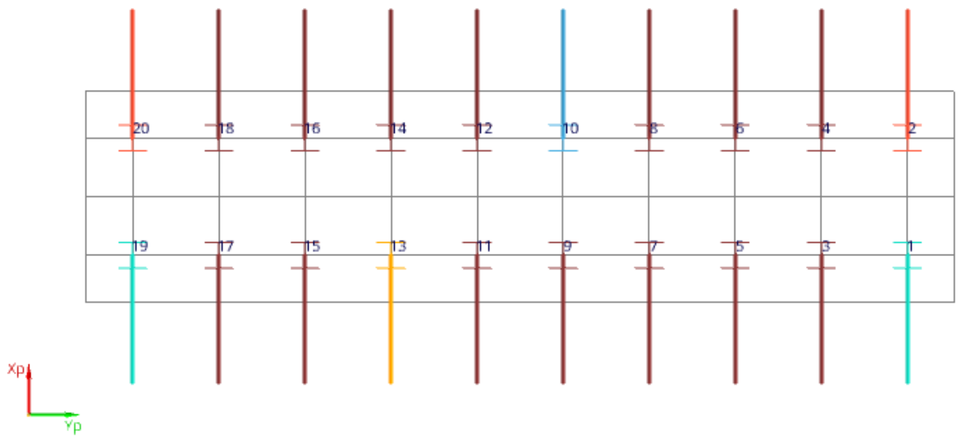
STR:


V Shear 2
1.25 kips
0 kips
-15.7 kips
V Shear 3
4.96 kips
0 kips
-26.2 kips
M Moment 3
6.68 kip-ft
0 kip-ft
-111 kip-ft
M Moment 2
86.8 kip-ft
0 kip-ft
-26.5 kip-ft
A Axial
12.2 kips
0 kips
-295 kips
R D/C Ratio
0
0.267
X Lateral X
0.0685 in
0 in
-0.0248 in
Y Lateral Y
0.254 in
0 in
-0.00724 in
82.2 ft
81.0 ft
79.7 ft
78.4 ft
77.1 ft
75.8 ft
74.5 ft
73.2 ft
71.9 ft
70.6 ft
69.3 ft
68.0 ft
66.7 ft
65.4 ft
64.1 ft
62.8 ft
61.5 ft
60.3 ft
59.0 ft
57.7 ft
56.4 ft
55.1 ft
53.8 ft
52.5 ft
51.2 ft
49.9 ft

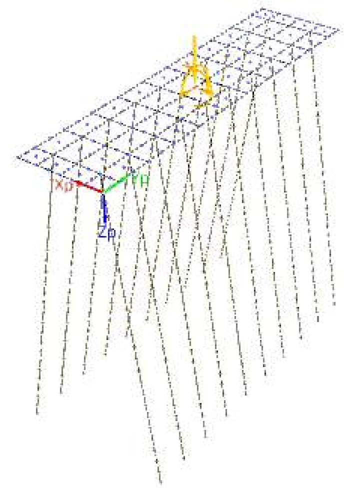
EXT:


V Shear 2
2.89 kips
0 kips
-2.89 kips
V Shear 3
6.84 kips
0 kips
-35.1 kips
M Moment 3
6.42 kip-ft
0 kip-ft
-6.42 kip-ft
M Moment 2
117 kip-ft
0 kip-ft
-37.5 kip-ft
A Axial
-5.34 kips
0 kips
-297 kips
X Lateral X
0.00706 in
0 in
-0.00706 in
Y Lateral Y
0.366 in
0 in
-0.0101 in
R D/C Ratio
0.613
0.205
0
82.2 ft
81.0 ft
79.7 ft
78.4 ft
77.1 ft
75.8 ft
74.5 ft
73.2 ft
71.9 ft
70.6 ft
69.3 ft
68.0 ft
66.7 ft
65.4 ft
64.1 ft
62.8 ft
61.5 ft
60.3 ft
59.0 ft
57.7 ft
56.4 ft
55.1 ft
53.8 ft
52.5 ft
51.2 ft
49.9 ft

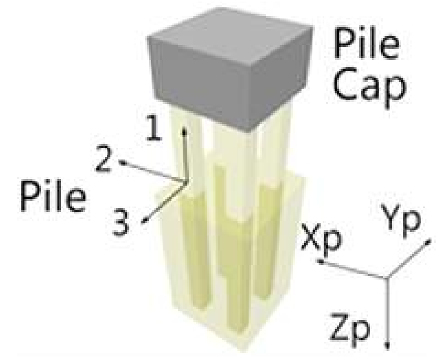
Pier 2



20
18
16
14
12
10
8
6
4
2
19
17
15
13
11
9
7
5
3
1
Xp
Yp

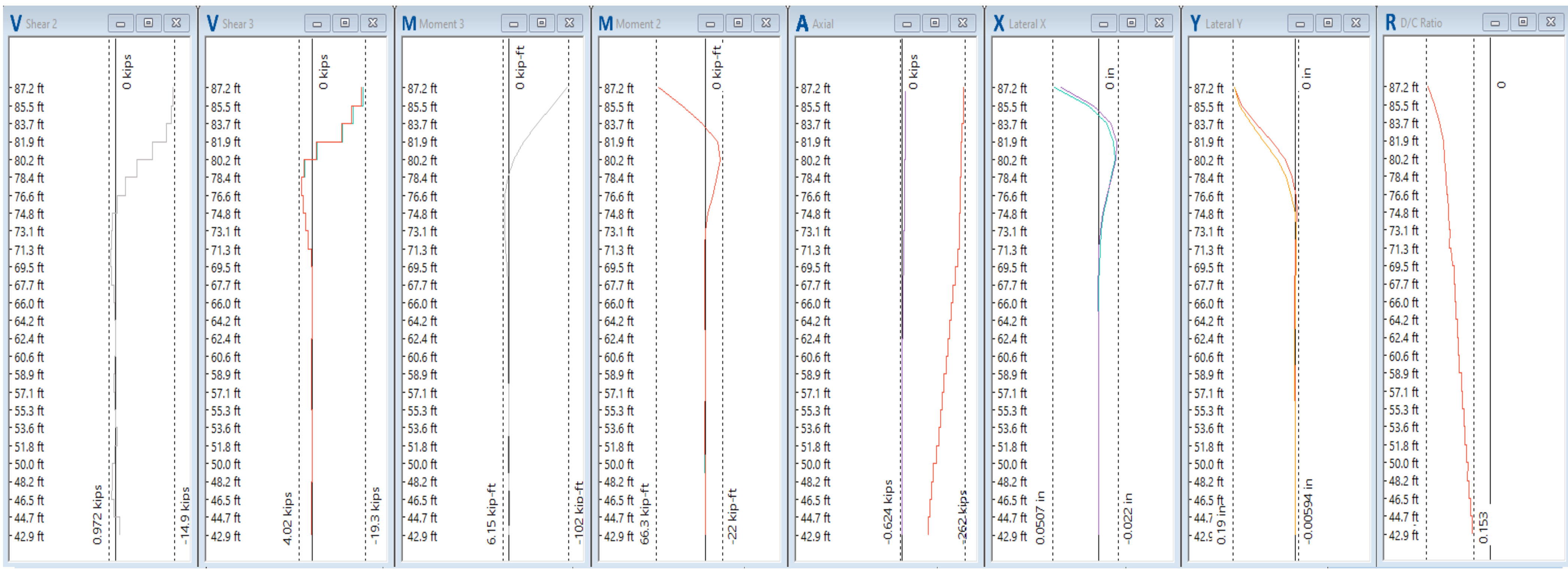


Xp
Yp
Zp



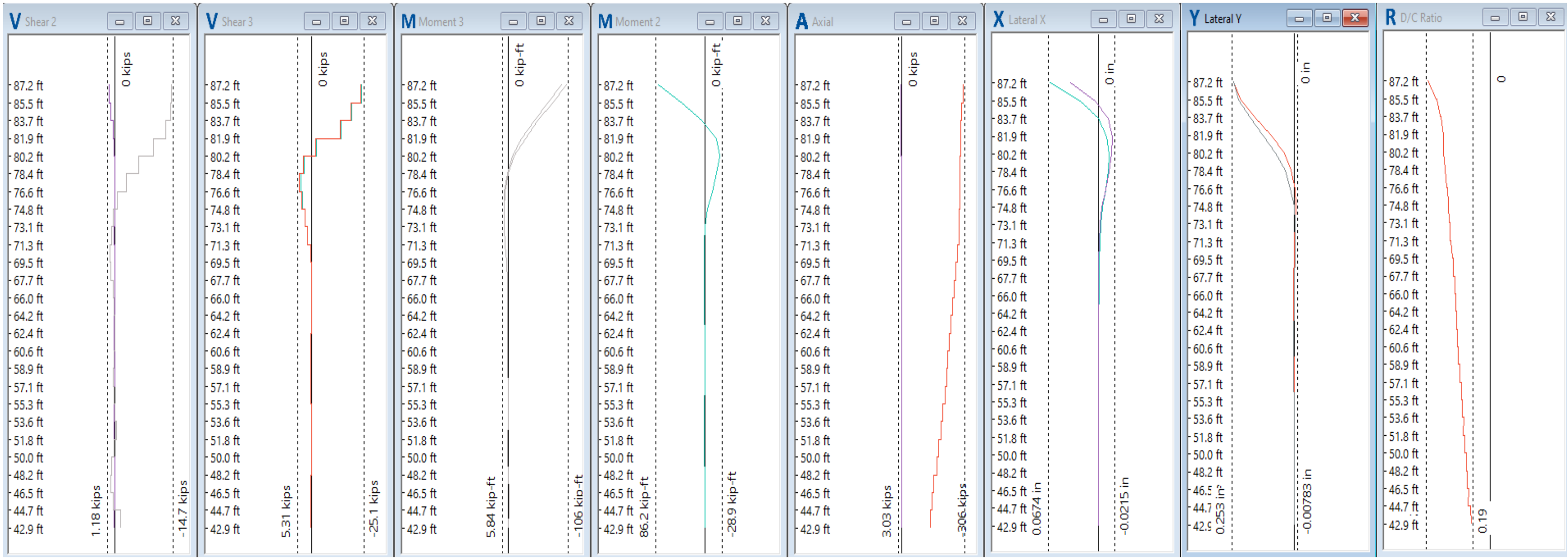
Pile Cap
1
2
3
Pile
Xp
Yp
Zp

SER:



V Shear 2
0 kips
0.972 kips
-14.9 kips
V Shear 3
0 kips
4.02 kips
-19.3 kips
M Moment 3
0 kip-ft
6.15 kip-ft
-102 kip-ft
M Moment 2
0 kip-ft
66.3 kip-ft
-22 kip-ft
A Axial
0 kips
-0.624 kips
-262 kips
X Lateral X
0 in
0.0507 in
-0.022 in
Y Lateral Y
0 in
0.19 in
-0.00594 in
R D/C Ratio
0
0.153
87.2 ft
85.5 ft
83.7 ft
81.9 ft
80.2 ft
78.4 ft
76.6 ft
74.8 ft
73.1 ft
71.3 ft
69.5 ft
67.7 ft
66.0 ft
64.2 ft
62.4 ft
60.6 ft
58.9 ft
57.1 ft
55.3 ft
53.6 ft
51.8 ft
50.0 ft
48.2 ft
46.5 ft
44.7 ft
42.9 ft

STR:



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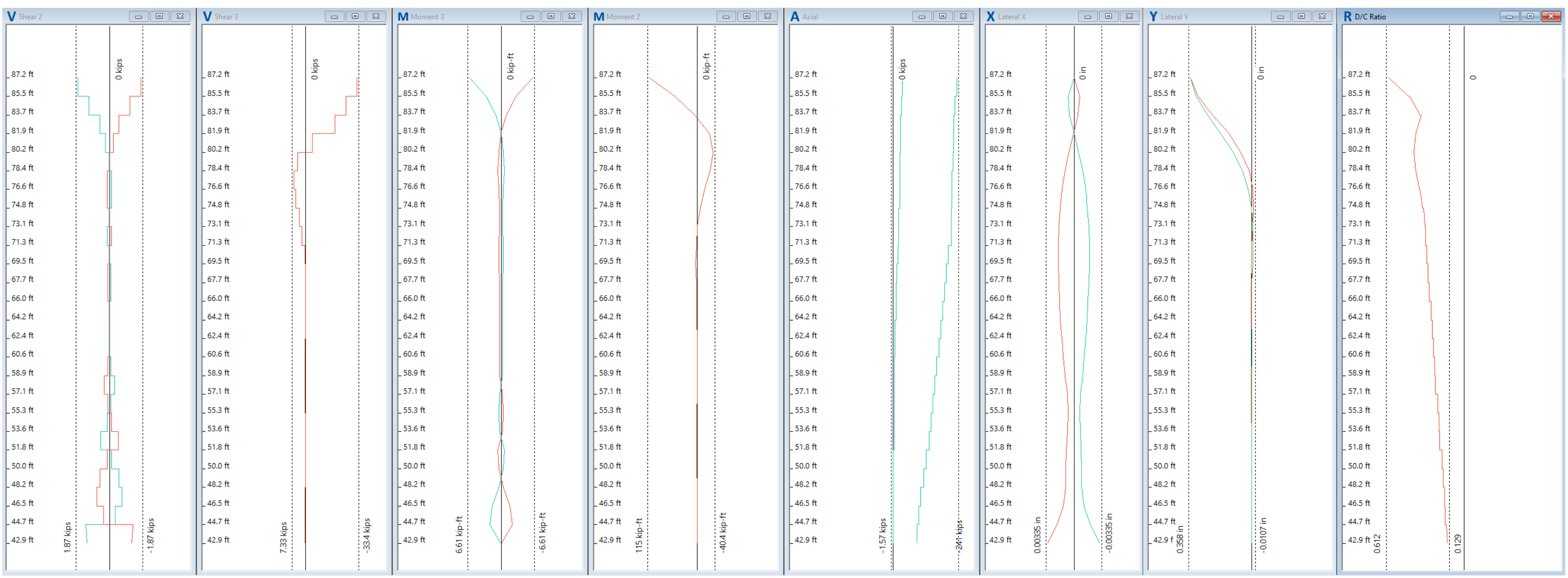
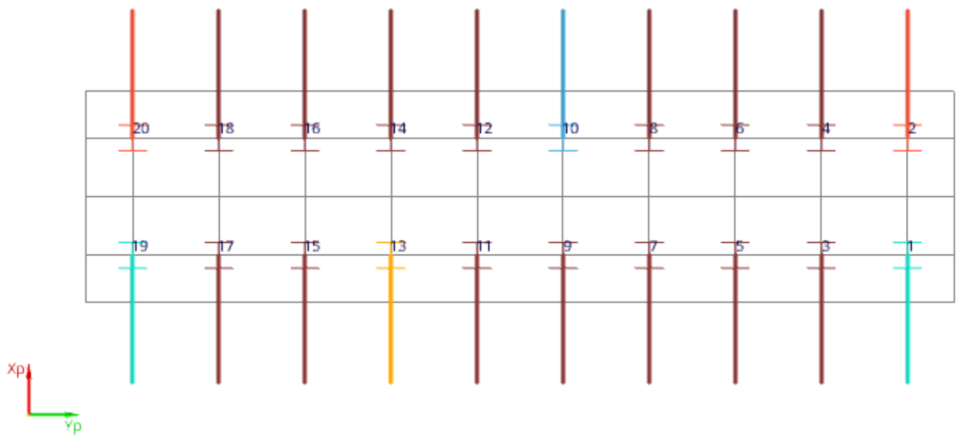
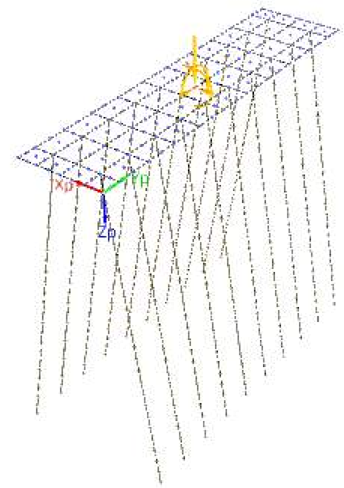
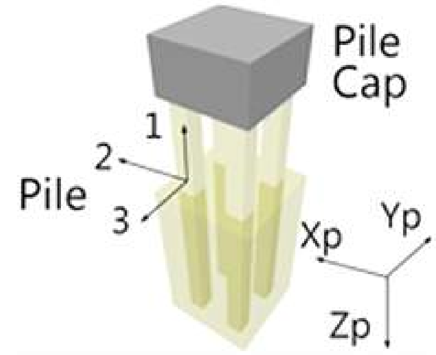


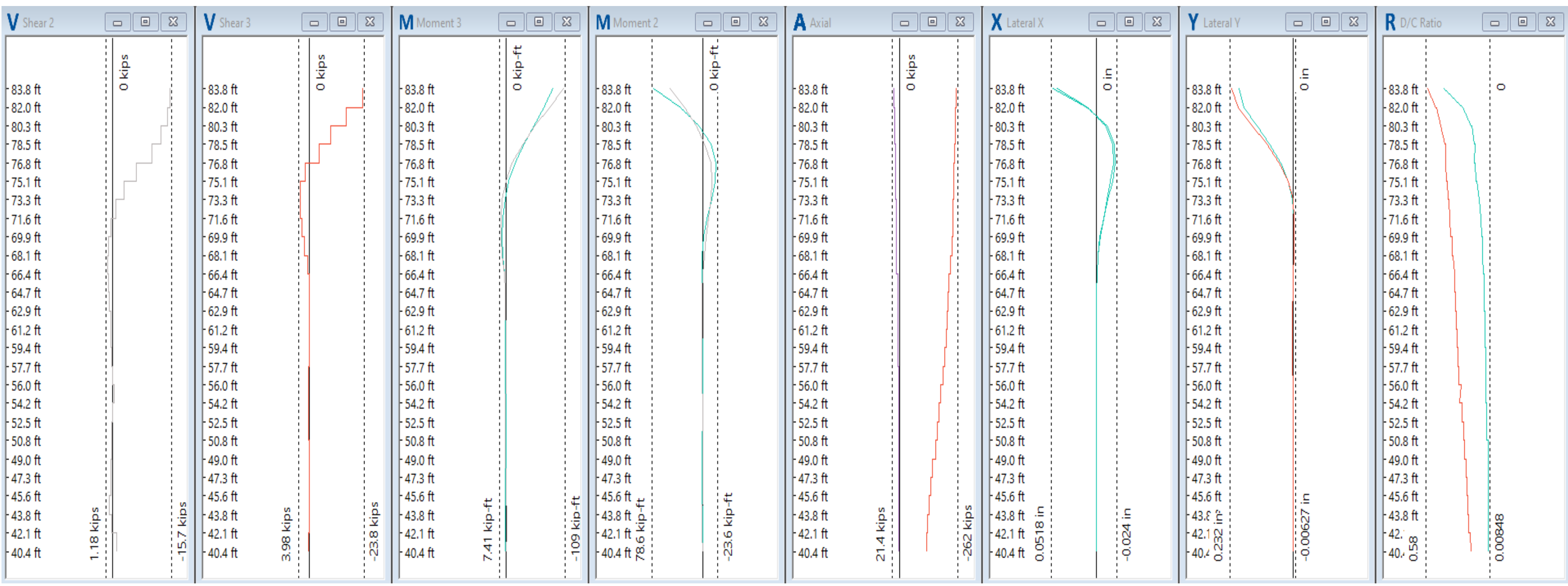
Pier 3


20
18
16
14
12
10
8
6
4
2
19
17
15
13
11
9
7
5
3
1
Xp
Yp

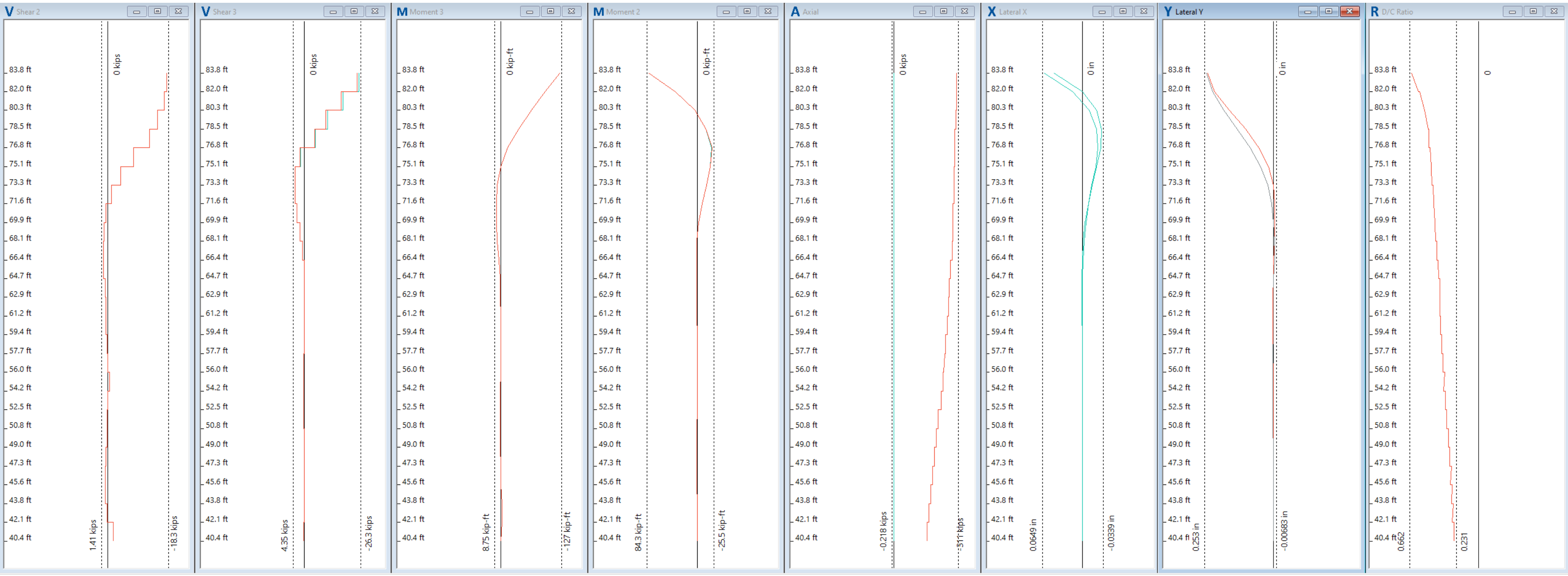



Pile Cap
1
2
Pile
3
Xp
Yp
Zp

SER:

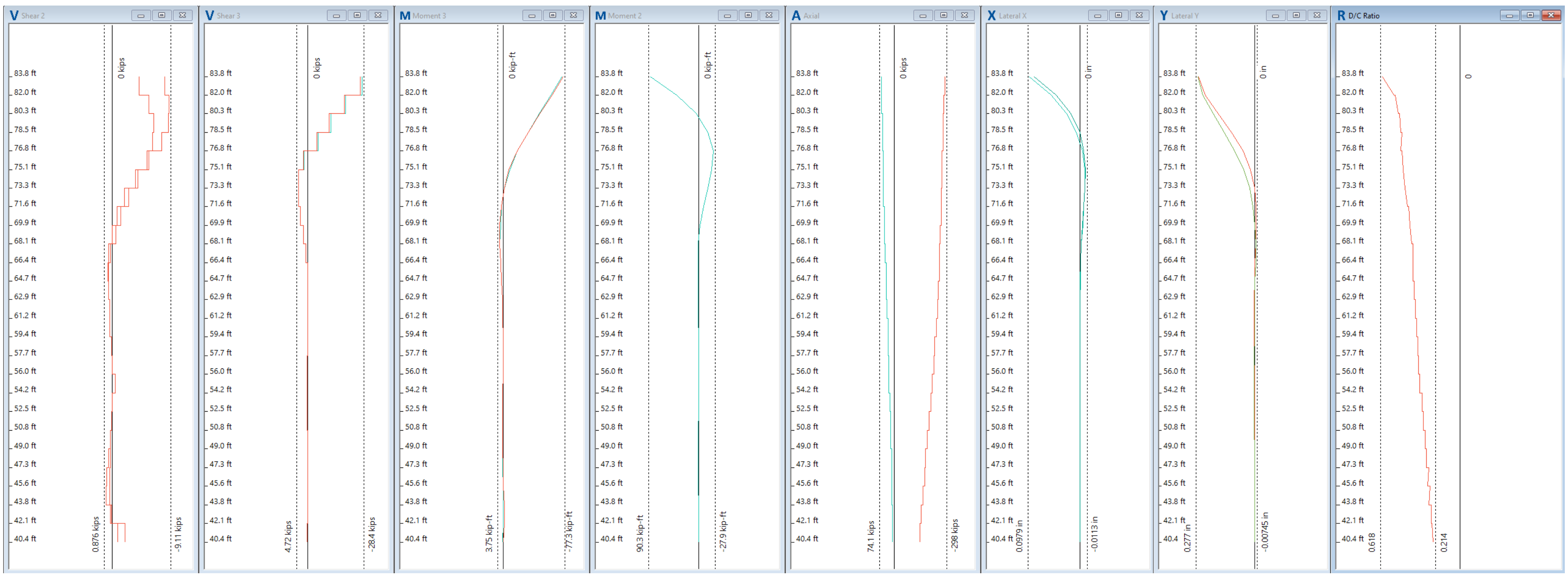

V Shear 2
0 kips
1.18 kips
-15.7 kips
V Shear 3
0 kips
3.98 kips
-23.8 kips
M Moment 3
0 kip-ft
7.41 kip-ft
-109 kip-ft
M Moment 2
0 kip-ft
78.6 kip-ft
-23.6 kip-ft
A Axial
0 kips
21.4 kips
-262 kips
X Lateral X
0 in
0.0518 in
-0.024 in
Y Lateral Y
0 in
0.232 in
-0.00627 in
R D/C Ratio
0
0.58
0.00848
83.8 ft
82.0 ft
80.3 ft
78.5 ft
76.8 ft
75.1 ft
73.3 ft
71.6 ft
69.9 ft
68.1 ft
66.4 ft
64.7 ft
62.9 ft
61.2 ft
59.4 ft
57.7 ft
56.0 ft
54.2 ft
52.5 ft
50.8 ft
49.0 ft
47.3 ft
45.6 ft
43.8 ft
42.1 ft
40.4 ft

STR:



V Shear 2
1.41 kips
0 kips
-18.3 kips
V Shear 3
4.35 kips
0 kips
-26.3 kips
M Moment 3
8.75 kip-ft
0 kip-ft
-127 kip-ft
M Moment 2
84.3 kip-ft
0 kip-ft
-25.5 kip-ft
A Axial
-0.218 kips
0 kips
-311 kips
X Lateral X
0.0649 in
0 in
-0.0339 in
Y Lateral Y
0.253 in
0 in
-0.00683 in
R D/C Ratio
0.662
0
0.231
83.8 ft
82.0 ft
80.3 ft
78.5 ft
76.8 ft
75.1 ft
73.3 ft
71.6 ft
69.9 ft
68.1 ft
66.4 ft
64.7 ft
62.9 ft
61.2 ft
59.4 ft
57.7 ft
56.0 ft
54.2 ft
52.5 ft
50.8 ft
49.0 ft
47.3 ft
45.6 ft
43.8 ft
42.1 ft
40.4 ft

EXT:



V Shear 2
0.876 kips
0 kips
-9.11 kips
V Shear 3
4.72 kips
0 kips
-28.4 kips
M Moment 3
3.75 kip-ft
0 kip-ft
-77.3 kip-ft
M Moment 2
90.3 kip-ft
0 kip-ft
-27.9 kip-ft
A Axial
74.1 kips
0 kips
-298 kips
X Lateral X
0.0979 in
0 in
-0.0113 in
Y Lateral Y
0.277 in
0 in
-0.00745 in
R D/C Ratio
0.618
0
0.214
83.8 ft
82.0 ft
80.3 ft
78.5 ft
76.8 ft
75.1 ft
73.3 ft
71.6 ft
69.9 ft
68.1 ft
66.4 ft
64.7 ft
62.9 ft
61.2 ft
59.4 ft
57.7 ft
56.0 ft
54.2 ft
52.5 ft
50.8 ft
49.0 ft
47.3 ft
45.6 ft
43.8 ft
42.1 ft
40.4 ft

Appendix H-3

Downdrag Load Calculation

Note: shaded cells are data to be input (Expect Project Information)

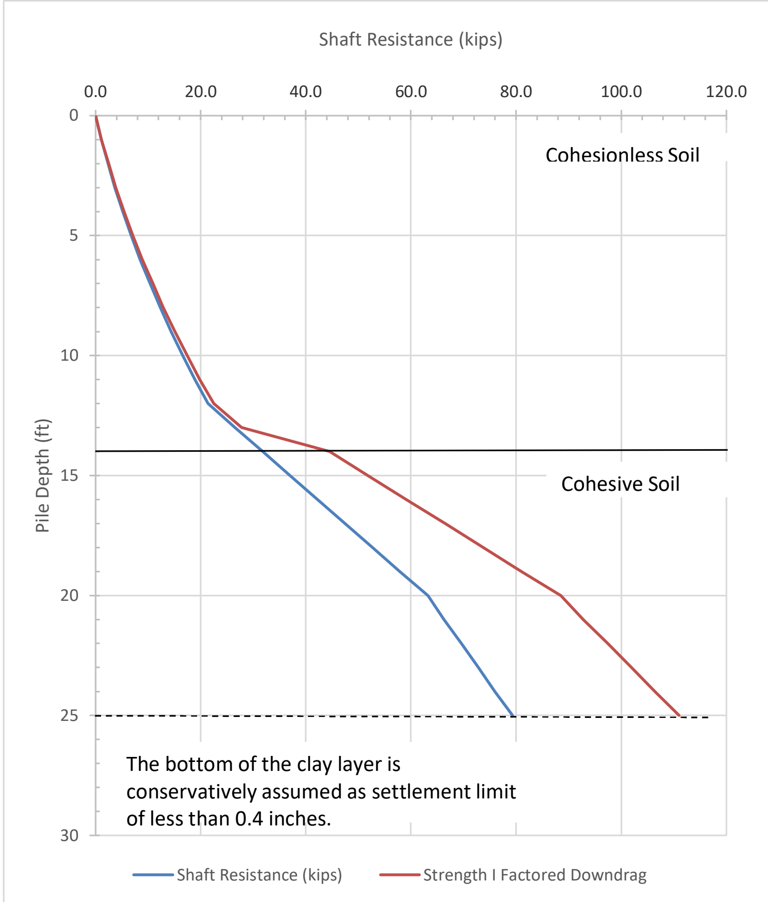
Designed to Amaze, Engineered to Last®

Computations For	**Tuttle Bridge Road Phase 2**	Made By	AS	Date	9/9/2024	Job No.	4462.07
	Maine DOT	Checked By	MCK	Date	9/13/2024		
	Downdrag Load Calculation - Abutment 1 (West)	Back Checked By	AG	Date	9/16/2024		

Soil Type	Downdrag Load Fators	
	SER	**STR**
Cohesionless Soil	1.00	1.05
Cohesive Soil	1.00	1.40
	AASHTO Table 3.4.1-1	AASHTO Table 3.4.1-2

Pile Depth Below Bottom of the Abutment (ft)	Soil Type	Shaft Resistance from DrivenPiles* (kips)	Factored Downdrag Load (kips)
0	Cohesionless	0.0	0.0
1	Cohesionless	1.1	1.2
2	Cohesionless	2.4	2.5
3	Cohesionless	3.7	3.9
4	Cohesionless	5.2	5.5
5	Cohesionless	6.8	7.1
6	Cohesionless	8.5	8.9
7	Cohesionless	10.4	10.9
8	Cohesionless	12.3	12.9
9	Cohesionless	14.4	15.1
10	Cohesionless	16.6	17.4
11	Cohesionless	18.9	19.8
12	Cohesionless	21.4	22.5
13	Cohesionless	26.5	27.8
14	Cohesive	31.8	44.5
15	Cohesive	37.0	51.8
16	Cohesive	42.2	59.1
17	Cohesive	47.5	66.5
18	Cohesive	52.7	73.8
19	Cohesive	57.9	81.1
20	Cohesive	63.2	88.5
21	Cohesive	66.3	92.8
22	Cohesive	69.6	97.4
23	Cohesive	72.8	101.9
24	Cohesive	76.0	106.4
25	Cohesive	**79.3**	**111.0**

* Shaft Resistance extracted from DrivenPiles Results used for Uplift Pile Capacity (Appendix G-2)



Results:

The calculated factored downdrag loads are **111 kips** per pile for the Strength I limit state and **79 kips** per pile for the Service I limit state.

Note: shaded cells are data to be input (Expect Project Information)

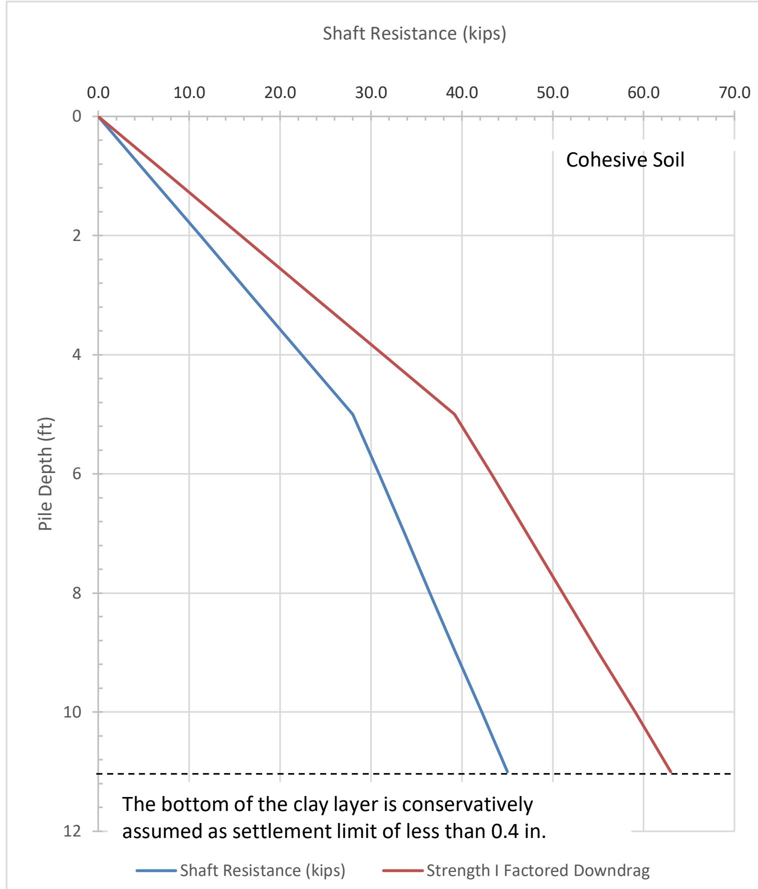
H&H Designed to Amaze, Engineered to Last®

Computations For	**Tuttle Bridge Road Phase 2**	Made By	AS	Date	9/9/2024	Job No.	4462.07
	Maine DOT	Checked By	MCK	Date	9/13/2024		
	Downdrag Load Calculation - Abutment 2 (East)	Back Checked By	AG	Date	9/16/2024		

Soil Type	**Downdrag Load Fators**	
	SER	**STR**
Cohesionless Soil	1.00	1.05
Cohesive Soil	1.00	1.40
	AASHTO Table 3.4.1-1	AASHTO Table 3.4.1-2

Pile Depth Below Bottom of the Abutment (ft)	Soil Type	Shaft Resistance from DrivenPiles* (kips)	Factored Downdrag Load (kips)
0	Cohesive	0.0	0.0
1	Cohesive	5.6	7.8
2	Cohesive	11.2	15.7
3	Cohesive	16.8	23.5
4	Cohesive	22.4	31.4
5	Cohesive	28.0	39.2
6	Cohesive	30.9	43.3
7	Cohesive	33.7	47.2
8	Cohesive	36.5	51.1
9	Cohesive	39.3	55.0
10	Cohesive	42.2	59.1
11	Cohesive	45.0	63.0

*Shaft Resistance extracted from DrivenPiles Results used for Uplift Pile Capacity (Appendix G-2)



Results:

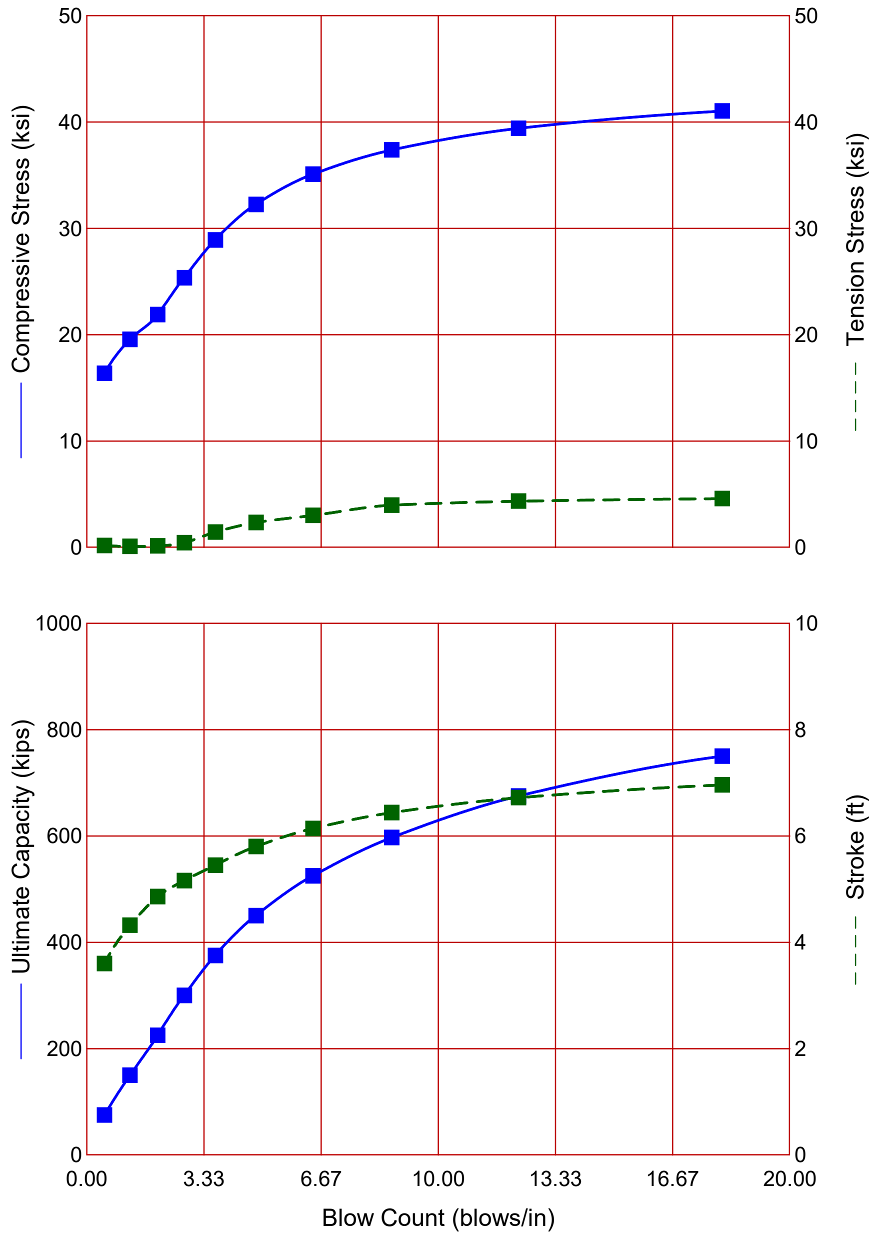
The calculated factored downdrag loads are **63 kips** per pile for the Strength I limit state and **45 kips** per pile for the Service I limit state.

Appendix H-4

Driveability Analyses

Hardesty & Hanover, LLP
West Abutment HP14X89

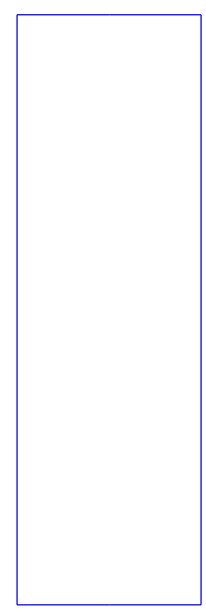
19-Sep-2024
GRLWEAP Version 2010



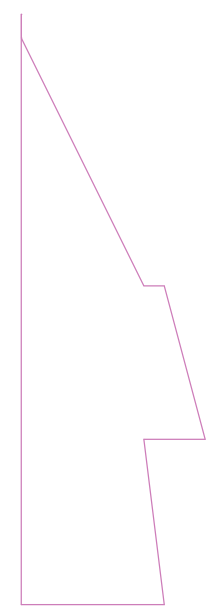
DELMAG D 30

Ram Weight	6.60	kips
Efficiency	0.800	
Pressure	1184 (80%)	psi
Helmet Weight	3.20	kips
Hammer Cushion	109975	kips/in
COR of H.C.	0.800	
Skin Quake	0.100	in
Toe Quake	0.040	in
Skin Damping	0.110	s/ft
Toe Damping	0.150	s/ft
Pile Length	50.00	ft
Pile Penetration	48.00	ft
Pile Top Area	26.10	in2

Pile Model



Skin Friction
Distribution

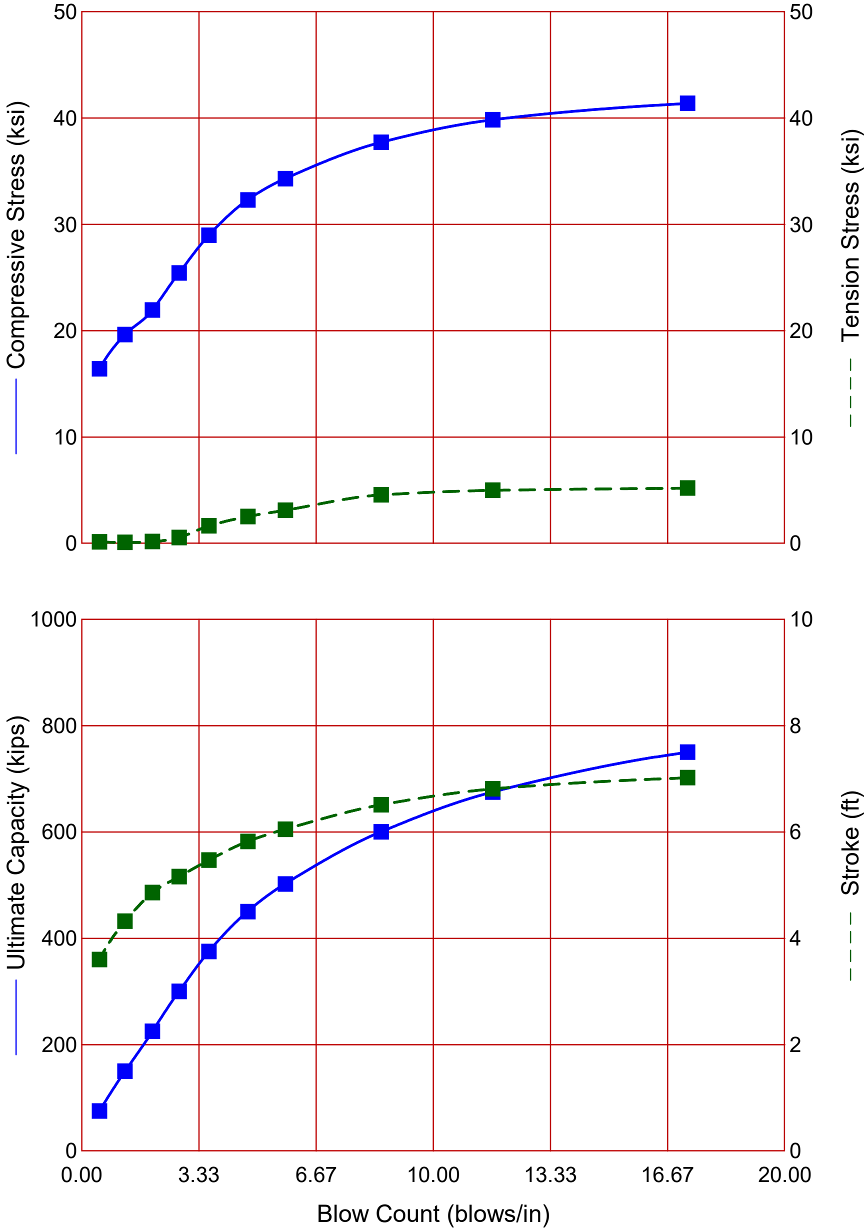


Res. Shaft = 10 %
(Proportional)

Hardesty & Hanover, LLP
West Abutment HP14X89

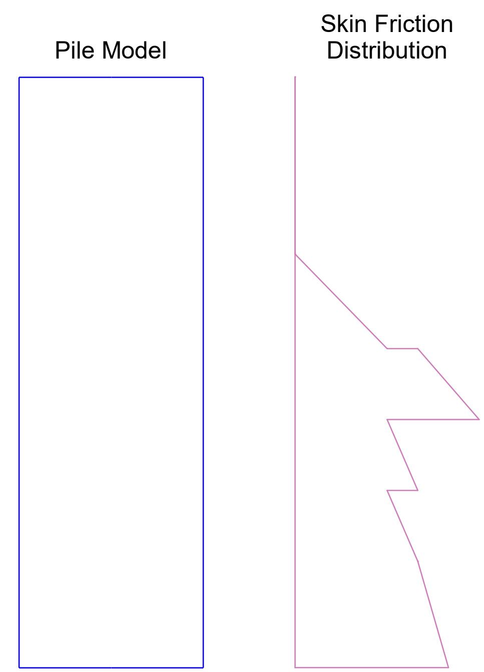
19-Sep-2024
GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
75.0	16.36	0.17	0.5	3.60	22.32
150.0	19.55	0.09	1.2	4.32	19.43
225.0	21.88	0.14	2.0	4.86	19.00
300.0	25.34	0.44	2.8	5.16	19.14
375.0	28.90	1.43	3.7	5.45	19.84
450.0	32.24	2.34	4.8	5.80	20.82
525.0	35.08	3.01	6.4	6.14	21.98
597.0	37.37	3.98	8.7	6.44	23.24
675.0	39.40	4.34	12.3	6.72	24.41
750.0	41.02	4.59	18.1	6.96	25.48



DELMAG D 30

Ram Weight	6.60	kips
Efficiency	0.800	
Pressure	1184 (80%)	psi
Helmet Weight	3.20	kips
Hammer Cushion	109975	kips/in
COR of H.C.	0.800	
Skin Quake	0.100	in
Toe Quake	0.040	in
Skin Damping	0.114	s/ft
Toe Damping	0.150	s/ft
Pile Length	50.00	ft
Pile Penetration	35.00	ft
Pile Top Area	26.10	in2



Res. Shaft = 10 %
(Proportional)

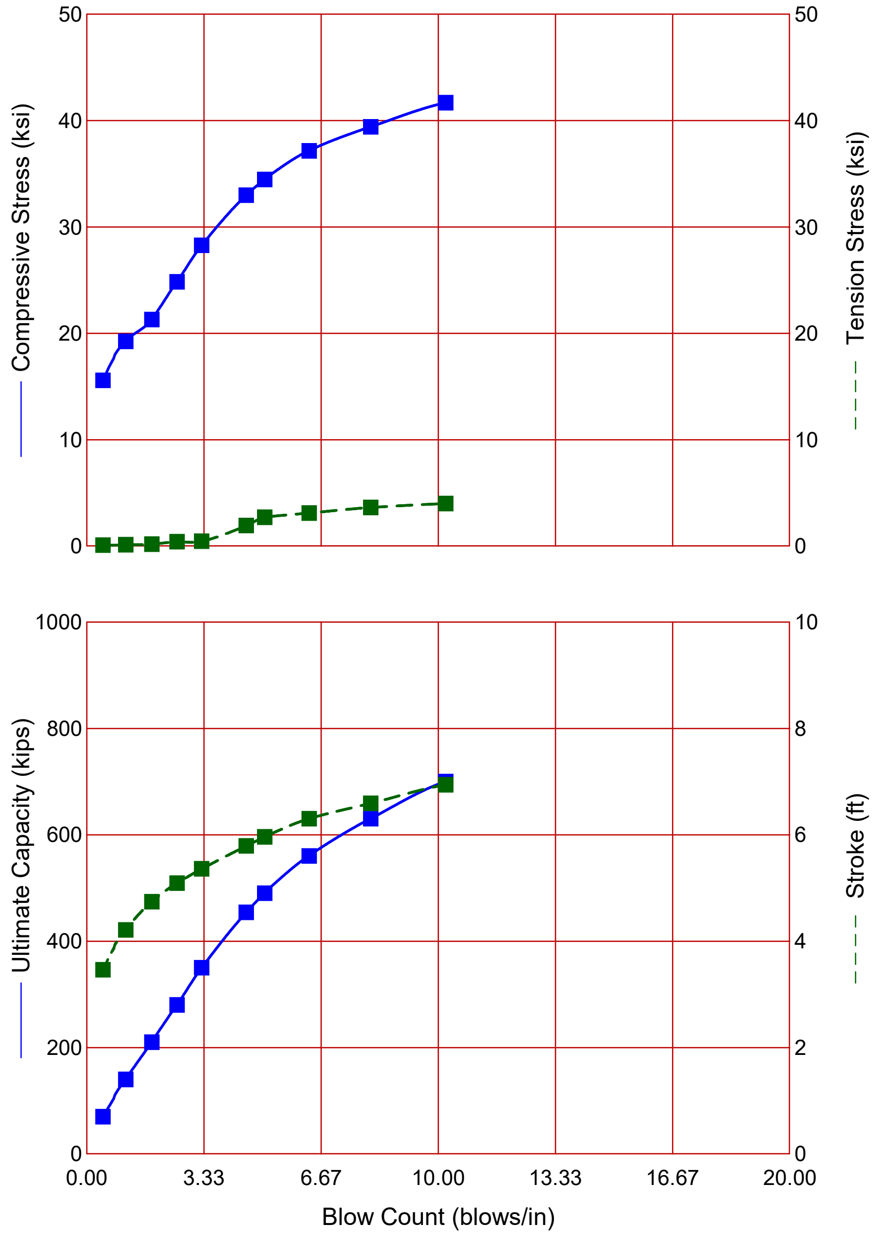
Hardesty & Hanover, LLP
East Abutment HP14X89

19-Sep-2024
GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
75.0	16.40	0.14	0.5	3.60	22.32
150.0	19.63	0.09	1.2	4.32	19.42
225.0	21.94	0.17	2.0	4.86	19.00
300.0	25.42	0.55	2.8	5.16	19.17
375.0	28.96	1.65	3.6	5.47	19.95
450.0	32.28	2.53	4.7	5.82	21.01
502.0	34.28	3.11	5.8	6.05	21.64
600.0	37.70	4.56	8.5	6.51	23.52
675.0	39.83	4.99	11.7	6.81	24.82
750.0	41.37	5.20	17.2	7.02	25.77

Hardesty & Hanover, LLP
PIER 1 - HP14X89

19-Sep-2024
GRLWEAP Version 2010

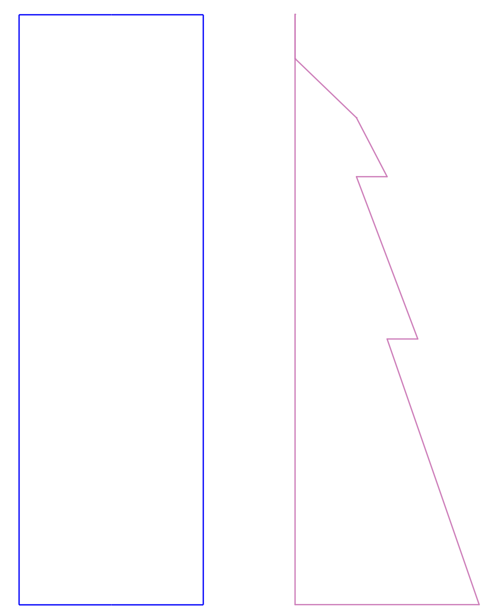


DELMAG D 30

Ram Weight	6.60	kips
Efficiency	0.800	
Pressure	1184 (80%)	psi
Helmet Weight	3.20	kips
Hammer Cushion	109975	kips/in
COR of H.C.	0.800	
Skin Quake	0.100	in
Toe Quake	0.040	in
Skin Damping	0.065	s/ft
Toe Damping	0.150	s/ft
Pile Length	40.00	ft
Pile Penetration	37.00	ft
Pile Top Area	26.10	in2

Pile Model

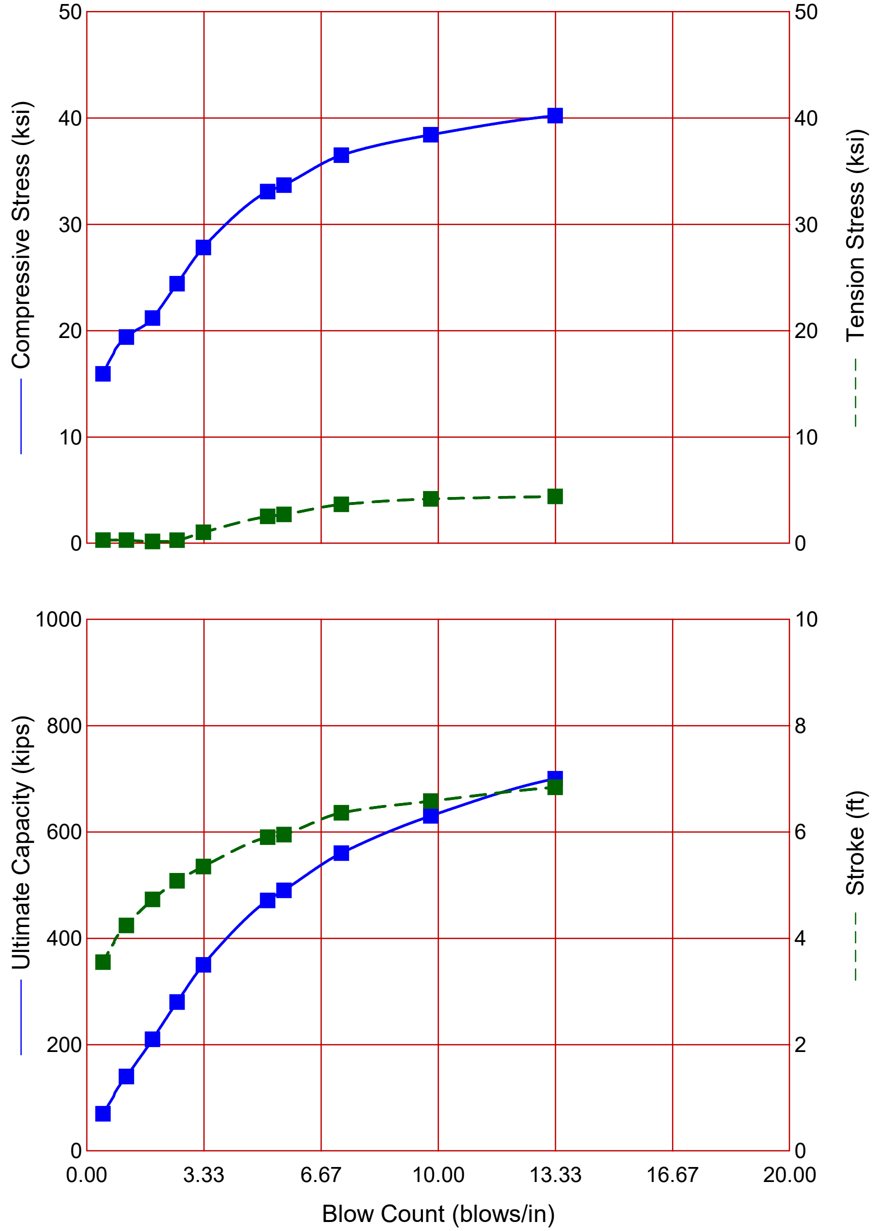
Skin Friction Distribution



Res. Shaft = 10 %
(Proportional)

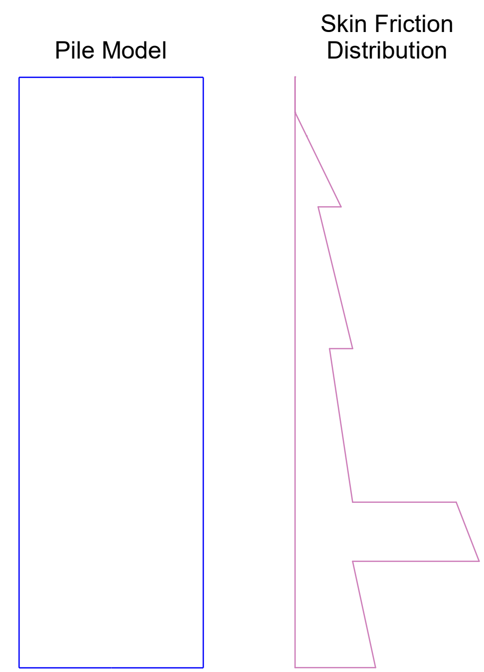
Hardesty & Hanover, LLP 19-Sep-2024
PIER 1 - HP14X89 GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
70.0	15.57	0.08	0.5	3.46	22.69
140.0	19.24	0.12	1.1	4.21	19.55
210.0	21.29	0.18	1.9	4.74	18.67
280.0	24.83	0.41	2.6	5.09	18.66
350.0	28.26	0.45	3.3	5.36	19.11
454.0	32.97	1.93	4.5	5.79	20.27
490.0	34.45	2.70	5.1	5.96	20.77
560.0	37.14	3.10	6.3	6.30	21.78
630.0	39.40	3.63	8.1	6.59	22.69
700.0	41.67	4.00	10.2	6.94	23.84



DELMAG D 30

Ram Weight	6.60	kips
Efficiency	0.800	
Pressure	1184 (80%)	psi
Helmet Weight	3.20	kips
Hammer Cushion	109975	kips/in
COR of H.C.	0.800	
Skin Quake	0.100	in
Toe Quake	0.040	in
Skin Damping	0.106	s/ft
Toe Damping	0.150	s/ft
Pile Length	50.00	ft
Pile Penetration	47.00	ft
Pile Top Area	26.10	in2



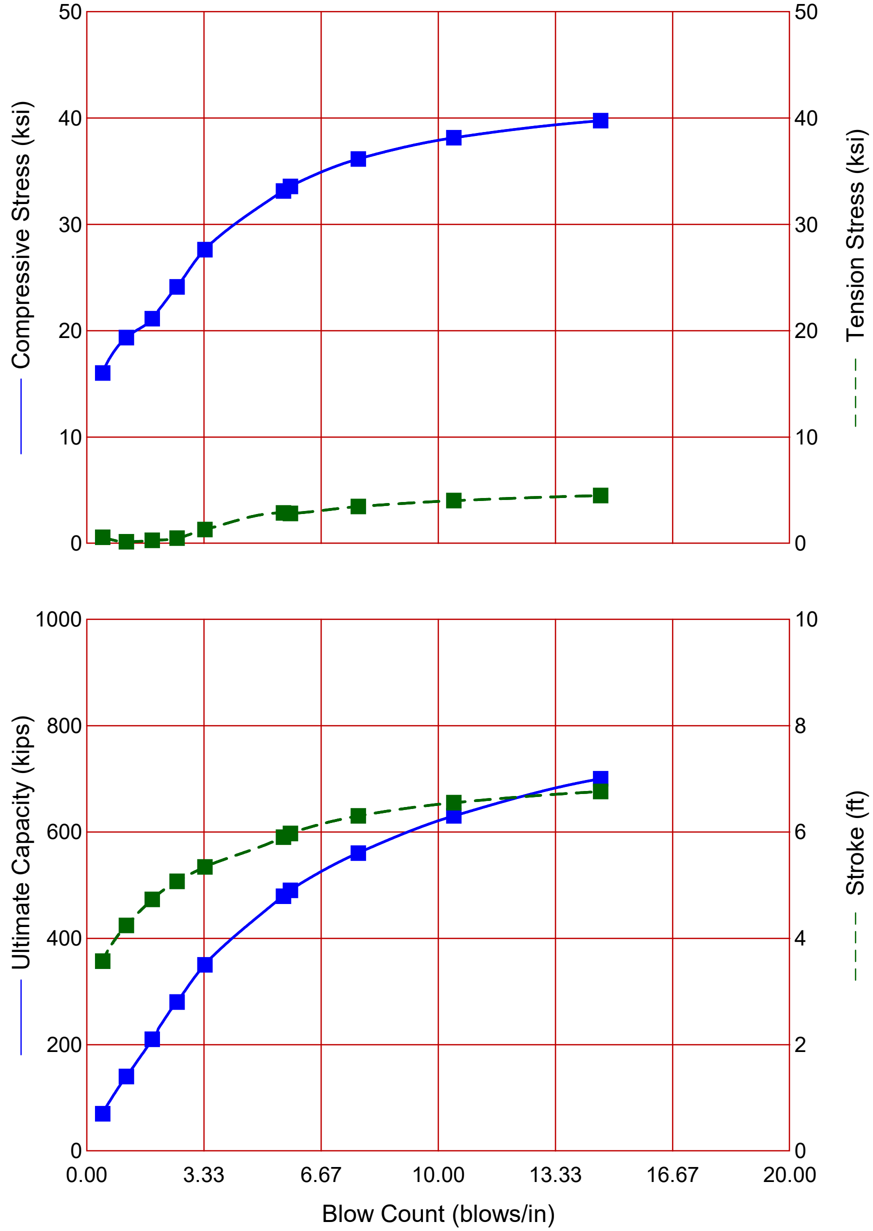
Res. Shaft = 10 %
(Proportional)

Hardesty & Hanover, LLP 19-Sep-2024
PIER 2 - HP14X89 GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
70.0	15.93	0.30	0.5	3.55	22.73
140.0	19.40	0.31	1.1	4.24	19.64
210.0	21.18	0.18	1.9	4.73	18.80
280.0	24.41	0.29	2.6	5.08	19.01
350.0	27.81	1.04	3.3	5.35	19.61
471.0	33.07	2.54	5.1	5.90	21.24
490.0	33.68	2.71	5.6	5.95	21.29
560.0	36.49	3.66	7.3	6.36	22.79
630.0	38.41	4.18	9.8	6.58	23.77
700.0	40.21	4.41	13.3	6.84	24.88

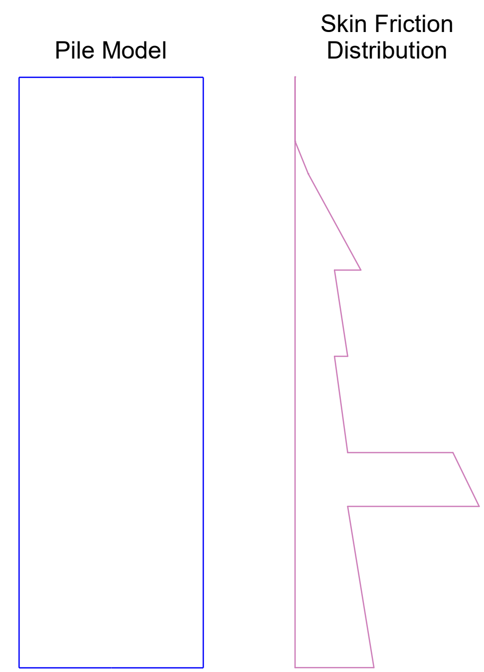
Hardesty & Hanover, LLP
PIER 3 - HP14X89

19-Sep-2024
GRLWEAP Version 2010



DELMAG D 30

Ram Weight	6.60	kips
Efficiency	0.800	
Pressure	1184 (80%)	psi
Helmet Weight	3.20	kips
Hammer Cushion	109975	kips/in
COR of H.C.	0.800	
Skin Quake	0.100	in
Toe Quake	0.040	in
Skin Damping	0.110	s/ft
Toe Damping	0.150	s/ft
Pile Length	55.00	ft
Pile Penetration	49.00	ft
Pile Top Area	26.10	in2



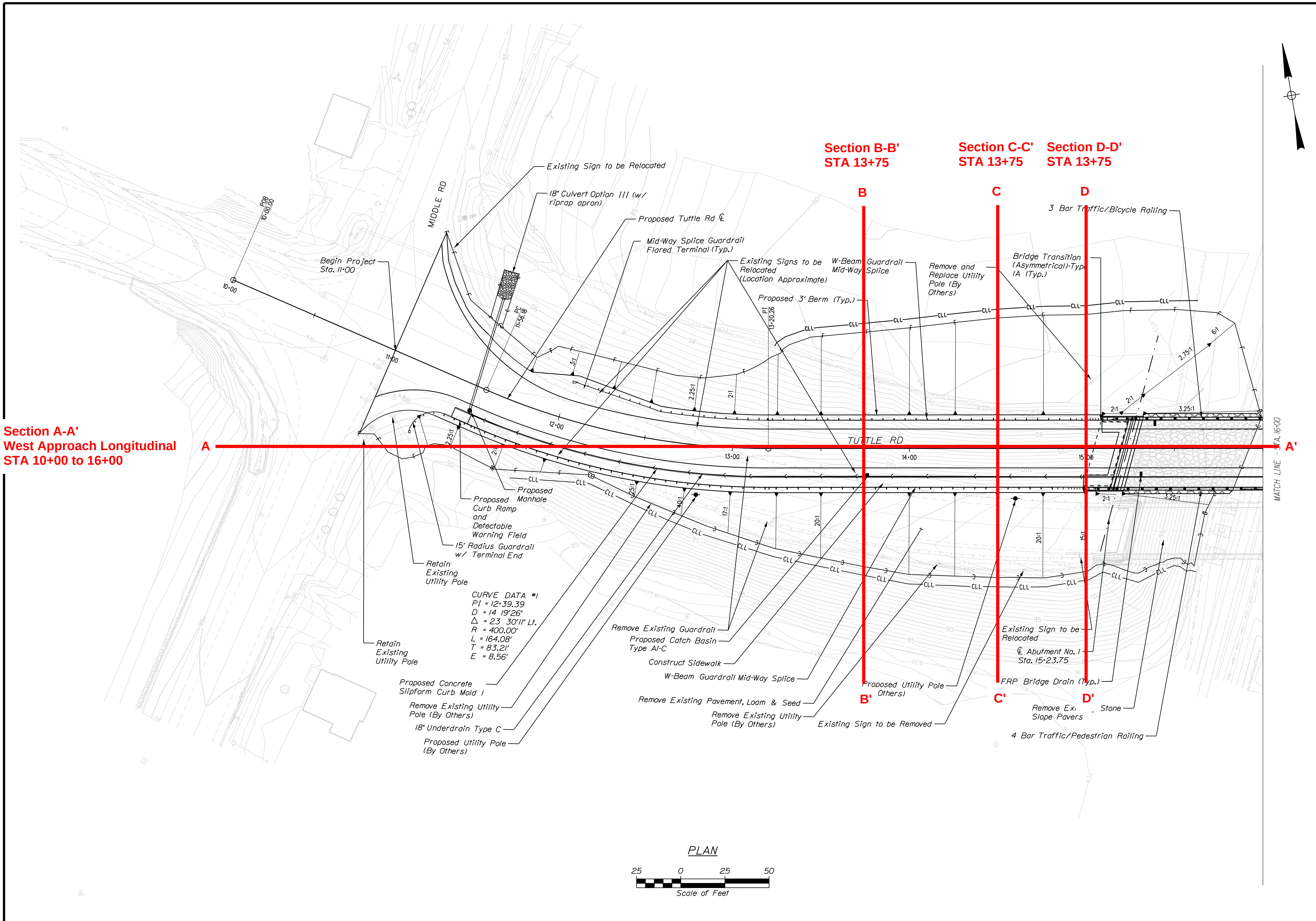
Res. Shaft = 10 %
(Proportional)

Hardesty & Hanover, LLP
PIER 3 - HP14X89

19-Sep-2024
GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
70.0	16.01	0.56	0.5	3.57	22.66
140.0	19.35	0.15	1.1	4.24	19.66
210.0	21.12	0.29	1.9	4.73	18.91
280.0	24.11	0.49	2.6	5.07	19.15
350.0	27.61	1.30	3.4	5.34	19.81
479.0	33.12	2.86	5.6	5.90	21.51
490.0	33.56	2.81	5.8	5.97	21.87
560.0	36.13	3.46	7.7	6.30	23.28
630.0	38.13	4.02	10.4	6.55	24.35
700.0	39.74	4.50	14.6	6.76	25.31

Appendix I
Global Stability Analyses



STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

2516100

WIN 25161.00

BRIDGE PLANS

BRIDGE NO. 5801

	BY	DATE
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DESIGN-DETAILED	GRS	07/2024
CHECKED-REVIEWED	SLM	07/2024
DESIGN2-DETAILED2	GRS	
DESIGN3-DETAILED3	SLM	
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

SIGNATURE

P.E. NUMBER

DATE

TUTTLE ROAD BRIDGE
INTERSTATE 295, RTE US 1 & MCRR
CUMBERLAND CUMBERLAND COUNTY

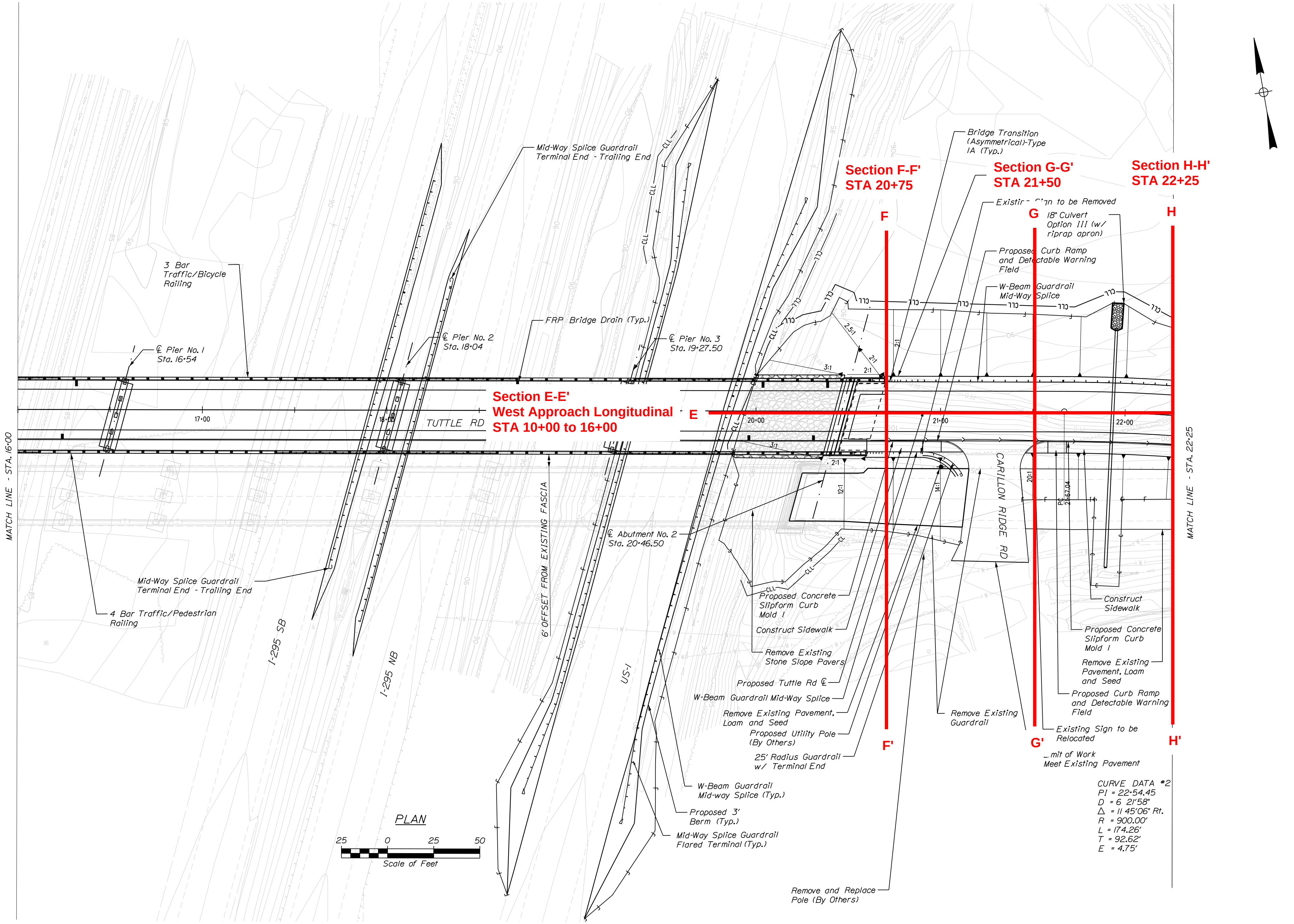
GENERAL PLAN (1 OF 3)

SHEET NUMBER

4

OF 71

Filename: ...\BRIDGE\004_BDPlan_1.dgn Division: BRIDGE Username: common Date: 7/11/2024



STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

2516100

BRIDGE PLANS
WIN 25161.00
BRIDGE NO. 5801

	BY	DATE
PROJ. MANAGER	Jude Brask	
DESIGN-DETAILED	GRS	07/2024
CHECKED-REVIEWED	SLM	07/2024
DESIGN2-DETAILED2		
DESIGN3-DETAILED3		
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

SIGNATURE
P.E. NUMBER
DATE

TUTTLE ROAD BRIDGE
INTERSTATE 295, RTE US 1 & MCRR
CUMBERLAND CUMBERLAND COUNTY

GENERAL PLAN (2 OF 3)

SHEET NUMBER
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OF 71

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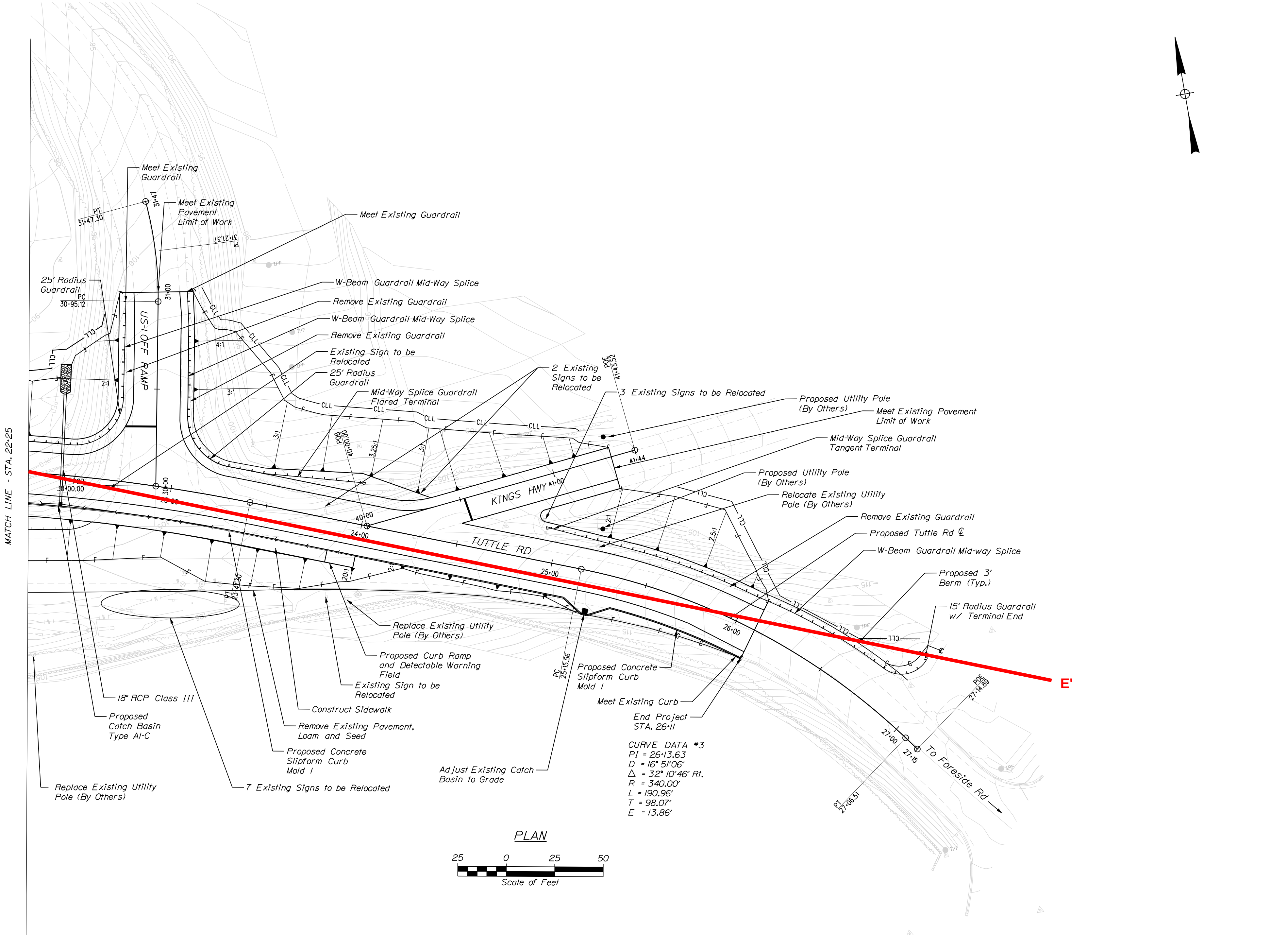


STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

2516100

WIN 25161.00

BRIDGE NO. 5801

BRIDGE PLANS

	BY	DATE
PROJ. MANAGER	Jude Brask	
DESIGN-DETAILED	GRS	07/2024
CHECKED-REVIEWED	SLM	07/2024
DESIGN2-DETAILED2		
DESIGN3-DETAILED3		
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

SIGNATURE
P.E. NUMBER
DATE

TUTTLE ROAD BRIDGE
INTERSTATE 295, RTE US 1 & MCRR
CUMBERLAND CUMBERLAND COUNTY

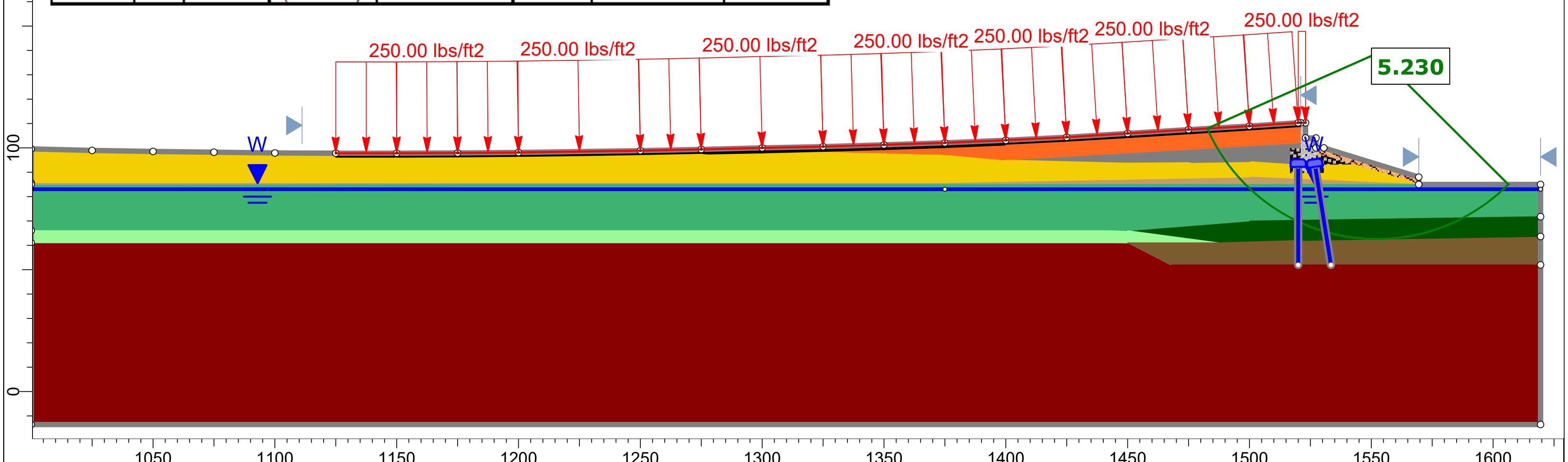
GENERAL PLAN (3 OF 3)

SHEET NUMBER
6
OF 71

SECTION A-A'

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Allow Sliding Along Boundary	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29			Water Table	Automatically Calculated
Upper Cohesive (PRESUMPSCOT)		130	Undrained	3000	0	Constant		Water Table	Automatically Calculated
Lower Cohesive (PRESUMPSCOT)		120	Undrained	1250	0	Constant		Water Table	Automatically Calculated
Soft Cohesive (PRESUMPSCOT)		105	Undrained	500	0	Constant		Water Table	Automatically Calculated
Cohesionless		120	Mohr-Coulomb	0	32			Water Table	Automatically Calculated
Dense Cohesionless		130	Mohr-Coulomb	0	36			Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40			Water Table	Automatically Calculated
FGA		20	Mohr-Coulomb	0	40			Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32			Water Table	Automatically Calculated
Pavement + Sub-base		135	Mohr-Coulomb	0	36			Water Table	Automatically Calculated
Concrete		150	Infinite Strength				No	Water Table	Automatically Calculated
Rip-Rap		140	Mohr-Coulomb	0	40			Water Table	Automatically Calculated
Granular Borrow		125	Mohr-Coulomb	0	32			Water Table	Automatically Calculated

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (ft)	Failure Mode	Pile Shear Strength (lbs)	Force Orientation
Support 1		Pile/ Micro Pile	Passive (Method B)	5.5	Shear	219000	Parallel to surface

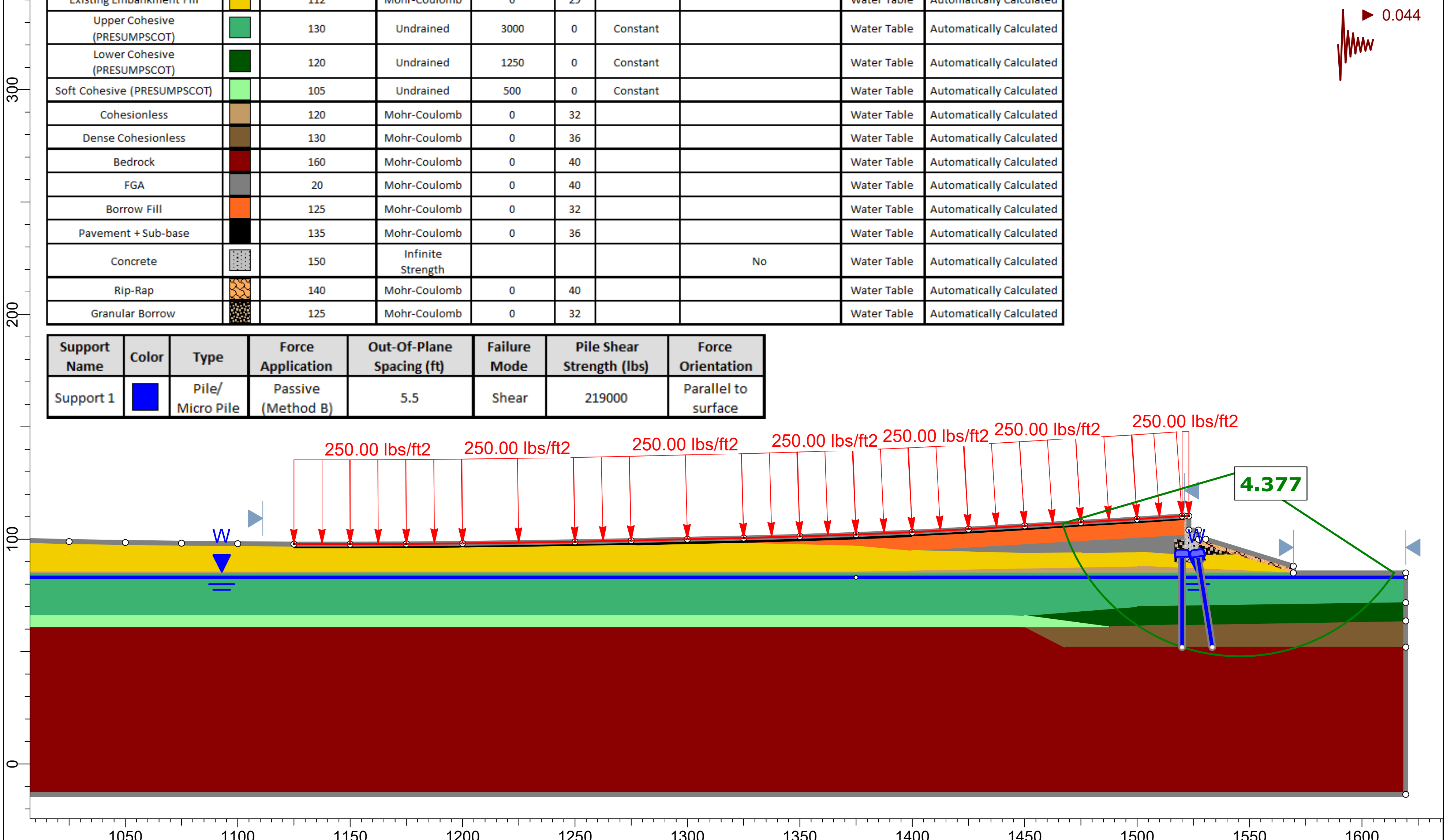


rocscience	*Project* Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR		
	Group West approach longitudinal section	*Scenario* STATIC	
	Drawn By MK	*Company* H&H	
SLIDEINTERPRET 9.034	*Date* 9/24/2024	*File Name* West Abutment.slmd	

SECTION A-A'

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Allow Sliding Along Boundary	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29			Water Table	Automatically Calculated
Upper Cohesive (PRESUMPSCOT)		130	Undrained	3000	0	Constant		Water Table	Automatically Calculated
Lower Cohesive (PRESUMPSCOT)		120	Undrained	1250	0	Constant		Water Table	Automatically Calculated
Soft Cohesive (PRESUMPSCOT)		105	Undrained	500	0	Constant		Water Table	Automatically Calculated
Cohesionless		120	Mohr-Coulomb	0	32			Water Table	Automatically Calculated
Dense Cohesionless		130	Mohr-Coulomb	0	36			Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40			Water Table	Automatically Calculated
FGA		20	Mohr-Coulomb	0	40			Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32			Water Table	Automatically Calculated
Pavement + Sub-base		135	Mohr-Coulomb	0	36			Water Table	Automatically Calculated
Concrete		150	Infinite Strength				No	Water Table	Automatically Calculated
Rip-Rap		140	Mohr-Coulomb	0	40			Water Table	Automatically Calculated
Granular Borrow		125	Mohr-Coulomb	0	32			Water Table	Automatically Calculated

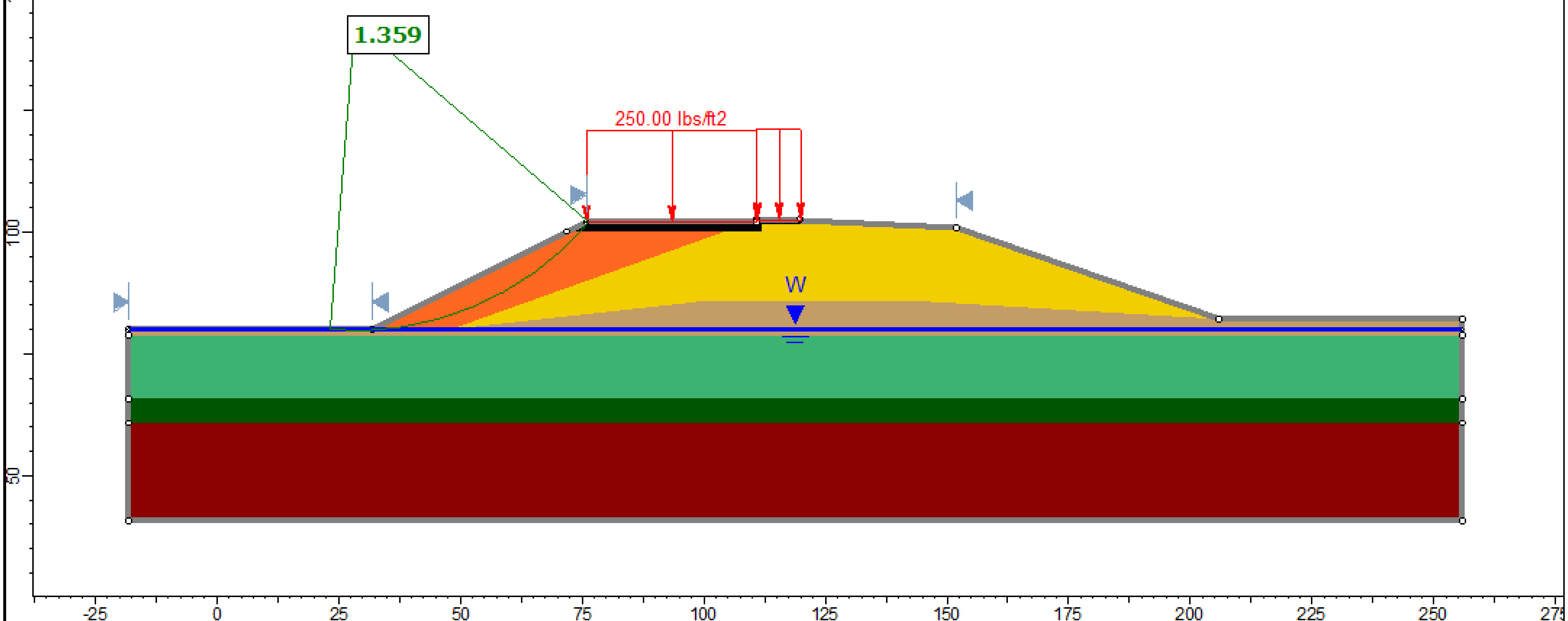
Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (ft)	Failure Mode	Pile Shear Strength (lbs)	Force Orientation
Support 1		Pile/ Micro Pile	Passive (Method B)	5.5	Shear	219000	Parallel to surface



rocscience	Project	Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR	
	Group: West approach longitudinal section	Scenario: SEISMIC	
	Drawn By: MK	Company: H&H	
SLIDEINTERPRET 9.034	Date: 9/24/2024	File Name: West Abutment.slmd	

SECTION B-B'

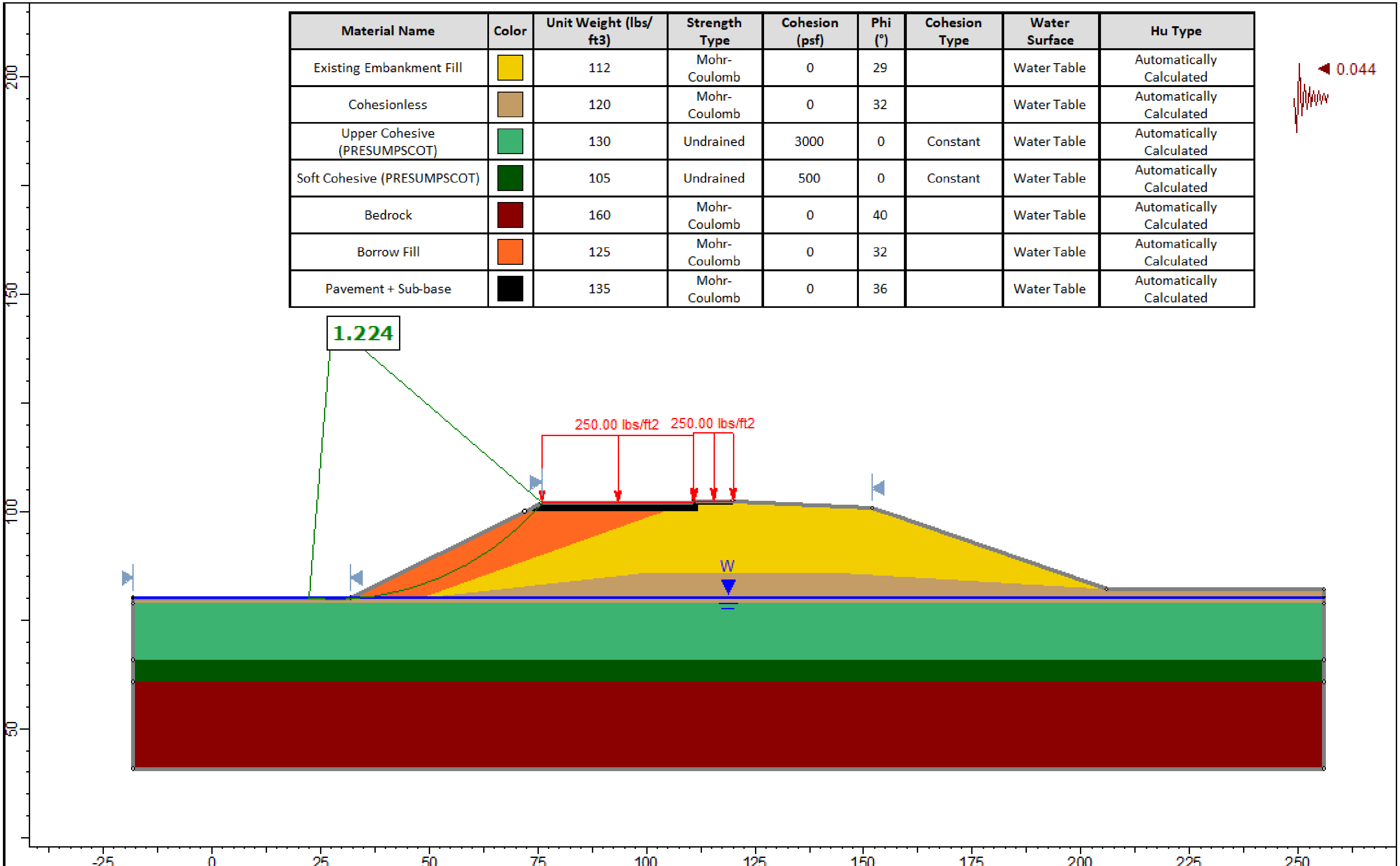
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29		Water Table	Automatically Calculated
Cohesionless		120	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Upper Cohesive (PRESUMPSCOT)		130	Undrained	3000	0	Constant	Water Table	Automatically Calculated
Soft Cohesive (PRESUMPSCOT)		105	Undrained	500	0	Constant	Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Pavement + Sub-base		135	Mohr-Coulomb	0	36		Water Table	Automatically Calculated



rocscience	*Project*	Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR	
	Group	West embankment station 13+75	*Scenario* STATIC
	Drawn By	MK	*Company* H&H
SLIDEINTERPRET 9.034	*Date*	9/24/2024	*File Name* West Approach STA13+75.slmd

SECTION B-B'

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29		Water Table	Automatically Calculated
Cohesionless		120	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Upper Cohesive (PRESUMPSCOT)		130	Undrained	3000	0	Constant	Water Table	Automatically Calculated
Soft Cohesive (PRESUMPSCOT)		105	Undrained	500	0	Constant	Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Pavement + Sub-base		135	Mohr-Coulomb	0	36		Water Table	Automatically Calculated



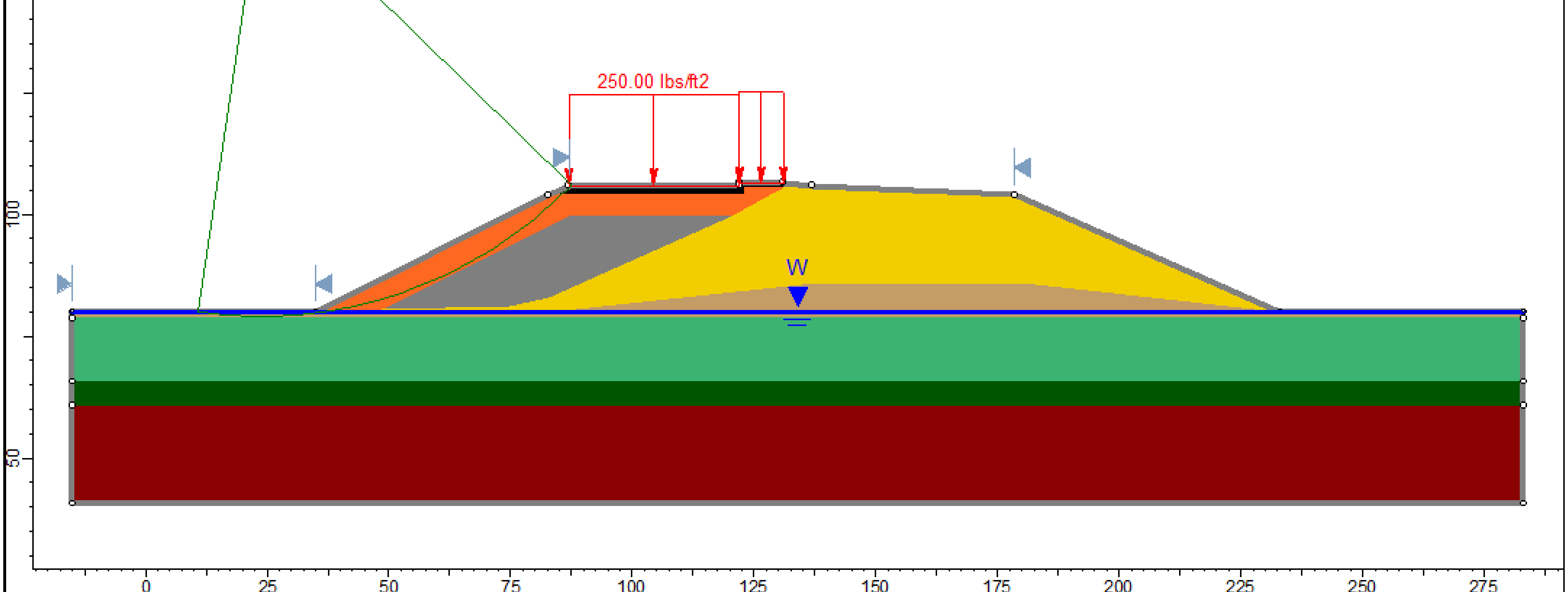
rocscience

Project	Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR
Group	West embankment station 13+75
Scenario	SEISMIC
Drawn By	MK
Company	H&H
Date	9/24/2024
File Name	West Approach STA13+75.slmd

SLIDEINTERPRET 9.034

SECTION C-C'

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29		Water Table	Automatically Calculated
Upper Cohesive (PRESUMPSCOT)		130	Undrained	3000	0	Constant	Water Table	Automatically Calculated
Soft Cohesive (PRESUMPSCOT)		105	Undrained	500	0	Constant	Water Table	Automatically Calculated
Cohesionless		120	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
FGA		20	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Pavement + Sub-base		135	Mohr-Coulomb	0	36		Water Table	Automatically Calculated

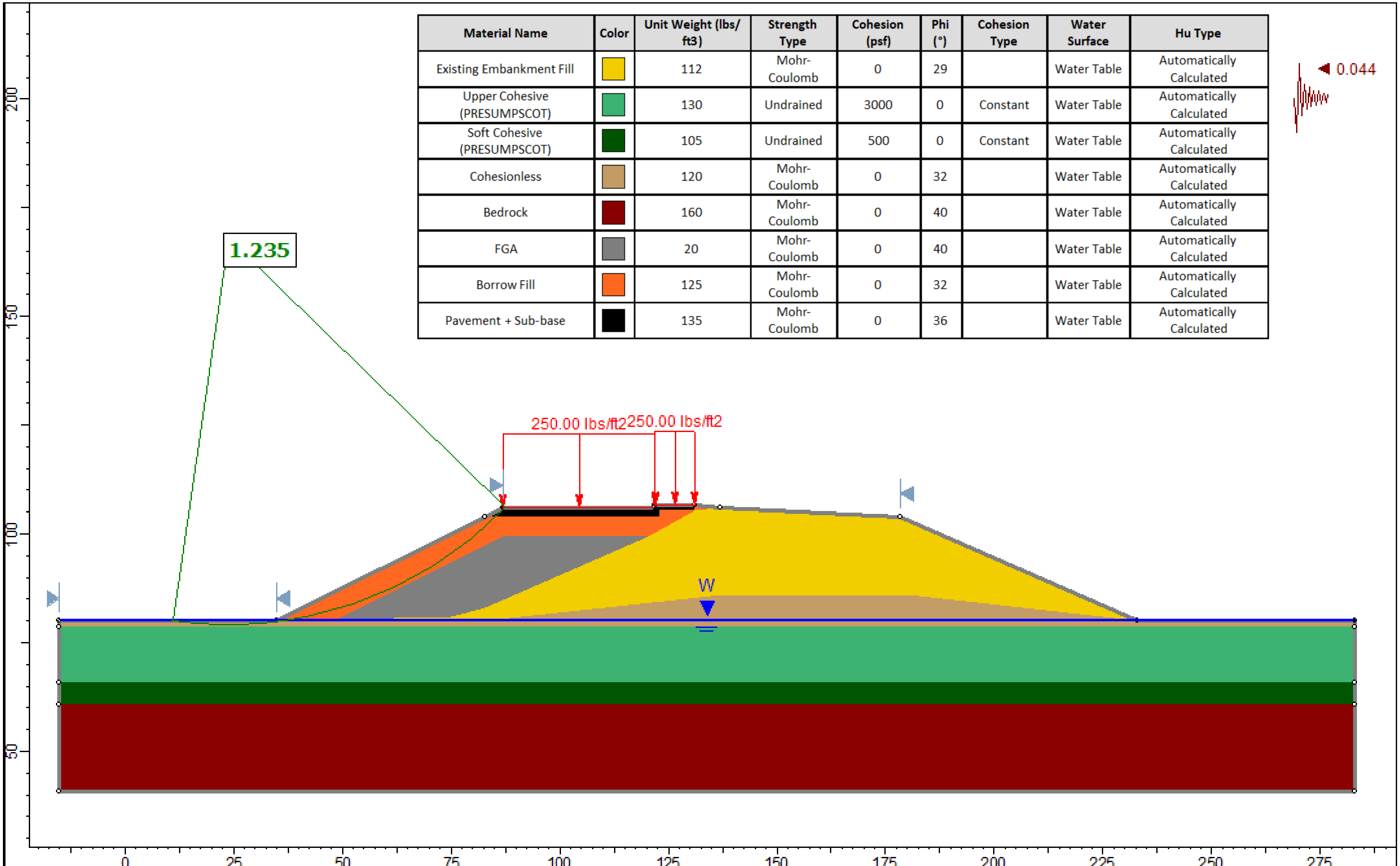


rocscience

SLIDEINTERPRET 9.034

Project	Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR		
Group	West embankment station 14+50	Scenario	STATIC
Drawn By	MK	Company	H&H
Date	9/24/2024	File Name	West Approach STA14+50.slmd

SECTION C-C'



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29		Water Table	Automatically Calculated
Upper Cohesive (PRESUMPSCOT)		130	Undrained	3000	0	Constant	Water Table	Automatically Calculated
Soft Cohesive (PRESUMPSCOT)		105	Undrained	500	0	Constant	Water Table	Automatically Calculated
Cohesionless		120	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
FGA		20	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Pavement + Sub-base		135	Mohr-Coulomb	0	36		Water Table	Automatically Calculated

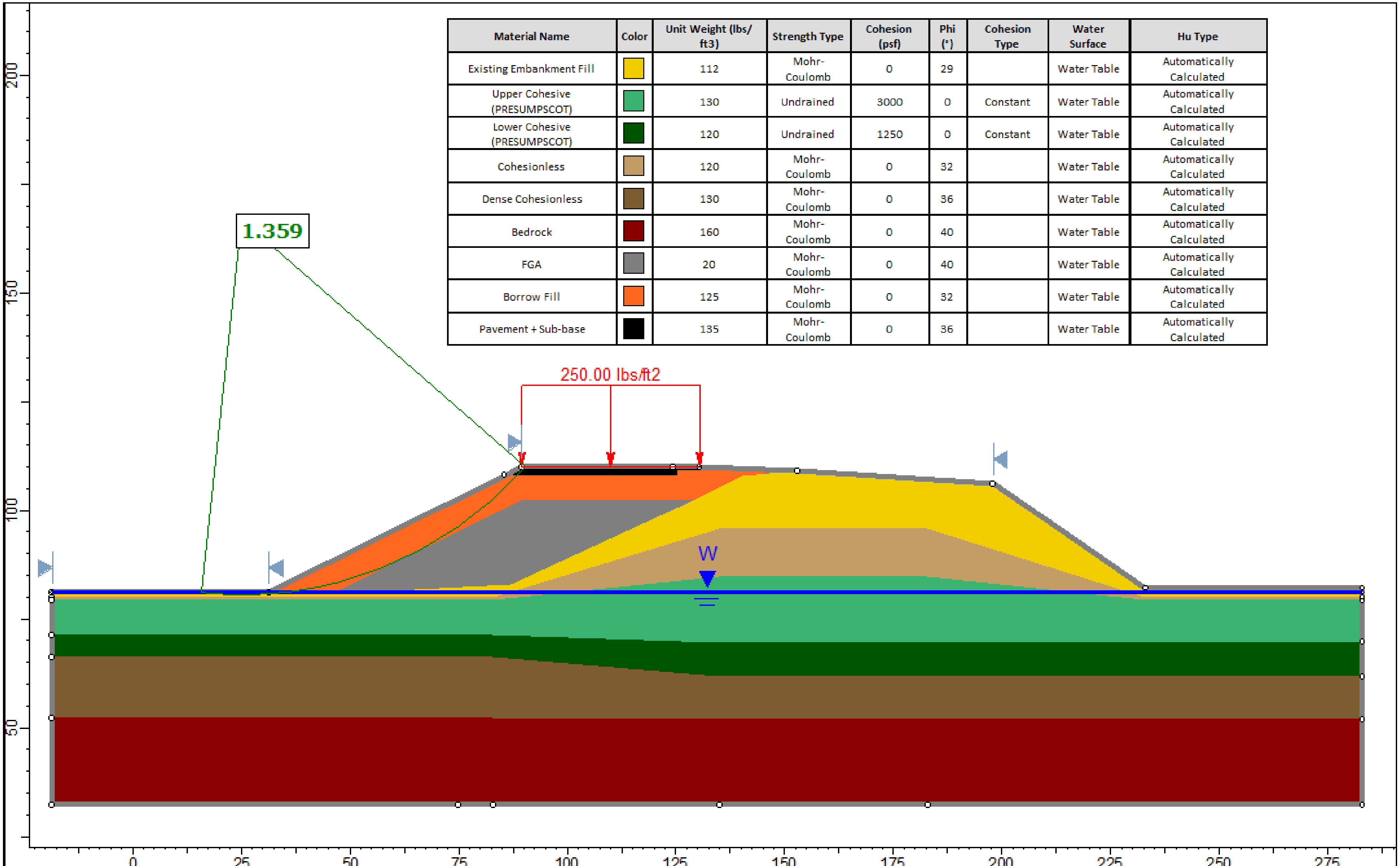
rocscience

Project	Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR		
Group	West embankment station 14+50	Scenario	SEISMIC
Drawn By	MK	Company	H&H
Date	9/24/2024	File Name	West Approach STA14+50.slmd

SLIDEINTERPRET 9.034

SECTION D-D'

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29		Water Table	Automatically Calculated
Upper Cohesive (PRESUMPSCOT)		130	Undrained	3000	0	Constant	Water Table	Automatically Calculated
Lower Cohesive (PRESUMPSCOT)		120	Undrained	1250	0	Constant	Water Table	Automatically Calculated
Cohesionless		120	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Dense Cohesionless		130	Mohr-Coulomb	0	36		Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
FGA		20	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Pavement + Sub-base		135	Mohr-Coulomb	0	36		Water Table	Automatically Calculated

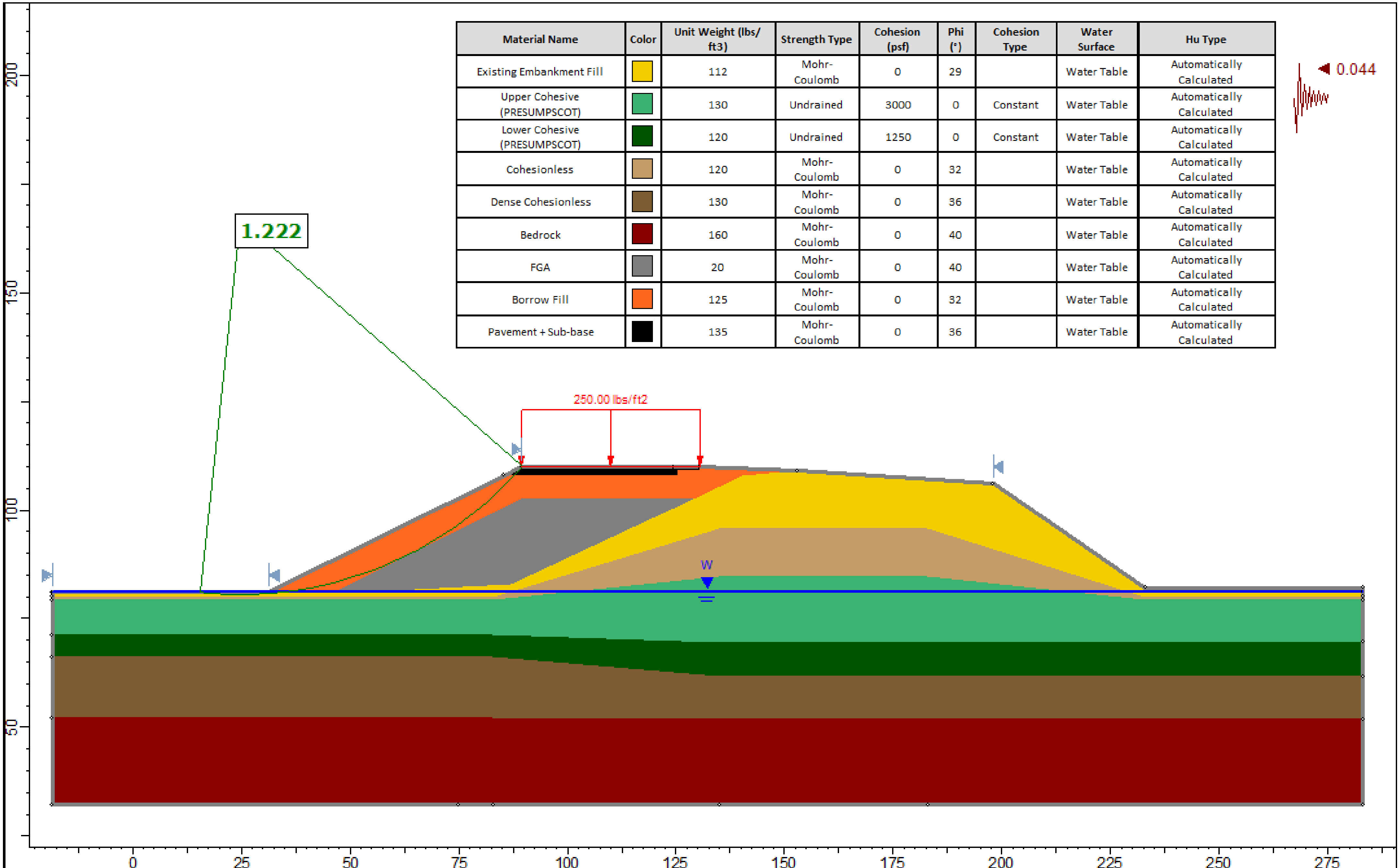


rocscience

Project	Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR		
Group	West embankment station 15+00	*Scenario*	STATIC
Drawn By	MK	*Company*	H&H
Date	9/24/2024	*File Name*	West Approach STA15+00.slmd

SLIDEINTERPRET 9.034

SECTION D-D'



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29		Water Table	Automatically Calculated
Upper Cohesive (PRESUMPSCOT)		130	Undrained	3000	0	Constant	Water Table	Automatically Calculated
Lower Cohesive (PRESUMPSCOT)		120	Undrained	1250	0	Constant	Water Table	Automatically Calculated
Cohesionless		120	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Dense Cohesionless		130	Mohr-Coulomb	0	36		Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
FGA		20	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Pavement + Sub-base		135	Mohr-Coulomb	0	36		Water Table	Automatically Calculated

rocscience

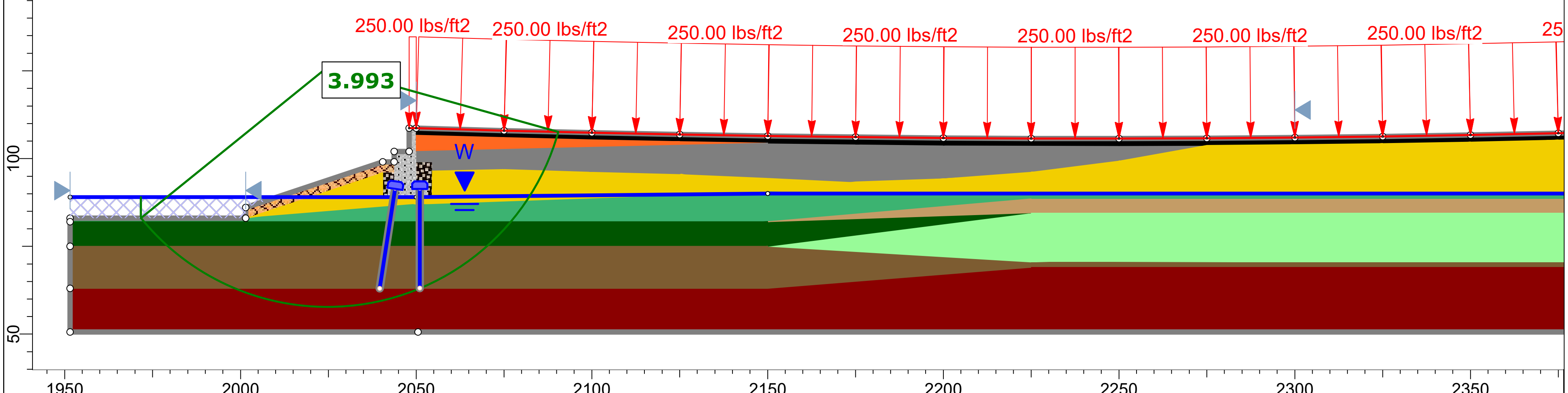
Project	Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR		
Group	West embankment station 15+00	*Scenario*	SEISMIC
Drawn By	MK	*Company*	H&H
Date	9/24/2024	*File Name*	West Approach STA15+00.slmd

SLIDEINTERPRET 9.034

SECTION E-E'

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Allow Sliding Along Boundary	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29			Water Table	Automatically Calculated
Upper Cohesive (PRESUMPSCOT)		130	Undrained	3000	0	Constant		Water Table	Automatically Calculated
Lower Cohesive (PRESUMPSCOT)		115	Undrained	1250	0	Constant		Water Table	Automatically Calculated
Soft Cohesive (PRESUMPSCOT)		95	Undrained	375	0	Constant		Water Table	Automatically Calculated
Cohesionless		125	Mohr-Coulomb	0	31			Water Table	Automatically Calculated
Dense Cohesionless		130	Mohr-Coulomb	0	36			Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40			Water Table	Automatically Calculated
FGA		20	Mohr-Coulomb	0	40			Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32			Water Table	Automatically Calculated
Pavement + Sub-base		135	Mohr-Coulomb	0	36			Water Table	Automatically Calculated
Concrete		150	Infinite Strength				No	Water Table	Automatically Calculated
Rip-Rap		140	Mohr-Coulomb	0	40			Water Table	Automatically Calculated
Granular Borrow		125	Mohr-Coulomb	0	32			Water Table	Automatically Calculated

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (ft)	Failure Mode	Pile Shear Strength (lbs)	Force Orientation
Support 1		Pile/Micro Pile	Passive (Method B)	5.5	Shear	219000	Parallel to surface



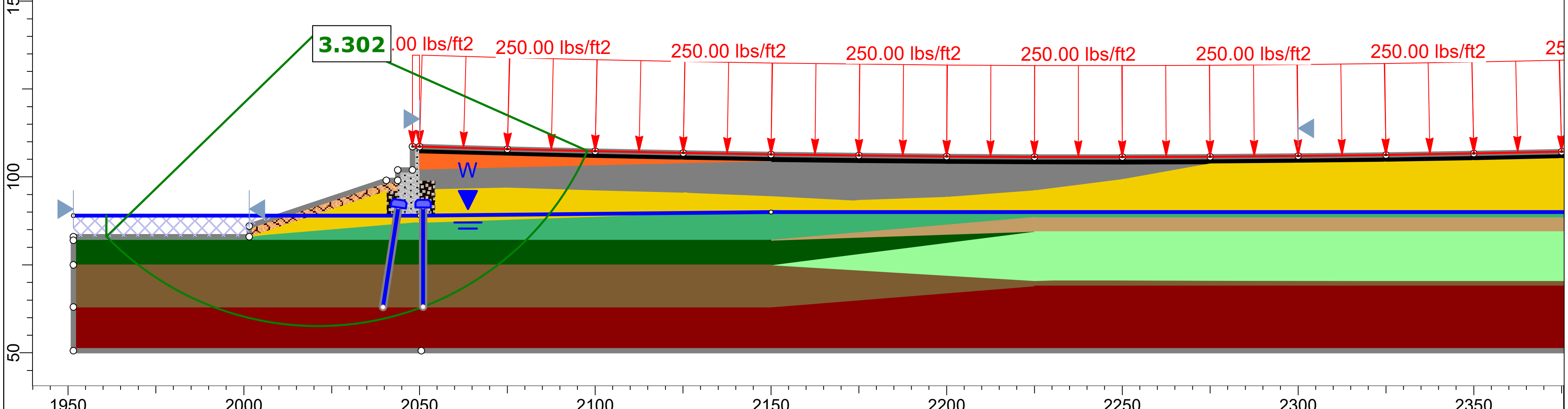
rocscience	*Project* Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR		
	Group East approach longitudinal section	*Scenario* STATIC	
	Drawn By MK	*Company* H&H	
SLIDEINTERPRET 9.034	*Date* 9/24/2024	*File Name* East Abutment.slmd	

SECTION E-E'

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Allow Sliding Along Boundary	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29			Water Table	Automatically Calculated
Upper Cohesive (PRESUMPSCOT)		130	Undrained	3000	0	Constant		Water Table	Automatically Calculated
Lower Cohesive (PRESUMPSCOT)		115	Undrained	1250	0	Constant		Water Table	Automatically Calculated
Soft Cohesive (PRESUMPSCOT)		95	Undrained	375	0	Constant		Water Table	Automatically Calculated
Cohesionless		125	Mohr-Coulomb	0	31			Water Table	Automatically Calculated
Dense Cohesionless		130	Mohr-Coulomb	0	36			Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40			Water Table	Automatically Calculated
FGA		20	Mohr-Coulomb	0	40			Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32			Water Table	Automatically Calculated
Pavement + Sub-base		135	Mohr-Coulomb	0	36			Water Table	Automatically Calculated
Concrete		150	Infinite Strength				No	Water Table	Automatically Calculated
Rip-Rap		140	Mohr-Coulomb	0	40			Water Table	Automatically Calculated
Granular Borrow		125	Mohr-Coulomb	0	32			Water Table	Automatically Calculated

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (ft)	Failure Mode	Pile Shear Strength (lbs)	Force Orientation
Support 1		Pile/Micro Pile	Passive (Method B)	5.5	Shear	219000	Parallel to surface

0.044

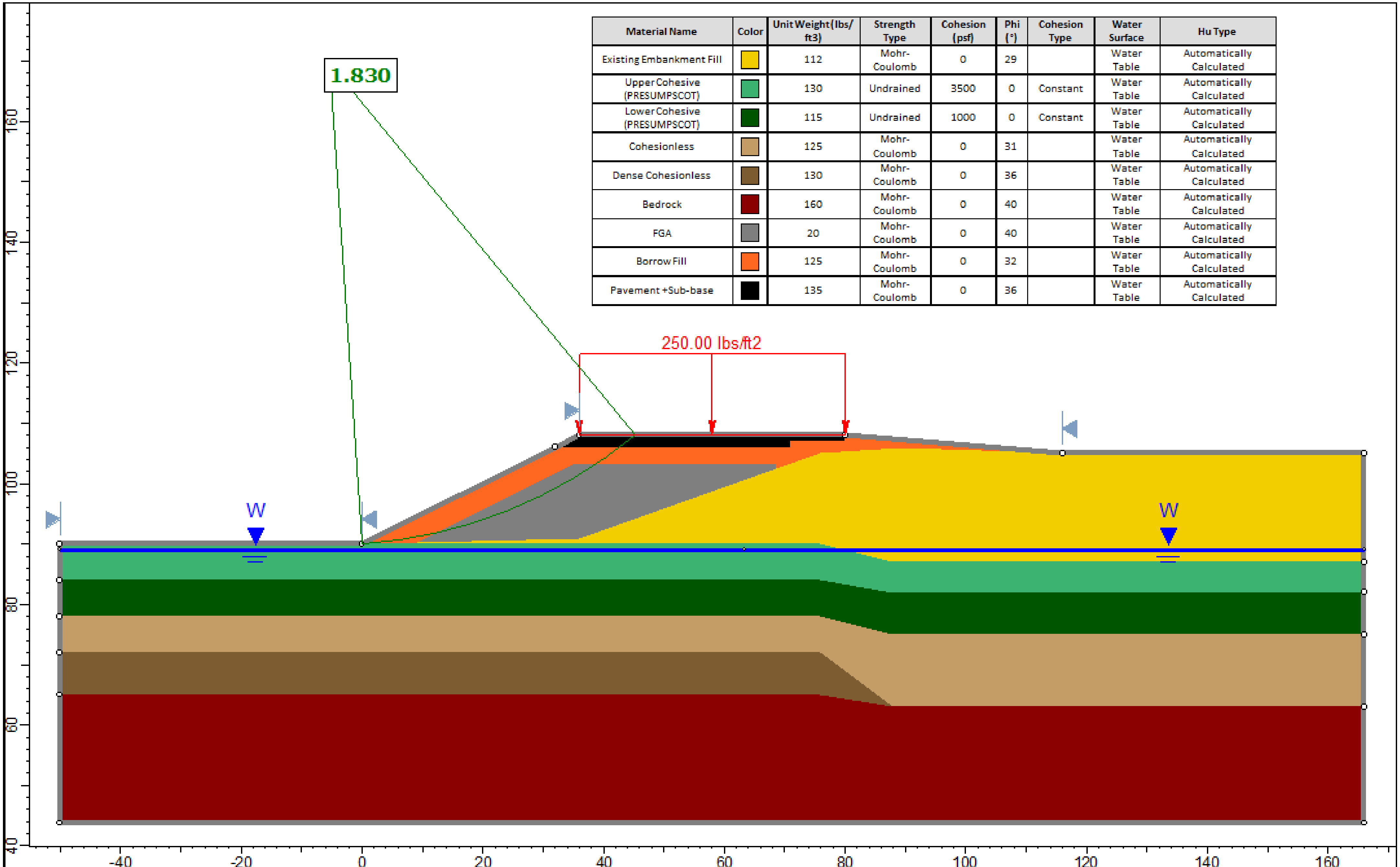


rocscience

SLIDEINTERPRET 9.034

Project	Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR
Group	East approach longitudinal section
Scenario	SEISMIC
Drawn By	MK
Company	H&H
Date	9/24/2024
File Name	East Abutment.slmd

SECTION F-F'



Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29		Water Table	Automatically Calculated
Upper Cohesive (PRESUMPSCOT)		130	Undrained	3500	0	Constant	Water Table	Automatically Calculated
Lower Cohesive (PRESUMPSCOT)		115	Undrained	1000	0	Constant	Water Table	Automatically Calculated
Cohesionless		125	Mohr-Coulomb	0	31		Water Table	Automatically Calculated
Dense Cohesionless		130	Mohr-Coulomb	0	36		Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
FGA		20	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Pavement +Sub-base		135	Mohr-Coulomb	0	36		Water Table	Automatically Calculated

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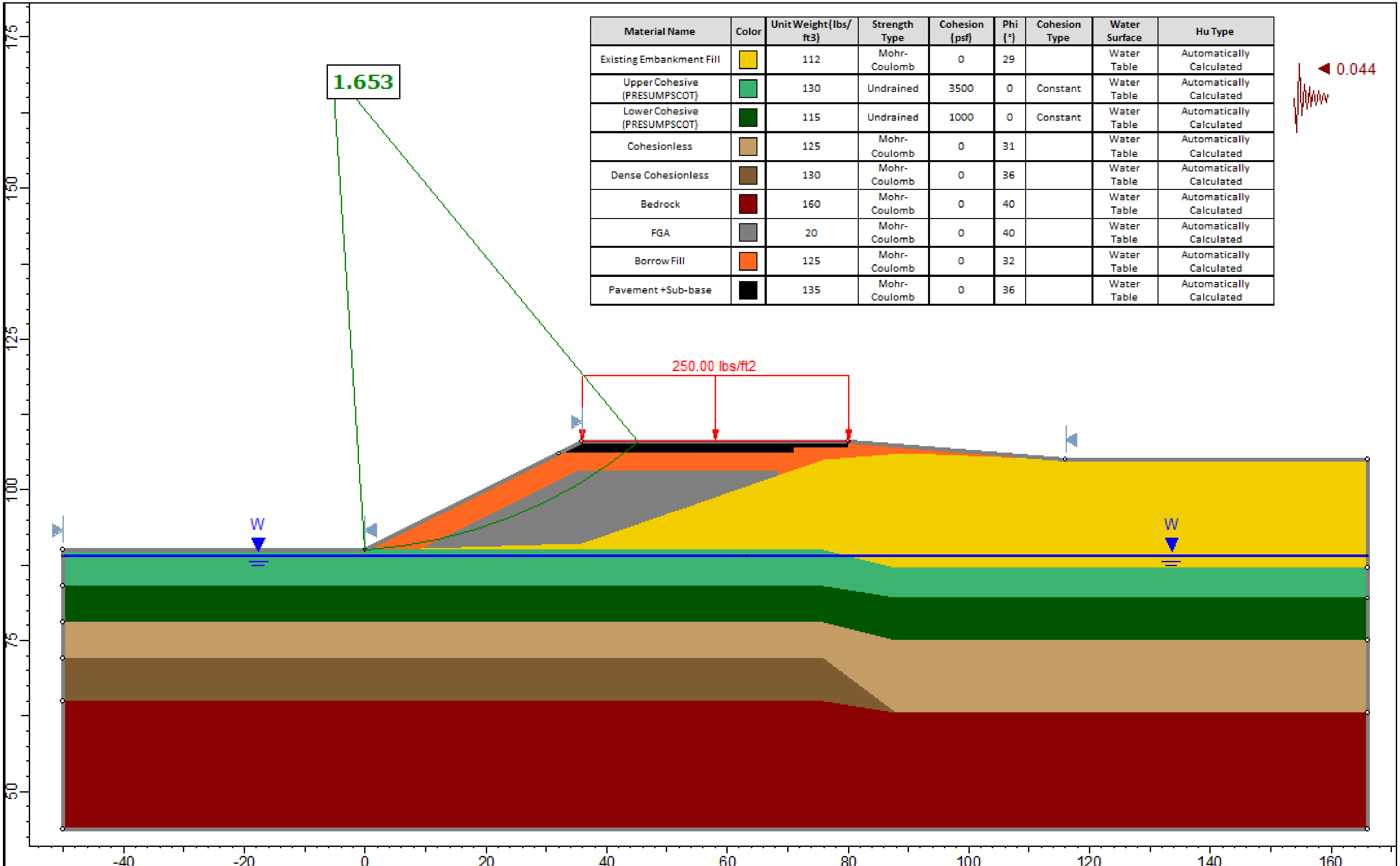
SLIDEINTERPRET 9.034

Project	Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR
Group	East embankment station 20+75
Scenario	STATIC
Drawn By	MK
Company	H&H
Date	9/24/2024
File Name	East Approach STA20 +75.slmd

SECTION F-F'

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29		Water Table	Automatically Calculated
Upper Cohesive (PRESUMPSCOT)		130	Undrained	3500	0	Constant	Water Table	Automatically Calculated
Lower Cohesive (PRESUMPSCOT)		115	Undrained	1000	0	Constant	Water Table	Automatically Calculated
Cohesionless		125	Mohr-Coulomb	0	31		Water Table	Automatically Calculated
Dense Cohesionless		130	Mohr-Coulomb	0	36		Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
FGA		20	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Pavement +Sub-base		135	Mohr-Coulomb	0	36		Water Table	Automatically Calculated



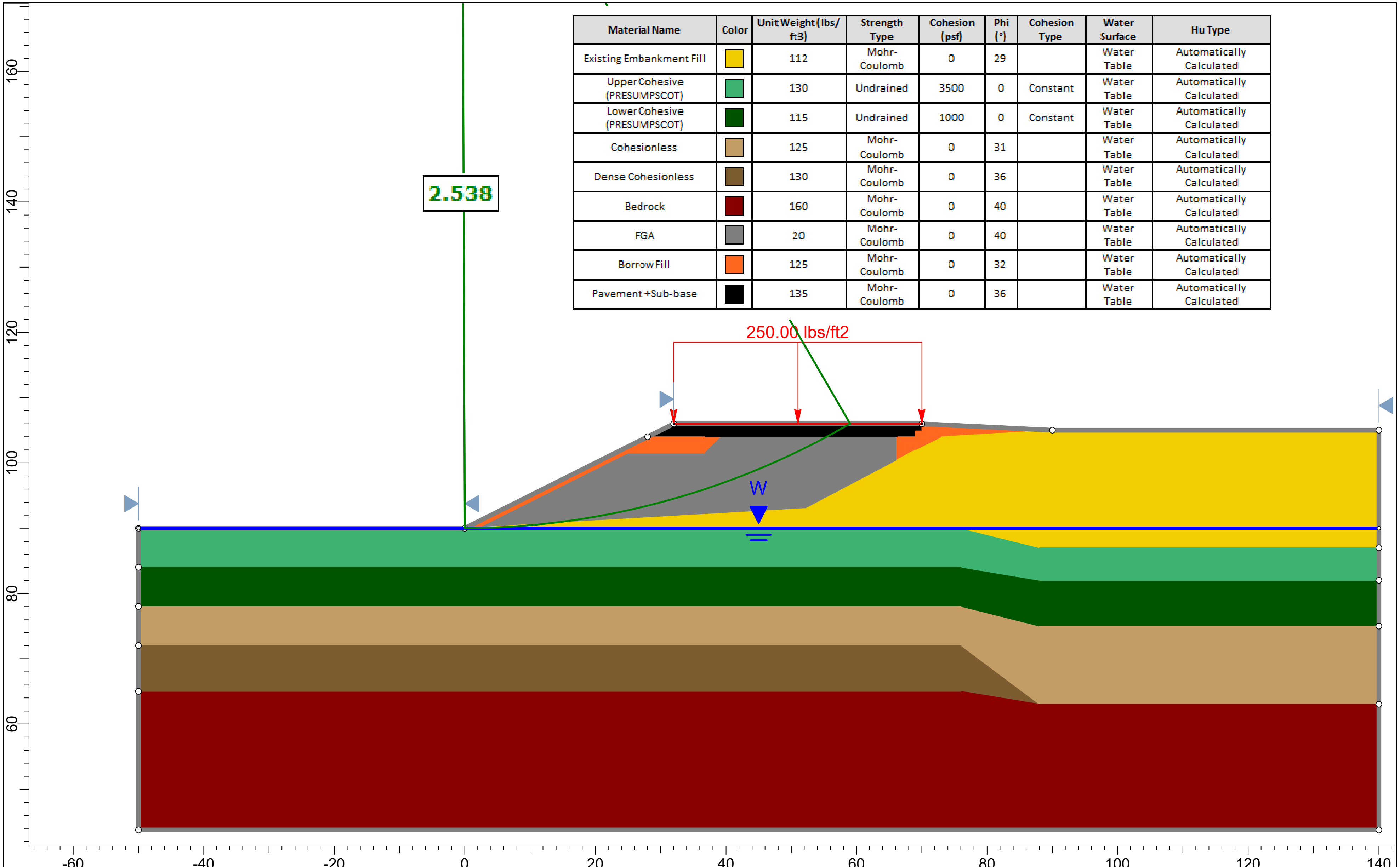
rocscience

Project	Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR		
Group	East embankment station 20+75	Scenario	SEISMIC
Drawn By	MK	Company	H&H
Date	9/24/2024	File Name	East Approach STA20 +75.slmd

SLIDEINTERPRET 9.034

SECTION G-G'

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29		Water Table	Automatically Calculated
Upper Cohesive (PRESUMPSCOT)		130	Undrained	3500	0	Constant	Water Table	Automatically Calculated
Lower Cohesive (PRESUMPSCOT)		115	Undrained	1000	0	Constant	Water Table	Automatically Calculated
Cohesionless		125	Mohr-Coulomb	0	31		Water Table	Automatically Calculated
Dense Cohesionless		130	Mohr-Coulomb	0	36		Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
FGA		20	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Pavement+Sub-base		135	Mohr-Coulomb	0	36		Water Table	Automatically Calculated

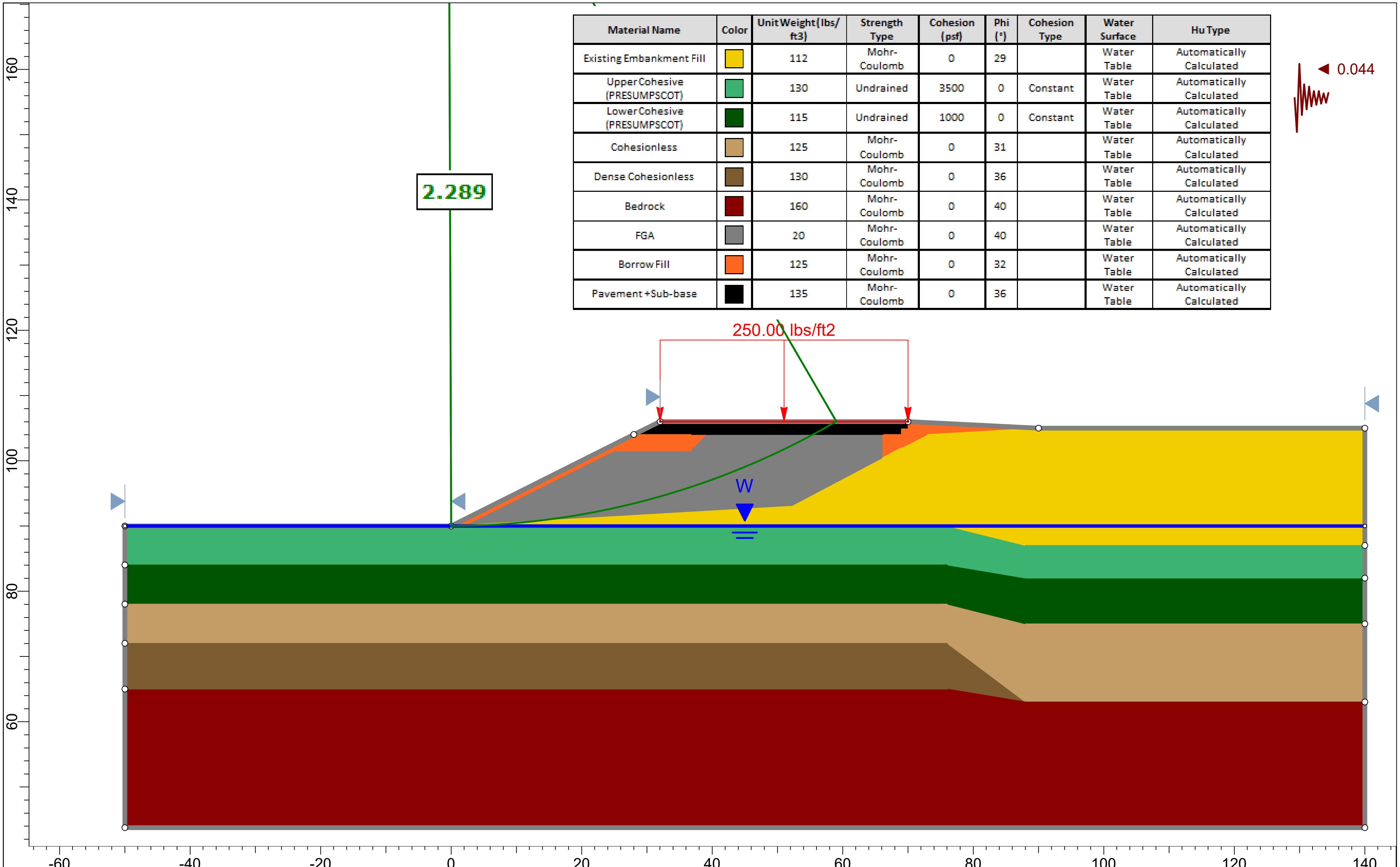


rocscience	*Project* Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR

Group	East embankment station 21+50	*Scenario*	STATIC
Drawn By	MK	*Company*	H&H
Date	9/24/2024	*File Name*	East Approach STA21+50 (B206 + B207).slmd

SLIDEINTERPRET 9.034

SECTION G-G'



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29		Water Table	Automatically Calculated
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Lower Cohesive (PRESUMPSCOT)		115	Undrained	1000	0	Constant	Water Table	Automatically Calculated
Cohesionless		125	Mohr-Coulomb	0	31		Water Table	Automatically Calculated
Dense Cohesionless		130	Mohr-Coulomb	0	36		Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
FGA		20	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Pavement+Sub-base		135	Mohr-Coulomb	0	36		Water Table	Automatically Calculated

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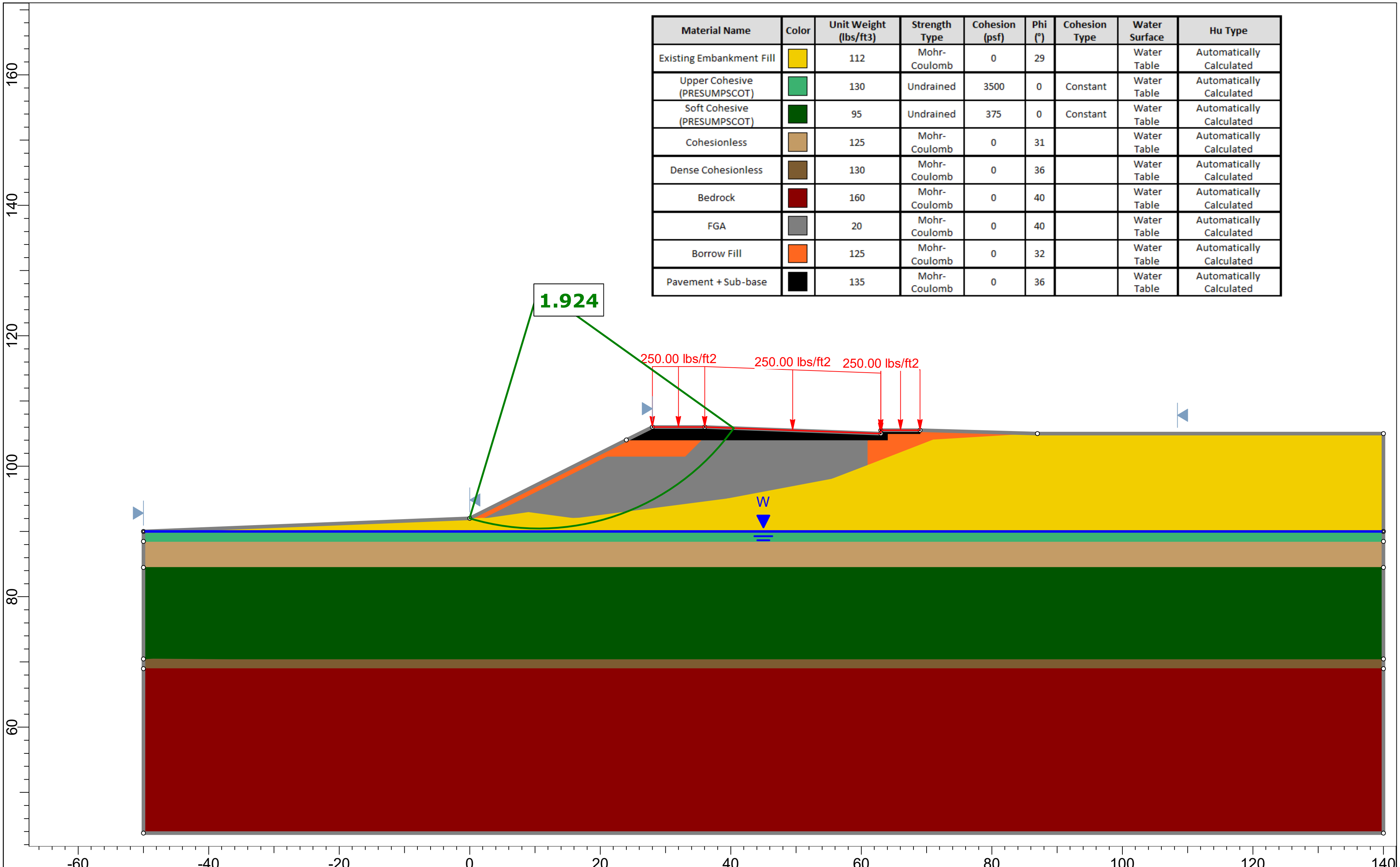
SLIDEINTERPRET 9.034

Project	Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR		
Group	East embankment station 21+50	*Scenario*	SEISMIC
Drawn By	MK	*Company*	H&H
Date	9/24/2024	*File Name*	East Approach STA21+50 (B206 + B207).slmd

SECTION H-H'



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29		Water Table	Automatically Calculated
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Soft Cohesive (PRESUMPSCOT)		95	Undrained	375	0	Constant	Water Table	Automatically Calculated
Cohesionless		125	Mohr-Coulomb	0	31		Water Table	Automatically Calculated
Dense Cohesionless		130	Mohr-Coulomb	0	36		Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
FGA		20	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Pavement + Sub-base		135	Mohr-Coulomb	0	36		Water Table	Automatically Calculated

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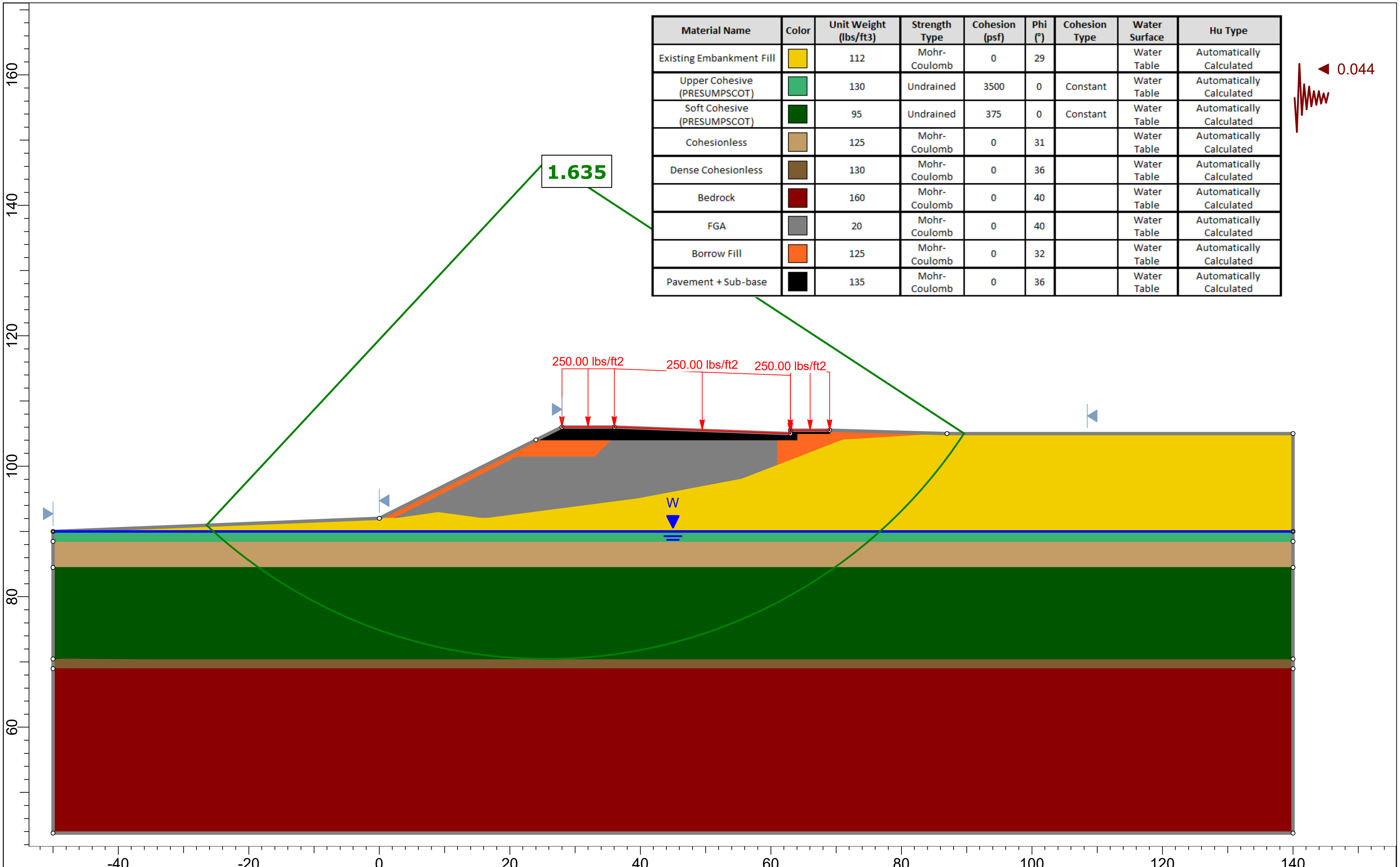
Project Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR

Group	East embankment station 22+25	*Scenario*	STATIC
Drawn By	MK	*Company*	H&H
Date	9/24/2024	*File Name*	East Approach STA22+25.slmd

SLIDEINTERPRET 9.034

SECTION H-H'



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Cohesion Type	Water Surface	Hu Type
Existing Embankment Fill		112	Mohr-Coulomb	0	29		Water Table	Automatically Calculated
Upper Cohesive (PRESUMPSCOT)		130	Undrained	3500	0	Constant	Water Table	Automatically Calculated
Soft Cohesive (PRESUMPSCOT)		95	Undrained	375	0	Constant	Water Table	Automatically Calculated
Cohesionless		125	Mohr-Coulomb	0	31		Water Table	Automatically Calculated
Dense Cohesionless		130	Mohr-Coulomb	0	36		Water Table	Automatically Calculated
Bedrock		160	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
FGA		20	Mohr-Coulomb	0	40		Water Table	Automatically Calculated
Borrow Fill		125	Mohr-Coulomb	0	32		Water Table	Automatically Calculated
Pavement + Sub-base		135	Mohr-Coulomb	0	36		Water Table	Automatically Calculated

rocscience

SLIDEINTERPRET 9.034

Project	Replacement of Tuttle Road Bridge Over I-295, RTE US1 & MCRR		
Group	East embankment station 22+25	*Scenario*	SEISMIC
Drawn By	MK	*Company*	H&H
Date	9/24/2024	*File Name*	East Approach STA22+25.slmd

Appendix J

FOSSA Settlement Analyses

Replacement of Tuttle Road Bridge

PROJECT IDENTIFICATION

Title:	Replacement of Tuttle Road Bridge
Project Number:	WIN 025161.00 -
Client:	Maine DOT
Designer:	MK
Station Number:	STA 13+75

Description:
Proposed Embankment

Company's information:

Name:	H&H
Street:	
	,
Telephone #:	
Fax #:	
E-Mail:	

Original file path and name: Y:\Shared\ ..... ent\FOSSA\West Approach\West Approach STA13+75.2ST
Original date and time of creating this file: 9/19/2024

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 5 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	112.00	0.25	Existing Embankment Fill
2	120.00	0.30	Cohesionless
3	130.00	0.50	Upper Cohesive (PRESUMSCOT)
4	105.00	0.40	Lower Cohesive (PRESUMSCOT)
5	160.00	0.40	Bedrock

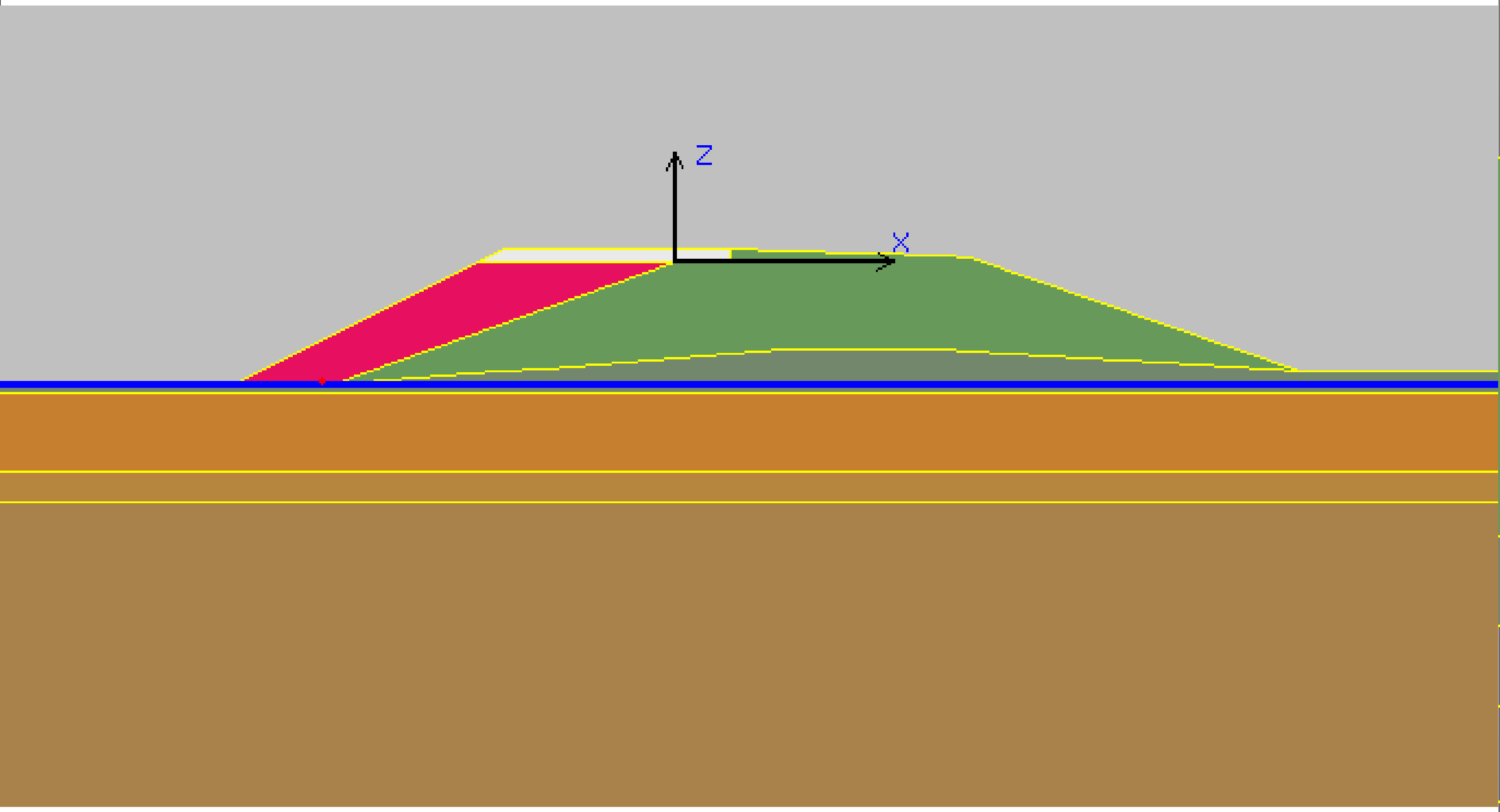
INPUT DATA – EMBANKMENT LAYERS – 2 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	125.00	Borrow Fill
2	135.00	Subbase + Pavement

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	0.00	80.00
2	32.00	80.00
3	75.00	80.00
4	83.00	80.00
5	135.00	80.00
6	183.00	80.00
7	233.00	80.00
8	300.00	80.00

DRAWING OF SPECIFIED GEOMETRY



INPUT DATA FOR CONSOLIDATION –– $\alpha = 1/6$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :	CREEP Ca/Cc
1	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	Yes	3.50	0.087	0.010	0.838	0.2592	Top	0.0320
4	Yes	1.00	0.131	0.015	0.756	17.2800	Bottom	0.0500
5	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Secondary Comprassion (Creep) : Settlement is calculated at t2/t1 = 49.4

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	46.15	0.00	80.00	0.15	79.85

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

SECONDARY SETTLEMENT (Creep), Ss -- Total Secondary Compression (Creep) = 0.065 ft.

Layer #	Underging Consolidation	Cc	C-alpha	e-zero	H [ft.]	t1/t2	Settlement Ss [ft.]
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	No	N/A	N/A	N/A	N/A	N/A	N/A
3	Yes	0.0870	0.0028	0.8380	13.00	49.4	0.033
4	Yes	0.1310	0.0066	0.7560	5.00	49.4	0.032
5	No	N/A	N/A	N/A	N/A	N/A	N/A

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	32.00	80.00	Existing Embankment Fill
	2	48.00	80.00	
	3	104.00	100.00	
	4	112.90	100.00	
	5	113.00	102.00	
	6	152.00	100.75	
	7	206.00	82.00	
2	1	32.00	80.00	Cohesionless
	2	48.00	80.00	
	3	122.00	85.68	
	4	147.00	85.68	
	5	206.00	82.00	
3	1	32.00	78.68	Upper Cohesive (PRESUMSCOT)
	2	75.00	78.68	
	3	83.00	78.68	
	4	135.00	78.68	
	5	183.00	78.68	
	6	233.00	78.68	
4	1	32.00	65.68	Lower Cohesive (PRESUMSCOT)
	2	75.00	65.68	
	3	83.00	65.68	
	4	135.00	65.68	
	5	183.00	65.68	
	6	233.00	65.68	
5	1	32.00	60.68	Bedrock
	2	75.00	60.68	
	3	83.00	60.68	
	4	135.00	60.68	
	5	183.00	60.68	
	6	233.00	60.68	

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 32.00 [ft]	1	72.00	100.00	Borrow Fill
	X2 = 104.00 [ft]	2	95.00	100.00	
2	X1 = 32.00 [ft]	1	76.00	102.00	Subbase + Pavement
	X2 = 113.00 [ft]	2	101.00	102.00	

HISTORY OF SETTLEMENT ANALYSES

History -- Settlement Analysis

Case # | Location of 1D Section | -------Time Rate Consolidation -------

#	X [ft]	Y [ft]	Ultimate Settlement, Sc [ft]	After... [days]	Actual Settlement [ft]	U-ave. (min. for all consol. layers) [%]	R E M A R K S
1	46.15	0.00	0.149	553.7	0.143	90.2	maximum settlement at X, 90% primary consolidation
2	46.15	0.00	0.149	1773.7	0.149	99.9	maximum settlement at X, 99.9% primary consolidation
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Replacement of Tuttle Road Bridge

PROJECT IDENTIFICATION

Title:	Replacement of Tuttle Road Bridge
Project Number:	WIN 025161.00 -
Client:	Maine DOT
Designer:	MK
Station Number:	STA 14+50

Description:
Proposed Embankment

Company's information:

Name:	H&H
Street:	
	,
Telephone #:	
Fax #:	
E-Mail:	

Original file path and name: Y:\Shared\ ..... ent\FOSSA\West Approach\West Approach STA14+50.2ST
Original date and time of creating this file: 9/19/2024

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 5 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	112.00	0.25	Existing Embankment Fill
2	120.00	0.30	Cohesionless
3	130.00	0.50	Upper Cohesive (PRESUMPSCOT)
4	105.00	0.40	Lower Cohesive (PRESUMPSCOT)
5	160.00	0.40	Bedrock

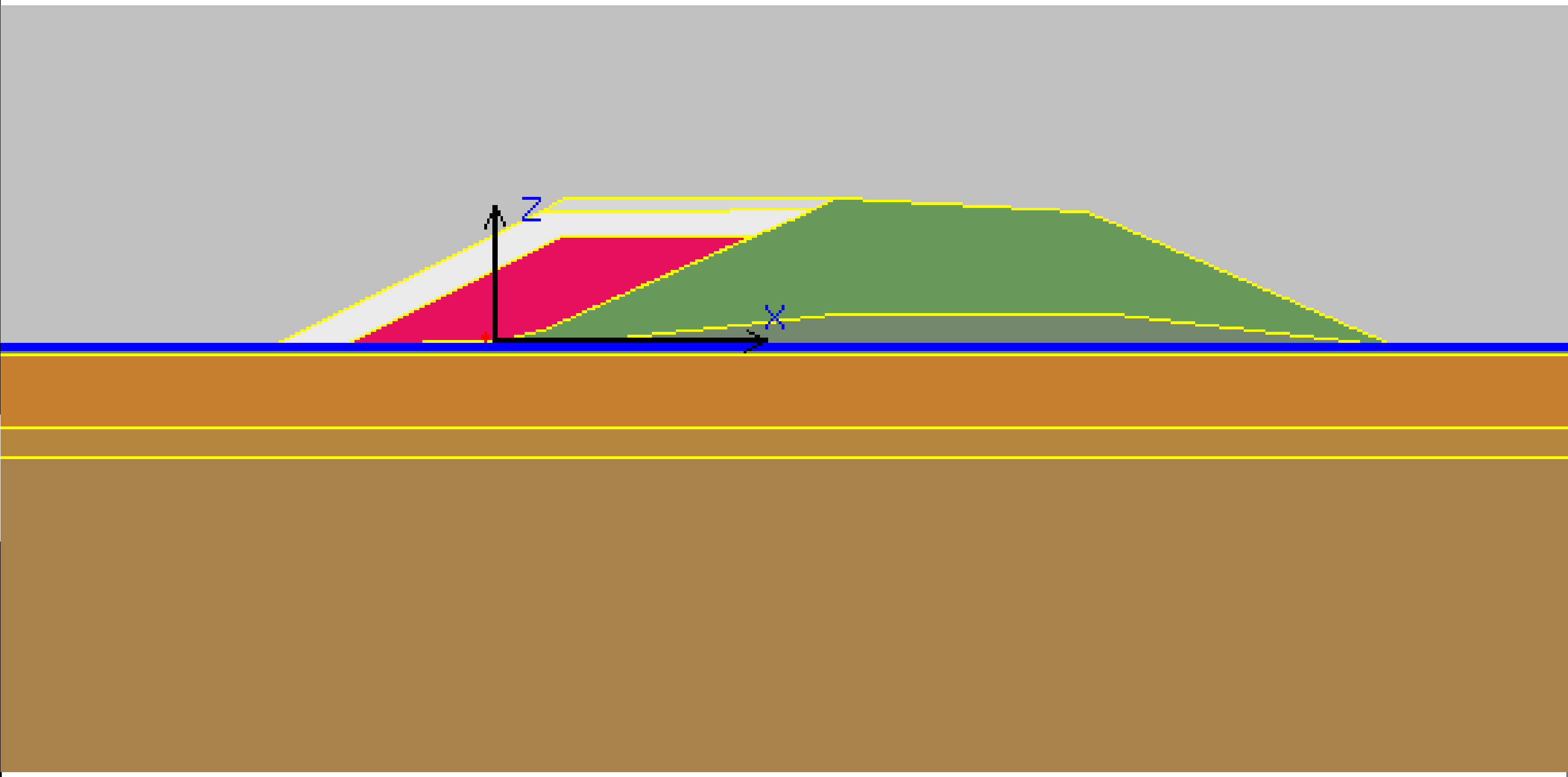
INPUT DATA – EMBANKMENT LAYERS – 3 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	20.00	ULFGA
2	125.00	Borrow Fill
3	135.00	Subbase + Pavement

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	0.00	80.00
2	32.00	80.00
3	75.00	80.00
4	83.00	80.00
5	135.00	80.00
6	183.00	80.00
7	233.00	80.00
8	300.00	80.00

DRAWING OF SPECIFIED GEOMETRY



INPUT DATA FOR CONSOLIDATION -- $\alpha = 1/6$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :	CREEP Ca/Cc
1	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	Yes	3.50	0.087	0.010	0.838	0.2592	Top	0.0211
4	Yes	1.00	0.131	0.015	0.756	17.2800	Bottom	0.0500
5	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Secondary Comprassion (Creep) : Settlement is calculated at t2/t1 = 49.7

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	73.33	0.00	80.96	0.15	80.81

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

SECONDARY SETTLEMENT (Creep), Ss -- Total Secondary Compression (Creep) = 0.054 ft.

Layer #	Underging Consolidation	Cc	C-alpha	e-zero	H [ft.]	t1/t2	Settlement Ss [ft.]
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	No	N/A	N/A	N/A	N/A	N/A	N/A
3	Yes	0.0870	0.0018	0.8380	13.00	49.7	0.022
4	Yes	0.1310	0.0066	0.7560	5.00	49.7	0.032
5	No	N/A	N/A	N/A	N/A	N/A	N/A

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	32.00	80.00	Existing Embankment Fill
	2	75.00	81.00	
	3	83.00	83.00	
	4	135.00	106.00	
	5	178.58	104.00	
	6	233.00	80.00	
2	1	32.00	80.00	Cohesionless
	2	75.00	80.00	
	3	83.00	80.00	
	4	135.00	85.68	
	5	183.00	85.68	
	6	233.00	80.00	
3	1	32.00	78.68	Upper Cohesive (PRESUMPSCOT)
	2	75.00	78.68	
	3	83.00	78.68	
	4	135.00	78.68	
	5	183.00	78.68	
	6	233.00	78.68	
4	1	32.00	65.68	Lower Cohesive (PRESUMPSCOT)
	2	75.00	65.68	
	3	83.00	65.68	
	4	135.00	65.68	
	5	183.00	65.68	
	6	233.00	65.68	
5	1	32.00	60.68	Bedrock
	2	75.00	60.68	
	3	83.00	60.68	
	4	135.00	60.68	
	5	183.00	60.68	
	6	233.00	60.68	

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 48.78 [ft]	1	87.00	99.50	ULFGA
	X2 = 120.30 [ft]	2	95.00	99.50	
2	X1 = 35.00 [ft]	1	83.00	104.00	Borrow Fill
	X2 = 131.00 [ft]	2	101.00	104.00	
3	X1 = 35.00 [ft]	1	87.00	106.00	Subbase + Pavement
	X2 = 135.00 [ft]	2	101.00	106.00	

HISTORY OF SETTLEMENT ANALYSES

Case #	Location of 1D Section : (X) [ft.]	(Y) [ft.]	Ultimate Settlement, Sc [ft.]	After... [days]	Actual Settlement, [ft.]	U-ave (min.for all consol.layers) [%]	U S E R ' S D E S C R I P T I O N
1	73.33	0.00	0.147	553.7	0.1	90.0	maximum settlement at X, 90% primary consolidation
2	73.33	0.00	0.147	1773.7	0.1	99.9	maximum settlement at X, 99.9% primary consolidation
3	---	---	---	---	---	---	
4	---	---	---	---	---	---	
5	---	---	---	---	---	---	
6	---	---	---	---	---	---	
7	---	---	---	---	---	---	
8	---	---	---	---	---	---	
9	---	---	---	---	---	---	
10	---	---	---	---	---	---	
11	---	---	---	---	---	---	
12	---	---	---	---	---	---	
13	---	---	---	---	---	---	
14	---	---	---	---	---	---	
15	---	---	---	---	---	---	

HISTORY OF STAGED CONSTRUCTION

History -- Settlement Analysis

Case # | Location of 1D Section | -------Time Rate Consolidation -------

#	X [ft]	Y [ft]	Ultimate Settlement, Sc [ft]	After... [days]	Actual Settlement [ft]	U-ave. (min. for all consol. layers) [%]	REMARKS
1	73.33	0.00	0.147	553.7	0.142	90.0	maximum settlement at X, 90% primary consolidation
2	73.33	0.00	0.147	1773.7	0.147	99.9	maximum settlement at X, 99.9% primary consolidation
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Replacement of Tuttle Road Bridge

PROJECT IDENTIFICATION

Title:	Replacement of Tuttle Road Bridge
Project Number:	WIN 025161.00 -
Client:	Maine DOT
Designer:	MK
Station Number:	STA 15+00

Description:

Proposed Embankment

Company's information:

Name:	H&H
Street:	
	,
Telephone #:	
Fax #:	
E-Mail:	

Original file path and name: Y:\Shared\ ..... ent\FOSSA\West Approach\West Abutment STA15+00.2ST
Original date and time of creating this file: 9/19/2024

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 6 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	112.00	0.25	Existing Embankmen Fill
2	130.00	0.35	Cohesionless
3	130.00	0.50	Upper cohesive (PRESUMPSCOT)
4	115.00	0.45	Lower cohesive (PRESUMPSCOT)
5	130.00	0.35	Dense Cohesionless
6	160.00	0.40	Bedrock

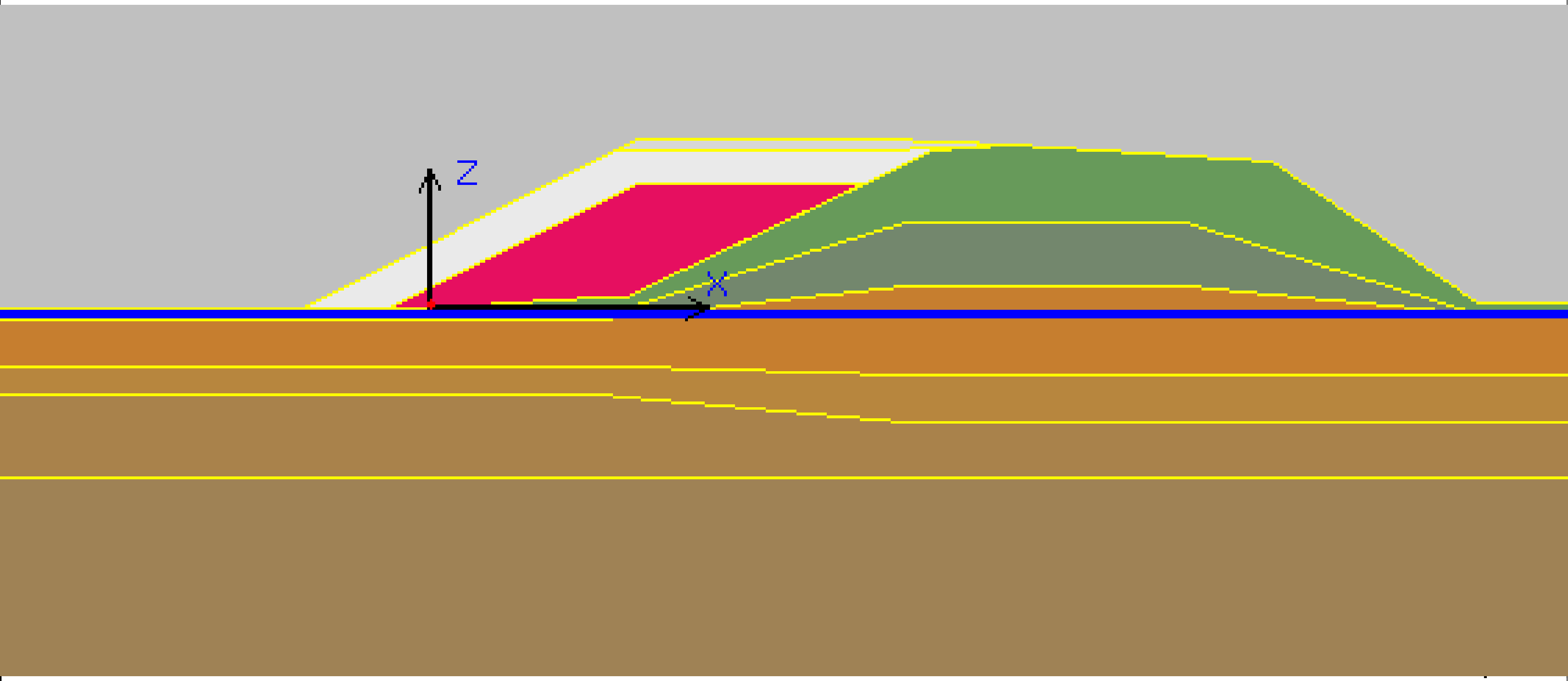
INPUT DATA – EMBANKMENT LAYERS – 3 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	20.00	ULFGA
2	125.00	Borrow Fill
3	135.00	Subbase + Pavement

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	0.00	80.00
2	32.00	80.00
3	75.00	80.00
4	83.00	80.00
5	135.00	80.00
6	183.00	80.00
7	233.00	80.00
8	300.00	80.00

DRAWING OF SPECIFIED GEOMETRY



INPUT DATA FOR CONSOLIDATION –– $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	No	N/A	N/A	N/A	N/A	N/A	N/A
3	Yes	3.50	0.087	0.010	0.838	0.2592	Top
4	Yes	3.50	0.369	0.011	1.340	25.9200	Bottom
5	No	N/A	N/A	N/A	N/A	N/A	N/A
6	No	N/A	N/A	N/A	N/A	N/A	N/A

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	53.95	0.00	81.00	0.05	80.95

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

SECONDARY SETTLEMENT (Creep), Ss -- Total Secondary Compression (Creep) = 0.075 ft.

Layer #	Underging Consolidation	Cc	C-alpha	e-zero	H [ft.]	t1/t2	Settlement Ss [ft.]
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	No	N/A	N/A	N/A	N/A	N/A	N/A
3	Yes	0.0870	0.0018	0.8380	8.00	134.8	0.017
4	Yes	0.3690	0.0129	1.3400	5.00	134.8	0.059
5	No	N/A	N/A	N/A	N/A	N/A	N/A
6	No	N/A	N/A	N/A	N/A	N/A	N/A

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	32.00	81.00	Existing Embankmen Fill
	2	54.00	81.00	
	3	87.00	83.00	
	4	140.00	108.00	
	5	153.00	109.00	
	6	198.00	106.00	
	7	233.00	82.00	
2	1	32.00	80.00	Cohesionless
	2	75.00	80.00	
	3	83.00	80.00	
	4	135.00	95.63	
	5	183.00	95.63	
	6	233.00	80.00	
3	1	32.00	79.20	Upper cohesive (PRESUMPSCOT)
	2	75.00	79.20	
	3	83.00	79.20	
	4	135.00	84.63	
	5	183.00	84.63	
	6	233.00	80.00	
4	1	32.00	71.20	Lower cohesive (PRESUMPSCOT)
	2	75.00	71.20	
	3	83.00	71.20	
	4	135.00	69.63	
	5	183.00	69.63	
	6	233.00	69.63	
5	1	32.00	66.20	Dense Cohesionless
	2	75.00	66.20	
	3	83.00	66.20	
	4	135.00	61.63	
	5	183.00	61.63	
	6	233.00	61.63	
6	1	32.00	52.20	Bedrock
	2	75.00	52.20	
	3	83.00	52.20	
	4	135.00	51.83	
	5	183.00	51.83	
	6	233.00	51.83	

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 46.70 [ft]	1	89.50	102.40	ULFGA
	X2 = 128.00 [ft]	2	95.00	102.40	
2	X1 = 32.00 [ft]	1	85.50	108.00	Borrow Fill
	X2 = 153.00 [ft]	2	130.00	108.00	
3	X1 = 32.00 [ft]	1	89.40	110.00	Subbase + Pavement
	X2 = 153.00 [ft]	2	130.50	110.00	

HISTORY OF SETTLEMENT ANALYSES

History -- Settlement Analysis

Case #	Location of 1D Section X [ft]	Y [ft]	Time Rate Consolidation: Ultimate Settlement, Sc [ft]	After... [days]	Actual Settlement [ft]	U-ave. (min. for all consol. layers) [%]	R E M A R K S
1	53.95	0.00	0.048	202.7	0.044	90.1	maximum settlement at X, 90% primary consolidation
2	53.95	0.00	0.048	649.3	0.048	99.9	maximum settlement at X, 99.9% consolidation
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Replacement of Tuttle Road Bridge

PROJECT IDENTIFICATION

Title: Replacement of Tuttle Road Bridge
Project Number: WIN 025161.00 -
Client: Maine DOT
Designer: MK
Station Number: STA 20+75

Description:
Proposed Embankment

Company's information:

Name: H&H
Street:
,
Telephone #:
Fax #:
E-Mail:

Original file path and name: Y:\Shared\ ..... ent\FOSSA\East Approach\East Approach STA20+75.2ST
Original date and time of creating this file: 9/19/2024

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 6 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	112.00	0.25	Existing Embankment Fill
2	130.00	0.45	Upper Cohesive (PRESUMPSCOT)
3	115.00	0.45	Lower Cohesive (PRESUMPSCOT)
4	125.00	0.30	Cohesionless
5	130.00	0.35	Dense Cohesionless
6	160.00	0.40	Bedrock

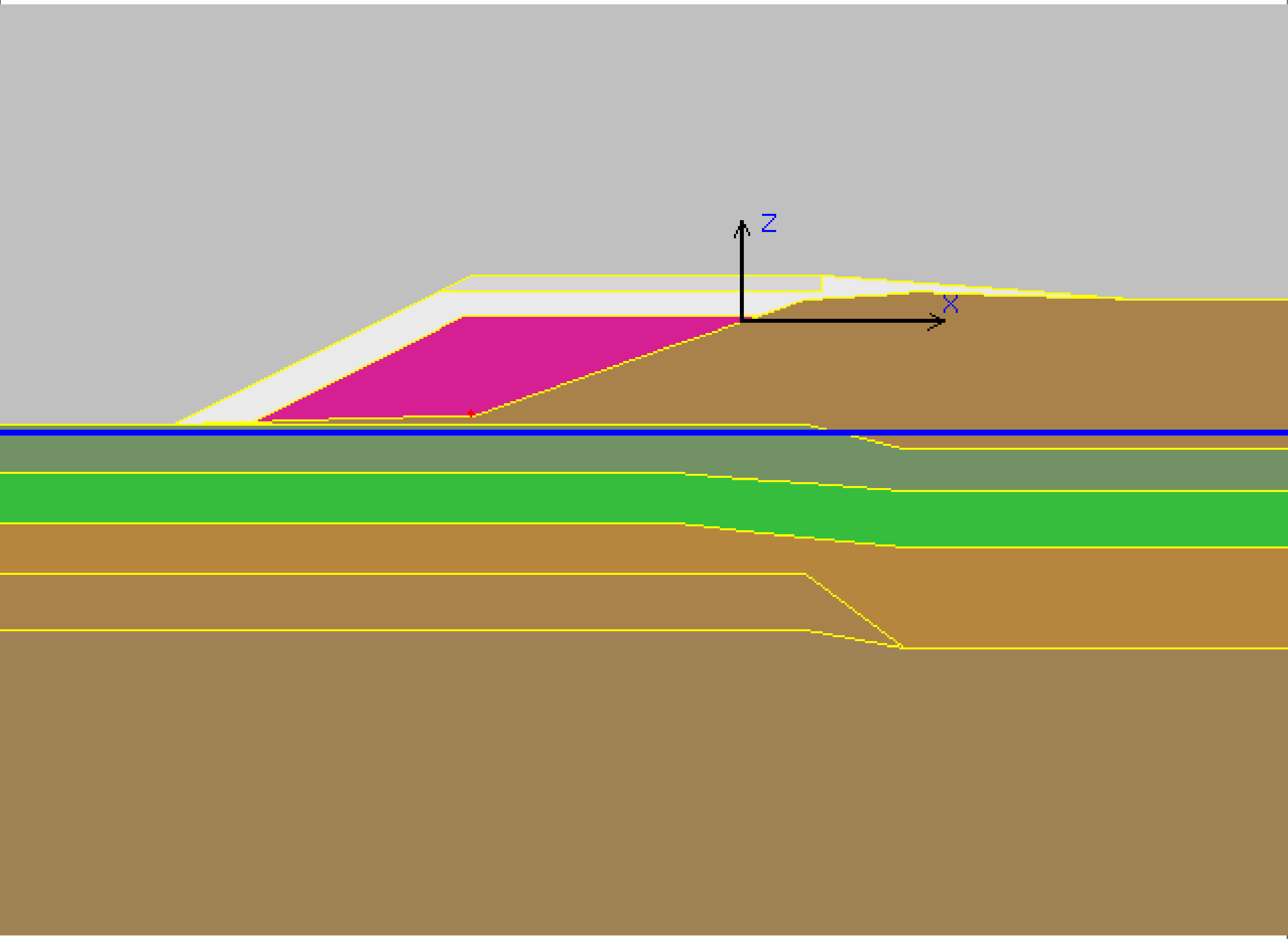
INPUT DATA – EMBANKMENT LAYERS – 3 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	20.00	ULFGA
2	125.00	Borrow Fill
3	135.00	Subbase + Pavement

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	0.00	89.00
2	32.00	89.00
3	63.00	89.00
4	94.00	89.00
5	126.00	89.00

DRAWING OF SPECIFIED GEOMETRY



INPUT DATA FOR CONSOLIDATION -- $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :	CREEP Ca/Cc
1	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	3.00	0.369	0.011	1.340	0.2592	Top	0.0350
3	Yes	3.00	0.369	0.011	1.340	25.9200	Bottom	0.0350
4	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Secondary Comprassion (Creep) : Settlement is calculated at t2/t1 = 242.3

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	35.77	0.00	90.99	0.08	90.91

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

SECONDARY SETTLEMENT (Creep), Ss -- Total Secondary Compression (Creep) = 0.158 ft.

Layer #	Underging Consolidation	Cc	C-alpha	e-zero	H [ft.]	t1/t2	Settlement Ss [ft.]
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	0.3690	0.0129	1.3400	6.00	242.3	0.079
3	Yes	0.3690	0.0129	1.3400	6.00	242.3	0.079
4	No	N/A	N/A	N/A	N/A	N/A	N/A
5	No	N/A	N/A	N/A	N/A	N/A	N/A
6	No	N/A	N/A	N/A	N/A	N/A	N/A

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	0.00	90.00	Existing Embankment Fill
	2	36.00	91.00	
	3	68.57	102.38	
	4	76.00	105.00	
	5	89.25	106.00	
	6	116.00	105.00	
2	1	0.00	90.00	Upper Cohesive (PRESUMPSCOT)
	2	14.00	90.00	
	3	33.00	90.00	
	4	76.00	90.00	
	5	88.00	87.00	
	6	109.00	87.00	
	7	111.00	87.00	
3	1	0.00	84.00	Lower Cohesive (PRESUMPSCOT)
	2	14.00	84.00	
	3	33.00	84.00	
	4	60.00	84.00	
	5	88.00	82.00	
	6	109.00	82.00	
	7	111.00	82.00	
4	1	0.00	78.00	Cohesionless
	2	14.00	78.00	
	3	33.00	78.00	
	4	60.00	78.00	
	5	88.00	75.00	
	6	109.00	75.00	
	7	111.00	75.00	
5	1	76.00	72.00	Dense Cohesionless
	2	88.00	63.00	
	3	311.68	63.00	
	4	344.49	63.00	
	5	360.89	63.00	
6	1	76.00	65.00	Bedrock
	2	88.00	63.00	
	3	328.08	63.00	
	4	344.49	63.00	
	5	360.89	63.00	

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 9.33 [ft]	1	35.00	103.10	ULFGA
	X2 = 70.70 [ft]	2	68.57	103.10	
2	X1 = 0.00 [ft]	1	32.00	106.00	Borrow Fill
	X2 = 116.00 [ft]	2	78.00	106.00	
		3	78.10	107.90	
3	X1 = 0.00 [ft]	1	36.00	108.00	Subbase + Pavement
	X2 = 116.00 [ft]	2	78.00	108.00	

History -- Settlement Analysis

Case #	Location of 1D Section		Time Rate Consolidation				
#	X [ft]	Y [ft]	Ultimate Settlement, Sc [ft]	After... [days]	Actual Settlement [ft]	U-ave. (min. for all consol. layers) [%]	REMARKS
1	35.77	0.00	0.083	112.7	0.076	90.1	maximum settlement at X, 90% primary consolidation
2	35.77	0.00	0.083	364.6	0.083	99.9	maximum settlement at X, 99.9% primary consolidation
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Replacement of Tuttle Road Bridge

PROJECT IDENTIFICATION

Title: Replacement of Tuttle Road Bridge
Project Number: WIN 025161.00 -
Client: Maine DOT
Designer: MK
Station Number: STA 21+50

Description:
Proposed Embankment

Company's information:

Name: H&H
Street:
,
Telephone #:
Fax #:
E-Mail:

Original file path and name: Y:\Shared\ ..... Approach\East Approach STA21+50 (B205 + B206).2ST
Original date and time of creating this file: 9/19/2024

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 6 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	112.00	0.30	Existing Embankment Fill
2	130.00	0.45	Upper Cohesive (PRESUMPSCOT)
3	115.00	0.45	Lower Cohesive (PRESUMPSCOT)
4	125.00	0.30	Cohesionless
5	130.00	0.35	Dense Cohesionless
6	160.00	0.40	Bedrock

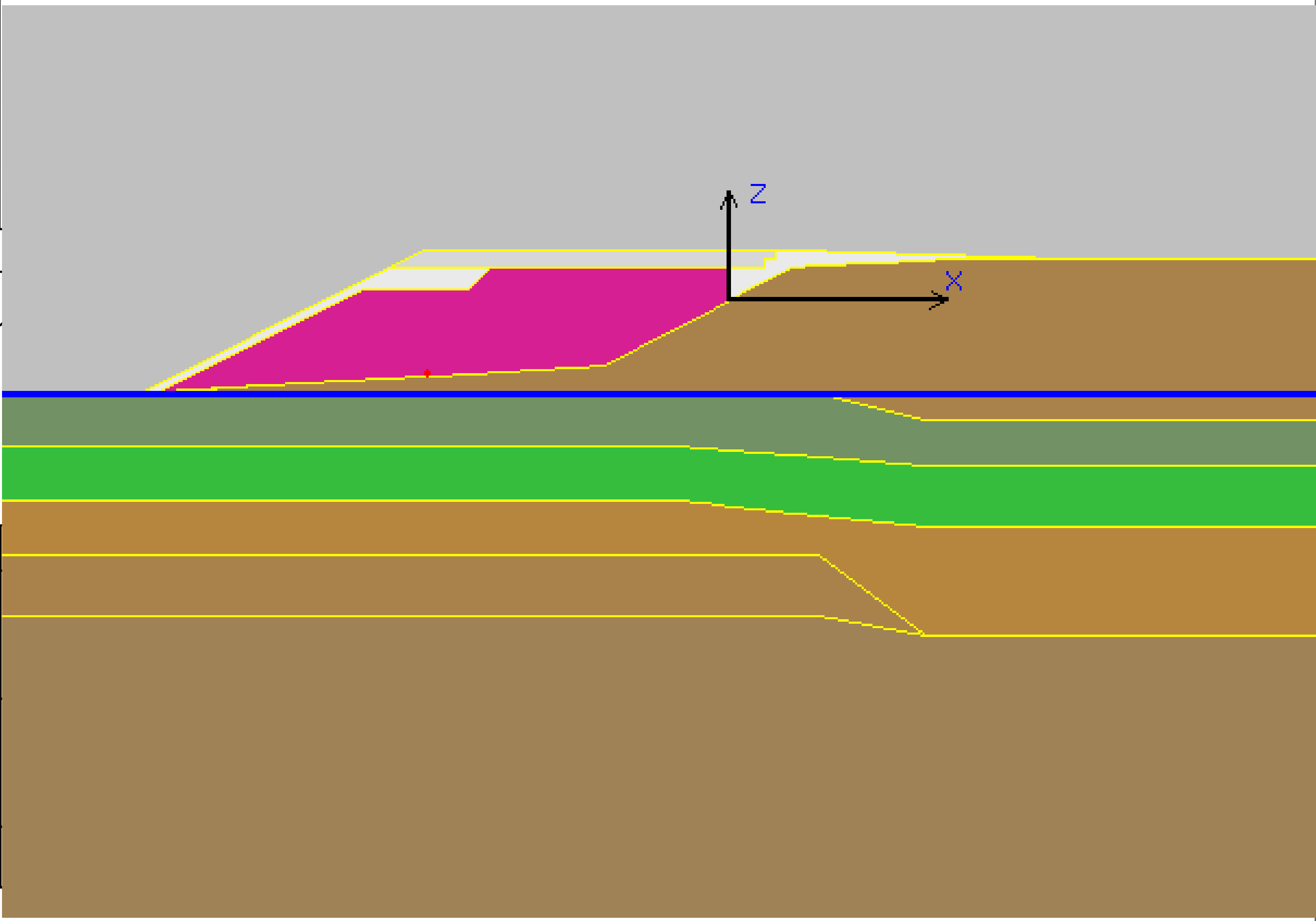
INPUT DATA – EMBANKMENT LAYERS – 3 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	20.00	ULFGA
2	125.00	Borrow Fill
3	135.00	Subbase + Pavement

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	0.00	90.00
2	32.00	90.00
3	63.00	90.00
4	94.00	90.00
5	126.00	90.00

DRAWING OF SPECIFIED GEOMETRY



INPUT DATA FOR CONSOLIDATION –– $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :	CREEP Ca/Cc
1	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	3.00	0.369	0.011	1.340	0.2592	Top	0.0350
3	Yes	3.00	0.369	0.011	1.340	25.9200	Bottom	0.0500
4	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Secondary Comprassion (Creep) : Settlement is calculated at t2/t1 = 242.3

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	32.24	0.00	91.86	0.04	91.82

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

SECONDARY SETTLEMENT (Creep), Ss -- Total Secondary Compression (Creep) = 0.192 ft.

Layer #	Underging Consolidation	Cc	C-alpha	e-zero	H [ft.]	t1/t2	Settlement Ss [ft.]
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	0.3690	0.0129	1.3400	6.00	242.3	0.079
3	Yes	0.3690	0.0185	1.3400	6.00	242.3	0.113
4	No	N/A	N/A	N/A	N/A	N/A	N/A
5	No	N/A	N/A	N/A	N/A	N/A	N/A
6	No	N/A	N/A	N/A	N/A	N/A	N/A

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	0.00	90.00	Existing Embankment Fill
	2	52.00	93.00	
	3	66.00	100.40	
	4	69.00	102.00	
	5	73.00	104.00	
	6	90.00	105.00	
2	1	0.00	90.00	Upper Cohesive (PRESUMPSCOT)
	2	14.00	90.00	
	3	33.00	90.00	
	4	76.00	90.00	
	5	88.00	87.00	
	6	109.00	87.00	
	7	111.00	87.00	
3	1	0.00	84.00	Lower Cohesive (PRESUMPSCOT)
	2	14.00	84.00	
	3	33.00	84.00	
	4	60.00	84.00	
	5	88.00	82.00	
	6	109.00	82.00	
	7	111.00	82.00	
4	1	0.00	78.00	Cohesionless
	2	14.00	78.00	
	3	33.00	78.00	
	4	60.00	78.00	
	5	88.00	75.00	
	6	109.00	75.00	
	7	111.00	75.00	
5	1	76.00	72.00	Dense Cohesionless
	2	88.00	63.00	
	3	311.68	63.00	
	4	344.49	63.00	
	5	360.89	63.00	
6	1	76.00	65.00	Bedrock
	2	88.00	63.00	
	3	328.08	63.00	
	4	344.49	63.00	
	5	360.89	63.00	

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 2.21 [ft]	1	24.95	101.50	ULFGA
	X2 = 66.00 [ft]	2	36.75	101.50	
		3	39.25	104.00	
		4	65.99	104.00	
2	X1 = 0.00 [ft]	1	28.00	104.00	Borrow Fill
	X2 = 104.00 [ft]	2	70.00	104.00	
		3	70.01	105.00	
		4	71.00	105.00	
		5	71.01	106.00	
3	X1 = 0.00 [ft]	1	31.80	106.00	Subbase + Pavement
	X2 = 104.00 [ft]	2	73.00	106.00	

History -- Settlement Analysis

Case # | Location of 1D Section | -------Time Rate Consolidation -------

#	X [ft]	Y [ft]	Ultimate Settlement, Sc [ft]	After... [days]	Actual Settlement [ft]	U-ave. (min. for all consol. layers) [%]	R E M A R K S
1	32.24	0.00	0.040	112.7	0.037	90.3	maximum settlement at X, 90% primary consolidation
2	32.24	0.00	0.040	364.6	0.040	99.9	maximum settlement at X, 99.9% primary consolidation
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Replacement of Tuttle Road Bridge

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PROJECT IDENTIFICATION

Title:	Replacement of Tuttle Road Bridge
Project Number:	WIN 025161.00 -
Client:	Maine DOT
Designer:	MK
Station Number:	STA 22+25

Description:

Proposed Embankment

Company's information:

Name:	H&H
Street:	
	,
Telephone #:	
Fax #:	
E-Mail:	

Original file path and name: Y:\Shared\ ..... ent\FOSSA\East Approach\East Approach STA22+25.2ST
Original date and time of creating this file: 9/23/2024

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 6 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	112.00	0.30	Existing Embankment Fill
2	130.00	0.45	Upper Cohesive (PRESUMPSCOT)
3	125.00	0.30	Cohesionless
4	95.00	0.40	Lower Cohesive (PRESUMPSCOT)
5	130.00	0.35	Dense Cohesionless
6	160.00	0.40	Bedrock

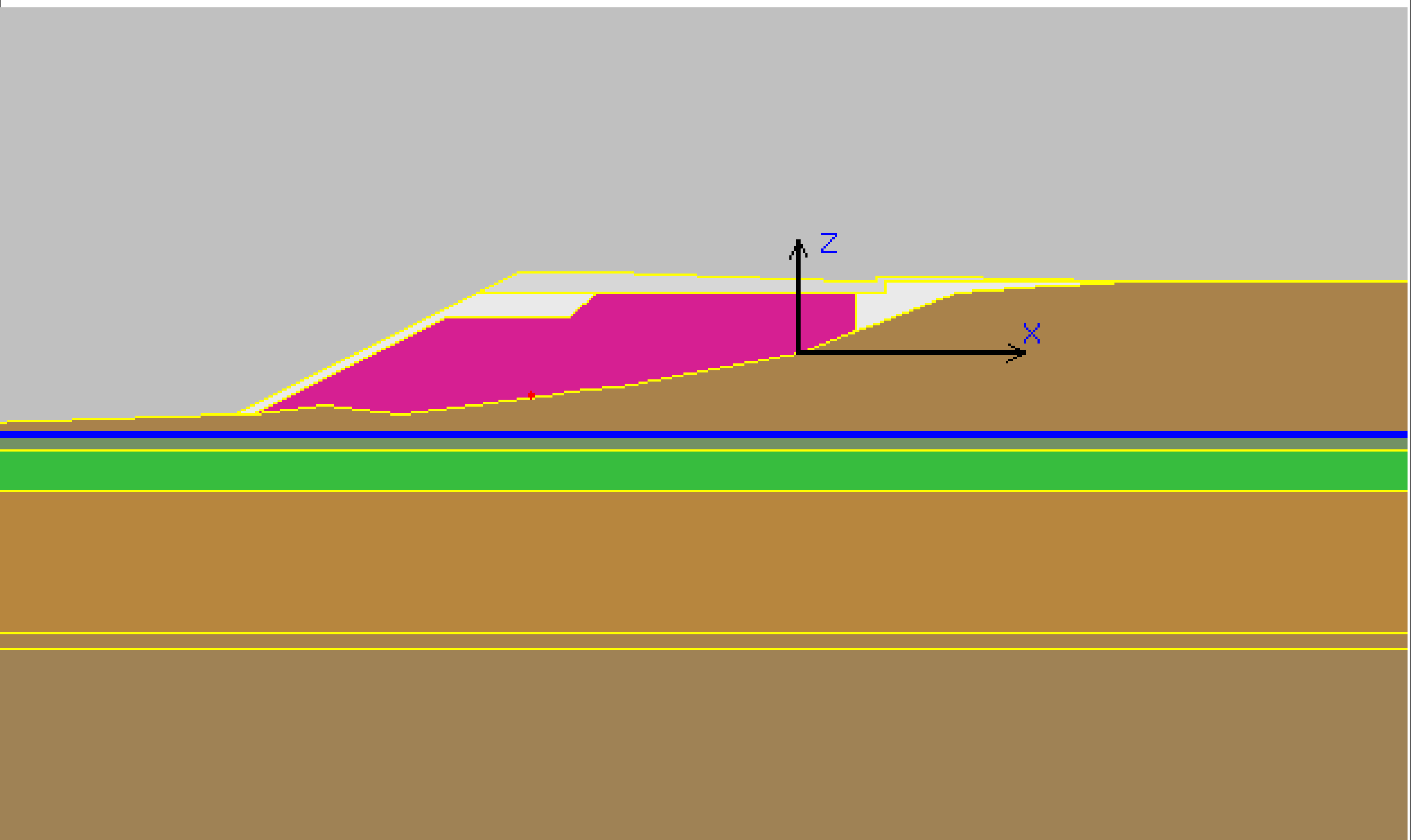
INPUT DATA – EMBANKMENT LAYERS – 3 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	20.00	ULFGA
2	125.00	Borrow Fill
3	135.00	Subbase + Pavement

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	0.00	90.00
2	32.00	90.00
3	63.00	90.00
4	94.00	90.00
5	126.00	90.00

DRAWING OF SPECIFIED GEOMETRY



INPUT DATA FOR CONSOLIDATION –– $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :	CREEP Ca/Cc
1	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	3.00	0.369	0.011	1.340	0.2592	Top & Bot.	0.0350
3	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4	Yes	1.10	0.154	0.009	0.780	0.0474	Top	0.0500
5	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Secondary Comprassion (Creep) : Settlement is calculated at t2/t1 = 7.8

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	29.23	0.00	93.66	0.17	93.49

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

SECONDARY SETTLEMENT (Creep), Ss -- Total Secondary Compression (Creep) = 0.062 ft.

Layer #	Underging Consolidation	Cc	C-alpha	e-zero	H [ft.]	t1/t2	Settlement Ss [ft.]
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	0.3690	0.0129	1.3400	1.55	7.8	0.008
3	No	N/A	N/A	N/A	N/A	N/A	N/A
4	Yes	0.1540	0.0077	0.7800	14.00	7.8	0.054
5	No	N/A	N/A	N/A	N/A	N/A	N/A
6	No	N/A	N/A	N/A	N/A	N/A	N/A

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	-57.63	90.00	Existing Embankment Fill
	2	0.00	92.00	
	3	2.00	92.00	
	4	9.00	93.00	
	5	16.50	92.00	
	6	39.50	95.00	
	7	55.50	98.00	
	8	71.00	104.00	
	9	87.00	105.00	
2	1	0.00	90.00	Upper Cohesive (PRESUMPSCOT)
	2	14.00	90.00	
	3	33.00	90.00	
	4	60.00	90.00	
	5	86.00	90.00	
	6	109.00	90.00	
	7	111.00	90.00	
3	1	0.00	88.45	Cohesionless
	2	14.00	88.45	
	3	33.00	88.45	
	4	60.00	88.45	
	5	86.00	88.45	
	6	109.00	88.45	
	7	111.00	88.45	
4	1	0.00	84.45	Lower Cohesive (PRESUMPSCOT)
	2	14.00	84.45	
	3	33.00	84.45	
	4	60.00	84.45	
	5	86.00	84.45	
	6	109.00	84.45	
	7	111.00	84.45	
5	1	0.00	70.45	Dense Cohesionless
	2	20.00	70.45	
	3	40.00	70.45	
	4	60.00	70.45	
	5	80.00	70.45	
6	1	0.00	68.95	Bedrock
	2	20.00	68.95	
	3	40.00	68.95	
	4	60.00	68.95	
	5	80.00	68.95	

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 2.00 [ft]	1	21.00	101.50	ULFGA
	X2 = 61.00 [ft]	2	33.00	101.50	
		3	35.50	104.00	
		4	60.99	104.00	
2	X1 = 0.00 [ft]	1	24.00	104.00	Borrow Fill
	X2 = 87.00 [ft]	2	64.00	104.00	
		3	64.01	105.00	
3	X1 = 0.00 [ft]	1	0.00	92.00	Subbase + Pavement
	X2 = 87.00 [ft]	2	28.00	106.00	
		3	36.00	106.00	
		4	63.00	105.00	
		5	63.01	105.50	
		6	69.00	105.50	

History -- Settlement Analysis

Case #	Location of 1D Section		-------Time Rate Consolidation -------				
#	X [ft]	Y [ft]	Ultimate Settlement, Sc [ft]	After... [days]	Actual Settlement [ft]	U-ave. (min. for all consol. layers) [%]	R E M A R K S
1	29.23	0.00	0.171	1825.0	0.127	73.7	maximum settlement at X, 5 years post construction
2	29.23	0.00	0.171	3484.6	0.154	90.1	maximum settlement at X, 90% primary consolidation
3	29.23	0.00	0.171	3650.0	0.156	91.0	maximum settlement at X, 10 years post construction
4	29.23	0.00	0.171	11348.3	0.171	99.9	maximum settlement at X, 99.9% primary consolidation
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							