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GEOTECHNICAL DESIGN REPORT
REPLACEMENT OF MAINE TURNPIKE OVERPASS BRIDGES OVER WARREN AVENUE
PORTLAND, MAINE

Prepared for:
Vanasse Hangen Brustlin, Inc
South Portland, Maine

March 2019
09.0025970.01

Prepared by:

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VIA EMAIL

March 22, 2019
File No. 09.0025970.01

Mr. Tim Bryant, P.E.
Vanasse Hangen Brustlin, Inc.
500 Southborough Drive
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Re: Geotechnical Design Report
Replacement of Maine Turnpike Overpass Bridges over Warren Avenue
Portland, Maine

Dear Tim:

We are pleased to provide this Geotechnical Design Report (GDR) to Vanasse Hangen Brustlin, Inc. (VHB) for the Maine Turnpike Overpass Bridges over Warren Avenue in Portland, Maine. Our work was completed in accordance with the Subconsultant Agreement between VHB and GZA GeoEnvironmental, Inc. (GZA) dated August 29, 2018, which incorporates GZA's proposal No. 09.P000059.19, dated August 3, 2018, and the *Limitations* included in **Appendix A** of this report. GZA is providing geotechnical engineering services as a Subconsultant to VHB, who is under contract with the Maine Turnpike Authority (MTA) for design of the proposed overpass bridge replacement.

It has been a pleasure serving VHB on this phase of the project, and we look forward to our continued work with you through project completion. If you have any questions regarding the report, or if we can provide further assistance, please do not hesitate to contact the undersigned.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Blaine M. Cardali, P.E.
Project Engineer

Andrew R. Blaisdell, P.E.
Consultant Reviewer

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Attachment: Geotechnical Design Report

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1.0 INTRODUCTION

This report presents the results of the geotechnical evaluation completed by GZA GeoEnvironmental, Inc. (GZA) for the proposed replacement of the Maine Turnpike Overpass Bridges over Warren Avenue in Portland, Maine. Our services were completed in accordance with the Subconsultant Agreement between VHB and GZA dated August 29, 2018, which incorporates GZA's proposal No. 09.P000059.19, dated August 3, 2018. This report is subject to the *Limitations* included in **Appendix A**.

1.1 BACKGROUND

The project includes replacement of the two Interstate 95 (I-95) Warren Avenue Overpass Bridges in Portland, Maine. The existing bridges were constructed from 1954 to 1956 and consist of separate 38-foot-wide, three-span bridges that carry the northbound and southbound barrels of I-95 over Warren Avenue. The bridges are currently supported on driven steel H-piles, with stub abutments (10BP42 piles) and two intermediate piers (12BP53 piles). The overall bridges are 226 feet long, with spans of 67, 92, and 67 feet. Prior to construction of the Maine Turnpike, the original ground surface sloped moderately downward to the south and was in the range of El. 70 near Abutment 2, and approximately El. 69 at Abutment 1. The Turnpike was constructed with a combination of mainline embankment fills of approximately 7 feet leading up to the bridge abutments and cuts as deep as approximately 12 feet to shape the Warren Avenue profile beneath the I-95 overpass bridges.

The proposed bridge replacements are needed to address collision damage to the bridge structure from over-height vehicles on Warren Avenue and other maintenance requirements of the existing bridge. The scope of work will include increasing the vertical clearance of the bridge over Warren Avenue from the current substandard 13'-10" to a minimum of 16'-6". To maintain traffic during construction it will be necessary to widen the bridges and roadway approaches.

Although reconstruction and rehabilitation were considered, the alternative selected by the bridge designer consists of a full replacement of the existing bridges with two 125-foot single-span integral abutment bridges. It is anticipated that the abutments will be founded driven H-pile foundations. The Warren Avenue profile will not be modified. A grade raise of approximately 2 to 5 feet is proposed on both barrels of the I-95 mainline.

1.2 OBJECTIVES AND SCOPE OF SERVICES

The objectives of our work were to evaluate subsurface conditions and to provide geotechnical engineering recommendations for the proposed Overpass Bridges replacement. To meet these objectives, GZA completed the following Scope of Services:

- Conducted site visits to observe surficial conditions and reviewed mapped surficial and bedrock geology of the site;
- Reviewed existing data;
- Coordinated and observed a subsurface exploration program, consisting of 17 test borings, to provide additional data to evaluate subsurface conditions;

- Conducted a laboratory testing program to evaluate engineering and index properties of the site soils;
- Conducted geotechnical engineering analyses to evaluate foundation types for new abutments; frost considerations for pavement, settlement of embankments and bridge abutments, slope stability; and groundwater and drainage considerations for Warren Avenue pavement;
- Developed geotechnical engineering recommendations including foundation design recommendations for proposed H-piles, settlement mitigation, lateral earth pressures and seismic design parameters; and
- Prepared this geotechnical design report summarizing our findings and design recommendations.

2.0 SUBSURFACE EXPLORATIONS

GZA completed a subsurface exploration program consisting of 17 test borings. Eight of the borings (WA-B101 through WA-B108) were drilled as bridge borings to assess foundation conditions for the bridge piers and abutments. A groundwater observation well was installed in boring WA-B103. Eight of the borings were drilled as roadway borings to assess groundwater and pavement subgrade conditions associated with the potential lowering of Warren Avenue. One boring (WA-E117) was drilled at the base of the southbound, west approach embankment to gather data on soil strength and compressibility for use in stability and settlement analyses of the bridge approaches.

The borings were drilled using 4-inch and 3-inch driven casing and drive-and-wash drilling techniques with a track-mounted drill rig. Standard penetration testing (SPT) and split-spoon sampling were performed at 5-foot typical intervals in the overburden using a 24-inch-long, 1-3/8-inch inside-diameter sampler, driven with an automatic hammer (Hammer No. NEBC2) with a rated hammer efficiency factor of 0.677, except for borings WA-R109 through WA-R116, which were sampled using a 3-inch outside-diameter split-spoon sampler. Field vane shear tests were taken in pairs at approximately 10-foot typical intervals within the clay layer and three thin-walled tube samples were taken in boring WA-E117 for laboratory test samples to evaluate clay properties.

The borings were backfilled with cuttings, crushed stone, and asphalt cold patch. The approximate as-drilled boring locations were established by GZA using taped ties to existing bridge structure components and nearby sign structures. See **Figure 2** for the as-drilled boring location plan. The Elevations of the borings were interpolated between the 1-foot contours shown on the boring location plan and should be considered approximate. Elevations referenced in this report are in feet and refer to the National American Vertical Datum of 1988 (NAVD88). The locations and elevations of the borings are considered approximate and are accurate to the degree implied by the methods used to determine them.

The borings were drilled to depths of approximately 6 to 69 feet below ground surface. All eight of the bridge abutment and pier borings (WA-B101 through WA-B108) were cored approximately 5 to 10 feet into bedrock. The embankment boring (WA-E117) was terminated upon split-spoon refusal and the eight roadway borings (WA-R109 through WA-R116) were terminated 6 feet below the existing roadway surface of Warren Avenue. New England Boring Contractors of Hermon, Maine provided drilling services

and coordinated utility clearance. GZA retained Sargent Corporation to set up and take down traffic control for the duration of the project. The drilling was completed between April 17 and April 26, 2018. GZA personnel monitored the drilling work and prepared logs of each boring that are included in **Appendix B**.

3.0 LABORATORY TESTING

GZA retained Thielsch Engineering of Cranston, Rhode Island to complete a laboratory testing program to assess the gradation and index properties of the soil. The program included: seven (7) gradation analyses / AASHTO Classifications / USCS / Maine Department of Transportation (MaineDOT) Frost Classification, and 21 moisture content tests on the soils.

GZA also retained GeoTesting Express of Acton, Massachusetts to complete a supplemental soil testing program on tube samples from boring WA-E117 to assess the engineering characteristics of the clay encountered at the site. The program included: three (3) incremental consolidation tests, three (3) moisture content tests, three (3) Atterberg limits, and three (3) isotropically-consolidated, undrained triaxial compression tests.

Results of the testing are included in **Appendix C**.

4.0 SUBSURFACE CONDITIONS

4.1 SURFICIAL AND BEDROCK GEOLOGY

Based on available surficial geologic mapping[1], the surficial unit in the vicinity of the bridges consists of the Presumpscot Formation, described as gray-blue, silty clay. Marine sand and gravel deposits and glacial till deposits are also mapped in the area of the bridges.

Bedrock in the vicinity of the site is mapped[2] as the Berwick formation of the Merrimack group, consisting of fine to medium grained quartz-plagioclase-biotite Granofels or Gneiss that is heavily injected by Pegmatite. Granite and gneiss intrusions are mapped east of the bridge.

4.2 SUBSURFACE PROFILE

Four soil units were encountered in the test borings overlying bedrock: Road Base, Fill, Marine Clay, and Glacial Till. Approximately 4 to 5 inches of asphalt pavement was encountered in the Warren Avenue roadway borings. The thicknesses and generalized descriptions of the soil units are presented in the

[1] Thompson, Woodrow B., 2008. Surficial geology of the Portland West quadrangle, Maine: Maine Geological Survey, Open-File Map 08-16, map, scale 1:24,000. *Maine Geological Survey Maps*. 2019. http://digitalmaine.com/mgs_maps/2019

[2] Hussey, Arthur M., II, 2003. Bedrock geology of the Portland West quadrangle, Maine: Maine Geological Survey, Open-File Map 03-94, 12 p. report, 21 figures, 1 plate, photographs, color map, cross section, scale 1:24,000. *Maine Geological Survey Maps*. 34. http://digitalmaine.com/mgs_maps/34

following table, in descending order from existing ground surface. Detailed descriptions of the materials encountered at specific locations are provided in the boring logs in **Appendix B**.

GENERALIZED SUBSURFACE CONDITIONS		
Soil Unit	**Approximate Encountered Thickness (ft)**	**Generalized Description**
Road Base	5 to 6	Very dense to dense, brown, fine to coarse SAND, little Gravel, trace to little Silt, dry to moist. (USCS: SM, SW-SM). MaineDOT Frost Classification: II to III *Encountered in Warren Avenue borings only: WA-R109 through -R116..*
Fill	3 to 7	Loose to medium dense, brown, fine to coarse SAND, little Gravel, little to trace Silt, dry to wet. (USCS: SP, SW, SM). A 0.2- to 0.5-foot thick topsoil layer was encountered at the abutment boring locations. *Encountered in borings WA-B101 through -B108 and WA-E117.*
Marine Clay	35 to 60	Variable, ranging <u>from</u>: Medium stiff to very stiff, gray/brown, Clayey SILT, little to trace Sand, wet.; <u>to:</u> Soft, gray, silty CLAY, trace Sand, wet (USCS: CL, ML). The upper 4-12 feet is medium stiff to very stiff (crust), and the unit becomes softer with depth. *Encountered in borings WA-B101 through -B108, and WA-E117, -R110, -R112, -R113, and -R115.*
Glacial Till	1 to 7	Variable, ranging <u>from</u>: Very dense, gray, fine to coarse SAND, little to trace Gravel, little Silt, wet; <u>to:</u> Dense, gray, GRAVEL, some fine to coarse Sand, little Silt. (USCS: SP-SM, SM, GP, GM). *Encountered in borings WA-B101 through -B106, and WA-E117*
Interpreted Top of Bedrock Elevation		<u>Encountered Top of Rock:</u> Abutment 1 NB: Approx. El. 19 to El .20 Abutment 1 SB: Approx. El. 13 to El. 20 Abutment 2 NB: Approx. El. 15 to El. 18 Abutment 2 SB: Approx. El. 5 to El. 17

<u>4.2.1 Bedrock</u>

Bedrock cored in the test borings was described as hard, fresh, fine to medium grained, gray, Gneiss with few quartz seams noted. In general, the joints are described as close to widely spaced, low to high angle, rough, planar to undulating, fresh to discolored, tight to open with some fine sand and clay infilling. In boring WA-B106, a 3.8-foot, hard, fresh, coarse grained, Pegmatite intrusion was encountered. The Rock Quality Designation (RQD) in the core runs ranged from 55 to 100 percent.

<u>4.2.2 Groundwater</u>

The groundwater level was measured in in the abutment borings ranging from approximately 8 to 10 feet below ground surface, corresponding to El. 62 to 60. The groundwater depth was measured in the Warren Avenue roadway borings from approximately 3 to greater than 6 feet, corresponding to El. 50 to 52. Measurements were taken during or shortly after completing drilling and were likely influenced by the drilling process. A groundwater monitoring well was installed in boring WA-B103 and indicated a stabilized water depth of approximately 5 feet, corresponding to El. 52. Groundwater levels vary due to season, precipitation, and construction activity in the area. Consequently, water levels during and after

construction are likely to vary from those encountered in the borings and observation well at the time the observations were made.

5.0 ENGINEERING EVALUATIONS

5.1 GENERAL

GZA has conducted geotechnical engineering evaluations in accordance with 2017 AASHTO LRFD Bridge Design Specifications, 8th Edition, with Interims (herein designated as AASHTO), and the MaineDOT Bridge Design Guide, 2014 Edition (MaineDOT BDG). The sections that follow describe the evaluations and the geotechnical basis for each element.

5.2 APPROACH EMBANKMENTS

The bridge replacement project includes widening the mainline embankments approximately 14 feet laterally with new fill heights of approximately 12 feet, raising the overall approach grade by 2 to 5 feet along the mainline, and raising the grade beneath portions of the old bridge spans by approximately 14 feet. Loading from the new fill is expected to induce settlement beneath the embankment. The principal strata considered for contribution to embankment settlement is the Marine Clay.

5.2.1 Settlement – Marine Clay Stress History

GZA reviewed the existing bridge plans and concluded that the original bridge construction project included typical fill heights of approximately 7 feet. The available plans do not indicate that settlement mitigation measures such as staged construction, vertical drains, or preloading were used for the approach embankments.

Loading from the currently proposed grade raise and widening is expected to cause consolidation of the clay, resulting in additional settlement. Based on the test boring and laboratory testing results, the marine clay profile includes an overconsolidated upper clay crust layer overlying normally consolidated weaker silty clay. Being overconsolidated, the crust material is less compressible, and will compress more rapidly than the normally consolidated clay below. Settlement in the crust layer is expected to consist primarily of recompression. Settlement in the underlying clay is expected to occur as virgin compression. Based on the laboratory and in-situ testing results and our experience with similar Presumpscot clay deposits in the area, GZA interpreted the marine clay deposit properties as follows:

- Modified recompression ratio (RR) is approximately 0.013 for the clay crust and 0.027 below;
- Modified compression ratio (CR) is approximately 0.21 for the clay crust and 0.25 below;
- Consolidation Coefficient (Cv) varies from approximately 1.0 square foot per day (ft^2/day) for recompression and 0.086 ft^2/day for virgin compression;
- Secondary Compression Coefficient ($C\alpha$) is 0.005 for the clay crust and 0.007 below; and
- Single-drainage conditions are present because the clay unit sits directly on bedrock.

5.2.2 Previous Settlement

Based on our understanding of the marine clay deposits and our review of historic topography and the bridge plans, we estimate a total settlement on the order of 8 to 12 inches has occurred along the existing bridge approach embankments.

5.2.3 Analysis of Future Settlement

GZA developed a three-dimensional model for analysis of future settlement using existing and proposed grading supplied by VHB, subsurface stratification based on the test boring logs, and soil properties developed from the laboratory and field testing as previously described. Where necessary, the subsurface conditions beyond the limits of the test borings were extrapolated to provide a complete subsurface model in the areas of interest.

Settlement analyses were completed using Settle3D software by Rocscience. The initial analysis assumed a design life of 75 years and maximum proposed fill heights of up to 14 feet, corresponding to mainline grade raises of up to 5 feet, with all fill consisting of conventional sand and gravel material. The results indicated total settlements up to approximately 26 inches would occur during the design life. Settlements of this magnitude are expected to result in significant pavement distress, a large bump at the approach/bridge interface, and possible decoupling and structural damage of approach slabs for the new bridges and are therefore considered unacceptable.

5.2.4 Settlement Mitigation Alternatives

Typically, if approach embankment settlements can be limited to less than 6 inches during the design life of a bridge, they can be accommodated by shimming during the regular repaving cycle (assumed to be approximately every 15 years). GZA evaluated three mitigation alternatives with the goal of achieving approximately 6 inches or less of differential settlement between the bridges and the approach embankments. The alternatives included a wick drain and preload scheme to cause the settlement to occur prior to completion of construction; use of expanded polystyrene (EPS) geofoam lightweight fill to reduce the magnitude of new loading and settlement; and use of Ultra Lightweight Foamed Glass Aggregate (ULFGA) to reduce the magnitude of new loading and settlement.

Although wick drains and preloading could technically be performed on this site, it would require extended construction stages with multiple mainline traffic diversions in order to provide settlement relief across the roadway cross-section. Due to the anticipated complications and time required to complete multiple stages of traffic diversion, this approach was judged to be impractical for this site.

The use of lightweight fill material has two distinct advantages: it can be completed within limited lateral footprints as needed during construction staging, and it eliminates the need for a hold period typically associated with a preload. Based on these considerations, settlement mitigation using lightweight fill was selected as the preferred alternative.

GZA evaluated the required volume of lightweight fill to achieve the desired post-construction settlement for each material type and found that based on typical unit pricing and estimated volumes, the cost of the ULFGA material was on the same order of magnitude as the EPS lightweight fill material. Placement and compaction of the ULFGA is anticipated to be completed using conventional earthwork

means, methods and equipment, whereas EPS is installed using handwork and is sensitive to placement and arrangement to achieve a stable embankment. Consequently, we anticipate that ULFGA can be completed more efficiently than placement of the EPS lightweight fill. In addition, the ULFGA material is inert to spilled fuel, which will damage EPS geofoam if it contacts it. EPS geofoam is conventionally protected by a durable HDPE membrane along the entire top and side surfaces of the EPS for protection from spilled fuel. Although we did not complete a full cost estimate, we anticipate that the additional time and labor for EPS geofoam installation and the additional cost of the HDPE membrane material and installation would result in a higher overall cost for this alternative. Therefore, based on anticipated ease of use, accelerated schedule and lower cost, GZA selected ULFGA as the preferred alternative for settlement mitigation on this project.

5.2.5 Estimated Settlement with Preferred Mitigation Alternative

Settlement analyses were completed for the preferred alternative using Settle3D software by Rocscience and the three-dimensional model and soil properties previously described. In order to meet the goal of limiting post construction settlement between the bridge and the approach to approximately 6 inches, GZA evaluated various vertical and lateral extents of the ULFGA material. The configuration that met the differential settlement criteria and required the least volume of ULFGA was considered the preferred solution. It was assumed that final pavement would be installed two years after filling, and that any settlement that occurred in those two years would be mitigated by shimming prior to final paving. During these first two years it is estimated that approximately 2 inches of settlement will occur at the back of the approach slabs and 2 to 4 inches of settlement will occur along the mainline. Therefore, the initial 2 to 4 inches of settlement are excluded from the estimates used by GZA to optimize the ULFGA limits and thickness.

Our evaluations showed that the design intent could be achieved using primarily ULFGA for the fills between the old ground surface and the new abutment, a typical fill thickness of about 8 to 10 feet extending laterally from the old abutment to the back of the new abutment. The upper 2.5 feet of material beneath the embankment will consist of conventional subbase, base gravel and pavement.

A second series of evaluations were performed in order to mitigate concentrated areas of predicted settlement along the shoulder of the proposed widened embankments near the northbound approach to Abutment 1 and the SB approach to Abutment 2.

The results of our evaluations for the ULFGA alternative are presented in the table that follows and in **Figures 5, 6, and 7**. Estimated settlements evaluated are between two and 75 years, which assumes that final paving will be completed two years after fills have been placed as discussed previously. The table below summarizes the estimated settlements at the embankment end of the approach slabs (approximately 20 feet behind the centerline of bearing) and across mainline sections approximately 0 to 300 feet beyond the approach slabs.

Settlement Results					
Settlement Mitigation Alternative	**Estimated Settlement between 2 and 75 years (inches)**				**Estimated Volume of ULFGA (CY)**
	Abutment 1	**Abutment 2**	**Mainline South**	**Mainline North**	
No Mitigation	10-20	8-15	4-17	5-13	0
Approach Slab Mitigation	4-5	4-6	4-8	5-10	5500
Approach Slab and I-95 Mainline Mitigation	4-5	4-6	4-8	5-8	6750

The aerial distributions of the anticipated settlements are presented in Figures 5, 6, and 7, which illustrate the analysis results for the three cases: No Mitigation; Approach Slab Mitigation; and Approach Slab and I-95 Mainline Mitigation, respectively.

5.2.6 Settlement Impacts on Water Main Sta.2438+67

An existing water main traverses the Turnpike mainline from approximately Sta. 2438+55, 65 Lt to approximately Sta. 2438+81, 65 Rt. It is understood that the existing pipe consists of an 18-inch ductile iron pipe within a 36-inch bell and spigot concrete casing, all of which was installed with the original Turnpike construction around 1955. We understand that the 18-inch pipe will be replaced within the existing concrete casing in conjunction with the Warren Avenue Bridge Replacements. As previously noted, GZA estimated the prior settlement of the mainline approaches in the area to be approximately 8 to 12 inches. It is considered likely that the water main has incurred similar magnitudes of historical settlement beneath the embankment and that little or no settlement has occurred beyond the embankment limits. It is possible that the configuration of the existing pipe could be surveyed during the pipe replacement process, if desired.

GZA has completed settlement analyses to assess total estimated settlement due to the proposed mainline grade raise and widening. Since the water main is already in place, all future settlement will result in pipeline deformation. Our analyses indicate that the additional settlement will be negligible outside the limits of the proposed embankment, reach a maximum of approximately 10 to 11 inches beneath the newly widened embankment, and will be approximately 8 to 10 inches beneath the existing embankment limits.

Since the new settlement will compound the already distorted shape of the water main, we recommend modifying the water main installation to tolerate the differential settlements. One technically-feasible alternative is to install articulated joints at the toe of the existing slopes (at approximately 68 Lt and 68 Rt) and just outside the limits of the proposed widened slope (at approximately 88 Lt and 88 Rt). These locations were identified as the likely locations where maximum curvature will be induced on the pipe and casing. Final design of modifications to the water main should be undertaken in conjunction with the Portland Water District's Engineer.

5.2.7 Embankment Slope Stability

GZA evaluated the stability of a 12-foot-high fill with an embankment inclination of 2H:1V at the northwest approach side slope using the analytical software application *Slope/W 2018*, developed by Geo-Slope International, and the Modified Bishop method. A grid and radius search technique was used to identify the slip surface with the lowest factor of safety.

The analysis results shown in **Figure 8** indicate that the side slope at the proposed northwest approach has a calculated factor of safety of 2.1 against rotational instability. Factors of safety for the other widened side slopes on the project are anticipated to be similar or greater than 2.1, since the proposed fill heights are expected to be less than or equal to that of the northwest approach.

Since a factor of safety of at least 1.3 is considered acceptable for permanent slopes not supporting structures per AASHTO, the results indicate that the proposed new approach fills are suitable from a global stability standpoint.

5.3 SEISMIC DESIGN CONSIDERATIONS

Seismic site class was evaluated in accordance with the 2017 AASHTO LRFD.

The subsurface profile for seismic design includes the approach fills (including backfill behind abutments) and underlying Marine Clay overlying bedrock. Seismic site class was determined in general accordance with LRFD Table C3.10.3.1, considering the average undrained shear strength in cohesive soils encountered in the borings. The average undrained shear strength for encountered cohesive soils is approximately 360 psf. Therefore, the bridges are assigned to Site Class E.

The available subsurface data indicates that the natural materials encountered at the site are sufficiently cohesive or dense that the potential for liquefaction is low.

5.4 EVALUATION OF FOUNDATIONS

Based on constructability and cost considerations, VHB selected an integral abutment bridge supported on steel H-piles. Design considerations are presented below.

5.4.1 Pile Design Considerations

Based on our experience with similar soils, we anticipate that the piles will be driven near or to bedrock to achieve the required resistance. The results of our evaluations indicate the piles will gain support through a combination of friction in overburden soils and end bearing in glacial till or on bedrock. GZA estimated the geotechnical side resistance of the pile for use in wave equation analyses conducted to assess the pile drivability. The side resistance was estimated using the Meyerhof (SPT) method for granular layers (Fill) and the α-method for the marine clay in accordance with AASHTO Article 10.7. Axial tensile geotechnical (uplift) resistance was not evaluated because the integral abutment configuration will not impose uplift loading on the piles. Since the piles will gain support in primarily dense granular soil and/or bedrock, there is no reduction for group interaction in axial compression.

We anticipate that the total and differential settlement will be limited to the elastic compression of the piles and should be less than ½ inch.

The piles will be installed on land through the approach embankments. Therefore, corrosion was not considered in the design.

Pile design recommendations are presented in **Section 6.3** of this report.

5.4.2 Load and Resistance Factors

Piles should be designed at the strength limit state considering the structural resistance factor of 0.50 per LRFD Section 10.7.3.2.3 for hard driving conditions, and the geotechnical resistance of the piles as established by dynamic testing and signal matching analysis. The piles should be driven to a nominal resistance calculated by dividing the maximum factored pile load by a resistance factor of 0.65, per AASHTO Table 10.5.5.2.3-1.

AASHTO LRFD load factors should be applied to horizontal earth pressure (EH), vertical earth pressure (EV) and earth surcharge (ES) loads using the load factors for permanent loads (γ_p) provided in AASHTO Table 3.4.1-2 for strength and extreme limit state design. A load factor (γ_p) of 1.0 should be applied to downdrag loads. A load factor of 1.5 may be applied to the passive pressure used to design the integral backwall (end diaphragm) to account for deformation of the backwall into the soil as a result of thermal expansion of the integral bridge deck.

5.4.3 Pile Type

The abutments are planned to be supported on ASTM A572, Grade 50 (fy=50 kips per square inch [ksi]) steel HP14x89 piles. Each abutment will include a single row of ten piles, resulting in a total of 40 piles.

5.4.4 Downdrag

Even with ULFGA mitigation, we anticipate more than 0.4 inch of settlement of the Marine Clay after pile installation. Given the potential for greater than 0.4 inch of settlement to occur relative to the abutment piles, the piles should be designed to resist downdrag loading.

Downdrag loading will be greater at Abutment 2 than Abutment 1 due to the additional clay thickness. For simplicity, we analyzed downdrag at Abutment 2 to represent the worst-case condition, which will be used for both abutments, 102 kips.

Side friction contributing to downdrag load was estimated using the β-method in accordance with NAVFAC DM 7.2-211, and as recommended by Sandford et al, "Bitumen Coatings Reduce Downdrag on Piles for Route 1 Interchange Bridges." Beta values were assumed to be 0.35 and 0.25 for the Fill and the Marine Clay, respectively. Based on past practice, a load factor of 1.0 was applied to the calculated downdrag resistance, which was added to the maximum factored load provided by VHB.

5.4.5 Loading Data

The maximum factored axial load for the strength condition provided by VHB is 2370 kips per 10-pile abutment resulting in a factored axial load of 237 kips per pile. Considering the 102 kips per pile downdrag load, the total factored load is 339 kips per pile. After applying the resistance factor of 0.65 for drivability, the required nominal pile resistance is 522 kips.

5.4.6 Preliminary Wave Equation Analysis

A preliminary wave equation analysis was performed to assess pile drivability. The goal of the analysis was to evaluate if a typical pile hammer could install the HP 14x89 piles to a nominal resistance of 522 kips without exceeding the allowable driving stresses.

The analyses used a typical design soil profile from WA-B104 (Abutment 1) with an embedded pile length of approximately 46 feet. The contribution of skin friction to the required nominal pile resistance was estimated to be approximately 10 percent. A Delmag D16-32 open-end diesel hammer with a rated energy of 40,200 foot-pounds (ft-lbs) and a ram weight of 3.52 kips, operated at the maximum fuel setting, was used for the evaluation. The results are summarized below.

DESIGN BASIS WAVE EQUATION ANALYSIS RESULTS					
Pile Type	**Embedded Pile Length**	**Driving System**	**Required Nominal Geotechnical Resistance (kips)**	**Max Driving Stress (ksi)**	**Final Penetration Resistance (blows per inch)**
HP 14x89	46 feet	Delmag D16-32 (40,200 ft-lbs)	522	39	11

Since the driving stresses do not exceed the limiting driving stress of 45 ksi (0.9 Fy) for ASTM A572 steel (50 ksi yield stress), and the calculated penetration resistance is within the MaineDOT preferred range of 6 to 15 blows per inch, the analyzed hammer system is judged acceptable to install the piles to the required nominal resistance noted.

5.4.7 Lateral Pile Analysis

GZA conducted lateral pile analyses using L-Pile 2015®. VHB provided the thermal deflection, end rotation and live load for use in our analyses as follows: maximum thermal deflection at the pile top of 0.731 inches, top rotation of 2.52×10^{-6} radian, and a 1.5-kip horizontal force induced by the live load in the direction of the imposed lateral deflection. Since each LPile analysis is restricted to two head conditions and one axial load, it was necessary to convert the thermal deflection to an equivalent lateral load at the pile head. This was accomplished by separate analysis in LPile where we varied the lateral load until the top movement matched the thermal deflection.

The HP14x89 piles are oriented in the strong axis for bending but were analyzed in both axes to assess possible out-of-axis bending due to the skewed bridge. The assumed axial load was 339 kips, representing the maximum factored axial load.

The subsurface strata encountered near the top of the piles included Fill overlying Marine Clay. Boring WA-B101 was selected as a basis for the design soil profile for the lateral pile analysis since it had the shallowest bedrock elevation which was judged to represent the worst case for lateral analysis. The design soil profile is summarized in the table below.

L-PILE® INPUT PARAMETERS DESIGN SOIL PROFILE PILE LENGTH = 46' (BORING WA-B101)						
Stratum	**Soil Model**	**Top of Layer Elevation (ft- NAVD 88)**	**Layer Thickness (ft)**	**k (pci) / E50**	**ϕ' (deg)/ Su (psf)**	**γ_e (pcf)**
Fill	Reese Sand	67	5	60	32	125
Marine Clay (Crust)	Matlock Clay	62	10	E_{50} = 0.007	1000 psf	45
Marine Clay	Matlock Clay	52	31	E_{50} = 0.008	400 psf	45

The results of our analyses are summarized in the table below.

L-PILE® ANALYSIS SUMMARY							
Pile Orientation	**Maximum Factored Axial Load (kips)**	**Equivalent Shear Force for Lateral Deflection of 0.731 in. (kips)**	**Shear Force Applied at Pile Head (kips)**	**Max. Moment (ft-kips)**	**Max. Combined Stress (ksi)**	**Axial Compressive Stress (ksi)**	**Bending Stress at Pile Head (ksi)**
Weak Axis	339	39.2	40.7	185	63.2	13.1	50.1
Strong Axis	339	54.4	55.9	316	44.6	13.1	31.5

Based on the above results, we recommend the piles be oriented in the strong axis, in order to keep the combined stress within the elastic range.

5.4.8 Lateral Earth Pressure

Thermal expansion of the bridge will cause the backwalls and wingwalls of the integral abutment to move toward the backfill, which will result in earth pressures on the backwall. The proposed approach to estimating soil resistance on the backwall is described in section 5.4.9.

Lateral earth pressure evaluations for abutments are based on the BDG as summarized below:

- AASHTO Commentary C3.10.9.1 specifies that single-span bridges are not required to include acceleration-augmented (earthquake-induced) soil pressures for design.

Design lateral earth pressure recommendations are provided in **Section 6.5** of this report.

5.4.9 Soil Spring Values

The bridge designer is evaluating the bridge using "The Finite Element Design Procedure," which is based on the Massachusetts Department of Transportation (MassDOT) LRFD Bridge Manual Section 3.10.11.5 and models the bridge as a three-dimensional space frame that includes the bridge superstructure, abutments, wingwalls, and piles.

Soil springs are used in the model to represent resistance that develops on the abutment as it deflects into the soil. The methodology requires an estimate of the K-value that ranges between at-rest and passive. In our opinion, Figure 3.10.8-1 is an acceptable means to estimate the K-value, since the compacted fill and ULFGA both have moderately high friction angles, similar to the compacted gravel borrow upon which the figure is based. In addition to the K-value, the designer needs to estimate the unit weight of the proposed backfill and the depth to pile fixity.

Since the backfill is proposed to consist of a combination of ULFGA and granular fill on this project, GZA developed combined parameters for use with the wall and backfill. A weighted average unit weight of 40 pound-force per cubic foot (pcf), and an estimated depth to fixity of 30 feet below the bottom of the abutment, are recommend for use in this calculation.

5.4.10 Frost Penetration

Fill soils are anticipated to be present at the abutments and embankments, either as existing fill or imported backfill. Based on the MaineDOT BDG, Section 5.2.1, the Freezing Index for the site is 1,250, and with low to moderate moisture content (±10 percent) soils, the estimated depth of frost penetration is 6.2 feet.

6.0 RECOMMENDATIONS

6.1 APPROACH SETTLEMENT MITIGATION

We recommend the use of ULFGA to reduce the loading from new embankment fills in the vicinity of the new abutments. The basic limits of the ULFGA should extend vertically from the old ground surface to the base of the new pavement section, and from the back of the new abutments to the face of the old abutments, after they are demolished and removed. Additional ULFGA is recommended to mitigate concentrated areas of predicted settlement along the shoulder of the proposed widened embankments near the northbound approach to Abutment 1 and the SB approach to Abutment 2. The recommended limits of ULFGA are shown on **Figure 7**.

Installation of the ULFGA should be completed in accordance with the Special Provision developed for that application and included in **Appendix D** for reference.

6.2 WATER MAIN SETTLEMENT MITIGATION

Since the new settlement will compound the already-distorted shape of the water main, we recommend modifying the water main installation to tolerate the differential settlements. One technically-feasible

alternative is to install articulated joints at the toe of the existing slopes (at approximately 68 Lt and 68 Rt) and just outside the limits of the proposed widened slope (at approximately 88 Lt and 88 Rt). These locations were identified as the likely locations where maximum curvature will be induced on the pipe and casing. Final design of modifications to the water main should be undertaken in conjunction with the Portland Water District's Engineer.

6.3 SETTLEMENT MONITORING

We recommend that optical survey points be used to monitor settlement beneath the approach roadways (approximately 5 feet beyond the limits of the approach slabs) to assess performance of the ULFGA. The survey points should consist of PK nails installed when the pavement is freshly placed and countersunk slightly to protect them from plows. The recommended survey point locations are summarized in the following table.

Location	Station	Offset
Abutment 1 NB	2436+23, 2436+42	20 Rt, 60 Rt
Abutment 1 SB	2436+06, 2435+87	20 Lt, 60 Lt
Abutment 2 NB	2437+98, 2438+17	20 Rt, 60 Rt
Abutment2 SB	2437+62, 2437+81	20 Lt, 60 Lt

The point elevations should be surveyed immediately upon placement of temporary pavement, referencing benchmarks that are well outside the area of anticipated settlement. Survey should be repeated at one-year intervals, until just prior to final paving. Once the final pavement is laid a new PK nail should be installed and surveyed. The survey should then be repeated at 5-year intervals until just before the surface is repaved. A new PK nail should be installed and surveyed immediately after repaving. The cycle should continue in the same fashion thereafter.

6.4 SEISMIC DESIGN

The United States Geological Survey Online Design Maps Tool was used to develop parameters for bridge design. Based on the site coordinates, the software provided the recommended AASHTO Response Spectra (Site Class E) for a 7 percent probability of exceedance in 75 years. These results are summarized for the site as follows:

SITE CLASS E SEISMIC DESIGN PARAMETERS	
Parameter	**Design Value**
Fpga	2.5
Fa	2.5
Fv	3.5
As (Period = 0.0 sec)	0.220 g
SDs (Period = 0.2 sec)	0.438 g
SD1 (Period = 1.0 sec)	0.157 g

6.5 ABUTMENT DESIGN

- Live load surcharge should be applied as a uniform lateral surcharge pressure using the equivalent fill height (Heq) values developed in accordance with AASHTO Article 3.11.6.4, based on the abutment/wingwall height and distance from the wall backface to the edge of traffic, a minimum of 2 feet.
- Foundation drainage should be provided in accordance with Section 5.4.1.9 of the BDG. We recommend the use of French drains on the uphill side of abutments and wing walls to prevent buildup of differential hydrostatic pressure. Foundation drains should be sloped to drain by gravity and should daylight through weep holes in the abutments.
- A weighted average unit weight of 40 pcf, and an estimated depth to fixity of 30 feet below the bottom of the abutment, are recommended for estimating abutment spring stiffness in accordance with MassDOT LRFD Bridge Manual Section 3.10.11.5.

6.6 PILE DESIGN

- The proposed abutments may be supported on HP14x89 ASTM A572, Grade 50 steel (50 ksi yield stress) H-piles driven to the required nominal resistance, anticipated to be developed through a combination of skin friction and end-bearing on or near the bedrock surface.
- Cast steel pile points should be provided to limit pile damage during driving.
- Pile installation should be controlled using wave equation analysis and field logging of the pile installation with final penetration resistance based on dynamic pile testing with signal matching analysis.
- The piles should be driven to a nominal resistance of 522 kips, calculated by dividing the maximum factored pile load of 339 kips by a resistance factor of 0.65.
- Preliminary wave equation analyses indicate that the piles can be driven to a nominal resistance of 522 kips using a diesel hammer with a rated energy of about 40,200 foot-pounds for 46-foot-long, ASTM A572 Grade 50 HP14x89 piles without exceeding the allowable driving stress of 45 ksi (0.9Fy for 50 ksi steel). The final penetration resistance was 10 to 11 bpi, which is within the MaineDOT range of 3 to 15 blows per inch.
- The pile tip elevations used in the drawings should correspond to the bedrock elevations encountered in the borings, plus or minus 5 feet to account for variability in the top of rock surface and to allow for the possibility that piles penetrate a short distance into the bedrock.
- We recommend that one pile at each abutment be dynamically tested with signal matching. The tests should be performed at the end of initial drive to assess driving stress and establish the penetration resistance criteria for the production piles. The plans should also require a 24-hour restrike test on each pile. If the initial driving results are favorable and show sufficient excess resistance to allow for some relaxation, the restrike tests may be waived. If the pile driving equipment is demobilized from the site between construction stages, additional dynamic pile testing will be required after remobilization.
- Piles shall be spliced in accordance with MaineDOT Section 501.047.

- Since the piles will be subject to axial and lateral loading, they should be checked for resistance to combined axial compression and flexure per AASHTO LRFD Articles 6.9.2.2 and 6.15.2. Per LRFD Article 6.5.4.2, the axial resistance factor ϕ_{cc}=0.75 and the flexural resistance factor ϕ_f=1.0 should be applied to the combined axial and flexural resistance of the pile in the interaction equation (AASHTO LRFD Eq. 6.9.2.2-1).

7.0 CONSTRUCTION CONSIDERATIONS

This section provides guidance regarding quality control during pile installation, excavation, dewatering, and foundation subgrade preparation and protection. These items are discussed in the paragraphs that follow.

7.1 PILE INSTALLATION CONTROL

We recommend that the pile installation be controlled using wave equation analysis and field logging of the pile installation and that final penetration resistance be based on dynamic pile testing with signal matching analysis as previously described.

Additional Pile Dynamic Analyzer testing may be recommended if unanticipated conditions are encountered during installation, including early pile take-up, pile driving out-of-plumb, or otherwise unexplained variations in hammer performance.

7.2 DEWATERING

Continuous dewatering is not anticipated to be necessary to control groundwater inflow in excavations. It is anticipated that any inflow of surface water or runoff to excavations can be handled by open pumping from sumps installed at the bottoms of excavations. Sumps should be fitted with geotextile or sand filters to prevent loss of subgrade fines during pumping. Dewatering discharge should be managed in accordance with the contractor's Stormwater Prevention Plan and MaineDOT Best Management Practices.

Due to the potential for flotation of the ULFGA in open excavations with surface water, we recommend that runoff and other flow be directed away from areas that will have ULFGA stored and placed. In order to maintain dry conditions and limit potential flotation of the ULFGA, it may be necessary to pump any ponded water using sumps placed in the base of excavations.

7.3 EXCAVATION AND TEMPORARY LATERAL SUPPORT

We anticipate that temporary support of excavation may be necessary to maintain portions of the roadway in a phased construction approach. It is anticipated that sheet pile walls will be required in the vicinity of the bridge in areas where grade separations exceed approximately 4 feet. Where walls are shorter in height, one alternative to temporary sheet pile is use of temporary wrapped-face geotextile walls combined with conventional precast concrete roadway barriers.

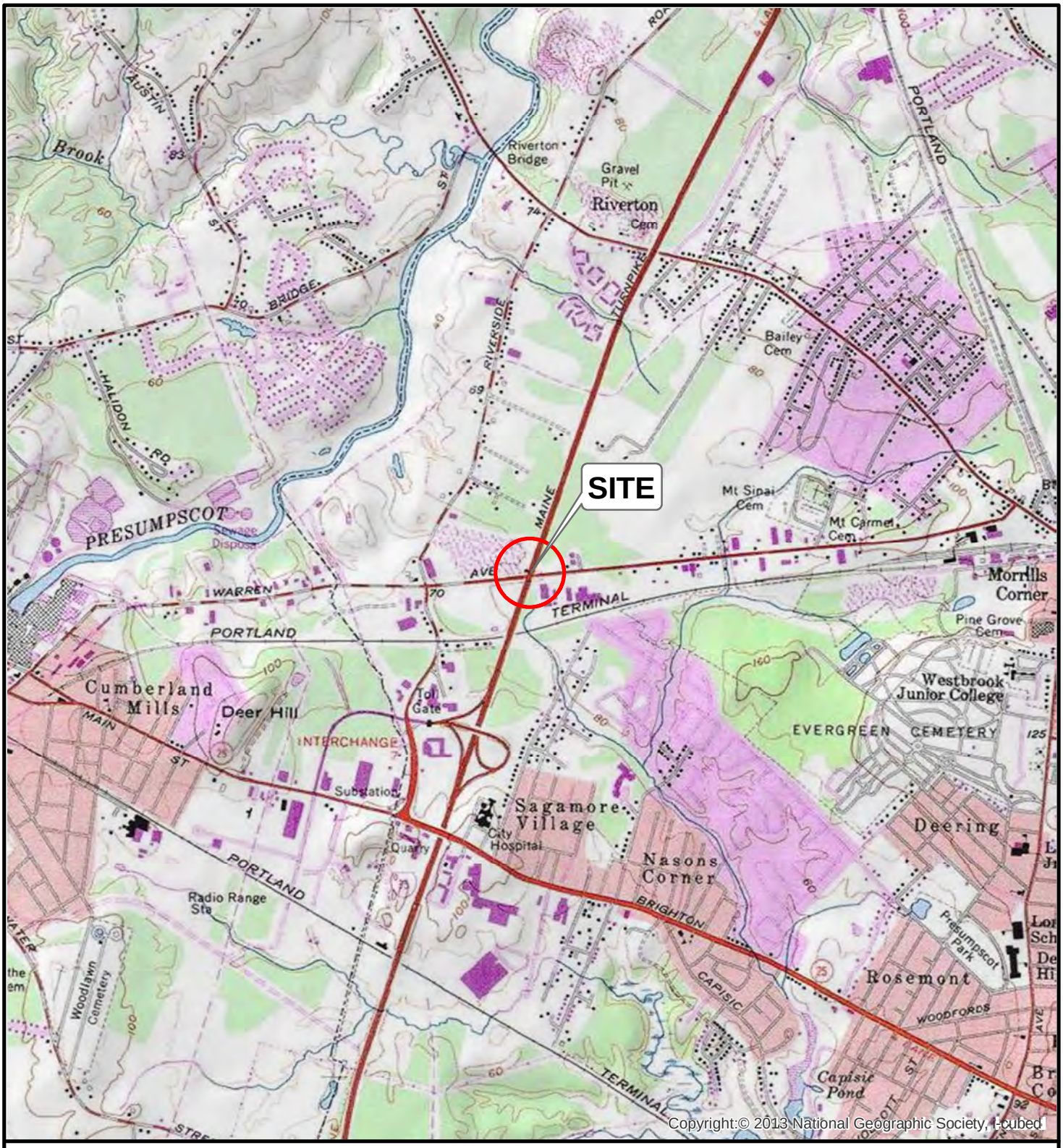
7.4 ULTRA-LIGHT WEIGHT FILL PLACEMENT

This project is expected to be the first large-scale implementation of ULFGA for MTA. We understand that the material can be handled and placed similarly to granular borrow but has a few unique aspects that affect construction: it needs to be encapsulated in geotextile, and it needs to be densified in a controlled fashion with careful attention to avoid crushing of the particles. We recommend that GZA provide field engineering to observe and provide input into material-specific aspects of construction sequencing, placement methodology, compaction equipment and compaction procedures.

We recommend that a nonwoven geotextile fabric be placed directly on the prepared subgrade as a separator between the ULFGA and all other materials. The geotextile should also be installed between the ULFGA and any differing adjacent material exposed by excavation or differing adjacent material being placed beside or on top of the ULFGA.

The ULFGA should be transported, placed and compacted in accordance with the project-specific Special Provision.

FIGURES



USGS QUADRANGLE LOCATION

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SOURCE : THIS MAP CONTAINS THE ESRI ARCGIS ONLINE USA TOPOGRAPHIC MAP SERVICE, PUBLISHED DECEMBER 12, 2009 BY ESRI ARCIMS SERVICES AND UPDATED AS NEEDED. THIS SERVICE USES UNIFORM NATIONALLY RECOGNIZED DATUM AND CARTOGRAPHY STANDARDS AND A VARIETY OF AVAILABLE SOURCES FROM SEVERAL DATA PROVIDERS. THIS MAP ALSO CONTAINS THE ESRI ARCGIS ONLINE USA COUNTIES WHICH PROVIDES DETAILED BOUNDARIES THAT ARE CONSISTENT WITH THE TRACT, BLOCK GROUP, AND STATE DATA SETS AND ARE EFFECTIVE AT REGIONAL AND STATE LEVELS.

0 1,000 2,000 4,000 6,000

SCALE IN FEET

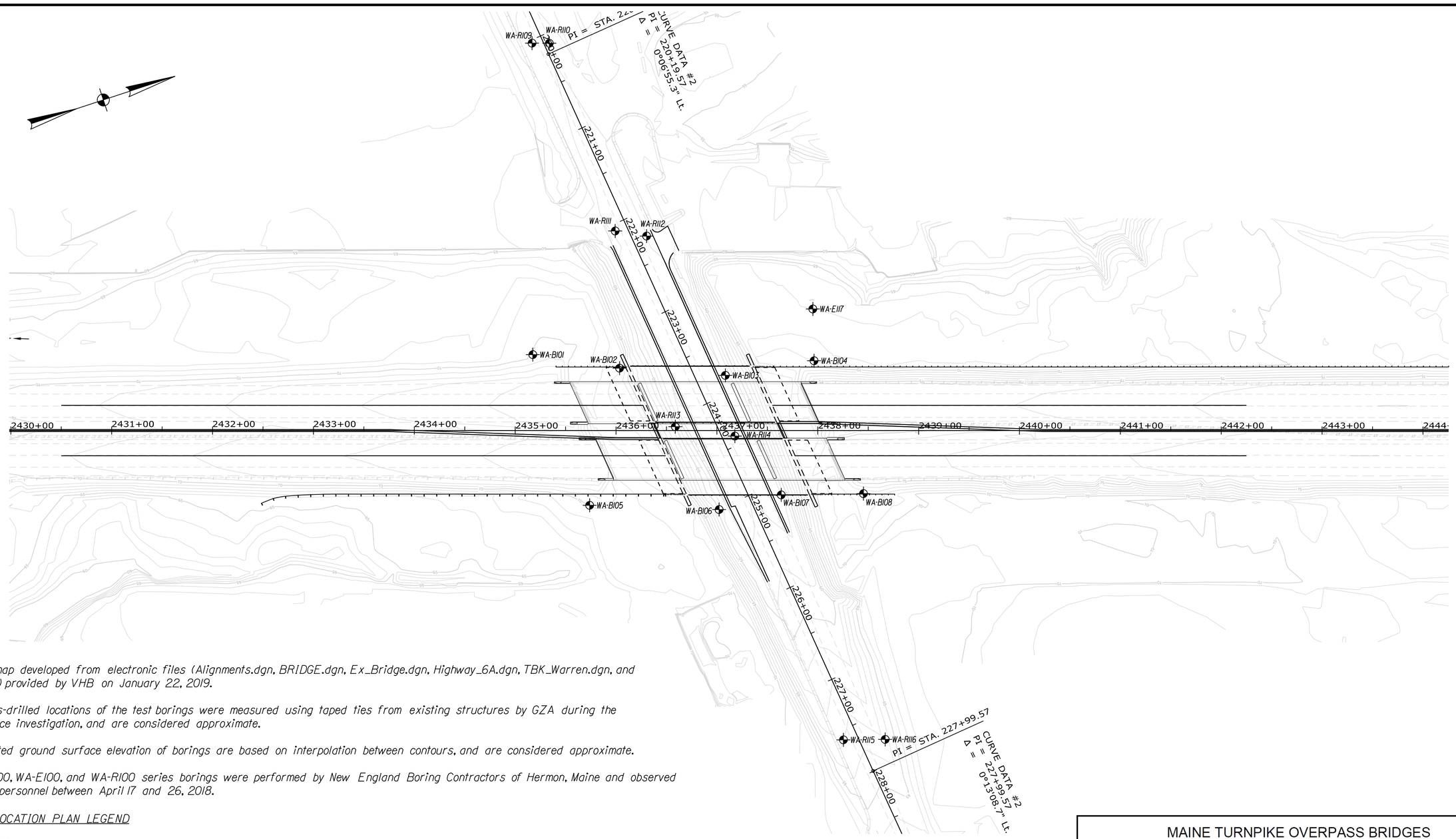
Data Supplied by :

esri

USGS science for a changing world

GZA	PROJ. MGR.: BMC DESIGNED BY: BMC REVIEWED BY: CLS OPERATOR: ADM DATE: 03-01-2019	**LOCUS PLAN**	JOB NO. 09.0025970.01
		WARREN AVE OVERPASS PORTLAND, MAINE	FIGURE NO. 1

Date:3/20/2019



NOTES

1) Base map developed from electronic files (Alignments.dgn, BRIDGE.dgn, Ex_Bridge.dgn, Highway_6A.dgn, TBK_Warren.dgn, and Topo.dgn) provided by VHB on January 22, 2019.

2) The as-drilled locations of the test borings were measured using taped ties from existing structures by GZA during the subsurface investigation, and are considered approximate.

3) Reported ground surface elevation of borings are based on interpolation between contours, and are considered approximate.

4) WA-BI00, WA-EI00, and WA-RI00 series borings were performed by New England Boring Contractors of Hermon, Maine and observed by GZA personnel between April 17 and 26, 2018.

BORING LOCATION PLAN LEGEND

- WA-BI08 — As-Drilled location and designation of cased wash Bridge boring
- WA-EII7 — As-Drilled location and designation of cased wash Embankment Boring
- WA-RII6 — As-Drilled location and designation of cased wash Roadway Boring

Scale: 50 0 50 100 Scale of Feet

No.	Revision	By	Date

Designed by: GZA

CONSULTANT PROJECT MANAGER: T. Bryant

	By	Date		By	Date
Designed			Checked	CLS	3/4/19
Drawn	BMC	2/15/19	In Charge of		

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FAX (207) 253-5596

MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER: Ralph Norwood, IV

MAINE TURNPIKE OVERPASS BRIDGES
OVER WARREN AVENUE
PORTLAND, ME

BORING LOCATION PLAN

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com

PREPARED FOR: VANASSE HANGEN BRUSTLIN, INC

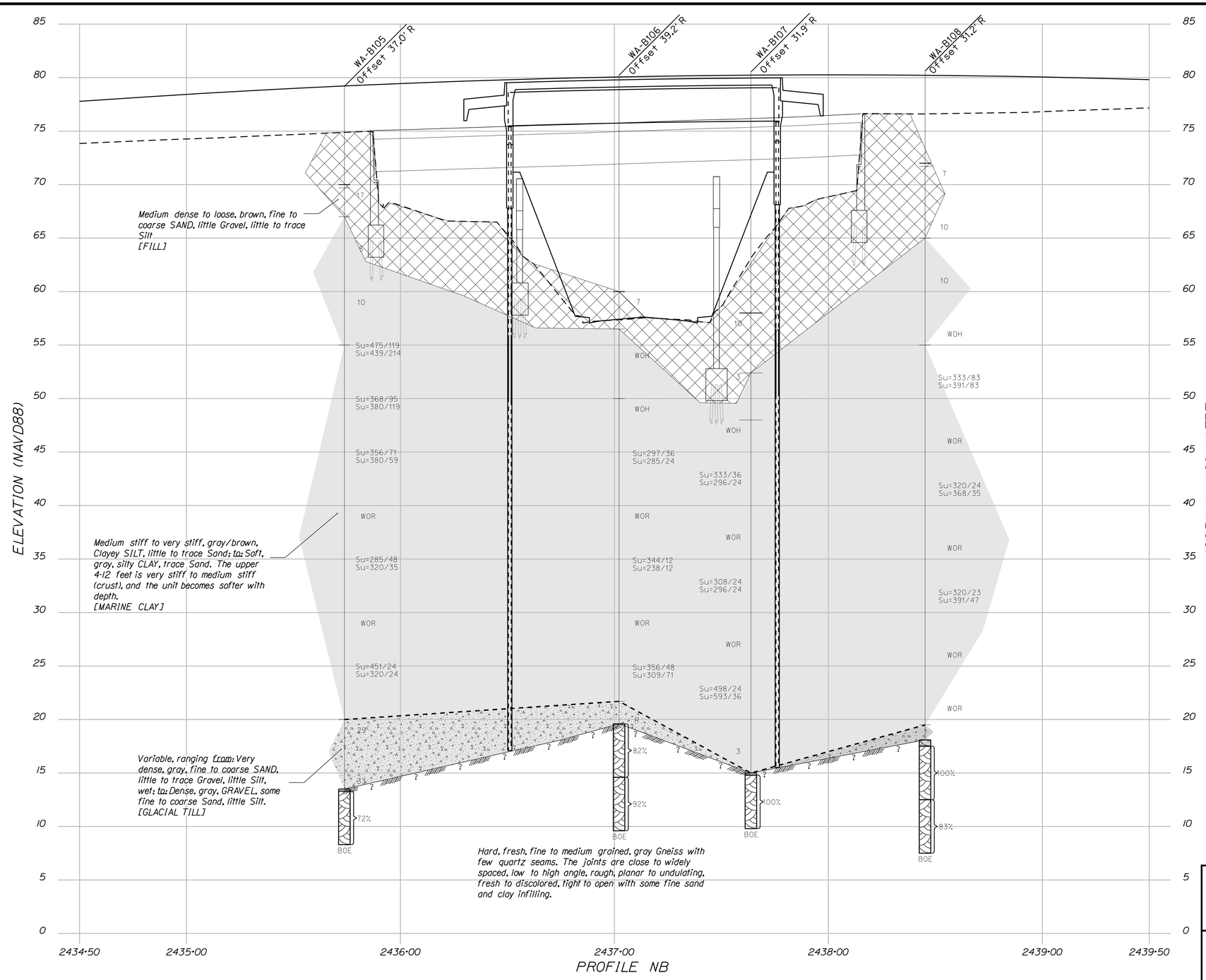
PROJ MGR:	BMC	REVIEWED BY:	CLS	CHECKED BY:	CLS
DESIGNED BY:	BMC	DRAWN BY:	BMC	SCALE:	AS SHOWN
DATE:	MARCH 2019	PROJECT NO.	09.0025970.01	REVISION NO.	0

FIG 2

SHEET NO. 1 OF 1

Filename: ...\From VHB\088_Boring_Plan.dgn

Date:3/20/2019



NOTES

1) Profile developed from electronic files provided by VHB on January 22, 2019 (Files included TBK.dgn, z_Profile.dgn, and Profile_Mainline_6A-NB.dgn).

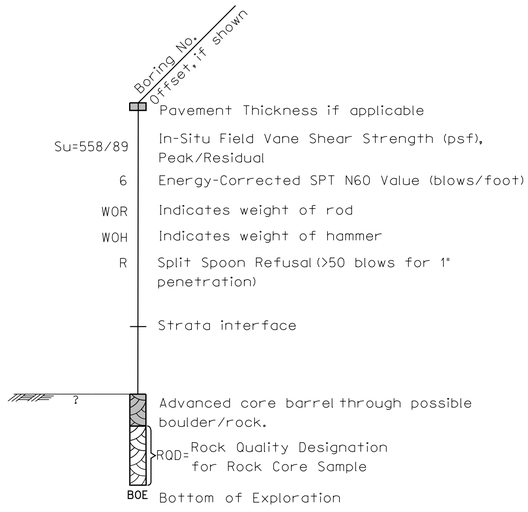
2) The as-drilled locations of the test borings were measured using taped ties from existing structures by GZA during the subsurface investigation, and are considered approximate.

3) Reported ground surface elevation of borings are based on interpolation between contours on the topographic survey, and are considered approximate.

4) 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 transitions may vary and are probably more erratic. For more specific information refer to the exploration logs.

5) Centerline borings are not shown for clarity. Refer to exploration logs for more specific information at individual loacations.

LEGEND



MAINE TURNPIKE OVERPASS BRIDGES
OVER WARREN AVENUE
PORTLAND, ME

NORTHBOUND INTERPRETIVE SUBSURFACE PROFILE

Scale: Horiz. 25 0 25 50
Vert. 5 0 5 10
Scale of Feet

No.	Revision	By	Date

Designed by:

CONSULTANT PROJECT MANAGER: T. Bryant

	By	Date		By	Date
Designed			Checked	CLS	3/4/19
Drawn	BMC	2/15/19	In Charge of		

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MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER: Ralph Norwood, IV

PREPARED BY:
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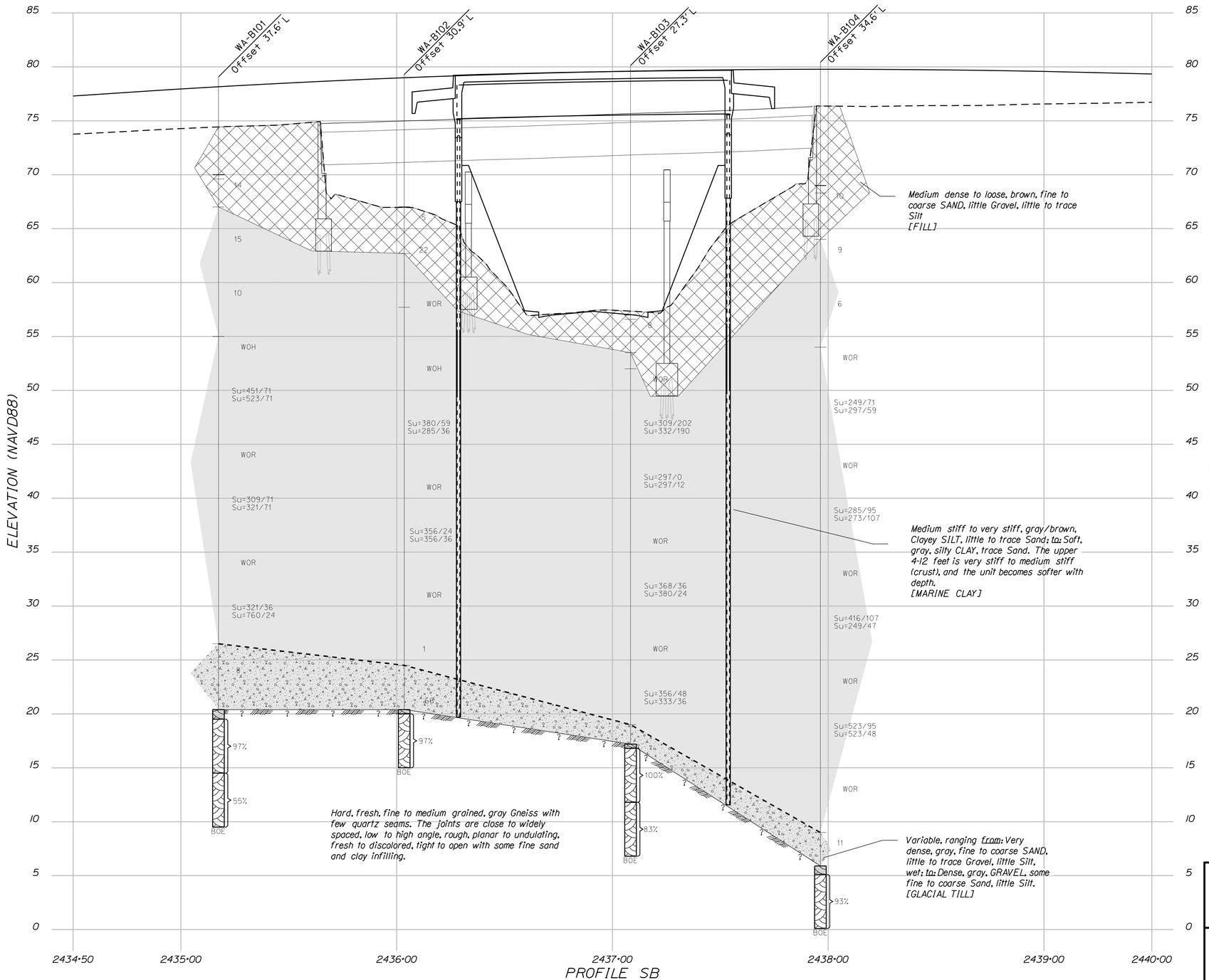
PREPARED FOR:
VANASSE HANGEN BRUSTLIN, INC

PROJ MGR: BMC	REVIEWED BY: CLS	CHECKED BY: CLS	FIG 3
DESIGNED BY: BMC	DRAWN BY: BMC	SCALE: AS SHOWN	
DATE: MARCH 2019	PROJECT NO. 09.0025970.01	REVISION NO. 0	SHEET NO. 1 OF 1

Filename: ...\089_Interp_Profile_NB.dgn



PROFILE SB

NOTES

1) Profile developed from electronic files provided by VHB on January 22, 2019 (Files included TBK.dgn, z_Profile.dgn, and Profile_Mainline_6A-SB.dgn).

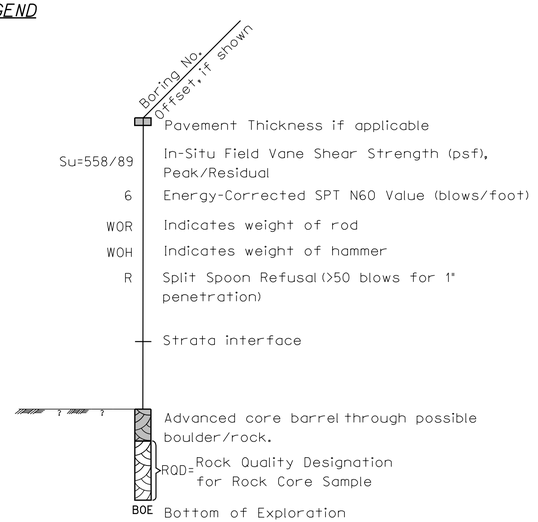
2) The as-drilled locations of the test borings were measured using taped ties from existing structures by GZA during the subsurface investigation, and are considered approximate.

3) Reported ground surface elevation of borings are based on interpolation between contours on the topographic survey, and are considered approximate.

4) 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 transitions may vary and are probably more erratic. For more specific information refer to the exploration logs.

5) Centerline borings are not shown for clarity. Refer to exploration logs for more specific information at individual locations.

LEGEND



MAINE TURNPIKE OVERPASS BRIDGES
OVER WARREN AVENUE
PORTLAND, ME

SOUTHBOUND INTERPRETIVE SUBSURFACE PROFILE

Date:3/20/2019

Filename: ...\090_Interp_Profile_SB.dgn

Scale: Horiz. 25 0 25 50
Vert. 5 0 5 10
Scale of Feet

No.	Revision	By	Date

Designed by: GZA

CONSULTANT PROJECT MANAGER: T. Bryant

	By	Date		By	Date
Designed			Checked	CLS	3/4/19
Drawn	BMC	2/15/19	In Charge of		

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MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER: Ralph Norwood, IV

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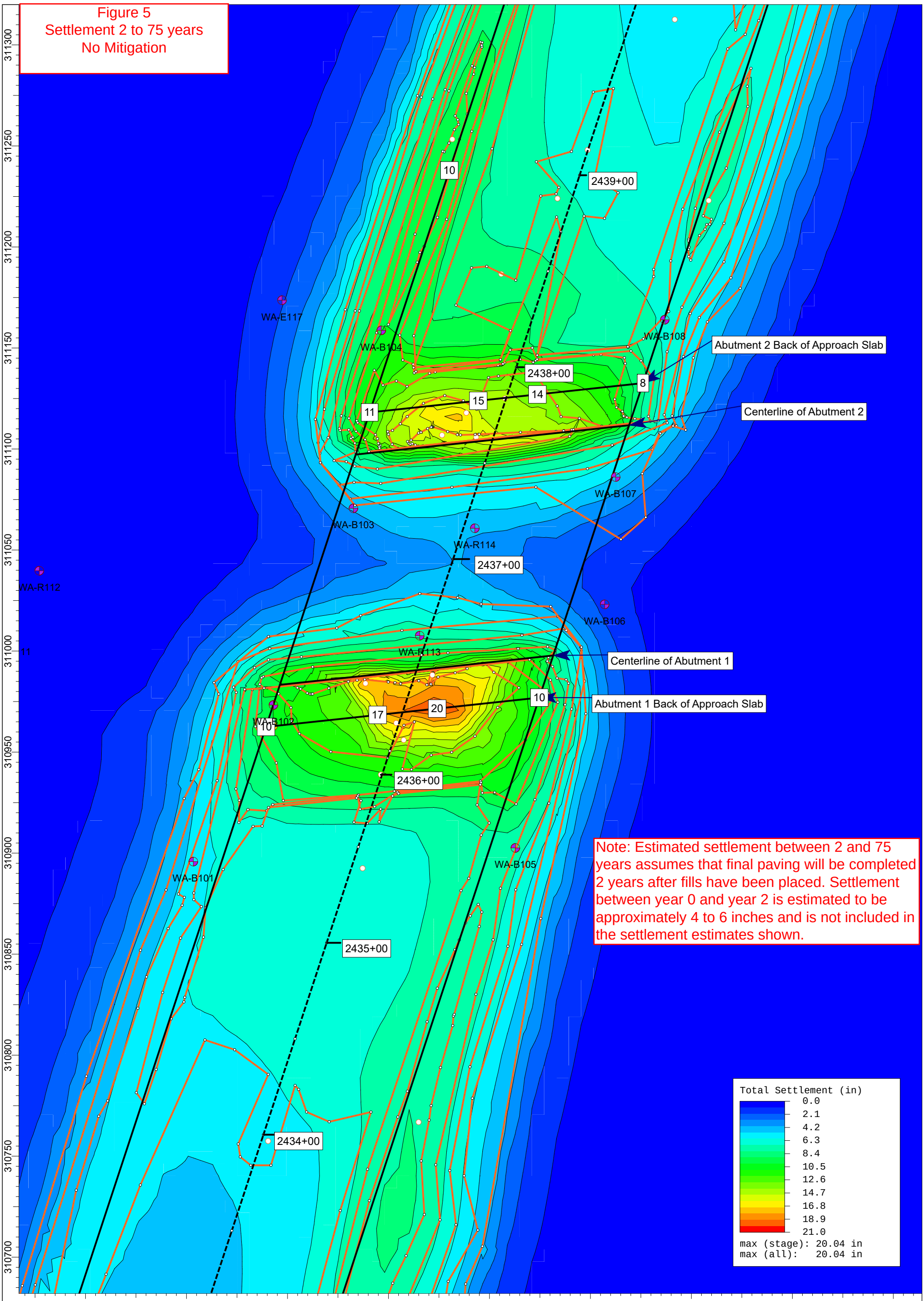
PREPARED FOR:
VANASSE HANGEN BRUSTLIN, INC

PROJ MGR: BMC	REVIEWED BY: CLS	CHECKED BY: CLS	FIG 4	
DESIGNED BY: BMC	DRAWN BY: BMC	SCALE: AS SHOWN		
DATE: MARCH 2019	PROJECT NO. 09.0025970.01	REVISION NO. 0	SHEET NO. 1 OF 1	

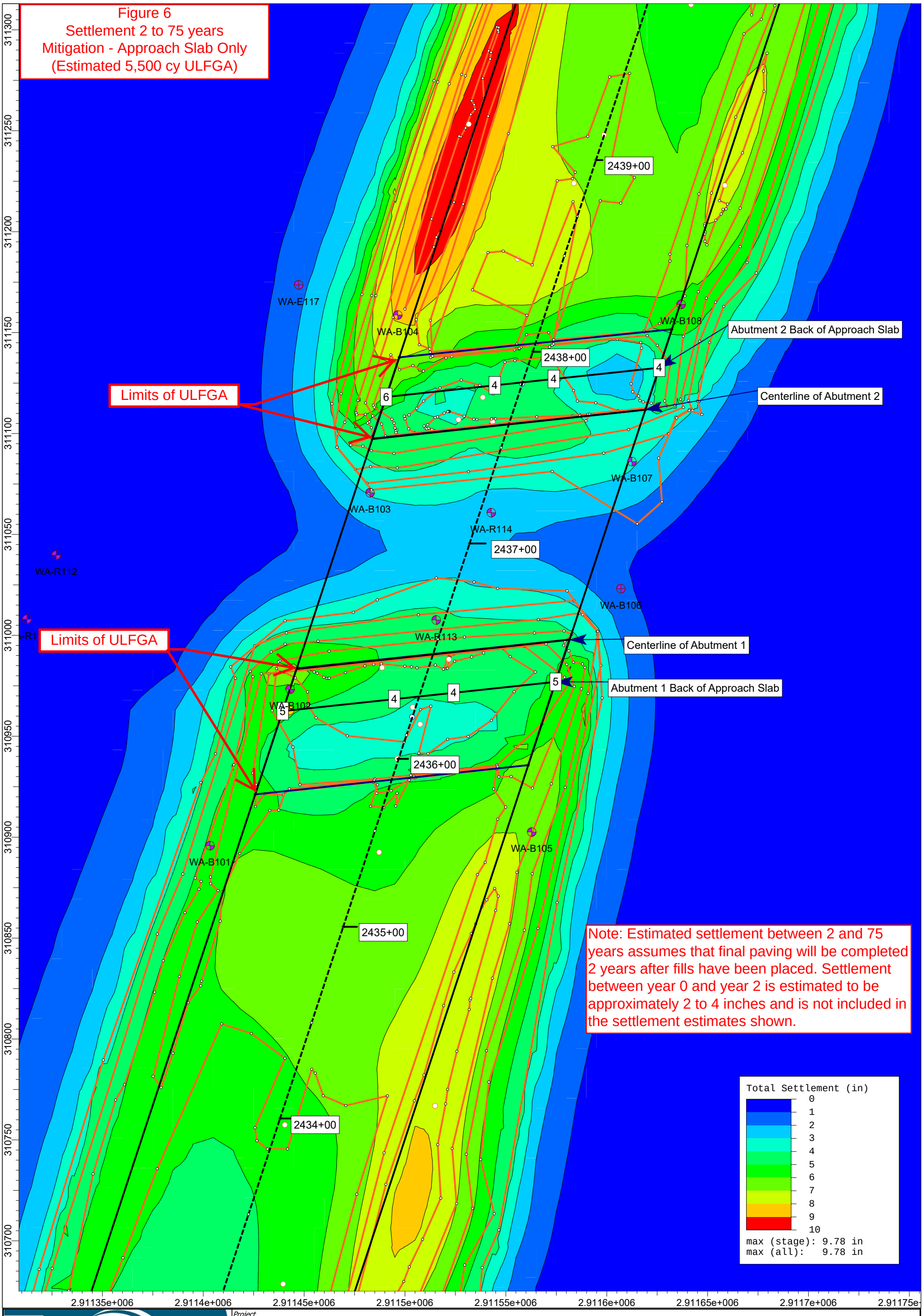
Figure 5
Settlement 2 to 75 years
No Mitigation



Project	Warren Avenue Bridge Replacement		
Analysis Description	LW Fill		
Drawn By	B. Cardali	Company	GZA GeoEnvironmental
Date	11/27/2018, 10:02:13 AM	File Name	Warren Ave NO ULFGA 3 15 19.s3z

SETTLE3D 4.016

Figure 6
Settlement 2 to 75 years
Mitigation - Approach Slab Only
(Estimated 5,500 cy ULFGA)

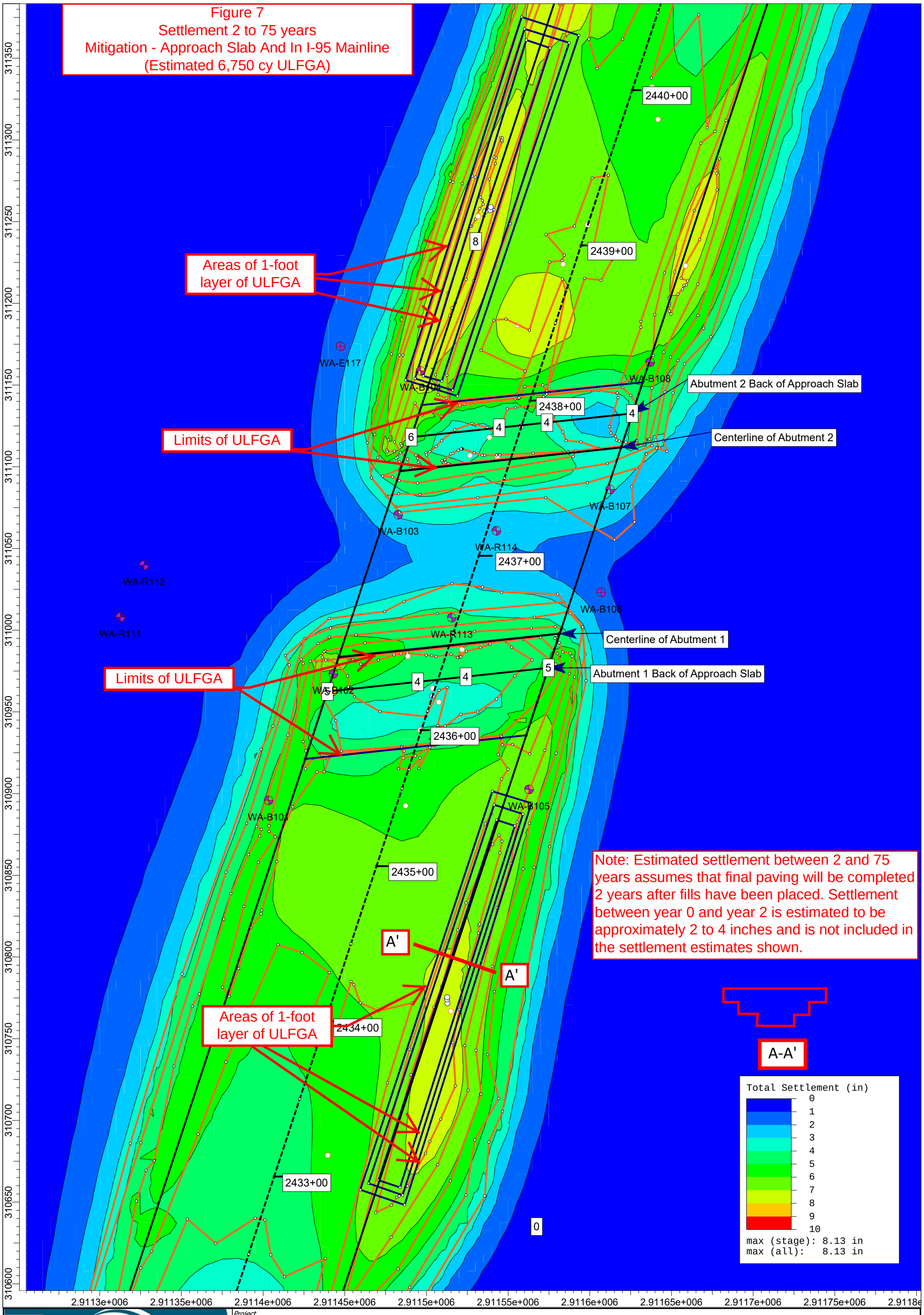


Note: Estimated settlement between 2 and 75 years assumes that final paving will be completed 2 years after fills have been placed. Settlement between year 0 and year 2 is estimated to be approximately 2 to 4 inches and is not included in the settlement estimates shown.

Project	Warren Avenue Bridge Replacement		
Analysis Description	LW Fill		
Drawn By	B. Cardali	Company	GZA GeoEnvironmental
Date	11/27/2018, 10:02:13 AM	File Name	Warren Ave LW Fill 5500 CY ULFGA 3 14 19.s3z

SETTLE3D 4.016

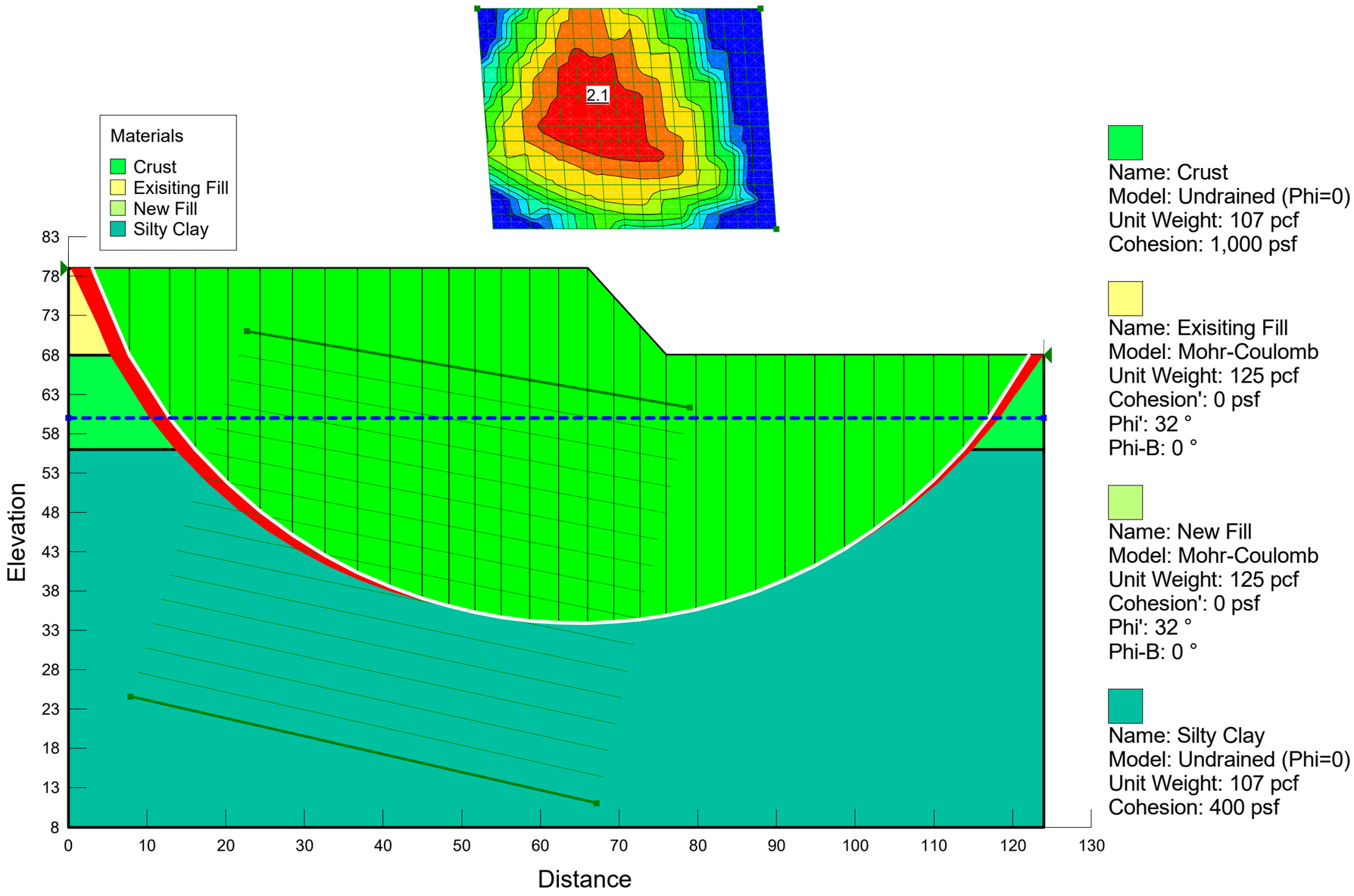
Figure 7
Settlement 2 to 75 years
Mitigation - Approach Slab And In I-95 Mainline
(Estimated 6,750 cy ULFGA)



Note: Estimated settlement between 2 and 75 years assumes that final paving will be completed 2 years after fills have been placed. Settlement between year 0 and year 2 is estimated to be approximately 2 to 4 inches and is not included in the settlement estimates shown.

Project	Warren Avenue Bridge Replacement		
Analysis Description	LW Fill		
Drawn By	B. Cardali	Company	GZA GeoEnvironmental
Date	3/22/2019, 10:02:13 AM	File Name	Warren Ave LW Fill 6750 CY ULFGA 3 22 19.s3z

SETTLE3D 4.016



Name: Crust
Model: Undrained (Phi=0)
Unit Weight: 107 pcf
Cohesion: 1,000 psf

Name: Exisiting Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Name: New Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Name: Silty Clay
Model: Undrained (Phi=0)
Unit Weight: 107 pcf
Cohesion: 400 psf

Date: 03/20/2019	Warren Avenue Portland, Maine	Figure 8
GZA	**Slope Stability**	

APPENDIX A – LIMITATIONS

GEOTECHNICAL LIMITATIONS

Use of Report

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the contract documents, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

Standard of Care

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in Proposal for Services and/or Report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the design has been altered in any way, GZA shall be so notified and afforded the opportunity to revise the report, as appropriate, to reflect the unanticipated changed conditions .

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

4. In conducting our work, GZA relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Inconsistencies in this information which we have noted, if any, are discussed in the Report.

Subsurface Conditions

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs. The nature and extent of variations between these explorations may not become evident until further exploration or construction. If variations or other latent conditions then become evident, it will be necessary to reevaluate the conclusions and recommendations of this report.

6. In preparing this report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein which were made available to GZA at the time of our evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

7. Water level readings have been made in test holes (as described in this Report) and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The water table encountered in the course of the work may differ from that indicated in the Report.

8. GZA's services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

9. Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

Compliance with Codes and Regulations

10. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

Cost Estimates

11. Unless otherwise stated, our cost estimates are only for comparative and general planning purposes. These estimates may involve approximate quantity evaluations. Note that these quantity estimates are not intended to be sufficiently accurate to develop construction bids, or to predict the actual cost of work addressed in this Report. Further, since we have no control over either when the work will take place or the labor and material costs required to plan and execute the anticipated work, our cost estimates were made by relying on our experience, the experience of others, and other sources of readily available information. Actual costs may vary over time and could be significantly more, or less, than stated in the Report.

Additional Services

12. GZA recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

APPENDIX B – TEST BORING LOGS

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B101
SHEET: 1 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Cased

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 70
Final Boring Depth (ft.): 60.5
Date Start - Finish: 4/18/2018 - 4/18/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
4/18/18	1500	8.7	15 min
4/19/18	0800	21.3	14 hrs

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.0-2.0	24	10	3 6 8 14	14	S-1: Top 5": Medium dense, brown, fine to coarse SAND, with organics. Bottom 5": Medium dense, brown/tan, fine to coarse SAND, little Gravel, trace Silt, moist.	1		0.4	TOPSOIL	69.6
												FILL	
											3		67.0
5	11 20 16 15 15	S-2	5.0-7.0	24	20	5 5 10 18	15	S-2: Very stiff, olive, Clayey SILT, little Sand.				CLAY CRUST	
10	44 43 44 49 45	S-3	10.0-12.0	24	20	4 4 6 5	10	S-3: Stiff, olive, Clayey SILT, little to trace Sand, wet.					
15		S-4	15.0-17.0	24	24	WOR WOH WOH WOH	0	S-4: Soft, gray, Silty CLAY, wet.			15		55.0
20		S-5 V-1 V-2	20.0-22.0 20.4-21.0 21.4-22.0	24	24			S-5: Soft, gray, Silty CLAY, wet. V-1: Field Vane: T_{raw} = 190/30 in-lbs (S_u = 451/71 psf) V-2: Field Vane: T_{raw} = 220/30 in-lbs (S_u = 523/71 psf)	2			SILTY CLAY	
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Tapered vane with 2.5" diameter, 4.5" height and 45 degree taper was used for field tests. T_{raw} = measured torque, S_u = Calculated Undrained Shear Strength.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B101

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B101
SHEET: 2 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Cased

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 70
Final Boring Depth (ft.): 60.5
Date Start - Finish: 4/18/2018 - 4/18/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
4/18/18	1500	8.7	15 min
4/19/18	0800	21.3	14 hrs

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-6	25.0-27.0	24	24	WOR WOR WOR WOR	0	S-6: Soft, gray, Silty CLAY, wet.					
30		S-7	30.0-32.0	24	24			S-7: Soft, gray, Silty CLAY, wet.					
		V-3						V-3: Field Vane: T_{raw} = 130/30 in-lbs (S_u = 309/71 psf)					
		V-4	30.4-31.0 31.4-32.0					V-4: Field Vane: T_{raw} = 135/30 in-lbs (S_u = 321/71 psf)				SILTY CLAY	
35		S-8	35.0-37.0	24	24	WOR WOR WOR WOR	0	S-8: Soft, gray, Silty CLAY, trace fine Sand, wet.					
40		S-9	40.0-42.0	24	24			S-9: Soft, gray, Silty CLAY, little fine Sand.					
		V-5						V-5: Field Vane: T_{raw} = 135/15 in-lbs (S_u = 321/36 psf)					
		V-6	40.4-41.0 41.4-42.0					V-6: Field Vane: T_{raw} = 320/10 in-lbs (S_u = 760/24 psf)	3		43.5		26.5
45		S-10	45.0-47.0	24	10	2 3 5 5	8	S-10: Loose, gray, fine to medium SAND, little Silt, wet. Roller bit encountered increased resistance at 49.6' bgs; probable Top of Rock. Advanced roller bit to 50.3' bgs and set up to core.				GLACIAL TILL	
50											49.6	GNEISS	20.4

REMARKS

3 - Based on roller bit advancement and wash return, top of Glacial Till at approximately 43.5' bgs.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B101

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:47 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B101
SHEET: 3 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Cased

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 70
Final Boring Depth (ft.): 60.5
Date Start - Finish: 4/18/2018 - 4/18/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
4/18/18	1500	8.7	15 min
4/19/18	0800	21.3	14 hrs

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
55		C-1	50.5-55.5	60	60			C-1: Hard, fresh, fine grained, gray, GNEISS with calcite stringers. Joints are close to moderately spaced, low angle, rough, planar to undulating, fresh, open. RQD = 97% Rock Core Times (min/ft): 4.0, 3.75, 4.0, 4.0, 4.0					
		C-2	55.5-60.5	60	60			C-2: 55.5'-58.3': Hard, fresh, fine grained, gray, GNEISS with calcite stringers. Joints are close to moderately spaced, low angle, rough, planar to undulating, fresh, open. 58.3'-60.5': Hard, fresh, fine grained, gray, GNEISS with calcite stringers. Joints are very close, low to high angle, fresh to slightly weathered, some Sand infilling, undulating, rough, open.				GNEISS	
60								RQD = 55% Rock Core Times (min/ft): 3.25, 3.5, 3.75, 4.0, 3.25			60.5		9.5
								End of exploration at 60.5 feet.					
65													
70													
75													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B101

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:47 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B102
SHEET: 1 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 67
Final Boring Depth (ft.): 52
Date Start - Finish: 4/18/2018 - 4/19/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
4/19/18	1015	9.7	30 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.0-2.0	24	12	WOH 2 3 4	5	S-1: Loose, brown, fine to coarse SAND, little Silt.	1			FILL	
		S-2	3.0-5.0	24	18	8 13 9 10	22	S-2: Top 16": Medium dense, brown, fine to coarse SAND, little Gravel, little Silt. Bottom 2": Gray/brown, Silty CLAY.			4.3		62.7
5													
		S-3	8.0-10.0	24	24	WOR WOR WOR WOR	0	S-3: Soft, gray, Silty CLAY, wet.					
10													
		S-4	14.0-16.0	24	24	WOR WOH WOH WOH	0	S-4: Soft, gray, Silty CLAY, wet.				SILTY CLAY	
15													
20		S-5 V-1 V-2	20.0-22.0 20.4-21.0 21.4-22.0	24	24			S-5: Soft, gray, Silty CLAY, wet. V-1: Field Vane: T_{raw} = 160/25 in-lbs (S_u = 380/59 psf) V-2: Field Vane: T_{raw} = 120/15 in-lbs (S_u = 285/36 psf)	2				
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Tapered vane with 2.5" diameter, 4.5" height and 45 degree taper was used for field tests. T_{raw} = measured torque, S_u = Calculated Undrained Shear Strength.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B102

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B102
SHEET: 2 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 67
Final Boring Depth (ft.): 52
Date Start - Finish: 4/18/2018 - 4/19/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
4/19/18	1015	9.7	30 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-6	25.0-27.0	24	24	WOR WOR WOR WOR	0	S-6: Soft, gray, Silty CLAY, wet.					
30		S-7	30.0-32.0	24	24			S-7: Soft, gray, Silty CLAY, wet.					
		V-3						V-3: Field Vane: T_{raw} = 150/10 in-lbs (S_u = 356/24 psf)					
		V-4	30.4-31.0 31.4-32.0					V-4: Field Vane: T_{raw} = 150/15 in-lbs (S_u = 356/36 psf)				SILTY CLAY	
35		S-8	35.0-37.0	24	8	WOR WOR WOR WOR	0	S-8: Soft, gray, Silty CLAY, trace fine Sand, wet.					
40		S-9	40.0-42.0	24	16	WOR WOR	1	S-9: Soft, gray, Silty CLAY, little fine to medium Sand, wet, with Sand seams from .5"-1" thick.					
		V-5	40.4-42.4			1 1		V-5: Field Vane: T_{raw} = Failed vane attempt. Increased roller bit resistance at 42.5' bgs.			42.5		24.5
45		S-10	45.0-46.6	19	4	10 15 51 50/1"	66	S-10: Dense, gray, GRAVEL, some fine to coarse Sand, little Silt.				GLACIAL TILL	
								Splitspoon refusal at 46.6' bgs.			46.6		20.4
		C-1	47.0-52.0	60	60			Roller bit advanced to 47.0' and set up to core. C-1: Hard, fresh, fine to medium grained, gray, GNEISS. Joints are close to widely spaced, undulating, rough, open, discolored to fresh, with some fine sand infilling. RQD = 97%				GNEISS	
50													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B102

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:48 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B102
SHEET: 3 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 67
Final Boring Depth (ft.): 52
Date Start - Finish: 4/18/2018 - 4/19/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
4/19/18	1015	9.7	30 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
								Rock Core Times (min/ft): 2.75, 2.75, 3.25, 2.5, 3.75				GNEISS	
											52		15.0
								End of exploration at 52 feet.					
55													
60													
65													
70													
75													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B102

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:48 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B103
SHEET: 1 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 57
Final Boring Depth (ft.): 50.2
Date Start - Finish: 4/26/2018 - 4/26/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

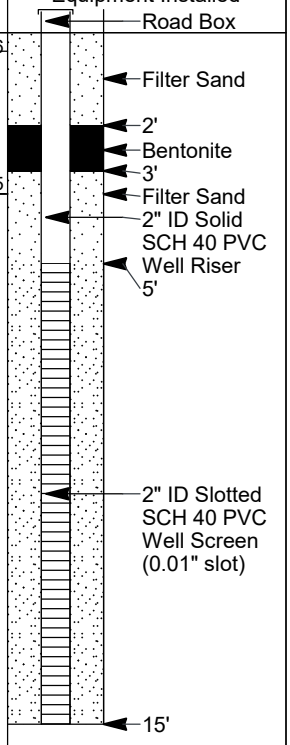
Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
		S-1	0.0-2.0	24	10	1 4 4 6	8	S-1 : Loose, brown, fine to coarse SAND, dry.	1	
5		S-2	5.0-7.0	24	24	WOR WOR WOR WOR	0	S-2 : Soft, gray, Silty CLAY, moist.		
10		S-3 V-1 V-2	10.0-12.0 10.4-11.0 11.4-12.0	24	24			S-3 : Soft, gray, Silty CLAY, moist. V-1 : Field Vane: T_{raw} = 130/85 in-lbs (S_u = 309/202 psf) V-2 : Field Vane: T_{raw} = 140/80 in-lbs (S_u = 332/190 psf)		
15		S-4 V-3 V-4	15.0-17.0 15.4-16.0 16.4-17.0	24	24			S-4 : Soft, gray, Silty CLAY, wet. V-3 : Field Vane: T_{raw} = 125/0 in-lbs (S_u = 297/0 psf) V-4 : Field Vane: T_{raw} = 125/5 in-lbs (S_u = 297/12 psf)		
20		S-5	20.0-22.0	24	24	WOR WOR WOR WOR	0	S-5 : Soft, gray, Silty CLAY, wet.	2	
25										

Depth (ft.)	Stratum Description	Elev. (ft.)
0.4	TOPSOIL	56.6
	FILL	
3.5		53.5
	SILTY CLAY	



REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Tapered vane with 2.5" diameter, 4.5" height and 45 degree taper was used for field tests. T_{raw} = measured torque, S_u = Calculated Undrained Shear Strength.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B103

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B103
SHEET: 2 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 57
Final Boring Depth (ft.): 50.2
Date Start - Finish: 4/26/2018 - 4/26/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-6	25.0-27.0	24	24			S-6: Soft, gray, Silty CLAY, wet.					
		V-5						V-5: Field Vane: T_{raw} = 155/15 in-lbs (S_u = 368/36 psf)					
		V-6	25.4-26.0 26.4-27.0					V-6: Field Vane: T_{raw} = 160/10 in-lbs (S_u = 380/24 psf)					
30		S-7	30.0-32.0	24	24	WOR WOR WOR WOR	0	S-7: Soft, gray, Silty CLAY, wet.				SILTY CLAY	
35		S-8	35.0-37.0	24	24			S-8: Soft, gray, Silty CLAY, wet.					
		V-7						V-7: Field Vane: T_{raw} = 150/20 in-lbs (S_u = 356/48 psf)					
		V-8	35.4-36.0 36.4-37.0 38.0-39.8					V-8: Field Vane: T_{raw} = 140/15 in-lbs (S_u = 333/36 psf) Apparent sand and gravel in wash water return from 38.0'-38.5', probable Glacial Till. Increased resistance during roller cone advancement at 39.8'. Practical refusal with roller cone at 40.2' bgs, probable Bedrock. Set up to core.			38	PROBABLE GLACIAL TILL	19.0
40		C-1	40.2-45.2	60	60			C-1: Hard, fresh, fine to medium grained, gray, GNEISS. Joints are close to widely spaced, moderate to high angle, planar, rough, tight. RQD = 100% Rock Core Times (min/ft): 2.5, 2.75, 3.25, 3.25, 3.5			39.8		17.2
45		C-2	45.2-50.2	60	60			C-2: Hard, fresh, fine to medium grained, gray, GNEISS. Joints are close to widely spaced, moderate to high angle, planar, rough, tight. RQD = 83% Rock Core Times (min/ft): 2.5, 2.75, 3.25, 3.25, 3.5			45.2	GNEISS	11.8
50													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B103

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:49 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B103
SHEET: 3 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 57
Final Boring Depth (ft.): 50.2
Date Start - Finish: 4/26/2018 - 4/26/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
								End of exploration at 50.2 feet.					
55													
60													
65													
70													
75													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B103

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:49 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B104
SHEET: 1 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 69
Final Boring Depth (ft.): 68.9
Date Start - Finish: 4/17/2018 - 4/17/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
4/19/18	12:30	8.2	30 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.0-2.0	24	14	1 4 6 12	10	S-1: Top 8": Brown, SILT, little fine to coarse Sand, trace Gravel, with organics. Bottom 6": Loose, brown, fine to coarse SAND, little Gravel, trace Silt.	1		0.7	TOPSOIL	68.3
												FILL	
5	20 43 59 52 40	S-2	5.0-7.0	24	18	2 3 6 3	9	S-2: Stiff, brown/tan, fine Clayey SILT, seams throughout ranging from .5" to 1.5".			5		64.0
10	OPEN	S-3	10.0-12.0	24	19	1 3 3 4	6	S-3: Medium stiff, gray, Silty CLAY, trace fine Sand, moist.				CLAY CRUST	
15		S-4	15.0-17.0	24	24	WOR WOR WOR WOR	0	S-4: Soft, gray, Silty CLAY, wet.			15		54.0
20		S-5 V-1 V-2	20.0-22.0 20.4-21.0 21.4-22.0	24	24			S-5: Soft, gray, Silty CLAY, wet. V-1: Field Vane: T_{raw} = 105/30 in-lbs (S_u = 249/71 psf) V-2: Field Vane: T_{raw} = 125/25 in-lbs (S_u = 297/59 psf)	2			SILTY CLAY	
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Tapered vane with 2.5" diameter, 4.5" height and 45 degree taper was used for field tests. T_{raw} = measured torque, S_u = Calculated Undrained Shear Strength.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B104

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B104
SHEET: 2 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 69
Final Boring Depth (ft.): 68.9
Date Start - Finish: 4/17/2018 - 4/17/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
4/19/18	12:30	8.2	30 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-6	25.0-27.0	24	24	WOR WOR WOR WOR	0	S-6: Soft, gray, Silty CLAY, wet.					
30		S-7	30.0-32.0	24	24			S-7: Soft, gray, Silty CLAY, wet.					
		V-3						V-3: Field Vane: T_{raw} = 120/40 in-lbs (S_u = 285/95 psf)					
		V-4	30.4-31.0 31.4-32.0					V-4: Field Vane: T_{raw} = 115/45 in-lbs (S_u = 273/107 psf)					
35		S-8	35.0-37.0	24	24	WOR WOR WOR WOR	0	S-8: Soft, gray, Silty CLAY, wet.				SILTY CLAY	
40		S-9	40.0-42.0	24	24			S-9: Soft, gray, Silty CLAY, wet.					
		V-5						V-5: Field Vane: T_{raw} = 175/45 in-lbs (S_u = 416/107 psf)					
		V-6	40.4-41.0 41.4-42.0					V-6: Field Vane: T_{raw} = 105/20 in-lbs (S_u = 249/47 psf)					
45		S-10	45.0-47.0	24	24	WOR WOR WOR WOR	0	S-10: Soft, gray, Silty CLAY, wet.					
50													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B104

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:51 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B104
SHEET: 3 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 69
Final Boring Depth (ft.): 68.9
Date Start - Finish: 4/17/2018 - 4/17/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
4/19/18	12:30	8.2	30 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
55		S-11 V-7 V-8	50.0-52.0 50.4-51.0 51.4-52.0	24	24			S-11: Soft, gray, Silty CLAY, wet. V-7: Field Vane: T_{raw} = 220/40 in-lbs (S_u = 523/95 psf) V-8: Field Vane: T_{raw} = 220/20 in-lbs (S_u = 523/48 psf)					
		S-12	55.0-57.0	24	24	WOR WOR WOR WOR	0	S-12: Soft, gray, Silty CLAY, little fine Sand, wet.				SILTY CLAY	
60		S-13	60.0-62.0	24	10	6 7 4 6	11	S-13: Medium dense, gray, fine to coarse SAND, little Gravel, little to trace Silt, wet.			60		9.0
												GLACIAL TILL	
		C-1	63.1-63.9 63.9-68.9	60	60			Roller bit advancement increased at 63.1'. Advanced roller bit to 63.9' and set up to core. C-1: Hard, fresh, fine grained, gray, GNEISS, with a quartz seam. Joints are close to moderately spaced, low angle to moderately dipping, planar, rough, fresh. RQD = 93% Rock Core Times (min/ft): 4.5, 3.5, 3.5, 3.25, 4.0			63.9		5.1
65												GNEISS	
											68.9		0.1
70								End of exploration at 68.9 feet.					
75													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B104

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:51 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B105
SHEET: 1 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali / B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 70
Final Boring Depth (ft.): 61.7
Date Start - Finish: 4/19/2018 - 4/19/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.0-2.0	24	11	2 5 12 14	17	S-1: Brown, fine to medium SAND, some Silt, with organics, dry.	1		0.3	TOPSOIL	69.7
												FILL	
											3		67.0
5		S-2	5.0-7.0	24	22	2 2 3 8	5	S-2: Loose, brown, fine SAND, some Silt, dry.					
												CLAY CRUST	
10		S-3	10.0-12.0	24	20	3 4 6 6	10	S-3: Stiff, light brown, Clayey SILT, moist.					
15		S-4 V-1 V-2	15.0-17.0 15.4-16.0 16.4-17.0	24	24			S-4: Soft, gray, Silty CLAY, wet. V-1: Field Vane: T_{raw} = 200/50 in-lbs (S_u = 475/119 psf) V-2: Field Vane: T_{raw} = 185/90 in-lbs (S_u = 439/214 psf)			15		55.0
20		S-5 V-3 V-4	20.0-22.0 20.4-21.0 21.4-22.0	24	24			S-5: Soft, gray, Silty CLAY, wet. V-3: Field Vane: T_{raw} = 155/40 in-lbs (S_u = 368/95 psf) V-4: Field Vane: T_{raw} = 160/50 in-lbs (S_u = 380/119 psf)	2			SILTY CLAY	
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Tapered vane with 2.5" diameter, 4.5" height and 45 degree taper was used for field tests. T_{raw} = measured torque, S_u = Calculated Undrained Shear Strength.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B105

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B105
SHEET: 2 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali / B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 70
Final Boring Depth (ft.): 61.7
Date Start - Finish: 4/19/2018 - 4/19/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-6	25.0-27.0	24	24			S-6: Soft, gray, Silty CLAY, wet.					
		V-5						V-5: Field Vane: T_{raw} = 150/30 in-lbs (S_u = 356/71 psf)					
		V-6	25.4-26.0 26.4-27.0					V-6: Field Vane: T_{raw} = 160/25 in-lbs (S_u = 380/59 psf)					
30		S-7	30.0-32.0	24	24	WOR WOR WOR WOR	0	S-7: Soft, gray, Silty CLAY, wet.					
35		S-8	35.0-37.0	24	20			S-8: Soft, gray, Silty CLAY, wet.					
		V-7						V-7: Field Vane: T_{raw} = 120/20 in-lbs (S_u = 285/48 psf)					
		V-8	35.4-36.0 36.4-37.0					V-8: Field Vane: T_{raw} = 135/15 in-lbs (S_u = 320/35 psf)				SILTY CLAY	
40		S-9	40.0-42.0	24	24	WOR WOR WOR WOR	0	S-9: Soft, gray, Silty CLAY, wet.					
45		S-10	45.0-47.0	24	24			S-10: Soft, gray, Silty CLAY, wet.					
		V-9						V-9: Field Vane: T_{raw} = 190/10 in-lbs (S_u = 451/24 psf)					
		V-10	45.4-46.0 46.4-47.0					V-10: Field Vane: T_{raw} = 135/10 in-lbs (S_u = 320/24 psf)					
50											50		20.0

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B105

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B105
SHEET: 3 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali / B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 70
Final Boring Depth (ft.): 61.7
Date Start - Finish: 4/19/2018 - 4/19/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-11	50.0-52.0	24	0	8 14 15 15	29	S-11: No recovery.				PROBABLE GLACIAL TILL	
55		S-12	55.0-56.5	24	6	3 3 30 50/1"	33	S-12: Dense, gray, wet, fine to medium SAND, little Silt. Apparent weathered rock in spoon shoe. Split spoon refusal at 56.5' bgs; advanced roller bit to 56.7' and set up to core.			56.5		13.5
		C-1	56.7-61.7	60	60			C-1: Hard, fresh, fine to medium grained, gray, GNEISS. Joints are close, low angle, undulating to planar, rough, partially open to open, fresh to discolored. RQD = 72% Rock Core Times (min/ft): 2.75, 3.25, 3.25, 3.5, 3.75				GNEISS	
60											61.7		8.3
								End of exploration at 61.7 feet.					
65													
70													
75													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B105

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:52 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B106
SHEET: 1 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 60
Final Boring Depth (ft.): 50.4
Date Start - Finish: 4/26/2018 - 4/26/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.0-2.0	24	15	1 2 5 9	7	S-1: Loose, brown, fine to coarse SAND, trace Silt, dry.	1			FILL	
											3.5		56.5
5		S-2	5.0-7.0	24	24	WOH WOH WOH WOH	0	S-2: Soft, gray, Silty CLAY, wet.				CLAY CRUST	
10		S-3	10.0-12.0	24	18	WOH WOH WOH 1	0	S-3: Soft, gray, Silty CLAY, wet.			10		50.0
15		S-4 V-1 V-2	15.0-17.0 15.4-16.0 16.4-17.0	24	24			S-4: Soft, gray, Silty CLAY, wet. V-1: Field Vane: T_{raw} = 125/15 in-lbs (S_u = 297/36 psf) V-2: Field Vane: T_{raw} = 120/10 in-lbs (S_u = 285/24 psf)				SILTY CLAY	
20		S-5	20.0-22.0	24	24	WOR WOR WOR WOR	0	S-5: Soft, gray, Silty CLAY, wet.	2				
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Tapered vane with 2.5" diameter, 4.5" height and 45 degree taper was used for field tests. T_{raw} = measured torque, S_u = Calculated Undrained Shear Strength.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B106

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B106
SHEET: 2 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 60
Final Boring Depth (ft.): 50.4
Date Start - Finish: 4/26/2018 - 4/26/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-6	25.0-27.0	24	24			S-6: Soft, gray, Silty CLAY, wet.					
		V-3						V-3: Field Vane: T_{raw} = 145/5 in-lbs (S_u = 344/12 psf)					
		V-4	25.4-26.0 26.4-27.0					V-4: Field Vane: T_{raw} = 100/5 in-lbs (S_u = 238/12 psf)					
30		S-7	30.0-32.0	24	24	WOR WOR WOR WOR	0	S-7: Soft, gray, Silty CLAY, wet.				SILTY CLAY	
35		S-8	35.0-37.0	24	24			S-8: Soft, gray, Silty CLAY, wet.					
		V-5						V-5: Field Vane: T_{raw} = 150/20 in-lbs (S_u = 356/48 psf)					
		V-6	35.4-36.0 36.4-37.0					V-6: Field Vane: T_{raw} = 130/30 in-lbs (S_u = 309/71 psf)			38.3		21.7
40												PROBABLE GLACIAL TILL	
		C-1	40.1-40.4 40.4-45.4	60	60			Split spoon refusal at 40.1' bgs. Advanced roller bit to 40.4' and set up to core. C-1: 40.4'-43.9': Hard, fresh, fine to medium grained, gray, GNEISS. Joints are closely spaced, low to moderate angle, undulating to planar, rough, partially open, fresh. 43.9'-45.4': Hard, fresh, coarse grained, gray, PEGMATITE. Joints are close to widely spaced, moderately dipping, planar, rough. Fine to medium Sand infillings.	3		40.4		19.6
45		C-2	45.4-50.4	60	60			RQD = 82% Rock Core Times (min/ft): 2.75, 2.25, 2.25, 2.75, 4.0 C-2: 45.4'-47.7': Hard, fresh, fine to medium grained, gray, PEGMATITE. Joints are close to widely spaced, moderately dipping, planar, rough. Fine to medium Sand infillings.				GNEISS	
50								47.7'-50.4': Hard, fresh, fine to medium grained, gray,					

REMARKS

3 - Gravelly sand in wash return at 38.3' bgs, probable Glacial Till.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B106

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:54 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B106
SHEET: 3 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 60
Final Boring Depth (ft.): 50.4
Date Start - Finish: 4/26/2018 - 4/26/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
								GNEISS. Joints are close to widely spaced, low angle, undulating to planar, open, rough, clay in joint at 47.7'. One high angle joint. RQD = 92% Rock Core Times (min/ft): 3.25, 4.25, 3.0, 3.25, 2.25			50.4		9.6
								End of exploration at 50.4 feet.					
55													
60													
65													
70													
75													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B106

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:54 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B107
SHEET: 1 of 2
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 58
Final Boring Depth (ft.): 48.2
Date Start - Finish: 4/24/2018 - 4/24/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
4/24/18	0915	3.4	

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.0-2.0	24	16	1 3 7 5	10	S-1: Loose, brown, fine to coarse SAND, trace Silt, dry.	1		0.5	TOPSOIL	57.5
												FILL	
5	20 12 13 13 15	S-2	5.0-7.0	24	16	4 2 1 1	3	S-2: Top 7": Loose, brown, wet, fine to coarse SAND, trace Silt. Bottom 9": Soft, gray, wet, Silty CLAY, some fine Sand.			5.6	CLAY CRUST	52.4
10		S-3	10.0-12.0	24	21	WOH WOR WOH WOH	0	S-3: Soft, gray, Silty CLAY, wet.			10		48.0
15		S-4 V-1 V-2	15.0-17.0 15.4-16.0 16.4-17.0	24	20			S-4: Soft, gray, Silty CLAY, wet. V-1: Field Vane: T_{raw} = 140/15 in-lbs (S_u = 333/36 psf) V-2: Field Vane: T_{raw} = 125/10 in-lbs (S_u = 296/24 psf)				SILTY CLAY	
20		S-5	20.0-22.0	24	24	WOR WOR WOR WOR	0	S-5: Soft, gray, Silty CLAY, wet.	2				
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Tapered vane with 2.5" diameter, 4.5" height and 45 degree taper was used for field tests. T_{raw} = measured torque, S_u = Calculated Undrained Shear Strength.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B107

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:55 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B107
SHEET: 2 of 2
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 58
Final Boring Depth (ft.): 48.2
Date Start - Finish: 4/24/2018 - 4/24/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
4/24/18	0915	3.4	

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-6	25.0-27.0	24	24			S-6: Soft, gray, Silty CLAY, wet.					
		V-3						V-3: Field Vane: T_{raw} = 130/10 in-lbs (S_u = 308/24 psf)					
		V-4	25.4-26.0 26.4-27.0					V-4: Field Vane: T_{raw} = 125/10 in-lbs (S_u = 296/24 psf)					
30		S-7	30.0-32.0	24	24	WOR WOR WOR WOR	0	S-7: Soft, gray, Silty CLAY, wet.				SILTY CLAY	
35		S-8	35.0-37.0	24	24			S-8: Soft, gray, Silty CLAY, wet.					
		V-5		24	24			V-5: Field Vane: T_{raw} = 210/10 in-lbs (S_u = 498/24 psf)					
		V-6	35.4-36.0 36.4-37.0					V-6: Field Vane: T_{raw} = 250/10 in-lbs (S_u = 593/36 psf)					
40		S-9	40.0-42.0	24	24	1 2 1 4	3	S-9: Soft, gray, Silty CLAY, wet, with fine Sand seams ranging from 1"-6".			43		15.0
45		C-1	43.0-43.2 43.2-48.2	60	60			Increased roller bit resistance at 43.0', advanced roller bit to 43.2' and set up to core. C-1: Hard, fresh, fine to medium grained, gray, GNEISS. Joints are close to widely spaced, low angle, undulating, rough, tight to open, fresh. RQD = 100% Rock Core Times (min/ft): 3.25, 4.0, 3.5, 3.5, 4.25				GNEISS	
50								End of exploration at 48.2 feet.			48.2		9.8

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B107

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:55 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B108
SHEET: 1 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 72
Final Boring Depth (ft.): 64.5
Date Start - Finish: 4/20/2018 - 4/20/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.0-2.0	24	12	1 2 5 12	7	S-1: Top 4": Silty, fine to medium SAND, with organics. Bottom 8": Loose, brown, fine to medium SAND, dry.	1		0.3	SILTY SAND	71.7
												FILL	
5	6 16 49 80 82	S-2	5.0-7.0	24	12	3 5 5 4	10	S-2: Medium dense, brown to gray, fine to coarse SAND, moist.			7		65.0
10		S-3	10.0-12.0	24	24	5 5 5 5	10	S-3: Stiff, olive-brown, Clayey SILT, trace fine Sand, moist.				CLAY CRUST	
15		S-4	15.0-17.0	24	24	WOH WOH WOH WOH	0	S-4: Soft, gray, Silty CLAY, wet.			17		55.0
20		S-5 V-1 V-2	20.0-22.0 20.4-21.0 21.4-22.0	24	24			S-5: Soft, gray, Silty CLAY, wet. V-1: Field Vane: T_{raw} = 140/35 in-lbs (S_u = 333/83 psf) V-2: Field Vane: T_{raw} = 165/35 in-lbs (S_u = 391/83 psf)	2			SILTY CLAY	
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Tapered vane with 2.5" diameter, 4.5" height and 45 degree taper was used for field tests. T_{raw} = measured torque, S_u = Calculated Undrained Shear Strength.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B108

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B108
SHEET: 2 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 72
Final Boring Depth (ft.): 64.5
Date Start - Finish: 4/20/2018 - 4/20/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-6	25.0-27.0	24	14	WOR WOR WOR WOR	0	S-6: Soft, gray, Silty CLAY, wet.					
30		S-7	30.0-32.0	24	12			S-7: Soft, gray, Silty CLAY, wet.					
		V-3						V-3: Field Vane: T_{raw} = 135/10 in-lbs (S_u = 320/24 psf)					
		V-4	30.4-31.0 31.4-32.0					V-4: Field Vane: T_{raw} = 155/.5 in-lbs (S_u = 368/35 psf)					
35		S-8	35.0-37.0	24	24	WOR WOR WOR WOR	0	S-8: Soft, gray, Silty CLAY, wet.				SILTY CLAY	
40		S-9	40.0-42.0	24	24			S-9: Soft, gray, Silty CLAY, wet.					
		V-5						V-5: Field Vane: T_{raw} = 135/10 in-lbs (S_u = 320/23 psf)					
		V-6	40.4-41.0 41.4-42.0					V-6: Field Vane: T_{raw} = 165/20 in-lbs (S_u = 391/47 psf)					
45		S-10	45.0-47.0	24	9	WOR WOR WOR WOR	0	S-10: Soft, gray, Silty CLAY, wet.					
50													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B108

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:56 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-B108
SHEET: 3 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 72
Final Boring Depth (ft.): 64.5
Date Start - Finish: 4/20/2018 - 4/20/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-11	50.0-52.0	24	0	WOR WOR WOR 2	0	S-11: No recovery. V-7: Field Vane: T_{raw} = 305/20 in-lbs (S_u = 724/48 psf)				SILTY CLAY	
		V-7	50.4-51.0										
			52.5-54.5					Increased roller bit resistance at 52.5', probable top of rock. Advanced roller bit to 54.5' and set up to core.			53.9		18.1
55		C-1	54.5-59.5	60	60			C-1: Hard, fresh, fine to medium grained, gray, GNEISS, with a quartz seam. Joints are close to widely spaced, moderate to high angle, undulating to planar, rough, open, with some sand infilling. RQD = 100% Rock Core Times (min/ft): 3.5, 4.5, 5.25, 5.5, 6.5				GNEISS	
60		C-2	59.5-64.5	60	60			C-2: Hard, fresh, fine to medium grained, gray, GNEISS, with a quartz seam. Joints are close to widely spaced, moderate to high angle, undulating to planar, rough, open, with some sand infilling. RQD = 83% Rock Core Times (min/ft): 3.5, 4.5, 3.0, 3.75, 4.0			64.5		7.5
65								End of exploration at 64.5 feet.					
70													
75													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-B108

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:56 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-E117
SHEET: 1 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Cased

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 67
Final Boring Depth (ft.): 60.2
Date Start - Finish: 4/17/2018 - 4/18/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.0-2.0	24	19	1 3 4 3	7	S-1: Medium stiff, brown, Clayey SILT, little fine Sand, moist, with organics.	1				
5		S-2	5.0-7.0	24	13	3 2 2 1	4	S-2: Medium stiff, gray/tan, Silty CLAY, little fine to medium Sand, moist.				CLAY CRUST	
10		S-3	10.0-12.0	24	24	WOH WOH WOH WOH	0	S-3: Soft, gray, Silty CLAY, little to trace fine Sand, moist.			12		55.0
15		U-1	15.0-17.0	24	24	PUSH		U-1: Gray, Silty CLAY, from bottom of tube sample, moist.					
		V-1	17.4-18.0					V-1: Field Vane: T_{raw} = 105/20 in-lbs (S_u = 249/48 psf)				SILTY CLAY	
		V-2	18.4-19.0					V-2: Field Vane: T_{raw} = 120/30 in-lbs (S_u = 286/71 psf)					
20		S-4	20.0-22.0	24	24			S-4: Soft, gray, Silty CLAY, wet.	2				
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Tapered vane with 2.5" diameter, 4.5" height and 45 degree taper was used for field tests. T_{raw} = measured torque, S_u = Calculated Undrained Shear Strength.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-E117

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-E117
SHEET: 2 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Cased

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 67
Final Boring Depth (ft.): 60.2
Date Start - Finish: 4/17/2018 - 4/18/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-5	25.0-27.0	24	24			S-5: Soft, gray, Silty CLAY, wet.					
		V-3						V-3: Field Vane: T_{raw} = 110/40 in-lbs (S_u = 261/95 psf)					
		V-4	25.4-26.0, 26.4-27.0					V-4: Field Vane: T_{raw} = 145/45 in-lbs (S_u = 344/107 psf)					
30		U-2	30.0-32.0	24	24			U-2: Gray, Silty CLAY from bottom of tube sample.					
		V-5	32.4-33.0					V-5: Field Vane: T_{raw} = 195/40 in-lbs (S_u = 463/95 psf)					
		V-6	33.4-34.0					V-6: Field Vane: T_{raw} = 190/40 in-lbs (S_u = 451/95 psf)					
35		S-6	35.0-37.0	24	24	WOR WOR WOR WOR	0	S-6: Soft, gray, Silty CLAY, trace fine Sand, wet.				SILTY CLAY	
40		S-7	40.0-42.0	24	24			S-7: Gray, Silty CLAY, trace Sand, wet.					
		V-7						V-7: Field Vane: T_{raw} = 195/10 in-lbs (S_u = 463/24 psf)					
		V-8	40.4-41.0, 41.4-42.0					V-8: Field Vane: T_{raw} = 160/10 in-lbs (S_u = 380/24 psf)					
45		S-8	45.0-47.0	24	19	WOR WOR WOR WOR	0	S-8: Soft, gray, Silty CLAY, trace fine Sand, wet.					
50													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-E117

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:58 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-E117
SHEET: 3 of 3
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Cased

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 67
Final Boring Depth (ft.): 60.2
Date Start - Finish: 4/17/2018 - 4/18/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		U-3	50.0-52.0	24	24	PUSH		U-3: Gray, Silty CLAY, trace fine Sand, from bottom of tube sample, wet.					
		V-9	52.4-53.0					V-9: Field Vane: T_{raw} = 275/35 in-lbs (S_u = 653/83 psf)					
		V-10	53.4-54.0					V-10: Field Vane: T_{raw} = 215/40 in-lbs (S_u = 510/95 psf)					
55		S-9	55.0-57.0	24	18	WOR WOH WOH WOH	0	S-9: Soft, gray, Silty CLAY, little fine Sand, wet.				SILTY CLAY	
60		S-10	59.8-60.0	2		50/2"	R	Increased roller bit resistance at 59.8', probable Glacial Till.			59.8 60.2	GLACIAL TILL	7.2 6.8
			60.0-60.2					S-10: Very dense, gray, fine to coarse SAND, some Gravel, little Silt, wet. Splitspoon refusal at 60.2', probable top of rock.					
								End of exploration at 60.2 feet.					
65													
70													
75													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-E117

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-R109
SHEET: 1 of 1
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Cased

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 56
Final Boring Depth (ft.): 6
Date Start - Finish: 4/17/2018 - 4/18/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): --

Sampler Type: SS
Sampler O.D. (in.): 3.0
Sampler Length (in.): 24
Rock Core Size: --

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
											0.5	PAVEMENT	55.5
		S-1	0.5-2.0	18	3	46 54 36	90	S-1: Very dense, brown, fine to coarse SAND, little Gravel, dry.	1				
		S-2	2.0-4.0	24	16	14 18 13 12	31	S-2: Medium dense, brown, fine to coarse SAND, little Gravel, dry.	2			ROAD BASE	
5		S-3	4.0-6.0	24	15	10 8 7 6	15	S-3: Medium dense, brown, fine to coarse SAND, little Gravel, wet.			6		50.0
								End of exploration at 6 feet.					
10													
15													
20													
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Samples retrieved using a 3" over-sized split spoon.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-R109

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:59 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-R110
SHEET: 1 of 1
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Cased

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 56
Final Boring Depth (ft.): 6
Date Start - Finish: 4/17/2018 - 4/18/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.):--

Sampler Type: SS
Sampler O.D. (in.): 3.0
Sampler Length (in.): 24
Rock Core Size: --

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.5-2.0	18	18	22 24 26	50	S-1: Dense, brown, fine to coarse SAND, little Gravel, dry.	1		0.5	PAVEMENT	55.5
		S-2	2.0-4.0	24	19	12 13 12 7	25	S-2: Medium dense, brown, fine to coarse SAND, little Silt, dry.	2			ROAD BASE	
5		S-3	4.0-6.0	24	19	3 3 4 5	7	S-3: Top 14": Loose, brown, fine to coarse SAND, little Silt. Bottom 5": Gray, Clayey SILT.			5.2		50.8
											5.6	CLAYEY SILT	50.4
								End of exploration at 6 feet.					
10													
15													
20													
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Samples retrieved using a 3" over-sized split spoon.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-R110

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:59 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-R111
SHEET: 1 of 1
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Cased

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 56
Final Boring Depth (ft.): 6
Date Start - Finish: 4/17/2018 - 4/18/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.):--

Sampler Type: SS
Sampler O.D. (in.): 3.0
Sampler Length (in.): 24
Rock Core Size: --

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
											0.5	PAVEMENT	55.5
		S-1	0.5-2.0	18	15	21 29 25	54	S-1: Dense, brown, fine to coarse SAND, little Gravel, dry.	1				
		S-2	2.0-4.0	24	20	15 25 17 17	42	S-2: Dense, brown, fine to medium SAND, little Gravel, dry.	2			ROAD BASE	
5		S-3	4.0-6.0	24	12	9 11 25 20	36	S-3: Medium dense, brown, moist, fine to coarse SAND, little Gravel.			5.5		50.5
								End of exploration at 6 feet.					
10													
15													
20													
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Samples retrieved using a 3" over-sized split spoon.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-R111

GZA TEMPLATE TEST BORING; 5/25/2018; 5:15:59 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-R112
SHEET: 1 of 1
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Cased

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 56
Final Boring Depth (ft.): 6
Date Start - Finish: 4/17/2018 - 4/18/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.):--

Sampler Type: SS
Sampler O.D. (in.): 3.0
Sampler Length (in.): 24
Rock Core Size: --

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
NOT APPLICABLE			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
											0.5	PAVEMENT	55.5
		S-1	0.5-2.0	18	16	26 23 20	43	S-1: Very dense, brown, fine to coarse SAND, little Gravel, dry.	1				
		S-2	2.0-4.0	24	21	15 16 21 20	37	S-2: Dense, brown, fine to coarse SAND, little Gravel, dry.	2			ROAD BASE	
5		S-3	4.0-6.0	24	16	32 13 7 7	20	S-3: Top 8": Medium dense, gray/brown, fine to medium SAND, little coarse Sand. Bottom 8": Gray, Clayey SILT, moist.			5.4		50.6
											6	CLAYEY SILT	50.0
								End of exploration at 6 feet.					
10													
15													
20													
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Samples retrieved using a 3" over-sized split spoon.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-R112

GZA TEMPLATE TEST BORING; 5/25/2018; 5:16:00 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-R113
SHEET: 1 of 1
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Cased

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 57
Final Boring Depth (ft.): 6
Date Start - Finish: 4/26/2018 - 4/26/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.):--

Sampler Type: SS
Sampler O.D. (in.): 3.0
Sampler Length (in.): 24
Rock Core Size: --

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
4/26/18	--	3.5	0 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.5-2.0	18	14	13 14 11	25	S-1: Medium dense, brown, fine to coarse SAND, little Gravel, dry.	1		0.5	PAVEMENT	56.5
		S-2	2.0-4.0	24	7	8 33 49	82	S-2: Top 8": Dense, brown, fine to coarse SAND, little Gravel, trace Silt, dry. Bottom 8": Gray, Silty CLAY, moist.	2			ROAD BASE	
5		S-3	4.0-6.0	24	24	4 5 3 3	8	S-3: Top 21": Loose, brown/gray, wet, fine to coarse SAND, little Gravel, little Silt. Bottom 3": Medium stiff, gray, Clayey SILT, wet.			5.4		51.6
											6	SILTY CLAY	51.0
								End of exploration at 6 feet.					
10													
15													
20													
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Samples retrieved using a 3" over-sized split spoon.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-R113

GZA TEMPLATE TEST BORING; 5/25/2018; 5:16:00 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-R114
SHEET: 1 of 1
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Cased

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 57
Final Boring Depth (ft.): 6
Date Start - Finish: 4/24/2018 - 4/24/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.):--

Sampler Type: SS
Sampler O.D. (in.): 3.0
Sampler Length (in.): 24
Rock Core Size: --

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
4/24/2018	--	4.5	0 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
											0.5	PAVEMENT	56.5
		S-1	0.5-2.0	18	16	37 26 31	57	S-1: Very dense, brown, fine to coarse SAND, trace Gravel, dry.	1				
		S-2	2.0-4.0	24	21	20 17 16 15	33	S-2: Dense, brown, fine to coarse SAND, dry.	2			ROAD BASE	
5		S-3	4.0-6.0	24	12	10 9 7 12	16	S-3: Medium dense, gray/brown, fine to coarse SAND, moist.			6		51.0
								End of exploration at 6 feet.					
10													
15													
20													
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Samples retrieved using a 3" over-sized split spoon.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-R114

GZA TEMPLATE TEST BORING; 5/25/2018; 5:16:01 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-R115
SHEET: 1 of 1
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Cased

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 63
Final Boring Depth (ft.): 6
Date Start - Finish: 4/26/2018 - 4/26/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): --

Sampler Type: SS
Sampler O.D. (in.): 3.0
Sampler Length (in.): 24
Rock Core Size: --

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
4/26/2018	--	3.9	0 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.5-2.0	18	17	47 30 29	59	S-1: Very dense, brown, fine to coarse SAND, little Gravel, dry.	1		0.5	PAVEMENT	62.5
		S-2	2.0-4.0	24	2	26 34 30 42	64	S-2: Very dense, brown, fine to coarse SAND, little Gravel, dry.	2			ROAD BASE	
5		S-3	4.0-6.0	24	16	57 17 9 11	26	S-3: Top 8": Dense, gray/brown, wet, fine to coarse SAND, little Gravel. Bottom 8": Gray, moist, Silty CLAY, some fine Sand.			4.7		58.3
											6	SILTY CLAY	57.0
								End of exploration at 6 feet.					
10													
15													
20													
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Samples retrieved using a 3" over-sized split spoon.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: WA-R115

GZA TEMPLATE TEST BORING; 5/25/2018; 5:16:01 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Warren Avenue Overpass I-95 Rehabilitation
Portland, Maine

EXPLORATION NO.: WA-R116
SHEET: 1 of 1
PROJECT NO: 09.0025970.00
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model: B-53
Drilling Method: Cased

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 63
Final Boring Depth (ft.): 6.4
Date Start - Finish: 4/24/2018 - 4/24/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.):--

Sampler Type: SS
Sampler O.D. (in.): 3.0
Sampler Length (in.): 24
Rock Core Size: --

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT ENCOUNTERED			

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.4-2.4	24	20	52 32 26 28	58	S-1: Very dense, brown, fine to coarse SAND, dry.	1		0.5	PAVEMENT	62.5
		S-2	2.4-4.4	24	21	17 14 21 34	35	S-2: Very dense, brown, fine to coarse SAND, trace Silt, moist.	2			ROAD BASE	
5		S-3	4.4-6.4	24	24	37 66 41 7	>100	S-3: Very dense, gray-brown, fine to coarse SAND, little Gravel, dry.			6.4		56.6
								End of exploration at 6.4 feet.					
10													
15													
20													
25													

REMARKS

1 - Automatic hammer energy transfer rate = 67.7
2 - Samples retrieved using a 3" over-sized split spoon.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

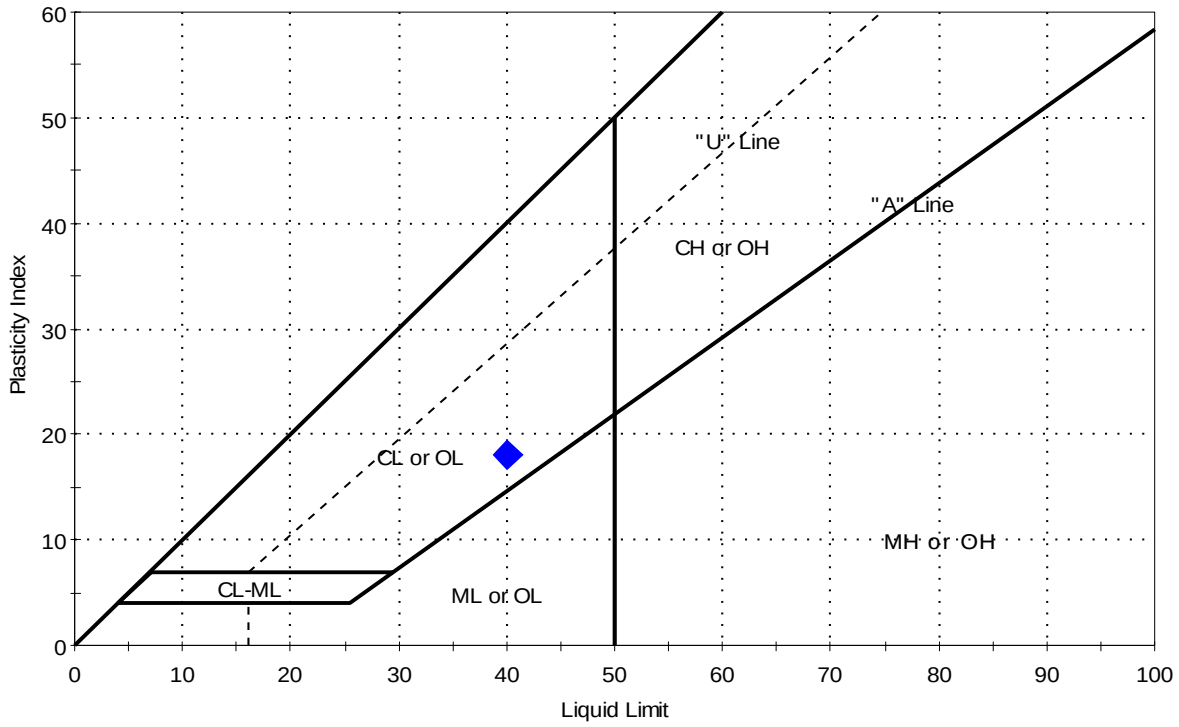
Exploration No.: WA-R116

GZA TEMPLATE TEST BORING; 5/25/2018; 5:16:02 PM

APPENDIX C – LABORATORY TEST RESULTS

Client:	GZA GeoEnvironmental, Inc.				
Project:	Warren Ave Rehabilitation				
Location:	Portland, ME			Project No:	GTX-308006
Boring ID:	WA-E117	Sample Type:	tube	Tested By:	cam
Sample ID:	U-1	Test Date:	05/04/18	Checked By:	emm
Depth :	15-17 ft	Test Id:	451722		
Test Comment:	---				
Visual Description:	Wet, 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
◆	U-1	WA-E117	15-17 ft	47	40	22	18	1.4	

Sample Prepared using the WET method

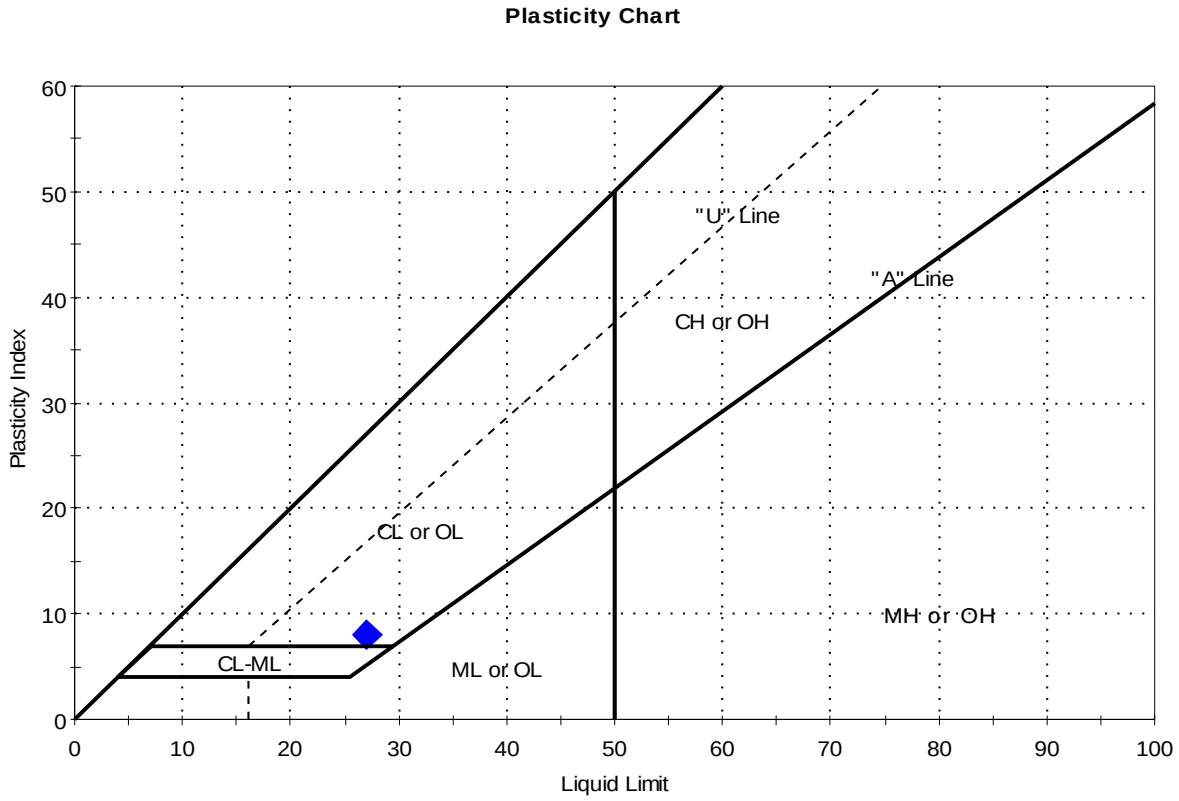
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	GZA GeoEnvironmental, Inc.				
Project:	Warren Ave Rehabilitation				
Location:	Portland, ME			Project No:	GTX-308006
Boring ID:	WA-E117	Sample Type:	tube	Tested By:	cam
Sample ID:	U-2	Test Date:	05/04/18	Checked By:	emm
Depth :	30-32 ft	Test Id:	451723		
Test Comment:	---				
Visual Description:	Wet, 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
◆	U-2	WA-E117	30-32 ft	39	27	19	8	2.5	

Sample Prepared using the WET method

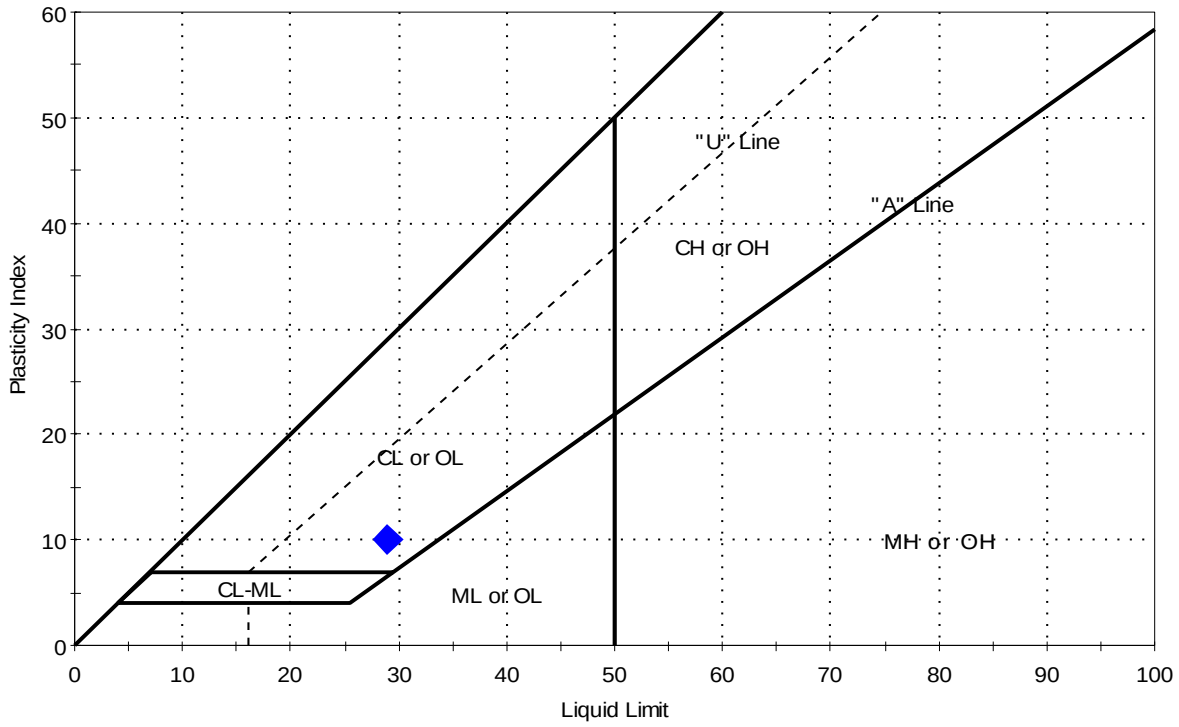
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	GZA GeoEnvironmental, Inc.				
Project:	Warren Ave Rehabilitation				
Location:	Portland, ME			Project No:	GTX-308006
Boring ID:	WA-E117	Sample Type:	tube	Tested By:	cam
Sample ID:	U-3	Test Date:	05/07/18	Checked By:	emm
Depth :	50-52 ft	Test Id:	451724		
Test Comment:	---				
Visual Description:	Wet, 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
◆	U-3	WA-E117	50-52 ft	38	29	19	10	1.9	

Sample Prepared using the WET method

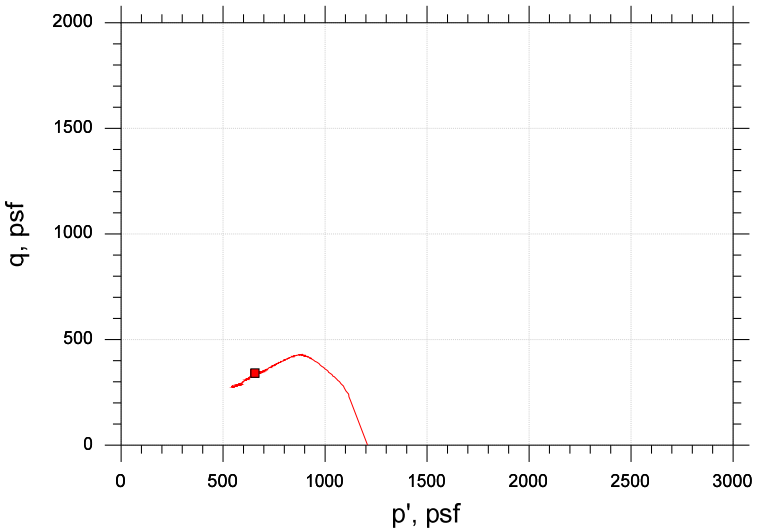
Dry Strength: VERY HIGH

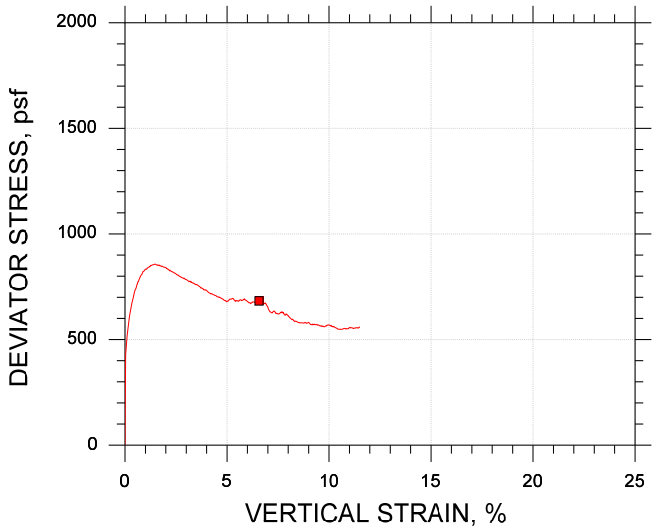
Dilatancy: SLOW

Toughness: LOW

Client: GZA GeoEnvironmental, Inc.	
Project Name: Warren Ave Rehabilitation	
Project Location: Portland, ME	
Project Number: GTX-308006	
Tested By: md	Checked By: njh
Boring ID: WA-E117	
Preparation: intact	
Description: Wet, dark gray clay	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 40	Plastic Limit: 22
Plasticity Index: 18	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767



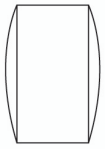


Symbol		■			
Sample ID		U-1			
Depth, ft		15-17			
Test Number		CU-2-1			
Initial	Height, in	5.980			
	Diameter, in	2.810			
	Moisture Content (from Cuttings), %	48.7			
	Dry Density, pcf	68.4			
	Saturation (Wet Method), %	89.8			
	Void Ratio	1.46			
Before Shear	Moisture Content, %	51.3			
	Dry Density, pcf	70.7			
	Cross-sectional Area (Method A), in²	6.016			
	Saturation, %	100.0			
	Void Ratio	1.39			
	Back Pressure, psf	1.310e+004			
Vertical Effective Consolidation Stress, psf		1207.			
Horizontal Effective Consolidation Stress, psf		1207.			
Vertical Strain after Consolidation, %		0.2644			
Volumetric Strain after Consolidation, %		3.337			
Time to 50% Consolidation, min		108.0			
Shear Strength, psf		341.3			
Strain at Failure, %		6.56			
Strain Rate, %/min		0.01600			
Deviator Stress at Failure, psf		682.7			
Effective Minor Principal Stress at Failure, psf		315.0			
Effective Major Principal Stress at Failure, psf		997.7			
B-Value		0.95			

Unit weight
=70.7*1.146=105 pcf

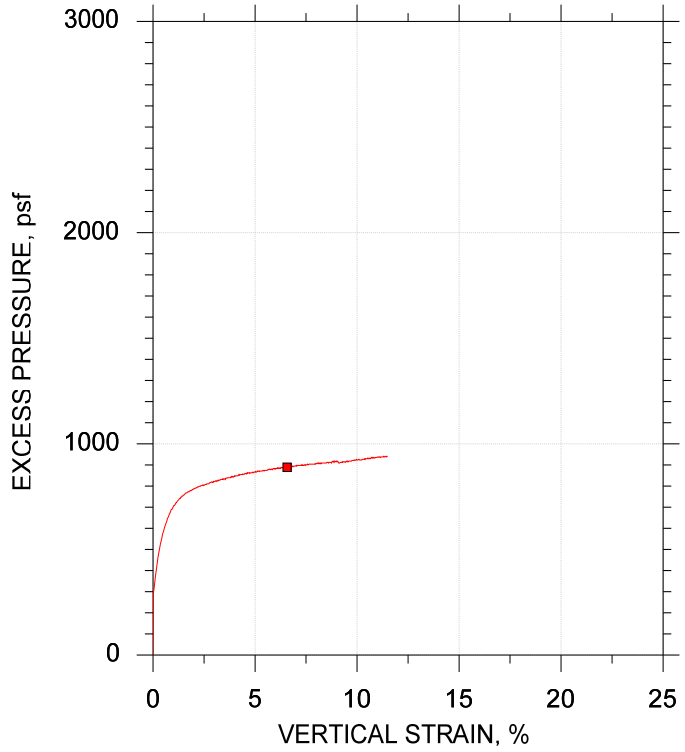
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

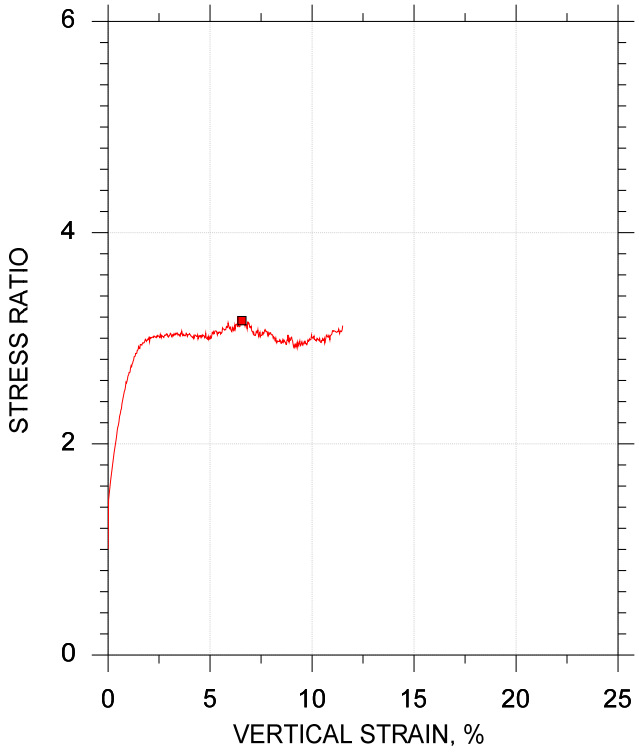
Remarks:

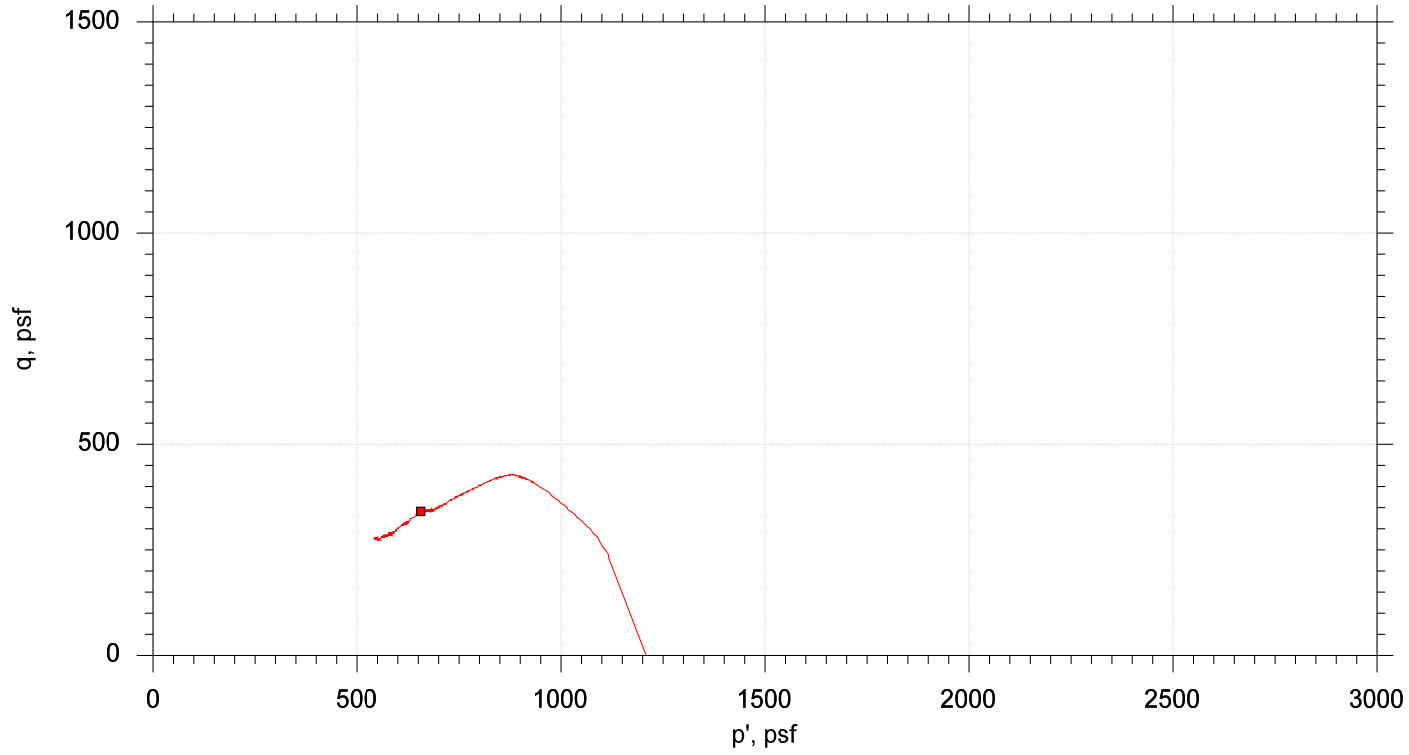


System LL

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







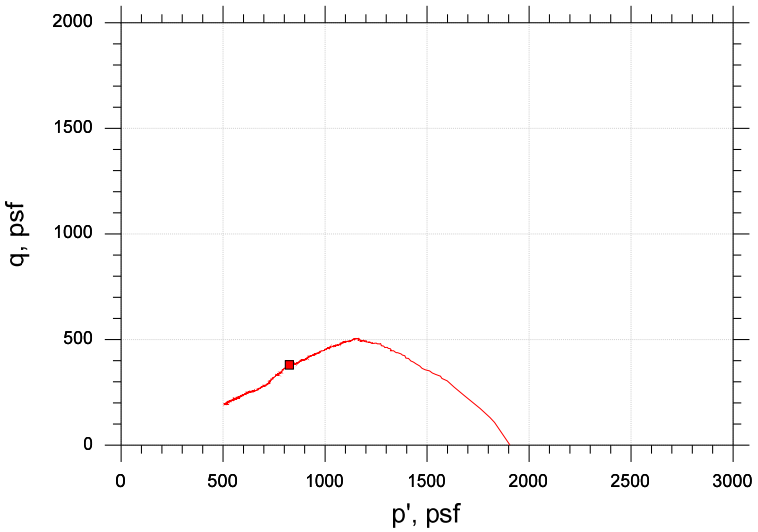
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	U-1	CU-2-1	15-17	md	04/30/18	njh	5/15/18	308006-CU-2-1n.dat

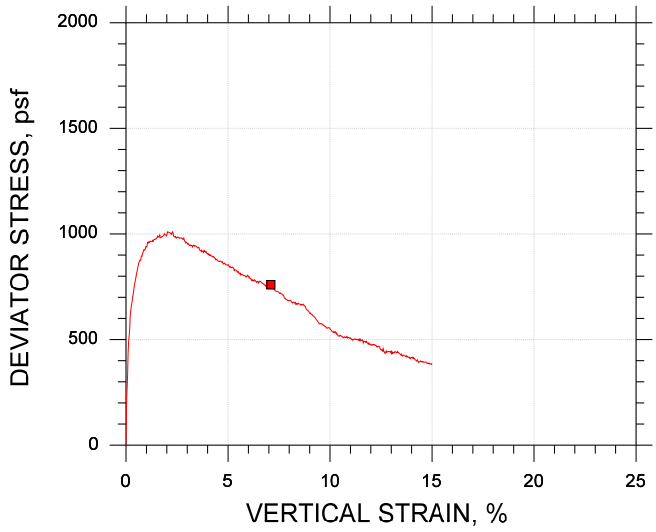
GeoTesting EXPRESS

Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
Boring No.: WA-E117	Sample Type: intact	
Description: Wet, dark gray clay		
Remarks: System LL		

Client: GZA GeoEnvironmental, Inc.	
Project Name: Warren Ave Rehabilitation	
Project Location: Portland, ME	
Project Number: GTX-308006	
Tested By: md	Checked By: njh
Boring ID: WA-E117	
Preparation: intact	
Description: Wet, dark gray clay	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 27	Plastic Limit: 19
Plasticity Index: 8	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767

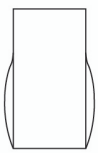




Symbol		■			
Sample ID		U-2			
Depth, ft		30-32			
Test Number		CU-1-1			
Initial	Height, in	4.200			
	Diameter, in	2.040			
	Moisture Content (from Cuttings), %	39.2			
	Dry Density, pcf	80.4			
	Saturation (Wet Method), %	96.6			
	Void Ratio	1.10			
Before Shear	Moisture Content, %	37.4			
	Dry Density, pcf	83.9			
	Cross-sectional Area (Method A), in²	3.198			
	Saturation, %	100.0			
	Void Ratio	1.01			
	Back Pressure, psf	2.030e+004			
Vertical Effective Consolidation Stress, psf		1890.			
Horizontal Effective Consolidation Stress, psf		1905.			
Vertical Strain after Consolidation, %		1.394			
Volumetric Strain after Consolidation, %		2.134			
Time to 50% Consolidation, min		100.0			
Shear Strength, psf		379.8			
Strain at Failure, %		7.10			
Strain Rate, %/min		0.01600			
Deviator Stress at Failure, psf		759.6			
Effective Minor Principal Stress at Failure, psf		445.5			
Effective Major Principal Stress at Failure, psf		1205.			
B-Value		0.96			

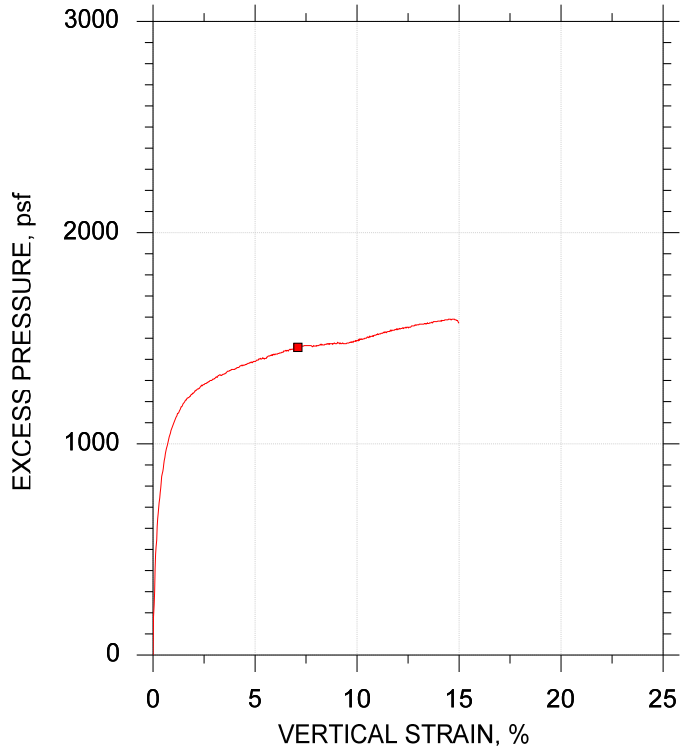
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

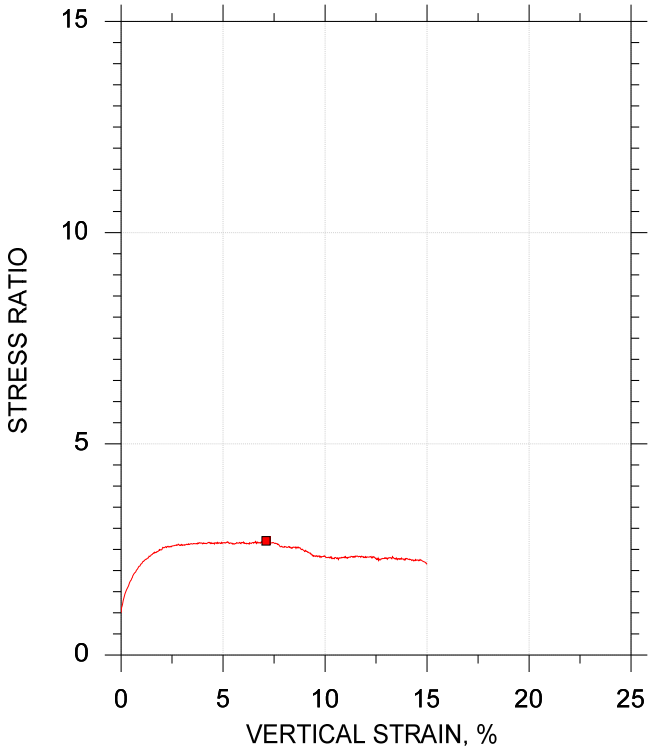
Remarks:

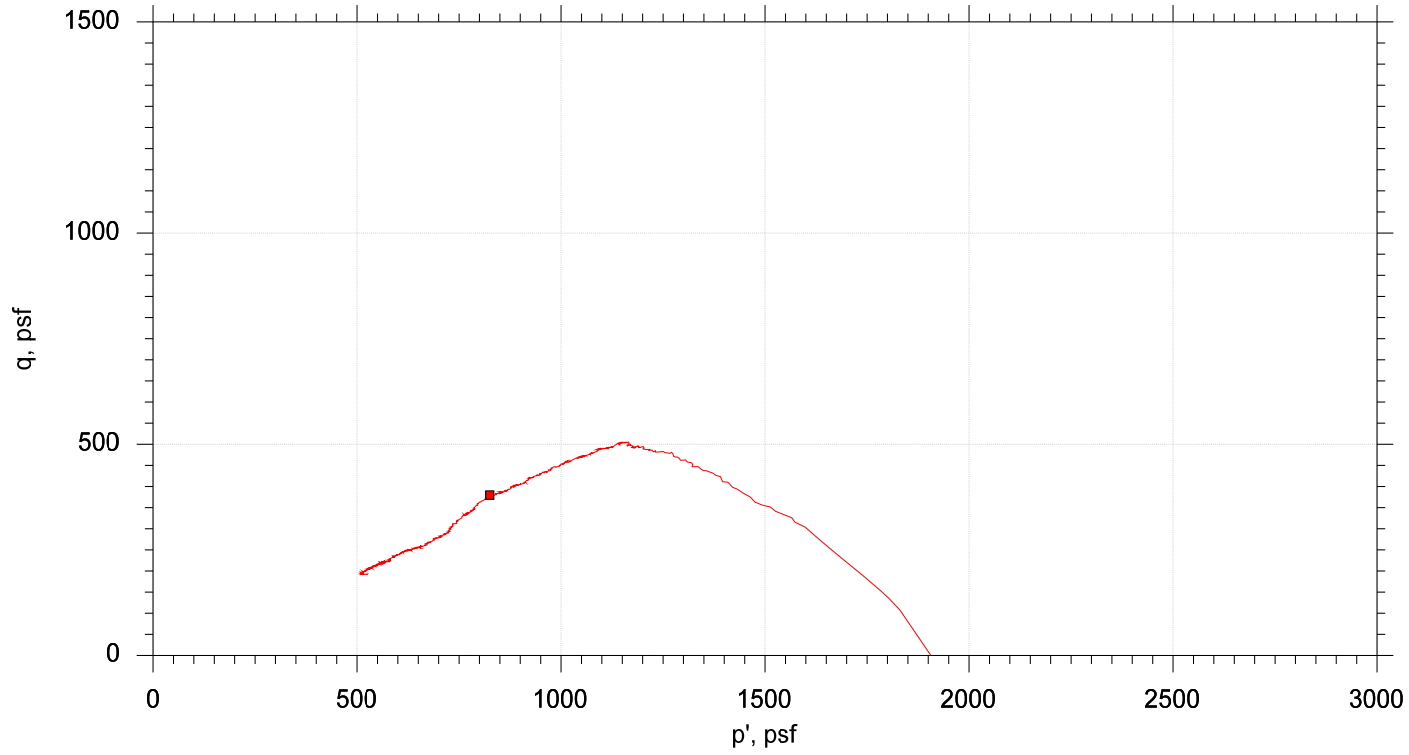


System LL

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







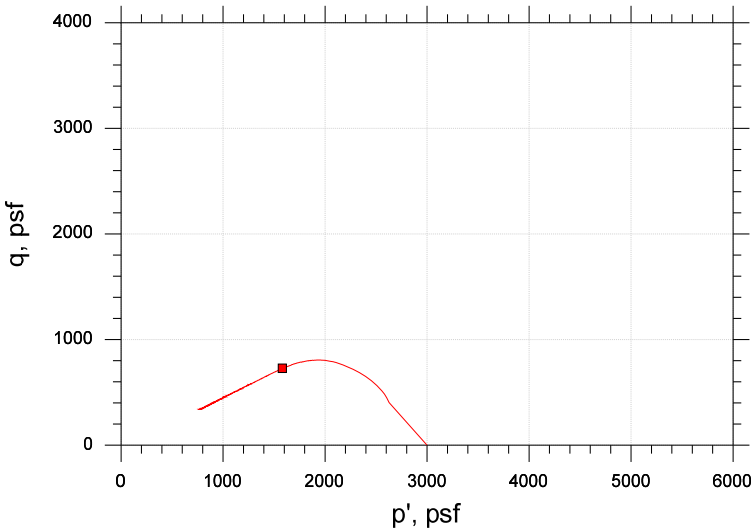
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	U-2	CU-1-1	30-32	md	04/25/18	njh	5/15/18	308006-CU-1-1n.dat

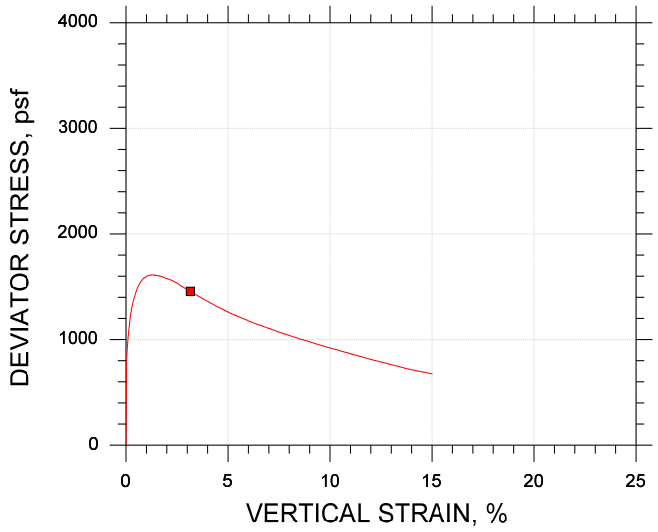
GeoTesting EXPRESS

Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
Boring No.: WA-E117	Sample Type: intact	
Description: Wet, dark gray clay		
Remarks: System LL		

Client: GZA GeoEnvironmental, Inc.	
Project Name: Warren Ave Rehabilitation	
Project Location: Portland, ME	
Project Number: GTX-308006	
Tested By: md	Checked By: njh
Boring ID: WA-E117	
Preparation: intact	
Description: Wet, dark gray clay	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 29	Plastic Limit: 19
Plasticity Index: 10	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





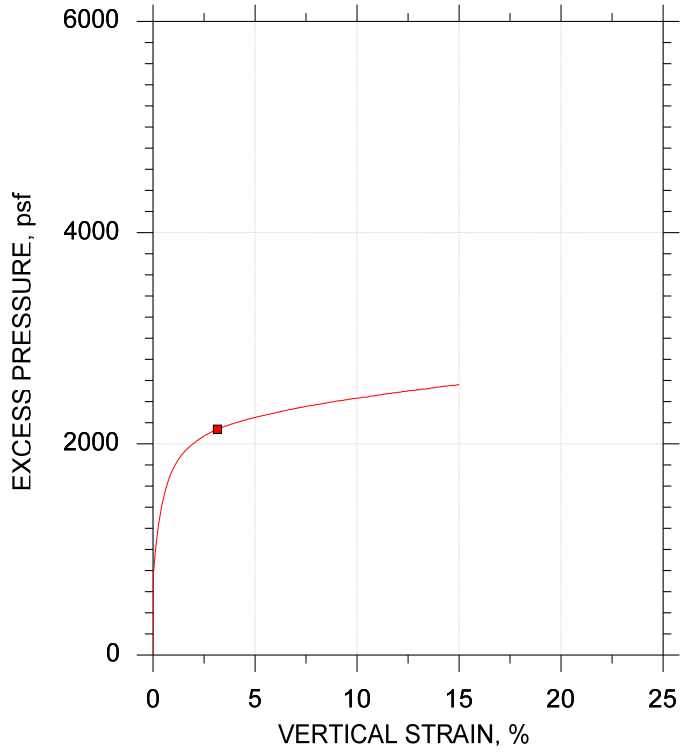
Symbol		■			
Sample ID		U-3			
Depth, ft		50-52			
Test Number		CU-3-1			
Initial	Height, in	6.020			
	Diameter, in	2.790			
	Moisture Content (from Cuttings), %	38.5			
	Dry Density, pcf	75.2			
	Saturation (Wet Method), %	83.7			
	Void Ratio	1.24			
Before Shear	Moisture Content, %	42.3			
	Dry Density, pcf	78.7			
	Cross-sectional Area (Method A), in²	5.936			
	Saturation, %	100.0			
	Void Ratio	1.14			
	Back Pressure, psf	1.627e+004			
Vertical Effective Consolidation Stress, psf		2984.			
Horizontal Effective Consolidation Stress, psf		2997.			
Vertical Strain after Consolidation, %		1.742			
Volumetric Strain after Consolidation, %		4.927			
Time to 50% Consolidation, min		262.0			
Shear Strength, psf		728.0			
Strain at Failure, %		3.16			
Strain Rate, %/min		0.01600			
Deviator Stress at Failure, psf		1456.			
Effective Minor Principal Stress at Failure, psf		853.5			
Effective Major Principal Stress at Failure, psf		2309.			
B-Value		0.95			

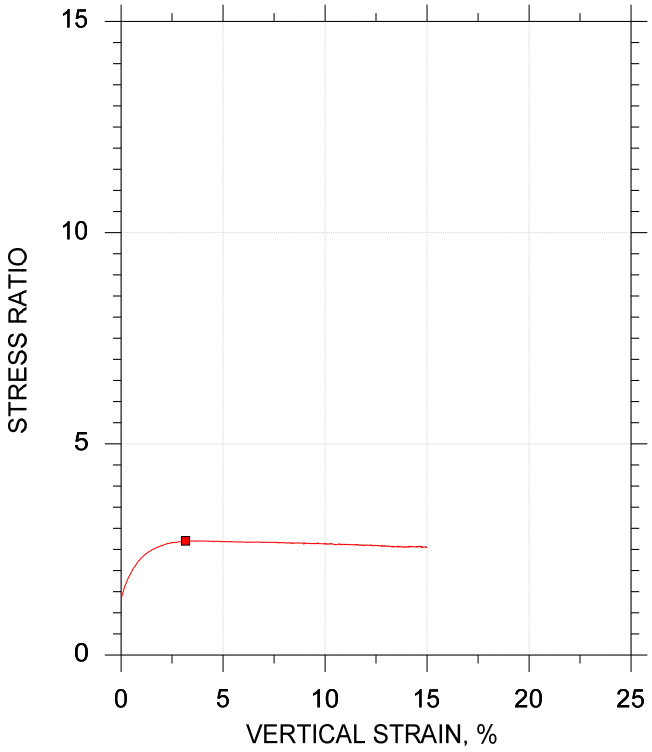
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

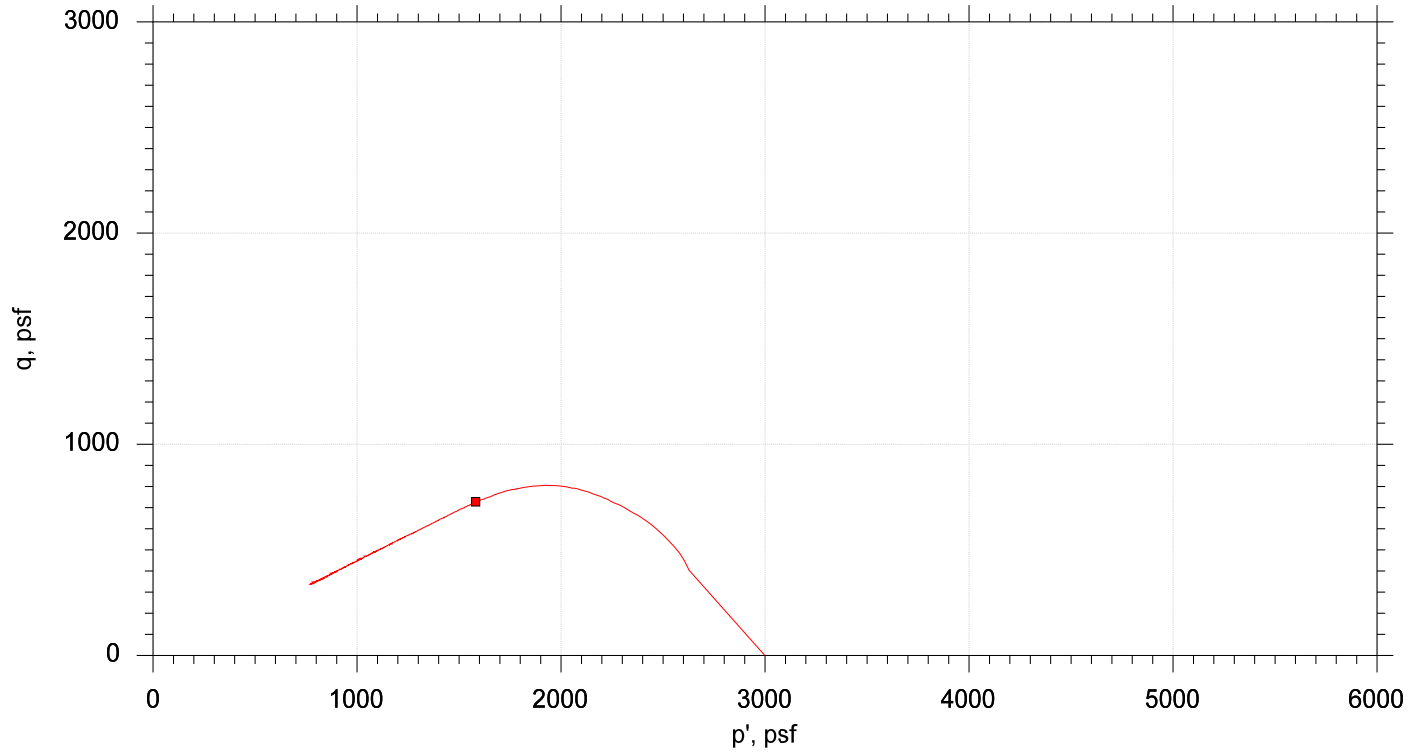
Remarks:

System D

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







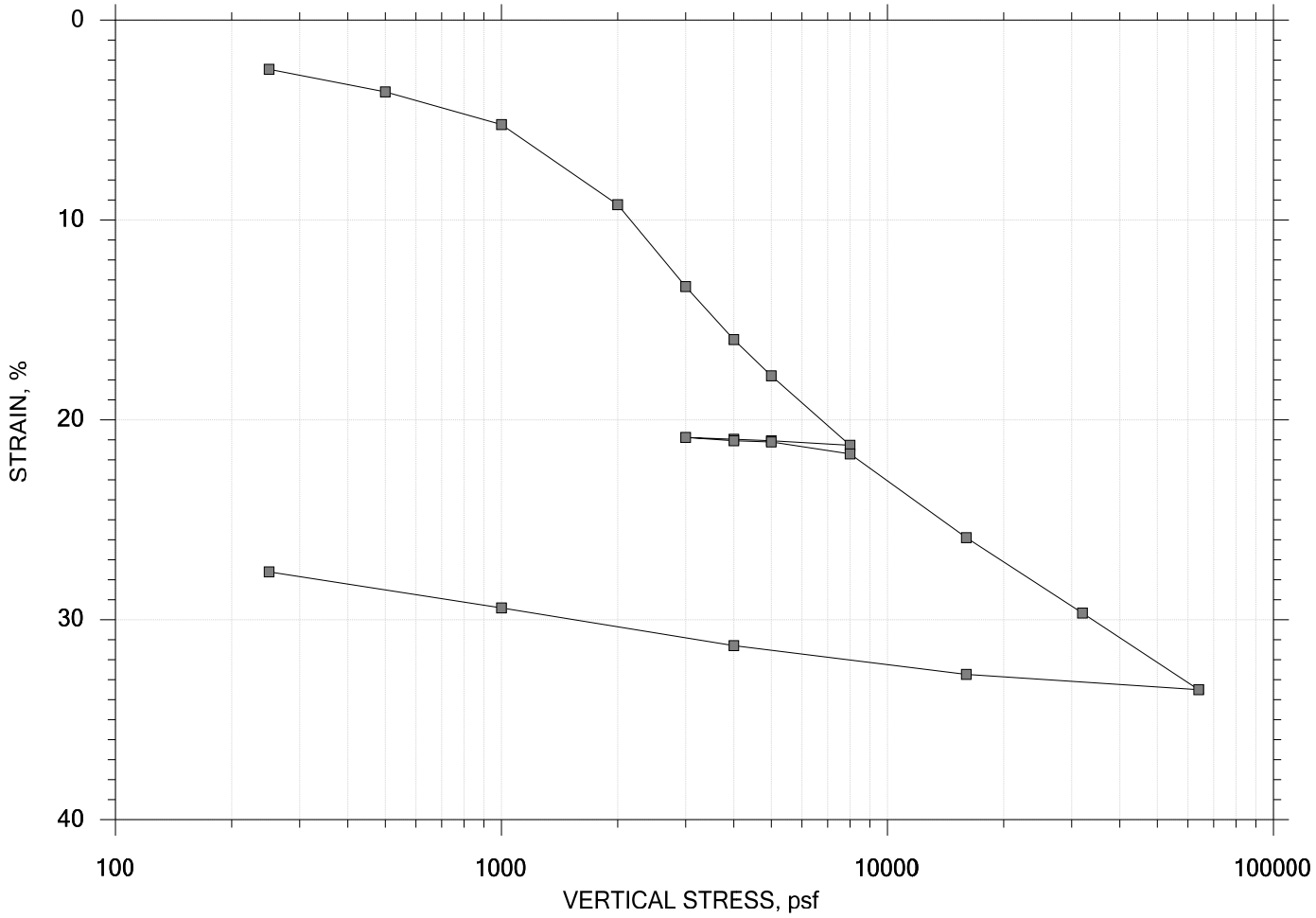
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	U-3	CU-3-1	50-52	md	05/02/18	njh	5/15/18	308006-CU-3-1n.dat

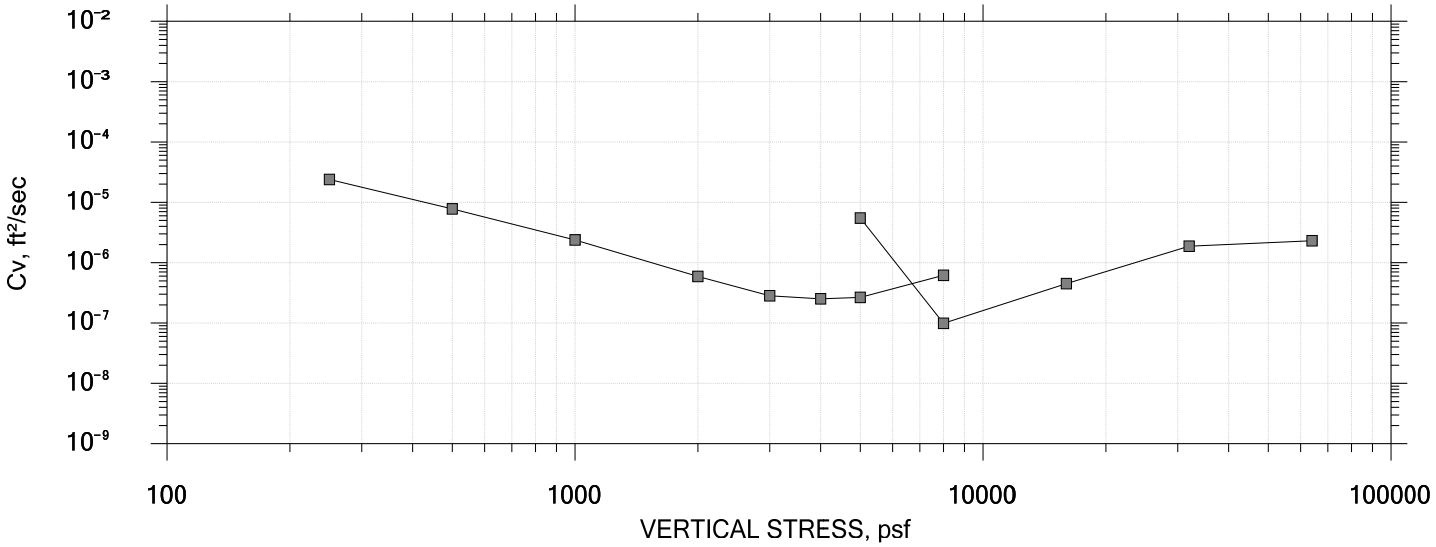
GeoTesting EXPRESS

Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
Boring No.: WA-E117	Sample Type: intact	
Description: Wet, dark gray clay		
Remarks: System D		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT

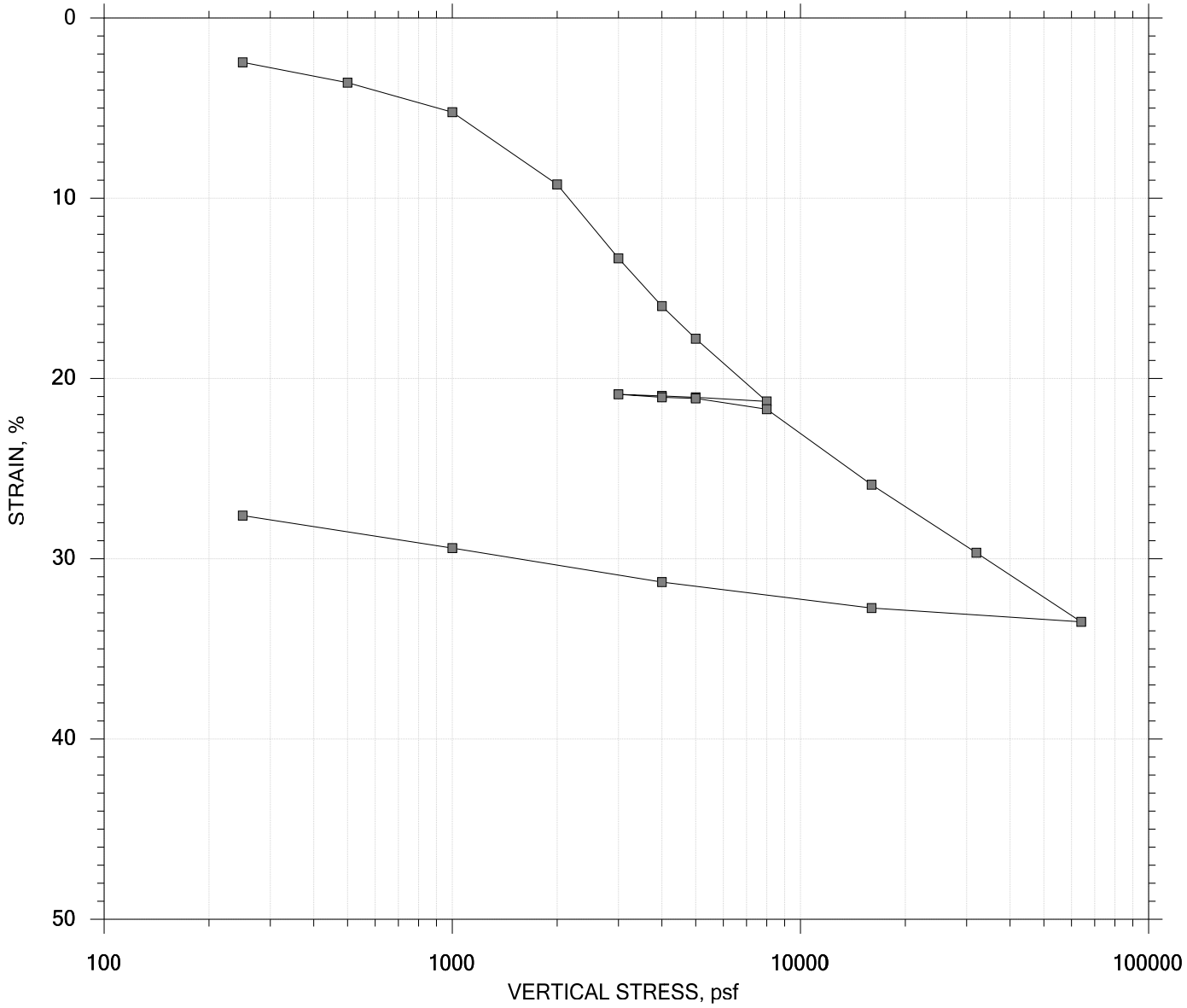




GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



				Before Test	After Test
Current Vertical Effective Stress: ---			Water Content, %	48.97	26.23
Preconsolidation Stress: ---			Dry Unit Weight, pcf	72.764	99.676
Compression Ratio: ---			Saturation, %	99.14	100.00
Diameter: 2.5 in		Height: 1 in	Void Ratio	1.36	0.72
LL: 40	PL: 22	PI: 18	GS: 2.75		

GeoTesting EXPRESS

Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
Boring No.: WA-E117	Tested By: md	Checked By: njh
Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
Depth: 15-17 ft	Sample Type: intact	Elevation: ---
Description: Wet, dark gray clay		
Remarks: System R		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
Boring No.: WA-E117	Tested By: md	Checked By: njh
Sample No.: U-1	Test Date: 05/01/18	Depth: 15-17 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---

Soil Description: Wet, dark gray clay
Remarks: System R

Estimated Specific Gravity: 2.75	Liquid Limit: 40	Specimen Diameter: 2.50 in
Initial Void Ratio: 1.36	Plastic Limit: 22	Initial Height: 1.00 in
Final Void Ratio: 0.721	Plasticity Index: 18	Final Height: 0.73 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	B-1955	RING		A-1197
Wt. Container + Wet Soil, gm	246.74	250.92	229.60	127.86
Wt. Container + Dry Soil, gm	170.27	205.01	205.01	103.01
Wt. Container, gm	8.5700	111.25	111.25	8.2700
Wt. Dry Soil, gm	161.70	93.758	93.758	94.740
Water Content, %	47.29	48.97	26.23	26.23
Void Ratio	---	1.36	0.721	---
Degree of Saturation, %	---	99.14	100.00	---
Dry Unit Weight, pcf	---	72.764	99.676	---

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.

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Warren Ave Rehabilitation
Boring No.: WA-E117
Sample No.: U-1
Test No.: IP-2

Location: Portland, ME
Tested By: md
Test Date: 05/01/18
Sample Type: intact

Project No.: GTX-308006
Checked By: njh
Depth: 15-17 ft
Elevation: ---

Soil Description: Wet, dark gray clay
Remarks: System R

Displacement at End of Increment

	Applied Stress psf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft²/sec	Mv 1/psf	k ft/day
1	250.	0.02459	1.30	2.46	2.297	1.04e-005	9.84e-005	5.53e-003
2	500.	0.03591	1.27	3.59	4.714	4.90e-006	4.53e-005	1.20e-003
3	1.00e+003	0.05222	1.23	5.22	12.237	1.83e-006	3.26e-005	3.23e-004
4	2.00e+003	0.09234	1.14	9.23	39.129	5.40e-007	4.01e-005	1.17e-004
5	3.00e+003	0.1333	1.04	13.3	70.426	2.74e-007	4.10e-005	6.06e-005
6	4.00e+003	0.1598	0.980	16.0	67.149	2.66e-007	2.65e-005	3.81e-005
7	5.00e+003	0.1779	0.938	17.8	70.529	2.40e-007	1.81e-005	2.35e-005
8	8.00e+003	0.2127	0.856	21.3	24.495	6.49e-007	1.16e-005	4.06e-005
9	5.00e+003	0.2104	0.861	21.0	0.000	0.00e+000	7.67e-007	0.00e+000
10	4.00e+003	0.2096	0.863	21.0	18.453	8.30e-007	7.83e-007	3.50e-006
11	3.00e+003	0.2087	0.865	20.9	18.636	8.23e-007	9.11e-007	4.05e-006
12	4.00e+003	0.2104	0.861	21.0	0.000	0.00e+000	1.66e-006	0.00e+000
13	5.00e+003	0.2110	0.860	21.1	6.001	2.55e-006	6.33e-007	8.70e-006
14	8.00e+003	0.2170	0.846	21.7	179.769	8.43e-008	1.99e-006	9.04e-007
15	1.60e+004	0.2589	0.747	25.9	114.219	1.25e-007	5.24e-006	3.53e-006
16	3.20e+004	0.2966	0.658	29.7	7.090	1.81e-006	2.36e-006	2.29e-005
17	6.40e+004	0.3350	0.567	33.5	5.130	2.24e-006	1.20e-006	1.45e-005
18	1.60e+004	0.3273	0.585	32.7	3.490	3.15e-006	1.60e-007	2.71e-006
19	4.00e+003	0.3129	0.619	31.3	10.568	1.07e-006	1.20e-006	6.95e-006
20	1.00e+003	0.2940	0.664	29.4	33.385	3.57e-007	6.30e-006	1.21e-005
21	250.	0.2760	0.706	27.6	131.568	9.53e-008	2.40e-005	1.23e-005

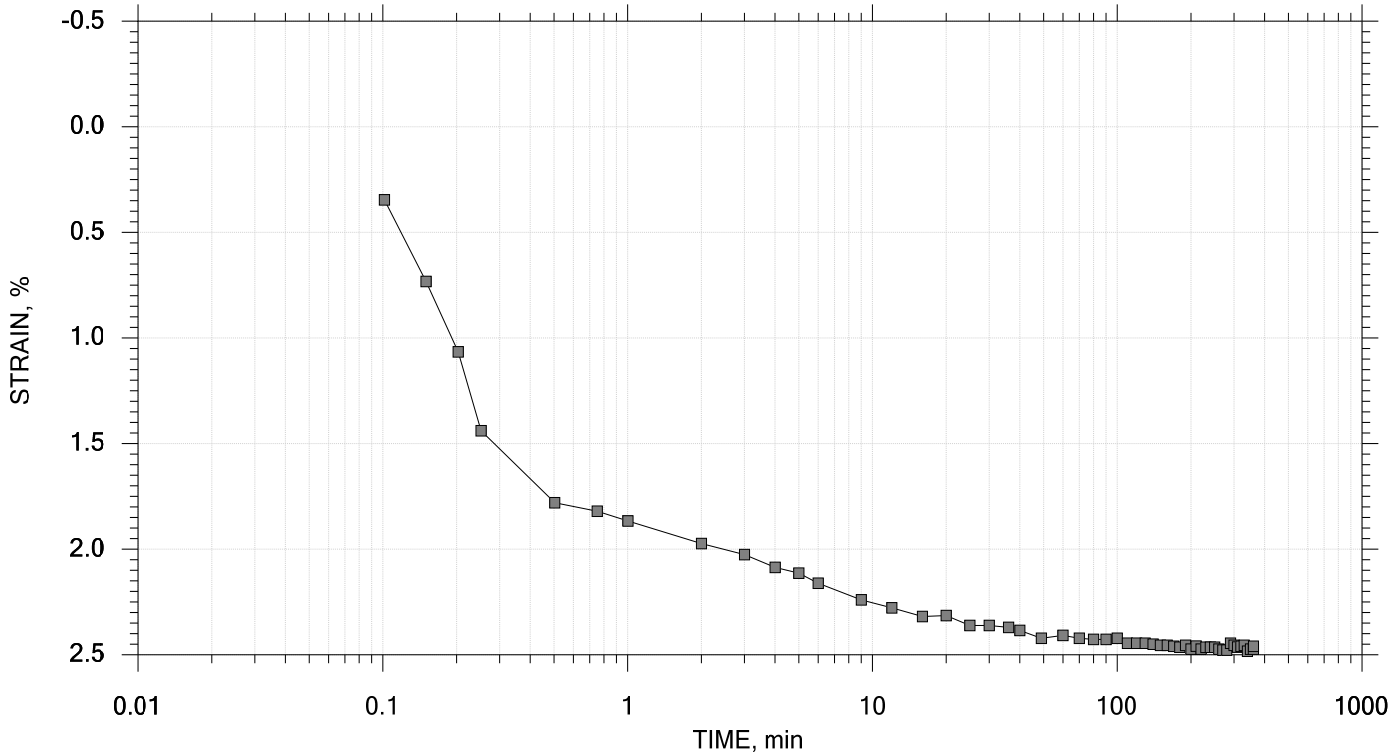
	Applied Stress psf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/sec	Mv 1/psf	k ft/day	Ca %
1	250.	0.02459	1.30	2.46	0.000	0.00e+000	9.84e-005	0.00e+000	0.00e+000
2	500.	0.03591	1.27	3.59	0.579	9.26e-006	4.53e-005	2.26e-003	0.00e+000
3	1.00e+003	0.05222	1.23	5.22	1.930	2.70e-006	3.26e-005	4.75e-004	0.00e+000
4	2.00e+003	0.09234	1.14	9.23	8.797	5.58e-007	4.01e-005	1.21e-004	0.00e+000
5	3.00e+003	0.1333	1.04	13.3	16.507	2.72e-007	4.10e-005	6.00e-005	0.00e+000
6	4.00e+003	0.1598	0.980	16.0	18.326	2.27e-007	2.65e-005	3.24e-005	0.00e+000
7	5.00e+003	0.1779	0.938	17.8	0.000	0.00e+000	1.81e-005	0.00e+000	0.00e+000
8	8.00e+003	0.2127	0.856	21.3	6.563	5.62e-007	1.16e-005	3.52e-005	0.00e+000
9	5.00e+003	0.2104	0.861	21.0	0.000	0.00e+000	7.67e-007	0.00e+000	0.00e+000
10	4.00e+003	0.2096	0.863	21.0	0.000	0.00e+000	7.83e-007	0.00e+000	0.00e+000
11	3.00e+003	0.2087	0.865	20.9	0.000	0.00e+000	9.11e-007	0.00e+000	0.00e+000
12	4.00e+003	0.2104	0.861	21.0	0.000	0.00e+000	1.66e-006	0.00e+000	0.00e+000
13	5.00e+003	0.2110	0.860	21.1	0.000	0.00e+000	6.33e-007	0.00e+000	0.00e+000
14	8.00e+003	0.2170	0.846	21.7	0.000	0.00e+000	1.99e-006	0.00e+000	0.00e+000
15	1.60e+004	0.2589	0.747	25.9	0.000	0.00e+000	5.24e-006	0.00e+000	0.00e+000
16	3.20e+004	0.2966	0.658	29.7	1.719	1.73e-006	2.36e-006	2.20e-005	0.00e+000
17	6.40e+004	0.3350	0.567	33.5	1.297	2.06e-006	1.20e-006	1.33e-005	0.00e+000
18	1.60e+004	0.3273	0.585	32.7	0.000	0.00e+000	1.60e-007	0.00e+000	0.00e+000
19	4.00e+003	0.3129	0.619	31.3	0.000	0.00e+000	1.20e-006	0.00e+000	0.00e+000
20	1.00e+003	0.2940	0.664	29.4	7.906	3.50e-007	6.30e-006	1.19e-005	0.00e+000
21	250.	0.2760	0.706	27.6	38.388	7.59e-008	2.40e-005	9.82e-006	0.00e+000

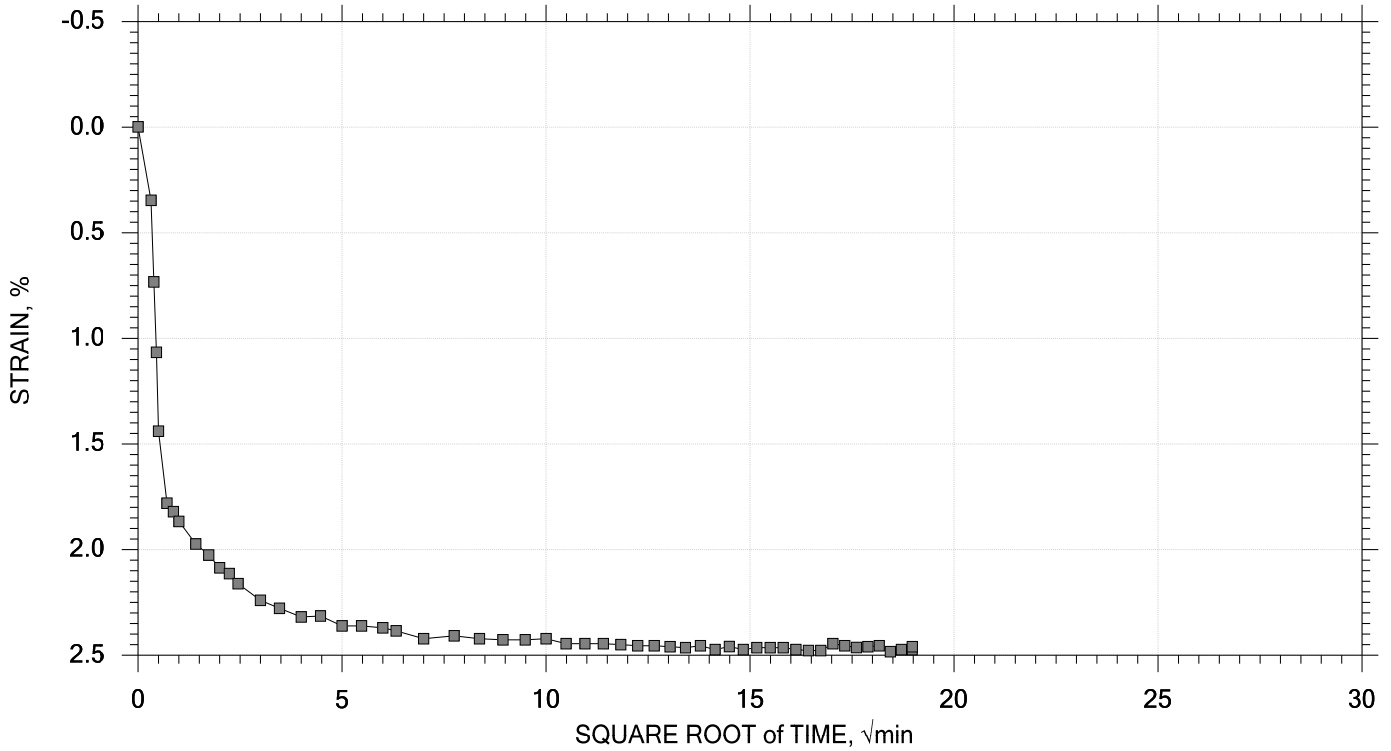
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 1 of 21

Stress: 250 psf





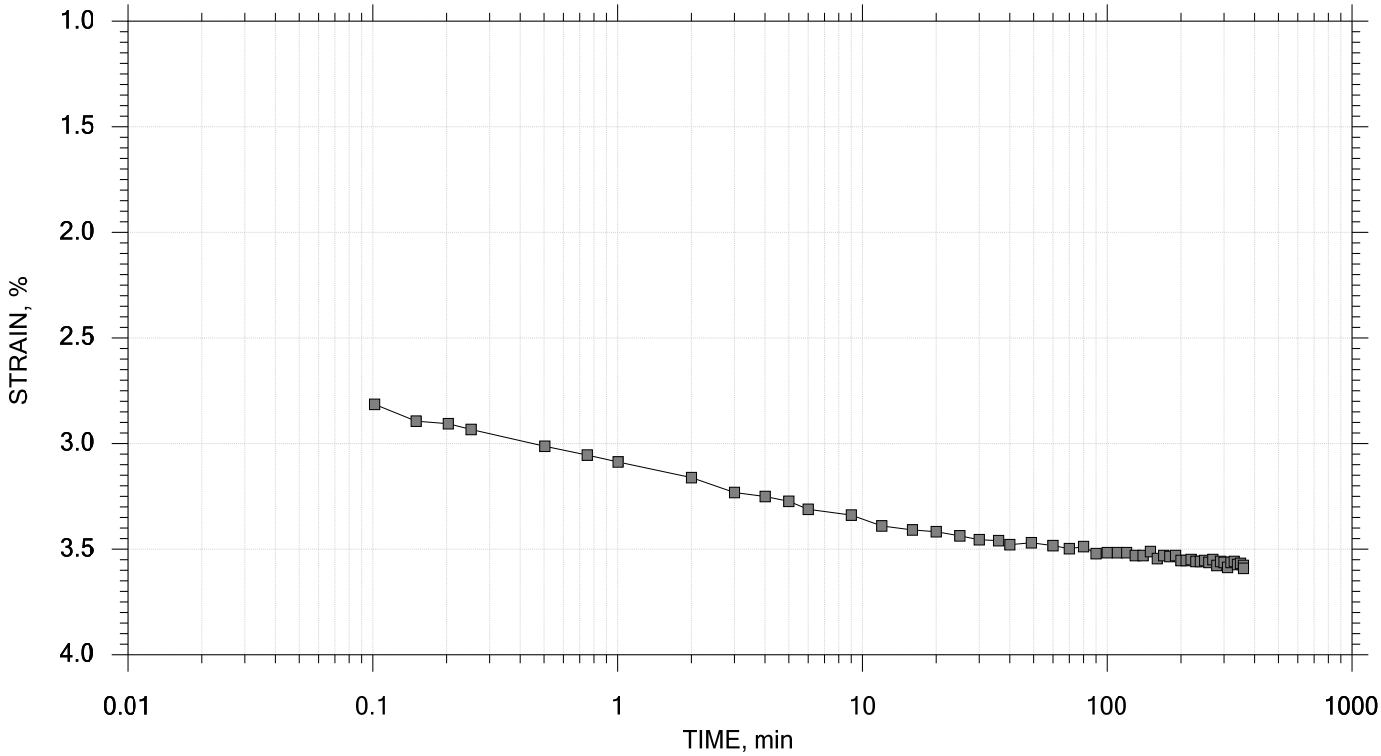
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

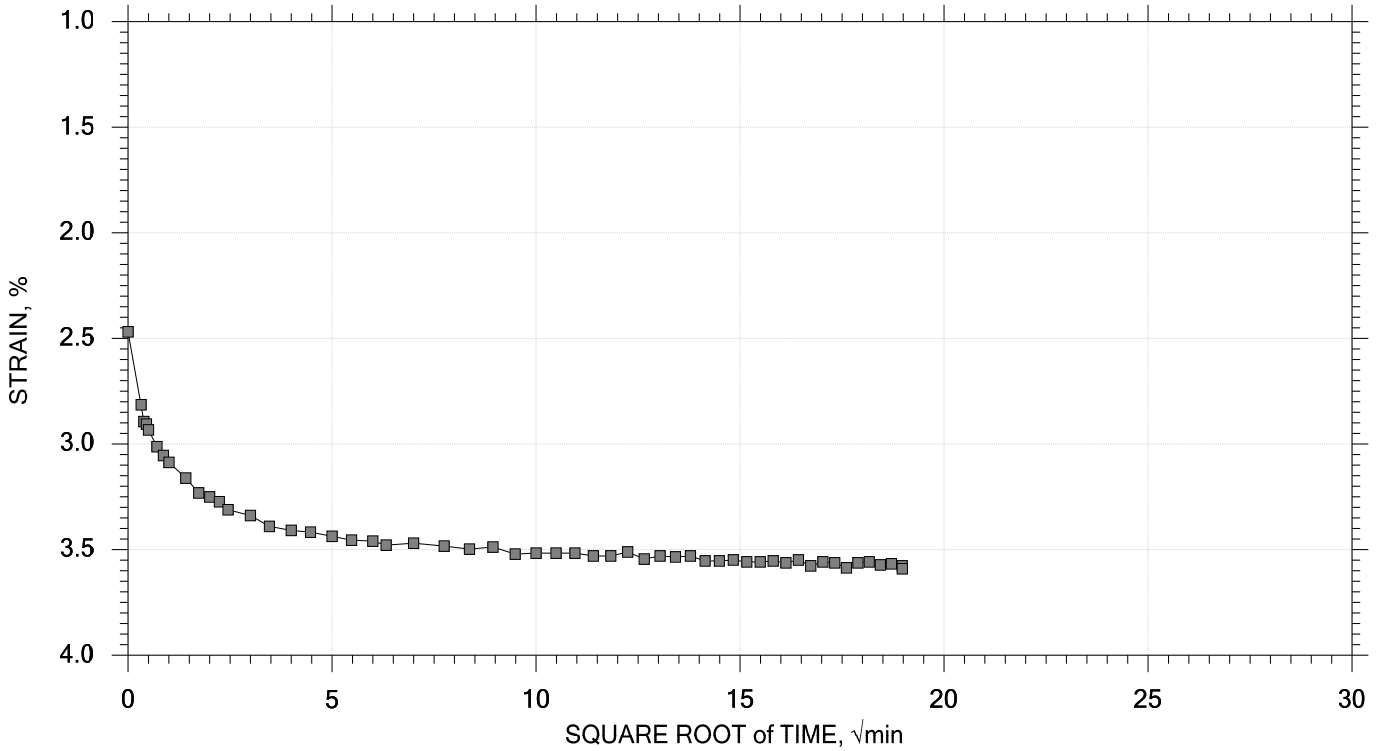
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 2 of 21

Stress: 500 psf





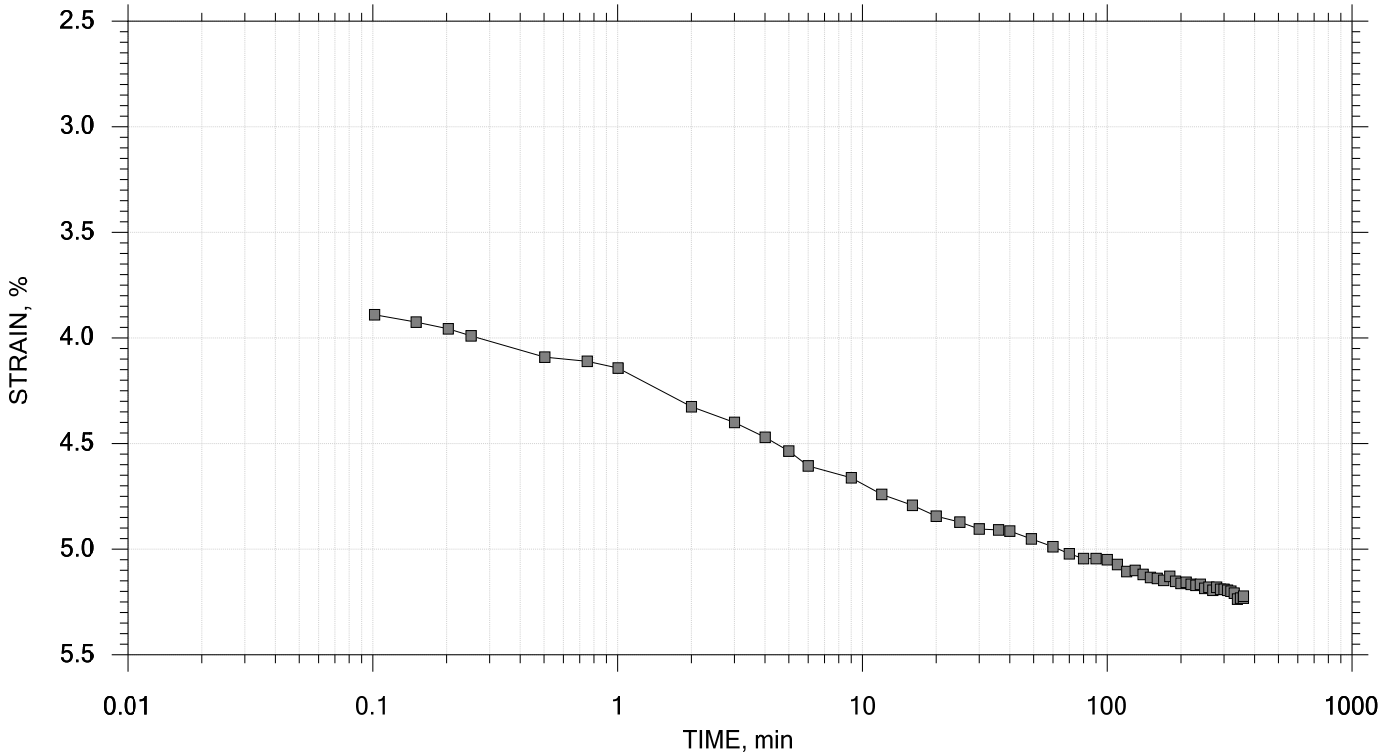
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

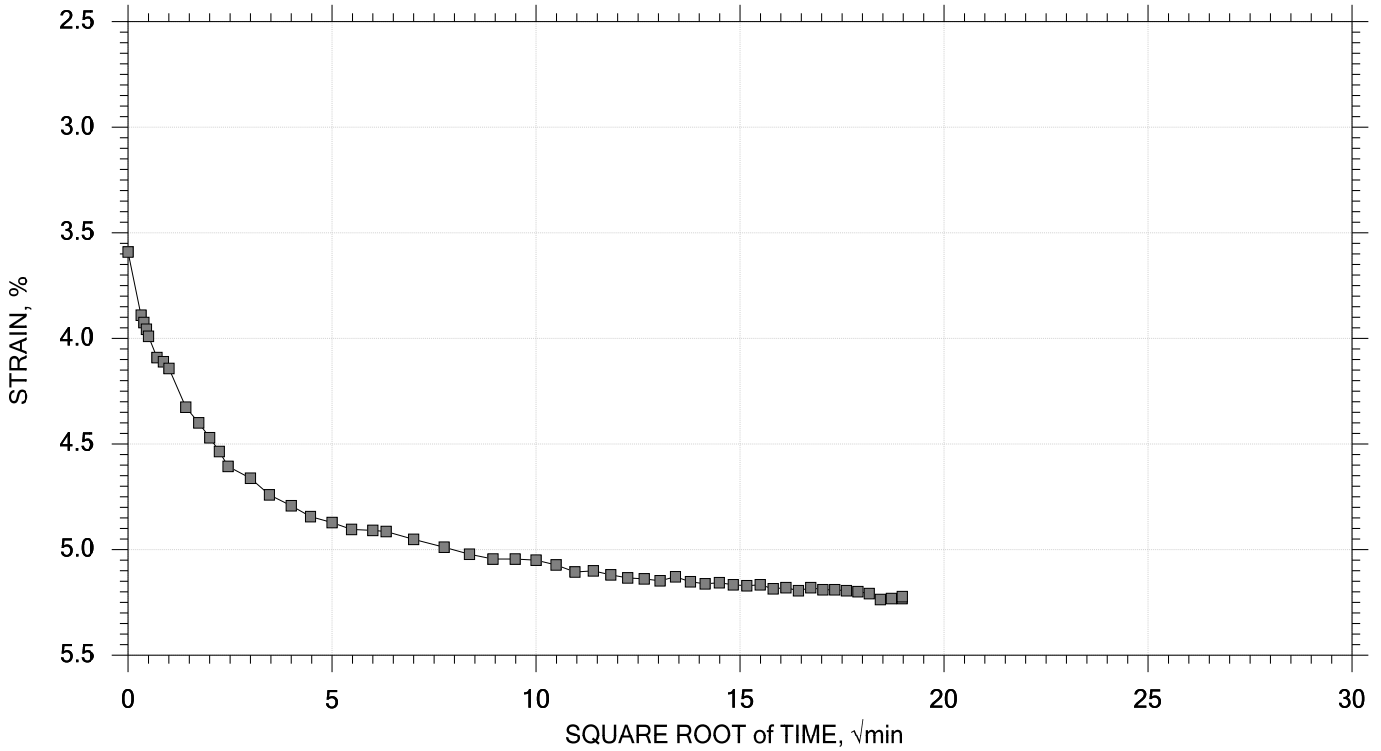
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 3 of 21

Stress: 1000 psf





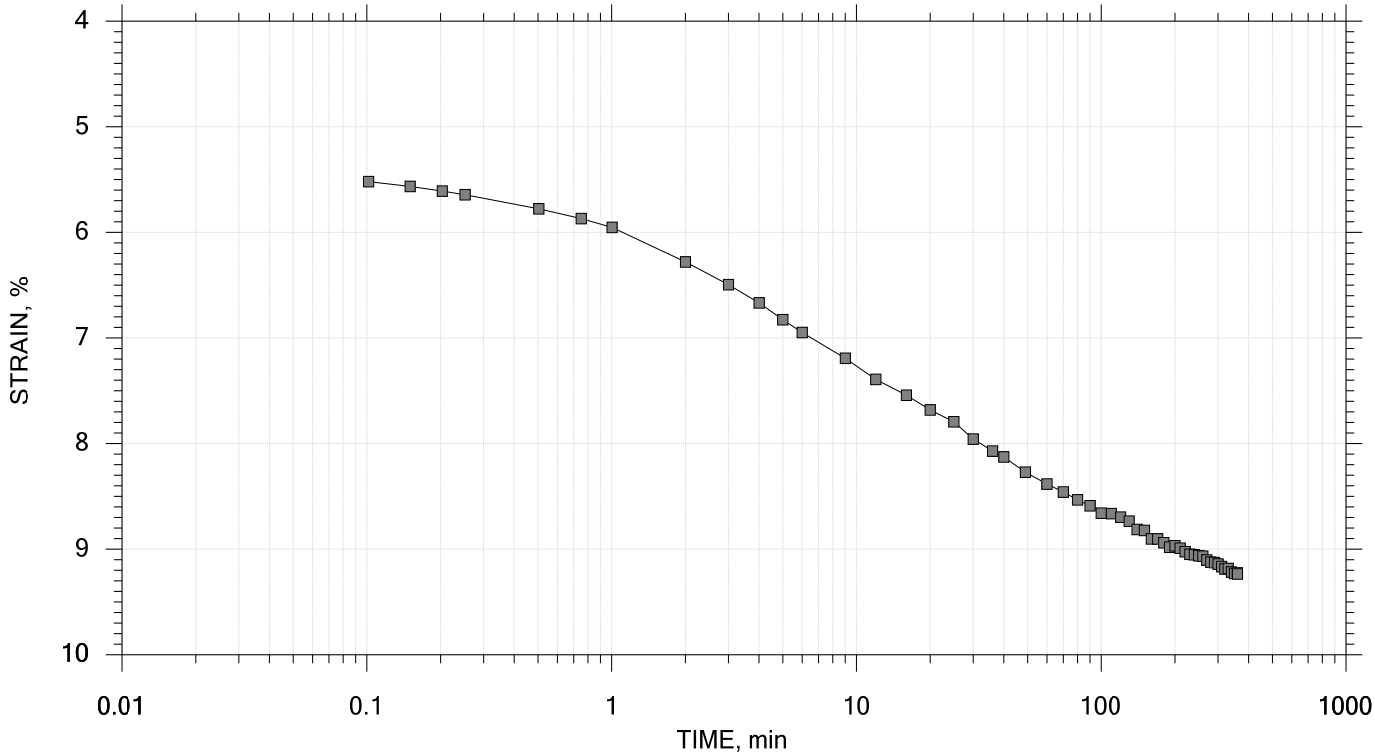
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

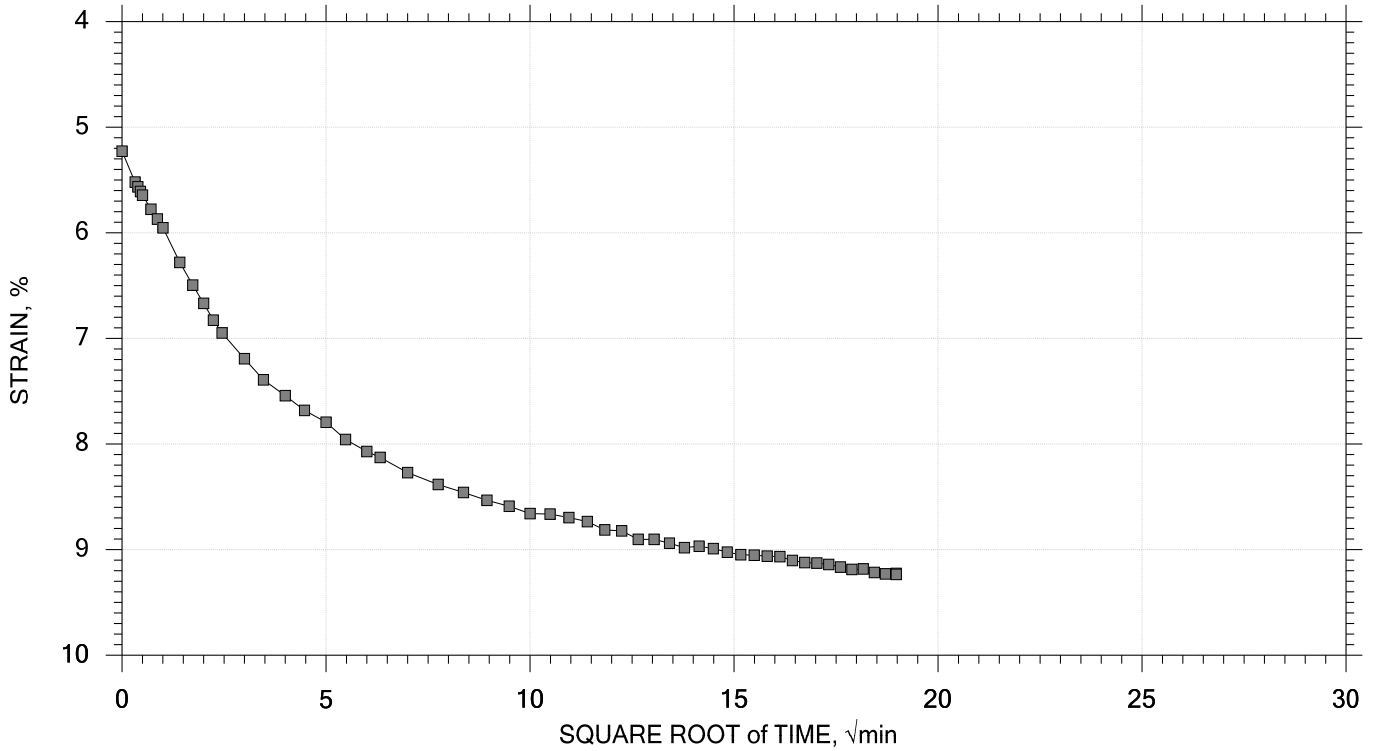
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 4 of 21

Stress: 2000 psf





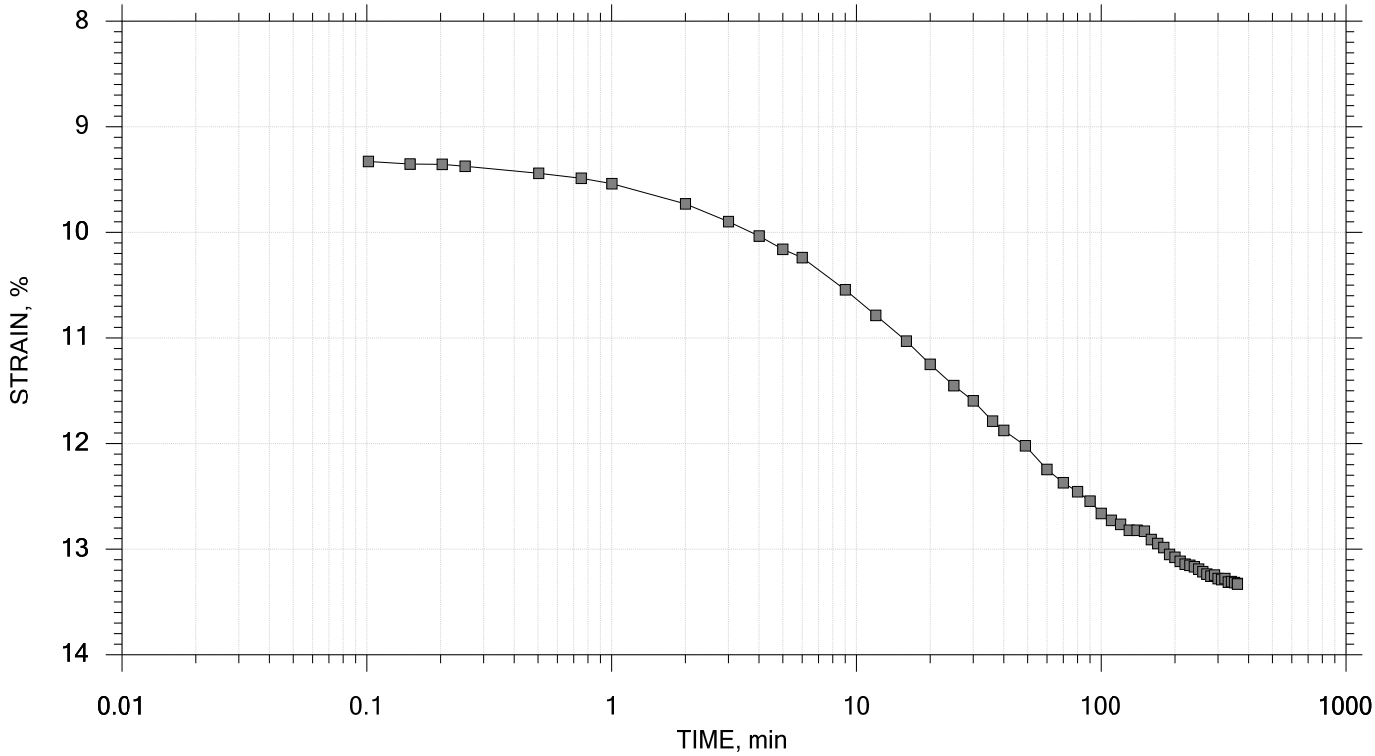
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

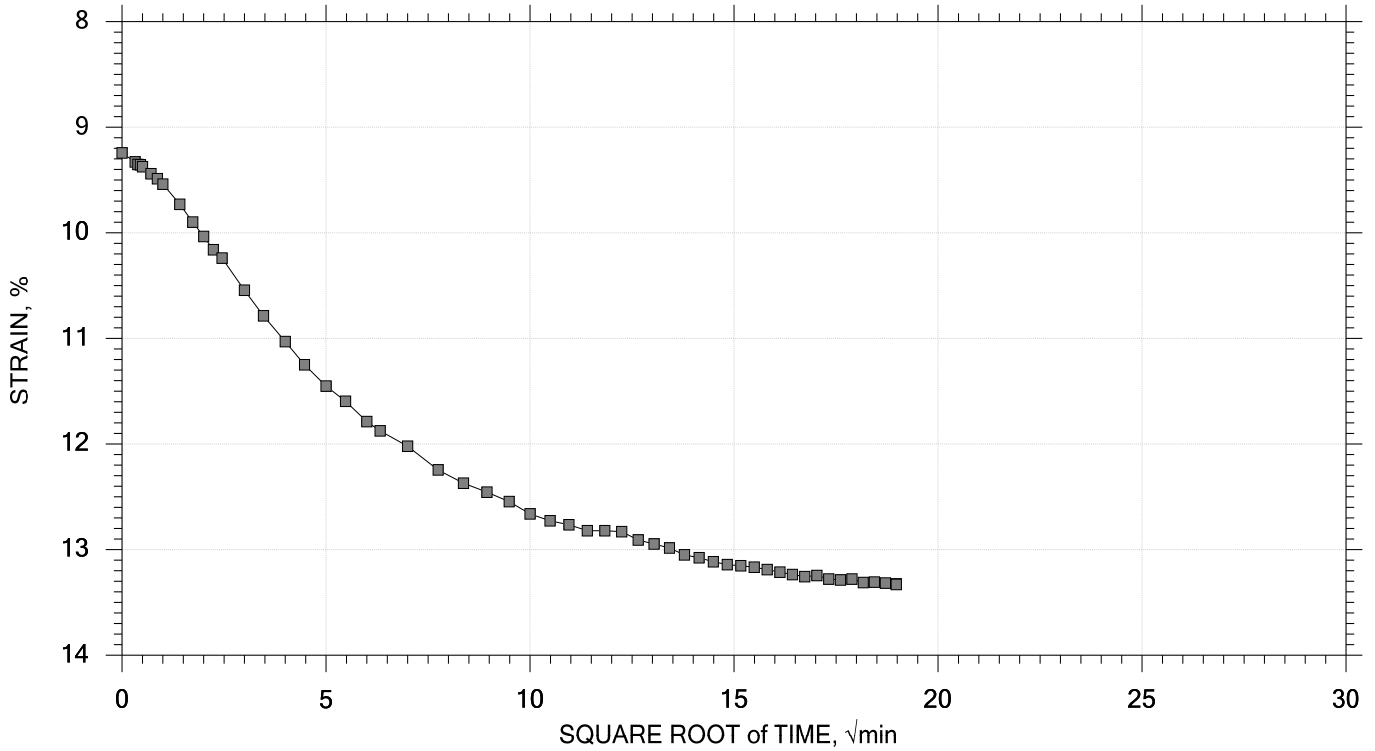
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 5 of 21

Stress: 3000 psf





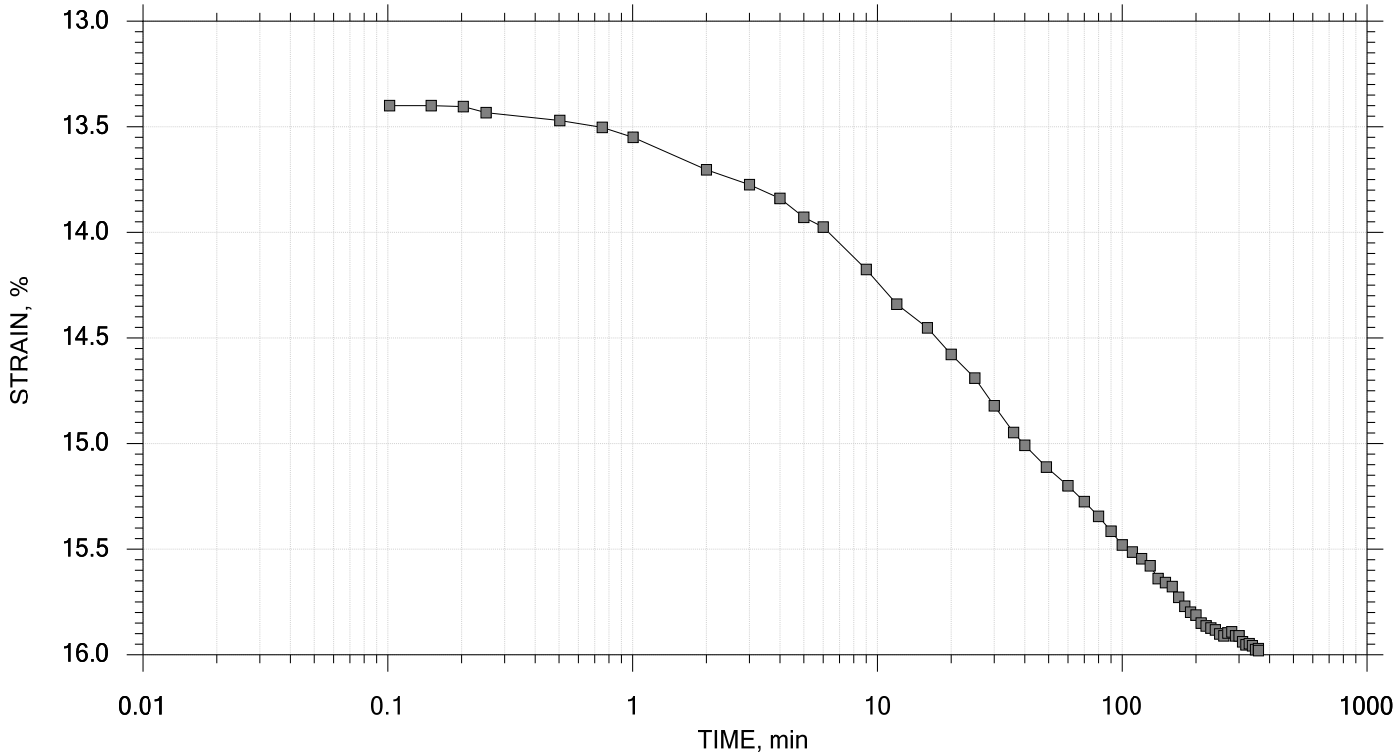
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

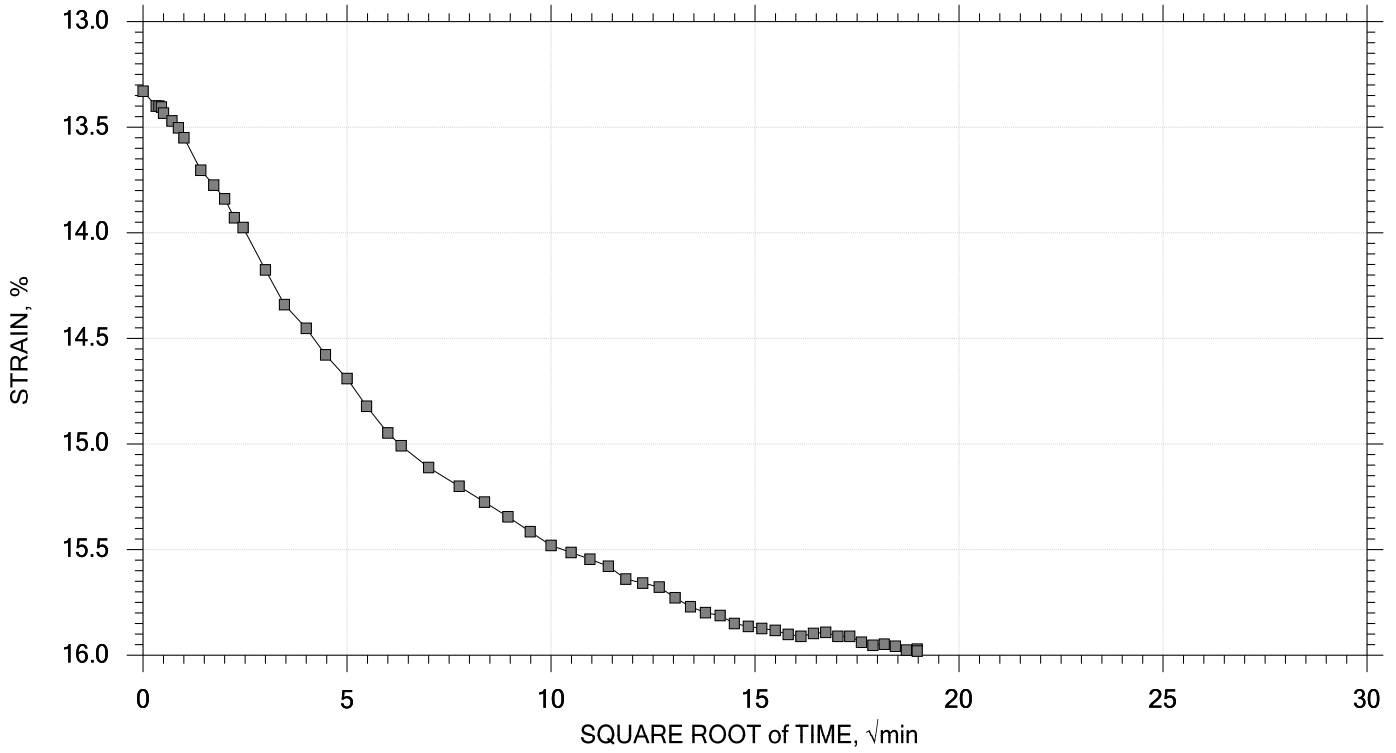
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 6 of 21

Stress: 4000 psf





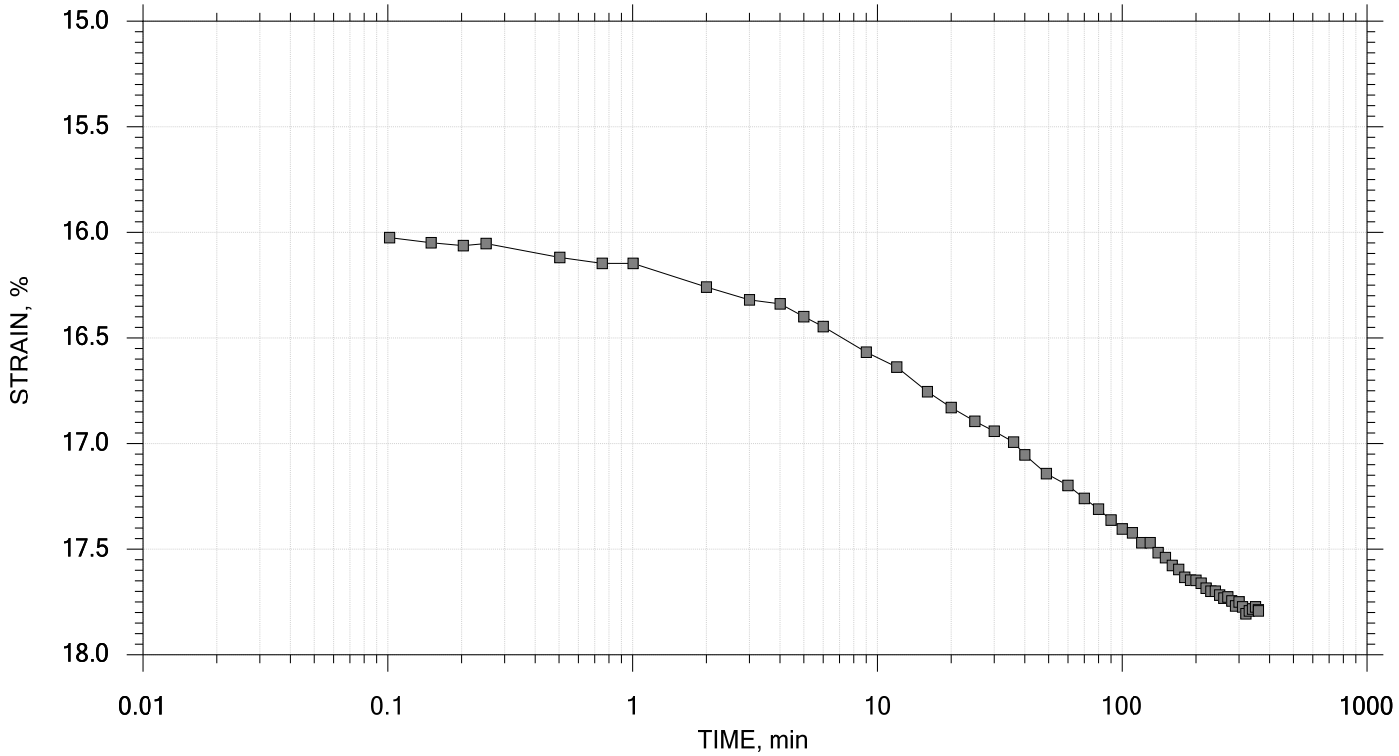
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

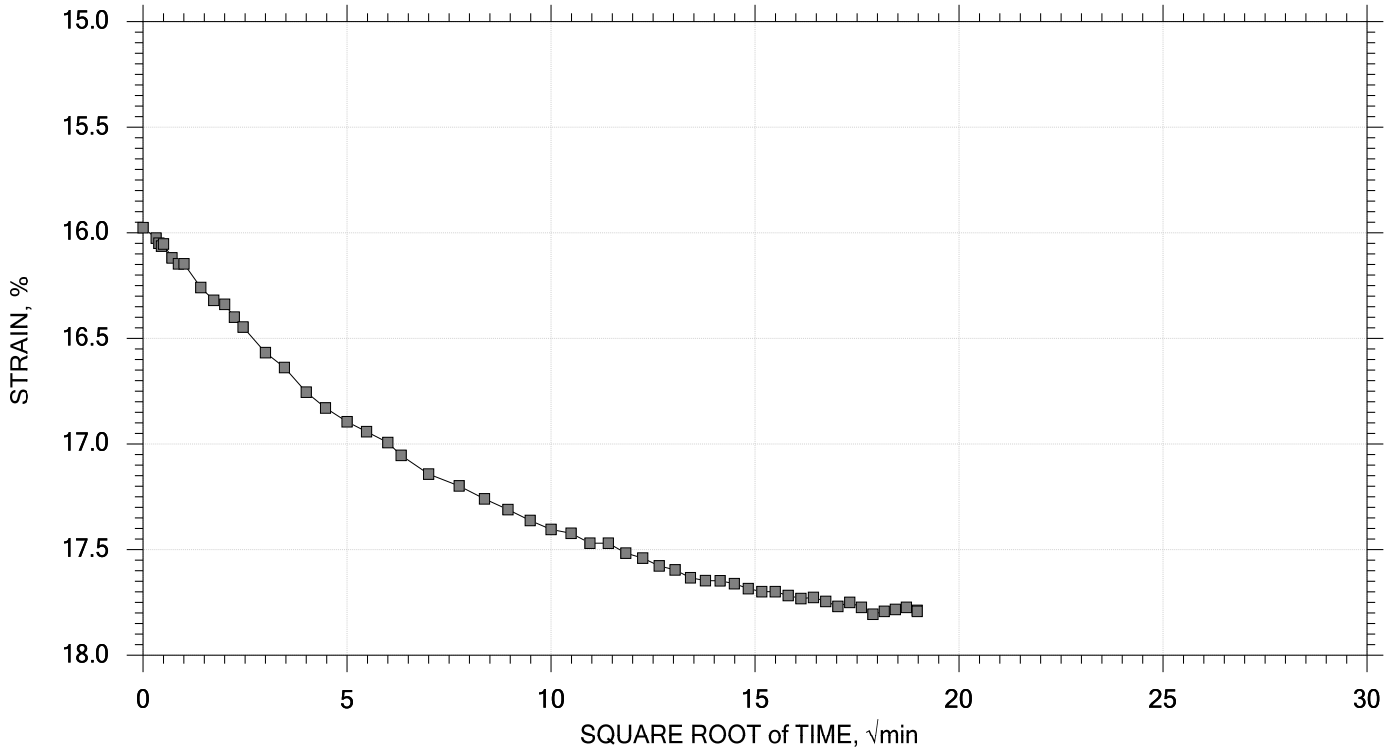
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 7 of 21

Stress: 5000 psf





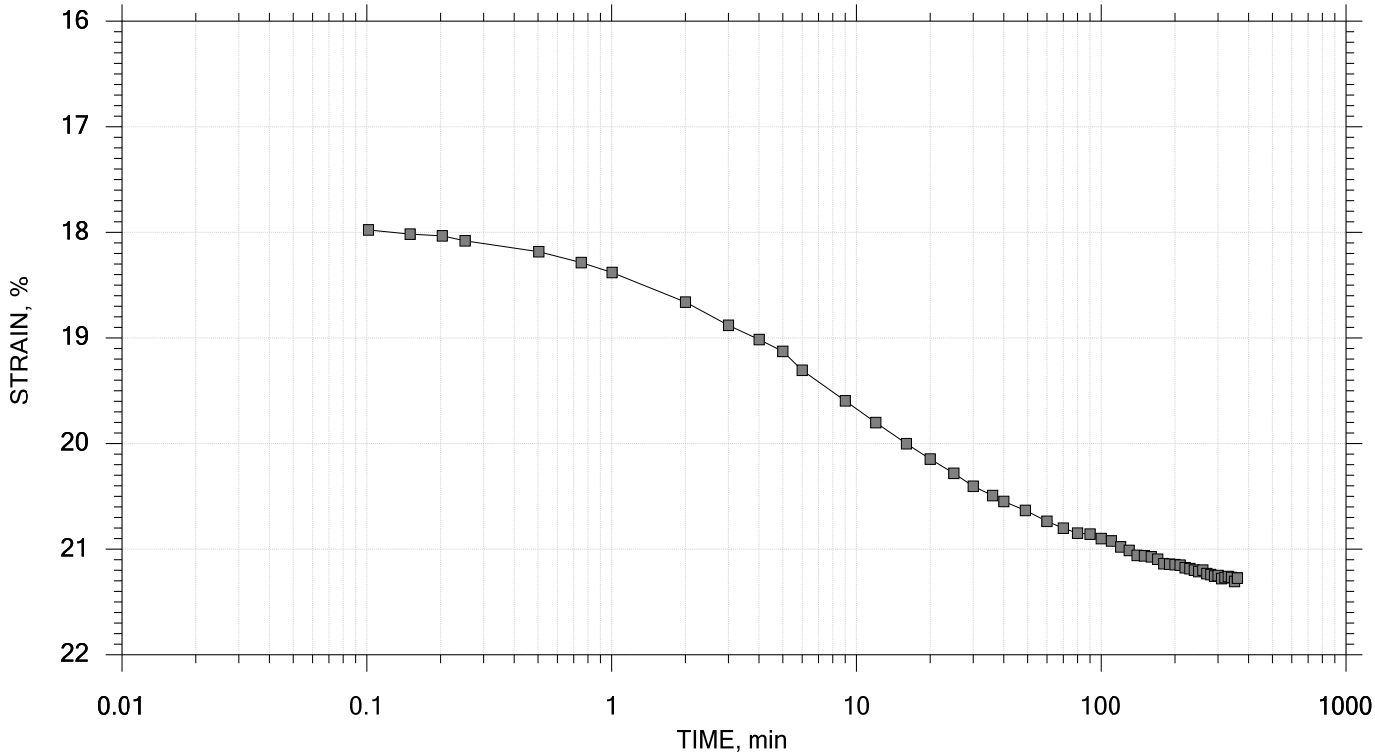
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

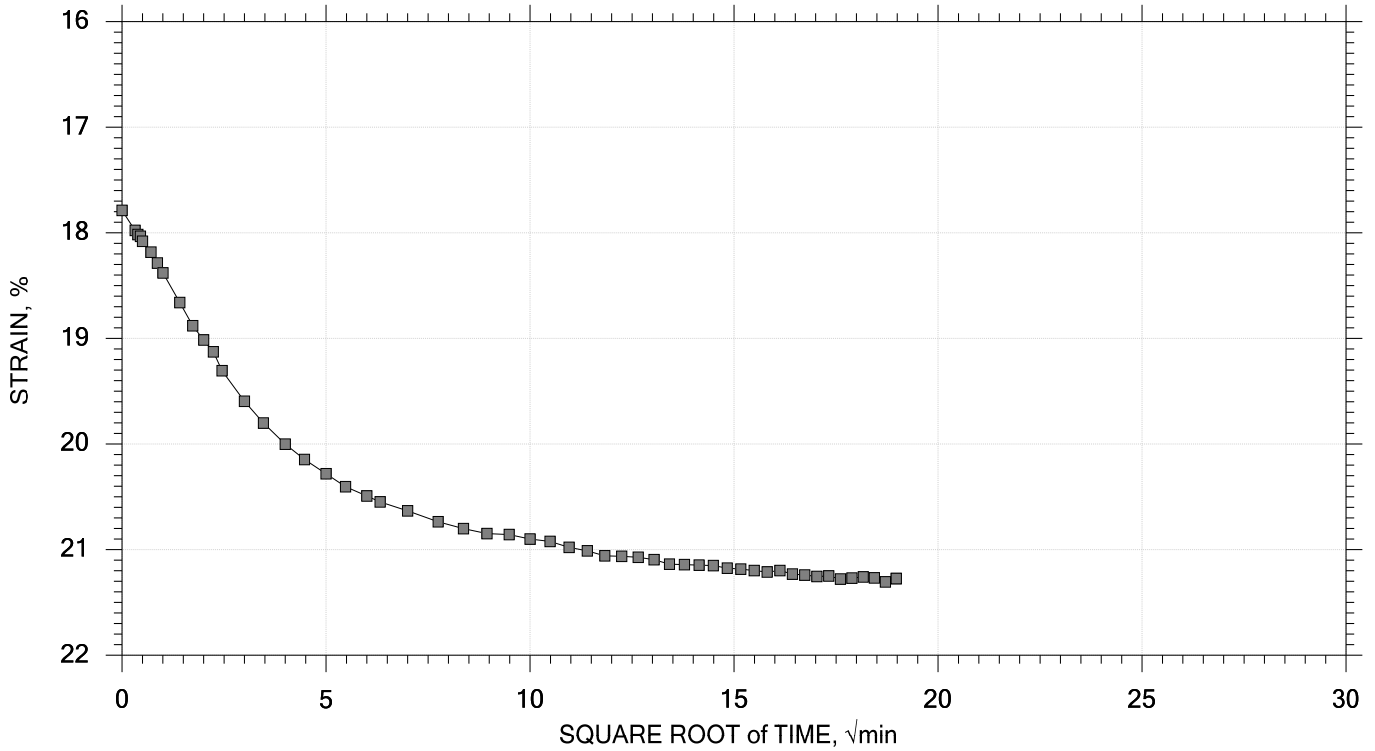
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 8 of 21

Stress: 8000 psf





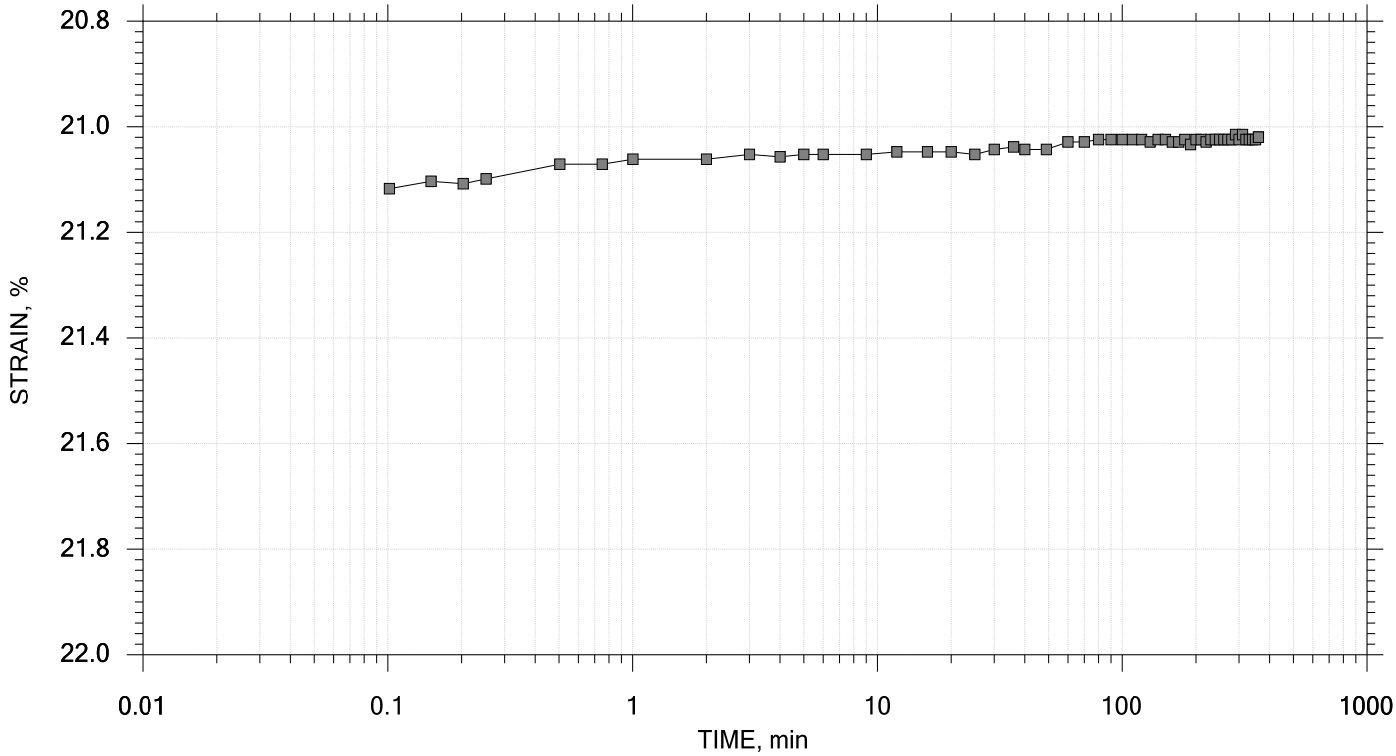
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

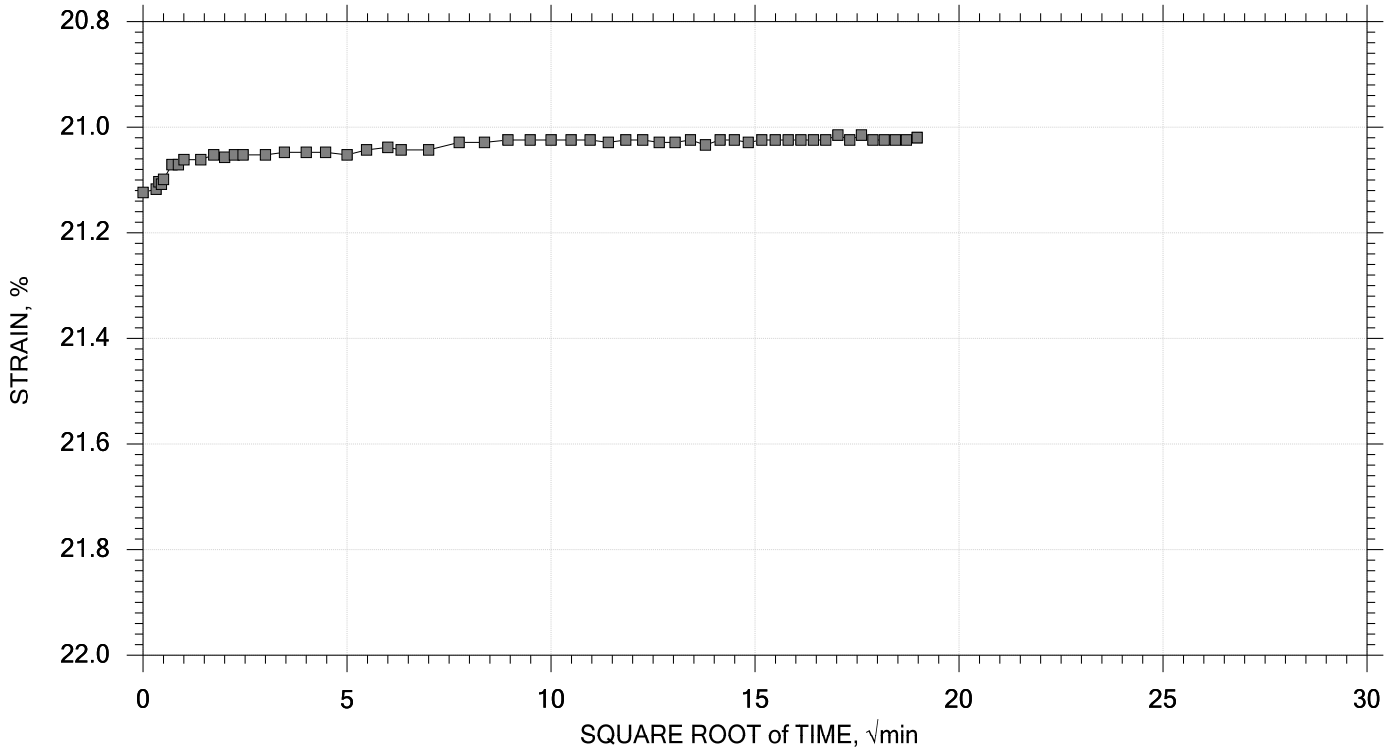
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 9 of 21

Stress: 5000 psf





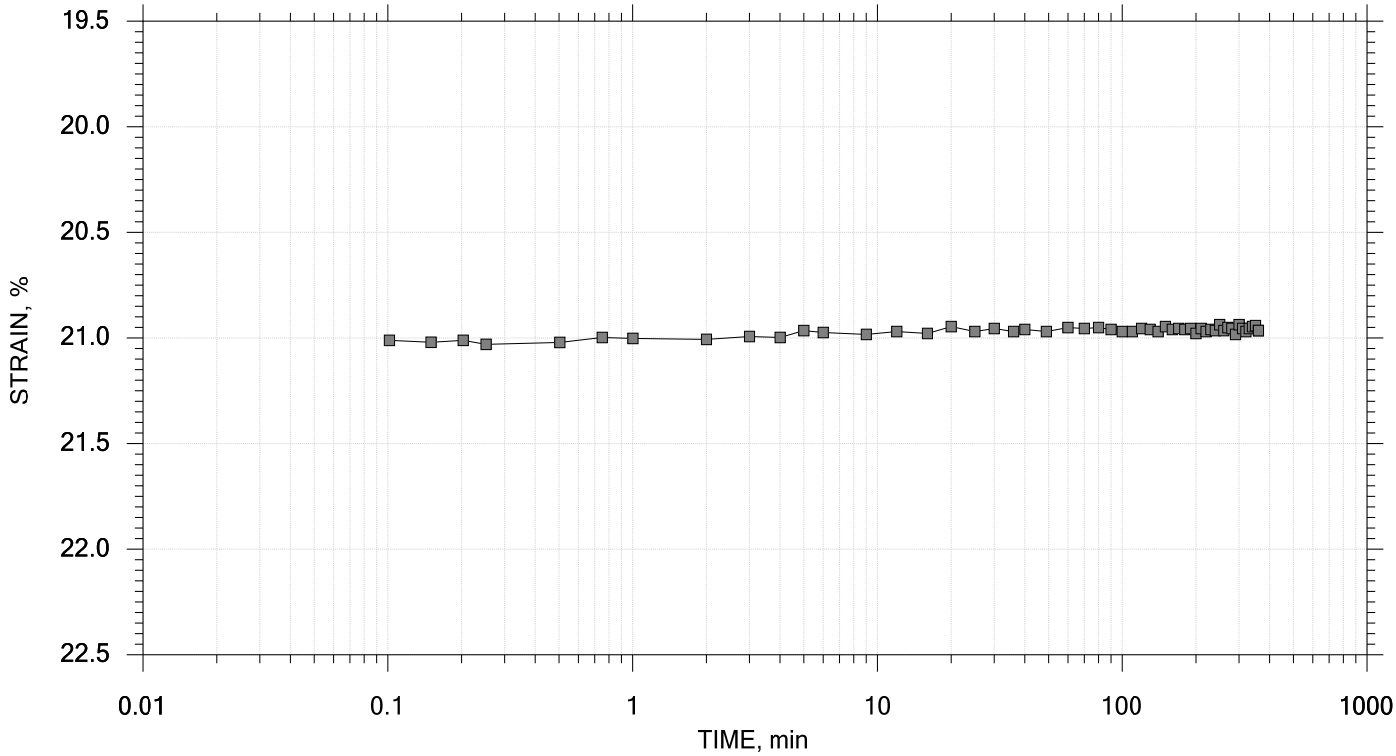
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

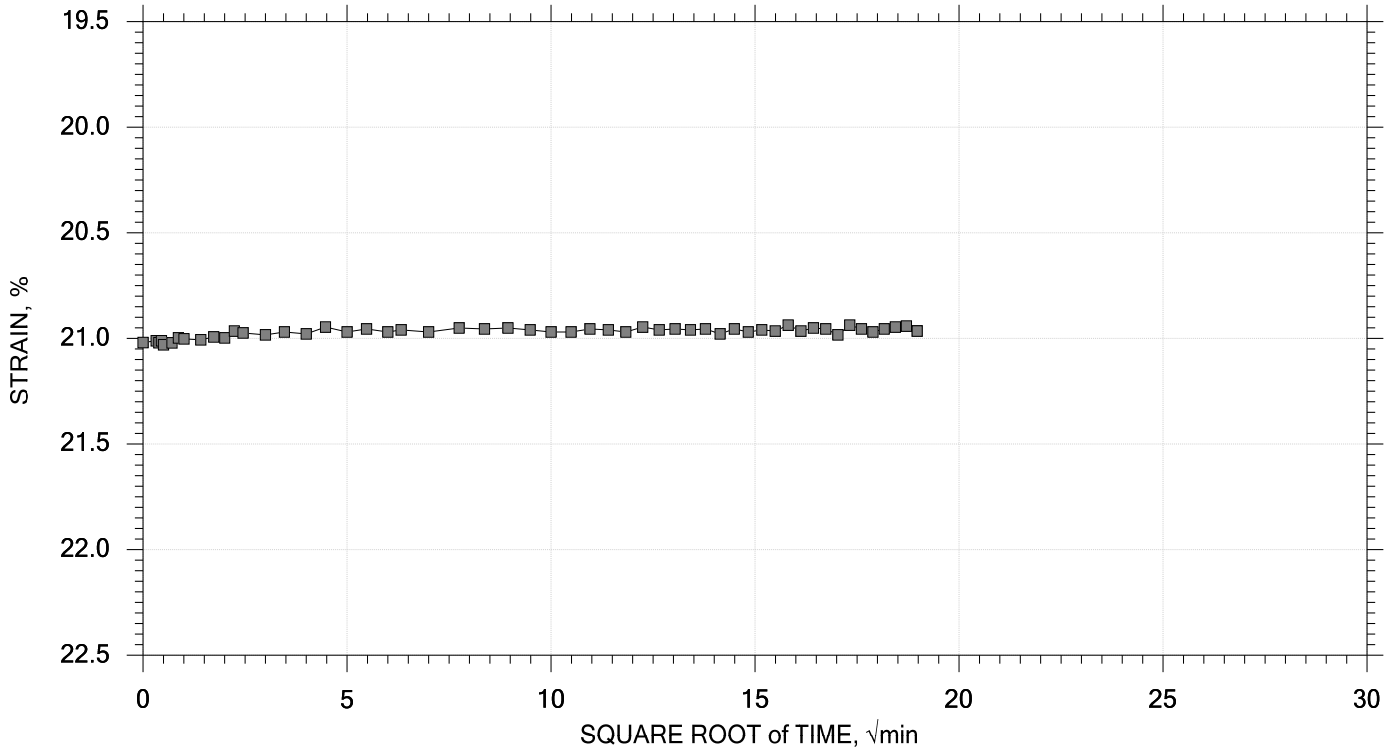
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 10 of 21

Stress: 4000 psf





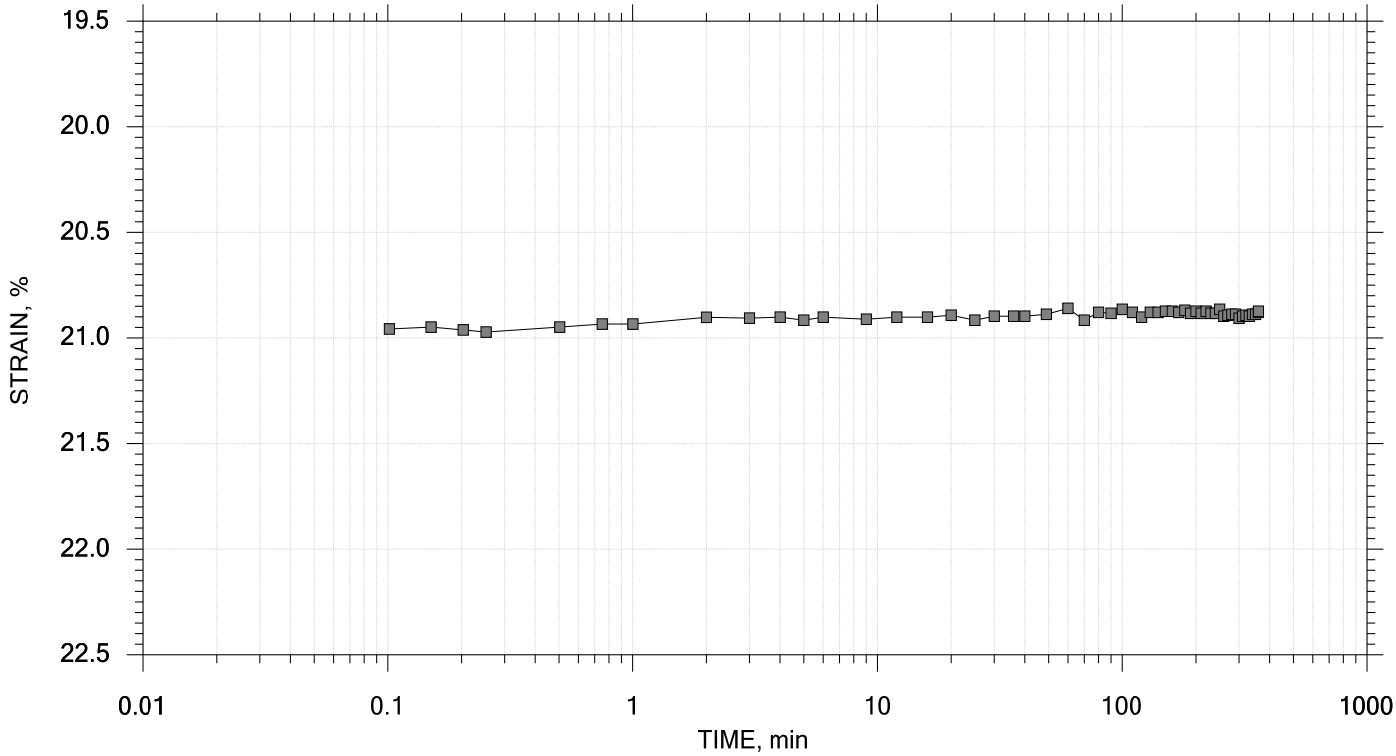
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

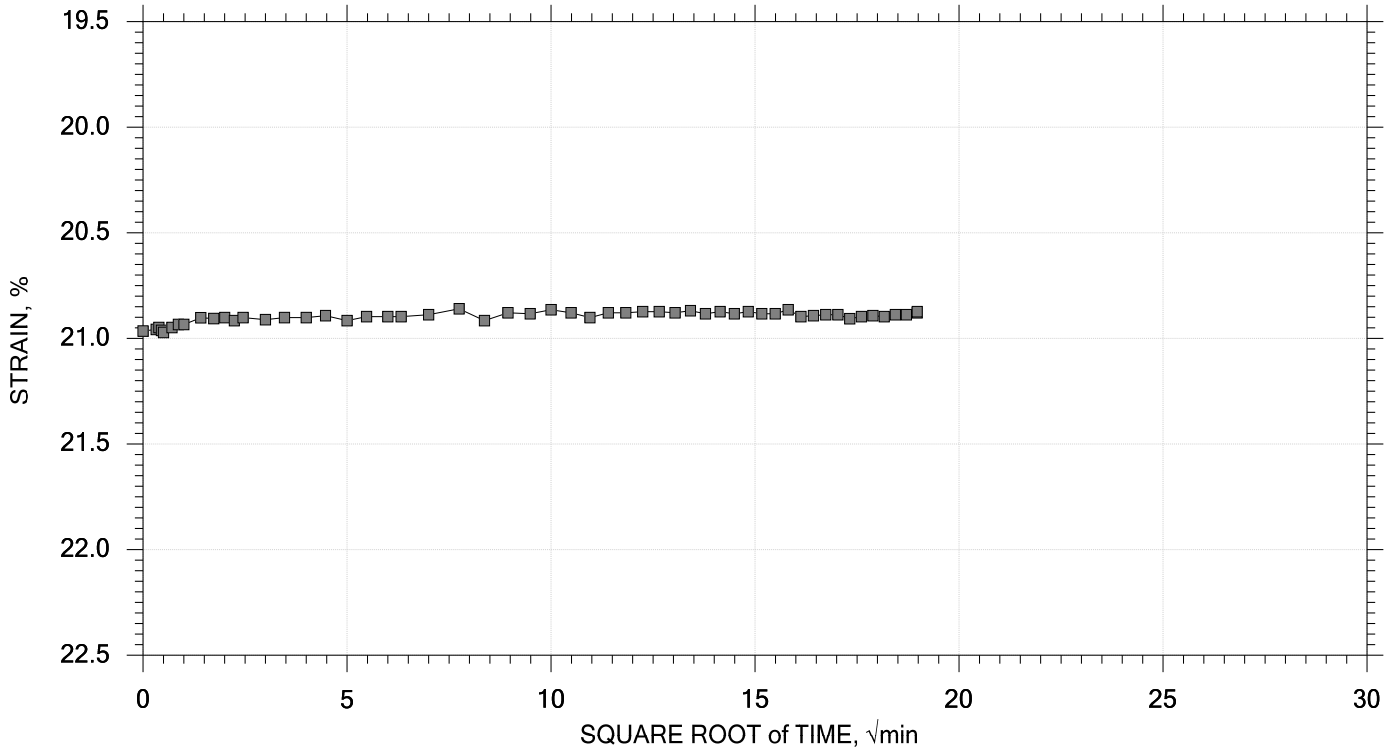
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 11 of 21

Stress: 3000 psf





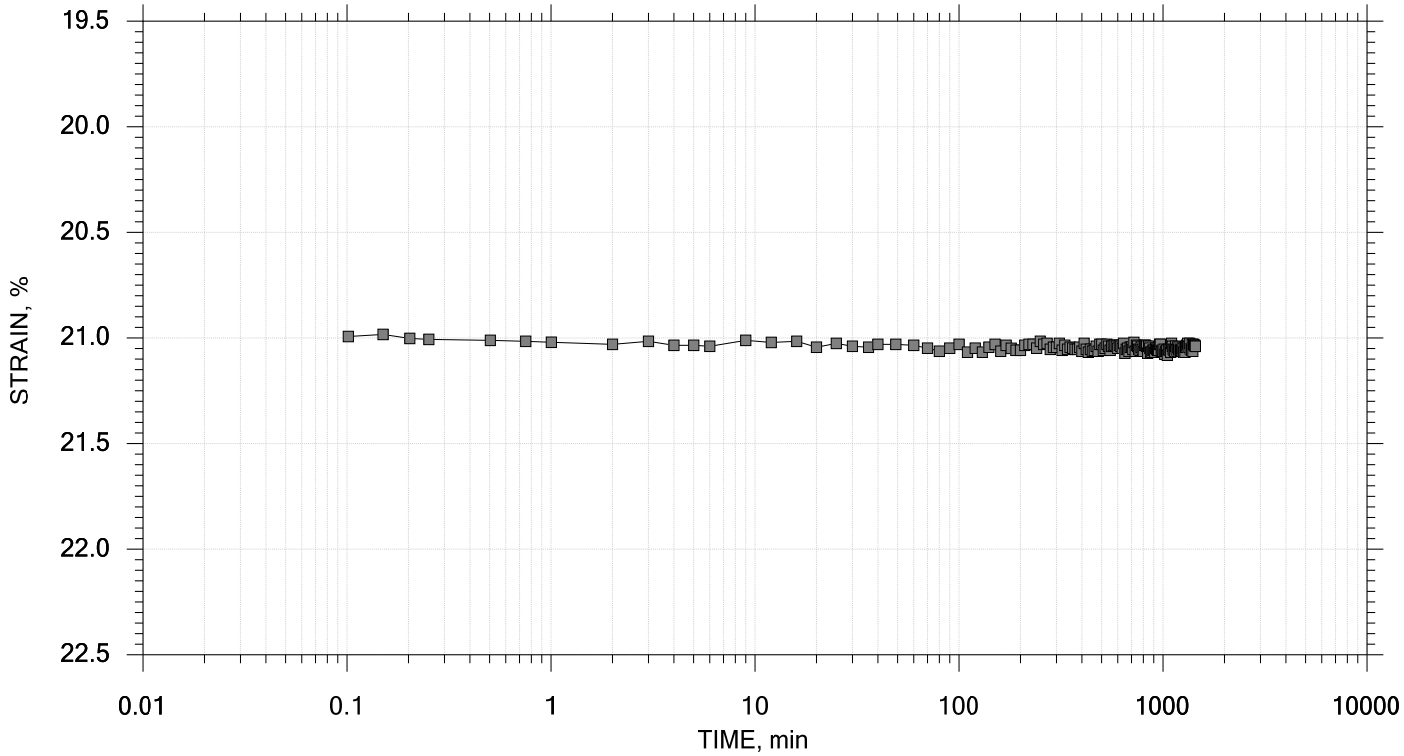
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

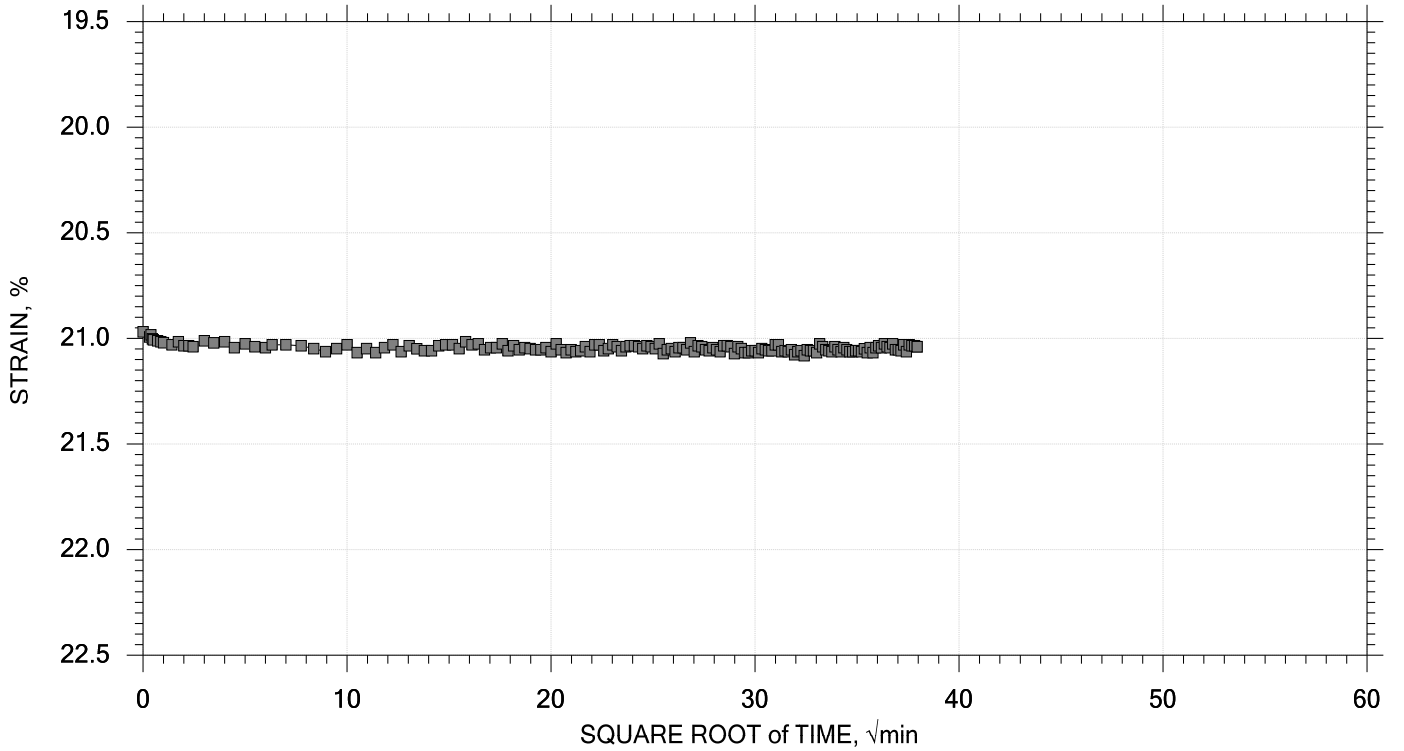
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 12 of 21

Stress: 4000 psf





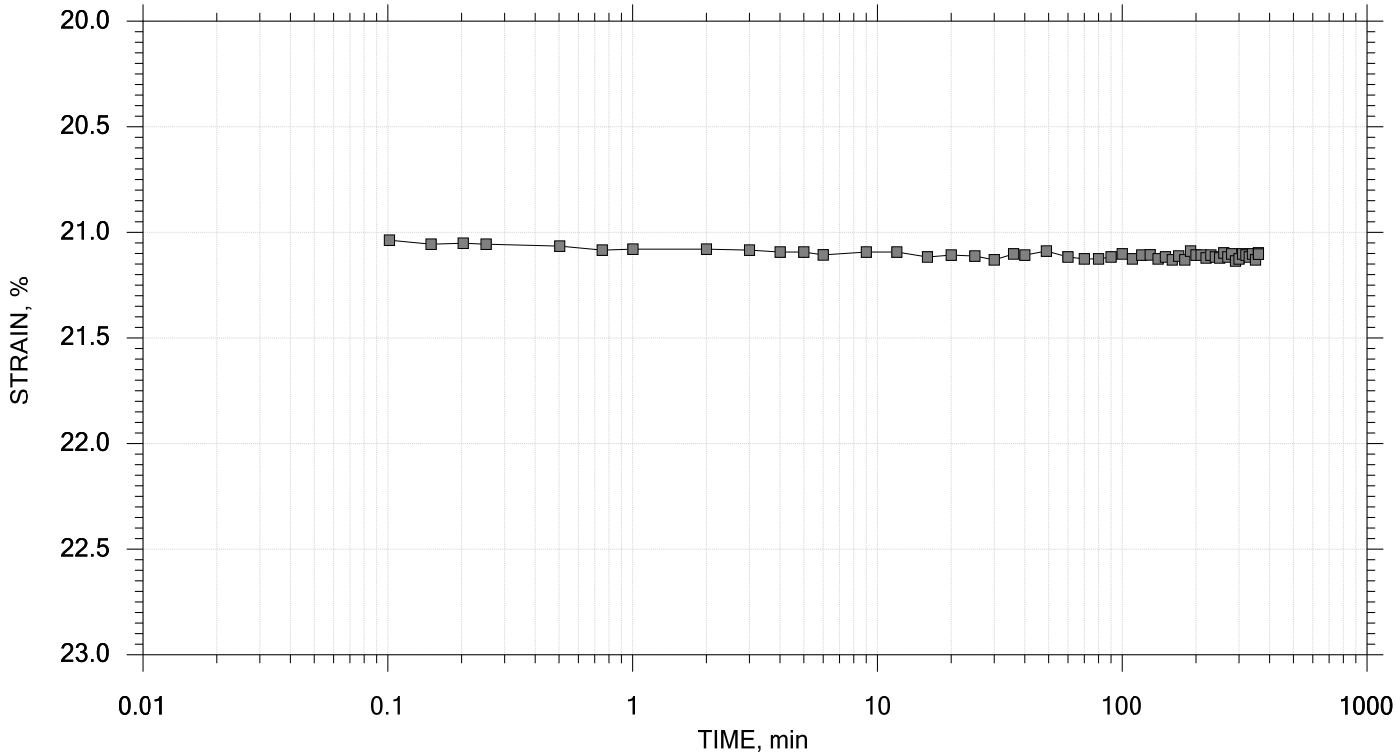
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

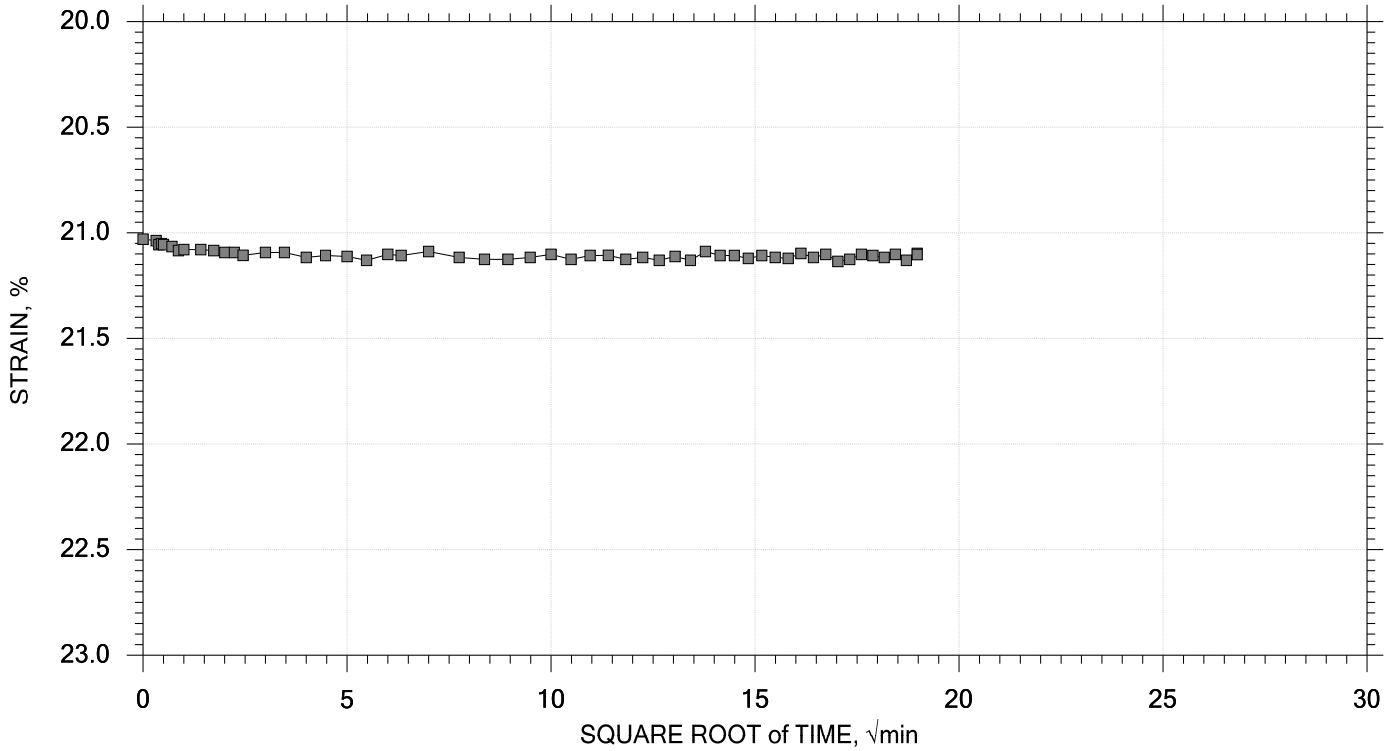
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 13 of 21

Stress: 5000 psf





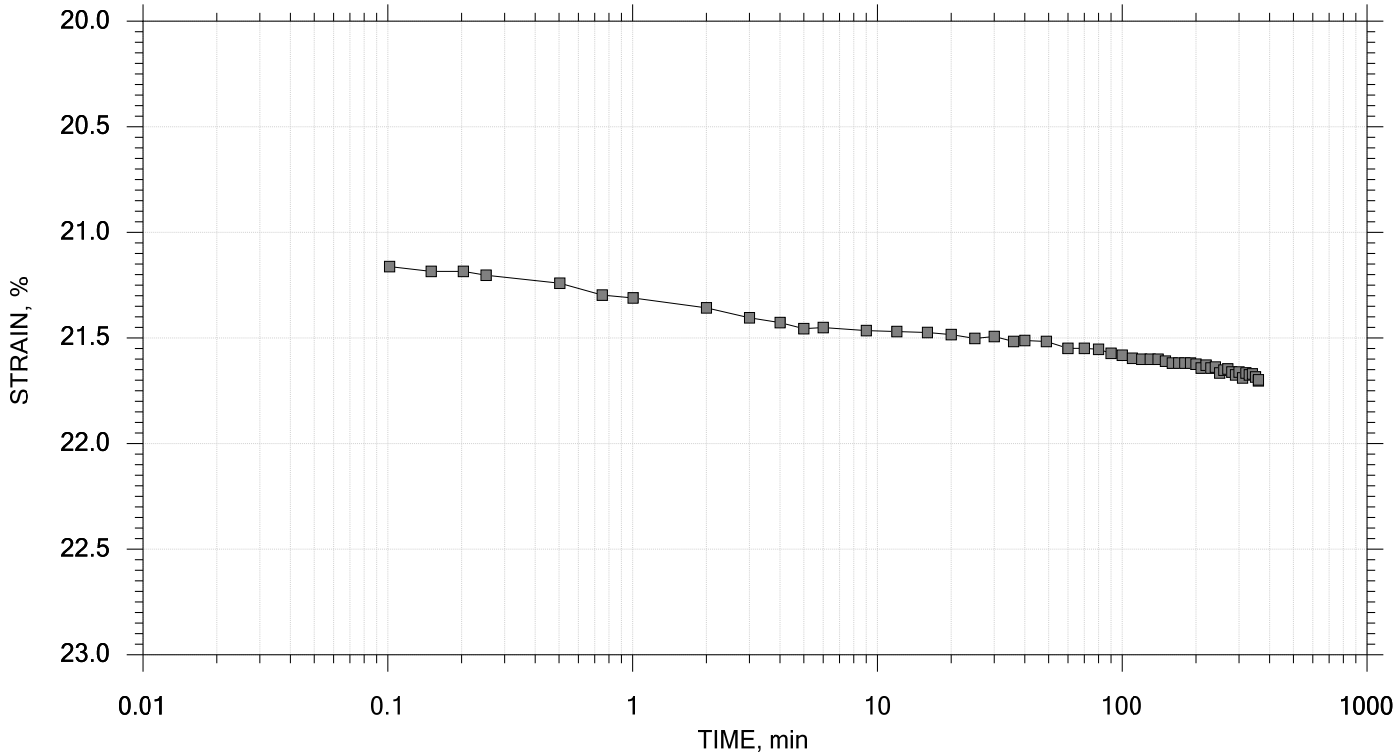
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

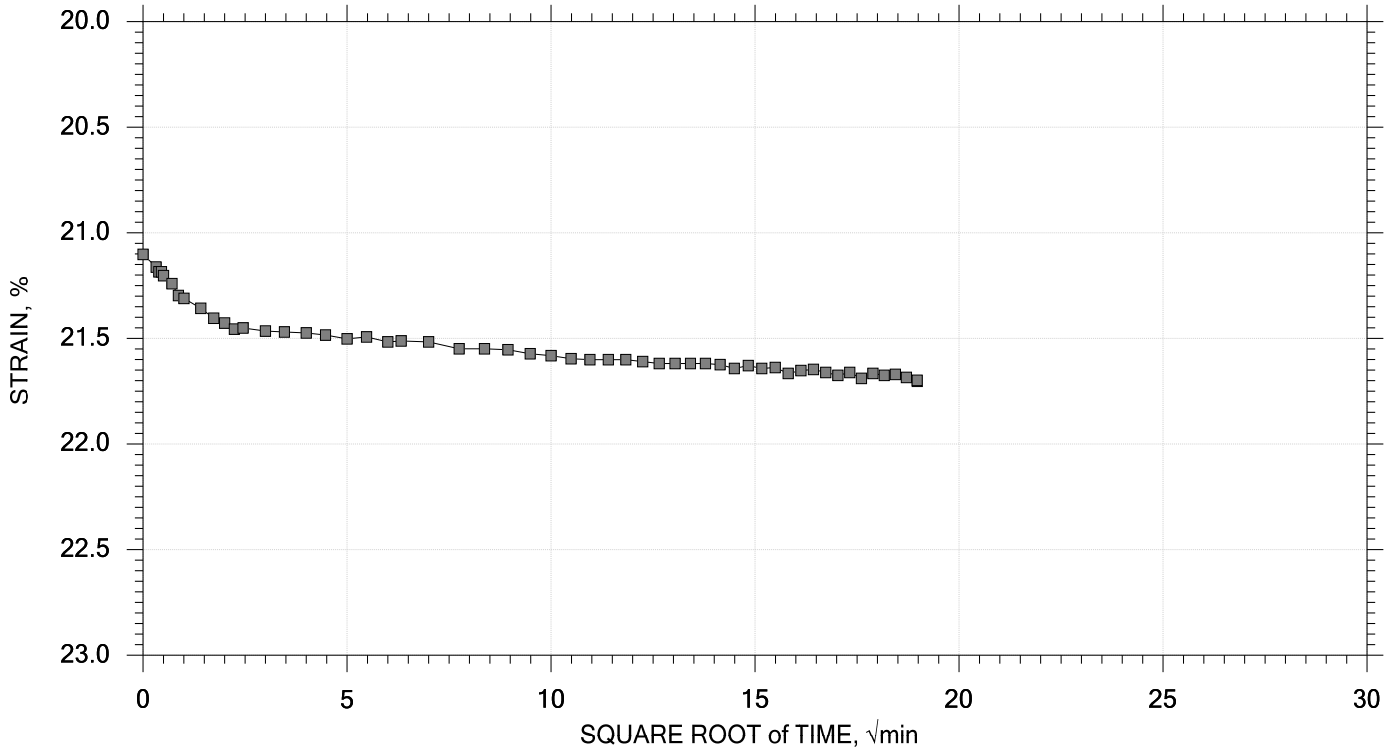
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 14 of 21

Stress: 8000 psf





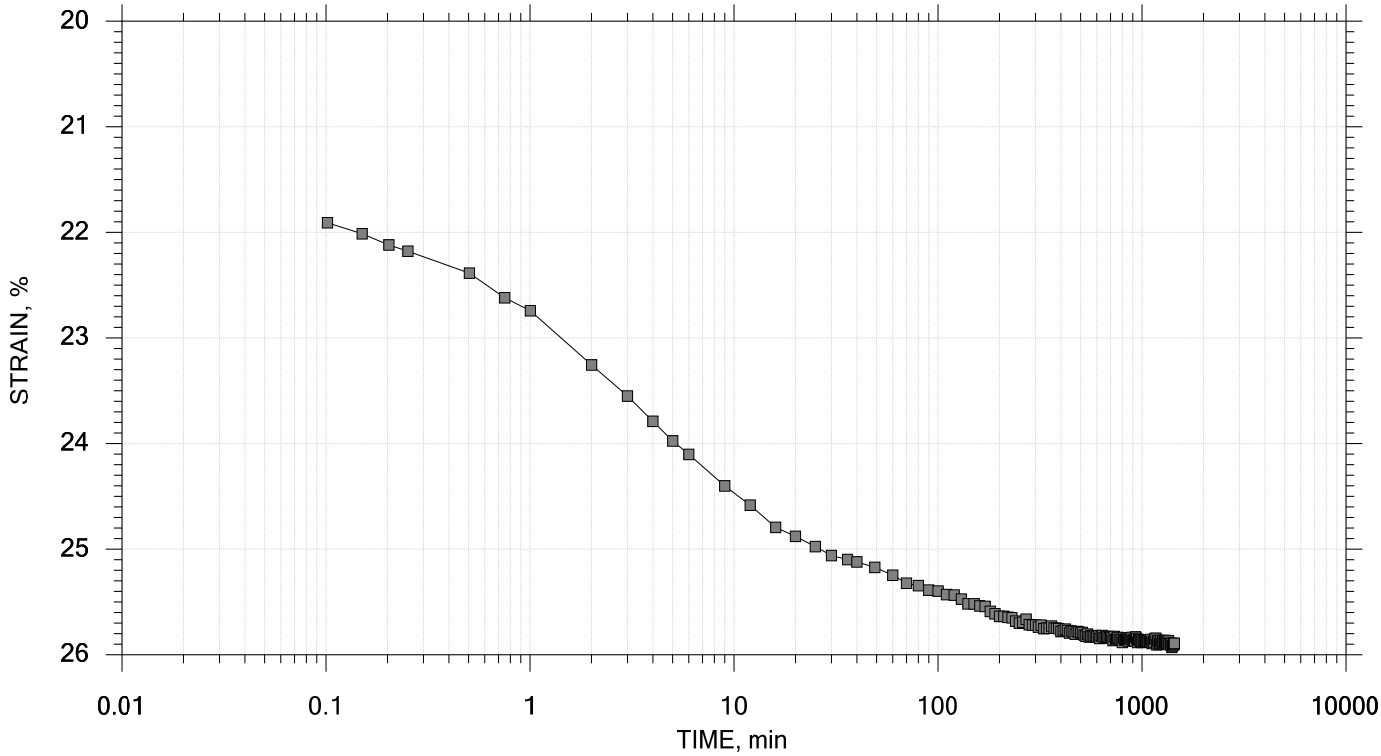
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

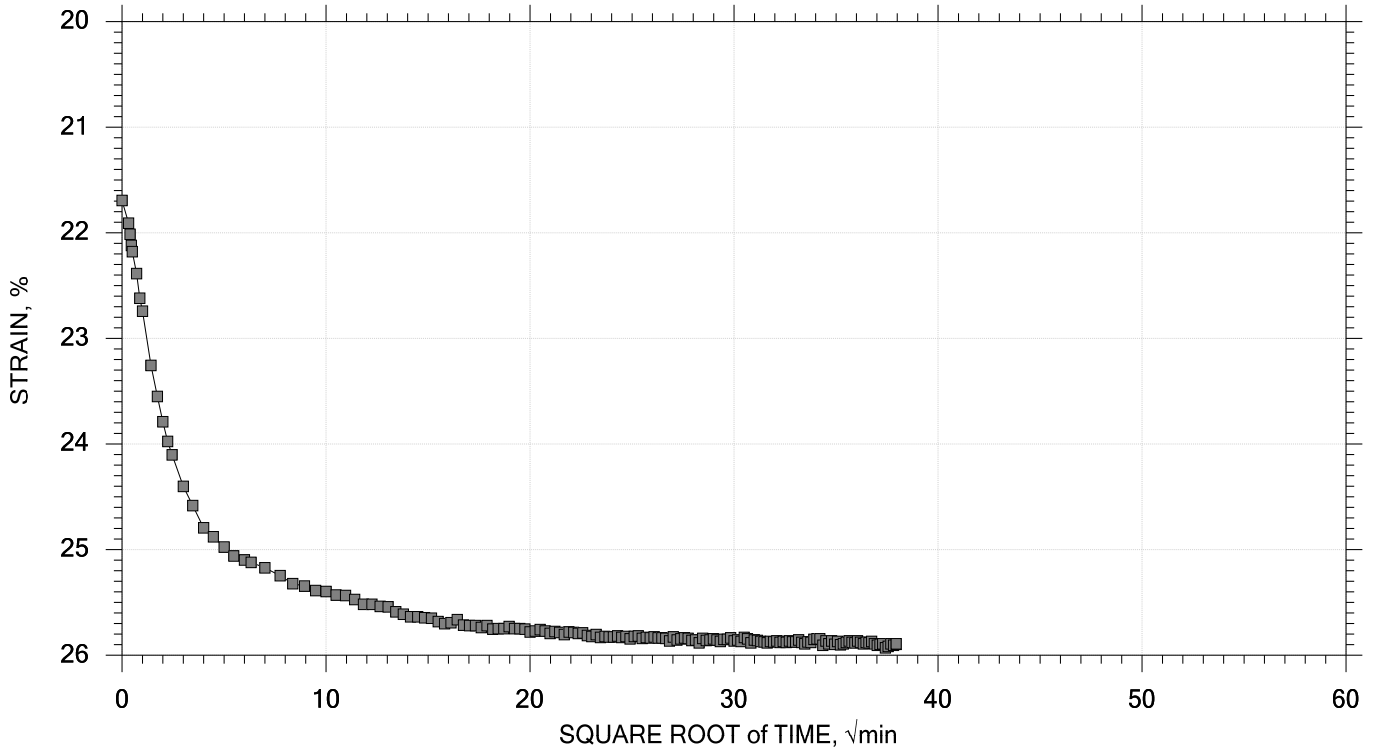
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 15 of 21

Stress: 16000 psf





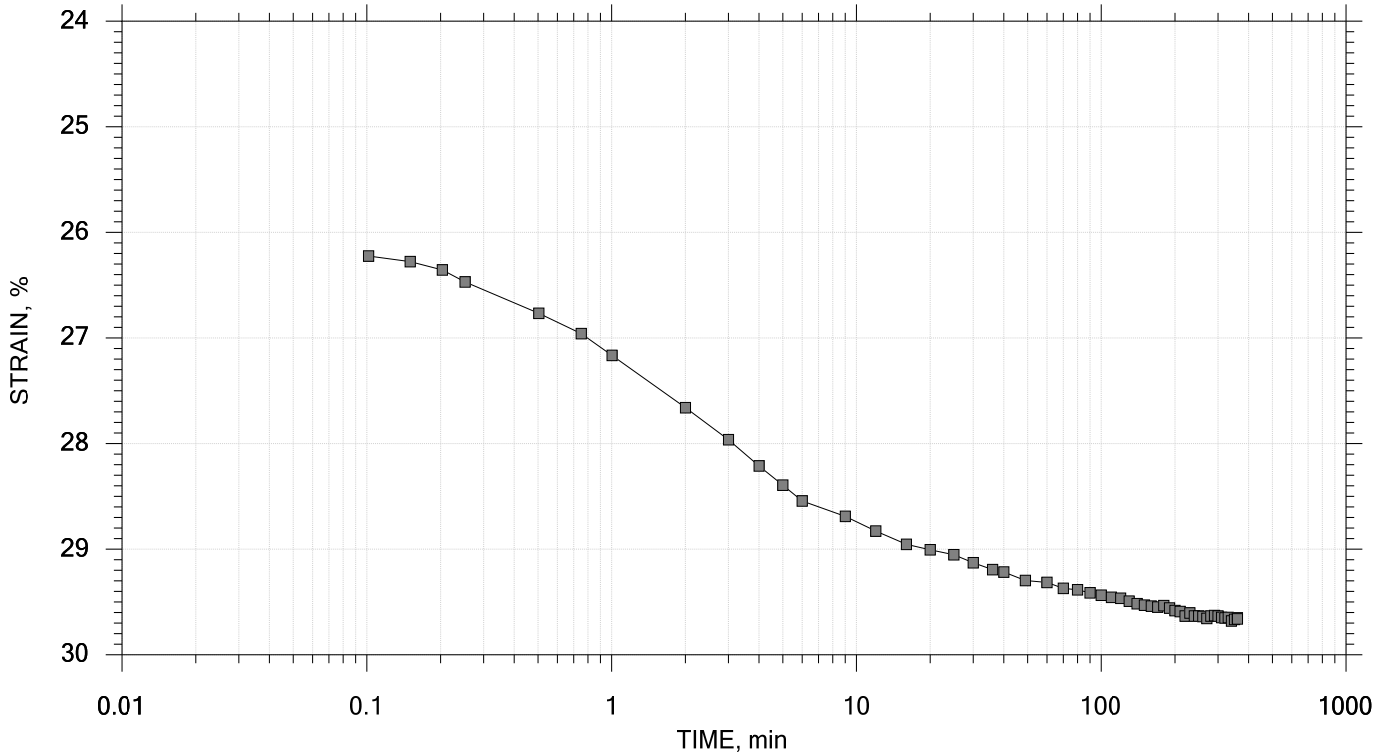
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

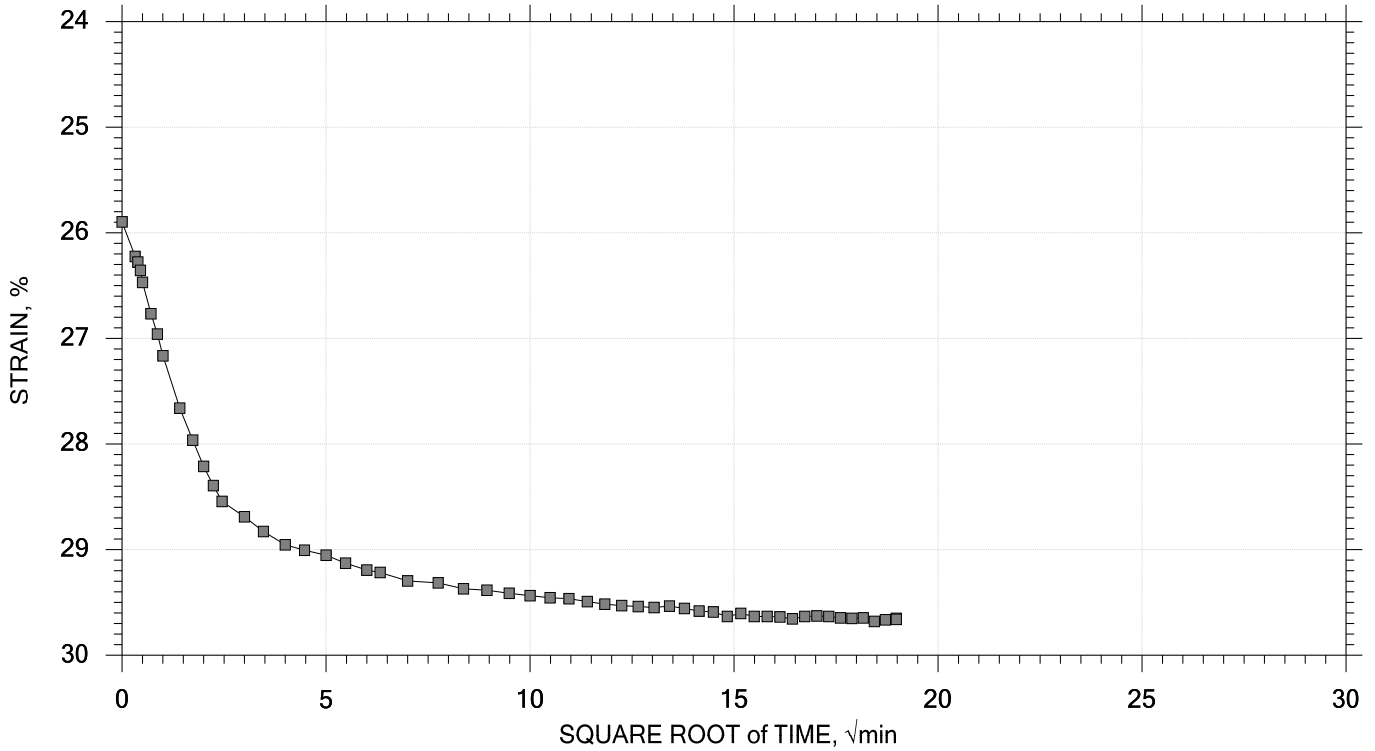
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 16 of 21

Stress: 32000 psf





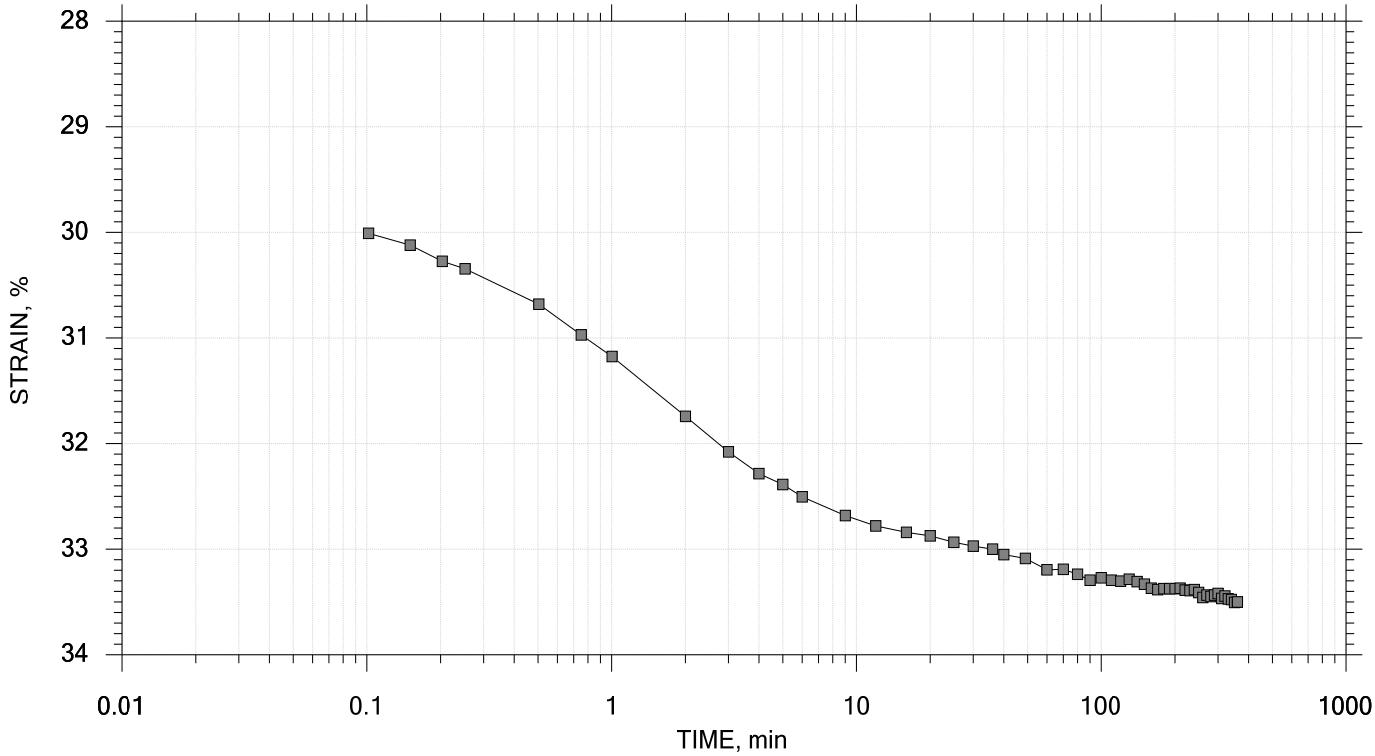
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

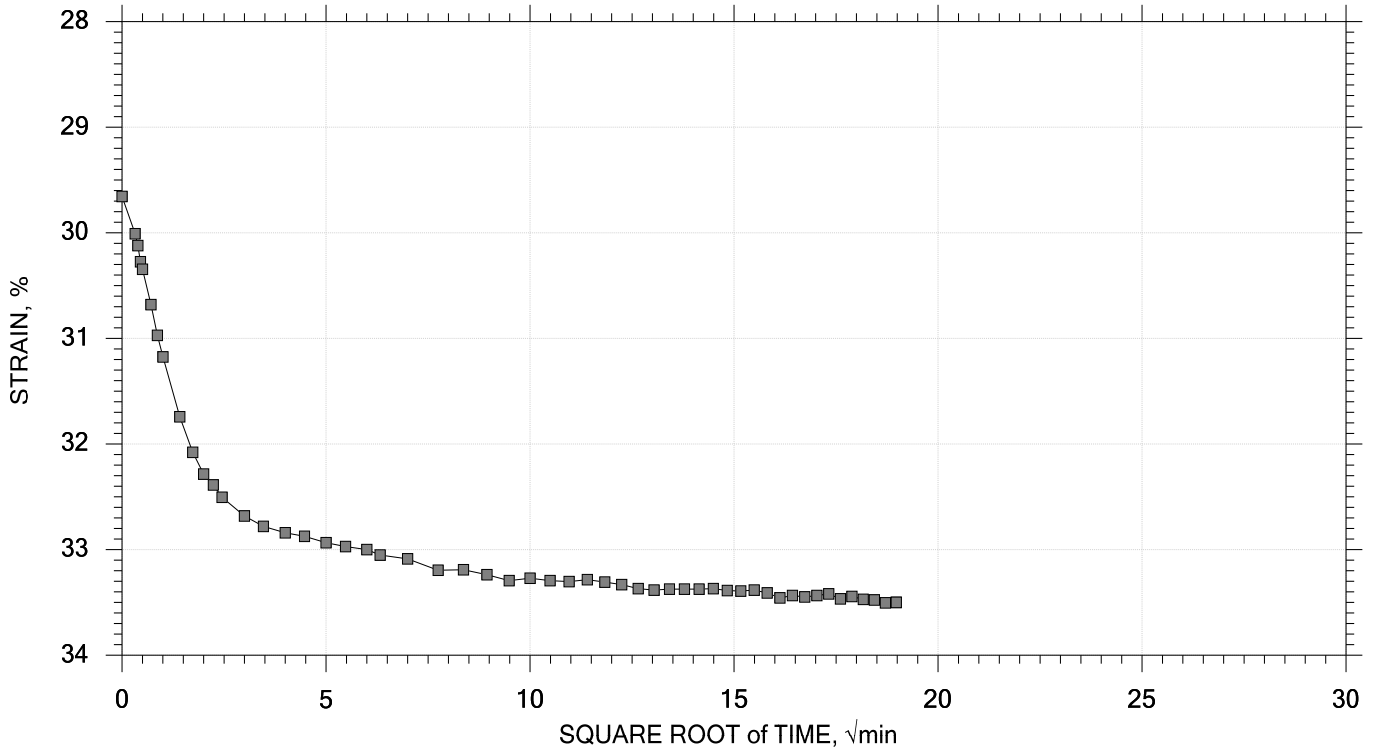
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 17 of 21

Stress: 64000 psf





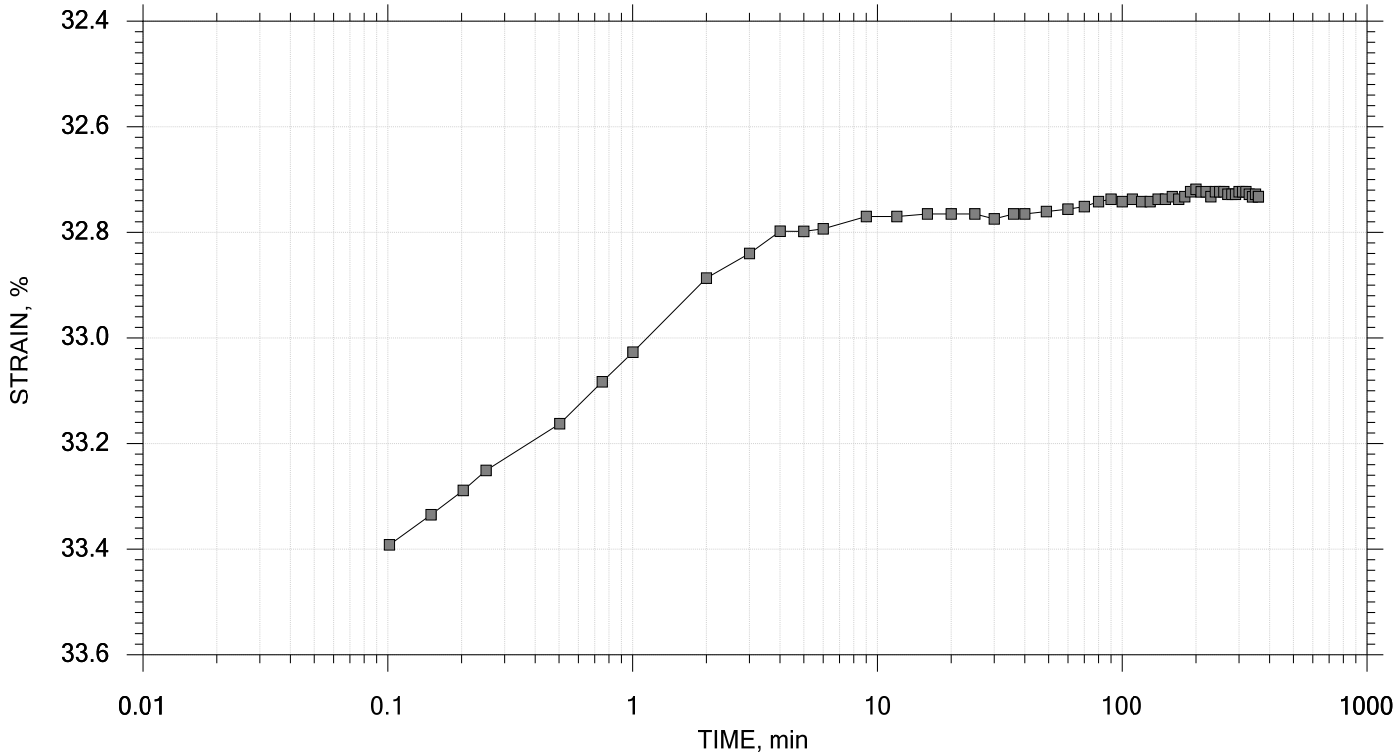
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

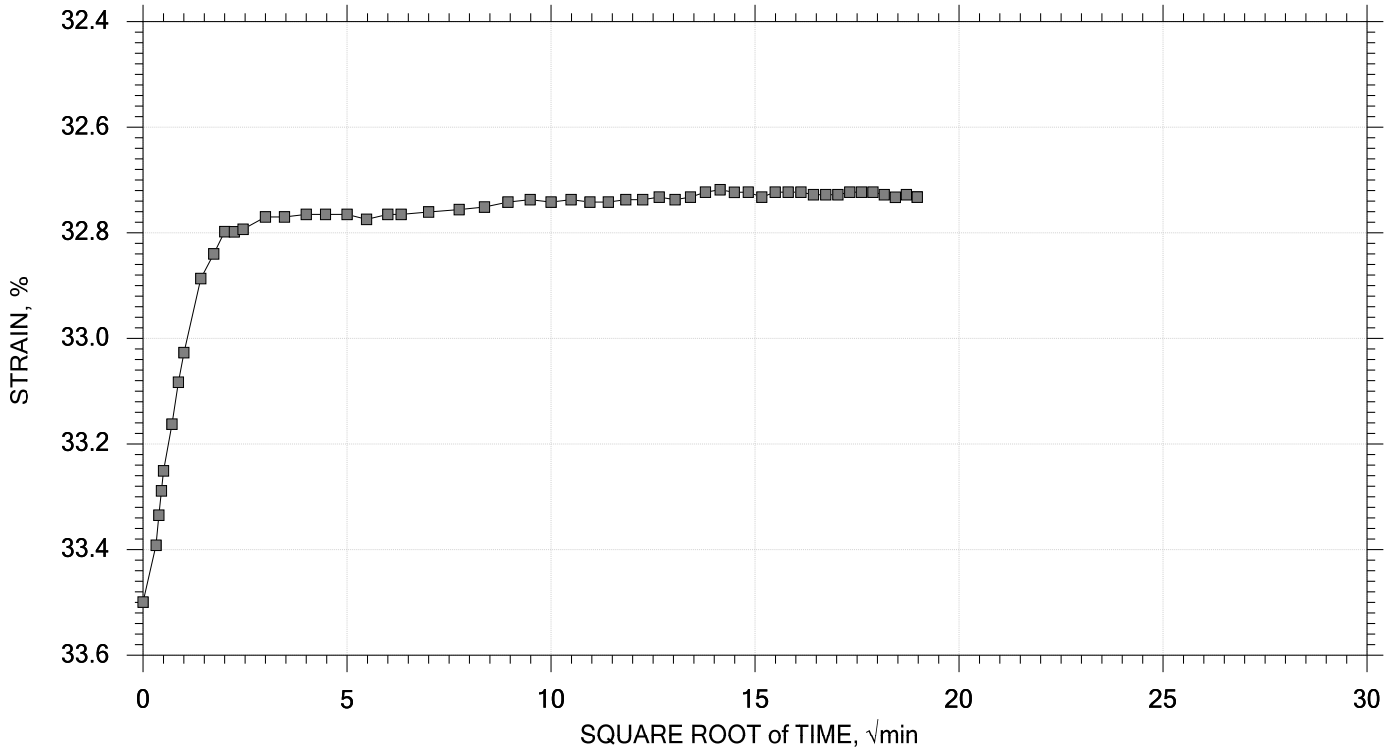
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 18 of 21

Stress: 16000 psf





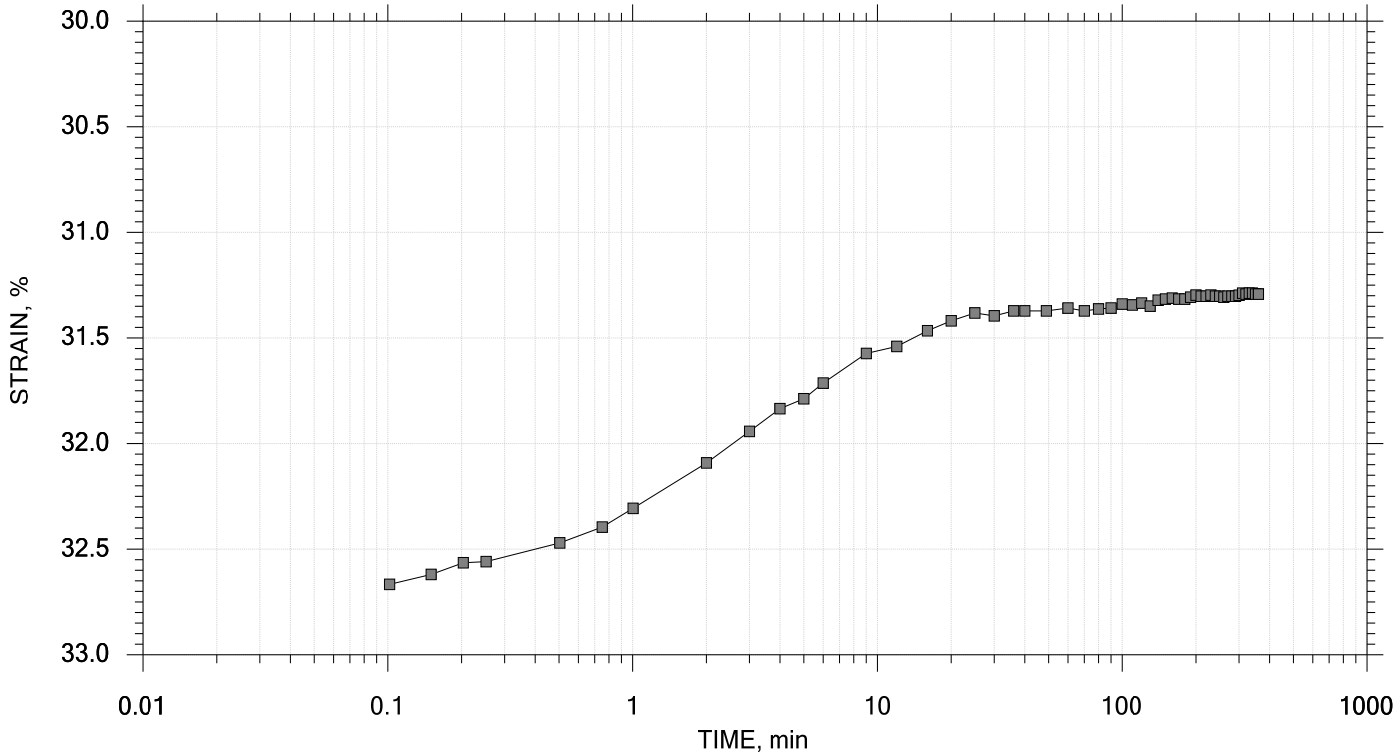
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

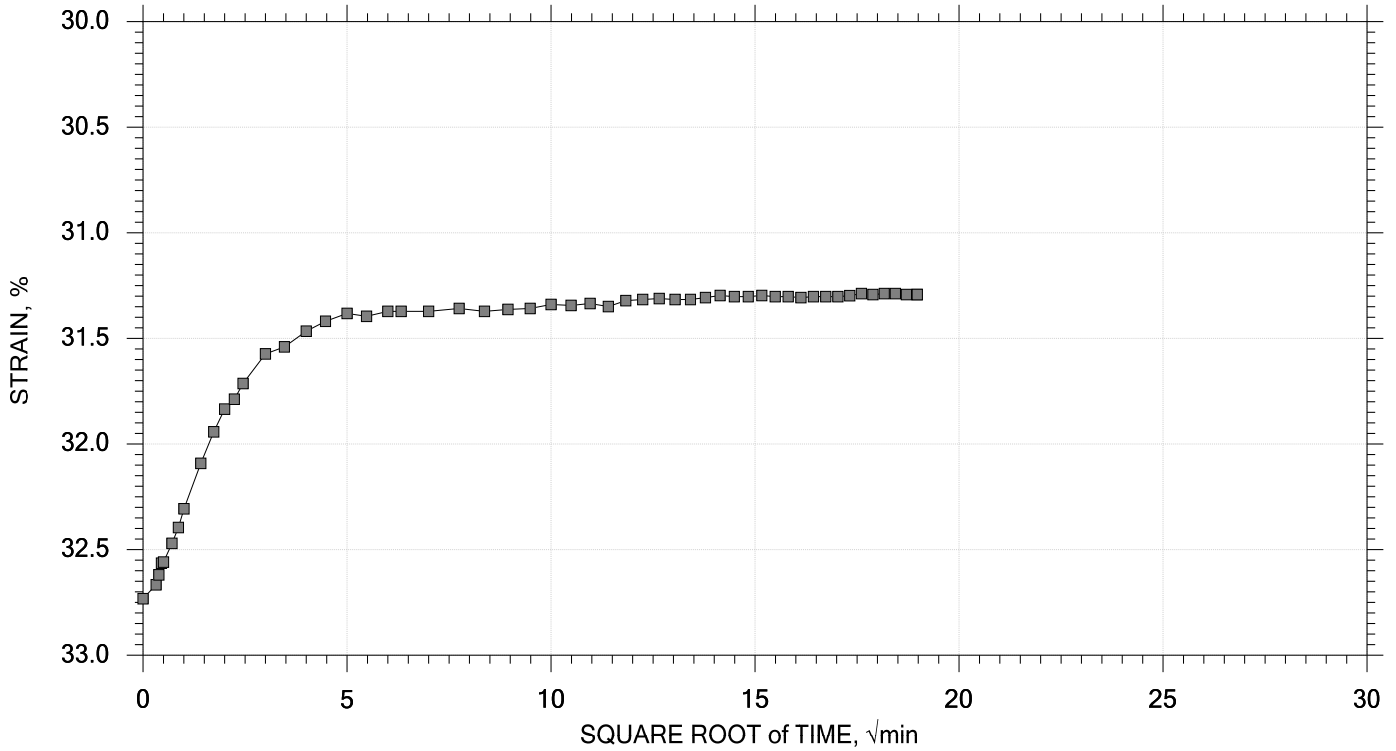
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 19 of 21

Stress: 4000 psf





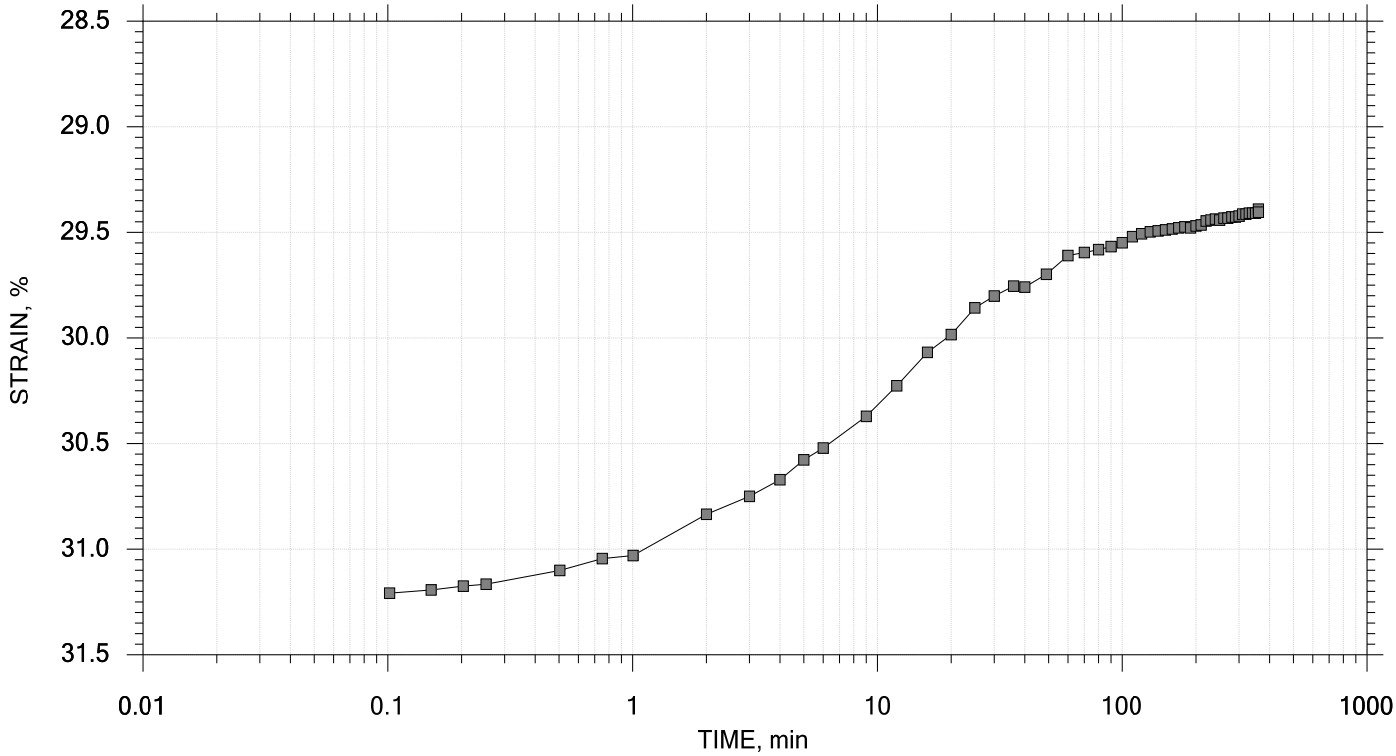
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

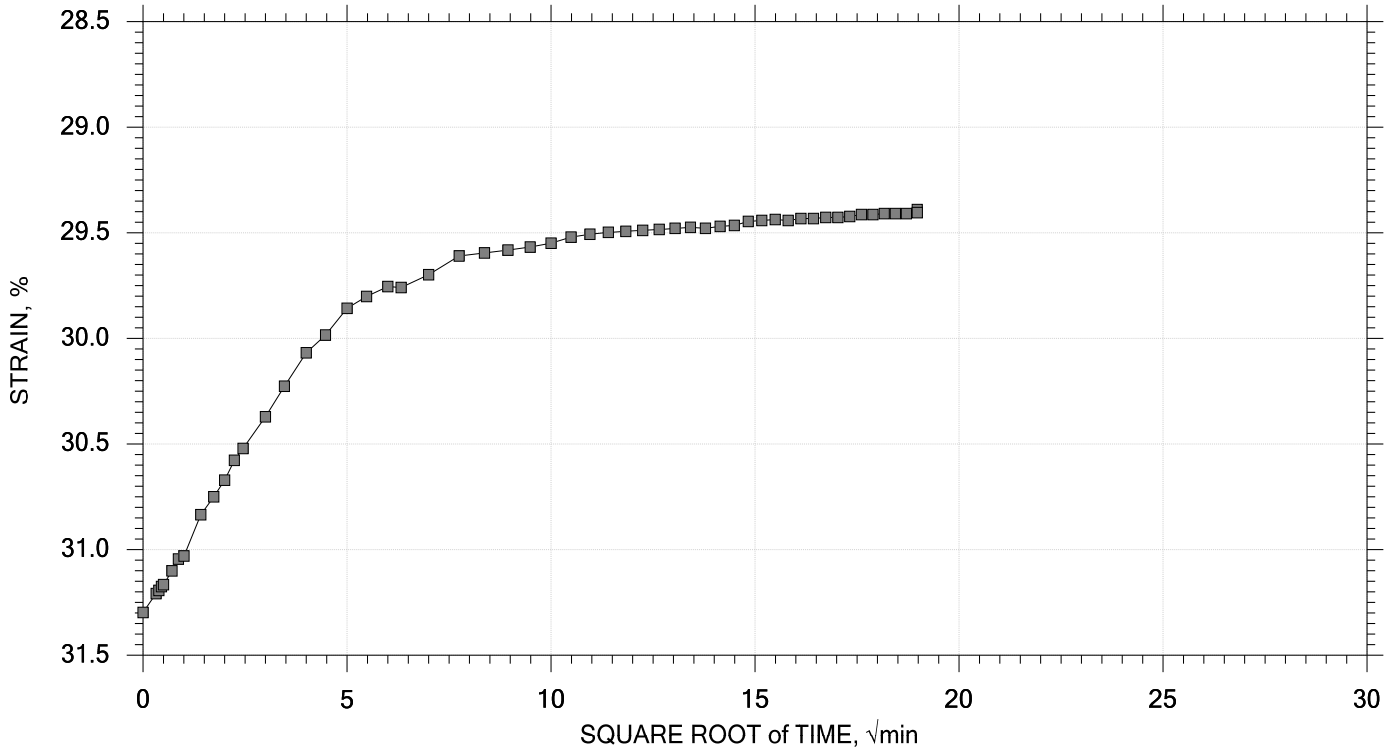
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 20 of 21

Stress: 1000 psf





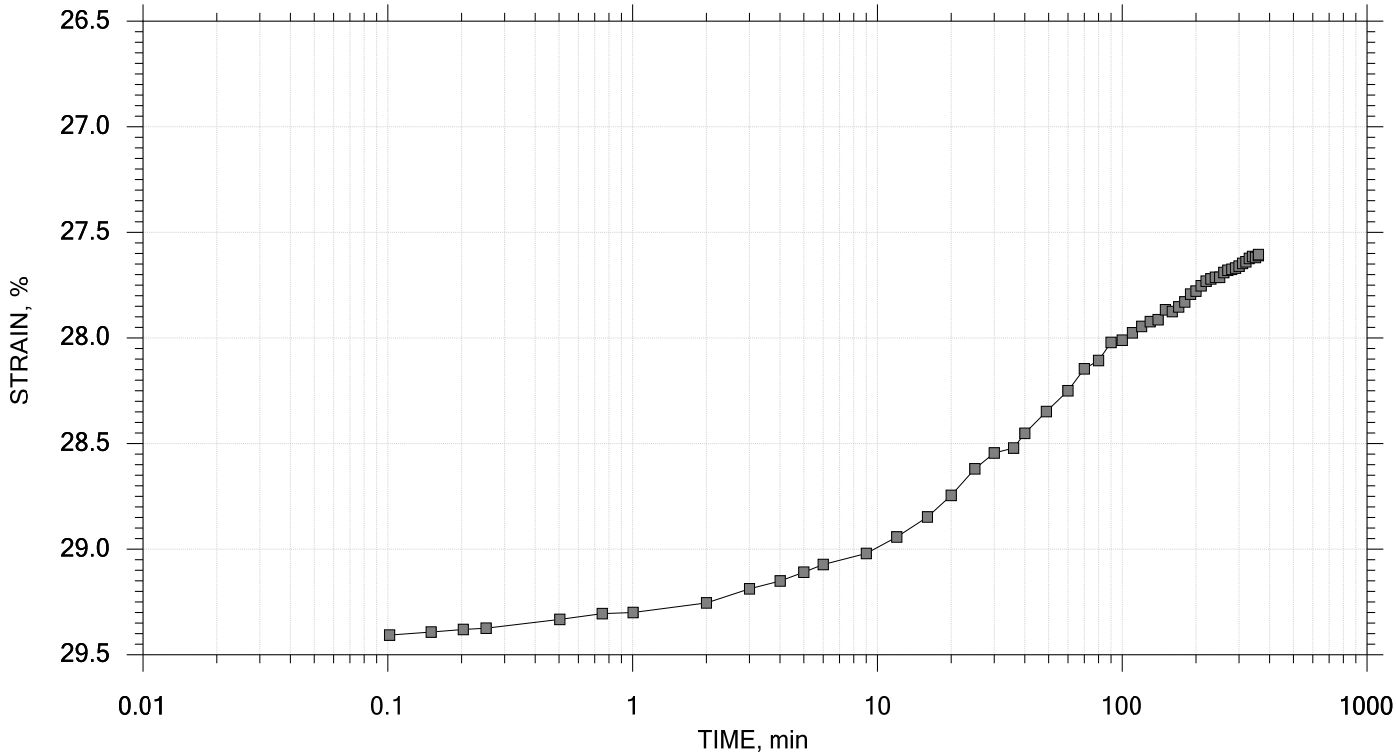
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

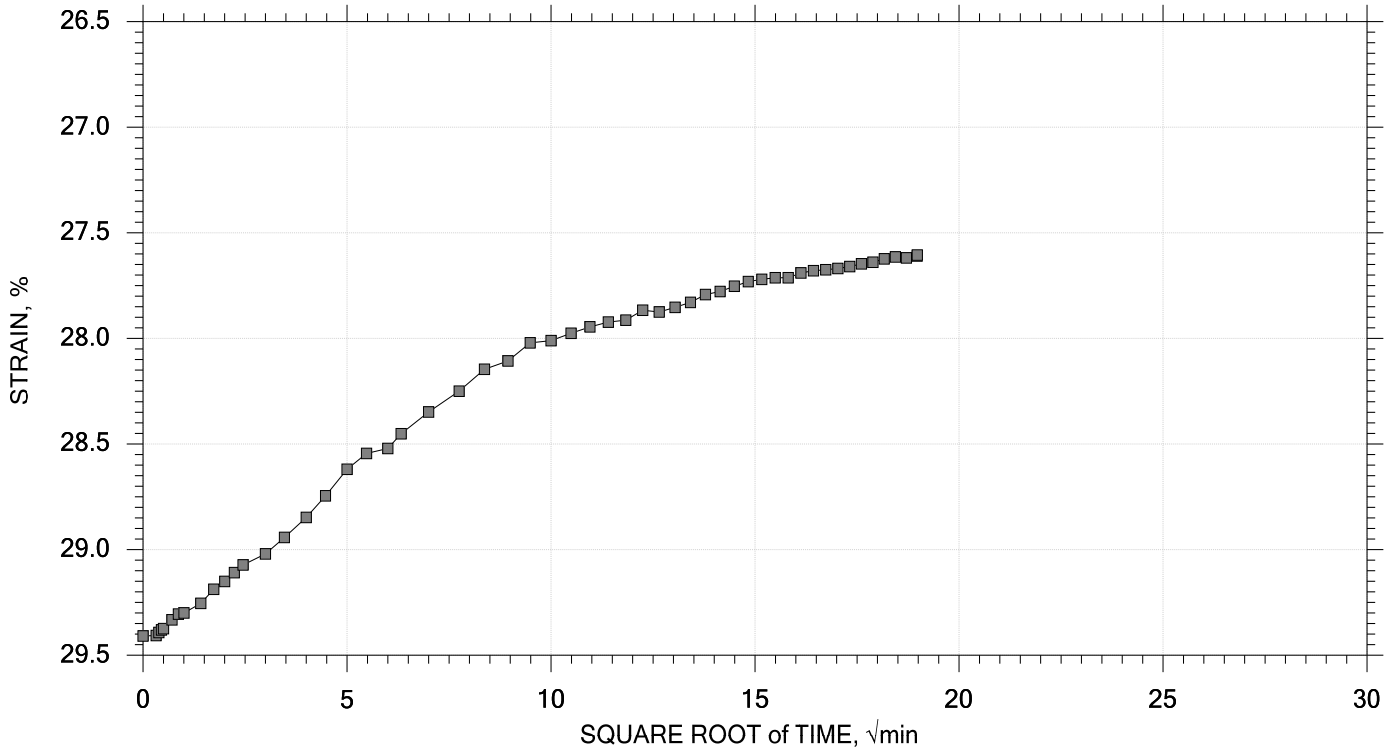
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 21 of 21

Stress: 250 psf

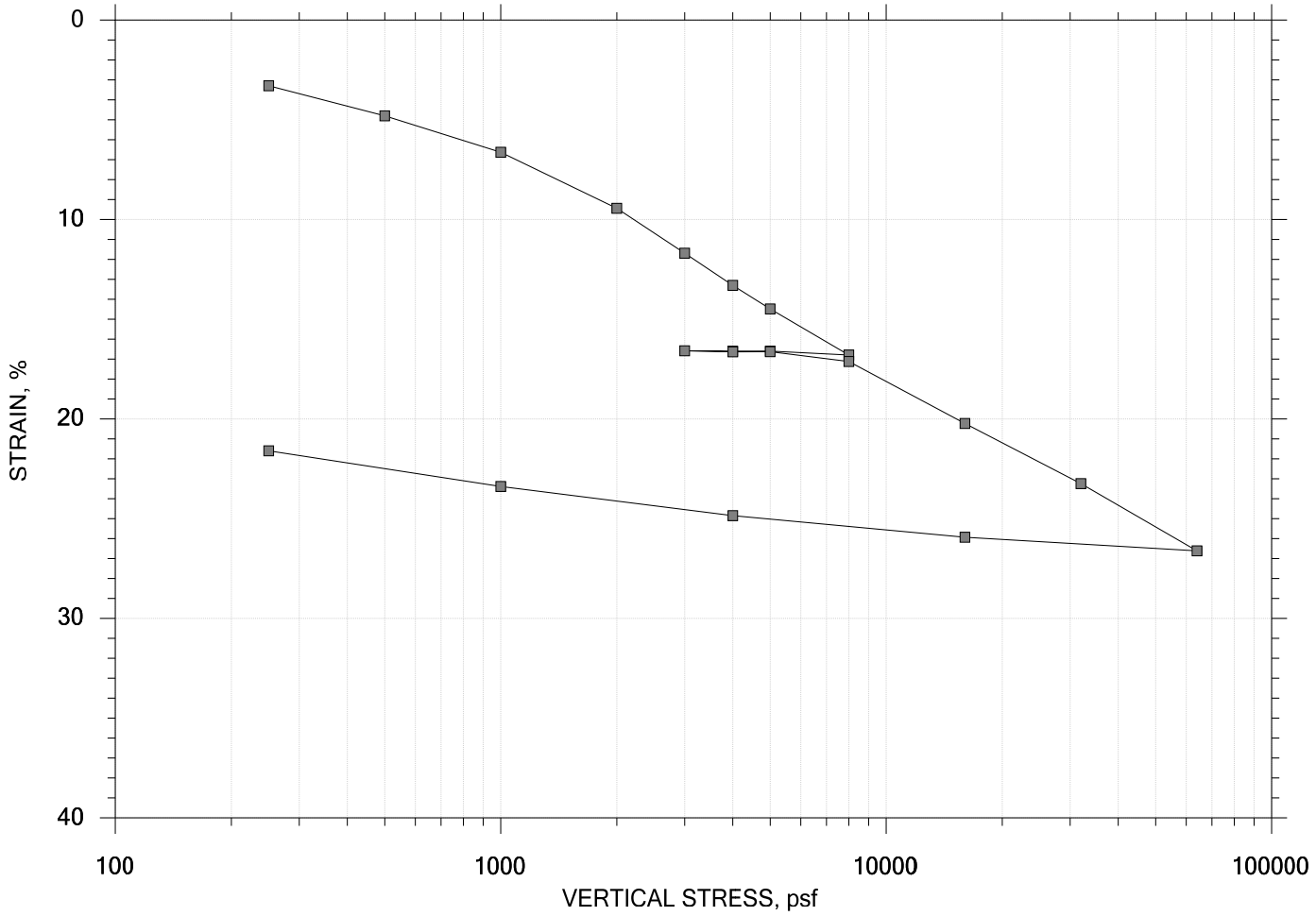


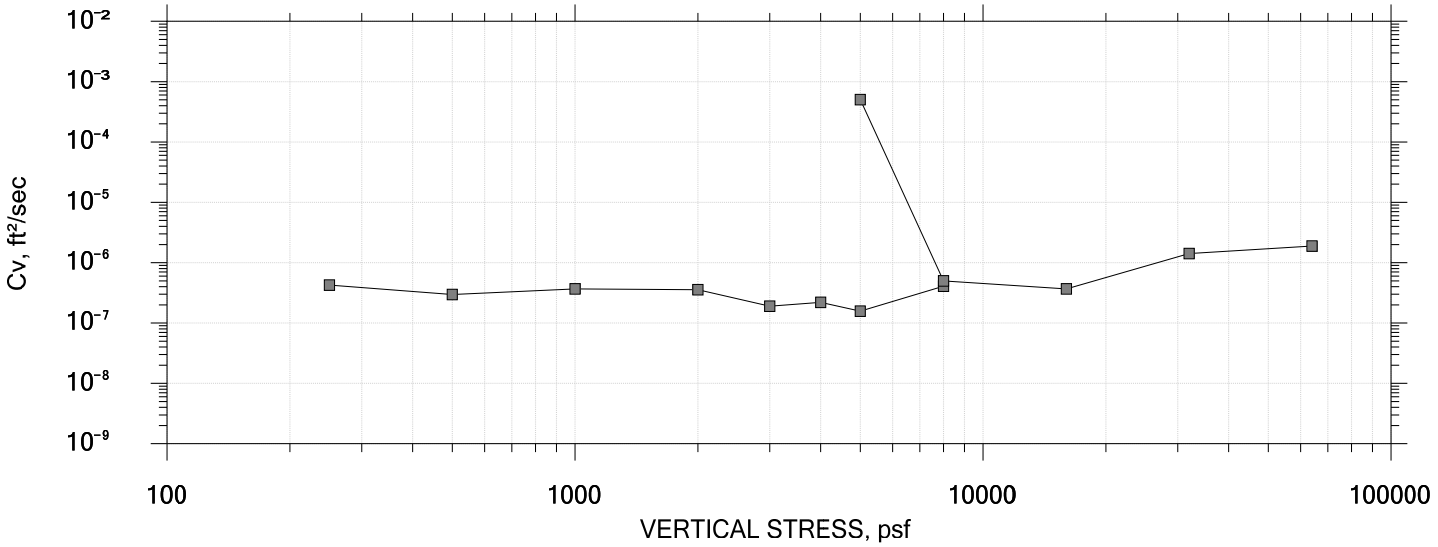


GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-1	Test Date: 05/01/18	Test No.: IP-2
	Depth: 15-17 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System R		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT

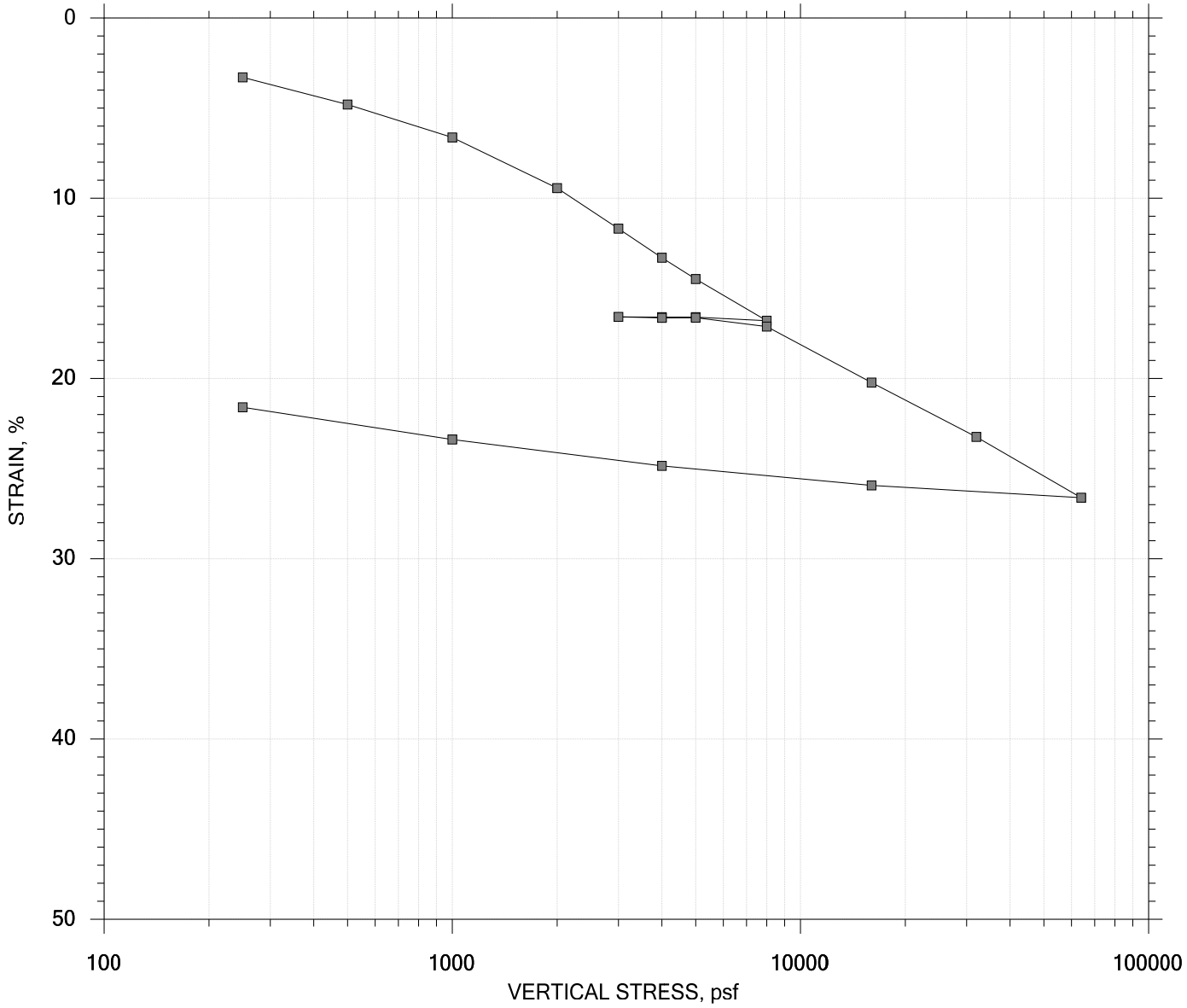




GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



				Before Test	After Test
Current Vertical Effective Stress: ---			Water Content, %	39.01	21.87
Preconsolidation Stress: ---			Dry Unit Weight, pcf	82.342	106.94
Compression Ratio: ---			Saturation, %	99.25	100.00
Diameter: 2.5 in		Height: 1 in	Void Ratio	1.08	0.60
LL: 27	PL: 19	PI: 8	GS: 2.74		

GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Warren Ave Rehabilitation
Location: Portland, ME
Project No.: GTX-308006
Boring No.: WA-E117
Tested By: md
Checked By: njh
Sample No.: U-2
Test Date: 04/26/18
Depth: 30-32 ft
Test No.: IP-1
Sample Type: intact
Elevation: ---

Soil Description: Wet, dark gray clay
Remarks: System Y

Estimated Specific Gravity: 2.74
Liquid Limit: 27
Specimen Diameter: 2.50 in
Initial Void Ratio: 1.08
Plastic Limit: 19
Initial Height: 1.00 in
Final Void Ratio: 0.599
Plasticity Index: 8
Final Height: 0.77 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	B-2035	RING		D-1346
Wt. Container + Wet Soil, gm	409.10	258.07	239.88	137.71
Wt. Container + Dry Soil, gm	296.13	216.68	216.68	114.54
Wt. Container, gm	8.1600	110.58	110.58	8.5800
Wt. Dry Soil, gm	287.97	106.10	106.10	105.96
Water Content, %	39.23	39.01	21.87	21.87
Void Ratio	---	1.08	0.599	---
Degree of Saturation, %	---	99.25	100.00	---
Dry Unit Weight, pcf	---	82.342	106.94	---

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.

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Warren Ave Rehabilitation
Location: Portland, ME
Project No.: GTX-308006
Boring No.: WA-E117
Tested By: md
Checked By: njh
Sample No.: U-2
Test Date: 04/26/18
Depth: 30-32 ft
Test No.: IP-1
Sample Type: intact
Elevation: ---

Soil Description: Wet, dark gray clay
Remarks: System Y

Displacement at End of Increment

	Applied Stress psf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft²/sec	Mv 1/psf	k ft/day
1	250.	0.03292	1.01	3.29	52.993	4.48e-007	1.32e-004	3.18e-004
2	500.	0.04798	0.977	4.80	57.349	3.94e-007	6.02e-005	1.28e-004
3	1.00e+003	0.06627	0.939	6.63	58.578	3.72e-007	3.66e-005	7.35e-005
4	2.00e+003	0.09436	0.881	9.44	49.912	4.16e-007	2.81e-005	6.30e-005
5	3.00e+003	0.1169	0.834	11.7	93.742	2.09e-007	2.25e-005	2.55e-005
6	4.00e+003	0.1330	0.800	13.3	93.024	2.02e-007	1.61e-005	1.76e-005
7	5.00e+003	0.1448	0.776	14.5	124.965	1.46e-007	1.18e-005	9.26e-006
8	8.00e+003	0.1679	0.728	16.8	47.431	3.68e-007	7.70e-006	1.53e-005
9	5.00e+003	0.1660	0.732	16.6	2.700	6.31e-006	6.49e-007	2.21e-005
10	4.00e+003	0.1659	0.732	16.6	0.000	0.00e+000	3.92e-008	0.00e+000
11	3.00e+003	0.1658	0.732	16.6	0.000	0.00e+000	1.07e-007	0.00e+000
12	4.00e+003	0.1664	0.731	16.6	0.000	0.00e+000	5.44e-007	0.00e+000
13	5.00e+003	0.1662	0.731	16.6	0.023	7.53e-004	-1.34e-007	-5.44e-004
14	8.00e+003	0.1712	0.721	17.1	50.017	3.39e-007	1.66e-006	3.03e-006
15	1.60e+004	0.2022	0.657	20.2	123.286	1.32e-007	3.88e-006	2.75e-006
16	3.20e+004	0.2324	0.594	23.2	12.183	1.23e-006	1.88e-006	1.25e-005
17	6.40e+004	0.2661	0.524	26.6	7.642	1.81e-006	1.05e-006	1.03e-005
18	1.60e+004	0.2593	0.538	25.9	3.542	3.77e-006	1.43e-007	2.90e-006
19	4.00e+003	0.2484	0.561	24.8	17.969	7.60e-007	9.04e-007	3.71e-006
20	1.00e+003	0.2338	0.591	23.4	64.149	2.20e-007	4.87e-006	5.78e-006
21	250.	0.2159	0.628	21.6	151.671	9.72e-008	2.38e-005	1.25e-005

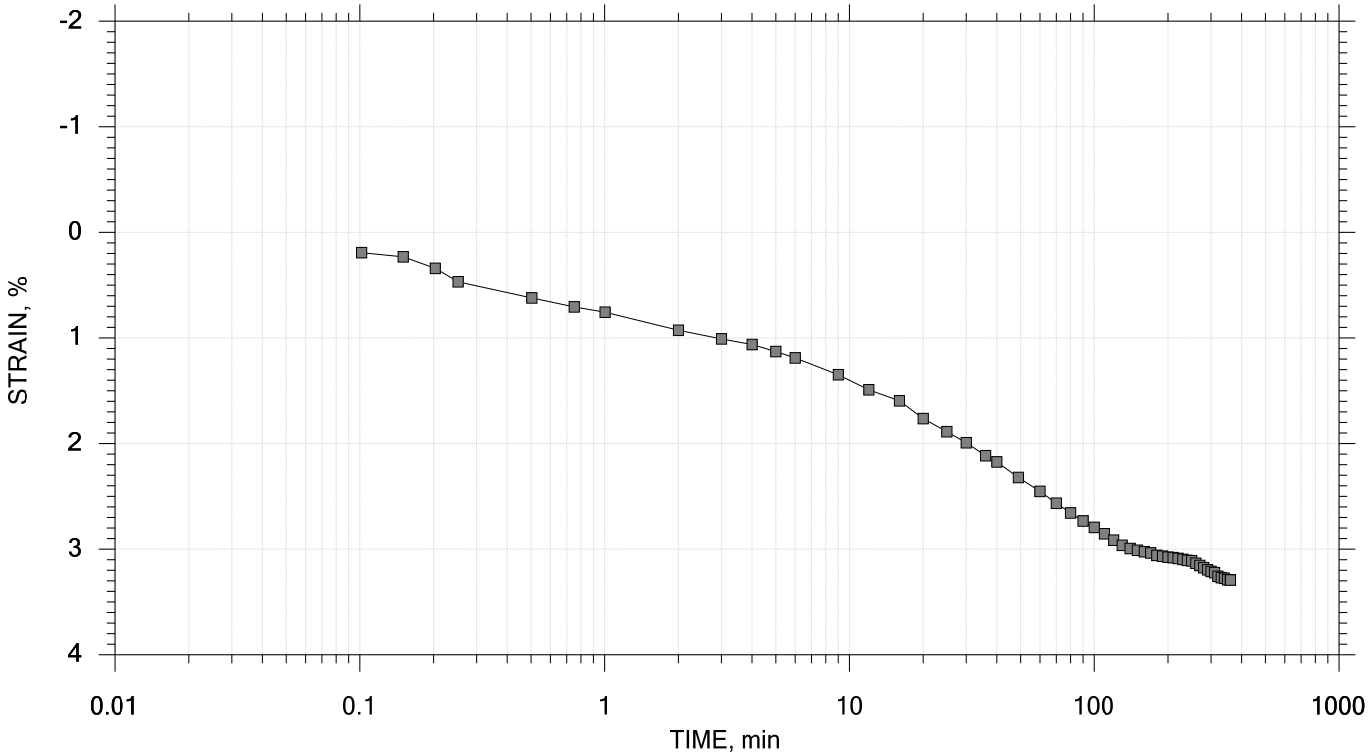
	Applied Stress psf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/sec	Mv 1/psf	k ft/day	Ca %
1	250.	0.03292	1.01	3.29	0.000	0.00e+000	1.32e-004	0.00e+000	0.00e+000
2	500.	0.04798	0.977	4.80	18.511	2.84e-007	6.02e-005	9.21e-005	0.00e+000
3	1.00e+003	0.06627	0.939	6.63	0.000	0.00e+000	3.66e-005	0.00e+000	0.00e+000
4	2.00e+003	0.09436	0.881	9.44	14.821	3.25e-007	2.81e-005	4.93e-005	0.00e+000
5	3.00e+003	0.1169	0.834	11.7	27.806	1.64e-007	2.25e-005	1.99e-005	0.00e+000
6	4.00e+003	0.1330	0.800	13.3	0.000	0.00e+000	1.61e-005	0.00e+000	0.00e+000
7	5.00e+003	0.1448	0.776	14.5	0.000	0.00e+000	1.18e-005	0.00e+000	0.00e+000
8	8.00e+003	0.1679	0.728	16.8	0.000	0.00e+000	7.70e-006	0.00e+000	0.00e+000
9	5.00e+003	0.1660	0.732	16.6	0.000	0.00e+000	6.49e-007	0.00e+000	0.00e+000
10	4.00e+003	0.1659	0.732	16.6	0.000	0.00e+000	3.92e-008	0.00e+000	0.00e+000
11	3.00e+003	0.1658	0.732	16.6	0.000	0.00e+000	1.07e-007	0.00e+000	0.00e+000
12	4.00e+003	0.1664	0.731	16.6	0.000	0.00e+000	5.44e-007	0.00e+000	0.00e+000
13	5.00e+003	0.1662	0.731	16.6	0.000	0.00e+000	-1.34e-007	-0.00e+000	0.00e+000
14	8.00e+003	0.1712	0.721	17.1	0.000	0.00e+000	1.66e-006	0.00e+000	0.00e+000
15	1.60e+004	0.2022	0.657	20.2	0.000	0.00e+000	3.88e-006	0.00e+000	0.00e+000
16	3.20e+004	0.2324	0.594	23.2	2.313	1.51e-006	1.88e-006	1.53e-005	0.00e+000
17	6.40e+004	0.2661	0.524	26.6	1.772	1.81e-006	1.05e-006	1.03e-005	0.00e+000
18	1.60e+004	0.2593	0.538	25.9	0.000	0.00e+000	1.43e-007	0.00e+000	0.00e+000
19	4.00e+003	0.2484	0.561	24.8	0.000	0.00e+000	9.04e-007	0.00e+000	0.00e+000
20	1.00e+003	0.2338	0.591	23.4	12.594	2.61e-007	4.87e-006	6.84e-006	0.00e+000
21	250.	0.2159	0.628	21.6	0.000	0.00e+000	2.38e-005	0.00e+000	0.00e+000

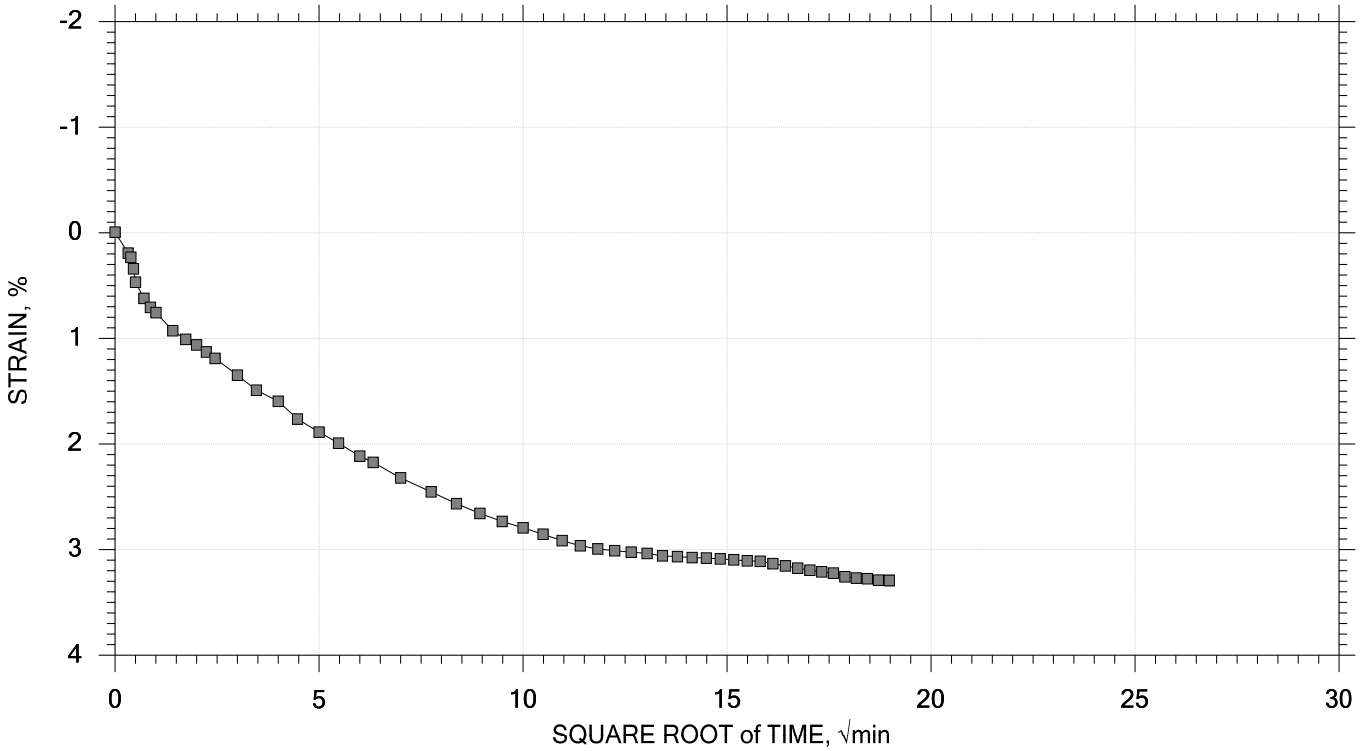
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 1 of 21

Stress: 250 psf





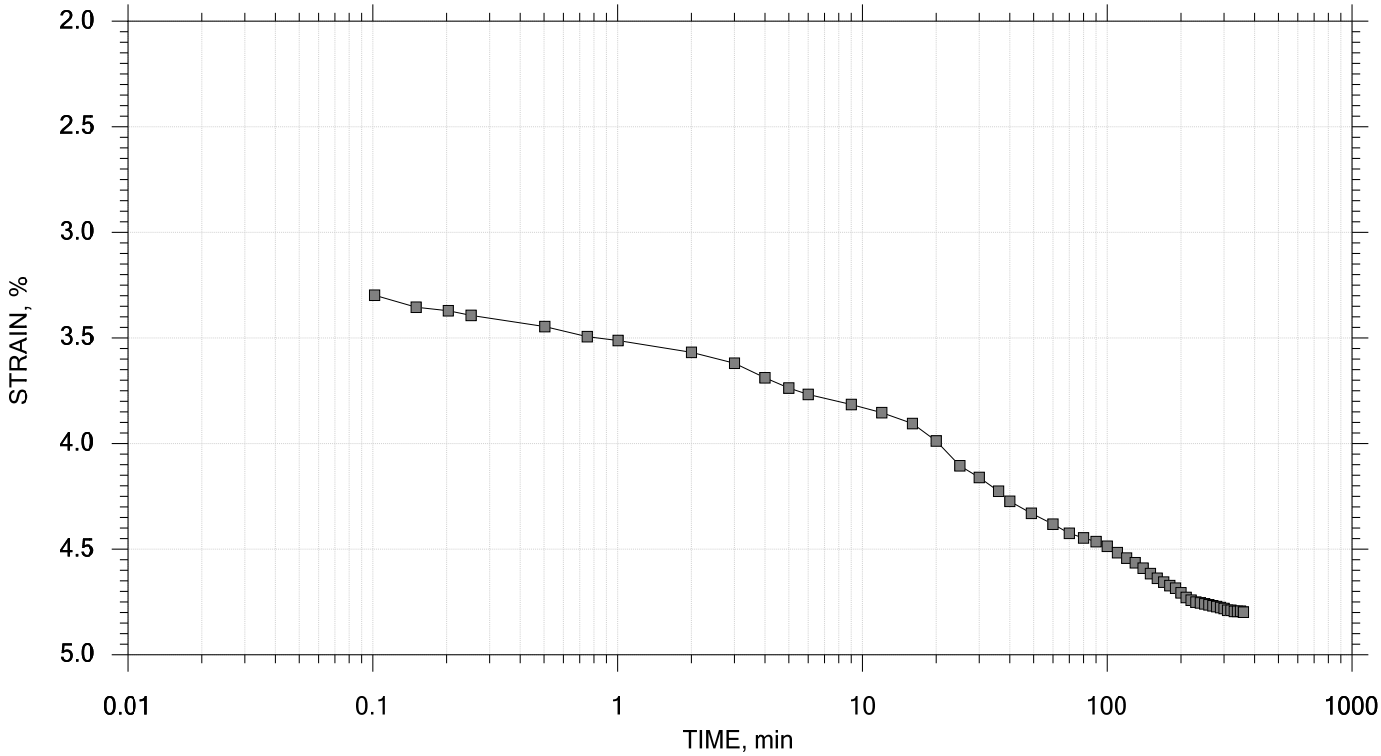
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

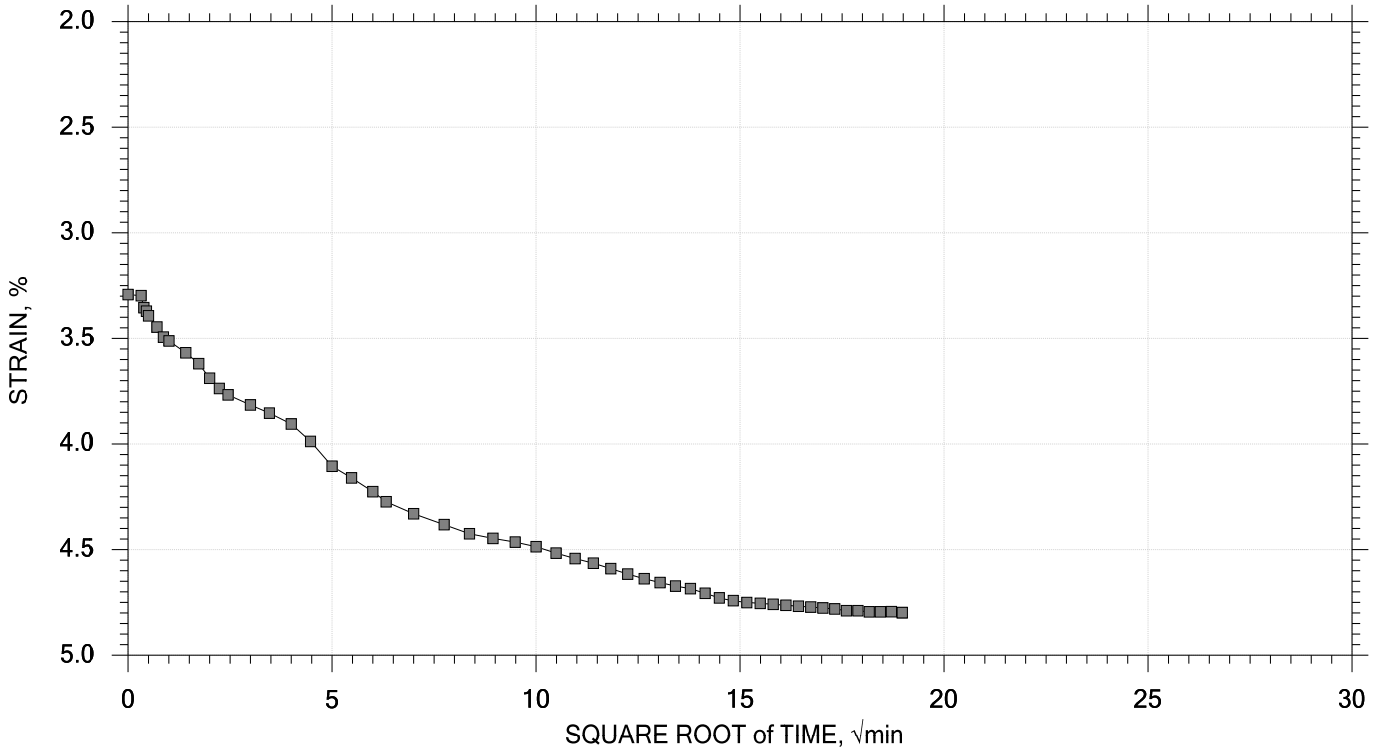
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 2 of 21

Stress: 500 psf





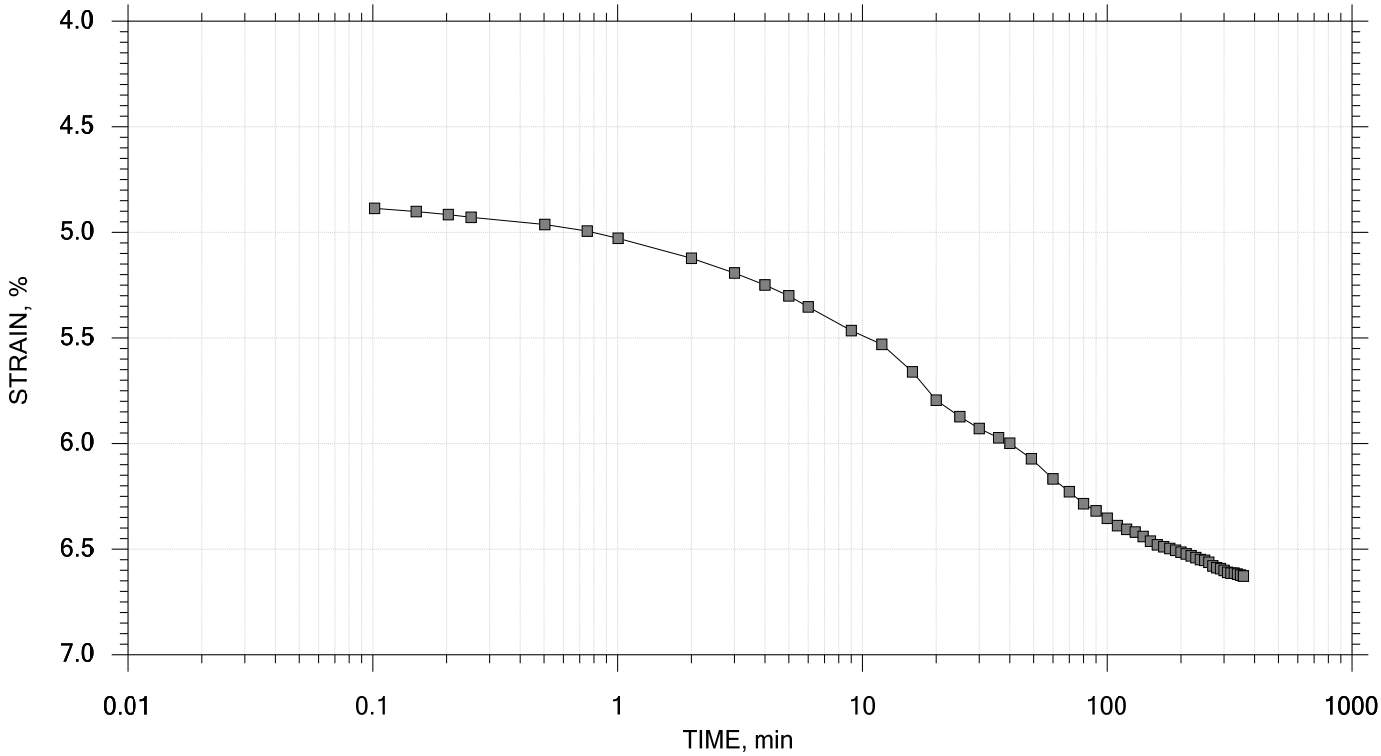
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

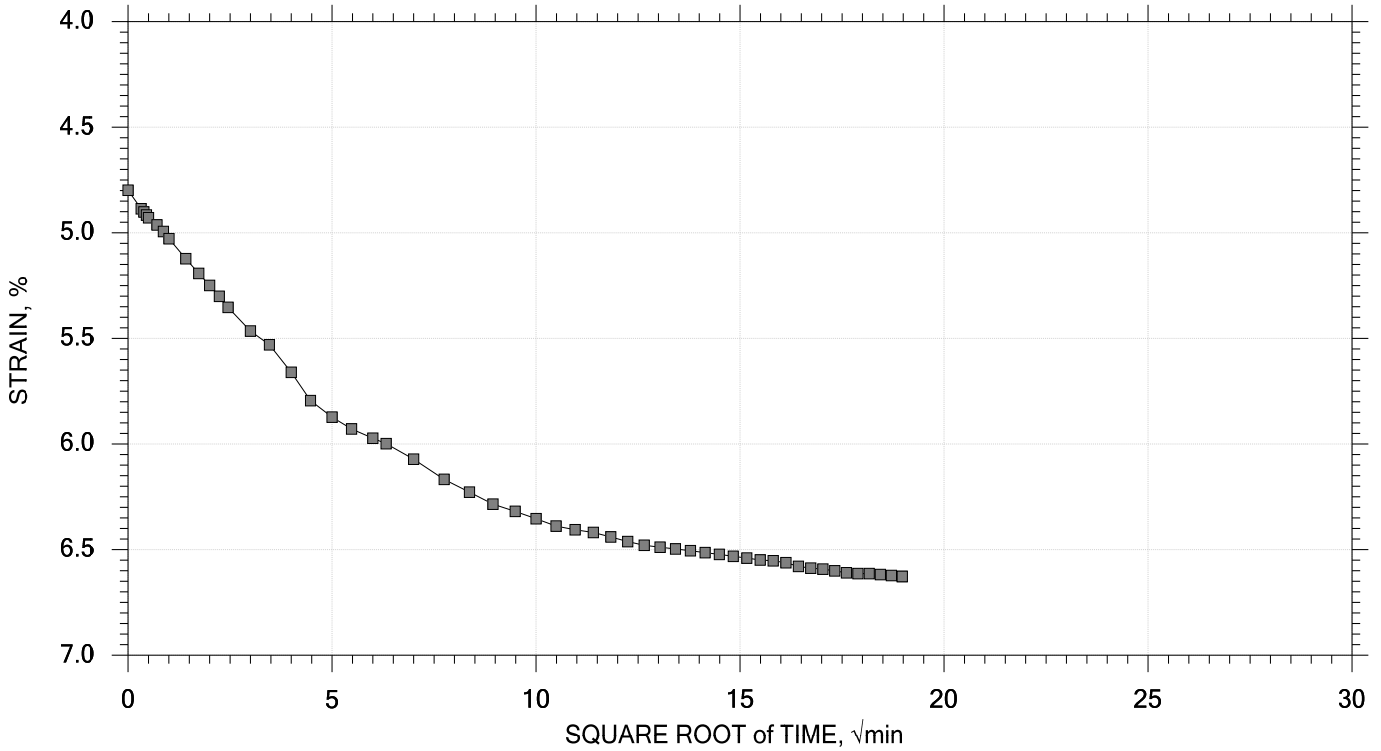
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 3 of 21

Stress: 1000 psf





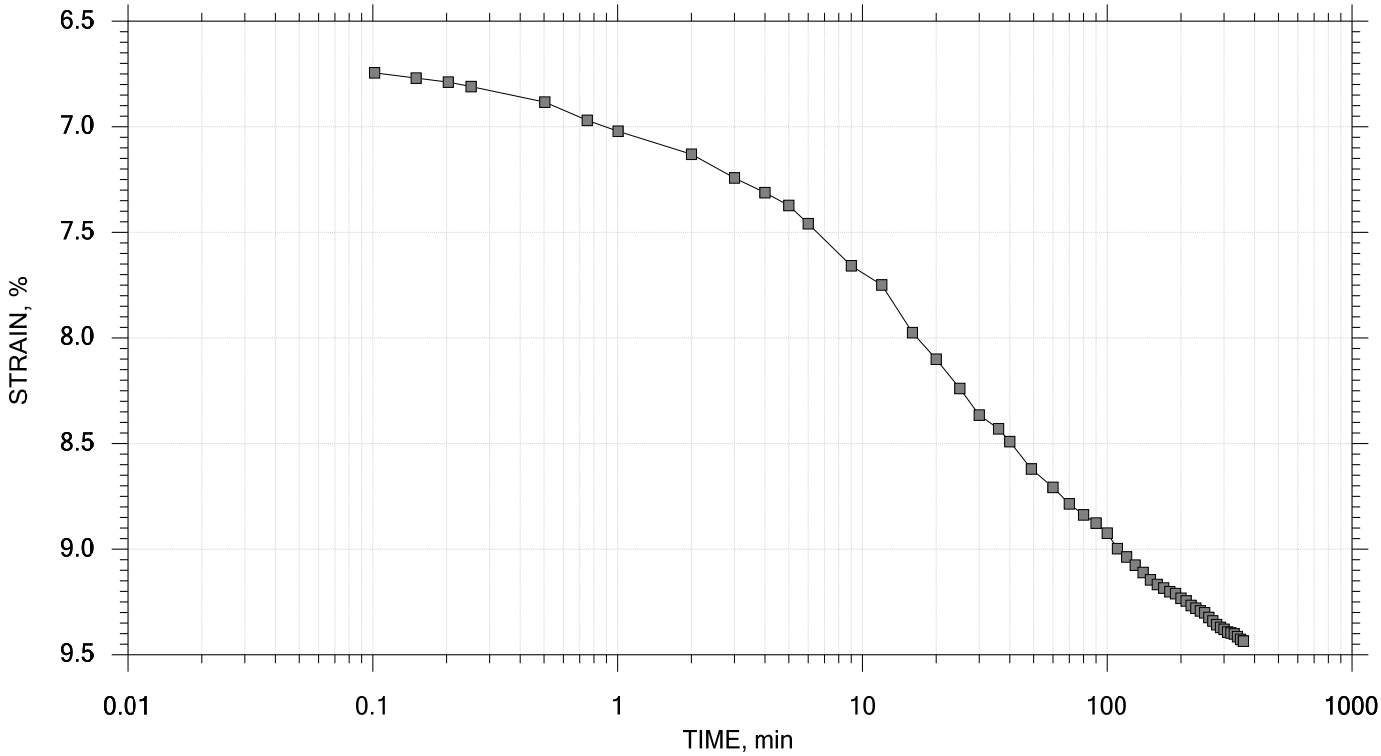
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

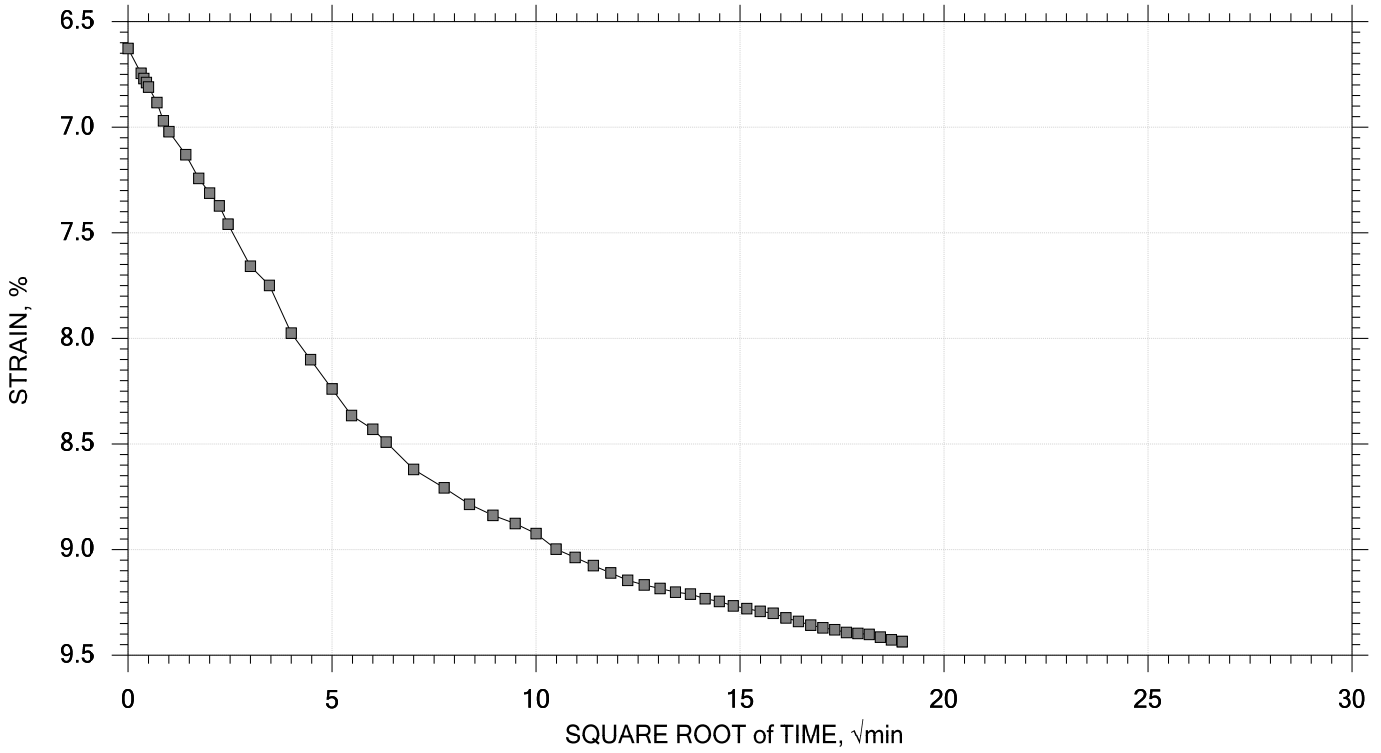
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 4 of 21

Stress: 2000 psf





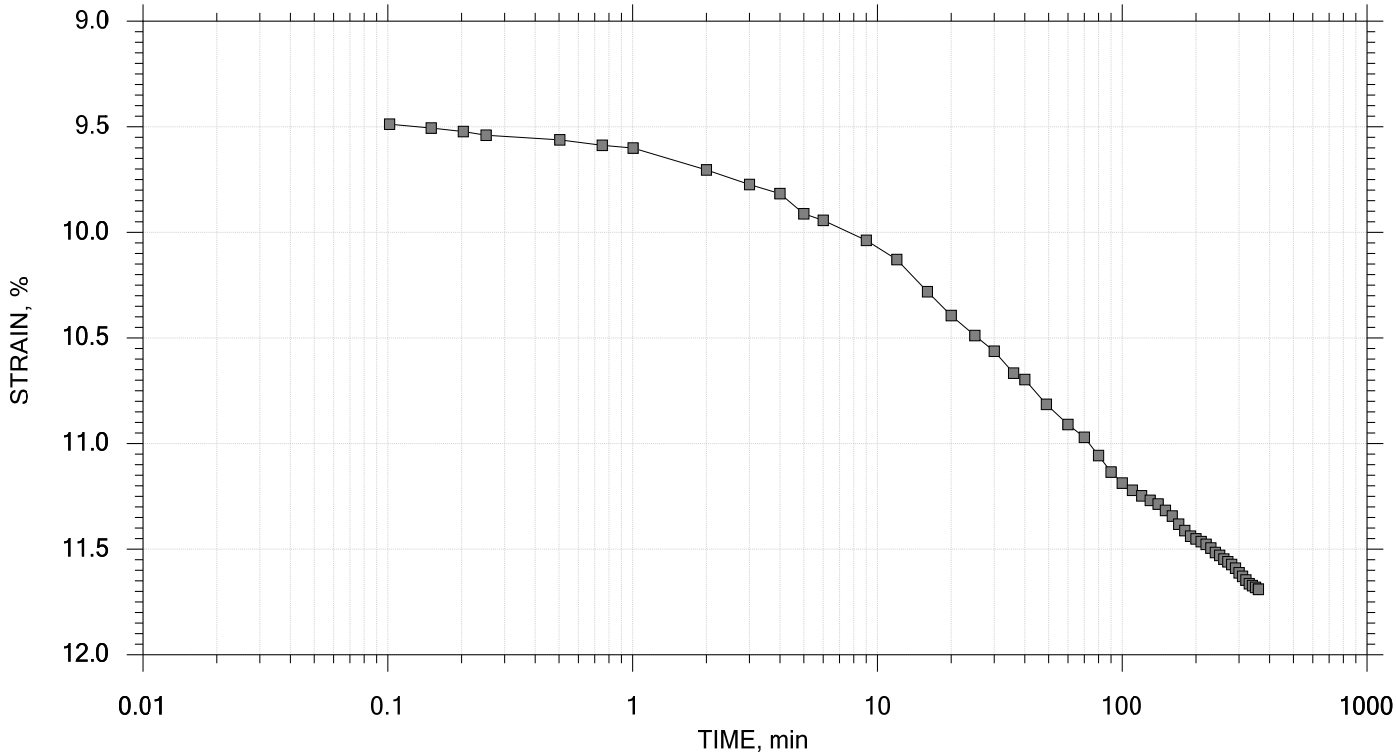
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

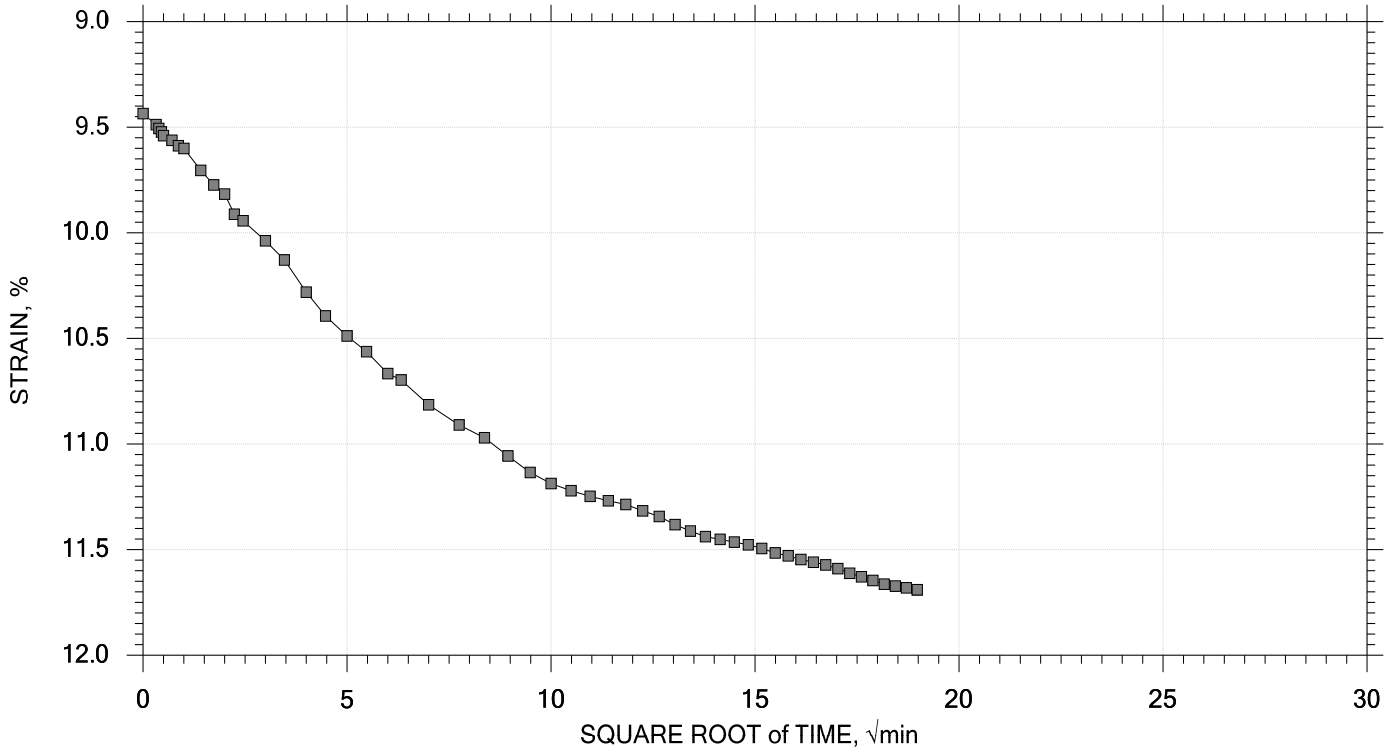
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 5 of 21

Stress: 3000 psf





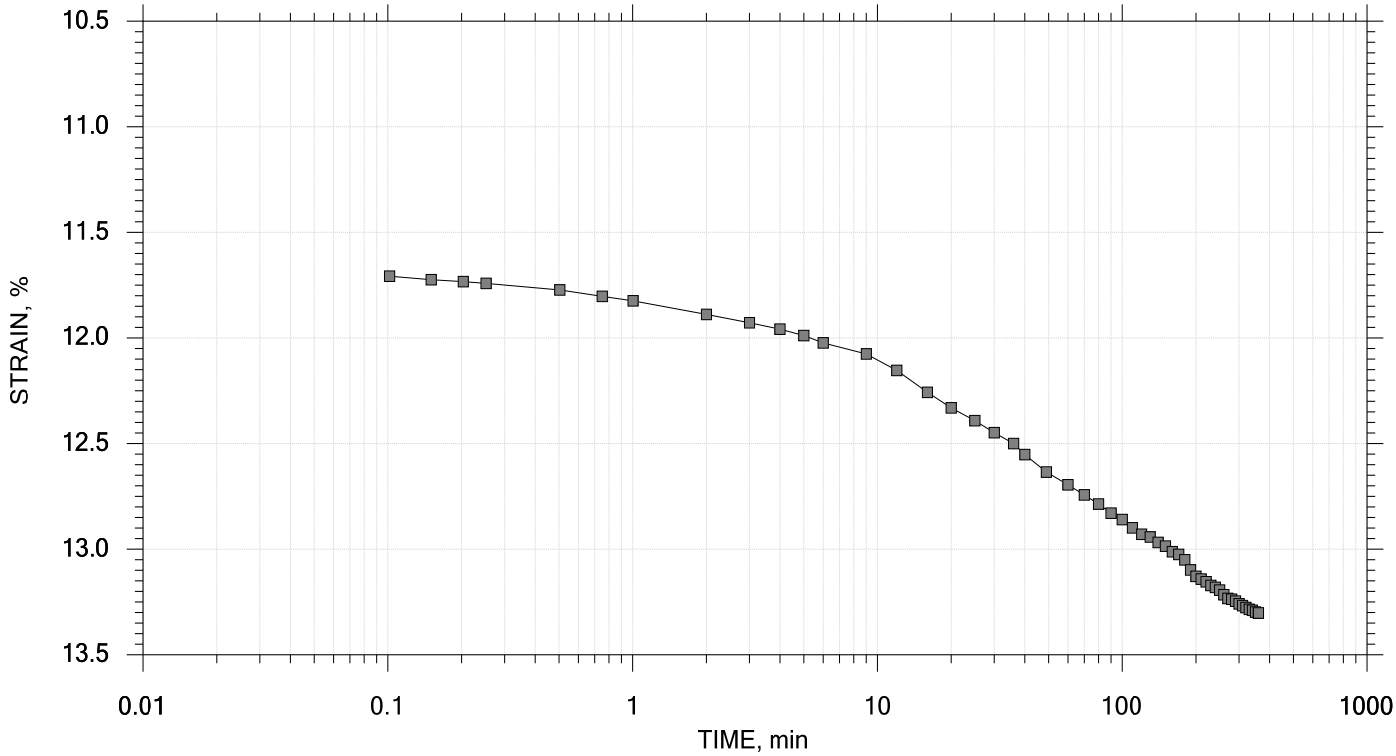
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

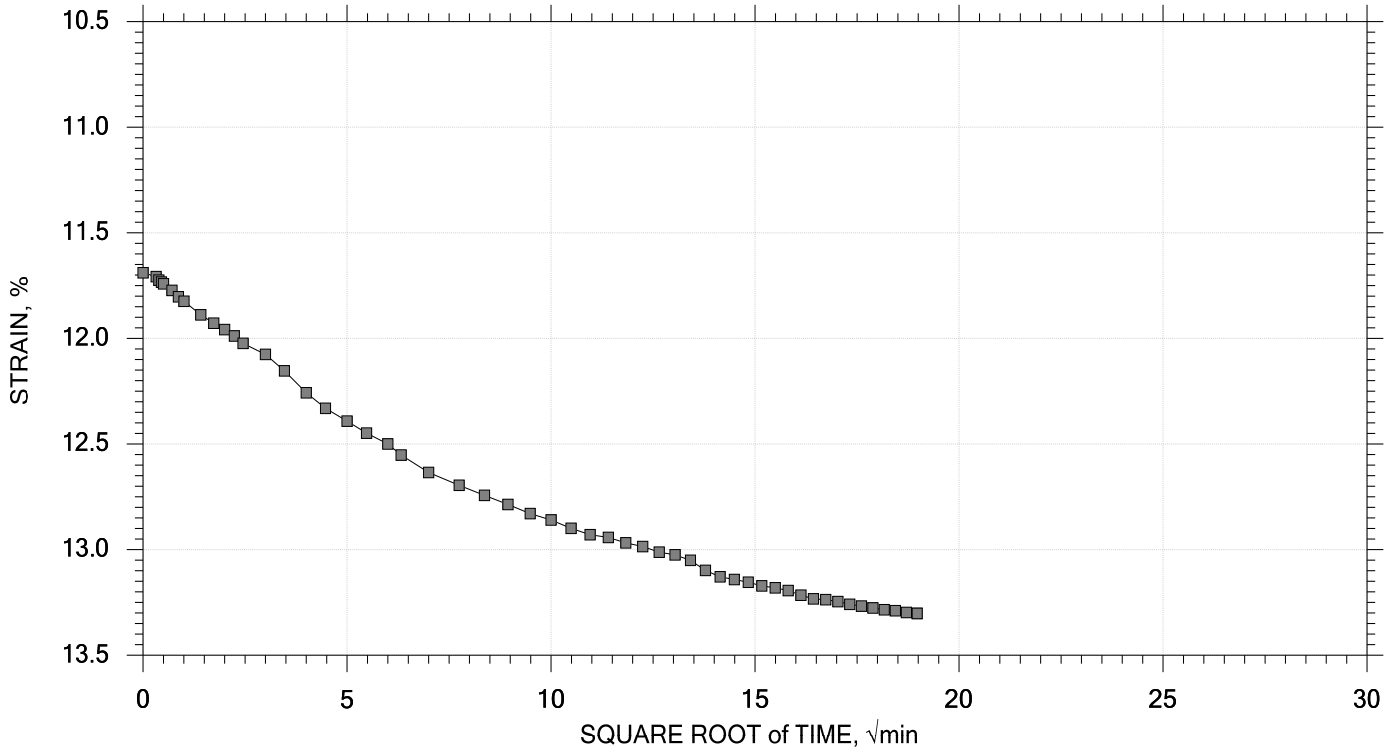
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 6 of 21

Stress: 4000 psf





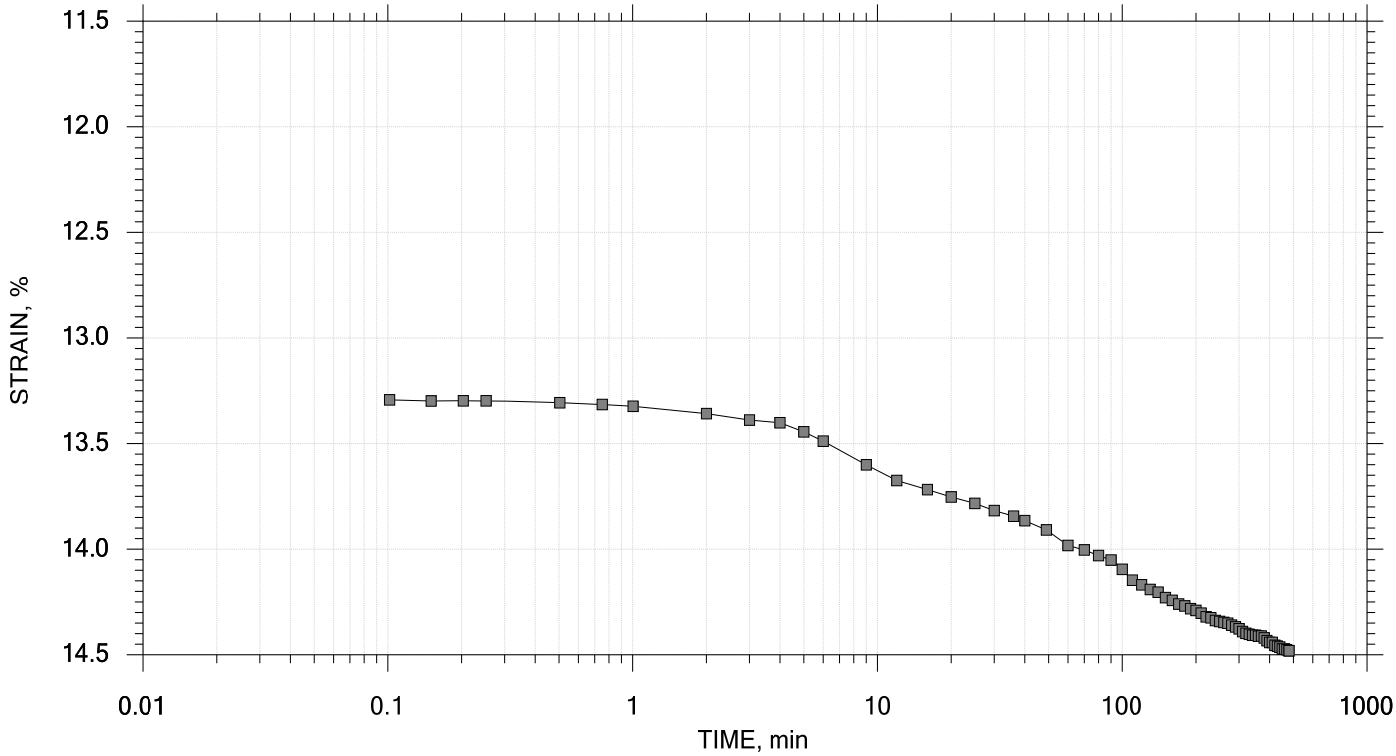
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

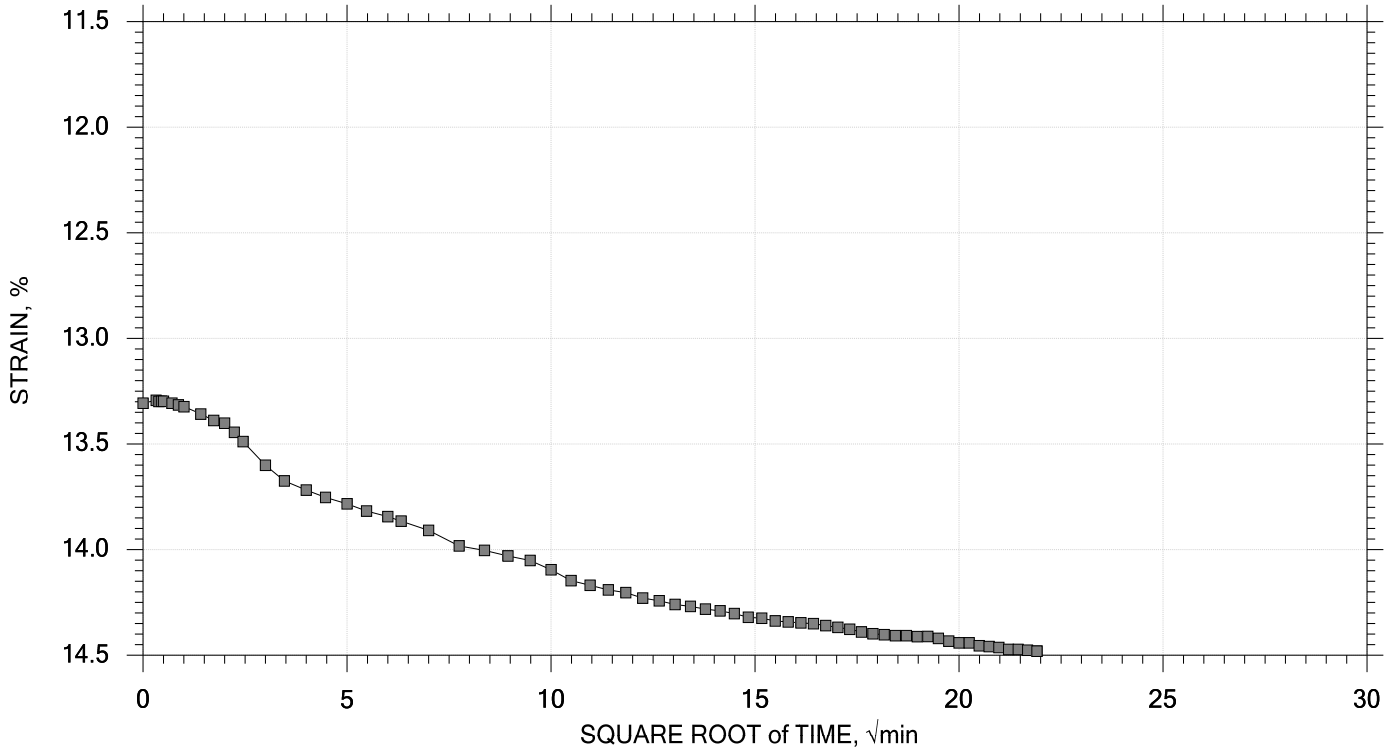
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 7 of 21

Stress: 5000 psf





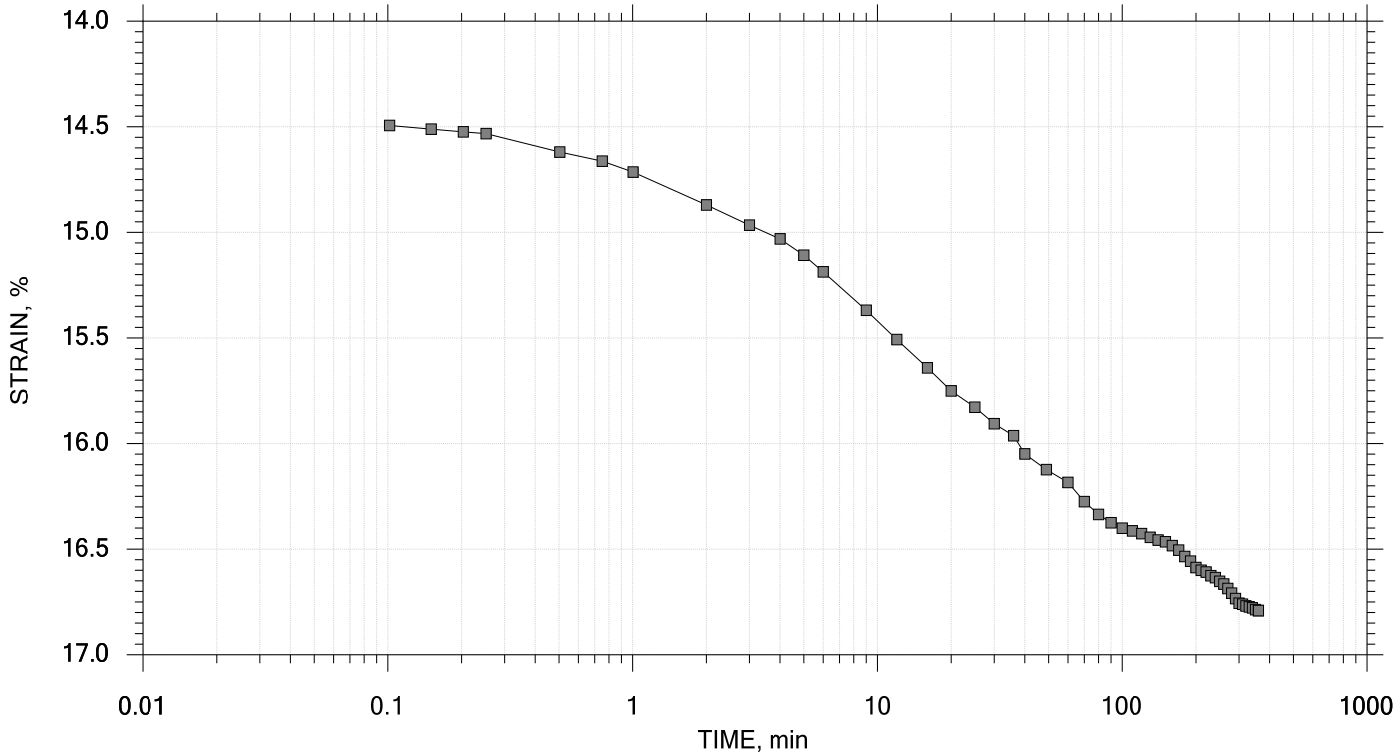
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

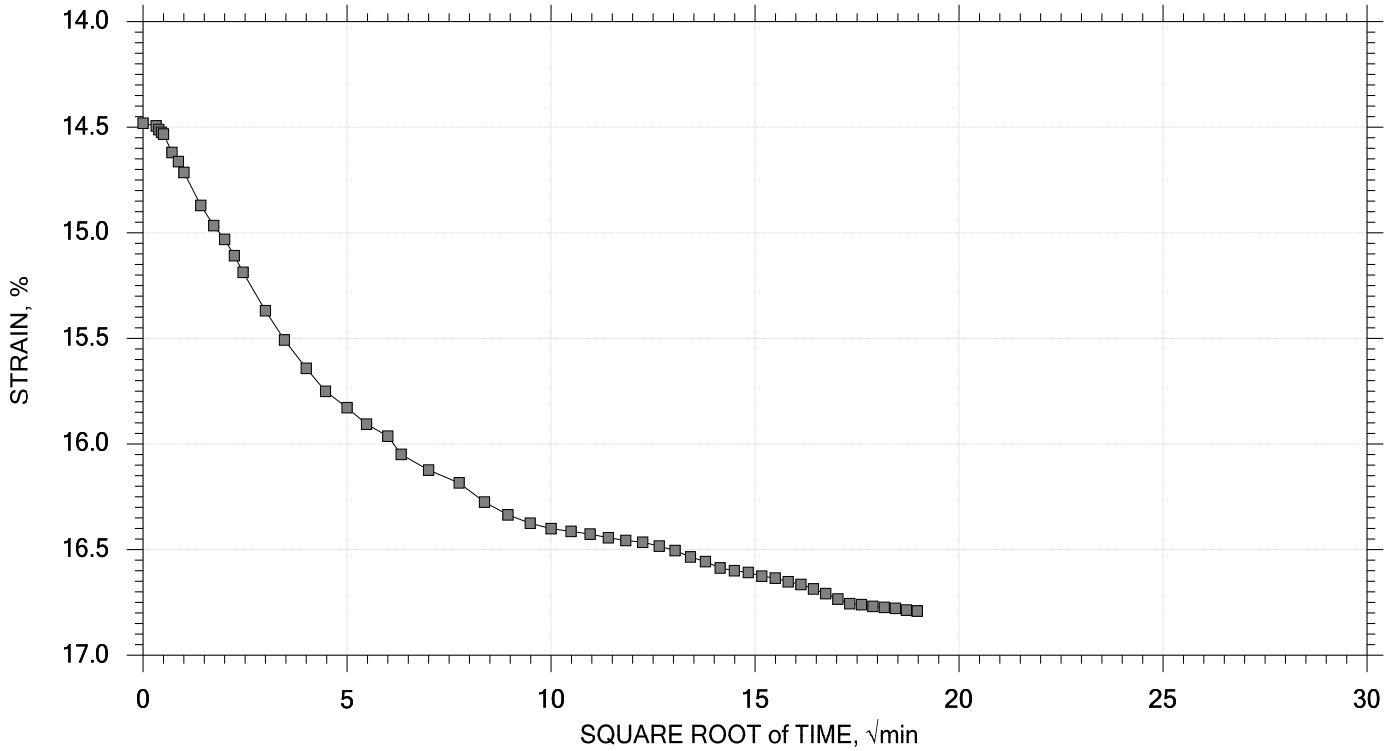
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 8 of 21

Stress: 8000 psf





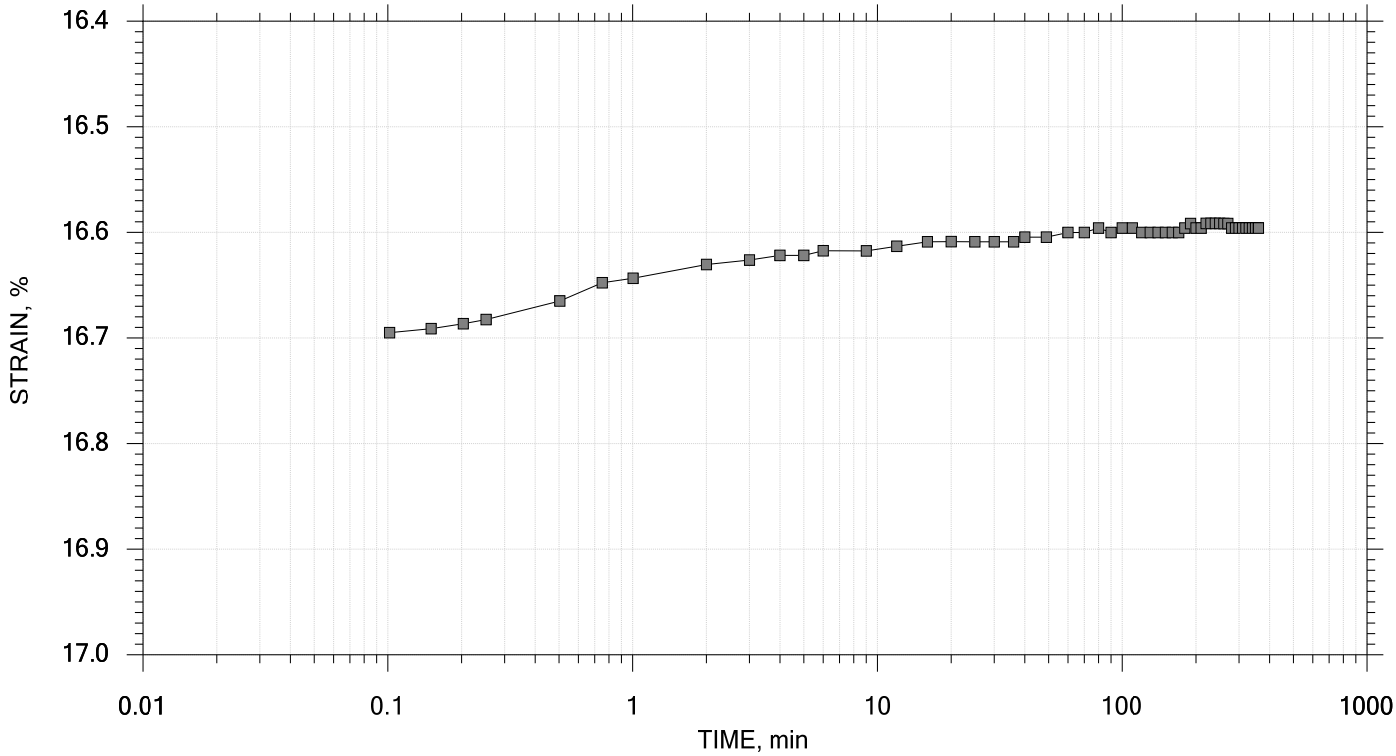
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

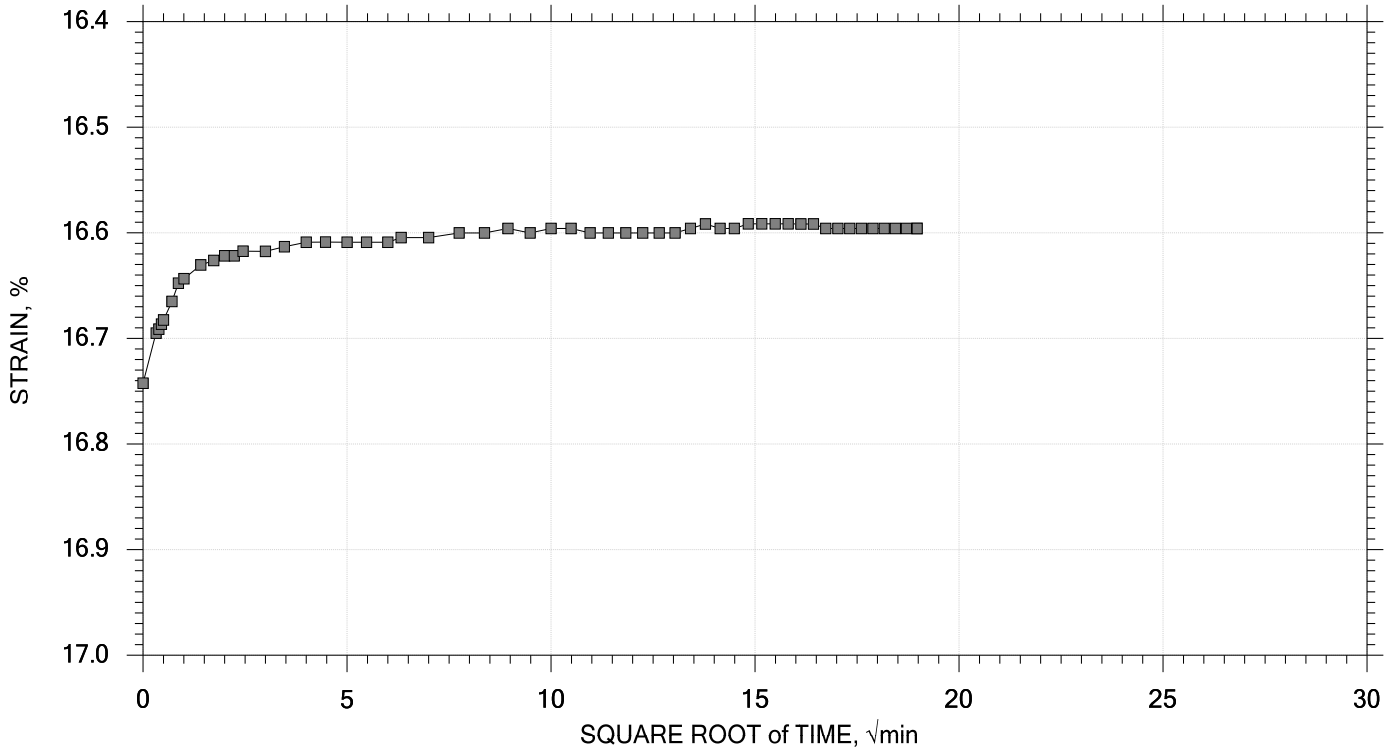
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 9 of 21

Stress: 5000 psf





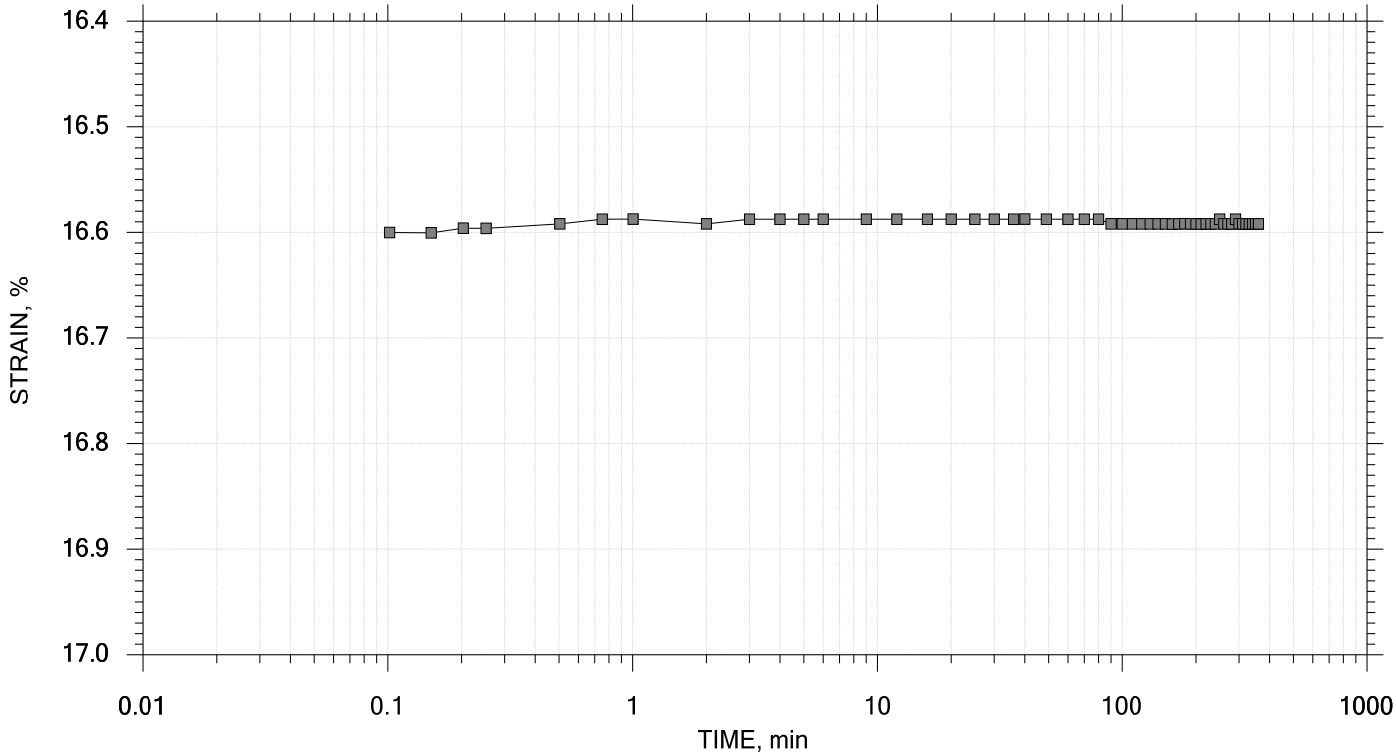
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

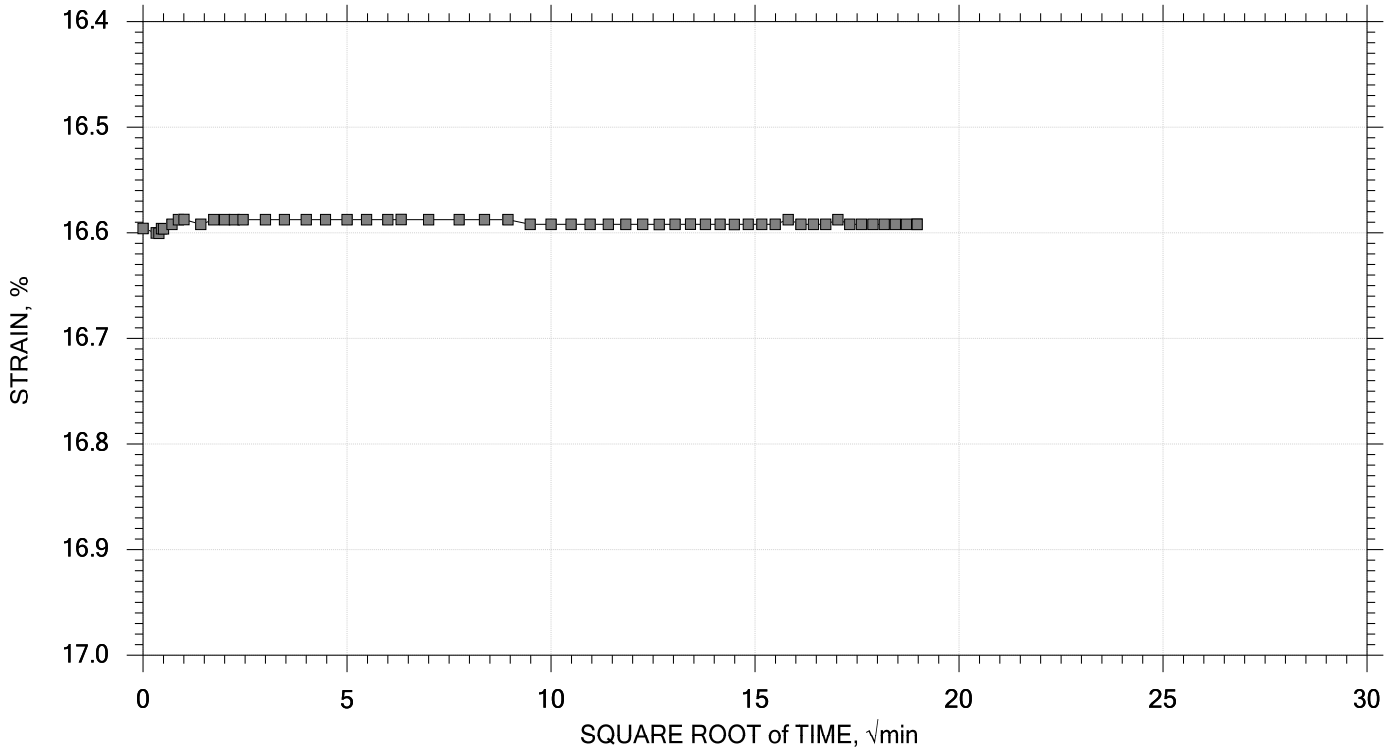
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 10 of 21

Stress: 4000 psf





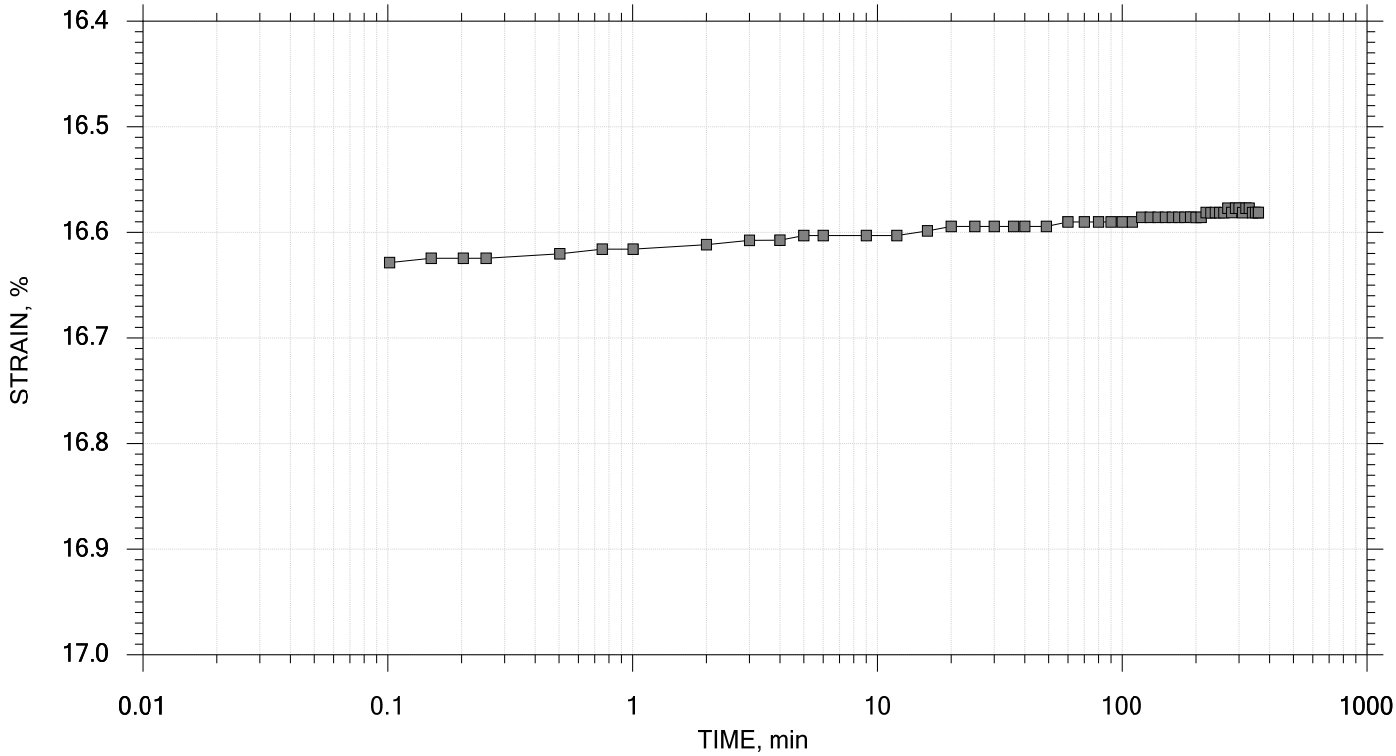
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

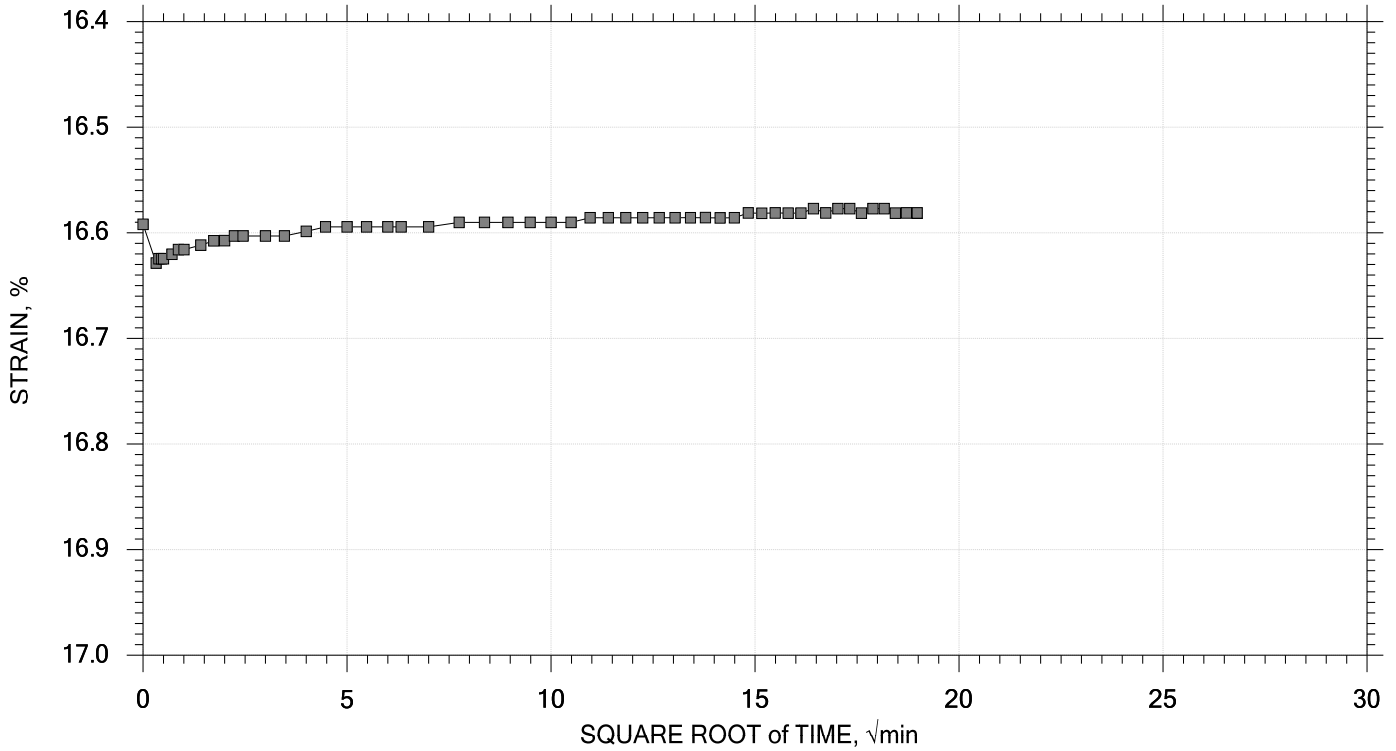
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 11 of 21

Stress: 3000 psf





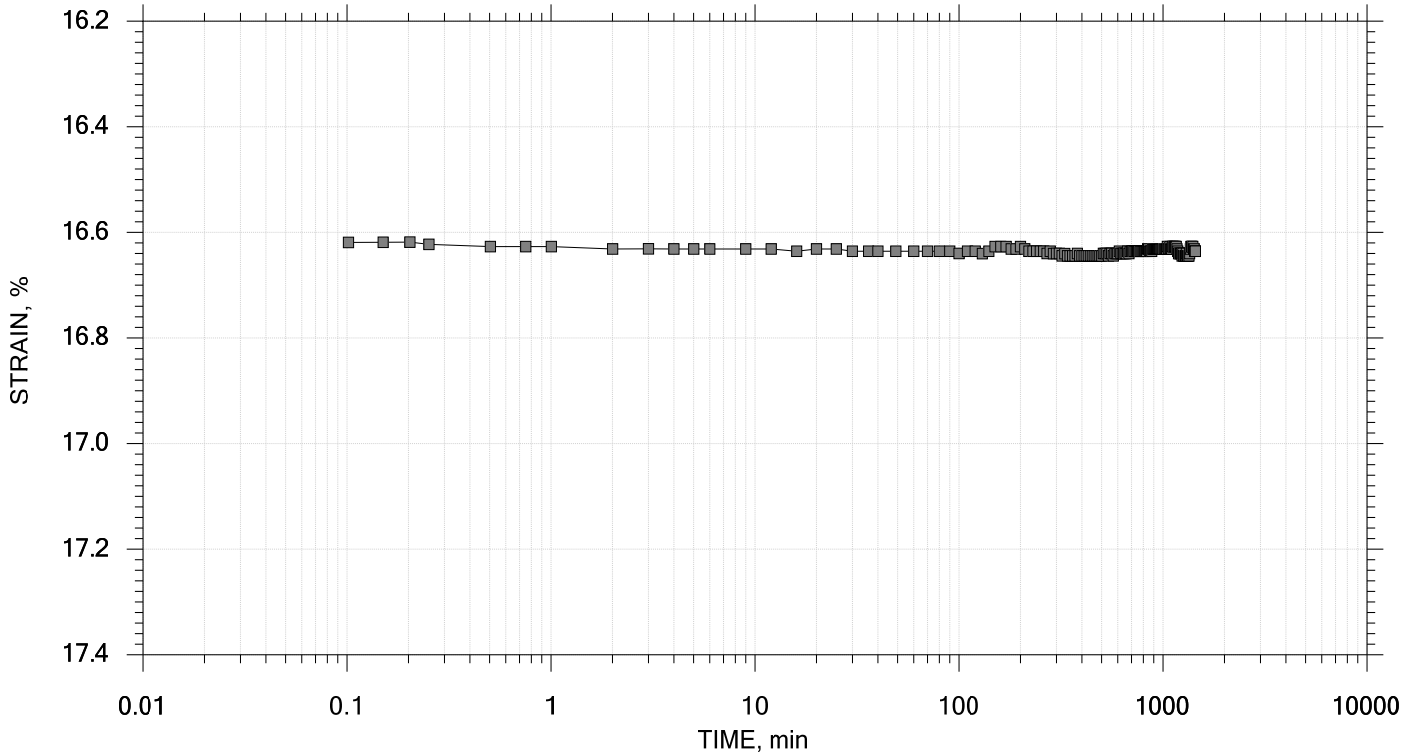
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

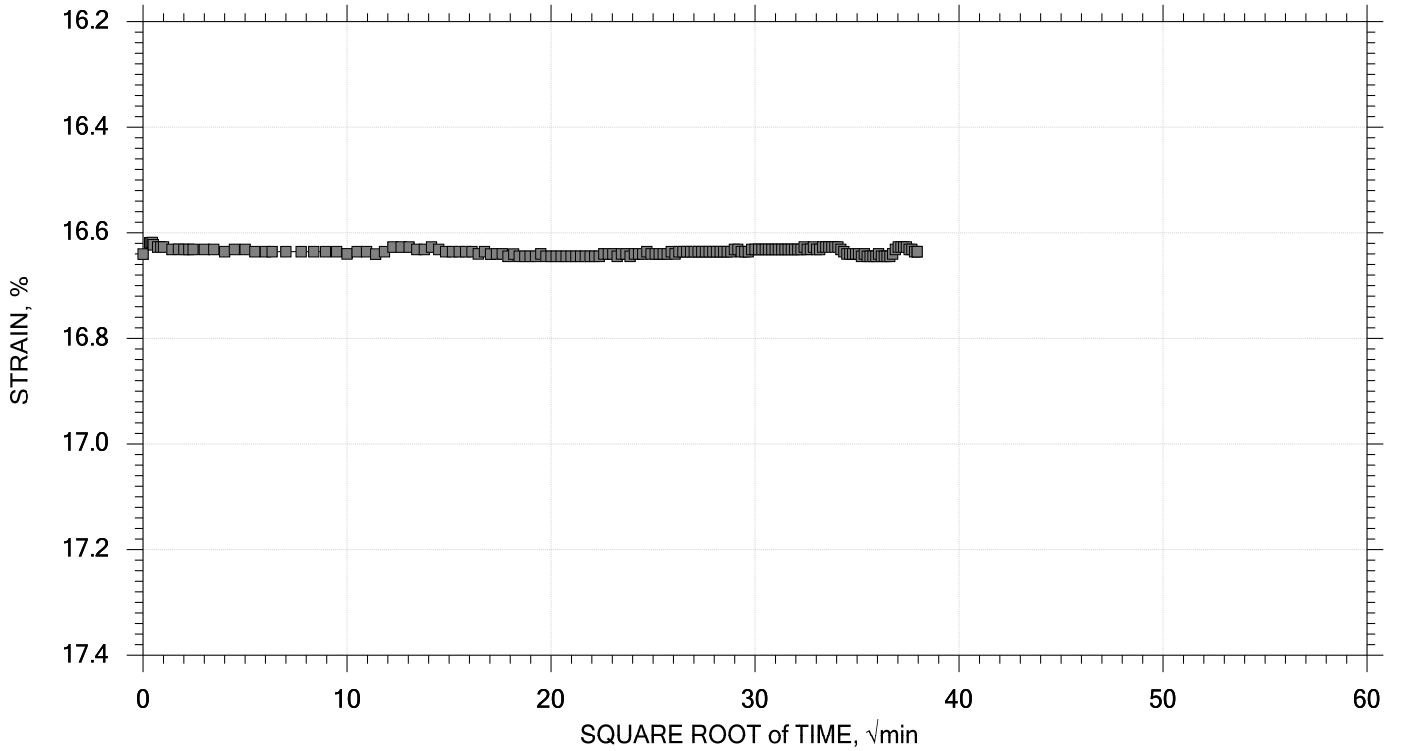
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 12 of 21

Stress: 4000 psf





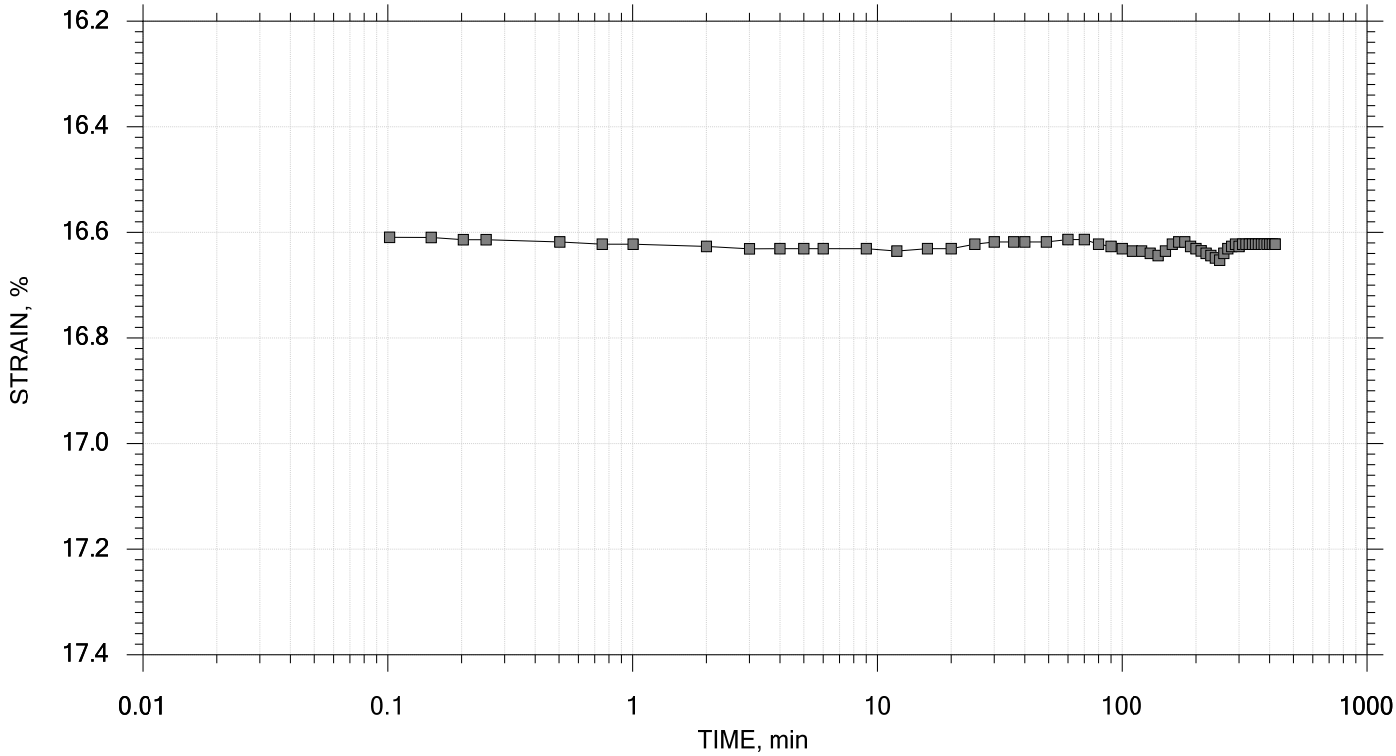
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

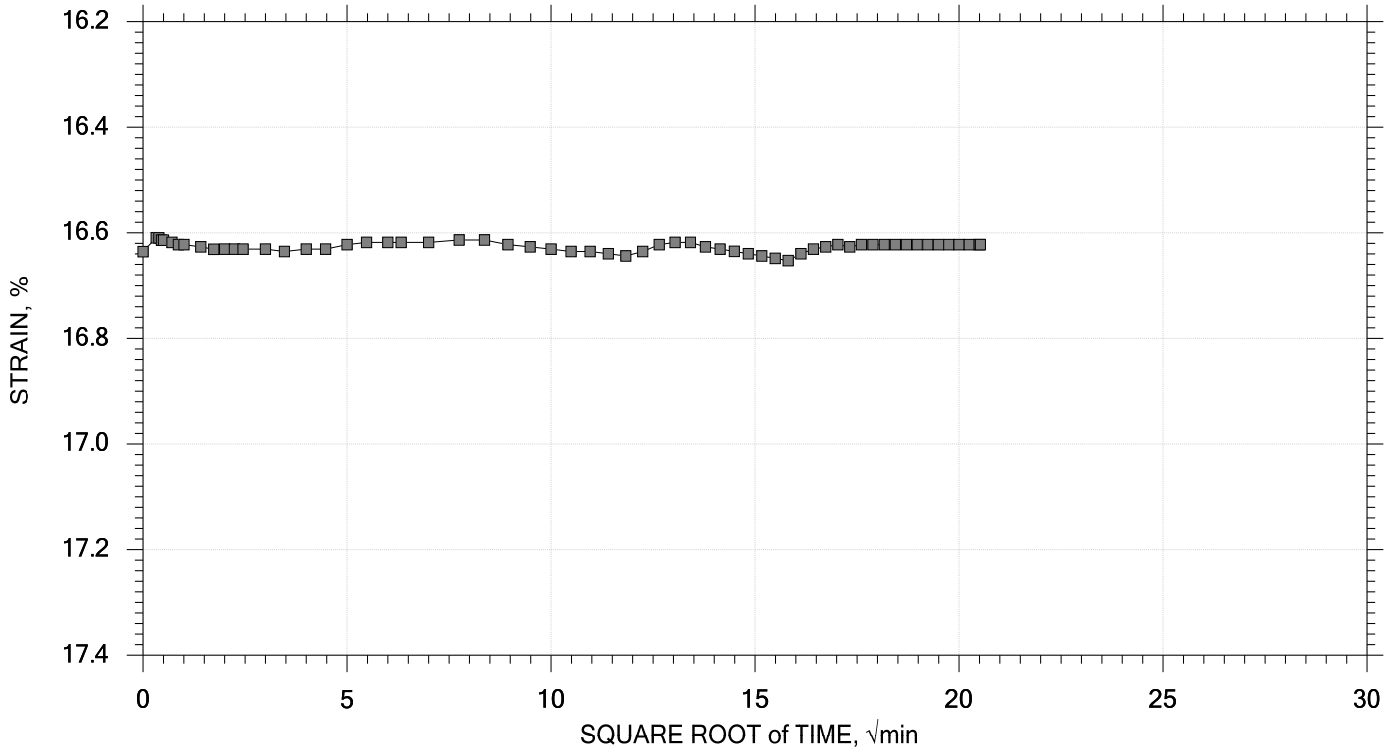
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 13 of 21

Stress: 5000 psf





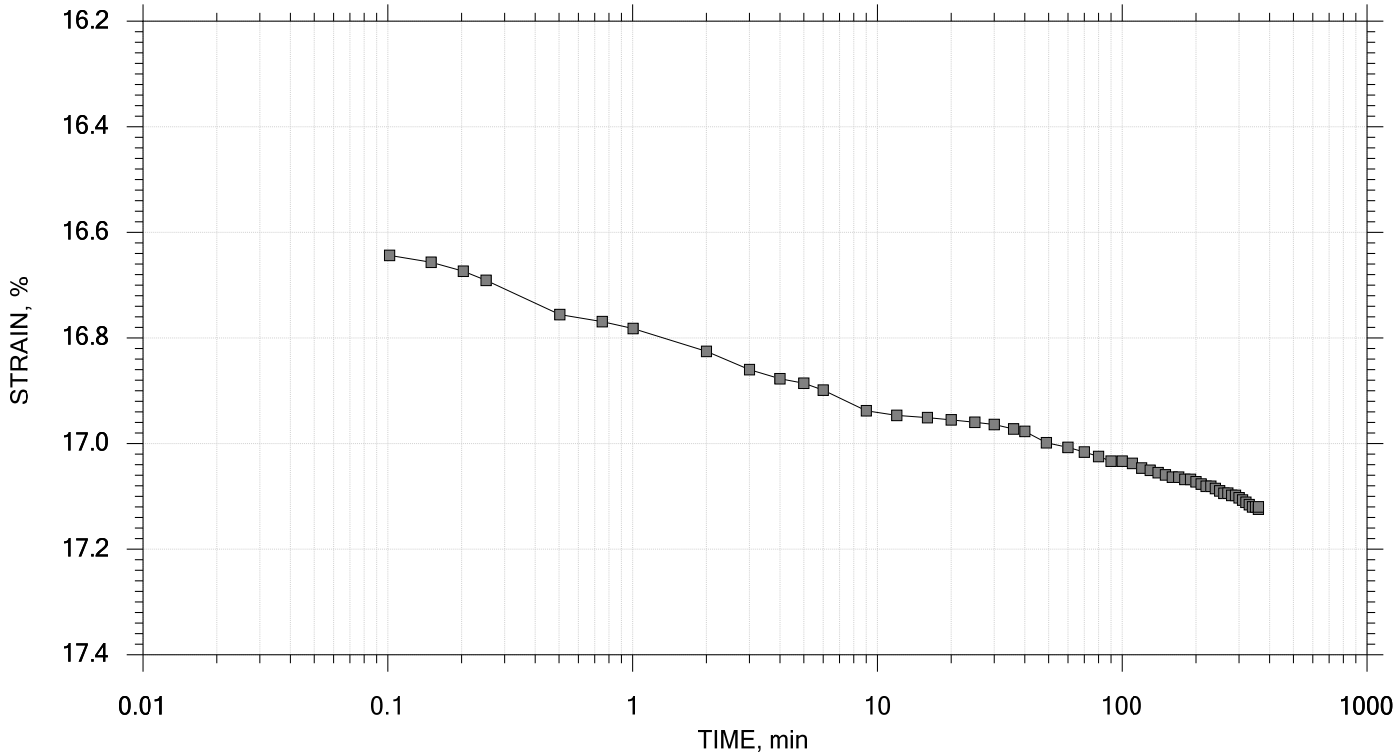
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

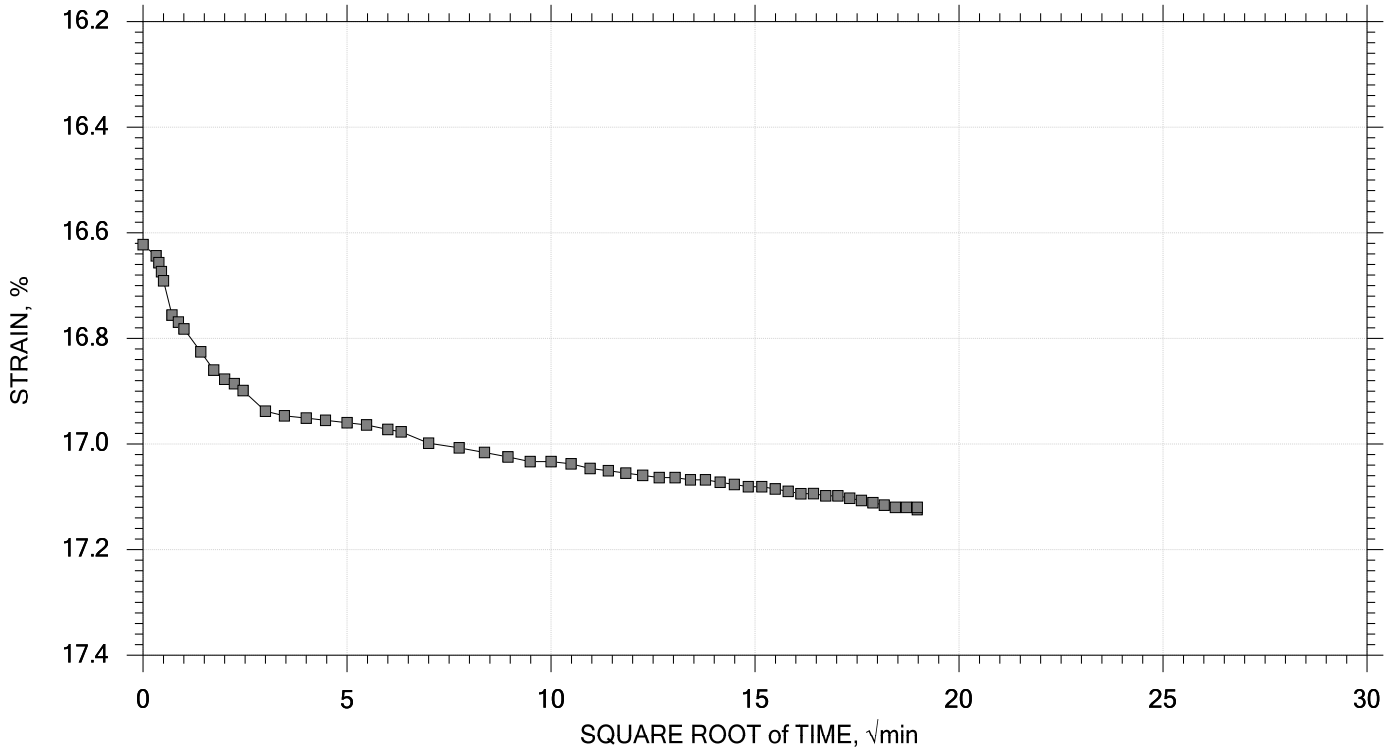
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 14 of 21

Stress: 8000 psf





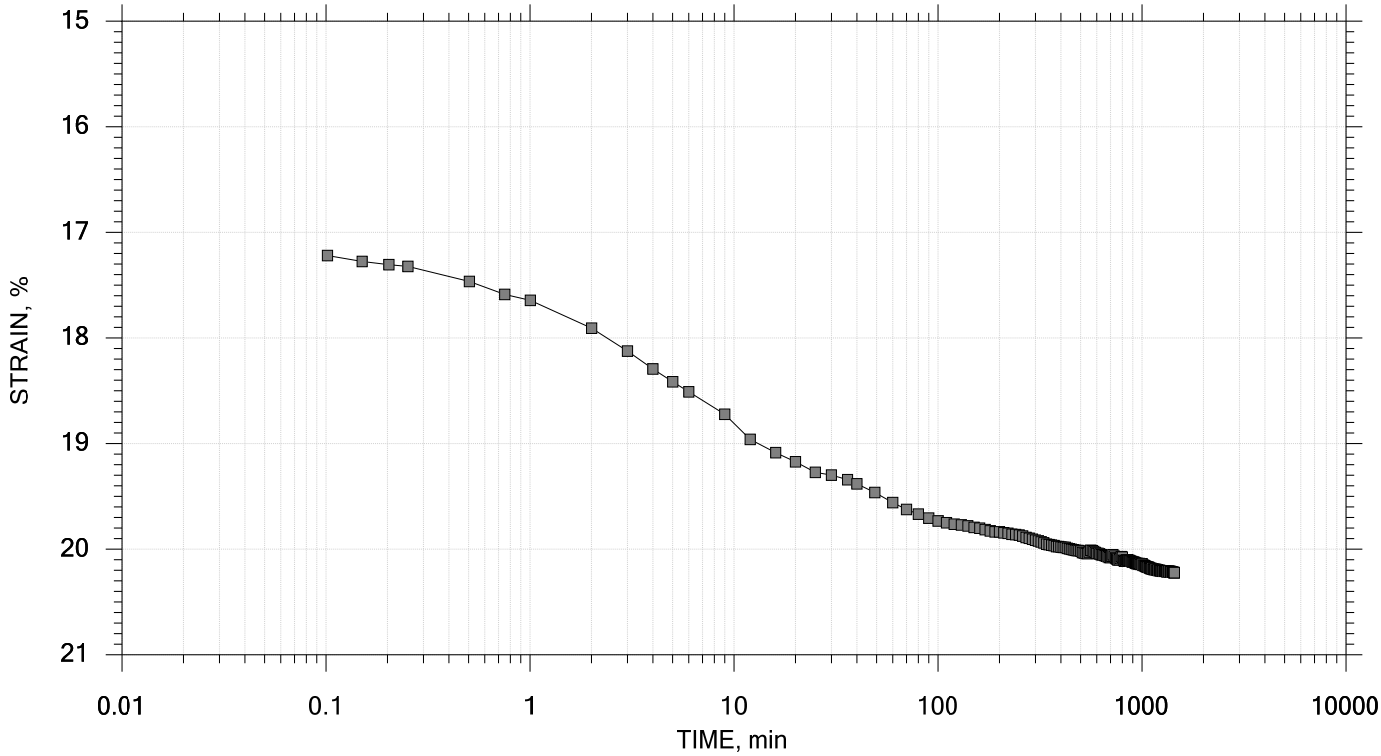
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

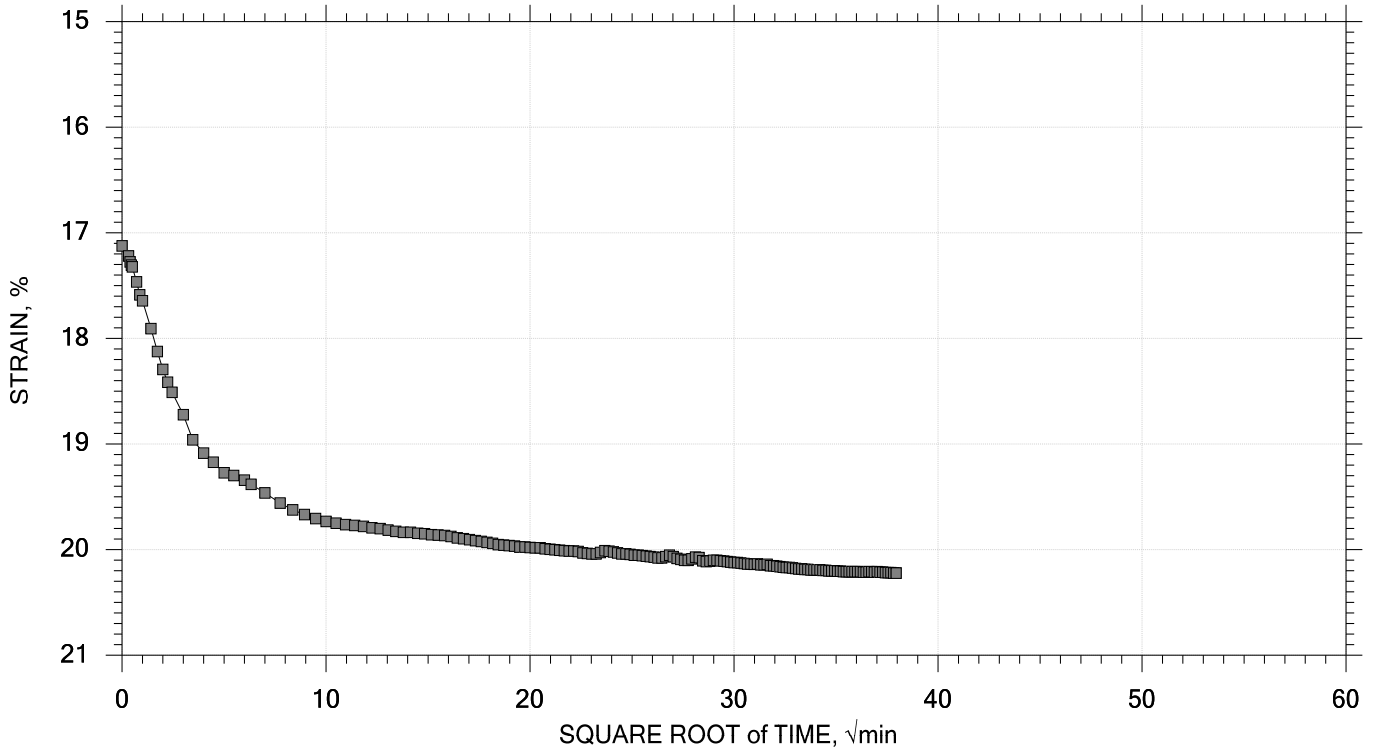
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 15 of 21

Stress: 16000 psf





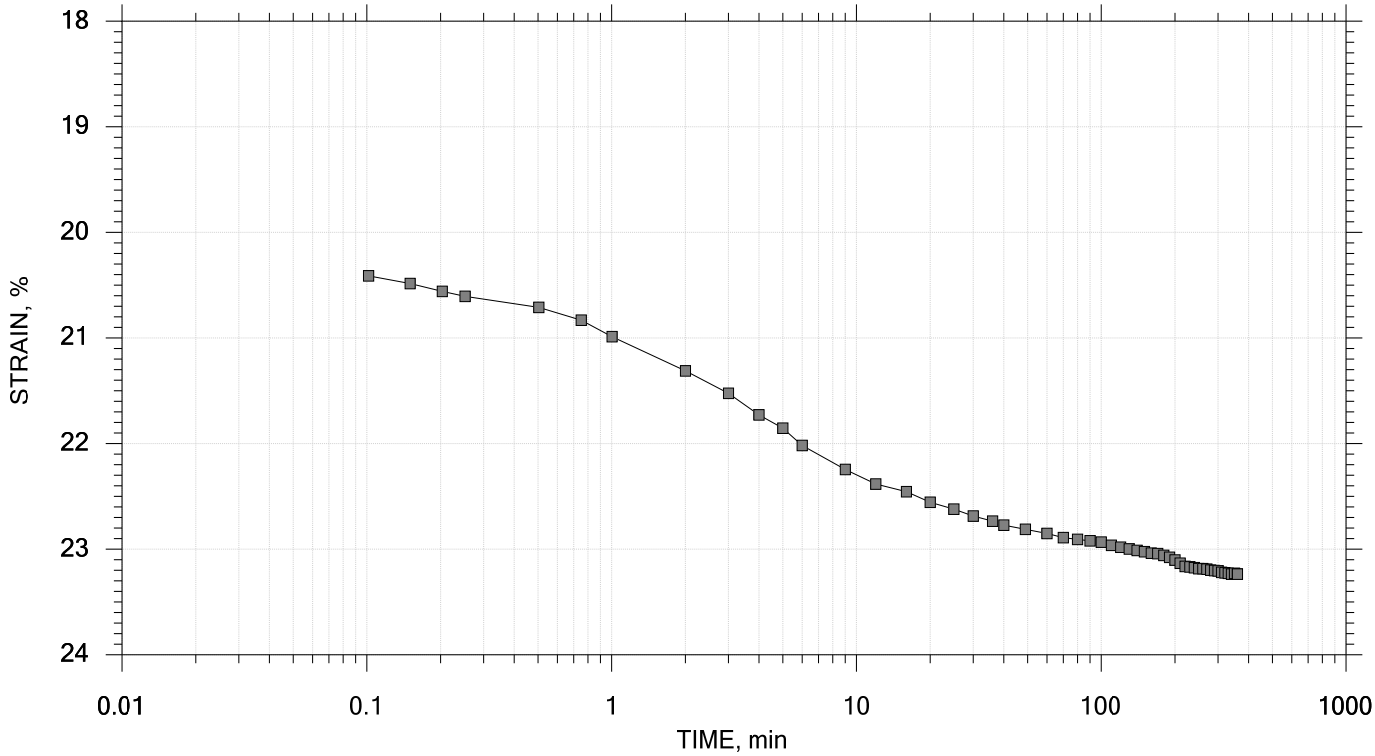
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

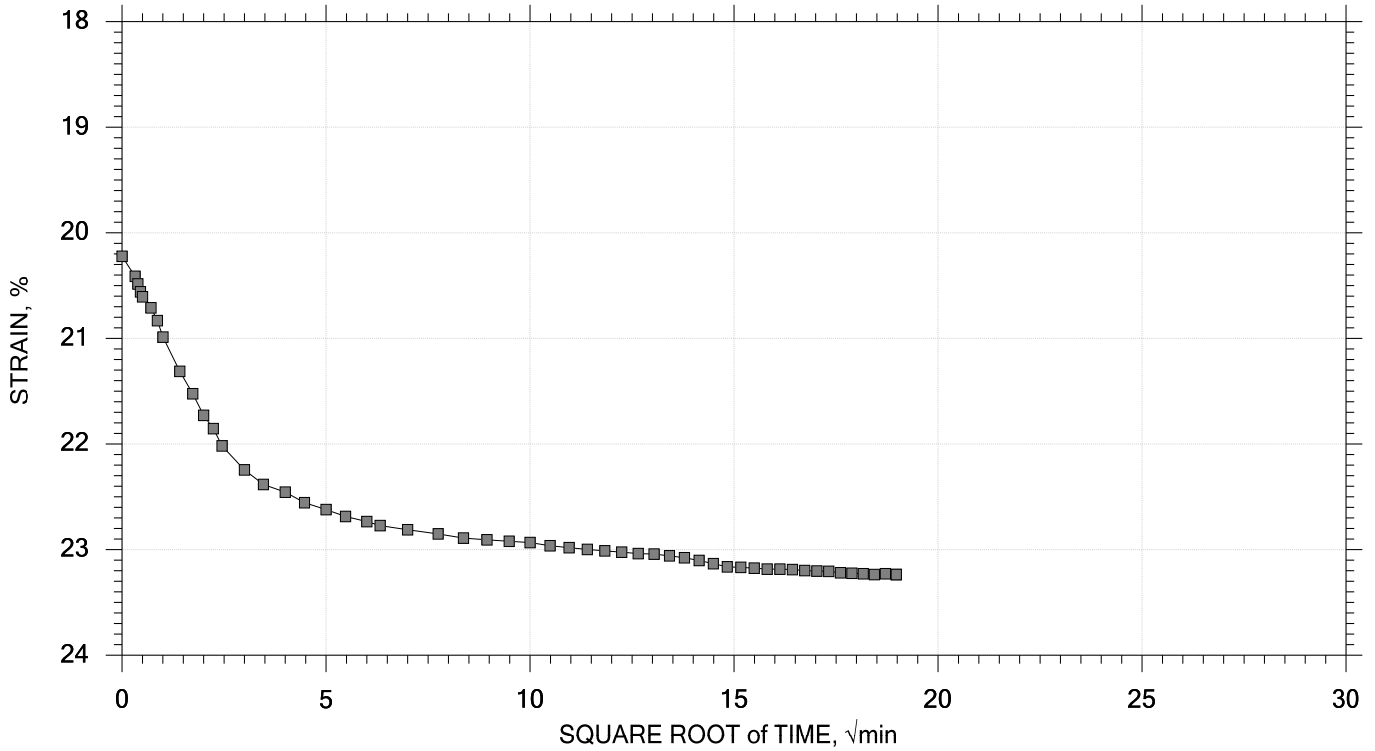
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 16 of 21

Stress: 32000 psf





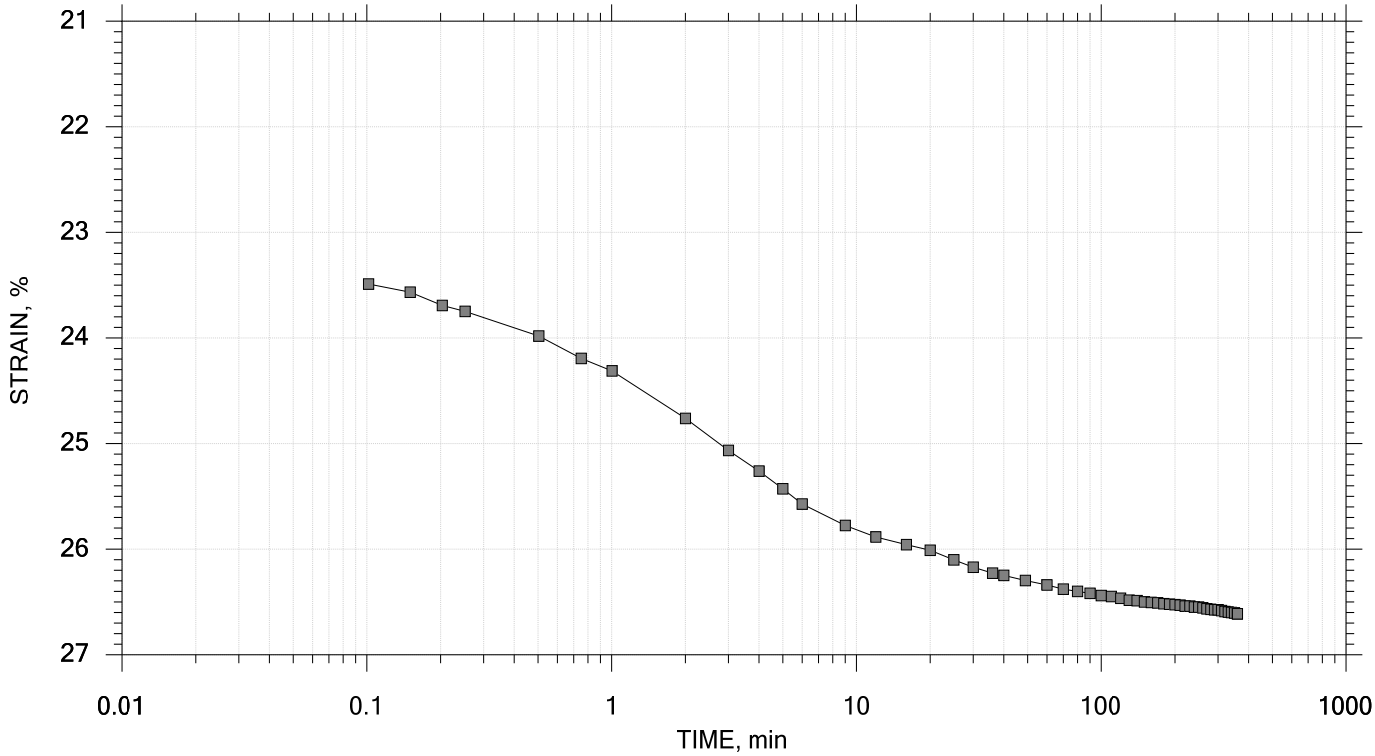
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

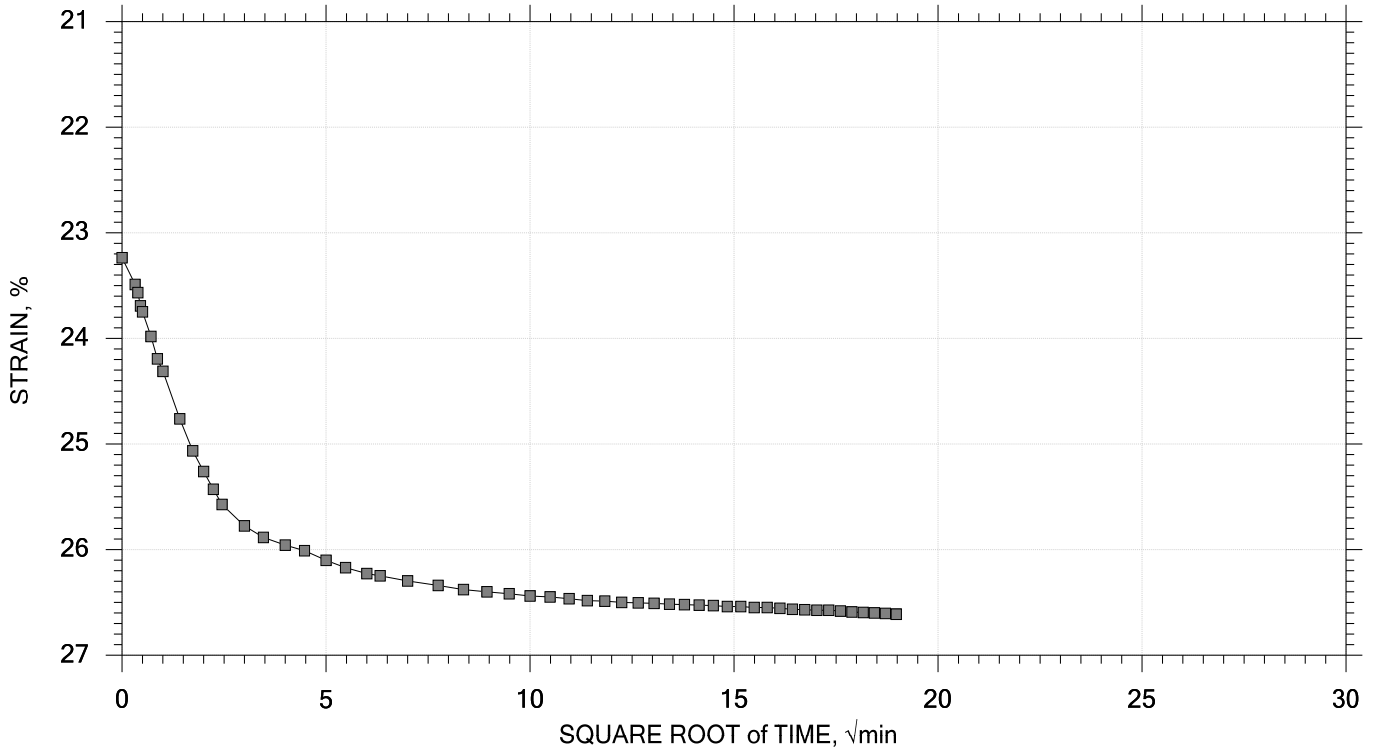
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 17 of 21

Stress: 64000 psf





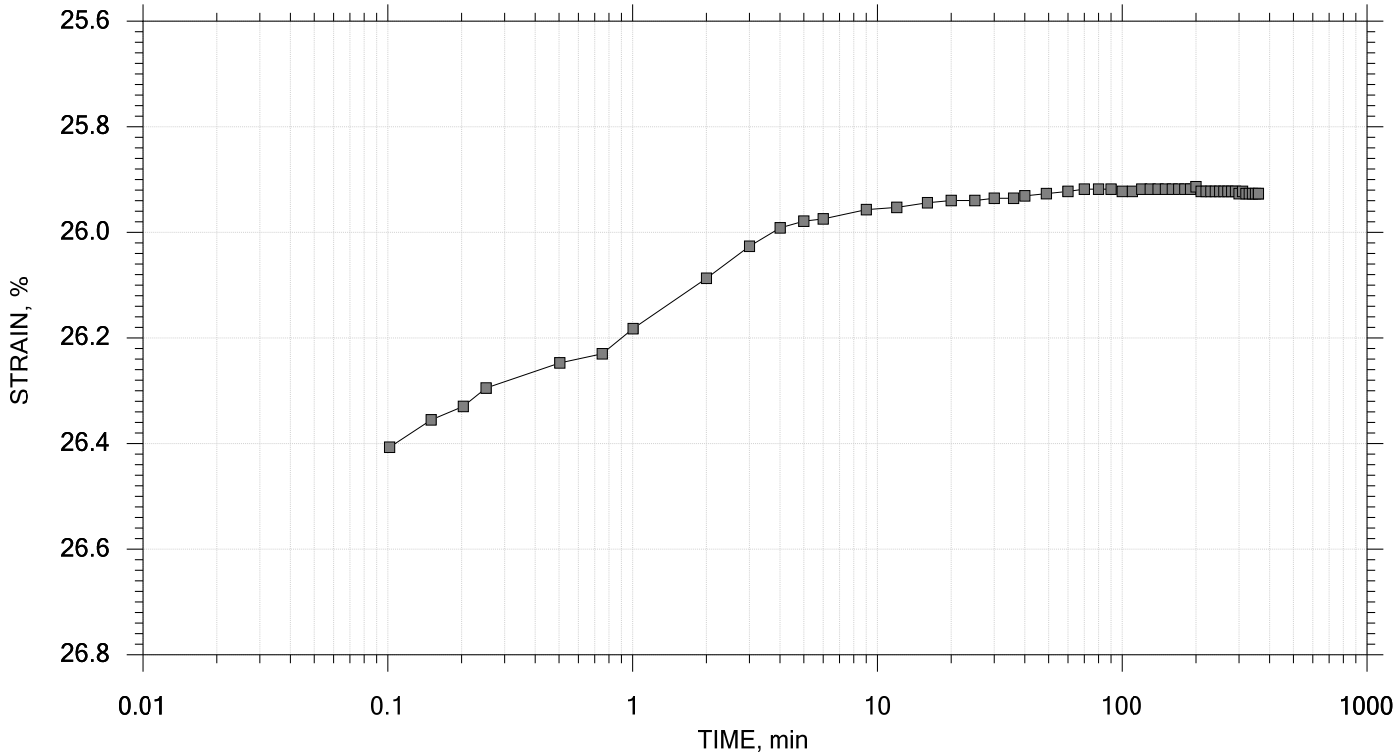
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

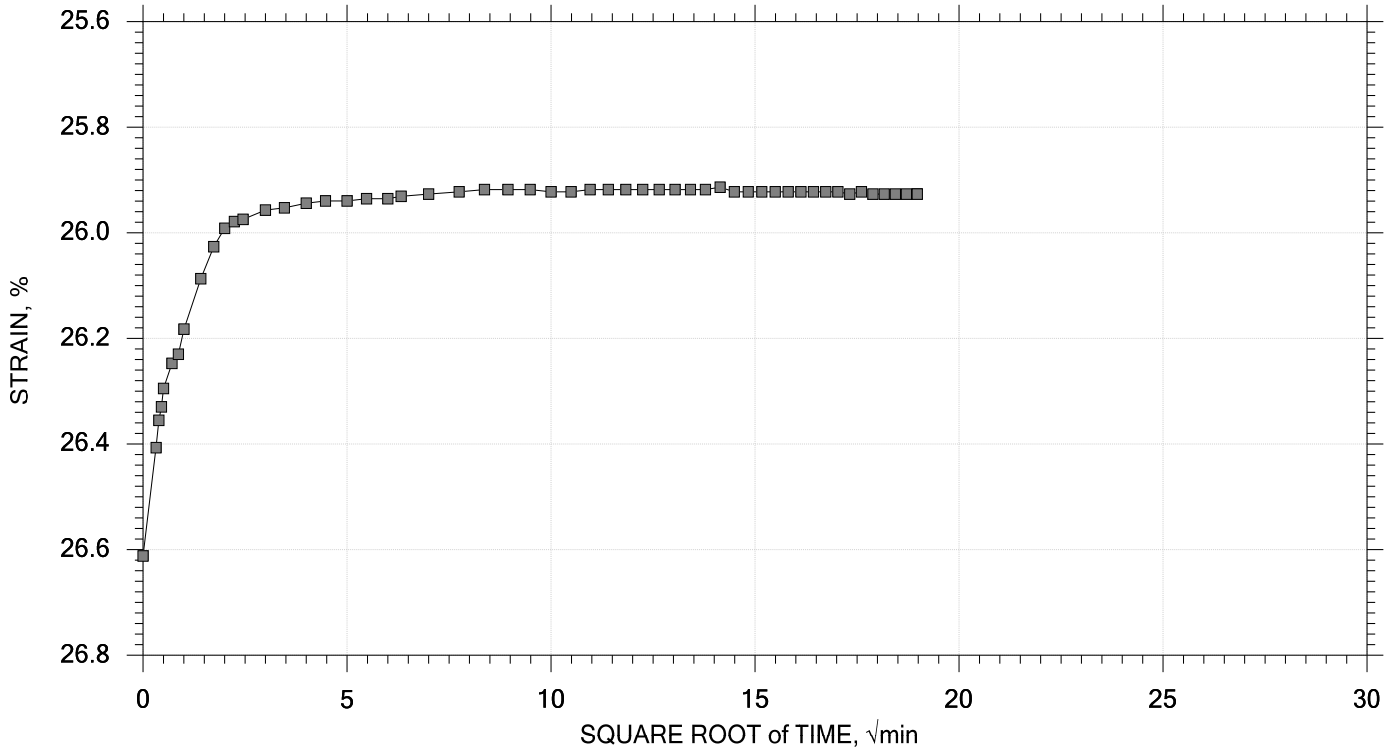
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 18 of 21

Stress: 16000 psf





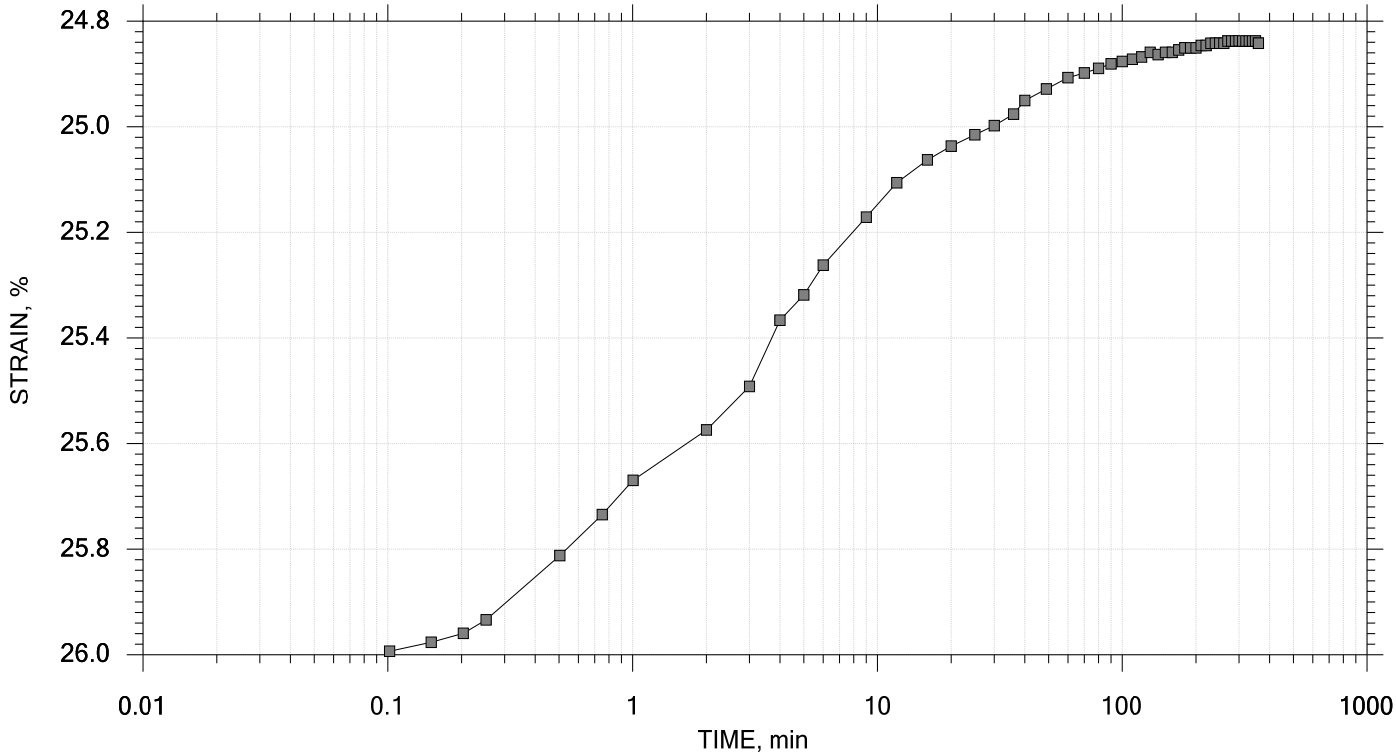
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

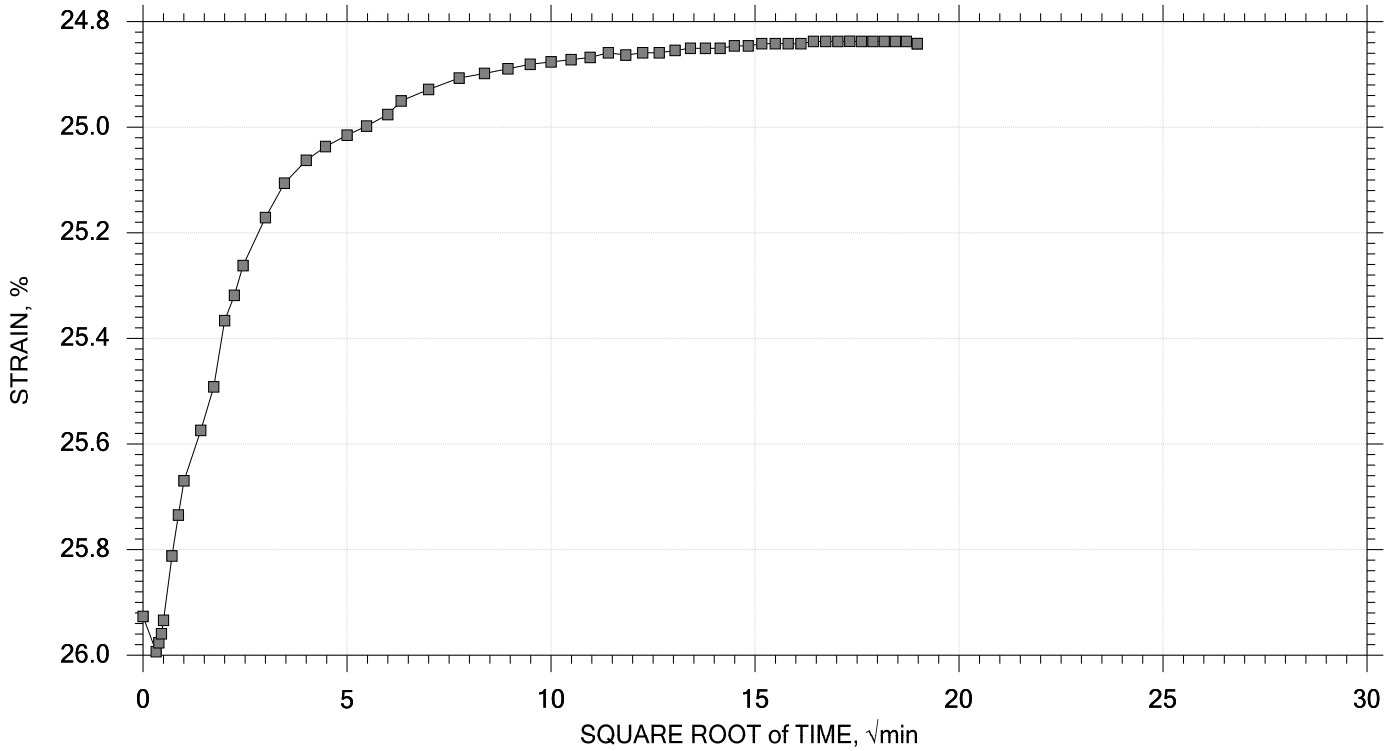
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 19 of 21

Stress: 4000 psf





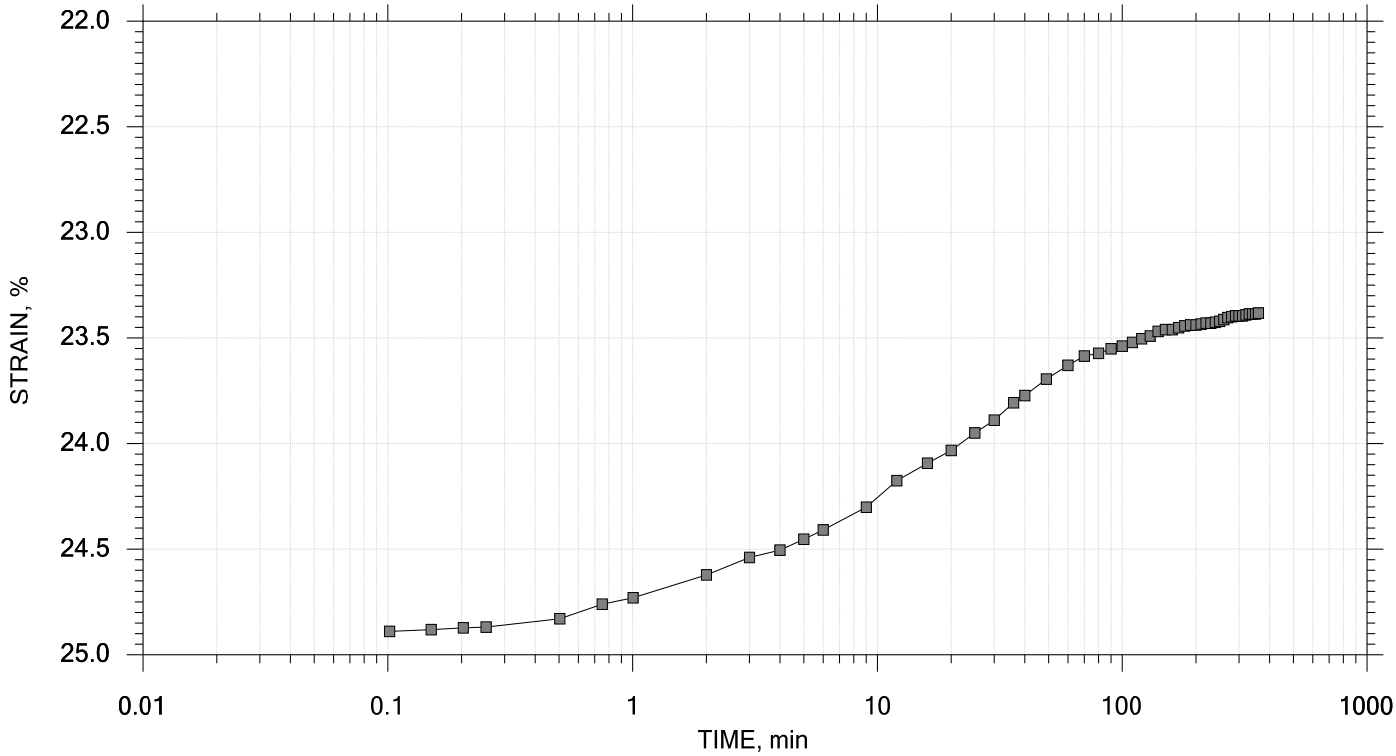
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

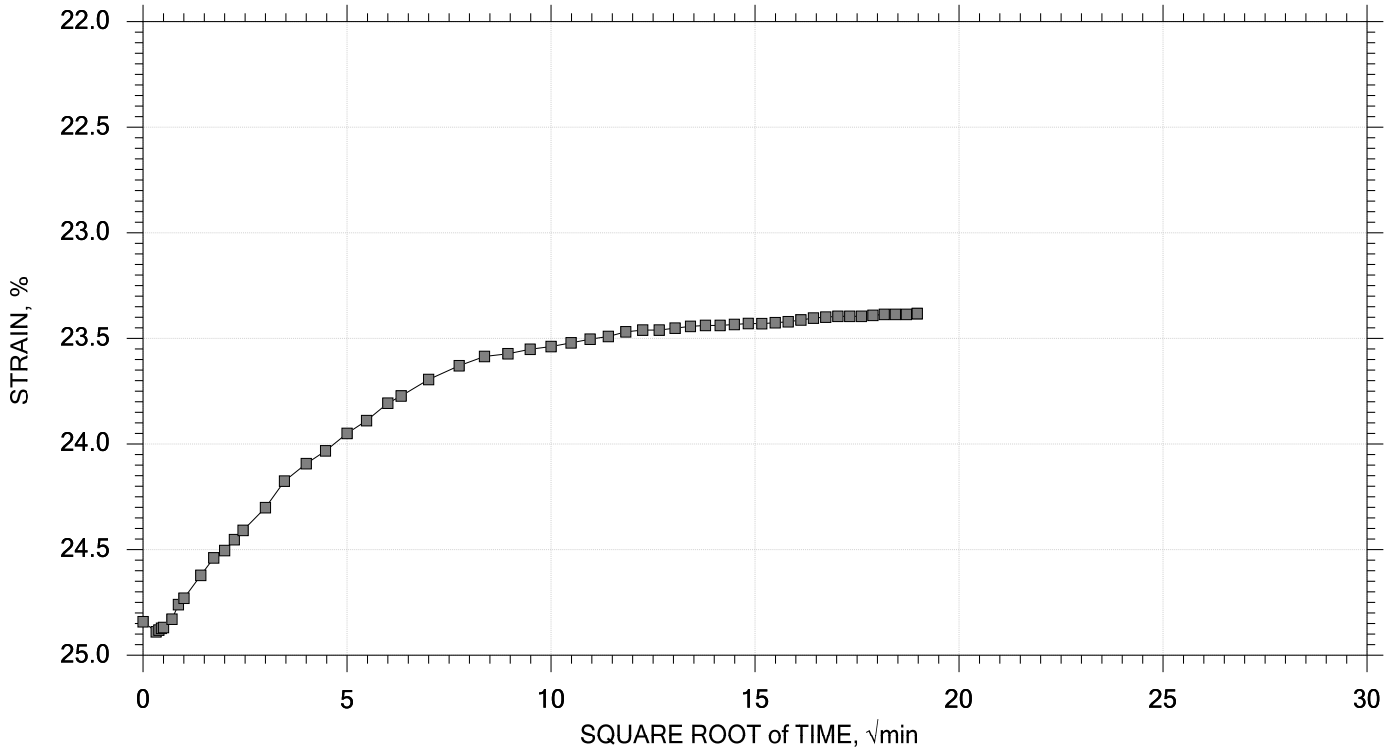
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 20 of 21

Stress: 1000 psf





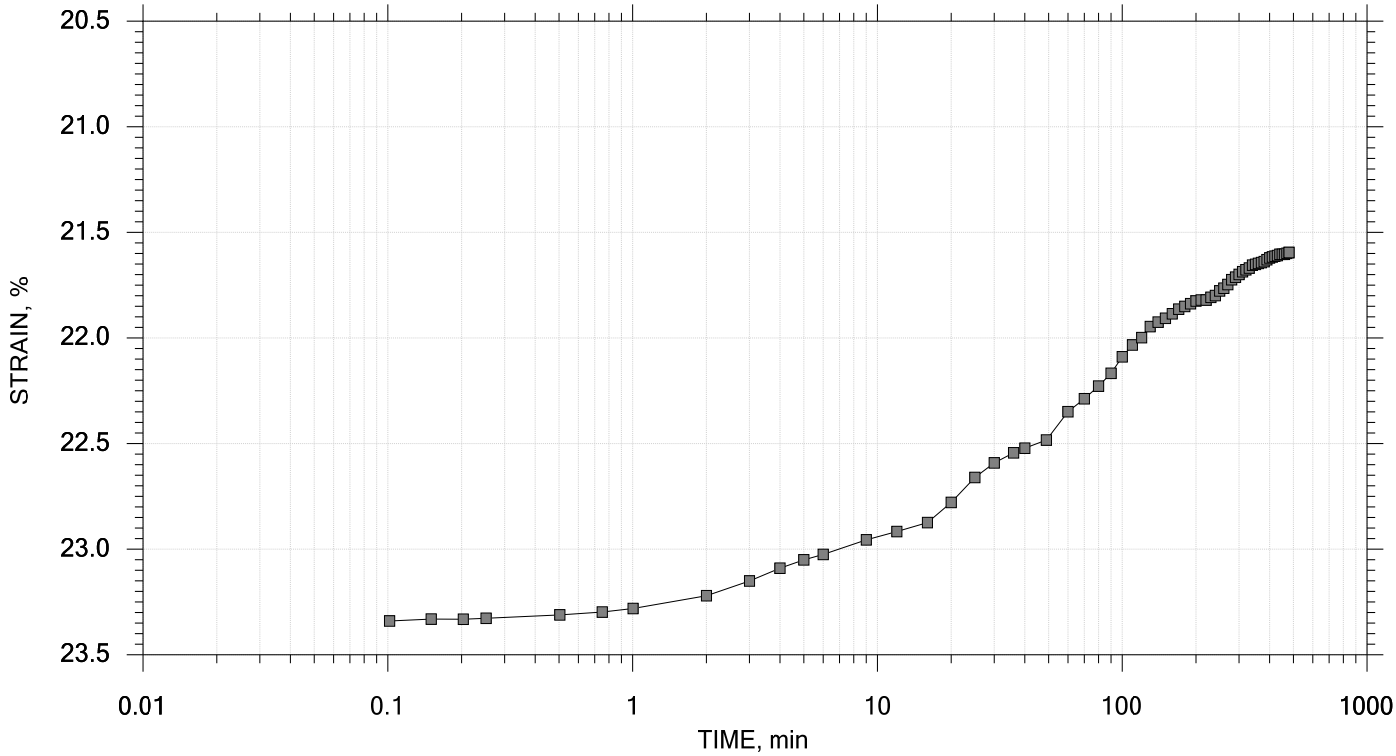
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

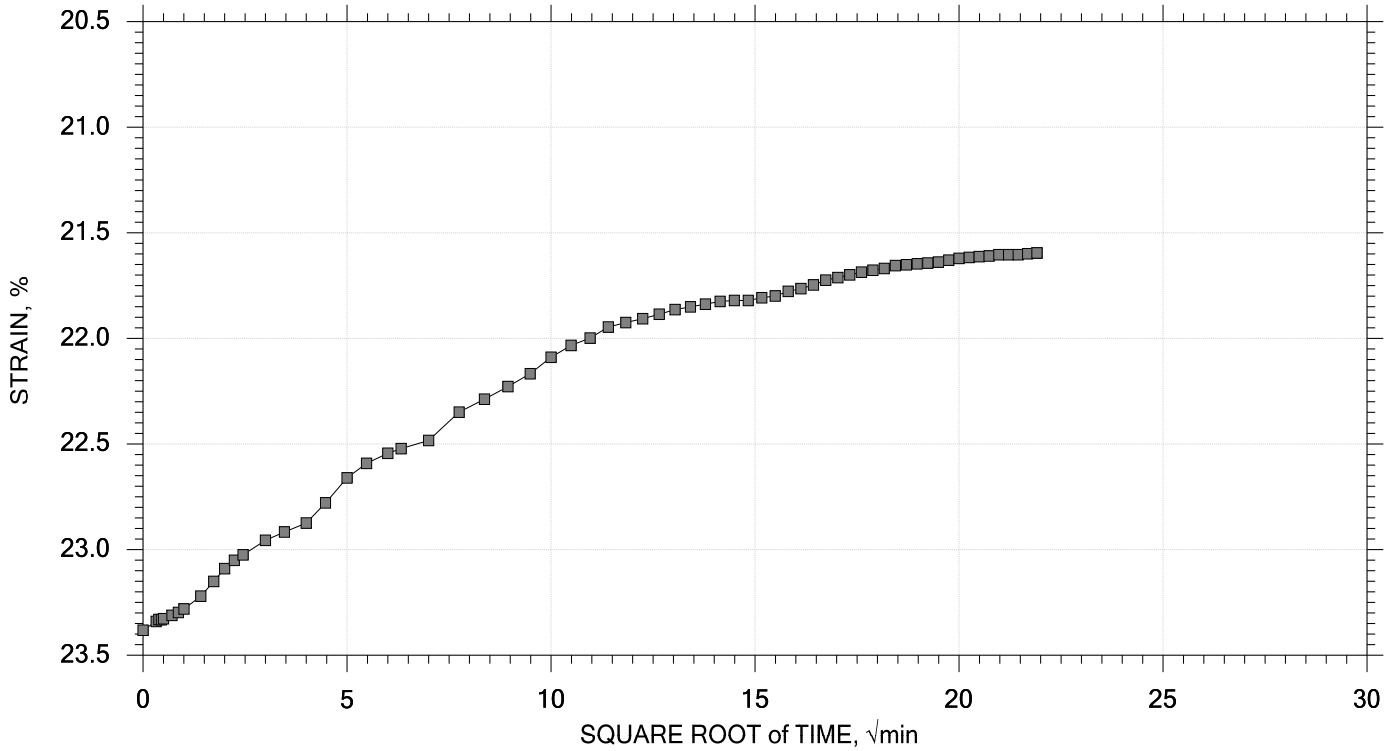
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 21 of 21

Stress: 250 psf

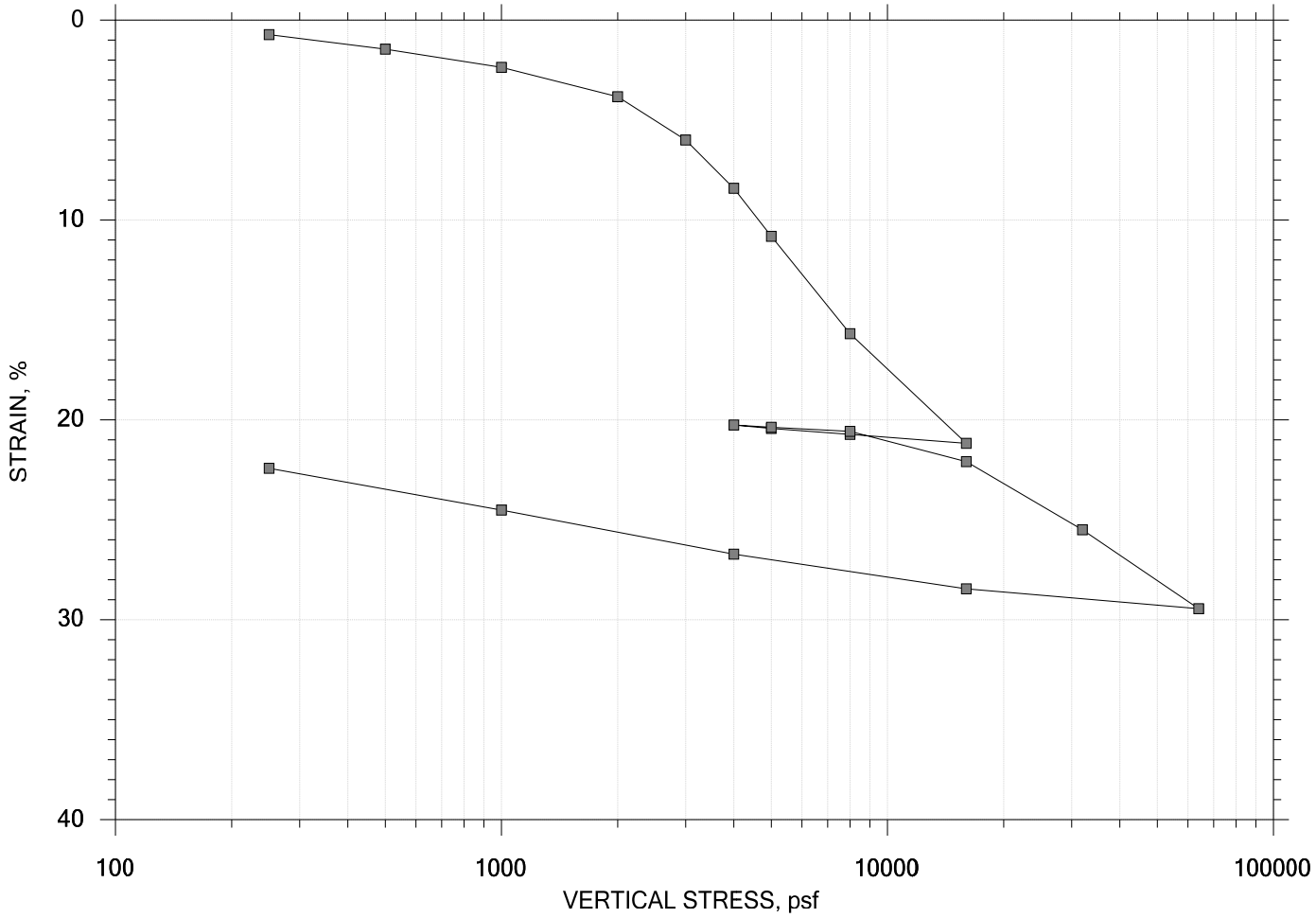


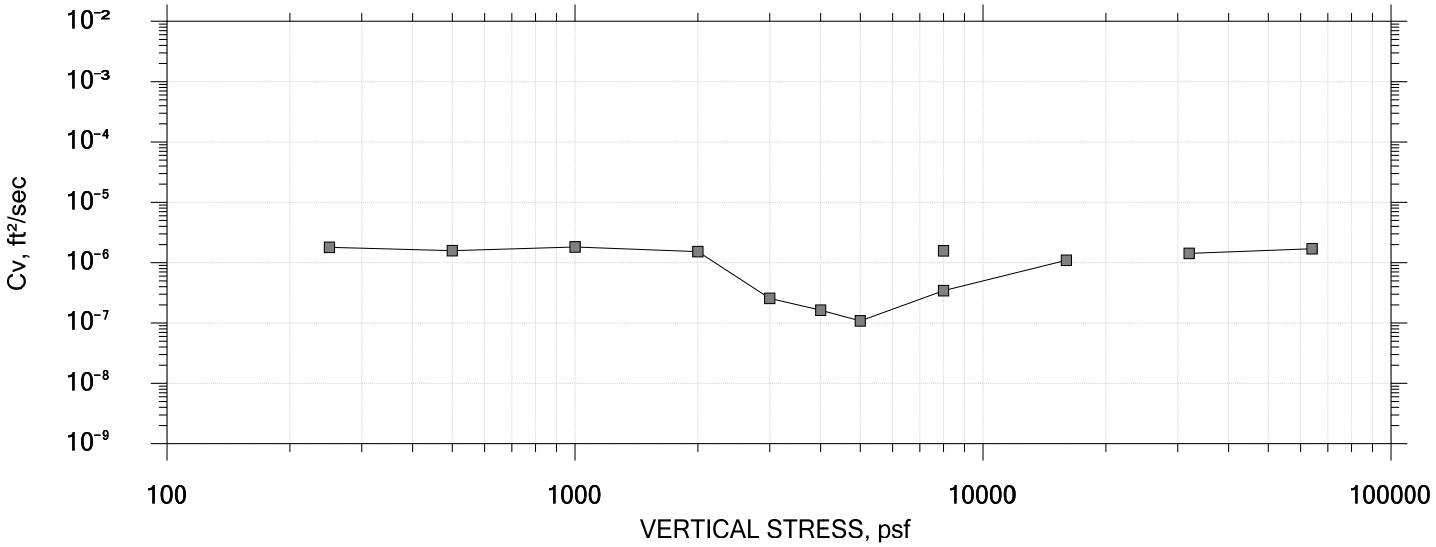


GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-2	Test Date: 04/26/18	Test No.: IP-1
	Depth: 30-32 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System Y		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT

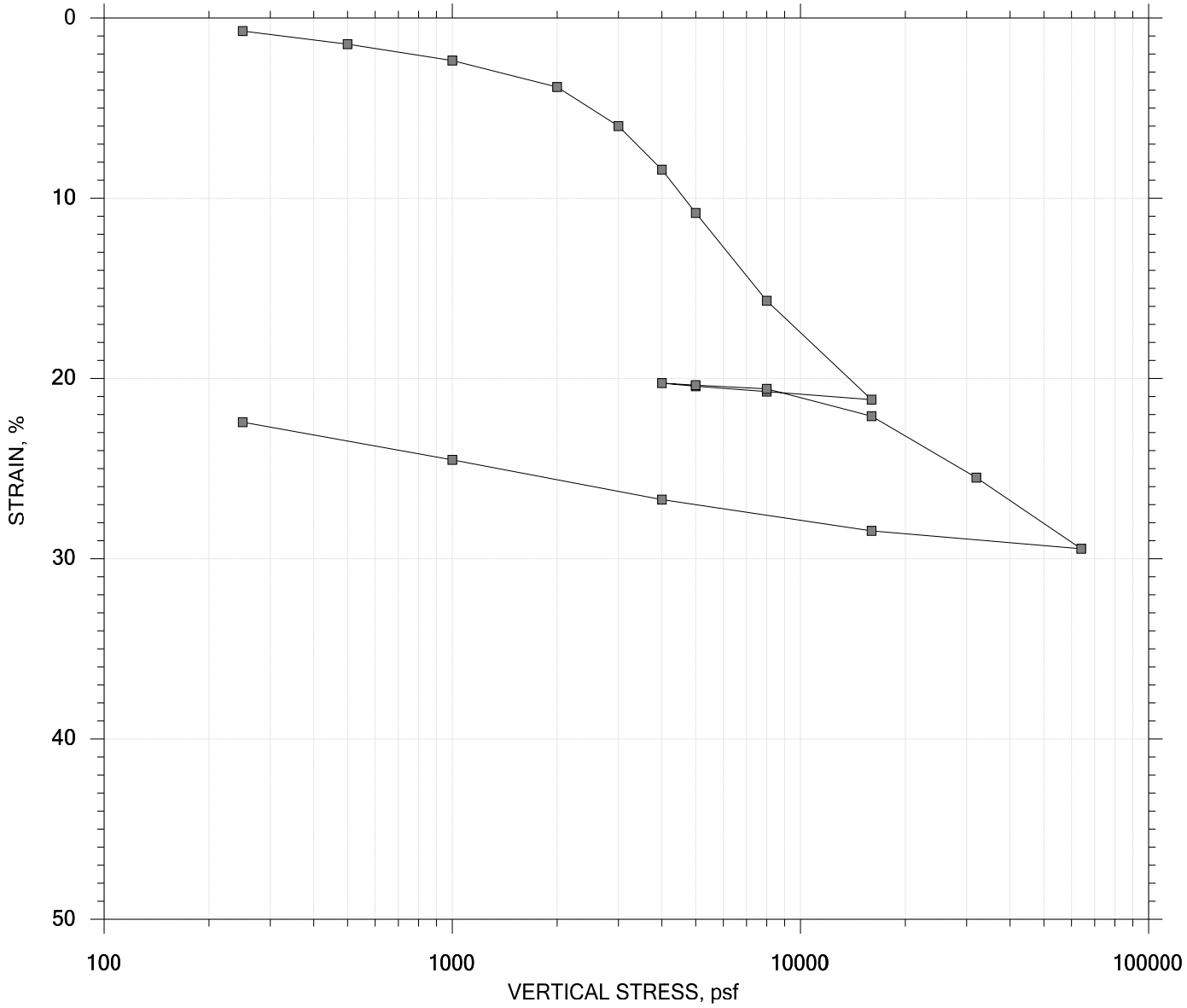




GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



				Before Test	After Test
Current Vertical Effective Stress: ---			Water Content, %	38.71	24.04
Preconsolidation Stress: ---			Dry Unit Weight, pcf	82.488	103.11
Compression Ratio: ---			Saturation, %	98.80	100.00
Diameter: 2.5 in		Height: 1 in	Void Ratio	1.07	0.66
LL: 29	PL: 19	PI: 10	GS: 2.74		

GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Warren Ave Rehabilitation | Location: Portland, ME | Project No.: GTX-308006
Boring No.: WA-E117 | Tested By: md | Checked By: njh
Sample No.: U-3 | Test Date: 05/01/18 | Depth: 50-52 ft
Test No.: IP-3 | Sample Type: intact | Elevation: ---

Soil Description: Wet, dark gray clay
Remarks: System T

Estimated Specific Gravity: 2.74 | Liquid Limit: 29 | Specimen Diameter: 2.50 in
Initial Void Ratio: 1.07 | Plastic Limit: 19 | Initial Height: 1.00 in
Final Void Ratio: 0.659 | Plasticity Index: 10 | Final Height: 0.80 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	D-1568	RING		C-587
Wt. Container + Wet Soil, gm	96.880	258.71	243.12	138.15
Wt. Container + Dry Soil, gm	72.380	217.57	217.57	113.03
Wt. Container, gm	8.3200	111.28	111.28	8.5400
Wt. Dry Soil, gm	64.060	106.29	106.29	104.49
Water Content, %	38.25	38.71	24.04	24.04
Void Ratio	---	1.07	0.659	---
Degree of Saturation, %	---	98.80	100.00	---
Dry Unit Weight, pcf	---	82.488	103.11	---

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.

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Warren Ave Rehabilitation
Boring No.: WA-E117
Sample No.: U-3
Test No.: IP-3

Location: Portland, ME
Tested By: md
Test Date: 05/01/18
Sample Type: intact

Project No.: GTX-308006
Checked By: njh
Depth: 50-52 ft
Elevation: ---

Soil Description: Wet, dark gray clay
Remarks: System T

Displacement at End of Increment

	Applied Stress psf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft²/sec	Mv 1/psf	k ft/day
1	250.	0.007241	1.06	0.724	16.113	1.51e-006	2.90e-005	2.36e-004
2	500.	0.01449	1.04	1.45	16.524	1.45e-006	2.90e-005	2.27e-004
3	1.00e+003	0.02357	1.02	2.36	14.598	1.62e-006	1.82e-005	1.58e-004
4	2.00e+003	0.03831	0.994	3.83	15.472	1.49e-006	1.47e-005	1.18e-004
5	3.00e+003	0.06000	0.949	6.00	86.230	2.57e-007	2.17e-005	3.01e-005
6	4.00e+003	0.08413	0.899	8.41	132.319	1.60e-007	2.41e-005	2.08e-005
7	5.00e+003	0.1082	0.849	10.8	184.689	1.09e-007	2.40e-005	1.41e-005
8	8.00e+003	0.1568	0.748	15.7	55.409	3.33e-007	1.62e-005	2.92e-005
9	1.60e+004	0.2117	0.634	21.2	16.182	1.01e-006	6.86e-006	3.73e-005
10	8.00e+003	0.2072	0.644	20.7	6.123	2.50e-006	5.55e-007	7.49e-006
11	5.00e+003	0.2043	0.650	20.4	6.259	2.47e-006	9.78e-007	1.30e-005
12	4.00e+003	0.2025	0.653	20.3	19.907	7.82e-007	1.76e-006	7.42e-006
13	5.00e+003	0.2037	0.651	20.4	0.000	0.00e+000	1.14e-006	0.00e+000
14	8.00e+003	0.2058	0.647	20.6	11.987	1.29e-006	6.92e-007	4.83e-006
15	1.60e+004	0.2209	0.615	22.1	0.000	0.00e+000	1.89e-006	0.00e+000
16	3.20e+004	0.2550	0.545	25.5	11.062	1.29e-006	2.13e-006	1.48e-005
17	6.40e+004	0.2945	0.463	29.4	7.657	1.69e-006	1.23e-006	1.12e-005
18	1.60e+004	0.2845	0.483	28.5	3.001	4.13e-006	2.07e-007	4.61e-006
19	4.00e+003	0.2672	0.519	26.7	15.263	8.43e-007	1.45e-006	6.57e-006
20	1.00e+003	0.2451	0.565	24.5	52.084	2.61e-007	7.36e-006	1.04e-005
21	250.	0.2242	0.608	22.4	250.301	5.74e-008	2.78e-005	8.62e-006

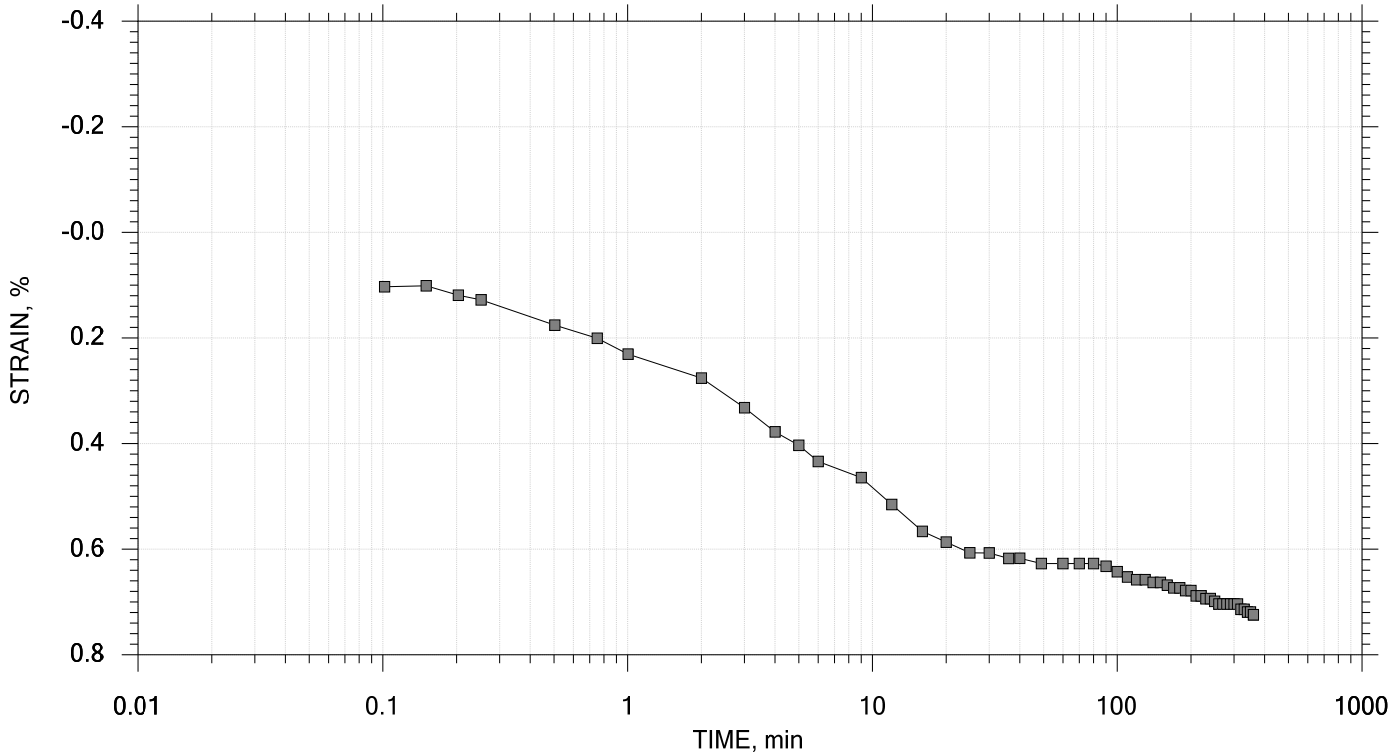
	Applied Stress psf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/sec	Mv 1/psf	k ft/day	Ca %
1	250.	0.007241	1.06	0.724	2.922	1.94e-006	2.90e-005	3.03e-004	0.00e+000
2	500.	0.01449	1.04	1.45	0.000	0.00e+000	2.90e-005	0.00e+000	0.00e+000
3	1.00e+003	0.02357	1.02	2.36	2.918	1.88e-006	1.82e-005	1.84e-004	0.00e+000
4	2.00e+003	0.03831	0.994	3.83	4.389	1.22e-006	1.47e-005	9.70e-005	0.00e+000
5	3.00e+003	0.06000	0.949	6.00	0.000	0.00e+000	2.17e-005	0.00e+000	0.00e+000
6	4.00e+003	0.08413	0.899	8.41	0.000	0.00e+000	2.41e-005	0.00e+000	0.00e+000
7	5.00e+003	0.1082	0.849	10.8	0.000	0.00e+000	2.40e-005	0.00e+000	0.00e+000
8	8.00e+003	0.1568	0.748	15.7	13.181	3.25e-007	1.62e-005	2.85e-005	0.00e+000
9	1.60e+004	0.2117	0.634	21.2	3.692	1.03e-006	6.86e-006	3.80e-005	0.00e+000
10	8.00e+003	0.2072	0.644	20.7	0.000	0.00e+000	5.55e-007	0.00e+000	0.00e+000
11	5.00e+003	0.2043	0.650	20.4	0.000	0.00e+000	9.78e-007	0.00e+000	0.00e+000
12	4.00e+003	0.2025	0.653	20.3	0.000	0.00e+000	1.76e-006	0.00e+000	0.00e+000
13	5.00e+003	0.2037	0.651	20.4	0.000	0.00e+000	1.14e-006	0.00e+000	0.00e+000
14	8.00e+003	0.2058	0.647	20.6	0.000	0.00e+000	6.92e-007	0.00e+000	0.00e+000
15	1.60e+004	0.2209	0.615	22.1	0.000	0.00e+000	1.89e-006	0.00e+000	0.00e+000
16	3.20e+004	0.2550	0.545	25.5	2.365	1.40e-006	2.13e-006	1.61e-005	0.00e+000
17	6.40e+004	0.2945	0.463	29.4	1.968	1.52e-006	1.23e-006	1.01e-005	0.00e+000
18	1.60e+004	0.2845	0.483	28.5	0.000	0.00e+000	2.07e-007	0.00e+000	0.00e+000
19	4.00e+003	0.2672	0.519	26.7	0.000	0.00e+000	1.45e-006	0.00e+000	0.00e+000
20	1.00e+003	0.2451	0.565	24.5	12.171	2.59e-007	7.36e-006	1.03e-005	0.00e+000
21	250.	0.2242	0.608	22.4	0.000	0.00e+000	2.78e-005	0.00e+000	0.00e+000

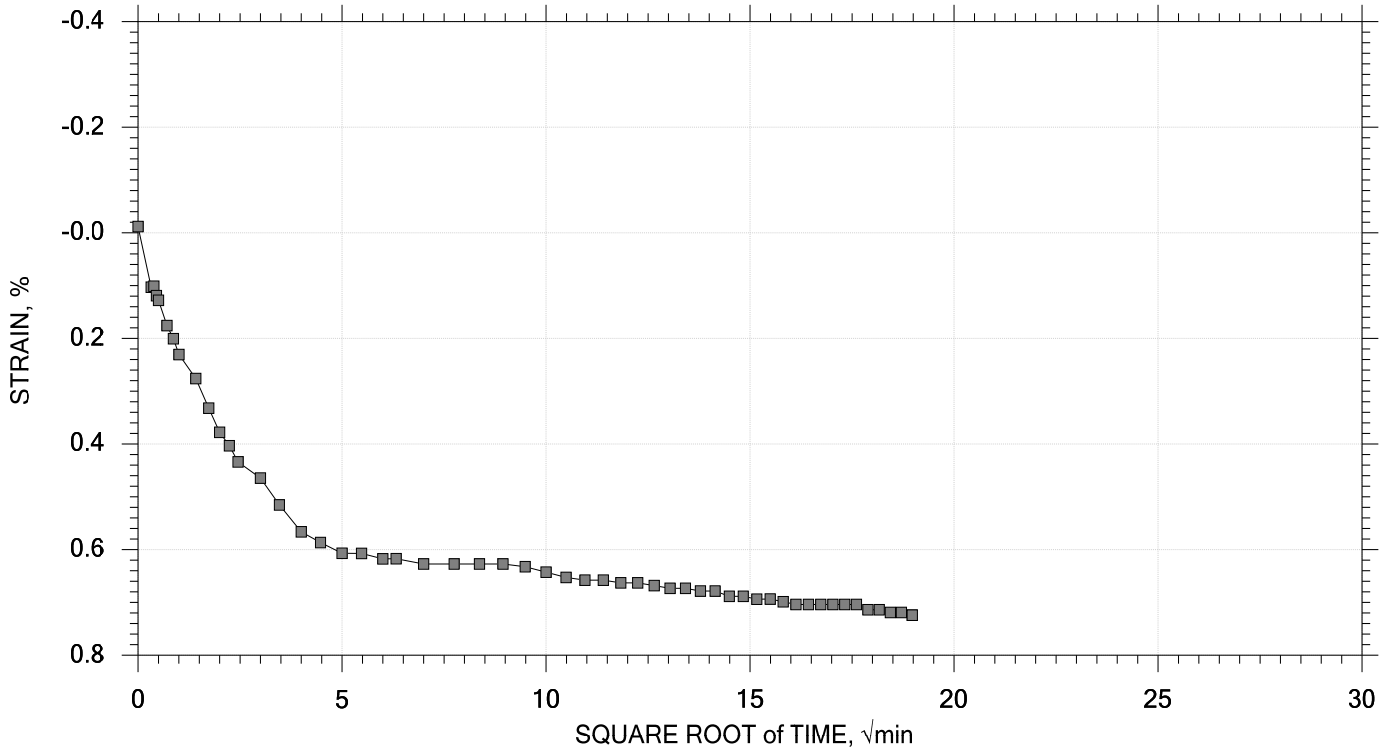
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 1 of 21

Stress: 250 psf





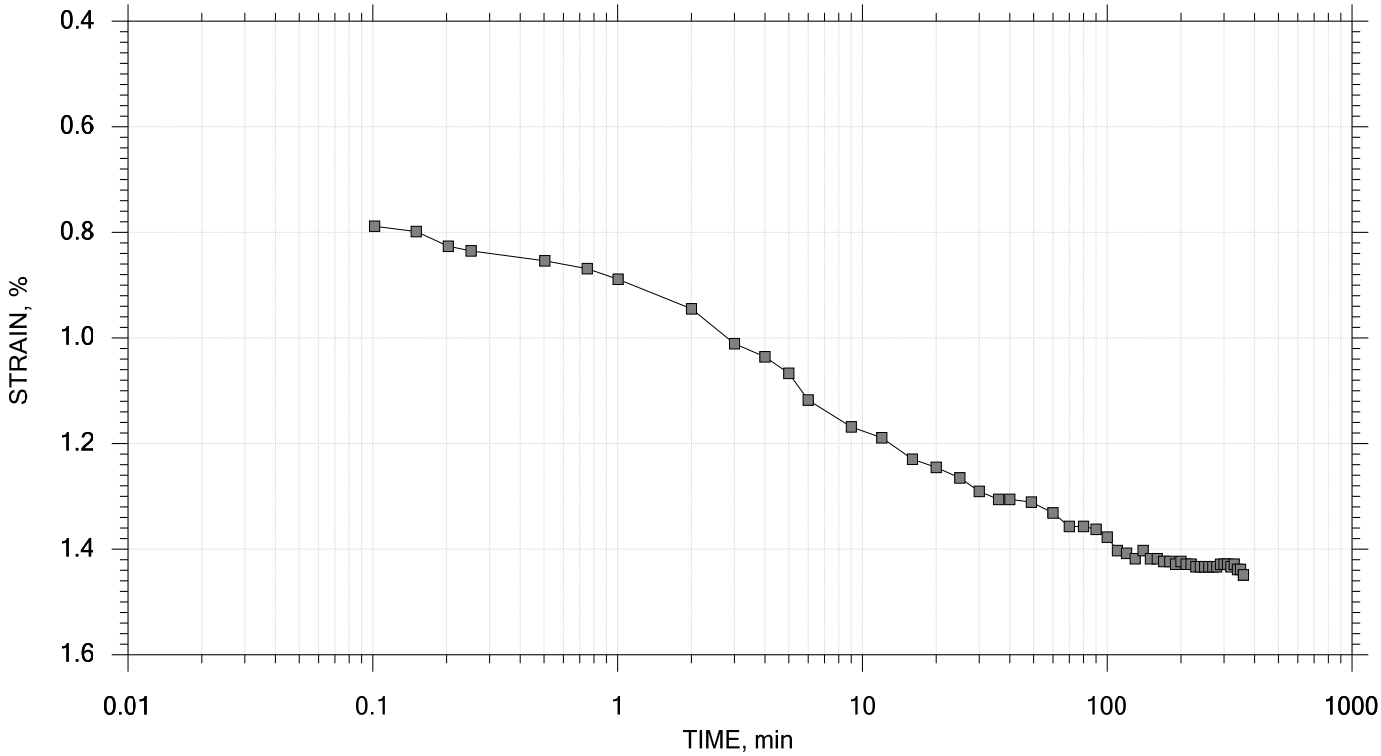
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

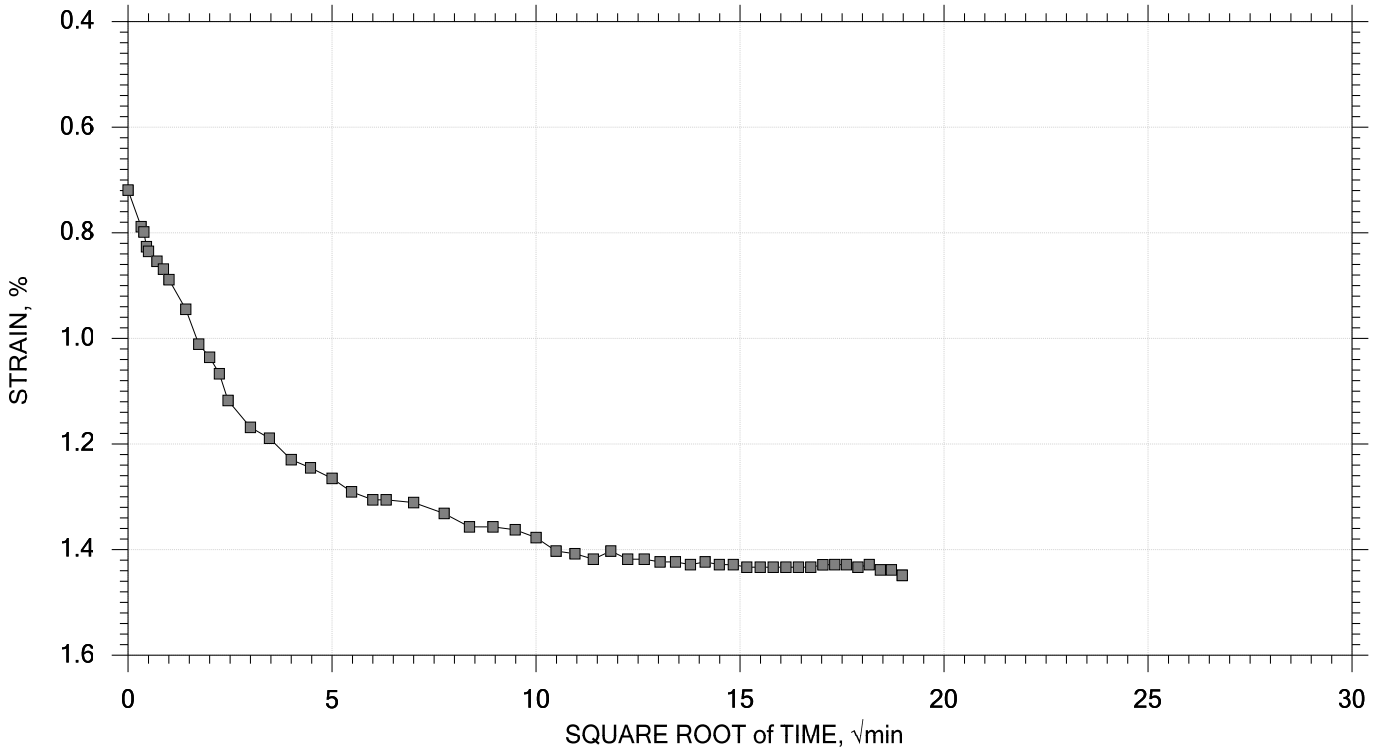
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 2 of 21

Stress: 500 psf





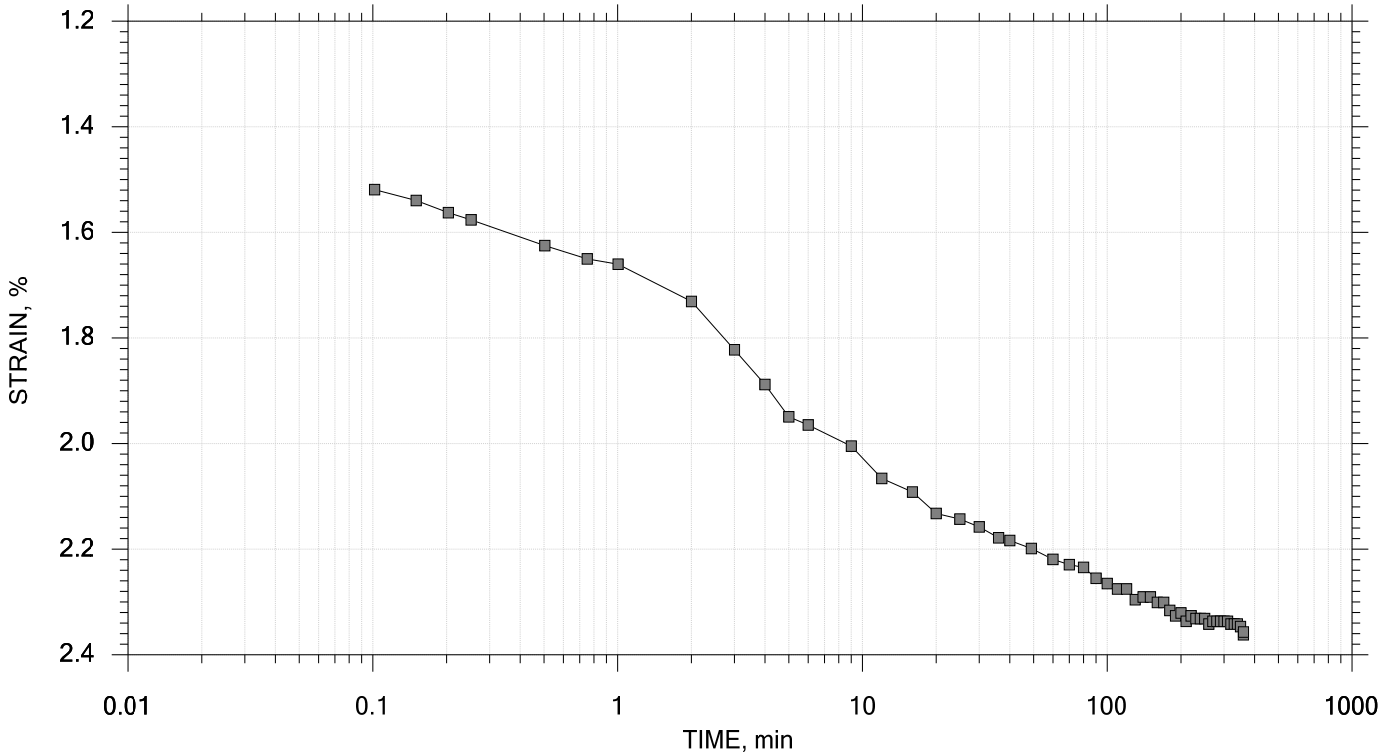
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

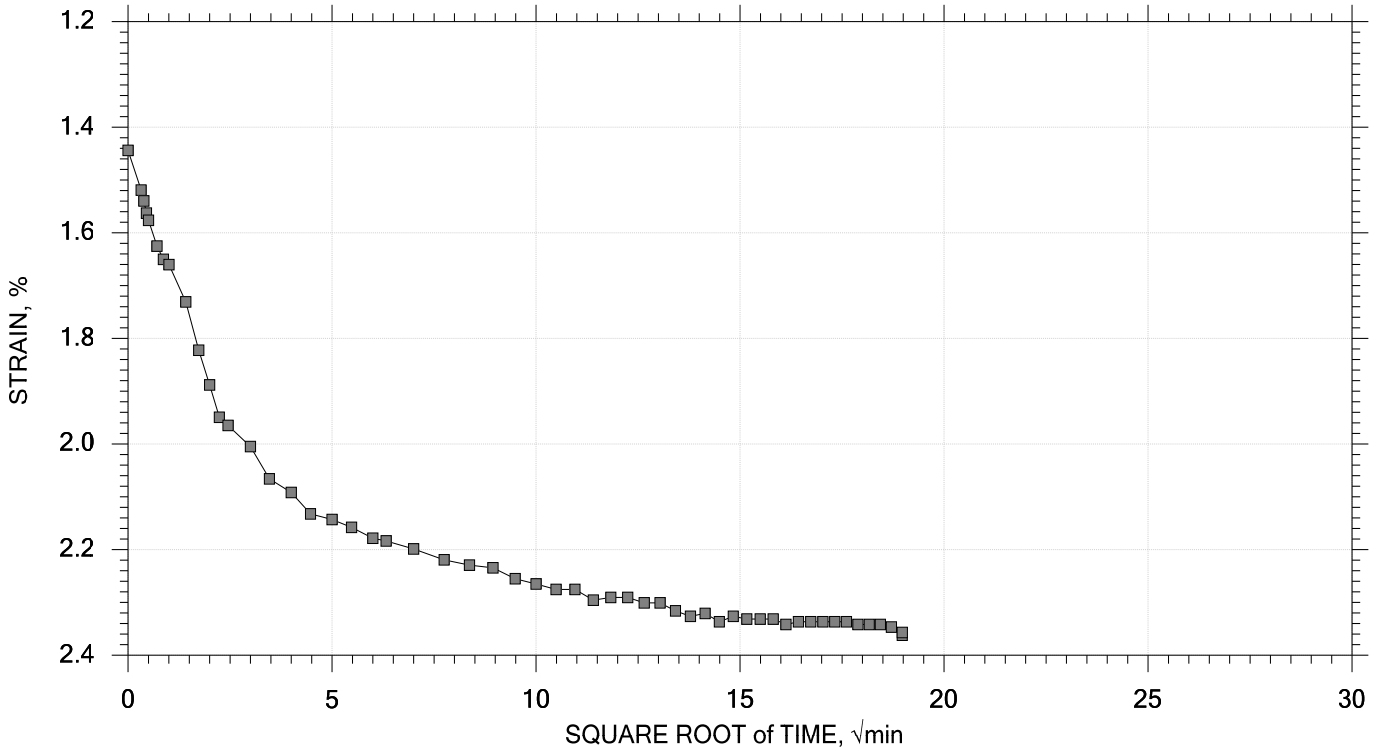
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 3 of 21

Stress: 1000 psf





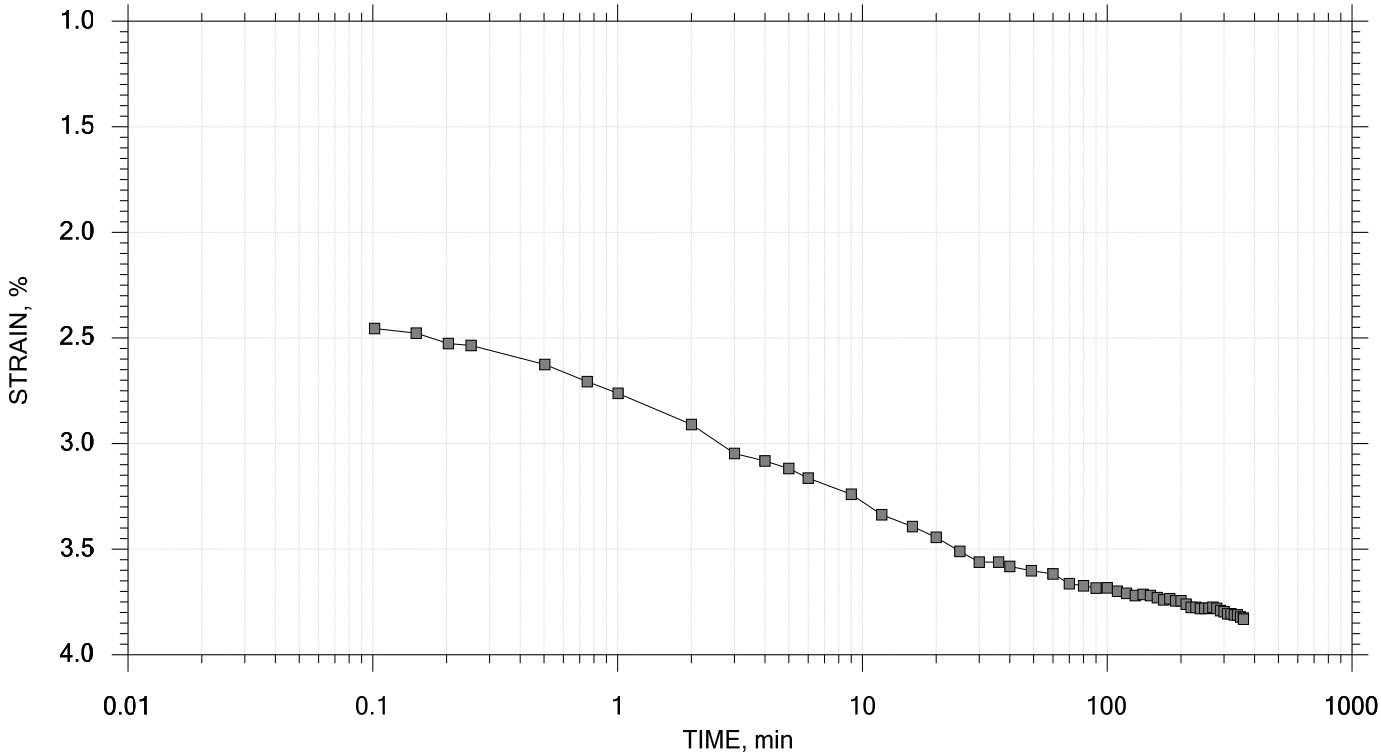
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

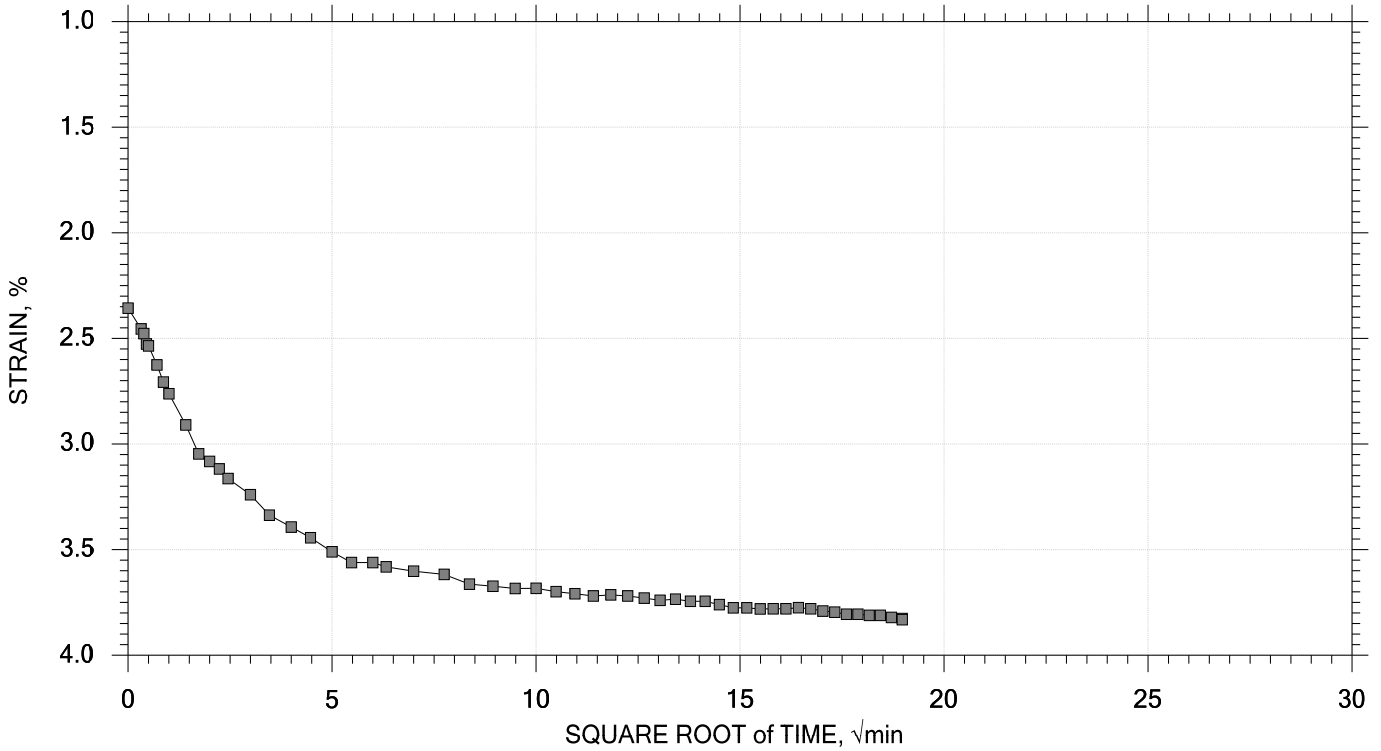
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 4 of 21

Stress: 2000 psf





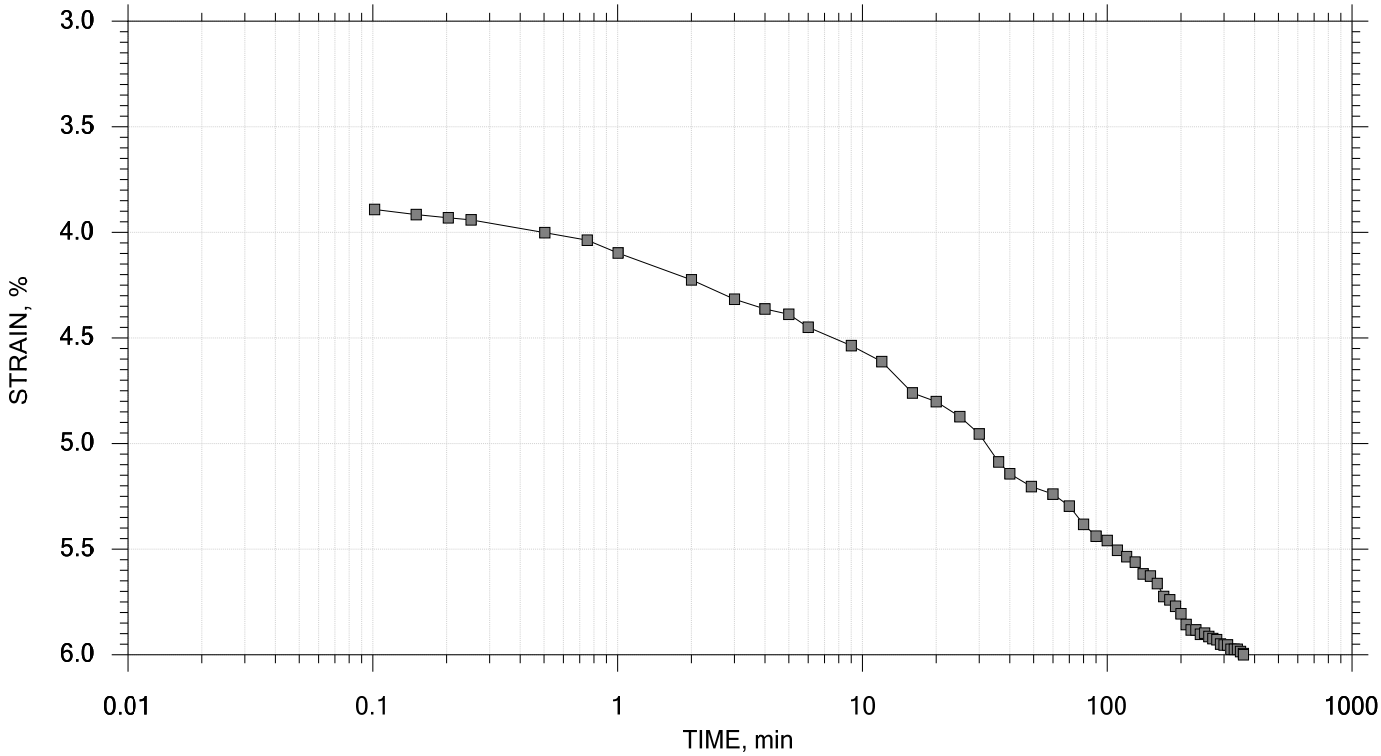
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

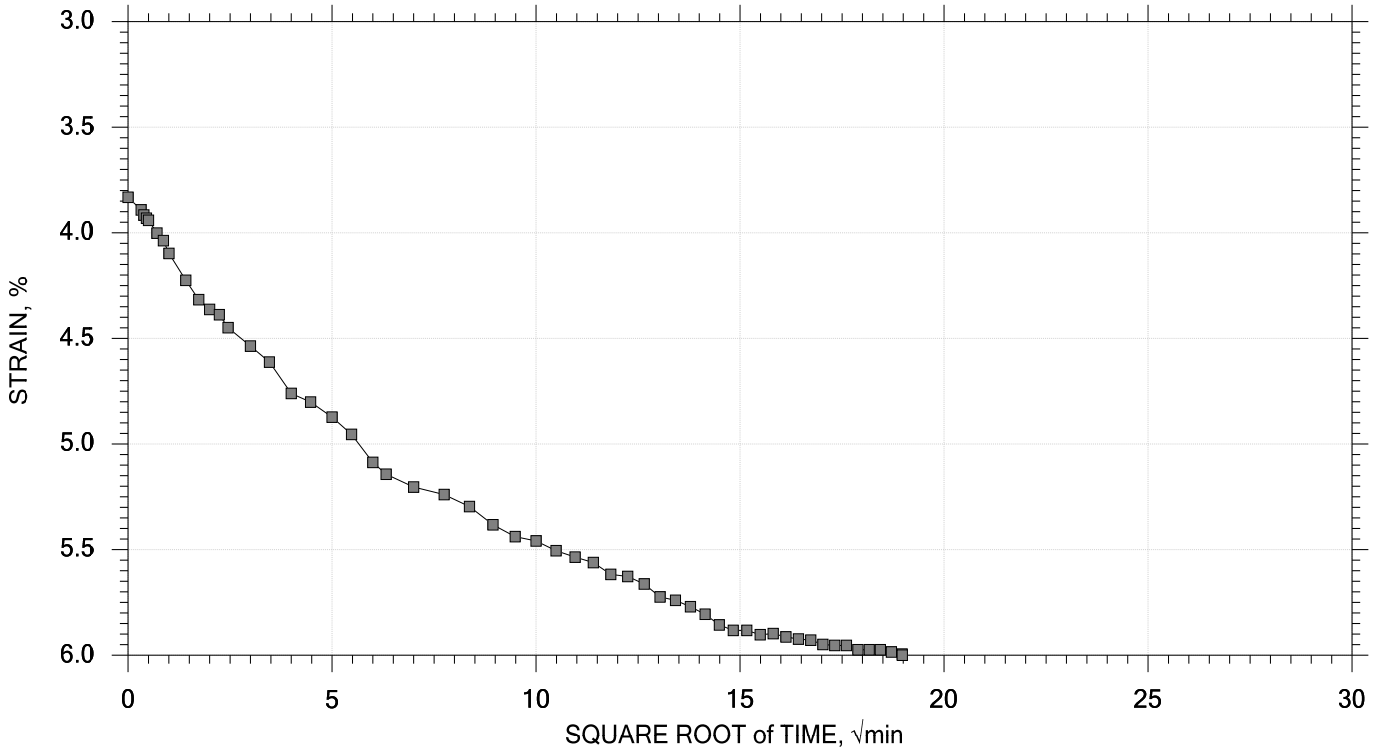
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 5 of 21

Stress: 3000 psf





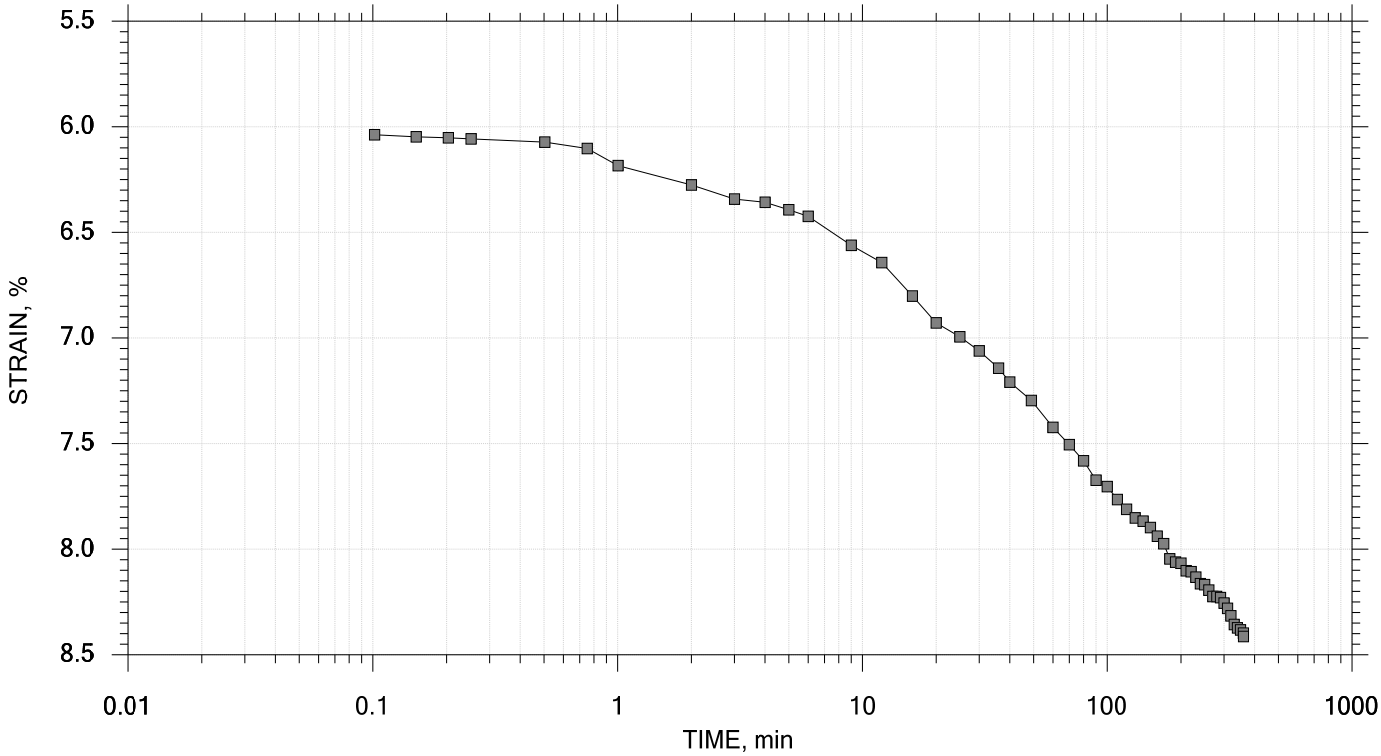
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

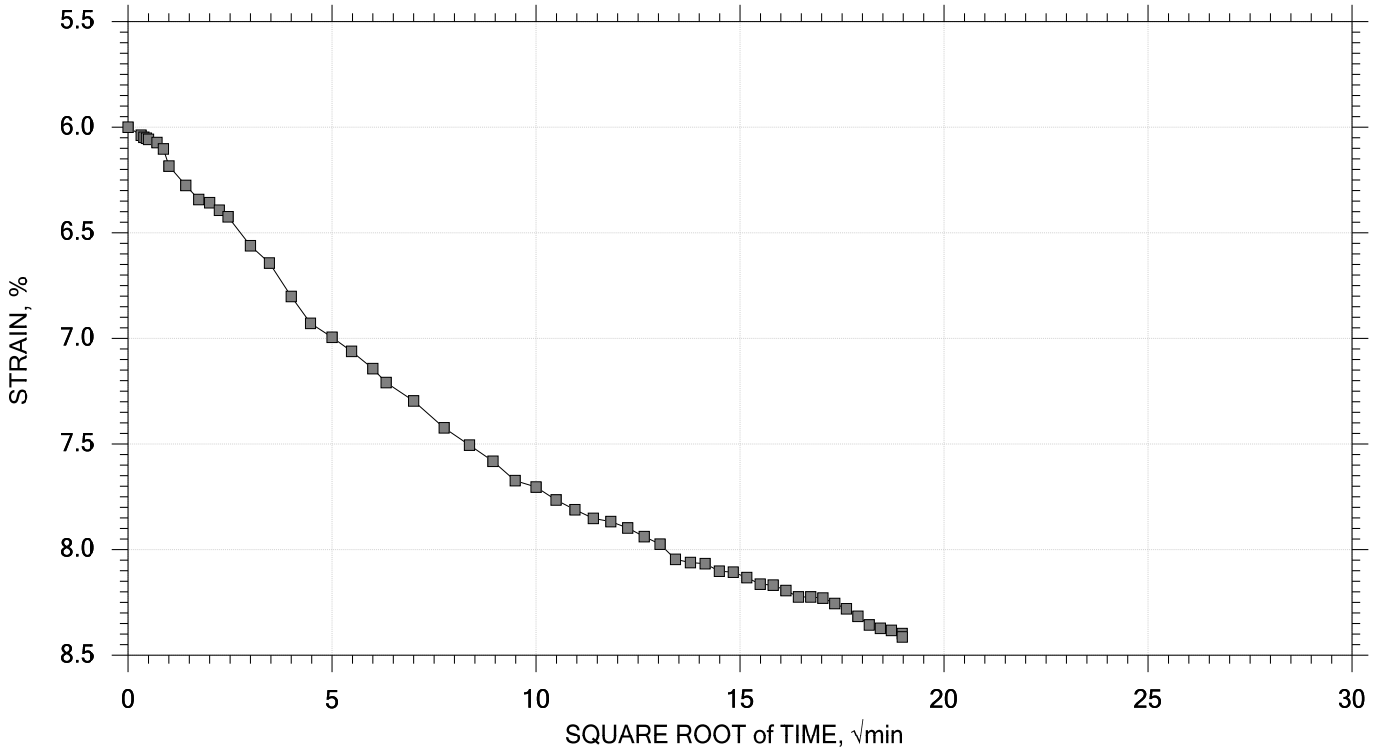
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 6 of 21

Stress: 4000 psf





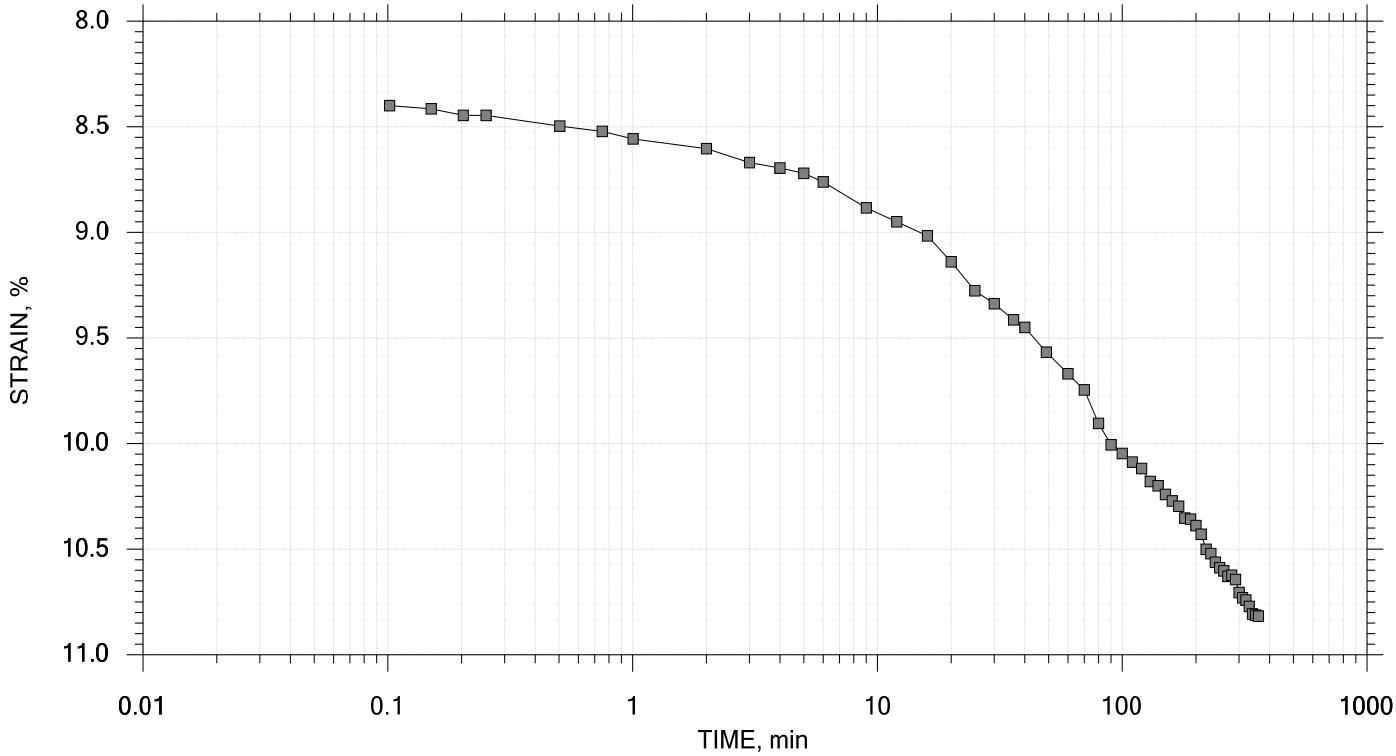
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

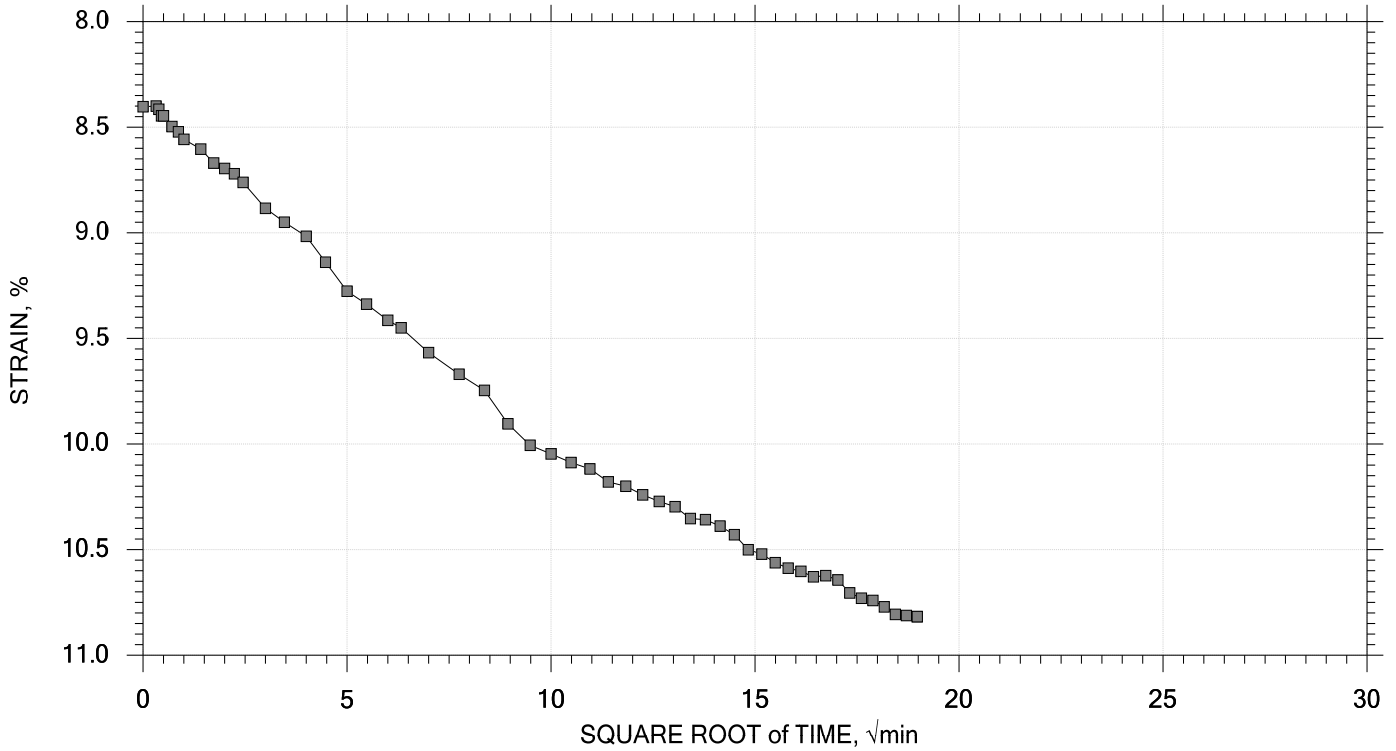
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 7 of 21

Stress: 5000 psf





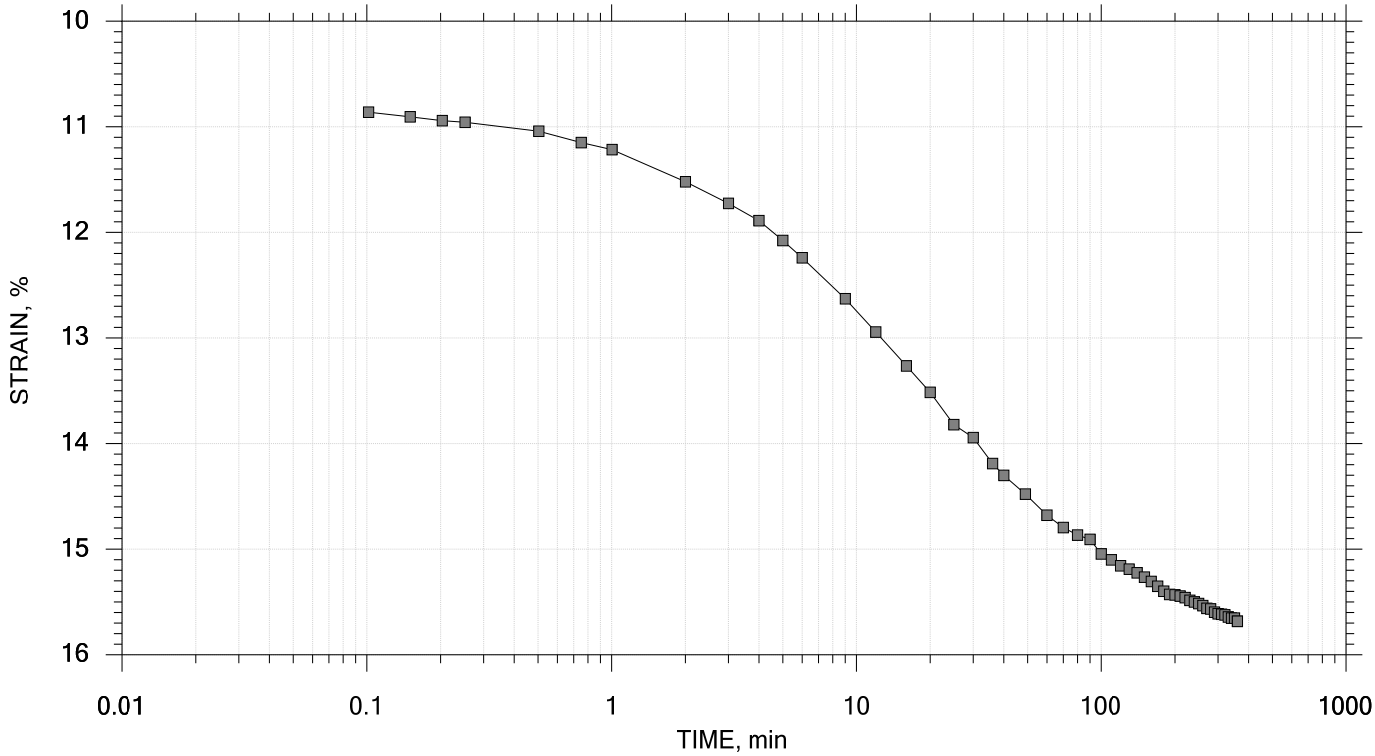
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

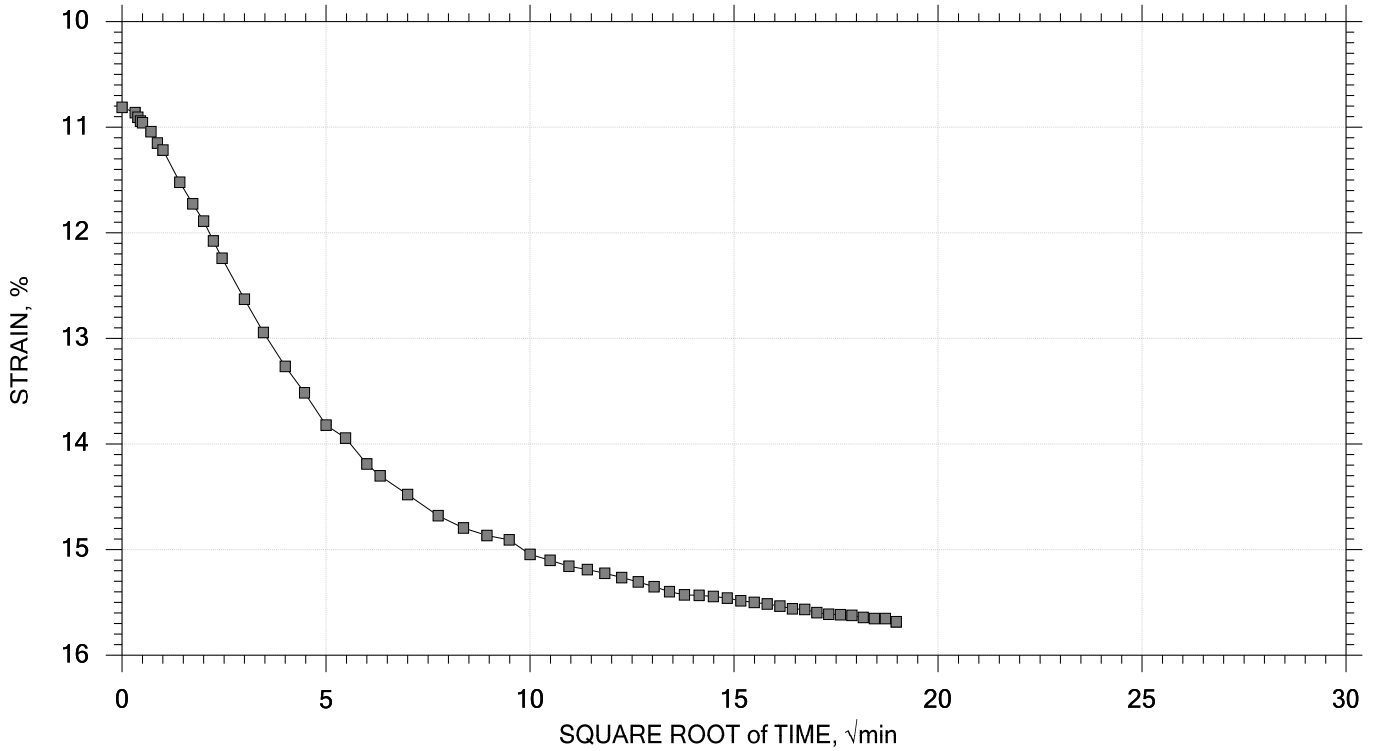
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 8 of 21

Stress: 8000 psf





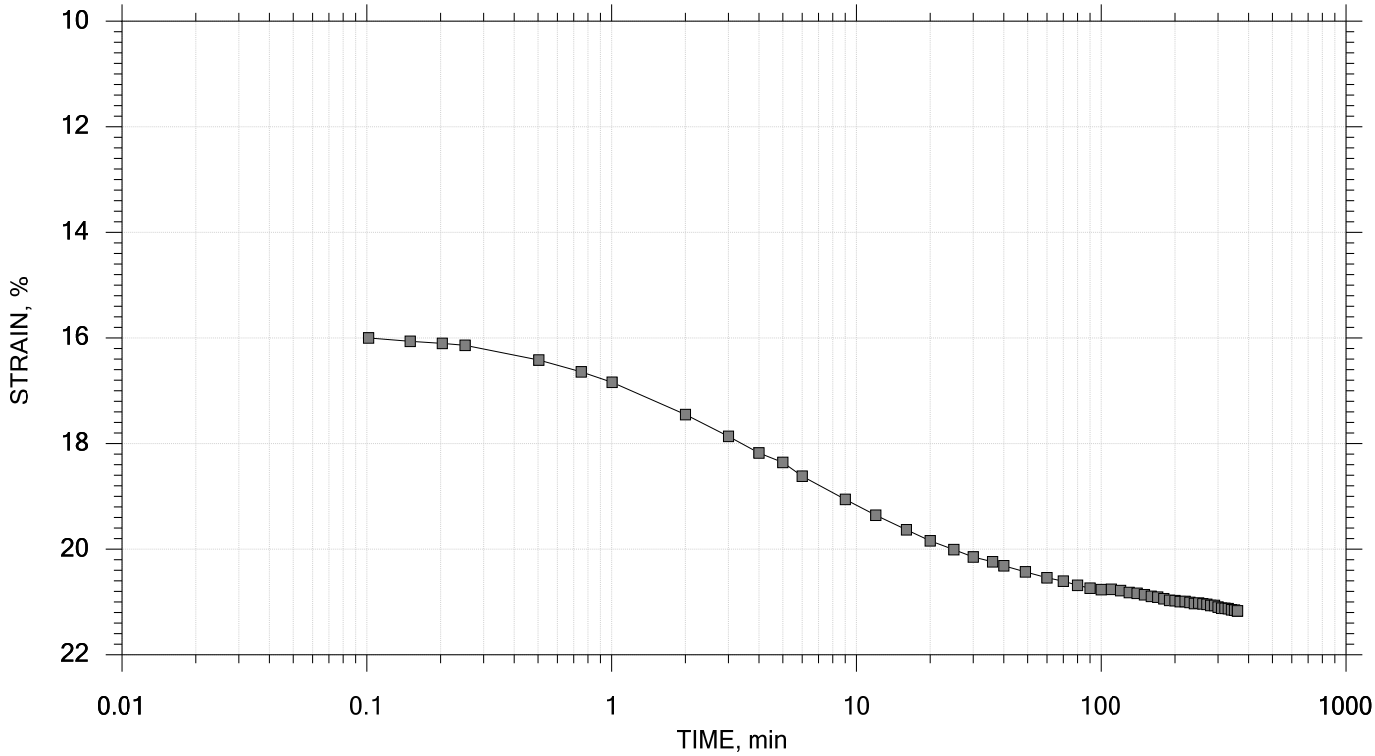
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

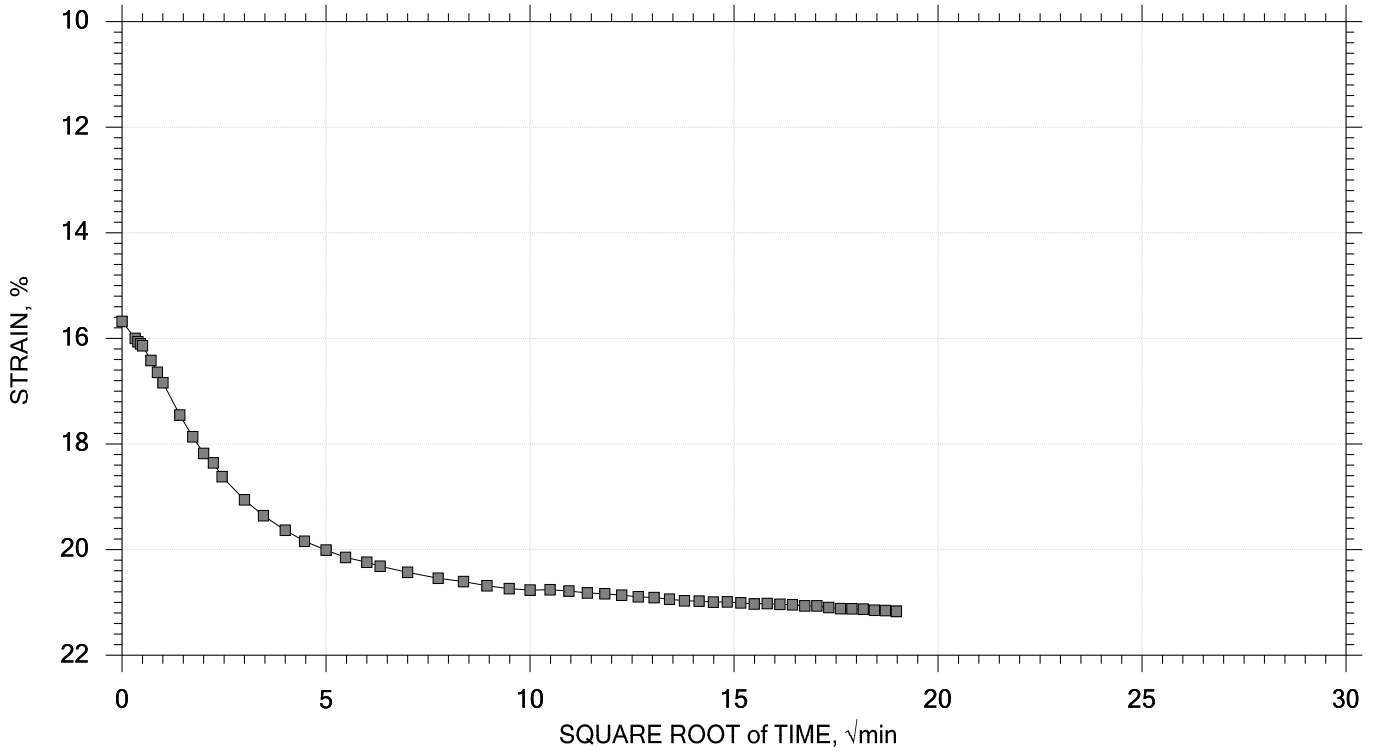
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 9 of 21

Stress: 16000 psf





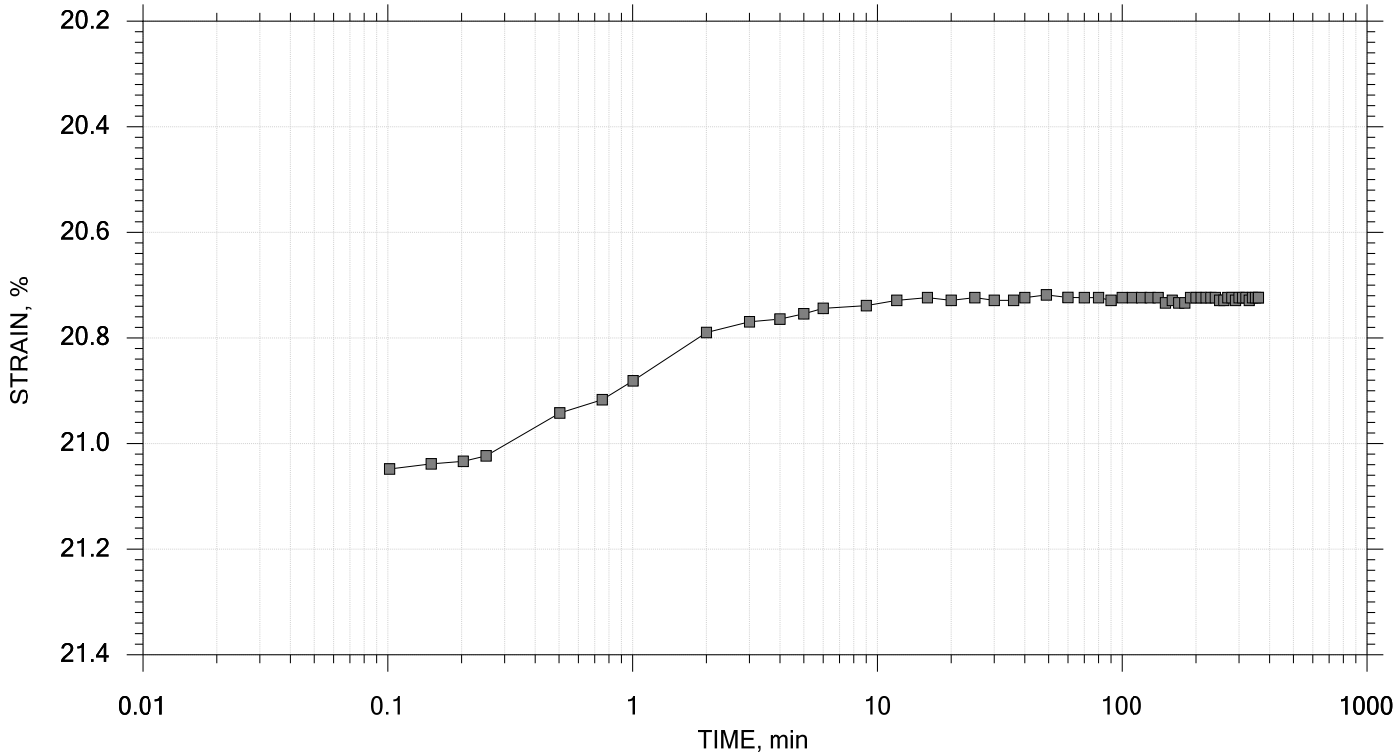
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

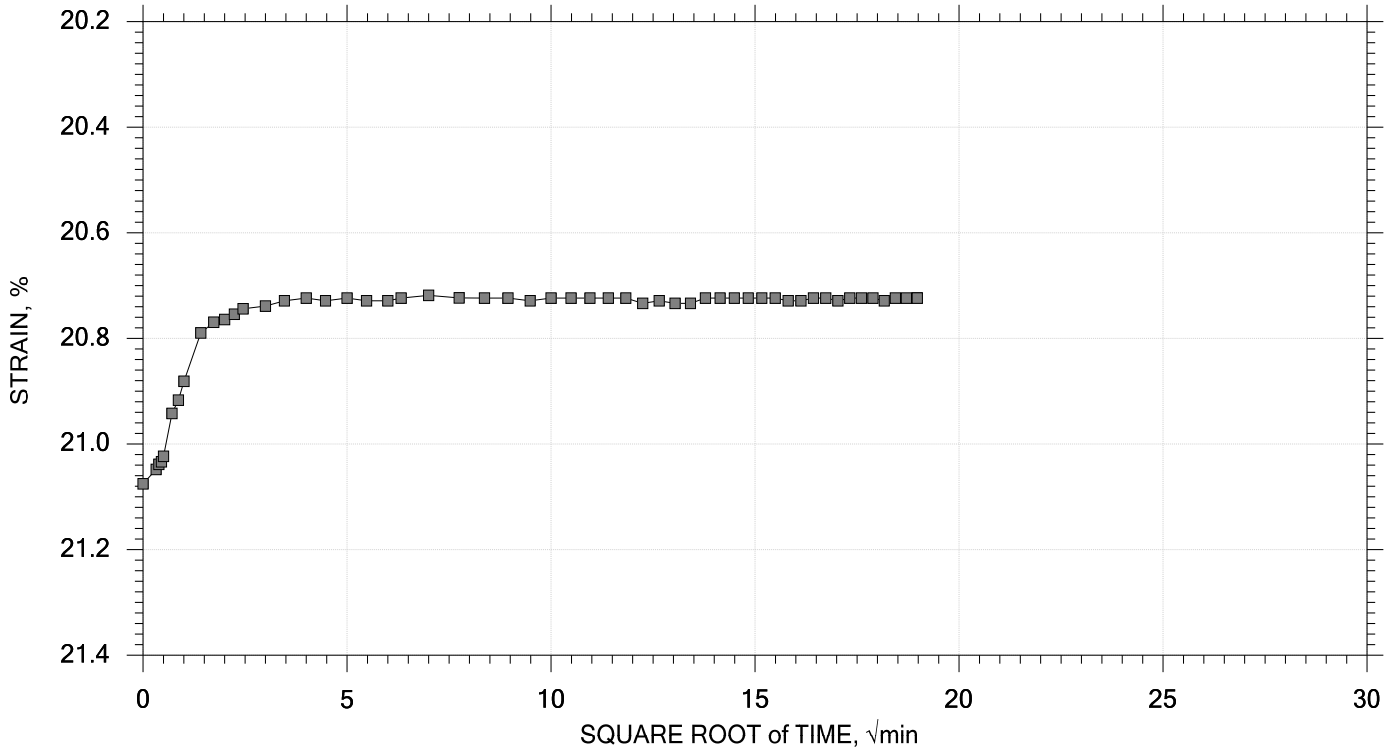
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 10 of 21

Stress: 8000 psf





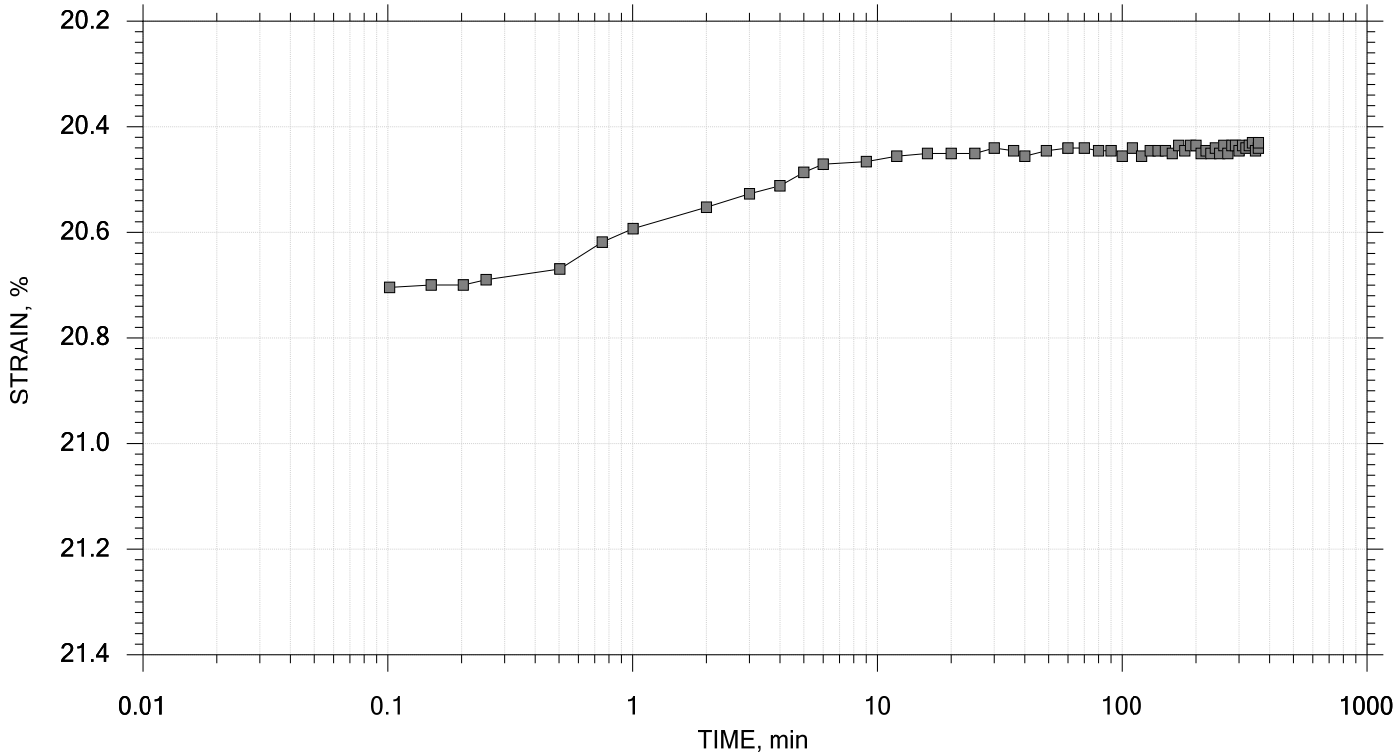
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

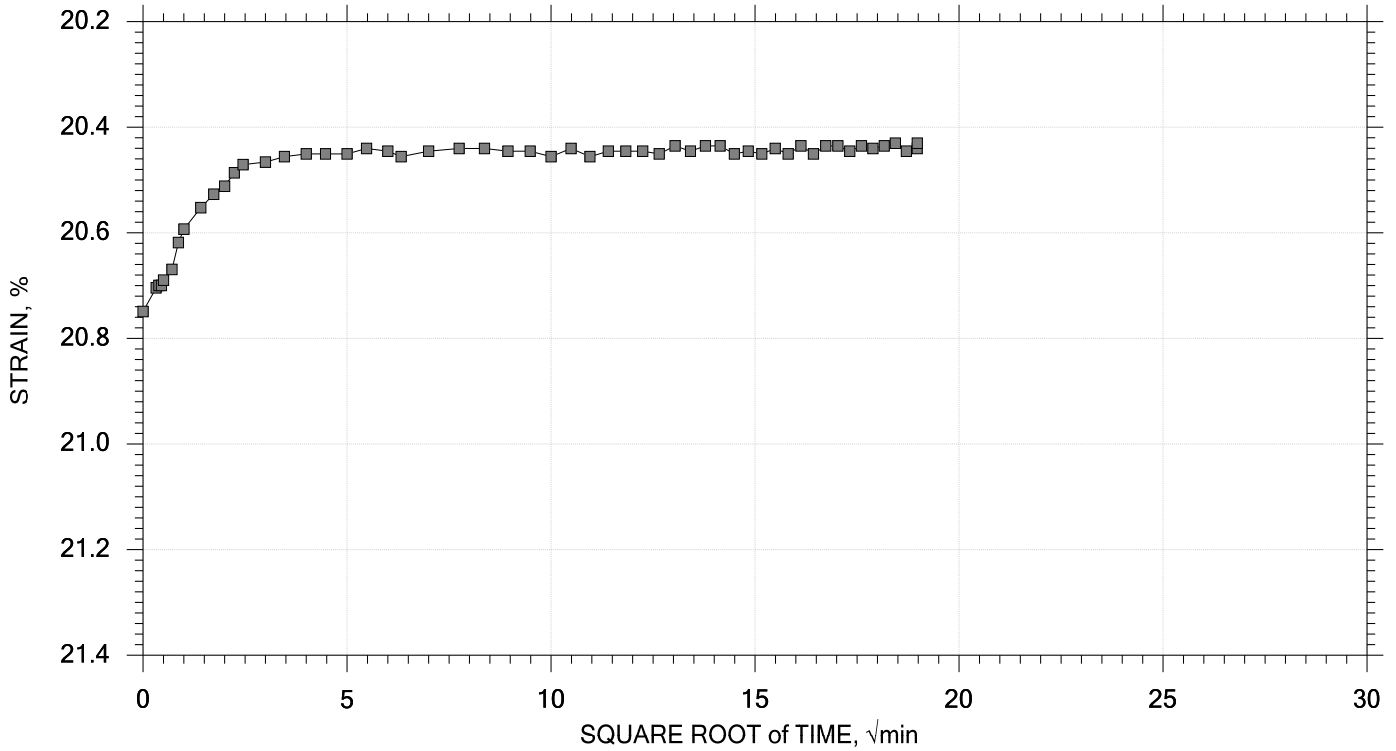
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 11 of 21

Stress: 5000 psf





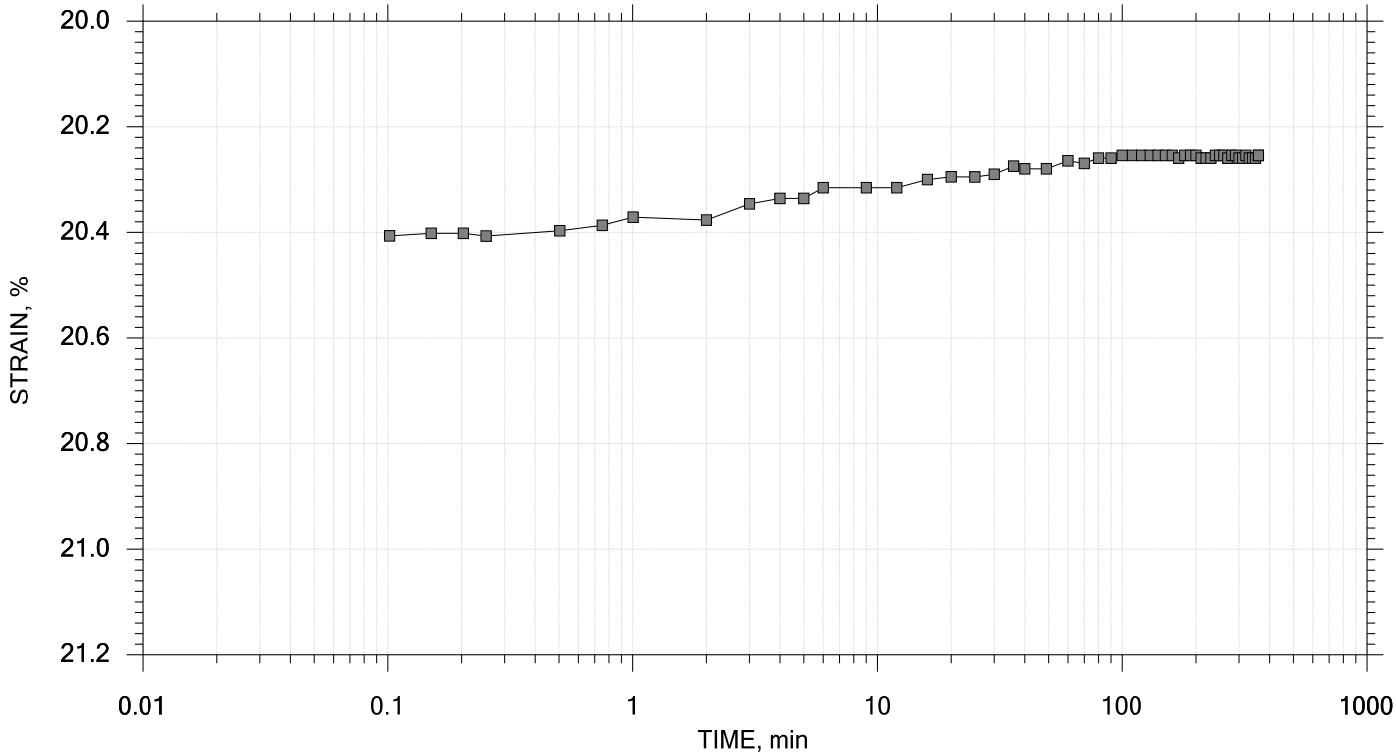
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

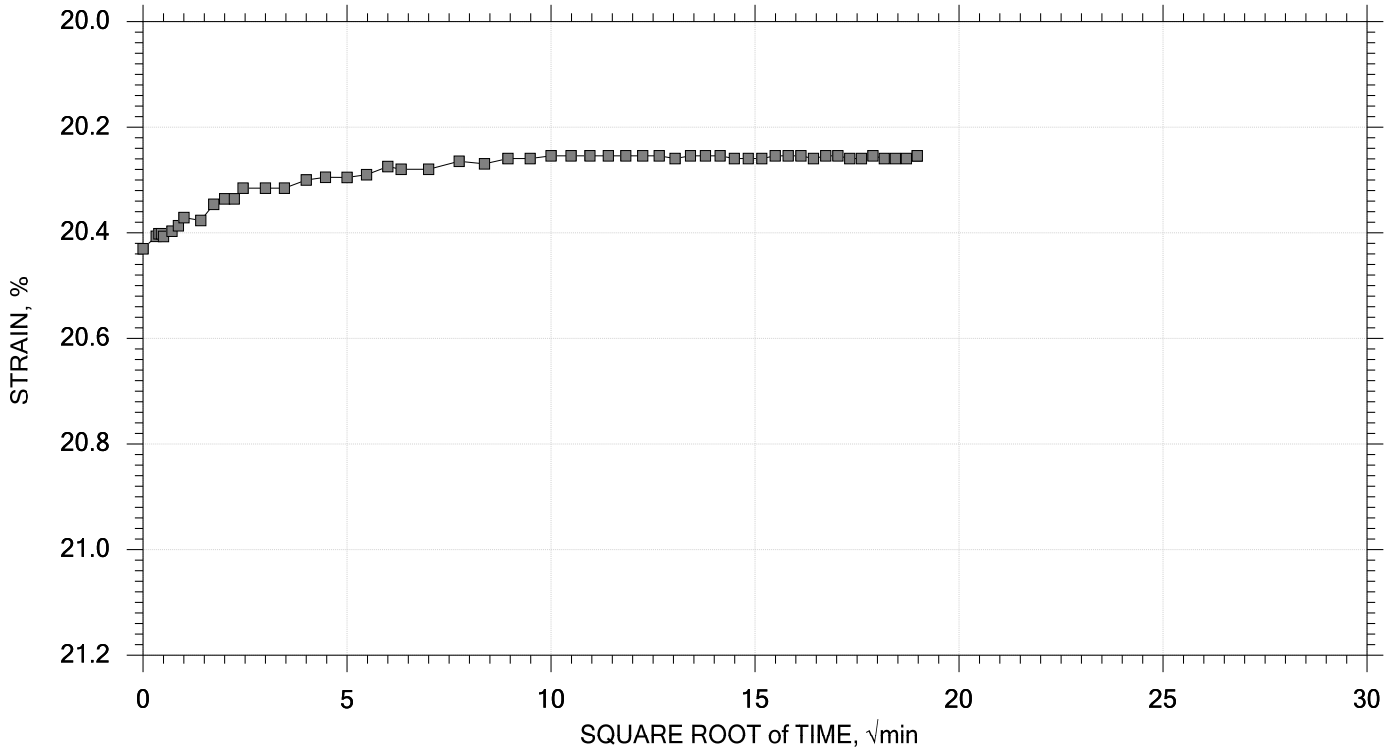
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 12 of 21

Stress: 4000 psf





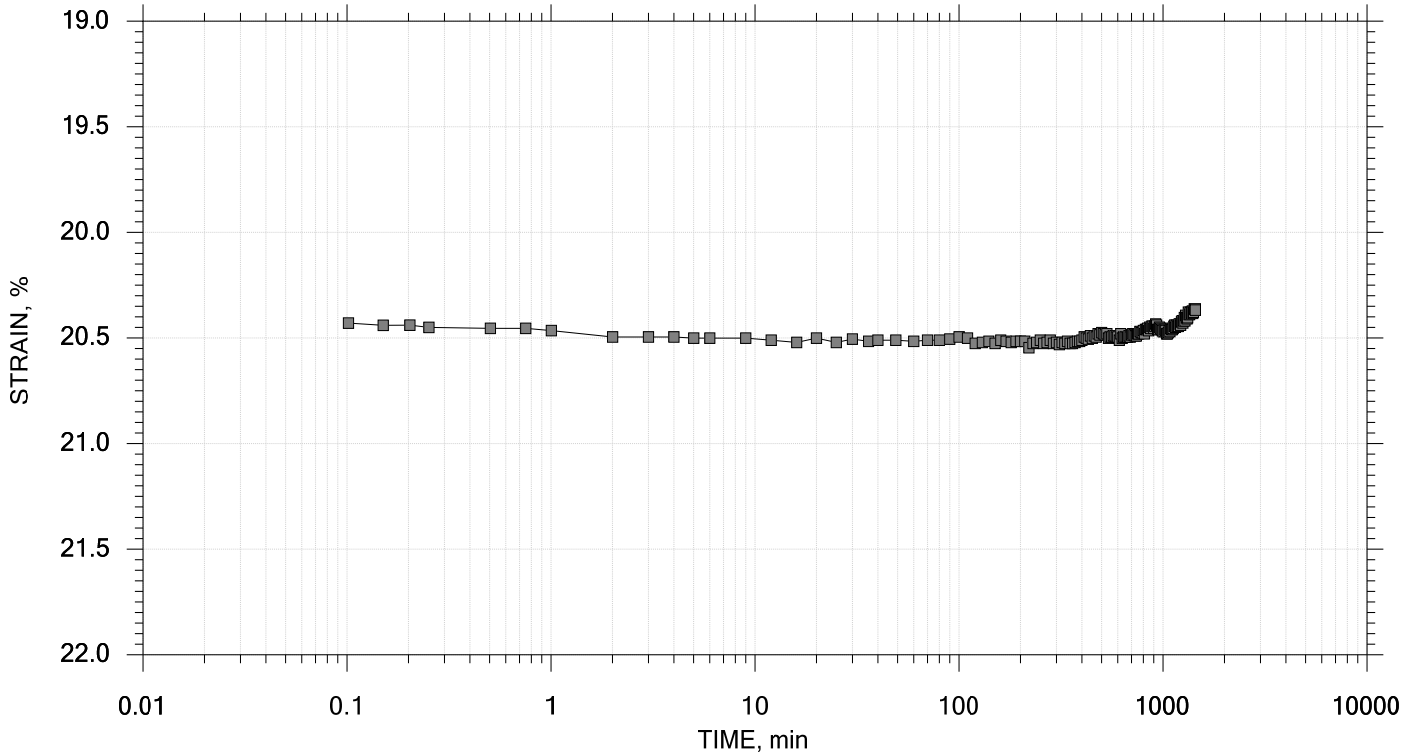
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

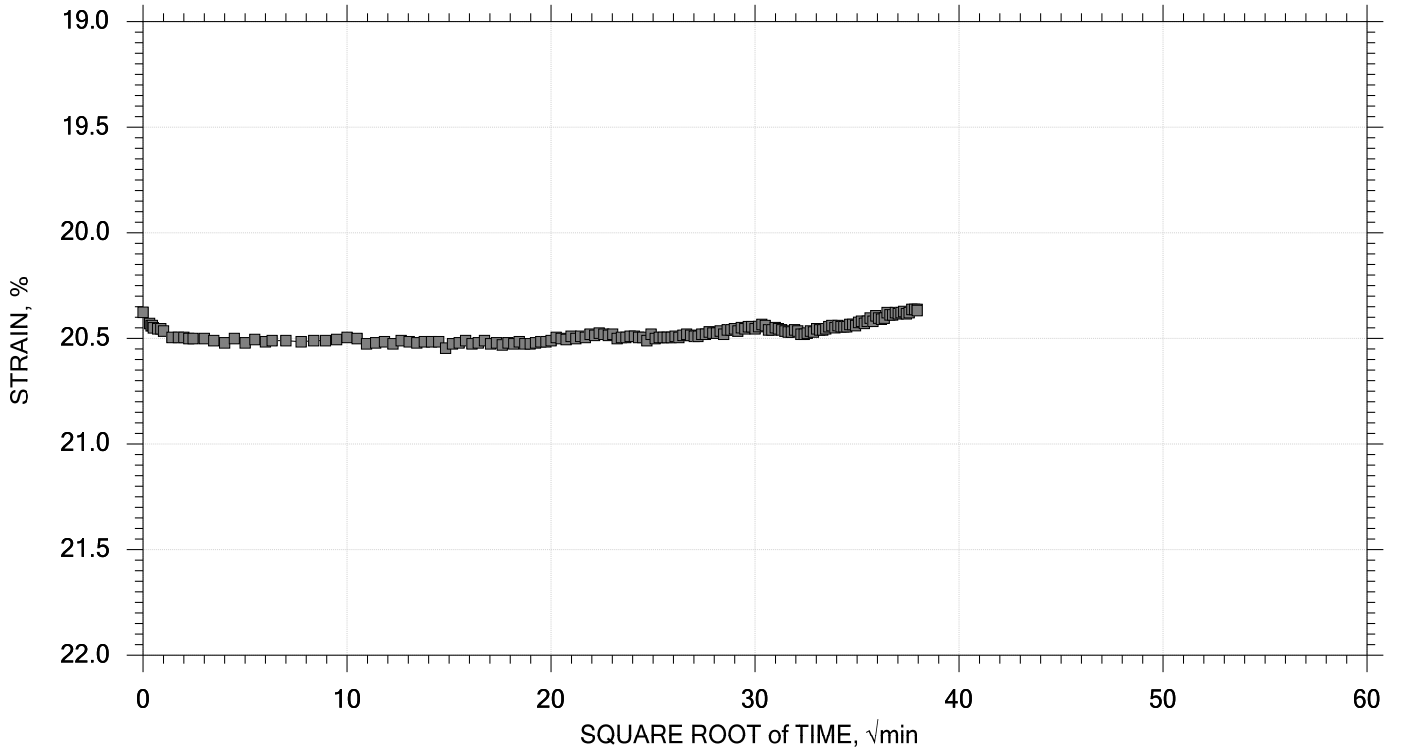
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 13 of 21

Stress: 5000 psf





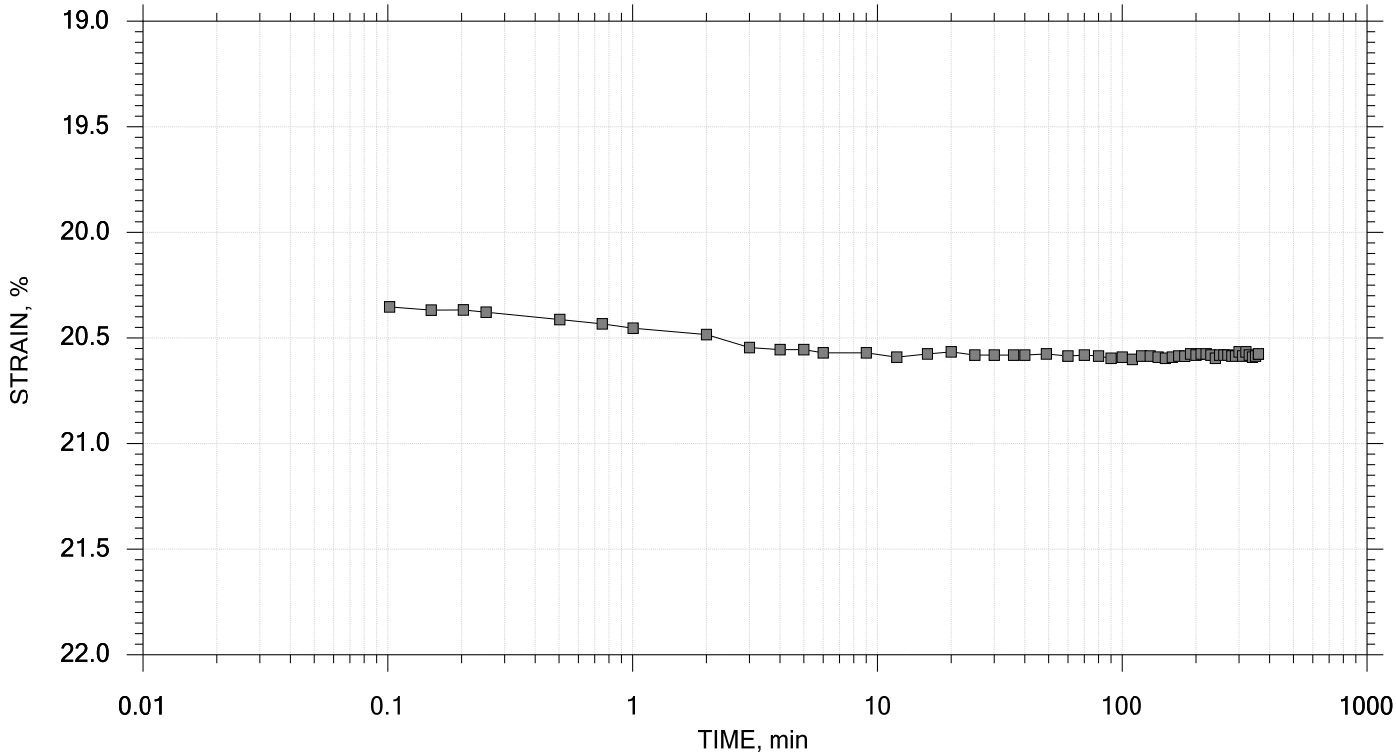
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

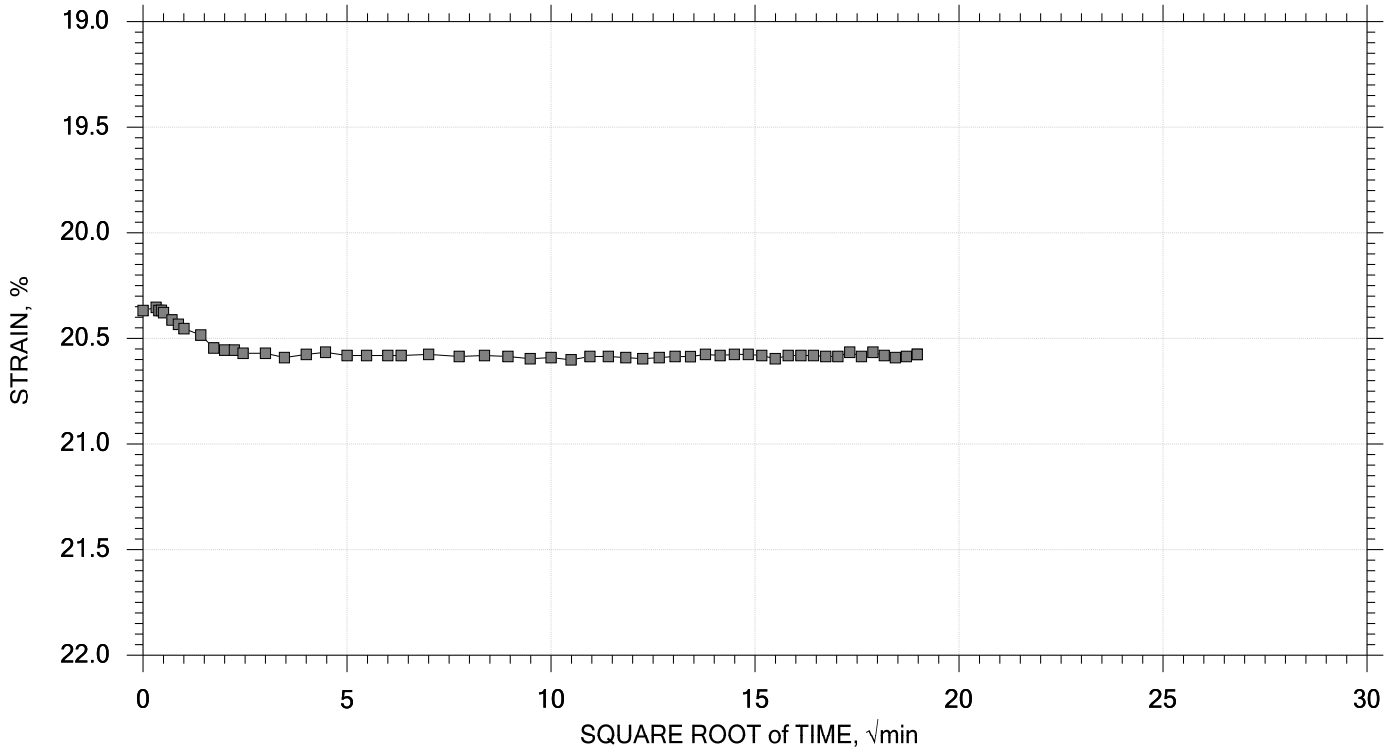
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 14 of 21

Stress: 8000 psf





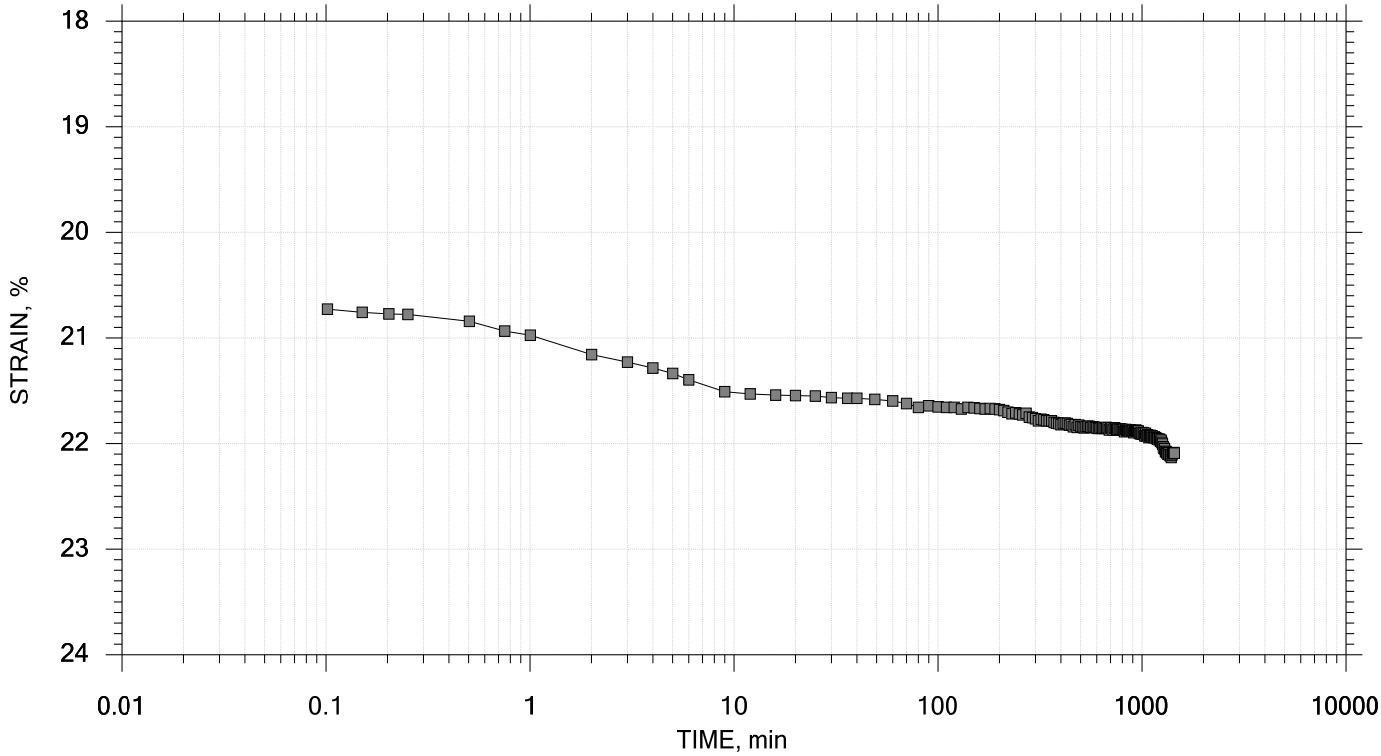
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

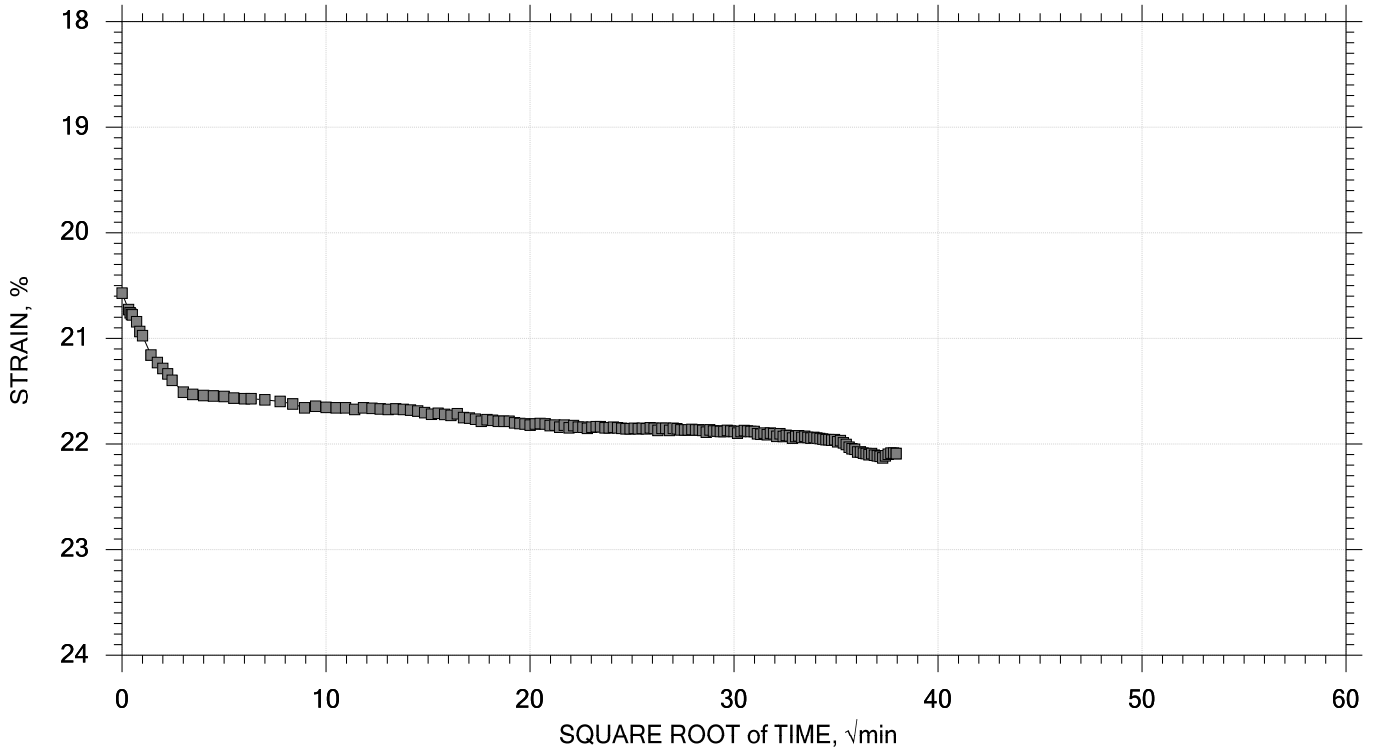
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 15 of 21

Stress: 16000 psf





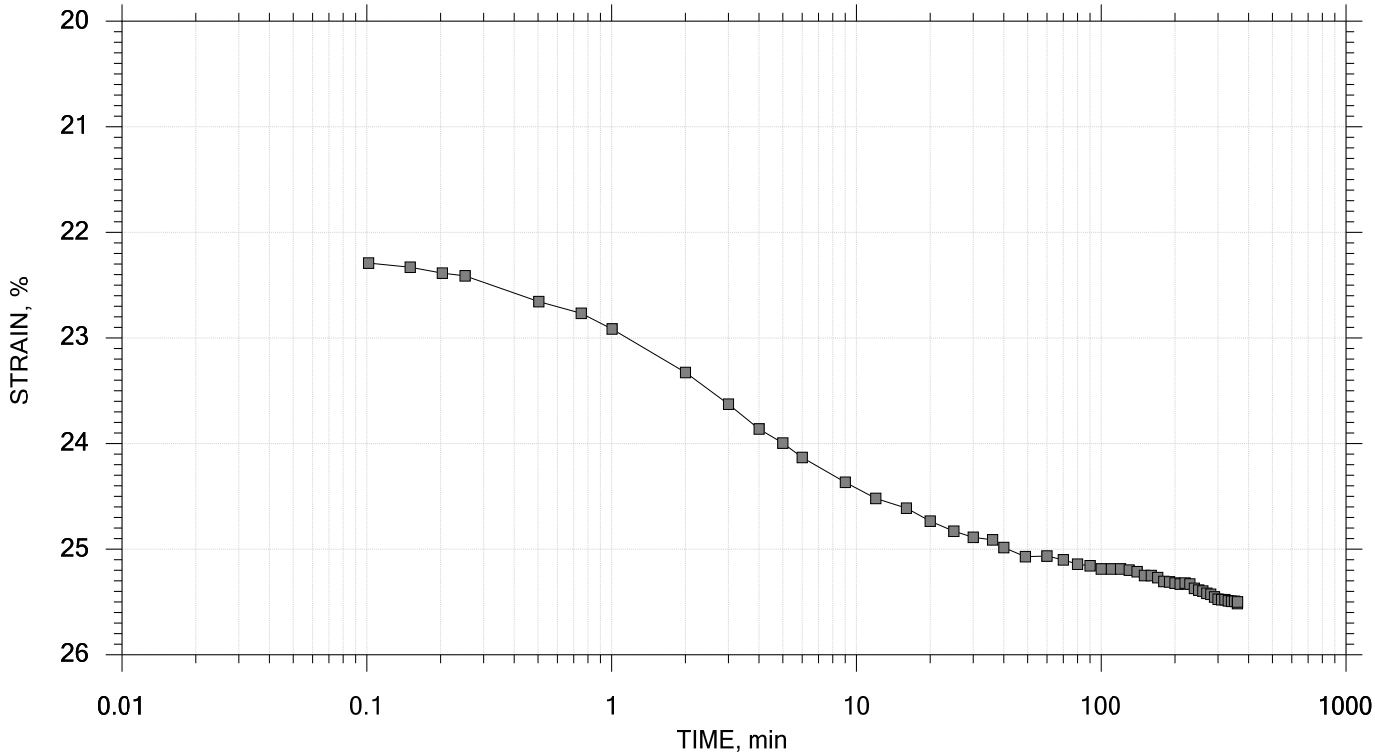
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

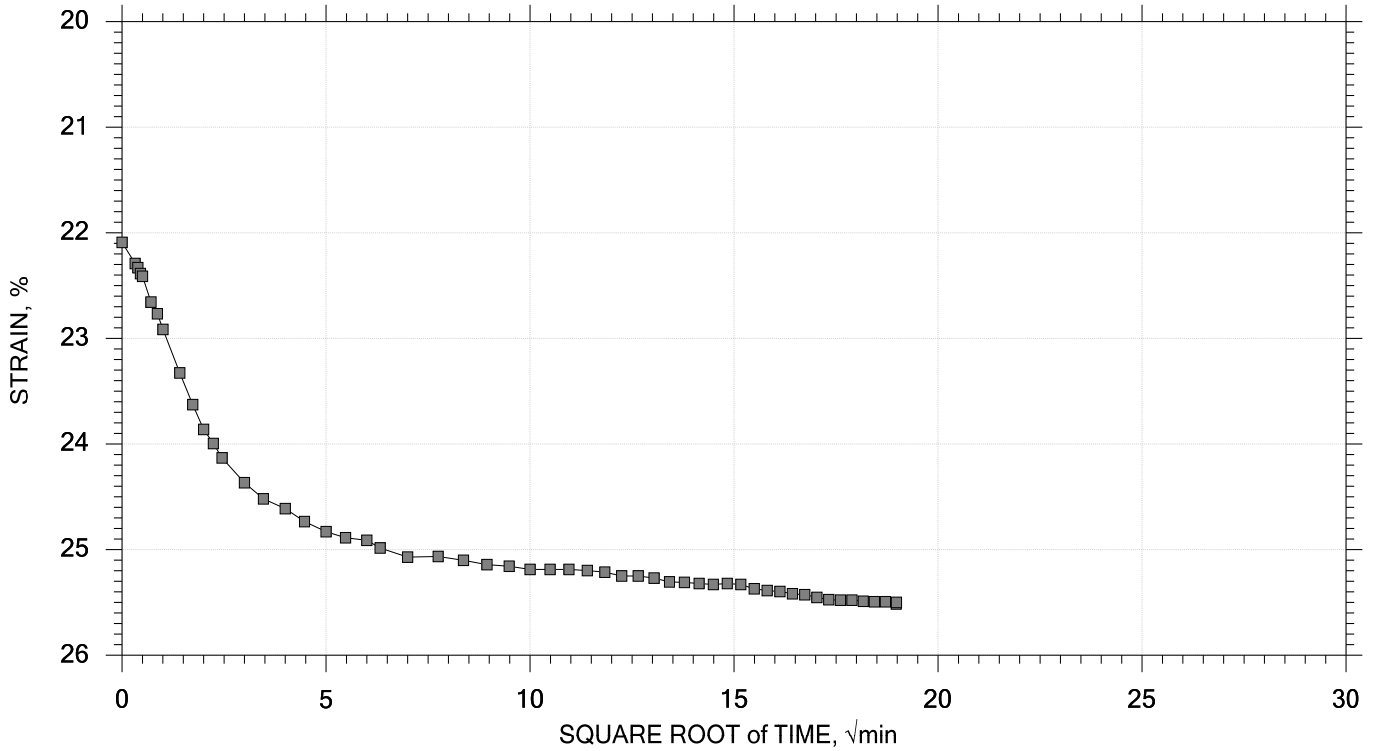
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 16 of 21

Stress: 32000 psf





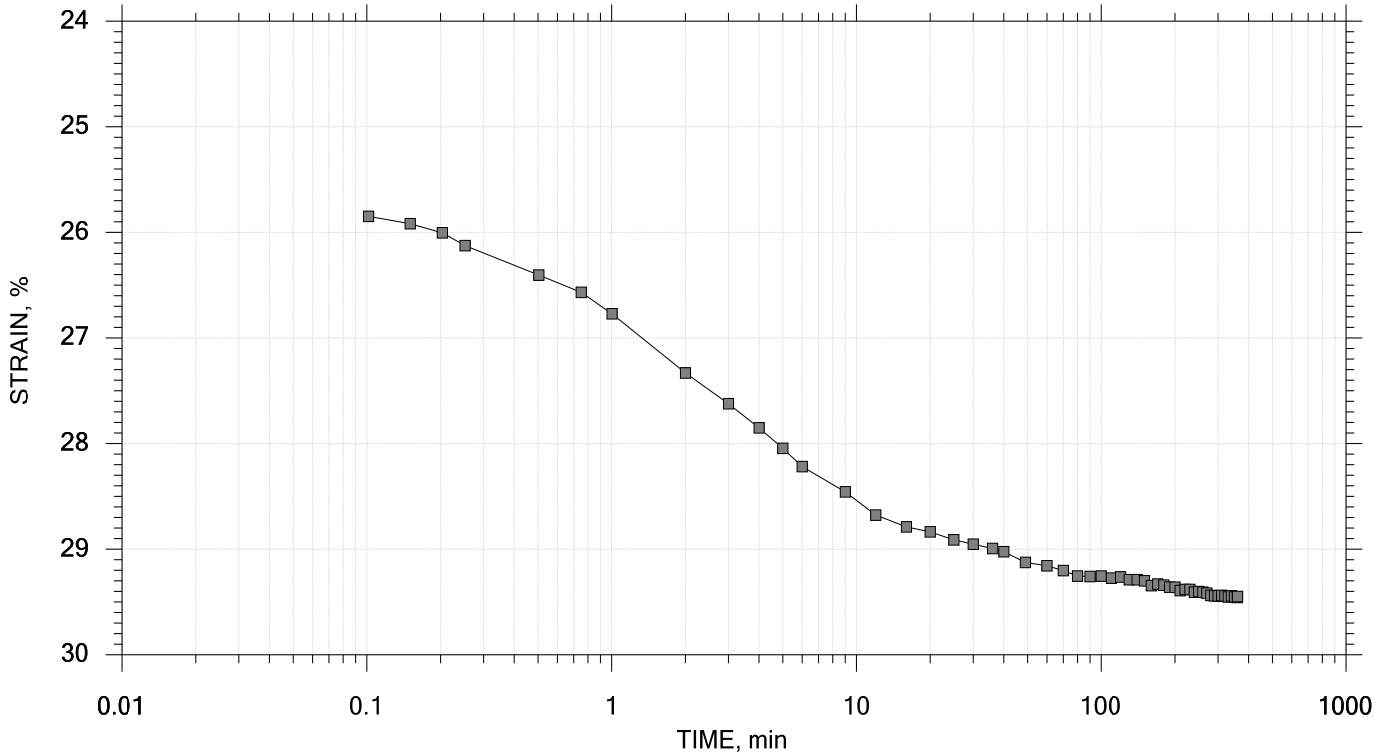
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

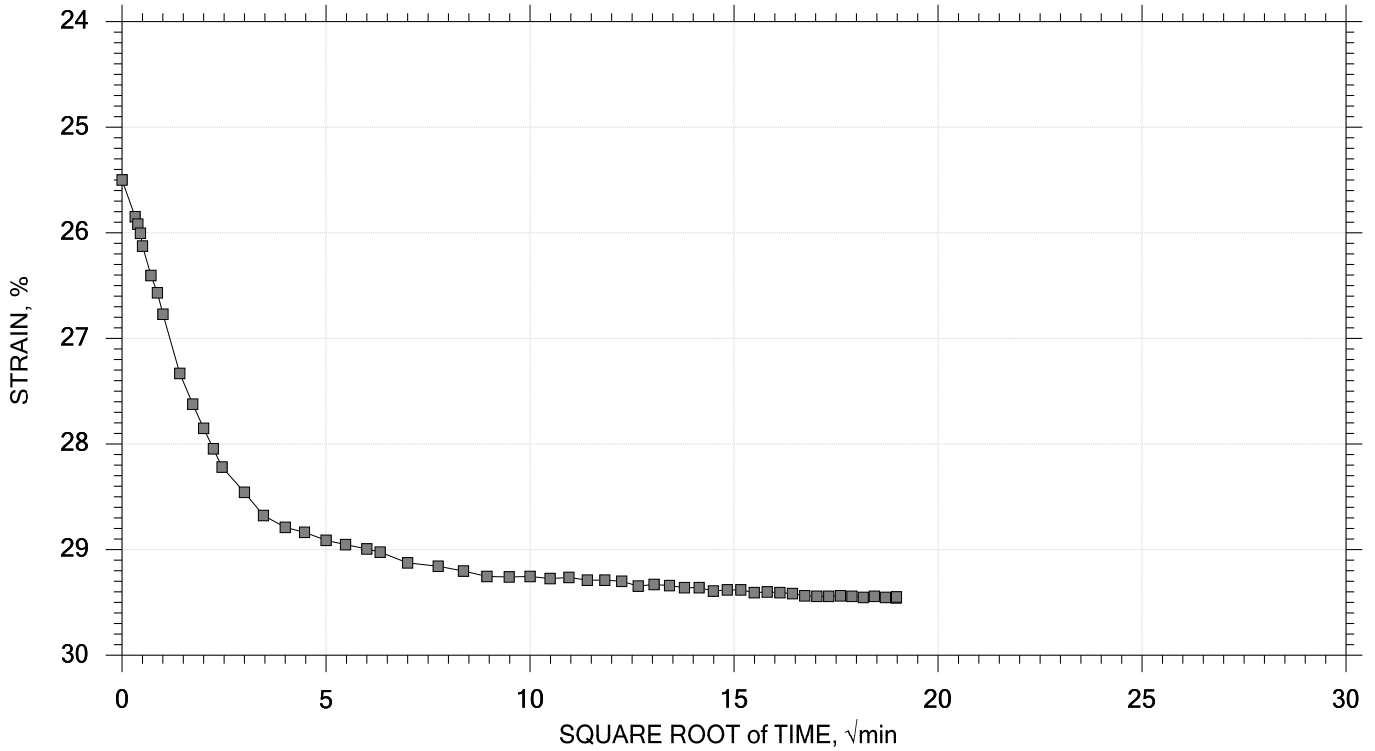
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 17 of 21

Stress: 64000 psf





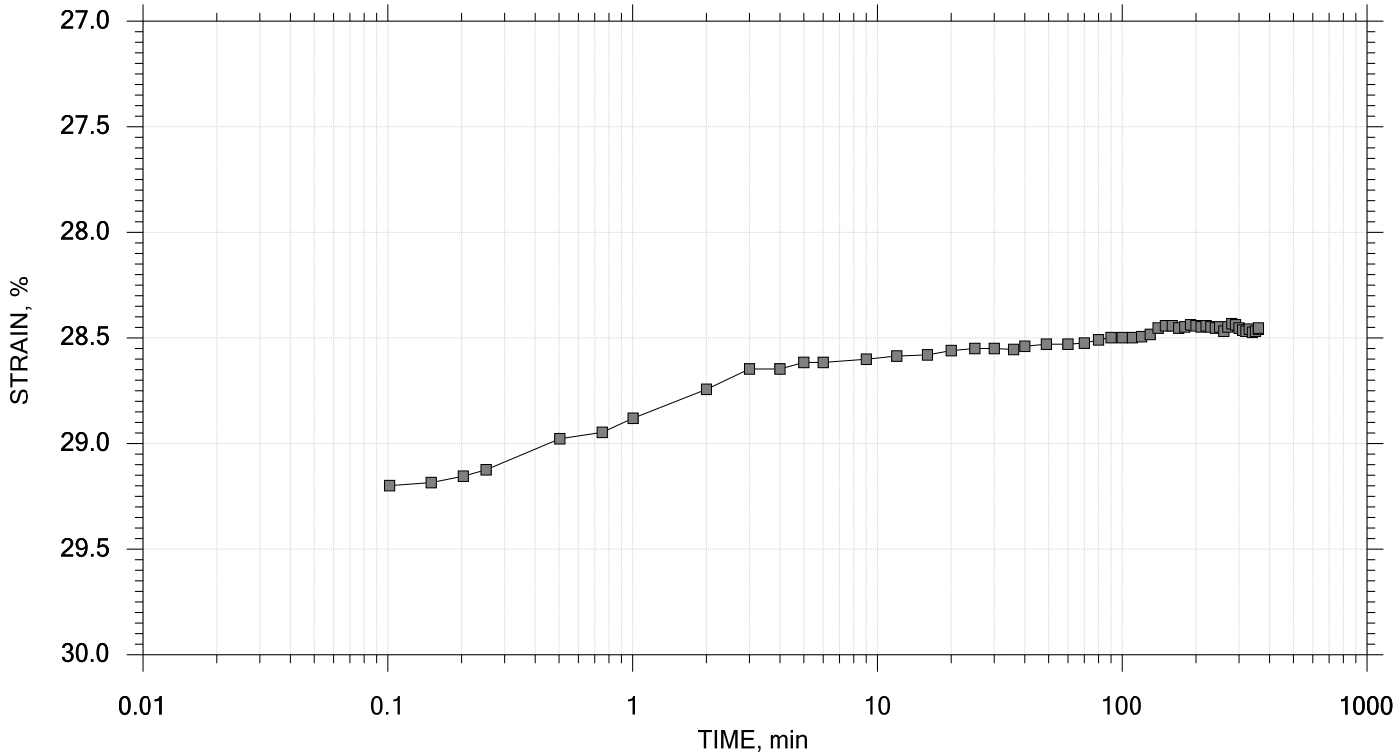
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

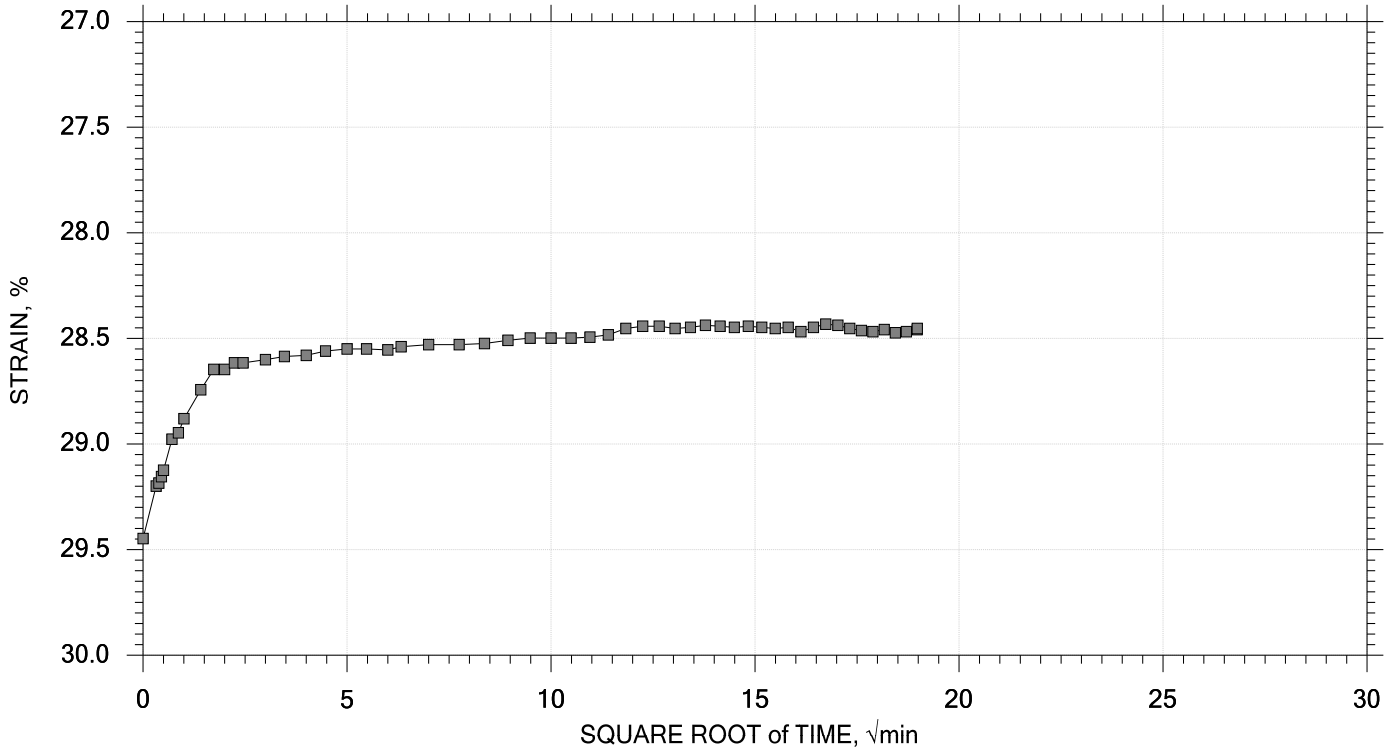
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 18 of 21

Stress: 16000 psf





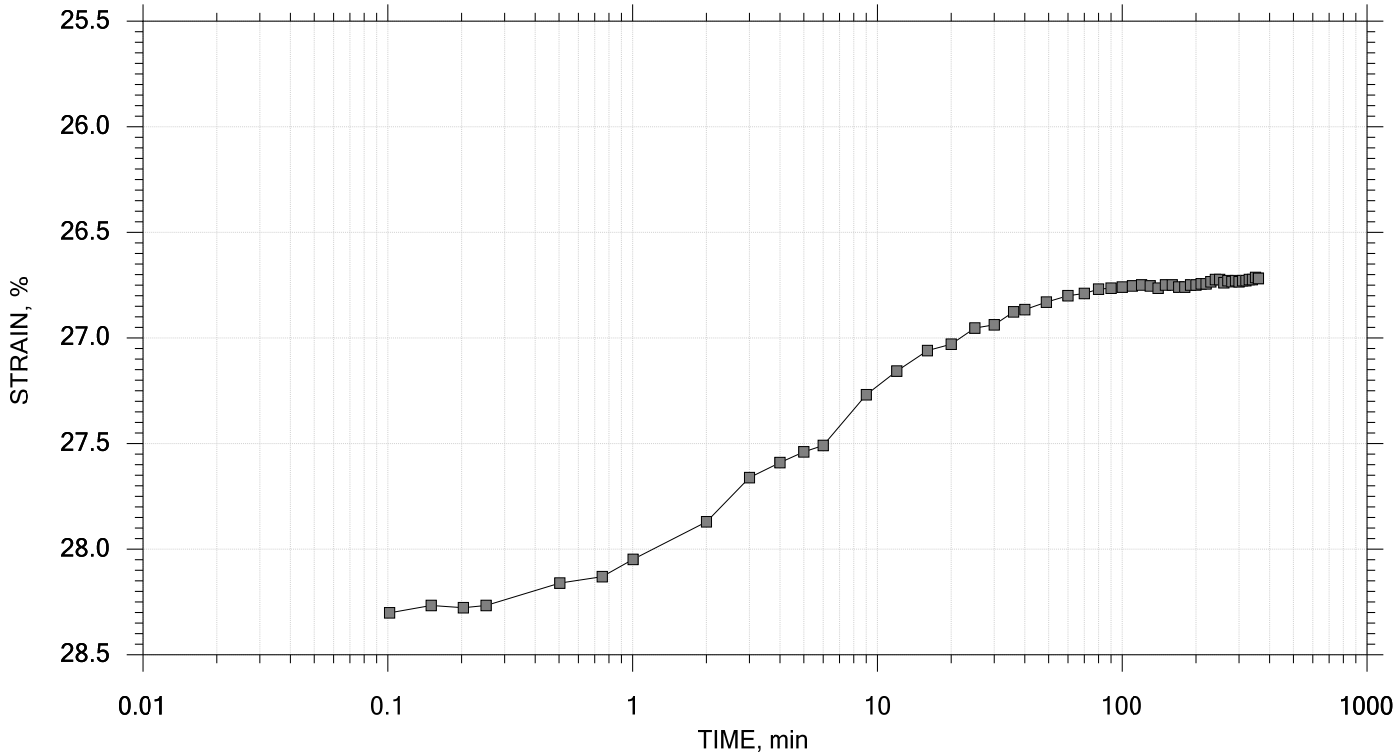
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

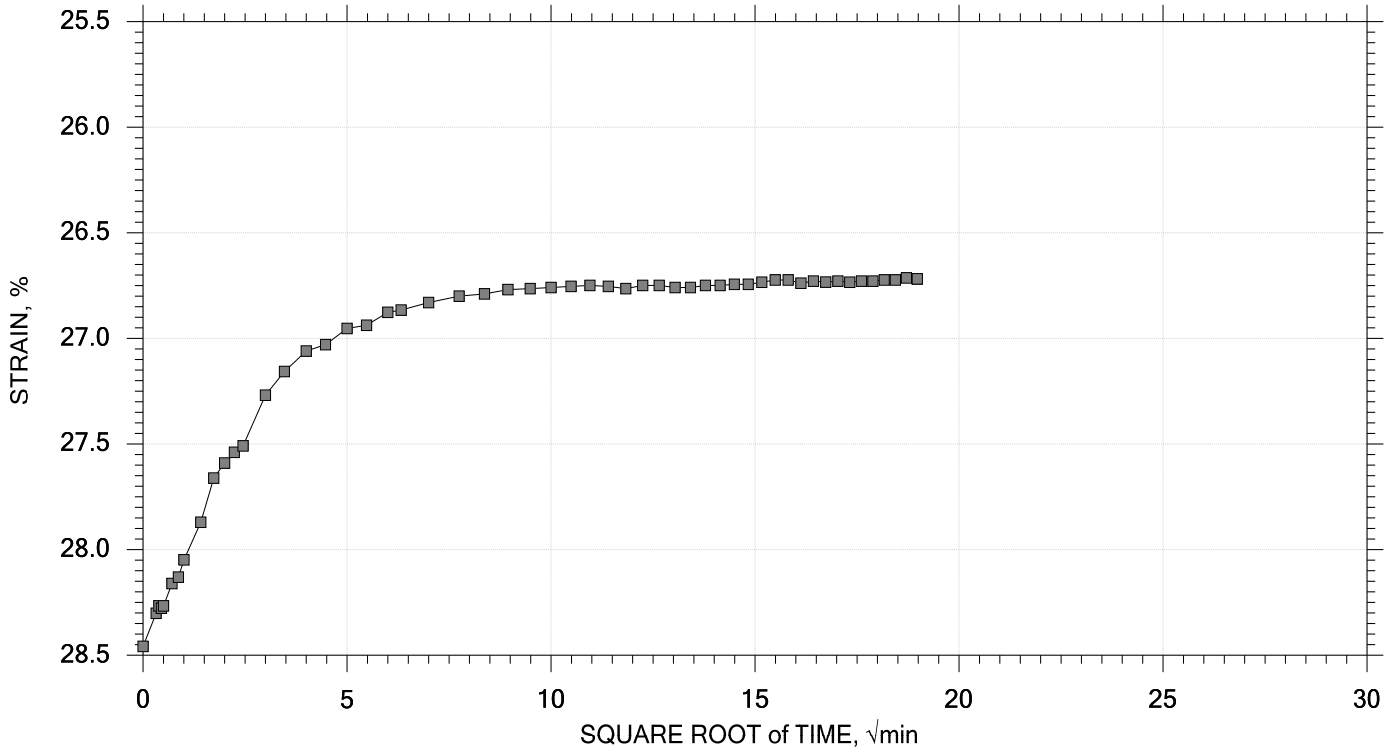
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 19 of 21

Stress: 4000 psf





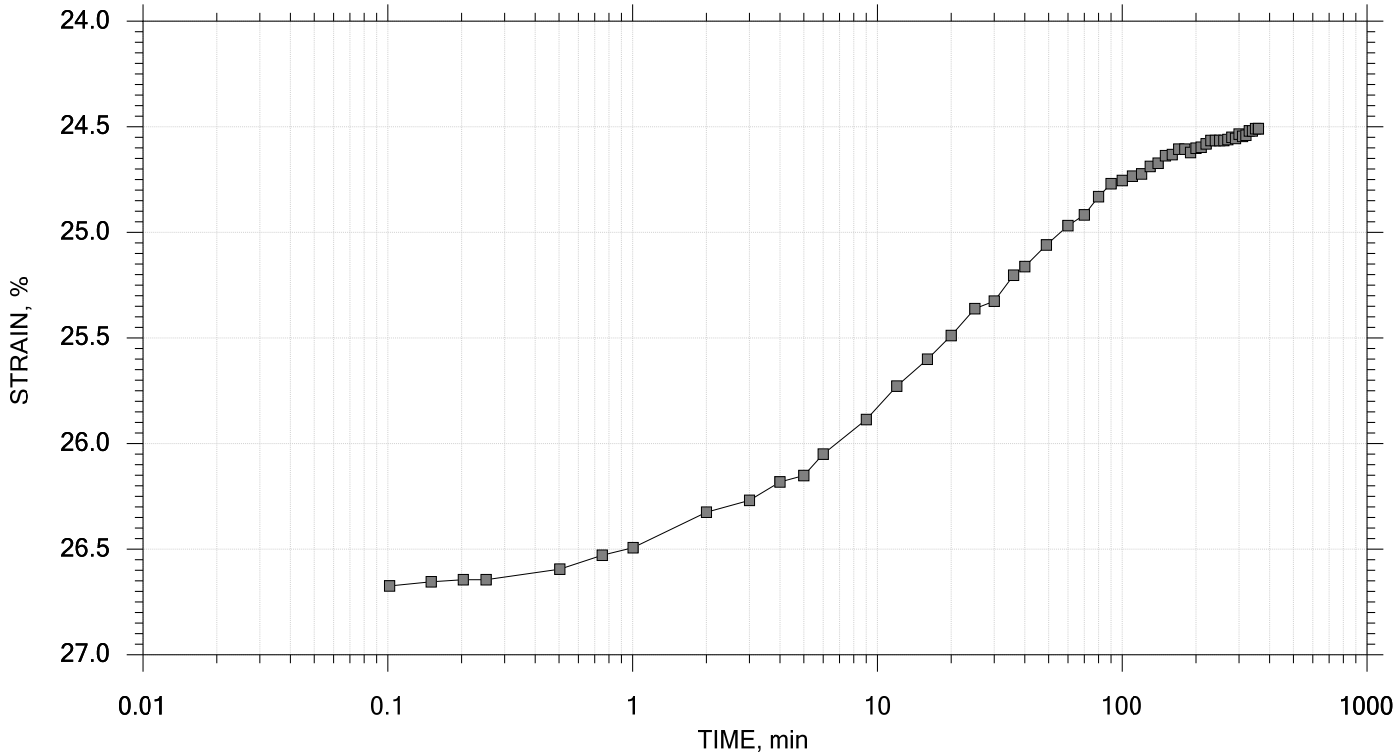
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

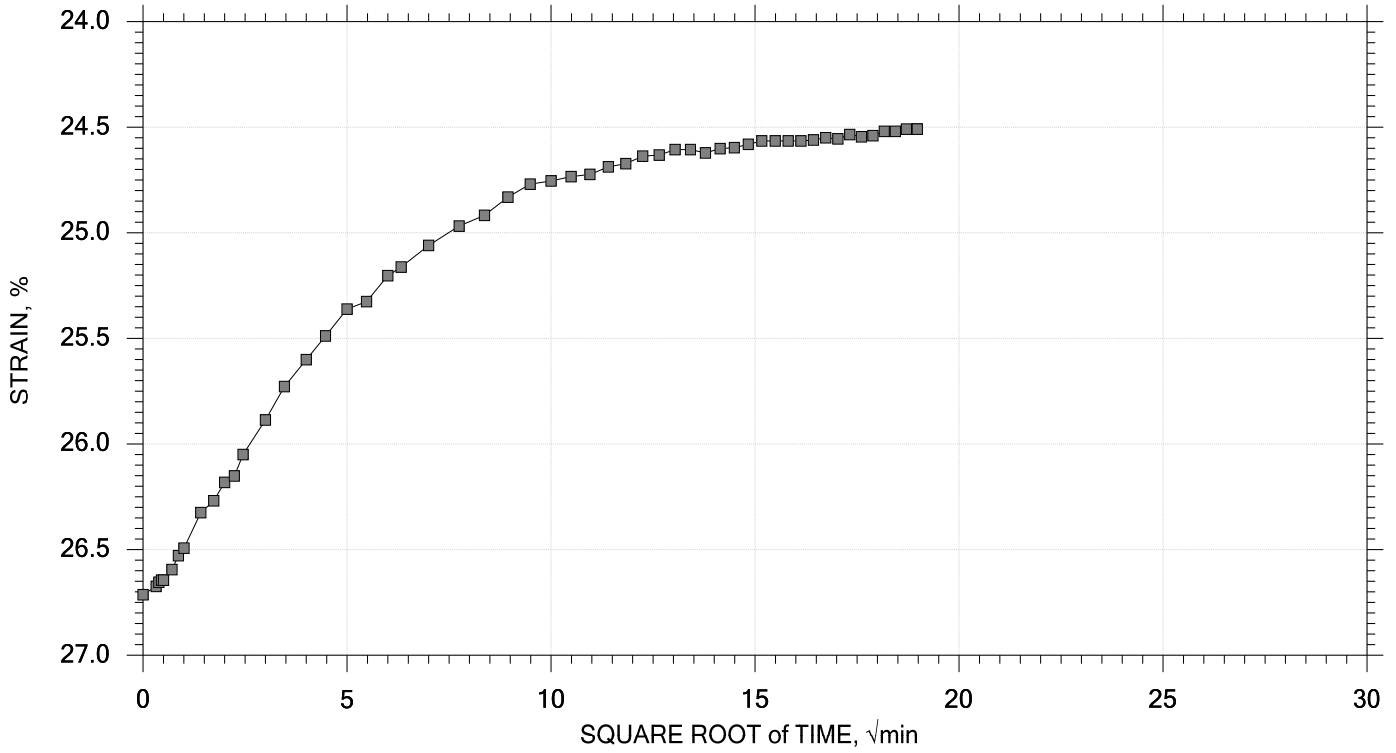
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 20 of 21

Stress: 1000 psf





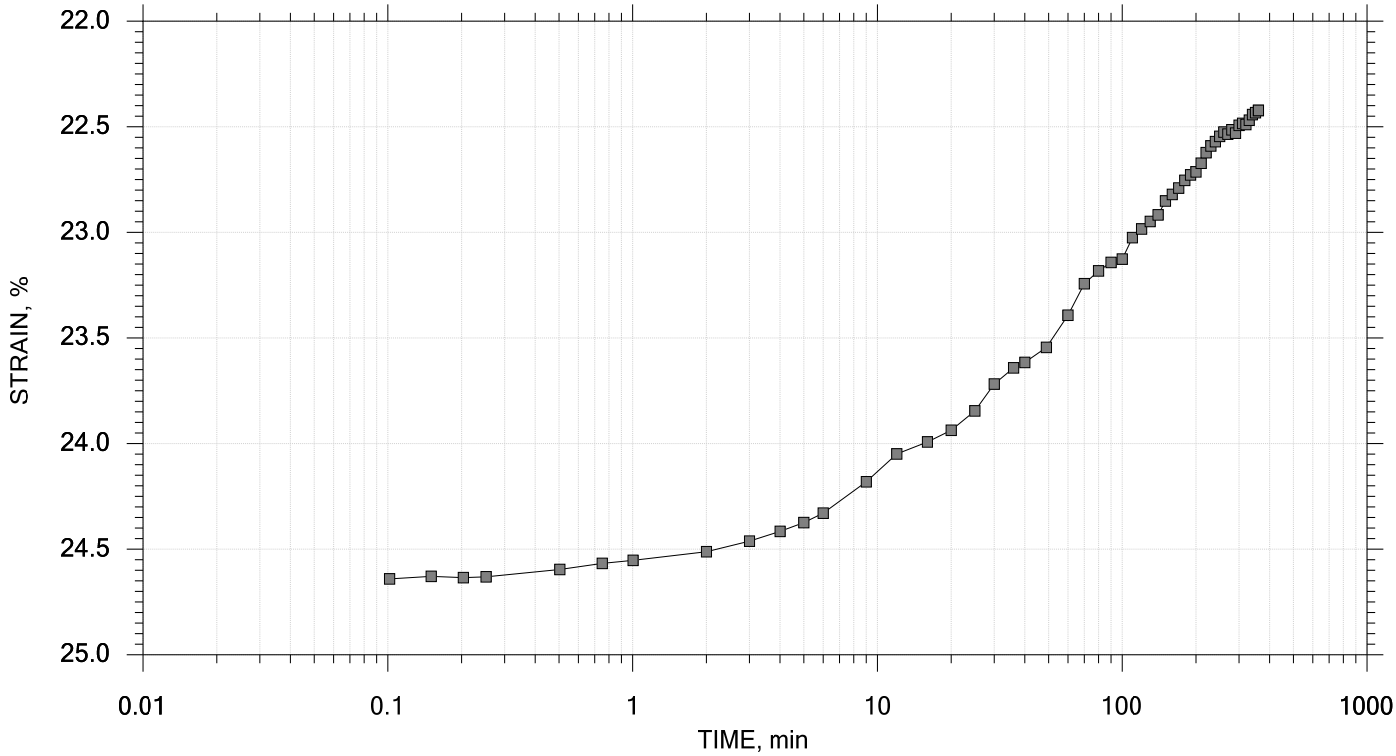
GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

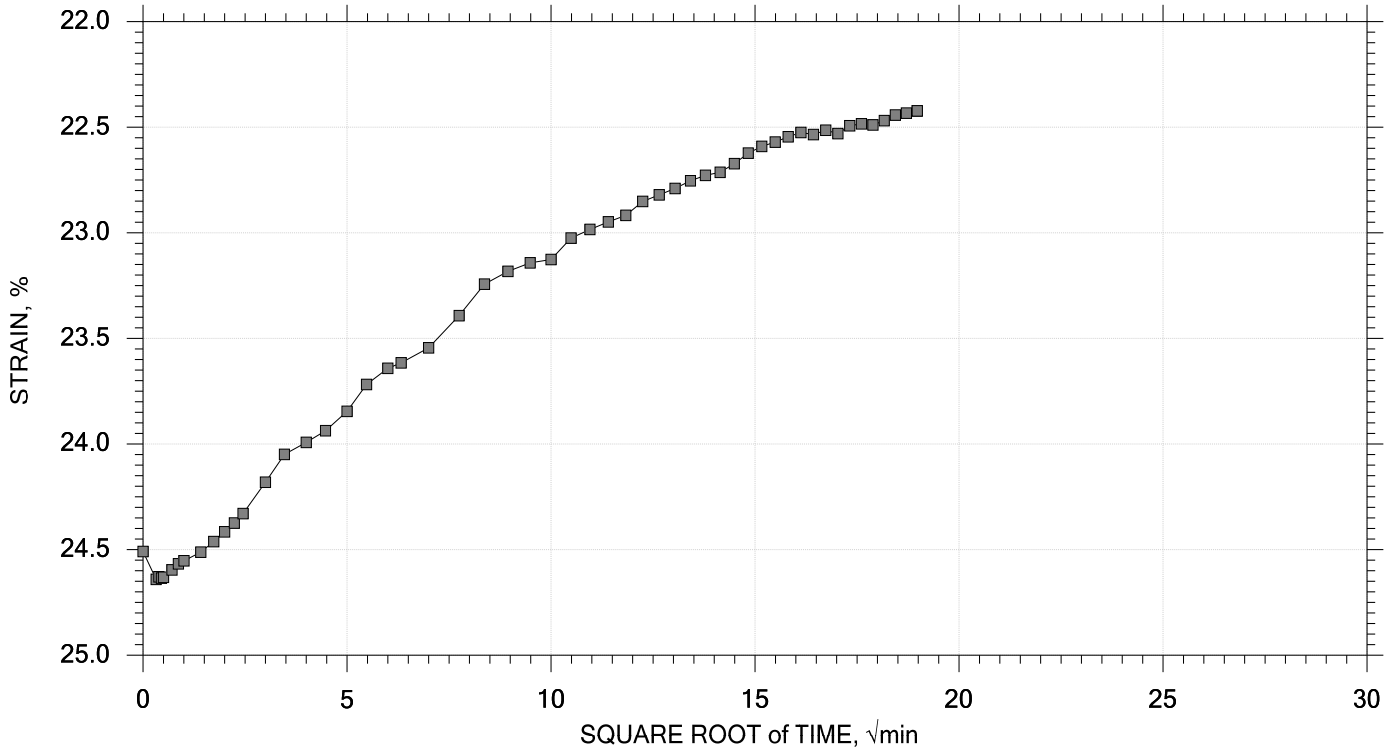
One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 21 of 21

Stress: 250 psf





GeoTesting EXPRESS	Project: Warren Ave Rehabilitation	Location: Portland, ME	Project No.: GTX-308006
	Boring No.: WA-E117	Tested By: md	Checked By: njh
	Sample No.: U-3	Test Date: 05/01/18	Test No.: IP-3
	Depth: 50-52 ft	Sample Type: intact	Elevation: ---
	Description: Wet, dark gray clay		
	Remarks: System T		

THIELSCH ENGINEERING

195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
http://www.thielsch.com
Let's Build a Solid Foundation

Client Information:
GZA Geoenvironmental
Portland, ME
PM: BMC
Assigned By: BMC
Collected By: EDF

Project Information:
Warren Ave.
Warren Ave. , Portland, ME
GZA Project Number: 09.0025970.00
Summary Page: 1 of 2
Report Date: 05.24.18

LABORATORY TESTING DATA SHEET

Boring ID	Sample No.	Depth (ft)	Laboratory No.	Identification Tests								Proctor / Direct Shear Tests								Laboratory Log and Soil Description
				Water Content %	LL %	PL %	Gravel %	Sand %	Fines %	Org. %	G_s	Dry unit wt. pcf	γ_d MAX (pcf) / W_{opt} (%)	γ_d MAX (pcf) / W_{opt} (%) (Corr.)	Strength (psi) @ 250 psf	Strength (psi) @ 500 psf	Strength (psi) @ 750 psf	Strength (psi) @ 1000 psf	EST. Shear Angle	
WA-B101	S-1	0-2	S-1	8.7			24.7	68.3	7.0											Dark Brown f-c SAND, some fine Gravel, trace Silt
WA-B101	S-3	10-12	S-2	30.8																
WA-B101	S-4	15-17	S-3	116.7																
WA-B101	S-6	25-27	S-4	45.5																
WA-B101	S-8	35-37	S-5	40.9																
WA-B103	S-2	5-7	S-6	241.8																
WA-B103	S-5	20-22	S-7	43.7																
WA-B103	S-7	30-32	S-8	109.9																
WA-B104	S-2	5-7	S-9	26.9			0.0	9.5	90.5											Grey Brown CLAYEY SILT, trace fine Sand
WA-B106	S-3	10-12	S-10	48.0																
WA-B106	S-5	20-22	S-11	44.6																

Reviewed By SAH

Date Reviewed 05.24.2018

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Warren Ave. , Portland, ME
GZA Project Number: 09.0025970.00
Summary Page: 2 of 2
Report Date: 05.24.18

LABORATORY TESTING DATA SHEET

Boring ID	Sample No.	Depth (ft)	Laboratory No.	Identification Tests								Proctor / Direct Shear Tests								Laboratory Log and Soil Description
				Water Content %	LL %	PL %	Gravel %	Sand %	Fines %	Org. %	G_s	Dry unit wt. pcf	γ_d MAX (pcf) / W_{opt} (%)	γ_d MAX (pcf) / W_{opt} (%) (Corr.)	Strength (psi) @ 250 psf	Strength (psi) @ 500 psf	Strength (psi) @ 750 psf	Strength (psi) @ 1000 psf	EST. Shear Angle	
WA-B106	S-7	30-32	S-12	67.7																
WA-B108	S-2	5-7	S-13	13.9			3.0	81.5	15.5											Grey Brown f-c SAND, little Silt, trace fine Gravel
WA-B108	S-4	15-17	S-14	34.0																
WA-B108	S-6	25-27	S-15	191.2																
WA-B108	S-8	35-37	S-16	149.6																
WA-B108	S-10	45-47	S-17	54.6																
WA-R109	S-2	2-4	S-18	4.7			6.1	71.8	22.1											Light Brown f-m SAND, some Silt, trace fine Gravel
WA-R111	S-2	2-4	S-19	8.5			3.4	75.1	21.5											Dark Brown f-m SAND, some Silt, trace fine Gravel
WA-R113	S-3	4-5.7	S-20	21.0			2.4	48.8	48.8											Dark Brown f-m SANDY and SILT, trace fine Gravel
WA-R116	S-1	0.4-2.4	S-21	5.1			22.0	71.2	6.8											Dark Brown f-c SAND, some f-c Gravel, trace Silt

Reviewed By _____

Date Reviewed 05.24.2018

THIELSCH ENGINEERING

State of Maine - Department of Transportation
Laboratory Testing Summary Sheet

Warren Ave

MDOT Project Number:

GZA Project Number: 09.0025970.00

Town(s): Portland, ME

Boring & Sample Identification Number	Station (Feet)	Sample No.	Depth (Feet)	Lab Number	Organic %	W.C.	L.L.	P.I.	Classification		
									Unified	AASHTO	Frost
WA-B101		S-1	0-2	1		8.74			SW-SM	A-1-b	II
WA-B104		S-2	5-7	9		26.9			ML	A-4(3)	IV
WA-B108		S-2	5-7	13		13.9			SM	A-1-b	II
WA-R109		S-2	2-4	18		4.7			SM	A-2-4(0)	III
WA-R111		S-2	2-4	19		8.5			SM	A-2-4(0)	III
WA-R113		S-3	4-5.7	20		21.0			SM	A-4(0)	IV
WA-R116		S-1	0.4-2.4	21		5.1			SW-SM	A-1-b	II

Classification of these soil samples is in accordance with AASHTO Classification System M-145-40. This classification is followed by the "Frost Susceptibility Rating" from zero (non-frost susceptible) to Class IV (highly frost susceptible). The "Frost Susceptibility Rating" is based upon the MDOT and Corps of Engineers Classification Systems.

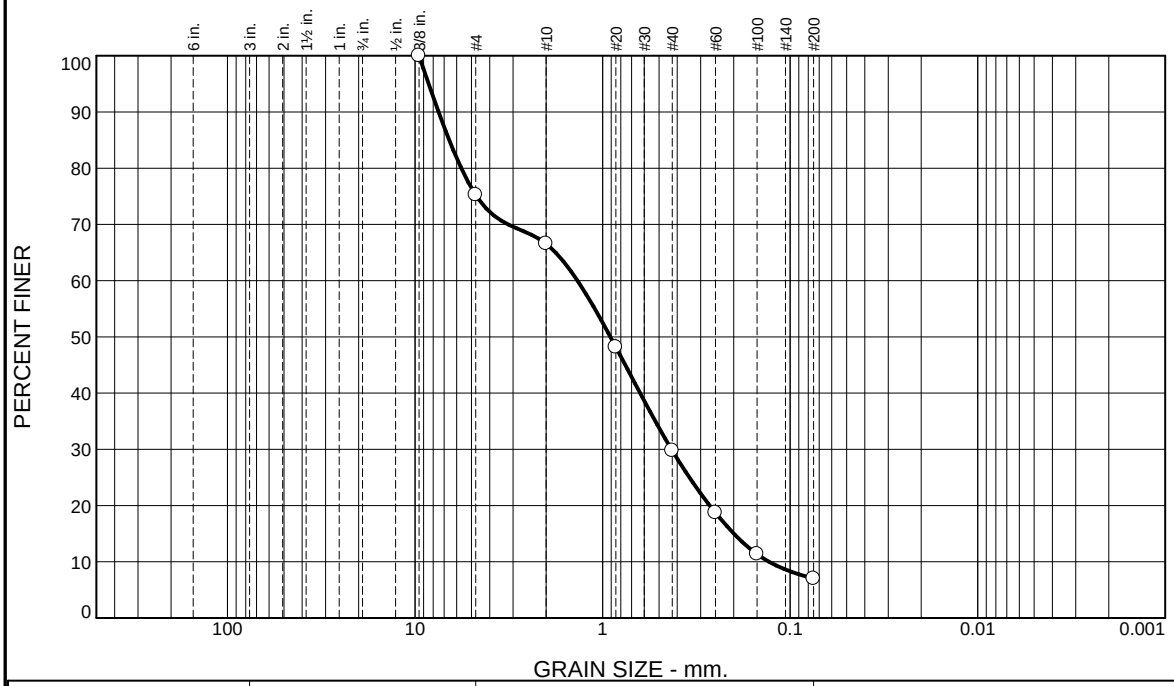
GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)

WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

LL = Liquid limit as determined by AASHTO T 89-96 and/or ASTM D 4318-98

PI = Plasticity Index as determined by AASHTO 90-96 and/or ASTM D4318-98

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	24.7	8.7	36.8	22.8	7.0	

Test Results (D7928 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	75.3		
#10	66.6		
#20	48.2		
#40	29.8		
#60	18.7		
#100	11.3		
#200	7.0		

* (no specification provided)

Material Description

Dark Brown f-c SAND, some fine Gravel, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SW-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 7.4866 D_{85}= 6.5715 D_{60}= 1.3603
D_{50}= 0.9095 D_{30}= 0.4290 D_{15}= 0.1994
D_{10}= 0.1296 C_u= 10.50 C_c= 1.04

Remarks

Date Received: 05/16/18 **Date Tested:** 05/23/18

Tested By: JS

Checked By: Steven Accetta

Title: Laboratory Manager

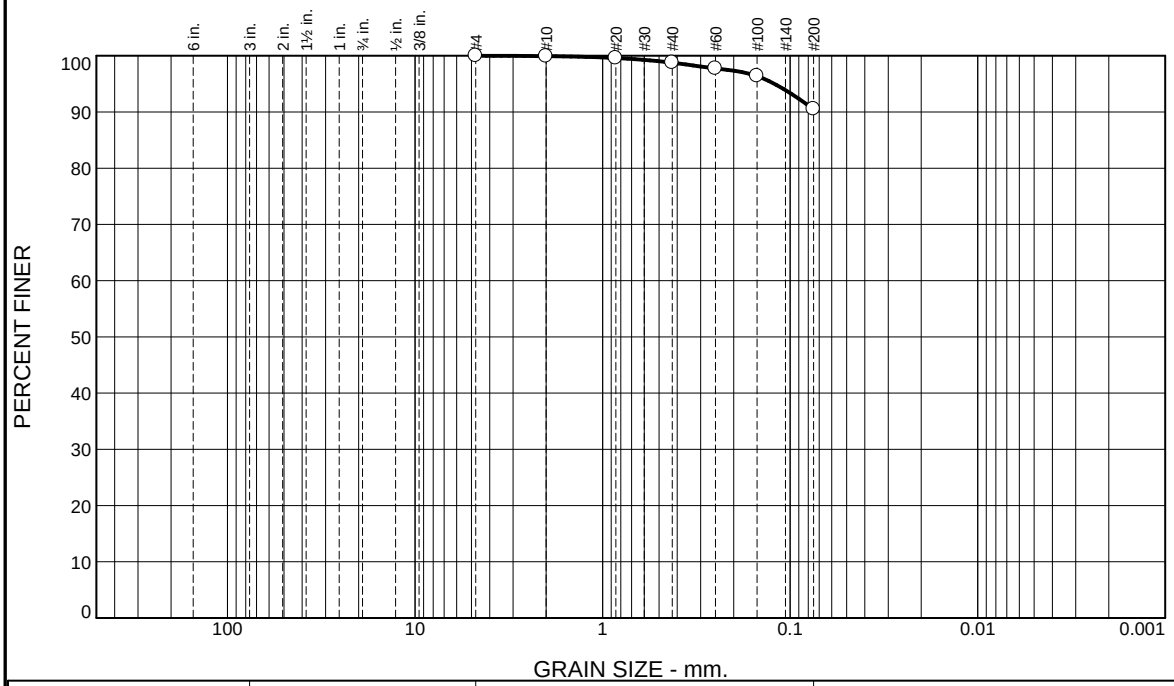
Source of Sample: Borings **Depth:** 0-2 **Date Sampled:** 05/23/18
Sample Number: WA-B101 / S-1

Thielsch Engineering Inc.

Cranston, RI

Client: GZA GeoEnvironmental
Project: Warren Ave
Portland, ME
Project No: 09.0025970.00 **Figure** S-1

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.1	8.3	90.5	

Test Results (D7928 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.9		
#20	99.6		
#40	98.8		
#60	97.7		
#100	96.4		
#200	90.5		

* (no specification provided)

Material Description

Grey Brown CLAYEY SILT, trace fine Sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(3)

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample visually classified as Clayey SILT. Sample rolled to 1/4".

Date Received: 5/16/18 **Date Tested:** 5/23/18

Tested By: JS

Checked By: Steven Accetta

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 5-7 **Date Sampled:** 5/23/18
Sample Number: WA-B104 / S-2

Thielsch Engineering Inc.

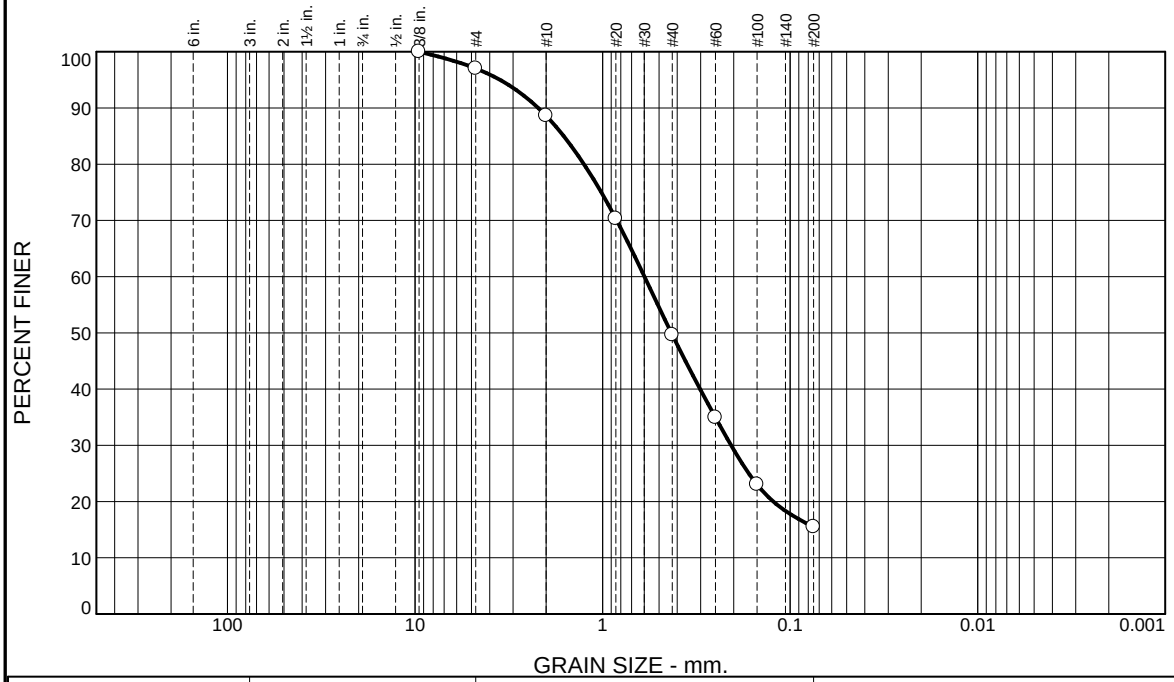
Cranston, RI

Client: GZA GeoEnvironmental

Project: Warren Ave
Portland, ME

Project No: 09.0025970.00 **Figure** S-9

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.0	8.4	38.9	34.2	15.5	

Test Results (D7928 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	97.0		
#10	88.6		
#20	70.3		
#40	49.7		
#60	34.9		
#100	23.0		
#200	15.5		

* (no specification provided)

Material Description

Grey Brown f-c SAND, little Silt, trace fine Gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 2.2035 D_{85}= 1.6108 D_{60}= 0.5981
D_{50}= 0.4300 D_{30}= 0.2064 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 05/16/18 **Date Tested:** 5/23/18

Tested By: JS

Checked By: Steven Accetta

Title: Laboratory Manager

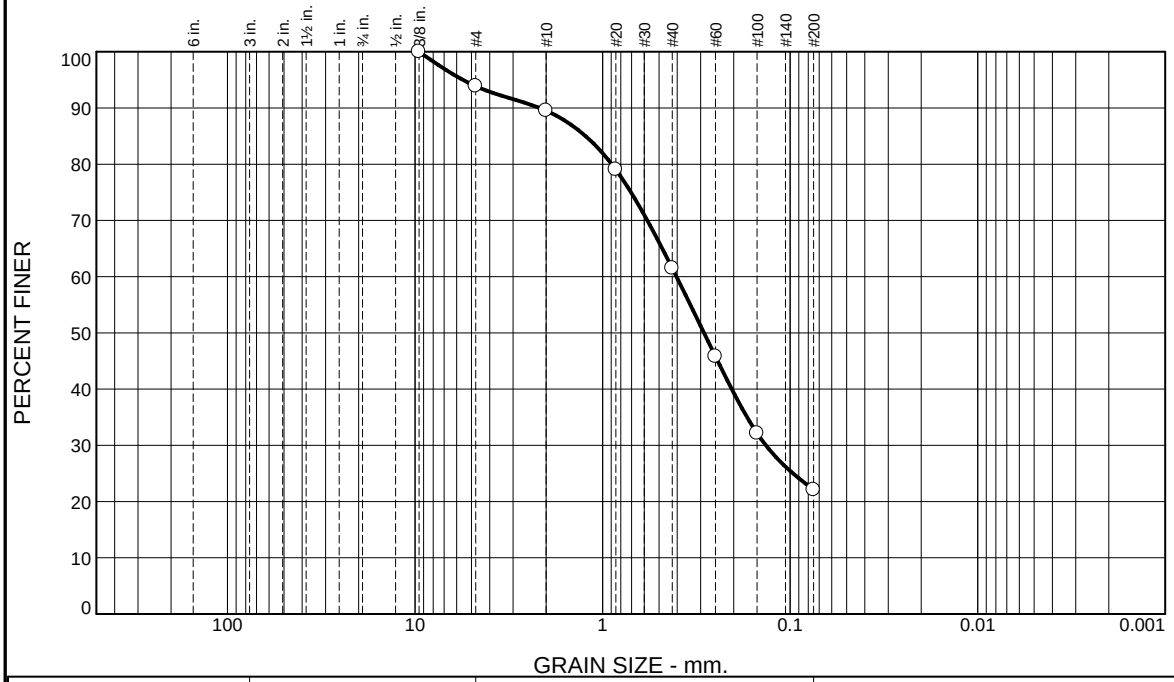
Source of Sample: Borings **Depth:** 5-7 **Date Sampled:** 05/23/18
Sample Number: WA-B108 / S-2

Thielsch Engineering Inc.

Cranston, RI

Client: GZA GeoEnvironmental
Project: Warren Ave
Portland, ME
Project No: 09.0025970.00 **Figure** S-13

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.1	4.4	28.0	39.4	22.1	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.375"	100.0		
#4	93.9		
#10	89.5		
#20	79.0		
#40	61.5		
#60	45.8		
#100	32.1		
#200	22.1		

* (no specification provided)

Material Description

Light Brown f-m SAND, some Silt, trace fine Gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 2.1644 D_{85}= 1.2314 D_{60}= 0.4036
D_{50}= 0.2878 D_{30}= 0.1347 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 05.17.18 **Date Tested:** 05.23.18

Tested By: MN

Checked By: Steven Accetta

Title: Laboratory Manager

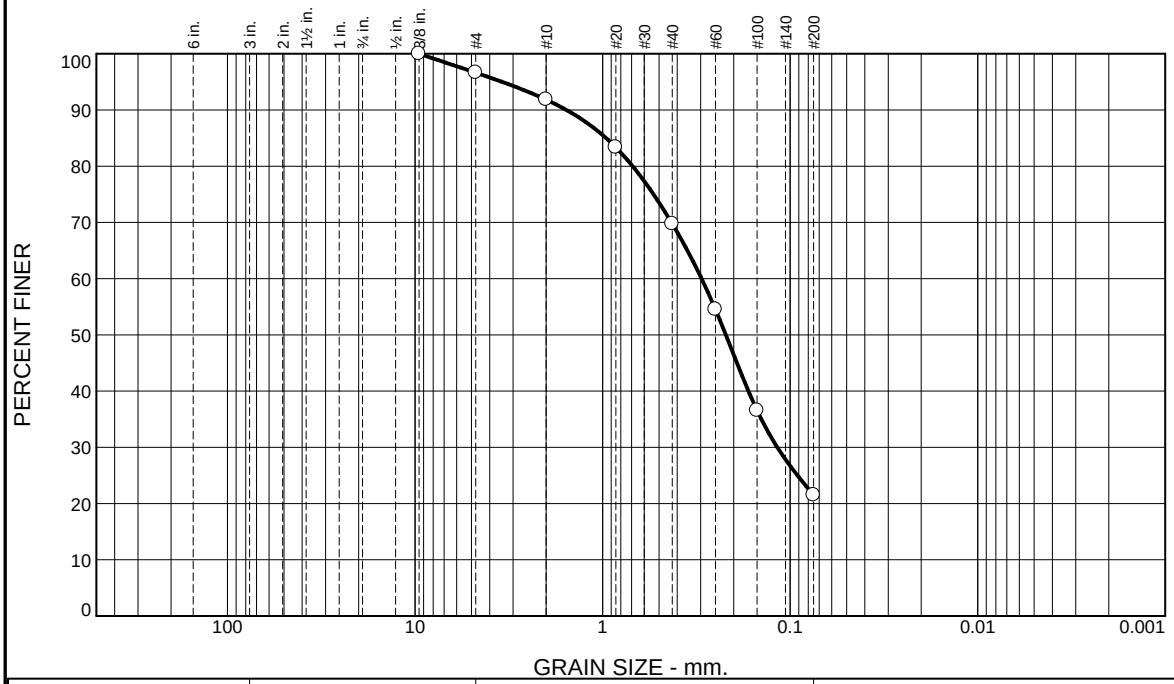
Source of Sample: Borings **Depth:** 2-4 **Date Sampled:**
Sample Number: WA-R109 / S-2

Thielsch Engineering Inc.

Cranston, RI

Client: GZA GeoEnvironmental
Project: Warren Ave
Portland, ME
Project No: 09.0025970.00 **Figure** S-18

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.4	4.8	22.0	48.3	21.5	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.375"	100.0		
#4	96.6		
#10	91.8		
#20	83.3		
#40	69.8		
#60	54.5		
#100	36.6		
#200	21.5		

* (no specification provided)

Material Description

Dark Brown f-m SAND, some Silt, trace fine Gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 1.5575 D_{85}= 0.9579 D_{60}= 0.2964
D_{50}= 0.2202 D_{30}= 0.1171 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 05.17.18 **Date Tested:** 05.23.18

Tested By: MN

Checked By: Steven Accetta

Title: Laboratory Manager

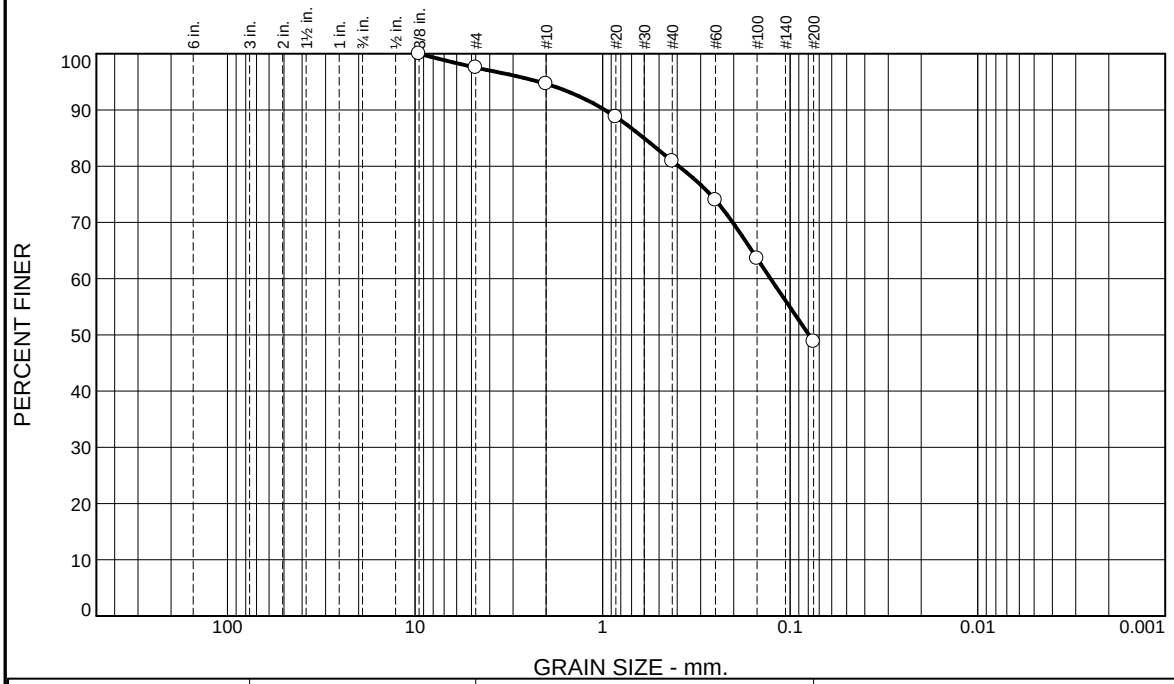
Source of Sample: Borings **Depth:** 2-4 **Date Sampled:**
Sample Number: WA-R111 / S-2

Thielsch Engineering Inc.

Cranston, RI

Client: GZA GeoEnvironmental
Project: Warren Ave
Portland, ME
Project No: 09.0025970.00 **Figure** S-19

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.4	2.9	13.8	32.1	48.8	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.375"	100.0		
#4	97.6		
#10	94.7		
#20	88.8		
#40	80.9		
#60	74.0		
#100	63.6		
#200	48.8		

* (no specification provided)

Material Description

Dark Brown f-m SANDY and SILT, trace fine Gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.9710 D_{85}= 0.6012 D_{60}= 0.1271
D_{50}= 0.0794 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample was visually classified as non-plastic.

Date Received: 05.17.18 **Date Tested:** 05.23.18

Tested By: MN

Checked By: Steven Accetta

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 4-5.7 **Date Sampled:**
Sample Number: WA-R113 / S-3

Thielsch Engineering Inc.

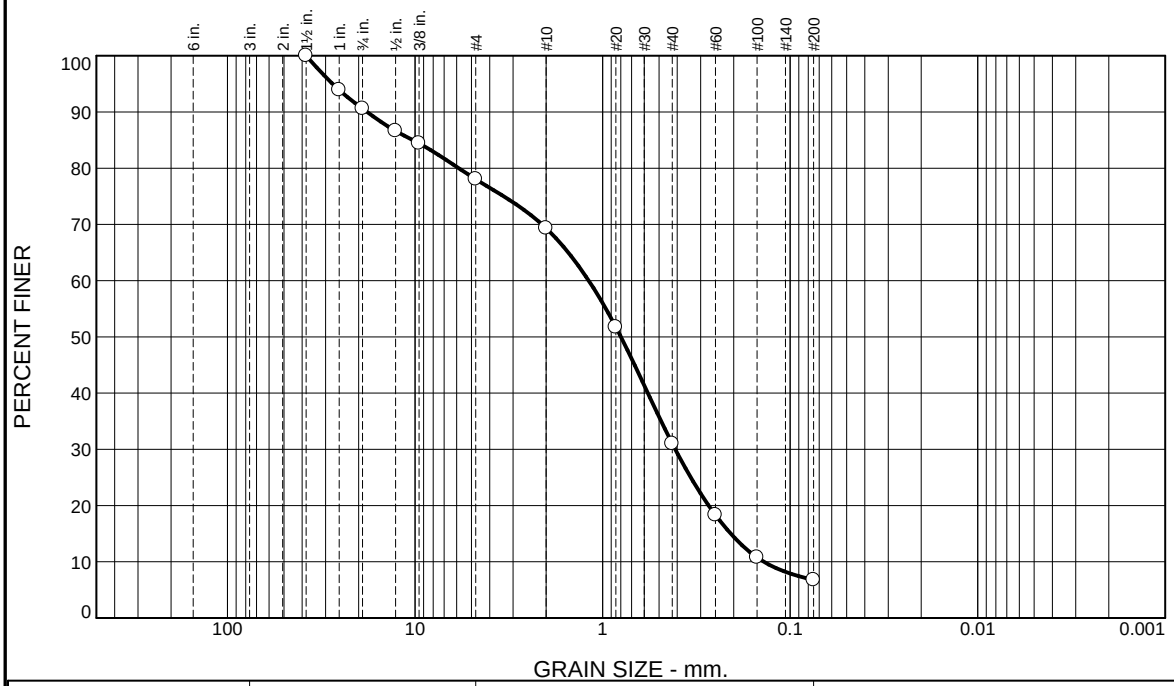
Cranston, RI

Client: GZA GeoEnvironmental

Project: Warren Ave
Portland, ME

Project No: 09.0025970.00 **Figure** S-20

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.4	12.6	8.7	38.3	24.2	6.8	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	93.9		
0.75"	90.6		
0.5"	86.6		
0.375"	84.4		
#4	78.0		
#10	69.3		
#20	51.7		
#40	31.0		
#60	18.3		
#100	10.8		
#200	6.8		

* (no specification provided)

Material Description

Dark Brown f-c SAND, some f-c Gravel, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SW-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 18.0137 D_{85}= 10.2641 D_{60}= 1.1857
D_{50}= 0.7991 D_{30}= 0.4099 D_{15}= 0.2073
D_{10}= 0.1381 C_u= 8.58 C_c= 1.03

Remarks

Date Received: 05.17.18 **Date Tested:** 05.23.18

Tested By: MN

Checked By: Steven Accetta

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 0.4-2.4 **Date Sampled:**
Sample Number: WA-R116 / S-1

Thielsch Engineering Inc.

Cranston, RI

Client: GZA GeoEnvironmental
Project: Warren Ave
Portland, ME
Project No: 09.0025970.00 **Figure** S-21

APPENDIX D – ULTRA-LIGHT WEIGHT FOAMED GLASS AGGREGATE SPECIAL PROVISION

SPECIAL PROVISION

SECTION 203

EXCAVATION AND EMBANKMENT

(Lightweight Fill)

203.01 Description

The following paragraph is added:

The work shall also consist of installing Ultra Lightweight Foamed Glass Aggregate (ULFGA) as shown on the Plans or as approved by the Resident. All work performed under this Special Provision shall be coordinated with the project's Geotechnical Engineer. The work also includes separating subgrade and granular fills from ULFGA by means of geotextile to prevent soil migration as described in this Special Provision.

203.02 Materials

The following paragraph is added:

The Contractor shall supply and install Lightweight backfills that consist of UL-FGA15 manufactured by AeroAggregates or an approved equivalent material. The material shall have an uncompacted moist density ranging from 15 to 19 pcf, and a maximum 10% compacted moist density of 21 pcf.

The following section is added:

203.021 Submittals

The Contractor shall submit a plan to the Resident for approval for transporting, delivering, stockpiling (if proposed), placing and compacting ULFGA. The plan will include at a minimum: the name and address of the supplier, laboratory testing data to show the uncompacted unit weight and internal friction angle, proposed means of delivery and stockpiling (if proposed), proposed equipment and procedures for placing separation geotextile, and placing and compacting ULFGA.

The plan shall also indicate a proposed schedule for the placement of the ULGFA. The Contractor shall provide a minimum of 3 working days' notice to the Resident prior to the placement of any ULGFA.

203.04 General

The following paragraphs are added:

Product Handling. The contractor shall protect the ULFGA before, during, and after construction as recommended by the material manufacturer.

Installation. The contractor shall place the ULFGA as indicated on the plans. Preparation of the subgrade shall include excavation with a smooth-edged bucket in order to minimize disturbance of the subgrade materials.

The areas to be filled shall not have standing water, ice, organic or otherwise unsuitable materials present prior to placement. If encountered, these materials should be excavated and replaced with compacted fill consisting of MaineDOT 703.06 Type D Gravel compacted to 95 percent of maximum density determined by ASTM D1557 (Modified Proctor Test).

A nonwoven geotextile fabric shall be placed directly on the prepared subgrade as a separator between the ULFGA and all other materials. The geotextile shall be installed between the ULFGA and any differing adjacent material exposed by excavation or differing adjacent material being placed beside or on top of the ULFGA.

The geotextile shall consist of punched nonwoven geotextile with a minimum grab tensile strength of 160 lbs per ASTM D4632 and shall meet the requirements of Subsection 722.04 for Separation Geotextile. To limit possible degradation, the geotextile shall not be exposed to the elements for more than 14 days after placement.

ULFGA may be dumped in place and spread in place. Construction equipment, other than for placement and compaction, shall not operate on the exposed ULFGA.

The ULFGA shall be placed in lifts not exceeding 12 inches in loose thickness. Each lift shall be compacted by two to four passes of a 110-220 lb vibrating plate compactor or by similar compactive effort. Sufficient compaction has been achieved when in the judgement of the Geotechnical Engineer the material ceases to densify further with additional passes of the plate compactor. Excessive compaction shall be avoided to minimize crushing of the aggregate.

Testing. The Contractor shall measure the as-delivered loose bulk density and submit documentation of the results. At least one test shall be performed for every 500 cubic yards of ULFGA delivered. Bulk density testing shall be performed in the presence of the Geotechnical Engineer.

The Contractor and Geotechnical Engineer shall visually observe compaction of each lift of ULFGA for sufficient compaction.

Compaction shall be performed in the presence of the Geotechnical Engineer who will observe performance of the selected equipment and the compactive effort, and establish requirements for the number of passes, and lift thickness for specific compaction equipment.

203.18 Method of Measurement

The following paragraph is added:

Lightweight Fill will be measured by the cubic yard in place by cross sectional elevations.

203.19 Basis of Payment

Lightweight Fill will be paid for at the contract unit price per cubic yard, which shall be full compensation for all labor, materials, equipment, and incidentals required to supply, deliver and install the ULFGA and separation geotextile as described in this Special Provision and shown on the Plans including the creation of an approved plan. Removal and replacement of Lightweight Fill damaged by the Contractor shall be incidental to the work, as directed by the Resident and/or Geotechnical Engineer. No additional compensation shall be provided for separation geotextile.

Payment will be made under:

Pay Item		Pay Unit
203.33	Lightweight Fill	Cubic Yard