

# GEOTECHNICAL DESIGN REPORT

19-0771

January 7, 2020

## Geotechnical Engineering Services

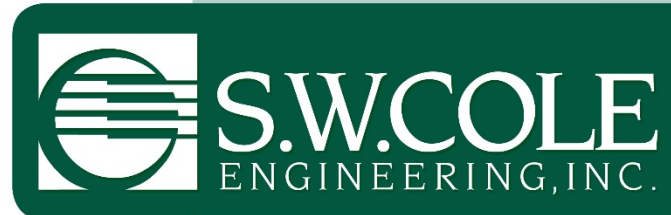
Schoodic Bridge #3649 Replacement  
State Route 193 over Schoodic Brook  
Cherryfield, Maine  
WIN 022230.00

**PREPARED FOR:**

Maine Department of Transportation  
Attention: Laura Krusinski, P.E.  
State House Station 16  
Augusta, ME 04333-0016

**PREPARED BY:**

S. W. Cole Engineering, Inc.  
26 Coles Crossing Drive  
Sidney, ME 04330  
T: (207) 626-0600



- *Geotechnical Engineering*
- *Construction Materials Testing and Special Inspections*
- *GeoEnvironmental Services*
- *Test Boring Explorations*

[www.swcole.com](http://www.swcole.com)

## TABLE OF CONTENTS

1.0 INTRODUCTION.....	1
1.1 Site Conditions .....	1
1.2 Proposed Construction.....	1
2.0 EXPLORATIONS AND TESTING .....	2
2.1 Explorations .....	2
2.2 Testing .....	2
3.0 SUBSURFACE CONDITIONS .....	3
3.1 Surficial and Bedrock Geology .....	3
3.2 Soil and Bedrock .....	3
3.3 Groundwater .....	7
4.0 GEOTECHNICAL EVALUATIONS .....	7
4.1 Foundation Options and Discussion .....	7
4.2 Settlement .....	7
4.3 Global Stability .....	8
4.4 Integral Abutment H-Piles.....	9
4.4.1 Strength Limit State Design.....	9
4.4.2 Service and Extreme Limit State Design.....	11
4.4.3 Downdrag.....	12
4.4.4 Lateral Pile Resistance .....	12
4.4.5 Driven Pile Resistance and Pile Quality Control .....	13
4.5 Integral Abutment Design.....	14
4.6 Frost Considerations .....	15
4.7 Seismic Design Considerations.....	15
4.8 Recommendations for Scour Evaluation.....	16
4.9 Construction Considerations .....	17
4.10 Temporary Detour .....	17
4.10.1 Settlement .....	17
4.10.2 Global Stability .....	18
5.0 CLOSURE.....	18
Appendix A	Limitations
Appendix B	Figures
	Site Location Map
	Boring Location Plan
	Interpretive Subsurface Profile
Appendix C	Boring Logs and Key to Soil and Rock Descriptions and Terms
Appendix D	Laboratory Test Results
Appendix E	Calculations

19-0771

January 7, 2020

Maine Department of Transportation  
Attention: Laura Krusinski, P.E.  
State House Station 16  
Augusta, ME 04333-0016

Subject: Geotechnical Design Report  
Geotechnical Engineering Services  
Schoodic Bridge #3649 Replacement  
State Route 193 over Schoodic Brook  
Cherryfield, Maine  
WIN 022230.00

Dear Laura:

In accordance with our Proposal, dated July 2, 2019, and project specific Assignment Letter #23, dated July 10, 2019, we have reviewed the provided information for the subject project. The purpose of our services was to review the provided subsurface information, laboratory testing and progress plan in order to provide geotechnical parameters and recommendations for foundations and earthwork associated with the proposed construction.

The services provided by S. W. Cole Engineering, Inc. (S.W.COLE) were conducted in accordance with our Multi-PIN Agreement with the Maine Department of Transportation (MaineDOT), No. 2015072000000000085, dated July 20, 2015. The contents of this report are subject to the limitations in Attachment A.

## **1.0 INTRODUCTION**

### **1.1 Site Conditions**

The site is Schoodic Bridge (MaineDOT Bridge #3649) carrying State Route 193 over Schoodic Brook in Cherryfield, Maine. The site location is shown on the "Site Location Map" attached in Appendix B. We understand the existing bridge was originally constructed in 1939 as a concrete T-beam bridge supported on mass concrete abutments and wingwalls founded on timber piles. The span of the bridge is 30 feet clear between abutment faces with a zero degree skew. We understand during construction the stream was realigned to be perpendicular to the road.

### **1.2 Proposed Construction**

Based on the provided Preliminary Design Report (PDR) prepared by MaineDOT dated July 2, 2019, we understand the existing bridge will be replaced with a new 60 foot single-span, Integral Abutment Bridge (IAB) with 13.5 degree skew supported on steel H-piles that are driven to end-

bearing on bedrock. We understand the superstructure will consist of precast, pre-stressed concrete NEXT F beam girders with an 8 inch reinforced concrete deck and a 1 inch integral wearing surface. We understand the replacement structure will be constructed on the existing alignment and the vertical grade will be raised slightly (less than 1 foot). We understand the proposed abutments will be constructed behind the existing abutments and that the existing abutments will be removed to about the streambed elevation. Below this elevation, the existing abutments will remain in place. We understand the bridge will be widened about 4 feet for a total curb-to-curb width of 28 feet. Similarly, the bridge approaches will be widened about 4 feet. Widening of the approaches will result in approximately 3 feet of new fill on both the left and right side of the approach from about Station 5+25 to 5+50 and 6+25 to 6+50. We understand construction will include about 375 linear feet of new roadway alignment with anticipated 2H:1V approach side slopes. We understand 1.75H:1V riprap slopes will wrap around and in front of the abutments for scour protection and will match into the approach side slopes.

We understand during construction of the new bridge, alternating two-way traffic controlled by traffic signals will be maintained on a special detour (temporary bridge) located on the downstream (west) side of the existing bridge.

## **2.0 EXPLORATIONS AND TESTING**

### **2.1 Explorations**

Three test borings (BB-CSB-101, -102 and -103) were made at the site for the proposed replacement structure on March 12 through March 28, 2018 by the MaineDOT Drill Crew using a trailer-mounted CME 45C drill rig. Four test borings (BB-CSB-201 through -204) were made at the site along the proposed detour alignment on January 23 and 28, 2019 by S. W. Cole Explorations, LLC (S.W.COLEX) using a track-mounted Diedrich D-50 drill rig. The exploration locations were selected and established in the field by MaineDOT. The explorations were logged in the field by MaineDOT. The “as-drilled” exploration locations are shown on the “Boring Location Plan” attached in Appendix B. Logs of these test borings and a Key to Soil and Rock Descriptions and Terms used on the logs are attached as Appendix C.

### **2.2 Testing**

The test borings were drilled using a combination of solid-stem auger, cased wash boring, and NQ2 rock core drilling techniques. The soils were sampled at approximate 5 foot intervals using a split-spoon sampler and Standard Penetration Testing (SPT) techniques using a calibrated automatic hammer. Undisturbed Shelby tube sampling and Vane Shear Testing (VST), using a Geonor vane kit, were performed where softer cohesive soils were encountered. Upon encountering refusal on bedrock, borings BB-CSB-101 and BB-CSB-103 were advanced up to 10 feet into bedrock using NQ2 rock coring.

Both the MaineDOT and S.W.COLEX drill rigs are equipped with automatic hammers to drive the split-spoon sampler. Both hammers were calibrated per ASTM D4633-10 “Standard Test

Method for Energy Measurement for Dynamic Penetrometers.” Corrected N-values discussed in this report were computed by applying the corresponding average energy transfer factors of 0.928 (for the MaineDOT hammer) and 0.918 (for the S.W.COLEX hammer) to the raw field N-values. The hammer efficiency factors (0.928 and 0.918), uncorrected SPT blow counts, uncorrected and corrected SPT N-values, VST, and rock core intervals and Rock Quality Designation (RQD) are shown on the boring logs provided in Appendix C.

Laboratory testing was performed on disturbed SPT and undisturbed Shelby tube samples obtained during the explorations. Laboratory testing was performed by the MaineDOT Materials Testing and Exploration Central Laboratory in Bangor, Maine, in accordance with applicable American Association of State Highway and Transportation Officials (AASHTO) testing procedures. Laboratory testing included 25 natural water content tests, 25 grain size analyses (18 with hydrometer and 7 without hydrometer), 14 Atterberg limits, and three consolidation tests. A summary and results of the laboratory testing are provided in Appendix D.

### **3.0 SUBSURFACE CONDITIONS**

#### **3.1 Surficial and Bedrock Geology**

According to the Maine Geological Survey’s (MGS’s) mapping of the Cherryfield Quadrangle, Maine (Open-File Map 82-2)<sup>1</sup>, surficial geologic units within the site vicinity consist of Glaciomarine Deposits (Presumpscot Formation - silt, clay and sand) and Glacial Stream Deposits and Glacial Till. The surficial geologic units encountered were generally consistent with the mapped geology; however, the explorations also encountered Fill soils from previous site development.

Bedrock in the site vicinity is mapped as Devonian or younger age material of the Deblois Pluton (Open-File Map 61-2)<sup>2</sup>. This material is generally composed of biotite granite. The observed bedrock is generally consistent with the mapped bedrock geology. There are no mapped faults within the site vicinity.

#### **3.2 Soil and Bedrock**

Subsurface conditions at the project site were explored by drilling 7 test borings. Borings BB-CSB-101 and BB-CSB-103 were drilled behind the existing north and south abutments, respectively. Boring BB-CSB-102 was drilled in front of the existing north abutment, through the existing bridge deck. Borings BB-CSB-201 through BB-CSB-204 were drilled downstream (west) of the existing bridge for the special detour alignment.

Test borings BB-CSB-101 and -103 encountered a soils profile generally consisting of fill overlying glaciomarine silt and clay overlying glacial till overlying bedrock. Test boring

---

<sup>1</sup> Borns, Harold W., Jr., Andersen, Bjorn, 1982, Reconnaissance surficial geology of the Cherryfield [15-minute] quadrangle, Maine: Maine Geological Survey, Open-File Map 82-2, map, scale 1:62,500.

<sup>2</sup> Gilman, Richard A., 1961, Reconnaissance bedrock geology of the Cherryfield [15-minute] quadrangle, Maine: Maine Geological Survey, Open-File Map 61-2, map, scale 1:62,500.

BB-CSB-102 encountered alluvium overlying glaciomarine silt and clay. Test borings BB-CSB-201 and -202 encountered a soils profile generally consisting of glaciomarine silt and clay overlying glacial till. Test borings BB-CSB-203 and -204 encountered a soil profile generally consisting of alluvial/wetland deposits overlying glaciomarine silt and clay and glacial till. The principal strata encountered in the explorations are summarized below. An Interpretive Subsurface Profile is attached in Appendix B. Refer to the boring logs in Appendix C for more detailed descriptions of the subsurface findings at the exploration locations.

Surficial: Test borings BB-CSB-101 and BB-CSB-103, made within the roadway of State Route 193 encountered a 7 and 7.5-inch thick layer of pavement, respectively. Boring BB-CBS-201 encountered 6 inch surficial layer of topsoil.

Fill: Below the pavement, borings BB-CSB-101 and BB-CSB-103 encountered fill extending to depths of 13.5 and 14.0 feet below ground surface (bgs), respectively, corresponding to El. 97.8 and 97.0 feet. The fill generally consisted of:

- Brown, damp, Gravelly SAND, little silt;
- Brown, moist to wet, SAND, little to some gravel, trace silt;
- Olive-brown, wet, SILT, some sand, little clay, trace gravel, trace organics; and
- Grey-brown, wet, Silty SAND, little clay, trace gravel.

The fill was generally loose to dense with SPT  $N_{60}$  values ranging from 6 to 43 blows per foot (bpf).

Alluvium: Test borings BB-CSB-102 made through the existing bridge deck and borings BB-CSB-203 and -204 encountered alluvium to depths of 2 to 9 feet, corresponding to Elevation (El.) 97.6 to 95.1 feet. The alluvial deposit generally consisted of:

- Brown, wet, SAND, trace gravel, trace silt;
- Brown, wet, SAND, little silt, trace gravel, trace clay, trace organics;
- Brown, wet, Silty SAND, little organics (wood).

The alluvial deposit was generally very loose with SPT  $N_{60}$  values of 3 bpf, where sampled.

Glaciomarine Soil: Below the fill materials and alluvium in BB-CSB-101, -102, -103 and -201 and from the ground surface in BB-CSB-202, -203 and -204 (along the proposed temporary detour), glaciomarine silts and clays were encountered in each boring to depths of about 10.5 to 38.0 feet bgs (El. 92.8 to 71.9 feet), where penetrated. Boring BB-CSB-102 was terminated in the glaciomarine soils at a depth of 17 feet bgs (El. 82.6 feet). The glaciomarine soils sampled generally consisted of:

- Olive to olive-brown, moist to wet, Clayey SILT;
- Grey, wet, Clayey SILT with black staining;
- Grey, wet, Clayey SILT, trace to little fine sand;

- Grey, wet, Clayey SILT, some to trace fine sand, trace gravel; and
- Grey, wet, CLAY, some silt, little gravel, trace fine sand.

The thickness of the glaciomarine deposit was relatively uniform (19 to 20 feet) along the proposed bridge alignment. The thickness of the glaciomarine deposit increased from south to north along the temporary detour alignment from about 4 to 15 feet thick at south approach to about 36 to 38 feet along the north approach.

Vane shear tests completed in the glaciomarine deposit measured undisturbed undrained shear strengths ranging from about 357 to 1,384 pounds per square foot (psf), indicating the glaciomarine deposit is soft to stiff in consistency. The remolded shear strengths ranged from about 22 to 312 psf. Based on the ratio of peak (undisturbed) to remolded shear strength, the glaciomarine clay has a sensitivity ranging from about 3 to 18 and classified as low to quick.

Atterberg Limits tests were conducted on 14 samples of the glaciomarine silt and clay. Results of the Atterberg Limits testing are summarized in the following table:

Boring No.	Sample No.	USCS Classification	Water Content (%)	Atterberg Limits			Liquidity Index (LI)
				LL	PL	PI	
BB-CSB-101	3D	CL	35.5	31	21	10	1.5
BB-CSB-101	1U	CL	36.8	38	23	15	0.9
BB-CSB-102	2D	CL	36.6	31	21	10	1.6
BB-CSB-102	1U	CL	33.5	27	19	8	1.8
BB-CSB-102	3D	CL	39.2	31	20	11	1.7
BB-CSB-103	4D	CL	23.6	34	20	14	0.3
BB-CSB-103	5D	CL	31.2	31	20	11	1.0
BB-CSB-103	6D	CL	35.5	31	20	11	1.4
BB-CSB-201	1U/A	CL	38.3	35	24	11	1.3
BB-CSB-201	1U/B	CL	39.2	40	24	16	1.0
BB-CSB-201	4D	CL	32.7	29	20	9	1.4
BB-CBS-202	4D	CL	34.5	32	19	13	1.2
BB-CBS-202	6D	CL	34.4	30	20	10	1.4
BB-CSB-203	1D/A	CL	27.4	34	21	13	0.5

The plasticity indices (PI) of these samples ranged from 8 to 16 indicating the soils generally have a low to medium plasticity. The natural water contents for these samples ranged from about 23 to 39 percent and liquid limits (LL) ranged from 27 to 40. The liquidity indices (LI) ranged from 0.3 to 1.8. Interpretation of these results indicate the soils with a LI of 1 or less are normally or heavily consolidated while those with LI in excess of 1 are on the verge of being a viscous liquid as the natural water content exceeds the LL. Soils with LI in excess of 1 have a high liquefaction potential and loss of strength and structure when disturbed. LI values greater than or equal to 1 are also indicative of soils that are unconsolidated and are commonly referred to as “quick.”

Three, one-dimensional consolidation tests were conducted on undisturbed Shelby Tube samples. The results of the tests are included in Appendix B and summarized in the following table:

Boring & Sample No.	Sample Depth (ft)	Sample Elevation (ft)	Stress History			Compressibility	
			Existing Vertical Effective Stress (psf)	Maximum Previous Stress (psf)	OCR	C <sub>R</sub>	R <sub>R</sub>
BB-CSB-101, 1U	20	91.3	1,800	2,500	1.4	0.18	0.02
BB-CSB-201, 1U/A	15	94.1	1,675	3,500	2.1	0.17	0.03
BB-CSB-201, 1U/B	16	93.1	1,725	2,800	1.6	0.15	0.03

OCR = Overconsolidation Ratio  
C<sub>R</sub> = Consolidation Ratio  
R<sub>R</sub> = Recompression Ratio

Based on the consolidation test results, the maximum previous stress (e.g. preconsolidation stress) within the glaciomarine deposit is greater than the existing vertical effective stress (Overconsolidation Ratio, OCR = 1.4 to 2.1) indicating the glaciomarine deposit is slightly overconsolidated.

**Glacial Till:** Underlying the glaciomarine deposit, the borings encountered glacial till which generally consisted of:

- Grey, wet, SAND, varying amounts of gravel and silt, with occasional cobbles.

The full thickness of the glacial till was penetrated in two of the seven borings and was observed to be 18.7 feet thick at BB-CSB-101 and 16 feet thick at BB-CSB-103. The test borings drilled along the proposed detour alignment were terminated approximately 6.3 to 16.5 feet into the glacial till layer.

The glacial till was generally medium dense to very dense with SPT N<sub>60</sub> values ranging from 15 bpf to 52 blows for about 4 inches (sampler refusal).

**Bedrock:** Bedrock was encountered and sampled in borings BB-CSB-101 and BB-CSB-103. The top of bedrock varied from about 49.5 to 50.7 feet bgs (El. 60.6 to 61.5 feet). The bedrock generally consisted of white and grey, hard to very hard, fresh to slightly weathered granite of the Deblois Pluton. Joints were generally horizontal to steeply dipping, close to wide and open with occasional silt infilling.

The following table summarizes the approximate depths to bedrock, corresponding top of bedrock elevations and Rock Quality Designation (RQD) where encountered.

Boring Number (Substructure)	Approximate Depth to Bedrock (feet)	Approximate Bedrock Elevation (feet)	RQD (RMQ)
BB-CSB-101 (Abutment No. 1)	50.7	60.6	R1: 43% (Poor) R2: 42% (Poor)
BB-CSB-103 (Abutment No. 2)	49.5	61.5	R2: 82% (Good) R3: 87% (Good)

RQD values for the bedrock generally ranged from 42 to 87 percent corresponding to a Rock Mass Quality (RMQ) of poor to good. Detailed descriptions of the rock core and RQD values for each core run are shown on the exploration logs in Appendix C.

### **3.3 Groundwater**

The soils encountered at the test borings were generally moist to wet from the ground surface. Water levels measured in six of the seven borings ranged from the ground surface to a depth of 13.7 feet bgs. It should be noted that water was introduced during drilling; therefore, water levels indicated may not represent stabilized ground water conditions. Long term groundwater information is not available. It should be anticipated that groundwater levels will fluctuate seasonally, particularly in response to periods of snowmelt and precipitation, changes in site use and the water level of Schoodic Brook.

## **4.0 GEOTECHNICAL EVALUATIONS**

S.W. COLE conducted geotechnical engineering evaluations in accordance with 2017 AASHTO LRFD Bridge Design Specifications, 8<sup>th</sup> Edition (LRFD) and the MaineDOT Bridge Design Guide, 2003 Edition with revisions through June 2018 (MaineDOT BDG) and offers the following:

### **4.1 Foundation Options and Discussion**

The PDR identifies a pile-supported Integral Abutment Bridge (IAB) as the preferred replacement structure and driven piles as the preferred foundation option. The following sections provide geotechnical design considerations and recommendations for H-pile supported IAB.

### **4.2 Settlement**

We understand the proposed replacement structure will be generally constructed on the existing alignment; and the vertical profile will be within 6 inches of existing grades. However, we understand the bridge approaches will be widened about 4 feet. Widening of the approaches will result in approximately 3 feet of new fill on both the left and right side of the approach from about Station 5+25 to 5+50 and 6+25 to 6+50.

As described above, the glaciomarine soils encountered at the site are generally medium stiff to soft in consistency with an Overconsolidation Ratio (OCR) of 1.4 within the existing roadway embankment.

We estimated the magnitude of stress increase within the glaciomarine deposit as a result of the anticipated fill placement and widening using normal-weight fills with a unit weight of 125 pounds per cubic foot (pcf). Since the combination of the existing vertical effective stress and estimated stress increase from the placement of about 3 feet of fill for the approach widening will be less than the maximum previous stress, the magnitude of consolidation settlement generally will be a function of the glaciomarine clays recompression ratio ( $R_R = 0.02$ ).

We conducted settlement evaluations using Settle3D software to assess the feasibility of constructing the proposed embankment fill and widening. Settlement evaluations were conservatively completed to model the approach embankment widening and 0.5 foot raise in grade using normal-weight fills at Station (Sta.) 6+25 where the clay thicknesses is the greatest. Settlement was evaluated for the short-term (0.1 year), 1 year and 50 years after loading. Estimates of the magnitude of total ground surface settlement for each stage are summarized below. The evaluation shows that the estimated magnitude of total ground surface settlement due to embankment widening and grade raise will result in total settlements less than 0.4 inches. The majority of this settlement will occur immediately during placement and compaction of the proposed fill for the widening and raise in roadway grades. Model run outputs are provided in Appendix E.

Model	Range of Estimated Total Settlement (inches)			
	Stage 1 (30 days)	Stage 2 (0 to 1 year)	Stage 3 (0 to 50 years)	Net Change from Stage 2 and 3
Abutment 2 North Approach Sta. 14+25	0.1 to 0.4	0.1 to 0.4	0.1 to 0.4	Negligible

As discussed above, the estimated settlement will occur as recompression since the combination of existing vertical stress and estimated stress increase within the glaciomarine deposit is less than the maximum past pressure. As a result, we anticipate most of the settlement will occur during construction, as fill is placed and compacted.

#### **4.3 Global Stability**

We performed global stability evaluations for the proposed approach embankments at Sta. 5+50 and 6+25 considering the embankment widening and raise in roadway grade. Our slope stability analyses were made using SLOPE/W software by Geo-Slope (GeoStudio 2012). We evaluated global stability considering the resistance factors outlined in LRFD Article 11.6.2.3 and guidance in Article C11.6.2.3 as follows:

##### Global Stability for Static Conditions

FS  $\geq$  1.3 ( $\phi = 0.75$ ) for slopes or walls not containing/supporting a structural element

##### Global Stability for Seismic Conditions

FS  $\geq$  1.0 ( $\phi = 1$ )

In accordance with LRFD Article 11.6.5.2.2, the seismic condition includes a seismic load by incorporating a horizontal seismic coefficient,  $k_h$ , of 0.083 g, equal to one-half of the calculated acceleration coefficient ( $A_s$ ) of 0.165 g.

Results of our global stability model runs indicated safety factors against global stability failure for the rapid drawdown condition at Sta. 5+50 is below the referenced safety factor per LRFD Article 11.6.2.3. Therefore, we recommend constructing a riprap buttress at the toe of embankment was used to improve the overall slope stability safety factor. The buttress should

extend from the north abutment at about Sta. 5+54 to Sta. 5+35. Results of our global stability model runs are summarized in the following table and included in Appendix E.

Model	Safety Factor
Abutment 1 Sta. 5+50 – Rapid Drawdown – Static Condition	1.16
Abutment 1 Sta. 5+50 – Rapid Drawdown – Riprap Buttress – Static Condition	1.34
Abutment 1 Sta. 5+50 – Low Water – Riprap Buttress – Seismic Condition	1.28
Abutment 2 Sta. 6+25 – Rapid Drawdown – Static Condition	1.35
Abutment 2 Sta. 6+25 – Low Water – Seismic Condition	1.20

#### **4.4 Integral Abutment H-Piles**

We understand Abutments No. 1 (North) and No. 2 (South) will be integral abutments founded on a single row of steel H-piles. The piles shall be end bearing on or within bedrock and driven to the required resistance. Based on discussions with the design team and MaineDOT BDG Section 5.4.2.1, pile sections may include HP 14x89, 14x102 or 14x117. Additional pile sections may be considered depending on the factored design axial loads. S.W.COLE can provide additional input on pile size once pile loading has been developed for the proposed structure.

H-piles shall be 50 ksi, Grade A572 steel with cast driving points conforming to MaineDOT Standard Specification 711.10 to help reduce damage to the piles during driving and improve penetration.

Based on the depths bedrock was encountered at the borings we estimate the following pile lengths:

Location	Approx. Bottom of Proposed Abutment	Approx. Top of Competent Bedrock	Estimated Pile Length (feet)
	Elevation (feet)		
Abutment No. 1 BB-CSB-101	102.0	60.6	42
Abutment No. 2 BB-CSB-103	102.0	61.5	41

The estimated pile lengths do not take into account variations in the bedrock surface elevation, pile damage, additional footage (5 feet) of pile required for dynamic testing instrumentation (per ASTM D4945), additional pile length needed to accommodate leads and driving equipment, or additional pile length needed for embedment in the abutment or pile cap.

#### **4.4.1 Strength Limit State Design**

Design of pile foundations bearing on or within bedrock at the strength limit state shall consider;

- Compressive axial geotechnical resistance of individual piles bearing on bedrock;
- Drivability resistance of individual piles driven to bedrock;
- Structural resistance of individual piles in axial compression, and;
- Structural resistance of individual piles in combined axial loading and flexure.

Pile groups should be designed to resist all lateral earth loads, vehicular loads, dead and live loads, and lateral forces transferred through the abutments. The pile group resistance after scour due to the design flood shall provide adequate foundation resistance using the resistance factors given in this section.

Per LRFD Article 6.5.4.2, at the strength limit state, the axial resistance factor  $\phi_c = 0.50$ , for severe driving conditions shall be applied to the structural compressive resistance of the pile. The H-piles will be subjected to lateral loading, therefore the piles shall be evaluated for resistance against combined axial compression and flexure in accordance with LRFD Articles 6.9.2.2 and 6.15.2.

Per LRFD Article 6.5.4.2, at the strength limit state, the axial resistance factor  $\phi_c = 0.70$  and the flexural resistance factor  $\phi_f = 1.0$  shall be applied to the combined axial and flexural resistance of the pile in the interaction equation (LRFD Eq. 6.9.2.2-1 or -2).

Abutment H-piles should be analyzed for determination of unbraced lengths and fixity using LPILE® 2016 (LPILE) software. The calculated unbraced lengths should be used to analyze the piles in combined axial compression and flexure resistance provided in LRFD Articles 6.9.2.2 and 6.15.2.

Structural Resistance. The nominal axial compressive structural resistance ( $P_n$ ) for piles loaded in compression shall be as specified in LRFD Article 6.9.4.1. The nominal axial structural compressive resistance ( $P_n$ ) subject to the combined axial compression and flexure shall be evaluated based on unbraced lengths ( $l$ ) and effective length factors ( $K$ ) as determined from LPILE once structural loads are available. The nominal axial structural resistance should be evaluated based on combined axial compression and flexure.

Preliminary estimates of the structural axial resistance for selected H-pile sections were calculated using a resistance factor,  $\phi_c = 0.50$ , for severe driving conditions. The unbraced pile lengths ( $l$ ) and effective length factors ( $K$ ) in these evaluations have been assumed. It is the responsibility of the structural engineer to calculate the nominal axial structural compressive resistance ( $P_n$ ) based on unbraced lengths ( $l$ ) and effective length factors ( $K$ ) determined from LPILE.

Geotechnical Resistance. The nominal axial geotechnical resistance in the strength limit state were calculated using the guidance in LRFD Article 10.7.3.2.3 which states the nominal bearing resistance of piles driven to point bearing on hard rock shall not exceed the structural pile resistances obtained from LRFD Article 6.9.4.1 with a resistance factor  $\phi_c = 0.50$  for severe driving conditions. For non-displacement piles driven to end bearing on or within bedrock, it is our experience that this is generally not the controlling resistance.

Drivability Analyses. Drivability analyses were performed to determine the pile resistance that might be achieved considering available diesel hammers. The maximum driving stresses in the

pile, assuming the use of 50 ksi steel, shall be less than 45 ksi. The drivability resistances were calculated using the resistance factor,  $\phi_{dyn}$ , of 0.65, for a single pile in axial compression when a dynamic test is performed as specified in LRFD Table 10.5.5.2.3-1.

A summary of the calculated factored axial compressive structural, geotechnical, and drivability resistances of selected H-piles for the strength limit states are provided in the following table.

<b>Factored Axial Pile Resistances at Strength Limit States</b>				
<b>Pile Section</b>	<b>Factored Axial Pile Resistance (kips)</b>			
	<b>Structural Resistance <math>\phi_c = 0.5</math></b>	<b>Controlling Geotechnical Resistance <math>\phi = 0.5</math></b>	<b>Drivability Resistance <math>\phi_{dyn} = 0.65</math></b>	<b>Controlling Axial Pile Resistance</b>
HP 14x89	652	652	469	469
HP 14x102	750	750	506	506
HP 14x117	860	860	541	541

LRFD Article 10.7.3.2.3 states the nominal axial compressive resistance of piles driven to hard rock is typically controlled by the structural resistance with a resistance factor for severe driving conditions applied. However, the estimated factored axial pile resistance from the drivability analyses for the H-pile sections are less than the controlling factored axial structural resistance per LRFD Article 10.7.3.2.3 therefore, drivability controls. The maximum applied factored axial pile load for the strength limit states should not exceed the controlling factored pile resistance shown in above table.

#### 4.4.2 Service and Extreme Limit State Design

The design of H-piles at the service limit state shall consider tolerable transverse and longitudinal movement of piles and pile group movement considering changes in soil conditions due to scour based on the design flood ( $Q_{100}$ ). For the service limit state, resistance factors of  $\phi = 1.0$  should be used in accordance with LRFD Article 10.5.5.1. The exception is the overall global stability of the foundation which should be investigated at the Service I load combination and a resistance factor,  $\phi$ , of 0.65.

Extreme limit state design shall include pile axial compressive resistance, overall global stability of the pile group, pile failure by uplift in tension, and structural failure. The extreme event load combinations are those related to seismic forces, ice loads, debris loads, and hydraulic events. Extreme limit state design shall also check that the nominal pile foundation resistance remaining after scour due to the check flood ( $Q_{500}$ ) can support the extreme limit state loads. Resistance factors for extreme limit states, per LRFD Article 10.5.5.3, shall be taken as  $\phi = 1.0$  with the exception of uplift of piles, for which the resistance factor,  $\phi_{up}$ , shall be 0.80 or less per LRFD Article 10.5.5.3.2.

The nominal axial geotechnical pile resistance at the service and extreme limit state was calculated using the guidance in LRFD Article 10.7.3.2.3. A summary of the calculated factored

axial structural, geotechnical, and drivability resistances of selected H-piles for the extreme and service limit states are provided in the following table.

<b>Factored Axial Pile Resistances at Service and Extreme Limit States</b>				
<b>Pile Section</b>	<b>Factored Axial Pile Resistance (kips)</b>			
	<b>Structural Resistance <math>\phi_c = 1.0</math></b>	<b>Controlling Geotechnical Resistance <math>\phi = 1.0</math></b>	<b>Drivability Resistance <math>\phi_{dyn} = 1.0</math></b>	<b>Controlling Axial Pile Resistance</b>
HP 14x89	1305	1305	721	721
HP 14x102	1500	1500	778	778
HP 14x117	1720	1720	832	832

LRFD Article 10.7.3.2.3 states that the nominal axial compressive resistance of piles driven to hard rock is typically controlled by the structural resistance with a resistance factor for severe driving conditions applied. However, the estimated factored axial pile resistances from the drivability analyses for the H-pile sections are less than the controlling factored axial structural resistance per LRFD Article 10.7.3.2.3 and the nominal structural resistances. The maximum applied factored axial pile load for the extreme and service limit states should not exceed the controlling factored pile resistance shown in above table.

#### 4.4.3 Downdrag

As previously discussed, settlement from the proposed raise in roadway grade and embankment widening is anticipated to be less than 0.4 inches. We anticipate settlement will occur during construction with negligible long-term settlement. Therefore, downdrag is not considered to be an issue.

#### 4.4.4 Lateral Pile Resistance

In accordance with LRFD Article 6.15.1, the structural analysis of pile groups subjected to lateral loads shall include consideration of soil-structure interaction effects as specified in LRFD Article 10.7.3.9. Assumptions regarding a fixed or pinned condition at the pile tip should be also confirmed with soil-structure interaction analyses.

A series of lateral pile resistance analyses should be performed to evaluate pile behavior at both abutments using LPile® Plus 5.0 (LPile) or FB-MultiPier® software. S.W.COLE is available to perform lateral pile analyses using LPile software once provided with the anticipate pile head deflections, moments and axial loads.

Geotechnical parameters for generation of soil-resistance (p-y) curves in lateral pile analyses using LPile® software are shown in the following Table. In general, the model developed emulates the soil at the site by using the soil layers, appropriate pile material properties, section parameters, and pile-head boundary conditions for the pile section being analyzed.

Recommended LPILE® Soil Parameters							
Elevation Range <sup>1,2</sup> (Depth Range) Top   Bottom		Soil Layer <sup>2</sup> (Soil Model)	K <sub>static</sub> (pci)	Soil Parameters			
				Effective Unit Wt. γ', (pcf)	Cohesion c, (psf)	e <sub>50</sub>	Friction Angle φ', (deg)
<b>Abutment 1 (Boring BB-CSB-101)</b>							
102.0 (0)	98.0 (4.0)	loose Sand/Silt Fill (Sand-Reese)	20	62.6	-	-	29
98.0 (4.0)	92.0 (10.0)	med stiff Glaciomarine (Soft Clay-Matlock)	-	57.6	600	0.010	-
92.0 (10.0)	79.3 (22.7)	soft Glaciomarine (Soft Clay-Matlock)	-	57.6	400	0.020	-
79.3 (22.7)	60.6 (41.4)	med dense/dense Glacial Till (Sand-Reese)	125	72.6	-	-	38
<b>Abutment 2 (Boring BB-CSB-103)</b>							
102.0 (0)	97.0 (5.0)	loose Sand/Silt Fill (Sand-Reese)	20	62.6	-	-	29
97.0 (5.0)	91.0 (11.0)	stiff Glaciomarine (Soft Clay-Matlock)	-	57.6	600	0.010	-
91.0 (11.0)	77.5 (24.5)	soft / med stiff Glaciomarine (Soft Clay-Matlock)	-	57.6	400	0.020	-
77.5 (24.5)	61.5 (40.5)	dense Glacial Till (Sand-Reese)	125	72.6	-	-	38

**Notes:** 1. Bottom of pile cap at El 102.0 feet.  
 2. Groundwater at El. 103.71 feet corresponding to Q<sub>50</sub>.

#### 4.4.5 Driven Pile Resistance and Pile Quality Control

The contract documents shall require the contractor to perform a wave equation analysis for the proposed pile-hammer system and conduct dynamic pile load tests with signal matching. The first pile driven at each abutment should be dynamically tested to confirm nominal pile resistance and verify the stopping criteria developed by the contractor in the wave equation analysis. Minimum 24-hour restrrike tests will be required and should be noted on the plans. Additional dynamic tests may be required as part of the pile field quality control program if:

- Pile behavior vary radically between adjacent piles;
- Pile behavior indicates pile refusal on a boulder or in a cobble layer above bedrock;
- Pile tip is not firmly embedded in bedrock; or
- Pile tip “walks” out of position and is out of tolerance.

Piles should be driven to an acceptable penetration resistance based on the results of a wave equation analysis provided by the contractor and as approved by the design team. Pile load testing should be completed by PDA testing with signal matching including one pile at each abutment. Driving stresses in the pile determined in the drivability analysis and confirmed by PDA testing shall be less than 45 ksi, in accordance with LRFD Article 10.7.8. The pile hammer should be selected such that the required pile resistance when the penetration resistance for the final 3 to 6 inches is between 3 to 15 blows per inch (bpi). If an abrupt increase in driving resistance is encountered, the driving may be terminated when the penetration is less than 0.5-

inch in 10 consecutive blows. Termination criteria shall be confirmed and evaluated for the selected pile hammer.

#### **4.5 Integral Abutment Design**

Integral abutment sections shall be designed for all relevant strength, service, and extreme limit states and load combinations specified in LRFD Articles 3.4.1 and 11.5.5. Stub abutments shall be designed to resist all lateral earth loads, vehicular loads, dead and live loads, and lateral forces transferred through the integral superstructure. The design of the integral abutment at the strength limit state shall consider reinforced-concrete structural design. Strength limit state design shall also consider changes in foundation conditions and foundation resistance after scour due to the design ( $Q_{100}$ ) flood.

A resistance factor ( $\phi$ ) of 1.0 shall be used to assess abutment design at the service limit state, including: settlement, excessive horizontal movement, and movement resulting after scour due to the design ( $Q_{100}$ ) flood. The overall stability of the foundation should be investigated at the Service I Load Combination and a resistance factor,  $\phi$ , of 0.65.

Extreme limit state design of integral abutment supported on H-piles shall include pile structural resistance, pile geotechnical resistance, pile resistance in combined axial and flexure, and overall stability. Resistance factors for extreme limit state shall be taken as 1.0. Extreme limit state design shall also check that the nominal foundation resistance remaining after scour due to the check ( $Q_{500}$ ) flood can support the extreme limit state loads with a resistance factor of 1.0.

The designer may assume Soil Type 4 (MaineDOT Bridge Design Guide (BDG) Section 3.6.1) for abutment backfill material soil properties. The backfill properties are as follows:

- Angle of internal friction ( $\phi$ ) of 32 degrees;
- Total unit weight ( $\gamma$ ) of 125 pcf; and
- Soil-concrete interface friction angle ( $\delta$ ) of 20 degrees.

Integral abutment sections shall be designed to withstand a lateral earth load equal to the passive pressure state. Calculation of passive earth pressures should assume a Coulomb passive earth pressure coefficient,  $K_p$ , of 6.7. Developing full passive pressure assumes that the ratio of lateral abutment movement to abutment height ( $y/H$ ) exceeds 0.005. If the calculated abutment rotation ( $y/H$ ) is 0.005 or less, the designer may consider using the Rankine passive earth pressure coefficient of 3.3.

Additional lateral earth pressure due to live load surcharge is required per Section 3.6.8 of the MaineDOT BDG for abutments if an approach slab is not specified. When a structural approach slab is specified, reduction, not elimination, of the surcharge load is permitted per LRFD Article 3.11.6.5. The live load surcharge may be estimated as a uniform horizontal earth pressure due to an equivalent height of soil ( $h_{eq}$ ) based on LRFD Table 3.11.6.4-1.

The abutment design shall include a drainage system behind the abutment to mitigate excessive hydrostatic pressures. Drainage behind the structure shall be in accordance with MaineDOT BDG Section 5.4.2.13.

Backfill within 10 feet of the abutments and side slope fill shall conform to MaineDOT Specification 703.19 “Granular Borrow for Underwater Backfill.”

Slopes in front of the pile supported integral abutments should be constructed with riprap and erosion control geotextile. The riprap slopes should not exceed 1.75:1(H:V) in accordance with MaineDOT Standard Detail 610(03). The 1.75H:1V riprap slopes shall “toe-in” at least 2 feet.

#### **4.6 Frost Considerations**

According to MaineDOT BDG Section 5.2.1 and BDG Figure 5-2, pile supported integral abutments shall be embedded a minimum of 4.0 feet for frost protection. Foundations bearing on soil should be designed with an appropriate embedment for frost protection. Based on the Maine Design Freezing Index Map<sup>3</sup>, the design freezing index for the Cherryfield, Maine area is approximately 1,300 freezing degree-days. Based on Section 5.2.1 of the MaineDOT BDG and subsurface soils encountered, the maximum seasonal frost penetration is estimated to be on the order of about 4 feet. Considering this, we recommend foundations should have at least 4 feet of soil cover to provide frost protection.

Riprap is not to be considered as contributing to the overall thickness of soils required for frost protection.

#### **4.7 Seismic Design Considerations**

Seismic site class was evaluated in accordance with LRFD Article 3.10.3.1 Method B (average N-value method). AASHTO allows for an N-value of 100 to be used for bedrock in the upper 100 feet of the soil profile. Based on the subsurface information and an N-value of 100 for the bedrock, the average N-value fell below 15 bpf corresponding to an AASHTO Site Class E as defined in LRFD Table 3.10.3.1-1.

The United States Geological Survey (USGS) Seismic Design Parameters program (Version 2.1) was used to obtain the seismic design parameters for the site. Based on the assigned site class (AASHTO Site Class E) and site coordinates, the software provides the recommended AASHTO Response Spectrum for a 7 percent probability of exceedance in 75 years (1,000-year return period). The results for the project site are summarized below and program output are provided in Appendix E.

---

<sup>3</sup>Maine Department of Transportation, Bridge Design Guide (BDG), August 2003, with Revisions through 2014, Figure 5-1.

RECOMMENDED SEISMIC DESIGN PARAMETERS	
Site Class	E
PGA	0.066 g
S <sub>s</sub>	0.139 g
S <sub>1</sub>	0.040 g
F <sub>pga</sub>	2.5
F <sub>a</sub>	2.5
F <sub>v</sub>	3.5
A <sub>s</sub>	0.165 g
S <sub>DS</sub>	0.347 g
S <sub>D1</sub>	0.141 g
Seismic Zone (based on S <sub>D1</sub> )	Zone 1

NOTE: Site Coordinates: N44.684919, W67.949833

#### **4.8 Recommendations for Scour Evaluation**

Laboratory grain size analyses were performed on soil samples taken near the approximate streambed elevation (El. 98 feet) to generate parameters to be used in scour analyses. Results of the grain size analyses tests are included in Appendix D and summarized in the following table:

Boring No.	Sample No.	Depth (ft)	Elevation (ft)	Estimated D <sub>95</sub> (mm)	Estimated D <sub>50</sub> (mm)
BB-CSB-101	3D	16	95.3	0.02	0.002
BB-CSB-102	1D	0	99.6	5.7	1.0
BB-CSB-102	2D	5	94.6	0.05	0.003
BB-CSB-103	4D	15	96.0	22.2	0.002

Design at the strength limit state should consider loss of lateral and vertical support due to scour. Design at the extreme limit state should check that the nominal foundation resistance due to the check flood (Q<sub>500</sub>) event is no less than the extreme limit state loads. At the service limit state, the design shall limit movements and ensure overall stability considering scour at the design load.

For scour protection of the pile-supported abutments, the bridge and abutment slopes will be armored with riprap. It is our understanding the existing abutments will remain at or below the streambed to provide additional protection to the new abutments. In accordance with MaineDOT BDG Section 2.3.11.3, the top of the riprap shall be located at the Q<sub>50</sub> elevation. It is our understanding that new riprap slopes in front of the new abutments will be keyed-in behind the existing abutments that remain at or below the streambed. The toe of the new riprap slopes outside of the existing abutments that remain should be keyed into the existing soils at least 2 feet.

Riprap shall conform to MaineDOT Standard Specification 703.26 "Plain and Hand Laid Riprap" and should be placed at a maximum slope of 1.75H:1V. The riprap section shall be underlain by a 1 foot layer of MaineDOT Standard Specification 703.19 "Granular Borrow Material for

Underwater Backfill” and a Class 1 nonwoven erosion control geotextile per MaineDOT Standard Specification 722.03.

#### **4.9 Construction Considerations**

Construction of the abutments will require pile driving. Cofferdams and temporary lateral earth support systems may be needed for construction of the detour structure and partial removal of the existing abutments. The new integral abutments will be constructed behind the existing abutments avoiding disturbance to the sensitive soils in the streambed and avoiding placement of fills in the brook.

Cobbles were encountered in the glacial till deposit. There is potential for these obstructions to impede the driving of H-piles to bedrock for abutment foundations. Obstructions may be cleared by conventional excavation methods, pre-augering, predrilling or spudding. Alternative methods to clear obstructions may be used as approved by the Resident. Care should be taken to drive H-piles within allowable tolerances without damaging the H-piles.

Excavations for the proposed abutments may expose pockets of soft or unsuitable material. Soft or unsuitable material shall be removed and replaced with compacted granular borrow or crushed stone. Sloughing and instability of the soils due to runoff, traffic vibrations, and construction activity is likely. The contractor should monitor the stability of slopes, excavation, soils at the roadway grade and the temporary earth retaining systems during construction. The contractor should control groundwater, surface water infiltration and soil erosion. Water should be controlled by pumping from sumps.

#### **4.10 Temporary Detour**

The glaciomarine deposit encountered along the proposed temporary detour are sensitive, characterized as having low shear strength in their natural state and will undergo significant strength loss when disturbed. The glaciomarine soils pose constructability and stability concerns for the temporary detour and temporary bridge.

##### **4.10.1 Settlement**

We understand the proposed detour structure will require tapered cuts and fills of up to 4 feet to achieve proposed roadway grade. As described above, the glaciomarine soils encountered at the site are generally medium stiff in consistency with an OCR of 1.6 to 2.1 within the proposed detour alignment.

We performed settlement evaluations using Settle3D software to assess feasibility. We estimated the magnitude of stress increase within the glaciomarine soil deposit as a result of the anticipated detour construction using 4 feet of normal-weight fills with a unit weight of 125 pounds per cubic foot (pcf).

Settlement evaluations were estimated for short-term (0.1 year) and 1 year after loading for the detour structure at conceptual temporary detour Sta. 2+50 (north approach) where the clay

thicknesses is the greatest. The evaluation shows that the estimated magnitude of total ground surface settlement due to the grade raise of 4 feet will result in total settlements approaching ¼ inch. Settlement evaluations were not performed for the south approach of the conceptual temporary detour. Model run output are provided in Appendix E.

#### **4.10.2 Global Stability**

Global stability evaluations of the proposed, approximately 4-foot high south approach embankment for the temporary detour were performed using SLOPE/W software. The results of the static global stability analyses for the anticipated conditions in the longitudinal and transverse directions and at a transverse skew at conceptual temporary detour Sta. 3+25 do not meet the minimum LRFD requirements of a factor of safety of 1.5 and 1.3, respectively. Model run output are provided in Appendix E.

Based on the evaluation, we anticipate special embankment construction measures to improve stability will be required as part of the contractor's temporary detour design at both approaches. Increasing the factor of safety could be accomplished by reducing the driving forces (e.g., using lightweight fills, reducing the volume of conventional fill), or increasing the resisting forces (e.g., excavating weak materials, constructing toe berms, installing slope reinforcement elements such as geotextile, sheeting or piles).

The contractor shall be required in the contract documents to demonstrate that the temporary detour embankments and abutments have acceptable factors of safety for slope stability. Minimum factors of safety shall be 1.3 for embankment slopes and 1.5 for slopes that contain or support an abutment.

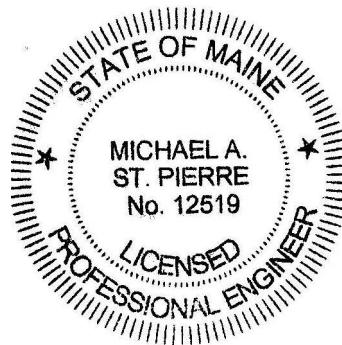
#### **5.0 CLOSURE**

We trust this information meets your present needs. Please contact us if you have any questions or need further assistance.

Sincerely,

**S. W. Cole Engineering, Inc.**

Michael A. St. Pierre, P.E.  
Senior Geotechnical Engineer



Robert E. Chaput, Jr., P.E.  
Senior Geotechnical Engineer

MAS/tjm-rec



## **APPENDIX A**

### **Limitations**

This report has been prepared for the exclusive use of the Maine Department of Transportation for specific application to the Proposed Schoodic Bridge (#3649) Replacement carrying State Route 193 over Schoodic Brook (MaineDOT WIN 022230.00) in Cherryfield, Maine. S. W. Cole Engineering, Inc. (S.W.COLE) has endeavored to conduct our services in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

The soil profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.

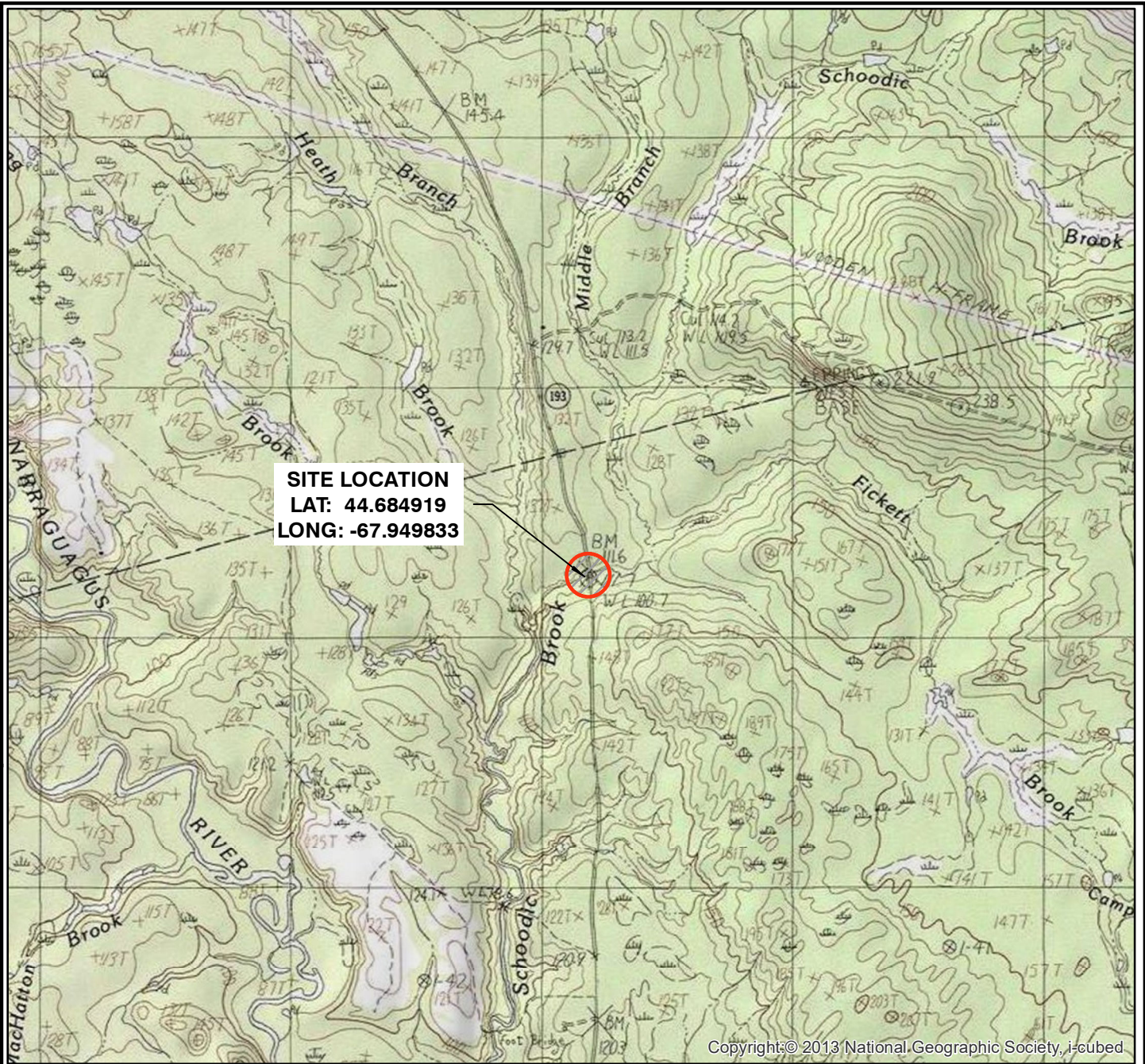
The analyses performed during this investigation and recommendations presented in this report are based in part upon the data obtained from subsurface explorations made at the site. Variations in subsurface conditions may occur between explorations and may not become evident until construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and to review the recommendations of this report.

Observations have been made during exploration work to assess site groundwater levels. Fluctuations in water levels will occur due to variations in rainfall, temperature, and other factors.

Recommendations contained in this report are based substantially upon information provided by others regarding the proposed project. In the event that any changes are made in the design, nature, or location of the proposed project, S.W.COLE should review such changes as they relate to analyses associated with this report. Recommendations contained in this report shall not be considered valid unless the changes are reviewed by S.W.COLE.

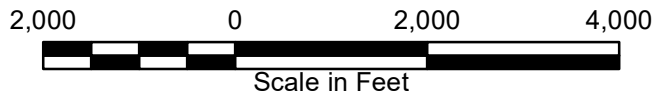


**APPENDIX B**  
**Figures**



**SITE LOCATION**  
**LAT: 44.684919**  
**LONG: -67.949833**

Copyright © 2013 National Geographic Society, i-cubed

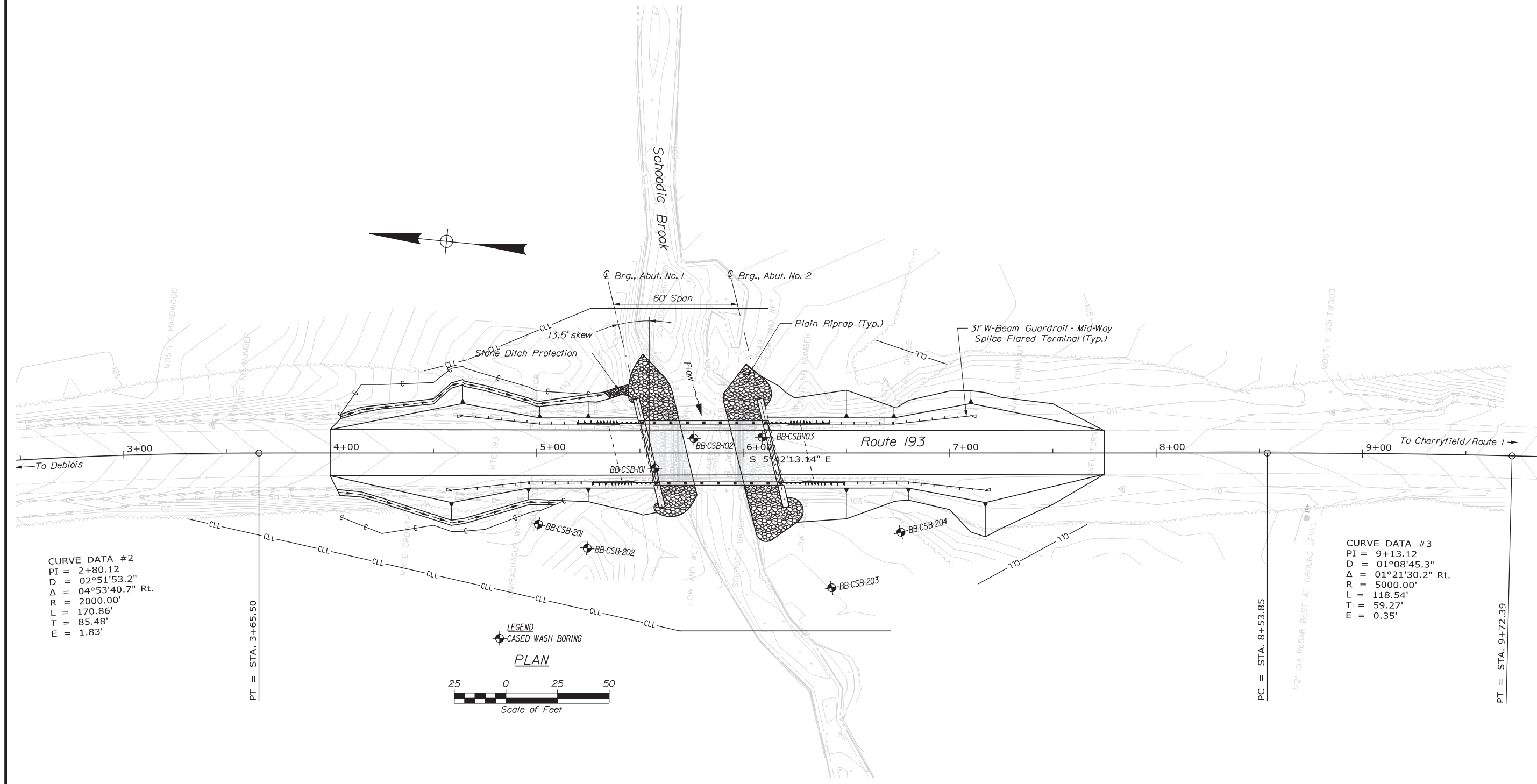


MAINE DEPARTMENT OF TRANSPORTATION  
**SITE LOCATION MAP**  
 SCHOODIC BRIDGE #3649 REPLACEMENT  
 STATE ROUTE 193 OVER SCHOODIC BROOK  
 CHERRYFIELD, MAINE  
 WIN 022230

**NOTE:**  
 SITE LOCATION MAP PREPARED FROM  
 ESRI ArcGIS ONLINE AND DATA PARTNERS  
 INCLUDING USGS AND © 2007 NATIONAL  
 GEOGRAPHIC SOCIETY.

Job No.	19-0771	Scale	1:24000
Date:	09/20/2019	Sheet	1

R:\2019\19-0771\GIS\MXDs\19-0771\_SLM.mxd, 9/20/2019 3:59:56 PM, 1:24,000.

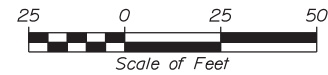


**CURVE DATA #2**  
 PI = 2+80.12  
 D = 02°51'53.2"  
 Δ = 04°53'40.7" Rt.  
 R = 2000.00'  
 L = 170.86'  
 T = 85.48'  
 E = 1.83'

PT = STA. 3+65.50

**LEGEND**  
 ◆ CASED WASH BORING

**PLAN**



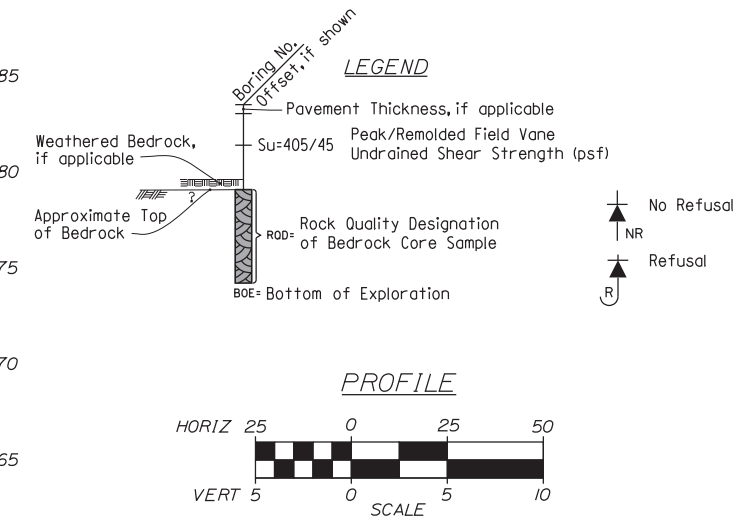
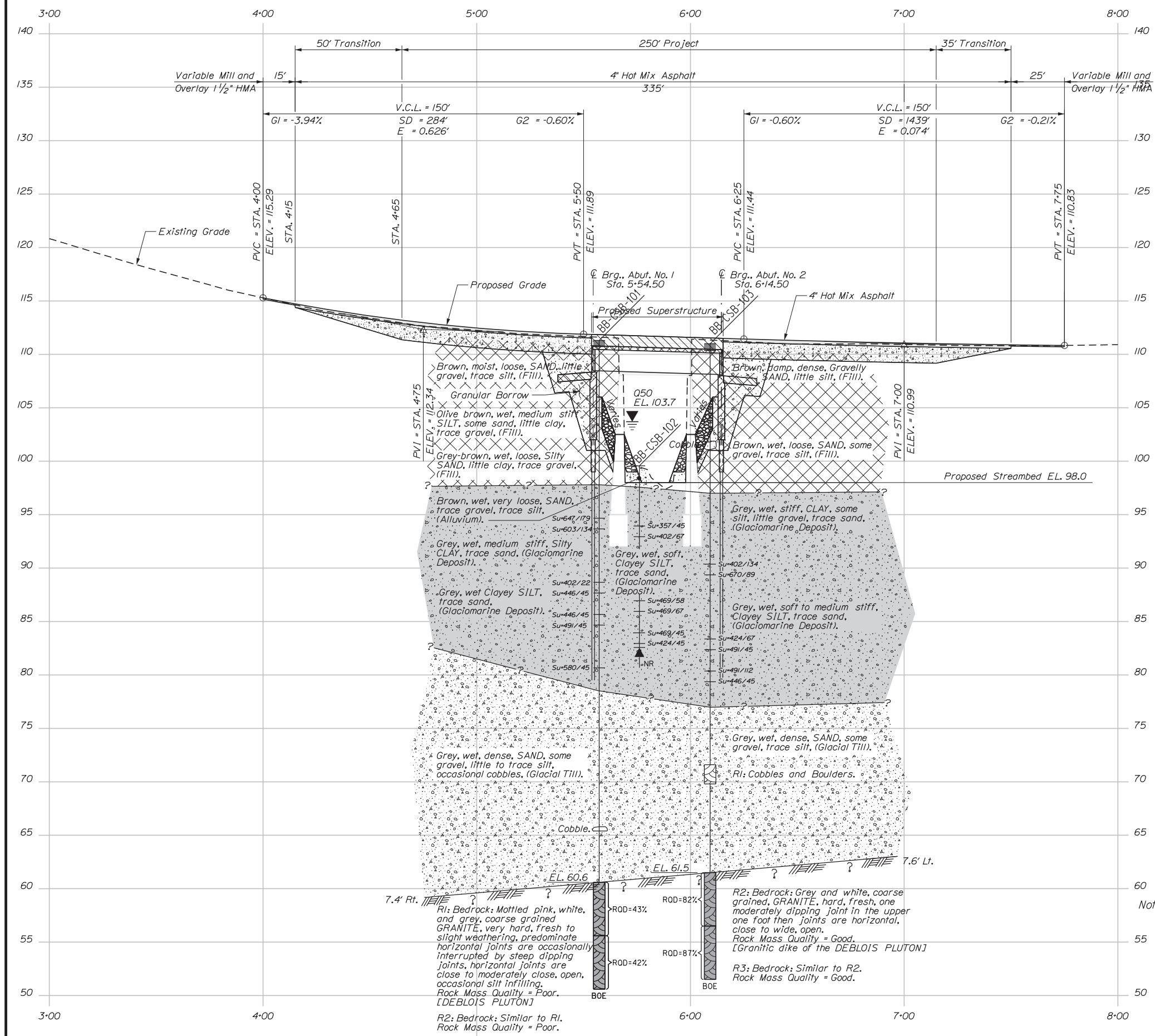
**CURVE DATA #3**  
 PI = 9+13.12  
 D = 01°08'45.3"  
 Δ = 01°21'30.2" Rt.  
 R = 5000.00'  
 L = 118.54'  
 T = 59.27'  
 E = 0.35'

PC = STA. 8+53.85

1/2" DIA REBAR BENT AT GROUND LEVEL

PT = STA. 9+72.39

STATE OF MAINE		DEPARTMENT OF TRANSPORTATION		2223000	
BRIDGE NO. 3649		WIN		22230.00	
BRIDGE PLANS		SIGNATURE		P.E. NUMBER	
DATE		DEC 2019		DATE	
PROJ. MANAGER		BY		DATE	
DESIGN-DETAILED		CHECKED-REVIEWED		SIGNATURE	
DESIGN-DETAILED		L. KRUSINSKI		T. WHITE	
DESIGN-DETAILED		DESIGN-DETAILED		DESIGN-DETAILED	
REVISIONS 1		REVISIONS 1		REVISIONS 1	
REVISIONS 2		REVISIONS 2		REVISIONS 2	
REVISIONS 3		REVISIONS 3		REVISIONS 3	
REVISIONS 4		REVISIONS 4		REVISIONS 4	
FIELD CHANGES		FIELD CHANGES		FIELD CHANGES	
SCHOODIC BRIDGE		SCHOODIC BROOK		CHERRYFIELD WASHINGTON COUNTY	
BORING LOCATION PLAN		BORING LOCATION PLAN		BORING LOCATION PLAN	
SHEET NUMBER		2		OF 4	



Notes: This generalized interpretive soil profile is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and have been developed by interpretations of widely spaced explorations and samples. Actual soil and bedrock transitions may vary and are probably more erratic. For more specific information refer to the exploration logs.

This interpretive subsurface profile was created through the borings nearest to the construction baseline. Borings BB-CSB-201, BB-CSB-202, BB-CSB-203 and BB-CSB-204 not shown for clarity. Refer to Boring Logs for information specific to these borings.

STATE OF MAINE		DEPARTMENT OF TRANSPORTATION		2223000		WIN		BRIDGE NO. 3649		BRIDGE PLANS	
PROJECT NAME		PROJECT NO.		DATE		SIGNATURE		P.E. NUMBER		DATE	
SCHOOLIC BRIDGE		SCHOOLIC BROOK		DEC 2019		L. KRUSINSKI		T. WHITE			
CHERRYFIELD		WASHINGTON COUNTY									
SHEET NUMBER		3									



**APPENDIX C**  
**Boring Logs & Key to Soil and Rock Descriptions and Terms**

UNIFIED SOIL CLASSIFICATION SYSTEM				MODIFIED BURMISTER SYSTEM																												
MAJOR DIVISIONS		GROUP SYMBOLS	TYPICAL NAMES	Descriptive Term	Portion of Total (%)																											
COARSE-GRAINED SOILS  (more than half of material is larger than No. 200 sieve size)	GRAVELS  (more than half of coarse fraction is larger than No. 4 sieve size)	CLEAN GRAVELS	GW Well-graded gravels, gravel-sand mixtures, little or no fines.	trace little some adjective (e.g. sandy, clayey)	0 - 10 11 - 20 21 - 35 36 - 50																											
		(little or no fines)	GP Poorly-graded gravels, gravel sand mixtures, little or no fines.																													
	SANDS  (more than half of coarse fraction is smaller than No. 4 sieve size)	GRAVEL WITH FINES (Appreciable amount of fines)	GM Silty gravels, gravel-sand-silt mixtures.			<b>TERMS DESCRIBING DENSITY/CONSISTENCY</b>																										
		(little or no fines)	GC Clayey gravels, gravel-sand-clay mixtures.			<b>Coarse-grained soils</b> (more than half of material is larger than No. 200 sieve): Includes (1) clean gravels; (2) silty or clayey gravels; and (3) silty, clayey or gravelly sands. Density is rated according to standard penetration resistance (N-value).																										
		SANDS WITH FINES (Appreciable amount of fines)	SM Silty sands, sand-silt mixtures			<b>Density of Cohesionless Soils</b>																										
			SC Clayey sands, sand-clay mixtures.			<b>Standard Penetration Resistance N-Value (blows per foot)</b>																										
FINE-GRAINED SOILS  (more than half of material is smaller than No. 200 sieve size)	SILTS AND CLAYS  (liquid limit less than 50)	ML Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity.	Very loose 0 - 4																													
		CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	Loose 5 - 10																													
		OL Organic silts and organic silty clays of low plasticity.	Medium Dense 11 - 30																													
	SILTS AND CLAYS  (liquid limit greater than 50)	MH Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Dense 31 - 50																													
		CH Inorganic clays of high plasticity, fat clays.	Very Dense > 50																													
		OH Organic clays of medium to high plasticity, organic silts.	<b>Fine-grained soils</b> (more than half of material is smaller than No. 200 sieve): Includes (1) inorganic and organic silts and clays; (2) gravelly, sandy or silty clays; and (3) clayey silts. Consistency is rated according to undrained shear strength as indicated.																													
HIGHLY ORGANIC SOILS	Pt Peat and other highly organic soils.	<table border="1"> <thead> <tr> <th>Consistency of Cohesive soils</th> <th>SPT N-Value (blows per foot)</th> <th>Approximate Undrained Shear Strength (psf)</th> <th>Field Guidelines</th> </tr> </thead> <tbody> <tr> <td>Very Soft</td> <td>WOH, WOR, WOP, &lt;2</td> <td>0 - 250</td> <td>Fist easily penetrates</td> </tr> <tr> <td>Soft</td> <td>2 - 4</td> <td>250 - 500</td> <td>Thumb easily penetrates</td> </tr> <tr> <td>Medium Stiff</td> <td>5 - 8</td> <td>500 - 1000</td> <td>Thumb penetrates with moderate effort</td> </tr> <tr> <td>Stiff</td> <td>9 - 15</td> <td>1000 - 2000</td> <td>Indented by thumb with great effort</td> </tr> <tr> <td>Very Stiff</td> <td>16 - 30</td> <td>2000 - 4000</td> <td>Indented by thumbnail</td> </tr> <tr> <td>Hard</td> <td>&gt;30</td> <td>over 4000</td> <td>Indented by thumbnail with difficulty</td> </tr> </tbody> </table>			Consistency of Cohesive soils	SPT N-Value (blows per foot)	Approximate Undrained Shear Strength (psf)	Field Guidelines	Very Soft	WOH, WOR, WOP, <2	0 - 250	Fist easily penetrates	Soft	2 - 4	250 - 500	Thumb easily penetrates	Medium Stiff	5 - 8	500 - 1000	Thumb penetrates with moderate effort	Stiff	9 - 15	1000 - 2000	Indented by thumb with great effort	Very Stiff	16 - 30	2000 - 4000	Indented by thumbnail	Hard	>30	over 4000	Indented by thumbnail with difficulty
Consistency of Cohesive soils	SPT N-Value (blows per foot)	Approximate Undrained Shear Strength (psf)	Field Guidelines																													
Very Soft	WOH, WOR, WOP, <2	0 - 250	Fist easily penetrates																													
Soft	2 - 4	250 - 500	Thumb easily penetrates																													
Medium Stiff	5 - 8	500 - 1000	Thumb penetrates with moderate effort																													
Stiff	9 - 15	1000 - 2000	Indented by thumb with great effort																													
Very Stiff	16 - 30	2000 - 4000	Indented by thumbnail																													
Hard	>30	over 4000	Indented by thumbnail with difficulty																													
<b>Desired Soil Observations (in this order, if applicable):</b>				<b>Rock Quality Designation (RQD):</b>																												
Color (Munsell color chart)				RQD (%) = $\frac{\text{sum of the lengths of intact pieces of core} * > 4 \text{ inches}}{\text{length of core advance}}$																												
Moisture (dry, damp, moist, wet)				*Minimum NQ rock core (1.88 in. OD of core)																												
Density/Consistency (from above right hand side)				Correlation of RQD to Rock Mass Quality																												
Texture (fine, medium, coarse, etc.)				<table border="1"> <thead> <tr> <th>Rock Mass Quality</th> <th>RQD (%)</th> </tr> </thead> <tbody> <tr> <td>Very Poor</td> <td>≤25</td> </tr> <tr> <td>Poor</td> <td>26 - 50</td> </tr> <tr> <td>Fair</td> <td>51 - 75</td> </tr> <tr> <td>Good</td> <td>76 - 90</td> </tr> <tr> <td>Excellent</td> <td>91 - 100</td> </tr> </tbody> </table>		Rock Mass Quality	RQD (%)	Very Poor	≤25	Poor	26 - 50	Fair	51 - 75	Good	76 - 90	Excellent	91 - 100															
Rock Mass Quality	RQD (%)																															
Very Poor	≤25																															
Poor	26 - 50																															
Fair	51 - 75																															
Good	76 - 90																															
Excellent	91 - 100																															
Name (sand, silty sand, clay, etc., including portions - trace, little, etc.)				<b>Desired Rock Observations (in this order, if applicable):</b>																												
Gradation (well-graded, poorly-graded, uniform, etc.)				Color (Munsell color chart)																												
Plasticity (non-plastic, slightly plastic, moderately plastic, highly plastic)				Texture (aphanitic, fine-grained, etc.)																												
Structure (layering, fractures, cracks, etc.)				Rock Type (granite, schist, sandstone, etc.)																												
Bonding (well, moderately, loosely, etc.,)				Hardness (very hard, hard, mod. hard, etc.)																												
Cementation (weak, moderate, or strong)				Weathering (fresh, very slight, slight, moderate, mod. severe, severe, etc.)																												
Geologic Origin (till, marine clay, alluvium, etc.)				Geologic discontinuities/jointing:																												
Groundwater level				-dip (horiz - 0-5 deg., low angle - 5-35 deg., mod. dipping - 35-55 deg., steep - 55-85 deg., vertical - 85-90 deg.) -spacing (very close - <2 inch, close - 2-12 inch, mod. close - 1-3 feet, wide - 3-10 feet, very wide >10 feet) -tightness (tight, open, or healed) -infilling (grain size, color, etc.)																												
<b>Maine Department of Transportation Geotechnical Section Key to Soil and Rock Descriptions and Terms Field Identification Information</b>				<b>Formation (Waterville, Ellsworth, Cape Elizabeth, etc.)</b>																												
				RQD and correlation to rock mass quality (very poor, poor, etc.) ref: ASTM D6032 and AASHTO Standard Specification for Highway Bridges, 17th Ed. Table 4.4.8.1.2A																												
				Recovery (inch/inch and percentage)																												
				Rock Core Rate (X.X ft - Y.Y ft (min:sec))																												
				<b>Sample Container Labeling Requirements:</b>																												
				WIN Blow Counts																												
				Bridge Name / Town Sample Recovery																												
				Boring Number Date																												
				Sample Number Personnel Initials																												
				Sample Depth																												

<b>Driller:</b> MaineDOT	<b>Elevation (ft.):</b> 111.3	<b>Auger ID/OD:</b> 5" Solid Stem
<b>Operator:</b> Daggett/Gould	<b>Datum:</b> NAVD88	<b>Sampler:</b> Standard Split Spoon
<b>Logged By:</b> B. Wilder	<b>Rig Type:</b> CME 45C	<b>Hammer Wt./Fall:</b> 140#/30"
<b>Date Start/Finish:</b> 3/26/2018-3/27/2018	<b>Drilling Method:</b> Cased Wash Boring	<b>Core Barrel:</b> NQ-2"
<b>Boring Location:</b> 5+57.3, 7.4 ft Rt.	<b>Casing ID/OD:</b> HW-4"/NW-3"	<b>Water Level*:</b> 10.5 ft bgs.

**Hammer Efficiency Factor:** 0.928      **Hammer Type:** Automatic  Hydraulic  Rope & Cathead

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

Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows					
0								SSA	110.7	7" HMA.	-0.6	
5	1D/A	24/17	5.00 - 7.00	2/3/2/2	5	8				1D (5.0-5.5 ft) Browned, moist, loose, fine to coarse SAND, little gravel, trace silt, (Fill). 1D/A (5.5-7.0 ft) Olive brown, wet, medium stiff, SILT, some sand, little clay, trace gravel, trace organics, (Fill).	G#303137 A-1-b, SW WC=3.1% G#303138 A-4, CL WC=19.3%	
10	2D	24/15	10.00 - 12.00	2/2/3/4	5	8				Grey-brown, wet, loose, Silty SAND, little clay, trace gravel, (Fill).	G#303139 A-4, CL WC=29.8%	
15	3D V1 V2	24/24	16.00 - 18.00 16.63 - 17.00 17.63 - 18.00	WOR/WOR/WOR/ WOR Su=647/179 psf Su=603/134 psf	---			HYD PUSH	97.8	Grey, wet, medium stiff, Silty CLAY, trace sand, (Glaciomarine Deposit). 55x110 mm vane raw torque readings: V1: 14.5/4.0 ft-lbs V2: 13.5/3.0 ft-lbs	G#303140 A-4, CL WC=35.5% LL=31 PL=21 PI=10	
20	1U V3 V4	24/24	20.00 - 22.00 22.63 - 23.00 23.63 - 24.00	Piston Sampler Su=402/22 psf Su=446/45 psf						Grey, wet, Clayey SILT, trace sand, (Glaciomarine Deposit).  55x110 mm vane raw torque readings: V3: 9.0/0.5 ft-lbs V4: 10.0/1.0 ft-lbs	G,C#303141 A-6, CL WC=36.8% LL=38 PL=23 PI=15	
25												

**Remarks:**

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Schoodic Bridge #3649 carries Route 193 over Schoodic Brook Location: Cherryfield, Maine				Boring No.: BB-CSB-101 WIN: 22230.00							
Driller: MaineDOT				Elevation (ft.): 111.3				Auger ID/OD: 5" Solid Stem							
Operator: Daggett/Gould				Datum: NAVD88				Sampler: Standard Split Spoon							
Logged By: B. Wilder				Rig Type: CME 45C				Hammer Wt./Fall: 140#/30"							
Date Start/Finish: 3/26/2018-3/27/2018				Drilling Method: Cased Wash Boring				Core Barrel: NQ-2"							
Boring Location: 5+57.3, 7.4 ft Rt.				Casing ID/OD: HW-4"/NW-3"				Water Level*: 10.5 ft bgs.							
Hammer Efficiency Factor: 0.928				Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>											
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt				R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person				S <sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf) S <sub>u</sub> (lab) = Lab Vane Undrained Shear Strength (psf) q <sub>p</sub> = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N <sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency N <sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected				T <sub>v</sub> = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test			
Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.			
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows								
25	V5		25.63 - 26.00	Su=446/45 psf											
	V6		26.63 - 27.00	Su=491/45 psf											
30	4D	24/12	30.00 - 32.00	WOR/WOR/2/14	2										
	V7		30.63 - 31.00	Su=580/45 psf											
	MV			Would Not Push											
35	5D	24/14	35.00 - 37.00	12/26/17/11	43	67	22								
40	6D	24/15	40.00 - 42.00	23/15/10/17	25	39	82								
45	MD	6/0	45.00 - 45.50	62 (6")	---		22								
50							57								
<b>Remarks:</b> Stratification lines represent approximate boundaries between soil types; transitions may be gradual.															
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.										Page 2 of 3  <b>Boring No.:</b> BB-CSB-101					

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS	<b>Project:</b> Schoodic Bridge #3649 carries Route 193 over Schoodic Brook <b>Location:</b> Cherryfield, Maine	<b>Boring No.:</b> BB-CSB-101  <b>WIN:</b> 22230.00
--	---	---

<b>Driller:</b> MaineDOT	<b>Elevation (ft.):</b> 111.3	<b>Auger ID/OD:</b> 5" Solid Stem
<b>Operator:</b> Daggett/Gould	<b>Datum:</b> NAVD88	<b>Sampler:</b> Standard Split Spoon
<b>Logged By:</b> B. Wilder	<b>Rig Type:</b> CME 45C	<b>Hammer Wt./Fall:</b> 140#/30"
<b>Date Start/Finish:</b> 3/26/2018-3/27/2018	<b>Drilling Method:</b> Cased Wash Boring	<b>Core Barrel:</b> NQ-2"
<b>Boring Location:</b> 5+57.3, 7.4 ft Rt.	<b>Casing ID/OD:</b> HW-4"/NW-3"	<b>Water Level*:</b> 10.5 ft bgs.

<b>Hammer Efficiency Factor:</b> 0.928	<b>Hammer Type:</b> Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt	R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person
	S <sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf) S <sub>u(lab)</sub> = Lab Vane Undrained Shear Strength (psf) q <sub>p</sub> = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N <sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency N <sub>60</sub> = (Hammer Efficiency Factor/60%)N-uncorrected
	T <sub>v</sub> = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test

Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows					
50	7D R1	8.4/6 60/59	50.00 - 50.70 50.70 - 55.70	14/40(2.4") RQD = 43%	---		NQ-2	60.6		Grey, wet, very dense, fine to coarse SAND, some gravel, trace silt.		
										Top of Bedrock at Elev. 60.6 ft. R1: Bedrock: Mottled pink, white, and grey, coarse grained GRANITE, very hard, fresh to slight weathering, predominate horizontal joints are occasionally interrupted by steep dipping joints, horizontal joints are close to moderately close, open, occasional silt infilling. Rock Mass Quality = Poor. [DEBLOIS PLUTON] R1: Core Times (min:sec) 50.7-51.7 ft (2:04) 51.7-52.7 ft (1:13) 52.7-53.7 ft (1:14) 53.7-54.7 ft (1:31) 54.7-55.7 ft (1:39) 98% Recovery		
55	R2	60/60	55.70 - 60.70	RQD = 42%						R2: Bedrock: Similar to R1. Rock Mass Quality = Poor. R2: Core Times (min:sec) 55.7-56.7 ft (1:41) 56.7-57.7 ft (1:16) 57.7-58.7 ft (2:02) 58.7-59.7 ft (2:15) 59.7-60.7 ft (2:21) 100% Recovery		
60								50.6		<b>Bottom of Exploration at 60.7 feet below ground surface.</b>		
65												
70												
75												

**Remarks:**

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS	<b>Project:</b> Schoodic Bridge #3649 carries Route 193 over Schoodic Brook <b>Location:</b> Cherryfield, Maine	<b>Boring No.:</b> BB-CSB-102  <b>WIN:</b> 22230.00
--	--	---

<b>Driller:</b> MaineDOT	<b>Elevation (ft.):</b> 99.6	<b>Auger ID/OD:</b> 5" Solid Stem
<b>Operator:</b> Wilder/Daggett	<b>Datum:</b> NAVD88	<b>Sampler:</b> Standard Split Spoon
<b>Logged By:</b> B. Slaven	<b>Rig Type:</b> CME 45C	<b>Hammer Wt./Fall:</b> 140#/30"
<b>Date Start/Finish:</b> 3/12/2018; 09:00-14:30	<b>Drilling Method:</b> Cased Wash Boring	<b>Core Barrel:</b> NQ-2"
<b>Boring Location:</b> 5+76.1, 7.1 ft Lt.	<b>Casing ID/OD:</b> HW-4"	<b>Water Level*:</b> None Observed

<b>Hammer Efficiency Factor:</b> 0.928	<b>Hammer Type:</b> Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>	
--	--	--

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

Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or ROD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows					
0	1D	24/4	0.00 - 2.00	3/1/1/1	2	3	18	97.6		Brown, wet, very loose, SAND, trace gravel, trace silt, (Alluvium).	G#303143 A-1-b, SP WC=20.5%	
							13					
							2					
							8					
							12					
5	2D V1 V2	24/24	5.00 - 7.00 5.63 - 6.00 6.63 - 7.00	WOR/WOR/WOR/ WO1P Su=357/45 psf Su=402/67 psf	---		HYD PUSH	82.6		Grey, wet, soft, Clayey SILT, trace fine sand, (Glaciomarine Deposit). 55x110 mm vane raw torque readings: V1: 8.0/1.0 ft-lbs V2: 9.0/1.5 ft-lbs	G#303144 A-4, CL WC=36.6% LL=31 PL=21 PI=10	
10	1U V3 V4	24/24	10.00 - 12.00 12.63 - 13.00 13.63 - 14.00	Piston Sampler Su=469/58 psf Su=469/67 psf			OPEN HOLE	82.6		Grey, wet, Clayey SILT, trace fine sand, (Glaciomarine Deposit).  55x110 mm vane raw torque readings: V3: 10.5/1.3 ft-lbs V4: 10.5/1.5 ft-lbs	G.#303145 A-4, CL WC=33.5% LL=27 PL=19 PI=8	
15	3D V5 V6	24/24	15.00 - 17.00 15.63 - 16.00 16.63 - 17.00	WOR/WOR/WOR/ WOR Su=469/45 psf Su=424/45 psf	---			82.6		Grey, wet, soft, Clayey SILT, trace fine sand, (Glaciomarine Deposit). 55x110 mm vane raw torque readings: V5: 10.5/1.0 ft-lbs V6: 9.5/1.0 ft-lbs	G#303146 A-6, CL WC=39.2% LL=31 PL=20 PI=11	
17.0	<b>Bottom of Exploration at 17.0 feet below ground surface.</b> NO REFUSAL											
20												
25												

**Remarks:**  
 14.4 ft from Road to Stream.  
 HYD = Hydraulic

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS	<b>Project:</b> Schoodic Bridge #3649 carries Route 193 over Schoodic Brook <b>Location:</b> Cherryfield, Maine	<b>Boring No.:</b> BB-CSB-103  <b>WIN:</b> 22230.00
--	--	---

<b>Driller:</b> MaineDOT	<b>Elevation (ft.):</b> 111.0	<b>Auger ID/OD:</b> 5" Solid Stem
<b>Operator:</b> Daggett/Gould	<b>Datum:</b> NAVD88	<b>Sampler:</b> Standard Split Spoon
<b>Logged By:</b> B. Wilder	<b>Rig Type:</b> CME 45C	<b>Hammer Wt./Fall:</b> 140#/30"
<b>Date Start/Finish:</b> 3/17/2018, 3/28/2018	<b>Drilling Method:</b> Cased Wash Boring	<b>Core Barrel:</b> NQ-2"
<b>Boring Location:</b> 6+09.2, 7.6 ft Lt.	<b>Casing ID/OD:</b> HW-4"/NW-3"	<b>Water Level*:</b> 11.0 ft bgs.

<b>Hammer Efficiency Factor:</b> 0.928	<b>Hammer Type:</b> Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>	
<small>           Definitions:            D = Split Spoon Sample            MD = Unsuccessful Split Spoon Sample Attempt            U = Thin Wall Tube Sample            MU = Unsuccessful Thin Wall Tube Sample Attempt            V = Field Vane Shear Test, PP = Pocket Penetrometer            MV = Unsuccessful Field Vane Shear Test Attempt            R = Rock Core Sample            SSA = Solid Stem Auger            HSA = Hollow Stem Auger            RC = Roller Cone            WOH = Weight of 140lb. Hammer            WOR/C = Weight of Rods or Casing            WO1P = Weight of One Person            S<sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf)            S<sub>u(lab)</sub> = Lab Vane Undrained Shear Strength (psf)            q<sub>p</sub> = Unconfined Compressive Strength (ksf)            N-uncorrected = Raw Field SPT N-value            Hammer Efficiency Factor = Rig Specific Annual Calibration Value            N<sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency            N<sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected            T<sub>v</sub> = Pocket Torvane Shear Strength (psf)            WC = Water Content, percent            LL = Liquid Limit            PL = Plastic Limit            PI = Plasticity Index            G = Grain Size Analysis            C = Consolidation Test         </small>		

Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.	
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows						
0								SSA	110.4		7½" HMA.	0.6	
	1D	24/14	1.50 - 3.50	10/13/15/9	28	43					Brown, damp, dense, Gravelly SAND, little silt, (Fill).		
5	2D	24/12	5.00 - 7.00	2/2/2/2	4	6					Brown, damp, loose, fine to coarse SAND, some gravel, trace silt, (Fill).		G#303147 A-1-b, SW-SM WC=2.7%
10	3D	24/5	10.00 - 12.00	2/2/2/3	4	6					Cobble from 9.2-9.9 ft bgs. Similar to above, (Fill).		
15	4D MV	24/15	15.00 - 17.00 15.63 - 15.64	3/4/5/8 Would Not Push	9	14	46		97.0		Grey, wet, stiff, CLAY, some silt, little gravel, trace sand, (Glaciomarine Deposit). Failed 55x110 mm vane attempt.	14.0	
							48						G#303148 A-6, CL WC=23.6% LL=34 PL=20 PI=14
							46						
							46						
							45						
20	5D V1 V2	24/24	20.00 - 22.00 20.63 - 21.00 21.63 - 22.00	WOR/WOR/WOR/ WOR Su=402/134 psf Su=670/89 psf	---		34				Grey, wet, soft to medium stiff, Clayey SILT, trace fine sand. 55x110 mm vane raw torque readings: V1: 9.0/3.0 ft-lbs V2: 15.0/2.0 ft-lbs	G#303149 A-6, CL WC=31.2% LL=31 PL=20 PI=11	
							40						
							39						
							33						
25													

**Remarks:**  
HYD = Hydraulic

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Schoodic Bridge #3649 carries Route 193 over Schoodic Brook Location: Cherryfield, Maine				Boring No.: BB-CSB-103 WIN: 22230.00							
Driller: MaineDOT				Elevation (ft.): 111.0				Auger ID/OD: 5" Solid Stem							
Operator: Daggett/Gould				Datum: NAVD88				Sampler: Standard Split Spoon							
Logged By: B. Wilder				Rig Type: CME 45C				Hammer Wt./Fall: 140#/30"							
Date Start/Finish: 3/17/2018, 3/28/2018				Drilling Method: Cased Wash Boring				Core Barrel: NQ-2"							
Boring Location: 6+09.2, 7.6 ft Lt.				Casing ID/OD: HW-4"/NW-3"				Water Level*: 11.0 ft bgs.							
Hammer Efficiency Factor: 0.928				Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>											
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt				R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person				S <sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf) S <sub>u(lab)</sub> = Lab Vane Undrained Shear Strength (psf) q <sub>p</sub> = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N <sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency N <sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected				T <sub>v</sub> = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test			
Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.			
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows								
25	1U	24/24	25.00 - 27.00	Piston Sampler			HYD PUSH								
	V3		27.63 - 28.00	Su=424/67 psf						55x110 mm vane raw torque readings: V3: 9.5/1.5 ft-lbs V4: 11.0-1.0 ft-lbs					
	V4		28.63 - 29.00	Su=491/45 psf											
30	6D V5	24/24	30.00 - 32.00 30.63 - 31.00	WOR/WOR/WOR/ WOR	---		42			Grey, wet, soft, Clayey SILT, trace fine sand, (Glaciomarine Deposit). 55x110 mm vane raw torque readings: V5: 11.0/2.5 ft-lbs V6: 10.0/1.0 ft-lbs	G#303150 A-6, CL WC=35.5% LL=31 PL=20 PI=11				
	V6		31.63 - 32.00	Su=491/112 psf Su=446/45 psf			40								
							32								
							24	77.5							
							20								
35	7D/MV	24/9	35.00 - 37.00	4/9/12/15	21	32	17			Grey, wet, dense, fine to coarse SAND, some silt, some gravel, (Glacial Till). Failed 55x110 mm vane attempt, would not push.					
							21								
							129								
							27								
40	R1	36/16	39.40 - 42.40				33 NQ-2	71.6		R1: Cobbles and Boulders. Roller Coned ahead to 45.0 ft bgs.					
							36								
							37								
							49	69.8							
							56								
							50								
45	8D	24/14	45.00 - 47.00	11/13/15/19	28	43	54			Grey, wet, dense, fine to coarse SAND, some gravel, trace silt, (Glacial Till). Set in NW Casing at 45.0 ft bgs.					
							95								
							150								
							199								
50	R2	60/56	49.50 - 54.50	RQD = 82%			a120	61.5		a120 blows for 0.5 ft.					
<b>Remarks:</b> HYD = Hydraulic															
Stratification lines represent approximate boundaries between soil types; transitions may be gradual.										Page 2 of 3					
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.										Boring No.: BB-CSB-103					



<b>Driller:</b> S.W.Cole	<b>Elevation (ft.):</b> 109.1	<b>Auger ID/OD:</b> 5" Solid Stem
<b>Operator:</b> Kevin/Joe	<b>Datum:</b> NAVD88	<b>Sampler:</b> Standard Split Spoon
<b>Logged By:</b> Wilder/Daggett	<b>Rig Type:</b> Diedrich D-50	<b>Hammer Wt./Fall:</b> 140#/30"
<b>Date Start/Finish:</b> 1/28/2019; 11:30-16:00	<b>Drilling Method:</b> Cased Wash Boring	<b>Core Barrel:</b> N/A
<b>Boring Location:</b> 5+00.8, 34.6 ft Rt.	<b>Casing ID/OD:</b> HW-4"	<b>Water Level*:</b> 13.7 ft bgs.

**Hammer Efficiency Factor:** 0.918      **Hammer Type:** Automatic     Hydraulic     Rope & Cathead

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

Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or ROD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows					
0								SSA	108.6	Topsoil.		
5	1D MV	24/24	5.00 - 7.00 5.63 - 5.63	2/2/2/2 Would not Push	4	6				Olive, wet, medium stiff, Clayey SILT, (Glaciomarine Deposit). Failed 55x110 mm vane attempt.		
10	2D V1 V2	24/20	10.00 - 12.00 10.63 - 11.00 11.63 - 12.00	Hydraulic Push Su=781/179 psf Su=737/156 psf	---			HYD PUSH	101.1	Grey, wet, medium stiff, Clayey SILT, black staining, (Glaciomarine Deposit). 55x110 mm raw torqur readings: V1: 17.5/4.0 ft-lbs V2: 16.5/3.5 ft-lbs		
15	1U V3 V4	24/24	15.00 - 17.00 17.63 - 18.00 18.63 - 19.00	Piston Sampler Su=580/89 psf Su=643/156 psf						Grey, wet, Clayey SILT, trace fine sand, (Glaciomarine Deposit).  55x110 mm raw torqur readings: V3: 13.0/2.0 ft-lbs V4: 14.5/3.5 ft-lbs	C#337251-A A-6, CL WC=38.3% LL=35 PL=24 PI=11 C#337252-B A-7-6, CL WC=39.2% LL=40 PL=24 PI=16	
20	3D V5 V6	24/24	20.00 - 22.00 20.63 - 21.00 21.63 - 22.00	WOR/WOR/WOR/ WOR Su=446/67 psf Su=513/45 psf	---					Grey, wet, soft to medium stiff, Clayey SILT, trace sand.  55x110 mm raw torqur readings: V5: 10.0/1.5 ft-lbs V6: 11.5/1.0 ft-lbs		
25												

**Remarks:**  
 Auto Hammer #367  
 HYD = Hydraulic Push

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Schoodic Bridge #3649 carries Route 193 over Schoodic Brook Location: Cherryfield, Maine				Boring No.: BB-CSB-201 WIN: 22230.00							
Driller: S.W.Cole				Elevation (ft.): 109.1				Auger ID/OD: 5" Solid Stem							
Operator: Kevin/Joe				Datum: NAVD88				Sampler: Standard Split Spoon							
Logged By: Wilder/Daggett				Rig Type: Diedrich D-50				Hammer Wt./Fall: 140#/30"							
Date Start/Finish: 1/28/2019; 11:30-16:00				Drilling Method: Cased Wash Boring				Core Barrel: N/A							
Boring Location: 5+00.8, 34.6 ft Rt.				Casing ID/OD: HW-4"				Water Level*: 13.7 ft bgs.							
Hammer Efficiency Factor: 0.918				Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>											
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt				R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person				S <sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf) S <sub>u(lab)</sub> = Lab Vane Undrained Shear Strength (psf) q <sub>p</sub> = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N <sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency N <sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected				T <sub>v</sub> = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test			
Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.			
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows								
25	4D V7 V8	24/24	25.00 - 27.00 25.63 - 26.00 26.63 - 27.00	WOC/WOC/WOC/ WOR Su=536/89 psf Su=536/89 psf	---		OPEN HOLE			Grey, wet, medium stiff, Clayey SILT, trace fine sand, (Glaciomarine Deposit). 55x110 mm raw torqur readings: V7: 12.0/2.0 ft-lbs V8: 12.0/2.0 ft-lbs	G#337233 A-4, CL WC=32.7% LL=29 PL=20 PI=9				
30	V9 V10		30.63 - 31.00 31.63 - 32.00	Su=603/45 psf Su=603/45 psf						55x110 mm raw torqur readings: V9: 13.5/1.0 ft-lbs V10: 13.5/1.0 ft-lbs					
35	5D V11 MV	24/24	35.00 - 37.00 35.63 - 36.00 36.63 - 36.63	WOR/WOR/WOR/2 Su=670/67 psf Would not Push	---				72.4	Grey, wet, medium stiff, Clayey SILT, trace fine sand, (Glaciomarine Deposit). 55x110 mm raw torqur readings: V11: 15.0/1.5 ft-lbs Failed 55x110 mm vane attempt.					
40	6D	24/7	40.00 - 42.00	9/5/5/5	10	15				Grey, wet, medium dense, fine to coarse SAND, some gravel, little silt, (Glacial Till).					
45	7D	24/13	45.00 - 47.00	11/10/12/12	22	34			62.1	Grey, wet, dense, fine to coarse SAND, some gravel, trace silt, (Glacial Till).					
50										<b>Bottom of Exploration at 47.0 feet below ground surface.</b> NO REFUSAL					
<b>Remarks:</b> Auto Hammer #367 HYD = Hydraulic Push															
Stratification lines represent approximate boundaries between soil types; transitions may be gradual.										Page 2 of 2					
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.										Boring No.: BB-CSB-201					

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Schoodic Bridge #3649 carries Route 193 over Schoodic Brook Location: Cherryfield, Maine	Boring No.: <u>BB-CSB-202</u>  WIN: <u>22230.00</u>
--	---	---

Driller: S.W.Cole	Elevation (ft.): 109.9	Auger ID/OD: 5" Solid Stem
Operator: Kevin/Joe	Datum: NAVD88	Sampler: Standard Split Spoon
Logged By: Wilder/Daggett	Rig Type: Diedrich D-50	Hammer Wt./Fall: 140#/30"
Date Start/Finish: 1/28/2019; 07:00-11:00	Drilling Method: Cased Wash Boring	Core Barrel: N/A
Boring Location: 5+24.5, 46.2 ft Rt.	Casing ID/OD: HW-4"	Water Level*: 11.5 ft bgs.

Hammer Efficiency Factor: 0.918      Hammer Type: Automatic     Hydraulic     Rope & Cathead

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

Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows					
0												
5	1D	24/24	5.00 - 7.00	6/6/7/9	13	20					Olive brown, moist, very stiff, Clayey SILT, (Glaciomarine Deposit).	
10	2D MV	24/24	10.00 - 12.00 10.63 - 10.63	2/2/2/3 Would not Push	4	6			100.9		Grey, wet, medium stiff, Clayey SILT, trace fine sand. Failed 55x110 mm vane attempt.	
15	3D V1 V2	24/24	15.00 - 17.00 15.63 - 16.00 16.63 - 17.00	Hydraulic Push Su=491/134 psf Su=513/112 psf	---						Grey, wet, soft to medium stiff, Clayey SILT, black staining, (Glaciomarine Deposit). 55x110 mm vane raw torque readings: V1: 11.0/3.0 ft-lbs V2: 11.5/2.5 ft-lbs	
20	1U V3 V4	24/24	20.00 - 22.00 22.63 - 23.00 23.63 - 24.00	Piston Sampler Su=625/89 psf Su=580/89 psf							Similar to above.  55x110 mm vane raw torque readings: V3: 14.0/2.0 ft-lbs V4: 13.0/2.0 ft-lbs	
25												

**Remarks:**  
Auto Hammer #367  
HYD = Hydraulic Push

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Schoodic Bridge #3649 carries Route 193 over Schoodic Brook Location: Cherryfield, Maine				Boring No.: BB-CSB-202 WIN: 22230.00							
Driller: S.W.Cole				Elevation (ft.): 109.9				Auger ID/OD: 5" Solid Stem							
Operator: Kevin/Joe				Datum: NAVD88				Sampler: Standard Split Spoon							
Logged By: Wilder/Daggett				Rig Type: Diedrich D-50				Hammer Wt./Fall: 140#/30"							
Date Start/Finish: 1/28/2019; 07:00-11:00				Drilling Method: Cased Wash Boring				Core Barrel: N/A							
Boring Location: 5+24.5, 46.2 ft Rt.				Casing ID/OD: HW-4"				Water Level*: 11.5 ft bgs.							
Hammer Efficiency Factor: 0.918				Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>											
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt				R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person				S <sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf) S <sub>u</sub> (lab) = Lab Vane Undrained Shear Strength (psf) q <sub>p</sub> = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N <sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency N <sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected				T <sub>v</sub> = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test			
Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.			
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows								
25	4D	24/24	25.00 - 27.00	WOR/WOR/WOR/	---		OPEN HOLE			Grey, wet, medium stiff, Clayey SILT, trace sand, (Glaciomarine Deposit). 55x110 mm vane raw torque readings: V5: 12.0/2.5 ft-lbs V6: 13.0/2.5 ft-lbs	G#337234 A-6, CL WC=34.5% LL=32 PL=19 PI=13				
	V5		25.63 - 26.00	Su=536/112 psf											
	V6		26.63 - 27.00	Su=580/112 psf											
30	5D	24/24	30.00 - 32.00	WOR/WOR/WOR/	---					Similar to above. 55x110 mm vane raw torque readings: V7: 12.0/1.5 ft-lbs V8: 12.0/1.5 ft-lbs					
	V7		30.63 - 31.00	Su=536/67 psf											
	V8		31.63 - 32.00	Su=536/67 psf											
35	6D	24/24	35.00 - 37.00	WOR/WOR/WOR/	---				71.9	Grey, wet, medium stiff, Clayey SILT, trace sand, trace gravel, (Glaciomarine Deposit). 55x110 mm vane raw torque readings: V9: 12.5/1.0 ft-lbs V10: 12.5/1.5 ft-lbs	G#337235 A-6, CL WC=34.4% LL=30 PL=20 PI=10				
	V9		35.63 - 36.00	Su=558/45 psf											
	V10		36.63 - 37.00	Su=558/67 psf											
40	7D	24/17	40.00 - 42.00	10/11/10/14	21	32				Grey, wet, dense, fine to coarse SAND, little gravel, little silt, trace clay, (Glacial Till).	G#337236 A-1-b, SC-SM WC=10.0%				
45	8D	24/16	45.00 - 47.00	14/14/16/23	30	46			62.9	Grey, wet, medium dense, fine to coarse SAND, some gravel, little silt, (Glacial Till).					
50										<b>Bottom of Exploration at 47.0 feet below ground surface.</b> NO REFUSAL					
<b>Remarks:</b> Auto Hammer #367 HYD = Hydraulic Push															
Stratification lines represent approximate boundaries between soil types; transitions may be gradual.										Page 2 of 2					
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.										Boring No.: BB-CSB-202					

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS	<b>Project:</b> Schoodic Bridge #3649 carries Route 193 over Schoodic Brook <b>Location:</b> Cherryfield, Maine	<b>Boring No.:</b> BB-CSB-203  <b>WIN:</b> 22230.00
--	--	---

<b>Driller:</b> S.W.Cole	<b>Elevation (ft.):</b> 103.3	<b>Auger ID/OD:</b> 5" Solid Stem
<b>Operator:</b> Kevin/Joe	<b>Datum:</b> NAVD88	<b>Sampler:</b> Standard Split Spoon
<b>Logged By:</b> Wilder/Daggett	<b>Rig Type:</b> Diedrich D-50	<b>Hammer Wt./Fall:</b> 140#/30"
<b>Date Start/Finish:</b> 1/23/2019; 08:00-11:00	<b>Drilling Method:</b> Cased Wash Boring	<b>Core Barrel:</b> N/A
<b>Boring Location:</b> 6+43, 66.3 ft Rt.	<b>Casing ID/OD:</b> HW-4"	<b>Water Level*:</b> Standing Water

<b>Hammer Efficiency Factor:</b> 0.918	<b>Hammer Type:</b> Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>	
--	--	--

Definitions: R = Rock Core Sample, SSA = Solid Stem Auger, HSA = Hollow Stem Auger, RC = Roller Cone, WOH = Weight of 140lb. Hammer, WOR/C = Weight of Rods or Casing, WO1P = Weight of One Person  
 S<sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf), S<sub>u(lab)</sub> = Lab Vane Undrained Shear Strength (psf), q<sub>p</sub> = Unconfined Compressive Strength (ksf), N-uncorrected = Raw Field SPT N-value, Hammer Efficiency Factor = Rig Specific Annual Calibration Value, N<sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency, N<sub>60</sub> = (Hammer Efficiency Factor/60%)\*N-uncorrected  
 T<sub>v</sub> = Pocket Torvane Shear Strength (psf), WC = Water Content, percent, LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index, G = Grain Size Analysis, C = Consolidation Test

Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or ROD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows					
0							SSA					
5	1D/A	24/20	5.00 - 7.00	1/1/1/1	2	3	HYD PUSH	96.8		1D (5.0-6.5 ft bgs.) Brown, wet, very loose, fine to coarse SAND, little silt, trace gravel, trace clay, trace organics, (Alluvial Deposit).	G#337237 A-1-b, SC-SM WC=30.6%	
								6.5		1D/A (6.5-7.0 ft bgs.) Grey, wet, very soft, Clayey SILT, trace fine sand, (Glaciomarine Deposit).	G#337238 A-6, CL WC=27.4% LL=34 PL=21 PI=13	
10	2D MV	24/18	10.00 - 12.00 10.63 - 10.63	7/18/20/20 Would not Push	38	58	a22	92.8		a22 blows for 0.5 ft. Grey, wet, very dense, Gravelly fine to coarse SAND, little silt, (Glacial Till). Failed 55x110 mm vane attempt.		
15	3D	24/13	15.00 - 17.00	43/29/23/20	52	80	OPEN HOLE			Grey, wet, very dense, fine to coarse SAND, some gravel, little silt, (Glacial Till).		
20	4D	24/17	20.00 - 22.00	7/10/17/18	27	41				Grey, wet, dense, fine to coarse SAND, some gravel, little silt, (Glacial Till).	G#337239 A-1-b, SM WC=8.0%	
25												

**Remarks:**  
 Auto Hammer #367  
 HYD = Hydraulic Push

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS	<b>Project:</b> Schoodic Bridge #3649 carries Route 193 over Schoodic Brook <b>Location:</b> Cherryfield, Maine	<b>Boring No.:</b> BB-CSB-203  <b>WIN:</b> 22230.00
--	---	---

<b>Driller:</b> S.W.Cole <b>Operator:</b> Kevin/Joe <b>Logged By:</b> Wilder/Daggett <b>Date Start/Finish:</b> 1/23/2019; 08:00-11:00 <b>Boring Location:</b> 6+43, 66.3 ft Rt.	<b>Elevation (ft.):</b> 103.3 <b>Datum:</b> NAVD88 <b>Rig Type:</b> Diedrich D-50 <b>Drilling Method:</b> Cased Wash Boring <b>Casing ID/OD:</b> HW-4"	<b>Auger ID/OD:</b> 5" Solid Stem <b>Sampler:</b> Standard Split Spoon <b>Hammer Wt./Fall:</b> 140#/30" <b>Core Barrel:</b> N/A <b>Water Level*:</b> Standing Water
---	--	---

<b>Hammer Efficiency Factor:</b> 0.918	<b>Hammer Type:</b> Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>	
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt	R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person	S <sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf) S <sub>u(lab)</sub> = Lab Vane Undrained Shear Strength (psf) q <sub>p</sub> = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N <sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency N <sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected

Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows					
25	5D	24/14	25.00 - 27.00	11/8/10/14	18	28			76.3	Grey, wet, medium dense, fine to coarse SAND, some gravel, trace silt, (Glacial Till).  <b>Bottom of Exploration at 27.0 feet below ground surface. NO REFUSAL</b>		
30												
35												
40												
45												
50												

**Remarks:**  
 Auto Hammer #367  
 HYD = Hydraulic Push

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS	<b>Project:</b> Schoodic Bridge #3649 carries Route 193 over Schoodic Brook <b>Location:</b> Cherryfield, Maine	<b>Boring No.:</b> BB-CSB-204  <b>WIN:</b> 22230.00
--	--	---


<b>Driller:</b> S.W.Cole	<b>Elevation (ft.):</b> 104.1	<b>Auger ID/OD:</b> 5" Solid Stem
<b>Operator:</b> Kevin/Joe	<b>Datum:</b> NAVD88	<b>Sampler:</b> Standard Split Spoon
<b>Logged By:</b> Wilder/Daggett	<b>Rig Type:</b> Diedrich D-50	<b>Hammer Wt./Fall:</b> 140#/30"
<b>Date Start/Finish:</b> 1/23/2019; 11:30-16:00	<b>Drilling Method:</b> Cased Wash Boring	<b>Core Barrel:</b> N/A
<b>Boring Location:</b> 6+76.4, 38.3 ft Rt.	<b>Casing ID/OD:</b> HW-4"	<b>Water Level*:</b> 1.0 ft bgs.

**Hammer Efficiency Factor:** 0.918      **Hammer Type:** Automatic     Hydraulic     Rope & Cathead

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

Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows					
0												
											SSA	
											HYD PUSH	
5	1D MV	24/16	5.00 - 7.00 5.63 - 5.83	1/1/1/2 Would not Push	2	3					Brown, wet, very loose, fine to medium Silty SAND, little organics, wood, (Alluvial/Wetland Deposit). Failed 55x110 mm vane attempt.	G#337240 A-4, SM WC=47.8%
10	1U	13.2/13.2	9.50 - 10.60	Piston Sampler					95.1		Grey, wet, Clayey SILT, little fine sand, (Glaciomarine Deposit).	
	MV		11.50 - 11.60	Would not Push							Failed 55x110 mm vane attempt.	
15	2D MV	24/24	15.00 - 17.00 15.63 - 15.83	2/3/3/3 Would not Push	6	9					Grey, wet, stiff, Clayey SILT, little fine sand, (Glaciomarine Deposit). Failed 55x110 mm vane attempt.	
20	2U	24/24	20.00 - 22.00	Piston Sampler							Grey, wet, stiff, Clayey SILT, trace fine sand, (Glaciomarine Deposit).	
	V1		22.63 - 23.00	$S_u=1384/312$ psf							55x110 mm vane raw torque readings: V1: 31.0/7.0 ft-lbs	
	MV		23.63 - 23.73								Failed 55x110 mm vane attempt.	
25									80.1		OPEN	

**Remarks:**  
 Auto Hammer #367  
 HYD = Hydraulic Push

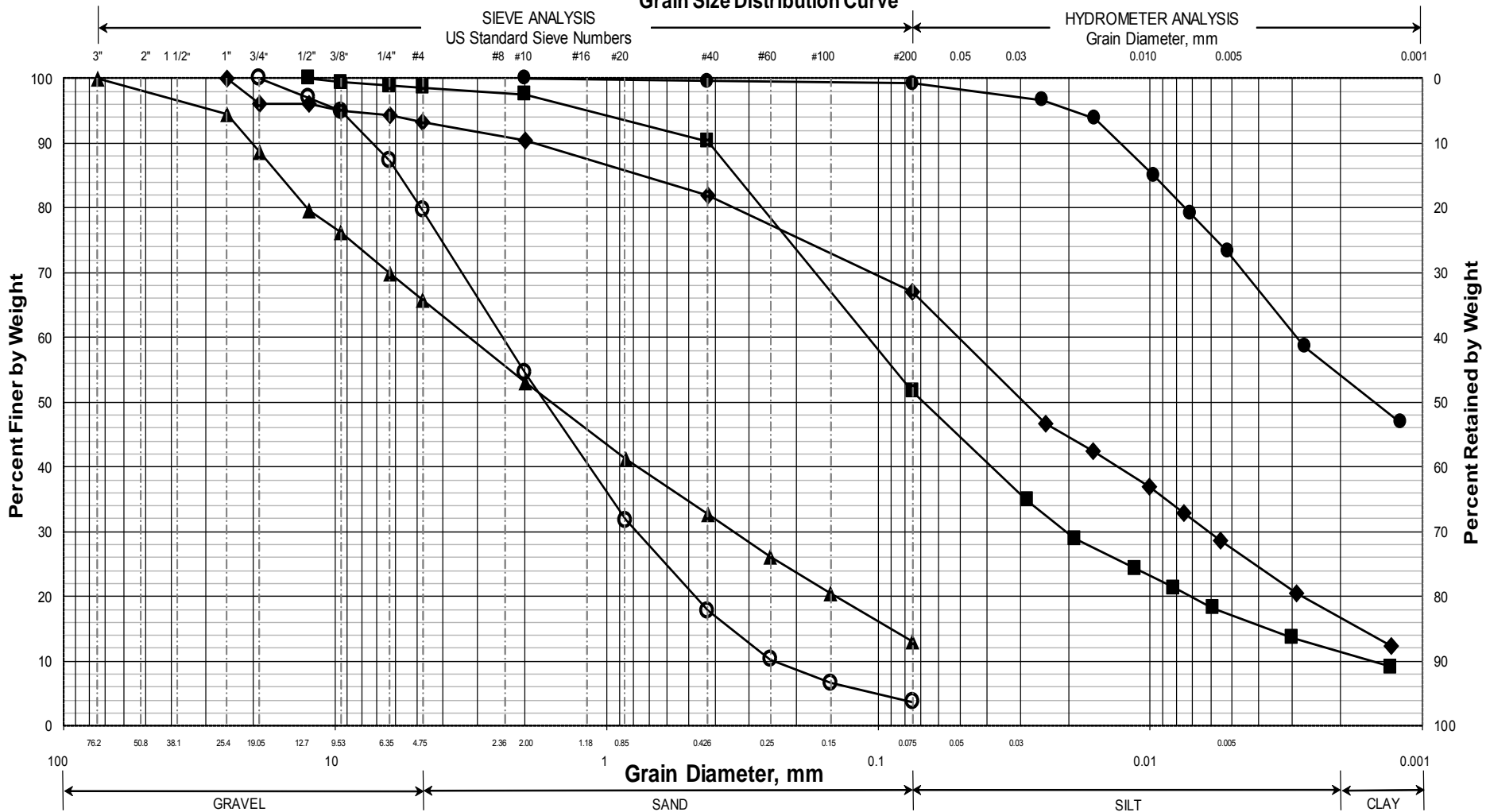
<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Schoodic Bridge #3649 carries Route 193 over Schoodic Brook Location: Cherryfield, Maine		Boring No.: <u>BB-CSB-204</u>						
Driller: S.W.Cole				Elevation (ft.): 104.1		Auger ID/OD: 5" Solid Stem						
Operator: Kevin/Joe				Datum: NAVD88		Sampler: Standard Split Spoon						
Logged By: Wilder/Daggett				Rig Type: Diedrich D-50		Hammer Wt./Fall: 140#/30"						
Date Start/Finish: 1/23/2019; 11:30-16:00				Drilling Method: Cased Wash Boring		Core Barrel: N/A						
Boring Location: 6+76.4, 38.3 ft Rt.				Casing ID/OD: HW-4"		Water Level*: 1.0 ft bgs.						
Hammer Efficiency Factor: 0.918				Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>								
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt		R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person		S <sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf) S <sub>u</sub> (lab) = Lab Vane Undrained Shear Strength (psf) q <sub>p</sub> = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N <sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency N <sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected		T <sub>v</sub> = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test						
Depth (ft.)	<b>Sample Information</b>								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows					
25	3D	24/13	25.00 - 27.00	3/16/14/15	30	46	HOLE				Grey, wet, dense, fine to coarse SAND, little gravel, little silt, (Glacial Till).	G#337241 A-2-4, SM WC=13.7%
30	4D	3.6/3.6	30.00 - 30.30	52(3.6")	---			73.8	Grey, wet, very dense, Gravelly fine to coarse SAND, little silt. <b>Bottom of Exploration at 30.3 feet below ground surface. SPOON REFUSAL</b>			
35												
40												
45												
50												
<b>Remarks:</b> Auto Hammer #367 HYD = Hydraulic Push												
Stratification lines represent approximate boundaries between soil types; transitions may be gradual.											Page 2 of 2	
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.											Boring No.: BB-CSB-204	



**APPENDIX D**  
**Laboratory Test Results**



## Maine Department of Transportation Grain Size Distribution Curve

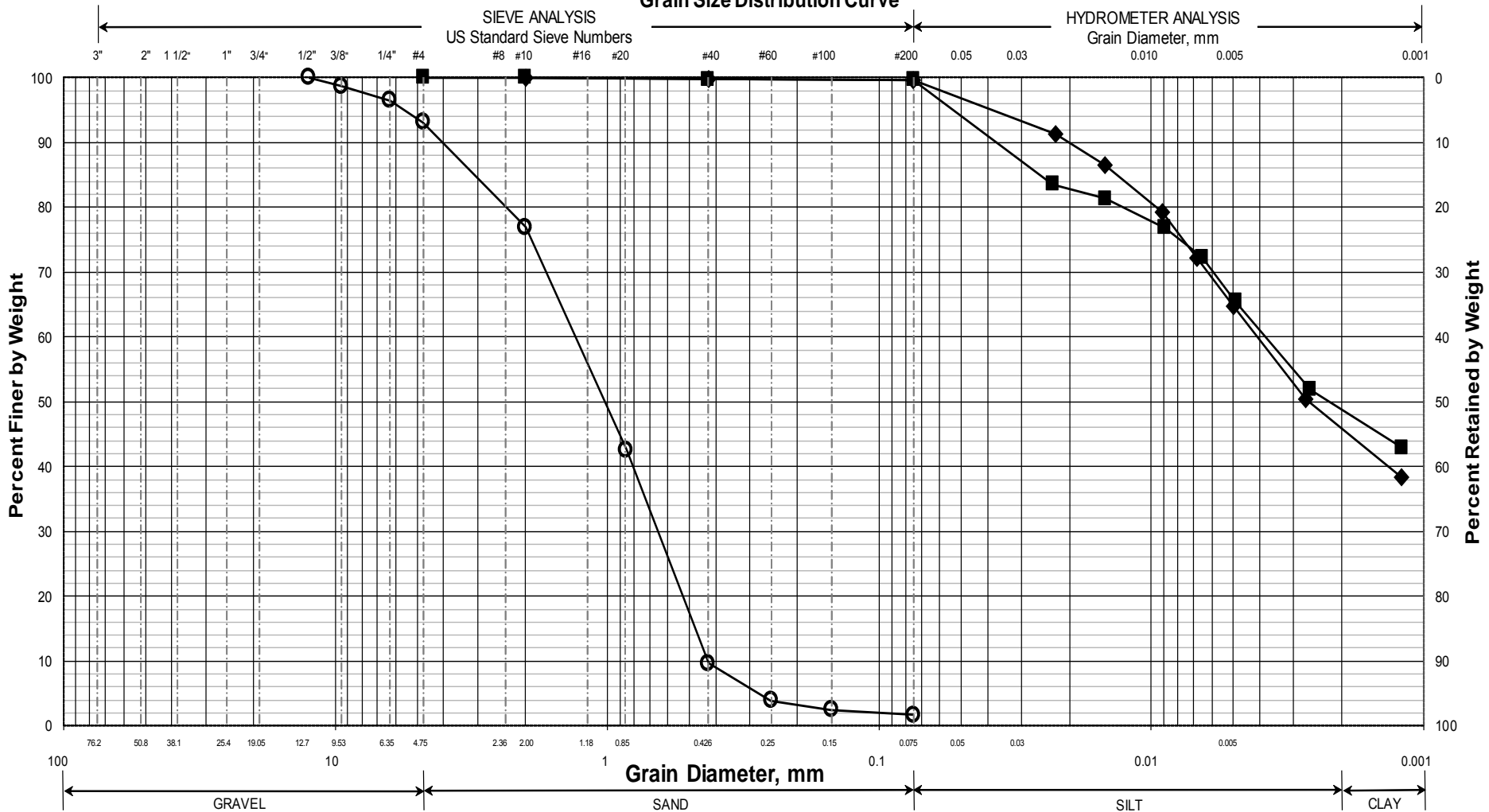


### UNIFIED CLASSIFICATION

	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	WC, %	LL	PL	PI
○	BB-CSB-101/1D	5+57.3	7.4 RT	5.0-5.5	SAND, little gravel, trace silt.	3.1			
◆	BB-CSB-101/1DA	5+57.3	7.4 RT	5.5-7.0	SILT, some sand, little clay, trace gravel.	19.3			
■	BB-CSB-101/2D	5+57.3	7.4 RT	10.0-12.0	Silty SAND, little clay, trace gravel.	29.8			
●	BB-CSB-101/3D	5+57.3	7.4 RT	16.0-18.0	Silty CLAY, trace sand.	35.5	31	21	10
▲	BB-CSB-101/6D	5+57.3	7.4 RT	40.0-42.0	SAND, some gravel, little silt.	8.7			
X									

WIN
022230.00
Town
Cherryfield
Reported by/Date
WHITE, TERRY A      4/26/2019

## Maine Department of Transportation Grain Size Distribution Curve

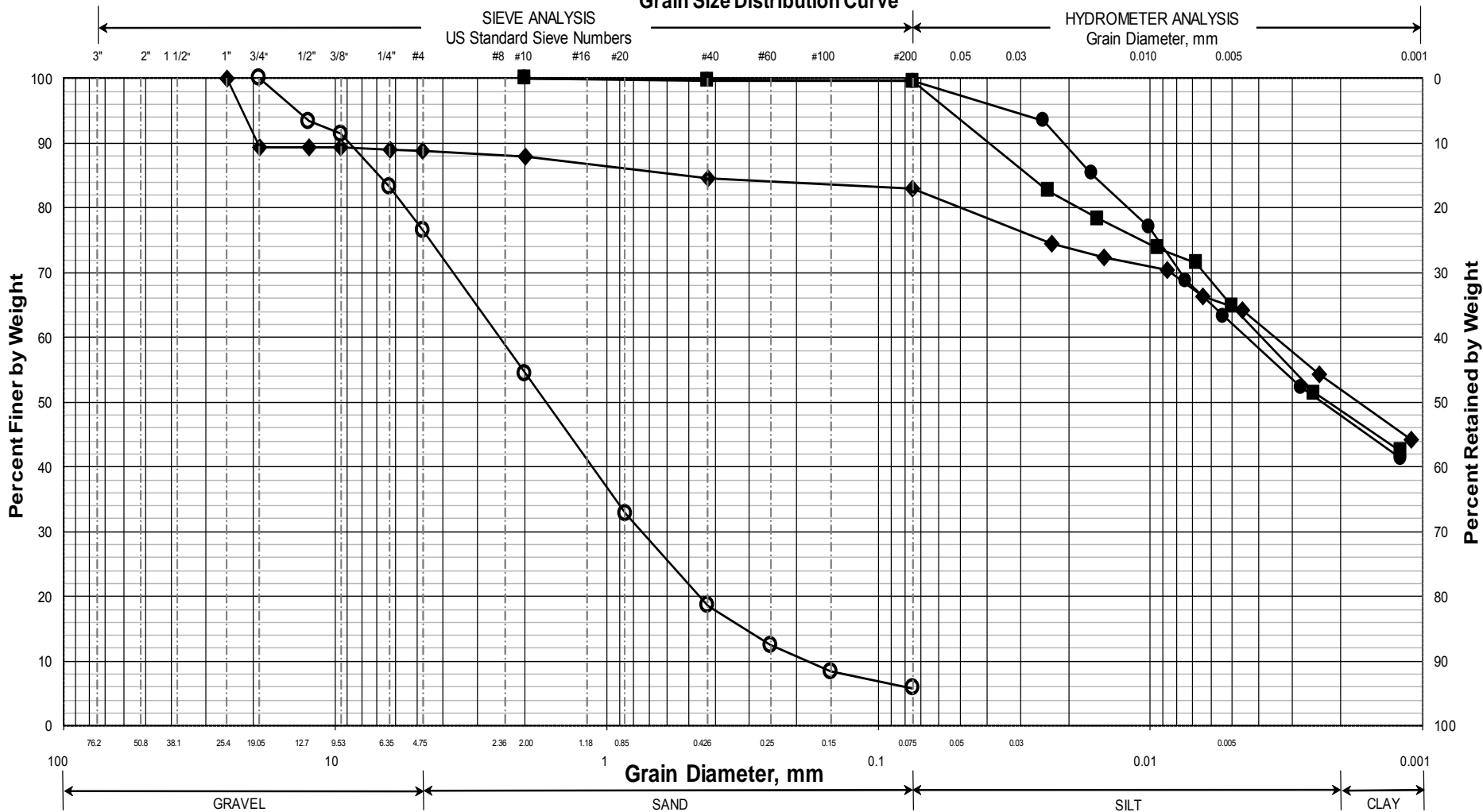


UNIFIED CLASSIFICATION

	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	WC, %	LL	PL	PI
○	BB-CSB-102/1D	5+76.1	7.1 LT	0.0-2.0	SAND, trace gravel, trace silt.	20.5			
◆	BB-CSB-102/2D	5+76.1	7.1 LT	5.0-7.0	Clayey SILT, trace sand.	36.6	31	21	10
■	BB-CSB-102/3D	5+76.1	7.1 LT	15.0-17.0	Clayey SILT, trace sand.	39.2	31	20	11
●									
▲									
X									

WIN
022230.00
Town
Cherryfield
Reported by/Date
WHITE, TERRY A      4/26/2019

## Maine Department of Transportation Grain Size Distribution Curve

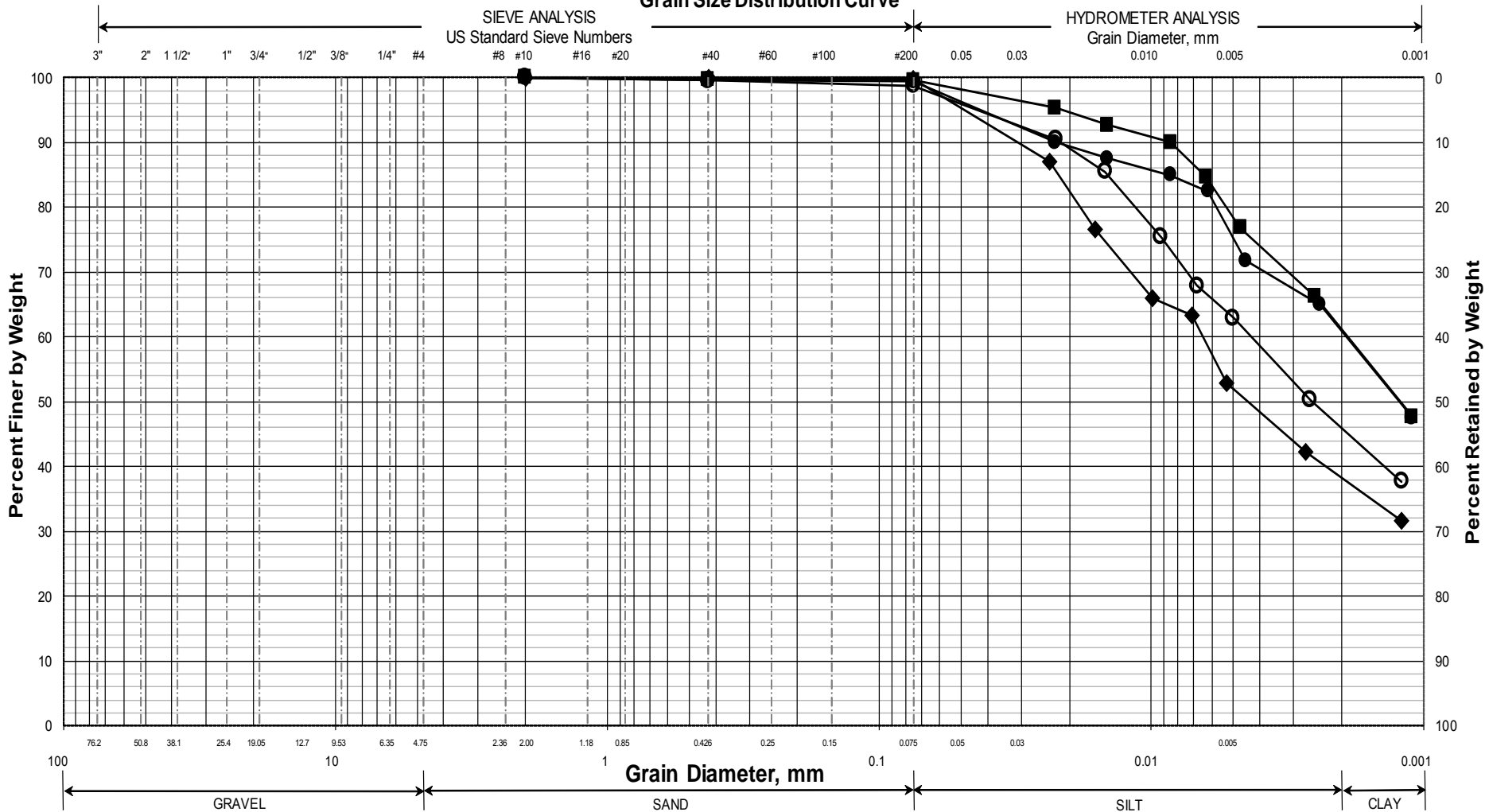


UNIFIED CLASSIFICATION

	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	WC, %	LL	PL	PI
○	BB-CSB-103/2D	6+09.2	7.6 LT	5.0-7.0	SAND, some gravel, trace silt.	2.7			
◆	BB-CSB-103/4D	6+09.2	7.6 LT	15.0-17.0	CLAY, some silt, little gravel, trace sand.	23.6	34	20	14
■	BB-CSB-103/5D	6+09.2	7.6 LT	20.0-22.0	Clayey SILT, trace sand.	31.2	31	20	11
●	BB-CSB-103/6D	6+09.2	7.6 LT	30.0-32.0	Clayey SILT, trace sand.	35.5	31	20	11
▲									
X									

WIN
022230.00
Town
Cherryfield
Reported by/Date
WHITE, TERRY A      7/30/2019

### Maine Department of Transportation Grain Size Distribution Curve

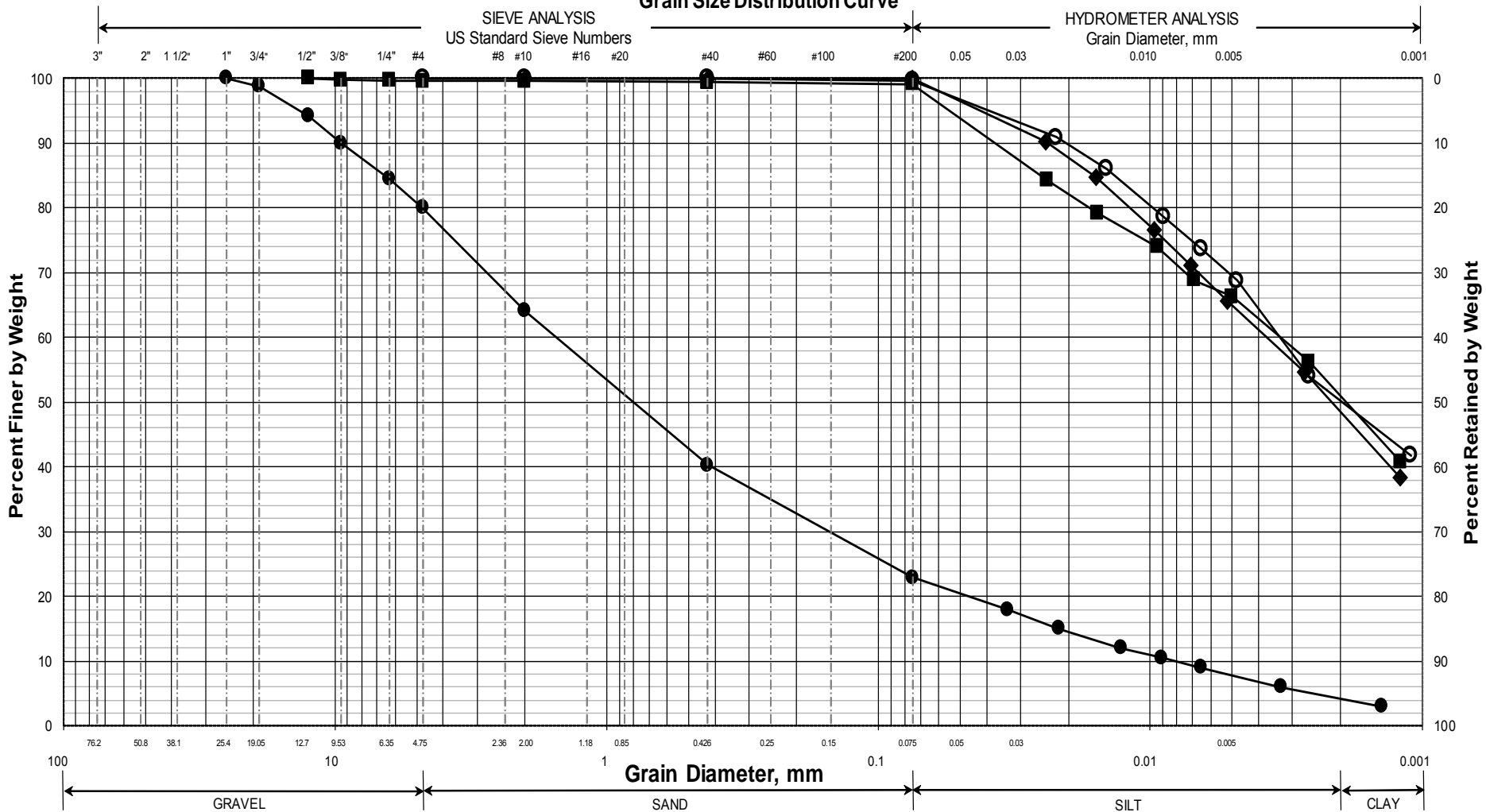


#### UNIFIED CLASSIFICATION

	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	WC, %	LL	PL	PI
○	BB-CSB-101/1U	5+57.3	7.4 RT	20.0-22.0	Clayey SILT, trace sand.	36.8	38	23	15
◆	BB-CSB-102/1U	5+76.1	7.1 LT	10.0-12.0	Clayey SILT, trace sand.	33.5	27	19	8
■	BB-CSB-201/1U	5+00.8	34.6 RT	15.0-17.0	Clayey SILT, trace sand.	38.3	35	24	11
●	BB-CSB-201/1U/A	5+00.8	34.6 RT	15.0-17.0	Clayey SILT, trace sand.	39.2	40	24	16
▲									
X									

WIN
022230.00
Town
Cherryfield
Reported by/Date
WHITE, TERRY A      4/26/2019

## Maine Department of Transportation Grain Size Distribution Curve

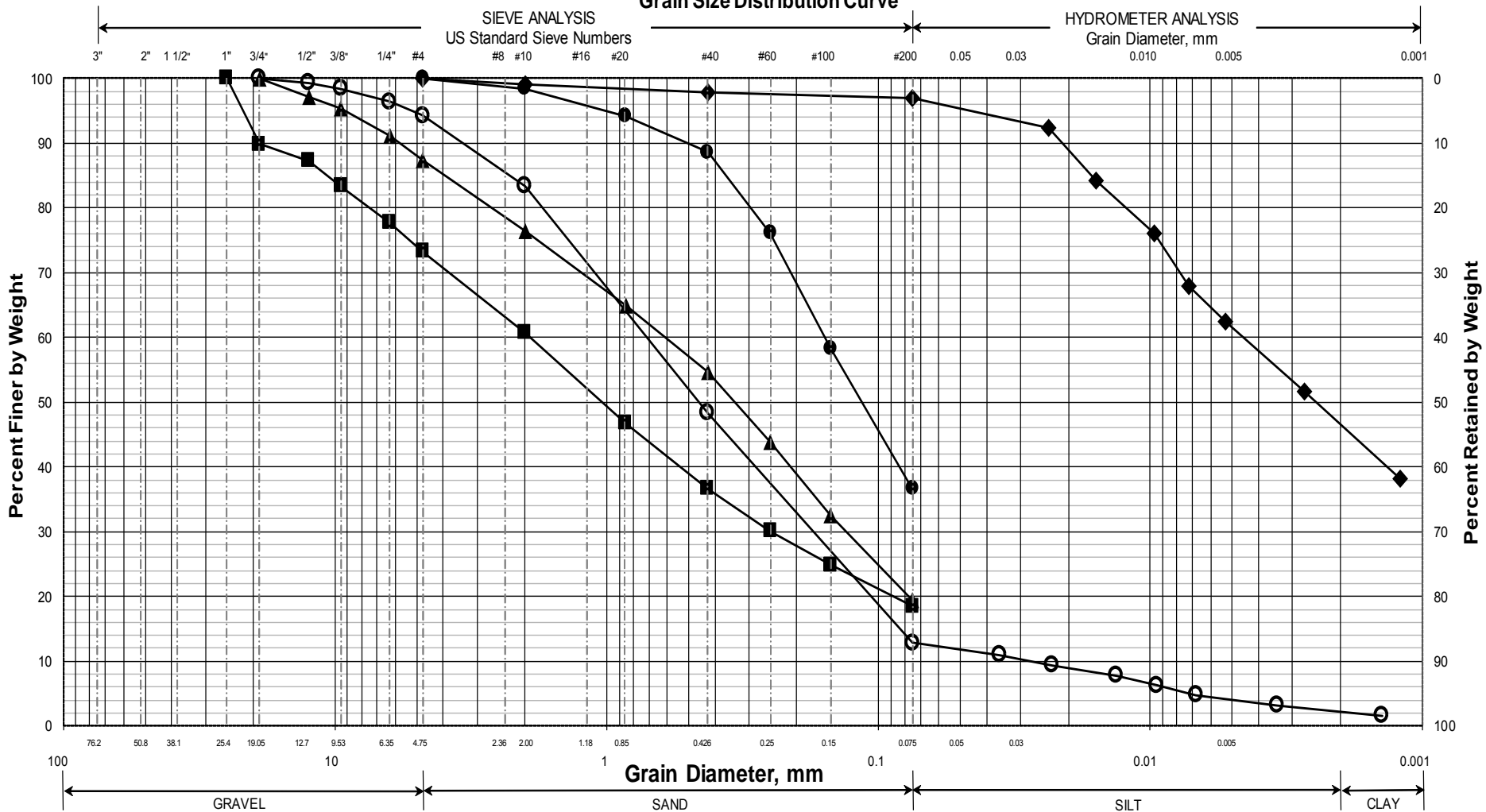


UNIFIED CLASSIFICATION

	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	WC, %	LL	PL	PI
○	BB-CSB-201/4D	5+00.8	34.6 RT	25.0-27.0	Clayey SILT, trace sand.	32.7	29	20	9
◆	BB-CSB-202/4D	5+24.5	46.2 RT	25.0-27.0	Clayey SILT, trace sand.	34.5	32	19	13
■	BB-CSB-202/6D	5+24.5	46.2 RT	35.0-37.0	Clayey SILT, trace sand, trace gravel.	34.4	30	20	10
●	BB-CSB-202/7D	5+24.5	46.2 RT	40.0-42.0	SAND, little gravel, little silt, trace clay.	10			
▲									
X									

WIN
022230.00
Town
Cherryfield
Reported by/Date
WHITE, TERRY A      4/26/2019

## Maine Department of Transportation Grain Size Distribution Curve



### UNIFIED CLASSIFICATION

	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	WC, %	LL	PL	PI
○	BB-CSB-203/1D	6+43	66.3 RT	5.0-7.0	SAND, little silt, trace gravel, trace clay.	30.6			
◆	BB-CSB-203/1DA	6+43	66.3 RT	5.0-7.0	Clayey SILT, trace sand.	27.4	34	21	13
■	BB-CSB-203/4D	6+43	66.3 RT	20.0-22.0	SAND, some gravel, little silt.	8			
●	BB-CSB-204/1D	6+76.4	38.3 RT	5.0-7.0	Silty SAND.	47.8			
▲	BB-CSB-204/3D	6+76.4	38.3 RT	25.0-27.0	SAND, little silt, little gravel.	13.7			
X									

WIN
022230.00
Town
Cherryfield
Reported by/Date
WHITE, TERRY A      7/30/2019



# GEOTECHNICAL TEST REPORT

## Central Laboratory

### SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
<b>303141</b>	<b>BB-CSB-101/1U</b>	<b>GEOTECHNICAL (UNDISTURBED)</b>	<b>3/27/2018</b>	<b>4/3/2018</b>
Sample Type: <b>GEOTECHNICAL</b> Location:		Station: <b>5+57.3</b> Offset, ft: <b>7.4</b>	RT Dbfg, ft: <b>20.0-22.0</b>	
WIN/Town <b>022230.00 - CHERRYFIELD</b>		Sampler: <b>BRUCE WILDER</b>		

### TEST RESULTS

#### Sieve Analysis (T 88)

##### Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	
No. 10 [2.00 mm]	<b>100.0</b>
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	<b>99.6</b>
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	<b>98.8</b>
[0.0224 mm]	<b>90.5</b>
[0.0148 mm]	<b>85.5</b>
[0.0092 mm]	<b>75.4</b>
[0.0068 mm]	<b>67.9</b>
[0.0050 mm]	<b>62.9</b>
[0.0026 mm]	<b>50.3</b>
[0.0012 mm]	<b>37.7</b>

#### Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %	<b>38</b>
Plastic Limit (T 90), %	<b>23</b>
Plasticity Index (T 90), %	<b>15</b>
Specific Gravity, Corrected to 20°C (T 100)	<b>2.73</b>
Loss on Ignition, % (T 267)	
Water Content (T 265), %	<b>36.8</b>

#### Consolidation (T 216)

Trimblings, Water Content, %	<b>33.0</b>
------------------------------	-------------

	Initial	Final		Void Ratio	% Strain
Water Content, %	<b>34.56</b>	<b>23.45</b>	Pmin		
Dry Density, lbs/ft³	<b>87.564</b>	<b>104.25</b>	Pp		
Void Ratio	<b>0.946</b>	<b>0.635</b>	Pmax		
Saturation, %	<b>99.69</b>	<b>100</b>	Cc/C'c		

#### Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear	Remold	U. Shear	Remold		
	tons/ft²	tons/ft²	tons/ft²	tons/ft²		
0-0.5	0.11	0	0.11	0.01	37.1	Alternating layers of light to dark gray very soft clay, silt lines at 2.5" and 4.25"
0.63-1	0.17	0.01	0.18	0.01	46.4	Alternating layers of light to dark gray very soft clay, silt lines at 8" and 11.75"
1-1.5	0.18	0.01	0.17	0.01	38.6	Alternating layers of light to dark gray very soft clay
1.5-2	0.16	0	0.19	0	41.4	Alternating layers of light gray to dark gray very soft clay, silt lines at 19.5", 21.5", 22.75"

Comments:

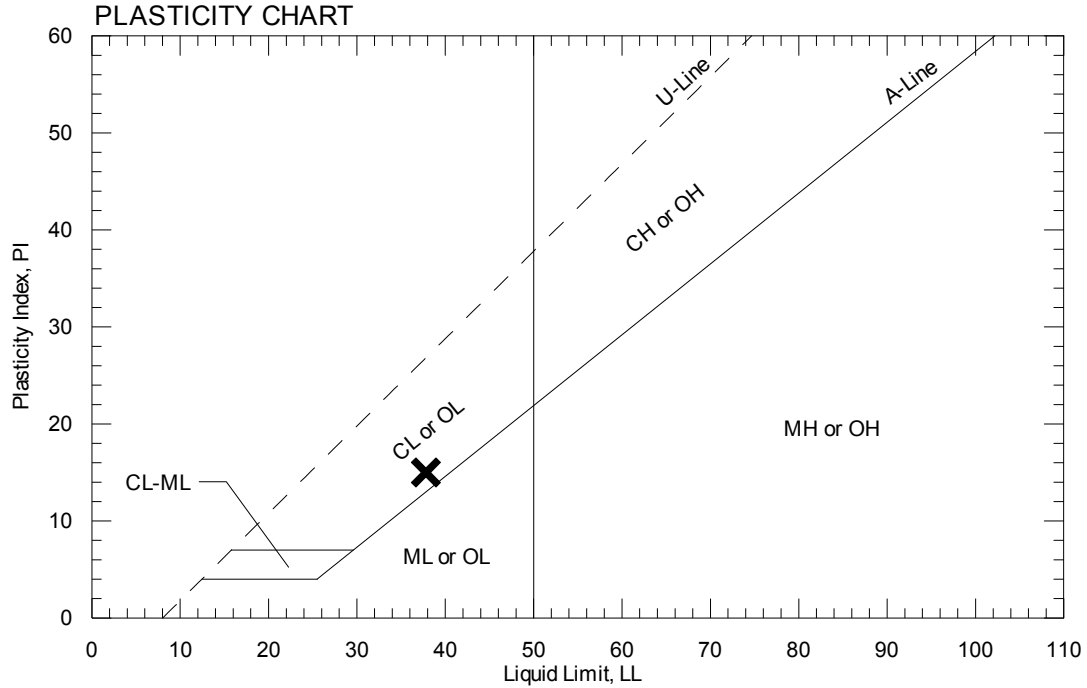
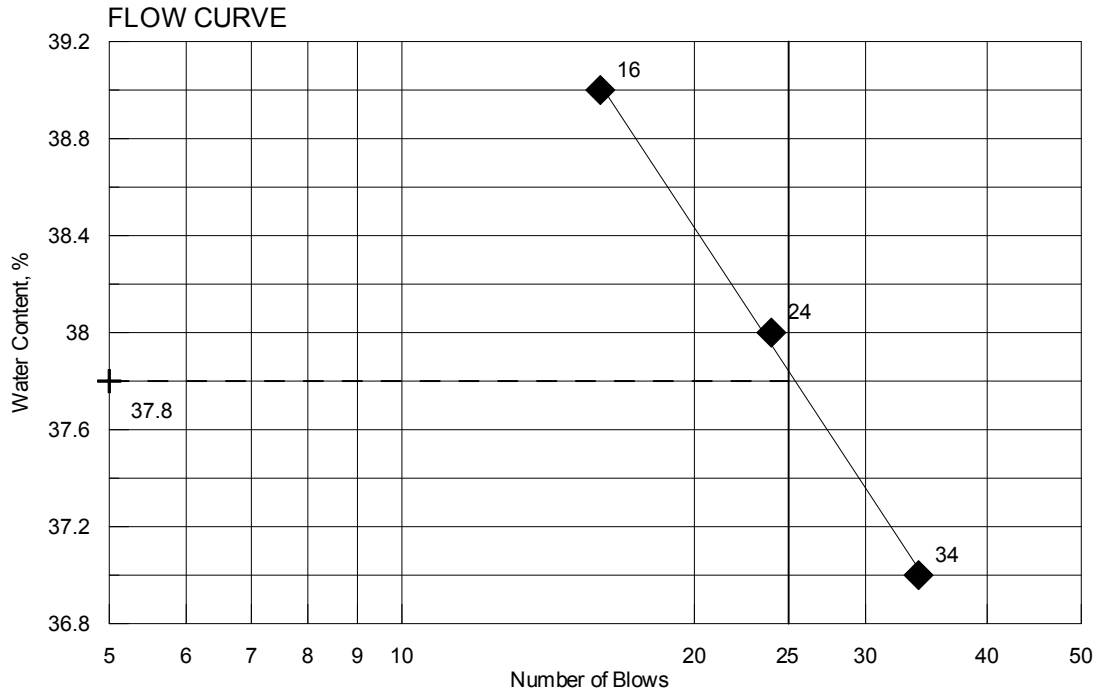
### AUTHORIZATION AND DISTRIBUTION

Reported by: **GREGORY LIDSTONE**

Date Reported: **5/21/2018**

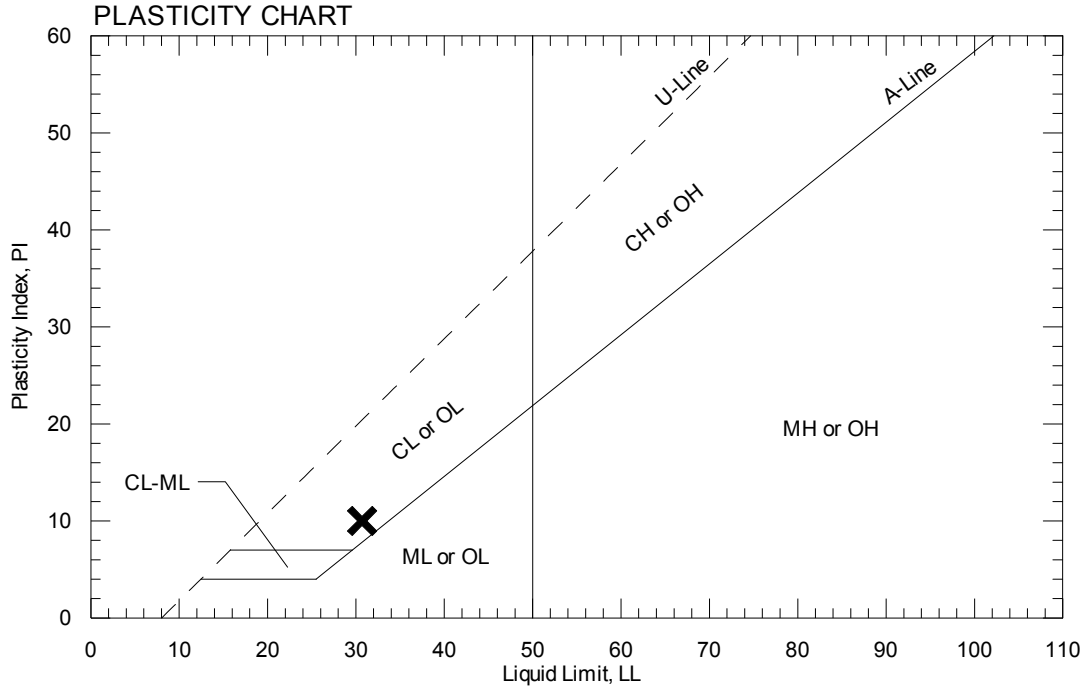
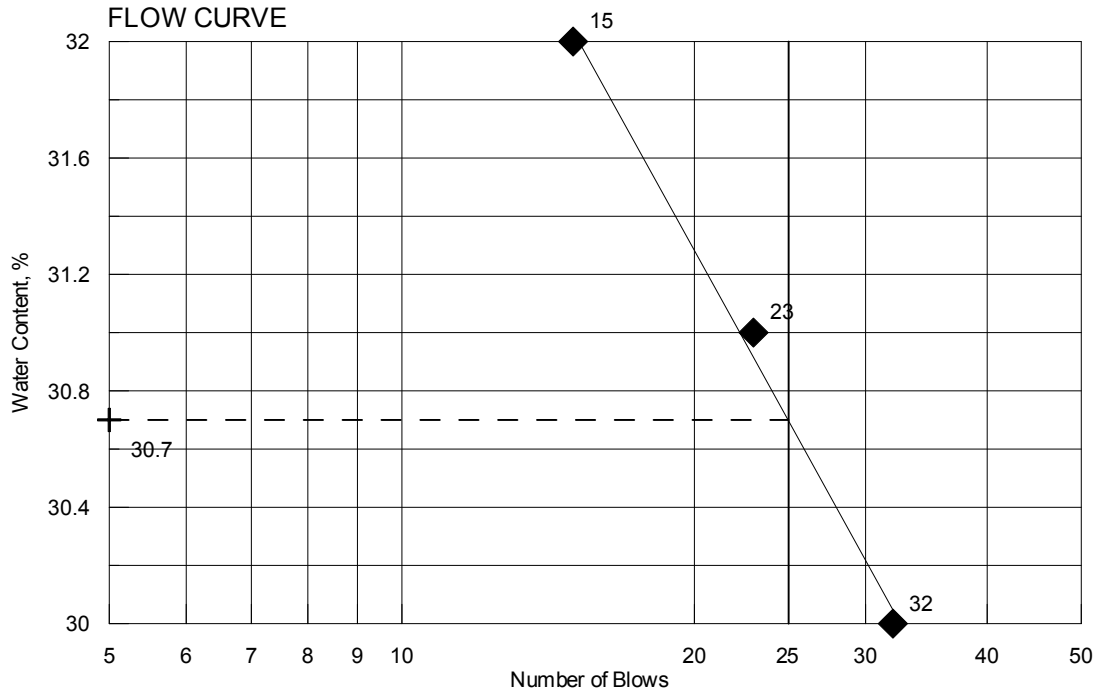
Paper Copy: Lab File; Project File; Geotech File

TOWN	Cherryfield	Reference No.	303141
WIN	022230.00	Water Content, %	36.8
Sampled	3/27/2018	Liquid Limit @ 25 blows (T 89), %	38
Boring No./Sample No.	BB-CSB-101/1U	Plastic Limit (T 90), %	23
Station	5+57.3	Plasticity Index (T 90), %	15
Depth	20.0-22.0	Tested By	BBURR





TOWN	Cherryfield	Reference No.	303140
WIN	022230.00	Water Content, %	35.5
Sampled	3/27/2018	Liquid Limit @ 25 blows (T 89), %	31
Boring No./Sample No.	BB-CSB-101/3D	Plastic Limit (T 90), %	21
Station	5+57.3	Plasticity Index (T 90), %	10
Depth	16.0-18.0	Tested By	BBURR





# GEOTECHNICAL TEST REPORT

## Central Laboratory

### SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
<b>303145</b>	<b>BB-CSB-102/1U</b>	<b>GEOTECHNICAL (UNDISTURBED)</b>	<b>3/27/2018</b>	<b>4/3/2018</b>
Sample Type: <b>GEOTECHNICAL</b> Location:		Station: <b>5+76.1</b> Offset, ft: <b>7.1</b> LT Dbfg, ft: <b>10.0-12.0</b>	Sampler: <b>BRUCE WILDER</b>	
WIN/Town <b>022230.00 - CHERRYFIELD</b>				

### TEST RESULTS

#### Sieve Analysis (T 88)

##### Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	
No. 10 [2.00 mm]	<b>100.0</b>
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	<b>99.9</b>
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	<b>99.8</b>
[0.0236 mm]	<b>87.1</b>
[0.0161 mm]	<b>76.6</b>
[0.0099 mm]	<b>66.0</b>
[0.0071 mm]	<b>63.4</b>
[0.0053 mm]	<b>52.8</b>
[0.0027 mm]	<b>42.2</b>
[0.0012 mm]	<b>31.7</b>

#### Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %	<b>27</b>
Plastic Limit (T 90), %	<b>19</b>
Plasticity Index (T 90), %	<b>8</b>
Specific Gravity, Corrected to 20°C (T 100)	<b>2.79</b>
Loss on Ignition, % (T 267)	
Water Content (T 265), %	<b>33.5</b>

#### Consolidation (T 216)

Trimmings, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

#### Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear	Remold	U. Shear	Remold		
	tons/ft²	tons/ft²	tons/ft²	tons/ft²		
0-0.5	0.16	0.01	0.22	0.02	33.3	Alternating layers of light to dark gray very soft clay, silt line at 4.25"
0.5-0.67						Clay to 6.5", two stones and wood 6.5" to 8". Remainder of sample in tube is disturbed.

#### Comments:

**Consolidation cancelled.**

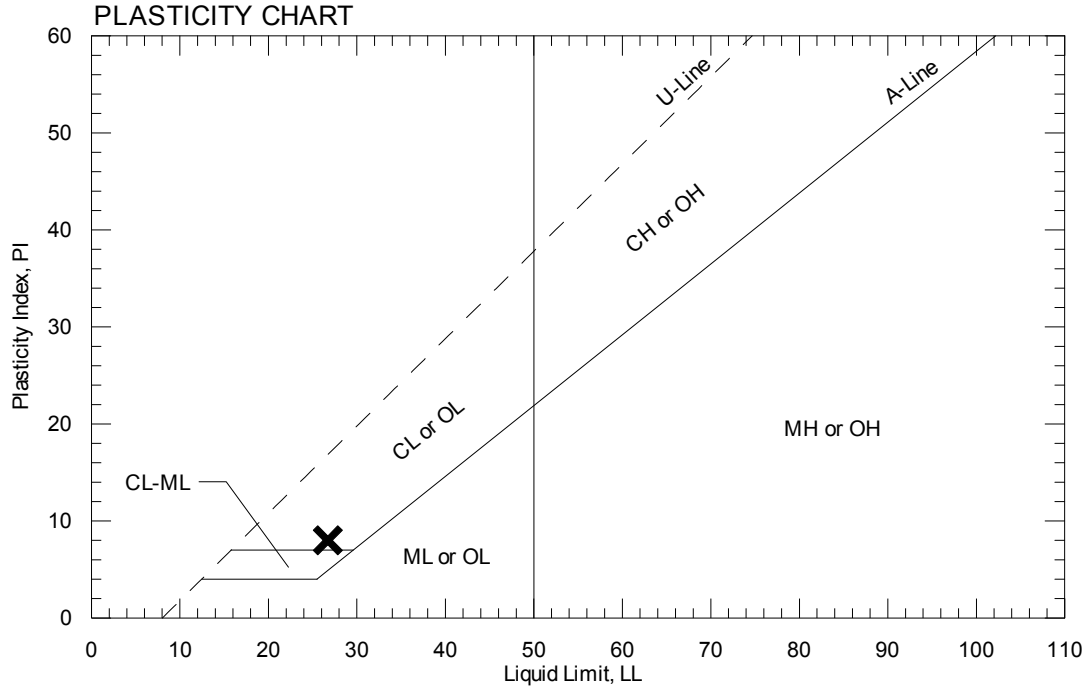
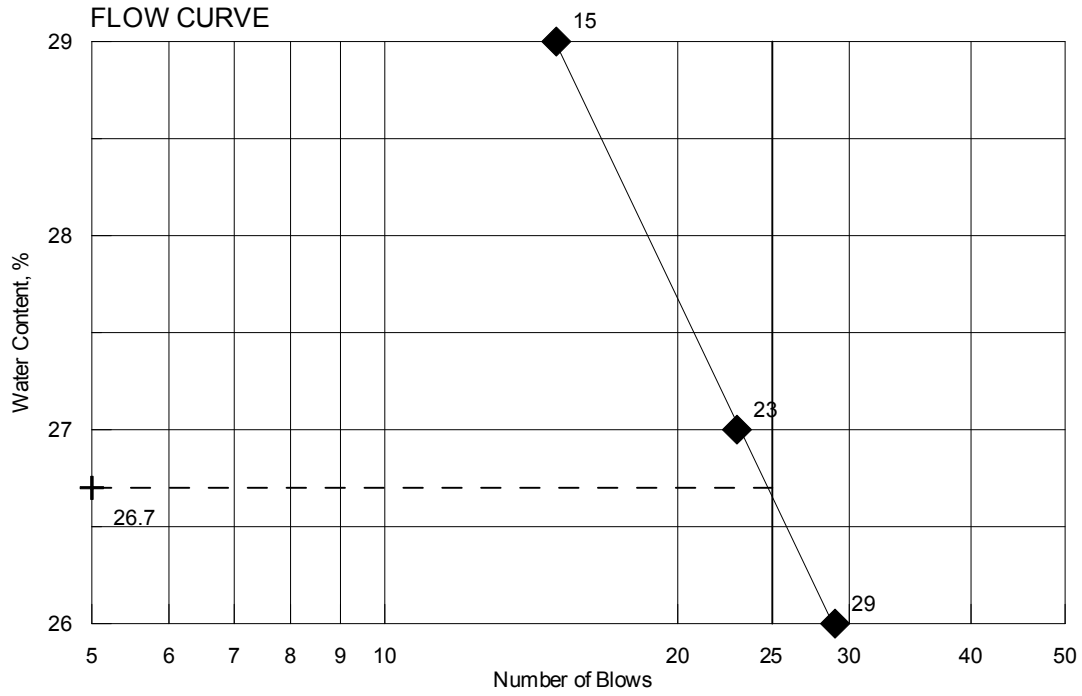
### AUTHORIZATION AND DISTRIBUTION

Reported by: **GREGORY LIDSTONE**

Date Reported: **5/21/2018**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Cherryfield	Reference No.	303145
WIN	022230.00	Water Content, %	33.5
Sampled	3/27/2018	Liquid Limit @ 25 blows (T 89), %	27
Boring No./Sample No.	BB-CSB-102/1U	Plastic Limit (T 90), %	19
Station	5+76.1	Plasticity Index (T 90), %	8
Depth	10.0-12.0	Tested By	BBURR





# GEOTECHNICAL TEST REPORT

## Central Laboratory

### SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
<b>303144</b>	<b>BB-CSB-102/2D</b>	<b>GEOTECHNICAL (DISTURBED)</b>	3/12/2018	4/3/2018
Sample Type: <b>GEOTECHNICAL</b> Location:		Station: <b>5+76.1</b> Offset, ft: <b>7.1</b> LT Dbfg, ft: <b>5.0-7.0</b>	Sampler: <b>BRUCE WILDER</b>	
WIN/Town <b>022230.00 - CHERRYFIELD</b>				

### TEST RESULTS

#### Sieve Analysis (T 88)

##### Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	
No. 10 [2.00 mm]	<b>100.0</b>
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	<b>99.8</b>
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	<b>99.6</b>
[0.0226 mm]	<b>91.3</b>
[0.0148 mm]	<b>86.5</b>
[0.0091 mm]	<b>79.3</b>
[0.0068 mm]	<b>72.1</b>
[0.0050 mm]	<b>64.8</b>
[0.0027 mm]	<b>50.4</b>
[0.0012 mm]	<b>38.4</b>

#### Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %	<b>31</b>
Plastic Limit (T 90), %	<b>21</b>
Plasticity Index (T 90), %	<b>10</b>
Specific Gravity, Corrected to 20°C (T 100)	<b>2.63</b>
Loss on Ignition, % (T 267)	
Water Content (T 265), %	<b>36.6</b>

#### Consolidation (T 216)

Trimmings, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

#### Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear	Remold	U. Shear	Remold		
	tons/ft²	tons/ft²	tons/ft²	tons/ft²		

Comments:

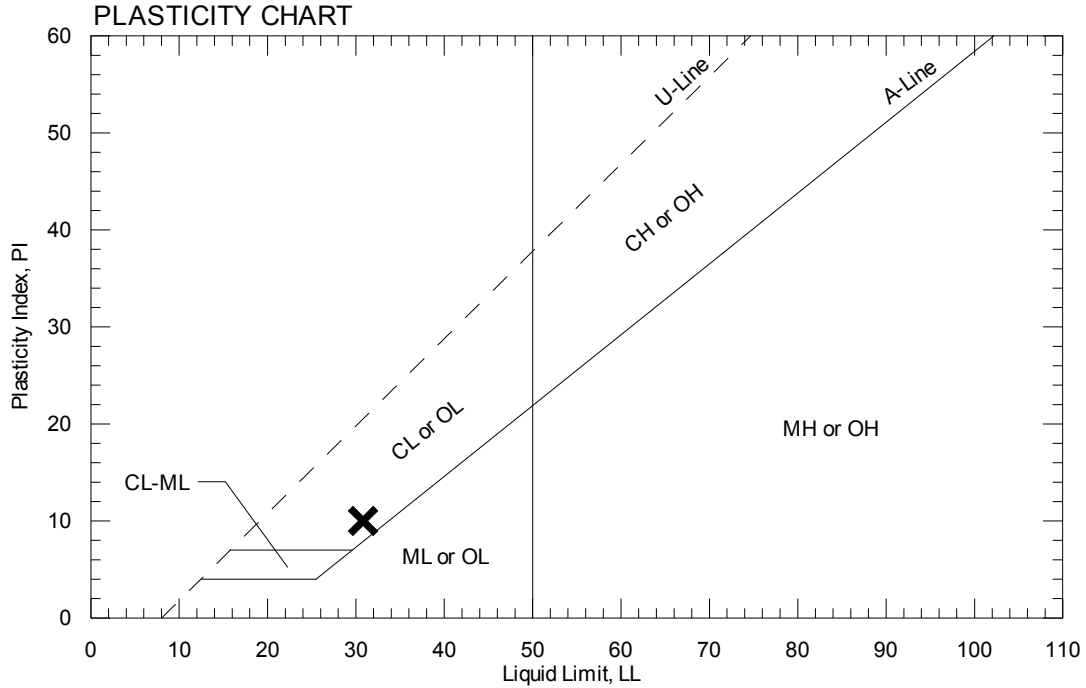
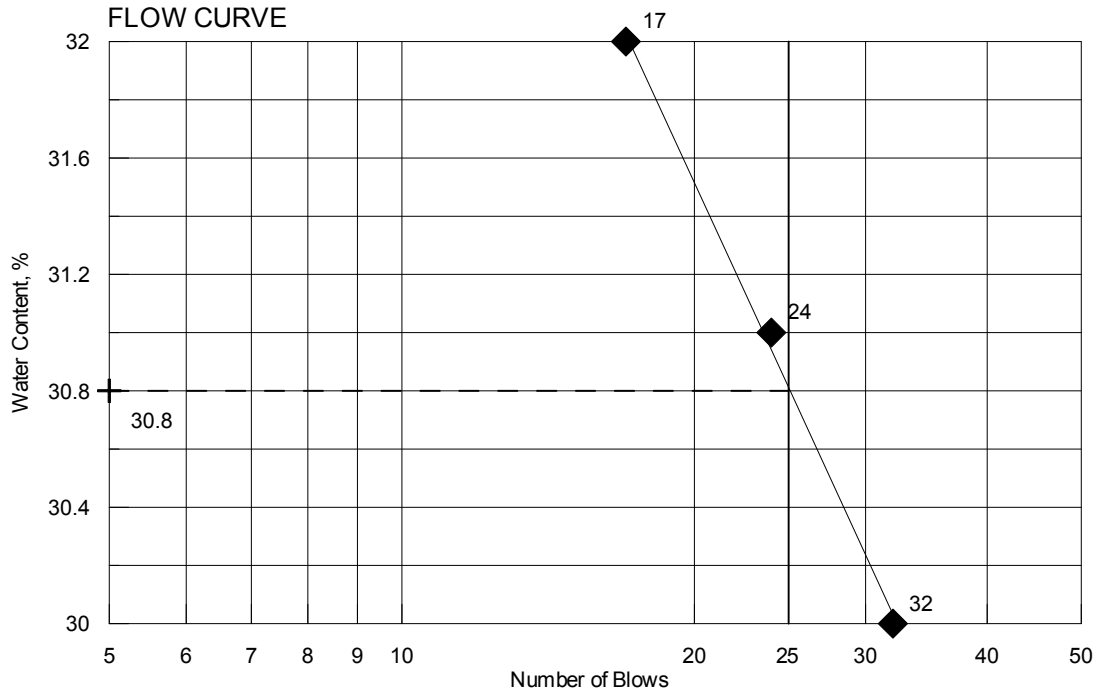
### AUTHORIZATION AND DISTRIBUTION

Reported by: **GREGORY LIDSTONE**

Date Reported: **4/27/2018**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Cherryfield	Reference No.	303144
WIN	022230.00	Water Content, %	36.6
Sampled	3/12/2018	Liquid Limit @ 25 blows (T 89), %	31
Boring No./Sample No.	BB-CSB-102/2D	Plastic Limit (T 90), %	21
Station	5+76.1	Plasticity Index (T 90), %	10
Depth	5.0-7.0	Tested By	BBURR





# GEOTECHNICAL TEST REPORT

## Central Laboratory

### SAMPLE INFORMATION

Reference No. **303146** Boring No./Sample No. **BB-CSB-102/3D** Sample Description **GEOTECHNICAL (DISTURBED)** Sampled **3/12/2018** Received **4/3/2018**

Sample Type: **GEOTECHNICAL** Location: Station: **5+76.1** Offset, ft: **7.1** LT Dbfg, ft: **15.0-17.0**

WIN/Town **022230.00 - CHERRYFIELD** Sampler: **BRUCE WILDER**

### TEST RESULTS

#### Sieve Analysis (T 88)

##### Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	<b>100.0</b>
No. 10 [2.00 mm]	<b>100.0</b>
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	<b>99.8</b>
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	<b>99.7</b>
[0.0230 mm]	<b>83.6</b>
[0.0148 mm]	<b>81.3</b>
[0.0089 mm]	<b>76.8</b>
[0.0065 mm]	<b>72.3</b>
[0.0049 mm]	<b>65.5</b>
[0.0026 mm]	<b>51.9</b>
[0.0012 mm]	<b>42.9</b>

#### Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %	<b>31</b>
Plastic Limit (T 90), %	<b>20</b>
Plasticity Index (T 90), %	<b>11</b>
Specific Gravity, Corrected to 20°C (T 100)	<b>2.66</b>
Loss on Ignition, % (T 267)	
Water Content (T 265), %	<b>39.2</b>

#### Consolidation (T 216)

Trimming, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

#### Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

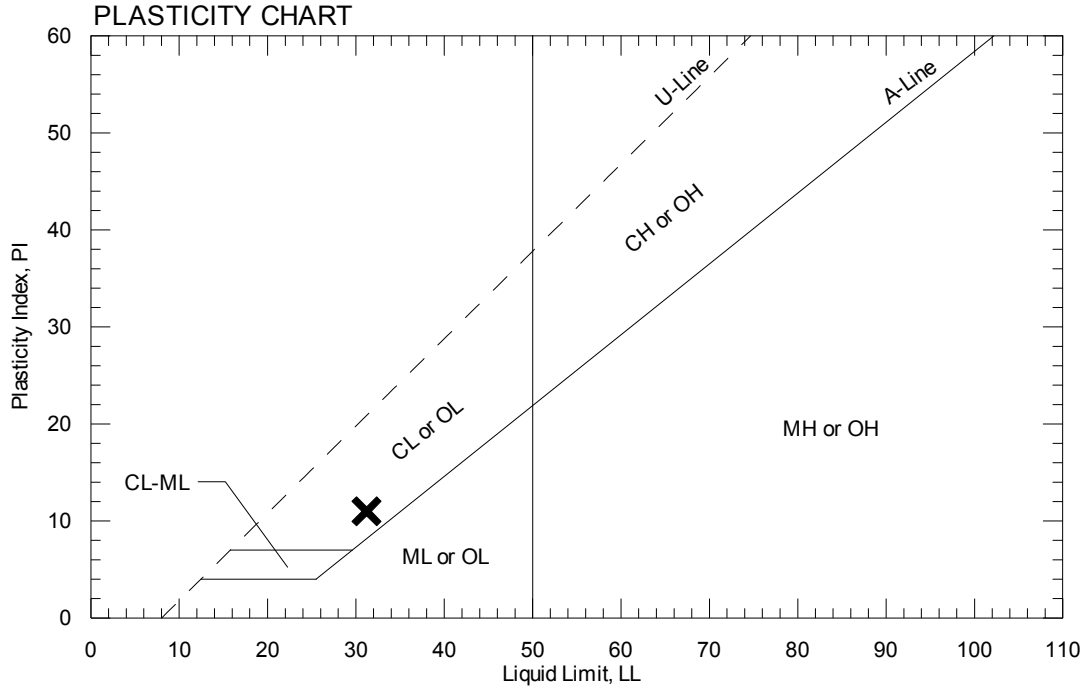
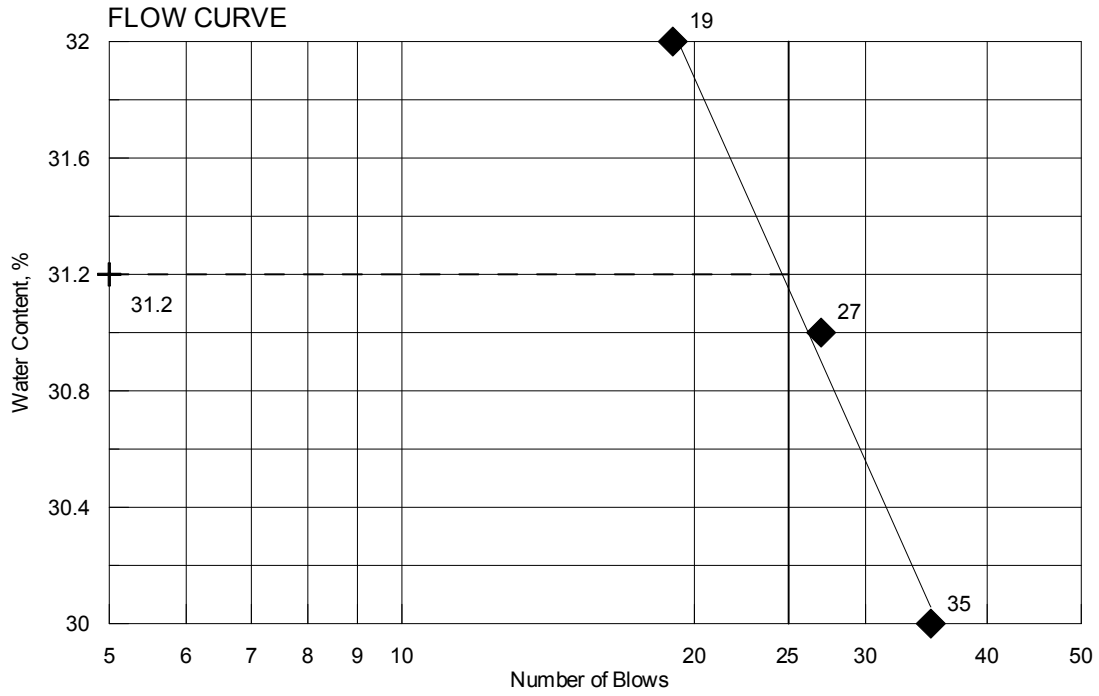
### AUTHORIZATION AND DISTRIBUTION

Reported by: **GREGORY LIDSTONE**

Date Reported: **4/26/2018**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Cherryfield	Reference No.	303146
WIN	022230.00	Water Content, %	39.2
Sampled	3/12/2018	Liquid Limit @ 25 blows (T 89), %	31
Boring No./Sample No.	BB-CSB-102/3D	Plastic Limit (T 90), %	20
Station	5+76.1	Plasticity Index (T 90), %	11
Depth	15.0-17.0	Tested By	BBURR





# GEOTECHNICAL TEST REPORT

## Central Laboratory

### SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
<b>303148</b>	<b>BB-CSB-103/4D</b>	<b>GEOTECHNICAL (DISTURBED)</b>	<b>3/26/2018</b>	<b>4/3/2018</b>
Sample Type: <b>GEOTECHNICAL</b> Location:		Station: <b>6+09.2</b> Offset, ft: <b>7.6</b> LT Dbfg, ft: <b>15.0-17.0</b>	Sampler: <b>BRUCE WILDER</b>	
WIN/Town <b>022230.00 - CHERRYFIELD</b>				

### TEST RESULTS

#### Sieve Analysis (T 88)

##### Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	<b>100.0</b>
¾ in. [19.0 mm]	<b>89.3</b>
½ in. [12.5 mm]	<b>89.3</b>
⅜ in. [9.5 mm]	<b>89.3</b>
¼ in. [6.3 mm]	<b>89.0</b>
No. 4 [4.75 mm]	<b>88.9</b>
No. 10 [2.00 mm]	<b>87.9</b>
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	<b>84.5</b>
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	<b>82.9</b>
[0.0230 mm]	<b>74.5</b>
[0.0148 mm]	<b>72.4</b>
[0.0087 mm]	<b>70.4</b>
[0.0064 mm]	<b>66.4</b>
[0.0046 mm]	<b>64.3</b>
[0.0024 mm]	<b>54.3</b>
[0.0011 mm]	<b>44.2</b>

#### Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %	<b>34</b>
Plastic Limit (T 90), %	<b>20</b>
Plasticity Index (T 90), %	<b>14</b>
Specific Gravity, Corrected to 20°C (T 100)	<b>2.67</b>
Loss on Ignition, % (T 267)	
Water Content (T 265), %	<b>23.6</b>

#### Consolidation (T 216)

Trimmings, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

#### Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

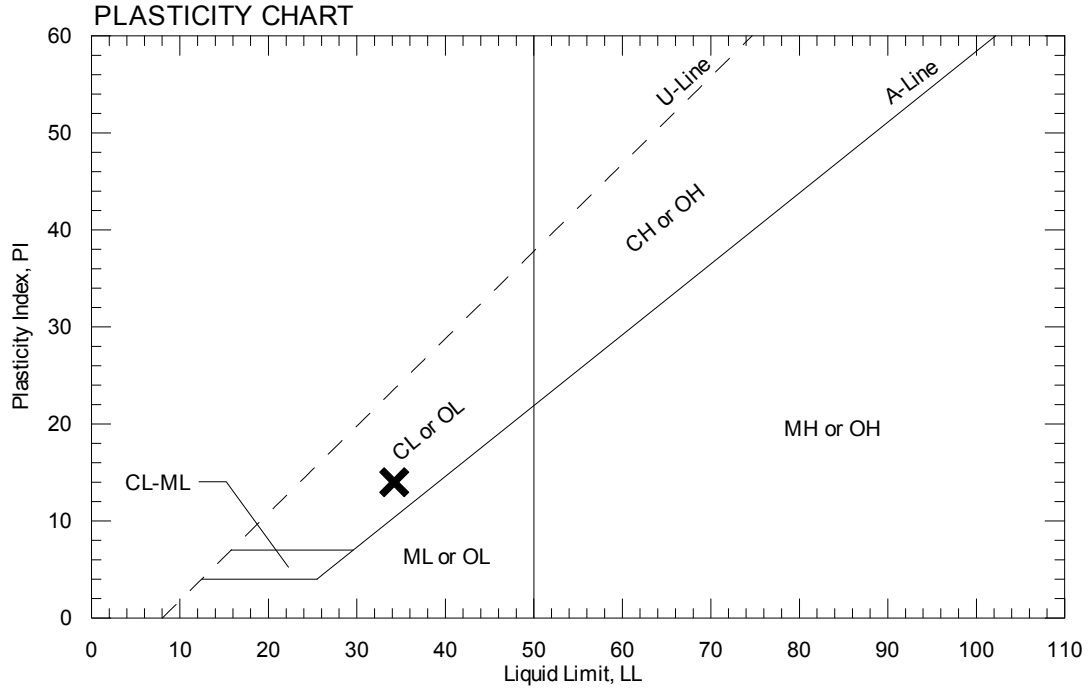
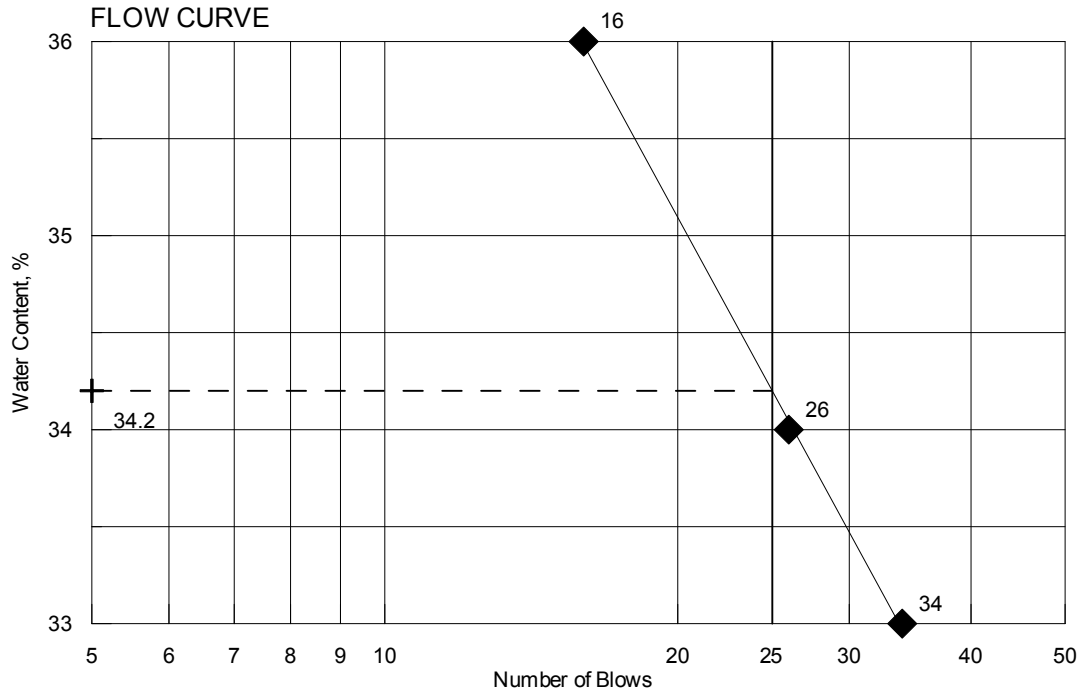
### AUTHORIZATION AND DISTRIBUTION

Reported by: **GREGORY LIDSTONE**

Date Reported: **4/27/2018**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Cherryfield	Reference No.	303148
WIN	022230.00	Water Content, %	23.6
Sampled	3/26/2018	Liquid Limit @ 25 blows (T 89), %	34
Boring No./Sample No.	BB-CSB-103/4D	Plastic Limit (T 90), %	20
Station	6+09.2	Plasticity Index (T 90), %	14
Depth	15.0-17.0	Tested By	BBURR





# GEOTECHNICAL TEST REPORT

## Central Laboratory

### SAMPLE INFORMATION

Reference No. **303149** Boring No./Sample No. **BB-CSB-103/5D** Sample Description **GEOTECHNICAL (DISTURBED)** Sampled **3/26/2018** Received **4/3/2018**

Sample Type: **GEOTECHNICAL** Location: Station: **6+09.2** Offset, ft: **7.6** LT Dbfg, ft: **20.0-22.0**

WIN/Town **022230.00 - CHERRYFIELD** Sampler: **BRUCE WILDER**

### TEST RESULTS

#### Sieve Analysis (T 88)

##### Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	
No. 10 [2.00 mm]	<b>100.0</b>
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	<b>99.8</b>
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	<b>99.6</b>
[0.0238 mm]	<b>82.7</b>
[0.0156 mm]	<b>78.3</b>
[0.0094 mm]	<b>73.8</b>
[0.0068 mm]	<b>71.5</b>
[0.0050 mm]	<b>64.8</b>
[0.0025 mm]	<b>51.4</b>
[0.0012 mm]	<b>42.5</b>

#### Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %	<b>31</b>
Plastic Limit (T 90), %	<b>20</b>
Plasticity Index (T 90), %	<b>11</b>
Specific Gravity, Corrected to 20°C (T 100)	<b>2.68</b>
Loss on Ignition, % (T 267)	
Water Content (T 265), %	<b>31.2</b>

#### Consolidation (T 216)

Trimming, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

#### Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

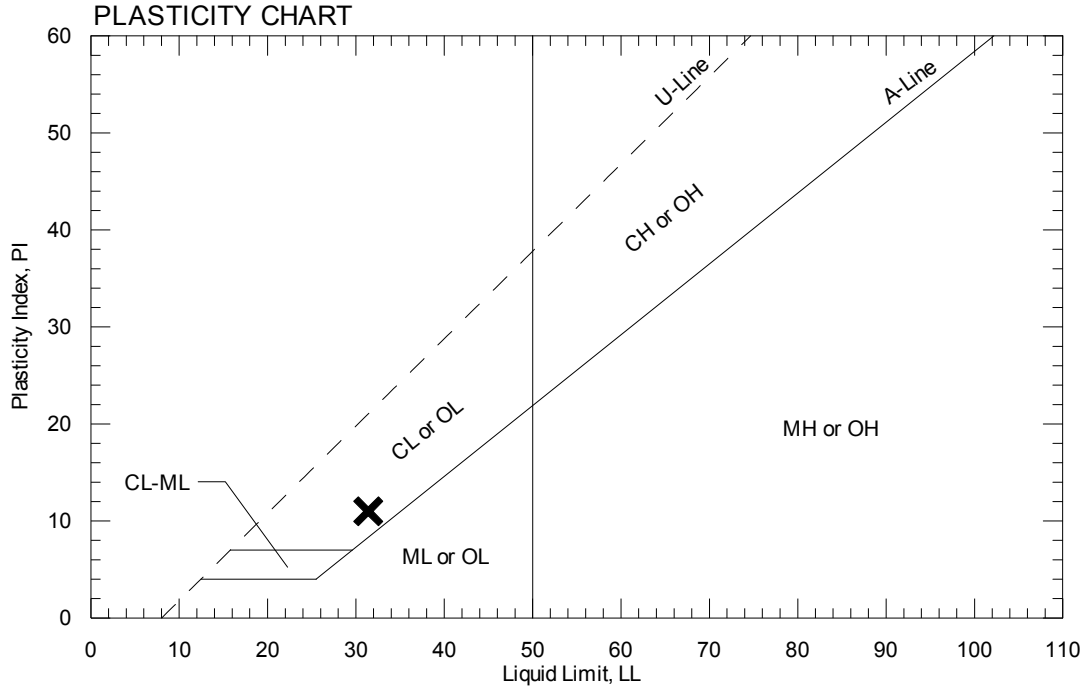
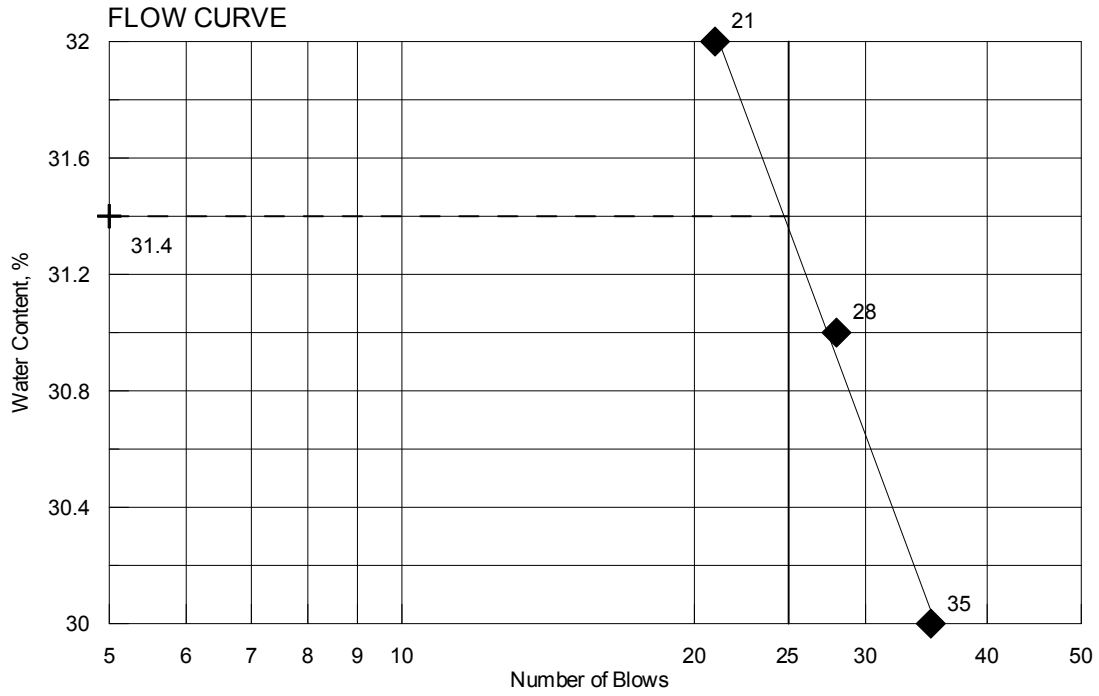
### AUTHORIZATION AND DISTRIBUTION

Reported by: **GREGORY LIDSTONE**

Date Reported: **4/27/2018**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Cherryfield	Reference No.	303149
WIN	022230.00	Water Content, %	31.2
Sampled	3/26/2018	Liquid Limit @ 25 blows (T 89), %	31
Boring No./Sample No.	BB-CSB-103/5D	Plastic Limit (T 90), %	20
Station	6+09.2	Plasticity Index (T 90), %	11
Depth	20.0-22.0	Tested By	BBURR





# GEOTECHNICAL TEST REPORT

## Central Laboratory

### SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
<b>303150</b>	<b>BB-CSB-103/6D</b>	<b>GEOTECHNICAL (DISTURBED)</b>	<b>3/26/2018</b>	<b>4/3/2018</b>
Sample Type: <b>GEOTECHNICAL</b> Location:		Station: <b>6+09.2</b> Offset, ft: <b>7.6</b> LT Dbfg, ft: <b>30.0-32.0</b>	Sampler: <b>BRUCE WILDER</b>	
WIN/Town <b>022230.00 - CHERRYFIELD</b>				

### TEST RESULTS

#### Sieve Analysis (T 88)

##### Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	
No. 10 [2.00 mm]	<b>100.0</b>
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	<b>99.7</b>
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	<b>99.6</b>
[0.0247 mm]	<b>93.5</b>
[0.0165 mm]	<b>85.3</b>
[0.0101 mm]	<b>77.0</b>
[0.0074 mm]	<b>68.8</b>
[0.0054 mm]	<b>63.3</b>
[0.0028 mm]	<b>52.3</b>
[0.0012 mm]	<b>41.3</b>

#### Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %	<b>31</b>
Plastic Limit (T 90), %	<b>20</b>
Plasticity Index (T 90), %	<b>11</b>
Specific Gravity, Corrected to 20°C (T 100)	<b>2.60</b>
Loss on Ignition, % (T 267)	
Water Content (T 265), %	<b>35.5</b>

#### Consolidation (T 216)

Trimmings, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

#### Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear	Remold	U. Shear	Remold		
	tons/ft²	tons/ft²	tons/ft²	tons/ft²		

Comments:

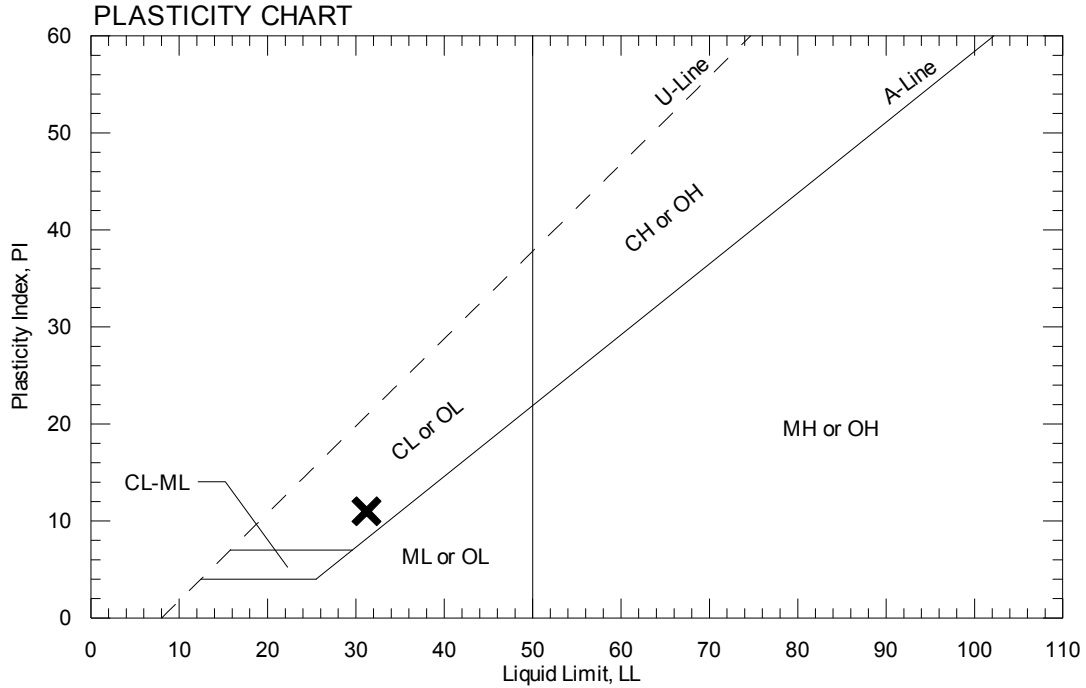
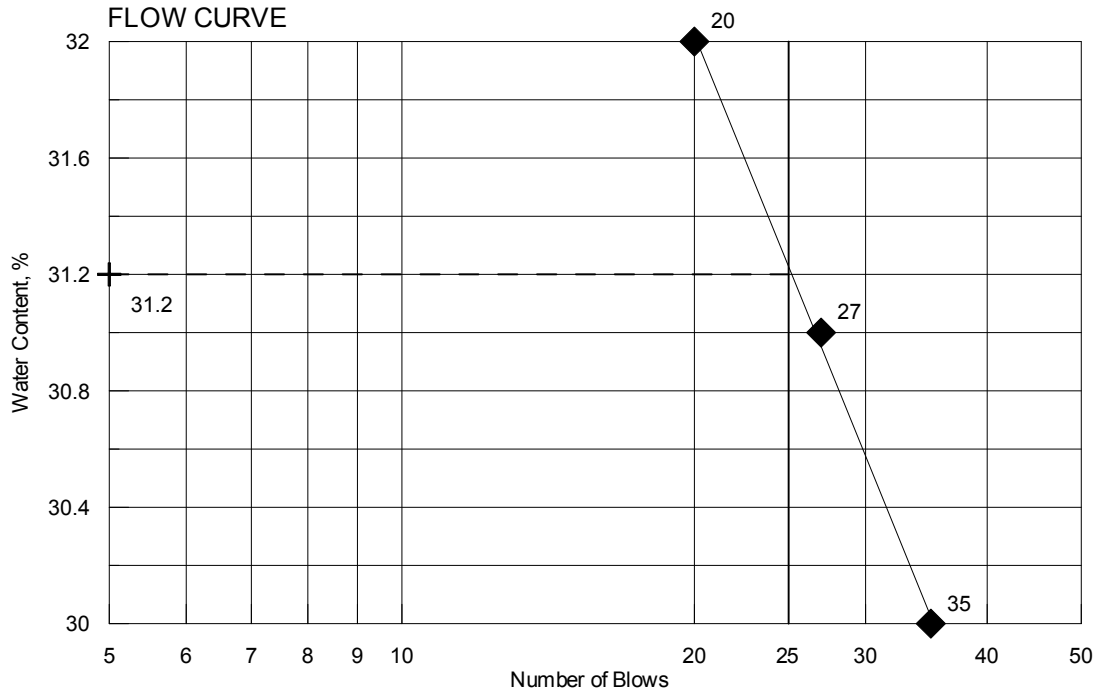
### AUTHORIZATION AND DISTRIBUTION

Reported by: **GREGORY LIDSTONE**

Date Reported: **4/27/2018**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Cherryfield	Reference No.	303150
WIN	022230.00	Water Content, %	35.5
Sampled	3/26/2018	Liquid Limit @ 25 blows (T 89), %	31
Boring No./Sample No.	BB-CSB-103/6D	Plastic Limit (T 90), %	20
Station	6+09.2	Plasticity Index (T 90), %	11
Depth	30.0-32.0	Tested By	BBURR





# GEOTECHNICAL TEST REPORT

## Central Laboratory

### SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
<b>337251</b>	<b>BB-CSB-201/1U</b>	<b>GEOTECHNICAL (UNDISTURBED)</b>	1/28/2019	2/22/2019
Sample Type: <b>GEOTECHNICAL</b> Location:		Station: <b>5+00.8</b>	Offset, ft: <b>34.6 RT Dbfg, ft: 15.0-17.0</b>	
WIN/Town <b>022230.00 - CHERRYFIELD</b>		Sampler: <b>BRUCE WILDER</b>		

### TEST RESULTS

#### Sieve Analysis (T 88)

##### Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	
No. 10 [2.00 mm]	<b>100.0</b>
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	<b>99.8</b>
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	<b>99.6</b>
[0.0226 mm]	<b>95.3</b>
[0.0145 mm]	<b>92.7</b>
[0.0085 mm]	<b>90.0</b>
[0.0063 mm]	<b>84.7</b>
[0.0047 mm]	<b>76.8</b>
[0.0025 mm]	<b>66.2</b>
[0.0011 mm]	<b>47.7</b>

#### Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %	<b>35</b>
Plastic Limit (T 90), %	<b>24</b>
Plasticity Index (T 90), %	<b>11</b>
Specific Gravity, Corrected to 20°C (T 100)	<b>2.74</b>
Loss on Ignition, % (T 267)	
Water Content (T 265), %	<b>38.3</b>

#### Consolidation (T 216)

Trimmings, Water Content, %	<b>39.7</b>
-----------------------------	-------------

	Initial	Final		Void Ratio	% Strain
Water Content, %	<b>41.09</b>	<b>29.79</b>	Pmin		
Dry Density, lbs/ft³	<b>80.101</b>	<b>94.184</b>	Pp		
Void Ratio	<b>1.14</b>	<b>0.816</b>	Pmax		
Saturation, %	<b>99.16</b>	<b>100</b>	Cc/C'c		

#### Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear	Remold	U. Shear	Remold		
	tons/ft²	tons/ft²	tons/ft²	tons/ft²		
0.0-0.5	0.16	0.01	0.19	0.02	40.3	Alternating layers of light to dark grey clay.
0.63-1.0	0.21	0.02	0.19	0.02	39.7	Alternating layers of light to dark grey clay.

#### Comments:

**End of Primary. From the same tube as 337252.**

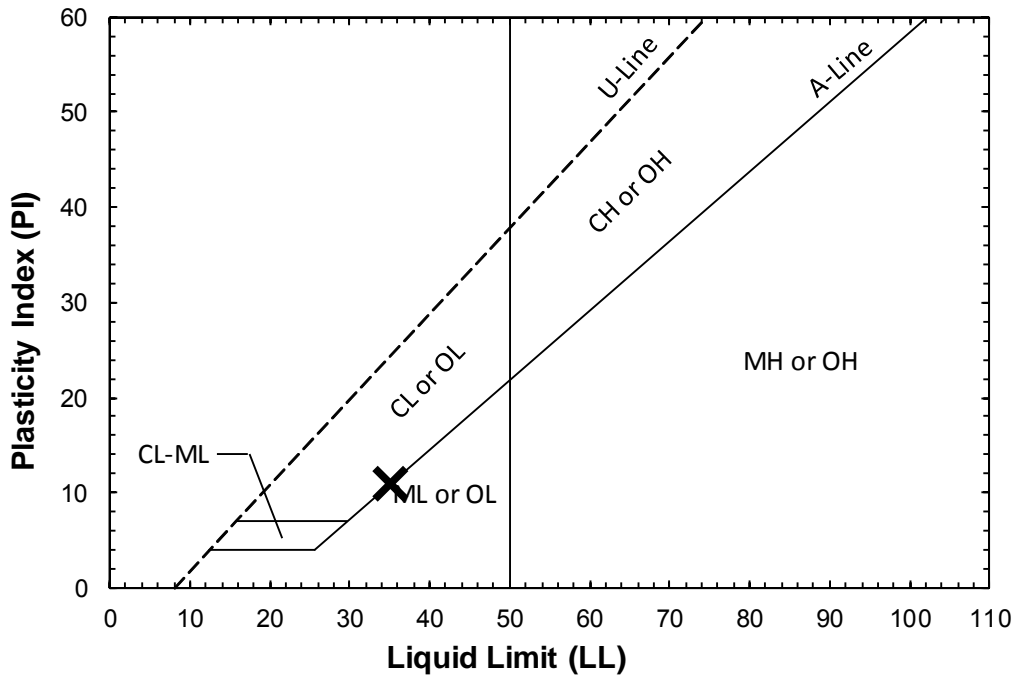
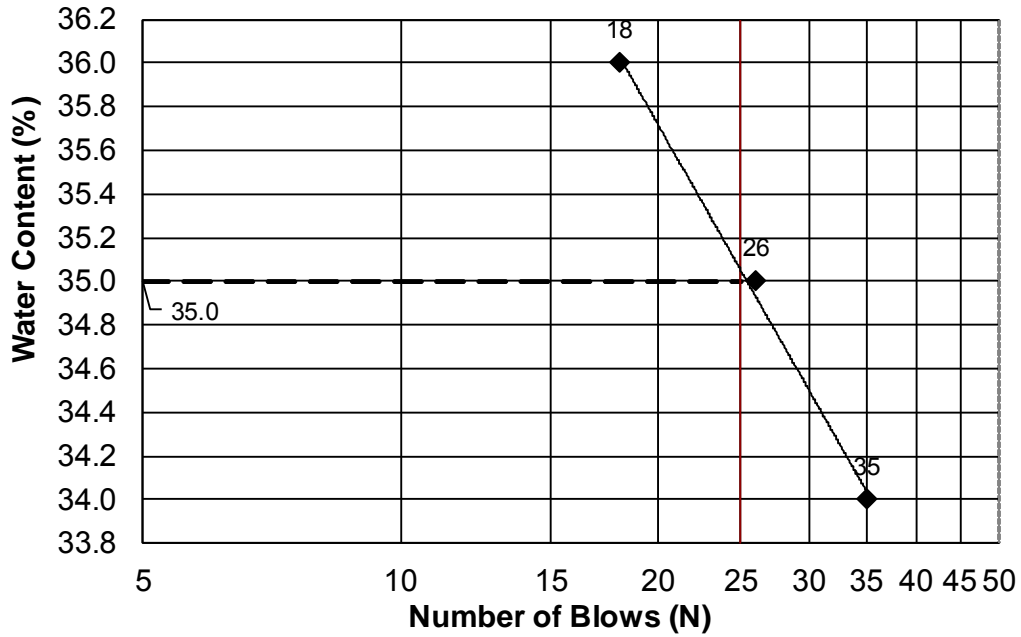
### AUTHORIZATION AND DISTRIBUTION

Reported by: **GREGORY LIDSTONE**

Date Reported: **3/27/2019**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Cherryfield	Reference No.	337251
WIN	022230.00	Water Content, %	38.3
Sampled	1/28/2019	Liquid Limit @ 25 blows (T 89), %	35
Boring No./Sample No.	BB-CSB-201/1U	Plastic Limit (T 90), %	24
Station	5+00.8	Plasticity Index (T 90), %	11
Depth	15.0-17.0	Tested By	BBURR





# GEOTECHNICAL TEST REPORT

## Central Laboratory

### SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
<b>337252</b>	<b>BB-CSB-201/1U</b>	<b>GEOTECHNICAL (UNDISTURBED)</b>	<b>1/28/2019</b>	<b>2/22/2019</b>
Sample Type: <b>GEOTECHNICAL</b> Location:		Station: <b>5+00.8</b> Offset, ft: <b>34.6</b> RT Dbfg, ft: <b>15.0-17.0</b>	Sampler: <b>BRUCE WILDER</b>	
WIN/Town <b>022230.00 - CHERRYFIELD</b>				

### TEST RESULTS

Sieve Analysis (T 88)	
Wash Method	
SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	
No. 10 [2.00 mm]	<b>100.0</b>
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	<b>99.7</b>
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	<b>99.4</b>
[0.0226 mm]	<b>90.0</b>
[0.0145 mm]	<b>87.5</b>
[0.0085 mm]	<b>85.0</b>
[0.0062 mm]	<b>82.5</b>
[0.0045 mm]	<b>71.8</b>
[0.0024 mm]	<b>65.0</b>
[0.0011 mm]	<b>47.5</b>
[ mm]	

Miscellaneous Tests	
Liquid Limit @ 25 blows (T 89), %	<b>40</b>
Plastic Limit (T 90), %	<b>24</b>
Plasticity Index (T 90), %	<b>16</b>
Specific Gravity, Corrected to 20°C (T 100)	<b>2.76</b>
Loss on Ignition, % (T 267)	
Water Content (T 265), %	<b>39.2</b>

Consolidation (T 216)					
Trimmings, Water Content, %					<b>39.7</b>
	Initial	Final		Void Ratio	% Strain
Water Content, %	<b>40.45</b>	<b>29.14</b>	Pmin		
Dry Density, lbs/ft³	<b>81.161</b>	<b>95.499</b>	Pp		
Void Ratio	<b>1.12</b>	<b>0.804</b>	Pmax		
Saturation, %	<b>99.41</b>	<b>100</b>	Cc/C'c		

Vane Shear Test on Shelby Tubes (Maine DOT)						
Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear	Remold	U. Shear	Remold		
	tons/ft²	tons/ft²	tons/ft²	tons/ft²		
1.125-1.5	0.1	0	0.09	0.01	39.8	Alternating layers of light to dark grey clay, silt line at 15.5", black line at 16".
1.5-2.0	0.11	0	0.1	0	38.0	Alternating layers of light to dark grey clay, silt line at 18.5", black line at 19".

Comments:

**End of Increment. From the same tube as 337251.**

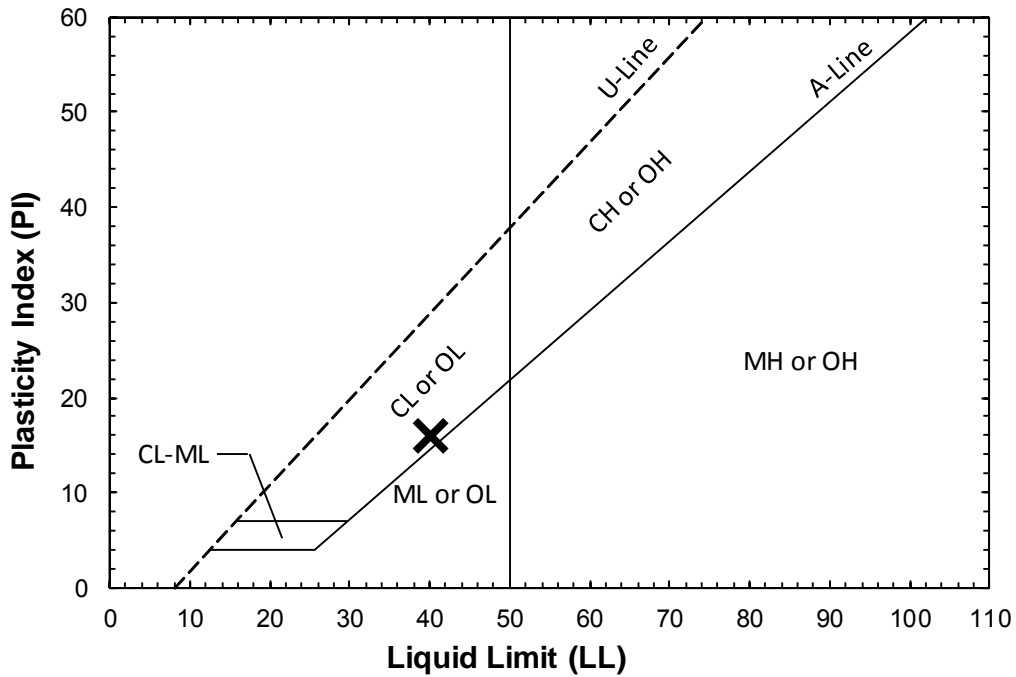
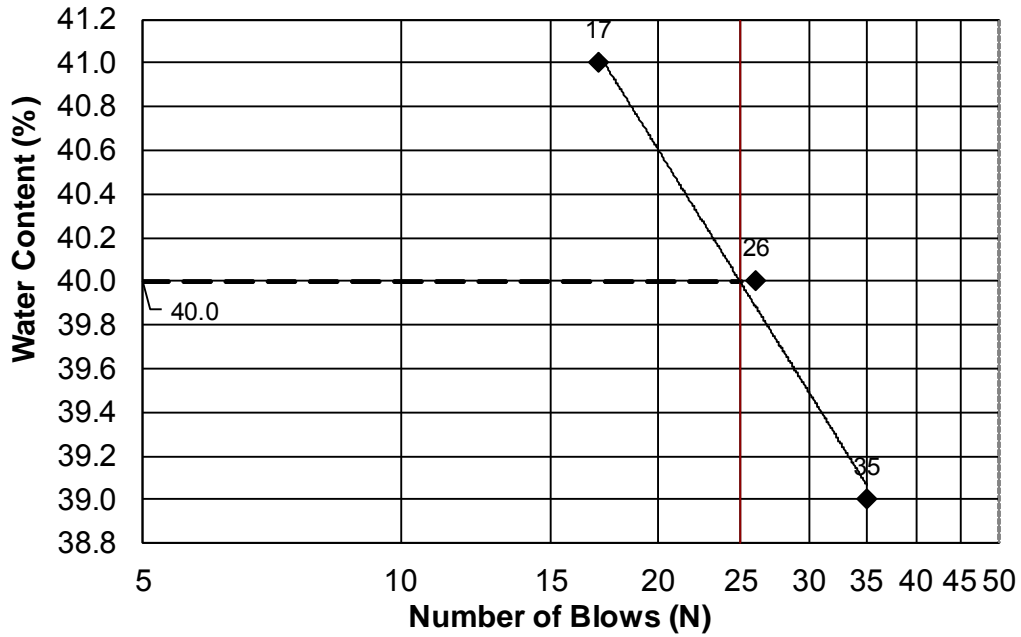
### AUTHORIZATION AND DISTRIBUTION

Reported by: **GREGORY LIDSTONE**

Date Reported: **4/25/2019**

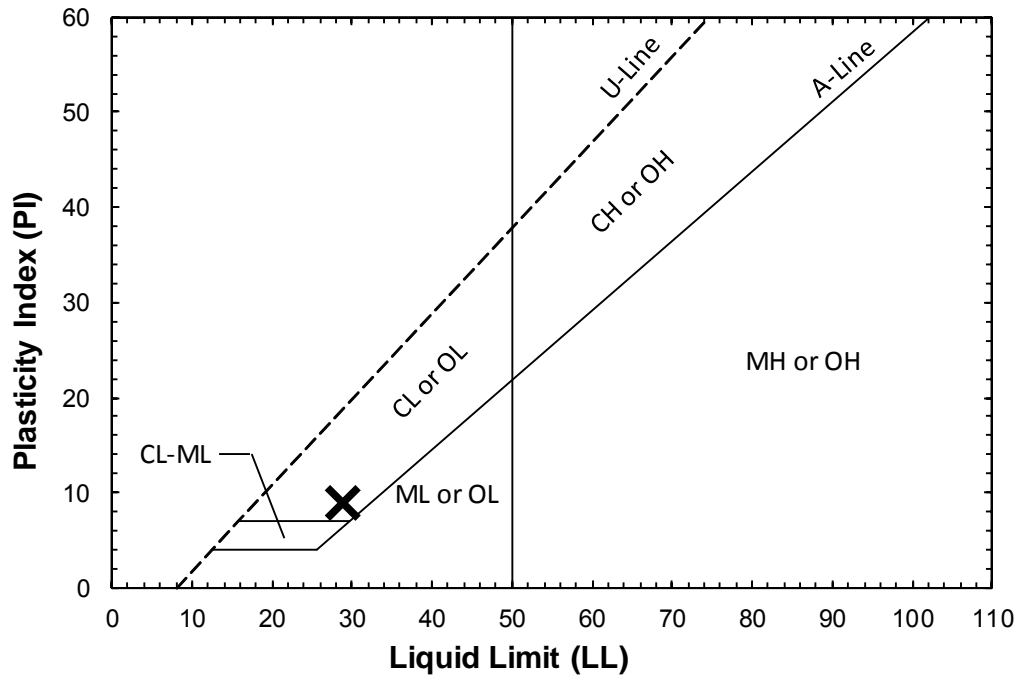
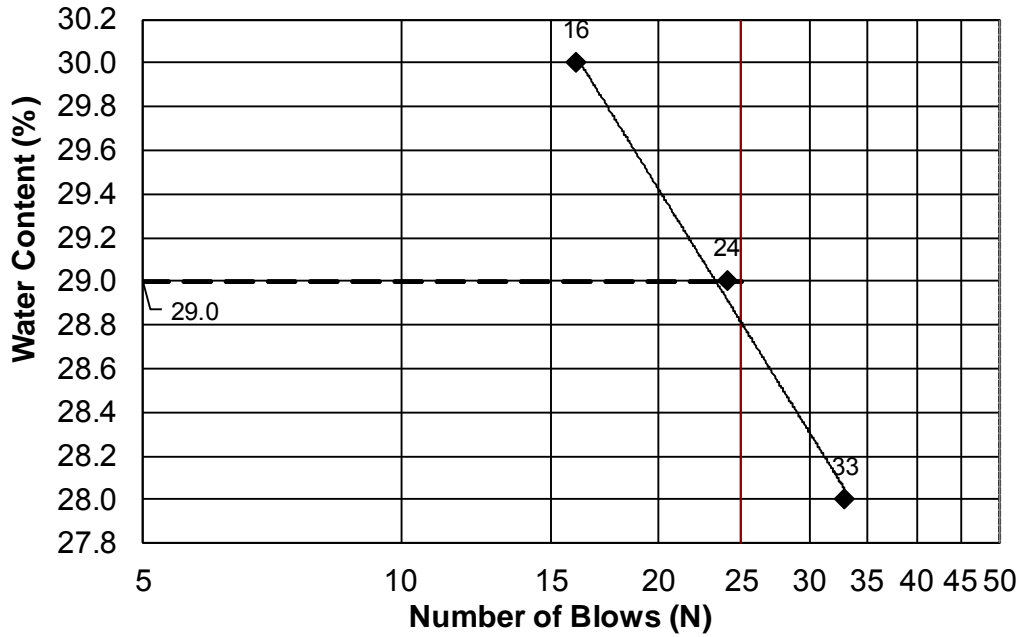
Paper Copy: Lab File; Project File; Geotech File

TOWN	Cherryfield	Reference No.	337252
WIN	022230.00	Water Content, %	39.2
Sampled	1/28/2019	Liquid Limit @ 25 blows (T 89), %	40
Boring No./Sample No.	BB-CSB-201/1U	Plastic Limit (T 90), %	24
Station	5+00.8	Plasticity Index (T 90), %	16
Depth	15.0-17.0	Tested By	BBURR



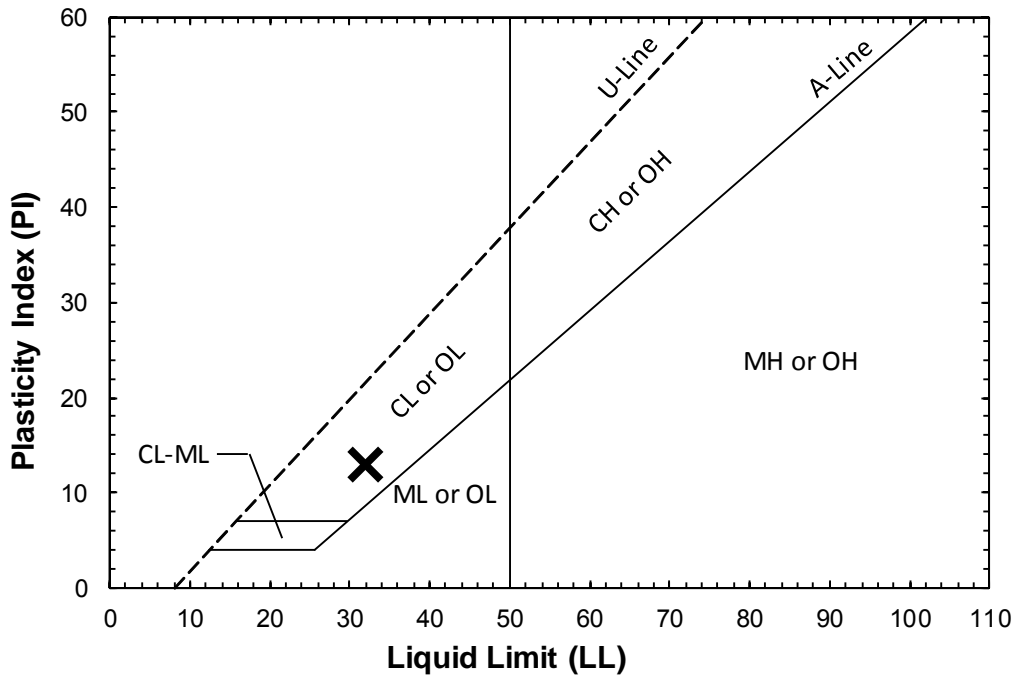
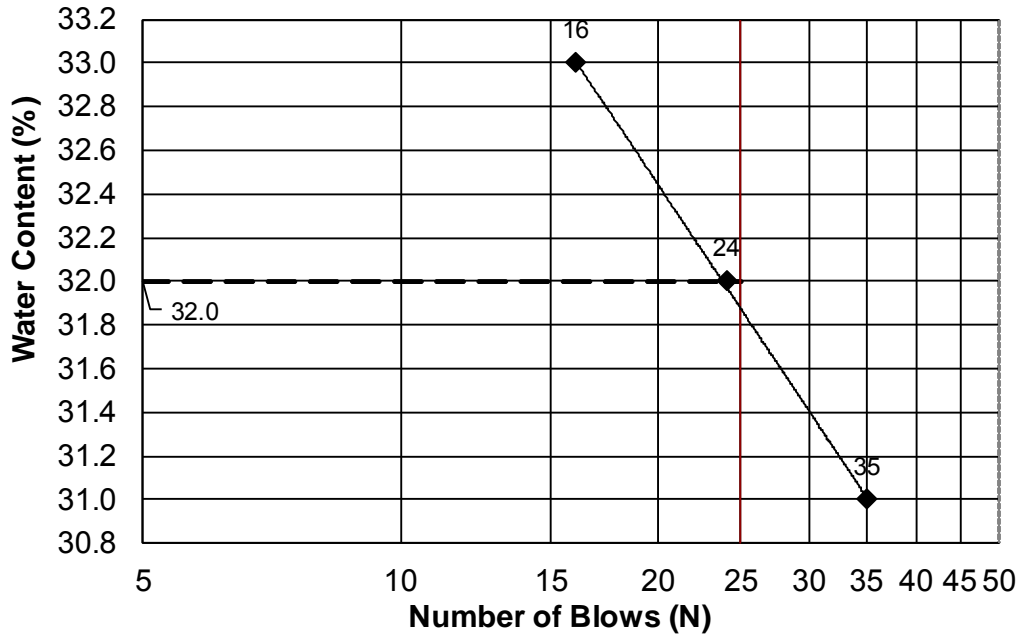


TOWN	Cherryfield	Reference No.	337233
WIN	022230.00	Water Content, %	32.7
Sampled	1/28/2019	Liquid Limit @ 25 blows (T 89), %	29
Boring No./Sample No.	BB-CSB-201/4D	Plastic Limit (T 90), %	20
Station	5+00.8	Plasticity Index (T 90), %	9
Depth	25.0-27.0	Tested By	BBURR





TOWN	Cherryfield	Reference No.	337234
WIN	022230.00	Water Content, %	34.5
Sampled	1/28/2019	Liquid Limit @ 25 blows (T 89), %	32
Boring No./Sample No.	BB-CSB-202/4D	Plastic Limit (T 90), %	19
Station	5+24.5	Plasticity Index (T 90), %	13
Depth	25.0-27.0	Tested By	BBURR





# GEOTECHNICAL TEST REPORT

## Central Laboratory

### SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
<b>337235</b>	<b>BB-CSB-202/6D</b>	<b>GEOTECHNICAL (DISTURBED)</b>	1/28/2019	3/1/2019
Sample Type: <b>GEOTECHNICAL</b> Location:		Station: <b>5+24.5</b> Offset, ft: <b>46.2</b> RT Dbfg, ft: <b>35.0-37.0</b>	Sampler: <b>BRUCE WILDER</b>	
WIN/Town <b>022230.00 - CHERRYFIELD</b>				

### TEST RESULTS

#### Sieve Analysis (T 88)

##### Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	<b>100.0</b>
⅜ in. [9.5 mm]	<b>99.8</b>
¼ in. [6.3 mm]	<b>99.7</b>
No. 4 [4.75 mm]	<b>99.6</b>
No. 10 [2.00 mm]	<b>99.6</b>
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	<b>99.4</b>
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	<b>99.1</b>
[0.0239 mm]	<b>84.3</b>
[0.0157 mm]	<b>79.2</b>
[0.0094 mm]	<b>74.0</b>
[0.0069 mm]	<b>68.9</b>
[0.0050 mm]	<b>66.3</b>
[0.0026 mm]	<b>56.2</b>
[0.0012 mm]	<b>40.8</b>

#### Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %	<b>30</b>
Plastic Limit (T 90), %	<b>20</b>
Plasticity Index (T 90), %	<b>10</b>
Specific Gravity, Corrected to 20°C (T 100)	<b>2.73</b>
Loss on Ignition, % (T 267)	
Water Content (T 265), %	<b>34.4</b>

#### Consolidation (T 216)

Trimming, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

#### Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

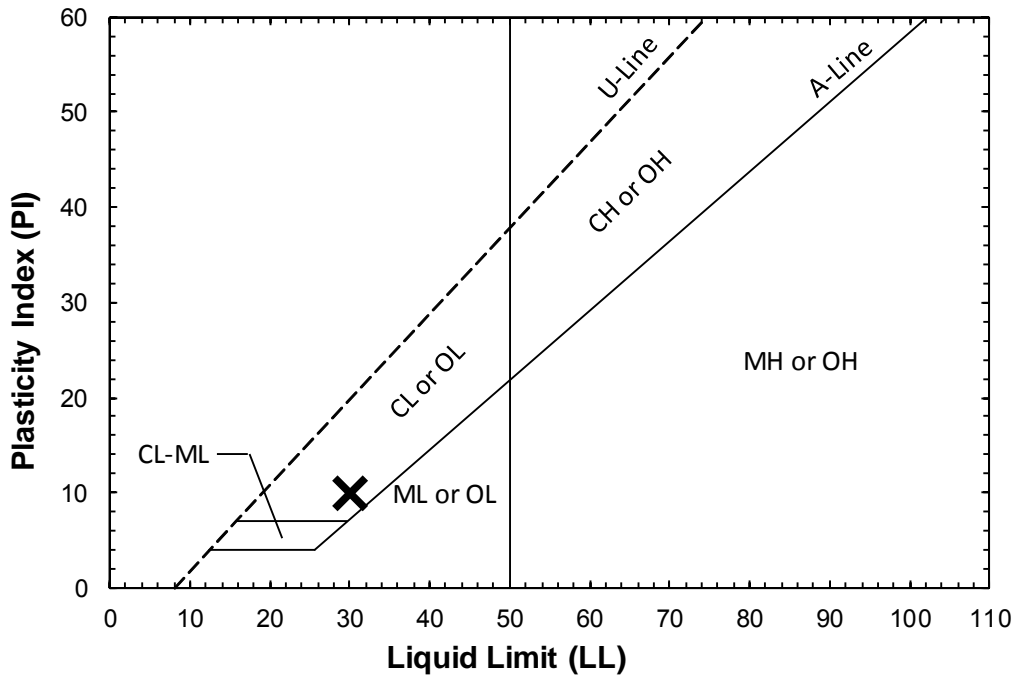
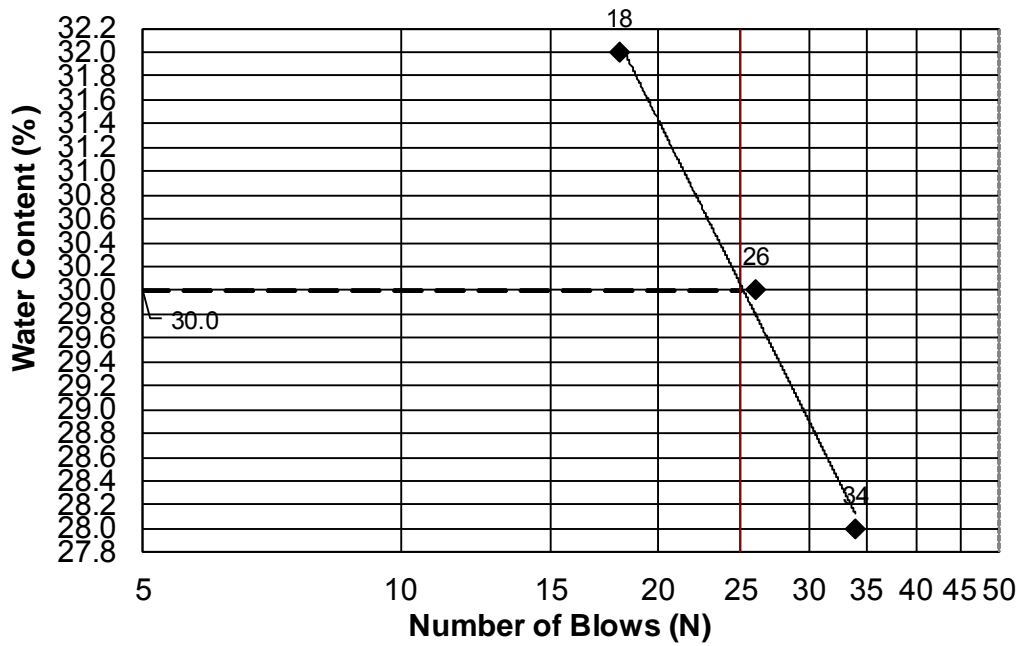
### AUTHORIZATION AND DISTRIBUTION

Reported by: **GREGORY LIDSTONE**

Date Reported: **3/26/2019**

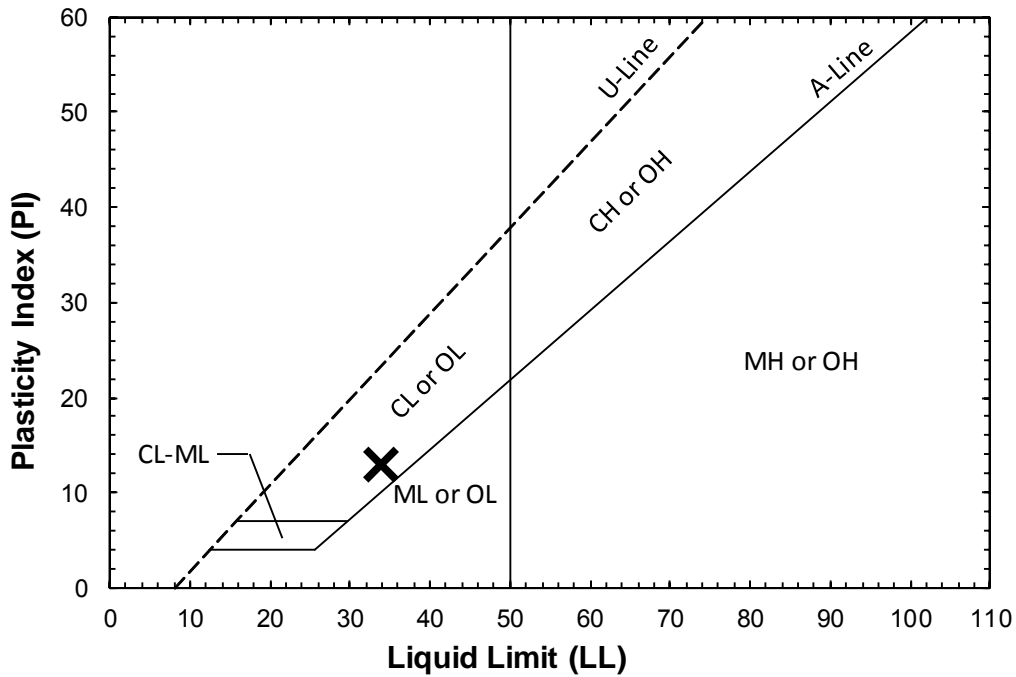
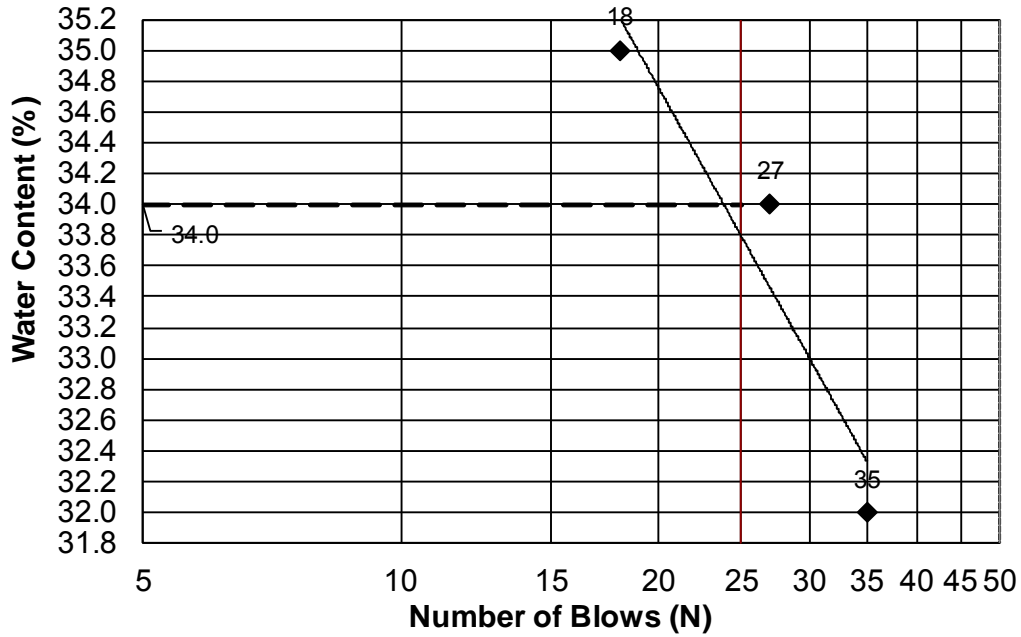
Paper Copy: Lab File; Project File; Geotech File

TOWN	Cherryfield	Reference No.	337235
WIN	022230.00	Water Content, %	34.4
Sampled	1/28/2019	Liquid Limit @ 25 blows (T 89), %	30
Boring No./Sample No.	BB-CSB-202/6D	Plastic Limit (T 90), %	20
Station	5+24.5	Plasticity Index (T 90), %	10
Depth	35.0-37.0	Tested By	BBURR



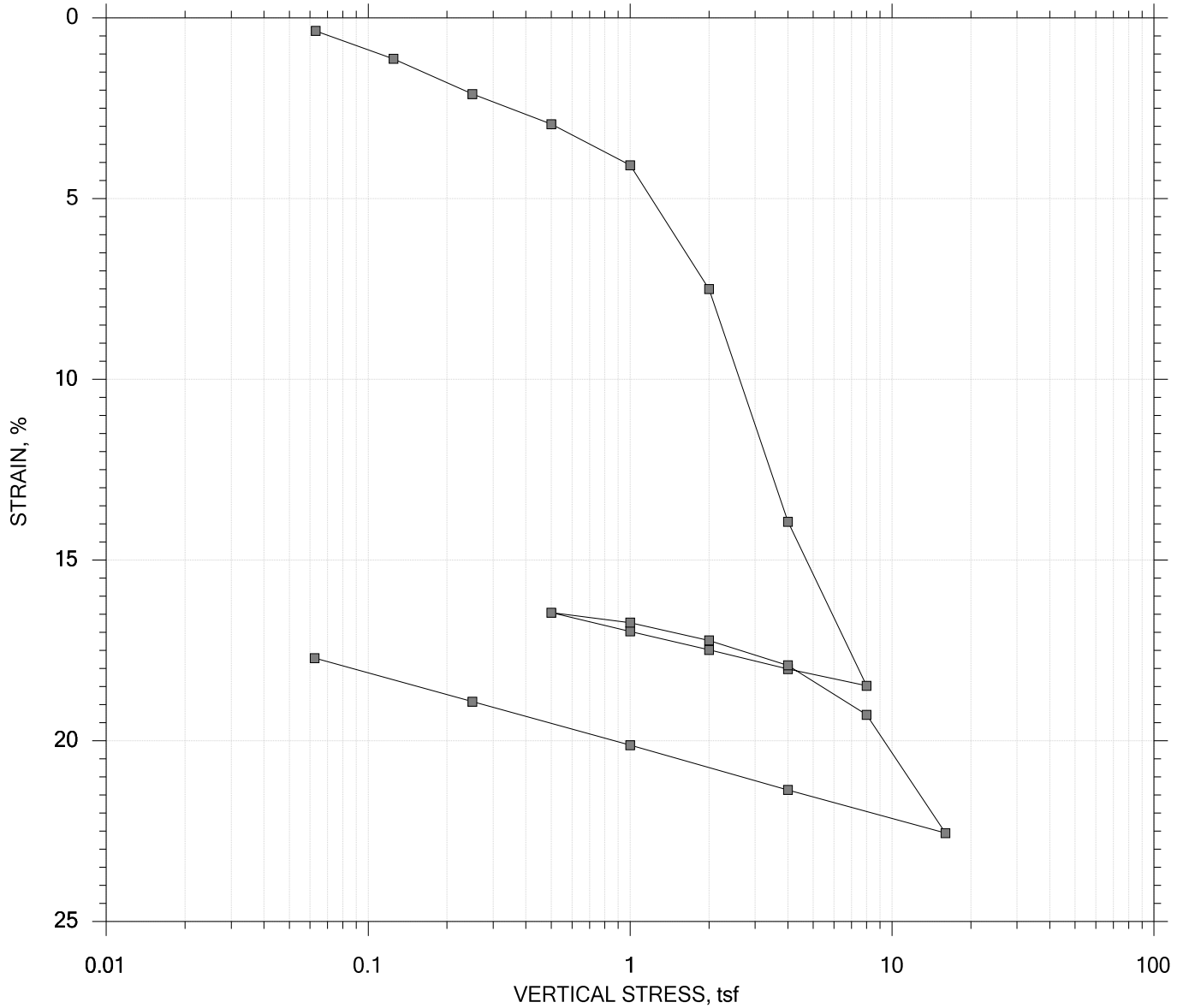


TOWN	Cherryfield	Reference No.	337238
WIN	022230.00	Water Content, %	27.4
Sampled	1/23/2019	Liquid Limit @ 25 blows (T 89), %	34
Boring No./Sample No.	BB-CSB-203/1DA	Plastic Limit (T 90), %	21
Station	6+43	Plasticity Index (T 90), %	13
Depth	5.0-7.0	Tested By	BBURR



# One-Dimensional Consolidation by ASTM D2435 - Method B

## SUMMARY REPORT

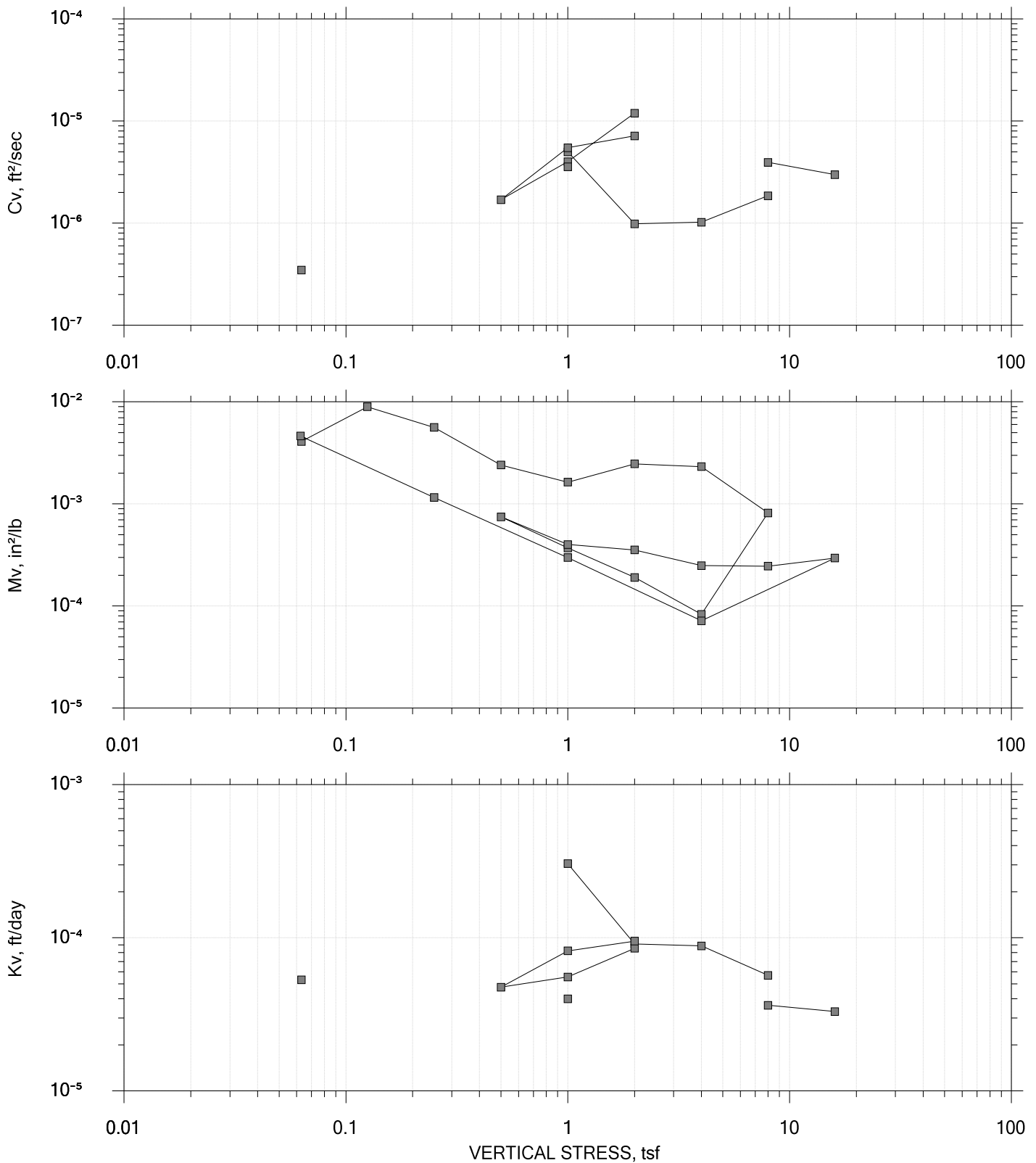


				Before Test	After Test
Current Vertical Effective Stress: ---		Water Content, %		34.56	23.25
Preconsolidation Stress: ---		Dry Unit Weight, pcf		87.564	104.25
Compression Ratio: ---		Saturation, %		99.69	100.00
Diameter: 2.495 in	Height: 1.006 in	Void Ratio		0.95	0.63
LL: 38	PL: 23	PI: 15	GS: 2.73		

Project: CHERRYFIELD		Location: --		Project No.: 22230.00	
Boring No.: BB-CSB-101		Tested By: GSL		Checked By: --	
Sample No.: 1U		Test Date: 4/25/18		Test No.: 303141	
Depth: 20.0-22.0		Sample Type: INTACT		Elevation: --	
Description: Gray very soft clay					
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test					
Displacement at End of Increment					

# One-Dimensional Consolidation by ASTM D2435 - Method B

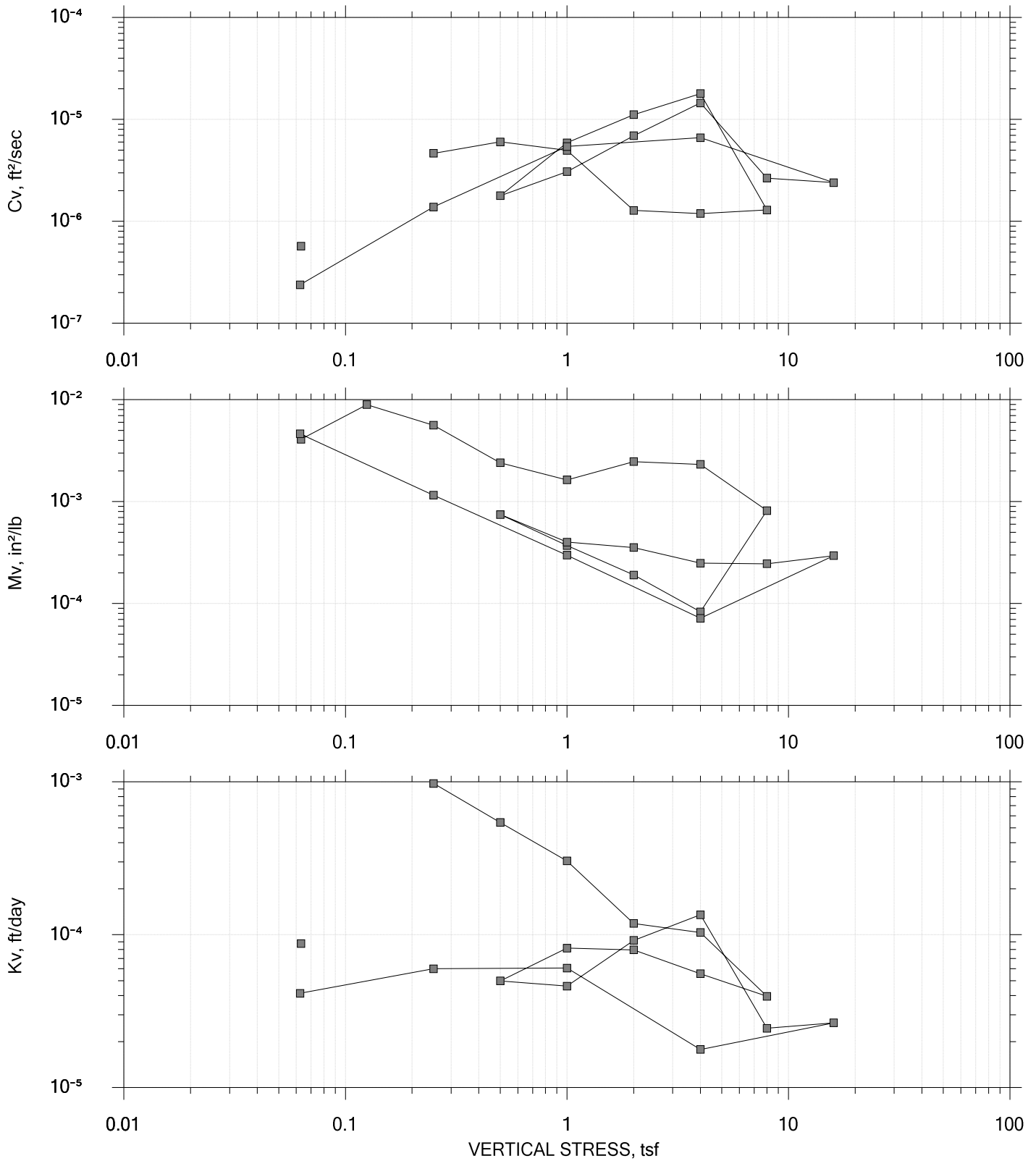
LOG of TIME COEFFICIENTS



Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		
Displacement at End of Increment		

# One-Dimensional Consolidation by ASTM D2435 - Method B

SQUARE ROOT of TIME COEFFICIENTS



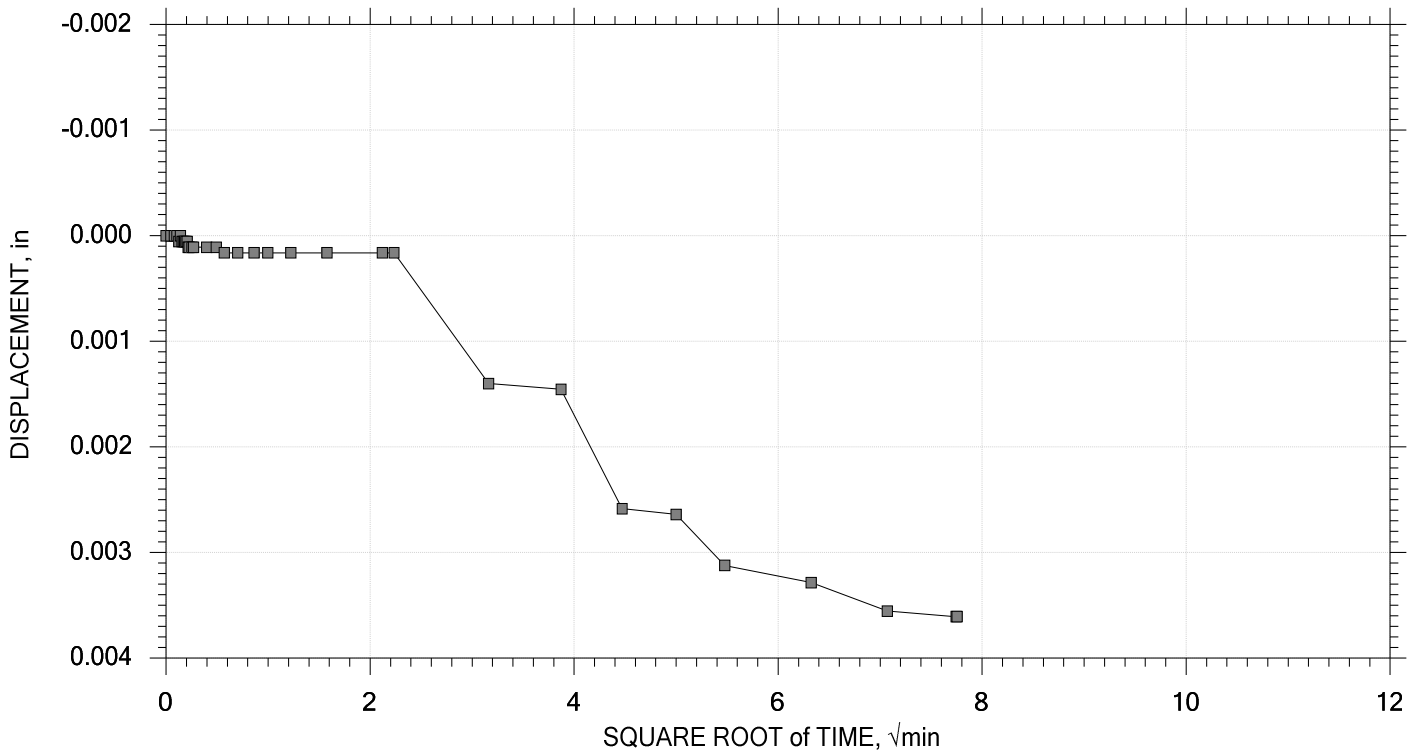
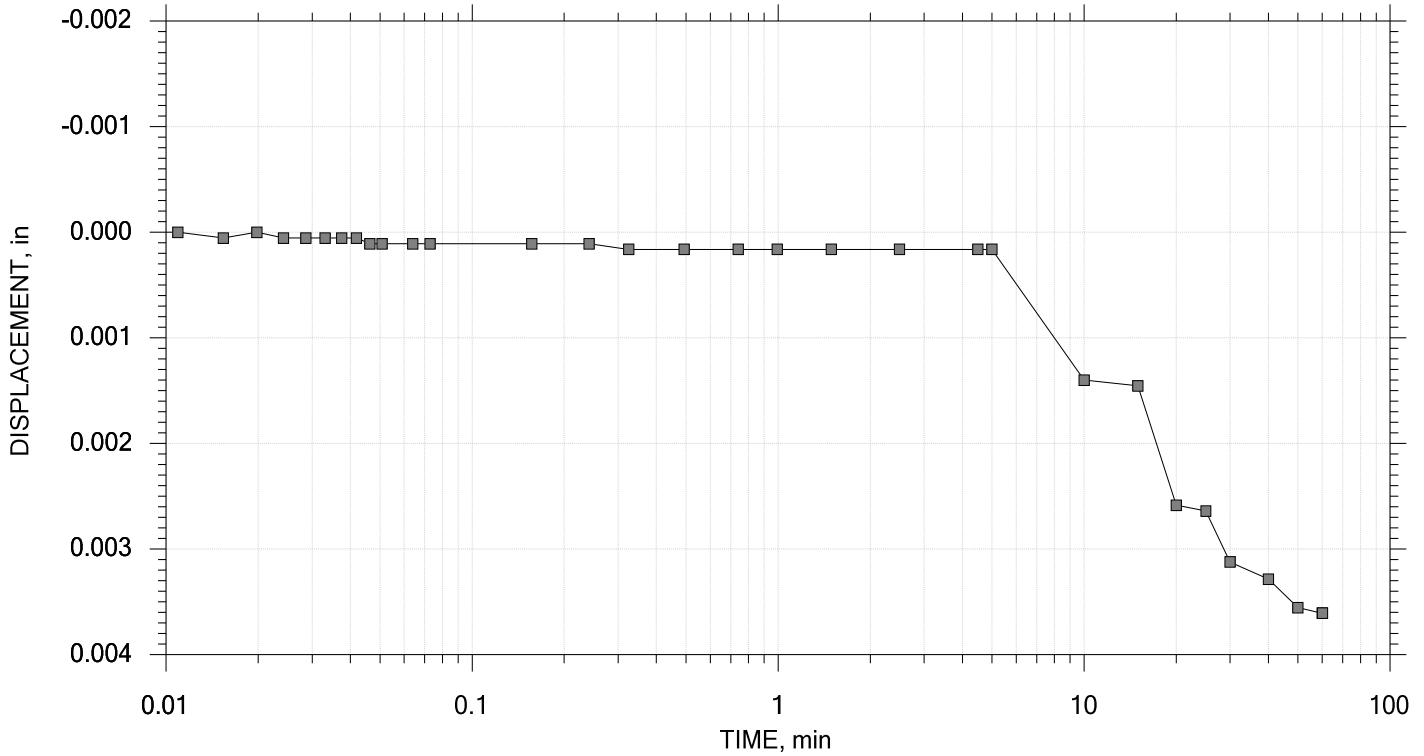
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		
Displacement at End of Increment		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Volume Step 1 of 21

Stress: 0.063044 tsf



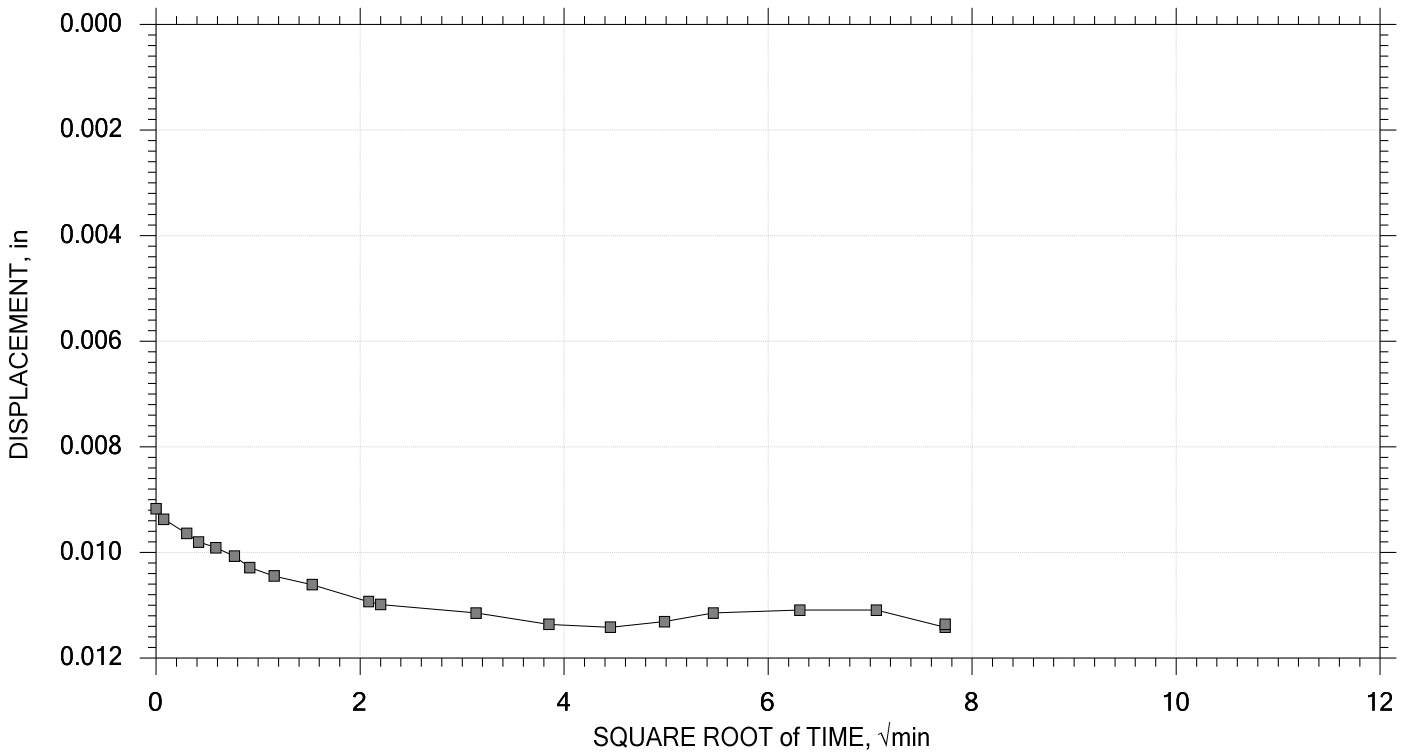
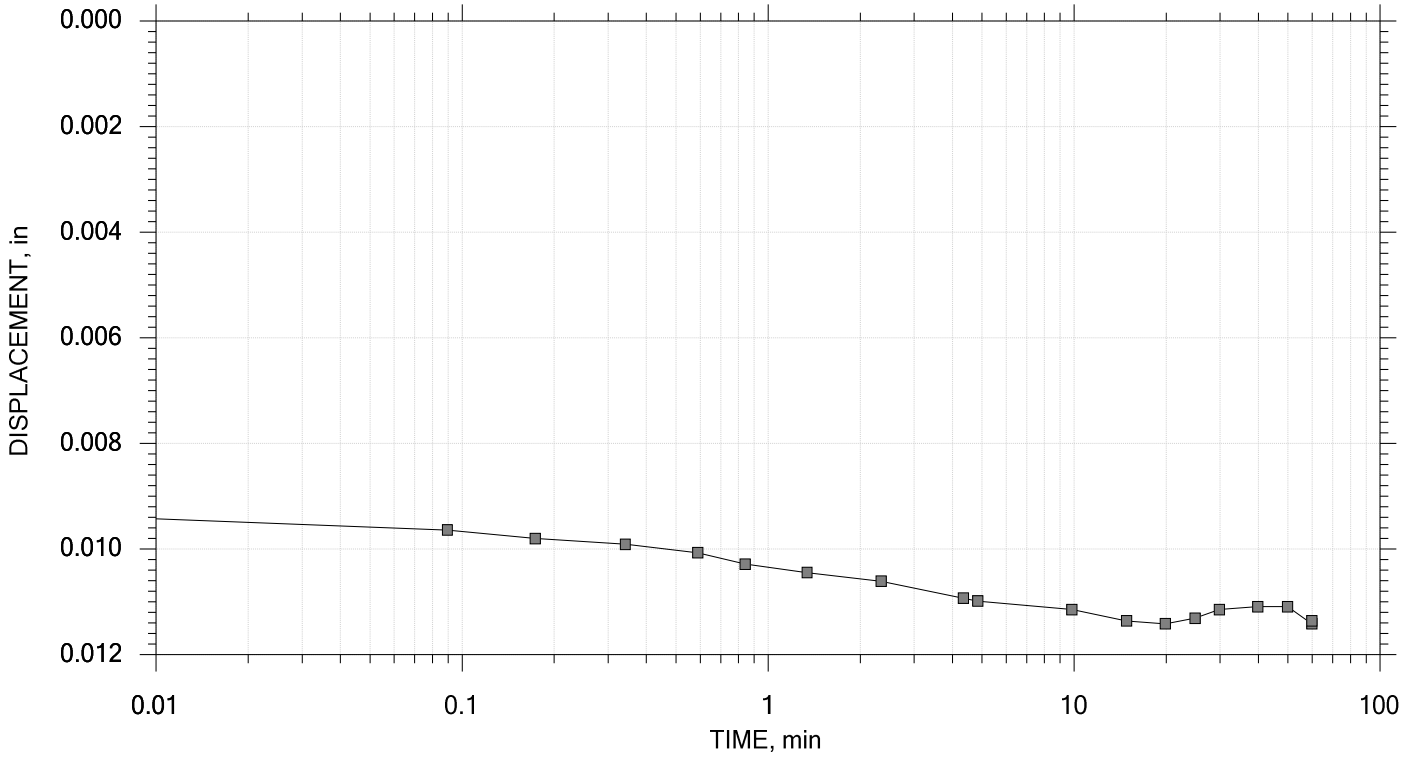
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 2 of 21

Stress: 0.125 tsf



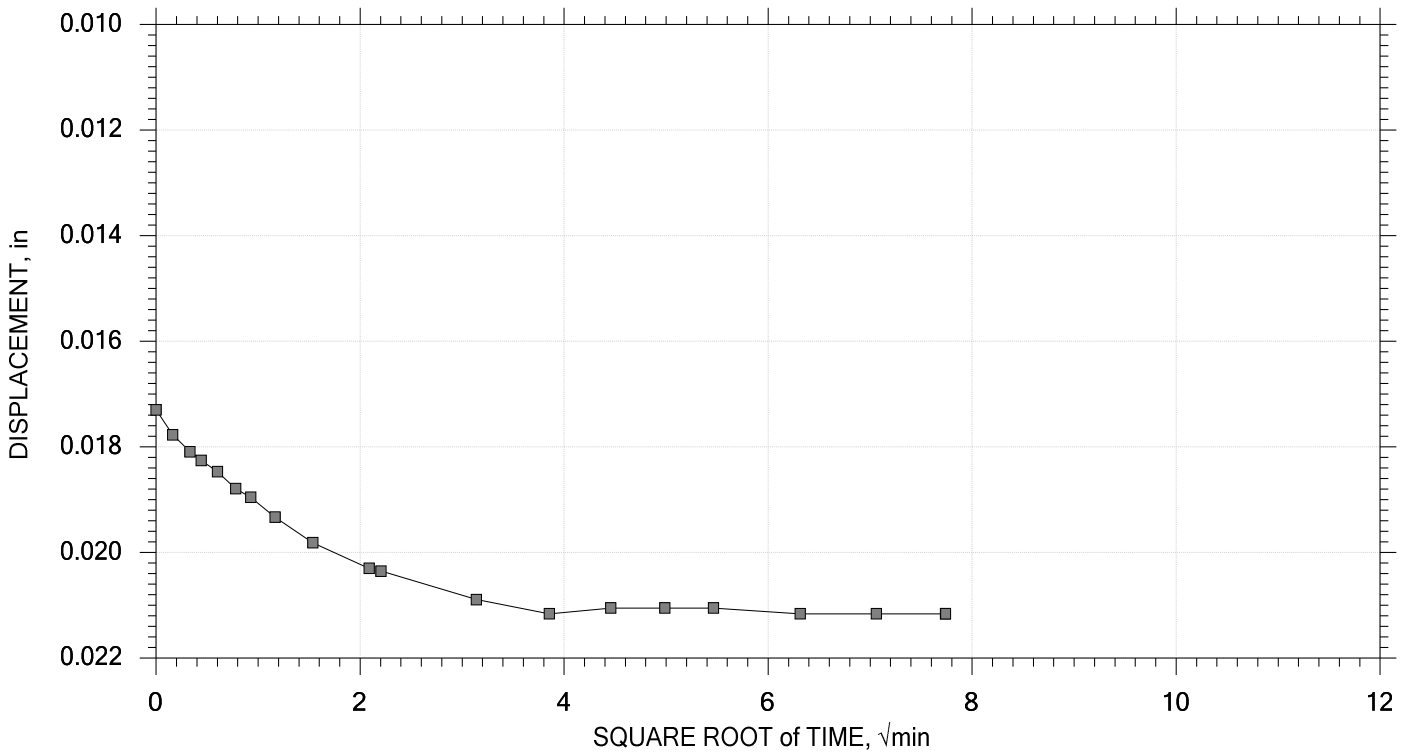
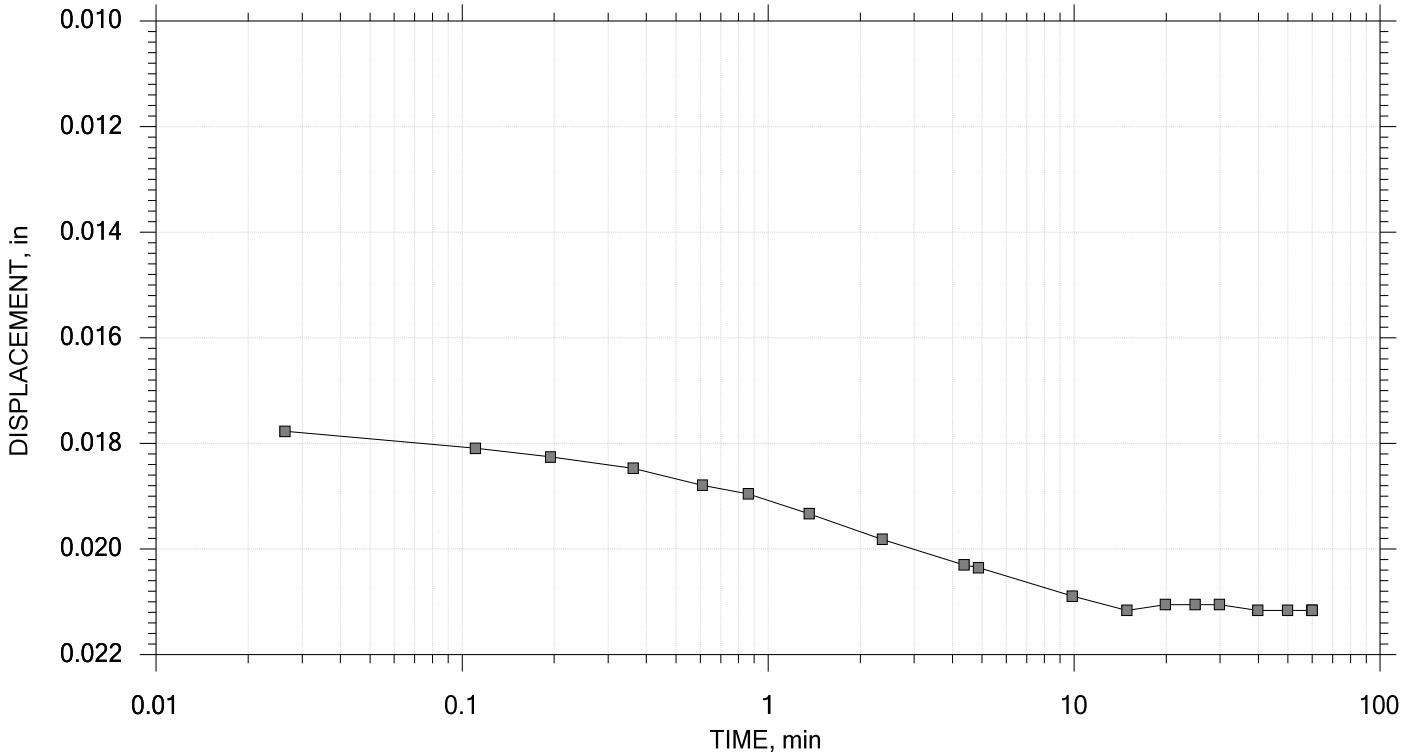
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 3 of 21

Stress: 0.25 tsf



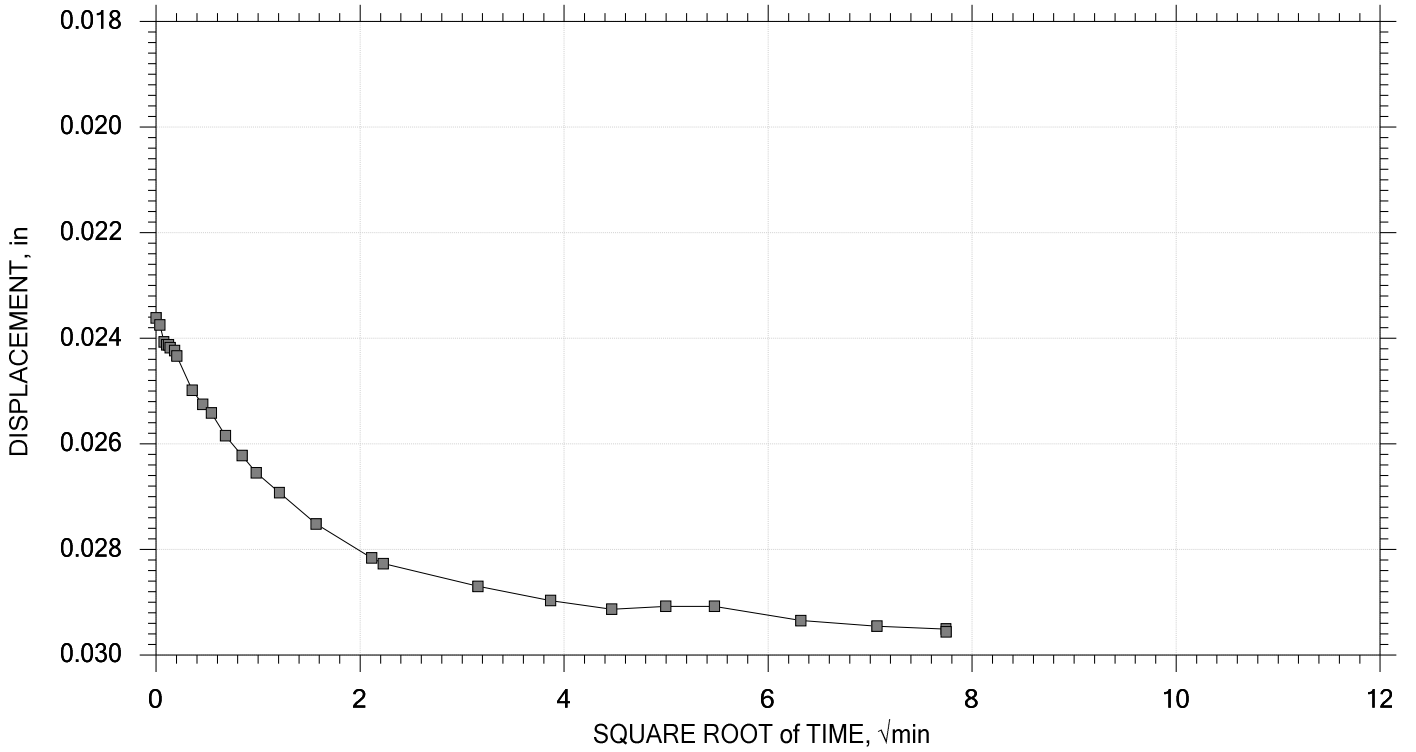
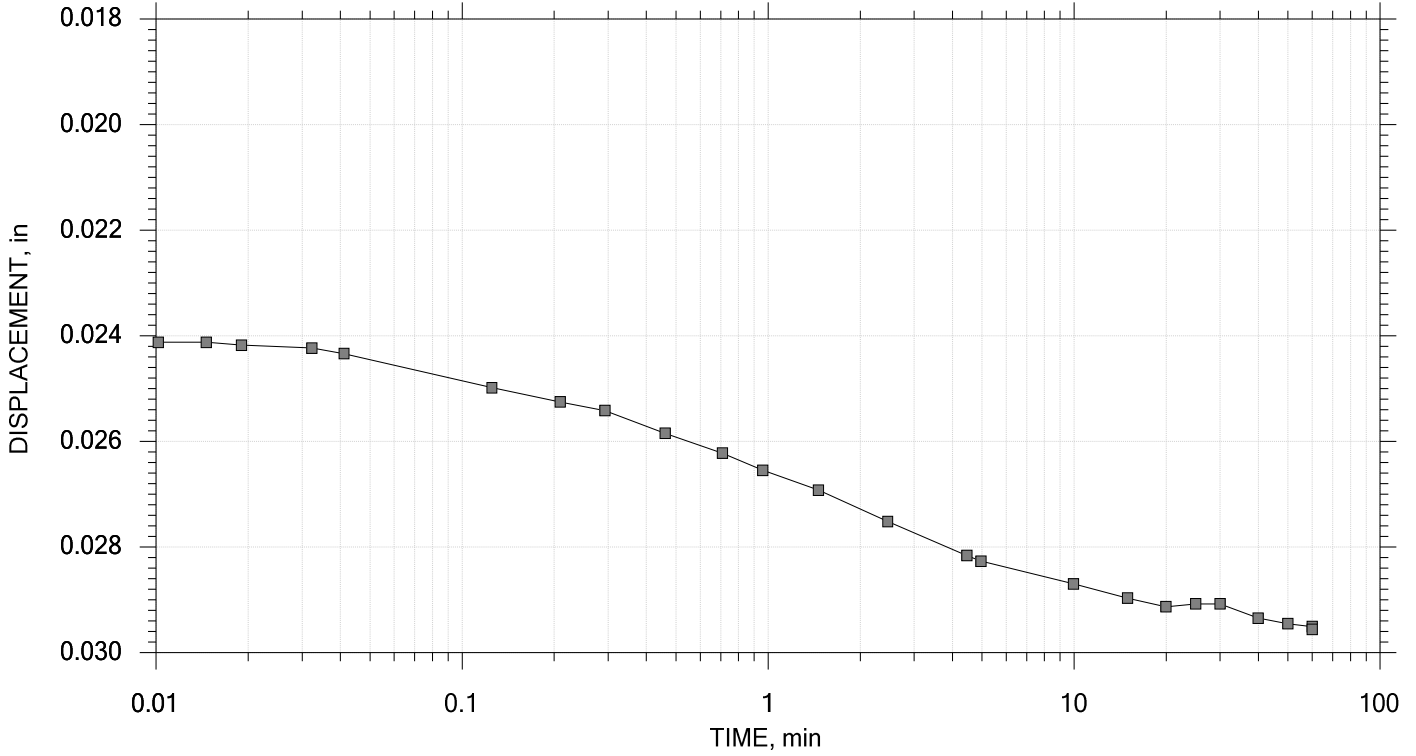
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 4 of 21

Stress: 0.5 tsf



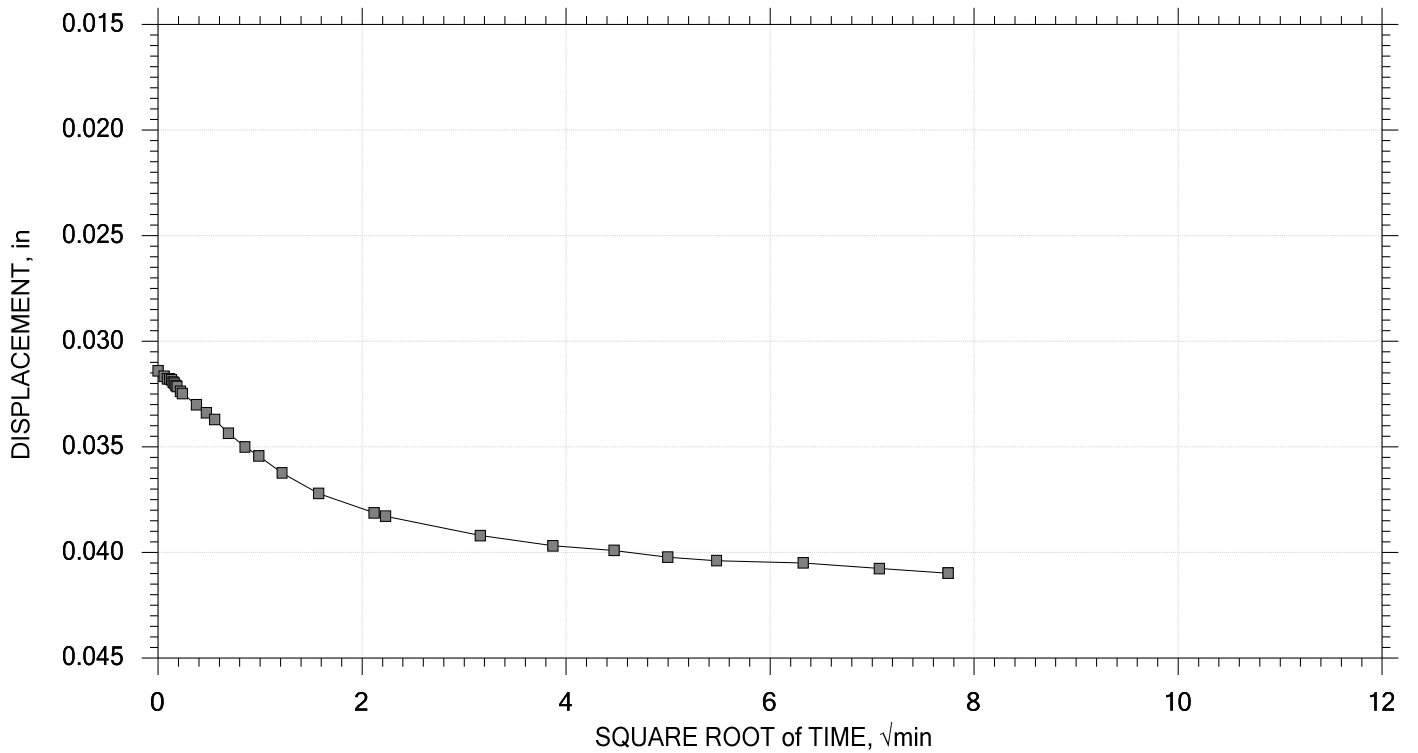
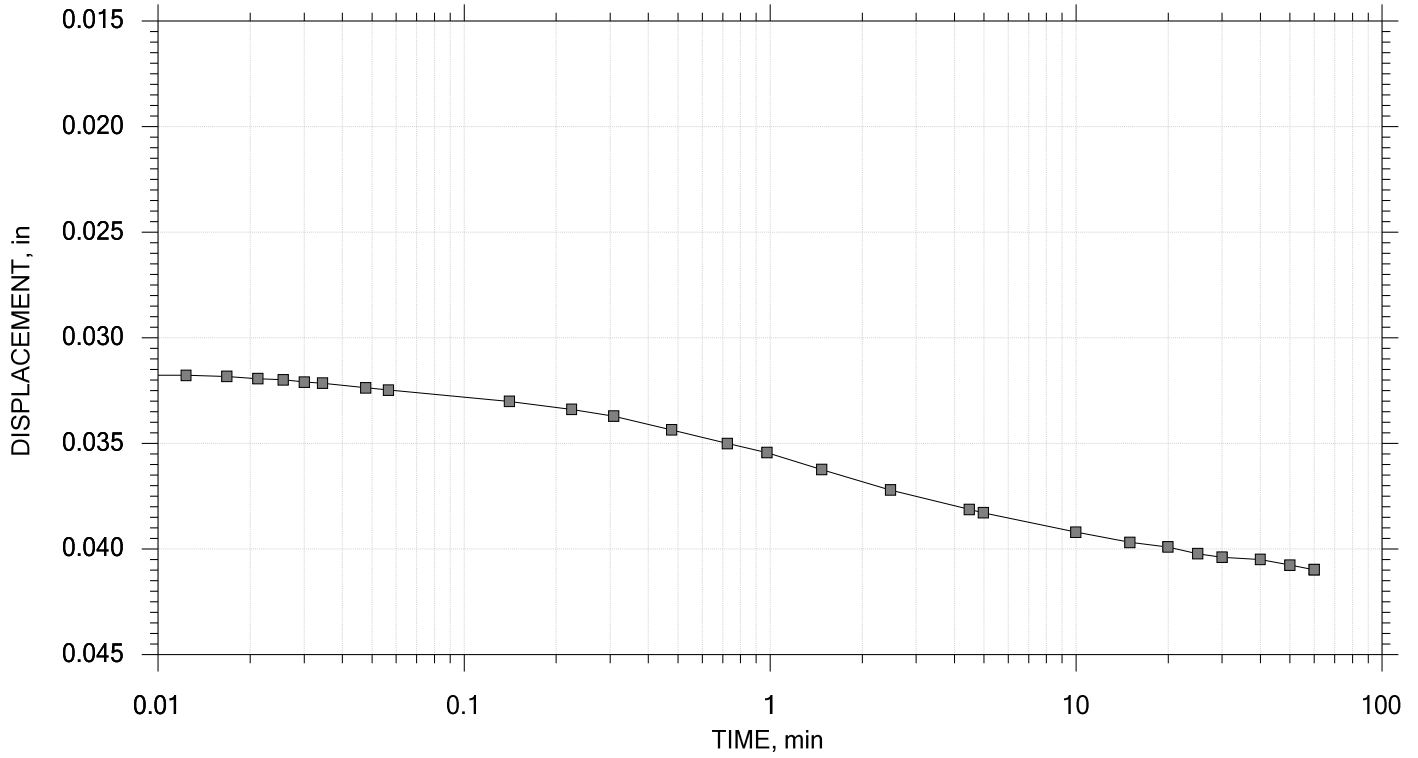
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 5 of 21

Stress: 1 tsf



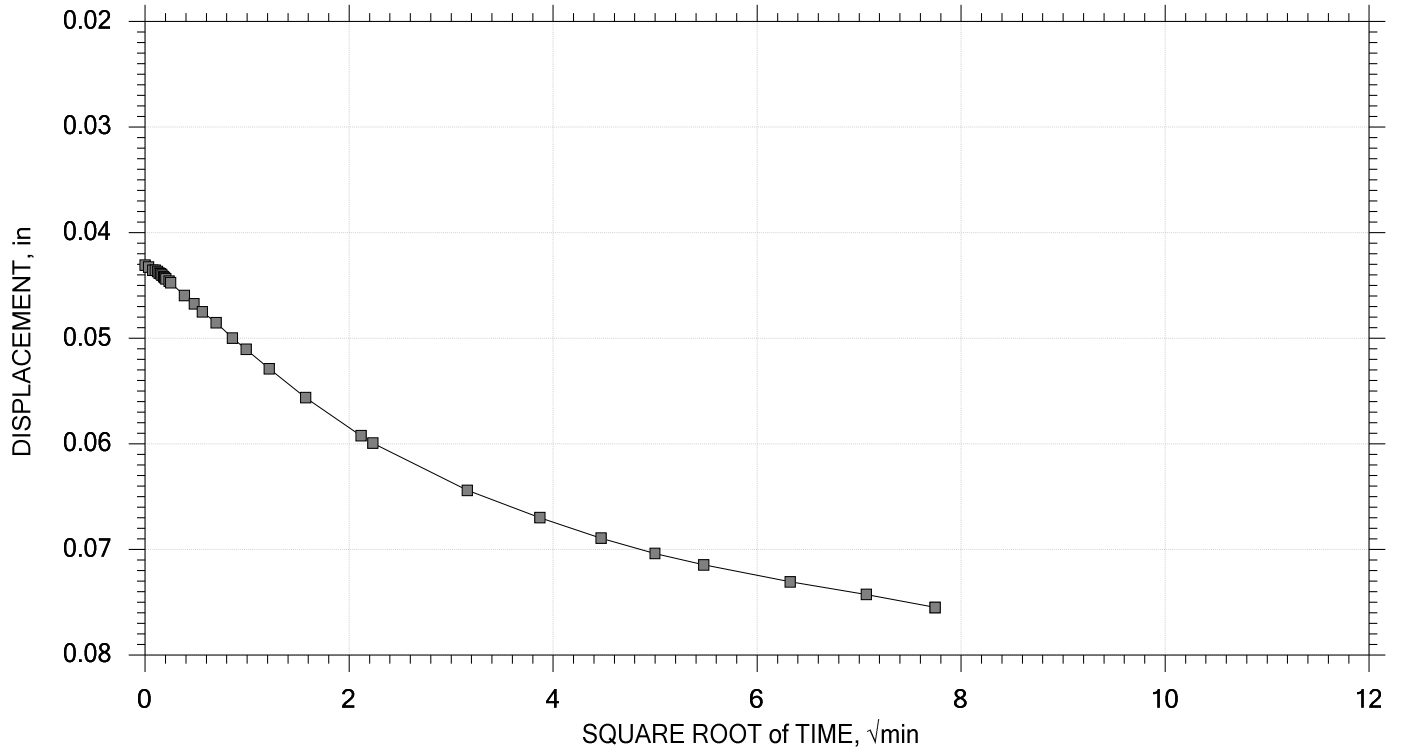
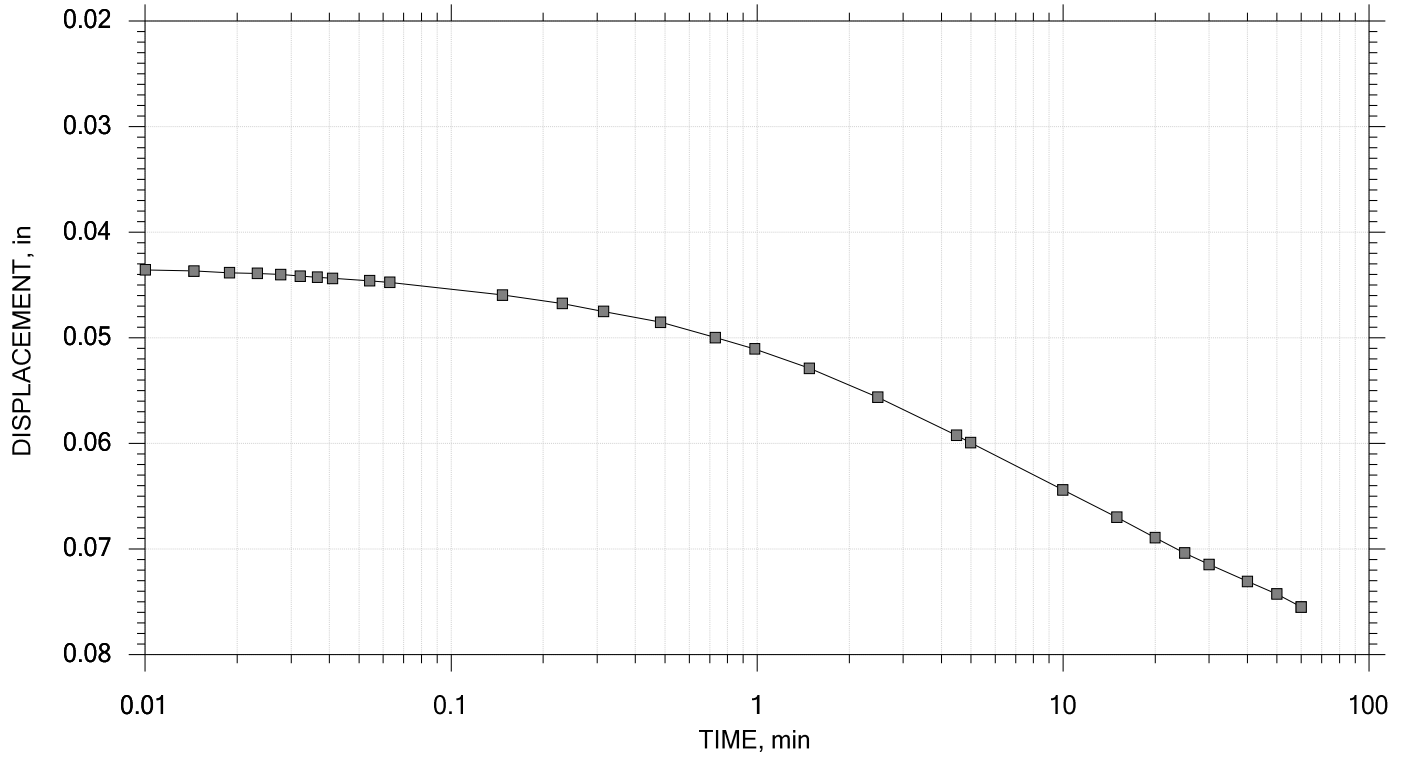
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 6 of 21

Stress: 2 tsf



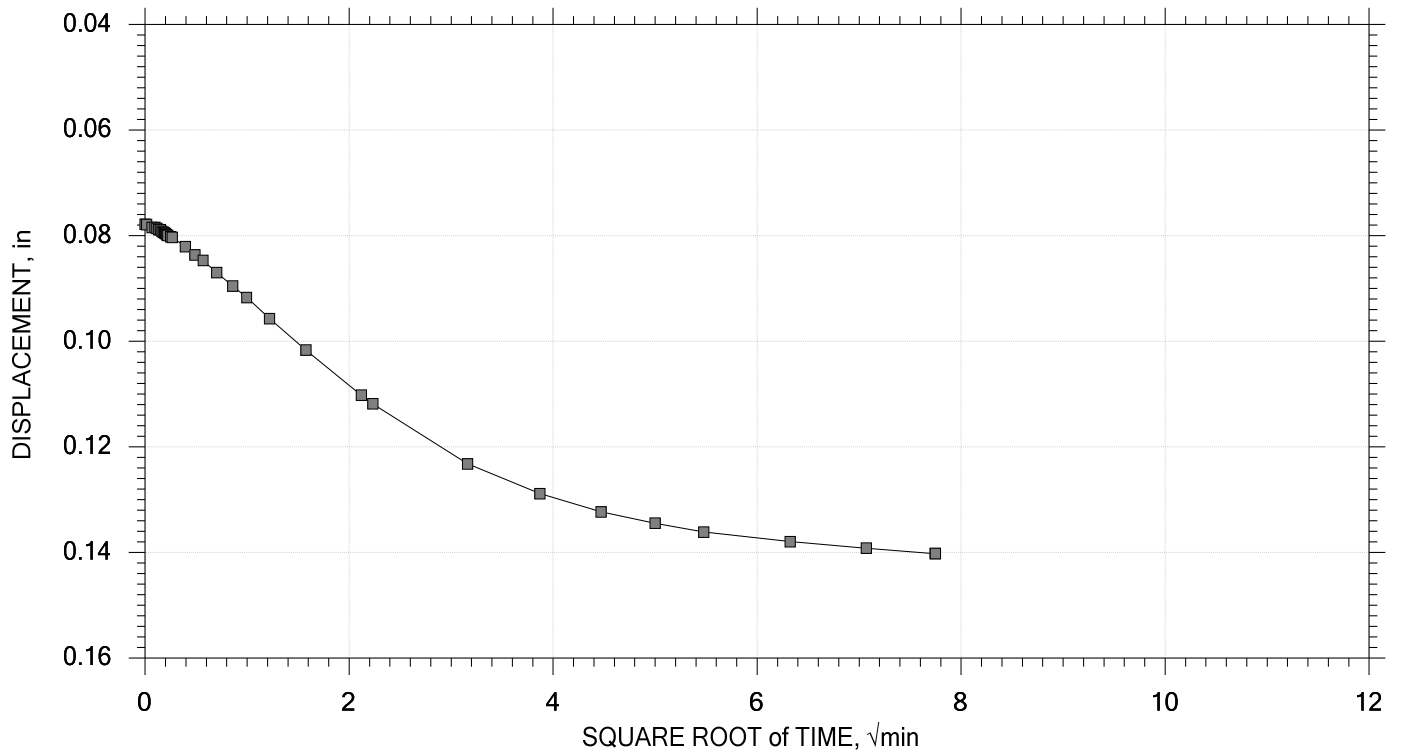
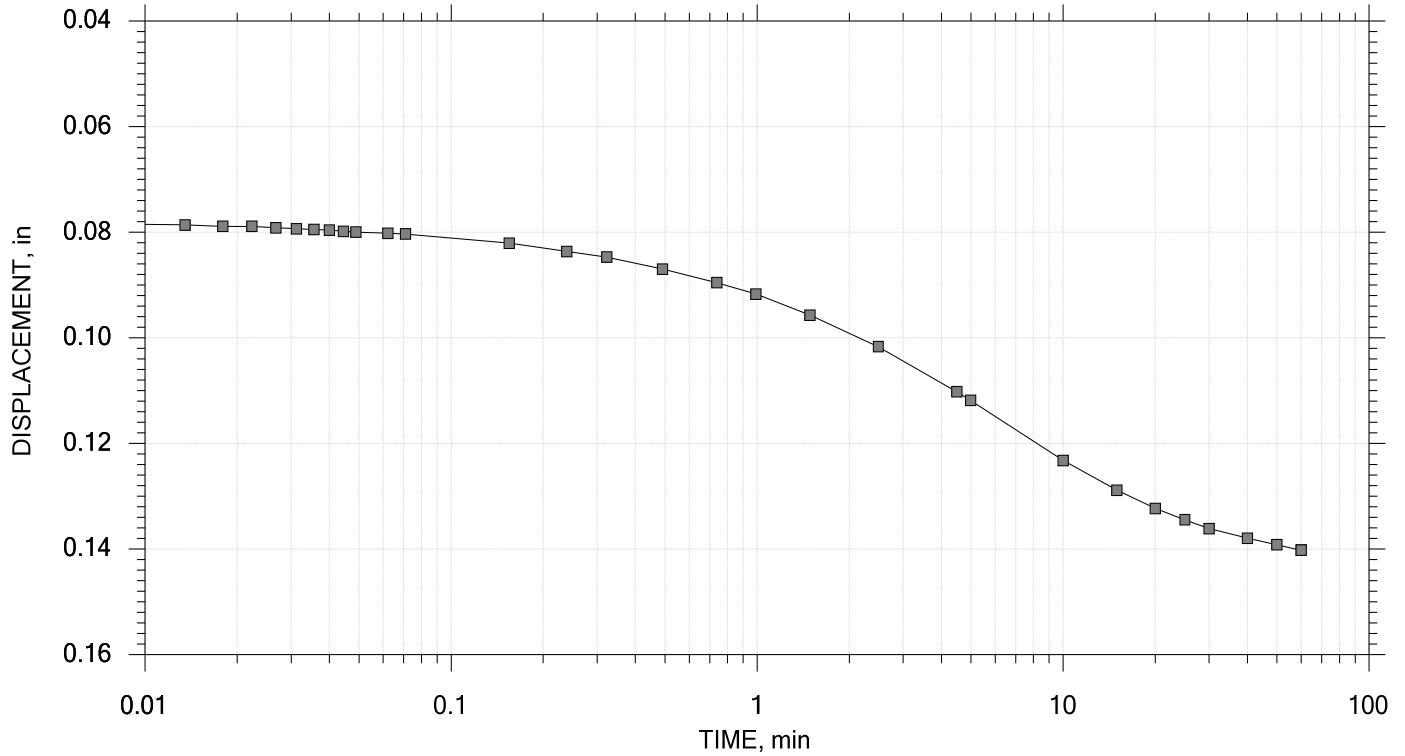
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 7 of 21

Stress: 4 tsf



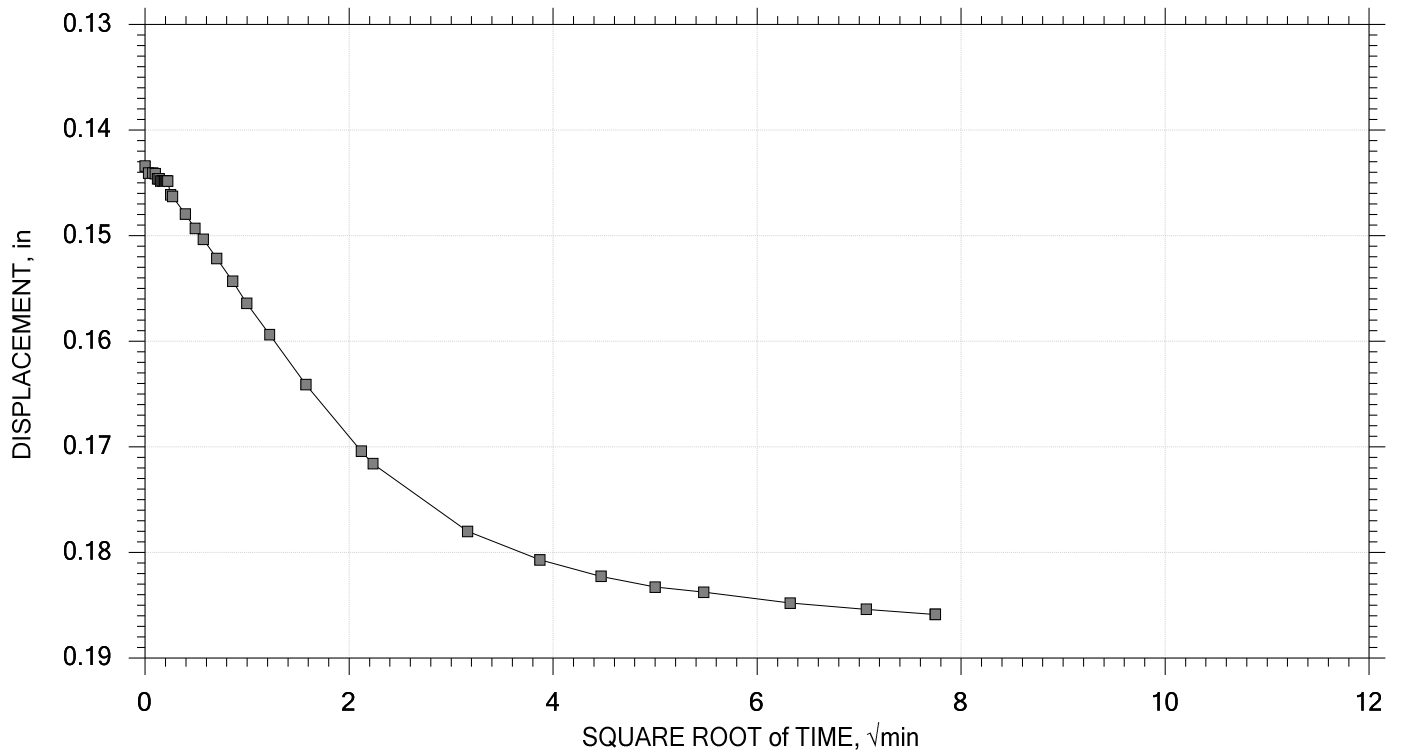
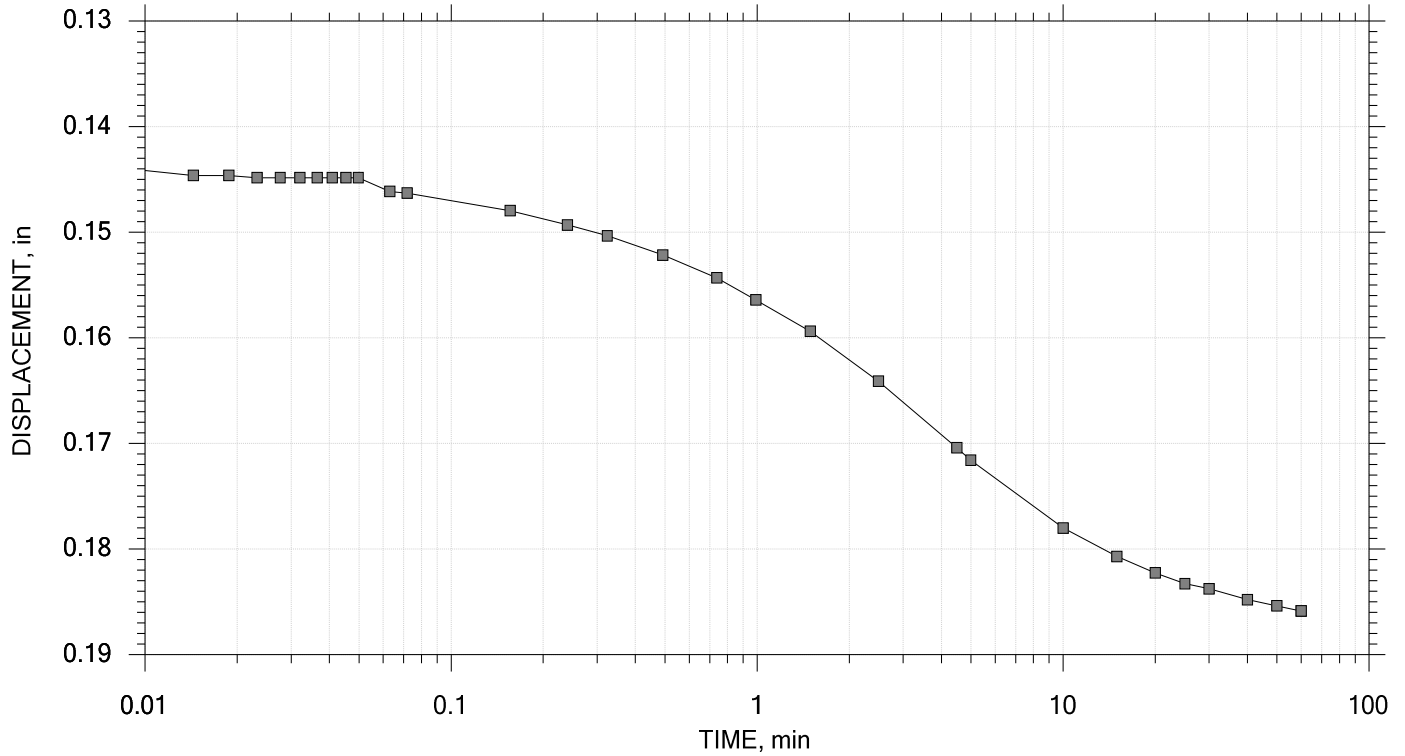
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 8 of 21

Stress: 8 tsf



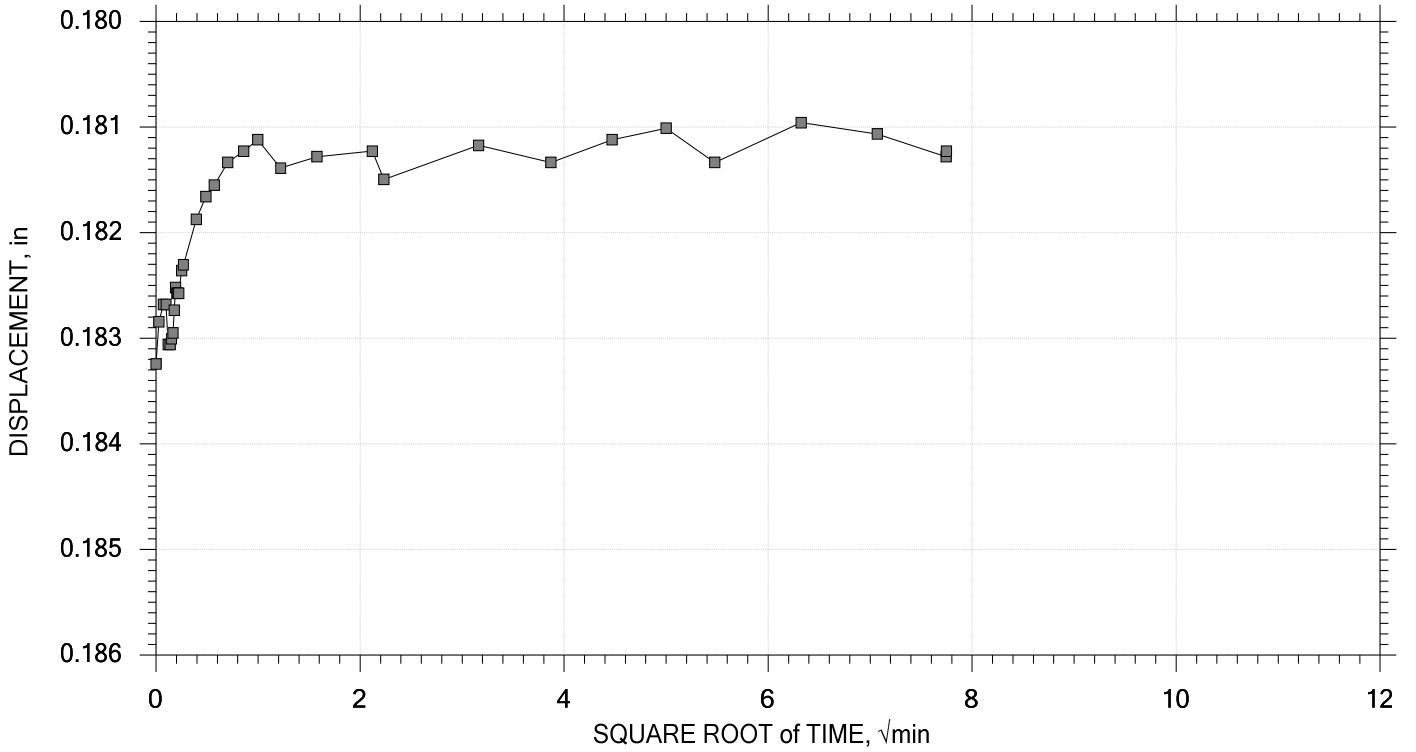
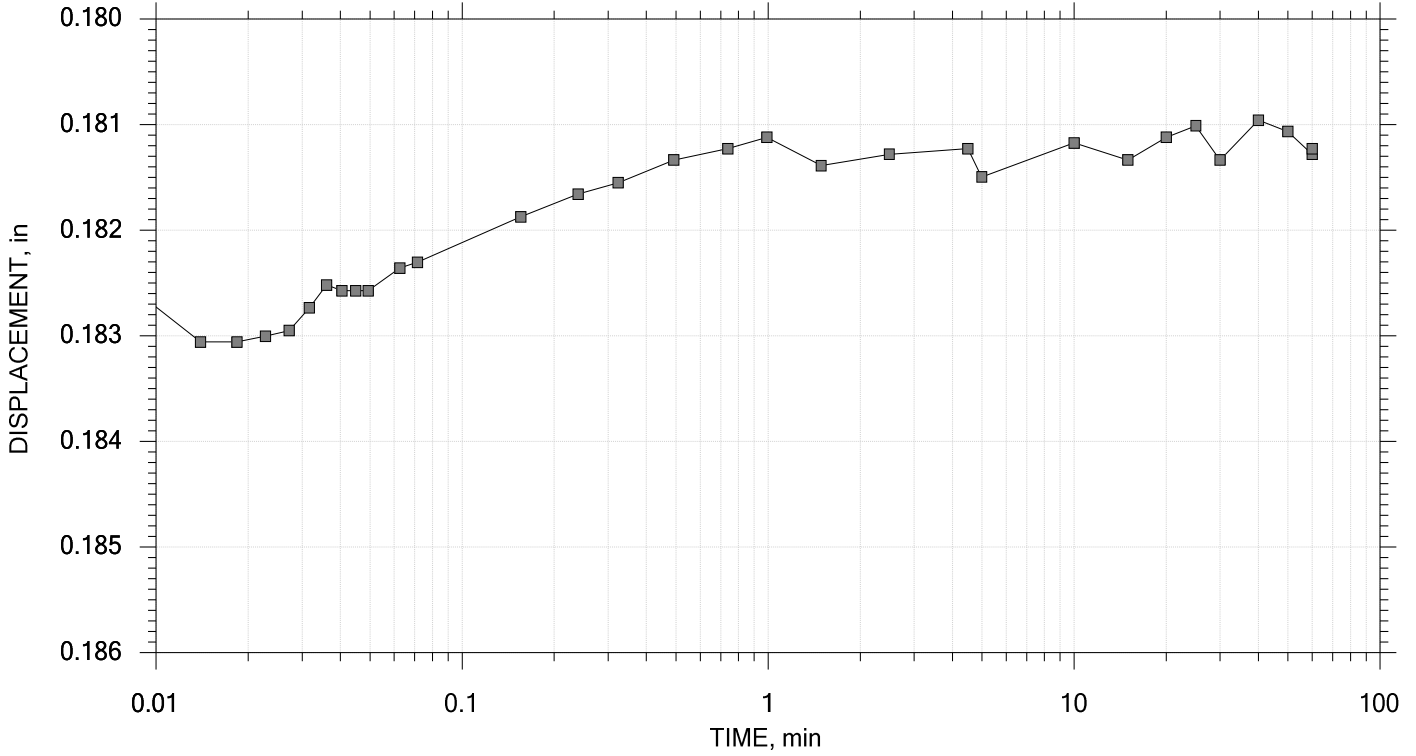
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 9 of 21

Stress: 4 tsf



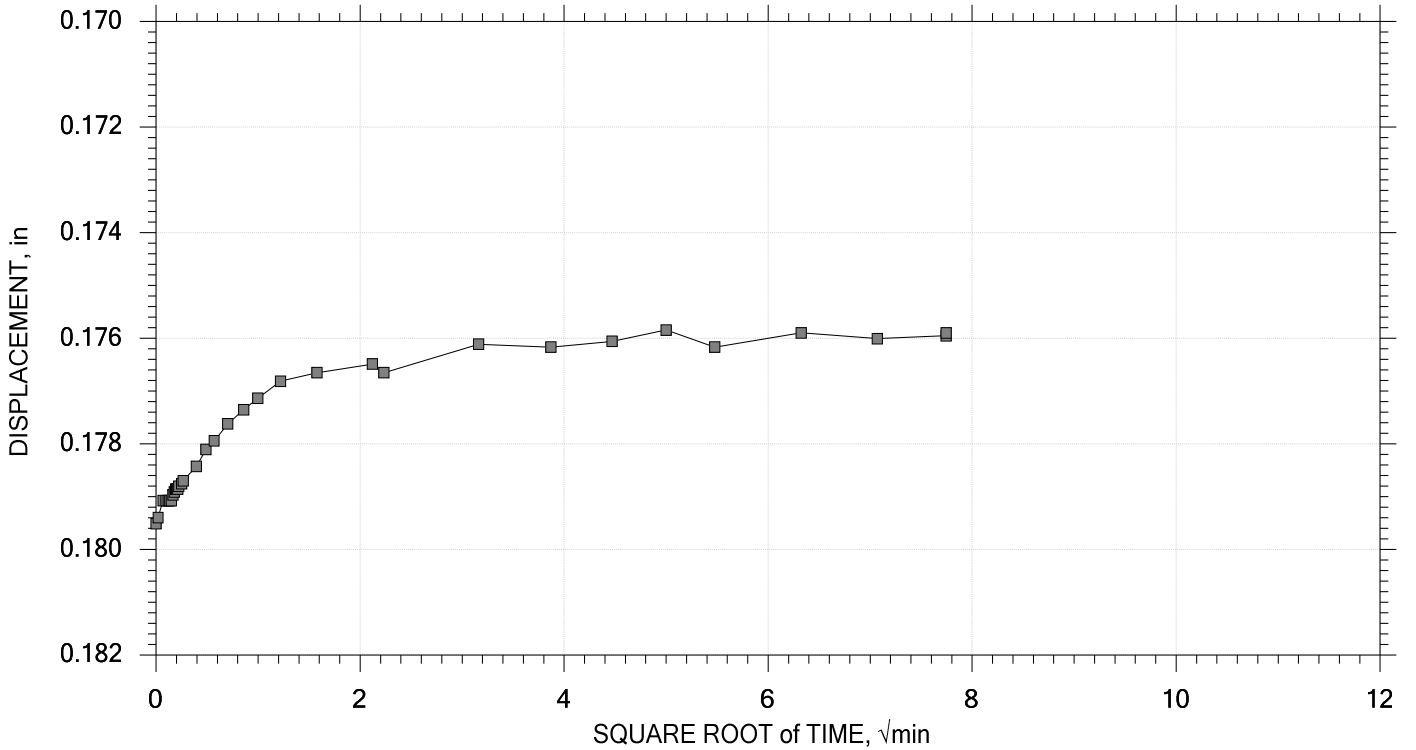
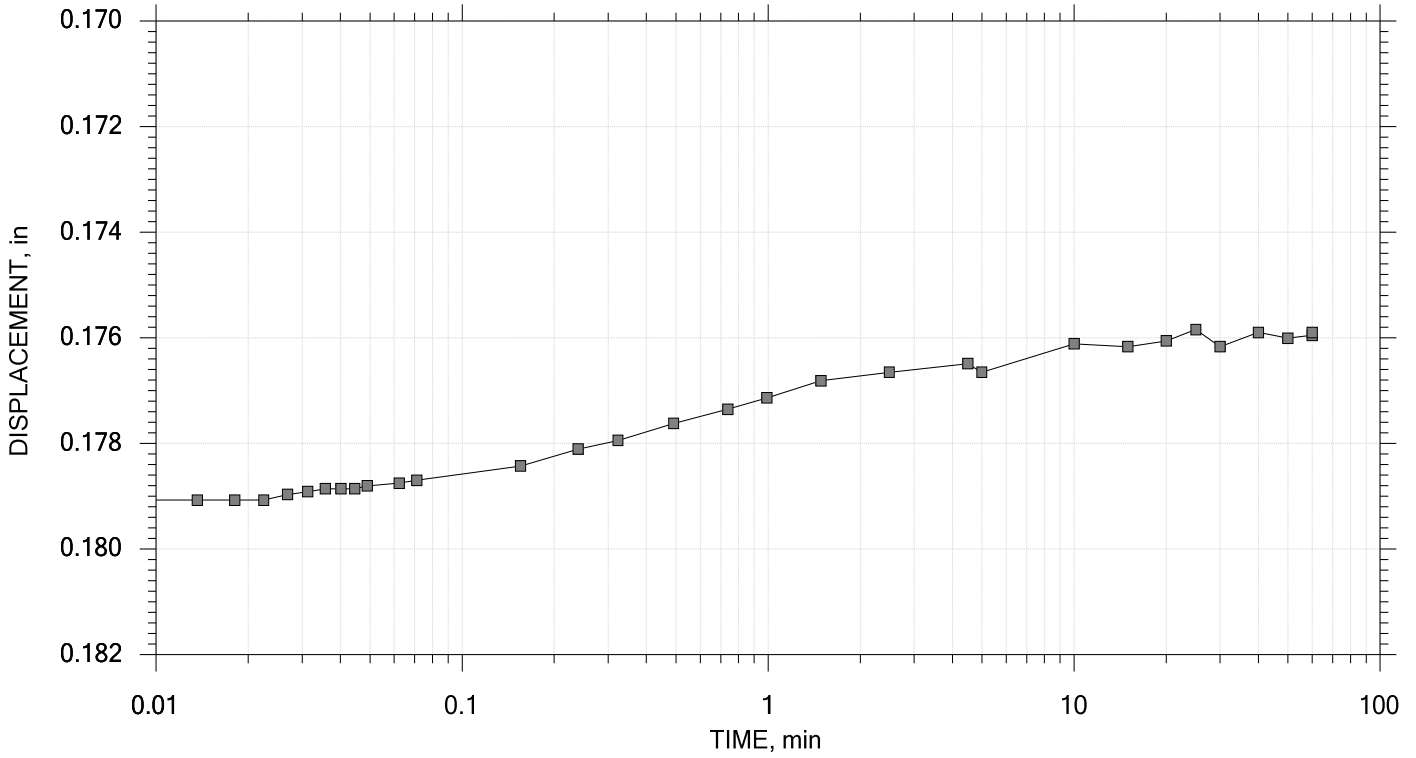
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 10 of 21

Stress: 2 tsf



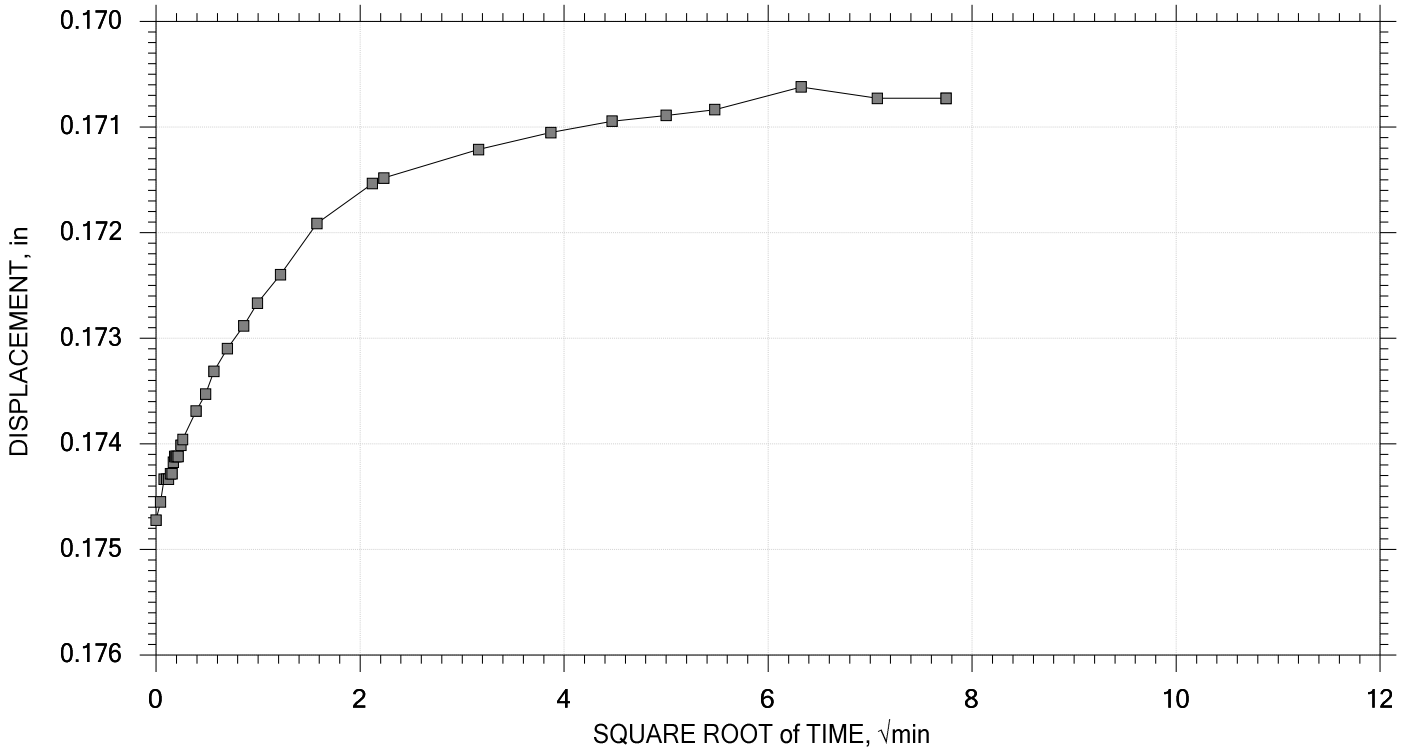
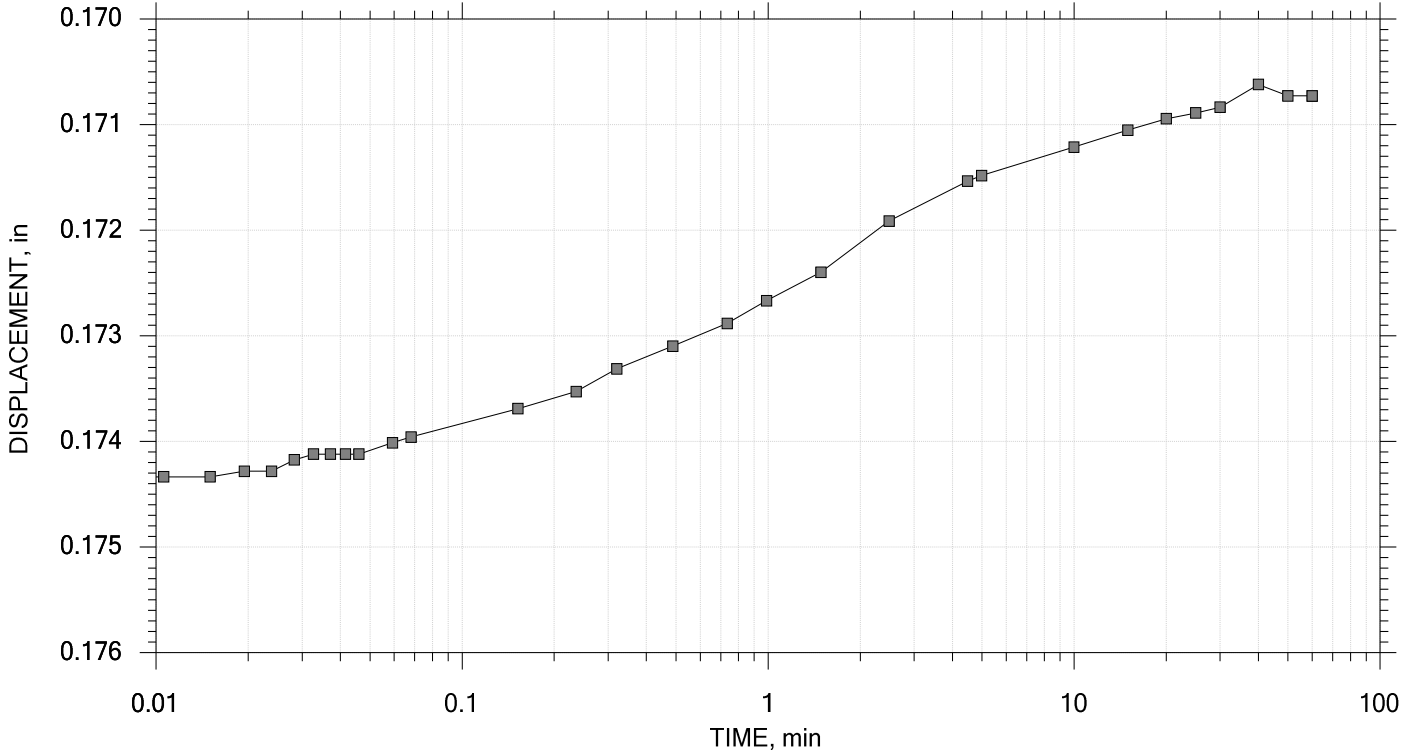
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 11 of 21

Stress: 1 tsf



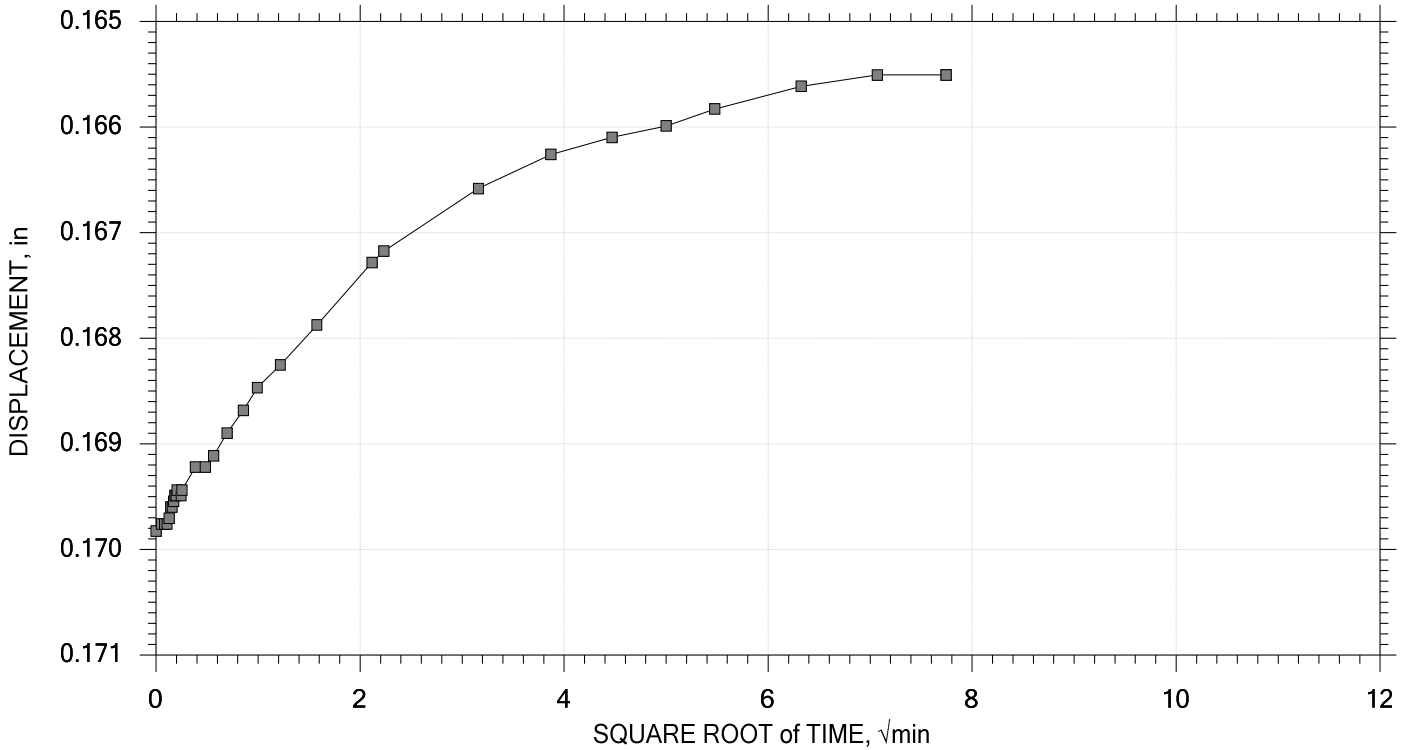
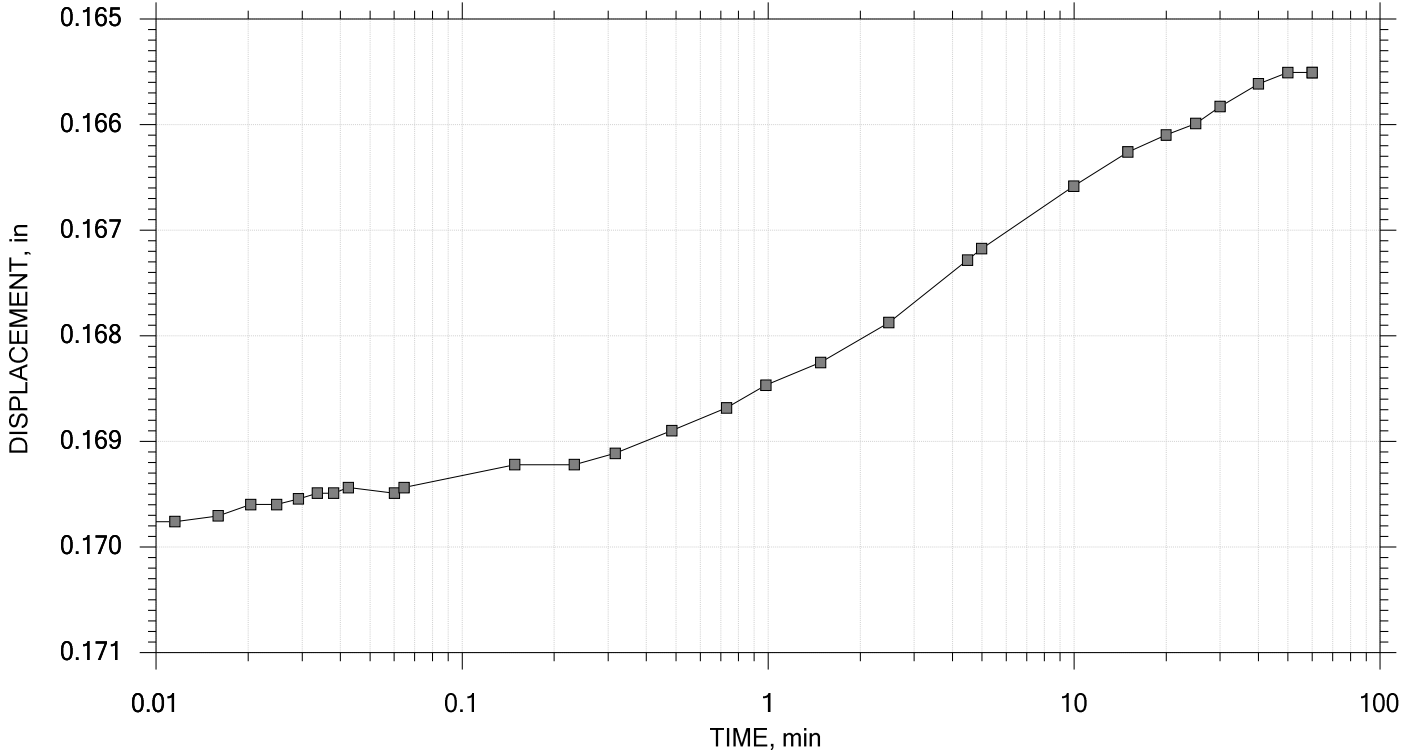
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 12 of 21

Stress: 0.5 tsf



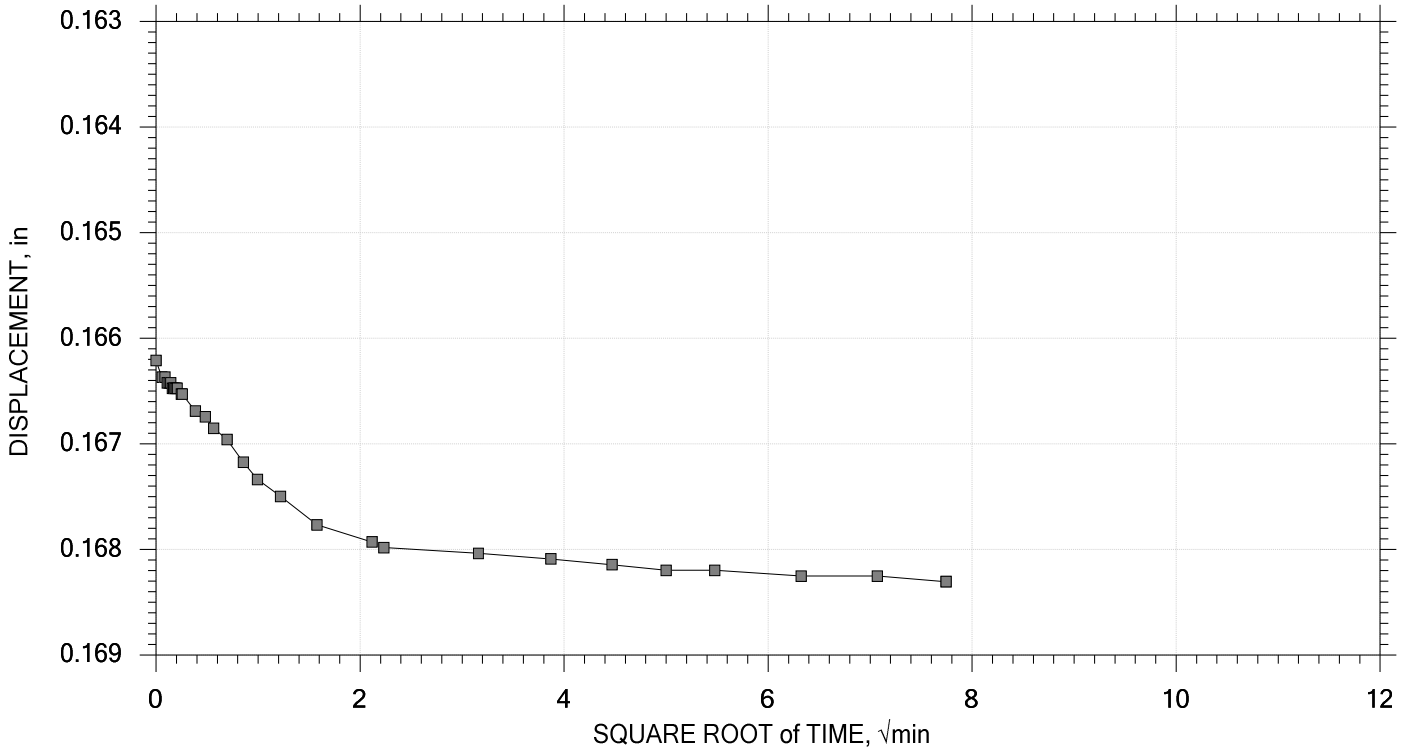
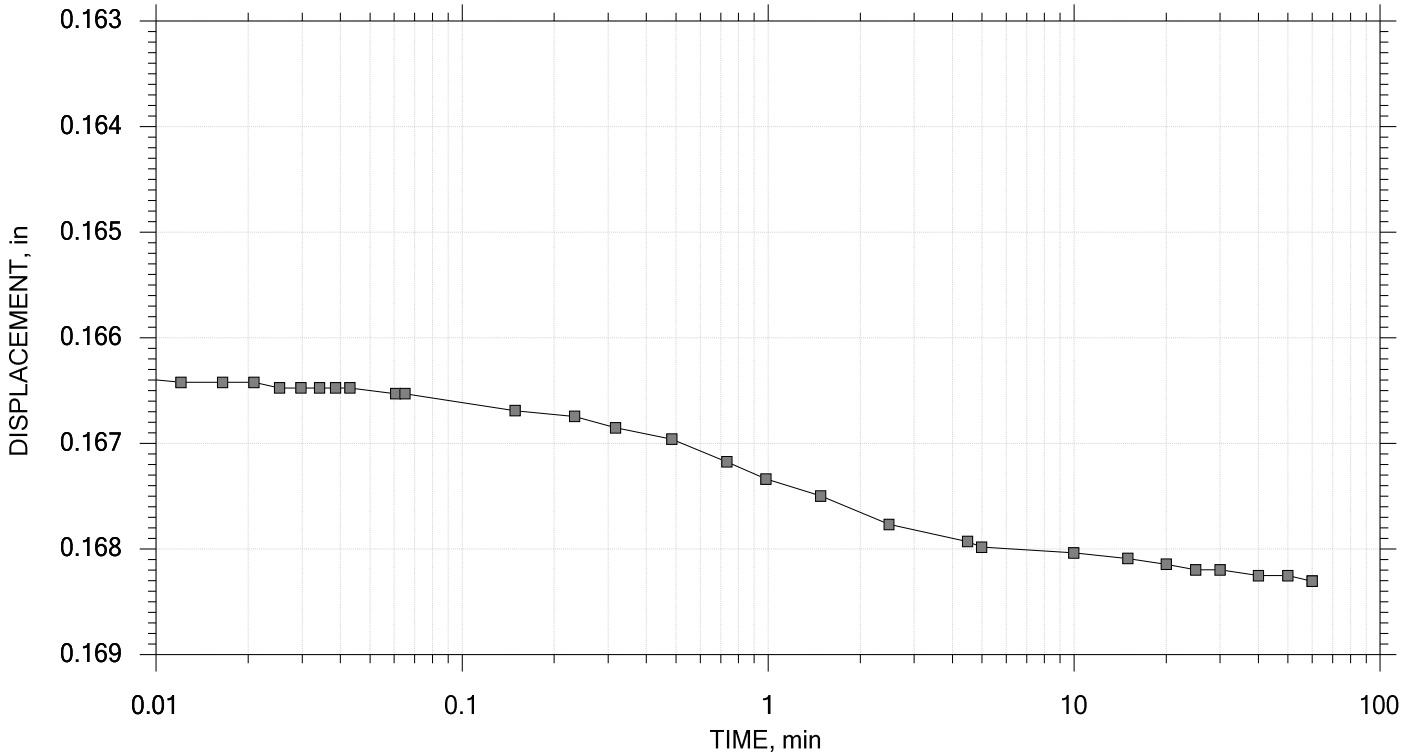
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 13 of 21

Stress: 1 tsf



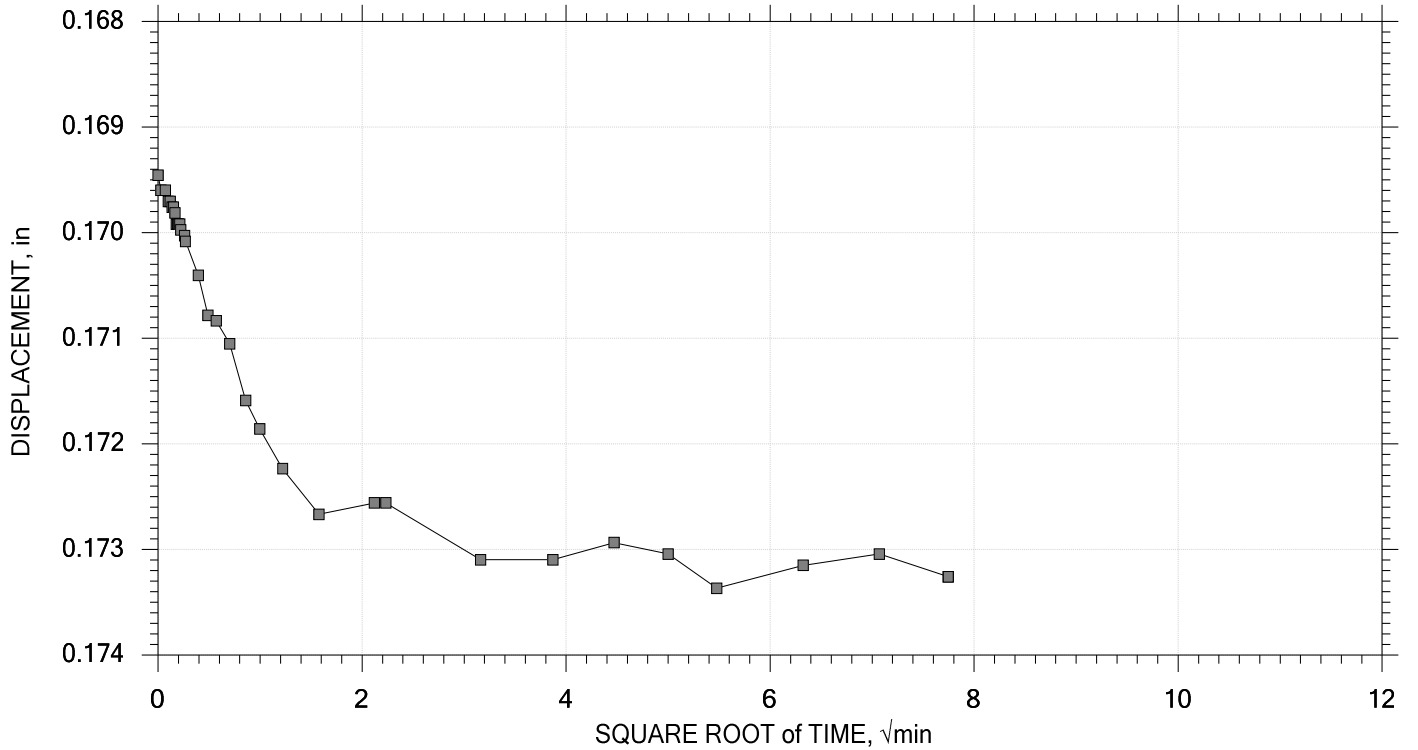
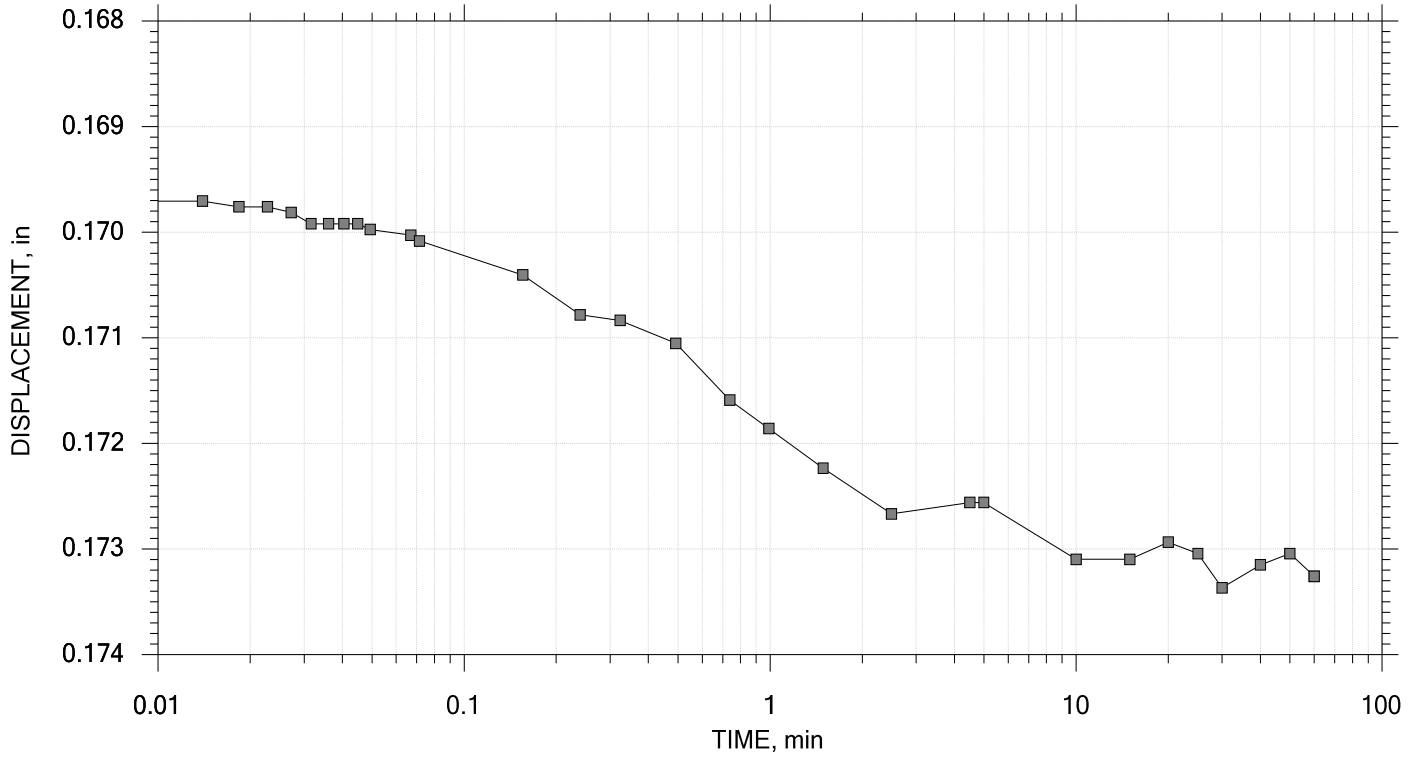
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 14 of 21

Stress: 2 tsf



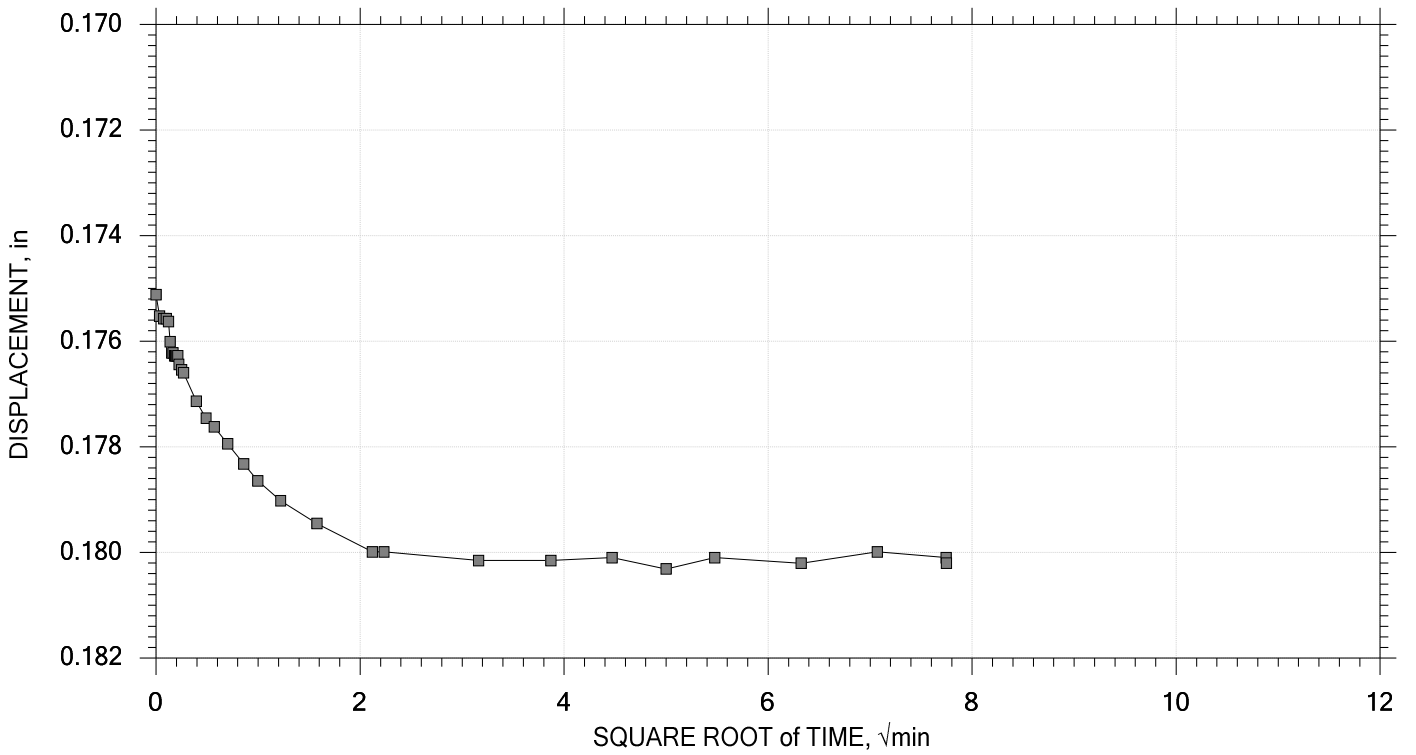
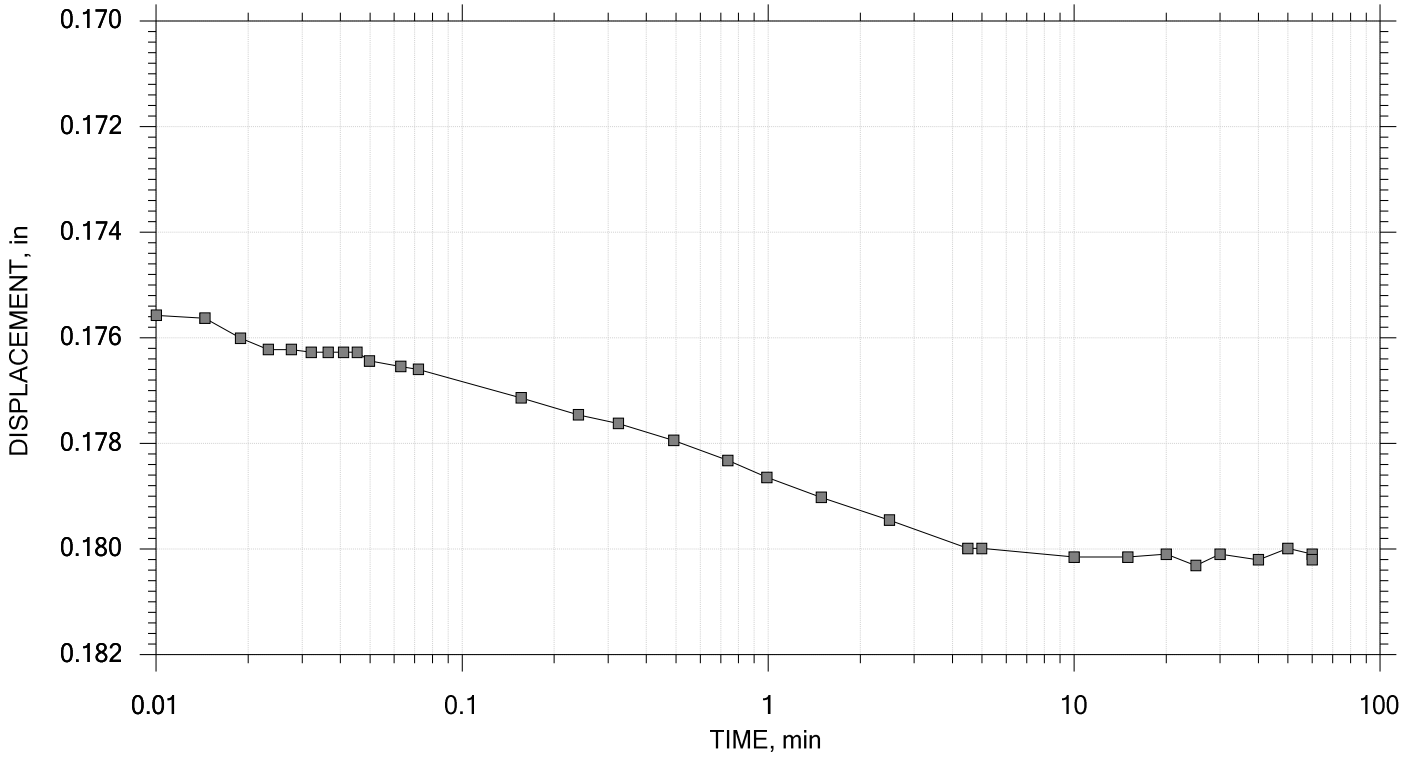
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 15 of 21

Stress: 4 tsf



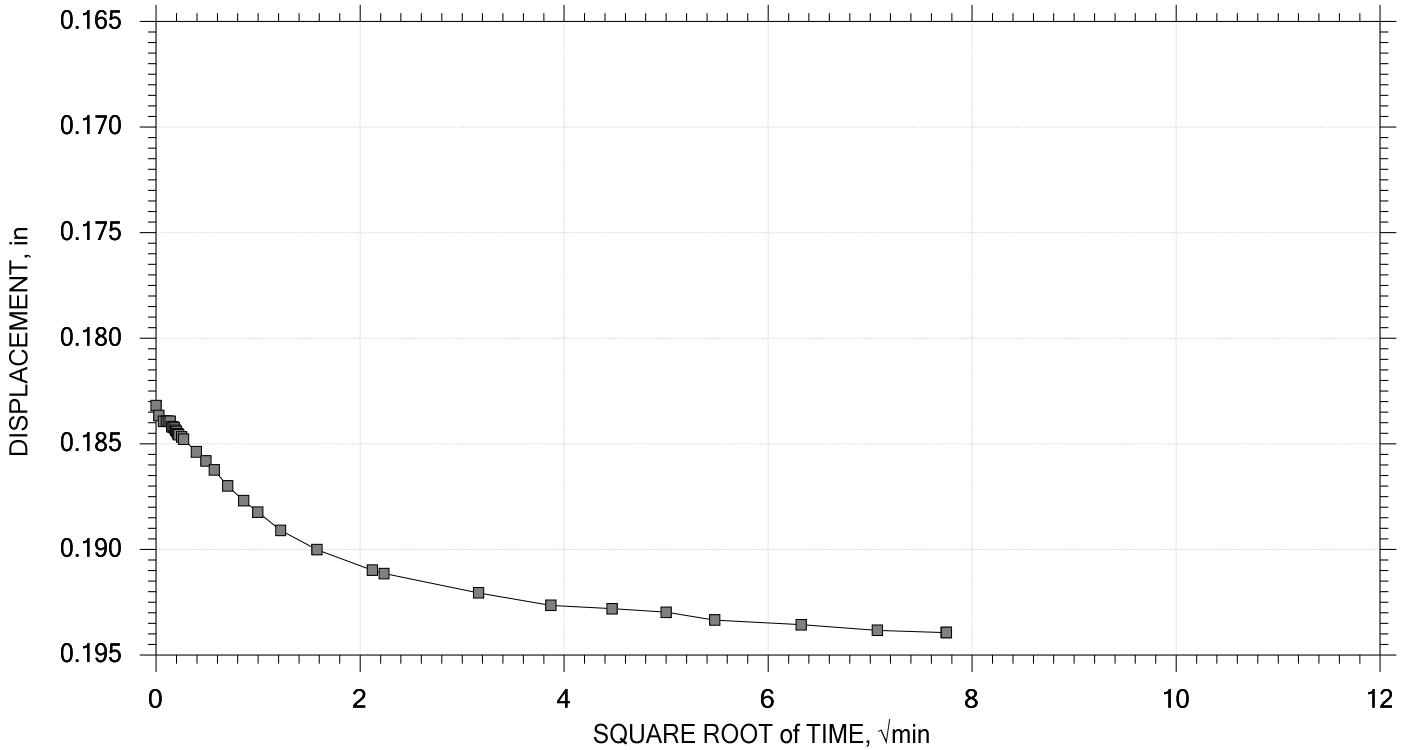
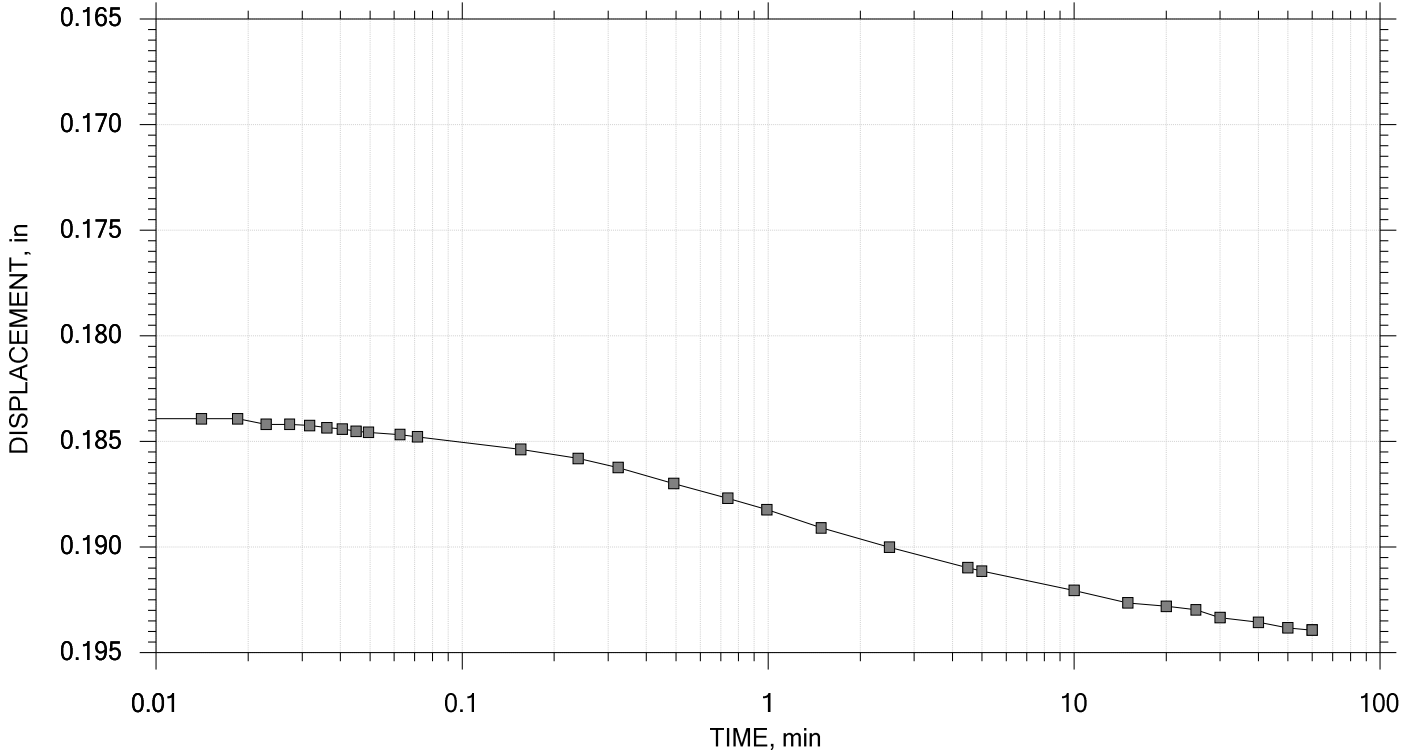
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 16 of 21

Stress: 8 tsf



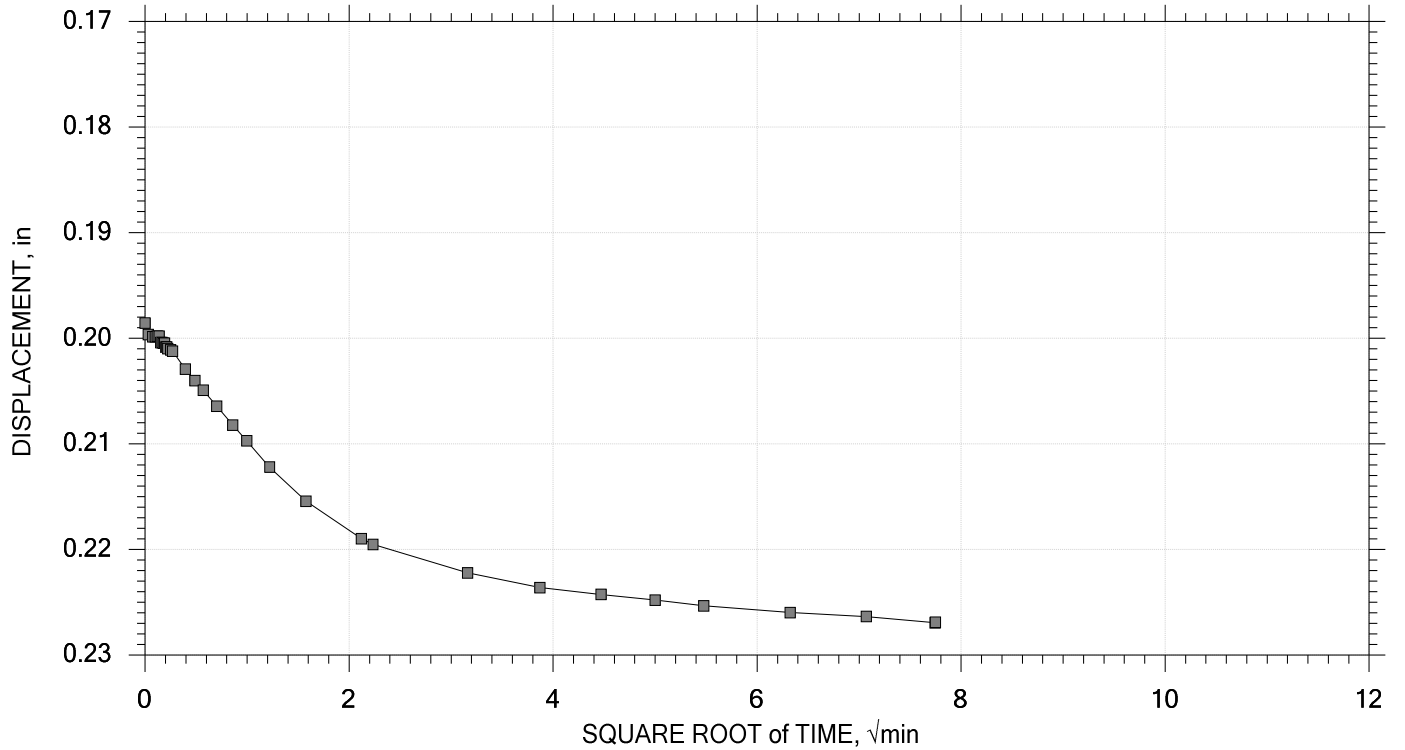
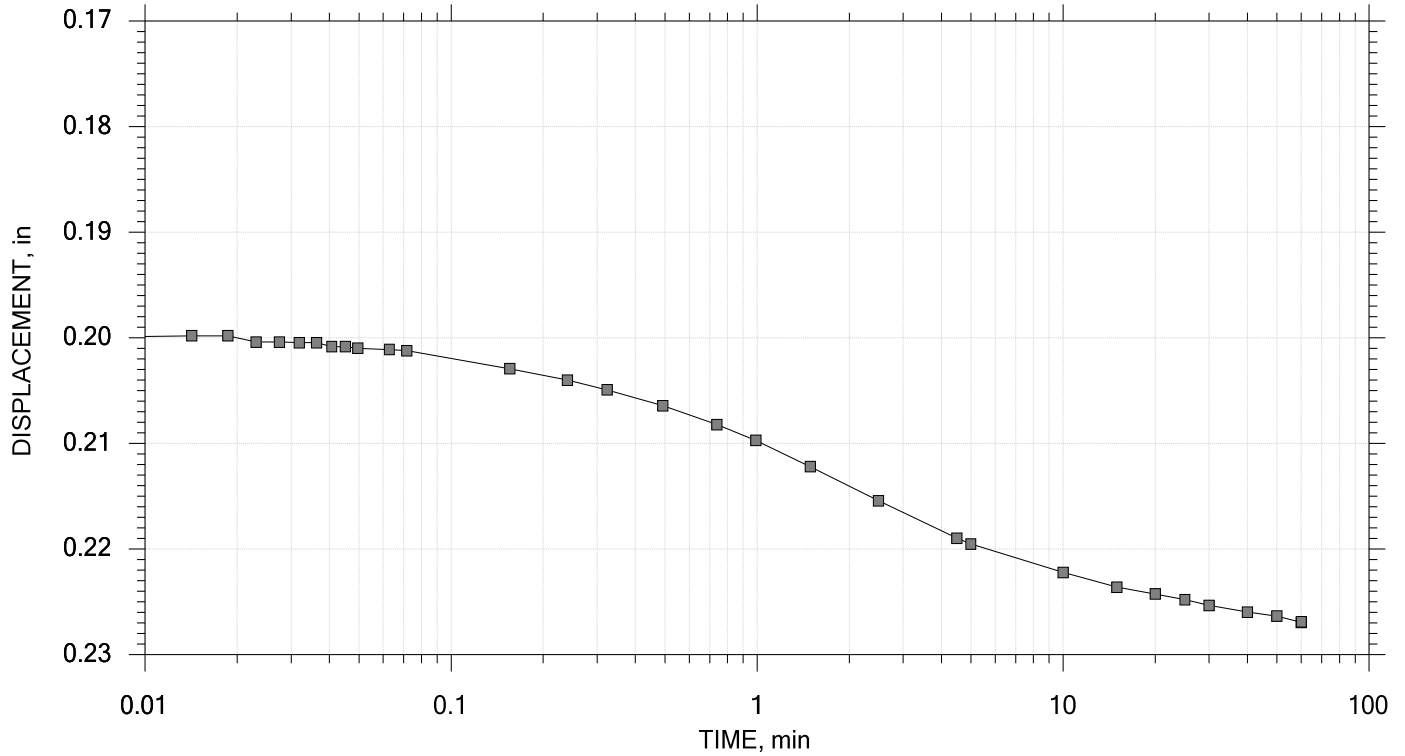
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 17 of 21

Stress: 16 tsf



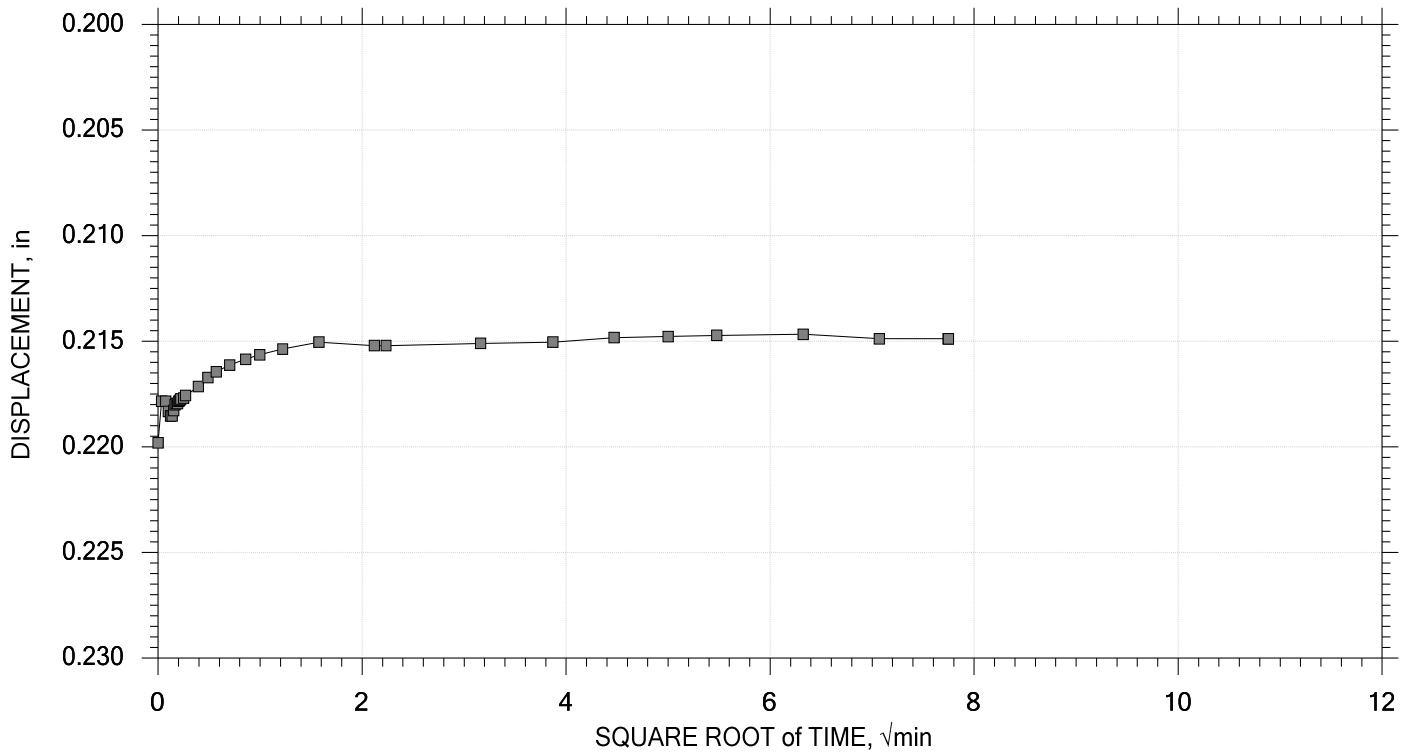
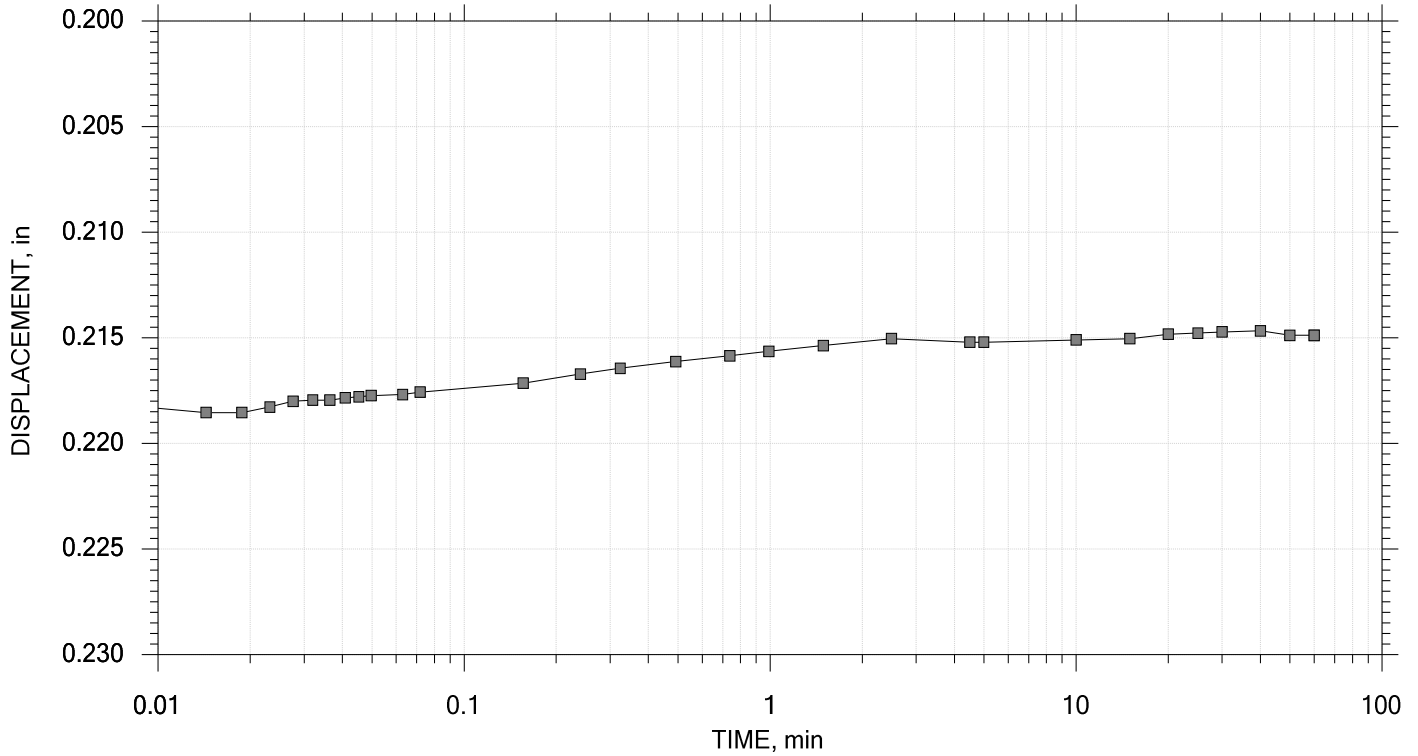
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 18 of 21

Stress: 4 tsf



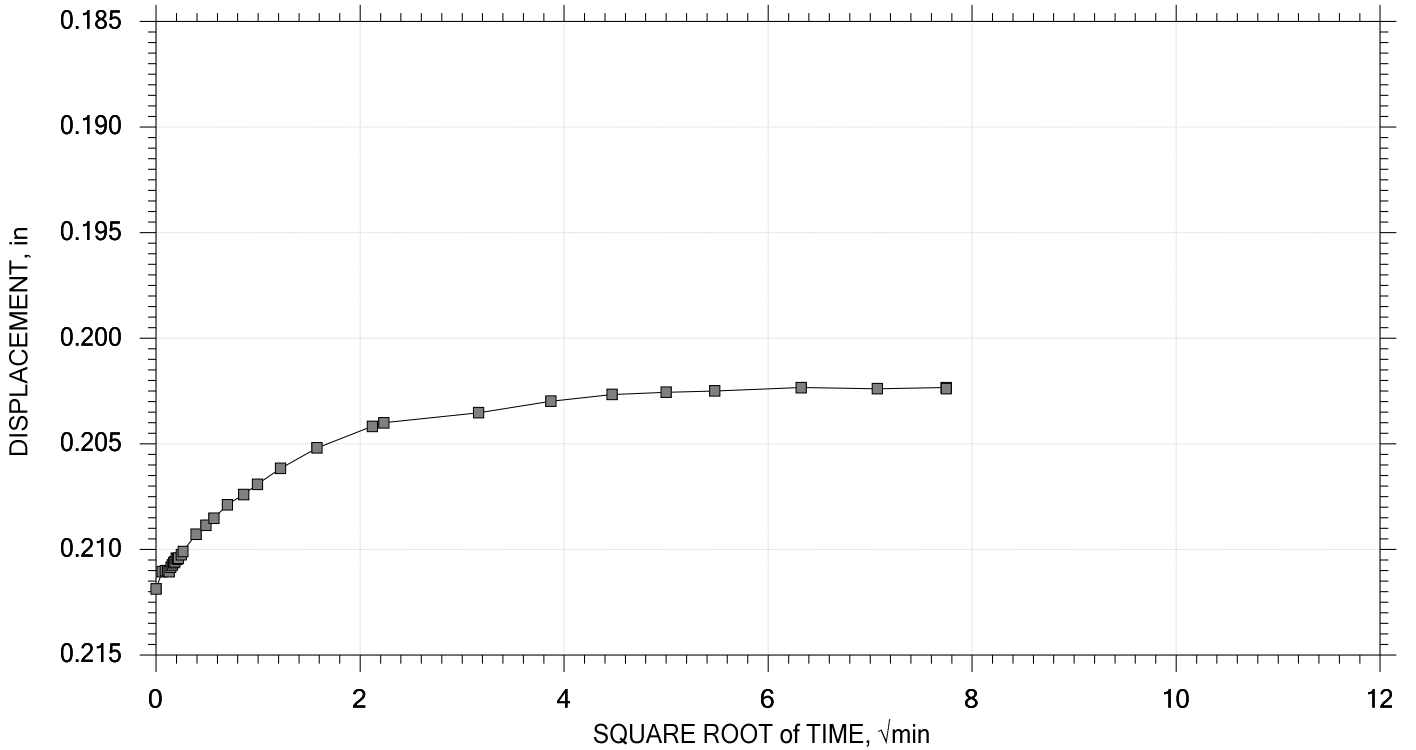
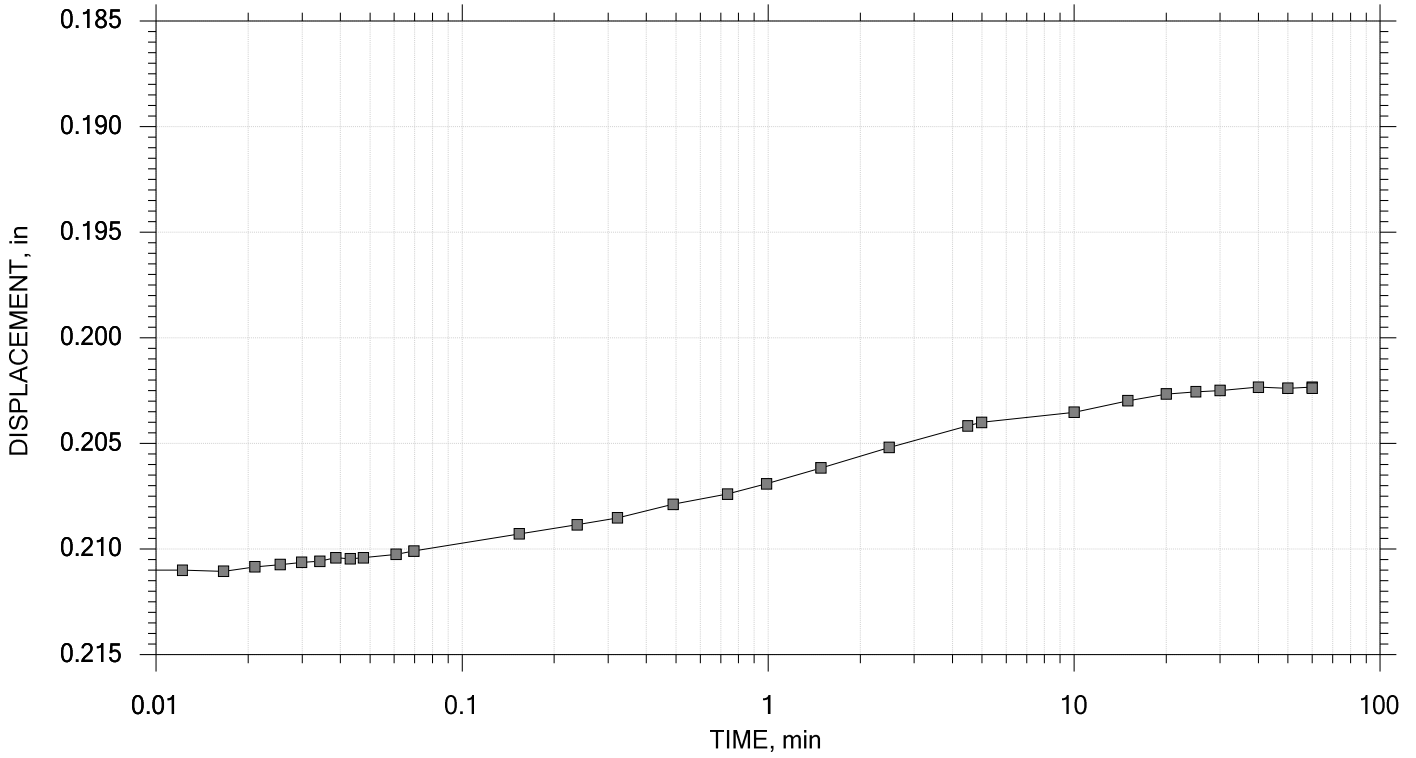
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 19 of 21

Stress: 1 tsf



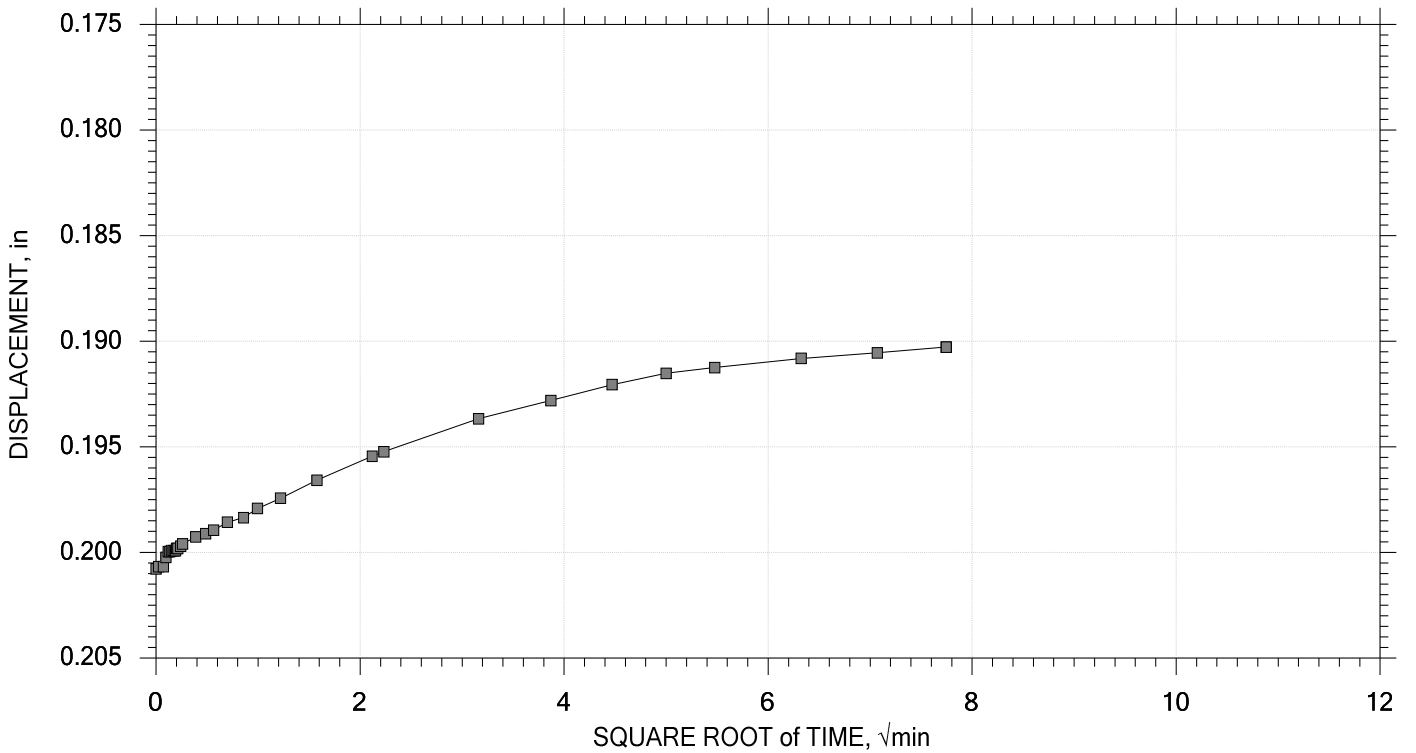
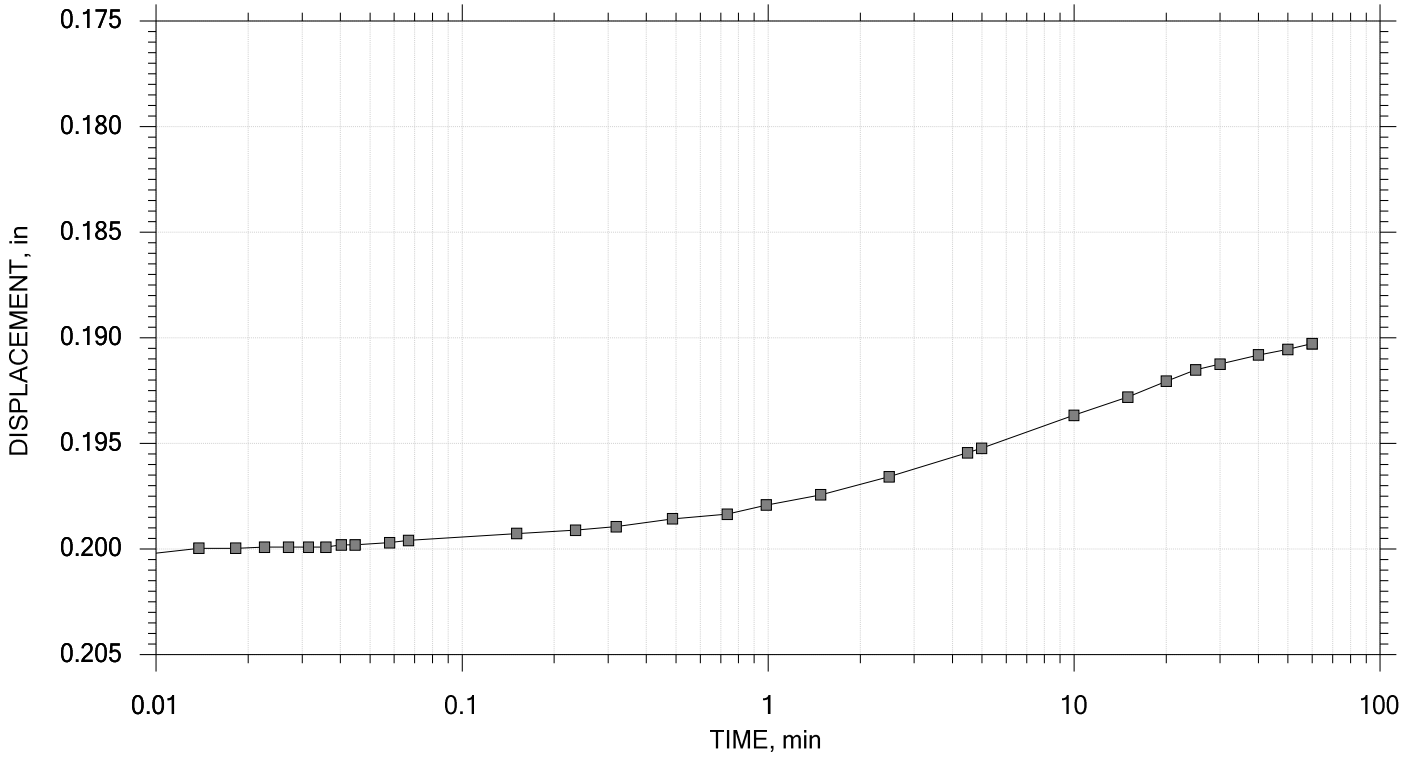
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 20 of 21

Stress: 0.25 tsf



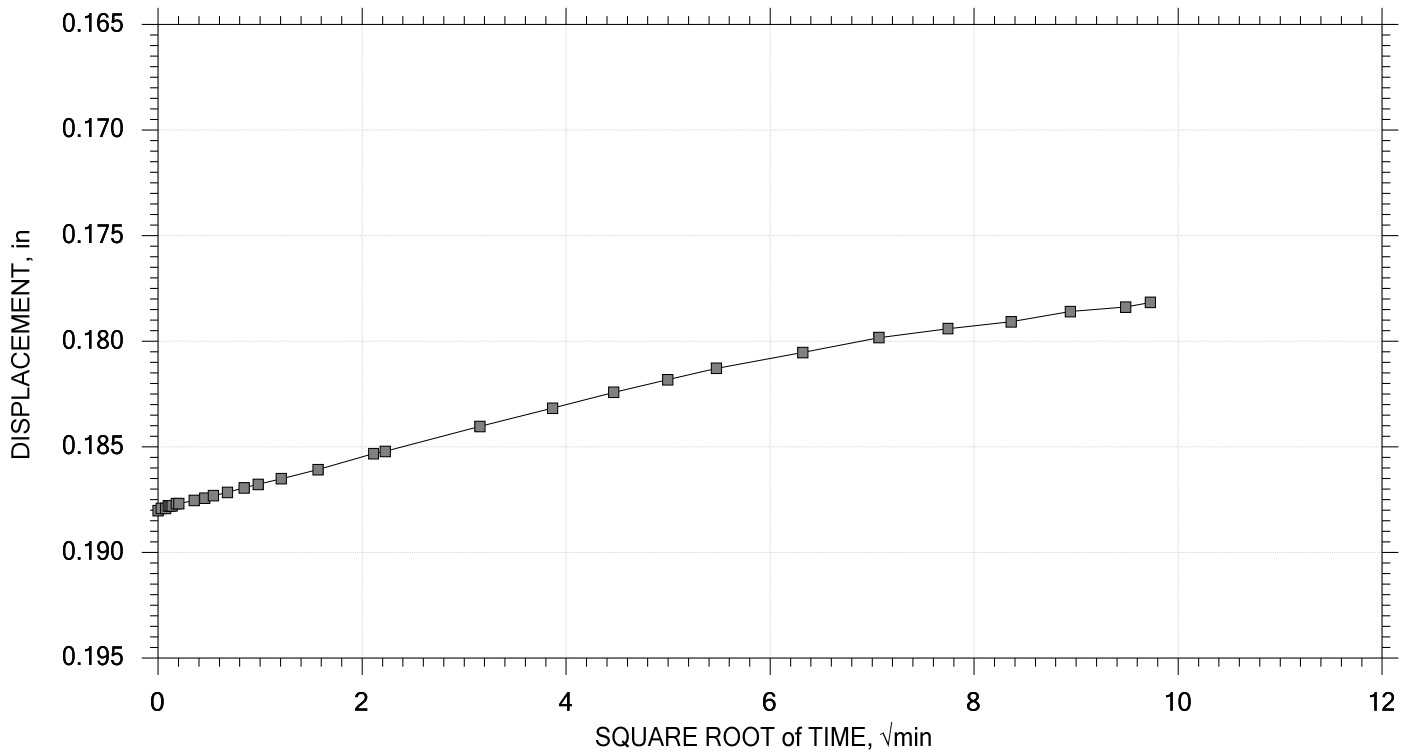
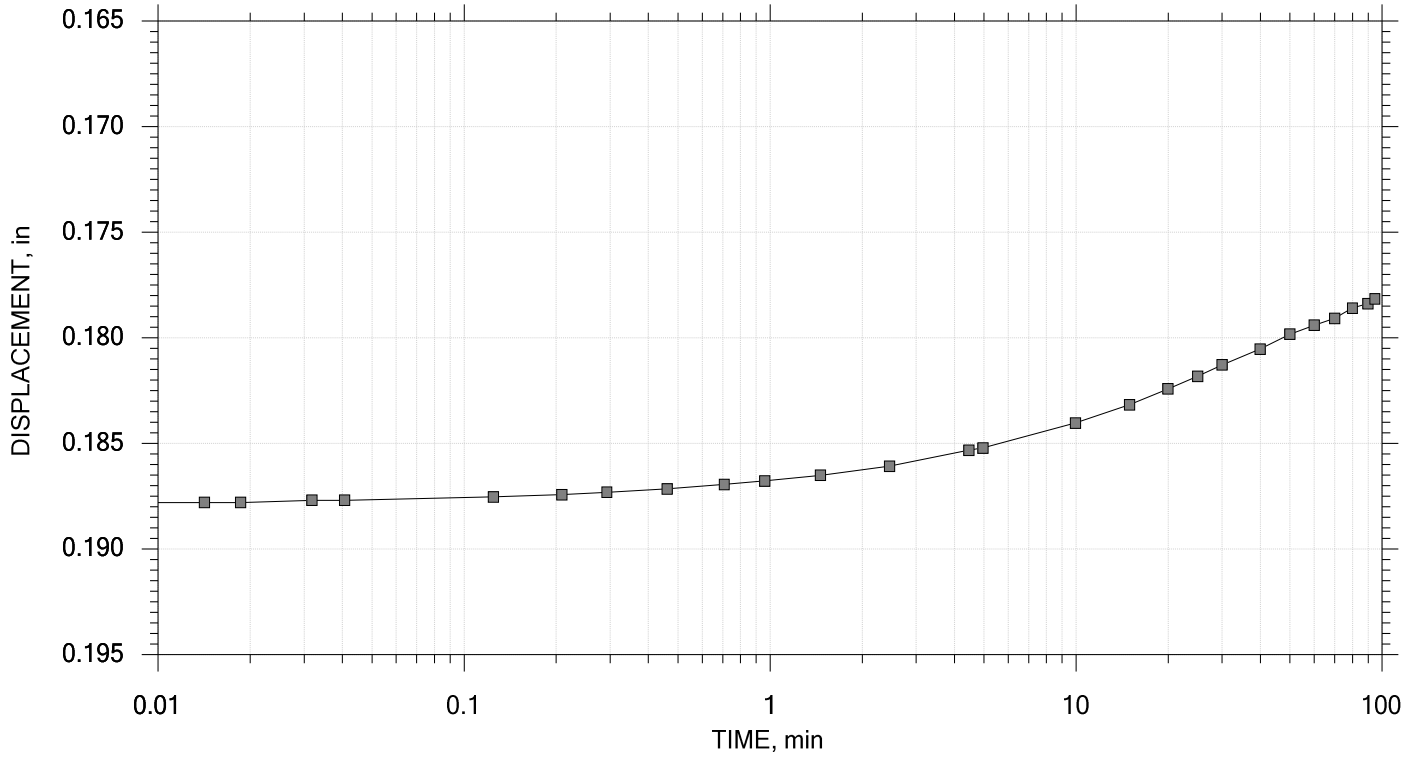
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 21 of 21

Stress: 0.0625 tsf



Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-101	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 4/25/18	Test No.: 303141
Depth: 20.0-22.0	Sample Type: INTACT	Elevation: --
Description: Gray very soft clay		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: CHERRYFIELD  
 Boring No.: BB-CSB-101  
 Sample No.: 1U  
 Test No.: 303141

Location: --  
 Tested By: GSL  
 Test Date: 4/25/18  
 Sample Type: INTACT

Project No.: 22230.00  
 Checked By: --  
 Depth: 20.0-22.0  
 Elevation: --

Soil Description: Gray very soft clay  
 Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test

Measured Specific Gravity: 2.73  
 Initial Void Ratio: 0.946  
 Final Void Ratio: 0.635

Liquid Limit: 38  
 Plastic Limit: 23  
 Plasticity Index: 15

Specimen Diameter: 2.50 in  
 Initial Height: 1.01 in  
 Final Height: 0.84 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	147	RING	RING	48
Wt. Container + Wet Soil, gm	131.46	414.08	401.30	181.68
Wt. Container + Dry Soil, gm	113.79	375.01	375.01	155.45
Wt. Container, gm	60.190	261.96	261.96	42.650
Wt. Dry Soil, gm	53.600	113.05	113.05	112.80
Water Content, %	32.97	34.56	23.25	23.25
Void Ratio	---	0.946	0.635	---
Degree of Saturation, %	---	99.69	100.00	---
Dry Unit Weight, pcf	---	87.564	104.25	---

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: CHERRYFIELD  
 Boring No.: BB-CSB-101  
 Sample No.: 1U  
 Test No.: 303141

Location: --  
 Tested By: GSL  
 Test Date: 4/25/18  
 Sample Type: INTACT

Project No.: 22230.00  
 Checked By: --  
 Depth: 20.0-22.0  
 Elevation: --

Soil Description: Gray very soft clay  
 Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test

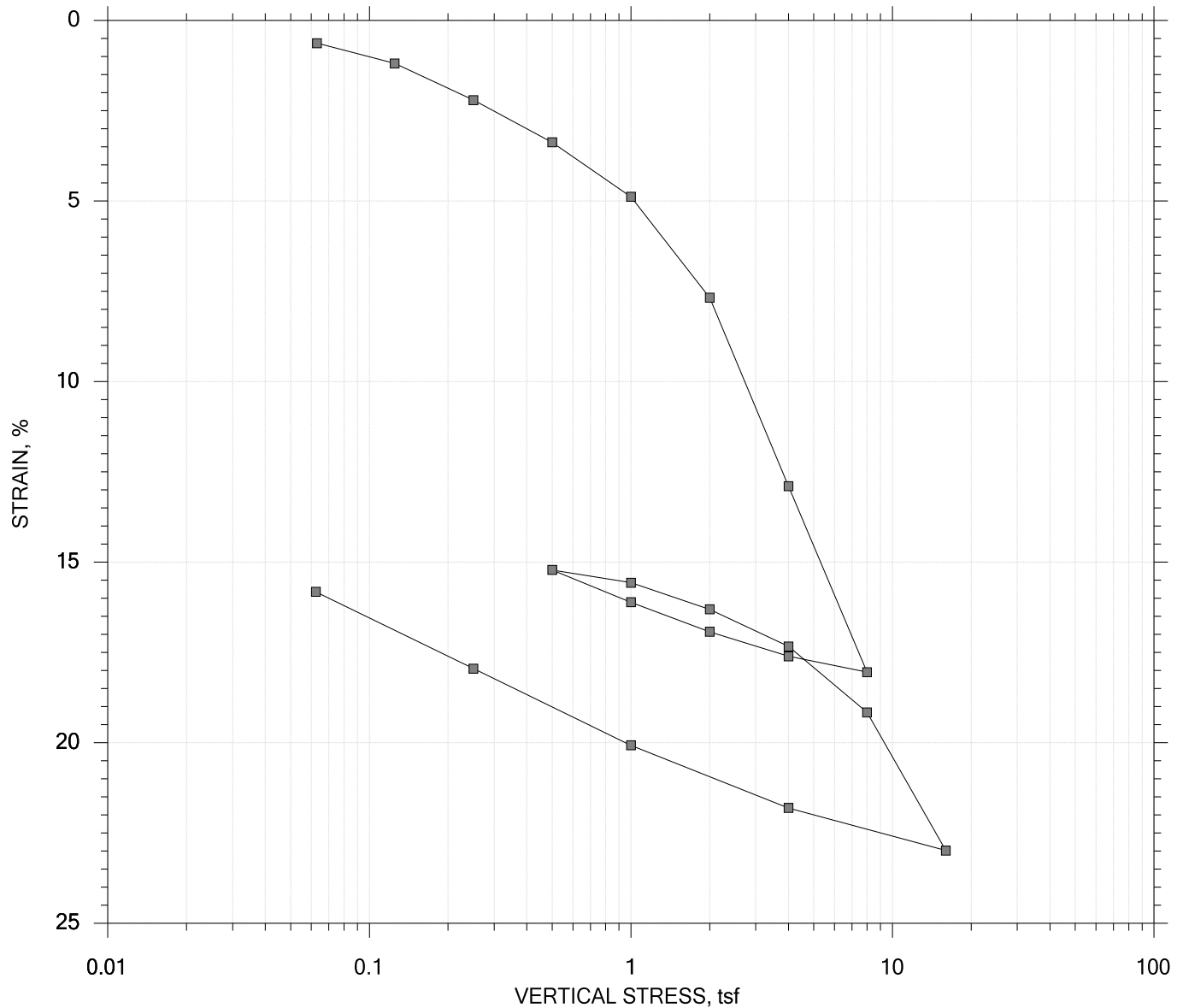
Displacement at End of Increment

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft <sup>2</sup> /sec	Mv 1/tsf	k ft/day
1	0.0630	0.003607	0.939	0.359	43.325	5.71e-007	5.69e-002	8.76e-005
2	0.125	0.01136	0.924	1.13	0.000	0.00e+000	1.24e-001	0.00e+000
3	0.250	0.02116	0.905	2.10	5.169	4.65e-006	7.79e-002	9.77e-004
4	0.500	0.02956	0.889	2.94	3.919	6.02e-006	3.34e-002	5.42e-004
5	1.00	0.04097	0.867	4.07	4.655	4.97e-006	2.27e-002	3.04e-004
6	2.00	0.07548	0.800	7.50	17.202	1.28e-006	3.43e-002	1.19e-004
7	4.00	0.1402	0.675	13.9	16.608	1.19e-006	3.22e-002	1.03e-004
8	8.00	0.1859	0.587	18.5	13.477	1.29e-006	1.13e-002	3.96e-005
9	4.00	0.1812	0.596	18.0	0.926	1.79e-005	1.15e-003	5.56e-005
10	2.00	0.1759	0.606	17.5	1.507	1.11e-005	2.65e-003	7.96e-005
11	1.00	0.1707	0.616	17.0	2.886	5.90e-006	5.14e-003	8.17e-005
12	0.500	0.1655	0.626	16.5	9.659	1.78e-006	1.04e-002	4.99e-005
13	1.00	0.1683	0.621	16.7	5.622	3.07e-006	5.57e-003	4.61e-005
14	2.00	0.1733	0.611	17.2	2.473	6.92e-006	4.92e-003	9.19e-005
15	4.00	0.1802	0.598	17.9	1.164	1.45e-005	3.45e-003	1.35e-004
16	8.00	0.1939	0.571	19.3	6.194	2.66e-006	3.41e-003	2.44e-005
17	16.0	0.2269	0.507	22.6	6.466	2.40e-006	4.09e-003	2.65e-005
18	4.00	0.2149	0.531	21.4	2.285	6.62e-006	9.95e-004	1.78e-005
19	1.00	0.2024	0.555	20.1	2.878	5.42e-006	4.14e-003	6.05e-005
20	0.250	0.1903	0.578	18.9	11.625	1.38e-006	1.61e-002	5.99e-005
21	0.0625	0.1782	0.602	17.7	69.354	2.39e-007	6.42e-002	4.14e-005

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft <sup>2</sup> /sec	Mv 1/tsf	k ft/day	Ca %
1	0.0630	0.003607	0.939	0.359	16.564	3.47e-007	5.69e-002	5.32e-005	0.00e+000
2	0.125	0.01136	0.924	1.13	0.000	0.00e+000	1.24e-001	0.00e+000	0.00e+000
3	0.250	0.02116	0.905	2.10	0.000	0.00e+000	7.79e-002	0.00e+000	0.00e+000
4	0.500	0.02956	0.889	2.94	0.000	0.00e+000	3.34e-002	0.00e+000	0.00e+000
5	1.00	0.04097	0.867	4.07	1.077	4.99e-006	2.27e-002	3.05e-004	0.00e+000
6	2.00	0.07548	0.800	7.50	5.195	9.86e-007	3.43e-002	9.12e-005	0.00e+000
7	4.00	0.1402	0.675	13.9	4.502	1.02e-006	3.22e-002	8.86e-005	0.00e+000
8	8.00	0.1859	0.587	18.5	2.181	1.86e-006	1.13e-002	5.68e-005	0.00e+000
9	4.00	0.1812	0.596	18.0	0.000	0.00e+000	1.15e-003	0.00e+000	0.00e+000
10	2.00	0.1759	0.606	17.5	0.326	1.20e-005	2.65e-003	8.55e-005	0.00e+000
11	1.00	0.1707	0.616	17.0	0.987	4.00e-006	5.14e-003	5.55e-005	0.00e+000
12	0.500	0.1655	0.626	16.5	2.355	1.70e-006	1.04e-002	4.76e-005	0.00e+000
13	1.00	0.1683	0.621	16.7	0.733	5.48e-006	5.57e-003	8.22e-005	0.00e+000
14	2.00	0.1733	0.611	17.2	0.555	7.16e-006	4.92e-003	9.51e-005	0.00e+000
15	4.00	0.1802	0.598	17.9	0.000	0.00e+000	3.45e-003	0.00e+000	0.00e+000
16	8.00	0.1939	0.571	19.3	0.970	3.94e-006	3.41e-003	3.63e-005	0.00e+000
17	16.0	0.2269	0.507	22.6	1.208	2.99e-006	4.09e-003	3.30e-005	0.00e+000
18	4.00	0.2149	0.531	21.4	0.000	0.00e+000	9.95e-004	0.00e+000	0.00e+000
19	1.00	0.2024	0.555	20.1	1.014	3.57e-006	4.14e-003	3.99e-005	0.00e+000
20	0.250	0.1903	0.578	18.9	0.000	0.00e+000	1.61e-002	0.00e+000	0.00e+000
21	0.0625	0.1782	0.602	17.7	0.000	0.00e+000	6.42e-002	0.00e+000	0.00e+000

# One-Dimensional Consolidation by ASTM D2435 - Method B

## SUMMARY REPORT

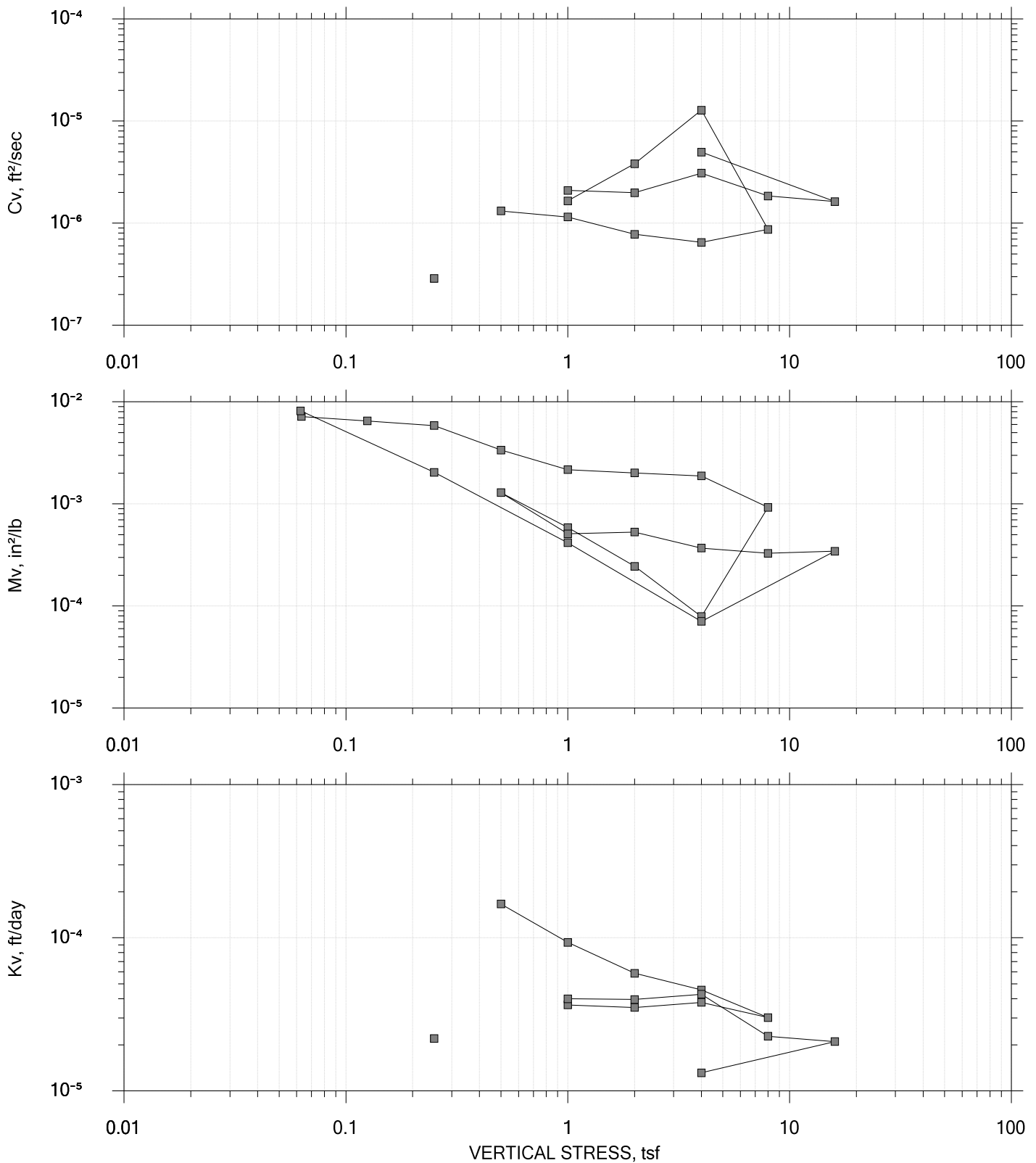


				Before Test	After Test	
Current Vertical Effective Stress: ---				Water Content, %	41.09	29.79
Preconsolidation Stress: ---				Dry Unit Weight, pcf	80.101	94.184
Compression Ratio: ---				Saturation, %	99.16	100.00
Diameter: 2.495 in		Height: 1.002 in		Void Ratio	1.14	0.82
LL: 30	PL: 19	PI: 11	GS: 2.74			

Project: CHERRYFIELD		Location: --		Project No.: 22230.00	
Boring No.: BB-CSB-201		Tested By: GSL		Checked By: --	
Sample No.: 1U		Test Date: 2/26/19		Test No.: 337251	
Depth: 15.0-17.0		Sample Type: INTACT		Elevation: --	
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.					
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test					
Displacement at End of Primary					

# One-Dimensional Consolidation by ASTM D2435 - Method B

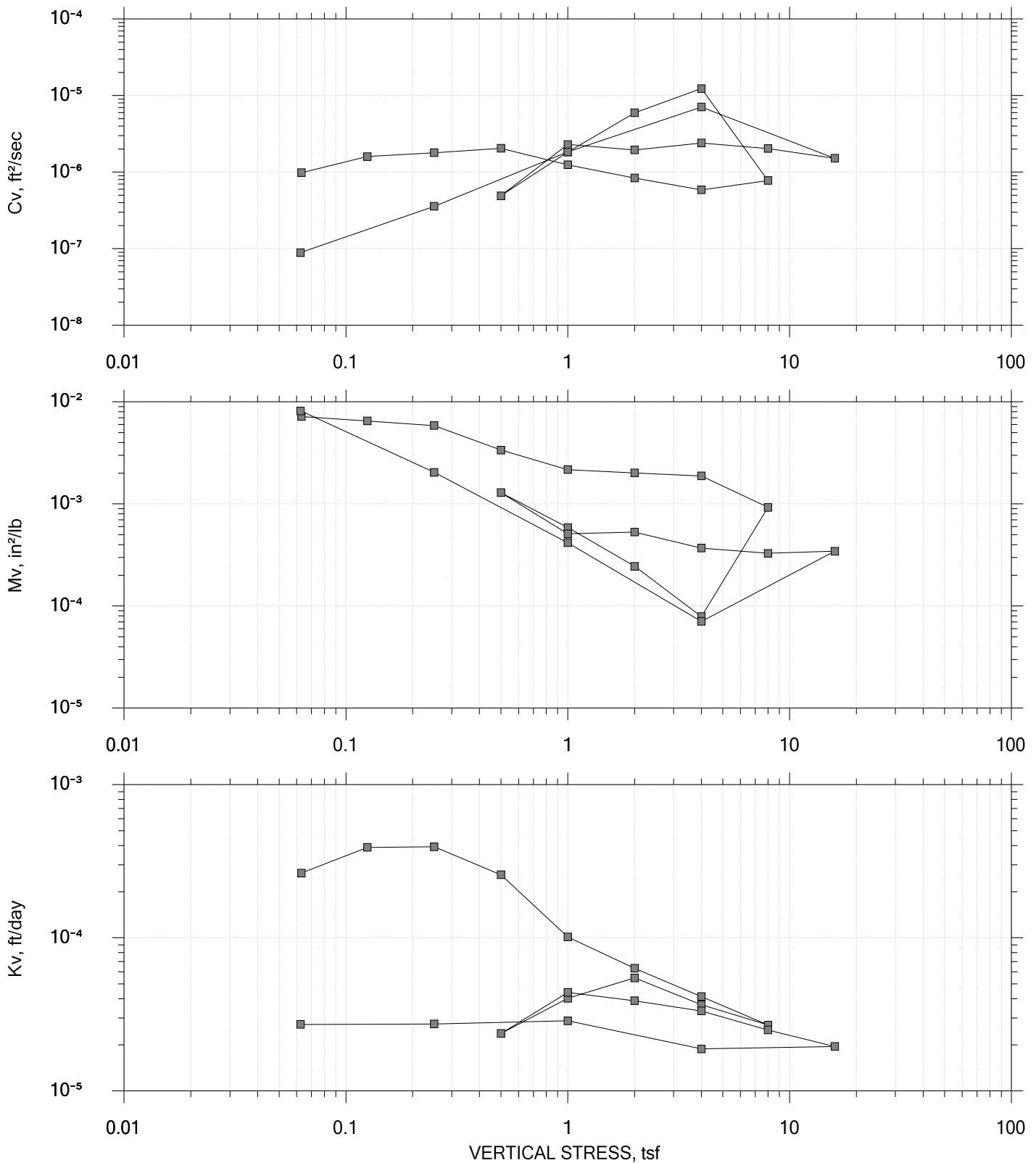
LOG of TIME COEFFICIENTS



	Project: CHERRYFIELD	Location: --	Project No.: 22230.00
	Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
	Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
	Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.			
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test			
Displacement at End of Primary			

# One-Dimensional Consolidation by ASTM D2435 - Method B

SQUARE ROOT of TIME COEFFICIENTS



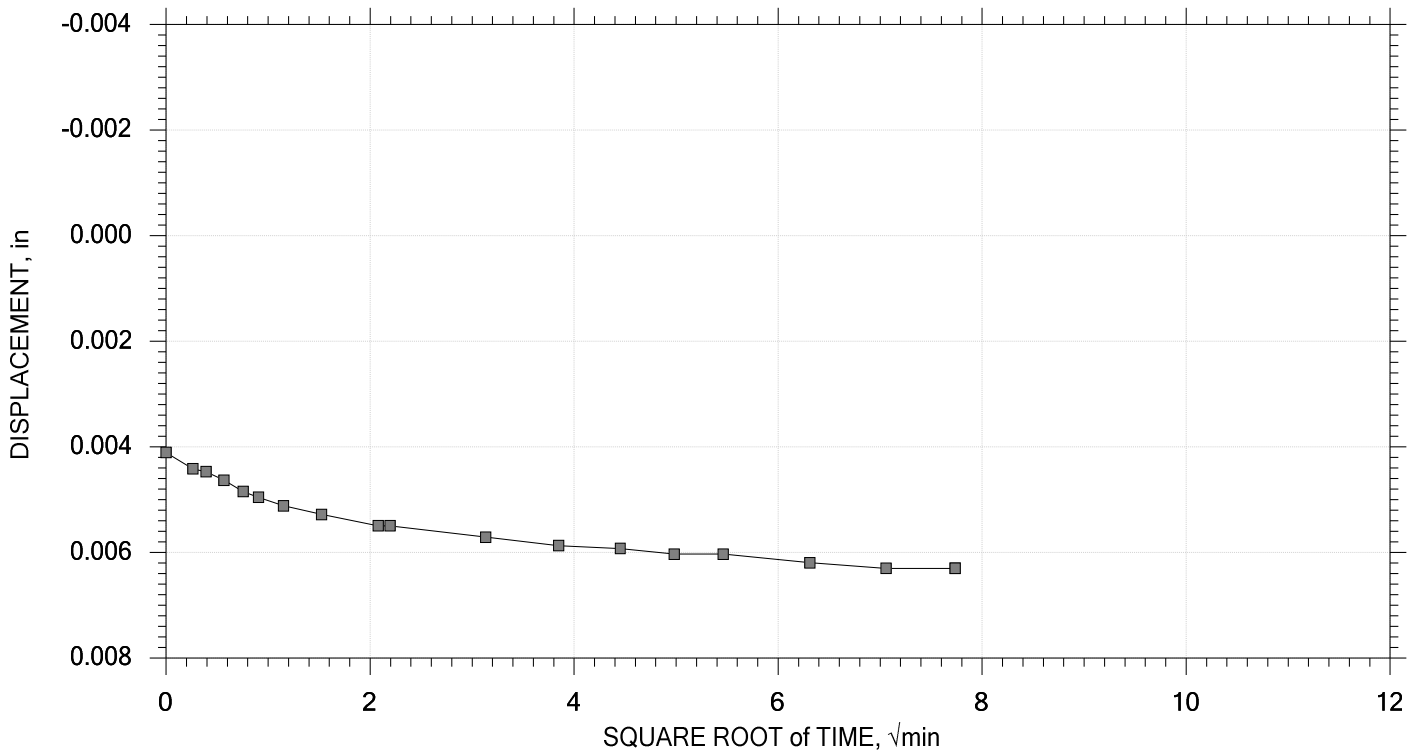
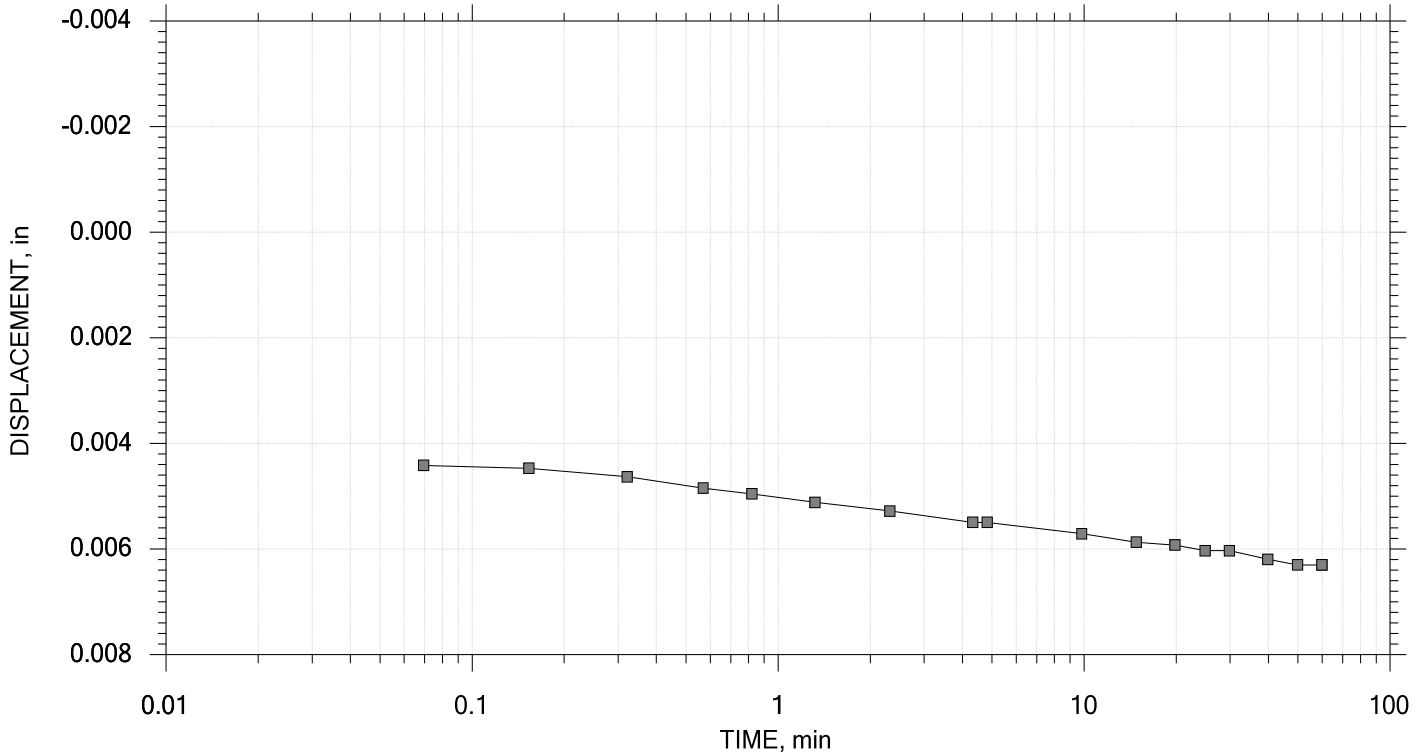
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		
Displacement at End of Primary		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Volume Step 1 of 21

Stress: 0.063044 tsf



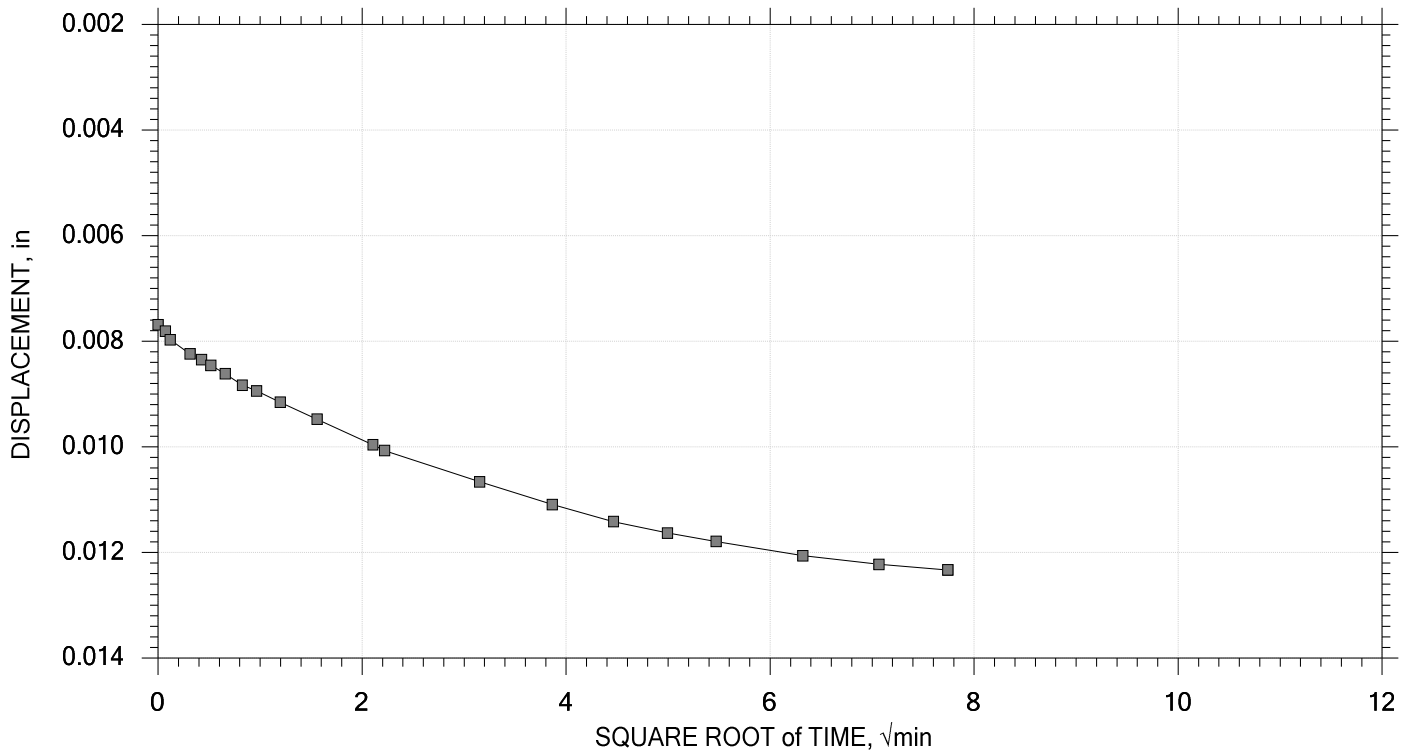
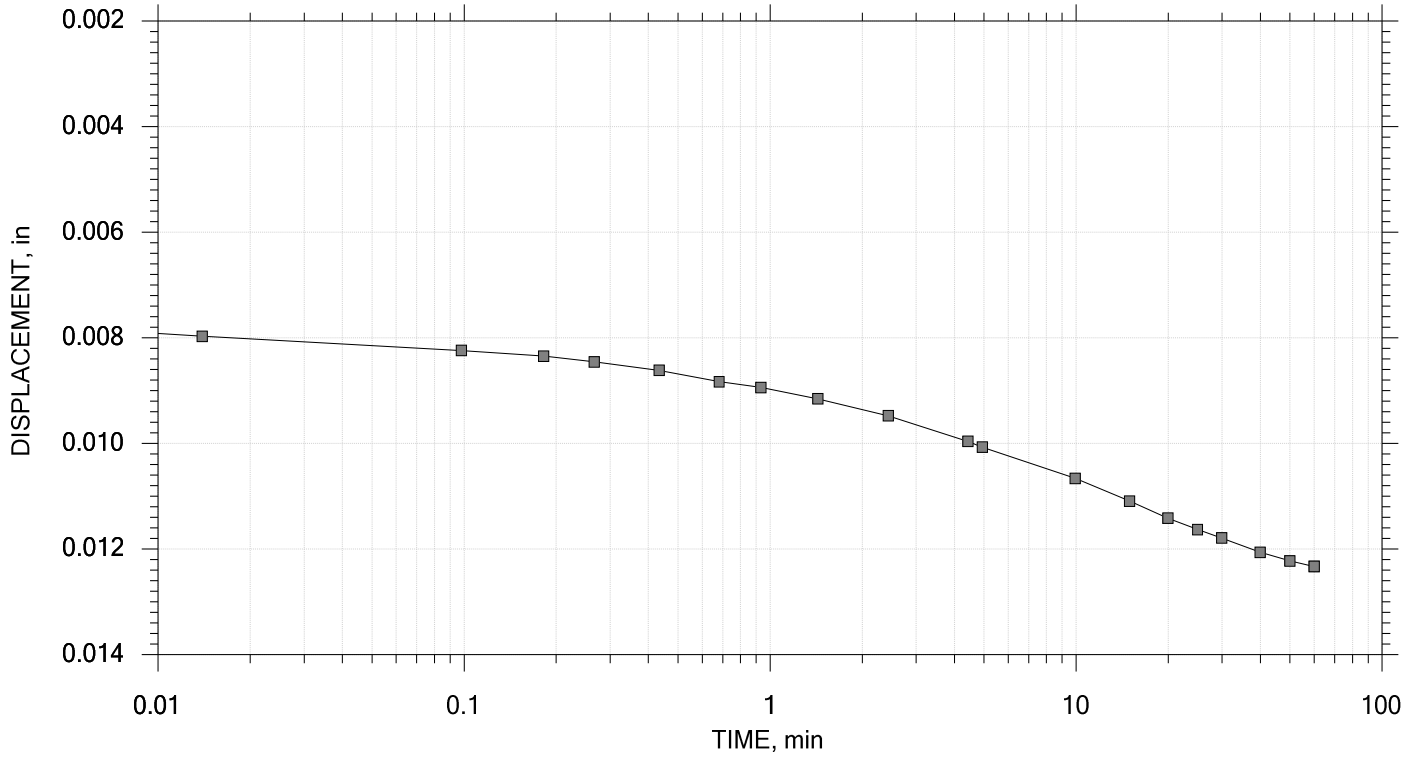
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 2 of 21

Stress: 0.125 tsf



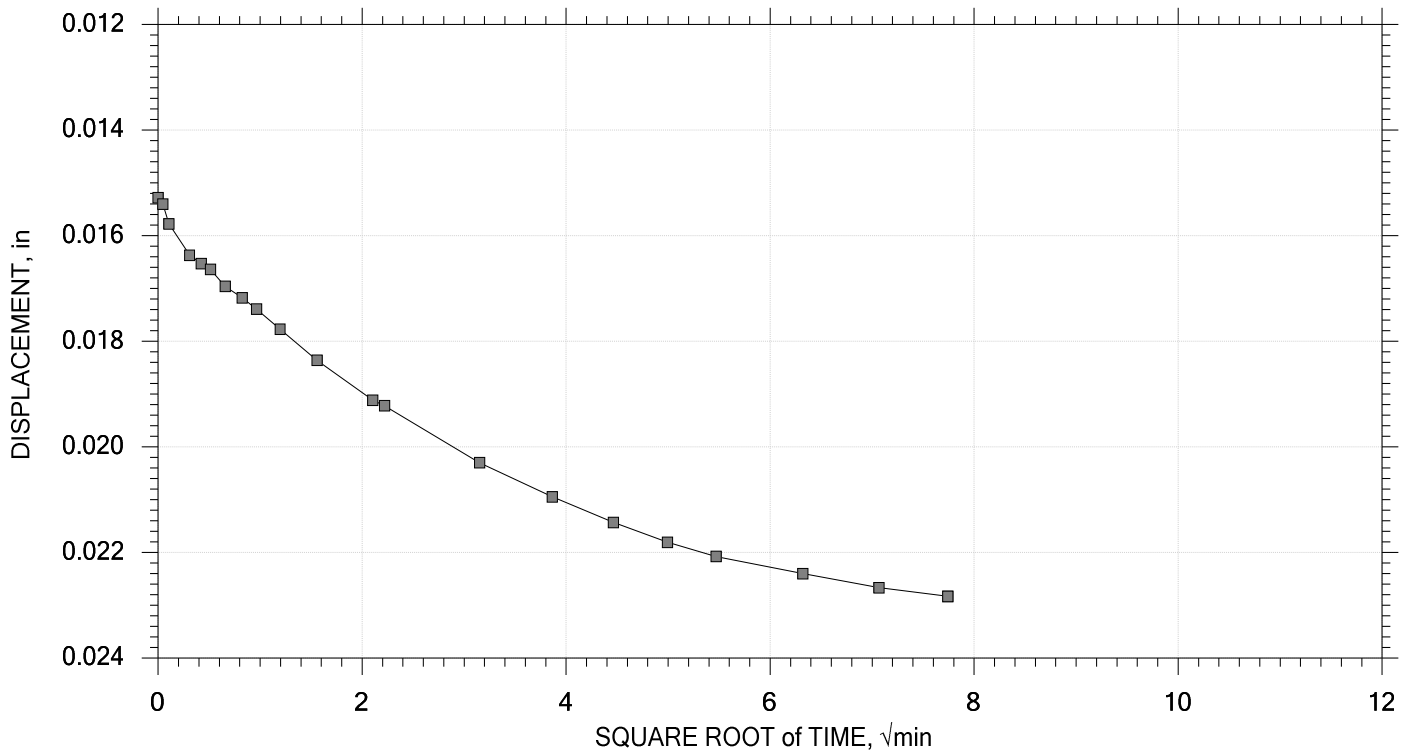
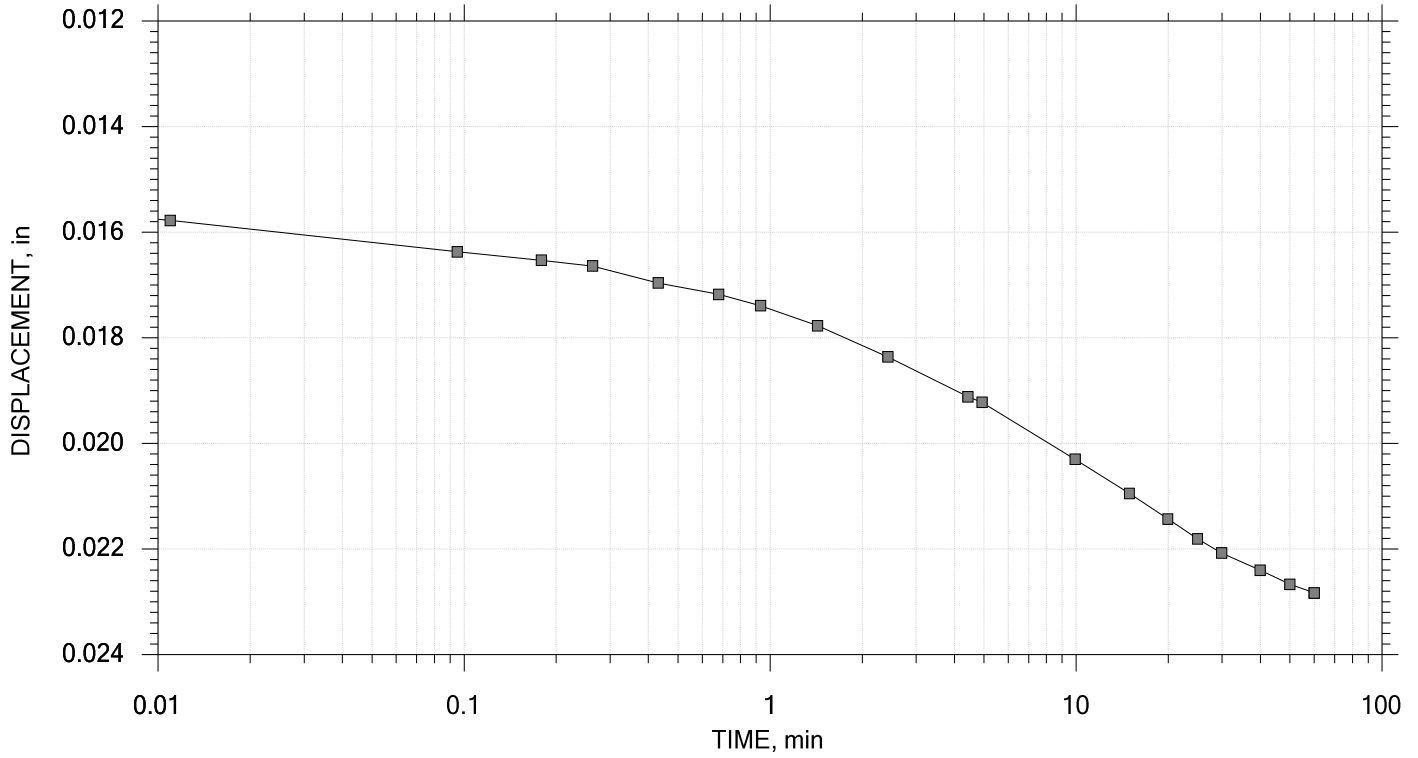
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 3 of 21

Stress: 0.25 tsf



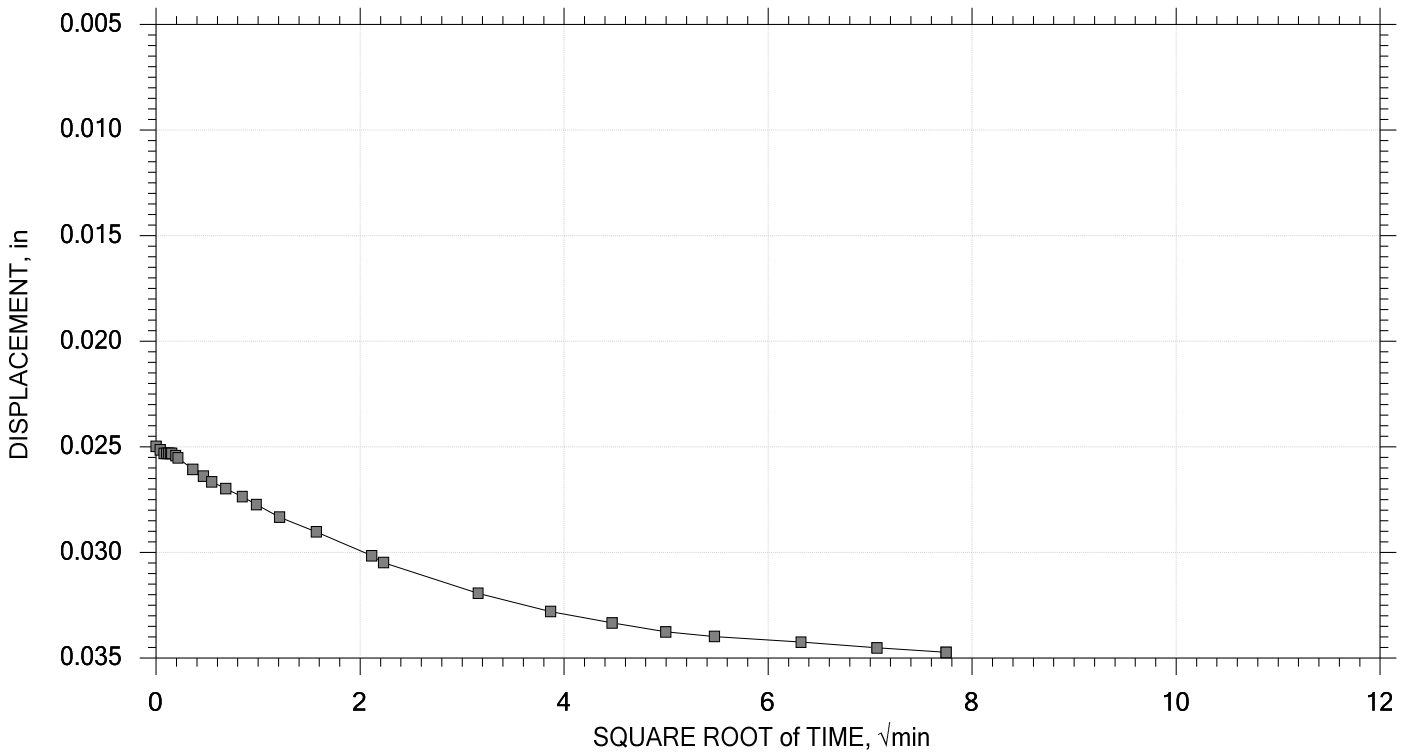
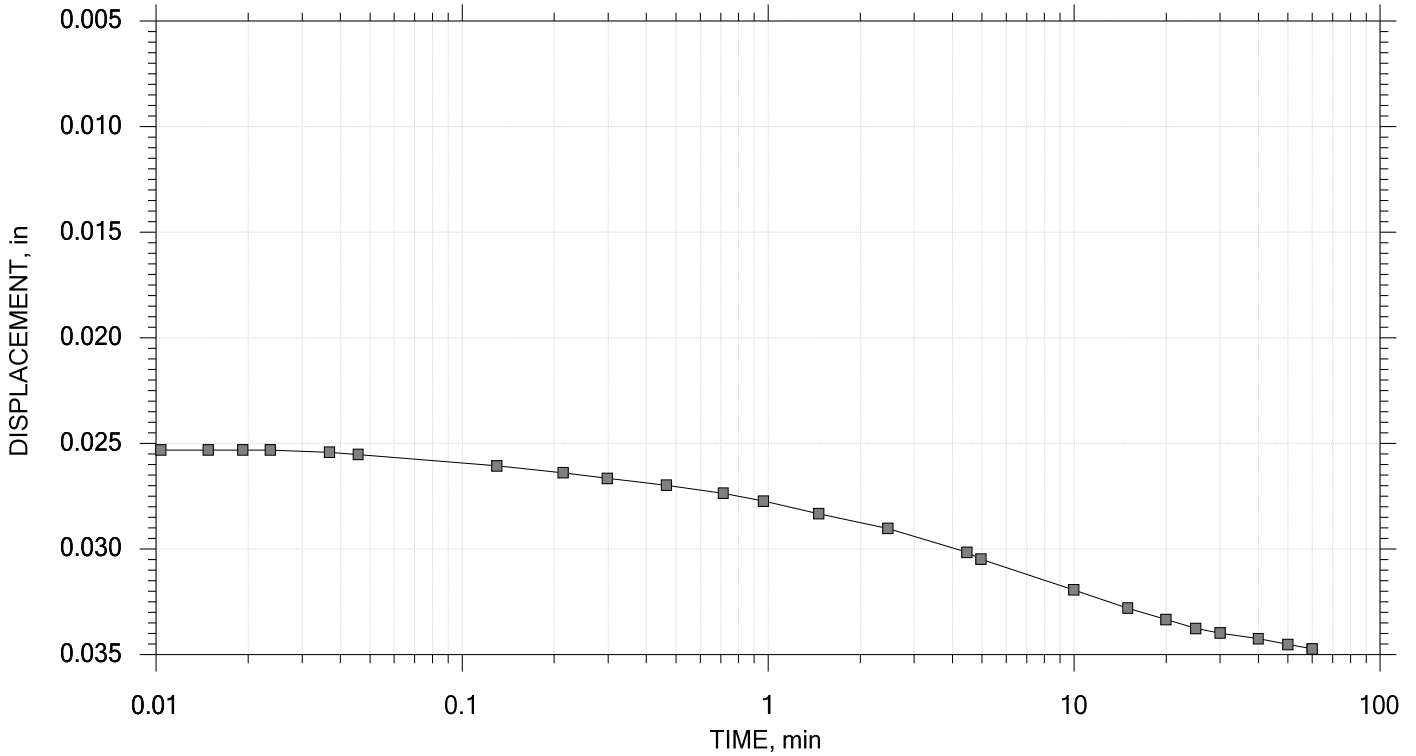
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 4 of 21

Stress: 0.5 tsf



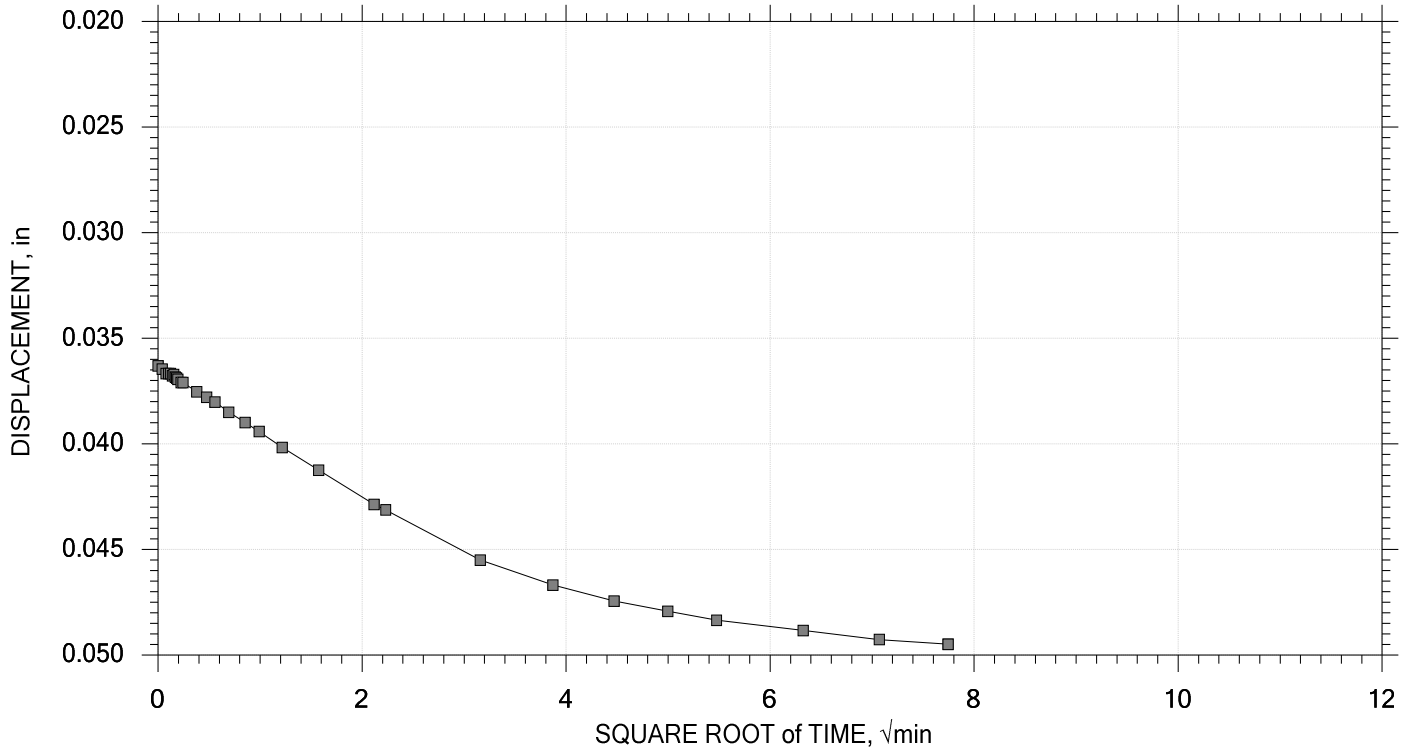
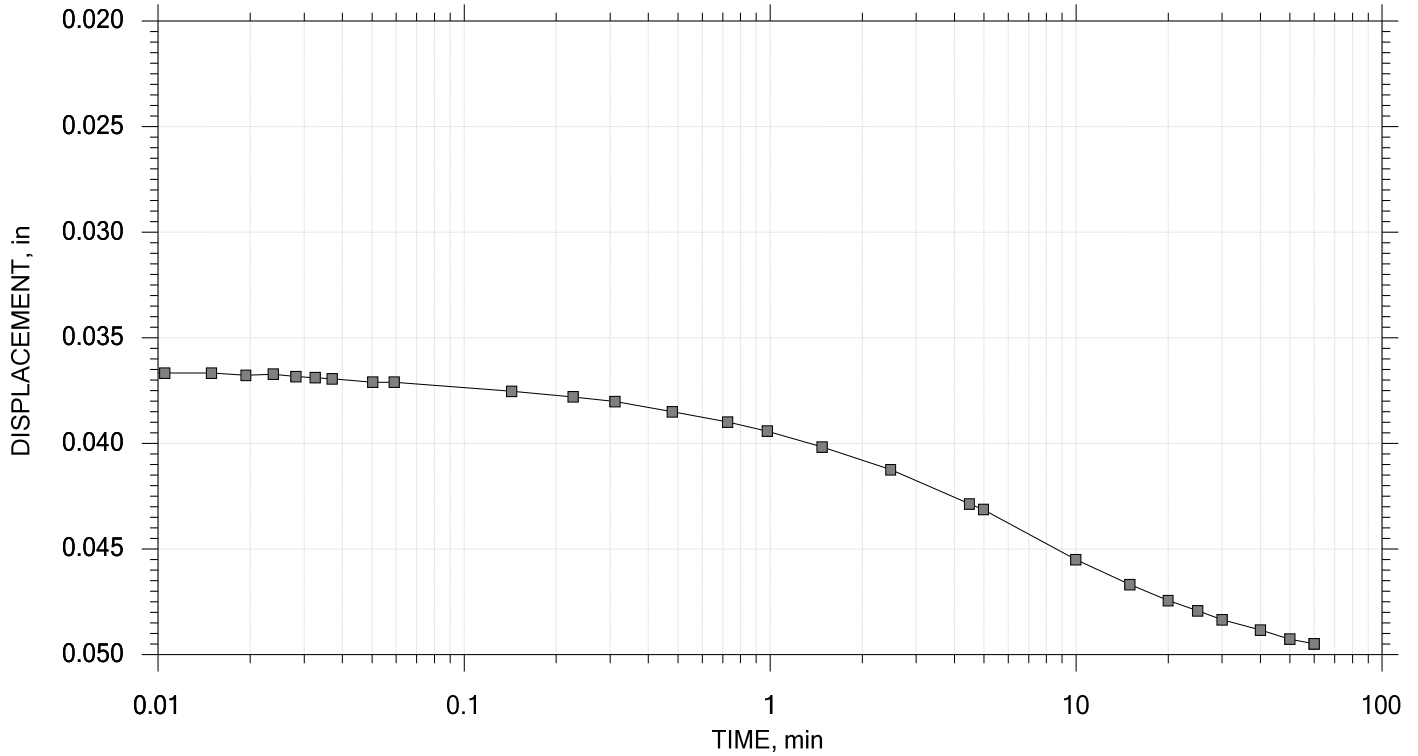
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 5 of 21

Stress: 1 tsf



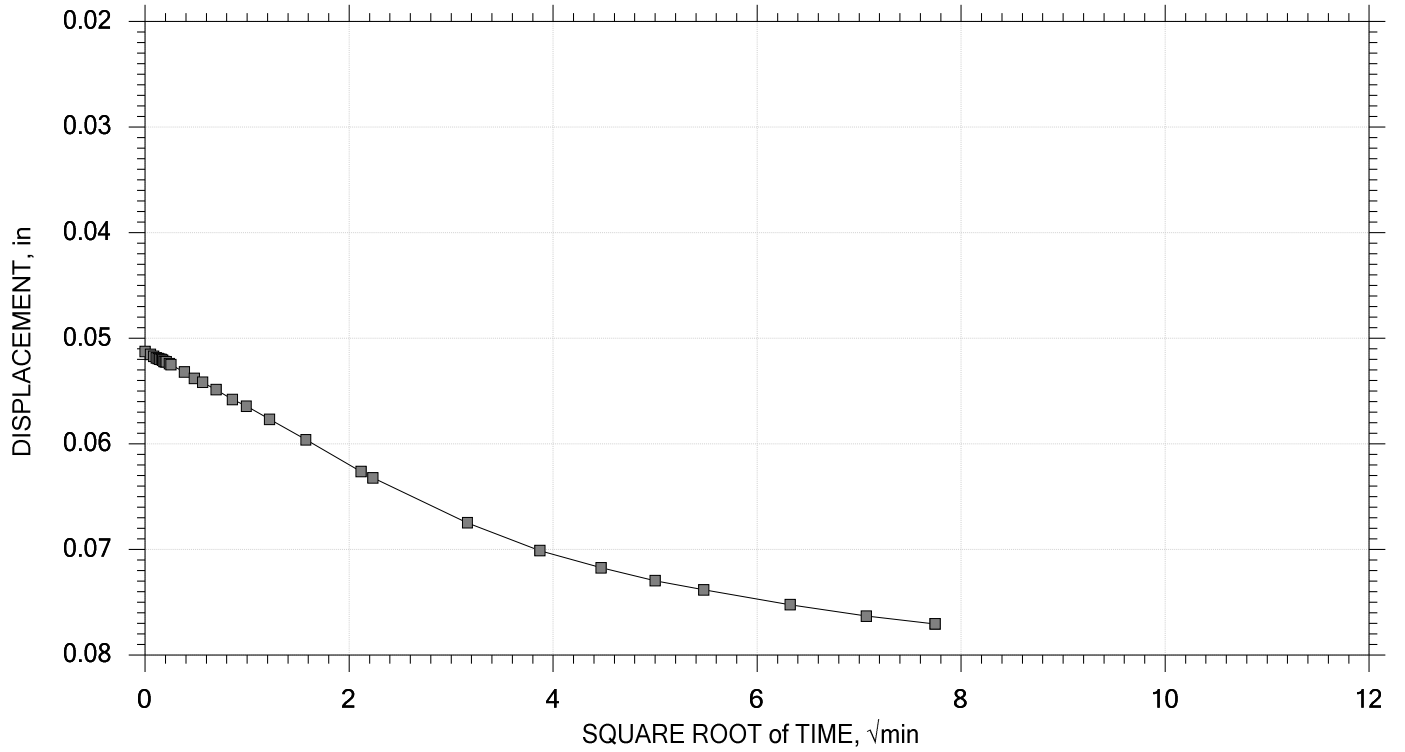
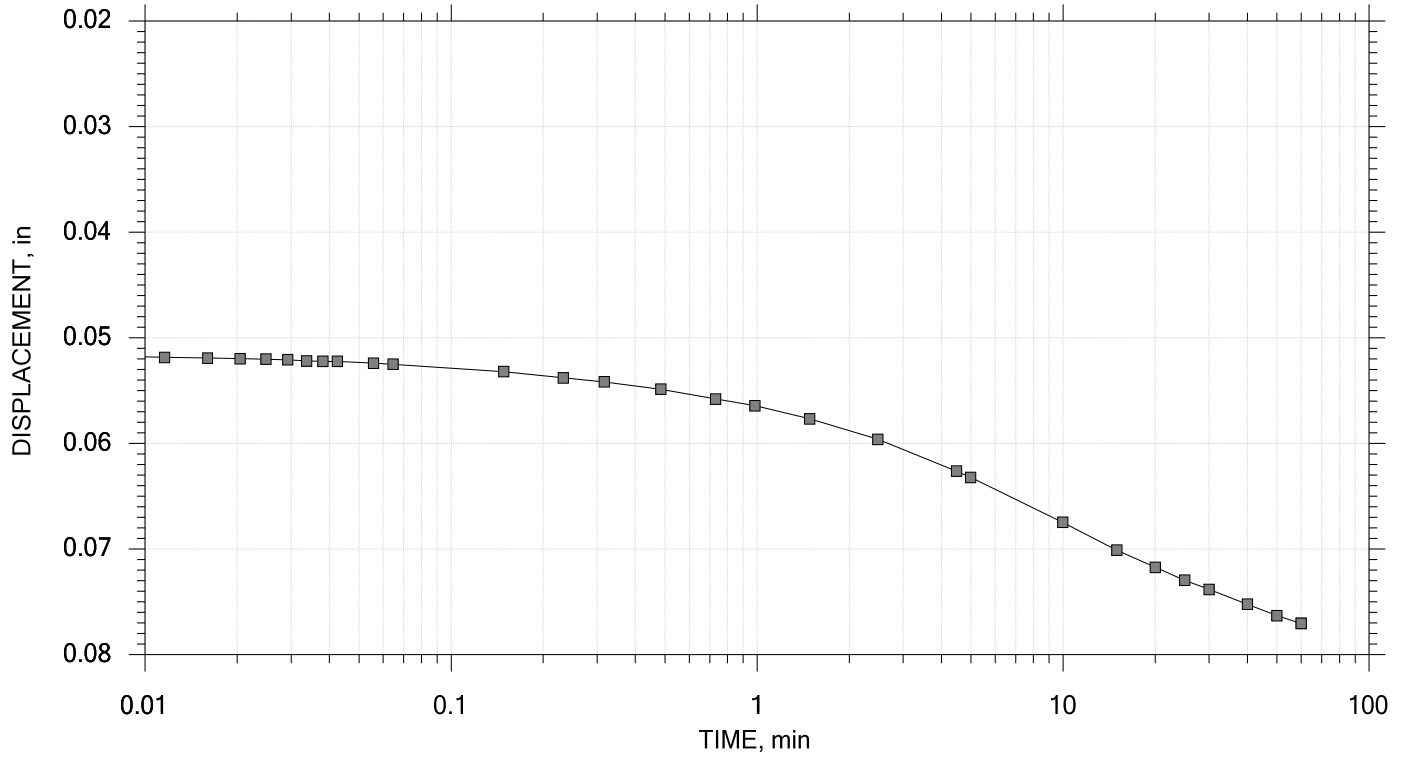
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 6 of 21

Stress: 2 tsf



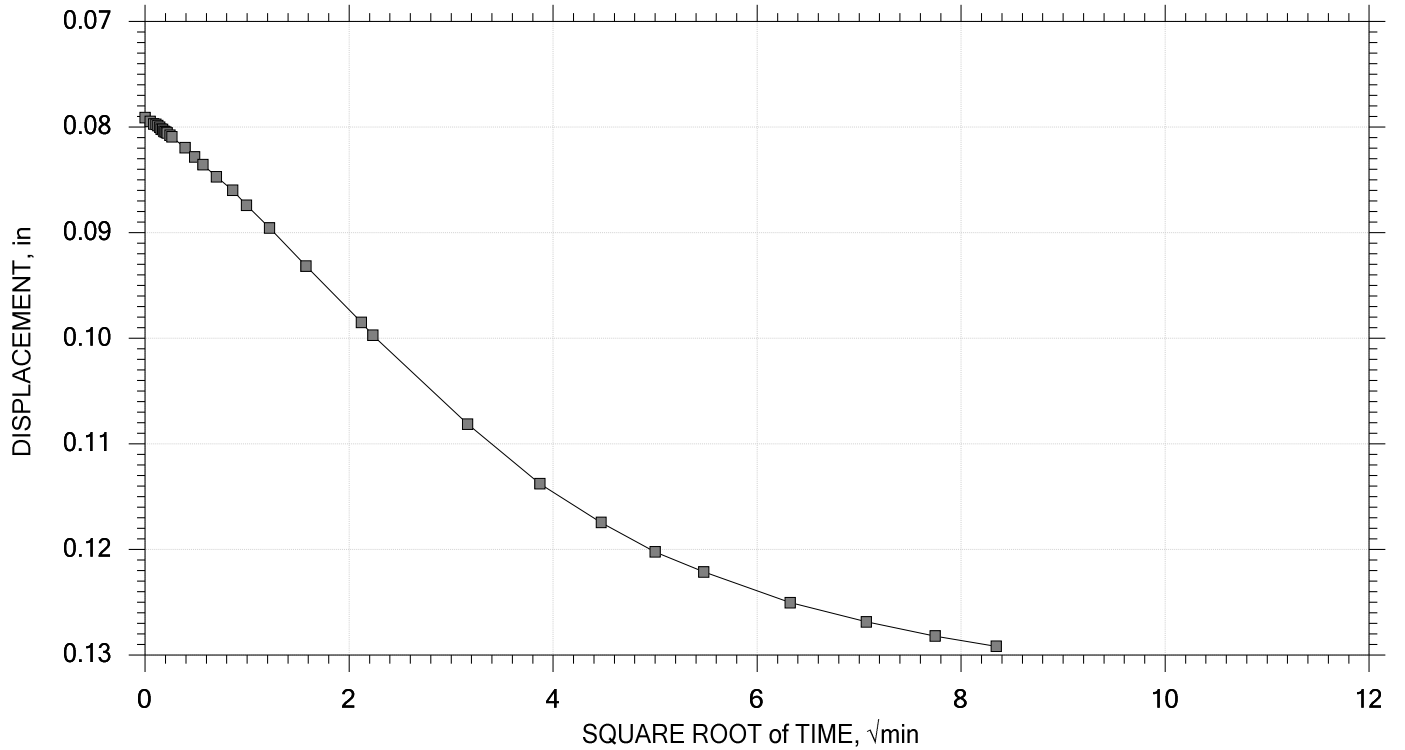
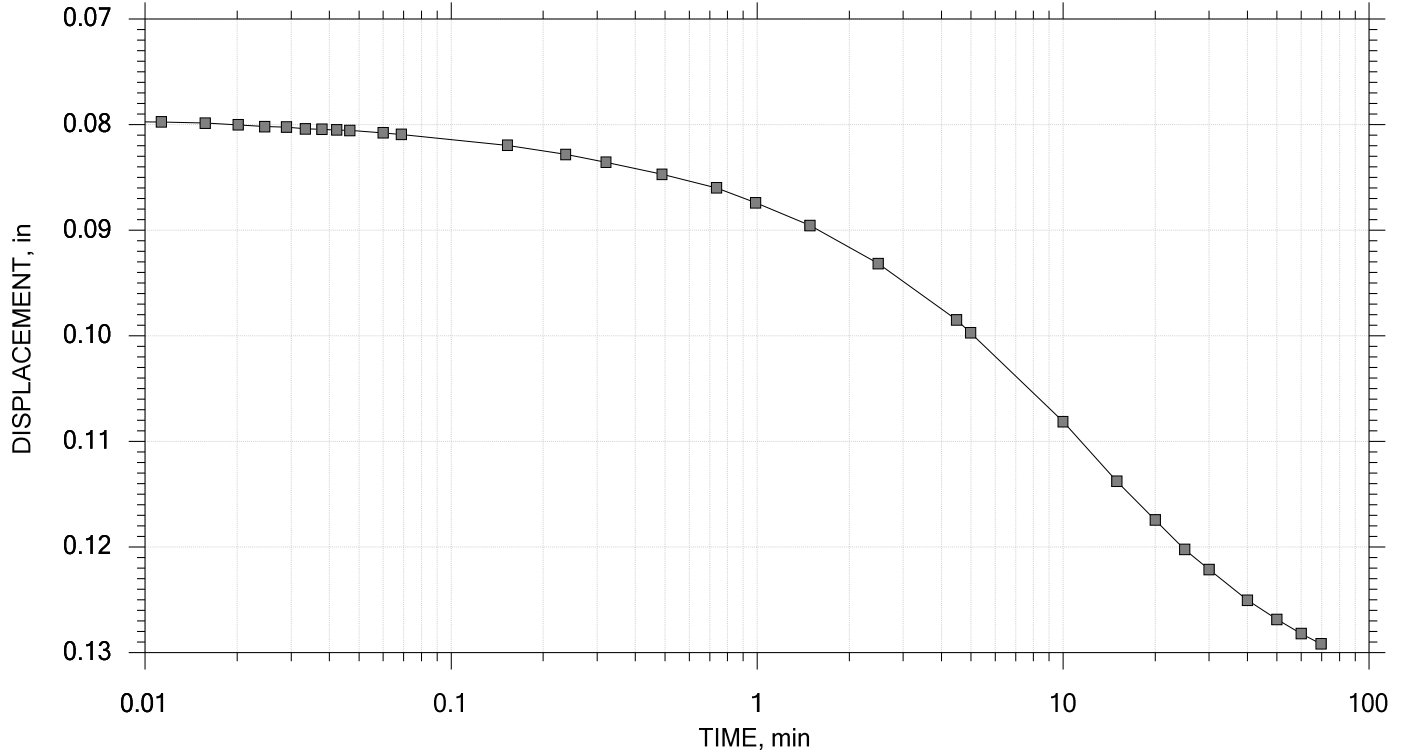
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 7 of 21

Stress: 4 tsf



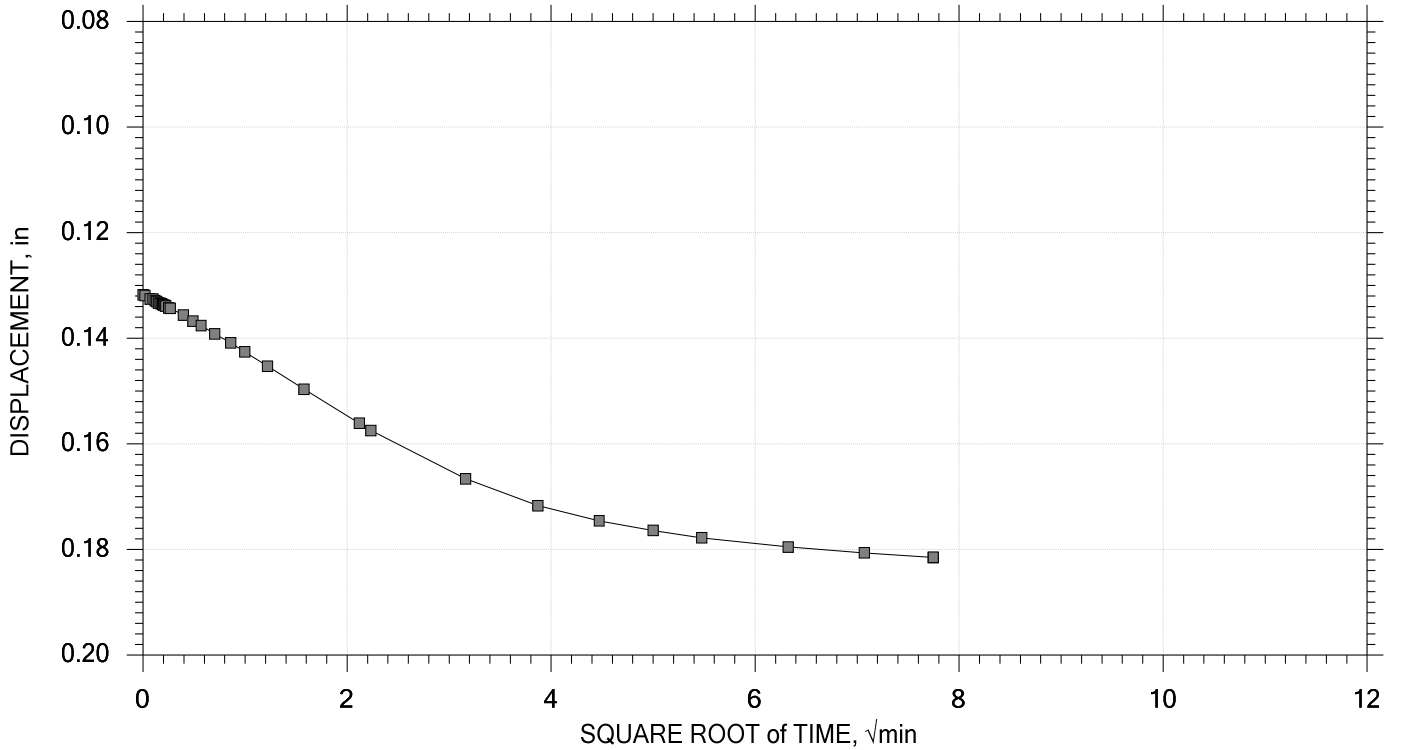
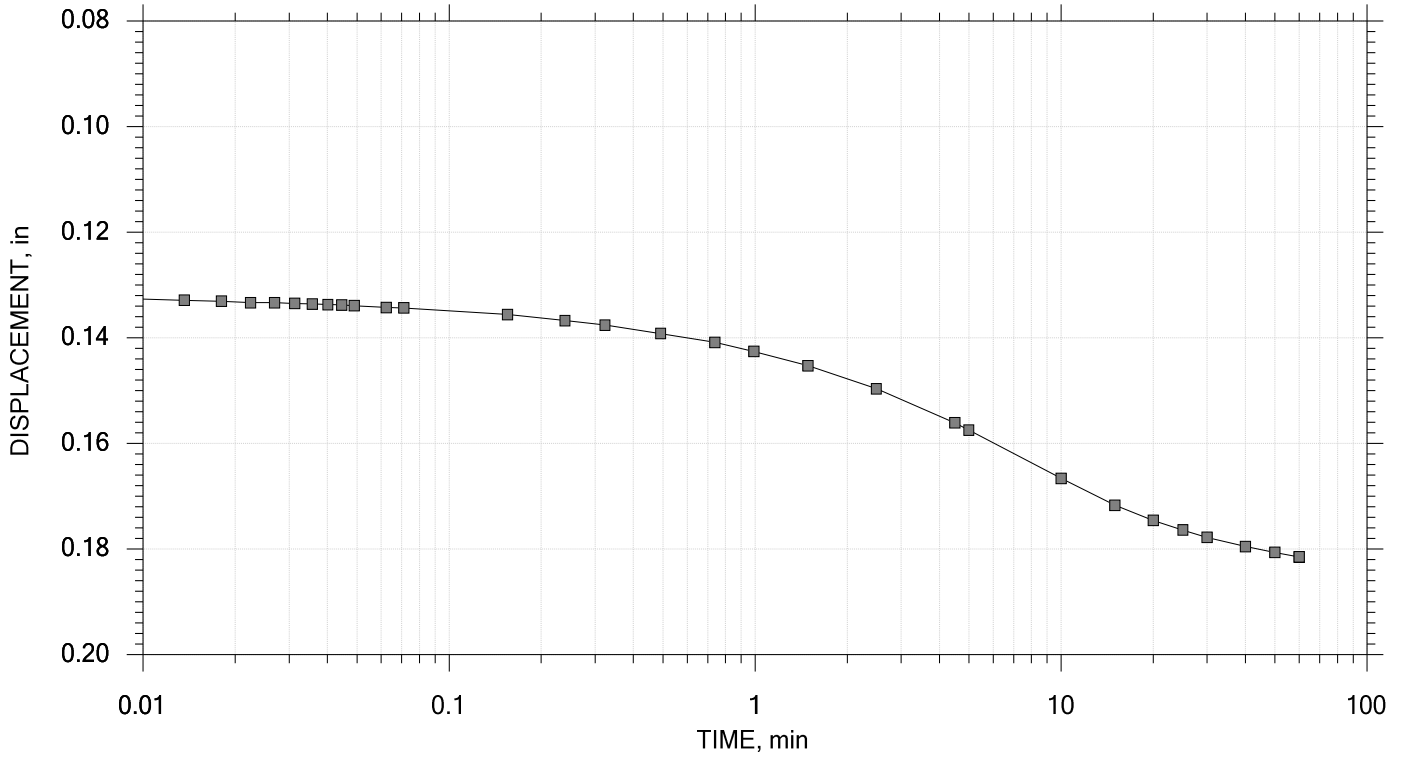
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 8 of 21

Stress: 8 tsf



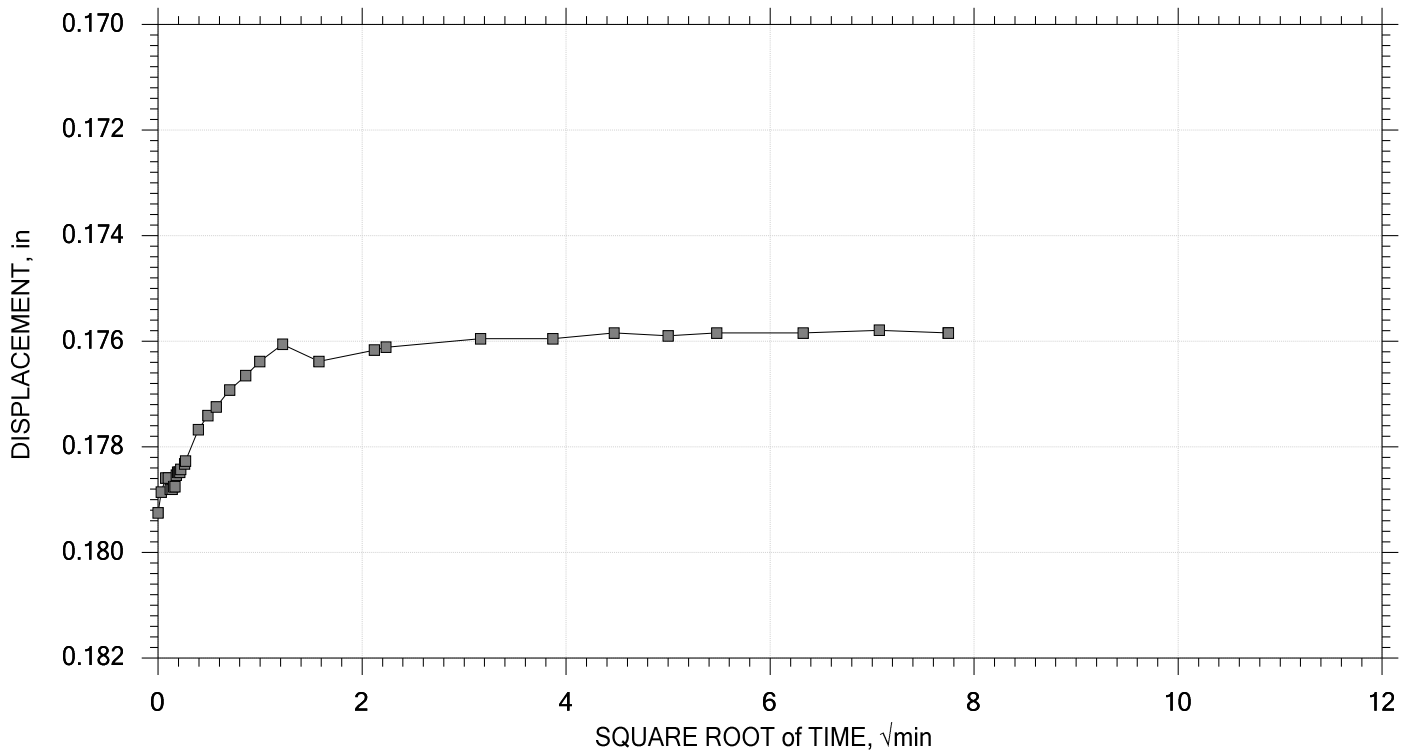
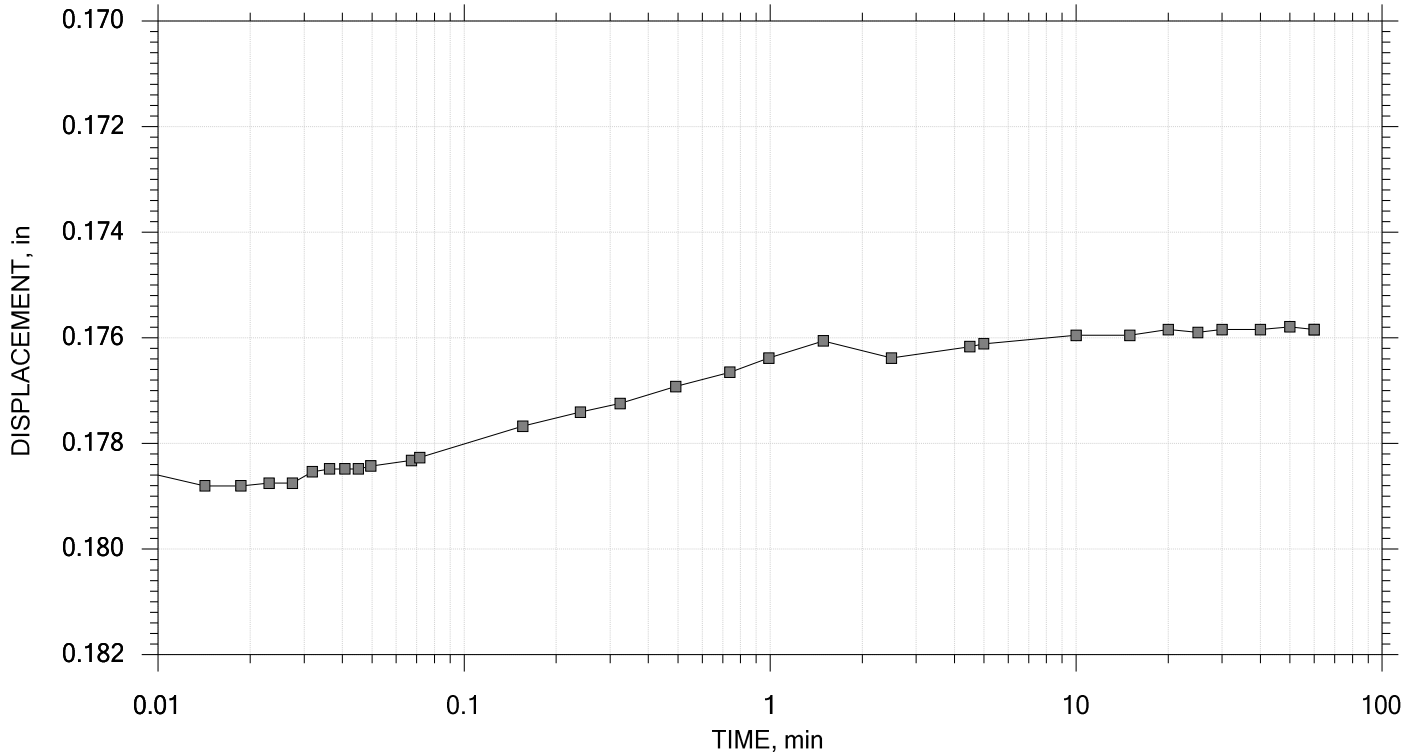
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 9 of 21

Stress: 4 tsf



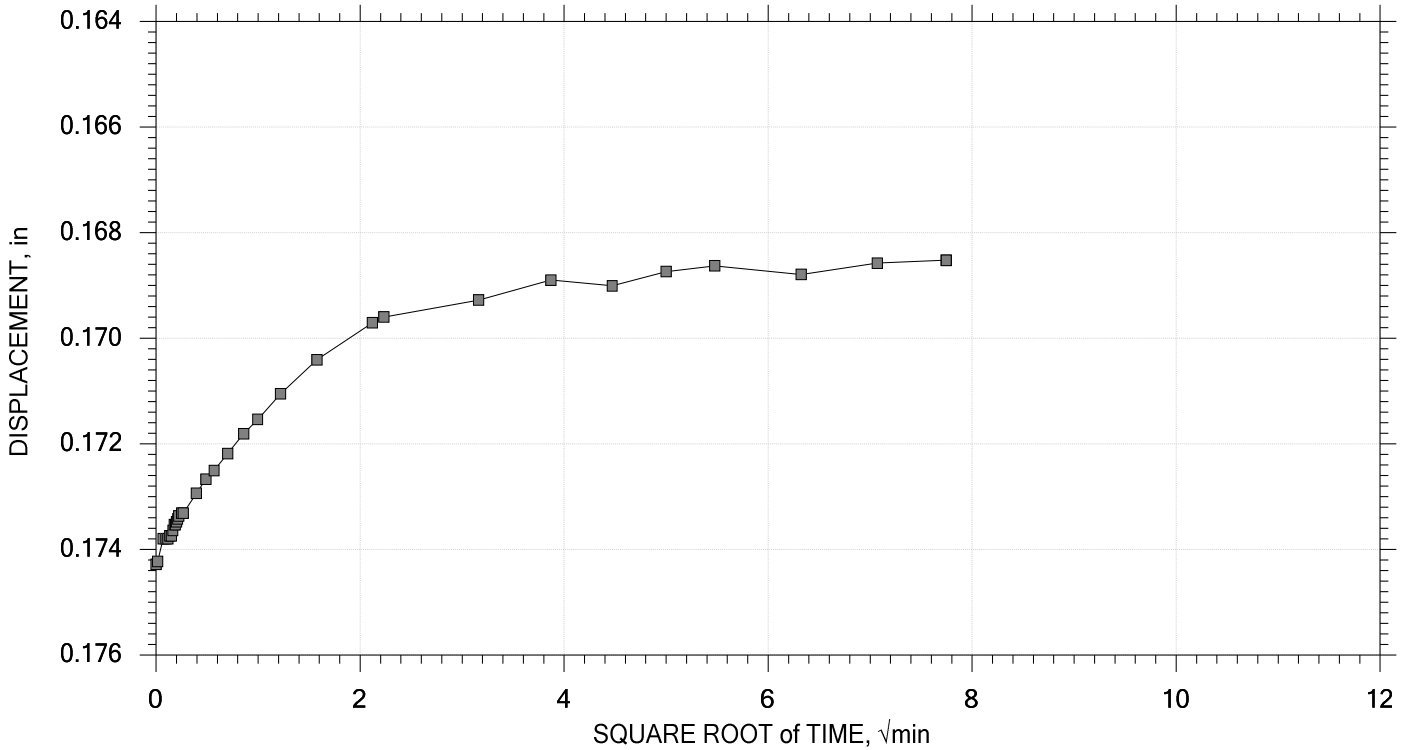
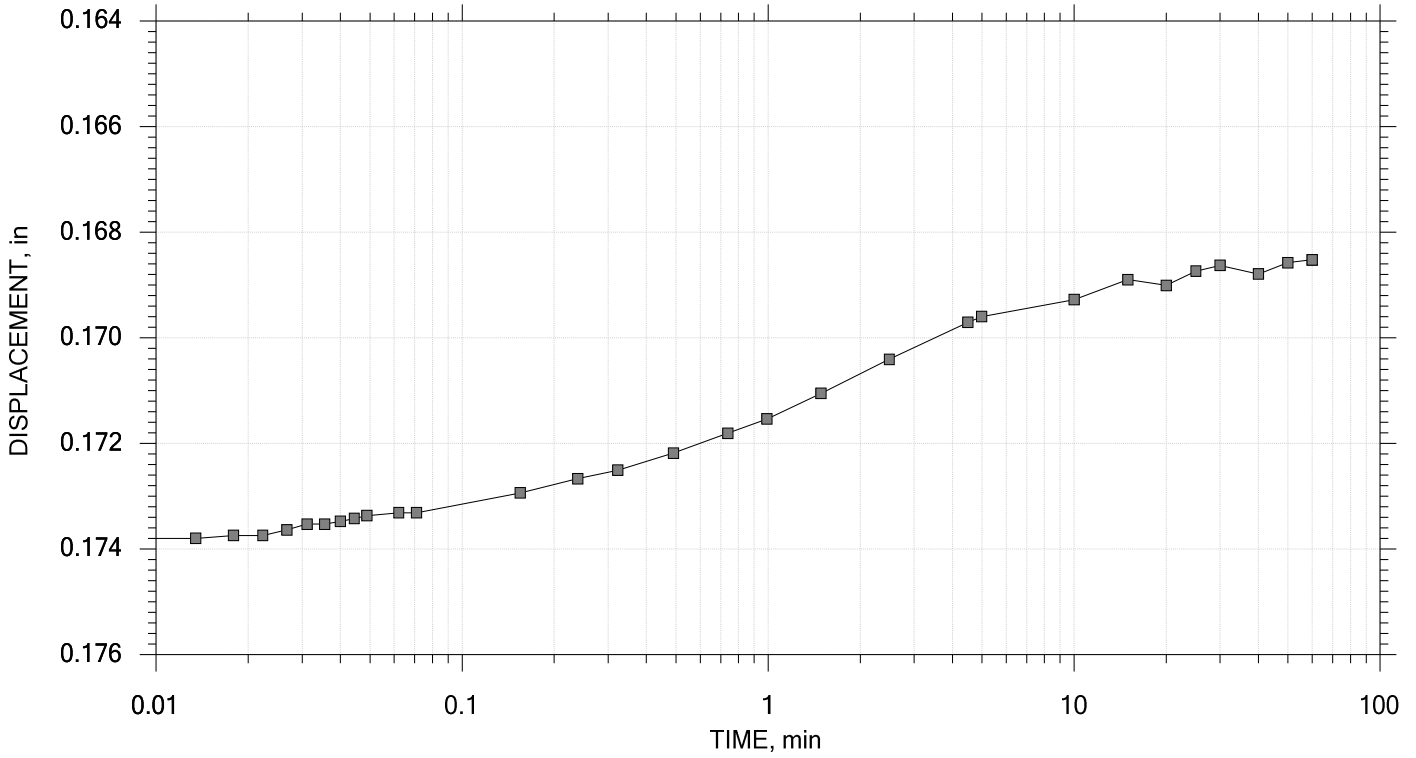
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 10 of 21

Stress: 2 tsf



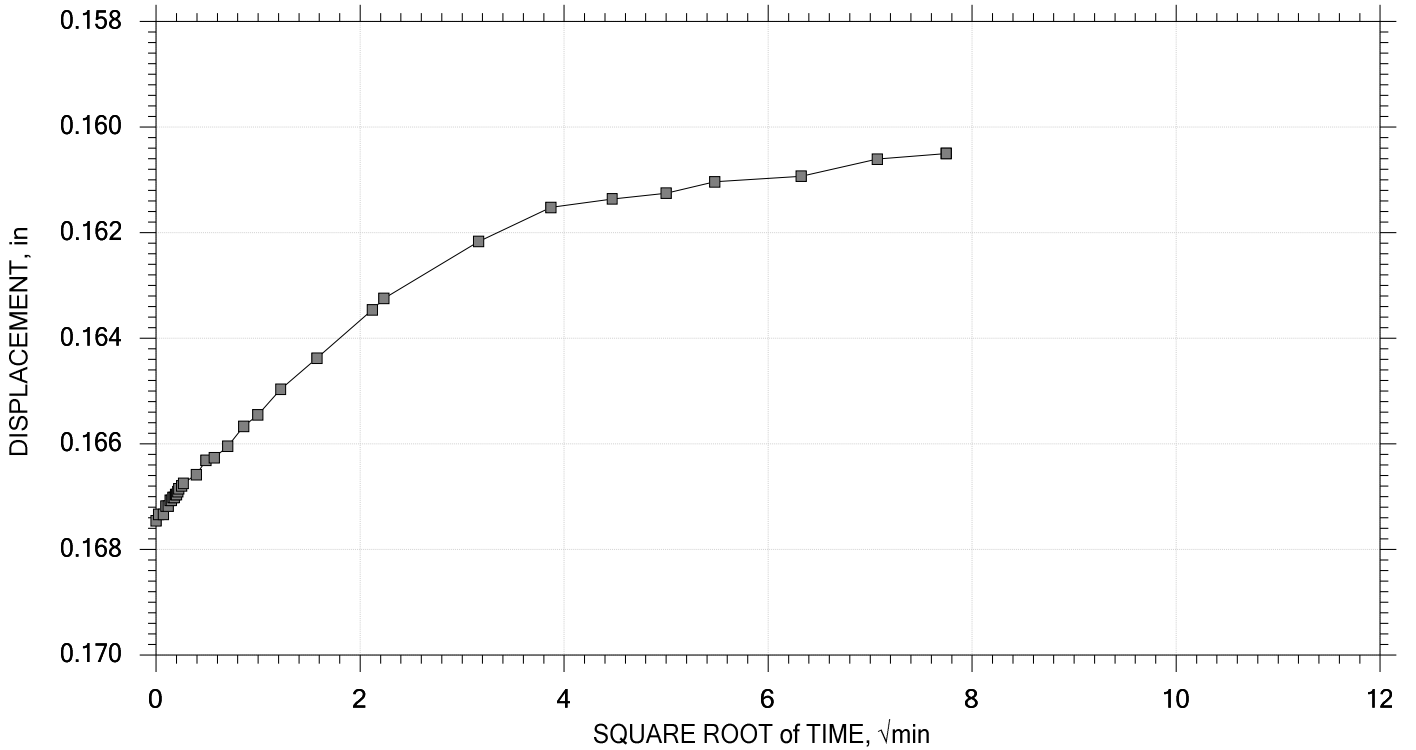
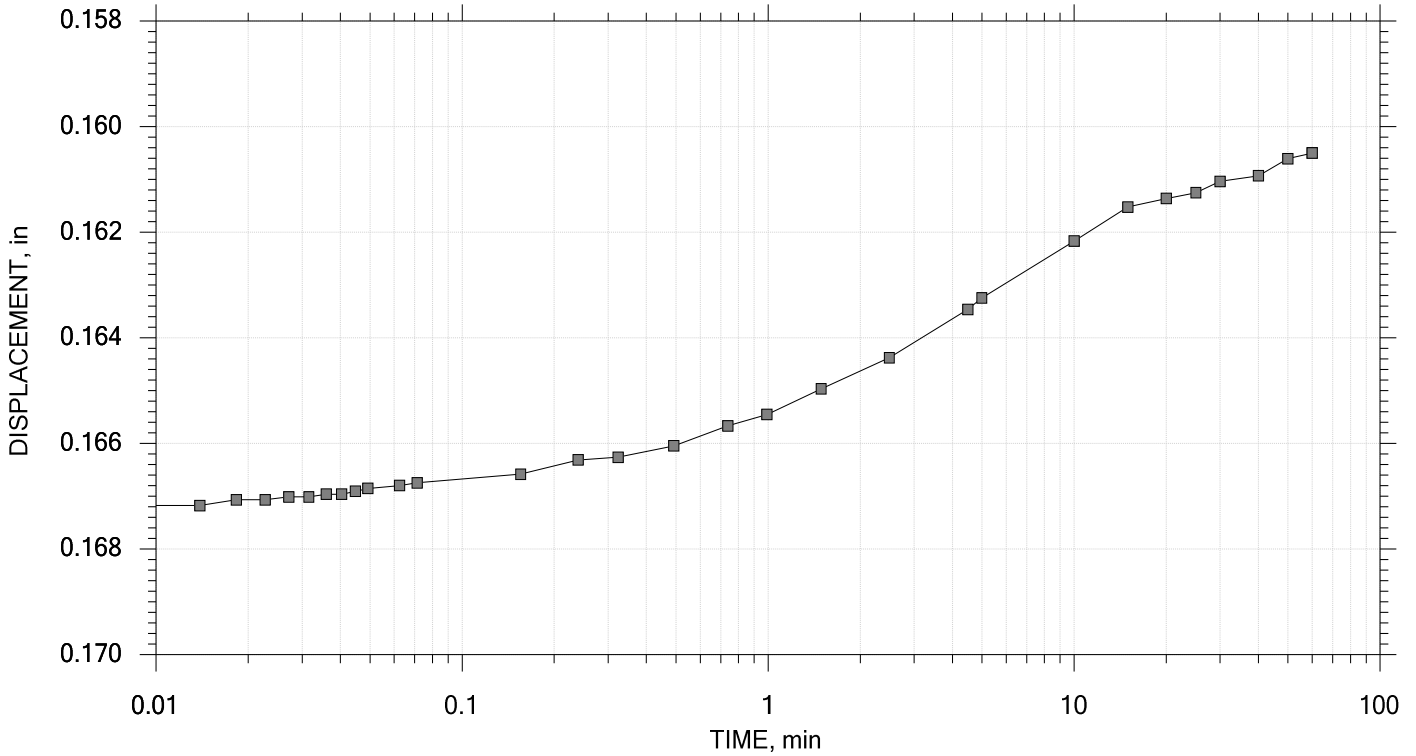
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 11 of 21

Stress: 1 tsf



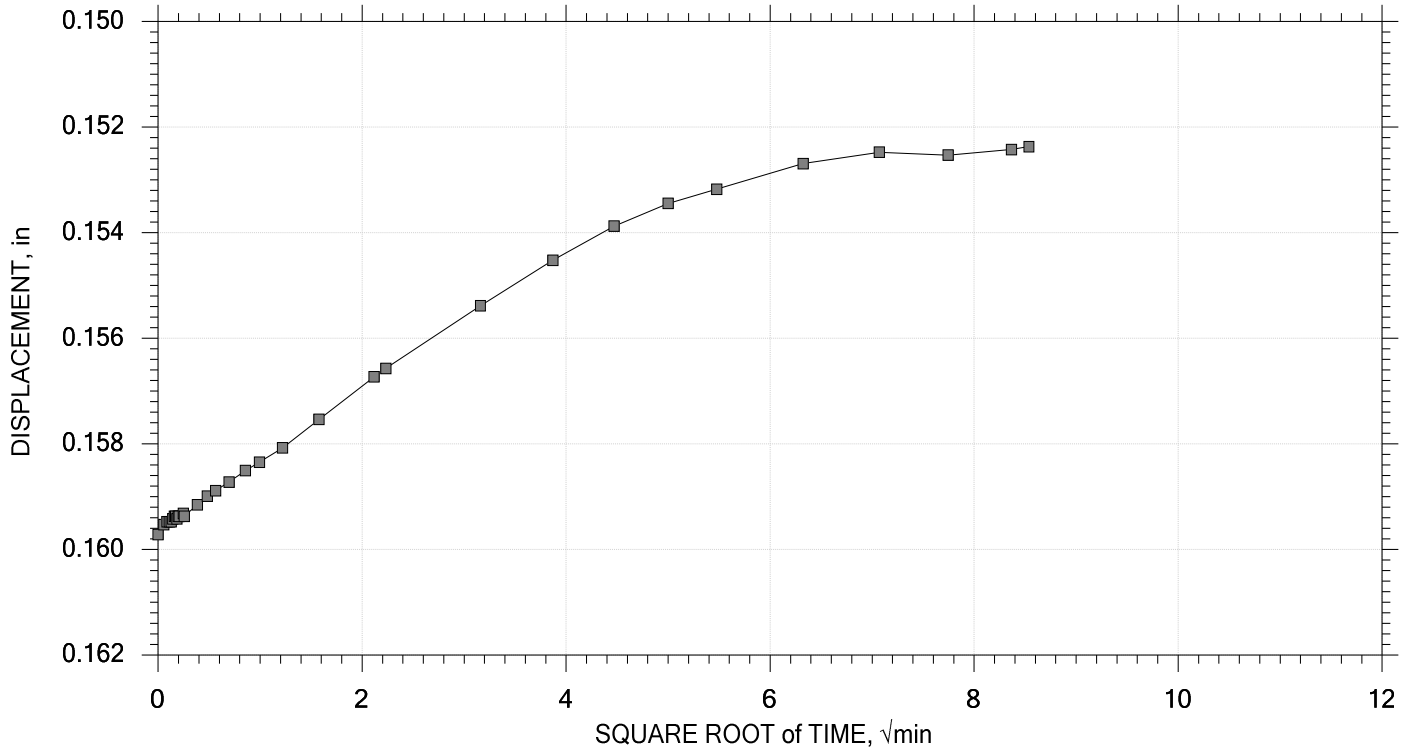
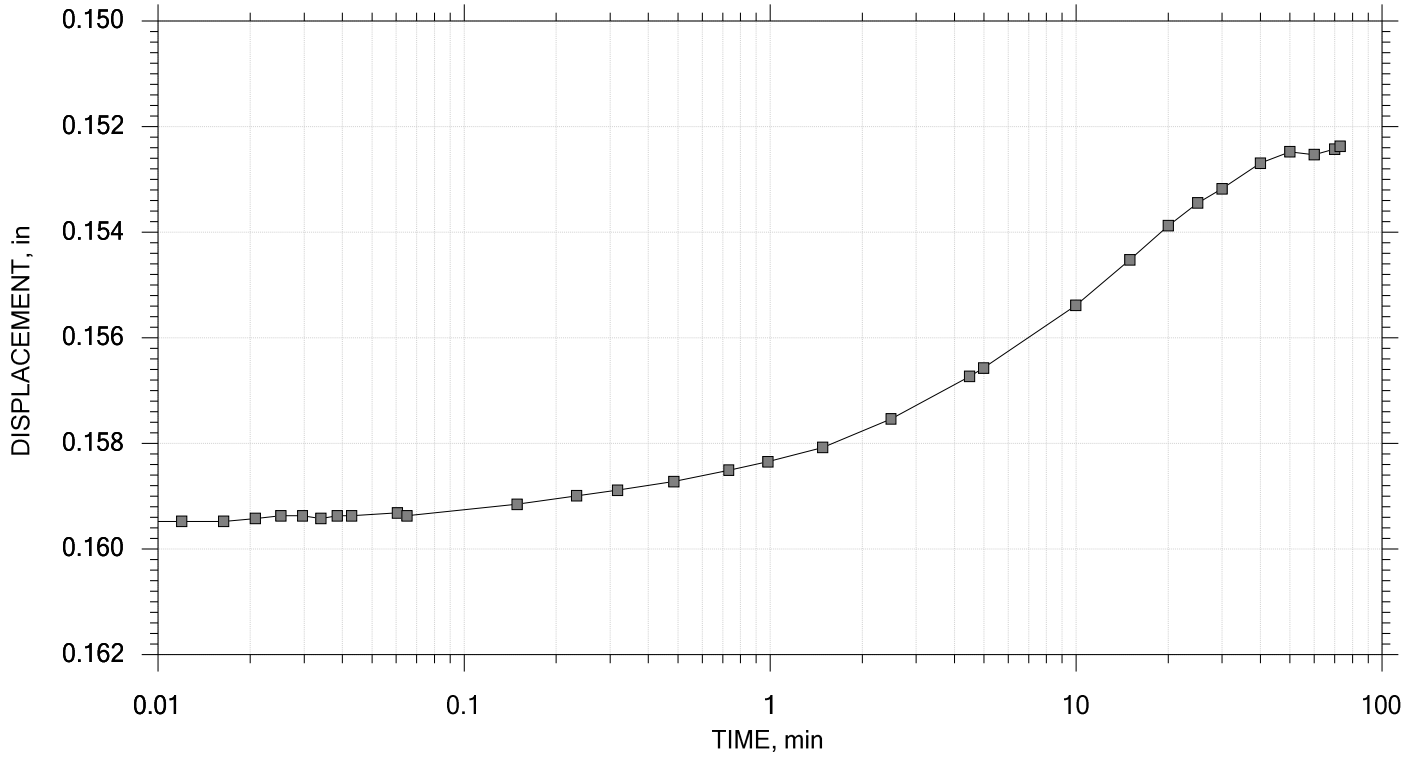
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 12 of 21

Stress: 0.5 tsf



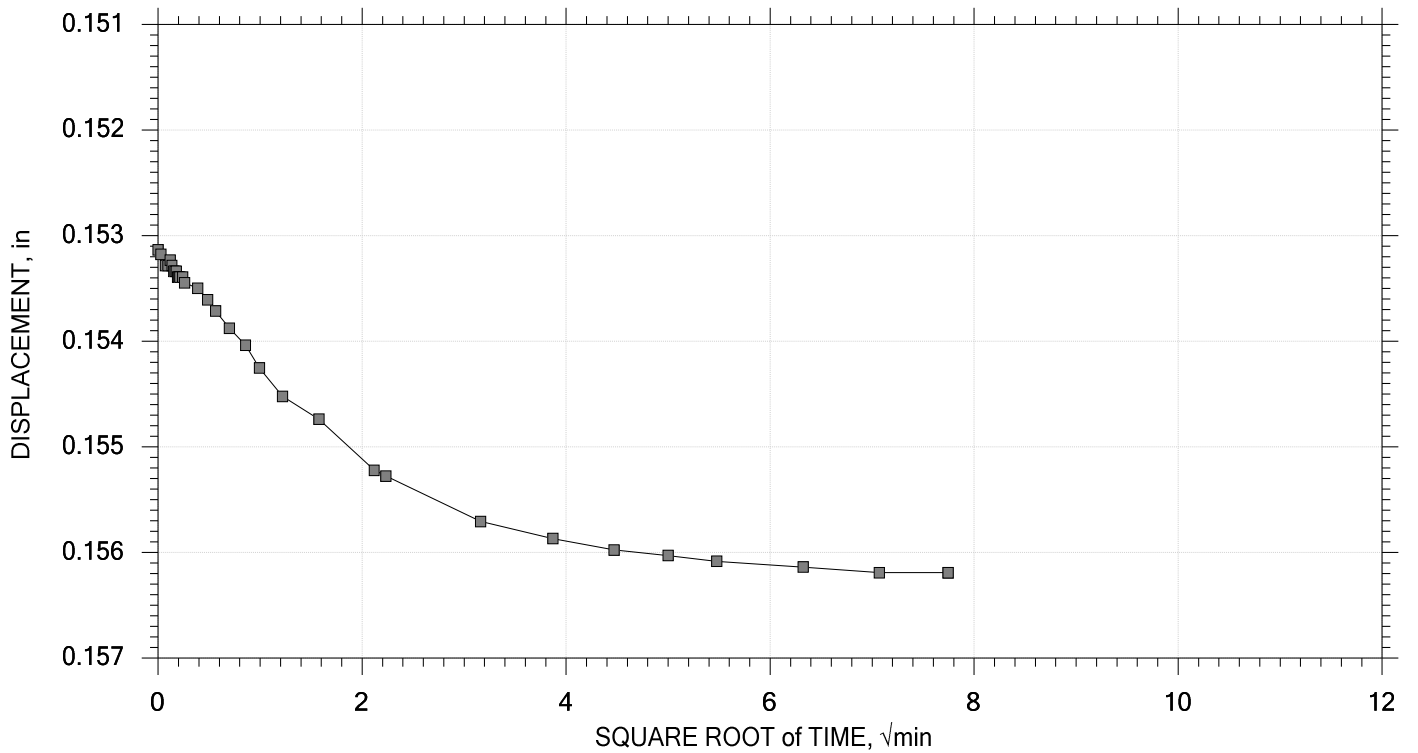
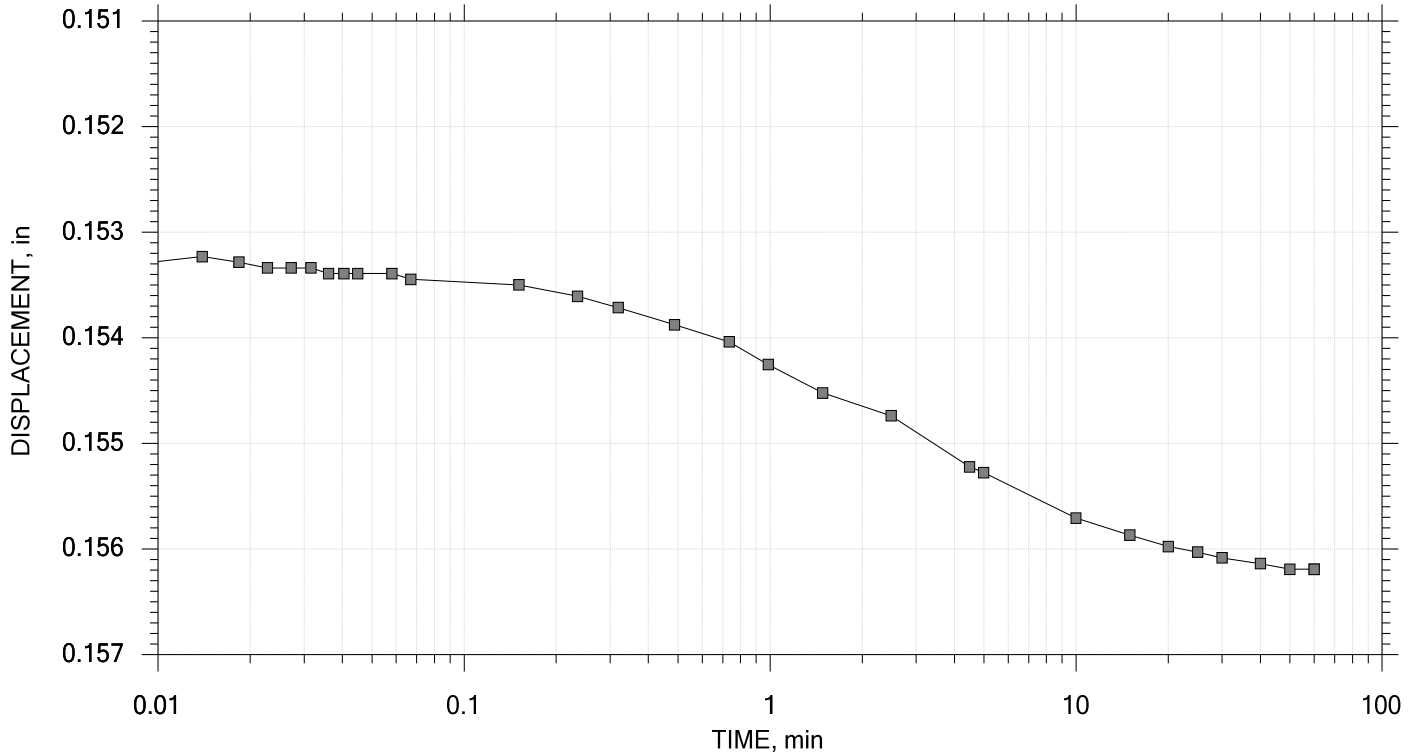
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 13 of 21

Stress: 1 tsf



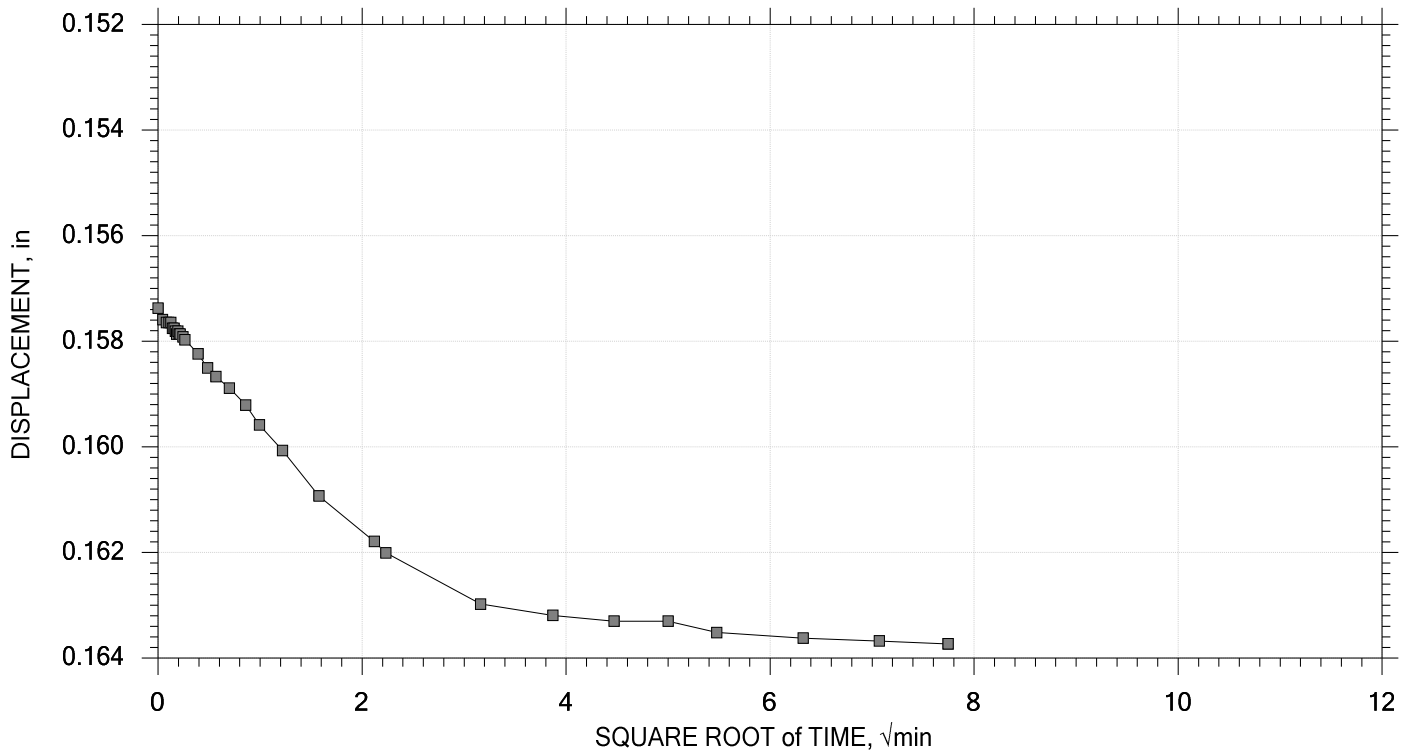
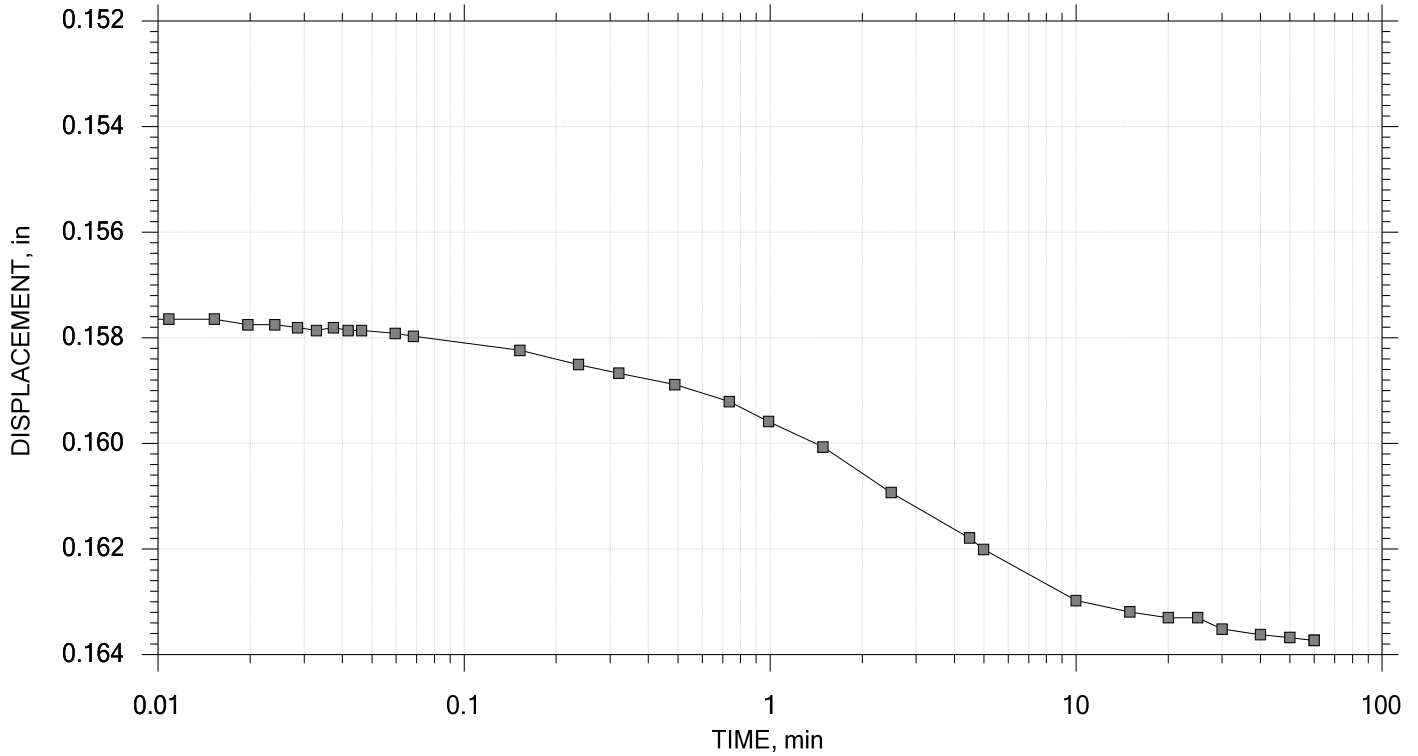
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 14 of 21

Stress: 2 tsf



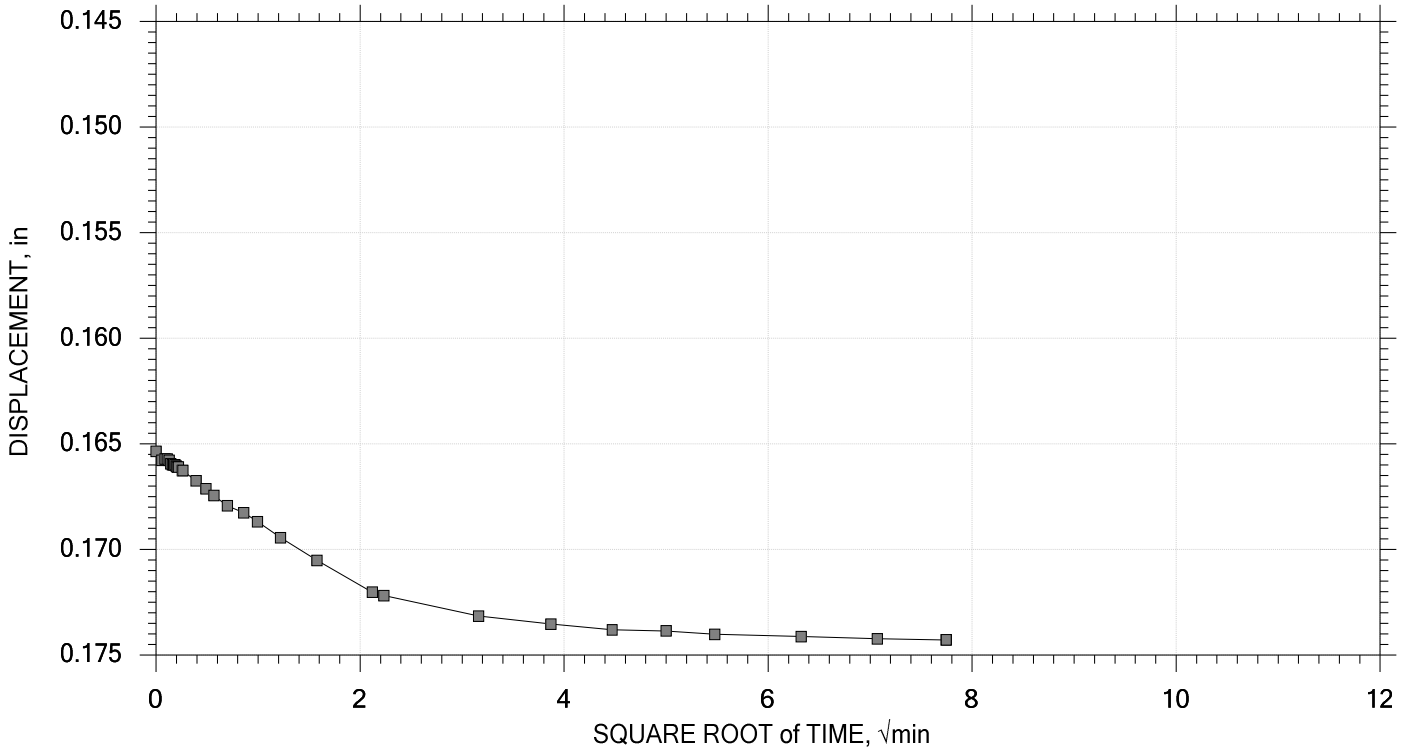
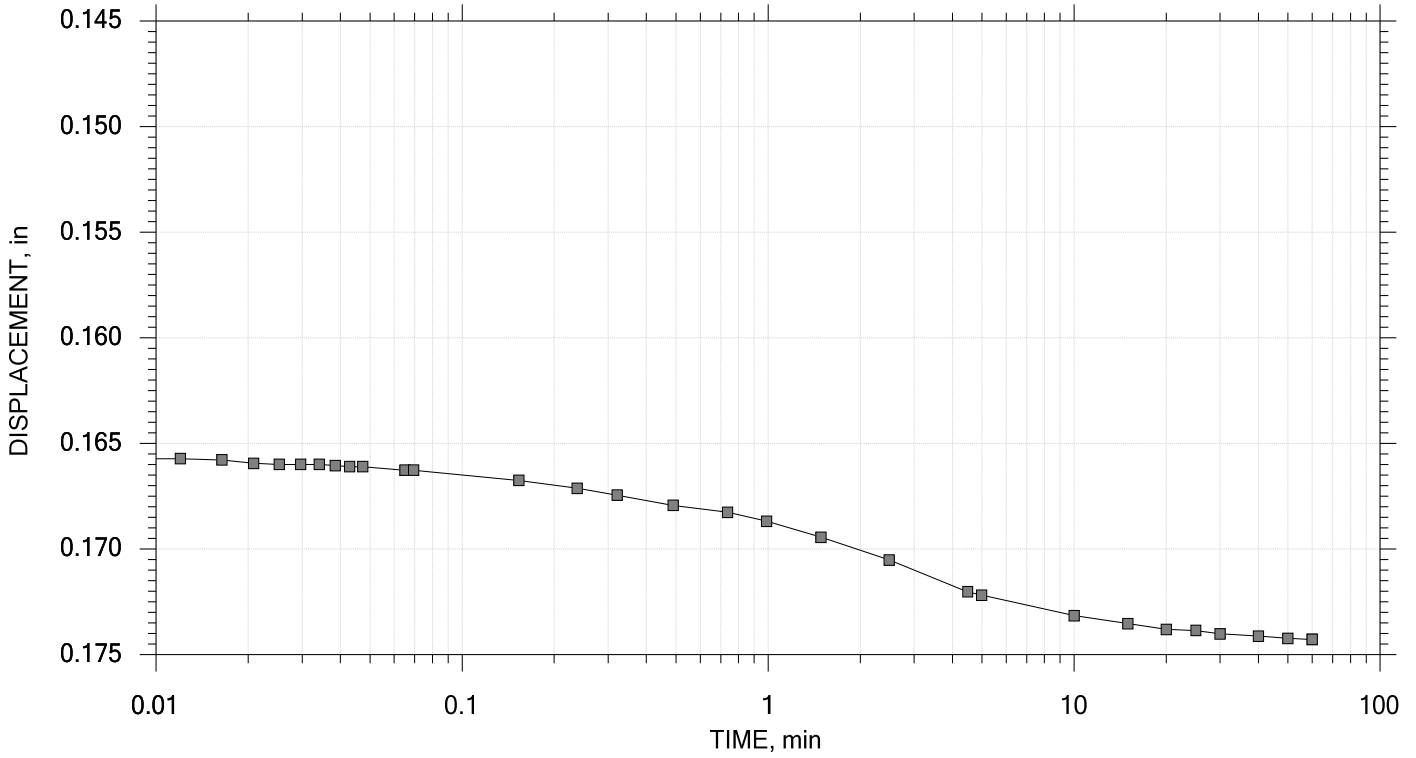
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 15 of 21

Stress: 4 tsf



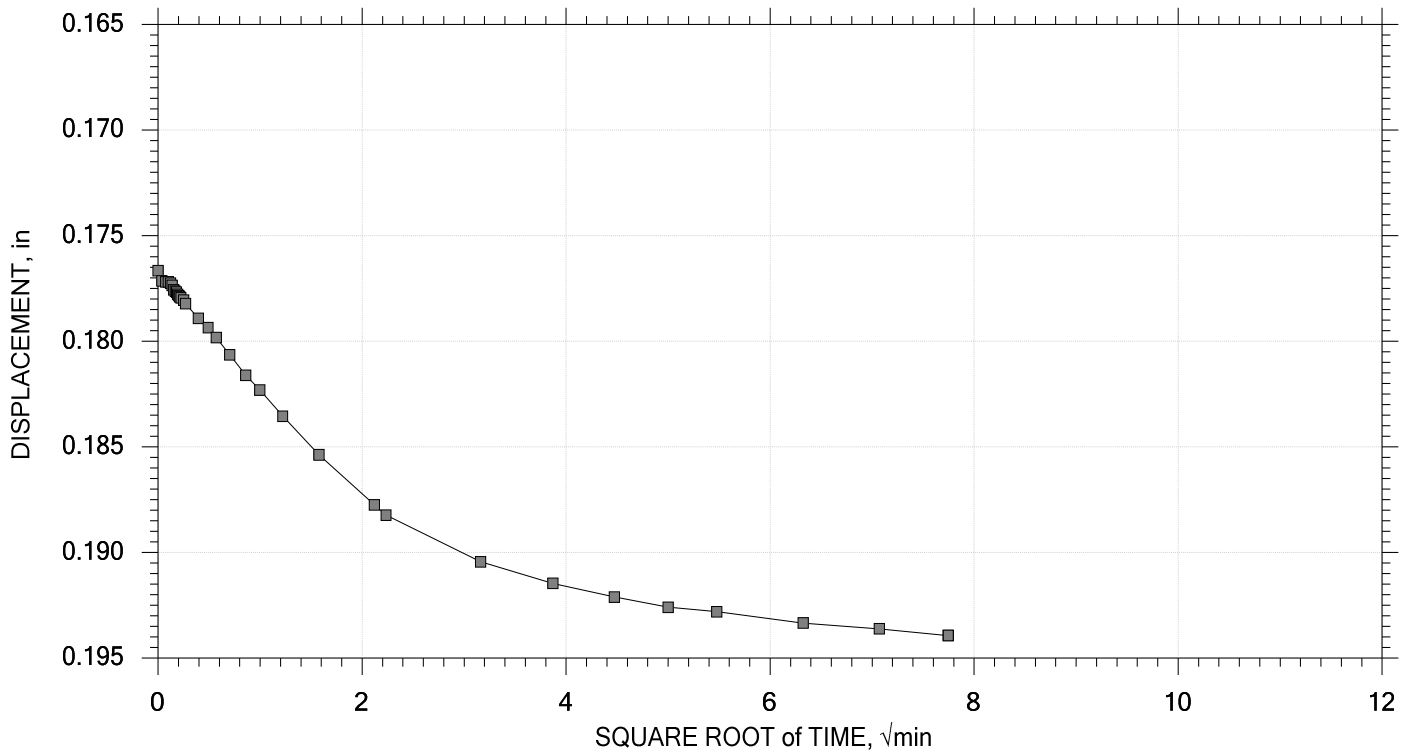
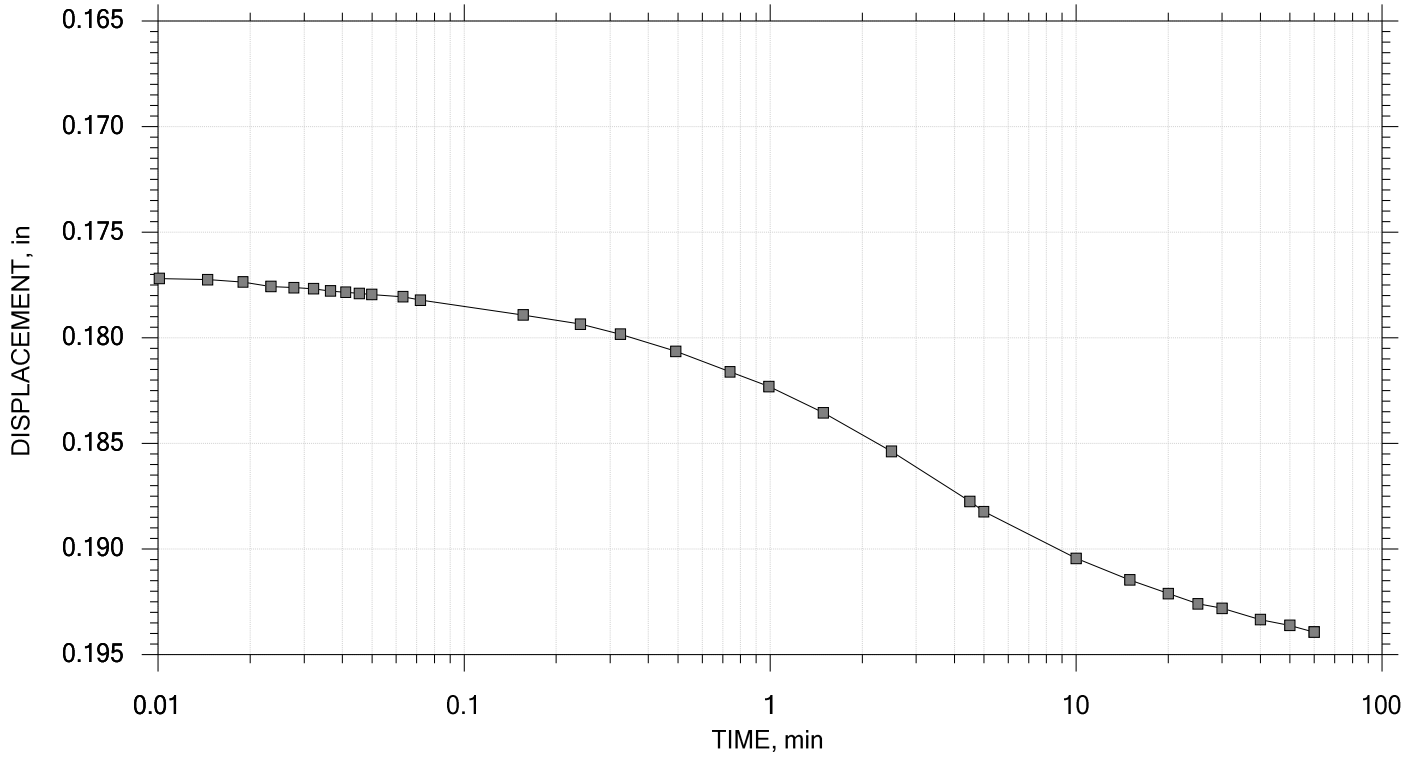
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 16 of 21

Stress: 8 tsf



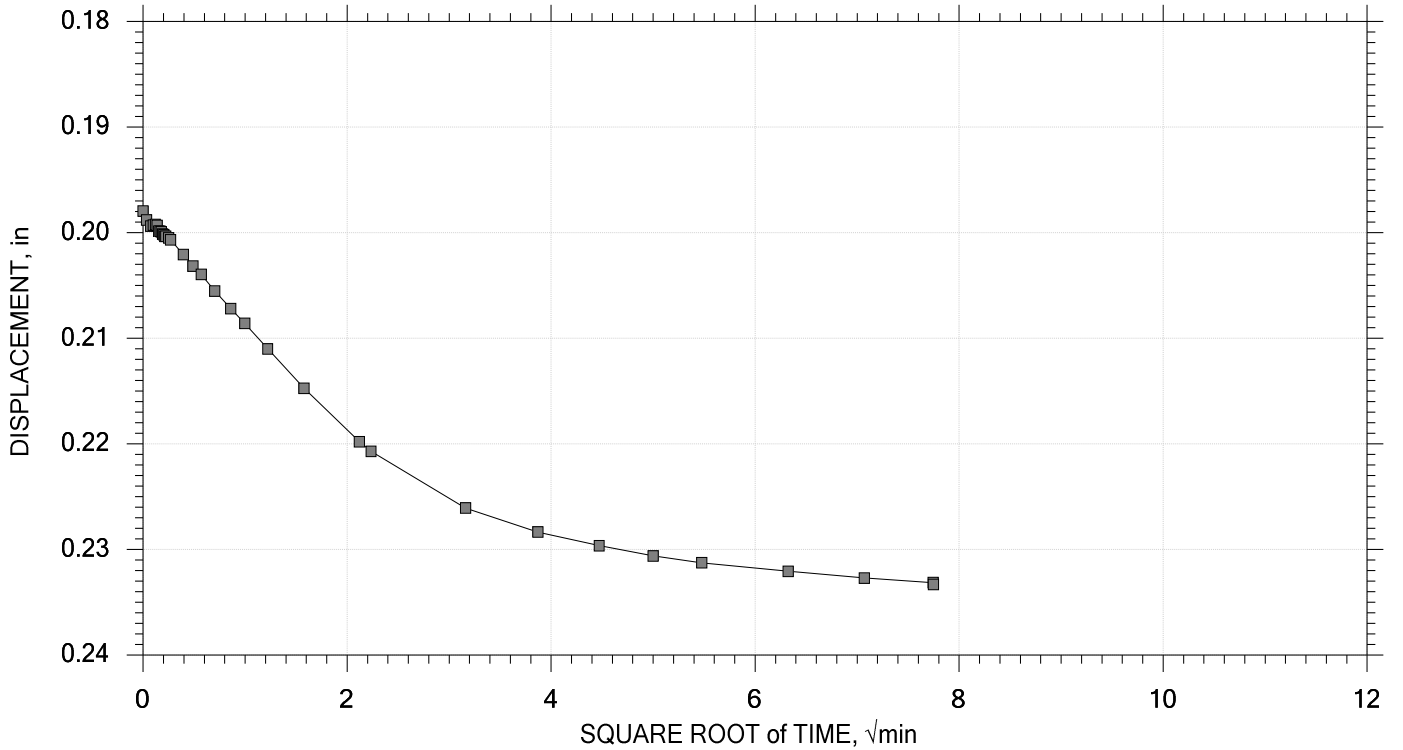
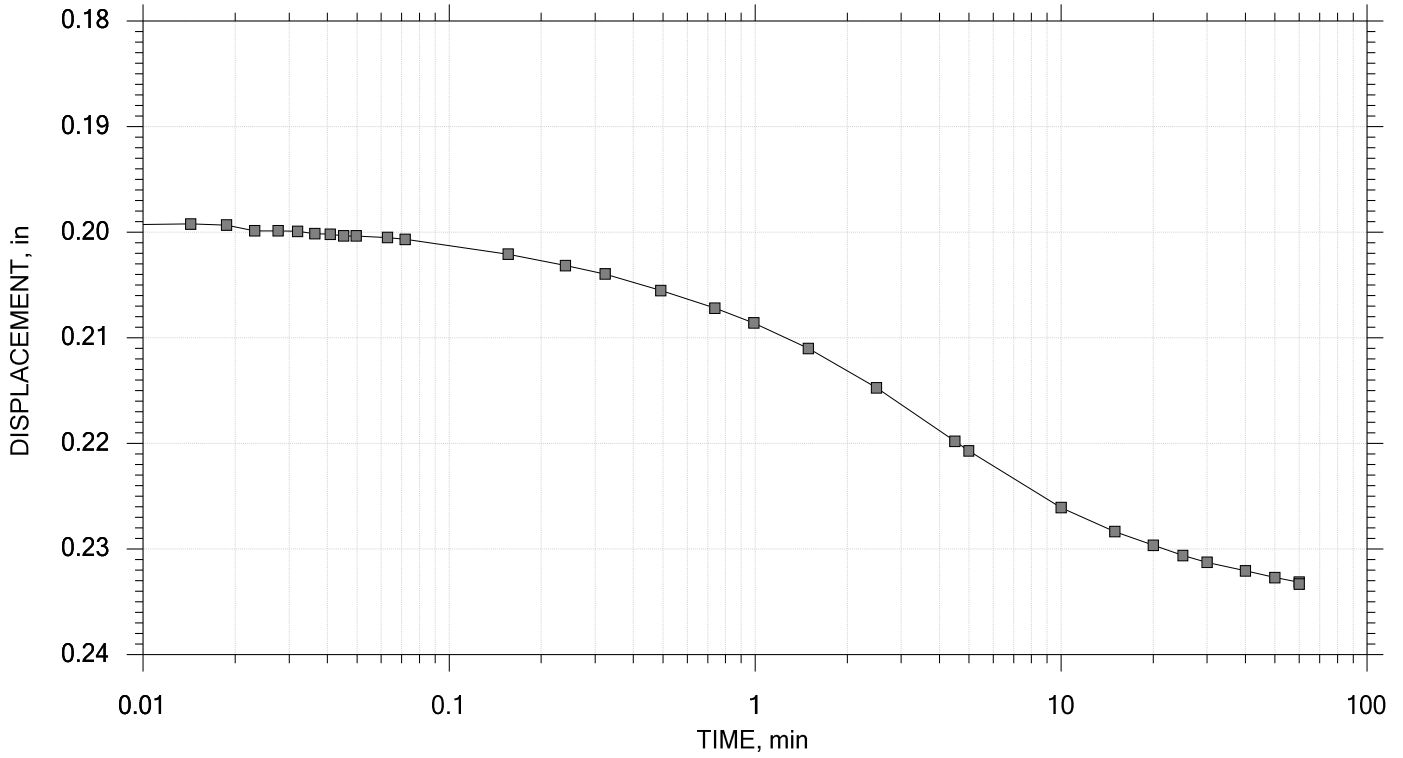
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 17 of 21

Stress: 16 tsf



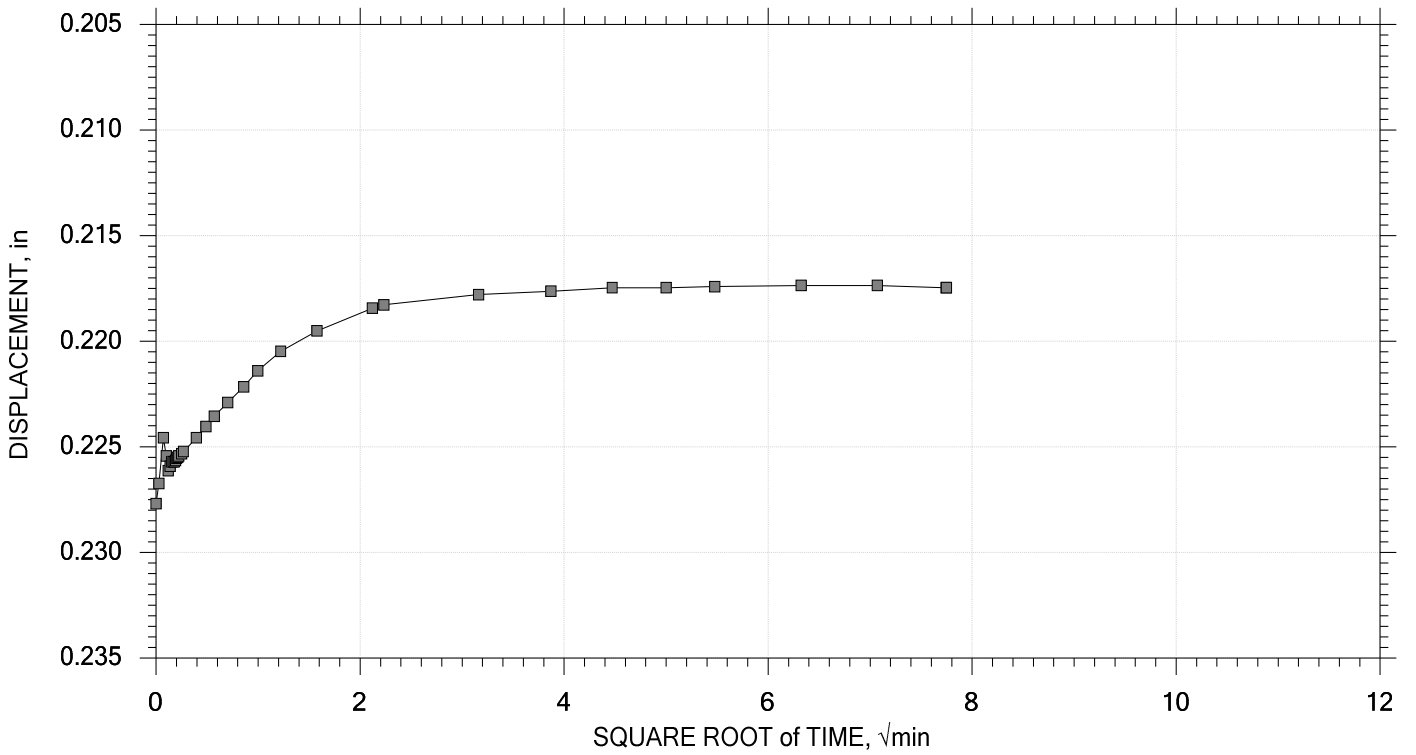
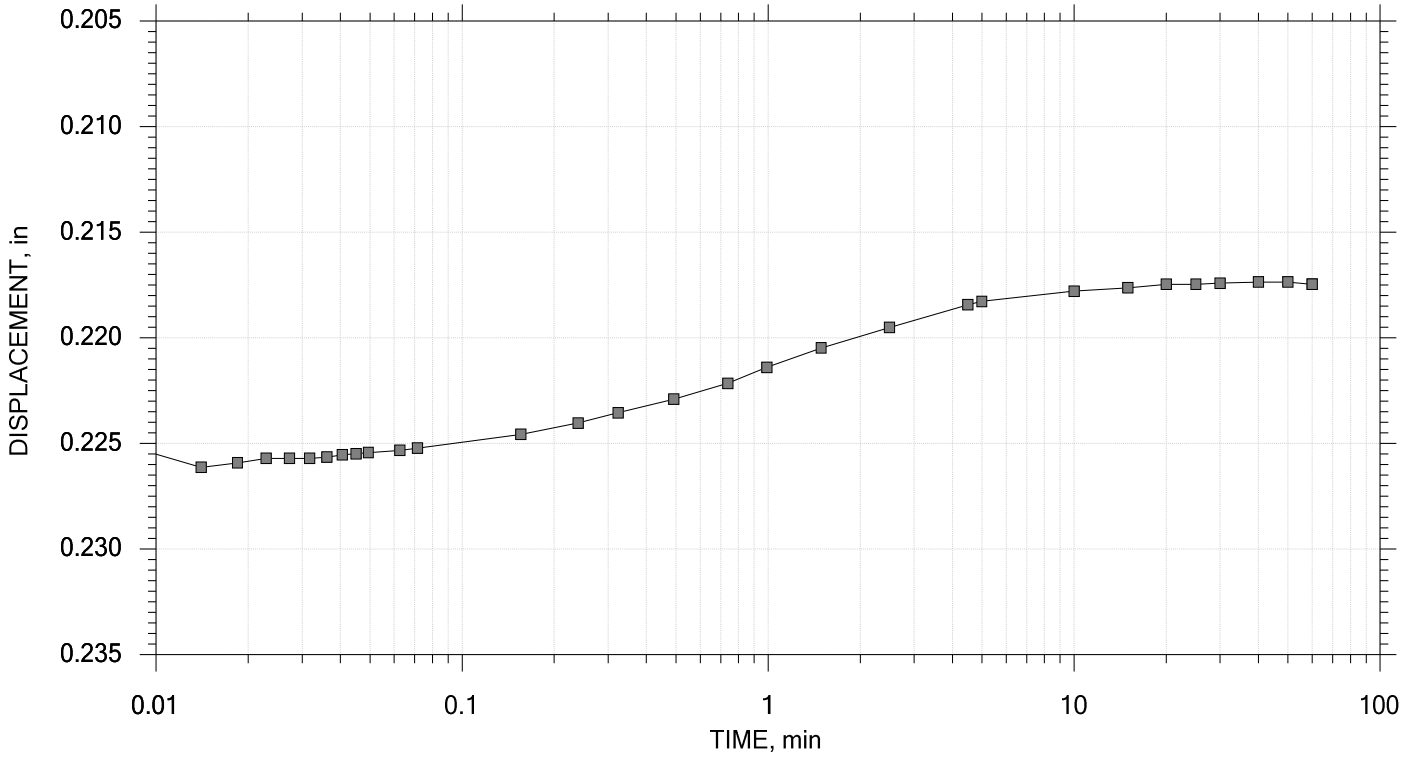
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 18 of 21

Stress: 4 tsf



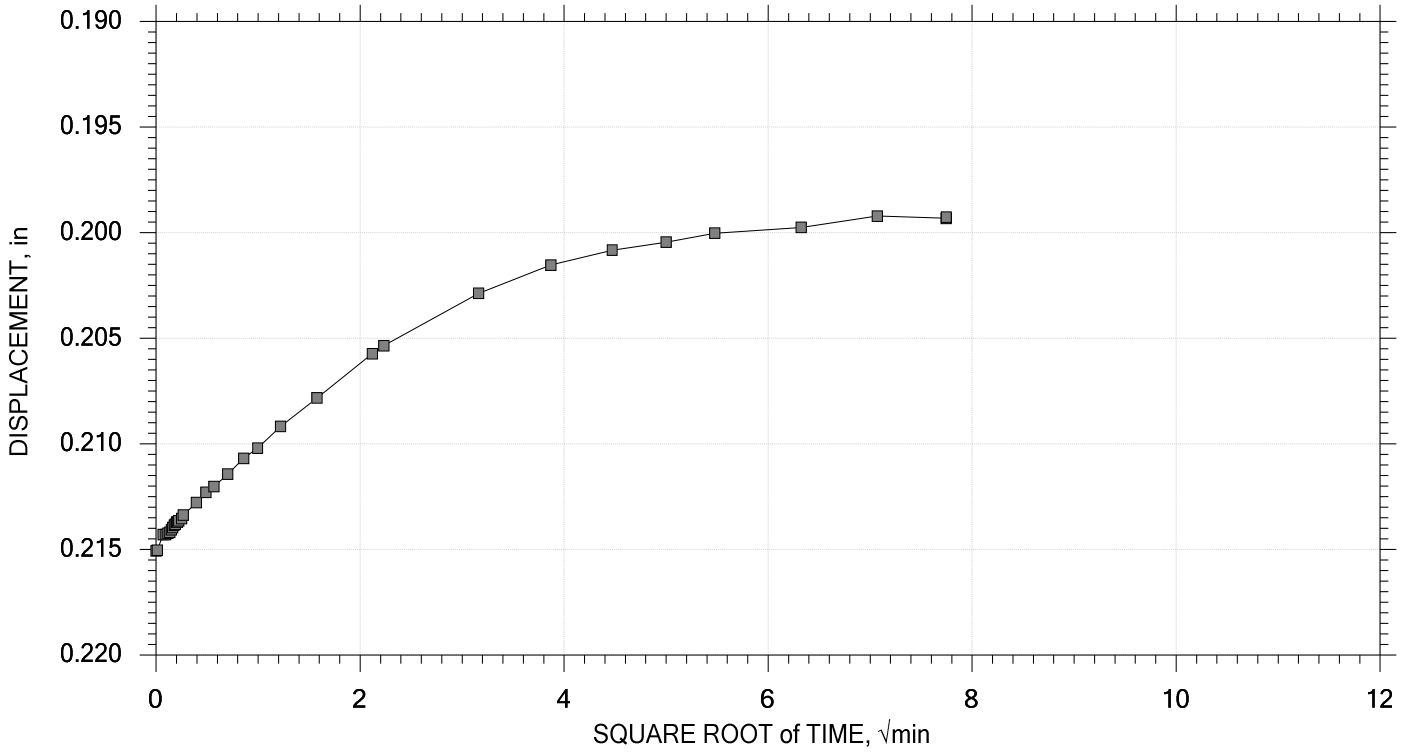
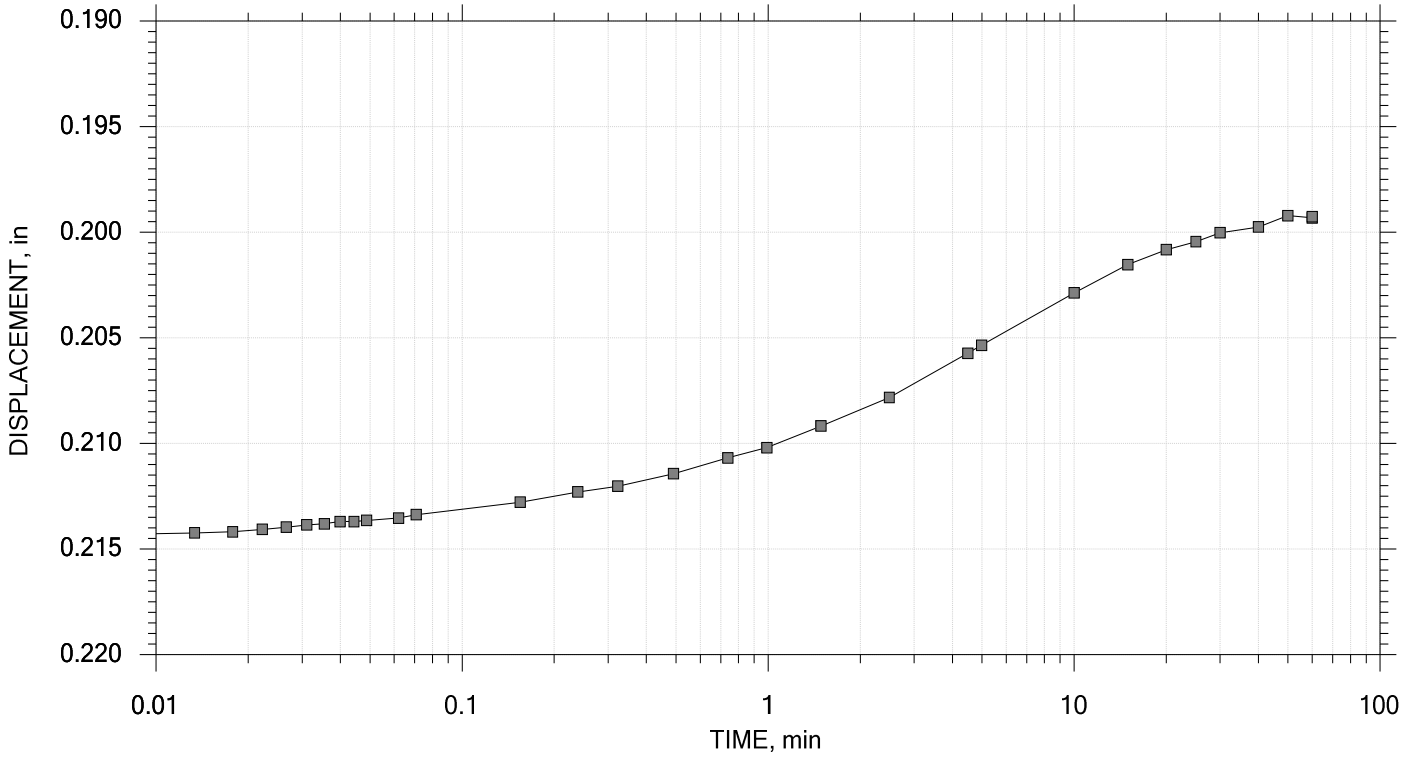
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 19 of 21

Stress: 1 tsf



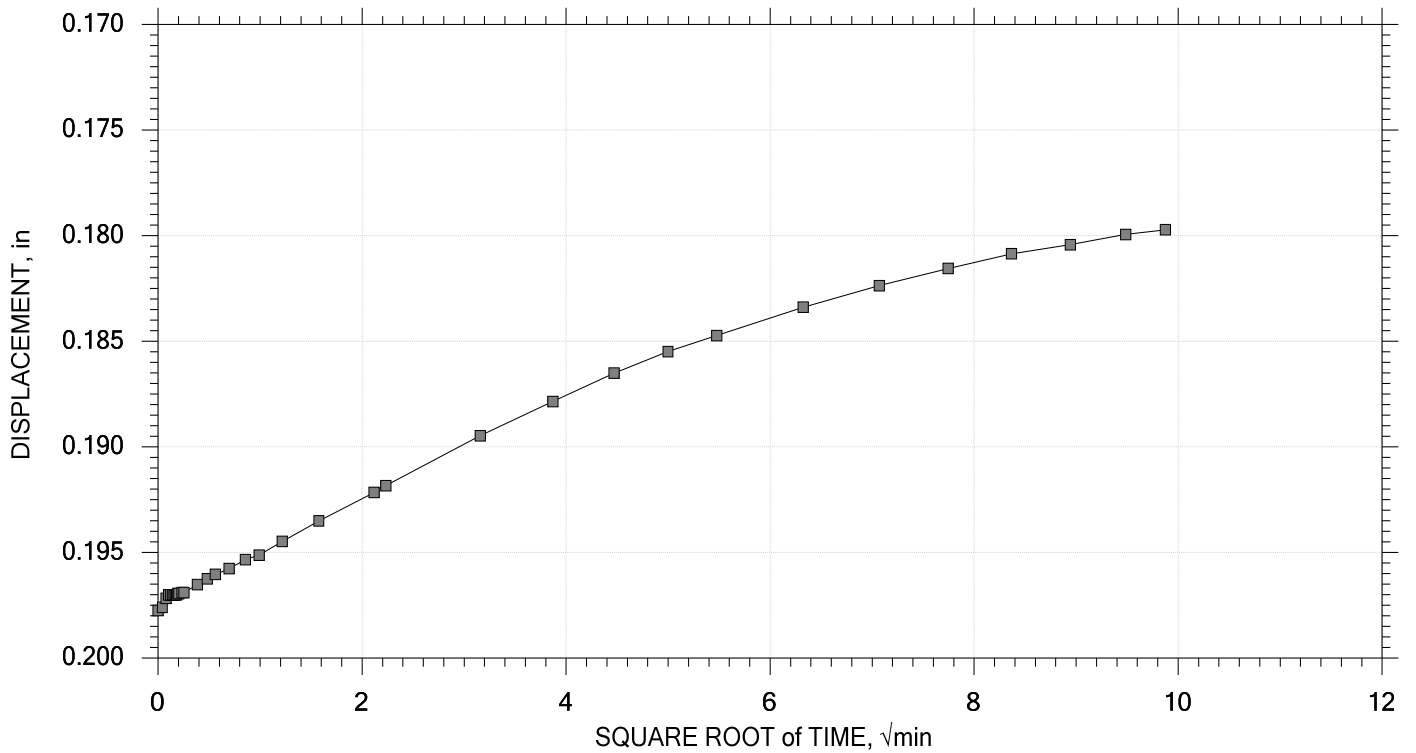
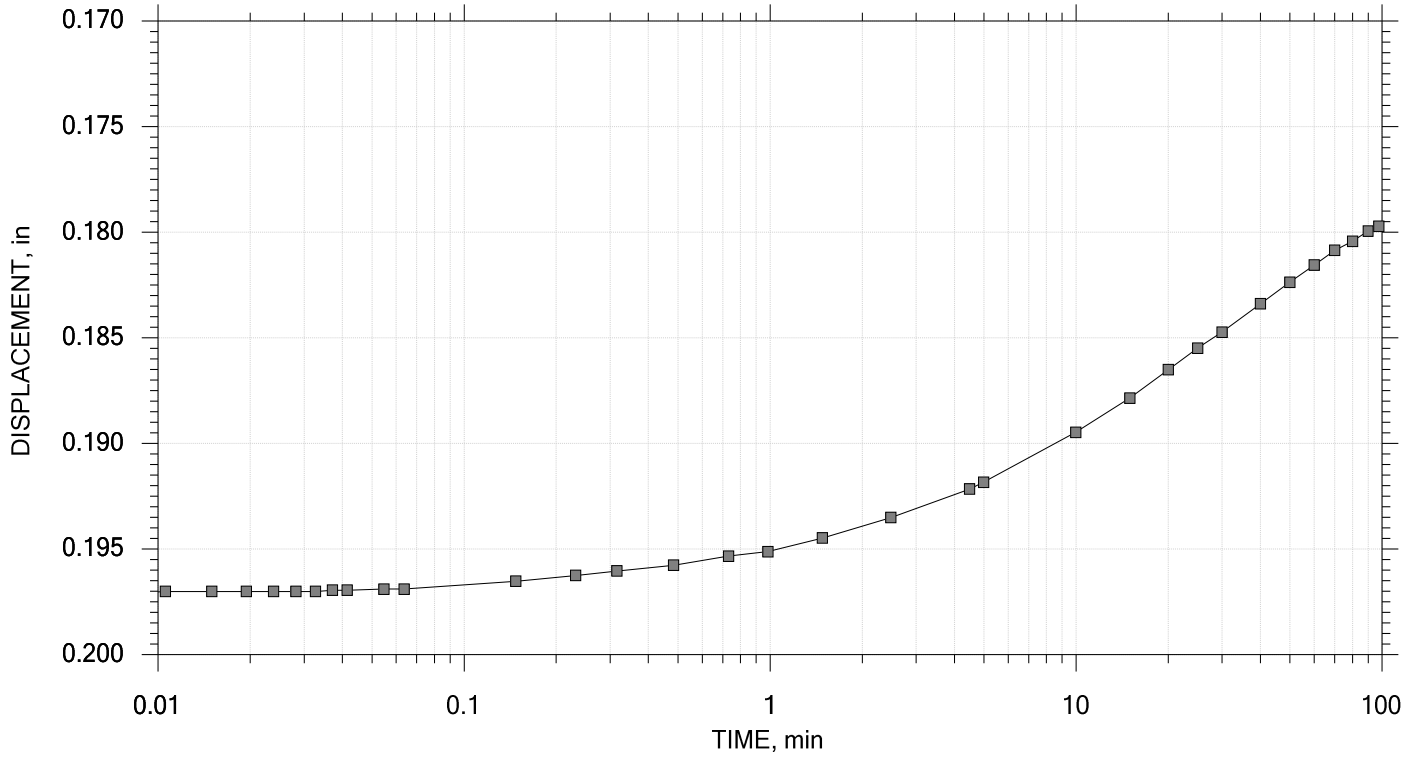
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 20 of 21

Stress: 0.25 tsf



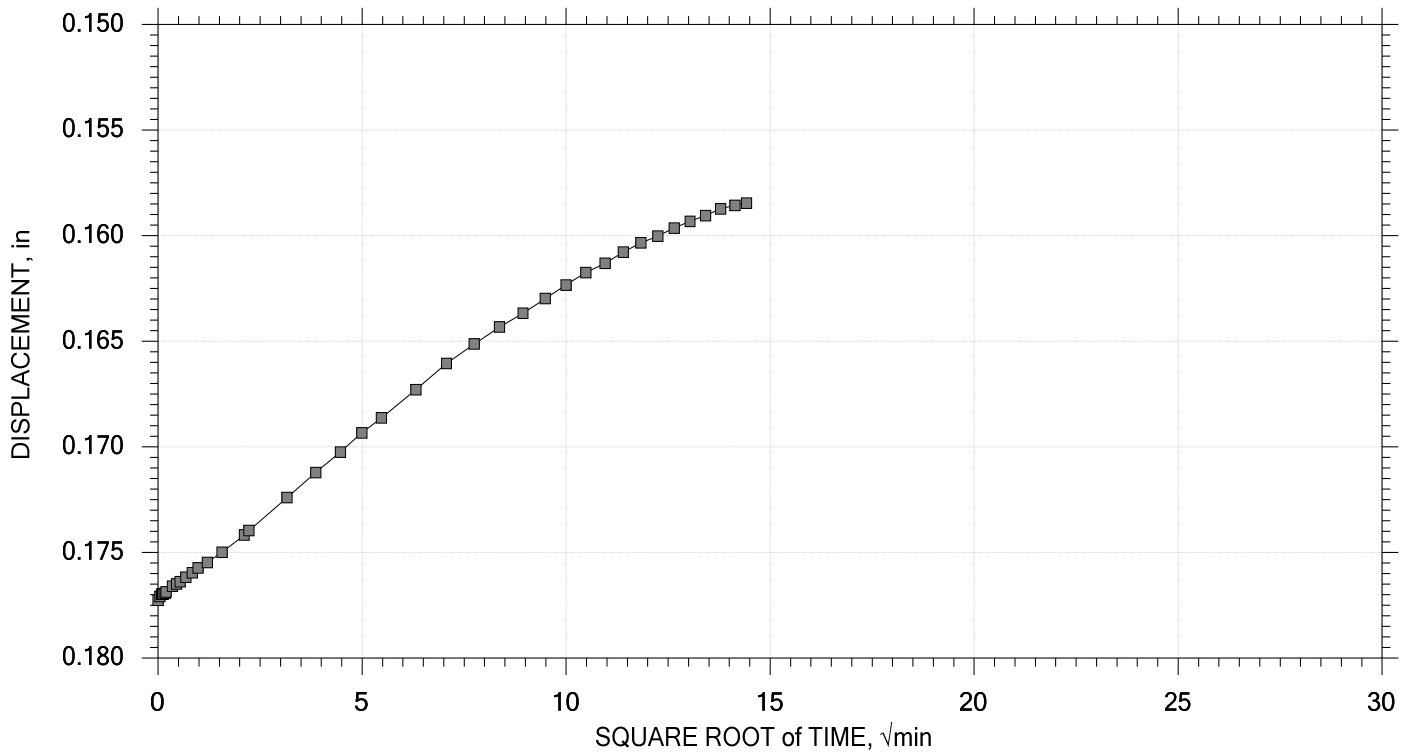
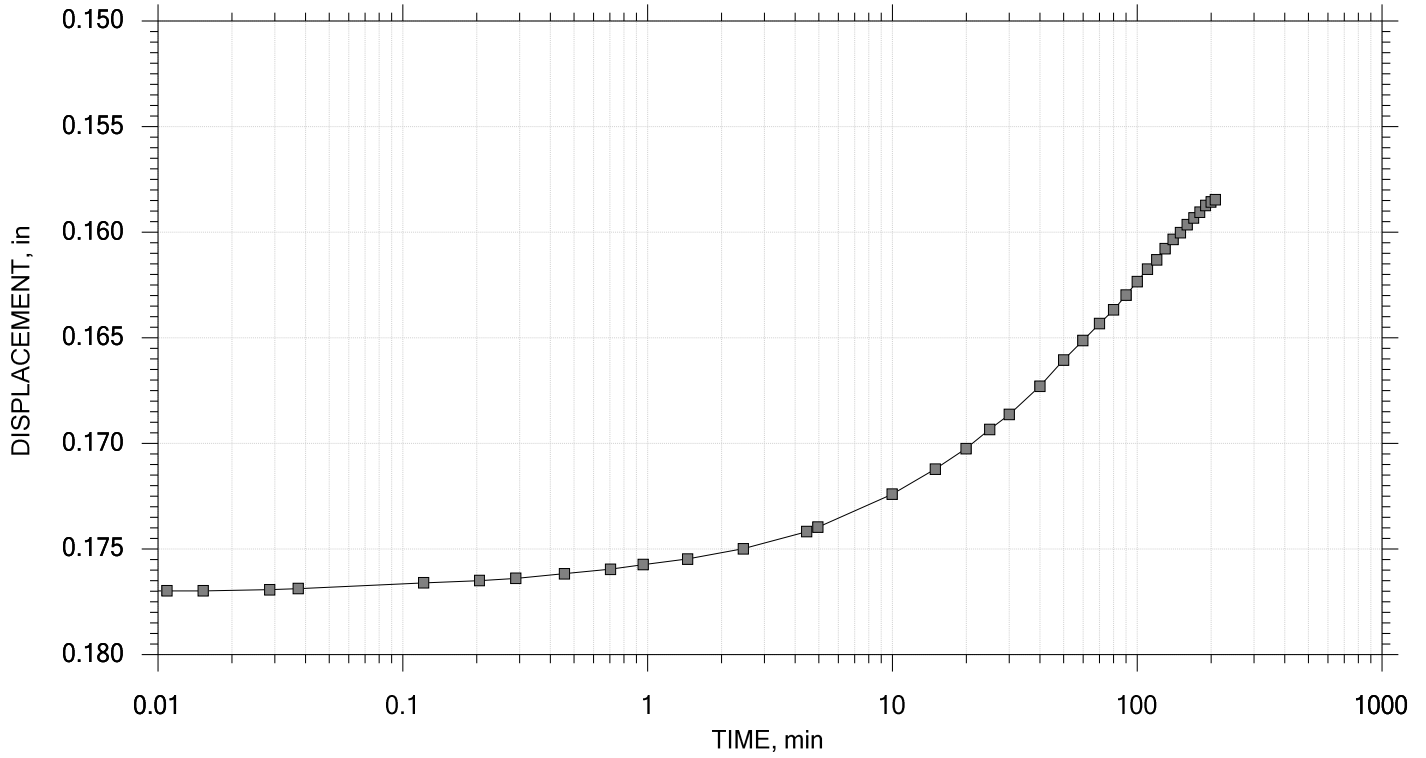
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 21 of 21

Stress: 0.0625 tsf



Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337251
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: CHERRYFIELD  
 Boring No.: BB-CSB-201  
 Sample No.: 1U  
 Test No.: 337251

Location: --  
 Tested By: GSL  
 Test Date: 2/26/19  
 Sample Type: INTACT

Project No.: 22230.00  
 Checked By: --  
 Depth: 15.0-17.0  
 Elevation: --

Soil Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.  
 Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test

Measured Specific Gravity: 2.74  
 Initial Void Ratio: 1.14  
 Final Void Ratio: 0.816

Liquid Limit: 30  
 Plastic Limit: 19  
 Plasticity Index: 11

Specimen Diameter: 2.50 in  
 Initial Height: 1.00 in  
 Final Height: 0.85 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	65	RING	RING+BASE	207
Wt. Container + Wet Soil, gm	163.87	407.22	395.58	194.34
Wt. Container + Dry Soil, gm	134.43	364.91	364.91	163.72
Wt. Container, gm	60.190	261.96	261.96	60.920
Wt. Dry Soil, gm	74.240	102.95	102.95	102.80
Water Content, %	39.66	41.09	29.79	29.79
Void Ratio	---	1.14	0.816	---
Degree of Saturation, %	---	99.16	100.00	---
Dry Unit Weight, pcf	---	80.101	94.184	---

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: CHERRYFIELD  
 Boring No.: BB-CSB-201  
 Sample No.: 1U  
 Test No.: 337251

Location: --  
 Tested By: GSL  
 Test Date: 2/26/19  
 Sample Type: INTACT

Project No.: 22230.00  
 Checked By: --  
 Depth: 15.0-17.0  
 Elevation: --

Soil Description: Grey Wet Soft Clayey Silt--Specimen from 6 to 7.5 inches in tube.  
 Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test

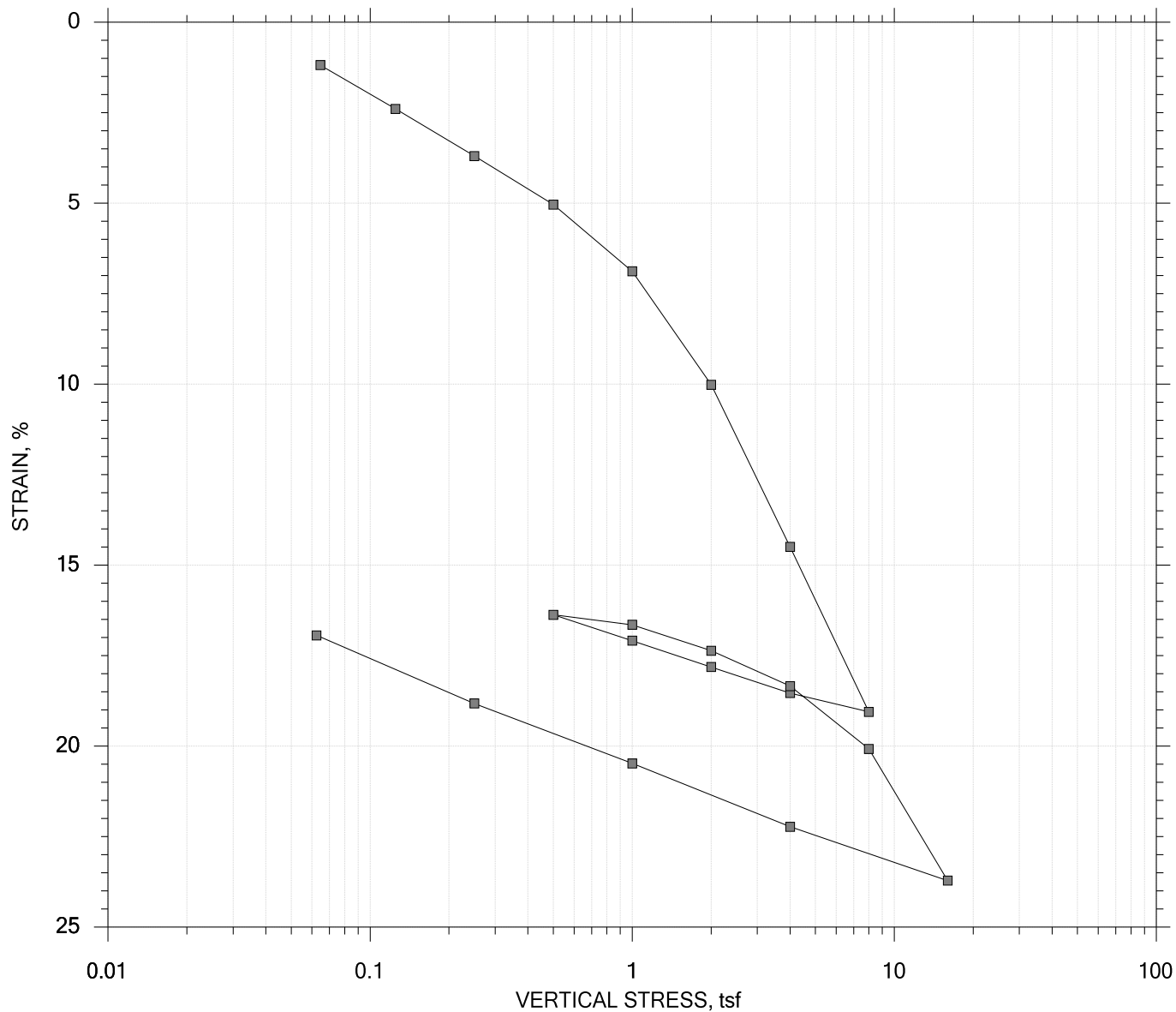
Displacement at End of Primary

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft <sup>2</sup> /sec	Mv 1/tsf	k ft/day
1	0.0630	0.006299	1.12	0.629	24.821	9.85e-007	9.98e-002	2.65e-004
2	0.125	0.01190	1.11	1.19	15.092	1.60e-006	9.03e-002	3.90e-004
3	0.250	0.02207	1.09	2.20	13.261	1.79e-006	8.12e-002	3.93e-004
4	0.500	0.03378	1.06	3.37	11.370	2.05e-006	4.68e-002	2.58e-004
5	1.00	0.04887	1.03	4.88	18.151	1.25e-006	3.01e-002	1.01e-004
6	2.00	0.07690	0.971	7.68	25.789	8.38e-007	2.80e-002	6.33e-005
7	4.00	0.1292	0.860	12.9	33.731	5.87e-007	2.61e-002	4.13e-005
8	8.00	0.1807	0.750	18.0	22.639	7.77e-007	1.29e-002	2.70e-005
9	4.00	0.1763	0.759	17.6	1.346	1.23e-005	1.10e-003	3.65e-005
10	2.00	0.1695	0.774	16.9	2.825	5.96e-006	3.40e-003	5.47e-005
11	1.00	0.1613	0.791	16.1	9.369	1.83e-006	8.16e-003	4.03e-005
12	0.500	0.1524	0.811	15.2	35.616	4.92e-007	1.79e-002	2.37e-005
13	1.00	0.1559	0.803	15.6	7.655	2.30e-006	7.09e-003	4.40e-005
14	2.00	0.1633	0.787	16.3	8.913	1.95e-006	7.37e-003	3.88e-005
15	4.00	0.1736	0.765	17.3	7.086	2.40e-006	5.13e-003	3.33e-005
16	8.00	0.1919	0.726	19.2	8.098	2.03e-006	4.57e-003	2.50e-005
17	16.0	0.2302	0.645	23.0	10.120	1.51e-006	4.78e-003	1.95e-005
18	4.00	0.2184	0.670	21.8	2.088	7.10e-006	9.82e-004	1.88e-005
19	1.00	0.2010	0.707	20.1	8.364	1.84e-006	5.78e-003	2.87e-005
20	0.250	0.1797	0.752	17.9	45.040	3.58e-007	2.83e-002	2.74e-005
21	0.0625	0.1585	0.798	15.8	190.982	8.90e-008	1.13e-001	2.72e-005

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft <sup>2</sup> /sec	Mv 1/tsf	k ft/day	Ca %
1	0.0630	0.006299	1.12	0.629	0.000	0.00e+000	9.98e-002	0.00e+000	0.00e+000
2	0.125	0.01190	1.11	1.19	0.000	0.00e+000	9.03e-002	0.00e+000	0.00e+000
3	0.250	0.02207	1.09	2.20	0.000	0.00e+000	8.12e-002	0.00e+000	0.00e+000
4	0.500	0.03378	1.06	3.37	4.102	1.32e-006	4.68e-002	1.66e-004	0.00e+000
5	1.00	0.04887	1.03	4.88	4.575	1.15e-006	3.01e-002	9.33e-005	0.00e+000
6	2.00	0.07690	0.971	7.68	6.456	7.78e-007	2.80e-002	5.87e-005	0.00e+000
7	4.00	0.1292	0.860	12.9	7.090	6.49e-007	2.61e-002	4.57e-005	0.00e+000
8	8.00	0.1807	0.750	18.0	4.704	8.68e-007	1.29e-002	3.01e-005	0.00e+000
9	4.00	0.1763	0.759	17.6	0.301	1.28e-005	1.10e-003	3.79e-005	0.00e+000
10	2.00	0.1695	0.774	16.9	1.023	3.83e-006	3.40e-003	3.51e-005	0.00e+000
11	1.00	0.1613	0.791	16.1	2.407	1.66e-006	8.16e-003	3.64e-005	0.00e+000
12	0.500	0.1524	0.811	15.2	0.000	0.00e+000	1.79e-002	0.00e+000	0.00e+000
13	1.00	0.1559	0.803	15.6	1.957	2.09e-006	7.09e-003	4.00e-005	0.00e+000
14	2.00	0.1633	0.787	16.3	2.032	1.99e-006	7.37e-003	3.95e-005	0.00e+000
15	4.00	0.1736	0.765	17.3	1.281	3.09e-006	5.13e-003	4.28e-005	0.00e+000
16	8.00	0.1919	0.726	19.2	2.069	1.85e-006	4.57e-003	2.28e-005	0.00e+000
17	16.0	0.2302	0.645	23.0	2.187	1.63e-006	4.78e-003	2.10e-005	0.00e+000
18	4.00	0.2184	0.670	21.8	0.694	4.96e-006	9.82e-004	1.31e-005	0.00e+000
19	1.00	0.2010	0.707	20.1	0.000	0.00e+000	5.78e-003	0.00e+000	0.00e+000
20	0.250	0.1797	0.752	17.9	13.034	2.88e-007	2.83e-002	2.20e-005	0.00e+000
21	0.0625	0.1585	0.798	15.8	0.000	0.00e+000	1.13e-001	0.00e+000	0.00e+000

# One-Dimensional Consolidation by ASTM D2435 - Method B

## SUMMARY REPORT

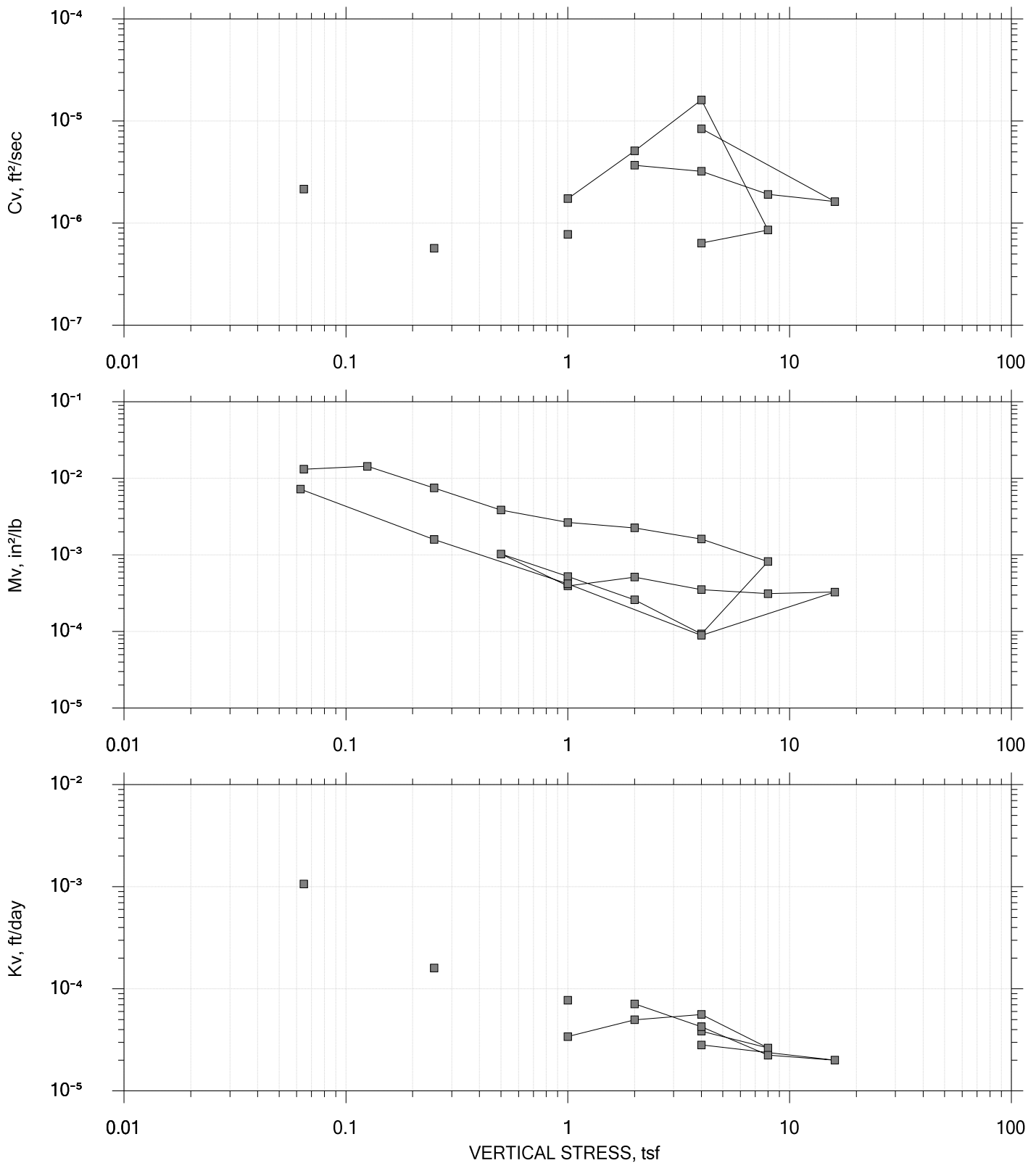


				Before Test	After Test	
Current Vertical Effective Stress: ---				Water Content, %	40.45	29.14
Preconsolidation Stress: ---				Dry Unit Weight, pcf	81.161	95.499
Compression Ratio: ---				Saturation, %	99.41	100.00
Diameter: 2.495 in		Height: 1.001 in		Void Ratio	1.12	0.80
LL: 34	PL: 21	PI: 13	GS: 2.76			

Project: CHERRYFIELD		Location: --		Project No.: 22230.00	
Boring No.: BB-CSB-201		Tested By: GSL		Checked By: --	
Sample No.: 1U		Test Date: 2/26/19		Test No.: 337252	
Depth: 15.0-17.0		Sample Type: INTACT		Elevation: --	
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.					
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test					
Displacement at End of Increment					

# One-Dimensional Consolidation by ASTM D2435 - Method B

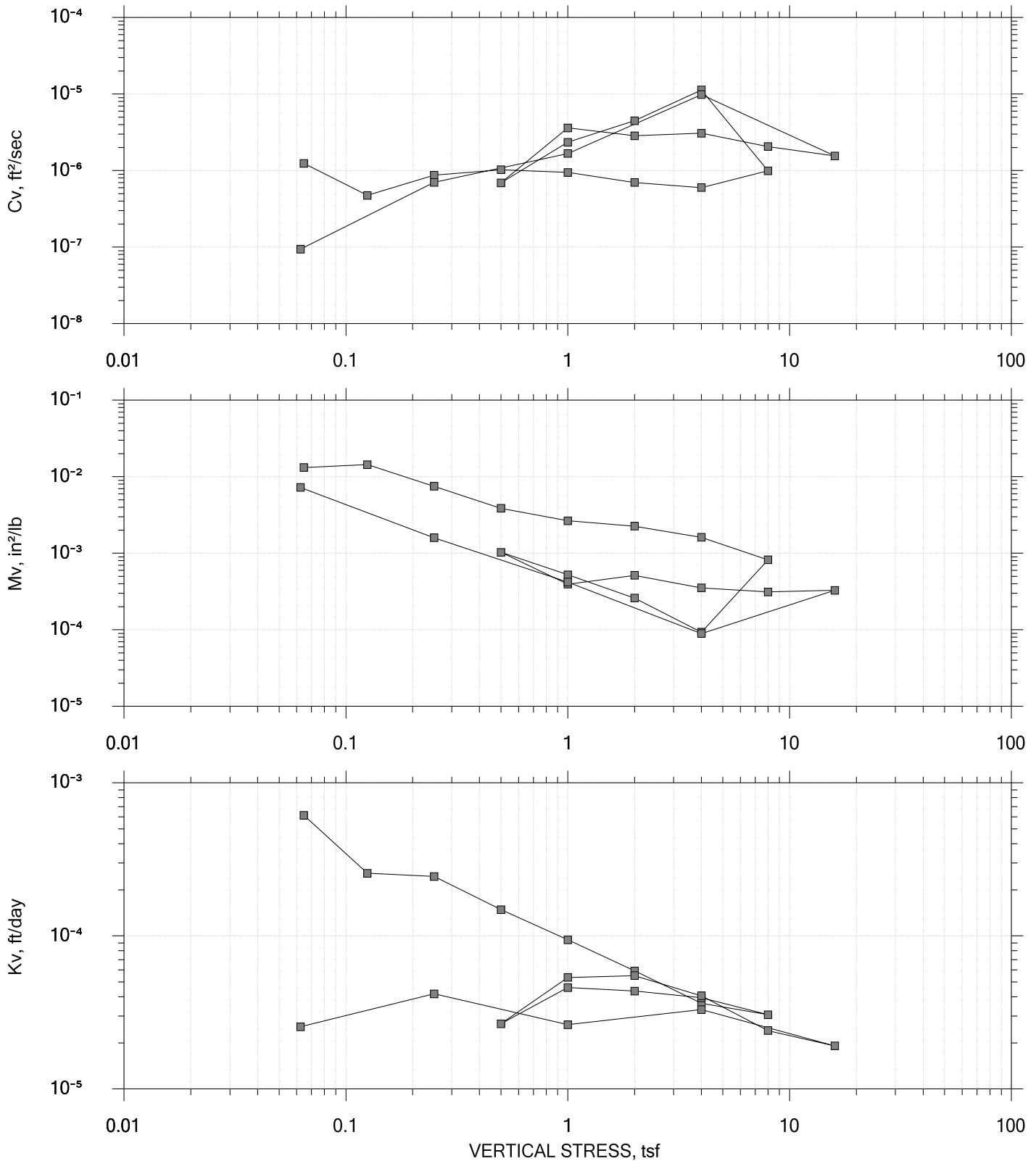
LOG of TIME COEFFICIENTS



Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		
Displacement at End of Increment		

# One-Dimensional Consolidation by ASTM D2435 - Method B

SQUARE ROOT of TIME COEFFICIENTS



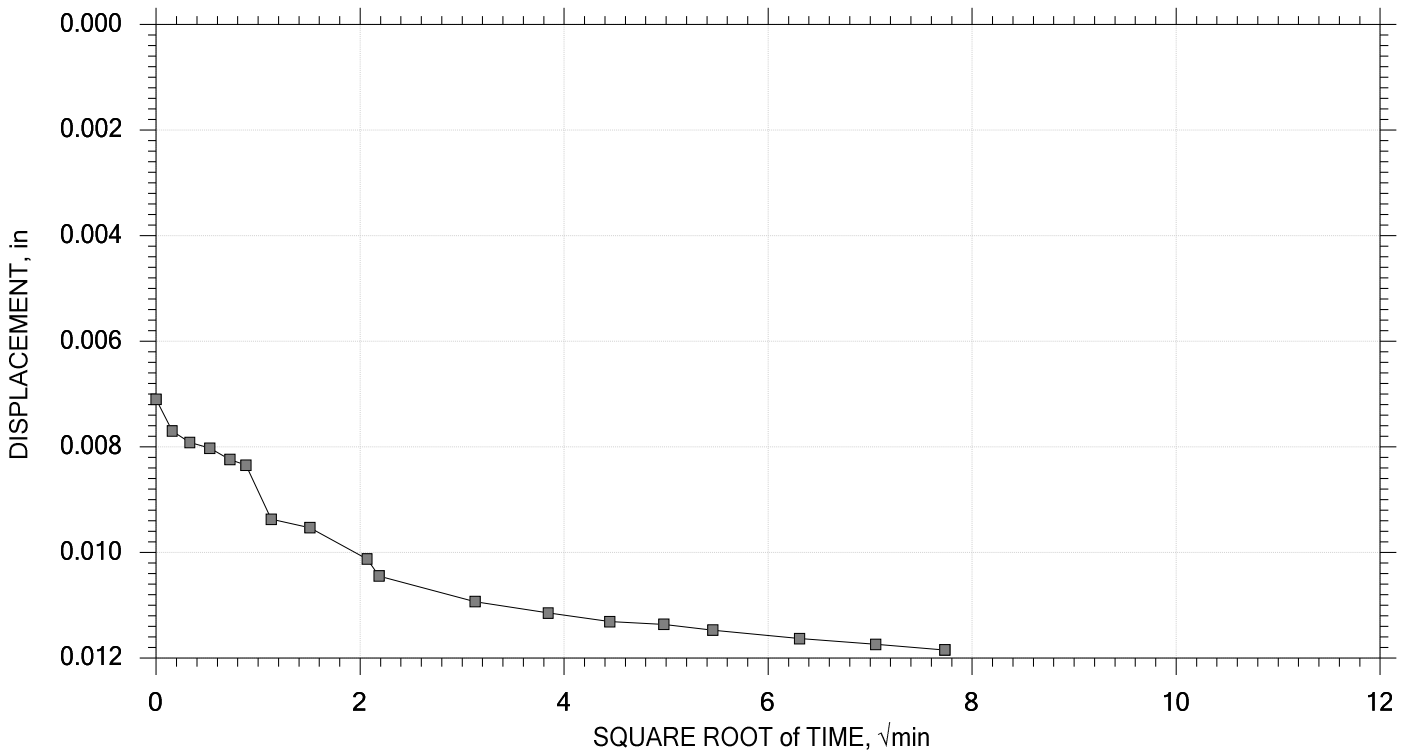
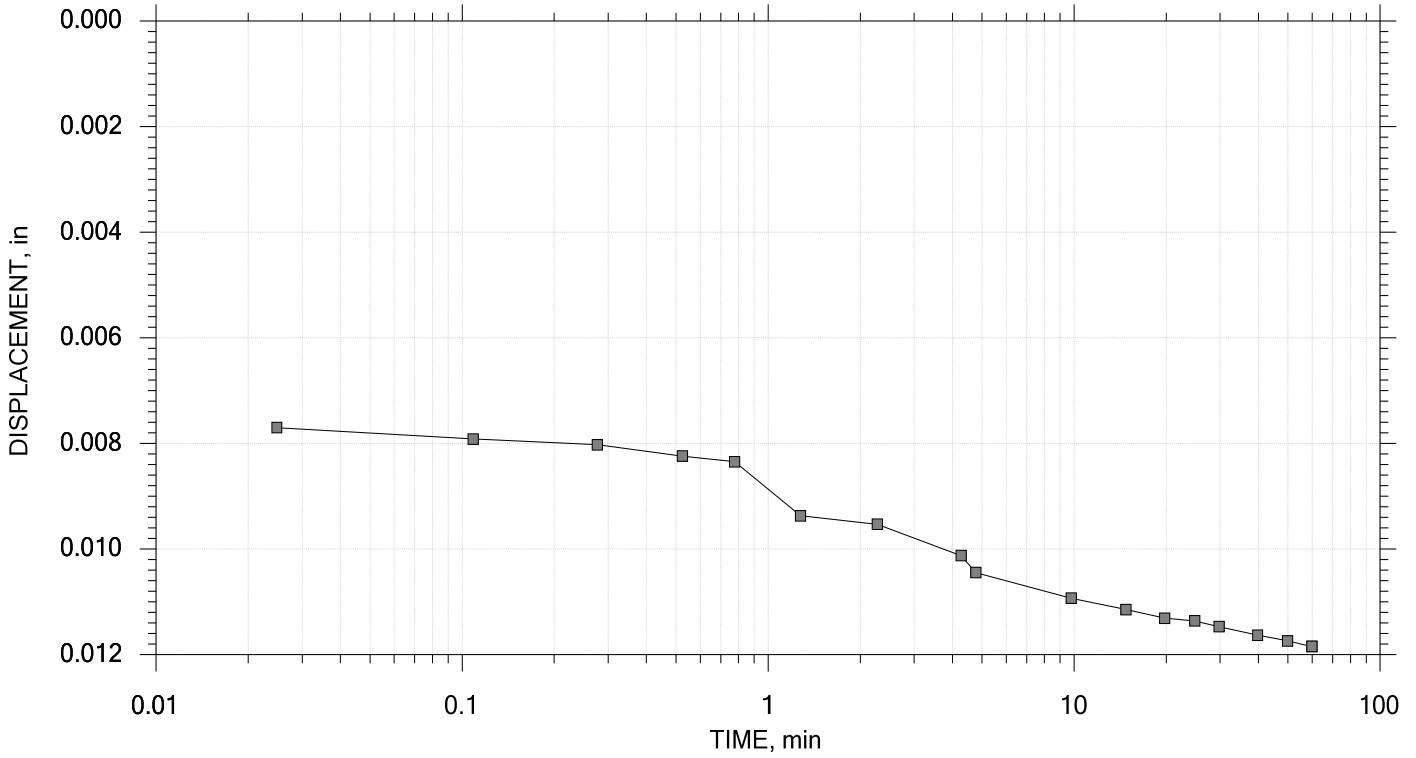
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		
Displacement at End of Increment		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Volume Step 1 of 21

Stress: 0.064562 tsf



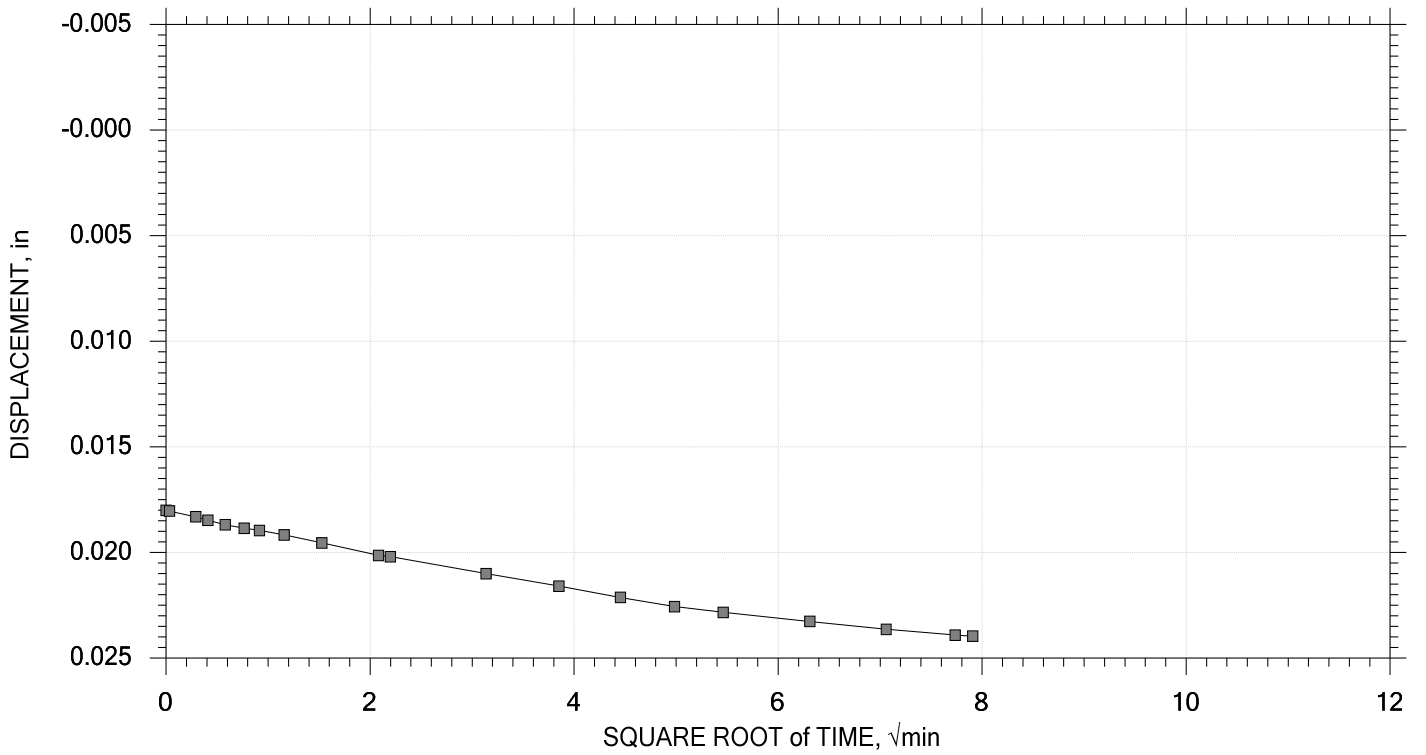
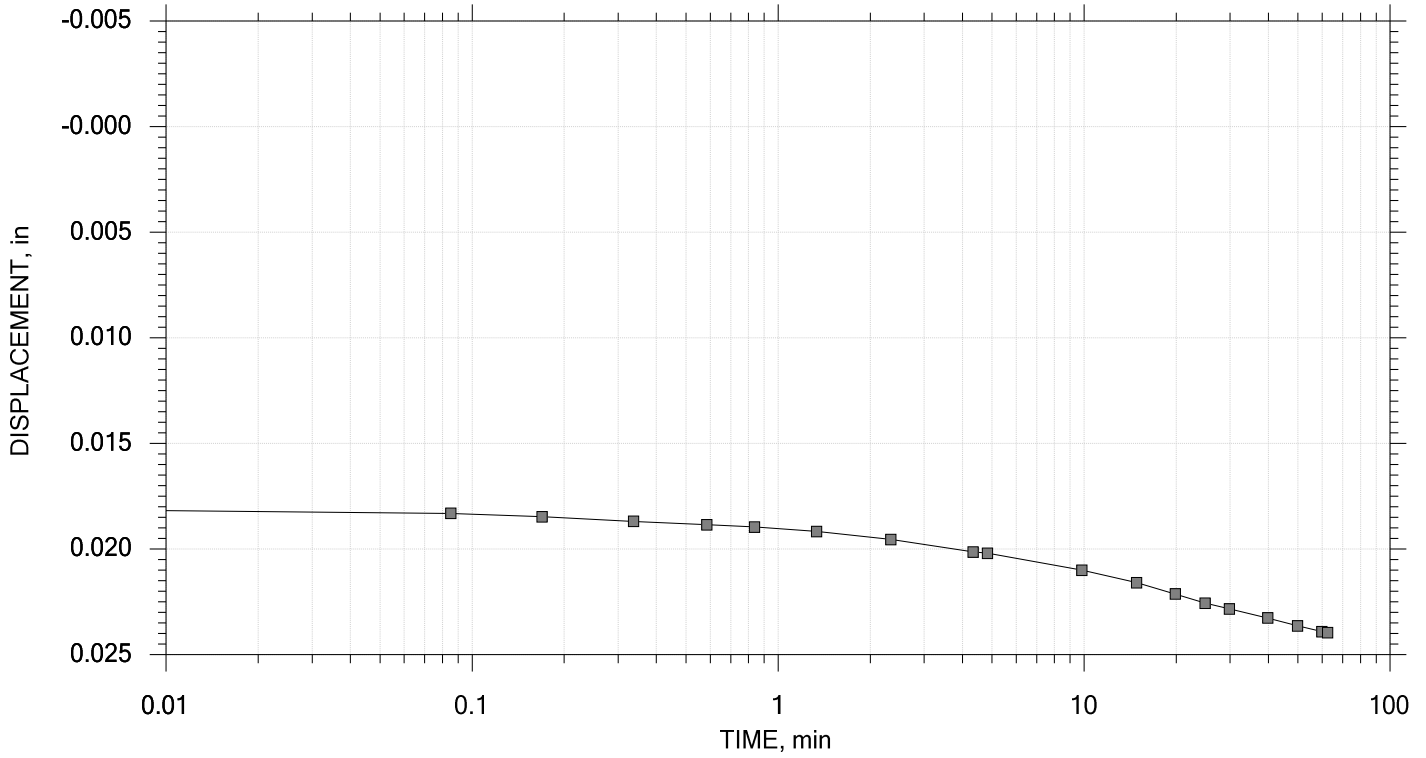
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 2 of 21

Stress: 0.125 tsf



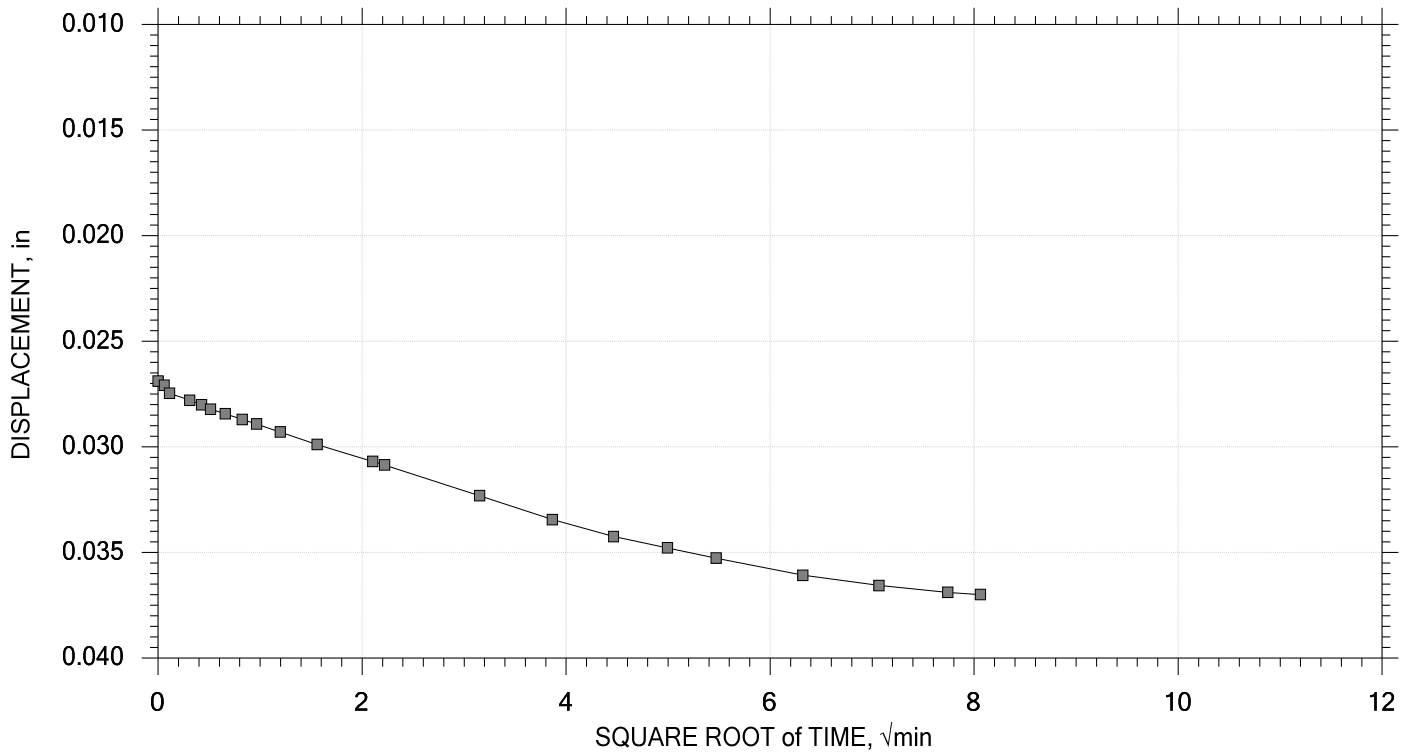
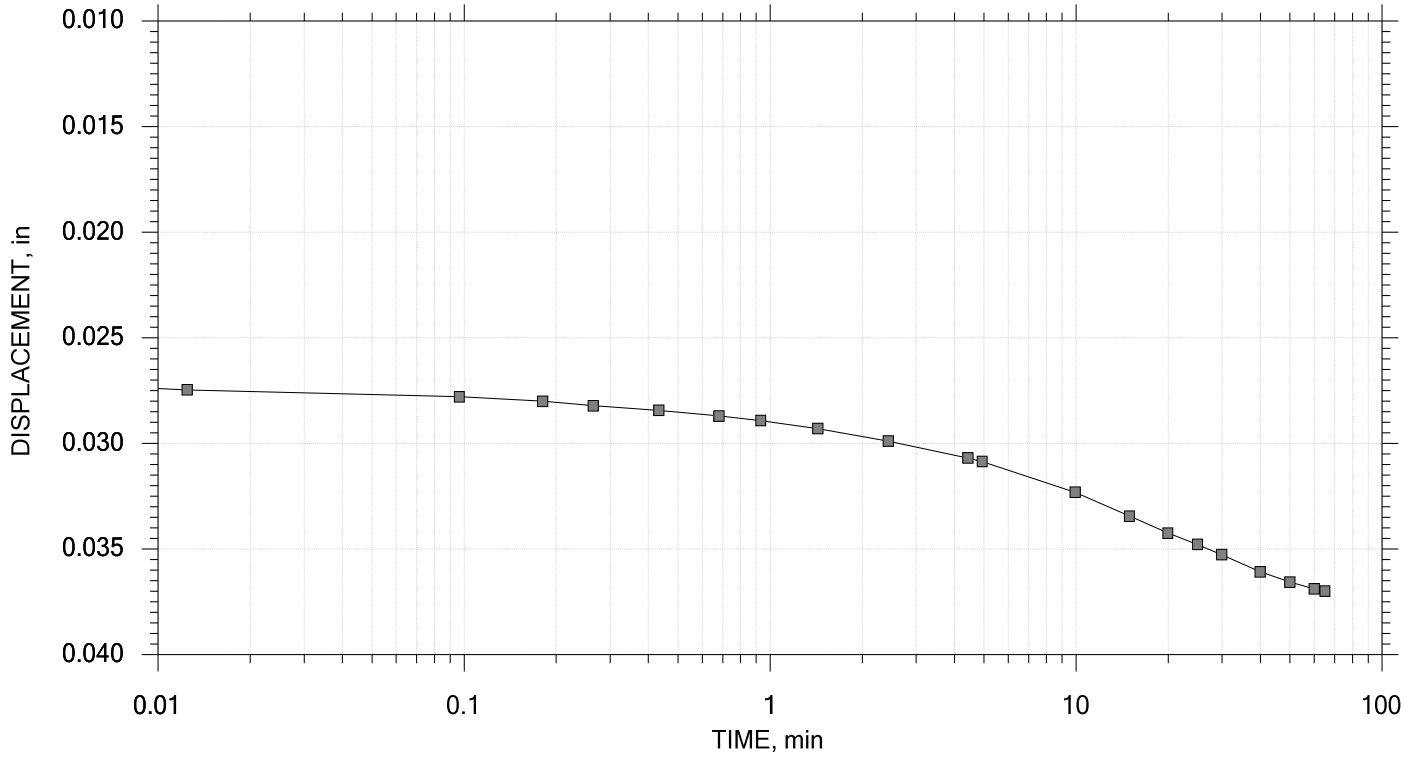
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 3 of 21

Stress: 0.25 tsf



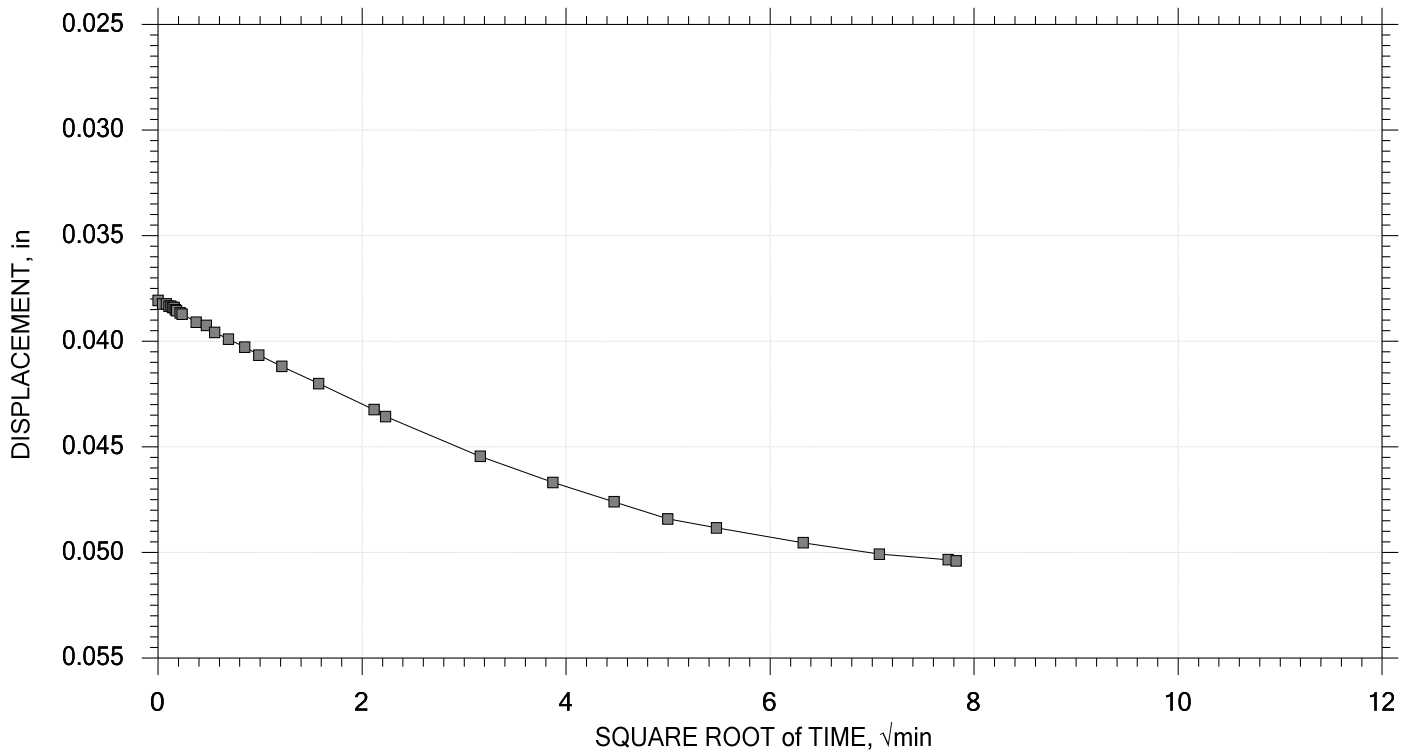
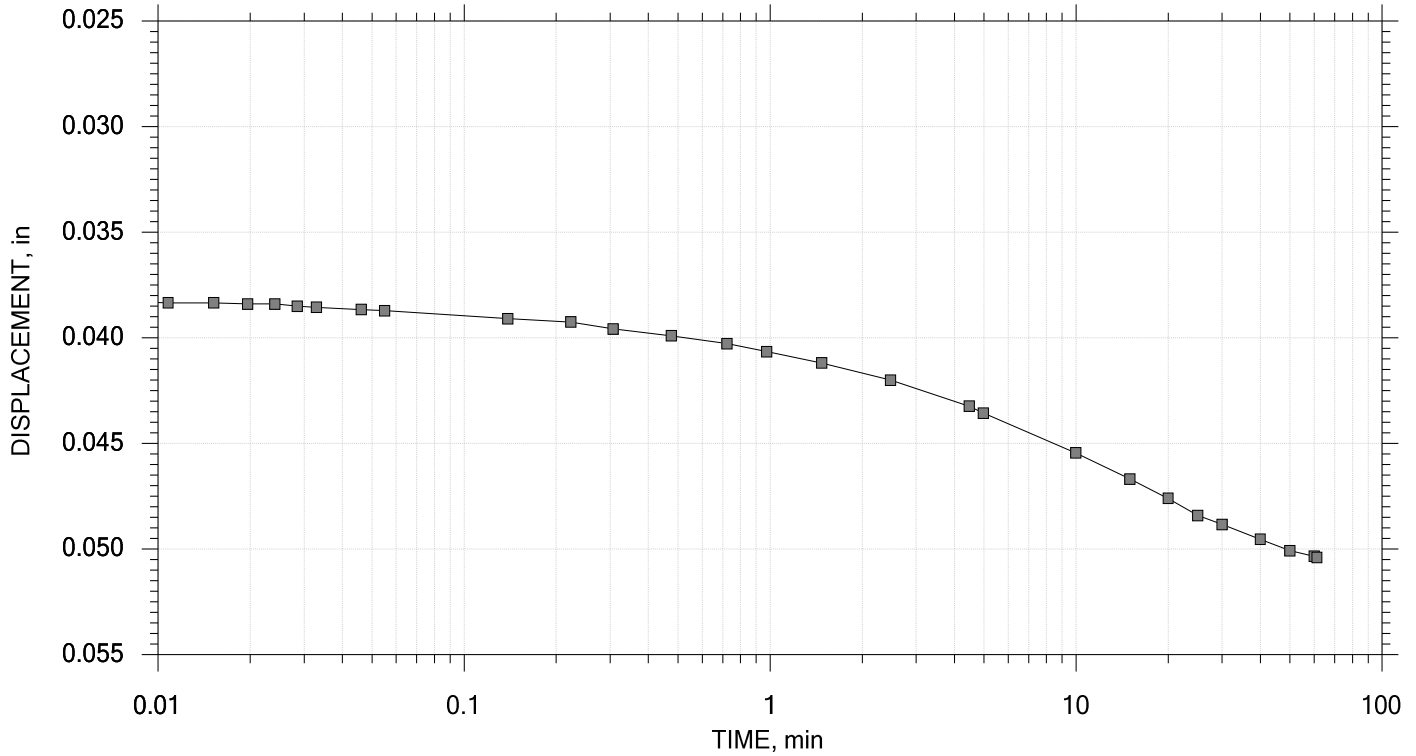
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 4 of 21

Stress: 0.5 tsf



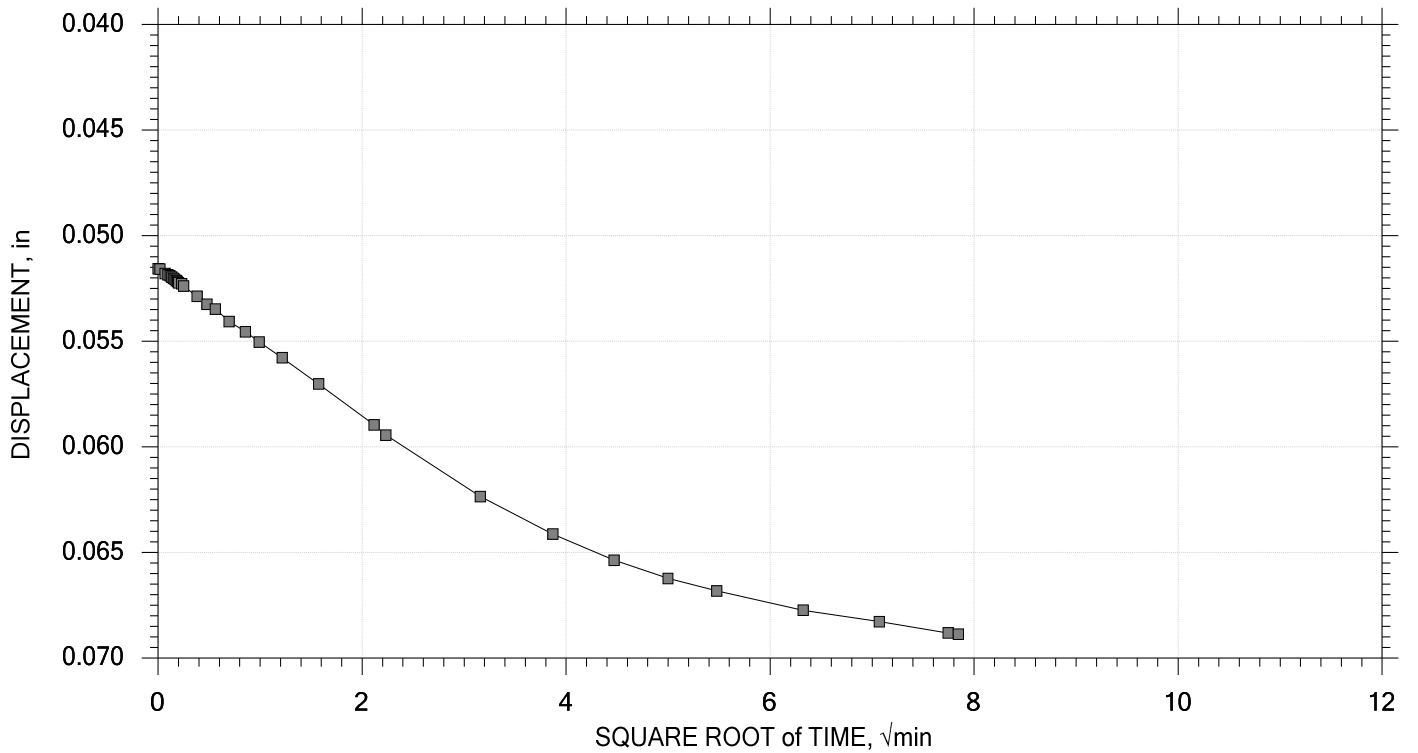
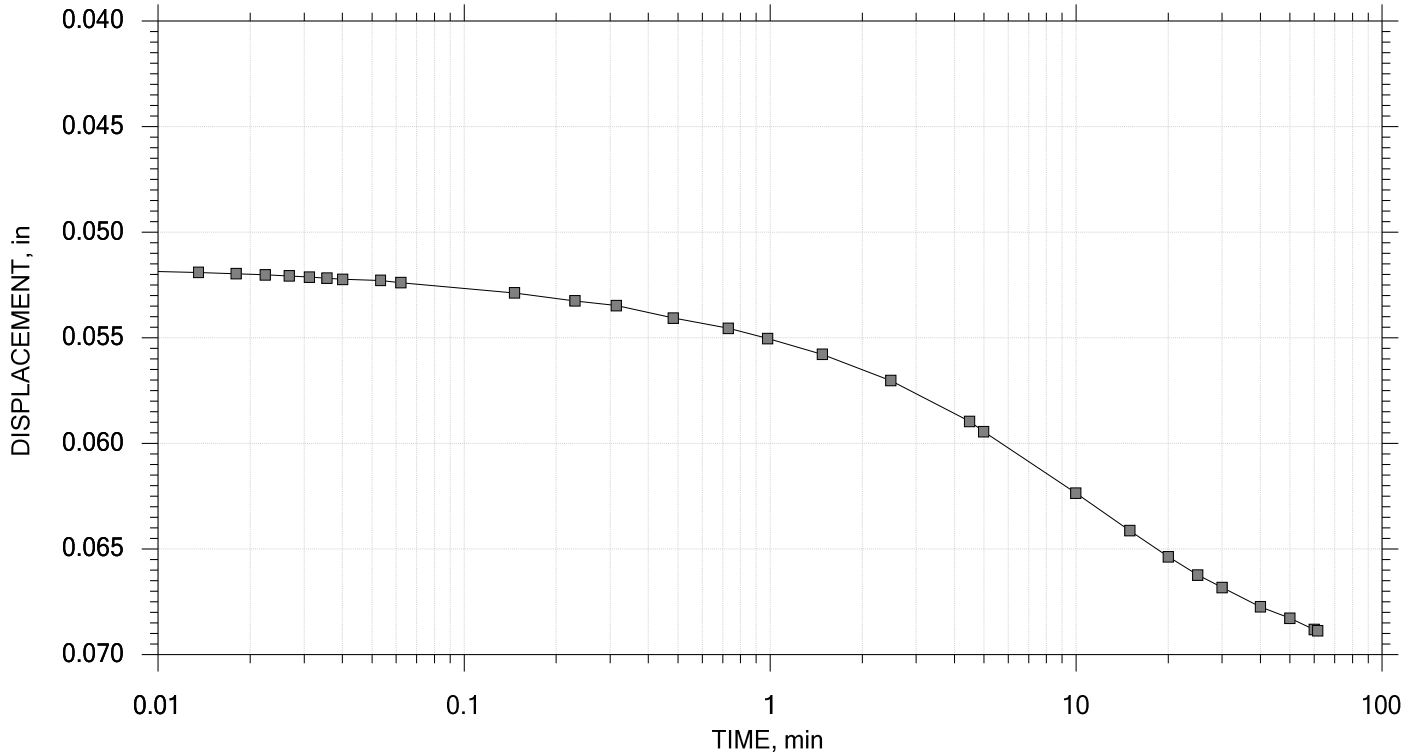
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 5 of 21

Stress: 1 tsf



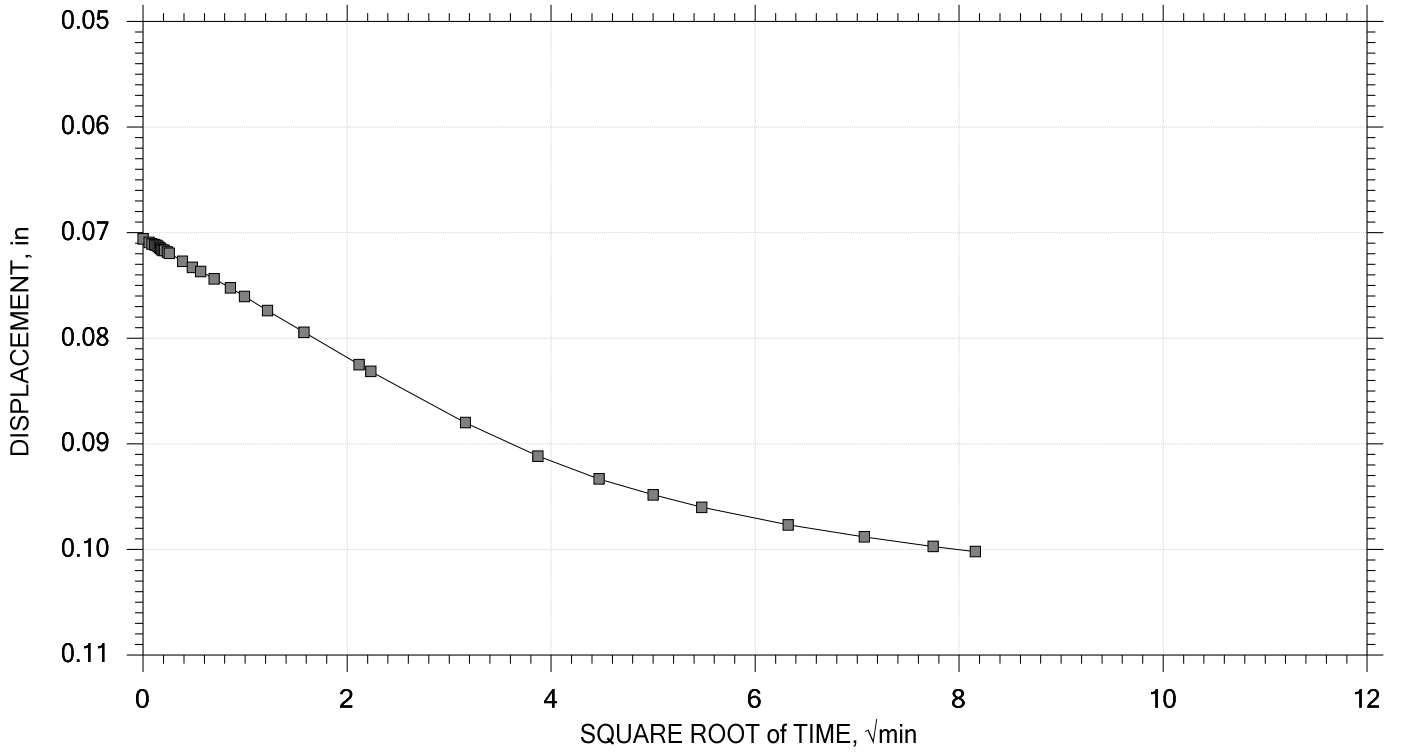
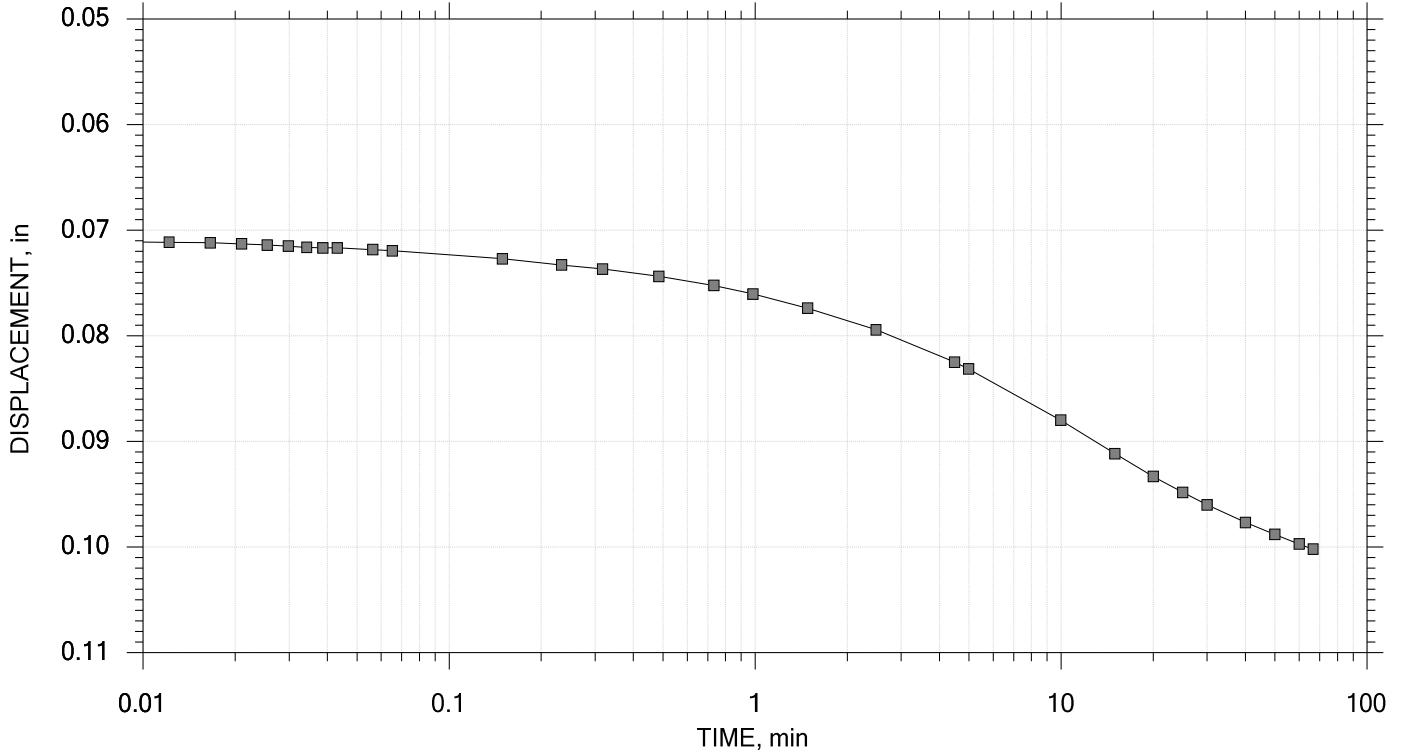
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 6 of 21

Stress: 2 tsf



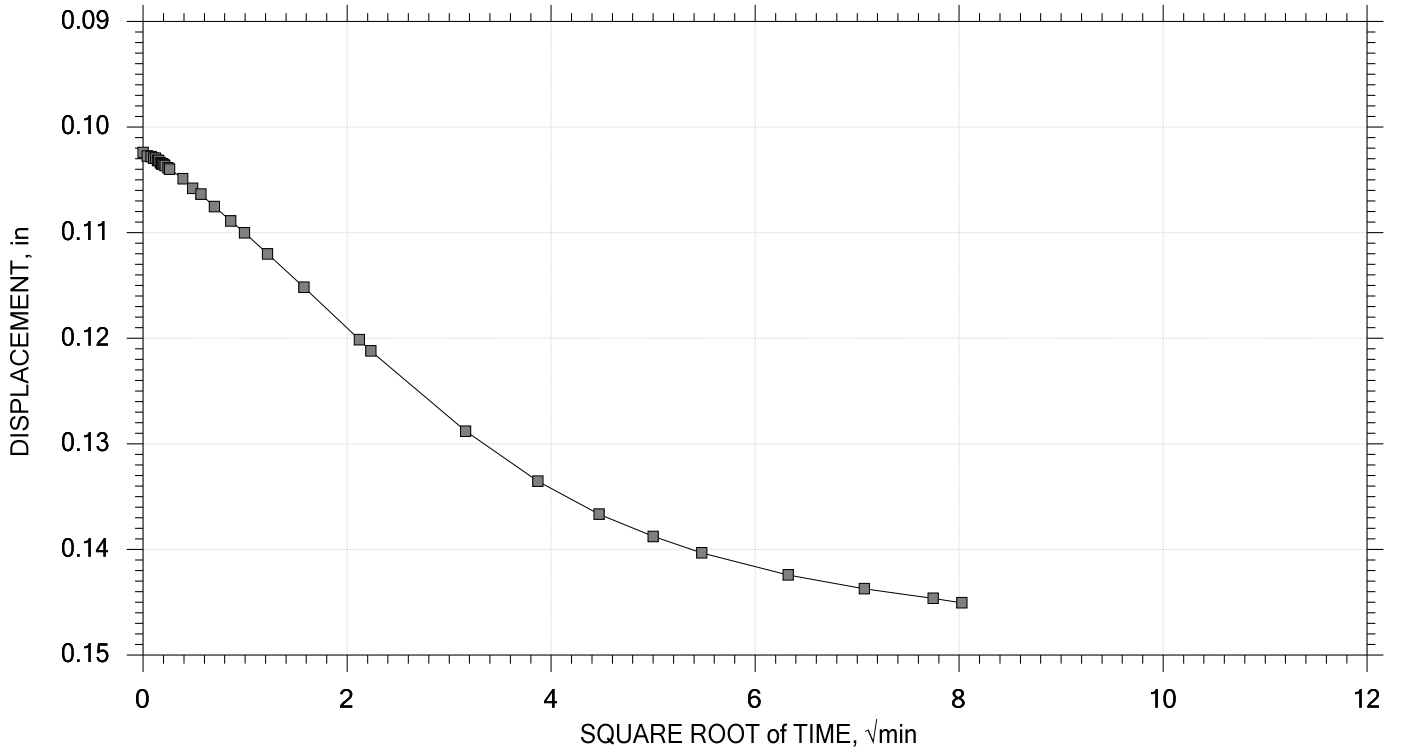
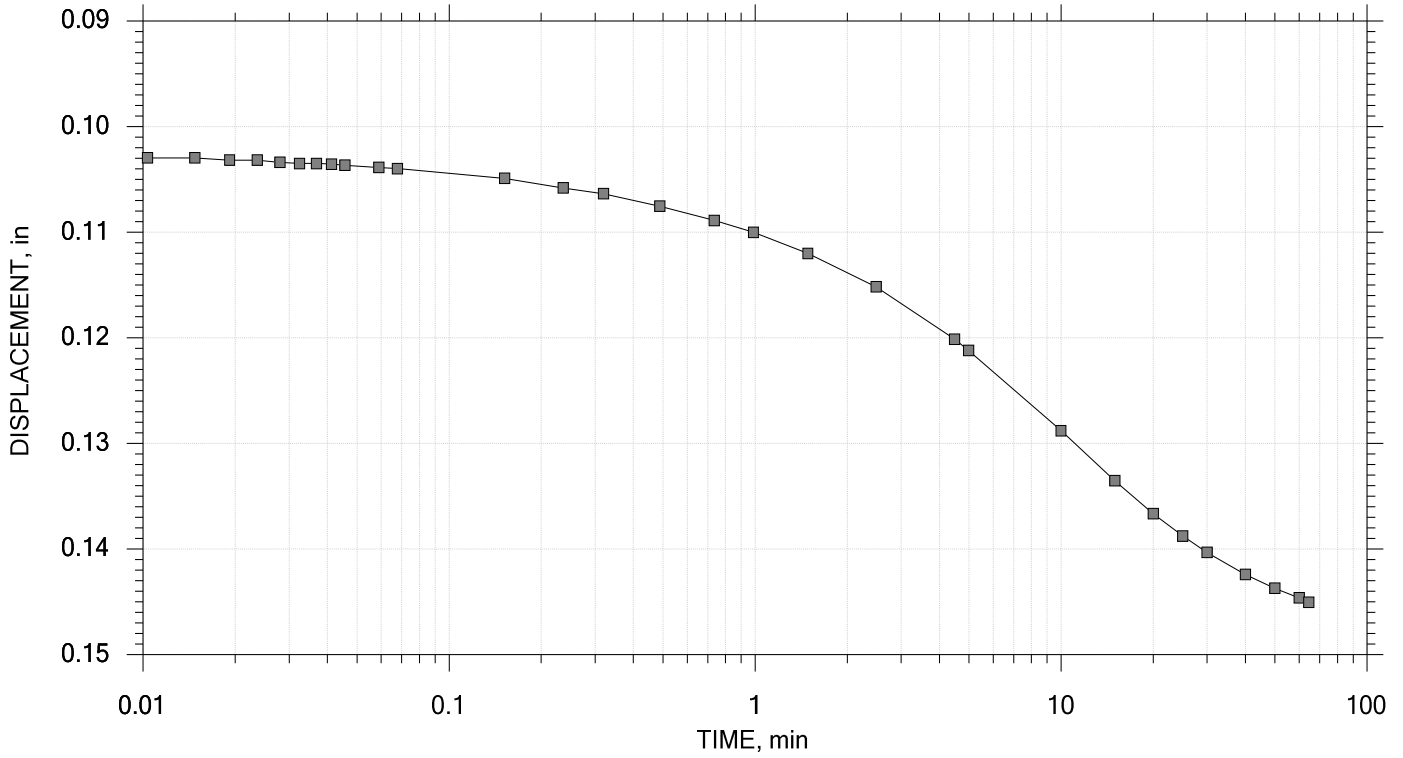
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 7 of 21

Stress: 4 tsf



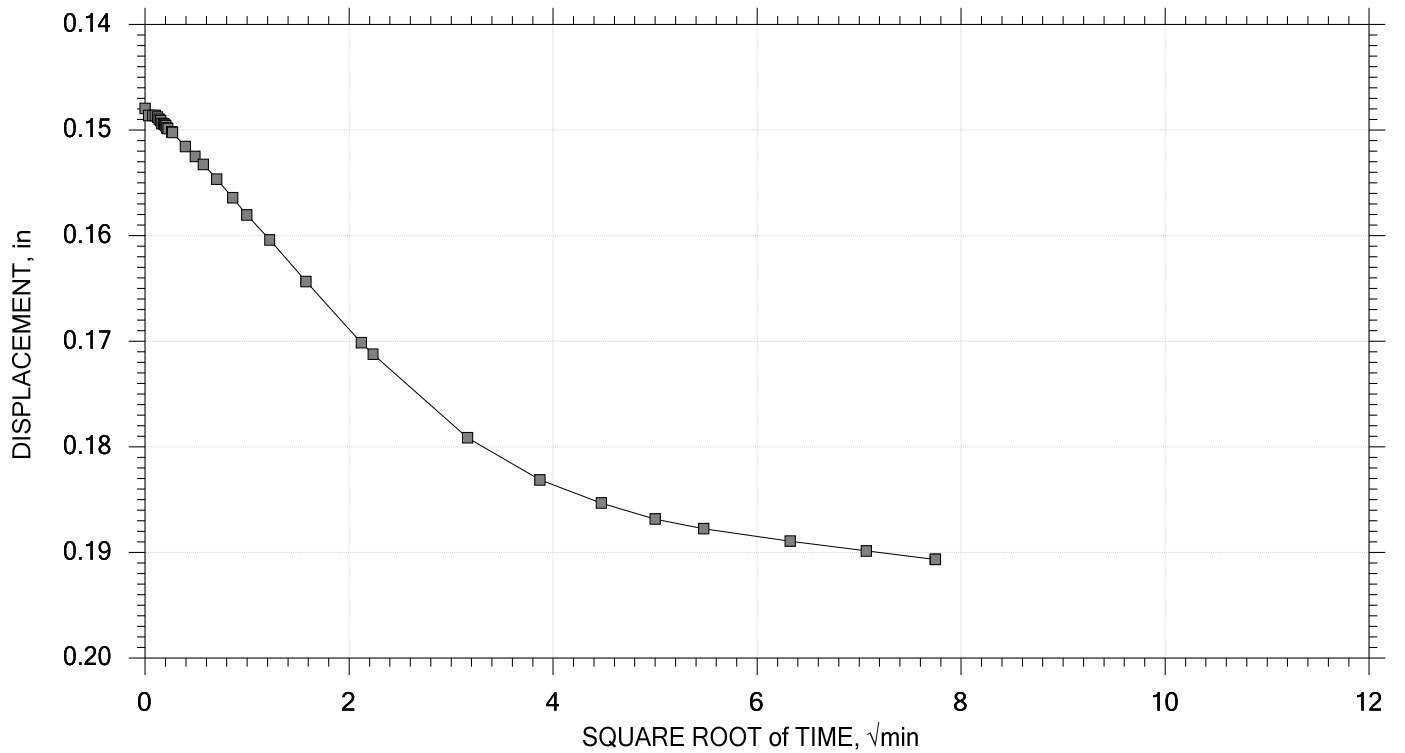
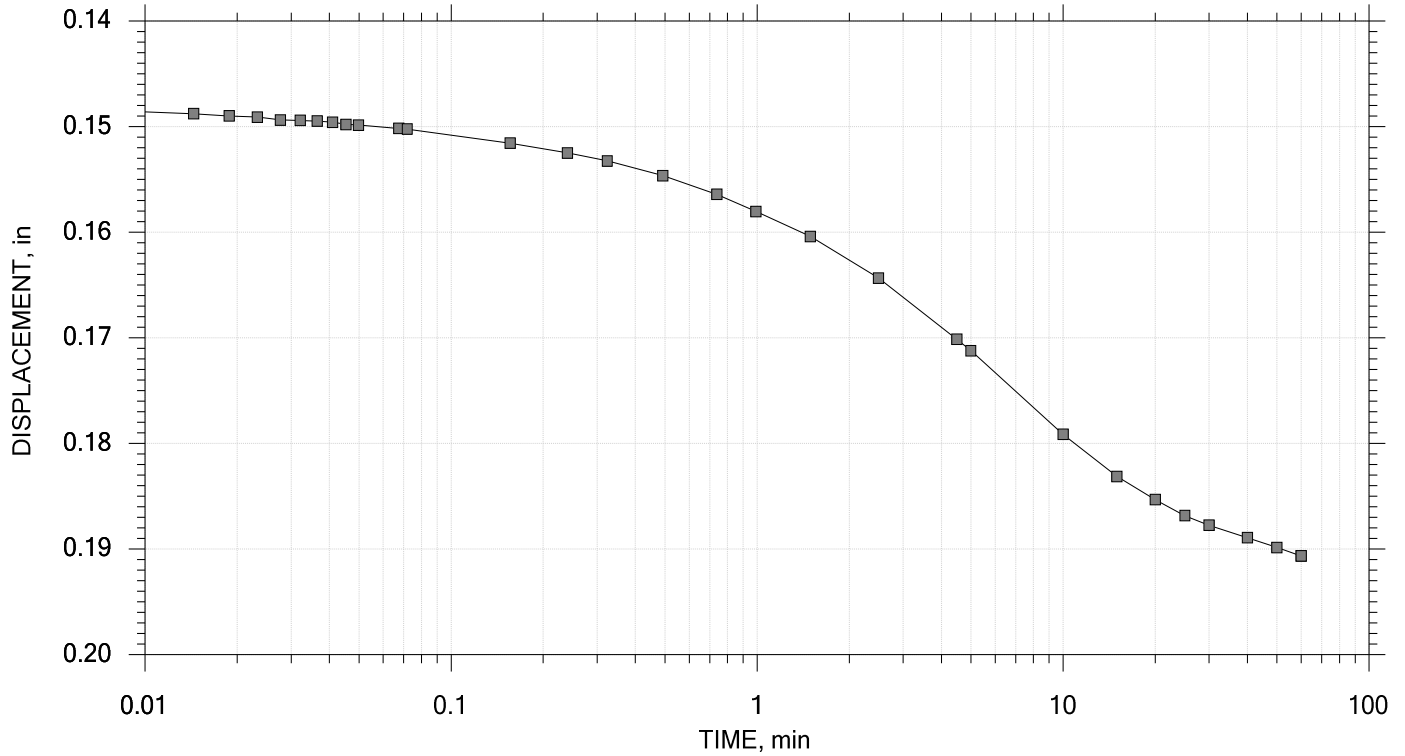
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 8 of 21

Stress: 8 tsf



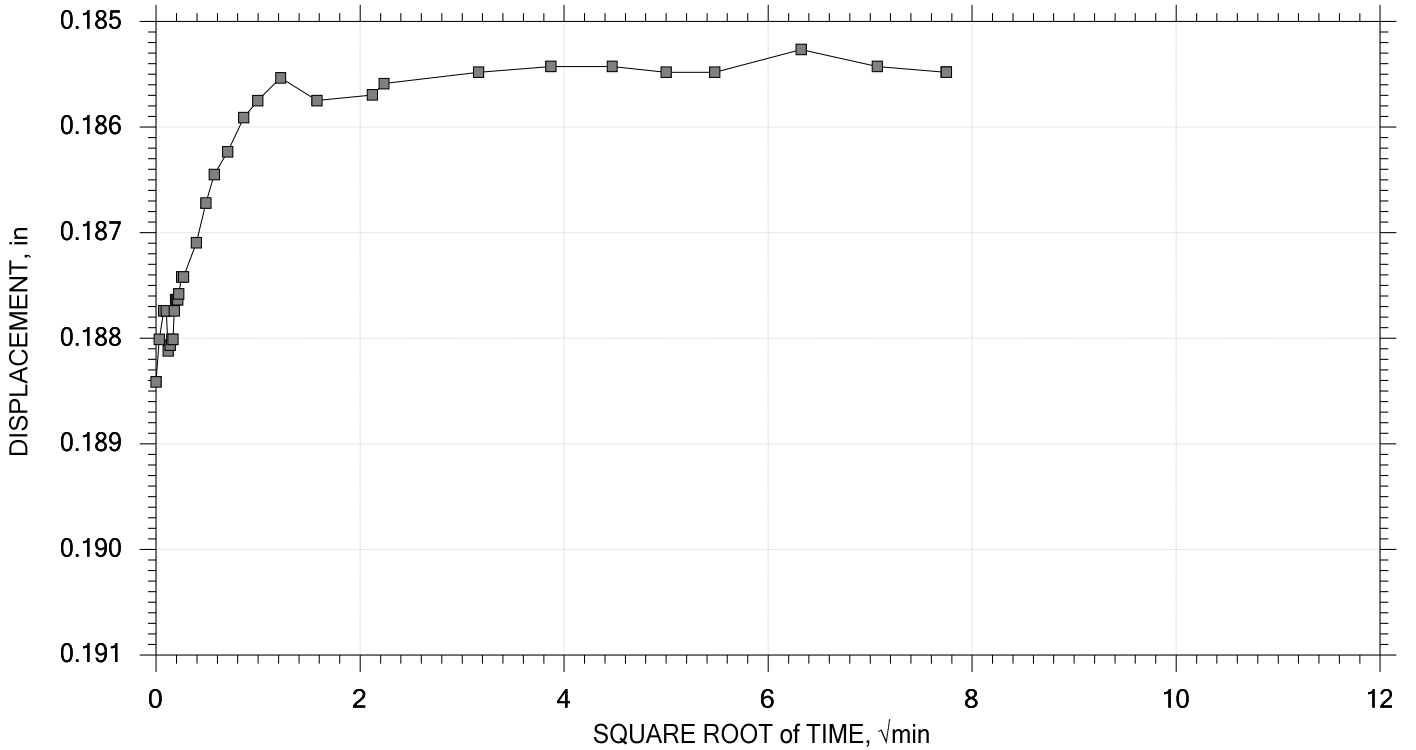
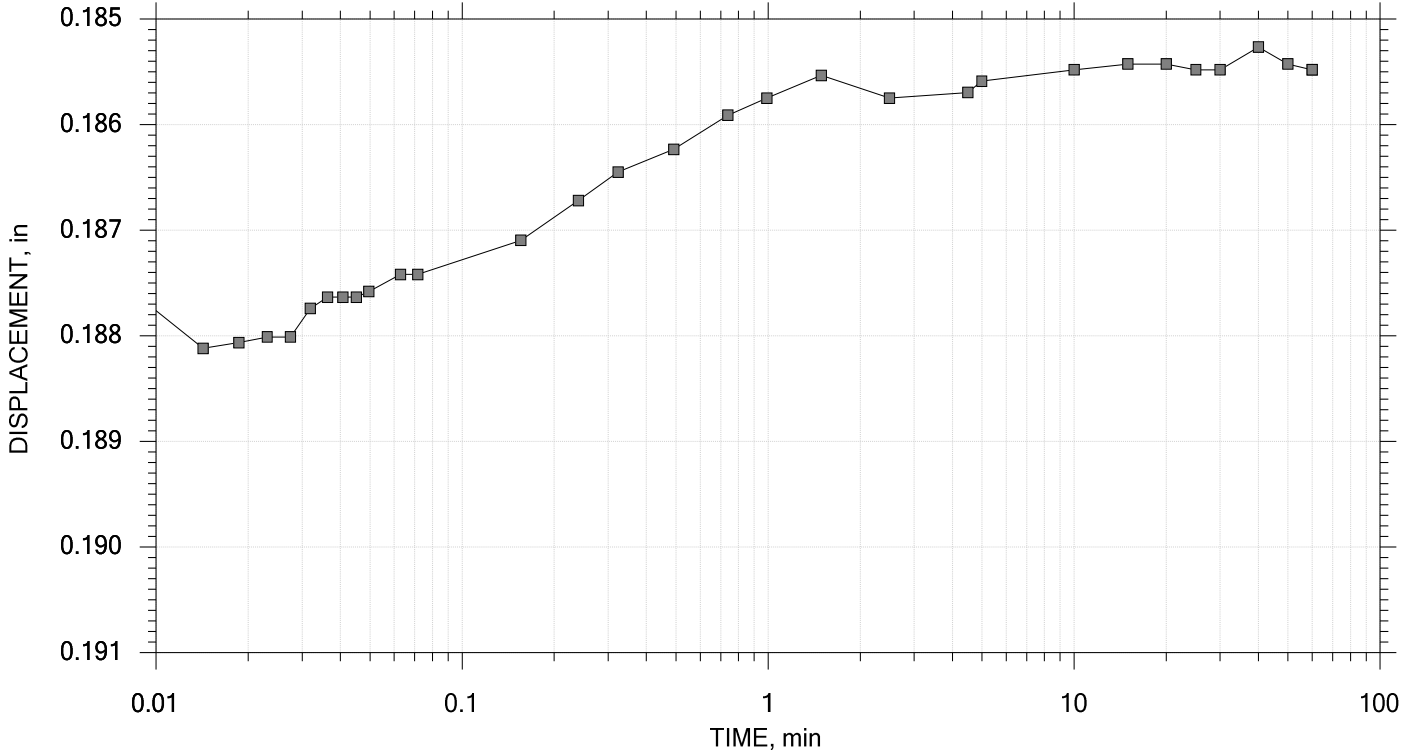
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 9 of 21

Stress: 4 tsf



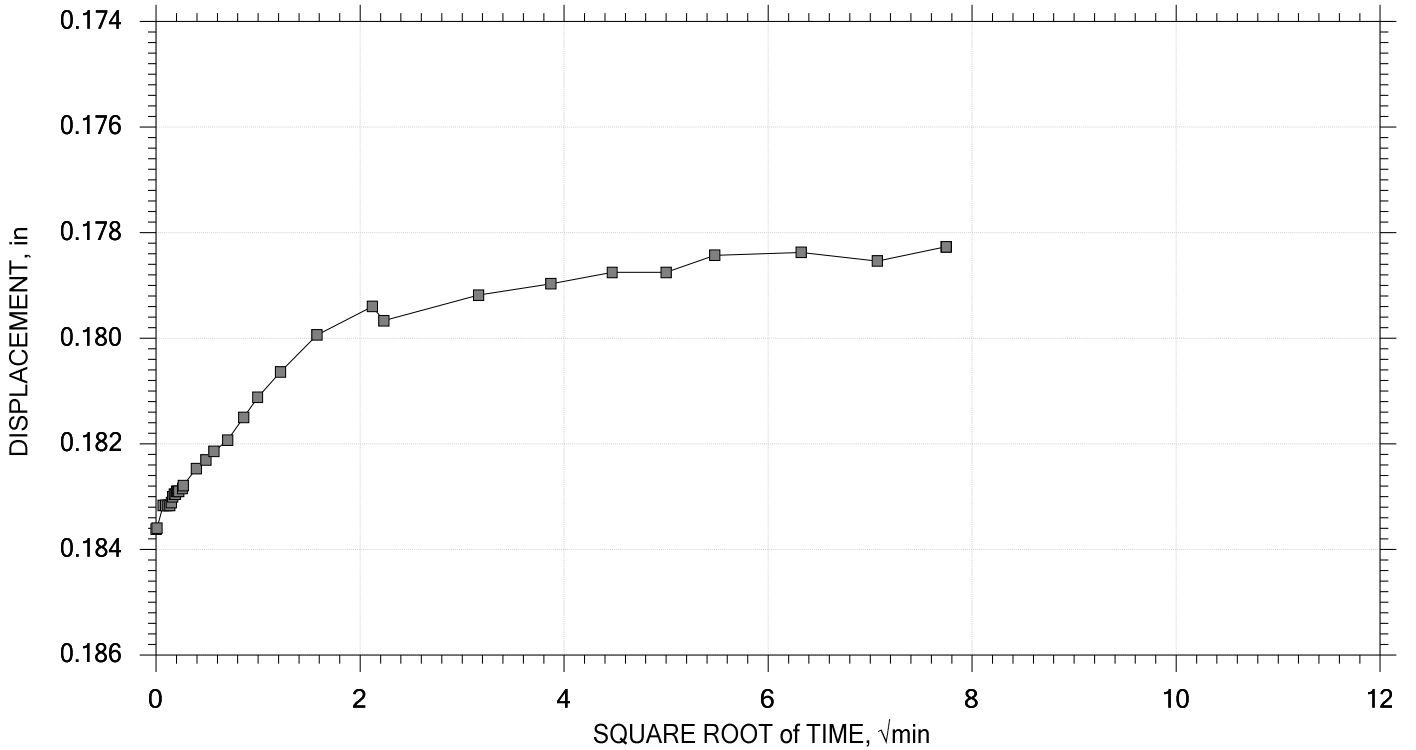
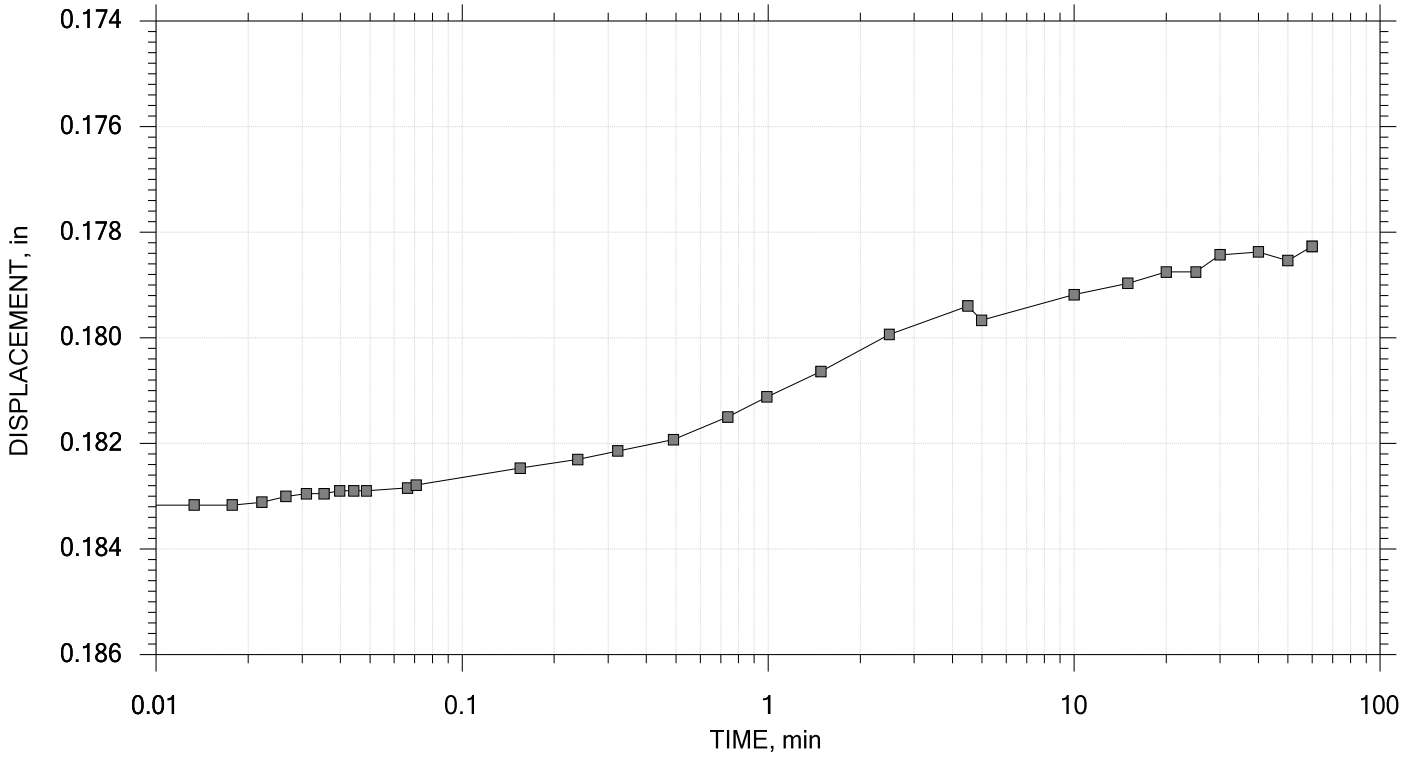
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 10 of 21

Stress: 2 tsf



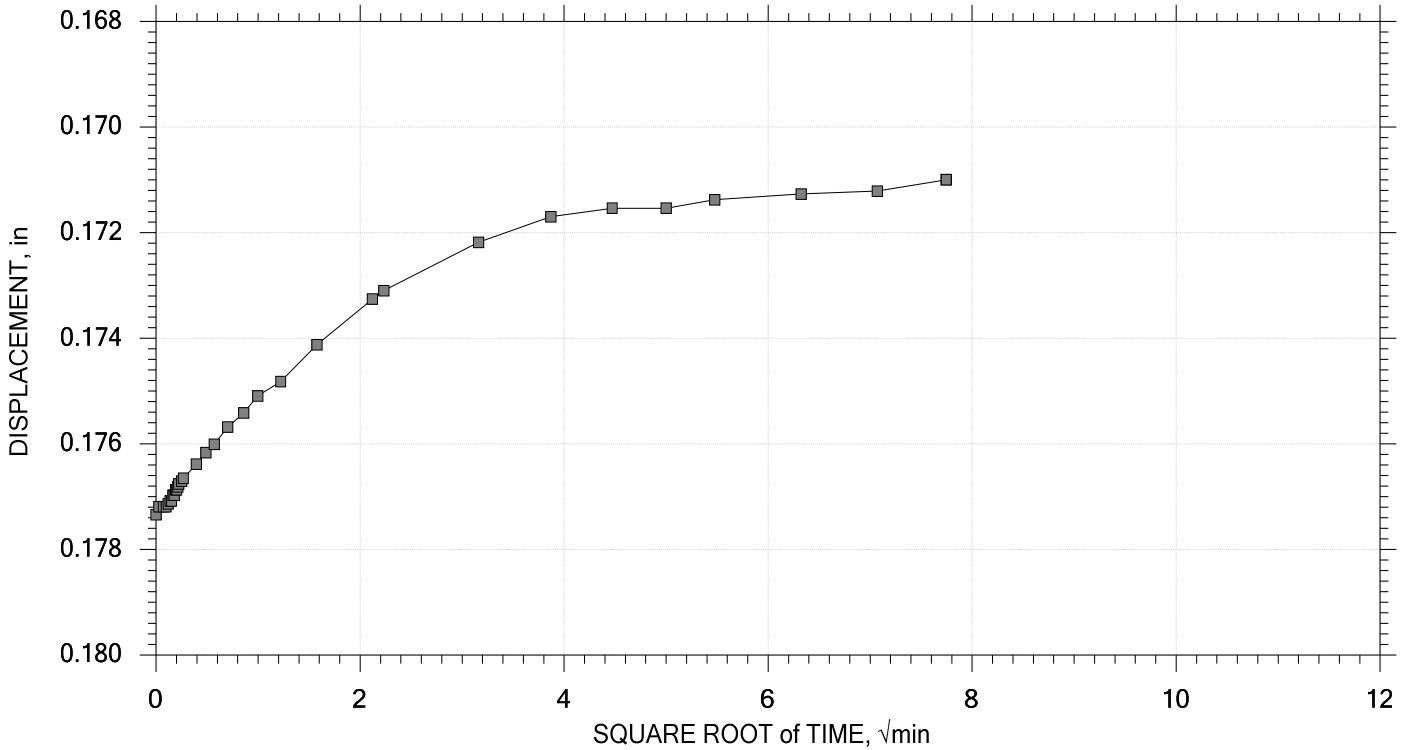
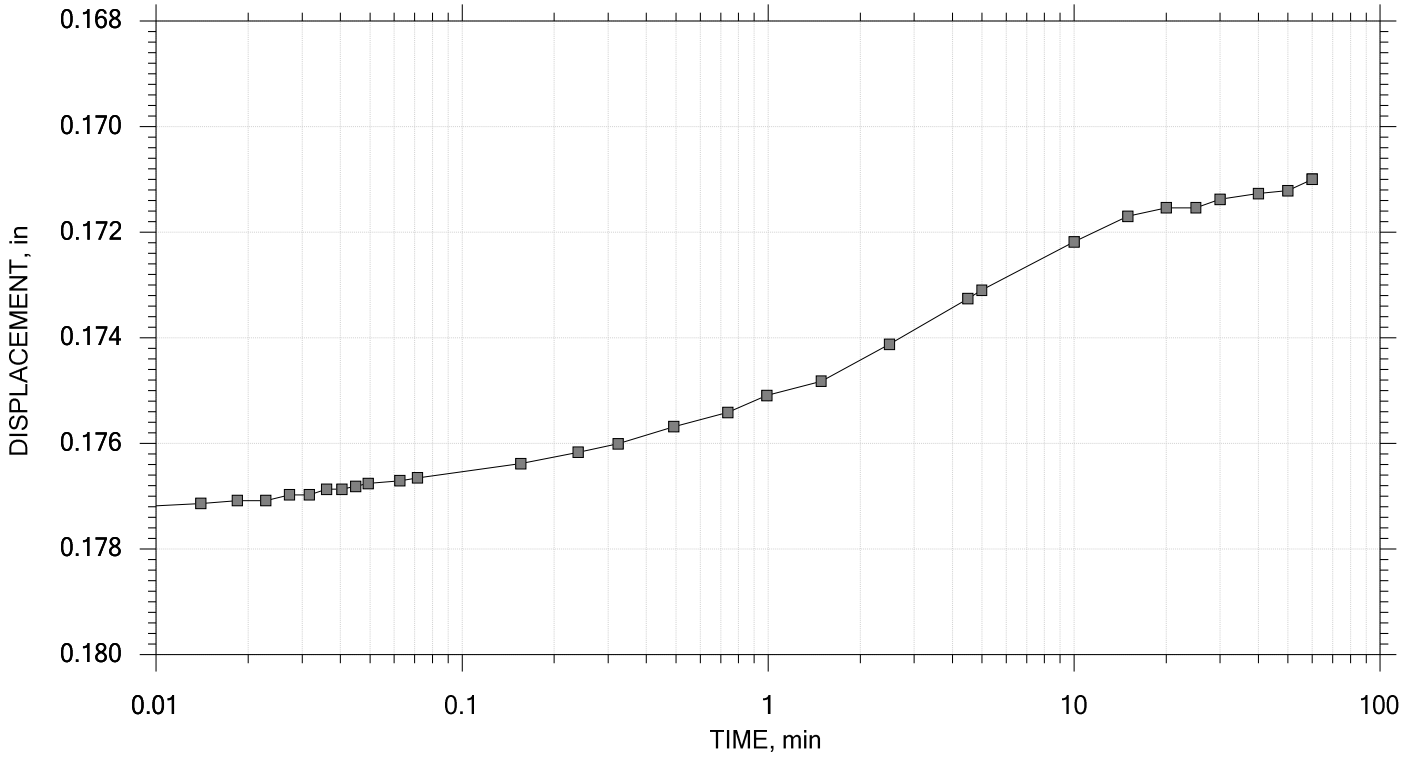
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 11 of 21

Stress: 1 tsf



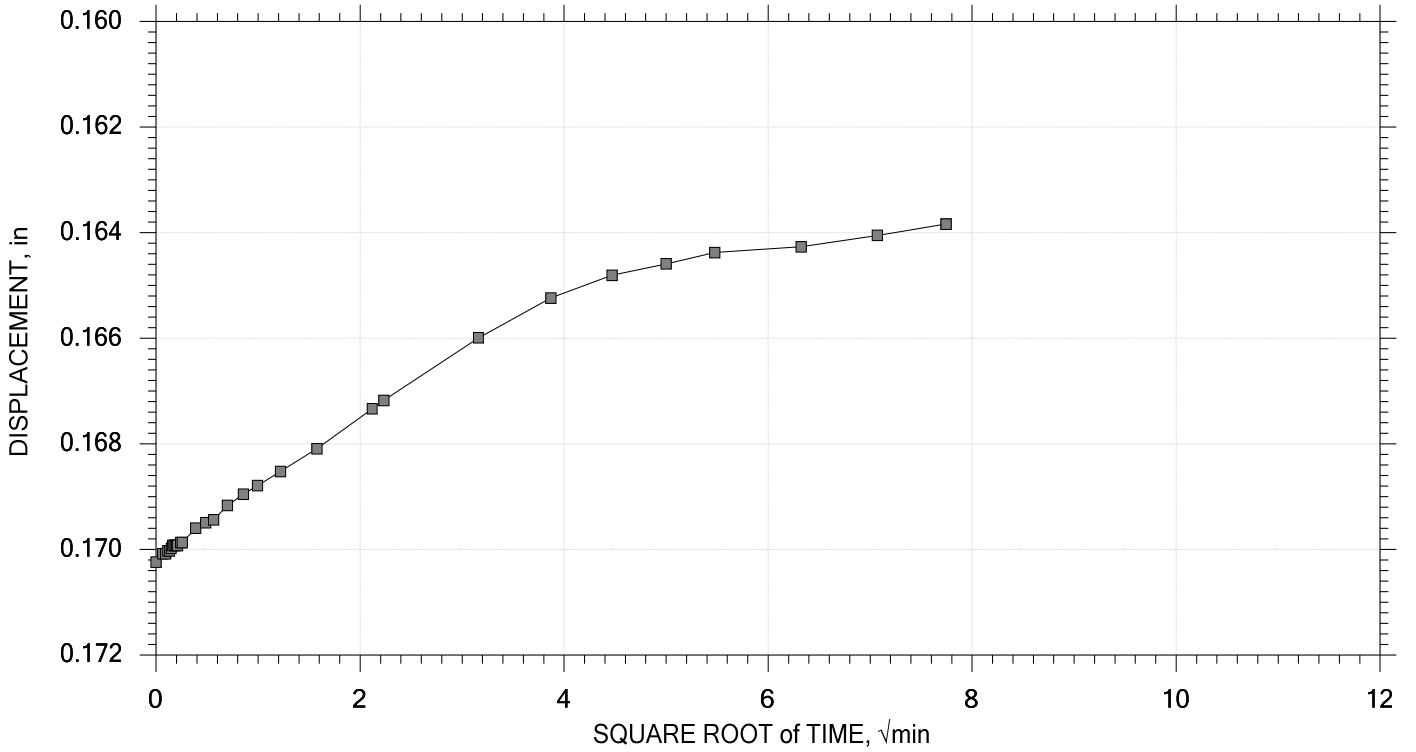
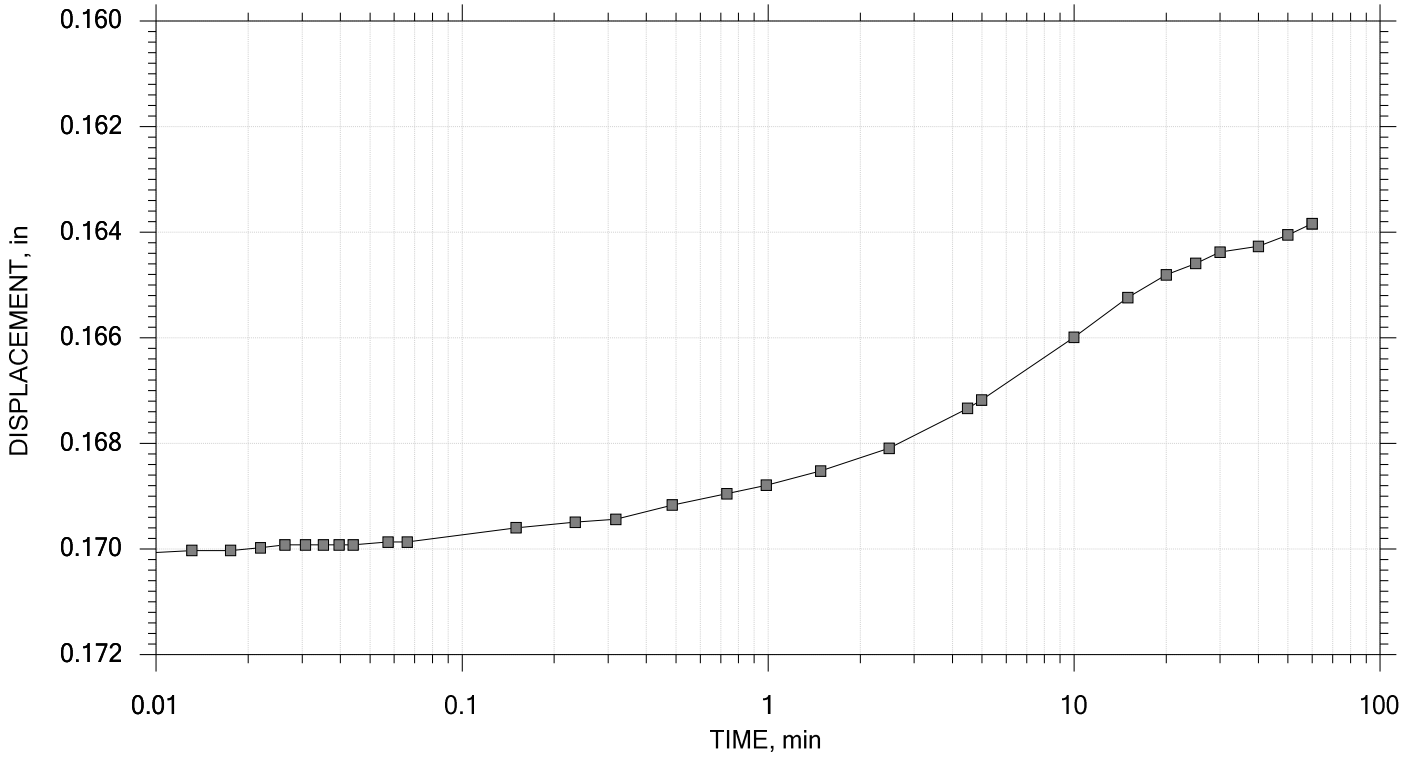
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 12 of 21

Stress: 0.5 tsf



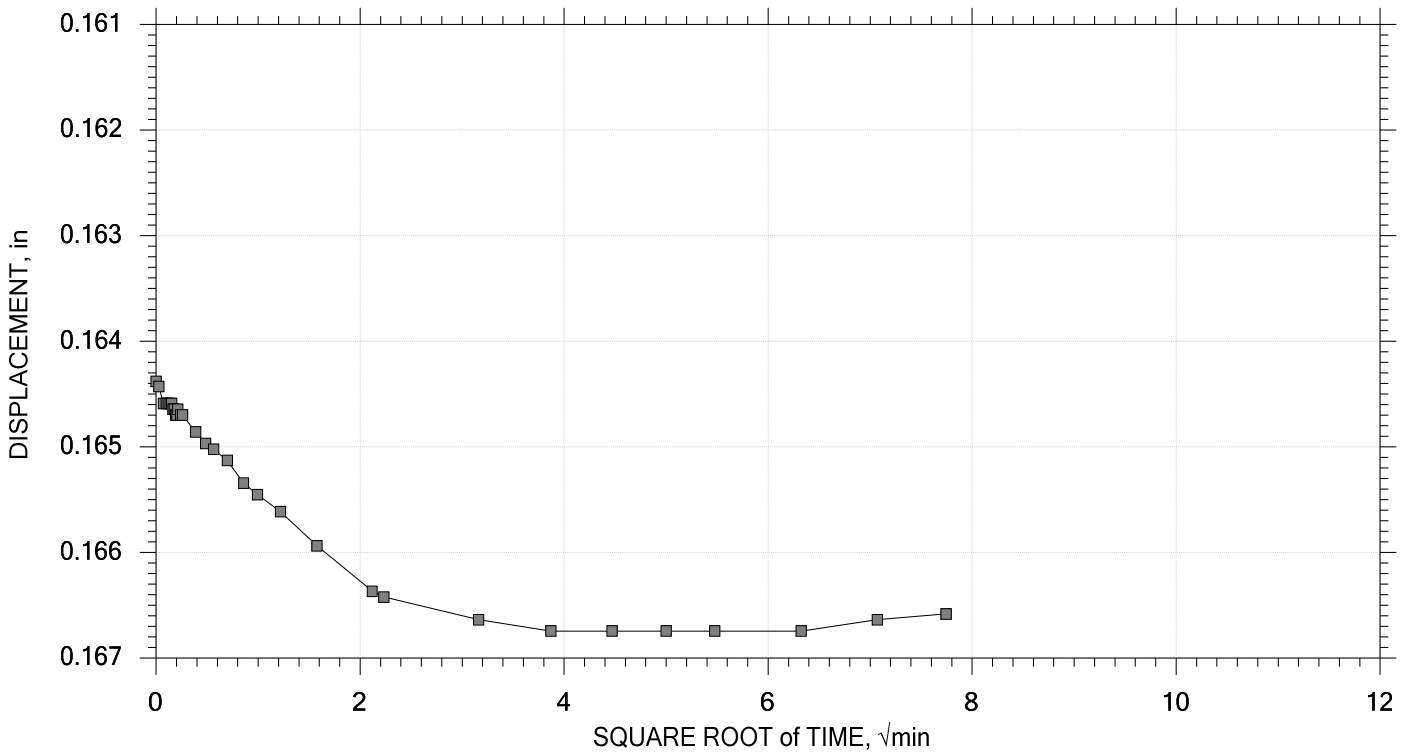
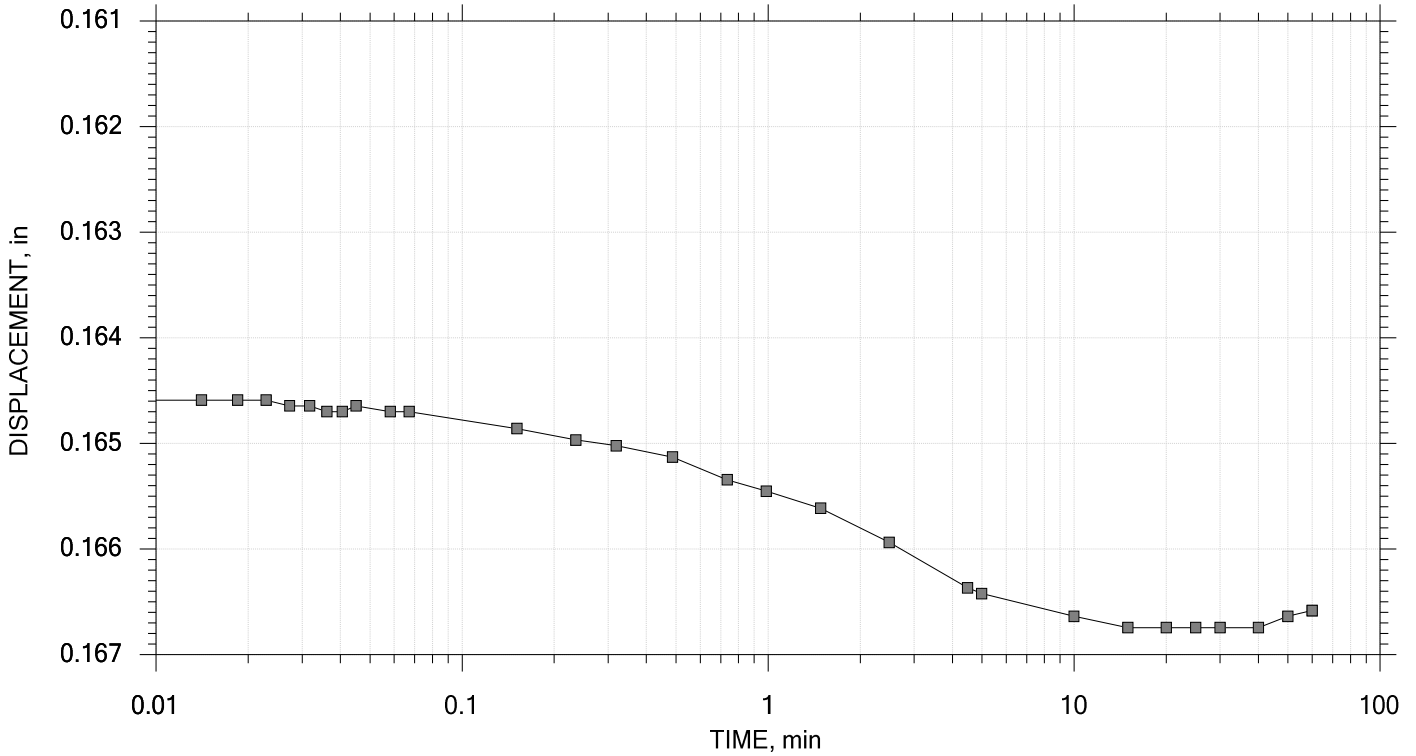
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 13 of 21

Stress: 1 tsf



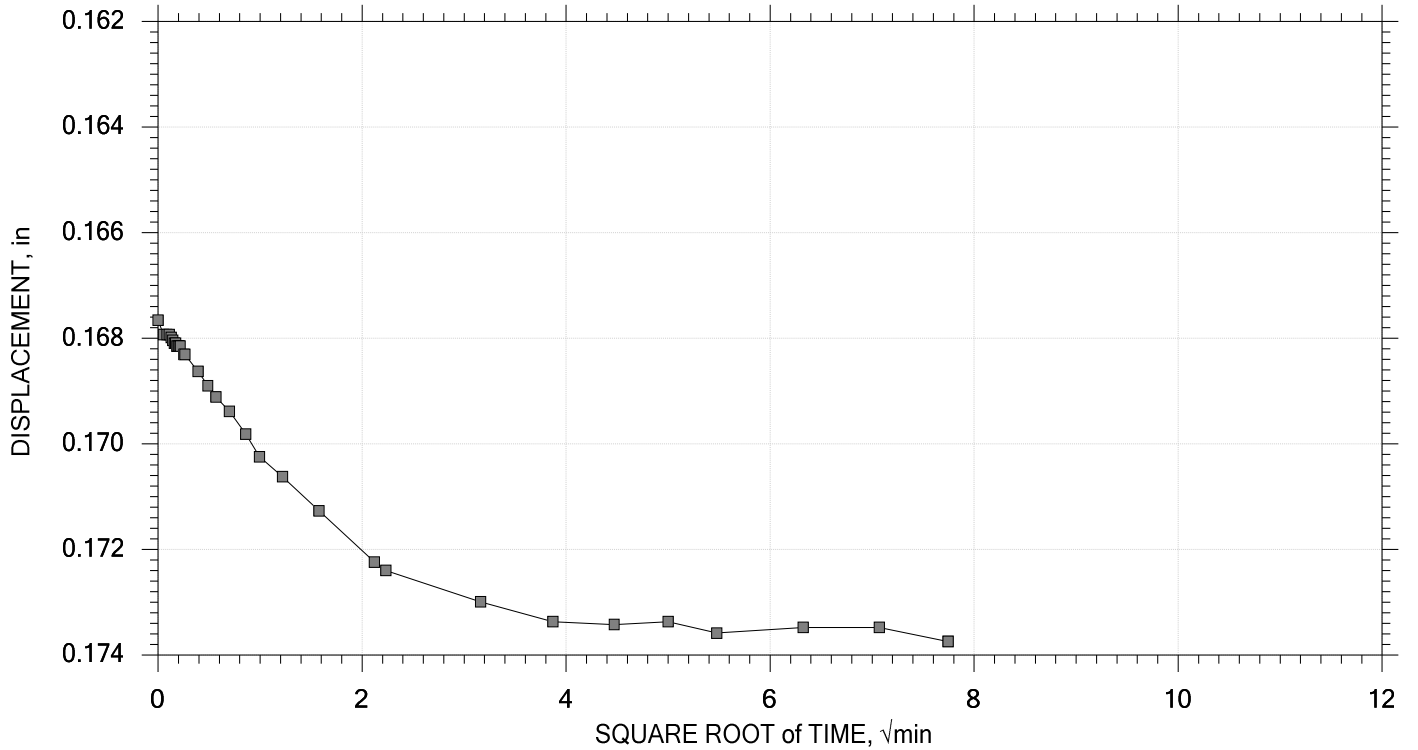
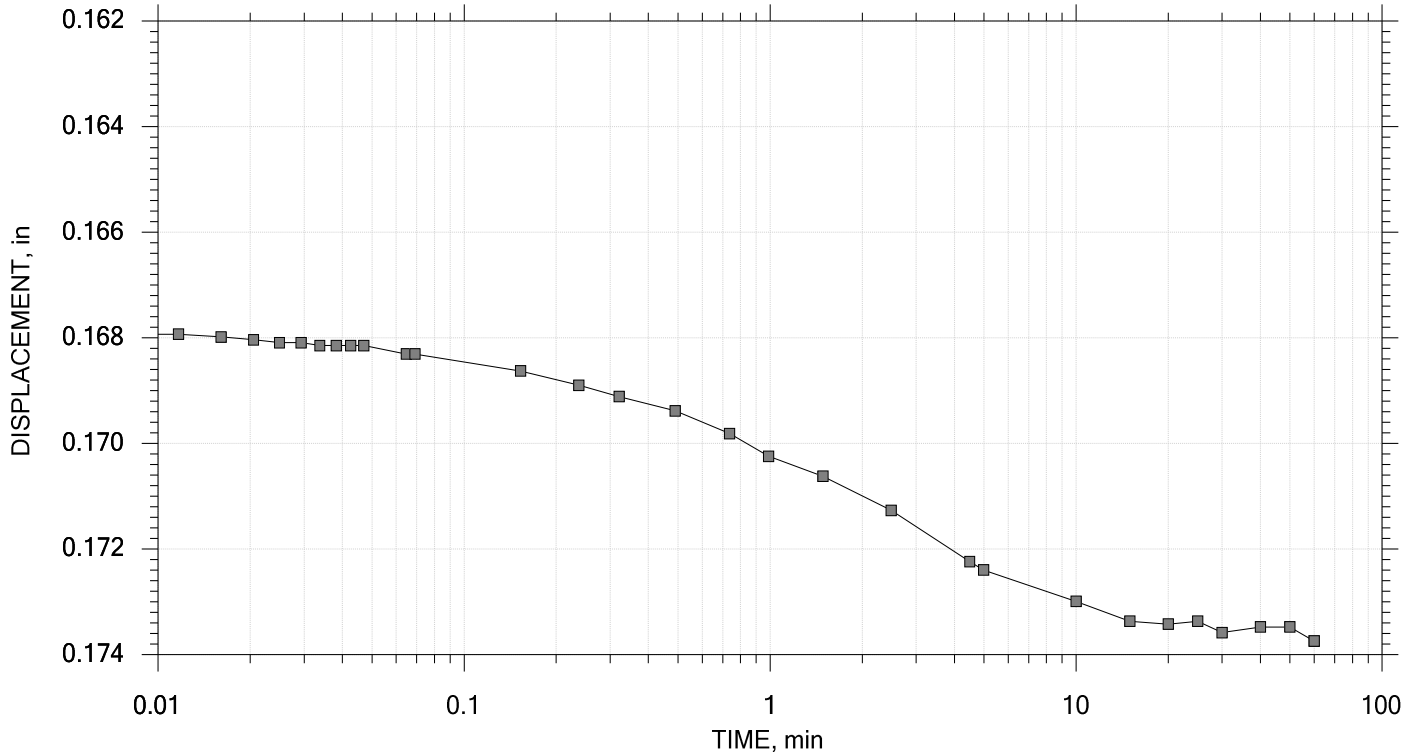
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 14 of 21

Stress: 2 tsf



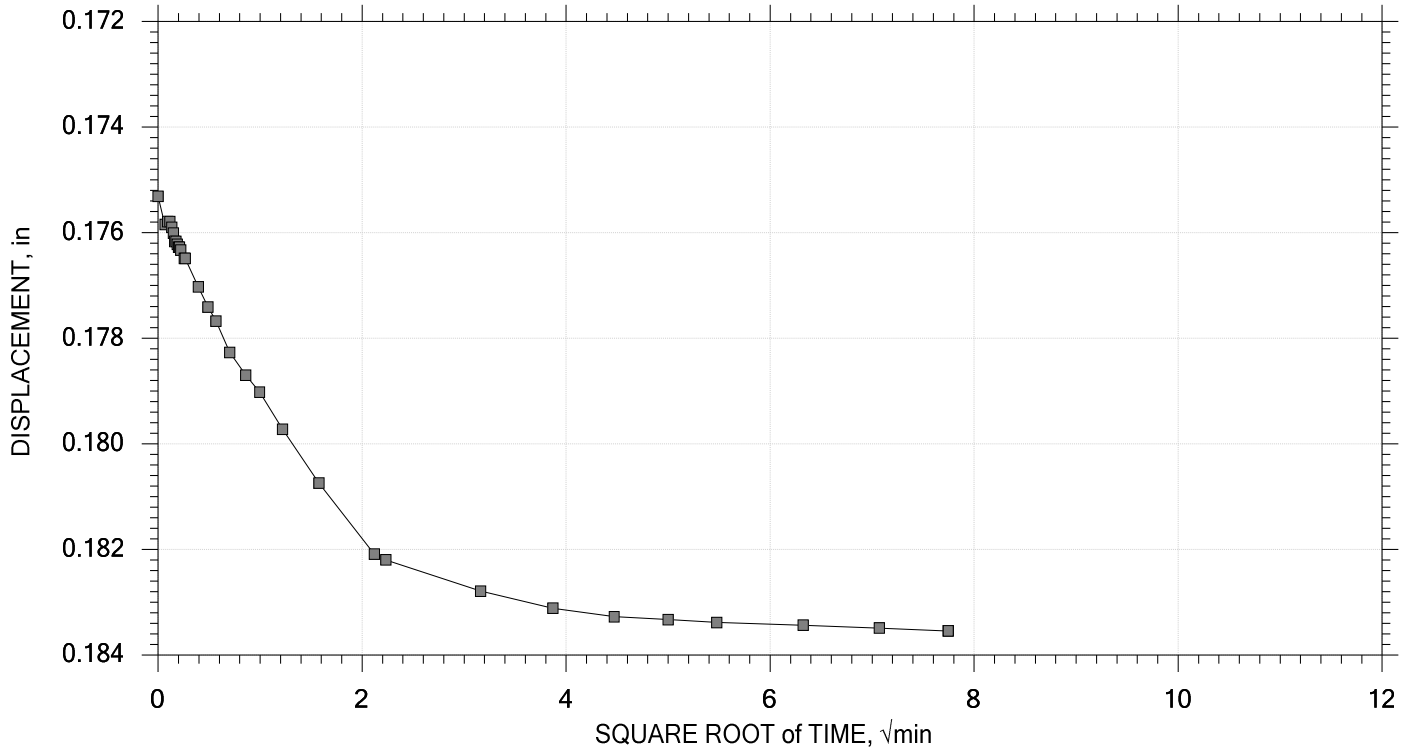
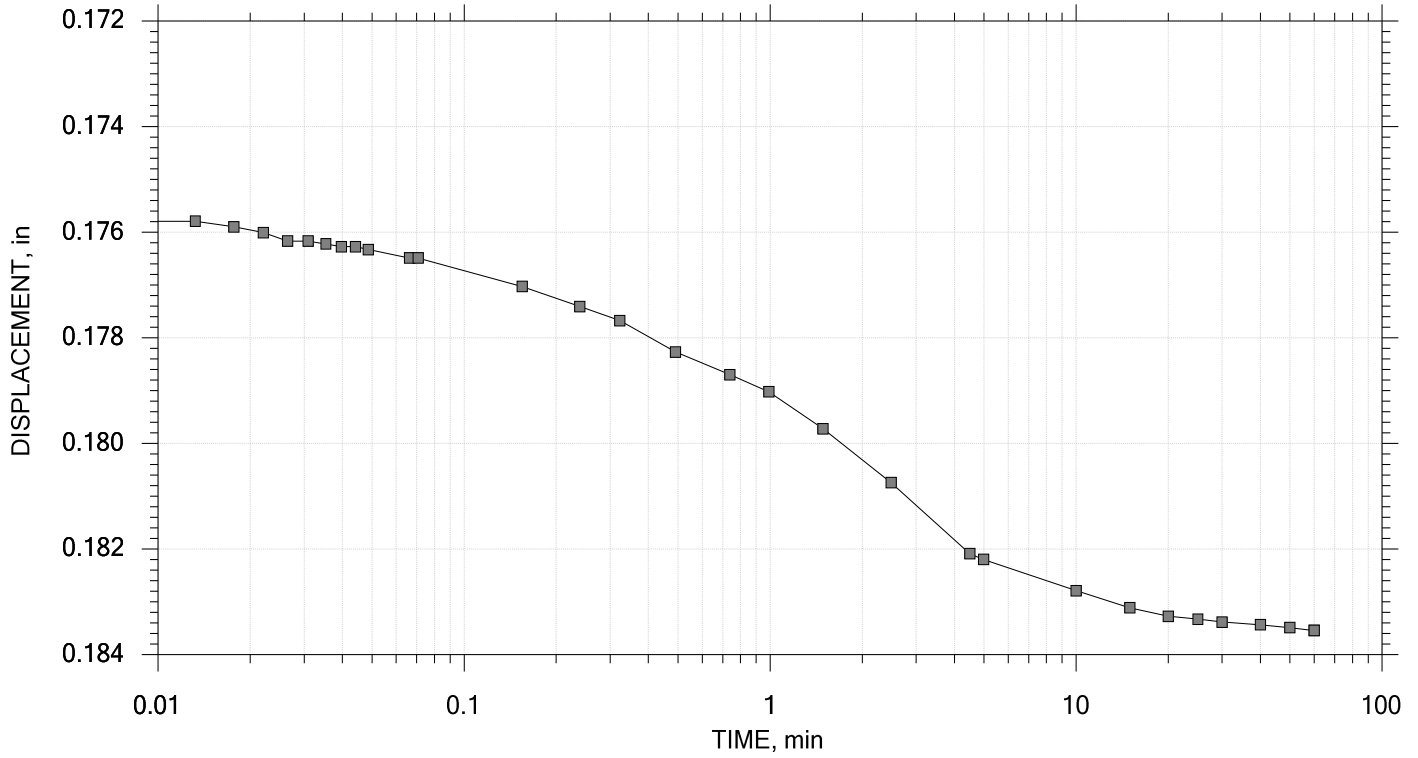
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 15 of 21

Stress: 4 tsf



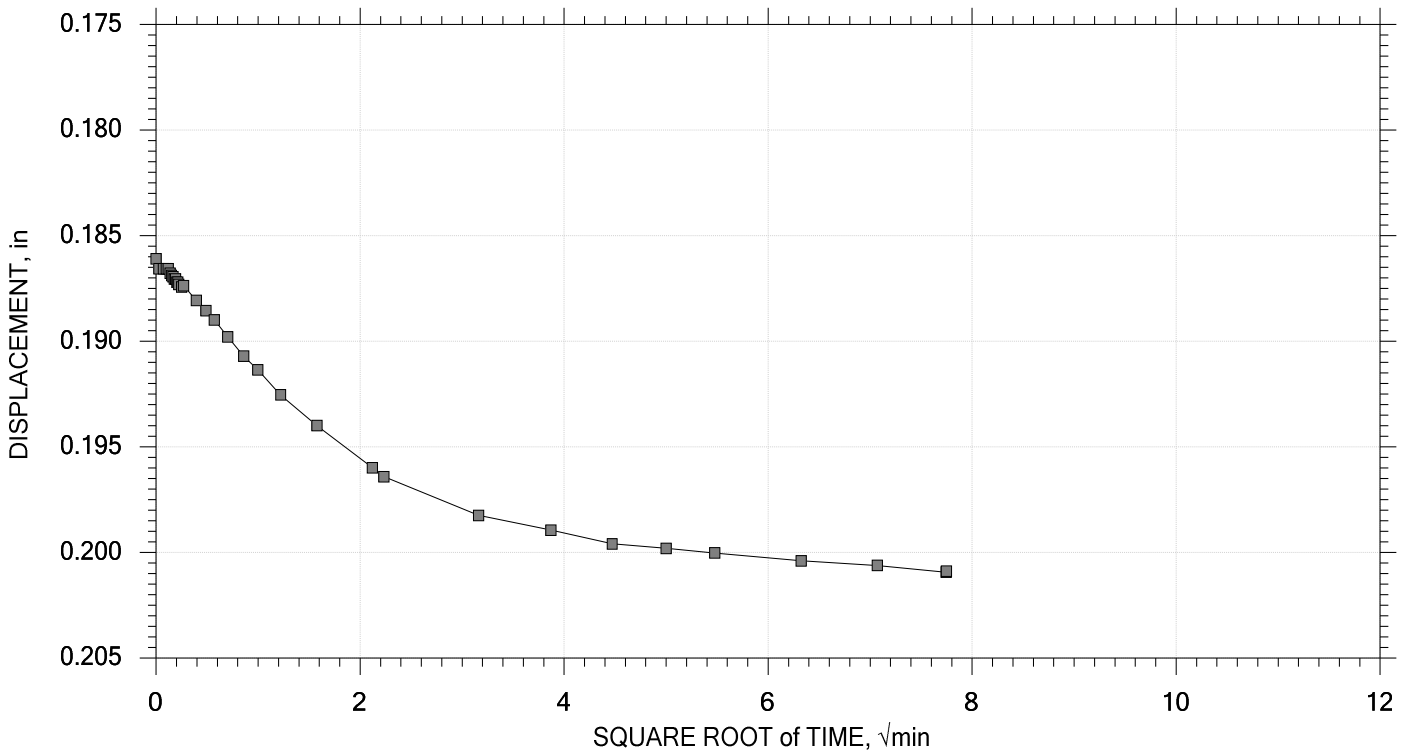
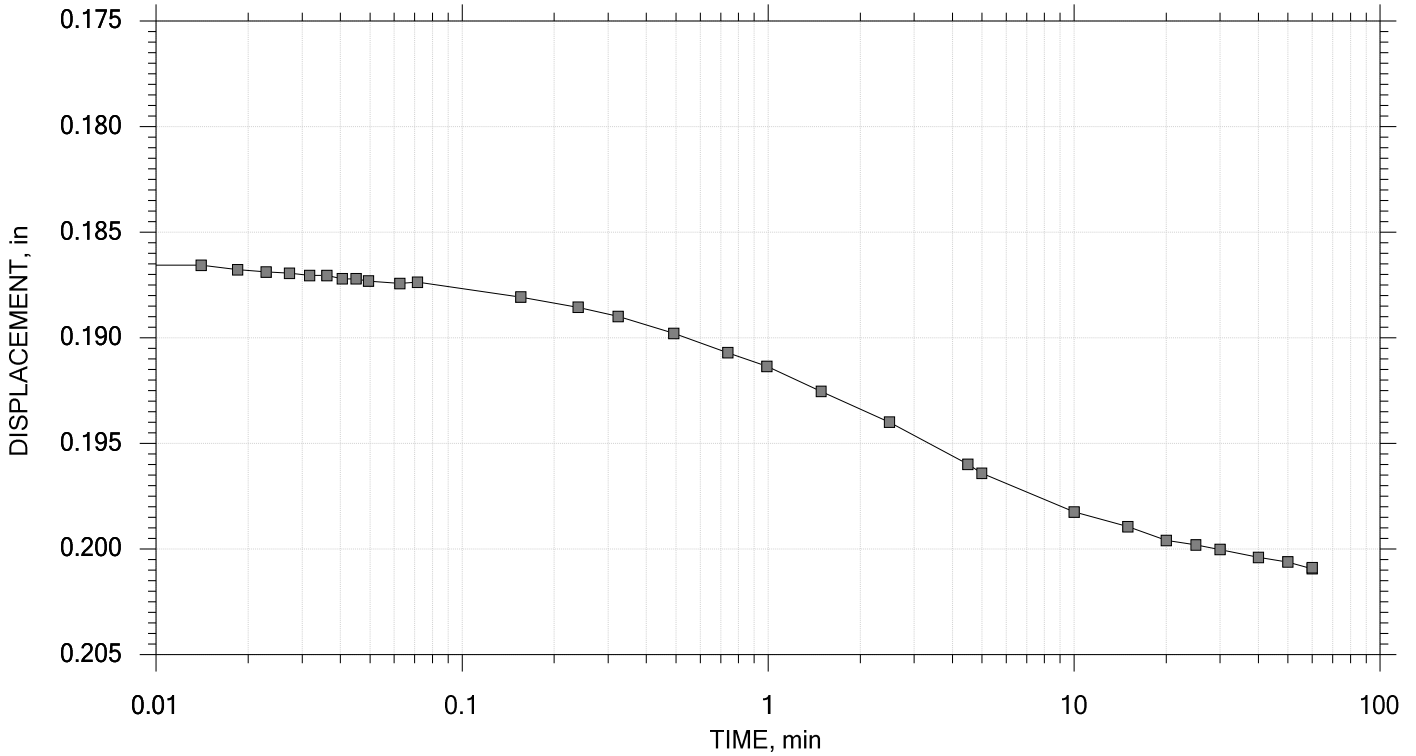
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 16 of 21

Stress: 8 tsf



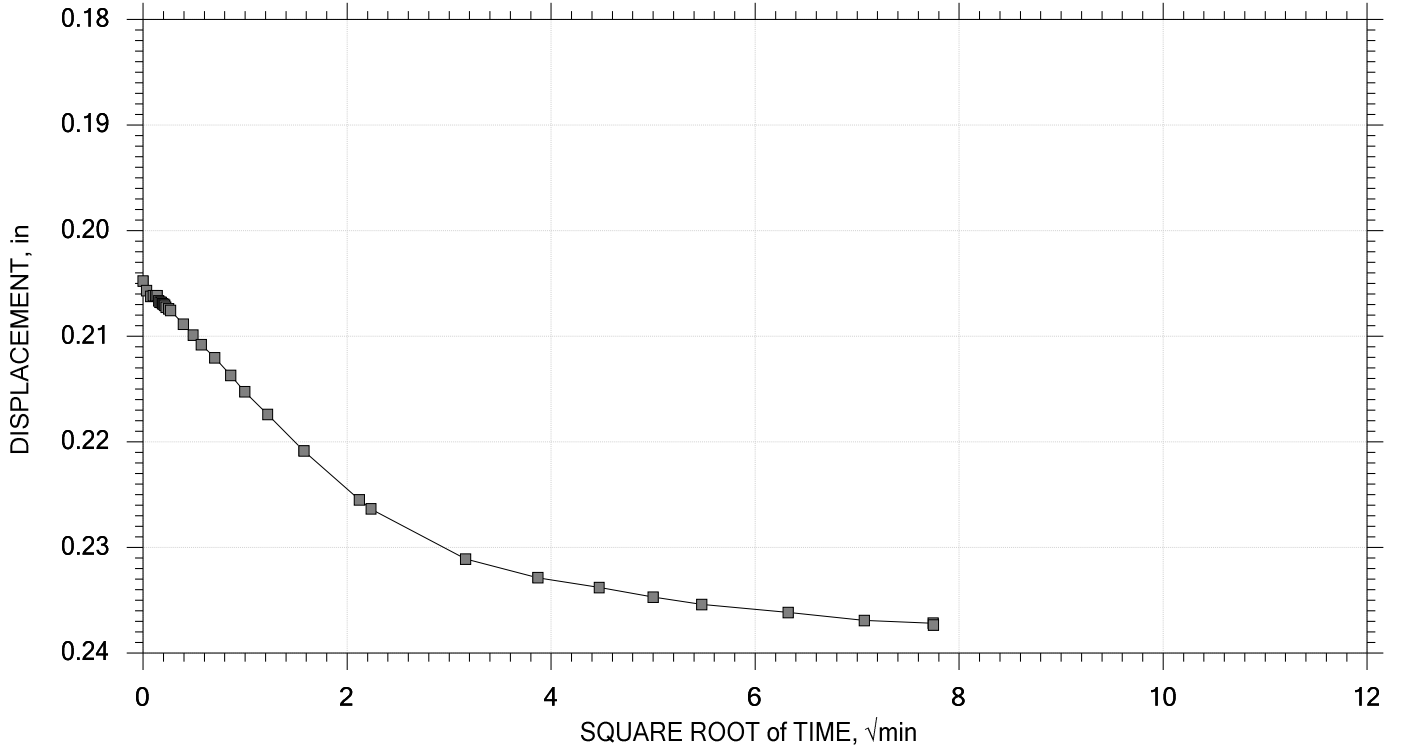
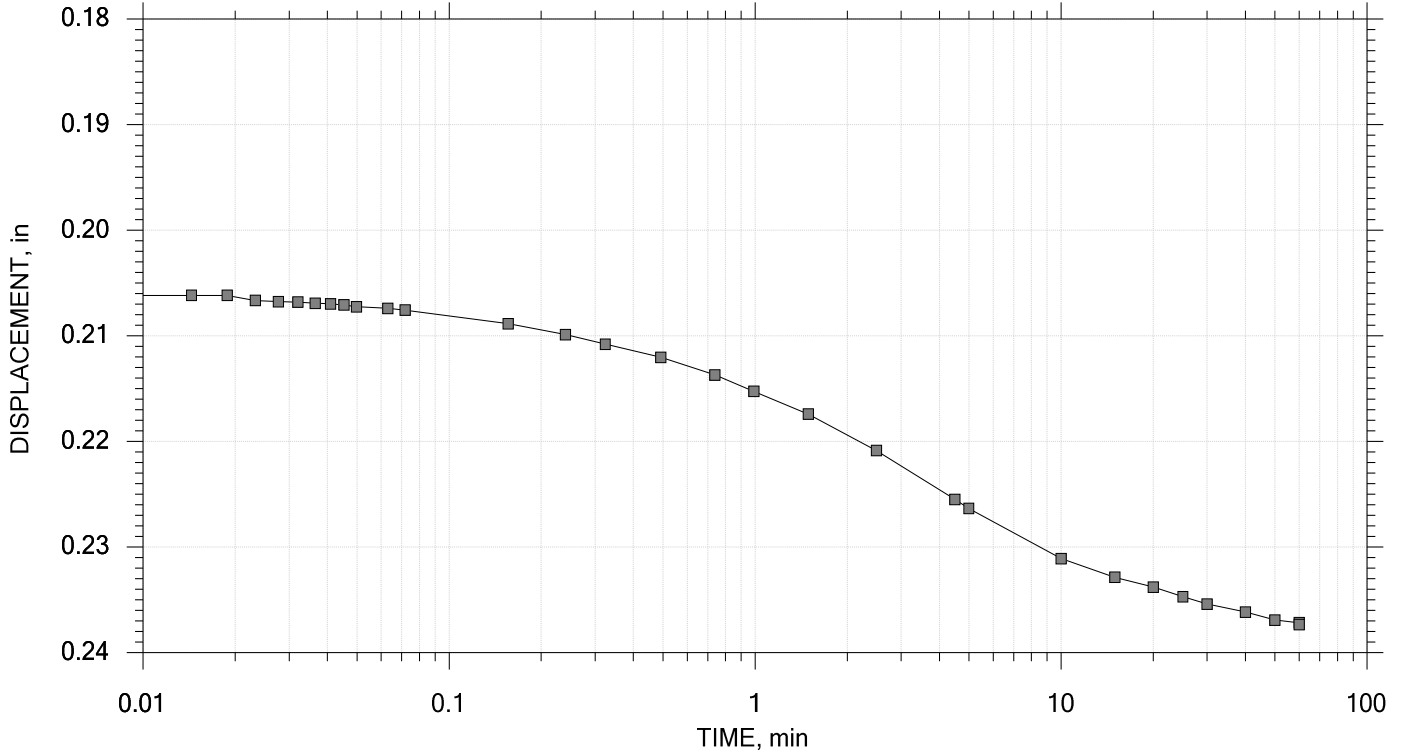
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 17 of 21

Stress: 16 tsf



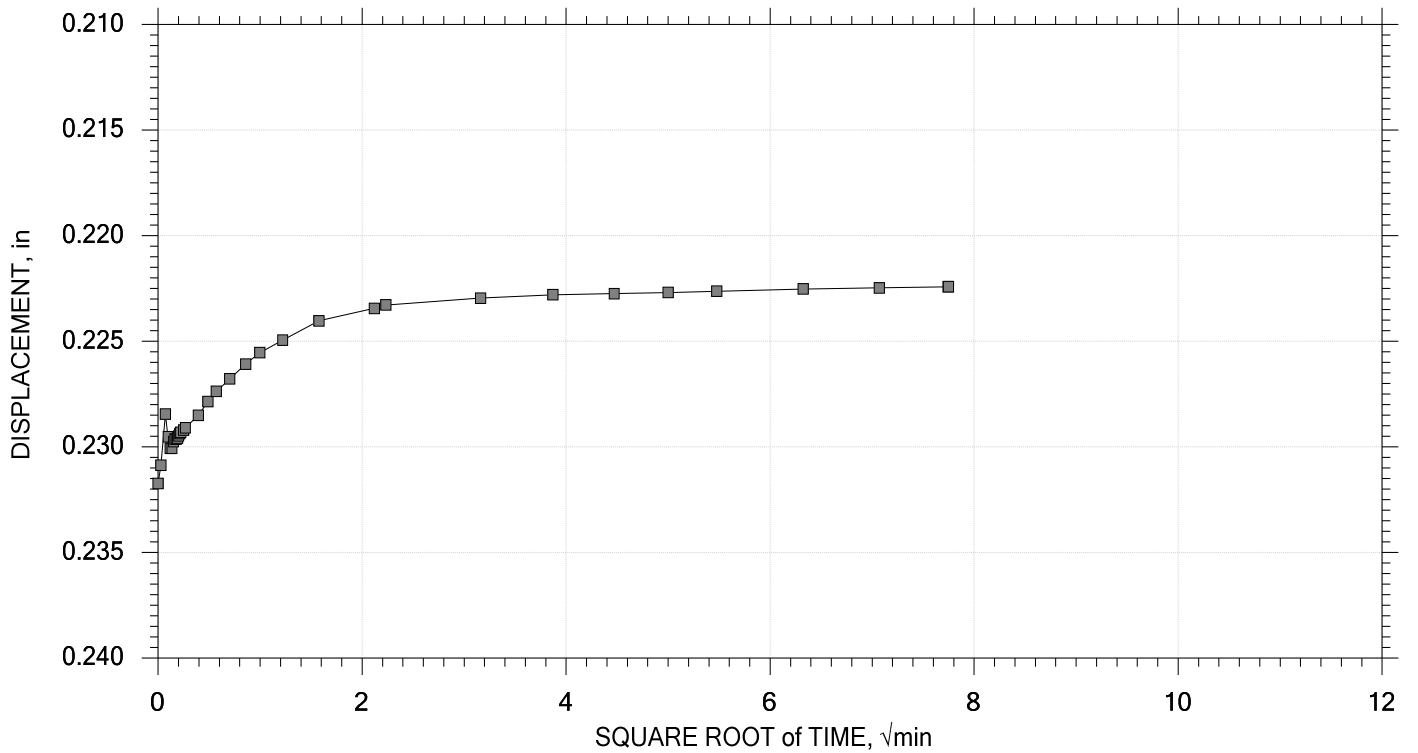
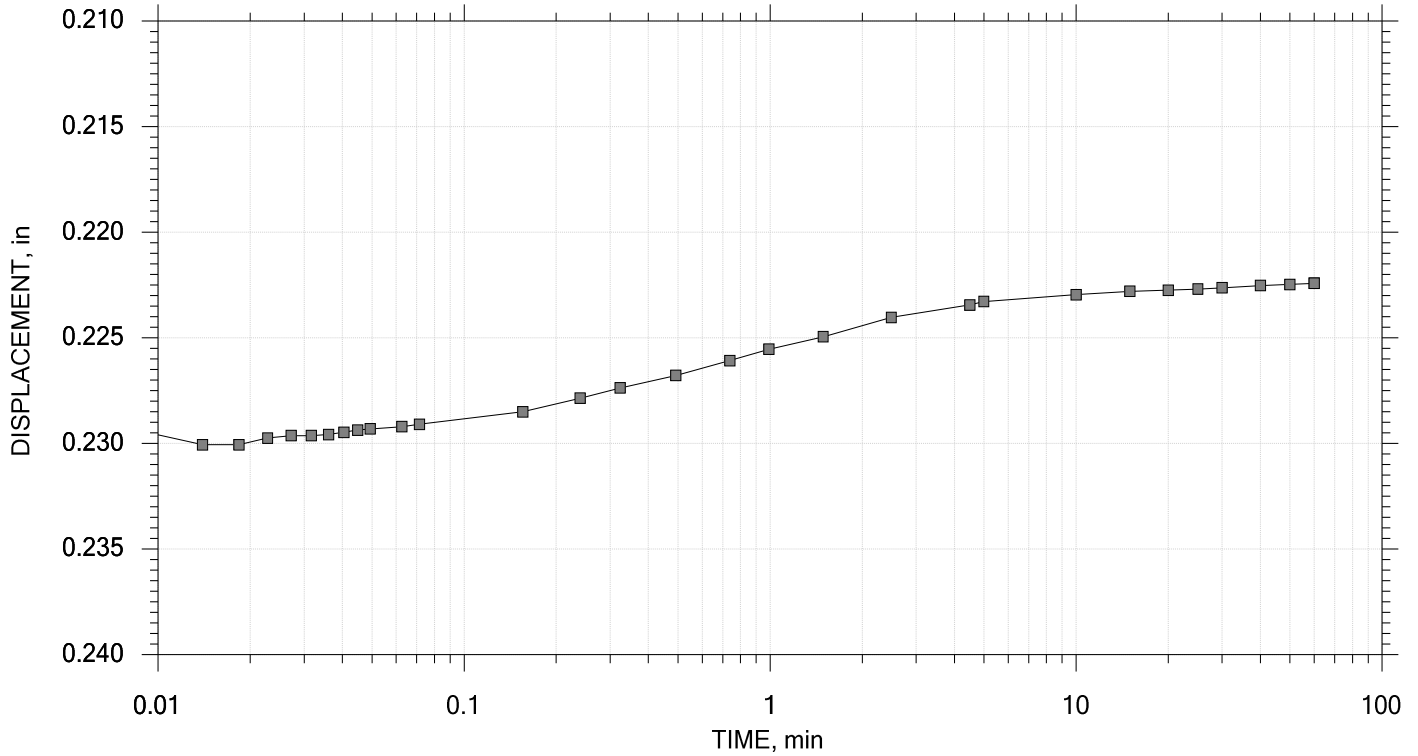
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 18 of 21

Stress: 4 tsf



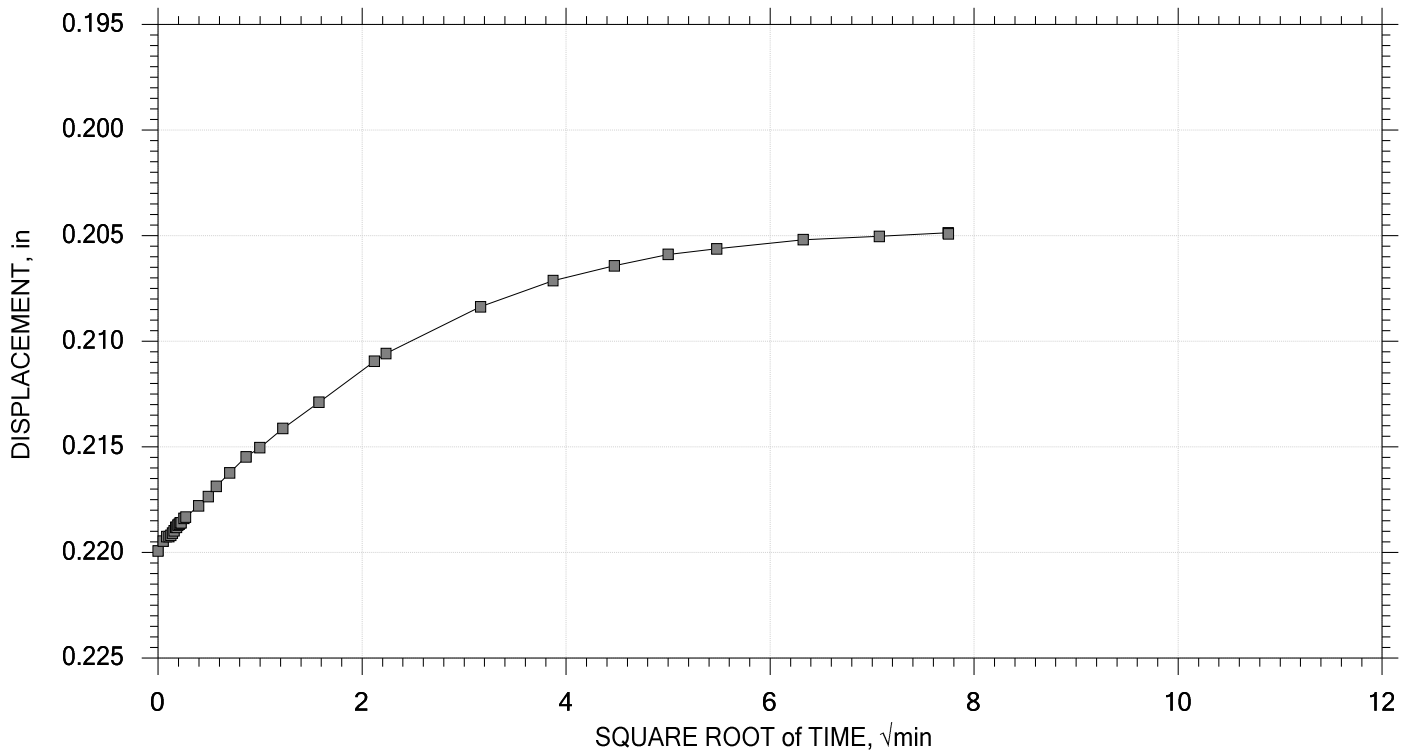
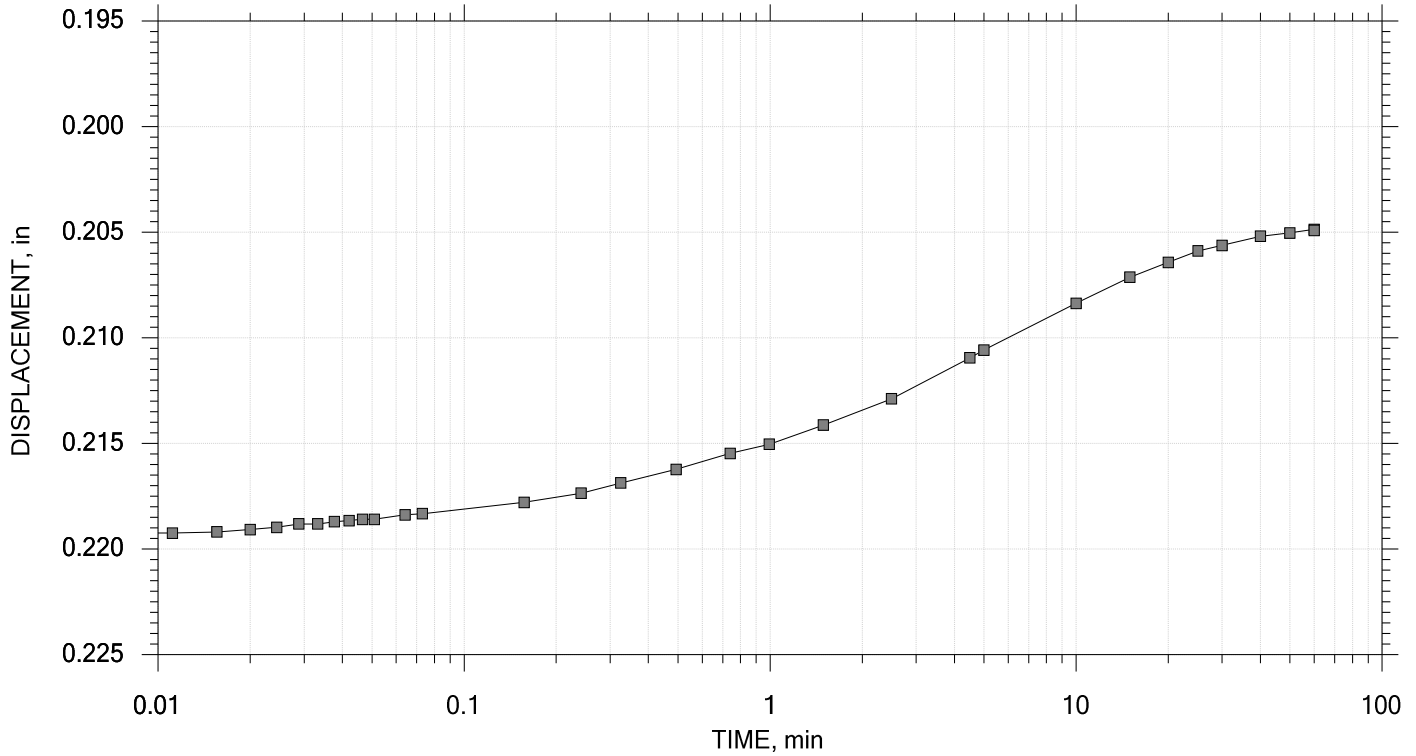
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 19 of 21

Stress: 1 tsf



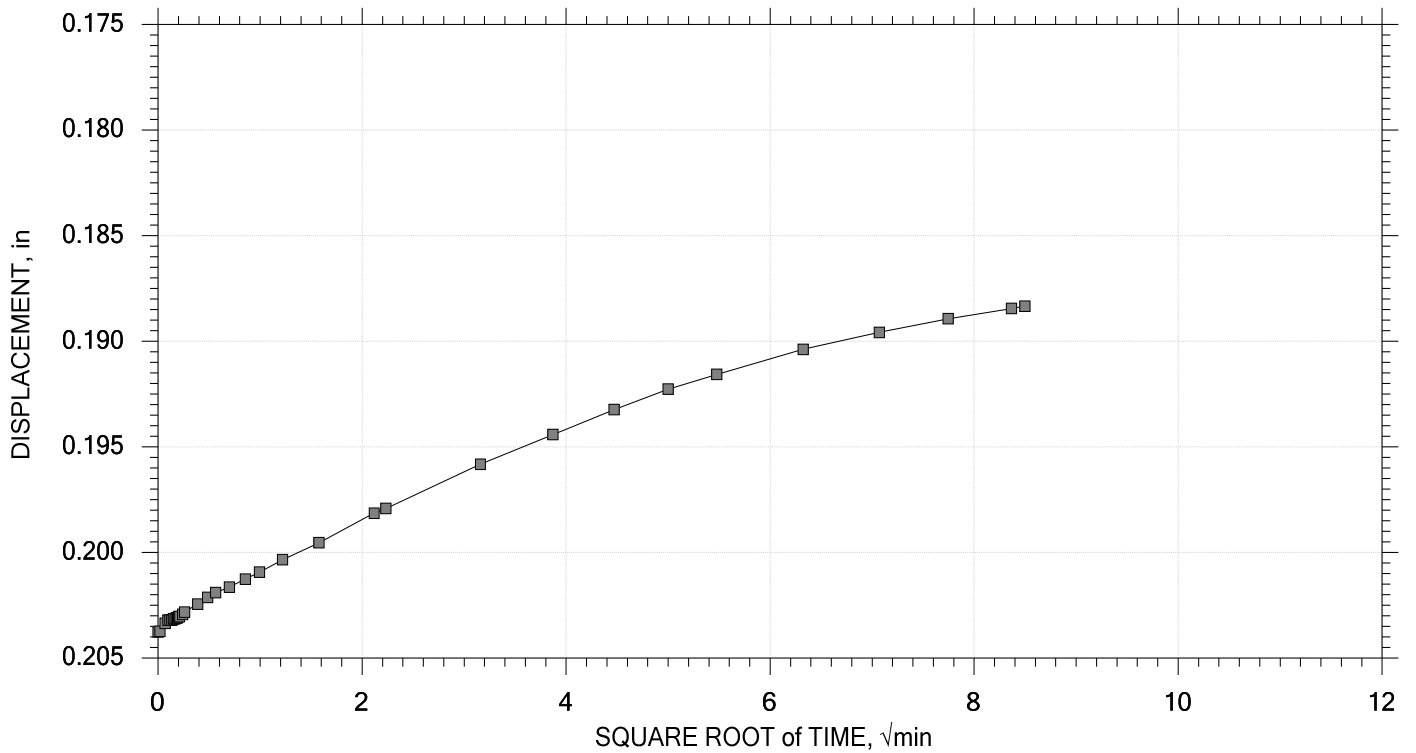
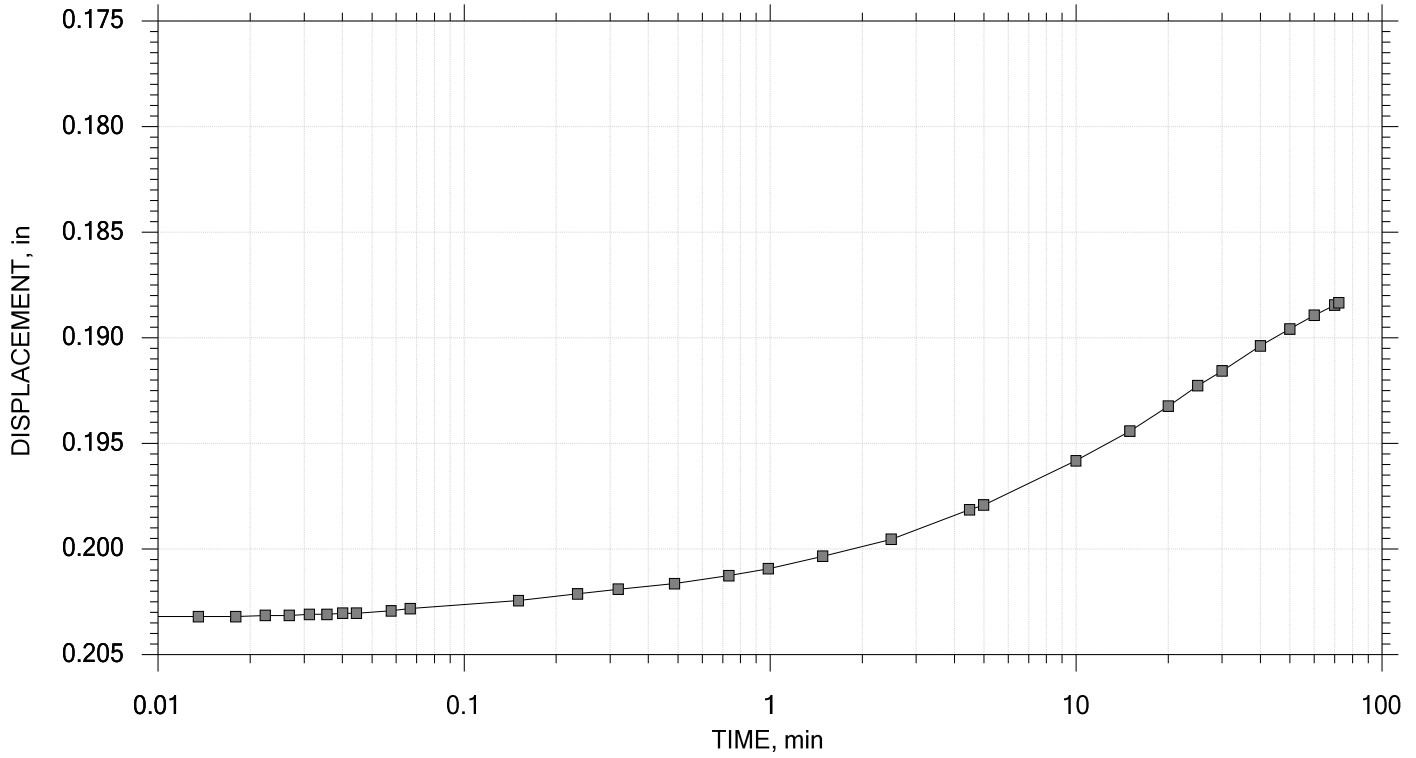
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 20 of 21

Stress: 0.25 tsf



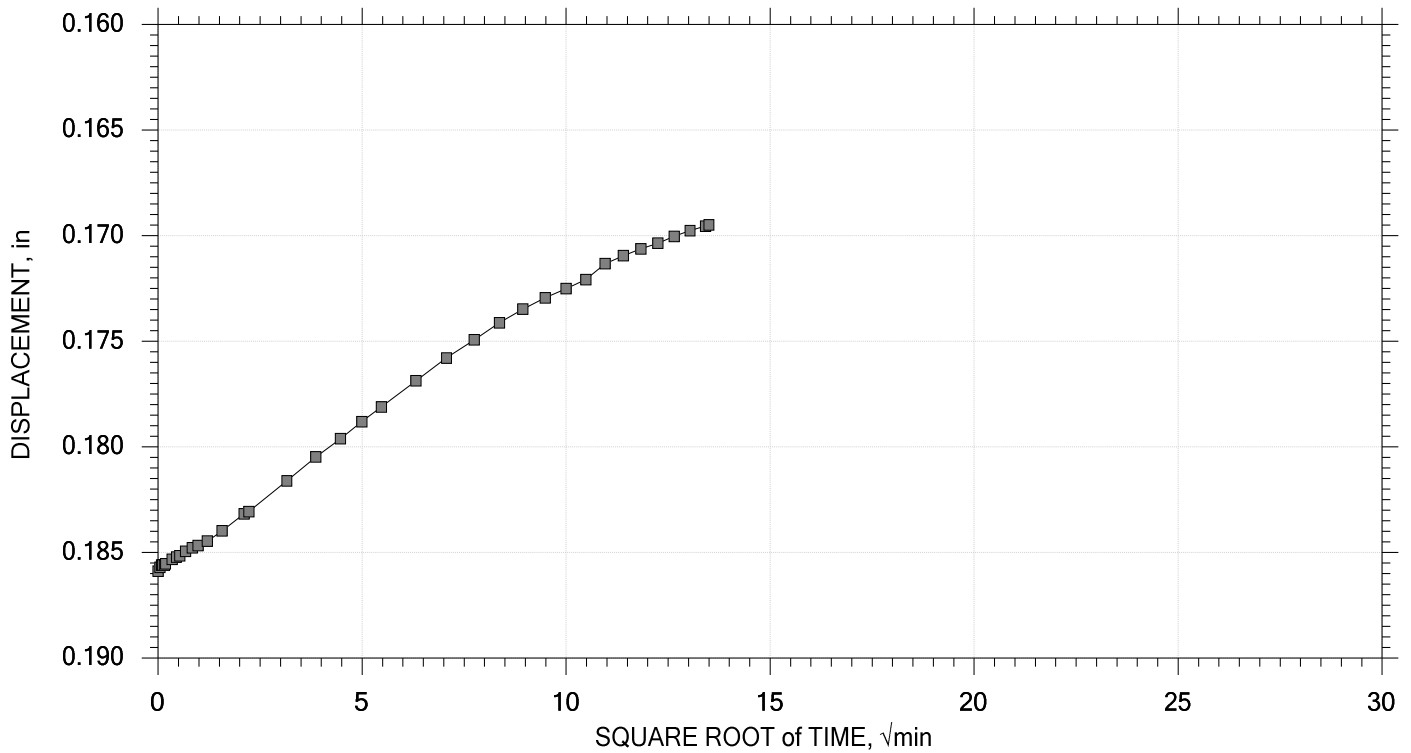
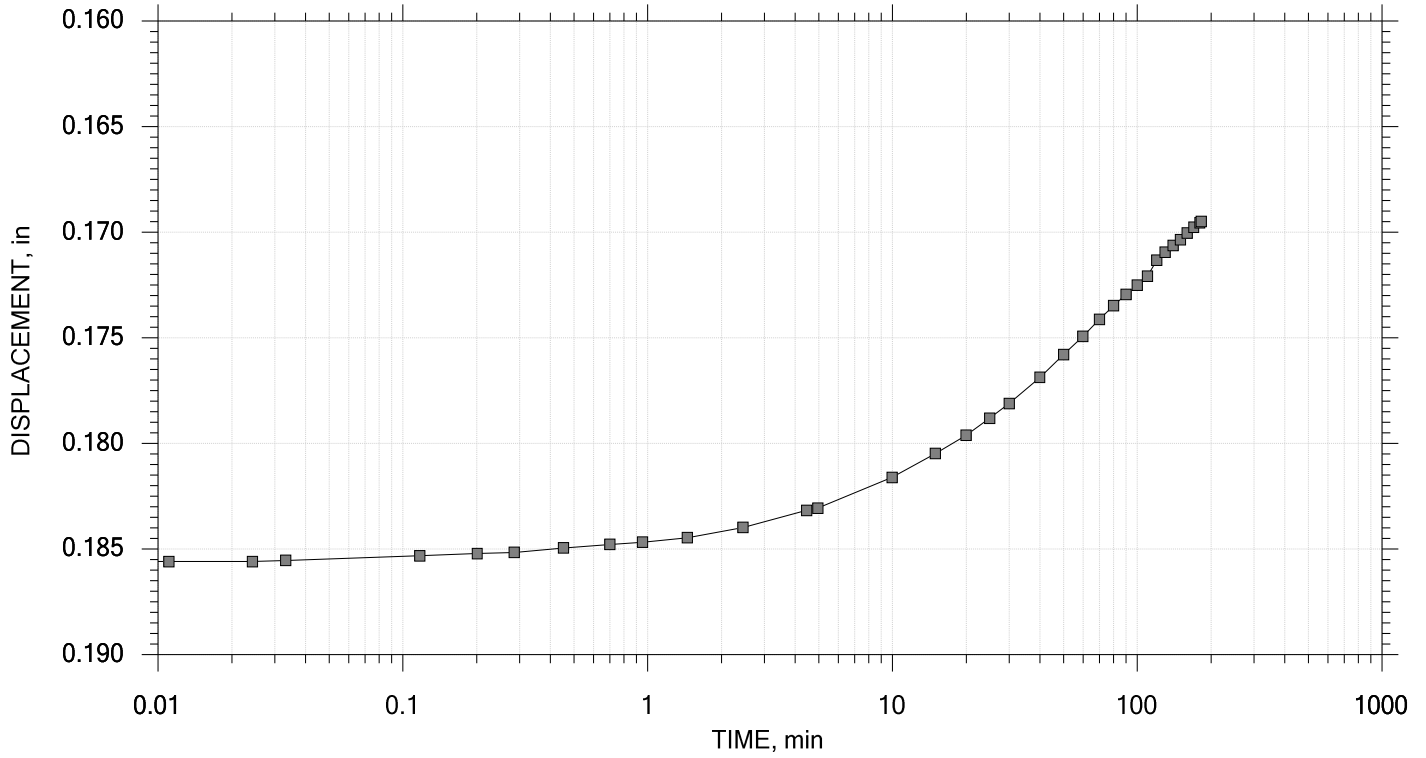
Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

# One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 21 of 21

Stress: 0.0625 tsf



Project: CHERRYFIELD	Location: --	Project No.: 22230.00
Boring No.: BB-CSB-201	Tested By: GSL	Checked By: --
Sample No.: 1U	Test Date: 2/26/19	Test No.: 337252
Depth: 15.0-17.0	Sample Type: INTACT	Elevation: --
Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.		
Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test		

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: CHERRYFIELD  
 Boring No.: BB-CSB-201  
 Sample No.: 1U  
 Test No.: 337252

Location: --  
 Tested By: GSL  
 Test Date: 2/26/19  
 Sample Type: INTACT

Project No.: 22230.00  
 Checked By: --  
 Depth: 15.0-17.0  
 Elevation: --

Soil Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.  
 Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test

Measured Specific Gravity: 2.76  
 Initial Void Ratio: 1.12  
 Final Void Ratio: 0.804

Liquid Limit: 34  
 Plastic Limit: 21  
 Plasticity Index: 13

Specimen Diameter: 2.50 in  
 Initial Height: 1.00 in  
 Final Height: 0.85 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	66	RING	RING+BASE	205
Wt. Container + Wet Soil, gm	132.45	408.36	396.57	199.30
Wt. Container + Dry Soil, gm	113.82	366.20	366.20	168.98
Wt. Container, gm	66.940	261.96	261.96	64.920
Wt. Dry Soil, gm	46.880	104.24	104.24	104.06
Water Content, %	39.74	40.45	29.14	29.14
Void Ratio	---	1.12	0.804	---
Degree of Saturation, %	---	99.41	100.00	---
Dry Unit Weight, pcf	---	81.161	95.499	---

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: CHERRYFIELD  
 Boring No.: BB-CSB-201  
 Sample No.: 1U  
 Test No.: 337252

Location: --  
 Tested By: GSL  
 Test Date: 2/26/19  
 Sample Type: INTACT

Project No.: 22230.00  
 Checked By: --  
 Depth: 15.0-17.0  
 Elevation: --

Soil Description: Grey Wet Soft Clayey Silt- Specimen from 12 to 13.5 inches in tube.  
 Remarks: Maine Sensitive Load/Unload/Reload/Unload Consolidation Test

Displacement at End of Increment

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft <sup>2</sup> /sec	Mv 1/tsf	k ft/day
1	0.0646	0.01184	1.10	1.18	19.558	1.24e-006	1.83e-001	6.14e-004
2	0.125	0.02396	1.07	2.39	49.904	4.75e-007	2.00e-001	2.57e-004
3	0.250	0.03699	1.04	3.70	26.540	8.70e-007	1.04e-001	2.44e-004
4	0.500	0.05039	1.02	5.04	21.866	1.03e-006	5.36e-002	1.49e-004
5	1.00	0.06886	0.977	6.88	22.948	9.47e-007	3.69e-002	9.43e-005
6	2.00	0.1002	0.910	10.0	29.444	7.00e-007	3.13e-002	5.91e-005
7	4.00	0.1450	0.815	14.5	31.499	6.01e-007	2.24e-002	3.63e-005
8	8.00	0.1906	0.719	19.1	17.110	9.95e-007	1.14e-002	3.06e-005
9	4.00	0.1855	0.729	18.5	1.430	1.13e-005	1.29e-003	3.95e-005
10	2.00	0.1783	0.745	17.8	3.665	4.49e-006	3.60e-003	4.36e-005
11	1.00	0.1710	0.760	17.1	7.139	2.35e-006	7.26e-003	4.59e-005
12	0.500	0.1638	0.775	16.4	24.668	6.91e-007	1.43e-002	2.67e-005
13	1.00	0.1666	0.770	16.6	4.741	3.61e-006	5.49e-003	5.35e-005
14	2.00	0.1737	0.754	17.4	5.941	2.85e-006	7.16e-003	5.50e-005
15	4.00	0.1835	0.734	18.3	5.389	3.08e-006	4.90e-003	4.06e-005
16	8.00	0.2009	0.697	20.1	7.791	2.06e-006	4.33e-003	2.40e-005
17	16.0	0.2373	0.619	23.7	9.635	1.56e-006	4.55e-003	1.91e-005
18	4.00	0.2224	0.651	22.2	1.481	9.85e-006	1.24e-003	3.30e-005
19	1.00	0.2049	0.688	20.5	9.085	1.67e-006	5.83e-003	2.63e-005
20	0.250	0.1883	0.723	18.8	22.580	7.03e-007	2.21e-002	4.19e-005
21	0.0625	0.1695	0.763	16.9	176.152	9.41e-008	1.00e-001	2.55e-005

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft <sup>2</sup> /sec	Mv 1/tsf	k ft/day	Ca %
1	0.0646	0.01184	1.10	1.18	2.615	2.16e-006	1.83e-001	1.07e-003	0.00e+000
2	0.125	0.02396	1.07	2.39	0.000	0.00e+000	2.00e-001	0.00e+000	0.00e+000
3	0.250	0.03699	1.04	3.70	9.429	5.69e-007	1.04e-001	1.60e-004	0.00e+000
4	0.500	0.05039	1.02	5.04	0.000	0.00e+000	5.36e-002	0.00e+000	0.00e+000
5	1.00	0.06886	0.977	6.88	6.479	7.79e-007	3.69e-002	7.76e-005	0.00e+000
6	2.00	0.1002	0.910	10.0	0.000	0.00e+000	3.13e-002	0.00e+000	0.00e+000
7	4.00	0.1450	0.815	14.5	6.888	6.38e-007	2.24e-002	3.86e-005	0.00e+000
8	8.00	0.1906	0.719	19.1	4.612	8.57e-007	1.14e-002	2.63e-005	0.00e+000
9	4.00	0.1855	0.729	18.5	0.233	1.61e-005	1.29e-003	5.62e-005	0.00e+000
10	2.00	0.1783	0.745	17.8	0.747	5.12e-006	3.60e-003	4.97e-005	0.00e+000
11	1.00	0.1710	0.760	17.1	2.236	1.74e-006	7.26e-003	3.41e-005	0.00e+000
12	0.500	0.1638	0.775	16.4	0.000	0.00e+000	1.43e-002	0.00e+000	0.00e+000
13	1.00	0.1666	0.770	16.6	0.000	0.00e+000	5.49e-003	0.00e+000	0.00e+000
14	2.00	0.1737	0.754	17.4	1.066	3.69e-006	7.16e-003	7.12e-005	0.00e+000
15	4.00	0.1835	0.734	18.3	1.195	3.22e-006	4.90e-003	4.26e-005	0.00e+000
16	8.00	0.2009	0.697	20.1	1.944	1.92e-006	4.33e-003	2.24e-005	0.00e+000
17	16.0	0.2373	0.619	23.7	2.135	1.63e-006	4.55e-003	2.00e-005	0.00e+000
18	4.00	0.2224	0.651	22.2	0.402	8.43e-006	1.24e-003	2.82e-005	0.00e+000
19	1.00	0.2049	0.688	20.5	0.000	0.00e+000	5.83e-003	0.00e+000	0.00e+000
20	0.250	0.1883	0.723	18.8	0.000	0.00e+000	2.21e-002	0.00e+000	0.00e+000
21	0.0625	0.1695	0.763	16.9	0.000	0.00e+000	1.00e-001	0.00e+000	0.00e+000



**APPENDIX E**  
**Calculations**



### Evaluation of Liquidity Index

**WIN:** WIN 022230  
**Project Name:** Schoodic Bridge (#3649) Replacement  
**Location:** Cherryfield ME

**S.W. COLE No.:** 19-0771  
**Evaluated By/Date:** MAS / Sept 2019 - Rev. Dec 2019

Boring No.	Sample No.	Visual Soil Description	Depth	USCS	A	B	C	D=(B-C)	E=(A-B)/D	Sensitivity	Remarks
					Water Content	Plastic Limit (PL)	Liquid Limit (LL)	Plasticity Index (PI)	Liquidity Index (LI)		
BB-CSB-101	3D	Silty CLAY, trace fine sand	16	CL	35.5	21	31	10	1.5	quick	viscous liquid when remolded
BB-CSB-101	1U	Silty CLAY, trace fine sand	20	CL	36.8	23	38	15	0.9	plastic	normally consolidated
BB-CSB-102	2D	Clayey SILT, trace fine sand	5	CL	36.6	21	31	10	1.6	quick	viscous liquid when remolded
BB-CSB-102	1U	Clayey SILT, trace fine sand	10	CL	33.5	19	27	8	1.8	quick	viscous liquid when remolded
BB-CSB-102	3D	Clayey SILT, trace fine sand	15	CL	39.2	20	31	11	1.7	quick	viscous liquid when remolded
BB-CSB-103	4D	CLAY, some silt, little gravel, trace sand	15	CL	23.6	20	34	14	0.3	plastic	over-consolidated
BB-CSB-103	5D	Clayey SILT, trace fine sand	20	CL	31.2	20	31	11	1.0	quick	viscous liquid when remolded
BB-CSB-103	6D	Clayey SILT, trace fine sand	30	CL	35.5	20	31	11	1.4	quick	viscous liquid when remolded
BB-CSB-201	1U/A	Clayey SILT	15	CL	38.3	24	35	11	1.3	quick	viscous liquid when remolded
BB-CSB-201	1U/B	Clayey SILT	15	CL	39.2	24	40	16	1.0	plastic	normally consolidated
BB-CSB-201	4D	Clayey SILT	25	CL	32.7	20	29	9	1.4	quick	viscous liquid when remolded
BB-CSB-202	4D	Clayey SILT, trace sand	25	CL	34.5	19	32	13	1.2	quick	viscous liquid when remolded
BB-CBS-202	6D	Clayey SILT	35	CL	34.4	20	30	10	1.4	quick	viscous liquid when remolded
BB-CSB-203	1D/A	Clayey SILT, little fine sand	6.5	CL	27.4	21	34	13	0.5	plastic	over-consolidated







## Evaluation of Vane Shear Sensitivity

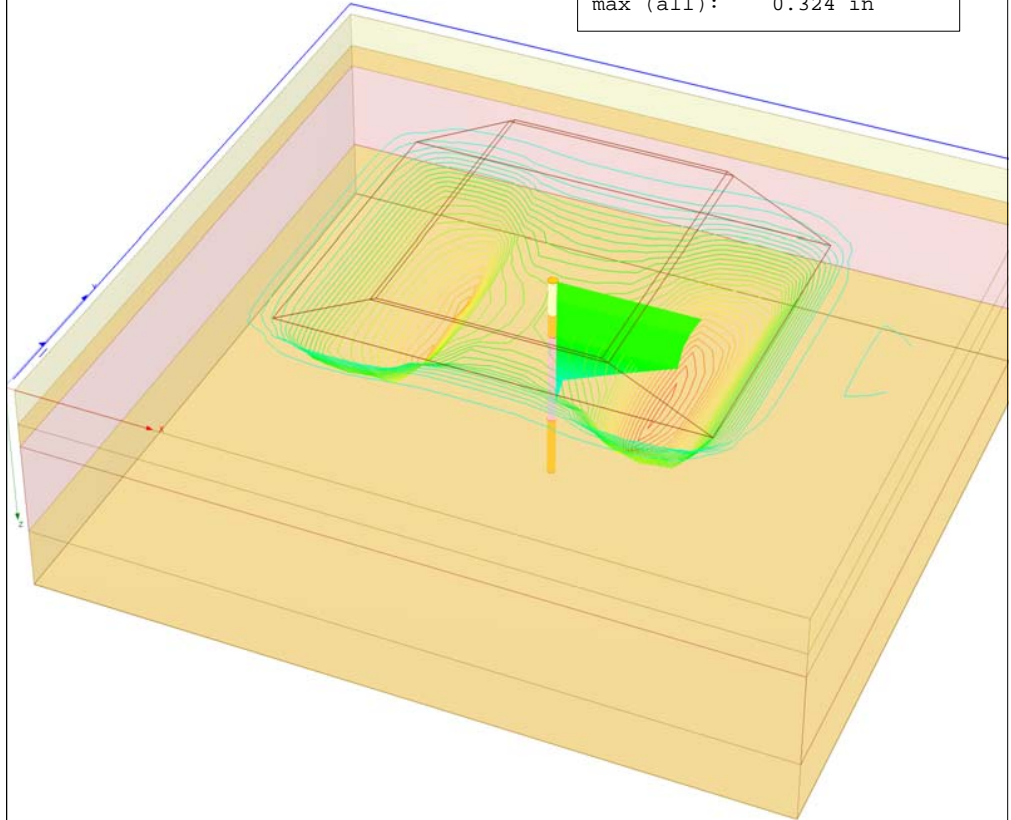
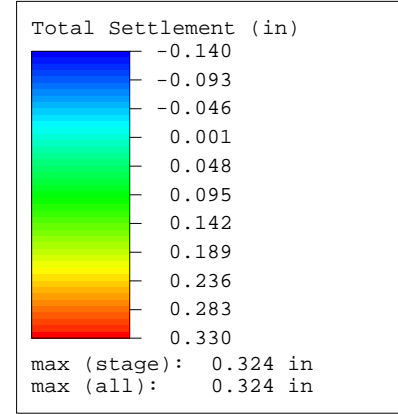
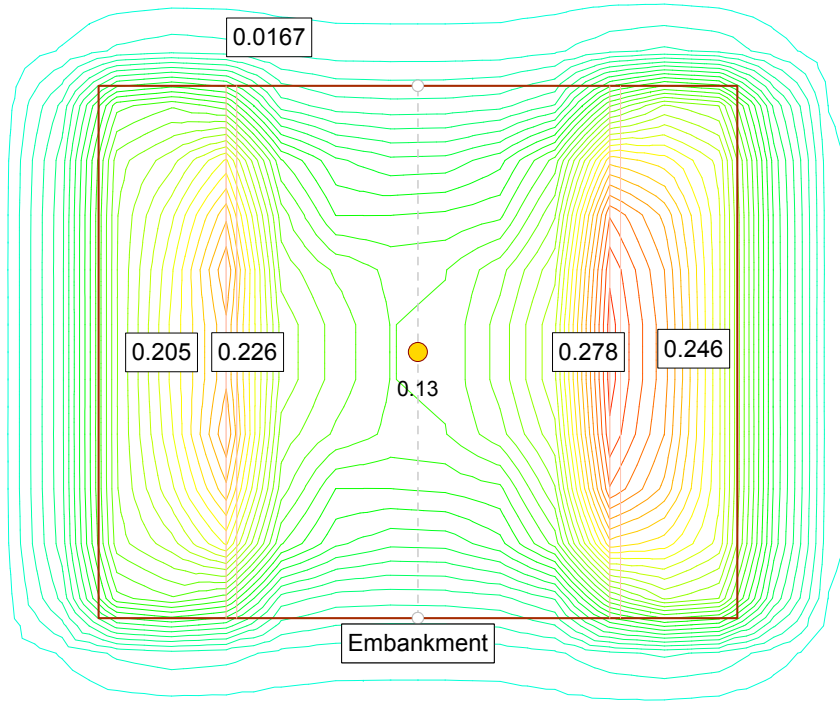
### Ratio of Undisturbed Shear Strength to Remolded Shear Strength

WIN: WIN 022230  
 Project Name: Schoodic Bridge (#3649) Replacement  
 Location: Cherryfield ME

S.W. COLE No.: 19-0771  
 Evaluated By/Date: MAS / Aug 2019 - Rev. Dec 2019





Boring No.	Sample No.	Depth	Undrained Shear Strength			Sensitivity	Undisturbed max = min =
			Undisturbed	Remolded			
BB-CSB-101	V1	16.6	647	179	3.6	Low Sensitive	
BB-CSB-101	V2	17.6	603	134	4.5	Medium Sensitive	1384
BB-CSB-101	V3	22.6	402	22	18.3	Quick	357
BB-CSB-101	V4	23.6	446	45	9.9	Highly Sensitive	
BB-CSB-101	V5	25.6	446	45	9.9	Highly Sensitive	Remolded max = 312
BB-CSB-101	V6	26.6	491	45	10.9	Highly Sensitive	min = 22
BB-CSB-101	V7	30.6	580	45	12.9	Highly Sensitive	
BB-CSB-101	MV	31.0			N/A	N/A	Sensitivity max = 18
BB-CSB-102	V1	5.6	357	45	7.9	Medium Sensitive	min = 3
BB-CSB-102	V2	6.6	402	67	6.0	Medium Sensitive	
BB-CSB-102	V3	12.6	469	58	8.1	Highly Sensitive	
BB-CSB-102	V4	13.6	469	67	7.0	Medium Sensitive	
BB-CSB-102	V5	15.6	469	45	10.4	Highly Sensitive	
BB-CSB-102	V6	16.6	424	45	9.4	Highly Sensitive	
BB-CSB-103	MV	16.5			N/A	N/A	
BB-CBS-103	V1	26.6	402	134	3.0	Low Sensitive	
BB-CBS-103	V2	21.6	670	89	7.5	Medium Sensitive	
BB-CBS-103	V3	27.6	424	67	6.3	Medium Sensitive	
BB-CBS-103	V4	28.6	491	45	10.9	Highly Sensitive	
BB-CBS-103	V5	30.6	491	112	4.4	Medium Sensitive	
BB-CBS-103	V6	31.6	446	45	9.9	Highly Sensitive	
BB-CBS-103	MV	35.0			N/A	N/A	
BB-CBS-201	MV	5.6			N/A	N/A	
BB-CSB-201	V1	10.6	781	179	4.4	Medium Sensitive	
BB-CSB-201	V2	11.6	737	156	4.7	Medium Sensitive	
BB-CSB-201	V3	17.6	580	89	6.5	Medium Sensitive	
BB-CSB-201	V4	18.6	643	156	4.1	Medium Sensitive	
BB-CSB-201	V5	20.6	446	67	6.7	Medium Sensitive	
BB-CSB-201	V6	21.6	513	45	11.4	Highly Sensitive	
BB-CSB-201	V7	25.6	536	89	6.0	Medium Sensitive	
BB-CSB-201	V8	26.6	536	89	6.0	Medium Sensitive	
BB-CSB-201	V9	30.6	603	45	13.4	Highly Sensitive	
BB-CSB-201	V10	31.6	603	45	13.4	Highly Sensitive	
BB-CSB-201	V11	35.6	670	67	10.0	Highly Sensitive	
BB-CSB-201	MV	36.6			N/A	N/A	
BB-CSB-202	MV	10.6			N/A	N/A	
BB-CSB-202	V1	15.6	491	134	3.7	Low Sensitive	
BB-CSB-202	V2	16.6	513	112	4.6	Medium Sensitive	
BB-CSB-202	V3	22.6	625	89	7.0	Medium Sensitive	
BB-CSB-202	V4	23.6	580	89	6.5	Medium Sensitive	
BB-CSB-202	V5	25.6	536	112	4.8	Medium Sensitive	
BB-CSB-202	V6	26.6	580	112	5.2	Medium Sensitive	
BB-CSB-202	V7	30.6	536	67	8.0	Medium Sensitive	
BB-CSB-202	V8	31.6	536	67	8.0	Medium Sensitive	
BB-CSB-202	V9	35.6	558	45	12.4	Highly Sensitive	
BB-CSB-202	V10	36.6	558	67	8.3	Highly Sensitive	
BB-CSB-203	MV	10.6			N/A	N/A	
BB-CSB-204	MV	5.6			N/A	N/A	
BB-CSB-204	MV	11.5			N/A	N/A	
BB-CSB-204	MV	16.6			N/A	N/A	
BB-CSB-204	V1	22.6	1384	312	4.4	Medium Sensitive	
BB-CSB-204	MV	23.6	1384	312	N/A	N/A	

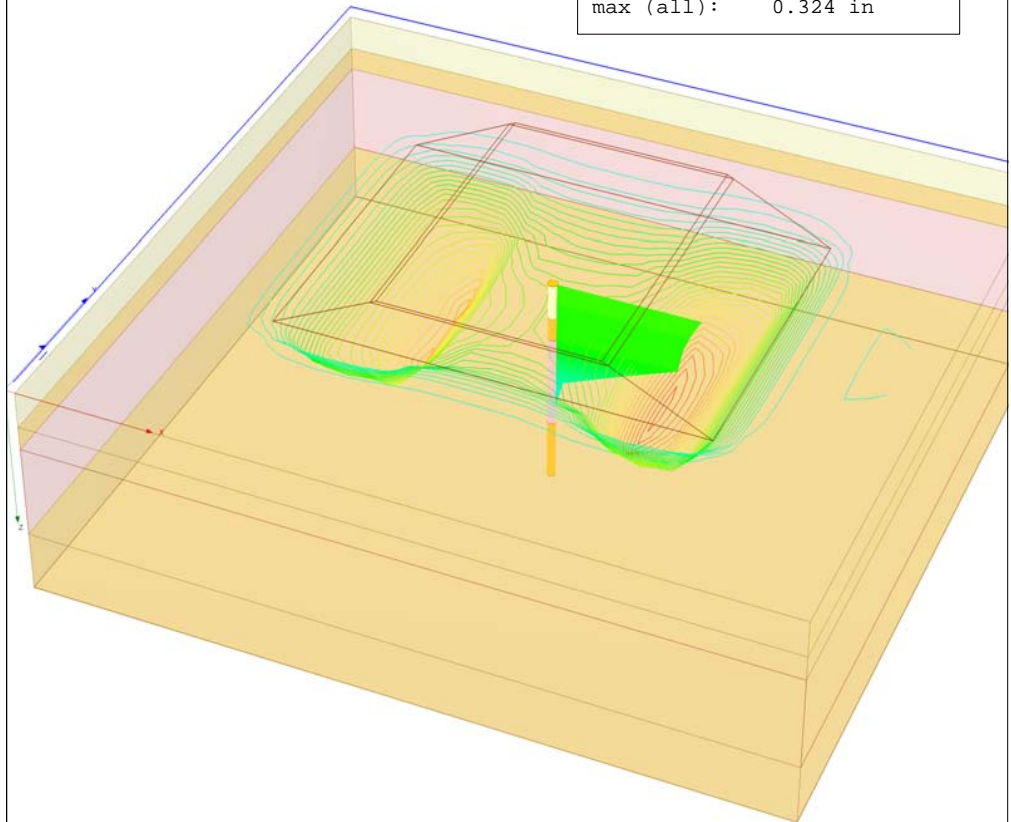
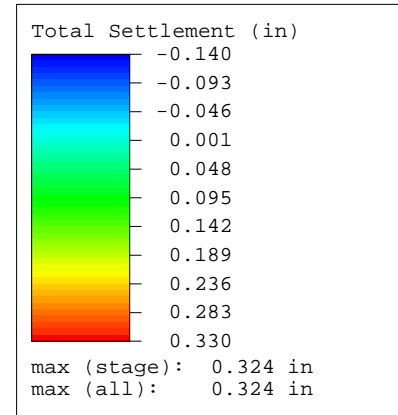
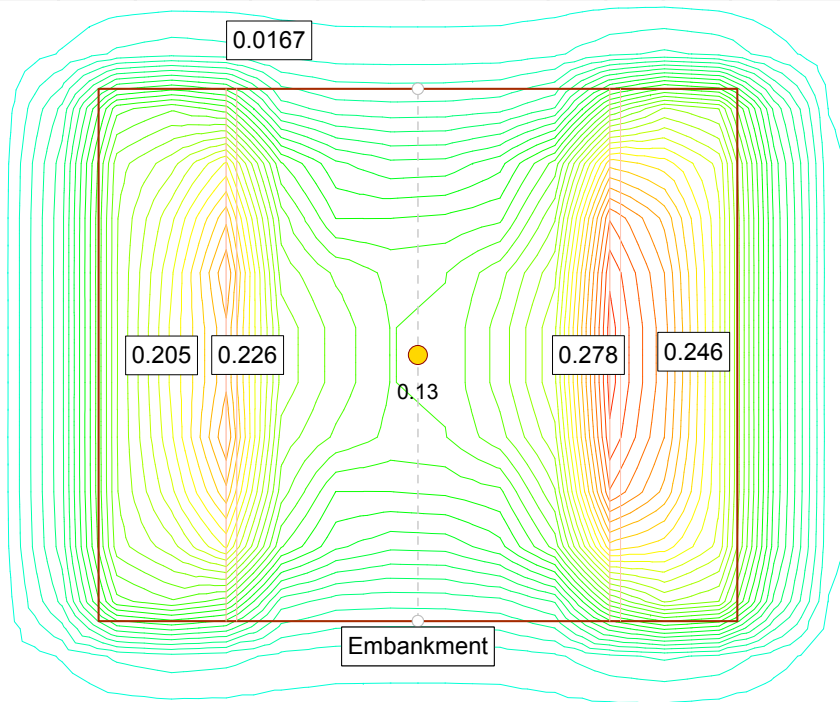
Material Name	Color	Unit Weight (kips/ft <sup>3</sup> )	Es (ksf)	Poisson Ratio	Material Type	Cc	Cr	OCR	e0	Cv (ft <sup>2</sup> /d)
Fill		0.125	125	0.35	-	-	-	-	-	-
Stiff Clayey Silt		0.122	100	0.45	-	-	-	-	-	-
Soft Silty Clay		0.118	-	0.45	Non-Linear	0.18	0.02	1.4	0.9	0.1
Glacial Till		0.135	-	0.4	-	-	-	-	-	-



SETTLE3D 4.023





Project	Schoodic Bridge #3649 - Sta 6+25 Settlement Evaluation - Grade Raise + Widening		
File Name	Abutment 2 Embankment Widening.s3z		
Drawn By	Michael St. Pierre, P.E.	Company	S. W. Cole Engineering, Inc.
Date	December 2019	Stage	Stage 1 = 0.1 y

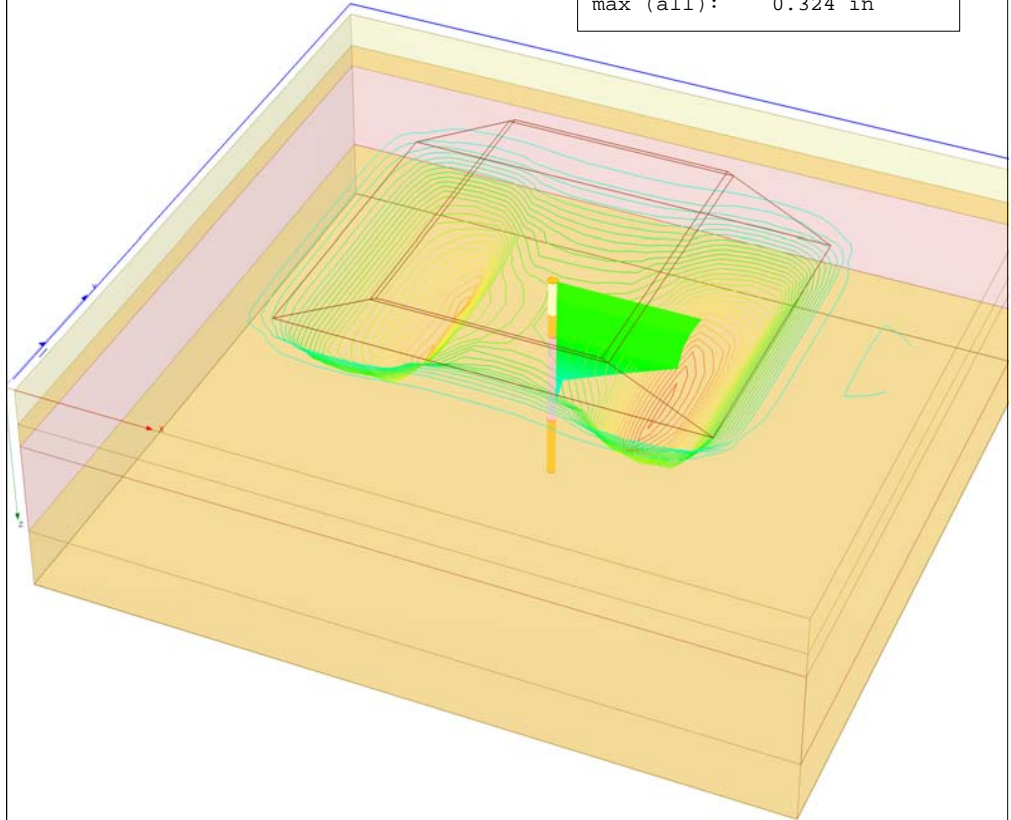
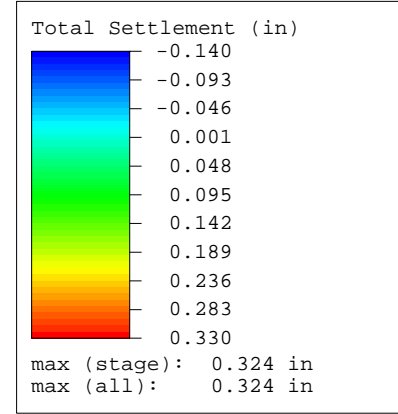
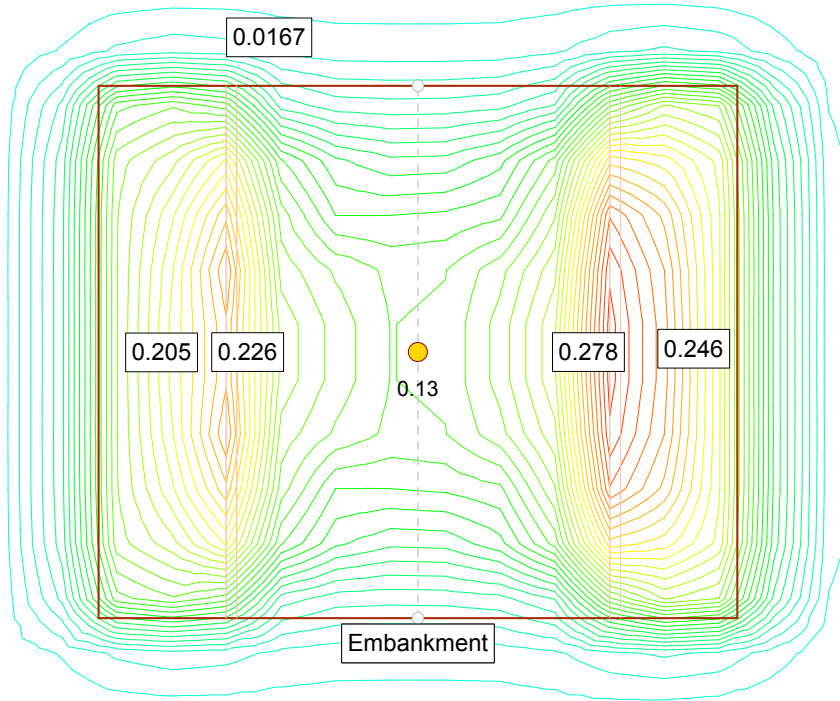
Material Name	Color	Unit Weight (kips/ft <sup>3</sup> )	Es (ksf)	Poisson Ratio	Material Type	Cc	Cr	OCR	e0	Cv (ft <sup>2</sup> /d)
Fill		0.125	125	0.35	-	-	-	-	-	-
Stiff Clayey Silt		0.122	100	0.45	-	-	-	-	-	-
Soft Silty Clay		0.118	-	0.45	Non-Linear	0.18	0.02	1.4	0.9	0.1
Glacial Till		0.135	-	0.4	-	-	-	-	-	-



SETTLE3D 4.023

Project	Schoodic Bridge #3649 - Sta 6+25 Settlement Evaluation - Grade Raise + Widening		
File Name	Abutment 2 Embankment Widening.s3z		
Drawn By	Michael St. Pierre, P.E.	Company	S. W. Cole Engineering, Inc.
Date	December 2019	Stage	Stage 2 = 1 y

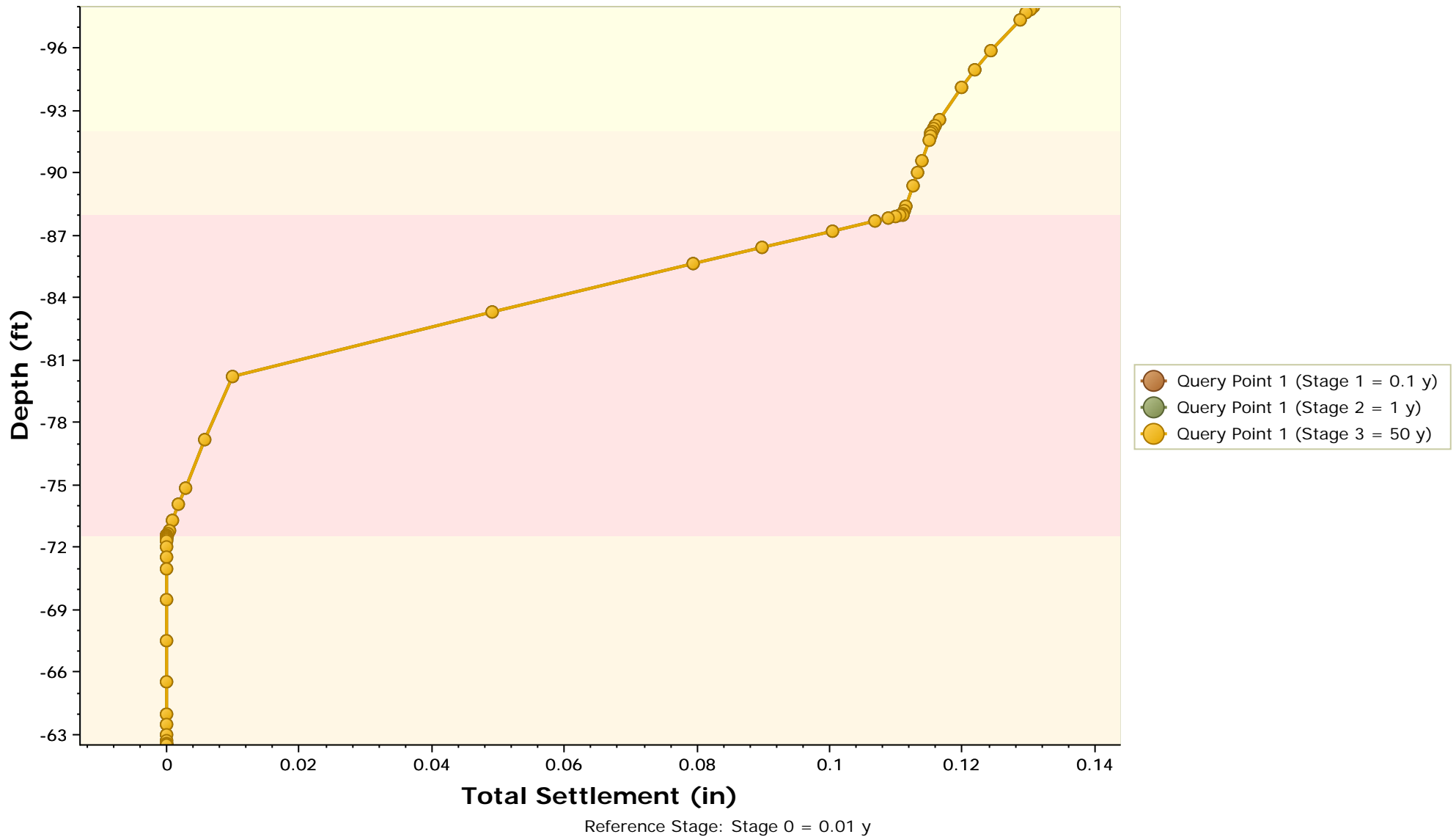
Material Name	Color	Unit Weight (kips/ft <sup>3</sup> )	Es (ksf)	Poisson Ratio	Material Type	Cc	Cr	OCR	e0	Cv (ft <sup>2</sup> /d)
Fill		0.125	125	0.35	-	-	-	-	-	-
Stiff Clayey Silt		0.122	100	0.45	-	-	-	-	-	-
Soft Silty Clay		0.118	-	0.45	Non-Linear	0.18	0.02	1.4	0.9	0.1
Glacial Till		0.135	-	0.4	-	-	-	-	-	-



SETTLE3D 4.023

Project	Schoodic Bridge #3649 - Sta 6+25 Settlement Evaluation - Grade Raise + Widening		
File Name	Abutment 2 Embankment Widening.s3z		
Drawn By	Michael St. Pierre, P.E.	Company	S. W. Cole Engineering, Inc.
Date	December 2019	Stage	Stage 3 = 50 y

# Total Settlement vs. Depth



SETTLE3D 4.023

<i>Project</i>	Schoodic Bridge #3649 - Sta 6+25 Settlement Evaluation - Grade Raise + Widening		
<i>File Name</i>	Abutment 2 Embankment Widening.s3z		
<i>Drawn By</i>	Michael St. Pierre, P.E.	<i>Company</i>	S. W. Cole Engineering, Inc.
<i>Date</i>	December 2019	<i>Stage</i>	

### **Objective**

Develop/correlate soil parameters for use in elastic and consolidation settlement evaluations using Settle3D software.

### **References**

1. Bowles, J.E., Foundation Analysis and Design, 3rd Ed., 1996.
2. Das, B.M., Principles of Foundation Engineering, 8th Ed., 2014.
3. "STP Blow Count Conversion and Friction Angle Correlation" Worksheets

### **Assumptions**

Generalized soil profile based on boring BB-CSB-103

loose to medium Sand Fill, 0 to 14 ft  
 stiff Clayey SILT, 14 to 20 ft  
 soft Clayey SILT, 20 to 34 ft  
 medium dense to dense Glacial Till, 34 to 49 ft

$$p_a := 14.7 \text{ psi}$$

$$\text{ORIGIN} := 1$$

From Das (2014) Pg 102  
 Eqn 3.32

$$\alpha := \begin{bmatrix} 5 \\ 10 \\ 15 \end{bmatrix}$$

5 for sands with fines  
 10 for clean normally consolidated sand  
 15 for clean overconsolidated sand

1. Estimate properties of Fill

$$\gamma_{sat_1} := 125 \text{ pcf}$$

See SPT Conversion WS

$$\phi_1 := 29 \text{ deg} \quad \text{Range: 29, 29, 39 deg}$$

From Reference 1, Table 2-7 Pg 123

$$\mu_1 := 0.35$$

See SPT Conversion WS

$$N_{60_1} := 10 \quad \text{Range: 9, 10, 79 bpf}$$

$$\alpha_{1,1} = 5$$

$$E_{s_1} := p_a \alpha_{1,1} N_{60_1} = 106 \text{ ksf}$$

From Reference 2, Table 5-6 Pg 316

sand, saturated

$$E_s := 250 \text{ kPa} \cdot (N_{60_1} + 15) = 131 \text{ ksf}$$

sand, all

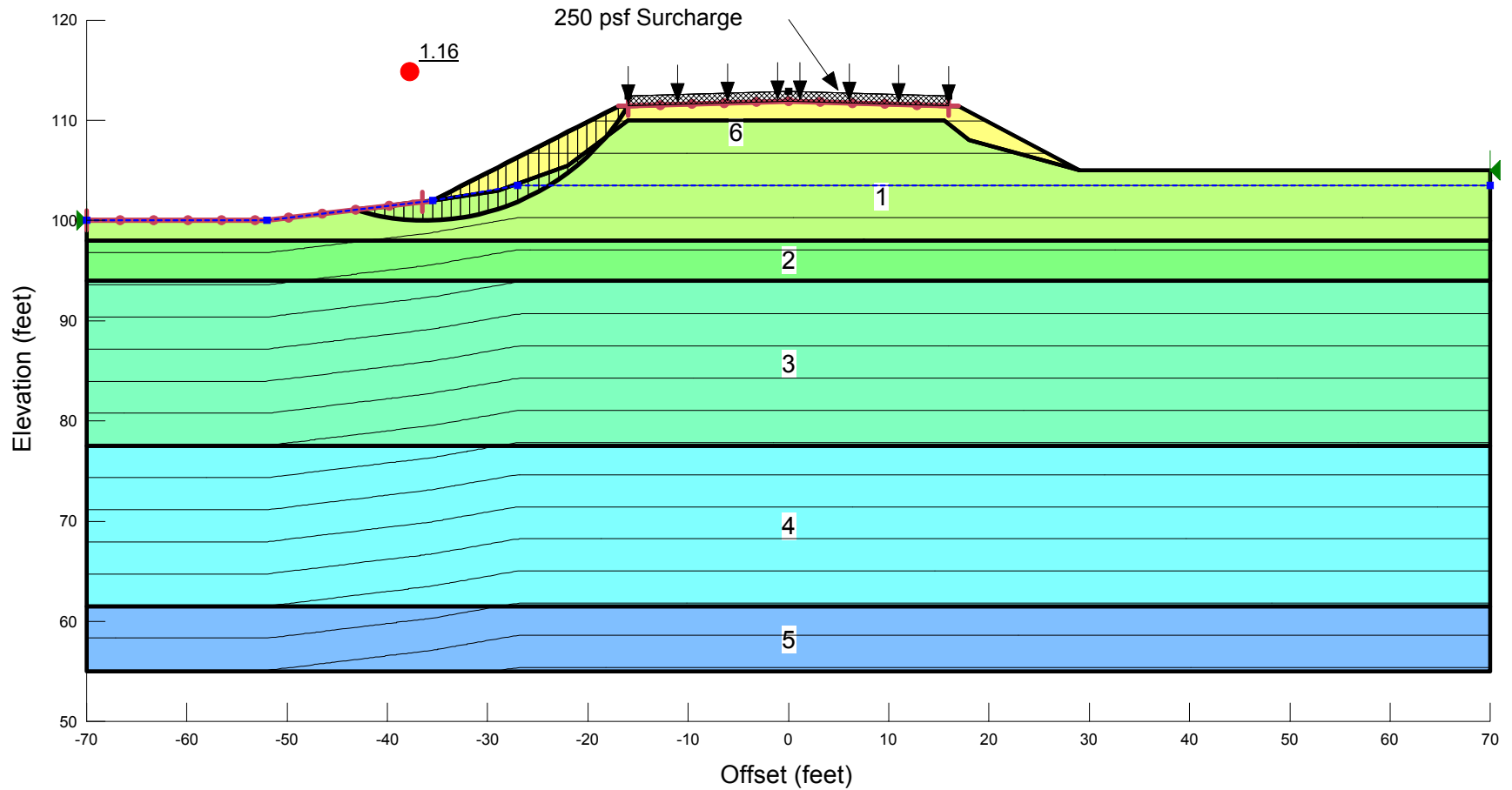
$$E_s := 2600 \text{ kPa} \cdot N_{60_1} = 543 \text{ ksf}$$

**use Es = 125 ksf**

2. Estimate properties of v. stiff Clayey SILT	$\gamma_{sat\_2} := 122$ <i>pcf</i>	
Assumed for cohesive soil	$\phi_2 := 0$ <i>deg</i>	
From Reference 1, Table 2-7 Pg 123	$\mu_2 := 0.45$	
See SPT Conversion WS	$N_{60\_2} := 9$	Range: 9 bpf
From Reference 2, Table 5-6 Pg 316		
Clayey Silt	$E_s := 300$ <i>kPa</i> $\cdot (N_{60\_2} + 6) = 94$ <i>ksf</i>	
	<b>use Es = 100 ksf</b>	
3. Estimate properties of Silty Clay	$\gamma_{sat\_3} := 118$ <i>pcf</i>	
From Reference 2, Table 2-7	$\mu_3 := 0.45$	
From laboratory testing BB-CSB-201, 1U	$C_R := 0.18$	
	$R_R := 0.02$	
	$e_o := 1.14$	
	$c_v := 10^{-6} \frac{ft^2}{sec} = 0.086 \frac{ft^2}{day}$	
4. Estimate properties of Glacial Till	$\gamma_{sat\_3} := 135$ <i>pcf</i>	
From Reference 1, Table 11.3	$\phi_4 := 36$ <i>deg</i>	Range: 36, 39 deg
From Reference 2, Table 2-7	$\mu_4 := 0.4$	
From Reference 3, Eqn 3.32 with	$N_{60\_4} := 30$	Range: 30, 36 bpf
	$\alpha_{3,1} = 15$	
	$E_{s\_4} := p_a \alpha_{3,1} N_{60\_4} = 953$ <i>ksf</i>	
From Reference 2, Table 5-6 Pg 316		
gravelly sand	$E_s := 1200$ <i>kPa</i> $\cdot (N_{60\_4} + 6) = 902$ <i>ksf</i>	
	$E_s := 600$ <i>kPa</i> $\cdot (N_{60\_4} + 6) + 2000 \cdot kPa = 493$ <i>ksf</i>	
	<b>use Es = 900 ksf</b>	





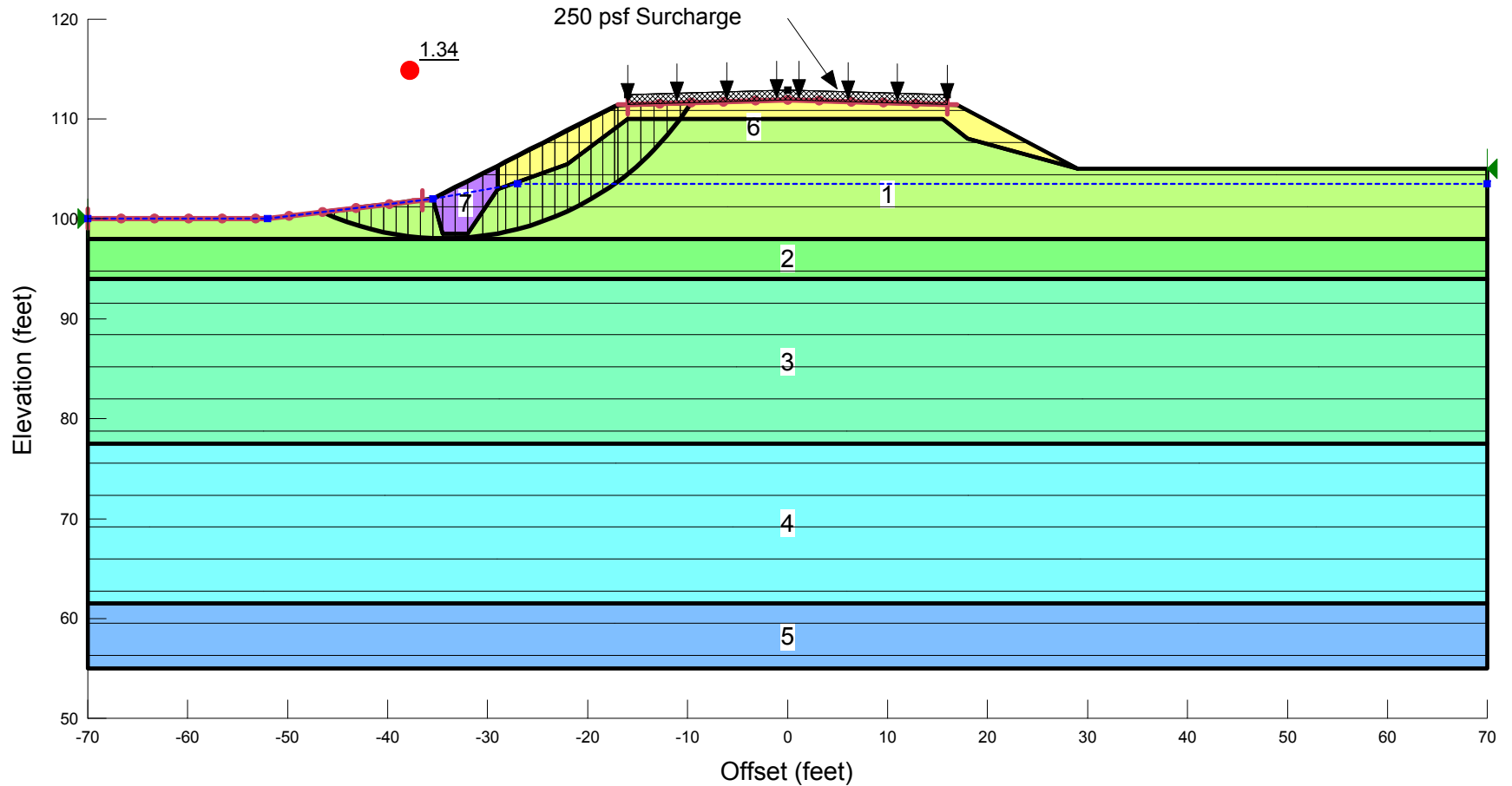


Schoodic Bridge #3649  
 Route 193 over Schoodic Brook  
 Cherryfield, Maine  
 WIN 022230

Station 5+50 (North Approach)  
 Static Conditions (Rapid Drawdown)

**Materials:**

- 1. Existing Fill: Unit Wt. = 125 pcf, Phi = 29 deg, C = 0 psf
- 2. Stiff Clayey SILT: Unit Wt. = 122 pcf, Phi = 0 deg, C = 600 psf
- 3. Soft Clayey SILT: Unit Wt. = 118 pcf, Phi = 0 deg, C = 400 psf
- 4. Glacial Till: Unit Wt. = 135 pcf, Phi = 36 deg, C = 0 psf
- 5. Bedrock: Impenetrable
- 6. New Fill: Unit Wt. = 125 pcf, Phi = 32 deg, C = 0 psf

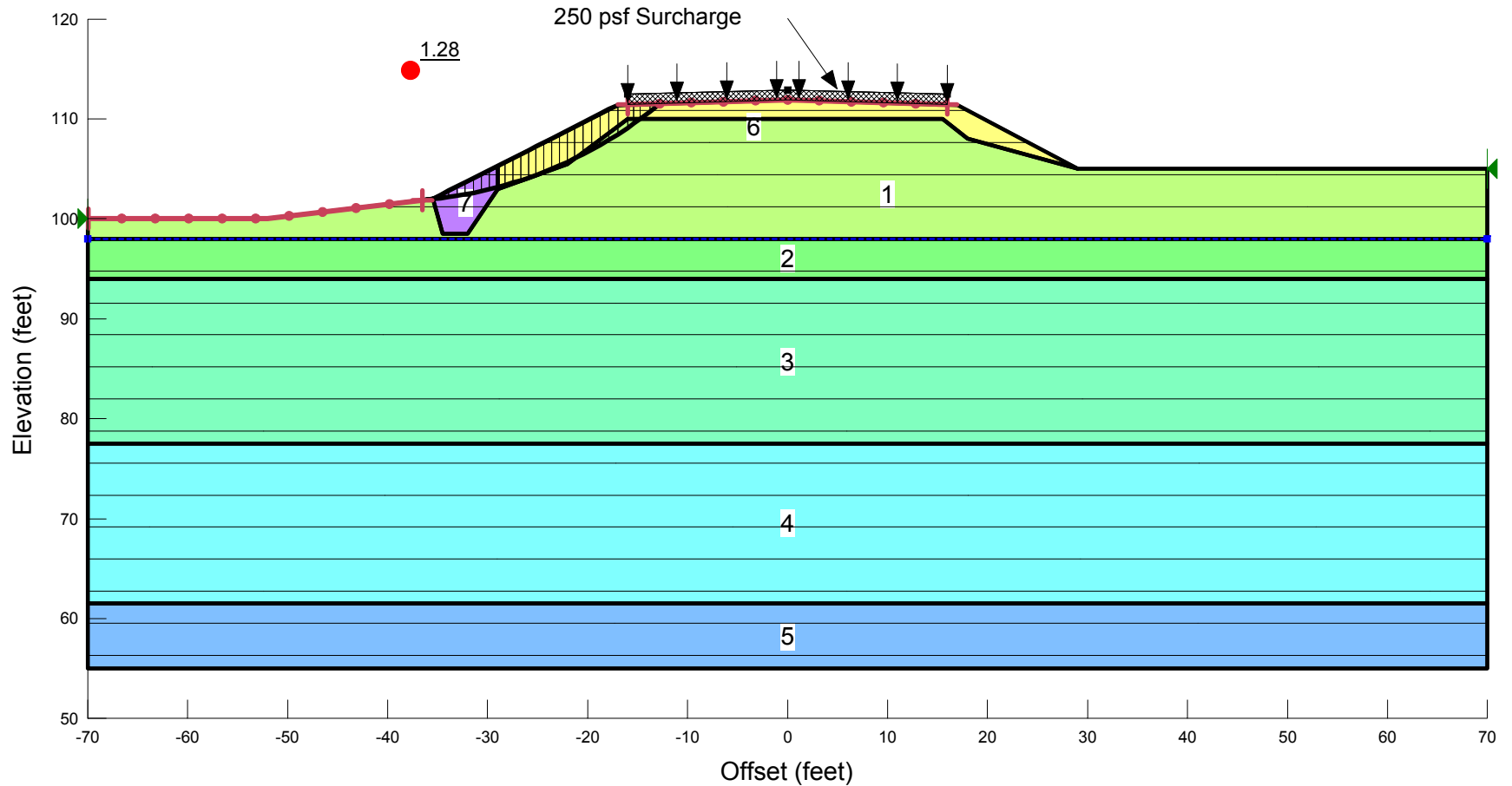


Schoodic Bridge #3649  
 Route 193 over Schoodic Brook  
 Cherryfield, Maine  
 WIN 022230

Station 5+50 (North Approach)  
 Static Conditions (Rapid Drawdown)  
 Riprap Buttress

**Materials:**

1. Existing Fill: Unit Wt. = 125 pcf,  $\Phi = 29$  deg,  $C = 0$  psf
2. Stiff Clayey SILT: Unit Wt. = 122 pcf,  $\Phi = 0$  deg,  $C = 600$  psf
3. Soft Clayey SILT: Unit Wt. = 118 pcf,  $\Phi = 0$  deg,  $C = 400$  psf
4. Glacial Till: Unit Wt. = 135 pcf,  $\Phi = 36$  deg,  $C = 0$  psf
5. Bedrock: Impenetrable
6. New Fill: Unit Wt. = 125 pcf,  $\Phi = 32$  deg,  $C = 0$  psf
7. Riprap: Unit Wt. = 140 pcf,  $\Phi = 45$  deg,  $C = 0$  psf

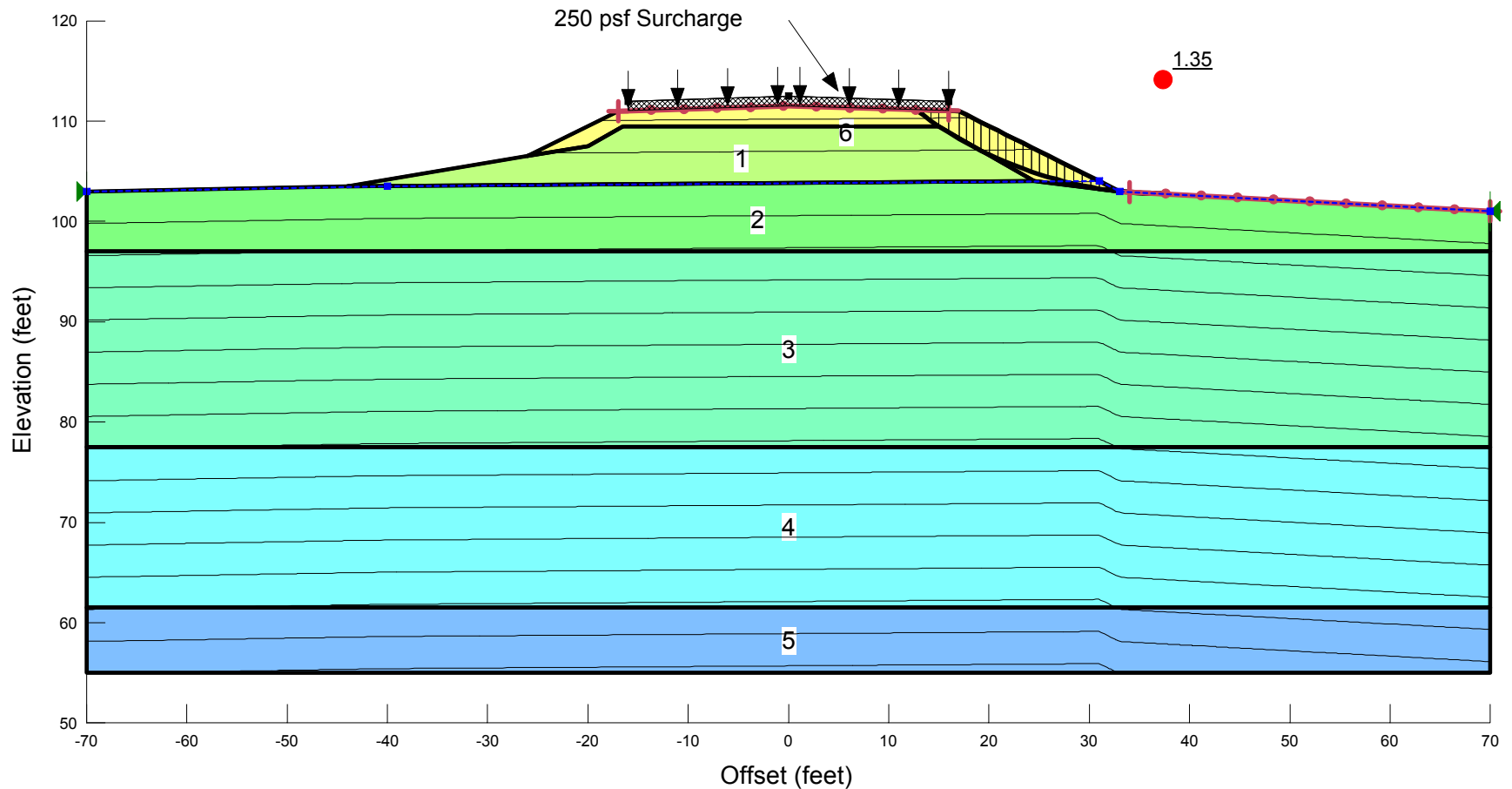


Schoodic Bridge #3649  
 Route 193 over Schoodic Brook  
 Cherryfield, Maine  
 WIN 022230

Station 5+50 (North Approach)  
 Seismic Conditions ( $k_h = 0.083 g$ )  
 Riprap Buttress

Materials:

1. Existing Fill: Unit Wt. = 125 pcf,  $\Phi = 29$  deg,  $C = 0$  psf
2. Stiff Clayey SILT: Unit Wt. = 122 pcf,  $\Phi = 0$  deg,  $C = 600$  psf
3. Soft Clayey SILT: Unit Wt. = 118 pcf,  $\Phi = 0$  deg,  $C = 400$  psf
4. Glacial Till: Unit Wt. = 135 pcf,  $\Phi = 36$  deg,  $C = 0$  psf
5. Bedrock: Impenetrable
6. New Fill: Unit Wt. = 125 pcf,  $\Phi = 32$  deg,  $C = 0$  psf
7. Riprap: Unit Wt. = 140 pcf,  $\Phi = 45$  deg,  $C = 0$  psf

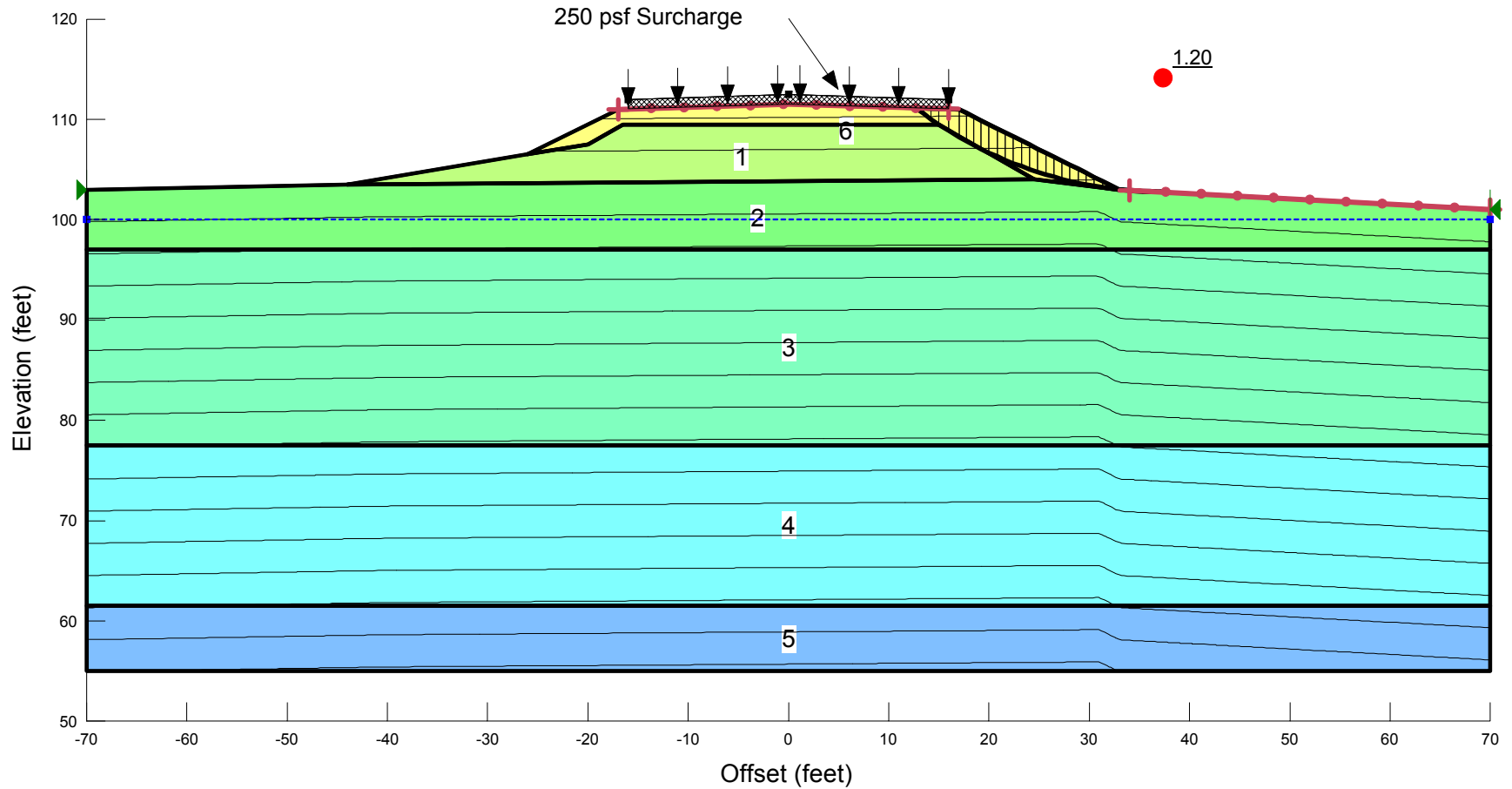


Schoodic Bridge #3649  
 Route 193 over Schoodic Brook  
 Cherryfield, Maine  
 WIN 022230

Station 6+25 (South Approach)  
 Static Conditions (Rapid Drawdown)

**Materials:**

- 1. Existing Fill: Unit Wt. = 125 pcf,  $\Phi$  = 29 deg, C = 0 psf
- 2. Stiff Clayey SILT: Unit Wt. = 122 pcf,  $\Phi$  = 0 deg, C = 600 psf
- 3. Soft Clayey SILT: Unit Wt. = 118 pcf,  $\Phi$  = 0 deg, C = 400 psf
- 4. Glacial Till: Unit Wt. = 135 pcf,  $\Phi$  = 36 deg, C = 0 psf
- 5. Bedrock: Impenetrable
- 6. New Fill: Unit Wt. = 125 pcf,  $\Phi$  = 32 deg, C = 0 psf



Schoodic Bridge #3649  
 Route 193 over Schoodic Brook  
 Cherryfield, Maine  
 WIN 022230

Station 6+25 (South Approach)  
 Seismic Conditions ( $k_h = 0.083 g$ )

Materials:

1. Existing Fill: Unit Wt. = 125 pcf,  $\Phi = 29$  deg,  $C = 0$  psf
2. Stiff Clayey SILT: Unit Wt. = 122 pcf,  $\Phi = 0$  deg,  $C = 600$  psf
3. Soft Clayey SILT: Unit Wt. = 118 pcf,  $\Phi = 0$  deg,  $C = 400$  psf
4. Glacial Till: Unit Wt. = 135 pcf,  $\Phi = 36$  deg,  $C = 0$  psf
5. Bedrock: Impenetrable
6. New Fill: Unit Wt. = 125 pcf,  $\Phi = 32$  deg,  $C = 0$  psf

**Design of Bearing H-Piles**

Reference:

1. AASHTO LRFD Bridge Design Specifications, 8th Edition, 2017. (LRFD)
2. AASHTO Standard Specifications for Highway Bridges 17th Edition, 2002. (AASHTO)

Bedrock Properties

RQD: BB-CSB-101 R1 & R2 = 43 & 42% <---- CONTROLS  
 BB-CSB-103 R2 & R3 = 82 & 87%

Rock Type: GRANITE, very hard, fresh to slightly weathered, coarse-grained, generally horizontal (0 to 5 degrees) with steep dipping (55 to 85 degrees), open joints

Friction Angle:  $\phi = 34$  to 40 deg (LRFD Table C10.4.6.4-1)

Co = 2,100 - 49,000 psi (AASHTO Table 4.4.8.1.2B)

Pile Properties:

HP14x89  
 HP14x102 **NOTE: ALL MATRICES IN THIS ORDER**  
 HP14x117

$$f_y := 50 \text{ ksi}$$

$$A_s := \begin{bmatrix} 26.1 \\ 30.0 \\ 34.4 \end{bmatrix} \cdot \text{in}^2$$

$$d := \begin{bmatrix} 13.8 \\ 14.0 \\ 14.2 \end{bmatrix} \cdot \text{in}$$

$$b := \begin{bmatrix} 14.7 \\ 14.8 \\ 14.9 \end{bmatrix} \cdot \text{in}$$

$$A_p := \overrightarrow{(d \cdot b)} = \begin{bmatrix} 202.86 \\ 207.2 \\ 211.58 \end{bmatrix} \text{in}^2 \quad \text{Area of Perimeter}$$

## Nominal and Factored Structural Compressive Resistance

Find Nominal Axial Structural Resistance

$$P_o := f_y \cdot A_s = \begin{bmatrix} 1305 \\ 1500 \\ 1720 \end{bmatrix} \text{ kip}$$

Structural Resistance of unbraced segment

Assume 4 foot unbraced section due to scour  $L_u=4$

Determine elastic critical buckling resistance  $P_e$

$$E_s := 29000 \text{ ksi}$$

$$K_{eff} := 2.0 \quad \text{effective length factor / LRFD Table C4.6.2.5-1}$$

$$l_{unbraced} := 4 \text{ ft} \quad \text{unbraced length top of pile}$$

$$r_y := \begin{bmatrix} 3.53 \\ 3.56 \\ 3.59 \end{bmatrix} \cdot \text{in} \quad \text{radius of gyration, weak axis / LRFD Article C6.9.4.1.2}$$

LRFD Eqn 6.9.4.1.2-1

$$P_e := \left( \frac{\pi^2 \cdot E_s}{\left( \frac{K_{eff} \cdot l_{unbraced}}{r_y} \right)^2} \cdot A_s \right) = \begin{bmatrix} 10101 \\ 11808 \\ 13769 \end{bmatrix} \text{ kip}$$

LRFD Article 6.9.4.1.1

$$\frac{P_e}{P_o} = \begin{bmatrix} 7.74 \\ 7.872 \\ 8.005 \end{bmatrix} \quad P_n := \left\| \begin{array}{l} \text{if } \left\| \frac{P_e}{P_o} \geq 0.44 \right\| \\ \left\| \frac{0.658 \left( \frac{P_o}{P_e} \right) \cdot P_o}{P_e} \right\| \\ \text{if } \left\| \frac{P_e}{P_o} < 0.44 \right\| \\ \left\| 0.877 \cdot P_e \right\| \end{array} \right\| = \begin{bmatrix} 1236 \\ 1422 \\ 1632 \end{bmatrix} \text{ kip}$$

Find Factored Axial Structural Resistance at Strength Limit State

$\phi_{cu} := 0.7$  For combined axial and flexural resistance of H piles  
 LRFD Article 6.5.4.2

$$P_r := \phi_{cu} \cdot P_n = \begin{bmatrix} 865 \\ 996 \\ 1143 \end{bmatrix} \text{ kip} \quad \text{LRFD Eqn 6.9.2.1-1}$$

Find Factored Axial Structural Resistance at Strength Limit State

Structural Resistance of braced length

$l_{braced} := 0.1 \text{ ft}$

LRFD Eqn 6.9.4.1.2-1

$$P_e := \left( \frac{\pi^2 \cdot E_s}{\left( \frac{K_{eff} \cdot l_{braced}}{r_y} \right)^2} \cdot A_s \right) = \begin{bmatrix} 16160886 \\ 18892808 \\ 22030411 \end{bmatrix} \text{ kip}$$

LRFD Article 6.9.4.1.1

$$\frac{P_e}{P_o} = \begin{bmatrix} 12383.821 \\ 12595.205 \\ 12808.378 \end{bmatrix} \quad \text{if } P_e/P_o \geq 0.44 \text{ then} \quad P_n := 0.658 \left( \frac{P_o}{P_e} \right) \cdot P_o = \begin{bmatrix} 1305 \\ 1500 \\ 1720 \end{bmatrix} \text{ kip}$$

Find Factored Axial Structural Resistance at Strength Limit State

$\phi_c := 0.5$  LRFD Article 6.5.4.2

$$P_r := \phi_c \cdot P_n = \begin{bmatrix} 652 \\ 750 \\ 860 \end{bmatrix} \text{ kip} \quad \text{LRFD Eqn 6.9.2.1-1}$$

## Nominal and Factored Geotechnical Resistance

LRFD Article 10.7.3.2.3 states "the nominal resistance of piles driven to point bearing on hard rock where pile penetration into the rock formation is minimal is controlled by the structural limit state. The nominal bearing resistance shall not exceed the values obtained from Article 6.9.4.1 with the resistance factor specified in Article 6.5.4.2 and Article 6.15 for severe driving conditions. A pile-driving acceptance criteria shall be developed that will prevent pile damage."

### Nominal Structural Resistance

$$P_n = \begin{bmatrix} 1305 \\ 1500 \\ 1720 \end{bmatrix} \text{ kip}$$

Find Factored Geotechnical Resistance at Strength, Service and Extreme Limit States

$$\phi_c := 0.5 \quad \text{LRFD 6.9.2.1-1 for Strength Limit State}$$

$$P_r := \phi_c \cdot P_n = \begin{bmatrix} 652 \\ 750 \\ 860 \end{bmatrix} \text{ kip}$$

$$\phi_{s\_ex} := 1.0 \quad \text{LRFD 6.9.2.1-1 for the Services and Extreme Limit States}$$

$$P_{r\_e} := \phi_{s\_ex} \cdot P_n = \begin{bmatrix} 1305 \\ 1500 \\ 1720 \end{bmatrix} \text{ kip}$$

### Drivability Analysis

From LRFD Article 10.7.8

For steel piles in compression or tension, limit driving stresses to 90% fy

$$\phi_{da} := 1.0 \quad \text{LRFD Table 10.5.5.2.3-1, Drivability Analysis, Steel Piles (See LRFD 6.5.4.2)}$$

$$\sigma_{da} := 0.9 \cdot f_y \cdot \phi_{da} = 45 \text{ ksi} \quad \text{LRFD Eqn 10.7.8.1}$$

Per LRFD, limit driving stresses to 45 ksi or less or

Per BDG Section 501, limit blow counts to 5-15 blows to inch (bpi) with 6-10 bpi optimal  
 limit blow counts to 3-5 bpi on sloping bedrock.

Find maximum resistance from drivability analysis:

$$\phi_{dyn} := 0.65 \quad \text{LRFD Table 10.5.5.2.3-1 Strength Limit State}$$

$$\phi_s := 1 \quad \text{Service and Extreme Limit States}$$

### GRLWeap Soil and Pile Model Assumptions

Estimated pile lengths: 41 to 42 ft (bottom of pile cap to bedrock from explorations)

Assume contractor drives **55 ft piles** (worst case) to account for additional pile length for testing (5 ft), rock embedment (< 1 ft), pile cap embedment (3 ft) and cut off.

Delmag D19-42 Hammer was chosen as typical pile hammer capable of producing energy of about 42,000 ft-lbs. The following pile hammer and cushion parameters were used in the analysis:

Hammer parameters			
Efficiency	<b>0.8</b>		
Pressure	<b>1600</b>	psi	Fixed <b>100</b> %
Stroke	<b>10.81</b>	ft	Fixed

From GRLWeap output:

$$R_{ndr} := \begin{bmatrix} 721 \\ 778 \\ 832 \end{bmatrix} \text{ kip} \quad \begin{array}{l} \text{HP14x89} \\ \text{HP14x102} \\ \text{HP14x117} \end{array}$$

Cushion Information			
	Hammer	Pile	
Area	<b>227.</b>	<b>0.</b>	in <sup>2</sup>
Elastic Modulus	<b>175.</b>	<b>0.</b>	ksi
Thickness	<b>2.</b>	<b>0.</b>	in
C.O.R.	<b>0.92</b>	<b>0.</b>	
Stiffness	<b>0.</b>	<b>0.</b>	kips/in
Helmet Weight	<b>3.</b>		kips

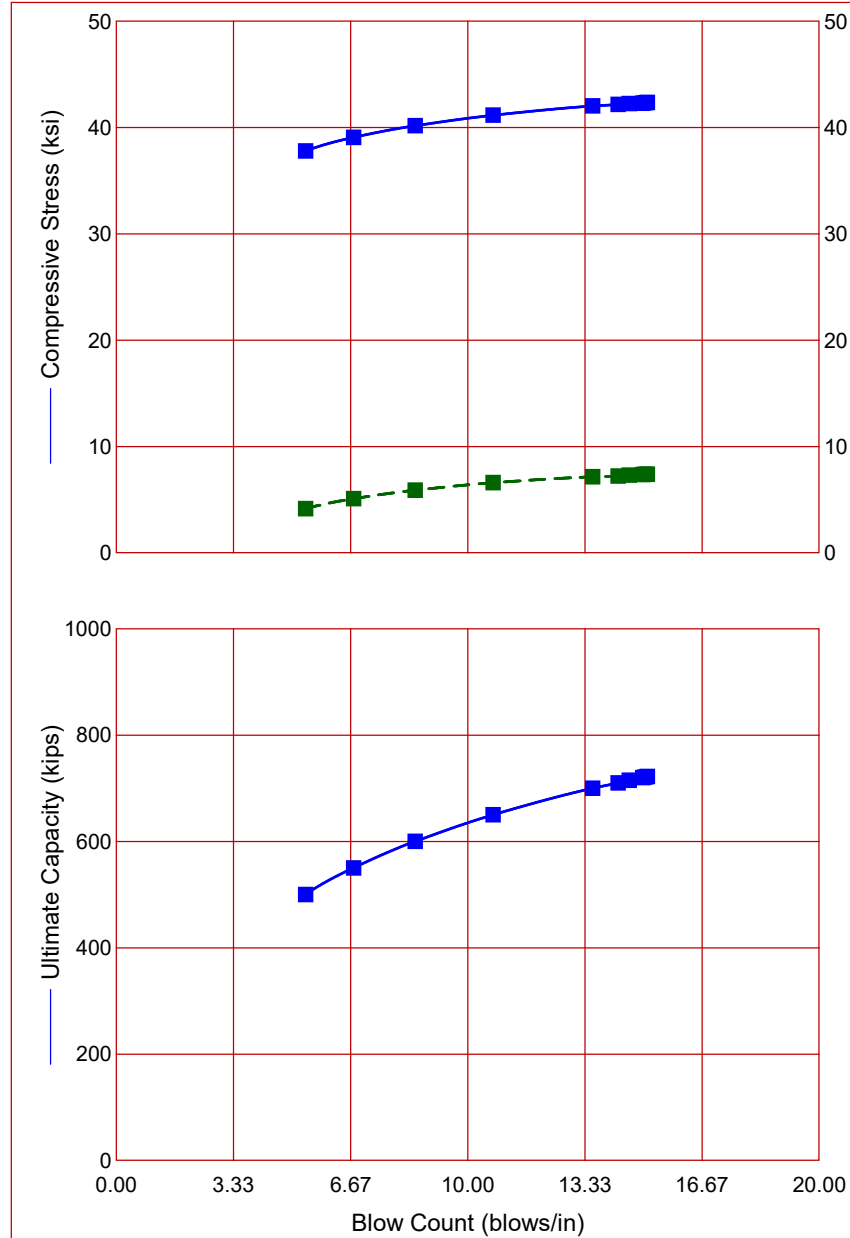
Strength Limit State

$$R_{fdr} := \overrightarrow{R_{ndr}} \cdot \phi_{dyn} = \begin{bmatrix} 469 \\ 506 \\ 541 \end{bmatrix} \text{ kip}$$

Service and Extreme Limit States

$$R_{dr} := \overrightarrow{R_{ndr}} \cdot \phi_s = \begin{bmatrix} 721 \\ 778 \\ 832 \end{bmatrix} \text{ kip}$$

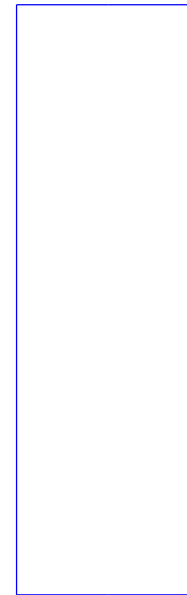
HP14x89



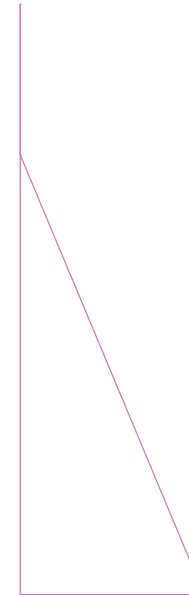
DELMAG D 19-42

Stroke	10.81 ft
Ram Weight	4.00 kips
Efficiency	0.800
Pressure	Variable
Helmet Weight	3.00 kips
Hammer Cushion	19863 kips/in
COR of H.C.	0.920
Skin Quake	0.100 in
Toe Quake	0.040 in
Skin Damping	0.050 s/ft
Toe Damping	0.150 s/ft
Pile Length	55.00 ft
Pile Penetration	41.00 ft
Pile Top Area	26.10 in <sup>2</sup>

Pile Model



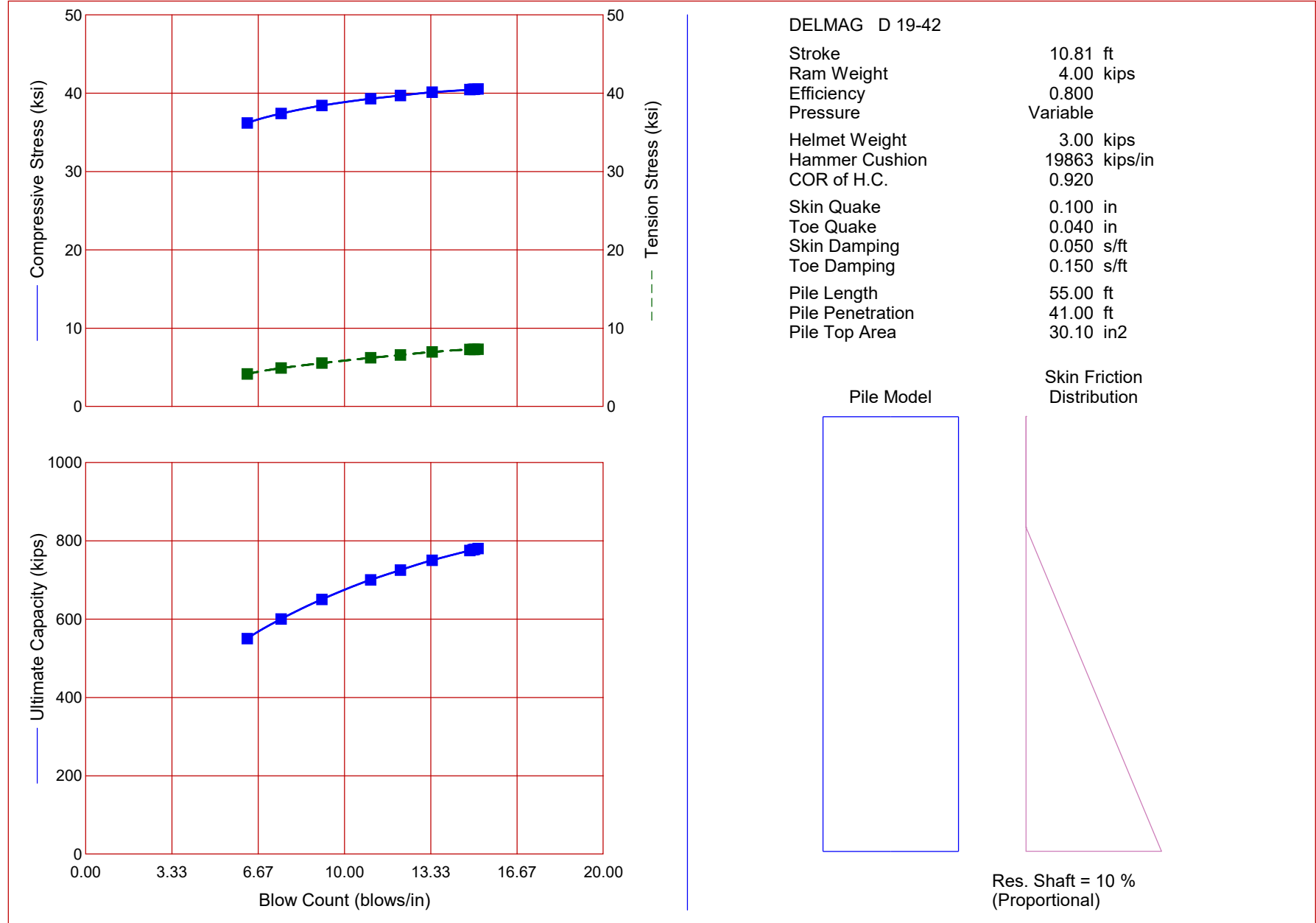
Skin Friction Distribution



Res. Shaft = 10 %  
(Proportional)

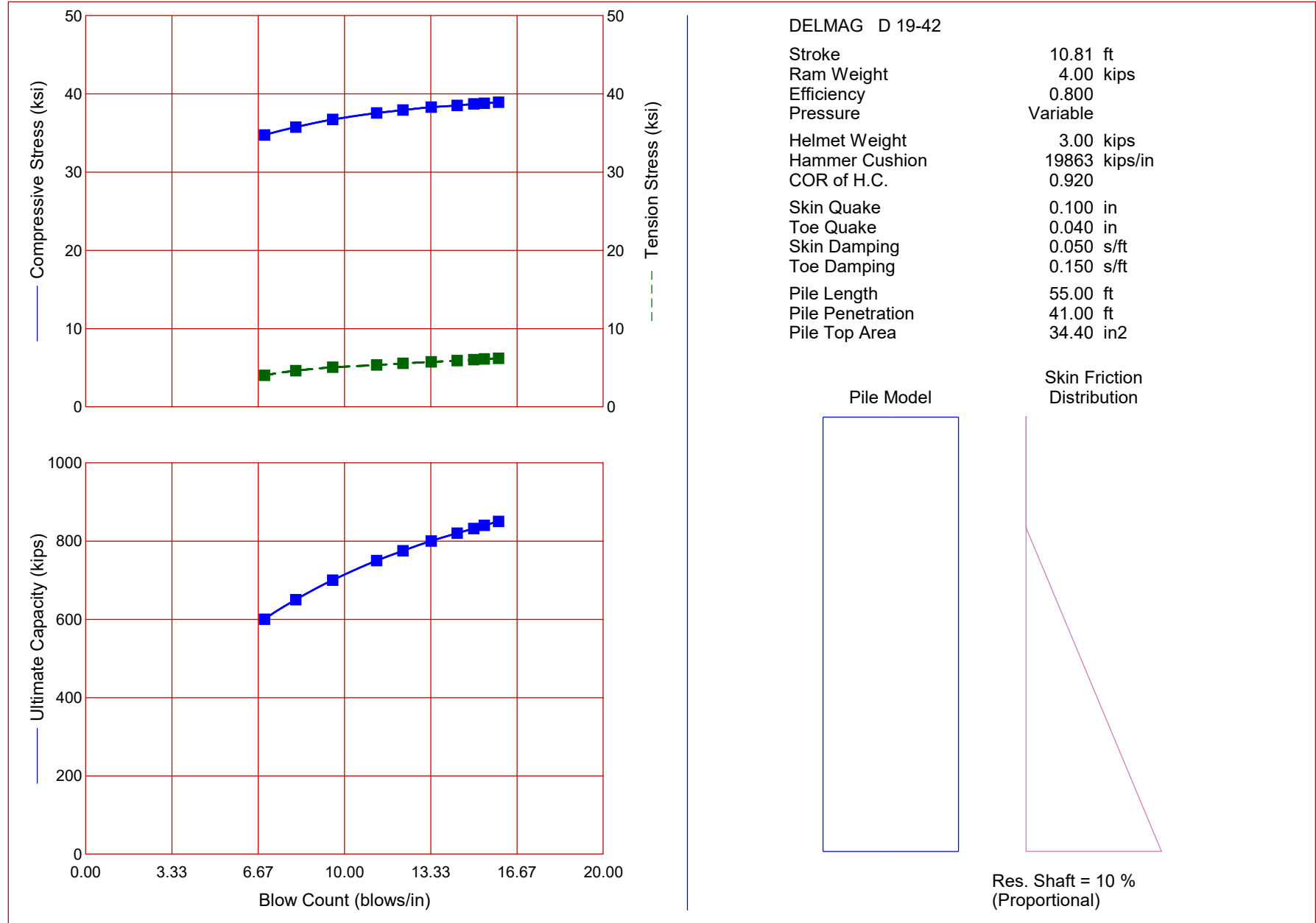
Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
500.0	37.78	4.15	5.4	10.81	24.54
550.0	39.06	5.10	6.8	10.81	24.50
600.0	40.16	5.90	8.5	10.81	24.52
650.0	41.15	6.60	10.7	10.81	24.54
700.0	42.02	7.16	13.6	10.81	24.52
710.0	42.16	7.22	14.3	10.81	24.45
715.0	42.23	7.31	14.6	10.81	24.49
720.0	42.27	7.36	15.0	10.81	24.46
721.0	42.32	7.38	15.0	10.81	24.47
722.0	42.34	7.40	15.1	10.81	24.47

HP14x102



Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
550.0	36.18	4.15	6.3	10.81	24.12
600.0	37.39	4.91	7.6	10.81	24.12
650.0	38.41	5.54	9.1	10.81	24.10
700.0	39.28	6.22	11.0	10.81	24.13
725.0	39.70	6.58	12.2	10.81	24.09
750.0	40.12	6.97	13.4	10.81	24.12
775.0	40.45	7.28	14.8	10.81	24.10
777.0	40.48	7.28	15.0	10.81	24.09
778.0	40.50	7.29	15.0	10.81	24.09
780.0	40.52	7.31	15.2	10.81	24.09

HP14x117



Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
600.0	34.73	4.03	6.9	10.81	23.71
650.0	35.74	4.63	8.1	10.81	23.71
700.0	36.72	5.07	9.5	10.81	23.67
750.0	37.55	5.36	11.3	10.81	23.69
775.0	37.92	5.56	12.3	10.81	23.64
800.0	38.29	5.76	13.4	10.81	23.66
820.0	38.51	5.92	14.4	10.81	23.62
832.0	38.70	6.03	15.0	10.81	23.61
840.0	38.78	6.13	15.4	10.81	23.65
850.0	38.92	6.21	16.0	10.81	23.67

**Estimated Frost Penetration Depth**

Based on MaineDOT Bridge Design Guide Section 5.2.1

Site Location: Cherryfield, Maine

Soil Conditions: Clayey SILT (Fine Grained)

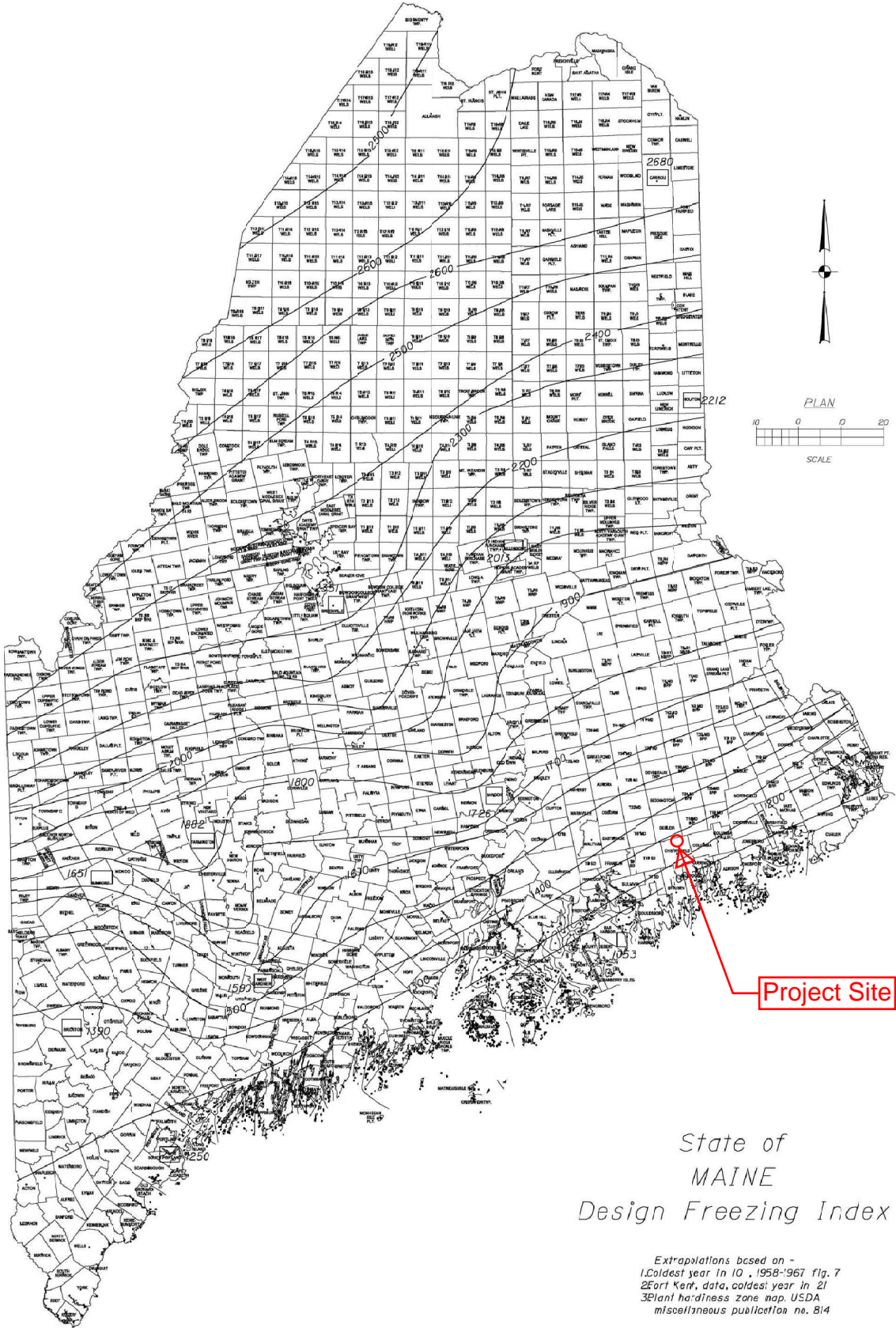
**Step 1.** From Figure 5-1: Design Freezing Index =  $\pm 1300$  freezing degree-days

**Step 2.** From laboratory test results: natural soil water content > 20%

**Step 3.** From Table 5-1: Depth of frost penetration = 46.6 inches = 3.9 feet

**USE 4 feet**

Figure 5-1 Maine Design Freezing Index Map



State of  
MAINE  
Design Freezing Index

Extrapolations based on -  
1) Coldest year in 10 . 1958-'967 fig. 7  
2) Fort Kent, data, coldest year in 21  
3) Plant hardiness zone map, USDA  
miscellaneous publication no. 814

## 5.2 General

### 5.2.1 Frost

Any foundation placed on seasonally frozen soils must be embedded below the depth of frost penetration to provide adequate frost protection and to minimize the potential for freeze/thaw movements. Fine-grained soils with low cohesion tend to be most frost susceptible. Soils containing a high percentage of particles smaller than the No. 200 sieve also tend to promote frost penetration.

In order to estimate the depth of frost penetration at a site, Table 5-1 has been developed using the Modified Berggren equation and Figure 5-1 Maine Design Freezing Index Map. The use of Table 5-1 assumes site specific, uniform soil conditions where the Geotechnical Designer has evaluated subsurface conditions. Coarse-grained soils are defined as soils with sand as the major constituent. Fine-grained soils are those having silt and/or clay as the major constituent. If the make-up of the soil is not easily discerned, consult the Geotechnical Designer for assistance. In the event that specific site soil conditions vary, the depth of frost penetration should be calculated by the Geotechnical Designer.

**Table 5-1 Depth of Frost Penetration**

Design Freezing Index	Frost Penetration (in)					
	Coarse Grained			Fine Grained		
	w=10%	w=20%	w=30%	w=10%	w=20%	w=30%
1000	66.3	55.0	47.5	47.1	40.7	36.9
1100	69.8	57.8	49.8	49.6	42.7	38.7
1200	73.1	60.4	52.0	51.9	44.7	40.5
1300	76.3	63.0	54.3	54.2	46.6	42.2
1400	79.2	65.5	56.4	56.3	48.5	43.9
1500	82.1	67.9	58.4	58.3	50.2	45.4
1600	84.8	70.2	60.3	60.2	51.9	46.9
1700	87.5	72.4	62.2	62.2	53.5	48.4
1800	90.1	74.5	64.0	64.0	55.1	49.8
1900	92.6	76.6	65.7	65.8	56.7	51.1
2000	95.1	78.7	67.5	67.6	58.2	52.5
2100	97.6	80.7	69.2	69.3	59.7	53.8
2200	100.0	82.6	70.8	71.0	61.1	55.1
2300	102.3	84.5	72.4	72.7	62.5	56.4
2400	104.6	86.4	74.0	74.3	63.9	57.6
2500	106.9	88.2	75.6	75.9	65.2	58.8
2600	109.1	89.9	77.1	77.5	66.5	60.0

## CHAPTER 5 - SUBSTRUCTURES

- Notes:
1.  $w$  = water content
  2. Where the Freezing Index and/or water content is between the presented values, linear interpretation may be used to determine the frost penetration.

**Determine Seismic Site Classification per AASHTO LRFD Table C3.10.3.1-1 - Method B**

Data From Boring BB-CSB-101

Layer No.	Layer Description	Depth Range (ft)		N <sub>60</sub> values recorded within layer						Average N <sub>60</sub> value	Layer Thickness	d <sub>i</sub> /N <sub>i</sub>
		Top	End							N <sub>i</sub>	d <sub>i</sub>	
1	Fill	0	13.5	8	8					8.0	13.5	1.69
2	Glaciomarine	13.5	32	1	2					1.5	18.5	12.33
3	Till	32	50.7	67	39	100	100			76.5	18.7	0.24
4	Bedrock	50.7	100	100						100.0	49.3	0.49
<b>Σ =</b>											<b>100</b>	<b>14.76</b>

**N<sub>bar</sub> = d<sub>i</sub>/d<sub>i</sub>/N<sub>i</sub> = 6.78**  
**Site Class = E**

Data From Boring BB-CSB-102

Layer No.	Layer Description	Depth Range (ft)		N <sub>60</sub> values recorded within layer						Average N <sub>60</sub> value	Layer Thickness	d <sub>i</sub> /N <sub>i</sub>
		Top	End							N <sub>i</sub>	d <sub>i</sub>	
1	Alluvium	0	2	3						3.0	2	0.67
2	Glaciomarine	2	17	1	1					1.0	15	15.00
<b>Σ =</b>											<b>17</b>	<b>15.67</b>

**N<sub>bar</sub> = d<sub>i</sub>/d<sub>i</sub>/N<sub>i</sub> = 1.09**  
**Site Class = E**

Data From Boring BB-CSB-103

Layer No.	Layer Description	Depth Range (ft)		N <sub>60</sub> values recorded within layer						Average N <sub>60</sub> value	Layer Thickness	d <sub>i</sub> /N <sub>i</sub>
		Top	End							N <sub>i</sub>	d <sub>i</sub>	
1	Fill	0	14	43	6	6				18.3	14	0.76
2	Clay	14	33.5	14	1	1				5.3	19.5	3.66
3	Till	33.5	49.5	32	43					37.5	16	0.43
4	Bedrock	49.5	100	100						100.0	50.5	0.51
<b>Σ =</b>											<b>100</b>	<b>5.35</b>

- NOTES:**
1. Weight of rod (WOR) and weight of hammer (WOH) values taken as N=1
  2. N<sub>60</sub> values > 100 taken as N=100
  3. N<sub>60</sub> value for bedrock taken as N=100

**N<sub>bar</sub> = d<sub>i</sub>/d<sub>i</sub>/N<sub>i</sub> = 18.69**  
**Site Class = D**

Schoodic Bridge #3649 / Cherryfield, ME

Conterminous 48 States  
 2007 AASHTO Bridge Design Guidelines  
 AASHTO Spectrum for 7% PE in 75 years

Latitude = 44.684919  
 Longitude = -067.949833  
 Site Class B  
 Data are based on a 0.05 deg grid spacing.

Period (sec)	Sa (g)	
0.0	0.066	PGA - Site Class B
0.2	0.139	Ss - Site Class B
1.0	0.040	S1 - Site Class B

Conterminous 48 States  
 2007 AASHTO Bridge Design Guidelines  
 Spectral Response Accelerations SDs and SD1

Latitude = 44.684919  
 Longitude = -067.949833  
 As = FpgaPGA, SDs = FaSs, and SD1 = FvS1  
 Site Class E - Fpga = 2.50, Fa = 2.50, Fv = 3.50  
 Data are based on a 0.05 deg grid spacing.




Period (sec)	Sa (g)	
0.0	0.165	As - Site Class E
0.2	0.347	SDs - Site Class E
1.0	0.141	SD1 - Site Class E

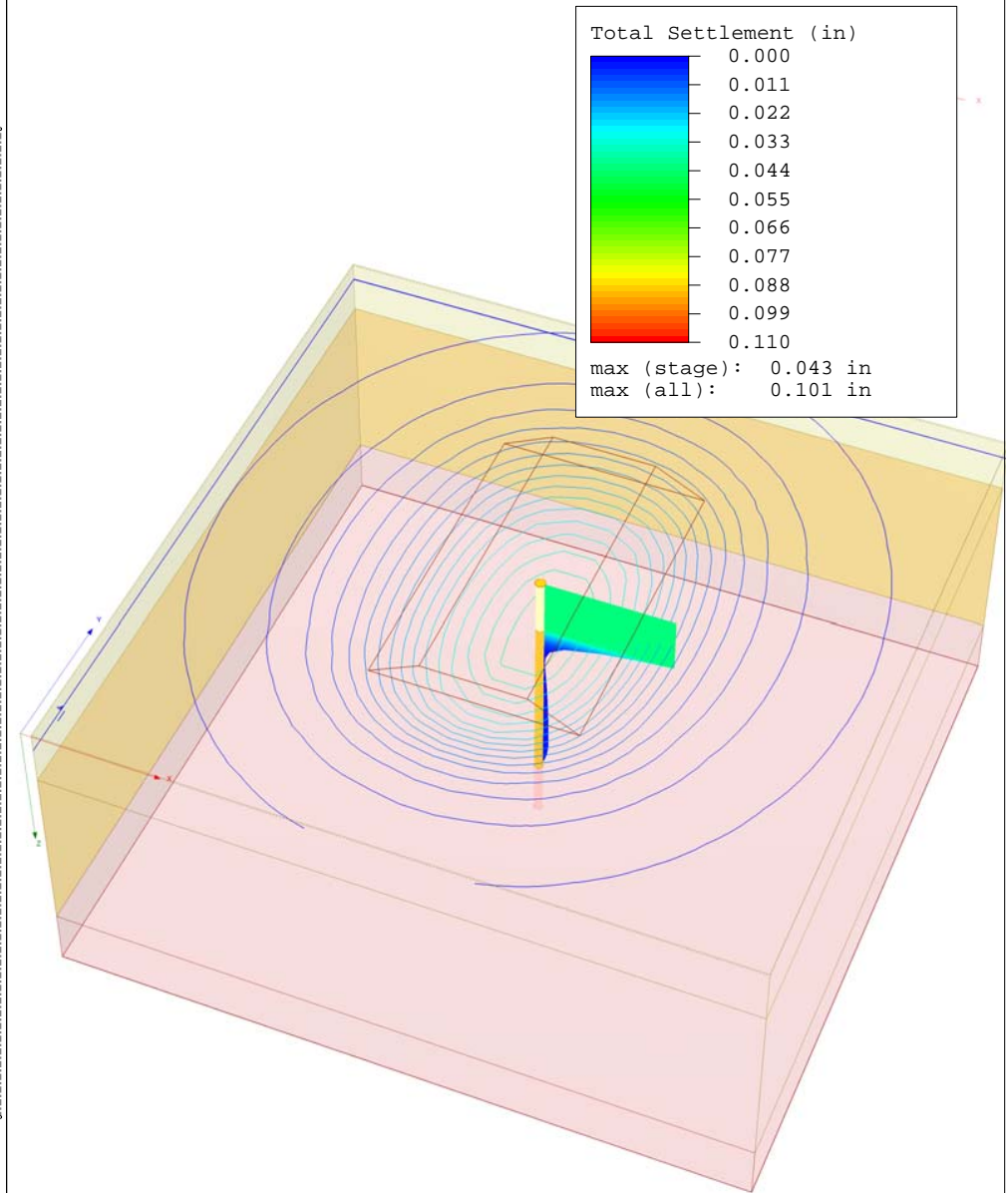
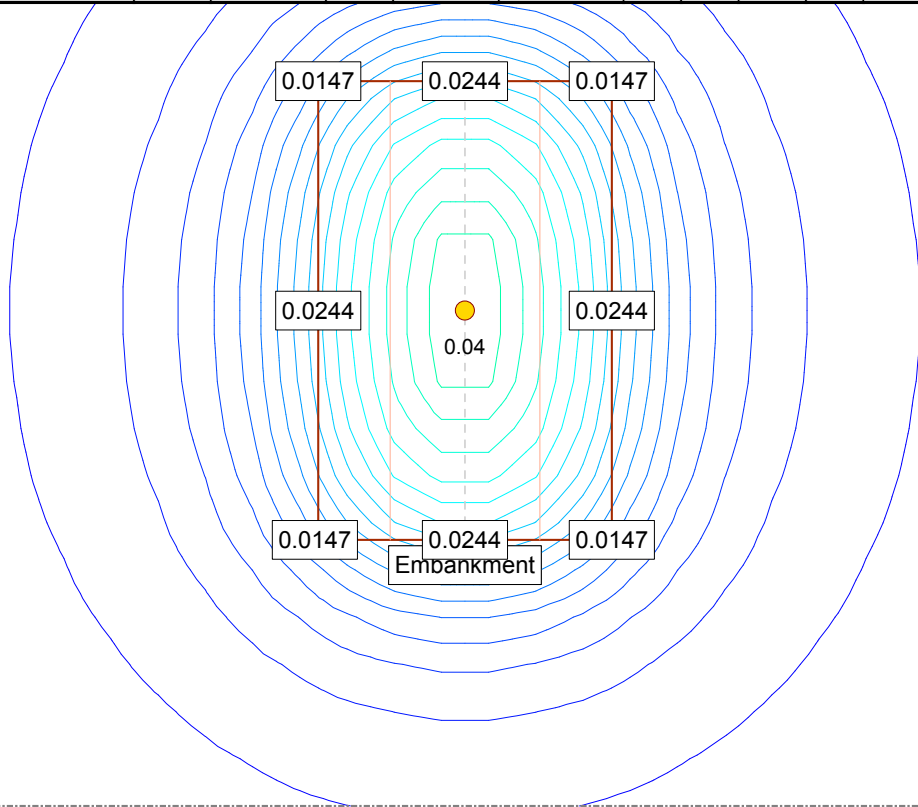
Conterminous 48 States  
 2007 AASHTO Bridge Design Guidelines  
 Design Response Spectra for Site Class E

Latitude = 44.684919  
 Longitude = -067.949833  
 As = FpgaPGA, SDs = FaSs, SD1 = FvS1  
 Site Class E - Fpga = 2.50, Fa = 2.50, Fv = 3.50  
 Data are based on a 0.05 deg grid spacing.

Period (sec)	Sa (g)	Sd in.	
0.000	0.165	0.000	T = 0.0, Sa = As
0.081	0.347	0.022	
0.200	0.347	0.136	T = 0.2, Sa = SDs
0.405	0.347	0.556	T = Ts, Sa = SDs
0.500	0.281	0.686	
0.600	0.234	0.824	
0.800	0.176	1.098	
1.000	0.141	1.373	T = 1.0, Sa = SD1
1.200	0.117	1.647	
1.400	0.100	1.922	

1.600	0.088	2.196
1.800	0.078	2.471
2.000	0.070	2.745
2.200	0.064	3.020
2.400	0.059	3.295
2.600	0.054	3.569
2.800	0.050	3.844
3.000	0.047	4.118
3.200	0.044	4.393
3.400	0.041	4.667
3.600	0.039	4.942
3.800	0.037	5.216
4.000	0.035	5.491

Material Name	Color	Unit Weight (kips/ft <sup>3</sup> )	Es (ksf)	Poisson Ratio	Material Type	Cc	Cr	OCR	e0	Cv (ft <sup>2</sup> /d)
Stiff Clayey Silt		0.122	100	0.45	-	-	-	-	-	-
Soft Silty Clay		0.118	-	0.45	Non-Linear	0.17	0.03	1.6	1.14	0.086
Glacial Till		0.135	-	0.35	-	-	-	-	-	-



SETTLE3D 4.018

Project

Schoodic Bridge #3649 - Detour Sta 2+50

File Name

North Detour Embankment Sta 2+50.s3z

Drawn By

Michael St. Pierre, P.E.

Company




S. W. Cole Engineering, Inc.

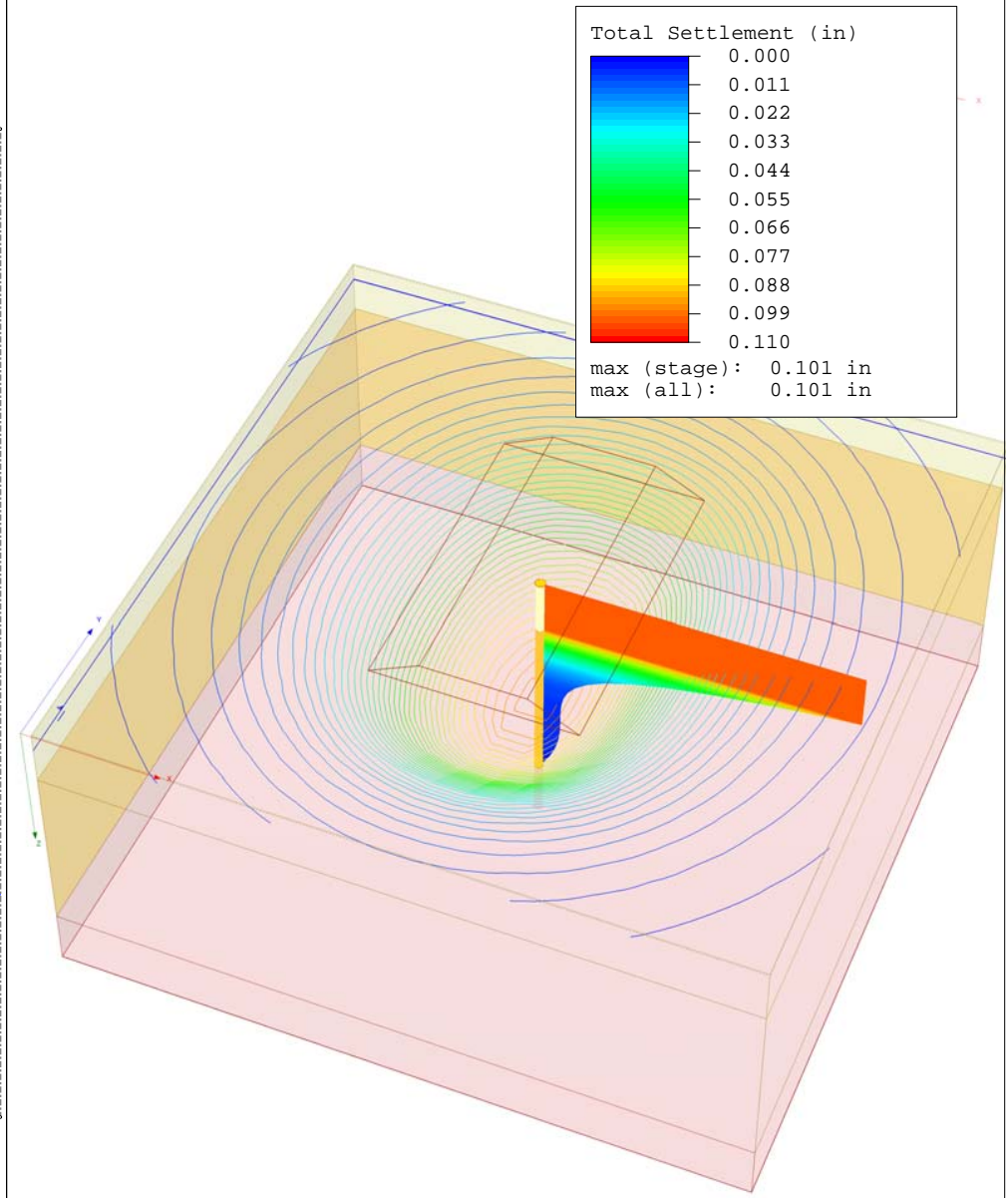
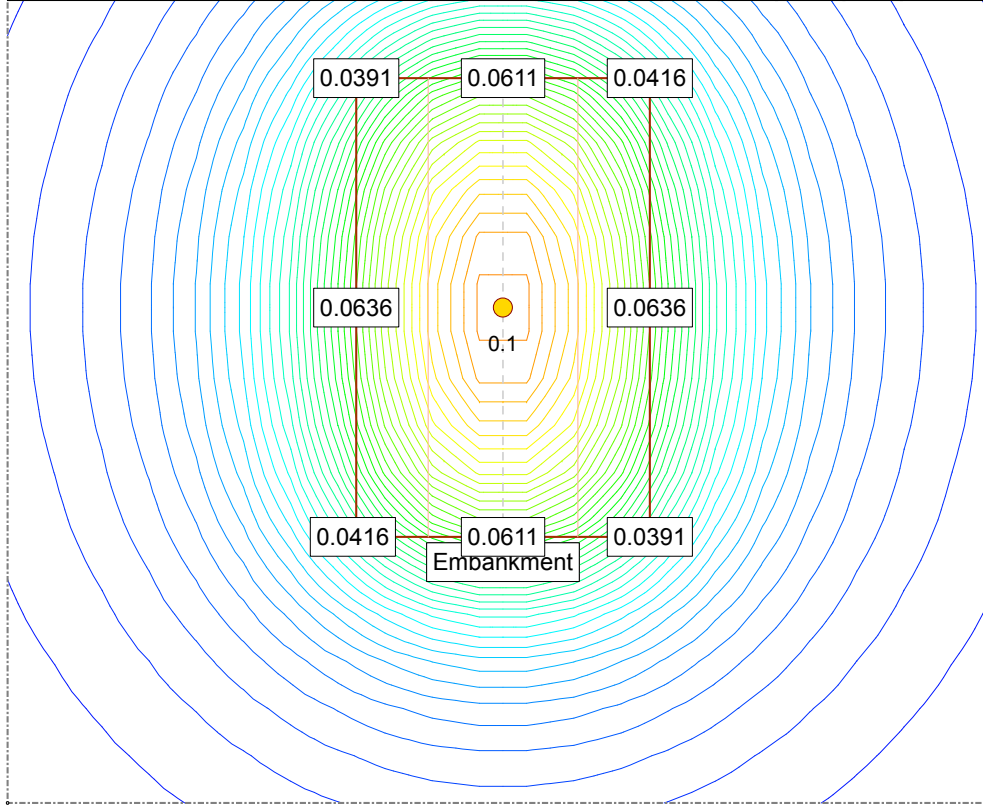
Date

December 2019

Stage

Stage 1 = 0.1 y

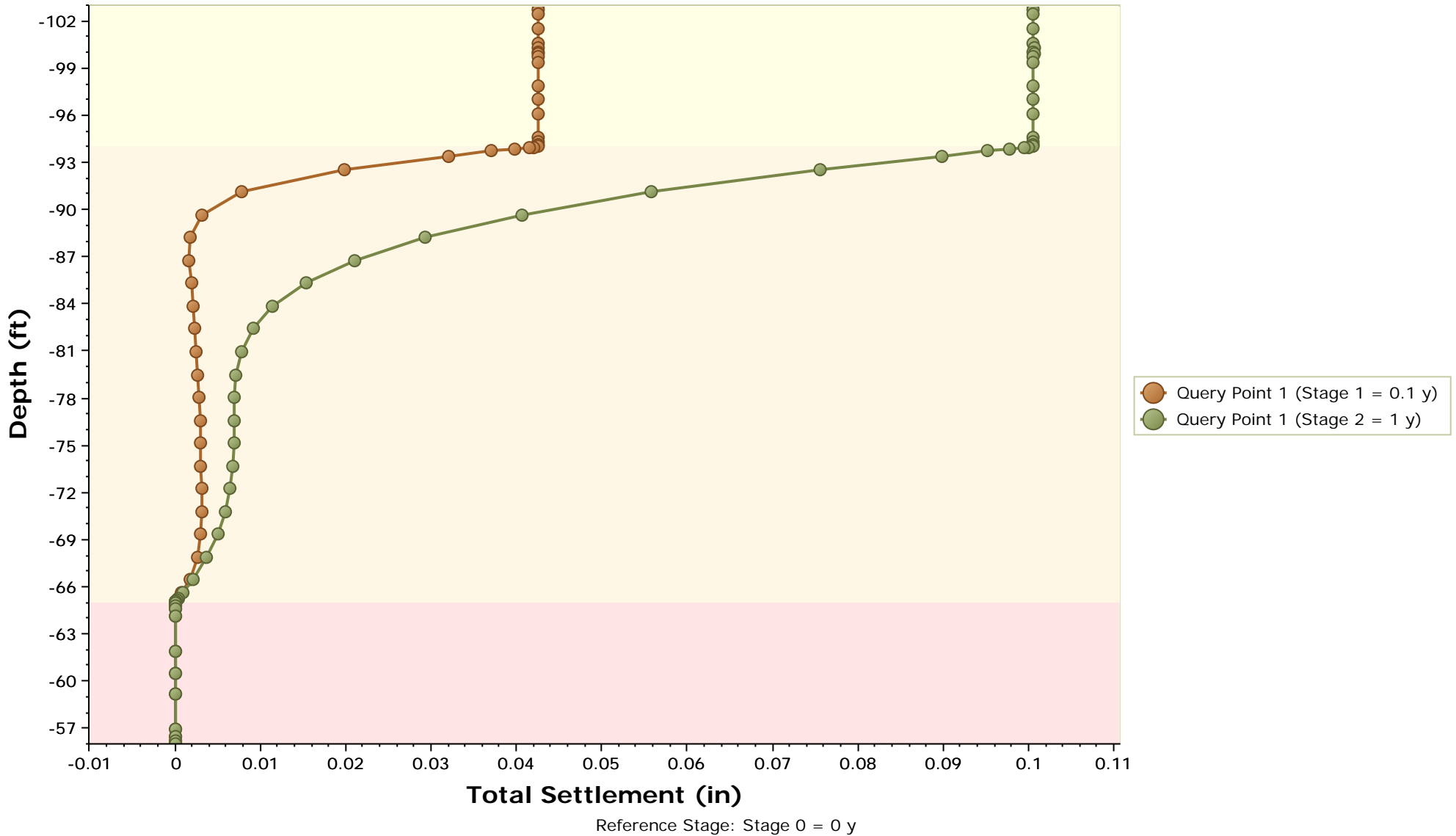
Material Name	Color	Unit Weight (kips/ft3)	Es (ksf)	Poisson Ratio	Material Type	Cc	Cr	OCR	e0	Cv (ft2/d)
Stiff Clayey Silt		0.122	100	0.45	-	-	-	-	-	-
Soft Silty Clay		0.118	-	0.45	Non-Linear	0.17	0.03	1.6	1.14	0.086
Glacial Till		0.135	-	0.35	-	-	-	-	-	-



SETTLE3D 4.018

Project	Schoolic Bridge #3649 - Detour Sta 2+50		
File Name	North Detour Embankment Sta 2+50.s3z		
Drawn By	Michael St. Pierre, P.E.	Company	S. W. Cole Engineering, Inc.
Date	December 2019	Stage	Stage 2 = 1 y

# Total Settlement vs. Depth



SETTLE3D 4.018

<i>Project</i>	Schoodic Bridge #3649 - Detour Sta 2+50		
<i>File Name</i>	North Detour Embankment Sta 2+50.s3z		
<i>Drawn By</i>	Michael St. Pierre, P.E.	<i>Company</i>	S. W. Cole Engineering, Inc.
<i>Date</i>	December 2019	<i>Stage</i>	

**Objective**

Develop/correlate soil parameters for use in elastic and consolidation settlement evaluations using Settle3D software.

**References**

1. Bowles, J.E., Foundation Analysis and Design, 3rd Ed., 1996.
2. Das, B.M., Principles of Foundation Engineering, 8th Ed., 2014.
3. "STP Blow Count Conversion and Friction Angle Correlation" Worksheets

**Assumptions**

Generalized soil profile based on boring BB-CSB-202

very stiff Clayey SILT, 0 to 9 ft (El. 109.9 to 100.9 ft)  
 soft Clayey SILT, 9 to 38 ft (El. 100.9 to 71.9 ft)  
 medium dense to dense Glacial Till, 38 to 47 ft (El. 71.9 to 62.9 ft)

$p_a := 14.7 \text{ psi}$

**ORIGIN := 1**

From Das (2014) Pg 102  
 Eqn 3.32

$$\alpha := \begin{bmatrix} 5 \\ 10 \\ 15 \end{bmatrix}$$

5 for sands with fines  
 10 for clean normally consolidated sand  
 15 for clean overconsolidated sand

1. Estimate properties of v. stiff Clayey SILT

$\gamma_{sat,1} := 122 \text{ pcf}$

Assumed for cohesive soil

$\phi_1 := 0 \text{ deg}$

From Reference 1, Table 2-7 Pg 123

$\mu_1 := 0.45$

See SPT Conversion WS

$N_{60,1} := 10$

Range: 28, 9 bpf

From Reference 2, Table 5-6 Pg 316

Clayey Silt

$E_s := 300 \text{ kPa} \cdot (N_{60,1} + 6) = 100 \text{ ksf}$

**use Es = 100 ksf**

2. Estimate properties of Silty Clay

$$\gamma_{sat\_2} := 118 \text{ pcf}$$

From Reference 2, Table 2-7

$$\mu_2 := 0.45$$

From laboratory testing  
 BB-CSB-201, 1U A+B

$$C_{R\_upper} := 0.17$$

$$C_{R\_lower} := 0.15$$

$$R_{R\_upper} := 0.03$$

$$R_{R\_lower} := 0.03$$

$$e_o := 1.14$$

$$c_v := 10^{-6} \frac{\text{ft}^2}{\text{sec}} = 0.086 \frac{\text{ft}^2}{\text{day}}$$

3. Estimate properties of Glacial Till

$$\gamma_{sat\_3} := 135 \text{ pcf}$$

See SPT Conversion WS

$$\phi_3 := 36 \text{ deg}$$

From Reference 2, Table 2-7

$$\mu_3 := 0.4$$

From Reference 3, Eqn 3.32 with

$$N_{60\_3} := 30$$

Range: 29, 38 bpf

$$\alpha_{3,1} = 15$$

$$E_{s\_3} := p_a \alpha_{3,1} N_{60\_3} = 953 \text{ ksf}$$

From Reference 2, Table 5-6 Pg 316

gravelly sand

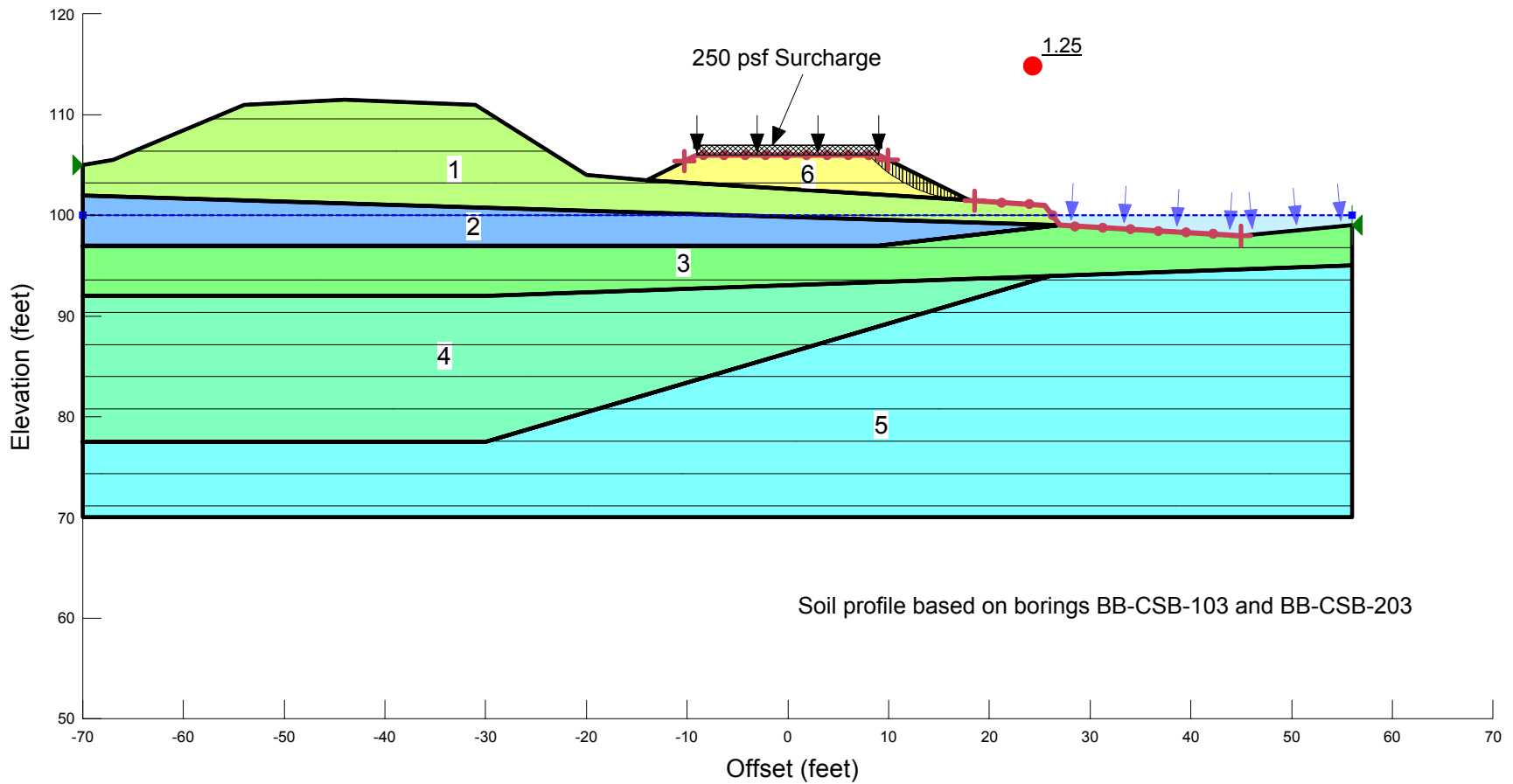
$$E_s := 1200 \text{ kPa} \cdot (N_{60\_3} + 6) = 902 \text{ ksf}$$

sand, all

$$E_s := 2600 \text{ kPa} \cdot N_{60\_3} = 1629 \text{ ksf}$$

**use Es = 900 ksf**



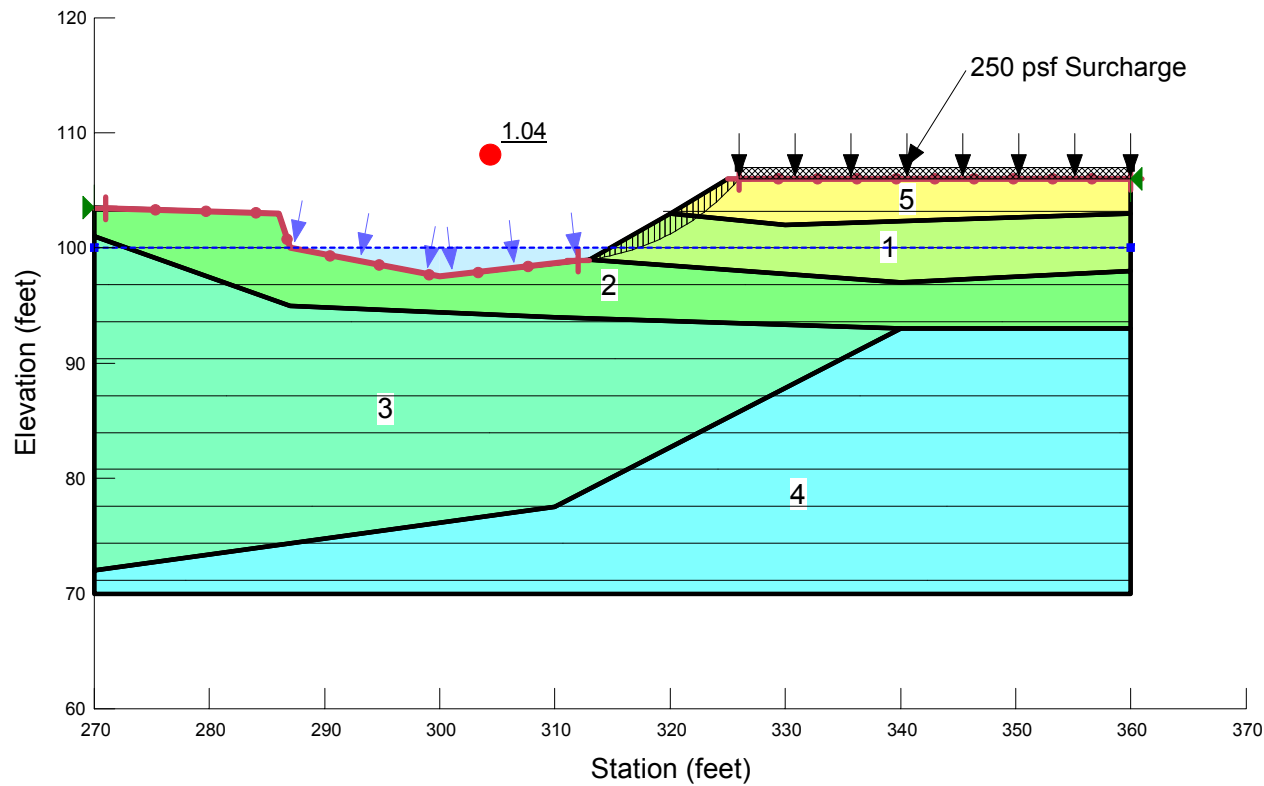


Schoodic Bridge #3649  
 Route 193 over Schoodic Brook  
 Cherryfield, Maine  
 WIN 022230

Conceptual Temporary Detour  
 Station 3+25 (South Approach)  
 Static Conditions - Transverse

**Materials:**

1. Existing Fill: Unit Wt. = 125 pcf, Phi = 29 deg, C = 0 psf
2. Alluvium: Unit Wt. = 122 pcf, Phi = 28 deg, C = 0 psf
3. Medium/Stiff Clayey SILT: Unit Wt. = 122 pcf, Phi = 0 deg, C = 600 psf
4. Soft Clayey SILT: Unit Wt. = 118 pcf, Phi = 0 deg, C = 400 psf
5. Glacial Till: Unit Wt. = 135 pcf, Phi = 36 deg, C = 0 psf
6. New Fill: Unit Wt. = 125 pcf, Phi = 32 deg, C = 0 psf



Schoodic Bridge #3649  
 Route 193 over Schoodic Brook  
 Cherryfield, Maine  
 WIN 022230

Conceptual Temporary Detour  
 Station 3+25 (South Approach)  
 Static Conditions - Longitudinal

Soil profile based on borings BB-CSB-201, -202, -203 and -204

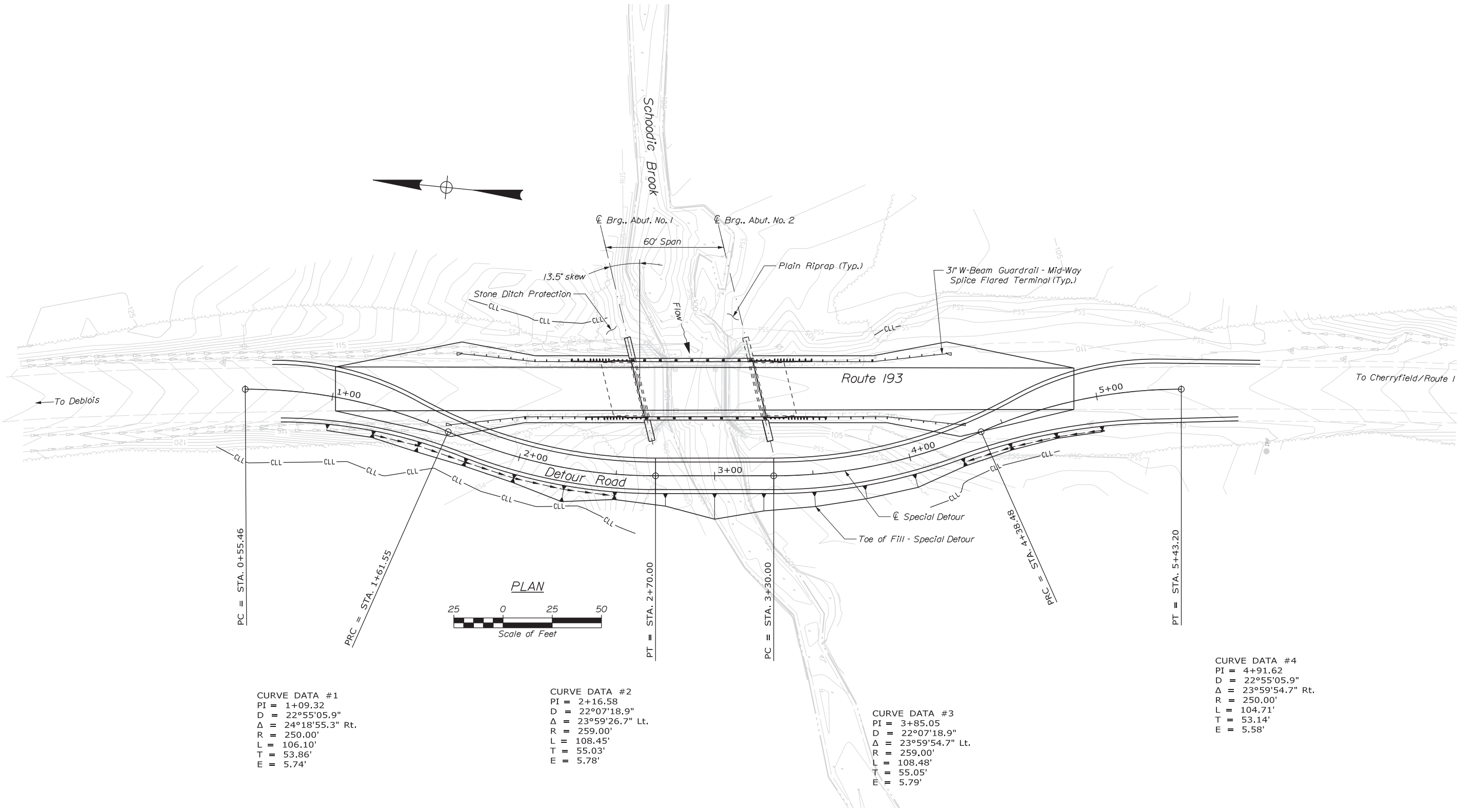
Materials:

1. Alluvium: Unit Wt. = 122 pcf,  $\Phi = 28$  deg,  $C = 0$  psf
2. Medium/Stiff Clayey SILT: Unit Wt. = 122 pcf,  $\Phi = 0$  deg,  $C = 600$  psf
3. Soft Clayey SILT: Unit Wt. = 118 pcf,  $\Phi = 0$  deg,  $C = 400$  psf
4. Glacial Till: Unit Wt. = 135 pcf,  $\Phi = 36$  deg,  $C = 0$  psf
5. New Fill: Unit Wt. = 125 pcf,  $\Phi = 32$  deg,  $C = 0$  psf

Username: richard.mayer Date: 7/13/2019

Division: BRIDGE

Filename: ... \MSTA\020\_Bridge\_Detour.dgn



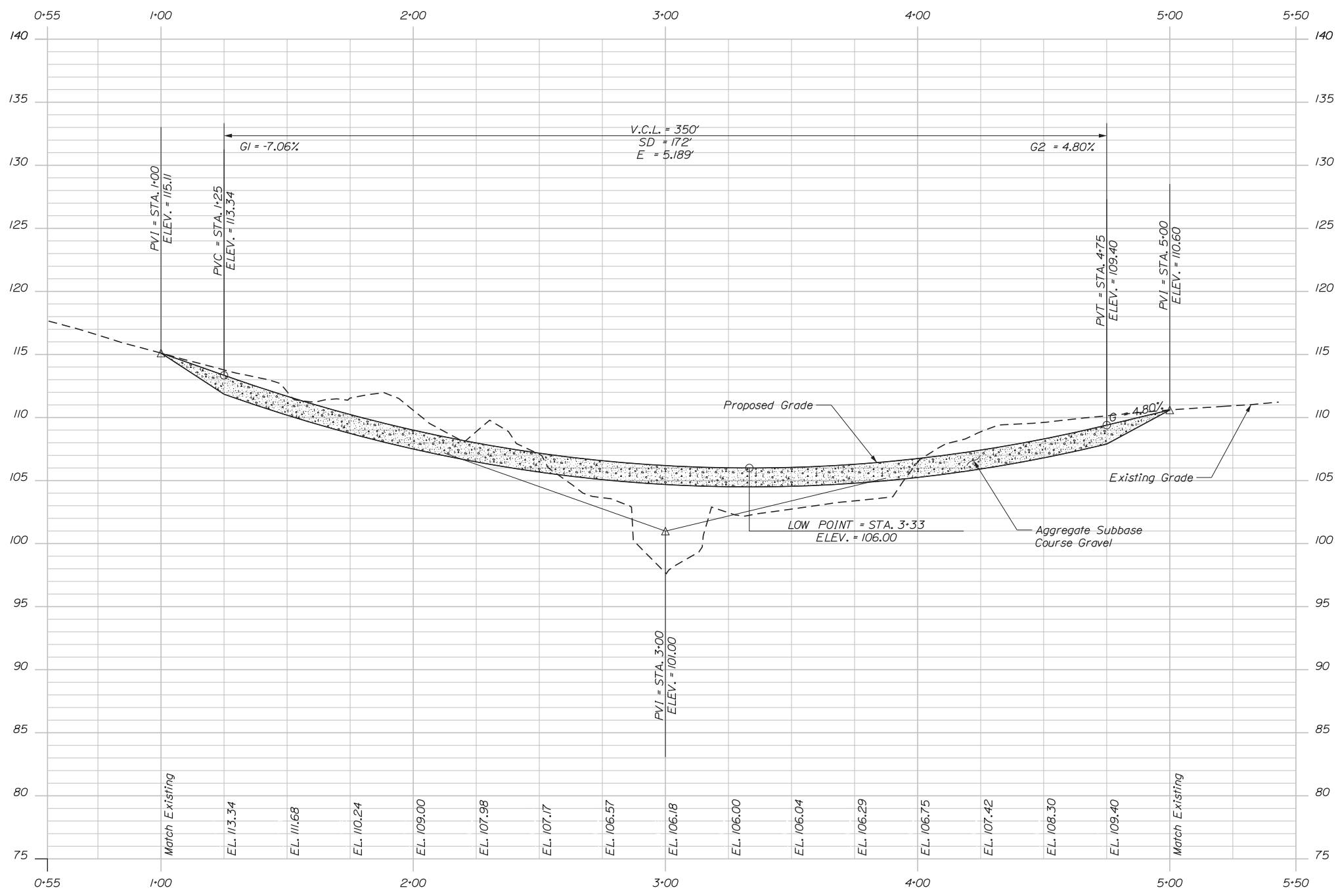
**CURVE DATA #1**  
 PI = 1+09.32  
 D = 22°55'05.9"  
 Δ = 24°18'55.3" Rt.  
 R = 250.00'  
 L = 106.10'  
 T = 53.86'  
 E = 5.74'

**CURVE DATA #2**  
 PI = 2+16.58  
 D = 22°07'18.9"  
 Δ = 23°59'26.7" Lt.  
 R = 259.00'  
 L = 108.45'  
 T = 55.03'  
 E = 5.78'

**CURVE DATA #3**  
 PI = 3+85.05  
 D = 22°07'18.9"  
 Δ = 23°59'54.7" Lt.  
 R = 259.00'  
 L = 108.48'  
 T = 55.05'  
 E = 5.79'

**CURVE DATA #4**  
 PI = 4+91.62  
 D = 22°55'05.9"  
 Δ = 23°59'54.7" Rt.  
 R = 250.00'  
 L = 104.71'  
 T = 53.14'  
 E = 5.58'

STATE OF MAINE		DEPARTMENT OF TRANSPORTATION		2223000	
SCHOODIC BRIDGE		SCHOODIC BROOK		WASHINGTON COUNTY	
CHERRYFIELD		WASHINGTON COUNTY		PROPOSED PLANS	
				SPECIAL DETOUR	
PROJ. MANAGER	M. WIGHT	BY	D. SHAW	DATE	
CHECKED-REVIEWED	M. GRAY	DESIGNED	T. WHITE	MAR 2018	
DESIGNED-DET ALOD	B. SLAVEN	P.E. NUMBER			
DESIGNED-DET ALOD3		DATE			
REVISIONS 1					
REVISIONS 2					
REVISIONS 3					
REVISIONS 4					
FIELD CHANGES					
SHEET NUMBER		20		OF XX	
CONCEPTUAL SPECIAL DETOUR FOR PRELIMINARY DESIGN NOT FOR CONSTRUCTION					
BRIDGE NO. 3649		WIN		22230.00	
BRIDGE PLANS					



PROPOSED PROFILE SPECIAL DETOUR

DESIGN-DETAILED	M. GRAY	BY	D. SHAW
CHECKED-REVIEWED		DATE	MAR 2018
DESIGN-DETAILED	B. SLAVEN	SIGNATURE	
DESIGN-DETAILED		P.E. NUMBER	
REVISIONS 1		DATE	
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SCHOODIC BRIDGE  
SCHOODIC BROOK  
CHERRYFIELD WASHINGTON COUNTY  
**PROPOSED PROFILE  
SPECIAL DETOUR**

SHEET NUMBER

21  
OF XX

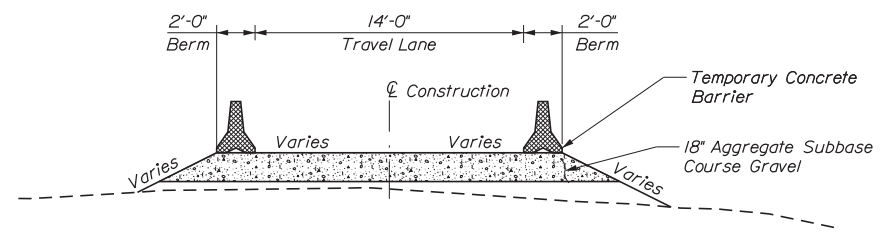
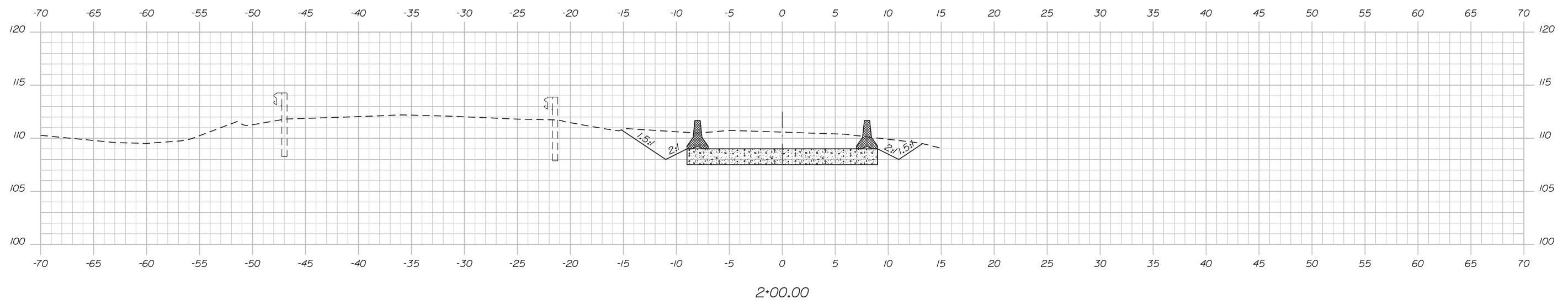
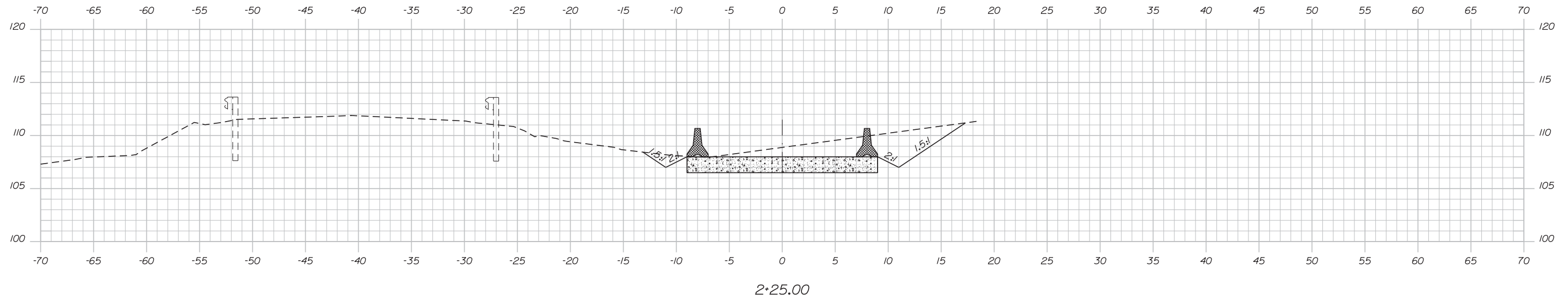
CONCEPTUAL SPECIAL DETOUR  
FOR PRELIMINARY DESIGN  
NOT FOR CONSTRUCTION

Date: 7/13/2019

Username: richard.mayer

Division: BRIDGE

Filename: ... \MSTA\032\_XSECT\_2+00\_003.dgn



PROPOSED TYPICAL DETOUR SECTION

STATE OF MAINE  
DEPARTMENT OF TRANSPORTATION  
2223000  
WIN  
22230.00  
BRIDGE NO. 3649  
BRIDGE PLANS

DESIGN-DETAILED	M. GRAY	DATE	
CHECKED-REVIEWED	D. SHAW	DATE	
DESIGN-DETAILED	B. SLAVEN	DATE	MAR 2018
DESIGN-DETAILED	T. WHITE	DATE	
REVISIONS 1		P.E. NUMBER	
REVISIONS 2		DATE	
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SCHOODIC BRIDGE  
SCHOODIC BROOK  
CHERRYFIELD WASHINGTON COUNTY  
CROSS SECTIONS

SHEET NUMBER  
**32**  
OF XX

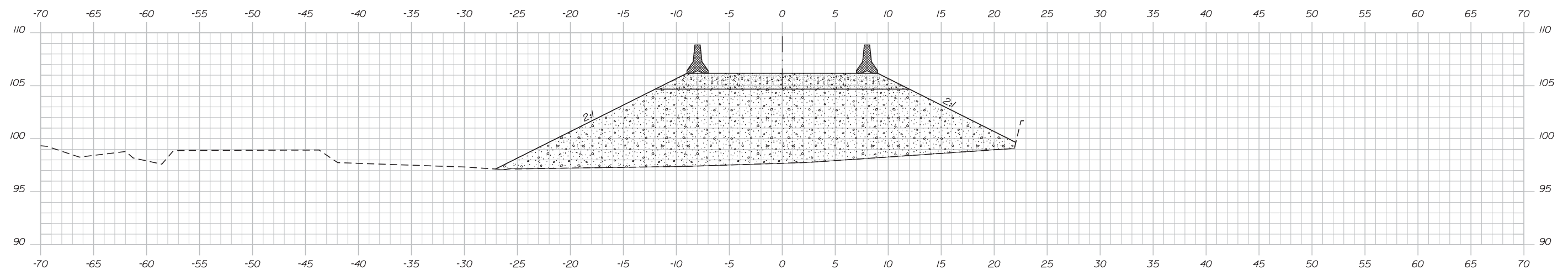
CONCEPTUAL SPECIAL DETOUR  
FOR PRELIMINARY DESIGN  
NOT FOR CONSTRUCTION

Date: 7/13/2019

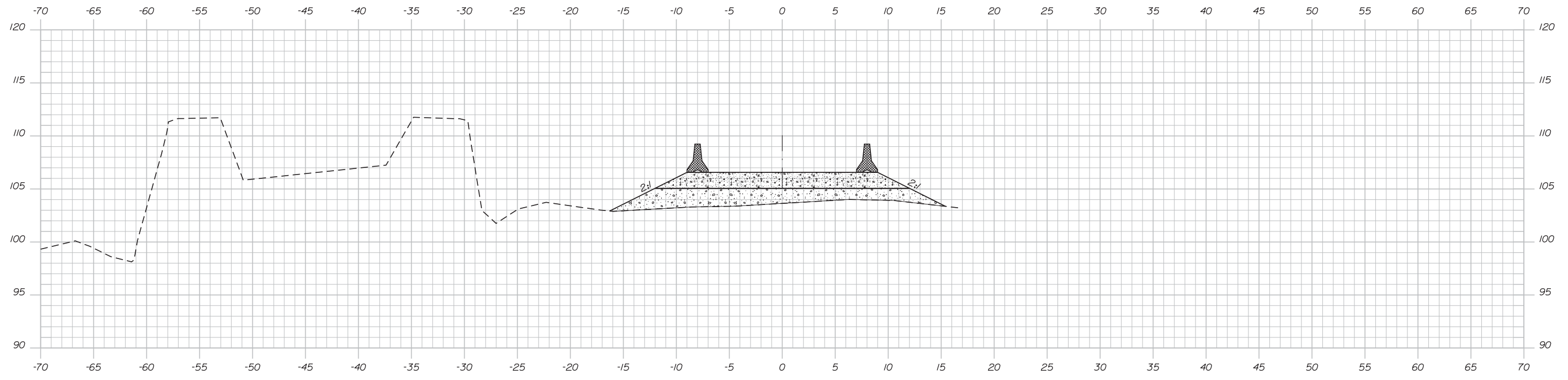
Username: richard.mayer

Division: BRIDGE

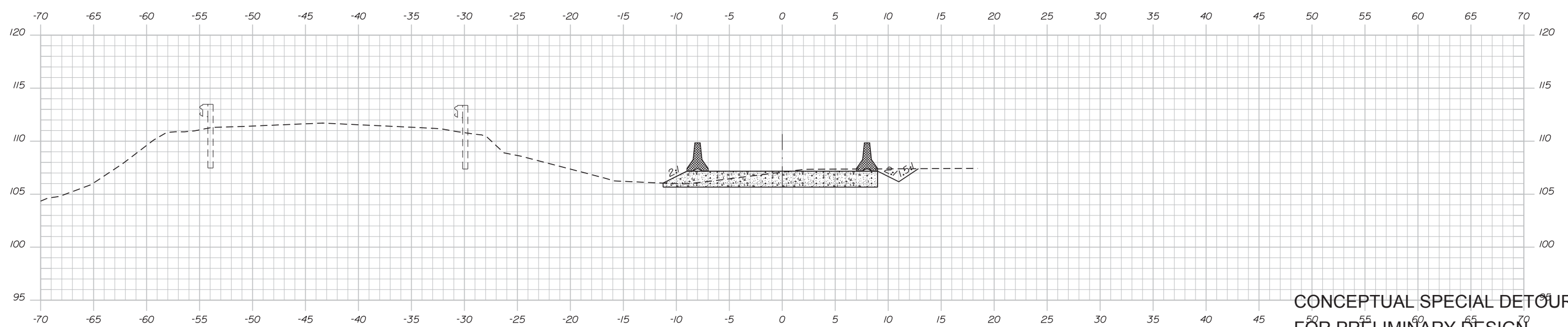
Filename: ... \MSTA\033\_XSECT\_2\*75\_004.dgn



3+00.00



2+75.00



2+50.00

CONCEPTUAL SPECIAL DETOUR  
 FOR PRELIMINARY DESIGN  
 NOT FOR CONSTRUCTION

STATE OF MAINE  
 DEPARTMENT OF TRANSPORTATION  
 2223000  
 WIN  
 22230.00  
 BRIDGE NO. 3649  
 BRIDGE PLANS

PROJ. MANAGER	M. WIGHT	BY	DATE
DESIGN-DETAILED	M. GRAY	D. SHAW	
CHECKED-REVIEWED			
DESIGN-DETAILED	B. SLAVEN	T. WHITE	MAR 2018
DESIGN-DETAILED			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SCHOODIC BRIDGE  
 SCHOODIC BROOK  
 WASHINGTON COUNTY  
 CHERRYFIELD  
 CROSS SECTIONS

SHEET NUMBER  
 33  
 OF XX

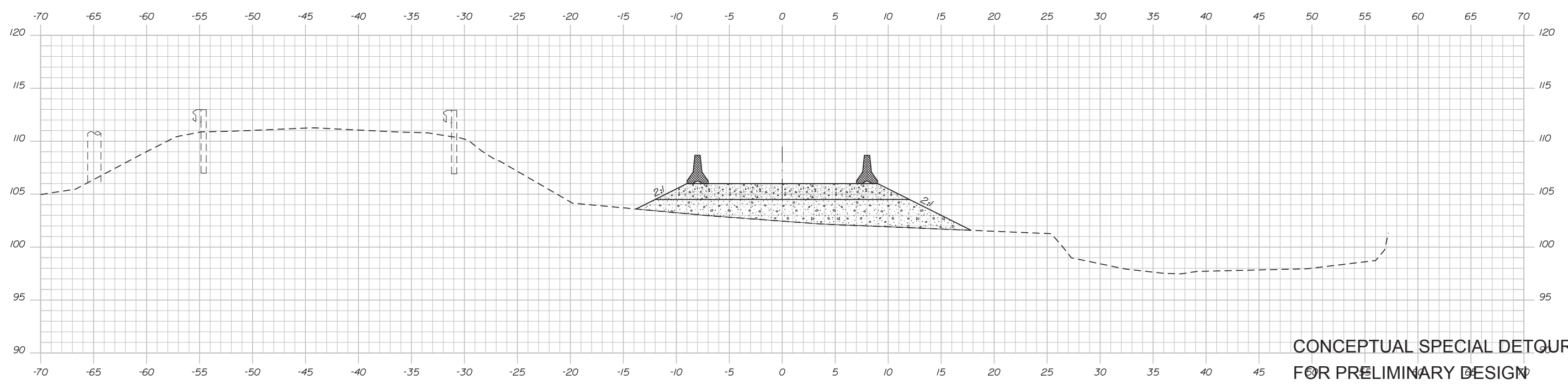
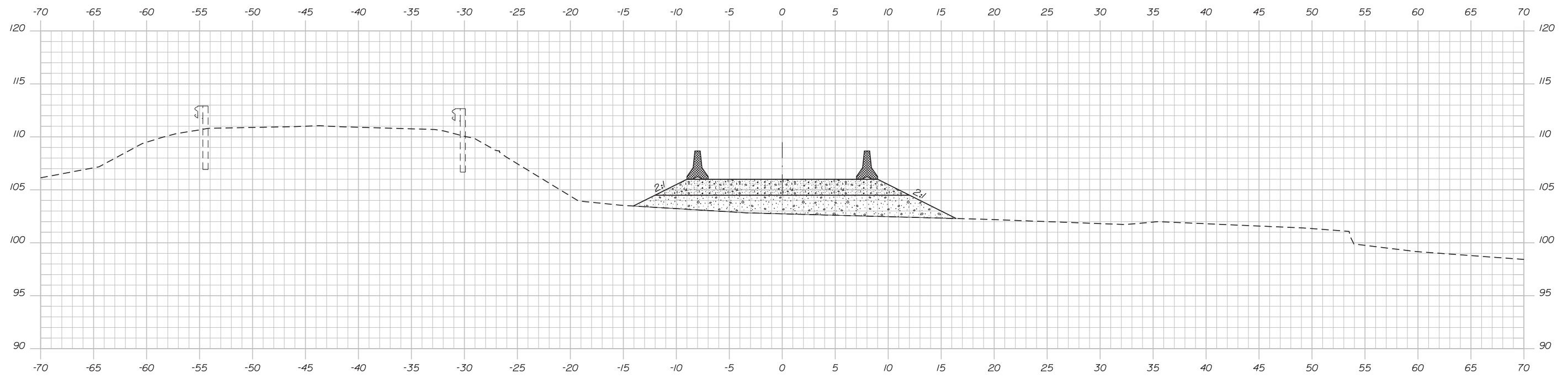
Sta. 2+75.00 to Sta. 3+00.00

Date: 7/13/2019

Username: richard.mayer

Division: BRIDGE

Filename: ... \MSTA\034\_XSECT\_3+25\_005.dgn



CONCEPTUAL SPECIAL DETAIL  
FOR PRELIMINARY DESIGN  
NOT FOR CONSTRUCTION

STATE OF MAINE  
DEPARTMENT OF TRANSPORTATION  
2223000  
WIN  
22230.00  
BRIDGE NO. 3649  
BRIDGE PLANS

PROJ. MANAGER	M. WIGHT	BY	DATE
DESIGN-DETAILED	M. GRAY	D. SHAW	
CHECKED-REVIEWED			
DESIGN-DETAILED	B. SLAVEN	T. WHITE	MAR 2018
DESIGN-DETAILED			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SCHOODIC BRIDGE  
SCHOODIC BROOK  
CHERRYFIELD WASHINGTON COUNTY  
CROSS SECTIONS

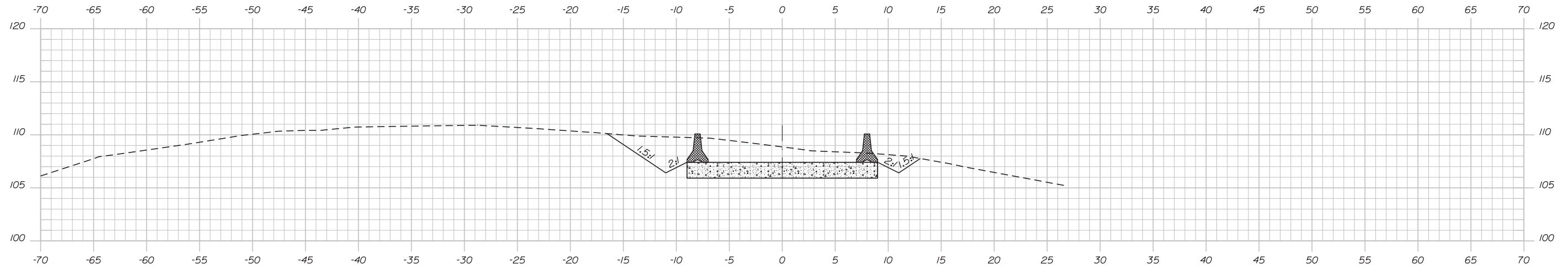
SHEET NUMBER  
**34**  
OF XX

Date: 7/13/2019

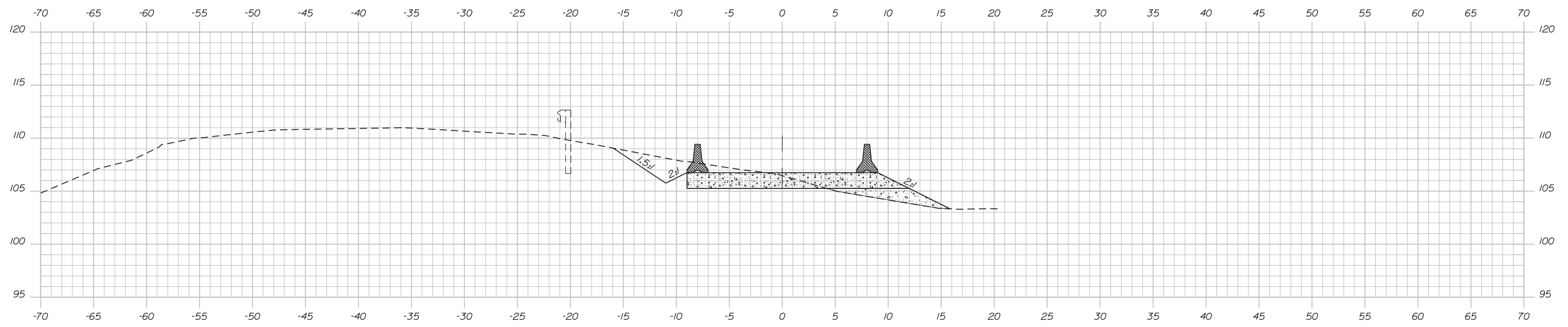
Username: richard.mayer

Division: BRIDGE

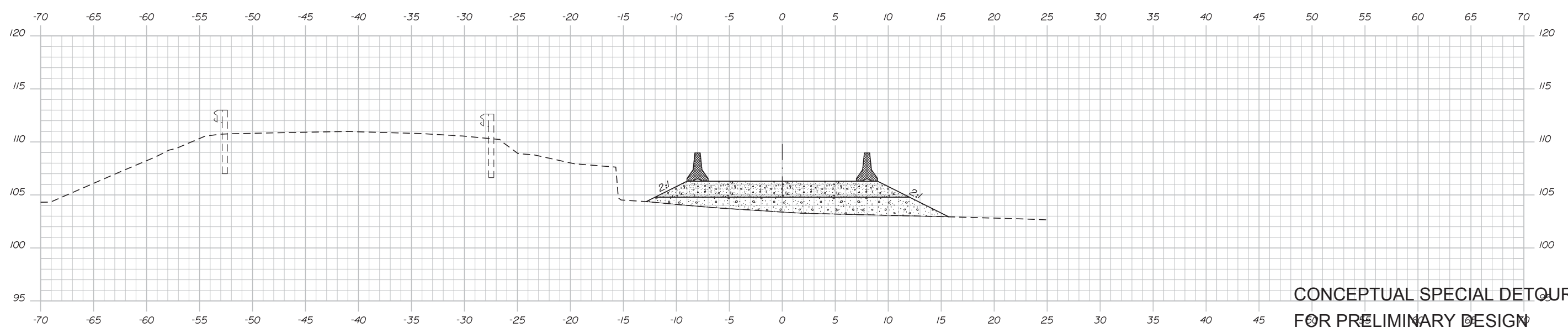
Filename: ... \MSTAO35\_XSECT\_3+75\_006.dgn



4+25.00



4+00.00



3+75.00

CONCEPTUAL SPECIAL DETOUR  
 FOR PRELIMINARY DESIGN  
 NOT FOR CONSTRUCTION

STATE OF MAINE  
 DEPARTMENT OF TRANSPORTATION  
 2223000  
 WIN  
 22230.00  
 BRIDGE NO. 3649  
 BRIDGE PLANS

PROJ. MANAGER	M. WIGHT	DATE	
CHECKED-REVIEWED	D. SHAW	SIGNATURE	
DESIGN-DETAILED	M. GRAY	DATE	MAR 2018
DESIGN-DETAILED	B. SLAVEN	P.E. NUMBER	
REVISIONS 1		DATE	
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SCHOOLIC BRIDGE  
 SCHOOLIC BROOK  
 CHERRYFIELD WASHINGTON COUNTY

CROSS SECTIONS

SHEET NUMBER  
 35  
 OF XX

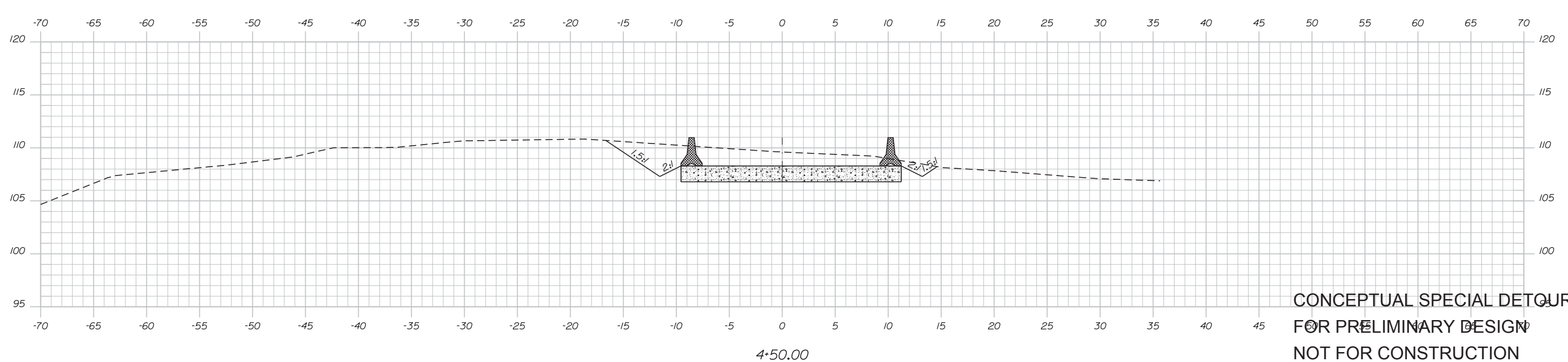
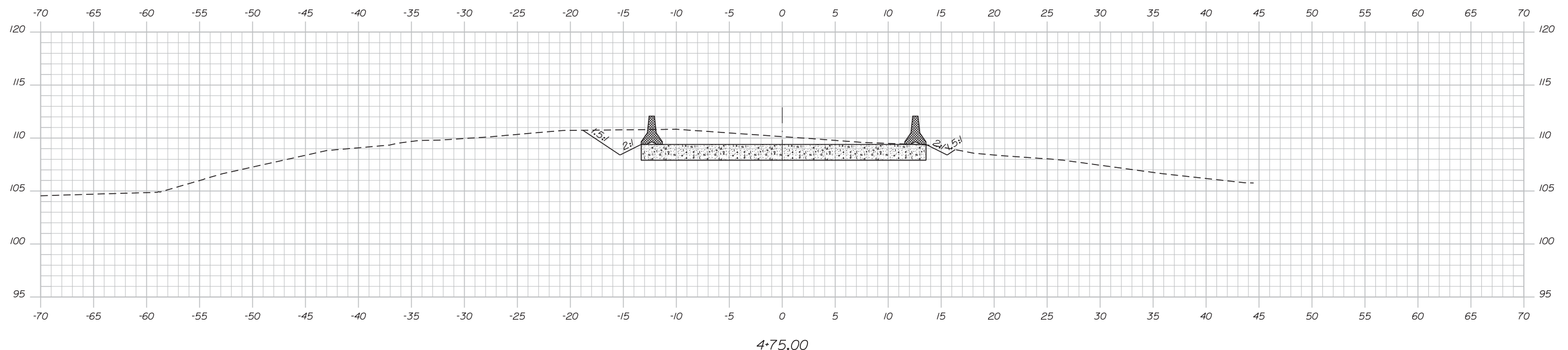
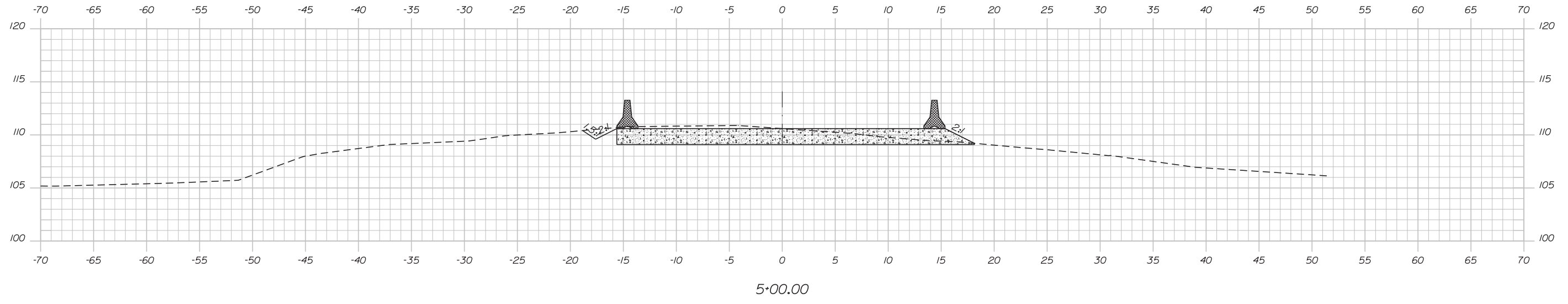
Sta. 3+75.00 to Sta. 4+25.00

Date: 7/13/2019

Username: richard.mayer

Division: BRIDGE

Filename: ... \MSTAO36\_XSECT\_4+50\_007.dgn



CONCEPTUAL SPECIAL DETOUR  
FOR PRELIMINARY DESIGN  
NOT FOR CONSTRUCTION

STATE OF MAINE  
DEPARTMENT OF TRANSPORTATION  
2223000  
WIN  
22230.00  
BRIDGE NO. 3649  
BRIDGE PLANS

PROJ. MANAGER	M. WIGHT	BY	DATE	SIGNATURE	P.E. NUMBER	DATE
DESIGN-DETAILED	M. GRAY	D. SHAW				
CHECKED-REVIEWED						
DESIGN-DETAILED	B. SLAVEN	T. WHITE	MAR 2018			
DESIGN-DETAILED						
REVISIONS 1						
REVISIONS 2						
REVISIONS 3						
REVISIONS 4						
FIELD CHANGES						

SCHOODIC BRIDGE  
SCHOODIC BROOK  
CHERRYFIELD WASHINGTON COUNTY  
CROSS SECTIONS

SHEET NUMBER  
**36**  
OF XX