

**MAINE DEPARTMENT OF TRANSPORTATION  
BRIDGE PROGRAM  
GEOTECHNICAL SECTION  
AUGUSTA, MAINE**

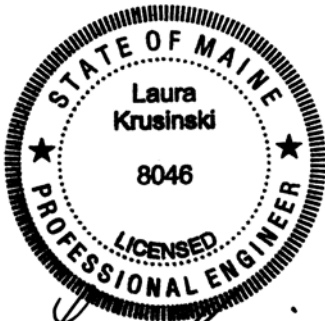
**GEOTECHNICAL DATA REPORT**

*For:*

**PROCTOR BROOK BRIDGE  
STATE ROUTE 16 OVER MEADOW BROOK  
NEW PORTLAND, MAINE**

*Prepared by:*

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Assistant Geotechnical Engineer



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*Reviewed by:*

Laura Krusinski, P.E.  
Senior Geotechnical Engineer

Somerset County  
WIN 21888.00

Soils Report 2018-25  
Bridge No. 5943

Fed No. STP-2188(800)  
July 12, 2018

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Appendix A – Boring Logs

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## **1.0 INTRODUCTION**

The purpose of this Geotechnical Data Report is to present the results of a limited geotechnical investigation and laboratory testing program conducted by the Maine Department of Transportation (MaineDOT) at the existing Proctor Brook Bridge, which carries State Route 16 over Meadow Brook in New Portland, Maine.

The existing structure was constructed in 1963 and consists of a galvanized steel pipe arch with a 10.25-foot span and 6.75-foot rise. According to the 2016 MaineDOT Bridge Inspection Report, the culvert has considerable damage (rating of 4) with heavy pitting and moderate scaling of the bottom plate.

The current Proctor Brook Bridge project is scoped as a culvert rehabilitation with a concrete invert lining and riprap slope protection.

## **2.0 GEOLOGIC SETTING**

Proctor Brook Bridge in New Portland, Maine carries State Route 16 over Meadow Brook as shown on Sheet 1 – Location Map.

The Maine Geologic Survey (MGS) “Surficial Geology of the New Portland Quadrangle, Maine, Open-file No. 09-47” (2009) indicates the surficial soils in the vicinity of the existing bridge consist of artificial fill and wetland deposits (peat, silt, clay, and sand) with nearly contacts to stream alluvium (sand, gravel, and silt) and the Presumpscot Formation. The Presumpscot Formation is comprised of glaciomarine silt, clay, and sand that accumulated on the ocean floor during late-glacial time when the relative sea level was higher than at present.

Based on the map entitled “Geologic Map of the Kingfield Quadrangle,” MGS (1979), the bedrock at the site is mapped as the Lexington Batholith.

## **3.0 SUBSURFACE INVESTIGATION**

Subsurface conditions were explored by drilling four test borings. BB-NPPB-101 was drilled south of the existing structure. Borings BB-NPPB-102, BB-NPPB-102A, and BB-NPPB-102B were drilled north of the existing structure. The exploration locations are show on Sheet 2 – Boring Location Plan and Interpretive Subsurface Profile.

The borings were drilled between January 25 and 27, 2017. Borings were performed by using a combination of solid stem auger, cased wash boring, and rock coring techniques. Soil samples were typically obtained in at 5-foot intervals using Standard Penetration Test (SPT) methods. During SPT sampling, the sampler is driven 24 inches and the hammer blows for each 6-inch interval of penetration are recorded. The sum of the blows for the second and third intervals is the N-value, or standard penetration resistance. The drill rig performing the borings was equipped with an automatic hammer to drive the split spoon. The hammer was calibrated per ASTM D4633 “Standard Test Method for Energy Measurement for Dynamic Penetrometers” in April of 2016. All N-values discussed in this report are corrected values

computed by applying an average energy transfer of 0.929 to the raw field N-values. This hammer efficiency factor (0.929) and both the raw field N-value and corrected N-value ( $N_{60}$ ) are shown on the boring logs.

In-situ vane shear tests were conducted in the soft soil deposits to measure the shear strength of the deposit. Bedrock was cored in using an NQ-2" core barrel and the Rock Quality Designation (RQD) of the core calculated. A geotechnical engineer logged the subsurface conditions encountered. The MaineDOT geotechnical engineer selected the boring location and drilling methods, designated type and depth of sampling techniques, reviewed boring log and identified field-testing requirements. The borings were located in the field using taped measurements at the completion of the drilling program and surveyed by MaineDOT Region 3.

Details and sampling methods used, field data obtained, and soil conditions encountered are presented in the boring logs provided in Appendix A – Boring Logs and on Sheet 3 – Boring Logs.

#### **4.0 LABORATORY TESTING**

A laboratory testing program was conducted on selected soil samples recovered from the test borings to assist in soil classification, evaluation of engineering properties of the soils, and geologic assessment of the project site. Laboratory testing consisted of ten standard grain size analyses with natural water content and six Atterberg limits test. Results of the soil tests are included in Appendix B – Laboratory Test Results. Moisture content information and other soil test results are also shown on the boring logs provided in Appendix A – Boring Logs and on Sheet 3 – Boring Logs.

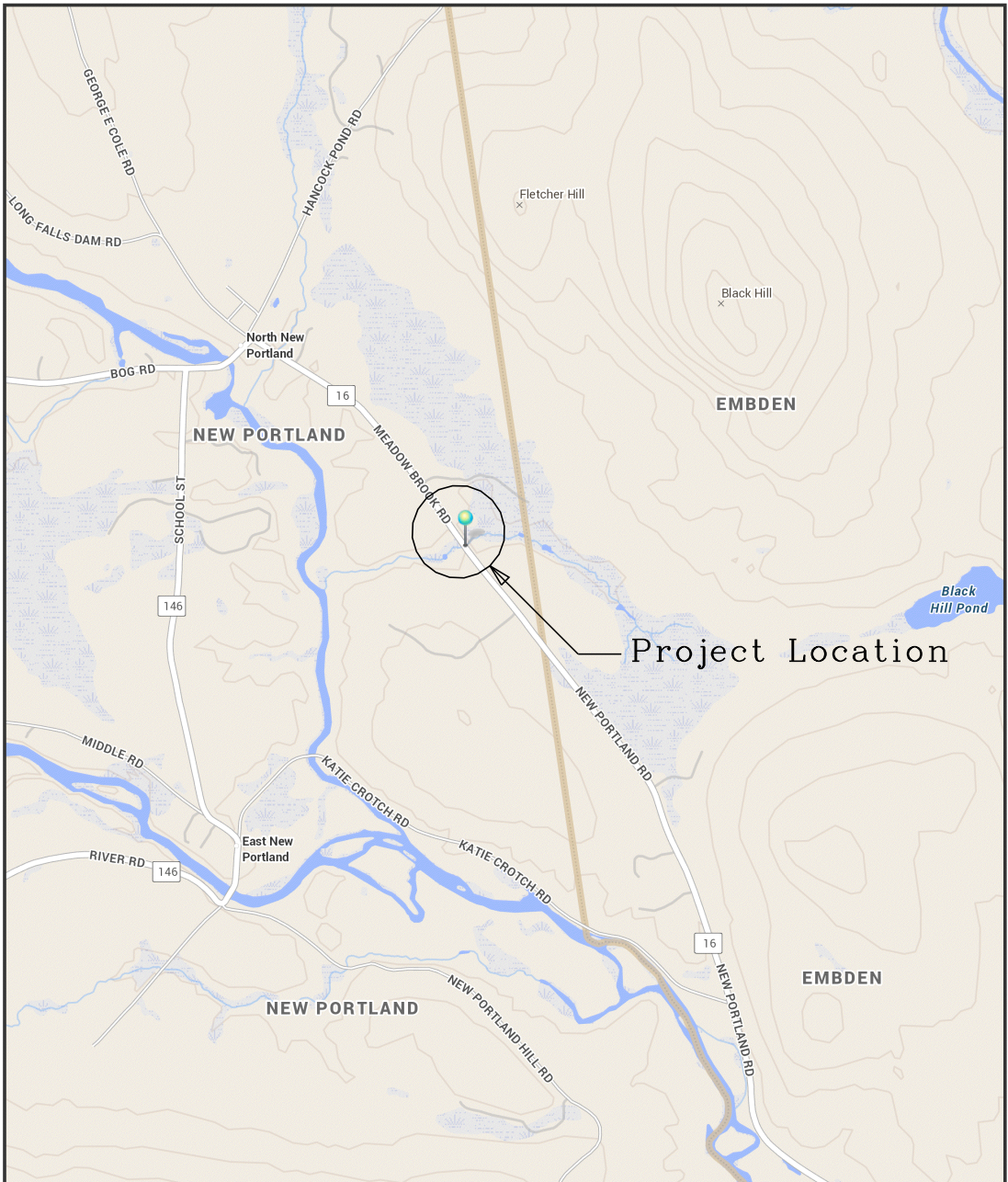
#### **5.0 CLOSURE**

This Geotechnical Data Report has been prepared for the use of the MaineDOT Bridge Program for specific application to the proposed invert lining project at the Proctor Brook Bridge in New Portland, Maine. The report was prepared in accordance with generally accepted geotechnical and foundation engineering practices. No other intended use or warranty is expressed or implied.

MaineDOT conducted a limited number of soil explorations at discrete locations near the existing bridge and a limited number of laboratory tests. MaineDOT shall not be responsible for the bidder's or contractor's interpretations, estimates, or conclusions derived from the geotechnical information. Data provided may not be representative of the subsurface conditions between boring locations.

## **Sheets**

# NEW PORTLAND, MAINE



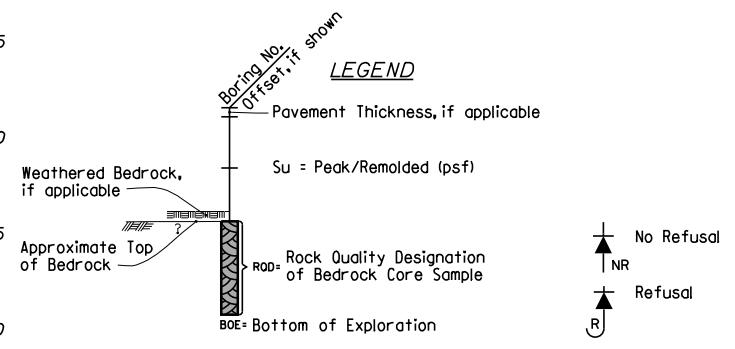
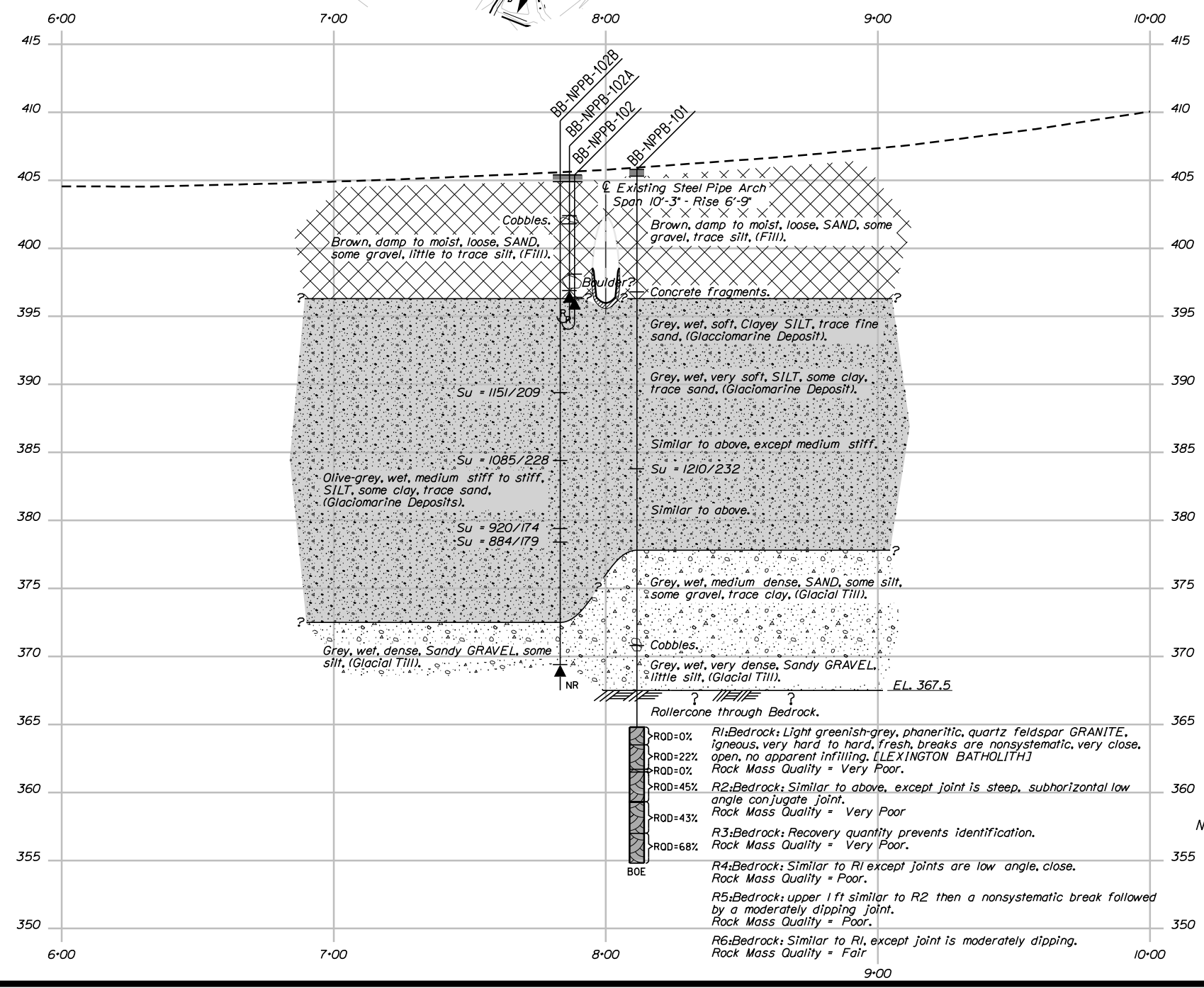
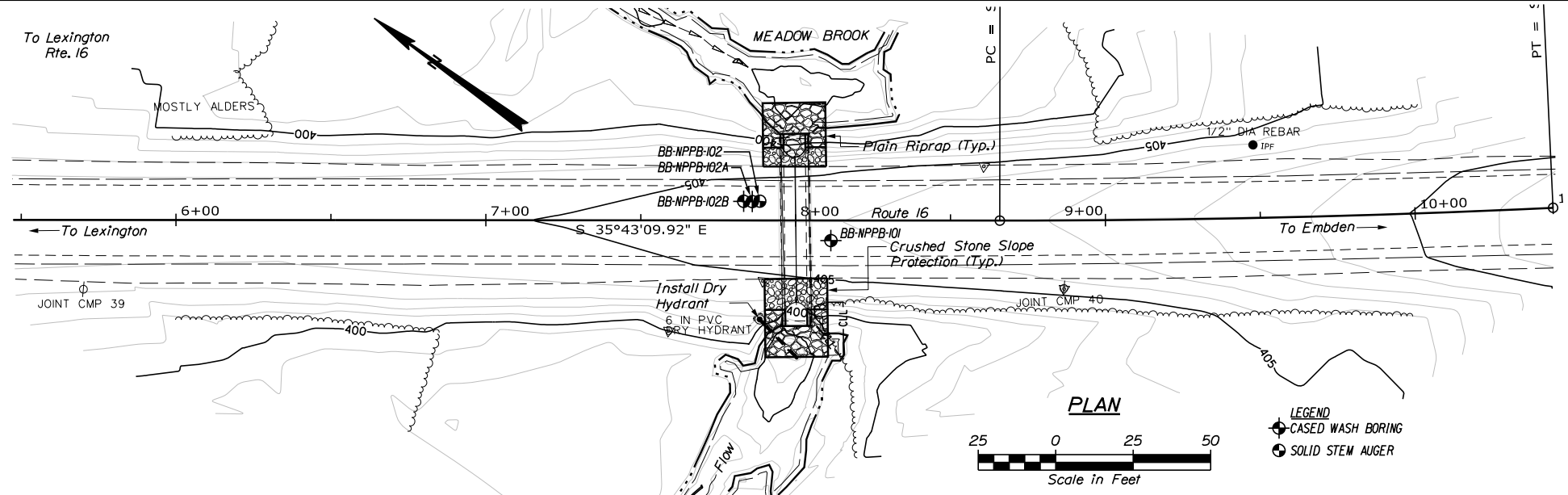
The Maine Department of Transportation provides this publication for information only. Reliance upon this information is at user risk. It is subject to revision and may be incomplete depending upon changing conditions. The Department assumes no liability if injuries or damages result from this information. This map is not intended to support emergency dispatch.

0.5 Miles  
1 inch = 0.57 miles

Date: 1/2/2018  
Time: 7:44:44 AM

SHEET NUMBER  <b>1</b>	PROCTOR BROOK BRIDGE MEADOW BROOK	STATE OF MAINE DEPARTMENT OF TRANSPORTATION
	NEW PORTLAND SOMERSET COUNTY	<b>STP-2188(800)</b>
OF 3	<b>LOCATION MAP</b>	<b>WIN</b> <b>21888.00</b> BRIDGE NO. 5943 BRIDGE PLANS

Filename: ... \GEOTECH\MSTA\006\_BLP8\ISP1.dgn Division: GEOTECH Username: Brandon.Slaven Date: 8/7/2018



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

STATE OF MAINE		DEPARTMENT OF TRANSPORTATION	
STP-2188(800)		BRIDGE NO. 5943	
WIN		21888.00	
BRIDGE PLANS			
PROJECT MANAGER	M. PARLIN	BY	J. HASBROUCK/R.F.
CHECKED/REVIEWED	J. HASBROUCK/R.F.	DATE	JULY 2018
DESIGNED/DETAILED	B. SLAVEN	DATE	JAN 2018
REVISIONS	1	SIGNATURE	
REVISIONS	2	P.E. NUMBER	
REVISIONS	3	DATE	
REVISIONS	4		
FIELD CHANGES			
PROCTOR BROOK BRIDGE			
MEADOW BROOK			
SOMERSET COUNTY			
NEW PORTLAND			
BORING LOCATION PLAN & INTERPRETIVE SUBSURFACE PROFILE			
SHEET NUMBER			
2			
OF 3			



## **Appendix A**

Boring Logs

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>																										
		CLEAN SANDS	SW Well-graded sands, gravelly sands, little or no fines			<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).																										
		(little or no fines)	SP Poorly-graded sands, gravelly sand, little or no fines.			<table border="1"> <thead> <tr> <th>Density of Cohesionless Soils</th> <th>Standard Penetration Resistance N-Value (blows per foot)</th> </tr> </thead> <tbody> <tr><td>Very loose</td><td>0 - 4</td></tr> <tr><td>Loose</td><td>5 - 10</td></tr> <tr><td>Medium Dense</td><td>11 - 30</td></tr> <tr><td>Dense</td><td>31 - 50</td></tr> <tr><td>Very Dense</td><td>&gt; 50</td></tr> </tbody> </table>			Density of Cohesionless Soils	Standard Penetration Resistance N-Value (blows per foot)	Very loose	0 - 4	Loose	5 - 10	Medium Dense	11 - 30	Dense	31 - 50	Very Dense	> 50												
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Medium Dense	11 - 30																															
Dense	31 - 50																															
Very Dense	> 50																															
SANDS WITH FINES (Appreciable amount of fines)	SM Silty sands, sand-silt mixtures	<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.																														
	SC Clayey sands, sand-clay mixtures.	<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
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Hard	>30	over 4000	Indented by thumbnail with difficulty																													
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.	<b>Rock Quality Designation (RQD):</b> RQD (%) = $\frac{\text{sum of the lengths of intact pieces of core} * > 4 \text{ inches}}{\text{length of core advance}}$ *Minimum NQ rock core (1.88 in. OD of core)  Correlation of RQD to Rock Mass Quality <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																															
CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.																																
OL Organic silts and organic silty clays of low plasticity.																																
SILTS AND CLAYS  (liquid limit greater than 50)	MH Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	<b>Desired Rock Observations (in this order, if applicable):</b> Color (Munsell color chart) Texture (aphanitic, fine-grained, etc.) Rock Type (granite, schist, sandstone, etc.) Hardness (very hard, hard, mod. hard, etc.) Weathering (fresh, very slight, slight, moderate, mod. severe, severe, etc.)  Geologic discontinuities/jointing: -dip (horiz - 0-5 deg., low angle - 5-35 deg., mod. dipping - 35-55 deg., steep - 55-85 deg., vertical - 85-90 deg.) -spacing (very close - <2 inch, close - 2-12 inch, mod. close - 1-3 feet, wide - 3-10 feet, very wide >10 feet) -tightness (tight, open, or healed) -infilling (grain size, color, etc.) Formation (Waterville, Ellsworth, Cape Elizabeth, etc.) RQD and correlation to rock 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))																														
	CH Inorganic clays of high plasticity, fat clays.																															
	OH Organic clays of medium to high plasticity, organic silts.																															
HIGHLY ORGANIC SOILS	Pt Peat and other highly organic soils.																															
<b>Desired Soil Observations (in this order, if applicable):</b> Color (Munsell color chart) Moisture (dry, damp, moist, wet) Density/Consistency (from above right hand side) Texture (fine, medium, coarse, etc.) Name (sand, silty sand, clay, etc., including portions - trace, little, etc.) Gradation (well-graded, poorly-graded, uniform, etc.) Plasticity (non-plastic, slightly plastic, moderately plastic, highly plastic) Structure (layering, fractures, cracks, etc.) Bonding (well, moderately, loosely, etc., ) Cementation (weak, moderate, or strong) Geologic Origin (till, marine clay, alluvium, etc.) Groundwater level																																
<b>Maine Department of Transportation  Geotechnical Section  Key to Soil and Rock Descriptions and Terms  Field Identification Information</b>				<b>Sample Container Labeling Requirements:</b> WIN Blow Counts Bridge Name / Town Sample Recovery Boring Number Date Sample Number Personnel Initials Sample Depth																												



<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS	<b>Project:</b> Proctor Brook Bridge #5943 carries Route 16 over Meadow Brook <b>Location:</b> New Portland, Maine	<b>Boring No.:</b> BB-NPPB-101  <b>WIN:</b> 21888.00
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<b>Driller:</b> S. W. Cole Explorations, LLC	<b>Elevation (ft.):</b> 405.8	<b>Auger ID/OD:</b> SSA 2 1/4"
<b>Operator:</b> Scott Hollabaugh	<b>Datum:</b> NAVD88	<b>Sampler:</b> Split-Spoon
<b>Logged By:</b> Nathan Strout	<b>Rig Type:</b> Diedrich D50	<b>Hammer Wt./Fall:</b> 140#/30"
<b>Date Start/Finish:</b> 1/25/2017 / 1/26/2017	<b>Drilling Method:</b> Cased-Wash	<b>Core Barrel:</b> NQ 2"
<b>Boring Location:</b> 8+11.4, 6.5 ft Rt.	<b>Casing ID/OD:</b> HW 4"/4.5" NW 3"/3.5"	<b>Water Level*:</b> 6.1' (after drilling)

<b>Hammer Efficiency Factor:</b> 0.9288	<b>Hammer Type:</b> Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>
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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>u</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							35		Grey, wet, medium dense, SAND, some silt, some gravel, trace clay, (Glacial Till).  Place NW Casing cobbles.  Grey, wet, very dense, Sandy GRAVEL, little silt, (Glacial Till).  Top of Bedrock at El. 367.5 ft. Rollercone through Bedrock from 38.3 to 41 ft bgs.  R1:Bedrock: Light greenish-grey, phaneritic, quartz feldspar GRANITE, igneous, very hard to hard, fresh, breaks are nonsystematic, very close, open, no apparent infilling. [LEXINGTON BATHOLITH] Rock Mass Quality = Very Poor. R1:Core Times (min:sec) 41-42 ft (2:31) 42-42.3 ft (1:38) 100% Recovery  R2:Bedrock: Similar to above, except joint is steep, subhorizontal low angle conjugate joint. Rock Mass Quality = Very Poor. Recovery = 100% R2:Core Times (min:sec) 42.3-43 ft (2:16) 43-44 ft (4:33) 44-44.1 ft (0:24)  No wash water return below ±42.5 ft bgs.	WC=25.7% LL=28 PL=21 PI=7  G#271081 A-2-4, SC-SM WC=9.2%	
						33					
						37					
						45					
30	9D	24/9	29.00 - 31.00	7/7/6/6	13	20	34				
							49				
							36				
							62				
							57				
35	MD	3/0	34.00 - 34.25	100-3"	---		186				
							52				
	10D	27/7	36.00 - 38.25	31/28/41/32	69	107	162				
							130				
40											
	R1	16/16	41.00 - 42.33	RQD = 0%							
	R2	22/22	42.30 - 44.13	RQD = 22%							
45	R3	2/1	44.10 - 44.27	RQD = 0%							
	R4	25/25	44.30 - 46.38	RQD = 45%							
	R5	26/26	46.50 - 48.67	RQD = 43%							
	R6	27/21	48.80 - 51.05	RQD = 68%							
50											

**Remarks:**  
 Auto-Hammer #562  
 Soils frozen to ±2'  
 Water level at 6.0' on 1/26/2017 at 8:00AM with casing at 34'

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS	<b>Project:</b> Proctor Brook Bridge #5943 carries Route 16 over Meadow Brook <b>Location:</b> New Portland, Maine	<b>Boring No.:</b> BB-NPPB-101  <b>WIN:</b> 21888.00
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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								354.8		R3:Bedrock: Recovery quantity prevents identification. Rock Mass Quality = Very Poor. R3:Core Times (min:sec) 44.1-44.3 ft (0:37) Recovery = 50%  R4:Bedrock: Similar to R1 except joints are low angle, close. Rock Mass Quality = Poor. R4:Core Times (min:sec) 44.3-45 ft (1:12) 45-46 ft (2:15) 46-46.5 ft (2:22) Recovery = 100%  R5:Bedrock: upper 1 ft similar to R2 then a nonsystematic break followed by a moderately dipping joint. Rock Mass Quality = Poor. R5:Core Times (min:sec) 46.5-47 ft (1:49) 47-48 ft (5:21) 48-48.8 ft (5:42) Recovery = 100%  R6:Bedrock: Similar to R1, except joint is moderately dipping. Rock Mass Quality = Fair. R6:Core Times (min:sec) 48.8-49 ft (1:02) 49-50 ft (8:06) 50-51 ft (13:13) Recovery = 78%		
55												
60												
65												
70												
75												

**Remarks:**  
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 Soils frozen to ±2'  
 Water level at 6.0' on 1/26/2017 at 8:00AM with casing at 34'

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS	<b>Project:</b> Proctor Brook Bridge #5943 carries Route 16 over Meadow Brook <b>Location:</b> New Portland, Maine	<b>Boring No.:</b> BB-NPPB-102  <b>WIN:</b> 21888.00
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<b>Driller:</b> S. W. Cole Explorations, LLC	<b>Elevation (ft.):</b> 405.4	<b>Auger ID/OD:</b> SSA 2 1/4"
<b>Operator:</b> Scott Hollabaugh	<b>Datum:</b> NAVD88	<b>Sampler:</b> Split-Spoon
<b>Logged By:</b> Nathan Strout	<b>Rig Type:</b> Diedrich D50	<b>Hammer Wt./Fall:</b> 140#/30"
<b>Date Start/Finish:</b> 1/26/2017	<b>Drilling Method:</b> Solid-Stem Auger	<b>Core Barrel:</b>
<b>Boring Location:</b> 7+88.5, 6.1 ft Lt.	<b>Casing ID/OD:</b>	<b>Water Level*:</b>

**Hammer Efficiency Factor:** 0.9288     
 **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	404.9		6" of Pavement	
	1D	5/4	1.50 - 1.92	100-5"	---						Brown, damp, SAND, some gravel, trace silt, (Fill).  Drill action suggests cobbles from 3 to 3.5 ft bgs.	
5											Brown, moist, SAND, some gravel, little silt, (Fill).  Probable boulder at from 6.4 to 8 ft bgs. NW casing would not penetrate through obstruction. Relocate boring. See log BB-NPPB-102A	
	2D	17/6	5.00 - 6.42	2/2/100-5"	---				396.4		<b>Bottom of Exploration at 9.0 feet below ground surface.</b>	
10												
15												
20												
25												

**Remarks:**  
 Auto-Hammer #56  
 Soils frozen to ±2'

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS				<b>Project:</b> Proctor Brook Bridge #5943 carries Route 16 over Meadow Brook <b>Location:</b> New Portland, Maine				<b>Boring No.:</b> BB-NPPB-102A							
<b>Driller:</b> S. W. Cole Explorations, LLC				<b>Elevation (ft.):</b> 405.4				<b>Auger ID/OD:</b> SSA 2 1/4"							
<b>Operator:</b> Scott Hollabaugh				<b>Datum:</b> NAVD88				<b>Sampler:</b> Split-Spoon							
<b>Logged By:</b> Nathan Strout				<b>Rig Type:</b> Diedrich D50				<b>Hammer Wt./Fall:</b> 140#/30"							
<b>Date Start/Finish:</b> 1/26/2017 / 1/27/2017				<b>Drilling Method:</b> Cased-Wash				<b>Core Barrel:</b>							
<b>Boring Location:</b> 7+86, 6.1 ft Lt.				<b>Casing ID/OD:</b> NW 3"/3.5"				<b>Water Level*:</b>							
<b>Hammer Efficiency Factor:</b> 0.9288				<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 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</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								
0							SSA	404.9				6" of Pavement			
5							25					Soil samples not retrieved. Soils similar to BB-NPPB-102 from 0 to 7 ft bgs.			
							33					Casing refusal at 7.3 ft bgs. Probable cobble/boulders from 7.3 to 8.5 ft bgs.			
							50/3"					Auger refusal at 8.5 ft bgs. Relocate boring. See log BB-NPPB-102B			
10								396.9				Bottom of Exploration at 8.5 feet below ground surface.			
15															
20															
25															

**Remarks:**

Auto-Hammer #562

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.

<b>Driller:</b> S. W. Cole Explorations, LLC	<b>Elevation (ft.):</b> 405.4	<b>Auger ID/OD:</b> SSA 2 1/4"
<b>Operator:</b> Scott Hollabaugh	<b>Datum:</b> NAVD88	<b>Sampler:</b> Split-Spoon
<b>Logged By:</b> Nathan Strout	<b>Rig Type:</b> Diedrich D50	<b>Hammer Wt./Fall:</b> 140#/30"
<b>Date Start/Finish:</b> 1/27/2017	<b>Drilling Method:</b> Cased-Wash	<b>Core Barrel:</b> NQ 2"
<b>Boring Location:</b> 7+83.2, 6.1 ft Lt.	<b>Casing ID/OD:</b> NW 3"/3.5"	<b>Water Level*:</b> 6.7' (after drilling)

**Hammer Efficiency Factor:** 0.9288      **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									404.9	6" of Pavement		
0.5										Soil samples not retrieved from 0 to 9 ft bgs. Soils similar to BB-NPPB-102 0 to 9 ft bgs.		
9									396.4			
9.5									395.9	1D(A) Brown, wet, loose, SAND, some silt, trace gravel, trace clay, trace organics.	G#271082 A-2-4, SC-SM WC=37.2% G#271083	
9.5										1D(B) Olive-grey, wet, medium stiff, SILT, some clay, trace fine sand, (Glaciomarine Deposit). PP=1.5-2.0 ksf	A-4, CL WC=27.5% LL=27 PL=20 PI=7	
15	2D V1	24/24	14.00 - 16.00 14.60 - 14.97	2/3/4/4 S <sub>u</sub> =1,151/209	---		23			Similar to above, except stiff. 20x40 mm vane direct readings: V1: 14.3/2.6 in-lbs	G#271084 A-4, CL WC=24.7% LL=29 PL=21 PI=8	
20	3D V2 MV	24/24	19.00 - 21.00 19.60 - 19.97 20.60 - 20.97	WOH/1/2/2 S <sub>u</sub> =1,085/228 Would not push	---		28			Grey, wet, stiff, SILT, some clay, trace sand, (Glaciomarine Deposit). 55x110 mm vane direct readings: V2: 24.3/5.1 ft-lbs		
25	4D	24/24	24.00 - 26.00	WOR-12"/WO1P-12"	---		39			Similar to above, except medium stiff. 55x110 mm vane direct readings: V3: 20.6/3.9 ft-lbs	G#271085 A-4, CL	

**Remarks:**  
 Auto-Hammer #562  
 Soils frozen to ±2'  
 PP = Pocket Penetrometer Test

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS	<b>Project:</b> Proctor Brook Bridge #5943 carries Route 16 over Meadow Brook <b>Location:</b> New Portland, Maine	<b>Boring No.:</b> BB-NPPB-102B  <b>WIN:</b> 21888.00
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<b>Driller:</b> S. W. Cole Explorations, LLC	<b>Elevation (ft.):</b> 405.4	<b>Auger ID/OD:</b> SSA 2 1/4"
<b>Operator:</b> Scott Hollabaugh	<b>Datum:</b> NAVD88	<b>Sampler:</b> Split-Spoon
<b>Logged By:</b> Nathan Strout	<b>Rig Type:</b> Diedrich D50	<b>Hammer Wt./Fall:</b> 140#/30"
<b>Date Start/Finish:</b> 1/27/2017	<b>Drilling Method:</b> Cased-Wash	<b>Core Barrel:</b> NQ 2"
<b>Boring Location:</b> 7+83.2, 6.1 ft Lt.	<b>Casing ID/OD:</b> NW 3"/3.5"	<b>Water Level*:</b> 6.7' (after drilling)

**Hammer Efficiency Factor:** 0.9288      **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 140 lb. Hammer      Hammer Efficiency Factor = Rig Specific Annual Calibration Value      PI = Plasticity Index  
 V = Field Vane Shear Test,    PP = Pocket Penetrometer      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							
25	V3 V4		24.60 - 24.97 25.60 - 25.97	S <sub>u</sub> =920/174 psf S <sub>u</sub> =884/179 psf			43		55x110 mm vane direct readings: V4: 19.8/4.0 ft-lbs  Grey, wet, stiff, Silty CLAY with fine sand seams (1/16" thick), (Glaciomarine Deposit).	WC=30.9% LL=30 PL=23 PI=7				
30	5D	24/24	29.00 - 31.00	3/3/3/3	6	9	OPEN							
35	6D	24/10	34.00 - 36.00	12/13/14/15	27	42					Grey, wet, dense, Sandy GRAVEL, some silt, (Glacial Till).	G#271086 A-1-b, GM WC=7.9%		
36.0	<b>Bottom of Exploration at 36.0 feet below ground surface.</b>													
50														

**Remarks:**  
 Auto-Hammer #562  
 Soils frozen to ±2'  
 PP = Pocket Penetrometer Test

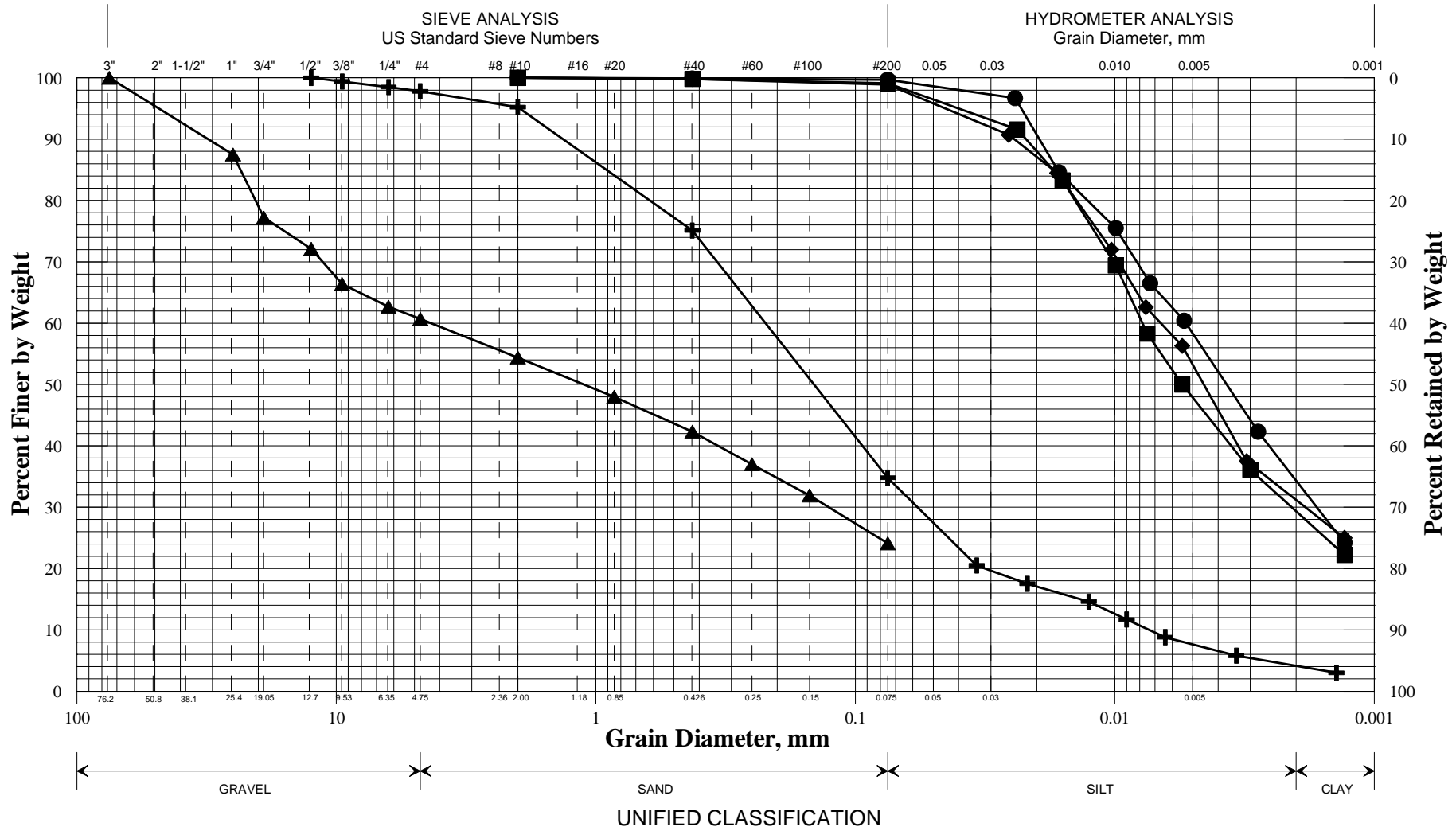
## **Appendix B**

Laboratory Test Results





**State of Maine Department of Transportation**  
**GRAIN SIZE DISTRIBUTION CURVE**

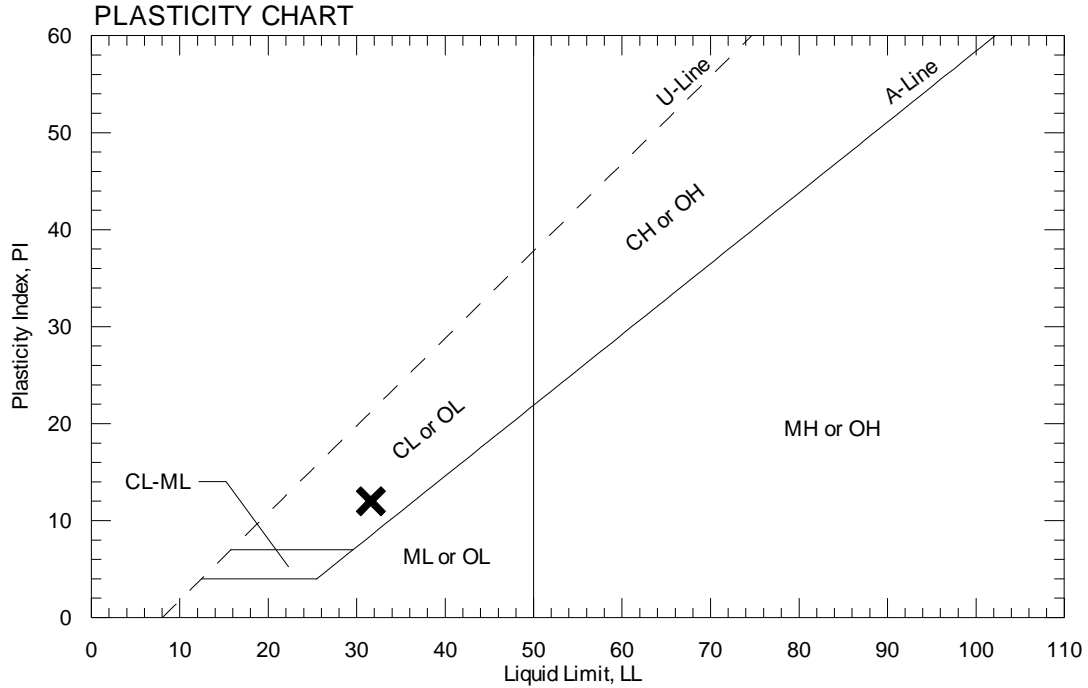
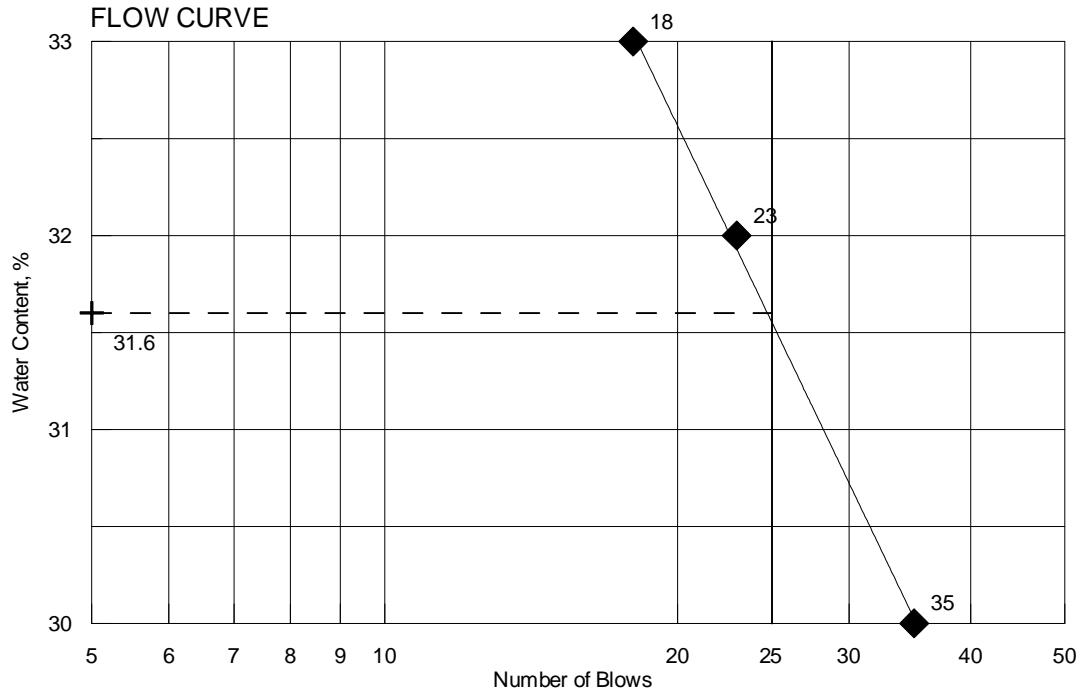


	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
+	BB-NPPB-102B/1D/A	7+83.2	6.1 LT	90.0-9.5	SAND, some silt, trace clay, trace gravel.	37.2			
◆	BB-NPPB-102B/1D/B	7+83.2	6.1 LT	9.5-11.0	SILT, some clay, trace sand.	27.5	27	20	7
■	BB-NPPB-102B/2D	7+83.2	6.1 LT	14.0-16.0	SILT, some clay, trace sand.	24.7	29	21	8
●	BB-NPPB-102B/4D	7+83.2	6.1 LT	24.0-26.0	SILT, some clay, trace sand.	30.9	30	23	7
▲	BB-NPPB-102B/6D	7+83.2	6.1 LT	34.0-36.0	Sandy GRAVEL, some silt.	7.9			
×									

WIN
021888.00
Town
New Portland
Reported by/Date
WHITE, TERRY A      3/14/2017

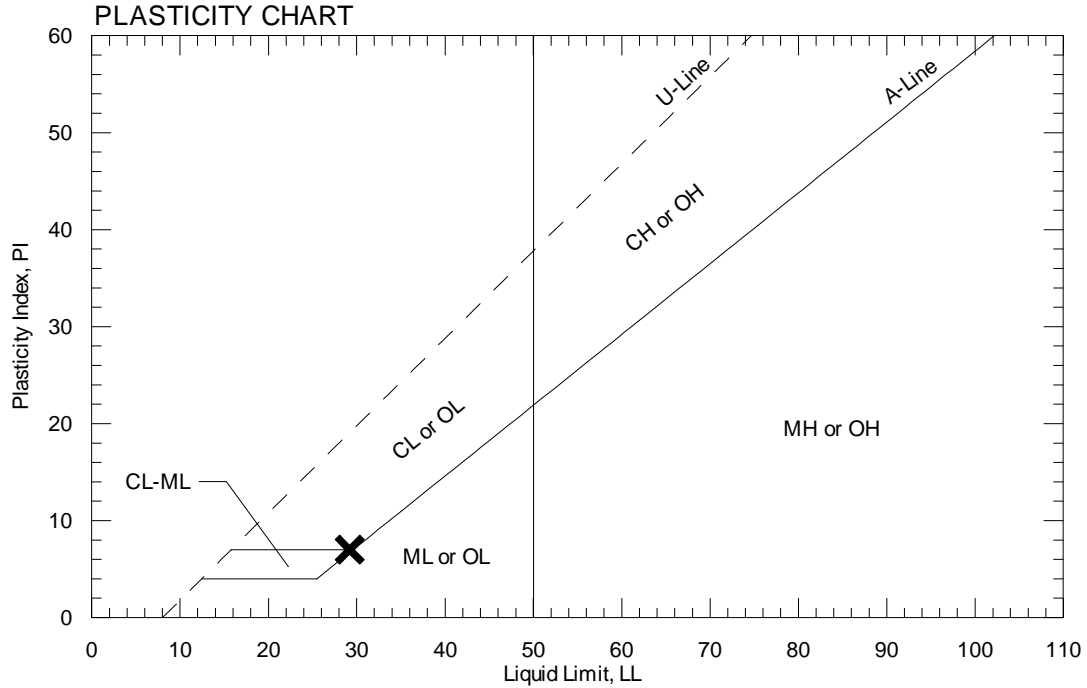
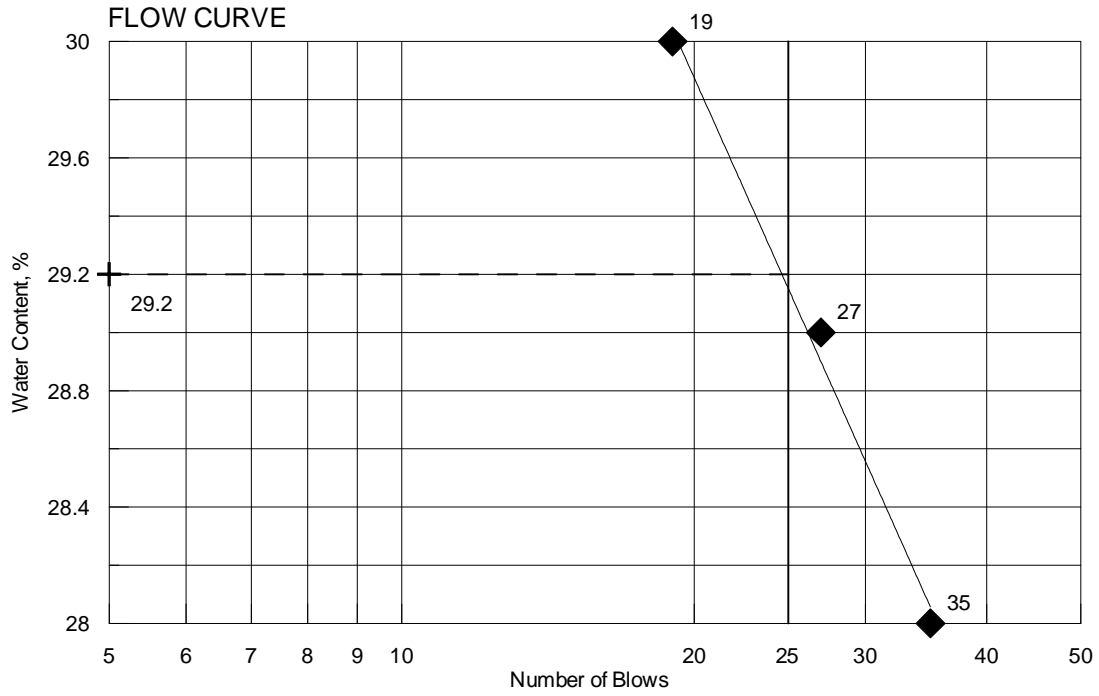


TOWN	New Portland	Reference No.	271078
WIN	021888.00	Water Content, %	30
Sampled	1/25/2017	Liquid Limit @ 25 blows (T 89), %	32
Boring No./Sample No.	BB-NPPB-101/5D	Plastic Limit (T 90), %	20
Station	8+11.4	Plasticity Index (T 90), %	12
Depth	15.0-17.0	Tested By	BBURR



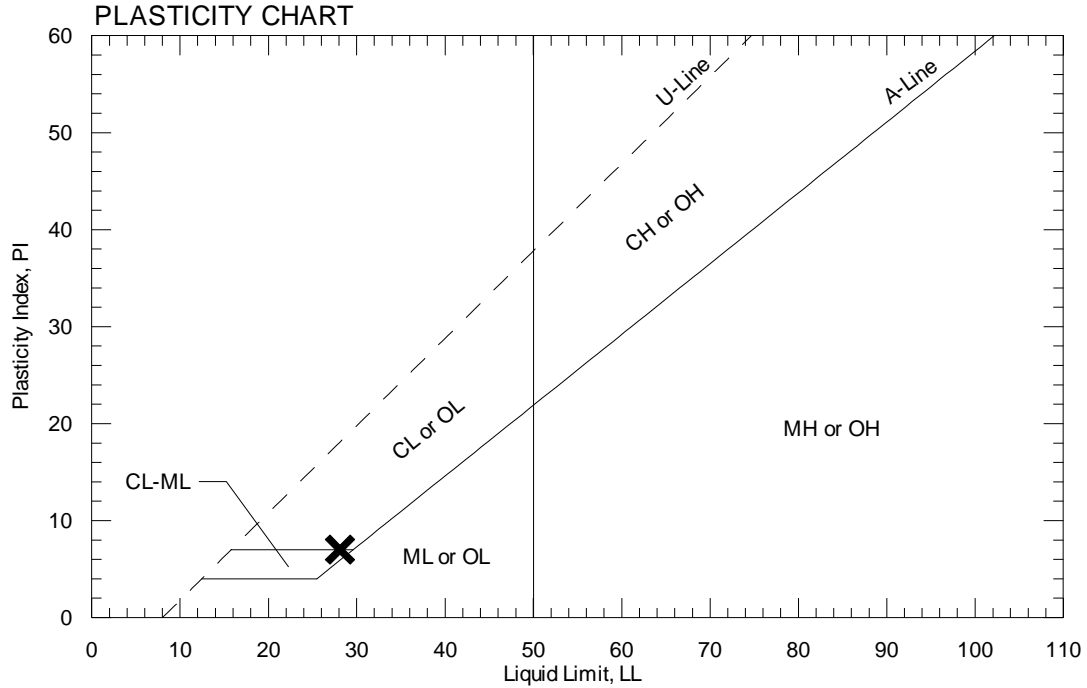
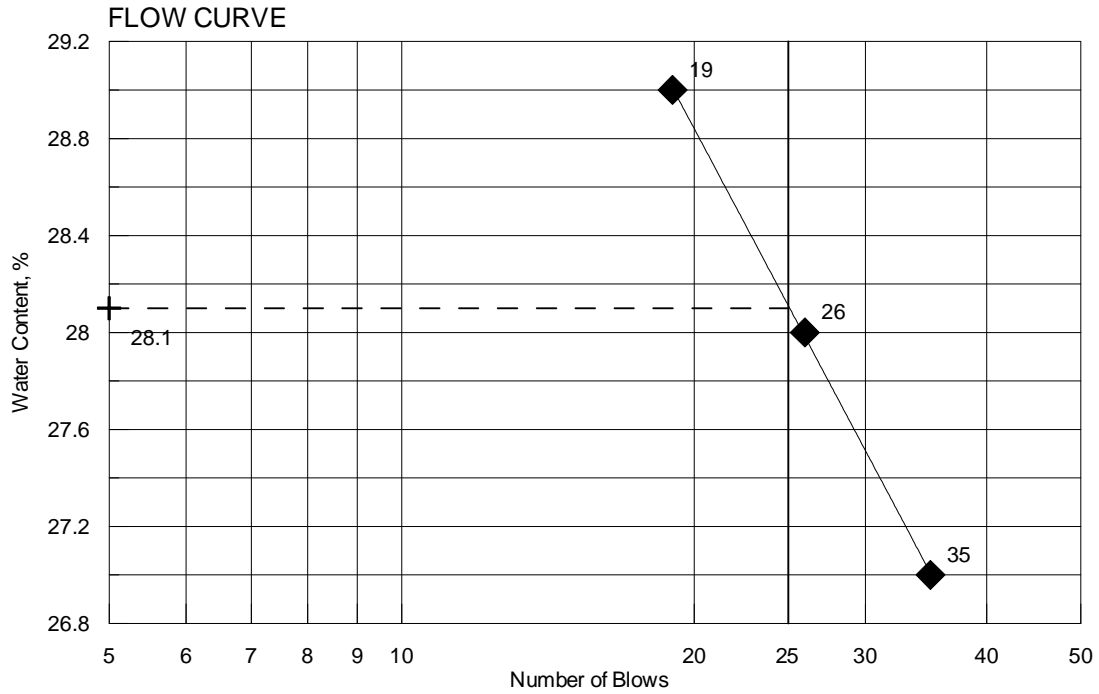


TOWN	New Portland	Reference No.	271079
WIN	021888.00	Water Content, %	31
Sampled	1/25/2017	Liquid Limit @ 25 blows (T 89), %	29
Boring No./Sample No.	BB-NPPB-101/6D	Plastic Limit (T 90), %	22
Station	8+11.4	Plasticity Index (T 90), %	7
Depth	19.0-21.0	Tested By	BBURR



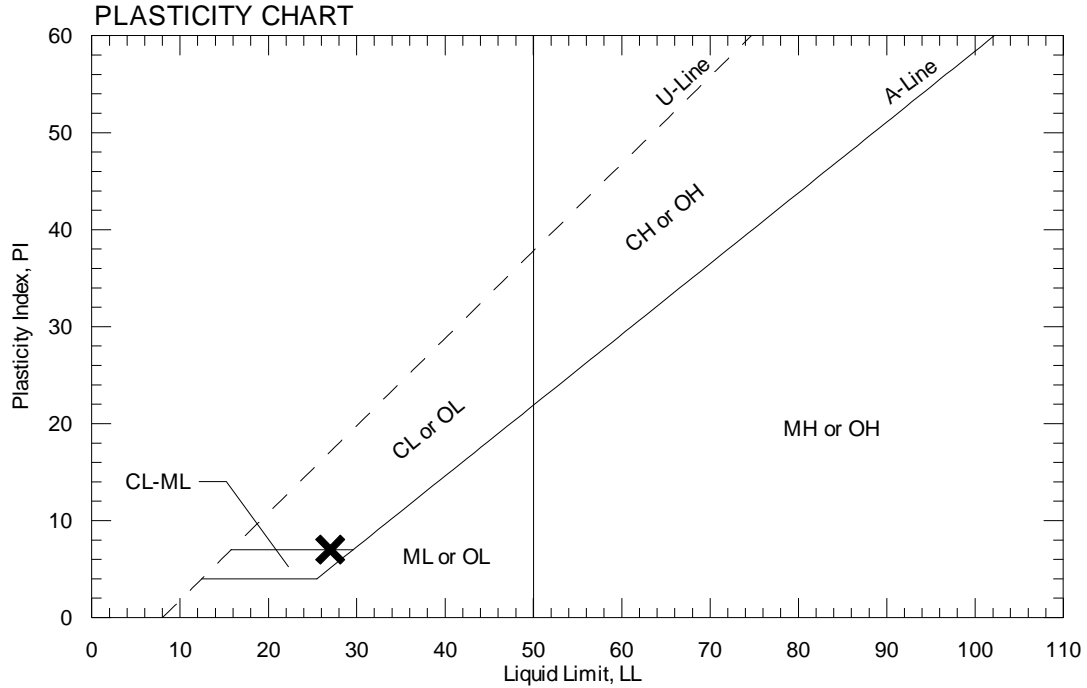
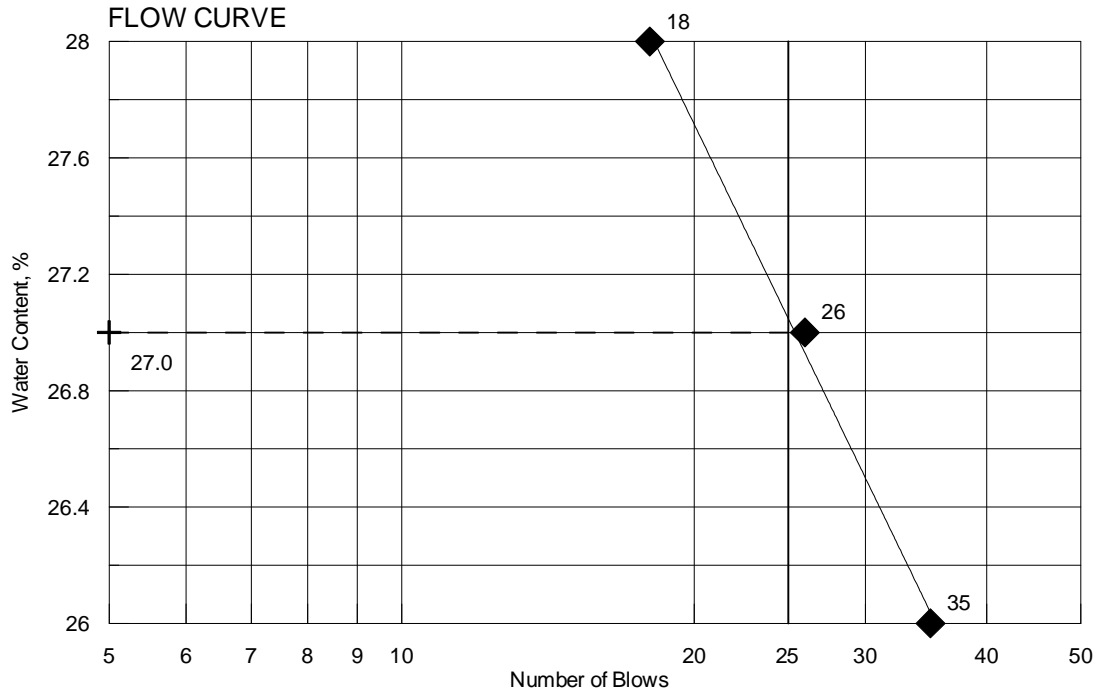


TOWN	New Portland	Reference No.	271080
WIN	021888.00	Water Content, %	25.7
Sampled	1/25/2017	Liquid Limit @ 25 blows (T 89), %	28
Boring No./Sample No.	BB-NPPB-101/8D	Plastic Limit (T 90), %	21
Station	8+11.4	Plasticity Index (T 90), %	7
Depth	24.0-26.0	Tested By	BBURR



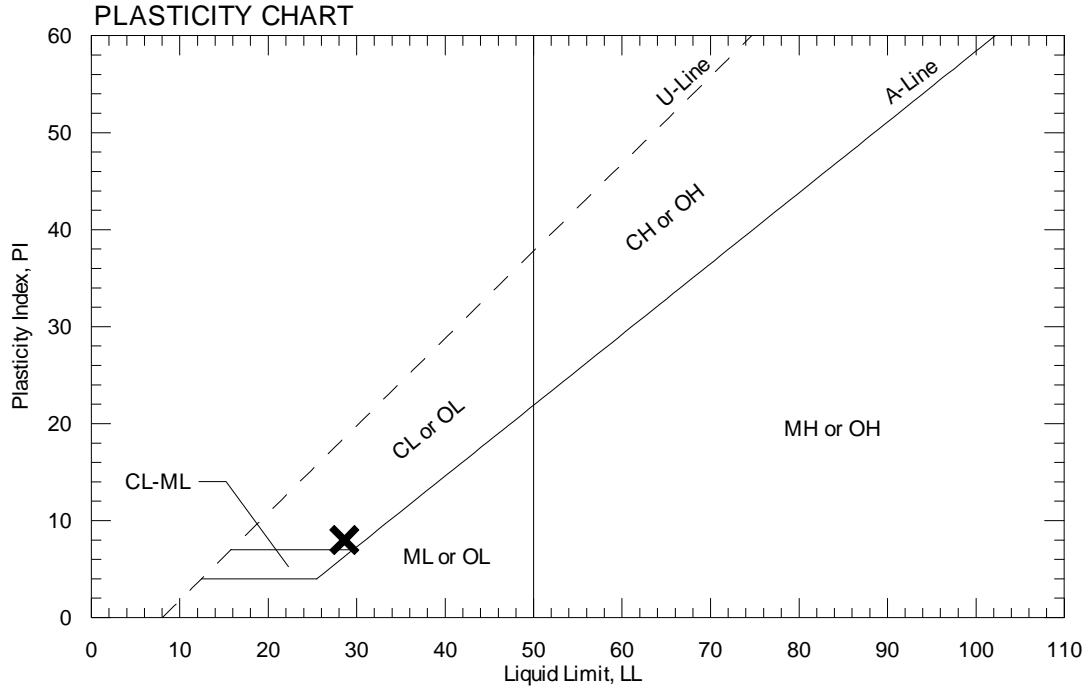
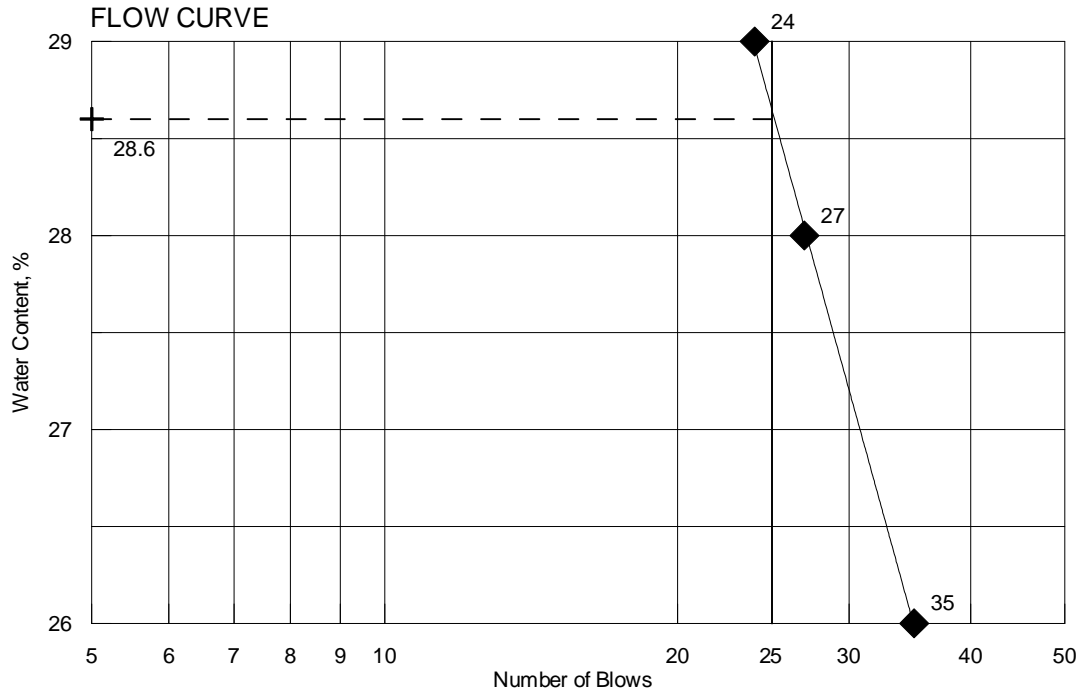


TOWN	New Portland	Reference No.	271083
WIN	021888.00	Water Content, %	27.5
Sampled	1/27/2017	Liquid Limit @ 25 blows (T 89), %	27
Boring No./Sample No.	BB-NPPB-102B/1D/B	Plastic Limit (T 90), %	20
Station	7+83.2	Plasticity Index (T 90), %	7
Depth	9.5-11.0	Tested By	BBURR





TOWN	New Portland	Reference No.	271084
WIN	021888.00	Water Content, %	24.7
Sampled	1/27/2017	Liquid Limit @ 25 blows (T 89), %	29
Boring No./Sample No.	BB-NPBB-102B/2D	Plastic Limit (T 90), %	21
Station	7+83.2	Plasticity Index (T 90), %	8
Depth	14.0-16.0	Tested By	BBURR





TOWN	New Portland	Reference No.	271085
WIN	021888.00	Water Content, %	30.9
Sampled	1/27/2017	Liquid Limit @ 25 blows (T 89), %	30
Boring No./Sample No.	BB-NPPB-102B/4D	Plastic Limit (T 90), %	23
Station	7+83.2	Plasticity Index (T 90), %	7
Depth	24.0-26.0	Tested By	BBURR

