

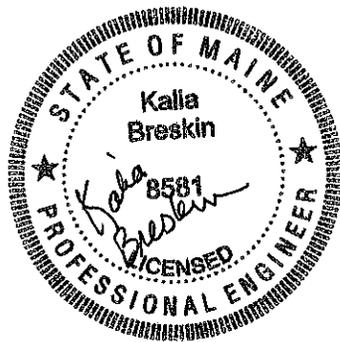
**MAINE DEPARTMENT OF TRANSPORTATION
HIGHWAY/BRIDGE PROGRAM
GEOTECHNICAL SECTION
AUGUSTA, MAINE**

GEOTECHNICAL DESIGN REPORT

For the Replacement of:

**ROUTE 230 STRUT
OVER HEATH BROOK
TRENTON, MAINE**

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Senior Geotechnical Engineer



Hancock County

WIN 19340.00

Soils Report No. 2012-129

August 3, 2012

GEOTECHNICAL DESIGN SUMMARY

The purpose of this report is to present subsurface information and make geotechnical recommendations for the replacement of a culvert which carries Heath Brook under Route 230 in Trenton. Route 230 is a Priority 5 Highway Corridor. The proposed replacement structure will be a 6-foot Option III corrugated metal pipe culvert. The structure will be 80 feet long under a roadway with two 10-foot lanes and 6-feet from edge of travelled way to the face of guardrail. The project includes 580 feet of highway construction.

Soils and Bedrock – This area is shown on mapping by the National Resource Conservation Survey as clay-silts having high fines content. Maine Geologic Survey mapping indicates clay-silt soils of the Presumpscot Formation.

Four borings were drilled for this project. Refusals were encountered in all borings, and a rock core was taken. All borings encountered 6-inches of Hot Mix Asphalt pavement. Subbase gravel was approximately 18” thick, and was underlain by a layer of olive-brown, wet, stiff SILT extending to a depth of 9 feet in the boring. This silt was underlain by a stratum of brown, wet, dense, SAND extending to bedrock refusal at depths ranging from 13.5 to 16.9 feet below ground surface.

Laboratory testing included grain size analysis and water content on the coarse fraction of all samples, and atterberg limits on the clay-silt soils. Water contents were slightly higher than the liquid limits, indicating a sensitive soil that may become disturbed easily.

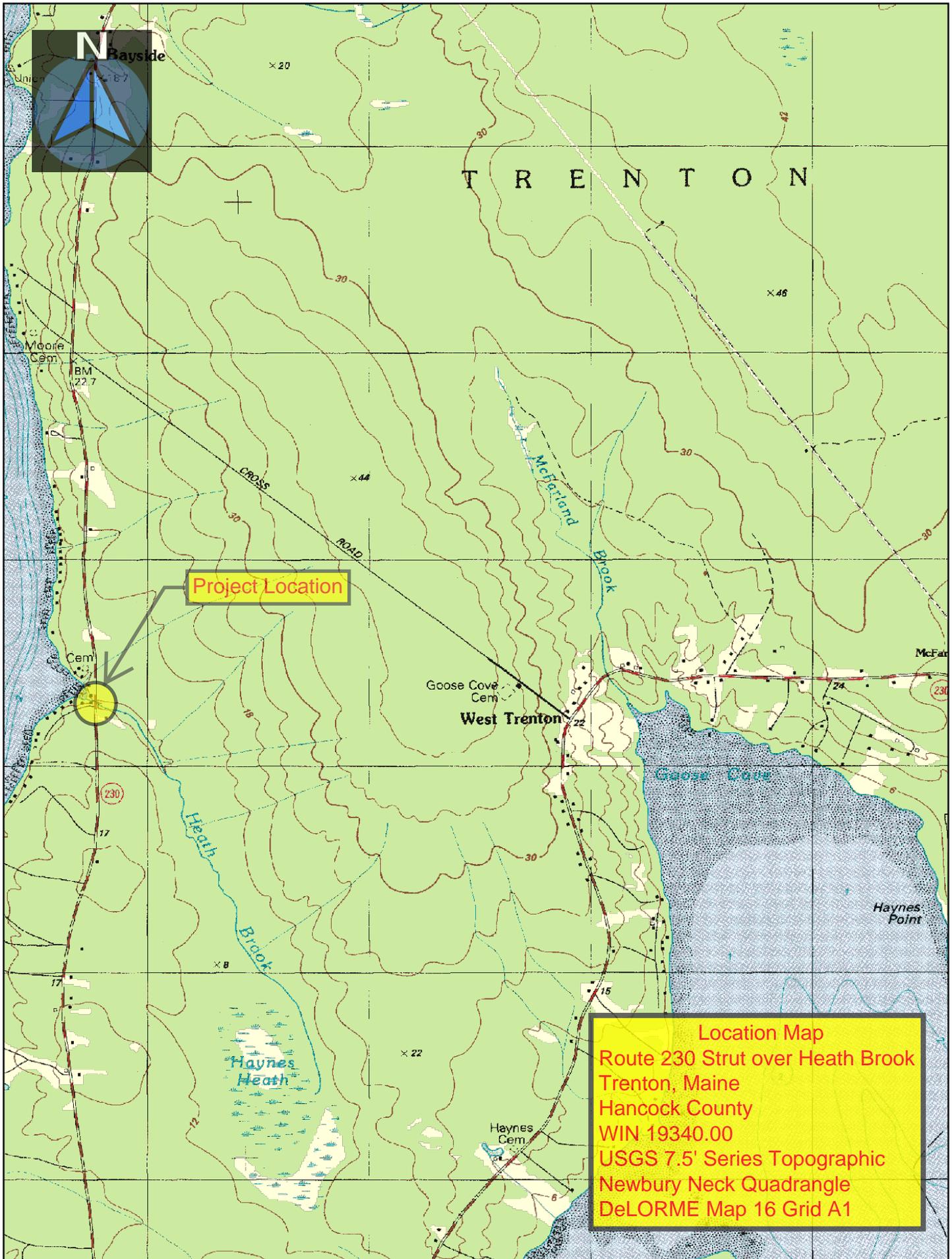
Bedrock at this site consists of a Rhyolitic Volcanic Welded Tuft. The core broke mostly along the subhorizontal shear foliation. There were 23 major core segments ranging in size from 1” to 4” long in a 5-foot long core section. Rock Mass Quality was 0% or Very Poor. Rock core photographs are included in this report.

Culvert Construction – A 6-foot diameter Option III culvert meeting MaineDOT Standard Specification 603 will be constructed to replace the existing 5-foot pipe. The road will be closed for this construction; staged construction will not be required.

Construction Considerations – Soils encountered in borings at this pipe included a stratum of olive-brown, wet stiff silt. These soils will be susceptible to disturbance and rutting as a result of exposure to water and construction traffic. If disturbance occurs, the Contractor shall remove and replace disturbed soils with compacted gravel borrow. The culvert subgrade will be at approximately 15 feet below existing ground surface, and bedrock refusals were encountered at or near this depth. Structural rock excavation is anticipated for this project.

Wet soils were encountered at a depth of 9 feet. The contractor will need to control groundwater and surface water infiltration using temporary ditches, sumps, and cofferdams as needed.

Sheets



Location Map
Route 230 Strut over Heath Brook
Trenton, Maine
Hancock County
WIN 19340.00
USGS 7.5' Series Topographic
Newbury Neck Quadrangle
DeLORME Map 16 Grid A1

Map Scale 1:24000

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. Road names used on this map may not match official road names.

Appendix A

Boring Logs and
Rock Core Photographs

Driller: MaineDOT	Elevation (ft.): 21.9	Auger ID/OD: 5" Dia. Solid Stem
Operator: Giguere/Giles	Datum: NAVD88	Sampler: Standard Split Spoon
Logged By: B. Wilder	Rig Type: CME 45C	Hammer Wt./Fall: 140#/30"
Date Start/Finish: 2/27/12; 08:30-11:30	Drilling Method: Cased Wash Boring	Core Barrel: NQ-2"
Boring Location: 3+96, 8.9 ft Rt.	Casing ID/OD: NW	Water Level*: None Observed

Hammer Efficiency Factor: 0.84 **Hammer Type:** Automatic Hydraulic Rope & Cathead

Definitions: R = Rock Core Sample S_u = Insitu Field Vane Shear Strength (psf) S_{u(lab)} = Lab Vane Shear Strength (psf)
D = Split Spoon Sample SSA = Solid Stem Auger T_v = Pocket Torvane Shear Strength (psf) WC = water content, percent
MD = Unsuccessful Split Spoon Sample attempt HSA = Hollow Stem Auger q_p = Unconfined Compressive Strength (ksf)
U = Thin Wall Tube Sample RC = Roller Cone N-uncorrected = Raw field SPT N-value
MU = Unsuccessful Thin Wall Tube Sample attempt WOH = weight of 140lb. hammer Hammer Efficiency Factor = Annual Calibration Value
V = Insitu Vane Shear Test WOR = weight of rods N₆₀ = SPT N-uncorrected corrected for hammer efficiency
MV = Unsuccessful Insitu Vane Shear Test attempt WO1P = Weight of one person N₆₀ = (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 ₆₀	Casing Blows				
0								21.40		6" PAVEMENT.	
	1D/A	24/19	1.50 - 3.50	9/7/5/4	12	17		19.90		1D (1.5-2.0 ft bgs) Brown, moist, medum dense, fine to coarse gravelly SAND, little silt.	G#239953 A-1-a, SM WC=6.5%
										1D/A (2.0-3.5 ft bgs) Olive brown, wet, stiff, Clayey SILT, trace sand, trace gravel.	G#239954 A-4, ML WC=21.4% LL=21 PL=17 PI=4
5	2D	24/20	5.00 - 7.00	2/4/5/4	9	13				Similar to above. Samples 1D/A and 2D are combined.	G#239954 A-4, ML WC=21.4% LL=21 PL=17 PI=4
10	3D	24/12	10.00 - 12.00	8/23/12/8	35	49		12.90		Brown, wet, dense, GRAVEL, some silt, some sand, (Till).	G#239955 A-2-4, GM WC=7.7%
15	R1	60/60	14.30 - 19.30	RQD = 28%				7.60		a50 blows for 0.3 ft. Top of Bedrock at Elev. 7.6 ft. R1: Bedrock: Greenish gray, siliceous, highly sheared welded TUFT, with traces (locally significant) of Pyrite and several QUARTZ veins or boudins. Rock Mass Quality = Very Poor R1: Core Times (min:sec) 14.3-15.3 ft (2:40) 15.3-16.3 ft (2:00) 16.3-17.3 ft (2:40) 17.3-18.3 ft (2:30) 18.3-19.3 ft (2:45) 100% Recovery	
20								2.60			
25											

Remarks:

Bottom of Exploration at 19.30 feet below ground surface.

Driller: MaineDOT	Elevation (ft.): 22.2	Auger ID/OD: 5" Dia.
Operator: Giguere/Giles	Datum: NAVD88	Sampler: N/A
Logged By: B. Wilder	Rig Type: CME 45C	Hammer Wt./Fall: N/A
Date Start/Finish: 2/27/12-2/27/12	Drilling Method: Solid Stem Auger	Core Barrel: N/A
Boring Location: 3+73.7, 9.1 ft Rt.	Casing ID/OD: N/A	Water Level*: None Observed

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

Definitions: R = Rock Core Sample S_u = Insitu Field Vane Shear Strength (psf) S_{u(lab)} = Lab Vane Shear Strength (psf)
D = Split Spoon Sample SSA = Solid Stem Auger T_v = Pocket Torvane 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 = Annual Calibration Value PI = Plasticity Index
V = Insitu Vane Shear Test WOR = weight of rods N₆₀ = SPT N-uncorrected corrected for hammer efficiency G = Grain Size Analysis
MV = Unsuccessful Insitu Vane Shear Test attempt WO1P = Weight of one person N₆₀ = (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 ₆₀	Casing Blows					
0								SSA	21.70		6" PAVEMENT.	
											Very similar to BB-TREN-101.	
5												
10												
15												
20												
25												
									5.30		Bottom of Exploration at 16.90 feet below ground surface. REFUSAL	

Remarks:

Driller: MaineDOT	Elevation (ft.): 21.5	Auger ID/OD: 5" Dia.
Operator: Giguere/Giles	Datum: NAVD88	Sampler: N/A
Logged By: B. Wilder	Rig Type: CME 45C	Hammer Wt./Fall: N/A
Date Start/Finish: 2/27/12-2/27/12	Drilling Method: Solid Stem Auger	Core Barrel: N/A
Boring Location: 3+81.3, 7.2 ft Lt.	Casing ID/OD: N/A	Water Level*: None Observed

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

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D = Split Spoon Sample SSA = Solid Stem Auger T_v = Pocket Torvane Shear Strength (psf) WC = water content, percent
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	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows						
0								SSA	21.00		6" PAVEMENT.		
											Very similar to BB-TREN-101.		
5													
10													
15									8.00			Bottom of Exploration at 13.50 feet below ground surface. REFUSAL	
20													
25													

Remarks:

Bidderford - Saco
Main Street Bridge
June 25-26, 2001
Maguire

~~BB-SR-101~~ REC = 100% }
R1 2.1'-4.2' RAD = 0% }
BB-SR-101 REC = 100% }
R2 4.2'-6.7' RAD = 64%

~~BB-SR-101~~ REC = 85%

~~R3~~
BB-
R2
BR-
R3

BB-SR-103
R3 8.3'-11.8'

~~R3~~ REC = 100%
~~4.3'~~ RAD = 0%

TRENTON
19340.00
BB-TREN-101
R1-14.3-19.3



TRENTON 19340.00

BB-Tren-101

R1-14.3-19.3

TRENTON

19340.00

BB-TREN-101

R1-14.3-19.3

R3 | R4 →

TRENTON

19340.00

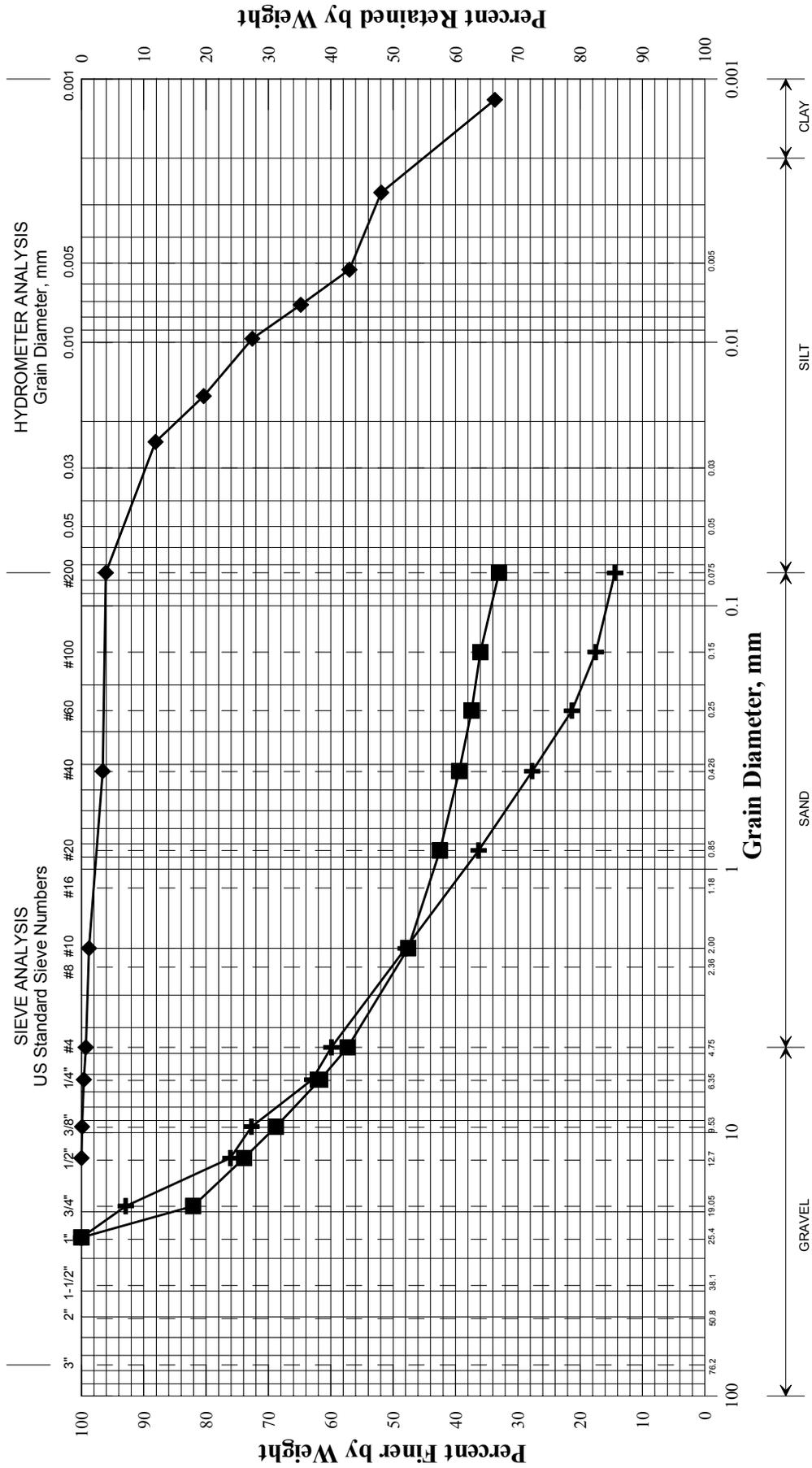
BB-TREN-101

R1-14.3-19.3

Appendix B

Laboratory Data

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE



UNIFIED CLASSIFICATION

Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
+	3+96	8.9 RT	1.5-2.0	Gravelly SAND, little silt.	6.5			
◆	3+96	8.9 RT	2.0-3.5, 5.0-7.0	Clayey SILT, trace sand, trace gravel.	21.4	21	17	4
■	3+96	8.9 RT	10.0-12.0	GRAVEL, some silt, some sand.	7.7			
●								
▲								
×								

WIN	019340.00
Town	Trenton
Reported by/Date	WHITE, TERRY A 5/24/2012