

STATE OF MAINE
MAINE DEPARTMENT OF TRANSPORTATION
Letter of Transmittal

To: Terry White, Geotechnical Highway Program
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Subject: Geotechnical Data Report, Large Culvert, Route 73, Owl's Head, Maine

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Date: 2/5/2018

Soils Report No.: 2018-02

Bridge #: 46010

Route: 73

WIN: 021808.00

Town: Owl's Head

Attached is one (1) copy of Soils Report No. 2018-02, "GEOTECHNICAL DATA REPORT, LARGE CULVERT #46010, OWL'S HEAD, MAINE" dated: February 1, 2018.

This report is available in TEDOCS as Document # 1681457.

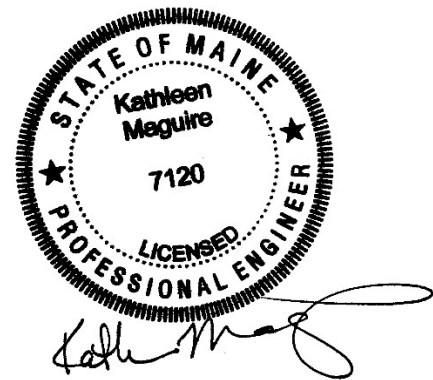
att: 1 of 2018-02

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

GEOTECHNICAL DATA REPORT

**LARGE CULVERT #46010
ROUTE 73
OWL'S HEAD, MAINE**

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Knox County

WIN 21808.00
February 1, 2018

Soils Report 2018-02

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1.0 INTRODUCTION

The Large Culvert on Route 73 in Owl's Head (#46010) was originally scoped for Replacement by Project Development. During the Preliminary Design Report (PDR) phase of the project the Region determined that the existing culvert could be sliplined by Maintenance forces.

The purpose of this Geotechnical Data Report is to document subsurface information collected for the proposed replacement of the existing 72-inch Corrugated Metal Pipe (CMP) culvert. This report presents the results of a limited geotechnical investigation performed at the existing culvert and the results of a limited laboratory testing program conducted on soil samples recovered during the geotechnical investigation. Route 73 Road is a Highway Corridor Priority 3 road.

2.0 GEOLOGIC SETTING

The culvert is located on Route 73 approximately 0.05 of a mile northerly of North Shore Drive as shown on Sheet 1 – Location Map.

The Maine Geologic Survey (MGS) map titled Surficial Geology Rockland Quadrangle, Maine, Open-File No. 10-8 (2010) indicates the surficial soils at the culvert consist of Presumpscot Formation. The Presumpscot Formation in this area consists of glaciomarine silt, clay, and sand deposited on the late-glacial sea floor. This area is likely to include areas of till exposed at the ground surface.

The MGS map Bedrock Geology of Maine (1985) cites bedrock at the culvert as interbedded pelite and sandstone of the Ogier Point Formation.

3.0 SUBSURFACE INVESTIGATION

Subsurface conditions were explored by drilling one (1) test boring (HB-OWH-101) and one (1) probe (HB-OWH-102) at opposite, diagonal corners of the existing structure. The MaineDOT drill crew drilled the boring and probe between October 5 and 7, 2016. The exploration locations are shown on Sheet 2 – Boring Location Plan.

Boring HB-OWH-101 was drilled using solid stem auger, cased wash boring, and open hole drilling techniques. Soil samples were obtained in the boring at 5-foot intervals using Standard Penetration Test (SPT) methods. Two (2) sample attempts were unsuccessful. Two (2) field vane shear tests were completed and three (3) unsuccessful field vane shear tests were attempted. Probe HB-OWH-102 was drilled using solid stem auger techniques. No soil samples were obtained in the probe. No refusal surface was encountered in the boring HB-OWH-101 or probe HB-OWH-102. Details and sampling methods used, field data obtained, and soil conditions encountered are presented in the boring logs provided in Appendix A – Boring Logs.

An experienced 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 logs and identified field testing requirements. The borings were located in the field using taped measurements at the completion of the drilling program.

4.0 LABORATORY TESTING

A laboratory testing program was conducted on the soil samples recovered from the test boring to assist in soil classification, evaluation of engineering properties of the soils, and geologic assessment of the project site. Laboratory testing consisted of one (1) standard grain size analysis with natural water content, five (5) grain size analyses with hydrometer and natural water content, and two (2) Atterberg Limits determinations. The results of soil tests are included as 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.

5.0 CLOSURE

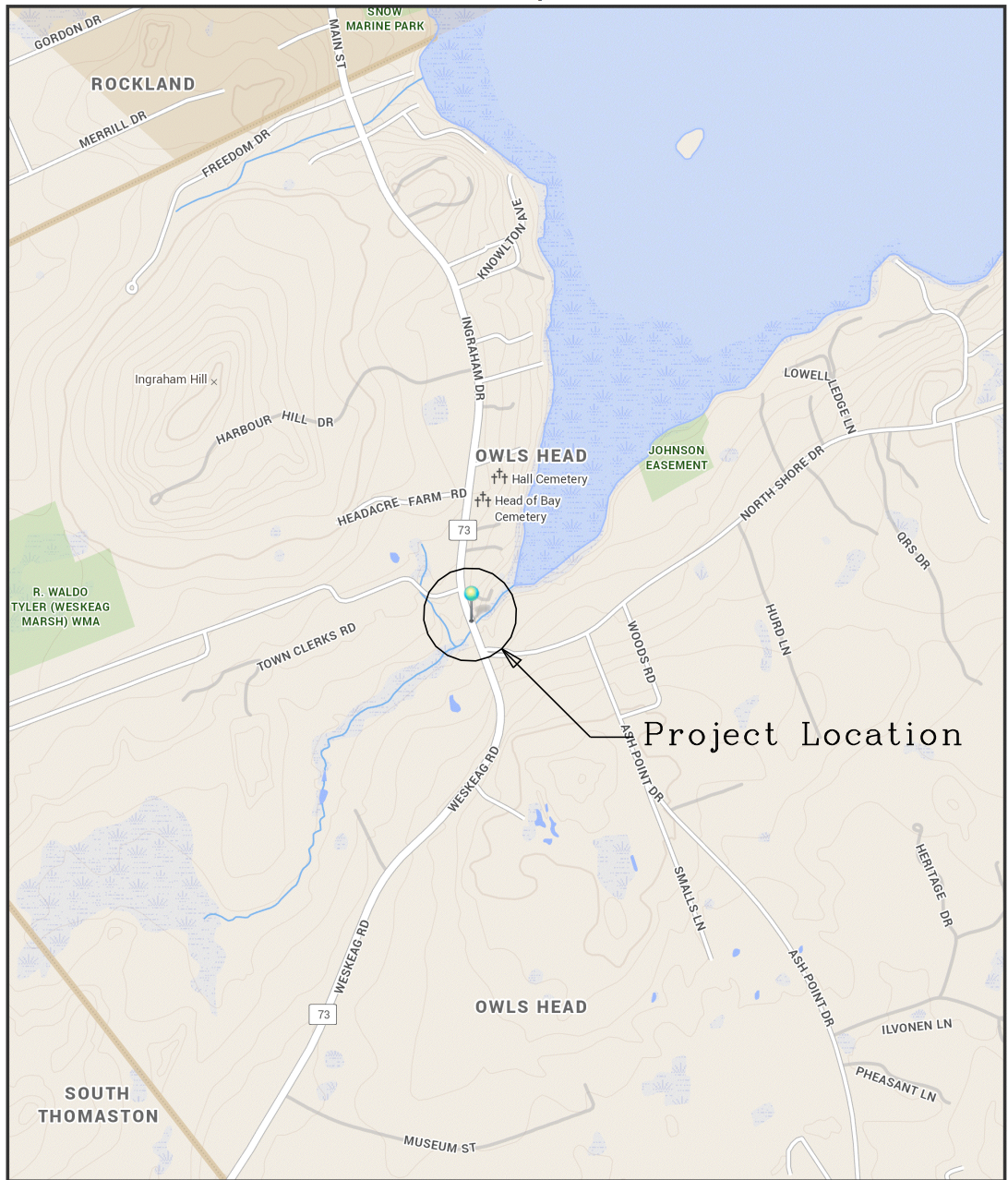
This Geotechnical Data Report has been prepared to document the geotechnical work conducted at the large culvert on Route 73 in Owl's Head, Maine in accordance with generally accepted geotechnical and foundation engineering practices. No other intended use or warranty is expressed or implied.

MaineDOT conducted a limited number of soil explorations at discrete locations at the culvert and a limited number of laboratory tests. No interpretations or conclusions have been derived from this geotechnical information. Data provided may not be representative of the subsurface conditions between boring locations.

Sheets



OWLS HEAD, 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.

0.25 Miles
1 inch = 0.28 miles

Date: 1/5/2018
Time: 11:14:51 AM

SHEET NUMBER 1	OWLS HEAD ROUTE 73 LARGE CULVERT KNOX COUNTY	STATE OF MAINE DEPARTMENT OF TRANSPORTATION	
		021808.00	
OF 2	LOCATION MAP	WIN	021808.00 HIGHWAY PLANS

POB = STA. 10+00.00

10+00

11+00

12+00

13+00

14+00

15+00

16+00

17+00

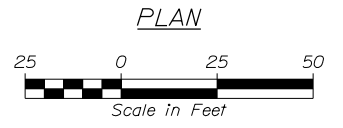
N20°37'26.76"W

PC = STA. 15+01.54

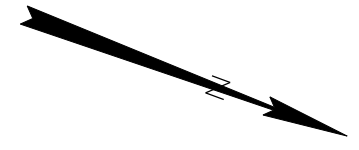
PT = STA. 17+19.96

CURVE DATA #1
 PI = 16+11.19
 D = 5°43'46.5"
 Δ = 12°30'52.4" Rt.
 R = 1000.00'
 L = 218.42'
 T = 109.65'
 E = 5.99'

LEGEND
 ⊕ CASED WASH BORING
 ⊙ PROBE



PLAN



PROJ. MANAGER	DATE	BY	DATE
DESIGN-DETAILED			
CHECKED-REVIEWED			
DESIGNS-DETAILED	C. RUSSELL	T. WHITE	JAN 2018
DESIGNS-DETAILED			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

OWLS HEAD
 ROUTE 73
 BORING LOCATION PLAN

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.			TERMS DESCRIBING DENSITY/CONSISTENCY											
		CLEAN SANDS (little or no fines)	SW Well-graded sands, gravelly sands, little or no fines			Coarse-grained soils (more than half of material is larger than No. 200 sieve): Includes (1) clean gravels; (2) silty or clayey gravels; and (3) silty, clayey or gravelly sands. Density is rated according to standard penetration resistance (N-value).											
			SP Poorly-graded sands, gravelly sand, little or no fines.														
		SANDS WITH FINES (Appreciable amount of fines)	SM Silty sands, sand-silt mixtures			Standard Penetration Resistance N-Value (blows per foot)											
SC Clayey sands, sand-clay mixtures.																	
FINE-GRAINED SOILS (more than half of material is smaller than No. 200 sieve size)	SILTS AND CLAYS (liquid limit less than 50)	ML Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity.	Density of Cohesionless Soils														
		CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.				Approximate Undrained Shear Strength (psf)											
		OL Organic silts and organic silty clays of low plasticity.							Field Guidelines								
	SILTS AND CLAYS (liquid limit greater than 50)	MH Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.										Consistency of Cohesive soils					
		CH Inorganic clays of high plasticity, fat clays.													SPT N-Value (blows per foot)		
		OH Organic clays of medium to high plasticity, organic silts.															
HIGHLY ORGANIC SOILS	Pt Peat and other highly organic soils.	Desired Rock Observations (in this order, if applicable): Color (Munsell color chart) Texture (aphanitic, fine-grained, etc.) Rock Type (granite, schist, sandstone, etc.) Hardness (very hard, hard, mod. hard, etc.) Weathering (fresh, very slight, slight, moderate, mod. severe, severe, etc.) Geologic discontinuities/jointing: -dip (horiz - 0-5 deg., low angle - 5-35 deg., mod. dipping - 35-55 deg., steep - 55-85 deg., vertical - 85-90 deg.) -spacing (very close - <2 inch, close - 2-12 inch, mod. close - 1-3 feet, wide - 3-10 feet, very wide >10 feet) -tightness (tight, open, or healed) -infilling (grain size, color, etc.) Formation (Waterville, Ellsworth, Cape Elizabeth, etc.) RQD and correlation to rock 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))															
	Desired Soil Observations (in this order, if applicable): Color (Munsell color chart) Moisture (dry, damp, moist, wet) Density/Consistency (from above right hand side) Texture (fine, medium, coarse, etc.) Name (sand, silty sand, clay, etc., including portions - trace, little, etc.) Gradation (well-graded, poorly-graded, uniform, etc.) Plasticity (non-plastic, slightly plastic, moderately plastic, highly plastic) Structure (layering, fractures, cracks, etc.) Bonding (well, moderately, loosely, etc.,) Cementation (weak, moderate, or strong) Geologic Origin (till, marine clay, alluvium, etc.) Groundwater level																
	Maine Department of Transportation Geotechnical Section Key to Soil and Rock Descriptions and Terms Field Identification Information																
Sample Container Labeling Requirements: WIN Blow Counts Bridge Name / Town Sample Recovery Boring Number Date Sample Number Personnel Initials Sample Depth																	

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Large Culvert #46010 Replacement on Route 73 Location: Owls Head, Maine	Boring No.: HB-OWH-101 WIN: 21808.00
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Driller: MaineDOT	Elevation (ft.): 29.3	Auger ID/OD: 5" Solid Stem
Operator: Daggett/Burpee	Datum: NAVD88	Sampler: Standard Split Spoon
Logged By: Be Schonewald	Rig Type: CME 45C	Hammer Wt./Fall: 140#/30"
Date Start/Finish: 10/7/2016; 08:20-14:30	Drilling Method: Cased Wash Boring	Core Barrel: N/A
Boring Location: 14+17.4, 10.3 ft Rt.	Casing ID/OD: NW-3"	Water Level*: None Observed

Hammer Efficiency Factor: 0.943	Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>	
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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_u = 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 N₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency G = Grain Size Analysis
 MV = Unsuccessful Field 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					
25											Losing water at 26.0 ft; apparent stratum change or gravelly seam.	WC=22.6% LL=33 PL=21 PI=12
	6D	24/24	28.50 - 30.50	WOH/WOH/WOH/2	---						Dark grey, very soft, SILT, some clay, little fine to coarse sand, trace gravel, with one 1 inch seam Silty GRAVEL, some sand.	G#304231 A-4, CL WC=26.5%
30												
35	7D V1	24/24	34.00 - 36.00	Vane Interval Su=536/89 psf			RC				Dark grey, medium stiff, SILT, some clay, trace fine sand, trace gravel. 55x110 mm vane raw torque readings: V1: 12.0/2.0 ft-lbs V2: 11.5/3.0 ft-lbs Sand seams noted when pushing vane. Easy advancing roller cone; smooth, with occasional gravel seams from 36.0 to approximately 48.5 ft bgs.	#304232 A-4, CL WC=15.9% LL=32 PL=20 PI=12
	V2		35.63 - 36.00	Su=513/134 psf								
40												
45												
50								-19.20			Gravelly layers based on drilling behavior.	

Remarks:

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Large Culvert #46010 Replacement on Route 73 Location: Owls Head, Maine	Boring No.: HB-OWH-101 WIN: 21808.00
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Driller: MaineDOT	Elevation (ft.): 29.3	Auger ID/OD: 5" Solid Stem
Operator: Daggett/Burpee	Datum: NAVD88	Sampler: Standard Split Spoon
Logged By: Be Schonewald	Rig Type: CME 45C	Hammer Wt./Fall: 140#/30"
Date Start/Finish: 10/7/2016; 08:20-14:30	Drilling Method: Cased Wash Boring	Core Barrel: N/A
Boring Location: 14+17.4, 10.3 ft Rt.	Casing ID/OD: NW-3"	Water Level*: None Observed

Hammer Efficiency Factor: 0.943	Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>	
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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-corrected = 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 N₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency G = Grain Size Analysis
 MV = Unsuccessful Field 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				
50	8D	24/14	52.50 - 54.50	17/19/14/16	33	52				Dark grey, dense, fine to coarse SAND, some silt, trace gravel, trace clay, (Marine Sand).	G#304233 A-2-4, SC-SM WC=14.8%
55							-25.20	-54.50			
60											
65											
70											
75											

Remarks:

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Large Culvert #46010 Replacement on Route 73 Location: Owls Head, Maine	Boring No.: HB-OWH-102 WIN: 21808.00
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Drilling Contractor: MaineDOT	Elevation (ft.): 29.7	Auger ID/OD: 5" Dia.
Operator: Daggett/Burpee	Datum: NAVD88	Sampler: N/A
Logged By: Be Schonewald	Rig Type: CME 45C	Hammer Wt./Fall: N/A
Date Start/Finish: 10/5/2016; 13:50-14:25	Drilling Method: Solid Stem Auger	Core Barrel: N/A
Boring Location: 13+72.2, 7.7 ft Lt.	Casing ID/OD: N/A	Water Level*: None Observed

Definitions: D = Spilt Spoon Sample MU = Unsuccessful Thin Wall Tube Sample Attempt WO1P = Weight of 1 Person
 S = Sample off Auger Flights R = Rock Core Sample S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
 B = Bucket Sample off Auger Flights SSA = Solid Stem Auger S_{u(lab)} = Lab Vane Undrained Shear Strength (psf) LL = Liquid Limit
 MD = Unsuccessful Split Spoon Sample Attempt HSA = Hollow Stem Auger q_p = Unconfined Compressive Strength (ksf) PL = Plastic Limit
 U = Thin Wall Tube Sample RC = Roller Cone N-value = Raw Field SPT N-value PI = Plasticity Index
 MV = Unsuccessful Field Vane Shear Test Attempt WOH = Weight of 140lb. Hammer T_v = Pocket Torvane Shear Strength (psf) G = Grain Size Analysis
 V = Field Vane Shear Test, PP = Pocket Penetrometer WOR/C = Weight of Rods or Casing WC = Water Content, percent C = Consolidation Test

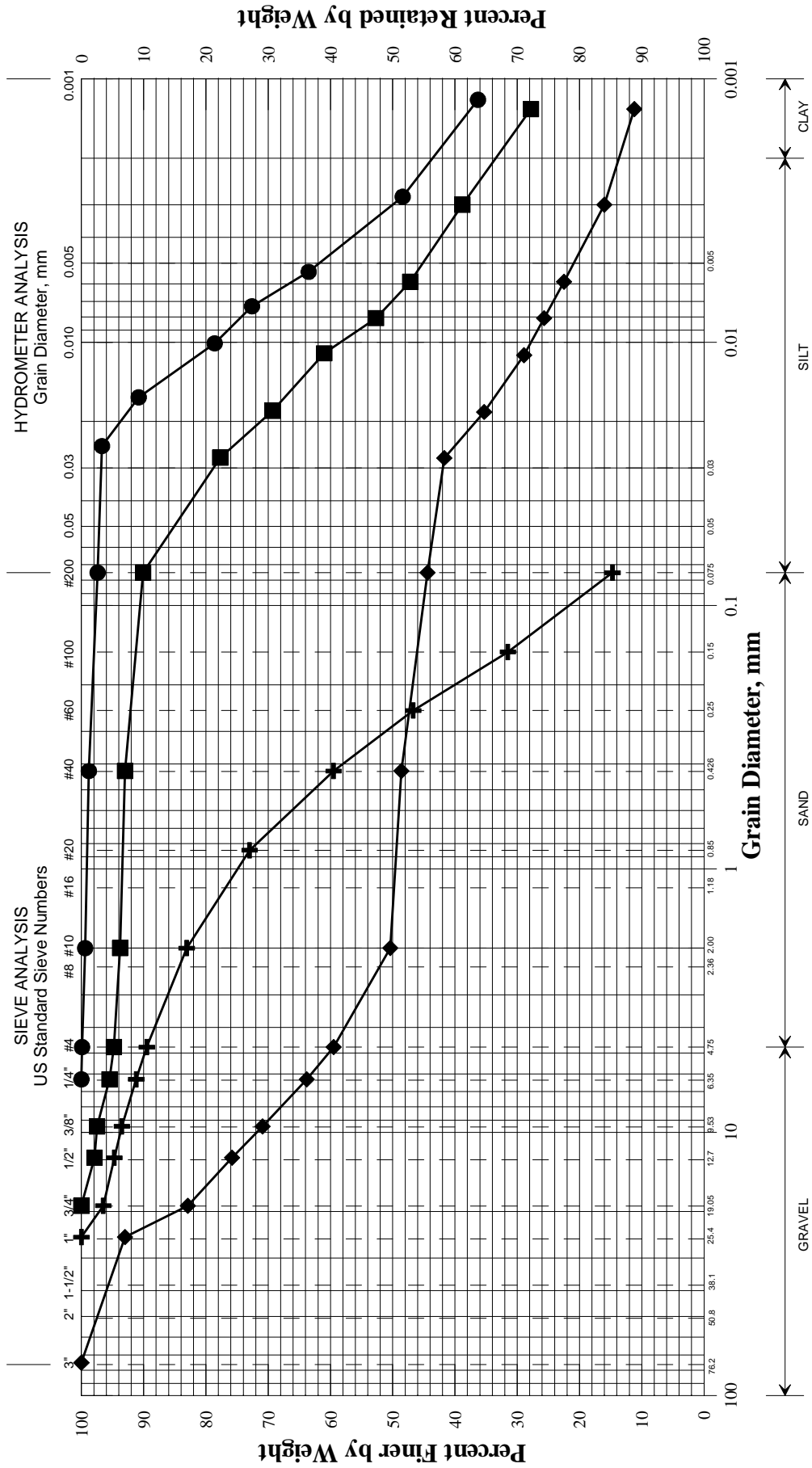
Depth (ft.)	Sample Information								Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log		
0								SSA	Drilling behavior suggests boney granular material. Auger Cuttings; Brown, Sandy granular Fill material.	
5									Auger Cuttings; Grey-brown, silty granular Fill material.	
10										
15									Drilling behavior suggests less boney; easier to advance; smooth.	
20										
25										

Remarks:

Appendix B

Laboratory Test Results

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE

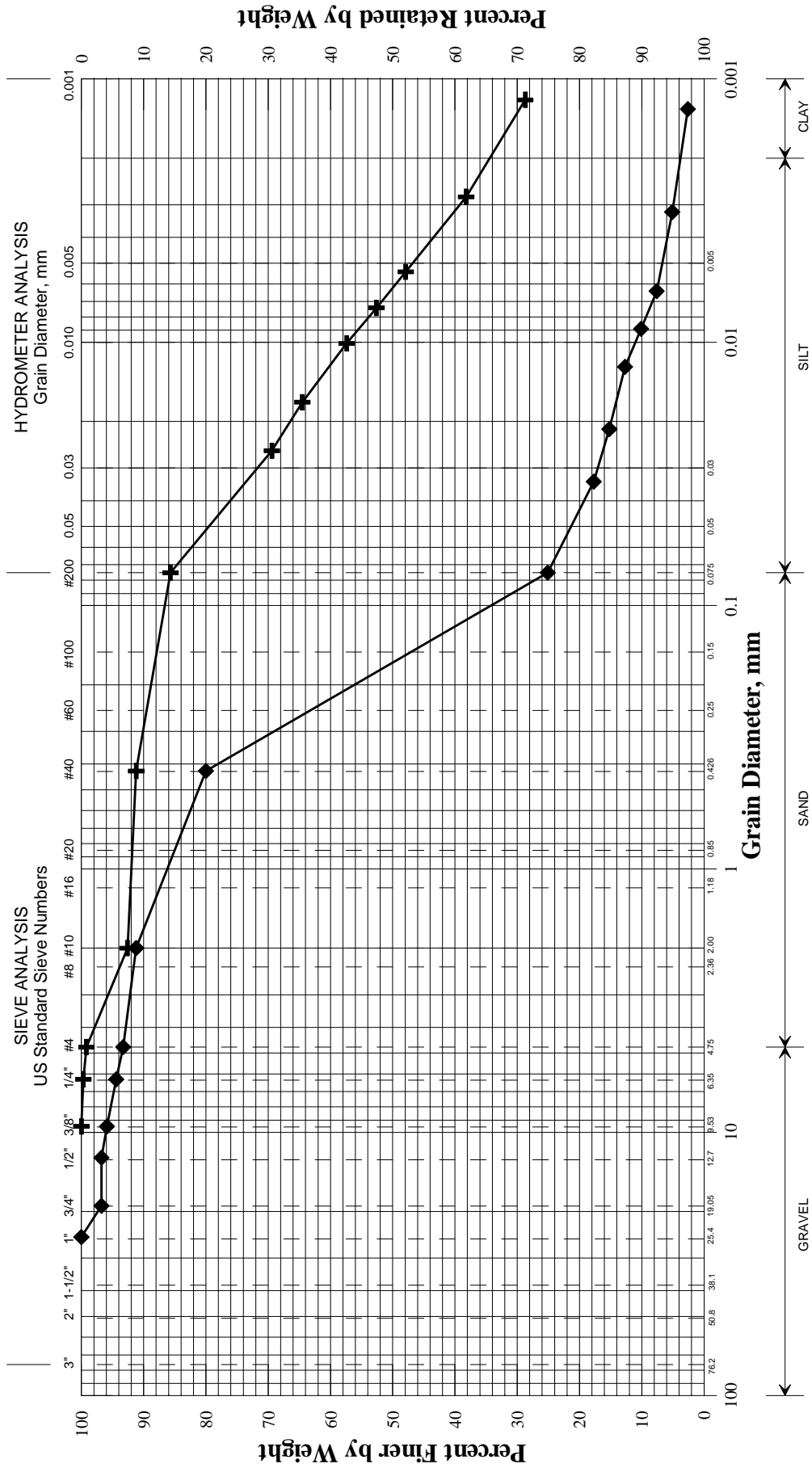


UNIFIED CLASSIFICATION

Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
+	14+17.4	10.3 RT	0.5-2.5	SAND, little silt, trace gravel.	5.3			
◆	14+17.4	10.3 RT	5.0-7.0	GRAVEL, some silt, little clay, trace sand.	9.3			
■	14+17.4	10.3 RT	16.0-16.25	SILT, some clay, trace gravel, trace sand.	22.4			
●	14+17.4	10.3 RT	16.25-18.0	Clayey SILT, trace sand, trace gravel.	25.9			
▲								
×								

WIN	021808.00
Town	Owls Head
Reported by/Date	WHITE, TERRY A 11/22/2016

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE

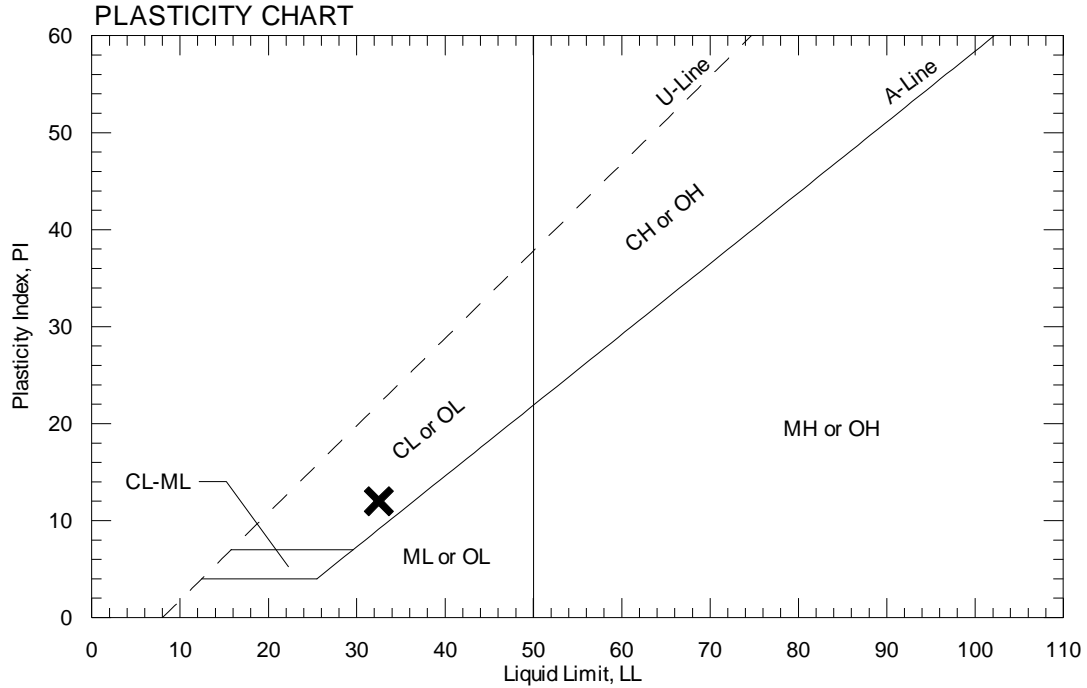
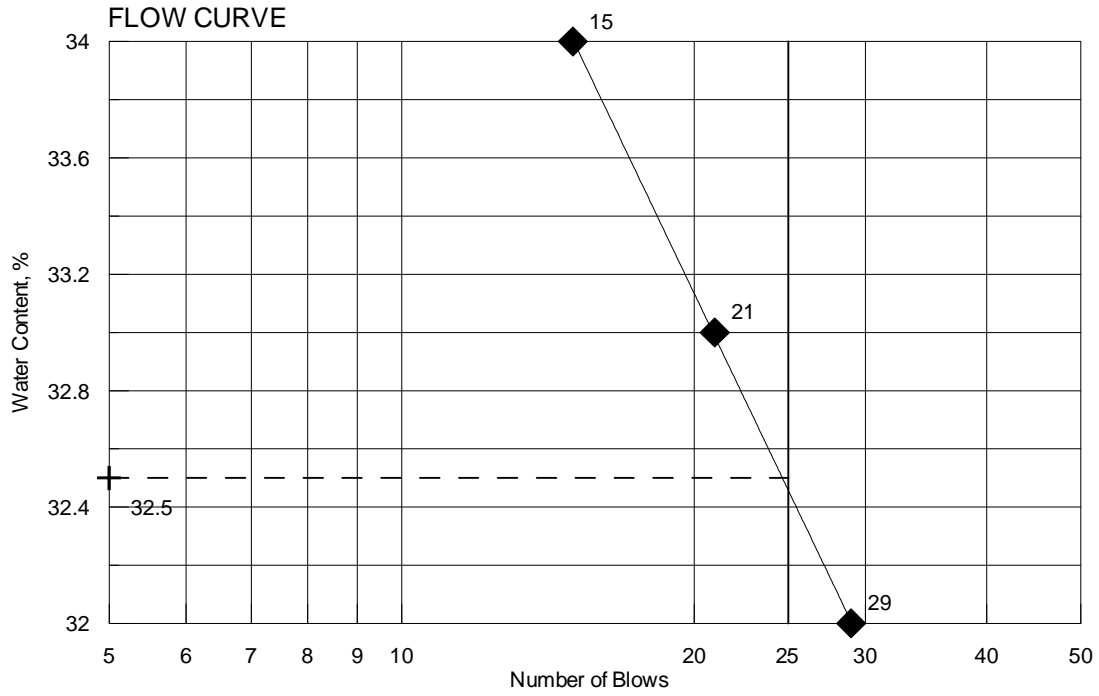


UNIFIED CLASSIFICATION

Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
HB-OWH-101/6D	14+17.4	10.3 RT	28.5-30.5	SILT, some clay, little sand, trace gravel.	26.5			
HB-OWH-101/8D	14+17.4	10.3 RT	52.5-54.5	SAND, some silt, trace gravel, trace clay.	14.8			

WIN	021808.00
Town	Owls Head
Reported by/Date	WHITE, TERRY A 11/22/2016

TOWN	Owls Head	Reference No.	304230
WIN	021808.00	Water Content, %	22.6
Sampled	10/6/2016	Liquid Limit @ 25 blows (T 89), %	33
Boring No./Sample No.	HB-OWH-101/5D	Plastic Limit (T 90), %	21
Station	14+17.4	Plasticity Index (T 90), %	12
Depth	24.0-26.0	Tested By	BBURR



TOWN	Owls Head	Reference No.	304232
WIN	021808.00	Water Content, %	15.9
Sampled	10/6/2016	Liquid Limit @ 25 blows (T 89), %	32
Boring No./Sample No.	HB-OWH-101/7D	Plastic Limit (T 90), %	20
Station	14+17.4	Plasticity Index (T 90), %	12
Depth	34.0-36.0	Tested By	BBURR

