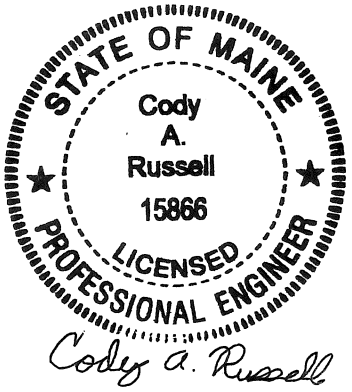
MAINE DEPARTMENT OF TRANSPORTATION
HIGHWAY PROGRAM
GEOTECHNICAL SECTION
AUGUSTA, MAINE

GEOTECHNICAL DESIGN REPORT

For the Replacement of

LARGE CULVERT #228492
ROUTE 127
WOOLWICH, MAINE

Prepared by:
Yueh-Ti Lee
Assistant Geotechnical Engineer



Reviewed by:
Cody Russell, P.E.
Senior Geotechnical Engineer

Sagadahoc County
WIN 27174.02

Soils Report 2026-10
February 5, 2026

PROJECT DETAILS

The purpose of this Geotechnical Design Report is to present subsurface information and make geotechnical design and construction recommendations for the replacement of an existing large culvert (#228492) consisting of a 72-inch diameter, 50-foot long aluminum pipe on Route 127 in Woolwich. The existing culvert is in poor condition and needs replacement both from an infrastructure and environmental standpoint. The culvert is located approximately 0.90 of a mile north of the Old Stage Road as shown in the attached Location Map. Route 127 is a Highway Corridor Priority 4 road.

The proposed replacement structure will be an 84-inch diameter, 88-foot long polymer coated corrugated steel pipe culvert. The invert of the proposed culvert is approximately 11.9 feet below the existing road grade at the roadway centerline. The roadway embankment slopes at the proposed culvert inlet and outlet shall be no steeper than 2H:1V to protect against erosion.

SUBSURFACE INVESTIGATION

One (1) boring (HB-WOO-101) and three (3) probes (HB-WOO-102, HB-WOO-103, and HB-WOO-104) were drilled for this project on September 6, 2023 by the MaineDOT drill crew using a trailer-mounted drill rig. Exploration locations are shown on the attached Boring Location Plan & Interpretive Subsurface Profile. Details and sampling methods used, field data obtained, and soil and groundwater conditions encountered are shown on the attached Boring Logs.

Boring HB-WOO-101 was drilled using solid stem auger, cased wash boring, and rock core drilling techniques. Soil samples were obtained in boring HB-WOO-101 at 5-foot intervals using Standard Penetration Test (SPT) methods. The MaineDOT drill rig is equipped with an automatic hammer to drive the split spoon. The MaineDOT calibrated automatic hammer delivers approximately 51 percent more energy during driving than the standard rope and cathead system. All N-values discussed in this report are corrected values (N_{60}) computed by applying an average energy transfer factor of 0.906 to the raw field N-values. Probes HB-WOO-102, HB-WOO-103, and HB-WOO-104 were drilled using solid stem auger drilling techniques. No soil samples were obtained in the probes.

The MaineDOT Geotechnical Team member selected the boring and probes locations, drilling methods, designated type and depth of sampling, reviewed field logs for accuracy and identified field and laboratory testing requirements. A NorthEast Transportation Training and Certification (NETTCP) certified Subsurface Investigator logged the subsurface conditions encountered. The boring and probe were located in the field by taping to surveyed site features after completion of the drilling program.

LABORATORY TESTING

A laboratory testing program was conducted to assist in soil classification, evaluation of engineering properties of the soils and geologic assessment of the project site. Laboratory testing consisted of three (3) standard grain size analyses with natural water content. The results of the

laboratory testing program are discussed in the following section and are shown on the attached Boring Logs, Laboratory Testing Summary Sheet, and Grain Size Distribution Curve sheet.

SUBSURFACE CONDITIONS

Subsurface conditions encountered in the test boring and probes were generally fill consisting of gravelly sand and sand underlain by glacial till consisting of sand underlain by bedrock. An interpretive subsurface profile depicting the generalized soil stratigraphy at the boring location is shown on the attached Boring Location Plan & Interpretive Subsurface Profile.

Boring HB-WOO-101 was drilled to refusal at a depth of approximately 12.6 feet below ground surface (bgs). Bedrock was cored in the boring for a total boring depth of approximately 17.6 feet bgs. Probes HB-WOO-102, HB-WOO-103, and HB-WOO-104 were drilled to depths of approximately 11.8 feet, 16.7 feet, and 14.0 feet bgs, respectively, where a refusal surface was encountered. The exact nature of the refusal surface was not determined in the probes.

The table below summarizes the field and laboratory information obtained in boring HB-WOO-101:

Approx. Depth BGS[1] (feet)	Soil Description	AASHTO[2] Classification	USCS[3]	WC%[4]
0.0 – 1.0	HMA Pavement	--	--	--
1.0 – 12.0	Fill: Brown, damp, gravelly fine to coarse sand, trace silt. Brown, damp, fine to coarse sand, some silt, some gravel. Boulder from 10.0 feet to 11.6 feet bgs.	A-1-b A-2-4	SW-SM SM	3.2 10.4
12.0 – 12.6	Till: Grey, wet, fine to coarse sand, some silt, some gravel.	A-2-4	SM	21.3
12.6 – 17.6	Bedrock	--	--	--

[1]BGS = below ground surface
[2]AASHTO = American Association of State Highway and Transportation Officials
[3]USCS = Unified Soil Classification System
[4]WC% = Water content in percent

Two (2) N_{60}-values obtained in the fill were 20 blows per foot (bpf) and 26 bpf, indicating that the fill is medium dense in consistency. No N_{60}-values were obtained in the glacial till.

Bedrock or a refusal surface was encountered at elevations ranging from approximately 36.3 feet to 41.5 feet in the vicinity of the proposed culvert. The approximate elevations of the top of bedrock or a refusal surface encountered at the boring and probe locations are shown in the attached Boring Logs.

The bedrock consists of interbedded pelite and sandstone of the Cape Elizabeth Formation. The Rock Quality Designation (RQD) of the bedrock was 72%, correlating to a Rock Quality of Fair.

Groundwater was not recorded in boring and probes. Groundwater levels can be expected to fluctuate subject to seasonal variations, local soil conditions, topography, precipitation, and construction activity.

GEOTECHNICAL DESIGN AND CONSTRUCTION RECOMMENDATIONS

The following sections discuss geotechnical recommendations for the design and construction of the proposed polymer-coated corrugated steel pipe culvert.

Polymer-Coated Corrugated Steel Pipe Culvert Design and Construction – The proposed replacement structure will consist of a 84-inch diameter, 88-foot long polymer-coated corrugated steel pipe culvert. The proposed structure inlet and outlet slopes shall be riprapped with slopes no steeper than 2H:1V to protect against erosion. The proposed polymer-coated corrugated steel pipe culvert shall be designed and constructed in accordance with MaineDOT Standard Specification 603. The invert of the proposed polymer-coated corrugated steel pipe culvert ranges from approximately 42.19 feet at the inlet end to approximately 40.62 feet at the outlet end with a slope of approximately 1.7%.

The full nature of the proposed culvert bearing surface will not become evident until the culvert excavation is made. Any cobbles or boulders encountered in excess of 6 inches shall be removed and replaced with compacted Granular Borrow Material for Underwater Backfill or Crushed Stone ¾-Inch. The prepared subgrade shall be proof-rolled using a static roller to visually confirm the prepared subgrade is firm and stable. The exposed subgrade shall be free of ponded water so that bedding material placement and compaction can be completed in the dry.

The proposed structure shall be bedded on a 1-foot thick layer of Granular Borrow, Material for Underwater Backfill meeting the requirements of MaineDOT Standard Specification 703.19. The soil envelope and backfill shall consist of Standard Specification 703.19 - Granular Borrow with a maximum particle size of 4 inches. The granular borrow bedding and backfill material shall be placed in lifts of 6 to 8 inches loose measure and compacted to the manufacturer's specifications or, in the absence of manufacturer's specifications. The bedding and backfill soil shall be compacted to at least 92 percent of the AASHTO T-180 maximum dry density. All subgrade surfaces should be protected from construction traffic in order to limit disturbance.

Bedrock Removal and Subgrade Preparation – The approximate invert of the proposed culvert ranges from an elevation of 42.19 feet at the inlet to 40.62 feet at the outlet. Constructing the culvert at this elevation may require removal of bedrock. The need for and depth of weathered bedrock removal will vary over the length of the polymer-coated corrugated steel pipe culvert. The bottom elevation of the excavation shall take into account the wall thickness of the culvert bottom and the required 1-foot layer of bedding material. The boring indicates that the Rock Quality of the bedrock is fair with a RQD of approximately 72 percent.

The bedrock surface shall be prepared in accordance with MaineDOT standard practices. The nature, slope, and degree of fracturing in the bedrock bearing surfaces will not be evident until the excavation from the polymer-coated corrugated steel pipe culvert is made. Construction activities should not be permitted to create any open fissures in the bedrock to remain. Any irregularities in the existing bedrock surface or irregularities created during the excavation process should be backfilled with crushed stone to the bottom of the required bedding material.

The Contractor shall remove any overburden soil and bedrock that can be removed using ordinary excavation equipment to expose the proposed bearing surface at the required elevation. The cleanliness and condition of the bedrock surface should be confirmed and accepted by the Resident prior to placing the structural bedding material. If soil is encountered at bedding material subgrade it shall be proof-rolled using multiple passes of a static roller to achieve a firm and stable surface for construction. Any cobbles, boulders, or loose bedrock encountered in excess of 6 inches shall be removed and replaced with compacted Granular Borrow Material for Underwater Backfill or Crushed Stone ¾-Inch.

Blasting shall be conducted in accordance with MaineDOT Standard Specifications Sections 105.2.7 and 203. The Contractor is required to conduct pre- and post-blast surveys, as well as blast vibrations monitoring at nearby structures in accordance with industry standards at the time of the blast.

It is anticipated that there will be seepage of water from fractures and joints exposed in the bedrock surface. Water should be controlled by pumping from sumps. The Contractor should maintain the excavation so that all work is completed in the dry.

Settlement – No settlement issues are anticipated at the site. The proposed polymer-coated corrugated steel pipe culvert is larger than the existing culvert and will result in a net unloading of the site soils at the proposed structure location. Placement of fill soils at the location of the existing structure is not anticipated to exceed the past loading condition of the site soils. Any settlement due to elastic compression of the bedding material will be immediate and negligible.

Scour and Riprap – Both the inlet and outlet of the polymer-coated corrugated steel pipe culvert shall be protected against scour with riprap conforming to MaineDOT Standard Specification Section 703.26 Plain and Hand Laid Riprap. The roadway embankment slopes at the proposed culvert inlet and outlet shall be no steeper than 2H:1V. No specific scour protection recommendations are needed other than armoring with riprap. The riprap on the slopes shall be underlain by a non-woven, Class 1 Erosion Control Geotextile meeting the requirements of MaineDOT Standard Specification 722.03 that is underlain by a 1-foot layer of protective aggregate cushion consisting of Granular Borrow Material for Underwater Backfill (703.19). The toe of the riprap sections shall be keyed into the existing soils 1 foot below the streambed elevation.

Construction Considerations – Construction activities will include construction of cofferdams and earth support systems to control stream flow during construction. Construction activities will also include common earth excavation. Construction of the corrugated metal pipe culvert will require soil excavation. Earth support systems shall be implemented if laying back slopes is not feasible. It is likely that the use of complex (four-sided) braced excavations with dewatering will

be necessary due to the depth of the excavation. If this is the case, adequate embedment into the native soils will be necessary to allow for the excavation and maintenance of a stable excavation bottom. All earth support systems shall be designed by a Professional Engineer licensed in the State of Maine. Regardless of the method of excavation, all excavations and earth support systems shall meet all applicable OSHA regulations.

The Contractor shall control groundwater and surface water infiltration using temporary ditches, sumps, granular drainage blankets, stone ditch protection or hand-laid riprap with geotextile underlayment to divert groundwater and surface water as needed to maintain a stable excavation and allow work in the dry.

Using the excavated native soils as backfill around the culvert shall not be permitted. The native soils may only be used as Common Borrow in accordance with MaineDOT Standard Specifications 203 and 703.

The Contractor will have to excavate the existing subbase and subgrade fill soils in the vicinity of the culvert. These materials should not be used to re-base the roadway. Excavated subbase sand and gravel may be used as fill below roadway subgrade level in fill areas provided all other requirements of MaineDOT Standard Specifications 203 and 703 are met.

CLOSURE

This report has been prepared for the use of the MaineDOT Highway Program and their project design consultant for specific application to the proposed replacement of a large culvert (#228492) under Route 127 in Woolwich, Maine in accordance with generally accepted geotechnical and foundation engineering practices. No other intended use or warranty is expressed or implied.

In the event that any changes in the nature, design, or location of the proposed project are planned, this report should be reviewed by a geotechnical engineer to assess the appropriateness of the conclusions and recommendations and to modify the recommendations as appropriate to reflect the changes in design. These analyses and recommendations are based in part upon a limited subsurface investigation at discrete exploratory location completed at the site. If variations from the conditions encountered during the investigation appear evident during construction, it may also become necessary to re-evaluate the recommendations made in this report.

It is recommended that a geotechnical engineer be provided the opportunity for a review of the design and specifications in order that the earthwork and foundation recommendations and construction considerations presented in this report are properly interpreted and implemented in the design and specifications.

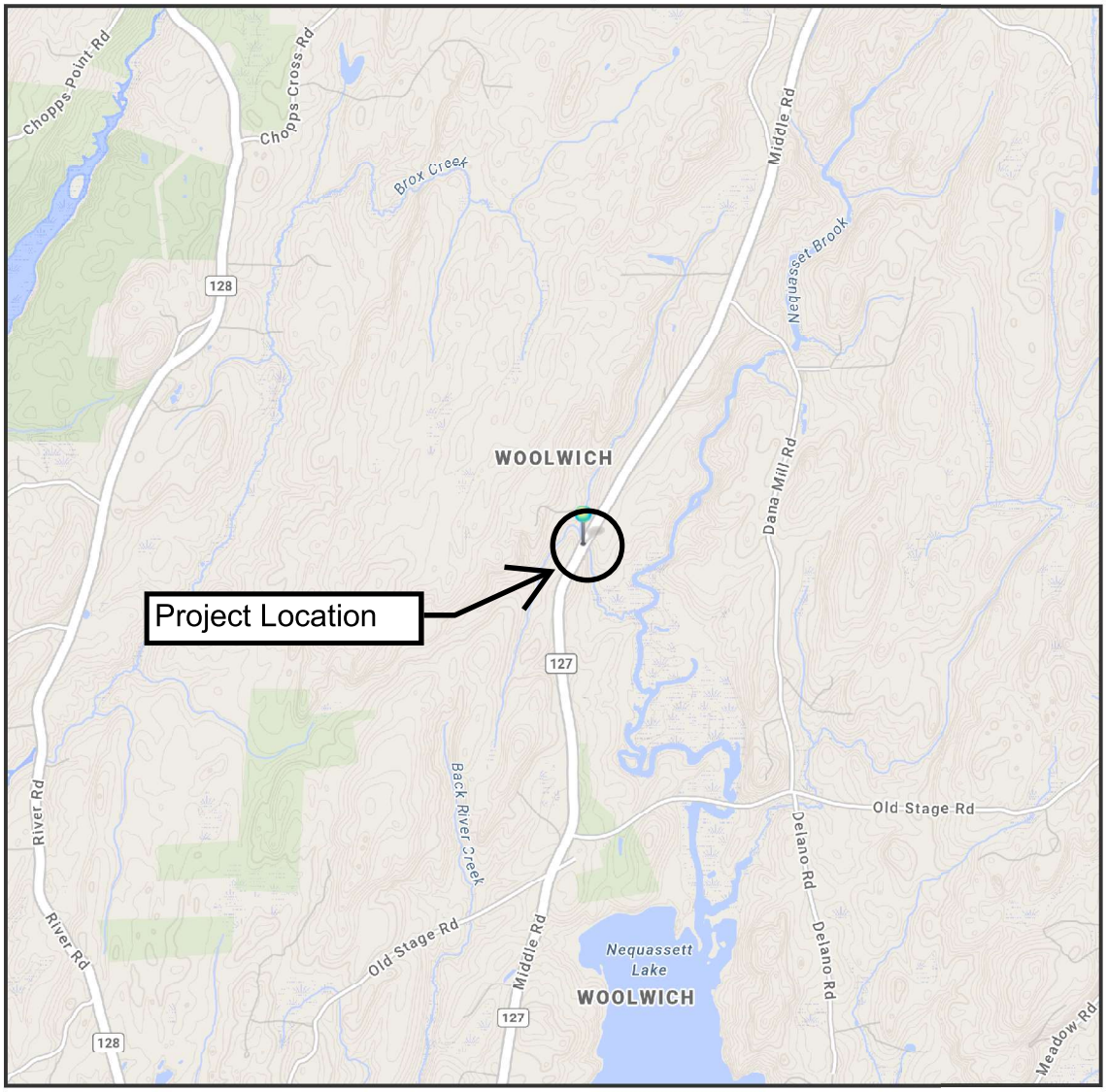
Attachments:

Location Map
Boring Location Plan & Interpretive Subsurface Profile
Key to Soil and Rock Descriptions and Terms
Boring Logs
Laboratory Testing Summary Sheet
Grain Size Distribution Curve Sheet

Date: 3/24/2026

Username: Yueh-Ti.Lee

WOOLWICH, MAINE



0.5 Miles

1 inch =0.57 miles

Date: 3/4/2026
Time: 10:14:38 AM

SHEET NUMBER 1 OF 2	WOOLWICH ROUTE 127 LOCATION MAP	STATE OF MAINE DEPARTMENT OF TRANSPORTATION WIN 027174.02 HIGHWAY PLANS

CURVE DATA
PI = 200+00.02
D = 02°51'53.24"
Δ = 03°25'11.08" (LT)
R = 2000.00'
L = 119.37'
T = 59.70'
E = 0.89'

1.5" MILL AND OVERLAY

PT = 200+59.68

STONE DITCH PROTECTION

STA 201+67
END TRANSITION
BEGIN FULL DEPTH CONSTRUCTION

STA 201+42
END PAVEMENT MILL AND 1.5" OVERLAY
BEGIN TRANSITION

STA 200+00
LIMIT OF WORK
BEGIN PAVEMENT MILL AND 1.5" OVERLAY

TO WOOLWICH
200+00
SAWCUT
201+00
N25°51'09.62"E
ROUTE 127
202+00
203+00
TO DRESDEN
204+00
N28°34'41.40"E

CL PROPOSED 7'-0" DIA. POLYMER COATED STEEL PIPE STA. 202+37

INSTALL PROPOSED STATE SUPPLIED 7' DIA X 88' POLYMER COATED STEEL PIPE

STA 203+22
END FULL DEPTH CONSTRUCTION
BEGIN TRANSITION

STA 203+47
END TRANSITION
BEGIN PAVEMENT MILL AND 1.5" OVERLAY

COFFERDAM

RIPRAP END TREATMENT

STA 204+25
END PAVEMENT MILL AND 1.5" OVERLAY
LIMITS OF WORK

HB-WOO-104
HB-WOO-102
HB-WOO-101
HB-WOO-103

REMOVE EXISTING CULVERT

INSTALL 18" X 24' OPT. 1

LEGEND
CASED WASH BORING
PROBE

RIPRAP DOWNSPOUT

PT = 203+98.81

STONE DITCH PROTECTION

CONSTRUCT RIPRAP DOWNSPOUT TO STA 201+65, 58' RT

RIPRAP END TREATMENT

SPECIAL FILL AS NEEDED

COFFERDAM

CURVE DATA
PI = 203+15.58
D = 01°38'13.28"
Δ = 02°43'31.79" (RT)
R = 3500.00'
L = 166.49'
T = 83.26'
E = 0.99'

PC = 202+32.32

PLAN

25 0 25 50
Scale of Feet

200+00 201+00 202+00 203+00 204+00 205+00

GRAVEL TRANSITION 25'-0"
155'-0" FULL DEPTH RECONSTRUCTION
GRAVEL TRANSITION 25'-0"

VCL = 205'
HLSD = 84'
E = 5.153'

PVC = STA. 201+42.24
ELEV. = 58.15

LOW POINT = STA. 202+42.76
ELEV. = 53.19

PVI = STA. 202+44.74
ELEV. = 48.04'

PVT = STA. 203+47.24
ELEV. = 58.54

G = -9.86%

G = 10.25%

STA 200+00
LIMIT OF WORK
BEGIN PAVEMENT MILL AND 1.5" OVERLAY

STA 204+25
END PAVEMENT MILL AND 1.5" OVERLAY
LIMIT OF WORK

4" HMA
20" A.S.C.G.
EXISTING SURFACE
PROFILE GRADE LINE

STA 201+42
END MILL AND OVERLAY
BEGIN TRANSITION

STA 201+67
END TRANSITION
BEGIN FULL DEPTH RECONSTRUCTION

STA 201+70.50
BEGIN GRANULAR BORROW TRANSITION

FROST TRANSITION (GRANULAR BORROW)

STA 203+47
END TRANSITION
BEGIN PAVEMENT MILL AND 1.5" OVERLAY

STA 203+22
END FULL DEPTH RECONSTRUCTION
BEGIN TRANSITION

STA. 203+03.50
END GRANULAR BORROW TRANSITION

Brown, damp, medium dense, Gravelly fine to coarse SAND, trace silt; and fine to coarse SAND, some silt, some gravel, (Fill).

Grey, wet, fine to coarse SAND, some silt, some gravel, (Till).

R1: BOULDER

EL. 40.6

R2: Bedrock: Interbedded PELITE and SANDSTONE, [Cape Elizabeth Formation]. Rock Quality = Fair

RQD = 72%

BOE

LIMIT OF STRUCTURAL EXCAVATION
REMOVE EXISTING 48" PIPE AND CONCRETE BOX
LIMIT OF STRUCTURAL EXCAVATION AND GRANULAR BORROW
STATE SUPPLIED 7' DIA X 88' POLYMER COATED STEEL PIPE SEE SPECIAL PROVISION 603 - PIPE CULVERTS AND STORM DRAINS
1' OF STRUCTURAL EXCAVATON BELOW GRADE AND GRANULAR BORROW MATERIAL FOR UNDERWATER BACKFILL

85 80 75 70 65 60 55 50 45 40 35

LEGEND
Weathered Bedrock, if applicable
Approximate Top of Bedrock
Rock Core, if Shown
Pavement Thickness, if applicable
RQD
Rock Quality Designation of Bedrock Core Sample
BOE = Bottom of Exploration
NR = No Refusal
50 = Refusal

PROFILE
HORIZ 25 0 25 50
VERT 5 0 5 10
SCALE

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

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
27174.02
WIN 027174.02
HIGHWAY PLANS

SIGNATURE
P.E. NUMBER
DATE

PROJ MANAGER	M ROONEY	
DESIGNED BY	S. KELLY	03/07/26
CHECKED/REVIEWED	T WHITE	MAR 2026
DESIGN CHECKED BY	P.T. LEE	
DESIGN CHECKED BY		
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
REVISIONS 5		
DELETIONS		

WOOLWICH
ROUTE 127
BORING LOCATION PLAN & INTERPRETIVE SUBSURFACE PROFILE

SHEET NUMBER
2
OF 2

Date: 3/25/2026
Username: Terry.White

Filename: \\st-fs01\Data\Bentley\WIN ORD\WIN\27174.02\HIGHWAY\PlanProfile_Route127_Guardrail.dgn

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
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 (little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly-graded gravels, gravel sand mixtures, little or no fines.
		GRAVEL WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (more than half of coarse fraction is smaller than No. 4 sieve size)	CLEAN SANDS (little or no fines)	SW	Well-graded sands, Gravelly sands, little or no fines
			SP	Poorly-graded sands, Gravelly sand, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures
			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.
			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.
			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.

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

MODIFIED BURMISTER SYSTEM

Descriptive Term	Portion of Total (%)
trace	0 - 10
little	11 - 20
some	21 - 35
adjective (e.g. Sandy, Clayey)	36 - 50

TERMS DESCRIBING DENSITY/CONSISTENCY

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).

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

Fine-grained soils (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.

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

Rock Quality Designation (RQD):

$$RQD\ (\%) = \frac{\text{sum of the lengths of intact pieces of core* > 4 inches}}{\text{length of core advance}}$$

*Minimum NQ rock core (1.88 in. OD of core)

Rock Quality Based on RQD

Rock Quality	RQD (%)
Very Poor	≤25
Poor	26 - 50
Fair	51 - 75
Good	76 - 90
Excellent	91 - 100

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 quality (very poor, poor, etc.)
ref: ASTM D6032 and FHWA NHI-16-072 GEC 5 - Geotechnical Site Characterization, Table 4-12
Recovery (inch/inch and percentage)
Rock Core Rate (X.X ft - Y.Y ft (min:sec))

Sample Container Labeling Requirements:

WIN
Bridge Name / Town
Boring Number
Sample Number
Sample Depth
Blow Counts
Sample Recovery
Date
Personnel Initials

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Route 127 Large Culvert Replacement
Location: Woolwich, Maine

Boring No.: HB-WOO-101
WIN: 27174.00

Driller:	MaineDOT	**Elevation (ft.)**	53.2	**Auger ID/OD:**	5" Solid Stem
Operator:	Daggett/Andrle	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	C. Russell	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	9/6/2023; 08:30-10:30	**Drilling Method:**	Cased Wash Boring	**Core Barrel:**	NQ-2"
Boring Location:	202+30.3, 7.0 ft Rt.	**Casing ID/OD:**	NW-3"	**Water Level*:**	Hole caved at 7.4 ft bgs.
Hammer Efficiency Factor: 0.906		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
T_v = 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 No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			12" HMA.	
								52.2		1.0	
	1D	24/4	1.00 - 3.00	5/6/7/5	13	20				Brown, damp, medium dense, Gravelly fine to coarse SAND, trace silt, (Fill).	G#379654 A-1-b, SW-SM WC=3.2%
5	2D	24/15	5.00 - 7.00	16/11/6/8	17	26				Brown, damp, medium dense, fine to coarse SAND, some silt, some gravel, (Fill).	G#379655 A-2-4, SM WC=10.4%
10	R1	19.2/17	10.00 - 11.60				64	43.2		10.0	
							25			Auger REFUSAL at 10.0 ft bgs. Dropped in NW Casing. R1: BOULDER. R1: Core Times (min:sec) 10.0-11.0 ft (1:07) dropped from 10.8-11.0 ft bgs. 11.0-11.6 ft (1:03)	
	3D	2.4/2.4	12.00 - 12.20	30(2.4")	---		a30	41.2			G#379656 A-2-4, SM WC=21.3%
	R2	60/54	12.60 - 17.60	RQD = 72%			NQ-2	40.6		12.0 a30 blows for 0.6 ft. Grey, wet, fine to coarse SAND, some silt, some gravel, (Till).	
15										12.6 Top of Bedrock at Elev. 40.6 R2: Bedrock: Interbedded PELITE and SANDSTONE, [Cape Elizabeth Formation]. Rock Quality = Fair R2: Core Times (min:sec) 12.6-13.6 ft (2:02) 13.6-14.6 ft (2:07) 14.6-15.6 ft (2:57) 15.6-16.6 ft (3:14) 16.6-17.6 ft (2:53) 90% Recovery	
								35.6		17.6	
20										**Bottom of Exploration at 17.6 feet below ground surface.**	
25											

Remarks:

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.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Route 127 Large Culvert Replacement

Location: Woolwich, Maine

Boring No.: HB-WOO-102

WIN: 27174.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	53.3	**Auger ID/OD:**	5" Dia.
Operator:	Daggett/Andrle	**Datum:**	NAVD88	**Sampler:**	N/A
Logged By:	C. Russell	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	9/6/2023; 11:50-12:05	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	202+50.1, 6.5 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Spilt Spoon Sample; S = Sample off Auger Flights; B = Bucket Sample off Auger Flights; MD = Unsuccessful Split Spoon Sample Attempt; U = Thin Wall Tube Sample; MV = Unsuccessful Field Vane Shear Test Attempt; V = Field Vane Shear Test, PP= Pocket Penetrometer
MU = Unsuccessful Thin Wall Tube Sample 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 1 Person; S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf); $S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf); q_p = Unconfined Compressive Strength (ksf); N-value = Raw Field SPT N-value; T_v = Pocket Torvane Shear Strength (psf); WC = Water Content, percent ≅ = Similar or Equal too
LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0						SSA			Probe, no material samples taken.	
5										
10										
							41.5		11.8	
									Bottom of Exploration at 11.8 feet below ground surface. Auger REFUSAL	
15										
20										
25										

Remarks:

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.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Route 127 Large Culvert Replacement

Location: Woolwich, Maine

Boring No.: HB-WOO-103

WIN: 27174.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	53.0	**Auger ID/OD:**	5" Dia.
Operator:	Daggett/Andrle	**Datum:**	NAVD88	**Sampler:**	N/A
Logged By:	C. Russell	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	9/6/2023; 10:40-10:55	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	202+48.3, 8.0 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Spilt Spoon Sample; S = Sample off Auger Flights; B = Bucket Sample off Auger Flights; MD = Unsuccessful Split Spoon Sample Attempt; U = Thin Wall Tube Sample; MV = Unsuccessful Field Vane Shear Test Attempt; V = Field Vane Shear Test, PP= Pocket Penetrometer
MU = Unsuccessful Thin Wall Tube Sample 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 1 Person; S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf); $S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf); q_p = Unconfined Compressive Strength (ksf); N-value = Raw Field SPT N-value; T_v = Pocket Torvane Shear Strength (psf); WC = Water Content, percent ≅ = Similar or Equal too
LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0						SSA			Probe, no material samples taken.	
5										
10										
15										
							36.3		16.7 **Bottom of Exploration at 16.7 feet below ground surface.** Auger REFUSAL	
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Route 127 Large Culvert Replacement

Location: Woolwich, Maine

Boring No.: HB-WOO-104

WIN: 27174.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	53.3	**Auger ID/OD:**	5" Dia.
Operator:	Daggett/Andrle	**Datum:**	NAVD88	**Sampler:**	N/A
Logged By:	C. Russell	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	9/6/2023; 11:15-11:40	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	202+20.4, 6.6 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Spilt Spoon Sample; S = Sample off Auger Flights; B = Bucket Sample off Auger Flights; MD = Unsuccessful Split Spoon Sample Attempt; U = Thin Wall Tube Sample; MV = Unsuccessful Field Vane Shear Test Attempt; V = Field Vane Shear Test, PP= Pocket Penetrometer
MU = Unsuccessful Thin Wall Tube Sample 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 1 Person; S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf); $S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf); q_p = Unconfined Compressive Strength (ksf); N-value = Raw Field SPT N-value; T_v = Pocket Torvane Shear Strength (psf); WC = Water Content, percent ≅ = Similar or Equal too
LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0						SSA			Probe, no material samples taken.	
5										
10										
15							39.3		14.0 **Bottom of Exploration at 14.0 feet below ground surface.** Auger REFUSAL	
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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State of Maine - Department of Transportation

Laboratory Testing Summary Sheet

Town(s): Woolwich Work Number: 27174.02

Boring & Sample Identification Number	Station (Feet)	Offset (Feet)	Depth (Feet)	Reference Number	G.S.D.C. Sheet	W.C. %	L.L.	P.I.	Classification		
									Unified	AASHTO	Frost
HB-WOO-101, 1D	202+30.3	7.0 Rt.	1.0-3.0	379654	1	3.2			SW-SM	A-1-b	0
HB-WOO-101, 2D	202+30.3	7.0 Rt.	5.0-7.0	379655	1	10.4			SM	A-2-4	II
HB-WOO-101, 3D	202+30.3	7.0 Rt.	12.0-12.2	379656	1	21.3			SM	A-2-4	II

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

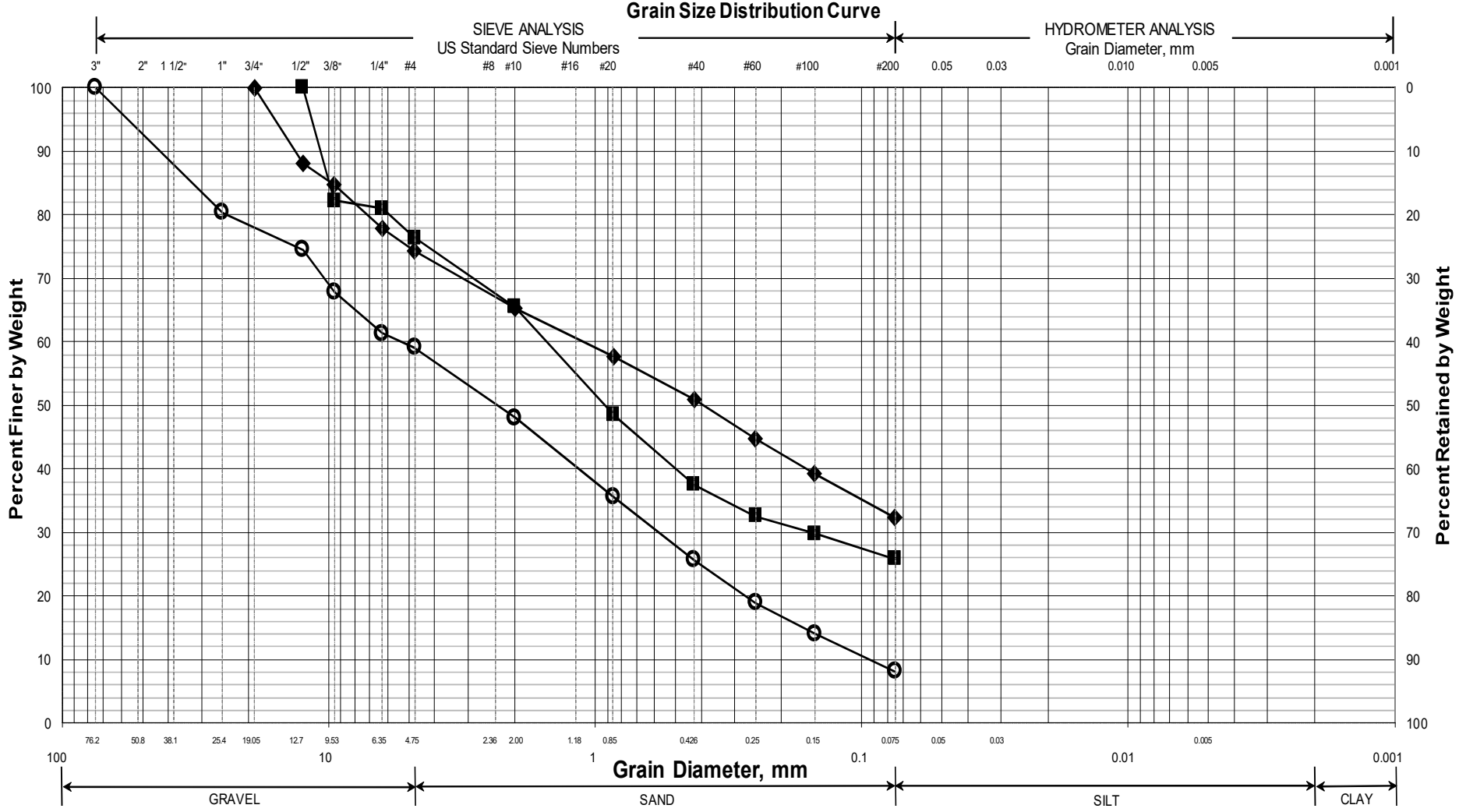
GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)

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

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

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

Maine Department of Transportation
Grain Size Distribution Curve



UNIFIED CLASSIFICATION

	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	WC, %	LL	PL	PI
○	HB-WOO-101/1D	202+30.3	7.0 RT	1.0-3.0	Gravelly SAND, trace silt.	3.2			
◆	HB-WOO-101/2D	202+30.3	7.0 RT	5.0-7.0	SAND, some silt, some gravel.	10.4			
■	HB-WOO-101/3D	202+30.3	7.0 RT	12.0-12.2	SAND, some silt, some gravel.	21.3			
●									
▲									
×									

WIN
027174.02
Town
Woolwich
Reported by/Date
WHITE, TERRY A 1/30/2026