REPORT

Preliminary Geotechnical Data Report

Interstate 95 Bridges 1427 and 5800 over Stillwater Avenue, Bangor, Maine (WIN 0274176.00)

Submitted to:

Maine Department of Transportation

Submitted by:

WSP USA, Inc.

428 Dow Highway Eliot, Maine 03903

207.865.4024

WIN 027176.00 / WSP US0025840.3905

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1.0 INTRODUCTION

This Preliminary Geotechnical Data Report (PGDR) summarizes the results of the geotechnical subsurface investigation and laboratory testing program of site soils and rock that WSP USA Inc. (WSP) performed to support the replacement of Bridge No. 1427 & No. 5800 that carries Interstate 95 (I-95) over Stillwater Avenue in Bangor, Maine. Figure 1 shows the site location.

2.0 PROJECT UNDERSTANDING

WSP reviewed the historical drawings[1] for the two existing I-95 bridges over Stillwater Avenue including historical boring logs provided by MaineDOT. The existing structures were constructed in 1960 and consist of two (2) three-span bridges with two (2) piers and two (2) abutments each.

3.0 GEOLOGIC SETTING

Available site geology information, consisting of surficial[2] geologic maps of the area indicate subsurface conditions consist of road embankment fills overlying Pleistocene Presumpscot Formation glaciomarine deposits generally consisting predominantly of silt and fine sand.

Available site geology information, consisting of bedrock[3] geologic maps of the area indicate bedrock in the region is mapped as the Medium bedded facies of the Penobscot River Member of the Silurian-aged Bangor Formation of the Vassalboro Group, consisting of medium to dark gray, fine-grained to very fine-grained, metawacke; a metamorphosed impure, poorly sorted sandstone with appreciable clay minerals. The 1958 historical Kenduskeag Avenue boring logs[1] characterize bedrock as phyllite (a general term for metamorphosed clay-rich rocks).

4.0 SUBSURFACE INVESTIGATIONS

4.1 Geotechnical Borings

WSP completed six (6) borings (BB-BSA-102, BB-BSA-103, BB-BSA-108, BB-BSA-109, BB-BSA-109A, and BB-BSA-110) within the paved roadway of Stillwater Avenue beyond the extents of the existing bridges in May 2024 and seven (7) borings (BB-BSA-101, BB-BSA-104, BB-BSA-104A, BB-BSA-105, BB-BSA-106, BB-BSA-107, and BB-BSA-111) within the paved roadway of I-95 beyond the existing bridge abutments in July 2024. The as-drilled boring locations and elevations are summarized in Table 1 and boring locations with respect to existing site features are illustrated in the Boring Location Plan in Figure 2.

The field program included Standard Penetration Testing (SPT) of predominantly coarse-grained soils and recovery of rock core from the bedrock. A WSP geotechnical engineer monitored drilling activities, selected sampling intervals, logged subsurface conditions encountered, and obtained soil samples for use in visual descriptions and subsequent laboratory testing and classification.

WSP subcontracted Seaboard Drilling, LLC (Seaboard) of Bangor, Maine, who completed the borings using a Diedrich D-50 drill rig for all borings. Borings were advanced using solid stem augers (SSA) followed by 4-inch or

[1] Maine State Highway Commission, 1960 Final As Built Plans, Project No. I-95-8(6)180, Interstate #95 over Stillwater Ave. in the City of Bangor, Penobscot County, Plans and Profiles, 41 sheets, Received from HNTB, Filename: 1427 & 5800 Bangor 1958 As-Built.pdf.

[2] Syverson, K.M., Thompson, A.M., and Johnston, R.A., (2011). Surficial Geology, Bangor Quadrangle, Maine. Open-File No. 11-6, Maine Geological Survey, 1 sheet, scale 1:24,000.

[3] Pollock, S.G., Johnston, R.A., (2011). Bedrock Geology of the Bangor Quadrangle, Maine, Open-File No. 11-57, Maine Geological Survey, 1 sheet, scale 1:240,000.

3-inch casing and drive and wash methods to refusal; rock coring was performed in either 4-inch or 3-inch casing seated in rock, depending on the drilling conditions.

SPT was performed using a calibrated automatic hammer system and standard 2-inch split spoon sampler in general accordance with American Society for Testing and Materials (ASTM) D1586. Sampling was conducted at approximately 5-foot intervals, where split spoons were advanced 24 inches with a 140-pound hammer dropped 30 inches. WSP recorded the number of hammer blows required to advance the sampler through each 6-inch increment. Measured, uncorrected N-values, calculated as the sum of the hammer blows to advance the sampler during the 6-inch to 18-inch intervals. Seaboard provided WSP with a copy of the automatic hammer calibration report from November 2023[4] for both drill rigs used. WSP used a calibrated hammer energy transfer ratio of 106.6% for the May borings and 108.7% for the July borings provided by in the report convert the measured N-values to N_{60} values. Uncorrected N-values and N_{60} are shown on the boring logs (Appendix A). WSP collected and stored soil samples in sealed glass jars for later evaluation and laboratory testing.

Up to 10 feet of rock core was collected in each boring using NX size (1-7/8-inch diameter) diamond tipped core barrels following either refusal of casing or failure to advance the split spoon sampler or roller bit. Rock core samples were placed in wooden boxes and transported to the WSP office. WSP recorded the lithology, Total Core Recovery (TCR), Rock Quality Designation (RQD), and coring rates for each core run which are provided in the boring logs in Appendix A. Photographs of all collected rock core are presented in Appendix B.

The boring logs provided in Appendix A present details of the sampling methods used, field data obtained, and soil and rock conditions encountered during the investigation. A description of the boring log symbols and terms used for the soil and rock descriptions precedes the boring logs. A WSP geotechnical engineer monitored drilling activities, selected sampling intervals, logged subsurface conditions encountered, and obtained soil samples for use in visual descriptions and subsequent laboratory testing and classification WSP field characterized the soils in accordance with ASTM D2488. WSP field characterized the bedrock lithology.

4.2 Geologic Evaluation of Exposed Rock Cuts

On April 23, 2024, WSP visited the Stillwater Avenue site to collect geological data from the exposed rock cuts along Stillwater Avenue beneath the I-95 existing bridge foundations. Locations are shown in Appedix D. During the site visit, WSP measured 37 geologic discontinuities and photographed existing rock cut conditions. Our discontinuity measurements and observations are presented in Table 2 (attached) and include discontinuity type, orientation, persistence, aperture, infilling materials, estimated strength, surface roughness, shape, spacing, and groundwater conditions. Our measured discontinuity orientations are plotted in Appendix D.1.

5.0 LABORATORY TESTING PROGRAM

After reviewing the collected samples in the office, WSP transferred select samples to GeoTesting Express (GTX) of Acton, Massachusetts for geotechnical laboratory testing in accordance with applicable AASHTO and ASTM testing procedures. The types and numbers of each of the laboratory tests conducted on soil samples and rock core are presented in Table 5-1. Soil testing results are included on the boring logs in Appendix A. Complete soil and rock laboratory testing results are provided in Appendix C.

[4] GRL Engineers, Inc., SPT Energy Calibration on November 2, 2023, Submitted to Eric Baron of S.W. Cole Explorations, LLC (now known as Seaboard Drilling LLC) on November 10, 2023.

Table 5-1: Number and Type of Laboratory Tests Performed

Laboratory Test	Test Standard	No. Tests Completed
Moisture content	AASHTO T267, ASTM D2216	18
Grain size analysis (coarse)	AASHTO T88, ASTM D6913	37
Grain size (fine)	AASHTO T88, ASTM D7928	12
Atterberg limits	AASHTO T89 / T90, ASTM D4318	11
Chlorides	AASHTO T291, ASTM D512	2
pH	AASHTO T289, ASTM D4972	2
Sulfates	AASHTO T290	2
Electric Resistivity	ASTM G57	1
Elastic Moduli of Rock in Uniaxial Compression - Rock	ASTM D7012 Method D	6

6.0 SUBSURFACE CONDITIONS

The boring logs in Appendix A provide detailed descriptions of the soil, bedrock, and measured groundwater conditions encountered in the borings.

Soils: The soils encountered in the borings generally consist of fill materials placed during construction of the bridge and roadway and naturally occurring sand deposits, clay deposits, sand and gravel interpreted as glacial till. Table 6-1 summarizes the major stratigraphic units, the range of thicknesses, and generalized material descriptions for soils encountered.

Table 6-1: Summary of Subsurface Fill and Soil Encountered

Stratigraphic Unit	Approximate Range in Encountered Thickness (feet)	Generalized Description
Asphalt	0.5 to 0.8	Asphalt pavement approximately 5-inch to 10-inch thick (*Encountered in all borings)*
Fill	2.6 to 20	The fill consists of olive brown to brown or grey to brown, dry to moist, medium dense to very dense, hard, fine to coarse Sand or SILT, with trace to little fine to coarse gravel, and non-plastic to slightly plastic. USCS: SM, ML, GM. AASHTO: A-1-b (0), A-4 (0), A-2-4 (0) *(Encountered in all borings)*
Sand, Silt, Gravel	1.3 to 22	Olive to brown to grey, moist to wet, medium dense to very dense, very stiff to hard, fine to coarse SAND or SILT with varying amounts of fine to coarse GRAVEL, and non-plastic to slightly plastic. USCS: SM, ML, GM, SC. AASHTO: A-2-4 (0), A-4 (0) *(Encountered in BB-BSA-101, -102, -105, -106, -107, -108, and -109)*

Stratigraphic Unit	Approximate Range in Encountered Thickness (feet)	Generalized Description
Clay	3 to 14.5	Grey with brown and olive, wet, very soft to hard, CLAY, trace to little fine sand, trace gravel, medium plasticity with interbedded silt or sand lenses. USCS: CL. AASHTO: A–6 (9, 10, 11, 15, 18, 19, 37) *(Encountered in BB-BSA-104, -106, -107, and -111))*
Glacial Till	3 to 10.3	Grey with brown to olive, wet, very dense to hard, fine to coarse SAND and fine to coarse GRAVEL, with varying amounts of silt and gravel, non-plastic, and weathered rock fragments. USCS: SM, GM, ML. AASHTO: A-1-b (0), A-4 (0) *(Encountered in BB-BSA-104, -106, -107, and -111)*

Notes: USCS classification from laboratory testing in accordance with ASTM D2487. AASHTO classification from laboratory testing and includes Group Classification and Group Index in parentheses in accordance with AASHTO M145.

Bedrock: Bedrock was cored for each boring location. Bedrock cores for BB-BSA-104 and BB-BSA-109 were taken at the offset borings BB-BSA-104A and BB-BSA-109A respectively. For the borings performed from Stillwater Avenue, top of bedrock surface ranged from 3.5 feet bgs (EL. 123.5 feet NAVD88) to 12.2 feet bgs (EL. 121.3 feet NAVD88). For the borings performed from I-95, top of bedrock ranged from 17.8 feet bgs (130.5 feet NAVD88) to 63.8 feet bgs (EL. 79.8 feet NAVD88). The bedrock was described as grey, very fine to fine grained, very thinly to thinly bedded, Metawacke [metasandstone] with calcite veins, medium strong to very strong, slightly to moderately weathered.

Rock quality designation (RQD) is a common parameter that is used to help assess the competency of sampled bedrock. RQD is defined as the sum of pieces of recovered bedrock greater than 4 inches in length divided by the total length of the core run. RQD values for bedrock encountered at the site ranges between 0 and 88 percent, which generally correlates to Rock Mass Quality ratings of very poor to good.

Groundwater: Groundwater levels were measured in all borings except BB-BSA-104, BB-BSA-104A, and BB-BSA-109. Groundwater was measured before the casing was withdrawn and at the end of the drilling day. Groundwater elevations vary from approximately EL. 123.1 feet to EL. 135.1 feet (NAVD88), ground water levels encountered at the time of drilling may have been influenced by the drilling methods used. Groundwater levels will fluctuate due to soil conditions and topography and seasonal variations in precipitation. Groundwater levels encountered during construction may differ from those recorded from the borings.

7.0 CONDITIONS OF EXPOSED ROCK CUTS

Rock Mass Rating (RMR) and Geological Strength Index (GSI) values were calculated for the existing rock cut exposures along Stillwater Avenue and for the rock core collected in each boring for comparison. The RMR system[5] assigns numerical ratings to six parameters, including strength of the intact rock, RQD, discontinuity spacing, discontinuity surface conditions, groundwater conditions, and orientation of discontinuities. These ratings

[5] Bieniawski, Z.T. 1989. Engineering Rock Mass Classifications: A Complete Manual for Engineers and Geologists in Mining, Civil, and Petroleum Engineering. John Wiley & Sons.

are summed to provide the RMR value. The GSI system[6] assigns a numerical rating to qualitative estimates of the lithology, discontinuity structure, and discontinuity surface conditions in a rock mass.

To determine the RMR, WSP used the discontinuities described in each rock cut exposure or core run and the RQD measured in each core run to assign ratings. We used the discontinuity orientations measured in the rock cuts to assign rating adjustments for the discontinuity sets that we identified as having unfavorable orientations relative to the existing foundation orientation (i.e., kinematically susceptible to sliding or toppling failure). The proposed foundation orientation may allow for a different rating adjustment for discontinuity orientation, and thus a modification to the RMR value. Our calculated RMR values are summarized in Table 2 (attached) for the measured rock cut exposures and Table 3 (attached) for the boring rock core runs. Full RMR calculations including the individual parameter ratings are provided in Appendix D.2. Based on our field observations and measurements at the Stillwater Avenue bridge site, we estimate that:

- RMR values range from 40 to 79 and average 63 for the exposed rock cuts from 37 discontinuities evaluated..
- RMR values range from 26 to 72 and average 44 for the rock core runs from 30 runs.

To determine the GSI, WSP used the discontinuity structure observed in the existing rock cuts and the discontinuity surface conditions described in the rock cuts and core runs to assign a rating. We selected the GSI value from the range established by Marinos and Hoek[6] for typical sandstone lithologies. The GSI chart is presented in Appendix D.3. Based on our field observations and measurements, we estimate a GSI value of 55 for the exposed rock cuts at the Stillwater Avenue bridge site.

8.0 REPORT AND EXPLORATION LIMITATIONS

This Preliminary Geotechnical Data Report (PGDR) was prepared for the replacement of I-95 Bridge No. 1427 & Bridge No. 5800 over Stillwater Ave in Bangor, Maine. The professional services provided by WSP for this project include only the geotechnical aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this report and have not been investigated or addressed.

[6] Marinos, Paul and Hoek, Evert. November 2000. GSI: a geologically friendly tool for rock mass strength estimation. ISRM International Symposium, Melbourne, Australia, paper number ISRM-IS-2000-035,

Signature Page

WSP USA, Inc.

Melissa E. Landon, PhD, PE
Lead Consultant, Geotechnical Engineering

Jeffrey D. Lloyd, PE
Assistant Vice President, Geotechnical Engineering

RJN/MEL/JDL

https://wsponlinenam.sharepoint.com/sites/us-win02609500/shared documents/06 deliverables/stillwater geotech data report/hntb stillwater ave bangor win 027176.00 wsp pgdr.docx

TABLES

Table 1: Summary of Subsurface Explorations
Geotechnical Data Report
MaineDOT I-95 Bridge Over Stillwater Avenue, Bangor, Maine
MaineDOT WIN 027176.00

	As-Drilled Locations[4]				Approximate Strata Thickness (feet)									
	Test Boring No.[1,2,3]	Northing	Easting	Ground Suface Elevation[4] (feet NAVD88)	Asphalt	Fill	Sand, Silt, Gravel[6]	Clay	Glacial Till	Weathered Bedrock	Approximate Top of Bedrock Depth (feet bgs[5])	Approximate Elevation of Top of Bedrock (feet NAVD88)	Approximate Bottom of Exploration Depth (ft) (feet bgs[5])	Approximate Elevation of Bottom of Exploration (feet NAVD88)
South bound Bridge #1427	BB-BSA-101	482856.27	1735264.27	150.5	0.6	12.9	15.0	NE[5]	3.0	NE[5]	31.5	119.0	41.5	109.0
	BB-BSA-102	482969.08	1735451.57	133.5	0.6	4.4	7.2	NE[5]	NE[5]	NE[5]	12.2	121.3	22.2	111.3
	BB-BSA-103	482888.01	1735425.94	132.1	0.6	2.5	NE[5]	NE[5]	NE[5]	4.1	7.2	124.9	17.2	114.9
	BB-BSA-104	483018.96	1735602.84	151.9	0.8	14.7	NE[5]	3.0	4.5	NE[5]	23.0	128.9	23.5	128.4
	BB-BSA-104A	483017.59	1735600.99	152.0	0.7	NE[5]	NE[5]	NE[5]	NE[5]	NE[5]	20.4	131.6	31.0	121.0
	BB-BSA-105	482984.90	1735593.56	152.1	0.8	12.3	11.9	NE[5]	NE[5]	1.4	26.4	125.7	36.2	115.9
North bound Bridge #5800	BB-BSA-106	482611.20	1735095.82	143.6	0.8	18.2	22.0	12.5	10.3	NE[5]	63.8	79.8	74.1	69.5
	BB-BSA-107	482578.95	1735092.78	143.1	0.5	20.0	18.5	14.5	9.9	NE[5]	63.4	79.7	77.2	65.9
	BB-BSA-108	482749.52	1735322.13	129.5	0.6	2.6	3.5	NE[5]	NE[5]	NE[5]	6.7	122.8	16.7	112.8
	BB-BSA-109	482636.37	1735255.48	127.0	0.7	8	1.3	NE[5]	NE[5]	0.1	NE[5]	NE[5]	10.1	116.9
	BB-BSA-109A	482637.93	1735257.73	127.0	NE[5]	NE[5]	NE[5]	NE[5]	NE[5]	NE[5]	3.5	123.5	14.0	113.0
	BB-BSA-110	482660.73	1735292.34	127.5	0.6	4.7	NE[5]	NE[5]	NE[5]	NE[5]	5.3	122.2	15.3	112.2
	BB-BSA-111	482728.68	1735418.07	148.3	0.6	8.9	NE[5]	4.0	4.3	NE[6]	17.8	130.5	29.0	119.3

Notes:

1. Boring locations are shown in Figure 2 - Boring Location Plan of the Preliminary Geotechnical Data Report.

2. Borings BB-BSA-102, BB-BSA-103, BB-BSA-108, BB-BSA-109, BB-BSA-109A, and BB-BSA-110 were performed by Seaboard Drilling, LLC in May, 2024. Borings BB-BSA-101, BB-BSA-104, BB-BSA-104A, BB-BSA-105, BB-BSA-106, BB-BSA-107, and BB-BSA-111 were performed by Seaboard Drilling, LLC in July, 2024.

3. Boring logs are presented in Appendix A of the Preliminary Geotechnical Data Report.

4. As drilled Boring Locations Derived from the Electronic file "Ground.dgn" Provided to WSP by HNTB on August 12, 2024.

5. bgs = below ground surface, NE = not encountered

6. This layer mainly consists of silty Sand or sandy Silt, but includes Gravel with some sand in borings BB-BSA-102 and BB-BSA-108 strata layers.

Prepared By: RJN
Checked By: LMP
Reviewed By: MEL

Table 2: Summary of Rock Cut Discontinuities
Preliminary Geotechnical Design Report
Bridge #1427 & #5800, I-95 over Stillwater Ave, Bangor, Maine
MaineDOT WIN 027176.00

Outcrop Area	Discontinuity ID	Discontinuity Type	Dip [degrees]	Uncorrected Dip Direction State Plane Grid North [degrees]	Corrected Dip Direction State Plane Grid North[1] [degrees]	Set[2]	Persistence [ft]	Aperture [in]	Infilling	Infilling Shear Strength[3]	Surface Roughness	Discontinuity Shape	Water	Discontinuity Spacing [ft]	Notes/Comments[4]	RMR
Stillwater Ave Northbound	1	bedding	32	348	333	5	10	0.13	none	-	rough	undulating to stepped	dry	0.2		40
	2	joint	84	229	214	3	15	0.25	lichen	low	slightly rough	planar	dry	1.5		64
	3	joint	88	245	230	3	3	0.50	none	-	slightly rough	planar	dry	2.8		78
	4	joint	85	265	250	2	8	0.25	lichen	low	smooth	planar	dry	0.9		46
	5	joint	11	243	228	1	5	0.13	none	-	smooth	undulating	dry	5.9		78
	6	joint	83	186	171	4	10	0.06	none	-	slightly rough	planar	dry	1.6		72
	7	bedding	25	335	320	5	10	tight	none	-	rough	stepped	dry	0.3		49
	8	joint	8	100	85	1	3	0.50	sandy soil	medium	smooth	planar	dry	5.9		73
	9	joint	75	50	35	3	15	0.06	none	-	slightly rough	planar	dry	1.1	Quartz veins 0.25" thick in vicinity	58
	10	joint	10	58	43	1	20	0.75	quartz	high	slightly rough	planar	dry	1.0		52
	11	joint	64	4	349	-	4	0.75	quartz	high	rough	irregular	dry	3.7		64
	12	joint	83	41	26	3	12	0.06	none	-	slightly rough	planar	dry	4.5		66
	13	joint	65	278	263	2	6	0.13	none	-	slightly rough	stepped	dry	5.4		54
	14	joint	4	48	33	1	10	0.50	quartz	high	slightly rough	undulating	dry	0.9		63
	15	joint	83	133	118	2	5	tight	none	-	smooth	planar	dry	5.1		68
	16	joint	8	124	109	1	10	0.38	broken rock	high	rough	undulating	dry	1.3		67
	17	joint	89	357	342	4	15	0.06	roots	low	slightly rough	undulating	dry	2.5		71
	18	joint	67	213	198	-	15	tight	none	-	smooth	undulating	dry	2.5		78
	19	joint	87	20	5	4	15	0.06	none	-	rough	stepped	dry	1.8		71
	20	joint	88	124	109	2	15	0.25	topsoil	low	slightly rough	planar	dry	1.7		47
	21	bedding	21	26	11	5	6	0.06	none	-	smooth	stepped	dry	0.4		42
	22	joint	80	278	263	2	10	0.13	none	-	slightly rough	planar	dry	1.8	Shotcrete and dowel repair 2 ft north	54
	23	joint	10	111	96	1	22.5	0.25	quartz	high	smooth	planar	dry	2.0		64
	24	joint	18	65	50	1	20	tight	none	-	slightly rough	undulating	dry	1.4		72
	25	joint	85	190	175	4	15	tight	none	-	slightly rough	planar	dry	2.3		79
	26	joint	59	212	197	-	15	1.50	quartz	high	smooth	planar	dry	2.2	Blast fragmentation to south	67
	27	joint	31	106	91	1	10	0.50	roots, topsoil	low	smooth	planar	dry	4.0		68
	28	joint	25	5	350	5	10	0.50	quartz, broken rock	high	rough	undulating	dry	1.8		69
	29	joint	81	10	355	4	10	0.13	broken rock	high	rough	planar	dry	2.2		74
	30	joint	10	220	205	1	24.8	0.50	broken rock	high	slightly rough	planar	dry	1.6		67
	31	joint	84	55	40	3	4.5	0.50	roots, sandy soil	low	slightly rough	planar	dry	2.3		69

Table 2: Summary of Rock Cut Discontinuities
Preliminary Geotechnical Design Report
Bridge #1427 & #5800, I-95 over Stillwater Ave, Bangor, Maine
MaineDOT WIN 027176.00

Outcrop Area	Discontinuity ID	Discontinuity Type	Dip [degrees]	Uncorrected Dip Direction State Plane Grid North [degrees]	Corrected Dip Direction State Plane Grid North[(1)] [degrees]	Set[(2)]	Persistence [ft]	Aperture [in]	Infilling	Infilling Shear Strength[(3)]	Surface Roughness	Discontinuity Shape	Water	Discontinuity Spacing [ft]	Notes/Comments[(4)]	RMR
Stillwater Ave Southbound	32	joint	76	329	314	-	3.9	0.25	sandy soil	medium	very rough	undulating	dry	0.9		66
	33	joint	72	183	168	4	3.5	0.13	sandy soil	medium	rough	planar to stepped	dry	0.2		53
	34	joint	66	278	263	2	-	0.13	sandy soil	medium	very rough	planar	dry	0.3		40
	35	joint	17	62	47	1	9.7	0.50	none	-	rough	undulating	dry	2.0		74
	36	joint	88	219	204	3	2.9	0.13	sandy soil	medium	smooth	planar	dry	0.6		60
	37	joint	89	262	247	2	3.4	0.25	none	-	smooth	stepped	dry	0.4		41

(1) Dip direction data corrected for magnetic declination (15 degrees west).
(2) See Appendix E for stereonets.
(3) Shear strength of infilling materials as follows:
Low = friction angle < 20 degrees
Medium = 20 degrees < friction angle < 30 degrees
High = 30 degrees < friction angle
(4) Discontinuity measurements were collected on April 23, 2024.

Prepared by: KAR
Checked by: BK
Reviewed by: JDL

Table 3: **Summary of Rock Core Quality**
Preliminary Geotechnical Design Report
Bridge #1427 & #5800, I-95 over Stillwater Ave, Bangor, Maine
MaineDOT WIN 027176.00

Test Boring Designation	Core Size	Run						TCR [1]		RQD [2]			Physical Rock Parameters			Lithologic, Rock Mass and Discontinuity Description[5,6]
		No.	Midpoint Depth Below Bedrock Surface	Depth Below Ground Surface (ft)			Length	Length		Length		Designation	Weathering[3]	Estimated Field Strength[3]	Rock Mass Rating [RMR][4]	
	(in)		(ft)	Start	End	Midpoint	(ft)	(ft)	%	(ft)	%					
BB-BSA-101	NX (1.88)	R1	0.4	31.5	32.4	32.0	0.9	0.8	89%	0.00	0%	Very Poor	Slightly Weathered (W2)	Very Strong (R5)	31	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with calcite veins, very strong, slightly weathered; discontinuities low angle to steep dipping, very close to close spacing, smooth to very rough, tight to open, highly fractured, clay infilling at bottom of run [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R2	1.2	32.4	32.9	32.7	0.5	0.5	100%	0.00	0%	Very Poor	Slightly Weathered (W2)	Strong (R4) to Very Strong (R5)	30	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone], clay and sand infilling at the top of run, strong to very strong, slightly weathered; discontinuities low angle to steep dipping, very close spacing, rough, open, highly fractured [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R3	3.2	32.9	36.5	34.7	3.6	3.6	100%	0.50	14%	Very Poor	Slightly Weathered (W2) to Fresh (W1)	Strong (R4) to Very Strong (R5)	39	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with frequent calcite veins, strong to very strong, slightly weathered to fresh; discontinuities low angle to steep dipping, very close to close spacing, rough to very rough, tight to open, average 3.5 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R4	7.5	36.5	41.5	39.0	5.0	5.0	100%	3.00	60%	Fair	Fresh (W1)	Strong (R4)	56	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with frequent calcite veins, strong, fresh; discontinuities low angle to steep dipping, very close spacing, rough to very rough, tight, average 1.6 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
BB-BSA-102	NX (1.88)	R1	2.5	12.2	17.2	14.7	5.0	4.5	90%	2.58	52%	Fair	Slightly Weathered (W2)	Strong (R4) to Extremely Strong (R6)	40	Grey, very fine to fine grained, thinly to thickly laminated, METAWACKE [metasandstone], frequent thin to thick calcite veins, strong to extremely strong, slightly weathered; discontinuities moderately to steeply dipping, close to moderately close spacing, irregular to planar, smooth to very rough, open; average 3.2 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R2	7.5	17.2	22.2	19.7	5.0	4.9	98%	4.38	88%	Good	Fresh (W1)	Extremely Strong (R6)	72	Grey, very fine to fine grained, thinly laminated, METAWACKE [metasandstone], frequent calcite veins, extremely strong, fresh; discontinuities horizontal dipping, close to wide spacing, irregular to planar, smooth to very rough, open; average 0.2 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].

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Preliminary Geotechnical Design Report
Bridge #1427 & #5800, I-95 over Stillwater Ave, Bangor, Maine
MaineDOT WIN 027176.00

Test Boring Designation	Core Size	Run						TCR [1]		RQD [2]			Physical Rock Parameters			Lithologic, Rock Mass and Discontinuity Description[5,6]
		No.	Midpoint Depth Below Bedrock Surface	Depth Below Ground Surface (ft)			Length	Length		Length		Designation	Weathering[3]	Estimated Field Strength[3]	Rock Mass Rating [RMR][4]	
	(in)		(ft)	Start	End	Midpoint	(ft)	(ft)	%	(ft)	%					
BB-BSA-103	NX (1.88)	R1	2.5	7.2	12.2	9.7	5.0	5.0	100%	1.54	31%	Poor	Slightly Weathered (W2)	Extremely Strong (R6)	44	Grey, very fine to fine grained, METAWACKE [metasandstone] with thin calcite veins and thick quartz veins, extremely strong, thinly laminated, slightly weathered; discontinuities low angle to steep dipping, very close to close spacing, stepped to irregular, very rough to smooth, open; average 4.0 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R2	7.5	12.2	17.2	14.7	5.0	5.0	100%	3.50	70%	Fair	Fresh (W1)	Extremely Strong (R6)	62	Grey, very fine to fine grained, METAWACKE [metasandstone] with thin calcite and quartz veins, extremely strong, thinly laminated, fresh; discontinuities moderately dipping, close to moderately close spacing, stepped to irregular, rough, open; average 0.8 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
BB-BSA-104A	NX (1.88)	R1	3.1	21.0	26.0	23.5	5.0	4.8	95%	2.80	56%	Fair	Slightly Weathered (W2) to Fresh (W1)	Strong (R4) to Very Strong (R5)	41	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with frequent calcite veins, strong to very strong, slightly weathered to fresh, clay and sand infilling 22.5 ft to 23 ft; discontinuities low angle to steep dipping, very close to close spacing, rough to very rough, tight to open, average 1.6 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R2	7.0	26.0	28.8	27.4	2.8	2.1	75%	1.70	61%	Fair	Fresh (W1)	Strong (R4) to Very Strong (R5)	58	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with calcite veins, strong to very strong, fresh; discontinuities low angle to moderate dipping, very close spacing, rough to very rough, tight, average 0.5 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R3	9.5	28.8	31.0	29.9	2.2	2.0	91%	0.50	23%	Very Poor	Fresh (W1)	Strong (R4) to Very Strong (R5)	41	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone], strong to very strong, fresh; discontinuities low angle to steep dipping, very close spacing, rough, tight to open, average 3.5 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
BB-BSA-105	NX (1.88)	R1	2.5	26.4	31.4	28.9	5.0	5.0	100%	1.50	30%	Poor	Slightly Weathered (W2) to Fresh (W1)	Strong (R4)	41	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with calcite veins, strong, slightly weathered to fresh; discontinuities low angle to steep dipping, very close to close spacing, rough to very rough, tight to open, average 3.2 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R2	7.4	31.4	36.2	33.8	4.8	4.8	100%	3.60	75%	Fair	Fresh (W1)	Very Strong (R5)	58	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with calcite veins, very strong, fresh; discontinuities low angle to steep dipping, very close spacing, smooth to rough, tight, average 1.6 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].

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Test Boring Designation	Core Size	Run						TCR [1]		RQD [2]			Physical Rock Parameters			Lithologic, Rock Mass and Discontinuity Description[5,6]
		No.	Midpoint Depth Below Bedrock Surface	Depth Below Ground Surface (ft)			Length	Length		Length		Designation	Weathering[3]	Estimated Field Strength[3]	Rock Mass Rating [RMR][4]	
	(in)		(ft)	Start	End	Midpoint	(ft)	(ft)	%	(ft)	%					
BB-BSA-106	NX (1.88)	R1	0.5	63.8	64.8	64.3	1.0	0.3	30%	0.00	0%	Very Poor	Slightly Weathered (W2) to Fresh (W1)	Strong (R4) to Very Strong (R5)	36	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with calcite veins, strong to very strong, slightly weathered to fresh; discontinuities low angle dipping, very close to close spacing, rough to very rough, tight to open [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R2	3.1	64.8	69.1	67.0	4.3	4.3	100%	2.00	47%	Poor	Fresh (W1)	Strong (R4) to Very Strong (R5)	35	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with frequent calcite veins, strong to very strong, fresh with chemical weathering 67.4 ft to 68.3 ft, sand infilling 67.9 ft to 68.3 ft; discontinuities low angle to vertical dipping, very close to close spacing, smooth to rough, tight to open, average 3.3 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R3	7.8	69.1	74.1	71.6	5.0	5.0	100%	3.10	62%	Fair	Fresh (W1)	Weak (R2)	45	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with frequent calcite veins, weak, fresh; discontinuities low angle to steep dipping, very close to close spacing, rough to very rough, tight to open, average 1.4 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
BB-BSA-107	NX (1.88)	R1	2.3	63.4	67.2	65.3	3.8	0.6	16%	0.00	0%	Very Poor	Highly Weathered (W4)	Strong (R4)	26	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone], strong, highly weathered with clay and sand infilling from 64.2 ft to 67.2; discontinuities low angle to steep dipping, close spacing, rough to very rough, open, highly fractured [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R2	4.7	67.2	68.2	67.7	1.0	0.2	17%	0.00	0%	Very Poor	Highly Weathered (W4)	Strong (R4)	27	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone], strong, highly weathered with clay and sand infilling; discontinuities low angle dipping, close spacing, very rough, open, highly fractured [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R3	7.2	68.2	72.2	70.2	4.0	3.8	95%	1.41	35%	Poor	Slightly Weathered (W2)	Strong (R4) to Very Strong (R5)	36	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with calcite veins, strong to very strong, slightly weathered, occasional moderate to severe chemical weathering with sand infilling; discontinuities low angle to steep dipping, very close to close spacing, rough to very rough, tight to open, average 3.5 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R4	11.7	72.2	77.2	74.7	5.0	5.0	100%	1.96	39%	Poor	Slightly Weathered (W2)	Strong (R4) to Very Strong (R5)	36	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with calcite veins, strong to very strong, slightly weathered, occasional moderate to severe chemical weathering with sand and clay infilling; discontinuities low angle to steep dipping, very close to close spacing, rough to very rough, tight to open, average 3.2 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].

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MaineDOT WIN 027176.00

Test Boring Designation	Core Size	Run						TCR [1]		RQD [2]			Physical Rock Parameters			Lithologic, Rock Mass and Discontinuity Description[5,6]
		No.	Midpoint Depth Below Bedrock Surface	Depth Below Ground Surface (ft)			Length	Length		Length		Designation	Weathering[3]	Estimated Field Strength[3]	Rock Mass Rating [RMR][4]	
	(in)		(ft)	Start	End	Midpoint	(ft)	(ft)	%	(ft)	%					
BB-BSA-108	NX (1.88)	R1	2.5	6.7	11.7	9.2	5.0	4.9	98%	2.92	58%	Fair	Slightly Weathered (W2)	Very Strong (R5) to Extremely Strong (R6)	51	Grey, very fine to fine grained, METAWACKE [metasandstone] with frequent calcite veins, very to extremely strong, thinly laminated, slightly weathered; discontinuities moderate to steep dipping, close to moderately close spacing, rough to polished, open; average 2.6 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R2	5.5	11.7	12.7	12.2	1.0	0.9	92%	0.42	42%	Poor	Slightly Weathered (W2) to Fresh (W1)	Extremely Strong (R6)	51	Grey, very fine to fine grained, METAWACKE [metasandstone] with some calcite veins, extremely strong, thinly laminated, fresh to slightly weathered; discontinuities low angle to steep dipping, very close to close spacing, planar to stepped, rough to smooth, open; average 1.0 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R3	7.0	12.7	14.7	13.7	2.0	1.8	88%	0.33	17%	Very Poor	Slightly Weathered (W2) to Fresh (W1)	Extremely Strong (R6)	45	Grey, very fine to fine grained, METAWACKE [metasandstone] with some calcite veins, extremely strong, thinly laminated, fresh to slightly weathered; discontinuities low angle to steep dipping, very close to close spacing, planar to stepped, rough to smooth, open; average 2.5 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R4	9.0	14.7	16.7	15.7	2.0	1.9	96%	0.71	35%	Poor	Slightly Weathered (W2) to Fresh (W1)	Extremely Strong (R6)	48	Grey, very fine to fine grained, METAWACKE [metasandstone] with some calcite veins, extremely strong, thinly laminated, fresh to slightly weathered; discontinuities low angle to steep dipping, very close to close spacing, planar to stepped, rough to smooth, open; average 2.0 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
BB-BSA-109A	NX (1.88)	R1	2.9	4.0	8.8	6.4	4.8	4.6	95%	1.42	30%	Poor	Slightly Weathered (W2) to Fresh (W1)	Very Strong (R5) to Extremely Strong (R6)	43	Grey, very fine grained, METAWACKE [metasandstone] with frequent calcite veins, very to extremely strong, thinly laminated, fresh to slightly weathered; discontinuities steep dipping, close spacing, planar to stepped, rough to smooth, open; average 2.1 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R2	7.9	8.8	14.0	11.4	5.2	5.1	99%	2.54	49%	Poor	Fresh (W1)	Very Strong (R5) to Extremely Strong (R6)	49	Grey, very fine grained, METAWACKE [metasandstone] with frequent calcite veins (0.1 to 0.7 in thick), very to extremely strong, thinly laminated, fresh; discontinuities low angle to steep dipping, very close to moderately close spacing, planar to stepped, rough to smooth, open; average 1.8 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
BB-BSA-110	NX (1.88)	R1	2.5	5.3	10.3	7.8	5.0	4.8	95%	2.46	49%	Poor	Fresh (W1)	Medium Strong (R3)	43	Grey, very fine grained, METAWACKE [metasandstone] with frequent thick and thin calcite veins, medium strong, thinly laminated, fresh; discontinuities horizontal to steep dipping, close to moderately close spacing, stepped, smooth to polished, open; average 1.0 fractures per foot [MEDIUM BEDDEDFACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R2	7.5	10.3	15.3	12.8	5.0	5.0	100%	3.54	71%	Fair	Fresh (W1)	Very Strong (R5) to Extremely Strong (R6)	54	Grey, very fine grained, METAWACKE [metasandstone] with frequent thick and thin calcite veins, very to extremely strong, thinly laminated, fresh; discontinuities steep dipping, close to wide spacing, stepped, smooth, open; average 0.8 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].

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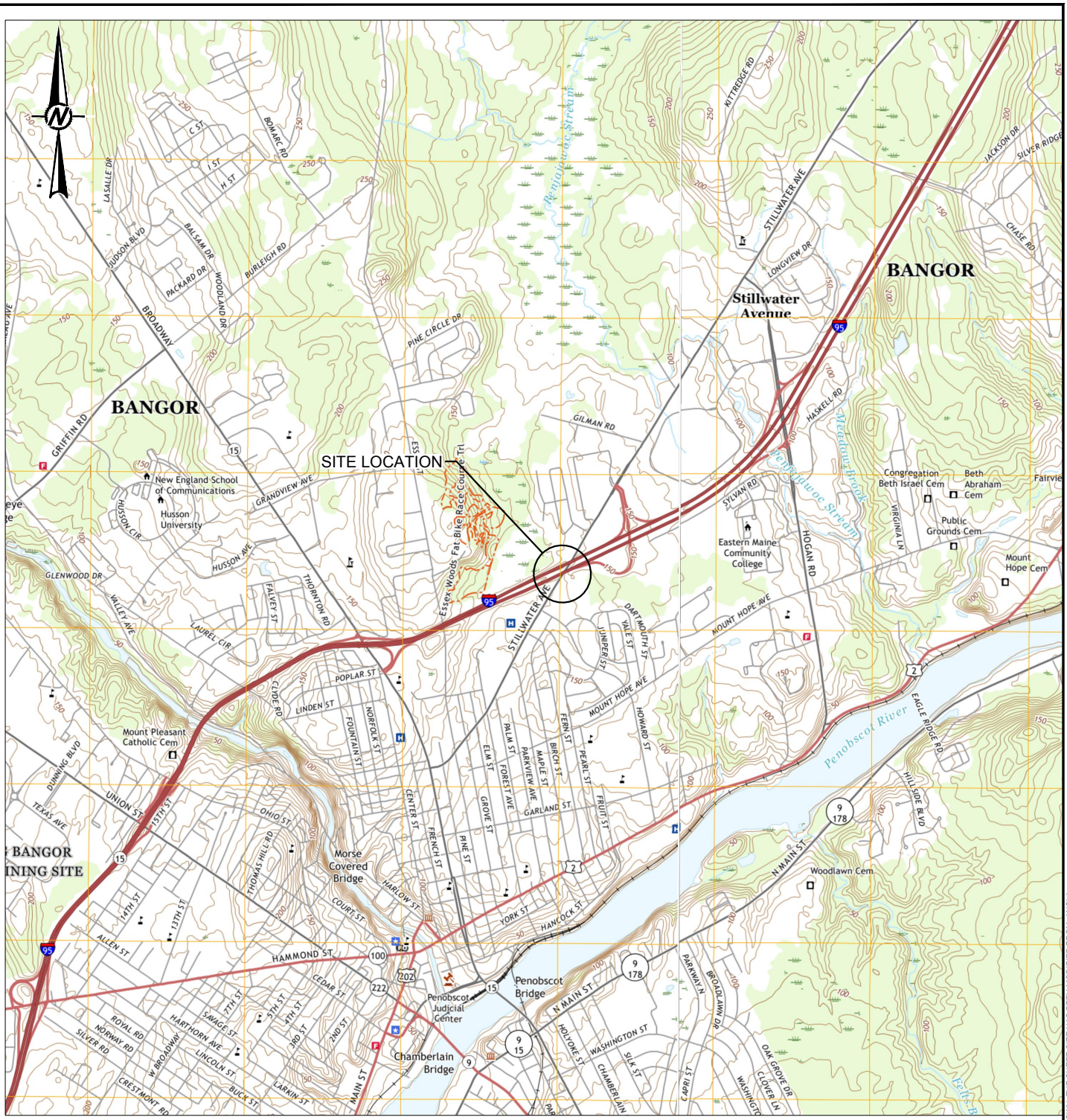
		No.	Midpoint Depth Below Bedrock Surface	Depth Below Ground Surface (ft)			Length	Length		Length		Designation	Weathering[3]	Estimated Field Strength[3]	Rock Mass Rating [RMR][4]	
	(in)		(ft)	Start	End	Midpoint	(ft)	(ft)	%	(ft)	%					
BB-BSA-111	NX (1.88)	R1	3.7	19.0	24.0	21.5	5.0	3.4	68%	0.75	15%	Very Poor	Slightly Weathered (W2)	Strong (R4) to Very Strong (R5)	37	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with frequent calcite veins, strong to very strong, slightly weathered with signs of chemical weathering; discontinuities low angle to steep dipping, close to very close spacing, rough to very rough, open to tight, highly fractured average from 19 ft to 21.3 ft [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].
		R2	8.7	24.0	29.0	26.5	5.0	5.0	100%	3.00	60%	Fair	Fresh (W1)	Strong (R4) to Very Strong (R5)	54	Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with frequent calcite veins, strong to very strong, fresh; discontinuities low angle dipping, very close spacing, rough, tight, average 1.6 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].

Notes:

1. TCR = total core recovery. Total core recovery is the length of core recovered divided by the length of the run.
2. RQD = rock quality designation. RQD is the total length of intact, full diameter core pieces recovered with a length greater than or equal to 4 inches measured along the core axis. The percent RQD is the total length of RQD measured divided by the run length. Note that vertical discontinuities are not included in determination of RQD.
3. Weathering and Estimated Field Strength based on Tables II.4 and II.3 (respectively) in Wyllie and Mah, 2004, Rock Slope Engineering: Civil and Mining, 4th Edition (based on ISRM, 1981).
4. Rock Mass Rating (RMR) System (Bieniawski, 1989) assigns numerical ratings to six parameters, including the strength of the intact rock, the RQD, the discontinuity spacing, groundwater conditions, and orientation of discontinuities. These ratings are summed to provide the RMR value. The rating adjustment for joint orientation was assigned a value of -4, which is the average of the orientation adjustments obtained from geologic field mapping of the exposed rock outcrops and which is based on the existing rock cut orientation. The proposed foundation orientation may allow for a different rating adjustment for joint orientation, and thus a modification to the RMR value shown on this table.
5. Bedrock formation name from: Pollock, Stephen G. 2011. Bedrock geology of the Bangor Quadrangle, Maine. Maine Geological Survey Open-File No. 11-57. Map scale 1:24,000.
6. ft = feet, in = inches

Prepared by: KAR
Checked by: BK
Reviewed by: JDL

FIGURES



REFERENCE(S)

1. BASE MAP TAKEN FROM U.S.G.S. 7.5 MINUTE QUADRANGLES OF BANGOR AND VEAZIE, MAINE DATED 2021

0 1500 3000
1" = 3000' FEET

CLIENT
HNTB CORPORATION
82 RUNNING HILL ROAD, SUITE 201
SOUTH PORTLAND, ME 04106

CONSULTANT
wsp

YYYY-MM-DD	2024-08-14
DESIGNED	DEB
PREPARED	AM
REVIEWED	MEL
APPROVED	

PROJECT
DESIGN BUILD PHASE I
I-95 BRIDGE NO. 1427 & 5800 OVER STILLWATER AVENUE
BANGOR, ME (WIN 027176.00)

TITLE
SITE LOCATION MAP

PROJECT NO.	CONTROL	REV.	FIGURE
US0025840.3905	0001-001	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 1 in

Last Edited By: usam7/01004 Date: 2024-08-14 Time:9:48:43 AM | Printed By: USAM7/01004 Date: 2024-08-14 Time:9:54:44 AM
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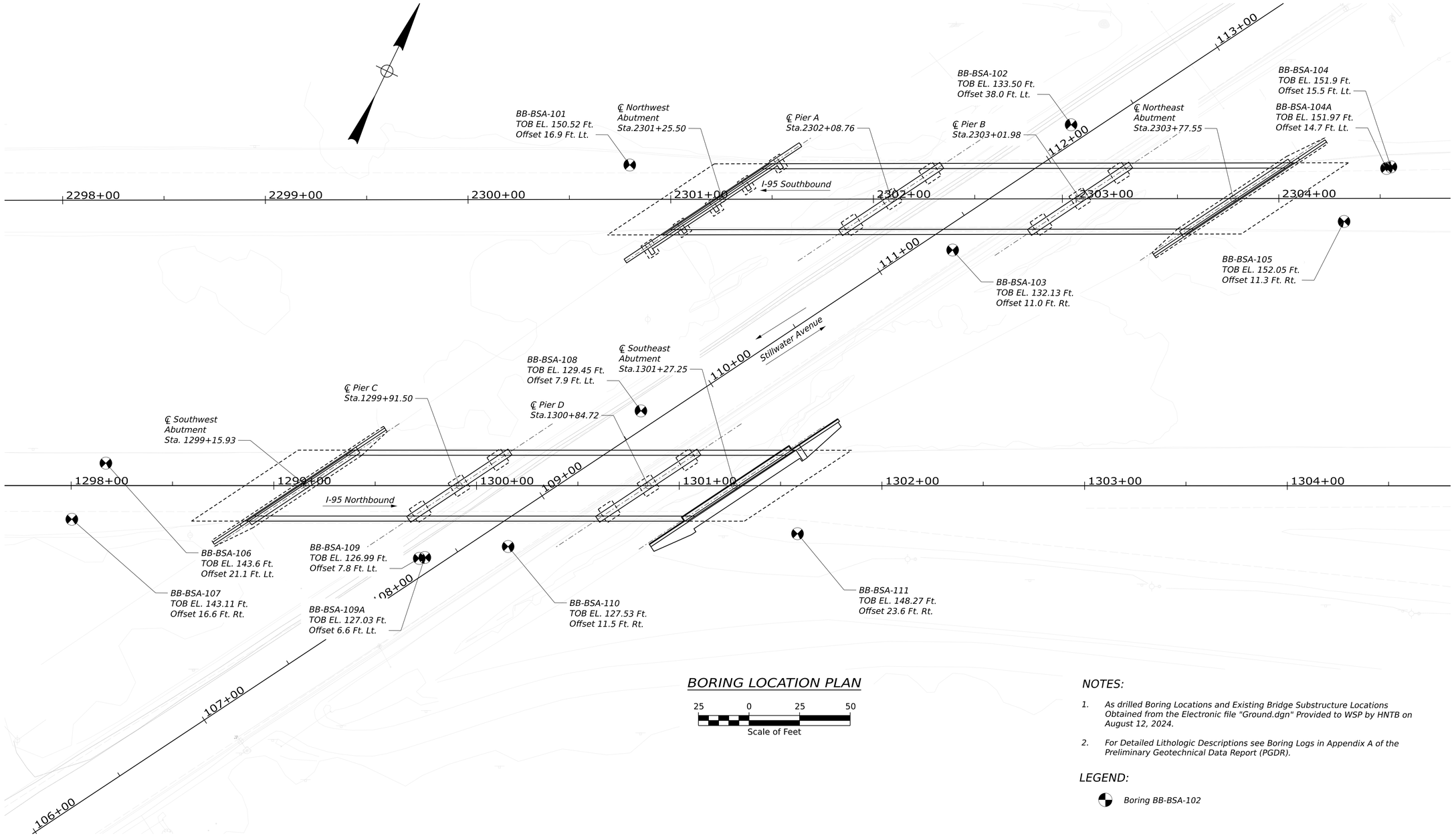

BORING LOCATION PLAN

25 0 25 50
Scale of Feet

NOTES:

1. *As drilled Boring Locations and Existing Bridge Substructure Locations Obtained from the Electronic file "Ground.dgn" Provided to WSP by HNTB on August 12, 2024.*
2. *For Detailed Lithologic Descriptions see Boring Logs in Appendix A of the Preliminary Geotechnical Data Report (PGDR).*

LEGEND:

Boring BB-BSA-102

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

027176.00

WIN
027176.00

BRIDGE PLANS

SIGNATURE

P.E. NUMBER

DATE

	BY	DATE
PROJ. MANAGER		
DESIGN-DETAILED		
CHECKED-REVIEWED		
DESIGN2-DETAILED2		
DESIGN3-DETAILED3		
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

BANGOR PENOBSCOT COUNTY
I-95 NB & SB OVER STILLWATER AVE

BORING LOCATON PLAN

SHEET NUMBER

02

OF 02

Date: 9/13/2024

Username: gomezni

Filename: c:\bms\wsp-pb-us-pw-02\wsp__nevin.gomez\d0895958\03_Stillwater_BorPlan.dgn

APPENDIX A

Boring Logs

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_{60}-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_{60}-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

Table A-2

Classification of Rock Material Strengths[1]

Grade	Description	Field Identification	Approx. Range of Uniaxial Compressive Strength	
			MPa	psi
S1	Very soft clay	Easily penetrated several inches by fist	<0.025	<4
S2	Soft clay	Easily penetrated several inches by thumb	0.025-0.05	4-7
S3	Firm clay	Can be penetrated several inches by thumb with moderate effort	0.05-0.10	7-15
S4	Stiff clay	Readily indented by thumb but penetrated only with great effort	0.10-0.25	15-35
S5	Very stiff clay	Readily indented by thumbnail	0.25-0.50	35-70
S6	Hard clay	Indented with difficulty by thumbnail	>0.50	>70
R0	Extremely weak rock	Indented by thumbnail	0.25-1.0	35-150
R1	Very weak rock	Crumbles under firm blows with point of geological hammer; can be peeled by a pocket knife	1-5	150-725
R2	Weak rock	Can be peeled by a pocket knife with difficulty; shallow indentations made by firm blow with point of geological hammer	5-25	725-3,500
R3	Medium strong rock	Cannot be scraped or peeled with a pocket knife; specimen can be fractured with single firm blow of geological hammer	25-50	3,500-7,000
R4	Strong rock	Specimen requires more than one blow of geological hammer to fracture it	50-100	7,000-15,000
R5	Very strong rock	Specimen requires many blows of geological hammer to fracture it	100-250	15,000-36,000
R6	Extremely strong rock	Specimen can only be chipped with geological hammer	>250	>36,000

Note: Grades S1 to S6 apply to cohesive soils, for example clays, silty clays, and combinations of silts and clays with sand, generally slow draining. Discontinuity wall strength will generally be characterized by grades R0-R6 (rock) while S1-S6 (clay) will generally apply to filled discontinuities.

[1] International Society for Rock Mechanics (ISRM), Commission on standardization of laboratory and field tests (1978): Suggested methods for the quantitative description of discontinuities in rock masses. Int. J. Rock Mech. Min. Sci. & Geomech. Abstr., Vol. 15, No. 6, pp. 319-368.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-101
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	150.52	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/29/24 (21:00); 7/30/24 (3:15)	**Drilling Method:**	SSA, Drive & Wash	**Core Barrel:**	NQ/NX
Boring Location:	N: 482856.27, E: 1735264.27	**Casing ID/OD:**	4" (ID)	**Water Level*:**	24.8' at 1:47 7/30/24
Hammer Efficiency Factor: 1.087		**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	1D	24/15	0.70 - 2.70	12-12-12-11	24	43	SSA	149.9		7" Asphlat Pavement (0.6)	
										Light Olive Brown, dry, dense, fine to coarse SAND, some gravel, little silt (FILL).	Fines = 16.8% A-1-b (0),SM
	2D	24/22	2.70 - 4.70	10-21-21-21	42	76				Olive with brown, dry, hard, SILT, some fine to coarse gravel, little fine to coarse sand, non-plastic (FILL).	
5	3D	24/22	5.00 - 7.00	15-28-43-42	71	129				Olive with brown, dry, hard, SILT, some fine to coarse gravel, little fine to coarse sand, non-plastic (FILL).	
	4D	24/22	7.00 - 9.00	24-16-26-39	42	76				Olive with brown, dry to moist (becomes moist at 8.9' bgs), hard, SILT, some fine to coarse sand, little fine to coarse gravel, non-plastic (FILL).	WC = 11.1% Fines = 52.2% A-4 (0), ML
10	5D	24/22	10.00 - 12.00	11-13-16-17	29	53	182			Olive with brown, moist, hard, SILT, some fine to coarse sand, little fine to coarse gravel, non-plastic (FILL).	
							171				
							142				
							85	137.0		(13.5)	
							53				
15	6D	22/6	15.00 - 16.83	16-16-10-22	26	47	OPEN			Olive brown, moist, dense, fine to coarse SAND, some fine to coarse gravel, some silt (SILTY SAND and GRAVEL)	WC = 10.7% Fines = 28.8% A-2-4 (0), SM-GM
20	7D	24/9	20.00 - 22.00	13-22-30-30	52	94				Olive brown, moist, dense, fine to coarse SAND, some fine to coarse gravel, some silt (SILTY SAND and GRAVEL)	
										Brown, wet, very dense, fine to medium SAND, some fine gravel, some silt (SILTY SAND WITH GRAVEL)	
										Increased roller bit resistance	
25	8D	24/6	25.00 - 27.00	29-33-34-23	67	121				Dark grayish brown, wet, very dense, fine to coarse SANDY GRAVEL, little silt (SANDY GRAVEL)	WC = 9.6% Fines = 17.5% A-1-b (0), GM-SM
30											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level reading taken on 7/30/24 at 1:47 am was made after the rock coring.

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: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-101
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	150.52	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/29/24 (21:00); 7/30/24 (3:15)	**Drilling Method:**	SSA, Drive & Wash	**Core Barrel:**	NQ/NX
Boring Location:	N: 482856.27, E: 1735264.27	**Casing ID/OD:**	4" (ID)	**Water Level*:**	24.8' at 1:47 7/30/24
Hammer Efficiency Factor: 1.087		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
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V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
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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_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.
30	9D	8/3	30.00 - 30.67	50/3"	R					Grey, wet, hard, SILT, some fine to coarse sand, some fine to coarse gravel, trace clay, fractured rock fragments (GLACIAL TILL)	
	R-1	10.8/9.6	31.50 - 32.40	RQD = 0%			NQ/NX	119.0		31.5	
	R-2	6/6	32.40 - 32.90	RQD = 0%						Bedrock encountered at 31.5 feet bgs Top of Bedrock Elev. 119.0 ft R1 (31.5' - 32.4'): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with calcite veins, very strong, slightly weathered; discontinuities low angle to steep dipping, very close to close spacing, smooth to very rough, tight to open, highly fractured, clay infilling at bottom of run [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = very poor 89% recovery 0% RQD Rock Core Rate (min:sec) 31.5 - 32.4 ft (3:01)	
	~~R-3~~	~~43.2/43.2~~	~~32.90 - 36.50~~	~~RQD = 14%~~							
35											
	R-4	60/60	36.50 - 41.50	RQD = 60%							
40								109.0		R2 (32.4' - 32.9'): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] clay and sand infilling at the top of run, strong to very strong, weathered; discontinuities low angle to steep dipping, very close spacing, rough, open, highly fractured [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = poor 100% recovery 0% RQD Rock Core Rate (min:sec) 32.4 - 32.9 ft (1:03)	
45										R3 (32.9' - 36.5'): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with frequent calcite veins, strong to very strong, slightly weathered to fresh; discontinuities low angle to steep dipping, very close to close spacing, rough to very rough, tight to open, average 3.5 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = very poor 100% recovery 14% RQD Rock Core Rate (min:sec) 32.9 - 33.5 ft (2:24) 33.5 - 34.5 ft (3:07) 34.5 - 35.5 ft (3:25) 35.5 - 36.5 ft (3:23)	
50											
55										R4 (36.5' - 41.5'): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with frequent calcite veins, strong, fresh; discontinuities low angle to steep dipping, very close spacing, rough to very rough, tight, average 1.6 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = fair 100% recovery 60% RQD Rock Core Rate (min:sec)	
60											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level reading taken on 7/30/24 at 1:47 am was made after the rock coring.

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: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-101
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	150.52	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/29/24 (21:00); 7/30/24 (3:15)	**Drilling Method:**	SSA, Drive & Wash	**Core Barrel:**	NQ/NX
Boring Location:	N: 482856.27, E: 1735264.27	**Casing ID/OD:**	4" (ID)	**Water Level*:**	24.8' at 1:47 7/30/24
Hammer Efficiency Factor: 1.087		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
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MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
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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_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 Information: 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.
60										36.5 - 37.5 ft (3:04) 37.5 - 38.5 ft (3:24) 38.5 - 39.5 ft (3:32) 39.5 - 40.5 ft (4:40) 40.5 - 41.5 ft (4:44)	
										41.5	
										Bottom of Exploration at 41.5 feet below ground surface. Boring backfilled with bentonite chips in the rock core socket, drill cuttings and gravel to bottom of pavement and patched with cold patch asphalt.	
65											
70											
75											
80											
85											
90											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level reading taken on 7/30/24 at 1:47 am was made after the rock coring.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-102
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	133.5	**Auger ID/OD:**	
Operator:	Kevin Hanscom	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	Lina-Maria Pua	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140 lbs/30 in
Date Start/Finish:	05/07/24 (23:53); 05/08/24 (02:12)	**Drilling Method:**	SSA, Cased Wash	**Core Barrel:**	NX
Boring Location:	N: 482969.08, E: 1735451.57	**Casing ID/OD:**	3 in/3.25 in	**Water Level*:**	9.3 ft on 05/08/24 at 01:59
Hammer Efficiency Factor: 1.066		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
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V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
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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	132.9		7.5" Asphalt Pavement (0.6)	
	1D	24/11.5	1.00 - 3.00	14-13-20-38	33	59				Brown, moist, very dense, fine to medium SAND, some fine gravel, little silt (FILL).	WC = 3.7% Fines = 14.0% A-1-b(0), SM
	2D	24/12	3.00 - 5.00	15-24-12-43	36	64				Brown, dry to moist, very dense, medium to fine SILTY SAND, some fine gravel, non-plastic (FILL). q_p > 0.9ksf	WC = 8.6% Fines = 38.0% A-4 (0), SM
5	3D	24/11	5.00 - 7.00	47-22-10-12	32	57	40	128.5		(5.0) Brown to yellow, moist to wet, hard, SILT, some sand, trace gravel, nonplastic to low plasticity (SANDY SILT).	
	4D	24/12	7.00 - 9.00	15-14-9-39	23	41	45			Brown to yellow, wet, hard, SANDY SILT, trace fine gravel, non-plastic to low plasticity (SANDY SILT). q_p = 0.8ksf, 0.9ksf	Fines = 50.2% A-4 (0), ML
	5D	24/5	9.00 - 11.00	69-34-27-13	61	108	36	124.5		(9.0) Brown to yellow, wet, very dense, fine to coarse GRAVEL, some fine to coarse sand, some silt, low to medium plasticity (GRAVEL)	WC = 15.5% Fines = 25.6% A-2-4 (0), GM
10							63				
							100				
	R1	60/54	12.20 - 17.20	RQD = 73%			135	121.3		(12.2) Bedrock encountered at 12.2 feet bgs Top of Bedrock at Elev. 121.3 ft. R1 (12.2'-17.2'): Grey, very fine to fine grained, thinly to thickly laminated, METAWACKE [metasandstone], frequent thin to thick calcite veins, strong to extremely strong, slightly weathered; discontinuities moderately to steeply dipping, close to moderately close spacing, irregular to planar, smooth to very rough, open; average 3.2 fractures per foot, chemical weathering in joints [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = Fair 90% Recovery Rock Core Rate (min:sec) 12.2-13.2 ft (2:24) 13.2-14.2 ft (3:05) 14.2-15.2 ft (3:17) 15.2-16.2 ft (3:03) 16.2-17.2 ft (3:19)	
							NX				
15											
	R2	60/59	17.20 - 22.20	RQD = 98%				111.3		R2 (17.2'-22.2'): Grey, very fine to fine grained, thinly laminated, METAWACKE [metasandstone], frequent calcite veins, extremely strong, fresh; discontinuities horizontal dipping, close to wide spacing, irregular to planar, smooth to very rough, open; average 0.2 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = Fair 98% Recovery Rock Core Rate (min:sec) 17.2-18.2 ft (2:54) 18.2-19.2 ft (3:07) 19.2-20.2 ft (2:48) 20.2-21.2 ft (3:15)	
20											
25											
30											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level reading taken on 5/8/24 at 01:59 was made 15 minutes after completion of drilling with bottom of casing at 12.2 ft bgs.

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.

Boring No.: BB-BSA-102

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-102
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	133.5	**Auger ID/OD:**	
Operator:	Kevin Hanscom	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	Lina-Maria Pua	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140 lbs/30 in
Date Start/Finish:	05/07/24 (23:53); 05/08/24 (02:12)	**Drilling Method:**	SSA, Cased Wash	**Core Barrel:**	NX
Boring Location:	N: 482969.08, E: 1735451.57	**Casing ID/OD:**	3 in/3.25 in	**Water Level*:**	9.3 ft on 05/08/24 at 01:59
Hammer Efficiency Factor: 1.066		**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 140 lb. 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 Information: 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.
30										21.2-22.2 ft (3:31)	
										22.2-	
										Bottom of Exploration at 22.2 feet below ground surface. Boring backfilled with bentonite chips in the rock core socket, gravel to bottom of pavement and patched with cold patch asphalt.	
35											
40											
45											
50											
55											
60											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level reading taken on 5/8/24 at 01:59 was made 15 minutes after completion of drilling with bottom of casing at 12.2 ft bgs.

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: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-103
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	132.13	**Auger ID/OD:**	
Operator:	Kevin Hanscom	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	Lina-Maria Pua	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140 lbs/30 in
Date Start/Finish:	05/08/24 (21:32); 05/08/24 (23:30)	**Drilling Method:**	SSA, Cased Wash	**Core Barrel:**	NX
Boring Location:	N: 482888.01, E: 1735425.94	**Casing ID/OD:**	3 in/3.25 in	**Water Level*:**	5.2 ft on 05/08/24 at 23:14
Hammer Efficiency Factor: 1.066		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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MV = Unsuccessful Field Vane Shear Test Attempt
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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 Information: 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	131.5		Asphalt Pavement	
										0.6	
	1D	24/16	1.00 - 3.00	21-24-21-21	45	80				Brown, dry, dense, SILTY GRAVEL, some sand, poorly-graded (FILL).	
								129.0		2DA, Top 1 in: Brown, dry, medium dense, SILTY GRAVEL, some sand, poorly-graded (FILL).	
	2D	24/12	3.00 - 5.00	7-10-6-48	16	28				3.1	
5										2DB, Bottom 11 in: Grey, dry, medium dense, angular GRAVEL, some weathered rock fragments (WEATHERED BEDROCK). Grey, moist to wet, very dense, WEATHERED BEDROCK, some silt, little sand (WEATHERED BEDROCK).	
	3D	26.4/15.5	5.00 - 7.20	45-34-45-50/4"	79	140					
								124.9		7.2	
	R1	60/60	7.20 - 12.20	RQD = 31%			NX			Bedrock encountered at 7.2 feet bgs Top of Bedrock at Elev. 124.9 ft R1 (7.2'-12.2'): Grey, very fine to fine grained, METAWACKE [metasandstone] with thin calcite veins and thick quartz veins, extremely strong, thinly laminated, slightly weathered; discontinuities low angle to steep dipping, very close to close spacing, stepped to irregular, very rough to smooth, open. average 4.0 fractures per foot [MEDIUM BEDDEED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = very poor 100% Recovery Rock Core Rate (min:sec) 7.2-8.2 ft (4:32) 8.2-9.2 ft (4:43) 9.2-10.2 ft (5:32) 10.2-11.2 ft (5:50) 11.2-12.2 ft (6:37)	
10											
	R2	60/60	12.20 - 17.20	RQD = 71%							
15								114.9		R2 (12.2'-17.2'): Grey, very fine to fine grained, METAWACKE [metasandstone] with thin calcite and quartz veins, extremely strong, thinly laminated, fresh; discontinuities moderately dipping, close to moderately close spacing, stepped to irregular, rough, open, average 0.8 fractures per foot [MEDIUM BEDDEED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = Excellent 100% Recovery	
20										17.2	
										Bottom of Exploration at 17.2 feet below ground surface. Boring backfilled with bentonite chips in the rock core socket, gravel to bottom of pavement and patched with cold patch asphalt.	
25											
30											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by MaineDOT.
3. Water level reading taken on 5/8/24 at 23:14 was made after completion of drilling with bottom of casing at 7.2 ft bgs.

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: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-104
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	151.9	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/30/24 (20:36); 7/30/24 (23:38)	**Drilling Method:**	SSA, Drive & Wash	**Core Barrel:**	NA
Boring Location:	N: 483018.96, E: 1735602.84	**Casing ID/OD:**	4" (ID)	**Water Level*:**	Not measured
Hammer Efficiency Factor: 1.087		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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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	1D	24/16	0.80 - 2.80	15-14-14-12	28	51	SSA	151.1		8" Asphalt Pavement	
										0.8	
										Brown, dry, very dense, fine to coarse SAND, some fine to coarse gravel, trace silt (FILL).	
	2D	24/20	2.80 - 4.80	13-14-9-14	23	42				Brown, dry, very dense, fine to coarse SAND, some fine to coarse gravel, trace silt (FILL).	
										Dark grayish brown, dry, hard, SILT, some fine to medium sand, little fine to coarse gravel, non-plastic (FILL).	Fines = 55.3% A-4 (0), ML
5	3D	24/19	5.00 - 7.00	7-11-10-10	21	38				Dark grayish brown, dry, hard, SILT, some fine to medium sand, little fine to coarse gravel, non-plastic (FILL).	
	4D	24/13	7.00 - 9.00	22-21-19-16	40	72				Dark grayish brown, dry, hard, SILT, some fine to medium sand, little fine to coarse gravel, non-plastic (FILL).	
										Dark grayish brown, dry to moist, very dense, fine to coarse SAND, some fine to coarse gravel, little silt (FILL).	WC = 6.5% Fines = 20.4% A-1-b (0), SM-GM
10	5D	24/24	10.00 - 12.00	9-7-18-24	25	45	99			Grayish brown, moist, hard, SILT, some fine to medium sand, little fine to coarse gravel, slightly plastic (FILL).	
							128				
							92				
							196				
							82			Wood fragments in wash water.	
15	6D	24/13	15.00 - 17.00	3-3-4-8	7	13	38	136.4		15.5	
							57			Grayish brown, wet, stiff, CLAY, little sand, trace gravel, medium plasticity (CLAY)	WC = 25% Fines = 87.8% LL = 30 PL = 17 PI = 13
							104				
							118	133.4		18.5	LI = 0.6 A-6 (10), CL
							62				
20	7D	24/6	20.00 - 22.00	24-33-24-35	57	103	OPEN			Greenish grey, wet, hard, SILT, some fine to coarse sand, little gravel, trace clay, slightly plastic (GLACIAL TILL)	WC =16.4% Fines = 59.5% A-4 (0), ML
								128.9		23.0	
								128.4		Possible bedrock	
										23.5	
25										**Bottom of Exploration at 23.5 feet below ground surface.** Boring terminated due to shoe broken in hole. Offset to BB-BSA-104A to rock core. Boring backfilled with gravel to bottom of pavement and patched with cold patch asphalt.	
30											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.

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: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-104A
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	151.97	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	DieDrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/30/24 (23:40); 7/31/24 (2:33)	**Drilling Method:**	SSA, Drive & Wash	**Core Barrel:**	NX
Boring Location:	N: 483017.59, E: 1735600.99	**Casing ID/OD:**	4" (ID)	**Water Level*:**	Not measured
Hammer Efficiency Factor: NA		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
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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 Information: 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	151.3		8" Asphalt pavement	
										0.7	
5											
10							152				
							115				
							49				
							121				
15							212				
							49			Wood coming up in wash water	
							44				
							53				
							54				
20							47				
							NX	131.6		20.4	
	R-1	60/57	21.00 - 26.00	RQD = 56%						Possible bedrock.	
										Bedrock encountered at 20.4 feet bgs Top of Bedrock at Elev. 131.6 ft R1 (21.0' - 26.0'): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with frequent calcite veins, strong to very strong, slightly weathered to fresh, clay and sand infilling 22.5 ft to 23 ft; discontinuities low angle to steep dipping, very close to close spacing, rough to very rough, tight to open, average 1.6 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = fair 95% recovery 56% RQD Rock Core Rate (min:sec) 21.0 - 22.0 ft (3:06) 22.0 - 23.0 ft (2:42)	
25											
	R-2	33.6/25.2	26.00 - 28.80	RQD = 61%							
	R-3	26.4/24	28.80 - 31.00	RQD = 23%							
30											

Remarks:

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-104A
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	151.97	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	DieDrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/30/24 (23:40); 7/31/24 (2:33)	**Drilling Method:**	SSA, Drive & Wash	**Core Barrel:**	NX
Boring Location:	N: 483017.59, E: 1735600.99	**Casing ID/OD:**	4" (ID)	**Water Level*:**	Not measured
Hammer Efficiency Factor: NA		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

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MV = Unsuccessful Field Vane Shear Test Attempt
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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_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
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C = Consolidation Test

Depth (ft.)	Sample Information: 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.
30								121.0		23.0 - 24.0 ft (2:08) 24.0 - 25.0 ft (2:14) 25.0 - 26.0 ft (2:50) R2 (26.0' - 28.8'): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with calcite veins, strong to very strong, fresh; discontinuities low angle to moderate dipping, very close spacing, rough to very rough, tight, average 0.5 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = fair 75% recovery 61% RQD Rock Core Rate (min:sec) 26.0 - 27.0 ft (2:19) 27.0 - 28.0 ft (2:28) 28.0 - 28.8 ft (0:15) R3 (28.8' - 31.0'): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] strong to very strong, fresh; discontinuities low angle to steep dipping, very close spacing, rough, tight to open, average 3.5 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = very poor 91% recovery 23% RQD Rock Core Rate (min:sec) 28.8 - 29.0 ft (0:08) 29.0 - 30.0 ft (2:56) 30.0 - 31.0 ft (3:18)	
35											
40											
45											
50											
55											
60											

31.0

Bottom of Exploration at 31.0 feet below ground surface.
Boring backfilled with bentonite chips in the rock core socket, drill cuttings and gravel to bottom of pavement and patched with cold patch asphalt.

Remarks:

1. As-drilled boring locations and ground surface elevations were provided by HNTB.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-105
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	152.05	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/31/24 (20:07); 8/1/24 (0:30)	**Drilling Method:**	SSA, Cased Wash	**Core Barrel:**	NX
Boring Location:	N: 482984.9, E: 1735593.56	**Casing ID/OD:**		**Water Level*:**	17.0' BGS 11:56 7/31/24
Hammer Efficiency Factor:	1.087	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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WOH = Weight of 140lb. Hammer
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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
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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	1D	24/18	0.90 - 2.90	14-14-15-14	29	53	SSA	151.2		10" Asphalt pavement. (0.8)	
										Olive brown, dry, very dense, fine to coarse SAND, some fine to coarse gravel, little silt (FILL).	Fines = 16.2% A-1-b (0), SM
	2D	24/19	2.90 - 4.90	9-11-13-12	24	43					
										Olive with brown, dry, hard, SILT, some fine to coarse sand, some fine to coarse gravel, non- plastic (FILL).	
5	3D	8/8	5.00 - 5.67	11-50/2"	R					Dark grayish brown, dry, hard, SANDY SILT, trace gravel (FILL).	Fines = 46.4% A-4 (0), ML/ SM
	4D	24/10	7.00 - 9.00	13-23-20-16	43	78				Dark grayish brown, dry, hard, SANDY SILT, trace gravel (FILL).	
10	5D	13.5/7	10.00 - 11.13	11-31-50/1.5"	R		35			Dark grayish brown, dry, hard, SANDY SILT, trace gravel (FILL).	
							67				
							40				
							57	139.0		(13.1)	
							45				
15	6D	24/13	15.00 - 17.00	3-4-8-11	12	22	38			Grayish brown, wet, medium dense, SILT, some fine to coarse sand, little fine to coarse subrounded gravel (SANDY SILT to SILTY SAND).	WC = 20.5% Fines = 55.7% A-4 (0), ML
							33				
							35				
							39				
							40				
20	7D	24/11	20.00 - 22.00	14-11-20-18	31	56	60			Increased drilling resistance. Olive brown, wet, very dense SILTY SAND, little fine to coarse gravel (SANDY SILT to SILTY SAND).	WC = 11.7% Fines = 40.3% A-4 (0), ML/ SM
							92				
							57				
							165				
							58				
25	8D	14/6	25.00 - 26.17	20-28-30/2"			OPEN	127.1		(25.0) Grey, wet, very dense, fractured rock with fine to coarse sand (WEATHERED ROCK)	
	R-1	60/60	26.40 - 31.40	RQD = 30%			NX	125.7		(26.4) Bedrock encountered at 26.4 feet bgs Top of Bedrock Elev. 125.7 ft R1 (26.4' - 31.4'): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with calcite veins, strong, slightly weathered to fresh; discontinuities low angle to steep dipping,	
30											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level reading taken on 7/31/24 at 23:58 was made after the rock coring.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-105
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	152.05	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/31/24 (20:07); 8/1/24 (0:30)	**Drilling Method:**	SSA, Cased Wash	**Core Barrel:**	NX
Boring Location:	N: 482984.9, E: 1735593.56	**Casing ID/OD:**		**Water Level*:**	17.0' BGS 11:56 7/31/24
Hammer Efficiency Factor:	1.087	**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 140 lb. 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 Information: 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.
30										very close to close spacing, rough to very rough, tight to open, average 3.2 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].	
	R-2	57.6/57.6	31.40 - 36.20	RQD = 75%						Rock Mass Quality = poor 100% recovery 30% RQD Rock Core Rate (min:sec) 26.4 - 27.4 ft (2:33) 27.4 - 28.4 ft (3:10) 28.4 - 29.4 ft (2:54) 29.4 - 30.4 ft (4:01) 30.4 - 31.4 ft (10:40)	
35								115.9		R2 (31.4' - 36.2'): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with calcite veins, very strong, fresh; discontinuities low angle to steep dipping, very close spacing, smooth to rough, tight, average 1.6 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION].	
										Rock Mass Quality = fair 100% recovery 75% RQD Rock Core Rate (min:sec) 31.4 - 32.4 ft (2:36) 32.4 - 33.4 ft (2:53) 33.4 - 34.4 ft (2:51) 34.4 - 35.4 ft (2:41) 35.4 - 36.2 (4:20)	
40										36.2	
										Bottom of Exploration at 36.2 feet below ground surface. Boring backfilled with bentonite chips in the rock core socket, drill cuttings and gravel to bottom of pavement and patched with cold patch asphalt.	
45											
50											
55											
60											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level reading taken on 7/31/24 at 23:58 was made after the rock coring.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-106
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	143.6	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/25/24 (20:19); 7/29/24 (1:56)	**Drilling Method:**	SSA, Cased Wash	**Core Barrel:**	NX
Boring Location:	N: 482611.2, E: 1735095.82	**Casing ID/OD:**	4" (ID)	**Water Level*:**	Refer to remarks note 3
Hammer Efficiency Factor:	1.087	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
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MV = Unsuccessful Field Vane Shear Test Attempt
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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	142.8		10" Asphalt Pavement (0.8)	
	1D	24/13	1.00 - 3.00	14-9-7-5	16	29				Brown, dry, medium dense, fine to coarse SAND, some fine gravel, trace silt (FILL).	
	2D	24/19	3.00 - 5.00	11-13-18-20	31	56				Olive with brown, moist, hard, SILT, some fine to medium sand, some fine to coarse gravel, non-plastic (FILL)	
5	3D	24/15	5.00 - 7.00	13-16-37-30	53	96				Olive with brown, moist, hard, SILT, some fine to medium sand, some fine to coarse gravel, non-plastic (FILL)	
	4D	24/0	7.00 - 9.00	25-27-22-23	49	89				No recovery.	
10	5D	24/13	10.00 - 12.00	8-9-11-27	20	36	64			Olive with brown, moist, hard, SILT, some fine to medium sand, some fine to coarse gravel, non-plastic (FILL)	
							148				
							133				
							166				
							82				
15	6D	24/9	15.00 - 17.00	12-31-20-15	51	92	87			Grey, wet, very dense, fine to coarse SAND, flakey fractured rock fragments (FILL).	
							124			Possible boulder or cobbles 12 to 15" thick.	
							OPEN				
								124.6		(19.0)	
20	7D	24/22	20.00 - 22.00	5-6-3-4	9	16	24			Olive with grey and orange mottling,wet, very stiff, CLAY, trace sand, medium plasticity (CLAY). Pp = 4.0 to 6.0 ksf.	WC = 26% Fines = 98.9% LL = 37 PL = 19 PI = 18 LI = 0.4 A-6 (19), CL
							26				
							22				
							34				
							31				
25	8D	24/24	25.00 - 27.00	4-7-8-9	15	27	42			Olive with grey and orange mottling, wet, very stiff, CLAY, trace sand, medium plasticity (CLAY). Pp = 6.0 to 8.0 ksf.	WC = 28% Fines = 99.7% LL = 36 PL = 19 PI = 17 LI = 0.5 A-6 (18), CL
							55				
							61				
							54				
30							35				

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level measured during drilling at 20.55'bgs on 7/26/24 at 3:23, 20.55'bgs on 7/28/24 at 20:19. Water level measured at 24.9'bgs on 7/29/24 at 1:08 was made after the rock coring.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-106
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	143.6	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/25/24 (20:19); 7/29/24 (1:56)	**Drilling Method:**	SSA, Cased Wash	**Core Barrel:**	NX
Boring Location:	N: 482611.2, E: 1735095.82	**Casing ID/OD:**	4" (ID)	**Water Level*:**	Refer to remarks note 3
Hammer Efficiency Factor:	1.087	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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MV = Unsuccessful Field Vane Shear Test Attempt
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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_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.
30	9D	24/24	30.00 - 32.00	WOH/18"-8			49			Grey, wet, very soft, CLAY, trace sand medium plasticity (CLAY). Pp < 1.0 tsf.	WC = 29% Fines = 98.7% LL = 26 PL = 15 PI = 11 LI = 1.3 A-6 (9), CL
							42	112.1		31.5	
							56			Grey, wet, fine to medium SANDY SILT, some fine gravel (SANDY SILT).	
							100				
							57				
35	10D	24/12	35.00 - 37.00	4-2-6-7	8	14	43			Grey, wet, stiff, SANDY SILT, trace fine to coarse subrounded to round gravel (SANDY SILT).	
							40				
							42				
							51				
							42				
40	11D	24/10	40.00 - 42.00	5-3-7-7	10	18	59			Grey, wet, very stiff, SANDY SILT, trace fine to coarse subrounded to round gravel (SANDY SILT).	WC = 11% Fines = 57.6% LL = 17 PL = 14 PI = 3 LI = -0.8 A-4 (0), ML
							48				
							50				
							52				
							40				
45	12D	24/18	45.00 - 47.00	3-4-4-6	8	14	53			Grey, wet, stiff, SANDY SILT, trace fine to coarse subrounded to round gravel (SANDY SILT).	
							49				
							53				
							61				
							43				
50	13D	24/12	50.00 - 52.00	10-8-6-11	14	25	54			Grey, wet, very stiff, SANDY SILT, trace fine to coarse subrounded to round gravel (SANDY SILT).	
							42				
							96				
							173	90.1		53.5	
							248				
55	14D	24/15	55.00 - 57.00	14-13-16-19	29	53	61			Olive, wet, hard, SANDY SILT, little fine to coarse subrounded to rounded gravel, non-plastic (GLACIAL TILL)	WC = 46.5% Fines = 48.9% A-4 (0), ML/ SM
							45				
							62				
							108				
60							112				

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level measured during drilling at 20.55'bgs on 7/26/24 at 3:23, 20.55'bgs on 7/28/24 at 20:19. Water level measured at 24.9'bgs on 7/29/24 at 1:08 was made after the rock coring.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-106
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	143.6	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/25/24 (20:19); 7/29/24 (1:56)	**Drilling Method:**	SSA, Cased Wash	**Core Barrel:**	NX
Boring Location:	N: 482611.2, E: 1735095.82	**Casing ID/OD:**	4" (ID)	**Water Level*:**	Refer to remarks note 3
Hammer Efficiency Factor:	1.087	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
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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_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
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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.
60	15D	24/16	60.00 - 62.00	31-35-62-50/3"	97	176	36			Olive with brown, wet, very dense, fine to coarse SAND, some fine to course gravel, little silt (GLACIAL TILL).	
							226				
							367				
	R-1	12/3.6	63.80 - 64.80	RQD = 0%			NX	79.8		63.8	
	R-2	51.6/51.6	64.80 - 69.10	RQD = 47%						Bedrock encountered at 63.8 feet bgs Top of Bedrock Elev. 79.8 ft R1 (63.8' - 64.8'): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with calcite veins, strong to very strong, slightly weathered to fresh; discontinuities low angle dipping, very close to close spacing, rough to very rough, tight to open [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = very poor 30% recovery 0% RQD Rock Core Rate (min:sec) 63.8 - 64.8 ft (2:31)	
65											
	R-3	60/60	69.10 - 74.10	RQD = 62%							
70											
								69.5		R2 (64.8' - 69.1'): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with frequent calcite veins, very strong to strong, fresh with chemical weathering 67.4 ft to 68.3 ft, sand infilling 67.9 ft to 68.3 ft; discontinuities low angle to vertical dipping, very close to close spacing, smooth to rough, tight to open, average 3.3 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = poor 100% recovery 47% RQD Rock Core Rate (min:sec) 64.8 - 65.8 ft (3:14) 65.8 - 66.8 ft (2:05) 66.8 - 67.8 ft (2:22) 67.8- 68.8 ft (2:20) 68.8 - 69.1 ft (0:57)	
75											
80											
85											
90										R3 (69.1' - 74.1'): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with frequent calcite veins, weak, fresh; discontinuities low angle to steep dipping, very close to close spacing, rough to very rough, tight to open, average 1.4 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = fair 100% recovery 62% RQD Rock Core Rate (min:sec) 69.1 - 70.1 ft (2:43) 70.1 - 71.1 ft (2:54) 71.1 - 72.1 ft (3:31) 72.1 - 73.1 ft (3:12) 73.1 - 74.1 ft (3:13)	
										74.1 **Bottom of Exploration at 74.1 feet below ground surface.**	

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level measured during drilling at 20.55'bgs on 7/26/24 at 3:23, 20.55'bgs on 7/28/24 at 20:19. Water level measured at 24.9'bgs on 7/29/24 at 1:08 was made after the rock coring.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-106
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	143.6	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/25/24 (20:19); 7/29/24 (1:56)	**Drilling Method:**	SSA, Cased Wash	**Core Barrel:**	NX
Boring Location:	N: 482611.2, E: 1735095.82	**Casing ID/OD:**	4" (ID)	**Water Level*:**	Refer to remarks note 3
Hammer Efficiency Factor:	1.087	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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N-uncorrected = Raw Field SPT N-value
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N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
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Depth (ft.)	Sample Information: 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.
90										Boring backfilled with bentonite chips in the rock core socket, drill cuttings and gravel to bottom of pavement and patched with cold patch asphalt.	
95											
100											
105											
110											
115											
120											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level measured during drilling at 20.55'bgs on 7/26/24 at 3:23, 20.55'bgs on 7/28/24 at 20:19. Water level measured at 24.9'bgs on 7/29/24 at 1:08 was made after the rock coring.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-107
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	143.11	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/22/24 (21:09); 7/24/24 (0:25)	**Drilling Method:**	SSA, Drive & Wash	**Core Barrel:**	NX
Boring Location:	N: 482578.95, E: 1735092.78	**Casing ID/OD:**	4"(ID)	**Water Level*:**	Refer to remarks note 3
Hammer Efficiency Factor:	1.087	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
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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	1D	24/14	0.70 - 2.70	8-10-8-6	18	33	SSA	142.6		6" Asphalt Pavement (0.5)	
										Brown, dry, medium dense, fine to coarse SAND, some fine to coarse gravel, trace silt (FILL).	
	2D	24/16	2.70 - 4.70	6-8-8-17	16	29				Grayish brown, dry, medium dense, SANDY SILT, trace fine gravel, non-plastic (FILL).	
	3D	24/19	4.70 - 6.70	12-19-18-18	37	67				Grayish brown, dry, hard, SANDY SILT, trace fine gravel, non-plastic (FILL).	Fines = 55.2% A-4 (0), ML
5	4D	24/10	6.70 - 8.70	14-7-18-10	25	45				Grayish brown, dry, hard, SANDY SILT, trace fine gravel, non-plastic (FILL).	
	5D	24/6	8.70 - 10.70	4-3-4-4	7	13				Grayish brown, dry, stiff, SANDY SILT, trace fine gravel, slightly plastic (FILL).	
10	6D	24/9	10.70 - 12.70	6-8-41-50/2"	49	89	23			Olive brown, wet, hard, SILT, some fine to coarse sand, trace fine gravel, slightly plastic, fractured rock fragments (FILL). Pp = 7.0 ksf	WC = 14.7% Fines = 62.3% A-4 (0), ML
							64				
							77				
							94				
							77				
15	7D	24/5	15.00 - 17.00	12-19-20-8	39	71	59			Olive brown, wet, very dense, fine to coarse SAND, fractured scalty rock fragments (FILL).	
							135				
							180				
							91				
							86				
20	8D	24/14	20.00 - 22.00	17-4-7-6	11	20	65	122.6		(20.5)	
							53			Grey with orange, mottled, wet, very stiff, CLAY, trace sand, medium plasticity (CLAY). Pp = 6.0 ksf	WC = 24% Fines = 98.3% LL = 33 PL = 17 PI = 16 LI = -0.4 A-6 (15), CL
							65				
							82				
							87				
25	9D	24/24	25.00 - 27.00	4-3-6-6	9	16	65			Grey to brown, mottled, wet, very stiff, CLAY, trace sand (CLAY) Pp = 4.5 to 5.0 ksf	Fines = 99.3% A-6 (37), CL
							93				
							88				
							97				
30							79				

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level measured during drilling at 6.45'bgs on 7/23/24 at 3:28, 18.7'bgs on 7/24/24 at 3:22, 19.3'bgs on 7/24/24 at 20:09. Water level measured at 23.9'bgs on 7/24/24 at 23:51 was made after the rock coring.

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* 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: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-107
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	143.11	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/22/24 (21:09); 7/24/24 (0:25)	**Drilling Method:**	SSA, Drive & Wash	**Core Barrel:**	NX
Boring Location:	N: 482578.95, E: 1735092.78	**Casing ID/OD:**	4"(ID)	**Water Level*:**	Refer to remarks note 3
Hammer Efficiency Factor: 1.087		**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 140 lb. 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.
30	10D	24/17	30.00 - 32.00	3-3-3-3	6	11	70			Greyish brown, moist, medium stiff, CLAY, trace sand, medium plasticity, interbedded silt seams (CLAY). Pp < 2.0 ksf FV-1: 442psf / 118psf (55mmx110mm Vane) FV-2: 813psf / 415psf (55mmx110mm Vane)	WC = 28% Fines = 99.1% LL = 28 PL = 16 PI = 12 LI = 1 A-6 (11), CL
							63				
							56				
							390				
							63				
35	11D	24/0	35.00 - 37.00	12-11-15-10	26	47	104	108.1		35.0 No recovery - washed water had fine to coarse gravel and clay fragments.	
							96				
							87				
							78				
							63				
40	12D	24/6	40.00 - 42.00	5-7-12-12	19	34	73			Brownish grey, wet, dense, SILTY SAND, little coarse gravel, slightly plastic (SILTY SAND)	WC = 10% Fines = 42.1% LL = 17 PL = 13 PI = 4 LI = -0.8 A-4 (0), SC/ SM
							76				
							103				
							111				
							81				
45	13D	24/4	45.00 - 47.00	9-9-6-9	15	27	105			Brownish grey, wet, medium dense, SILTY SAND, little coarse gravel, slightly plastic (SILTY SAND).	
							103				
							111				
							118				
							90				
50	14D	24/8	50.00 - 52.00	6-8-15-8	23	42	81			Greyish brown, wet, dense, CLAYEY SAND, some gravel, low plasticity (CLAYEY SAND).	WC = 10% Fines = 39.6% LL = 20 PL = 12 PI = 8 LI = -0.3 A-4 (0), SC
							89				
							105				
							113	89.6		53.5	
							89				
55	15D	24/14	55.00 - 57.00	26-41-51-50/4"	92	167	60			Olive with brown mottled, wet, very dense, SILTY SAND, little gravel, non-plastic (GLACIAL TILL).	WC = 10.6% Fines = 38.3% A-4 (0), SM
							198				
							171				
							212				
60							196				

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level measured during drilling at 6.45'bgs on 7/23/24 at 3:28, 18.7'bgs on 7/24/24 at 3:22, 19.3'bgs on 7/24/24 at 20:09. Water level measured at 23.9'bgs on 7/24/24 at 23:51 was made after the rock coring.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-107
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	143.11	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/22/24 (21:09); 7/24/24 (0:25)	**Drilling Method:**	SSA, Drive & Wash	**Core Barrel:**	NX
Boring Location:	N: 482578.95, E: 1735092.78	**Casing ID/OD:**	4"(ID)	**Water Level*:**	Refer to remarks note 3
Hammer Efficiency Factor:	1.087	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
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V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
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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_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.
60	16D	8/8	60.00 - 60.67	53-50/2"	R		OPEN			Olive with brown mottled, wet, very dense, SILT, some fine round to subround gravel, trace fine to medium sand, weathered coarse gravel (GLACIAL TILL).	
	R-1	45.6/7.2	63.40 - 67.20	RQD = 0%			R	79.7		63.4	
							NX			Bedrock encountered at 63.4 feet bgs Top of Bedrock Elev. 80.1 ft R1 (63.4' - 67.2): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone], strong, highly weathered with clay and sand infilling from 64.2 ft to 67.2; discontinuities low angle to steep dipping, close spacing, rough to very rough, open, highly fractured [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = very poor 16% recovery 0% RQD Rock Core Rate (min:sec) 63.4 - 64.2 ft (1:09) 64.2 - 65.0 ft (1:29) 65.0 - 65.3 ft (0:41) 65.3 - 66.3 ft (1:51) 66.3 - 67.2 ft (1:13)	
65											
	R-2	12/2.04	67.20 - 68.20	RQD = 0%							
	R-3	48/45.6	68.20 - 72.20	RQD = 35%							
70											
	R-4	60/60	72.20 - 77.20	RQD = 39%							
75											
								65.9		R2 (67.2' - 68.2'): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] strong, highly weathered with clay and sand infilling; discontinuities low angle dipping, close spacing, very rough, open, highly fractured [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = very poor 17% recovery 0% RQD Rock Core Rate (min:sec) 67.2 - 68.2 ft (0:29) R3 (68.2' - 72.2): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with calcite veins, strong to very strong, slightly weathered, occasional moderate to severe chemical weathering with sand infilling; discontinuities low angle to steep dipping, very close to close spacing, rough to very rough, tight to open, average 3.5 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = poor 95% recovery 35% RQD Rock Core Rate (min:sec) 68.2 - 69.2 ft (1:42) 69.2 - 70.2 ft (1:59) 70.2 - 71.2 ft (2:32) 71.2 - 72.2 ft (1:28) R4 (72.2' - 77.2): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with calcite veins, strong to very strong, slightly weathered, occasional moderate to severe chemical weathering with sand and clay infilling; discontinuities low angle to	
80											
85											
90											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level measured during drilling at 6.45'bgs on 7/23/24 at 3:28, 18.7'bgs on 7/24/24 at 3:22, 19.3'bgs on 7/24/24 at 20:09. Water level measured at 23.9'bgs on 7/24/24 at 23:51 was made after the rock coring.

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* 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: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-107
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	143.11	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/22/24 (21:09); 7/24/24 (0:25)	**Drilling Method:**	SSA, Drive & Wash	**Core Barrel:**	NX
Boring Location:	N: 482578.95, E: 1735092.78	**Casing ID/OD:**	4"(ID)	**Water Level*:**	Refer to remarks note 3
Hammer Efficiency Factor:	1.087	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
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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_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
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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 Information: 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.
90										steep dipping, very close to close spacing, rough to very rough, tight to open, average 3.2 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = poor 100% recovery 39% RQD Rock Core Rate (min:sec) 72.2 - 73.2 ft (2:07) 73.2 - 74.2 ft (1:35) 74.2 - 75.2 ft (1:53) 75.2 - 76.2 ft (1:32) 76.2 - 77.2 ft (1:30)	
95										77.2 **Bottom of Exploration at 77.2 feet below ground surface.** Boring backfilled with bentonite chips in the rock core socket, drill cuttings and gravel to bottom of pavement and patched with cold patch asphalt.	
100											
105											
110											
115											
120											

Remarks:

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-108
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	129.45	**Auger ID/OD:**	
Operator:	Kevin Hanscom	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	Lina-Maria Pua	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140 lbs/30 in
Date Start/Finish:	05/07/24 (21:55); 05/07/24 (23:30)	**Drilling Method:**	SSA, Cased Wash	**Core Barrel:**	NX
Boring Location:	N: 482749.52, E: 1735322.13	**Casing ID/OD:**	3 in/3.25 in	**Water Level*:**	4.8 ft on 05/07/24 at 22:20
Hammer Efficiency Factor:	1.066	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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MV = Unsuccessful Field Vane Shear Test Attempt
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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
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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	128.9		7.5" Asphalt Pavement	
										0.6	
	1D	24/16	1.00 - 3.00	22-18-16-20	34	60				Brown to yellow, dry, very dense, fine to coarse SAND, some silt, little fine gravel (FILL).	MC = 8.0% Fines = 28.5% A-2-4 (0), SM
								126.3		2DA To 2 in: Brown to yellow, dry, very dense, fine to coarse SAND, some silt, little fine gravel (FILL).	
	2D	24/9	3.00 - 5.00	15-14-24-16	38	68				3.2	
5										2DB Bottom 7 in: Grey, dry, very dense, GRAVEL, some sand, little silt (GRAVEL)	
	3D	24/12	5.00 - 7.00	12-12-12-50/2"	24	43				Brown, wet, dense, GRAVEL, some sand, little silt (GRAVEL). Grey angular GRAVEL with some sand and little silt in the tip of the split spoon.	
	R1	60/59	6.70 - 11.70	RQD = 59%				122.8		6.7	
							NX			Bedrock encountered at 6.7 feet bgs Top of Bedrock at Elev. 122.8 ft R1 (6.7'-11.1'): Grey, very fine to fine grained, METAWACKE [metasandstone] with frequent calcite veins, very to extremely strong, thinly laminated, slightly weathered; discontinuities moderate to steep dipping, close to moderately close spacing, rough to polished, open. average 2.6 fractures per foot [MEDIUM BEDDEED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = fair 98% Recovery Rock Core Rate (min:sec) 6.7-7.7 ft (2:33) 7.7-8.7 ft (2:46) 8.7-9.7 ft (3:19) 9.7-10.7 ft (2:51) 10.7-11.7 ft (3:17)	
10											
	R2	12/11	11.70 - 12.70	RQD = 40%							
	R3	24/21	12.70 - 14.70	RQD = 19%							
	R4	24/23	14.70 - 16.70	RQD = 37%							
15								112.8		R2 (11.1'-12.7'): Grey, very fine to fine grained, METAWACKE [metasandstone] with some calcite veins, extremely strong, thinly laminated, fresh to slightly weathered; discontinuities low angle to steep dipping, very close to close spacing, planar to stepped, rough to smooth, open. average 1.0 fractures per foot [MEDIUM BEDDEED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = poor 92% Recovery Rock Core Rate (min:sec) 11.7-12.7 ft (3:07) R3 (12.7'-14.7'): Grey, very fine to fine grained, METAWACKE [metasandstone] with some calcite veins, extremely strong, thinly laminated, fresh to slightly weathered; discontinuities low angle to steep dipping, very close to close spacing, planar to stepped, rough to smooth, open. average 2.5 fractures per foot [MEDIUM BEDDEED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = very poor 88% Recovery Rock Core Rate (min:sec) 12.7-13.7 ft (2:04) 13.7-14.7 ft (3:25) R4 (14.7'-16.7'): Grey, very fine to fine grained, METAWACKE	
20											
25											
30											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by MaineDOT.
3. Water level reading taken on 5/7/24 at 22:20 was made before the start of rock coring with bottom of casing at 6.7 ft bgs.

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Boring No.: BB-BSA-108

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-108
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	129.45	**Auger ID/OD:**	
Operator:	Kevin Hanscom	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	Lina-Maria Pua	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140 lbs/30 in
Date Start/Finish:	05/07/24 (21:55); 05/07/24 (23:30)	**Drilling Method:**	SSA, Cased Wash	**Core Barrel:**	NX
Boring Location:	N: 482749.52, E: 1735322.13	**Casing ID/OD:**	3 in/3.25 in	**Water Level*:**	4.8 ft on 05/07/24 at 22:20
Hammer Efficiency Factor:	1.066	**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 140 lb. 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 Information: 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.
30										[metasandstone] with some calcite veins, extremely strong, thinly laminated, fresh to slightly weathered; discontinuities low angle to steep dipping, very close to close spacing, planar to stepped, rough to smooth, open, average 2.0 fractures per foot [MEDIUM BEDDEED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = poor 96% Recovery Rock Core Rate (min:sec) 14.7-15.7 ft (2:30) 15.7-16.7 ft (2:48)	
35										16.7 **Bottom of Exploration at 16.7 feet below ground surface.** Boring caved in after rock coring was completed. The boring above the cave-in was backfilled with gravel to bottom of pavement and patched with cold patch.	
40											
45											
50											
55											
60											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by MaineDOT.
3. Water level reading taken on 5/7/24 at 22:20 was made before the start of rock coring with bottom of casing at 6.7 ft bgs.

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: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-109
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	126.99	**Auger ID/OD:**	4.0 in/4.5 in
Operator:	Kevin Hanscom	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	Lina-Maria Pua	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140 lbs/30 in
Date Start/Finish:	05/07/24 (1:20); 05/07/24 (2:30)	**Drilling Method:**	Hollow Stem Augers	**Core Barrel:**	NX
Boring Location:	N: 482636.37, E: 1735255.48	**Casing ID/OD:**		**Water Level*:**	Not Measured
Hammer Efficiency Factor:	1.066	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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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	126.3		Asphalt Pavement — 0.7	
	1D	24/12	1.00 - 3.00	19-16-17-18	33	59				Brown to yellow, dry, very dense, fine to coarse SAND, some gravel, little silt (FILL).	
	2D	24/15.5	3.00 - 5.00	27-22-63-54	85	151				Brown to yellow, dry to moist, very dense, SANDY GRAVEL, little silt (FILL).	MC = 5.7% Fines = 15.9% A-1-b (0), GM
5	3D	24/13.5	5.00 - 7.00	19-23-16-17	39	69				Brown to yellow, wet, very dense, fine to coarse SAND, some gravel, some silt, poorly-graded (FILL).	
	4D	24/23	7.00 - 9.00	41-41-67-103	108	192				4DA Top 19 in: Brown, wet to moist, very dense, fine to coarse SAND, some gravel, little silt (FILL).	MC = 11.7% Fines = 20.3% A-1-b (0), SM
	5D	12/10	9.00 - 10.00	28-63	R			118.3		8.7 — 4DB Bottom 4 in: Brown, moist, hard, SILT, some fine sand, little gravel (SANDY SILT).	
10	6D	1/1	10.00 - 10.08	50/1"	R			117.0		Brown, moist, SILT, some fine sand, little gravel (SANDY SILT). — 10.0	
								116.9		Grey, very dense, PROBABLE BEDROCK FRAGMENTS, some silt. (WEATHERED BEDROCK). — 10.1	
										Bottom of Exploration at 10.1 feet below ground surface. Boring backfilled with drill cuttings to bottom of pavement and patched with cold patch.	
15											
20											
25											
30											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by MaineDOT.

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: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-109A
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	127.03	**Auger ID/OD:**	4 in/4.5in
Operator:	Kevin Hanscom	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	Lina-Maria Pua	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140 lbs/30 in
Date Start/Finish:	05/07/24 (20:18); 05/07/24 (21:44)	**Drilling Method:**	SSA, Cased Wash	**Core Barrel:**	NX
Boring Location:	N: 482637.93, E: 1735257.73	**Casing ID/OD:**	4.0 in/4.25 in	**Water Level*:**	2.8 ft on 05/07/24 at 21:35
Hammer Efficiency Factor: 1.066		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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MV = Unsuccessful Field Vane Shear Test Attempt
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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 Information: 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			Offset 2.6 feet from BB-BSA-109A towards the bridge	
							NX	123.5		3.5	
	R-1	57.6/52	4.00 - 8.80	RQD = 33%						Driller noted encountering probable bedrock at 3.5 feet bgs with the augers. Bedrock encountered at 3.5 feet bgs Top of Bedrock at Elev. 123.5 ft Advanced with augers to 4.0 feet bgs R1 (4'-8.8'): Grey, very fine grained, METAWACKE [metasandstone] with frequent calcite veins, very to extremely strong, thinly laminated, fresh to slightly weathered; discontinuities steep dipping, close spacing, planar to stepped, rough to smooth, open. average 2.1 fractures per foot [MEDIUM BEDDEED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = fair 90% Recovery Rock Core Rate (min:sec) 4.0-5.0 ft (1:19) 5.0-6.0 ft (2:24) 6.0-7.0 ft (2:56) 7.0-8.0 ft (3:20) 8.0-8.8 ft (4:28)	
5											
	R-2	66/61.5	8.80 - 14.30	RQD = 49%							
10											
								113.0		R2 (8.8'-14.0'): Grey, very fine grained, METAWACKE [metasandstone] with frequent calcite veins (0.1 to 0.7 in thick), very to extremely strong, thinly laminated, fresh; discontinuities low angle to steep dipping, very close to moderately close spacing, planar to to stepped, rough to smooth, open. average 1.8 fractures per foot [MEDIUM BEDDEED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = poor 93% Recovery Rock Core Rate (min:sec) 8.8-9.8 ft (2:10) 9.8-10.8 ft (3:07) 10.8-11.8 ft (2:59) 11.8-12.8 ft (3:30) 12.8-14.0 ft (4:19)	
15											
20											
25											
30											
										14.0	

Bottom of Exploration at 14.0 feet below ground surface.
Boring backfilled with bentonite chips in the rock core socket, gravel to bottom of pavement and patched with cold patch asphalt.

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by MaineDOT.
3. Water level reading taken on 5/7/24 at 21:35 was made after rock coring was completed with bottom of casing at 3.5 ft bgs.

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.

Boring No.: BB-BSA-109A

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-110
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	127.53	**Auger ID/OD:**	
Operator:	Kevin Hanscom	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	Lina-Maria Pua	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140 lbs/30 in
Date Start/Finish:	05/08/24 (20:09); 05/08/24 (21:22)	**Drilling Method:**	SSA, Cased Wash	**Core Barrel:**	NX
Boring Location:	N: 482660.73, E: 1735292.34	**Casing ID/OD:**	3.0 in/3.25 in	**Water Level*:**	3.1 ft on 05/08/24 at 20:34
Hammer Efficiency Factor: 1.066		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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MV = Unsuccessful Field Vane Shear Test Attempt
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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	126.9		Asphalt Pavement	
										0.6	
	1D	24/11	1.00 - 3.00	16-21-16-20	37	66				Brown, dry, dense, Silty GRAVEL, little sand (FILL).	
	2D	24/6	3.00 - 5.00	10-8-9-21	17	30				Grey, wet, medium dense, Silty angular GRAVEL, trace sand (FILL).	
5	3D	3/3	5.00 - 5.25	50/3"	R		NX	122.2		Grey, wet, very dense, angular GRAVEL, some silt, trace sand, poorly-graded (FILL).	
	~~R1~~	~~60/57~~	~~5.30 - 10.30~~	~~RQD = 52%~~						5.3	
										Bedrock encountered at 5.3 feet bgs Top of Bedrock at Elev. 122.2 ft R1 (5.3'-10.3'): Grey, very fine grained, METAWACKE [metasandstone] with frequent thick and thin calcite veins, medium strong, thinly laminated, fresh; discontinuities horizontal to steep dipping, close to moderately close spacing, stepped, smooth to polished, open. average 1.0 fractures per foot [MEDIUM BEDDEED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = fair 95% Recovery Rock Core Rate (min:sec) 5.3-6.3 ft (2:20) 6.3-7.3 ft (2:31) 7.3-8.3 ft (2:21) 8.3-9.3 ft (2:54) 9.3-10.3 ft (3:10)	
10	R2	60/60	10.30 - 15.30	RQD = 72%							
15								112.2		R2 (10.3'-15.3'): Grey, very fine grained, METAWACKE [metasandstone] with frequent thick and thin calcite veins, very to extremely strong, thinly laminated, fresh; discontinuities steep dipping, close to wide spacing, stepped, smooth, open. average 0.8 fractures per foot [MEDIUM BEDDEED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = fair 100% Recovery Rock Core Rate (min:sec) 10.3-11.3 ft (3:15) 11.3-12.3 ft (2:42) 12.3-13.3 ft (3:30) 13.3-14.3 ft (2:58) 14.3-15.3 ft (3:40)	
20										15.3	
25										**Bottom of Exploration at 15.3 feet below ground surface.** Boring backfilled with bentonite chips in the rock core socket, gravel to bottom of pavement and patched with cold patch asphalt.	
30											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by MaineDOT.
3. Water level reading taken on 5/8/24 at 20:34 was made before the start of rock coring with bottom of casing at 5.3 ft bgs.

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: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-111
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	148.27	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/25/24 (0:44); 7/25/24 (4:25)	**Drilling Method:**	SSA, Cased Wash	**Core Barrel:**	NX
Boring Location:	N: 482728.68, E: 1735418.07	**Casing ID/OD:**	4" (ID)	**Water Level*:**	14.75' 4:07 7/25/24
Hammer Efficiency Factor: 1.087		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
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V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
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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	1D	24/9	0.60 - 2.60	9-11-9-11	20	36	SSA	147.7		7" Ashpalt pavement	
										0.6	
										Olive brown, moist, dense, fine to coarse SAND AND fine to coarse GRAVEL, little silt (FILL).	Fines = 13.5% A-1-a (0), GM-SM
	2D	24/19	3.00 - 5.00	11-20-22-16	42	76				Olive with brown, moist, hard, SILT, some round to subround gravel, little fine to medium sand, weathered coarse gravel, non-plastic (FILL).	
5	3D	13.5/12	5.00 - 6.13	13-21-50/1.5"	R		165			Light olive brown, moist, hard, SANDY SILT, trace gravel, non-plastic (FILL).	Fines = 61.6% A-4 (0), ML
							64				
	4D	24/12	7.00 - 9.00	12-26-20-13	46	83	47			Fractured rock fragments, trace organics (roots) (FILL).	
							88				
							47	138.8		Olive with dark grey, moist, hard, SANDY SILT, trace gravel, non-plastic (FILL).	
10	5D	24/22	10.00 - 12.00	7-9-11-15	20	36	59			9.5	
							73			Olive with orange mottled, moist, hard, CLAY, trace sand, medium plasticity (CLAY). Pp 3.0 to 3.5 tsf	WC = 21% Fines = 99.4% LL = 32 PL = 17 PI = 15 LI = 0.3 A-6 (15), CL
							146				
							210	134.8		13.5	
							119				
15	6D	24/13	15.00 - 17.00	19-24-16-45	40	72	71			Grayish brown, wet, very dense, SAND and GRAVEL, little silt, and fractured rock fragments (GLACIAL TILL).	WC = 13.4% Fines = 20.0% A-1-b (0), SM/GM
							95				
							208	130.5		17.8	
							NX			Bedrock encountered at 17.8 feet bgs Top of Bedrock at Elev. 130.5 ft R1 (19.0' - 24.0'): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with frequent calcite veins, strong to very strong, slightly weathered with signs of chemical weathering; discontinuities low angle to steep dipping, close to very close spacing, rough to very rough, open to tight, highly fractured average from 19 ft to 21.3 ft [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = very poor 68% recovery 15% RQD Rock Core Rate (min:sec) 19.0 - 20.0 ft (2:11) 20.0 - 21.0 ft (1:11) 21.0 - 22.0 ft (1:55) 22.0 - 23.0 ft (1:49) 23.0 - 24.0 ft (1:56)	
	R-1	60/40.8	19.00 - 24.00	RQD = 15%							
20											
	R-2	60/60	24.00 - 29.00	RQD = 60%							
25											
								119.3		R2 (24.0' - 29.0'): Grey, very fine grained, thinly to very thinly bedded, METAWACKE [metasandstone] with frequent calcite veins, very strong to strong, fresh; discontinuities low angle dipping, very	
30											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level reading taken on 7/25/24 at 4:07 am was made after the rock coring.

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.

Boring No.: BB-BSA-111

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MaineDOT I-95 Bridges Over Stillwater Avenue
Location: Bangor, Maine

Boring No.: BB-BSA-111
WIN: 027176.00

Driller:	Seaboard	**Elevation (ft.)**	148.27	**Auger ID/OD:**	
Operator:	Ryan H.	**Datum:**	Maine East Zone	**Sampler:**	Standard Split Spoon
Logged By:	D. Burgess	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	140lb/30in
Date Start/Finish:	7/25/24 (0:44); 7/25/24 (4:25)	**Drilling Method:**	SSA, Cased Wash	**Core Barrel:**	NX
Boring Location:	N: 482728.68, E: 1735418.07	**Casing ID/OD:**	4" (ID)	**Water Level*:**	14.75' 4:07 7/25/24
Hammer Efficiency Factor: 1.087		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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WOH = Weight of 140 lb. 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)
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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
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PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: 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.
30										close spacing, rough, tight, average 1.6 fractures per foot [MEDIUM BEDDED FACIES, PENOBSCOT RIVER MEMBER, BANGOR FORMATION]. Rock Mass Quality = fair 100% recovery 60% RQD Rock Core Rate (min:sec) 24.0 - 25.0 ft (3:39) 25.0 - 26.0 ft (5:35) 26.0 - 27.0 ft (5:39) 27.0 - 28.0 ft (5:10) 28.0 - 29.0 ft (3:51)	
35										29.0 **Bottom of Exploration at 29.0 feet below ground surface.** Boring backfilled with bentonite chips in the rock core socket, gravel to bottom of pavement and patched with cold patch asphalt.	
40											
45											
50											
55											
60											

Remarks:

1. Hammer Efficiency factor provided by S.W. Cole and taken from "2023PA00074 - SW Cole - SPT Report" by GRL Engineers Inc., dated 11/10/2023.
2. As-drilled boring locations and ground surface elevations were provided by HNTB.
3. Water level reading taken on 7/25/24 at 4:07 am was made after the rock coring.

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

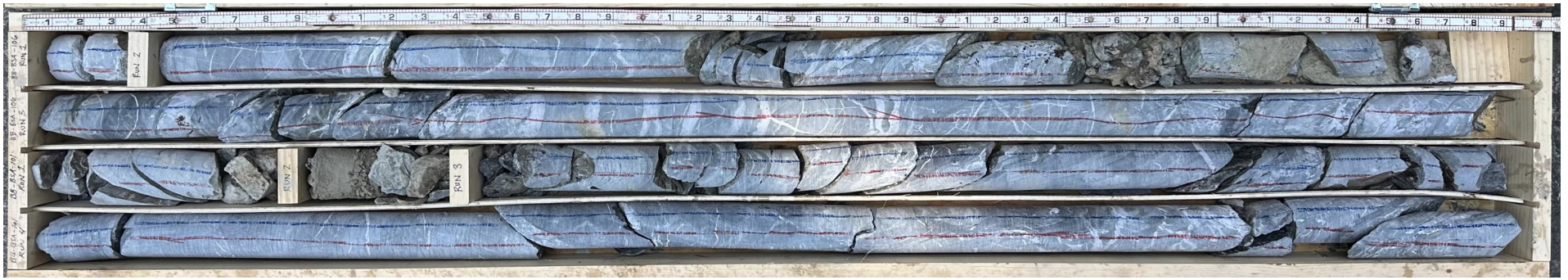
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

APPENDIX B

Rock Core Photographs

APPENDIX B
ROCK CORE PHOTOGRAPHS
MAINEDOT I-95 BRIDGE OVER STILLWATER AVENUE
BANGOR, MAINE
MAINEDOT WIN #027176.00

Boring	Run	Depth Below Surface	Recovery		RQD		Rock Type	Box Row	Date Cored
		Feet	Feet	%	Feet	%			
BB-BSA-101	R1	31.5 - 32.4	0.8 / 0.9	89	0.0 / 0.9	0	Metawacke	3	7/29/2024
	R2	32.4 - 32.9	0.5 / 0.5	100	0.0 / 0.5	0	Metawacke	3	7/29/2024
	R3	32.9 - 36.5	3.6 / 3.6	100	0.5 / 3.6	14	Metawacke	3	7/29/2024
	R4	36.5 - 41.5	5.0 / 5.0	100	3.0 / 5.0	60	Metawacke	4	7/29/2024
BB-BSA-106	R1	63.8 - 64.8	0.3 / 1.0	30	0 / 0.3	0	Metawacke	1	7/28/2024
	R2	64.8 - 69.1	4.3 / 4.3	100	2 / 4.3	47	Metawacke	1	7/28/2024
	R3	69.1 - 74.1	5.0 / 5.0	100	3.6 / 5.0	62	Metawacke	2	7/28/2024



Notes:
1. "Box row" indicates the section of the box where the core is contained: 1 = top, 4 = bottom.
2. Top of each core run is on the left and increases with depth to the right.

Prepared By: RJN
Checked By: LMP
Reviewed By: JDL

APPENDIX B
ROCK CORE PHOTOGRAPHS
MAINEDOT I-95 BRIDGE OVER STILLWATER AVENUE
BANGOR, MAINE
MAINEDOT WIN #027176.00

Boring	Run	Depth Below Surface	Recovery		RQD		Rock Type	Box Row	Date Cored
		Feet	Feet	%	Feet	%			
BB-BSA-102	R1	12.2 - 17.2	4.50 / 5.0	90	3.7 / 5.0	73	Metawacke	3	5/8/2024
	R2	17.2 - 22.2	4.9 / 5.0	98	4.9 / 5.0	98	Metawacke	4	5/8/2024
BB-BSA-108	R1	6.7 - 11.7	4.9 / 5.0	98	3.0 / 5.0	59	Metawacke	1	5/7/2024
	R2	11.7 - 12.7	0.9 / 1.0	92	0.4 / 1.0	40	Metawacke	2	5/7/2024
	R3	12.7 - 14.7	1.76 / 2.0	88	0.38 / 2.0	19	Metawacke	2	5/7/2024
	R4	14.7 - 16.7	1.92 / 2.0	96	0.74 / 2.0	37	Metawacke	2	5/7/2024

Notes:
1. "Box row" indicates the section of the box where the core is contained: 1 = top, 4 = bottom.
2. Top of each core run is on the left and increases with depth to the right.

Prepared By: RJN
Checked By: LMP
Reviewed By: JDL

APPENDIX B
ROCK CORE PHOTOGRAPHS
MAINEDOT I-95 BRIDGE OVER STILLWATER AVENUE
BANGOR, MAINE
MAINEDOT WIN #027176.00

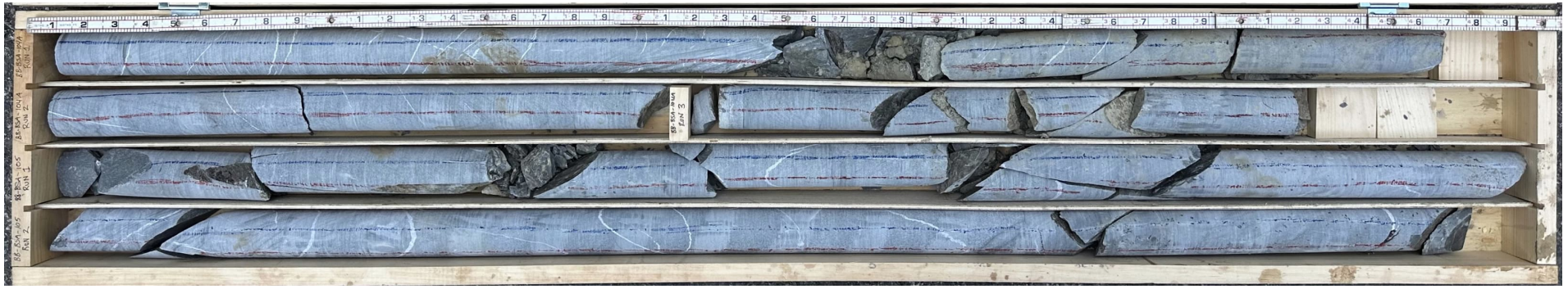
Boring	Run	Depth Below Surface	Recovery		RQD		Rock Type	Box Row	Date Cored
		Feet	Feet	%	Feet	%			
BB-BSA-103	R1	7.2 - 12.2	5.0 / 5.0	100	1.6 / 5.0	31	Metawacke	3	5/8/2024
	R2	12.2 - 17.2	5.0 / 5.0	100	3.6 / 5.0	71	Metawacke	4	5/8/2024
BB-BSA-110	R1	5.3 - 10.3	4.8 / 5.0	95	2.6 / 5.0	52	Metawacke	1	5/8/2024
	R2	10.3 - 15.3	5.0 / 5.0	100	3.6 / 5.0	72	Metawacke	2	5/8/2024

Notes:
1. "Box row" indicates the section of the box where the core is contained: 1 = top, 4 = bottom.
2. Top of each core run is on the left and increases with depth to the right.

Prepared By: RJN
Checked By: LMP
Reviewed By: JDL

APPENDIX B
ROCK CORE PHOTOGRAPHS
MAINEDOT I-95 BRIDGE OVER STILLWATER AVENUE
BANGOR, MAINE
MAINEDOT WIN #027176.00

Boring	Run	Depth Below Surface	Recovery		RQD		Rock Type	Box Row	Date Cored
		Feet	Feet	%	Feet	%			
BB-BSA-104A	R1	21.0 - 26.0	4.8 / 5.0	95	2.8 / 5.0	56	Metawacke	1	7/30/2024
	R2	26.0 - 28.8	2.1 / 2.8	75	1.7 / 2.8	61	Metawacke	2	7/30/2024
	R3	28.8 - 31.0	2.0 / 2.2	91	0.5 / 2.2	23	Metawacke	2	7/30/2024
BB-BSA-105	R1	26.4 - 31.4	5.0 / 5.0	100	1.5 / 5.0	30	Metawacke	3	7/31/2024
	R2	31.4 - 36.2	4.8 / 4.8	100	3.6 / 4.8	75	Metawacke	4	7/31/2024

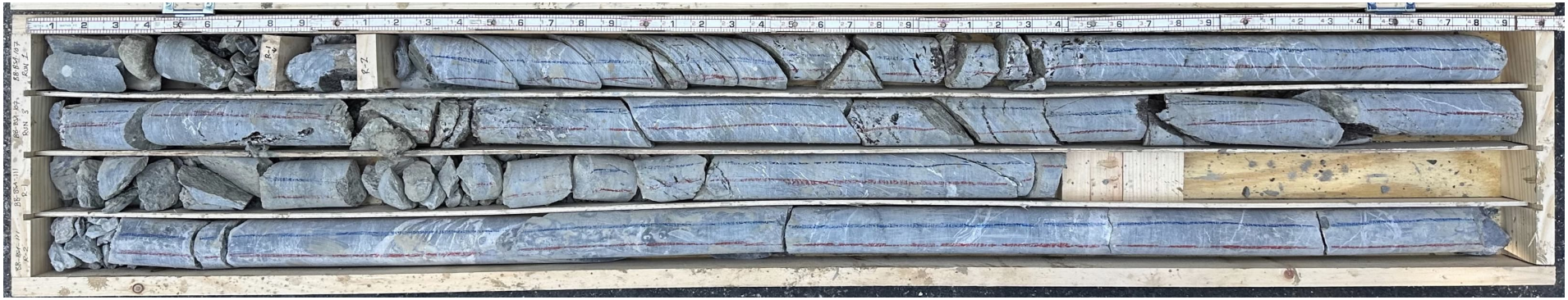


Notes:
1. "Box row" indicates the section of the box where the core is contained: 1 = top, 4 = bottom.
2. Top of each core run is on the left and increases with depth to the right.

Prepared By: RJN
Checked By: LMP
Reviewed By: JDL

APPENDIX B
ROCK CORE PHOTOGRAPHS
MAINEDOT I-95 BRIDGE OVER STILLWATER AVENUE
BANGOR, MAINE
MAINEDOT WIN #027176.00

Boring	Run	Depth Below Surface	Recovery		RQD		Rock Type	Box Row	Date Cored
		Feet	Feet	%	Feet	%			
BB-BSA-107	R1	63.4 - 67.2	0.6 / 3.8	23	0.0 / 3.8	0	Metawacke	1	7/23/2024
	R2	67.2 - 68.2	0.2 / 1.0	17	0.0 / 1.0	0	Metawacke	1	7/24/2024
	R3	68.2 - 72.2	3.8 / 4.0	95	1.4 / 4.0	35	Metawacke	1	7/24/2024
	R4	72.2 - 77.2	5.0 / 5.0	100	2.0 / 5.0	39	Metawacke	2	7/24/2024
BB-BSA-111	R1	19.0 - 24.0	3.4 / 5.0	68	0.8 / 5.0	15	Metawacke	3	7/24/2024
	R2	24.0 - 29.0	5.0 / 5.0	100	3.0 / 5.0	60	Metawacke	4	7/24/2024



Notes:
1. "Box row" indicates the section of the box where the core is contained: 1 = top, 4 = bottom.
2. Top of each core run is on the left and increases with depth to the right.

Prepared By: RJN
Checked By: LMP
Reviewed By: JDL

APPENDIX B
ROCK CORE PHOTOGRAPHS
MAINEDOT I-95 BRIDGE OVER STILLWATER AVENUE
BANGOR, MAINE
MAINEDOT WIN #027176.00

Boring	Run	Depth Below Surface (Feet)	Recovery (Feet)	Recovery (%)	RQD (Feet)	RQD (%)	Rock Type	Box Row	Date Cored
BB-BSA109A	R1	4.0 - 8.8	4.3 / 4.8	90	1.6 / 4.8	33	Metawacke	2	5/7/2024
	R2	8.8 - 13.9	4.8 / 5.1	93	2.5 / 5.1	49	Metawacke	2,3	5/7/2024

Notes:
1. "Box row" indicates the section of the box where the core is contained: 1 = top, 4 = bottom.
2. Top of each core run is on the left and increases with depth to the right.

Prepared By: RJN
Checked By: LMP
Reviewed By: JDL

APPENDIX C

Laboratory Test Results

GeoTesting EXPRESS
A Sercel Business

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	---	Sample Type:	---	Tested By:	ajl
Sample ID:	---	Test Date:	08/12/24	Checked By:	ank
Depth :	---	Test Id:	780399		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
BB-BSA-101	4D	7-9 ft	Moist, olive brown sandy silt with gravel	11.1
BB-BSA-101	6D	15-17 ft	Moist, olive brown silty sand with gravel	10.7
BB-BSA-101	8D	25-27 ft	Moist, dark grayish brown silty gravel with sand	9.6
BB-BSA-104	4D	7-9 ft	Moist, dark grayish brown silty sand with gravel	6.5
BB-BSA-104	5D	10-12 ft	Moist, grayish brown sandy silt	11.1
BB-BSA-104	7D	20-22 ft	Moist, greenish gray silt with sand	16.4
BB-BSA-105	6D	15-17 ft	Moist, grayish brown sandy silt	20.5
BB-BSA-105	7D	20-22ft	Moist, olive brown silty sand with gravel	11.7
BB-BSA-106	14D	55-57 ft	Moist, gray silty sand	46.5
BB-BSA-107	6D	10.7-12.7 ft	Moist, olive brown silt with sand	14.7

Notes: Temperature of Drying : 110º Celsius

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	---	Sample Type:	---	Tested By:	ajl
Sample ID:	---	Test Date:	08/14/24	Checked By:	ank
Depth :	---	Test Id:	780423		

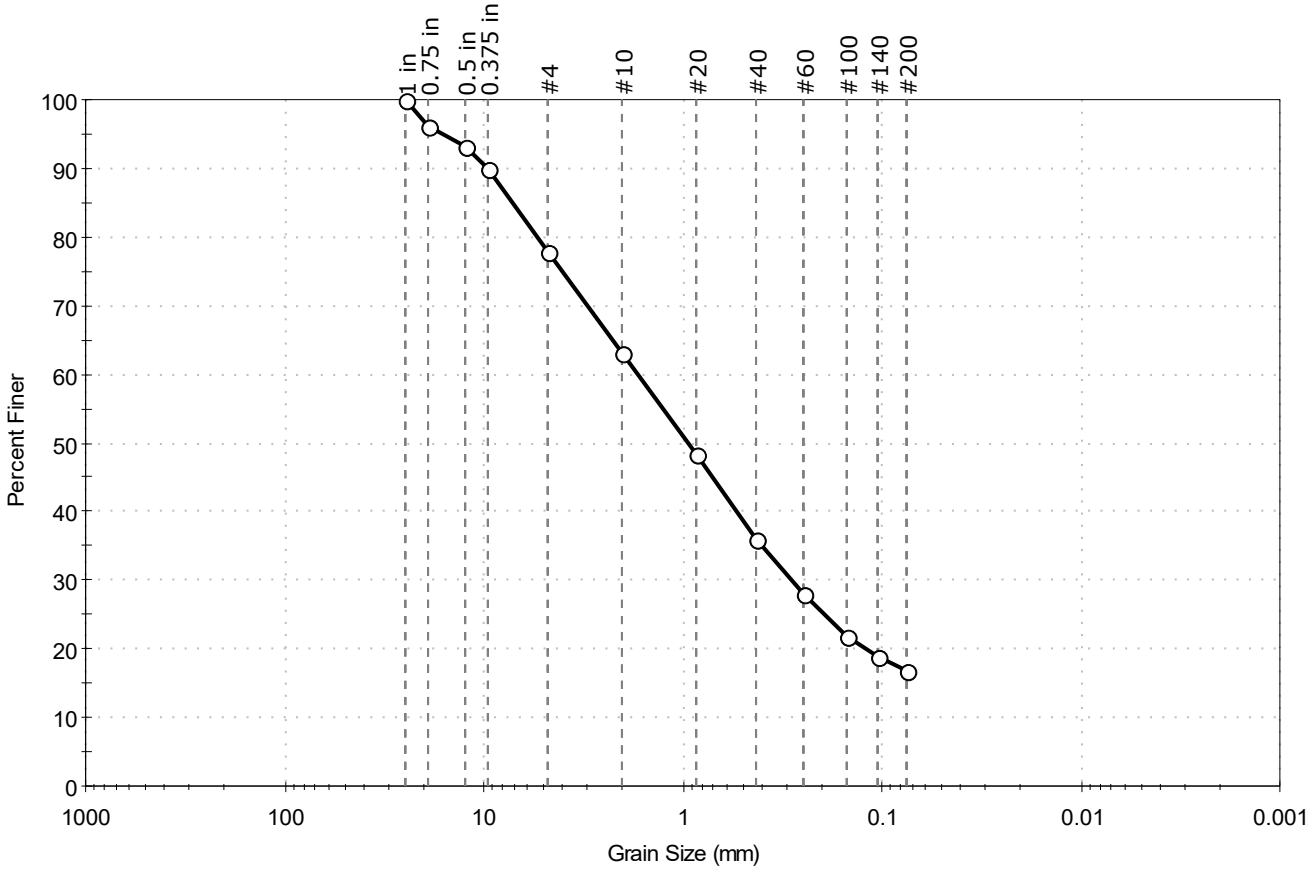
Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
BB-BSA-107	15D	55-57 ft	Moist, grayish brown silty sand with gravel	10.6
BB-BSA-111	6D	15-17 ft	Moist, grayish brown silty sand with gravel	13.4

Notes: Temperature of Drying : 110º Celsius

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-101	Sample Type:	Jar	Tested By:	ajl
Sample ID:	1D	Test Date:	08/19/24	Checked By:	ank
Depth :	0.7-2.7 ft	Test Id:	780401		
Test Comment:	---				
Visual Description:	Moist, light olive brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	22.0	61.2	16.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	96		
0.5 in	12.50	93		
0.375 in	9.50	90		
#4	4.75	78		
#10	2.00	63		
#20	0.85	48		
#40	0.42	36		
#60	0.25	28		
#100	0.15	22		
#140	0.11	19		
#200	0.075	17		

Coefficients

D_{85} = 7.1397 mm	D_{30} = 0.2832 mm
D_{60} = 1.6778 mm	D_{15} = N/A
D_{50} = 0.9366 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

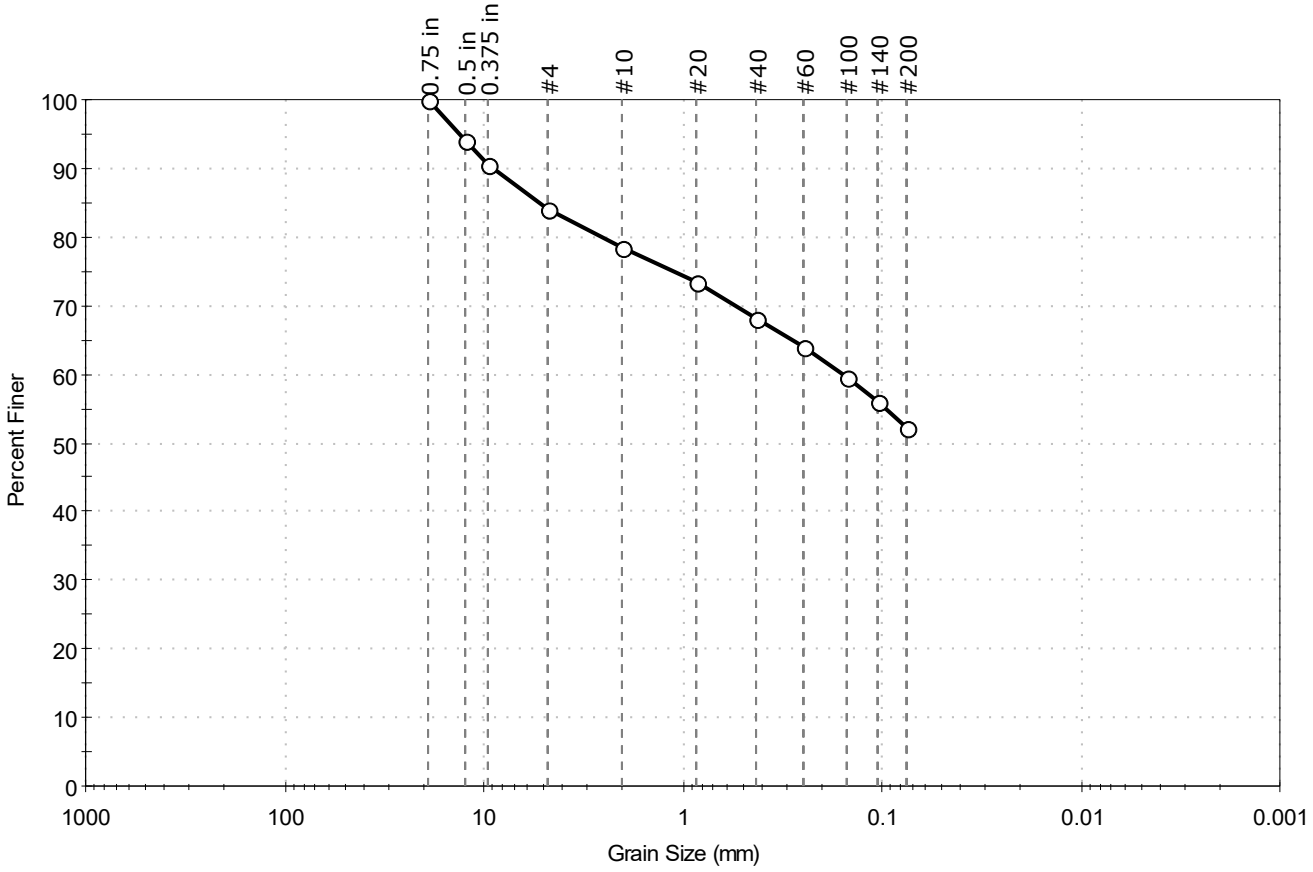
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-101	Sample Type:	Jar	Tested By:	ajl
Sample ID:	4D	Test Date:	08/19/24	Checked By:	ank
Depth :	7-9 ft	Test Id:	780402		
Test Comment:	---				
Visual Description:	Moist, olive brown sandy silt with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	15.8	32.0	52.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	94		
0.375 in	9.50	91		
#4	4.75	84		
#10	2.00	79		
#20	0.85	73		
#40	0.42	68		
#60	0.25	64		
#100	0.15	59		
#140	0.11	56		
#200	0.075	52		

Coefficients

D_{85} = 5.2031 mm	D_{30} = N/A
D_{60} = 0.1591 mm	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

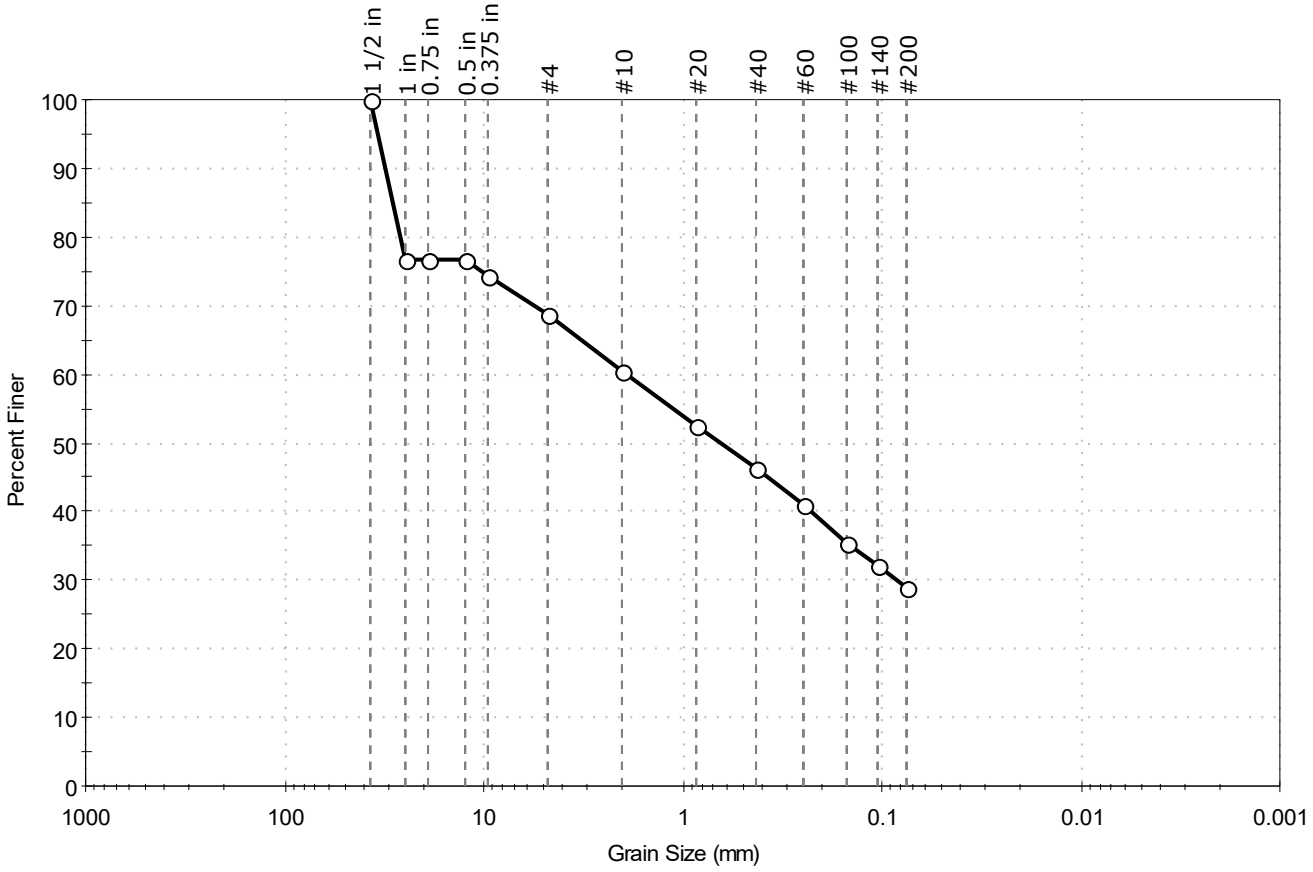
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-101	Sample Type:	Jar	Tested By:	ajl
Sample ID:	6D	Test Date:	08/16/24	Checked By:	ank
Depth :	15-17 ft	Test Id:	780403		
Test Comment:	---				
Visual Description:	Moist, olive brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	31.2	40.0	28.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2 in	37.50	100		
1 in	25.00	77		
0.75 in	19.00	77		
0.5 in	12.50	77		
0.375 in	9.50	74		
#4	4.75	69		
#10	2.00	61		
#20	0.85	53		
#40	0.42	46		
#60	0.25	41		
#100	0.15	35		
#140	0.11	32		
#200	0.075	29		

Coefficients

D_{85} = 28.9113 mm D_{30} = 0.0851 mm

D_{60} = 1.8753 mm D_{15} = N/A

D_{50} = 0.6407 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

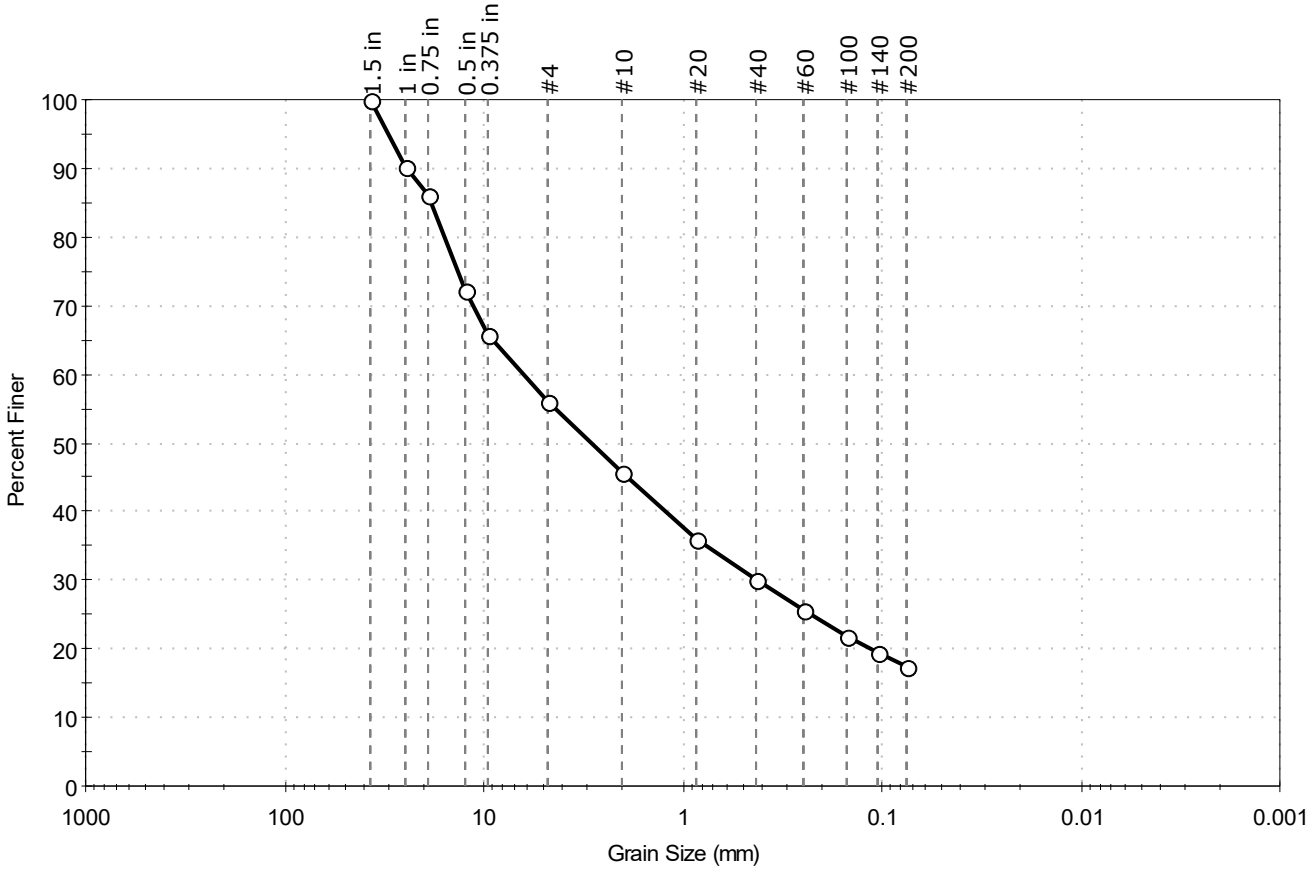
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-101	Sample Type:	Jar	Tested By:	ajl
Sample ID:	8D	Test Date:	08/19/24	Checked By:	ank
Depth :	25-27 ft	Test Id:	780404		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown silty gravel with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	43.8	38.7	17.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	90		
0.75 in	19.00	86		
0.5 in	12.50	72		
0.375 in	9.50	66		
#4	4.75	56		
#10	2.00	46		
#20	0.85	36		
#40	0.42	30		
#60	0.25	26		
#100	0.15	22		
#140	0.11	19		
#200	0.075	18		

Coefficients

D_{85} = 18.3264 mm D_{30} = 0.4200 mm

D_{60} = 6.2648 mm D_{15} = N/A

D_{50} = 2.8644 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

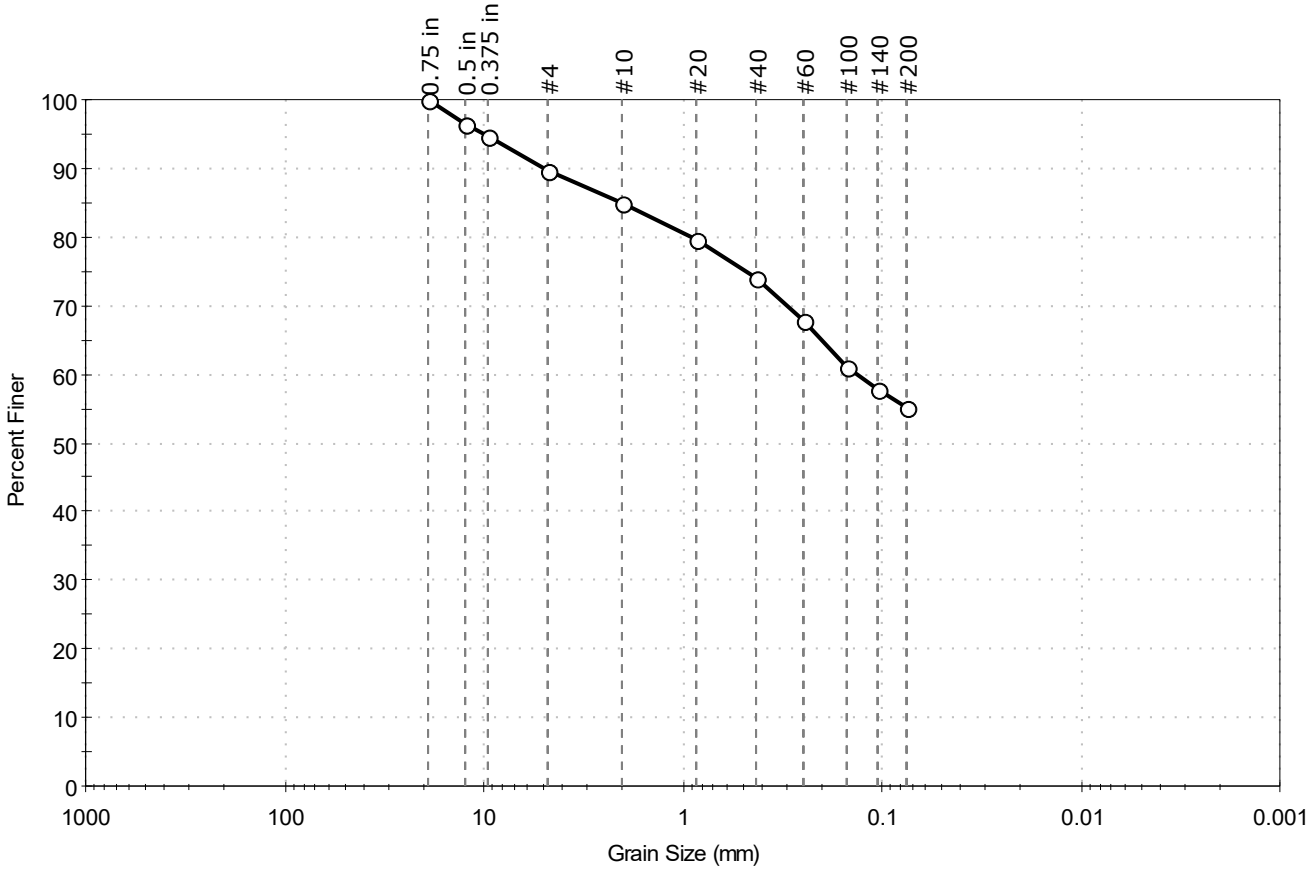
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-104	Sample Type:	Jar	Tested By:	ajl
Sample ID:	2D	Test Date:	08/19/24	Checked By:	ank
Depth :	2.8-4.8 ft	Test Id:	780405		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	10.4	34.3	55.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	96		
0.375 in	9.50	95		
#4	4.75	90		
#10	2.00	85		
#20	0.85	80		
#40	0.42	74		
#60	0.25	68		
#100	0.15	61		
#140	0.11	58		
#200	0.075	55		

Coefficients

D_{85} = 1.9913 mm	D_{30} = N/A
D_{60} = 0.1326 mm	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

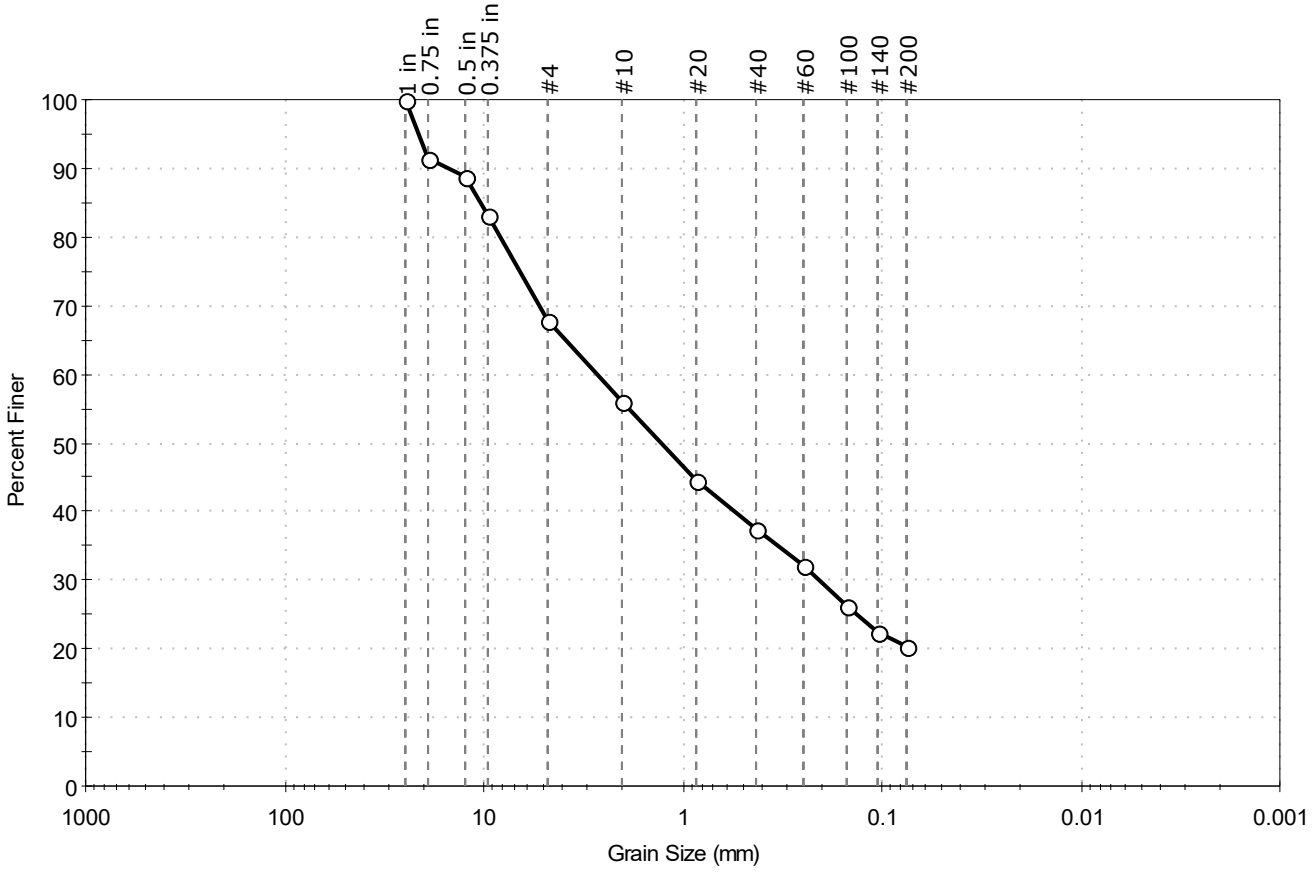
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-104	Sample Type:	Jar	Tested By:	ajl
Sample ID:	4D	Test Date:	08/19/24	Checked By:	ank
Depth :	7-9 ft	Test Id:	780406		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	32.0	47.6	20.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	92		
0.5 in	12.50	89		
0.375 in	9.50	83		
#4	4.75	68		
#10	2.00	56		
#20	0.85	45		
#40	0.42	37		
#60	0.25	32		
#100	0.15	26		
#140	0.11	23		
#200	0.075	20		

Coefficients

D_{85} = 10.3977 mm D_{30} = 0.2076 mm

D_{60} = 2.6769 mm D_{15} = N/A

D_{50} = 1.2727 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

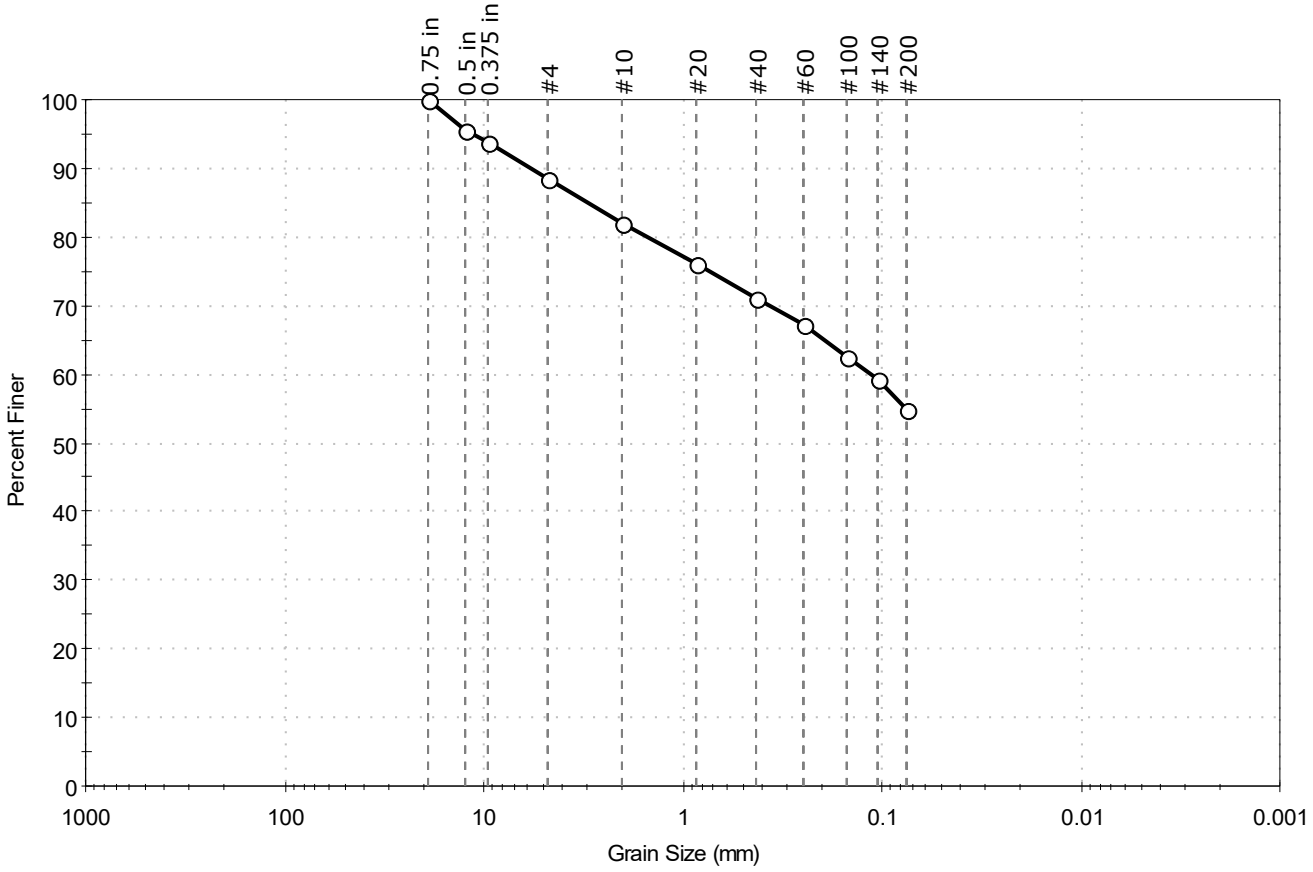
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-104	Sample Type:	Jar	Tested By:	ajl
Sample ID:	5D	Test Date:	08/19/24	Checked By:	ank
Depth :	10-12 ft	Test Id:	780407		
Test Comment:	---				
Visual Description:	Moist, grayish brown sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	11.6	33.5	54.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	96		
0.375 in	9.50	94		
#4	4.75	88		
#10	2.00	82		
#20	0.85	76		
#40	0.42	71		
#60	0.25	67		
#100	0.15	63		
#140	0.11	59		
#200	0.075	55		

Coefficients

D_{85} = 3.0173 mm	D_{30} = N/A
D_{60} = 0.1137 mm	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

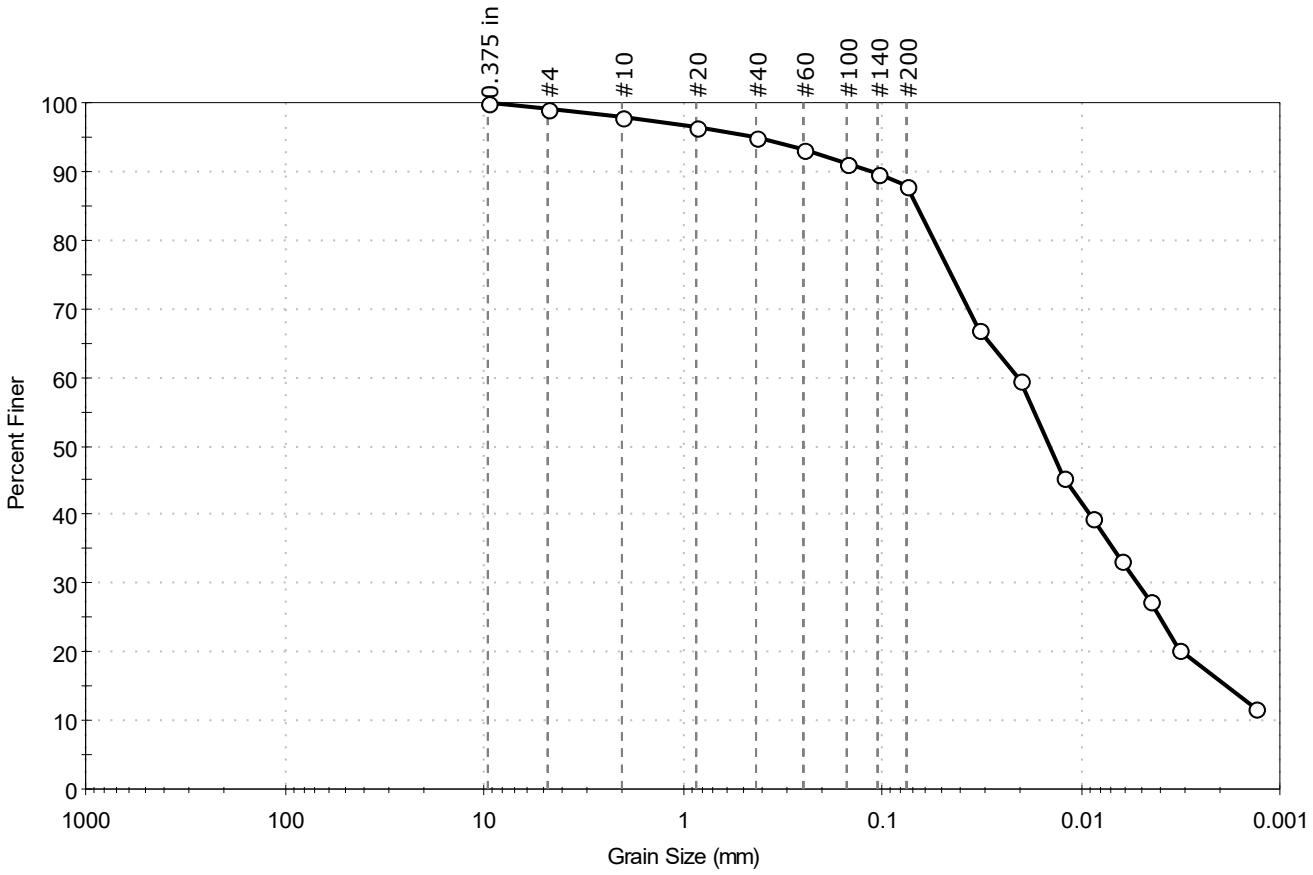
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-104	Sample Type:	Jar	Tested By:	ajl
Sample ID:	6D	Test Date:	08/15/24	Checked By:	ank
Depth :	15-17 ft	Test Id:	780410		
Test Comment:	---				
Visual Description:	Moist, grayish brown clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	1.0	11.2	87.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	98		
#20	0.85	96		
#40	0.42	95		
#60	0.25	93		
#100	0.15	91		
#140	0.11	90		
#200	0.075	88		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0324	67		
---	0.0201	60		
---	0.0122	45		
---	0.0088	39		
---	0.0063	33		
---	0.0045	27		
---	0.0032	20		
---	0.0013	12		

Coefficients

D_{85} = 0.0670 mm	D_{30} = 0.0052 mm
D_{60} = 0.0205 mm	D_{15} = 0.0019 mm
D_{50} = 0.0143 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (10))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

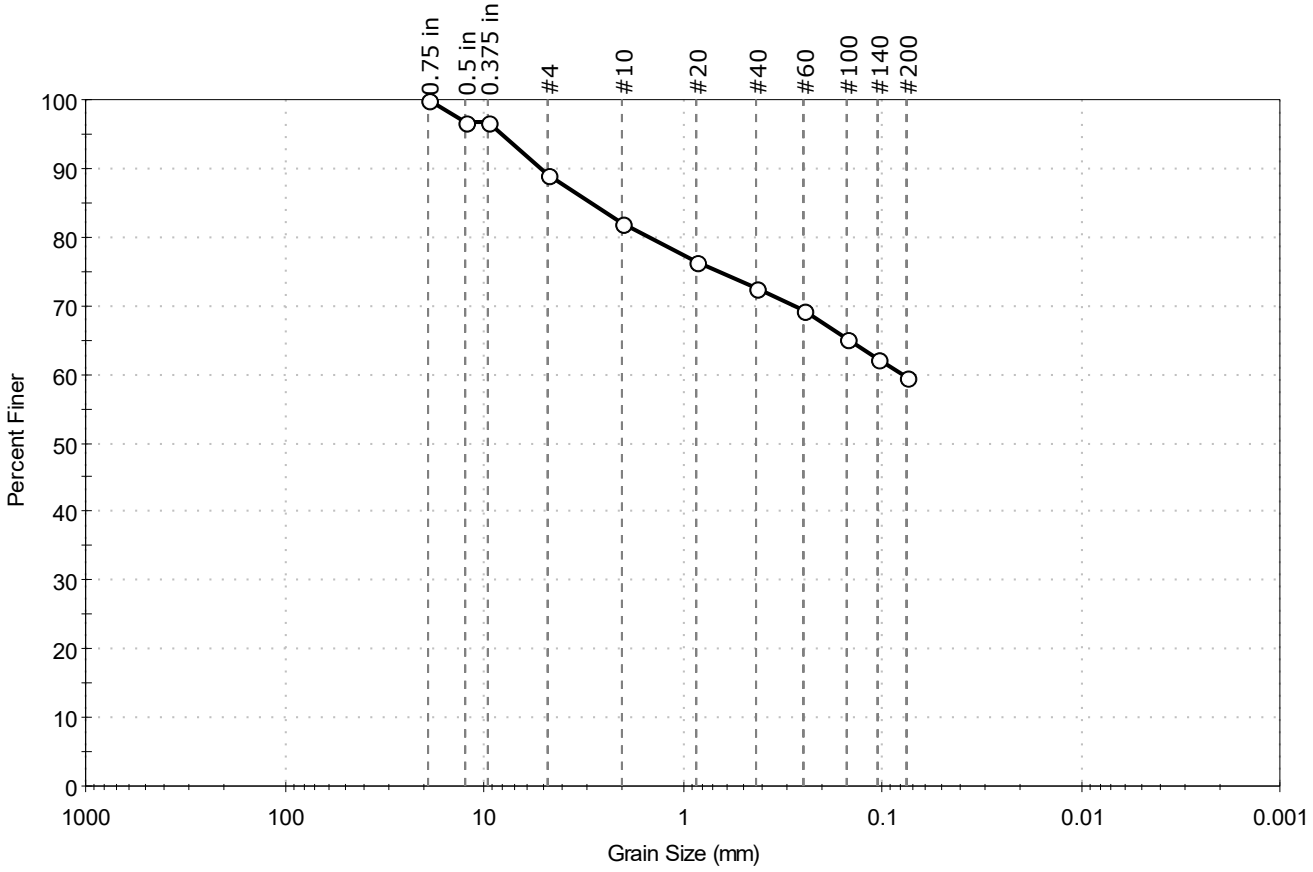
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-104	Sample Type:	Jar	Tested By:	ajl
Sample ID:	7D	Test Date:	08/19/24	Checked By:	ank
Depth :	20-22 ft	Test Id:	780408		
Test Comment:	---				
Visual Description:	Moist, greenish gray silt with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	10.8	29.7	59.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	97		
0.375 in	9.50	97		
#4	4.75	89		
#10	2.00	82		
#20	0.85	76		
#40	0.42	72		
#60	0.25	69		
#100	0.15	65		
#140	0.11	62		
#200	0.075	59		

Coefficients

D_{85} = 2.8830 mm	D_{30} = N/A
D_{60} = 0.0799 mm	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

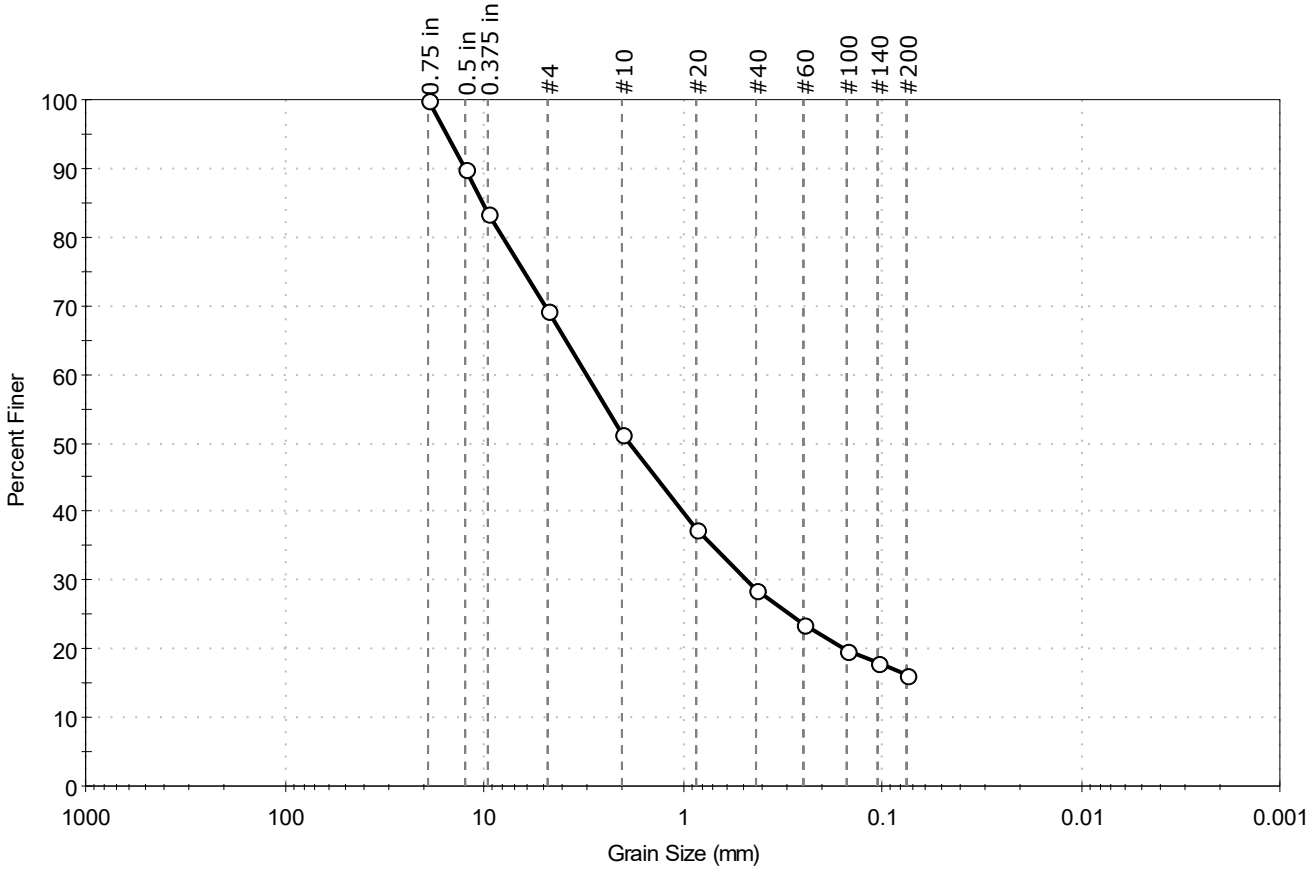
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-105	Sample Type:	Jar	Tested By:	ajl
Sample ID:	1D	Test Date:	08/19/24	Checked By:	ank
Depth :	0.9-2.9 ft	Test Id:	780366		
Test Comment:	---				
Visual Description:	Moist, olive brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	30.7	53.1	16.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	90		
0.375 in	9.50	83		
#4	4.75	69		
#10	2.00	51		
#20	0.85	37		
#40	0.42	29		
#60	0.25	24		
#100	0.15	20		
#140	0.11	18		
#200	0.075	16		

Coefficients

D_{85} = 10.1411 mm D_{30} = 0.4740 mm

D_{60} = 3.0347 mm D_{15} = N/A

D_{50} = 1.8370 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

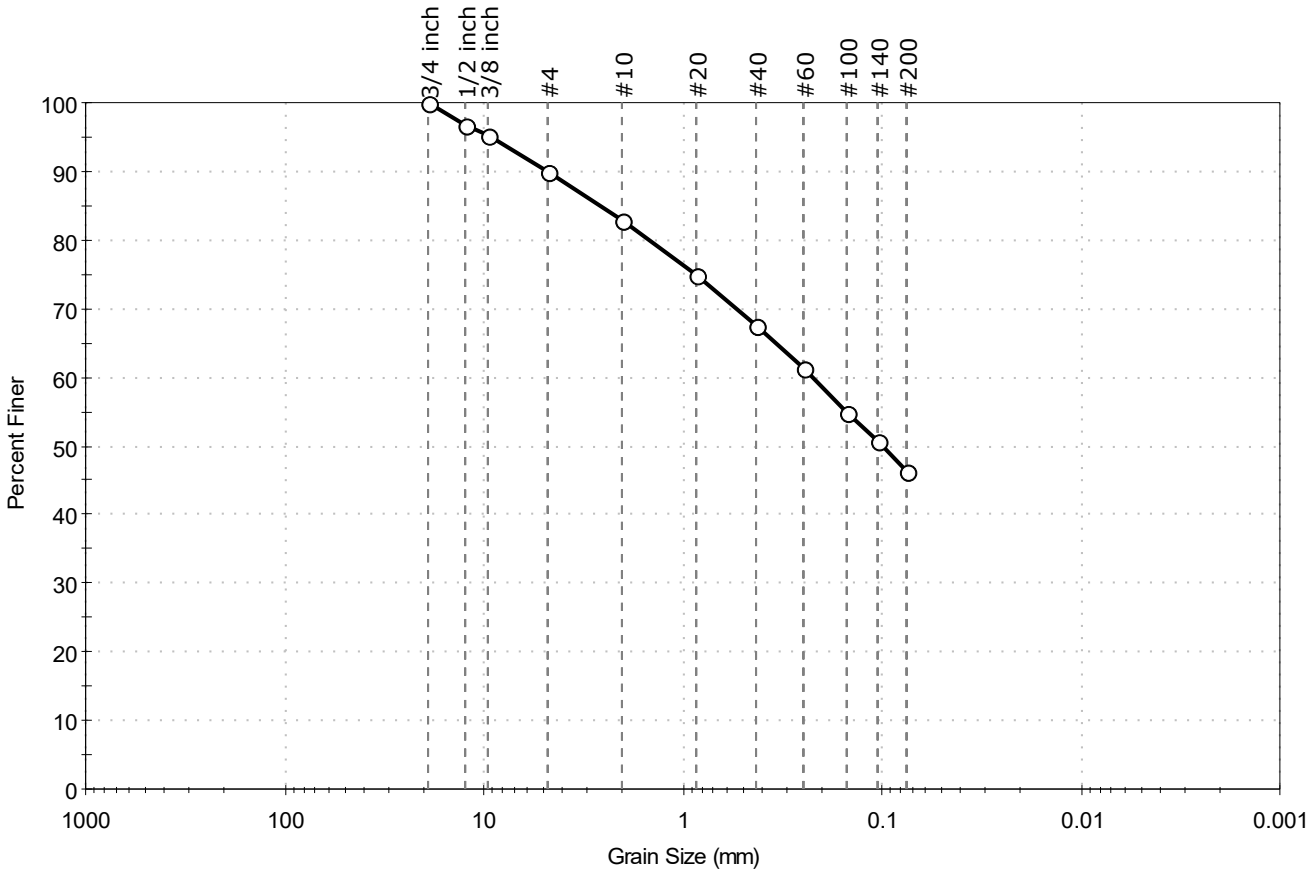
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-105	Sample Type:	Jar	Tested By:	ajl
Sample ID:	3D	Test Date:	08/19/24	Checked By:	ank
Depth :	5-5.6 ft	Test Id:	780367		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	10.0	43.6	46.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3/4 inch	19.00	100		
1/2 inch	12.50	97		
3/8 inch	9.50	95		
#4	4.75	90		
#10	2.00	83		
#20	0.85	75		
#40	0.42	67		
#60	0.25	61		
#100	0.15	55		
#140	0.11	51		
#200	0.075	46		

Coefficients

D_{85} = 2.5683 mm	D_{30} = N/A
D_{60} = 0.2264 mm	D_{15} = N/A
D_{50} = 0.1002 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

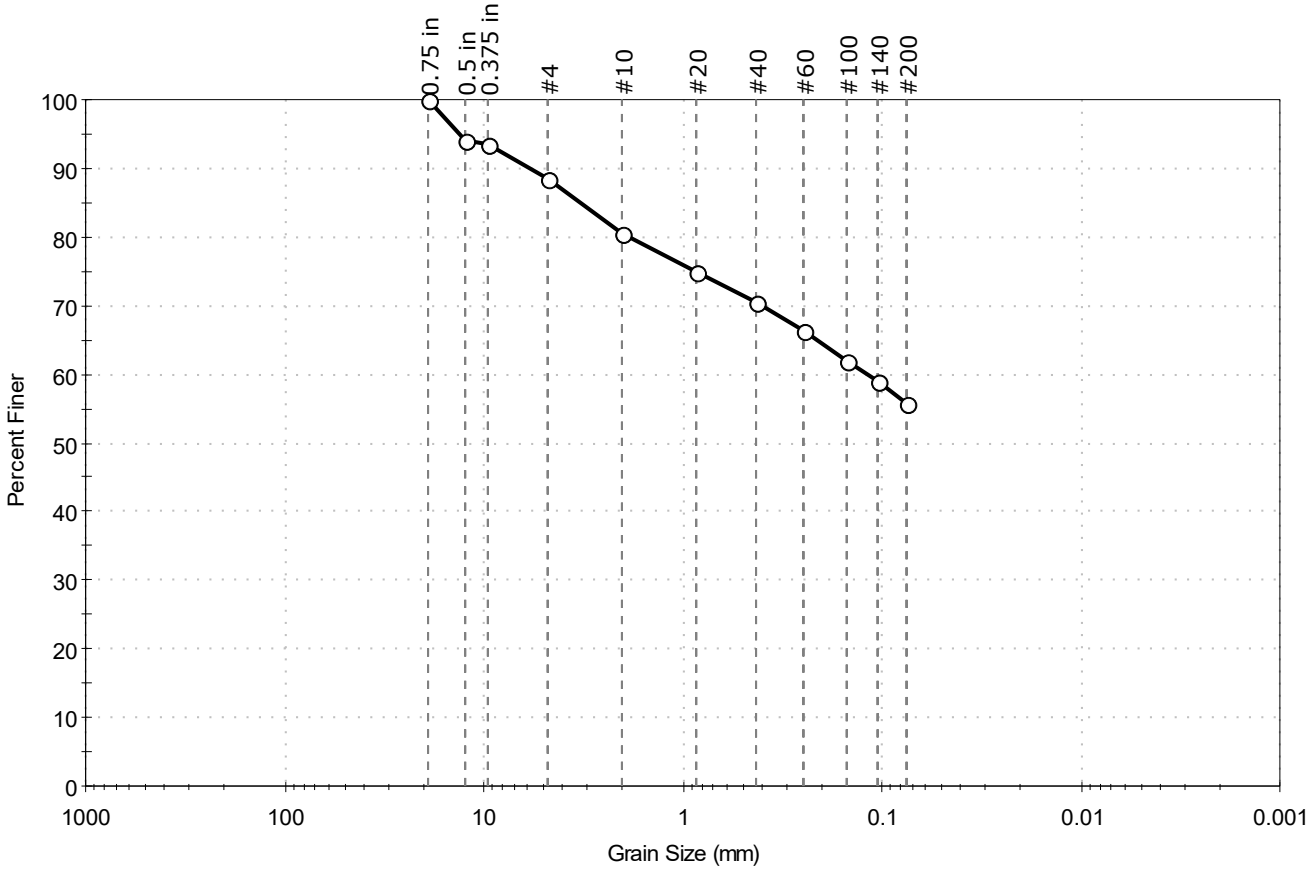
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-105	Sample Type:	Jar	Tested By:	ajl
Sample ID:	6D	Test Date:	08/19/24	Checked By:	ank
Depth :	15-17 ft	Test Id:	780368		
Test Comment:	---				
Visual Description:	Moist, grayish brown sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	11.4	32.9	55.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	94		
0.375 in	9.50	93		
#4	4.75	89		
#10	2.00	81		
#20	0.85	75		
#40	0.42	70		
#60	0.25	67		
#100	0.15	62		
#140	0.11	59		
#200	0.075	56		

Coefficients

D_{85} = 3.2112 mm	D_{30} = N/A
D_{60} = 0.1201 mm	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

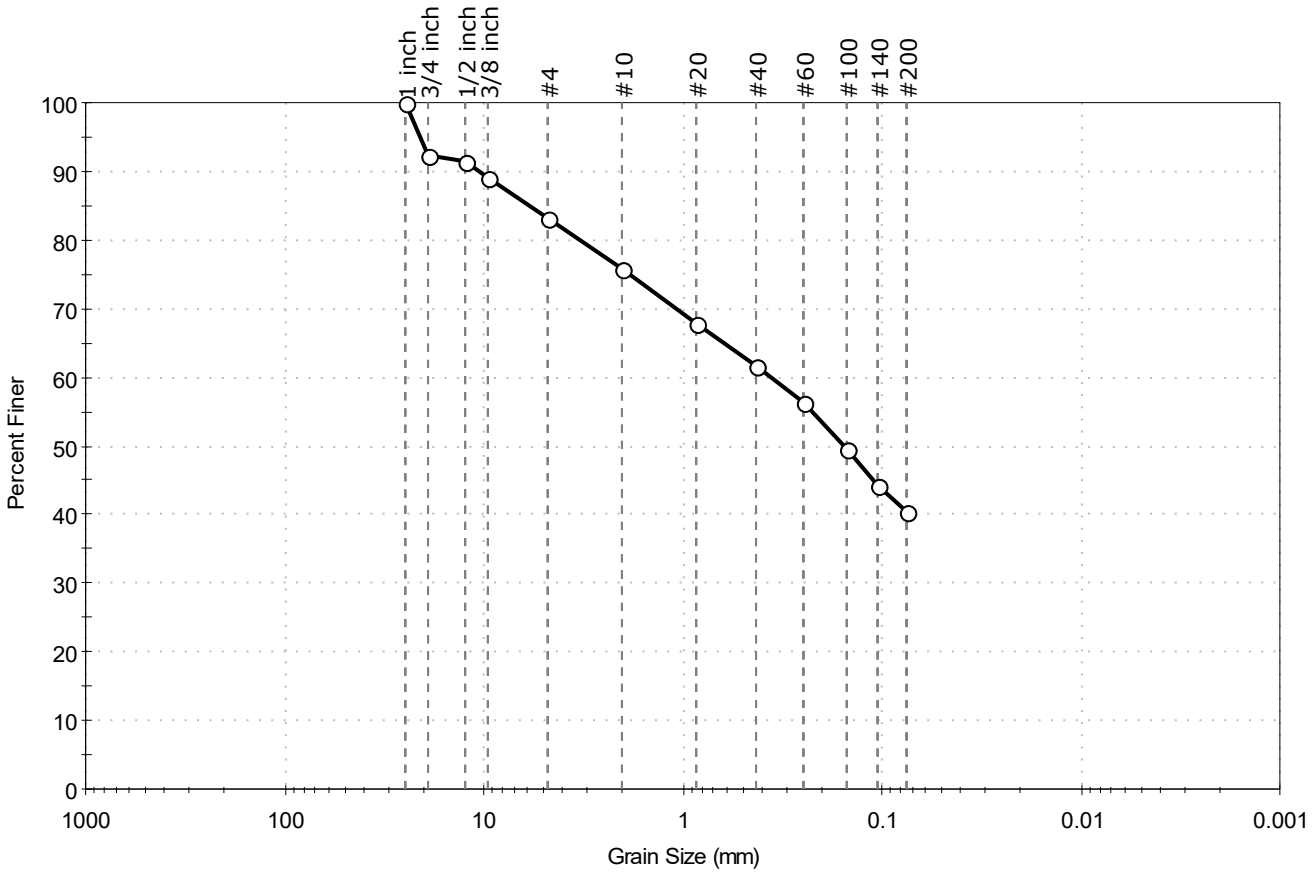
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-105	Sample Type:	Jar	Tested By:	ajl
Sample ID:	7D	Test Date:	08/19/24	Checked By:	ank
Depth :	20-22ft	Test Id:	780369		
Test Comment:	---				
Visual Description:	Moist, olive brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	16.9	42.8	40.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 inch	25.00	100		
3/4 inch	19.00	92		
1/2 inch	12.50	91		
3/8 inch	9.50	89		
#4	4.75	83		
#10	2.00	76		
#20	0.85	68		
#40	0.42	62		
#60	0.25	56		
#100	0.15	49		
#140	0.11	44		
#200	0.075	40		

Coefficients

D_{85} = 5.8920 mm	D_{30} = N/A
D_{60} = 0.3574 mm	D_{15} = N/A
D_{50} = 0.1564 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

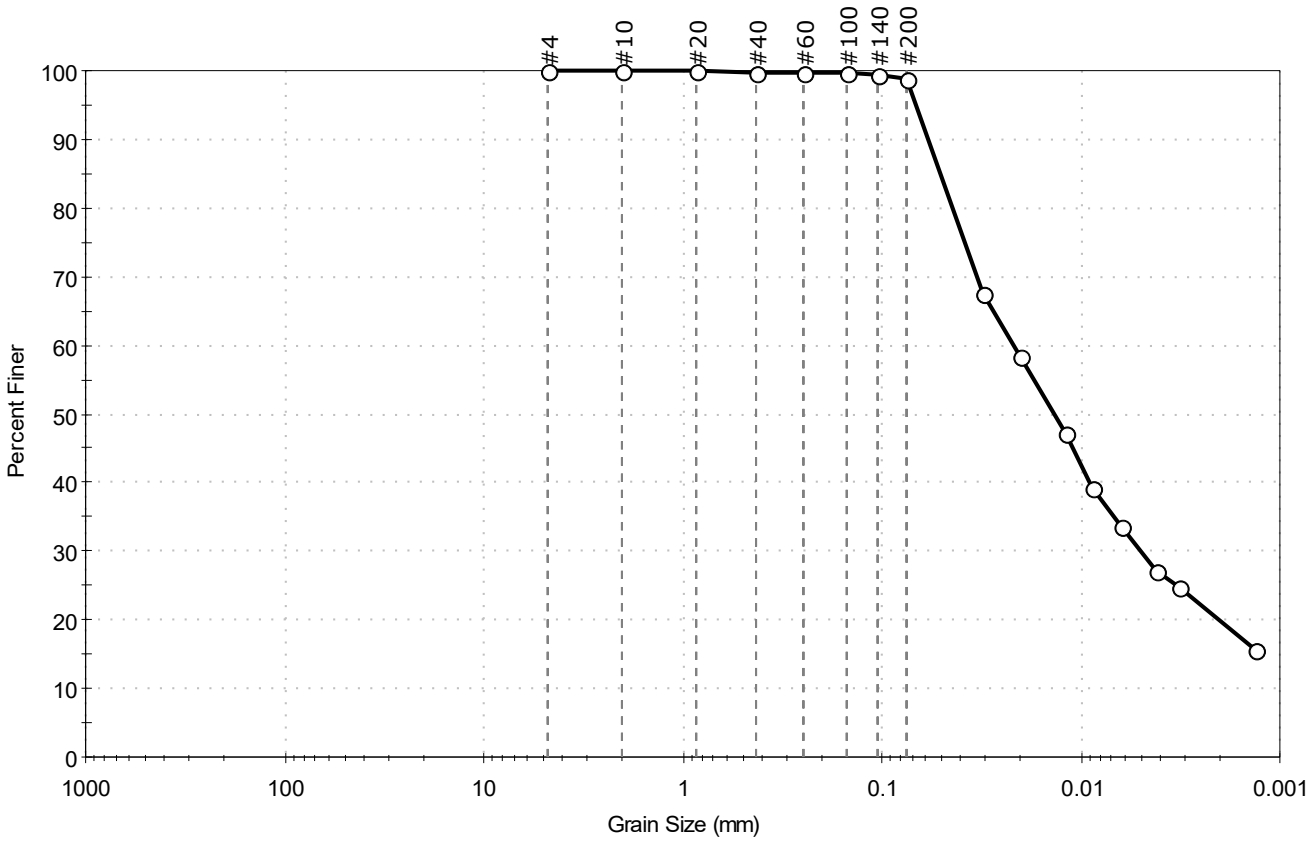
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-106	Sample Type:	Jar	Tested By:	ajl
Sample ID:	7D	Test Date:	08/15/24	Checked By:	ank
Depth :	20-22 ft	Test Id:	780382		
Test Comment:	---				
Visual Description:	Moist, light olive brown clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	1.1	98.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	99		
#200	0.075	99		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0314	67		
---	0.0203	58		
---	0.0121	47		
---	0.0087	39		
---	0.0062	34		
---	0.0042	27		
---	0.0032	25		
---	0.0013	16		

Coefficients

D_{85} =0.0510 mm	D_{30} =0.0050 mm
D_{60} =0.0219 mm	D_{15} =N/A
D_{50} =0.0137 mm	D_{10} =N/A
C_u =N/A	C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (19))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

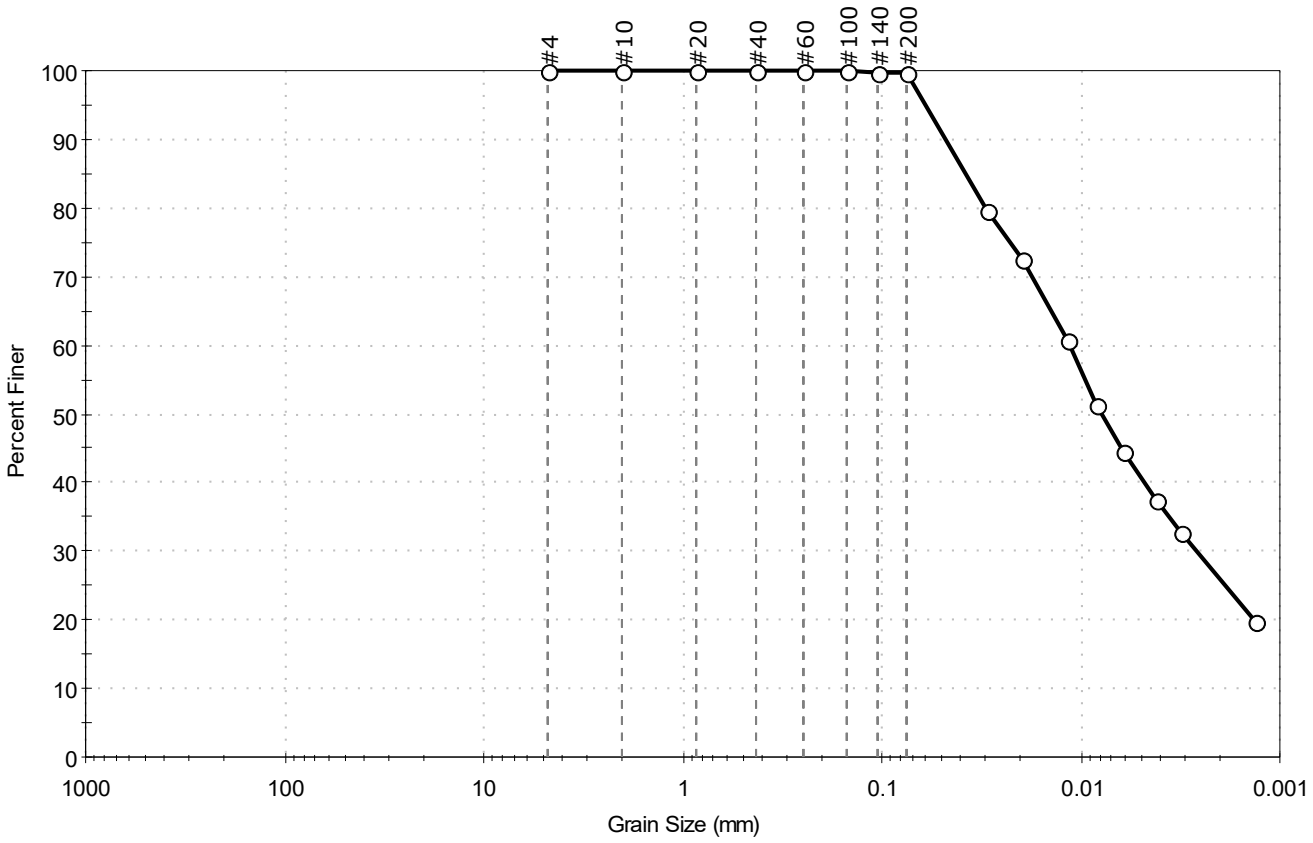
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-106	Sample Type:	Jar	Tested By:	ajl
Sample ID:	8D	Test Date:	08/15/24	Checked By:	ank
Depth :	25-27 ft	Test Id:	780383		
Test Comment:	---				
Visual Description:	Moist, grayish brown clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.3	99.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0298	80		
---	0.0196	73		
---	0.0117	61		
---	0.0084	51		
---	0.0061	44		
---	0.0042	37		
---	0.0031	33		
---	0.0013	20		

Coefficients

D_{85} = 0.0383 mm	D_{30} = 0.0026 mm
D_{60} = 0.0113 mm	D_{15} = N/A
D_{50} = 0.0079 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (18))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

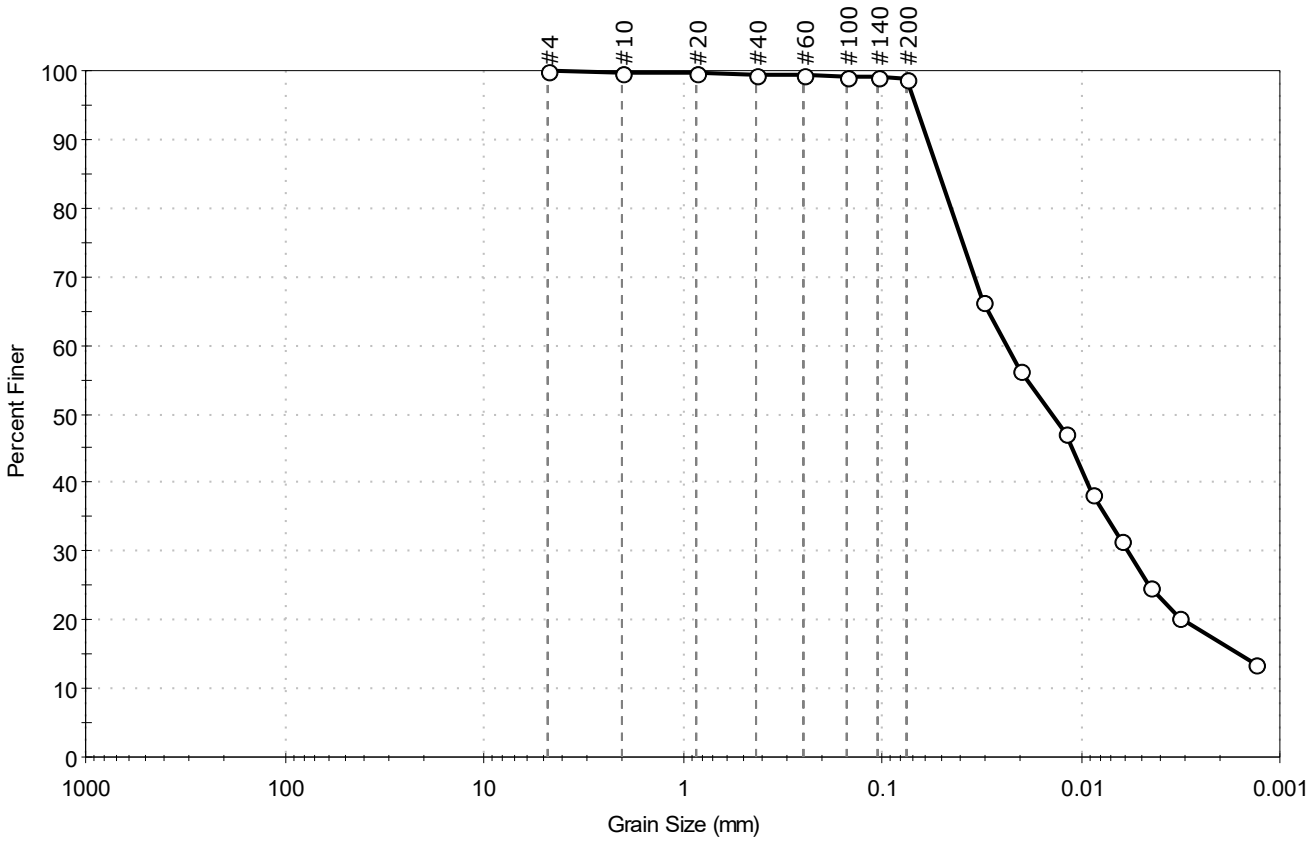
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-106	Sample Type:	Jar	Tested By:	ajl
Sample ID:	9D	Test Date:	08/15/24	Checked By:	ank
Depth :	30-32 ft	Test Id:	780384		
Test Comment:	---				
Visual Description:	Moist, gray clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	1.3	98.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	99		
#100	0.15	99		
#140	0.11	99		
#200	0.075	99		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0308	66		
---	0.0202	56		
---	0.0121	47		
---	0.0087	38		
---	0.0063	32		
---	0.0045	25		
---	0.0032	20		
---	0.0013	14		

Coefficients

D_{85} = 0.0515 mm	D_{30} = 0.0058 mm
D_{60} = 0.0236 mm	D_{15} = 0.0016 mm
D_{50} = 0.0141 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (9))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

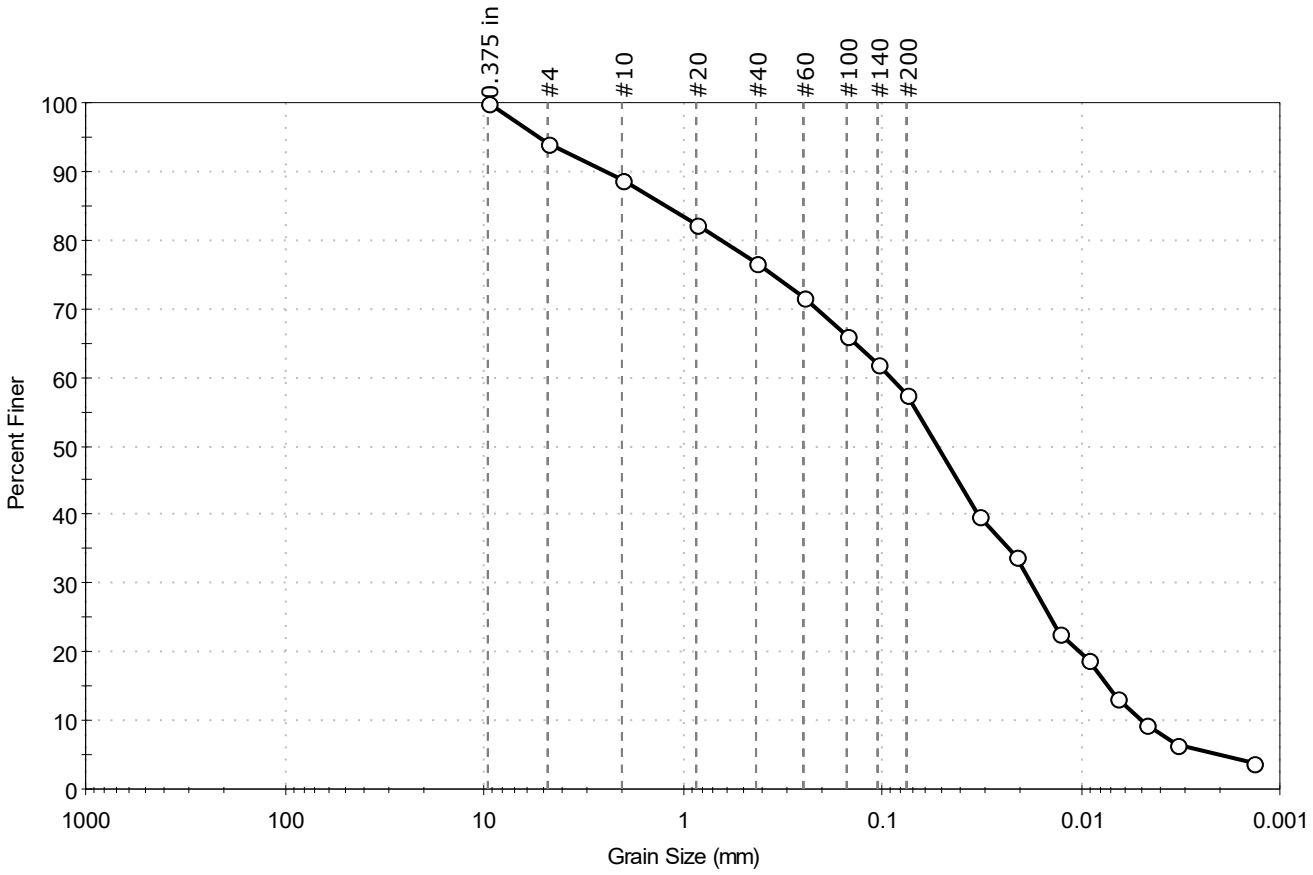
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-106	Sample Type:	Jar	Tested By:	ajl
Sample ID:	11D	Test Date:	08/15/24	Checked By:	ank
Depth :	40-42 ft	Test Id:	780385		
Test Comment:	---				
Visual Description:	Moist, gray sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	6.0	36.4	57.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	94		
#10	2.00	89		
#20	0.85	82		
#40	0.42	77		
#60	0.25	72		
#100	0.15	66		
#140	0.11	62		
#200	0.075	58		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0327	40		
---	0.0212	34		
---	0.0128	23		
---	0.0091	19		
---	0.0065	13		
---	0.0047	9		
---	0.0033	7		
---	0.0014	4		

Coefficients

D_{85} = 1.2010 mm	D_{30} = 0.0177 mm
D_{60} = 0.0912 mm	D_{15} = 0.0073 mm
D_{50} = 0.0526 mm	D_{10} = 0.0049 mm
C_u = 18.612	C_c = 0.701

Classification

ASTM Sandy SILT (ML)

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

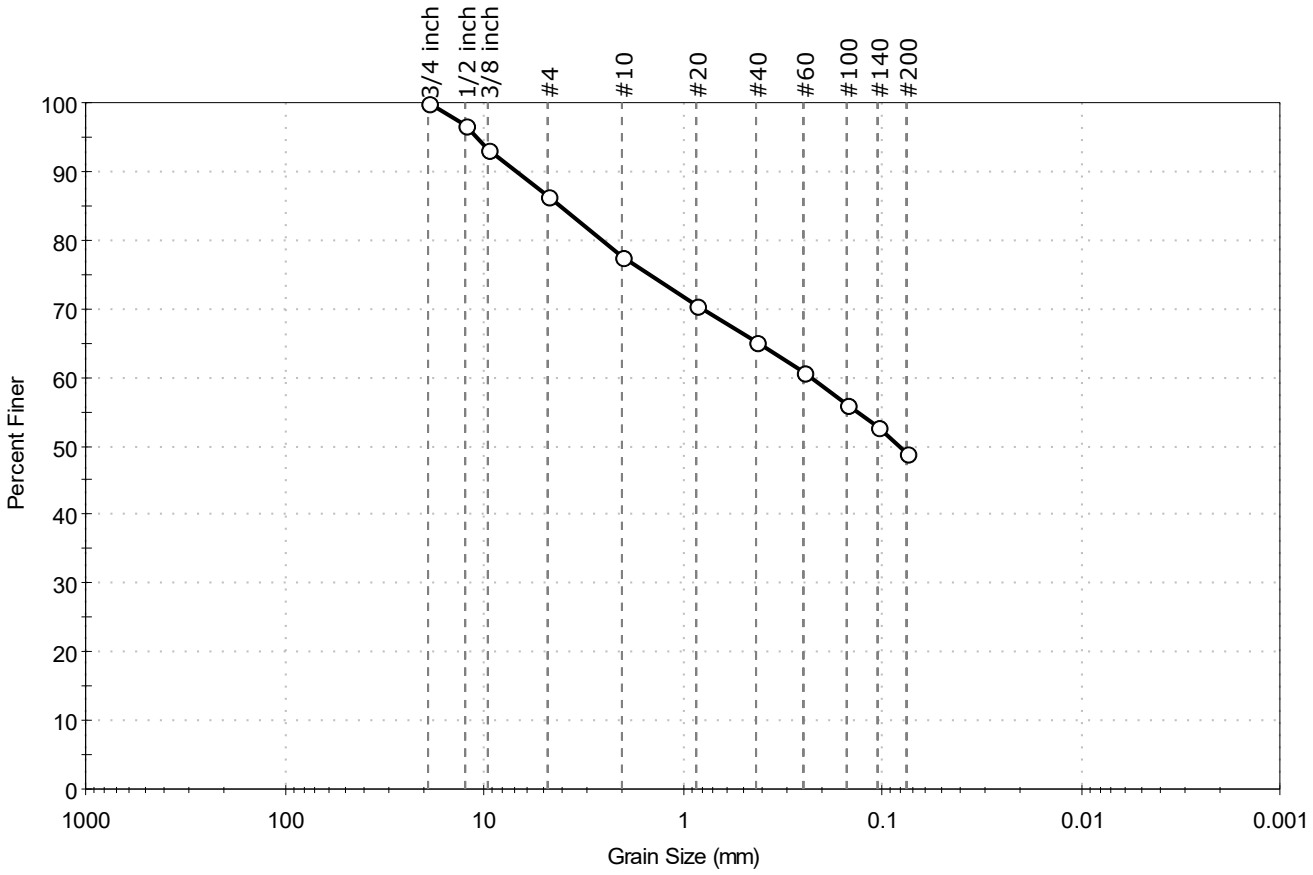
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-106	Sample Type:	Jar	Tested By:	ajl
Sample ID:	14D	Test Date:	08/16/24	Checked By:	ank
Depth :	55-57 ft	Test Id:	780380		
Test Comment:	---				
Visual Description:	Moist, gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	13.6	37.5	48.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3/4 inch	19.00	100		
1/2 inch	12.50	97		
3/8 inch	9.50	93		
#4	4.75	86		
#10	2.00	77		
#20	0.85	70		
#40	0.42	65		
#60	0.25	61		
#100	0.15	56		
#140	0.11	53		
#200	0.075	49		

Coefficients

D_{85} = 4.1627 mm	D_{30} = N/A
D_{60} = 0.2272 mm	D_{15} = N/A
D_{50} = 0.0828 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

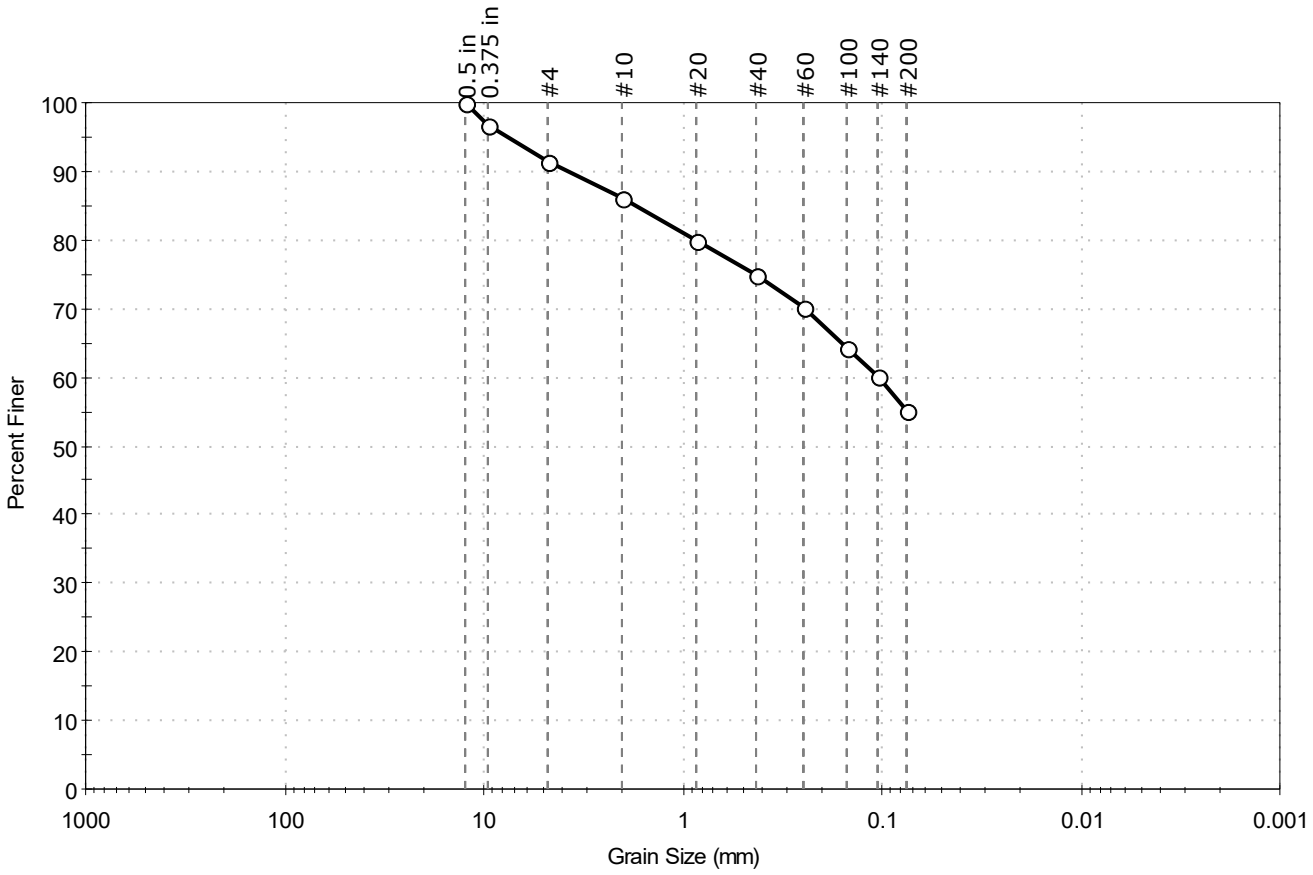
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-107	Sample Type:	Jar	Tested By:	ajl
Sample ID:	3D	Test Date:	08/19/24	Checked By:	ank
Depth :	4.7-6.7 ft	Test Id:	780391		
Test Comment:	---				
Visual Description:	Moist, grayish brown sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	8.5	36.3	55.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	97		
#4	4.75	92		
#10	2.00	86		
#20	0.85	80		
#40	0.42	75		
#60	0.25	70		
#100	0.15	64		
#140	0.11	60		
#200	0.075	55		

Coefficients

D_{85} = 1.6952 mm D_{30} = N/A

D_{60} = 0.1052 mm D_{15} = N/A

D_{50} = N/A D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

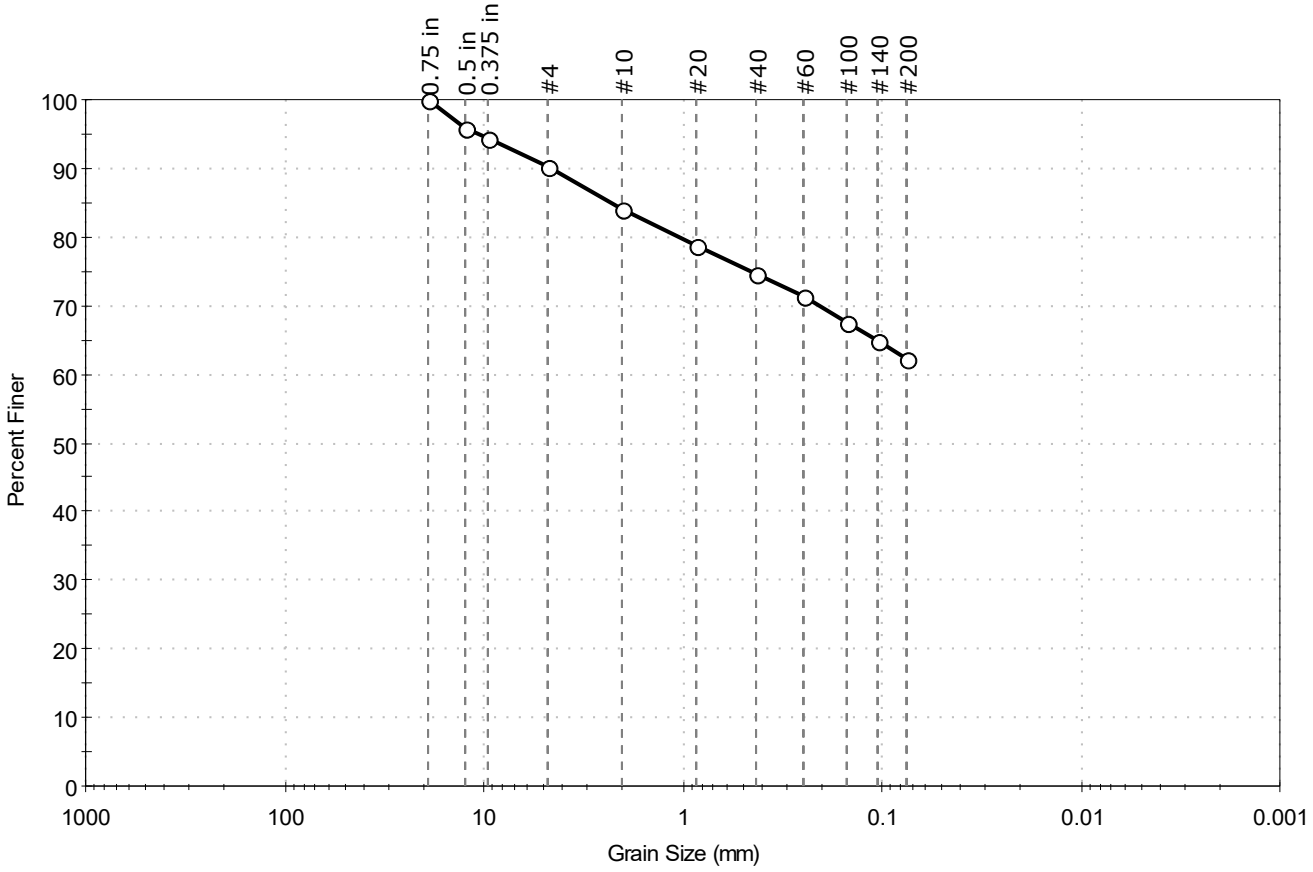
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-107	Sample Type:	Jar	Tested By:	ajl
Sample ID:	6D	Test Date:	08/19/24	Checked By:	ank
Depth :	10.7-12.7 ft	Test Id:	780392		
Test Comment:	---				
Visual Description:	Moist, olive brown silt with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	9.7	28.0	62.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	96		
0.375 in	9.50	94		
#4	4.75	90		
#10	2.00	84		
#20	0.85	79		
#40	0.42	75		
#60	0.25	71		
#100	0.15	68		
#140	0.11	65		
#200	0.075	62		

Coefficients

D_{85} = 2.2895 mm	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

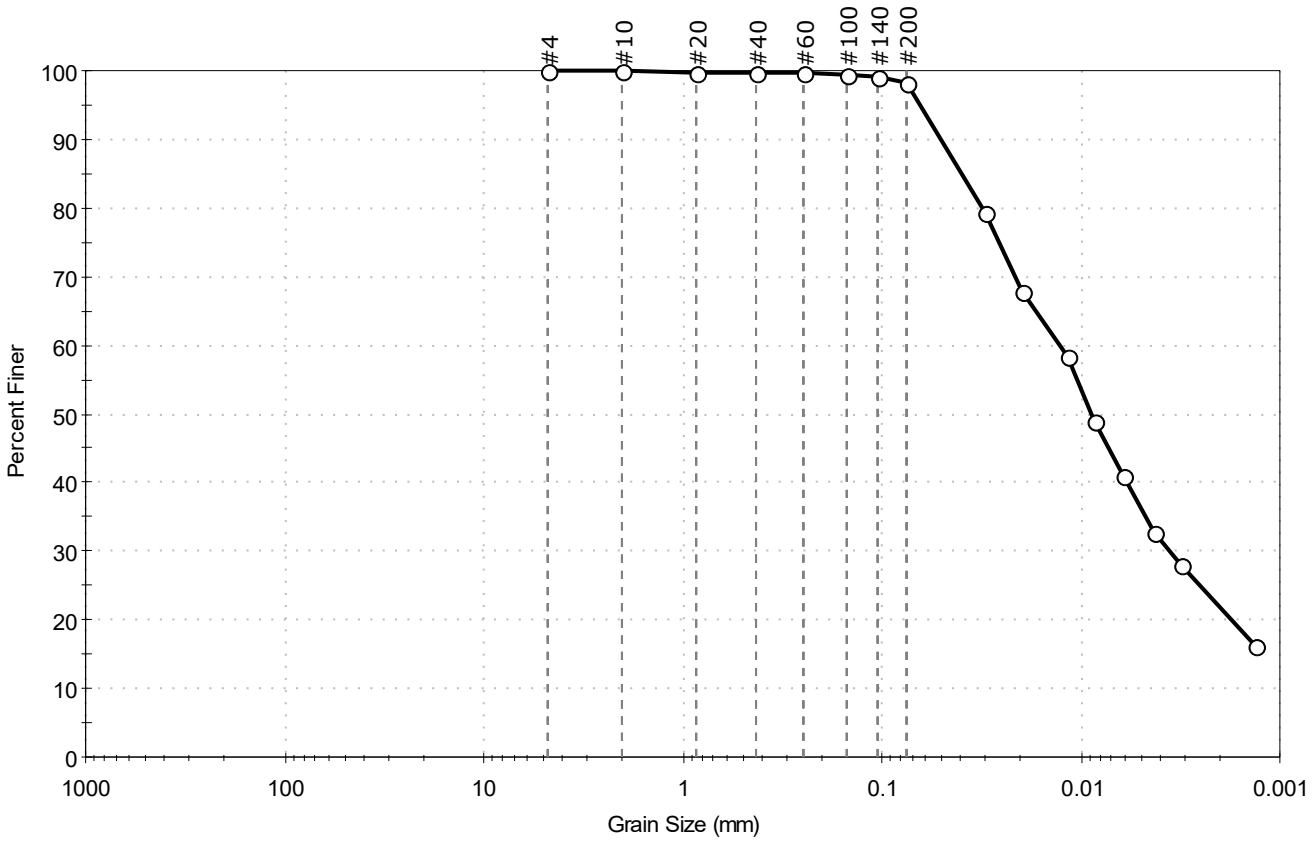
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-107	Sample Type:	Jar	Tested By:	ajl
Sample ID:	8D	Test Date:	08/15/24	Checked By:	ank
Depth :	20-22 ft	Test Id:	780395		
Test Comment:	---				
Visual Description:	Moist, grayish brown clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	1.7	98.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	99		
#140	0.11	99		
#200	0.075	98		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0303	79		
---	0.0196	68		
---	0.0117	58		
---	0.0085	49		
---	0.0061	41		
---	0.0043	33		
---	0.0032	28		
---	0.0013	16		

Coefficients

D_{85} = 0.0395 mm	D_{30} = 0.0036 mm
D_{60} = 0.0127 mm	D_{15} = N/A
D_{50} = 0.0088 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (15))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

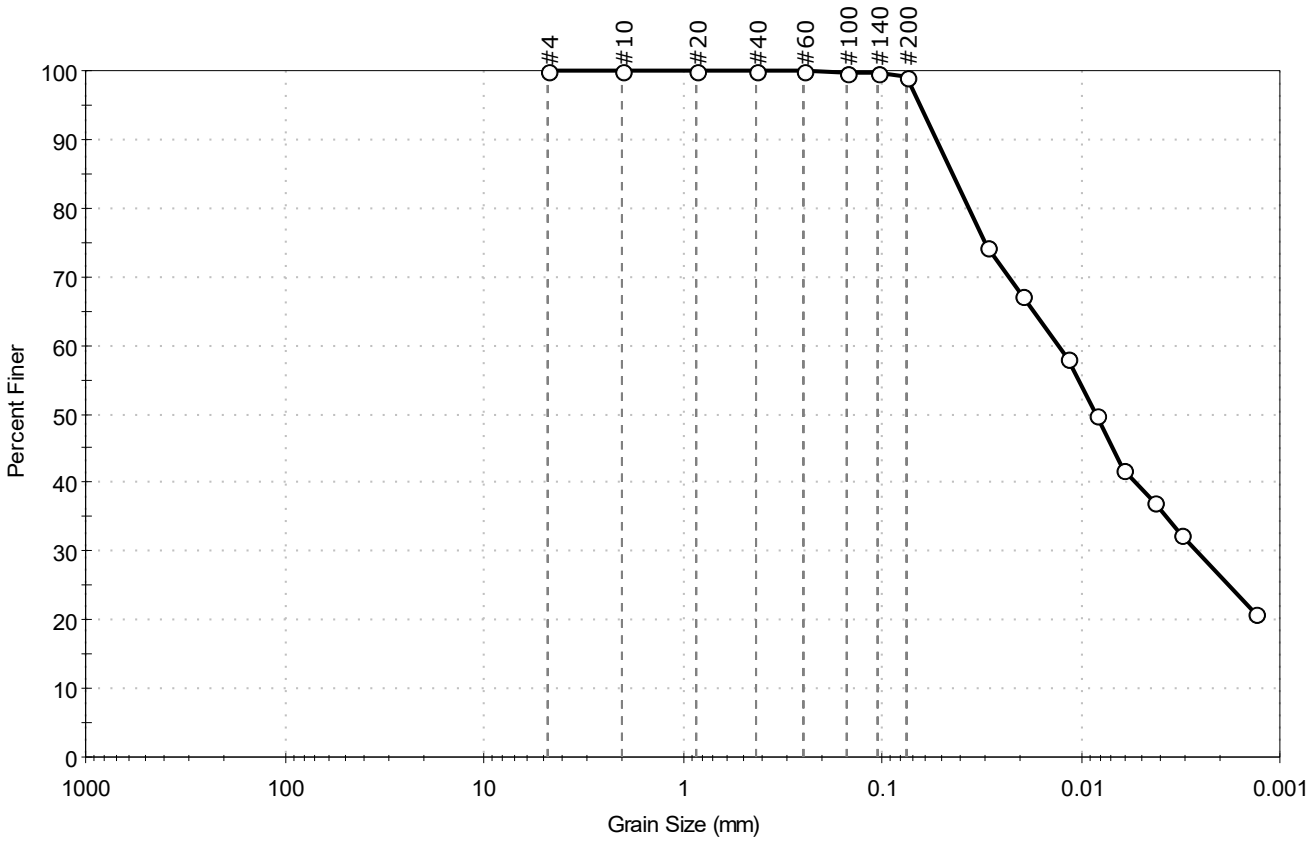
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-107	Sample Type:	Jar	Tested By:	ajl
Sample ID:	9D	Test Date:	08/15/24	Checked By:	ank
Depth :	25-27 ft	Test Id:	780396		
Test Comment:	---				
Visual Description:	Moist, olive brown clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.7	99.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	99		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0295	74		
---	0.0198	67		
---	0.0117	58		
---	0.0083	50		
---	0.0061	42		
---	0.0043	37		
---	0.0031	33		
---	0.0013	21		

Coefficients

D_{85} = 0.0440 mm	D_{30} = 0.0026 mm
D_{60} = 0.0131 mm	D_{15} = N/A
D_{50} = 0.0084 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (37))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

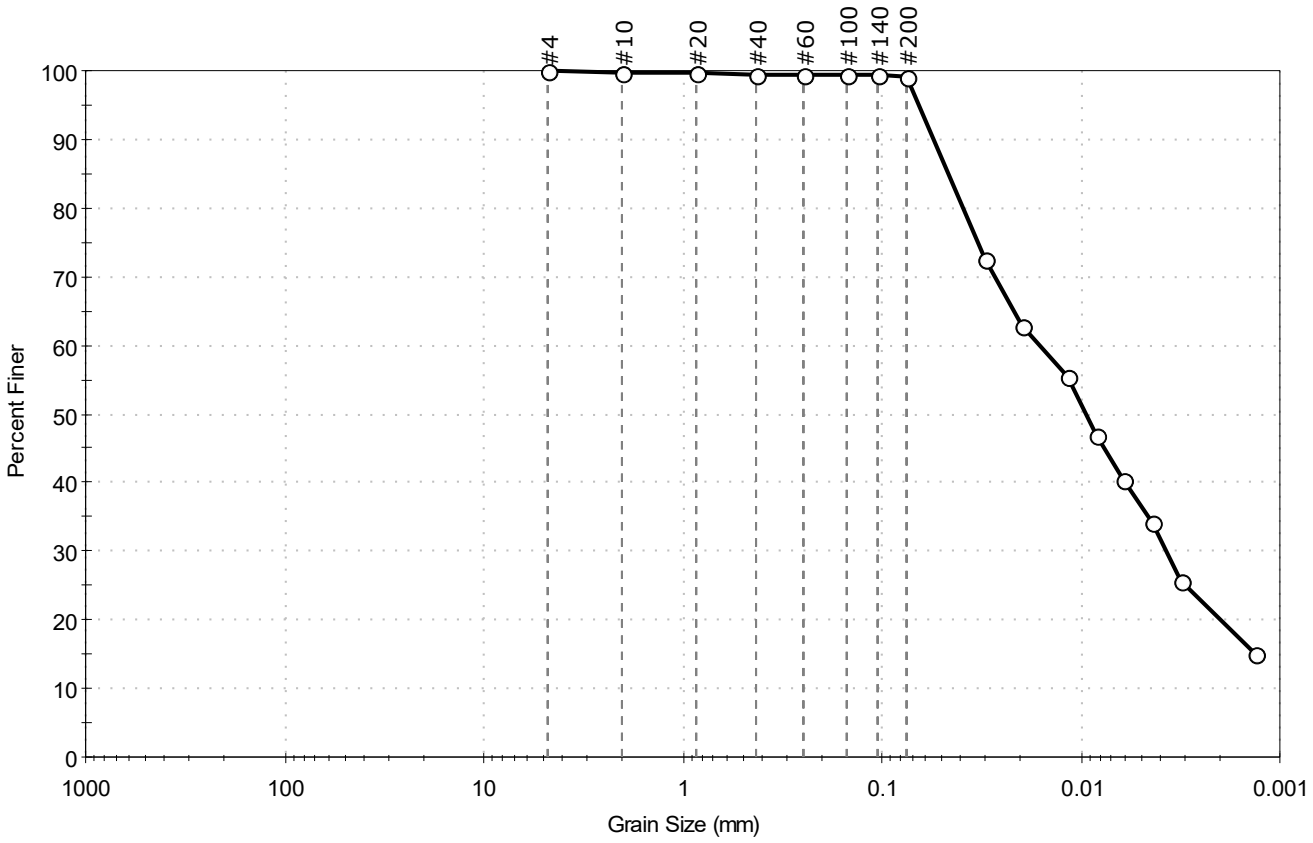
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-107	Sample Type:	Jar	Tested By:	ajl
Sample ID:	10D	Test Date:	08/15/24	Checked By:	ank
Depth :	30-32 ft	Test Id:	780397		
Test Comment:	---				
Visual Description:	Moist, grayish brown clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.9	99.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	99		
#100	0.15	99		
#140	0.11	99		
#200	0.075	99		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0305	73		
---	0.0196	63		
---	0.0117	55		
---	0.0085	47		
---	0.0061	41		
---	0.0044	34		
---	0.0032	26		
---	0.0013	15		

Coefficients

D_{85} = 0.0465 mm	D_{30} = 0.0037 mm
D_{60} = 0.0160 mm	D_{15} = 0.0013 mm
D_{50} = 0.0095 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (11))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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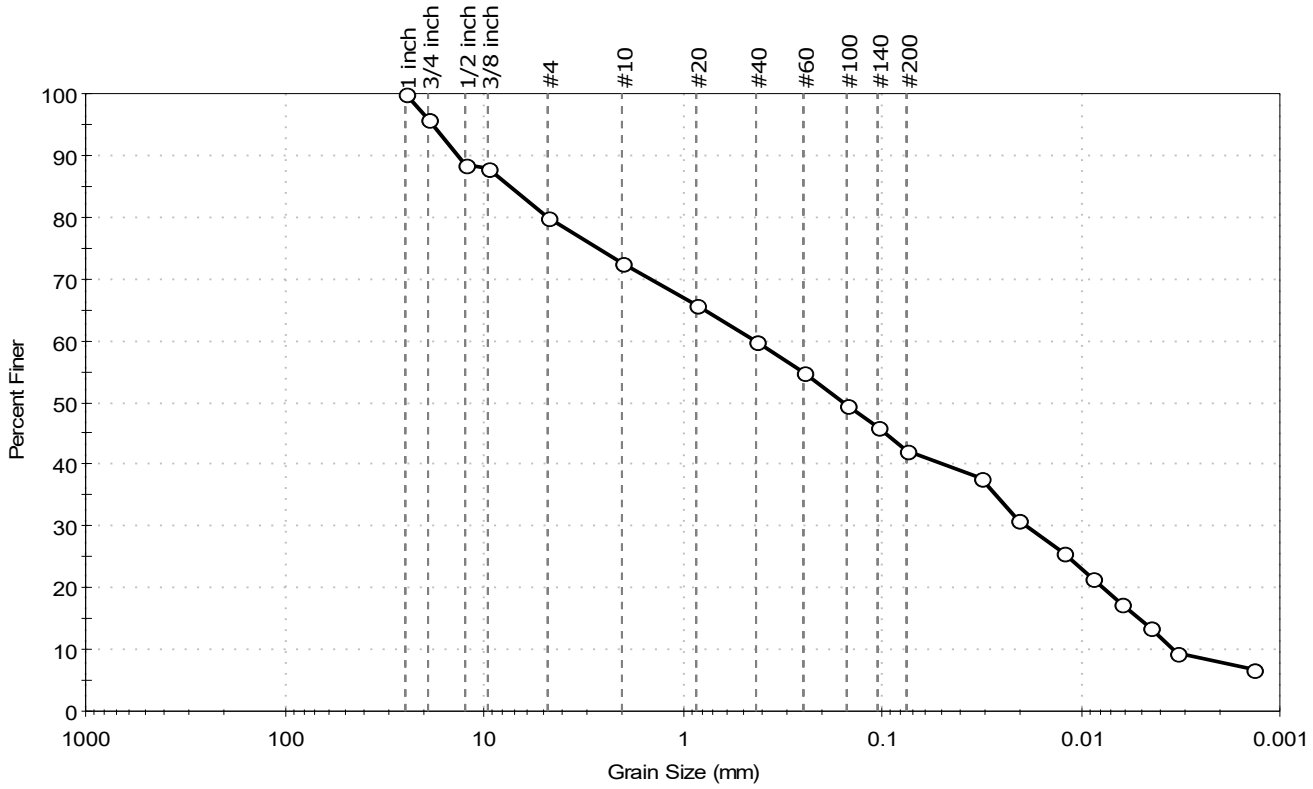
Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-107	Sample Type:	Jar	Tested By:	ajl
Sample ID:	12D	Test Date:	08/15/24	Checked By:	ank
Depth :	40-42 ft	Test Id:	781642		
Test Comment:	---				
Visual Description:	Moist, brownish gray silty clayey sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	19.9	38.0	42.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 inch	25.00	100		
3/4 inch	19.00	96		
1/2 inch	12.50	88		
3/8 inch	9.50	88		
#4	4.75	80		
#10	2.00	73		
#20	0.85	66		
#40	0.42	60		
#60	0.25	55		
#100	0.15	49		
#140	0.11	46		
#200	0.075	42		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0320	38		
---	0.0207	31		
---	0.0122	26		
---	0.0088	22		
---	0.0063	17		
---	0.0045	13		
---	0.0033	9		
---	0.0014	7		

Coefficients

D_{85} = 7.3626 mm	D_{30} = 0.0188 mm
D_{60} = 0.4262 mm	D_{15} = 0.0052 mm
D_{50} = 0.1580 mm	D_{10} = 0.0034 mm
C_u = 125.353	C_c = 0.244

Classification

ASTM — Silty, Clayey SAND with Gravel (SC-SM)

AASHTO — Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

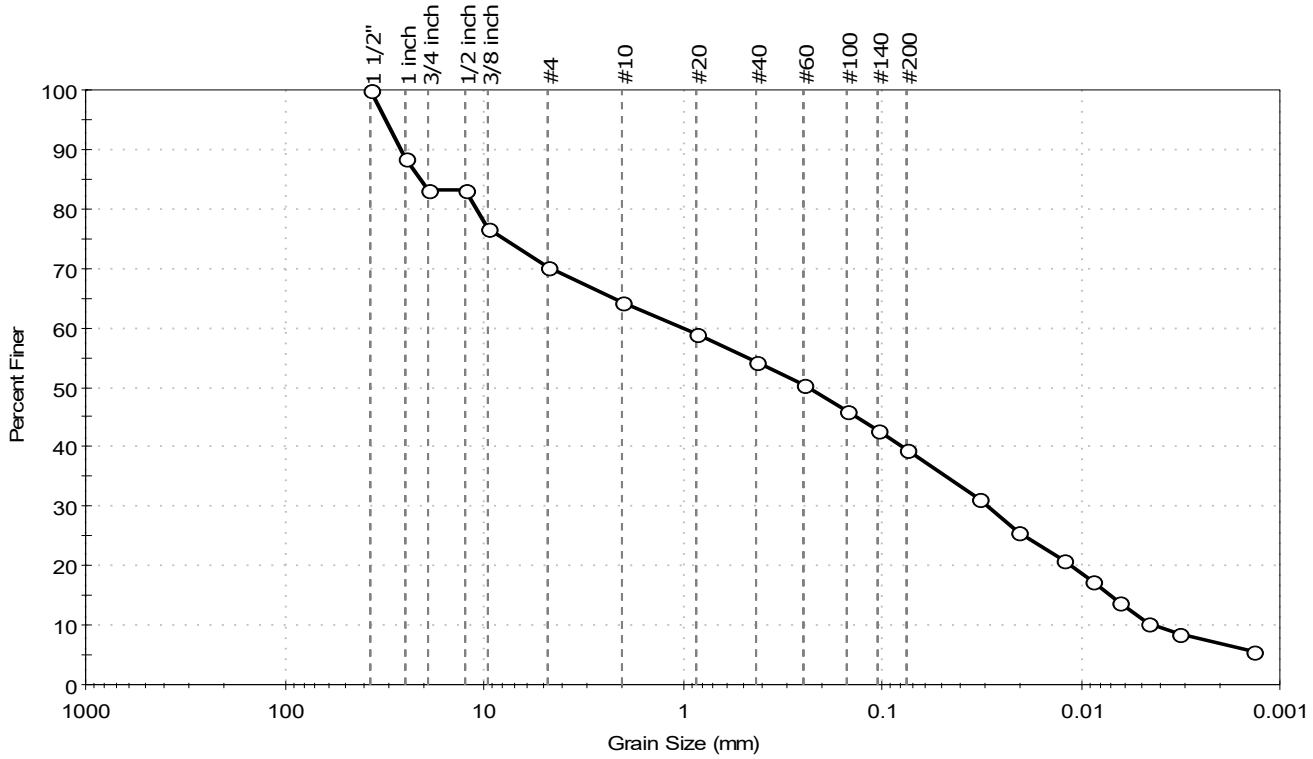
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-107	Sample Type:	Jar	Tested By:	ajl
Sample ID:	14D	Test Date:	08/15/24	Checked By:	ank
Depth :	50-52 ft	Test Id:	780394		
Test Comment:	---				
Visual Description:	Moist, grayish brown clayey sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	29.9	30.5	39.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2"	37.50	100		
1 inch	25.00	89		
3/4 inch	19.00	83		
1/2 inch	12.50	83		
3/8 inch	9.50	77		
#4	4.75	70		
#10	2.00	64		
#20	0.85	59		
#40	0.42	54		
#60	0.25	51		
#100	0.15	46		
#140	0.11	43		
#200	0.075	40		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0325	31		
---	0.0209	26		
---	0.0123	21		
---	0.0088	17		
---	0.0064	14		
---	0.0046	10		
---	0.0033	9		
---	0.0014	6		

Coefficients

D_{85} = 20.8858 mm D_{30} = 0.0294 mm

D_{60} = 0.9990 mm D_{15} = 0.0071 mm

D_{50} = 0.2343 mm D_{10} = 0.0042 mm

C_u = 237.857 C_c = 0.206

Classification

ASTM Clayey SAND with Gravel (SC)

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

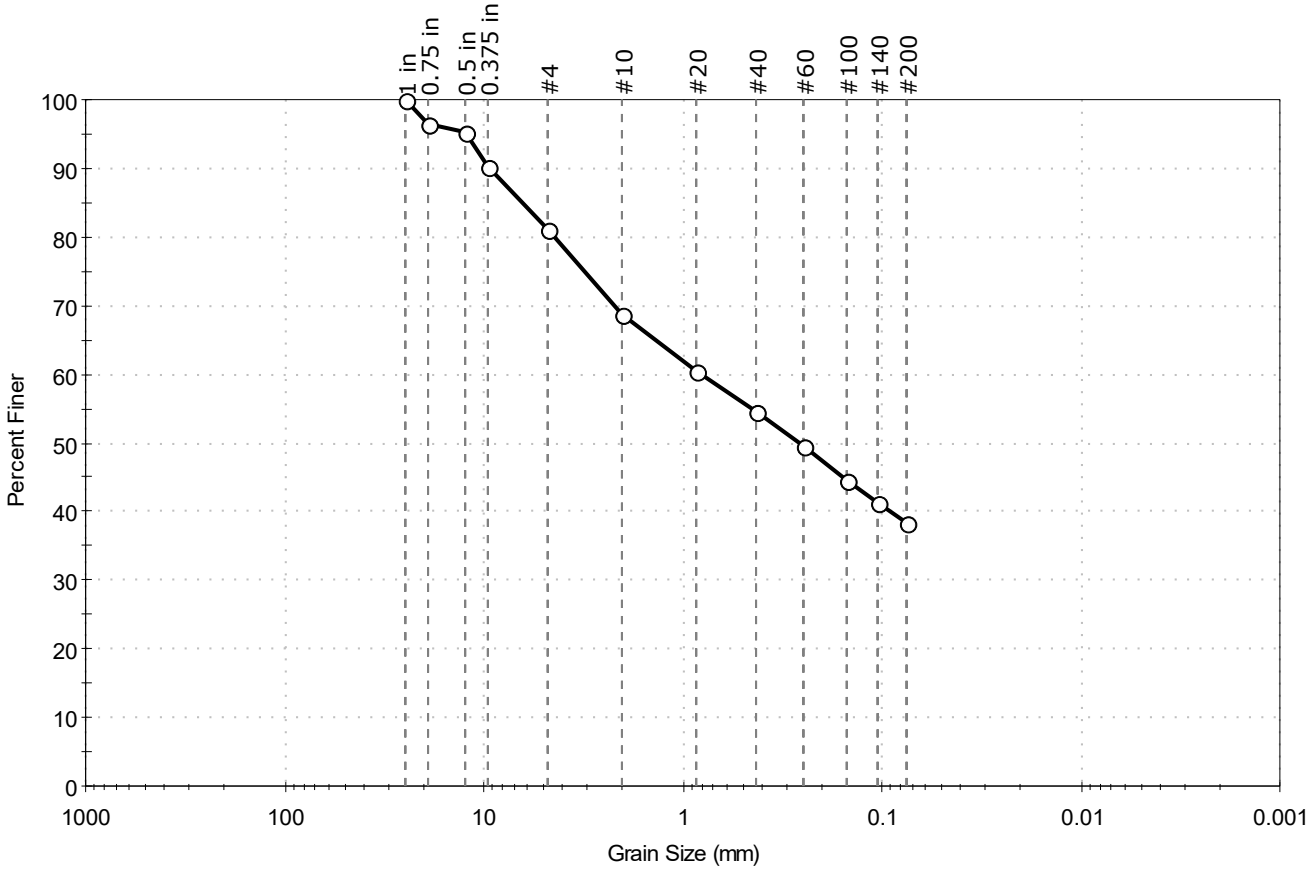
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-107	Sample Type:	Jar	Tested By:	ajl
Sample ID:	15D	Test Date:	08/16/24	Checked By:	ank
Depth :	55-57 ft	Test Id:	780393		
Test Comment:	---				
Visual Description:	Moist, grayish brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	19.0	42.7	38.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	96		
0.5 in	12.50	95		
0.375 in	9.50	90		
#4	4.75	81		
#10	2.00	69		
#20	0.85	61		
#40	0.42	55		
#60	0.25	50		
#100	0.15	45		
#140	0.11	41		
#200	0.075	38		

Coefficients

D_{85} = 6.3985 mm D_{30} = N/A

D_{60} = 0.7963 mm D_{15} = N/A

D_{50} = 0.2606 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

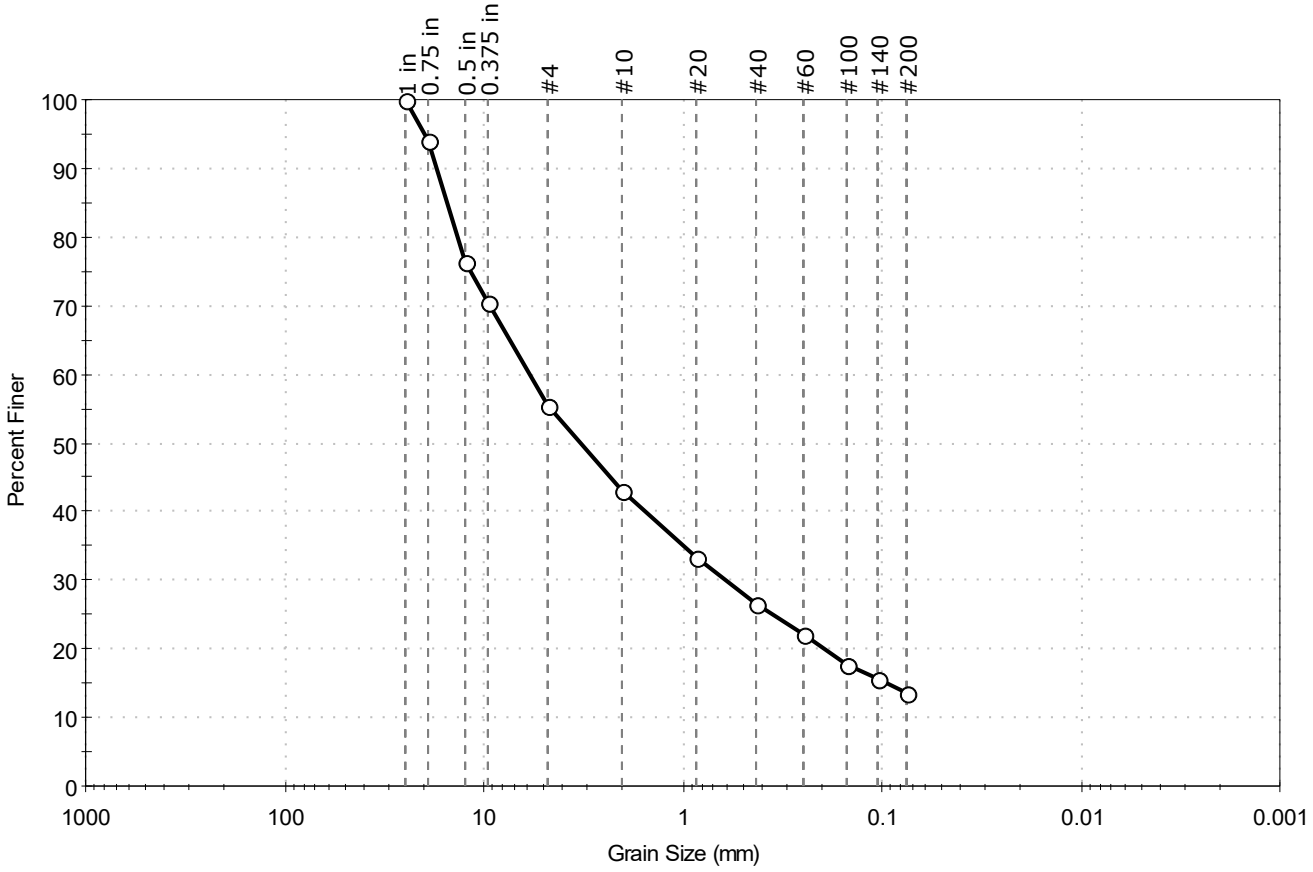
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-111	Sample Type:	Jar	Tested By:	ajl
Sample ID:	1D	Test Date:	08/16/24	Checked By:	ank
Depth :	1-3 ft	Test Id:	780418		
Test Comment:	---				
Visual Description:	Moist, olive brown silty gravel with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	44.5	42.0	13.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	94		
0.5 in	12.50	76		
0.375 in	9.50	70		
#4	4.75	55		
#10	2.00	43		
#20	0.85	33		
#40	0.42	27		
#60	0.25	22		
#100	0.15	18		
#140	0.11	16		
#200	0.075	13		

Coefficients

D_{85} = 15.3239 mm	D_{30} = 0.5991 mm
D_{60} = 5.8553 mm	D_{15} = 0.0959 mm
D_{50} = 3.2528 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (0))

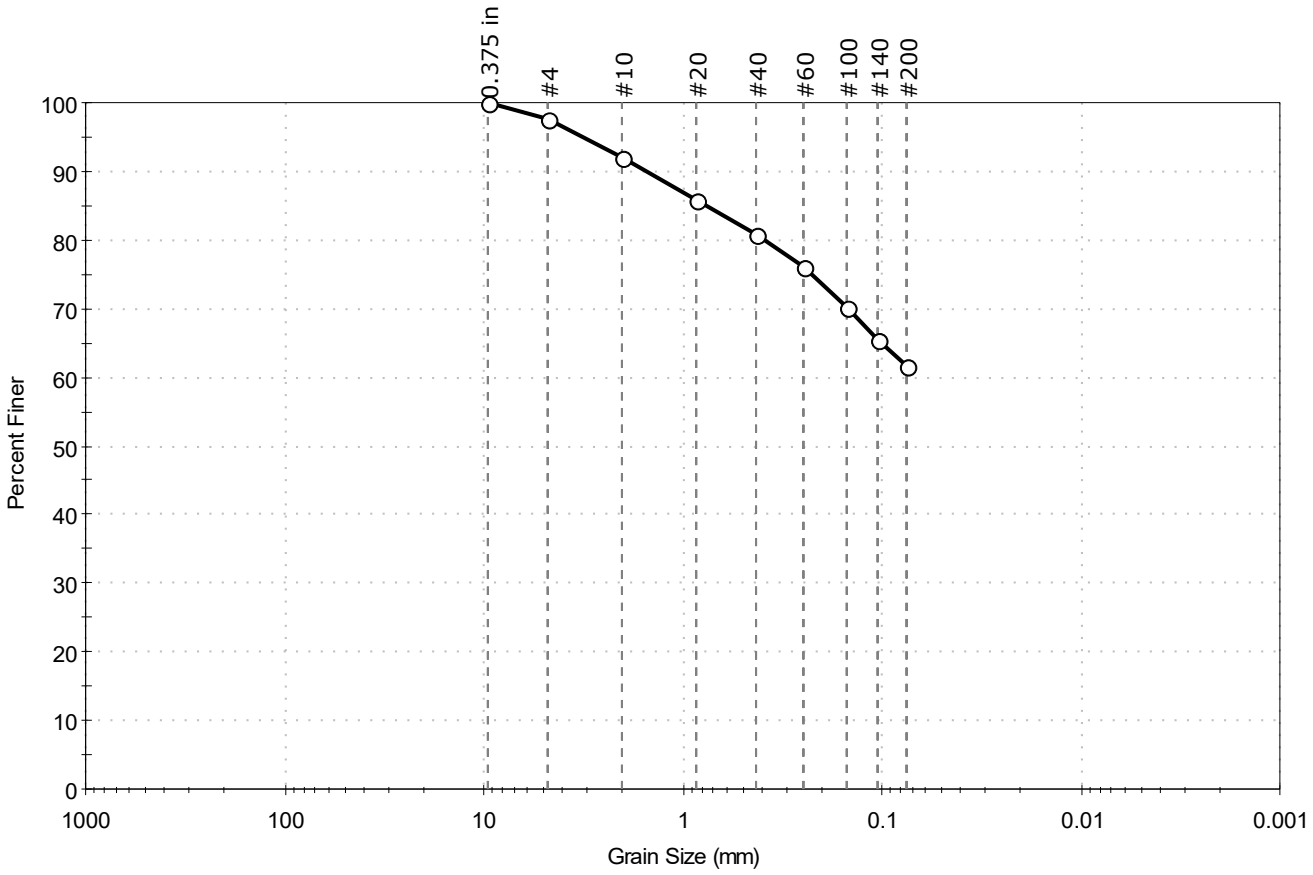
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-111	Sample Type:	Jar	Tested By:	ajl
Sample ID:	3D	Test Date:	08/19/24	Checked By:	ank
Depth :	5-7 ft	Test Id:	780420		
Test Comment:	---				
Visual Description:	Moist, light olive brown sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	2.4	36.0	61.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	98		
#10	2.00	92		
#20	0.85	86		
#40	0.42	81		
#60	0.25	76		
#100	0.15	70		
#140	0.11	66		
#200	0.075	62		

Coefficients

D_{85} = 0.7542 mm D_{30} = N/A

D_{60} = N/A D_{15} = N/A

D_{50} = N/A D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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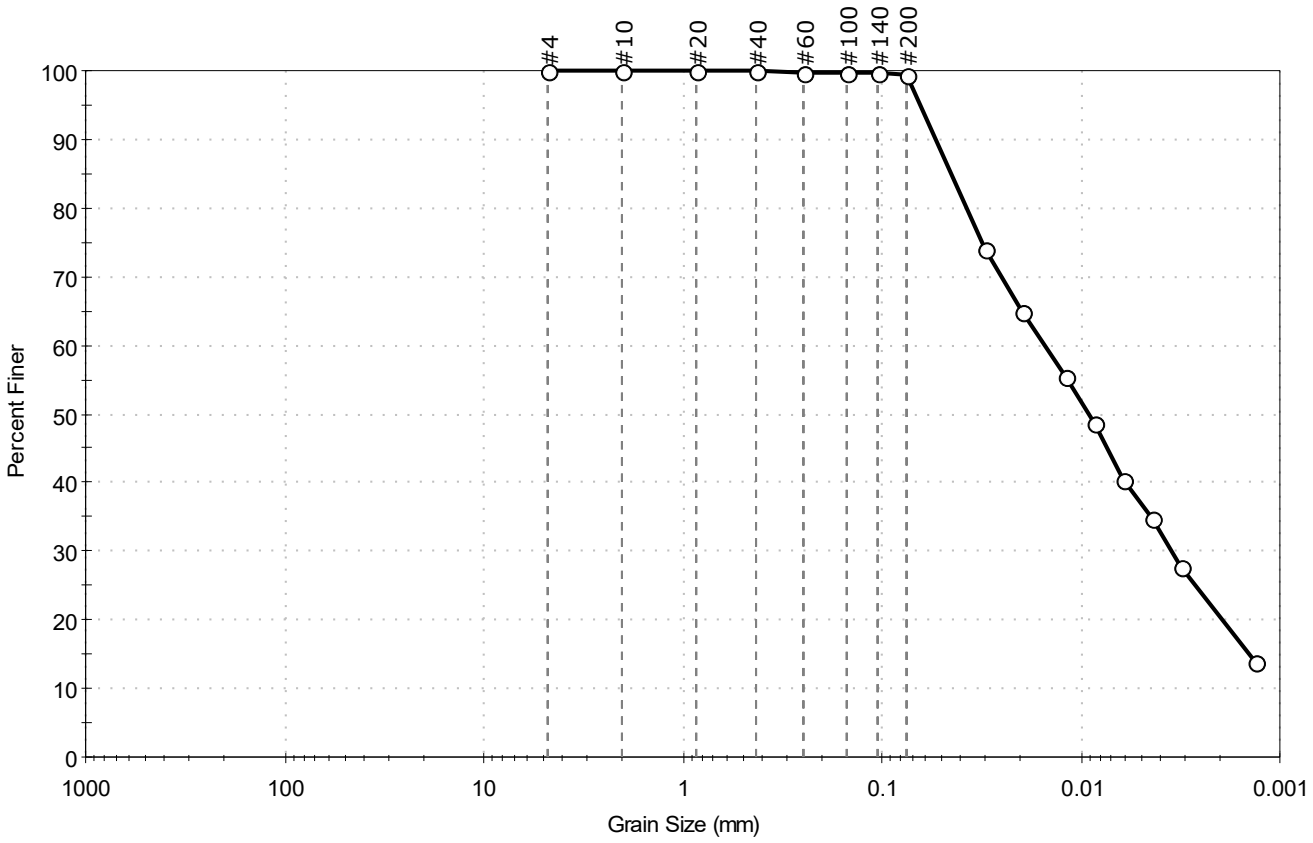
Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-111	Sample Type:	Jar	Tested By:	ajl
Sample ID:	5D	Test Date:	08/15/24	Checked By:	ank
Depth :	10-12 ft	Test Id:	780422		
Test Comment:	---				
Visual Description:	Moist, olive brown clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.6	99.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	99		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0305	74		
---	0.0196	65		
---	0.0118	56		
---	0.0085	49		
---	0.0061	40		
---	0.0044	35		
---	0.0032	28		
---	0.0013	14		

Coefficients

D_{85} = 0.0450 mm	D_{30} = 0.0035 mm
D_{60} = 0.0151 mm	D_{15} = 0.0014 mm
D_{50} = 0.0091 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (15))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

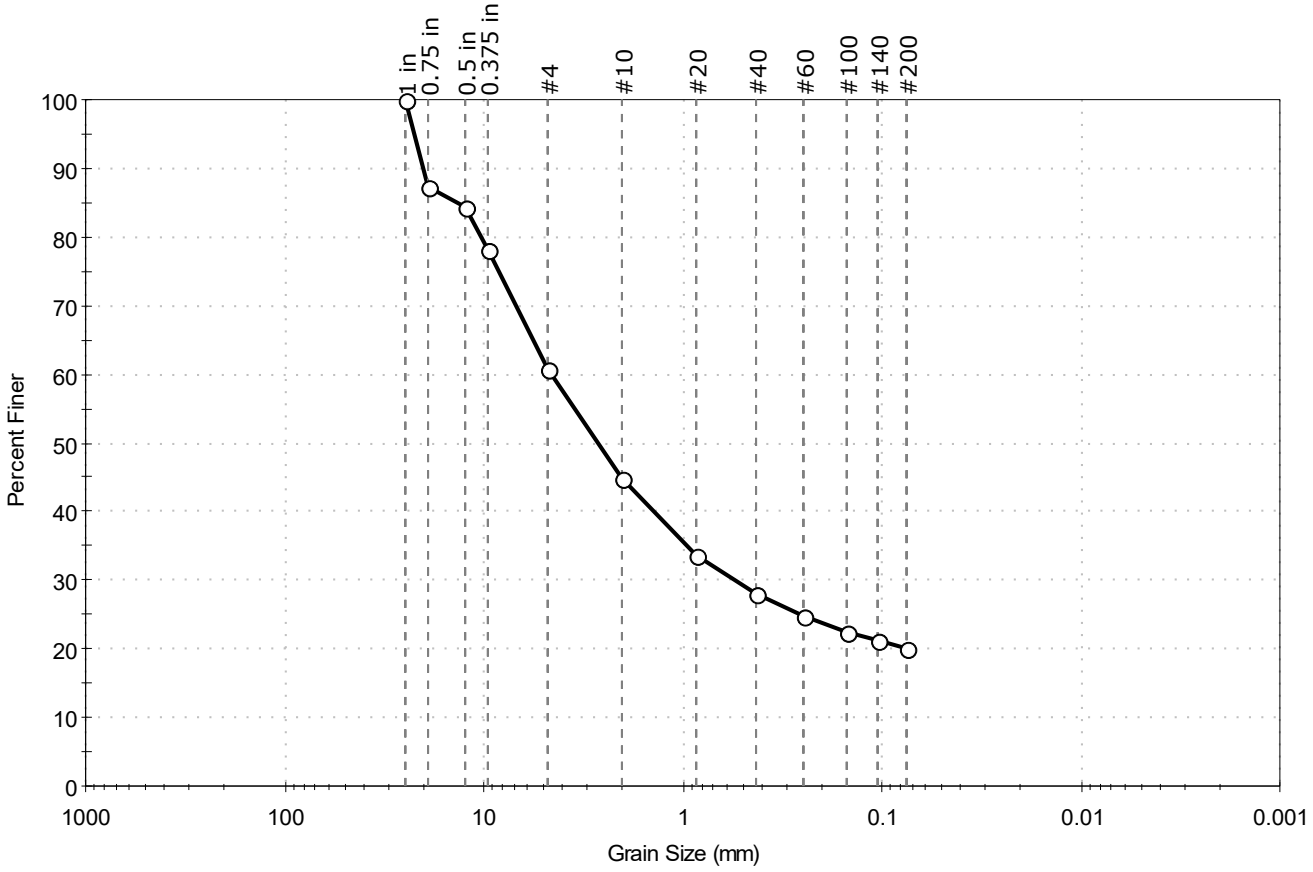
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-111	Sample Type:	Jar	Tested By:	ajl
Sample ID:	6D	Test Date:	08/16/24	Checked By:	ank
Depth :	15-17 ft	Test Id:	780421		
Test Comment:	---				
Visual Description:	Moist, grayish brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	39.3	40.7	20.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	87		
0.5 in	12.50	84		
0.375 in	9.50	78		
#4	4.75	61		
#10	2.00	45		
#20	0.85	34		
#40	0.42	28		
#60	0.25	25		
#100	0.15	22		
#140	0.11	21		
#200	0.075	20		

Coefficients

D_{85} = 13.6712 mm D_{30} = 0.5440 mm

D_{60} = 4.5692 mm D_{15} = N/A

D_{50} = 2.6581 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

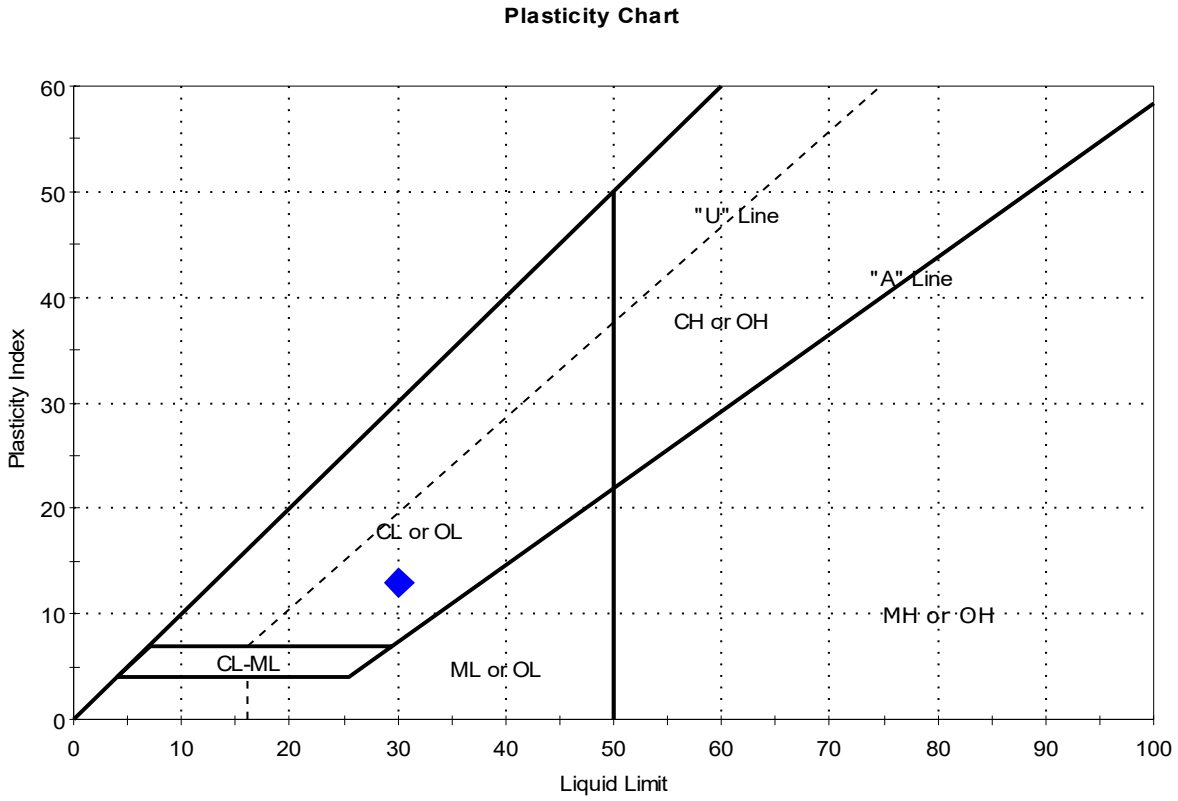
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-104	Sample Type:	Jar	Tested By:	cam
Sample ID:	6D	Test Date:	08/16/24	Checked By:	ank
Depth :	15-17 ft	Test Id:	780409		
Test Comment:	---				
Visual Description:	Moist, grayish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

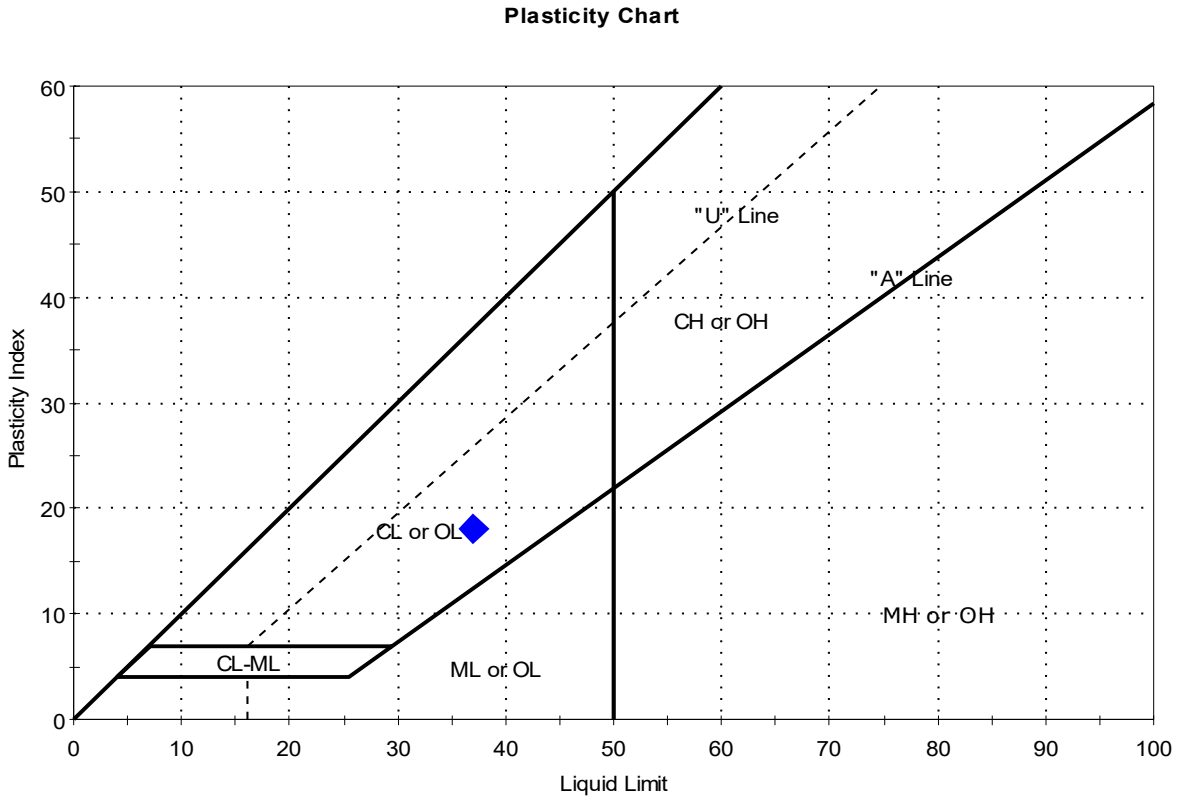


Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	6D	B-BSA-10	15-17 ft	25	30	17	13	0.6	Lean CLAY (CL)

Sample Prepared using the WET method
5% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-106	Sample Type:	Jar	Tested By:	cam
Sample ID:	7D	Test Date:	08/19/24	Checked By:	ank
Depth :	20-22 ft	Test Id:	780372		
Test Comment:	---				
Visual Description:	Moist, light olive brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

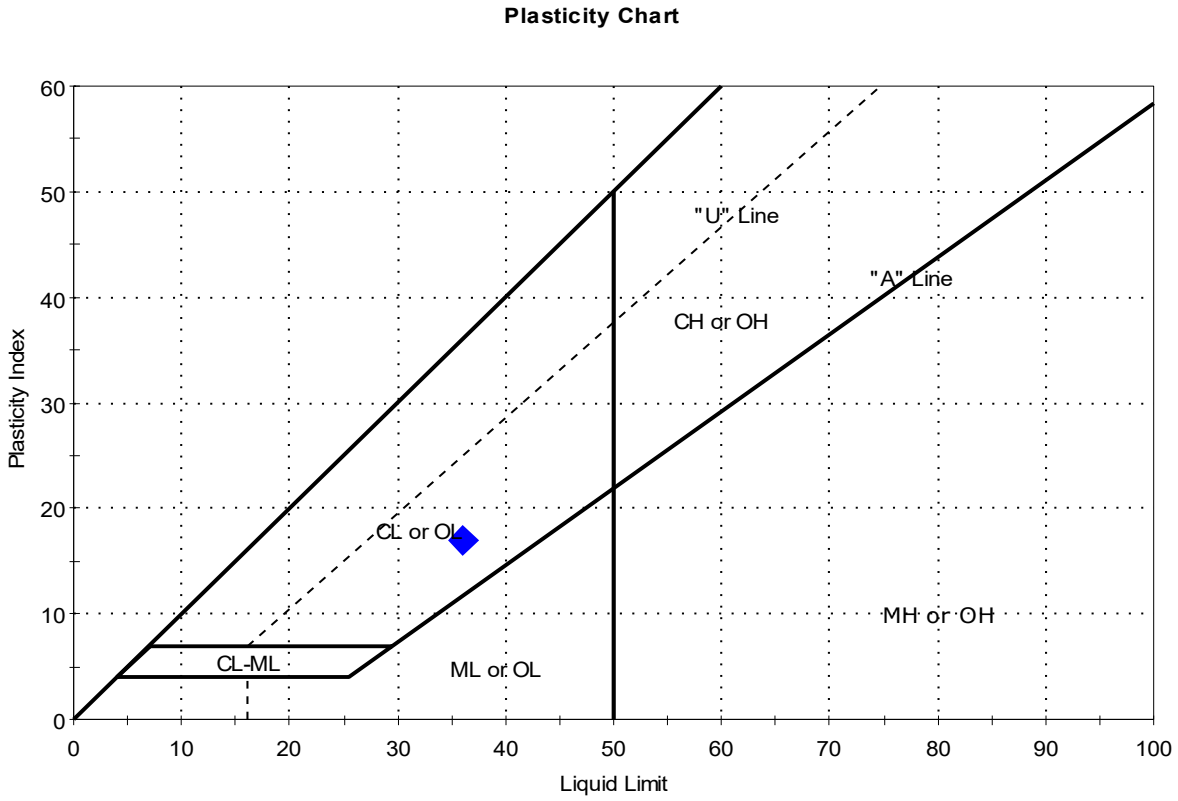


Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	7D	B-BSA-10	20-22 ft	26	37	19	18	0.4	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-106	Sample Type:	Jar	Tested By:	cam
Sample ID:	8D	Test Date:	08/19/24	Checked By:	ank
Depth :	25-27 ft	Test Id:	780373		
Test Comment:	---				
Visual Description:	Moist, grayish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

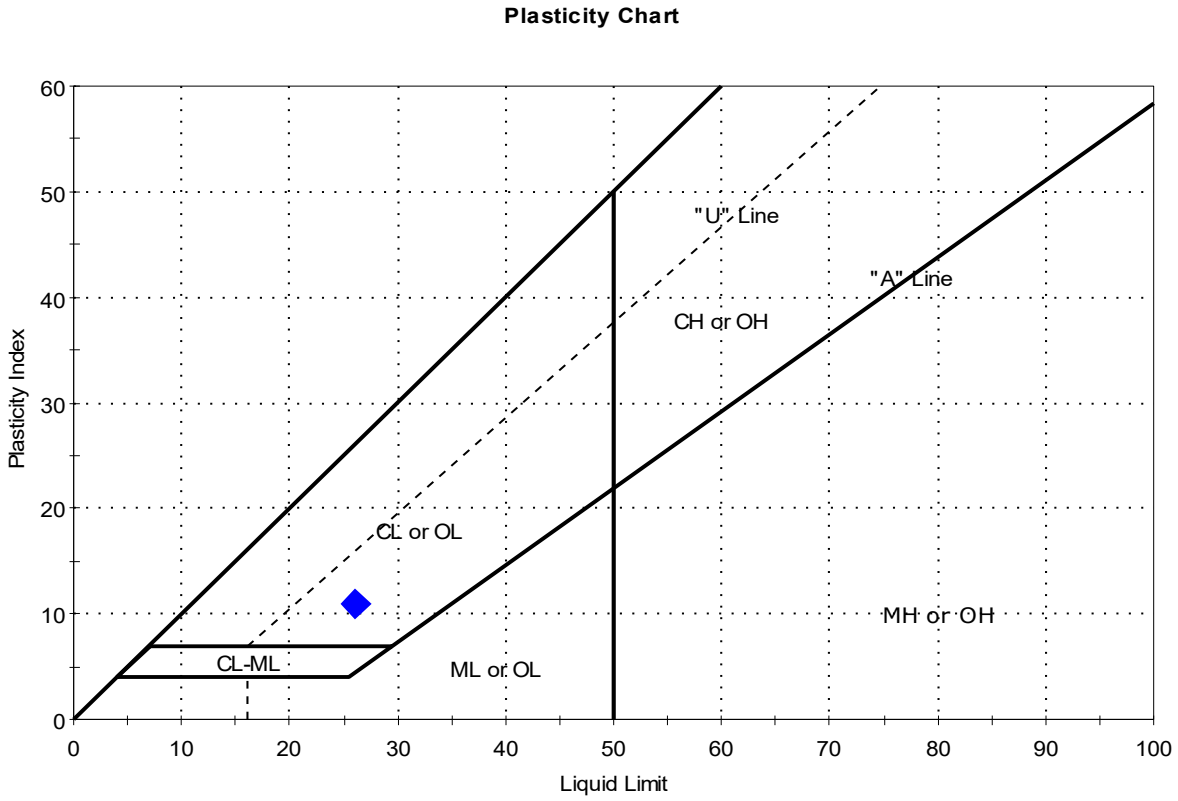


Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	8D	B-BSA-10	25-27 ft	28	36	19	17	0.5	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-106	Sample Type:	Jar	Tested By:	cam
Sample ID:	9D	Test Date:	08/16/24	Checked By:	ank
Depth :	30-32 ft	Test Id:	780374		
Test Comment:	---				
Visual Description:	Moist, gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

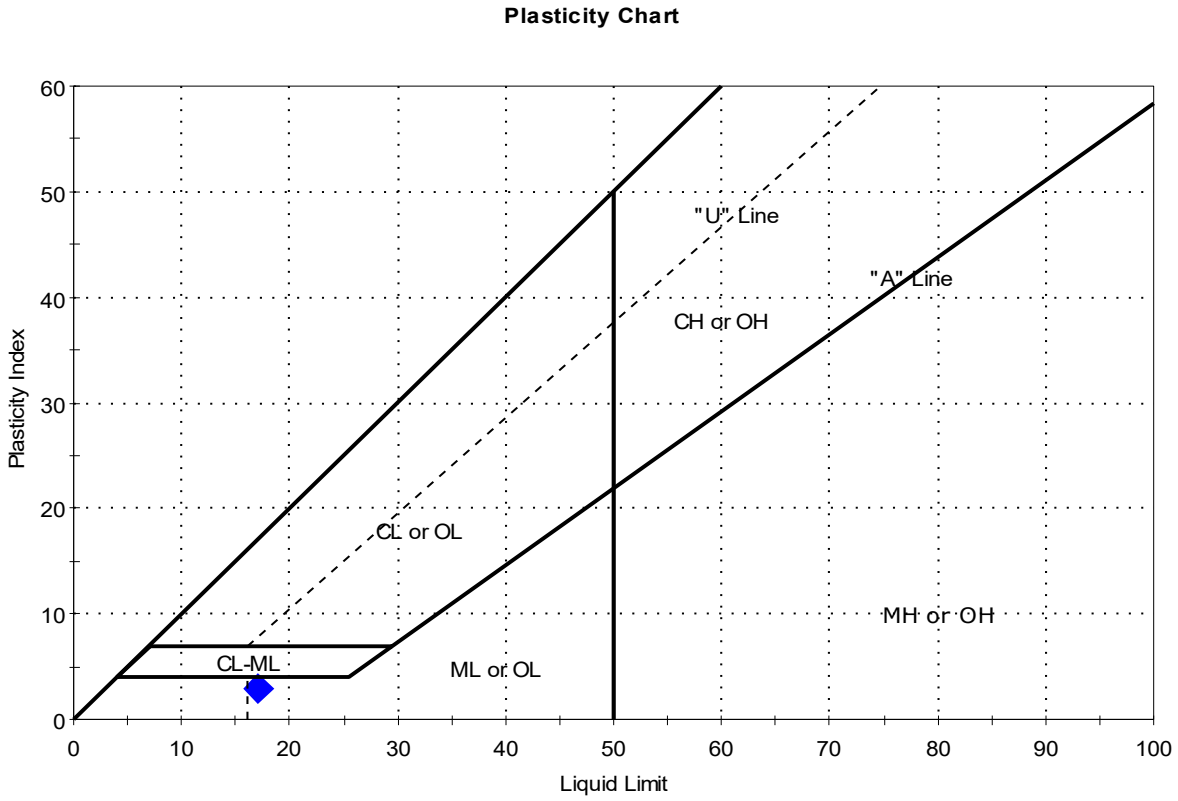


Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	9D	B-BSA-10	30-32 ft	29	26	15	11	1.3	Lean CLAY (CL)

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-106	Sample Type:	Jar	Tested By:	cam
Sample ID:	11D	Test Date:	08/16/24	Checked By:	ank
Depth :	40-42 ft	Test Id:	780375		
Test Comment:	---				
Visual Description:	Moist, gray sandy silt				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

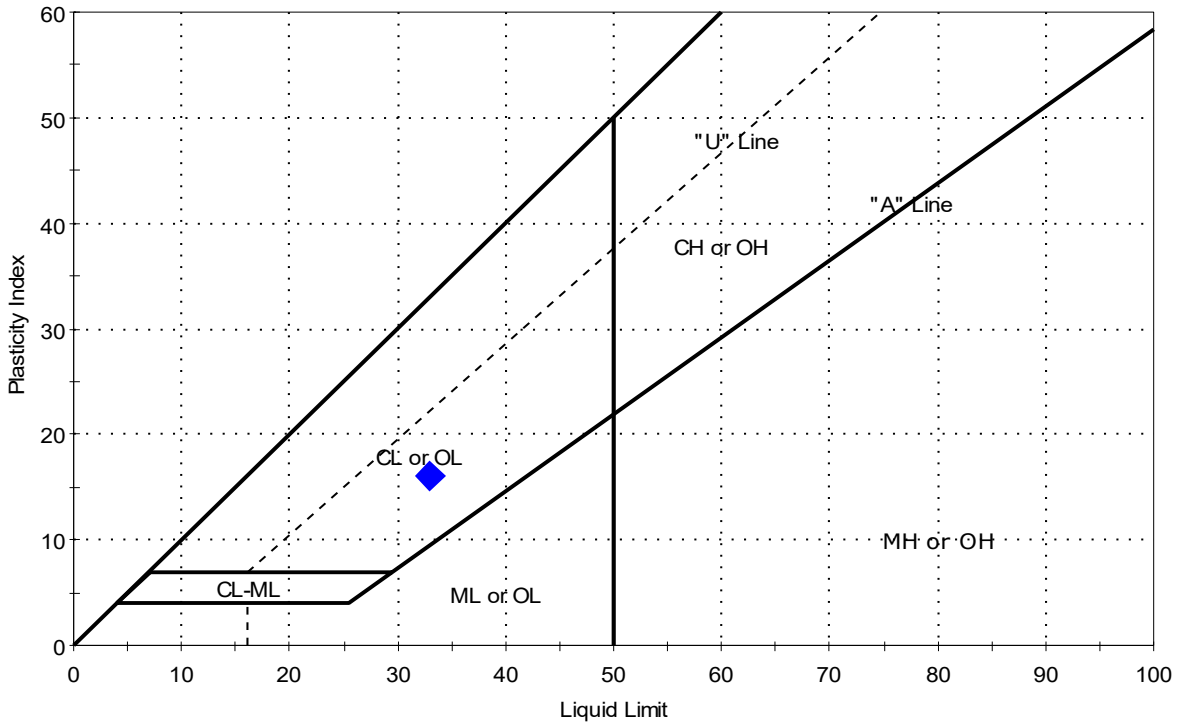


Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	11D	B-BSA-10	40-42 ft	11	17	14	3	-0.8	Sandy SILT (ML)

Sample Prepared using the WET method
23% Retained on #40 Sieve
Dry Strength: n/a
Dilatancy: n/a
Toughness: n/a

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-107	Sample Type:	Jar	Tested By:	cam
Sample ID:	8D	Test Date:	08/19/24	Checked By:	ank
Depth :	20-22 ft	Test Id:	780386		
Test Comment:	---				
Visual Description:	Moist, grayish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

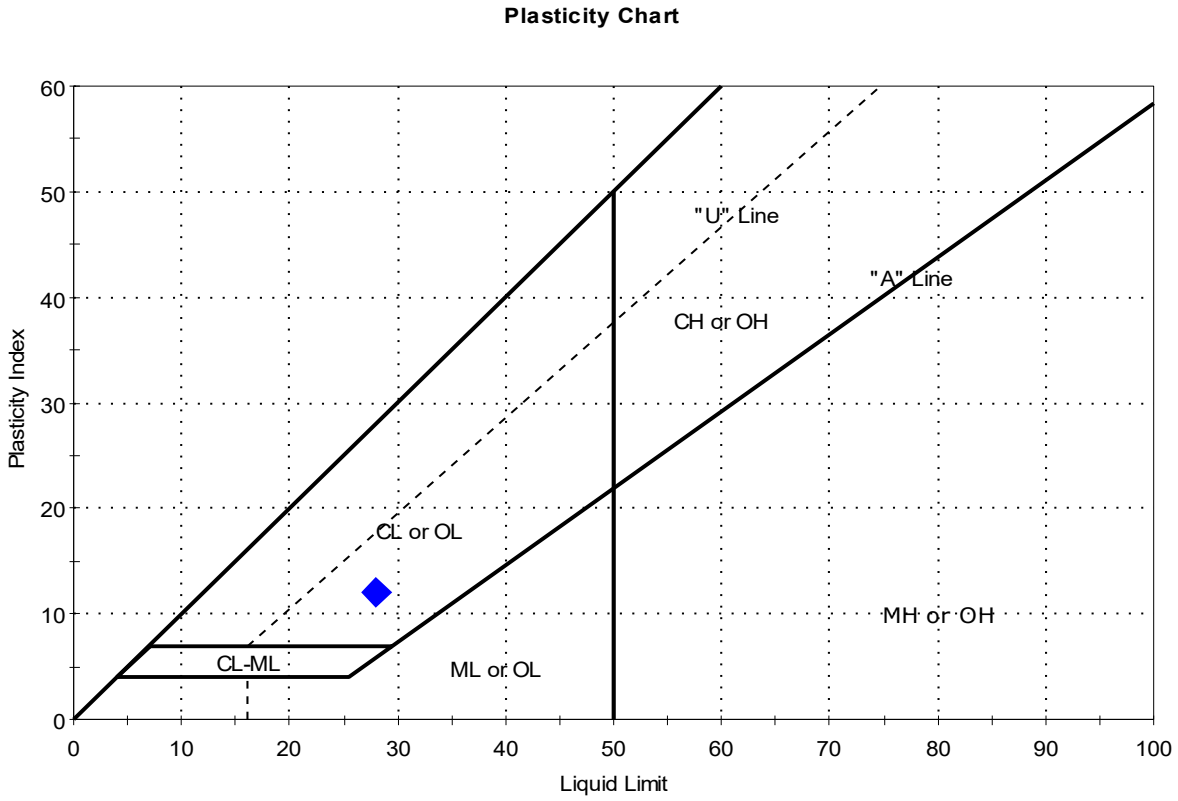


Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	8D	B-BSA-10	20-22 ft	24	33	17	16	0.4	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-107	Sample Type:	Jar	Tested By:	cam
Sample ID:	10D	Test Date:	08/19/24	Checked By:	ank
Depth :	30-32 ft	Test Id:	780388		
Test Comment:	---				
Visual Description:	Moist, grayish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

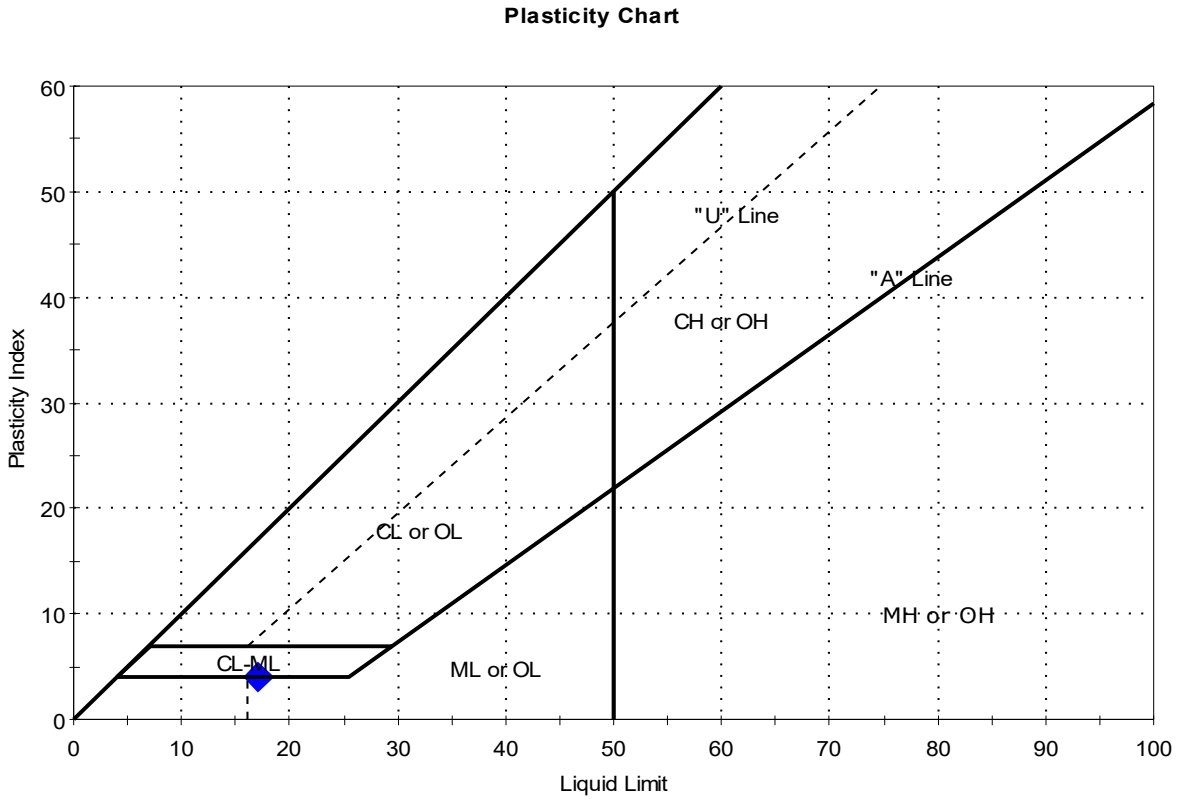


Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	10D	B-BSA-10	30-32 ft	28	28	16	12	1	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-107	Sample Type:	Jar	Tested By:	cam
Sample ID:	12D	Test Date:	08/16/24	Checked By:	ank
Depth :	40-42 ft	Test Id:	780389		
Test Comment:	---				
Visual Description:	Moist, brownish gray silty clayey sand with gravel				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

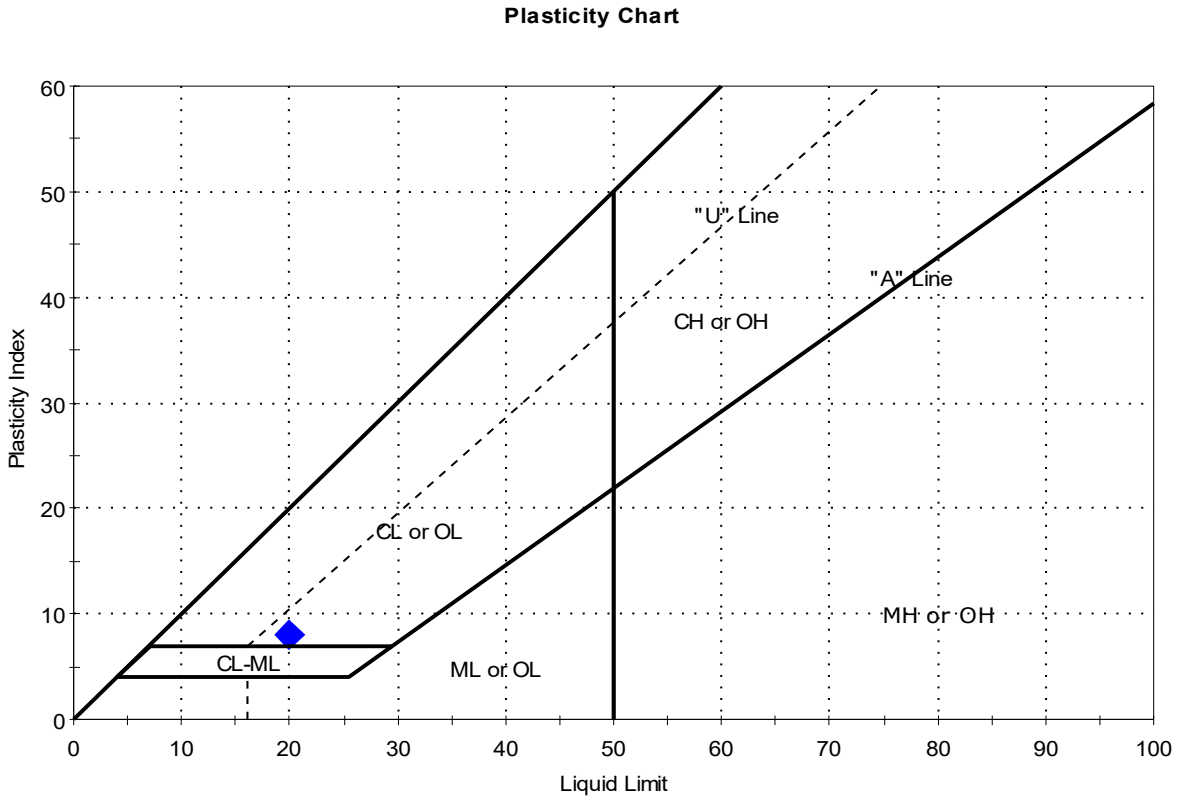


Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	12D	B-BSA-10	40-42 ft	10	17	13	4	-0.8	Silty, Clayey SAND with Gravel (SC-SM)

Sample Prepared using the WET method
40% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-107	Sample Type:	Jar	Tested By:	cam
Sample ID:	14D	Test Date:	08/15/24	Checked By:	ank
Depth :	50-52 ft	Test Id:	780390		
Test Comment:	---				
Visual Description:	Moist, grayish brown clayey sand with gravel				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

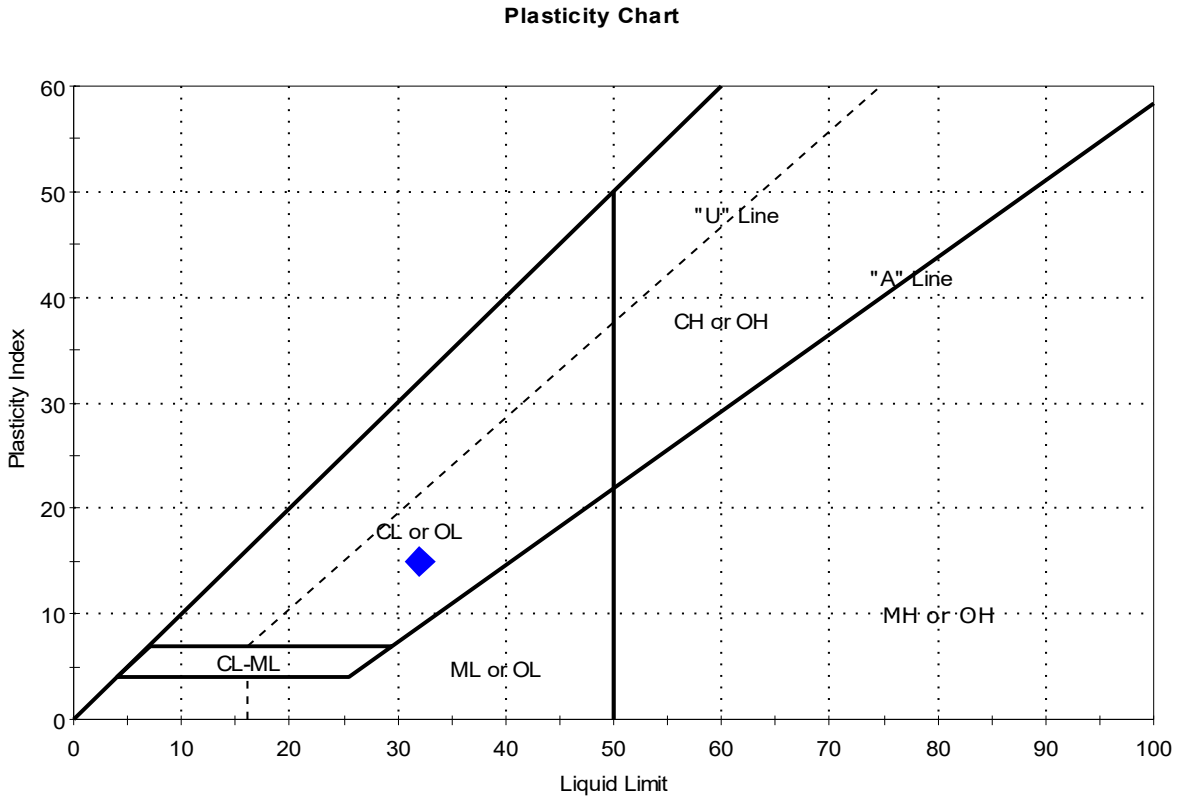


Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	14D	B-BSA-10	50-52 ft	10	20	12	8	-0.3	Clayey SAND with Gravel (SC)

Sample Prepared using the WET method
46% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-111	Sample Type:	Jar	Tested By:	cam
Sample ID:	5D	Test Date:	08/16/24	Checked By:	ank
Depth :	10-12 ft	Test Id:	780417		
Test Comment:	---				
Visual Description:	Moist, olive brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	5D	B-BSA-11	10-12 ft	21	32	17	15	0.3	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	---	Sample Type:	---	Tested By:	ajl
Sample ID:	---	Test Date:	06/05/24	Checked By:	ank
Depth :	---	Test Id:	771711		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
BB-BSA-102	1D	1-3ft	Moist, brown silty sand with gravel	3.7
BB-BSA-102	2D	3-5ft	Moist, brown silty sand with gravel	8.6
BB-BSA-102	5D	9-11ft	Moist, light brown silty gravel with sand	15.5
BB-BSA-108	1D	0-2ft	Moist, yellowish brown silty sand with gravel	8.0
BB-BSA-109	2D	3-5ft	Moist, grayish brown silty gravel with sand	5.7
BB-BSA-109	4D	7-9ft	Moist, brown silty sand with gravel	11.7

Notes: Temperature of Drying : 110º Celsius

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	---	Sample Type:	---	Tested By:	ajl
Sample ID:	---	Test Date:	06/07/24	Checked By:	ank
Depth :	---	Test Id:	771713		

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
BB-BSA-102	1D	1-3ft	Moist, brown silty sand with gravel	7.9	7.2
BB-BSA-109	2D	3-5ft	Moist, grayish brown silty gravel with sand	8.2	7.3

Notes: Sample Preparation: screened through #10 sieve

Method A, pH meter used

Client:	WSP USA, Inc.
Project:	MaineDOT I-95 Bridge Over Stillwater
Location:	Merrimack, NH
GTX#:	319180
Test Date:	06/10/24
Due Date:	06/13/24
Tested By:	NMK
Checked By:	ank

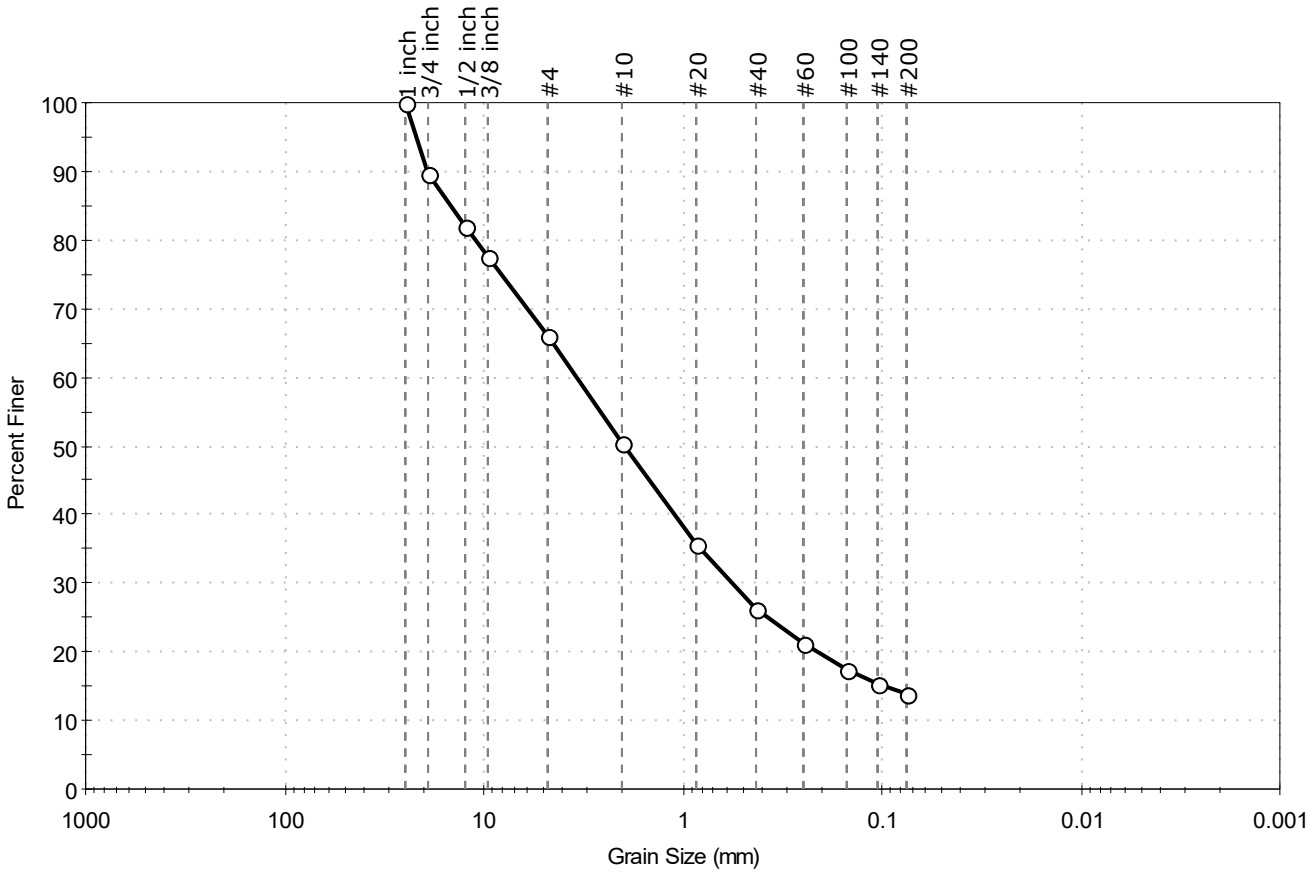
Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, $(ohm\text{-}cm)^{-1}$
BB-BSA-102	1D	1-3 ft	Moist, brown silty gravel	1,202	8.32E-04

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box
Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)
Test conducted in standard laboratory atmosphere: 68-73 F

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-102	Sample Type:	Jar	Tested By:	ajl
Sample ID:	1D	Test Date:	06/10/24	Checked By:	ank
Depth :	1-3ft	Test Id:	771699		
Test Comment:	---				
Visual Description:	Moist, brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	34.0	52.0	14.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 inch	25.00	100		
3/4 inch	19.00	90		
1/2 inch	12.50	82		
3/8 inch	9.50	78		
#4	4.75	66		
#10	2.00	51		
#20	0.85	36		
#40	0.42	26		
#60	0.25	21		
#100	0.15	17		
#140	0.11	15		
#200	0.075	14		

Coefficients

D_{85} = 14.7631 mm
D_{30} = 0.5584 mm
D_{60} = 3.3977 mm
D_{15} = 0.0975 mm
D_{50} = 1.9370 mm
D_{10} = N/A
C_u = N/A
C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

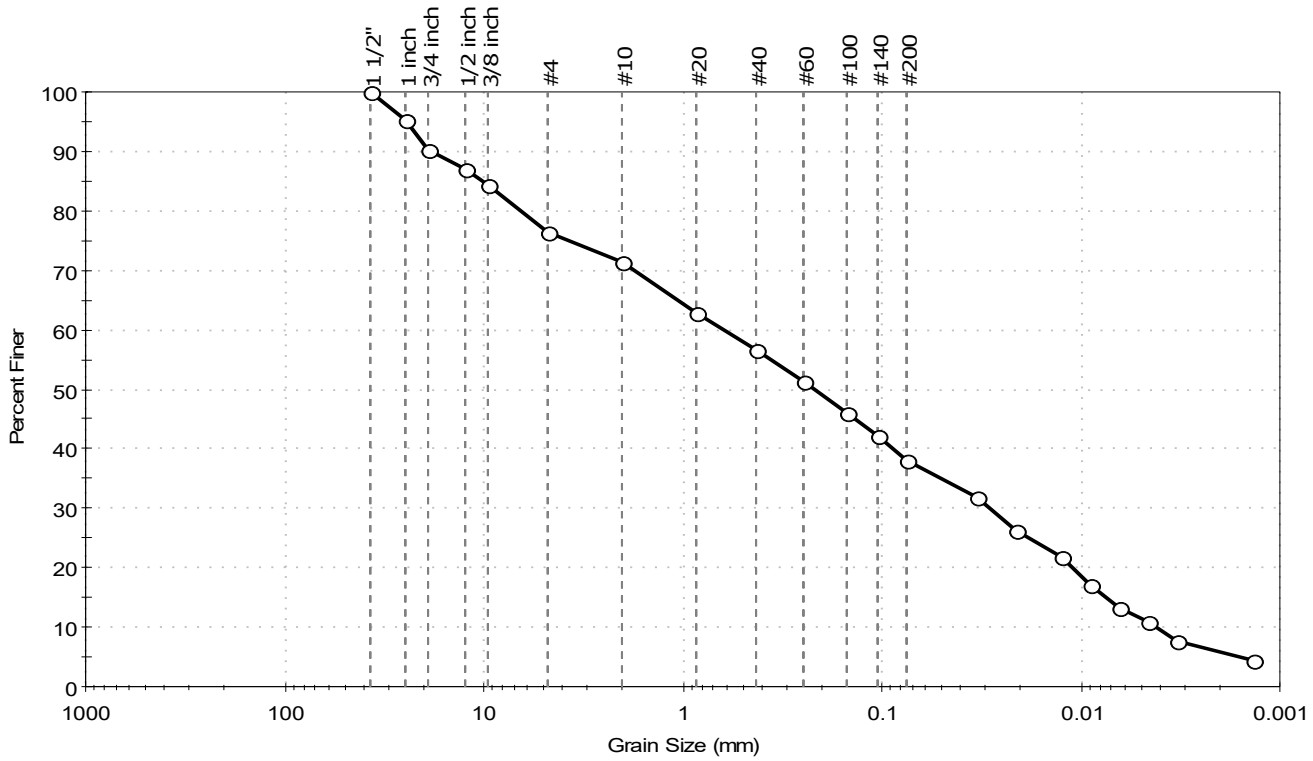
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-102	Sample Type:	Jar	Tested By:	ajl
Sample ID:	2D	Test Date:	06/11/24	Checked By:	ank
Depth :	3-5ft	Test Id:	771725		
Test Comment:	---				
Visual Description:	Moist, brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	23.6	38.4	38.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2"	37.50	100		
1 inch	25.00	95		
3/4 inch	19.00	90		
1/2 inch	12.50	87		
3/8 inch	9.50	84		
#4	4.75	76		
#10	2.00	71		
#20	0.85	63		
#40	0.42	57		
#60	0.25	51		
#100	0.15	46		
#140	0.11	42		
#200	0.075	38		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0330	32		
---	0.0213	26		
---	0.0125	22		
---	0.0090	17		
---	0.0065	13		
---	0.0046	11		
---	0.0033	8		
---	0.0014	4		

Coefficients

D_{85} = 10.2078 mm D_{30} = 0.0286 mm

D_{60} = 0.6168 mm D_{15} = 0.0074 mm

D_{50} = 0.2201 mm D_{10} = 0.0042 mm

C_u = 146.857 C_c = 0.316

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

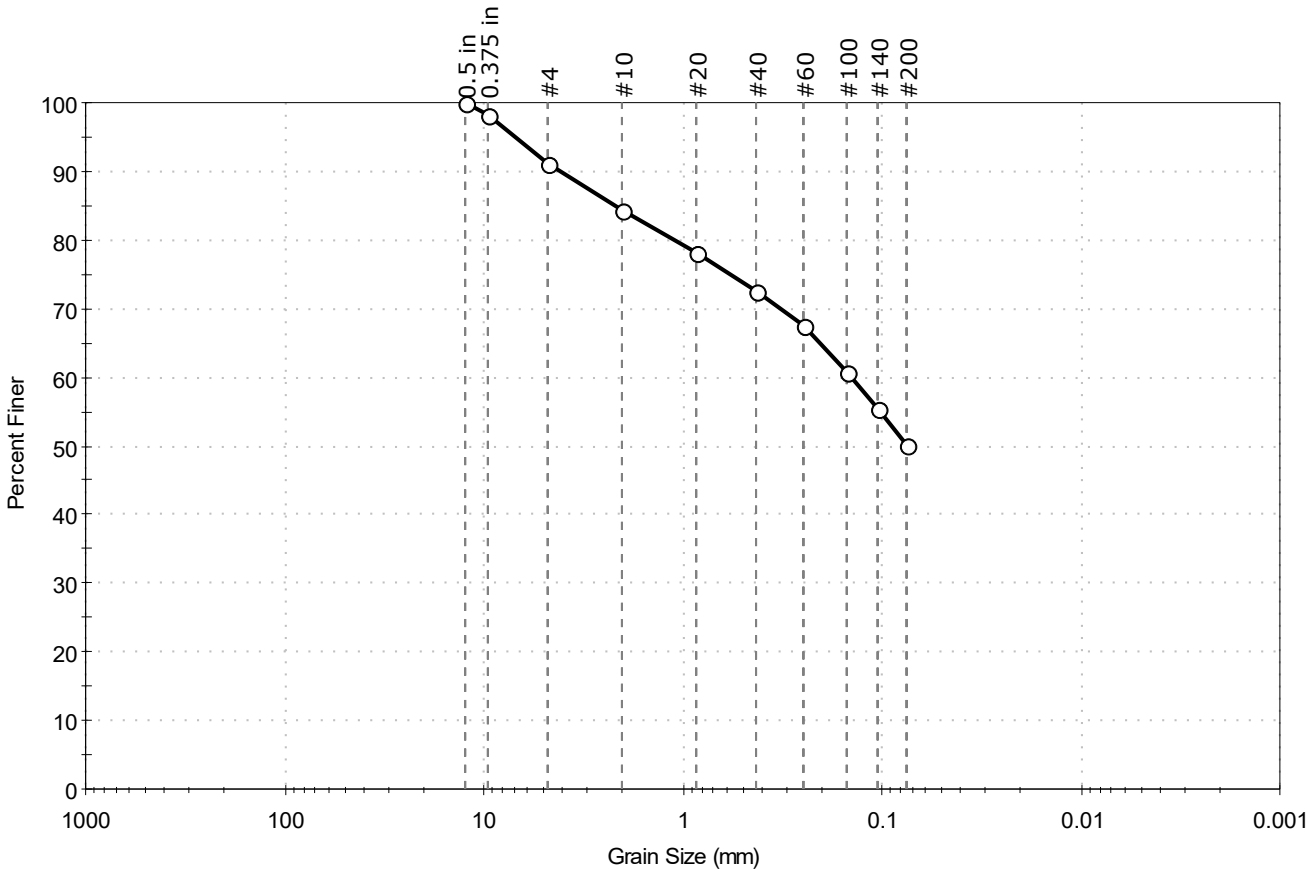
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-102	Sample Type:	Jar	Tested By:	ajl
Sample ID:	4D	Test Date:	06/11/24	Checked By:	ank
Depth :	7-9ft	Test Id:	771701		
Test Comment:	---				
Visual Description:	Moist, brown sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	8.7	41.1	50.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	98		
#4	4.75	91		
#10	2.00	84		
#20	0.85	78		
#40	0.42	73		
#60	0.25	67		
#100	0.15	61		
#140	0.11	55		
#200	0.075	50		

Coefficients

D_{85} = 2.1488 mm D_{30} = N/A
D_{60} = 0.1431 mm D_{15} = N/A
D_{50} = N/A D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM Sandy SILT (ML)

AASHTO Silty Soils (A-4 (0))

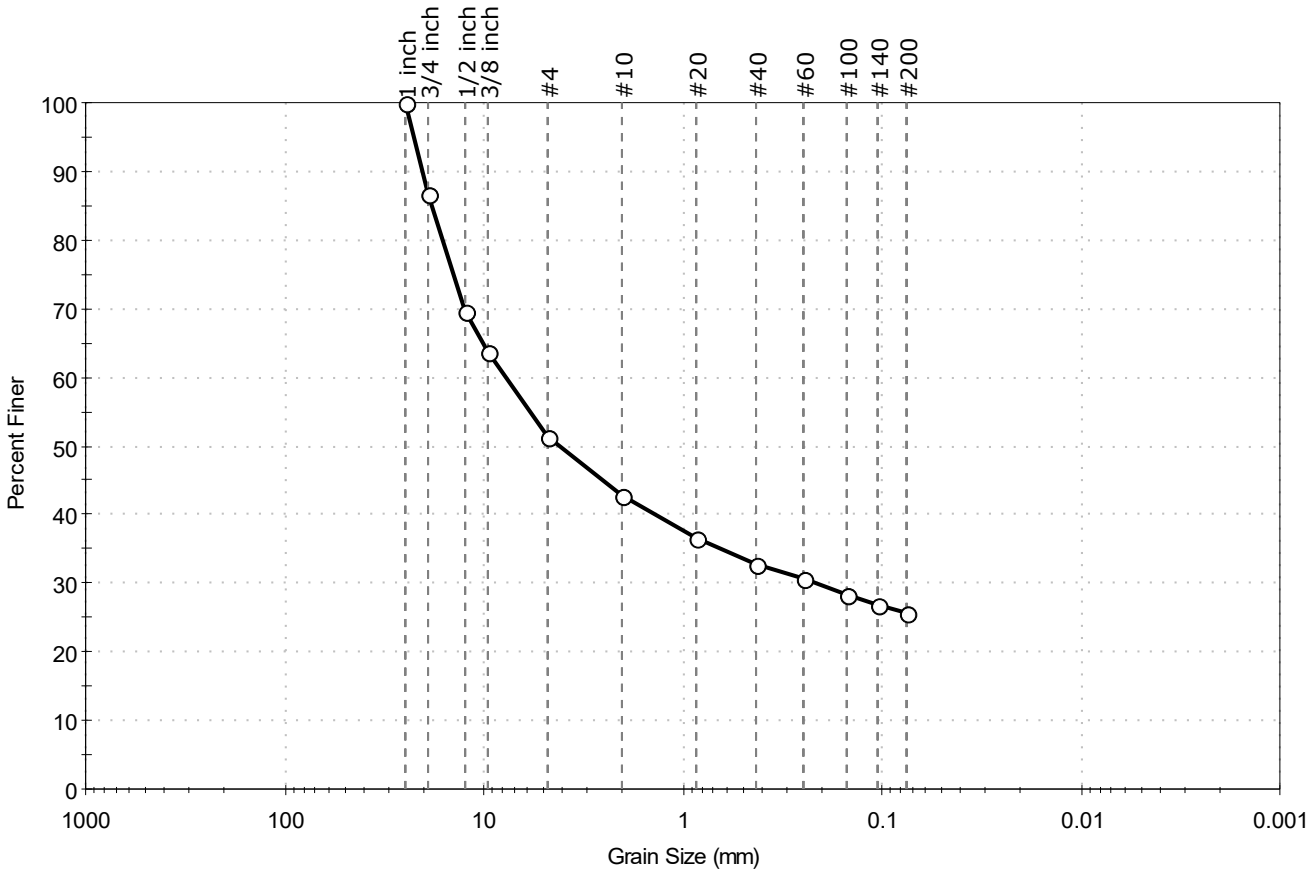
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-102	Sample Type:	Jar	Tested By:	ajl
Sample ID:	5D	Test Date:	06/10/24	Checked By:	ank
Depth :	9-11ft	Test Id:	771702		
Test Comment:	---				
Visual Description:	Moist, light brown silty gravel with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	48.7	25.7	25.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 inch	25.00	100		
3/4 inch	19.00	87		
1/2 inch	12.50	70		
3/8 inch	9.50	64		
#4	4.75	51		
#10	2.00	43		
#20	0.85	36		
#40	0.42	33		
#60	0.25	31		
#100	0.15	28		
#140	0.11	27		
#200	0.075	26		

Coefficients

D_{85} = 18.2066 mm D_{30} = 0.2200 mm

D_{60} = 7.7553 mm D_{15} = N/A

D_{50} = 4.1504 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

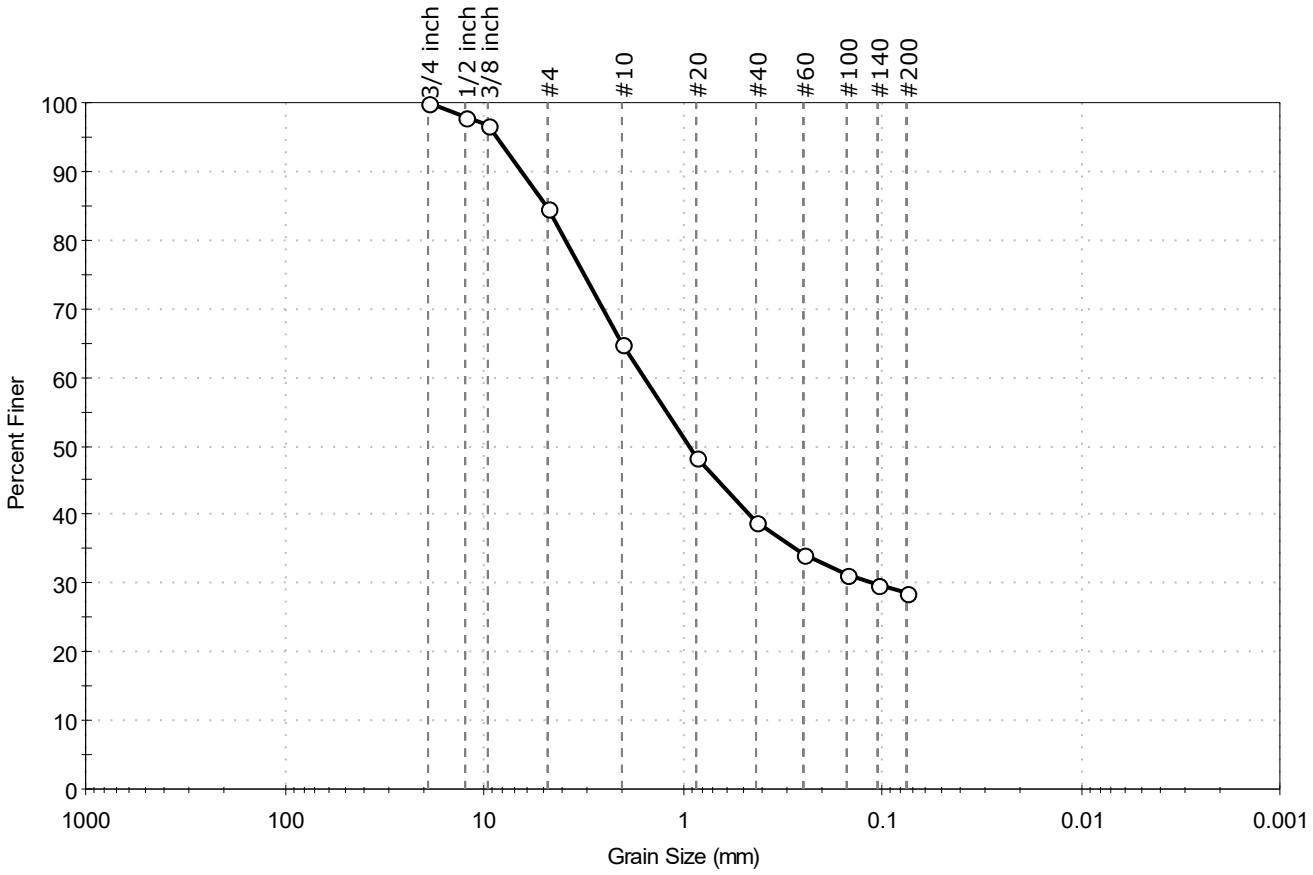
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-108	Sample Type:	Jar	Tested By:	ajl
Sample ID:	1D	Test Date:	06/10/24	Checked By:	ank
Depth :	0-2ft	Test Id:	771703		
Test Comment:	---				
Visual Description:	Moist, yellowish brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	15.4	56.1	28.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3/4 inch	19.00	100		
1/2 inch	12.50	98		
3/8 inch	9.50	97		
#4	4.75	85		
#10	2.00	65		
#20	0.85	48		
#40	0.42	39		
#60	0.25	34		
#100	0.15	31		
#140	0.11	30		
#200	0.075	28		

Coefficients

D_{85} = 4.8781 mm D_{30} = 0.1095 mm

D_{60} = 1.5572 mm D_{15} = N/A

D_{50} = 0.9286 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

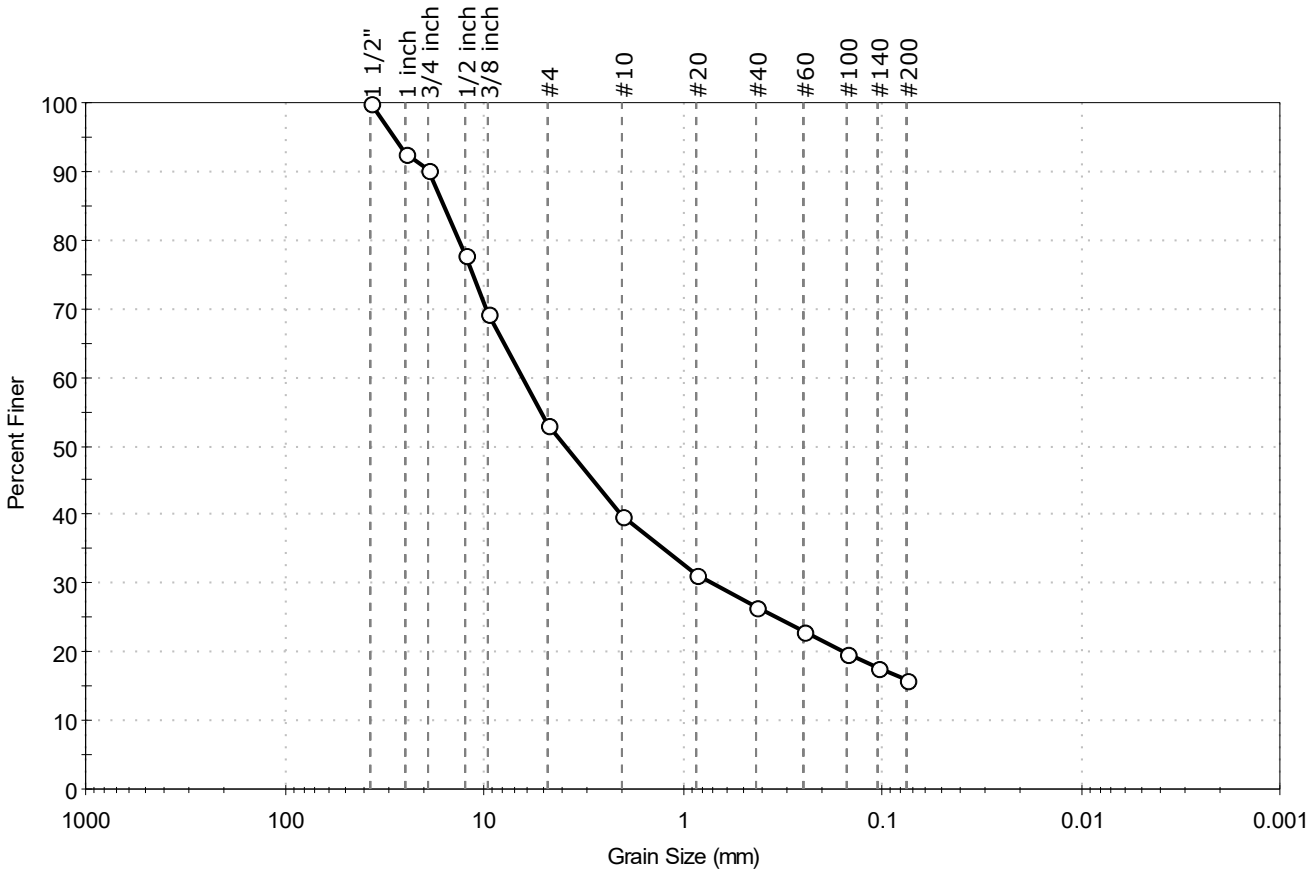
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-109	Sample Type:	Jar	Tested By:	ajl
Sample ID:	2D	Test Date:	06/11/24	Checked By:	ank
Depth :	3-5ft	Test Id:	771704		
Test Comment:	---				
Visual Description:	Moist, grayish brown silty gravel with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	46.8	37.3	15.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2"	37.50	100		
1 inch	25.00	93		
3/4 inch	19.00	90		
1/2 inch	12.50	78		
3/8 inch	9.50	69		
#4	4.75	53		
#10	2.00	40		
#20	0.85	31		
#40	0.42	26		
#60	0.25	23		
#100	0.15	20		
#140	0.11	18		
#200	0.075	16		

Coefficients

D_{85} = 15.9069 mm	D_{30} = 0.7017 mm
D_{60} = 6.3678 mm	D_{15} = N/A
D_{50} = 3.8773 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

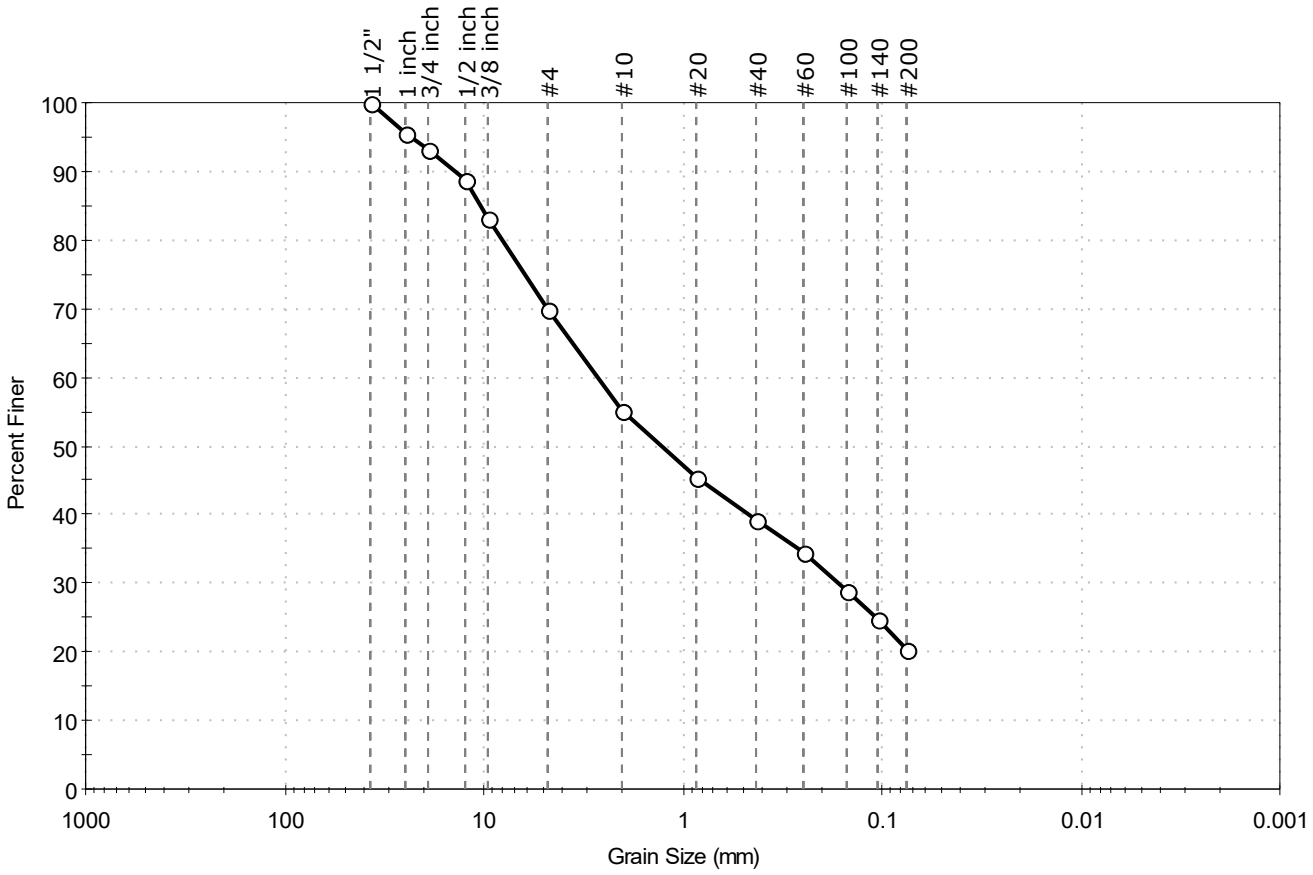
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-109	Sample Type:	Jar	Tested By:	ajl
Sample ID:	4D	Test Date:	06/10/24	Checked By:	ank
Depth :	7-9ft	Test Id:	771705		
Test Comment:	---				
Visual Description:	Moist, brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	30.1	49.6	20.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2"	37.50	100		
1 inch	25.00	96		
3/4 inch	19.00	93		
1/2 inch	12.50	89		
3/8 inch	9.50	83		
#4	4.75	70		
#10	2.00	55		
#20	0.85	45		
#40	0.42	39		
#60	0.25	35		
#100	0.15	29		
#140	0.11	25		
#200	0.075	20		

Coefficients

D_{85} = 10.4311 mm	D_{30} = 0.1670 mm
D_{60} = 2.6443 mm	D_{15} = N/A
D_{50} = 1.2721 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MaineDOT I-95 Bridge over Stillwater				
Location:	Merrimack, NH			Project No:	GTX-319180
Boring ID:	BB-BSA-102	Sample Type:	Jar	Tested By:	cam
Sample ID:	4D	Test Date:	06/10/24	Checked By:	ank
Depth :	7-9ft	Test Id:	771698		
Test Comment:	---				
Visual Description:	Moist, brown sandy silt				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	4D	B-BSA-10	7-9ft	13	n/a	n/a	n/a	n/a	Sandy SILT (ML)

27% Retained on #40 Sieve
Dry Strength: n/a
Dilatancy: n/a
Toughness: n/a
The sample was determined to be Non-Plastic

PO Box 572455 / Salt Lake City UT 84157-2455 / USA
TEL +1 801 262 2448 · FAX +1 801 262 9870 · www.TEi-TS.com

GEOTESTING EXPRESS INCORPORATED
125 NAGOG PARK
ACTON MA 01720-3451
USA

Analysis No.	TS-A2411955
Report Date	14 June 2024
Date Sampled	12 June 2024
Date Received	13 June 2024
Where Sampled	Acton, MA USA
Sampled By	Client

This is to attest that we have examined: Soil: Project: MaineDOT I-95 Bridge over Stillwater; Site Location: - — -; Job Number: GTX-319180

When examined to the applicable requirements of:

AASHTO T 291-18	"Standard Method of Test for Determining Water-Soluble Chloride Ion Content in Soil" Method B
AASHTO T 290-20	"Standard Method of Test for Determining Water-Soluble Sulfate Ion Content in Soil"

Results:

AASHTO T 291 – Chloride (Method B)

Sample		Results		Minimum Detection Limit
		ppm (mg/kg)	%[1]	
BB-BSA-102		215.	0.0215	10.
1D	1 – 3'			
BB-BSA-109		59.	0.0059	
2D	3 – 5'			

NOTE: [1]Percent by weight after drying and prepared as per the Standard.

AASHTO T 290 – Sulfates (Soluble)

Sample		Results		Minimum Detection Limit
		ppm (mg/kg)	%[1]	
BB-BSA-102		< 10.	< 0.0010	10.
1D	1 – 3'			
BB-BSA-109		< 10.	< 0.0010	
2D	3 – 5'			

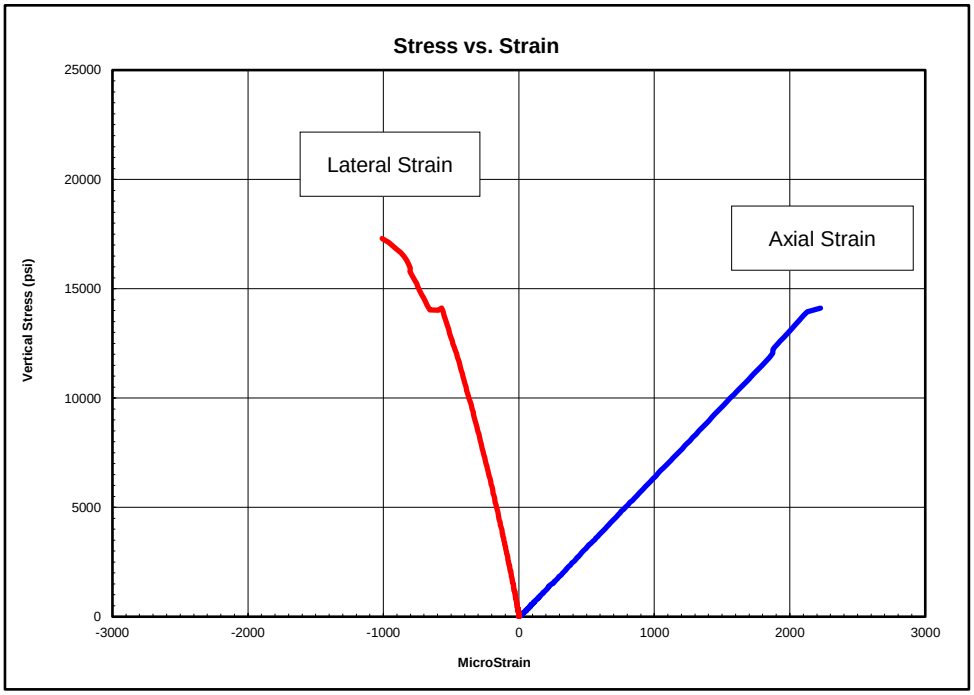
NOTE: [1]Percent by weight after drying and prepared as per the Standard.

END OF ANALYSIS

Merrill Gee P.E. – Engineer in Charge

Client:	WSP USA, Inc.
Project Name:	MaineDOT I-95 Bridge over Stillwater
Project Location:	Merrimack, NH
GTX #:	319180
Test Date:	6/13/2024
Tested By:	gp
Checked By:	jsc
Boring ID:	BB-BSA-102
Sample ID:	R1
Depth, ft:	14.87-15.25
Sample Type:	rock core
Sample Description:	See photographs Intact material failure Best Effort end preparation performed

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 17,296 psi

The axial strain gauges failed before the peak value was attained. Young's Modulus and Poisson's Ratio could not be determined within the third stress range for this test.

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
1700-6300	6,470,000	0.23
6300-11000	6,460,000	0.27
11000-15600	---	---

Notes:
Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

Client:	WSP USA, Inc.	Test Date:	6/12/2024
Project Name:	MaineDOT I-95 Bridge over Stillwater	Tested By:	gp
Project Location:	Merrimack, NH	Checked By:	smd
GTX #:	319180		
Boring ID:	BB-BSA-102		
Sample ID:	R1		
Depth (ft):	14.87-15.25		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.38	4.38	4.38
Specimen Diameter, in:	1.97	1.97	1.97
Specimen Mass, g:	593.5		
Bulk Density, lb/ft^3	169	**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.2	**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:
Is the maximum gap ≤ 0.02 in.? YES

Maximum difference must be < 0.020 in.
Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

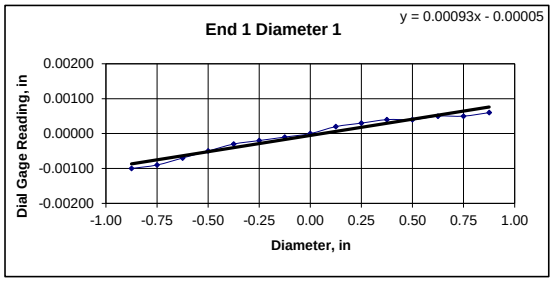
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00100	-0.00090	-0.00070	-0.00050	-0.00030	-0.00020	-0.00010	0.00000	0.00020	0.00030	0.00040	0.00040	0.00050	0.00050	0.00060
Diameter 2, in (rotated 90°)	0.00090	0.00080	0.00050	0.00040	0.00030	0.00020	0.00010	0.00000	0.00000	-0.00020	-0.00040	-0.00060	-0.00070	-0.00090	-0.00120

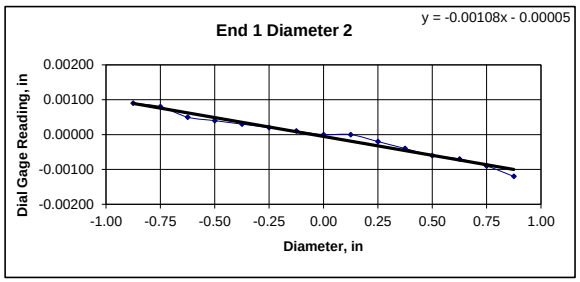
Difference between max and min readings, in:
0° = 0.00160 90° = 0.00210

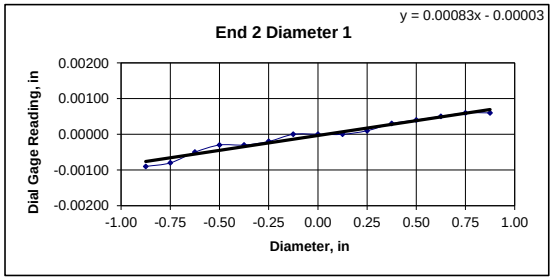
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00090	-0.00080	-0.00050	-0.00030	-0.00030	-0.00020	0.00000	0.00000	0.00000	0.00010	0.00030	0.00040	0.00050	0.00060	0.00060
Diameter 2, in (rotated 90°)	-0.00100	-0.00090	-0.00070	-0.00040	-0.00030	-0.00020	0.00000	0.00000	0.00020	0.00030	0.00050	0.00060	0.00070	0.00070	0.00090

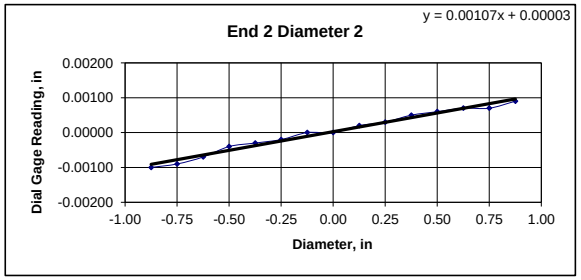
Difference between max and min readings, in:
0° = 0.0015 90° = 0.0019

Maximum difference must be < 0.0020 in. Difference = ± 0.00105
Flatness Tolerance Met? NO









DIAMETER 1

End 1:
Slope of Best Fit Line 0.00093
Angle of Best Fit Line: 0.05337

End 2:
Slope of Best Fit Line 0.00083
Angle of Best Fit Line: 0.04764

Maximum Angular Difference: 0.00573

Parallelism Tolerance Met? NO
Spherically Seated

DIAMETER 2

End 1:
Slope of Best Fit Line 0.00108
Angle of Best Fit Line: 0.06204

End 2:
Slope of Best Fit Line 0.00107
Angle of Best Fit Line: 0.06139

Maximum Angular Difference: 0.00065

Parallelism Tolerance Met? YES
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00160	1.970	0.00081	0.047	YES
Diameter 2, in (rotated 90°)	0.00210	1.970	0.00107	0.061	YES
END 2					
Diameter 1, in	0.00150	1.970	0.00076	0.044	YES
Diameter 2, in (rotated 90°)	0.00190	1.970	0.00096	0.055	YES

Maximum angle of departure must be ≤ 0.25°
Perpendicularity Tolerance Met? YES

Client:	WSP USA, Inc.	Test Date:	6/12/2024
Project Name:	MaineDOT I-95 Bridge over Stillwater	Tested By:	gp
Project Location:	Merrimack, NH	Checked By:	smd
GTX #:	319180		
Boring ID:	BB-BSA-102	Reliable dial gauge measurements could not be performed on this rock type. Tolerance measurements were performed using a machinist straightedge and feeler gauges to ASTM specifications.	
Sample ID:	R1		
Depth (ft):	14.87-15.25		
Visual Description:	See photographs		

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

END FLATNESS

END 1

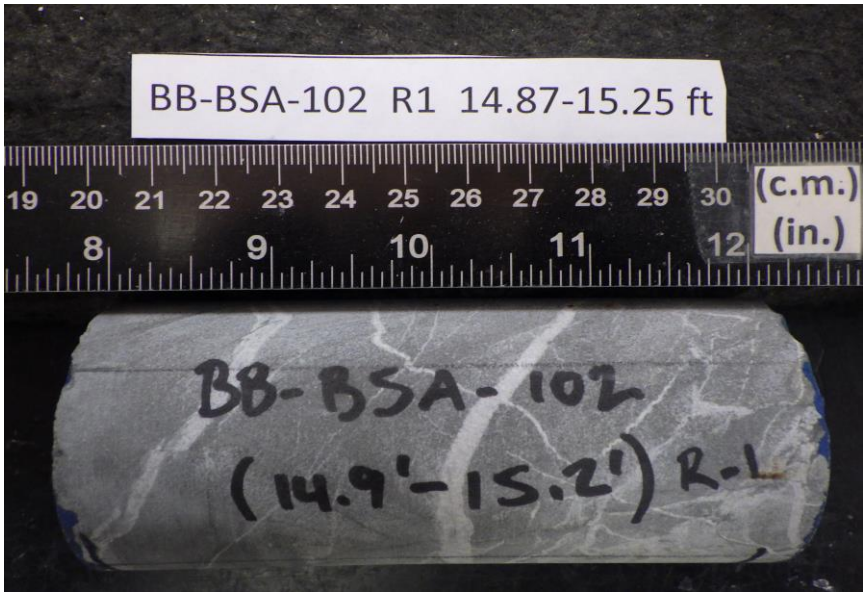
Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

END 2

Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

End Flatness Tolerance Met? YES

Client:	WSP USA, Inc.
Project Name:	MaineDOT I-95 Bridge over Stillwater
Project Location:	Merrimack, NH
GTX #:	319180
Test Date:	6/13/2024
Tested By:	smd
Checked By:	jsc
Boring ID:	BB-BSA-102
Sample ID:	R1
Depth, ft:	14.87-15.25

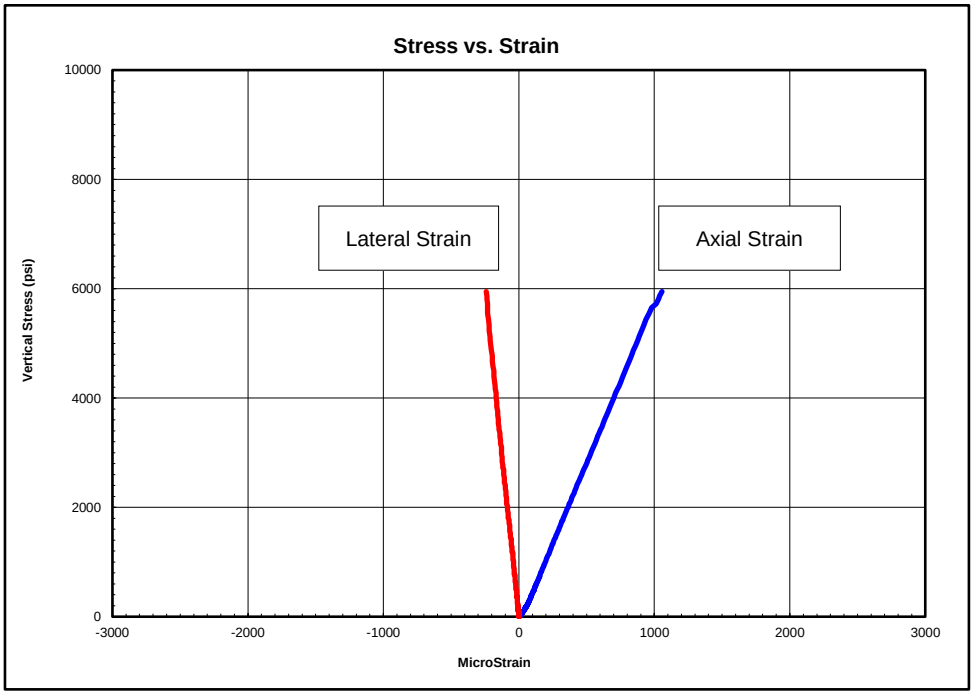


After cutting and grinding

After break

Client:	WSP USA, Inc.
Project Name:	MaineDOT I-95 Bridge over Stillwater
Project Location:	Merrimack, NH
GTX #:	319180
Test Date:	6/13/2024
Tested By:	gp
Checked By:	jsc
Boring ID:	BB-BSA-110
Sample ID:	R1
Depth, ft:	5.93-6.31
Sample Type:	rock core
Sample Description:	See photographs Intact material and discontinuity failure Best Effort end preparation performed

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 5,948 psi

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
600-2200	6,020,000	0.26
2200-3800	5,880,000	0.25
3800-5400	6,000,000	0.25

Notes:
Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

Client:	WSP USA, Inc.	Test Date:	6/12/2024
Project Name:	MaineDOT I-95 Bridge over Stillwater	Tested By:	gp
Project Location:	Merrimack, NH	Checked By:	smd
GTX #:	319180		
Boring ID:	BB-BSA-110		
Sample ID:	R1		
Depth (ft):	5.93-6.31		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.41	4.41	4.41
Specimen Diameter, in:	1.97	1.97	1.97
Specimen Mass, g:	604.37		
Bulk Density, lb/ft^3	171	**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.2	**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:

Is the maximum gap ≤ 0.02 in.? YES

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00240	-0.00210	-0.00210	-0.00190	-0.00130	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00030	-0.00040	-0.00050	-0.00050
Diameter 2, in (rotated 90°)	-0.00120	-0.00110	-0.00100	-0.00090	-0.00060	-0.00030	-0.00010	0.00000	0.00020	0.00040	0.00060	0.00070	0.00080	0.00100	0.00110

Difference between max and min readings, in:

0° = 0.00240 90° = 0.00230

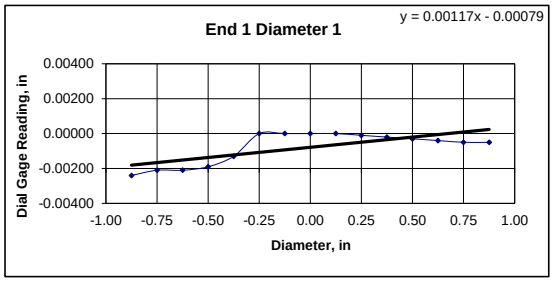
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Diameter 2, in (rotated 90°)	0.00110	0.00100	0.00080	0.00060	0.00050	0.00030	0.00010	0.00000	0.00000	-0.00020	-0.00040	-0.00070	-0.00090	-0.00100	-0.00140

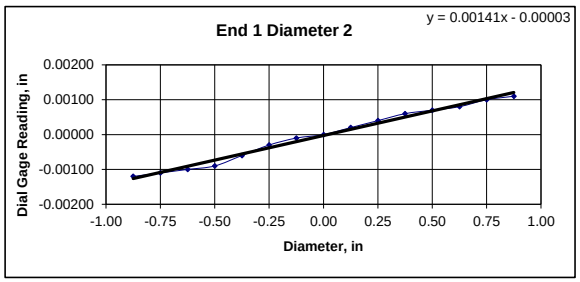
Difference between max and min readings, in:

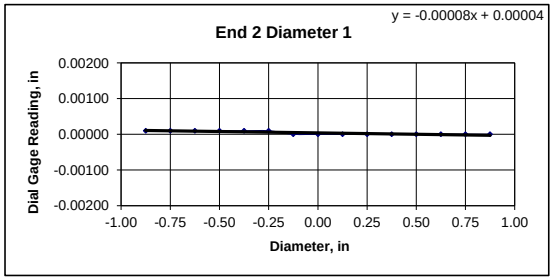
0° = 0.0001 90° = 0.0025

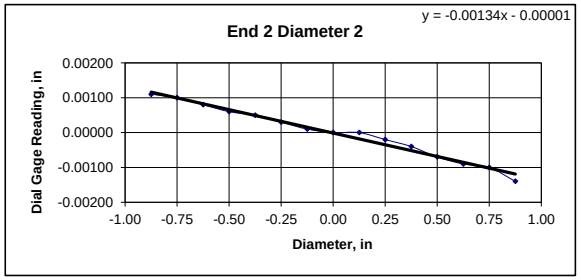
Maximum difference must be < 0.0020 in. Difference = ± 0.00125

Flatness Tolerance Met? NO









DIAMETER 1

End 1:
- Slope of Best Fit Line: 0.00117
- Angle of Best Fit Line: 0.06695

End 2:
- Slope of Best Fit Line: 0.00008
- Angle of Best Fit Line: 0.00442

Maximum Angular Difference: 0.06253

Parallelism Tolerance Met? NO

Spherically Seated

DIAMETER 2

End 1:
- Slope of Best Fit Line: 0.00141
- Angle of Best Fit Line: 0.08087

End 2:
- Slope of Best Fit Line: 0.00134
- Angle of Best Fit Line: 0.07694

Maximum Angular Difference: 0.00393

Parallelism Tolerance Met? YES

Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00240	1.970	0.00122	0.070	YES
Diameter 2, in (rotated 90°)	0.00230	1.970	0.00117	0.067	YES
END 2					
Diameter 1, in	0.00010	1.970	0.00005	0.003	YES
Diameter 2, in (rotated 90°)	0.00250	1.970	0.00127	0.073	YES

Maximum angle of departure must be ≤ 0.25°

Perpendicularity Tolerance Met? YES

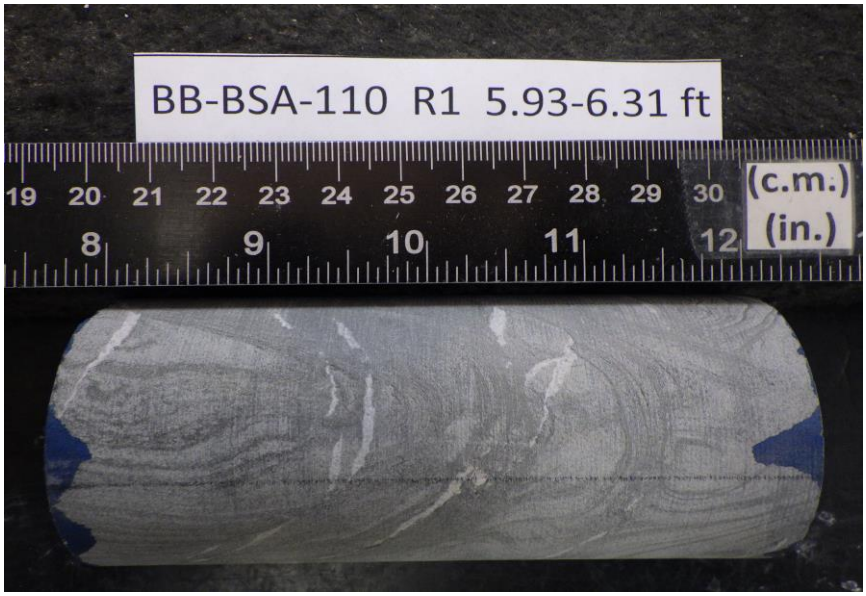
Client:	WSP USA, Inc.	Test Date:	6/12/2024
Project Name:	MaineDOT I-95 Bridge over Stillwater	Tested By:	gp
Project Location:	Merrimack, NH	Checked By:	smd
GTX #:	319180		
Boring ID:	BB-BSA-110	Reliable dial gauge measurements could not be performed on this rock type. Tolerance measurements were performed using a machinist straightedge and feeler gauges to ASTM specifications.	
Sample ID:	R1		
Depth (ft):	5.93-6.31		
Visual Description:	See photographs		

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

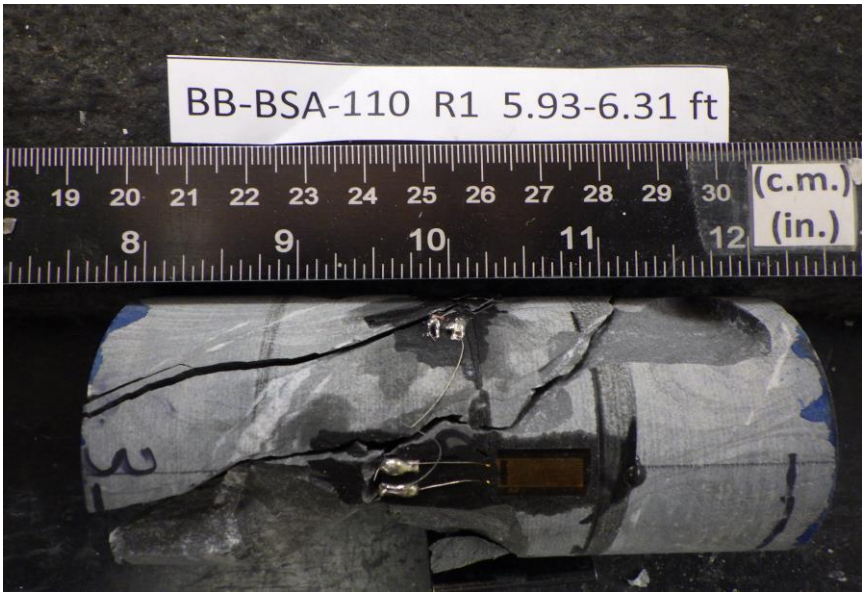
END FLATNESS		
END 1		
Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES
END 2		
Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

End Flatness Tolerance Met? YES

Client:	WSP USA, Inc.
Project Name:	MaineDOT I-95 Bridge over Stillwater
Project Location:	Merrimack, NH
GTX #:	319180
Test Date:	6/13/2024
Tested By:	gp
Checked By:	smd
Boring ID:	BB-BSA-110
Sample ID:	R1
Depth, ft:	5.93-6.31



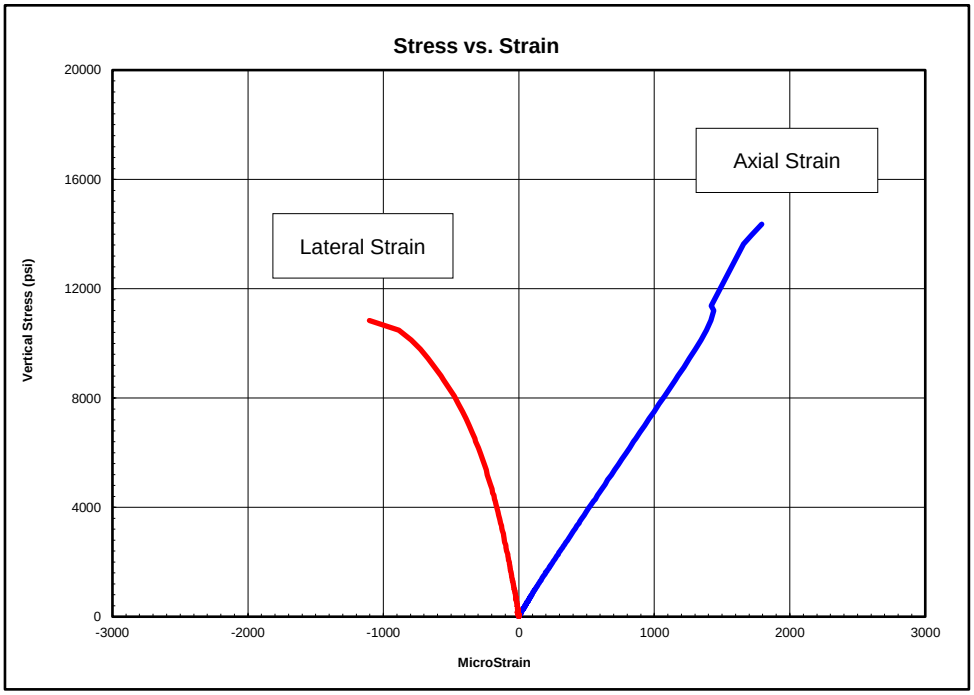
After cutting and grinding



After break

Client:	WSP USA, Inc.
Project Name:	MaineDOT I-95 Bridge over Stillwater
Project Location:	Merrimack, NH
GTX #:	319180
Test Date:	8/29/2024
Tested By:	gp
Checked By:	jsc
Boring ID:	BB-BSA-101
Sample ID:	R-4
Depth, ft:	37-37.3
Sample Type:	rock core
Sample Description:	See photographs Intact material failure Best Effort end preparation performed

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 14,361 psi

The lateral strain gauges failed before the peak value was attained. Poisson's Ratio could not be determined within the second and third stress ranges.

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
1400-5300	7,410,000	0.34
5300-9100	7,340,000	---
9100-12900	11,000,000	---

Notes:
Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

Client:	WSP USA, Inc.	Test Date:	8/28/2024
Project Name:	MaineDOT I-95 Bridge over Stillwater	Tested By:	gp
Project Location:	Merrimack, NH	Checked By:	smd
GTX #:	319180		
Boring ID:	BB-BSA-101		
Sample ID:	R-4		
Depth (ft):	37-37.3		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.33	4.33	4.33
Specimen Diameter, in:	1.97	1.97	1.97
Specimen Mass, g:	589.14		
Bulk Density, lb/ft^3	170	**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.2	**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:
Is the maximum gap ≤ 0.02 in.? YES

Maximum difference must be < 0.020 in.
Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

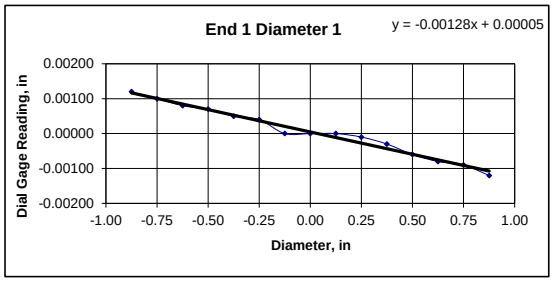
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00120	0.00100	0.00080	0.00070	0.00050	0.00040	0.00000	0.00000	0.00000	-0.00010	-0.00030	-0.00060	-0.00080	-0.00090	-0.00120
Diameter 2, in (rotated 90°)	0.00100	0.00080	0.00070	0.00070	0.00050	0.00030	0.00010	0.00000	0.00000	-0.00010	-0.00040	-0.00050	-0.00070	-0.00070	-0.00130

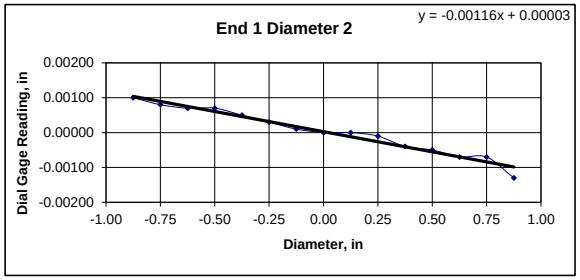
Difference between max and min readings, in:
0° = 0.00240 90° = 0.00230

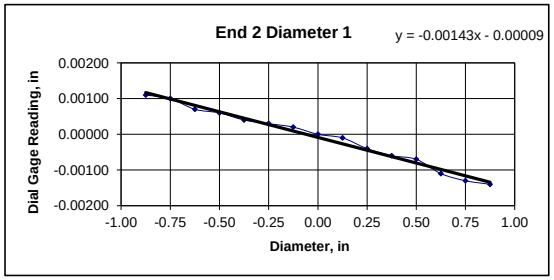
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00110	0.00100	0.00070	0.00060	0.00040	0.00030	0.00020	0.00000	-0.00010	-0.00040	-0.00060	-0.00070	-0.00110	-0.00130	-0.00140
Diameter 2, in (rotated 90°)	-0.00130	-0.00110	-0.00090	-0.00070	-0.00030	-0.00020	-0.00010	0.00000	0.00000	0.00020	0.00040	0.00050	0.00070	0.00080	0.00120

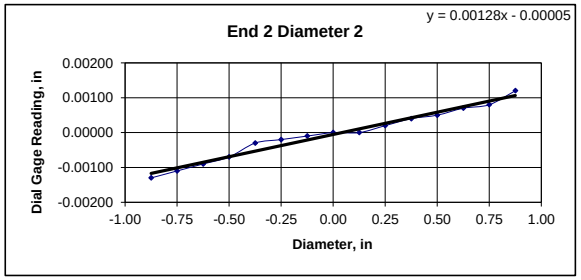
Difference between max and min readings, in:
0° = 0.0025 90° = 0.0025

Maximum difference must be < 0.0020 in. Difference = ± 0.00125
Flatness Tolerance Met? NO









DIAMETER 1

End 1:
Slope of Best Fit Line 0.00128
Angle of Best Fit Line: 0.07334

End 2:
Slope of Best Fit Line 0.00143
Angle of Best Fit Line: 0.08218

Maximum Angular Difference: 0.00884

Parallelism Tolerance Met? NO
Spherically Seated

DIAMETER 2

End 1:
Slope of Best Fit Line 0.00116
Angle of Best Fit Line: 0.06630

End 2:
Slope of Best Fit Line 0.00128
Angle of Best Fit Line: 0.07317

Maximum Angular Difference: 0.00688

Parallelism Tolerance Met? NO
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00240	1.970	0.00122	0.070	YES
Diameter 2, in (rotated 90°)	0.00230	1.970	0.00117	0.067	YES
END 2					
Diameter 1, in	0.00250	1.970	0.00127	0.073	YES
Diameter 2, in (rotated 90°)	0.00250	1.970	0.00127	0.073	YES

Maximum angle of departure must be ≤ 0.25°
Perpendicularity Tolerance Met? YES

Client:	WSP USA, Inc.	Test Date:	8/28/2024
Project Name:	MaineDOT I-95 Bridge over Stillwater	Tested By:	gp
Project Location:	Merrimack, NH	Checked By:	smd
GTX #:	319180		
Boring ID:	BB-BSA-101	Reliable dial gauge measurements could not be performed on this rock type. Tolerance measurements were performed using a machinist straightedge and feeler gauges to ASTM specifications.	
Sample ID:	R-4		
Depth (ft):	37-37.3		
Visual Description:	See photographs		

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

END FLATNESS		
END 1		
Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES
END 2		
Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

End Flatness Tolerance Met? YES

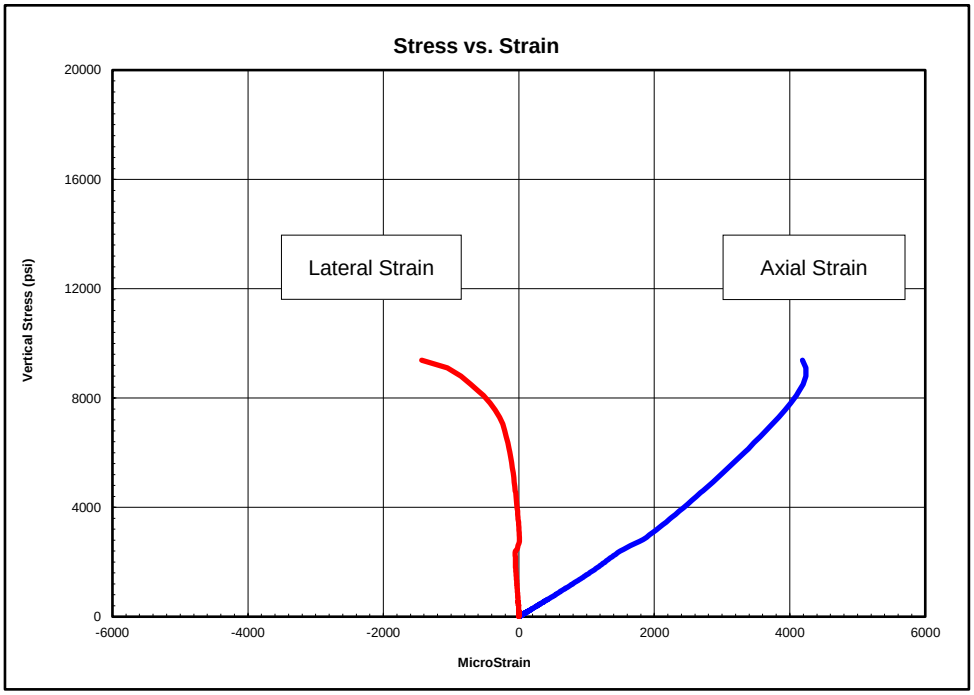
Client:	WSP USA, Inc.
Project Name:	MaineDOT I-95 Bridge over Stillwater
Project Location:	Merrimack, NH
GTX #:	319180
Test Date:	8/29/2024
Tested By:	gp
Checked By:	smd
Boring ID:	BB-BSA-101
Sample ID:	R-4
Depth, ft:	37-37.3

After cutting and grinding

After break

Client:	WSP USA, Inc.
Project Name:	MaineDOT I-95 Bridge over Stillwater
Project Location:	Merrimack, NH
GTX #:	319180
Test Date:	8/29/2024
Tested By:	gp
Checked By:	jsc
Boring ID:	BB-BSA-105
Sample ID:	R-1
Depth, ft:	28.8-29.1
Sample Type:	rock core
Sample Description:	See photographs Intact material failure Best Effort end preparation performed

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 9,458 psi

Poisson's Ratio within the first and third stress ranges could not be determined.

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
900-3500	1,610,000	---
3500-6000	2,190,000	0.10
6000-8500	2,730,000	---

Notes:
Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

Client:	WSP USA, Inc.	Test Date:	8/28/2024
Project Name:	MaineDOT I-95 Bridge over Stillwater	Tested By:	gp
Project Location:	Merrimack, NH	Checked By:	smd
GTX #:	319180		
Boring ID:	BB-BSA-105		
Sample ID:	R-1		
Depth (ft):	28.8-29.1		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.30	4.30	4.30
Specimen Diameter, in:	1.96	1.96	1.96
Specimen Mass, g:	582.84		
Bulk Density, lb/ft^3	171	**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.2	**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:
Is the maximum gap ≤ 0.02 in.? YES

Maximum difference must be < 0.020 in.
Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

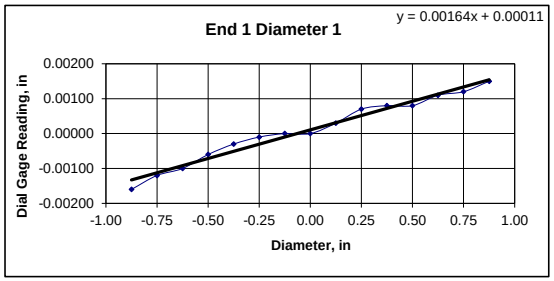
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00160	-0.00120	-0.00100	-0.00060	-0.00030	-0.00010	0.00000	0.00000	0.00030	0.00070	0.00080	0.00080	0.00110	0.00120	0.00150
Diameter 2, in (rotated 90°)	-0.00100	-0.00080	-0.00080	-0.00050	-0.00040	-0.00030	-0.00010	0.00000	0.00000	0.00010	0.00020	0.00030	0.00030	0.00050	0.00070

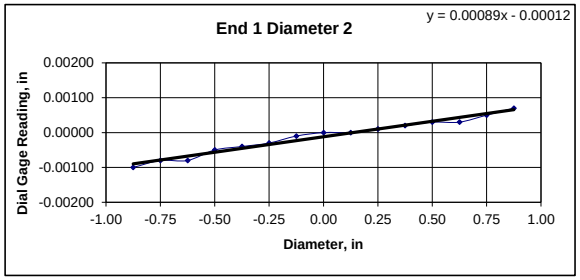
Difference between max and min readings, in:
0° = 0.00310 90° = 0.00170

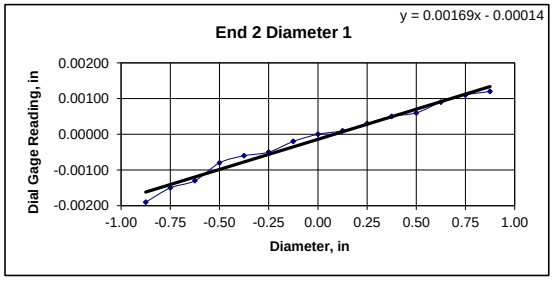
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00190	-0.00150	-0.00130	-0.00080	-0.00060	-0.00050	-0.00020	0.00000	0.00010	0.00030	0.00050	0.00060	0.00090	0.00110	0.00120
Diameter 2, in (rotated 90°)	0.00070	0.00060	0.00060	0.00060	0.00030	0.00010	0.00000	0.00000	0.00000	-0.00010	-0.00030	-0.00060	-0.00070	-0.00080	-0.00110

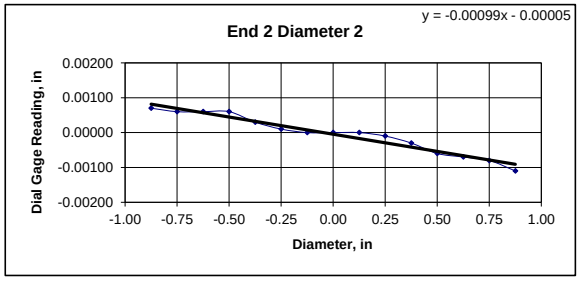
Difference between max and min readings, in:
0° = 0.0031 90° = 0.0018

Maximum difference must be < 0.0020 in. Difference = ± 0.00155
Flatness Tolerance Met? NO









DIAMETER 1

End 1:
Slope of Best Fit Line 0.00164
Angle of Best Fit Line: 0.09396

End 2:
Slope of Best Fit Line 0.00169
Angle of Best Fit Line: 0.09675

Maximum Angular Difference: 0.00278

Parallelism Tolerance Met? YES
Spherically Seated

DIAMETER 2

End 1:
Slope of Best Fit Line 0.00089
Angle of Best Fit Line: 0.05091

End 2:
Slope of Best Fit Line 0.00099
Angle of Best Fit Line: 0.05648

Maximum Angular Difference: 0.00557

Parallelism Tolerance Met? NO
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00310	1.960	0.00158	0.091	YES
Diameter 2, in (rotated 90°)	0.00170	1.960	0.00087	0.050	YES

Maximum angle of departure must be ≤ 0.25°
Perpendicularity Tolerance Met? YES

END 2					
Diameter 1, in	0.00310	1.960	0.00158	0.091	YES
Diameter 2, in (rotated 90°)	0.00180	1.960	0.00092	0.053	YES

Client:	WSP USA, Inc.	Test Date:	8/28/2024
Project Name:	MaineDOT I-95 Bridge over Stillwater	Tested By:	gp
Project Location:	Merrimack, NH	Checked By:	smd
GTX #:	319180		
Boring ID:	BB-BSA-105	Reliable dial gauge measurements could not be performed on this rock type. Tolerance measurements were performed using a machinist straightedge and feeler gauges to ASTM specifications.	
Sample ID:	R-1		
Depth (ft):	28.8-29.1		
Visual Description:	See photographs		

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

END FLATNESS

END 1

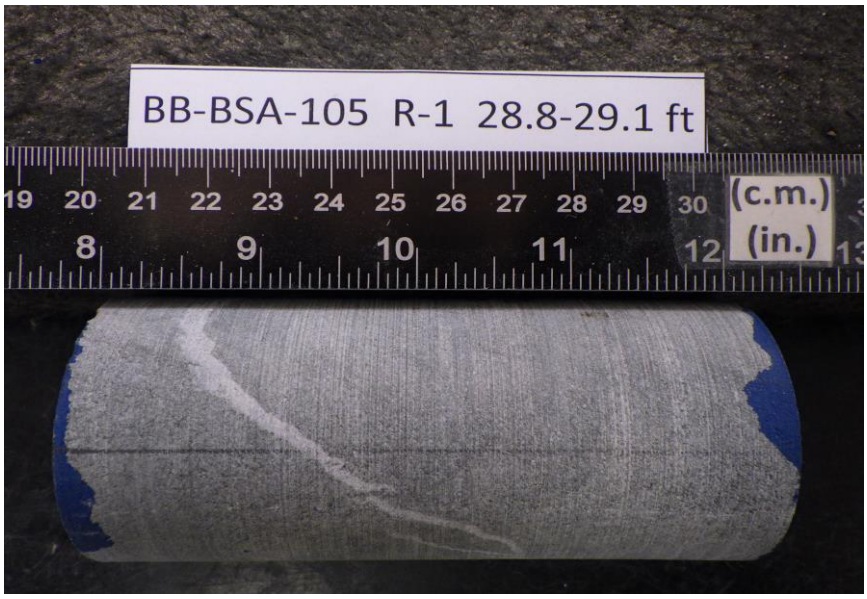
Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

END 2

Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

End Flatness Tolerance Met? YES

Client:	WSP USA, Inc.
Project Name:	MaineDOT I-95 Bridge over Stillwater
Project Location:	Merrimack, NH
GTX #:	319180
Test Date:	8/29/2024
Tested By:	gp
Checked By:	smd
Boring ID:	BB-BSA-105
Sample ID:	R-1
Depth, ft:	28.8-29.1

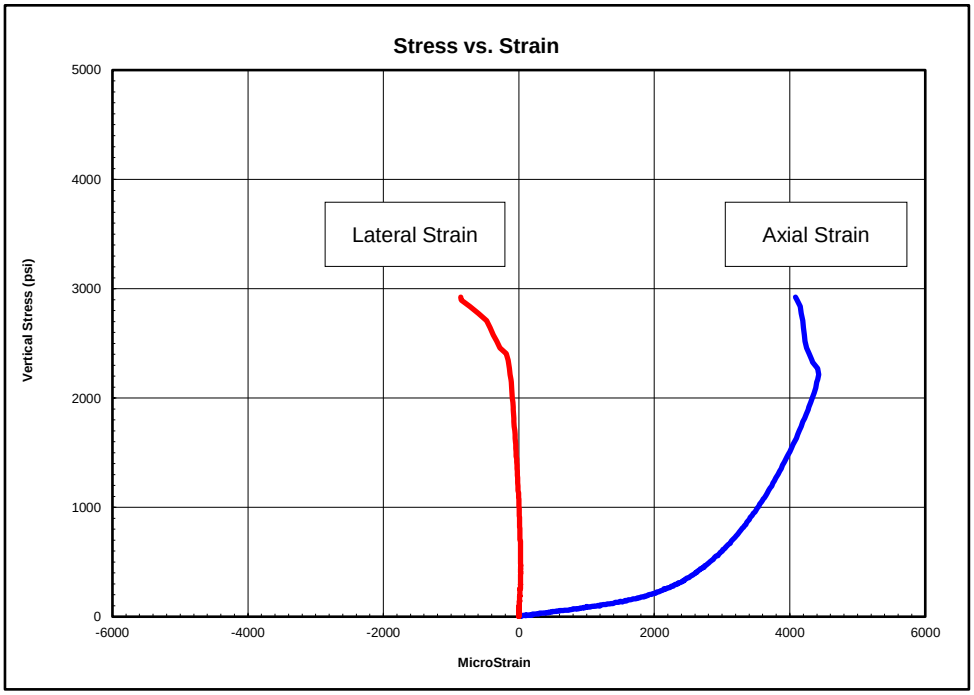


After cutting and grinding

After break

Client:	WSP USA, Inc.
Project Name:	MaineDOT I-95 Bridge over Stillwater
Project Location:	Merrimack, NH
GTX #:	319180
Test Date:	8/29/2024
Tested By:	gp
Checked By:	jsc
Boring ID:	BB-BSA-106
Sample ID:	R-3
Depth, ft:	69.3-69.6
Sample Type:	rock core
Sample Description:	See photographs Intact material failure Best Effort end preparation performed

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 3,226 psi

The strain gauges failed before the peak value was attained. Young's Modulus and Poisson's Ratio could not be determined within the third stress range.

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
300-1200	626,000	0.03
1200-2000	1,310,000	0.14
2000-2900	---	---

Notes:
Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

Client:	WSP USA, Inc.	Test Date:	8/28/2024
Project Name:	MaineDOT I-95 Bridge over Stillwater	Tested By:	gp
Project Location:	Merrimack, NH	Checked By:	smd
GTX #:	319180		
Boring ID:	BB-BSA-106		
Sample ID:	R-3		
Depth (ft):	69.3-69.6		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.40	4.40	4.40
Specimen Diameter, in:	1.96	1.96	1.96
Specimen Mass, g:	603.87		
Bulk Density, lb/ft^3	173	**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.2	**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:

Is the maximum gap ≤ 0.02 in.? NO

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? NO

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00100	0.00100	0.00080	0.00060	0.00040	0.00030	0.00010	0.00000	-0.00020	-0.00030	-0.00050	-0.00090	-0.00100	-0.00130	-0.00140
Diameter 2, in (rotated 90°)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Difference between max and min readings, in:

0° = 0.00240 90° = 0.00000

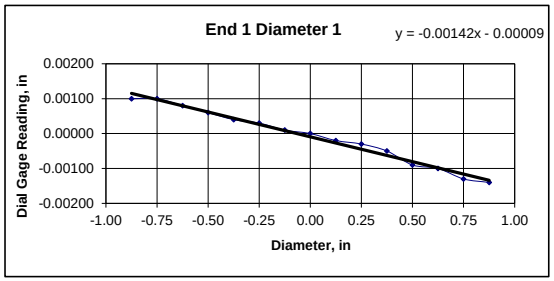
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00130	0.00110	0.00100	0.00080	0.00060	0.00030	0.00010	0.00000	-0.00010	-0.00040	-0.00070	-0.00080	-0.00110	-0.00140	-0.00170
Diameter 2, in (rotated 90°)	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020

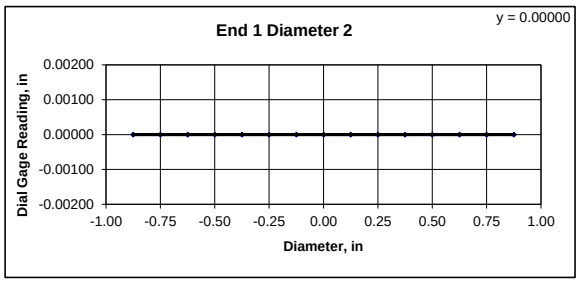
Difference between max and min readings, in:

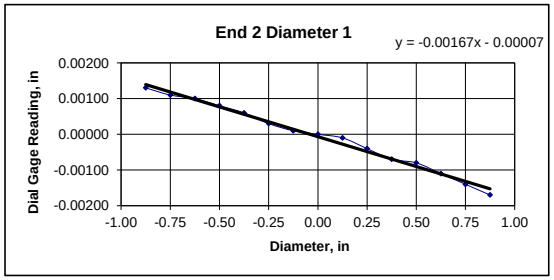
0° = 0.003 90° = 0.0003

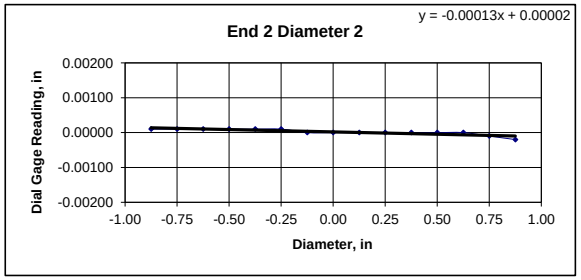
Maximum difference must be < 0.0020 in. Difference = ± 0.00150

Flatness Tolerance Met? NO









DIAMETER 1

End 1:
- Slope of Best Fit Line: 0.00142
- Angle of Best Fit Line: 0.08152

End 2:
- Slope of Best Fit Line: 0.00167
- Angle of Best Fit Line: 0.09560

Maximum Angular Difference: 0.01408

Parallelism Tolerance Met? NO

Spherically Seated

DIAMETER 2

End 1:
- Slope of Best Fit Line: 0.00000
- Angle of Best Fit Line: 0.00000

End 2:
- Slope of Best Fit Line: 0.00013
- Angle of Best Fit Line: 0.00769

Maximum Angular Difference: 0.00769

Parallelism Tolerance Met? NO

Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00240	1.960	0.00122	0.070	YES
Diameter 2, in (rotated 90°)	0.00000	1.960	0.00000	0.000	YES
END 2					
Diameter 1, in	0.00300	1.960	0.00153	0.088	YES
Diameter 2, in (rotated 90°)	0.00030	1.960	0.00015	0.009	YES

Maximum angle of departure must be ≤ 0.25°

Perpendicularity Tolerance Met? YES

Client:	WSP USA, Inc.	Test Date:	8/28/2024
Project Name:	MaineDOT I-95 Bridge over Stillwater	Tested By:	gp
Project Location:	Merrimack, NH	Checked By:	smd
GTX #:	319180		
Boring ID:	BB-BSA-106	Reliable dial gauge measurements could not be performed on this rock type. Tolerance measurements were performed using a machinist straightedge and feeler gauges to ASTM specifications.	
Sample ID:	R-3		
Depth (ft):	69.3-69.6		
Visual Description:	See photographs		

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

END FLATNESS

END 1

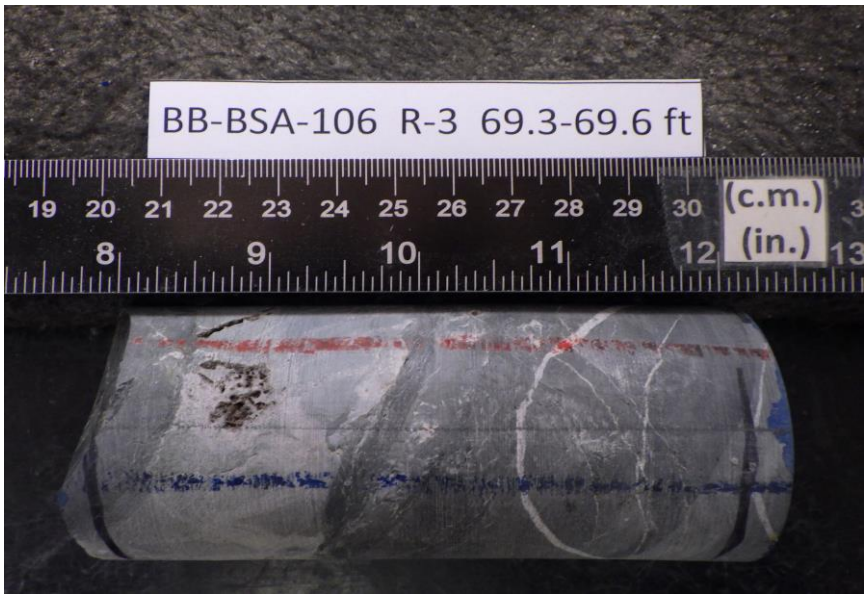
Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

END 2

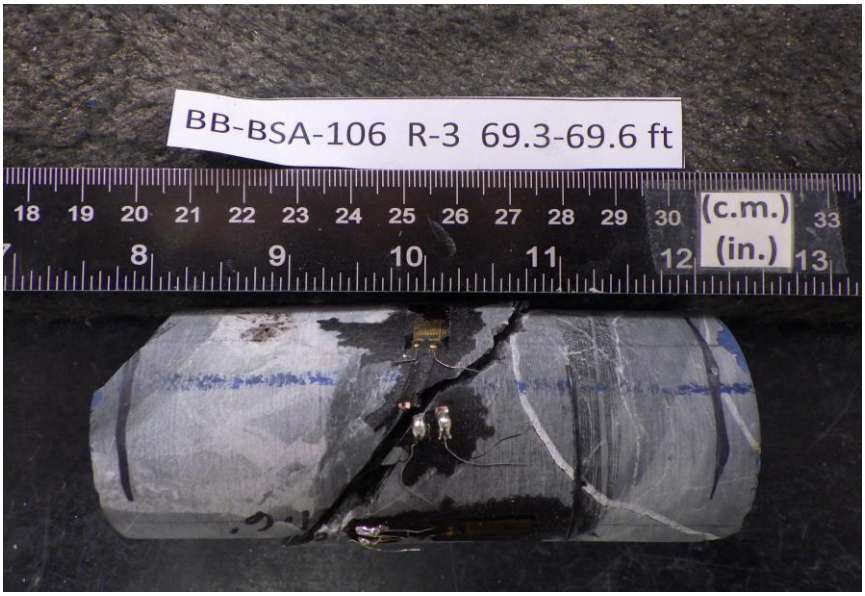
Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

End Flatness Tolerance Met? YES

Client:	WSP USA, Inc.
Project Name:	MaineDOT I-95 Bridge over Stillwater
Project Location:	Merrimack, NH
GTX #:	319180
Test Date:	8/29/2024
Tested By:	gp
Checked By:	smd
Boring ID:	BB-BSA-106
Sample ID:	R-3
Depth, ft:	69.3-69.6



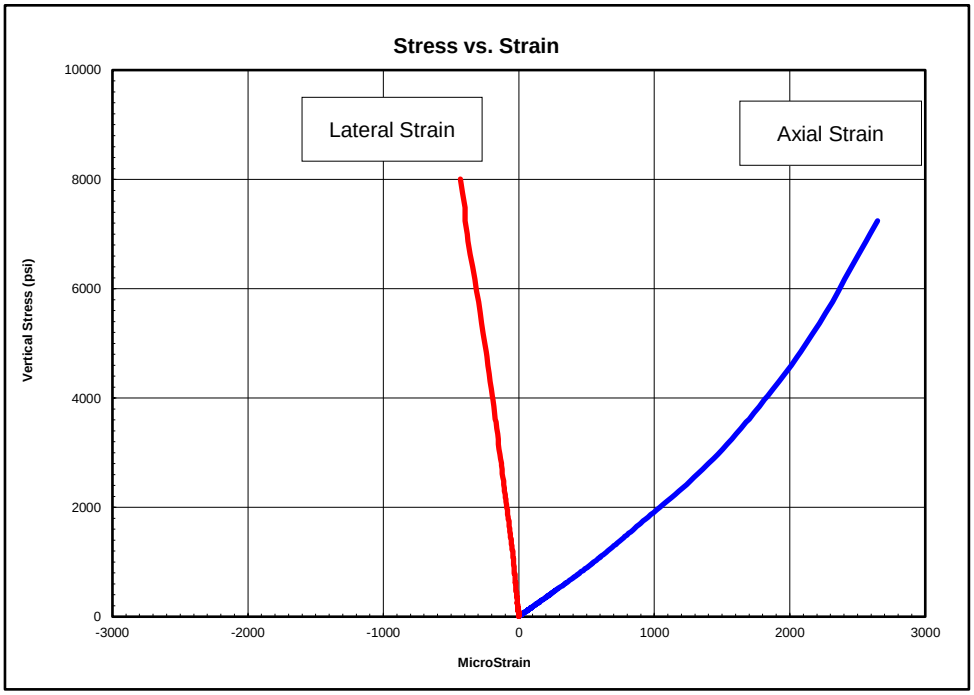
After cutting and grinding



After break

Client:	WSP USA, Inc.
Project Name:	MaineDOT I-95 Bridge over Stillwater
Project Location:	Merrimack, NH
GTX #:	319180
Test Date:	8/29/2024
Tested By:	gp
Checked By:	jsc
Boring ID:	BB-BSA-111
Sample ID:	R-1
Depth, ft:	21.4-21.7
Sample Type:	rock core
Sample Description:	See photographs Intact material and discontinuity failure Best Effort end preparation performed

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 8,006 psi

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
800-2900	2,080,000	0.10
2900-5100	3,070,000	0.17
5100-7200	4,360,000	0.29

Notes:
Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

Client:	WSP USA, Inc.	Test Date:	8/28/2024
Project Name:	MaineDOT I-95 Bridge over Stillwater	Tested By:	gp
Project Location:	Merrimack, NH	Checked By:	smd
GTX #:	319180		
Boring ID:	BB-BSA-111		
Sample ID:	R-1		
Depth (ft):	21.4-21.7		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.52	4.52	4.52
Specimen Diameter, in:	1.96	1.96	1.96
Specimen Mass, g:	619.07		
Bulk Density, lb/ft^3	173	**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.3	**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:

Is the maximum gap ≤ 0.02 in.? NO

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? NO

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00160	0.00150	0.00120	0.00090	0.00070	0.00050	0.00020	0.00000	0.00000	-0.00040	-0.00070	-0.00080	-0.00110	-0.00160	-0.00170
Diameter 2, in (rotated 90°)	-0.00020	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Difference between max and min readings, in:

0° = 0.00330 90° = 0.00020

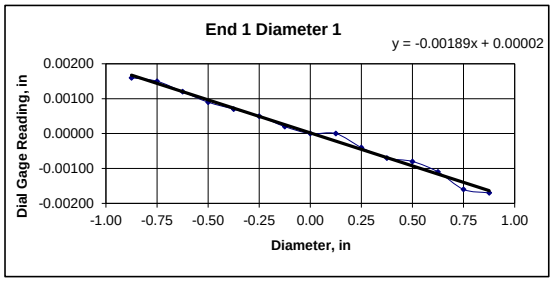
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00140	0.00130	0.00090	0.00070	0.00060	0.00020	0.00010	0.00000	-0.00020	-0.00050	-0.00070	-0.00100	-0.00120	-0.00150	-0.00190
Diameter 2, in (rotated 90°)	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00020	-0.00030

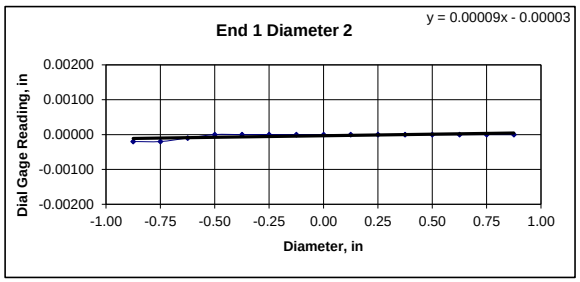
Difference between max and min readings, in:

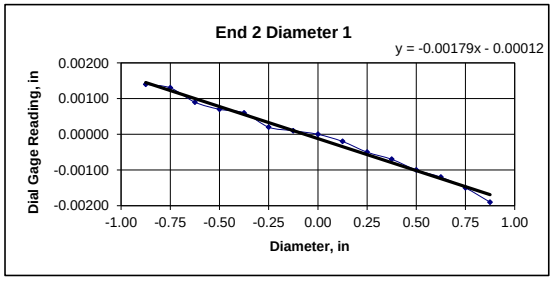
0° = 0.0033 90° = 0.0005

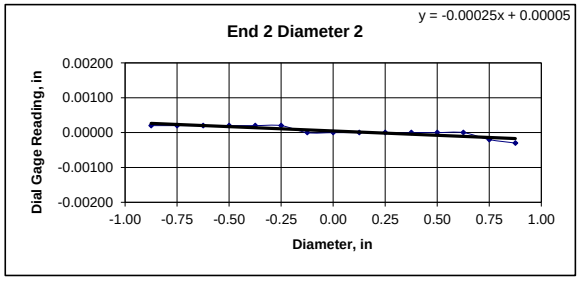
Maximum difference must be < 0.0020 in. Difference = ± 0.00165

Flatness Tolerance Met? NO









DIAMETER 1

End 1:
Slope of Best Fit Line 0.00189
Angle of Best Fit Line: 0.10837

End 2:
Slope of Best Fit Line 0.00179
Angle of Best Fit Line: 0.10280

Maximum Angular Difference: 0.00557

Parallelism Tolerance Met? NO
Spherically Seated

DIAMETER 2

End 1:
Slope of Best Fit Line 0.00009
Angle of Best Fit Line: 0.00507

End 2:
Slope of Best Fit Line 0.00025
Angle of Best Fit Line: 0.01424

Maximum Angular Difference: 0.00917

Parallelism Tolerance Met? NO
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00330	1.960	0.00168	0.096	YES
Diameter 2, in (rotated 90°)	0.00020	1.960	0.00010	0.006	YES
END 2					
Diameter 1, in	0.00330	1.960	0.00168	0.096	YES
Diameter 2, in (rotated 90°)	0.00050	1.960	0.00026	0.015	YES

Maximum angle of departure must be ≤ 0.25°

Perpendicularity Tolerance Met? YES

Client:	WSP USA, Inc.	Test Date:	8/28/2024
Project Name:	MaineDOT I-95 Bridge over Stillwater	Tested By:	gp
Project Location:	Merrimack, NH	Checked By:	smd
GTX #:	319180		
Boring ID:	BB-BSA-111	Reliable dial gauge measurements could not be performed on this rock type. Tolerance measurements were performed using a machinist straightedge and feeler gauges to ASTM specifications.	
Sample ID:	R-1		
Depth (ft):	21.4-21.7		
Visual Description:	See photographs		

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

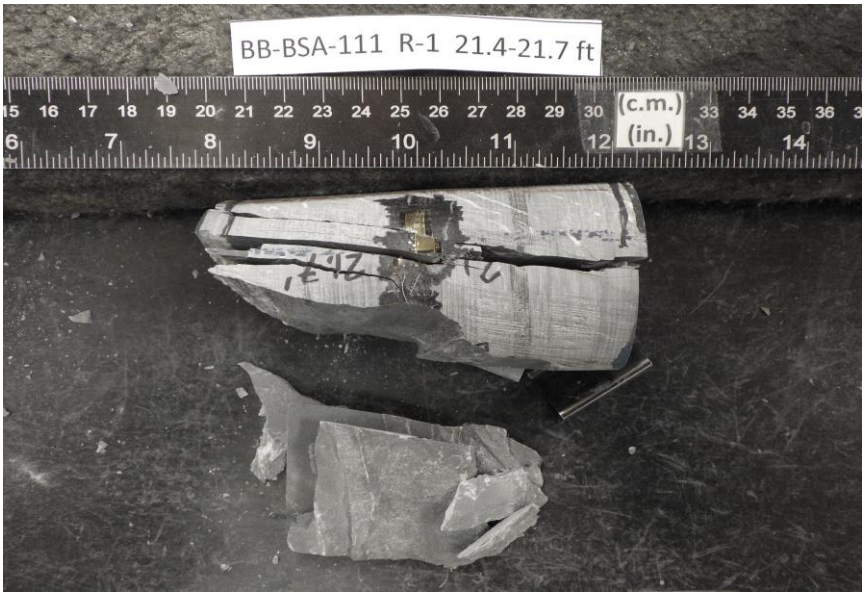
END FLATNESS

END 1		
Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES
END 2		
Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

End Flatness Tolerance Met? YES

Client:	WSP USA, Inc.
Project Name:	MaineDOT I-95 Bridge over Stillwater
Project Location:	Merrimack, NH
GTX #:	319180
Test Date:	8/29/2024
Tested By:	gp
Checked By:	smd
Boring ID:	BB-BSA-111
Sample ID:	R-1
Depth, ft:	21.4-21.7

After cutting and grinding



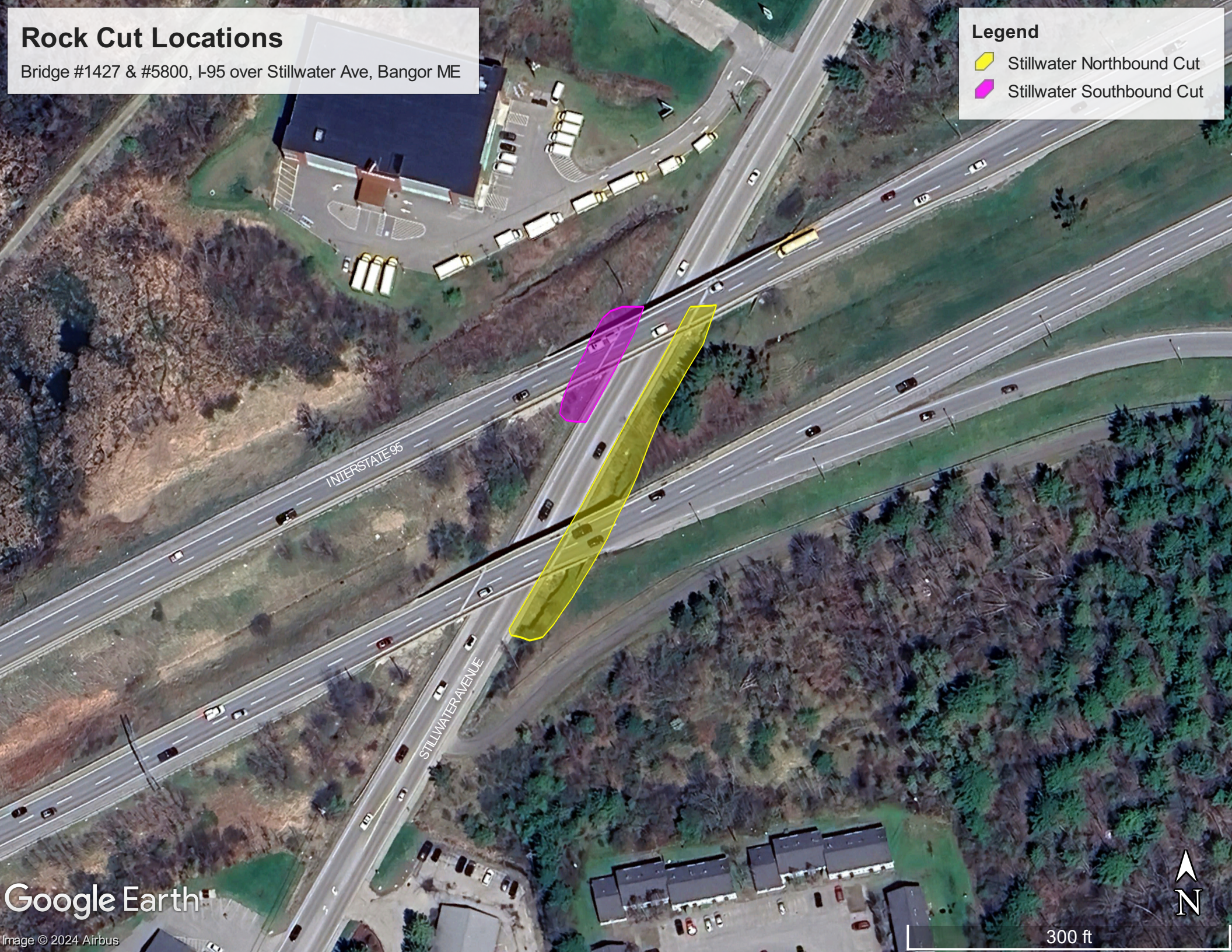
After break

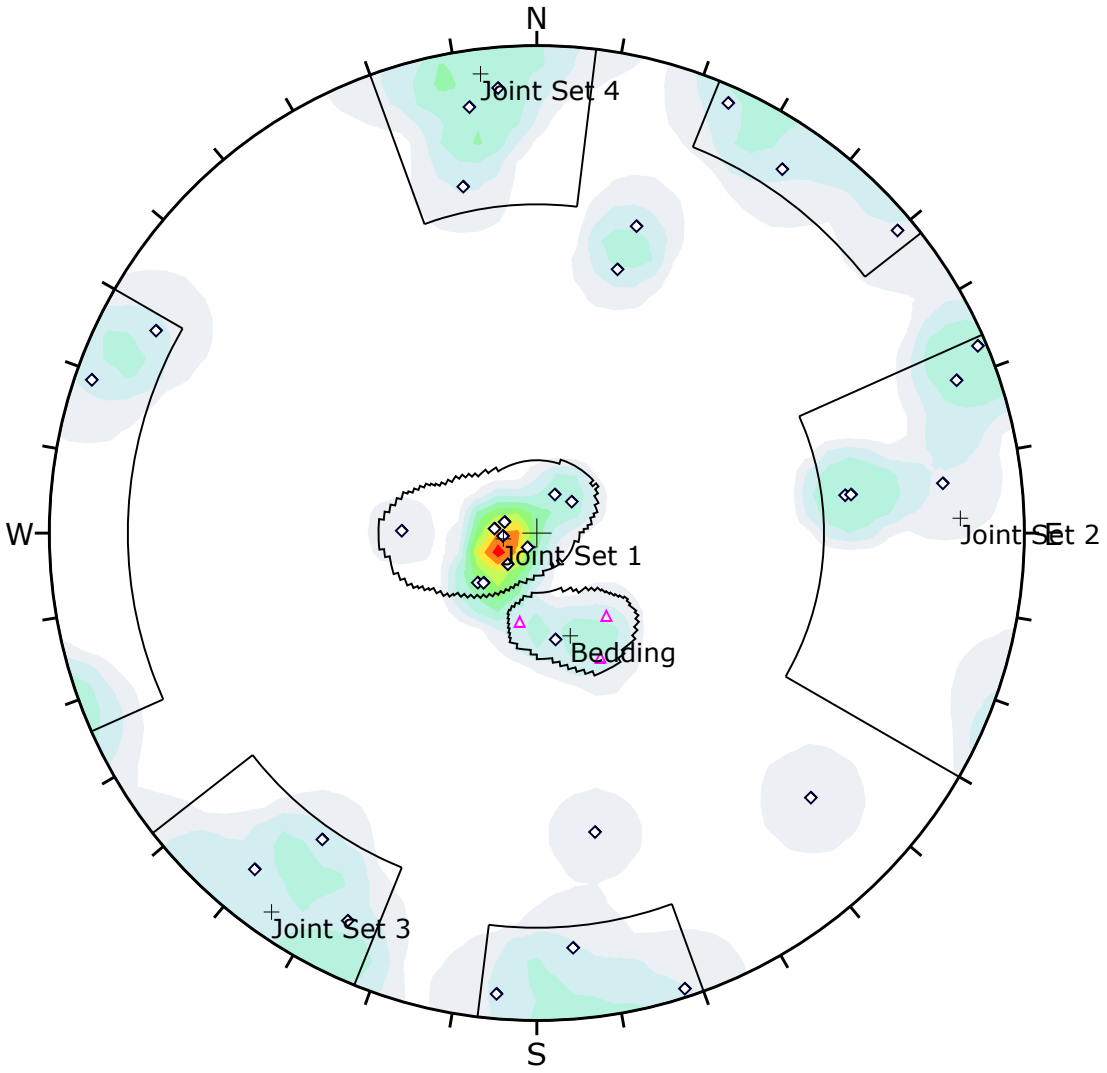
APPENDIX D

Rock Discontinuity Calculations

Rock Cut Locations

Bridge #1427 & #5800, I-95 over Stillwater Ave, Bangor ME





Symbol	TYPE	Quantity
△	bedding	3
◇	joint	34

Color	Density Concentrations
	0.00 - 1.40
	1.40 - 2.80
	2.80 - 4.20
	4.20 - 5.60
	5.60 - 7.00
	7.00 - 8.40
	8.40 - 9.80
	9.80 - 11.20
	11.20 - 12.60
	12.60 - 14.00

Contour Data	Pole Vectors
Maximum Density	13.44%
Contour Distribution	Fisher
Counting Circle Size	1.0%

	Color	Dip	Dip Direction	Label
Mean Set Planes				
1m		8	80	Joint Set 1
2m		82	268	Joint Set 2
3m		87	35	Joint Set 3
4m		87	173	Joint Set 4
5m		25	342	Bedding

Plot Mode	Pole Vectors
Vector Count	37 (37 Entries)
Hemisphere	Lower
Projection	Equal Angle

wsp

DIPS 8.025

Project	I-95 Bridge #1427 & #5800 over Stillwater Ave, Bangor ME, MaineDOT WIN 027176.00			
Analysis Description	Outcrops along Stillwater Ave Northbound and Southbound			
Drawn By: KAR	Checked By: BK	Reviewed By: JDL	Scale: N/A	**Appendix D.1**
Date: 5/21/2024	File Name: Stillwater-outcrop-data.dips8			

Appendix D.2: Calculation of Rock Mass Rating
Preliminary Geotechnical Design Report
Bridge #1427 & #5800, I-95 over Stillwater Ave, Bangor, Maine
MaineDOT WIN 027176.00

References:

1. Bieniawski, Z.T. 1989. Engineering Rock Mass Classifications: A Complete Manual for Engineers and Geologists in Mining, Civil, and Petroleum Engineering. John Wiley & Sons.
2. Wyllie, Duncan C. 1999. Foundations on Rock, 2nd Edition. E&FN Spon.
3. Hoek, Evert. 2006. Practical Rock Engineering. Rocscience Inc.

Notes:

1. The RMR ratings for parameter 1 (intact rock strength), parameter 2 (drill core quality RQD), and parameter 3 (discontinuity spacing) are selected using Charts A, B, and C, respectively, from Bieniawski 1989 (Ref. 1). For core runs on which UCS lab testing was not performed, the intact strength rating is selected based on field strength estimates using Table 3.5 from Wyllie 1999 (Ref. 2).
2. The RMR ratings for parameter 4 (discontinuity condition) are selected using Section E of Table 4 from Hoek 2006 (Ref. 3).
3. The RMR ratings for parameter 5 (groundwater) are selected using Table 3.5 from Wyllie 1999 (Ref. 2).
4. For the outcrop discontinuities, the RQD is correlated from discontinuity spacing based on Chart D from Bieniawski 1989 (Ref. 1).
5. For the boring core runs, the persistence rating is based on an average of the persistence measurements at the outcrops.
6. The rating adjustment for joint orientation (parameter B) is selected from Bieniawski 1989 (Ref. 1), using an orientation adjustment of -15 ("unfavorable" for foundations) for the bedding set based on the kinematic possibility of planar sliding and for joint set 2 based on the kinematic possibility of toppling. Since the boring rock core was collected unoriented, an average of all outcrop orientation adjustments is used for the boring core runs.

Prepared by: KAR
Checked by: BK
Reviewed by: JDL

Overall average RMR = 54

Boring or Outcrop	Run Number or Discontinuity ID	Intact Strength			RQD (%)	Fracture Spacing			A. Classification Parameters										B. Rating adjustment for joint orientation	RMR
		UCS (psi)	UCS (MPa)	Field Strength Estimate		Average fractures per foot	Average spacing (ft)	Average spacing (mm)	1	2	3	4						5		
									Strength of rock	RQD	Spacing of joints	Condition of Joints						Ground water		
												Persistence	Aperture	Roughness	Infilling	Weathering	Total			
BB-BSA-101	R1	-	-	Very Strong (R5)	0	broken	-	-	12	3	5	2	0	1	0	5	8	7	-4	31
	R2	-	-	Strong (R4) to Very Strong (R5)	0	broken	-	-	7	3	5	2	0	5	0	5	12	7	-4	30
	R3	-	-	Strong (R4) to Very Strong (R5)	14	3.5	0.3	87	7	5	6	2	0	5	6	5	18	7	-4	39
	R4	-	-	Strong (R4)	60	1.6	0.6	191	9	12	8	2	5	5	6	6	24	7	-4	56
BB-BSA-102	R1	17,296	119	Strong (R4) to Extremely Strong (R6)	52	3.2	0.3	95	11	10	6	2	0	1	2	5	10	7	-4	40
	R2	-	-	Extremely Strong (R6)	88	0.2	5.0	1524	15	18	16	2	0	6	6	6	20	7	-4	72
BB-BSA-103	R1	-	-	Extremely Strong (R6)	31	4.0	0.3	76	15	7	6	2	1	1	4	5	13	7	-4	44
	R2	-	-	Extremely Strong (R6)	70	2.0	0.5	152	15	14	7	2	4	5	6	6	23	7	-4	62
BB-BSA-104A	R1	-	-	Strong (R4) to Very Strong (R5)	56	1.6	0.6	191	7	11	8	2	0	5	0	5	12	7	-4	41
	R2	-	-	Strong (R4) to Very Strong (R5)	61	0.5	2.0	610	7	12	12	2	5	5	6	6	24	7	-4	58
	R3	-	-	Strong (R4) to Very Strong (R5)	23	3.5	0.3	87	7	6	6	2	0	5	6	6	19	7	-4	41
BB-BSA-105	R1	-	-	Strong (R4)	30	3.2	0.3	95	7	7	6	2	0	5	6	5	18	7	-4	41
	R2	-	-	Very Strong (R5)	75	1.6	0.6	191	12	15	8	2	5	1	6	6	20	7	-4	58
BB-BSA-106	R1	-	-	Strong (R4) to Very Strong (R5)	0	broken	-	-	7	3	5	2	0	5	6	5	18	7	-4	36
	R2	-	-	Strong (R4) to Very Strong (R5)	47	3.3	0.3	92	7	10	6	2	0	1	0	6	9	7	-4	35
	R3	-	-	Weak (R2)	62	1.4	0.7	218	3	12	8	2	0	5	6	6	19	7	-4	45
BB-BSA-107	R1	-	-	Strong (R4)	0	broken	-	-	7	3	5	2	0	5	0	1	8	7	-4	26
	R2	-	-	Strong (R4)	0	broken	-	-	7	3	5	2	0	6	0	1	9	7	-4	27
	R3	-	-	Strong (R4) to Very Strong (R5)	35	3.5	0.3	87	7	8	6	2	0	5	0	5	12	7	-4	36
	R4	-	-	Strong (R4) to Very Strong (R5)	39	3.2	0.3	95	7	8	6	2	0	5	0	5	12	7	-4	36

Boring or Outcrop	Run Number or Discontinuity ID	Intact Strength			RQD (%)	Fracture Spacing			A. Classification Parameters									B. Rating adjustment for joint orientation	RMR
		UCS (psi)	UCS (MPa)	Field Strength Estimate		Average fractures per foot	Average spacing (ft)	Average spacing (mm)	1	2	3	4					5		
									Strength of rock	RQD	Spacing of joints	Condition of Joints					Ground water		
												Persistence	Aperture	Roughness	Infilling	Weathering	Total		
BB-BSA-108	R1	-	-	Very Strong (R5) to Extremely Strong (R6)	58	2.6	0.4	117	12	11	7	*2*	0	5	6	5	18	7	*-4*	51
	R2	-	-	Extremely Strong (R6)	42	1.0	1.0	305	15	9	9	*2*	1	1	6	5	15	7	*-4*	51
	R3	-	-	Extremely Strong (R6)	17	2.5	0.4	122	15	5	7	*2*	1	1	6	5	15	7	*-4*	45
	R4	-	-	Extremely Strong (R6)	35	2.0	0.5	152	15	8	7	*2*	1	1	6	5	15	7	*-4*	48
BB-BSA-109A	R1	-	-	Very Strong (R5) to Extremely Strong (R6)	30	1.8	0.6	169	12	7	7	*2*	0	1	6	5	14	7	*-4*	43
	R2	-	-	Very Strong (R5) to Extremely Strong (R6)	49	1.6	0.6	191	12	10	8	*2*	1	1	6	6	16	7	*-4*	49
BB-BSA-110	R1	5,948	41	Medium Strong (R3)	49	1.0	1.0	305	5	10	9	*2*	1	1	6	6	16	7	*-4*	43
	R2	-	-	Very Strong (R5) to Extremely Strong (R6)	71	0.8	1.3	381	12	14	10	*2*	0	1	6	6	15	7	*-4*	54
BB-BSA-111	R1	-	-	Strong (R4) to Very Strong (R5)	15	broken	-	-	6	5	5	*2*	0	5	6	5	18	7	*-4*	37
	R2	-	-	Strong (R4) to Very Strong (R5)	60	1.6	0.6	191	7	12	8	2	5	5	6	6	24	7	*-4*	54
Outcrop along Stillwater Ave Northbound	Disc. 1	-	-	-	*20*	-	0.2	61	*15*	5	6	2	1	5	6	5	19	10	-15	40
	Disc. 2	-	-	-	*93*	-	1.5	457	*15*	19	10	2	0	3	0	5	10	10	0	64
	Disc. 3	-	-	-	*99*	-	2.8	853	*15*	20	13	6	0	3	6	5	20	10	0	78
	Disc. 4	-	-	-	*85*	-	0.9	274	*15*	17	9	4	0	1	0	5	10	10	-15	46
	Disc. 5	-	-	-	*100*	-	5.9	1798	*15*	20	16	4	1	1	6	5	17	10	0	78
	Disc. 6	-	-	-	*95*	-	1.6	488	*15*	19	11	2	1	3	6	5	17	10	0	72
	Disc. 7	-	-	R6	*41*	-	0.3	91	**15**	9	6	2	6	5	6	5	24	10	-15	49
	Disc. 8	-	-	-	*100*	-	5.9	1798	*15*	20	16	6	0	1	0	5	12	10	0	73
	Disc. 9	-	-	-	*88*	-	1.1	335	*4*	18	9	2	1	3	6	5	17	10	0	58
	Disc. 10	-	-	-	*86*	-	1.0	305	*4*	17	9	2	0	3	2	5	12	10	0	52
	Disc. 11	-	-	R3	*100*	-	3.7	1128	**4**	20	14	4	0	5	2	5	16	10	0	64
	Disc. 12	-	-	-	*100*	-	4.5	1372	*4*	20	15	2	1	3	6	5	17	10	0	66
	Disc. 13	-	-	-	*100*	-	5.4	1646	*4*	20	16	4	1	3	6	5	19	10	-15	54
	Disc. 14	-	-	-	*85*	-	0.9	274	*15*	17	9	2	0	3	2	5	12	10	0	63
	Disc. 15	-	-	R6	*100*	-	5.1	1554	**15**	20	16	4	6	1	6	5	22	10	-15	68
	Disc. 16	-	-	-	*91*	-	1.3	396	*15*	18	10	2	0	5	2	5	14	10	0	67
	Disc. 17	-	-	-	*99*	-	2.5	762	*15*	20	13	2	1	3	2	5	13	10	0	71
	Disc. 18	-	-	-	*99*	-	2.5	762	*15*	20	13	2	6	1	6	5	20	10	0	78
	Disc. 19	-	-	-	*96*	-	1.8	549	*12*	19	11	2	1	5	6	5	19	10	0	71
	Disc. 20	-	-	-	*96*	-	1.7	518	*12*	19	11	2	0	3	0	5	10	10	-15	47
	Disc. 21	-	-	-	*56*	-	0.4	122	*12*	11	7	4	1	1	6	5	17	10	-15	42
	Disc. 22	-	-	-	*96*	-	1.8	549	*12*	19	11	2	1	3	6	5	17	10	-15	54
	Disc. 23	-	-	R5	*98*	-	2.0	610	**12**	20	12	2	0	1	2	5	10	10	0	64
	Disc. 24	-	-	-	*92*	-	1.4	427	*12*	18	10	2	6	3	6	5	22	10	0	72
	Disc. 25	-	-	R6	*99*	-	2.3	701	**15**	20	12	2	6	3	6	5	22	10	0	79
	Disc. 26	-	-	-	*99*	-	2.2	671	*15*	20	12	2	0	1	2	5	10	10	0	67
	Disc. 27	-	-	-	*100*	-	4.0	1219	*15*	20	15	2	0	1	0	5	8	10	0	68
	Disc. 28	-	-	-	*96*	-	1.8	549	*15*	19	11	2	0	5	2	5	14	10	0	69
	Disc. 29	-	-	R6	*99*	-	2.2	671	**15**	20	12	2	1	5	4	5	17	10	0	74
	Disc. 30	-	-	R6	*95*	-	1.6	488	**15**	19	11	2	0	3	2	5	12	10	0	67
	Disc. 31	-	-	R6	*99*	-	2.3	701	**15**	20	12	4	0	3	0	5	12	10	0	69

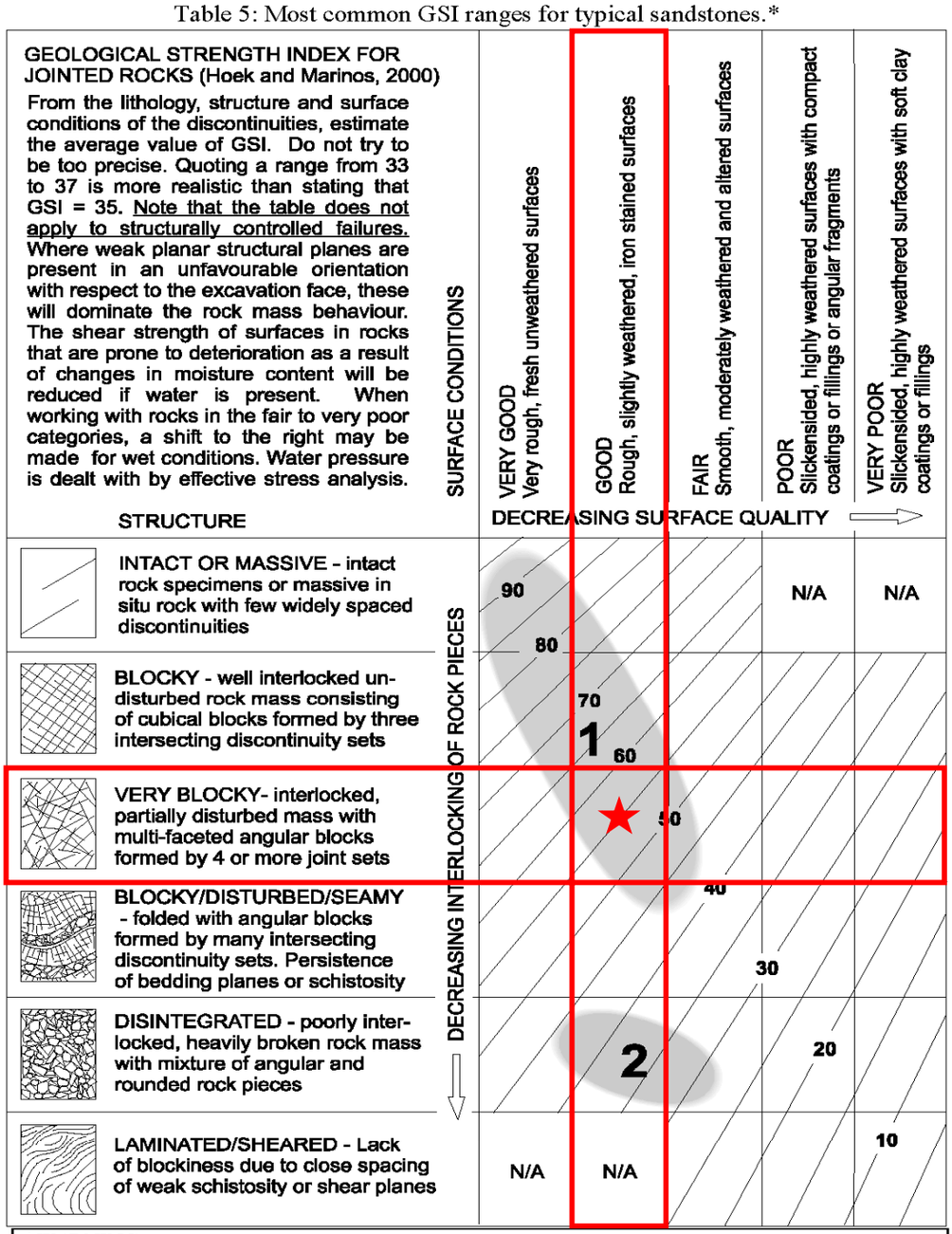
Boring or Outcrop	Run Number or Discontinuity ID	Intact Strength			RQD (%)	Fracture Spacing			A. Classification Parameters									B. Rating adjustment for joint orientation	RMR
		UCS (psi)	UCS (MPa)	Field Strength Estimate		Average fractures per foot	Average spacing (ft)	Average spacing (mm)	1	2	3	4						5	
									Strength of rock	RQD	Spacing of joints	Condition of Joints						Ground water	
												Persistence	Aperture	Roughness	Infilling	Weathering	Total		
Outcrop along Stillwater Ave Southbound	Disc. 32	-	-	-	*85*	-	0.9	274	*15*	17	9	4	0	6	0	5	15	10	0	66
	Disc. 33	-	-	-	*20*	-	0.2	61	*15*	5	6	4	1	5	2	5	17	10	0	53
	Disc. 34	-	-	-	*41*	-	0.3	91	*12*	9	6	*4*	1	6	2	5	18	10	-15	40
	Disc. 35	-	-	-	*98*	-	2.0	610	*12*	20	12	4	0	5	6	5	20	10	0	74
	Disc. 36	-	-	R5	*76*	-	0.6	183	**12**	15	8	6	1	1	2	5	15	10	0	60
	Disc. 37	-	-	-	*56*	-	0.4	122	*12*	11	7	4	0	1	6	5	16	10	-15	41

Appendix D.3: Calculation of Geological Strength Index
Preliminary Geotechnical Design Report
Bridge #1427 & #5800, I-95 over Stillwater Ave, Bangor, Maine
MaineDOT WIN 027176.00

Prepared by: KAR
Checked by: BK
Reviewed by: JDL

GSI = 55

Table 5: Most common GSI ranges for typical sandstones.*



1. Massive or bedded (no clayey cement present)
2. Brecciated (no clayey cement present)

GSI chart from: *Marinos, Paul, and Hoek, Evert. November 2000. GSI: a geologically friendly tool for rock mass strength estimation. ISRM International Symposium, Melbourne, Australia, paper number ISRM-IS-2000-035.*

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