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ENGINEERING | EXPLORATION | EXPERIENCE

Geotechnical Report

*Public Safety Building
273 Main Street, Belfast, Maine*



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Client

City of Belfast
131 Church Street
Belfast, Maine 04915

Project #: 23099
Date: 7/5/2023

July 5, 2023
Summit #23099

Erin Herbig, City Manager
City of Belfast
131 Church Street
Belfast, Maine 0915

Reference: Geotechnical Engineering Services
Public Safety Building – 273 Main Street, Belfast, Maine

Dear Ms. Herbig;

Summit Geoengineering Services, Inc. (SGS) has completed a preliminary geotechnical investigation for a new public safety building located at 273 Main Street in Belfast, Maine. The scope of services included performing explorations at the site and preparing this preliminary report summarizing our findings and geotechnical recommendations for development at the site.

The subsurface soils consist of topsoil or granular fill overlying miscellaneous fill, glacial marine deposit, and/or glacial till. Frequent buried debris including stumps, trees, and metal were encountered within the miscellaneous fill at a depth range of 2 to 7 feet. Bedrock was encountered at a depth range of 8 to 19 feet below ground surface (BGS). Groundwater was observed at a depth range of 3 to 8 feet BGS.

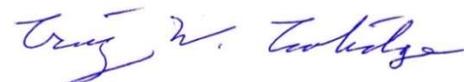
The site is currently developed by the Belfast Fire Department. Expansion is considered to the north within a cleared gravel lot. Alternatively, the existing building may be removed and the site redeveloped with a new public safety building.

This report provides discussion of the geotechnical findings and preliminary recommendations for development at the site based upon the results of the subsurface investigation. SGS appreciates the opportunity to serve you during this phase of your project.

Sincerely yours,
Summit Geoengineering Services



Colleen Sullivan, E.I.
Geotechnical Engineer



Craig W. Coolidge, P.E.
Vice President, Principal Engineer

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1.0 Project and Site Description

Summit Geoengineering Services (SGS) was asked by the City of Belfast to conduct a preliminary geotechnical investigation for a new Public Safety Building located at 273 Main Street in Belfast, Maine. Presently the southern portion of the site is developed by the Belfast Fire Station with a footprint of 8,500 ft². The north portion of the site is a cleared vacant lot. Expansion to the north of the existing building is being considered. Alternatively, the existing building may be removed and the site redeveloped with a new building.

Topography at the site is relatively flat sloping from south to north, elevations 196 to 192 feet. The site is bordered by wooded areas to the west and north, with a stream located at the east site boundary. The cleared portion of the lot is elevated 3 to 7 feet along an existing fill embankment to the east, west, and north.

2.0 Subsurface Investigation & Laboratory Testing

2.1 Subsurface Explorations

SGS observed the subsurface conditions with the excavation of 10 test pits on June 2, 2023 and the drilling of 7 test borings on June 8, 2023. Test pits were performed using a Kubota KX040-4 excavator. Test borings were performed by SGS using a track mount AMS 9580 VTR drill rig. Explorations were conducted in a grid spaced across the site to evaluate subgrade conditions for site development.



Excavation of Test Pit TP-6, facing West

Ten test pits were excavated to approximately 10 feet BGS or refusal. Refusal was encountered in 7 of the 10 test pit explorations ranging from 8 to 10 feet BGS. Test pit TP-2 ended with refusal on a probable boulder and test pit TP-5 terminated within the glacial marine clay due to caving of sidewalls.

Test borings were advanced using a combination of 2½-inch hollow stem augers and 3½-inch casing to a depth of refusal encountered at 9 to 19 feet below ground surface (BGS). Sampling was conducted with standard penetration tests (SPT-N) using a split spoon sampler and auto-drop hammer.

Soils were visually classified by a geotechnical engineer using the Unified Soil Classification System (USCS). Explorations were approximately located by SGS by use of a handheld GPS and taping from existing site features for notification of Dig Safe and Ok to Dig. ProMark Utility Locating, Inc. was subcontracted by SGS to physically scan exploration locations prior to completing explorations. An Exploration Location Plan is included in Appendix A. An Exploration Summary Table and exploration logs are included in Appendix B.

2.2 Laboratory Testing

One sample of the granular fill was tested for grain size analysis in accordance with ASTM D6913. Results of the grain size test is summarized below. A thin-walled tube sample was collected at test boring B-5 within the miscellaneous fill. Moisture content of the miscellaneous fill was 30.9 percent. Detailed results of the laboratory tests are attached in Appendix C.

Laboratory Test Summary							
Boring	Sample	Depth	Grain Size Distribution			USCS	Moisture Content
			Gravel	Sand	Fines		
B-4	S-1	0' – 2'	18%	60%	22%	SM	13.6%

3.0 Subsurface Conditions

The subsurface conditions consist of **topsoil** or **granular fill**, overlying **miscellaneous fill**, **glacial marine deposit**, and/or **glacial till** overlying **bedrock**. A summary of the soil layers is provided below. An Exploration Summary Table and details of the explorations are provided in Appendix B.

3.1 Soil Layers

Topsoil, encountered in borings B-1, B-2, and B-6 and test pits TP-1 through TP-3, is located at ground surface ranging from 1 to 6 inches in thickness. The topsoil is described as dark brown silt with variable sand to sand with some silt and rootlets. The topsoil is classified as ML to SM in accordance with the Unified Soil Classification System (USCS). The topsoil is soft or loose and damp.

Granular fill was encountered at ground surface in the explorations at the northern portion of the site and ranges from 1 to 4 feet in thickness. The granular fill is described as brown sand with variable silt and gravel. Occasional cobbles, asphalt fragments, and silt-clay seams were observed within the fill. The fill is classified as SP-SM to SM in accordance with the USCS. The fill is loose to compact and damp.

Miscellaneous fill was encountered beneath the granular fill at the northern portion of the site and ranged from 4 to 9 feet in thickness. The miscellaneous fill consists of dark brown stained silt-clay with variable sand and gravel and is mixed with frequent buried stumps, trees, and cobbles. Occasional glass, metal, plastic, and brick fragments were encountered within the fill. The miscellaneous fill is considered to range in density from very soft to firm. Test pit TP-2, in particular, contained more significant debris, including vehicle parts and pieces. The fill is visually classified as ML to CL in accordance with the USCS and is considered damp to wet with depth.



Miscellaneous Fill in Test Pit TP-2



Frequent Buried Stumps & Logs in Test Pit TP-1

Glacial marine deposit is located beneath the miscellaneous fill to the north and beneath the topsoil to the south in a majority of explorations across the site. The marine deposit has a thickness ranging from 1 to 10 feet and consists of brown silt-sand with variable gravel to slightly mottled brown to gray silt-clay with trace to little sand. Upper portions appear to be reworked at the southern portion of the site with occasional glass and asphalt pieces from 0 to 2 feet BGS. The deposit is classified as SM-ML, ML, and CL in accordance with the USCS and is considered soft to compact/stiff in density and wet. Pocket penetrometer tests performed in the field indicate the marine deposit has an unconfined compressive strength ranging from 3,000 to 8,000 psf and averaging 6,000 psf.

Glacial till is present throughout the site with a thickness ranging between 1 and 8 feet. The till is described as olive brown silt with variable sand, gravel, and clay to orange brown sandy gravel with some silt. The deposit is visually classified as ML to GM in accordance with the USCS. The till is stiff/compact to hard and wet.

3.2 Bedrock

Bedrock was encountered in the test borings at a depth range of 9 to 19 feet BGS (elevation 177 to 186 feet) and a depth range of 8 to 11 feet BGS (elevation 182 to 187 feet) in the test pits. Bedrock refusal was encountered in all test pits except TP-2, TP-5, and TP-10 explored to a depth of 6, 7, and 10 feet BGS respectively. Mapping by the Maine Geological Survey indicates bedrock at the site consists of the Gushee member (O€pgu) as part of the Penobscot Formation which includes well developed layered feldspathic metawake with fine-grained plagioclase, quartz, and amphibole granofels. Based on visual inspection of the bedrock exposed in the test pits, the bedrock appears to match the description of the Gushee member.

3.3 Groundwater

Groundwater was encountered in the test borings at a depth range of 3 to 8 feet BGS and at a depth range of 4 to 7 feet BGS in the test pits. Groundwater is present within the miscellaneous fill and mottling within the marine deposit and glacial till suggests fluctuation of groundwater between wet and dry periods.

4.0 Preliminary Recommendations

Details for site development were not available at the time of this report. The following considerations are provided for site development:

- Spread footing foundations appear suitable at the southern portion of the site near or within the footprint of existing pavement and/or building structure.
- Over-excavation and replacement of miscellaneous fill is required for adequate support of structures within the northern portion of the site. Depth of the miscellaneous fill layer ranges from 5 to 11 feet below existing ground surface.

To replace the miscellaneous fill, engineered fill such as Gravel Borrow or similar is recommended. Gravel Borrow should be placed in maximum 12-inch lifts and should be compacted to 95 percent of its maximum dry density determined in accordance with ASTM D1557. Gravel Borrow should consist of well graded granular material having no rocks with a maximum dimension over 6 inches. The portion passing a 3-inch sieve should meet the following gradation specification:

GRAVEL BORROW	
Sieve Size	Percent Passing
¼ inch	0 to 70
No. 200	0 to 10

Reference: MDOT Specification 703.20, Gravel Borrow (2020)

Alternatives to over-excavation and replacement of material may include ground improvement (such as vertical stone columns, mat slab foundations, and/or pile support foundations). Suitability for alternatives should be performed once plans for site development are established.

The soils at the site are categorized as Site Class D in accordance with ASCE 7-10. Soils encountered at the site are not considered susceptible to widespread liquefaction during earthquake. The following seismic site coefficients should be used:

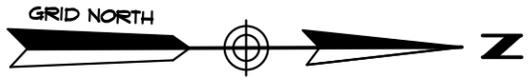
SUBGRADE SITE SEISMIC DESIGN COEFFICIENTS – ASCE 7-10	
Seismic Coefficient	Site Class D
Peak Ground Acceleration (PGA)	0.098
Site Modified Peak Ground Acceleration (PGA _M)	0.157
Short period spectral response (S _S)	0.196
1 second spectral response (S ₁)	0.073
Maximum short period spectral response (S _{MS})	0.313
Maximum 1 second spectral response (S _{M1})	0.174
Design short period spectral response (S _{DS})	0.209
Design 1 second spectral response (S _{D1})	0.116

During the explorations, groundwater was observed at a depth range of 3 to 8 feet BGS. Depending upon depth of excavations, dewatering may be required. Dewatering effort may vary depending upon location, size, and depth of excavation. Any soil removal and/or dewatering should be performed in accordance to any environmental permits or requirements established for the site.

5.0 Closure

Our recommendations are preliminary and based on professional judgment and generally accepted principles of geotechnical engineering and project information provided by others. No other warranty is expressed or implied. Our evaluations and recommendations are based on discrete and widely spaced data points. Some changes in subsurface conditions from those presented in this report are anticipated to occur. Should these conditions differ from those described in this report, SGS should be notified so that we can re-evaluate our recommendations. SGS appreciates the opportunity to serve you during this phase of your project. If there are any questions or additional information is required, please do not hesitate to call.

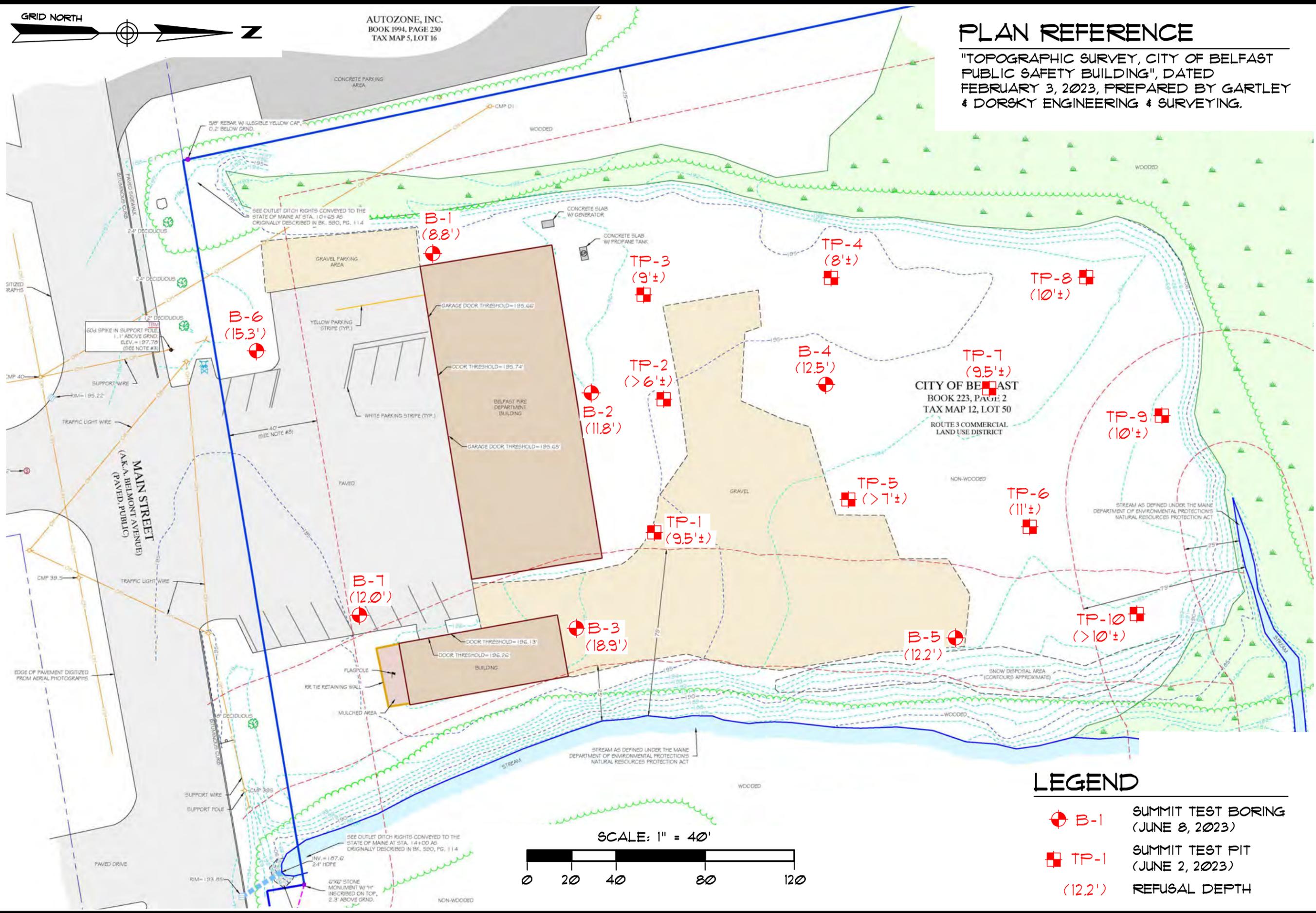
APPENDIX A
EXPLORATION LOCATION PLAN



AUTOZONE, INC.
BOOK 1994, PAGE 230
TAX MAP 5, LOT 16

PLAN REFERENCE

"TOPOGRAPHIC SURVEY, CITY OF BELFAST
PUBLIC SAFETY BUILDING", DATED
FEBRUARY 3, 2023, PREPARED BY GARTLEY
& DORSKY ENGINEERING & SURVEYING.



PROJECT: **PUBLIC SAFETY BUILDING**
213 MAIN STREET - BELFAST, MAINE
CLIENT: **CITY OF BELFAST**

TITLE: **EXPLORATION LOCATION PLAN**
SCALE: 1" = 40'
DATE: JUNE 26, 2023
DRAIN BY: KRF
APPR BY: CRS

MAIL: P.O. BOX 515
GARDINER, ME 04345
OFFICE: 210 MAINE AVENUE
FAIRINGDALE, MAINE
TEL: (207) 446-3360

PROJ. #: 23099
FIGURE: 1



LEGEND

- ⊕ B-1 SUMMIT TEST BORING (JUNE 8, 2023)
- ⊞ TP-1 SUMMIT TEST PIT (JUNE 2, 2023)
- (12.2') REFUSAL DEPTH

APPENDIX B
EXPLORATION SUMMARY TABLE
EXPLORATION LOGS



Project Name: Public Safety Building
 Location: 273 Main Street, Belfast, Maine

Project Number: 23099
 Dates: 7/5/2023

EXPLORATION SUMMARY TABLE

EXPLORATION NUMBER	SURFACE ELEVATION	GRANULAR FILL	MISCELLANEOUS FILL W/ ORGANICS	GLACIAL MARINE DEPOSIT	GLACIAL TILL	REFUSAL DEPTH	GROUNDWATER DEPTH
TP-1	195.0	NE	0.2 to 7.0	NE	7.0 to 9.5	9.5	6.0
TP-2	195.0	NE	0.5 to 5.0	5.0 to 6.0	NE	NE	4.0
TP-3	195.0	NE	0.3 to 6.0	6.0 to 7.0	7.0 to 9.0	9.0	5.5
TP-4	195.0	0 to 2.0	2.0 to 6.5	6.5 to 7.5	7.5 to 8.0	8.0	6.5
TP-5	193.0	0 to 2.0	2.0 to 6.0	6.0 to 7.0	NE	NE	4.0
TP-6	193.0	0 to 4.0	4.0 to 6.0	6.0 to 8.5	8.5 to 10.0/11.0	10.0/11.0	5.0
TP-7	194.0	0 to 2.0	2.0 to 6.0	6.0 to 9.0	9.0 to 9.5	9.5	4.5
TP-8	194.0	0 to 3.5	3.5 to 7.0	7.0 to 9.0	9.0 to 10.0	10.0	5.0
TP-9	192.0	0 to 3.0	3.0 to 6.0	6.0 to 9.0	9.0 to 10.0	10.0	6.5
TP-10	192.0	0 to 3.5	3.5 to 7.0	7.0 to 9.0	9.0 to 10.0	NE	4.5
B-1	195.0	NE	NE	0.1 to 5.4	5.4 to 8.8	8.8	7.1
B-2	196.0	NE	0.1 to 8.0	NE	8.0 to 11.8	11.8	7.8
B-3	196.0	0 to 2.4	2.4 to 11.0	11.0 to 16.3	16.3 to 18.9	18.9	7.1
B-4	194.0	0 to 2.4	2.4 to 6.5	6.5 to 8.5	8.5 to 12.5	12.5	7.2
B-5	193.0	0 to 1.0	1.0 to 10.0	10.0 to 12.2	NE	12.2	3.6
B-6	196.0	NE	NE	0.2 to 7.0	7.0 to 15.3	15.3	3.1
B-7	195.0	NE	NE	0.5 to 10.0	10.0 to 12.0	12.0	8.0

NOTES:

- 1.) Test pits were performed on June 2, 2023 by Summit Geoengineering Services (SGS) using a Kubota KX040-4 Excavator. Test borings were performed on June 8, 2023 by SGS using a track mounted AMS 9580 VTR drill rig.
- 2.) Test pits were advanced to a depth range of 10 to 11 feet below ground surface or bedrock refusal, whichever was encountered first. Test boring refusal depths are presumed to be on bedrock based on drilling resistance. Bedrock depths were measured to the nearest tenth of a foot in the explorations. Surface elevations were estimated using 1-ft contours provided on the Topography Survey dated February 2, 2023 prepared by Gartley & Dorsky.
- 3.) Where a range of bedrock depths was encountered in a test pit, depths are separated by a forward slash; i.e. 10.0/11.0 indicates bedrock refusal depths ranged from 10.0 to 11.0 feet BGS.
- 4.) Explorations were field located by SGS by taping off existing site features and using a Garmin eTrex handheld GPS.
- 5.) NE = None Encountered.

EXPLORATION COVER SHEET

The exploration logs are prepared by the geotechnical engineer from both field and laboratory data. Soil descriptions are based upon the Unified Soil Classification System (USCS) per ASTM D2487 and/or ASTM D2488 as applicable. Supplemental descriptive terms for estimated particle percentage, color, density, moisture condition, and bedrock may also be included to further describe conditions.

Drilling and Sampling Symbols:

S = Split Spoon Sample	Hyd = Hydraulic Advancement of Drilling Rods
UT = Thin Wall Shelby Tube	Push = Direct Push of Drilling Rods
SSA = Solid Stem Auger	WOH = Weight of Hammer
HSA = Hollow Stem Auger	WOR = Weight of Rod
RW = Rotary Wash	PI = Plasticity Index
SV = Lab Shear Vane (Torvane)	LL = Liquid Limit
PP = Pocket Penetrometer	MC = Natural Moisture Content
C = Rock Core Sample	USCS = Unified Soil Classification System
FV = Field Vane Shear Test	Su = Undrained Shear Strength
SP = Concrete Punch Sample	Su(r) = Remolded Shear Strength

Water Level Measurements:

Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In pervious soils, the indicated elevations are considered reliable groundwater levels. In impervious soils, the accurate determination of groundwater elevations may not be possible, even after several days of observations. Groundwater monitoring wells may be required to record accurate depths and fluctuation.

Gradation Description and Terminology:

Boulders:	Over 12 inches	Trace:	Less than 5%
Cobbles:	12 inches to 3 inches	Little:	5% to 15%
Gravel:	3 inches to No.4 sieve	Some:	15% to 30%
Sand:	No.4 to No. 200 sieve	Silty, Sandy, etc.:	Greater than 30%
Silt:	No. 200 sieve to 0.005 mm		
Clay:	less than 0.005 mm		

Density of Granular Soils and Consistency of Cohesive Soils:

CONSISTENCY OF COHESIVE SOILS		DENSITY OF GRANULAR SOILS	
SPT N-value blows/ft	Consistency	SPT N-value blows/ft	Relative Density
0 to 2	Very Soft	0 to 4	Very Loose
2 to 4	Soft	5 to 10	Loose
5 to 8	Firm	11 to 30	Compact
9 to 15	Stiff	31 to 50	Dense
16 to 30	Very Stiff	>50	Very Dense
>30	Hard		



TEST PIT LOG

Test Pit # **TP-1**

Project: Public Safety Building
273 Main Street
Belfast, Maine

Project #: 23099
Groundwater:
6 ft +/-

Contractor: Summit Geoengineering Services, Inc.

Ground Surface Elevation: 195 ft +/-

Equipment: Kubota KX040-4

Reference: Estimated from Topographic Survey dated 2-3-23 by G&D

Summit Staff: C. Sullivan, E.I., K. Luce

Date: 6/2/2023

Weather: 80°, Clear

Depth (ft)	DESCRIPTION	
	ENGINEERING	GEOLOGIC/GENERAL
1	Brown medium-fine SAND, some Silt, rootlets, loose, damp, SM	TOPSOIL
2	Brown SILT-SAND, little Gravel & Clay, slightly mottled, occasional cobbles & miscellaneous debris (wood & plastic), firm/compact, damp-moist, ML-SM	MISCELLANEOUS FILL (WITH ORGANICS)
3		
4	Dark brown SILT, little Sand & Clay, trace Gravel, frequent buried Organic debris (sticks, logs, stumps), soft-firm, damp-wet, ML	(1.5'-diameter boulder at 6' +/-)
5		Slow groundwater seepage at 6' +/-
6		
7		
8	Olive gray Clayey SILT, little Sand, trace Gravel, slightly mottled, firm, wet, ML	GLACIAL TILL
9		Groundwater pooling in bottom of test pit at 9.5' +/-
10	End of Exploration at 9.5', Refusal on Bedrock	BEDROCK
11		
12		
13		
14		
15		
16		
17		



TEST PIT LOG

Test Pit # **TP-2**

Project: Public Safety Building
273 Main Street
Belfast, Maine

Project #: 23099
Groundwater:
4 ft +/-

Contractor: Summit Geoengineering Services, Inc.

Ground Surface Elevation: 195 ft +/-

Equipment: Kubota KX040-4

Reference: Estimated from Topographic Survey dated 2-3-23 by G&D

Summit Staff: C. Sullivan, E.I., K. Luce

Date: 6/2/2023

Weather: 80°, Clear

Depth (ft)	DESCRIPTION	
	ENGINEERING	GEOLOGIC/GENERAL
1	Brown medium-fine SAND, some Silt, rootlets, loose, damp, SM	TOPSOIL
2	Olive brown SILT-SAND, little Gravel, slightly mottled, occasional cobbles, compact/firm, damp, ML-SM	0.5' +/- MISCELLANEOUS FILL (WITH ORGANICS)
3	Dark brown SILT, little Sand, trace Clay, frequent buried Organic debris (sticks, logs, stumps), frequent cobbles & miscellaneous debris (metal, rubber, plastic), soft-firm, damp-wet, ML	
4		2.5' +/- Groundwater pooling in bottom of test pit at 4' +/- (Metal debris and 2'-diameter boulder at 4.5' +/-)
5		
6	Brown-gray Silty CLAY, little fine Sand, slightly mottled, soft-firm, wet, CL	5' +/- PP = 3,000 to 4,000 psf GLACIAL MARINE DEPOSIT (Test pit sidewalls caving at 5' +/-)
7	End of Exploration at 6', No Refusal - Sidewalls Caving	6' +/-
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		





TEST PIT LOG

Test Pit # **TP-3**

Project: Public Safety Building
273 Main Street
Belfast, Maine

Project #: 23099
Groundwater:
5.5 ft +/-

Contractor: Summit Geoengineering Services, Inc.

Ground Surface Elevation: 195 ft +/-

Equipment: Kubota KX040-4

Reference: Estimated from Topographic Survey dated 2-3-23 by G&D

Summit Staff: C. Sullivan, E.I., K. Luce

Date: 6/2/2023

Weather: 80°, Clear

Depth (ft)	DESCRIPTION	
	ENGINEERING	GEOLOGIC/GENERAL
1	Brown medium-fine SAND, little Silt, rootlets, loose, damp, SM	TOPSOIL
2	Brown-olive brown fine Sandy SILT, little Gravel, slightly-moderately mottled, occasional wood fibers & cobbles, firm, damp, ML	0.3' +/- MISCELLANEOUS FILL (WITH ORGANICS)
3	-----	
4	Dark brown SILT, trace-little Clay, trace fine Sand & Gravel, frequent buried Organic debris (sticks, logs, stumps), frequent cobbles, firm, damp-wet, ML	
5		(1.5'-diameter boulder at 4.5' +/-)
6		Groundwater pooling in bottom of test pit at 5.5' +/-
7	Gray Silty CLAY, trace Gravel & Sand, firm, wet, CL	6' +/- PP = 5,000 to 6,000 psf GLACIAL MARINE DEPOSIT
8	Olive brown SILT, some Sand, little Clay, occasional cobbles, slightly-moderately mottled, stiff, wet, ML	7' +/- GLACIAL TILL
9	End of Exploration at 9', Refusal on Bedrock	9' +/- BEDROCK
10		
11		
12		
13		
14		
15		
16		
17		



TEST PIT LOG

Test Pit # **TP-4**

Project: Public Safety Building
273 Main Street
Belfast, Maine

Project #: 23099
Groundwater:
6.5 ft +/-

Contractor: Summit Geoengineering Services, Inc.

Ground Surface Elevation: 195 ft +/-

Equipment: Kubota KX040-4

Reference: Estimated from Topographic Survey dated 2-3-23 by G&D

Summit Staff: C. Sullivan, E.I., K. Luce

Date: 6/2/2023

Weather: 80°, Clear

Depth (ft)	DESCRIPTION	
	ENGINEERING	GEOLOGIC/GENERAL
1	Brown Silty SAND, little-some Gravel, slightly mottled, occasional cobbles, compact, damp, SM	GRANULAR FILL
2		
3	Dark brown SILT, trace-little Clay, trace fine Sand & Gravel, frequent buried Organic debris (sticks, logs, stumps) at 5' +/-, miscellaneous debris (brick & asphalt), firm, damp-wet, ML	2' +/- MISCELLANEOUS FILL (WITH ORGANICS) (1.5'-diameter buried stump at 3' +/-)
4		
5		
6		(Test pit sidewalls caving at 6' +/-)
7	Gray Silty CLAY, little Sand, trace Gravel, slightly mottled, firm, wet, CL	6.5' +/- GLACIAL MARINE DEPOSIT
8		
9	Olive brown SILT, some Sand & Gravel, little Clay, slightly mottled, occasional cobbles, firm-stiff, wet, ML	7.5' +/- GLACIAL TILL
10	End of Exploration at 8', Refusal on Bedrock	8' +/- BEDROCK
11		
12		
13		
14		
15		
16		
17		





TEST PIT LOG

Test Pit # **TP-5**

Project: Public Safety Building
273 Main Street
Belfast, Maine

Project #: 23099

Groundwater:
4 ft +/-

Contractor: Summit Geoengineering Services, Inc.

Ground Surface Elevation: 193 ft +/-

Equipment: Kubota KX040-4

Reference: Estimated from Topographic Survey dated 2-3-23 by G&D

Summit Staff: C. Sullivan, E.I., K. Luce

Date: 6/2/2023

Weather: 80°, Clear

Depth (ft)	DESCRIPTION	
	ENGINEERING	GEOLOGIC/GENERAL
1	Olive brown Silty SAND, little-some Gravel, slightly mottled, compact, damp, SM	GRANULAR FILL
2		
3	Dark brown SILT, trace-little Clay, trace Gravel & Sand, frequent buried Organic debris (sticks, logs, stumps) at 3.5' +/-, occasional miscellaneous debris (plastic, glass, asphalt), soft-firm, damp-wet, ML	2' +/- MISCELLANEOUS FILL (WITH ORGANICS) (2'-diameter boulders at 3' +/-) (Test pit sidewalls caving at 4' +/-)
4		
5		
6		
7	Olive brown Silty CLAY, little fine Sand & Gravel, slightly mottled, soft-firm, moist-wet, CL	6' +/- GLACIAL MARINE DEPOSIT Groundwater pooling in bottom of test pit at 7' +/-
8	End of Exploration at 7', No Refusal - Sidewalls Caving & Pooling Water Preventing Advancement	7' +/-
9		
10		
11		
12		
13		
14		
15		
16		
17		



TEST PIT LOG

Test Pit # **TP-6**

Project: Public Safety Building
273 Main Street
Belfast, Maine

Project #: 23099

Groundwater:
5' +/-

Contractor: Summit Geoengineering Services, Inc.

Ground Surface Elevation: 193 ft +/-

Equipment: Kubota KX040-4

Reference: Estimated from Topographic Survey dated 2-3-23 by G&D

Summit Staff: C. Sullivan, E.I., K. Luce

Date: 6/2/2023

Weather: 80°, Clear

Depth (ft)	DESCRIPTION	
	ENGINEERING	GEOLOGIC/GENERAL
1	Brown Silty SAND, little Gravel, occasional-frequent cobbles, slightly mottled, firm, damp-moist, SM	GRANULAR FILL (1'-diameter boulder at 3' +/-)
2		
3		
4		
5	Dark brown SILT-CLAY, little fine Sand trace Gravel, occasional buried Organic debris (trees, logs, stumps), at 4.5', soft-firm, damp-wet, ML-CL	4' +/- (2'-diameter boulder at 4' +/-) MISCELLANEOUS FILL (WITH ORGANICS) Slow groundwater seepage at 5' +/-
6		
7	Gray SILT-CLAY, trace-little fine Sand, slightly mottled, firm-stiff, moist-wet, ML-CL	6' +/- GLACIAL MARINE DEPOSIT PP = 6,000 to 7,000 psf
8		
9	Olive brown SILT, little fine Sand, Gravel, & Clay, slightly-moderately mottled, blocky, firm-stiff, wet, ML	8.5' +/- GLACIAL TILL
10		
11	End of Exploration at 10' to 11', Refusal on Probable Bedrock	10' - 11' +/- PROBABLE BEDROCK
12		
13		
14		
15		
16		
17		



TEST PIT LOG

Test Pit # **TP-7**

Project: Public Safety Building
273 Main Street
Belfast, Maine

Project #: 23099

Groundwater:
4.5 ft +/-

Contractor: Summit Geoengineering Services, Inc.

Ground Surface Elevation: 194 ft +/-

Equipment: Kubota KX040-4

Reference: Estimated from Topographic Survey dated 2-3-23 by G&D

Summit Staff: C. Sullivan, E.I., K. Luce

Date: 6/2/2023

Weather: 80°, Clear

Depth (ft)	DESCRIPTION	
	ENGINEERING	GEOLOGIC/GENERAL
1	Brown Silty SAND, little Gravel, rootlets from 0'-0.5', occasional-frequent cobbles, slightly mottled, firm, damp-moist, SM	GRANULAR FILL
2		
3	Dark gray SILT-CLAY, trace Sand & Gravel, frequent buried Organic debris (stumps, leaves, sticks), slightly mottled, firm, damp-wet, ML-CL	2' +/- MISCELLANEOUS FILL (WITH ORGANICS) (Nested buried trees at 4.5' - 5') Groundwater pooling in bottom of test pit at 4.5' +/-
4		
5		
6		
7	Gray SILT-CLAY, little Sand & Gravel, slightly-moderately mottled, firm-stiff, wet, ML-CL	6' +/- GLACIAL MARINE DEPOSIT
8		
9		
10	Olive gray SILT, little-some Gravel & Sand, occasional cobbles, moderately-heavily mottled, stiff, wet, ML	9' +/- GLACIAL TILL
11	End of Exploration at 9.5', Refusal on Probable Bedrock	9.5' +/- PROBABLE BEDROCK
12		
13		
14		
15		
16		
17		



TEST PIT LOG

Test Pit # **TP-8**

Project: Public Safety Building
273 Main Street
Belfast, Maine

Project #: 23099
Groundwater:
5 ft +/-

Contractor: Summit Geoengineering Services, Inc.

Ground Surface Elevation: 194 ft +/-

Equipment: Kubota KX040-4

Reference: Estimated from Topographic Survey dated 2-3-23 by G&D

Summit Staff: C. Sullivan, E.I., K. Luce

Date: 6/2/2023

Weather: 80°, Clear

Depth (ft)	DESCRIPTION	
	ENGINEERING	GEOLOGIC/GENERAL
1	Brown Silty SAND, little Gravel, loose-compact, damp, SM	GRANULAR FILL
2	Brown Sandy SILT, little Gravel, occasional Silt-Clay pockets, firm, damp, ML	
3		
4	Dark brown SILT-CLAY, trace-little fine Sand & Gravel, frequent buried Organic debris (logs & sticks), occasional miscellaneous debris (brick fragments), firm, moist-wet, ML-CL	3.5' +/- MISCELLANEOUS FILL (WITH ORGANICS) (2.5'-diameter boulder at 4' +/-)
5		
6		
7		
8	Gray Silty CLAY, trace fine Sand, slightly-moderately mottled, firm, wet, CL	7' +/- GLACIAL MARINE DEPOSIT PP = 5,000 to 7,000 psf
9		
10	Olive gray SILT, little-some Gravel & Sand, occasional cobbles, moderately-heavily mottled, stiff, wet, ML	9' +/- GLACIAL TILL
11	End of Exploration at 10', Refusal on Bedrock	
12		10' +/- BEDROCK
13		
14		
15		
16		
17		





TEST PIT LOG

Test Pit # **TP-9**

Project: Public Safety Building
273 Main Street
Belfast, Maine

Project #: 23099

Groundwater:
6.5 ft +/-

Contractor: Summit Geoengineering Services, Inc.

Ground Surface Elevation: 192 ft +/-

Equipment: Kubota KX040-4

Reference: Estimated from Topographic Survey dated 2-3-23 by G&D

Summit Staff: C. Sullivan, E.I., K. Luce

Date: 6/2/2023

Weather: 80°, Clear

Depth (ft)	DESCRIPTION	
	ENGINEERING	GEOLOGIC/GENERAL
1	Brown Silty SAND, some Gravel, occasional cobbles, loose-compact, damp, SM	GRANULAR FILL
2		
3		
4	Dark brown SILT-CLAY, occasional buried Organic debris, slightly mottled, firm, damp, ML-CL	3' +/- MISCELLANEOUS FILL (WITH ORGANICS)
5	Dark brown SILT, some Sand, little Gravel, frequent Organics & cobbles, firm, moist-wet, ML	
6		(1.5'-diameter boulders at 5' +/-)
7	Olive gray-gray Silty CLAY, little Sand & Gravel, slightly mottled, firm, moist-wet, CL	6' +/- PP = 3,000 - 4,000 psf GLACIAL MARINE DEPOSIT Slow groundwater seepage in north sidewall at 6.5' +/- Groundwater pooling in bottom of test pit at 6.5' +/-
8		
9		
10	Olive gray SILT, little-some Gravel & Sand, occasional cobbles, moderately-heavily mottled, stiff, wet, ML	9' +/- GLACIAL TILL
11	End of Exploration at 10', Refusal on Bedrock	10' +/- BEDROCK
12		
13		
14		
15		
16		
17		



TEST PIT LOG

Test Pit # **TP-10**

Project: Public Safety Building
273 Main Street
Belfast, Maine

Project #: 23099

Groundwater:
4.5 ft +/-

Contractor: Summit Geoengineering Services, Inc.

Ground Surface Elevation: 192 ft +/-

Equipment: Kubota KX040-4

Reference: Estimated from Topographic Survey dated 2-3-23 by G&D

Summit Staff: C. Sullivan, E.I., K. Luce

Date: 6/2/2023

Weather: 80°, Clear

Depth (ft)	DESCRIPTION	
	ENGINEERING	GEOLOGIC/GENERAL
1	Brown Silty SAND, some Gravel, occasional cobbles, loose-compact, damp, SM	GRANULAR FILL (1.5'-diameter boulder at 2' +/-)
2		
3		
4	Dark brown Silty CLAY, trace-little Sand & Gravel, frequent buried Organic debris (sticks, logs, trees), occasional cobbles, firm, moist, CL	3.5' PP = 5,000 to 6,000 psf MISCELLANEOUS FILL (WITH ORGANICS) (6"-diameter buried tree at 4' +/-) Groundwater pooling in bottom of test pit at 4.5' +/- Groundwater seepage in south sidewall at 5' +/-
5		
6		
7		
8	Olive gray-gray Silty CLAY, little Sand, trace Gravel, slightly mottled, firm, wet, CL	7' GLACIAL MARINE DEPOSIT
9		
10	Olive gray SILT, little Sand & Gravel, slightly mottled, firm, wet, ML	9' GLACIAL TILL
11	End of Exploration at 10', No Refusal	10'
12		
13		
14		
15		
16		
17		





SOIL BORING LOG

Boring #: **B-1**

Project: Public Safety Building
 Location: 273 Main Street
 City, State: Belfast, Maine

Project #: 23099
 Sheet: 1 of 1
 Chkd by: CRS

Drilling Co: Summit Geoengeering Services
 Driller: S. Floyd
 Summit Staff: C. Sullivan, E.I.

Boring Elevation: 195 ft +/-
 Reference: Estimated from Topographic Survey dated 2-3-23 by Gartley & Dorsky
 Date started: 6/8/2023 Date Completed: 6/8/2023

DRILLING METHOD		SAMPLER	
Vehicle:	AMS Track	Length:	24" SS
Model:	9580 VTR	Diameter:	2"OD/1.5"ID
Method:	2-1/4" HSA	Hammer:	140 lb
Hammer Style:	Auto	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH			
Date	Depth	Elevation	Reference
6/8/2023	7.1 ft +/-	188 ft +/-	Measured in 10' of augers

Depth (ft.)	SAMPLER				Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	No.	Pen/Rec (in)	Depth (ft)	blows/6"				
1	S-1	24/16	0 - 2	3	188+/-	Dark brown SILT, little fine Sand, rootlets, soft, damp, ML	PP = 4,000 psf to 5,000 psf	0.1' +/- GLACIAL MARINE DEPOSIT (PORTIONS REWORKED)
2				3	Olive brown SILT-SAND, little Gravel, trace misc. debris (glass & asphalt fragments), slightly mottled, firm, damp, ML-SM			
3	S-2	24/15	2 - 4	1	Olive brown Silty CLAY, little Sand & Gravel, trace asphalt fragments, slightly mottled, 1/2"-Sand seam at 3'+/-, soft, moist to wet, CL			
4				1				
5				1				
6	S-3	24/19	5 - 7	1	Same as above, firm, wet, CL			
7				8	190+/-	Olive brown SILT, little fine Sand & Gravel, slightly to moderately mottled, slaty rock fragments throughout, stiff to very stiff, wet, ML	PP = 4,000 psf to 5,000 psf	5.4' +/- GLACIAL TILL
8	S-4	8/7	7 - 7.7	38	Same as above, very stiff to hard, wet, ML			
9				50/2"				
10					186+/-	End of Exploration at 8.8', Auger Refusal on Bedrock	PP = 4,000 psf to 5,000 psf	8.8' +/- BEDROCK
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

Granular Soils		Cohesive Soils		% Composition ASTM D2487	NOTES: PP = Pocket Penetrometer, MC = Moisture Content LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength Shallow = 0 to 35 degrees Dipping = 35 to 55 degrees Steep = 55 to 90 degrees Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200	Soil Moisture Condition Dry: S = 0% Humid: S = 1 to 25% Damp: S = 26 to 50% Moist: S = 51 to 75% Wet: S = 76 to 99% Saturated: S = 100%
Blows/ft.	Density	Blows/ft.	Consistency			
0-4	V. Loose	<2	V. soft	< 5% Trace 5-15% Little 15-30% Some > 30% With		
5-10	Loose	2-4	Soft			
11-30	Compact	5-8	Firm			
31-50	Dense	9-15	Stiff			
>50	V. Dense	16-30 >30	V. Stiff Hard			



SOIL BORING LOG

Boring #: **B-2**

Project: Public Safety Building
 Location: 273 Main Street
 City, State: Belfast, Maine

Project #: 23099
 Sheet: 1 of 1
 Chkd by: CRS

Drilling Co: Summit Geoengineering Services
 Driller: S. Floyd
 Summit Staff: C. Sullivan, E.I.

Boring Elevation: 196 ft +/-
 Reference: Estimated from Topographic Survey dated 2-3-23 by Gartley & Dorsky
 Date started: 6/8/2023 Date Completed: 6/8/2023

DRILLING METHOD		SAMPLER	
Vehicle:	AMS Track	Length:	24" SS
Model:	9580 VTR	Diameter:	2"OD/1.5"ID
Method:	2-1/4" HSA	Hammer:	140 lb
Hammer Style:	Auto	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH			
Date	Depth	Elevation	Reference
6/8/2023	7.8 ft +/-	188 ft +/-	Measured in 10' of augers

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	blows/6"	Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
2				1		Brown SILT, little-some Gravel, little Sand, slightly mottled, soft to firm, damp, ML	0.1' +/- MISCELLANEOUS FILL (WITH ORGANICS)	
3	S-2	24/9	2 - 4	2		Brown SILT-CLAY, little Gravel & fine Sand, 1"-Sand seam at 2.3'; frequent wood debris at 3' +/-, soft, moist, ML-CL	PP = 4,000 psf 2' +/-	
4				1				
5				2				
6	S-3	24/21	5 - 7	1		Gray Silty CLAY, some Sand, little Gravel, soft, moist, CL	5' +/-	
7				1		Dark brown Organic SILT, soft, moist, OL	5.7' +/-	
8				1		Olive gray SILT-CLAY, trace-little Sand, trace Gravel & Organic debris (sticks, leaves, rootlets) soft, wet, ML-CL	5.8' +/-	
9	S-4	24/24	7 - 9	1		Same as above, soft, wet, ML-CL	PP = 2,000 psf	
10				8	188+/-	Olive brown SILT, little Gravel & Sand, moderately to heavily mottled, very stiff, wet, ML	8' +/- GLACIAL TILL	
11				13				
12				25				
13	S-5	10/7	10 - 10.8	40		Olive brown SILT, little-some Gravel & Sand, moderately mottled, slatey gray fragments throughout, hard, wet, ML		
14				50/4"				
15					184+/-	End of Exploration at 11.8', Auger Refusal on Bedrock	11.8' +/- BEDROCK	
16								
17								
18								
19								
20								
21								
22								

Granular Soils		Cohesive Soils		% Composition ASTM D2487	NOTES: PP = Pocket Penetrometer, MC = Moisture Content LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength Shallow = 0 to 35 degrees Dipping = 35 to 55 degrees Steep = 55 to 90 degrees Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200	Soil Moisture Condition Dry: S = 0% Humid: S = 1 to 25% Damp: S = 26 to 50% Moist: S = 51 to 75% Wet: S = 76 to 99% Saturated: S = 100%
Blows/ft.	Density	Blows/ft.	Consistency			
0-4	V. Loose	<2	V. soft			
5-10	Loose	2-4	Soft	< 5% Trace		
11-30	Compact	5-8	Firm	5-15% Little		
31-50	Dense	9-15	Stiff	15-30% Some		
>50	V. Dense	16-30	V. Stiff	> 30% With		
		>30	Hard			



SOIL BORING LOG

Boring #: **B-3**

Project: Public Safety Building
 Location: 273 Main Street
 City, State: Belfast, Maine

Project #: 23099
 Sheet: 1 of 1
 Chkd by: CRS

Drilling Co: Summit Geoengineering Services
 Driller: S. Floyd
 Summit Staff: C. Sullivan, E.I.

Boring Elevation: 196 ft +/-
 Reference: Estimated from Topographic Survey dated 2-3-23 by Gartley & Dorsky
 Date started: 6/8/2023 Date Completed: 6/8/2023

DRILLING METHOD		SAMPLER	
Vehicle:	AMS Track	Length:	24" SS
Model:	9580 VTR	Diameter:	2"OD/1.5"ID
Method:	2-1/4" HSA	Hammer:	140 lb
Hammer Style:	Auto	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH			
Date	Depth	Elevation	Reference
6/8/2023	7.1 ft +/-	189 ft +/-	Measured in 10' of augers

Depth (ft.)	SAMPLER				Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum	
	No.	Pen/Rec (in)	Depth (ft)	blows/6"					
1	S-1	24/17	0 - 2	2	194 +/-	Brown medium-fine SAND, little Silt & Gravel, occasional asphalt fragments from 0'-0.2', loose-compact, damp, SP-SM		GRANULAR FILL	
2				3					
3				6					
4	S-2	24/15	2 - 4	7		194 +/-	Same as above, asphalt fragments from 2.2'-2.4', compact, damp, SP-SM		2.4' +/- MISCELLANEOUS FILL (WITH ORGANICS)
5				10					
6				11					
7				6					
8	S-3	24/13	5 - 7	1					
9				1					
10				2		185 +/-	Olive gray Silty CLAY, trace Gravel & fine Sand, occasional wood fibers, soft to firm, moist, CL	PP = 6,000 psf to 7,000 psf	
11	S-4	24/8	7 - 9	WOH					
12				WOH					
13				WOH					
14				WOH					
15									
16	S-5	24/21	10 - 12	1					
17				1					
18				1					
19									
20					185 +/-	Olive gray Silty CLAY, trace fine Sand, soft, wet, CL	PP = 5,000 psf	11' +/- GLACIAL MARINE DEPOSIT	
21	S-6	24/20	15 - 17	1					
22				2					
23				7					
24				17	185 +/-	Gray SILT, little-some fine Sand, little Gravel, slaty rock pieces throughout, slightly mottled, stiff-very stiff, wet, ML		16.3' +/- GLACIAL TILL	
25									
26									
27									
28					185 +/-	End of Exploration at 18.9', Auger Refusal on Bedrock		18.9' +/- BEDROCK	
29									
30									
31									

Granular Soils		Cohesive Soils		% Composition ASTM D2487	NOTES: PP = Pocket Penetrometer, MC = Moisture Content LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength Shallow = 0 to 35 degrees Dipping = 35 to 55 degrees Steep = 55 to 90 degrees Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200	Soil Moisture Condition Dry: S = 0% Humid: S = 1 to 25% Damp: S = 26 to 50% Moist: S = 51 to 75% Wet: S = 76 to 99% Saturated: S = 100%	
Blows/ft.	Density	Blows/ft.	Consistency				
0-4	V. Loose	<2	V. soft	< 5% Trace			
5-10	Loose	2-4	Soft				
11-30	Compact	5-8	Firm				
31-50	Dense	9-15	Stiff				
>50	V. Dense	16-30	V. Stiff				> 30% With
		>30	Hard				



SOIL BORING LOG

Boring #: **B-4**

Project: Public Safety Building
 Location: 273 Main Street
 City, State: Belfast, Maine

Project #: 23099
 Sheet: 1 of 1
 Chkd by: CRS

Drilling Co: Summit Geoengineering Services
 Driller: S. Floyd
 Summit Staff: C. Sullivan, E.I.

Boring Elevation: 194 ft +/-
 Reference: Estimated from Topographic Survey dated 2-3-23 by Gartley & Dorsky
 Date started: 6/8/2023 Date Completed: 6/8/2023

DRILLING METHOD		SAMPLER	
Vehicle:	AMS Track	Length:	24" SS
Model:	9580 VTR	Diameter:	2"OD/1.5"ID
Method:	2-1/4" HSA	Hammer:	140 lb
Hammer Style:	Auto	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH			
Date	Depth	Elevation	Reference
6/8/2023	7.2 ft +/-	187 ft +/-	Measured in 15' of augers

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	blows/6"	Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
2				2				
3				4				
4	S-2	24/20	2 - 4	2		Same as above, loose, damp, SM		
5				3				
6				1		Olive brown Silty CLAY, trace fine Sand, Gravel, & asphalt fragments, occasional wood debris, slightly mottled, soft, moist, CL	PP = 2,000 psf to 4,000 psf	2.4' +/- MISCELLANEOUS FILL (WITH ORGANICS)
7				1				
8	S-3	24/21	5 - 7	WOH		Olive gray Silty CLAY, trace fine Sand & Organic debris (leaves, rootlets, sticks), soft, wet, CL	PP = 3,000 psf to 4,000 psf	
9				1		Gray Silty CLAY, trace fine Sand, slightly-moderately mottled, soft to firm, wet, CL		
10				2				
11	S-4	24/24	7 - 9	4	188 +/-	Olive brown Clayey SILT, trace fine sand, slightly mottled, stiff, wet, ML		6.5' +/- GLACIAL MARINE DEPOSIT
12				9				
13				22				
14				19	186 +/-	Olive brown SILT, little Sand & Gravel, 2"-crushed cobble at 8.5', gray slaty rock fragments throughout, slightly-moderately mottled, very stiff to hard, wet, ML		8.5' +/- GLACIAL TILL
15	S-5	8/8	10 - 10.7	37		Same as above, moderately mottled, very stiff to hard, wet, ML		
16				50/2"				
17								
18					182 +/-	End of Exploration at 12.5', Auger Refusal on Bedrock		12.5' +/- BEDROCK
19								
20								
21								
22								

Granular Soils		Cohesive Soils		% Composition ASTM D2487	NOTES: PP = Pocket Penetrometer, MC = Moisture Content LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength Shallow = 0 to 35 degrees Dipping = 35 to 55 degrees Steep = 55 to 90 degrees Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200	Soil Moisture Condition Dry: S = 0% Humid: S = 1 to 25% Damp: S = 26 to 50% Moist: S = 51 to 75% Wet: S = 76 to 99% Saturated: S = 100%
Blows/ft.	Density	Blows/ft.	Consistency			
0-4	V. Loose	<2	V. soft	< 5% Trace 5-15% Little 15-30% Some > 30% With		
5-10	Loose	2-4	Soft			
11-30	Compact	5-8	Firm			
31-50	Dense	9-15	Stiff			
>50	V. Dense	16-30 >30	V. Stiff Hard			



SOIL BORING LOG

Boring #: **B-5**

Project: Public Safety Building
 Location: 273 Main Street
 City, State: Belfast, Maine

Project #: 23099
 Sheet: 1 of 1
 Chkd by: CRS

Drilling Co: Summit Geoengeering Services
 Driller: S. Floyd
 Summit Staff: C. Sullivan, E.I.

Boring Elevation: 193 ft +/-
 Reference: Estimated from Topographic Survey dated 2-3-23 by Gartley & Dorsky
 Date started: 6/8/2023 Date Completed: 6/8/2023

DRILLING METHOD	SAMPLER
Vehicle: AMS Track	Length: 24" SS
Model: 9580 VTR	Diameter: 2"OD/1.5"ID
Method: 3.5" Casing	Hammer: 140 lb
Hammer Style: Auto	Method: ASTM D1586

ESTIMATED GROUND WATER DEPTH			
Date	Depth	Elevation	Reference
6/8/2023	3.6 ft +/-	189 ft +/-	Measured in 10' of casing

Depth (ft.)	SAMPLER				Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	No.	Pen/Rec (in)	Depth (ft)	blows/6"				
1	S-1	24/19	0 - 2	5	192+/-	Brown Silty SAND, little Gravel, asphalt pieces from 0.4'-0.5', compact, damp, SM		GRANULAR FILL
2				7				
3	S-2	24/9	2 - 4	2	192+/-	Olive gray SILT, little Gravel, trace fine Sand & Clay, slightly mottled, stiff, damp, ML Olive gray SILT, trace Sand, Gravel, & Clay, slightly mottled, soft to firm, damp, ML	MC = 30.9%	1' +/- MISCELLANEOUS FILL (WITH ORGANICS)
4				2				
5				3				
6				1				
7	UT-1	30/9.5	5 - 7.5	PUSH				
8					183+/-	Olive brown-gray SILT-CLAY, little Sand & Gravel, frequent Organics, firm, moist, ML-CL		
9								
10								
11	S-4	24/24	10 - 12	3				
12				4	181+/-	End of Exploration at 12.2', Casing Refusal on Bedrock		10' +/- GLACIAL MARINE DEPOSIT
13				5				
14				6				
15					181+/-			12.2' +/- PROBABLE BEDROCK
16								
17								
18								
19								
20								
21								
22								

Granular Soils		Cohesive Soils		% Composition ASTM D2487	NOTES: PP = Pocket Penetrometer, MC = Moisture Content LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength Shallow = 0 to 35 degrees Dipping = 35 to 55 degrees Steep = 55 to 90 degrees Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200	Soil Moisture Condition
Blows/ft.	Density	Blows/ft.	Consistency			Dry: S = 0%
0-4	V. Loose	<2	V. soft	< 5% Trace	Humid: S = 1 to 25%	
5-10	Loose	2-4	Soft	5-15% Little	Damp: S = 26 to 50%	
11-30	Compact	5-8	Firm	15-30% Some	Moist: S = 51 to 75%	
31-50	Dense	9-15	Stiff	> 30% With	Wet: S = 76 to 99%	
>50	V. Dense	16-30	V. Stiff		Saturated: S = 100%	
		>30	Hard			



SOIL BORING LOG

Boring #: **B-6**

Project: Public Safety Building
 Location: 273 Main Street
 City, State: Belfast, Maine

Project #: 23099
 Sheet: 1 of 1
 Chkd by: CRS

Drilling Co: Summit Geoengineering Services
 Driller: S. Floyd
 Summit Staff: C. Sullivan, E.I.

Boring Elevation: 196 ft +/-
 Reference: Estimated from Topographic Survey dated 2-3-23 by Gartley & Dorsky
 Date started: 6/8/2023 Date Completed: 6/8/2023

DRILLING METHOD		SAMPLER	
Vehicle: AMS Track	Length: 24" SS		
Model: 9580 VTR	Diameter: 2"OD/1.5"ID		
Method: 2-1/4" HSA	Hammer: 140 lb		
Hammer Style: Auto	Method: ASTM D1586		

ESTIMATED GROUND WATER DEPTH			
Date	Depth	Elevation	Reference
6/8/2023	3.1 ft +/-	193 ft +/-	Measured in 15' of augers

Depth (ft.)	DRILLING METHOD				Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	No.	Pen/Rec (in)	Depth (ft)	blows/6"				
1	S-1	24/13	0 - 2	2	193 +/-	Dark brown fine Sandy SILT, rootlets, soft, damp, ML		TOPSOIL
				4		Brown Silty SAND, trace Gravel, loose, damp, SM		0.2' +/-
				5		Gray SILT, trace fine Sand & Gravel, little Clay, slightly mottled, stiff, damp, ML		0.5' GLACIAL MARINE DEPOSIT (PORTIONS REWORKED)
2				4		Same as above, occasional wood fibers, firm, moist, ML		
	S-2	24/14	2 - 4	1		Olive gray-gray Silty medium-fine SAND, little Gravel, loose, moist, SM		2.5' +/-
3				3				
				4		Olive gray Silty CLAY, little Gravel, trace fine Sand, firm, moist, CL	PP = 4,000 psf to 5,000 psf	2.9' +/-
4				3				
5								
	S-3	24/14	5 - 7	1		Same as above, wet, soft to very soft, CL		
6				1		Olive gray Silty CLAY, trace fine Sand, soft, wet, CL	PP = 3,000 psf to 4,000 psf	5.3' +/-
				1				
7				4				
	S-4	24/14	7 - 9	2		Gray SILT, little to some fine Sand, little Gravel, crushed cobbles, slightly mottled, firm to stiff, wet, ML		7' +/- GLACIAL TILL
8				3				
				5				
9				7				
10								
	S-5	24/15	10 - 12	3		Same as above, wet, very stiff, ML		
11				6		Orange brown Sandy GRAVEL, some Silt, gray slatey rock in spoon tip, heavily mottled, compact, wet, GM		11' +/-
				16				
12				32				
13								
14								
15								
	S-6	3/3	15 - 15.3	50/3"		Weathered gray slatey rock fragments		
16						End of Exploration at 15.3', Refusal on Bedrock		15.3' +/- BEDROCK
17								
18								
19								
20								
21								
22								

Granular Soils		Cohesive Soils		% Composition ASTM D2487	NOTES: PP = Pocket Penetrometer, MC = Moisture Content LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength Shallow = 0 to 35 degrees Dipping = 35 to 55 degrees Steep = 55 to 90 degrees Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200	Soil Moisture Condition Dry: S = 0% Humid: S = 1 to 25% Damp: S = 26 to 50% Moist: S = 51 to 75% Wet: S = 76 to 99% Saturated: S = 100%
Blows/ft.	Density	Blows/ft.	Consistency			
0-4	V. Loose	<2	V. soft			
5-10	Loose	2-4	Soft	< 5% Trace		
11-30	Compact	5-8	Firm	5-15% Little		
31-50	Dense	9-15	Stiff	15-30% Some		
>50	V. Dense	16-30 >30	V. Stiff Hard	> 30% With		



SOIL BORING LOG

Boring #: **B-7**
 Project #: 23099
 Sheet: 1 of 1
 Chkd by: CRS

Drilling Co: Summit Geoengeering Services Boring Elevation: 195 ft +/-
 Driller: S. Floyd Reference: Estimated from Topographic Survey dated 2-3-23 by Gartley & Dorsky
 Summit Staff: C. Sullivan, E.I. Date started: 6/8/2023 Date Completed: 6/8/2023

DRILLING METHOD		SAMPLER		ESTIMATED GROUND WATER DEPTH			
Vehicle: AMS Track	Length: 24" SS	Date	Depth	Elevation	Reference		
Model: 9580 VTR	Diameter: 2"OD/1.5"ID	6/8/2023	8 ft +/-	187 ft +/-	Measured in 15' of augers		
Method: 2-1/4" HSA	Hammer: 140 lb						
Hammer Style: Auto	Method: ASTM D1586						

Depth (ft.)					Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	No.	Pen/Rec (in)	Depth (ft)	blows/6"				
	SP-1	12/12	0 - 1	PUNCH		6" Bituminous Pavement		PAVEMENT
1				↓	195+/-	Brown medium to fine SAND, little Silt and Gravel, compact, damp, SP-SM Gray SILT, little fine Sand and Gravel, trace Clay, pushed cobble in spoon tip, firm to stiff, damp, ML Cobble/boulder at 2' based on drilling resistance Offset 2' North Olive gray Silty CLAY, trace to little Sand, soft to firm, moist to wet, CL	PP = 3,000 psf to 5,000 psf	0.5' +/- GLACIAL MARINE DEPOSIT (PORTIONS REWORKED)
	S-1	11/8	1 - 1.9	5				
2				50/5"				
3								
4								
5								
6	S-2	24/14	5 - 7	1				
7				1				
8				6				
9								
10								
11	S-3	24/15	10 - 12	16	185+/-	Olive brown SILT, little to some Gravel, little Sand, slightly-moderately mottled, weathered rock fragments at 11'+/-, hard, wet, ML		10' +/- GLACIAL TILL
12				46				
13				49	183+/-	End of Exploration at 12', Auger Refusal on Bedrock		12' +/- BEDROCK
14				50/3"				
15								
16								
17								
18								
19								
20								
21								
22								

Granular Soils		Cohesive Soils		% Composition ASTM D2487	NOTES: PP = Pocket Penetrometer, MC = Moisture Content LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength Shallow = 0 to 35 degrees Dipping = 35 to 55 degrees Steep = 55 to 90 degrees Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200	Soil Moisture Condition Dry: S = 0% Humid: S = 1 to 25% Damp: S = 26 to 50% Moist: S = 51 to 75% Wet: S = 76 to 99% Saturated: S = 100%
Blows/ft.	Density	Blows/ft.	Consistency			
0-4	V. Loose	<2	V. soft			
5-10	Loose	2-4	Soft	< 5% Trace		
11-30	Compact	5-8	Firm	5-15% Little		
31-50	Dense	9-15	Stiff	15-30% Some		
>50	V. Dense	16-30	V. Stiff	> 30% With		
		>30	Hard			

APPENDIX C
LABORATORY TEST RESULTS



THIN WALLED TUBE SAMPLING - ASTM D1587

PROJECT NAME: Public Safety Building
PROJECT LOCATION: 273 Main Street, Belfast, Maine
COLLECTION DATE: 6/8/2023
TEST DATE: 6/14/2023

PROJECT #: 23099
CLIENT: City of Belfast
SAMPLE #: UT-1
TECHNICIAN: Katie Luce

Test Boring Information

Boring Number: B-5
Drilling Method: Direct Push
Drilling Tooling: 3-inch Casing
Sampling Method: Tube Push

Sample Information

Tube Length: 30"
Recovery: 9.5"
Tube Diameter: 2.5"
Depth: 5' - 7.5'

Trial / Specimen Number	Moisture Content	Unit Weight	Torvane
1	30.1%	112 pcf	600 psf
2	33.2%	109 pcf	500 psf
3	29.5%	113 pcf	400 psf
Average	30.9%	111 pcf	500 psf

Visual Description (ASTM D2488):

Olive brown to gray SILT-CLAY, little Sand & Gravel, frequent Organics, firm, moist, ML-CL



Photograph of cross sectional sample view.



Photograph of longitudinal sample view.

REMARKS:

Reviewed By: CRS



GRAIN SIZE ANALYSIS - ASTM D6913

PROJECT NAME: Public Safety Building
 PROJECT LOCATION: 273 Main Street, Belfast, Maine
 CLIENT: City of Belfast
 TECHNICIAN: Katie Luce
 SOIL DESCRIPTION: SAND, some Silt and Gravel, SM

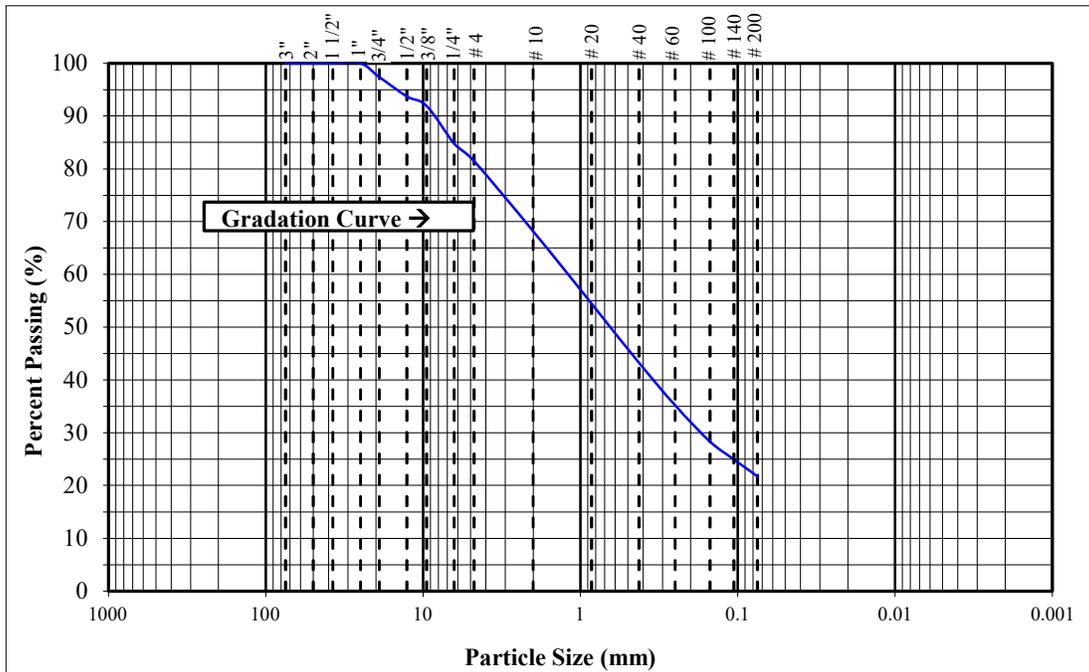
PROJECT #: 23099
 EXPLORATION #: B-4
 SAMPLE #: S-1
 SAMPLE DEPTH: 0' - 2'
 TEST DATE: 6/21/2023

TEST PROCEDURE

Sample Source: Split Spoon	Sieve Stack: Composite	Specimen Procedure: Air Dry
Test Method: Method A	Separating Sieve(s): 3/8 Inch	Dispersion Type: (NaPO ₃) ₆ Solution

DATA

<u>STANDARD SIEVE</u> <u>DESIGNATION (mm)</u>	<u>ALTERNATIVE SIEVE</u> <u>DESIGNATION (in)</u>	<u>PERCENT</u> <u>PASSING</u> <u>(%)</u>
75	(3 in)	100
50	(2 in)	100
37.5	(1-1/2 in)	100
25.0	(1 in)	100
19.0	(3/4 in)	97
12.7	(1/2 in)	94
9.5	(3/8 in)	92
6.35	(1/4 in)	85
4.75	(No. 4)	81
2.00	(No. 10)	68
0.850	(No. 20)	54
0.425	(No. 40)	43
0.250	(No. 60)	35
0.150	(No. 100)	28
0.106	(No. 140)	25
0.075	(No. 200)	22



REMARKS: Moisture Content = 13.6%

Reviewed By: CRS