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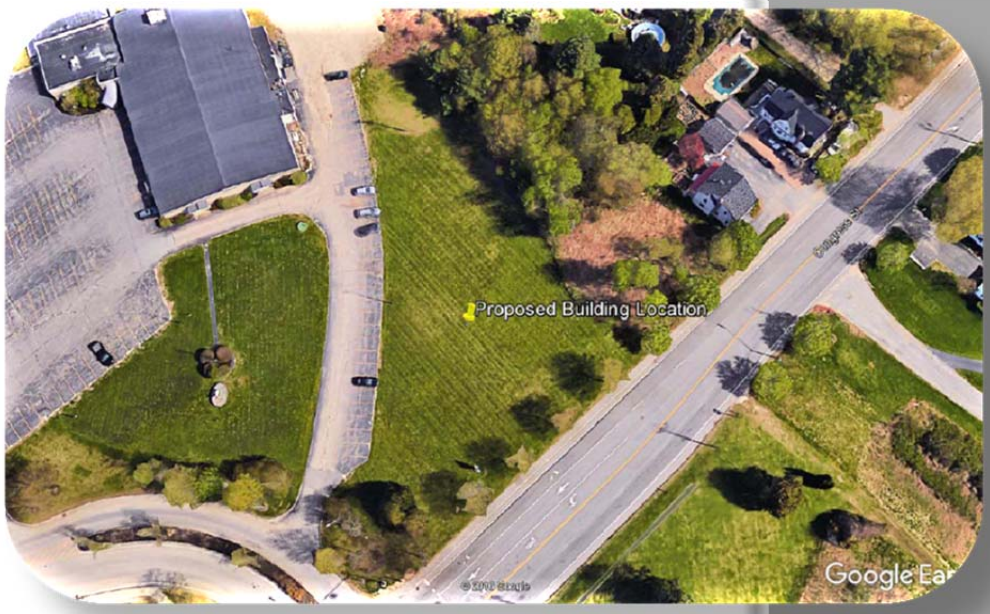
Geotechnical Report

Proposed Medical Building

1945 Congress Street, Portland, Maine



Client

Michael Bedecs, D.O.
Age Management Center
1375 Congress Street
Portland, ME 04101

SUMMIT
GEOENGINEERING SERVICES

145 Lisbon Street (PO Box 7216) Lewiston, Maine 04243 | (207) 576-3313
173 Pleasant Street Rockland, Maine 04841 | (207) 318-7761
www.summitgeoeng.com

Project #: 16092
Date: 10/17/2016

October 17, 2016
Summit #16092

Age Management Center
Attn: Michael Bedecs, D.O.
1375 Congress Street
Portland, ME 04101

Reference: Geotechnical Engineering Services
Proposed Medical Building – 1945 Congress St, Portland, Maine

Dear Dr. Bedecs;

Summit Geoengineering Services, Inc. (SGS) has completed a geotechnical investigation for the proposed medical building at the site referenced above. Our scope of services included the drilling of two test borings and performing two cone penetration tests (CPT) in and around the proposed building footprint and preparing this geotechnical report summarizing our findings and providing geotechnical recommendations.

Our scope of services for this project did not include an environmental site assessment or further investigation for the presence or absence of hazardous or toxic material on, below, or around the site. Any statements in this report, or on the soil boring logs, regarding odors or unusual and suspicious conditions observed are for informational purposes and are not intended to constitute an environmental assessment.

1.0 Project and Site Description

We understand the project consists of the construction of a new medical office building at the site referenced above. We further understand that the proposed building will be a three story wood framed structure with a footprint of approximately 7,900 square feet containing a partial basement. The east portion of the proposed building will be a slab on grade. Finish floor elevation (FFE) for the basement will be approximately elevation 67 feet and FFE for the slab on grade will be approximately 75 feet.

The site is located at the existing grass/lawn area southeast of the Elk's Lodge building at 1945 Congress Street in Portland, Maine. Grades are relatively flat in this area, ranging from approximately elevation 70 feet to 75 feet, increasing in elevation in an easterly direction. We anticipate up to 2 feet of fill will be required for the exterior of the west end of the building, and up to 7 feet of cut will be required for construction of the basement. The slab-on-grade for the east portion of the building will be approximately at existing grade. Based on discussions with Structural Integrity, Inc., we understand that the column loads will be a maximum of approximately 50 kips and linear loads will be a maximum of approximately 3 kips/ft.

2.0 Subsurface Exploration and Laboratory Testing

2.1 Subsurface Exploration

Summit Geoengineering Services (SGS) observed the subsurface conditions with the drilling of 2 test borings and 2 cone penetration tests (CPT) on July 6, 2016 using a track mounted AMS Power Probe 9500 VTR rig. Refusal was encountered in Boring B-2, CPT-1, and CPT-2 at depths of 72.5 feet, 34.1 feet, and 38.9 feet respectively. Boring B-1 was advanced to a depth of 22 feet without refusal. Refusal at the CPT-2 location was likely due to a dense gravel layer or cobble.

The borings were advanced using 3" diameter direct push steel casing. During the borings, split spoon sampling was conducted in general accordance with ASTM D1586 at 5 foot intervals. In situ field vane shear testing was performed in Boring B-2 at a depth of 18 feet. In Boring B-2, the borings were advanced using a direct push spear-tip probe.

The CPT explorations were performed in accordance with ASTM D5778 using a Vertek 5 ton digital cone pushed at a constant rate (2 cm/s) with dual-point anchors set at a depth of 1 feet. Measured parameters included cone resistance (q_c), sleeve friction (f_s), and piezocone pore pressure (u_2). Seismic shear wave velocity measurements were collected at discrete intervals of 3.28 feet (1 meter rod breaks) in accordance with ASTM D7400 during both CPTs.

The explorations were located prior to their completion by taping from existing site features. The approximate locations of the borings and CPT are shown on the Exploration Location Plan in Appendix A. Boring Logs and the CPT Logs are provided in Appendix B.

2.2 Laboratory Testing

Laboratory testing was performed on samples of clay recovered from the split spoons collected during the borings. Laboratory testing consisted of the following:

- (3) Moisture Content Tests (ASTM D2216/D4643)
- (1) Atterberg Limit Test (ASTM D4318)

Moisture content tests were performed on three split spoon samples from Boring B-2, ranging in depth from 10 feet to 22 feet below ground surface. The Atterberg Limit was performed on sample S-4 (15 ft. to 17 ft. depth) from Boring B-2. Result from the laboratory tests are summarized below. Detailed results of each test are included in Appendix C.

Presumpscot Formation (Clay):

Moisture Content: 21.8% to 43.4% (average of 33.3%)
Liquid Limit: 40, Plasticity Index: 18

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3.0 Subsurface Conditions

The subsurface conditions presented herein are based on the findings from the test borings and CPTs performed by SGS on July 6, 2016.

3.1 Soil

The following subsurface layers and thicknesses were encountered in our geotechnical investigation, starting from the ground surface:

- ***Topsoil,*** 8 inches to 1 foot
- ***Fill,*** 2.0 feet
- ***Glacial Marine,*** greater than 19 feet to 69 feet

The ***Topsoil*** was encountered in both borings and ranged in thickness from 8 inches to 1 foot. This soil is described as dark brown fine silty sand with some rootlets and visually classifies as SM in accordance with the United Soil Classification System (USCS).

The ***Fill*** is located beneath the topsoil and is approximately 2 feet thick. The soil in this layer is described as dark brown sandy silt and visually classifies as SM in accordance with the USCS. Standard Penetration Testing blow counts (SPT-N) values for the layer ranged from 12 bpf to 26 bpf and averaged at 17 bpf. This soil is dry and compact.

The ***Glacial Marine*** deposit is located beneath the fill layer and extends to bedrock. The composition of the glacial marine deposit varies across the proposed building footprint, generally consisting of granular (sand/silt) material towards the east end of the building, and consisting of primarily cohesive (clay) soil towards the west end of the building.

The glacial marine deposit at the east end of the building (Boring B-1) is described as olive brown to brown silt with little to some sand, trace to little clay, and trace to little gravel. Pocket penetrometer readings (an approximate measurement of unconfined compressive strength) of samples recovered in Boring B-1 range from 3,000 psf to 6,000 psf. SPT-N in the layer ranges from 9 to 28 and average 19 blows per foot. This soil visually classifies as ML in accordance with USCS.

The glacial marine deposit towards the west end (Boring B-2 and CPT-2) consists of approximately 10 feet of stiff silty clay (down to approximate elevation 56 feet), overlying approximately 15 feet of soft silty clay. Below the silty clay is interbedded with sand and silt to refusal depths ranging from 34.1 feet to 72.5 feet. The upper stiff clay “crust” ranges in Pocket Penetrometer measurements from 3,500 psf to 5,000 psf. SPT-N ranges from 13 to 7 and averages 10 blows per foot. It is described as firm to stiff olive brown silty clay with trace sand and gravel. The lower soft clay deposit ranges in Pocket Penetrometer measurements from 0 to 1,000 psf, ranges in SPT-N from 0 to 2 blows per foot, and resulted in a field vane measurement of 600 psf at 18 foot depth. Moisture content ranges from 21.8% to 43.4% with an average of

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33.3%. The clay has a Liquid Limit (PL) of 40 and a Plasticity Index (PI) of 18. The stiff clay and soft clay both visually classify as CL in accordance with USCS.

3.2 Bedrock

Bedrock was encountered at the B-2 location at a depth of 72.5 feet. Mapping by the Maine Geological Survey indicates the bedrock at the site is of the Precambrian Z Spring Point Formation consisting of green schist and amphibolites facies ranging from mafic to felsic volcanic rock.

3.3 Groundwater

Groundwater was encountered at depths ranging from 8.0 feet to 11.9 feet. Slight mottling was observed in both borings between 5 and 7 feet. Mottling can indicate a temporary rise in the groundwater level during periods of heavy rainfall. The table below summarizes the groundwater depths and corresponding elevation interpreted from the site plan.

GROUNDWATER DEPTHS/ELEVATIONS		
Exploration	**Groundwater Depth (ft.)**	**Groundwater Elevation (ft.)**
B-1	10.6 ft.	64.2 ft. +/-
B-2	11.9 ft.	57.9 ft. +/-
CPT-1	10.5 ft.	61.6 ft. +/-
CPT-2	8.0 ft.	61.8 ft. +/-

Note: All elevations are interpreted from the site plan.

4.0 Geotechnical Evaluation

The primary geotechnical concern for the proposed medical office building is the foundation's susceptibility to total and differential settlements due to the variable soil conditions throughout the building footprint and the soft soils underneath the west end of the proposed building. To minimize these settlements, we have provided subgrade preparation recommendations (Section 5.0) to keep settlement magnitudes within tolerable limits.

5.0 Foundation Recommendations

The recommendations provided herein apply to the foundation for the proposed medical office building.

5.1 Foundation Bearing Pressure

Assuming that the recommendations from this report are followed, the proposed building can be supported using conventional spread footings proportioned with an allowable bearing pressure of 3,000 psf. We anticipate that footings will be supported on native sandy silt or

clayey silt soil. If the recommendations provided below are followed, we anticipate that post construction total settlement to be less than 1 inch and differential settlement within the building will be less than a deflection of 1/300 (δ/L deflection divided by span length) between column footings.:

- All topsoil is removed from within the proposed building footprint prior to excavation of the basement.
- All interior or exterior footings exposed to freezing temperatures are constructed at the recommended frost protection depth of 4' below exterior finish grade or finish floor elevation. Interior footings in heated areas are constructed 2' below finish floor elevation
- If soft or unsuitable soil is encountered at the bottom of the excavation, it is removed and replaced with ¾" crushed stone prior to proofrolling. If a significant amount of soft/unsuitable soils are encountered, SGS should be notified.
- If the exposed soil at the bottom of footing trenches is granular (silt/sand/gravel), it is proofrolled with a minimum of 4 passes with a large plate compactor or vibratory roller. All proofrolling should be performed on dry, unfrozen soils.
- If the exposed soil is cohesive (clay), proofrolling is not strictly necessary. For this condition, we recommend that excavations be performed using a smooth-edged bucket.

5.2 Frost Protection

The design air freezing index for the Portland area is approximately 1,200 degree F days (10 year, 90% probability). Based on this, a total of 4 feet of frost protection should be provided for footings exposed to freezing temperatures.

The exterior of all foundation elements should be backfilled with FB. The portion of FB passing the 3" sieve size should meet the following gradation requirements:

FOUNDATION BACKFILL	
Sieve Size	**Percent Finer**
3 inch	100
¼ inch	25 to 100
No. 40	0 to 50
No. 200	0 to 7

Reference: MDOT Specification 703.06, Type E (2014)

Maximum particle size should be limited to 6 inches. Foundation backfill should be placed in 6 to 12 inch lifts and compacted to 90% of its optimum dry density determined in accordance with ASTM D1557. The compaction requirement for FB should be increased to 95% for the slab-on-grade foundation areas beneath pavement.

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5.3 Seismic Design

The soil profile at the site was evaluated for seismic site class using data from the cone penetration tests (CPT-1 and CPT-2) conducted with shear wave velocity testing as follows:

- Average shear wave velocity (V_s) of CPT-1 = 925 ft/sec
- Average shear wave velocity (V_s) of CPT-2 = 900 ft/sec

Based on the summary of field and laboratory testing, we recommend Site Class D be used in accordance with the 2012/2015 International Building Code. The following seismic site coefficients should be used:

SEISMIC DESIGN COEFFICIENTS – 2012/2015 IBC	
Seismic Coefficient	**Site Class D**
Short period spectral response (S_S)	0.244
1 second spectral response (S_1)	0.079
Maximum factored spectral response (S_{MS})	0.391
1 second factored spectral response (S_{M1})	0.189
Design short period spectral response (S_{DS})	0.261
Design 1 second spectral response (S_{D1})	0.126

Soils susceptible to liquefaction were not encountered at the site.

5.4 Groundwater Control

On the day of the explorations, groundwater was observed between 8.0 feet and 11.9 feet below ground surface, ranging in approximate elevations of 57.9 feet to 64.2 feet. Based on this, groundwater is anticipated to rise to or above proposed footing elevation for the basement.

To keep the basement area dry to and to preclude uplift pressure on the basement slab, groundwater should be kept at or below the bottom of footing elevation. We recommend that perimeter foundation underdrains be included along all basement foundation walls. Underdrains are not strictly necessary for the foundations walls of the slab-on-grade area. We recommend that underdrains consist of 6-inch diameter, perforated PVC pipe surrounded by a minimum of 6 inches of crushed stone wrapped in filter fabric. The underdrains should be placed at the base of the foundation and outlet to a free draining location or pumped if necessary.

5.5 Slab-on-Grade

Based on a finish floor elevation of 67 feet for the basement slab and 75 feet for the first floor slab on grade, approximately 3 to 8 feet of cut will be required to construct the basement slab

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and the first floor slab will be at or near existing grade. We anticipate that a combination of existing fill and glacial marine soil (stiff clayey silt and sandy silt) will be exposed in the slab excavations. Assuming that the slab areas are continuously heated (above freezing temperature), we recommend that the slab be constructed on a minimum of 12" of Structural Fill or ¾" crushed stone. The subgrade beneath the SF or ¾" crushed stone should be compacted with a minimum of 6 passes in each of 2 perpendicular directions with a 10 ton minimum (operating) weight vibratory roller if the exposed material is granular. If the exposed soil is cohesive, the roller should be operated in static mode. If ¾" crushed stone is placed on top of clayey soils, a separation geotextile (such as Mirafi 140N) should be placed on the subgrade prior to installing the stone. Any soft or unsuitable soil exposed in the slab excavation should be removed and replaced with compacted SF or ¾" crushed stone.

The portion of SF passing the 3" sieve shall meet the following gradation requirements:

STRUCTURAL FILL (SF)	
Sieve Size	**Percent finer**
3 inch	100
½ inch	35 to 80
¼ inch	25 to 65
No. 40	0 to 30
No. 200	0 to 7

Reference: MDOT Specification 703.06, Type D

The maximum particle size should be limited to 6 inches. Structural Fill should be placed in 6 to 12 inch lifts and should be compacted to a minimum of 95 percent of its maximum dry density, determined in accordance with ASTM D1557. For the conditions described above, the garage and basement slabs can be designed using a subgrade modulus value of 175 pci.

Exterior concrete slabs should be constructed on a minimum of 30" of Structural Fill (SF). Soil exposed in the excavation below the SF for the exterior slabs should be proofrolled with a minimum of 6 passes in each of two perpendicular directions with a 10 ton minimum (operating weight) roller. Any exposed soft or unsuitable soil should be removed and replaced with ¾" crushed stone or compacted SF. Exterior slabs attached to the building should be constructed on frost wall foundations to preclude differential movement between the building threshold and entry pads, which could block doors.

5.6 Retaining Wall Design Parameters

Based on the subgrade preparation recommendations provided in Section 5.1, native glacial marine soil can be assumed to be at the bottom of the footing and Foundation Backfill (FB) can be assumed to be the soil on the exterior of the foundation wall. The gradation requirements for FB are presented in Section 5.2.

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The following soil parameters can be used for the structural design of the foundation:

Foundation Backfill (FB):

Active Equivalent Fluid Pressure (free at top): 40 psf/ft
At-Rest Equivalent Fluid Pressure (fixed at top): 60 psf/ft
Passive Equivalent Fluid Pressure: 400 psf/ft
Unit Weight: 130 pcf
Internal Friction Angle: 30^{o}

Glacial Marine Soil:

Friction Coefficient: 0.45
Unit Weight: 125 pcf
Passive Equivalent Fluid Pressure: 350 psf/ft
Cohesion: 0 psf

These values assume that groundwater is controlled at the base of the wall with a continuous underdrain pipe as described in Section 5.4. We recommend that foundation walls be backfilled with FB meeting the gradation requirements presented in Section 5.2. FB should be compacted to a minimum of 90% to 95% of its maximum dry density in accordance with ASTM D1557 (See Section 5.2).

6.0 Earthwork Considerations

The existing fill soils (sand, silt) are classified as OSHA Type C soil. The native glacial marine is classified as OSHA Type B soil. Based on this, general excavations less than a depth of 20 feet are limited to a maximum side slope of 1.5 horizontal to 1 vertical in the existing fill soil and to a maximum slope of 1.0 horizontal to 1 vertical in the native glacial marine soil.

Excavations within the existing fill soil or native glacial marine deposit may be susceptible to subgrade softening when exposed to excessive surface water or groundwater. Surface water should be redirected from excavation areas. Where softened, we recommend the subgrade at the base of the excavation be over-excavated and replaced with a minimum of 12 inches of Crushed Stone. Crushed Stone should meet the following gradation specification:

CRUSHED STONE ¾ INCH	
Sieve Size	**Percent finer**
1 inch	100
¾ inch	90 to 100
½ inch	20 to 55
⅜ inch	0 to 15
No. 4	0 to 5

Reference: MDOT Specification 703.13, Crushed Stone ¾-Inch (2014)

If ¾" crushed stone is placed on top of clayey soils, a separation geotextile (such as Mirafi 140N) should be placed on the subgrade prior to installing the stone. Crushed Stone should be should be tamped to lock the stone structure together.

In general, we do not anticipate groundwater within footing excavations. If localized perched groundwater is encountered, dewatering may consist of shallow sumps at the base of the excavation. Diversion and control of surface water should be performed to prevent water flow from rain or snowmelt from entering the excavations.

We recommend that a qualified geotechnical consultant be retained to monitor and test soil materials used during construction and confirm that soil conditions and construction methods are consistent with this report.

7.0 Closure

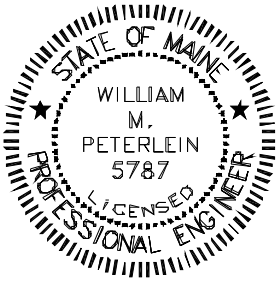
Our recommendations are based on professional judgment and generally accepted principles of geotechnical engineering and project information provided by others. Some changes in subsurface conditions from those presented in this report may occur. Should these conditions differ materially from those described in this report, SGS should be notified so that we can re-evaluate our recommendations.

It is recommended that this report be made available in its entirety to contractors for informational purposes and be incorporated in the construction Contract Documents. We recommend that SGS be retained to review final construction documents relevant to the recommendations in this report.

We appreciate 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.

Sincerely,
Summit Geoengineering Services, Inc.

Mathew Hardison, EI
Geotechnical Engineer



William M. Peterlein, PE
President & Principal Engineer

APPENDIX A

EXPLORATION LOCATION PLAN

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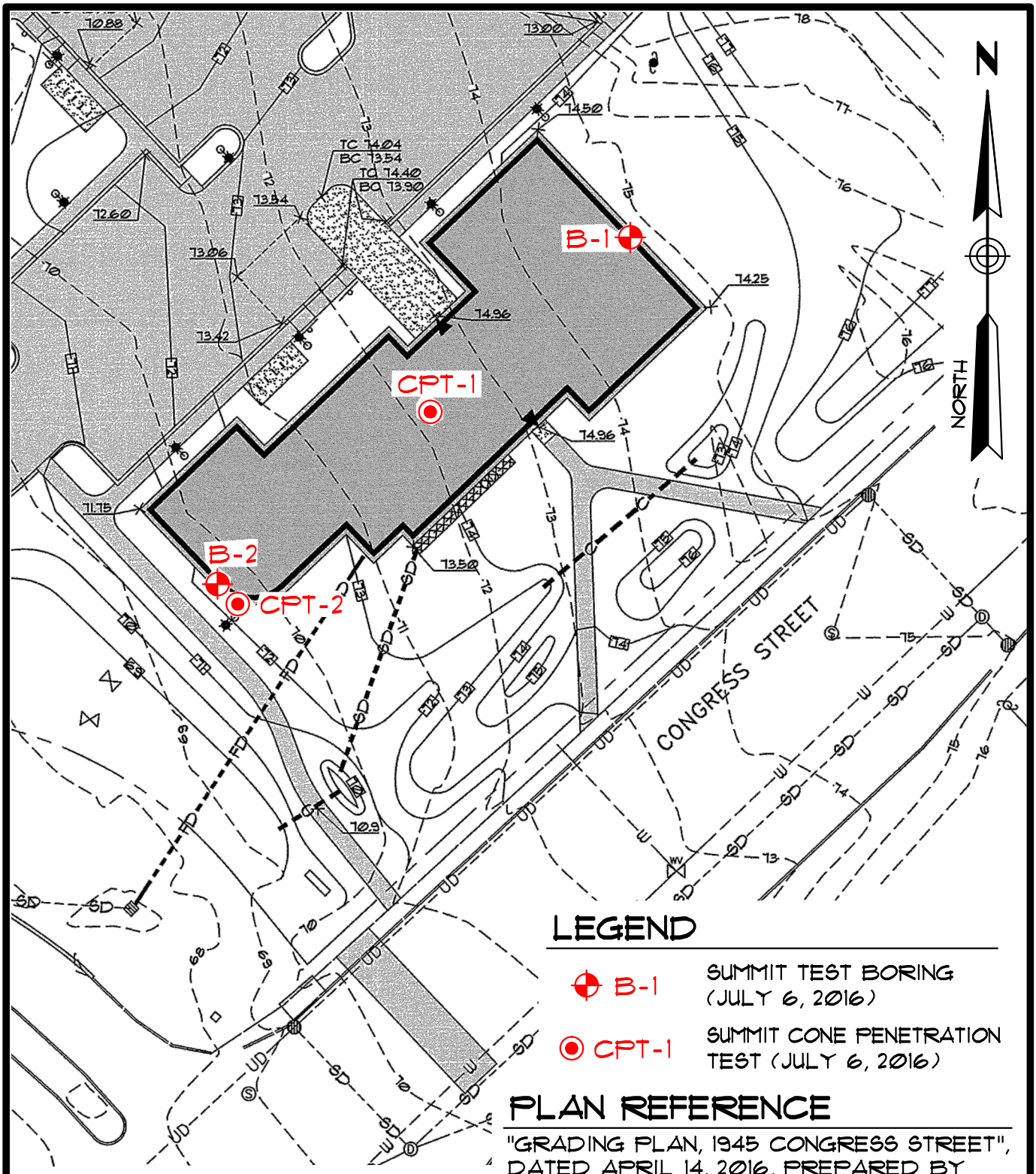

LEGEND

B-1	SUMMIT TEST BORING (JULY 6, 2016)
CPT-1	SUMMIT CONE PENETRATION TEST (JULY 6, 2016)

PLAN REFERENCE

"GRADING PLAN, 1945 CONGRESS STREET", DATED APRIL 14, 2016, PREPARED BY PINKHAM & GREER CIVIL ENGINEERING.

EXPLORATION LOCATION PLAN
NEW MEDICAL OFFICE BUILDING

1945 CONGRESS STREET - PORTLAND, MAINE

PREPARED FOR

MICHAEL BEDECS

DATE: 10-14-2016	DRAWN BY: KRF	CHECKED BY: WMP
JOB: 16092	SCALE: 1" = 40'	FILE: 16092 BOR

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APPENDIX B

EXPLORATION LOGS

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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:

SS = Split Spoon Sample
UT = Thin Wall Shelby Tube
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RW = Rotary Wash
SV = Shear Vane
PP = Pocket Penetrometer
RC = Rock Core Sample
FV = Field Vane Shear Test
PS = Concrete Punch Sample
Hyd = Hydraulic Advancement of Drilling Rods
Push = Direct Push of Drilling Rods
WOH = Weight of Hammer
WOR = Weight of Rod
PI = Plasticity Index
LL = Liquid Limit
W = Natural Water Content
USCS = Unified Soil Classification System
Su = Undrained Shear Strength
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		

SUMMIT GEOENGINEERING SERVICES

SOIL BORING LOG

Boring #: **B-1**

Project:	Proposed Medical Building	Project #:	16092
Location:	1945 Congress Street	Sheet:	1 of 1
City, State:	Portland, Maine	Chkd by:	

Drilling Co:	Summit Geoengineering Services	Boring Elevation:	74.8 ft. +/-
Driller:	C. Coolidge, P.E.	Reference:	Topographic map by Pinkham and Greer Civil Engineers, dated 5/2016
Summit Staff:	P. Spicer, M. Hardison, E.I.	Date started: 7/6/2016	Date Completed: 7/6/2016

DRILLING METHOD		SAMPLER	
Vehicle:	Tracked	Length:	24" SS
Model:	AMS Power Probe	Diameter:	2"OD/1.5"ID
Method:	3" Casing	Hammer:	140 lb
Hammer Style:	Automatic	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
7/6/2016	10.6 ft.	64.2 ft. +/-	Measured after completion

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	blows/6"	Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	S-1	24/18	0 to 2	3		Dark brown fine Sandy SILT, some rootlets, trace		TOPSOIL
1				4	73.8'	Clay, loose, dry, SM		
				9		Same as above, compact, SM		FILL
2				13				
3					71.8'			
								GLACIAL MARINE
4								
5								
	S-2	24/20	5 to 7	12		Olive brown SILT, little Clay, Sand, and Gravel,	PP = 5,000 to	
6				13		slightly mottled, occasional Sand seams, compact,	6,000 psf	
				15		humid, ML		
7				16				
8								
9								
10								
	S-3	24/24	10 to 12	4		same as above, trace Clay, loose to compact, moist,	PP = 4,000 to	
11				6		wet starting at 11.2' depth, ML	5,000 psf	
				3				
12				4				
13								
14								
15								
	S-4	24/18	15 to 17	2		Brown Sandy SILT, little Gravel, trace Clay, loose,		
16				3		wet, ML		
				11				
17				20				
						Likely cobble @ 17', dense drilling		
18								
19								
20								
	S-5	24/24	20 to 22	10		Brown Sandy SILT, little Gravel, trace Clay,	PP = 3,000 to	
21				10		compact, wet, ML	6,000 psf	
				13				
22				12	53'			
						End of boring at 22', no refusal		

Granular Soils		Cohesive Soils		% Composition
Blows/ft.	Density	Blows/ft.	Consistency	ASTM D2487
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	

NOTES: PP = Pocket Penetrometer, MC = Moisture Content
LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test
Bedrock Joints 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%

SUMMIT GEOENGINEERING SERVICES

SOIL BORING LOG

Boring #: **B-2**

Project: Proposed Medical Building | Project #: 16092
Location: 1945 Congress Street | Sheet: 1 of 1
City, State: Portland, Maine | Chkd by:

Drilling Co: Summit Geoengineering Services
Driller: C. Coolidge, P.E.
Summit Staff: P. Spicer, M. Hardison, E.I.

Boring Elevation: 69.8 ft. +/-
Reference: Topographic map by Pinkham and Greer Civil Engineers, dated 5/2016
Date started: 7/6/2016 Date Completed: 7/6/2016

DRILLING METHOD		SAMPLER	
Vehicle:	Tracked	Length:	24" SS
Model:	AMS Power Probe	Diameter:	2"OD/1.5"ID
Method:	3" Casing	Hammer:	140 lb
Hammer Style:	Automatic	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
7/6/2016	11.9 ft.	57.9 ft. +/-	Measured after completion

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	blows/6"	Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	S-1	24/12	0 to 2	1		Dark brown Sandy SILT, some rootlets, loose, dry,		TOPSOIL
1				3	68.8'	SM		
				6		Same as above, compact, SM		FILL
2				6				
3								
								GLACIAL MARINE
4								
5								
	S-2	24/18	5 to 7	3		Olive brown Silty CLAY, trace Sand and Gravel,	PP = 3,500 psf to	
6				6		slightly blocky, mottling, stiff, humid, CL	4,500 psf	
				7				
7				10				
8								
9								
10								
	S-3	24/24	10 to 12	3		Olive brown Silty CLAY, firm, moist, CL	PP = 3,000 psf to	
11				3			5,000 psf	
				4			(MC = 34.6%)	
12				4				
13								
14								
15								
	S-4	24/24	15 to 17	WOH		Gray Silty CLAY, soft, wet, CL	PP = 0 psf	
16				WOH			(MC = 43.4%)	
				WOH			LL = 40	
17				1			PI = 18	
18	FV1		17.5 to 18			Advanced field vane from 17.5' using hydraulic push		
						Su = 600 psf, Sur = 100 psf		
19								
20						19.8' push refusal for vane		
	S-5	24/24	20 to 22	0		Gray Silty fine SAND, little Clay, very loose, wet,	PP = 1,000 psf	
21				1		SM	(MC = 21.8%)	
				1				
22				2				
				PROBE		Probed to refusal	Dense drilling @ 60'	
73					-2.7'	Refusal @ 72.5', end of boring		

Granular Soils		Cohesive Soils		% Composition
Blows/ft.	Density	Blows/ft.	Consistency	ASTM D2487
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	

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

Bedrock Joints
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%

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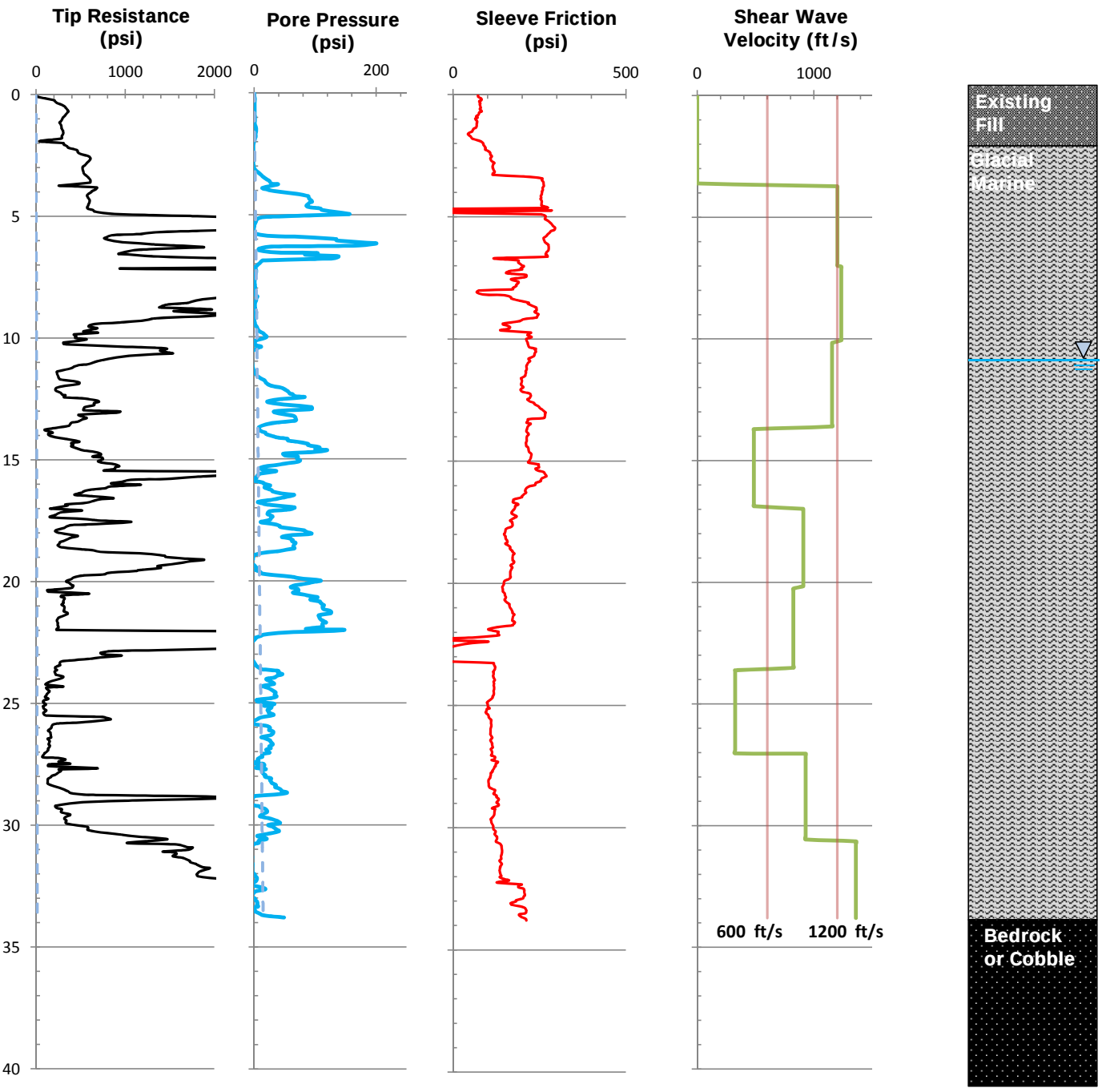
PIEZOCONE PENETRATION LOG

Test Number:	CPT-1		
Sheet:	1 of 1		
Project:	Proposed Medical Building	Project Number:	16092
Location:	1945 Congress Street	Method:	ASTM D5778
City, State	Portland, Maine	Weather:	90° Sunny

Cone ID:	Vertek #4544.101	Test Elevation:	72.1 ft. +/-
Cone Type:	VTK 5 Ton Digital Cone	Reference:	Topographic map by Pinkham and Greer Civil Engineers, dated 5/2016
Piezocone:	Silicone Single Filter	Date started:	7/6/2016 Date Completed: 7/6/2016
Push Rig:	AMS Power Probe 9500 VTR	ESTIMATED GROUND WATER DEPTH	
Anchor Style:	Dual Driven Anchors	Date / Depth / Elevation / Reference	
Performed By:	Craig Coolidge, P.E.	7/6/2016 / 10.5 ft. / 61.6 ft. +/- / Interpreted from pore pressure	



NOTES:

Soil Profile based on interpretation of CPT measurements and nearby borings

Shear Wave Velocity test (V_s) performed at 3.3 feet (1-meter) increments

Abrupt push refusal encountered at depth of 33.8 feet

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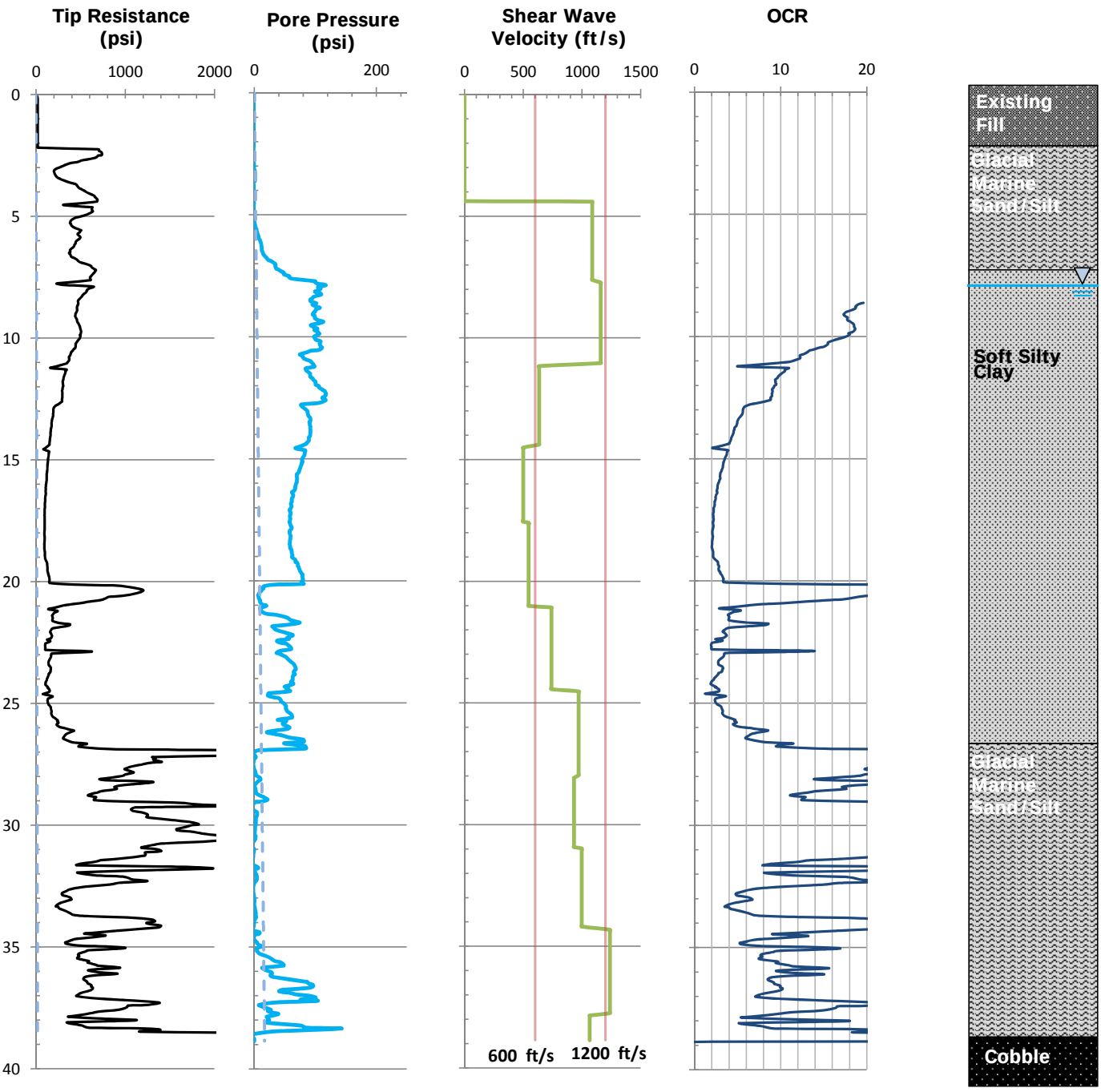
PIEZOCONE PENETRATION LOG

Test Number:	CPT-2		
Sheet:	1 of 1		
Project:	Proposed Medical Building	Project Number:	16092
Location:	1945 Congress Street	Method:	ASTM D5778
City, State	Portland, Maine	Weather:	90° Sunny

Cone ID:	Vertek #4544.101	Test Elevation:	69.8 ft. +/-
Cone Type:	VTK 5 Ton Digital Cone	Reference:	Topographic map by Pinkham and Greer Civil Engineers, dated 5/2016
Piezocone:	Silicone Single Filter	Date started:	7/6/2016 Date Completed: 7/6/2016
Push Rig:	AMS Power Probe 9500 VTR	ESTIMATED GROUND WATER DEPTH	
Anchor Style:	Dual Driven Anchors	Date / Depth / Elevation / Reference	
Performed By:	Craig Coolidge, P.E.	7/6/2016 / 8.0 ft. / 61.8 ft. +/- / Interpreted from pore pressure	



NOTES:

Soil Profile based on interpretation of CPT measurements and nearby borings
Shear Wave Velocity test (V_s) performed at 3.3 feet (1-meter) increments
OCR profile calculated using a k-valie of 0.30
Abrupt push refusal encountered at depth of 38.9 feet

APPENDIX C

LABORATORY TEST RESULTS

145 Lisbon Street (PO Box 7216) Lewiston, Maine 04243 | (207) 576-3313
173 Pleasant Street Rockland, Maine 04841 | (207) 318-7761
www.summitgeoeng.com

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Laboratory Determination of Water (Moisture) Content of Soil ASTM D2216 / D4643

PROJECT NAME:	Proposed Medical Building	PROJECT #:	16092
PROJECT LOCATION:	1945 Congress St, Portland, ME	DRYING METHOD:	Oven Dried
CLIENT:	Age Management Center	DESCRIPTION:	Glacial Marine Clay
SOURCE:	Boring B-2	TECHNICIAN:	Erika Stewart, E.I.
COLLECTION DATE:	07/06/16	TESTING DATE:	07/11/16

Location	Sample No.	Depth	Moisture Content	Remarks
B-2	S-3	10' - 12'	34.6%	Stiff Olive Clay
B-2	S-4	15' - 17'	43.4%	Gray Clay
B-2	S-5	20' - 22'	21.8%	Gray Clay w/ Sand & Gravel

REMARKS:

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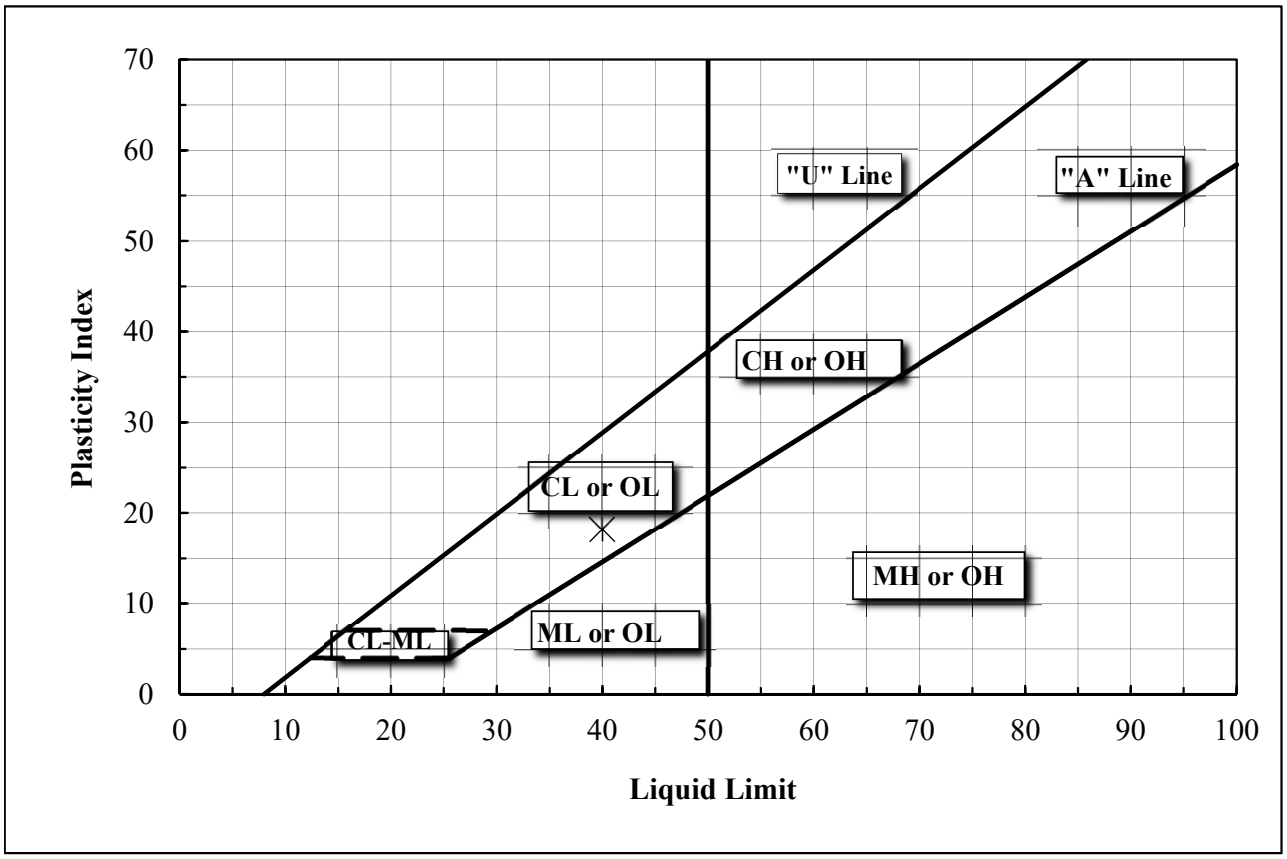
ATTERBERG LIMIT TEST - ASTM D4318

Method "A" (Multi-point)

PROJECT NAME:	Proposed Medical Building	PROJECT NUMBER:	16092
CLIENT:	Age Management Center	SAMPLE NUMBER:	B-2, S-4
SOURCE:	Boring B-2	DEPTH:	15' - 17'
DATE:	7/11/2016	TECHNICIAN:	Erika Stewart, E.I.

DATA

Source	Depth	LL	PL	PI	Classification
B-2	15' - 17'	40	22	18	Gray CLAY, CL



Notes: Moisture Content = 43.4%. Trace black organic streaks.