SUMMIT
GEOENGINEERING SERVICES

Geotechnical Report

UNE Dental School Building
Stevens Avenue
Portland, Maine

Prepared for:

University of New England

Prepared by:

Summit Geoengineering Services
Project #11296
January 2012

640 Main Street, Lewiston, Maine 04240, (207) 576-3313
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January 31, 2012
Summit #11296

Al Thibeau
University of New England
11 Hills Beach Road
Biddeford, Maine 04005

Reference: Geotechnical Investigation, Proposed Dental School Building
Stevens Avenue, Portland, Maine

Dear Al;

We have completed the geotechnical investigation for the proposed new dental school building at the Portland Campus. Our scope of services included performing 5 test borings at the site and preparing this report summarizing our findings and geotechnical recommendations.

1.0 Project Description

The project consists of the construction of a new building on the UNE campus at 750 Stevens Avenue in Portland. The building has a footprint of approximately 18,000 square feet. We understand that a parking level will be constructed beneath the building. The parking level will be at a depth of approximately 4 feet below the existing grade (elevation 23 feet +/-) and will have a paved surface. The location of the proposed building is currently occupied by three wood frame structures, two garages, parking lots, and lawns.

Column loads are estimated to range from 215 kips to 610 kips with a live load to dead load ratio of approximately 50% to 60%. Columns will be spaced from 15 to 35 feet.

2.0 Subsurface Exploration and Laboratory Testing

Summit Geoengineering Services (SGS) observed the subsurface conditions with the drilling of 5 borings on January 12, 2012. The borings were located by taping from existing buildings. Northern Test Borings, under contract to SGS, advanced the borings using 2¼-inch hollow stem augers. Two borings were performed to a depth of 22 feet and three borings were advanced to refusal, ranging from16.1 to 27.4 feet. Standard penetration tests (SPT) with split spoon samples were obtained at 5-foot intervals. A 1-inch diameter PCV groundwater observation well was installed in boring B-3.

Summit was onsite to coordinate and observe the boring explorations. The location of the borings is shown on Boring Location Plan in Appendix A. Logs of the explorations are included in Appendix B.

The sample taken at a depth of 5 to 7 feet in B-4 was tested for grain size analysis in accordance with ASTM 422. The results of this test are presented in Appendix A.

3.0 Subsurface Conditions

The subsurface conditions generally consist of ***topsoil*** overlying ***glacial marine deposits*** overlying ***glacial till*** explored to a depth of 16.8 to 27.4 feet. Bedrock was encountered at borings B-1, B-2, and B-4 at depths of 27.4 feet, 20.4 feet, and 16.8 feet, respectively. The subgrade is further described into 3 layers as follows:

The topsoil ranged from 6 to 12 inches in thickness consisting of dark brown silt with little sand and rootlets and is visually classified as ML in accordance with the Unified Soil Classification System (USCS). The topsoil was generally loose to compact and damp to frozen.

The glacial marine deposit consisted of light brown to tan medium-fine sand with a trace to little silt and is visually classified as SM or SP in accordance with the Unified Soil Classification System (USCS). The sample taken in B-4 at a depth of 5 to 7 feet contained 97.9% sand and 2.1% silt. This sample has a USCS classification of SP. SPT-N values for the sand ranged from 4 to 38 blows per foot (bpf) and averaged 20 bpf, indicating compact to dense conditions. The glacial marine deposits were generally damp.

The glacial till, encountered in B-1, B-2, and B-4, ranged from brown medium-fine to medium-coarse sand with little silt and gravel to brown silty clay with some sand and little gravel. The glacial till is visually classified as SM and CL in accordance with the Unified Soil Classification System (USCS). SPT-N values for the sand ranged from 54 to 62 blows per foot (bpf), indicating very dense / hard conditions. The glacial marine deposits were generally damp

Bedrock was encountered at borings B-1, B-2, and B-4 at depths of 27.4 feet, 20.4 feet, and 16.8 feet, respectively. Refusal was not encountered in the other explorations. Bedrock mapping by the Maine Geological Survey indicates the bedrock is part of the Berwick Formation consisting of fine-grained gray quartz-plagioclase biotite gneiss.

Groundwater was not observed in our explorations. Groundwater was measured at a depth of 20.3 feet in the observation well at B-3 on January 25, 2012.

4.0 Foundation Design Recommendations

Based on the proposed finished exterior grade (paved parking lot) and the required frost protection depth, the footings for the new building will be constructed on the native sandy glacial marine deposit. With proper preparation, this soil is suitable to support the proposed building on conventional spread footing foundations.

A. Allowable Bearing Pressure

We recommend that the foundations be designed using an allowable bearing pressure of 4,000 psf for interior and exterior isolated and continuous footings. For the proposed footing loads, the

total settlement associated with the above bearing pressure ranges from ½" to ¾". Due to the uniformity of the subsurface conditions, differential settlement will be negligible, on the order of 0.1%.

We recommend that the subgrade soil in the building footprint be prepared as follows:

- Remove topsoil, pavement, and existing building foundations in their entirety from within the building footprint. Voids left after the removal of existing foundations can be backfilled with the existing sandy glacial marine soil. This soil should be compacted to 95% of its maximum dry density where it is placed within the building footprint. Outside the building footprint the compaction requirement can be reduced to 90%.

- After removal and backfilling of removed foundations, the soil within the building footprint is proofrolled prior to excavating for the footings. Proofrolling should consist of making a minimum of 5 passes in 2 perpendicular directions using a large vibratory roller with a minimum operating weight of 10 tons.

- Exterior footings are constructed to a depth of 4 feet below exterior grade for frost protection.

- Footing trenches are excavated using a smoothed edge bucket to minimize disturbance to the native soil. The footing subgrade should be proofrolled to re-densify the disturbed soil. Proofrolling should consist of making a minimum of 5 passes using a large walk behind vibratory roller. Wet and soft areas, if encountered, should be removed and replaced with crushed stone.

We recommend the following parameters be used for the existing sandy glacial marine soil in the design of subsurface structures.

DESIGN PARAMETERS – EXISTING SANDY GLACIAL MARINE SOIL	
Total Natural (moist) Unit Weight (γ_t)	125 pcf
Saturated (buoyant) Unit Weight (γ_s)	63 pcf
Friction Coefficient (f)	0.45
Passive Earth Pressure Coefficient (K_p)	3.1
Active Earth Pressure Coefficient (K_a)	0.33
Friction Angle (f_c)	30^0
Cohesion (c)	0

B. 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, exterior footings on the existing granular fill soil should be constructed at a minimum depth of 4 feet below the exterior finished grade.

We recommend that the exterior of the foundation walls be backfilled with soil meeting the following gradation specification:

FOUNDATION BACKFILL (FB)	
Sieve Size	**Percent finer**
3 inch	100
¼ inch	60 to 100
No. 40	0 to 50
No. 200	0 to 7

Reference: MaineDOT Specification 703.06, Type F

The maximum particle size should be limited to 6 inches. The Foundation Backfill should be compacted to a minimum of 95 percent of its maximum dry density, determined in accordance with ASTM D1557. This compaction requirement can be reduced to 90% in landscaped areas.

The interior of foundation walls should be backfilled with Structural Fill as described below.

C. Building Slab

We recommend the building slab be constructed on a minimum 12-inch thick layer of Structural Fill (SF). The maximum particle size should be limited to 6 inches and meet the following gradation specifications passing the 3-inch sieve:

STRUCTURAL FILL (SF)	
Sieve Size	**Percent finer**
3 inch	100
1/4 inch	0 to 70
No. 200	0 to 10

Reference: MDOT Specification 703.20, Gravel Borrow

SF should be placed in 6 to 12-inch lifts and should be compacted to 95 percent of its maximum dry density determined in accordance with ASTM D1557.

An alternative is to construct the slab on 6 inches of ¾ inch crushed stone. The crushed stone can be placed directly on the proofrolled subgrade. It should be compacted using a vibratory roller sufficiently to lock the aggregate particles together.

For the conditions described above, the slab can be designed using a subgrade modulus of 175 pci.

We recommend the subgrade be proof-rolled as described in Section 4A of this report.

D. Groundwater Control

Groundwater was not observed in the explorations performed at the site. The water level was measured at a depth of 20.3 feet in the observation well at boring B-3 on January 25, 2012. This measurement was taken with an electronic depth meter. Based on this we anticipate that groundwater will be well below the bottom of the building footings and perimeter underdrains are not strictly necessary.

It is generally good practice to install underdrains to account for unanticipated changes in regional hydrogeology and to control potential infiltration of surface or roof runoff water into the foundation backfill. We recommend exterior grades slope away from the building footprint to reduce runoff water from infiltrating the Foundation Backfill.

Perimeter underdrains, if used, should consist of 4 inch rigid perforated PVC placed adjacent to the exterior footings and surrounded by a minimum of 6 inches of crushed stone wrapped in filter fabric to prevent clogging from the migration of the fine soil particles in the foundation backfill soils. The underdrain pipe should be outlet to a location where it will be free flowing. Where exposed at the ground surface, the ends of pipes should be screened or otherwise protected from entry and nesting of wildlife, which could cause clogging.

E. Seismic Design

Based on the depth to bedrock, the soil descriptions, and the blow counts obtained in the test borings, the soil at the site is classified as Seismic Site Class C in accordance with the International Building Code (IBC). We recommend the following seismic design coefficients be used:

SUBGRADE SITE SEISMIC DESIGN COEFFICIENTS - IBC	
Seismic Coefficient	**Site Class C**
Short period spectral response (S_S)	0.314
1 second spectral response (S_1)	0.077
Site coefficient (F_a)	1.2
Site Coefficient (F_v)	1.7
Design short period spectral response (S_{DS})	0.251
Design 1 second spectral response (S_{DS})	0.087

The sandy glacial marine are not susceptible to liquefaction based on their density.

5.0 Earthwork Considerations

Voids remaining after the removal of existing building foundations can be backfilled with the existing sandy glacial marine soil. This soil should be compacted to 95% of its maximum dry density where it is placed within the building footprint. Outside the building footprint the compaction requirement can be reduced to 90%.

Groundwater will not be an issue during construction of the footings. We recommend that surface water be diverted away from open excavations and that the footing trenches be kept dry.

We recommend that the building footprint be proofrolled as described in section 4.0A prior to placing SF or constructing foundations.

The existing glacial marine deposit may is too fine to meet the specifications for Foundation Backfill or Structural Fill.

Utility trenching and general excavations below 4 feet should be sloped no greater than 1.5H to 1V (OSHA type C) in the native sand. These slopes are based on the current OSHA Excavation Guidelines.

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 in consistence with this report.

7.0 Closure

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

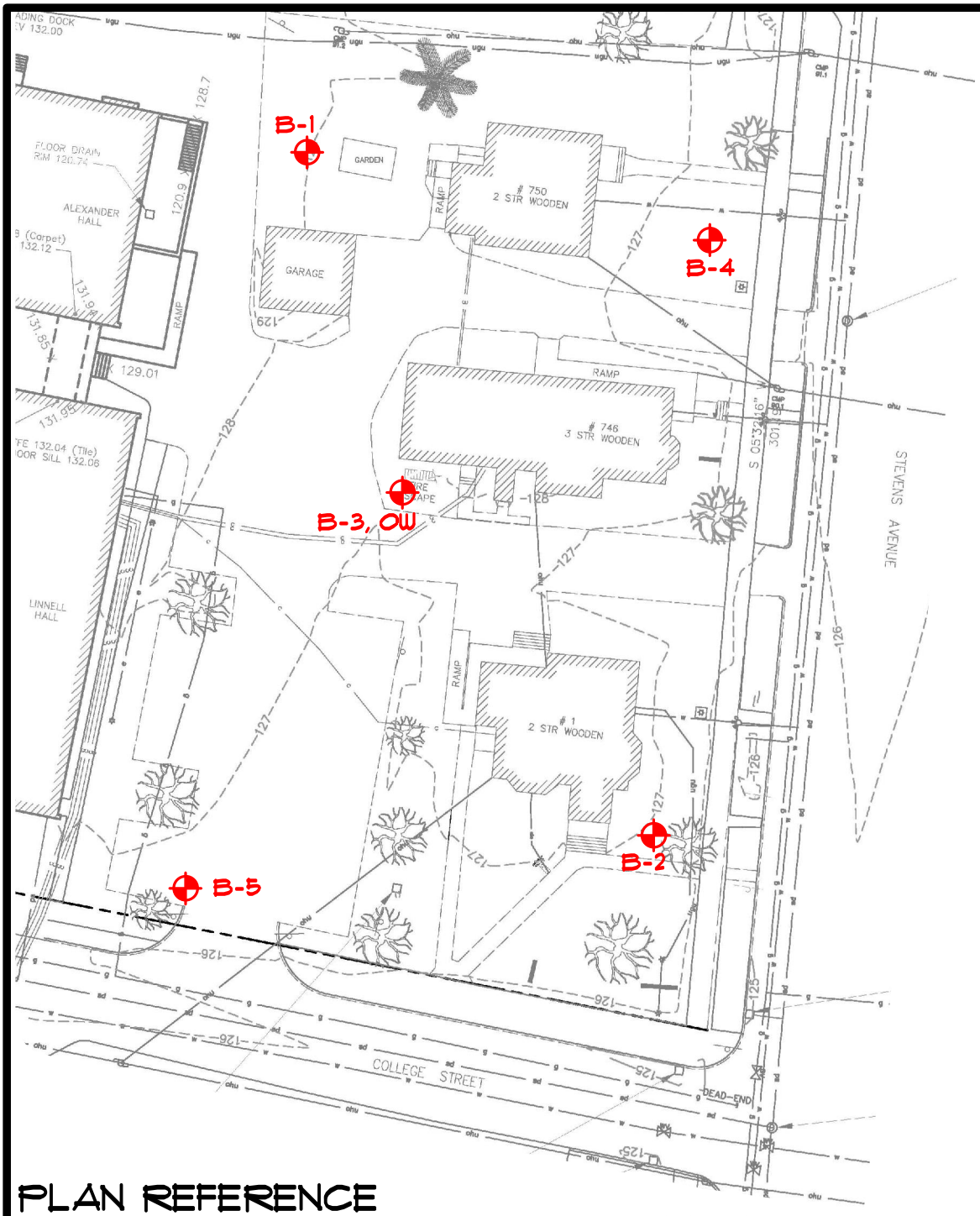
We appreciate the opportunity to serve you during this phase of your project. If there are any questions or additional information is required, please do not hesitate to call.

Sincerely yours,
Summit Geoengineering Services,

William M. Peterlein, P.E.
President & Principal Engineer

APPENDIX A

EXPLORATION LOCATION PLAN



PLAN REFERENCE

"COLLEGE OF DENTAL MEDICINE, EXISTING CONDITIONS PLAN", DATED JANUARY 2012, PREPARED BY SITE DESIGN ASSOCIATES.

LEGEND

B-1 — SUMMIT TEST BORING (1-12-2012)

TEST BORING LOCATION PLAN
COLLEGE OF DENTAL MEDICINE

STEVENS AVENUE - PORTLAND, MAINE

PREPARED FOR

UNIVERSITY OF NEW ENGLAND

DATE: JAN. 2012	DRAWN BY: KRF	CHECKED BY: WMP
JOB: 11296	SCALE: 1" = 40'	FILE: 11296 SKT

640 MAIN STREET
LEWISTON, MAINE 04240
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APPENDIX B

EXPLORATION LOGS

EXPLORATION REPORT COVER SHEET

The exploration report has been prepared by the geotechnical engineer from both field and laboratory data. Differences between field logs and exploration reports may exist.

It is common practice in the soil and foundation engineering profession that field logs and laboratory data sheets not be included in engineering reports, because they do no represent the engineer's final opinion as to appropriate descriptions for conditions encountered in the exploration and testing work. The field logs will be retained in our office for review. Results of laboratory tests are generally shown on the borings logs or are described in the text of the report as appropriate.

Drilling and Sampling Symbols:

SS = Split Spoon
ST = Shelby Tube – 2" OD, disturbed
UT = Shelby Tube – 3" OD, undisturbed
HSA = Hollow Stem Auger
CS = Casing – size as noted
Sv = Vane Shear
PP = Pocket Penetrometer
RX = Rock Core – size as noted
Hyd = Hydraulic advance of probes
WOH = Weight of Hammer
WOR = Weight of Rod
GS = Grain Size Data
PI = Plasticity Index
LL = Liquid Limit
w = Natural Water Content
USCS = unified Soil Classification System

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; additional evidence of groundwater elevations via observation or monitoring wells must be sought.

Gradation Description and Terminology:

Boulders:	Over 8 inches	Trace:	Less than 5%
Cobbles:	8 inches to 3 inches	Little:	5% to 15%
Gravel:	3 inches to No.4 sieve	Some:	15% to 25%
Sand:	No.4 to No. 200 sieve	Silty, Sandy, etc.:	Greater than 25%
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 3	Very Loose
3 to 4	Soft	4 to 9	Loose
5 to 8	Firm	10 to 29	Compact
9 to 16	Stiff	30 to 49	Dense
17 to 32	Very Stiff	50 to 80	Very Dense
>32	Hard		

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SOIL BORING LOG

Boring #: **B-1**

Project: UNE Dental Building
Location: Stevens Avenue, Portland, Maine

Project #: 11296
Sheet: 1 of 2
Chkd by:

Drilling Co: Northern Test Boring
Personnel: Nick
Summit Staff: Erika Hawksley

Boring Location: Taped from existing buildings by Summit
Elevation: 128 ft +/-
Date started: 1/12/2012 Date Completed: 1/12/2012

DRILLING METHOD		SAMPLER	
Vehicle:	ATV	Type:	24" SS
Model:	Diedrich D-50	Hammer:	140 lb
Method:	2 1/4" HSA	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
1/12/2012	N/E	N/E	None Observed

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	S-1	24/20	0 - 2	5	Brown SILT, rootlets, loose, damp to frozen, ML	Lawn	TOPSOIL
1				4	Dark brown SILT, trace Sand and organics, loose,		0.7'
				5	damp, ML		
2				4			GLACIAL MARINE DEPOSITS
3							
4							
5							
	S-2	24/21	5 - 7	6	Light brown to brown medium-fine to medium-coarse		
6				8	SAND, little Silt, compact, damp, SM		
				10			
7				8			
8							
9							
10							
	S-3	24/22	10 - 12	7	Tan to light brown fine to medium-fine SAND, little		
11				8	Silt, compact, damp, SM		
				9			
12				11			
13							
14							
15							
	S-4	24/20	15 - 17	10	Tan to light brown medium-fine SAND, little Silt,		
16				12	compact, damp, SM		
				15			
17				15			
18							
19							
20							
	S - 5	24/20	20 - 22	14	Tan to light brown medium-coarse SAND, ltrace Silt,		
21				17	dense, damp to moist, SP		
				19			
22				27			

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES: PP = Pocket Penetrometer Resistance

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

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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SOIL BORING LOG

Boring #: **B-1**

Project: UNE Dental Building
Location: Stevens Avenue, Portland, Maine

Project #: 11296
Sheet: 2 of 2
Chkd by:

Drilling Co: Northern Test Boring
Personnel: Nick
Summit Staff: Erika Hawksley

Boring Location: Taped from existing buildings by Summit
Elevation: 128 ft +/-
Date started: 1/12/2012 Date Completed: 1/12/2012

DRILLING METHOD		SAMPLER	
Vehicle:	ATV	Type:	24" SS
Model:	Diedrich D-50	Hammer:	140 lb
Method:	2 1/4" HSA	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
1/12/2012	N/E	N/E	None Observed

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
23							GLACIAL MARINE DEPOSITS
24							
25							24'+/- GLACIAL TILL
	S-6	24/20	25 - 27	23	Tan medium-coarse SAND, some Gravel, very dense,		
26				30	moist, SP, overlying brown medium-fine SAND,		
				32	little Silt and Gravel, very dense, moist, SM		
27				27			
28					Auger Refusal at 27.4', Probable Bedrock		27.4' PROBABLE BEDROCK
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES: PP = Pocket Penetrometer Resistance

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

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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SOIL BORING LOG

Boring #: **B-2**

Project: UNE Dental Building
Location: Stevens Avenue, Portland, Maine

Project #: 11296
Sheet: 1 of 1
Chkd by:

Drilling Co: Northern Test Boring
Personnel: Nick
Summit Staff: Erika Hawksley

Boring Location: Taped from existing buildings by Summit
Elevation: 127 ft +/-
Date started: 1/12/2012 Date Completed: 1/12/2012

DRILLING METHOD		SAMPLER	
Vehicle:	ATV	Type:	24" SS
Model:	Diedrich D-50	Hammer:	140 lb
Method:	2 1/4" HSA	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
1/12/2012	N/E	N/E	None Observed

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	S-1	24/20	0 - 2	10	Dark brown SILT, rootlets, little Sand, loose to compact,	Lawn	TOPSOIL
1				2	damp to frozen, ML		
				2	Brownish orange medium-fine SAND, little Silt, loose,		1'
2				2	damp, SM		
							GLACIAL MARINE DEPOSITS
3							
4							
5							
	S-2	24/24	5 - 7	4	Brownish-orange medium-fine SAND, little Silt, loose,		
6				3	damp, SM		
				3	Light brown to tan fine SAND, little Silt, loose, damp,		
7				5	SM		
8							
9							
10							
	S-3	24/20	10 - 12	11	Light brown to tan medium-fine SAND, little Silt,		
11				12	compact, damp, SM		
				19			
12				23			
13							
14							
15							
	S-4	24/18	15 - 17	12	Same as above, compact, damp, SM		
16				17			
				21			
17				19			
18							
19							
20							
	S-5	5/5	20 - 20.4	50/5"	Same as above, light brown, dense, damp, SM		
21					Brown Silty CLAY, some Sand, little Gravel, very dense,		20.2'
					damp, CL		GLACIAL TILL
22					Auger Refusal at 20.4', Probable Bedrock		20.4'
							PROBABLE BEDROCK

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES: PP = Pocket Penetrometer Resistance

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

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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SOIL BORING LOG

Boring #: **B-3**

Project: UNE Dental Building
Location: Stevens Avenue, Portland, Maine

Project #: 11296
Sheet: 1 of 1
Chkd by:

Drilling Co: Northern Test Boring
Personnel: Nick
Summit Staff: Erika Hawksley

Boring Location: Taped from existing buildings by Summit
Elevation: 127 ft +/-
Date started: 1/12/2012 Date Completed: 1/12/2012

DRILLING METHOD		SAMPLER	
Vehicle:	ATV	Type:	24" SS
Model:	Diedrich D-50	Hammer:	140 lb
Method:	2 1/4" HSA	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
1/12/2012	N/E	N/E	Measurement in well, No water observed
1/25/2012	20.3	106.7 ft +/-	Measurement in well

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	S-1	24/20	0 - 2	10	Brown SILT, rootlets, compact, damp to frozen, ML	Lawn	TOPSOIL
1				6	Dark brown SILT, trace Sand and organics, loose		0.5'
				4	to compact, damp to frozen, ML		
2				4			GLACIAL MARINE DEPOSITS
3							
4							
5							
	S-2	24/18	5 - 7	7	Light brown to tan medium-fine to fine SAND, little		
6				7	Silt, compact, damp, SM		
				10			
7				10			
8							
9							
10							
	S-3	24/20	10 - 12	7	Light brown to tan medium-fine to medium-coarse		
11				10	SAND, little Silt, compact, damp, SM		
				15			
12				24			
13							
14							
15							
	S-4	24/16	15 - 17	15	Light brown coarse SAND, trace Silt, compact, damp,		
16				14	SP, overlying light brown fine SAND, little Silt, compact,		
				16	damp, SM		
17				19			
18							
19							
20							
	S-5	24/16	20 - 22	11	Light brown to tan medium-fine SAND, little Silt,		
21				12	compact, damp to moist, SM		
				12			
22				12			
					End of Exploration at 22', No Refusal		22'

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES: PP = Pocket Penetrometer Resistance

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

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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SOIL BORING LOG

Boring #: **B-4**

Project: UNE Dental Building
Location: Stevens Avenue, Portland, Maine

Project #: 11296
Sheet: 1 of 1
Chkd by:

Drilling Co: Northern Test Boring
Personnel: Nick
Summit Staff: Erika Hawksley

Boring Location: Taped from existing buildings by Summit
Elevation: 127 ft +/-
Date started: 1/12/2012 Date Completed: 1/12/2012

DRILLING METHOD		SAMPLER	
Vehicle:	ATV	Type:	24" SS
Model:	Diedrich D-50	Hammer:	140 lb
Method:	2 1/4" HSA	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
1/12/2012	N/E	N/E	None Observed

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	S-1	24/18	0 - 2	3	Brown SILT, rootlets, compact, damp to frozen, ML	Lawn	TOPSOIL
1				2	Dark brown SILT, trace Sand, loose, damp to frozen, ML		0.5'
				2			
2				3			GLACIAL MARINE DEPOSITS
3							
4							
5							
	S-2	24/20	5 - 7	5			
6				7	Light brown to tan medium-fine to fine SAND, little		
				10	Silt, compact, damp, SM		
7				11			
8							
9							
10							
	S-3	24/20	10 - 12	12	Light brown to tan medium-fine SAND, Little Silt,		
11				14	compact to dense, damp, SM		
				16			
12				17			
13							
14							
15							
	S-4	21/14	15 - 16.8	19	Brown fine SAND, little Silt and Gravel, very dense,		15'+/-
16				24	damp, SM		GLACIAL TILL
				30			
17				50/3"			
					Auger Refusal at 16.8', Probable Bedrock		16.8'
18							PROBABLE BEDROCK
19							
20							
21							
22							

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES: PP = Pocket Penetrometer Resistance

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

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-5**

Project: UNE Dental Building
Location: Stevens Avenue, Portland, Maine

Project #: 11296
Sheet: 1 of 1
Chkd by:

Drilling Co: Northern Test Boring
Personnel: Nick
Summit Staff: Erika Hawksley

Boring Location: Taped from existing buildings by Summit
Elevation: 127 ft +/-
Date started: 1/12/2012 Date Completed: 1/12/2012

DRILLING METHOD		SAMPLER	
Vehicle:	ATV	Type:	24" SS
Model:	Diedrich D-50	Hammer:	140 lb
Method:	2 1/4" HSA	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
1/12/2012	N/E	N/E	None Observed

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
					Bituminous Pavement=6"		PAVEMENT
1	S-1	24/20	0.5 - 2.5	36	Brown SAND, little Silt and Gravel, compact, damp, SM		0.5'
				15			
2				5			GLACIAL MARINE DEPOSITS
				3			
3							
4							
5							
	S-2	24/2	5 - 7	14	Rock at spoon tip, Same as above		
6				8			
				9			
7				11			
8							
9							
10							
	S-3	24/14	10 - 12	14	Light brown to tan medium-fine SAND, compact,		
11				14	damp, SP		
				18			
12				18			
13							
14							
15							
	S-4	24/14	15 - 17	12	Same as above, compact, damp, SP		
16				18			
				17			
17				16			
18							
19							
20							
	S-5	24/14	20 - 22	7	Light brown coarse SAND, compact, damp, SP,		
21				9	overlying tan fine SAND, compact, damp to moist, SP		
				11			
22				9			
					End of Exploration at 22', No Refusal		22'

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES: PP = Pocket Penetrometer Resistance

Bedrock Joints
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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%

APPENDIX C

LABORATORY TESTING

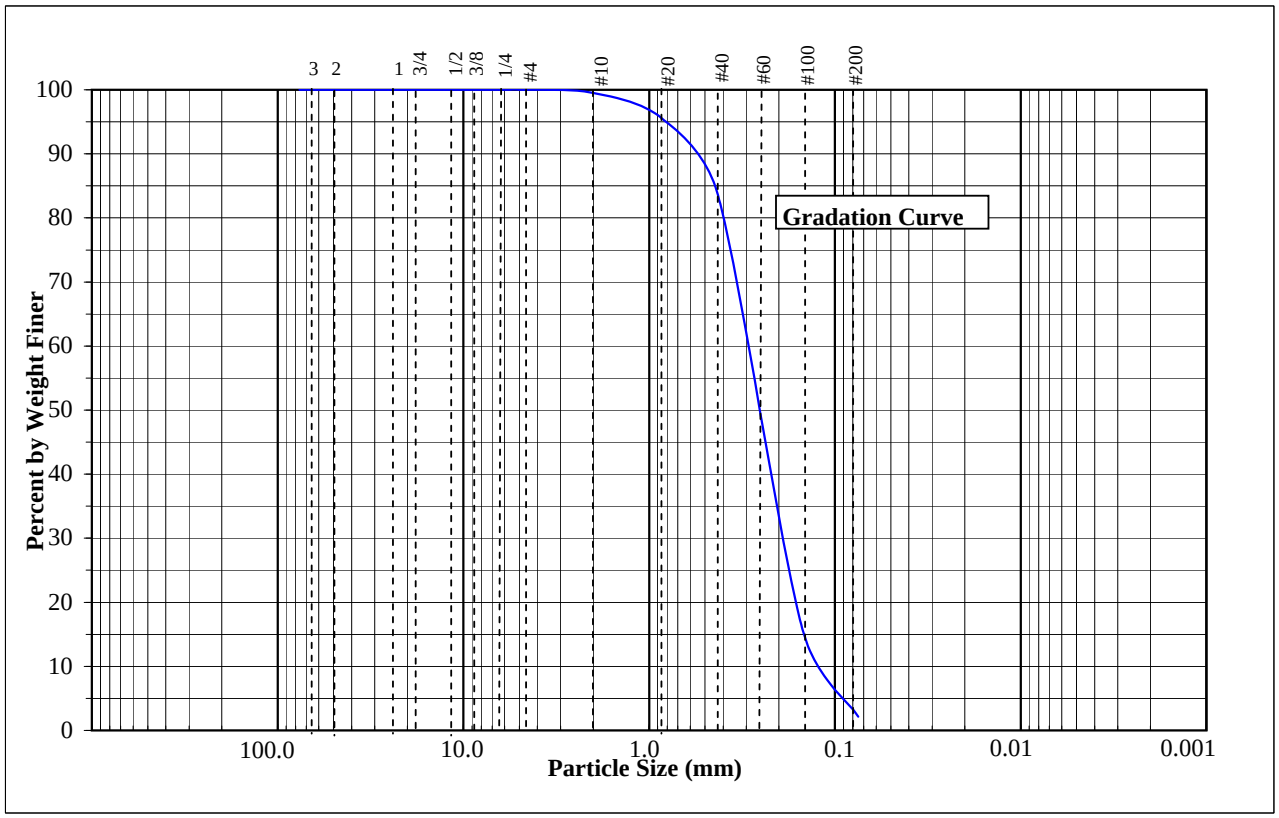
SUMMIT ENVIRONMENTAL CONSULTANTS, INC.
434 Cony Road, Augusta, Maine 04330
Phone:(207) 621-8334 Fax:(207) 626-9094

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	UNE Dental	PROJECT #:	14381 / 11296
CLIENT:	Summit Geoengineering Services	SUMMIT SAMPLE:	S2
CLIENT SOIL DES:		INTENDED USE:	Investigation
SOURCE:	B4 5-7'	SPECIFICATION:	
DATE:	January 23, 2012	TECHNICIAN:	M. Gilman

DATA

PARTICLE SIZE mm		% BY WT FINER
76.20	(3 in)	100.0
50.80	(2 in)	100.0
38.10	(1-1/2 in)	100.0
25.40	(1 in)	100.0
19.05	(3/4 in)	100.0
12.70	(1/2 in)	100.0
9.53	(3/8 in)	100.0
6.35	(1/4 in)	100.0
4.75	(No. 4)	100.0
2.00	(No. 10)	99.5
0.85	(No. 20)	95.5
0.43	(No. 40)	83.5
0.15	(No. 100)	15.9
0.08	(No. 200)	2.1



REMARKS: Moisture Content = 5.4%

Reviewed: Darrell A. Gilman, CMT Manager
Date: 1/24/12