SUMMIT
GEOENGINEERING SERVICES

GEOTECHNICAL REPORT

New Apartment Building
Hampshire Street
Portland, Maine

Prepared for:

Developers Collaborative
17 Chestnut St
Portland, Maine

Prepared by:

Summit Geoengineering Services
640 Main Street
Lewiston, Maine

Project #12082
May 2012

May 30, 2012
SGS #12082

Developers Collaborative
c/o Archetype, P.A.
48 Union Wharf
Portland, ME 04101
Attn: David Lloyd

Reference: Geotechnical Engineering Investigation, Proposed Apartment Building
Hampshire St., Portland, Maine

Dear David:

We have completed the geotechnical investigation for the construction of an apartment building on Hampshire Street in Portland, Maine. Our scope of services included performing four test borings at the site and preparing this report summarizing our findings and 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. No hazardous materials were encountered in the test borings completed at the site.

1.0 Project Description

The project consists of the construction of a new four story apartment building. The eastern portion of the building will have a full basement which will be used for parking. The western portion will have parking at the first floor level. Grading plans were not available for this report. We anticipate that the basement level will be at or near the ground surface at Newbury Street. The first floor level is anticipated to be approximately 10 feet higher, at or near the ground surface at Federal Street. A retaining wall, anticipated to be up to 10 feet tall, will be located between the basement and first floor portions of the building. We understand that the building will be a timber framed structure. We expect that the basement and first floor parking areas will be paved and no floor slabs will be required.

The site is currently occupied by 6 buildings. We understand that three of the buildings will be demolished entirely and a portion of a fourth building will be demolished.

2.0 Explorations and Laboratory Testing

Summit Geoengineering Services (SGS) observed the subsurface conditions at the site with the drilling of four borings on May 17, 2012. The boring explorations were located by Summit by taping from existing site features. Northern Test Boring advanced the borings using 2¼-inch hollow stem augers under contract to Summit. Borings were performed to a depth of refusal, ranging from 9.5 to 15.4 feet. Standard penetration tests (SPT) with split spoon samples were obtained at 5-foot intervals. Summit was onsite to coordinate and observe the boring explorations. The location of the borings is shown on the Test Boring Location Plan in Appendix A. Logs of the explorations are included in Appendix B.

Two samples of the glacial marine soil were tested for moisture content in accordance with ASTM D2216 and one sample of the glacial marine soil was tested for Atterberg limit in accordance with ASTM D4318. A summary of the laboratory tests are presented below:

LABOROATORY TEST SUMMARY				
Location	**USCS**	**Liquid Limit**	**Plasticity Index**	**Moisture Content**
B-2, 5 to 7 ft	CL-ML	22	7	24.4
B-3. 5 to 7 ft	CL-ML	--	--	21.1

Detailed results of the laboratory test are provided in Appendix C.

3.0 Subsurface Conditions

The soil at the site generally consists of topsoil or pavement overlying fill or glacial marine deposits, overlying glacial till. A three foot thick layer of fill was encountered below the topsoil at B-1 and a one foot thick layer of fill was encountered beneath the pavement at B-4. Bedrock was encountered in each of the four borings at depths ranging from 9.5 to 15.4 feet. Free groundwater was not observed in the borings.

The topsoil was 12 inches thick and consisted of dark brown silty sand with trace rootlets and organics. This soil is visually classified as SM in accordance with the Unified Soil Classification System (USCS). The topsoil was generally loose and damp to moist.

The pavement, encountered at B-4, was 3 inches thick. The fill beneath the pavement consisted of dark brown silty sand with a little gravel, classified as SM

The fill soil at B-1 is described as olive-brown silty sand with a little gravel (SM). The fill at this location contained cobbles and rubble. No organics or other deleterious materials were observed in this boring.

The glacial marine deposits vary from olive-brown to olive-gray and mottled clayey silt to dark brown medium to coarse sand with some silt. Based on the Atterberg limit test, the clayey silt soil has a liquid limit of 22 and a plasticity index of 7. Based on this, the clayey silt soil is classified as CL-ML. The sand glacial marine deposit is classified as SM. SPT-N values for the

glacial marine deposits ranged from 5 to 8 blows per foot (bpf) and averaged 7 bpf, indicating loose to firm conditions. The glacial marine deposits were generally damp to wet with moisture contents of 21.1 to 24.4 percent.

The glacial till consisted of olive brown and mottled silty sand with little gravel to olive brown clayey silt with little gravel and trace fine sand. The glacial till is classified as ML or SM in accordance with the Unified Soil Classification System (USCS). SPT-N values for the glacial till ranged from 10 to 44 blows per foot (bpf) indicating compact/stiff to dense/hard conditions. The glacial till was generally damp to moist.

Refusal, presumed to be bedrock, was encountered at the following depths

DEPTH TO BEDROCK	
Boring	**Depth Below Existing Ground Surface (ft)**
B-1	9.5
B-2	10.0
B-3	10.9
B-4	15.4

Samples of the bedrock were not taken. Based on maps published by the Maine Geological Survey, the bedrock is part of the Spring Point Formation consisting of greenish-gray biotite-quartz schist and amphibolite.

Groundwater was not observed in the borings directly. Based on observations of the samples in B-3, we conclude that groundwater was approximately 11 feet below the existing ground surface. We expect that permanent groundwater generally exists near the bedrock surface. Mottling within the glacial marine and glacial till indicates groundwater depths may fluctuate within glacial marine and glacial till deposits.

4.0 Foundation Design Recommendations

A. Allowable Bearing Pressure

With proper site preparation, the proposed building can be supported using a conventional spread footing foundation. We recommend that the footings for the proposed building be designed using an allowable bearing pressure of 3,000 psf for soil, 10,000 psf for weathered, loose, or fragmented bedrock, and 20,000 for clean hard bedrock. Column locations and loads were not available for this report. Assuming typical loading conditions for this type of building, total settlement for this allowable bearing pressure is estimated to be less than 1 inch. Assuming that a proper transition is provided between footings on bedrock and footings on soil (discussed below) differential settlement will be tolerable. This bearing pressure and associated settlement is based on the following conditions:

- All existing topsoil and pavement is removed prior to placing fill or constructing footings.

- The footing subgrade soil is proofrolled by making a minimum of 5 passes using a vibratory roller with a minimum operating weight of 10 tons. Footing trenches can be proofrolled bay making a minimum of 5 passes using a large walk-behind vibratory compactor.
- The base of excavations in clayey silt glacial marine deposits is protected from disturbance, especially when wet. Areas in excavations that become soft from disturbance are over excavated and stabilized using crushed stone and/or geotextile filter fabric.
- Fill, if required beneath the footings consists of MeDOT 703.06, Type D soil compacted to a minimum of 95 percent of its maximum dry density, determined in accordance with ASTM D1557 or crushed stone.
- Clean hard bedrock means the removal of loose, weathered, or fragmented bedrock and construction of the footing directly on the bedrock surface.
- A transition zone is provided between footings on bedrock and footings on soil, as shown on the detail in Appendix A.

Based on proposed site grading and encountered bedrock depth, excavation of bedrock may be necessary to construct the retaining wall between the basement and first floors. Samples of the bedrock were not obtained. Based on the abruptness of refusal, we expect that there is little to no weathering at the surface and that the bedrock is hard and intact. Controlled blasting may be necessary to remove bedrock.

B. Soil Design Parameters and Properties

We recommend the following design parameters be used for foundation design:

SOIL PROPERTIES AND DESIGN PARAMETERS				
Parameter	**Foundation and Retaining Wall Backfill**	**Glacial Marine (Clayey Silt)**	**Glacial Till**	**Bedrock ***
Total (moist) unit weight	130 pcf	115 pcf	125 pcf	145 pcf
Saturated unit weight	135 pcf	125 pcf	130 pcf	145 pcf
Friction angle	32 degrees	18 degrees	34 degrees	40 degrees
Cohesion	0 psf	2,000 psf		5,000 psf
Allowable bearing	NA	3,000 psf	3,000 psf	20,000 psf
Active earth pressure coefficient	0.31	0.50	0.28	NA
At-rest earth pressure coefficient	0.47	0.69	0.44	NA
Passive earth pressure coefficient	3.25	1.89	3.53	NA
Base friction coefficient	0.60	0.40	0.55	0.75
Uplift earth pressure coefficient	1.50	1.00	1.65	NA

* Typical values for Bedrock
NA = Not Applicable

The values for the Backfill soils are based on 95% compaction of fill by ASTM D1557, Modified Proctor Density.

C. Frost Protection

Based on the required frost protection depth, exterior footings should be constructed at a minimum depth of 4 feet below the exterior finished grade. This frost protection depth is based on a design air-freezing index of 1,250-degree days for the Portland area. Since hard bedrock is non frost susceptible, there is no frost depth protection requirement for footings constructed on hard, intact bedrock. Underdrains should be installed beside footings on bedrock to drain any infiltrating water perching on the bedrock surface.

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

FOUNDATION BACKFILL	
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.

D. Groundwater Control

Due to the depth of cut between the basement and adjacent first floor parking areas and potential for groundwater, we recommend that perimeter underdrains be installed along the exterior of the foundations in the basement parking area. Foundation underdrains are not strictly necessary for foundations in the first floor parking area. We recommend exterior grades slope away from the building footprint to reduce runoff water from infiltrating the Foundation Backfill.

Perimeter underdrains 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

The subgrade profile at the site is categorized as Site Class D for soil and Site Class B for bedrock in accordance with the 2009 International Building Code (IBC). The following seismic site coefficients should be used:

SEISMIC SITE COEFFICIENTS		
Seismic Coefficient	**Site Class B**	**Site Class D**
Short period spectral response (S_S)	0.314	0.314
1 second spectral response (S_1)	0.077	0.077
Site coefficient (F_a)	1.0	1.55
Site Coefficient (F_v)	1.0	2.40
Design short period spectral response (S_{DS})	0.210	0.324
Design 1 second spectral response (S_{DS})	0.051	0.123

Soils susceptible to liquefaction were not encountered in the borings.

F. Retaining Walls

We recommend that cast-in-place retaining walls be designed for the lateral earth pressures taken from the following table.

RETAINING WALL EQUIVALENT FULID DESIGN PRESSURES		
Condition	**Equivalent Fluid Pressure**	**Live Load Surcharge**
At-rest	60 psf/ft	60 psf/ft
Active	40 psf/ft	

These values are based on the wall supporting Retaining Wall Backfill in an active (free to rotate) or at rest (wall restrained at the ends or the top) state and assume that adequate drainage is provided at the base of the walls.

Passive resisting pressure in front of cast-in-place walls can be taken as 420 psf per foot of embedment depth for Retaining Wall Backfill, 200 psf per foot for glacial marine soil, and 440 psf per foot for glacial till. Values in the table in Section 4B above should be used for the friction coefficient at the base of the wall for walls. If crushed stone is used at the base of the wall a value of 0.6 can be used for the friction coefficient for sliding.

Cast in place retaining wall footings should be constructed at a minimum depth of 4 feet below the exterior finished grade for frost protection, except where on bedrock. The maximum retaining wall footing contact pressure should be limited to the values in the Section 4B table. A transition zone as shown in Appendix A should be used where retaining wall footings are on bedrock and soil.

We recommend that retaining walls be backfilled with Retaining Wall Backfill meeting the following gradation requirements (MeDOT 703.06, Type D).

RETAINING WALL BACKFILL	
Sieve Size	**Percent finer**
3 inch	100
¼"	25 to 70
No. 40	0 to 30
No. 200	0 to 7

Retaining wall backfill should be compacted to 95% of its maximum dry density.

We recommend that underdrains be installed at the base of retaining walls to prevent the build up of hydrostatic pressures. The underdrains should be located adjacent to the wall on the top of the footing or on the bedrock surface (where footings are constructed on bedrock). The underdrain should consist of 4" rigid perforated PVC surrounded by a minimum of 6 inches of crushed stone and filter fabric to prevent clogging from the migration of the fine soil particles in the foundation backfill soils. The underdrain pipe should outlet to a location where it will be free flowing.

5.0 Pavement Section Design

The mean annual freezing index for the Portland area is approximately 900 degree F days. The mean annual frost penetration depth for this freezing index and the soil at the site is approximately 30 inches. The subgrade soil in the new basement and first floor parking areas is anticipated to consist of the glacial marine or glacial till soils. The CBR value for the proofrolled glacial marine soil is estimated to be 8. The CBR for the glacial till soil is estimated to be and sand fill is estimated to be 12.

Based on the subgrade soil conditions and the anticipated traffic (cars and light trucks traveling at low speeds) we recommend a minimum total pavement section thickness of approximately 60% of the mean annual frost penetration depth, or 18 inches. We further recommend that the pavement section consist of the following materials.

PAVEMENT SECTION MATERIAL THICKNESSES		
Material	**Thickness (in)**	**Specification**
Asphalt Surface Course	3/4	MeDOT 703.09 Grading D MeDOT Superpave 9.5 mm
Asphalt Binder Course	2-1/4	MeDOT Superpave 19 mm
Base Soil	3	MeDOT 703.06 Type A
Subbase Soil	12	MeDOT 703.06 Type D

The material specifications are referenced to the 1995 Maine Department of Transportation Standard Specifications for Highways and Bridges.

We recommend that the subgrade soil in pavement areas be proofrolled as described in Section 4A above. The foundations of the existing buildings should be removed in their entirety during

demolition. At a minimum, existing foundations should be removed down to the bottom of the Subbase Soil layer to provide a cushion. Wet, soft, and loose soil should be removed and replaced with Subbase Soil. Proofrolling should be performed in the static mode where the exposed subgrade consists of stiff silty clay. We recommend that surface water be prevented from ponding on the surface where the silty clay soil is exposed.

Subbase and Base soil can be placed in a single lift. These soils should be compacted to a minimum of 95 percent of its maximum dry density, determined in accordance with ASTM D1557, Modified Proctor Density.

Groundwater is not an issue for pavement areas at this site and underdrains are not necessary. This conclusion assumes that a perimeter foundation underdrain is provided along the exterior of the foundations in the basement area.

6.0 Construction Considerations

The composition of the existing fill is primarily mineral. Only minor amounts of debris and other unsuitable materials were encountered in the borings. Building demolition debris, boulders, or rubble encountered beneath new footings or within the building footprint, should be removed in its entirety. Any voids should be backfilled with MeDOT 703.06 Type D soil or crushed stone

After demolition and removal of the existing building foundations, excavation is expected to be relatively straight forward at this site. The maximum permissible slopes are 1.5H:1V in the sandy glacial marine soil and existing fill and 1H:1V in the clayey silt glacial marine soil, in accordance with the current OSHA regulations

The subgrade soil within the building footprint should be proofrolled by making a minimum of 5 passes using a vibratory roller with a minimum operating weight of 10 tons. Soft, wet, or other unsuitable areas should be removed and backfilled with MeDOT 703.06 Type D soil or crushed stone.

7.0 Closure

Our recommendations are based on professional judgment and generally accepted principles of geotechnical engineering. Some changes in subsurface conditions 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.

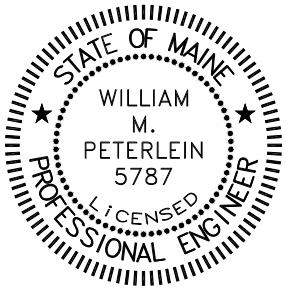
Finished grades and foundation loads were not available for this report. We recommend that SGS be given an opportunity to review the grading and foundation plans to confirm that the assumptions used to generate the recommendations in this report are valid.

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.

We appreciate the opportunity to provide geotechnical engineering services on this phase of the project. If there are any questions please do not hesitate to contact me.

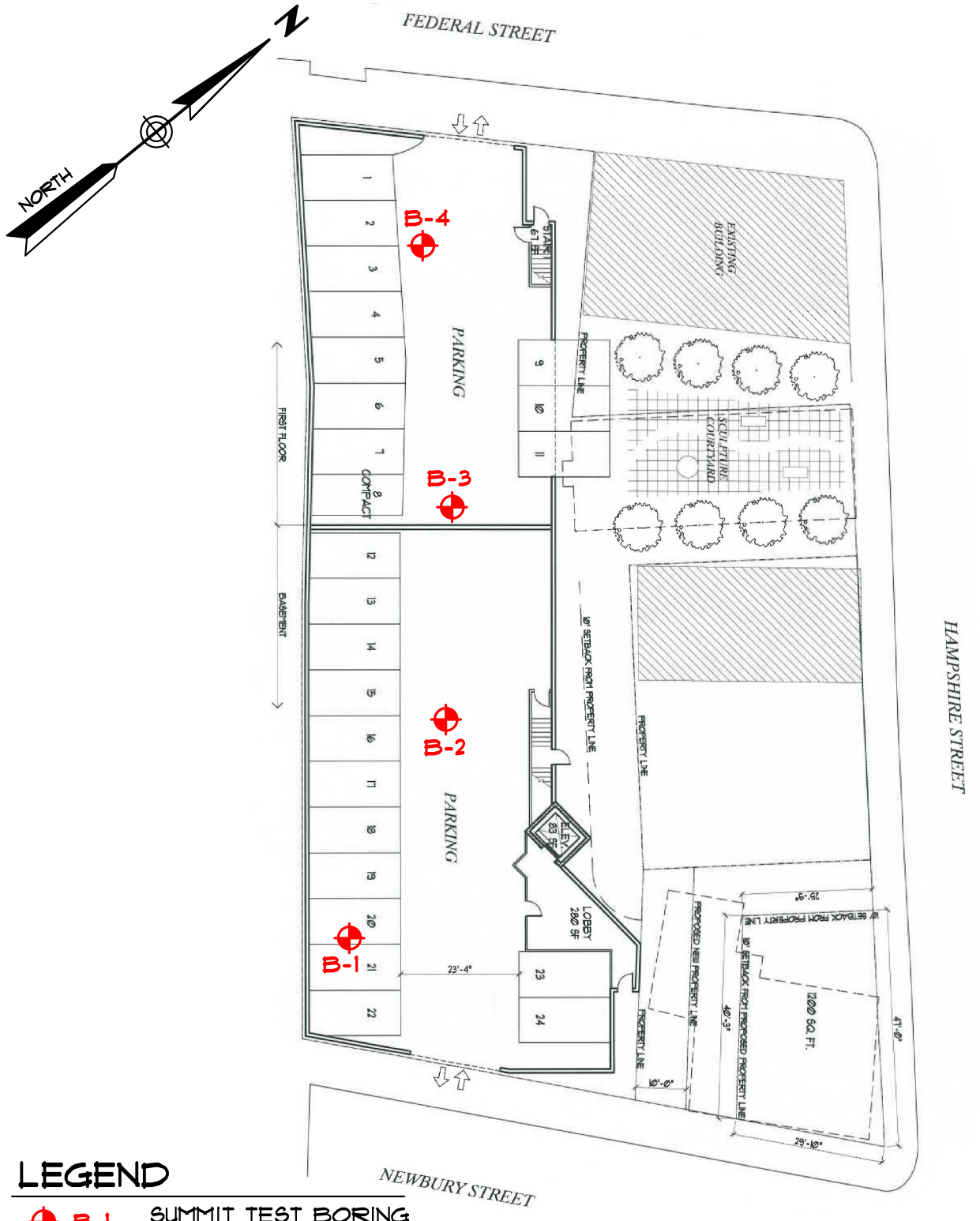
Sincerely,
Summit Geoengineering Services, Inc.

William M. Peterlein, P.E.
Principal Geotechnical Engineer



APPENDIX A

BORING LOCATION PLAN
BEDROCK TRANSITION DETAIL



LEGEND

B-1 SUMMIT TEST BORING (MAY 17, 2012)

TEST BORING LOCATION PLAN
PROPOSED APARTMENT BUILDING

HAMPSHIRE STREET - PORTLAND, MAINE

PREPARED FOR

DEVELOPERS COLLABORATIVE

DATE: MAY 2012	DRAWN BY: KRF	CHECKED BY: WMP
JOB: 12082	SCALE: 1" = 30'	FILE: 12082 BOR

640 MAIN STREET
LEWISTON, MAINE 04240

Tel.: (207) 576-3313
Fax: (207) 795-6128
www.summitgeoeng.com

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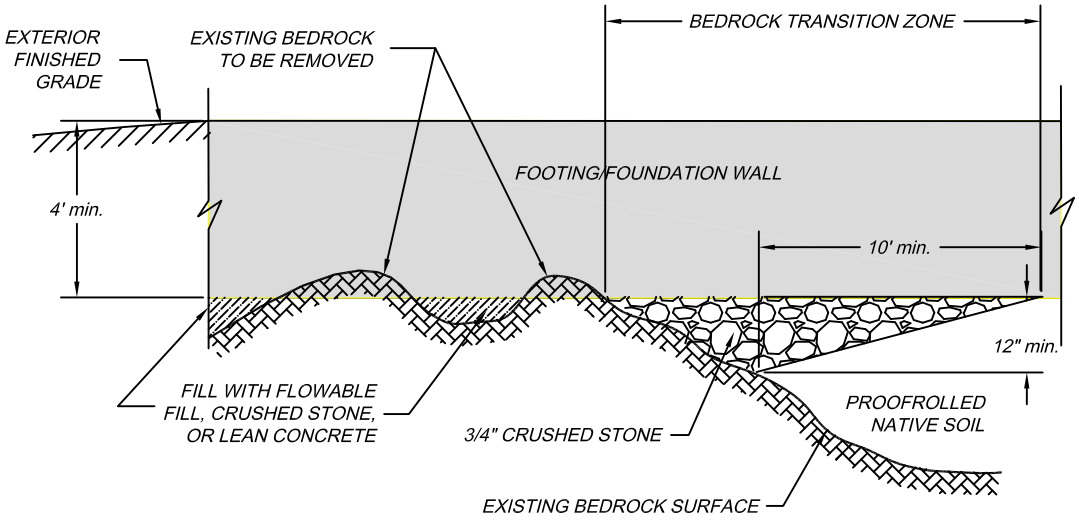
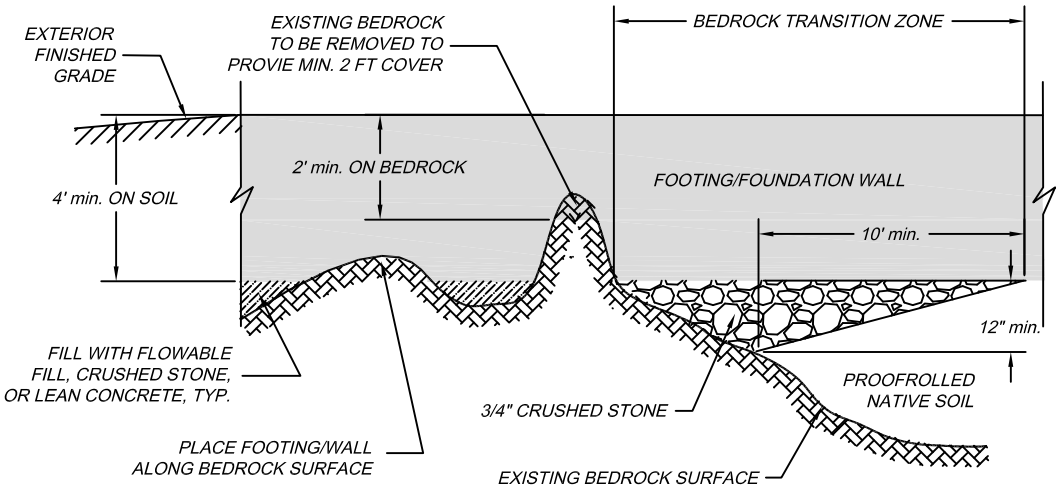
GEOENGINEERING SERVICES



FOOTING SUBGRADE OPTION #1 - FULL FROST PROTECTION

(not to scale)



FOOTING SUBGRADE OPTION #2 - MINIMUM FROST PROTECTION

(not to scale)

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GEOENGINEERING SERVICES
640 Main Street
Lewiston, Maine 04240

TITLE: FOOTING ON BEDROCK

DRAWN:	SCALE:	
WMP	NTS	
PROJ NO.:	DATE:	FIGURE:
12082	5/30/2012	

PROJECT: HAMPSHIRE STREET APARTMENT, PORTLAND, MAINE

APPENDIX B

BORINGS 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

Project:	Archetype - Apartment Building	Boring #:	**B-1**
Location:	Hampshire Street	Project #:	12082
	Portland, Maine	Sheet:	1 of 1
		Chkd by:	

Drilling Co:	Northern Test Boring	Boring Location:	
Personnel:	Mike Nadeau	Elevation:	Not Available
Summit Staff:	Bill Peterlein, P.E., Erika Hawksley	Date started: 5/17/2012	Date Completed: 5/17/2012

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

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
5/17/2012	N/A	N/A	No groundwater observed

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	S-1	24/12	0 - 2	3	Dark brown Silty fine SAND, trace organics, moist,		TOPSOIL
1				6	loose, SM		
				7	Olive brown Silty SAND, little Gravel, damp, compact, SM		
2				9			FILL
3							
					Drilled around rocks and rubble at 3'		
4							
	S-2	24/24	4 - 6	13	Olive brown and mottled Silty SAND, little to trace Gravel,		
5				19	damp, dense, SM		GLACIAL TILL
				25			
6				22			
7							
8							
9							
	S-3	5/5	9 - 9.5'	10/5"	Brown Silty SAND, little Gravel, moist, compact, SM		
10				50/0"	End of explorationat 9.5', Auger Refusal		
							BEDROCK
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

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:

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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SOIL BORING LOG

Boring #: **B-2**

Project: Archetype - Apartment Building
Location: Hampshire Street, Portland, Maine

Project #: 12082
Sheet: 1 of 1
Chkd by:

Drilling Co: Northern Test Boring
Personnel: Mike Nadeau
Summit Staff: Bill Peterlein, P.E., Erika Hawksley

Boring Location:
Elevation: Not Available
Date started: 5/17/2012 Date Completed: 5/17/2012

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

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
5/17/2012	N/A	N/A	Caved at 4' (moist)

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	S-1	24/4	0 - 2	1	Dark brown Silty SAND, trace rootlets and organics		TOPSOIL
1				1	moist, very loose, SM		
				2			
2				4			GLACIAL MARINE
3							
4							
5							
	S-2	24/24	5 - 7	1	Olive gray Silty CLAY, trace fine Sand, wet, soft to	wc = 24.4%	
6				2	firm, CL-ML	LL = 22	
				3		PI = 7	
7				4			
8							
9							
					Denser at 9'		
10							GLACIAL TILL
					End of exploration at 10', Auger Refusal		
11							BEDROCK
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

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:

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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SOIL BORING LOG

Boring #: **B-3**

Project:	Archetype - Apartment Building	Project #:	12082
Location:	Hampshire Street	Sheet:	1 of 1
	Portland, Maine	Chkd by:	

Drilling Co:	Northern Test Boring	Boring Location:	
Personnel:	Mike Nadeau	Elevation:	Not Available
Summit Staff:	Bill Peterlein, P.E., Erika Hawksley	Date started: 5/17/2012	Date Completed: 5/17/2012

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

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
5/17/2012	N/A	N/A	Moist at spoon tip (10.9')

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	S-1	24/14	0 - 2	1	Dark brown Silty SAND, trace rootlets and organics		TOPSOIL
1				2	damp, loose, SM		
				4			
2				4			GLACIAL MARINE
3							
4							
5							
	S-2	24/20	5 - 7	3	Olive gray Silty CLAY, trace fine Sand, moist, firm,	wc = 21.1%	
6				2	CL-ML		
				4			
7				4			
8							
9							
					Denser at 9'		
10							GLACIAL TILL
	S-3	9/6	10 - 10.9	3	Dark brown course SAND, some Silt, moist, SM		
11				50/3"	Olive brown Clayey SILT, trace fine Sand, moist, hard, ML		
					End of exploration at 10.9', Auger Refusal		
12							BEDROCK
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

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:

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%

SUMMIT
GEOENGINEERING SERVICES

SOIL BORING LOG

Boring #: **B-4**

Project: Archetype - Apartment Building
Location: Hampshire Street, Portland, Maine

Project #: 12082
Sheet: 1 of 1
Chkd by:

Drilling Co: Northern Test Boring
Personnel: Mike Nadeau
Summit Staff: Bill Peterlein, P.E., Erika Hawksley

Boring Location:
Elevation: Not Available
Date started: 5/17/2012 Date Completed: 5/17/2012

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

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
5/17/2012	N/A	N/A	Caved at 2' (dry)

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
					Bituminous Pavement = 3"		PAVEMENT
1	S-1	24/10	0.3 - 2.3	12	Dark brown Silty SAND, little Gravel, damp, compact, SM		0.3'
				8			FILL
2				4			
				5			GLACIAL MARINE
3							
4							
5							
	S-2	24/12	5 - 7	3	Dark brown medium-coarse SAND, some Silt, damp,		
6				3	loose, SM		
				4	Olive brown and slightly mottled Silty CLAY, trace		
7				6	fine Sand, damp, firm, CL-ML		
8							
					Denser at 8'		
9							
10							
	S-3	24/15	10 - 12	6	Dark brown course SAND, some Silt, moist, SM		
11				5	Olive brown to gray Clayey SILT, little Gravel, trace fine		
				4	Sand, moist, stiff, ML		GLACIAL TILL
12				6			
13							
14							
15							
	S-4	4/1	15 - 15.4	50/4"	Same as above, moist, stiff, ML		
16					End of exploration at 15.4', Auger Refusal		15.4'
							BEDROCK
17							
18							
19							
20							
21							
22							

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:

Bedrock Joints
Shallow = 0 to 35 degrees
Dipping = 35 to 55 degrees
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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%

APPENDIX C

LABORATORY TEST RESULTS

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

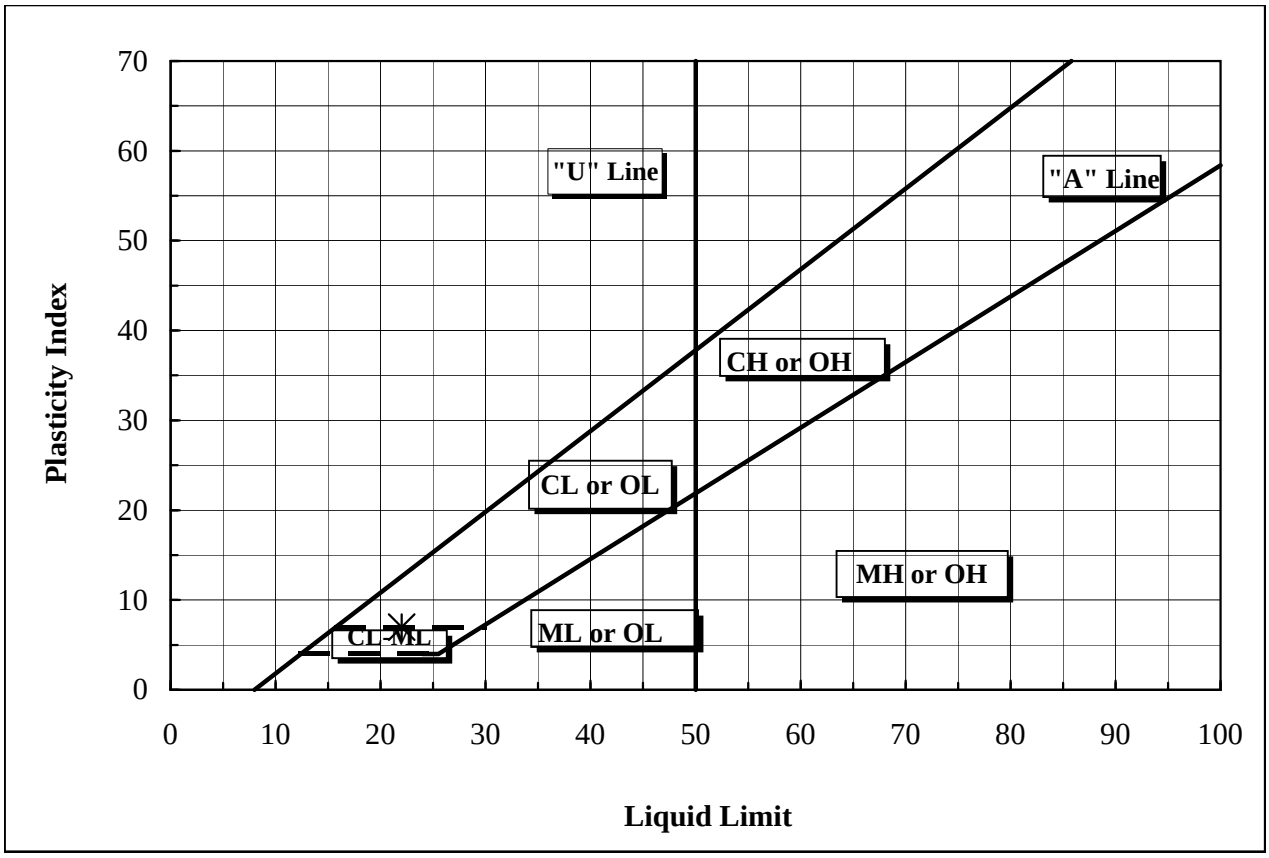
ATTERBERG LIMIT TEST - ASTM D4318

Method "A" (Multi-point)

PROJECT NAME:	Archetype Apartments - Portland	PROJECT #:	14381 / 12082
CLIENT:	Summit Geoengineering Services	SAMPLE #:	S1
PROCEDURE:	A	DEPTH:	5'-7'
INTENDED USE:	Investigation	DATE:	5/21/12
SAMPLE SOURCE:	B2, S2	TECHNICIAN:	M. Gilman

DATA

Source	Depth	LL	PL	PI	Classification
B2, S2	5'-7'	22	15	7	Silty Clay (CL-ML)



Notes:

Reviewed: Darrell A. Gilman, CMT Manager
Date: 5/24/2012

SUMMIT ENVIRONMENTALCONSULTANTS, INC.
434 Cony Road, Augusta, Maine04330
Phone: (207) 621-8334 Fax: (207) 626-9094

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

PROJECT NAME:	Apartment Building Hampshire Street - Portla	PROJECT #:	14381 / 12082
CLIENT:	Summit Geoengineering Services	DRYING METHOD:	Oven
SAMPLE SOURCE:	Borings	DATE:	May 21, 2012
SAMPLING METHOD:	Split - Spoon	TECH:	M. Gilman

Location	Sample No.	Depth	Moisture Content	Remarks
B2,S2	S1	5'-7'	24.4%	
B3, S2	S2	5'-7'	21.1%	

REMARKS:

Reviewed: Darrell A. Gilman - CMT Manager

Date: May 22, 2012