

August 11, 2016

Mr. Michael Hatfield
Municipality of East Hants
230-15 Commerce Court
Elmsdale, NS B2S 3K5

Dear Mr. Hatfield,

**Re: Geotechnical Investigation – Proposed Building Development
Lot 92-5a1, Commerce Court, Elmsdale, NS**

This is our geotechnical investigation report for the proposed building development at Lot 92-5a1 on Commerce Court in Elmsdale, NS. It is understood that the lot is intended to be developed for new municipal infrastructure, possibly home to the new Municipal Aquatic Centre. The subsurface conditions are generally good for conventional spread footing foundations and a grade slab.

The subsurface conditions encountered throughout the proposed development area generally consist of rootmat overlying glacial till. Fill and re-worked till were encountered in two test pits and ranged in thickness from 0.5 m to 0.6 m. Peat was encountered at the hand probe locations and ranged in thickness from 0.5 m to 0.6 m. Native soil was encountered in all test pits and ranged in depth from 0.1 m to 0.8 m. Bedrock and groundwater seepage were not encountered in the test pits.

The main findings/recommendations from our investigation are as follows:

- A foundation system with footings founded on undisturbed native soil or structural fill would be practical for this site following site work.
- The existing fill, re-worked till, and organics (peat/rootmat) should be removed from within the building areas and reinstated with approved structural fill. Proof-rolling should be conducted at the footing design grade elevation and floor design subgrade elevation. Weak zones should be replaced with approved structural fill. Approved structural fill should be placed and compacted in lifts to design grades, as required.
- Organics (peat/rootmat) should be removed from the roadway/parking areas. The existing fill and re-worked till can likely remain in roadway/parking areas. Proof-rolling should be conducted at design subgrade in pavement areas. Weak zones should be replaced with approved structural fill. Approved structural fill should be placed and compacted in lifts to design grades, as required.
- Geotechnical inspection of earthworks is recommended (and is required for building permits).

Please contact us if you have any questions.

Thank you,



Devan McKenney, EIT
Geotechnical Engineer
dmckenney@conquest-eng.com



R. Bruce MacNeil, P.Eng
Senior Geotechnical Engineer
bmacneil@conquest-eng.com

TABLE OF CONTENTS

	<i>page</i>
1.0 INTRODUCTION	1
2.0 SITE DESCRIPTION AND GEOLOGY	1
3.0 SUMMARIZED SUBSURFACE CONDITIONS	2
4.0 DISCUSSION AND RECOMMENDATIONS.....	4
4.1 MAIN FINDINGS	4
4.2 EARTHWORKS	4
4.2.1 <i>Surface Water Control and Erosion Control</i>	4
4.2.2 <i>Excavation</i>	4
4.2.3 <i>Dewatering of Excavations</i>	5
4.2.4 <i>Fill Placement and Compaction</i>	5
4.2.5 <i>Slopes and Toe Drainage</i>	6
4.2.6 <i>Building Area Subgrade</i>	6
4.2.7 <i>Inspection and Testing</i>	6
4.3 FOUNDATIONS	6
4.3.1 <i>Shallow Foundations</i>	6
4.3.2 <i>Slab on Grade and Exterior Slabs</i>	7
4.4 PAVEMENT STRUCTURE	7
4.5 ADDITIONAL GEOTECHNICAL SERVICES.....	7
5.0 CLOSURE	8

TABLES

TABLE A: SUMMARY OF FINDINGS – TEST PITS	3
TABLE B: SUMMARY OF FINDINGS – HAND PROBES	3
TABLE C: PAVEMENT STRUCTURE THICKNESSES	7

APPENDICES

APPENDIX A:	SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS (CONQUEST)
	TEST PIT RECORDS 101 TO 108
	FIGURE 1: SIEVE ANALYSIS
	FIGURE 2: FACTORED ULS BEARING RESISTANCE
	FIGURE 3: SLS BEARING RESISTANCE
	PHOTOGRAPHS 1 TO 8
	DRAWING 1: TEST PIT AND HAND PROBE LOCATION PLAN
APPENDIX B:	SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS (LVM)
	LVM TEST PIT LOGS 1 TO 8

1.0 INTRODUCTION

We have conducted a geotechnical investigation for the proposed building development at Lot 92-5a1 on Commerce Court in Elmsdale, Nova Scotia at the request of the Municipality of East Hants. The purpose of this investigation was to evaluate the subsurface conditions at the site and to provide recommendations.

This report presents all of our findings and our recommendations for foundation design and general site work. This report includes recommendations for geotechnical works only.

2.0 SITE DESCRIPTION AND GEOLOGY

The proposed building development is located at Lot 92-5a1 on Commerce Court in Elmsdale, Nova Scotia. The proposed development is currently an undeveloped lot covered in vegetation (most trees have been removed).

Photograph A shows a view of the site looking south.

Based on geological mapping the principal soil type in the area is silty till plains. Bedrock in the area is mapped as anhydrite and gypsum of the Carrolls Corner Formation, which is part of the Windsor Group.



Photograph A: View of the site looking south.

3.0 SUMMARIZED SUBSURFACE CONDITIONS

The field program consisted of eight (8) test pits (TP101 to TP108), and five (5) hand probes (HP1 to HP5), completed on August 3, 2016. Eight test pits (TP1 to TP8) were conducted at the proposed development area in 2014 by LVM. The test pit and hand probe locations are shown in Figure A (a complete location plan is attached in the appendix).

The test pits were conducted using an excavator. Representative samples were taken during the field work and the conditions at the test pits were logged in detail. The soil conditions encountered at the site are described in detail on the appended Test Pit Records and summarized below in the following paragraphs and Table A.

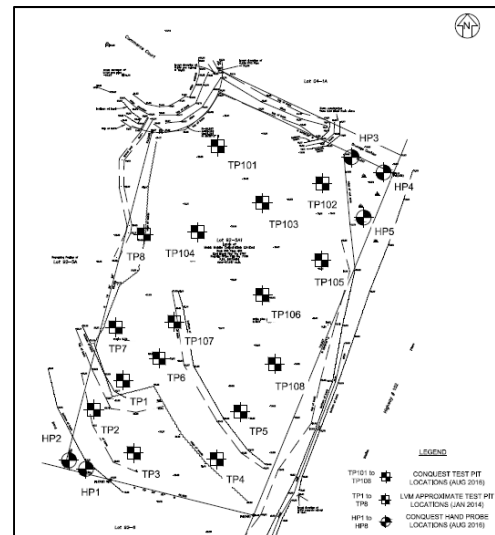


Figure A: Test Pit and Hand Probe Locations

The subsurface conditions encountered throughout the proposed development area generally consist of rootmat overlying glacial till. Fill and re-worked till were encountered in two test pits and ranged in thickness from 0.5 m to 0.6 m. Peat was encountered at the hand probe locations and ranged in thickness from 0.5 m to 0.6 m. Native soil was encountered in all test pits and ranged in depth from 0.1 m to 0.8 m. Bedrock and groundwater seepage were not encountered in the test pits.

Hand probes were conducted in low lying areas where peat deposits were expected. The peat encountered in the hand probes ranged in thickness from 0.5 m to 0.6 m. These results are shown below in Table B.

Grain size testing conducted on one sample of the native glacial till shows 14% gravel, 32% sand, and 55% fines (silt and clay). Moisture content of the sample was 10.9%. The grain size curve is shown in Figure 1 in the appendix.

Atterberg Limit results on one sample of the glacial till from Test Pits 1 showed a Liquid Limit of 24.0% with a corresponding Plastic Limit of 14.9%, and a Plasticity Index of 8, indicative of low plasticity clay (CL).

Table A: Summary of Findings – Test Pits (Current Investigation)

Location	Elevation ¹ (m)	Thickness of Rootmat (m)	Thickness of Fill (m)	Depth to Native Soil (m)	Groundwater Depth ² (m)	Depth of Test Pit (m)
TP101	20.7	--	0.5 ³	0.5	--	4.6
TP102	19.3	0.1	--	0.1	--	5.2
TP103	20.2	0.1	--	0.1	--	5.0
TP104	21.0	0.1	--	0.1	--	3.8
TP105	20.3	0.1	--	0.1	--	3.8
TP106	20.2	0.2	--	0.2	--	4.1
TP107	22.0	0.1 ⁴	0.6	0.7	--	3.8
TP108	19.9	0.1	--	0.1	--	3.8

Notes: ¹Geodetic Datum. Ground surface elevation taken with GPS mapping unit.

²Measured during excavation.

³Re-worked till.

⁴Encountered below fill.

Table B: Summary of Findings – Hand Probes

Location	Elevation ¹ (m)	Thickness of Peat (m)
HP1	19.1	0.6
HP2	19.2	0.5
HP3	18.9	0.5
HP4	19.0	0.5
HP5	18.8	0.6

Notes: ¹Geodetic Datum. Ground surface elevation taken with GPS mapping unit.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Main Findings

It is understood that the lot is intended to be developed for new municipal infrastructure, possibly home to the new Municipal Aquatic Centre. The subsurface conditions are generally good for conventional spread footing foundations and grade slab.

The main findings/recommendations from our investigation are as follows:

- A foundation system with footings founded on undisturbed native soil or structural fill would be practical for this site following site work.
- The existing fill, re-worked till, and organics (peat/rootmat) should be removed from within the building areas and reinstated with approved structural fill. Proof-rolling should be conducted at the footing design grade elevation and floor design subgrade elevation. Weak zones should be replaced with approved structural fill. Approved structural fill should be placed and compacted in lifts to design grades, as required.
- Organics (peat/rootmat) should be removed from the roadway/parking areas. The existing fill and re-worked till can likely remain in roadway/parking areas. Proof-rolling should be conducted at design subgrade in pavement areas. Weak zones should be replaced with approved structural fill. Approved structural fill should be placed and compacted in lifts to design grades, as required.
- Geotechnical inspection of earthworks is recommended (and is required for building permits).

The following sections outline our geotechnical recommendations for site preparation and design.

4.2 Earthworks

Earthworks for this project will likely involve excavations into the existing fill and native soil in the proposed development areas, and placement of structural fill to achieve design grade elevations if required.

4.2.1 Surface Water Control and Erosion Control

Prior to excavations, surface water drainage controls should be provided on the up-gradient side of the site to minimize run-off onto exposed soils. Suitable erosion and sedimentation control measures should be employed. These may include silt fences, check dams in ditches, and granular working pads.

4.2.2 Excavation

Excavation into the site soils will be practical with conventional earth-moving equipment.

Within the building area, the existing fill, re-worked till, and organics (peat/rootmat) should be removed and reinstated with approved structural fill. Proof-rolling should be conducted at the footing design grade elevation and floor design subgrade elevation. Weak zones should be replaced with approved structural fill. Approved structural fill should be placed and compacted in lifts to design grades, as required.

Within the roadway/parking areas, organics (peat/rootmat) should be removed. The existing fill and re-worked till can likely remain in roadway/parking areas. Proof-rolling should be conducted at design subgrade in pavement areas. Weak zones should be replaced with approved structural fill. Approved structural fill should be placed and compacted in lifts to design grades, as required.

Temporary excavation side slopes in soil should be stable at one horizontal to one vertical (1H:1V).

Material that is planned for re-use should be placed directly in the intended areas or compacted in stockpiles for later use. Unsuitable materials should be used in landscaped areas or wasted off-site.

Excavated existing fill material could be considered for reuse on site if possible; otherwise, this material should be exported off-site and disposed properly. Excavated fill containing organics will not be suitable for reuse.

4.2.3 Dewatering of Excavations

With proper surface water controls, dewatering of excavations through the use of ditches and swales draining to sumps would be practical. Sumps should be anticipated by the contractor for the building excavation.

4.2.4 Fill Placement and Compaction

Fill required for the building area should consist of the following:

- approved on-site soils, or;
- imported, quarried rockfill and gravel or sand and gravel pit run.

Excavated fill containing organic material will not be suitable for re-use.

Re-use of approved, drier portions of the glacial till may be practical but may require some careful planning by the contractor and low amounts of precipitation during site grading. The moisture content would have to be within 2% of optimum (based on ASTM D698) to allow for reuse.

The lift thickness used during placement of fills must be compatible with the compaction equipment and the material type to ensure the specified density throughout. The lift thickness should not exceed approximately 400 mm for mass filling and 200 mm for backfilling of foundations and services. The maximum particle size should be no larger than $\frac{2}{3}$ of the lift thickness.

Fill materials should be compacted to the following percentage of maximum Standard Proctor dry density:

• Fill in building areas	100%
• Fill within 300 mm of paved area subgrade	98%
• Fill below 300 mm of paved area	95%
• Landscaped areas	93%

Where fill is needed below footings, the fill must be extended laterally beyond the edges of the footings to include a 0.3 m bench and the conventional 1H:1V splay.

4.2.5 Slopes and Toe Drainage

Permanent fill slopes should be 2H:1V, or lower. Permanent cut slopes should be stable at 3H:1V for slope heights of less than 2 m. Cut slopes of greater heights will require a 300 mm thick granular blanket or deep rooting vegetation to reinforce the slope. A toe drain or swale should be provided for drainage at the base of cut slopes.

4.2.6 Building Area Subgrade

The contractor must take precautions to avoid disturbance of the site soils, or reinstate the material to the required condition. The condition of the subgrade should be reviewed prior to placement of base gravel.

4.2.7 Inspection and Testing

It is recommended that inspection of all footing bearing surfaces be conducted by experienced geotechnical personnel prior to placement of concrete. Inspection and testing is also recommended during site grading and backfilling operations.

4.3 Foundations

A foundation system consisting of spread footings and a grade slab founded on structural fill or native soil is favorable for the proposed building.

4.3.1 Shallow Foundations

For analysis using Limit States Design, we calculated bearing capacities for square and strip footings up to 3 m for a settlement tolerance of 25 mm. Other bearing capacities for other footing sizes (or settlement tolerances) can be provided at your request. Bearing resistance values for square and strip footings founded on native soil or structural fill are plotted on Figures 2 and 3 in the appendix.

For comparison using the old Working Stress design approach, an allowable bearing pressure of 150 kPa for a tolerable settlement of 25 mm and footing size up to 2.0 m would have been used for a footing founded on native soil or structural fill. This includes a global factor of safety of 3.

Footings should be founded a minimum of 1.2 m below grade for frost protection, or equivalent insulation provided.

4.3.2 Slab on Grade and Exterior Slabs

A conventional grade slab founded on approved structural fill or native soil is practical for this site. A 150 mm thick layer of DTIR Type 1 Gravel is recommended below the floor slab for levelling and support purposes. The gravel should be compacted to 100% Standard Proctor.

For a slab on grade, a perimeter foundation drainage system is recommended, unless the surrounding finished exterior grades are below the floor elevation.

We typically recommend a 50 mm thickness of approved insulation for frost protection of exterior slabs but this may vary depending on subgrade type and slab thickness and should be reviewed once more details are known. The insulation should extend 1.0 m beyond the slab edge.

4.4 Pavement Structure

With the subgrade prepared as outlined in Section 4.2, the following pavement structure is recommended. However, it will be critical to evaluate the subgrade prior to placement of gravel.

Table C: Pavement Structure Thicknesses

Material	Standard Duty Pavement¹	Heavy Duty Pavement
Asphalt Concrete:		
Top Course	75 mm	40 mm
Base Course	-	50 mm
Type 1 Gravel	300 mm	150 mm
Type 2 Gravel	-	200 mm

Notes: ¹Cars and light trucks.

All aggregate and asphalt concrete materials should meet the DTIR Standard Specifications. The gravels should be compacted to 100% of Standard Proctor maximum dry density. Asphalt concrete should be compacted to 92.5% of Maximum Theoretical Relative Density.

The contractor should consider the use of a geotextile at subgrade level if the project driveway is used as a construction access road.

4.5 Additional Geotechnical Services

It is recommended that inspection of the footing bearing surfaces be conducted by Conquest Engineering prior to placement of concrete. Inspection and testing is recommended during site grading and backfilling operations.

5.0 CLOSURE

This report has been prepared for the sole benefit of the Municipality of East Hants, its designates, nominees and partners. Any use or reliance on this report under any of the following conditions would render this report inapplicable:

- where there have been any change in site conditions; or
- where used for purposes not intended or delineated in this report; or
- where used by third parties without express written agreement of Conquest Engineering.

Any use of, or reliance upon, this report under such circumstances or by such parties is strictly prohibited and without risk or liability to Conquest.

Conquest Engineering used reasonable care, skill, competence and judgment in the preparation of this report. The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff in accordance with generally accepted engineering and scientific practices current at the time the work was performed. The information and conclusions contained in this report are generally consistent with professional standards for individuals providing similar services at the same time, in the same locale and under like circumstances.

A field investigation is a limited sampling of a site. Some variation between sampling locations should be expected. The conclusions presented in this report represent the best technical judgment of Conquest Engineering based on the data obtained from the work. The conclusions are based on the site conditions observed by Conquest Engineering at the time the work was performed at the specific testing and/or sampling locations, and can only be extrapolated to an undefined limited area around these locations. The extent of the limited area depends on the soil and groundwater conditions, as well as the history of the site reflecting natural, construction and other activities. Due to the nature of the investigation and the limited data available, Conquest Engineering cannot warrant against undiscovered environmental liabilities.

If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein. Further, if there are changes to the proposed work, such as adjustments in founding elevation or building loads, etc., we require that we be notified to allow for review of our recommendations.



Devan McKenney, EIT
Geotechnical Engineer
dmckenney@conquest-eng.com



R. Bruce MacNeil, P.Eng
Senior Geotechnical Engineer
bmacneil@conquest-eng.com

APPENDIX A

Geotechnical and Materials Engineers

SOIL DESCRIPTION

Terminology describing common soil genesis:

<i>Topsoil</i>	- mixture of soil and humus capable of supporting good vegetative growth
<i>Peat</i>	- fibrous aggregate of visible and invisible fragments of decayed organic matter
<i>Till</i>	- unstratified glacial deposit which may range from clay to boulders
<i>Fill</i>	- any materials below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

<i>Desiccated</i>	- having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
<i>Fissured</i>	- having cracks, and hence a blocky structure
<i>Varved</i>	- composed of regular alternating layers of silt and clay
<i>Stratified</i>	- composed of alternating successions of different soil types, e.g. silt and sand
<i>Layer</i>	- >75 mm
<i>Seam</i>	- 2 mm to 75 mm
<i>Parting</i>	- < 2 mm
<i>Well Graded</i>	- having wide range in grain sizes and substantial amounts of all intermediate particle sizes
<i>Uniformly Graded</i>	- predominantly of one grain size

Terminology describing soils on the basis of grain size and plasticity is based on the Unified Soil Classification System (USCS) (ASTM D-2488). The classification excludes particles larger than 76 mm (3 inches). This system provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present:

<i>Trace, or occasional</i>	Less than 10%
<i>Some</i>	10-20%
<i>Frequent</i>	Greater than 20%

The standard terminology to describe cohesionless soils includes the compactness (formerly “relative density”), as determined by laboratory test or by the Standard Penetration Test ‘N’ – value.

Relative Density	‘N’ Value	Compactness %
<i>Very Loose</i>	<4	<15
<i>Loose</i>	4-10	15-35
<i>Compact</i>	10-30	35-65
<i>Dense</i>	30-50	65-85
<i>Very Dense</i>	>50	>85

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression tests, or occasionally by standard penetration tests.

Consistency	Undrained Shear Strength (Su)		'N' Value
	Kips/sq.ft.	KPa	
<i>Very Soft</i>	< 0.25	< 12.5	< 2
<i>Soft</i>	0.25 – 0.5	12.5 – 25	2 – 4
<i>Firm</i>	0.5 – 1.0	25 – 50	4 – 8
<i>Stiff</i>	1.0 – 2.0	50 – 100	8 – 15
<i>Very Stiff</i>	2.0 – 4.0	100 – 200	15 – 30
<i>Hard</i>	> 4.0	> 200	> 30

ROCK DESCRIPTION

Rock Quality Designation (RQD)

The classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. RQD was originally intended to be done on N-size (45 mm) core; however, it can be used on different core sizes if the bulk of the fractures caused by drilling stresses are easily distinguishable from in situ fractures.

RQD	ROCK QUALITY
90 – 100	Excellent, intact, very sound
75 – 90	Good, massive, moderately jointed or sound
50 – 75	Fair, blocky and seamy, fractured
25 – 50	Poor, shattered and very seamy or blocky, severely fractured
0 – 25	Very poor, crushed, very severely fractured

Terminology describing rock mass:

Spacing (mm)	Bedding, Laminations, Bands	Discontinuities
2000 – 6000	<i>Very Thick</i>	<i>Very Wide</i>
600 – 2000	<i>Thick</i>	<i>Wide</i>
200 – 600	<i>Medium</i>	<i>Moderate</i>
60 – 200	<i>Thin</i>	<i>Close</i>
20 – 60	<i>Very Thin</i>	<i>Very Close</i>
< 20	<i>Laminated</i>	<i>Extremely Close</i>
< 6	<i>Thinly Laminated</i>	

Strength Classification	Uniaxial Compressive Strength (MPa)
<i>Very Weak</i>	1 – 5
<i>Weak</i>	5 – 25
<i>Medium Strong</i>	25 – 50
<i>Strong</i>	50 – 100
<i>Very Strong</i>	100 – 250
<i>Extremely Strong</i>	> 250

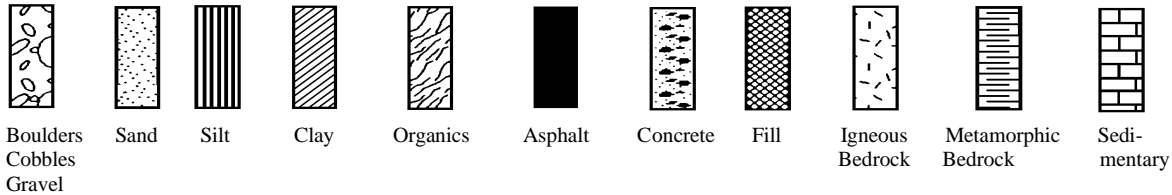
Terminology describing weathering:

<i>Slight</i>	- Weathering limited to the surface of major discontinuities. Typically iron stained.
<i>Moderate</i>	- Weathering extends throughout rock mass. Rock is not friable.
<i>High</i>	- Weathering extends throughout rock mass. Rock is friable.



STRATA PLOT

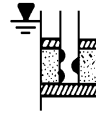
Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:



WATER LEVEL MEASUREMENT



Borehole or
Standpipe



Piezometer

SAMPLE TYPE AND/OR FIELD TESTS

SS	Split Spoon Sample (obtained by performing the Standard Penetration Test)	AS	Auger Sample
ST	Shelby Tube or Thin Wall Tube	BS	Bulk Sample
PS	Piston sample	WS	Wash Sample
DC	Dynamic Cone Penetration	HQ, NQ, BQ, etc.	Rock Core Samples (obtained with the use of standard size diamond drilling bits)
FSV	Field Shear Vane		

N- VALUE

Numbers in this column are the results of the SPT (Standard Penetration Test): the number of blows of a 140 pound (64kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil. For split spoon samples where insufficient penetration was achieved and 'N' values cannot be presented, the abbreviation SSR (Split Spoon Refusal) will appear in place of a numerical value.

OTHER TESTS

Symbols in this column indicate that the following laboratory tests have been carried out and the results are presented separately.

S	Sieve analysis	H	Hydrometer analysis
G _s	Specific gravity of soil particles	γ	Unit weight
k	Permeability	C	Consolidation
↓	Single packer permeability test; test interval from depth shown to bottom of borehole	CD	Consolidated drained triaxial
┃	Double packer permeability test; Test interval as indicated	CU	Consolidated undrained triaxial with pore pressure measurements
○	Falling head permeability test using casing	UU	Unconsolidated undrained triaxial
↓	Falling head permeability test using well point or piezometer	DS	Direct shear
		Q _u	Unconfined compression
		I _p	Point Load Index (I _p on Borehole Records equals I _p (50); the index corrected to a reference diameter of 50 mm)
		MSV	Laboratory Miniature Shear Vane



**Conquest
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TEST PIT RECORD

Project Name: Proposed Building Development

Location: Lot 92-5a1, Commerce Court, Elmsdale, NS

Project No.: 394-005

Client: Municipality of East Hants

Water Level Date: --

Test Pit: 101

Sheet: 1 of 1

Date: August 3, 2016

Datum: Geodetic

SUBSURFACE PROFILE

SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	20.7				
		RE-WORKED TILL: Stiff, light brown, sandy clay -trace organics -trace gravel -subrounded to subangular clasts -dry to moist	20.2				
1		TILL: Very stiff to hard, brown, sandy clay -trace gravel and cobbles -subrounded to subangular clasts -moist					
					GS	1	Moisture Content = 10.9%
2							
3							
4							
			16.1		GS	2	
5		End of Test Pit at 4.6 m -no bedrock encountered -no groundwater encountered					



**Conquest
Engineering
Ltd.**

TEST PIT RECORD

Project Name: Proposed Building Development

Location: Lot 92-5a1, Commerce Court, Elmsdale, NS

Project No.: 394-005

Client: Municipality of East Hants

Water Level Date: --

Test Pit: 102

Sheet: 1 of 2

Date: August 3, 2016

Datum: Geodetic

SUBSURFACE PROFILE

SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	19.3				
		ROOTMAT	19.2				
		TILL: Loose, grey, silty sand -trace roots/rootlets -trace gravel	18.8		GS	1	
		-subrounded to subangular clasts -moist to wet					
1		TILL: Stiff, light brown, sandy clay -trace gravel and cobbles -subrounded to subangular clasts -moist	18.2				
		TILL: Very stiff to hard, brown, sandy clay -trace gravel -trace cobbles and boulders (up to 1.0 m in diameter) -subrounded to subangular clasts -moist					
2							
3							
4							
5							



**Conquest
Engineering
Ltd.**

TEST PIT RECORD

Project Name: Proposed Building Development

Location: Lot 92-5a1, Commerce Court, Elmsdale, NS

Project No.: 394-005

Client: Municipality of East Hants

Water Level Date: --

Test Pit: 102

Sheet: 2 of 2

Date: August 3, 2016

Datum: Geodetic

SUBSURFACE PROFILE

SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
			14.1				
		End of Test Pit at 5.2 m -no bedrock encountered -no groundwater encountered					
6							
7							
8							
9							
10							



**Conquest
Engineering
Ltd.**

TEST PIT RECORD

Project Name: Proposed Building Development

Location: Lot 92-5a1, Commerce Court, Elmsdale, NS

Project No.: 394-005

Client: Municipality of East Hants

Water Level Date: --

Test Pit: 103

Sheet: 1 of 1

Date: August 3, 2016

Datum: Geodetic

SUBSURFACE PROFILE

SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	20.2				
		ROOTMAT	20.1				
		TILL: Loose, grey, silty sand -trace rootlets -trace gravel	19.7				
		-subrounded to subangular clasts -moist					
1		TILL: Stiff, light brown, sandy clay -trace gravel -trace cobbles and boulders (up to 0.3 m in diameter) -subrounded to subangular clasts -moist	19.0				
		TILL: Very stiff to hard, brown, sandy clay -trace gravel -trace cobbles and boulders (up to 0.3 m in diameter) -subrounded to subangular clasts -moist					
2							
3							
4							
5		End of Test Pit at 5.0 m -no bedrock encountered -no groundwater encountered	15.2				



**Conquest
Engineering
Ltd.**

TEST PIT RECORD

Project Name: Proposed Building Development

Location: Lot 92-5a1, Commerce Court, Elmsdale, NS

Project No.: 394-005

Client: Municipality of East Hants

Water Level Date: --

Test Pit: 104

Sheet: 1 of 1

Date: August 3, 2016

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	21.0				
		ROOTMAT	20.9				
		TILL: Loose, grey, silty sand -trace rootlets -trace gravel -subrounded to subangular clasts -moist	20.5				
1		TILL: Stiff, light brown, sandy clay -trace gravel -trace cobbles and boulders (up to 0.5 m in diameter) -subrounded to subangular clasts -moist	19.8				
		TILL: Very stiff to hard, brown, sandy clay -trace gravel -trace cobbles and boulders (up to 0.5 m in diameter) -subrounded to subangular clasts -moist			GS	1	
2							
3							
			17.2				
4		End of Test Pit at 3.8 m -no bedrock encountered -no groundwater encountered					
5							



**Conquest
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Ltd.**

TEST PIT RECORD

Project Name: Proposed Building Development

Location: Lot 92-5a1, Commerce Court, Elmsdale, NS

Project No.: 394-005

Client: Municipality of East Hants

Water Level Date: --

Test Pit: 105

Sheet: 1 of 1

Date: August 3, 2016

Datum: Geodetic

SUBSURFACE PROFILE

SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	20.3				
		ROOTMAT	20.2				
		CLAY: Stiff, dark grey, clay -trace rootlets and organics -trace sand -subrounded to subangular clasts -dry to moist	19.5		GS	1	
1		TILL: Loose to compact, brown, silty sand -trace rootlets -trace gravel -subrounded to subangular clasts -moist	19.2				
2		TILL: Very stiff to hard, brown, sandy clay -trace gravel -trace cobbles and boulders (up to 0.3 m in diameter) -subrounded to subangular clasts -moist					
3							
4		End of Test Pit at 3.8 m -no bedrock encountered -no groundwater encountered	16.5				
5							



**Conquest
Engineering
Ltd.**

TEST PIT RECORD

Project Name: Proposed Building Development

Location: Lot 92-5a1, Commerce Court, Elmsdale, NS

Project No.: 394-005

Client: Municipality of East Hants

Water Level Date: --

Test Pit: 106

Sheet: 1 of 1

Date: August 3, 2016

Datum: Geodetic

SUBSURFACE PROFILE

SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	20.2				
		ROOTMAT	20.0				
		TILL: Loose to compact, brown, silty sand -trace gravel -subrounded to subangular clasts -moist	19.6				
1		TILL: Stiff, brown, sandy clay -trace gravel and cobbles -subrounded to subangular clasts -moist	19.3				
2		TILL: Very stiff to hard, brown, sandy clay -trace gravel and cobbles -subrounded to subangular clasts -moist					
3							
4			16.1				
		End of Test Pit at 4.1 m -no bedrock encountered -no groundwater encountered					
5							



**Conquest
Engineering
Ltd.**

TEST PIT RECORD

Project Name: Proposed Building Development

Location: Lot 92-5a1, Commerce Court, Elmsdale, NS

Project No.: 394-005

Client: Municipality of East Hants

Water Level Date: --

Test Pit: 107

Sheet: 1 of 1

Date: August 3, 2016

Datum: Geodetic

SUBSURFACE PROFILE

SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	22.0				
		FILL: Loose to compact, brown, sand with gravel -french drain at surface -15 mm of rootmat at surface -subrounded to subangular clasts -moist	21.4				
		ROOTMAT	21.3				
		TILL: Loose to compact, light brown, silty sand -trace gravel -subrounded to subangular clasts -moist	21.1				
1		TILL: Very stiff, brown, sandy clay -trace to some gravel -trace cobbles and boulders (up to 0.6 m in diameter) -subrounded to subangular clasts -moist					
2							
3							
4		End of Test Pit at 3.8 m -no bedrock encountered -no groundwater encountered	18.2				
5							



**Conquest
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Ltd.**

TEST PIT RECORD

Project Name: Proposed Building Development

Location: Lot 92-5a1, Commerce Court, Elmsdale, NS

Project No.: 394-005

Client: Municipality of East Hants

Water Level Date: --

Test Pit: 108

Sheet: 1 of 1

Date: August 3, 2016

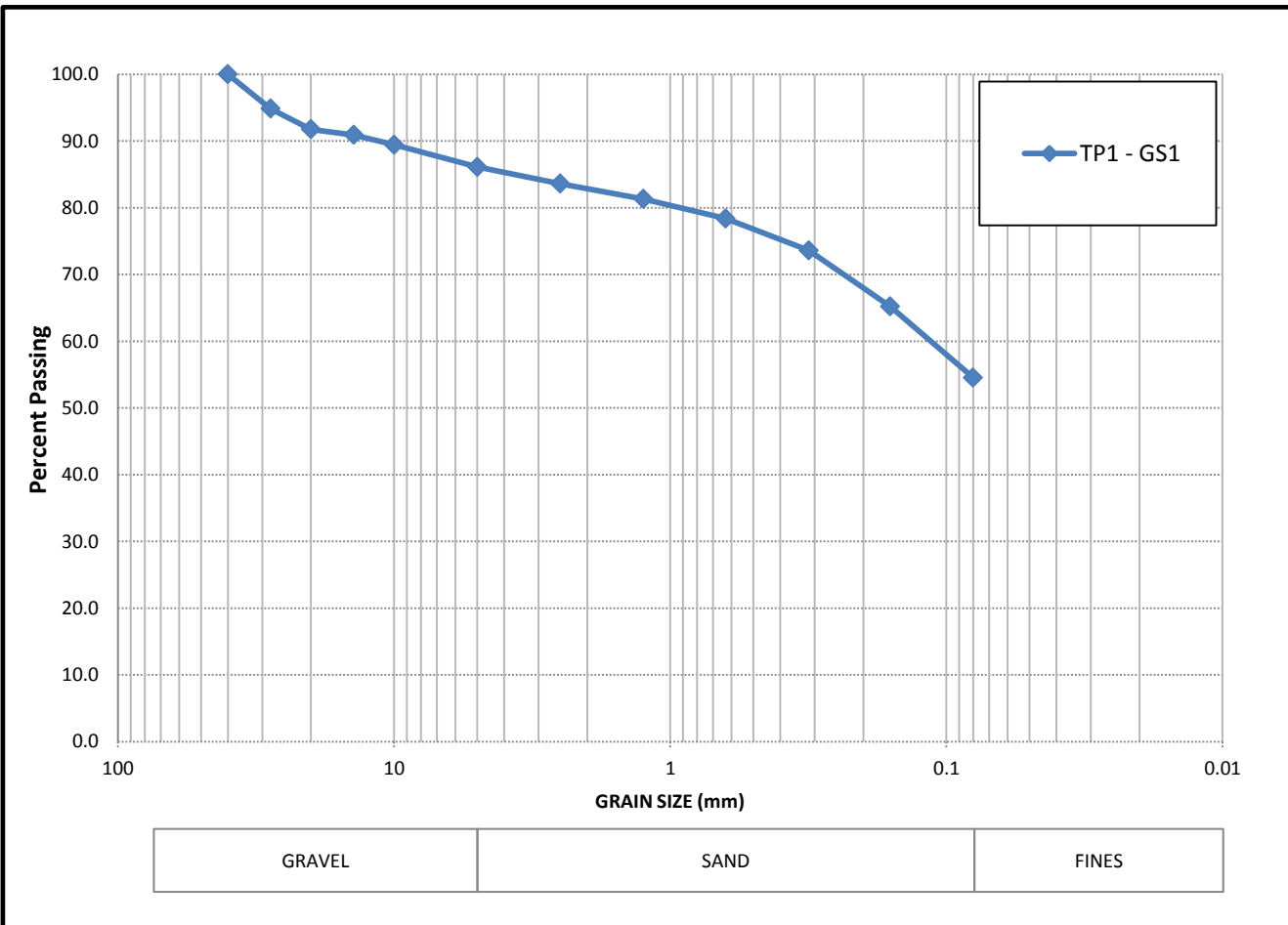
Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	19.9				
		ROOTMAT	19.8				
		TILL: Soft to stiff, brown, clayey sandy silt -trace rootlets -trace gravel -moist	19.1				
1		TILL: Stiff to very stiff, brown, sandy clay -trace gravel -trace boulders (up to 0.3 m in diameter) -subrounded to subangular clasts -moist					
2					GS	1	
3							
4		End of Test Pit at 3.8 m -no bedrock encountered -no groundwater encountered	16.1				
5							

GRAIN SIZE REPORT

Project: Proposed Building Development
Client: Municipality of East Hants
Project No: 394-005

GRAIN SIZE DISTRIBUTION PLOT



SOIL CLASSIFICATION

Sample No	Depth	Classification	Moisture Content (%)	Gravel (%)	Sand (%)	Silt and Clay (%)
TP1 - GS1	1.2 m	Sandy lean clay (CL)	10.9	14	32	55

Conquest Engineering Limited

348 Bluewater Road, Bedford, NS B4B 1J6
Office (902) 835-7313 • Fax (902) 835-1260

Comments: Samples taken from test pits conducted on August 3, 2016.

FACTORED ULS BEARING RESISTANCE (NATIVE SOIL OR STRUCTURAL FILL)

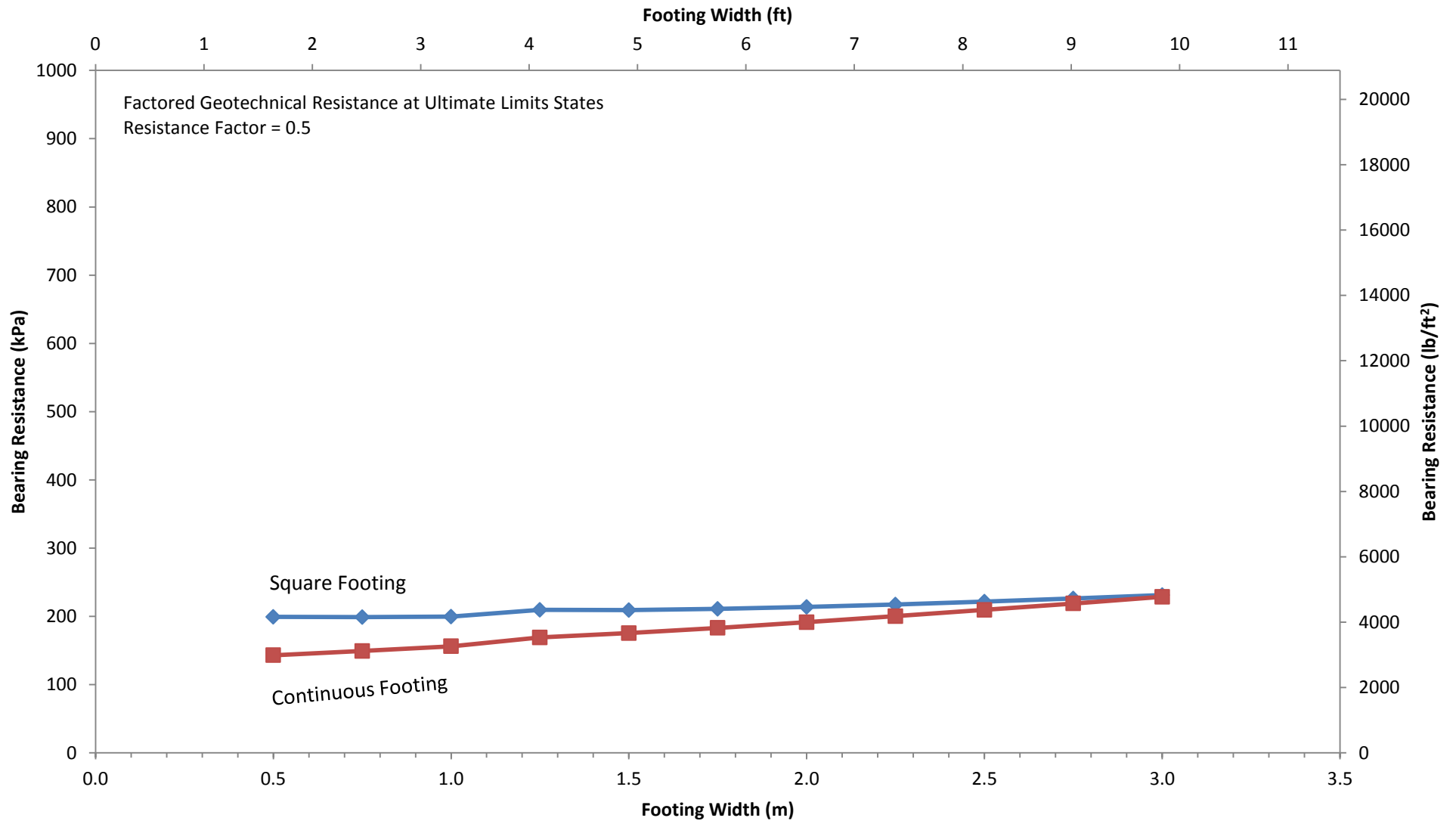


Figure 2

Project # 394-005

SLS BEARING RESISTANCE (NATIVE SOIL OR STRUCTURAL FILL)

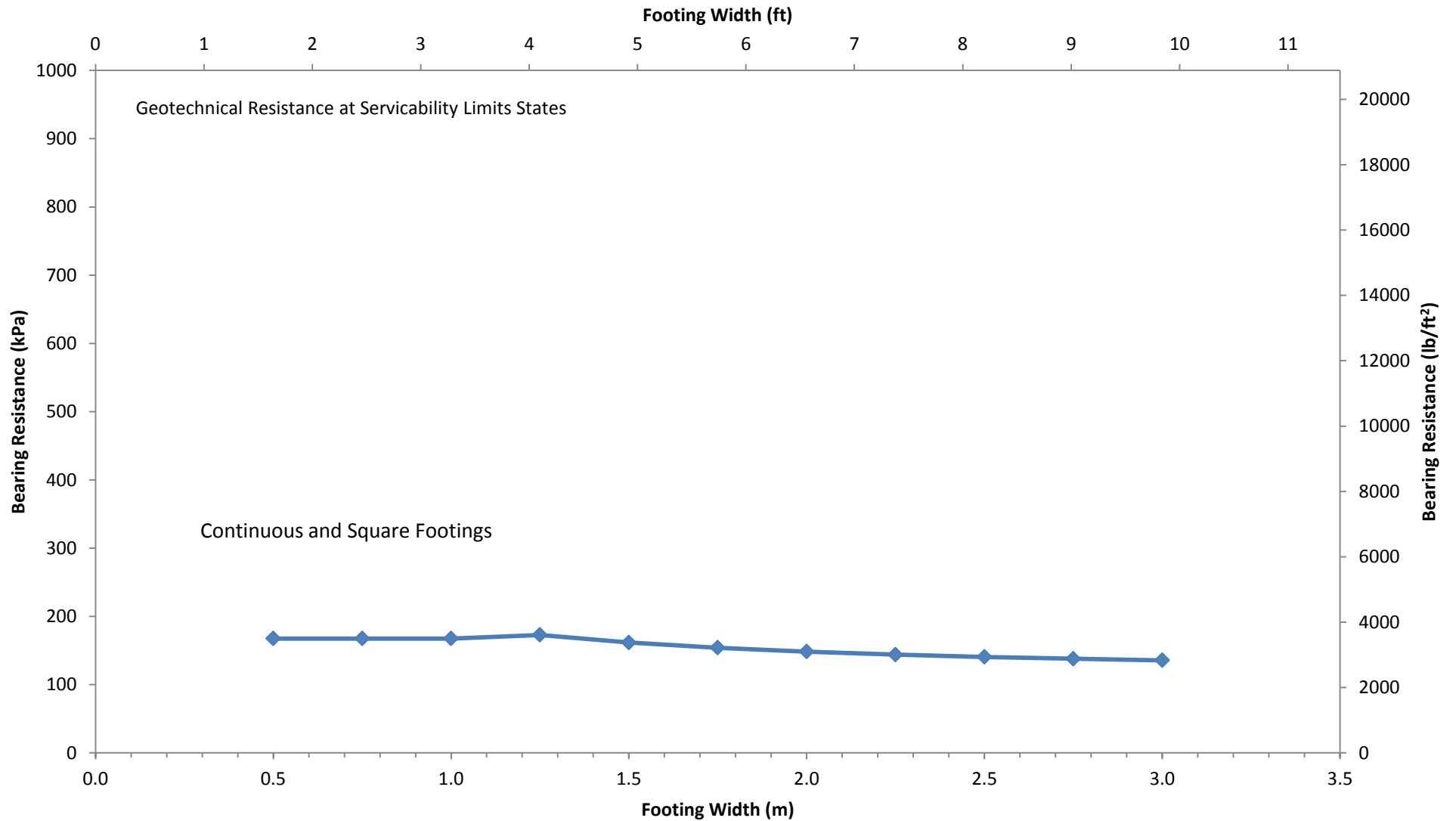
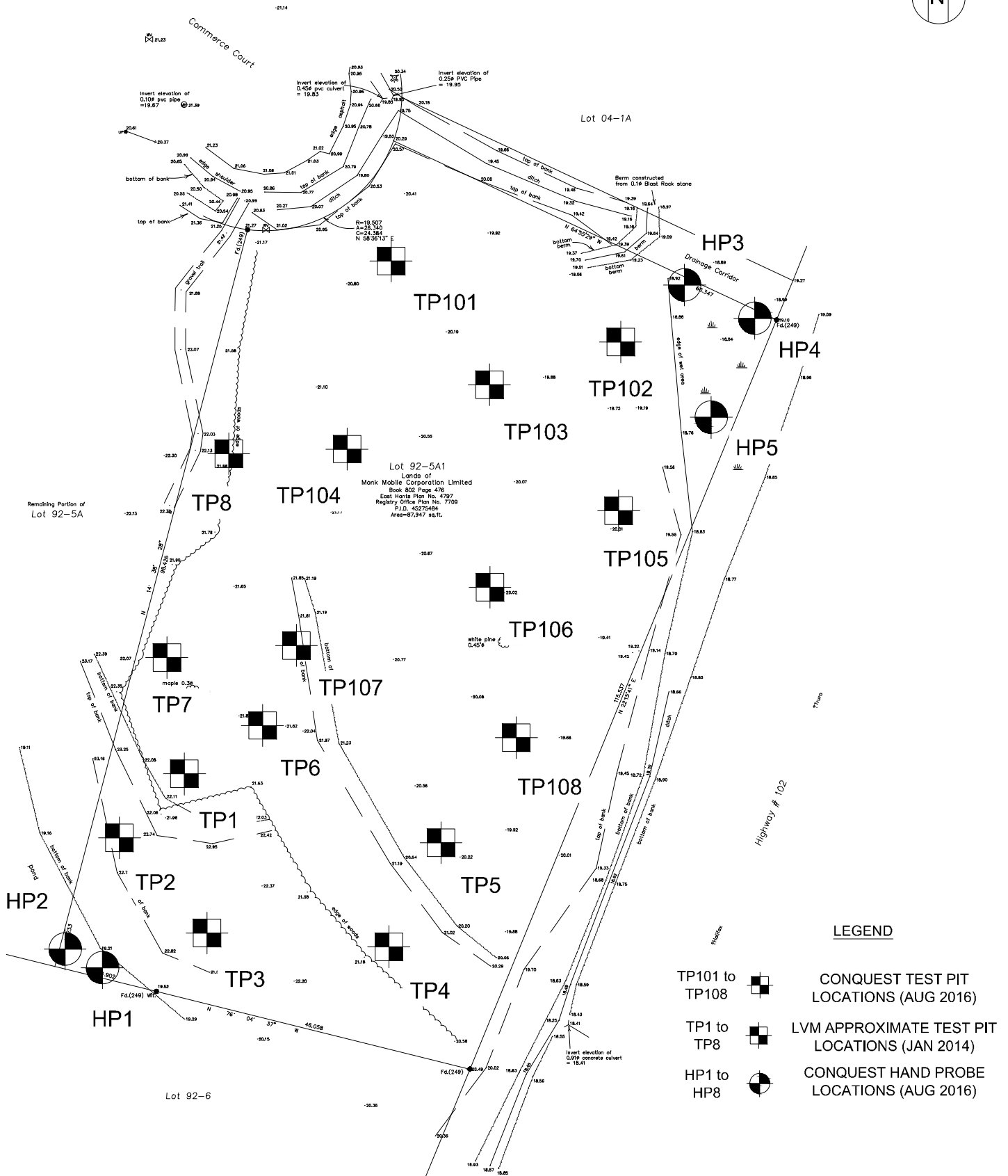


Figure 3

Project # 394-005



**CONQUEST
ENGINEERING
LTD.**
348 Bluewater Road
Bedford, Nova Scotia
B4B 1J6

PROJECT
**TEST PIT AND HAND PROBE
LOCATION PLAN**
PROPOSED BUILDING DEVELOPMENT
LOT 92-5A1, COMMERCE COURT
ELMSDALE, NS

JOB #: 394-005
SCALE: 1:750
DATE: 10-AUG-2016
DRAWN BY: DM
CHECKED BY: RBM

DOCUMENTS PREPARED BY CONQUEST ENGINEERING LTD. ARE TO BE USED ONLY FOR THE SPECIFIC PROJECT AND SPECIFIC USE FOR WHICH THEY WERE PREPARED. ANY EXTENSION OF USE TO OTHER PROJECTS, BY OWNER, OR ANY OTHER PARTY, WITHOUT THE EXPRESSED, WRITTEN AUTHORIZATION OF CONQUEST ENGINEERING LTD. IS DONE AT THE USER'S OWN RISK, IF USED IN A WAY OTHER THAN WHAT WAS SPECIFICALLY INTENDED, THE OWNER WILL HOLD CONQUEST ENGINEERING LTD. HARMLESS FROM ALL CLAIMS AND LOSSES.

DRAWING:
1
REV:
0



Photograph 1: Test Pit 101. August 3, 2016.



Photograph 2: Test Pit 102. August 3, 2016.



Photograph 3: Test Pit 103. August 3, 2016.



Photograph 4: Test Pit 104. August 3, 2016.



Photograph 5: Test Pit 105. August 3, 2016.



Photograph 6: Test Pit 106. August 3, 2016.



Photograph 7: Test Pit 107. August 3, 2016.



Photograph 8: Test Pit 108. August 3, 2016.

APPENDIX B

TEST PIT LOG

<div>LVM MARITIME TESTING</div>				TEST PIT LOG						
				PROJECT Geotechnical Investigation - Proposed New Building Lot 92-5A1, Commerce Court, Elmsdale, NS						
LOGGED/DWN. BAM		CKD. TKM		DATE OF INVEST. 1/30/14		JOB NO. 18369		TEST PIT TP 2		
<div>WC % wp- □ w- ● wl- △ 10 20 30 40 50</div>		DEPTH ft m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		BACKHOE TYPE	
					DATUM Existing Ground Surface		COND.	TYPE	POCKET PENE.	Excavator
					SURFACE ELEVATION					
									OTHER TESTS	
		1			FILL : mixture of soil, organics, roots, loose, wet, brown.					
		2								
		3	1							
		4			Rootmat / Topsoil					
		5								
		6			TILL : silty sandy clay, trace gravel, occasional cobble, compact, moist, reddish brown to brown.					
		7	2							
		8								
		9			End of Test Pit at 2.4 metres in Till.					
		10			Test Pit dry upon completion.					
		11	3							
		12								
		13	4							
		14								
		15								
		16	5							
PLATE 2										

TEST PIT LOG

<div>LVM MARITIME TESTING</div>				TEST PIT LOG							
				PROJECT Geotechnical Investigation - Proposed New Building Lot 92-5A1, Commerce Court, Elmsdale, NS							
LOGGED/DWN. BAM		CKD. TKM		DATE OF INVEST. 1/30/14		JOB NO. 18369		TEST PIT TP 5			
<div>WC % wp- □ w- ● wl- △ 10 20 30 40 50</div>		DEPTH ft m		MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		BACKHOE TYPE	
						DATUM Existing Ground Surface		COND.	TYPE	POCKET PENE.	Excavator
						SURFACE ELEVATION					
								OTHER TESTS			
		1			FILL : mixture of soil, organics, roots, loose, wet, brown.						
		2									
		3									
		4									
		5									
		6			TILL : silty sandy clay, trace gravel, occasional cobble, compact, moist, reddish brown to brown.						
		7									
		8									
		9									
		10									
		11									
		12									
		13									
		14									
		15									
		16									
		5									
End of Test Pit at 2.1 metres in Till. Test Pit dry upon completion.											
PLATE 5											

