Structural BD

Castor Rd.
151-01098-01

Preliminary Geotechnical Investigation
Part of Lot 10 Concession 5, Parts 1& 2
Registered Plan 50R-9611
Embrun, Ontario

Prepared for:

Township of Russell
717 Notre-Dame Street
Embrun, Ontario
K0A 1W0

Attention: Mrs. Dominique Tremblay

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LRL File No.: 120430

December 21, 2012

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1 INTRODUCTION

The Township of Russell retained the services of LRL Associates Ltd. to carry out a preliminary geotechnical investigation for a proposed future development in Embrun, Ontario.

The purpose of the investigation was to identify the subsurface conditions at the site by means of a limited number of test holes and based on the factual information obtained to provide general guidelines on the geotechnical engineering aspects of the preliminary design of the project including construction considerations which could influence design decisions.

This report has been prepared in consideration of the terms and conditions noted above and with the assumption that the design of the project will satisfy any applicable codes and standards. Should there be any changes in the design features, which may relate to the guidelines provided in the report, LRL Associates Ltd. should be advised in order to review the report recommendations.

2 PROJECT AND SITE

The site under investigation for the proposed future development is known as Part of lot 10, Concession 5 being parts 1 and 2 of Registered Plan 50R-9611 in Embrun, Ontario. The site under development has an irregular shape with a maximum frontage of approximately 465 metres on Notre Dame Street and a maximum depth of about 305 metres. There were no proposed development plan at the time of submitting this report.

A review of the surficial geology maps for the site area indicate that the site is underlain by glaciomarine deposits composed mostly of silt and clay with minor sand and gravel.

3 PROCEDURE

The field work for this investigation was carried out on November 6, 2012 at which time twelve (12) test pits, numbered TP-1 to TP-12 were put down at the site. Prior to the field work the test pit locations were cleared for the presence of any underground services and utilities.

The test pits were advanced to depths of about 3.5 to 5.2 metres below the existing ground surface using a backhoe supplied and operated by the client.

The soil conditions encountered at the test pits were classified based on visual and tactile examination of the materials exposed on the sides and bottom of the test holes. In situ vane shear strength testing was carried out in cohesive materials.

The field work was supervised throughout by a member of our engineering staff who logged the subsurface conditions encountered at each test pit. A description of the subsurface conditions encountered at each of the test pits are given in the attached record of test pit logs. The approximate locations of the test pits are shown on the attached Test Pit Location Plan, Figure G.002.

4 SUBSURFACE SOIL AND GROUNDWATER CONDITIONS

4.1 General

As previously indicated, the soil and groundwater conditions encountered at the test pits put down for this investigation are given in the Record of Test Pit Logs. The test pits indicate the subsurface conditions at the specific test locations only. Boundaries between soil units on the record of test pit logs are often not distinct, but rather are transitional and have been interpreted.

Subsurface conditions at other than the test pit locations may vary from the conditions encountered at the test pits. In addition to soil and bedrock variability, fill of variable physical and chemical composition may be present over portions of the site.

The soil descriptions presented in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves judgement and LRL does not guarantee descriptions as exact, but infers accuracy to the extent that is common in current geotechnical practice.

Standpipes were installed at test pits TP-1, TP-5, TP-7, and TP-11 to measure the subsequent groundwater levels. The water levels were measured at the standpipes on November 27, 2012.

The following is a brief overview of the subsurface conditions encountered at test pits.

4.2 Topsoil

All of the test pits encountered about a 200 to 350 millimetre thickness of topsoil from the surface. The material was classified as topsoil based on colour and the presence of organic materials and is intended as identification for geotechnical purposes only and does not constitute a statement as to the suitability of this layer for cultivation and sustaining plant growth.

4.3 Sand

A 0.3 to 0.7 metre thick layer of brown silty sand was encountered below the topsoil at all of the test pits. Based on the difficulty of excavating of the backhoe, it is considered that the sand is in the compact state of packing.

4.4 Silty Clay

A silty clay deposit was encountered beneath the sand layer at all of the test pits. The clay is described as brown becoming grey with reddish bands with depth with occasional interbedded silt layers. The results of in situ vane shear testing carried out in the silty clay generally gave undrained shear strength values of more than 100 kilopascals from the surface of the silty clay to a depth of about 2.4 metres below the existing ground surface followed by undrained shear strength values of about 20 to 40 kilopascals. All of the test pits were terminated within the silty clay deposit.

The results of the in situ vane shear testing and tactile examination carried out for the silty clay material indicate that the silty clay encountered in the test pits is typically stiff from the surface of the silty clay deposit to a depth of about 2.4 metres where it becomes firm to soft in consistency.

4.5 Groundwater Conditions

Stand pipes (25 millimetre diameter) were installed down to a depth of about 3.0 metres below the existing ground surface at test pits TP-1, TP-5, TP-7 and TP-12 to measure subsequent groundwater levels. The groundwater levels were measured on November 27, 2012 in the test pit standpipes. At that time the groundwater level was measured at a depth of about 1.28 metres below the existing ground surface at test pit TP-1. The standpipes installed at test pits TP-5, TP-7 and TP-12 were dry. It should be noted that the standpipes may have been clogged with clay.

It should be noted that groundwater levels could fluctuate with seasonal weather conditions, (i.e.: rainfall, droughts, spring thawing) or due to construction activities at or in the vicinity of the site.)

5 PROPOSED FUTURE DEVELOPMENT

This section of the report provides general engineering guidelines on the geotechnical design aspects of the project based on our interpretation of the information from the test pits and the project requirements.

5.1 Foundations

With the exception of topsoil and fill material, the subsurface conditions encountered at the test pits advanced during the investigation may be suitable for the support of the future development on conventional spread footing foundations, provided the restrictions mentioned below are met. The excavations for the foundations should be taken through topsoil, fill or otherwise deleterious material to expose the native undisturbed silty clay.

Strip footings a maximum 0.75 metres in width and pad footings a maximum 1.5 metres in width, founded at a maximum depth of 1.5 metres below the existing ground surface within the native undisturbed silty clay deposit, may be designed using a maximum allowable bearing pressure of 60 kilopascals for serviceability limit state (SLS) and 90 kilopascals for ultimate limit state (ULS) factored bearing resistance. The above allowable bearing pressures are suitable for a maximum landscape grade raise at the proposed building foundations of 0.6 metres above the original ground surface.

If the footings are wider or founded deeper or if the grade raises are greater than that mentioned above, the above allowable bearing pressure at serviceability limit state will have to be reviewed by LRL Associates Ltd and may have to be reduced. A greater bearing capacity or permissible grade raise may result from carrying out boreholes and consolidation analyses at the site.

Provided that any loose and/or disturbed soil is removed from the bearing surfaces prior to pouring concrete, the total and differential settlement should be less than 25 millimetres.

Any fill required to raise the footings for the future development to the proposed founding level should consist of imported granular material (engineered fill) meeting Ontario Provincial Standards Specifications (OPSS) requirements for Granular A or Granular B Type II and should be compacted in maximum 200 millimetre thick loose lifts to at least 98 percent of the standard Proctor maximum dry density. To allow the spread of load beneath the footings, the engineered fill should extend down and out from the edges of the footing at 1 horizontal to 1 vertical, or flatter. The excavations for the proposed addition should be sized to accommodate this fill placement.

5.2 Seismic Design

Based on the limited information from the test pits, for Seismic design purposes, in accordance with the 2006 Ontario Building Code Section 4.1.8.4, Table 4.1.8.4.A., the site classification for seismic site response is Site Class E. A greater seismic site response class may result from carrying out an additional geotechnical investigation including the drilling of boreholes and /or seismic velocity testing could be carried out using a multichannel analysis of surface waves (MASW).

5.3 Frost Protection

All exterior footings and those in any unheated parts of the future development should be provided with at least 1.5 metres of earth cover for frost protection purposes. Isolated, exterior footings constructed in areas that are to be cleared of snow during the winter period should be provided with at least 1.8 metres of earth cover for frost protection purposes. Alternatively, the required frost protection could be provided using a combination of earth cover and extruded polystyrene insulation. Detailed guidelines for footing insulation frost protection could be provided upon request.

5.4 Foundation Wall Backfill and Drainage

To prevent possible foundation frost jacking, the backfill against foundation walls should consist of free draining, non-frost susceptible material such as sand or sand and gravel meeting OPSS Granular B Type I grading requirements.

Where the backfill material will ultimately support a pavement structure or walkway, it is suggested that the foundation wall backfill material be compacted in 250 millimetre thick lifts to 95 percent of the standard Proctor dry density value.

5.5 Foundation Drainage

For structures containing a basement, a conventional, perforated perimeter drain should be provided at the footing founding level, leading by gravity flow to a sump, sump and pump or a storm sewer. The drain should be provided with a 150 millimetres thick surround of 20 millimetres minus crushed stone wrapped in a suitable geotextile.

In order to minimize ponding of water adjacent to the foundation walls, roof water should be controlled by a roof drainage system and the exterior grade should be sloped to promote surface water away from the foundation walls.

5.6 Slab on Grade Support

For predictable performance of the concrete floor slab all existing topsoil, fill and any otherwise deleterious material should be removed from below the proposed floor slab area. The exposed native subgrade surface should then be inspected and approved by geotechnical personnel. Any soft areas evident should be subexcavated and replaced with suitable engineered fill.

The fill material beneath the concrete floor slab should consist of a 150 millimetre layer of crushed stone meeting OPSS requirements for Granular A compacted to at least 98% of the standard Proctor maximum dry density, immediately beneath the concrete floor slab followed by sand or sand and gravel meeting the OPSS requirements for Granular B Type I, or equivalent, compacted in maximum 300 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density.

In order to control cracking, the floor slab should be provided with crack control joints. The crack control joints should be provided in a grid pattern with spacing no greater than 4.5 metres.

If any areas of the future development are to remain unheated during the winter period, thermal protection of the slab on grade may be required. Further details on the insulation requirements could be provided, if necessary.

5.7 Trees

It should be noted that the silty clay soils at the site may be sensitive to water depletion by trees of high water demand during periods of dry weather. When trees draw water from the silty clay, the silty clay undergoes shrinkage which can result in settlement of adjacent structures. A research carried out by the Institute for Research Construction, formerly the Division of Building Research, of the National Research Council of Canada, referenced as CBD-62. Trees and Buildings, published in February 1965, provides the following guideline:

> *"If trees are already growing on the building site, every effort should be made so to locate the structure that it conforms with the suggestions in the next paragraph. If this cannot be done then, with natural reluctance trees that are going to be too close to the building must be cut down and their root systems removed. It is far better that this should be done and new trees planted appropriately than that aesthetic claims should over-rule sound judgement with the possibility of damage to the building and the eventual inevitable removal of the trees in any case. Care should be taken that the removed trees have not already desiccated the clay, which may then swell under the changed environment.*
>
> *If trees are to be planted as a part of the landscaping around the building, a good working rule has been found to be that trees should preferably be planted no nearer a building on shrinkable clay than the eventual height to which the tree may be expected to grow. This rule may require modification if the topography around the building varies. Even in its application, attention must be given to the differing transpiration characteristics of trees"*

Table I provides a list of the common trees in decreasing order of water demand and, accordingly, decreasing risk of potential effects on structures.

6 EXCAVATION

The sides of the excavations in overburden materials should be sloped in accordance with the requirements in Ontario's Occupational Health and Safety Act (OHSA), O. Reg. 527/00. The silty clay can be classified as Type 3. That is, open cut excavations deeper than 1.2 metres within overburden deposits should be carried out with side slopes of 1 horizontal to 1 vertical starting at the base of the excavations, or flatter. Where space constraints dictate, the excavation and backfilling operations should be carried out within a tightly fitting, braced steel trench box.

The listed slopes are for fully drained excavations. Much gentler slopes could be required under undrained excavations, where local water infiltrations occur and where the excavations are exposed for prolonged periods of time. Any excavated material stockpiled near an excavation or trench should be stored at a distance equal to or greater than the depth of the excavation/trench and construction equipment traffic should be limited near open excavation.

Groundwater inflow from the native soils into the excavations during construction, if any, should be handled by pumping from sumps within the excavations. Surface water runoff into the excavation should be minimized and diverted away from the excavation.

7 SITE SERVICES

7.1 Pipe Bedding and Cover Material

It is suggested that the service pipe bedding material consist of at least 150 millimetres of granular material meeting OPSS requirements for Granular A. A provisional allowance should, however, be made for subexcavation of any existing fill or disturbed material encountered at subgrade level. Granular material meeting OPSS specifications for Granular B Type II could be used as a sub-bedding material. The use of clear crushed stone as bedding or sub-bedding material should not be permitted unless it is placed over a suitable geotextile fabric meeting OPSS 1860 Class I requirements.

Cover material, from pipe spring line to at least 300 millimetres above the top of the pipe, should consist of granular material, such as OPSS Granular A.

The sub-bedding, bedding and cover materials should be compacted in maximum 200 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density using suitable vibratory compaction equipment.

7.2 Trench Backfill

The general backfilling procedures should be carried out in a manner that is compatible with the future use of the area above the service trenches.

In areas where the service trench will be located below or in close proximity to existing or future roadway areas, acceptable native materials should be used as backfill between the roadway subgrade level and the depth of seasonal frost penetrations (i.e. 1.8 metres below finished grade) in order to reduce the potential for differential frost heaving between the area over the trench and the adjacent section of roadway. Where native backfill is used, it should match the native materials exposed on the trench walls. Some of the native materials from the lower part of the trench excavations may be wet of optimum for compaction. Depending on the weather conditions encountered during construction, some drying of materials and/or recompaction may be required. Any wet materials that cannot be compacted to the required density should either be wasted from the site or should be used outside of existing or future roadway areas. Backfill below the zone of seasonal frost penetration could consist of either acceptable native material or imported granular material conforming to OPSS Granular B Type I.

To minimize future settlement of the backfill and achieve an acceptable subgrade for the roadways, sidewalks, etc., the trench backfill should be compacted in maximum 300 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density. The specified density may be reduced where the trench backfill is not located within or in close proximity to existing or future roadways, driveways, sidewalks, or any other type of permanent structure.

7.3 Seepage Barrier

The permanent lowering of the groundwater level at the site can be caused by drainage through the granular bedding and cover materials within the sewer trenches. Groundwater lowering can cause stress within the silty clay materials which underlie the site and in turn result in settlement of footings/foundations. To minimize the possibility of groundwater lowering at this site due to the presence of the proposed sewers, clay dykes should be provided within service trenches at about 150 metre spacing. Details for construction of the proposed clay dykes are shown in the attached Figure 3.

7.4 Re-use of On-site Soils

The existing overburden materials at the site consist of mainly silty clay, which is considered to be frost susceptible and should not be used as backfill material directly against foundation walls. However, the existing overburden material could be reused for general backfill material (service trenches and general landscaping and/or backfilling), if the material can be compacted according to the guidelines outlined above at the time of construction.

It should be noted that the adequacy of a material for reuse as backfill will mainly depend on the water content of the material at the time of use and on the weather conditions at that time. Any excavated materials proposed for reuse should be stockpiled in a manner promote drying and should be inspected and approved for reuse by a geotechnical engineer.

8 CONSTRUCTION CONSIDERATION

Once the final development plans have been prepared, a final geotechnical investigation report should be prepared in order to provide specific guidelines with regards to the proposed development.

The engagement of the services of the geotechnical consultant during construction is recommended to confirm that the subsurface conditions throughout the proposed development do not materially differ from those given in the report and that the construction activities do not adversely affect the intent of the design.

All footing areas and any engineered fill areas for the proposed addition should be inspected by LRL Associates Ltd to ensure that a suitable subgrade has been reached and properly prepared. The placing and compaction of any granular materials beneath the foundations and slab on grade should be inspected to ensure that the materials used conform to the grading and compaction specifications.

The subgrade for the pavement areas, watermain and sewers should be inspected and approved by geotechnical personnel. In situ density testing should be carried out on the pavement granular materials and pipe bedding and backfill to ensure the materials meet the specifications from a compaction point of view.

If footings are to be constructed during winter months, the footing subgrade should be protected from freezing temperatures using suitable construction techniques.

9 REPORT CONDITIONS AND LIMITATIONS

It is stressed that the information presented in this report is provided for the guidance of the designers and is intended for this project only. The use of this report as a construction document is neither intended nor authorized by LRL Associates Ltd. Contractors bidding on or undertaking the works should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of the factual data as it affects their construction techniques, schedule, safety and equipment capabilities.

The professional services for this project include only the geotechnical aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or contamination resulting from previous uses or activities at this site or adjacent properties, and/or resulting from the introduction onto the site of materials from off site sources are outside the terms of reference for this report.

The recommendations provided in this report are based on subsurface data obtained at the specific test locations only. Boundaries between zones on the Record of Borehole Sheets are often not distinct but transitional and were interpreted. Experience indicates that the subsurface soil and groundwater conditions can vary significantly between and beyond the test locations. For this reason, the recommendations given in this report are subject to a field verification of the subsurface soil conditions at the time of construction.

The soil descriptions presented in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves judgement and LRL Associates Ltd. does not guarantee descriptions as exact, but infers accuracy to the extent that is common in current geotechnical practice.

The report recommendations are applicable only to the project described in the report. Any changes to the project will require a review by LRL Associates Ltd., to insure compatibility with the recommendations contained in this project.

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report or if we may be of further services to you, please do not hesitate to contact our office.

Yours truly,
LRL Associates Ltd.

LICENSED PROFESSIONAL ENGINEER
J.P.B. CHARLEBOIS
100186540
Dec 21, 2012
PROVINCE OF ONTARIO

Bahareh Vazhbakht, M.Sc.

Benoît Charlebois, P.Eng.

FIGURES

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PROJECT

PRELIMINARY GEOTECHNICAL INVESTIGATION
PART OF LOT 10 CONCESSION 5, PARTS 1 & 2 OF
REGISTERED PLAN 50R-9611, EMBRUN, ONTARIO

DRAWING TITLE

KEY PLAN

CLIENT

TOWNSHIP OF RUSSELL

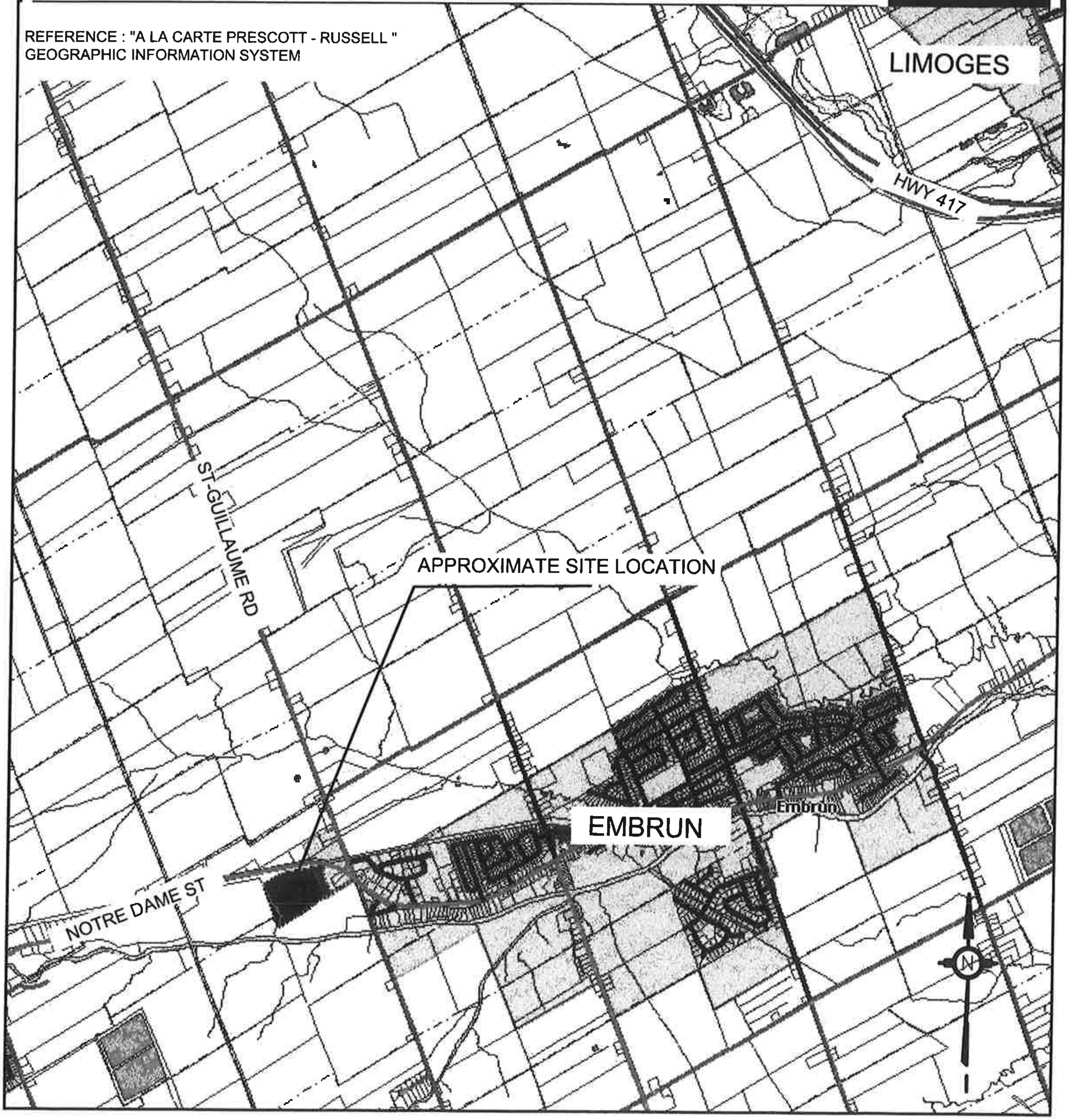
DATE

DECEMBER 2012

PROJECT

120430

G.001



REFERENCE : "A LA CARTE PRESCOTT - RUSSELL "
GEOGRAPHIC INFORMATION SYSTEM

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PROJECT

PRELIMINARY GEOTECHNICAL INVESTIGATION
PART OF LOT 10 CONCESSION 5, PARTS 1 & 2 OF
REGISTERED PLAN 50R-9611, EMBRUN, ONTARIO

DRAWING TITLE

TEST PIT LOCATION PLAN

CLIENT

TOWNSHIP OF RUSSELL

DATE

DECEMBER 2012

PROJECT

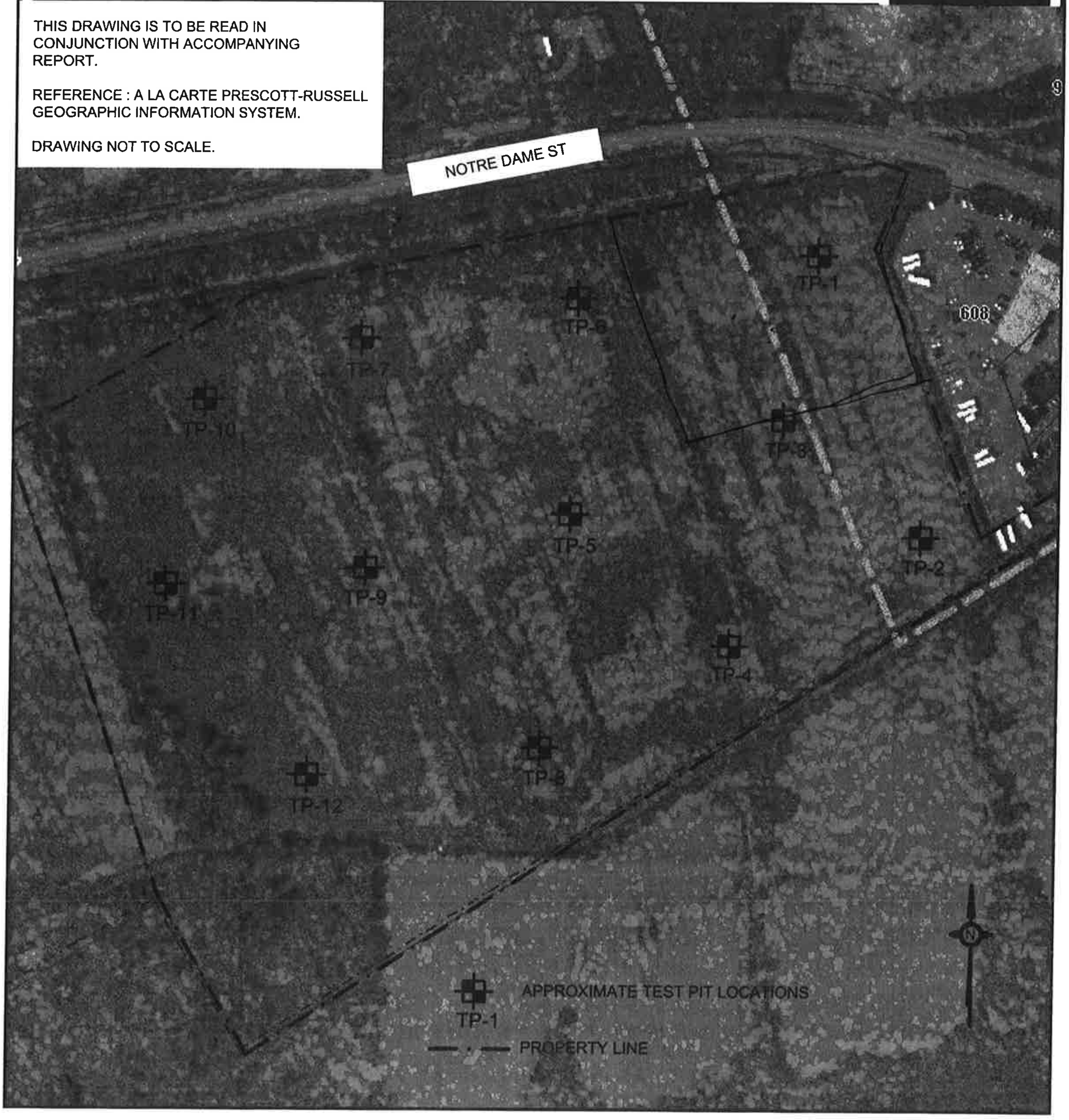
120430

G.002

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT.

REFERENCE : A LA CARTE PRESCOTT-RUSSELL GEOGRAPHIC INFORMATION SYSTEM.

DRAWING NOT TO SCALE.



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PROJECT
PRELIMINARY GEOTECHNICAL INVESTIGATION
PART OF LOT 10 CONCESSION 5, PARTS 1&2
REGISTERED PLAN 50R-9611
EMBRUN-ONTARIO

DRAWING TITLE
CLAY DYKE DETAIL

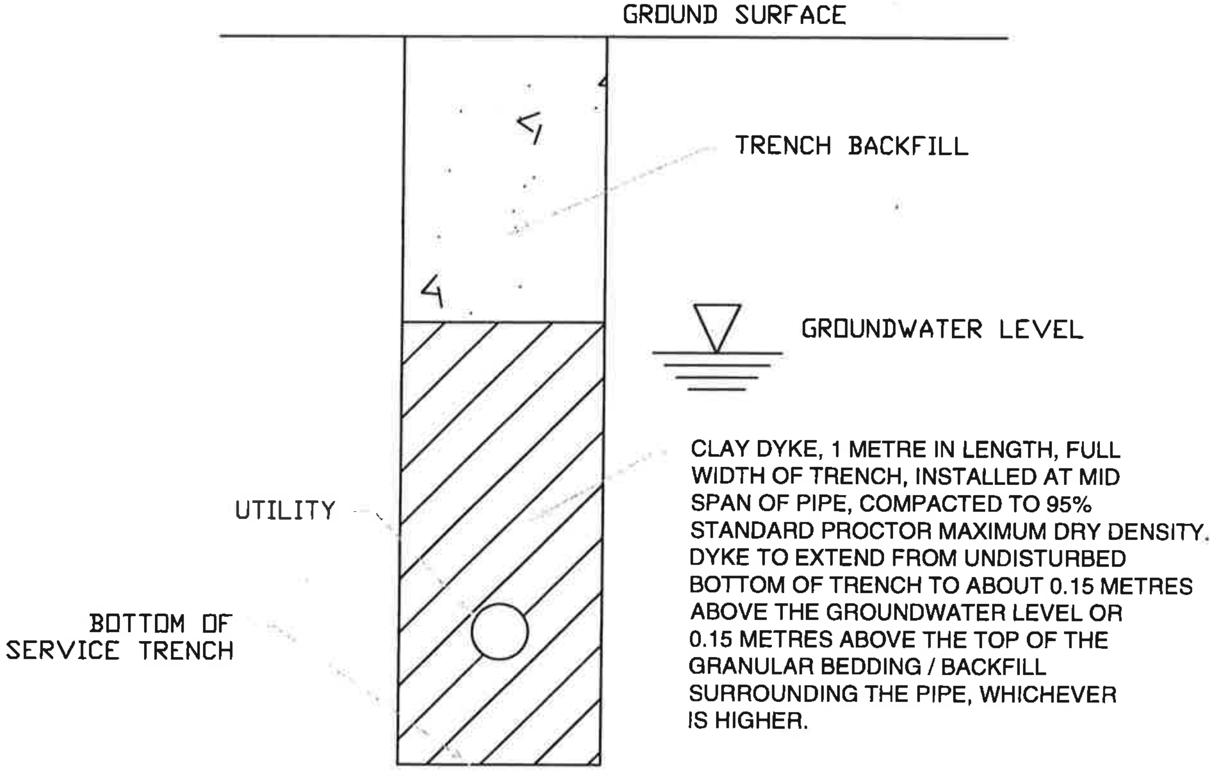
CLIENT
TOWNSHIP OF RUSSELL

DATE
DECEMBER 2012

PROJECT
120430

G.003

CLAY DYKE DETAIL



CLAY DYKE, 1 METRE IN LENGTH, FULL WIDTH OF TRENCH, INSTALLED AT MID SPAN OF PIPE, COMPACTED TO 95% STANDARD PROCTOR MAXIMUM DRY DENSITY. DYKE TO EXTEND FROM UNDISTURBED BOTTOM OF TRENCH TO ABOUT 0.15 METRES ABOVE THE GROUNDWATER LEVEL OR 0.15 METRES ABOVE THE TOP OF THE GRANULAR BEDDING / BACKFILL SURROUNDING THE PIPE, WHICHEVER IS HIGHER.

NOT TO SCALE

TABLES

Table 1

ORDER OF WATER DEMAND FOR COMMON TREES

Some common trees in decreasing order of water demand:

Broad Leaved Deciduous

Poplar
Alder
Aspen
Willow
Elm
Maple
Birch
Ash
Beech
Oak

Deciduous Conifer

Larch

Evergreen Conifers

Spruce
Fir
Pine

APPENDIX A

LRL ASSOCIATES • ASSOCIÉS ENGINEERS INGÉNIEURS

Test Pit Log: TP-1

Project No.: 120430

Client: Township of Russell

Date: November 6, 2012

Excavation Method: Backhoe

Project: Preliminary Geotechnical Investigation

Location: Notre Dame Street - Embrun - Ontario

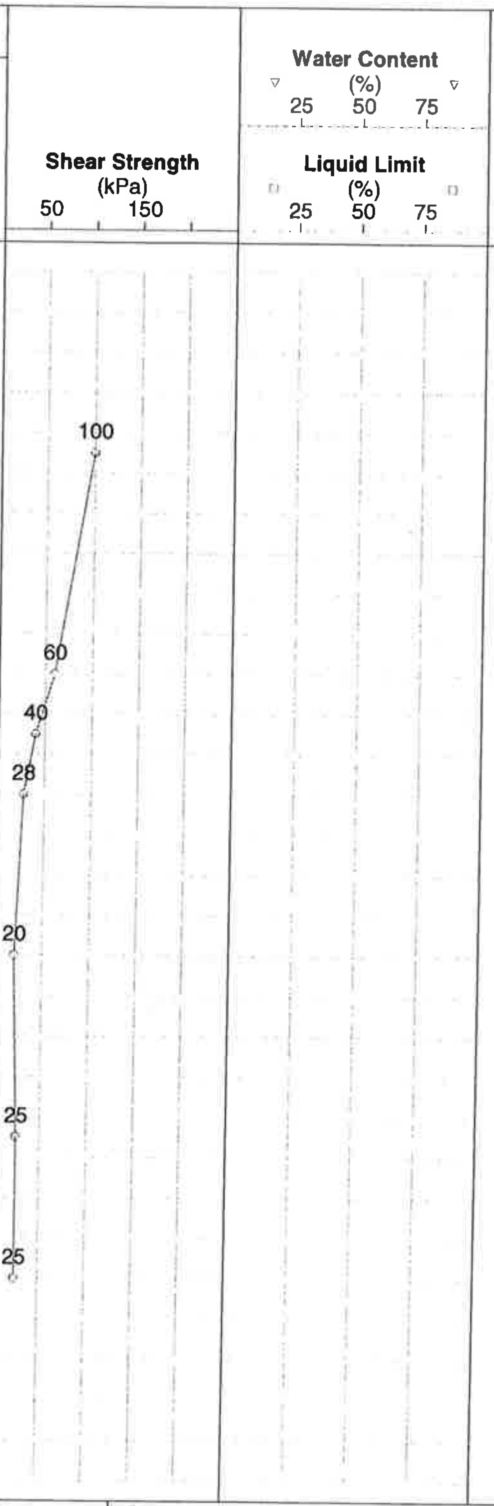
Field Personnel: B.V.

Excavation Contractor Township of Russell

SUBSURFACE PROFILE

SAMPLE DATA

Depth	Soil Description	Elev./Depth (m)	Sample Number
0 ft / 0 m	Ground Surface	0.00	
	Topsoil	0.00 -0.30	
	Sand Brown, fine grained silty sand, moist, compact.	0.30 -0.60	
	Silty Clay Brown becoming grey with reddish bands at a depth of about 2.3m, with occasional interbedded silt layers, stiff becoming firm below 2.3m and firm to soft below 2.6m.	0.60 -5.20	
	End of Testpit	5.20	



Water Level (Standpipe or Open Excavation)

A 3.0m long standpipe was installed

1.28m (Nov. 27, 2012)

Easting: 0

Northing: 0

Site Datum:

Groundsurface Elevation: 0

Top of Riser Elev.: 0

Excavation Width:

Excavation Length:

NOTES:

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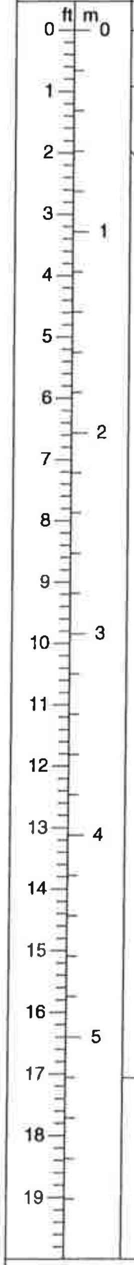
Test Pit Log: TP-2

Project No.: 120430
Client: Township of Russell
Date: November 6, 2012
Excavation Method: Backhoe

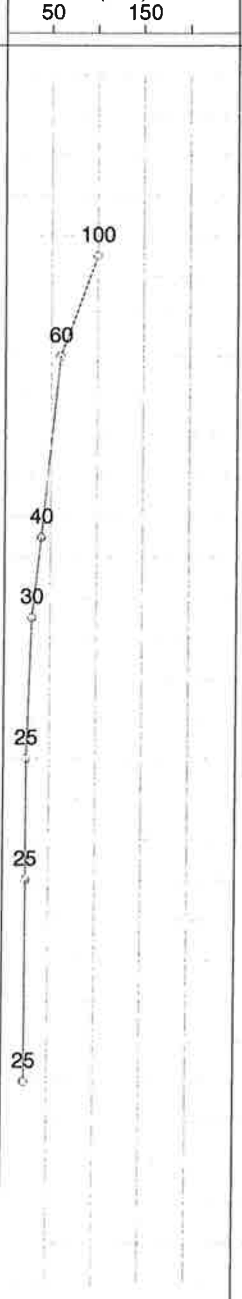
Project: Preliminary Geotechnical Investigation
Location: Notre Dame Street - Embrun - Ontario
Field Personnel: B.V.
Excavation Contractor Township of Russell

SUBSURFACE PROFILE / SAMPLE DATA

Depth	Soil Description	Elev./Depth (m)	Sample Number
	Ground Surface	0.00	
	Topsoil	0.00 -0.28	
	Sand Brown, fine grained silty sand, moist, compact.	0.28 -0.60	
	Silty Clay Brown becoming grey with reddish bands at a depth of about 2.7m, with occasional interbedded silt layers, stiff becoming firm below 2.3m and firm to soft below 2.7m.	0.60 -5.20	
	End of Testpit	5.20	



Shear Strength (kPa)



Water Content (%) ▽ 25 50 75 ▽

Liquid Limit (%) 25 50 75

Water Level (Standpipe or Open Excavation)

Easting: 0
Northing: 0
Site Datum:
Groundsurface Elevation: 0
Top of Riser Elev.: 0
Excavation Width:
Excavation Length:

NOTES:

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Test Pit Log: TP-3

Project No.: 120430

Client: Township of Russell

Date: November 6, 2012

Excavation Method: Backhoe

Project: Preliminary Geotechnical Investigation

Location: Notre Dame Street - Embrun - Ontario

Field Personnel: B.V.

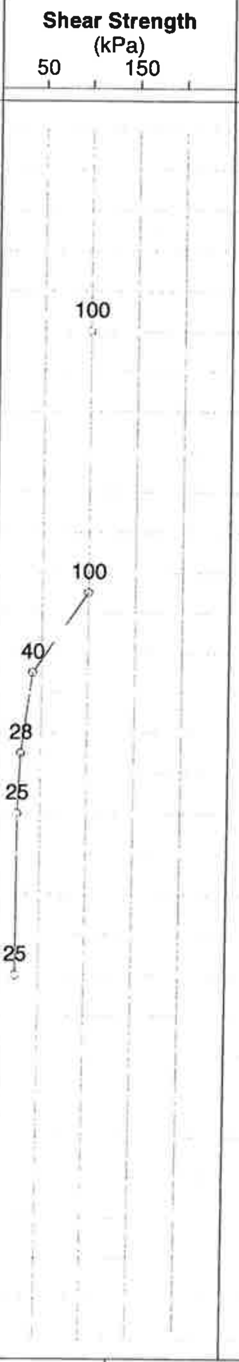
Excavation Contractor Township of Russell

SUBSURFACE PROFILE

SAMPLE DATA

Depth (ft / m)	Soil Description	Elev./Depth (m)	Sample Number
0 / 0	Ground Surface	0.00	
0	**Topsoil** 200mm of topsoil	0.00	
	Sand Brown, fine grained silty sand, moist, compact.		
3 / 1	**Silty Clay** Brown becoming grey with reddish bands at a depth of about 2.7m, with occasional interbedded silt layers, stiff becoming firm below 2.7m and firm to soft below 3.1m.	-0.88 0.88	
16 / 5	End of Testpit	-4.80 4.80	

Depth scale: ft 0–19; m 0–5



Water Content (%)
▽ 25 50 75 ▽

Liquid Limit (%)
□ 25 50 75 □

Water Level (Standpipe or Open Excavation)

Easting: 0

Northing: 0

Site Datum:

Groundsurface Elevation: 0

Top of Riser Elev.: 0

Excavation Width:

Excavation Length:

NOTES:

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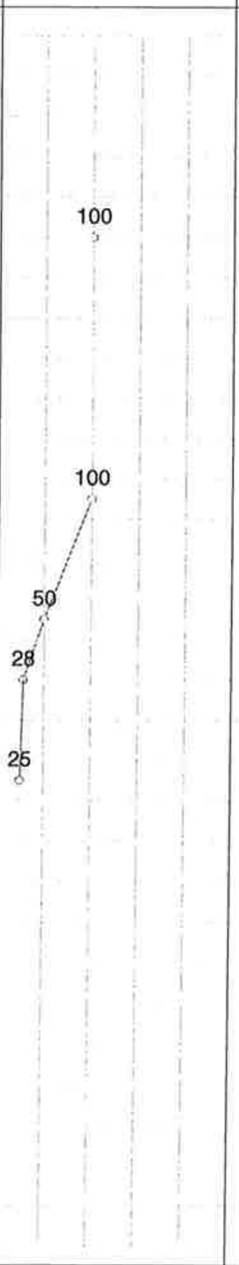
Test Pit Log: TP-4

Project No.: 120430
Client: Township of Russell
Date: November 6, 2012
Excavation Method: Backhoe

Project: Preliminary Geotechnical Investigation
Location: Notre Dame Street - Embrun - Ontario
Field Personnel: B.V.
Excavation Contractor Township of Russell

SUBSURFACE PROFILE / SAMPLE DATA

Depth	Soil Description	Elev./Depth (m)	Sample Number
0 ft / 0 m	Ground Surface	0.00 0.00	
	Topsoil 200mm of topsoil		
	Sand Brown, fine grained silty sand, moist, compact.		
	Silty Clay Brown becoming grey with reddish bands at a depth of about 2.9m, with occasional interbedded silt layers, stiff becoming firm below 2.9m and firm to soft below 3.2m.	-0.80 0.80	
	End of Testpit	-3.80 3.80	



Water Content (%) 25 50 75

Liquid Limit (%) 25 50 75

Water Level (Standpipe or Open Excavation)

Easting: 0
Northing: 0
Site Datum:
Groundsurface Elevation: 0
Top of Riser Elev.: 0
Excavation Width:
Excavation Length:

NOTES:

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Test Pit Log: TP-5

Project No.: 120430

Client: Township of Russell

Date: November 5, 2012

Excavation Method: Backhoe

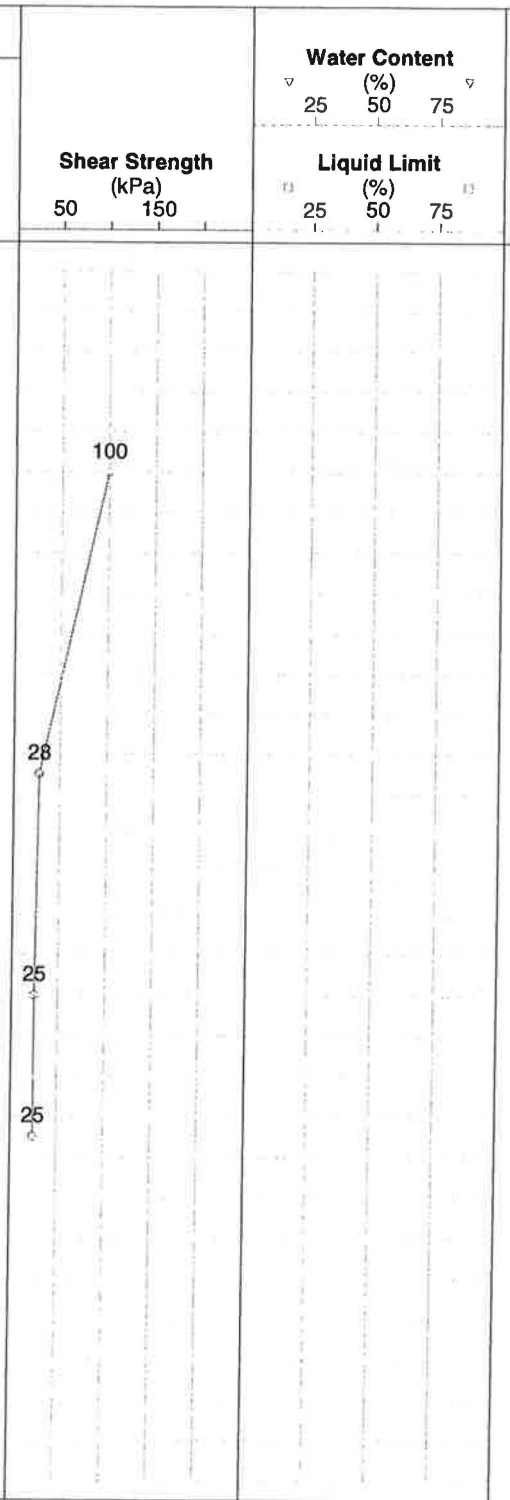
Project: Preliminary Geotechnical Investigation

Location: Notre Dame Street - Embrun - Ontario

Field Personnel: B.V.

Excavation Contractor Township of Russell

SUBSURFACE PROFILE		SAMPLE DATA	
Depth (ft / m)	Soil Description	Elev./Depth (m)	Sample Number
0 ft / 0 m	Ground Surface	0.00	
	Topsoil 200mm of topsoil	0.00	
	Sand Brown, fine grained silty sand, moist, compact.	-0.70 0.70	
	Silty Clay Brown becoming grey with reddish bands at a depth of about 2.5m, with occasional interbedded silt layers, stiff becoming firm to soft below 2.5m.	-4.40 4.40	
	End of Testpit		



Water Level (Standpipe or Open Excavation)

A 3.0m long standpipe was installed

Dry @ 3.0m (Nov. 27, 2012)

Easting: 0

Northing: 0

Site Datum:

Groundsurface Elevation: 0

Top of Riser Elev.: 0

Excavation Width:

Excavation Length:

NOTES:

Test Pit Log: TP-6

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Project No.: 120430

Client: Township of Russell

Date: November 5, 2012

Excavation Method: Backhoe

Project: Preliminary Geotechnical Investigation

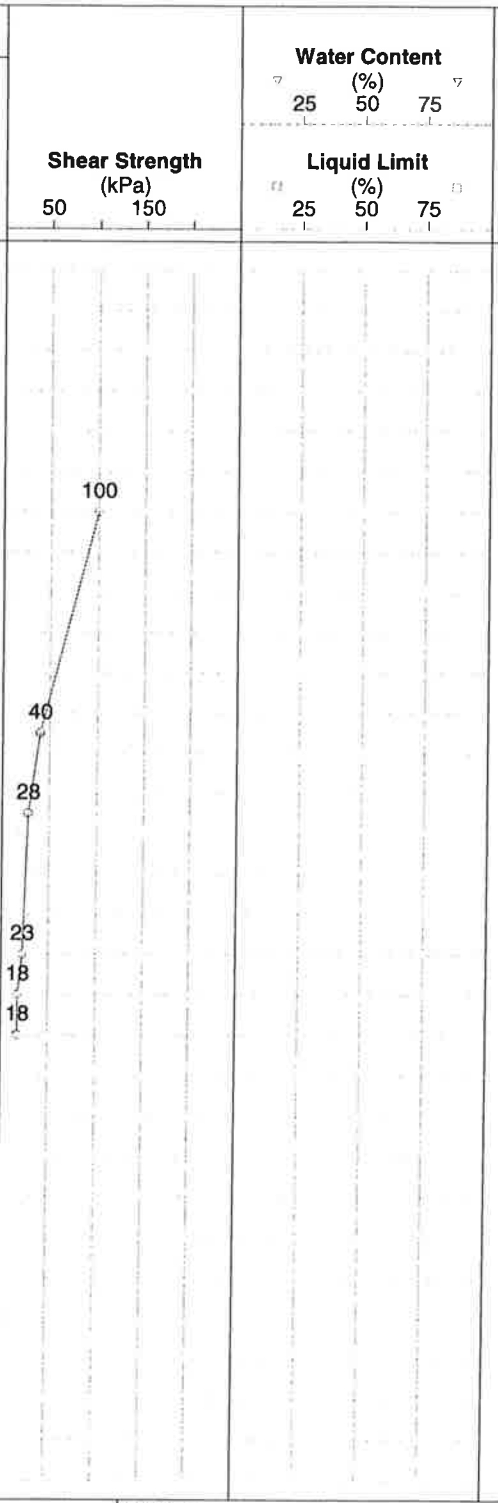
Location: Notre Dame Street - Embrun - Ontario

Field Personnel: B.V.

Excavation Contractor Township of Russell

SUBSURFACE PROFILE / SAMPLE DATA

Depth (ft / m)	Soil Description	Elev./Depth (m)	Sample Number
0 / 0	Ground Surface	0.00	
	Topsoil 200mm of topsoil	0.00 -0.25	
	Sand Brown, fine grained silty sand, moist, compact.	0.25 -0.95	
	Silty Clay Brown becoming grey with reddish bands at a depth of about 2.3m, with occasional interbedded silt layers, stiff becoming firm to soft below 2.3m.	0.95 -4.00	
	End of Testpit	4.00	



Water Level (Standpipe or Open Excavation)

Easting: 0

Northing: 0

Site Datum:

Groundsurface Elevation: 0

Top of Riser Elev.: 0

Excavation Width:

Excavation Length:

NOTES:

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Test Pit Log: TP-7

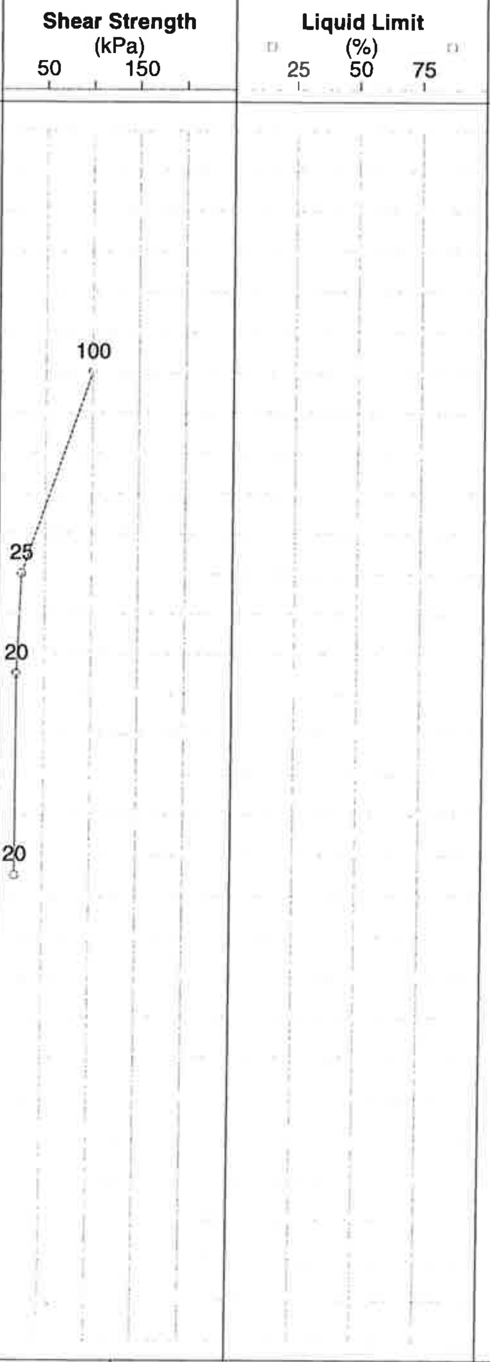
Project No.: 120430
Client: Township of Russell
Date: November 6, 2012
Excavation Method: Backhoe

Project: Preliminary Geotechnical Investigation
Location: Notre Dame Street - Embrun - Ontario
Field Personnel: B.V.
Excavation Contractor Township of Russell

SUBSURFACE PROFILE

SAMPLE DATA

Depth (ft / m)	Soil Description	Elev./Depth (m)	Sample Number
0 / 0	Ground Surface	0.00	
	Topsoil	0.00 -0.35	
	Sand Brown, fine grained silty sand, moist, compact.	0.35 -0.70	
	Silty Clay Brown becoming grey with reddish bands at a depth of about 2.2m, with occasional interbedded silt layers, stiff becoming firm to soft below 2.2m.	0.70 -3.80	
	End of Testpit	3.80	



Water Level (Standpipe or Open Excavation)

A 3.0m long standpipe was installed

Dry @3.0m (Nov. 27, 2012)

Easting: 0
Northing: 0
Site Datum:
Groundsurface Elevation: 0
Top of Riser Elev.: 0
Excavation Width:
Excavation Length:

NOTES:

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Test Pit Log: TP-8

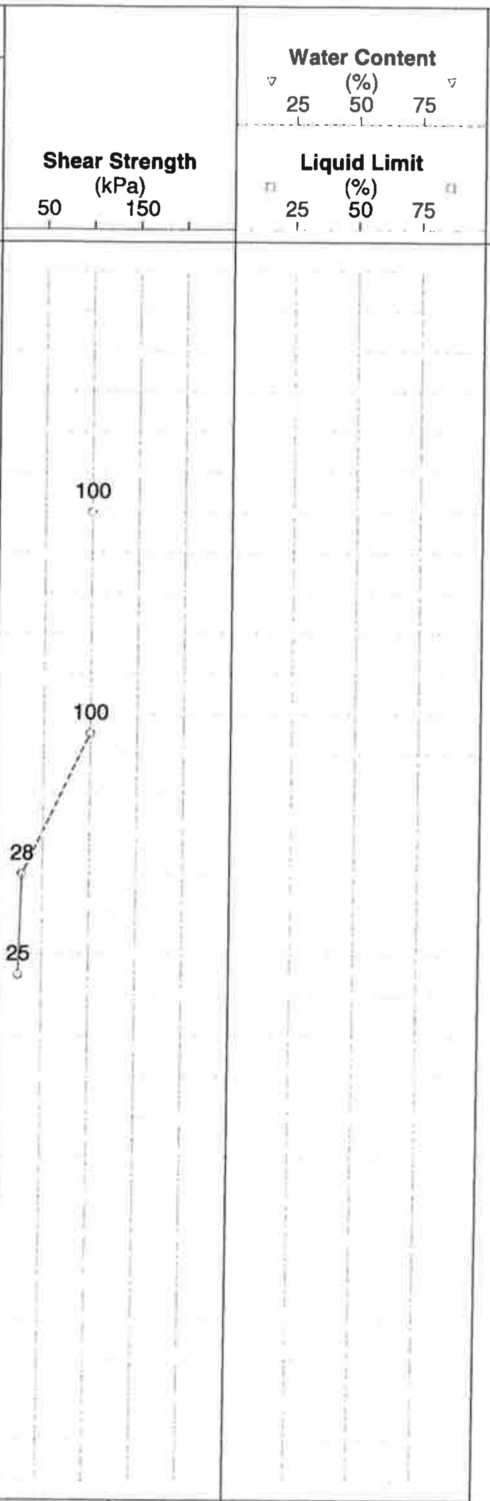
Project No.: 120430
Client: Township of Russell
Date: November 6, 2012
Excavation Method: Backhoe

Project: Preliminary Geotechnical Investigation
Location: Notre Dame Street - Embrun - Ontario
Field Personnel: B.V.
Excavation Contractor Township of Russell

SUBSURFACE PROFILE / SAMPLE DATA

Depth	Soil Description	Elev./Depth (m)	Sample Number
	Ground Surface	0.00	
	Topsoil	0.00 -0.35	
	Sand Brown, fine grained silty sand, moist, compact.	0.35 -0.70	
	Silty Clay Brown becoming grey with reddish bands with depth, with occasional interbedded silt layers, stiff becoming firm to soft below 3.0m.	0.70 -3.60	
	End of Testpit	3.60	

Depth scale: ft 0–19; m 0–5



Water Level (Standpipe or Open Excavation)

Easting: 0
Northing: 0
Site Datum:
Groundsurface Elevation: 0
Top of Riser Elev.: 0
Excavation Width:
Excavation Length:

NOTES:

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Test Pit Log: TP-9

Project No.: 120430

Client: Township of Russell

Date: November 6, 2012

Excavation Method: Backhoe

Project: Preliminary Geotechnical Investigation

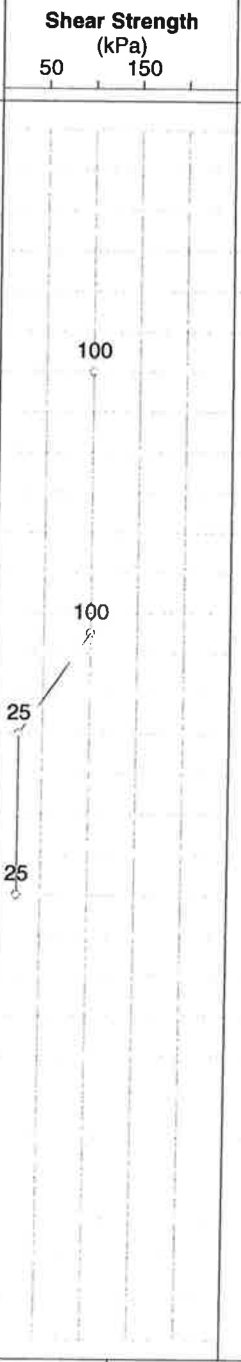
Location: Notre Dame Street - Embrun - Ontario

Field Personnel: B.V.

Excavation Contractor Township of Russell

SUBSURFACE PROFILE / SAMPLE DATA

Depth (ft / m)	Soil Description	Elev./Depth (m)	Sample Number	Water Level (Standpipe or Open Excavation)
0 / 0	Ground Surface	0.00		
	Topsoil	0.00 -0.23		
	Sand Brown, fine grained silty sand, moist, compact.	0.23 -0.60		
	Silty Clay Brown becoming grey with reddish bands with depth, with occasional interbedded silt layers, stiff becoming firm to soft below 3.0m.	0.60 -3.90		
13 / 4	End of Testpit	3.90		



Water Content (%) 25 50 75

Liquid Limit (%) 25 50 75

Easting: 0

Northing: 0

Site Datum:

Groundsurface Elevation: 0

Top of Riser Elev.: 0

Excavation Width:

Excavation Length:

NOTES:

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Test Pit Log: TP-10

Project No.: 120430

Client: Township of Russell

Date: November 6, 2012

Excavation Method: Backhoe

Project: Preliminary Geotechnical Investigation

Location: Notre Dame Street - Embrun - Ontario

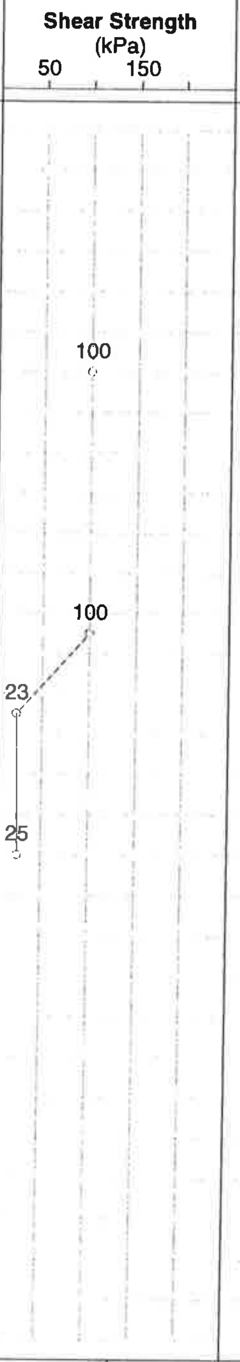
Field Personnel: B.V.

Excavation Contractor Township of Russell

SUBSURFACE PROFILE

SAMPLE DATA

Depth	Soil Description	Elev./Depth (m)	Sample Number
ft 0 / m 0	Ground Surface	0.00	
	Topsoil	0.00 -0.33	
	Sand Brown, fine grained silty sand, moist, compact.	0.33 -0.90	
	Clay Brown becoming grey with reddish bands with depth, with occasional interbedded silt layers, stiff becoming firm to soft below 2.9m.	0.90 -3.80	
	End of Testpit	3.80	



Water Content
(%)
25 50 75

Liquid Limit
(%)
25 50 75

Water Level (Standpipe or Open Excavation)

Easting: 0

Northing: 0

Site Datum:

Groundsurface Elevation: 0

Top of Riser Elev.: 0

Excavation Width:

Excavation Length:

NOTES:

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Test Pit Log: TP-11

Project No.: 120430

Client: Township of Russell

Date: November 6, 2012

Excavation Method: Backhoe

Project: Preliminary Geotechnical Investigation

Location: Notre Dame Street - Embrun - Ontario

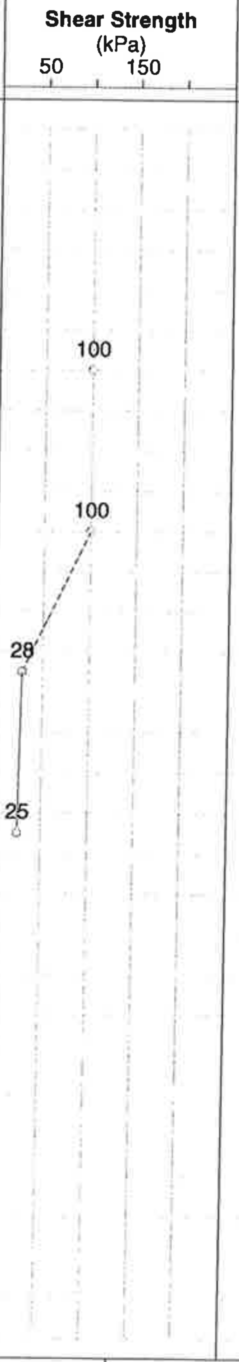
Field Personnel: B.V.

Excavation Contractor Township of Russell

SUBSURFACE PROFILE

SAMPLE DATA

Soil Description	Elev./Depth (m)	Sample Number
Ground Surface	0.00	
Topsoil	0.00 -0.30	
Sand Brown, fine grained silty sand, moist, compact.	0.30 -0.80	
Silty Clay Brown becoming grey with reddish bands with depth, with occasional interbedded silt layers, stiff becoming firm to soft below 2.7m.	0.80 -3.70	
End of Testpit	3.70	



Water Content (%) 25 50 75

Liquid Limit (%) 25 50 75

Water Level (Standpipe or Open Excavation)

A 3.0m long standpipe was installed

Dry @ 3.0m (Nov. 27, 2012)

Easting: 0

Northing: 0

Site Datum:

Groundsurface Elevation: 0

Top of Riser Elev.: 0

Excavation Width:

Excavation Length:

NOTES:

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Test Pit Log: TP-12

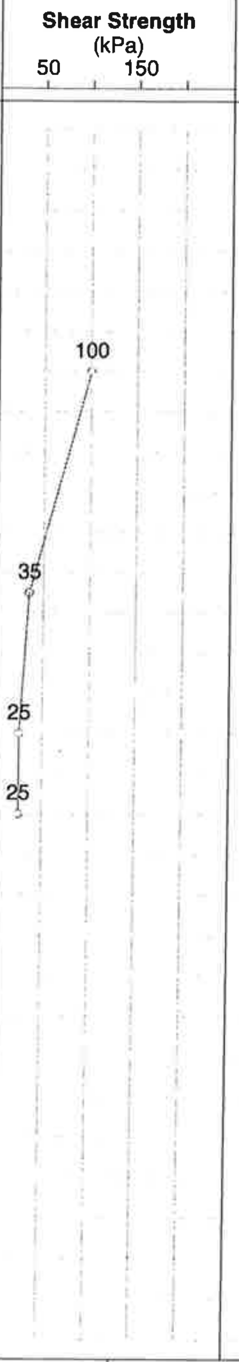
Project No.: 120430
Client: Township of Russell
Date: November 6, 2012
Excavation Method: Backhoe

Project: Preliminary Geotechnical Investigation
Location: Notre Dame Street - Embrun - Ontario
Field Personnel: B.V.
Excavation Contractor Township of Russell

SUBSURFACE PROFILE

SAMPLE DATA

Depth (ft / m)	Soil Description	Elev./Depth (m)	Sample Number
0 / 0	Ground Surface	0.00	
	Topsoil 200mm of topsoil	0.00	
	Sand Brown, fine grained silty sand, moist, compact.	-0.60 0.60	
	Silty Clay Brown becoming grey with reddish bands with depth, with occasional interbedded silt layers, stiff becoming firm below 2.3 and firm to soft below 3.0m.		
	End of Testpit	-3.50 3.50	



Water Content
(%)
25 50 75

Liquid Limit
(%)
25 50 75

Water Level (Standpipe or Open Excavation)

Easting: 0
Northing: 0
Site Datum:
Groundsurface Elevation: 0
Top of Riser Elev.: 0
Excavation Width:
Excavation Length:

NOTES:

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Symbols and Terms Used on Borehole and Test Pit Logs

The following explains the data presented in the borehole and test pit logs.

1. Soil Description

The soil descriptions presented in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves some judgement and LRL Associates Ltd. does not guarantee descriptions as exact, but infers accuracy to the extent that is common in current geotechnical practice. Boundaries between zones on the logs are often not distinct but transitional and were interpreted.

a. Proportion

The proportion of each constituent part, as defined by the grain size distribution, is denoted by the following terms:

Term	Proportions
"trace"	1% to 10%
"some"	10% to 20%
prefix (i.e. "sandy" silt)	20% to 35%
"and" (i.e. sand "and" gravel)	35% to 50%

b. Compactness and Consistency

The state of compactness of granular soils is defined on the basis of the Standard Penetration Test. See Section 2c for more details. The consistency of clayey or cohesive soils is based on the shear strength of the soil, as determined by field vane tests and by a visual and tactile assessment of the soil strength.

The state of compactness of granular soils is defined by the following terms:

State of Compactness Granular Soils	Standard Penetration Number "N"
Very loose	0 – 4
Loose	4 – 10
Compact or medium	10 - 30
Dense	30 - 50
Very dense	over - 50

The consistency of cohesive soils is defined by the following terms:

Consistency Cohesive Soils	Undrained Shear Strength (Cu) (kPa)
Very soft	under 10
Soft	10 - 25
Medium or firm	25 - 50
Stiff	50 - 100
Very stiff	100 - 200
Hard	over - 200

2. Sample Data

a. Elevation depth

This is a reference to the geodesic elevation of the soil or to a benchmark of an arbitrary elevation at the location of the borehole or test pit. The depth of geological boundaries is measured from ground surface.

b. Type

Symbol	Type	Letter Code
❘	Auger	AU
⧗	Split spoon	SS
‖	Shelby tube	ST
▥	Rock Core	RC

c. Sample Number

Each sample taken from the borehole is numbered in the field as shown in this column.

LETTER CODE (as above) – Sample Number

d. Blows (N) or RQD

This column indicates the Standard Penetration Number (N) as per ASTM D-1586. This is used to determine the state of compactness of the soil sampled. It corresponds to the number of blows required to drive 300 mm of the split spoon sampler using a 622 kg*m/s^2 hammer falling freely from a height of 760 mm. For a 600 mm long split spoon, the blow counts are recorded for every 150 mm. The "N" index is obtained by adding the number of blows from the 2nd and 3rd count. Technical refusal indicates a number of blows greater than 50.

In the case of rock, this column presents the Rock Quality Designation (RQD). The RQD is calculated as the cumulative length of rock pieces recovered having lengths of 10 cm or more divided by the length of coring. The qualitative description of the bedrock based on RQD is given below.

Rock Quality Designation (RQD) (%)	Description of Rock Quality
0 –25	very poor
25 – 50	poor
50 – 75	fair
75 – 90	good
90 – 100	excellent

e. Recovery (%)

For soil samples this is the percentage of the recovered sample obtained versus the length sampled. In the case of rock, the percentage is the length of rock core recovered compared to the length of the drill run.

3. General Monitoring Well Data