GEOTECHNICAL INVESTIGATION REPORT
PARKHILL RESIDENTIAL DEVELOPMENT
1232 PARKHILL ROAD WEST
PETERBOROUGH, ONTARIO
PROJECT NO. G022 510 A1

Prepared for:
2210240 Ontario Inc.
2345 Yonge Street, Suite 800
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M4P 2E5

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P.O. Box 694
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K9J 6Z8

JULY, 2009

TABLE OF CONTENTS

TABLES

ENCLOSURES

APPENDICES

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1.0 INTRODUCTION

This report presents the results of a geotechnical investigation performed for a proposed residential development located at 1232 Parkhill Road West, in the west end of Peterborough, Ontario. The Site is north of Parkhill Road approximately 850 metres east of the intersection of Brealey Drive and Parkhill Road in Peterborough, Ontario. Geo-Logic Inc. (Geo-Logic) was retained by 2210240 Ontario Inc. to complete this geotechnical investigation. This work was carried out under the authorization of Mr. Brian Fenton, representing 2210240 Ontario Inc. in accordance with our proposal dated May 15, 2009.

2210240 Ontario Inc. provided a base plan produced by Elliot and Parr Surveyors, which was used to create the Test Hole Plan (Plate 1). It is Geo-Logic's understanding that the buildings shall consist of residential lots and one to two-storey buildings with foundation requirements being typical of residential dwellings.

2.0 PURPOSE AND SCOPE

The purpose of this geotechnical investigation is to define the subsurface soil and groundwater conditions at the project site, and to develop geotechnical recommendations regarding earthwork construction, dewatering, pipe bedding and backfill, road construction, foundation and slab-on-grade design.

Please note that the contents of this report must in no way be construed as an opinion of this site's environmental status. However, Geo-Logic Inc. also conducted a Hydrogeologic Assessment and Environmental Site Assessment (Phase I), in conjunction with this geotechnical investigation, and which are summarized in separate reports.

The following scope of work was performed in order to accomplish the foregoing purposes.

1. Underground services were cleared prior to the excavation. The test pits were located as shown on the Test Hole Plan (Plate 1).
2. The subsurface conditions were explored by excavating, sampling and logging a total of fourteen (14) test pits. The logs of these test pits are attached in Appendix A.
3. Geotechnical analyses of materials encountered was performed by means of laboratory testing to obtain relevant soil properties, including grain size and moisture content. The laboratory results are attached in Appendix B.
4. Geotechnical engineering analysis of acquired field and laboratory data, and preparation of a geotechnical investigation report outlining our findings, conclusions, and recommendations.

3.0 FIELD AND LABORATORY PROCEDURES

A field investigation was conducted under the supervision of Geo-Logic staff on June 18, 2009. The work consisted of subsurface exploration by means of excavating and sampling a total of fourteen (14) exploratory test pits at locations shown on Plate 1. The test pits were excavated to a depths ranging from about 4.0 to 5.5 metres below existing grade (mbeg). A log of each test pit was maintained, and representative samples of the soils encountered were obtained and returned to the laboratory.

The test pits were dug using a tracked excavator. Representative, disturbed samples of the strata penetrated were obtained from the test pits directly from the test pits walls or excavator bucket. Soil samples obtained from the test pits were inspected in the field immediately upon retrieval for type, texture, and colour. All test pits were backfilled following completion of the fieldwork. All samples were sealed in clean plastic containers and transported to the Geo-Logic laboratory for further visual-tactile examination, and to select appropriate samples for laboratory analysis.

Groundwater measurements and observations were taken in the open test pits throughout the duration of the fieldwork, and later via temporary standpipe piezometers installed in selected test pits. Groundwater data is presented on individual test pit logs.

Laboratory testing of various soil properties was conducted on selected samples, and consisted of moisture content tests on all recovered soil samples and grain size distribution analyses on three (3) representative soil samples.

4.0 SITE LOCATION AND CONDITION

The Site is bounded by Parkhill Road West and residential properties to the south, undeveloped woodlands to the west and north and a residential property to the east. Further to the north is the Trans-Canada Rail Trail and Jackson Creek that flows into Lily Lake. A small tributary into Jackson Creek is noted to the west of the Site. Geographically, the location is described as Part Lot 8, Concession 1, formerly the Township of Smith, now in the City of Peterborough.

The development is proposed for an area of 35.96 hectares (ha). Other development details have not been provided to Geo-Logic at the time of writing this report. It is understood that the development will be municipally serviced for water and sewer. No other details were provided regarding the proposed number of homes or lot sizes.

The surrounding topography is characterized by drumlins. The predominant surface feature to the north and northwest of the Site is Jackson Creek and its associated tributary and wetlands. No surface water features were noted on the Site. The Site exhibited moderate topographic relief, on the order of approximately 15 to 20 m with the grade falling from the southeast toward the northwest. The elevation of the southeast corner of the Site is approximately 260 metres above sea level (masl) while the northwest corner is approximately 240 masl.

5.0 SUBSURFACE CONDITIONS

5.1 REGIONAL GEOLOGY

The Peterborough area is underlain by Middle Ordovician Limestone, which lies directly on the Precambrian bedrock. The limestone belongs to the Lindsay formation as part of the Trenton-Black River Group. The glacial materials deposited over bedrock in the area are from the Late Wisconsin period. When the ice retreated, a thin mantle of till and gravel was left behind in the Peterborough area. The Site itself is situated in the physiographic region known at the Peterborough Drumlin Field (Chapman and Putnam, 1984) and are comprised of till plains (drumlinized). The limestone is relatively soft and highly fossiliferous limestone. The drumlins in this area are composed of highly calcareous till and contain less small rubble and more boulders on the order of two to three feet in diameter (Chapman and Putnam, 1966). Directly east of the Site is a narrow spillway, the result of historic flows within Jackson Creek.

5.2 LOCAL GEOLOGY

5.2.1 General

Details of the subsurface conditions encountered at the site are presented graphically on the test pit logs in Appendix A. It should be noted that the boundaries between the strata have been inferred from the test pit observations and non-continuous samples. They generally represent a transition from one soil type to another, and should not be inferred to represent an exact plane of geological change. Further, conditions may vary between and beyond the test pits.

The test pits typically encountered a surficial layer of topsoil over native glacial till. Groundwater was encountered in six of the open test pits, at a minimum depth of about 1.2mbeg.

The following sections describe the major soil strata and subsurface conditions encountered during this investigation in more detail.

5.2.2 Topsoil

A layer of surficial topsoil was encountered at the surface of all fourteen test pits. The topsoil ranged in thickness from approximately 0.3 to 0.9 m. These soils were observed to be in a damp, loose state, with a silty, highly organic content. As such, they are expected to be devoid of any structural engineering properties.

5.2.3 Glacial Till

An underlying layer of glacial till that extended to the full depth of investigation was encountered in each test pit. The glacial till generally appeared grey in colour, and consisted of silty sand with varying amounts gravel and clay, occasional cobbles and boulders were also encountered. The till typically increased in density with depth. Bedrock was not encountered in any of the test pits. The glacial till was generally observed to have a moist, compact to dense in-situ state.

Moisture content tests conducted on samples of the glacial till yielded values ranging from about 5 to 12 % moisture by weight. Grain size distribution analyses conducted on samples of the glacial till (obtained between depths of 0.9 to 4.4 mbeg) suggest the following compositional ranges: 8 to 20 % gravel, 42 to 46 % sand, and 35 to 50 % silt and clay-sized particles (Plate B-1).

It is anticipated that the glacial till encountered may exhibit a low to moderate susceptibility to frost action. This material may be suitable for reuse as backfill material, conditional on it being workable and within 2% of its optimal moisture content – a final review and any approval to reuse this soil as backfill must be made at the time of construction. Based upon the subsurface exploration program, the underlying till is estimated to have a hydraulic conductivity on the order of 10^{-4} to 10^{-5} cm/sec.

5.2.4 Groundwater

Groundwater measurements and observations were obtained from the open test pits upon immediate completion of test pit excavation, and again on June 30, 2009 via temporary standpipe piezometers installed in selected test pits.

During excavation operations, six open test pits encountered seepage, at depths ranging between approximately 1.2 and 2.3 mbeg. Open test pits TP-1, and 8 to 14 remained dry throughout the excavation operations. Temporary standpipe piezometers installed in test pits TP-5, 8, and 11 exhibited groundwater levels of 1.1, 0.6, and 3.3 mbeg (respectively) on June 30, 2009. Note that based on test pit observations and the moisture content levels of the soil samples obtained, it appears that the groundwater levels measured in TP-5 and 8 on June 30, 2009 represented either groundwater that was perched above the denser, less permeable till, or is groundwater that was transmitted through the denser, less permeable till soil via localized seams of more hydraulically-conductive soil.

It should be noted that groundwater levels are transient and tend to fluctuate with the seasons, periods of precipitation, and temperature.

6.0 DISCUSSION AND RECOMMENDATIONS

6.1 GENERAL

In summary, a subdivision development is proposed to be constructed at this 36 ha Site north of Parkhill Road West. Based on the results of our geotechnical investigation, it is our professional opinion that the Site is suitable for the planned development.

Supporting data upon which our recommendations are based have been presented in the foregoing sections of this report. The following recommendations are governed by the physical properties of the subsurface materials that were encountered at the site, and assumes that they are representative of the overall site conditions. It should be noted that these conclusions and recommendations are intended for use by the designers only. Contractors bidding on or undertaking any work at the site 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 this factual data as it affects their proposed construction techniques, equipment capabilities, costs, sequencing, and the like. Comments, techniques, or recommendations pertaining to construction should not be construed as instructions to the contractor.

Based on the information gathered during this investigation, the subsurface conditions typically consist of a surficial layer of topsoil over native glacial till. Groundwater was encountered in eight of the test pits, either during their excavation or later via temporary standpipe piezometers, at depths ranging between about 0.6 and 3.3 mbeg. (Note that the shallower groundwater measurements obtained during this investigation appear to represent groundwater that is either perched above the underlying dense, less permeable till, or is being transmitted through the dense, less permeable till via seams of hydraulically conductive soil.)

Details regarding our conclusions and recommendations are outlined in the following sections.

6.2 SITE PREPARATION, EXCAVATION, AND DEWATERING

It is recommended that any and all topsoil, fill, vegetation, organic and organic-bearing material be stripped and removed from the proposed roadway and building envelope areas prior to commencing earthwork construction. The subexcavated surfaces must be proof rolled and/or approved by a member of Geo-Logic Inc. prior to placement of fill or foundations.

Excavations should be carried out to conform to the manner specified in Ontario Regulation 213/91 and the Occupational Health and Safety Act and Regulations for Construction Projects (OHSA). All excavations above the water table not exceeding 1.2 m in depth may be constructed with vertical, unsupported slopes. The native soils encountered during this investigation are generally classed by OHSA as Type 2. As such, unsupported walls of excavations in this soil must maintain a gradient of 1 horizontal to 1 vertical (1H:1V) or flatter to within 1.2 m of the bottom of the excavation.

Based on groundwater measurements, it is anticipated that groundwater seepage into open excavations will be encountered. It is expected that pumping from collection sumps to an acceptable outlet will control this groundwater infiltration. Should any excavations require more intensive dewatering / groundwater control, the use of filtered sumps, or other suitable method of dewatering and/or sheet piling may be necessary.

6.3 SERVICE INSTALLATION

6.3.1 Bedding

The materials encountered during this investigation at the anticipated service invert elevations typically consist of native silty sand till soil. As such, a normal compacted Class "B" bedding is recommended for all underground services. Class "B" bedding is Granular "A", or 19 mm crusher run limestone, as per Ontario Provincial Standard Specifications (OPSS). The minimum recommended bedding thickness for the underground services is 150 mm. All bedding should be compacted to 98 % of its Standard Proctor Maximum Dry Density (SPMDD).

6.3.2 Backfill

It is recommended that cover backfilling of the underground services be accomplished using Granular "A", sand, or other suitable material as allowed by the Municipality's standards, to a minimum of 300 mm above the pipe. Compaction of this material should be 100 % SPMDD. Approved, suitable excavated soil can be reused as trench backfill provided the soil is workable and at a moisture content that will permit adequate compaction. Saturated silts, organics and wet clay should not be reused. A final review and approval to reuse any soils must be made during construction. Compaction of any native soil in service trenches is recommended to be a minimum of 98 % of its SPMDD.

6.4 ROAD CONSTRUCTION

Based on the results of this investigation, we would recommend the following procedures be implemented to prepare the proposed new roadways for their construction:

1. Remove any free organic topsoil, fill, organics and organic-bearing materials, loam, frozen earth, and boulders larger than 150 mm in diameter encountered at subgrade elevation for the full width of construction.
2. Proof roll the subgrade for the purpose of detecting possible zones of overly wet or soft subgrade. Any deleterious areas thus delineated should be replaced with acceptable earth fill or granular material compacted to a minimum of 95 % of its SPMDD.
3. Contour the subgrade surface to prevent ponding of water during the construction and to promote rapid drainage of the sub-base and base course materials. 150 mm diameter perforated pipe subdrains should be installed along any curb lines. The pipe should be encased in filter fabric and surrounded by clear stone aggregate. It is recommended that the subdrains outlet to the storm sewer system.
4. Construct transitions between varying depths of granular base materials at a rate of 1:25 minimum.

The subgrade soils encountered in these areas consisted of soils possessing potentially moderate frost susceptibility. In this regard, the following minimum flexible pavement structure is recommended for the construction of the new roadway areas.

Table 1: Pavement Structure

Profile	Material	Minimum Thickness (mm)	In Conformance with OPSS Form
Asphalt Surface	H.L. 3 or 4	40	1150
Asphalt Base	H.L. 8	50	
Granular Base	Granular "A"	150	1010
Granular Subbase	Granular "B"	300	

The following steps are recommended for optimum construction of these planned paved areas:

1 The Granular "A" and "B" courses should be compacted to a minimum 100 % of their respective SPMDD's.
2 All asphaltic concrete courses should be placed, spread and compacted conforming to OPSS Form 310 or equivalent. All asphaltic concrete should be compacted to between 92.0 and 96.5 % of their respective laboratory Maximum Relative Densities (MRD's).
3 Adequate drainage should be provided to ensure satisfactory pavement performance.

It is recommended that all fill material be placed in uniform lifts not exceeding 200 millimeters in thickness before compaction. It is suggested that all granular material used as fill should have an in-situ moisture content within 2 % of their optimum moisture content. All granular materials should be compacted to 100 % SPMDD. Granular materials should consist of Granular "A" and "B" conforming to the requirements of OPSS Form 1010 or equivalent.

It is noted that the above recommended pavement structures are for the end use of the project. During construction of the project the recommended granular depths may not be sufficient to support loadings encountered.

6.5 FOUNDATION DESIGN

In general, it is recommended that structural loading for one to two-storey buildings be supported on spread and continuous strip footings for column and load bearing walls, respectively. The footings should be founded on the compact to dense native soils, which were encountered in the test pits below approximately 1 to 2 mbeg. Alternatively, suitably reinforced footings may be founded on engineered fill placed directly on the compact to dense native soil.

For design purposes, and based on one- to two-storey residential houses, it is generally recommended that footings constructed on the compact to dense native soils or engineered fill be proportioned using the following bearing capacities:

Table 2: Bearing Pressures for Footing Design

Parameter		Bearing Pressure
		Compact to dense, undisturbed native soil or engineered fill
Maximum Allowable Bearing Pressure		120 kPa (2,500 psf)
In terms of Limit Equilibrium	Factored Bearing Capacity at ULS	265 kPa (5,500 psf)
	Bearing Capacity at SLS Type II	120 kPa (2,500 psf)

Footings (and foundation walls) placed on engineered fill must be suitably reinforced, using 2 continuous runs of 15M rebar throughout the footings, and 2 runs of 20M rebar throughout near the top and bottom of the foundation walls. Any engineered fill upon which footings are placed must be *at least 300mm* in thickness. The following is recommended for the construction of any engineered fill for the footings:

1. Remove any and all existing vegetation, topsoil, fill, organics, and organic-bearing soils to the competent, undisturbed native soil from within the area of the proposed engineered fill.
2. The area of the engineered fill should extend horizontally 1.0 m beyond the outside edge of the building foundations and then extend downward at a 1:1 slope to the competent native soil.
3. The base of the engineered fill area must be approved by a member of Geo-Logic Inc. prior to placement of any fill, to ensure that all unsuitable materials have been removed, that the materials encountered are similar to those observed, and that the subgrade is suitable for the engineered fill.
4. Place well graded granular fill equivalent to Granular "B" Type I (conforming to OPSS 1010) up to the underside of footings in maximum 300 mm lifts, compacted to 100% of its SPMDD. Any fill material placed under sufficiently wet conditions should consist of an approved, rock-based fill, with the inclusion of appropriate geotextile fabric around the rock-based fill should the rock fill contain enough voids to warrant.
5. Full time testing and inspection of the engineered fill will be required, to ensure compliance with material and compaction specifications.

Should any larger buildings (i.e., larger that the anticipated one to two-storey residential dwellings) be proposed, it is recommended that further subsurface exploration be conducted to assess the soil properties in that area. All exterior footings or footings in unheated areas, should be founded at least 1.2 m below the final adjacent grade for frost protection. Footings and walls exposed to frost action should be backfilled with non-frost susceptible granular material.

Under no circumstances should the foundations be placed above organic materials, loose, frozen subgrade, construction debris, or within ponded water. Prior to forming, all foundation excavations must be inspected and approved by a member of Geo-Logic Inc. This will ensure that the foundation bearing material has been prepared properly at the foundation subgrade level and that the soils exposed are similar to those encountered during this investigation.

For design purposes, and based on extensive experience with and knowledge of subsurface conditions in this area, this site is conservatively classed as Site Class D for Seismic Site Response, in accordance with the Ontario Building Code.

For foundations constructed in accordance with the foregoing manner, total and differential settlements are estimated to be less than 25 mm.
Should basement areas be incorporated into any of the buildings' designs, it is recommended that for drainage purposes, perimeter drains be installed about the structure. The subdrains would serve to drain seepage water that infiltrates the backfill, intersect the groundwater, and help relieve hydrostatic pressures due to any seasonally high groundwater levels. The perimeter drain should consist of a perforated pipe, at least 150 mm in diameter, surrounded by clear, crushed stone and suitable filter protection. The subdrain should discharge to a positive sump or other permanent frost free outlet.

6.6 SLAB ON GRADE

Floors may generally be constructed as normal slabs-on-grade, on granular fill over native, inorganic subsoils prepared in accordance with Section 6.2 of this report. The floor slab should be formed over a base course consisting of at least 150 mm of Granular "A" backfill as per OPSS (or 19mm clear stone beneath basement areas) compacted to a minimum of 100% of its SPMDD. All grade increases or infilling below the granular or clearstone should utilize well graded, free draining Granular "B", Type I backfill as per OPSS 1010, compacted to a minimum of 98% of its SPMDD. All fill placed as engineered fill must be inspected, approved and compaction verified by personnel from Geo-Logic.

6.7 TEST PITS DURING TENDERING

We recommend test pits be dug at representative locations of the site due to the limitations of this report, (see Section 7.0 - "Statement of Limitations") - attendance by bidding contractors should be mandatory. This will allow them to make their own assessments of the soil and groundwater conditions at the site and how these will affect their proposed construction methods, techniques and schedules.

6.8 DESIGN REVIEW AND INSPECTION

Due to the preliminary nature of the design details at the time of this report, we recommend that our firm be retained to review the foundation design and grading proposals when they are available.

Geotechnical inspection and compaction testing must be carried out to ensure compliance with our recommendations.

7.0 STATEMENT OF LIMITATIONS

The attached Statement of Limitations is an integral part of this report. Should questions arise regarding any aspect of this report, please contact our office

Sincerely yours,

Geo-Logic Inc.
GEOTECHNICAL ENGINEERS
AND HYDROGEOLOGISTS

Peter Hynes, B.A.Sc.
Geotechnical Engineering Group

Garnet Brenchley, P.Eng.
Senior Engineer

/sph
Encls.

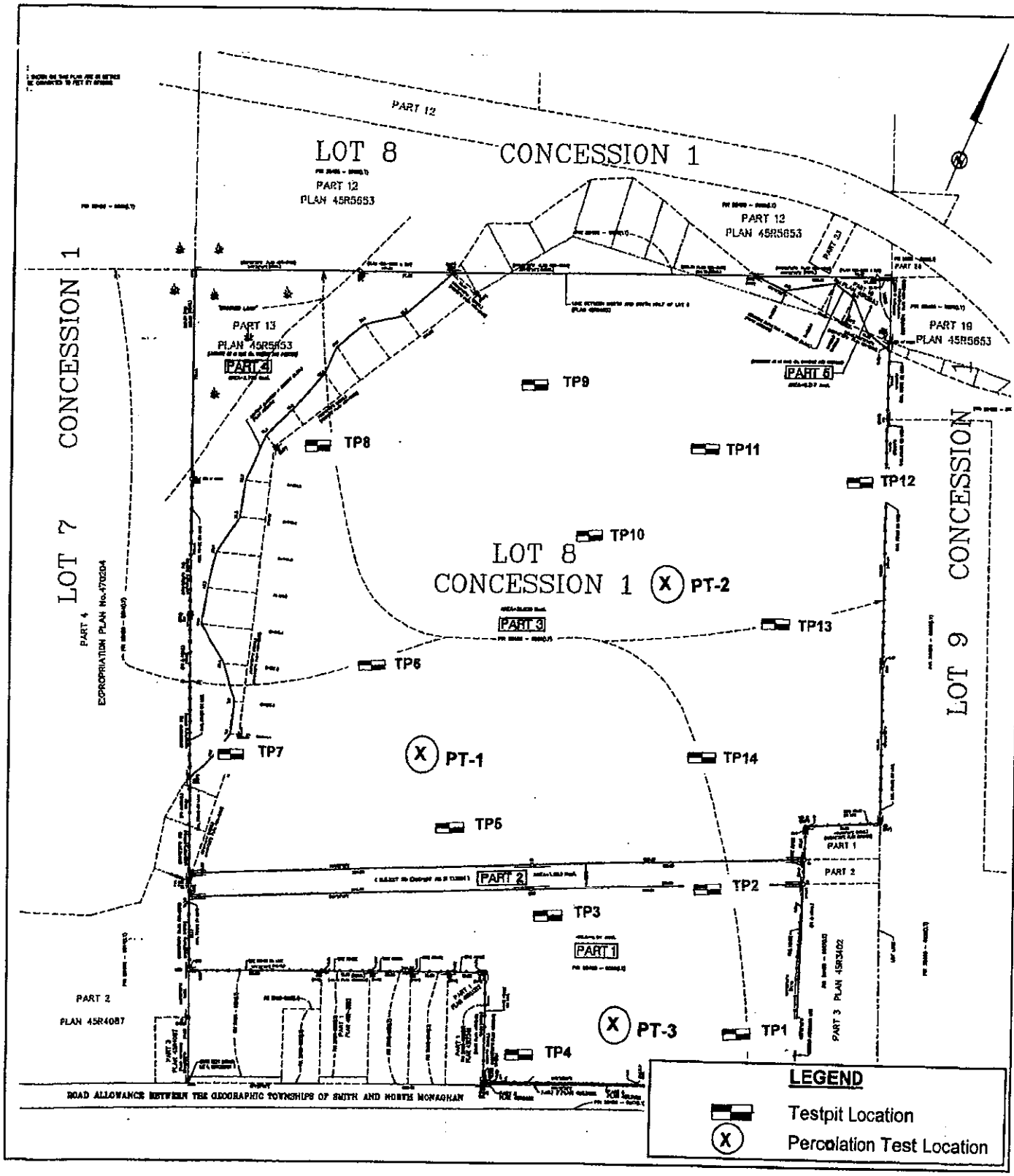
STATEMENT OF LIMITATIONS

The report is intended for the guidance of the building designers. From a construction standpoint, contractors must make their own assessments of the groundwater and soil conditions at the site and how these will affect their proposed construction methods, techniques and schedules.

The conclusions and recommendations in this report are based on information determined at the test hole locations and on geological data of a general nature which may be available for the area investigated. Soil and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations and conditions may become apparent during construction which could not be detected or anticipated at the time of the investigation.

We recommend that we be retained to ensure that all necessary subgrade preparation requirements are met and to confirm that the soil conditions do not deviate materially from those encountered at the test hole locations. In cases where this recommendation is not followed, the company's responsibility is limited to interpreting accurately the information encountered at the test holes.

This report is applicable only to the project described in the introduction, constructed substantially in accordance with details of alignment and elevations quoted in the text. This report has been prepared for the sole use of 2210240 Ontario Inc. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Geo-Logic Inc accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.



TEST HOLE PLAN

Proposed Residential Development
1232 Parkhill Road West, Peterborough
Part Lot 8 Concession 1
Township of Smith, County of Peterboough

Base plan provided by Elliot and Parr, Surveyors, Dated February 2008

DATE: JULY, 2009

SCALE: 1 : NTS

JOB NUMBER: G022510 A1

DRAWING NUMBER: PLATE 1

GEO-LOGIC INC.

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APPENDIX A

TEST PIT LOGS

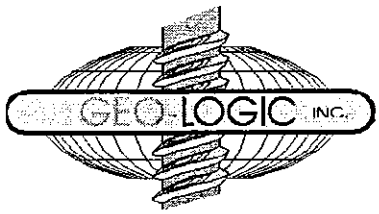
Log of Test Pit: TP-1

Project No: G022510 A1

Project: Parkhill Road Subdivision

Location: Parkhill Road West

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J-6Z8



SUBSURFACE PROFILE				SAMPLE		MOISTURE CONTENT	Piezometer Data	REMARKS
DEPTH	SYMBOL	DESCRIPTION	DEPTH (m)	NUMBER	TYPE	% dry weight 20 40 60 80		
ft / m		Ground Surface	0.00					Location UTM 17 T 0709681 4908829
		TOPSOIL Dark brown to light brown with depth, loose, moist	0.41					
			0.85					
		TILL Grey silty sand till, cobbles, gravel, damp, compact Boulders encountered from 2.72mbeg to depth		CS-1	CS	10		
			2.74					
		Dense		CS-2	CS	9		
			4.57					Test pit dry upon completion. Test pit terminated at 4.57 mbeg.
		Test Pit terminated						

Ground Surface Elevation (m):

Completion Depth (m): 4.57

Date of Excavation: June 18, 2009

Geologist/Technologist: G. Bolin

Excavating Company: Terry Dunford

Excavating Equipment: Track mounted excavator

Plate No.: A-1

Log of Test Pit: TP-2

Project No: G022510 A1

Project: Parkhill Road Subdivision

Location: Parkhill Road West

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J-6Z8

SUBSURFACE PROFILE				SAMPLE		MOISTURE CONTENT	Piezometer Data	REMARKS
DEPTH (ft / m)	SYMBOL	DESCRIPTION	DEPTH (m)	NUMBER	TYPE	% dry weight (20 40 60 80)		
0 / 0		Ground Surface	0.00					Location UTM 0709668 4908929
1		***TOPSOIL*** Dark brown to light brown with depth, loose, moist	0.46					
2		***TILL*** Grey silty sand till, cobbles, boulders, damp to wet with depth, compact to very dense with depth						
3 / 1								Test pit cave in starting at 1.07 mbeg.
4		Increased sand content from 2.45mbeg to depth						
5				CS-1	CS	10		
6								
7 / 2								Seepage in test pit at 2.13 mbeg.
8		Very dense, increased boulder content	2.44	CS-2	CS	9		
9								
10 / 3								
11								
12				CS-3	CS	8		
13 / 4								
14								
15								
16 / 5								
17								
18			5.49					Test pit terminated at 5.49 mbeg.
19		Test Pit terminated						

Ground Surface Elevation (m):

Completion Depth (m): 5.49

Date of Excavation: June 18, 2009

Geologist/Technologist: G. Bolin

Excavating Company: Terry Dunford

Excavating Equipment: Track mounted excavator

Plate No.: A-2

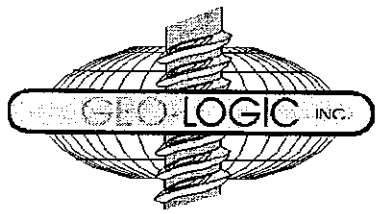
Log of Test Pit: TP-3

Project No: G022510 A1

Project: Parkhill Road Subdivision

Location: Parkhill Road West

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J-6Z8



DEPTH (ft / m)	DESCRIPTION	DEPTH (m)	SAMPLE NUMBER	SAMPLE TYPE	MOISTURE CONTENT (% dry weight)	Piezometer Data	REMARKS
0 / 0	Ground Surface	0.00					Location UTM 0709544 4908895
1	***TOPSOIL*** Dark brown to light brown with depth, loose, moist	0.34					
2	***TILL*** Grey silty sand till, cobbles, boulders, damp to wet with depth, dense to very dense with depth						
3 / 1							
4			CS-1	CS	11		
5							
6							
7 / 2							Seepage in test pit at 1.98 mbeg.
8							
9	Very dense	2.74					
10 / 3							
11			CS-2	CS	9		
12							
13 / 4							
14							Test pit dry upon completion.
15	Test Pit terminated	4.57					Test pit terminated at 4.57 mbeg.
16							

Ground Surface Elevation (m):

Completion Depth (m): 4.57

Date of Excavation: June 18, 2009

Geologist/Technologist: G. Bolin

Excavating Company: Terry Dunford

Excavating Equipment: Track mounted excavator

Plate No.: A-3

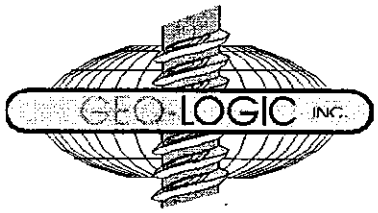
Log of Test Pit: TP-4

Project No: G022510 A1

Project: Parkhill Road Subdivision

Location: Parkhill Road West

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J-6Z8



SUBSURFACE PROFILE				SAMPLE		MOISTURE CONTENT	Piezometer Data	REMARKS
DEPTH (ft / m)	SYMBOL	DESCRIPTION	DEPTH (m)	NUMBER	TYPE	% dry weight (20 40 60 80)		
0 ft / 0 m		Ground Surface	0.00					Location UTM 0709540 4908822
1		***TOPSOIL*** Dark brown to light brown with depth, loose, moist	0.40					
2		***TILL*** Grey silty sand till, cobbles, boulders, moist, dense						
3 / 1			1.22					Test pit cave in starting at 1.07 mbeg.
4		Wet						
5				CS-1	CS	10		
6 / 2								Seepage in test pit at 1.98 mbeg.
7								
8								
9			2.90					
10 / 3		Very dense		CS-2	CS	9		
11								
12								
13 / 4			3.96					Test pit terminated at 3.96 mbeg.
14		Test Pit terminated						

Ground Surface Elevation (m):

Completion Depth (m): 3.96

Date of Excavation: June 18, 2009

Geologist/Technologist: G. Bolin

Excavating Company: Terry Dunford

Excavating Equipment: Track mounted excavator

Plate No.: A-4

Log of Test Pit: TP-6

Project No: G022510 A1

Project: Parkhill Road Subdivision

Location: Parkhill Roadb West

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J-6Z8

SUBSURFACE PROFILE				SAMPLE		MOISTURE CONTENT	Piezometer Data	REMARKS
DEPTH (ft / m)	SYMBOL	DESCRIPTION	DEPTH (m)	NUMBER	TYPE	% dry weight 20 40 60 80		
0 / 0		Ground Surface	0.00					Location UTM 0709279 4909008
1		***TOPSOIL*** Dark brown to light brown with depth, loose, moist	0.40					
2		***TILL*** Grey silty sand till, cobbles, gravel, boulders, wet, compact						
3 / 1								
4				CS-1	CS	12		Test pit cave in starting at 1.22 mbeg.
5								
6								
7 / 2								Seepage in test pit at 2.29 mbeg.
8								
9			2.74					
10 / 3		Dense						
11				CS-2	CS	9		
12								
13 / 4								
14								
15			4.57					Test pit terminated at 4.57 mbeg.
16		Test Pit terminated						

Ground Surface Elevation (m):

Completion Depth (m): 4.57

Date of Excavation: June 18, 2009

Geologist/Technologist: G. Bolin

Excavating Company: Terry Dunford

Excavating Equipment: Track mounted excavator

Plate No.: A-6

Log of Test Pit: TP-7

Project No: G022510 A1

Project: Parkhill Road Subdivision

Location: Parkhill Road West

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J-6Z8

SUBSURFACE PROFILE				SAMPLE		MOISTURE CONTENT	Piezometer Data	REMARKS
DEPTH (ft / m)	SYMBOL	DESCRIPTION	DEPTH (m)	NUMBER	TYPE	% dry weight (20 40 60 80)		
0 / 0		Ground Surface	0.00					
		TOPSOIL Dark brown to light brown with depth, loose, moist	0.61					
		TILL Grey silty sand till, cobbles, boulders, wet, compact		CS-1	CS	11		
				CS-2	CS	11		Test pit cave in starting at 1.52 mbeg. Seepage in test pit at 1.83 mbeg.
			3.96					
		Grey blue, dense		CS-3	CS	9		
			4.88					Test pit dry upon completion.
		Test Pit terminated						Test pit terminated at 4.88 mbeg.

Ground Surface Elevation (m):

Completion Depth (m): 4.88

Date of Excavation: June 18, 2009

Geologist/Technologist: G. Bolin

Excavating Company: Terry Dunford

Excavating Equipment: Track mounted excavator

Plate No.: A-7

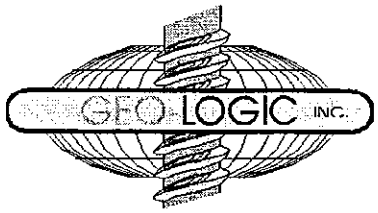
Log of Test Pit: TP-8

Project No: G022510 A1

Project: Parkhill Road Subdivision

Location: Parkhill Road West

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J-6Z8



SUBSURFACE PROFILE

DEPTH (ft)	DEPTH (m)	SYMBOL	DESCRIPTION	DEPTH (m)
0	0		Ground Surface	0.00
			TOPSOIL Dark brown to light brown with depth, loose, moist	0.46
			TILL Grey silty sand till, cobbles, gravel, wet, compact	
			Dense	2.59
			Test Pit terminated	3.96

SAMPLE

NUMBER	TYPE
CS-1	CS
CS-2	CS

MOISTURE CONTENT — % dry weight (20, 40, 60, 80)

18

9

Piezometer Data

REMARKS

Location UTM 17 T
0709232 4909134

Water Level, June 31, 2009
0.62 mbg

Piezometer installed to 3.96 mbeg.

Test pit dry upon completion.

Test pit terminated at 3.96 mbeg.

Ground Surface Elevation (m):

Completion Depth (m): 3.96

Date of Excavation: June 18, 2009

Geologist/Technologist: G. Bolin

Excavating Company: Terry Dunford

Excavating Equipment: Track mounted excavator

Plate No.: A-8

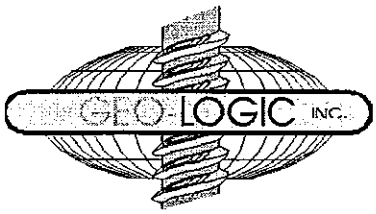
Log of Test Pit: TP-9

Project No: G022510 A1

Project: Parkhill Road Subdivision

Location: Parkhill Road West

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J-6Z8



SUBSURFACE PROFILE				SAMPLE		MOISTURE CONTENT % dry weight 20 40 60 80	Piezometer Data	REMARKS
DEPTH (ft / m)	SYMBOL	DESCRIPTION	DEPTH (m)	NUMBER	TYPE			
0 / 0		Ground Surface	0.00					Location UTM 17 T 0709322 4909248
0–1		***TOPSOIL*** Dark brown to light brown with depth, loose, moist	0.51					
1–8 / 1–2		***TILL*** Grey silty sand till, cobbles and bolders, damp	2.44	CS-1	CS	10		
8–14 / 2–4		Dense	4.27	CS-2	CS	8		Test pit dry upon completion.
14		Test Pit terminated						Test pit terminated at 4.27 mbeg.
15								

Ground Surface Elevation (m):

Completion Depth (m): 4.27

Date of Excavation: June 18, 2009

Geologist/Technologist: G. Bolin

Excavating Company: Terry Dunford

Excavating Equipment: Track mounted excavator

Plate No.: A-9

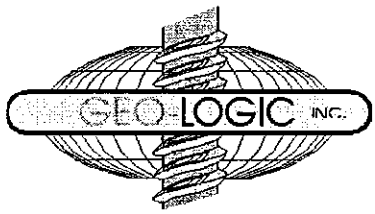
Log of Test Pit: TP-10

Project No: G022510 A1

Project: Parkhill Road Subdivision

Location: Parkhill Road West

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J-6Z8



SUBSURFACE PROFILE				SAMPLE		MOISTURE CONTENT	Piezometer Data	REMARKS
DEPTH (ft / m)	SYMBOL	DESCRIPTION	DEPTH (m)	NUMBER	TYPE	% dry weight 20 40 60 80		
0 / 0		Ground Surface	0.00					Location UTM 17 T 0709421 4909085
1		***TOPSOIL*** Dark brown to light brown with depth, loose, moist	0.41					
2		***TILL*** Grey silty sand till, cobbles, boulders, gravel, damp, compact						
3 / 1								
4								
5				CS-1	CS	10		
6								
7 / 2								
8								
9			2.96					
10 / 3		Dense		CS-2	CS	10		
11								
12								
13 / 4			4.27					Test pit dry upon completion.
14		Test Pit terminated						Test pit terminated at 4.27 mbeg.
15								

Ground Surface Elevation (m):

Completion Depth (m): 4.27

Date of Excavation: June 18, 2009

Geologist/Technologist: G. Bolin

Excavating Company: Terry Dunford

Excavating Equipment: Track mounted excavator

Plate No.: A-10

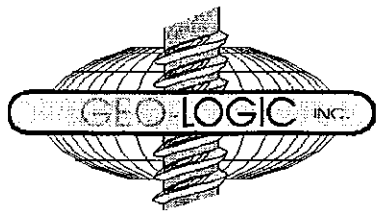
Log of Test Pit: TP-11

Project No: G022510 A1

Project: Parkhill Road Subdivision

Location: Parkhill Road West

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J-6Z8



SUBSURFACE PROFILE				SAMPLE		MOISTURE CONTENT	Piezometer Data	REMARKS
DEPTH (ft / m)	SYMBOL	DESCRIPTION	DEPTH (m)	NUMBER	TYPE	% dry weight (20 40 60 80)		
0 / 0		Ground Surface	0.00					
0–2 / 0–0.76		***TOPSOIL*** Dark brown to light brown with depth, loose, moist	0.76					
3–7 / 1–2		***TILL*** Sandy silty sand, trace clay, damp, compact		CS-1	CS	11		
8 / 2.44		Dense	2.44					
10–13 / 3–4				CS-2	CS	11		
15 / 4.57		Test Pit terminated	4.57					Water Level, June 31, 2009 3.32 mbg Test pit dry upon completion. Test pit terminated at 4.57 mbeg.

Ground Surface Elevation (m):

Completion Depth (m): 4.57

Date of Excavation: June 18, 2009

Geologist/Technologist: G. Bolin

Excavating Company: Terry Dunford

Excavating Equipment: Track mounted excavator

Plate No.: A-11

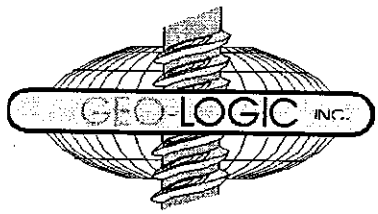
Log of Test Pit: TP-12

Project No: G022510 A1

Project: Parkhill Road Subdivision

Location: Parkhill Road West

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J-6Z8



DEPTH (ft)	DEPTH (m)	SYMBOL	DESCRIPTION	DEPTH (m)	SAMPLE NUMBER	SAMPLE TYPE	MOISTURE CONTENT (% dry weight)	Piezometer Data	REMARKS
0	0		Ground Surface	0.00					Location UTM 17 T 0709618 4909298
1			***TOPSOIL*** Dark brown to light brown with depth, loose, moist	0.61					
2			***TILL*** Grey silty sand till, trace clay, trace gravel, damp, compact						
3	1								
4									
5					CS-1	CS	9		
6			Cobbles	1.83					
7	2								
8									
9				2.74					
10	3		Dense	3.05	CS-2	CS	9		
11			Silty sand till, cobbles, boulders, damp, dense		CS-3	CS	12		
12									
13	4								Test pit dry upon completion.
14				4.27					Test pit terminated at 4.27 mbeg.
15			Test Pit terminated						

Ground Surface Elevation (m):

Completion Depth (m): 4.27

Date of Excavation: June 18, 2009

Geologist/Technologist: G. Bolin

Excavating Company: Terry Dunford

Excavating Equipment: Track mounted excavator

Plate No.: A-12

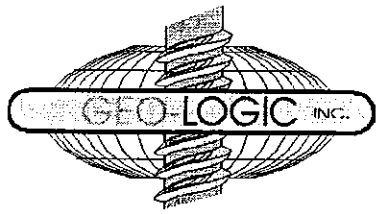
Log of Test Pit: TP-13

Project No: G022510 A1

Project: Parkhill Road Subdivision

Location: Parkhill Road West

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J-6Z8



SUBSURFACE PROFILE				SAMPLE				
DEPTH (ft / m)	SYMBOL	DESCRIPTION	DEPTH (m)	NUMBER	TYPE	MOISTURE CONTENT % dry weight (20 40 60 80)	Piezometer Data	REMARKS
0 / 0		Ground Surface	0.00					Location UTM 17 T 0709670 4909153
		TOPSOIL Dark brown to light brown with depth, loose, moist	0.61					
		TILL Grey silty sand till, gravel, cobbles, boulders, damp, compact						
4				CS-1	CS	8		
8		Dense	2.44	CS-2	CS	12		
13 / 4				CS-3	CS	9		Test pit dry upon completion.
14		Test Pit terminated	4.27					Test pit terminated at 4.27 mbeg.

Ground Surface Elevation (m):

Completion Depth (m): 4.27

Date of Excavation: June 18, 2009

Geologist/Technologist: G. Bolin

Excavating Company: Terry Dunford

Excavating Equipment: Track mounted excavator

Plate No.: A-13

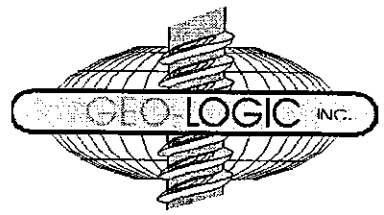
Log of Test Pit: TP-14

Project No: G022510 A1

Project: Parkhill Road Subdivision

Location: Parkhill Road West

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J-6Z8



SUBSURFACE PROFILE

DEPTH (ft)	DEPTH (m)	SYMBOL	DESCRIPTION	DEPTH (m)
0	0		Ground Surface	0.00
			TOPSOIL Dark brown to light brown with depth, loose, moist	0.30
			TILL Grey silty sand till, cobbles, boulders,wet, compact	
	1			
	2			
	3			
	4		Test Pit terminated	3.96

SAMPLE

NUMBER	TYPE	MOISTURE CONTENT (% dry weight)
CS-1	CS	11
CS-2	CS	10
		5

Piezometer Data

REMARKS

Location UTM 17 T
0709613 4909063

Test pit dry upon completion.

Test pit terminated at 3.96 mbeg.

Ground Surface Elevation (m):

Completion Depth (m): 3.96

Date of Excavation: June 18, 2009

Geologist/Technologist: G. Bolin

Excavating Company: Terry Dunford

Excavating Equipment: Track mounted excavator

Plate No.: A-14

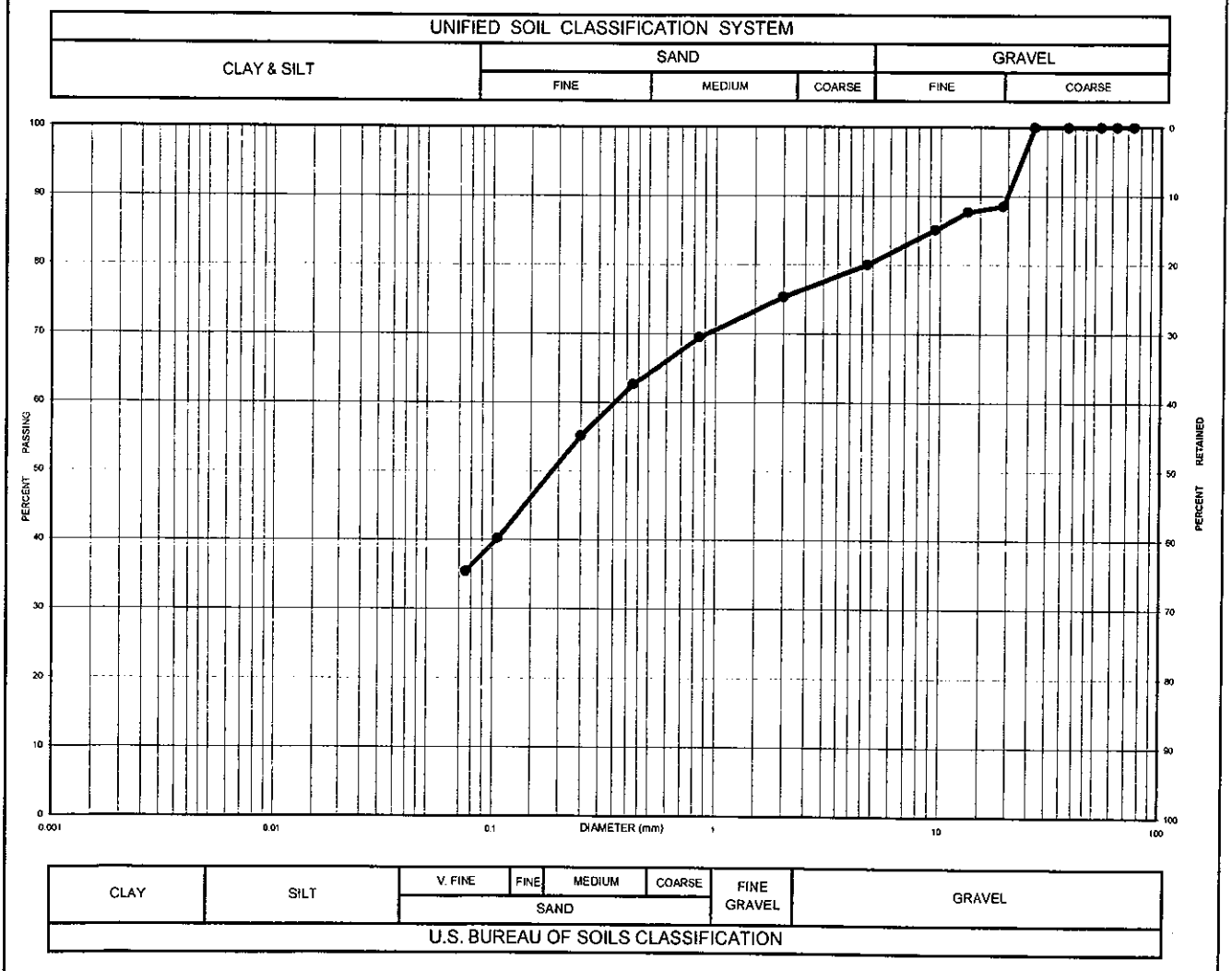
APPENDIX B

LABORATORY DATA

GEO-LOGIC INC. 347 Pido Road Unit 29 Peterborough, ON, K9J 6X7 Tel: (705) 749-3317 Fax: (705) 749-9248

GRAIN SIZE DISTRIBUTION CHART

Client:	*Danhew Holdings*	Ref No.:	*G022510A1*
Project:	*Parkhill Road West*	Location:	*1232 Parkhill Road West*
Borehole No.:	*TP-3*	Sample No.:	*CS-1*
Depth:	*3.0 -4.0'*	Enclosure:	*1*

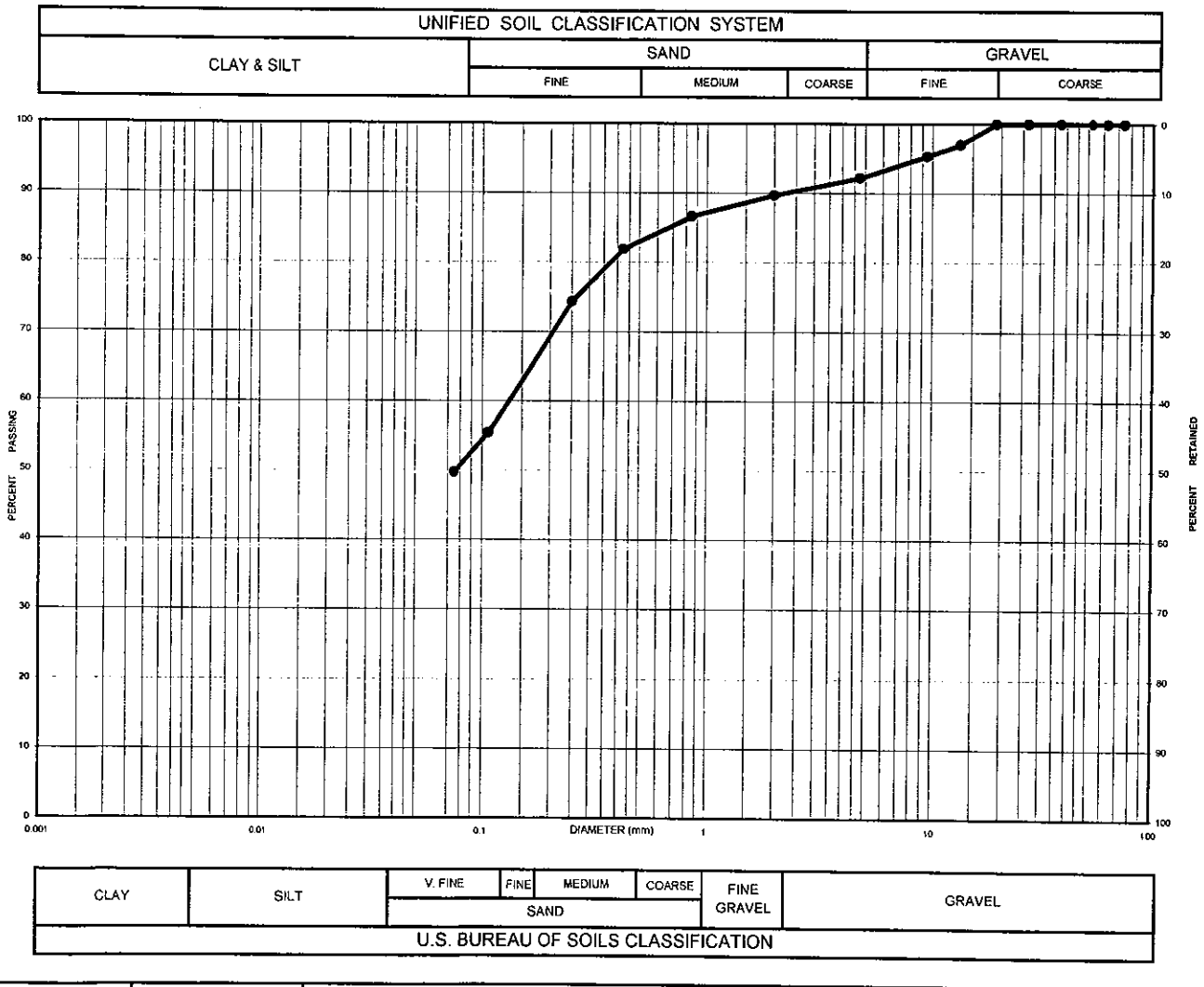


Sample No.	Depth	Description	Gravel	Sand	Silt	Clay	Class.
TP-3, CS-1	3.0 -4.0'	*SAND & SILT some gravel*	20	45	35		*SM*

GEO-LOGIC INC. 347 Pido Road Unit 29 Peterborough, ON, K9J 6X7 Tel: (705) 749-3317 Fax: (705) 749-9248

GRAIN SIZE DISTRIBUTION CHART

Client:	*Danhew Holdings*	Ref No.:	*G022510A1*
Project:	*Parkhill Road West*	Location:	*1232 Parkhill Road West*
Borehole No.:	*TP-8*	Sample No.:	*CS-2*
Depth:	*9.0 - 11.0'*	Enclosure:	*2*

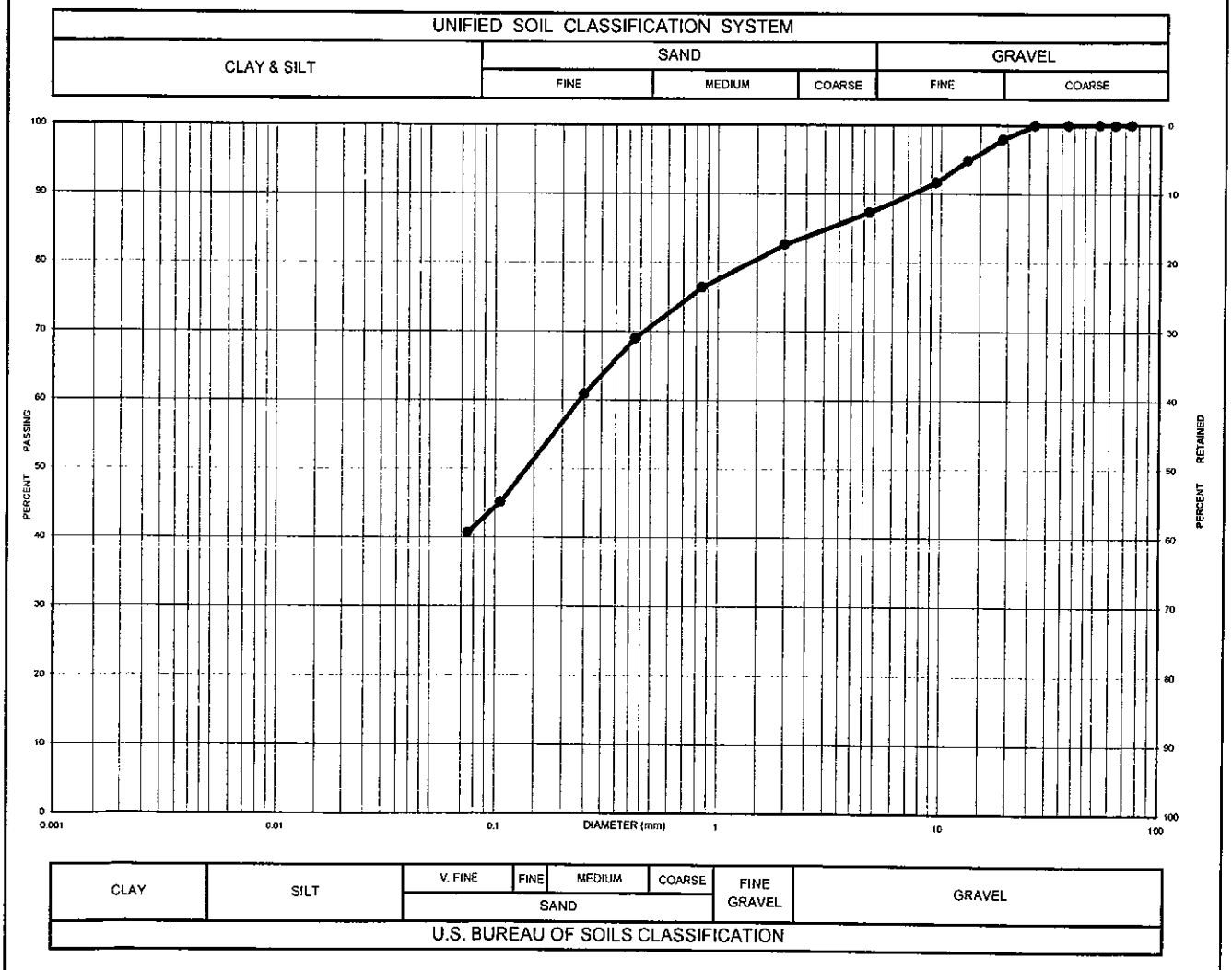


Sample No.	Depth	Description	Gravel	Sand	Silt	Clay	Class.
TP-8, CS-2	9.0 - 11.0'	*SAND & SILT trace of gravel*	8	43	50		*ML*

GEO-LOGIC INC. 347 Pido Road Unit 29 Peterborough, ON, K9J 6X7 Tel: (705) 749-3317 Fax: (705) 749-9248

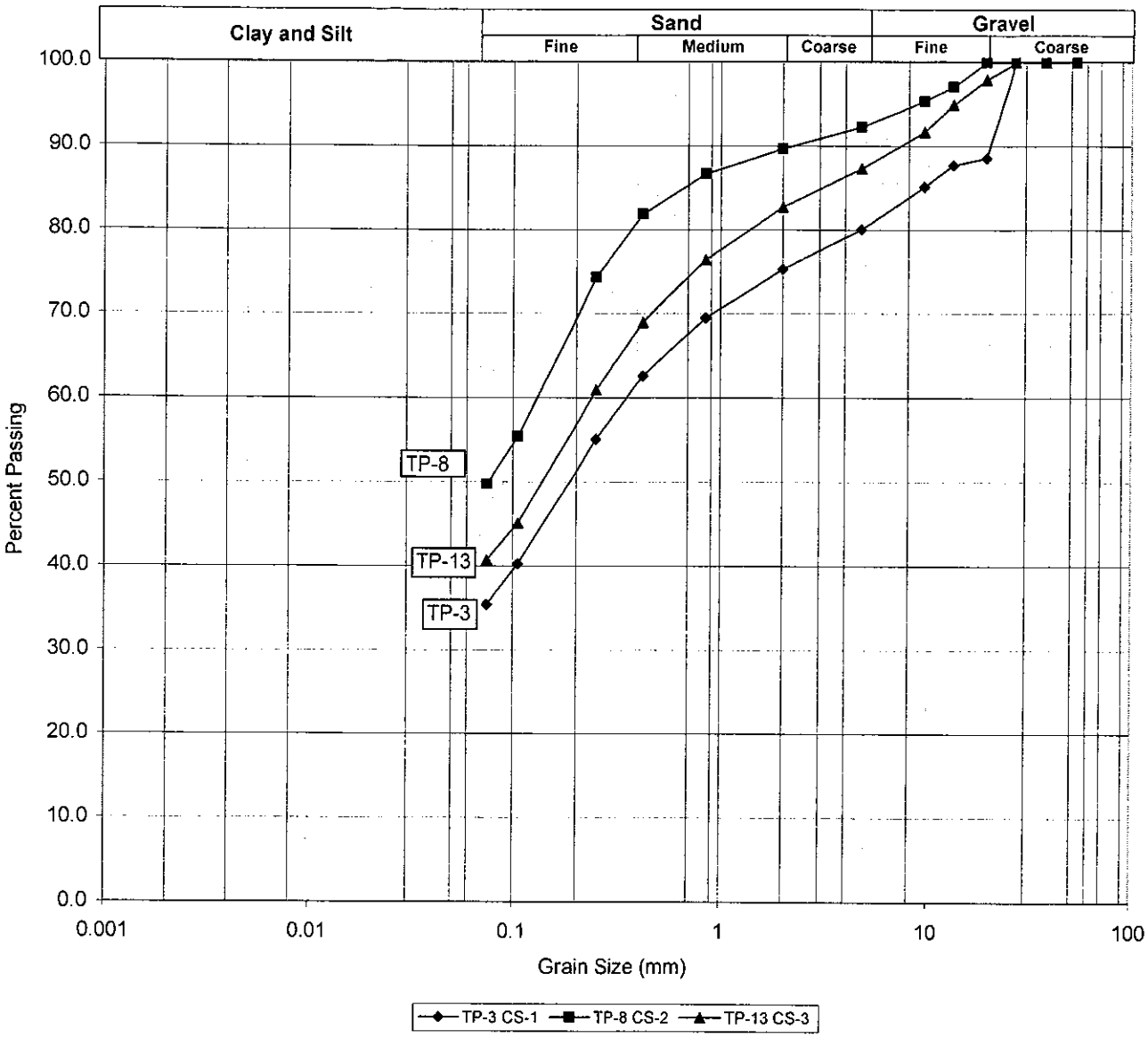
GRAIN SIZE DISTRIBUTION CHART

Client:	*Danhew Holdings*	Ref No.:	*G022510A1*
Project:	*Parkhill Road West*	Location:	*1232 Parkhill Road West*
Borehole No.:	*TP-13*	Sample No.:	*CS-3*
Depth:	*12.0 - 14.0'*	Enclosure:	*3*



Sample No.	Depth	Description	Gravel	Sand	Silt	Clay	Class.
TP-13, CS-3	12.0 - 14.0'	*SAND & SILT some gravel*	13	47	41		*SM*

GRAIN SIZE DISTRIBUTION DATA



SAMPLE	DEPTH (m)	% GRAVEL	% SAND	% SILT & CLAY	SOIL DESCRIPTION	CLASS
TP-3 CS-1	0.9 - 1.2	20	45	35	SILTY SAND some gravel	SM
TP-8 CS-2	2.7 - 3.4	8	42	50	SILTY SAND trace gravel	ML
TP-13 CS-3	3.8 - 4.4	13	46	41	SILTY SAND some gravel	SM

SIEVE ANALYSIS

DATE: July 2009

SITE: 1232 Parkhill Road West

JOB NUMBER: G022510 A1

DRAWING NUMBER: PLATE 4

GEO-LOGIC INC.

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7

(705) 749-3317 FAX (705) 749-9248 EMAIL:peterborough@geo-logic.ca