Terraprobe
Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

HYDROGEOLOGIC STUDY
DERRY ROAD WEST & ARGENTIA ROAD
MISSISSAUGA, ONTARIO

Prepared For:

HDR Corporation
255 Adelaide Street West
Toronto, Ontario
L5H 1X9

Attention: Mr. Andrew O'Connor

File No. 13-13-3146-6
February 3, 2015

TABLE OF CONTENTS

FIGURES:

APPENDICES:

1.0 INTRODUCTION

Terraprobe Inc. was retained by HDR Corporation to conduct a Hydrogeologic Study in support of the proposed intersection improvements at Derry Road and Argentia Road in the Region of Peel, Ontario. The property consists of intersecting roadway sections as shown on the Site Location Plan (Figure 1). The property is located in a developed area of Mississauga that is fully serviced with municipal piped water and sewage facilities.

The study was undertaken to assess geologic and hydrogeologic conditions at the site and to provide detailed information regarding the hydrogeologic impact of the proposed improvements on the local ground water function. The Region of Peel requires that a hydrogeologic investigation be completed in order to assess the potential impact of the proposed development on the ground water system. The purpose of the study was to addresses the following items:

- Determine the location and nature of any remaining private wells in the study area.
- Determine the potential zone of influence (area of drawdown or impact on ground water quality) expected from the construction work associated with improvement of intersection.
- If required, develop a program for monitoring of any remaining private wells during construction of the works.
- An assessment of the possible requirements for ground water control during construction.

2.0 SCOPE OF WORK

The scope of work for the study consisted of the following:

- Review of available background information. A review of available background geologic and Hydrogeologic information for the site including topographic mapping, geological mapping, and MOE water well records.
- Review of Geotechnical Investigation report. A Geotechnical Investigation report prepared by Terraprobe Inc. entitled *"Draft Geotechnical Investigation Intersection Improvements, Derry Road and Argentia Road, Region of Peel, Ontario"*, dated July 15, 2014, was reviewed to further assess existing geologic conditions at the subject site.
- Discussion with the Region of Peel to confirm the current extent of water services in the area. The Region of Peel was contacted to obtain information regarding the current extent of water servicing in the area, and to confirm which residents were connected to the municipal watermain.
- Site inspection. A detailed visual inspection of the site and surrounding areas was conducted to determine local topography and drainage, and an assessment of hydrogeologically significant features.
- Engineering analysis to assess the potential impact of the development on local ground water quality and ground water levels.

3.0 SITE AND PROJECT DESCRIPTION

3.1 Site Location and Project Description

The subject property consists of approximately 440 m stretch of Derry Road West (approximately 170 m east and 270 m west) and approximately 480 m stretch of Argentia Road (approximately 280 m north and 200 m to the south) at the Derry Road/Argentia Road intersection located in Mississauga, Ontario. Derry Road is a six lane asphalt paved roadway with additional turning lanes and Argentia Road is a four lane asphalt paved roadway. The property includes roadways, associated right-of-ways, and boulevards within the project limits as shown on the attached Figure 2. There is an existing Highway 401 overpass on Derry Road east of the intersection and a railway bridge on Derry Road west of the intersection, adjacent to the property limits. Both structures are not considered to be part of the Property.

The surrounding properties are commercial and industrial in land use. The nearest permanent water course is Mullet Creek located approximately 180 m east of the east end of the Property. A seasonal tributary of Mullet Creek traverses the western stretch of Derry Road.

The property is proposed to be further developed with improvement of the existing intersection. The property and the area is fully serviced with municipal piped water and sewage facilities. The Region of Peel requires that a hydrogeologic investigation be completed in order to assess the potential impact of the proposed development on the ground water system. The study was undertaken to assess geologic and hydrogeologic conditions at the site and to provide information regarding the potential impact of the proposed development on the local ground water function.

3.2 Site Topography and Drainage

The property is predominately flat-lying to gently rolling, and generally slopes to the southeast. Based on the Ontario Base map information, the ground surface varies from approximately 190 m (middle portion) to approximately 185 m east and west ends) geodetic elevation. Regionally, the ground surface slopes down to the southeast towards Mullet Creek located approximately 180 m east of the east end of the property.

A tributary of Mullet Creek runs across the west limit of the site. There are no permanent water courses or significant drainage features at the subject site. The nearest water feature Mullet Creek located approximately 180 m east of the east end of the Property. A seasonal tributary of Mullet Creek traverses the western stretch of Derry Road.

3.3 Regional Geology and Hydrogeology

Based on published geological information for the general area, the surficial geology consists of surficial deposits of clay to silt textured till/ modern alluvial deposits (Halton Till). The bedrock in this area

consists of shale, limestone/dolostone, siltstone belonging to Queenston Formation of Upper Ordovician age. Based on the review of the MOE well record, the depth of bedrock in the area varies from 2.1 m to 14.6 m.

The regional hydrogeologic conditions were assessed on the basis of water well records and geologic mapping. Based on this information, two significant hydrostratigraphic units were defined in the vicinity of the site. Each of these units is described below:

- Glacial till materials. The till materials comprise primarily silty clay with occasional sand and gravel seams (Halton Till Unit). The till materials are generally considered to be of low permeability. Ground water in this unit is encountered due to presence of intermittent sand and gravel seams.

- Shale Bedrock. The area is underlain by shale bedrock of the Queenston Formation. This unit is of low permeability. Ground water in this unit is encountered due to presence of fracturing.

The geologic and hydrogeologic conditions in the vicinity of the subject property were assessed based on Ministry of Environment well records (Appendix A). Geological cross sections of the site were prepared from information obtained in the MOE water well records (Figure 5 and 6).

3.4 Regional Physiography

From a regional perspective, the site is situated within the physiographic feature known as the Bevelled Till Plains. The till plain is characterized by a level to undulating tract of clay soils with fine-textured glaciolacustrine deposits overlying bedrock of the Queenston formation. The site is situated within the Credit River watershed which extends southeast to Lake Ontario. The area is drained by several creeks which generally flow southwards toward Lake Ontario.

3.5 Ground Water Resources

Private well records on file with the Ministry of the Environment were reviewed for wells located within 1 km of the site. Information contained in these records provides data for determining the nature and use of local groundwater resources. Locations of those wells with available MOE records are shown on Figure 4. Cross sections were created using MOE well record data. Cross sections were plotted to illustrate subsurface stratigraphy and water levels within the area. The MOE well record data is presented in Appendix A. A total of 17 wells were identified within 1 km of the site. There was no information for 3 of the wells in the record. A summary of data obtained from these MOE records is presented in Table 3-1 below.

Table 3-1: Summary of Local Water Wells

Total Number of Wells	14
Wells completed in Overburden	3 (21%)
Wells completed in Bedrock	11 (79%)
Well Type	
Drilled Well	10 (71%)
Unknown	4 (29%)
Depth Ranges	
50 ft or Less	13 (93%)
51 ft to 100 ft	1 (7%)
Water Use	
Domestic	1 (7%)
Public or Municipal	3 (21%)
Commercial	1 (7%)
Monitoring	3 (21%)
Unknown	6 (44%)
Reported Pumping Rates	
0 to 20 LPM (0 to 5 GPM)	3 (21%)
Unknown	11 (79%)

The above summary indicates that most local wells registered in the area obtain their water supply from the bedrock. About 71% of the registered wells are smaller diameter drilled wells completed to depths of less than 65 ft. Well records indicate that three of the wells produce a fresh water supply while water detail was unknown for rest of the wells. The stratigraphy information from the records for most wells indicated that silt & clay till material is present at the ground surface, followed by shale bedrock. Based on the well records, it is evident that most local wells draw water from shale bedrock.

The site is situated in a fully serviced area within the city of Mississauga, and it is understood that there is no active use of the ground water for domestic purposes in the vicinity of the site

3.6 Discussion with the Region of Peel

Discussions were held with the Region of Peel to confirm the extent of existing water servicing in the area. Based on the discussion, there is no ground water use in the study area. All the properties within about 500 m of the site are serviced by municipally piped water

3.7 Site Inspection to Assess Hydrogeologic Features

A detailed site inspection was conducted to assess the presence of features which are significant from a hydrogeologic viewpoint. In particular, the site was inspected to assess the following:

- Areas of visible ground water discharge, springs or seepage at the site or in the vicinity of the on-site water courses.
- Areas of potential enhanced ground water recharge such as closed drainage features or depressions or large flat areas which may allow for significant ground water infiltration.

- Inspection of swales and drainage courses for evidence of ground water seepage or springs.
- Evidence of phreatophytic vegetation, which may indicate seasonally high ground water levels and/or ground water discharge and seepage.

An inspection was performed on September 27, 2013 to assess the presence of any natural environmental features. The site consists of roadways, associated right-of-ways, and boulevards. No significant areas of ground water recharge were identified on the subject site. No permanent creeks or water features were identified. A seasonal tributary of Mullet Creek traverses the western stretch of Derry Road. There are no significant low lying areas or closed depressions which would allow for ponding and infiltration of ground water within the proposed development areas. The nearest permanent water course is Mullet Creek located approximately 180 m east of the east end of the property.

The site is located in an area of ground water recharge; however, the site is characterized by very low permeability soils which provide limited recharge capability. Further information regarding the results of the subsurface investigation is provided in Sections 3.8 to 3.10. Given the low permeability soils encountered, ground water flow from the subject property will not contribute significantly to base flow in the tributaries of the Credit River including the Mullet Creek located in the area.

3.8 Results of Geotechnical Investigation

A detailed geotechnical investigation of the subject site was conducted by Terraprobe and the results are presented in our report entitled "*Geotechnical Investigation, Intersection Improvements Derry Road and Argentia Road, Region of Peel, Ontario*", Terraprobe File No. 11-13-3148, dated July 15, 2014. The field investigation was conducted during the period of June 6 to 9, 2014. Twenty eight boreholes were drilled to depths ranging from approximately 0.6 – 1.8 m below ground surface and coring of asphalt pavement at four locations. The boreholes were located in the field by Terraprobe and the approximate locations are shown on Figure 3. The borehole logs are presented in Appendix B. The following summarises the various soil types encountered during the subsurface investigation.

3.8.1 Pavement Structure

A surficial layer of asphalt approximately 140 to 170 mm in thickness was present at the boreholes located at the existing roadways. An approximately 140 to 150 mm thick concrete slab was encountered at the location of two boreholes drilled on the sidewalks. Asphalt and concrete was underlain by granular material consisting of gravelly sand to sand and gravel ranging in thickness from 410 to 1040 mm.

3.8.2 Topsoil

A topsoil layer (approximately 130 to 280 mm thick) was encountered at the ground surface at the boreholes located in the widening areas beyond the existing pavement platform. The topsoil thickness is confirmed at the borehole location only, and may vary between and beyond the boreholes.

3.8.3 Fill Material

Sand and gravel to silty sand fill material was encountered below the topsoil in boreholes located in the boulevard areas. Silty clay fill material was encountered below the granular material at several borehole locations (BH17 to 21, 24, 25, 28 to 30 & 32 to 34) across the site and extended to the depths of 0.6 m to 1.8 m below ground surface.

3.8.4 Native Soils

Undisturbed native soils were encountered beneath the granular fill or silty clay fill material across the Site. The native soils consisted of predominantly silty clay with some sand and trace gravel (glacial till). The native soils extended to the investigated depth of 1.8 m below ground surface.

3.9 Geotechnical Laboratory Test Results

Geotechnical laboratory testing consisted of water content determination on all samples, and a sieve and hydrometer analysis on selected soil samples. The measured natural water contents of individual samples are plotted on the enclosed borehole logs at respective sampling depths, and the results of the Sieve and Hydrometer analysis are appended and summarized below.

Table 3.2: Summary of Geotechnical Laboratory Test Results

Borehole No. Sample No.	Sampling Depth below Grade	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Description (MIT System)
Borehole 10 Sample 2	0.9 m	2	17	51	30	Clayey silt, some sand, trace gravel
Borehole 16 Sample 1	0.4 m	8	69	23	-	Silty sand, trace gravel
Borehole 30 Sample 3	1.4 m	0	22	53	25	Clayey silt, some sand, trace gravel
Borehole 31 Sample 1	0.4 m	31	56	13	-	Sand & gravel, some silt

3.10 Ground Water

The unstabilized ground water levels in the boreholes were measured during and upon completion of the drilling operations and this information is reported on the Borehole Logs in Appendix B. No free water was encountered in any of the boreholes.

4.0 DISCUSSION AND RECOMMENDATIONS

In general, the proposed construction activities include widening and improvement of the existing roadways (Derry Road & Argentia Road) at their intersection. It is anticipated that the proposed works will not involve significant excavation or grading activities. The construction will involve excavation to depths of less than about 2.0 m below existing grades. The construction works could potentially affect ground water levels and quantity of ground water if:

- Excavations are made below the ground water table for any trenches; and,
- One or more water bearing zones are intersected by the excavation and cut off.

Ground water was not encountered within the investigated depths of 1.8 m below existing grades. The creation of the excavations will generally not result in the introduction of contaminants into the shallow ground water system. Any accidental contamination such as spillage or leakage of fuel or the like would be immediately reported and cleaned up before any significant impact occurred. The noted soils are of low permeability and would preclude any significant migration of contamination. Similarly, if excavations are made below the water table, the flow of ground water will be towards the excavation. Thus, contamination will not escape from the excavation since there will be inward flow.

On this basis, the proposed works have the potential to affect ground water levels only if excavations are carried below the ground water table. The potential to affect the shallow ground water would be considered to be quite low as a result of the low permeability native soils encountered. The excavations have no significant potential to affect local ground water quality.

4.1 Impact of Development on Ground Water Levels

There is limited potential to drawdown the ground water level as a result of the excavations because of the low permeability soils. No private water wells are located in the area. Review of MOE water well records (Appendix A) for an area within 1 km of the site indicates that depths of the wells range from approximately 4.6 m to 5.2 m. The wells are completed at relatively greater depth and given the low permeability soils found at the surface it is concluded that the wells will not be impacted by the shallow earthworks for this project.

4.2 Ground Water Control

Low permeability native soils encountered at the site will not tend to have free flowing ground water. However, some ground water seepage may be encountered from the granular fill soils. The seepage would be greater if the work is conducted during wet weather periods or during rainfall. This perched ground water can be controlled by continuous pumping from a conventional sump pump arrangement at the base of the excavation.

4.3 Water Well Monitoring Program Requirements

The results of the investigation conclude that there is no ground water use in the study area. All the properties or residences within about 500 m of the site are serviced by municipally piped water. Therefore, no well monitoring program is required.

4.4 Response and Contingency Plan

As there is no known use of private wells in the vicinity of the project area, no response and contingency plan is required during the construction activities.

5.0 SUMMARY AND CONCLUSIONS

The proposed development is underlain by low permeability glacial till soils. As a result, any potential impact to ground water resulting from construction of the proposed development will be limited in extent. There is no use of ground water and no private water wells are located in the area. Therefore no well monitoring program or mitigation measures are required.

Low permeability native soils encountered at the site will not tend to have free flowing ground water. However, some ground water seepage may be encountered from the granular fill soils. This perched ground water can be controlled by continuous pumping from a conventional sump pump arrangement at the base of the excavation. The volume of water seepage encountered during the excavation will be relatively small, therefore a permit to take water (PTTW) will not be required.

We trust that the above-noted information is suitable for your review. If you have any questions regarding this information, please do not hesitate to contact the undersigned.

Yours truly,

Terraprobe Inc.

Muhammad I. Shahid, P.Geo., QP_{ESA}
Senior Project Manager

Shama M. Qureshi, P.Eng., P.Geo., QP_{RA}
Associate

FIGURES

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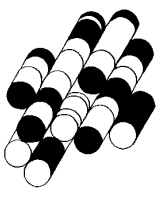

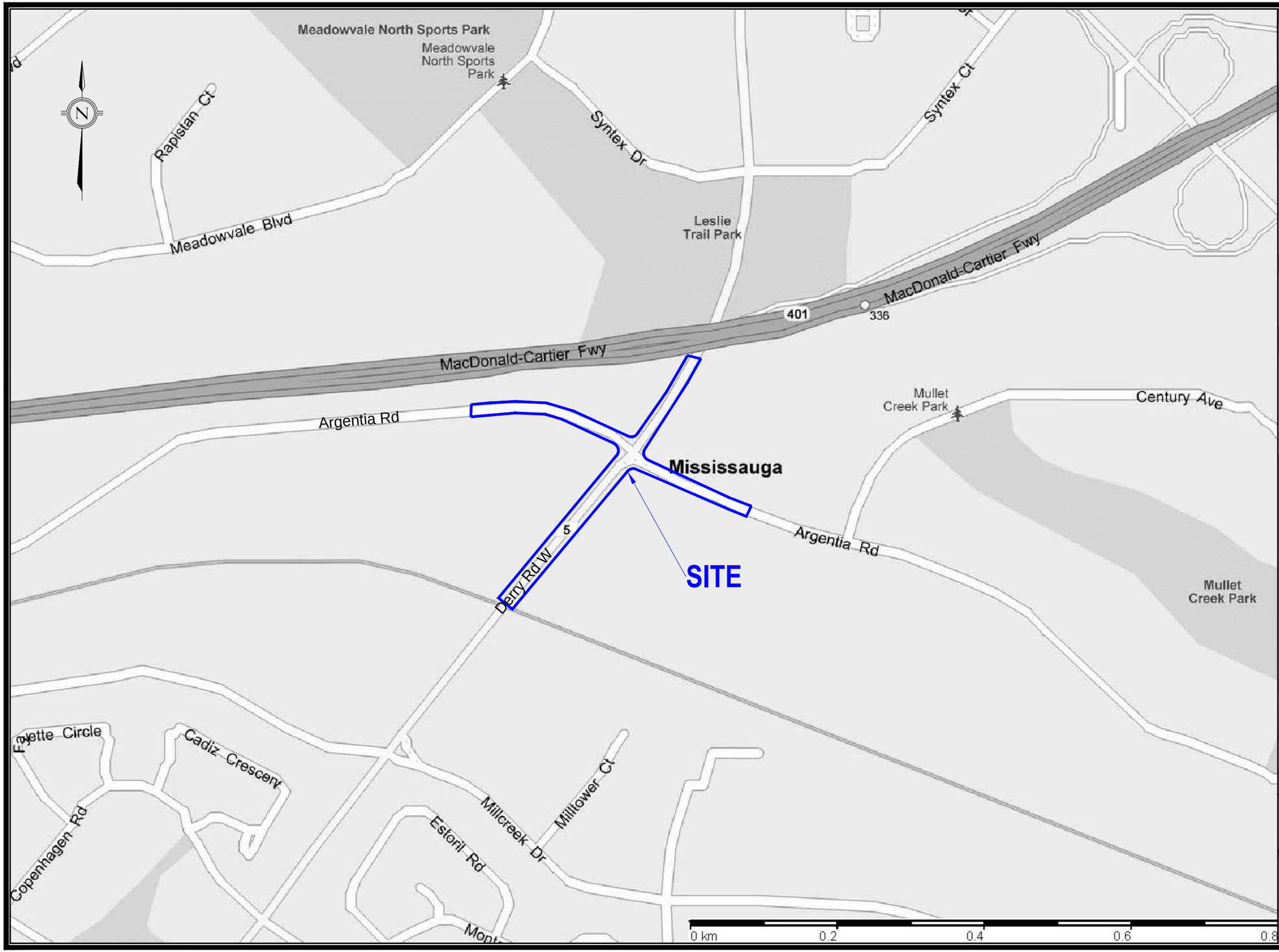

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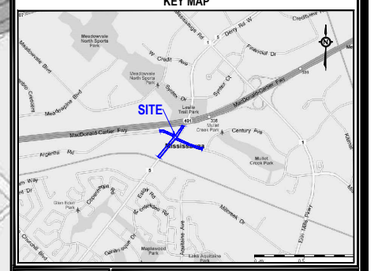
KEY MAP



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NOTES:

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PROJECT TITLE:
Hydrogeologic Study

SITE LOCATION:
Derry Road West & Argentia Road
Mississauga, Ontario

FIGURE TITLE:
SITE LOCATION PLAN

REV NO.:	FILE NO.:
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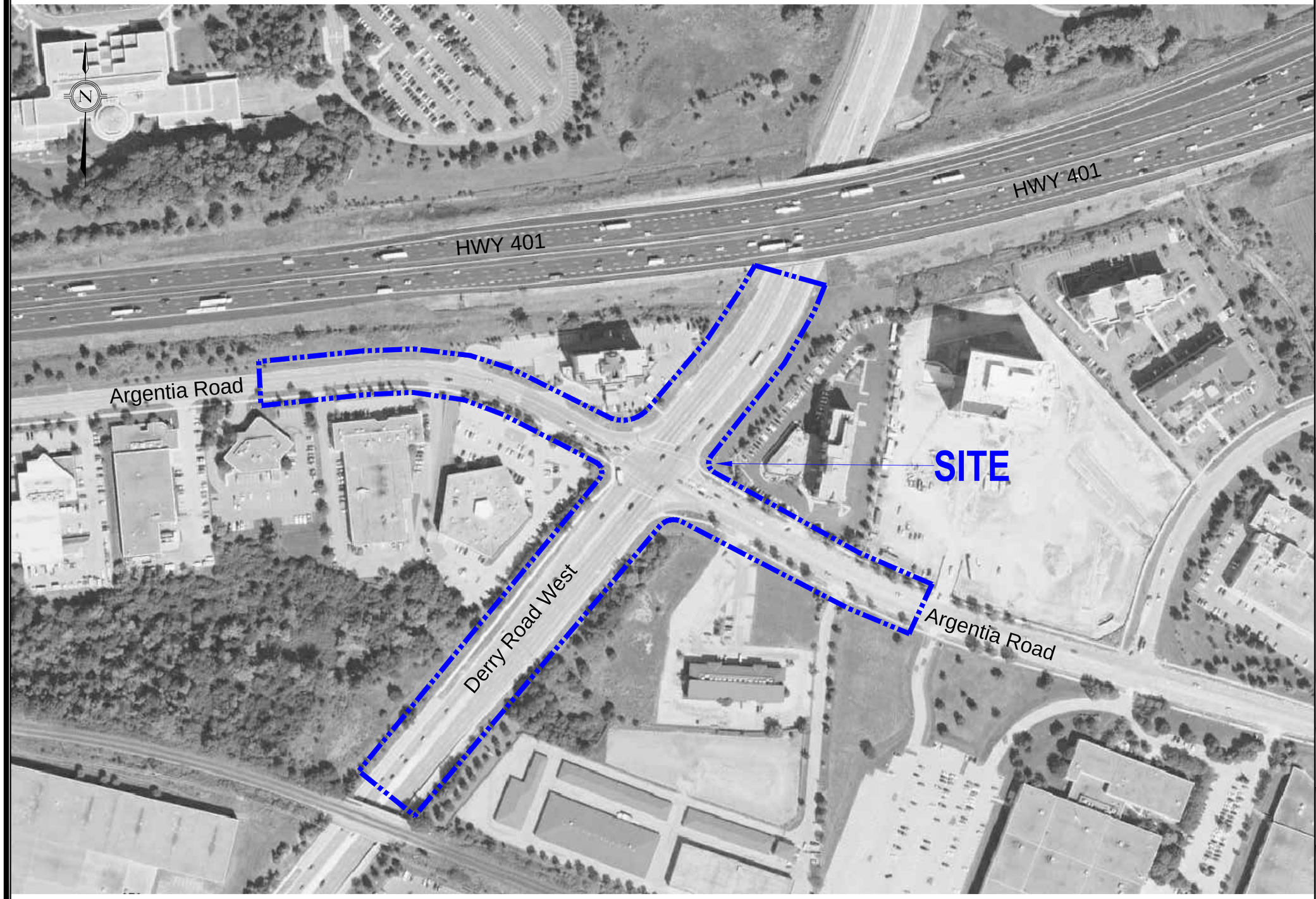
SCALE: As Shown	**FIGURE NO.:** 1
DATE: July 2014	



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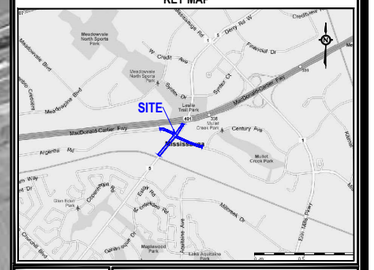

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PROJECT TITLE:
Hydrogeologic Study

SITE LOCATION:
Derry Road West & Argentia Road
Mississauga, Ontario

FIGURE TITLE:
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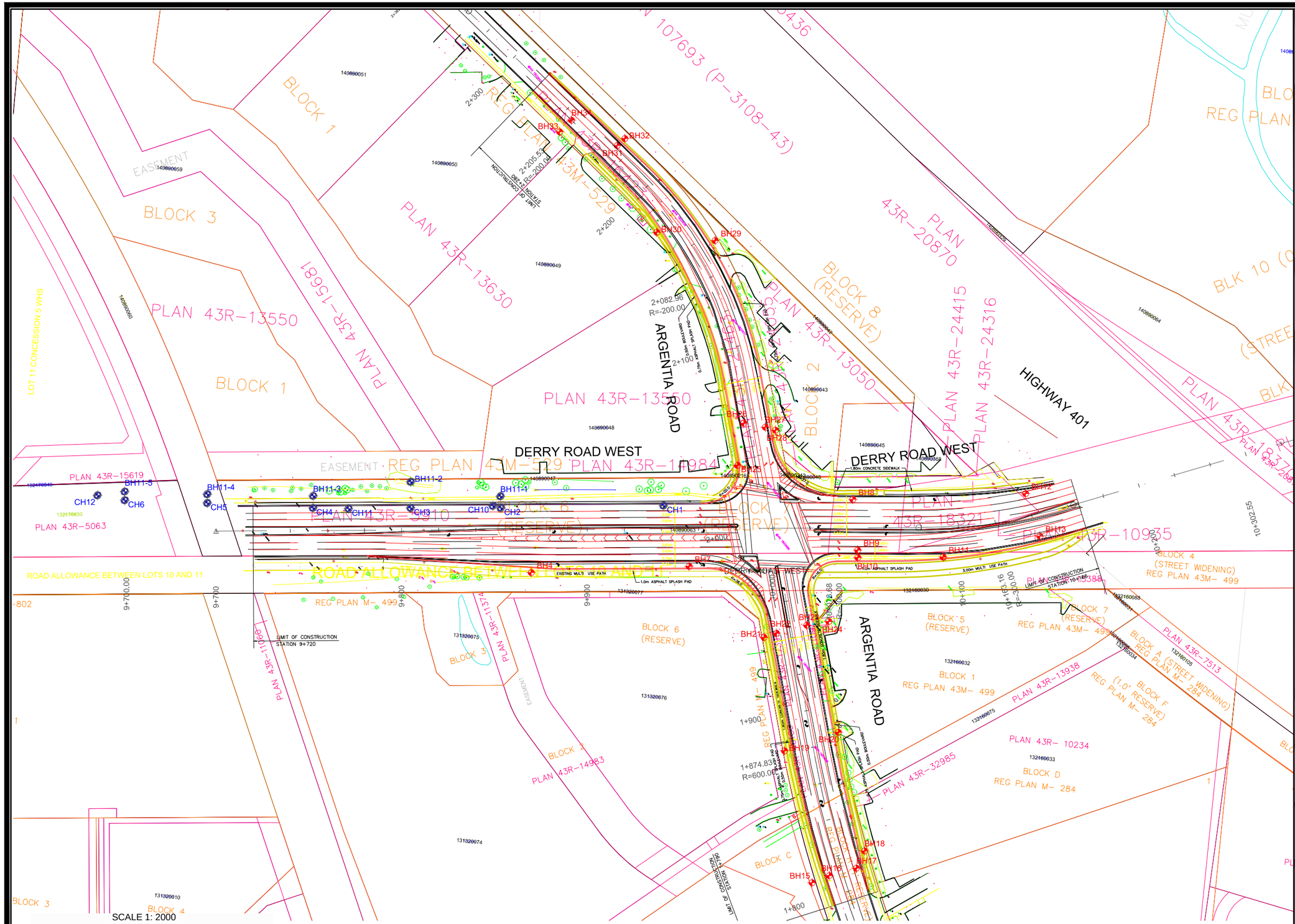
DATE: July 2014	



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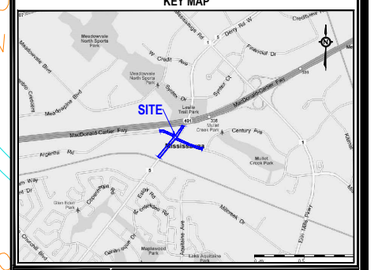

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- Terraprobe Borehole
- SPL Borehole

PROJECT TITLE:
Hydrogeologic Study

SITE LOCATION:
Derry Road West & Argentia Road
Mississauga, Ontario

FIGURE TITLE:
BOREHOLE LOCATION PLAN

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DATE: July 2014	

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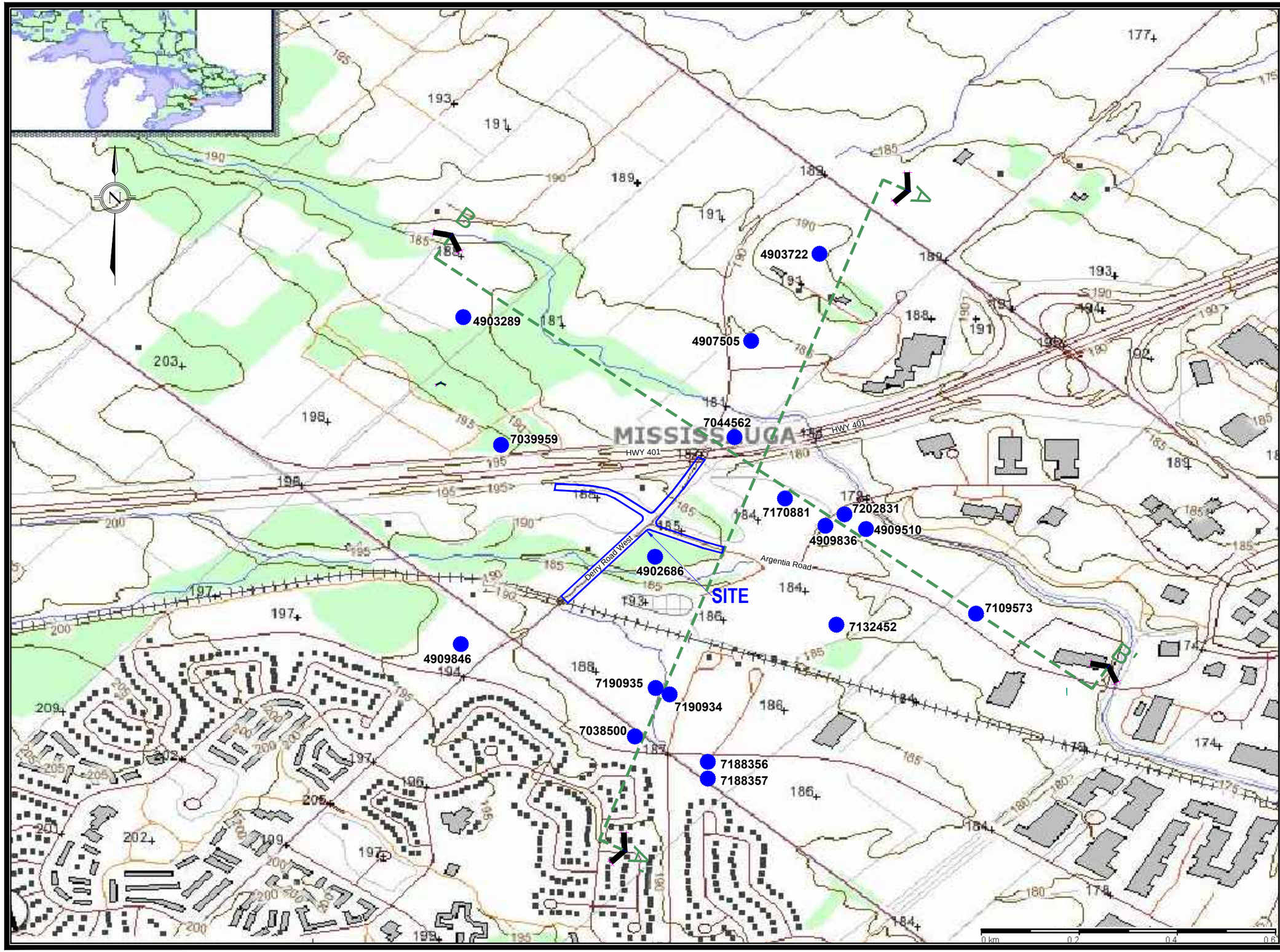

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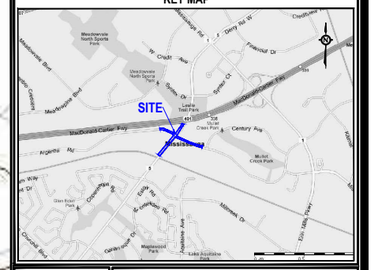

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4907505 — MOE Well Location

Cross Section Location

PROJECT TITLE:
Hydrogeologic Study

SITE LOCATION:
Derry Road West & Argentia Road
Mississauga, Ontario

FIGURE TITLE:
MOE WELL LOCATIONS

REV NO.:	FILE NO.:
0	13-13-3146-6
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DATE: July 2014	

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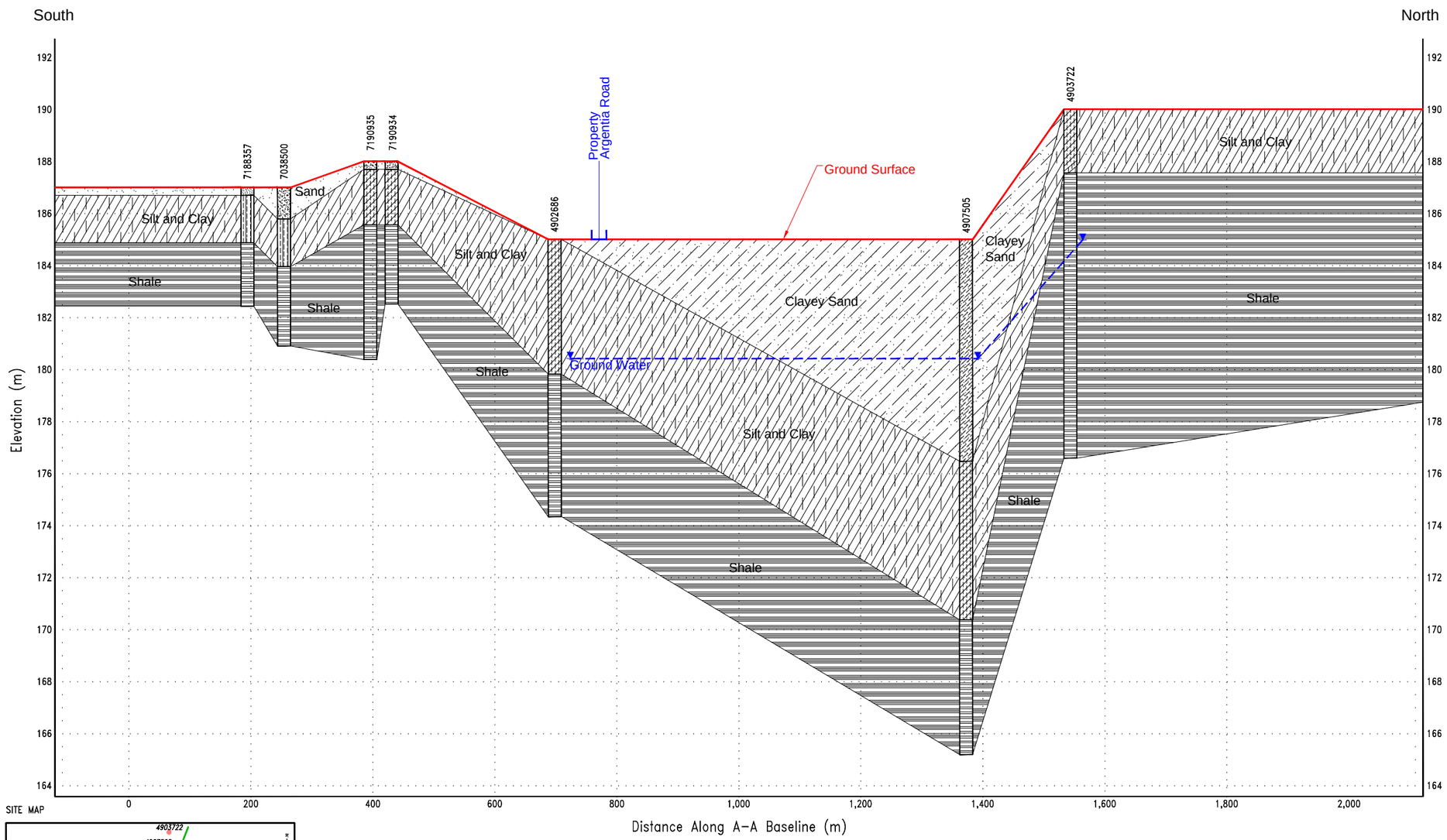
CROSS SECTION A-A'



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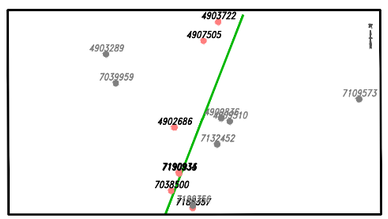

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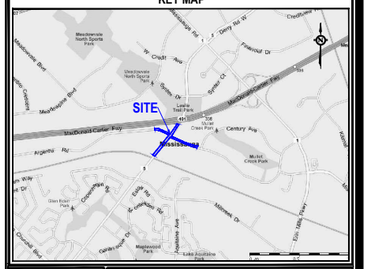
KEY MAP



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NOTES:

LEGEND:

- Clayey Sand
- Silt and Clay
- Shale
- Static Water Level

PROJECT TITLE:
Hydrogeologic Study

SITE LOCATION:
Derry Road West & Argentia Road
Mississauga, Ontario

FIGURE TITLE:
CROSS SECTION A-A'

REV NO.:	FILE NO.:
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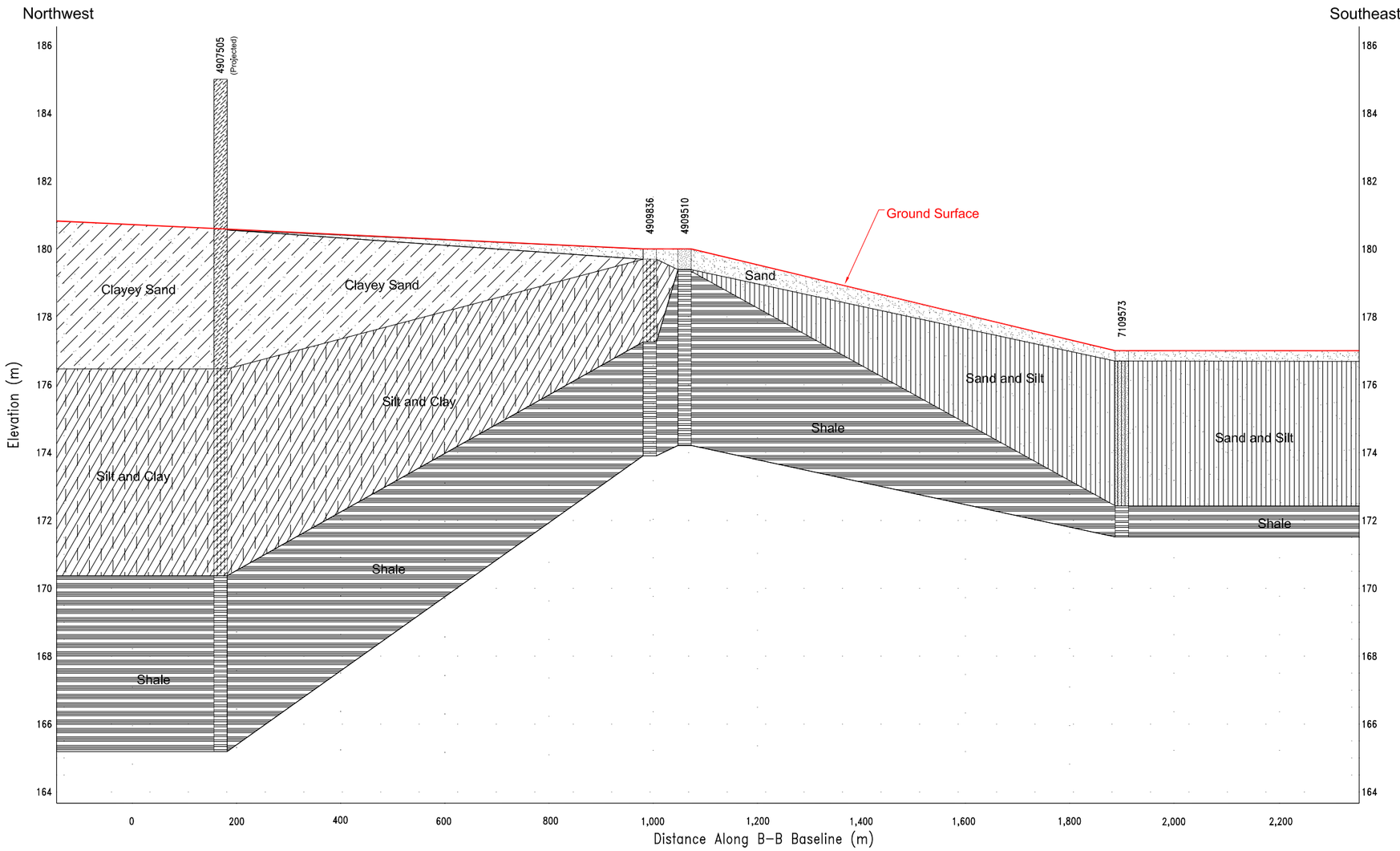
DATE:	
July 2014	

CROSS SECTION B-B'



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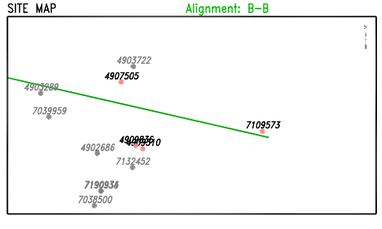

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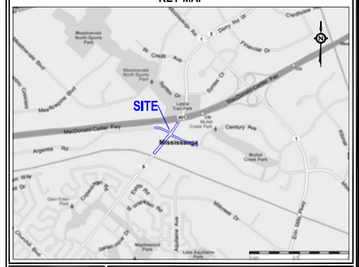

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- Clayey Sand
- Silt and Clay
- Shale
- Sand and Silt

PROJECT TITLE:
Hydrogeologic Study

SITE LOCATION:
Derry Road West & Argentia Road
Mississauga, Ontario

FIGURE TITLE:
CROSS SECTION A-A'

REV NO.:	FILE NO.:
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DATE: July 2014	

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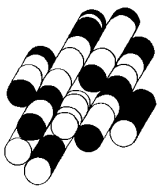
APPENDIX A

TERRAPROBE INC.



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MISSISSAUGA CITY HS W 05(011)	17 600586 4828842[W]	1991/03 4005	06	UK 0053	015 / 053 003 / 1:30	CO		4907505 (76449) BRWN CLAY SAND SOFT 0015 BRWN CLAY SAND HARD 0028 RED CLAY 0048 RED SHLE SOFT 0053 RED SHLE HARD 0065
MISSISSAUGA CITY HS W 05(011)	17 599865 4828743[W]	1969/07 2643	07	FR 0015	002 / 006 012 / 4:0	PS	13 4	4903289 () BRWN CLAY MSND 0015 GRVL 0017
MISSISSAUGA CITY (011)	17 600569 4828589[W]	2007/06 4011	06		018 / / :0			7044562 (Z57001)
MISSISSAUGA CITY ()	17 600402 4827869[W]	2012/10 7241	02			MT	8 10	7190934 (Z157115) A137067 BRWN LOAM LOOS 0001 RED SILT CLAY DNSE 0009 RED SHLE PORS 0018
MISSISSAUGA CITY ()	17 600405 4827864[W]	2012/10 7241	02			MT	15 10	7190935 (Z157116) A138339 BRWN LOAM LOOS 0001 RED SILT CLAY DNSE 0009 RED SHLE PORS 0025
MISSISSAUGA CITY ()	17 600654 4828424[W]	2011/09 6607						7170881 (M10398) A115344
MISSISSAUGA CITY ()	17 600686 4828078[W]	2009/01 6607	02			MO	5 10	7132452 (Z101313) A088195 BRWN LOAM PCKD 0001 RED SILT SHLE HARD 0015
MISSISSAUGA CITY ()	17 600735 4828293[W]	2013/05 7215						7202831 (C21879) A144943
MISSISSAUGA CITY ()	17 599953 4827992[W]	2005/07 6809	02			NU	4.5 10	4909846 (Z23502) A023225 BRWN SAND STNS 0003 BRWN SAND 0013 RED SHLE 0015
MISSISSAUGA CITY ()	17 600716 4828272[W]	2005/01 6032	02			NU	10 10	4909836 (Z05370) A005319 BRWN GRVL SAND FILL 0002 BRWN SILT CLAY GRVL 0010 RED SHLE WTHD 0020
MISSISSAUGA CITY ()	17 599937 4828530[W]	2006/11 1129	02				37 10	7039959 (Z48784) A039905 BRWN LOAM 0001 BRWN SILT CLYY SNDY 0003 BRWN SILT GRVL CLAY 0013 0014 BRWN SILT CLAY SAND 0018 BRWN GRVL CLAY SILT 0023 GRVL CLAY SILT 0042 RED SHLE 0049

Notes:
1. UTM in Zone, Easting, Northing and Datum is NAD83; L: UTM estimated from Centroid of Lot; W: UTM not from Lot Centroid
2. Date Work Completed
3. Well Contractor Licence Number
4. Casing diameter in inches
5. Unit of Depth in Feet
6. See Table 4 for Meaning of Code
7. STAT LVL: Static Water Level in Feet ; PUMP LVL: Water Level After Pumping in Feet
8. Pump Test Rate in GPM, Pump Test Duration in Hour : Minutes
9. See Table 3 for Meaning of Code
10. Screen Depth and Length in feet
11. See Table 1 and 2 for Meaning of Code

1. Core Material and Descriptive terms

Code	Description	Code	Description	Code	Description	Code	Description	Code	Description
BLDR	BOULDERS	FCRD	FRACTURED	IRFM	IRON FORMATION	PORS	POROUS	SOFT	SOFT
BSLT	BASALT	FGRD	FINE-GRAINED	LIMY	LIMY	PRDG	PREVIOUSLY DUG	SPST	SOAPSTONE
CGRD	COARSE-GRAINED	FGVL	FINE GRAVEL	LMSN	LIMESTONE	PRDR	PREV. DRILLED	STKY	STICKY
CGVL	COARSE GRAVEL	FILL	FILL	LOAM	TOPSOIL	QRTZ	QUARTZITE	STNS	STONES
CHRT	CHERT	FLDS	FELDSPAR	LOOS	LOOSE	QSND	QUICKSAND	STNY	STONEY
CLAY	CLAY	FLNT	FLINT	LTCL	LIGHT-COLOURED	QTZ	QUARTZ	THIK	THICK
CLN	CLEAN	FOSS	FOSILIFEROUS	LYRD	LAYERED	ROCK	ROCK	THIN	THIN
CLYY	CLAYEY	FSND	FINE SAND	MARL	MARL	SAND	SAND	TILL	TILL
CMTD	CEMENTED	GNIS	GNEISS	MGRD	MEDIUM-GRAINED	SHLE	SHALE	UNKN	UNKNOWN TYPE
CONG	CONGLOMERATE	GRNT	GRANITE	MGVL	MEDIUM GRAVEL	SHLY	SHALY	VERY	VERY
CRYS	CRYSTALLINE	GRSN	GREENSTONE	MRBL	MARBLE	SHRP	SHARP	WBRG	WATER-BEARING
CSND	COARSE SAND	GRVL	GRAVEL	MSND	MEDIUM SAND	SHST	SCHIST	WDFR	WOOD FRAGMENTS
DKCL	DARK-COLOURED	GRWK	GREYWACKE	MUCK	MUCK	SILT	SILT	WTHD	WEATHERED
DLMT	DOLOMITE	GVLY	GRAVELLY	OBDN	OVERBURDEN	SLTE	SLATE		
DNSE	DENSE	GYPS	GYPSUM	PCKD	PACKED	SLTY	SILTY		
DRTY	DIRTY	HARD	HARD	PEAT	PEAT	SNDS	SANDSTONE		
DRY	DRY	HPAN	HARDPAN	PGVL	PEA GRAVEL	SNDY	SANDY		

2. Core Color

Code	Description
WHIT	WHITE
GREY	GREY
BLUE	BLUE
GREN	GREEN
YLLW	YELLOW
BRWN	BROWN
RED	RED
BLCK	BLACK
BLGY	BLUE-GREY

3. Water Use

Code	Description	Code	Description
DO	Domestic	OT	Other
ST	Livestock	TH	Test Hole
IR	Irrigation	DE	Dewatering
IN	Industrial	MO	Monitoring
CO	Commercial		
MN	Municipal		
PS	Public		
AC	Cooling And A/C		
NU	Not Used		

4. Water Detail

Code	Description	Code	Description
FR	Fresh	GS	Gas
SA	Salty	IR	Iron
SU	Sulphur		
MN	Mineral		
UK	Unknown		

Well ID

Well ID Number: 4903289

Well Audit Number:

Well Tag Number:

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	
Township	MISSISSAUGA CITY
Lot	011
Concession	HS W 05
County/District/Municipality	PEEL
City/Town/Village	
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 599864.60 Northing: 4828743.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To
BRWN	CLAY	MSND		0 ft	15 ft
	GRVL			15 ft	17 ft

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed

Method of Construction & Well Use

Method of Construction	Well Use
Cable Tool	Public

Status of Well

Water Supply

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
7 inch	STEEL		13 ft

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To
6 inch		13 ft	17 ft

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 2643

Results of Well Yield Testing

After test of well yield, water was	CLEAR
If pumping discontinued, give reason	
Pump intake set at	
Pumping Rate	12 GPM
Duration of Pumping	4 h:0 m

Final water level	6 ft
If flowing give rate	
Recommended pump depth	14 ft
Recommended pump rate	10 GPM
Well Production	PUMP
Disinfected?	

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL	2 ft		
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

Water Details

Water Found at Depth	Kind

15 ft	Fresh

Hole Diameter

Depth From	Depth To	Diameter

Audit Number:

Date Well Completed: July 07, 1969

Date Well Record Received by MOE: August 19, 1969

Well ID

Well ID Number: 4903722

Well Audit Number:

Well Tag Number:

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	
Township	MISSISSAUGA CITY
Lot	011
Concession	HS W 05
County/District/Municipality	PEEL
City/Town/Village	
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 600694.60 Northing: 4828983.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To
BRWN	CLAY			0 ft	8 ft
RED	SHLE			8 ft	44 ft

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed

Method of Construction & Well Use

Method of Construction	Well Use
Boring	Domestic

Status of Well

Water Supply

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
30 inch	CONCRETE		44 ft

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 1307

Results of Well Yield Testing

After test of well yield, water was	CLEAR
If pumping discontinued, give reason	
Pump intake set at	
Pumping Rate	8 GPM
Duration of Pumping	

Final water level	44 ft
If flowing give rate	
Recommended pump depth	44 ft
Recommended pump rate	
Well Production	BAILER
Disinfected?	

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL	17 ft		
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

Water Details

Water Found at Depth	Kind

44 ft	Fresh

Hole Diameter

Depth From	Depth To	Diameter

Audit Number:

Date Well Completed: July 15, 1971

Date Well Record Received by MOE: December 21, 1971

Well ID

Well ID Number: 7038500

Well Audit Number: *Z54891*

Well Tag Number: *A041375*

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	6905 MILLCREEK DR
Township	MISSISSAUGA CITY
Lot	
Concession	
County/District/Municipality	PEEL
City/Town/Village	MISSISSAUGA
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 600346.00 Northing: 4827735.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To
BRWN	FILL	SAND		0 m	1.22 m
BRWN	CLAY	SILT		1.22 m	3.1 m
RED	SHLE			3.1 m	

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed
0 m	.3 m	CONCRETE	
.3 m	1.5 m	BENTONITE	
1.5 m		SAND	

Method of Construction & Well Use

Method of Construction	Well Use
Other Method	

Status of Well

Abandoned-Other

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
5.08 cm	PLASTIC	0 m	3.66 m

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To
5.33 cm	PLASTIC	2.44 m	3.66 m

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 7241

Results of Well Yield Testing

After test of well yield, water was

If pumping discontinued, give reason
Pump intake set at
Pumping Rate
Duration of Pumping
Final water level
If flowing give rate
Recommended pump depth
Recommended pump rate
Well Production
Disinfected?

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	

60	60

Water Details

Water Found at Depth	Kind

Hole Diameter

Depth From	Depth To	Diameter
0 m	3.66 m	8.89 cm

Audit Number: Z54891

Date Well Completed: October 11, 2006

Date Well Record Received by MOE: December 18, 2006

Well ID

Well ID Number: 7109573

Well Audit Number: *M00291*

Well Tag Number: *A065566*

This table contains information from the original well record and any subsequent updates.

This well is part of a well cluster.

The information below is extracted from the cluster well record.

More information on the cluster well record (related to other wells in the cluster)

is also available.

Well Location

Address of Well Location	1940 ARGENTIA RD
Township	MISSISSAUGA CITY
Lot	
Concession	
County/District/Municipality	PEEL
City/Town/Village	Mississauga
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 601850.00 Northing: 4828403.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To
BRWN	SAND	LOAM		0 m	.3 m
BRWN	SAND	SILT	SHLE	.3 m	4.6 m

BRWN	SHLE	WTHD	4.6 m	5.6 m

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed
0 m	2 m	BENTONITE CHIPS	

Method of Construction & Well Use

Method of Construction	Well Use
Auger	Monitoring

Status of Well

Test Hole

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
5.1 cm	PLASTIC	0 m	2.6 m

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To
6.4 cm	PLASTIC		

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 6607

Results of Well Yield Testing

After test of well yield, water was	
If pumping discontinued, give reason	
Pump intake set at	
Pumping Rate	
Duration of Pumping	
Final water level	
If flowing give rate	
Recommended pump depth	
Recommended pump rate	
Well Production	
Disinfected?	N

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	

60	60

Water Details

Water Found at Depth	Kind

Hole Diameter

Depth From	Depth To	Diameter
0 m	5.6 m	21 cm

Audit Number: M00291

Date Well Completed: September 21, 2007

Date Well Record Received by MOE: November 05, 2007

Well ID

Well ID Number: 7188356

Well Audit Number: *Z140840*

Well Tag Number: *A124320*

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	6850 MILLCREEK DR
Township	MISSISSAUGA CITY
Lot	
Concession	
County/District/Municipality	PEEL
City/Town/Village	Mississauga
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 600507.00 Northing: 4827627.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To
BRWN	SAND		FILL	0 ft	7 ft
RED	SHLE			7 ft	15 ft

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed
0 ft	1 ft	FLUSHMOUNT CASING AND CONCRETE	

1 ft	4 ft	3/8 BENTONITE
4 ft	15 ft	WELL SAND

Method of Construction & Well Use

Method of Construction	Well Use
Rotary (Convent.)	Test Hole

Status of Well

Test Hole

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
2 inch	PLASTIC	0 ft	5 ft

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To
2.375 inch	PLASTIC	5 ft	15 ft

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 7383

Results of Well Yield Testing

After test of well yield, water was
If pumping discontinued, give reason
Pump intake set at

Pumping Rate
Duration of Pumping
Final water level
If flowing give rate
Recommended pump depth
Recommended pump rate
Well Production
Disinfected?

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

Water Details

Water Found at Depth	Kind
6 ft	

Hole Diameter

Depth From	Depth To	Diameter
0 ft	15 ft	8.5 inch

Audit Number: Z140840

Date Well Completed: May 28, 2012

Date Well Record Received by MOE: September 27, 2012

Well ID

Well ID Number: 7188357

Well Audit Number: *Z140839*

Well Tag Number: *A124319*

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	6850 MILLCREEK DRIVE
Township	MISSISSAUGA CITY
Lot	
Concession	
County/District/Municipality	PEEL
City/Town/Village	Mississauga
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 600506.00 Northing: 4827608.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To
BRWN	SAND	GRVL		0 ft	1 ft
BRWN	SILT	CLAY	TILL	1 ft	7 ft
RED	SHLE			7 ft	15 ft

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed

0 ft	1 ft	FLUSHMOUNT CASING AND CONCRETE
1 ft	4 ft	3/8 BENTONITE
4 ft	15 ft	WELL SAND

Method of Construction & Well Use

Method of Construction	Well Use
Rotary (Convent.)	Test Hole

Status of Well

Test Hole

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
2 inch	PLASTIC	0 ft	5 ft

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To
2.375 inch	PLASTIC	5 ft	15 ft

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 7383

Results of Well Yield Testing

After test of well yield, water was
If pumping discontinued, give reason

Pump intake set at
Pumping Rate
Duration of Pumping
Final water level
If flowing give rate
Recommended pump depth
Recommended pump rate
Well Production
Disinfected?

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

Water Details

Water Found at Depth	Kind
6 ft	

Hole Diameter

Depth From	Depth To	Diameter
0 ft	15 ft	8.5 inch

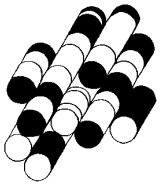
Audit Number: Z140839

Date Well Completed: May 28, 2012

Date Well Record Received by MOE: September 27, 2012

APPENDIX B

TERRAPROBE INC.



LOG OF BOREHOLE 4

Terraprobe

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 9, 2014
Sheet No. : 1 of 1

Position : E: 600277, N: 4828231 (UTM 17T)
Elevation Datum : N/A
Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	250mm **TOPSOIL**										
0.3	**FILL**, silty sand, trace gravel, brown, damp		1	SS							
	...sand and gravel below		2A	SS							
0.9	**SILTY CLAY**, sandy, trace gravel, brown, moist (GLACIAL TILL)		2B	SS							
	...containing shale fragments, reddish brown below		3	SS							
1.8	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3} : Numbers refer to Sensitivity
○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 7

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 9, 2014
Sheet No. : 1 of 1

Position : E: 600328, N: 4828300 (UTM 17T)
Elevation Datum : N/A
Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	150mm **TOPSOIL**										
0.2	**FILL**, gravelly sand, some silt, brown, damp ...silty clay, moist below		1	SS					○ at 10		
0.6	**SILTY CLAY**, some sand, trace gravel, brown, moist (GLACIAL TILL)		2	SS							
			3	SS					○ at 10		
1.8	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+^{3}, ×^{3}: Numbers refer to Sensitivity
○$^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 8

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 6, 2014
Sheet No. : 1 of 1

Position : E: 600355, N: 4828391 (UTM 17T)
Elevation Datum : N/A
Rig type : CME 75, truck-mounted
Drilling Method : Solid stem augers

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	200mm **ASPHALTIC CONCRETE**										
0.2	640mm **FILL-SAND AND GRAVEL**, some silt, dense, brown, damp		1	SS	41						
0.8	**SILTY CLAY**, some sand, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		2	SS	23						
			3	SS	72 / 225mm						...at 1.6m, sampler bouncing
1.6	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3}: Numbers refer to Sensitivity
○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 9

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 6, 2014
Sheet No. : 1 of 1

Position : E: 600378, N: 4828376 (UTM 17T)
Elevation Datum : N/A
Rig type : CME 75, truck-mounted
Drilling Method : Solid stem augers

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	180mm **ASPHALTIC CONCRETE**										
0.2	1040mm **FILL-GRAVELLY SAND**, some silt, compact to dense, brown, damp		1	SS	48						
			2	SS	21						
1.2	**SILTY CLAY**, some sand, trace gravel, hard, brown, moist (GLACIAL TILL)		3	SS	33						
1.8	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3} : Numbers refer to Sensitivity
○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 10

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 9, 2014
Sheet No. : 1 of 1

Position : E: 600381, N: 4828373 (UTM 17T)
Elevation Datum : N/A
Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	150mm **PC CONCRETE**										
0.2	410mm **FILL-SAND AND GRAVEL**, some silt, brown, damp		1	SS					○		
0.6	**SILTY CLAY**, some sand, trace gravel, brown, moist (GLACIAL TILL)		2	SS					○		2 17 51 30
			3	SS							
1.8	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3} : Numbers refer to Sensitivity
○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 11

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 9, 2014
Sheet No. : 1 of 1

Position : E: 600410, N: 4828409 (UTM 17T)
Elevation Datum : N/A
Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE							20 40 60 80 100	10 20 30		
	140mm **PC CONCRETE**										
	1080mm **FILL-GRAVELLY SAND**, some silt, containing clay lumps, brown, moist		1	SS							
			2	SS							
1.2	**SILTY CLAY**, some sand, trace gravel, brown, moist (GLACIAL TILL)		3	SS							
1.7	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE

$+^3$, $\times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

LOG OF BOREHOLE 12

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 6, 2014
Sheet No. : 1 of 1

Position : E: 600411, N: 4828466 (UTM 17T)
Elevation Datum : N/A
Rig type : CME 75, truck-mounted
Drilling Method : Solid stem augers

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	155mm **ASPHALTIC CONCRETE**										
0.2	890mm **FILL-GRAVELLY SAND**, some silt, compact to dense, brown, damp		1	SS	46						
			2A	SS	23						
1.0	**SILTY CLAY**, some sand, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		2B								
			3	SS	32						
1.8	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3} : Numbers refer to Sensitivity
○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 13

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 6, 2014
Sheet No. : 1 of 1

Position : E: 600434, N: 4828457 (UTM 17T)
Elevation Datum : N/A
Rig type : CME 75, truck-mounted
Drilling Method : Solid stem augers

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	155mm **ASPHALTIC CONCRETE**										
0.2	620mm **FILL-GRAVELLY SAND**, some silt, dense, brown, damp		1	SS	49						
			2A								
0.8	**SILTY CLAY**, some sand, trace gravel, stiff to very stiff, brown, moist (GLACIAL TILL)		2B	SS	13						
			3	SS	26						
1.8	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3} : Numbers refer to Sensitivity
○ $^{3\%}$ STRAIN AT FAILURE

Terraprobe

LOG OF BOREHOLE 15

Client : HDR Corporation
Project No.: 11-13-3148

Project : Derry / Argentia Intersection Improvements
Date started : June 9, 2014

Location : Mississauga, Ontario
Sheet No. : 1 of 1

Position : E: 600503, N: 4828244 (UTM 17T)
Elevation Datum : N/A

Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	150mm **TOPSOIL**										
0.2	**SILTY CLAY**, some sand, trace gravel, brown, moist (GLACIAL TILL)		1	SS							
			2	SS							
0.9	**END OF BOREHOLE**										

Unable to advance deeper

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 16

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 6, 2014
Sheet No. : 1 of 1

Position : E: 600505, N: 4828254 (UTM 17T)
Elevation Datum : N/A
Rig type : CME 75, truck-mounted
Drilling Method : Solid stem augers

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	180mm **ASPHALTIC CONCRETE**										
0.2	620mm **FILL-SAND**, some silt, trace clay, trace gravel, compact, grey, damp		1	SS	28						7 70 *(23)*
0.8	**SILTY CLAY**, some sand, trace gravel, stiff to hard, brown, moist (GLACIAL TILL)		2	SS	12						
	...reddish brown below		3	SS	74 / 275mm						
1.7	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3}: Numbers refer to Sensitivity
○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 17

Terraprobe

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 6, 2014
Sheet No. : 1 of 1

Position : E: 600511, N: 4828268 (UTM 17T)
Elevation Datum : N/A
Rig type : CME 75, truck-mounted
Drilling Method : Solid stem augers

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	180mm **ASPHALTIC CONCRETE**										
0.2	600mm **FILL-SAND**, some silt, trace clay, trace gravel, dense, grey, damp		1	SS	31						
			2A								
0.8	**FILL**, silty clay, some sand, trace gravel, containing shale fragments, firm to stiff, reddish brown, moist		2B	SS	11						
			3	SS	4				○		
1.8	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3} : Numbers refer to Sensitivity
○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 18

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 9, 2014
Sheet No. : 1 of 1

Position : E: 600507, N: 4828277 (UTM 17T) Elevation Datum : N/A
Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	200mm **TOPSOIL**										
0.2	**FILL**, silty clay, some sand, trace gravel, trace rootlets, brown, moist		1	SS							
0.6	**END OF BOREHOLE**										

Borehole encountered obstruction at 0.6m and was moved within 2m radius around original location. Borehole was terminated at 0.6m after 3 attempts.

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3}: Numbers refer to Sensitivity ○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 19

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 9, 2014
Sheet No. : 1 of 1

Position : E: 600438, N: 4828277 (UTM 17T)
Elevation Datum : N/A
Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	150mm **TOPSOIL**										
0.2	**FILL**, silty clay, some sand, trace gravel, brown, moist		1	SS							
0.6	**SILTY CLAY**, some sand, trace gravel, brown, moist (GLACIAL TILL)		2	SS							
	...containing shale fragments, reddish brown below		3	SS							
1.5	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3} : Numbers refer to Sensitivity
○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 20

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 9, 2014
Sheet No. : 1 of 1

Position : E: 600448, N: 4828306 (UTM 17T) Elevation Datum : N/A
Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE							20 40 60 80 100	10 20 30		
	130mm **TOPSOIL**										
	FILL, silty sand, trace gravel, brown, damp		1	SS							
			2A								
0.8	**FILL**, silty clay, some sand, trace gravel, brown, damp		2B	SS							
			3	SS							no futher progress due to obstruction
1.4	**END OF BOREHOLE**										

Unable to advance deeper

Borehole was dry and open upon completion of drilling.

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE

$+^{3}$, $\times^{3}$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

LOG OF BOREHOLE 21

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 9, 2014
Sheet No. : 1 of 1

Position : E: 600383, N: 4828307 (UTM 17T)
Elevation Datum : N/A
Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	250mm **TOPSOIL**										
0.3	**FILL**, silty clay, some sand, trace gravel, brown, moist		1	SS							
0.6	**SILTY CLAY**, some sand, trace gravel, brown, moist (GLACIAL TILL)		2	SS							
			3	SS							
1.8	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3}: Numbers refer to Sensitivity
○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 22

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 6, 2014
Sheet No. : 1 of 1

Position : E: 600386, N: 4828314 (UTM 17T)
Elevation Datum : N/A
Rig type : CME 75, truck-mounted
Drilling Method : Solid stem augers

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	150mm **ASPHALTIC CONCRETE**										
0.2	560mm **FILL-SAND**, some silt, trace clay, trace gravel, compact, grey, damp		1	SS	23						
0.7	**SILTY CLAY**, some sand, trace gravel, stiff, brown, moist (GLACIAL TILL)		2	SS	10						
	...containing shale fragments, hard, reddish brown below		3	SS	99 / 225mm						
1.6	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3}: Numbers refer to Sensitivity
○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 23

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 6, 2014
Sheet No. : 1 of 1

Position : E: 600393, N: 4828329 (UTM 17T)
Elevation Datum : N/A
Rig type : CME 75, truck-mounted
Drilling Method : Solid stem augers

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	180mm **ASPHALTIC CONCRETE**										
0.2	570mm **FILL-SAND**, some silt, trace clay, trace gravel, compact, grey, damp		1	SS	14						
			2A								
0.8	**SILTY CLAY**, some sand, trace gravel, stiff, brown, moist (GLACIAL TILL)		2B	SS	11						
			3	SS	15						
1.8	...containing shale fragments, reddish brown below										

END OF BOREHOLE

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3}: Numbers refer to Sensitivity
○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 24

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 9, 2014
Sheet No. : 1 of 1

Position : E: 600398, N: 4828340 (UTM 17T) Elevation Datum : N/A
Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	230mm **TOPSOIL**										
0.2	**FILL**, silty clay, some sand, trace gravel, reddish brown, moist		1	SS							
	...sand below		2A	SS							
1.1	**SILTY CLAY**, some sand, trace gravel, brown, moist (GLACIAL TILL)		2B								
			3	SS							
1.8	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

LOG OF BOREHOLE 25

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 9, 2014
Sheet No. : 1 of 1

Position : E: 600302, N: 4828354 (UTM 17T) Elevation Datum : N/A
Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	150mm **TOPSOIL**										
0.2	**FILL**, silty clay, some sand, trace gravel, brown, moist		1	SS							
0.6	**SILTY CLAY**, some sand, trace gravel, brown, moist (GLACIAL TILL)		2	SS							
1.1	**END OF BOREHOLE**										

Unable to advance deeper

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3} : Numbers refer to Sensitivity ○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 26

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 6, 2014
Sheet No. : 1 of 1

Position : E: 600286, N: 4828371 (UTM 17T)
Elevation Datum : N/A
Rig type : CME 75, truck-mounted
Drilling Method : Solid stem augers

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	140mm **ASPHALTIC CONCRETE**										
0.2	430mm **FILL-GRAVELLY SAND**, some silt, compact, brown, damp		1	SS	17						
0.6	**SILTY CLAY**, some sand, trace gravel, containing shale fragments, hard, reddish brown, moist (GLACIAL TILL)		2	SS	77						
			3	SS	65						
1.8	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+^{3}, ×^{3}: Numbers refer to Sensitivity
○$^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 27

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 6, 2014
Sheet No. : 1 of 1

Position : E: 600295, N: 4828379 (UTM 17T)
Elevation Datum : N/A
Rig type : CME 75, truck-mounted
Drilling Method : Solid stem augers

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	140mm **ASPHALTIC CONCRETE**										
0.2	410mm **FILL-GRAVELLY SAND**, some silt, compact, brown, damp		1A	SS	17						
0.5	**SILTY CLAY**, some sand, trace gravel, hard, brown, moist (GLACIAL TILL)		1B								
	...containing shale fragments, reddish brown below		2	SS	55						
			3	SS	59						
1.8	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3}: Numbers refer to Sensitivity
○ $^{3\%}$ STRAIN AT FAILURE

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LOG OF BOREHOLE 28

Client : HDR Corporation
Project No.: 11-13-3148

Project : Derry / Argentia Intersection Improvements
Date started : June 9, 2014

Location : Mississauga, Ontario
Sheet No. : 1 of 1

Position : E: 600300, N: 4828382 (UTM 17T)
Elevation Datum : N/A

Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	230mm **TOPSOIL**										
0.2	**FILL**, silty clay, some sand, trace gravel, reddish brown, moist		1	SS							
			2A	SS							
0.9	**SILTY CLAY**, some sand, trace gravel, brown, moist (GLACIAL TILL)		2B	SS							
	...containing shale fragments, reddish brown below		3	SS							
1.5	**END OF BOREHOLE**										

Unable to advance deeper

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

UNIT WEIGHT γ kN/m³

REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

+ 3, × 3: Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

LOG OF BOREHOLE 29

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 9, 2014
Sheet No. : 1 of 1

Position : E: 600200, N: 4828421 (UTM 17T)
Elevation Datum : N/A
Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	150mm **TOPSOIL**										
0.2	**FILL**, silty clay, some sand, trace gravel, trace rootlets, brown, moist		1	SS							
0.6	**SILTY CLAY**, some sand, trace gravel, brown, moist (GLACIAL TILL)		2	SS							
1.1	**END OF BOREHOLE**										

Unable to advance deeper

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3}: Numbers refer to Sensitivity
○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 30

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 9, 2014
Sheet No. : 1 of 1

Position : E: 600177, N: 4828399 (UTM 17T)
Elevation Datum : N/A
Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	230mm **TOPSOIL**										
0.2	**FILL**, silty clay, some sand, trace gravel, trace rootlets, brown, moist		1	SS							
0.6	**SILTY CLAY**, some sand to sandy, trace gravel, brown, moist (GLACIAL TILL)		2	SS							
			3	SS							0 22 53 25
1.7	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

+ ^{3}, × ^{3} : Numbers refer to Sensitivity
○ $^{3\%}$ STRAIN AT FAILURE

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LOG OF BOREHOLE 31

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 6, 2014
Sheet No. : 1 of 1

Position : E: 600127, N: 4828412 (UTM 17T)
Elevation Datum : N/A
Rig type : CME 75, truck-mounted
Drilling Method : Solid stem augers

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	120mm **ASPHALTIC CONCRETE**										
	600mm **FILL-GRAVELLY SAND**, some silt, compact, brown, damp		1	SS	21						31 56 *(13)*
0.7	**SILTY CLAY**, some sand, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		2	SS	22						
			3	SS	45						
1.8	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

+ 3, × 3 : Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

LOG OF BOREHOLE 32

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 9, 0204
Sheet No. : 1 of 1

Position : E: 600127, N: 4828417 (UTM 17T)
Elevation Datum : N/A
Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	280mm **TOPSOIL**										
0.3	**FILL**, silty clay, some sand, trace gravel, trace rootlets, brown, moist		1	SS							
0.6	**SILTY CLAY**, some sand, trace gravel, brown, moist (GLACIAL TILL)		2	SS							
1.1	**END OF BOREHOLE**										

Unable to advance deeper

Borehole was dry and open upon completion of drilling.

+ 3, × 3 : Numbers refer to Sensitivity
○ 3% STRAIN AT FAILURE

LOG OF BOREHOLE 33

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 9, 2014
Sheet No. : 1 of 1

Position : E: 600102, N: 4828392 (UTM 17T) Elevation Datum : N/A
Rig type : PIONJAR

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	230mm **TOPSOIL**										
0.2	**FILL**, silty clay, some sand, trace gravel, trace rootlets, brown, moist		1	SS							
0.6	**SILTY CLAY**, some sand, trace gravel, brown, moist (GLACIAL TILL)		2	SS							
1.1	**END OF BOREHOLE**										

Unable to advance deeper

Borehole was dry and open upon completion of drilling.

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE

+ ^{3}, × ^{3}: Numbers refer to Sensitivity ○ $^{3\%}$ STRAIN AT FAILURE

LOG OF BOREHOLE 34

Client : HDR Corporation
Project : Derry / Argentia Intersection Improvements
Location : Mississauga, Ontario

Project No.: 11-13-3148
Date started : June 6, 2014
Sheet No. : 1 of 1

Position : E: 600101, N: 4828401 (UTM 17T)
Elevation Datum : N/A
Rig type : CME 75, truck-mounted
Drilling Method : Solid stem augers

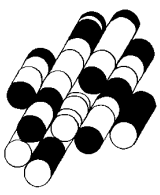
ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SPT 'N' VALUE	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	GROUND SURFACE										
	150mm **ASPHALTIC CONCRETE**										
0.2	650mm **FILL-SAND AND GRAVEL**, some silt, brown, damp		1	SS	19				○		
			2A								
0.8	**FILL**, silty clay, some sand, trace gravel, trace organics, stiff, brown, moist		2B	SS	10						
1.2	**SILTY CLAY**, some sand, trace gravel, very stiff, brown, moist (GLACIAL TILL)		3	SS	22						
1.8	**END OF BOREHOLE**										

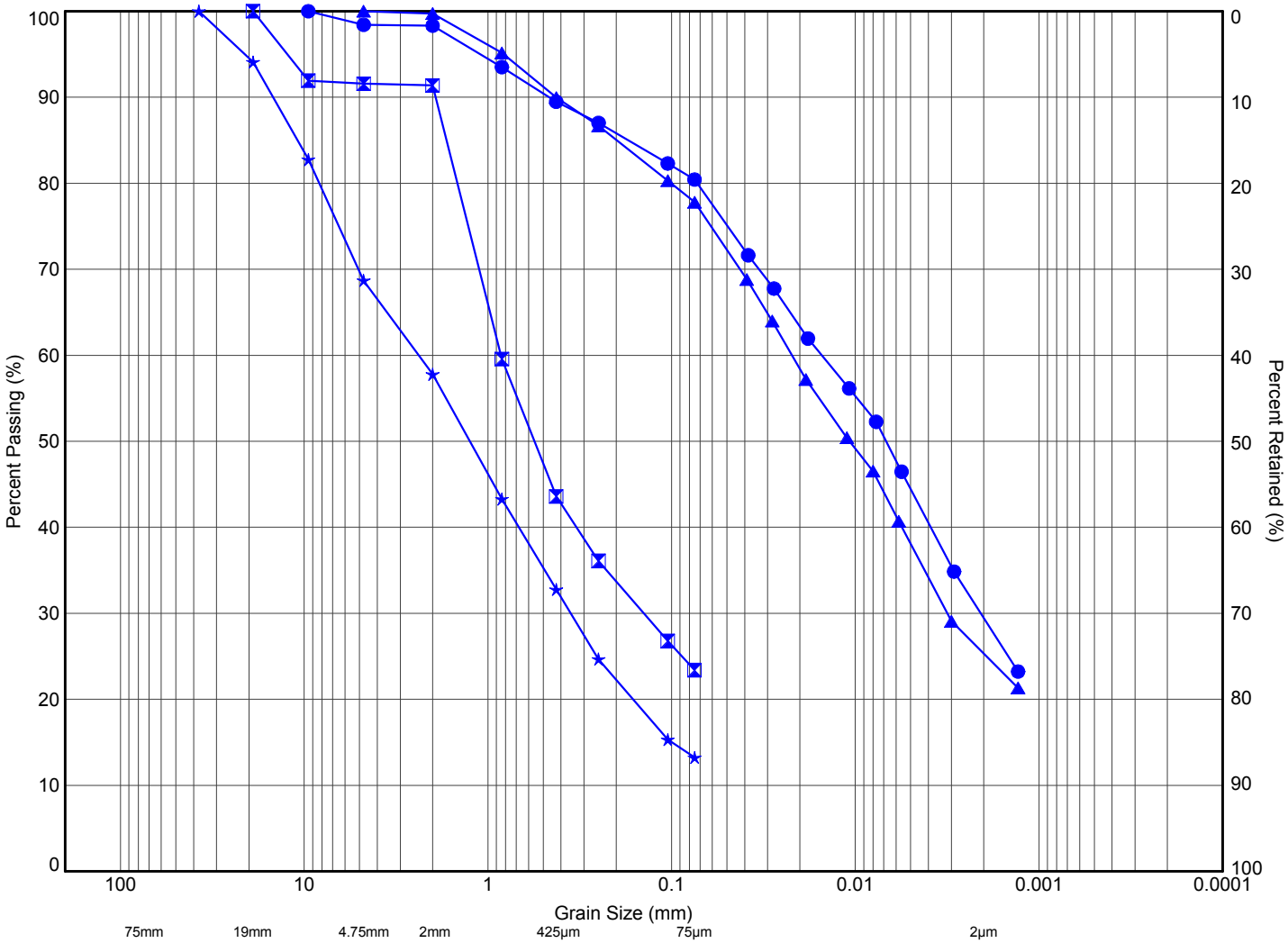
Borehole was dry and open upon completion of drilling.

+ 3, × 3 : Numbers refer to Sensitivity
○ 3% STRAIN AT FAILURE

APPENDIX C

TERRAPROBE INC.





	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**10**	SS2	0.9		2	17	51	30	
⊠	**16**	SS1	0.4		8	69			*(23)*
▲	**30**	SS3	1.4		0	22	53	25	
★	**31**	SS1	0.4		31	56			*(13)*

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title: **GRAIN SIZE DISTRIBUTION**

File No.: **11-13-3148**