

HYDROGEOLOGICAL INVESTIGATION 1315 SILVER SPEAR ROAD MISSISSAUGA, ONTARIO

Prepared for:

Starlight Investments 1400-3280 Bloor Street West, Centre Tower Toronto, Ontario M8X 2X3

Attention:

Ms. Ashley Burke

File No 1-17-0292-46 Issued: December 4, 2017

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Greater Toronto

11 Indell Lane Brampton, Ontario L6T 3Y3 (905) 796-2650 Fax: 796-2250 Hamilton – Niagara 903 Barton Street, Unit 22 Stoney Creek, Ontario L8E 5P5 (905) 643-7560 Fax: 643-7559

TerraprobeInc.Central Ontario22220 Bayview Drive, Unit 25L8E 5P5Barrie, Ontario L4N 4Y83-7559(705) 739-8355 Fax: 739-8369www.terraprobe.ca

Northern Ontario

1012 Kelly Lake Rd., Unit 1 **Sudbury**, Ontario P3E 5P4 (705) 670-0460 Fax: 670-0558

EXECUTIVE SUMMARY

Terraprobe Inc. (Terraprobe) was retained by Starlight Investments to conduct a hydrogeological investigation for the proposed redevelopment of municipal address 1315 Silver Spear Road, in Mississauga, Ontario (the "Site"). The property is situated located south of Burnhamthorpe Road East and Dixie Road. A site location plan is provided as Figure 1.

The purpose of the investigation is to assess the ground water conditions and dewatering requirements for the proposed construction activities at the Site. As part of the investigation, a total of five (5) exploratory boreholes were advanced at the Site. Three (3) boreholes were instrumented with a 50 mm diameter monitoring well.

The conclusions of Terraprobe's borehole investigation are as follows:

- The proposed development involves constructing a new 10-storey residential structure north of the existing 8-storey residential structure. The proposed structure will rest on a 2-level underground parking structure (P2), with an estimated finished floor elevation (FFE) of about 7 metres below existing grade (Elev. 139 ±m), within very dense sands above the ground water table.
- In general, the stratigraphy at the Site consists of earth fill extending to a depth of 0.8 metres below existing grade (Elev. 143.7 to 146.7 m), underlain by native soils consisting primarily cohesionless glacial till overlying a sand deposit extending to depths between 12.5 to 12.6 metres below existing grade (Elev. 132.0 to 135.0 m).
- The hydrogeological conditions and requirements for the Site are summarized below:

Ground Water Conditions					
Ground Water Elevation	Below 132 masl				
Zone of Influence	0 m (dewatering is not required)				

Ground Water Quality							
	City of Toronto Storm	City of Toronto Sanitary and					
	Sewer Limits	Combined Sewer Limits					
Untreated Ground Water (Sample ID - SW-UFB)	N/A	N/A					
Treatment Required Prior to Discharge (Yes/No)	No	No					

Ground Water Quantity - Short Term (Construction)						
Site Area	Ground Wa	ter Seepage	2-Year Rainfall Event		Total Discharge Volume (Seepage + Rainfall)	
	L/day	L/sec	L/day	L/sec	L/day	L/sec
Entire Site	0	0.00	94,000	1.09	94,000	1.09



Ground Water Quantity - Long Term (Post Construction)							
Site Area	Ground Water Seepage		Infiltration (2-Year Rainfall Event)		Total Discharge Volume		
	L/day	L/sec	L/day	L	/sec	L/day	L/sec
Entire Site	0	0.00	3,000	0	.03	3,000	0.03
MOECC Regul	ation Requireme	nts					
Environmental Activity and Sector Desistry (EASD) Desting				Not Required			
	and Sector	r Registry (EASI	() I osting		(No ground water contribution)		
Short Term Permit to Take Water (PTTW)				Not Required			
Long Term Permit to Take Water (PTTW)					Not Required		
Municipality Requirements, if connected to municipal sewer							
Short Term Discharge Agreement				Required			
Long Term Discharge Agreement				Not Required			
					(Depend	ent on managemen	t of water)

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1.0 INTRODUCTION

Terraprobe Inc. (Terraprobe) was retained by Starlight Investments to conduct a hydrogeological investigation for the proposed redevelopment of municipal address 1315 Silver Spear Road, in Mississauga, Ontario (the "Site"). The property is situated located south of Burnhamthorpe Road East and Dixie Road. A site location plan is provided as Figure 1.

The proposed development involves constructing a new 10-storey residential structure north of the existing 8-storey residential structure. The proposed structure will rest on a 2-level underground parking structure (P2), with an estimated finished floor elevation (FFE) of about 7 metres below existing grade (Elev. 139 \pm m), within very dense sands above the ground water table.

The following drawings were provided to Terraprobe and were reviewed in preparation of this report:

• "1315 Silver Spear Road, Mississauga, Ontario", Project No. 14-40, Drawing No. A100 to A501, dated May 11, 2017, by Architecture Unfolded.

The purpose of the investigation is to assess the ground water conditions and dewatering requirements for the proposed construction activities at the Site. As part of the investigation, a total of five (5) exploratory boreholes were advanced at the Site. Three (3) boreholes were instrumented with a 50 mm diameter monitoring well.

Terraprobe's field investigation involved advancing a total of five (5) exploratory/confirmatory boreholes for the proposed construction activities at the Site. The locations of the boreholes are provided on the Borehole Location Plans as Figure 2 (Existing Condition) and Figure 3 (Proposed Condition). A subsurface profile of the boreholes is provided as Figure 4. The results of the individual boreholes are recorded on the Borehole Logs in Appendix A. A summary of the geotechnical laboratory tests is provided in Appendix B.

Based on the information secured from this investigation, interpretation, analysis, and advice with respect to the hydrogeological engineering aspects of the proposed development concepts are provided.



2.0 SCOPE OF WORK

The scope of work for the hydrogeologic investigation consisted of the following:

- <u>Completion of rising head permeability analyses.</u> A rising head test was not completed as dewatering is not required at the site for the proposed redevelopment.
- <u>Assessment of ground water control requirements.</u> An assessment of the ground water inflow rates and volumes for the currently proposed design was completed. The information obtained from the soil grain size information was utilized in order to provide an assessment of the potential ground water control requirements during construction and for the completed structures following construction.
- <u>Completion of ground water sampling and analysis.</u> Ground water sampling was not completed as dewatering is not required at the site for the proposed development.
- <u>Report preparation</u>. A hydrogeological report has been prepared for the project. A summary of the local ground water conditions in the area has been completed. An evaluation of the proposed construction methods and an assessment of the possible requirements for dewatering or depressurization were completed. Recommendations regarding the estimates of the ground water control volumes and rates are provided. Regulatory requirements for the ground water takings will be discussed.

3.0 DESCRIPTION OF SITE CONDITIONS

3.1 Site Location and Description

The Site is bounded by Burnhamthorpe Road East to the north, and existing residential developments to the south, east and west. The Site is an irregular shaped parcel and is currently occupied by an 8-storey residential tower to the east and a parking structure and at-grade parking lot to the west. A site location plan is provided as Figure 1.

3.2 Site Topography and Drainage

The subject site and surrounding lands consist of a residential area of Mississauga. The site has an approximate average ground surface elevation of $146.2 \pm m$ and slopes towards the south.

There are no surface water bodies or features located on the Site or adjacent to the Site. According to the Credit Valley Conservation Authority (CVC), the Site is located within the Lake Ontario Waterfront which drains into Lake Ontario located approximately 6.4 km to the southeast. The approximate depth to ground water, based on Ministry of the Environment and Climate Change (MOECC) well records within the vicinity of the site is approximately 20 m (Elev. $126 \pm m$). Ground water and surface water is expected to flow to the south towards Lake Ontario. Storm water at the site is expected to drain towards the catch basins located on the Site and on the municipal roads adjacent to the Site.

3.3 Site Geology and Hydrogeology

The following stratigraphy is based on the findings of Terraprobe's subsurface investigation, as well as the Terraprobe geotechnical laboratory testing conducted on selected representative soil samples.

In general, the stratigraphy at the Site consists of earth fill extending to a depth of 0.8 metres below existing grade (Elev. 143.7 to 146.7 m), underlain by native soils consisting primarily cohesionless glacial till overlying a sand deposit extending to depths between 12.5 to 12.6 metres below existing grade (Elev. 132.0 to 135.0 m).

Three (3) monitoring wells were installed and screened within the native sand deposit to capture the founding and lowest finished floor elevation. The wells were found to be dry two weeks after drilling. For design purposes, the prevailing ground water should be considered to be below Elev. $132 \pm m$ (approximately 14.2 $\pm m$ below existing grade).



3.4 Subsurface Investigation

Terraprobe's field investigation involved advancing a total of five (5) exploratory boreholes from June 5th to June 7th, 2017. The locations of the boreholes are provided on the Borehole Location Plans as Figure 2 (Existing Condition) and Figure 3 (Proposed Condition). A subsurface profile of the boreholes is provided as Figure 4. The results of the individual boreholes are recorded on the Borehole Logs in Appendix A. A summary of the geotechnical laboratory tests is provided in Appendix B.

Based on the information secured from this investigation, interpretation, analysis, and advice with respect to the hydrogeological engineering aspects of the proposed development concepts are provided.

3.4.1 Soil

The following stratigraphy is based on the Terraprobe borehole findings, as well as on the geotechnical laboratory testing conducted on selected representative soil samples. It should be noted that the subsurface conditions are confirmed at the borehole location only, and may vary at other locations. The boundaries between the various strata represent an inferred transition rather than a precise plane of geological change. This summary is intended to correlate this data to assist in the interpretation of the subsurface conditions at the Sites. For more specific subsurface details, refer to the enclosed Terraprobe Borehole Logs in Appendix A and a summary of the geotechnical laboratory test results in Appendix B.

Earth Fill Materials

Boreholes 1, 2 and 3 encountered topsoil at existing grade with a thickness ranging from 225 to 250 mm. Boreholes 4 and 5 encountered a pavement structure at existing grade consisting of 75 to 100 mm of asphaltic concrete underlain by 125 to 150 mm of aggregate.

Underling the topsoil and pavement structure, the boreholes encountered a layer of earth fill extending to a depth of 0.8 metres below existing grade (Elev. 143.7 to 146.7 m). The earth fill consists of silty sand, and contains trace amounts of gravel, clay, rootlets, organics, and asphalt and wood fragments. The earth fill is typically orangey brown to dark brown, and moist. The Standard Penetration Test (SPT) results (N-Values) measured in the earth fill ranged from 4 to 14 blows per 300 mm of penetration, indicating a loose to compact (typically loose) relative density.

Cohesionless Glacial Till

Underlying the earth fill, the boreholes encountered a native undisturbed cohesionless glacial till at a depth of 0.8 metres below existing grade (Elev. 143.7 to 146.7 m). The glacial till has a matrix varying from sandy silt to sand with trace to some silt and contains trace gravel and trace clay. The glacial till is typically brown with oxidation staining at depths of 0.8 to 2.3 metres below existing grade (Elev. 143.7 to 145.9 m), and is moist to damp. SPT N-Values measured in the cohesionless glacial till ranged from 10 to 82 blows per 300 mm of penetration, indicating a compact to very dense (typically dense to very dense below depths of 1.5 to 2.0 m below existing grade) relative density.



Sand

Underlying the cohesionless glacial till, the boreholes encountered a sand deposit at a depth of 4.6 metres below existing grade (Elev. 139.9 to 142.9 m), and observed the deposit extending beyond the vertical extent of the investigation at depths of 12.5 to 12.6 metres below existing grade (Elev. 132.0 to 135.0 m). The sand deposit contains a variable quantity of silt (ranging from trace silt to silty), trace amounts gravel and clay, and occasional silt seams at depths of 7.6 to 11.0 metres below existing grade (Elev. 135.8 to 138.4 m). SPT N-Values measured in the sand deposit ranged from 50 blows per 300 mm of penetration to 95 blows per 250 mm of penetration, indicating a dense to very dense (typically very dense) relative density.

3.4.2 Ground Water Elevations

Three (3) monitoring wells were installed by Terraprobe within Borehole 1, 2 and 4 upon completion of drilling. Stabilized ground water levels were measured in the monitoring well at least one week after the completion of drilling. The monitoring wells were constructed of PVC pipe with an interior diameter of 50 mm. The monitoring wells had a screen length of 3.1 m.

The ground water measurements are shown on the Terraprobe Borehole Logs and are summarized as follows.

Terraprobe Monitoring Wells						
Ground Water Level in Well						
Borehole No.	Surface Elev.	Well Screen Elev, (masl)	June 2	1, 2017	June 27, 2017	
	(masl)		Depth (m)	Elev. (masl)	Depth (m)	Elev. (masl)
BH1	145.7	135.0 to 138.0	Dry	N/A	Dry	N/A
BH 2	147.5	135.3 to 138.4	Dry	N/A	Dry	N/A
BH 4	144.5	133.1 to 136.1	Dry	N/A	Dry	N/A

For design purposes, the prevailing ground water table should be taken to be below Elev. $132 \pm m$. In general, the excavation to the proposed P2 level at Elev. $139 \pm m$ will not extend below the prevailing ground water table. Perched water may be present in the earth fill and in the sand deposit. The soils at this site are cohesionless and will allow for the free flow of water.

Construction dewatering at adjacent sites, existing building drains or dewatering systems may cause significant changes to the depth of the ground water table over time. Ground water levels may also fluctuate with time and seasonally depending on the amount of precipitation and surface runoff.



3.4.3 Ground Water Quality

Samples of ground water were not collected by Terraprobe nor analysed for the City of Mississauga sewer use by-law parameters due to insufficient ground water at the site.

3.4.4 Aquifer Performance Tests

Due to an insufficient quantity of ground water within Boreholes 1, 2 and 4, rising head tests were not performed. As such, the grain size distribution measurements made in the sand deposit, where the proposed P2 level is to be constructed at Elev. 139 \pm m, estimate the hydraulic conductivity of the sand at about 10⁻⁵ m/s.

According to Freeze and Cherry (1979), the typical hydraulic conductivities of the strata investigated at the Property are:

- Glacial Till 10^{-6} m/s to 10^{-12} m/s
- Sand to Silty Sand 10⁻³ m/s to 10⁻⁷ m/s

The estimated hydraulic conductivity from the grain size information is relatively consistent with the published values associated with the geological materials which were tested.



4.0 DISCUSSION AND ANALYSIS

4.1 Summary of Hydrogeological Conditions

The results of the investigation completed by Terraprobe indicate the following hydrogeologic features for the Site:

- The stabilized ground water elevation for the Site is below Elev. 132 ± m and is located in the sand deposit, which corresponds to approximately 6.4 ±m below the base of the excavation at approximately Elev. 138.4 ±m.
- Based on the grain size distribution measurements made in the sand deposit, the hydraulic conductivity applicable to the Site is approximately 1×10^{-5} m/s.

4.2 Proposed Development Plan

The proposed development involves constructing a new 10-storey residential structure north of the existing 8-storey residential structure. The proposed structure will rest on a 2-level underground parking structure (P2), with an estimated finished floor elevation (FFE) of about 7 metres below existing grade (Elev. 139 \pm m), within very dense sands above the ground water table.

It is the understanding of Terraprobe that the relevant construction elevations for the proposed development options are approximately:

P2 Finished Floor Elevation	
Base of Excavation	
Excavation Area	Approximately 50 x 75 m

4.3 Short-Term Ground Water Control Requirements (Construction Dewatering)

The base of the excavation for the proposed P2 level is at an approximate elevation of $138.4 \pm m$, which is approximately $6.4\pm m$ above the prevailing ground water table at the Site (below Elev. $132\pm m$). As such, construction dewatering will not be required at the Site.

Localized dewatering however will be required of any protrusions extending below the highest noted ground water elevation at the Site during construction activities. Waterproofing of these protrusions will be required in the long term.

Should the excavation ever be exposed to the elements, storm water will have to be managed. The shortterm control of ground water should take into account storm water management from rainfall events. The collection system should also account for a typical 2-year design storm event which will generate approximately 94,000 L from the Site. A dewatering system should be designed to take into account



removal of rainfall from the excavation. According to O. Reg. 63/16, a plan for discharge must consider the conveyance of storm water from a 100-year storm event which translates to approximately 352,000 L.

A numerical analysis was conducted utilizing computer software (Slide 7.013, released March 1, 2016, developed by Rocscience Inc.), utilizing the finite element modelling method. The finite element model for ground water seepage indicates that no ground water flow exists through the walls or the floor of the proposed excavation. The finite element model results are presented in Appendix E.

An EASR Posting will **<u>not</u>** be required for the construction activities at this Site. A short term PTTW will **<u>not</u>** be required for the construction activities at this Site.

If water (storm water, ground water or a combination of both) is discharged into the City sewer system during construction activities, a Discharge Agreement for construction <u>will</u> have to be obtained from the City.

4.4 Long-Term Ground Water Control Requirements (Post Construction)

The base of the excavation for the proposed P2 level is at an approximate elevation of $138.4 \pm m$, which is approximately $6.4\pm m$ above the prevailing ground water table at the Site (below Elev. $132\pm m$). As such, long-term dewatering will not be required at the Site.

A long term PTTW will **<u>not</u>** be required at this Site.

If the redevelopment has a subfloor drainage system (weeper system) that is connected to the City sewers, a Discharge Agreement <u>will</u> have to be obtained from the City.

Regular ground water seepage is not anticipated.

4.5 Assessment of Potential Impacts

4.5.1 Short Term Discharge of Pumped Ground Water (Construction Dewatering)

The base of the excavation for the proposed P2 level is at an approximate elevation of $138.4 \pm m$, which is approximately $6.4\pm m$ above the prevailing ground water table at the Site (below Elev. $132\pm m$). As such, short term dewatering of the ground water will not be required at the Site. It should be noted that stormwater will have to be managed.

4.5.2 Long Term Discharge of Pumped Ground Water (Post Construction)

If the buildings will be drained structures, a permanent dewatering system would be required. Ground water takings of up to approximately 0.0075 L/sec are possible in the event a 100-year rainfall event raises the water table to the level of the drainage system.



4.5.3 Zone of Influence (ZOI)

The Zone of Influence (ZOI) is calculated based on the estimated ground water taking rate and the average hydraulic conductivity recorded at the Site. The base of the excavation for the proposed P2 level is at an approximate elevation of $138.4 \pm m$, which is approximately $6.4\pm m$ above the prevailing ground water table at the Site (below Elev. $132\pm m$). As such, dewatering will not be required at the Site. Since dewatering will not be required, a ZOI will not be created by dewatering activities.

4.5.4 Geotechnical Considerations

The base of the excavation for the proposed P2 level is at an approximate elevation of $138.4 \pm m$, which is approximately $6.4\pm m$ above the prevailing ground water table at the Site (below Elev. $132\pm m$). As such, dewatering will not be required at the Site. Since dewatering will not be required, a ZOI will not be created by dewatering activities and settlement in the surrounding soils will not occur due to dewatering. Therefore, settlement will not occur that will have an impact on adjacent structures.

Additional information pertaining to the geotechnical considerations at the Site will be discussed in a preliminary design and geotechnical report by Terraprobe to be provided under a separate cover (File No: 1-17-0292-01).

4.5.5 Surface Water, Wetlands and Areas of Natural Significance

There are no surface water bodies or features located on the Site or adjacent to the Site. According to the Credit Valley Conservation Authority (CVC), the Site is located within the Lake Ontario Waterfront which drains into Lake Ontario located approximately 6.4 km to the southeast. The approximate depth to ground water, based on Ministry of the Environment and Climate Change (MOECC) well records from within the vicinity of the site is approximately 20 m (Elev. 126 \pm m). Ground water and surface water is expected to flow to the south towards Lake Ontario. Storm water at the site is expected to drain towards the catch basins located on the Site and on the municipal roads adjacent to the Site.

There are no surface water bodies, wetlands or other sensitive features on the Site or within the ZOI to be affected by the dewatering activities.

4.5.6 Local Wells and Zone of Influence

The Site is located in a serviced area of The City of Mississauga. The Site and surrounding area are provided with municipal piped water and sewer supply. There is no use of the ground water for water supply in this area of Mississauga. As such, it is expected that there would be no impact to drinking water wells.

No domestic water wells are located within a 250 m radius of the Site. No domestic water wells were located on adjacent properties to the Site.



4.5.7 Contamination Sources

The Site and the immediately surrounding area currently consist mostly of residential and commercial areas. These property uses are not anticipated to be a source of potential contamination and are not expected to provide an area of potential environmental concern for the Site.



5.0 CONCLUSIONS AND RECOMMENDATIONS

The conclusions of the investigation are as follows:

- The proposed development involves constructing a new 10-storey residential structure north of the existing 8-storey residential structure. The proposed structure will rest on a 2-level underground parking structure (P2), with an estimated finished floor elevation (FFE) of about 7 metres below existing grade (Elev. 139 ±m), within very dense sands above the ground water table.
- In general, the stratigraphy at the Site consists of earth fill extending to a depth of 0.8 metres below existing grade (Elev. 143.7 to 146.7 m), underlain by native soils consisting primarily cohesionless glacial till overlying a sand deposit extending to depths between 12.5 to 12.6 metres below existing grade (Elev. 132.0 to 135.0 m).
- The hydrogeological conditions and requirements for the Site are summarized below:

Ground Water Conditions				
Ground Water Elevation	Below 132 masl			
Zone of Influence	0 m (dewatering is not required)			

Ground Water Quality						
	City of Toronto Storm Sewer Limits	City of Toronto Sanitary and Combined Sewer Limits				
Untreated Ground Water (Sample ID - SW-UFB)	N/A	N/A				
Treatment Required Prior to Discharge (Yes/No)	No	No				

Ground Water Quantity - Short Term (Construction)							
Site Area	Ground Water Seepage		2-Year Rainfall Event		Total Discha (Seepage +	Total Discharge Volume (Seepage + Rainfall)	
	L/day	L/sec	L/day	L/sec	L/day	L/sec	
Entire Site	0	0.00	94,000	1.09	94,000	1.09	
Ground Water	Quantity - Long	Term (Post Co	nstruction)				
Ground Water Se		er Seepage	eepage Infiltration (2-Year Rainfall Event)		Total Discharge Volume		
	L/day	L/sec	L/day	L/sec	L/day	L/sec	
Entire Site	0	0.00	3,000	0.03	3,000	0.03	
MOECC Regul	ation Requireme	nts					
Environmental Activity and Sector Registry (EASR) Posting				Not R (No g	Not Required (No ground water contribution)		
Short Term Permit to Take Water (PTTW)				Not R	equired		
Long Term Pern	nit to Take Water	(PTTW)		Not R	Not Required		

Municipality Requirements, if connected to municipal sewer										
Short Term Discharge Agreement	Required									
Long Term Discharge Agreement	Not Required (Dependent on management of water)									



We trust this report meets with your requirements. Should you have any questions regarding the information presented, please do not hesitate to contact our office.

Yours truly,

Terraprobe Inc.

Mal ,

Nicholas Ng, B.A.Sc, EIT Project Manager



Matthew J. Bielaski, P. Eng., QP_{RA} Associate



















SAMP	LING METHODS	PENETRATION RESISTANCE							
AS CORE DP FV	auger sample cored sample direct push field vane grab samplo	Standard Penetration Test (SPT) resistance ('N' values) is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a standard 50 mm (2 in.) diameter split spoon sampler for a distance of 0.3 m (12 in.).							
SS ST WS	split spoon shelby tube wash sample	Dynamic Cone Test (DCT) resistance is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a conical steel point of 50 mm (2 in.) diameter and with 60° sides on 'A' size drill rods for a distance of 0.3 m (12 in.)."							

COHESIONLE	SS SOILS	COHESIVE S	OILS	COMPOSITION					
Compactness	'N' value	Consistency	'N' value	Undrained Shear Strength (kPa)	Term (e.g)	% by weight			
very loose loose compact dense very dense	< 4 4 – 10 10 – 30 30 – 50 > 50	very soft soft firm stiff very stiff hard	< 2 2 - 4 4 - 8 8 - 15 15 - 30 > 30	< 12 12 - 25 25 - 50 50 - 100 100 - 200 > 200	<i>trace</i> silt some silt silty sand <i>and</i> silt	< 10 10 – 20 20 – 35 > 35			

TESTS AND SYMBOLS

MH	mechanical sieve and hydrometer analysis	⊻	Unstabilized water level					
W, Wc	water content	Ţ	1° water level measurement					
w_L , LL	liquid limit	$\overline{\mathbf{\Lambda}}$	2 nd water level measurement					
w_{P}, PL	plastic limit	▼	Most recent water level measurement					
I _P , PI	plasticity index							
k	coefficient of permeability	3.0+	Undrained snear strength from field vane (with sensitivity)					
Y	soil unit weight, bulk	Cc	compression index					
Gs	specific gravity	Cv	coefficient of consolidation					
φ'	internal friction angle	m _v	coefficient of compressibility					
C'	effective cohesion	е	void ratio					
Cu	undrained shear strength							

FIELD MOISTURE DESCRIPTIONS

Damp	refers to a soil sample that does not exhibit any observable pore water from field/hand inspection.
Moist	refers to a soil sample that exhibits evidence of existing pore water (e.g. sample feels cool, cohesive soil is at plastic limit) but does not have visible pore water
Wet	refers to a soil sample that has visible pore water

		Terraprobe										L	.00	g of	F BC	RE	HOLE 1
Pro	ject I	No. : 1-17-0292-01	Clie	ent	: 5	Starlig	ht Inve	estments								Origin	ated by:MC
Dat	e sta	rted :June 5, 2017	Pro	ject	t :1	315	Silver \$	Spear Ro	ad							Comp	oiled by :NN
She	et N	o. :1 of 1	Loc	atio	on : N	Aissis	sauga	, Ontario								Cheo	cked by:JC
Posi	tion	: E: 612625, N: 4830690 (UTM 17T)				Elevati	on Datu	m : Geode	tic								
Rigi	ype	SOIL PROFILE			SAMP	LES		: Solid s	iem au est Valu	gers es							Lab Data
pth Scale (m	Elev Depth (m)	Description	Iphic Log	lumber	Type	'N' Value	/ation Scale (m)	(Blows / 0.3n X Dynamic 0 10 Undrained Sl O Unconfir	1) Cone 20 near Stre led	3 <u>0 4</u> ngth (kPa + Fié	40 a) eld Vane	Plastic Limit	Disture / I Natu Water C	Plasticity Iral Liqui Content Lim	Headspace Vapour (ppm)	Instrument Details	and period period period period period period period period Comments GRAIN SIZE DISTRIBUTION (%)
ے 0	145.7	GROUND SURFACE	U U U	2		SPT	Шe	Pocket F 40	enetromet	er ∎ La 20 1	ib Vane 60	1() 20	30			(MIT) GR SA SI CL
-	145.4 0.3 144.9	250mm TOPSOIL FILL, silty sand, trace gravel, trace clay, trace rootlets, trace organics, loose, dark brown moist		1	SS	8	- 145 –						0		_		
-1	144.2	SAND, some silt, trace gravel, trace clay, compact, brown, moist (GLACIAL TILL)	_/0	2	SS	18			\setminus			0					
-2	1.5	SANDY SILT, trace gravel, trace clay, dense to very dense, brown, damp (GLACIAL TILL)		3	SS	35	- 144					0					
- 3		at 2.3 m, contains oxidation staining		4	SS	82	. 143 –					0					
-			· · · ·	5	SS	61	- 142 -					c)				
-4 -	141.1			:		00/	-										
-5	4.0	SAND, trace to some silt, very dense, greyish brown, damp		6	SS	82 / 275mm	- 141					0					
-6							140 -										
- -7				7	SS	74	139 -					0			_		
- -8		at 7.6 m, silt, trace sand, trace clay, moist		8	SS	82 / 275mm	138 -						0		_		
9							137 -										
- 10		at 9.1 m, silty sand, trace clay, damp		9	SS	68	- 136 -					0			_		0 73 24 3
- 11		at 10.7 m, silt, trace sand, trace clay, wet		10	SS	75	- 135 –						c	D C	_		
- 12							- 134 –								_		
	<u>133.1</u> 12.6	at 12.2 m, silty sand, trace clay, moist		11	SS	80 / 275mm	-						0				
logs.gp		END OF BOREHOLE							D~	WA ⁻	TER LE	EVEL RE		S	(m)		
92-01_borehole_		Borehole was dry and open upon completion of drilling. 50 mm dia. monitoring well installed.							Jun 21 Jun 27	, 2017 , 2017 , 2017	vvale	dry dry dry	<u>, 111</u>	n/a n/a	τιτ		
file: 1-17-02		-															

🚳 Terraprobe

Proj	ect N	lo. : 1-17-0292-01	Clie	nt	: 5	Starlig	ht Inv	estments								Origin	ated b	y : MC
Jate	e stai	rted :June 7. 2017	Proi	iect	t :1	315 \$, Silver :	Spear Ro	ad							Com	oiled b	v : NN
She	et No	1 of 1		' atic	n · N	lissis	sauda	' Ontario								Che	cked b	v · JC
Positi	on	E: 612657 N: 4830737 (UTM 17T)	200			Flevati	ion Datu	m · Geode	tic							one		y . 00
lia tv	be :	: Truck-mounted				Drilling	Method	: Hollow	stem a	uaers								
<u> </u>		SOIL PROFILE			SAMP	LES	e	Penetration 1	est Value	es			()	,	0			Lab Data
scale (m	Elev		: Log	ber	Φ	Value	n Scal	(Blows / 0.311 X Dynamic (1,0) Cone 2 <u>0</u> 3	30 40	0	Mois Plastic Limit	Natural Nater Conten	Liquid t Limit	dspace apour ppm)	rument etails	r Level	and Comments
eptn	Depth (m)	Description	aphic	Numb	Typ	z.	evatic (n	Undrained St O Unconfir	ear Strer ed	ngth (kPa	a) Id Vane	PL	MC	ш	Hea Va	Dot	Unsta Vate	GRAIN SIZE STRIBUTION (
ב	147.5	GROUND SURFACE	<u>5</u>			SP	Ĕ	40	80 1	20 16	5 vane 50	10	20	30				(MIT) GR SA SI
	147.2 0.3	250mm TOPSOIL		1	SS	4						С)					
	146.7	trace rootlets, trace organics, loose,					147 -											
	0.8	SAND some silt trace gravel trace	_/ [.o.	. 2	SS	10						0						
		clay, compact, brown, damp		-			1											
			0.	. 3	SS	30	146-					0						
				_			· ·			\land								
	145.2 2.3	SANDY SILT. trace gravel. trace clay.				26	145 -											
		contains oxidation staining, dense,		4	55	30	145 -											
		(GLACIAL TILL)	· •	.—														
				. 5	SS	38	144 -					0						
			: 6															
	142.9		6				143 -		ļ									
	4.6	SAND, trace to some silt, very dense,		6	SS	84						0						
		greyish blown, damp																
							142 -							_				
				-								_						
				7	SS	83	141 -					0		_				
							140 -											
				8	SS	79						0						
							139 -											
		at 9.1 m, silt, trace sand, trace clay,		. 9	SS	95/							0			日		
		muist		Ĥ		∠50mm	138 -		1				-			日	·.	
)							.											
																目	.]	
		at 10.7 m silty sand trace clay domp				20 /	137 -		1]	
		ac io.r in, sity sand, trace ciay, damp		10	SS	ອງ/ 250mm						9						0 76 21
																	:	
							136 -		1						1	目:	:	
2							.									日		
	135.0			. 11	SS	50 / 125mm						0						
	12.5					<u>, </u>	,						DINOO					
									Da	WAT	ER LE <u>Wate</u>	:vel REA r Depth (r	idings n) <u>Elev</u>	vation (n	<u>n)</u>			
		Water level and cave not measured upor	ı						Jun 21 Jun 27	2017		dry dry		n/a n/a				
		completion of drilling.										-						
		50 mm dia. monitoring well installed.																

		Terraprobe							LOG OF	BO	REF	HOLE 3
Proj	ect N	No. : 1-17-0292-01	Clie	ent	: 5	Starlig	ght Inv	estments			Origin	ated by :MC
Date	e sta	rted :June 5, 2017	Pro	jec	t :1	315	Silver	Spear Road			Comp	oiled by : NN
She	et N	o. :1 of 1	Loc	atio	on : N	Missis	sauga	, Ontario			Cheo	ked by : JC
Posit	ion	: E: 612661, N: 4830692 (UTM 17T)				Elevati	ion Datu	m : Geodetic				,
Rig t	ype	: Truck-mounted				Drilling	Method	: Solid stem augers				
Ê		SOIL PROFILE			SAMP	LES	ale	Penetration Test Values (Blows / 0.3m)	Moisture / Plasticity	ø	Ħ	Lab Data
th Scale (r	<u>Elev</u> Depth	Description	hic Log	mber	ype	N' Value	ation Sca (m)	X Dynamic Cone 10 20 30 40 Undrained Shear Strength (kPa)	Plastic Natural Liquid Limit Water Content Limit	eadspac Vapour (ppm)	nstrumer Details	end stappilized Comments GRAIN SIZE
Dept	(m)		Grap	Ž		PT -	Eleva	O Unconfined + Field Vane ● Pocket Penetrometer Lab Vane 40 90 120 160		т	=	DISTRIBUTION (%) (MIT)
0	146.6	225mm TOPSOIL	<u>x 1/2</u>	1	SS	7						GR SA SI CI
	0.2	FILL, silty sand, trace gravel, trace clay,		<u> </u>		<u> </u>						
4	146.0 0.8	orangey brown to dark brown, moist	Ť	×		12	146 -					
I		SAND AND SILT, trace gravel, trace clay, compact, brown, moist		<u> </u>		13						
		(GĽÁCIAĽ TILĽ)	0	_			-					
2				3	SS	20	145 -		0			
	144.5 2.3											at 2.1m, auger grinding
		contains oxidation staining, dense to very		4	SS	37			0			
3		GLACIAL TILL)					144 -					
				5	SS	72			Ф			
			0				143 -					
4												
	142.2											
	4.6	SAND, trace to some silt, very dense,		6	SS	72 / 250mm	142 -		0			
5							1					
~							141 -					
0				7	SS	50 /			0			
							5					
7							140 -					
				8	SS	50/						
3					00	100mm	139-					
							138 -					
9							100					
				9	SS	50 / 125mm			0			
							137 -					
10												
44				10	SS	82 / 275mm	136 -		0			
11		at 11.0 m, silt seam		-		2751111						
												Σ
12							135 -					
				11	SS	92/	· ·					
	134.2 12.6					250mm	1		0			
		END OF BOREHOLE										
		Unstabilized water level measured at										
		11.6 m below ground surface; borehole was open upon completion of drilling.										
		·										

		Terraprobe						LOG OF BOREHOLE
Proj	ject l	No. : 1-17-0292-01	Clie	ent	: 5	Starlig	ht Inv	stments Originated by : M
Dat	e sta	rted : June 6, 2017	Pro	jec	t :1	315 \$	Silver	compiled by : N
She	et N	o. 1 of 1	loc	atio	on:N	/issis	sauda	Ontario Checked by : J0
Posit	tion	: E: 612650. N: 4830647 (UTM 17T)				Elevati	on Datu	: Geodetic
Rig t	уре	: Truck-mounted				Drilling	Method	: Solid stem augers
Ê		SOIL PROFILE			SAMP	LES	e	Penetration Test Values
scale (n	Elev		; Log	Der	ω	Value	n Sca n)	X Dynamic Cone Invitiguity Image: Second Se
epth S	Depth (m)	Description	aphic	Numb	Typ	Ż.	evatio (r	Indrained Shear Strength (kPa)
	144.5	GROUND SURFACE	ບັ	_		SP	Ш	
	144.3 0.2			1	SS	10		
F	143.7	FILL, silty sand, trace gravel, trace clay,					144 -	
-1	0.8	trace rootlets, trace organics, trace asphalt fragments, loose, orangey brown to dark brown, moist	0	2	SS	64		
- -2	1.5	SAND, some silt, trace gravel, trace clay, containing oxidation staining, very dense, brown, damp		3	SS	39	143 -	ρ
-		SANDY SILT, trace gravel, trace clay, dense to very dense, brown, damp	· .0	4	SS	58	142 -	
-3			:]o					
ŀ			•	5	SS	52	141 -	Φ
-4	139.9						140 -	
-5	4.6	SAND , trace to some silt, very dense, greyish brown, damp		6	SS	90		o
-							139 -	
6 -				7	SS	50	. 138 -	o
-7								
-				_			137 -	
-8				8	SS	89		
-9							136 -	
-				9	SS	84 / 275mm	135 -	
- 10								
- 11				10	SS	90	134 -	o
-				-			133 -	
- 12	132.0			1	SS	50 / 125mm		o
	12.3	END OF BOREHOLE						WATER LEVEL READINGS
		Borehole was dry and caved to 11.5 m below ground surface upon completion of drilling.						DateWater Depth (m)Elevation (m)Jun 21, 2017dryn/aJun 27, 2017dryn/a
		50 mm dia. monitoring well installed.						

	3	Terraprobe						L	OG OF BC	OREHOLE 5
Proj	ect N	Jo. : 1-17-0292-01	Clie	ent	: १	Starlig	jht Inv	estments		Originated by : MC
Date	ə star	rted : June 6, 2017	Pro	ject	t : 1	315 \$	Silver	Spear Road		Compiled by : NN
She	et No	o. :1 of 1	Loc	atic	on∶N	∕lissis	sauga	Ontario		Checked by : JC
Positi	ion :	E: 612664, N: 4830678 (UTM 17T)				Elevati	ion Datu	n : Geodetic		
Rig ty	/pe :	Truck-mounted				Drilling	J Method	: Solid stem augers		- <u> </u>
Ê	\vdash	SOIL PROFILE			SAMPI	LES Ø	cale	Penetration Test Values (Blows / 0.3m) Moist	ture / Plasticity	Lab Data
i Scale	<u>Elev</u>	Description	lic Log	nber	be	l' Valu	ion Sc (m)	X Dynamic Cone <u>10</u> <u>20</u> <u>30</u> <u>40</u> Undrained Shear Strength (kPa)	Natural Liquid Vater Content Limit Vater Content	(ppm) transition (ppm) trans
Depth	(m)		Graph	Nu	Ê	PT "	Elevat	O Unconfined + Field Vane PL ● Pocket Penetrometer ■ Lab Vane 400		E 58 GRAIN SIZE DISTRIBUTION (%) (MIT)
-0	146.7 146.4	COUND SURFACE	7.00			14		40 80 120 160 10	20 30	GR SA SI CL
	0.3	150mm AGGREGATE	/ 👹	Ľ		14	-			
-1	145.9 0.8	FILL, silty sand, trace gravel, trace clay, trace rootlets, trace organics, trace wood		2	SS	24	. 146 -			
	145.2	dark brown, moist]	.H	<u> </u>	<u> </u>				
	1.5	SAND, some silt, trace gravel, trace clay, containing oxidation staining,	í	3	SS	26	145 -			
-2		Compact, brown, damp	/ 				·			
-		SANDY SILT, trace gravel, trace clay, compact to dense, brown, damp		4	SS	45	1	0		
-3		(GLÀCIAL TILL)					. 144 -			
				5	SS	44] -			
						143 -			
-4					1					
\mathbf{F}	142.1				 	ļ!				
-5	4.0	SAND , trace to some silt, very dense, greyish brown, damp		6	SS	58	142 -			
] -			
F I					1		141 -			
-6						50 /				
					- 33	125mm	1			
							140 -			
'										
-				$\left \right $			139 -			
-8				8	55	87	4			
					1					
							138 -			
-9				9	ss	94 /				
				H	<u> </u>	225mm	137 -			
- 10										
					1		-			
				10	SS	50 / 125mm	136 -	· · · · · · · · · · · · · · · · · · ·		
- 11						1.20111	1.			
-							135 -			
- 12							100			
	134.2			. 11	SS	50 / 125mm	, . ,	0		
~	12.5	END OF BOREHOLE								

Borehole was dry and open upon completion of drilling.

file: 1-17-0292-01_borehole_logs.gpj







