

# **TECHNICAL MEMORANDUM**

DATE May 29, 2019

Project No. 18111310

EMAIL LBekeris@golder.com

BByerley@golder.com

TO Pauline Dicaire, Senior Project Manager of Capital Projects Ottawa Police Service c/o Jenna Wood, Senior Project Manager, Colliers Project Leaders

**FROM** Loren Bekeris and Brian Byerley

### DESKTOP WATER WELL IMPACT STUDY PROPOSED OTTAWA POLICE SERVICE SOUTH FACILITY 55 LODGE ROAD, OTTAWA, ONTARIO

This report presents the results of a desktop water well impact study carried out by Golder Associates Ltd. (Golder) for the proposed Ottawa Police Service South Facility site that is to be located at 55 Lodge Road in Ottawa, Ontario. It is understood that this study is required for site plan approval.

The purpose of this study was to determine the general soil and groundwater conditions across the site and to address possible construction-related impacts to private water supply wells. The soil and groundwater conditions were assessed by means of existing data from on-site boreholes, published mapping and publicly available information. The water well records in the Ministry of the Environment, Conservation and Park (MECP) Water Well Information System (WWIS) for nearby water wells were used to provide further information regarding hydrogeological conditions in the area and identify where nearby water well users are taking their water.

# 1.0 DESCRIPTION OF PROJECT AND SITE

Plans are currently being prepared for the proposed Ottawa Police Service South Facility to be located at 55 Lodge Road in Ottawa, Ontario (see Site Plan, Figure 1). From the preliminary drawings provided to Golder, it is understood that the new station will be located in the northern part of the site and consist of a three-storey main office building attached to another two-storey building and a two-storey parking structure, with a total footprint of approximately 12,000 square metres. All structures will be of slab on grade construction (i.e., no basement). It is understood that the structures will be founded on shallow foundations or pile foundations.

The following is known about the site:

- The site is located to the northeast of the intersection of Prince of Wales Drive and Lodge Road.
- The site is approximately triangular in shape and measures about 420 metres by 190 metres in plan.
- The ground surface is gently sloping down to the east, with ground surface elevations ranging from about 89 metres at Prince of Wales Drive to about 83 metres at the Rideau River.
- The site was the former location of the previous Carleton Lodge building.
- This site is currently vacant, is grass covered, and contains some tree coverage.

# 2.0 GEOLOGY AND HYDROGEOLOGY

The following sections describe the published local geology and hydrogeology in the vicinity of the site.

# 2.1 Surficial Geology

Based on published mapping (Figure 2), the surficial geology at and surrounding the site is interpreted to consist of marine silt and clay deposits. Published mapping indicates the bedrock surface to be at depths in the range of 15 to 50 metres below the ground surface across the site (Figure 3).

# 2.2 Bedrock Geology

The Ontario Geological Survey bedrock geology mapping indicates that the site is underlain by the sandstone and dolostone of the March Formation.

# 2.3 Hydrogeology

### 2.3.1 Overburden Aquifer

The fine-grained overburden deposits in the area are generally not capable of supplying sufficient quantities of groundwater to be considered an aquifer. As a result, the principal water supply aquifer within the vicinity of the site is considered to be the underlying bedrock formations. However, as discussed in Section 4.1, some local wells are completed in a deep gravel layer.

### 2.3.2 Bedrock Aquifers

The March formation and, where present, the overlying Oxford formation form the widely used Dolostone aquifer, which generally supplies adequate yields for domestic water supplies. Well yields in the Dolostone aquifer have been reported between 45 and 680 L/min. Groundwater flow within the Dolostone aquifer is controlled predominantly by fractures. In addition, the March formation, which contains sandstone interbeds, tends to yield more water than the Oxford formation, which contains shale interbeds (MRSPR, 2008), although the upper Oxford can be highly transmissive.

# 3.0 SITE SPECIFIC GEOLOGY AND HYDROGEOLOGY

# 3.1 General

Golder completed a geotechnical investigation at this site in 2016, which included 15 boreholes advanced across the site. Golder subsequently completed an additional geotechnical investigation at the site in 2018 and 2019 in order to provide geotechnical input to the detailed design; this investigation included 4 boreholes advanced across the site.

Based on a review of the geotechnical investigation results and published geological mapping, the subsurface conditions at the site are interpreted to consist of a layer of topsoil/fill, overlying a thick deposit of sensitive silty clay, extending to about 8 to 15 metres depth. The clay deposit is underlain by a deposit of glacial till, followed by dolostone bedrock. Borehole logs from both Golder investigations are provided as Attachment 1, and borehole locations are indicated on Figure 1. Note that no soil sampling was carried out in boreholes 19-01 and 19-02 which were advanced to confirm the bedrock depth at these locations.

# 3.2 Site Specific Geology

### Topsoil and Fill

Topsoil exists at the ground surface at all of the borehole locations. At the borehole locations, the topsoil thickness ranges from about 50 to 760 millimetres, but more typically between 80 and 150 millimetres.

A layer of fill exists below the topsoil at all of the borehole locations, except boreholes BH16-12 and BH16-15. The fill extends down to depths ranging from about 0.6 to 2.3 metres, but more typically between 0.6 to 0.8 metres, below the existing ground surface. The fill generally consists of silty sand to sandy silt with varying amounts of gravel, cobbles, rootlets, and organic matter.

### Silty Clay to Clay

At all of the borehole locations, the topsoil and fill are underlain by a deposit of sensitive marine silty clay from the previous Champlain Sea that covered much of the Ottawa area.

The upper portion of the silty clay has generally been weathered to a grey brown crust and extends to depths ranging from about 4.6 to 7.6 metres below the existing ground surface. The full depth of the silty clay in boreholes 16-09 and 16-12 has been weathered to a grey brown crust and extends to depths of about 4.0 and 5.3 metres below the ground surface, respectively.

The silty clay below the depth of weathering is grey in colour. Where fully penetrated, the unweathered silty clay extends to depths ranging from about 8.5 to 15.3 metres below the existing ground surface.

### **Glacial Till**

At all of the borehole locations, there exists a thick deposit of glacial till beneath the silty clay. The glacial till typically consists of a heterogeneous mixture of gravel, cobbles, and boulders in a matrix of sandy silt to silty sand with trace to some clay. This deposit was fully penetrated only in borehole 18-02, where it extends to a depth of about 25.9 metres below the existing ground surface. Where not fully penetrated, the glacial till was proven to depths ranging from about 5.9 to 29 metres below the existing ground surface.

### **Clayey Silt**

A thin deposit of clayey silt was encountered below the glacial till at the location of borehole 18-02. The layer is 0.6 metre in thickness and extends down to a depth of 26.5 metres below the ground surface.

### Gravel

A deposit of gravel was encountered below the clayey silt at the location of borehole 18-02. The layer is 1.5 metre in thickness and extends down to a depth of about 28 metres below the ground surface.

### Bedrock

Practical refusal to augering was encountered in boreholes 16-01, 16-03, and 16-06 at depths ranging from about 19.0 to 26.4 metres below the existing ground surface. Auger refusal could indicate boulders within the glacial till or the bedrock surface.

Boreholes 18-02, 19-01, and 19-02 were extended into the underlying bedrock using rotary diamond drilling techniques. These boreholes were extended to about 2.1 to 5.2 metres into the bedrock. The recovered bedrock cores from these locations consist of fresh, thinly to medium bedded, light to medium grey, sandy dolostone or dolostone bedrock. The following table summarizes the auger refusal and bedrock depths and elevations encountered at the site.

Borehole Number	Ground Surface Elevation (metres)	Elevation of Bedrock or Auger Refusal (metres)	Depth of Bedrock or Auger Refusal (metres)
16-01	88.54	65.71 <sup>1</sup>	22.83 <sup>1</sup>
16-03	84.80	58.44 <sup>1</sup>	26.36 <sup>1</sup>
16-06	87.67	68.65 <sup>1</sup>	19.02 <sup>1</sup>
18-02	84.90	56.88	28.02
19-01	87.09	51.84	35.25
19-02	85.48	53.32	32.16

Notes:

<sup>1</sup> Auger Refusal

# 3.3 Hydrogeology

Standpipe piezometers were sealed into boreholes 16-04, 16-07, 16-10, 16-12, and 16-15 to allow for subsequent measurement of the groundwater level at the site. The groundwater levels in these standpipe piezometers were measured on February 2, 2017 and December 19, 2018. The following table summarizes the measured groundwater levels.

Borehole Number	Ground Surface Elevation (metres)	Strata	Groundwater Level Depth on 02/02/2017 (metres)	Groundwater Level Elevation on 02/02/2017 (metres)	Groundwater Level Depth on 19/12/2018 (metres)	Groundwater Level Elevation on 19/12/2018 (metres)
16-04	83.65	Silty Clay	1.14	82.51	1.05	82.60
16-07	84.57	Silty Clay	1.27	83.30	0.28	84.29
16-10	86.31	Glacial Till	2.78	83.53	0.73	85.58
16-12	87.91	Silty Clay / Glacial Till	0.71	87.20	0.74	87.17
16-15	86.75	Silty Clay	3.22	83.53	-	-

It should be noted that groundwater levels are expected to fluctuate seasonally. Higher groundwater levels are expected during wet periods of the year, such as spring and fall.

# 4.0 POTENTIAL IMPACTS TO EXISTING GROUNDWATER USERS

It is understood that all structures will be of slab on grade construction (i.e., no basement). The excavations for shallow foundations, if used, will either be within the engineered fill or through the engineered fill and into the very stiff to stiff weathered silty clay crust. Excavations for site services may extend slightly into the glacial till in the area around boreholes 16-09 and 16-12. Minimal dewatering is anticipated to be required for pile foundations.

The maximum depth of excavations for site servicing and shallow foundations is assumed to be approximately 5 metres below ground surface. The water table was found to be at an average of 1.3 metres below ground surface; therefore, dewatering during construction of site services and shallow foundations will require approximately 3.7 metres of dewatering. Assuming the maximum hydraulic conductivity of the dewatered silty clay

to clay is 10<sup>-6</sup> metres/second, the maximum radius of influence associated with this dewatering is approximately 40 metres (at a distance of 40 metres, less than 0.1 metre of water level drawdown would occur after 30 days of dewatering). To ensure a conservative assessment of potential impacts to groundwater users, existing groundwater users within 200 metres of the site were considered.

# 4.1 Nearby Groundwater Supply Wells

There are a total of 27 well records in the WWIS database located within 200 metres of the site (see Figure 1). Of these, 17 well records correspond to water supply wells, 7 to well abandonment records and 3 to test holes. Details regarding the water supply wells are presented in the following table.

Well ID	Depth of Well (m)	Depth to Static Water Level (m)	Depth to Water Found (m)	Available Drawdown (m)	Type of Well
1504662	57.9	2.4	57.3	55.5	Bedrock
1504663	90.8	2.4	42.6; 59.7; 89.9	88.4	Bedrock
1504664	53.3	2.1	53.3	51.2	Bedrock
1504665	23.8	7.6	18.3	16.2	Overburden (Gravel from 18.3 – 23.8 m)
1505930	42.7	6.4	38.1; 41.1	36.3	Bedrock
1505934	82.0	5.2	82.0	76.8	Bedrock
1505936	41.1	10.4	40.5	30.8	Bedrock
1512146	79.2	Not provided	24.3; 52.4; 78.6	Not calculated	Bedrock
1513522	15.2	3.7	14.3	11.6	Overburden (Gravel from 11.6 – 15.2 m)
1515365	83.2	6.1	54.9; 67.1	77.1	Bedrock
1516589	115.8	3.6	61.0; 67.1	112.2	Bedrock
1517095	68.0	9.1	24.4; 67.1	58.8	Bedrock
1519100	68.6	6.1	56.3; 67.1	62.5	Bedrock
1519500	36.6	9.1	35.1	27.4	Bedrock
1522199	19.2	2.5	16.2	16.7	Overburden (Gravel from 14.6 – 19.2 m)
1530599	25.0	4.0	24.7	21.0	Overburden (Sand and Gravel from 19.8 – 25.0 m)
7163245	152.4	2.3	102.4; 130.5; 138.7	150.1	Bedrock

Based on the well record information, there are 3 water supply wells located in the vicinity of the Carleton Lodge Long Term Care Home (Well IDs 1504664, 1505930 and 1516589, the last of which was drilled in 1978 to supply water to the lodge). However, the Carleton Lodge is now serviced by municipal water supply, and there are no residences corresponding to the other two well records. Therefore, these three well records are interpreted to no longer correspond to active water supply wells.

The remaining water supply wells are primarily located near the intersection of Woodroffe Avenue and Prince of Wales Drive, and along the southern half of Lodge Road. Based on aerial photographs, there are approximately 12 residences in these two areas that are likely served by private water supply wells. City of Ottawa infrastructure maps indicate that these areas are not serviced by municipal water supply. These wells include both bedrock wells and overburden wells, ranging in depth from 15.2 to 152.4 metres. At all of the wells (except Well ID 1505934), there is an extensive layer of clay and/or glacial till measuring at least 7 metres thick overlying the gravel or bedrock aquifer. The available drawdown in the wells, calculated as the difference between the static water level and the depth of the well, ranges from 11.6 to 150.1 metres. As previously mentioned, construction dewatering associated with typical site servicing and shallow foundations could temporarily lower the shallow water table by up to 3.7 metres; however, given the protective clay layer and the available drawdown in the supply wells, it is interpreted that this lowering would not negatively impact water supply. It is understood that there are no structures or land uses planned for the site that would permanently lower the groundwater levels in the area surrounding the site (i.e., deep drained foundations).

Based on the lack of anticipated impacts to water supply wells in the vicinity of the site during construction activities, a groundwater monitoring program is not recommended.

# 5.0 LIMITATIONS AND USE OF MEMORANDUM

This technical memorandum was prepared for the exclusive use of the Ottawa Police Service and Colliers Project Leaders. The technical memorandum, which specifically includes all tables, figures and appendices, is based on data gathered by Golder Associates Ltd., and information provided to Golder Associates Ltd. by others. The information provided by others has not been independently verified or otherwise examined by Golder Associates Ltd. to determine the accuracy or completeness. Golder Associates Ltd. has relied in good faith on this information and does not accept responsibility for any deficiency, misstatements, or inaccuracies contained in the information as a result of omissions, misinterpretation or fraudulent acts.

The services performed as described in this technical memorandum were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

Any use which a third party makes of this technical memorandum, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Golder Associates Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made, or actions taken based on this technical memorandum.

# 6.0 CLOSURE

We trust this submission satisfies the requirements for a desktop hydrogeological assessment of the Ottawa Police Service South Facility site that is to be located at 55 Lodge Road in Ottawa, Ontario. If you have any questions regarding this report, please contact the undersigned.

Loren Bekeris, M.Sc., P.Eng. *Environmental Engineer* 

Brian Byerley, M.Sc., P.Eng. *Principal, Senior Hydrogeologist* 

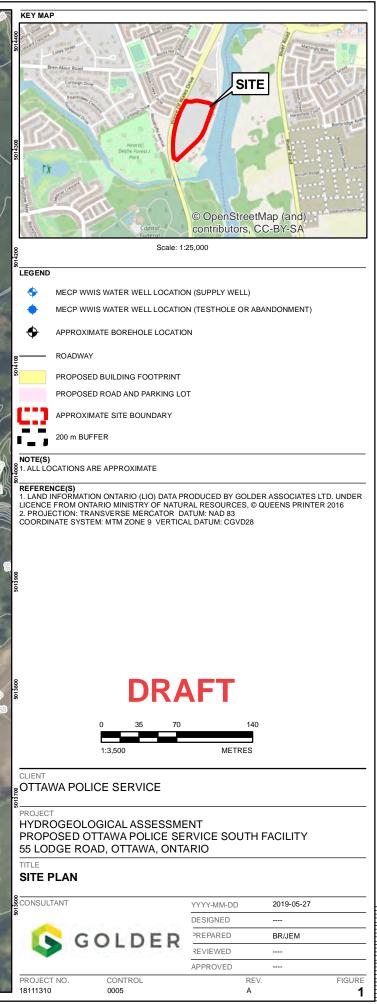
LEB/BTB/mvrd https://golderassociates.sharepoint.com/sites/34624g/deliverables/hydrogeology/desktop water well impact study/18111310-001-tm-reva-water well impact study-2905\_19.docx

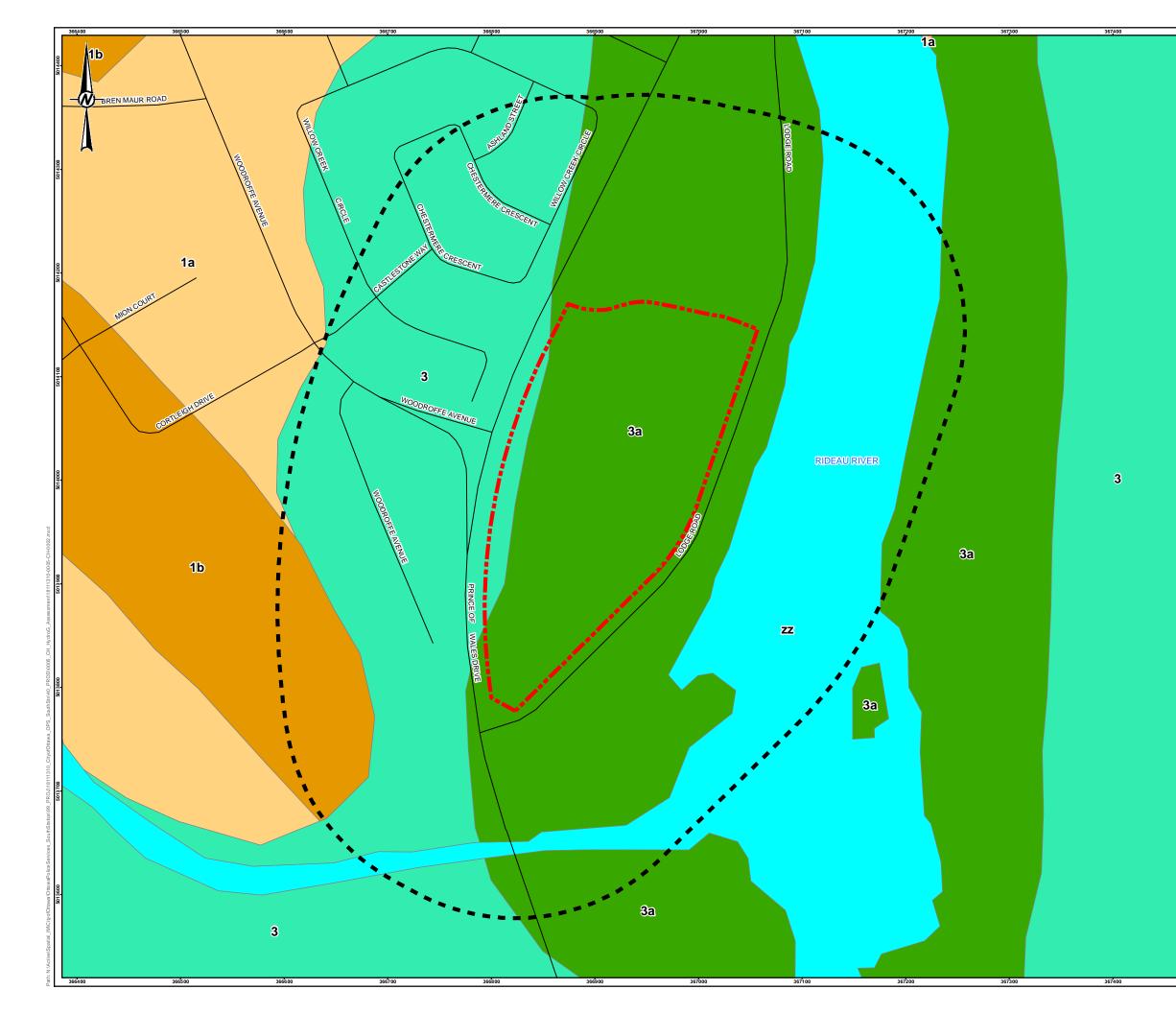
Attachments: Figure 1 – Site Plan Figure 2 – Surficial Geology Figure 3 – Drift Thickness Attachment 1 – Borehole Logs

References

Mississippi-Rideau Source Protection Region. 2008. Water Characterization Report, Preliminary Draft. March 2008.

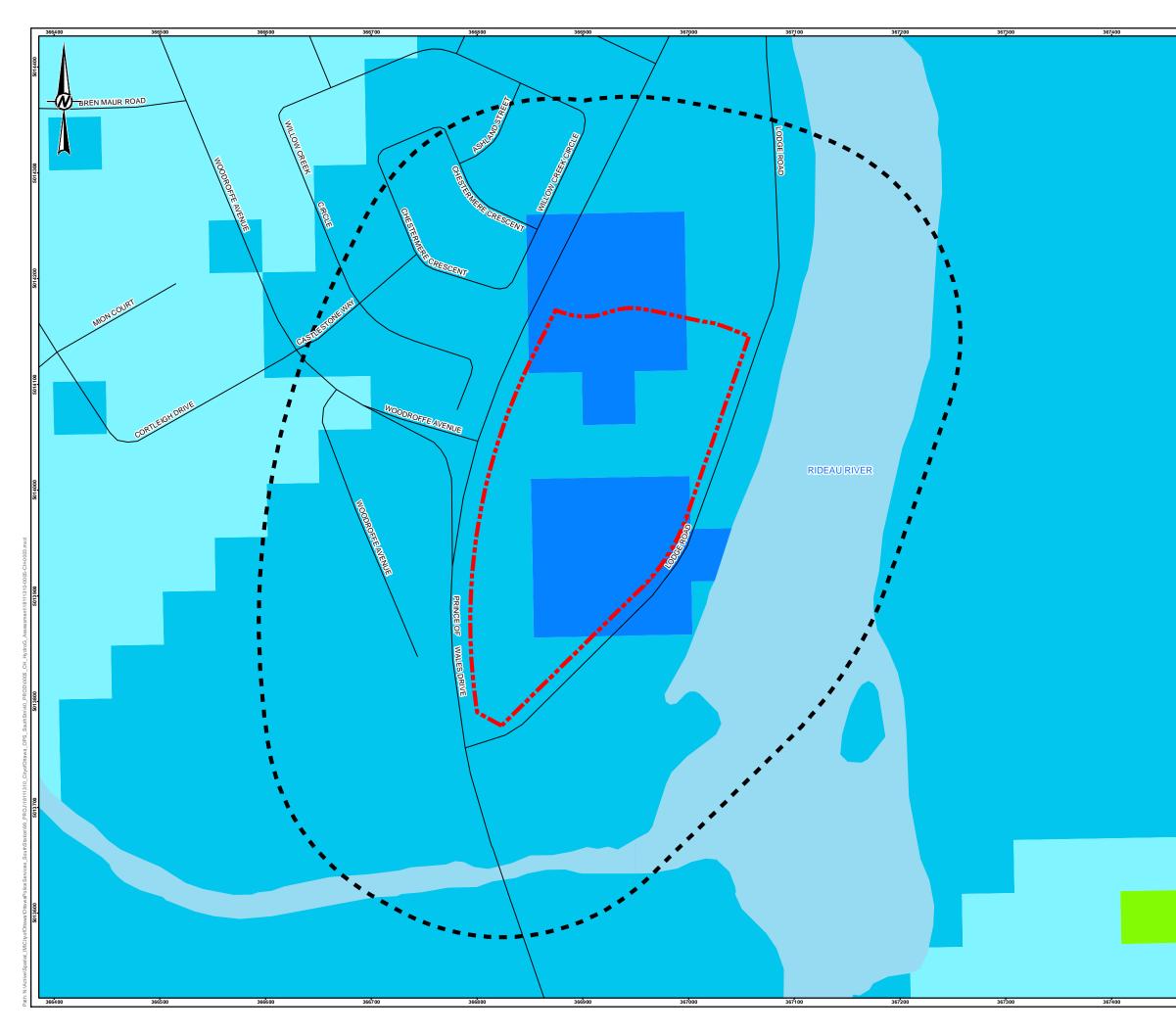






LEGEND			
4400	ROADWAY		
2	APPROXIMATE SITE BOUNDARY		
• = •	200 m BUFFER		
	3. OFFSHORE MARINE DEPOSITS: C	LAY, SILTY CLAY & S	ILT
	3a. OFFSHORE MARINE DEPOSITS:	CLAY, SILT UNDERLY	ING EROSIONAL
	TERRACES	_	
8	1a. TILL, PLAIN WITH LOCAL RELIEF	<5 m	
5014300	1b. TILL, DRUMLINIZED		
	zz. WATERBODY		
NOTE(S)			
	CATIONS ARE APPROXIMATE		
REFERE	NCE(S)		
1. BÉLAN SURVEY	IGER, J. R. 2008 URBAN GEOLOGY OF OF CANADA, OPEN FILE 5311, 1 DVD.	THE NATIONAL CAP	ITAL AREA, GEOLOGICAL
	NFORMATION ONTARIO (LIO) DATA PI FROM ONTARIO MINISTRY OF NATU		R ASSOCIATES LTD. UNDER
ຣູັ່ 3. PROJE	CTION: TRANSVERSE MERCATOR D	ATUM: NAD 83	QUEENO FRINTEN 2010
COORDI	NATE SYSTEM: MTM ZONE 9 VERTICA	AL DATUM: CGVD28	
5014100			
ũ			
5014000			
501			
8			
5013900			
5013800	DRA	<b>VEL</b>	
en E			
	0 35 70	140	
	1:3,500	METRES	
CLIENT	WA POLICE SERVICE		
¦≊OTTA\	WA PULICE SERVICE		
PROJEC	Г		
	, OGEOLOGICAL ASSESSME	ENT	
	OSED OTTAWA POLICE SE		FACILITY
	DGE ROAD, OTTAWA, ONT	ARIO	
TITLE			
SURF	ICIAL GEOLOGY		
8 CONSUL	ταντ	10/10/1411 55	2010 05 27
		YYYY-MM-DD	2019-05-27
1	11010 M 10100	DESIGNED	
	GOLDER	PREPARED	BR/JEM
		REVIEWED	
		APPROVED	
PROJEC <sup>*</sup> 18111310		REV A	7. FIGURE <b>2</b>
			۷

25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEE



LEGEND				
e ROAD	WAY			
S WATE	RBODY			
APPR	OXIMATE SITE BOUNDARY			
200 m	BUFFER			
TREND IN DEPT	H TO BEDROCK (METRES)			
5 to 10	)			
10 to 7				
15 to 2				
25 to 9	50			
NOTE(S) 1. ALL LOCATION	NS ARE APPROXIMATE			
SURVEY OF CAI 22. LAND INFORM LICENCE FROM 3. PROJECTION	ER, J. R., URBAN GEOLOGY OF VADA, OPEN FILE D3256, 2001 IATION ONTARIO (LIO) DATA PF ONTARIO MINISTRY OF NATUF TRANSVERSE MERCATOR D/ YSTEM: MTM ZONE 9 VERTICA	RODUCED BY GOLDE AL RESOURCES, © ( TUM: NAD 83	R ASSOCIATES LTD. UI	NDER
50 i i 100				
5014000				
5613900 2				
5013400	0 35 70 1:3,500	140 METRES		
PROJECT HYDROGE( PROPOSEE	OLICE SERVICE DLOGICAL ASSESSME O OTTAWA POLICE SE ROAD, OTTAWA, ONTA	RVICE SOUTH	FACILITY	
		YYYY-MM-DD	2019-05-27	
1.000		DESIGNED		
	GOLDER	PREPARED	BR/JEM	
		APPROVED		
PROJECT NO. 18111310	CONTROL 0005	REV	. Fl	GURE

Organic or Inorganic	Soil Group	Туре	of Soil	Gradation or Plasticity	Cu	$=\frac{D_{60}}{D_{10}}$		$Cc = \frac{(D)}{D_{10}}$	$\frac{30^{2}}{xD_{60}}$	Organic Content	USCS Group Symbol	Group Name		
		Gravels (>50% by mass of coarse fraction is coarse fraction is generating (so than 4.75 mm) (so than 4		Poorly Graded		<4		≤1 or :	≥3		GP	GRAVEL		
(ss	5 mm)			EL2 sines (EL2 fines (EL2 Sines (EL2) (EL		tines (12%) 120 mass (120 mass)		Well Graded		≥4		1 to 3	3	
by mae	SOILS	GRAVELS 60% by mas arse fractior er than 4.75	Gravels with	Below A Line			n/a				GM	SILTY GRAVEL		
SANIC S30%	AINED ger tha	(>5 co large	>12% fines (by mass)	Above A Line			n/a			10001	GC	CLAYEY GRAVEL		
INORG	SE-GR/ ss is lar	of is mm)	Sands with	Poorly Graded		<6		≤1 or	≥3	≤30%	SP	SAND		
INORGANIC (Organic Content ≲30% by mass)	COARSE-GRAINED SOILS (>50% by mass is larger than 0.075 mm)	SANDS 6 by mass se fraction than 4.75	≤12% fines (by mass)	Well Graded		≥6		1 to	3		SW	SAND		
(O	(>50%	SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	Sands with >12%	Below A Line			n/a				SM	SILTY SAND		
		(≳t cc smal	fines (by mass)	Above A Line			n/a				SC	CLAYEY SAND		
Organic	Soil		-	Laboratory		1	Field Indica	ators		Organic	USCS Group	Primary		
or Inorganic	Group	Туре	of Soil	Tests	Dilatancy	Dry Strength	Shine Test	Thread Diameter	Toughness (of 3 mm thread)	Content	Symbol	Name		
				Linuted Linute	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	<5%	ML	SILT		
(ss	5 mm)		ow)	Liquid Limit <50	Slow	None to Low	Dull	3mm to 6 mm	None to low	<5%	ML	CLAYEY SILT		
by ma	OILS an 0.07	SILTS	on Plasticity Chart below)		Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT		
INORGANIC ≎ontent ≤30%	FINE-GRAINED SOILS mass is smaller than 0.	SILTS SILTS (Non-Plastic or Pl and below A-Line on Plasticity Chart below)		Liquid Limit	Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	<5%	MH	CLAYEY SILT		
INORC	-GRAII s is sm	CN)		≥50	None	Medium to high	Dull to slight	1 mm to 3 mm	Medium to high	5% to 30%	ОН	ORGANIC SILT		
INORGANIC (Organic Content ≤30% by mass)	FINE-GRAINED SOILS (≥50% by mass is smaller than 0.075 mm)	olot	e on	Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	0% to	CL	SILTY CLAY		
Ō	(≥50%	CLAYS	Plasticity Chart below)	Liquid Limit 30 to 50	None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium	30%	CI	SILTY CLAY		
	-		Plas	Liquid Limit ≥50	None	High	Shiny	<1 mm	High	(see Note 2)	СН	CLAY		
			mineral soil tures			•			•	30% to 75%		SILTY PEAT, SANDY PEAT		
HIGHLY ORGANIC SOILS	Content >30% by mass)	may con mineral so	nantly peat, Itain some Il, fibrous or Nous peat							75% to 100%	PT	PEAT		
40 30 (ld) xappus Apstrated 10 7 4 8 0	ITY CLAY-CLAY	See Note 1)	AY	SILTY CLAY CLAY CLAY CLAY CLAY CLAY CLAY CLAY	CLAY CH CLAYEY S ORGANIC 3			a hyphen, For non-cc the soil h transitiona gravel. For cohess liquid limit of the plass <b>Borderlin</b> separated A borderlin has been transition	for example, bhesive soils, as between il material be ive soils, the and plasticity sticity chart (s <b>e Symbol</b> — by a slash, fine symbol sh identified as between simil	GP-GM, S the dual sy 5% and etween "c dual symb r index val ee Plastici A borderl or example ould be us s having p ar materia	two symbols = SW-SC and Cl ymbols must b 12% fines (i.e lean" and "di bol must be us ues plot in the ty Chart at left ine symbol is e, CL/Cl, GM/S sed to indicate properties that ls. In addition a range of simi	L-ML. e used when e. to identify rty" sand or sed when the c CL-ML area t). two symbols SM, CL/ML. e that the soil t are on the , a borderline		

### The Golder Associates Ltd. Soil Classification System is based on the Unified Soil Classification System (USCS)

Note 1 – Fine grained materials with PI and LL that plot in this area are named (ML) SILT with slight plasticity. Fine-grained materials which are non-plastic (i.e. a PL cannot be measured) are named SILT. Note 2 – For soils with <5% organic content, include the descriptor "trace organics" for soils with between 5% and 30% organic content include the prefix "organic" before the Primary name.

### ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

#### PARTICI E SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

#### MODIFIERS FOR SECONDARY AND MINOR CONSTITUENTS

Percentage by Mass	Modifier
>35	Use 'and' to combine major constituents ( <i>i.e.</i> , SAND and GRAVEL)
> 12 to 35	Primary soil name prefixed with "gravelly, sandy, SILTY, CLAYEY" as applicable
> 5 to 12	some
≤ 5	trace

#### PENETRATION RESISTANCE

#### Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.). Values reported are as recorded in the field and are uncorrected.

#### **Cone Penetration Test (CPT)**

An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm<sup>2</sup> pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); Nd: The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

- PH: Sampler advanced by hydraulic pressure
- PM: Sampler advanced by manual pressure
- WH: Sampler advanced by static weight of hammer
- WR: Sampler advanced by weight of sampler and rod

Compactness <sup>2</sup>				
Term	SPT 'N' (blows/0.3m) <sup>1</sup>			
Very Loose	0 to 4			
Loose	4 to 10			
Compact	10 to 30			
Dense	30 to 50			
Verv Dense	>50			

NON-COHESIVE (COHESIONLESS) SOILS

- 1. SPT 'N' in accordance with ASTM D1586, uncorrected for the effects of overburden pressure.
- Definition of compactness terms are based on SPT 'N' ranges as provided in Terzaghi, Peck and Mesri (1996). Many factors affect the recorded SPT 'N' 2. value, including hammer efficiency (which may be greater than 60% in automatic trip hammers), overburden pressure, groundwater conditions, and grainsize. As such, the recorded SPT 'N' value(s) should be considered only an approximate guide to the soil compactness. These factors need to be considered when evaluating the results, and the stated compactness terms should not be relied upon for design or construction.

Field Moisture Condition

Term	Description				
Dry	Soil flows freely through fingers.				
Moist	Soils are darker than in the dry condition and may feel cool.				
Wet	As moist, but with free water forming on hands when handled.				
	Dry Moist				

SAMPLES	
AS	Auger sample
BS	Block sample
CS	Chunk sample
DD	Diamond Drilling
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
GS	Grab Sample
MC	Modified California Samples
MS	Modified Shelby (for frozen soil)
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
то	Thin-walled, open - note size (Shelby tube)
TP	Thin-walled, piston – note size (Shelby tube)
WS	Wash sample

### SOIL TESTS

SOIL 12515	
w	water content
PL, w <sub>p</sub>	plastic limit
LL, wL	liquid limit
С	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test <sup>1</sup>
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement <sup>1</sup>
D <sub>R</sub>	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity
М	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO <sub>4</sub>	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
Y	unit weight

Tests anisotropically consolidated prior to shear are shown as CAD, CAU. 1.

	COHESIVE SOILS	
	Consistency	
Term	Undrained Shear Strength (kPa)	SPT 'N' <sup>1,2</sup> (blows/0.3m)
Very Soft	<12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.

SPT 'N' values should be considered ONLY an approximate guide to consistency; for sensitive clays (e.g., Champlain Sea clays), the N-value approximation for consistency terms does NOT apply. Rely on direct 2 measurement of undrained shear strength or other manual observations.

Water Content													
Term Description													
w < PL	Material is estimated to be drier than the Plastic Limit.												
w ~ PL	Material is estimated to be close to the Plastic Limit.												
w > PL	Material is estimated to be wetter than the Plastic Limit.												

Unless otherwise stated, the symbols employed in the report are as follows:

I.	GENERAL	(a) w	Index Properties (continued) water content
π	3.1416	w <sub>l</sub> or LL	liquid limit
ln x	natural logarithm of x	w <sub>p</sub> or PL	plastic limit
log <sub>10</sub>	x or log x, logarithm of x to base 10 acceleration due to gravity	l₀ or PI NP	plasticity index = (w <sub>l</sub> – w <sub>p</sub> ) non-plastic
g t	time	Ws	shrinkage limit
		IL	liquidity index = $(w - w_p) / I_p$
		lc	consistency index = $(w_l - w) / I_p$
		emax	void ratio in loosest state
		emin	void ratio in densest state
П.	STRESS AND STRAIN	ID	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)
	shear strain	(b)	Hydraulic Properties
$\gamma \Delta$	change in, e.g. in stress: $\Delta \sigma$	(b) h	hydraulic head or potential
2 8	linear strain	q	rate of flow
εv	volumetric strain	V	velocity of flow
η	coefficient of viscosity	i	hydraulic gradient
υ	Poisson's ratio	k	hydraulic conductivity
σ	total stress		(coefficient of permeability)
σ	effective stress ( $\sigma' = \sigma - u$ )	j	seepage force per unit volume
$\sigma'_{vo}$	initial effective overburden stress		
σ1, σ2, σ3	principal stress (major, intermediate, minor)	(c)	Consolidation (one-dimensional)
		C <sub>c</sub>	compression index
σoct	mean stress or octahedral stress		(normally consolidated range)
	$= (\sigma_1 + \sigma_2 + \sigma_3)/3$	Cr	recompression index
τ	shear stress		(over-consolidated range)
u	porewater pressure	Cs	swelling index
E	modulus of deformation	Cα	secondary compression index
G K	shear modulus of deformation bulk modulus of compressibility	mv Cv	coefficient of volume change coefficient of consolidation (vertical
IX .			direction)
		Ch	coefficient of consolidation (horizontal direction)
		Tv	time factor (vertical direction)
III.	SOIL PROPERTIES	U	degree of consolidation
(2)	Index Properties	σ′ <sub>P</sub> OCR	pre-consolidation stress
<b>(a)</b> ρ(γ)	Index Properties bulk density (bulk unit weight)*	OCK	over-consolidation ratio = $\sigma'_p / \sigma'_{vo}$
ρ(γ) ρ <sub>d</sub> (γ <sub>d</sub> )	dry density (dry unit weight)	(d)	Shear Strength
ρω(γω)	density (unit weight) of water	τρ, τr	peak and residual shear strength
ρs(γs)	density (unit weight) of solid particles	φ' δ	effective angle of internal friction
γ'	unit weight of submerged soil	δ	angle of interface friction
	$(\gamma' = \gamma - \gamma_w)$	μ	coefficient of friction = tan $\delta$
D <sub>R</sub>	relative density (specific gravity) of solid	C'	effective cohesion
-	particles ( $D_R = \rho_s / \rho_w$ ) (formerly $G_s$ )	Cu, Su	undrained shear strength ( $\phi = 0$ analysis)
e	void ratio porosity	p n'	mean total stress $(\sigma_1 + \sigma_3)/2$
n S	degree of saturation	p' q	mean effective stress $(\sigma'_1 + \sigma'_3)/2$ $(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
0		Ч Qu	compressive strength ( $\sigma_1 - \sigma_3$ )
		St	sensitivity
* Danai	ty oumbol is a Unit weight symbol is	Notes: 1	
	ty symbol is $\rho$ . Unit weight symbol is $\gamma$ e $\gamma = \rho g$ (i.e. mass density multiplied by	Notes: 1	$\tau = c' + \sigma' \tan \phi'$ shear strength = (compressive strength)/2
	eration due to gravity)	-	

# LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY

#### WEATHERINGS STATE

Fresh: no visible sign of rock material weathering.

Faintly weathered: weathering limited to the surface of major discontinuities.

Slightly weathered: penetrative weathering developed on open discontinuity surfaces but only slight weathering of rock material.

Moderately weathered: weathering extends throughout the rock mass but the rock material is not friable.

Highly weathered: weathering extends throughout rock mass and the rock material is partly friable.

Completely weathered: rock is wholly decomposed and in a friable condition but the rock and structure are preserved.

### **BEDDING THICKNESS**

Description	Bedding Plane Spacing
Very thickly bedded	Greater than 2 m
Thickly bedded	0.6 m to 2 m
Medium bedded	0.2 m to 0.6 m
Thinly bedded	60 mm to 0.2 m
Very thinly bedded	20 mm to 60 mm
Laminated	6 mm to 20 mm
Thinly laminated	Less than 6 mm

#### JOINT OR FOLIATION SPACING

Description	Spacing
Very wide	Greater than 3 m
Wide	1 m to 3 m
Moderately close	0.3 m to 1 m
Close	50 mm to 300 mm
Very close	Less than 50 mm

#### **GRAIN SIZE**

<u>Term</u>	<u>Size*</u>
Very Coarse Grained	Greater than 60 mm
Coarse Grained	2 mm to 60 mm
Medium Grained	60 microns to 2 mm
Fine Grained	2 microns to 60 microns
Very Fine Grained	Less than 2 microns

Note: \* Grains greater than 60 microns diameter are visible to the naked eye.

### CORE CONDITION

#### **Total Core Recovery (TCR)**

The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run.

#### Solid Core Recovery (SCR)

The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.

#### **Rock Quality Designation (RQD)**

The percentage of solid drill core, greater than 100 mm length, as measured along the centerline axis of the core, relative to the length of the total core run. RQD varies from 0% for completely broken core to 100% for core in solid segments.

#### **DISCONTINUITY DATA**

#### Fracture Index

A count of the number of naturally occuring discontinuities (physical separations) in the rock core. Mechanically induced breaks caused by drilling are not included.

#### **Dip with Respect to Core Axis**

The angle of the discontinuity relative to the axis (length) of the core. In a vertical borehole a discontinuity with a 90° angle is horizontal.

#### **Description and Notes**

An abbreviation description of the discontinuities, whether naturally occurring separations such as fractures, bedding planes and foliation planes and mechanically separated bedding or foliation surfaces. Additional information concerning the nature of fracture surfaces and infillings are also noted.

Abbreviations		
JN Joint	PL	Planar
FLT Fault	CU	Curved
SH Shear	UN	Undulating
VN Vein	IR	Irregular
FR Fracture	K	Slickensided
SY Stylolite	PO	Polished
BD Bedding	SM	Smooth
FO Foliation	SR	Slightly Rough
CO Contact	RO	Rough
AXJ Axial Joint	VR	Very Rough
KV Karstic Void		

- MB Mechanical Break

# RECORD OF BOREHOLE: 16-01

BORING DATE: December 2, 2017

SHEET 1 OF 3

DATUM: CGVD28

LOCATION: N 5014141.2 ;E 366882.1 SAMPLER HAMMER, 64kg; DROP, 760mm

METRES	DOH.	SOIL PROFILE	<b>.</b>		SAI	MPLES	DYNAMIC RESISTAN	PENETRA	NS/0.3m	R.	HYDRAU k	LIC CONI , cm/s	JUCTIVI	ΙΫ́,	NGP	PIEZOMETER
TRES	BORING METHOD		STRATA PLOT		н	TYPE BLOWS/0.30m	20	40	60	80	10 <sup>-6</sup>		10 <sup>-4</sup>	10 <sup>-3</sup>	ADDITIONAL LAB. TESTING	OR STANDPIPE
ME	RING	DESCRIPTION	ATA	ELEV. DEPTH	NUMBER	TYPE WS/0.3	SHEAR S Cu, kPa	TRENGTH	nat V. rem V. (	+ Q-● ∌ U-O		ER CON	TENT PE		NDDI 1. TI	INSTALLATION
	BOF		STR/	(m)	ž	BLOI	20	40	60	80	Wp H 20	40	⊖ <u>vv</u> 60	WI 80		
		GROUND SURFACE		88.54												
0		FILL/TOPSOIL - (ML) sandy SILT;		0.00												
		brown; moist FILL - (SM) SILTY SAND, some gravel;	1	0.15	1	SS 8										
		brown, contains roots; non-cohesive, moist, loose														
				87.78 0.76												
1		FILL - (SP/SM) gravelly SAND to SILTY SAND; brown; non-cohesive, moist,		0.76												
		compact			2	SS 14										
				87.02												
		FILL - (SM/GM) SILTY SAND and		1.52												
		GRAVEL; brown; non-cohesive, wet, compact			3	SS 14										
2																
		(CI/CH) SILTY CLAY to CLAY trace		86.26 2.28												
		(CI/CH) SILTY CLAY to CLAY, trace sand; brown (WEATHERED CRUST); cohesive, w>PL, very stiff to stiff														
					4	SS 10										
3				⊢												
Ĵ				F												
					5	SS 4										
				Ļ												
4							Ð			+						
								Ð		126						
	(me															
	200 mm Diam (Hollow Stem)			ſ												
5	Power Auger				6	SS 4										
Ĩ	Diam			Ļ												
	um 0															
	00								+							
							Œ	,	+							
6				82.44												
		(CI/CH) SILTY CLAY to CLAY, trace sand; grey; cohesive, w>PL, firm		6.10												
					7	SS 1										
				⊢												
7							•	+								
·								'								
							⊕	+								
		(CI/CH) SILTY CLAY to CLAY, some		80.92 7.62												
		sand; grey, contains silt seams; cohesive, w>PL, firm			8	SS PH										
8		UNICONC, W-TL, IIIII			Ů	33   PH										
				ŀ												
		(SM) gravelly SILTY SAND; grey,		80.08 8.46												
		contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet,														
9		compact														
~				⊢												
					9	SS 17										
					-											
				F												
10	_ L		-1471	·	-+	-   -	┣━┽-		-+	-	<u>+</u> − −  −	· – <del>†</del> -	-	-+-	-  -	
		CONTINUED NEXT PAGE														
DFI	этн	SCALE					Â								10	GGED: DWM
								Gold	er iates							CKED: EDW

### LOCATION: N 5014141.2 ;E 366882.1

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: 16-01

BORING DATE: December 2, 2017

SHEET 2 OF 3

DATUM: CGVD28

ц Д (л	BORING METHOD	SOIL PROFILE			SAM	IPLES	DYNAM RESIST				λ,		AULIC CO k, cm/s				AL	PIEZOMETER
METRES	G ME		STRATA PLOT	.EV.	i BER	TYPE BLOWS/0.30m	20 SHEAR				30 · O - •	10 W	) <sup>-6</sup> 10 ATER C0			10 <sup>-3</sup>	ADDITIONAL LAB. TESTING	OR STANDPIPE
Ξ	ORIN	DESCRIPTION	RATA	PTH m)	NUMBER	OWS/0.3	Cu, kPa	OTILIN	i I	em V. €	Q - • U - O					WI	ADD LAB.	INSTALLATION
	ñ			,		BL	20	) 41	0 6	50 8	30	2				80	+	
10		CONTINUED FROM PREVIOUS PAGE (SM) gravelly SILTY SAND; grey,	- 9782	-+	+												+	
		contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet,																
		compact																
11																		
12																		
13																		
14																		
	ĉ																	
	Power Auger 200 mm Diam. (Hollow Stem)																	
	Power Auger Diam. (Hollov																	
15	ower. Diam.																	
	mm [																	
	20(																	
16																		
																		$\overline{\Delta}$
17																		
18																		
10																		
19																		
20	_L	CONTINUED NEXT PAGE	_12292	-	-+		$\vdash -+$			+	<b> </b>	+		+		+	-  -	
	ידע פ	GCALE					Â			I	1			1	1			GGED: DWM
1:4							(7)	GC Ass	olde	r								CKED: EDW

### LOCATION: N 5014141.2 ;E 366882.1

SAMPLER HAMMER, 64kg; DROP, 760mm

### RECORD OF BOREHOLE: 16-01

BORING DATE: December 2, 2017

SHEET 3 OF 3

DATUM: CGVD28

а ЛЕ	BORING METHOD	SOIL PROFILE	<b> </b> –	r –	SA	MPL		DYNAMI RESISTA				Ì,	HYDRAU			ING	PIEZOMETER
DEPTH SCALE METRES	3 ME	_	STRATA PLOT	ELEV.	3ER	Щ	BLOWS/0.30m			60 			10 <sup>-6</sup>	 ) <sup>-5</sup> 1 DNTENT	10 <sup>-3</sup>	LAB. TESTING	OR STANDPIPE INSTALLATION
WE	JRINC	DESCRIPTION	RATA	DEPTH	NUMBER	ТҮРЕ	/SWO	SHEAR S Cu, kPa	JIRENG	ren	. v. + n V. ⊕	Ū- O			WI	ADD -AB.	INSTALLATION
-	BC		STF	(m)	Ĺ		BLC	20	40	60	80	0	20		80		
· 20		CONTINUED FROM PREVIOUS PAGE	-														
-		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet,															
		(GLACIAL TILL); non-cohesive, wet, compact															
	(L																
21	v Ster																
	Auger (Hollo																
	ower Diam.																
	Power Auger 200 mm Diam. (Hollow Stem)																
22	200																
		End of Borehole		65.71 22.83													
23		Auger Refusal															
24																	
25																	
26																	
27																	
21																	
28																	
29																	
30																	
DE	ртн 9	CALE						Â								10	OGGED: DWM
	50								Gol	lder							ECKED: EDW

#### LOCATION: N 5014138.6 ;E 366933.0

SAMPLER HAMMER, 64kg; DROP, 760mm

### RECORD OF BOREHOLE: 16-02

BORING DATE: December 2, 2017

SHEET 1 OF 2

DATUM: CGVD28

	ПОН	SOIL PROFILE						DYNAMIC PE RESISTANCE	NE IRATI E, BLOWS		Ì,		k, cm/s				RGR	PIEZOMETER
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	20 I SHEAR STRI Cu, kPa		1	30 Q - ● U - ○	w	ATER C		T PERCE		ADDITIONAL LAB. TESTING	OR STANDPIPE INSTALLATION
-	ä	GROUND SURFACE	ST				В	20	40	50 E	30					80	+ +	
0		FILL/TOPSOIL - (SM) sandy SILT, some gravel; dark brown; non-cohesive, moist		85.86	1	SS	8											
1		FILL - (SM/GM) SILTY SAND and GRAVEL; brown; non-cohesive, wet, compact		85.10 0.76	2	ss	19											
2		(CI/CH) SILTY CLAY to CLAY, trace sand; grey brown with red mottling (WEATHERED CRUST); cohesive, w>PL, very stiff to stiff		84.34 1.52	3	ss	4						0					Ā
					4	ss	5						0					
3							Ĩ											
					5	SS	4						0					
4	ц (ц							⊕ ⊕			++							
5	Power Auger mm Diam. (Hollow Stem)			80.68	6	SS	2							0				
6	200 mm [	(CI/CH) SILTY CLAY to CLAY; grey; Cohesive, w>PL, firm to stiff		5.18				⊕ ⊕	+++									
0					7	SS	PH							0				
7								⊕ ⊕	+									
8					8	ss v	WR							0				
								⊕	+									
9					9	SS N	WR							0				
10		CONTINUED NEXT PAGE					_									+		
DEI	PTH S	CALE			I	<u> </u>			olde: socia	, 	1		1	1	1	1	LO	GGED: DWM

### LOCATION: N 5014138.6 ;E 366933.0

SAMPLER HAMMER, 64kg; DROP, 760mm

### RECORD OF BOREHOLE: 16-02

BORING DATE: December 2, 2017

SHEET 2 OF 2

DATUM: CGVD28

<b>—</b>	Т	Q	SOIL PROFILE		s	AMPL	.ES	DYNAM		ETRATIO	DN .	>	HYDRA	AULIC C	ONDUCT	IVITY,			
DEPTH SCALE	2	BORING METHOD		5	-			RESIST				30					0 <sup>-3</sup>	ADDITIONAL LAB. TESTING	PIEZOMETER OR
TH SC		IG ME	DESCRIPTION			TYPE	\$/0.30			1	1	Q - • U - O			ONTENT			DITIO	STANDPIPE
DEP	Z	ORIN		STRATA PLOT (m) (m)	H⊇	≿	BLOWS/0.30m	Cu, kPa	а	r	em V. 🕀	U- O	Wp		W		WI	ADI LAB.	INSTALLATION
	_	В		<u>اللا</u>	_		В	2	0 4	ю е	i0 8	30 					10 		
-	10		CONTINUED FROM PREVIOUS PAGE (CI/CH) SILTY CLAY to CLAY; grey;		-			Ð		+									
È			cohesive, w>PL, firm to stiff	75.5	0														
F			End of Borehole	10.3	6			⊕		+									
E																			
È.	11																		
F																			
E																			
F																			:
Ē	10																		
E	12																		-
F																			
Ē																			
E																			
-	13																		-
E																			
F																			
Ē																			
-	14																		-
F																			
E																			
F																			- -
E	15																		-
F																			
F																			
E																			
<u> </u>	16																		
Ē																			
F																			
Ē																			
E.	17																		
F																			
Ē																			
F																			:
	10																		
E M	18																		-
30 - -																			
5/18/																			
Ĭ																			
AIS.G	19																		-
SAL-N																			
2 -																			
:95.G																			
5372	20																		-
100																			
MIS-BHS 001 1537295.GPJ GAL-MIS.GDT 5/18/17 JEM/TB	DEF	PTH S	SCALE				1	Â		പ്പം	*							LC	OGGED: DWM
HIS-F	1:5	50						Ô	Ass	OCi2	<u>tes</u>							СН	ECKED: EDW

### RECORD OF BOREHOLE: 16-03

BORING DATE: December 5, 2017

SHEET 1 OF 3

DATUM: CGVD28

LOCATION: N 5014136.8 ;E 366990.0 SAMPLER HAMMER, 64kg; DROP, 760mm

J A LE	THOD		SOIL PROFILE		_	SA	MPL			MIC PEN TANCE,			Ľ,		, cm/s				NG	PIEZOMETER
METRES	BORING METHOD			STRATA PLOT	ELEV.	BER	ы	BLOWS/0.30m					80 - Q - ●	10 <sup>-6</sup>	10 <sup>-5</sup>			0 <sup>-3</sup>	ADDITIONAL LAB. TESTING	OR STANDPIPE
M	ORIN		DESCRIPTION	TRAT#	DEPTH (m)	NUMBER	түре	LOWS					- Q- ● 9 U- O	Wp H		OW		WI	ADC LAB.	INSTALLATION
			GROUND SURFACE	S	84.80			ä	2	0 4	10	60	80	20	40	60	) ;	80	+	
0			FILL/TOPSOIL - (ML) sandy SILT:		0.00															
		Ì	brown; non-cohesive, moist	'	0.15	1	SS	10												
			brown; non-cohesive, moist, loose to compact		84.04															
			(ML-SM) sandy CLAYEY SILT to SILTY SAND; brown to black, contains organic		0.76															
1			matter; non-cohesive, moist, loose			2	SS	9												
					83.28															
			(CI/CH) SILTY CLAY to CLAY, trace sand; brown with red mottling		1.52															
2		- 1 (	(WEATHERED CRUST); cohesive, w>PL, stiff to very stiff			3	SS	6												
						4	SS	4												
3							1													
						5	SS	3												
4													>96 +							
													>96 +							
		200 mm Diam. (Hollow Stem)																		
5	Power Auger	. (Hollo				6	SS	2												
-	Powe	n Diam	(CI/CH) SILTY CLAY to CLAY; grey with black mottling; cohesive, w>PL, firm		79.62 5.18															
		200 m	black mottling; cohesive, w>PL, firm						$\oplus$		+									
									⊕		+									
6																				
						7	SS	рц												
						ĺ	35													
7									Ð	+										
									⊕	+										
8						8	SS	WR												
									⊕		+									
									⊕		Ļ									
9																				
10	- L				1			-				†			-+-			†		
	рті		ALE	•					Â											GGED: DWM
DE		130	<i>//</i> 122							G	olde	r ates								CKED: EDW

### LOCATION: N 5014136.8 ;E 366990.0

SAMPLER HAMMER, 64kg; DROP, 760mm

### RECORD OF BOREHOLE: 16-03

BORING DATE: December 5, 2017

SHEET 2 OF 3

DATUM: CGVD28

1	DOH.	SOIL PROFILE	1.		S/	MPLE	RESISTAN	CE, BLOV	/S/0.3m	Ì,	HYDRAU k				RG₽	PIEZOMETER
METRES	BORING METHOD		STRATA PLOT		ER	TYPE	20	40		80	10 <sup>-6</sup>		10-4	10 <sup>-3</sup>	ADDITIONAL LAB. TESTING	OR STANDPIPE
ME	RING	DESCRIPTION	ATA I	ELEV.		TYPE	SHEAR ST Cu, kPa	RENGTH	nat V rem V. 6	+ Q-● ∌ U-O		ER CON	tent pe O <sup>W</sup>		ADDI AB. T	INSTALLATION
u l	BOI		STR.	(m)	Ź		20	40		80	Wp H 20	40	60	WI 80		
10		CONTINUED FROM PREVIOUS PAGE														
		(CI/CH) SILTY CLAY to CLAY; grey with black mottling; cohesive, w>PL, firm														
11					9	SS F										
12																
13																
14																
	em)															
	llow St															
15	Power Auger 200 mm Diam. (Hollow Stem)															
	Im Dia			69.46												
	200 m	(ML/SM) gravelly sandy SILT to SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive,		15.34												
		boulders (GLACIAL TILL); non-cohesive, wet, loose														
16				×												
17					10	SS										
					$\vdash$	1										
18																
19																
				×												
20				1		╞┥			. +	-	<u> </u>		-	-+-		
				1	<u> </u>											
DEF	PTH S	SCALE						Gold	er iates						LC	GGED: DWM

### LOCATION: N 5014136.8 ;E 366990.0

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: 16-03

BORING DATE: December 5, 2017

DATUM: CGVD28

SHEET 3 OF 3

N F	ТНОВ	SOIL PROFILE			SA	.MPLE		DYNAMIC PENETRA RESISTANCE, BLOV	``		DRAULIC C k, cm/s			2	ING	PIEZOMETER
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.30m	20 40 I I SHEAR STRENGTH Cu, kPa	60 80 nat V. + Q - € rem V. ⊕ U - 0	3	10 <sup>-6</sup> 1 WATER C		PERCE	0 <sup>-3</sup> NT WI	ADDITIONAL LAB. TESTING	OR STANDPIPE INSTALLATION
-	BC			(m)			BL(	20 40	60 80	_	-	10 61		30 T		
20	-	CONTINUED FROM PREVIOUS PAGE (ML/SM) gravelly sandy SILT to SILTY	6 XX				$\dashv$			_						
21		SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose														
22	Power Auger 200 mm Diam. (Hollow Stem)															
24	200 m															
26		End of Borehole		<u>58.44</u> 26.36												
27		Auger Refusal														
28																
29																
30 DEF	PTH S	CALE						Gold	er							DGGED: DWM

# RECORD OF BOREHOLE: 16-04

BORING DATE: December 6, 2017

SHEET 1 OF 1

DATUM: CGVD28

LOCATION: N 5014129.8 ;E 367031.1 SAMPLER HAMMER, 64kg; DROP, 760mm

	ДОН	SOIL PROFILE	1.	ı —	s/	MPL		DYNAMIC PENETRATION     HYDRAULIC CONDUCTIVITY,       RESISTANCE, BLOWS/0.3m     k, cm/s
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	түре	BLOWS/0.30m	20 40 60 80 10 <sup>5</sup> 10 <sup>4</sup> 10 <sup>3</sup> 65 OR SHEAR STRENGTH nat V. + Q. ● WATER CONTENT PERCENT 5TANDPIPE
<u> </u>	BORI		STRA <sup>-</sup>	DEPTH (m)	N N	-	BLOW	Cu, kPa         rem V. ⊕         U - O         Wp           Wu         Twi
0		GROUND SURFACE		83.65				
0		FILL/TOPSOIL - (ML) sandy SILT; brown; non-cohesive, moist FILL - (ML) sandy SILT, trace gravel; brown; non-cohesive, moist loose		0.00		SS	6	
1		(CI/CH) SILTY CLAY to CLAY, some sand; brown with red mottling, contains silty sand seams (WEATHERED CRUST); cohesive, w>PL, very stiff to stiff		82.89 0.76	2	ss	8	• <u>v</u>
2					3	ss	6	
2								⊕ 115_ Native Backfill
3					4	ss	4	
4	/ Stem)							⊕
	Power Auger 200 mm Diam. (Hollow Stem)							
5	200				5	SS	3	Φ +
6		(CI/CH) SILTY CLAY to CLAY; grey,		77.55 6.10		-		⊕ + Bentonite Seal     ☐
		contains and seams; cohesive, w>PL, firm to stiff				ss	РН	C Standpipe
7								⊕         +
8					7	ss	PH	O Cave
		End of borehole		74.81 8.84				⊕ + ⊕ +
9				0.04				W.L. in Screen at Elev. 82.51 m on Feb. 2, 2017
10								
DEI	PTH S	CALE	_1	1	L			Golder LOGGED: DWM CHECKED: EDW

### LOCATION: N 5014078.8 ;E 366857.1

SAMPLER HAMMER, 64kg; DROP, 760mm

### RECORD OF BOREHOLE: 16-05

BORING DATE: December 6, 2017

SHEET 1 OF 1

DATUM: CGVD28

	THO	SOIL PROFILE			SA	AMPLE		DYNAMIC RESISTAI				<u>کر</u>		k, cm/s			ING	PIEZOMETER
METRES	BORING METHOD		STRATA PLOT	ELEV.	ËR	<u>س</u>	BLOWS/0.30m			6			10			10 <sup>-3</sup>	ADDITIONAL LAB. TESTING	OR STANDPIPE
Ψ	RING	DESCRIPTION	RATA	DEPTH	NUMBER	TYPE	/SMC	SHEAR S Cu, kPa	IKENG	re n	ar.v. + em V.⊕	Q - • U - O			PERCE		ADD AB. 7	INSTALLATION
	BC		STF	(m)	Ĺ		BLC	20	40	6	3 (	0	20			80		
0		GROUND SURFACE	XXXX	88.04														
		FILL/TOPSOIL - (ML) sandy SILT;	₩	87.86 0.18														
		FILL - (SM) SILTY SAND, trace gravel; brown, contains organic matter;			1	SS	4											
		non-cohesive, moist, loose				$\left  \right $												
				87.13		1												
1		(CI/CH) SILTY CLAY to CLAY, some sand; brown (WEATHERED CRUST);		0.91	2	SS	12											
		cohesive, w>PL, very stiff to stiff																
						$\left\{ \right\}$												
					3	SS	7											
2																		
						1												
								€	>			115						
									⊕			126						
3																		
						1												
					4	SS	5											
								Œ				+						
4								4	,			+						
	Ê								⊕			+						
	w Stem)			83.47 4.57														
	200 mm Diam (Hollow	(CI/CH) SILTY CLAY to CLAY; brown, contains silt seams; w>PL, firm to stiff		4.07	5	SS	1											
5	Diam				5	33	'											
	um o					1												
	20							⊕		+								
								⊕		+								
6				81.94														
		(CI/CH) SILTY CLAY to CLAY; grey; cohesive, w>PL, stiff		6.10		1												
					6	SS	PH											
_																		
7								Φ		+								
								Ð		+								
					<b>,</b>	SS	ы											
8					7	35	гH											
								⊕			+							
		(ML) sandy CLAYEY SILT, some gravel;		79.31 8.73														
9		grey, contains cobbles and boulders (GLACIAL TILL); cohesive, wet, very																
		loose				1												
					8	SS	3											
				78.29														
10		End of Borehole		9.75														
.0																		
			1						\ \			1	۱			1		
DEF	PTH	SCALE							Gol	der							LC	GGED: DWM

# RECORD OF BOREHOLE: 16-06

BORING DATE: December 7, 2017

SHEET 1 OF 2

DATUM: CGVD28

LOCATION: N 5014063.2 ;E 366910.7 SAMPLER HAMMER, 64kg; DROP, 760mm

.,\_\_..

l S	THOD	SOIL PROFILE			AMPLE				TION S/0.3m	<u>کر</u>		cm/s			LING	PIEZOMETER
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT ) dd   a		TYPE	R SHE	AR STRE	40 INGTH	nat V. +	30 Q - ●	10 <sup>-6</sup>	10 <sup>-5</sup> ER CONTI	10 <sup>-4</sup> I ENT PER	10 <sup>-3</sup> CENT	ADDITIONAL LAB. TESTING	OR STANDPIPE INSTALLATION
Σ	BORIN		(m	™ ≧		Cu, k	Pa		rem V. 🕀	U - O	Wp H		w	- WI	ADI	INSTALLATION
-		GROUND SURFACE			1	٥	20	40	<u>60</u> 8	30	20	40	60	80		
0		FILL/TOPSOIL - (ML) sandy SILT;		00 10				-							+	
		brown; moist FILL - (SP/SM) SAND to SILTY SAND, some gravel; brown, contains organic matter; non-cohesive, moist, compact		1	SS 1	2										
1		FILL - (SM/SP) gravelly SILTY SAND to SAND; brown, contains cobbles; non-cohesive, dry to moist, dense	86 0	93 74 2	ss 4	5										
2				3	SS 4	0										
		(CI/CH) SILTY CLAY to CLAY, some sand; brown to grey, contains rootlets and silt seams (WEATHERED CRUST); cohesive, w>PL, very stiff to stiff	85	39 28 4	ss 1	2										
3																
				5	SS	6				138						
4							⊕ •	Ð		135						
5	Power Auger 200 mm Diam. (Hollow Stem)			6	ss	3										
Ū	200 mm Diam						⊕		+							
6							Ð		+							
				7	ss :	2										
7						•				÷						
		(CI/CH) SILTY CLAY to CLAY; grey;	<u>80</u> 7	05 62			₽		-	+						
8		cohesive, w>PL, stiff to firm		8	SS F	н										
						•		+	+							
9						₽										
10		CONTINUED NEXT PAGE			+		+		+					-+		
DEI	PTH	SCALE				Â		-1-1	er ates						LO	GED: DWM

### LOCATION: N 5014063.2 ;E 366910.7

SAMPLER HAMMER, 64kg; DROP, 760mm

### **RECORD OF BOREHOLE: 16-06**

BORING DATE: December 7, 2017

SHEET 2 OF 2

DATUM: CGVD28

л Р Г	BORING METHOD	SOIL PROFILE			SA	MPLE		DYNAMIC RESISTAN		VS/0.3m	,	HYDRAU			AL NG	PIEZOMETER
DEPTH SCALE METRES	U ME		STRATA PLOT	ELEV.	3ER	ш	BLOWS/0.30m			60	80	10-		0 <sup>-3</sup>	ADDITIONAL LAB. TESTING	OR STANDPIPE INSTALLATION
Ľ₩	JRINC	DESCRIPTION	RATA	DEPTH	NUMBER	ТҮРЕ	/SMC	SHEAR ST Cu, kPa	IKENGIH	rem V.	+ u-● ● U-O	Wp VVA		WI	ADDI -AB. 7	INSTALLATION
-	BC		STF	(m)			BLC	20	40	60	80	20		80		
10		CONTINUED FROM PREVIOUS PAGE (CI/CH) SILTY CLAY to CLAY; grey;	-				-							-		
		cohesive, w>PL, stiff to firm														
11																
12																
13				74.67												
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet,		10.00												
		(GLACIAL TILL); non-conesive, wet, loose														
					<u> </u>											
14	2						_									
	w Sten				9	SS	7									
	Hollov			1	$\vdash$											
	Power Auger 200 mm Diam. (Hollow Stem)															
	L L L															
15	200															
16																
17				1												
18																
				68.65												
19		End of Borehole Auger Refusal		68.65 19.02	1											
		nuyei nelusai														
20																
DE	PTH S	CALE							<b>A</b>						LC	) GGED: DWM
1:								<b>F</b>	Gold ssoc	er iator						ECKED: EDW

### LOCATION: N 5014050.8 ;E 366967.0

SAMPLER HAMMER, 64kg; DROP, 760mm

### RECORD OF BOREHOLE: 16-07

BORING DATE: December 7, 2017

SHEET 1 OF 1

DATUM: CGVD28

ц 	BORING METHOD	SOIL PROFILE	r . –		S/	AMPL		DYNAMIC PENET RESISTANCE, BI	RATION .OWS/0.3m	Ì,	HYDRAULIC C k, cm/s	ONDUCTI	/ITY,	PG	PIEZOMETER
RES	MET		LOT		Ľ.		.30m	20 40	60	80		0 <sup>-5</sup> 10 <sup>-4</sup>		TONA	OR
METRES	RING	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	JMBE	TYPE	BLOWS/0.30m	SHEAR STRENG Cu, kPa	TH nat V. rem V.	+ Q-● ⊕ U-O	WATER C			ADDITIONAL LAB. TESTING	INSTALLATION
5	BOF		STR/	(m)	ž	Ľ	BLO	20 40		80		0 60			
		GROUND SURFACE	<u> </u>	84.57					Ĩ				Ť		
0		FILL/TOPSOIL - (ML) sandy SILT;		0.00											×
		brown; moist FILL - (SM) SILTY SAND, trace gravel;			1	ss	8								
		dark brown, contains rootlets; non-cohesive, moist, loose													
				83.81 0.76		-									
1		(CI/CH) SILTY CLAY to CLAY, some sand; brown, contains roots; cohesive, w>PL, very stiff to stiff		0.70											
		w>PL, very sun to sun			2	SS	11								
						$\left  \right $									
						1									
					3	ss	8				0				
2															
										143					
										143					
										143					🛛 🕅
3															Native Backfill
Ŭ						1									
					4	SS	5					þ			
4	(ji							Ð		t					
	v Ste							•		+					
	Auge														
	Power Auger 200 mm Diam. (Hollow Stem)														
5					5	SS	2				0				
	20				<u> </u>	-									
								<b>⊕</b>							
								Φ	+						
								Ð	+						
6				78.47											Bentonite Seal
		(CI/CH) SILTY CLAY to CLAY; grey with black mottling; cohesive, w>PL, firm		0.10											
					6	SS	РН						C		Silica Sand
						$\left  \right $									
7								⊕ +							
															Standpipe
								⊕ +							
						$\left  \right $									
					7	SS	WR					0			🛛 🕅
8															🛛 🕅
						1									Cave
								•	+						8
								⊕							🛛 🕅
9								Ů   Ť							🛛 🕅
		End of Borehole		75.43 9.14				⊕ +							
															W.L. in Screen at Elev. 83.30 m on Feb. 2, 2017
															Feb. 2, 2017
10															
									lder ociates						
DE	PTH	SCALE							dor						OGGED: DWM

### LOCATION: N 5014032.7 ;E 367007.8

SAMPLER HAMMER, 64kg; DROP, 760mm

### RECORD OF BOREHOLE: 16-08

BORING DATE: December 8, 2017

SHEET 1 OF 1

DATUM: CGVD28

ц Т	DOH.	SOIL PROFILE			SA	MPL		DYNAMIC PE RESISTANCI	E, BLOW	S/0.3m	Ì,		k, cm/s	NDUCTI	ч <b>нт</b> ,	R₽	PIEZOMETER
METRES	BORING METHOD		STRATA PLOT	ELEV.	ER	_	BLOWS/0.30m	20	40		30 <b>`</b>	10-6		1		ADDITIONAL LAB. TESTING	OR STANDPIPE
Ш. Ч.	RING	DESCRIPTION	(ATA	DEPTH	NUMBER	түре	)/S//(	SHEAR STRI Cu, kPa	-NGTH	nat V. + rem V. ⊕	Q - ● U - O	WA Wo				ADDI AB. T	INSTALLATION
'	BG		STF	(m)	2		BLC	20	40	<u>60 8</u>	30	20					
0		GROUND SURFACE FILL/TOPSOIL - (SM) SILTY SAND;		83.78						_							
		brown; moist	/	<u>0.00</u> 0.10	1	SS	5										
		FILL - (SM/ML) SILTY SAND to sandy CLAYEY SILT; dark brown, contains					Ĵ										
		rootlets; non-cohesive, moist, loose		83.02													
1		(CI/CH) SILTY CLAY to CLAY, trace sand; brown with red mottling, contains rootlets (WEATHERED CRUST);		0.76													
		cohesive, w>PL, very stiff to stiff			2	SS	8										
2					3	SS	5										
-				ŀ													
								♦			109						
								•			106						
3																	
					_												
					4	SS	2										
				ŀ		$\left  \right $											
4	item)							₽		+							
	Iger							•		+							
	Power Auger Diam (Hollov																
	Power Auger 200 mm Diam (Hollow Stem)			ſ													
5	200				5	SS	2										
		(CI/CH) SILTY CLAY to CLAY; grey;		78.60 5.18		$\left  \right $											
		cohesive, w>PL, firm to stiff						<b>⊕</b>	+								
								⊕	ļ								
6																	
					6	SS	1										
				ŀ													
7								Ð	+								
								Ð	+								
					_												
8					7	SS	WR										
				ŀ													
								⊕	.	F							
		End of Dorohola		74.94 8.84				Ð	+								
9		End of Borehole		0.84													
10																	
DE	PTH	SCALE						14 M	614							LC	OGGED: DWM
	50								rOIC	er ates							ECKED: EDW

# RECORD OF BOREHOLE: 16-09

BORING DATE: December 8, 2017

SHEET 1 OF 1

DATUM: CGVD28

LOCATION: N 5014017.9 ;E 366830.2 SAMPLER HAMMER, 64kg; DROP, 760mm

u J	BORING METHOD		SOIL PROFILE	1.	r	SA	AMPL		DYNAMIC PENET RESISTANCE, BI	LOW	ION S/0.3m	2		AULIC C k, cm/s				RGR	PIEZOMETER
METRES	MET			STRATA PLOT		R.		BLOWS/0.30m	20 40			o <b>`</b>					10 <sup>-3</sup>	ADDITIONAL LAB. TESTING	OR
MET	SING		DESCRIPTION	\TA F	ELEV. DEPTH	NUMBER	TYPE	NS/0	SHEAR STRENG Cu, kPa	STH	nat V. + rem V. ⊕	Q - ● U - O		ATER C				B. TE	INSTALLATION
រី	BOR			STR∕	(m)	ĭ	-	3LOV	20 40			0		o <b> </b>			WI 80	L <sub>A</sub>	
		+	GROUND SURFACE		88.91			-	20 40		<u> </u>	0							
0			FILL/TOPSOIL - (SM) SILTY SAND;	*	0.05						1					1			
			brown; moist FILL - (ML/CL) CLAYEY SILT to SILTY		\$	1	SS	5											
			CLAY; brown, contains rootlets; cohesive, w>PL																
					88.15														
1			(CI/CH) SILTY CLAY to CLAY; brown, contains silt seams (WEATHERED		0.76														
			CRUST); cohesive, w>PL, very stiff			2	SS	7						0					
							-												
						<u> </u>													
						3	SS	5						0					
2																			
												400							
		tem)							⊕			129	1						
	er	S wol										143	8						
3	Power Auger	ч. (Но																	
5	Powe	200 mm Diam. (Hollow Stem)					1												
		00 m				4	SS	5					0						
		Ñ																	
					84.95							143	8						
4		ŀ	(ML/SM) gravelly sandy SILT to SILTY		3.96	1							t						
			(ML/SM) gravelly sandy SILT to SILTY SAND; brown, contains silty clay seams, cobbles and boulders (GLACIAL TILL);																
			non-cohesive, most, loose to compact																
5						5	SS	9							þ				
							-												
					1		1												
						6	SS	14					0						
					82.97														
6		T	End of Borehole		5.94														
7																			
8																			
9																			
10																			
				1			1										1		
DE	PTH	I SO	CALE					(	(March	lde	Ť							L	OGGED: DWM
1:	50								Gol	)Ci	ates							СН	ECKED: EDW

### **RECORD OF BOREHOLE: 16-10** LOCATION: N 5013992.4 ;E 366898.2

BORING DATE: December 8, 2017

SHEET 1 OF 2

DATUM: CGVD28

SAMPLER HAMMER, 64kg; DROP, 760mm

Ļ	Ē	SOIL PROFILE			SA	AMPL		DYNAMIC PENET RESISTANCE, BL	ATION S/0.3m	HYDRAULIC CONDUCTIVITY, k, cm/s	ξF	PIEZOMETER
DEPTH SCALE METRES	BORING METHOD		STRATA PLOT		H ۲		BLOWS/0.30m	20 40	60 80	10 <sup>-6</sup> 10 <sup>-5</sup> 10 <sup>-4</sup> 10 <sup>-3</sup>	ADDITIONAL LAB. TESTING	OR
MET	SING	DESCRIPTION	ATA F	ELEV. DEPTH	NUMBER	TYPE	NS/0.	SHEAR STRENGT Cu, kPa	H nat V. + Q - ● rem V. ⊕ U - O	WATER CONTENT PERCENT	BDIT B. TE	STANDPIPE INSTALLATION
5	BOR		STR/	(m)	۲		BLO	20 40	60 80	Wp	<b>A</b> A	
		GROUND SURFACE		86.31							+	
0		FILL/TOPSOIL - (ML) sandy SILT;		0.05							<u> </u>	X
		brown; moist FILL - (SM/ML) SILTY SAND to CLAYEY	' 🗱		1	SS	5					
		SILT; brown; non-cohesive, moist		85.70								
		(ML) CLAYEY SILT, some sand; brown, contains silt seams; cohesive, w>PL,		0.61	<u> </u>	-						
1		very stiff		1	2	SS	8					
				1	1		Ŭ					
				84.79								
		(CI/CH) SILTY CLAY to CLAY, trace sand; brown with red mottling (WEATHERED CRUST); cohesive,		1.52								
2		(WEATHERED CRUST); cohesive, w>PL, very stiff			3	SS	5					
2					<u> </u>							
									143			
									143			
										†		⊻₿
3					<u> </u>	-						
					4	SS	6					
4								•	120			
								Ð	106			
	Ê											
	Power Auger mm Diam. (Hollow Stem)											
5	Power Auger Diam. (Hollo				5	SS	5					Native Backfill
Ŭ,	Diam											
	200 mm			80.8 <u>3</u>				⊕ -				
	2	black mottling; cohesive, w>PL, firm to		5.48								
		stiff						⊕   -	-			
6					-	-						
					6	SS	РН					
7								⊕	+			
								Ð	+			
8					7	SS	PH					
						-						
								<b>⊕</b>	+			
9								⊕   +				
10				T	1	†1		+ -		T		<b>x</b>
		I	-	1	I							1
		SCALE									L	

### LOCATION: N 5013992.4 ;E 366898.2

SAMPLER HAMMER, 64kg; DROP, 760mm

**RECORD OF BOREHOLE: 16-10** 

SHEET 2 OF 2 DATUM: CGVD28

BORING DATE: December 8, 2017

ц Д	IJОН,	SOIL PROFILE	L		SA	MPL		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m	k, cm/s	NGAL	PIEZOMETER
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	түре	BLOWS/0.30m	20 40 60 80 SHEAR STRENGTH nat V. + Q - ● Cu, kPa rem V. ⊕ U - O	10 <sup>-6</sup> 10 <sup>-5</sup> 10 <sup>-4</sup> 10 <sup>-3</sup> WATER CONTENT PERCENT Wp - O <sup>W</sup> WI	ADDITIONAL LAB. TESTING	OR STANDPIPE INSTALLATION
-	BC		STF	(m)			BLC	20 40 60 80	20 40 60 80		
10		CONTINUED FROM PREVIOUS PAGE (CI/CH) SILTY CLAY to CLAY; grey with black mottling; cohesive, w>PL, firm to									Native Backfill
		stiff									
11		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet,		75.52 10.79							Bentonite Seal
	v Stem)	compact									Silica Sand
12	Power Auger 200 mm Diam. (Hollow Stem)					-					
	200 mm				8	SS	16				
13											Standpipe
14		End of Borehole		72.33 13.98							Cave
											W.L. in Screen at Elev. 83.53 m on Feb. 2, 2017
15											
16											
17											
18											
19											
20											
DEI	PTH	SCALE						Golder		LC	DGGED: DWM

### LOCATION: N 5013966.7 ;E 366959.7

SAMPLER HAMMER, 64kg; DROP, 760mm

### RECORD OF BOREHOLE: 16-11

BORING DATE: December 8, 2017

SHEET 1 OF 1

DATUM: CGVD28

	ГНОВ	SOIL PROFILE		S/	MPLES		C PENETRAT ANCE, BLOW		ζ,		:m/s			ING	PIEZOMETER
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT a dd   g	TH S	TYPE BLOWS/0.30m	20 SHEAR Cu, kPa	40 I STRENGTH	60 80 nat V. + 0 rem V. ⊕ 0		10 <sup>-6</sup> WATE Wp —	10 <sup>-5</sup> R CONTEN	T PERCEI	D <sup>-3</sup>	ADDITIONAL LAB. TESTING	OR STANDPIPE INSTALLATION
1	BO		(m	1) Z		20	40	60 80		20 20			0		
0	-	GROUND SURFACE FILL/TOPSOIL - (SM) sandy SILT;	84	1.22 ).00 ).10	$\left  \right $			+			_	+			
		brown; moist FILL - (SM) SILTY SAND; dark brown, contains rootlets; non-cohesive, moist, loose	83	0.10 1 3.61 0.61	SS 6										
1		(CI/CH) SILTY CLAY to CLAY, some sand; brown (WEATHERED CRUST); cohesive, w>PL, very stiff to stiff		2	SS 5										
				3	SS 6										
2					-	•			+						
3							Ð		+						
				4	SS 2										
4	Power Auger 200 mm Diam. (Hollow Stem)					e	€	++							
5	Pov 200 mm Diá			5	SS 3										
6			78	3.12		⊕ ⊕		+ +							
		(CI/CH) SILTY CLAY to CLAY; grey; cohesive; w>PL, stiff	e	5.10	SS 1										
7						⊕ ⊕	+	+							
8				7	SS PI										
		End of Borehole		5.38 3.84		⊕		+							
9															
10															
DEF	PTH S	CALE				Â	Golde	 • <b>r</b>			1		<u>                                      </u>	LOG	GED: DWM

# RECORD OF BOREHOLE: 16-12

BORING DATE: December 13, 2017

SHEET 1 OF 1

DATUM: CGVD28

LOCATION: N 5013936.2 ;E 366820.0 SAMPLER HAMMER, 64kg; DROP, 760mm

л н	BORING METHOD		SOIL PROFILE		1	SA	MPL		DYNAMIC PENETRA RESISTANCE, BLO		Ì,	HYDRAULIC CON k, cm/s		NG	PIEZOMETER
DEPTH SCALE METRES	MET			STRATA PLOT	ELEV.	Ë	ш	BLOWS/0.30m	20 40		80	10 <sup>-6</sup> 10 <sup>-5</sup>		ADDITIONAL LAB. TESTING	OR STANDPIPE
W	5NIS		DESCRIPTION	ATA	DEPTH	NUMBER	түре	)/S/(	SHEAR STRENGTH Cu, kPa	nat V. + rem V. ∉	- Q-● 9 U-O			ADDI AB. T	INSTALLATION
ב	Ca	3		STR	(m)			BLC	20 40	60	80	20 40	60 80	<b>_</b> _	
0			GROUND SURFACE		87.91										
0		T	TOPSOIL - (ML) sandy SILT; brown; moist		0.00										
			(CI/CH) SILTY CLAY to CLAY, some sand; brown (WEATHERED CRUST);			1	SS	3							
			sand; brown (WEATHERED CRUST); cohesive, w>PL, very stiff												
						<u> </u>	-								≚8
1						2	SS	5							
							33	5							
						3	SS	7							
2															Native Backfill
											115				
		Ê							Ð		115				
		w Ste									143				
3	Auger	OlloH)													
Ĩ	Power Auger	Diam.													
	ш	200 mm Diam. (Hollow Stem)				4	SS	6							
		200													
											143				
4		┢	(CL/CI) SILTY CLAY, trace sand and		83.92 3.99										
			gravel; brown, contains silt seams (WEATHERED CRUST); w>PL, very												
			stiff to stiff												Bentonite Seal
5						5	SS	3							Silica Sand
J															
		┟	(SM) gravelly SILTY SAND; grey, contains cobbles and boulders		82.58 5.33										
			(GLACIAL TILL); non-cohesive, wet,			6	SS	16							Standpipe
			compact												
6		$\square$	End (Decks)	₽₿\$	81.81		1								
			End of Borehole		6.10										W.L. in Screen at
															Elev. 87.20 m on Feb. 2, 2017
7															
,															
8															
9															
5															
10															
DE	PTł	H S(	CALE						Gold					L	OGGED: DWM
	50								Gold	er					IECKED: EDW

#### LOCATION: N 5013919.6 ;E 366870.5

SAMPLER HAMMER, 64kg; DROP, 760mm

### RECORD OF BOREHOLE: 16-13

BORING DATE: December 12, 2017

SHEET 1 OF 3

DATUM: CGVD28

ļ,	DOH.	SOIL PROFILE	1.		SA	MPLE		DYNAMIC PEN RESISTANCE,	BLOW	10N S/0.3m	$\mathbf{X}$	HYDRAU k	k, cm/s		VITY,		NG	PIEZOMETER
METRES	BORING METHOD	DECODIDATION	STRATA PLOT	ELEV.	BER	닖	BLOWS/0.30m	20 4 SHEAR STREM	NGTH	60 nat V	80 + Q - ●	10 <sup>-6</sup>	10 <sup>°</sup> TER CO			0 <sup>-3</sup>	ADDITIONAL LAB. TESTING	OR STANDPIPE
Ī	<b>30RIN</b>	DESCRIPTION	TRAT	DEPTH (m)	NUMBER	ТҮРЕ	LOWS	Cu, kPa		rem V. 6	Ð U- O	Wpl		-0 <sup>W</sup>		WI	ADC LAB.	INSTALLATION
	ш	GROUND SURFACE	ν,	86.61	-	$\left  \right $	ш	20 4	40	60	80	20	40	60	) {	30	$\square$	
0		FILL/TOPSOIL - (ML) sandy SILT; dark brown; moist		0.00														
		FILL - (SM/ML) sandy SILT to SILTY SAND; brown; non-cohesive, moist,	-	86.3 <u>1</u> 0.30	1'	SS	4											
		k loose		86.00 0.61														
1		(CI/CH) SILTY CLAY to CLAY, some sand; brown (WEATHERED CRUST); cohesive, w>PL, very stiff to stiff			2	SS	8											
							Ŭ											
					3	ss	5											
2						$\left  \right $												
								Ð			129							
								€	, ,		118							
3																		
					4	SS	3											
4								Ð			+							
-								Ð		+								
	(ma)																	
	Power Auger 200 mm Diam. (Hollow Stem)				5	SS	1											
5	Power Auger Diam. (Hollov			81.43														
	J mm C	(CI/CH) SILTY CLAY to CLAY; grey with black mottling; cohesive, w>PL, stiff		5.18				Ð		+								
	3							⊕										
6					L			Ŷ		'								
							, I											
					6	SS	РΗ											
7								•		†								
								Ð	+									
						1												
8					7	SS	PH											
				78.18														
		(CI/CH) SILTY CLAY to CLAY; grey with black mottling, contains sandy silt seams; cohesive, w>PL, stiff		8.43														
9		Scalls, Collesive, WPTL, SUII																
Ĵ					⊢	$\left  \right $												
					8	SS	2											
					⊢	$\left  \right $												
10	_ L	CONTINUED NEXT PAGE		76.63		+ -	-	+		+	-	-	+			+	-	
		1	-	1	I				I							1	1	
	ртн S 50	SCALE						G	olde	er ates								DGGED: DWM ECKED: EDW

### LOCATION: N 5013919.6 ;E 366870.5

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: 16-13

SHEET 2 OF 3 DATUM: CGVD28

BORING DATE: December 12, 2017

CALE ≣S	ETHOD	SOIL PROFILE	10		AMPLES	RESISTANC		``	HYDRAU k 10 <sup>-6</sup>	LIC CONDUC , cm/s 10 <sup>-5</sup>	CTIVITY, 10 <sup>-4</sup> 10 <sup>-3</sup>	NAL	PIEZOMETER OR
METRES	BORING METHOD	DESCRIPTION	(m) (m) (m)	ΉŠ	TYPE DI OWS/0 30m	20 SHEAR STR Cu, kPa		80 t V. + Q - ● n V. ⊕ U - O	WAT	ER CONTEN		ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATION
	BO					20	40 60	80	20		60 80		
10		CONTINUED FROM PREVIOUS PAGE (SM) gravelly SILTY SAND; grey,	9.9	98	++		+					+	
		contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist											
11													
12													
13													
-													
14													
	Power Auger 200 mm Diam. (Hollow Stem)												
	lger ollow												
15	Power Auger Diam. (Hollov												
	Po Di												
	200 r												
16													
47													
17													
18													
19													
20	LL	L			↓↓.				$\downarrow \_ \_ \downarrow$			_  _	
		CONTINUED NEXT PAGE											
				•			L						
		SCALE					bolder sociat						GED: DWM
1:	50					<b>V</b> As	social	es				CHE	CKED: EDW

### LOCATION: N 5013919.6 ;E 366870.5

SAMPLER HAMMER, 64kg; DROP, 760mm

### RECORD OF BOREHOLE: 16-13

BORING DATE: December 12, 2017

SHEET 3 OF 3

DATUM: CGVD28

്ഗി	E					MPLES	RESISTANCE, BLC		5		LIC CONDU cm/s		RGR	PIEZOMETER
METRES	BORING METHOD		STRATA PLOT	ELEV.	BER	TYPE BLOWS/0.30m	20 40	60 80		10 <sup>-6</sup>		0 <sup>-3</sup>	ADDITIONAL LAB. TESTING	OR STANDPIPE
E E	JRIN(	DESCRIPTION	RATA	DEPTH	NUMBER	TYPE OWS/0.3	SHEAR STRENGTH Cu, kPa	rem V. ⊕	ũ- Õ				ADD LAB.	INSTALLATION
·	Я			(m)	_	BLC	20 40	60 80	)	20	40	30	-	
20		CONTINUED FROM PREVIOUS PAGE (SM) gravelly SILTY SAND; grey,											+	
		contains cobbles and boulders												
		(GLACIAL TILL); non-cohesive, moist												
	Ē													
21	/ Sten													
	Hollov													
	Power Auger Diam. (Hollov													
	Power Auger 200 mm Diam. (Hollow Stem)													
22	200 r													
22					9	AS -								
ļ		FulstBacks		63.75										
23		End of Borehole Auger Refusal		22.86										
24														
25														
26														
27														
28														
29														
30														
							Gold			I			· · ·	
DEF	PTH S	SCALE					Gold	ler						GGED: DWM CKED: EDW

# RECORD OF BOREHOLE: 16-14

BORING DATE: December 9, 2017

SHEET 1 OF 1

DATUM: CGVD28

LOCATION: N 5013898.3 ;E 366924.6 SAMPLER HAMMER, 64kg; DROP, 760mm

s	тнор	SOIL PROFILE	F		SA	MPLE				BLOWS		ζ,		AULIC CO k, cm/s			2	ING	PIEZOMETER
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.30m	2 SHEAF Cu, kPa		⊥ NGTH r	hat V. –	80 - Q - ● - U - O	w	ATER C		I PERCE	0 <sup>-3</sup> NT WI	I ADDITIONAL LAB. TESTING	OR STANDPIPE INSTALLATION
	ĕ		ST	(m)	_	$\square$	B	2	0 4	10 E	60 	80					30 	+	
0		GROUND SURFACE FILL/TOPSOIL - (ML) sandy SILT; brown; moist FILL - (SM/ML) sandy SILT to SILTY SAND; dark brown, contains rootlets; non-cohesive, moist, loose		84.83 0.00 0.10	1	SS	5												
1		(CI/CH) SILTY CLAY to CLAY; brown with red motting, contains silty sand seams (WEATHERED CRUST); cohesive, w>PL, very stiff to stiff		84.07 0.76	2	ss	6							0					
2					3	ss	5							0					
					4	ss	5							с					
3					5	ss	4							c	>				
4	Power Auger 200 mm Diam. (Hollow Stem)								<b>⊕</b>	€		106 112	-						
5	Pow 200 mm Diar				6	ss	4							c					
6		(CI/CH) SILTY CLAY to CLAY; grey with black mottling; cohesive, w>PL, firm to stiff		79.04 5.79		-		⊕ ⊕	₽ +			+							
					7	ss	PH								(	þ			
7								⊕ ⊕		+	+								
8					8	ss	РН												
9		End of Borehole		75.99 8.84				⊕ ⊕		+									
10																			
DEI	PTH S	SCALE	<u> </u>					Â	G	older ocia	r					<u> </u>	<u> </u>	LC	OGGED: DWM

# RECORD OF BOREHOLE: 16-15

BORING DATE: December 13, 2017

SHEET 1 OF 1

DATUM: CGVD28

LOCATION: N 5013834.4 ;E 366824.6 SAMPLER HAMMER, 64kg; DROP, 760mm

December 13, 2017

OPEN         SOIL PROFILE         SAMPLES         Description         Presistance allow being and being and	0.3m     Indicators     10 <sup>6</sup> 10 <sup>6</sup> 10 <sup>7</sup> 10 <sup>3</sup> 10 <sup>8</sup> 30     80     10 <sup>6</sup> 10 <sup>4</sup> 10 <sup>3</sup> 10 <sup>8</sup> 10 <sup>8</sup> 1at V. + Q - •     WATER CONTENT PERCENT     Will     10 <sup>8</sup> 10 <sup>8</sup> 10 <sup>8</sup> 30     80     20     40     60     80
O         O         D <thd< th=""> <thd< th=""> <thd< th=""> <thd< th=""></thd<></thd<></thd<></thd<>	
0         GROUND SURFACE         00.75         000         0           1         TOPSOL - (ML) sandy SILT; brown; (CI/CH) SILTY CLAY to CLAY, some sample brown with red motting (WEATHERED CRUST); cohesive, w-PL, very stiff to stiff         0         1         SS         6           2         SS         7         0         0         1         SS         6           3         SS         5         7         0         0         1         SS         6           4         SS         5         SS         5         7         0 <th></th>	
1       UD-SOL (CICH) SILTY CLAY to CLAY, some same (WEATHERED CRUST); cohesive, w-PL, very stiff to stiff       1       SS       6         3       JS       5       SS       5         4       JS       5       SS       5         5       JS       5       SS       5         6       JS       SS       5         7       JS       F       0         8       CUCH) SILTY CLAY to CLAY; grey, contains silt seams; cohesive, w-PL, stiff       0       0         7       JS       PH       0         8       SS       1       0         6       JS       1       0         7       JS       PH       0         8       SS       1       0	o
6     C(I/CH) SILTY CLAY to CLAY; grey, contains silt seams; cohesive, w>PL, stiff     6.10     7     SS     PH       7     8     8     SS     1       8     (SM) grayelly SILTY SAND; grey, (SM) grayelly SILTY SAND; grey,     935     8.53	+ 115_ 123_ 0 0 0 0 0 0 0 0 0 0 0 0 0
8 (SM) gravelly SILTY SAND: grey. 935 8.53	O Bentonite Seal
8 (SM) gravelly SILTY SAND: grey. 935 8.53	- Silica Sand
(SM) gravelly SILTY SAND; grev. 8.53	O O
9 contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact 9 SS 20	
End of Borehole         9.45           10         9.45	>96 + Bentonite Seal

#### LOCATION: N 5014098.5 ;E 366864.7

#### **RECORD OF BOREHOLE: 18-01**

BORING DATE: December 5, 6, 7 & 10, 2018

SHEET 1 OF 3

DATUM: CGVD28

SAMPLER HAMMER, 64kg; DROP, 760mm

9	ДĢ		SOIL PROFILE			SA	MPLE		DYNAMIC PENETR RESISTANCE, BLC	WS/0.3m	2	HYDR.	AULIC Co k, cm/s	JNDUCI	i IVI I Y,		او بـ	PIEZOMETER
METRES	BORING METHOD			LOT		Ř		30m	20 40	60	80	1	0 <sup>-6</sup> 1	) <sup>-5</sup> 1	0 <sup>-4</sup> 1	0 <sup>-3</sup>	ADDITIONAL LAB. TESTING	OR
METI	DNG		DESCRIPTION	TAP	ELEV. DEPTH	NUMBER	TYPE	VS/0.	SHEAR STRENGTH Cu, kPa	I nat V. + rem V. €	- Q - •	W	ATER C				B. TE	STANDPIPE INSTALLATION
	BOR			STRATA PLOT	(m)	R	-	BLOWS/0.30m					p ├───				LAI	
		╉	GROUND SURFACE	0)	88.58	-	$\vdash$		20 40	60	80		20 4	06	<u>50 8</u>	30		
0		┤	TOPSOIL - (ML) sandy SILT; dark	ESS	0.00													
		ſ	brown; frozen FILL - (CL) sandy SILTY CLAY, trace	/	0.13	1	SS	7										
		- I	gravel; grey brown, contains sand seams, rootlets and cobbles; cohesive,															
			w~PL, firm to stiff															
1																		
						2	SS	4					0					
						3	SS	9										
2					86.45													
		ľ	(CI/CH) SILTY CLAY to CLAY; grey brown (WEATHERED CRUST);		2.13		]											
			cohesive, w>PL, very stiff															
						4	SS	6										
3							$\left\{ \right\}$											
3							1											
						5	SS	2					0					
		(j																
	_	200 mm Diam. (Hollow Stem)																
4	Power Auger	(Holic									>96+							
	ower	Diam.									>96+							
	<u>م</u>	Ē																
		500					1											
-						6	SS	3						0				
5																		
											>96+							
											>96+							
6					82.48													
			(CI/CH) SILTY CLAY; grey, contains silt seams/layers; cohesive, w>PL, stiff		6.10													
			• · · · · · ·			7	SS	1				ŀ						
-									<b>⊕</b>									
7									Ψ	+								
									⊕		+							
		╞	(ML/SM) sandy SILT to SILTY SAND,		80.96 7.62													
			(ML/SM) sandy SILT to SILTY SAND, some gravel to gravelly; grey, contains cobbles and boulders (GLACIAL TILL);		1.02							_						
8			cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to dense			8	SS	6				0						
		$\dashv$				-												
9	lore	sing																
,	Wash Bore	W Ca																
	≤	Ξ																
						_												
						9	SS	14									MH	
10	_ L	-		_12292			+ -	-	+	-+	·					+	-	<b></b>
			CONTINUED NEXT FAGE					_										
DE	PTH	H S(	CALE						GOL		D						LC	DGGED: KM
	50							Ť	$\mathbf{P}$								011	ECKED: CRG

#### LOCATION: N 5014098.5 ;E 366864.7

SAMPLER HAMMER, 64kg; DROP, 760mm

### **RECORD OF BOREHOLE: 18-01**

BORING DATE: December 5, 6, 7 & 10, 2018

SHEET 2 OF 3

DATUM: CGVD28

л Р Г	<u>дон.</u>	SOIL PROFILE			SAI	MPLES	DYNAMIC PENETRA RESISTANCE, BLO			HYDRAULIC COND k, cm/s		RGA	PIEZOMETER
METRES	BORING METHOD	DESCRIPTION		ELEV.	NUMBER	TYPE BLOWS/0.30m	20 40 I I SHEAR STRENGTH Cu, kPa	60 80 nat V. + Q - 0	•	10 <sup>-6</sup> 10 <sup>-5</sup>	10 <sup>-4</sup> 10 <sup>-3</sup> ENT PERCENT	ADDITIONAL LAB. TESTING	OR STANDPIPE INSTALLATION
≤ز د	BORIN		STRAT	EPTH (m)	NUN	3LOWS	Cu, kPa 20 40	rem V. ⊕ U - 0 60 80	$^{\circ}$	Wp <b>⊢</b> €	₩ <b>1</b> WI 60 80	ADI	INGTALLATION
10		CONTINUED FROM PREVIOUS PAGE					20 40			20 40			
-		(ML/SM) sandy SILT to SILTY SAND, some gravel to gravelly; grey, contains cobbles and boulders (GLACIAL TILL);		F									
		non-cohesive, wet, loose to dense											
11					10	SS 41							
12													
					11	SS 13				0		мн	
13													
14					12	SS 15							
15	Wash Bore HW Casing												
	Wa			╞									
					13	SS 6				0			
16				┝	_								
4-7				F	14	SS >50							
17													
18													
					15	SS 7				0		мн	
					15	SS 7							
19													
20	_L		_12292				+	-+	- +		+-	· _	
	DTLI		_1_1										GGED: KM
1:		SCALE					GOL	DER					CKED: CRG

## **RECORD OF BOREHOLE: 18-01** LOCATION: N 5014098.5 ;E 366864.7

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: December 5, 6, 7 & 10, 2018

SHEET 3 OF 3

DATUM: CGVD28

N L	ТНОВ	SOIL PROFILE		+	AMPLE		DYNAMIC PENETRATIO RESISTANCE, BLOWS/0	· · ·	HYDRAULIC k, cm			-3	-ING	PIEZOMETER
METRES	BORING METHOD	DESCRIPTION	(m) (m) (m)		TYPE	BLOWS/0.30m	20 40 60 I I I SHEAR STRENGTH na Cu, kPa re		WATER	CONTENT	0 <sup>-4</sup> 10 PERCEI	NT	ADDITIONAL LAB. TESTING	OR STANDPIPE INSTALLATION
,	BO		(m)	z		BLO	20 40 60	) 80	Wp			0		
20	-+	CONTINUED FROM PREVIOUS PAGE (ML/SM) sandy SILT to SILTY SAND,	Ø 191							_				
21		some gravel to gravely; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to dense												
22 23														
24	bore sing													
25	Wash Bore HW Casing				-									
26				18	SS \	₩Н								
27 28														
29		End of Borehole	59.6 28.9	2										
30														
DEF		CALE	1 1	_1			GOLD	) E R	1		I	I		OGGED: KM ECKED: CRG

## **RECORD OF BOREHOLE: 18-02**

BORING DATE: Nov. 28, 29 & Dec. 4, 5, 2018

SHEET 1 OF 4

DATUM: CGVD28

LOCATION: N 5014098.6 ;E 366965.6 SAMPLER HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	Ē																	PIEZOMETER
LΣ	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH		TYPE	BLOWS/0.30m	20 SHEAR STRE Cu, kPa	1		Q - ● U - O		TER CO	NTENT	PERCE		ADDITIONAL LAB. TESTING	OR STANDPIPE INSTALLATION
;	BOR		STRA	(m)	٦ ا	[ ]	BLOV				30	Wp 20		W		WI 80	PA	
0		GROUND SURFACE		84.90														
		TOPSOIL - (ML) sandy SILT; dark brown; frozen	1	0.00														
		FILL - (CI) SILTY CLAY, some sand; brown and grey brown, contains black mottling; cohesive, w>PL, very stiff		84.14	1	ss	8											
1		(CI/CH) SILTY CLAY to CLAY; grey brown, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		0.76		ss	7											
2					3	ss	5						0					
					4	ss	4											
3																		
					5	SS	3						0					
4	(m)										>96+ >96+							
5	200 mm Diam. (Hollow Stem)			79.72		ss	1											
	200 mm	(CL/CH) SILTY CLAY; grey to dark grey, contains silt seams; cohesive, w>PL, firm to stiff		5.18	;			⊕	+	+								
6					7	ss	РН								0			
7								Ð	+									
								⊕	+									
8					8	ss	PH						<b></b>	4	o			
								⊕ ⊕	+	-								
9					9	ss	wн							С	,			
10					 		_					-				 		
		CONTINUED NEXT PAGE																

# RECORD OF BOREHOLE: 18-02

RC

SHEET 2 OF 4

DATUM: CGVD28

LOCATION: N 5014098.6 ;E 366965.6 SAMPLER HAMMER, 64kg; DROP, 760mm BORING DATE: Nov. 28, 29 & Dec. 4, 5, 2018

L L	DOH.		SOIL PROFILE			SA	MPLE		DYNAMIC P RESISTANC		ATION WS/0.3m			AULIC C k, cm/s				NGAL	PIEZOMETER
METRES	BORING METHOD			STRATA PLOT	ELEV.	ЖЕR	<u>ш</u>	BLOWS/0.30m			60	80				1	0 <sup>-3</sup>	ADDITIONAL LAB. TESTING	OR STANDPIPE
Ξ	RING		DESCRIPTION	ATA	DEPTH	NUMBER	TYPE	WS/(	SHEAR STF Cu, kPa	RENGTH	I nat V. rem V	+ Q-● ⊕ U-O	W W	ATER C			NT WI	ADDI AB. T	INSTALLATION
נ	BO			STR	(m)	z		BLC	20	40	60	80					80	نـ`	
10			CONTINUED FROM PREVIOUS PAGE																
			(CL/CH) SILTY CLAY; grey to dark grey, contains silt seams; cohesive, w>PL,						Ð		Ť								
			firm to stiff																
11						10	SS \	WH						0					
									⊕		+								
									⊕		+								
									Ð		+								
12																			
						11	SS \	wн						нο					
		Ê																	
13	Ļ	200 mm Diam. (Hollow Stem)							Ð		+								
	Power Auger	. (Holk							⊕		+								
	Powe	n Diam			71 40				Ψ										
		um 00	(SM/ML) gravely SILTY SAND to		71.18 13.72														
14		~	(SM/ML) gravely SILTY SAND to gravely sandy SILT; grey, contains cobbles (GLACIAL TILL); non-cohesive,			12	SS	8											
			wet, compact to very loose																
						13	ss	20					0					мн	
15																			
						14	ss	4											
16																			
						15	ss	5											
	-	$\neg$																	
17						16	SS	8						}				мн	
						-													
						17	SS	3											
18					66 70	17	33	3											
	Bore	Casing	(SM) gravelly SILTY SAND; grey, contains cobbles and boulders		66.7 <u>6</u> 18.14														
	Wash Bore	HW C8	(GLACIAL TILL); non-cohesive, wet, compact to very dense			18	SS	28											
19																			
													-						
						19	SS	11					0					МН	
20		_					ss	29		_	-+-		<b>↓</b>	<u> </u>	+	<u> </u>	∔	-  -	
			CONTINUED NEXT PAGE																
DE	PTH	H S(	CALE							าเ	DI	= D						LO	GGED: KM
1:	50										ויי	- R						CHE	CKED: CRG

### **RECORD OF BOREHOLE:** 18-02

SHEET 3 OF 4 DATUM: CGVD28

LOCATION: N 5014098.6 ;E 366965.6

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: Nov. 28, 29 & Dec. 4, 5, 2018

HOND - 21 - 22 - 22 - 22 - 25 - 25 - 25 - 26 - 26 - 26	DESCRIPTION  CONTINUED FROM PREVIOUS PAGE (SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to very dense	STRAT/ ind	LEV. (m) 20 21 22 23 24 24	SS SS SS SS SS	13 36	SHEAR STRE Cu, kPa	NGTH	nat V. + rem V. ⊕		ATER CO		B. TEX	PIEZOMETER OR STANDPIPE INSTALLATION
- 20 - 21 - 22 - 23 - 24 - 24 - 25	(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to very dense		20 21 22 22 23	SS SS SS SS SS	29 13 36 57				0				
- 22 - 25 - 25 - 25 - 25 - 25 - 25 - 25	(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to very dense		21	SS SS SS SS	13 36 57				0			MH	
21 22 23 24 24 24 24 24 24 24 24 24 24 24 24 24	contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to very dense		21	SS SS SS SS	13 36 57							МН	
22 23 24 Mash Bore Wath Bore 25	FileDown		22	ss	36							МН	
23 Mash Bore HW Casing			23	SS	57				0			мн	
23 Mash Bore HW Casing	Fileso MI			_									
57 Mash Bore HW Casing	Rites Att		24	ss	55								
25			24	SS	55								
25	Programme Progra												
25									I		- I	1 1	
				1	1								
26			25	ss	54								
20	(ML) CLAYEY SILT - grey contains sage		58.99	_									
	(ML) CLAYEY SILT ; grey, contains sand seams; cohesive, w>PL, very Stiff	5	26 58.38	ss	73					0		МН	
27	(GP) GRAVEL, some sand, trace non-plastic fines; grey, contains cobbles and boulders; non-cohesive, wet, very dense		26.52										
28			56.88 27	SS	>50								
	Borehole Continued on RECORD OF DRILLHOLE 18-02	2	28.02										
29													
30 DEPTH S						GC							DGGED: KM

		CT: 18111310		RE	СС	R	D	0									: 18-02		10									SHEET 4 O	
		on: N 5014098.6 ;E 366965.6 \TION: -90° AZIMUTH:							DF	RILL	. RI	G:	CN	۸E 8	350		3, 29 & Dec. 4, 5			=nvii	om	ent	al F	Drilli	na		I	DATUM: CO	VD28
DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	H <u>COLOUR</u>	SH		loint Fault Shear Zonju ERY	r igate	.Q.D	BI F( O C C C C C C C	D- E O- F O- C R- C L - C	Beddi oliati Conta Drtho Cleav	ng on ct gonal age	I	PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular DISCONTINUITY	PO- K - SM- Ro - MB- DATA	Polis Slick Smo Roug Mec	hed ensid	led al Br	reak HYE	BR NOT abbr of at sym	- Bi re: Fo eviatio borevi bols. JLIC TIVIT	roke or add ons re ations Dia YPoir	litiona efer ti s & ameti nt Lo	al o list ral vaorn	лс	
DE	DRILI	BEDROCK SURFACE	SYN			۳ (		% C	SOLID ORE 9	%	% 898 11		PEI 0.3	7 7 7 0 7 0 7 0 7 0	IP w.r CORE AXIS	6	TYPE AND SURF DESCRIPTION	ACE I		icon Jr		к, 9 <sup>0</sup>	cm/s	ec	(1	ndex MPa	) AV	Ω' ′G.	
- 29 - 29 - 30 - 30 - 31	Rotary Drill HO Cone	Fresh, light grey, thinly bedded, medium strong sandy DOLOSTONE (MARCH FORMATION)		56.88	2																							_	
- - - - - - - - - - - - - - - - - - -				51.69	4																							_	
- - - - - - - - - - - - - - - - - - -		End of Drillhole		33.21																									
- 36 - 37 - 37 - 37 - 38																													
DE 1:		SCALE							C	3	С	)	L	C		E	R											LOGGED: K HECKED: C	

# RECORD OF BOREHOLE: 19-01

BORING DATE: February 19-20, 2019

SHEET 1 OF 5

DATUM: CGVD28

LOCATION: N 5014031.0 ;E 366869.9 SAMPLER HAMMER, 64kg; DROP, 760mm

ATE. Febluary 19-20, 2019

U Z	ПОН	SOIL PROFILE	- <u></u>		SA			DYNAMIC PENE RESISTANCE, B	TRATION	an y		NULIC CO k, cm/s			R R	PIEZOMETER
METRES	BORING METHOD		STRATA PLOT	ELEV.	ER		BLOWS/0.30m	20 40	60		10	) <sup>-6</sup> 10			ADDITIONAL LAB. TESTING	OR STANDPIPE
ME	RING	DESCRIPTION	\$ATA	DEPTH	NUMBER	TYPE	)/S//(	SHEAR STRENC Cu, kPa	TH na trer	tV. + Q-● nV.⊕ U-O	W/	ATER CO		NT WI	ADDI AB. T	INSTALLATION
1	BO		STR	(m)	z		BLC	20 40	60	80	20		0 6	30	Ľ	
0		GROUND SURFACE		87.09												
		Unsampled Overburden		0.00												
1																
2																
3																
5																
4																
	Stem)															
	Power Auger 200 mm Diam (Hollow Stem)															
5	Power Auger															
	Po															
	1000															
6																
7																
~																
8																
9																
10			-			┝┥	-	-+-	+		+			 +	-	
DE	PTH	SCALE					C	GO	LD	ER						DGGED: PAH
1:	50														CH	ECKED: CRG

# RECORD OF BOREHOLE: 19-01

BORING DATE: February 19-20, 2019

SHEET 2 OF 5

DATUM: CGVD28

LOCATION: N 5014031.0 ;E 366869.9 SAMPLER HAMMER, 64kg; DROP, 760mm

» ALE	1 HOD		SOIL PROFILE	F		SA	MPLE		DYNAMIC PI RESISTANC			Ì,		ILIC CONE , cm/s			MG	PIEZOMETER
DEPTH SCALE METRES	BORING METHOD		DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE	BLOWS/0.30m	20 SHEAR STR Cu, kPa	40 ENGTH		80	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>	ADDITIONAL LAB. TESTING	OR STANDPIPE INSTALLATION
בֿ	BORIN			STRAT,	DEPTH (m)	NUM	∣≻∣	SMOLE					Wpl		0 <sup>W</sup>	- WI	ADI LAB.	INSTALLATION
10		-	CONTINUED FROM PREVIOUS PAGE	0				ш	20	40	60	80	20	40	60	80		
10			Unsampled Overburden															
11		Stem)																
	uger	follow																
	Power Auger	iam. (F																
	₽.	200 mm Diam. (Hollow Stem)																
12		20																
	$\vdash$	$\dashv$																
13																		
14																		
15																		
16																		
	sore	sing																
	Wash Bore	NW Ca																
17																		
18																		
19																		
20	Ľ	$- \mid$						_			<u> </u>							
			CONTINUED NEXT PAGE															
DE	PTF	H SC	ALE						G		DF	R					LO	GGED: PAH
1:	50							V				• •					CHE	CKED: CRG

# RECORD OF BOREHOLE: 19-01

BORING DATE: February 19-20, 2019

SHEET 3 OF 5

DATUM: CGVD28

LOCATION: N 5014031.0 ;E 366869.9 SAMPLER HAMMER, 64kg; DROP, 760mm

ļ	THOD	SOIL PROFILE	<b>-</b>	1	SA	MPLE		DYNAMIC PEN RESISTANCE,			λ,	HYDRAU					NG	PIEZOMETER
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	түре	BLOWS/0.30m	SHEAR STREI Cu, kPa	IGTH	nat V. + rem V. ⊕	0	10 <sup>-6</sup> WA Wp 20	TER CO		PERCE		ADDITIONAL LAB. TESTING	OR STANDPIPE INSTALLATION
		CONTINUED FROM PREVIOUS PAGE		1			-	20 4				20	4	. 6				
20		Unsampled Overburden																
	ore																	
	Wash Bore																	
21	s z	2																
	-	_																
22																		
23																		
24																		
25																		
	Bore	2																
	Wash Bore																	
26	1																	
27																		
28																		
29																		
30		CONTINUED NEXT PAGE		$\mathbb{L}^{-}$						L						$\mathbb{L}^{-}$		
	этн	SCALE						GO										GGED: PAH
	50	OUNEL						jGO		ノヒ	К							CKED: CRG

# **RECORD OF BOREHOLE: 19-01**

BORING DATE: February 19-20, 2019

SHEET 4 OF 5

DATUM: CGVD28

LOCATION: N 5014031.0 ;E 366869.9 SAMPLER HAMMER, 64kg; DROP, 760mm

ш		QO	SOIL PROFILE			SA	MPL	ES	DYNAMIC RESISTAN			0N 10.3m	$\sum_{i=1}^{n}$	HYDR	AULIC CO k, cm/s	ONDUCT	IVITY,		. (7	
DEPTH SCALE	RES	BORING METHOD		LOT		щ		30m	20	40		0 8	i0 ``	1	D <sup>-6</sup> 1(		) <sup>-4</sup> 10	D <sup>-3</sup>	ADDITIONAL LAB. TESTING	PIEZOMETER
PTH	MET	RING	DESCRIPTION		LEV.	NUMBER	TYPE	BLOWS/0.30m	SHEAR ST Cu, kPa	TREN	GTH n	at V. + em V. ⊕	Q - ● U - O	W	ATER CO				AB. TE	STANDPIPE INSTALLATION
B		BOF		STR	(m)	ž		BLO	20	40		0 8		VV		0 6		WI 0	Ρ	
_	30	_	CONTINUED FROM PREVIOUS PAGE																	
F			Unsampled Overburden																	-
E																				-
Ē																				-
F	31																			-
Ē																				-
Ę																				-
Ē																				-
-	32																			-
E																				-
Ē		Bore																		-
F		Wash Bore NQ Core																		-
F	33																			-
F																				:
E																				-
Ē																				-
-	34																			-
Ē																				-
Ē																				-
Ę																				-
F	35				51.84															-
Ē			Borehole Continued on RECORD OF DRILLHOLE 19-01																	-
F																				
Ē	36																			-
Ē																				-
F																				
Ē																				-
F	37																			-
-																				-
E																				-
Ē																				-
	38																			-
10 11																				-
11/3																				-
- GDT																				-
	39																			-
I GAI																				-
0.GPJ																				-
11131	40																			-
1 181																				
MIS-BHS 001 18111310.GPJ GAL-MIS.GDT 11/3/19 JEM	DEI	PTH S	SCALE							$\mathbf{c}$			D						LC	) GGED: PAH
MIS-B	1:						<		G				R							ECKED: CRG

			T: 18111310 N: N 5014031.0 ;E 366869.9		RE	CC	DR	D									E: <b>19-0</b> <sup>4</sup>												HEET		3
			rion: -90° Azimuth:							DF	RILL	RIC	G: (	CME	E-85	50	OR: CCC Geotec		cal &	Env	viror	nen	tal I	Drill	ling			DF		 37020	5
DEPTH SCALE METRES		DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH COLOUR RETURN	Sł Vi C.	% C(	Sheai /ein Conju	r igate	.Q.D %	CC OR CL FF IN F	- Bec - Foli - Cor - Cle - Cle RACT. IDEX PER .3 m	ntact nogo avag DIP CC	nal	PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular DISCONTINUITY TYPE AND SURF DESCRIPTIO	K S F N Y DA		ckens nooth ugh	sided	Break HY CON K	NO abb of a	TE: Forevia abbrei nbols. ULIC TIVI	For ad tions viation	dditior refer ns &	_oada ex a) ∆				
- - - - - - - - 36			BEDROCK SURFACE Fresh, light to medium grey, fine grained, faintly porous, medium bedded DOLOSTONE BEDROCK, with some calcite nodules and occasional thin shale partings		51.84 35.25	R1	100																								
- - - - - - - - - 37 -	Rotary Drill	NQ Core			40.74	R2	50																								
- - - - - - - - - - - - - -			End of Drillhole	74	49.74 37.35																										
- - - - - - - - - - - - - - - - - - -																															
- 40 - 40 																															
- 41 																															
42 - - - - - - - - - - - - - - - - - - -																															
MISS.GDT 11/3/19 JEM 1 1 1 1 1 1 1 1 1 1 1 7																															
MIS-RCK 004 18111310.GPJ GAL-MISS.GDT 11/3/19 JEM 																															
DE MIS-RCK 00 1 :	EP" : 50		CALE							C	3	С			D	E	R												)gge Ecke		

#### LOCATION: N 5014028.0 ;E 366929.9

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: 19-02

SHEET 1 OF 5 DATUM: CGVD28

BORING DATE: February 21-22, 2019

Ш.	DOH.	SOIL PROFILE	1.	ı —	SA	AMPL		DYNAMIC PENETR RESISTANCE, BLC	· •	HYDRAULIC CONDUC k, cm/s		RG₽	PIEZOMETER
METRES	BORING METHOD		STRATA PLOT	ELEV.	ĒR	ш	BLOWS/0.30m		60 80	10 <sup>-6</sup> 10 <sup>-5</sup>		ADDITIONAL LAB. TESTING	OR STANDPIPE
ΞΨ	RING	DESCRIPTION	٤ATA	DEPTH	NUMBER	TYPE	)/S//(	SHEAR STRENGT Cu, kPa	H nat V. + Q - ● rem V. ⊕ U - O	WATER CONTEN		ADDI .AB. T	INSTALLATION
-	BO		STF	(m)			BLC	20 40	60 80		60 80		
0	<b> </b>	GROUND SURFACE Unsampled Overburden	_	85.48 0.00									
				0.00									
1													
2													
3													
4													
5	Wash Bore												
J	Wash												
6													
7													
8													
9													
10	μL			↓		↓_	-	<b>⊢</b> – <b>∔</b> – − <b> </b> −		+		.  -	
		CONTINUED NEXT PAGE											
DE	PTH	SCALE						GOL	DER			LO	GGED: PAH

# **RECORD OF BOREHOLE: 19-02**

BORING DATE: February 21-22, 2019

SHEET 2 OF 5

DATUM: CGVD28

LOCATION: N 5014028.0 ;E 366929.9 SAMPLER HAMMER, 64kg; DROP, 760mm

ļ	ДОН	SOIL PROFILE	- I -	1	SA	MPLE		DYNAMIC PEN RESISTANCE,	BLOW	'ION S/0.3m	Ì,	HYDRAL		IVITY,		RG	PIEZOMETER
METRES	BORING METHOD		STRATA PLOT	ELEV.	Ш		BLOWS/0.30m		40		BO <b>`</b>	10 <sup>-6</sup>			0-3	I ADDITIONAL LAB. TESTING	OR STANDPIPE
Ψ	RING	DESCRIPTION	RATA	DEPTH	NUMBER	TYPE	/S/(	SHEAR STREM Cu, kPa	NGTH	nat V. + rem V. €	- Q - ● 9 U - O				NT WI	ADDI AB. 1	INSTALLATION
1	BO		STF	(m)			BLC	20 4	40	60	80	20			<u>80</u>	<u> </u>	
10		CONTINUED FROM PREVIOUS PAGE	-						<u> </u>						<u> </u>		
		Unsampled Overburden															
															1		
11																	
12																	
13																	
14																	
	a p																
15	Wash Bore NW Casing																
	× N																
16																	
10																	
17																	
18																	
10																	
19																	
<u></u>										$\perp$							
20		CONTINUED NEXT PAGE	7	T <b></b>		[].			Γ-	T		[ — —  -	 		T <b></b>		
		1		1				I	1	1	1				1		
DE	PTH	SCALE					5	GO	) L	DE	R					LC	OGGED: PAH
1:	50							,	_	_						CHE	ECKED: CRG

# RECORD OF BOREHOLE: 19-02

BORING DATE: February 21-22, 2019

SHEET 3 OF 5

DATUM: CGVD28

LOCATION: N 5014028.0 ;E 366929.9 SAMPLER HAMMER, 64kg; DROP, 760mm

S L	ETHOD	SOIL PROFILE	Ц			AMPL	_	DYNAMIC PEN RESISTANCE,			<u>``</u> `	HYDRAU k 10 <sup>-6</sup>				0-3	NAL	PIEZOMETER OR
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	түре	BLOWS/0.30m	SHEAR STREN Cu, kPa	IGTH	⊥ nat V. + rem V. ⊕		WAT Wp H	TER CO		PERCE	WI	I ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATION
-+	-	CONTINUED FROM PREVIOUS PAGE				$\vdash$	ш	20 4	10	60 8	30	20	40	<u> </u>	0 8	80	+	
20		Unsampled Overburden	+			+				1								
21																		
21																		
22																		
										1								
23										1								
										1								
										1								
24										1								
										1								
										1								
	Sore																	
25	Wash Bore NW Casing																	
	< Z																	
26																		
27																		
28																		
										1								
										1								
										1								
										1								
29										1								
										1								
										1								
30				↓		<u> </u>	_		L	↓	L	$\mid$				∔	_	
		CONTINUED NEXT PAGE																
DF	этн я	SCALE						GO									10	) GGED: PAH
	50							5 G U		JE	К							ECKED: CRG

#### LOCATION: N 5014028.0 ;E 366929.9

RECORD OF BOREHOLE: 19-02

SHEET 4 OF 5 DATUM: CGVD28

BORING DATE: February 21-22, 2019

	SAM	MPLE	R HAMMER, 64kg; DROP, 760mm												PEI	NETRAT	TION TE	STHAN	/MER,	64kg; DROP, 760mm
ш		QD	SOIL PROFILE			SA	AMPL	ES	DYNAMI RESISTA			0.3m	ì	HYDR.	AULIC Co k, cm/s	ONDUCT	IVITY,		.0	
SCAL	RES	МЕТН		LOT		щ		30m	20	40			10					0-3	IONAL STIN(	PIEZOMETER
DEPTH SCALE	MET	BORING METHOD	DESCRIPTION		ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.30m	SHEAR S Cu, kPa	STREN	GTH n	at V. + em V. ⊕	Q - ● U - O	W	ATER C	ONTENT		NT WI	ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATION
		BO		STR	(m)	z		BLC	20	40	) 6	<u>ع 0</u>	0					30	L, T	
-	30	e 6	CONTINUED FROM PREVIOUS PAGE Unsampled Overburden																	
-		Wash Bore NW Casing																		-
F	-	ΪŹ	Borehole Continued on RECORD OF		54.92															-
Ē			DRILLHOLE 19-02																	-
-	31																			-
E																				-
F																				-
Ē	32																			-
Ē																				-
Ē																				-
E																				-
F	33																			-
-																				-
-																				-
-	34																			-
F	34																			:
Ē																				-
Ē																				-
F	35																			-
E																				-
E																				-
F																				-
Ē	36																			
-																				-
Ē																				-
F	37																			-
Ē																				-
-																				-
Ē																				-
 ⊻-	38																			-
l 11																				-
11/3																				-
S.GD1	39																			-
H H																				-
PJ G/																				
310.G																				-
MIS-BHS 001 18111310.GPJ GAL-MIS.GDT 11/3/19 JEM	40																			-
001																				
-BHS			SCALE					¢	G	0	LD	) E	R							DGGED: PAH
MIS	1:5	50						V		-		-							CH	ECKED: CRG

LO	CAT	ECT: 18111310 TION: N 5014028.0 ;E 366929.9 NATION: -90° AZIMUTH:	RECORD OF DRILLHOLE: 19-02 DRILLING DATE: February 21-22, 2019 DRILL RIG: CME-850 DRILLING CONTRACTOR: CCC Geotechnical & E	SHEET 5 OF 5 DATUM: CGVD28 Enviromental Drilling
DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	(m) COVERY RQ.D. FRACT. DISCONTINUITY DATA	ensided NOTE: For additional oth abbreviations refer to list
_		BEDROCK SURFACE	54.92	
- - - - - - - - -		Limestone and dolostone COBBLES and BOULDERS (Inferred GLACIAL TILL) or Highly weathered BEDROCK	30.56 R1	
- - - - - - - -	<u> </u>	Fresh, light to medium grey, fine grained, faintly porous, medium bedded DOLOSTONE BEDROCK, with some calcite nodules and occasional thin shale partings	R2 53.32 32.16 R3	
- - 33 - - - -		End of Drillhole	R4 51.73 33.75	
- 34 - - - - - - - - - - - - - - - - - - -				
- 36    - 37   				
40 DE 11201000000000000000000000000000000000				
DE 1:		H SCALE	<b>GOLDER</b>	LOGGED: PAH CHECKED: CRG