

DATE September 14, 2017**PROJECT No.** 1658448-1000-1**TO** Claridge Homes Corporation**FROM** Loren Bekeris
Brian Byerley**EMAIL** Loren_Bekeris@golder.com
Brian_Byerley@golder.com**DESKTOP HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
RIVERSIDE SOUTH LANDS
RIVER ROAD AND SPRATT ROAD, OTTAWA, ONTARIO**

This report presents the results of a desktop hydrogeological assessment carried out for the proposed residential development site to be located on the Riverside South Lands (east of River Road and west of Spratt Road) in Ottawa, Ontario.

The purpose of this hydrogeological assessment was to determine the general soil and groundwater conditions across this site, by means of existing on-site borehole information, and to address possible construction-related impacts to private water supply wells. The on-site information was enhanced with published mapping and publicly available information. The water well records in the Ministry of the Environment and Climate Change (MOECC) Water Well Information System (WWIS) for nearby water wells were used to provide further information regarding hydrogeological conditions in the area and to identify where nearby water wells may be in use.

1.0 DESCRIPTION OF PROJECT AND SITE

Plans are being prepared to develop a proposed residential development within the Riverside South Lands which is located east of River Road and west of Spratt Road in Ottawa, Ontario (see Key Plan inset, Figure 1).

The following is known about the project and site.

- The western boundary of the site is located east of River Road, approximately 400 metres north of the intersection with Rideau Road. The eastern boundary of the site is located west of Spratt Road, approximately 845 metres north of the intersection with Rideau Road.
- The site is irregular in shape, with the southwestern portion adjacent to River Road measuring approximately 390 metres by 420 metres and the northern portion measuring about 200 metres by 1,110 metres.
- The site topography is relatively flat with a gentle downward slope from east to west (i.e., towards the Rideau River).
- The majority of the site is currently undeveloped and predominantly consists of agricultural land with localized vegetation and trees.
- It is understood that the proposed development will include conventional residential dwellings (single family homes and townhouses) as well as access roads and services within the subdivision. A park and institutional development are also proposed for the site.



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 the site is interpreted to predominantly consist of a thick deposit of silty clay. Glacial till and shallow bedrock are indicated to be present near the eastern boundary of the site. Published mapping indicates the bedrock surface to be at depths in the range of 5 to 15 metres below the ground surface, sloping down from the east to the west across the site (Figure 3).

2.2 Bedrock Geology

The Geological Survey of Canada bedrock geology mapping indicates that the bedrock on the site should consist of March Formation interbedded sandstone/dolostone and Oxford Formation dolostone on the northeast and southwest parts of the site, respectively (Figure 4). The bedrock formations are divided by the Hazeldean Fault, which crosses the site on a northwest to southeast trend.

2.3 Hydrogeology

2.3.1 Overburden Aquifer

The clay and glacial till deposits in the area are generally not capable of supplying sufficient quantities of groundwater to be considered an aquifer. As a result, the principal aquifer within the vicinity of the site is considered to be the underlying bedrock formations.

2.3.2 Bedrock Aquifers

The Oxford formation and underlying March 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.

2.3.3 Local Water Supply Wells

There are a total of 15 water wells identified in the MOECC Water Well Information System (WWIS), with a location accuracy of 300 metres or less, located within 100 metres of the site. The WWIS indicates that all of the wells were constructed to be used as water supply (domestic or livestock). The depths of the wells range from 14 to 27 metres, and the depth to the static water level ranges from 2 to 12 metres.

3.0 SITE SPECIFIC GEOLOGY AND HYDROGEOLOGY

3.1 General

Golder Associates completed a geotechnical investigation on this site in 2017, which included 35 boreholes advanced across the site (Golder Associates Ltd., 2017).

Golder Associates also previously completed several geotechnical investigations on or in the vicinity of this site, including an investigation that was carried out in 2007 for the City of Ottawa for the overall planning of the Riverside South Community.

Based on a review of those previous studies and published geological mapping, the subsurface conditions on the site likely consist of a thick deposit of sensitive and compressible silty clay; the silty clay is expected to thin towards the northeast portion of the site, adjacent to Spratt Road, where glacial till and potentially bedrock is expected at shallow depths. The borehole logs for the 2017 on-site investigation are included in Attachment A, and borehole locations are indicated on Figure 1.

3.2 Site Specific Geology

Topsoil and Fill

Topsoil exists at the ground surface, or buried beneath the surficial fill, at most of the borehole locations, and typically ranges from about 60 to 300 millimetres in thickness. Fill (some of which is topsoil) exists at boreholes 17-7, 17-8, 17-29, 17-30, 17-31, 17-32, 17-33, and 17-35. The fill layers extend to depths of between about 0.1 to 1.1 metres below the existing ground surface. The fill consists of topsoil, asphaltic concrete, sand, sandy gravel, silty sand, silty clay, and/or sand and gravel.

Upper Sands and Silts

A deposit of sandy silt, sand, or silty sand with varying amounts of gravel exists below the topsoil and/or fill in boreholes 17-2, 17-8, 17-9, 17-10, 17-12 to 17-16, 17-20, 17-21, 17-29, and 17-35. The deposit generally extends to depths ranging from about 0.4 to 1.3 metres below the existing ground surface, with the exception of borehole 17-21 where it extends to a depth of about 3.5 metres below the existing ground surface.

Layered Silt, Clayey Silt, and Silty Sand

A deposit of layered silt, clayey silt, and silty sand exists below the topsoil in boreholes 17-3, 17-4, and 17-5. The layered deposit generally extends to depths ranging from about 1.4 to 2.0 metres below the existing ground surface.

Weathered Silty Clay, Clayey Silt, and Silty Sand

Deposits of silty clay to clay and/or layered silty clay, clayey silt, and silty sand exists in all of the boreholes, with the exception of boreholes 17-20 and 17-21. These deposits have been weathered to a grey brown colour. These weathered deposits extend to depths of about 1.8 to 5.8 metres below the existing ground surface.

Unweathered Silty Clay to Clay

The silty clay deposit below the depth of weathering in boreholes 17-5, 17-6, 17-8 to 17-19, 17-23, 17-24, and 17-26 is unweathered and grey in colour. The unweathered silty clay was fully penetrated to depth of about 3.8 to 6.3 metres below the existing ground surface at seven boreholes, where the thickness of the deposit ranges from about 0.3 to 3.2 metres. The unweathered silty clay was not fully penetrated in the remaining boreholes but was proven to depths ranging from about 5.8 to 7.9 metres below the existing ground surface.

Lower Sand to Gravelly Silty Sand

A deposit of sand to gravelly silty sand exists below the weathered silty clay in boreholes 17-26, 17-27, and 17-28. This deposit was proven/inferred to depths of about 5.5 and 3.2 metres below the existing ground surface, at boreholes 17-26 and 17-28, respectively, and fully penetrated to a depth of about 3.3 metres below the existing ground surface at borehole 17-27. The deposit also contains cobbles and boulders.

Glacial Till

A deposit of glacial till exists below the silty clay in boreholes 17-1, 17-3 to 17-7, 17-11, 17-19, 17-22, 17-24, and 17-25, and below the silty sand in boreholes 17-20 and 17-21. Glacial till was also inferred in borehole 17-2A below the silty clay and in borehole 17-22 below the upper portion of the glacial till, based on the results of the dynamic cone penetration testing. The glacial till generally consists of a heterogeneous mixture of gravel, cobbles, and boulders in a matrix of silty sand to sandy silt. The glacial till was encountered at depths ranging from about 0.9 to 6.3 metres below the existing ground surface, and proven to extend to depths ranging from about 4.2 to 8.2 metres below the existing ground surface.

Silty Sand and Gravel

A layer deposit of silty sand and gravel was encountered below the glacial till in boreholes 17-20 and 17-21. This layered deposit was not fully penetrated at the borehole locations, but was proven to depths of about 6.1 and 7.9 metres, respectively, below the existing ground surface.

Auger Refusal and Bedrock

Practical refusal to auger advancement was encountered at boreholes 17-1, 17-2, 17-4, 17-23, 17-24, 17-25, and 17-26 at depths ranging from about 3.8 to 6.7 metres below the existing ground surface. Refusal to dynamic cone penetration test advancement was encountered in boreholes 17-23A, 17-27A, and 17-28 at depths between about 3.2 and 4.3 metres below the existing ground surface. Refusal could indicate the bedrock surface or may reflect the presence of cobbles and boulders in the glacial till deposit.

In borehole 17-27, the bedrock was encountered below the overburden soils at a depth of about 3.3 metres below the existing ground surface, where it was cored for a depth of about 3.3 metres (i.e., to a total depth of about 6.6 metres below the existing ground surface).

The bedrock encountered was logged as fresh, thinly to medium bedded, grey, fine grained limestone.

3.3 Hydrogeology

Standpipe piezometers or monitoring wells were sealed into selected boreholes during the geotechnical investigation to allow for measurements of the groundwater level on January 30, 2017, as provided in the following table.

Borehole Number	Soil Strata	Ground Surface Elevation (m)	Water Level Depth (m)	Water Level Elevation (m)
17-1	Glacial Till	90.0	0.4	89.6
17-3	Glacial Till	91.1	1.3	89.8
17-9	Silty Clay	90.3	0.2	90.1
17-14A	Silty Clay	90.5	0.7	89.8
17-18A	Silty Clay	90.7	0.3	90.4
17-21	Silty Sand	94.7	2.5	92.2
17-24A	Silty Clay	92.6	0.8	91.8
17-27	Bedrock	93.9	0.8	93.1
17-28	Gravelly Silty Sand	94.0	0.3	93.7
17-29	Silty Clay	90.2	0.7	89.5
17-30	Silty Clay	90.0	0.6	89.4
17-31	Silty Clay	90.1	0.7	89.4

Water levels across the site range from 0.2 to 2.5 metres depth. 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.

4.0 POTENTIAL IMPACTS TO EXISTING GROUNDWATER USERS

There are a total of 15 wells in the WWIS database that were constructed as water supply wells, located within 100 metres of the site. Details regarding the water supply wells are presented in the following table. Refer to Figure 1 for the well locations.

Well ID	Depth of Well (m)	Depth to Static Water Level (m)	Depth to Water Found (m)	Available Drawdown (m)	Type of Well
1500339	15.2	5.5	15.2	9.7	Bedrock
1500342	20.7	2.4	20.7	18.3	Bedrock
1500343	14.9	4.3	14.6	10.6	Bedrock
1500344	17.7	4.9	17.7	12.8	Bedrock
1500345	21.6	4.9	21.0	16.7	Bedrock
1500346	22.9	12.2	22.9	10.7	Bedrock
1500348	18.9	7.3	18.3	11.6	Bedrock
1500349	20.4	4.6	19.8	15.8	Bedrock
1510843	16.8	6.1	16.5	10.7	Bedrock
1511750	26.2	6.4	26.2	19.8	Bedrock
1513667	22.3	3.0	21.6	19.3	Bedrock
1516805	25.6	4.6	23.8	21.0	Bedrock
1517460	16.2	6.1	15.8	10.1	Bedrock
1517927	18.3	5.8	15.2; 17.1	12.5	Bedrock
7196225	--	--	--	--	--

A review of aerial photographs for the site area suggests that there are approximately 26 dwellings along River Road that are within 100 metres of the site and that may be supplied by water wells. Given that only 15 well records were identified in the WWIS, it is possible that the records for some water wells in the vicinity of the site contained inaccurate location information and thus were not captured in the table above, or that they are shallow dug wells for which well records were not submitted.

The well record associated with Well ID 7196225 is for an extension of the well casing (above ground). The original well record for the well is not available. As such no details regarding the original construction of the well are available. From the available well records, water supply wells in the area generally obtain water from the bedrock aquifer. As such it is likely that Well ID 7196225 is completed in a similar fashion.

The available drawdown in the wells, calculated as the difference between the static water level and the depth of the well) ranges from 9.7 to 21.0 metres. Construction dewatering associated with typical site servicing could temporarily reduce the available drawdown in the wells but not likely to the degree that could 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).

If shallow dug wells are supplying dwellings are located within 100 metres of the site, there may be an increased potential for temporary well interference due to construction dewatering at the site.

Prior to construction at the site, it is recommended that a well survey be completed of the residences with wells located within approximately 100 metres of the property boundary. Information to be collected during the well survey could include the depth of the well, type of pump, and static water level. Water quality samples could be collected from selected wells and analyzed for a typical suite of parameters (i.e. the 'subdivision package' as per MOECC Procedure D-5-5).

5.0 LIMITATIONS AND USE OF MEMORANDUM

This technical memorandum was prepared for the exclusive use of Claridge Homes Corporation. 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.

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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.

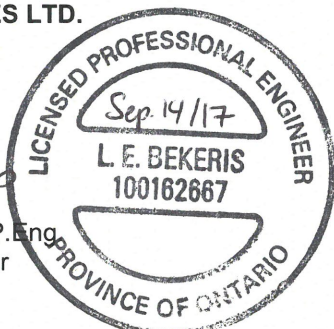
6.0 CLOSURE

We trust this submission satisfies the requirements for a desktop hydrogeological assessment of the proposed residential subdivision development to be located on the Riverside South Lands (east of River Road and west of Spratt Road) in Ottawa, Ontario. If you have any questions regarding this report, please contact the undersigned.

GOLDER ASSOCIATES LTD.

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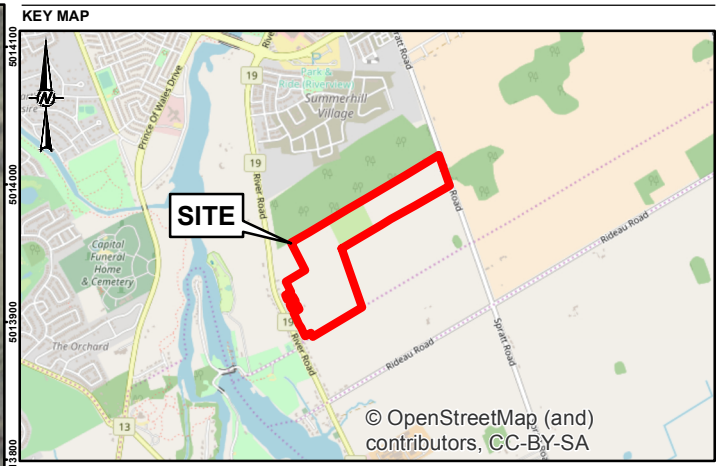
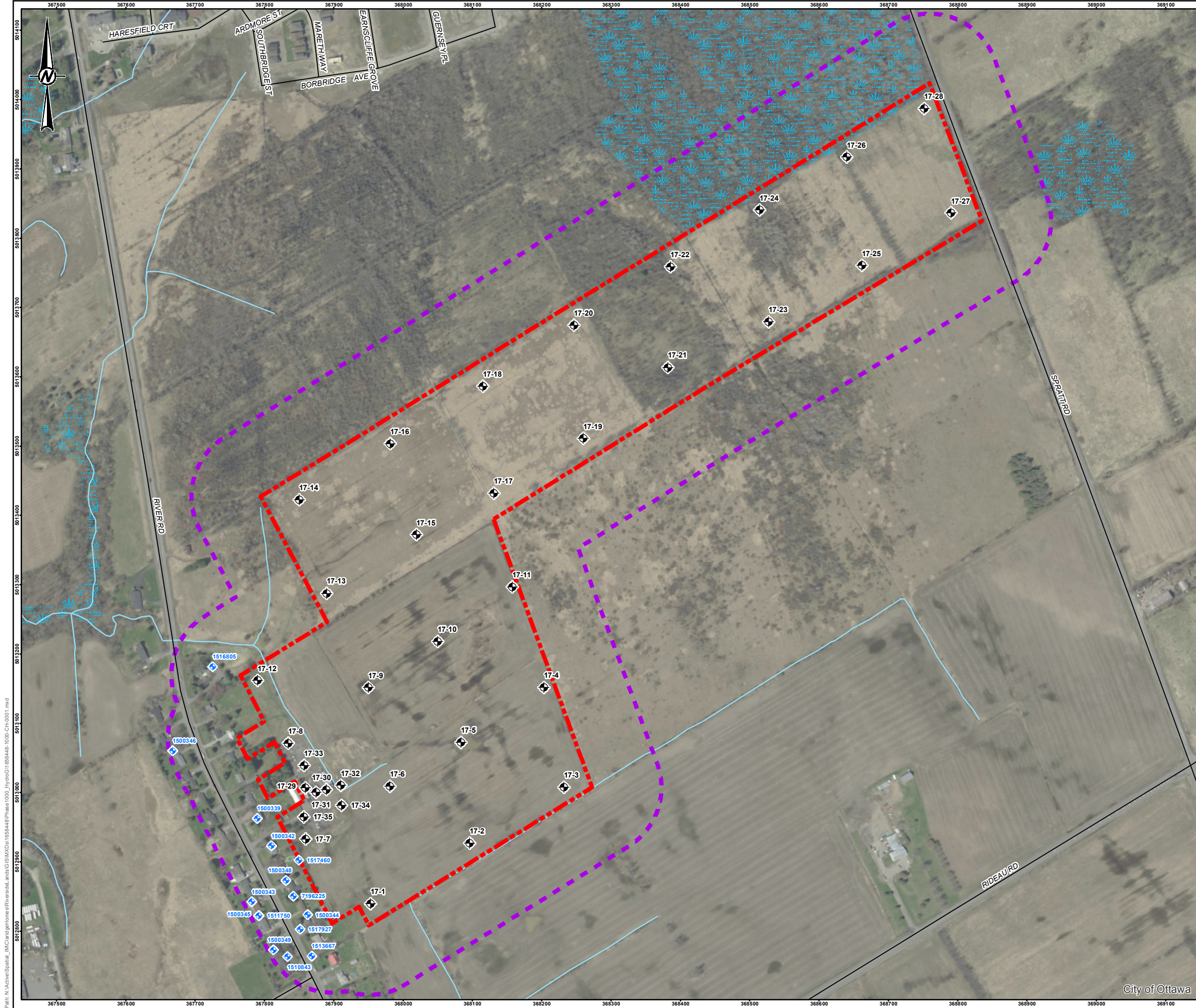
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Attachments: Figures 1 to 4
Attachment A – Borehole Logs

References

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



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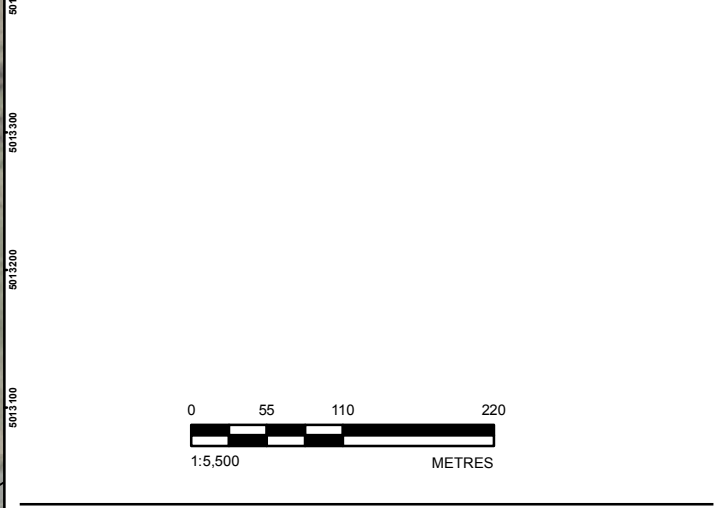
- LEGEND**
- MOECC LISTED WATER WELL
 - APPROXIMATE BOREHOLE LOCATION
 - ROADWAY
 - WATERCOURSE
 - WETLAND
 - APPROXIMATE SITE BOUNDARY
 - 100 m BUFFER

NOTE(S)

1. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD. REPORT NO. 1658448-1000.

REFERENCE(S)

1. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2014
2. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: MTM ZONE 9, VERTICAL DATUM: CGVD28



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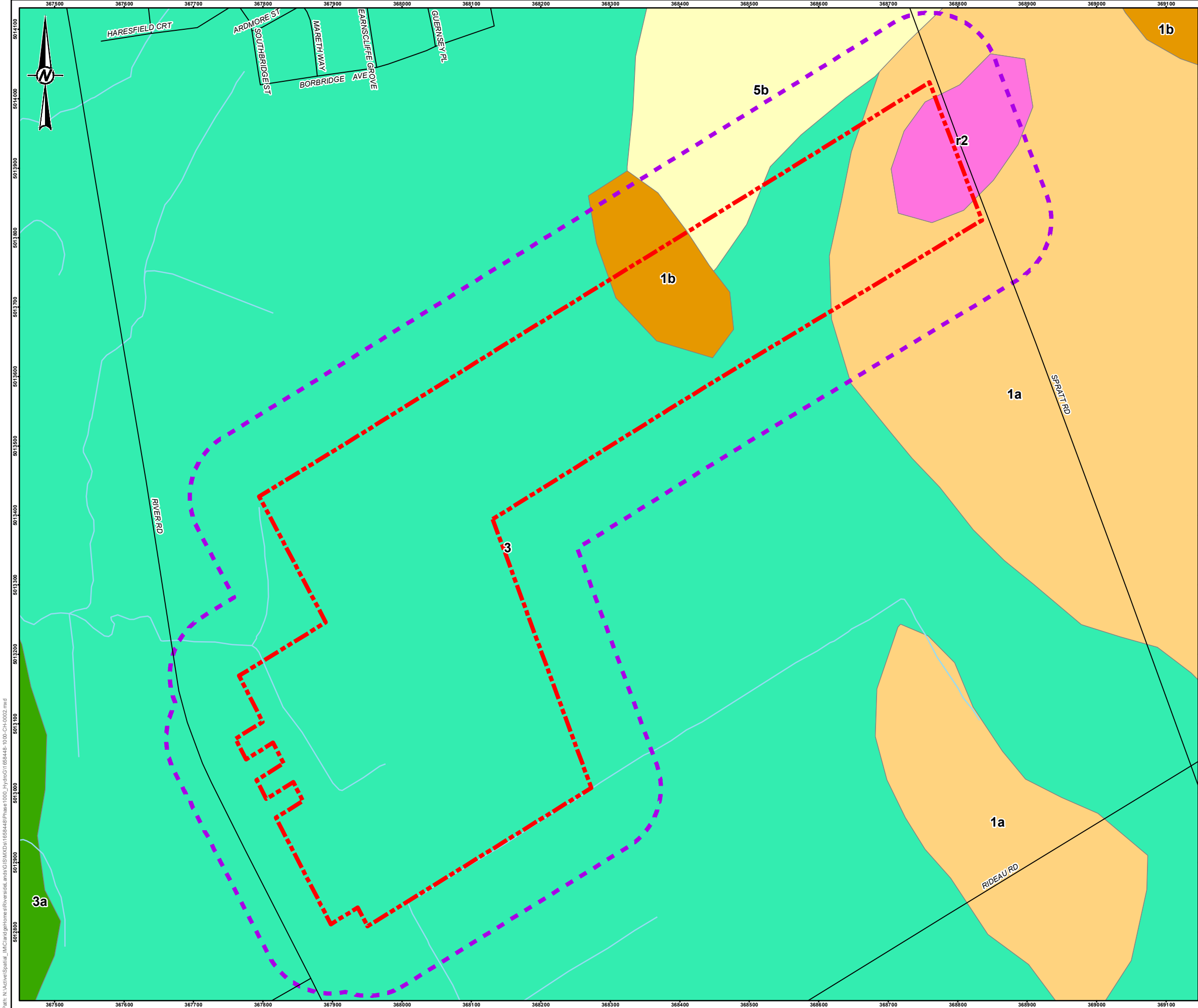
PROJECT
HYDROGEOLOGICAL ASSESSMENT
RIVERSIDE SOUTH LANDS, RIVER ROAD AND SPRATT ROAD
OTTAWA, ONTARIO

TITLE
SITE PLAN

CONSULTANT	YYYY-MM-DD	2017-09-06
DESIGNED	---	
PREPARED	JEM	
REVIEWED	LEB	
APPROVED	BTB	

PROJECT NO. 1658448 PHASE 1000 REV. 0

FIGURE 1



LEGEND

- ROADWAY
- WATERCOURSE
- APPROXIMATE SITE BOUNDARY
- 100 m BUFFER
- 5b: NEARSHORE SEDIMENTS: FINE TO MEDIUM GRAINED SAND
- 3. OFFSHORE MARINE DEPOSITS: CLAY, SILTY CLAY & SILT
- 3a. OFFSHORE MARINE DEPOSITS: CLAY, SILT UNDERLYING EROSIONAL TERRACES
- 1a. TILL, PLAIN WITH LOCAL RELIEF <5 m
- 1b. TILL, DRUMLINIZED
- r2. BEDROCK: LIMESTONE, DOLOMITE, SANDSTONE & LOCAL SHALE

NOTE(S)

1. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD. REPORT NO. 1658448-1000.

REFERENCE(S)

1. BÉLANGER, J. R. 2008 URBAN GEOLOGY OF THE NATIONAL CAPITAL AREA, GEOLOGICAL SURVEY OF CANADA, OPEN FILE 5311, 1 DVD.
2. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2014
3. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: MTM ZONE 9, VERTICAL DATUM: CGVD28

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PROJECT
HYDROGEOLOGICAL ASSESSMENT
RIVERSIDE SOUTH LANDS, RIVER ROAD AND SPRATT ROAD
OTTAWA, ONTARIO

TITLE
SURFICIAL GEOLOGY

CONSULTANT

2017-09-06

DESIGNED

PREPARED

JEM

REVIEWED

LEB

APPROVED

BTB

PROJECT NO.
1658448

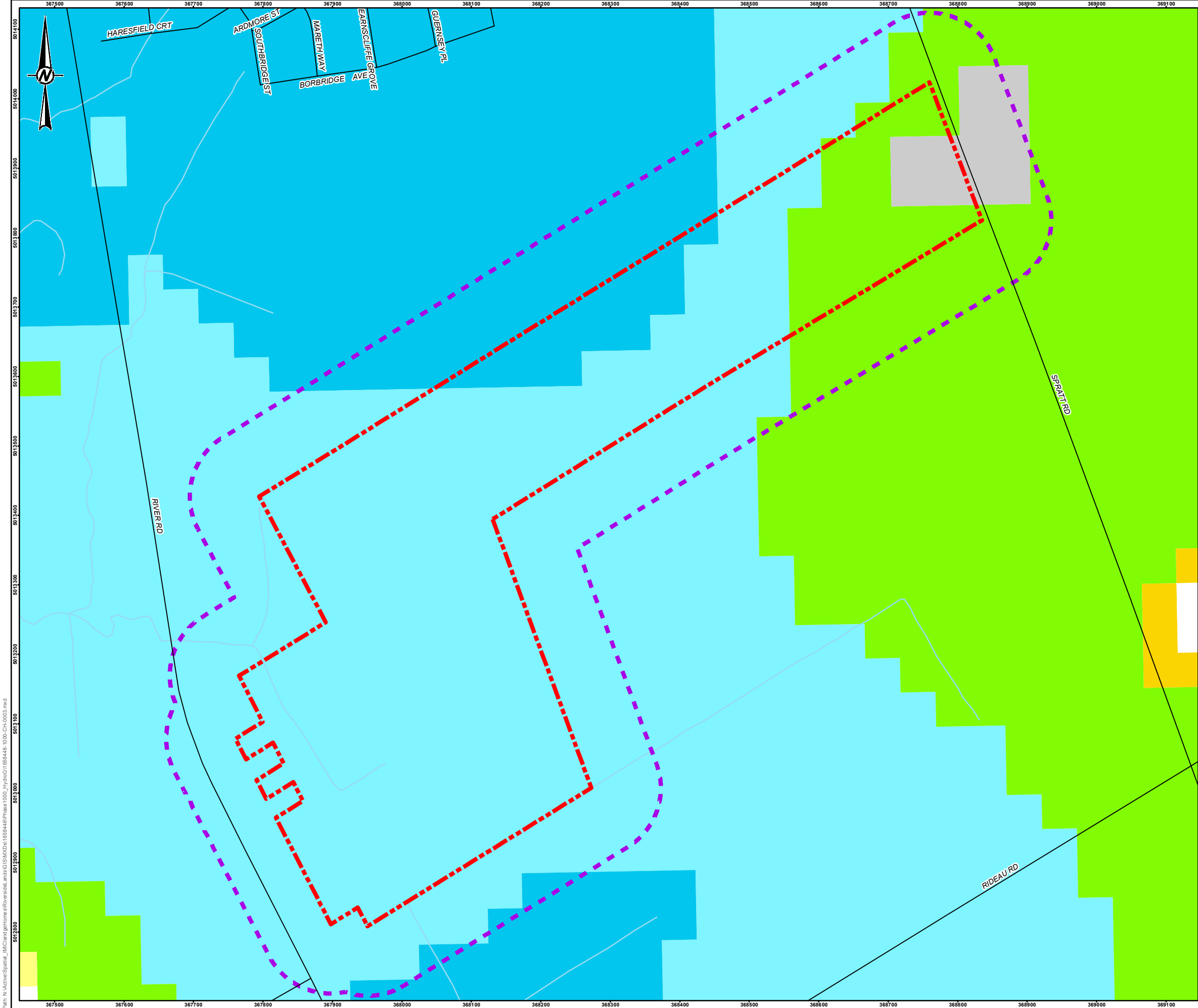
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FIGURE
2

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LEGEND

- ROADWAY
- WATERCOURSE
- APPROXIMATE SITE BOUNDARY
- 100 m BUFFER

TREND IN DEPTH TO BEDROCK (METRES)

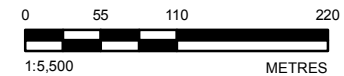
- 0 to 1
- 1 to 2
- 2 to 3
- 3 to 5
- 5 to 10
- 10 to 15
- 15 to 25
- 25 to 50
- 50 to 100
- 100 to 200

NOTE(S)

1. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD. REPORT NO. 1658448-1000.

REFERENCE(S)

- 2010 BÉLANGER, J. R., URBAN GEOLOGY OF THE NATIONAL CAPITAL AREA, GEOLOGICAL SURVEY OF CANADA, OPEN FILE D3256, 2001
- LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2014
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CLARIDGE HOMES CORPORATION

PROJECT

HYDROGEOLOGICAL ASSESSMENT
RIVERSIDE SOUTH LANDS, RIVER ROAD AND SPRATT ROAD
OTTAWA, ONTARIO

TITLE

DRIFT THICKNESS

CONSULTANT



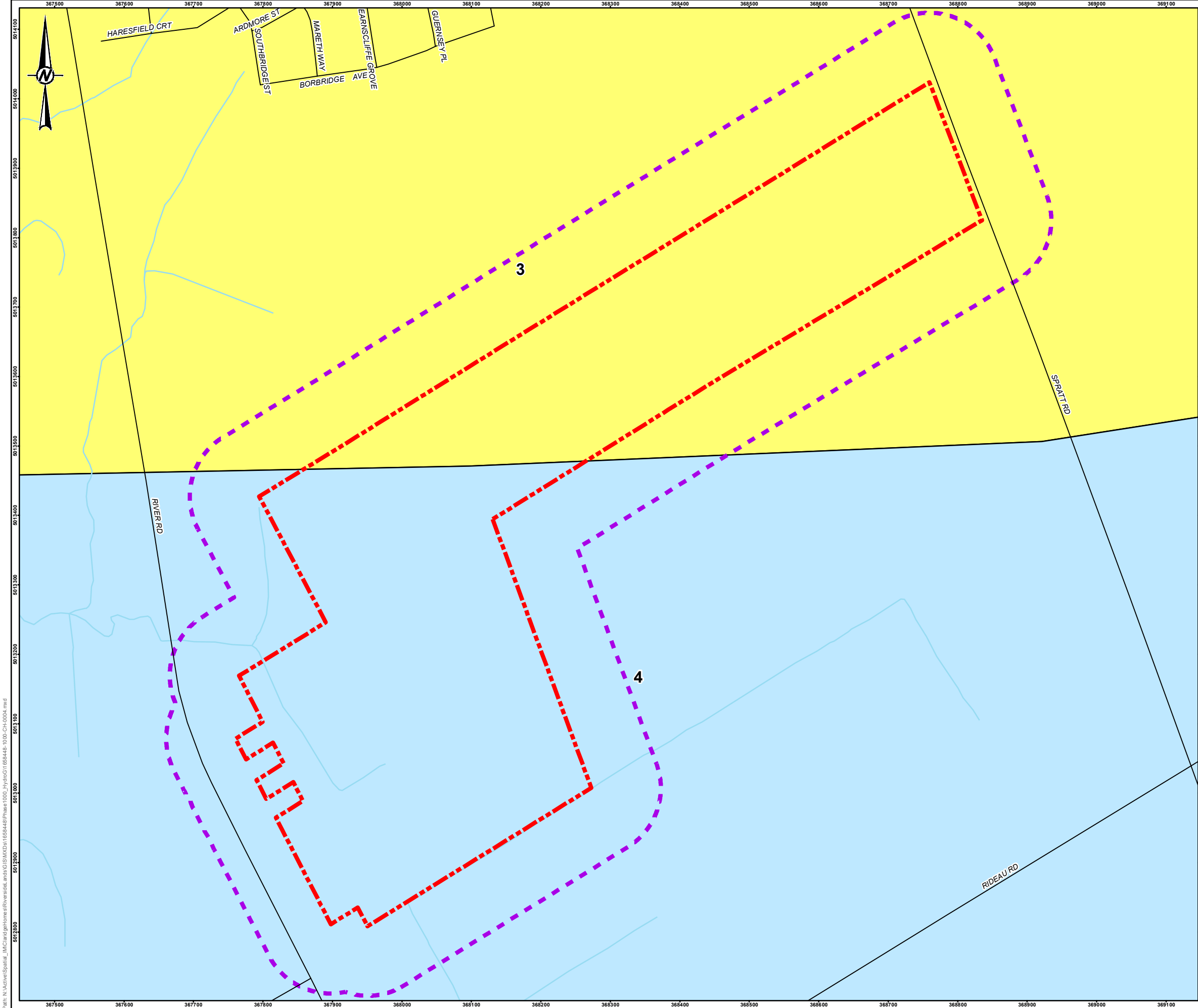
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REVIEWED	LEB
APPROVED	BTB

PROJECT NO.
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FIGURE
3



LEGEND

- ROADWAY
- WATERCOURSE
- APPROXIMATE SITE BOUNDARY
- 100 m BUFFER
- 4. OXFORD FORMATION: SUBLITHOGRAPHIC TO FINE CRYSTALLINE DOLOSTONE
- 3. MARCH FORMATION: INTERBEDDED QUARTZ SANDSTONE, SANDY DOLOSTONE, AND DOLOSTONE

NOTE(S)

1. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD. REPORT NO. 1658448-1000.

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1. BÉLANGER, J. R., URBAN GEOLOGY OF THE NATIONAL CAPITAL AREA, GEOLOGICAL SURVEY OF CANADA, OPEN FILE D3256, 2001.
2. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2014
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CLIENT
CLARIDGE HOMES CORPORATION

PROJECT
HYDROGEOLOGICAL ASSESSMENT
RIVERSIDE SOUTH LANDS, RIVER ROAD AND SPRATT ROAD
OTTAWA, ONTARIO

TITLE
BEDROCK GEOLOGY

CONSULTANT	YYYY-MM-DD	2017-09-06
DESIGNED	---	
PREPARED	JEM	
REVIEWED	LEB	
APPROVED	BTB	

PROJECT NO.
1658448

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FIGURE
4

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ATTACHMENT A

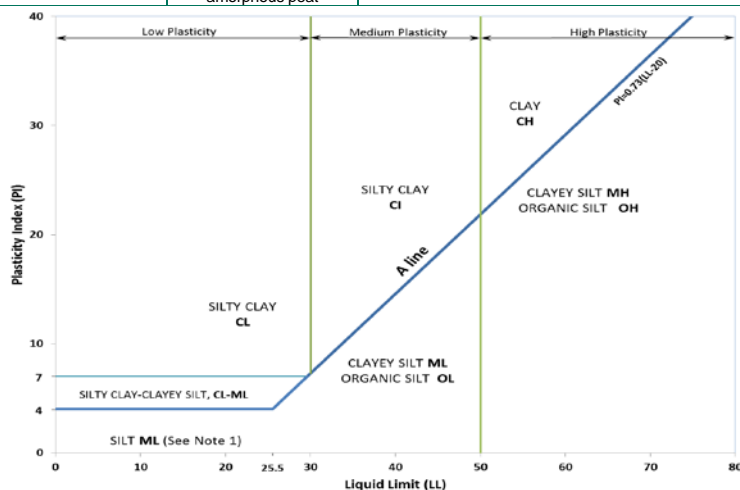
Borehole Logs



METHOD OF SOIL CLASSIFICATION

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

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$		$Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$			Organic Content	USCS Group Symbol	Group Name	
INORGANIC (Organic Content ≤30% by mass)	COARSE-GRAINED SOILS (>50% by mass is larger than 0.075 mm)	GRAVELS (>50% by mass of coarse fraction is larger than 4.75 mm)	Gravels with ≤12% fines (by mass)	Poorly Graded	<4		≤1 or ≥3			≤30%	GP	GRAVEL	
				Well Graded	≥4		1 to 3				GW	GRAVEL	
			Gravels with >12% fines (by mass)	Below A Line	n/a						GM	SILTY GRAVEL	
				Above A Line	n/a						GC	CLAYEY GRAVEL	
		SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	Sands with ≤12% fines (by mass)	Poorly Graded	<6		≤1 or ≥3				SP	SAND	
				Well Graded	≥6		1 to 3				SW	SAND	
			Sands with >12% fines (by mass)	Below A Line	n/a						SM	SILTY SAND	
				Above A Line	n/a						SC	CLAYEY SAND	
Organic or Inorganic	Soil Group	Type of Soil		Laboratory Tests	Field Indicators					Organic Content	USCS Group Symbol	Primary Name	
					Dilatancy	Dry Strength	Shine Test	Thread Diameter	Toughness (of 3 mm thread)				
INORGANIC (Organic Content ≤30% by mass)	FINE-GRAINED SOILS (≥50% by mass is smaller than 0.075 mm)	SILTS (Non-Plastic or PI and LL plot below A-Line on Plasticity Chart below)	Liquid Limit <50	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	<5%	ML	SILT		
				Slow	None to Low	Dull	3mm to 6 mm	None to low	<5%	ML	CLAYEY SILT		
				Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT		
			Liquid Limit ≥50	Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	<5%	MH	CLAYEY SILT		
				None	Medium to high	Dull to slight	1 mm to 3 mm	Medium to high	5% to 30%	OH	ORGANIC SILT		
		CLAYS (PI and LL plot above A-Line on Plasticity Chart below)	Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	0% to 30%	CL	SILTY CLAY		
			Liquid Limit 30 to 50	None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium	(see Note 2)	CI	SILTY CLAY		
			Liquid Limit ≥50	None	High	Shiny	<1 mm	High		CH	CLAY		
HIGHLY ORGANIC SOILS (Organic Content >30% by mass)		Peat and mineral soil mixtures								30% to 75%	PT	SILTY PEAT, SANDY PEAT	
		Predominantly peat, may contain some mineral soil, fibrous or amorphous peat								75% to 100%		PEAT	



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.

Dual Symbol — A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC and CL-ML.

For non-cohesive soils, the dual symbols must be used when the soil has between 5% and 12% fines (i.e. to identify transitional material between “clean” and “dirty” sand or gravel.

For cohesive soils, the dual symbol must be used when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart (see Plasticity Chart at left).

Borderline Symbol — A borderline symbol is two symbols separated by a slash, for example, CL/CI, GM/SM, CL/ML.

A borderline symbol should be used to indicate that the soil has been identified as having properties that are on the transition between similar materials. In addition, a borderline symbol may be used to indicate a range of similar soil types within a stratum.



ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE 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.e., SAND and GRAVEL, SAND and CLAY)
> 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.).

Cone Penetration Test (CPT)

An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm² pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); N_d :

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

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
FS	Foil sample
GS	Grab Sample
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size
TP	Thin-walled, piston – note size
WS	Wash sample

SOIL TESTS

w	water content
PL, w_p	plastic limit
LL, w_L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test ¹
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement ¹
D_r	relative density (specific gravity, G_s)
DS	direct shear test
GS	specific gravity
M	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 ₄	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

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

COHESIVE SOILS

NON-COHESIVE (COHESIONLESS) SOILS

Compactness²

Term	SPT 'N' (blows/0.3m) ¹
Very Loose	0 - 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

- SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects.
- Definition of compactness descriptions based on SPT 'N' ranges from Terzaghi and Peck (1967) and correspond to typical average N_{60} values.

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.

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N' ^{1,2} (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

- 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 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.
$w \sim PL$	Material is estimated to be close to the Plastic Limit.
$w > PL$	Material is estimated to be wetter than the Plastic Limit.



LIST OF SYMBOLS

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

I. GENERAL

π	3.1416
$\ln x$	natural logarithm of x
\log_{10}	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta \sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
ν	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

(a) Index Properties (continued)

w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index $= (w_l - w_p)$
w_s	shrinkage limit
I_L	liquidity index $= (w - w_p) / I_p$
I_C	consistency index $= (w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index $= (e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
C_v	coefficient of consolidation (vertical direction)
C_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio $= \sigma'_p / \sigma'_{vo}$

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction $= \tan \delta$
c'	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p'	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

* Density symbol is ρ . Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

Notes: 1
2

$\tau = c' + \sigma' \tan \phi'$
shear strength = (compressive strength)/2



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

<u>Description</u>	<u>Bedding Plane Spacing</u>
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

<u>Description</u>	<u>Spacing</u>
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 occurring 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	

PROJECT: 1658448

RECORD OF BOREHOLE: 17-1

SHEET 1 OF 1

LOCATION: N 5012839.8 ; E 367953.0

BORING DATE: January 13, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION				
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m													
								SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT								
								20	40	60	80	nat V. rem V.	+ ⊕	Q - U -			● ○	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴
								20	40	60	80		20	40	60	80				
0		GROUND SURFACE		89.98																
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) sandy SILT; dark brown; non-cohesive (CI/CH-ML and SM) SILTY CLAY, CLAYEY SILT and SILTY SAND; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff		0.06																
				1	SS	5														
1																				
		2		SS	4															
2																				
		(CI/CH) SILTY CLAY to CLAY; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff		87.85																
			2.13																	
					3	SS	5													
3																				
		(ML-SM) gravelly sandy SILT to SILTY SAND; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact		86.78																
				3.20																
					4	SS	8													
4																				
					5	SS	26													
		End of Borehole Auger Refusal		85.48																
				4.50																
5																				
6																				
7																				
8																				
9																				
10																				

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-2

SHEET 1 OF 1

LOCATION: N 5012927.0 ; E 368096.0

BORING DATE: January 16, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³				
								SHEAR STRENGTH Cu, kPa				nat V. + Q - rem V. ⊕ U - ○		WATER CONTENT PERCENT					
														Wp ———— W ———— Wl					
0		GROUND SURFACE		90.52															
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, fine; dark brown; non-cohesive		0.00															
				90.27															
		(SM) SILTY SAND, fine; brown; non-cohesive, moist		0.25															
				90.00															
		(CI/CH) SILTY CLAY to CLAY; grey brown, contains silty fine sand seams, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		0.52															
1					89.15	1	SS	7											
		(CI/CH-ML and SM) SILTY CLAY, CLAYEY SILT and SILTY SAND; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff		1.37															
2				88.39	2	SS	3												
		(CI/CH) SILTY CLAY to CLAY; grey brown, fissured (WEATHRED CRUST); cohesive, w>PL, very stiff		2.13															
					3	SS	4												
3																			
					4	SS	8												
4		End of Borehole Auger Refusal		86.71 3.81															
5																			
6																			
7																			
8																			
9																			
10																			

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

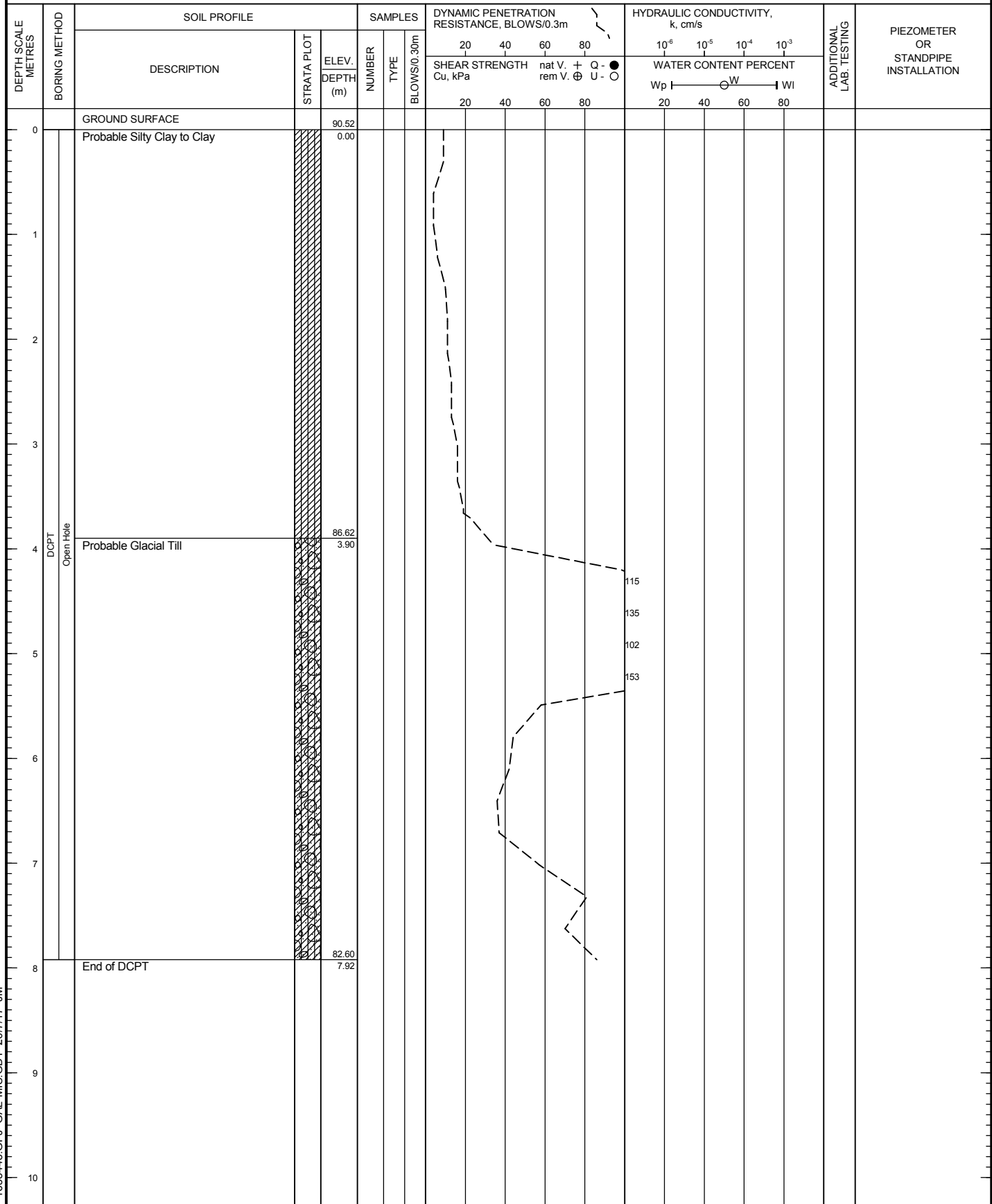
RECORD OF BOREHOLE: 17-2A

SHEET 1 OF 1

LOCATION: N 5012927.0 ; E 368096.0

BORING DATE: January 16, 2017

DATUM: Geodetic



DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-4

SHEET 1 OF 1





LOCATION: N 5013152.1 ;E 368203.6

BORING DATE: January 10, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m										
								SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	nat V. rem V.	+ ⊕	Q - U -			● ○
0		GROUND SURFACE		91.01													
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) CLAYEY SILT; dark brown; non-cohesive		0.00													
		(ML and SM) SILT, CLAYEY SILT and SILTY SAND; grey brown; non-cohesive, wet, very loose to loose		90.71 0.30													
1					1	SS	6										
					2	SS	3										
2			(CI/CH) SILTY CLAY to CLAY; grey brown, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		89.03 1.98												
					3	SS	4										
3																	
			(SM) gravelly SILTY SAND; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to very dense		87.73 3.28												
					4	SS	3										
4																	
				5	SS	21											
				6	SS	>50											
5																	
				7	SS	25											
6				8	SS	19											
7		End of Borehole Auger Refusal		84.27 6.74													
8																	
9																	
10																	

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-5

SHEET 1 OF 1






LOCATION: N 5013072.9 ; E 368083.3

BORING DATE: January 10, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	nat V. rem V.	+ ⊕	Q - U -	● ○		
								20	40	60	80						
0		GROUND SURFACE		90.40													
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) CLAYEY SILT; brown; non-cohesive		0.00	1	GRAB	-										
		(ML and SM) SILT, CLAYEY SILT and SILTY SAND; grey brown; non-cohesive, wet, very loose to loose		0.15													
				0.25													
1					2	SS	4										
			(CI/CH) SILTY CLAY to CLAY; grey brown, fissured, contains clayey silt layers (WEATHERED CRUST); cohesive, w>PL, very stiff		89.03												
					1.37	3	SS	4									
2																	
			(CI/CH-ML and SM) SILTY CLAY, CLAYEY SILT and SILTY SAND; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff		88.27												
					2.13	4	SS	3									
3																	
		(CI/CH) SILTY CLAY to CLAY; grey brown, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		87.50													
				2.90	5	SS	2										
4																	

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-6

SHEET 1 OF 1

LOCATION: N 5013009.8 ; E 367980.8

BORING DATE: January 9, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION				
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT								
								20	40	60	80	nat V. rem V.	+ ⊕	Q - U -			● ○	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴
								20	40	60	80									
0		GROUND SURFACE		90.26																
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) CLAYEY SILT; dark brown; non-cohesive		0.00																
		(CI/CH-ML and SM) SILTY CLAY, CLAYEY SILT and SILTY SAND; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff		0.15																
1					1	SS	3													
					2	SS	2													
2																				
					3	SS	2													
3			(CI/CH) SILTY CLAY to CLAY; grey brown, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		87.21 3.05	4	SS	3												
4																				
		(CI/CH) SILTY CLAY to CLAY; grey; cohesive, w>PL, stiff		85.99 4.27																
5					5	SS	2													
		(SM) gravelly SILTY SAND, some gravel; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact		85.08 5.18																
6					6	SS	16													
		End of Borehole		84.16 6.10																
7																				
8																				
9																				
10																				

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-7

SHEET 1 OF 1





LOCATION: N 5012933.6 ; E 367859.5

BORING DATE: January 5, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	20 40 60 80				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³					
								SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ U - ●		WATER CONTENT PERCENT					
								20 40 60 80				Wp -----○ W----- WI					
		GROUND SURFACE		90.24													
0	Power Auger 200 mm Diam. (Hollow Stem)	FILL/TOPSOIL - (SM) SILTY SAND; dark brown; moist		0.00													
		FILL - (SP-CL/CI) Mixture of SAND and SILTY CLAY; brown to grey brown; non-cohesive, moist, loose to very loose		89.94 0.30	1	GRAB	-										
1		(CI/CH) SILTY CLAY to CLAY, some sand; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff		89.18 1.06	2	SS	4										
2					3	SS	6										
					4	SS	2										
3																	
					5	SS	3										
4																	
5																	
6		(SM) SILTY SAND, some gravel; grey, contains clayey silt seams, cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact		84.45 5.79	7	SS	2										
7																	
8																	
9																	
10																	

DEPTH SCALE

1 : 50



LOGGED: DG

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-8

SHEET 1 OF 1







LOCATION: N 5013071.6 ; E 367834.3

BORING DATE: January 23, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	RESISTANCE, BLOWS/0.3m				k, cm/s							
								SHEAR STRENGTH Cu, kPa		nat V. + rem V. ⊕		Q - U - ⊙		WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³			Wp	W
								20	40	60	80	20	40	60	80				
0		GROUND SURFACE		89.77															
	Power Auger 200 mm Diam. (Hollow Stem)	FILL - (SP/GP) SAND and GRAVEL; dark grey to black, contains asphaltic concrete fragments; non-cohesive, moist		0.00	1	GRAB	-												
		(SM) SILTY SAND; brown; non-cohesive, moist		0.41 89.16	2	GRAB	-												
		(CI/CH) SILTY CLAY to CLAY; red brown to grey brown, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		0.61	3	SS	5												
1																			
		(CI/CH-ML and SM) SILTY CLAY, CLAYEY SILT and SILTY SAND; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff		88.40 1.37	4	SS	5												
2																			
						5	SS	2											
3		(CI/CH) SILTY CLAY to CLAY; grey brown, contains silty fine sand seams (WEATHERED CRUST); cohesive, w>PL, very stiff		86.87 2.90	6	SS	2												
4		(CI/CH) SILTY CLAY to CLAY; grey; cohesive, w>PL, stiff		85.81 3.96															
					7	SS	WH												
5																			
								⊕		+									
											+								
6		End of Borehole		83.83 5.94								+							
7																			
8																			
9																			
10																			

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-9

SHEET 1 OF 1

LOCATION: N 5013151.7 ; E 367949.8

BORING DATE: January 16, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION									
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT													
								20		40		60		80			10 ⁻⁶		10 ⁻⁵		10 ⁻⁴		10 ⁻³		
								20		40		60		80			Wp		W		Wi				
0		GROUND SURFACE		90.26																					
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown; non-cohesive		0.00																					
		(SM) SILTY SAND; grey brown; non-cohesive, wet		0.15	1	GRAB	-																		
		(CI/CH) SILTY CLAY to CLAY; grey brown, contains silty fine sand seams, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		89.85																					
				0.41																					
1					2	SS	5																		
					3	SS	5																		
2																									
					4	SS	2																		
3																									
				5	SS	3																			
4		(CI/CH) SILTY CLAY to CLAY; grey; cohesive, w>PL, stiff		86.30																					
				3.96				⊕		+															
5				6	SS	WH																			
								⊕		+															
								⊕		+															
6																									
				7	SS	WH																			
7				8	SS	WH		⊕		+															
								⊕		+															
								⊕		+															
8		End of Borehole		82.34						+															
				7.92																					
9																									
10																									

<

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DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

PROJECT: 1658448

RECORD OF BOREHOLE: 17-10

SHEET 1 OF 1






LOCATION: N 5013218.5 ;E 368049.9

BORING DATE: January 16, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION					
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³							
								SHEAR STRENGTH Cu, kPa				nat V. rem V.	+ ⊕	- ⊖	Q - U -			● ○	WATER CONTENT PERCENT			
								20	40	60	80							Wp	W	Wi	20	40
0		GROUND SURFACE		90.56																		
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown; non-cohesive		0.00	1	GRAB	-															
		(SM) SILTY SAND; brown; non-cohesive, moist		0.23																		
		(CI/CH) SILTY CLAY to CLAY; grey brown to red brown, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		0.46																		
1					2	SS	6															
		(CI/CH-ML and SM) SILTY CLAY, CLAYEY SILT and SILTY SAND; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff		1.37																		
					3	SS	3															
2																						
						4	SS	3														
3						5	SS	3														
		(CI/CH) SILTY CLAY to CLAY; grey; cohesive, w>PL, firm to stiff		3.66			⊕			+												
4										+												
5					6	SS	WH															
6		End of Borehole		5.94			⊕			+	+											
7																						
8																						
9																						
10																						

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-10A

SHEET 1 OF 1

LOCATION: N 5013218.0 ;E 368050.0

BORING DATE: January 16, 2017

DATUM: Geodetic

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ U - ○		WATER CONTENT PERCENT Wp ——— W ——— WI					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵			10 ⁻⁴	10 ⁻³
0	Power Auger 200 mm Diam. (Hollow Stem)	GROUND SURFACE		90.56													
		For soil stratigraphy refer to Record of Borehole 17-10		0.00													
1																	
2																	
3																	
4																	
					1	TP	PH										
		End of Borehole		86.14 4.42													
5																	
6																	
7																	
8																	
9																	
10																	

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-11

SHEET 1 OF 1

LOCATION: N 5013297.0 ; E 368157.3

BORING DATE: January 17, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m											
								SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT						
								20	40	60	80	nat V. rem V.	+ ⊕	Q - U -	● ○			10 ⁻⁶
								20	40	60	80							
0		GROUND SURFACE		90.58														
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) sandy SILT; dark brown; non-cohesive (CI/CH-ML and SM) SILTY CLAY, CLAYEY SILT and SILTY SAND; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff		0.00														
			90.38															
			0.20															
1					1	SS	6											
					2	SS	2											
2			(CI/CH) SILTY CLAY to CLAY; grey brown, contains silty fine sand seams, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		88.60													
				1.98														
				3	SS	4												
3																		
					4	SS	2											
4		(CI/CH) SILTY CLAY to CLAY; grey; cohesive, w>PL, stiff		86.77														
			3.81															
5					5	SS	1											
6		(ML) sandy SILT, some gravel; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very dense		85.25														
			5.33															
					6	SS	69											
6		End of Borehole		84.64														
				5.94														
7																		
8																		
9																		
10																		

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 - 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-12A

SHEET 1 OF 1

LOCATION: N 5013162.0 ; E 367790.0

BORING DATE: January 23, 2017

DATUM: Geodetic

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ U - ● ○		WATER CONTENT PERCENT Wp ———— W ———— WI					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵			10 ⁻⁴	10 ⁻³
0	Power Auger 200 mm Diam. (Hollow Stem)	GROUND SURFACE		89.76													
		For soil stratigraphy refer to Record of Borehole 17-12		0.00													
1																	
2																	
3																	
4																	
5					1	TP	PH										
		End of Borehole		84.73 5.03													
6																	
7																	
8																	
9																	
10																	

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-13

SHEET 1 OF 1







LOCATION: N 5013287.2 ; E 367889.6

BORING DATE: January 20, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³					
								nat V. rem V.	⊕ ⊖	⊕ ⊖	⊕ ⊖	Wp — W — Wl					
								20	40	60	80	20	40	60	80		
0	Power Auger 200 mm Diam. (Hollow Stem)	GROUND SURFACE		90.32													
		TOPSOIL - (SM) SILTY SAND; dark brown; non-cohesive		0.00													
		(SP) SAND, some non-plastic fines; grey brown; non-cohesive, moist		0.23	1	GRAB	-										
				89.59													
1		(CI/CH-ML and SM) SILTY CLAY, CLAYEY SILT and SILTY SAND; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff		0.73	2	SS	4										
		(CI/CH) SILTY CLAY to CLAY; red brown and grey brown, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		89.10													
				1.22													
				88.19													
2		(CI/CH-ML and SM) SILTY CLAY, CLAYEY SILT and SILTY SAND; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff to stiff		2.13	4	SS	2										
3																	
		(CI/CH) SILTY CLAY to CLAY; grey, contains silty fine sand seams; cohesive, w>PL, firm		87.20													
				3.12	5	SS	2										
								⊕		+							
4										+							
5					6	SS	WH										
								⊕		+							
										+							
6		End of Borehole		84.38						+							
				5.94													
7																	
8																	
9																	
10																	

WL in open borehole at 1.00 m depth below ground surface upon completion of drilling

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-14

SHEET 1 OF 1

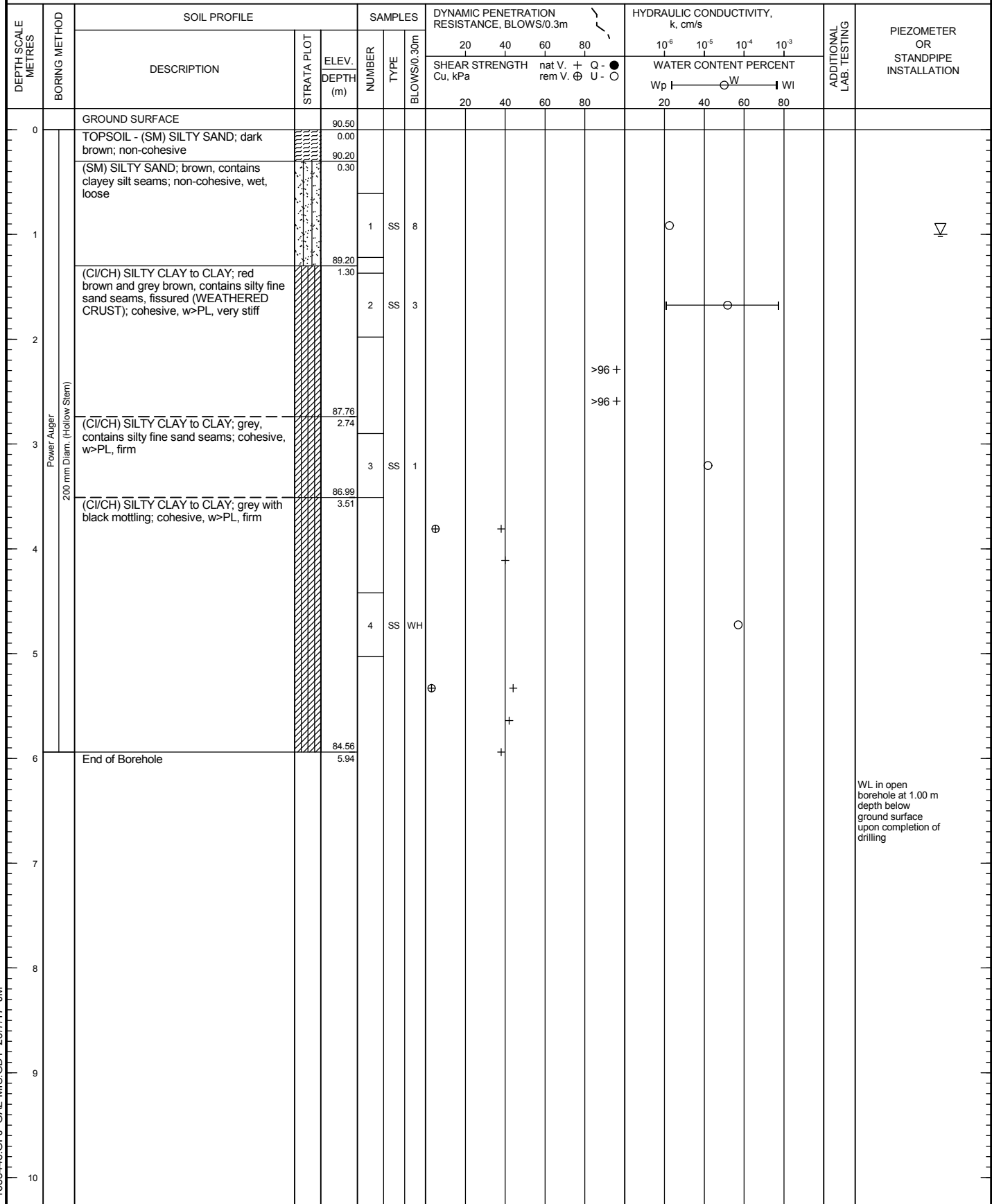
LOCATION: N 5013422.4 ;E 367850.2

BORING DATE: January 19, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm



DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-14A

SHEET 1 OF 1

LOCATION: N 5013422.0 ; E 367850.0

BORING DATE: January 20, 2017

DATUM: Geodetic

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ U - ○		WATER CONTENT PERCENT Wp — W — Wi			
								20	40	60	80	10 ⁻⁶	10 ⁻⁵		
0	Power Auger 200 mm Diam. (Hollow Stem)	GROUND SURFACE		90.50											
		For soil stratigraphy refer to Record of Borehole 17-14		0.00											
1															
2															
3															
4					1	TP	PH								
		End of Borehole		86.23 4.27											
5															
6															
7															
8															
9															
10															

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-15

SHEET 1 OF 1





LOCATION: N 5013372.2 ; E 368018.8

BORING DATE: January 20, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³		
								nat V. rem V.	+	⊕	Q - U -	● ○	Wp	W	Wi		
		GROUND SURFACE		90.66													
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown; non-cohesive		0.00	1	GRAB	-										
		(SP) SAND, fine, some non-plastic fines; brown; non-cohesive, moist		0.23													
		(CI/CH) SILTY CLAY to CLAY; red brown to grey brown, contains silty fine sand seams, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff to stiff		0.41													
1					2	SS	4										
					3	SS	4										
2								⊕			+						
3			(CI/CH) SILTY CLAY to CLAY, some sand; grey with black mottling, contains silty fine sand seams; cohesive, w>PL, firm to stiff		87.76	4	SS	2									
					2.90				⊕		+						
4											+						
5					5	SS	WH										
								⊕		+							
6										+							
					6	SS	WH										
7										+							
										+							
										+							
8		End of Borehole		82.89													
				7.77													
9																	
10																	

WL in open borehole at 1.00 m depth below ground surface upon completion of drilling

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-16

SHEET 1 OF 1






LOCATION: N 5013504.1 ; E 367981.5

BORING DATE: January 19, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s					ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m													
								SHEAR STRENGTH Cu, kPa		nat V. + rem V. ⊕		Q - ● U - ○		WATER CONTENT PERCENT						
								20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³	Wp			W	Wi
		GROUND SURFACE		90.43																
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) sandy SILT; dark brown; non-cohesive		0.00	1	GRAB	-													
		(SM) SILTY SAND; brown, contains clayey silt seams; non-cohesive, wet		0.18																
				0.25	2	GRAB	-													
				89.67																
1		(CI/CH-ML and SM) SILTY CLAY, CLAYEY SILT and SILTY SAND; grey brown, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		0.76	3	SS	2													
		(CI/CH) SILTY CLAY to CLAY; red brown and grey brown, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		89.21	4	SS	2													
				1.22																
2																				
3		(CI/CH) SILTY CLAY to CLAY; grey with black mottling; cohesive, w>PL, stiff to firm		87.84	5	SS	WH													
				2.59																
4																				
5																				
6		End of Borehole		84.64																
				5.79																
7																				
8																				
9																				
10																				

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001_1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-17

SHEET 1 OF 1

LOCATION: N 5013432.3 ; E 368131.3

BORING DATE: January 17, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m												
								SHEAR STRENGTH Cu, kPa		nat V. + rem V. ⊕		Q - U - ●		WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³			Wp	W
		GROUND SURFACE		90.44															
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) CLAYEY SILT; dark brown; non-cohesive		0.00															
		(CI/CH) SILTY CLAY to CLAY; red brown and grey brown, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		0.15															
1					1	SS	7												
		(CI/CH-ML and SM) SILTY CLAY, CLAYEY SILT and SILTY SAND, fine; grey brown (WEATHERED CRUST); cohesive, w>PL, stiff to very stiff		89.07															
2					2	SS	2												
						3	SS	2											
			(CI/CH) SILTY CLAY to CLAY; grey; cohesive, w>PL, firm		87.70														
3				2.74															
					4	SS	WH												
4		(CL/CI) SILTY CLAY to CLAY; grey with black mottling, contains clayey silt seams; cohesive, w>PL, stiff		86.48			⊕	+		+									
				3.96															
					5	SS	WH												
5																			
							⊕		+	+									
									+										
6		End of Borehole		84.50						+									
				5.94															
7																			
8																			
9																			
10																			

WL in open borehole at 0.80 m depth below ground surface upon completion of drilling

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-17A

SHEET 1 OF 1

LOCATION: N 5013432.0 ; E 368131.0

BORING DATE: January 17, 2017

DATUM: Geodetic

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ U - ○		WATER CONTENT PERCENT Wp ——— W ——— WI					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵			10 ⁻⁴	10 ⁻³
0	Power Auger 200 mm Diam. (Hollow Stem)	GROUND SURFACE		90.44													
		For soil stratigraphy refer to Record of Borehole 17-17		0.00													
1																	
2																	
3																	
					1	TP	PH										
		End of Borehole		86.78 3.66													
4																	
5																	
6																	
7																	
8																	
9																	
10																	

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-18A

SHEET 1 OF 1

LOCATION: N 5013586.9 ; E 368115.5

BORING DATE: January 19, 2017

DATUM: Geodetic

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	SHEAR STRENGTH Cu, kPa		WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵		
0	Power Auger 200 mm Diam. (Hollow Stem)	GROUND SURFACE		90.69											
		For soil stratigraphy refer to Record of Borehole 17-18		0.00											
1															
2															
3															
4					1	TP	PH								
		End of Borehole		86.42											
				4.27											
5															
6															
7															
8															
9															
10															

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-20

SHEET 1 OF 1





LOCATION: N 5013674.4 ;E 368246.4

BORING DATE: January 18, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m										
								SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ U - ⊙		WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³		
0		GROUND SURFACE		92.23													
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown; non-cohesive		0.00	1	GRAB	-										
		(SM) SILTY SAND; grey brown; non-cohesive, wet, loose		91.98													
				0.25													
1		(SM) gravelly SILTY SAND; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to dense		91.32	2	SS	11										
				0.91													
						3	SS	26									
2						4	SS	50									
					5	SS	32										
4					6	SS	25										
					7	SS	11										
5																	
		(SM/GM) SILTY SAND and GRAVEL; grey; non-cohesive, wet, compact		87.05													
				5.18													
					8	SS	15										
6				86.13													
		End of Borehole		6.10													
7																	
8																	
9																	
10																	

WL in open borehole at 0.61 m depth below ground surface upon completion of drilling

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-22

SHEET 1 OF 1

LOCATION: N 5013759.1 ; E 368386.0

BORING DATE: January 24, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	RESISTANCE, BLOWS/0.3m				k, cm/s					
								SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ U - ⊙		WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³		
0		GROUND SURFACE		91.97													
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) CLAYEY SILT; dark brown; non-cohesive		0.00													
		(CI/CH-ML and SM) SILTY CLAY, CLAYEY SILT and SILTY SAND; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff		91.74													
				0.23													
1					1	SS	5										
		(CI/CH) SILTY CLAY to CLAY; grey brown, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		90.60													
				1.37													
2					2	SS	4										
			(ML) sandy SILT, some gravel; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact		89.99												
					1.98												
					3	SS	17										
3				88.92													
		(SM) SILTY SAND, some gravel; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact		3.05													
					4	SS	10										
				88.31													
		Probable Glacial Till		3.66													
4																	
	DCPT Open Hole																
5																	
6																	
				</													

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-23A

SHEET 1 OF 1

LOCATION: N 5013679.9 ; E 368527.7

BORING DATE: January 25, 2017

DATUM: Geodetic

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ U - ○		WATER CONTENT PERCENT Wp ——— W ——— WI					
							20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴			10 ⁻³
0	DCPT Open Hole	GROUND SURFACE		92.56												
		For soil stratigraphy refer to Record of Borehole 17-23		0.00												
1																
2																
3																
4																
5		End of Borehole DCPT Refusal		88.29 4.27												
6																
7																
8																
9																
10																

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-24

SHEET 1 OF 1

LOCATION: N 5013840.9 ; E 368514.0

BORING DATE: January 24, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s					ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION			
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	RESISTANCE, BLOWS/0.3m				k, cm/s								
								SHEAR STRENGTH Cu, kPa		nat V. + rem V. ⊕		Q - ● U - ○		WATER CONTENT PERCENT						
								20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³					
0		GROUND SURFACE		92.58																
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) sandy SILT; dark brown; non-cohesive		0.00																
				92.31																
		(CI/CH-ML and SM) SILTY CLAY, CLAYEY SILT and SILTY SAND; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff		0.27																
1					1	SS	4													
						2	SS	2												
2					90.60															
			(CI/CH) SILTY CLAY to CLAY; grey brown, slightly fissured (WEATHERED CRUST); cohesive, w>PL, stiff		1.98															
						3	SS	1												
3				89.53																
		(CI/CH) SILTY CLAY to CLAY; grey, contains silty fine sand seams; cohesive, w>PL, firm to stiff		3.05																
					4	SS	WH													
4								⊕	+											
									+											
					5	SS	WH													
5																				
6																				
									+											

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-24A

SHEET 1 OF 1

LOCATION: N 5013841.0 ; E 368514.0

BORING DATE: January 24, 2017

DATUM: Geodetic

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ U - ○		WATER CONTENT PERCENT Wp — W — Wi			
								20	40	60	80	10 ⁻⁶	10 ⁻⁵		
0	Power Auger 200 mm Diam. (Hollow Stem)	GROUND SURFACE		92.58											
		For soil stratigraphy refer to Record of Borehole 17-24		0.00											
1															
2															
3					1	TP	PH								
		End of Borehole		89.07 3.51											
4															
5															
6															
7															
8															
9															
10															

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-25

SHEET 1 OF 1

LOCATION: N 5013760.8 ; E 368661.4

BORING DATE: January 25, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m										
								SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	nat V. rem V.	+ ⊕	- ⊖			Q - U
0		GROUND SURFACE		93.17													
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) sandy SILT; dark brown; non-cohesive		0.00													
		(CI/CH-ML and SM) SILTY CLAY, CLAYEY SILT and SILTY SAND; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff		92.92													
				0.25													
1			1	SS	6												
				91.95													
		(CI/CH) SILTY CLAY to CLAY; grey brown, contains clayey silt seams, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		1.22													
			2	SS	5												
2																	
			3	SS	5												
3																	
4		(ML) sandy SILT, some gravel; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very dense		89.33													
	End of Borehole Auger Refusal			3.84													
				88.98	5	SS	>50										
				4.19													
5																	
6																	
7																	
8																	
9																	
10																	

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-26

SHEET 1 OF 1






LOCATION: N 5013917.4 ; E 368640.0

BORING DATE: January 25, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION								
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	SHEAR STRENGTH				WATER CONTENT PERCENT													
								20		40		60		80				10 ⁻⁶		10 ⁻⁵		10 ⁻⁴		10 ⁻³	
								Cu, kPa		nat V. + rem V. ⊕		Q - U - ● ○		Wp				W		WI					
								20	40	60	80	20	40	60	80										
0		GROUND SURFACE		93.09																					
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) CLAYEY SILT; dark brown; non-cohesive		0.00	1	GRAB	-																		
		(CI/CH) SILTY CLAY to CLAY; grey brown, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff to stiff		92.86																					
				0.23																					
1					2	SS	5																		
					3	SS	4																		
2																									
3			(CI/CH) SILTY CLAY to CLAY; grey, contains clayey silt seams; cohesive, w>PL, stiff		90.04	4	SS	1																	
				3.05																					
				89.28																					
		(SP) SAND; grey brown; non-cohesive, wet, compact		3.81																					
4					5	SS	11																		
				88.52																					
				4.57																					
5		(SM) gravelly SILTY SAND; brown, contains cobbles and boulders; non-cohesive, wet, compact to very dense																							
				87.57	6	SS	>50																		
				5.52																					
6		End of Borehole Auger Refusal																							
7																									
8																									
9																									
10																									

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-27

SHEET 1 OF 2

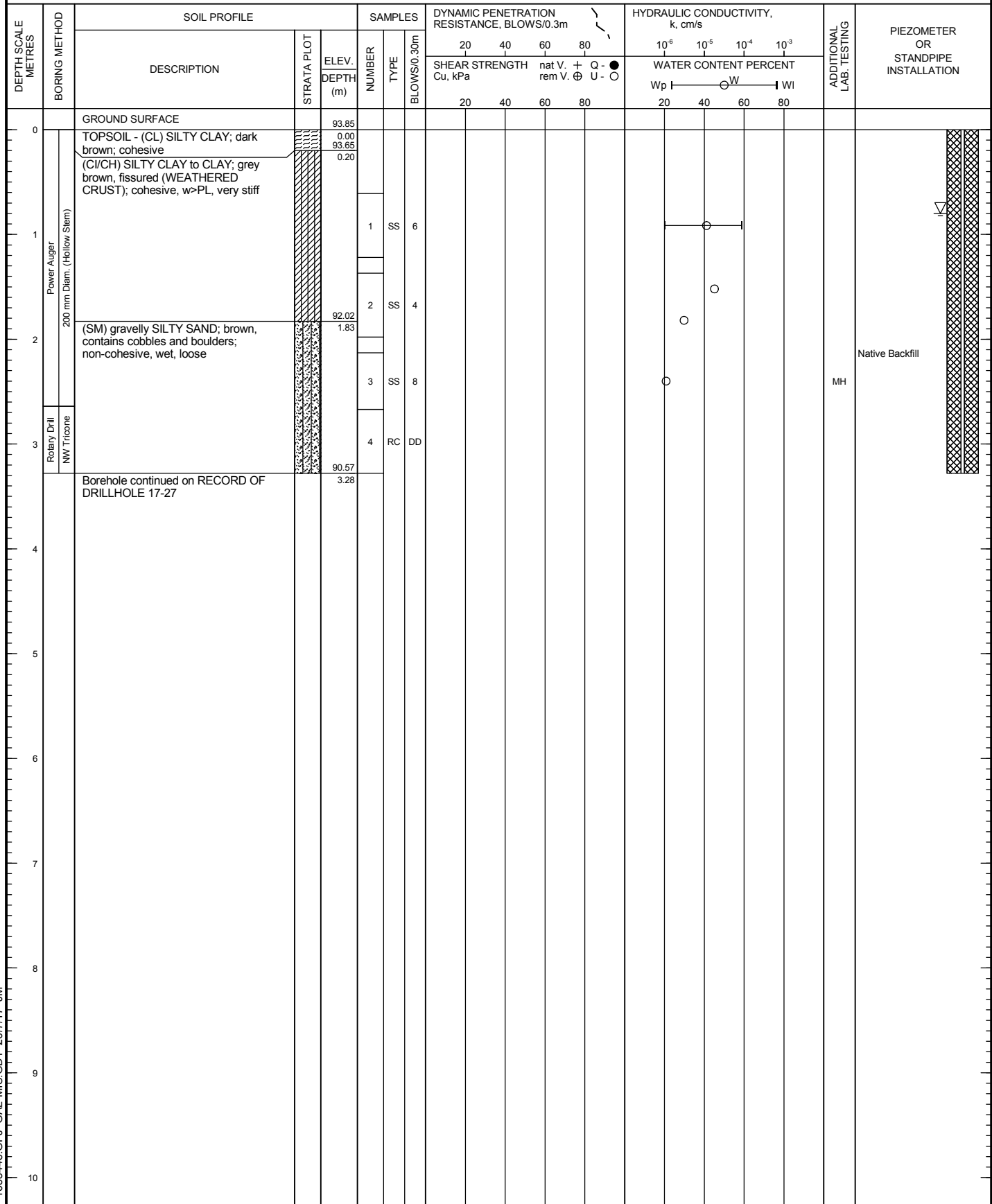
LOCATION: N 5013836.4 ;E 368790.7

BORING DATE: January 25-26, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm



DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

SHEET 2 OF 2

DATUM: Geodetic

DRILLING CONTRACTOR: CCC

MIS-RCK 004 1658448.GPJ GAL-MISS.GDT 267/17 JM

CHECKED: SAT

PROJECT: 1658448

RECORD OF BOREHOLE: 17-27A

SHEET 1 OF 1

LOCATION: N 5013836.4 ; E 368790.7

BORING DATE: January 25, 2017

DATUM: Geodetic

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ U - ○		WATER CONTENT PERCENT Wp — W — Wi					
							20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴			10 ⁻³
0	Power Auger 200 mm Diam. (Hollow Stem)	GROUND SURFACE		93.85												
		For soil stratigraphy refer to Record of Borehole 17-27		0.00												
1																
2																
3																
4		End of Borehole DCPT Refusal		90.41 3.44												
5																
6																
7																
8																
9																
10																

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-28

SHEET 1 OF 1

LOCATION: N 5013987.7 ; E 368751.8

BORING DATE: January 26, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m										
								SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	nat V. rem V.	+ ⊕	Q - U -			● ○
								20	40	60	80	20	40	60	80		
0		GROUND SURFACE		93.95													
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) CLAYEY SILT; dark brown; non-cohesive		0.00													
		(CI/CH) SILTY CLAY to CLAY; grey brown, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		93.72													
				0.23													
						1	SS	5									
1																	Native Backfill
2																	Silica Sand
				91.82													
		(SM) gravelly SILTY SAND; brown, contains cobbles and boulders; non-cohesive, wet, compact to dense		2.13													Standpipe
3	DCPT Open Hole																Cave
		End of Borehole DCPT Refusal		90.75 3.20													
4																	WL in Standpipe at Elev. 93.65 m on Jan. 30, 2017
5																	
6																	
7																	
8																	
9																	
10																	

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-29

SHEET 1 OF 1




LOCATION: N 5013007.0 ; E 367859.2

BORING DATE: January 23, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM]				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	ND = Not Detected				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³						
								HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] ND = Not Detected				WATER CONTENT PERCENT						
								20	40	60	80			Wp	W	WI		
								20	40	60	80			20	40	60	80	
0		GROUND SURFACE		90.22														
0	Power Auger 200 mm Diam. (Hollow Stem)	FILL - Asphaltic concrete grinding and chunks		0.00	1	GRAB	-	⊕										Flush Mount Casing
				89.84														Bentonite Seal
				0.38														
				0.46	2	GRAB	-	⊕										Silica Sand
				89.46														
				0.76														
1		TOPSOIL - (SM) SILTY SAND; dark brown; non-cohesive (ML) sandy SILT; grey, with black staining; non-cohesive, moist (CI/CH) SILTY CLAY to CLAY; dark grey to red grey with staining, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff	 		3	SS	5	⊕										
2		End of Borehole		88.09														50 mm Diam. PVC #10 Slot Screen
				2.13														WL in Screen at Elev. 89.45 m on Jan. 30, 2017
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-30

SHEET 1 OF 1

LOCATION: N 5013004.5 ; E 367889.2

BORING DATE: January 13, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM]				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	ND = Not Detected				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³					
								HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] ND = Not Detected				WATER CONTENT PERCENT					
								20 40 60 80	20 40 60 80	Wp ———— WI	20 40 60 80						
0	Power Auger 200 mm Diam. (Hollow Stem)	GROUND SURFACE		89.95													
		ASPHALTIC CONCRETE		0.00													
		FILL - (SW-GW) SAND and GRAVEL; dark grey brown (PAVEMENT STRUCTURE); non-cohesive, moist		0.10													
		TOPSOIL - (SM) SILTY SAND, fine; black and grey; non-cohesive		0.20													
		(CI/CH) SILTY CLAY to CLAY; grey brown, contains silty fine sand seams, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		0.34	1	SS	18										
1						2	SS	7									
2																	
						3	SS	3									
						4	SS	2									
3		End of Borehole		87.05													
				2.90													
4																	
5																	
6																	
7																	
8																	
9																	
10																	

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-32

SHEET 1 OF 1

LOCATION: N 5013010.6 ; E 367910.1

BORING DATE: January 13, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM]				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	ND = Not Detected				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³					
								HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] ND = Not Detected				WATER CONTENT PERCENT					
								20 40 60 80				Wp ———— W ———— Wl 20 40 60 80					
0	Power Auger 200 mm Diam. (Hollow Stem)	GROUND SURFACE		89.84													
		FILL - (SM-GM) SILTY SAND and GRAVEL; brown; non-cohesive		0.00	1	GRAB	-	⊕									
		TOPSOIL - (ML) sandy SILT; dark brown to black; non-cohesive		0.08													
		(CI/CH) SILTY CLAY to CLAY; grey brown, contains silty fine sand seams, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		89.54													
1				0.30													
					2	SS	7	⊕									
2					3	SS	3	⊕									
		End of Borehole		87.71													
				2.13													
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

WL in open
borehole at 1.30 m
depth below
ground surface
upon completion of
drilling

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-33

SHEET 1 OF 1

LOCATION: N 5013039.4 ;E 367857.2

BORING DATE: January 23, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] \oplus				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	ND = <i>Not Detected</i> 20 40 60 80				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³					
								HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] ND = <i>Not Detected</i> \square				WATER CONTENT PERCENT					
								20 40 60 80				Wp \bigcirc W Wl 20 40 60 80					
0	Power Auger 200 mm Diam. (Hollow Stem)	GROUND SURFACE		89.99													
		ASPHALTIC CONCRETE		0.00													
		FILL - Asphaltic concrete		0.12 89.66	1	GRAB	-	\oplus									
		(ML) CLAYEY SILT; grey with black staining (WEATHERED CRUST); cohesive, w>PL		0.33 89.38	2	GRAB	-	\oplus									
		(CI/CH) SILTY CLAY to CLAY; grey brown and red brown, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		0.61													
1				88.47	3	SS	6	\oplus									
2		(CI/CH-ML and SM) SILTY CLAY, CLAYEY SILT and SILTY SAND; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff		1.52	4	SS	3	\oplus									
		End of Borehole		87.86 2.13													
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-34

SHEET 1 OF 1




LOCATION: N 5012981.8 ; E 367911.1

BORING DATE: January 13, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] \oplus				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	ND = <i>Not Detected</i> 20 40 60 80				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³					
								HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] ND = <i>Not Detected</i> \square				WATER CONTENT PERCENT					
								20 40 60 80				Wp — \bigcirc W — Wl 20 40 60 80					
0		GROUND SURFACE		89.99													
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) sandy SILT; dark brown; non-cohesive		0.00	1	GRAB	-	\oplus									
		(CI/CH) SILTY CLAY to CLAY; grey brown, contains silty sand seams, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		89.69													
				0.30													
1					2	SS	6	\oplus									
2					3	SS	3	\oplus									
		End of Borehole		87.86													
				2.13													
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

WL in open
borehole at 1.06 m
depth below
ground surface
upon completion of
drilling

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM

PROJECT: 1658448

RECORD OF BOREHOLE: 17-35

SHEET 1 OF 1

LOCATION: N 5012965.0 ; E 367856.7

BORING DATE: January 13, 2017

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM]				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	ND = <i>Not Detected</i>				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³					
								HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] ND = <i>Not Detected</i>				WATER CONTENT PERCENT					
								20 40 60 80				Wp ———— W ———— Wl					
								20	40	60	80	20	40	60	80		
0		GROUND SURFACE		90.45													
	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.06	1	GRAB	-	⊕									
		FILL - (SP-GP) SAND and GRAVEL, angular; grey (PAVEMENT STRUCTURE); non-cohesive, moist		90.11													
		TOPSOIL - (ML) sandy SILT; dark brown; non-cohesive		89.84													
		(SM) SILTY SAND; grey brown, contains clayey silt seams; non-cohesive, wet, loose		0.61													
1			(CI/CH) SILTY CLAY to CLAY; grey brown, fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		89.23	2	SS	7	⊕								
				1.22													
2				88.32	3	SS	5	⊕									
		End of Borehole		2.13													
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

DEPTH SCALE

1 : 50



LOGGED: PAH

CHECKED: SAT

MIS-BHS 001 1658448.GPJ GAL-MIS.GDT 26/7/17 JM