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Wilson Associates
Consulting Hydrogeologists

May 24, 2019
Revised August 21, 2019

Mr. David Walter, C.E.T.
WMI & Associates Limited
119 Collier Street
Barrie, Ontario
L4M 1H5

Dear Mr. Walter:

Re: Hydrogeological Study and Water Balance Analysis
265 Whitfield Crescent, Town of Midland

It is proposed to develop an existing 0.4247ha property at 265 Whitfield Crescent in the Town of Midland as self storage facility.

As requested by WMI & Associates, this report has been prepared to address the requirements of the June 2013 "Hydrogeological Assessment Submissions: Conservation Authority Guidelines for Development Applications" (the CA Guideline).

Provided for this study were the following documentation:

- Geotechnical Investigation Report, 1000 William Street & 265 Whitfield Crescent, Midland. Cambium Inc. (Cambium), April 1, 2019.
- Site Servicing & Grading Plan, WMI & Associates Limited, May 2019.

Copies of the above documentation are attached for reference.

This report revision addresses comments detailed in the July 15, 2019 correspondence from the Severn Sound Environmental Association, including the use of local Environment Canada precipitation values rather than those listed in the 2015 Severn Sound Source Protection Area Approved Assessment Report, Chapter 3.

LOCATION AND HYDROGEOLOGICAL SETTING

The subject lands at 265 Whitfield Crescent occupy a 0.4247ha, rectangularly-shaped parcel situated on the west side of Whitfield Crescent. The site is currently undeveloped, and mostly cleared. The site exhibits a moderate slope to the east, with an approximate relief of 5 to 6m.

No surface water bodies are mapped on the property. A small water feature is mapped (per Simcoe County website) nearby to the east (on 1000 William Street), possibly functioning as a perched groundwater feature atop low-permeability soils, but is not connected to a surface water body. Wetland associated with the Wye River is mapped about 50m to the south of the southwest corner of the property.

Lands surrounding the site to the north, east and south are mainly developed as commercial properties. Lands immediately to the west of the site are undeveloped.

The subject lands are located within the Simcoe Uplands physiographic region of southern Ontario, an area of northern Simcoe County characterized by till upland plains and steep-sided, flat floored valleys. According to the Ontario Geological Survey Map P.975 "Quaternary Geology of the Orr Lake (Western Half) - Nottawasaga Area (Eastern Half)", the native upper soils beneath the site are reported to consist of glaciolacustrine shallow water deposits of sand with minor fine gravel or ice-contact deposits of gravel and sand. According to the Cambium Report, site-specific test pits identified that the upper soils on the site consist of gravelly sand.

According to a historical water well record for a well drilled nearby to the northeast (MECP Well Record # 57-7708, attached), the overburden in the vicinity of the site is about 24 metres deep, and consists largely of sand with some intermediate-depth fine-grained deposits. The 2005 North Simcoe Municipal Groundwater Study (Cross-Section B) indicates that the overburden sands form regional Aquifers A2 and A3.

The bedrock beneath the site consists mainly of limestone and dolostone of the Simcoe Group.

Although the area is municipally serviced, municipal and historical water wells will have obtained potable groundwater from aquifers in the lower overburden. The bedrock beneath the site is not locally typically used as a source of potable groundwater due to the likelihood of obtaining lower yields of aesthetically-poorer quality groundwater.

According to the 2015 Severn Sound Source Protection Area Approved Assessment Report (the Severn Sound Report), the site is not located within a well head protection area (WHPA-A through WHPA-E). The Simcoe County Interactive Mapping Website indicates that the site is located within Well Head Protection Zone WHPA-Q2. The site is not mapped to be located within a significant groundwater recharge area or a highly vulnerable aquifer area. The Russell and Heritage municipal well fields are located more than 1km to the northwest and southwest.

WATERTABLE

Watertable conditions were observed by Cambium in open test pits, and are summarized in Table 5 of the Cambium report. To generally summarize the Cambium Table 5 data, no groundwater was encountered in the on-site test pits.

Locally, Figure 4.4.1 of the 2005 North Simcoe Municipal Groundwater Study (NSMGS) indicates that shallow groundwater will flow eastwards towards the Wye River system.

WATER BUDGET ANALYSIS

The following assumptions are made for this assessment:

- Based on the small site area and relatively consistent relief, the site is assumed to act as one catchment. The site is considered to exhibit a rolling topography (per the 1995 MECP definitions referenced by the CA guideline) and sandy soil conditions (native upper soils reported by Cambium and by Quaternary Geology mapping).

- According to calculations provided by WMI & Associates Limited, the 0.4247ha site currently exhibits a pervious area of 100% (0.4247ha) and an impervious area of 0% (0ha). The proposed development of the site will exhibit a pervious area of 35.2% (0.1495ha) and an impervious area of 64.8% (0.2752ha).

- The water surplus for the site is assumed to be 457.6mm/year (rounded to 458mm/year), based on the 1981-2010 precipitation normal for the closest Environment Canada weather station - Midland WPCP weather station (1040.6mm/year, rounded to 1041mm/year) and the actual evapotranspiration rate as identified for the Wye River subwatershed by Table 3.2-3 of the 2015 Severn Sound Source Protection Area Approved Assessment Report, Chapter 3 (583mm/year).

The following tables provide a water budget analysis following the general guidance of the April 2013 Conservation Authority Guidelines for Hydrogeological Assessments.

Table 1 - Water Budget - Undeveloped Conditions

Catchment Designation	Site	
	Undeveloped	Totals
Area (m^2)	4247	4247
Pervious Area (m^2)	4247	4247
Impervious Area (m^2)	0	0
Impervious Factors (Per MECP Guidelines referenced by CA Guideline)		
Topography Infiltration Factor	Rolling 0.20	
Soil Infiltration Factor	Sand 0.4	
Land Cover Infiltration Factor	Cleared 0.1	
MOECC Infiltration Factor	0.7	
Actual Infiltration Factor	0.7	
Run-Off Coefficient	0.3	
Runoff from Impervious Surfaces*	0	
Inputs (per Unit Area)		
Precipitation (mm/year)	1041	1041
Run-On (mm/year)	0	0
Other Inputs (mm/year)	0	0
Total Inputs (mm/year)	1041	1041
Outputs (per Unit Area)		
Precipitation Surplus (mm/year)	458	458
Net Surplus (mm/year)	458	458
Evapotranspiration (mm/year)	583	583
Infiltration (mm/year)	321	321
Impervious Area Infiltration (mm/year)	0	0
Total Infiltration (mm/year)	321	321
Runoff Pervious Areas (mm/year)	137	137
Runoff Impervious Areas (mm/year)	0	0
Total Runoff (mm/year)	137	137
Total Outputs (mm/year)	1041	1041
Difference (Inputs - Outputs) (mm/year)	0	0

Inputs (Volume)		
Precipitation (m^3/year)	4421	4421
Run-On (m^3/year)	0	0
Other Inputs (m^3/year)	0	0
Total Inputs (m^3/year)	4421	4421
Outputs (Volume)		
Precipitation Surplus (m^3/year)	1945	1945
Net Surplus (m^3/year)	1945	1945
Evapotranspiration (m^3/year)	2476	2476
Infiltration (m^3/year)	1363	1363
Impervious Area Infiltration (m^3/year)	0	0
Total Infiltration (m^3/year)	1363	1363
Runoff Pervious Areas (m^3/year)	582	582
Runoff Impervious Areas (m^3/year)	0	0
Total Runoff (m^3/year)	582	582
Total Outputs (m^3/year)	4421	4421
Difference (Inputs - Outputs) (m^3/year)	0	0

Note: ** Minor differences attributable to rounding.

Table 2 - Water Budget - Post-Development Conditions

Under Post-Development conditions, the proposed re-development of the site will exhibit a pervious area of 35.2% (0.1495ha) and an impervious area of 64.8% (0.2752ha).

Catchment Designation	Site		
	Pervious	Impervious	Totals
Area (m^2)	1495	2752	4247
Pervious Area (m^2)	1495	0	1495
Impervious Area (m^2)	0	2752	2752
Impervious Factors (Per MECP Guidelines referenced by CA Guideline)			
Topography Infiltration Factor	Rolling 0.20	Rolling 0.20	
Soil Infiltration Factor	Sand 0.4	Sand 0.4	
Land Cover Infiltration Factor	Cleared 0.1	Cleared 0.1	
MOECC Infiltration Factor	0.7	0.7	
Actual Infiltration Factor	0.7	0.7	
Run-Off Coefficient	0.3	1	
Runoff from Impervious Surfaces*	0	0.8	
Inputs (per Unit Area)			
Precipitation (mm/year)	1041	1041	1041
Run-On (mm/year)	0	0	0
Other Inputs (mm/year)	0	0	0
Total Inputs (mm/year)	1041	1041	1041
Outputs (per Unit Area)			
Precipitation Surplus (mm/year)	458	833	701
Net Surplus (mm/year)	458	833	701
Evapotranspiration (mm/year)	583	208	340
Infiltration (mm/year)	321	0	113
Impervious Area Infiltration (mm/year)	0	0	0
Total Infiltration (mm/year)	321	0	113
Runoff Pervious Areas (mm/year)	137	0	48
Runoff Impervious Areas (mm/year)	0	833	540
Total Runoff (mm/year)	137	833	588
Total Outputs (mm/year)	1041	1041	1041
Difference (Inputs - Outputs) (mm/year)	0	0	0

Inputs (Volume)			
Precipitation (m³/year)	1556	2865	4421
Run-On (m³/year)	0	0	0
Other Inputs (m³/year)	0	0	0
Total Inputs (m³/year)	1556	2865	4421
Outputs (Volume)			
Precipitation Surplus (m³/year)	685	2292	2977
Net Surplus (m³/year)	685	2292	2977
Evapotranspiration (m³/year)	872	572	1444
Infiltration (m³/year)	480	0	480
Impervious Area Infiltration (m³/year)	0	0	0
Total Infiltration (m³/year)	480	0	480
Runoff Pervious Areas (m³/year)	205	0	205
Runoff Impervious Areas (m³/year)	0	2292	2292
Total Runoff (m³/year)	205	2292	2497
Total Outputs (m³/year)	1557	2864	4421
Difference (Inputs - Outputs) (m³/year)	1**	-1**	0

Note: * Per guidelines, evaporation from impervious areas assumed to be 20% of precipitation.

** Minor differences attributable to rounding.

Table 3 - Water Budget - Post-Development Conditions with Mitigation

Based on the above assessment, approximately 883m^3/year (38.5%) of the runoff from the impervious areas of the site will need to be infiltrated on the site in order to maintain the overall rate of infiltration relative to pre-development conditions. The viability of infiltrating this volume of water is discussed below.

Catchment Designation	Site		
	Pervious	Impervious	Totals
Area (m^2)	1495	2752	4247
Pervious Area (m^2)	1495	0	1495
Impervious Area (m^2)	0	2752	2752
Impervious Factors (Per MECP Guidelines referenced by CA Guideline)			
Topography Infiltration Factor	Rolling 0.20	Rolling 0.20	
Soil Infiltration Factor	Sand 0.4	Sand 0.4	
Land Cover Infiltration Factor	Cleared 0.1	Cleared 0.1	
MOECC Infiltration Factor	0.7	0.7	
Actual Infiltration Factor	0.7	0.7	
Run-Off Coefficient	0.3	1	
Runoff from Impervious Surfaces*	0	0.8	
Inputs (per Unit Area)			
Precipitation (mm/year)	1041	1041	1041
Run-On (mm/year)	0	0	0
Other Inputs (mm/year)	0	0	0
Total Inputs (mm/year)	1041	1041	1041
Outputs (per Unit Area)			
Precipitation Surplus (mm/year)	458	833	701
Net Surplus (mm/year)	458	833	701
Evapotranspiration (mm/year)	583	208	340
Infiltration (mm/year)	321	0	113
Impervious Area Infiltration (mm/year)	0	321	208
Total Infiltration (mm/year)	321	321	321
Runoff Pervious Areas (mm/year)	137	0	48
Runoff Impervious Areas (mm/year)	0	512	332
Total Runoff (mm/year)	137	512	380
Total Outputs (mm/year)	1041	1041	1041

Difference (Inputs - Outputs) (mm/year)	0	0	0
Inputs (Volume)			
Precipitation (m^3/year)	1556	2865	4421
Run-On (m^3/year)	0	0	0
Other Inputs (m^3/year)	0	0	0
Total Inputs (m^3/year)	1556	2865	4421
Outputs (Volume)			
Precipitation Surplus (m^3/year)	685	2292	2977
Net Surplus (m^3/year)	685	2292	2977
Evapotranspiration (m^3/year)	872	572	1444
Infiltration (m^3/year)	480	0	480
Impervious Area Infiltration (m^3/year)	0	883	883
Total Infiltration (m^3/year)	480	883	1363
Runoff Pervious Areas (m^3/year)	205	0	205
Runoff Impervious Areas (m^3/year)	0	1409	1409
Total Runoff (m^3/year)	205	1409	1614
Total Outputs (m^3/year)	1557	2864	4421
Difference (inputs - Outputs) (m^3/year)	1**	-1**	0

Note: * Per guidelines, evaporation from impervious areas assumed to be 20% of precipitation.

** Minor differences attributable to rounding.

Table 4 - Water Budget Summary

Characteristic	Site				
	Current	Post-Development	% Change (Current to Post)	Post Development with Mitigation	% Change (Current to Post with Mitigation)
Inputs (Volumes)					
Precipitation (m^3/year)	4421	4421	0	4421	0
Run-On (m^3/year)	0	0	0	0	0
Other Inputs (m^3/year)	0	0	0	0	0
Total Inputs (m^3/year)	4421	4421	0	4421	0
Outputs (Volumes)					
Precipitation Surplus (m^3/year)	1945	2977	53	2977	53
Net Surplus (m^3/year)	1945	2977	53	2977	53
Evapotranspiration (m^3/year)	2476	1444	-42	1444	-42
Infiltration (m^3/year)	1363	480	-65	480	-65
Impervious Area Infiltration (m^3/year)	0	0	0	883	35
Total Infiltration (m^3/year)	1363	480	-65	1363	0
Runoff Pervious Areas (m^3/year)	582	205	-65	205	-65
Runoff Impervious Areas (m^3/year)	0	2292	+2292 m^3/year	1409	+1409 m^3/year
Total Runoff (m^3/year)	582	2497	329	1614	177
Total Outputs (m^3/year)	4421	4421	0	4421	0

Mitigation assumes that 38.5% of runoff from the impervious areas of the site can be infiltrated on-site, or about 883m^3/year. It is assumed that most of this will be infiltrated into grass swales, infiltration galleries, or other equivalent Low Impact Development (LID) measures. According to the grain-size analyses for the upper overburden deposits provided in the Cambium report (for TP5 GS2, attached), the native soils (i.e. a gravelly sand) will exhibit a percolation rate (T-time) in the range of 20min/cm (per Cambium interpretation of Ontario Building Code guidelines for Unified Soil Classification Type "SP"), or about 0.72m/day. Conservatively assuming that the impervious area drainage of 883m^3/year is to be infiltrated over 30 days throughout the year, approximately 29.4m^3 of water needs to be infiltrated per day. Based on an infiltration rate of 0.72m/day, LID measures with a total site footprint of at least 41m^2 are required.

SUMMARY

1. The upper soils on the site consist of gravelly sand.

2. Based on the Cambium Inc. Test Pit data, no shallow groundwater was encountered.

3. The site is located within Well Head Protection Zone WHPA-Q2, and is not mapped to be located within a significant groundwater recharge area or a highly vulnerable aquifer area. The Russell and Heritage municipal well fields are located more than 1km to the northwest and southwest.

4. Based on known site conditions (i.e. sandy soils, rolling relief, cleared cover), an MECP infiltration factor of 0.7 is indicated for the undeveloped site.

5. Water budget analysis indicates that the development proposal of the site will reduce overall infiltration by about 65% from pre-development conditions.

6. Due to the calculated loss in overall infiltration of the development proposal in comparison to pre-development conditions, infiltration enhancement measures must be adopted to infiltrate approximately 38.5% of runoff from impervious surfaces. It is assumed that most of this will be infiltrated into grass swales, infiltration galleries, or other equivalent Low Impact Development (LID) measures (see above for minimum LID areas). The infiltration measures need to be maintained in a low-sediment condition to avoid infiltration loss over time.

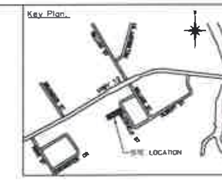
Should there be any questions regarding the above information and analysis, please feel free to contact this office.

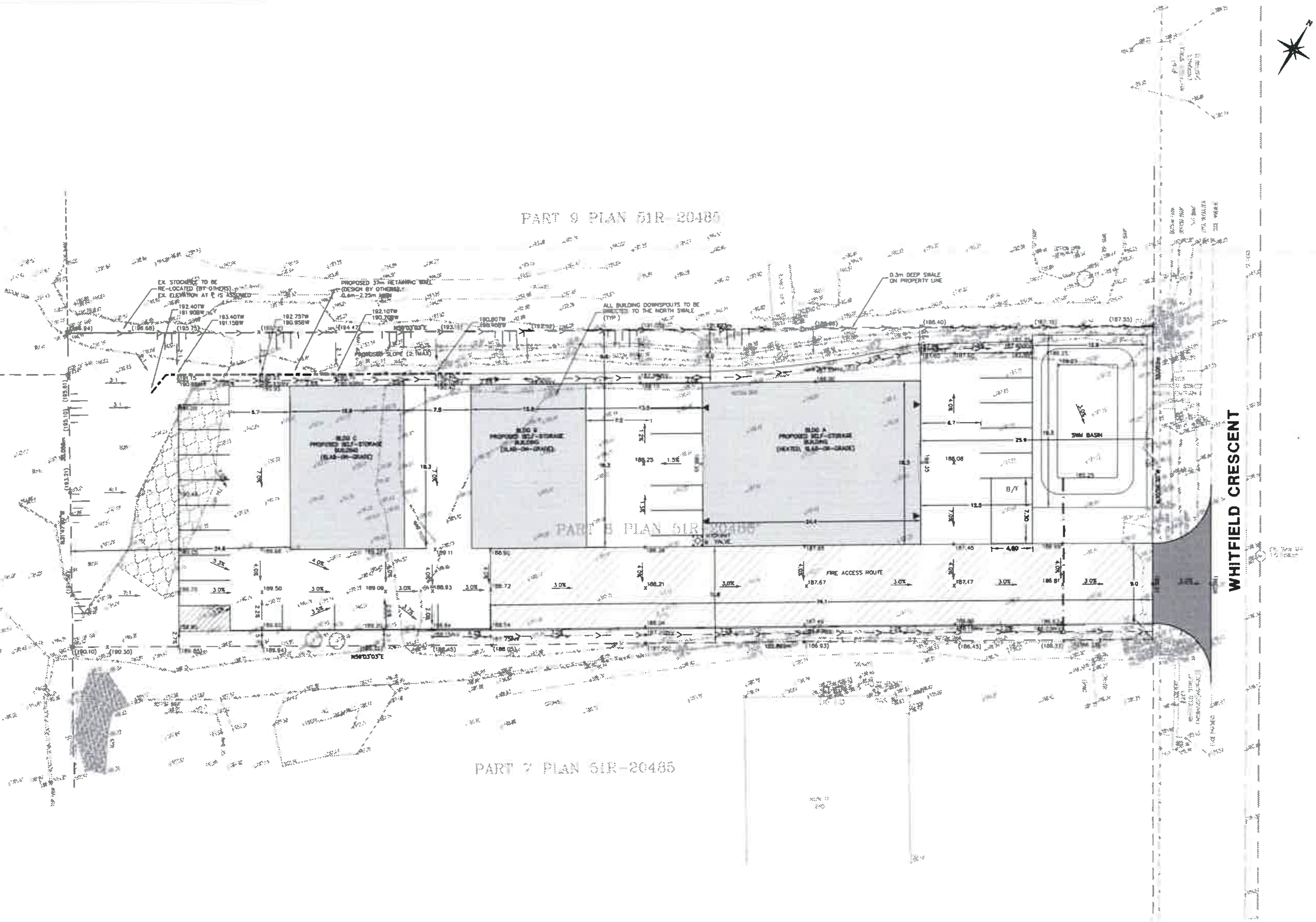
Yours sincerely.
IAN D. WILSON ASSOCIATES LIMITED

Geoffrey Rether, P.Geo.

PROFESSIONAL GEOSCIENTISTS
GEOFFREY B. RETHER
PRACTISING MEMBER
0426
ONTARIO

Key Plan





SITE STATISTICS		
ZONING – (M1) INDUSTRIAL		
	REQUIRED	PROVIDED
MINIMUM LOT AREA	0.4 ha	0.42ha
MINIMUM FRONTAGE	30.0 m	35.05m
MAXIMUM COVERAGE	60%	21.7%
MINIMUM SETBACKS		
FRONT	7.5m	27.8m
REAR	8.6m	21.7m
INTERNAL SIDE	6.0m	6.0m
BUILDING AREA		911sqm
PARKING	1 PER 40sqm (23)	22
B/F	1	1
TOTAL		23

Notes:

1. Unless noted otherwise, the measurements and distances shown on this drawing are shown in meters.
2. Do not scale drawings.
3. It is the contractor's responsibility to verify all dimensions, levels and datums on site and report any discrepancies or omissions to WMI & Associates Ltd. prior to construction.
4. This drawing is to be read and understood in conjunction with all other relevant documents applicable to this project.
5. This drawing is the exclusive property of WMI & Associates Ltd. and the reproduction of any part of this document without prior written consent is strictly prohibited.

Benchmark: 202.945m
TOP NUT OF EXISTING FIRE HYDRANT LOCATED ON THE NORTH SIDE OF HIGHWAY No.12, APPROXIMATELY 200m WEST OF THE INTERSECTION OF WILLIAM STREET AND HIGHWAY No.12

PRELIMINARY

No.	Issue / Revision	Date
1	OWNER REVIEW	MAY 14, 2019

265 WHITFIELD CRESCENT

SITE SERVICING & GRADING PLAN

Client:
Jason Redmon
699 Aberdeen Blvd. Unit 902
Midland ON
L4M 1H2

WMI & Associates Limited
119 Collier Street
Barrie, Ontario
L4M 1H5
Ph 705-797-2027
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Drawn By	AW	Checked By	DW	Drawing No.
Scale	1:200	Project No.	19-543	SSGR

Geotechnical Investigation Report 1000 William Street & 265 Whitfield Crescent, Midland, Ontario

Cambium Reference No.: 8679-001

April 01, 2019

Prepared for: Jason Redman

CAMBIUM

Cambium Inc.

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1.0 INTRODUCTION

Cambium Inc. (Cambium) was retained by WMI & Associates on behalf of Jason Redman (Client) to complete a geotechnical investigation in support of the design and construction of a commercial storage development at 1000 William Street and an assessment of subsurface conditions at 265 Whitfield Crescent in Midland, Ontario (Site).

The William Street property is currently used as outdoor heavy equipment and construction materials storage, the lot is rectangular, relatively flat, and approximately 2.25 acres in size with fill noted across the center and eastern extents of the site, with the western extents appearing to have recently been stripped. The Whitfield Crescent property is currently vacant and undeveloped, the lot is rectangular, has rolling topography and is approximately 1 acre in size.

The proposed development at 1000 William Street consist of numerous 1-storey storage structures throughout the site, driving and parking areas, and storm water management features at the west and east ends of the site. At the time of investigation the development details of the 265 Whitfield Crescent site were understood to consist of a 1-storey office building, two 1-storey storage structures, driving and parking areas, outdoor storage areas, and a storm water management feature at the east end of the site. Following consultation with the Client, Cambium was directed that a test pit investigation was the Client's preferred method to sample and test the in-situ subsurface soils.

The geotechnical investigation was required to confirm the subsurface conditions at the Site in order to provide geotechnical design parameters as input into the design and construction of the proposed storage development. A Site Plan, including test pit locations, is included as Figure 1 of this report.

2.0 METHODOLOGY

2.1 TEST PIT INVESTIGATION

A test pit investigation was completed on February 27th, 2019, to assess subsurface conditions at the Site. A total of six (6) test pits, designated as TP101-19 through TP106-19, were advanced throughout each of the properties. All of the test pits were terminated at depths ranging from 1.8 m to 3.1 m below ground surface (mbgs). The test pit locations were selected and laid out in consultation with the Client. Test pits TP101-19 through TP104-19 were advanced throughout the William Street property, generally adjacent to proposed structures. Test pits TP105-19 and TP106-19 were advanced at the eastern and western ends of the Whitfield Crescent property to classify the native soils present at the site.

The test pit elevations and locations were surveyed by DEMTech Services. The test pit UTM's where surveyed by Cambium with a handheld Garmin etrex 20x and are provided in Table 4 and on the test pit logs, elevations are provided in Table 3 and on the test pit logs. Test pit locations are shown on Figure 1.

Test pits were advanced using a track mounted CAT 312 hydraulic excavator, equipped with a frost ripper and toothed bucket, provided by the client and supervised by a Cambium technician. Dynamic probe penetration tests (DPT), consisting of measuring the number of blows required to advance a 19 mm diameter steel rod into the subgrade soils a distance of 150 mm using an 8 kg hammer falling 750 mm, were attempted in each test pit to determine the in-situ density and bearing capacity of the subgrade soils.

The encountered soil units were logged in the field using visual and tactile methods, and samples were placed in labelled plastic bags for transport, future reference, possible laboratory testing, and storage.

Open test pits were checked for groundwater and general stability prior to backfilling. The test pits were backfilled with the excavated material, compacted with the bucket of the excavator, and the property was reinstated to as close to pre-existing conditions as possible.

Test pit logs are provided in Appendix A. Site soil and groundwater conditions are described and geotechnical recommendations are discussed in the following sections of this report.

2.2 PHYSICAL LABORATORY TESTING

Physical laboratory testing, including four (4) sieve and hydrometer analyses (LS-702, 705), was completed on selected soil samples to confirm textural classification and to assess geotechnical parameters. Natural moisture content testing (LS-701) was completed on all retrieved soil samples. Results are presented in Appendix B and are discussed in Section 3.0.

3.0 SUBSURFACE CONDITIONS

The subsurface conditions at the site consist predominantly of topsoil or fill soils overlying clayey silt or till soils predominantly grading from a sandy silt to silt matrix. These soils were encountered throughout the test pits to the termination depths ranging from 1.5 mbgs to 3.1 mbgs. A layer of fill soil consisting of either sandy soils or clayey silt soils was noted at the surface of each of the test pit locations within the William Street property, the fill soils generally extended to depths between 0.8 mbgs and 1.5 mbgs. It should be noted that organic soils were encountered below the fill soils in test pits TP103-19 and TP104-19. All the test pits were terminated in native soils, and bedrock was not encountered within the excavation depths.

The test pit locations are shown on Figure 1 and the individual soil units are described in detail below with test pit logs provided in Appendix A. A summary of the depth of imported fill and topsoil is provided in Table 1 as an overview, with further descriptions provided below.

Table 1 Summary of Depths of Fill and Topsoil Across Site

Test Pit	Depth of Imported Fill (mbgs)	Depth of Organics (mbgs)	Description of Organics
TP101-19	0 – 1.5	-	-
TP102-19	0 – 1.5	-	-
TP103-19	0 – 0.8	0.8 – 1.1	Topsoil
TP104-19	0 – 0.9	0.9 – 1.2	Topsoil
TP105-19	-	0 – 0.6	Topsoil
TP106-19	-	0 – 0.3	Topsoil

3.1 TOPSOIL

A layer of black to brown topsoil between 300 mm and 600 mm in thickness was encountered at the surface of test pits TP105-19 and TP106-19 advanced at 265 Whitfield Crescent. The topsoil was frozen at the time of the investigation and loose in relative density. Black topsoil with some rootlets and organics was also noted beneath the fill soils in TP103-19 and TP104-19; in both test pits the topsoil was observed to be approximately 300 mm thick.

3.2 FILL SOILS

A layer of fill soils was observed at the surface of test pits TP101-19 through TP104-19 on the William Street property, and was generally brown sand with some gravel and silt, trace clay and occasional cobble, the exception being TP104-19 where the fill was predominately brown clayey silt, trace sand and likely reworked native soils. The fill extended to depths between 0.8 mbgs and 1.5 mbgs, and is summarized in Table 1. Based on visual inspection and observations during excavations the soils were noted as loose to compact in relative density with a natural moisture content ranging between 4% and 13%.

Laboratory particle size distribution analyses were completed for two (2) samples of the fill soils, taken from the test pits and depths provided in Table 2 in order to identify the varying textures encountered throughout the fill material. The testing results are provided in Appendix B and are summarized in Table 2 based on the Unified Soils Classification System (USCS).

Table 2 Particle Size Distribution – Fill Soils

TP	Depth (mbgs)	Description	% Gravel	% Sand	% Silt	% Clay
TP102-19	1.5	Sand some Silt some Gravel trace Clay	14	66	17	3
TP103-19	0.3	Sand some Gravel some Silt trace Clay	16	66	14	4

3.3 NATIVE SOILS

Beneath the fill soils discussed above, the native soils consisted glaciofluvial ice-contact deposits generally consisting of till material with varying amounts of silt and sand throughout the test pit locations, which extended to the termination depths ranging from 1.8 mbgs to 3.1 mbgs.

The texture of the native soils varied at each property. At 1000 William Street the native soils encountered was predominantly brown clayey silt, with trace sand. The DPT penetration resistances indicated a firm to very stiff consistency. Based on laboratory testing, the natural moisture content ranged between 16% and 38%. All of the test pits located in this property were terminated in the native clayey silt soils.

At 265 Whitfield Crescent, the native soils were predominately brown silty gravelly sand with trace clay inferred as a till material. Based on the DPT penetration resistances this material had a compact to very dense relative density with natural moisture content between 5% and 6%. Both test pits TP105-19 and TP106-19 were terminated in the native silty gravelly sand.

Laboratory particle size distribution analyses were completed for two (2) samples of the native soils, taken from the test pits and depths provided in Table 3 in order to identify the varying textures encountered throughout the overburden material. The testing results are provided in Appendix B and are summarized in Table 3 based on the USCS.

Table 3 Particle Size Distribution – Native Soils

TP	Depth (mbgs)	Description	% Gravel	% Sand	% Silt	% Clay
TP101-19	2.1	Silt and Clay trace Sand	0	5	54	41
TP105-19	1.8	Gravelly Silty Sand trace Clay	26	39	28	7

3.4 BEDROCK

Bedrock was not encountered within the investigation depths. Each of the test pits were terminated at depths ranging from 1.8 mbgs to 3.1 mbgs generally in native soils, the exception being TP102-19 which was terminated in fill soils at 1.5 mbgs. The elevation of each test pit and their respective termination depths are identified in Table 4 below.

Table 4 Test Pit Termination Depth – Elevations

Test Pit ID	Test Pit Elevation (mASL)	Test Pit Termination Depth (mbgs)	Test Pit Termination Elevation (mASL)
TP101-19	187.31	2.4	184.91
TP102-19	186.51	2.1	184.41
TP103-19	186.42	3.1	183.32
TP104-19	187.12	3.1	184.02
TP105-19	**	1.8	**
TP106-19	**	1.8	**

***Test pits not surveyed by DEMTech*

3.5 GROUNDWATER

Groundwater (free water) was noted in test pits TP101-19, TP102-19 and TP103-19. The observed groundwater elevation and caving (sloughing) depths are summarised in Table 5. Given the presence of predominately granular fill overlying low permeable clayey silt along the central and western extents of 1000 William Street, it is possible that observed groundwater may be perched seepage in this area.

The moisture content of the soils generally ranged from 3% to 43%. It should be noted that soil moisture and groundwater levels at the Site may fluctuate seasonally and in response to climatic events.

Table 5 Ground Water and Caving Observations

Test Pit ID	Test Pit Elevation (mASL)	Depth to Groundwater (mbgs)	Ground Water Elevation (mASL)	Caving Depth (mbgs)
TP101-19	187.31	1.2	186.11	0.9
TP102-19	186.51	1.3	185.21	1.2
TP103-19	186.42	1.5	184.92	-
TP104-19	187.12	-	-	-
TP105-19	**	-	-	-
TP106-19	**	-	-	-

***Test pits not surveyed by DEMTech*

3.6 INFILTRATION TESTING

In order to help determine the infiltration rates, four (4) particle size distribution tests (hydrometer analyses) were completed on samples as described in Section 3.2. In order to determine the rate at which water will be absorbed into the soil ("T" time), the soil was classified according to the USCS and the T Time was interpolated based on the USCS gradation charts for the two particle size distribution tests (hydrometer analyses) described in Section 3.2 and 3.3 of this report. The hydraulic conductivity was calculated based on the Puckett equation. The results are summarised in Tables 6, 7 and 8 and the T time is included on the grain size distribution charts in Appendix B.

Table 6 Infiltration Results – Fill Soils

Test ID	Sample Depth (mbgs)	Percolation Time (T-time)	USCS Soil Type	Hydraulic Conductivity (K)
TP102-19	1.8	10 mins/cm	Silty Sand (SM)	2.4×10^{-5} m/s
TP103-19	0.3	9 mins/cm	Silty Sand (SM)	2.0×10^{-5} m/s

Table 7 Infiltration Results – Native Soils (1000 William Street)

Test ID	Sample Depth (mbgs)	Percolation Time (T-time)	USCS Soil Type	Hydraulic Conductivity (K)
TP101-19	2.1	> 50 mins/cm	Silt (ML)	1.3×10^{-8} m/s

Table 8 Infiltration Results – Native Soils (265 Whitfield Crescent)

Test ID	Sample Depth (mbgs)	Percolation Time (T-time)	USCS Soil Type	Hydraulic Conductivity (K)
TP105-19	1.8	20 mins/cm	Silt (ML)	1.1×10^{-5} m/s

Based on these test results we believe a percolation time of 10 mins/cm is appropriate for the gravelly sand fill soils, 20 mins/cm for the gravelly silty sand at 265 Whitfield Crescent and > 50 mins/cm for the silt soils at 1000 William Street.

4.0 GEOTECHNICAL CONSIDERATIONS

The following recommendations are based on test pit information and are intended to assist designers. Recommendations should not be construed as providing instructions to contractors, who should form their own opinions about site conditions. It is possible that subsurface conditions beyond the test pit locations may vary from those observed. If significant variations are found before or during construction, Cambium should be contacted so that we can reassess our findings, if necessary.

4.1 SITE PREPARATION

The existing fill material and any organic materials encountered should be excavated and removed from beneath any structures which will be occupied (i.e., offices, maintenance buildings, residential, etc.); additionally this material should be excavated and removed to a minimum distance of 3 m around the proposed occupied building footprint. The fill material may potentially be left in place beneath the single storey storage units and driving areas, however an additional test pitting program is recommended to confirm that the site was stripped prior to the placement of existing fill and/or delineate the extent of the organics at 1000 William Street, as organics and topsoil were noted in TP103-19 and TP104-19. The fill material includes, but is not limited to the fill identified in this report. Any topsoil and materials with significant quantities of organics and deleterious materials (i.e., construction debris, asphalt etc.) are not appropriate for use as fill below storage units and driving areas.

The exposed subgrade should be proof-rolled and inspected by a qualified geotechnical engineer prior to placement of granular fill or foundations. Any loose/soft soils identified at the time of proof-rolling that are unable to uniformly be compacted should be sub-excavated and removed. The excavations created through the removal of these materials should be backfilled with approved engineered fill consistent with the recommendations provided below. Additionally the test pit locations summarized below in Table 9 should be excavated to the termination depths provided in Table 4 and reinstated with approved engineered fill should they be situated beneath any load bearing structural elements (i.e., footings).

The near surface sand and silt soils can be very unstable if they are wet or saturated. Such conditions are common in the spring and late fall. Under these conditions, temporary use of granular fill, and possible reinforcing geotextiles, may be required to prevent severe rutting on construction access routes.

Table 9 Test Pit UTM Coordinates

Test Pit ID	UTM Zone	UTM Northing	UTM Easting
TP101-19***	17 T	590548	4953893
TP102-19***	17 T	590557	4953975
TP103-19***	17 T	590696	4953893
TP104-19***	17 T	590557	4953975
TP105-19	17 T	590408	4953928
TP106-19	17 T	590359	4953882

****Test pit locations also provided in DEMTech Topographic Survey*

4.2 FROST PENETRATION

Based on climate data and design charts, the maximum frost penetration depth below the surface at the site is estimated at 1.6 mbgs.

If strip and spread foundations are to be used, exterior footings for the proposed structures should be situated at or below this depth for frost penetration or should be adequately insulated.

It is assumed that the pavement structure thickness will be less than 1.6 m, so grading and drainage are important for good pavement performance and life expectancy. Any services should be located below this depth or be appropriately insulated.

4.3 EXCAVATIONS AND BACKFILL

All excavations must be carried out in accordance with the latest edition of the Occupational Health and Safety Act (OHSA). The generally loose to compact fill and native soils may be classified as Type 3 soils above the groundwater table in accordance with OHSA. Type 3 soils may be excavated with side slopes no steeper than 1H:1V. Below the groundwater table the soils may be classified as Type 4 soils and may be excavated with unsupported side slopes no steeper than 3H:1V.

4.4 DEWATERING

Groundwater was encountered in three (3) of the six (6) test pits at TP101-19, TP102-19 and TP103-19 at depths ranging from 1.2 mbgs to 1.5 mbgs, given the presence of predominately granular fill overlying low permeable clayey silt in this area, it is possible that observed groundwater may be perched seepage. Seepage may occur across the Site if high groundwater conditions are present during construction due to seasonal fluctuations. If groundwater seepage is encountered it should be manageable with filtered sumps and pumps and depending on size of excavation, a Permit to Take Water (PTTW) from the Ministry of the Environment and Climate Change (MOECC) will likely not be required. It is noted that the elevation of the groundwater table will vary due to seasonal conditions and in response to heavy precipitation events. In order to minimize predictable water issues and costs, it is recommended that excavation and in-ground construction be performed in drier seasons.

4.5 BACKFILL AND COMPACTION

Excavated topsoil from the Site is not appropriate for use as fill below grading and parking areas. Excavated sand soils not containing organics, may be appropriate for use as fill below grading and parking areas, provided that the actual or adjusted moisture content at the time of construction is within a range that permits compaction to required densities, and that the material is only used below frost penetration depth of 1.6 m below proposed grade. Some moisture content adjustments may be required depending upon seasonal conditions. Geotechnical inspections and testing of engineered fill are required to confirm acceptable quality.

Any engineered fill below foundations should be placed in lifts appropriate to the type of compaction equipment used, and be compacted to a minimum of 100% of standard Proctor maximum dry density (SPMDD), as confirmed by nuclear densometer testing. If native soils from the site are not used as engineered fill, imported material for engineered fill should consist of clean, non-organic soils, free of chemical contamination or deleterious material. The moisture content of the engineered fill will need to be close enough to optimum at the time of placement to allow for adequate compaction. Consideration could be given to using a material meeting the specifications of OPSS 1010 Granular B or an approved equivalent. Foundation wall and any buried utility backfill material should consist of free-draining imported granular material. Most of the native site soils are too fine-grained to provide proper drainage, and as such this should be accomplished using well graded Granular B Type 1 material complying with OPSS 1010.

The backfill material, if any, in the upper 300 mm below the pavement subgrade elevation should be compacted to 100 percent of SPMDD in all areas.

4.6 FOUNDATION DESIGN

We understand that the proposed development at 1000 William Street consists of multiple one-storey self-storage units, all with which will be constructed without basements. At the time of investigation, the proposed development plans for 265 Whitfield Crescent consists three (3) one-storey structures which includes one office/maintenance building and two self-storage units, all with which will be constructed without basements. Assuming that the site is prepared as outlined above, the native sub-soils are competent to support all structures on either conventional strip and spread footings or frost protected reinforced raft foundations.

4.6.1 STRIP AND SPREAD FOOTINGS

Assuming any new exterior footings will be placed a minimum of 1.6 m below final adjacent grade for frost protection, these footings can be founded on compact clayey silt or till soils at depth. Any required grade raises to the footing elevations can be accomplished with engineered fill, using an OPSS 1010 SSM or Granular 'B' Type I granular material in 200 mm lifts and compacted to a minimum of 100% of Standard Proctor Maximum Dry Density (SSPMD) as specified above. New footings situated at a minimum depth of 1.6 m below the final adjacent grade, founded in undisturbed compact native clayey silt or till may be designed for an allowable bearing capacity of 100 kPa at serviceability limit state (SLS) and 145 kPa at ultimate limit state (ULS) in all areas.

4.6.2 FROST PROTECTED REINFORCED RAFT FOUNDATION

In addition to the strip and spread footings recommendations above, the storage units may be constructed on frost protected reinforced raft foundations found on either native soils or potentially compact fill soils overlying native inorganic clayey silt subject to the approval by Cambium. Storage units constructed on raft foundations, founded in approved compact fill soils may be designed for an allowable bearing capacity of 50 kPa at SLS and 70 kPa at ULS in all areas. It is noted that topsoil and organics was noted between the fill and inorganic soils in test pits TP103-19 and TP104-19, as such further test pits are recommend prior to construction in order to delineate the underlying topsoil extents. Raft foundations may also be suitable for the proposed office/maintenance building, however given that it would be classified as an occupied structure, it will need to be found on either native soils or approved engineered fill placed and compacted on inorganic soils per Section 4.5.

The quality of the subgrade should be inspected by Cambium during construction, prior to constructing the footings, to confirm bearing capacity estimates and suitability of fill. Settlement potential at the above-noted SLS loadings is less than 25 mm and differential settlement should be less than 10 mm.

4.7 FLOOR SLABS

To create a stable working surface, to distribute loadings, and for drainage purposes, an allowance should be made to provide at least 200 mm of OPSS 1010 Granular A compacted to 98% of SPMDD beneath all floor slabs.

4.8 SUBDRAINAGE

Perimeter subdrains will not be required for structures built on reinforced, raft foundations. Given the investigation was limited to termination depths varying between 1.5 and 3.1 mbgs, if the groundwater table is encountered during excavation for strip footings, geotextile wrapped subdrains set in a trench of clear stone and connected to a sump or other frost-free positive outlet would be recommended around the perimeter of the building foundations.

4.9 BURIED UTILITIES

Trench excavations above the groundwater table should generally consider Type 3 soil conditions, which require side slopes no steeper than 1H:1V, otherwise shoring would be required. Any excavations below the water table should generally consider Type 4 soil conditions which require side slopes of 3H:1V or flatter. Bedding and cover material for any services should consist of OPSS 1010-3 Granular A or B Type II, placed in accordance with pertinent Ontario Provincial Standard Drawings (OPSD 802.013). The bedding and cover material shall be placed in maximum 200 mm thick lifts and should be compacted to at least 98 percent of SPMDD. The cover material shall be a minimum of 300 mm over the top of the pipe and compacted to 98 percent of SPMDD, taking care not to damage the utility pipes during compaction.

4.10 PAVEMENT DESIGN

The performance of the pavement is dependent upon proper drainage and subgrade preparation. All topsoil and organic materials should be removed down to native material and backfilled with approved engineered fill or native material, compacted to 98 percent SPMDD. The subgrade should be proof rolled and inspected by a Geotechnical Engineer. Any areas where boulders, rutting, or appreciable deflection is noted should be subexcavated and replaced with suitable fill. The fill should be compacted to at least 98 percent SPMDD.

From discussions with the client, it is understood that the preference is to have gravel surfaced driving and parking areas throughout the Whitfield Crescent and William Street properties. The recommended pavement structure should satisfy applicable standards for parking and driving areas and should, as a minimum, consist of the pavement layers identified in Table 10.

Table 10 Recommended Minimum Pavement Structure

Pavement Layer	
Granular Surface	100 mm OPSS 1010 Granular M or Granular S
Granular Base	300 mm OPSS 1010 Granular A

Material and thickness substitutions must be approved by the Design Engineer.

The thickness of the base layer could be increased at the discretion of the Engineer, to accommodate site conditions at the time of construction, including soft or weak subgrade soil replacement.

Compaction of the subgrade should be verified by the Engineer prior to placing the granular fill. Granular layers should be placed in 200 mm maximum loose lifts and compacted to at least 98% of SPMDD (ASTM D698) standard. The granular materials specified should conform to OPSS standards, as confirmed by appropriate materials testing.

Drainage features such as subdrains beneath the pavement structure, connecting to the storm sewer or an alternate frost-free outlet, or other drainage alternatives left to the discretion of the designer are recommended to extend the lifespan of the pavement structure.

The final granular surface should be sloped at a minimum of 2 percent to shed runoff, and regular maintenance of the granular surface should be performed to ensure it remains free of surficial deformations.

4.11 DESIGN REVIEW AND INSPECTIONS

Cambium should be retained to complete testing and inspections during construction operations to examine and approve subgrade conditions, placement and compaction of fill materials, granular base courses, and asphaltic concrete.

We should be contacted to review and approve design drawings, prior to tendering or commencing construction, to ensure that all pertinent geotechnical-related factors have been addressed. It is important that onsite geotechnical supervision be provided at this site for excavation and backfill procedures, deleterious soil removal, subgrade inspections and compaction testing.

5.0 CLOSING

We trust that the information contained in this report meets your current requirements. If you have questions or comments regarding this document, please do not hesitate to contact the undersigned at (705) 719-0700 ext. 405.

Respectfully submitted,

CAMBIUM INC.

LICENSED PROFESSIONAL ENGINEER
R. L. GETHIN
100196175
APRIL 1, 2019
PROVINCE OF ONTARIO

Rob Gethin, P.Eng.
Senior Project Manager

RLG/jb

P:\8600 to 8699\8679-001 Jason Redman - Geotechnical Investigation - #1000 William Street, Midland, ON\Deliverables\REPORT - Geotechnical\Final\2019-04-01 RPT 1000 William & 265 Whitfield Geotech.docx

Appended Figures

GEOTECHNICAL INVESTIGATION

JASON REDMAN
1000 William Street and
265 Whitfield Crescent
Midland, Ontario

LEGEND

- Testpit Locations
- Subject Property(approx.)

Notes:
- Base mapping features are © Queen's Printer of Ontario, 2017 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
- Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.

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TEST PIT LOCATION PLAN

Project No.: 8679-001		Date: March 2019	Rev.:
Scale: 1:2,000		Projection: NAD 1983 UTM Zone 17N	
Created by: SH	Checked by: RG	Figure: 1	

O:\GIS\project_MXDs\8600 to 8699\8679-001 Jason Redman - Geotechnical Investigation - #1000 William Street, Midland, ON\2019-03-04 FIG 1 Test Pit Location Plan.mxd

Appendix A
Test Pit Logs

TABLE 1: TEST PIT LOGS

Geotechnical Investigation: 1000 William Street & 265 Whitfield Crescent, Midland, ON

Technician: A. Griffin

Cambium Reference No. 8679-001

Completed February 28th, 2019

Test Pit ID	Depth (mbgs[1])	Soil Sample	Moisture Content (%)	Material Description	Depth (m)	DPT[2] (Blows/150 mm)
TP101-19	0 - 1.5	GS1		Brown sand, some gravel, some silt, trace clay, occasional cobble, frozen to 0.6 mbgs, moist, saturated at 1.2 mbgs, loose to compact, FILL	0.61 - 0.76	4
					0.76 - 0.91	13
17T, 590548, 4953893	1.5 - 2.4	GS2		Dark brown to grey clayey silt, trace sand, wet, firm to stiff	0.91 - 1.10	20
				Caving (sloughing) of test pit walls at 0.9 mbgs and seepage noted at 1.2 mbgs	1.10 - 1.22	13
				Test pit terminated at 2.4 mbgs	1.22 - 1.37	8
					1.37 - 1.52	8
				GSA GS2 (2.1 mbgs): 0% Gravel, 5% Sand, 54% Silt, 41% Clay	1.52 - 1.67	5
					1.67 - 1.83	5
					1.52 - 1.67	2
					1.67 - 1.83	3
					1.83 1.98	7
					1.98 2.13	9
					2.13 2.29	12
					2.29 2.44	15
					2.44 2.59	19
					2.59 2.74	21

Test Pit ID	Depth (mbgs[1])	Soil Sample	Moisture Content (%)	Material Description	Depth (m)	DPT[2] (Blows/150 mm)
TP102-19	0 - 1.5	GS1/GS2		Brown sand, some gravel, some silt, trace clay, occasional cobble, frozen to 0.9 mbgs, moist, saturated at 1.35, loose to compact, FILL		
17T, 590557, 4953975	1.5			Grey clayey silt, trace sand, wet, firm to stiff		
				Caving (sloughing) of test pit walls at 1.2 mbgs and seepage noted at 1.3 mbgs		
				Test pit terminated at 1.5 mbgs due to unstable excavation		
				GSA GS2 (1.5 mbgs): 14% Gravel, 66% Sand, 17% Silt, 3% Clay		

[1]: metres below ground surface

[2]: Dynamic Penetration Test

TABLE 1: TEST PIT LOGS

Geotechnical Investigation: 1000 William Street & 265 Whitfield Crescent, Midland, ON

Technician: A. Griffin

Cambium Reference No. 8679-001

Completed February 28th, 2019

CAMBIUM

Test Pit ID	Depth (mbgs[1])	Soil Sample	Moisture Content (%)	Material Description	Depth (m)	DPT[2] (Blows/150 mm)
TP103-19	0 - 0.8	GS1		Brown silty sand, some gravel, trace clay, occasional cobble, frozen, compact, FILL	1.52 - 1.67	5
	0.8 - 1.1	GS2		Black sandy silty topsoil, some rootlets and organics, frozen	1.67 - 1.83	5
17T, 590696,	1.1 - 3.1	GS3/GS4		Brown clayey silt, trace sand, moist to wet, firm to stiff	1.83 1.98	5
4953893				Test pit open upon completion, seepage noted at 1.5 mbgs	1.98 2.13	6
				Test pit terminated at 3.1 mbgs	2.13 2.29	7
					2.29 2.44	6
				GSA GS1 (0.3 mbgs): 16% Gravel, 66% Sand, 15% Silt, 3% Clay	2.44 2.59	6
					2.59 2.74	6

Test Pit ID	Depth (mbgs[1])	Soil Sample	Moisture Content (%)	Material Description	Depth (m)	DPT[2] (Blows/150 mm)
TP104-19	0 - 0.9	GS1		Brown clayey silt, trace sand, frozen to 0.91 mbgs, firm, FILL	1.22 - 1.37	2
	0.9 -1.2	GS2		Black sandy silty topsoil, some rootlets and organics, moist, loose	1.37 - 1.52	8
17T, 590557,	1.2 - 3.1	GS3/GS4		Brown clayey silt, trace sand, moist, firm to stiff	1.52 - 1.67	7
4953975				Test pit open and dry upon completion	1.67 - 1.83	8
				Test pit terminated at 3.05 mbgs	1.83 - 1.98	7
					1.98 - 2.13	18
					2.13 - 2.29	30
					2.29 - 2.44	15

[1]: metres below ground surface

[2]: Dynamic Penetration Test

TABLE 1: TEST PIT LOGS

Geotechnical Investigation: 1000 William Street & 265 Whitfield Crescent, Midland, ON

Technician: A. Griffin

Cambium Reference No. 8679-001

Completed February 28th, 2019

CAMBIUM

Test Pit ID	Depth (mbgl[1])	Soil Sample	Moisture Content (%)	Material Description	Depth (m)	DPT[2] (Blows/150 mm)
TP105-19 17T, 590408, 4953928	0 - 0.6 0.6 -1.8	 GS1/GS2		Black sandy silty topsoil, some rootlets and organics, frozen to 0.6 mbgs Brown silty gravelly sand, some cobbles, trace clay, moist, dense to very dense Grey at 1.8 mbgs Test pit open and dry upon completion Test pit terminated at 1.8 mbgs due to refusal on very dense gravel GSA GS2 (1.8 mbgs) : 26% Gravel, 39% Sand, 28% Silt, 7% Clay	1.22 - 1.37 1.37 - 1.52 1.52 - 1.67	2 30 30 = 125mm

Test Pit ID	Depth (mbgl[1])	Soil Sample	Moisture Content (%)	Material Description	Depth (m)	DPT[2] (Blows/150 mm)
TP106-19 17T, 590359, 4953882	0 - 0.3 0.3 - 1.8	 GS1/GS2		Black sandy silty topsoil, some rootlets and organics, frozen to 0.3 mbgs Brown silty gravelly sand, some cobbles, trace clay, moist, dense to very dense Grey at 1.8 mbgs Test pit open and dry upon completion Test pit terminated at 1.8 mbgs due to refusal on very dense gravel	1.22 - 1.37 1.37 - 1.52 1.52 - 1.67 1.67 - 1.83 1.83 - 1.98 1.98 - 2.13	13 15 17 24 24 30 = 125mm

[1]: metres below ground surface

[2]: Dynamic Penetration Test

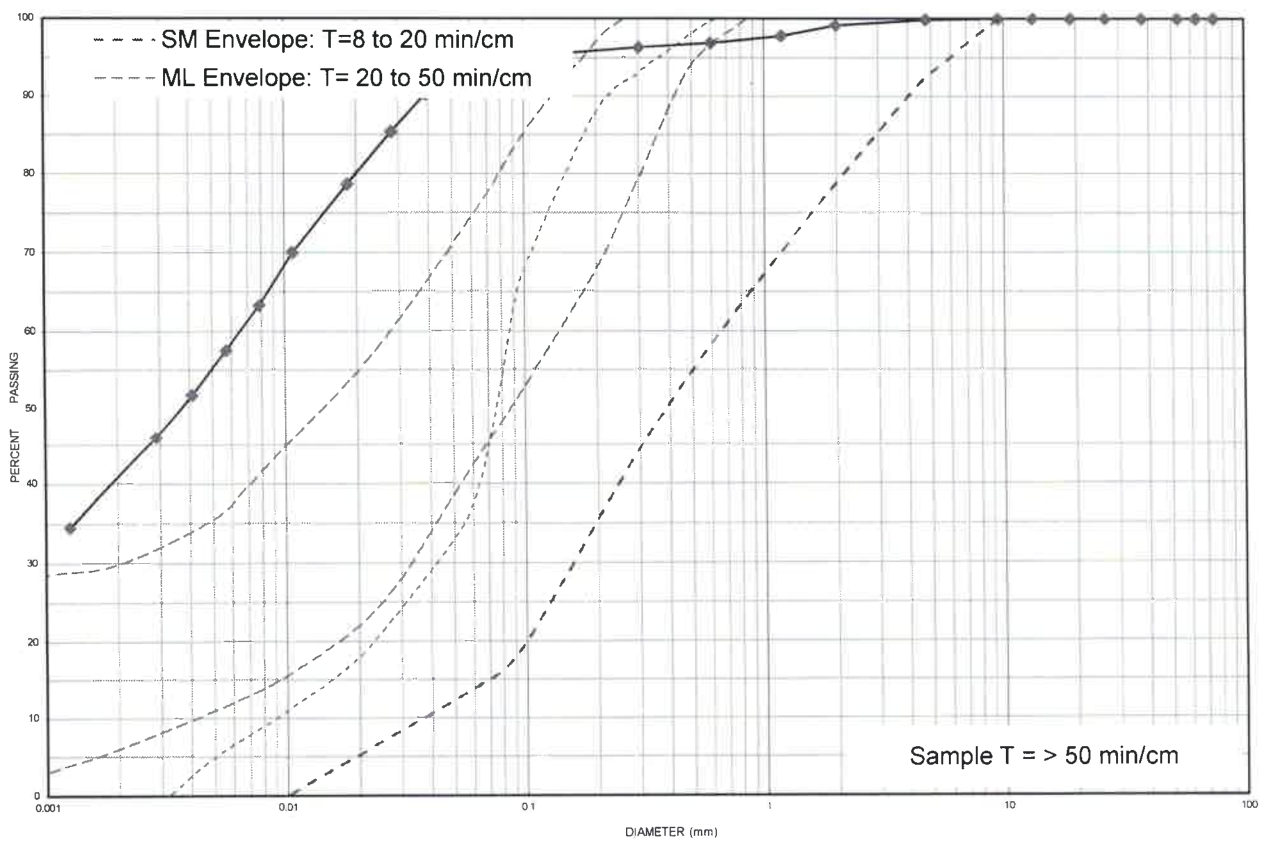
Appendix B

Physical Laboratory Testing Results

Grain Size Distribution Chart

Project Number:	*8679-001*	**Client:**	*Jason Redman*		
Project Name:	*1000 William Street, Midland, ON*				
Sample Date:	*February 27, 2019*	**Sampled By:**	*Alex Griffin - Cambium Inc.*		
Hole No.:	*TP 1 GS 2*	**Depth:**	*2.1 m*	**Lab Sample No:**	*S-19-0123*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
TP 1	GS 2	2.1 m	0	5	95		42.6

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silt and Clay trace Sand	ML-CL	0.0066	-	-	-	-

Issued By: (Senior Project Manager)

Date Issued: *March 15, 2019*

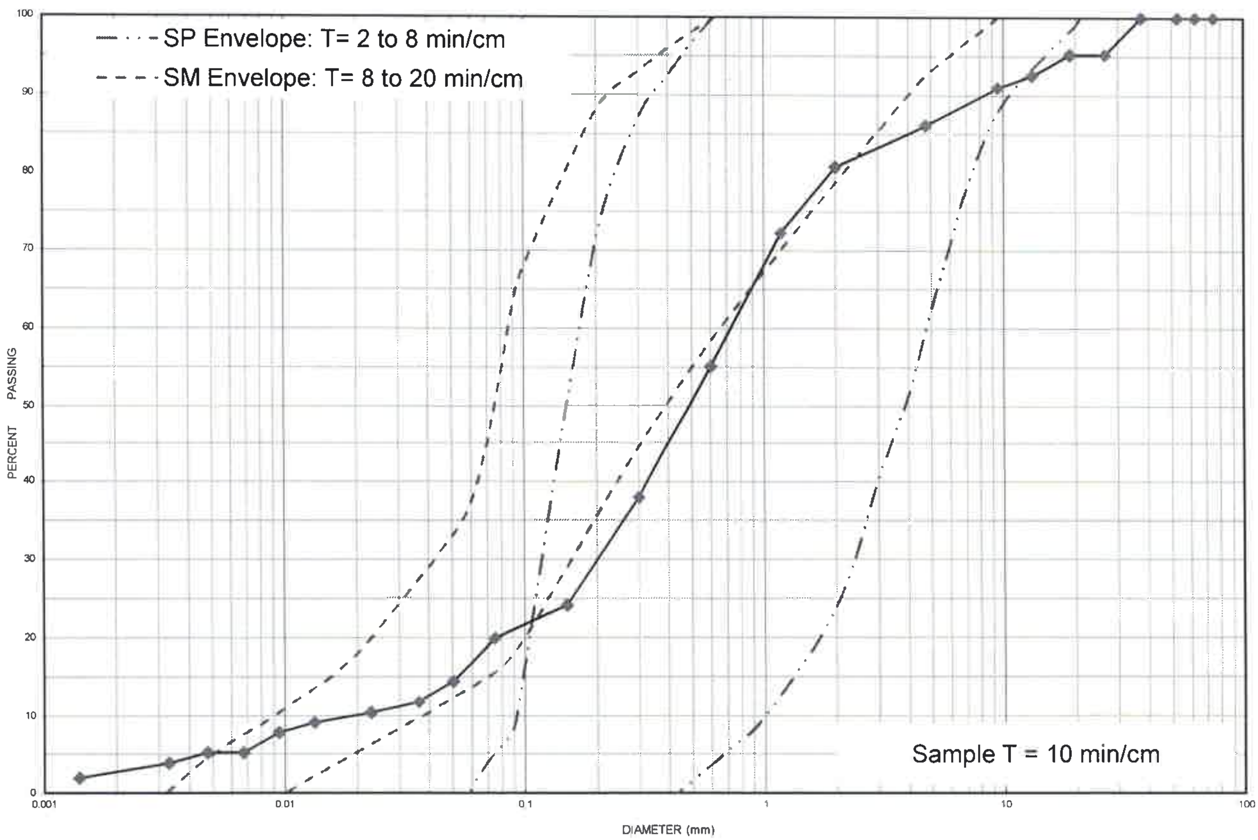
Cambium Inc. (Laboratory)
866.217.7900 | cambium-inc.com
701 The Queensway | Units 5-6 | Peterborough | ON | K9J 7J6

Form: L6V.2 - Grad.Hydo

Grain Size Distribution Chart

Project Number: 8679-001 **Client:** Jason Redman
Project Name: 1000 William Street, Midland, ON
Sample Date: February 27, 2019 **Sampled By:** Alex Griffin - Cambium Inc.
Hole No.: TP 2 GS 2 **Depth:** 1.5 m **Lab Sample No:** S-19-0121

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
TP 2	GS 2	1.5 m	14	66	20		11.5

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Sand some Silt some Gravel trace Clay	SW	0.720	0.200	0.019	37.89	2.92

Issued By: (Senior Project Manager) *Date Issued:* March 15, 2019

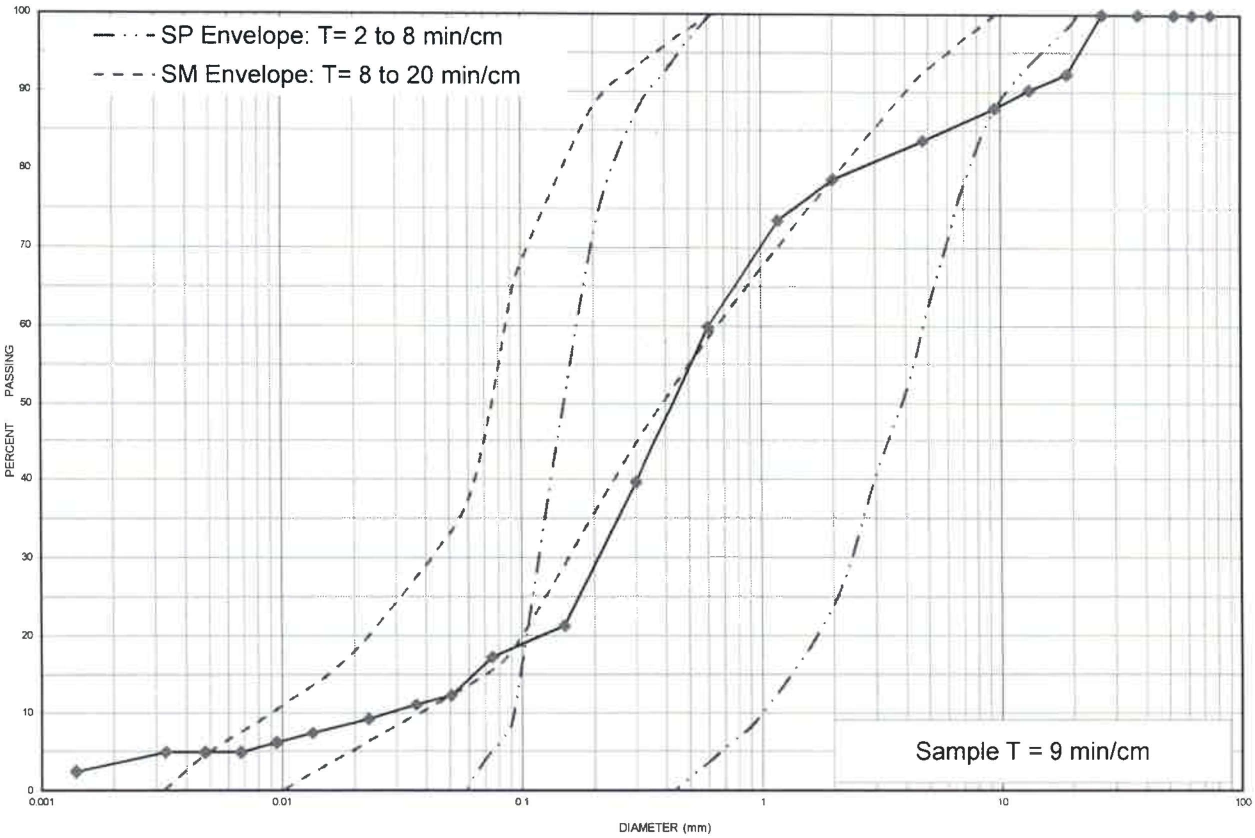
Grain Size Distribution Chart

CAMBIUM

CCIL

Project Number:	8679-001	**Client:**	Jason Redman
Project Name:	1000 William Street, Midland, ON		
Sample Date:	February 27, 2019	**Sampled By:**	Alex Griffin - Cambium Inc.
Hole No.:	TP 3 GS 1	**Depth:**	0.3 m
Lab Sample No:	S-19-0122		

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
TP 3	GS 1	0.3 m	16	66	18		8.7

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Sand some Gravel some Silt trace Clay	SW	0.600	0.220	0.027	22.22	2.99

Issued By: (Senior Project Manager)

Date Issued: March 15, 2019

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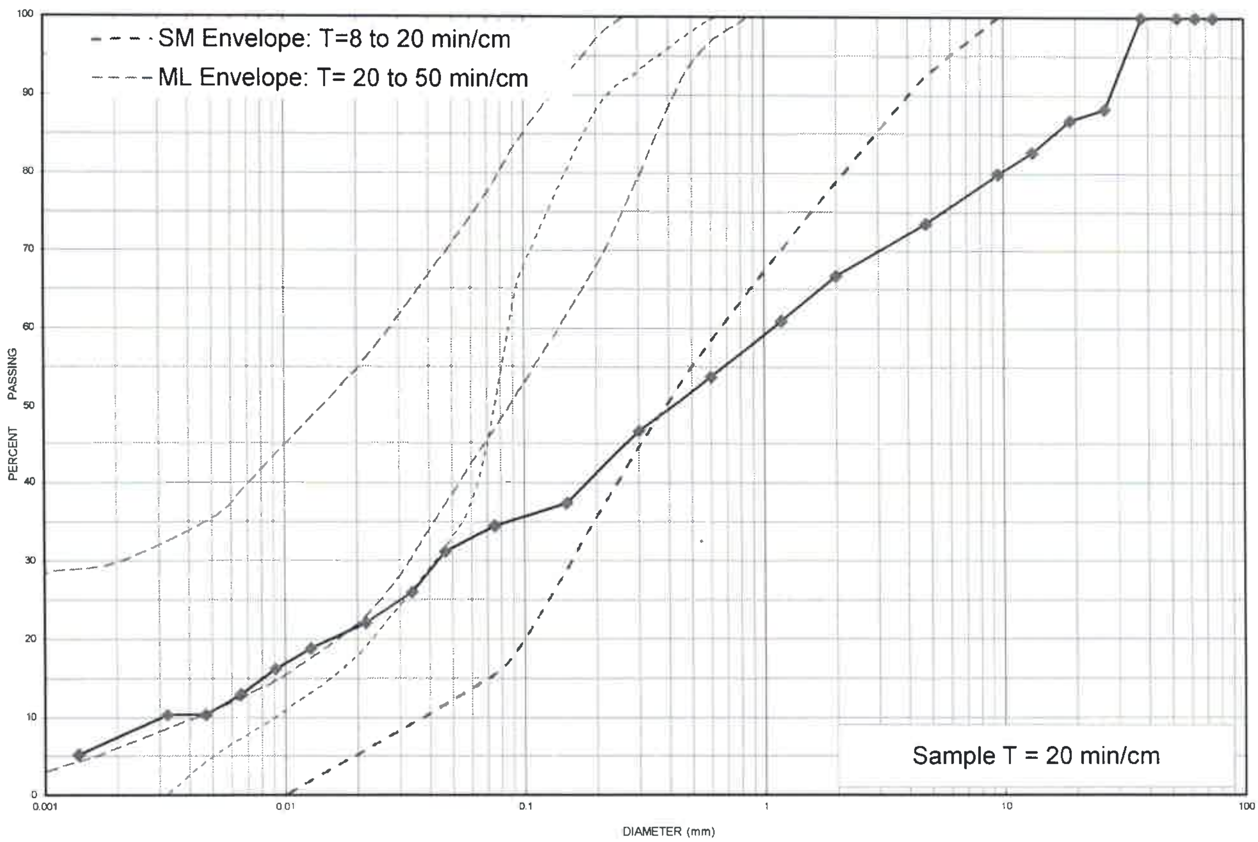
Form: L6V.2 - Grad.Hydo

Grain Size Distribution Chart

Project Number: *8679-001* **Client:** *Jason Redman*
Project Name: *1000 William Street, Midland, ON*
Sample Date: *February 27, 2019* **Sampled By:** *Alex Griffin - Cambium Inc.*
Hole No.: *TP 5 GS 2* **Depth:** *1.8 m* **Lab Sample No:** *S-19-0123*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
TP 5	GS 2	1.8 m	26	39	35		5.1

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Gravelly Silty Sand trace Clay	SP	1.100	0.044	0.003	366.67	0.59

Issued By: ______ (Senior Project Manager)
Date Issued: March 15, 2019

Cambium Inc. (Laboratory)
866.217.7900 | cambium-inc.com
701 The Queensway | Units 5-6 | Peterborough | ON | K9J 7J6

Form: L6V.2 - Grad Hydo

31 D/12 W

The Ontario Water Resources Commission Act

WATER WELL RECORD

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 5707708 | MUNICIP 57013 | CON CON 03

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Simcoe	Tay (to Midland)	III	016

[redacted] Midland Ont

DATE COMPLETED: DAY 11 MO. 08 YR. 70

953880 | RC 4 | ELEVATION 0600 | RC 5 | BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	TO
dark	loam		Top Soil	0	1
yellow	sand			1	14
grey	sand			14	30
grey	clay		very soft	30	42
light yel.	sand	silt	fine	42	57
grey	sand		fine to medium	57	60
yellow	sand	silt, gravel		60	79
brown	limestone		shale	79	100
blue & brown	limestone		soft	100	136
red	granite		soft	136	139

APL

31 | 0001 02 | 0014509 | 0030209 | 0042205 | 005750906 | 0060208
32 | 007950906 | 0100015 | 0136315 | 0139731

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0081	☒ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
0092	☒ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	TO
6 / 06	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE	.188	0	0081
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☒ OPEN HOLE		81	0139
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET
MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: ☒ PUMP ☐ BAILER
PUMPING RATE: 0108 GPM
DURATION OF PUMPING: 16 HOURS 00 MINS

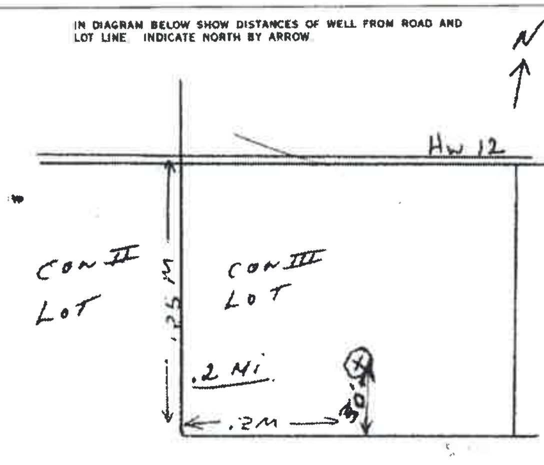
STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
016	045 FEET	018	016 FEET	016 FEET	016 FEET

WATER LEVELS DURING: ☐ PUMPING ☒ RECOVERY

IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: ☒ CLEAR ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: FEET
RECOMMENDED PUMPING RATE: GPM
003.7 GPM/FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL

1 ☐ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☒ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE 09

1 ☐ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☒ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: H. HAMMERS | LICENCE NUMBER: 2514
ADDRESS: RR#3 Barrie, Ont.
NAME OF DRILLER OR BORER: A. Hammers | LICENCE NUMBER: 2513
SIGNATURE OF CONTRACTOR: Henry Hammers | SUBMISSION DATE: DAY ___ MO ___ YR ___

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 2514 | DATE RECEIVED: 111270
DATE OF INSPECTION | INSPECTOR: P/L
REMARKS: CSS S8

OWRC COPY