Peto MacCallum Ltd.
CONSULTING ENGINEERS

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
221 FOX STREET
PENETANGUISHENE, ONTARIO

for

QUEEN'S COURT HOMES

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PML Ref.: 12BF046
Report: 1
November 2012

Peto MacCallum Ltd.
CONSULTING ENGINEERS

November 2, 2012

PML Ref.: 12BF046
Report: 1

Mr. Brady Welch
Queen's Court Homes
80 Richmond Street West, 13th Floor
Toronto, Ontario
M5H 2A4

Dear Mr. Welch

Preliminary Geotechnical Investigation
Proposed Residential Development
221 Fox Street
Penetanguishene, Ontario

Peto MacCallum Ltd. (PML) is pleased to present the results of the preliminary geotechnical investigation recently completed at the above noted project site. Authorization for this work was provided by Mr. D. Walter of WMI Associates Ltd. (WMI) in an email, dated August 29, 2012, on behalf of the Client.

A residential development is proposed for the property at 221 Fox Street in Penetanguishene. The latest concept comprises 78 lots for single family dwellings and a townhouse block. A main road with several smaller side roads is planned and the development will be fully serviced. A Storm Water Management (SWM) pond is proposed in the west central portion of the site.

A preliminary geotechnical investigation has been requested to explore the general subsurface conditions at the site, and based on this information, provide a preliminary assessment of the geotechnical conditions in order to assist in the planning of the development. Geo-environmental assessment of the site was not within the terms of reference, and no work has been carried out in this regard.

The comments and recommendations provided in this report are based on the site conditions as revealed in a limited number of boreholes at the time of the investigation. Design is in the conceptual stages and details of the development plans, including layout and final grades were not available at the time of this study. Accordingly, the comments and recommendations provided in this report are general in nature, and suitable only for preliminary design and planning purposes. When design details are available, supplementary investigation and analysis will be required for final geotechnical design.

INVESTIGATION PROCEDURES

The field work for this investigation was conducted on October 11, 2012, and consisted of Boreholes 1 to 3 advanced to depths of 6.2 to 6.5 m. Borehole locations are shown on Drawing 1, appended.

Co-ordination of clearances of underground utilities was provided by PML.

The boreholes were advanced using continuous flight solid stem augers, powered by a rubber tire mounted CME-750 drill rig supplied and operated by a specialist drilling contractor working under the full time supervision of a member of our engineering staff.

Representative samples of the overburden in the boreholes were recovered at frequent depth intervals for identification purposes using a conventional split spoon sampler. Standard penetration tests were carried out simultaneously with the sampling operations to assess the strength characteristics of the substrata. Ground water conditions in the boreholes were closely monitored during the course of the field work.

Standpipes were installed in all three boreholes. Standpipes become the property of the Owner and as per O.Reg. 903 will have to be decommissioned by the Owner when no longer required.

The locations of the boreholes were established in the field by WMI and PML based on existing walking trails within the site and access points. The locations of the boreholes were limited to the existing accessible areas as no tree clearing was allowed at the time of our investigation due to the presence of certain protected species of trees.

All recovered soil samples were returned to our laboratory for moisture content determinations and detailed examination to confirm field classification. Three grain size analyses were carried out and the results were provided on Figures 1 to 3, appended.

SUMMARIZED SUBSURFACE CONDITIONS

Reference is made to the appended Log of Borehole sheets for details of the subsurface conditions, including soil classifications, inferred stratigraphy, standard penetration test N values, ground water observations, standpipe installation details, and the results of laboratory moisture content determinations.

Due to the soil sampling procedures and limited sample size, the depth demarcations on the borehole logs must be viewed as "transitional" zones between layers, and cannot be construed as exact geologic boundaries between layers.

A description of the distribution and characteristics of the various soil units and ground water observations encountered in the boreholes are provided below.

Topsoil

Topsoil, 150 mm thick, was encountered at the surface of all three boreholes.

Sand

Beneath the topsoil a sand deposit was present that was penetrated at 4.0 and 5.5 m depth in Boreholes 1 and 3, respectively. In Borehole 2, the sand extended to the 6.5 m depth of exploration. The sand was interrupted by a clayey silt unit in Boreholes 1 and 2.

The sand typically contained trace silt in the upper portion becoming silty sand in the lower portion. Sandy silt layers were also noted. The sand was very loose to loose, locally compact, and saturated below about 2.0 m depth with moisture contents ranging from 4 to 21%. A grain size analysis was conducted on samples of the sand from Boreholes 2 and 3, and the results are presented on Figures 1 and 2, appended.

Clayey Silt

A clayey silt unit was encountered in Borehole 1 from 0.8 to 1.4 m depth and in Borehole 2 from 2.9 to 4.0 m depth. The unit was soft to firm and contained some sand in Borehole 2. In Borehole 1 the moisture content was 36% and in Borehole 3 it was 18%, being wetter than plastic limit to about plastic limit. A grain size analysis was carried out on a sample of the clayey silt from Borehole 1, and the results are presented on Figure 3.

Till

A till deposit was encountered at the base of Boreholes 1 and 3 from 4.0 and 5.5 m depth, respectively, to the depth of exploration. The till comprised compact to very dense silty sand, trace gravel with cobbles and boulders noted. The till was moist to wet with moisture contents of 9 to 17%.

Ground Water

Upon completion of augering, water or wet cave was noted in all boreholes, at depths of 3.0 to 5.8 m.

More stabilized water levels within the standpipes were measured five days after installation. The water levels measured in Boreholes 1 and 3 and were 1.9 and 2.2 m below existing grade, respectively. In Borehole 3 the standpipe was set within the lower sand below the clayey silt and the water level was at 4.4 m depth.

Ground water levels are subject to seasonal variation and will fluctuate in response to precipitation.

ENGINEERING CONSIDERATIONS

Site Preparation and Engineered Fill

It must be fully recognized that details of the lot grading, as well as service inverts and plans for basements had not been established at the time of this study. Accordingly, the comments and recommendations provided in this report are preliminary in nature. Further detailed geotechnical investigation will be required once development details have been finalized.

The boreholes have revealed very loose to compact sand with an intermittent soft to firm clayey silt layer over a compact to very dense till deposit at about 4.0 to 5.5 m depth. The ground water table is interpreted to be about 2.0 m below existing grade. The relatively weak soils and shallow water table must be taken into account during the design of the development.

Where grades are to be raised and will be supporting structures (roads, services and houses) engineered fill must be employed or there is potential for damaging, gross and differential settlements.

Engineered fill must comprise select material placed in controlled lift thicknesses and thoroughly compacted under fulltime geotechnical review. Guidelines for construction can be provided at a later date when details of the development are more advanced.

House Foundations and Floor Slabs

Weak soils are present in the boreholes to about 4 m depth and based on this only a very low bearing capacity is available for design of footings. For footings supported by native soils in the upper 4 m a net geotechnical bearing resistance at Serviceability Limit States (SLS) of 50 kPa and a factored net bearing resistance at Ultimate Limit States (ULS) of 75 kPa is available for design. Locally, these values will be reduced to 25 kPa at SLS and 50 kPa at ULS near Boreholes 2 and 3 at about 2 to 3 m depth. Below 4 m depth, net bearing resistances at SLS and ULS are on the order of 150 kPa and 225 kPa, respectively.

Consideration may be given to providing a minimum of 1.5 m of engineered fill under the founding level. This is would require replacement of the typically loose native soils with compacted engineered fill. It is envisioned that engineered fill would be utilized to support the footings and continue up to support the floor slab.

A net geotechnical resistance of 150 kPa at SLS and a factored net resistance of 225 kPa at ULS may be adopted for preliminary design of footings founded on a minimum 1.5 m of engineered fill.

Alternatively, a deep foundations system such as helical piers or driven piles can be considered however would require deeper boreholes during detailed design and structurally supported floor slabs would be required.

Based on the relatively high ground water table about 2 m below existing grades, basements are discouraged or the lowest floor slabs should be set at least 0.6 m above the ground water table. A seasonal groundwater monitoring program would be advisable to establish an appropriate seasonal high groundwater elevation for setting the basement level grade.

Floor slabs can be supported on engineered fill or native soils. Inclusion of an under slab drainage system is prudent at this stage, subject to further geotechnical investigation during detailed design.

Site Servicing

At the time of this report design inverts were not established and for purposes of this report, it is assumed that service inverts will typically be about 3 m depth below existing grade or less.

It is expected that the underground utilities will be founded within the native soils where settlement and bearing capacity issues are generally not anticipated. Localized areas may require an increased thickness in bedding.

Standard granular bedding and cover material in accordance with OPSS are envisioned.

Excavated site soils are expected to be generally suitable for reuse as backfill, except for soil from below the ground water table. Such wet soil will need to be "dried" out to a moisture content suitable for achieving a high degree of compaction, subject to geotechnical field review and monitoring.

Storm Water Management Pond

It is understood that the SWM pond will be located in the central west portion of the site. Details of the pond were not available at the time of this report.

Whether the pond is designed to have a permanent pool level or be a detention pond, and infiltration is being considered, the high ground water table must be taken into account.

Where the pond will reach below 2 m below existing grades then dewatering will be required to permit construction as discussed below.

Where berm construction is being considered the berms will need to be constructed as engineered fill.

In general relatively flat slopes of three horizontal to one vertical (3H:1V) or flatter are required. Slopes of 5H:1V of flatter should be utilized in the water level zone, if applicable. Further recommendations such as pond erosion protection can be provided once the configuration and soil make up are determined.

Excavation and Ground Water Control

At this preliminary stage it is assumed excavation will be carried out for shallow foundations, SWM pond and site servicing up to 3 m below existing grades.

All construction work must be carried out in accordance with the Occupational Health and Safety Act (OHSA). In general for excavations above the ground water table (about 1.5 to 2.0 m depth) the site soils are classified as Type 4 soils requiring excavation/trench slopes to be cut back at

3H:1V from the base of the excavation. In general, seepage quantities are expected to be relatively minor and may be removed using conventional sump pumping techniques.

For excavation below the ground water table (deeper than 2 m below existing grades) dewatering will be required to permit excavation in the dry. A dewatering system should be designed and installed be specialist in the field. It is likely that a Permit-to-Take-Water will be required for the site were extensive excavation is required below 2 m depth below existing grades.

Pavement Design and Construction

Beneath the topsoil the site soils comprise sand with trace silt to silty sand and clayey silt which range from low to high frost susceptibility. Depending on the grading of the site, pavement subgrade will comprise native soils or engineered fill. Assuming the engineered fill is comprised of native materials then typical pavement design should be sufficient with consideration for increased subbase in areas of highly frost susceptible subgrade. Further the typically loose soil will required proofrolling prior to placement of granulars. Construction should be relatively straightforward, except it is noted that due to the silty site soils and ground water table within the upper 2 m of existing grades, equipment mobility and compaction and could potentially pose some difficulty particularly during wet weather.

Final Design

The comments and recommendations provided in this report are based on the site conditions as revealed in a limited number of boreholes at the time of the investigation. Details of the development plans, including layout and final grades were not available at the time of this study. Accordingly, the comments and recommendations provided in this report are general in nature, and suitable only for preliminary design and planning purposes. When design details are available, supplementary investigation and analysis will be required to finalize the geotechnical recommendations.

CLOSURE

We trust this report is complete within our terms of reference, and the information presented is sufficient for your present purposes. If you have any questions, or when we may be of further assistance, please do not hesitate to call our office.

Sincerely

Peto MacCallum Ltd.

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Enclosure(s):
Particle Size Distribution Chart – Figures 1 to 3
List of Abbreviations
Log of Borehole Nos. 1 to 3
Drawing No. 1 – Borehole Location Plan

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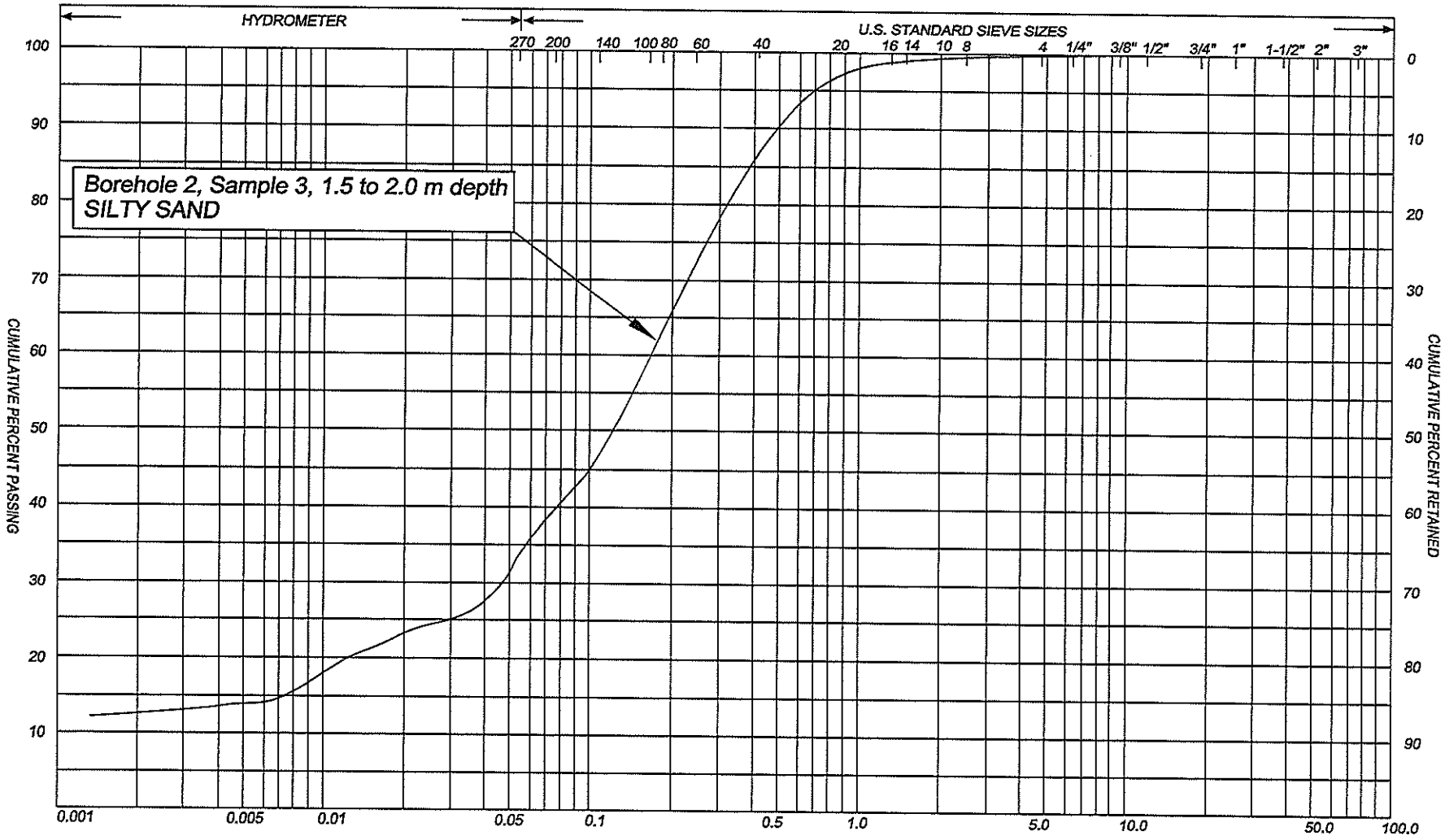
PARTICLE SIZE DISTRIBUTION CHART

PML Ref.: 12BF046
Lab No.: L20340
Figure No.: 1



SILT & CLAY				FINE	MEDIUM	COARSE	GRAVEL		COB BLES	UNIFIED
				SAND						
CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	GRAVEL		COBBLES	M.I.T.
	SILT			SAND						
CLAY	SILT			V. FINE	FINE	MED	COARSE	GRAVEL		U.S. BUREAU
				SAND						

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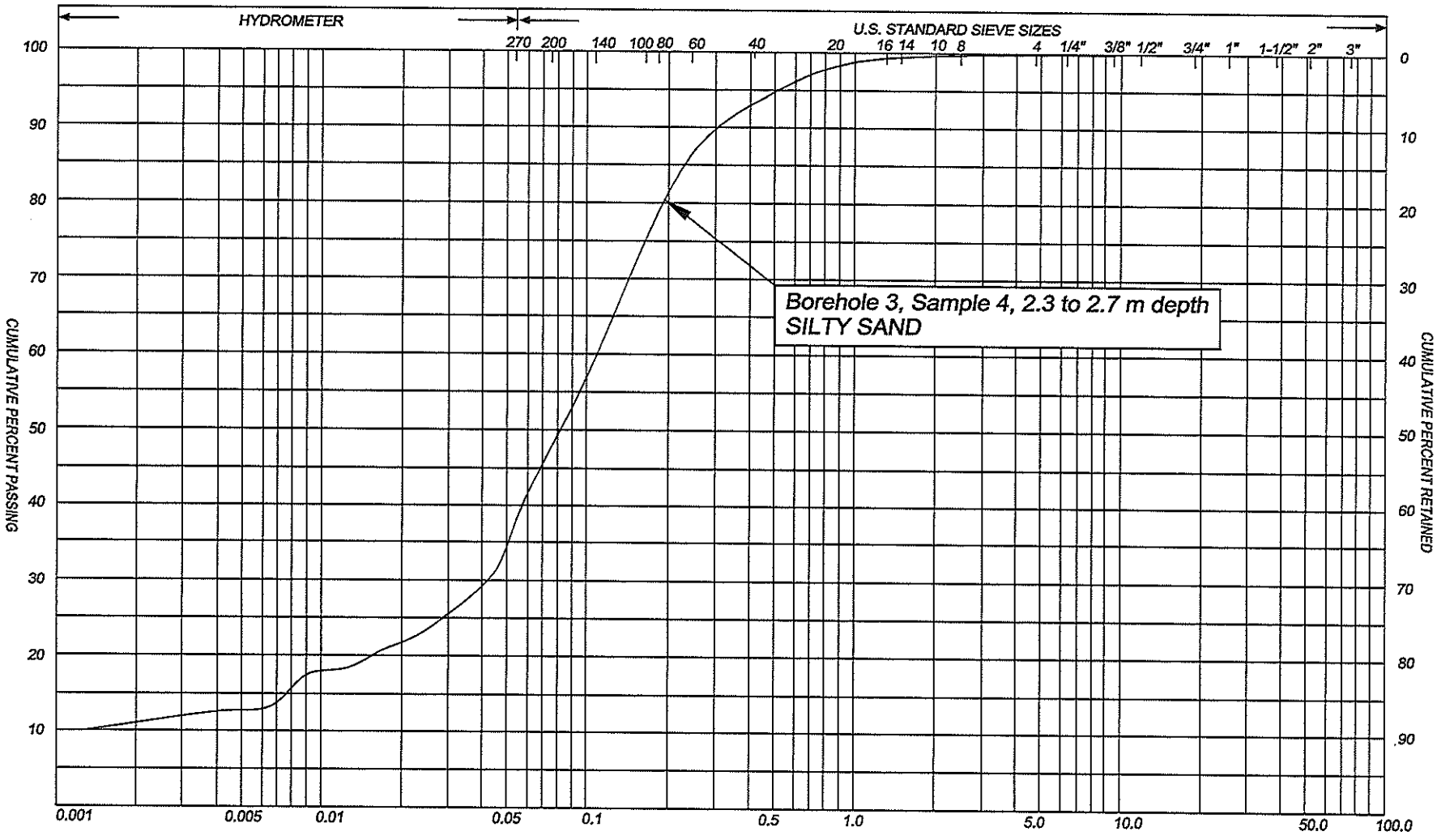
PARTICLE SIZE DISTRIBUTION CHART

PML Ref.: 12BF046
Lab No.: L20341
Figure No.: 2



SILT & CLAY				FINE	MEDIUM	COARSE	GRAVEL		COB BLES	UNIFIED
				SAND						
CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	GRAVEL		COBBLES	M.I.T.
	SILT			SAND						
CLAY	SILT			V. FINE	FINE	MED	COARSE	GRAVEL		U.S. BUREAU
				SAND						

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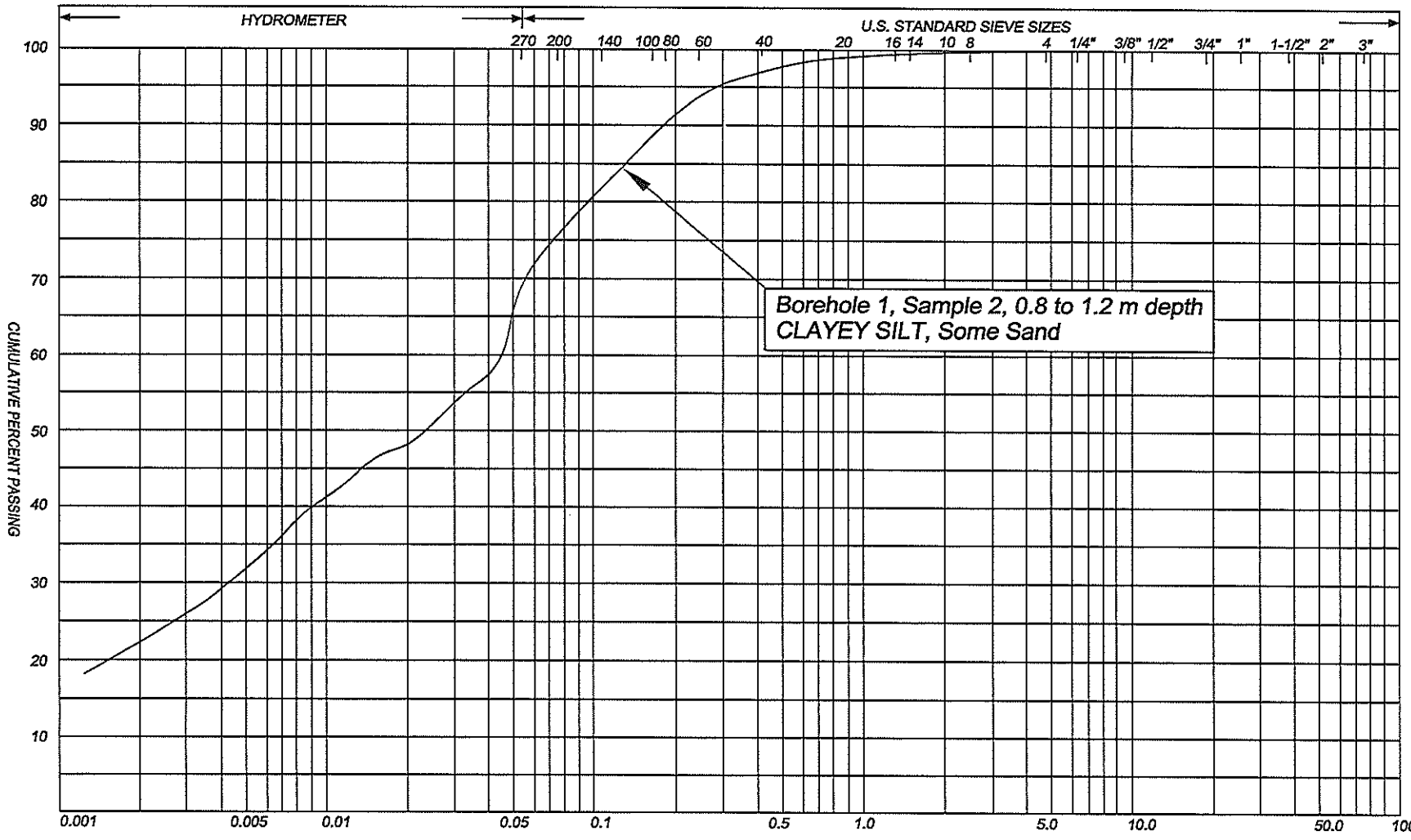
PARTICLE SIZE DISTRIBUTION CHART

PML Ref.: 12BF046
Lab No.: L20339
Figure No.: 3



SILT & CLAY				FINE	MEDIUM	COARSE	GRAVEL		COB BLES	UNIFIED
				SAND						
CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	GRAVEL		COBBLES	M.I.T.
	SILT			SAND						
CLAY	SILT			V. FINE	FINE	MED	COARSE	GRAVEL		U.S. BUREAU
				SAND						

LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

Standard Penetration Resistance N: - The number of blows required to advance a standard split spoon sampler 0.3 m into the subsoil. Driven by means of a 63.5 kg hammer falling freely a distance of 0.76 m.

Dynamic Penetration Resistance: - The number of blows required to advance a 51 mm, 60 degree cone, fitted to the end of drill rods, 0.3 m into the subsoil. The driving energy being 475 J per blow.

DESCRIPTION OF SOIL

The consistency of cohesive soils and the relative density or denseness of cohesionless soils are described in the following terms:

CONSISTENCY	N (blows/0.3 m)	c (kPa)	DENSENESS	N (blows/0.3 m)
Very Soft	0 - 2	0 - 12	Very Loose	0 - 4
Soft	2 - 4	12 - 25	Loose	4 - 10
Firm	4 - 8	25 - 50	Compact	10 - 30
Stiff	8 - 15	50 - 100	Dense	30 - 50
Very Stiff	15 - 30	100 - 200	Very Dense	> 50
Hard	> 30	> 200		

WTPL	Wetter Than Plastic Limit
APL	About Plastic Limit
DTPL	Drier Than Plastic Limit

TYPE OF SAMPLE

SS	Split Spoon	TW	Thinwall Open
WS	Washed Sample	TP	Thinwall Piston
SB	Scraper Bucket Sample	OS	Oesterberg Sample
AS	Auger Sample	FS	Foil Sample
CS	Chunk Sample	RC	Rock Core
ST	Slotted Tube Sample		
	PH Sample Advanced Hydraulically		
	PM Sample Advanced Manually		

SOIL TESTS

Qu	Unconfined Compression	LV	Laboratory Vane
Q	Undrained Triaxial	FV	Field Vane
Qcu	Consolidated Undrained Triaxial	C	Consolidation
Qd	Drained Triaxial		

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LOG OF BOREHOLE NO. 1

PROJECT Proposed Residential Development
LOCATION 221 Fox Street, Penetanguishene, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE: October 11, 2012
OUR PROJECT NO. 12BF046
ENGINEER GW
TECHNICIAN TP

DEPTH in METRES	DESCRIPTION (GROUND ELEVATION)	LEGEND	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE
0.0						
0.15	TOPSOIL: Dark brown, silty sand, trace roots, moist		1	SS	5	
	SAND: Loose, light brown, sand, trace silt, moist to wet					
0.80	CLAYEY SILT: Firm, brown, clayey silt, some sand, WTPL		2	SS	6	
1.4	SAND: Compact to loose, silty sand, trace gravel, saturated		3	SS	10	
			4	SS	12	
			5	SS	8	
4.0	TILL: Dense to very dense, brown, silty sand, trace gravel, cobbles and boulders, wet to moist		6	SS	31	
6.2	BOREHOLE TERMINATED AT 6.2 m		7	SS	50/120 mm	

SHEAR STRENGTH C_u (kPa) 20 40 60 80
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ___ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

Bentonite
Slotted pipe
Filter sand

Upon completion of augering
Wet cave at 5.8 m

Water Level Readings

Date	Depth (m)
Oct 16	1.9 m

NOTES:

SENSITIVITY
UNDISTURBED FIELD VANE
REMOLDED FIELD VANE
LAB SHEAR TEST
POCKET PENETROMETER

CHECKED BY

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LOG OF BOREHOLE NO. 2

PROJECT Proposed Residential Development
LOCATION 221 Fox Street, Penetanguishene, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE: October 11, 2012
OUR PROJECT NO. 12BF046
ENGINEER GW
TECHNICIAN TP

DEPTH in METRES	DESCRIPTION (GROUND ELEVATION)	NUMBER	TYPE	BLOWS/0.3m N - VALUES
0.0				
0.15	TOPSOIL: Dark brown, silty sand, trace roots, moist	1	SS	4
	SAND: Loose, light brown, sand, trace silt, moist to saturated			
1.0	Sandy silt layers	2	SS	7
	Becoming silty sand, trace clay	3	SS	7
2.0		4	SS	8
2.9	CLAYEY SILT: Soft, brown, clayey silt, APL to WTPL	5	SS	3
4.0	SAND: Compact to dense, grey, sand, some silt, trace gravel, saturated	6	SS	15
5.0				
6.0		7	SS	31
6.5	BOREHOLE TERMINATED AT 6.5 m			
7.0				
8.0				
9.0				
10.0				
11.0				
12.0				
13.0				
14.0				
15.0				

SHEAR STRENGTH C_u (kPa) 20 40 60 80
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

Bentonite
Slotted pipe
Filter sand

Upon completion of augering
Water at 3.0 m
Cave at 5.2 m

Water Level Readings

Date	Depth (m)
Oct 16	4.4 m

NOTES:

SENSITIVITY
UNDISTURBED FIELD VANE
REMOLDED FIELD VANE
LAB SHEAR TEST
POCKET PENETROMETER

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LOG OF BOREHOLE NO. 3

PROJECT Proposed Residential Development
LOCATION 221 Fox Street, Penetanguishene, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE: October 11, 2012
OUR PROJECT NO. 12BF046
ENGINEER GW
TECHNICIAN TP

DEPTH In METRES	DESCRIPTION (GROUND ELEVATION)	NUMBER	TYPE	BLOWS/0.3m N - VALUES
0.0				
0.15	TOPSOIL: Dark brown, silty sand, trace roots, moist	1	SS	6
	SAND: Compact to very loose, brown, sand, trace silt, sandy silt layers, moist	2	SS	11
1.0				
	Becoming silty sand, trace clay, saturated	3	SS	7
2.0				
		4	SS	3
3.0		5	SS	2
4.0	Becoming sand, trace to some silt, trace gravel			
		6	SS	12
5.0				
5.5	TILL: Compact, brown, silty sand, trace gravel, cobbles and boulders, wet			
6.0		7	SS	21
6.5	BOREHOLE TERMINATED AT 6.5 m			
7.0				
8.0				
9.0				
10.0				
11.0				
12.0				
13.0				
14.0				
15.0				

SHEAR STRENGTH C_u (kPa) 20 40 60 80
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

Bentonite
Slotted pipe
Filter sand

Upon completion of augering
Wet cave at 4.9 m

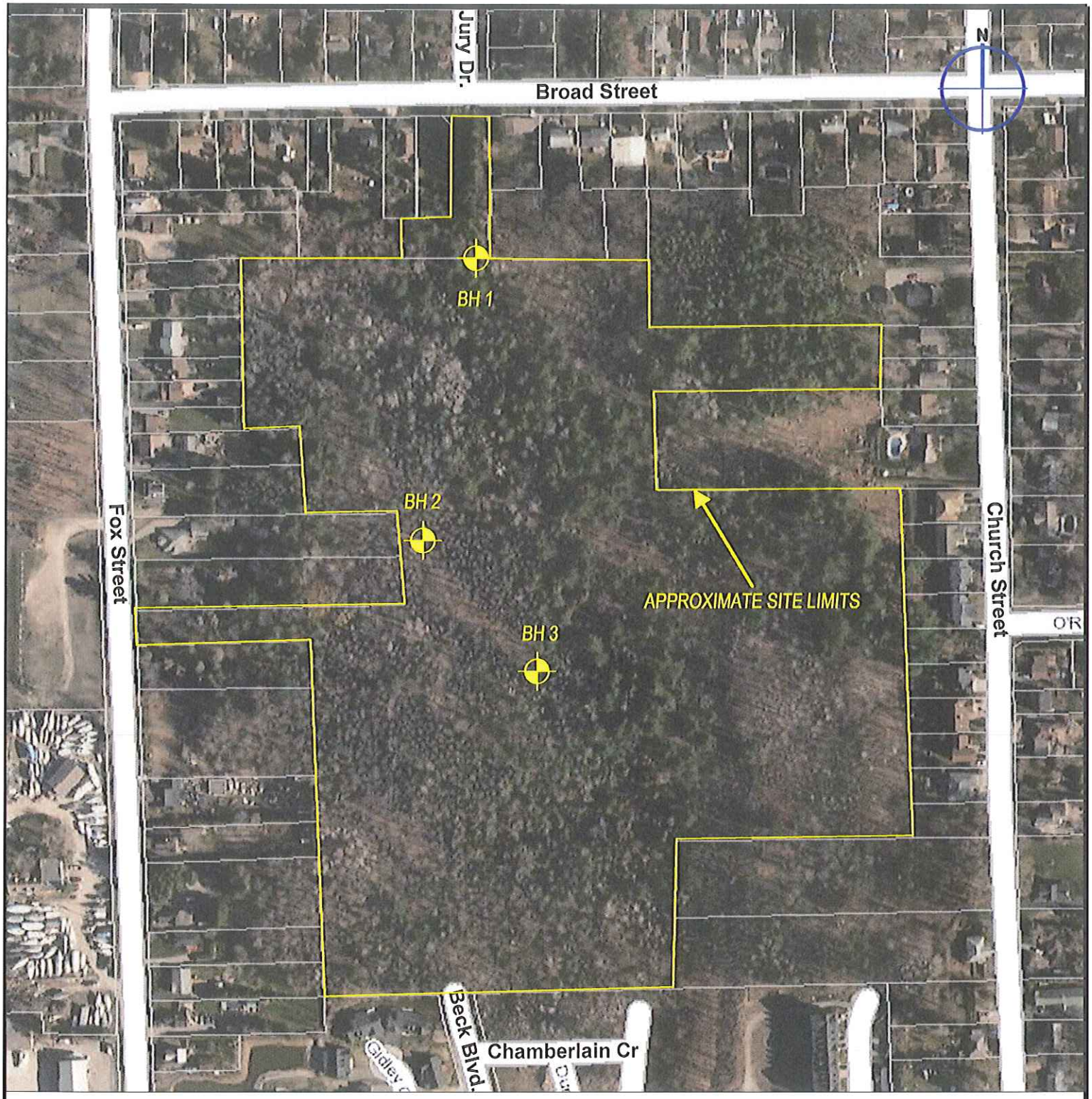
Water Level Readings

Date	Depth (m)
Oct 16	2.2 m

NOTES:

$+^{S}$ SENSITIVITY
$+$ UNDISTURBED FIELD VANE
$\oplus$ REMOLDED FIELD VANE
$\otimes$ LAB SHEAR TEST
▲ POCKET PENETROMETER

CHECKED BY



LEGEND

BH 1 — Borehole 1

SCALE 0m 30m 60m 90m 120m 150m

BOREHOLE LOCATION PLAN

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
221 FOX STREET, PENETANGUISHENE, ONTARIO

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

DATE	SCALE	JOB NO.	DRAWING NO.
NOVEMBER 2012	AS SHOWN	12BF046	1