GEOTECHNICAL INVESTIGATION
PROPOSED PEAKS MEADOWS SUBDIVISION - BLOCK 46
TOWN OF THE BLUE MOUNTAINS, ONTARIO

for

PEPPERMILL CONSTRUCTION LIMITED
C/O THE MUZZO GROUP OF COMPANIES

PETO MacCALLUM LTD.
25 SANDFORD FLEMING DRIVE
UNIT 2
COLLINGWOOD, ONTARIO
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PML Ref.: 19CF004
Report: 1
June 2019

Peto MacCallum Ltd.
CONSULTING ENGINEERS

June 21, 2019

PML Ref.: 19CF004
Report: 1

Peppermill Construction Limited
c/o Mr. Barry Stern
The Muzzo Group of Companies
50 Confederation Parkway
Concord, Ontario
L4K 4T8

Dear Mr. Stern

Geotechnical Investigation
Proposed Peaks Meadows Subdivision - Block 46
Town of The Blue Mountains, Ontario

Peto MacCallum Ltd. (PML) is pleased to present the results of the geotechnical investigation recently completed at the above noted project site. Authorization for the work was provided by Mr. B. Stern, in the signed Engineering Services Agreement, dated March 12, 2019.

Block 46 on the south side of the existing Dorothy Drive is to be developed with 16 residential lots. Full-depth basements are anticipated for the lots. The site and lot configuration is shown on Drawing 1, appended.

The purpose of this geotechnical investigation was to explore the subsurface conditions at the site, and based on this information, provide comments and geotechnical engineering recommendations for house foundations and basements.

Geoenvironmental services (observations, recording, testing or assessment of the environmental conditions of the soil and ground water) were not within the terms of reference for this assignment, and no work has been carried out in this regard. If excess excavated soils requiring transportation off-site are generated, a program of soil sampling and chemical testing will be needed to determine the chemical properties of the soil to evaluate appropriate Receiving Site options, in accordance with the MOECC document; Management of Excess Soil – A Guide for Best Management Practices, January, 2014.

The comments and recommendations provided in this report are based on the site conditions at the time of the investigation, and are applicable only to the proposed works as described in the report. Any changes in plans, including finished grades and layout will require review by PML to re-assess the applicability of the report, and may require modified recommendations, additional analysis and/or investigation.

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BARRIE, COLLINGWOOD, HAMILTON, KITCHENER, LONDON, TORONTO

INVESTIGATION PROCEDURES

The field work for this investigation was carried out on April 30, 2019 and May 3, 2019 and consisted of Boreholes 1 to 3 drilled to 6.2 m to 6.4 m depth, and Test Pits 101 to 104 excavated to 2.9 m to 3.3 m depth. The borehole and test pit locations are shown on Drawing 1, attached.

The location of the boreholes were established in the field by PML based on a drawing provided by the Client. The ground surface elevation, at the borehole and test pit locations, was obtained with a Sokkia SHC5000 Global Navigation Satellite System (GNSS). Co-ordination for clearances of underground utilities was provided by PML. The boreholes were drilled cognizant of underground utilities.

The boreholes were advanced using continuous flight solid stem augers, powered by a track mounted CME-55 drill rig, equipped with an automatic hammer, supplied and operated by a specialist drilling contractor working under the full-time supervision of a member of PML's engineering staff.

Representative samples of the overburden were recovered at frequent 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 subsoil. The ground water conditions in the boreholes were assessed during drilling by visual examination of the soil samples, the sampler, and drill rods as the samples were retrieved, and measurement of the ground water, if any, upon completion.

The test pits were advanced utilizing a backhoe from a local excavation contractor, working under the full-time supervision of a member of PML's engineering staff. Samples of the major units were collected and the subsurface conditions were logged.

All recovered samples were returned to our laboratory for moisture content determination and detailed examination to confirm field classification. Two soil samples were submitted for grain size analysis and Atterberg Limits testing. The results are provided on Figures 1 and 2, 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 (N Values, blows per 300 mm penetration of the split spoon sampler), ground water observations, and the results of laboratory water content determinations and Atterberg Limits testing.

Due to the soil sampling procedures and the limited size of samples, the depth/elevation demarcations on the borehole logs must be viewed as “transitional” zones, and cannot be construed as exact geologic boundaries between layers. PML should be retained to assist in determining geologic boundaries in the field during construction, if required.

Reference is also made to the Log of Test Pit sheets for details of the subsurface conditions observed in the test pits, including soil strata, assess soil density/consistency, and ground water conditions.

The boreholes and test pits revealed surface topsoil, over native units of clay to silty clay, sand and gravel, silty sand, and shale.

Soil

Surface topsoil, 150 to 400 mm in thickness, was encountered at the surface of all boreholes and test pits, with the exception of Test Pit 104.

A native layer of sandy silt was located at the surface of Test Pit 104, and extended to 600 mm depth.

A unit of native clay to silty clay was encountered below the topsoil or sandy silt in all boreholes and test pits extending to 1.4 to 4.0 m depth (elevation 227.8 to 231.8) in Boreholes 1 to 3 and Test Pits 103 and 104. In Test Pits 102 and 101, the material extended to the 3.0 to 3.3 m depth of excavation. Two samples of the soil were submitted for grain size analysis and Atterberg Limits testing. The results are provided on Figures 1 and 2, respectively. The material was firm to hard (N Values of 4 to 32) in the boreholes and judged to be firm to very stiff in the test pits. The material was drier than plastic limit to wetter than plastic limit with moisture contents of 8 to 34%.

In Boreholes 1 and 3, a layer of sand/silty sand was noted beneath the clay to silty clay layer, extending to 5.5 m depth (elevation 230.3) and 4.0 m depth (elevation 226.7), respectively. The material was dense to very dense (N Values of 35 to 58), and very moist to wet with moisture contents of 7 to 18%.

A native sand and gravel deposit was observed below the silty sand or clay to silty clay in Boreholes 1 and 2, and Test Pits 103 and 104, and extended down to the 2.9 to 6.4 m depth of termination. N Values were greater than 50, indicating very dense conditions. The soil was moist with moisture contents of 12 to 14%.

Beneath the sand and gravel or sand in Boreholes 2 and 3, a shale deposit was observed to the depth of exploration. The weathered shale had N Values greater than 50, and was moist with moisture contents of 10 to 18%.

Ground Water

First ground water strike during drilling, the water level upon completion of augering, and water level in the wells upon return to site approximately two weeks later are shown below:

BOREHOLE/ TEST PIT	**FIRST WATER STRIKE DURING DRILLING DEPTH (m) / ELEVATION**	**WATER/WET CAVE SEEPAGE LEVEL UPON COMPLETION DEPTH (m) / ELEVATION**	**WATER LEVEL READING, MAY 23, 2019 DEPTH (m) / ELEVATION**
1	1.8 / 234.0	2.1 / 233.7	2.2 / 233.6
2	2.7 / 229.5	1.8 / 230.4	--
3	2.3 / 228.4	2.4 / 228.3	2.4 / 228.3
101	2.8 / 232.3	3.0 / 232.1	--
102	No Water	No Water	--
103	2.0 / 228.4	2.2 / 228.2	--
104	2.4 / 227.4	2.8 / 227.0	--

The ground water typically resides in the sand to sand and gravel below the clay to silty clay. Local perched water can also be expected.

Ground water levels will fluctuate seasonally, and in response to variations in precipitation.

GEOTECHNICAL ENGINEERING CONSIDERATIONS

Site Grading

At the time of this report, no grading design had been completed. Building finished grades and founding levels were also not available.

Where grades are to be raised under houses the fill needs to be constructed as engineered fill. Reference is made to Appendix A for guidelines for engineered fill construction. The following general highlights are provided:

- Strip existing topsoil, and other deleterious materials down to native inorganic soil. The upper 0.5 m of typically soft clay to silty clay should also be removed. The excavated soil should be segregated and stockpiled for reuse or disposal;

- The exposed silty clay/clay subgrade will be sensitive to disturbance if wet or allowed to become wet. Limited compaction, if any, of the wet subgrade will be possible, subject to geotechnical review during construction. It is recommended the initial lift of engineered fill should comprise 400 mm of Granular B Type II, compacted to 100% Standard Proctor maximum dry density;

- Following geotechnical review and approval of the subgrade, spread approved material in maximum 200 mm thick lifts and uniformly compacted to 100% Standard Proctor maximum dry density in building areas;

- Engineered fill material should comprise inorganic soil, free of deleterious and oversized material, at a moisture content suitable for compaction. The excavated site soil is expected to be very limited and too wet for reuse as engineered fill. In this regard, imported soil will be needed for use as engineered fill under buildings, and is recommended to comprise OPSS Granular B or OPSS Select Subgrade Material (SSM). Prospective imported fill material should be reviewed by PML to ensure suitability;

- The engineered fill pad must extend at least 1 m beyond the structure to be supported, then outwards and downwards at no steeper than 45° to the horizontal to meet the underlying approved native subgrade. In this regard, strict survey control and detailed documentation of the lateral and vertical extent of the engineered fill limits should be carried out to ensure that the engineered fill pad fully incorporates the structure to be supported;

- Engineered fill construction must be carried out under full time field review by PML, to approve sub-excavation and subgrade preparation, backfill materials, placement and compaction procedures, and to verify that the specified compaction standards are achieved throughout.

Foundations

It is anticipated that footings will be supported on the native clay to silty clay soil locally the underlying sand or sand and gravel 0.5 to 3.0 m below existing grade. Footings supported on the native soil 0.5 to 3.0 m below existing grade can be designed for a geotechnical bearing resistance at Serviceability Limit State (SLS) of 100 kPa, and a factored bearing resistance at Ultimate Limit State (ULS) of 150 kPa.

Footings supported on engineered fill, constructed as discussed above, can also be designed for a geotechnical bearing resistance at SLS of 100 kPa, and factored bearing resistance of 150 kPa.

It is noted that the sand/sand and gravel below the clay to silty clay is wet (ground water is within the sand/sand and gravel). East of Borehole 2 the clay to silty clay was penetrated at shallower depths (1.4 to 2.1 m below existing grade) and therefore footings/basements in this area are not recommended to be set below about 1 m below existing grade, otherwise ground water will have both construction and long term implications.

The clay to silty clay may be wet and easily disturbed by pedestrian traffic. As such, it is recommended that immediately after excavation and approval of the footing subgrade a skim coat be placed to protect the subgrade. The use of a smooth edge bucket is also recommended.

The bearing resistance at SLS is based on total settlement of 25 mm in the bearing stratum with differential settlement of 75% of this value.

Footings subject to frost action should be provided with a minimum 1.2 m of earth cover or equivalent insulation.

Prior to placement of structural concrete, all founding surfaces should be reviewed by PML to verify the design bearing capacity is available, or to reassess the design parameters based on the actual conditions revealed in the excavation.

Seismic Considerations

Based on the soil profile in the boreholes (N Values), Site Classification D is applicable for Seismic Site Response as set out in Table 4.1.8.4.A of the Ontario Building Code (2012). There is a low potential for liquefaction based on the soil stratigraphy noted in the boreholes and test pits.

Basement Walls and Floor Slabs

Full-depth basements are proposed for all houses. Basement walls must be designed to resist the unbalanced horizontal earth pressure imposed by the backfill adjacent to the walls. The lateral earth pressure, P, may be computed using the following equation and assuming a triangular pressure distribution:

$$P = K(\gamma h + q) + C_p$$

Where
P = lateral pressure at depth h (m) below ground surface (kPa)
K = lateral earth pressure coefficient of backfill = 0.5
h = depth below grade (m) at which lateral pressure is calculated
γ = unit weight of compacted granular backfill = 21.0 kN/m^3
q = surcharge loads (kPa)
C_p = compaction pressure

The above equation assumes that drainage measures will be incorporated to prevent the buildup of hydrostatic pressure. In this regard, foundation wall backfill should comprise free draining granular material conforming to OPSS Granular B. A weeping tile system should be installed to prevent the build-up of hydrostatic pressure behind the wall. The weeping tiles should be protected by a properly designed granular filter or geotextile to prevent migration of fines into the system. The drainage pipe should be placed on a positive grade and lead to a frost-free outlet.

Foundation/basement wall backfill should be placed in thin lifts compacted to a minimum 95% Standard Proctor maximum dry density. Over compaction close to the walls should be avoided as this could generate excessive pressure on the walls.

Basement floor slab construction is feasible on native soils or engineered fill. In general, a minimum 200 mm thick base layer of crushed stone (nominal 19 mm size) is recommended directly under the slab. A polyethylene sheet vapour barrier should be incorporated under the ground floor slab if a vapour sensitive floor finish is planned.

Exterior grades should be established to promote surface drainage away from the buildings.

Reference is made to the appended Figure 3 for general recommendations regarding drainage and backfill requirements for basement walls and floor slabs.

Excavation and Ground Water Control

At the time of this report, no grading design had been completed. Building finished grades and founding levels were also not available. It is assumed that excavation for basements will be advanced a maximum 3 m below existing grade, 1.0 m below existing grade east of Borehole 2, and will encounter the clay to silty clay, locally the underlying sand to sand and gravel.

The site soils should be considered as Type 3 soil requiring excavation sidewalls to be constructed at no steeper than one horizontal to one vertical (1H:1V) from the base of the excavation in accordance with the Occupational Health and Safety Act.

Excavations for the proposed residences as noted above, will typically be above the ground water table. Local seepage from clay to silty clay layer should be handled by conventional sump pumping techniques.

The ground water table is within the sand to sand and gravel below the clay to silty clay. Where excavation is taken below the clay to silty clay into the sand to sand and gravel, dewatering will likely be required.

Water taking in Ontario is governed by the Ontario Water Resources Act (OWRA) and the Water Takings and Transfer Regulation O. Reg. 387/04. Section 34 of the OWRA requires anyone taking more than 50,000 L/d to notify the Ministry of the Environment, Conservation and Parks (MECP). This requirement applies to all withdrawals, whether for consumption, temporary construction dewatering, or permanent drainage improvements. Where it is assessed than more than 50,000 L/d but less than 400,000 L/d of ground water taking is required, the Owner can register online via the Environmental Activity and Sector Registry (EASR) system. Where it is assessed that more than 400,000 L/d of ground water taking is required then a Category 3 Permit-to-Take-Water (PTTW) is required.

For excavation as discussed above, a PTTW or registry on the ESAR system is likely not required. Deeper excavation into the sand to sand and gravel would likely require a PTTW or registry on the EASR system.

It is recommended that a test dig be undertaken to allow prospective contractors an opportunity to observe and evaluate the conditions likely to be encountered and assess preferred means of excavation and ground water control measures based on their own experience.

Geotechnical Review and Construction Inspection and Testing

It is recommended that the final design drawings be submitted to PML to review of compatibility with site conditions and recommendations of this report.

Earthworks operations should be carried out under the supervision of PML to approve subgrade preparation, backfill materials, placement and compaction procedures, and verify the specified degree of compaction is achieved uniformly throughout fill materials.

Prior to placement of structural concrete, all founding surfaces must be inspected by PML to verify the design bearing capacity is available, or to reassess the design parameters based on the actual conditions.

The comments and recommendations provided in the report are based on the information revealed in the boreholes. Conditions away from and between boreholes may vary. Geotechnical review during construction should be on going to confirm the subsurface conditions are substantially similar to those encountered in the boreholes, which may otherwise require modification to the original 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.

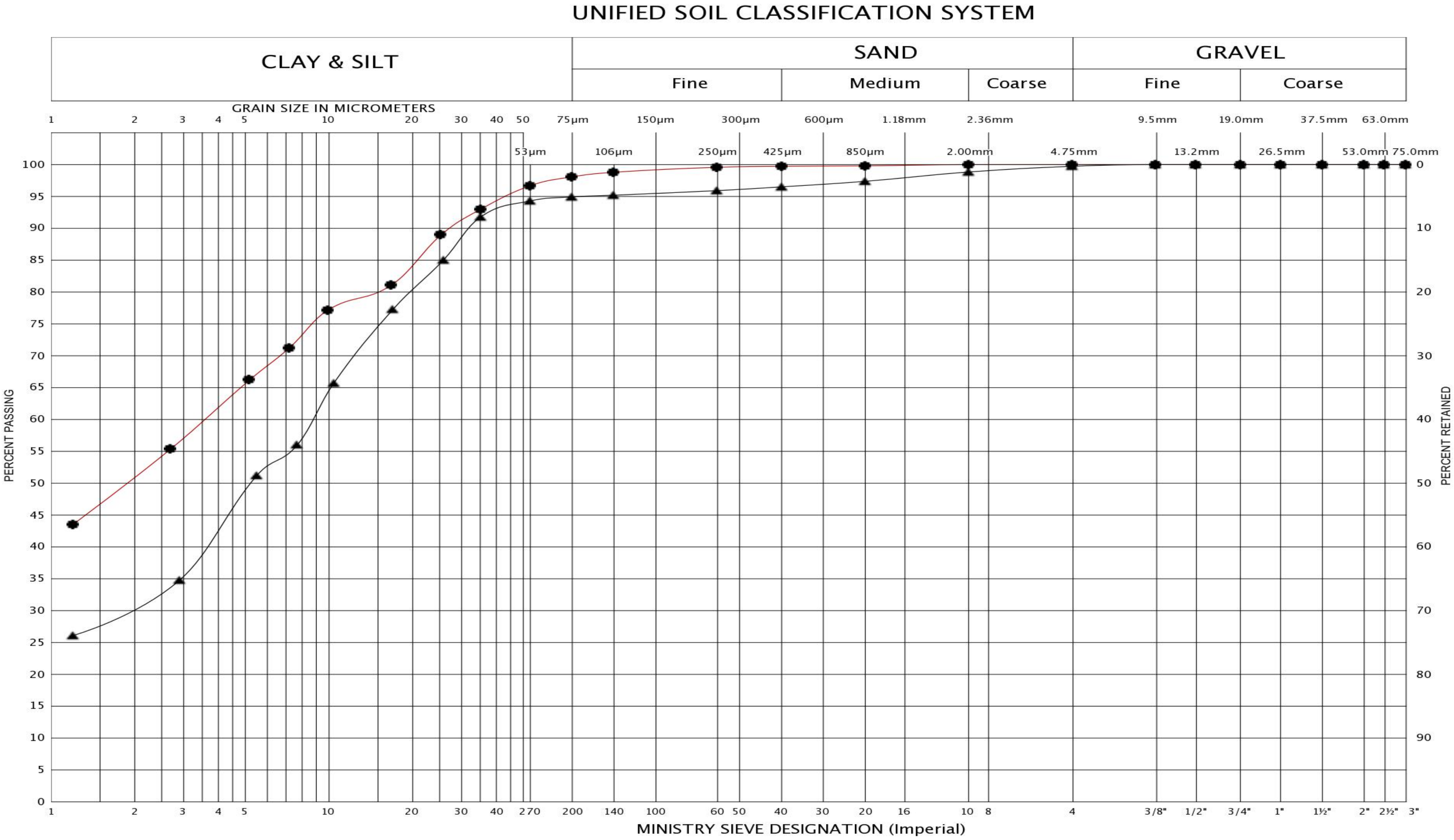
Davin Power, E.I.T.
Project Supervisor, Geotechnical Services

LICENSED PROFESSIONAL ENGINEER
G. R. WHITE
PROVINCE OF ONTARIO

Geoffrey R. White, P.Eng.
Associate
Manager Geotechnical and Geoenvironmental Services

DP/GRW:jlb/tc

Enclosures:
Figure 1 - Particle Size Distribution Charts
Figure 2 - Atterberg Limits Chart
Figure 3 - General Recommendations Regarding Drainage and
Backfill Requirements for Basement Wall and Floor Slab Construction
List of Abbreviations
Log of Borehole No's. 1 to 3
Log of Test Pit No's. 101 to 104
Drawing 1 - Borehole Location Plan
Appendix A - Engineered Fill



LEGEND			
	BH	1	2
	SAMPLE	3	2
	SYMBOL	●	▲

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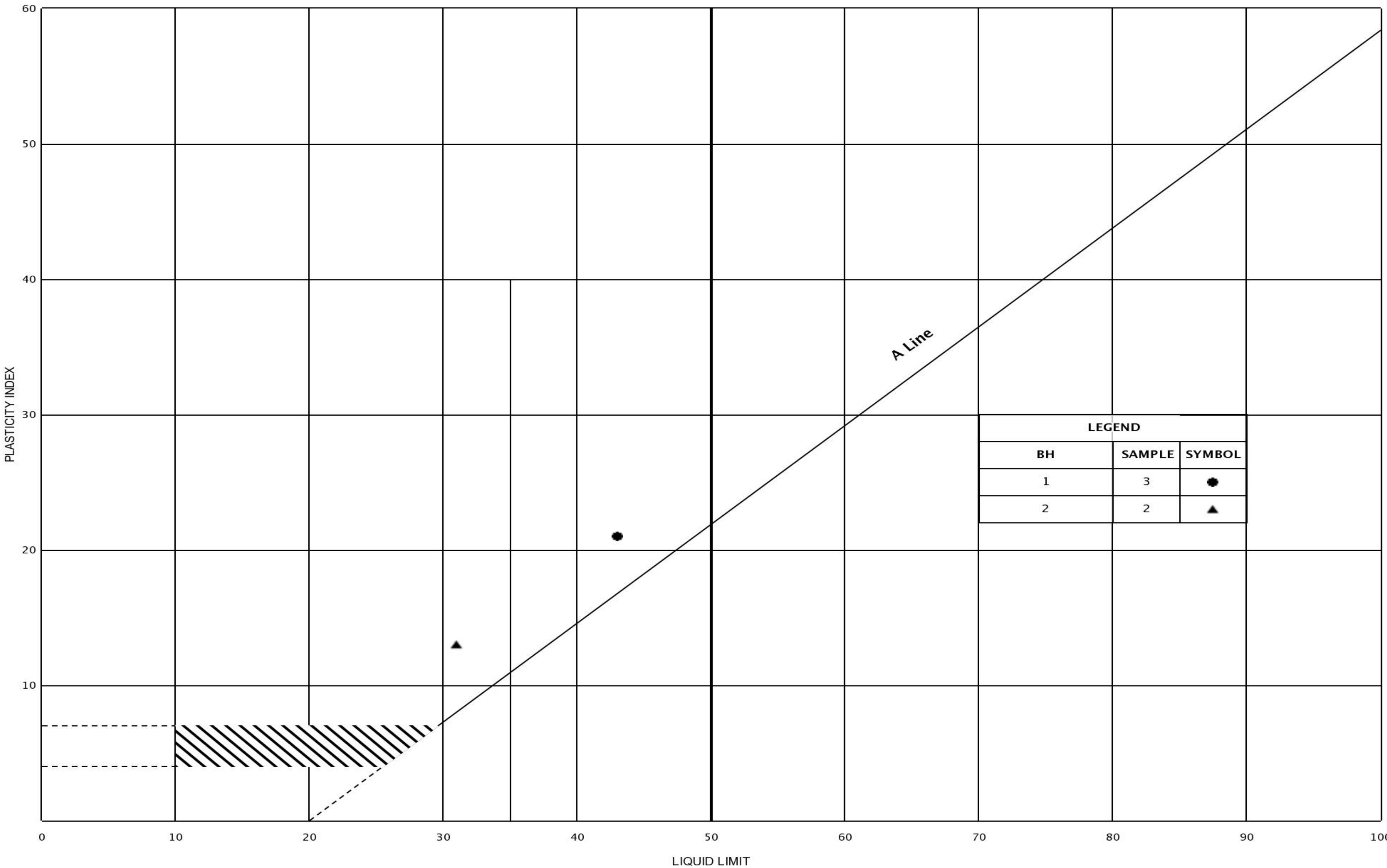
GRAIN SIZE DISTRIBUTION

CLAY TO SILTY CLAY, Trace Sand

FIG No.: 1

Project No.: 19CF004



PLASTICITY CHART

CLAY TO SILTY CLAY, Trace Sand

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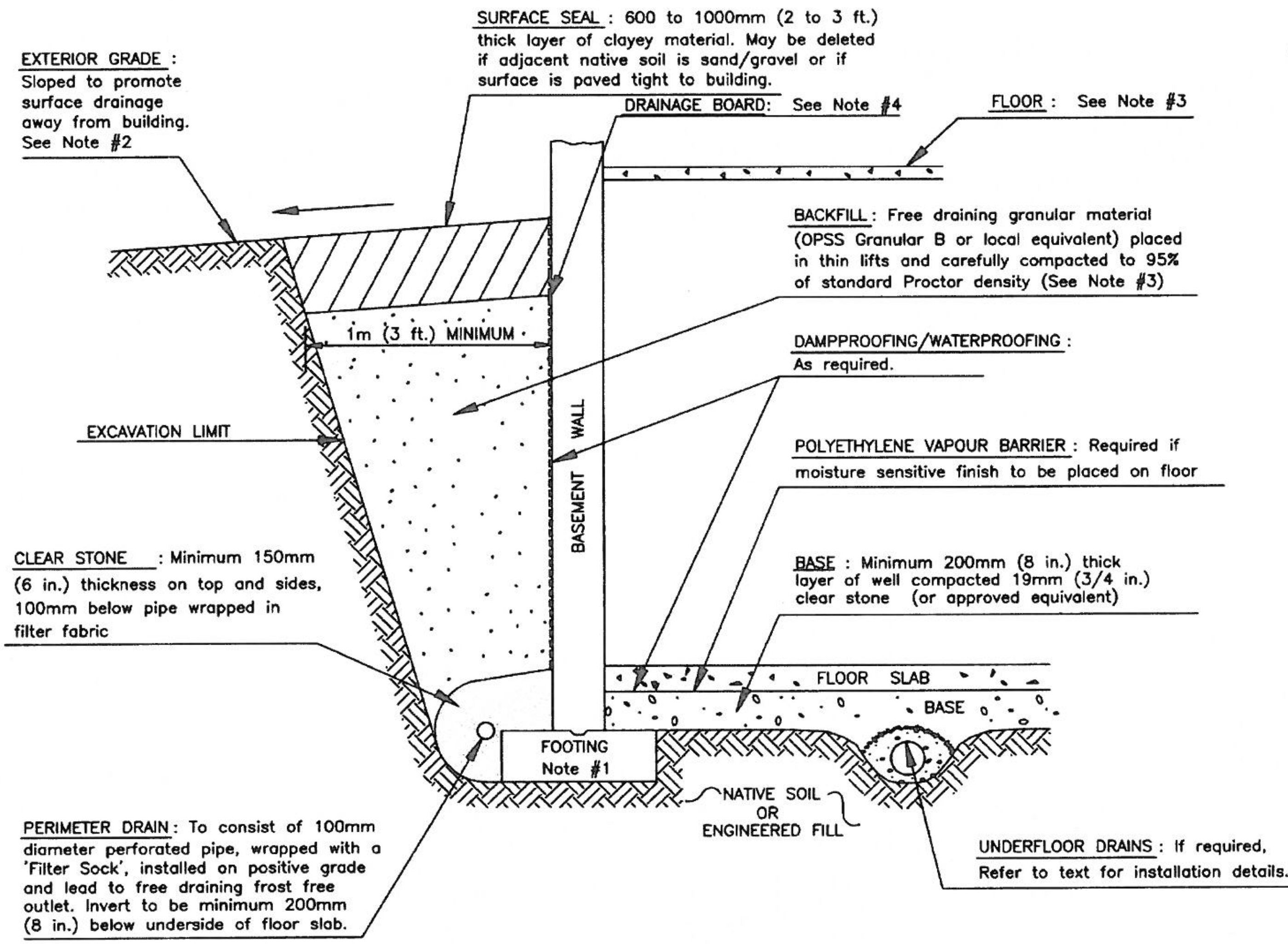
FIG No.: 2

HWY.:

Proj No. 19CF004

STD – GEO–A REV 1/2004



NOTES

1. Footing may be constructed by placement of structural concrete neat against natural soil. Drain to be installed in a similar manner immediately above footing maintaining 200mm (8 in.) distance between top of drain and underside of floor slab.

2. Exterior grade to be minimum 300mm (12 in.) below interior floor slab, or other means established to prevent entry of surface water into building through building openings.

3. Basement wall to be supported by floor system or interior bracing prior to commencement of backfill placement. Heavy construction equipment should not be permited within a distance from the foundation wall equivalent to half the wall height. Overcompaction of backfill to be avoided as excessive lateral earth pressure may result.

4. A proprietary drainage board product may be used with compacted native soil as backfill against the wall.

5. Refer to text for details regarding founding levels, competent bearing material and construction details specific to particular site.

STANDARD DRAWING

GENERAL RECOMMENDATIONS REGARDING DRAINAGE AND BACKFILL REQUIREMENTS FOR BASEMENT WALL AND FLOOR SLAB CONSTRUCTION

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DRAWN: N/A	DATE	SCALE	JOB NO.	FIGURE NO.
CHECKED: GW APPROVED: GW	JUNE 2019	N.T.S.	19CF004	3

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		

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

TYPE OF SAMPLE

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

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

17T 548030E 4930897N

PROJECT Proposed Peak Meadows Subdivision - Block 46
PML REF. 19CF004
LOCATION Town of The Blue Mountains, Ontario
BORING DATE May 3, 2019
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

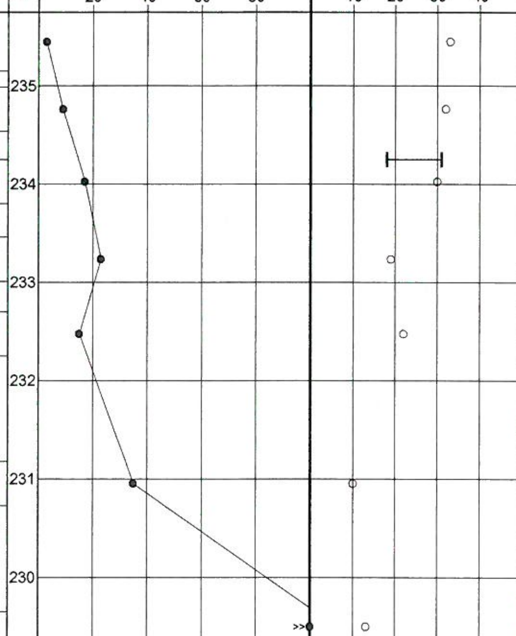
SOIL PROFILE

DEPTH / ELEV (metres)	DESCRIPTION
	SURFACE ELEVATION 235.75
0.15 / 235.60	TOPSOIL: Brown, sand, trace silt, trace gravel, very moist
	CLAY TO SILTY CLAY: Soft to very stiff, brown to red, clay to silty clay, trace sand, WTPL to APL
4.0 / 231.8	SILTY SAND: Dense, brown, silty sand, trace clay, trace gravel, wet
5.5 / 230.3	SAND AND GRAVEL: Very dense, brown to grey, sand and gravel, trace silt, wet
6.4 / 229.4	BOREHOLE TERMINATED AT 6.4 m

SAMPLES

NUMBER	TYPE	"N" VALUES
1	SS	3
2	SS	9
3	SS	17
4	SS	23
5	SS	15
6	SS	35
7	SS	94/250mm

SHEAR STRENGTH (kPa): + FIELD VANE, △ TORVANE, ○ Qu, ▲ POCKET PENETROMETER, ○ Q — 50 100 150 200
DYNAMIC CONE PENETRATION ×, STANDARD PENETRATION TEST ● — 20 40 60 80
PLASTIC LIMIT W_P — NATURAL MOISTURE CONTENT W — LIQUID LIMIT W_L
WATER CONTENT (%) 10 20 30 40
UNIT WEIGHT kN/m³



GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stick-up casing in concrete
Bentonite seal
First water strike at 1.8 m
19 mm slotted pipe
Filter sand

Upon completion of augering
Water at 2.1 m
No cave
Water Level Readings:

Date	Depth	Elev.
2019-05-23	2.2	233.6

NOTES

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LOG OF BOREHOLE NO. 2

17T 548098E 4930951N

PROJECT Proposed Peak Meadows Subdivision - Block 46
LOCATION Town of The Blue Mountains, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE May 3, 2019
PML REF. 19CF004
ENGINEER GW
TECHNICIAN AT

SURFACE ELEVATION 232.20

DEPTH / ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES	GROUND WATER OBSERVATIONS AND REMARKS
0.18 / 232.02	TOPSOIL: Black, silt, trace sand, trace gravel, wet	1	SS	7	
	CLAY TO SILTY CLAY: Firm to hard, brown to red, clay to silty clay, trace sand, APL to DTPL	2	SS	32	
		3	SS	11	
2.3 / 229.9	Becoming clayey silty sand, trace gravel, moist	4	SS	30	First water strike at 2.7 m
2.9 / 229.3	SAND AND GRAVEL: Very dense, brown, sand and gravel, trace silt, wet	5	SS	76/290mm	
4.0 / 228.2	SHALE: Grey, weathered, shale, moist	6	SS	54	
		7	SS	75/290mm	
6.4 / 225.8	BOREHOLE TERMINATED AT 6.4 m				Upon completion of augering Water at 1.8 m No cave

Chart column headings: STRAT PLOT; ELEVATION SCALE (232–226); SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q (50, 100, 150, 200); DYNAMIC CONE PENETRATION ×, STANDARD PENETRATION TEST ● (20, 40, 60, 80); PLASTIC LIMIT W_P, NATURAL MOISTURE CONTENT W, LIQUID LIMIT W_L; WATER CONTENT (%) (10, 20, 30, 40); UNIT WEIGHT kN/m³; GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Depth scale: 0.0 – 15.0 m

NOTES

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LOG OF BOREHOLE NO. 3

17T 548194E 4930998N

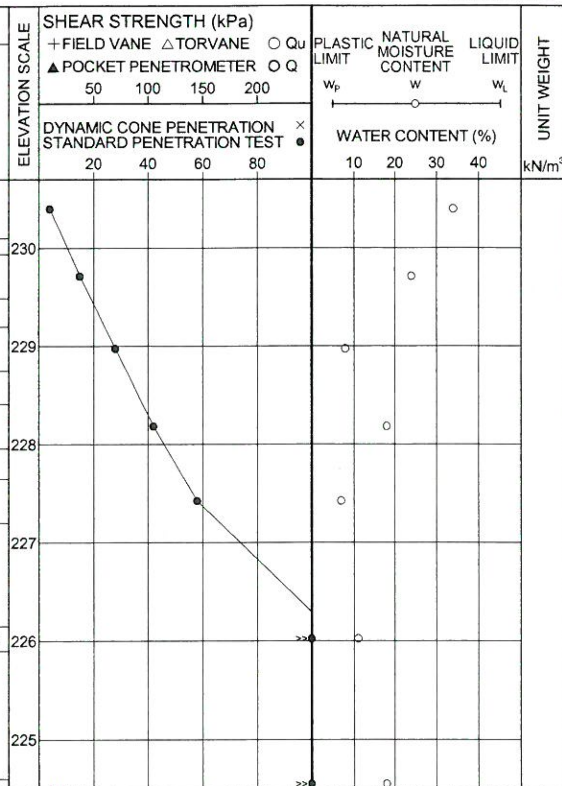
PROJECT Proposed Peak Meadows Subdivision - Block 46
LOCATION Town of The Blue Mountains, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE May 3, 2019
PML REF. 19CF004
ENGINEER GW
TECHNICIAN AT

SURFACE ELEVATION 230.70

DEPTH / ELEV (metres)	DESCRIPTION	SAMPLE NUMBER	TYPE	"N" VALUES	GROUND WATER OBSERVATIONS AND REMARKS
0.15 / 230.55	TOPSOIL: Black, sandy silt, trace gravel, wet				Stick-up casing in concrete
	CLAY TO SILTY CLAY: Soft to very stiff, brown to red, clay to silty clay, trace sand, WTPL to DTPL	1	SS	4	Bentonite seal
		2	SS	15	
		3	SS	28	
2.1 / 228.6	SAND: Dense to very dense, brown, sand, trace to some silt, some gravel, very moist to wet	4	SS	42	First water strike at 2.3 m
		5	SS	58	19 mm slotted pipe Filter sand
4.0 / 226.7	SHALE: Grey, weathered, shale, moist	6	SS	94/250mm	
6.2 / 224.5	BOREHOLE TERMINATED AT 6.2 m	7	SS	50/145mm	Upon completion of augering Water at 2.4 m No cave

Water Level Readings:

Date	Depth	Elev.
2019-05-23	2.4	228.3



NOTES

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LOG OF TEST PIT NO. 101

17T 547973E 4930889N

PROJECT Proposed Peak Meadows Subdivision - Block 46

LOCATION Town of The Blue Mountains, Ontario

EXCAVATION METHOD Excavator

BORING DATE April 30, 2019

PML REF. 19CF004

ENGINEER GW

TECHNICIAN AT

SURFACE ELEVATION 235.10

DEPTH / ELEV (metres)	DESCRIPTION	SAMPLE NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	NATURAL MOISTURE CONTENT	GROUND WATER OBSERVATIONS AND REMARKS
0.40	TOPSOIL: Black, sandy silt, trace gravel, wet	1	GS	-	235		
234.70	CLAY TO SILTY CLAY: Firm to very stiff, brown to red, clay to silty clay, trace sand, APL	2	GS	-	234, 233	~19%	
3.0	Becoming hard with cobbles and boulders	3	GS	-	232		First water strike at 2.8 m
3.3 / 231.8	TEST PIT TERMINATED AT 3.3 m						Upon completion of excavation Water seepage at 3.0 m No sidewall sloughing

Chart headings: SHEAR STRENGTH (kPa): + FIELD VANE, △ TORVANE, ○ Qu, ▲ POCKET PENETROMETER, ○ Q (50, 100, 150, 200); DYNAMIC CONE PENETRATION ×, STANDARD PENETRATION TEST ● (20, 40, 60, 80); PLASTIC LIMIT W_P, NATURAL MOISTURE CONTENT W, LIQUID LIMIT W_L; WATER CONTENT (%) (10, 20, 30, 40); UNIT WEIGHT kN/m³; GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Depth scale: 0.0 to 15.0 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF TEST PIT NO. 102

17T 548082E 4930922N

PROJECT Proposed Peak Meadows Subdivision - Block 46
LOCATION Town of The Blue Mountains, Ontario
EXCAVATION METHOD Excavator
BORING DATE April 30, 2019
PML REF. 19CF004
ENGINEER GW
TECHNICIAN AT

DEPTH / ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES	GROUND WATER OBSERVATIONS AND REMARKS
	SURFACE ELEVATION 233.70				
0.40	TOPSOIL: Black, sandy silt, trace gravel, wet	1	GS	-	
233.30	CLAY TO SILTY CLAY: Firm to very stiff, brown to red, clay to silty clay, trace sand, APL	2	GS	-	
3.0		3	GS	-	
230.7	TEST PIT TERMINATED AT 3.0 m				Upon completion of excavation No water No sidewall sloughing

Chart columns: SHEAR STRENGTH (kPa) — +FIELD VANE △TORVANE ○ Qu ▲POCKET PENETROMETER ○ Q (50, 100, 150, 200); DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ● (20, 40, 60, 80); PLASTIC LIMIT W_P, NATURAL MOISTURE CONTENT W, LIQUID LIMIT W_L; WATER CONTENT (%) (10, 20, 30, 40); UNIT WEIGHT kN/m³; GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL. ELEVATION SCALE: 233, 232, 231. Depth scale 0.0 to 15.0 m.

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF TEST PIT NO. 103

17T 548137E 4930988N

PROJECT Proposed Peak Meadows Subdivision - Block 46
LOCATION Town of The Blue Mountains, Ontario
EXCAVATION METHOD Excavator
BORING DATE April 30, 2019
PML REF. 19CF004
ENGINEER GW
TECHNICIAN AT

SURFACE ELEVATION 230.40

DEPTH / ELEV (metres)	DESCRIPTION	SAMPLE NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	WATER CONTENT (%)	GROUND WATER OBSERVATIONS AND REMARKS
0.30 / 230.10	TOPSOIL: Dark brown to black, sandy silt, trace gravel, very moist to wet	1	GS	-	230		
1.4 / 229.0	CLAY TO SILTY CLAY: Firm to very stiff, brown to red, clay to silty clay, trace sand, APL	2	GS	-	229	~22	
3.0 / 227.4	SAND AND GRAVEL: Dense, brown, sand and gravel, trace silt, wet	3	GS	-	228	~14	First water strike at 2.0 m
	TEST PIT TERMINATED AT 3.0 m						Upon completion of excavation Water at 2.2 m No sidewall sloughing

Legend: SHEAR STRENGTH (kPa): + FIELD VANE, △ TORVANE, ○ Qu, ▲ POCKET PENETROMETER, ○ Q (50, 100, 150, 200); DYNAMIC CONE PENETRATION ×, STANDARD PENETRATION TEST ● (20, 40, 60, 80); PLASTIC LIMIT W_P, NATURAL MOISTURE CONTENT w, LIQUID LIMIT W_L; WATER CONTENT (%) (10, 20, 30, 40); UNIT WEIGHT kN/m³; GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF TEST PIT NO. 104

17T 548247E 4931025N

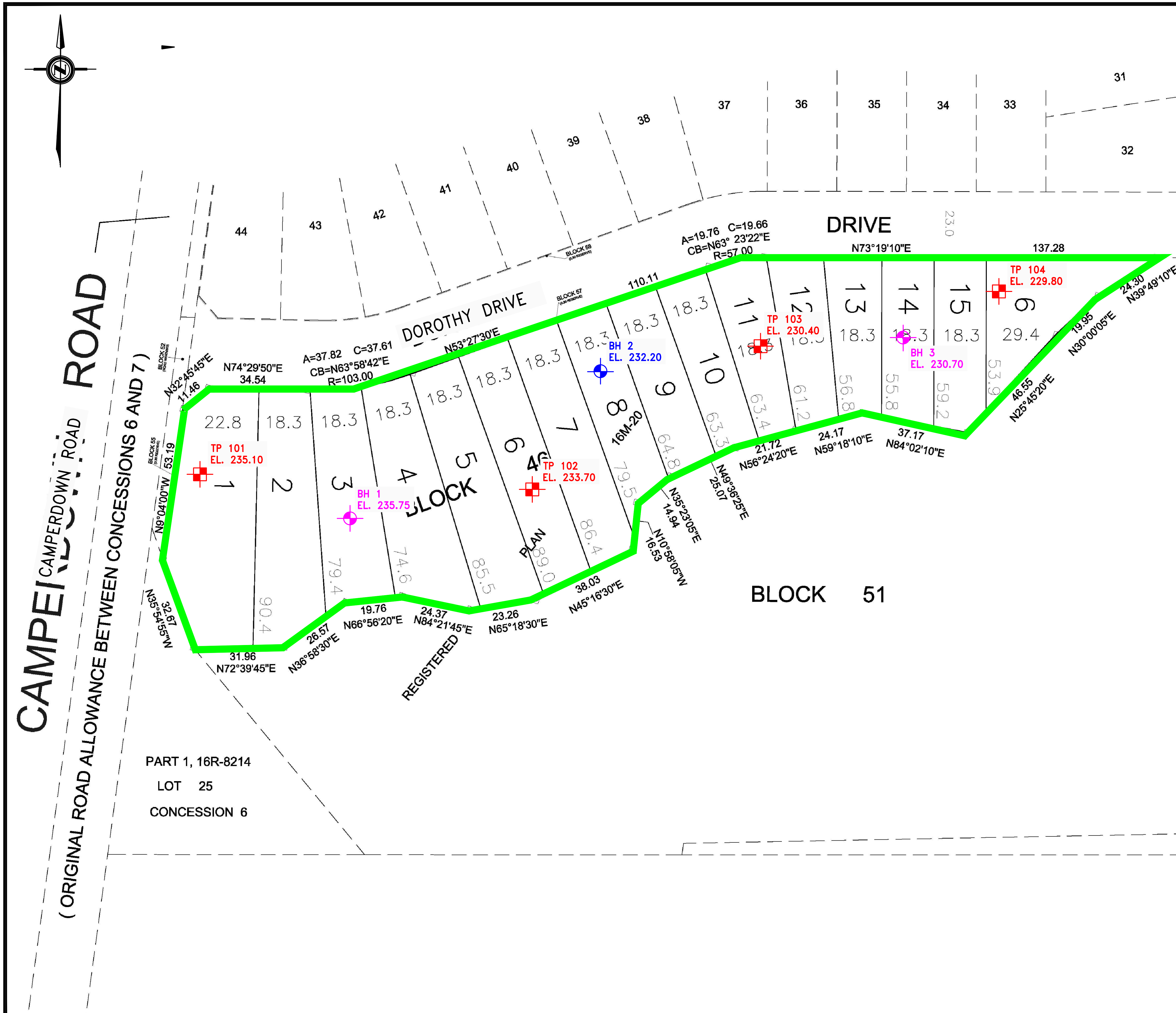
PROJECT Proposed Peak Meadows Subdivision - Block 46
PML REF. 19CF004
LOCATION Town of The Blue Mountains, Ontario
BORING DATE April 30, 2019
ENGINEER GW
EXCAVATION METHOD Excavator
TECHNICIAN AT

DEPTH / ELEV (metres)	SOIL PROFILE – DESCRIPTION	SAMPLES – NUMBER	SAMPLES – TYPE	SAMPLES – "N" VALUES	GROUND WATER OBSERVATIONS AND REMARKS
	SURFACE ELEVATION 229.80				
0.60	SANDY SILT: Loose, dark brown, sandy silt, trace gravel, organics, wet	1	GS	-	
229.20	CLAY TO SILTY CLAY: Firm to stiff, brown to blue, clay to silty clay, trace sand, APL	2	GS	-	
2.0 / 227.8	SAND AND GRAVEL: Dense, brown, sand and gravel, trace silt, wet	3	GS	-	First water strike at 2.4 m
2.9 / 226.9	TEST PIT TERMINATED AT 2.9 m				Upon completion of excavation Water at 2.8 m No sidewall sloughing

Column headings: SOIL PROFILE; STRAT PLOT; SAMPLES; ELEVATION SCALE (229, 228, 227); SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q, 50 100 150 200; DYNAMIC CONE PENETRATION ×, STANDARD PENETRATION TEST ●, 20 40 60 80; PLASTIC LIMIT W_P, NATURAL MOISTURE CONTENT W, LIQUID LIMIT W_L; WATER CONTENT (%) 10 20 30 40; UNIT WEIGHT kN/m^3; GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Depth scale: 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 14.0, 15.0

NOTES



KEY PLAN
TOWN OF THE BLUE MOUNTAINS, ONTARIO

LEGEND:

(green line)	SITE LIMITS
BH 1 EL. 235.75	BOREHOLE 1 WITH PIEZOMETER SURFACE ELEVATION
BH 2 EL. 232.20	BOREHOLE 2 SURFACE ELEVATION
TP 101 EL. 235.10	TEST PIT 101 SURFACE ELEVATION

NOTE:
BASE PLAN PROVIDED BY CLIENT.

0m 20 40 60 80 100
SCALE

BOREHOLE LOCATION PLAN

PROPOSED PEAKS MEADOWS SUBDIVISION – BLOCK 46
TOWN OF THE BLUE MOUNTAINS, ONTARIO

Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	AT	DATE	SCALE	PML REF.	DRAWING NO.
CHECKED	RB	JUNE 2019	AS SHOWN	19CF004	1
APPROVED	GW				

APPENDIX A

Engineered Fill

ENGINEERED FILL

The information presented in this appendix is intended for general guidance only. Site specific conditions and prevailing weather may require modification of compaction standards, backfill type or procedures. Each site must be discussed, and procedures agreed with Peto MacCallum Ltd. prior to the start of the earthworks and must be subject to ongoing review during construction. This appendix is not intended to apply to embankments. Steeply sloping ravine residential lots require special consideration.

For fill to be classified as engineered fill suitable for supporting structural loads, a number of conditions must be satisfied, including but not necessarily limited to the following:

1. Purpose

The site specific purpose of the engineered fill must be recognized. In advance of construction, all parties should discuss the project and its requirements and agree on an appropriate set of standards and procedures.

2. Minimum Extent

The engineered fill envelope must extend beyond the footprint of the structure to be supported. The minimum extent of the envelope should be defined from a geotechnical perspective by:

- at founding level, extend a minimum 1.0 m beyond the outer edge of the foundations, greater if adequate layout has not yet been completed as noted below; and

- extend downward and outward at a slope no greater than 45° to meet the subgrade

All fill within the envelope established above must meet the requirements of engineered fill in order to support the structure safely. Other considerations such as survey control, or construction methods may require an envelope that is larger, as noted in the following sections.

Once the minimum envelope has been established, structures must not be moved or extended without consultation with Peto MacCallum Ltd. Similarly, Peto MacCallum Ltd. should be consulted prior to any excavation within the minimum envelope.

3. Survey Control

Accurate survey control is essential to the success of an engineered fill project. The boundaries of the engineered fill must be laid out by a surveyor in consultation with engineering staff from Peto MacCallum Ltd. Careful consideration of the maximum building envelope is required.

During construction it is necessary to have a qualified surveyor provide total station control on the three dimensional extent of filling.

4. Subsurface Preparation

Prior to placement of fill, the subgrade must be prepared to the satisfaction of Peto MacCallum Ltd. All deleterious material must be removed and in some cases, excavation of native mineral soils may be required.

Particular attention must be paid to wet subgrades and possible additional measures required to achieve sufficient compaction. Where fill is placed against a slope, benching may be necessary and natural drainage paths must not be blocked.

5. Suitable Fill Materials

All material to be used as fill must be approved by Peto MacCallum Ltd. Such approval will be influenced by many factors and must be site and project specific. External fill sources must be sampled, tested and approved prior to material being hauled to site.

6. Test Section

In advance of the start of construction of the engineered fill pad, the Contractor should conduct a test section. The compaction criterion will be assessed in consultation with Peto MacCallum Ltd. for the various fill material types using different lift thicknesses and number of passes for the compaction equipment proposed by the Contractor.

Additional test sections may be required throughout the course of the project to reflect changes in fill sources, natural moisture content of the material and weather conditions.

The Contractor should be particularly aware of changes in the moisture content of fill material. Site review by Peto MacCallum Ltd. is required to ensure the desired lift thickness is maintained and that each lift is systematically compacted, tested and approved before a subsequent lift is commenced.

7. Inspection and Testing

Uniform, thorough compaction is crucial to the performance of the engineered fill and the supported structure. Hence, all subgrade preparation, filling and compacting must be carried out under the full time inspection by Peto MacCallum Ltd.

All founding surfaces for all buildings and residential dwellings or any part thereof (including but not limited to footings and floor slabs) on structural fill or native soils must be inspected and approved by PML engineering personnel prior to placement of the base/subbase granular material and/or concrete. The purpose of the inspection is to ensure the subgrade soils are capable of supporting the building/house foundation and floor slab loads and to confirm the building/house envelope does not extend beyond the limits of any structural fill pads.

8. Protection of Fill

Fill is generally more susceptible to the effects of weather than natural soil. Fill placed and approved to the level at which structural support is required must be protected from excessive wetting, drying, erosion or freezing. Where adequate protection has not been provided, it may be necessary to provide deeper footings or to strip and recompact some of the fill.

9. Construction Delay Time Considerations

The integrity of the fill pad can deteriorate due to the harsh effects of our Canadian weather. Hence, particular care must be taken if the fill pad is constructed over a long time period.

It is necessary therefore, that all fill sources are tested to ensure the material compactability prior to the soil arriving at site. When there has been a lengthy delay between construction periods of the fill pad, it is necessary to conduct subgrade proof rolling, test pits or boreholes to verify the adequacy of the exposed subgrade to accept new fill material.

When the fill pad will be constructed over a lengthy period of time, a field survey should be completed at the end of each construction season to verify the areal extent and the level at which the compacted fill has been brought up to, tested and approved.

In the following spring, subexcavation may be necessary if the fill pad has been softened attributable to ponded surface water or freeze/thaw cycles.

A new survey is required at the beginning of the next construction season to verify that random dumping and/or spreading of fill has not been carried out at the site.

10. Approved Fill Pad Surveillance

It should be appreciated that once the fill pad has been brought to final grade and documented by field survey, there must be ongoing surveillance to ensure that the integrity of the fill pad is not threatened.

Grading operations adjacent to fill pads can often take place several months or years after completion of the fill pad.

It is imperative that all site management and supervision staff, the staff of Contractors and earthwork operators be fully aware of the boundaries of all approved engineered fill pads.

Excavation into an approved engineered fill pad should never be contemplated without the full knowledge, approval and documentation by the geotechnical consultant.

If the fill pad is knowingly built several years in advance of ultimate construction, the areal limits of the fill pad should be substantially overbuilt laterally to allow for changes in possible structure location and elevation and other earthwork operations and competing interests on the site. The overbuilt distance required is project and/or site specified.

Iron bars should be placed at the corner/intermediate points of the fill pad as a permanent record of the approved limits of the work for record keeping purposes.

11. Unusual Working Conditions

Construction of fill pads may at times take place at night and/or during periods of freezing weather conditions because of the requirements of the project schedule. It should be appreciated therefore, that both situations present more difficult working conditions. The Owner, Contractor, Design Consultant and Geotechnical Engineer must be willing to work together to revise site construction procedures, enhance field testing and surveillance, and incorporate design modifications as necessary to suit site conditions.

When working at night there must be sufficient artificial light to properly illuminate the fill pad and borrow areas.

Placement of material to form an engineered fill pad during winter and freezing temperatures has its own special conditions that must be addressed. It is imperative that each day prior to placement of new fill, the exposed subgrade must be inspected and any overnight snow or frozen material removed. Particular attention should be given to the borrow source inspection to ensure only nonfrozen fill is brought to the site.

The Contractor must continually assess the work program and have the necessary spreading and compacting equipment to ensure that densification of the fill material takes place in a minimum amount of time. Changes may be required to the spreading methods, lift thickness, and compaction techniques to ensure the desired compaction is achieved uniformly throughout each fill lift.

The Contractor should adequately protect the subgrade at the end of each shift to minimize frost penetration overnight. Since water cannot be added to the fill material to facilitate compaction, it is imperative that densification of the fill be achieved by additional compaction effort and an appropriate reduced lift thickness. Once the fill pad has been completed, it must be properly protected from freezing temperatures and ponding of water during the spring thaw period.

If the pad is unusually thick or if the fill thickness varies dramatically across the width or length of the fill pad, Peto MacCallum Ltd. should be consulted for additional recommendations. In this case, alternative special provisions may be recommended, such as providing a surcharge preload for a limited time or increase the degree of compaction of the fill.