Peto MacCallum Ltd.
CONSULTING ENGINEERS

GEOTECHNICAL INVESTIGATION
PROPOSED BUILDING ADDITION
CANPLAS INDUSTRIES
31 PATTERSON ROAD
BARRIE, ONTARIO

for

GERRITS ENGINEERING LIMITED

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PML Ref.: 17BF018
Report: 1
June 2017

Peto MacCallum Ltd.
CONSULTING ENGINEERS

June 7, 2017

PML Ref.: 17BF018
Report: 1

Mr. Aaron Menard, P.Eng.
Gerrits Engineering Limited
231 Bayview Drive
Suite 303
Barrie, Ontario
L4N 4Y5

Dear Mr. Menard

Geotechnical Investigation
Proposed Building Addition
Canplas Industries
31 Patterson Road
Barrie, 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 described in this report was provided by Mr. A. Menard in the email dated April 20, 2017.

A 55.2 m by 28.6 m addition is planned in the southeast corner of the existing warehouse. The addition will be a tall single storey slab-on-grade structure matching the existing floor slab elevation of 236.19. A possible future addition may be constructed near the southwest corner. The location of the additions are shown on Drawing 1, appended.

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

Geo-environmental 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 soils requiring transportation off-site are generated, a program of sampling and testing will be needed to determine the chemical properties of the soil to evaluate 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 addressed in the report. Any changes in the proposed plans will require review by PML to assess the validity of the report, and may require modified recommendations, additional investigation and/or analysis

INVESTIGATION PROCEDURES

The field work for the investigation was carried out on May 23, 2017, and consisted of Boreholes 101 to 106 drilled to 5.0 m depth within the proposed southeast addition area, Borehole 107 drilled to 5.0 m depth within the possible future addition area, and Test Pits 1 to 3, excavated adjacent to the existing building to expose existing footings. The borehole and test pit locations are shown on the Borehole/Test Pit Location Plan, Drawing 1, appended.

Co-ordination for clearances of underground public utilities was provided by PML with the aid of a private locating service.

The boreholes were advanced using continuous flight solid stem augers, powered by a rubber tire mounted CME-75 drill rig, equipped with an automatic hammer, supplied and operated by a specialist drilling contractor. The test pits were excavated using a rubber tire backhoe, supplied and operated by a local excavating contractor. The test pits and boreholes were carried out concurrently, 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 water level in the open boreholes, if any.

The location of each borehole and test pit was established in the field by PML based on a plan provided by the Client and cognizant of underground utilities. Surface elevations of the boreholes

and test pits were referenced to the following Temporary Bench Mark (TBM), as shown on Drawing 1, attached, and described as follows:

TBM: Top of Finished Floor of Warehouse Building at Southeast Entrance
Elevation 236.19 (Metric, Geodetic)

All recovered samples were returned to our laboratory for moisture content determination and detailed examination to confirm field classification.

SUMMARIZED SUBSURFACE CONDITIONS

Reference is made to the appended Log of Borehole sheets for details of the subsurface conditions, including soil types, inferred stratigraphy, Standard Penetration N values, ground water observations and the results of laboratory water content determinations. Reference is made to the appended Log of Test Pit sheets for details of the subsurface conditions adjacent to the existing building, existing footing founding levels and dimensions.

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. PML should be retained to assist in defining the geologic boundaries in the field during construction, if required.

The site stratigraphy comprised topsoil (local pavement), over fill, over native sand, grading to a silty sand at depth.

At the surface of Boreholes 101 to 106 and Test Pits 1 to 3, a 200 to 500 mm thick layer of topsoil was present.

At the surface of Borehole 107, a 380 mm thick pavement structure was observed, comprising 60 mm of asphalt, over 120 mm of granular base and 200 mm of granular subbase.

Below the topsoil or pavement structure in all boreholes and test pits, a fill unit was encountered, extending to 0.8 to 1.8 m depth (elevation 234.2 to 234.7). The fill comprised sand, some silt, and trace organics, locally trace gravel. The unit was moist with typical moisture contents of 5 to 15%.

Below the fill in all test pits and boreholes, a native sand unit was encountered. The unit extended to the 1.6 to 1.7 m depth of excavation in the test pits and to the 5.0 m depth of exploration in all boreholes. The unit comprised sand with some silt and trace gravel, grading to silty sand, with silt seams/layers below 2.5 to 4.0 m depth. The material was compact to dense and moist to wet with water contents of 8 to 25%.

The three test pits showed the existing building footings to be founded on the native sand at 1.3 to 1.5 m depth (elevation 234.7).

Upon completion of excavating, the test pits encountered no seepage or sidewall sloughing.

Upon completion of augering, water or wet cave was encountered in all of the boreholes at 2.0 to 3.0 m depth (elevation 232.95 to 233.3).

Ground water levels are subject to fluctuations and seasonal variations.

GEOTECHNICAL ENGINEERING CONSIDERATIONS

General

A 55.2 m by 28.6 m addition is planned in the southeast corner of the existing warehouse. The addition will be a tall single storey slab-on-grade structure matching the existing floor slab elevation of 236.19. A possible future addition may be constructed near the southwest corner. The location of the additions are shown on Drawing 1, appended.

Engineered Fill

The boreholes and test pits showed existing fill down to 0.8 to 1.8 m depth over competent native sand. The existing fill is considered unsuitable to support building footings or floor slab-on-grade, due to potential for excessive gross and differential settlement. In this regard, it is recommended that the existing fill be sub-excavated and replaced with engineered fill. The proposed addition can then be supported on conventional strip footings founded on engineered fill or the native sand, with the floor slab-on-grade supported on the engineered fill.

General guidelines for engineered fill construction are provided in Appendix A. Highlights are as follows:

- Sub-excavate the existing topsoil, pavement, fill, and other deleterious materials down to native soil. The excavated soil should be segregated and stockpiled for reuse or disposal;

- The exposed subgrade should then be compacted with a heavy roller to ensure 100% Standard Proctor maximum dry density, under geotechnical review during construction. If wet subgrade conditions are encountered, the use of OPSS Granular B, Type II (crushed rock) for the first lift of engineered fill may be required, subject to geotechnical field review;

- Following geotechnical subgrade approval, the site can be raised up to the design floor slab-on-grade level using engineered fill. The engineered fill material must be spread in maximum 300 mm thick loose lifts and uniformly compacted to 100% Standard Proctor maximum dry density;

- Engineered fill material should comprise inorganic soil, free of deleterious material, at moisture content suitable for compaction. Excavated site soil is expected to comprise mostly the existing fill which is considered generally unsuitable for reuse as engineered fill, due to the presence of organics. Reuse of excavated soil is subject to geotechnical review and approval at the time of construction. Imported material for engineered fill should comprise select granular soil such as OPSS Select Subgrade Material (SSM) or OPSS Granular B and must be at a moisture content suitable for compaction. Prospective imported material, should be reviewed by our office to ensure suitability;

- The engineered fill pad must extend at least 1 m beyond the structures 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

The southeast building addition (and possible future addition) can be supported on conventional strip and spread footings founded at normal depth on engineered fill and/or the native sand. A geotechnical bearing resistance at Serviceability Limit State (SLS) of 150 kPa, and factored bearing resistance at Ultimate Limit State (ULS) of 225 kPa are recommended for design.

The geotechnical bearing resistance at SLS is based on 25 mm or settlement in the bearing stratum with differential settlement not exceeding 75% of the value.

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

Abutting new and existing footings should be at the same level. The test pits revealed the founding level of the existing building was elevation 234.7.

Prior to placement of structural concrete, all founding surfaces must be examined by PML to check the design bearing capacity is available, and/or to reassess the available soil capacity.

Seismic Design

Based on the soil profile revealed in the boreholes, 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). Based on the type and relative density of the soil cover at the site, the soils have a low potential for liquefaction.

Floor Slab-on-Grade

Floor slab-on-grade construction is considered feasible on the engineered fill constructed as described earlier in the report.

A minimum 200 mm thick base layer of crushed stone (nominal 20 mm size) is recommended directly beneath the floor slab. Where a vapour sensitive floor finish is to be used then the use of polyethylene sheeting or similar means should be incorporation as a vapour barrier.

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

Excavation and Ground Water Control

Excavation for engineered fill and foundation construction is expected to extend down as much as about 1.8 m depth (elevation 234.2) based on the boreholes and will encounter topsoil and fill and the upper portion of the native sand deposit.

The site soils should be considered as Type 3 soil requiring excavation side walls 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.

Ground water was encountered below 2.3 m depth (elevation 233.2) within the proposed addition area during the investigation, and as such ground water is not anticipated to pose significant issues during excavation. Conventional sump pumping techniques should be adequate to control nuisance seepage.

Water taking in Ontario is governed by the Ontario Water Resources Act (OWRA) and the Water Taking and Transfer Regulation O.Reg. 387/040, Section 34 of the OWRA requires any one taking more than 50,000 L/d to obtain a Permit-to-Take-Water (PTTW). This requirement applies to all withdrawals, whether for consumption, temporary construction dewatering or permanent drainage improvements. Projects assessed to be taking more than 50,000 L/d but less than 400,000 L/d of ground water can obtain a permit/permission online via the Environmental

Activity and Sector Registry (EASR) system. If it is assessed that more than 400,000 L/d is required then a Category 3 PTTW will be required.

Based on the discussion above, a PTTW or registry on the EASR is not anticipated.

It is recommended that a test dig be undertaken to allow prospective contractors an opportunity to observe and evaluate the subsurface 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 drawings be submitted to PML for geotechnical review for compatibility with the site conditions and the recommendations provided in 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 that the specified compaction standards are achieved 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, considering previous activity at the site. 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.

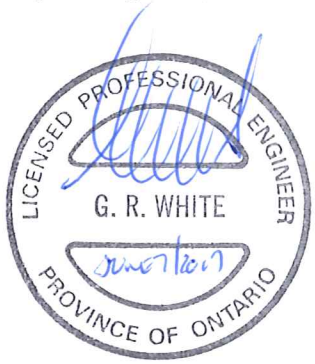
CLOSURE

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.

Richard Blair
Project Engineer, Geotechnical Services



Geoffrey R. White, P.Eng.
Associate
Manager, Geotechnical and Geo-environmental Services

RB/GRW/TLB:jlb

Enclosures:
List of Abbreviations
Log of Test Pits 1 to 3
Log of Boreholes 101 to 107
Drawing 1 - Borehole Location Plan
Appendix A – Engineered Fill

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	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 TEST PIT NO. 1

PROJECT Proposed Building Addition - Canplas Industries
LOCATION 31 Patterson Road, Barrie, Ontario
EXCAVATION METHOD Excavator
BORING DATE May 23, 2017
PML REF. 17BF018
ENGINEER GW
TECHNICIAN RB

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) +FIELD VANE △TORVANE ○ Qu ▲POCKET PENETROMETER ○ Q / DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT kN/m³	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 236.15						50 100 150 200 / 20 40 60 80	10 20 30 40		
0.0	TOPSOIL: Dark brown, sand, moist					236				
0.32										
235.83	FILL: Brown, sand, some silt, trace organics, moist									
						235				
1.5										Existing footing founded at EL. 234.7 Footing 180 mm thick and projects 95 mm from foundation wall
234.7	SAND: Compact, brown, sand, some silt, stratified, moist									
1.7										
234.5	TEST PIT TERMINATED AT 1.7 m DEPTH									Upon completion of excavating No seepage No sidewall sloughing
2.0										
3.0										
4.0										
5.0										

NOTES

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LOG OF TEST PIT NO. 2

PROJECT Proposed Building Addition - Canplas Industries
LOCATION 31 Patterson Road, Barrie, Ontario
EXCAVATION METHOD Excavator
BORING DATE May 23, 2017
PML REF. 17BF018
ENGINEER GW
TECHNICIAN RB

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L; WATER CONTENT (%)	UNIT WEIGHT kN/m³	GROUND WATER OBSERVATIONS AND REMARKS; GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 236.00						50 100 150 200 / 20 40 60 80	10 20 30 40		
0.0	TOPSOIL: Dark brown, sand, moist									
0.24 / 235.76	FILL: Dark brown, sand, some silt, trace organics, moist					235				
1.3 / 234.7	SAND: Compact, brown, sand, some silt, stratified, moist									Existing footing founded at EL. 234.7 Footing 140 mm thick and projects 90 mm from foundation wall
1.6 / 234.4	TEST PIT TERMINATED AT 1.6 m DEPTH									Upon completion of excavating No seepage No sidewall sloughing
1.0										
2.0										
3.0										
4.0										
5.0										

NOTES

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LOG OF TEST PIT NO. 3

PROJECT Proposed Building Addition - Canplas Industries
LOCATION 31 Patterson Road, Barrie, Ontario
EXCAVATION METHOD Excavator
BORING DATE May 23, 2017
PML REF. 17BF018
ENGINEER GW
TECHNICIAN RB

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) +FIELD VANE △TORVANE ○ Qu ▲POCKET PENETROMETER ○ Q; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L; WATER CONTENT (%)	UNIT WEIGHT kN/m³	GROUND WATER OBSERVATIONS AND REMARKS; GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 236.05						50 100 150 200 / 20 40 60 80	10 20 30 40		
0.0	TOPSOIL: Dark brown, sand, moist					236				
0.33										
235.72	FILL: Dark brown, sand, some silt, trace organics, moist									
1.0						235				
1.4										Existing footing founded at EL. 234.7
234.7	SAND: Compact, brown, sand, some silt, stratified, moist									Footing 180 mm thick and projects 95 mm from foundation wall
1.6										
234.5	TEST PIT TERMINATED AT 1.6 m DEPTH									Upon completion of excavating No seepage No sidewall sloughing
2.0										
3.0										
4.0										
5.0										

NOTES

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LOG OF BOREHOLE NO. 101

PROJECT Proposed Building Addition - Canplas Industries
PML REF. 17BF018
LOCATION 31 Patterson Road, Barrie, Ontario
BORING DATE May 23, 2017
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN RB

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLE NUMBER	SAMPLE TYPE	"N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 236.10					236
0.30	235.80	TOPSOIL: Dark brown, sand, trace silt, moist		1	SS	7	
		FILL: Dark brown, sand, some silt, trace organics, moist		2	SS	9	235
1.4	234.7	SAND: Compact to dense, brown, sand, trace silt, stratified, moist to wet		3	SS	22	
				4	SS	32	234
				5	SS	24	233
4.0	232.1	Becoming silty sand, with silt seams, wet		6	SS	36	232
5.0	231.1	BOREHOLE TERMINATED AT 5.0 m					

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER O 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

First water strike at 3.0 m

Upon completion of augering
Wet cave at 3.0 m

NOTES

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LOG OF BOREHOLE NO. 102

PROJECT Proposed Building Addition - Canplas Industries
PML REF. 17BF018
LOCATION 31 Patterson Road, Barrie, Ontario
BORING DATE May 23, 2017
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN RB

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 235.95					
0.50	TOPSOIL: Dark brown, sand, trace silt, trace gravel, very moist		1	SS	7	
235.45	FILL: Dark brown to brown, sand, some silt, trace organics, moist		2	SS	6	
1.4						
234.6	SAND: Dense to compact, brown, sand, trace to some silt, stratified, moist to wet		3	SS	34	
			4	SS	25	
3.0						
233.0	Becoming silty sand, with silt seams, wet		5	SS	26	First water strike at 3.0 m
			6	SS	20	
5.0						
231.0	BOREHOLE TERMINATED AT 5.0 m					Upon completion of augering Water at 3.0 m Cave at 3.3 m

ELEVATION SCALE: 235, 234, 233, 232, 231

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

NOTES

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LOG OF BOREHOLE NO. 103

PROJECT Proposed Building Addition - Canplas Industries
PML REF. 17BF018
LOCATION 31 Patterson Road, Barrie, Ontario
BORING DATE May 23, 2017
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN RB

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 236.00					
0.0 / 236.00						
0.30 / 235.70	TOPSOIL: Dark brown, sand, trace silt, moist		1	SS	12	
	FILL: Dark brown, sand, some silt, trace organics, moist		2	SS	13	235
1.4 / 234.6	SAND: Compact, brown, sand, trace to some silt, stratified, moist		3	SS	14	
			4	SS	26	234
3.0 / 233.0	Becoming silty sand, with silt seams, wet		5	SS	20	233
			6	SS	20	232
5.0 / 231.0	BOREHOLE TERMINATED AT 5.0 m					231

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

First water strike at 3.3 m

Upon completion of augering
Wet cave at 2.9 m

NOTES

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LOG OF BOREHOLE NO. 104

PROJECT Proposed Building Addition - Canplas Industries — **PML REF.** 17BF018
LOCATION 31 Patterson Road, Barrie, Ontario — **BORING DATE** May 23, 2017 — **ENGINEER** GW
BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** RB

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	"N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 235.80					
0.0	235.80						
0.25	235.55	TOPSOIL: Dark brown, sand, trace silt, moist		1	SS	8	
		FILL: Dark brown, sand, some silt, trace organics, moist		2	SS	19	235
1.4	234.4	SAND: Dense to compact, brown, sand, trace to some silt, stratified, moist		3	SS	30	234
				4	SS	27	
3.0	232.8	Becoming silty sand, with silt seams, wet		5	SS	20	233
							232
5.0	230.8			6	SS	14	231
		BOREHOLE TERMINATED AT 5.0 m					

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

First water strike at 3.0 m

Upon completion of augering
Wet cave at 2.6 m

NOTES

Peto MacCallum Ltd.
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LOG OF BOREHOLE NO. 105

PROJECT Proposed Building Addition - Canplas Industries
PML REF. 17BF018
LOCATION 31 Patterson Road, Barrie, Ontario
BORING DATE May 23, 2017
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN RB

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 236.00					
0.0	0.20	TOPSOIL: Dark brown, sand, trace silt, moist		1	SS	6	
	235.80	FILL: Dark brown to brown, sand, some silt, trace organics, moist		2	SS	13	235
1.0							
	1.8			3	SS	31	
2.0	234.2	SAND: Dense to compact, brown, sand, trace to some silt, stratified, moist to wet					234
				4	SS	34	
3.0							233
				5	SS	20	
4.0	4.0						
	232.0	Becoming silty sand, with silt seams					232
5.0	5.0			6	SS	19	
	231.0	BOREHOLE TERMINATED AT 5.0 m					231
6.0							
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0							

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

First water strike at 3.0 m
Upon completion of augering
Wet cave at 2.7 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 106

PROJECT Proposed Building Addition - Canplas Industries
PML REF. 17BF018
LOCATION 31 Patterson Road, Barrie, Ontario
BORING DATE May 23, 2017
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN RB

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 235.45				
0.0		TOPSOIL: Dark brown, sand, trace silt, moist		1	SS	7
0.45	235.00	FILL: Dark brown, sand, some silt, trace organics, moist				
0.80	234.65	SAND: Compact, brown, sand, trace to some silt, stratified, moist to wet		2	SS	11
1.0						
				3	SS	26
2.0						
2.5	233.0	Becoming silty sand, with silt layers, wet		4	SS	16
3.0						
				5	SS	19
4.0						
5.0				6	SS	19
5.0	230.5	BOREHOLE TERMINATED AT 5.0 m				
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

ELEVATION SCALE: 235, 234, 233, 232, 231

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER O 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

First water strike at 2.3 m

Upon completion of augering
Wet cave at 2.0 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

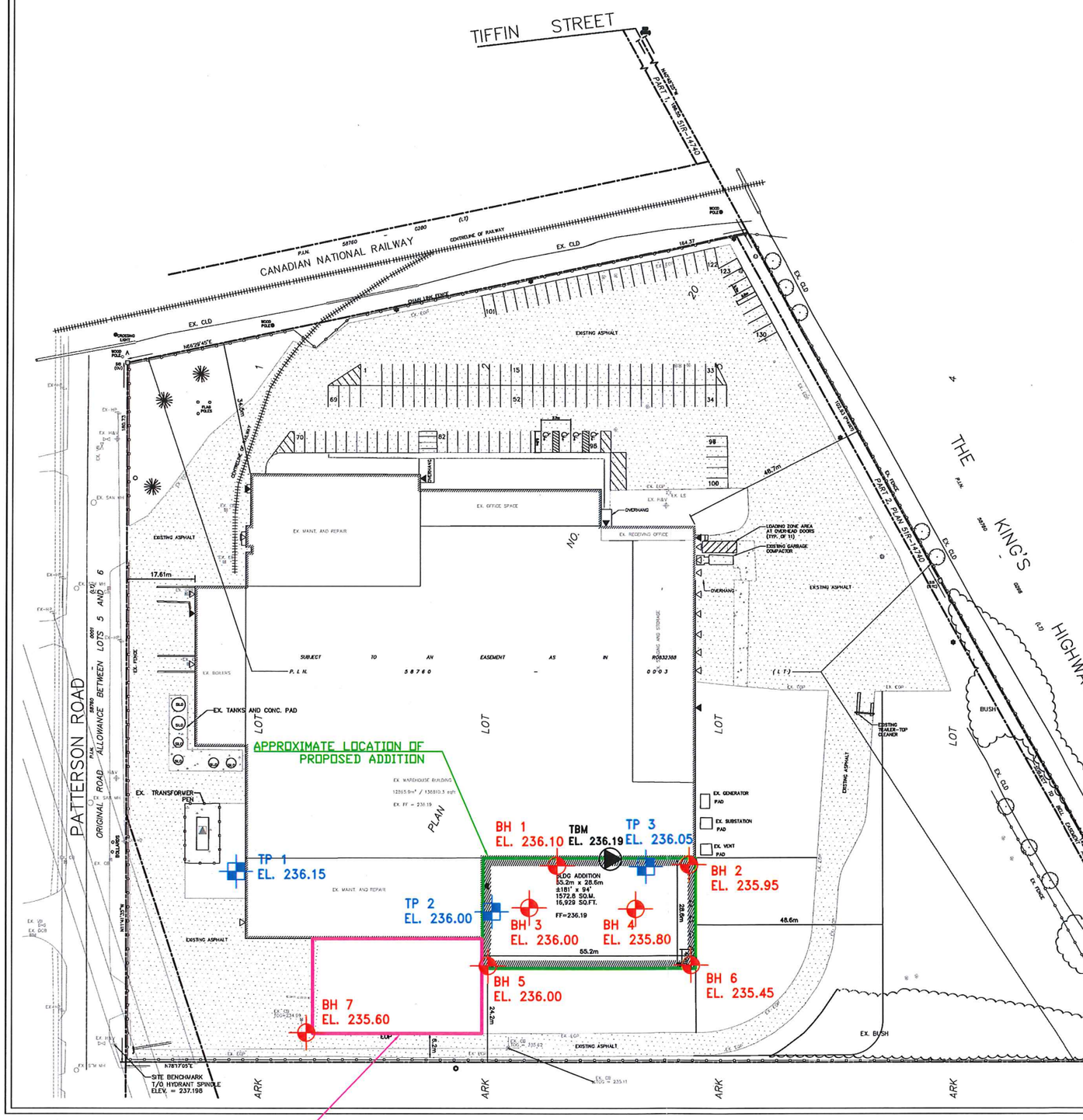
LOG OF BOREHOLE NO. 107

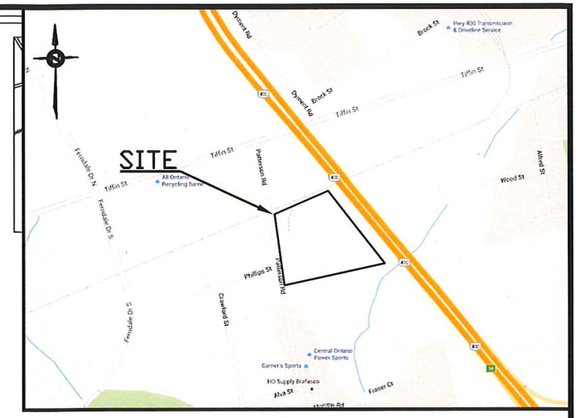
PROJECT Proposed Building Addition - Canplas Industries
PML REF. 17BF018
LOCATION 31 Patterson Road, Barrie, Ontario
BORING DATE May 23, 2017
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN RB

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / DYNAMIC CONE PENETRATION / STANDARD PENETRATION TEST	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT kN/m³	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
		SURFACE ELEVATION 235.60									
0.0		PAVEMENT: 60 mm asphalt, over		1A	GS	-					
0.38		120 mm granular base, over		1B							
235.22		200 mm granular subbase, moist									
		FILL: Brown, sand, some silt, trace gravel, moist		2	SS	20	235				
1.0											
1.4											
234.2		SAND: Dense to compact, brown, sand, trace to some silt, stratified, wet		3	SS	31	234				First water strike at 1.5 m
2.0											
				4	SS	29	233				
2.9											
3.0	232.7	Becoming silty sand, with silt seams, wet		5	SS	21					
							232				
4.0											
				6	SS	11	231				
5.0											
5.0	230.6	BOREHOLE TERMINATED AT 5.0 m									Upon completion of augering Wet cave at 2.4 m
6.0											
7.0											
8.0											
9.0											
10.0											
11.0											
12.0											
13.0											
14.0											
15.0											

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

NOTES





KEY PLAN
BARRIE, ONTARIO

LEGEND:

BH 1 EL. 236.10	BOREHOLE 1 SURFACE ELEVATION
TP 1 EL. 236.15	TEST PIT 1 SURFACE ELEVATION
TBM EL. 236.19	TEMPORARY BENCH MARK TOP OF FINISHED FLOOR OF WAREHOUSE BUILDING AT SOUTHEAST ENTRANCE ELEVATION 236.19 (METRIC, GEODETIC)

REFERENCE:

BASE PLAN PROVIDED BY CLIENT.

0m 20 40 60 80 100

SCALE

BOREHOLE/TEST PIT LOCATION PLAN

PROPOSED BUILDING ADDITION
CANPLAS INDUSTRIES
31 PATTERSON ROAD, BARRIE, ONTARIO

Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	RB	DATE	SCALE	PML REF.	DRAWING NO.
CHECKED	GW	JUNE 2017	AS SHOWN	17BF018	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.