August 16, 2024

PH4944-LET.01.REV.02.

Thunder Road Limited Partnership
801-250 City Centre Avenue
Ottawa, Ontario
K1R 6K7

Attention: Geoff Boole

Subject: **Terrain Analysis**
Site Plan Application
6150 Thunder Road and 5368 Boundary Road
Ottawa (Carlsbad Springs), Ontario

PATERSON GROUP
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Geotechnical Engineering
Environmental Engineering
Hydrogeology
Materials Testing
Building Science
Rural Development Design
Retaining Wall Design
Noise and Vibration Studies

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INTRODUCTION

Further to your request, Paterson has conducted a Terrain Analysis in support of a Site Plan Application for the proposed commercial development to be located at 6150 Thunder Road and 5368 Boundary Road, Ottawa (Carlsbad Springs), Ontario.

The purpose of this work has been to determine the suitability of the subject site to support private septic system servicing as it relates to the City of Ottawa Hydrogeological and Terrain Analysis Guidelines (HTAG) annotated procedure D-5-4.

The Subject Site consists of an approximately 15.2 hectare (ha) lot which is currently vacant and has been historically undeveloped. The ground surface is generally flat and the regional groundwater flow direction is anticipated to be westerly with localized flows influenced by surficial watercourses.

The Subject Site is bordered to the east by Thunder Road, a commercial business (gas station) and Boundary Road, to the north by a mapped watercourse followed by residential dwellings, and to the south and west vacant treed properties. The subject site itself is zoned RG for Rural General Industrial Zone with conditions, while surrounding areas are zoned RC for Rural Commercial Zone, RU for Rural Countryside Zone, or RG for Rural General Industrial Zone (GeoOttawa).

BACKGROUND

Subject Site

The subject site is an approximately 15.2 ha lot and is currently undeveloped. Historically the site has been vacant and tree covered, with some treed areas removed for development purposes. The Site Plan application is for a proposed new commercial development including a commercial office with associated areas for storage, shop and detailing operations, a shed and associated outdoor vehicle storage areas. Please refer to Figure-1 Key Plan and McRobie Architects + Interior Designers Site Plan Drawing number SPA-01 (Project 21- 135) dated April 2021 and revised August 16, 2024 attached for the proposed site location and site layout.

A new sewage system to service the commercial building has been proposed. As part of the sewage system design process, a septic flow calculation was completed and resulted in a total daily design sanitary sewage flow (TDDSSF) volume of 1,875 L/day. Please refer to Paterson Drawing PH4944-1-REV.05. Sewage System Layout Plan and Paterson Drawing PH4944-2-REV.05 – Sewage System Details and Notes attached for additional details. The approved Ottawa Septic System Office (OSSO) Sewage System Installation Permit will be submitted as part of the Site Plan application package.

Regional Geology

Published Ontario Geological Survey (OGS) surficial geology mapping (OGS MRD128) for the area in the vicinity of the subject site indicates that the majority of the site is underlain predominantly by a coarse-textured glaciomarine deposit consisting of sand, gravel, minor silt and clay.

Published bedrock geology mapping (OGS MRD219) indicates that the subject lands are underlain by shale and limestone of the Carlsbad Formation. The available bedrock mapping coincides with the well driller's description on the Ministry of the Environment, Conservation and Parks (MECP) Water Well Records (WWR) for the surrounding well supplies installed within the subject area, which generally indicate a shale bedrock.

Available overburden thickness mapping indicates an overburden that is 25 to 50 m thick.

Karst Features

The term "karst" refers to a geologic formation characterized by the dissolution of carbonate bedrock, such as limestone or dolostone. In order for karstification to occur, precipitation must be allowed to infiltrate the top of the bedrock to dissolutionally enlarge previously existing joints and bedding planes. Based on available mapping by the Ontario Geological Survey, there is no inferred, potential or known karstification in the subject area.

Site Geology – Field Programs

A series of boreholes were put down on the subject site to provide general coverage to delineate the subsurface soil conditions as part of the geotechnical investigation (Paterson Report PG5161-1-REV.04 dated August 9, 2024). A field investigation was undertaken on December 19, 2018 in which 3 boreholes were drilled to a maximum depth of 4.2 m below ground surface (bgs). A further investigation occurred on June 30 and July 2, 2020, where 7 boreholes were drilled to a maximum depth of 7.5 m bgs. A supplemental investigation was carried out on April 15, 2021 and July 14, 2021 where a total of 6 boreholes were drilled to a maximum depth of 5.8 m bgs. The boreholes from the various field investigations were to assess the subsurface soil conditions. Of the boreholes drilled, four were subject to Dynamic Cone Penetration Tests (DCPT) which extended to a maximum depth of 21.2 m bgs. The locations of the boreholes on the property are delineated on the Test Hole Location Plan, drawing PG5161-1-REV.02., attached.

The borehole locations were recorded and the subsurface conditions, including the soil morphology and depth to the groundwater table (if encountered), were carefully observed and recorded. The soils encountered were classified texturally in the field, and later reviewed in the laboratory.

Generally, the subsurface profile at the test hole locations were observed to consist of topsoil extending to approximately 0.1 - 0.25 m, overlying a silty sand with trace clay layer, which is underlain by a firm brown to grey silty clay with sand seams. The silty sand with trace clay layer extending to a depth of 0.7 - 1.3 m bgs, with the brown to grey silty clay extending to the depth of the boreholes. In the northern portion of the site, a fill layer was observed with thicknesses ranging from 0.6 - 0.75 m. Groundwater levels were measured and varied between 0.1 and 5.9 m bgs.

It should be noted that groundwater levels can fluctuate both seasonally and in conjunction with precipitation events. Therefore, the groundwater levels could vary at the time of construction.

Reference should be made to the borehole logs appended to this report for the details of the soil profiles encountered at each test hole location. The client should be aware that any information pertaining to soils are furnished as a matter of general information only and borehole descriptions are not to be interpreted as descriptive of conditions at locations other than those described by the boreholes themselves.

Two samples taken from the native material in the proposed commercial building footprint were submitted for sieve and Atterberg Limit analyses. The samples were collected during the geotechnical program at a depth of 1.5 - 2.1 m bgs and are labeled BH2-SS3 and BH6-SS3. Analytical results from the sieve and Atterberg Limit analysis can be found attached.

Carlsbad Trickle System

The Carlsbad Trickle system is a network of small diameter pipes which supplies drinking water from the City of Ottawa's central distribution system. It was needed to address widespread well-water quality and quantity problems in a specific area. As the Carlsbad Trickle System supplies water to this area, it is a strong indicator that there is poor well water quality and/or quantity. As such, there is a reduced potential that dwellings are supplied by a private water supply.

TERRAIN ANALYSIS

Hydrogeological Sensitivity of the Site

The subject site is currently unoccupied and has been historically vacant. A commercial development consisting of a commercial office with associated area for storage, shop and detailing operations, a shed and associated outdoor vehicle storage areas with associated infrastructure and private septic servicing is proposed for the site. The subject site fronts onto Thunder Road and is bordered by developed residential and commercial properties as well as agricultural or vacant lands. The adjacent properties are generally serviced by municipal water supply and private septic systems.

The overburden at the test hole locations generally consists of a topsoil overlying silty sand with trace clay which was overlying a silty clay deposit. Refusal to DCPT was recorded to extend to a maximum depth of 21.2 m bgs . According to available geological mapping, the drift thickness within the site varies from 25 - 50 m bgs.

According to the geotechnical field investigation, the overburden thickness was observed to be greater than 2 m. As the proposed site does not have bedrock within 2 m of the ground surface, the site is not considered hydrogeologically sensitive. Separation distances are not required to be increased between the septic components and the onsite well.

Conceptual Lot Development Plan

As the septic flows for the proposed building are based on Part 8 of the Ontario Building Code (OBC), the variables used in the calculation to determine the flows are discussed in the Ottawa Septic System Office (OSSO) approved Septic Installation Permit which has been submitted separately as part of the Site Plan application. The flows from the approved OSSO Septic Installation Permit are summarized below.

It is proposed to construct a commercial office with associated area for storage, shop and detailing operations, a shed and associated outdoor vehicle storage areas on the subject site. It is anticipated that the site will not be open to the general public, however some delivery drivers will be onsite briefly for pickups. The location of the proposed building can be found on the attached McRobie Architects + Interior Designers Site Plan Drawing

number SPA-01 (Project 21- 135) dated April 2021 and revised August 16, 2024. The current proposed configuration of the commercial building is as follows:

- Number of Storeys: 1
- Building size: 745 m^2
- Area of office space: 15 m^2 per office
- Offices: 5
- Number of Bays : 2 (4 total bay doors with pull-through)
- Washrooms within office area: 4
- Number of Employees: 15 office + 10 in yard; average of 5-7 in both

Please note that the proposed design layout is not meant to restrict the location of the proposed buildings or private services. The design will be reviewed and approved by the Ottawa Septic System Office (OSSO) and will be constructed in accordance with the required regulations. The OSSO requires inspections during construction in order to ensure compliance.

Theoretical Sewage System Volumes

A septic flow value was calculated for the proposed development as part of the OSSO Septic Installation Permit application process and resulted in a total daily design sanitary sewage flow (TDDSSF) of 1,875 L/day. The approved OSSO septic permit will has been included in the Site Plan application submission package. The septic flow values were calculated in accordance with the OBC and are as follows:

Office Space:

- 5 offices with the higher of either:
  - 75 L/day x 15 employees = 1,125 L/day
  - (15 m^2 x 5 offices = 75 m^2) / 9.3 x 75 L/day = 605 L/day
  - Includes four waterclosets within office area.
- For a total of **1,125 L/day** office space.

Storage, Shop, Detailing operations and Yard:

- Based on employee count:
  - 75 L/day x 10 employees = 750 L/day
- For a total of **750 L/day** for the storage, shop, detailing operations and yard.

The following Assumptions were made in the above calculations:

- Maximum of 15 employees per day for the office area.
- Maximum of 10 employees per day for the storage, shop, detailing operations and yard area.
- No waterclosets in the storage, shop and detailing operations area.
- No public waterclosets.
- No floor drains draining to septic bed.

The resulting total daily design sewage flow (TDDSF) is **1,875 L/day**.

Predictive Nitrate Impact Assessment

In order to demonstrate that private services would adequately support the proposed commercial development, a predictive nitrate impact assessment for the subject site was completed. The values shown in the Predictive Nitrate Impact Assessment attached to this report are summarized below.

- ❑ Site area — 15.2 ha
- ❑ Impervious area (%) — 58 %
- ❑ Daily sewage flow — 1.875 m^3/d
- ❑ Concentration of nitrate in effluent — 40 mg/L
  (Value based on typical effluent concentration)
- ❑ Surplus Water — 379 mm/yr
  (The surplus water value was estimated based on Environment Canada Climate Office values with a soil type comprised of a fine sandy loam (Urban lawns / Shallow Rooted Crops) and anthropogenic sources.)
- ❑ Combined infiltration factor based on: — 0.70
  - Topography infiltration factor — 0.20
  - Soil texture infiltration factor — 0.40
  - Cover infiltration factor — 0.10

The topography infiltration factor of 0.20 is based upon a generally rolling land with an average slope of 2.8 to 3.8 m/km. The soil texture infiltration factor was based upon an “open sandy loam” with a value of 0.4 which is a reasonable generalization based upon the site investigations and available geological mapping. The “cover infiltration factor” was calculated at 0.10 based upon a cultivated land type cover.

The calculation for a conventional septic system results in a predicted nitrate concentration of **1.55 mg/L** nitrate for the subject site, using a value of 40 mg /L nitrate concentration within the effluent. This value was based upon a daily sewage flow of 1,875 L/day. It is expected that the actual usage should be lower. Therefore, it is anticipated that the site can attenuate the planned TDDSSF using conventional treatment.

CONCLUSIONS

Based on the information contained within the body of this report the following conclusions can be drawn:

1. The site is not considered hydrogeologically sensitive, and is not in an area of karst or inferred karst.

2. The predicted nitrate concentrations at the property boundary are calculated to be below the required 10 mg/L threshold when a conventional system is used.

3. A Sewage System Permit and Building Permit need to be issued prior to the commencement of construction on the proposed warehouse addition or the proposed septic system.

4. The results of the Terrain Analysis have provided satisfactory evidence that the subject site can support the proposed commercial development with respect to sewage system flow volumes.

We trust that the current submission satisfies your immediate requirements.

Best Regards,

Paterson Group Inc.

Alexander Schopf, PhD, EIT

Erik Ardley, P.Geo

Attachments:

- ❑ Key Plan
- ❑ MCROBIE Site Plan SPA-01 21-135 dated April 2021 Revised August 16, 2024
- ❑ Paterson Borehole Logs
- ❑ Nitrate Impact Assessment Calculations
- ❑ Atterberg Limits Testing Results
- ❑ Grain Size and Hydrometer Testing Results
- ❑ Paterson Drawing PH4944-1-REV.05 – Sewage System Layout Plan
- ❑ Paterson Drawing PH4944-2-REV.05 – Sewage System Details and Notes
- ❑ Paterson Drawing PG5161-1 - Test Hole Location Plan

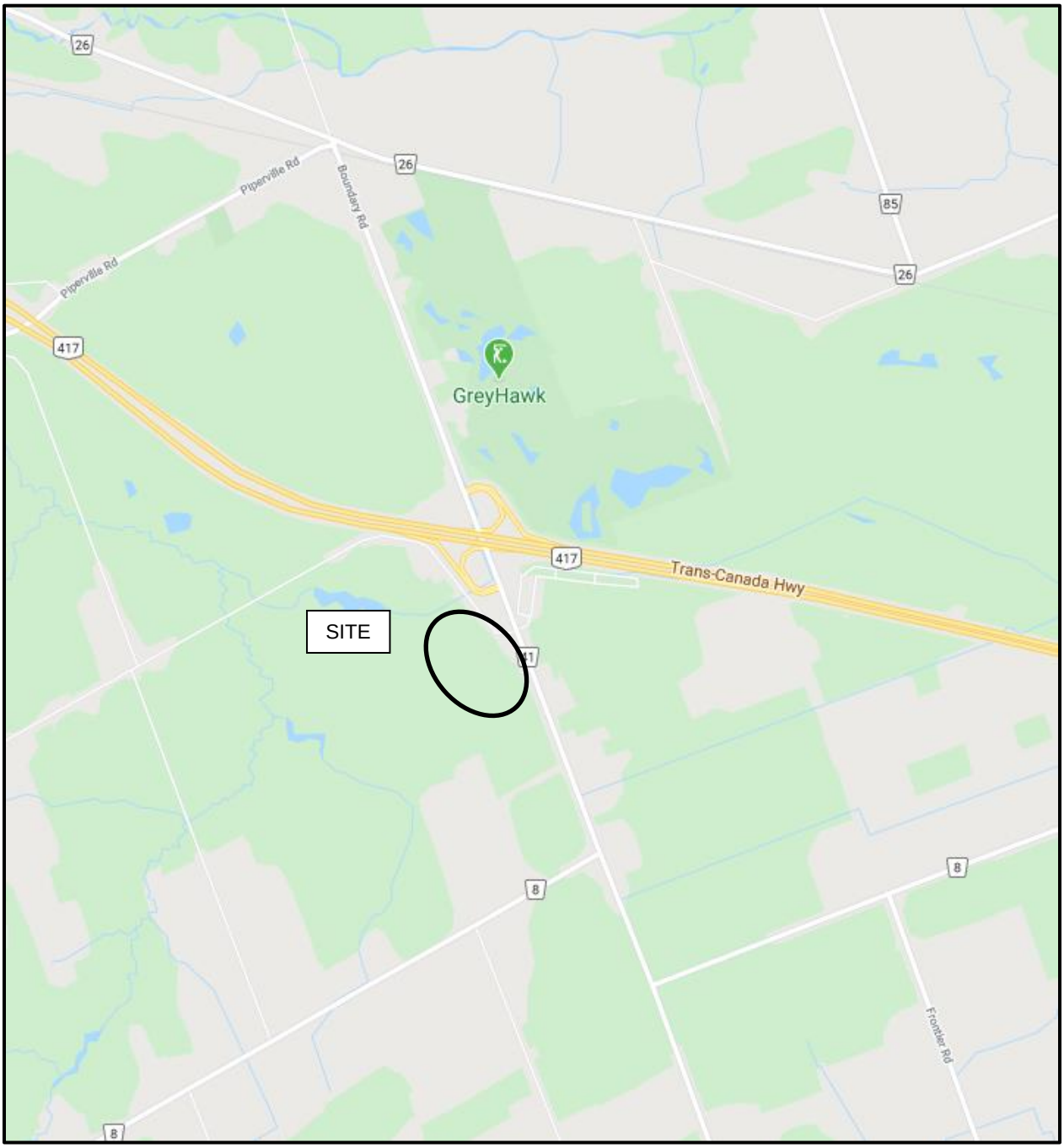

FIGURE 1

KEY PLAN

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

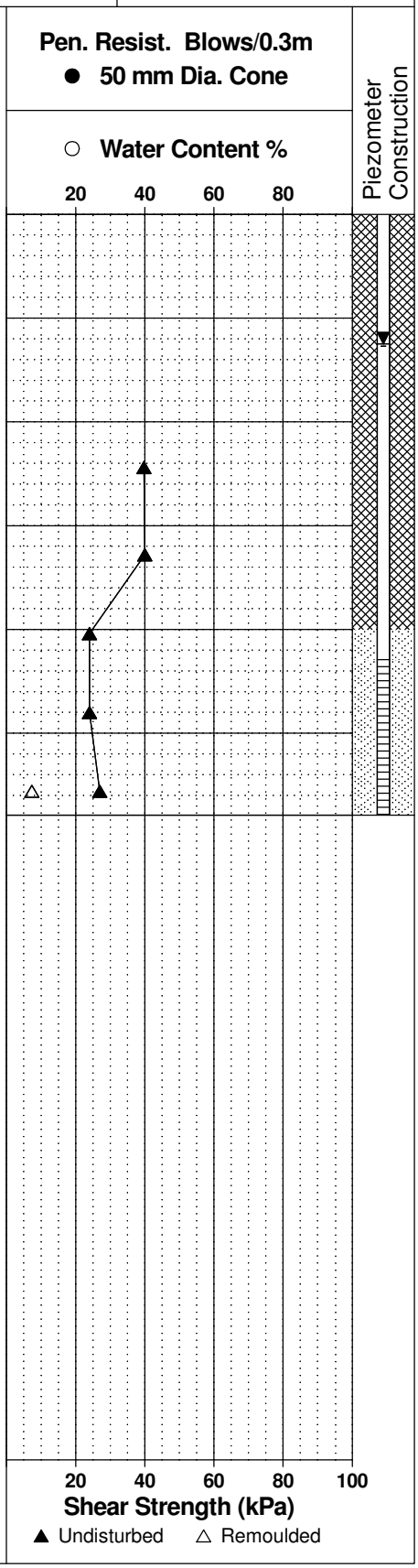
FILE NO. PG5161

REMARKS

HOLE NO. BH 1-21

BORINGS BY Track-Mount Power Auger **DATE** April 15, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.96
TOPSOIL 0.08							
FILL: Brown silty sand, trace topsoil 0.60		AU	1				
Compact, brown **SILTY SAND**		SS	2	33	12	1	75.96
1.68							
Stiff, brown **SILTY CLAY** 2.00		SS	3	25	2	2	74.96
Firm, grey **SILTY CLAY**						3	73.96
						4	72.96
						5	71.96
5.79							
End of Borehole							
(GWL @ 1.25m - July 21, 2021)							



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

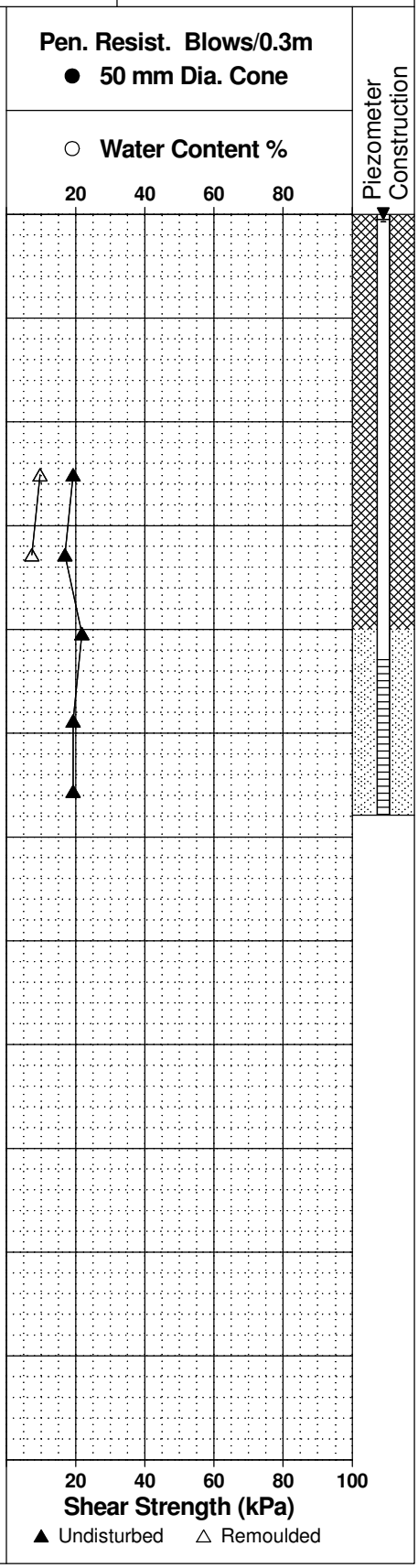
FILE NO. PG5161

REMARKS

HOLE NO. BH 2-21

BORINGS BY Track-Mount Power Auger **DATE** April 15, 2021

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	76.76
TOPSOIL	0.08							
FILL: Brown silty sand with topsoil	0.76		AU	1				
Loose, brown **SILTY SAND**	1.37		SS	2	33	9	1	75.76
Stiff, brown **SILTY CLAY**	2.10		SS	3	50	1	2	74.76
			SS	4	100	P		
			SS	5	100	P	3	73.76
Soft, grey **SILTY CLAY**							4	72.76
							5	71.76
	5.79							
Dynamic Cone Penetration Test commenced at 5.79m depth. Cone pushed to 19.2m depth.							6	70.76
							7	69.76
							8	68.76
							9	67.76
							10	66.76
							11	65.76
							12	64.76



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Proposed Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

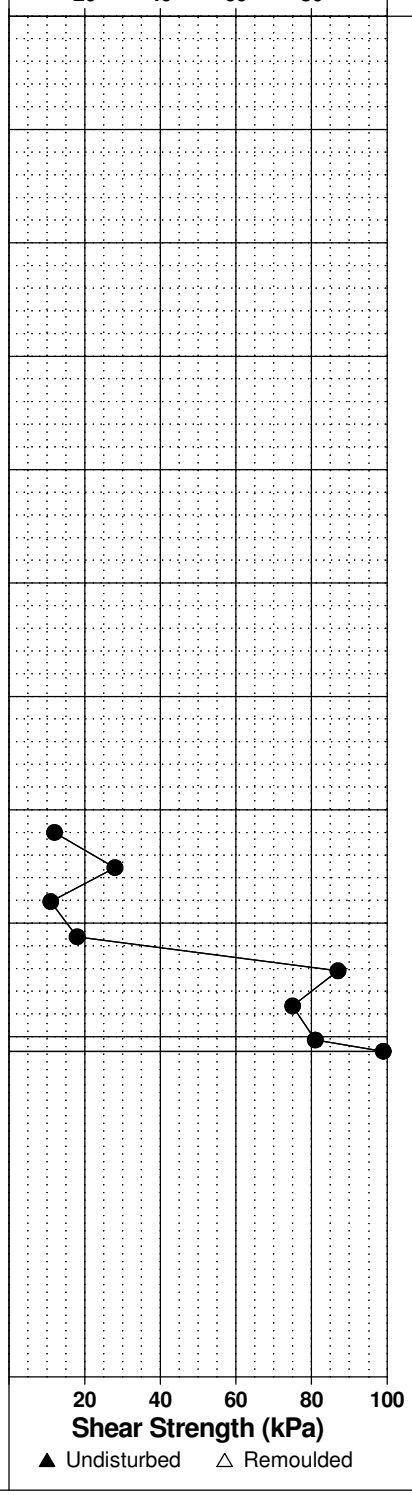
FILE NO. PG5161

REMARKS

HOLE NO. BH 2-21

BORINGS BY Track-Mount Power Auger **DATE** April 15, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						12	64.76		
						13	63.76		
						14	62.76		
						15	61.76		
						16	60.76		
						17	59.76		
						18	58.76		
						19	57.76		
						20	56.76		
21.13						21	55.76		
End of Borehole									
Practical DCPT refusal at 21.13m depth									
(GWL @ 0.05m - July 21, 2021)									



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

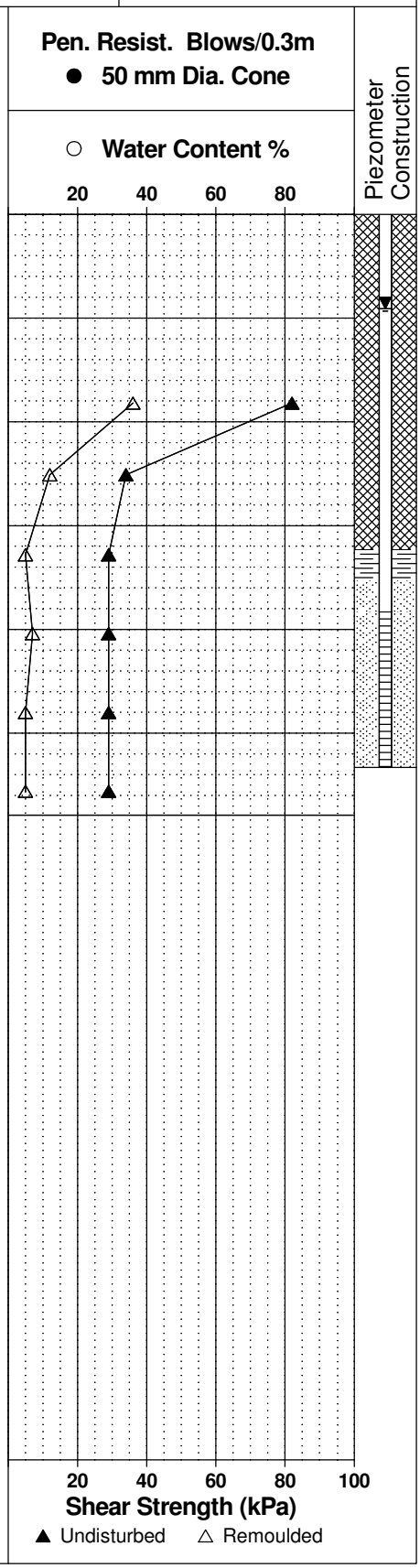
FILE NO. PG5161

REMARKS

HOLE NO. BH 3-21

BORINGS BY Track-Mount Power Auger **DATE** July 14, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.33
TOPSOIL 0.25		AU	1				
Compact, brown **SILTY SAND,** trace clay 0.46		AU	2				
Very stiff to stiff, brown **SILTY CLAY** with sand		SS	3	79	4	1	75.33
1.50		SS	4	75	P	2	74.33
Firm, grey **SILTY CLAY**						3	73.33
						4	72.33
5.79						5	71.33
End of Borehole							
(GWL @ 0.91m - July 21, 2021)							



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

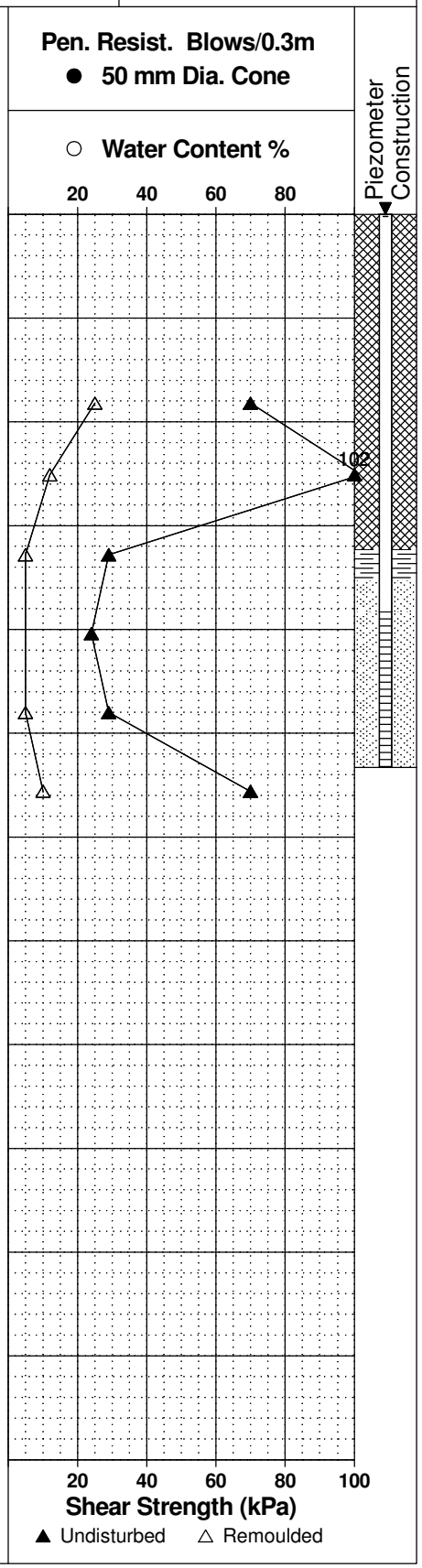
FILE NO. PG5161

REMARKS

HOLE NO. BH 4-21

BORINGS BY Track-Mount Power Auger **DATE** July 13, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.53
TOPSOIL 0.28		AU	1				
Compact, brown **SILTY SAND** 0.76		AU	2				
		SS	3	83	4	1	75.53
Stiff to very stiff, brown **SILTY CLAY,** trace sand		SS	4	83	P	2	74.53
3.00						3	73.53
Firm to stiff, grey **SILTY CLAY**						4	72.53
						5	71.53
5.79						6	70.53
Dynamic Cone Penetration Test commenced at 5.79m depth. Cone pushed to 18.0m depth.						7	69.53
						8	68.53
						9	67.53
						10	66.53
						11	65.53
						12	64.53



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Proposed Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

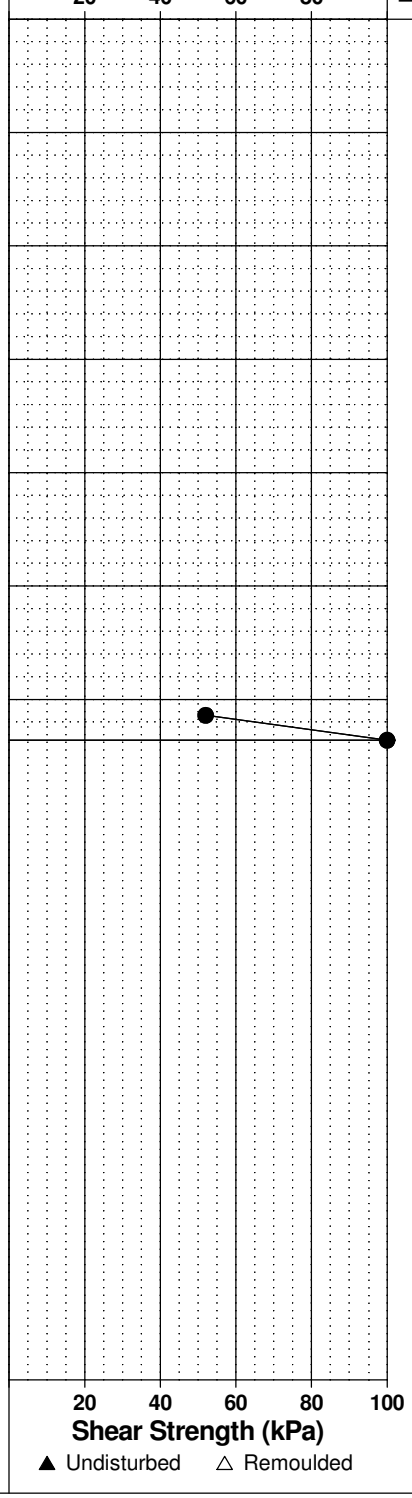
FILE NO. PG5161

REMARKS

HOLE NO. BH 4-21

BORINGS BY Track-Mount Power Auger **DATE** July 13, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						12	64.53		
						13	63.53		
						14	62.53		
						15	61.53		
						16	60.53		
						17	59.53		
						18	58.53		
18.36									
End of Borehole									
Practical DCPT refusal at 18.36m depth									



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

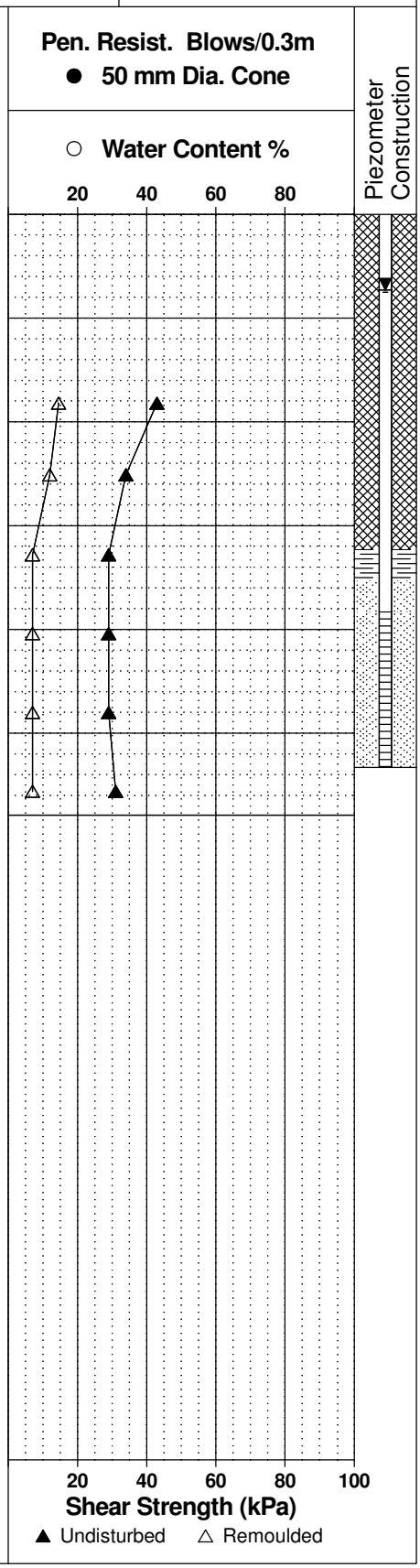
FILE NO. PG5161

REMARKS

HOLE NO. BH 5-21

BORINGS BY Track-Mount Power Auger **DATE** July 14, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.34
TOPSOIL 0.25		AU	1				
Compact, brown **SILTY SAND,** trace clay 0.41		AU	2				
		AU	3				
Very stiff to stiff, brown **SILTY CLAY** with sand		SS	4	67	3	1	75.34
1.50		SS	5	58	P	2	74.34
Firm, grey **SILTY CLAY,** trace sand						3	73.34
						4	72.34
						5	71.34
5.79							
End of Borehole							
(GWL @ 0.73m - July 21, 2021)							



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

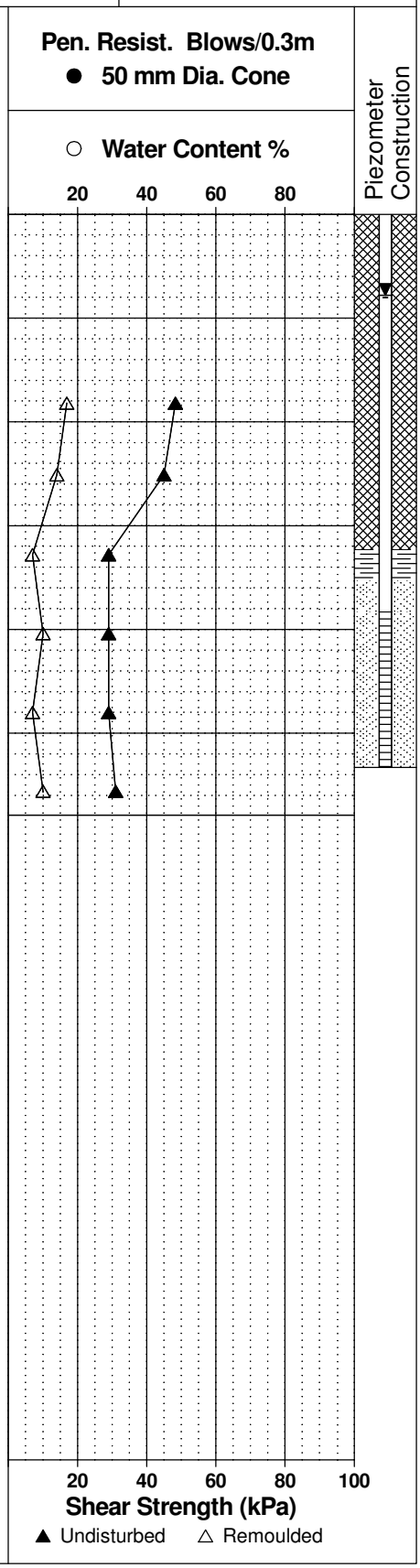
FILE NO. PG5161

REMARKS

HOLE NO. BH 6-21

BORINGS BY Track-Mount Power Auger **DATE** July 14, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.30
TOPSOIL 0.25		AU	1				
Comapct, brown **SILTY SAND** with topsoil 0.46		AU	2				
		AU	3				
Very stiff to stiff, brown **SILTY CLAY** with sand		SS	4	58	6	1	75.30
1.50							
		SS	5	71	P	2	74.30
Firm, grey **SILTY CLAY,** trace sand						3	73.30
						4	72.30
						5	71.30
5.79							
End of Borehole							
(GWL @ 0.78m - July 21, 2021)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

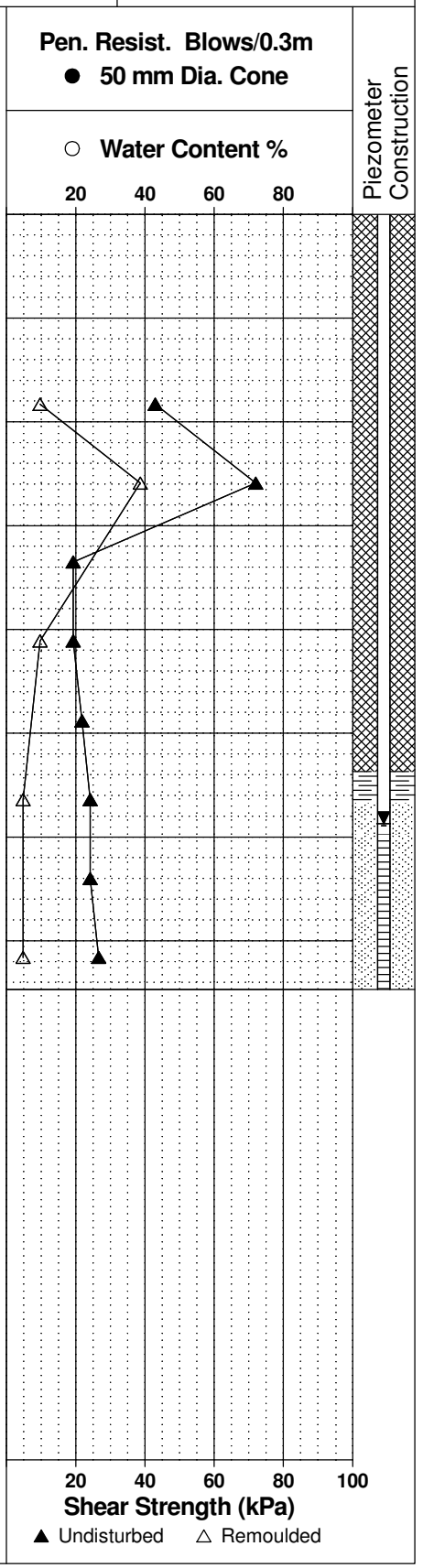
FILE NO. PG5161

REMARKS

HOLE NO. BH 1-20

BORINGS BY Track-Mount Power Auger **DATE** June 30, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.32
TOPSOIL 0.25		AU	1				
Brown **SILTY SAND** 0.38		SS	2	83	3	1	75.32
Firm, brown **SILTY SAND**						2	74.32
- soft to firm and grey by 3.0m depth						3	73.32
						4	72.32
						5	71.32
						6	70.32
7.47						7	69.32
End of Borehole							
(GWL @ 5.87m - July 22, 2020)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

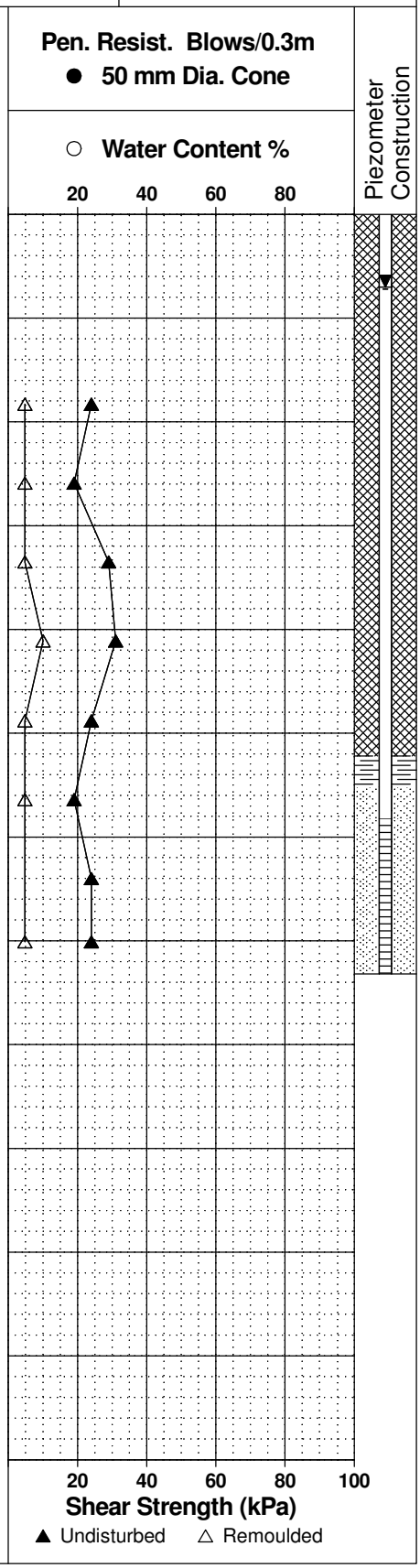
FILE NO. PG5161

REMARKS

HOLE NO. BH 2-20

BORINGS BY Track-Mount Power Auger **DATE** July 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.62
Very loose, brown **SILTY SAND,** some organics		AU	1				
0.56							
Brown **SILTY SAND** with sand seams		SS	2	79	3	1	75.62
1.52						2	74.62
						3	73.62
Firm to soft, grey **SILTY CLAY**						4	72.62
						5	71.62
						6	70.62
7.32						7	69.62
Dynamic Cone Penetration Test commenced at 7.32m depth. Cone pushed to 19.5m depth.						8	68.62
						9	67.62
						10	66.62
						11	65.62
						12	64.62



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

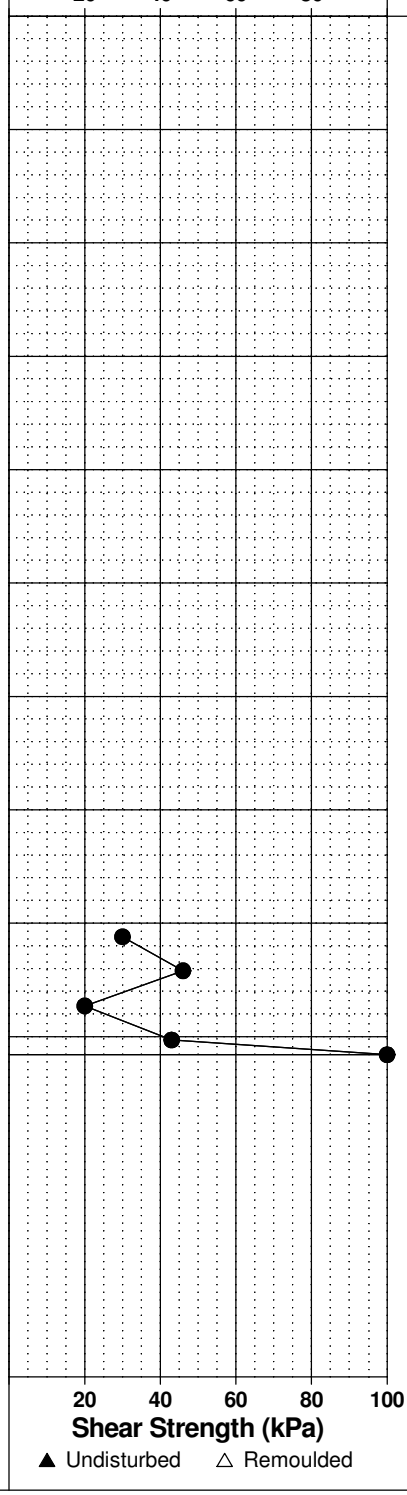
FILE NO. PG5161

REMARKS

HOLE NO. BH 2-20

BORINGS BY Track-Mount Power Auger **DATE** July 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						12	64.62		
						13	63.62		
						14	62.62		
						15	61.62		
						16	60.62		
						17	59.62		
						18	58.62		
						19	57.62		
						20	56.62		
21.16						21	55.62		
End of Borehole									
Practical DCPT refusal at 21.16m depth									
(GWL @ 0.70m - July 22, 2020)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

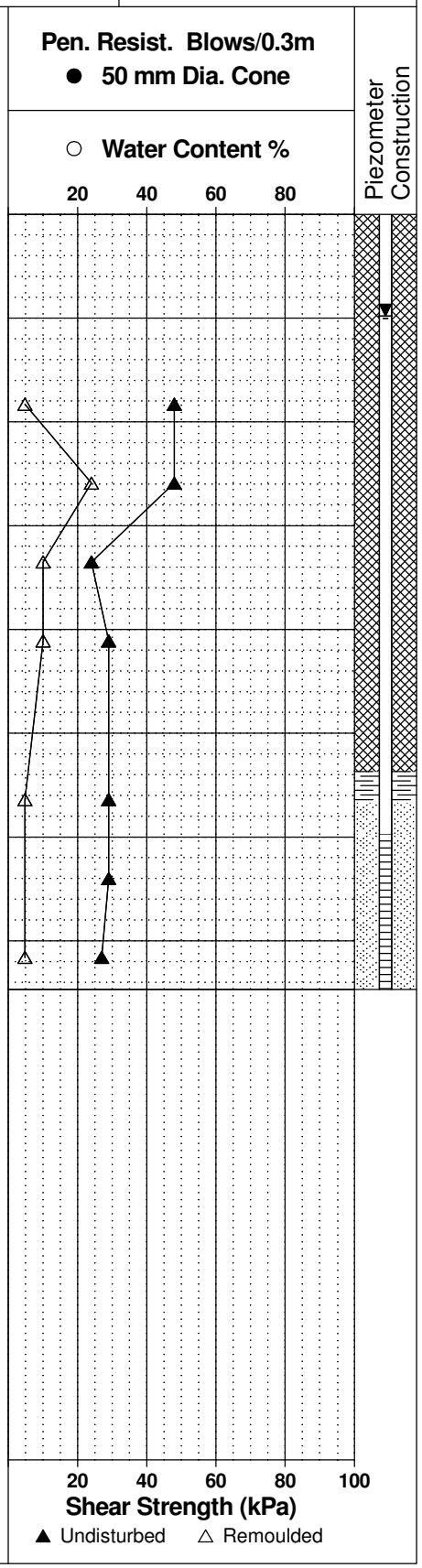
FILE NO. PG5161

REMARKS

HOLE NO. BH 3-20

BORINGS BY Track-Mount Power Auger **DATE** June 30, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.90
Loose, brown **SILTY SAND,** some organics, trace clay		AU	1				
		SS	2	58	8	1	75.90
1.27							
Firm, brow **SILTY CLAY**						2	74.90
- grey by 3.0m depth						3	73.90
						4	72.90
		SS	3	100	1	5	71.90
						6	70.90
7.47						7	69.90
End of Borehole							
(GWL @ 0.98m - July 22, 2020)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

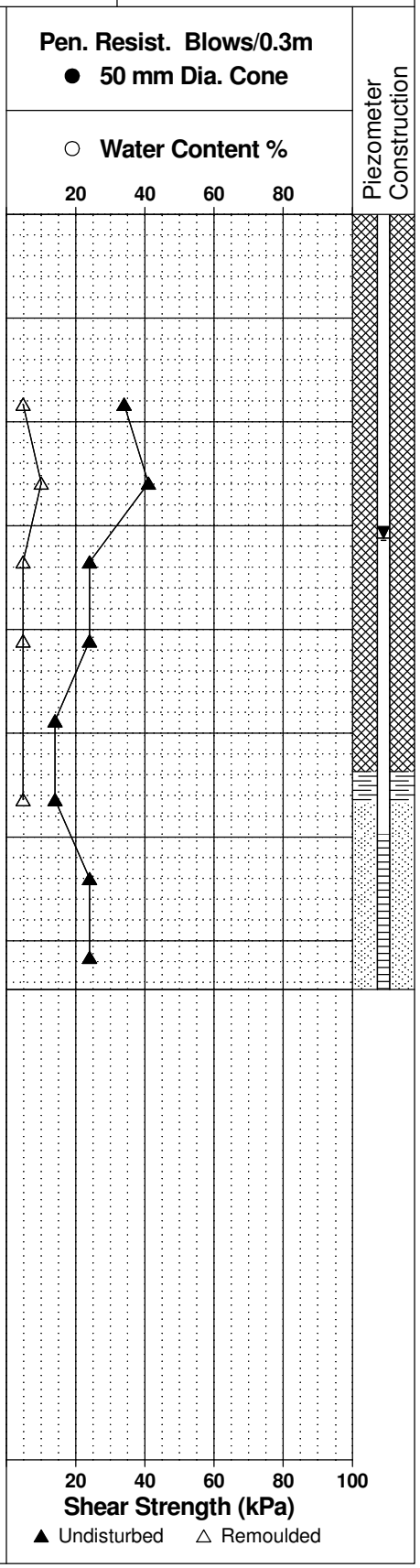
FILE NO. PG5161

REMARKS

HOLE NO. BH 4-20

BORINGS BY Track-Mount Power Auger **DATE** June 30, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.46
TOPSOIL 0.08		AU	1				
Very loose, brown **SILTY SAND,** trace organics 0.60		SS	2	46	2	1	75.46
						2	74.46
Firm, brown **SILTY CLAY**						3	73.46
- soft and grey by 3.0m depth						4	72.46
						5	71.46
						6	70.46
7.47						7	69.46
End of Borehole							
(GWL @ 3.12m - July 22, 2020)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

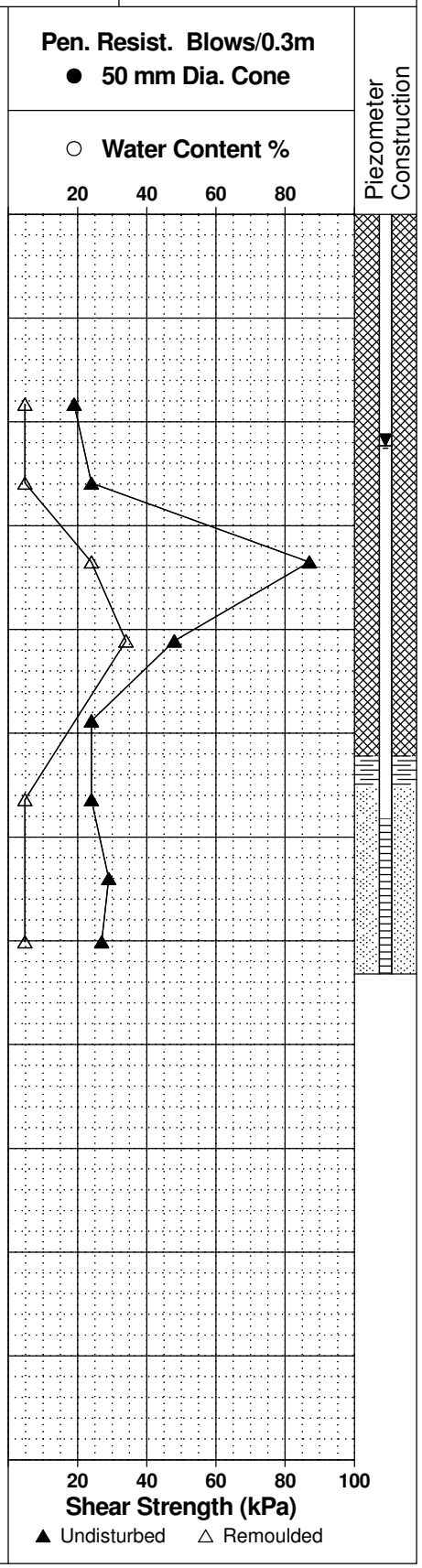
FILE NO. PG5161

REMARKS

HOLE NO. BH 5-20

BORINGS BY Track-Mount Power Auger **DATE** June 30, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	77.03
TOPSOIL 0.10		AU	1				
Loose, brown **SILTY SAND,** trace organics		SS	2	42	4	1	76.03
1.30							
Firm, brown **SILTY CLAY** 1.52						2	75.03
Soft to firm, grey **SILTY CLAY,** trace sand seams						3	74.03
						4	73.03
						5	72.03
						6	71.03
7.32						7	70.03
Dynamic Cone Penetration Test commenced at 7.32m depth. Cone pushed to 15.2m depth.						8	69.03
						9	68.03
						10	67.03
						11	66.03
						12	65.03



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

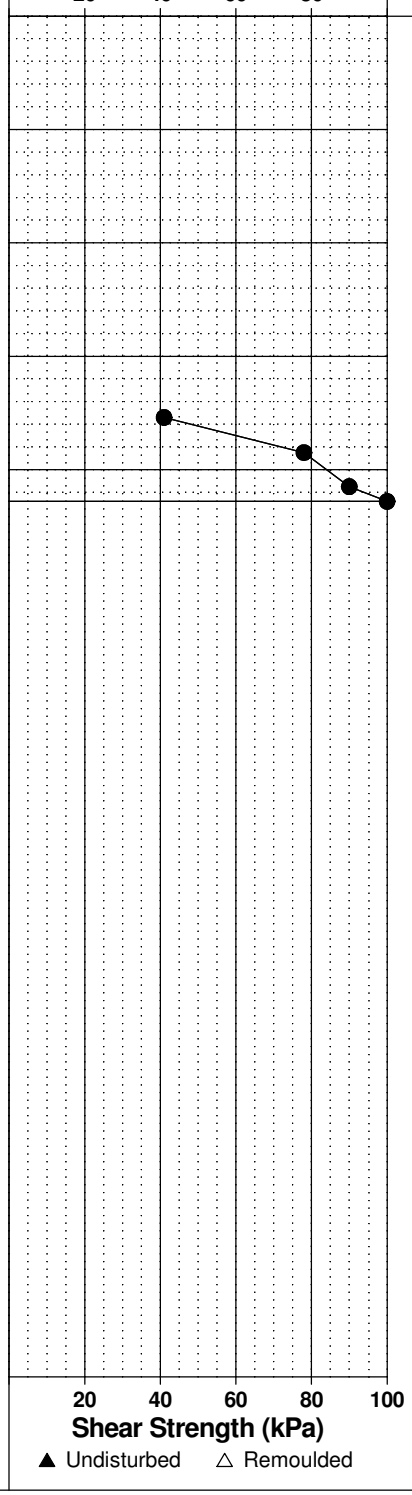
FILE NO. PG5161

REMARKS

HOLE NO. BH 5-20

BORINGS BY Track-Mount Power Auger **DATE** June 30, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0			
						12	65.03		
						13	64.03		
						14	63.03		
						15	62.03		
						16	61.03		
16.28									
End of Borehole Practical DCPT refusal at 16.28m depth (GWL @ 2.23m - July 22, 2020)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

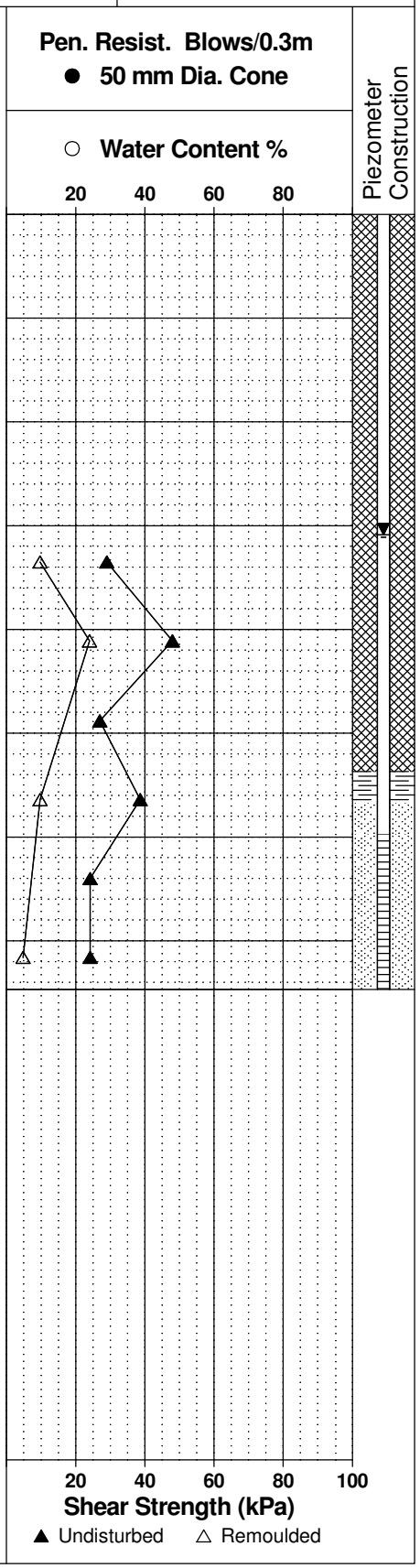
FILE NO. PG5161

REMARKS

HOLE NO. BH 6-20

BORINGS BY Track-Mount Power Auger **DATE** June 30, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.93
Compact, brown **SILTY SAND**		AU	1				
		SS	2	33	10	1	75.93
1.37							
		SS	3	100	1	2	74.93
						3	73.93
Firm to soft, grey **SILTY CLAY**						4	72.93
						5	71.93
						6	70.93
						7	69.93
7.47							
End of Borehole							
(GWL @ 3.09m - July 22, 2020)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Warehouse Development - Thunder Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5161

REMARKS

HOLE NO. BH 7-20

BORINGS BY Track-Mount Power Auger **DATE** June 30, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.90
TOPSOIL 0.15		AU	1				
FILL: Brown silty sand 0.81		SS	2	100	2	1	75.90
Very loose, brown **SILTY SAND** with clay		SS	3	100	W	2	74.90
- grey by 2.3m depth						3	73.90
3.81						4	72.90
Soft, grey **SILTY CLAY**						5	71.90
5.94							
End of Borehole							
(GWL @ 1.15m - July 22, 2020)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
5368 Boundary Road and 6150 Thunder Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Annis, O'Sullivan, Vollebekk Ltd.

FILE NO. PE4480

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** December 19, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	77.22
TOPSOIL		AU	1				
0.30							
Loose, brown **SILTY SAND**		SS	2	42	6	1	76.22
1.52							
		SS	3	83	W	2	75.22
Brown **SILTY CLAY**							
		SS	4	83	W		
- grey by 2.7m depth						3	74.22
		SS	5	71	9		
						4	73.22
		SS	6	96	W		
4.42							
End of Borehole							
(GWL @ 0.93m - Jan. 14, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
5368 Boundary Road and 6150 Thunder Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Annis, O'Sullivan, Vollebekk Ltd.

FILE NO. PE4480

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** December 19, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.76
TOPSOIL							
0.25		AU	1				
Very loose, brown **SILTY SAND**						1	75.76
1.07		SS	2	38	2		
Brown **SILTY CLAY**		SS	3	88	W	2	74.76
- grey by 2.2m depth		SS	4	83	4		
		SS	5	100	W	3	73.76
		SS	6	100	W	4	72.76
4.42							
End of Borehole							
(GWL @ 0.46m - Jan. 14, 2019)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
5368 Boundary Road and 6150 Thunder Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Annis, O'Sullivan, Vollebekk Ltd.

FILE NO. PE4480

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** December 19, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.90
TOPSOIL							
0.30		AU	1				
Very loose, brown **SILTY SAND**							
0.97		SS	2	88	3	1	75.90
		SS	3	12	W	2	74.90
Brown **SILTY CLAY**							
		SS	4	100	W		
- grey by 3.0m depth						3	73.90
		SS	5	92	W		
						4	72.90
		SS	6	100	W		
4.42							
End of Borehole							
(GWL @ 0.42m - Jan. 14, 2019)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their "sensitivity". The sensitivity, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, if the bulk of the fractures caused by drilling stresses (called "mechanical breaks") are easily distinguishable from the normal in situ fractures.

RQD %	**ROCK QUALITY**
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC%	-	Natural water content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic Limit, % (water content above which soil behaves plastically)
PI	-	Plasticity Index, % (difference between LL and PL)
Dxx	-	Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2$ / (D10 x D60)
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

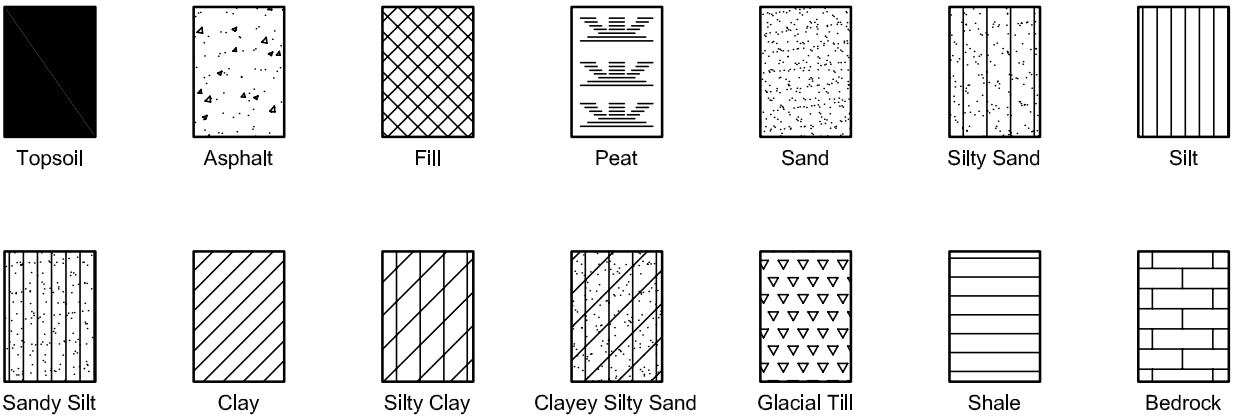
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

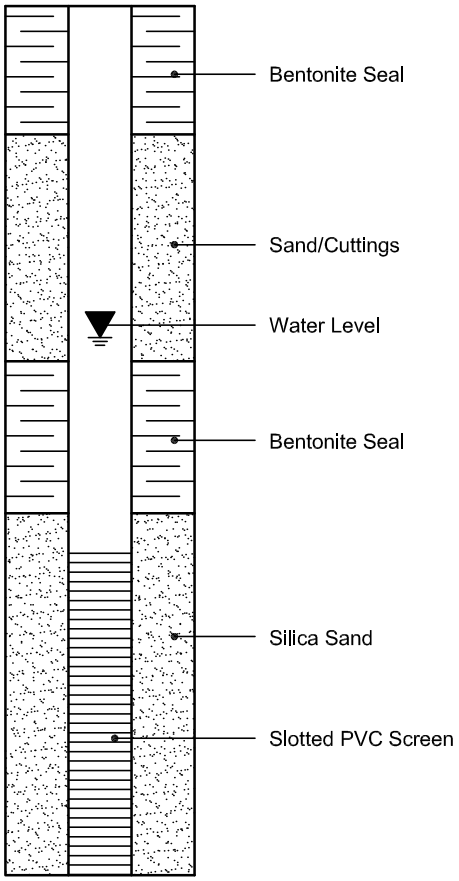
SYMBOLS AND TERMS (continued)

STRATA PLOT

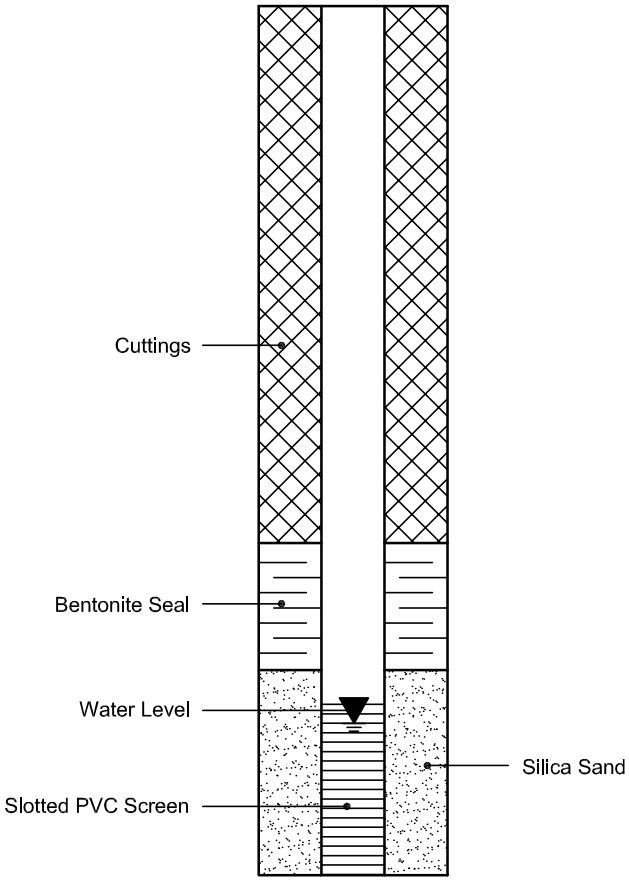


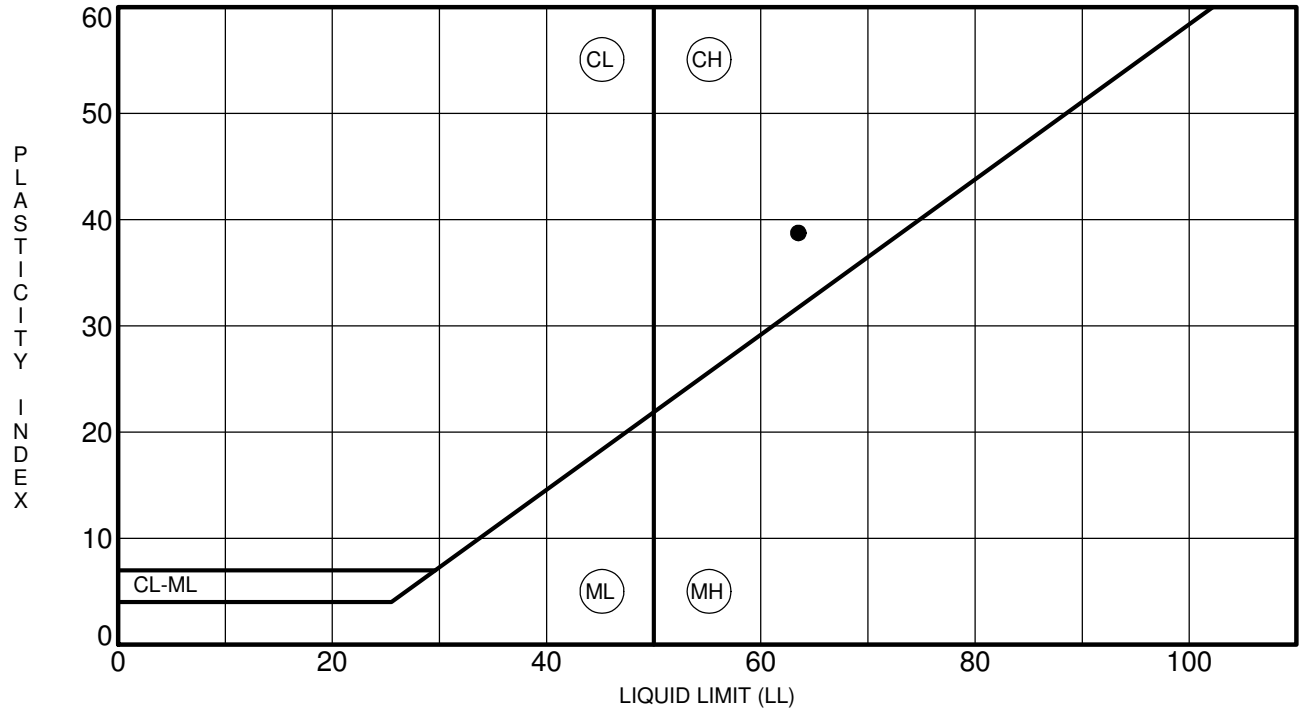
MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION





Specimen Identification	LL	PL	PI	Fines	Classification
● **BH 2-21 SS 3**	**64**	**25**	**39**		**CH - Inorganic clays of high plasticity**

CLIENT	**Exit 96 Developments**	FILE NO.	**PG5161**
PROJECT	**Geotechnical Investigation - Prop. Warehouse Development - Thunder Road**	DATE	**15 Apr 21**

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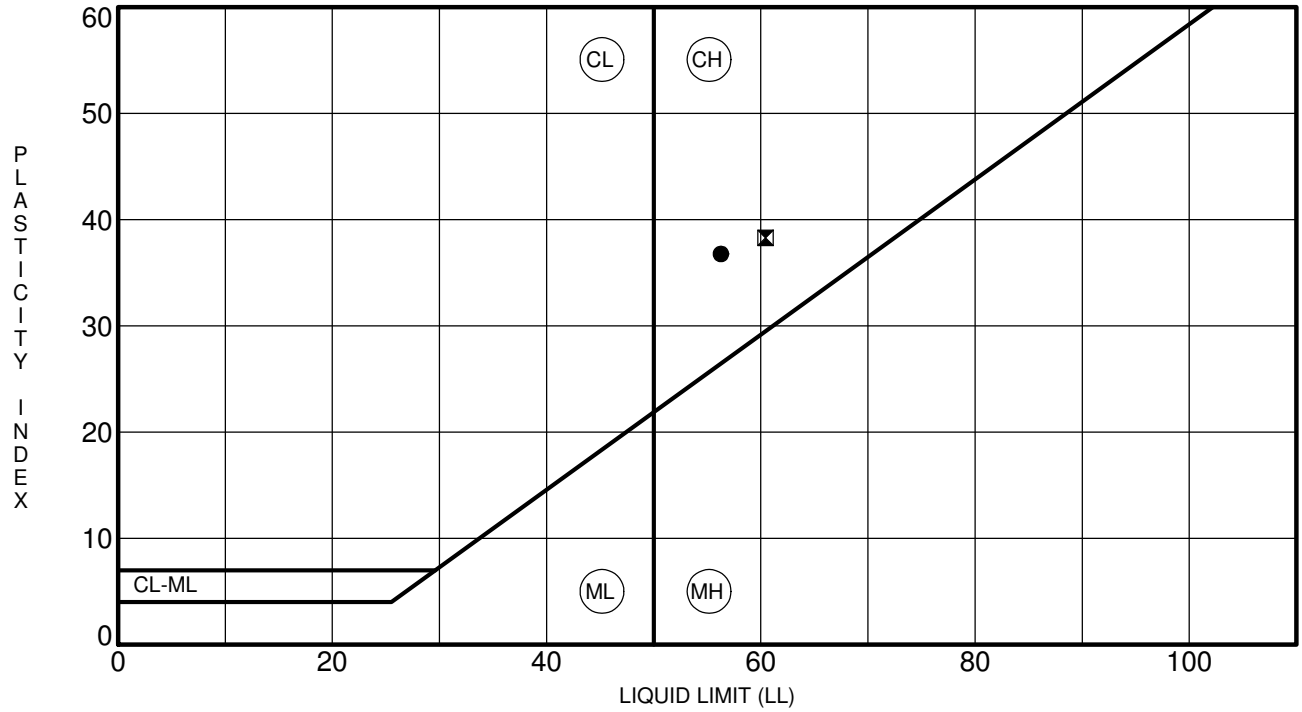
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

ATTERBERG LIMITS' RESULTS



Specimen Identification			LL	PL	PI	Fines	Classification
●	**BH 5-21**	**SS 5**	**56**	**19**	**37**		**CH - Inorganic clays of high plasticity**
⊠	**BH 6-21**	**SS 5**	**60**	**22**	**38**		**CH - Inorganic clays of high plasticity**

CLIENT	**Exit 96 Developments**	FILE NO.	**PG5161**
PROJECT	**Supplemental Geotechnical Investigation - Proposed Warehouse Development - Thunder Road**	DATE	**14 Jul 21**

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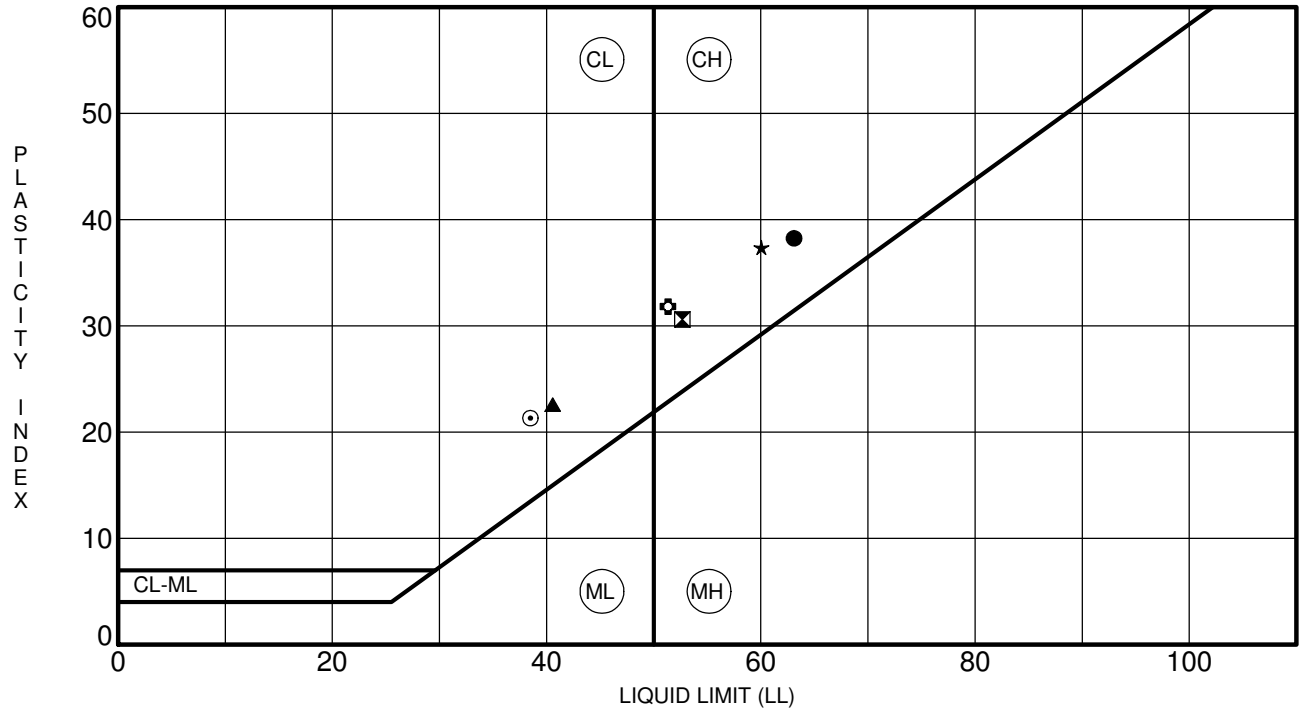
ATTERBERG LIMITS' RESULTS



Specimen Identification			LL	PL	PI	Fines	Classification
●	**BH 1-20**	**SS 2**	**63**	**25**	**38**		**CH - Inorganic clays of high plasticity**
⊠	**BH 2-20**	**SS 2**	**53**	**22**	**31**		**CH - Inorganic clays of high plasticity**
▲	**BH 3-20**	**SS 2**	**41**	**18**	**23**		**CL - Inorganic clays of low plasticity**
★	**BH 4-20**	**SS 2**	**60**	**23**	**37**		**CH - Inorganic clays of high plasticity**
⊙	**BH 5-20**	**SS 2**	**38**	**17**	**21**		**CL - Inorganic clays of low plasticity**
✿	**BH 6-20**	**SS 3**	**51**	**20**	**32**		**CH - Inorganic clays of high plasticity**

CLIENT **Exit 96 Developments** FILE NO. **PG5161**

PROJECT **Geotechnical Investigation - Prop. Warehouse Development - Thunder Road** DATE **30 Jun 20**

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ATTERBERG LIMITS' RESULTS

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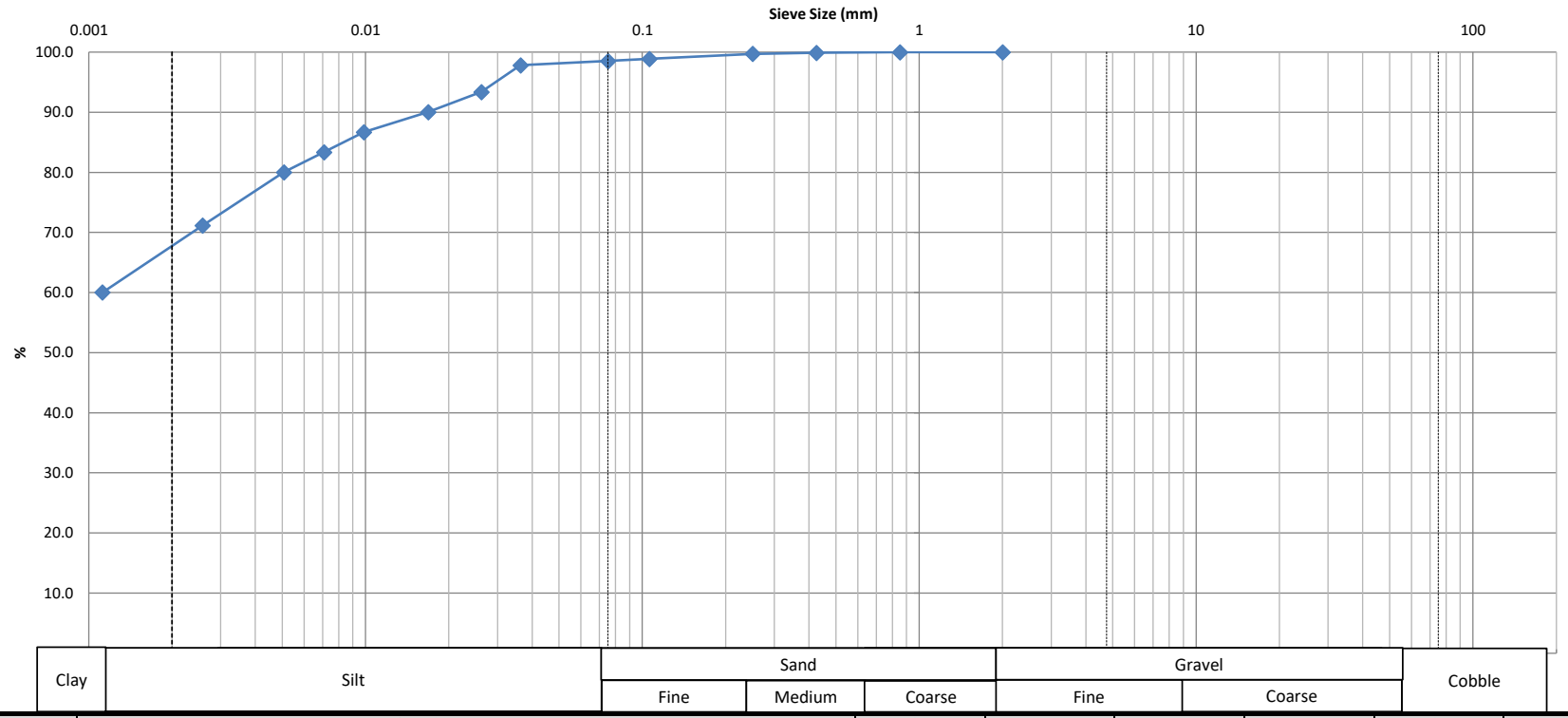
SIEVE ANALYSIS **ASTM C136**

CLIENT:	Exit 96 Developments	DEPTH:	5' - 7'	FILE NO:	PG5161
CONTRACT NO.:		BH OR TP No.:	BH6 SS3	LAB NO:	18125
PROJECT:	Thunder Road @ Boundary Road			DATE RECEIVED:	22-Jul-20
				DATE TESTED:	23-Jul-20
DATE SAMPLED:	22-Jul-20			DATE REPORTED:	0-Jan-00
SAMPLED BY:	A.C.			TESTED BY:	DB



Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					40.3					
	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)		Clay (%)	
					0.0	1.5	28.0		70.5	

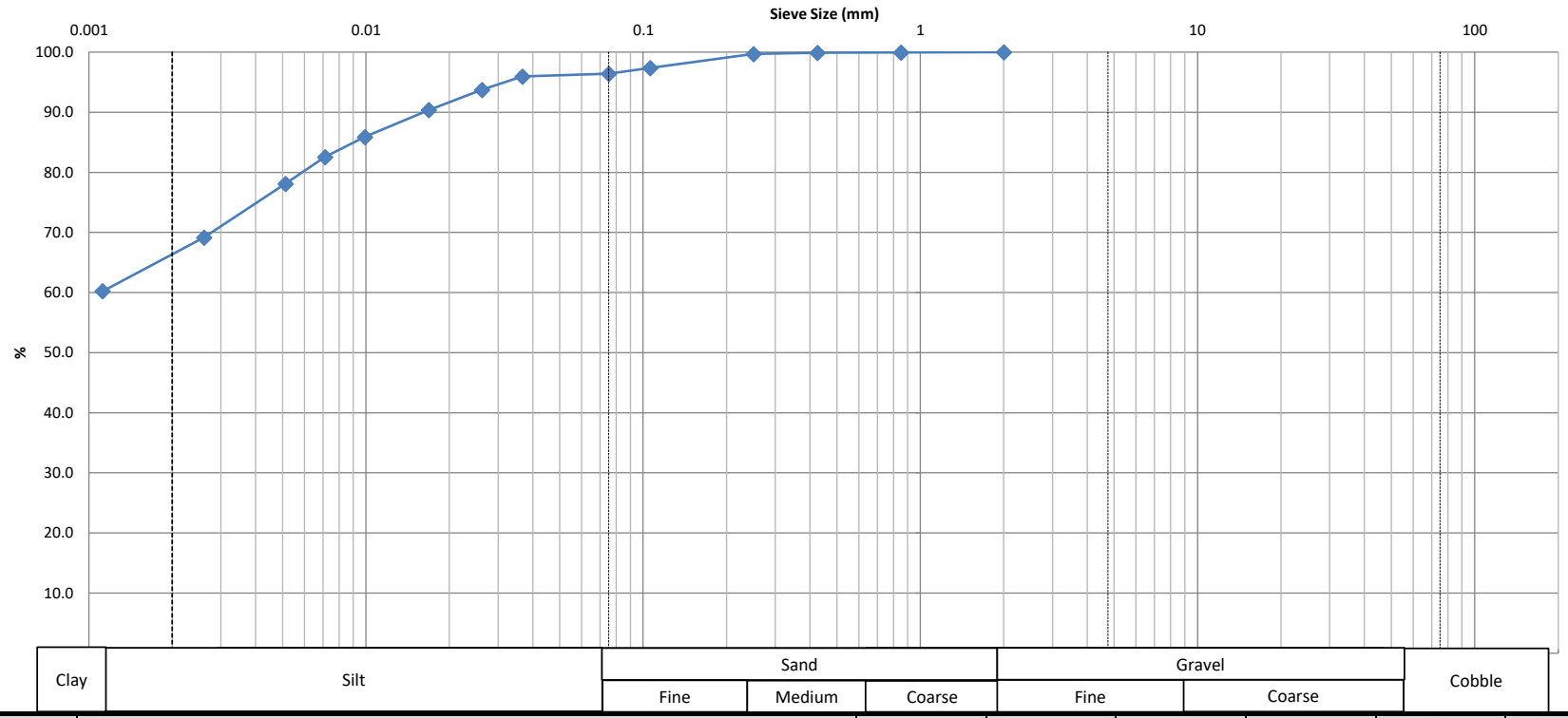
Comments:

REVIEWED BY:	Curtis Beadow	Joe Fosyth, P. Eng.

patersongroup
consulting engineers

SIEVE ANALYSIS **ASTM C136**

CLIENT:	Exit 96 Developments	DEPTH:	5' - 7 '	FILE NO:	PG5161
CONTRACT NO.:		BH OR TP No.:	BH2 SS3	LAB NO:	18126
PROJECT:	Thunder Road @ Boundary			DATE RECEIVED:	22-Jul-20
				DATE TESTED:	23-Jul-20
DATE SAMPLED:	22-Jul-20			DATE REPORTED:	1-Aug-20
SAMPLED BY:	A.C.			TESTED BY:	DB



Identification	Soil Classification	MC(%)	LL	PL	PI	Cc	Cu
		38.7					

D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
				0.0	3.6	25.9	70.5

Comments:

REVIEWED BY:	Curtis Beadow	Joe Fosyth, P. Eng.

6160 Thunder Road

PH4944

PREDICTIVE NITRATE IMPACT ASSESSEMENT

Infiltration Factors		
Topography	0.20	
Soil	0.40	
Cover	0.10	
Total	**0.70**	
Site Characteristics		
Area of Site :	152200	m^2
Total of roof areas:	1304	m^2
Total area of paved driveway areas:	86771	m^2
Roof + paved driveway areas	88075	m^2
Impervious Area	88075	m^2
Percent Impervious Area =	58	%
Infiltration Area =	64125	m^2
Septic Effluent		
Concentration of Effluent (Cs) =	40	mg/L
Daily Sewage Flow (Qs)=	1.875	m^3
See Notes below.		
Infiltration Calculation		
Nitrate concentration in precipitation (C_i) =	0	mg/L
Surplus Water (Environment Canada)	379	mm/yr
Factored Water Surplus =	265	mm/yr
Infiltration % due to stormwater management measures	-	%
Infiltration rate from stormwater management measures =	0	mm/yr
Infiltration Flow Entering the System (Q_i) =	47	m^3/day
Mass Balance Model (MOEE, 1995)		
$C_T = (Q_bC_b+Q_eC_e+Q_iC_i)/(Q_b+Q_e+Q_i)$ = Cumulative Nitrate Concentration		
Q_b = flow entering the system across the upgradient area	0	m^3/day
C_b = background nitrate concentration	0	mg/L
Q_e = flow entering the system from the septic drainfield	1.875	m^3/day
C_e = concentration of nitrates in the septic effluent	40	mg/L
Q_i = flow entering the system from infiltration	47	m^3/day
C_i = Concentration of nitrates in the infiltrate	0	mg/L
C_T =	**1.55**	**mg/L**

Notes: Site characteristic values were measured as approximate values from the available site plan. Daily Sewage Flow volume was calculted by Paterson Group as a preliminary design flow.

BOUNDARY ROAD

THUNDER ROAD

BH 1
77.22

BH 1-20
76.32

BH 1-21
76.96

BH 2-21
76.76
(55.63)

BH 2-20
76.62
(55.46)

BH 2
76.76

BH 3
76.90

BH 3-21
76.33

BH 3-20
76.90

BH 4-21
76.53
(58.17)

BH 4-20
76.46

BH 5-21
76.34

BH 5-20
77.03
(60.75)

BH 6-21
76.30

BH 6-20
76.93

BH 7-20
76.90

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT PE4480, 2018
- 77.03 GROUND SURFACE ELEVATION (m)
- (60.75) PRACTICAL DCPT REFUSAL ELEVATION (m)

ALL GROUND SURFACE ELEVATIONS REFERENCE A GEODETIC DATUM (NAD83 ZONE 18T).

SCALE: 1:2500

0 25 50 75 100 125 150 175m

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL
2	BH 3-21 AND BH 6-21 ADDED	19/07/2021	JV
1	BH 1-21 AND BH 2-21 ADDED	21/04/2021	JV

AVENUE 31

GEOTECHNICAL INVESTIGATION
6150 THUNDER ROAD AND 5368 BOUNDARY ROAD
OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:2500	Date: 08/2020
Drawn by: NFRV	Report No.: PG5161-1
Checked by: JV	PG5161-1
Approved by: DJG	Revision No.: 2

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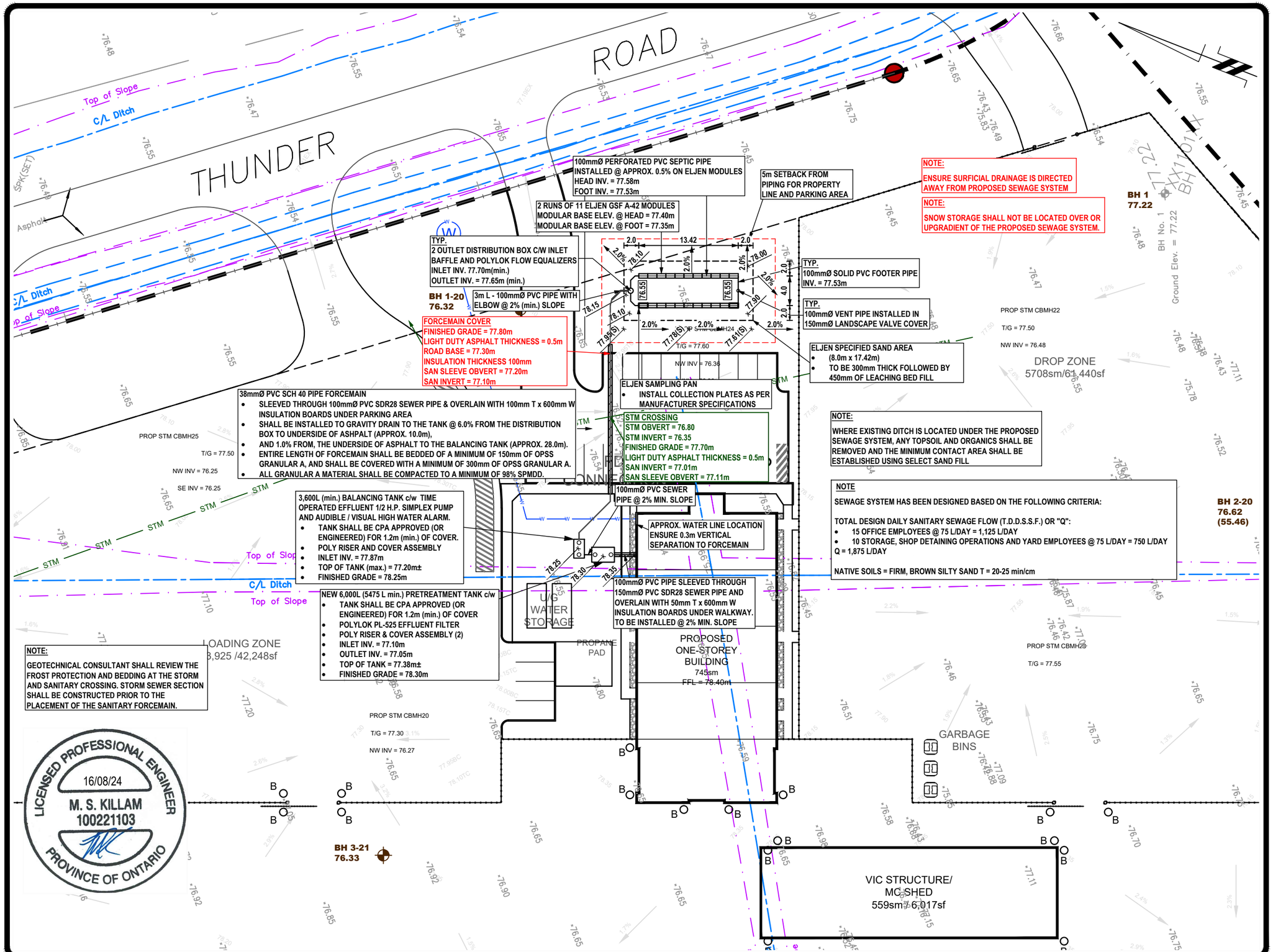

LEGEND:

✥	Bore Hole Location - as per Paterson Group Report No. PG5161-1(rev.3)
x 100.99	Existing Ground Surface Elev. (m)
x 102.30	Proposed Ground Surface Elev. (m)
x 102.30(s)	Proposed Swale Elev. (m)
77.55	Proposed Subgrade Elev. (m)
TBC	To be Confirmed
⌐	Proposed Structure
←	Surficial Flow Direction

All units are in meters unless otherwise specified.

BENCHMARK INFORMATION:

Refer to Grading and Drainage Plan No. C304, dated July, 2024, by LRL Engineering.

REFERENCE:

Base Plan Information obtained from Site Plan No. SPA-1, dated June 26, 2024, by McRobie Architects and Interior Designers

Topographic obtained from Grading and Drainage Plan No. C304, dated July, 2024, by LRL Engineering.

DD/MM/YY	DESCRIPTION	REV.
16/08/24	Revised Per Client Request	5
15/08/24	Issued for Final Review	4
08/08/24	Revised Forcemain Layout	3
06/08/24	Revised per Storm Crossing Elevations.	2
30/07/24	Revised per Preliminary Discussion Comments	1
12/07/24	Issued for Preliminary Review	0

Consultant:

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7Z9
TEL: (613) 226-7381

Client:

THUNDER ROAD LIMITED PARTNERSHIP

Project:

PROPOSED COMMERCIAL FACILITY

6160 THUNDER ROAD
OTTAWA (VARS), ONTARIO

Drawing:

SEWAGE SYSTEM LAYOUT PLAN

Scale:	Drawn by:
1:500	HV
Date: 08/2024	Checked by: MK

Drawing No.:

PH4944-1(rev.5)

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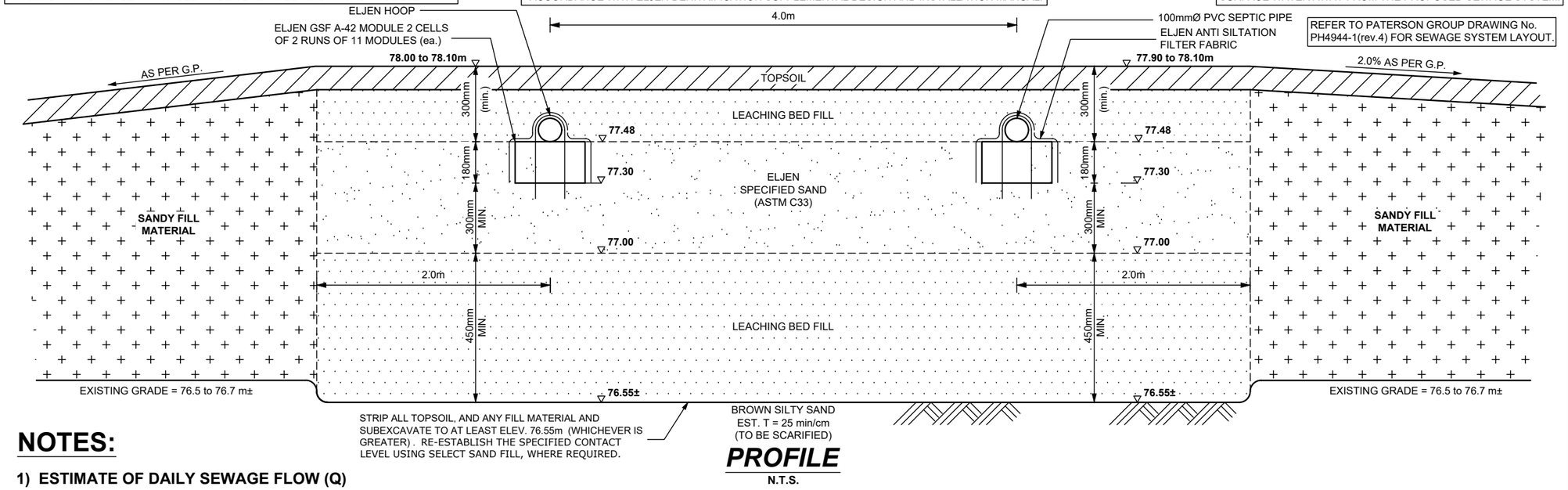
COVER MATERIAL TO CONSIST OF LEACHING BED FILL FOLLOWED BY APPROX. 100mm OF SANDY TOPSOIL. LEACHING BED TO BE VEGETATED AS SOON AS POSSIBLE.

SEWAGE SYSTEM DESIGN, SPECIFICATION, DETAILS AND NOTES HAVE BEEN COMPLETED IN ACCORDANCE WITH ELJEN DENITRIFICATION SUPPLEMENTAL DESIGN AND INSTALLATION MANUAL.

FINAL GRADING SHALL BE SUITABLY SHAPED TO DIRECT SURFACE WATER AWAY FROM THE PROPOSED SEWAGE SYSTEM.

REFER TO PATERSON GROUP DRAWING No. PH4944-1(rev.4) FOR SEWAGE SYSTEM LAYOUT.



PROFILE

N.T.S.

NOTES:

1) ESTIMATE OF DAILY SEWAGE FLOW (Q)

THE PROPOSED SEWAGE SYSTEM HAS BEEN DESIGNED TO SUPPORT A COMMERCIAL TYPE USAGE CONSISTING OF OFFICE, AND STORAGE, SHOP AND DETAINING OPERATIONS SPACE. THE DAILY DESIGN SEWAGE FLOW RATE IS CALCULATED IN ACCORDANCE WITH O.B.C. TABLE 8.2.1.3.B.

OFFICE SPACE:

- 75 L/DAY x 15 EMPLOYEES = 1,125 L/DAY

STORAGE, SHOP, DETAINING OPERATIONS AND YARD SPACE:

- 75 L/DAY x 10 EMPLOYEES = 750 L/DAY

ESTIMATED SEWAGE FLOW = 1,875 L/DAY

2) SOIL CONDITIONS

SOILS INFORMATION GATHERED BY PATERSON GROUP INC. ON JULY 1, 2020. REFER TO PATERSON GROUP REPORT PG6308-1 FOR FULL SOILS BREAKDOWN.

BH 1-20, ELEV. 76.32m		BH 2-20, ELEV. 76.62m	
0-0.25	TOPSOIL	0-0.56	VERY LOOSE, BROWN SISA, SOME ORGANICS
0.25-0.38	BROWN SILTY SAND	0.56-1.52	BROWN SILTY SAND
0.38-7.47	FIRM BROWN SILTY CLAY GREYING @ 3.0m DEPTH	1.52-7.32	FIRM TO SOFT GREY SILTY CLAY
- TH DRY UPON COMPLETION		- TH DRY UPON COMPLETION	

1) PRETREATMENT TANK

- TANK SHALL BE CONNECTED TO BUILDING BY A 150mm Ø PVC PIPE SLEEVED THROUGH A 200mmØ PVC SDR 28 PIPE AND OVERLAIN WITH 50mm T x 600mm W RIGID INSULATION BOARDS (UNDER ROADWAY) AND SHALL BE INSTALLED AT 2.0% (min.) SLOPE TO THE PRETREATMENT TANK.
- MINIMUM WORKING CAPACITY OF PRETREATMENT TANK = (3 x Q) = 3 x 1,875 L/DAY = 5,625 L (min.)
- IT IS RECOMMENDED THAT A NEW 6,000L MIN. TWO-COMPARTMENT CONCRETE SEPTIC TANK BE INSTALLED.
- AN OBC APPROVED EFFLUENT FILTER (I.E. POLYLOK PL-525 EFFLUENT FILTER, OR EQUIVALENT) SHALL BE INSTALLED ON THE OUTLET PIPE IN THE PRETREATMENT TANK.
- THE ACCESS LIDS TO THE TANK OPENINGS SHALL BE EXTENDED TO THE GROUND SURFACE. INSTALL RISERS AND COVERS TO SUIT.
- ACCESS LIDS SHALL INCLUDE SAFETY DEVICES AS PER CSA B66-21.

4) LEACHING BED SIZING CRITERIA

- NO. OF MODULES REQUIRED = Q/95 = 1,875/95 = 19.7 MODULES
- USE 2 RUNS OF 11 (22) ELJEN GSF A-42 MODULES EACH
- SAND AREA REQUIRED = QT/400 = 1,875(20)/400 = 117.2m²
- SAND AREA PROVIDED = 8.0m x 17.42m = 139.4m² (min.)

5) BALANCING TANK

- INSTALL A 3,600L MIN. BALANCING TANK IN SERIES AND DOWNSTREAM FROM THE NEW SEPTIC TANK.
- A TIME OPERATED SIMPLEX PUMPING SYSTEM (I.E. MYERS ME3F, OR SIMILAR) AND A HIGH WATER ALARM SHALL BE INSTALLED IN THE BALANCING TANK.
- THE TIME OPERATIONAL PUMPING SYSTEM SHALL OPERATE EVERY HOUR (I.E. 79 L/DOSE + VOLUME TO CHARGE THE SYSTEM - 33 L)
- A 3mmØ DRAIN HOLE SHALL BE INSTALLED IN THE UNDERSIDE OF THE FORCEMAIN IN THE BALANCING TANK NEAR THE WALL CONNECTION.
- RISERS WITH A COVER SHALL BE INSTALLED OVER THE BALANCING TANK TO PROVIDE ACCESS FROM THE GROUND SURFACE.
- DISCHARGE PIPING FOR PUMP SHALL BE CONFIGURED SUCH THAT THE PUMP IS EASILY SERVICED FROM THE GROUND SURFACE.

6) DISTRIBUTION BOX / FORCEMAIN

- A 38mmØ (NOMINAL) PVC SCH 40 FORCEMAIN SHALL BE USED TO CARRY THE EFFLUENT FROM THE BALANCING TANK TO THE 3m L x 100mm Ø PVC SEWER PIPE.
- 100mm SEWER PIPE SHALL DRAIN BY GRAVITY TO A 2 OUTLET DISTRIBUTION BOX.
- THE FORCE MAIN SHALL BE INSTALLED TO GRAVITY DRAIN TO THE BALANCING TANK @ 6.0% FROM THE DISTRIBUTION BOX TO THE UNDERSIDE OF ASPHALT (APPROX. 10m) AND 1.0% FROM THE UNDERSIDE OF ASPHALT TO THE BALANCING TANK (APPROX. 28.0m).
- THE FORCE MAIN SHALL BE OVERLAIN WITH 100mm T x 600mm C/W RIGID INSULATION AND SHALL BE SLEEVED THROUGH A 100mmØ SDR 28 SEWER PIPE.
- THE FORCEMAIN SHALL BE BEDDED ON A MINIMUM OF 150mm OF OPSS GRANULAR 'A' AND SHALL BE COVERED WITH A MINIMUM OF 300mm GRANULAR 'A'. GRANULAR SHALL BE COMPACTED TO A MINIMUM OF 98% SPMDD.
- THE DISTRIBUTION BOX SHALL BE EQUIPPED WITH AN INLET BAFFLE AND OUTLET PIPES (4).
- EACH PIPING RUN SHALL BE FED BY A 2 OUTLET DISTRIBUTION BOX.
- THE DISTRIBUTION BOX SHALL BE CONNECTED TO THE DISTRIBUTION PIPING RUNS USING 100mmØ SOLID PVC SEWER PIPE @ 2% (min.) SLOPE.

7) LEACHING BED CONSTRUCTION GUIDELINES

- REMOVE ALL EXISTING TOPSOIL, ORGANICS AND ANY FILL MATERIAL, WITHIN THE LIMITS OF THE SAND AREA AND SUBEXCAVATE TO AT LEAST ELEVATION 76.55m, WHICHEVER IS GREATER. RE-ESTABLISH THE SPECIFIED CONTACT LEVEL USING SELECT SAND FILL, WHERE REQUIRED.
- THE SUBGRADE SURFACE SHALL BE SCARIFIED, UNDER DRY CONDITIONS.
- PLACE A 450mm MIN. THICK LAYER OF LEACHING BED FILL OVER THE SUITABLY PREPARED SUBGRADE.
- LEACHING BED SAND FILL SHALL BE UNIFORM SAND WITH GRADING LIMITS SIMILAR TO 100% PASSING 13.2mm SIEVE, LESS THAN 5% PASSING 0.075mm SIEVE, AND HAVING A PERCOLATION TIME OF 6 TO 8 min/cm. LEACHING BED FILL SHALL BE PRE- APPROVED BY THE CONSULTANT.
- PLACE A 300mm MIN. THICK LAYER OF ELJEN SPECIFIED SAND FILL OVER THE LEACHING BED FILL.
- THE ELJEN SPECIFIED SAND FILL SHALL CONSIST OF WASHED SAND MEETING THE REQUIREMENTS OF ASTM C33 "STANDARD SPECIFICATION FOR CONCRETE AGGREGATES" WITH LESS THAN THAN 5% PASSING 0.075mm SIEVE. ELJEN SPECIFIED SAND FILL SHALL BE PRE-APPROVED BY THE CONSULTANT.
- THE MODULES SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- THE MODULES SHALL BE INSTALLED AT A 0.5% SLOPE, END TO END AND WITH THE WHITE DEMARCATION LINE FACING UP.
- THE MODULAR BASE LEVEL (ELEV. 76.40 AT THE HEAD AND 76.35m AT THE FOOT) SHALL BE ESTABLISHED WITH ELJEN SPECIFIED SAND FILL, HAVING A MINIMUM THICKNESS OF 150mm.
- THE ELJEN MODULES SHALL BE FED BY GRAVITY BY A 100mmØ PVC SEWER PIPE @ 2% (min.) SLOPE FROM THE DISTRIBUTION BOX TO BE OVERLAIN WITH 50mm T x 600mm W RIGID INSULATION BOARDS
- THE DISTRIBUTION PIPE SHALL CONSIST OF A 100mmØ PERFORATED PVC PIPE CENTRED OVER THE MODULES. THE PIPE SHALL BE SECURED TO THE TOP OF THE MODULES USING AN ELJEN HOOP (MINIMUM 1 HOOP PER MODULE).
- THE INVERT LEVEL OF THE DISTRIBUTION PIPE SHALL BE SET ON THE MODULES AT A 0.5% AT ELEVATION 77.58m AT THE HEAD AND 77.53m AT THE FOOT. THE END OF THE PIPE RUNS SHALL BE CONNECTED TO A 100mmØ SOLID PVC FOOTER PIPE
- INSTALL ELJEN SYSTEM SAMPLING DEVICE AS PER MANUFACTURER'S RECOMMENDATIONS.
- THE ELJEN ANTI-SILTATION FILTER FABRIC SHALL BE SPREAD LENGTHWISE OVER THE PERFORATED SEPTIC PIPE AND DOWN THE SIDES OF THE MODULES. ENSURE ENDS OF MODULES ARE ALSO COVERED WITH FABRIC.
- THE MODULES SHALL BE BACKFILLED, WITH ELJEN SPECIFIED SAND FILL TO AT LEAST THE TOP OF THE ELJEN MODULES, FOLLOWED BY 200mm (min.) TO 500mm (max.) OF LEACHING BED FILL, FOLLOWED BY 100mm OF SANDY TOPSOIL, WITHIN THE LIMITS OF THE SAND AREA. THE BED AREA SHOULD BE VEGETATED AS SOON AS POSSIBLE.
- THE SIDES OF THE BED SHOULD BE SLOPED AT 3H:1V OR SHALLOWER.
- VENT SYSTEM SHALL BE INSTALLED ON THE FOOTER PIPE. CONNECT A 100mmØ PVC VENT PIPE TO FOOTER PIPE, EXTENDING TO GROUND SURFACE. VENT PIPE TO BE INSTALLED IN 150mmØ LANDSCAPE VALVE COVER.

8) MINIMUM CLEARANCE DISTANCE FROM DISTRIBUTION PIPE

- 5.7m FROM ANY PROPERTY LINE
- 7.7m FROM ANY STRUCTURE: 5.0m FROM ANY BASEMENTLESS STRUCTURE
- 17.7m FROM ANY DRILLED WELL
- 5.0m FROM ANY TREE (UNLESS OTHERWISE APPROVED)

9) MINIMUM CLEARANCE DISTANCE FROM TANK(S)

- 1.5m FROM ANY STRUCTURE
- 15.0m FROM ANY DRILLED OR DUG WELL
- 3.0m FROM ANY PROPERTY LINE

10) GENERAL

- SNOW STORAGE SHALL NOT BE LOCATED OVER PROPOSED SEWAGE SYSTEM.
- THE SEWAGE SYSTEM HAS NOT BEEN DESIGNED TO SUPPORT TRAFFIC LOADING.
- THE BACKFILLING OF THE SEWAGE SYSTEM SHOULD MINIMIZE THE RISK OF OVER COMPACTION WITH THE USE RUBBER TRACKED EQUIPMENT AND BY AVOIDING THE CREATION OF ANY CONSTRUCTION ROUTES OR PATHWAYS OVER THE SYSTEM.
- ANY NEW IRRIGATION / SPRINKLER SYSTEM SHOULD NOT BE USED IN PROXIMITY OF THE PROPOSED SEWAGE SYSTEM.
- ENSURE WALKWAYS AND/OR SHRUBBERY ARE NOT PLACED WITHIN PROXIMITY OF THE TANKAGE.
- THE BACKWASH WATERS FROM ANY WATER TREATMENT UNIT, SUCH AS WATER SOFTENER, SHOULD NOT DISCHARGE INTO THE SEWAGE SYSTEM.
- THE SEWAGE SYSTEM HAS NOT BEEN DESIGNED FOR THE USE OF A GARBAGE DISPOSAL.
- SEWAGE SYSTEM INSTALLER SHALL BE QUALIFIED AND REGISTERED UNDER PART 8 OF THE ONTARIO BUILDING CODE AND SHALL BE AN AUTHORIZED EJLEN TREATMENT SYSTEM INSTALLER.
- ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH THE LATEST BY-LAWS, CODES AND REGULATIONS.
- CONTRACTOR SHALL REVIEW DRAWINGS IN DETAIL AND SHALL INFORM THE CONSULTANT OF ANY ERRORS AND/OR OMISSIONS ON DESIGN DRAWINGS IMMEDIATELY.
- CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE AND PROTECT ALL EXISTING UNDERGROUND SERVICES.
- CONTRACTOR SHALL VISIT THE SITE AND REVIEW ALL DOCUMENTATION TO BECOME FAMILIAR WITH THE SITE AND SUBSURFACE SOIL CONDITIONS TO DETERMINE SUITABLE METHODS OF CONSTRUCTION.
- THE MANUFACTURER PROVIDES A LIMITED WARRANTY OF THE SYSTEM COMPONENTS. THE OWNER OF THE SYSTEM MUST SIGN A MAINTENANCE AGREEMENT WITH THE MANUFACTURER'S REPRESENTATIVE. THE SYSTEM OWNER IS RESPONSIBLE FOR THE ANNUAL FEES ASSOCIATED WITH THE MAINTENANCE.
- THE FIRM OF PATERSON GROUP INC. HAS PROVIDED DESIGN SERVICES ONLY FOR THE SUBJECT SEWAGE SYSTEM. THE DESIGN HAS BEEN CARRIED OUT IN ACCORDANCE WITH THE MANUFACTURER'S GUIDELINES AND OUR INTERPRETATION OF PART 8 OF THE ONTARIO BUILDING CODE.
- INSPECTIONS BY THE CONSULTANT DURING THE INSTALLATION OF THE SYSTEM IS A REQUIREMENT OF SOME REGULATING AUTHORITIES AND IS STRONGLY RECOMMENDED BY THIS FIRM.
- THE PROPERTY LINE / SEPARATION DISTANCES SHOULD BE CONFIRMED PRIOR TO CONSTRUCTION.
- CONSTRUCTION INSPECTIONS DURING THE INSTALLATION OF THE SEWAGE SYSTEM MAY BE REQUIRED BY THE REGULATING AUTHORITY AND ARE STRONGLY RECOMMENDED BY THIS FIRM. IF THIS FIRM IS TO COMPLETE ANY CONSTRUCTION INSPECTION(S), ADDITIONAL FEES MAY BE APPLIED. CONFIRMATION OF PAYMENT WILL BE REQUIRED PRIOR TO THE INSPECTION.
- THE TEST HOLE INFORMATION PROVIDED, IS INTENDED TO BE USED FOR DESIGN PURPOSES ONLY, AND SHOULD NOT BE RELIED UPON FOR CONSTRUCTION PURPOSES. IF DISCREPANCIES ARE FOUND DURING THE CONSTRUCTION PROCESS, IT IS THE CLIENT'S RESPONSIBILITY TO CONTACT THIS FIRM TO MAKE ANY NECESSARY COMMENTS OR REVISIONS. ADDITIONAL REVISIONS ARE NOT CONSIDERED PART OF THE DESIGN WORKS AND WILL BE CONSIDERED AS AN ADDITIONAL COST.

LICENSED PROFESSIONAL ENGINEER
16/08/24
M. S. KILLAM
100221103
PROVINCE OF ONTARIO

DD/MM/YY	DESCRIPTION	REV.
16/08/24	Revised per Client Request	5
15/08/24	Issued for Final Review	4
08/08/24	Revised Forcemain Layout	3
06/08/24	Revised per Storm Crossing Elevations.	2
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Consultant:

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7Z9
TEL: (613) 226-7381

Client:

THUNDER ROAD LIMITED PARTNERSHIP

Project:

PROPOSED COMMERCIAL FACILITY

6160 THUNDER ROAD
OTTAWA (VARS), ONTARIO

Drawing:

SEWAGE SYSTEM DETAILS AND NOTES

Scale:	Drawn by:
N.T.S.	HV
Date: 08/2024	Checked by: MK

Drawing No.:

PH4944-2(rev.5)

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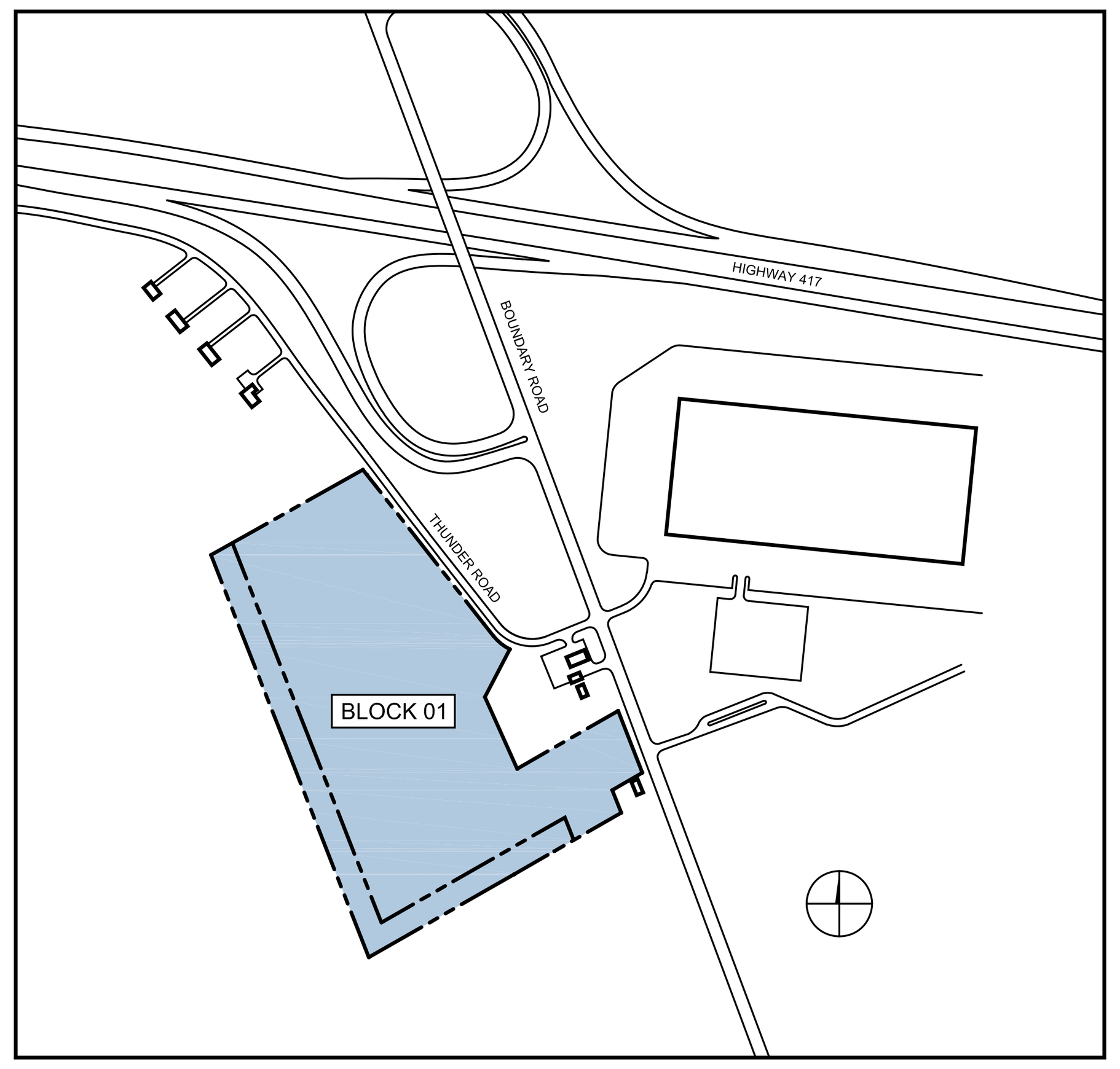


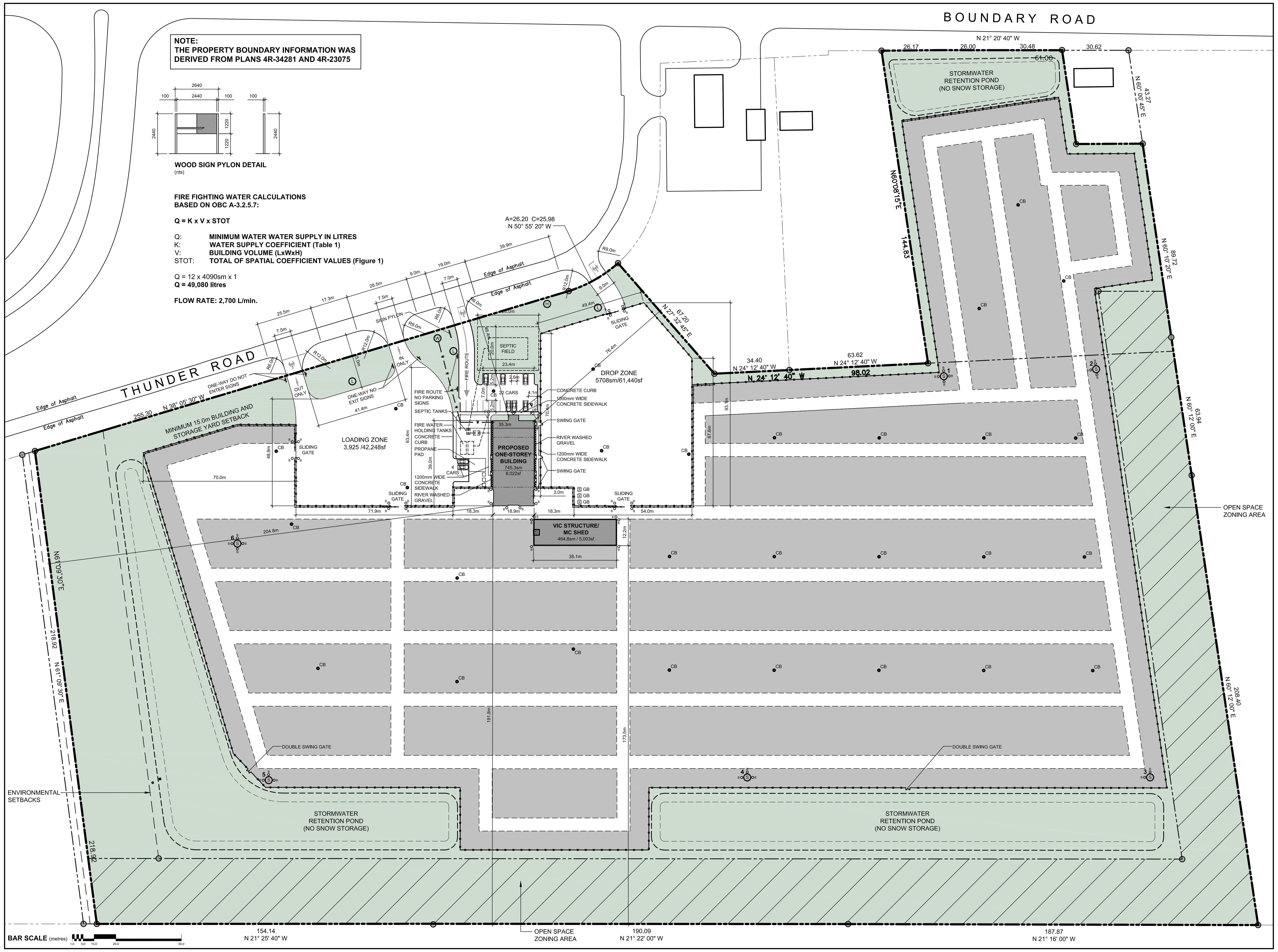
01 LOCATION PLAN
SP-A01 SCALE: NTS

SITE AREA SUMMARY			
	GROSS AREA	OPEN SPACE ZONING AREA	DEVELOPABLE NET AREA
BLOCK 01	15.16 HA 37.46 ACRES	2.38 HA 5.88 ACRES	12.78 HA 31.58 ACRES

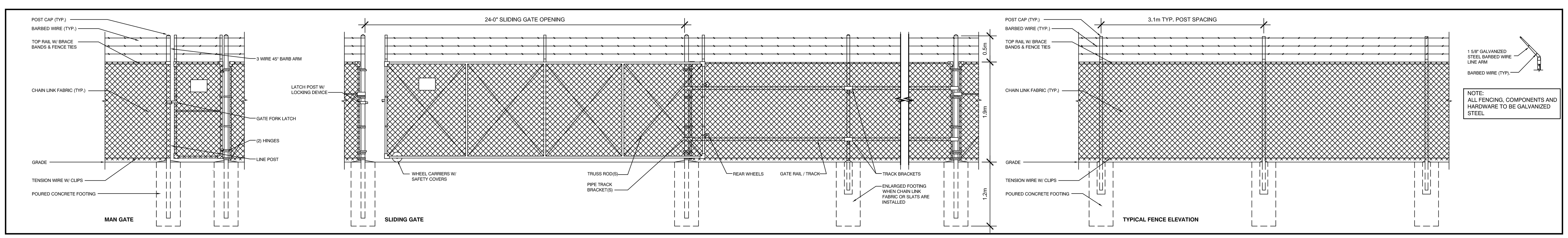
BUILDING AREA SUMMARY	
MAIN BUILDING	GFA = 745.3sm
VIC STRUCTURE /MC SHED	GFA = 464.8sm
TOTAL	GFA = 1,210.1sm

ZONING MECHANISM: ZONING BY-LAW 2008-250 CONSOLIDATION		REQUIRED/PERMITTED	PROVIDED
ZONING: RG[908R]-h RURAL GENERAL INDUSTRIAL ZONE		LIGHT INDUSTRIAL LIMITED COMMERCIAL	LIGHT INDUSTRIAL
MINIMUM LOT AREA		0.4HA	TOTAL: 15.16HA 37.46 ACRES
MINIMUM LOT WIDTH		30m	281.5m THUNDER ROAD 82.7m BOUNDARY ROAD
MAXIMUM LOT COVERAGE		50.0% MAX	0.80%
MINIMUM FRONT YARD		15m	46.4m
MINIMUM CORNER SIDE YARD		12m	N/A
MINIMUM INTERIOR YARD SETBACK	ABUTTING RG, RH OR RC ZONES	3m	N/A
	ALL OTHER CASES	8m	NORTH: 204.8m SOUTH: 76.4m S
MINIMUM REAR YARD		15m	173.5m
MAXIMUM FLOOR SPACE INDEX		2	.008
MAXIMUM BUILDING HEIGHT		15m	5.5m
OUTDOOR STORAGE	NOT PERMITTED WITHIN ANY REQUIRED FRONT OR CORNER YARD		NO STORAGE IS PROPOSED IN REQUIRED 15m FRONT YARD
	STORAGE MUST BE SCREEN WHEN ABUTTING RESIDENTIAL ZONES AND PUBLIC STREETS		CHAIN LINK FENCE WITH VINYY SLATS PROPOSED ALONG ROADS
MINIMUM WIDTH OF LANDSCAPING		3.0m	PROVIDED
PARKING - TYPICAL SECTION 101	450.0sm OFFICE (2.4/100sm) 11 495.3sm WAREHOUSE (.8/100sm) 4 464.8sm WAREHOUSE (.8/100sm) 4	19	26
BICYCLE PARKING SECTION 111		NOT REQUIRED IN RURAL ZONE	0
LOADING SECTION 113		0 FOR LESS THAN 1000sm	0

02 SITE & ZONING DATA & STATISTICS
SP-A01 SCALE: NTS



03 SITE PLAN
SP-A SCALE: 1:1500



04 FENCE DETAILS
SP-A01 SCALE: 1:50

Symbol		Symbol	
	VEHICULAR TRAFFIC DIRECTION INDICATOR	W	WATER CHAMBER
	PAINTED LINES IN PARKING LOT	H	HYDRO POLE
	VEHICLE STORAGE AREA	L	LIGHT STANDARD
	SEEDED GRASS REFER TO LANDSCAPE PLAN	S	SECURITY POLE WITH BOLLARDS AS PER SECURITY SPECIFICATIONS
DP	DEPRESSED CONCRETE CURB	S	BUILDING-MOUNTED SECURITY POINT
	CHAIN-LINK FENCE	FD	FIRE DEPARTMENT CONNECTION
	CHAIN-LINK FENCE WITH WHITE VINYL SLATS	B	200mm DIA. CONCRETE-FILLED STEEL BOLLARD
GB	GARBAGE BIN	CB	CATCH BASIN REFER TO CIVIL

05 SYMBOLS LEGEND
SP-A01 SCALE: NTS

24 X 36 - PLOT ARCH D

MCROBIE
ARCHITECTS + INTERIOR DESIGNERS

OWNER:
AVENUE 31 CAPITAL INC.
801-250 City Centre
Ottawa, ON K1R 6R7

PLANNING CONSULTANT:
RE:PUBLIC URBANISM
Montreal, QC

CIVIL ENGINEER:
LRL ENGINEERING
5430 Canotek Road
Ottawa, ON K1J 9G2

LANDSCAPE ARCHITECTS:
JAMES B. LENNOX & ASSOCIATES INC.
3332 Carling Avenue
Ottawa, ON K2H 5A8

TRAFFIC ENGINEERING
C.F. CROZIER & ASSOCIATES INC.
211 Yonge Street, Suite 600
Toronto, ON M5B 1M4

North

Revisions

No.	By	Description	Date
01	JAS	REVISED FOR REVIEW	2024-06-21
02	JAS	REVISED FOR REVIEW	2024-06-24
03	JAS	ISSUED FOR APPROVAL	2024-06-26
04	JAS	ISSUED FOR COORDINATION	2024-07-22
05	JAS	REVISED FOR COORD.	2024-07-30
06	JAS	ISSUED AS LEASE SCHEDULE	2024-08-08
07	JAS	REVISED FOR SPA	2024-08-16

Project
THUNDER ROAD INDUSTRIAL PARK

6160 THUNDER ROAD, OTTAWA

Drawing
LOCATION PLAN, ZONING REVIEW AND SITE PLAN

Scale: AS NOTED
Drawn: ERM
Checked: JAS

Stamp: ONTARIO ASSOCIATION OF ARCHITECTS JILL TROWER LICENCE 5833

Project No.: 21-135
Date: APRIL 2021
Drawing No.: SP-A01

PLAN NO. ______

D07-12-21-0205