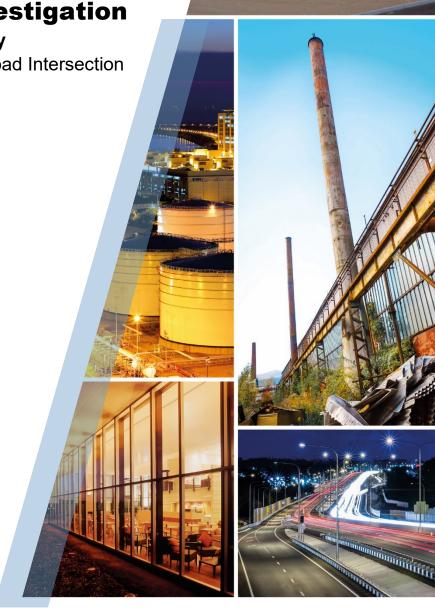


### **Geotechnical Investigation**

**Proposed Sortation Facility** Leikin Drive and Merivale Road Intersection Nepean, Ontario

Medusa LP





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### 1. Introduction

The technical services of GHD were retained by Medusa LP (Client), represented by Mr. Russell Beach, to carry out a Geotechnical Investigation for the construction of a new sortation facility located east of the Leikin Drive and Merivale Road intersection, in Nepean, Ontario.

The investigation was carried out in accordance with GHD's Offer of Professional Services N<sup>o.</sup> 11226724-01-Rev-1, dated April 15, 2021.

Note that the current Site was previously partially investigated by Fondex in November of 1991 (Report N<sup>o.</sup> O-A756-A). The geotechnical information provided within this previous investigative report was reviewed and considered while preparing the scope for the current investigation. Borehole logs deemed pertinent have been included in this report.

The purpose of the geotechnical investigation was to evaluate the subsoil conditions within the proposed distribution centers footprint in order to provide geotechnical comments and recommendations for the design and construction of the new structure.

This report presents the complete description and findings of our Geotechnical Investigation and provides recommendations and comments regarding the design of the foundations, as well as the construction of the proposed sortation facility.

In addition, this report is accompanied by a series of six appendices:

Appendix A	Site Location Plan (Drawing Nº. 11227097-A1-1A)
Appendix B	GHD Borehole Reports and Rock Photographs
Appendix C	GHD Test Pit Reports and Photographs
Appendix D	GHD Piezocone (CPT) Sounding Reports Preconsolidation Profile Graphs D1 and D2 Dissipation Profile Graph D3
Appendix E	Fondex Borehole Reports, November 1991
Appendix F	Geotechnical Laboratory Results

This report is subject to a number of limiting conditions due to the inherent nature of geological, geotechnical, and hydrogeological profiles determined by investigative fieldwork. The applicable limitations of this study are explained following the technical section of this report. These limitations are an integral part of this report and the reader is strongly encouraged to inform himself/herself in order to facilitate their comprehension, interpretation, and use of this document.



### 2. Site and Project Descriptions

The investigated site is located just west of the Leikin Drive/Merivale Road intersection in Nepean, Ontario and is bounded by agricultural land and subsequently Merivale Road and Leikin Drive to the East, by a agricultural land to the North and West, and by Bill Leathem/Longfields Drive and Paragon Avenue to the south.

A gravel road bisects the lower half of the site from East to West. At the time the investigation was completed, the portion of the site situated North of the gravel road was plowed and used for agriculture purposes. The portion of the site located South of the gravel access road consists mostly in barren grassland with shrubs and small trees.

Note than an apparent earth fill mound covered with vegetation was observed just North of the Bill Leathern Drive and Paragon Avenue Intersection, south of the gravel access road.

The site is relatively flat with site grade elevations generally varying between 90.3 meters (m) and 90.7 m at GHD sounding locations. The maximum grade elevation recorded at a GHD sounding location on the aforementioned soil mound is 95.2 m.

According to the project details provided by Medusa LP, the project will consist in the construction a single storey sortation facility which will encompass an area of 25,090 square meters (m<sup>2</sup>) (270,000 square feet (ft<sup>2</sup>)).

Currently, a finished floor elevation of 91.8 m has been established by Medusa LP. As such, a site grade raise, up to 1.4 m will be required within the proposed sortation facility building footprint.

The proposed building will be surrounded to the North and South by concrete loading dock areas and subsequently heavy-duty asphaltic pavement trailer circulation and parking areas. The loading dock areas will be located roughly 1.2 m below the top of the future interior slab on grades, near an approximate elevation of 90.6 m.

In addition, a light-duty asphaltic parking area is proposed just West of the sortation facility building footprint.

Trailer access to the site will be possible along a proposed private road along the southern limit of the site, running East to West between Paragon Avenue and Leikin Drive. A second trailer access is proposed along Longfield Drive, at the western limit of the site. Employee access is also proposed along Longfield Drive

The drawing N<sup>o.</sup> 11227097-A1-1A, presented in the Appendix A of this report, illustrates current site conditions, proposed building and exterior asphaltic and concrete structure configurations as well as the location of the various investigative soundings completed by GHD.



### 3. Geotechnical Investigation Objectives

An initial review of the previously completed Fondex Report suggests that the site stratigraphy consists of a native silt and clay, overlying a clayey silt deposit followed by a glacial till deposit and ultimately bedrock.

Although, bedrock was not encountered within borehole N<sup>o.</sup> BH-09 previously completed by Fondex and located within the proposed sortation facility building footprint, surrounding Fondex boreholes would suggest bedrock roughly 20 m below grade.

According to the available Fondex borehole logs, the silt and clay deposit is initially stiff to very stiff, while a firm to stiff consistency was identified beyond the initial 3 m of the deposit.

Based on the proposed development details and readily available geotechnical information, the following important topics required assessment in order to provide geotechnical comments and recommendations with respect to the proposed construction:

- the extent and depth/thickness of the firm to stiff silty clay/clayey silt deposit;
- the depth of underlying till and the bedrock stratums;
- the evaluation of the geotechnical properties of the said clay, the glacial till and the bedrock stratums;
- the hydraulic conditions across the expansion footprint.

This evaluation is required in order to provide geotechnical comments and recommendations specific to the proposed construction, namely

- the foundation design (foundation types as well as the limit states capacities);
- the potential soil improvement techniques for building foundations and slabs if applicable for this site;
- the seismic site classification;
- the earthworks design for both interior building and the exterior slabs (concrete aprons) as well as flexible pavement structures;
- the excavation works;
- the general construction recommendations.



### 4. Methods of Investigation

The following bullets briefly summarize the field and laboratory work scope completed for this investigation:

- Advancement of nine boreholes across the investigated site. Six of these boreholes were advanced within the proposed building footprints (identified as boreholes N<sup>os.</sup> BH-01 to BH-6). The three remaining boreholes were advanced within surrounding pavement and stormwater pond areas (identified as boreholes N<sup>os.</sup> BH-11 to BH-13). The majority of the boreholes (BH-01, BH-04 to BH-06 and BH-11 to BH-13) were sampled to depths varying between 6.1 m and 10.5 m BGS and completed with a dynamic penetration test to penetration refusal. The borehole N<sup>os.</sup> BH-02, BH-03, both located within the proposed building footprint, were drilled within bedrock to depths of 23.62 m and 22.81 m BGS. In-situ vane shear test were completed at these two borehole locations to measure the undrained shear strength and aid in calibration of the CPT results.
- Installation of two piezometers and one open standpipe within boreholes N<sup>os.</sup> BH-02 and BH-03 and installation of one open standpipe within boreholes N<sup>os.</sup> BH-01, BH-04 to BH-06 and BH-11 to BH-13 in order to evaluate the underground water conditions across the proposed development.
- Completion of cone penetration test (CPT) at 11 locations (identified as CPT-01 to CPT-08, CPT-14, CPT-16 and CPT-18) to a maximum depth of 22 m BGS to assess subsurface soil conditions at each location. The CPT is an in-situ instrumentation/tool to assess soil stratigraphy and soil strength parameters in a continuous fashion.
- Excavation of 32 test pits across the Site to depths varying between 1.5 and 3.4 m BGS to assess topsoil layer thickness, reworked native thickness and condition of the existing fill materials to determine stripping requirements.
- Geotechnical soil/rock sampling in all of the boreholes and the test pits .
- Geotechnical laboratory sampling on selected representative soils samples recovered throughout the field investigation activities.

The field and laboratory testing programs were established by GHD in consultation with the Client. All of the field work activities were carried out between April 19<sup>,</sup> 2021, and May 7<sup>th</sup> 2021, under the constant supervision or a member of GHD's technical staff.

The following subsections describe in more detail the various scope elements carried out during this investigation.

### 4.1 Surveying

Prior to conducting the field investigation, the preliminary concept plan N<sup>o.</sup> DE20073 A-100 showing the proposed sortation facility was provided by the Client. This plan served to position all required soundings in order to complete the geotechnical investigation.

All soundings on the Site were positioned by GHD field personnel using a portable Leica Global Positioning System (GPS) receiver unit, which uses satellite positioning. The sounding coordinates and elevations mentioned in the present report refer to the geodetic system MTM 09 NAD 83.



Table 4.1 provides a listing of the geodetic coordinates recorded at each sounding location.

Sounding N <sup>o.</sup>	Х	Y	Z
Boreholes			
BH-01	366477.63	5017942.84	90.59
BH-02	366599.58	5018011.41	90.61
BH-03	366427.79	5017867.93	90.52
BH-04	366567.28	5017946.11	90.50
BH-05	366518.80	5017869.42	90.47
BH-06	366640.09	5017937.35	90.53
BH-11	366474.05	5017740.71	95.01
BH-12	366605.03	5017606.53	90.31
BH-13	366809.62	5017824.83	90.38
Test Pits			
TP-01	366239.17	5017861.22	90.67
TP-02	366350.84	5017942.36	90.59
TP-03	366431.00	5017938.38	90.52
TP-04	366475.95	5018013.03	90.46
TP-05	366565.38	5018013.45	90.60
TP-06	366603.70	5018084.52	90.61
TP-15	366292.49	5017826.88	90.65
TP-16	366351.68	5017860.36	90.62
TP-17	366450.06	5017904.30	90.59
TP-18	366524.80	5017946.17	90.55
TP-19	366584.28	5017980.12	90.68
TP-20	366653.21	5017996.11	90.52
TP-24	366263.59	5017757.81	90.68
TP-25	366326.97	5017764.92	90.71
TP-26	366386.21	5017798.30	90.68
TP-27	366471.14	5017866.88	90.58
TP-28	366545.67	5017908.90	90.71
TP-29	366605.43	5017942.56	90.72
TP-30	366492.78	5017827.93	90.56
TP-31	366627.41	5017903.27	90.41
TP-35	366558.20	5017809.80	90.46
TP-36	366701.14	5017889.70	90.34
TP-40	366658.89	5017827.60	90.51
TP-43	366526.59	5017723.06	93.75
TP-44	366587.94	5017715.58	90.55
TP-45	366763.13	5017843.19	90.52
TP-46	366877.48	5017907.62	90.36
TP-47	366973.39	5017961.21	90.31
TP-49	366510.78	5017662.81	90.87

### Table 4.1 Sounding Geodetic Coordinates (m)



Sounding N <sup>o.</sup>	Х	Y	Z
TP-49PILE	NA	NA	92.87
TP-50	366472.03	5017605.63	90.55
TP-51	366550.34	5017657.78	90.42
TP-52	366538.82	5017605.51	92.69
Piezocone Soundings			
CPT-01	366408.63	5017902.81	90.59
CPT-02	366547.14	5017980.74	90.54
CPT-03	366600.93	5018008.51	90.58
CPT-04	366424.87	5017866.60	90.48
CPT-05	366497.25	5017906.97	90.66
CPT-06	366615.31	5017978.32	90.46
CPT-07	366448.33	5017830.41	90.53
CPT-08	366587.51	5017909.64	90.55
CPT-14	366235.90	5017866.97	90.59
CPT-16	366660.47	5017830.11	90.46
CPT-18	366453.29	5017675.76	90.89

### Table 4.1 Sounding Geodetic Coordinates (m)

### 4.2 Boreholes

The drilling work was carried out using a track-mounted drill rig (CMC-55) under the full-time supervision of GHD technical representative. The boreholes were advanced using hollow stem augers or casing methodology to balance any potential hydraulic uplift pressures. Soil samples were collected every 0.75 m intervals to the confirmation of the firm silty clay/clayey silt deposit and 1.5 m intervals thereafter to the termination depth of the borehole within boreholes drilled to bedrock. All samplings were conducted using a 50 mm outside diameter split-spoon sampler (SS) in general accordance with the specifications of the Standard Penetration Test Method (ASTM D1587-8). In addition, at each borehole location the relative density or consistency of the subsurface soil layers were measured using the Standard Penetration Test (SPT) method, by counting the number of blows ('N') required to drive a conventional split-barrel soil sampler 0.3 m depth.

Additionally, intact (undisturbed) samples (ST) of the cohesive silty clay/clayey silt deposit were retrieved at relevant depths using thin-walled "Shelby" tubes (ASTM D1587) for testing purposes in our soils laboratory.

Borehole N<sup>os.</sup> BH-01, BH-04 to BH-06, BH-12 and BH-13 were completed with a dynamic penetration tests using the same drill rig used to complete the boreholes. The physical elements of the completed DCPTs such as the hammer weight and falling height are equivalent to SPT testing according to ASTM D1586. However, rather than using a split spoon sampler, a solid 60-degree cone was attached to the end of a rod for conducting DCPT. The results of DCPT are recorded in terms of the number of blows required to drive the penetrometer for a distance of 30 cm, which is called N30.

Finally, bedrock samples were recovered in borehole N<sup>os.</sup> BH-02 and BH-03 using an "NQ" caliber core barrel.



The borehole locations are illustrated in drawing N<sup>o.</sup> 11227097-A1-1A. The corresponding GHD borehole reports are presented in Appendix B.

### 4.3 **Piezocone Soundings (CPT)**

The cone penetration tests (CPTs) were carried out on eleven selected locations across the site. The CPTs were performed according to the requirements of the ASTM Standards D5778-12. The soundings were terminated at probe penetration or deviation refusals. Within CPTs, the tip resistance  $q_t$ , the pore pressure  $u_2$  generated by the probe penetration and the skin friction  $f_s$  were measured at depth intervals of 1 cm allowing continuous profiles of these parameters to be obtained. These parameters were used to estimate the soil parameters such as undrained shear strength and the preconsolidation stress that is required for detailed geotechnical settlement analysis.

Two seismic profiles were also completed within CPTs N<sup>os.</sup> CPT-03 and CPT-04. The seismic profiles are determined by measuring the average shear wave velocity (Vs) along the CPT's which are produced by providing a vibration on the ground surface and then measuring the response at the CPT probe depth.

The CPT sounding locations are illustrated in drawing N<sup>o.</sup> 11227097-A1-1. The corresponding CPT reports are presented in Appendix D.

### 4.4 Vane Shear Tests

Two vane shear tests were performed in boreholes N<sup>os.</sup> BH-02 and BH-03, near respective piezocone soundings N<sup>os.</sup> CPT-03 and CPT-04, in order to define the shear strength values within the silty clay/clayey silt deposit and to calibrate shear strength values estimated from the CPT results. The measured shear strength values are illustrated on the corresponding BH and CPT reports. The shear strength values are equally illustrated on the borehole reports presented in Appendix B. The said CPT reports are presented in Appendix D.

### 4.5 Test Pit Excavations

A total of 32 test pits were completed by means of a mechanical shovel to depths varying between 1.5 and 3.4 m BGS to assess topsoil layer thickness, reworked native thickness, condition of existing fill materials to determine stripping requirements as well as to assess the condition of the underlying native soils.

The Test Pit reports are presented in Appendix C.

### 4.6 Geotechnical Laboratory Testing

All of the recovered geotechnical soil and rock samples were transported to our Montreal office laboratory where they were logged and visually identified for presentation purposes in this report. The borehole samples will be stored for a period of 6 months, after which they will be discarded, unless otherwise requested by the Client. The test pit samples will be discarded once the final report is issued to the Client.

Geotechnical laboratory testing was conducted on representative samples of the subsoil. The purpose of these laboratory tests was to determine the geotechnical engineering properties of the



subsoil stratas encountered throughout the investigations. The geotechnical laboratory-testing program consisted of:

- 24 water content determinations on selected soil samples (NQ 2501-170);
- 7 grain-size analysis on selected soil samples (LC 21-040);
- 2 hydrometer analysis on selected soil samples (NQ 2501-025);
- 15 consistency limits measurements on selected soil samples (NQ 2501-092);
- 2 oedometric consolidation tests on selected soil samples (ASTM D-2435).

The detailed results of the geotechnical laboratory tests are presented in Appendix F and are summarized in Section 5 of this report.

### 4.7 **Open Standpipes and Piezometric Installations**

Piezometers (PZ) or open standpipes (OS) were installed in the cavity of selected drilled boreholes in order to define the hydraulic conditions across the investigated site. Depths and elevations of these probes are presented hereafter in Table 4.2.

Borehole Nº.	Installation N <sup>o.</sup>	Installation Elevation	Probe Depth	Probe Elevation
BH-01	OS-01	90.59	9.15	81.44
	PZ-02a		7.55	83.06
BH-02	PZ-02b	90.61	13.61	77.00
	OS-02		4.85	85.76
	PZ-03a		7.70	82.82
BH-03	PZ-03b	90.52	13.23	77.29
	OS-03		6.76	83.76
BH-04	OS-04	90.50	6.10	84.40
BH-05	OS-05	90.47	6.10	84.37
BH-06	OS-06	90.53	5.96	84.57
BH-11	OS-11	95.01	10.67	84.34
BH-12	OS-12	90.31	5.99	84.32
BH-13	OS-13	90.38	10.46	79.92

## Table 4.2Depths and Elevations of Piezometer and Open StandpipeInstallations (m)

OS: Open Standpipe PZ: Piezometer

Short duration dissipation tests (approximately 10 to 15 minutes) were also performed during all piezocone soundings to define the at-rest pore pressure  $u_0$  at refusal depth. The obtained dissipation curves for each sounding are illustrated on Graph D3 presented in Appendix D while their results are discussed in Section 6.



### 5. Soil Description

The subsoil conditions encountered at the Site generally consist of surficial topsoil or remoulded native soil and localized fill layers overlying a silt and clay deposit of variable thickness, a clayey silt deposit, a glacial till deposit and ultimately bedrock.

Table 5.1 presents an overview of the depth/elevation of each subsoil stratum encountered at the various sounding locations completed during the field investigation.



### Table 5.1 Subsoil Stratigraphy Depth and Elevation (m)

Sounding N <sup>o.</sup>	Sounding Elev.	Remoulded Native Soil/Top soil (thickness)	Fill (this has a sec)	Silt and Clay Crust		Silt and Clay Deposit		Clayey Silt Deposit		Loose to Compact Till Deposit		Bedrock		End of Sounding	
N <sup>o.</sup>			(thickness)	Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.
BH-01	90.59	0.14		0.14	90.45	3.81	86.78	13.5 <sup>1</sup>	77.1 <sup>1</sup>	19.5 <sup>1</sup>	71.1 <sup>1</sup>			21.16*	69.43*
BH-02	90.61	0.10		0.10	90.51	3.40	87.21	9.15	81.46	10.67	79.94	22.13	68.48	23.62	66.99
BH-03	90.52	0.13		0.13	90.39	3.50	87.02	12.19	78.33	16.20	74.32	19.97	70.55	22.81	67.71
BH-04	90.50	0.13		0.13	90.37	3.25	87.25	11.5 <sup>1</sup>	79.0 <sup>1</sup>	15.0 <sup>1</sup>	75.6 <sup>1</sup>			22.73*	67.77*
BH-05	90.47	0.15		0.15	90.32	3.27	87.20	13.0 <sup>1</sup>	77.5 <sup>1</sup>	18.0 <sup>1</sup>	72.5 <sup>1</sup>			22.05*	68.42*
BH-06	90.53	0.16		0.16	90.37	3.05	87.48	13.5 <sup>1</sup>	77.0 <sup>1</sup>	19.5 <sup>1</sup>	71.0 <sup>1</sup>			21.97*	68.56*
BH-11	95.01	0.30	5.34	5.64	89.37	9.90	85.11							10.51	84.50
BH-12	90.31	0.05	0.56	0.61	89.70	3.05	87.26	11.5 <sup>1</sup>	77.8 <sup>1</sup>	14.5 <sup>1</sup>	75.8 <sup>1</sup>			17.53*	72.78*
BH-13	90.38	0.09		0.09	90.29	3.81	86.57	13.0 <sup>1</sup>	77.4 <sup>1</sup>	14.0 <sup>1</sup>	76.4 <sup>1</sup>			19.46*	70.92*
Piezocone	e Soundings														
CPT-01 <sup>2</sup>	90.59					3.50	87.09	12.75	77.84	17.00	73.59			19.08**	71.48**
CPT-02 <sup>2</sup>	90.54					3.50	87.04	13.00	77.54	20.50	70.04			20.92**	69.59**
CPT-03 <sup>2</sup>	90.58					3.50	87.08	10.50	80.08	16.00	74.58			20.72**	69.79**
CPT-04 <sup>2</sup>	90.48					3.50	86.98	12.50	77.98	17.00	73.48			18.89**	71.56**
CPT-05 <sup>2</sup>	90.66					3.00	87.66	14.00	76.66	18.25	72.41			18.63**	71.99**



#### Loose to Silt and Clay Silt and Clay **Clayey Silt** Remoulded **Compact Till** End of Sounding Bedrock Native Crust Deposit Deposit Sounding Sounding Fill Deposit Soil/Top (thickness) N<sup>o.</sup> Elev. soil Elev. Depth Depth Depth Depth Elev. Elev. Depth Elev. Elev. Depth Elev. (thickness) CPT-06<sup>2</sup> 74.96 17.10\*\* 90.46 3.25 87.21 12.25 78.21 15.50 73.35\*\* ---------------**CPT-07<sup>2</sup>** 90.53 ---4.00 86.53 12.25 78.28 14.50 76.03 ---15.62\*\* 74.88\*\* ------------14.50 76.05 19.50 21.93\*\* CPT-08<sup>2</sup> 90.55 ---3.50 87.05 71.05 ---68.58\*\* ------------CPT-14<sup>2</sup> 80.34 18.37\*\* 90.59 4.00 86.59 10.25 15.75 74.84 72.17\*\* ------------CPT-16<sup>2</sup> 90.46 4.00 86.46 13.00 77.46 18.00 72.46 20.66\*\* 69.78\*\* ---------------72.19\*\* CPT-18<sup>2</sup> 18.66\*\* 90.89 -----4.00 86.89 12.25 78.64 18.00 72.89 ----------Test Pits **TP-01** 90.67 0.30 0.30 90.37 --2.80 87.87 ------------------------**TP-02** 0.30 90.29 87.59 90.59 0.30 ---3.00 ------------------------**TP-03** 90.52 0.30 0.30 90.22 --2.90 87.62 ------------------------**TP-04** 90.16 --87.36 90.46 0.30 0.30 3.10 ------------------------**TP-05** 90.60 90.30 87.60 0.30 0.30 3.00 ---------------------------**TP-06** 90.61 0.30 0.30 90.31 --87.61 ---3.00 --------------------**TP-15** 90.65 0.30 0.30 90.35 --2.80 87.85 ------------------------**TP-16** 90.62 0.30 0.30 90.32 --3.00 87.62 ------------------------

### Table 5.1 Subsoil Stratigraphy Depth and Elevation (m)



### Table 5.1 Subsoil Stratigraphy Depth and Elevation (m)

Sounding N⁰.	Sounding Elev.	Remoulded Native Soil/Top soil (thickness)	Fill (thickness)	Silt and Clay Crust		Silt and Clay Deposit		Clayey Silt Deposit		Loose to Compact Till Deposit		Bedrock		End of Sounding	
				Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.
TP-17	90.59	0.30		0.30	90.29									1.45	89.14
TP-18	90.55	0.30		0.30	90.25									1.50	89.05
TP-19	90.68	0.30		0.30	90.38									1.50	89.18
TP-20	90.52	0.30		0.30	90.22									3.00	87.52
TP-24	90.68	0.50		0.50	90.18									3.00	87.68
TP-25	90.71	0.30		0.30	90.41									3.30	87.41
TP-26	90.68	0.30		0.30	90.38									2.90	87.78
TP-27	90.58	0.30		0.30	90.28									1.50	89.08
TP-28	90.71	0.30		0.30	90.41									1.50	89.21
TP-29	90.72	0.30		0.30	90.42									1.45	89.27
TP-30	90.56	0.30		0.30	90.26									3.00	87.56
TP-31	90.41	0.30		0.30	90.11									3.00	87.41
TP-35	90.46	0.30		0.30	90.16									3.00	87.46
TP-36	90.34	0.30		0.30	90.04									3.00	87.34
TP-40	90.51	0.30		0.30	90.21									3.00	87.51



#### Table 5.1 **Subsoil Stratigraphy Depth and Elevation (m)**

	Sounding Elev.	Remoulded Native Soil/Top soil (thickness)	Fill (thickness)	Silt and Clay Crust		Silt and Clay Deposit		Clayey Silt Deposit		Loose to Compact Till Deposit		Bedrock		End of Sounding	
				Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.
TP-43	93.75		>3.35											3.35	90.40
TP-44	90.55	0.50		0.50	90.05									3.00	87.55
TP-45	90.52	0.30		0.30	90.22									3.00	87.52
TP-46	90.36	0.30		0.30	90.06									3.00	87.36
TP-47	90.31	0.60		0.60	89.71									3.00	87.31
TP-49	90.87		0.70	0.70	90.17									3.00	87.87
TP- 49Pile	92.87		2.00											2.00	90.87
TP-50	90.55	0.20		0.20	90.35									3.00	87.55
TP-51	90.42	0.30		0.30	90.12									3.00	87.42
TP-52	92.69		2.70	2.70	89.99									3.32	89.37

\*: Borehole terminated upon dynamic penetration test refusal on very dense till or probable bedrock \*\*: CPT terminated upon cone penetration refusal or deviation

<sup>1</sup> Approximate stratigraphy depth interpreted based on DCPT results Notes:

<sup>2</sup>:Approximate stratigraphy depth interpreted based on CPT results

--: Stratigraphy not encountered, not sampled or not interpreted



The different soil units encountered across the Site are briefly described in the following paragraphs. Detailed descriptions of the units are presented in the borehole and test pit reports in the Appendices B and C while the interpreted stratigraphy based on the CPT tests results are presented in the Appendix D.

### 5.1 Topsoil/Remoulded Native Soil

All soundings revealed a surficial topsoil layer or remoulded native soil layers most likely due to historical agricultural activities on Site. The topsoil and remoulded native soil consist of a clayey silt with traces of sand with the presence of rootlets and organics. The topsoil and remoulded native soil thickness varies between 0.1 m to 0.7 m at the various soundings locations.

It should be noted that the thickness of topsoil may vary between borehole and test pit locations. Classification of this material was based solely on visual and textural evidence; testing of organic content or other constituents was not carried out as it was not part of this scope of work.

### 5.2 Fill

Apparent earth fill mounds covered with vegetation were observed just North of the Bill Leathem Drive and Paragon Avenue Intersection, south of the gravel access road. The sounding N<sup>os.</sup> BH-11, TP-43, TP-49Pile, TP-52 completed on these mounds confirmed the presence of a brown and moist clayey silt fill layer. A maximum fill thickness of 5.34 m was recorded within borehole N<sup>o.</sup> BH-11.

In addition, a 0.6 m thick surficial fill layer was also encountered within borehole N<sup>o.</sup> BH-12, located in the vicinity of these mounds.

The presence of buried organics was observed within the fill layers.

### 5.3 Silt and Clay Deposit

Below the aforementioned layer, a native silt and clay deposit was encountered within all the soundings at depths varying between 0.10 m and 0.70 m (Elevations comprised between 89.4 m and 90.5 m) with the exception of soundings N<sup>os.</sup> BH-11 and TP-52 located on fill mounds, where the silt and clay deposit was encountered below surficial fill at respective depths of 5.64 m and 2.70 m (Elevations of 89.37 m and 89.99 m).

Within the majority of the boreholes and test pits, the initial 2.5 m to 4.3 m of the silt and clay deposit is stiff to very stiff with measured undrained shear strength values generally varying between 50 kPa to 120 kPa, brown to grey and moist, corresponding to a clayey crust. Beyond the crust, the silt and clay deposit become grey, very moist to saturated.

Four grain-size distribution and tests were carried out on selected representative silt and clay deposit samples recovered during the field investigation. The grain-size distribution test results are summarized in the table below. The distribution test curves are illustrated on the grain-size distribution reports presented in the Appendix E.



		Water	Grain-Size					
Sounding (Sample)	Sample Depth	Content,	Gravel Sand		Silt	Clay	Classification	
N <sup>a</sup>	(m)	‰ (%)	>5 <i>m</i> m	5 <i>mm</i> — 0.08 <i>m</i> m	0.08 mm— 0.002 mm	< 0.002 mm	(USCS)	
BH-01 (TM-5)	3.39-3.53	45	0	7	93		СН	
BH-01 (SS-11)	9.15-9.76	68	0	7	93		СН	
BH-02 (SS-3)	1.52-2.13	27	0	10	90		CL	
BH-03 (SS-11)	8.23-8.84	66	0	4	96		CL	

# Table 5.2Summary of the Grain-Size Distribution Analyzes –<br/>Silt and Clay Deposit

Furthermore, 10 representative silt and clay deposit samples recovered during the field investigation were subjected to Atterberg Limit determinations. The plasticity chart indicating the test results are presented in Appendix E. The results are also summarized in Table 5.3 below.

# Table 5.3Summary of the Atterberg Limits Test Results – Silt and ClayDeposit

		Water Content, w₀ (%)	Atterberg Lin	nits			
(Sample)	Sample Depth (m)		Liquid Limit, w_(%)	Plastic Limit, w⊳(%)	Plastic Index, I⊧ (%)	Liquid Index, I <sub>L</sub> (%)	Classification (USCS)
BH-01 (TM-5)	3.39-3.53	45	52	21	31	0.77	СН
BH-01 (SS-11)	9.15-9.76	68	50	24	26	1.69	СН
BH-02 (SS-3)	1.52-2.13	27	38	17	21	0.48	CL
BH-02 (TM-07)	4.81-4.98	54	47	22	25	1.28	CL
BH-03 (SS-11)	8.23-8.84	66	48	23	25	1.72	CL
BH-03 (TM-13)	10.87- 11.02	58	41	22	19	1.89	CL



			Atterberg Lin	nits			
Sounding (Sample) N <sup>a</sup>	Sample Depth (m)	Water Content, ‰(%)	Liquid Limit, w_(%)	Plastic Limit, w⊳(%)	Plastic Index, I⊧ (%)	Liquid Index, I <sub>L</sub> (%)	Classification (USCS)
TP-01 (GS-3)	0.80-1.50	33	63	26	37	0.19	СН
TP-25 (GS-3)	0.70-2.10	37	53	24	29	0.45	СН
TP-35 (GS-3)	0.70-1.80	30	59	25	34	0.15	СН
TP-44 (GS-3)	0.80-1.80	39	74	34	40	0.13	СН

# Table 5.3Summary of the Atterberg Limits Test Results – Silt and Clay<br/>Deposit

Based on these analysis results, the silt and clay deposit generally has the characteristics of medium to high to medium plasticity clay and can be classified as a "CL or CH" soil in accordance with Unified Soil Classification System (USCS) classification.

Based on the vane profiles measured both within the boreholes and the CPT soundings, the grey silt and clay deposit, below the initial crust, can be characterized as firm to stiff with measured shear strength values generally varying between 35 kPa and 60 kPa down to the bottom of the deposit which was encountered 9.2 to 12.2 m BGS within the two deep boreholes and 10.5 to 14.5 m BGS within the eleven CPT's completed across the site.

The undrainded shear strength measures in each borehole and interpreted in each CPT are illustrated on the detailed borehole and cpt reports respectively presented in the Appendices B and D.

Two oedometer consolidation tests were completed on intact clay samples recovered from borehole N<sup>os.</sup> BH-02 and BH-03. Table 5.4 below summarizes the results of these consolidation tests.

# Table 5.4Summary of the Oedometer Consolidation Tests Results – Silt<br/>and Clay Deposit

Sounding (Sample) N <sup>o</sup>	Sample Depth (m)	Initial Void Ratio, e <sub>0</sub>	Recompression Index, Cr	Compression Index, Cc	Preconsolidation Pressure, c <sup>2</sup> p (kPa)	Vertical Pressure, ơ'v (kPa)	OCR
BH- 02/ST-7	4.81- 4.98	1.56	0.07	0.87	167	42	4
BH- 03/ST- 13	10.87- 11.02	1.50	0.06	1.13	176	81	2.2

The underlying preconsolidation profile for each CPT sounding is illustrated on Graph D1 presented in Appendix D. The Consolidation test results in Table 5.4 and the CPT results in Graph D1 suggest



that the clayey deposit is over consolidated with OCR values ranging between 4 in the upper part of the deposit and 1.5 in its the lower part.

The overall thickness of the silt and clay deposit generally varies between 9.0 m and 14.0 m across the Site.

The borehole N<sup>o.</sup> BH-11 was terminated in the silt and clay deposit at a depth of 10.5 m (Elevation of 84.5 m).

Sampling within boreholes N<sup>os.</sup> BH-01, BH-04 to BH-06, BH-12 and BH-13 were terminated at depths varying between 5.9 m to 11.3 m (Elevations comprised between 79.1 m and 84.6 m) within the silt and clay deposit.

### 5.4 Clayey Silt Deposit

Underlying the silt and clay deposit, a native stratified clayey silt deposit was encountered within the deep borehole N<sup>os.</sup> BH-02 and BH-03 at respective depths of 9.2 m and 12.2 m (Elevations of 81.46 m and 78.33 m) and within all CPT soundings at interpreted depths varying between 10.5 m and 14.5 m (Elevations comprised between 80.1 m and 76.1 m).

The deposit is globally firm to stiff with measured shear strength values generally above 40 kPa, is grey in colour, saturated and stratified with thin layers of clay, silt or sand layers.

One hydrometer and one grain-size distribution tests were carried out on selected representative clayey silt deposit samples recovered during the field investigation. The grain-size distribution and hydrometer test results are summarized in the table below. The distribution test curves are illustrated on the hydrometer and grain-size distribution reports presented in the Appendix E.

# Table 5.5Summary of the Grain-Size Distribution and Hydrometer Analyzes -<br/>Clayey Silt Deposit

Sounding (Sample) Nº	Sample Depth (m)	Water Content, w <sub>o</sub> (%)	Grain-Size				
			Gravel	Sand	Silt	Clay	Classification
			>5 <i>m</i> m	5 <i>mm</i> 0.08 <i>m</i> m	0.08 mm— 0.002 mm	< 0.002 mm	(USCS)
BH-02 (SS-11/SS-12)	9.15-9.76	25	0	2	98		CL-ML
BH-03 (SS-14)	12.19-12.80	39	0	6	67	27	CL

Two representative clayey silt deposit samples recovered during the field investigation were also subjected to Atterberg Limit determinations. The plasticity chart indicating the test results are presented in Appendix E. The results are also summarized in Table 5.6 below.



# Table 5.6Summary of the Atterberg Limits Test Results - Clayey SiltDeposit

		Water	Atterberg	Limits			
Sounding (Sample) N <sup>o.</sup>	Sample Depth (m)	Content, w <sub>o</sub> (%)	Liquid Limit, w∟ (%)	Plastic Limit, w <sub>P</sub> (%)	Plastic Index, I <sub>P</sub> (%)	Liquid Index, I∟(%)	Classification (USCS)
BH-02 (SS- 11/SS-12)	9.15- 9.76	25	27	22	5	0.60	CL-ML
BH-03 (SS-14)	12.19- 12.80	39	26	18	8	2.63	CL

Based on these analysis results, the clayey silt deposit generally has the characteristics of low plasticity clay and low plasticity silt and can be classified as a "CL and CL-ML" soil in accordance with Unified Soil Classification System (USCS) classification.

Note that the Nilcon Vane profiles in borehole N<sup>o.</sup> BH-02 was terminated upon penetration refusal at a depth of 11.1 m on a probable sandy layer.

### 5.5 Glacial Till Deposit

Below the clayey silt deposit, a glacial till deposit was encountered at respective depths of 10.7 m and

16.2 m below existing site grades (Elevations of 79.9 m and 74.3 m) in the deep borehole N<sup>os.</sup> BH-02 and BH-03 and in all CPT soundings at depths varying between 14.5 m and 20.5 m (Elevations comprised between 70.0 m and 76.0 m).

The glacial till deposits sampled in boreholes N<sup>os.</sup> BH-02 and BH-03 is primarily composed of a silt and sand matrix with variable proportions of gravel (ranging from traces to gravelly) and traces of clay. The presence of cobbles was also observed within the borehole N<sup>o.</sup> BH-02.

The glacial till deposits can initially be generally characterized as being in a very loose to loose state, based on the Standard penetration N values recorded varying between 1 and 6 throughout the sampling procedures. Beyond respective depths of 18 m and 17 m BGS within these same boreholes, slightly higher SPT values ranging between 9 and 20 were recorded, indicative of a generally compact soil matrix.

One hydrometer and two grain-size distribution tests were carried out on selected representative till deposit samples. The results are presented in the table below. The distribution test curves are illustrated on the grain-size distribution reports presented in Appendix E.



# Table 5.7Summary of the Grain-Size Distribution and HydrometerAnalyzes – Glacial Till Deposit

		Water Conten t, w <sub>6</sub> (%)	Grain-Size D	Distribution (%	)			
Sounding (Sample) N <sup>o</sup>	Sample Depth		Gravel	Sand	Silt	Clay	Classification (USCS)	
	(m)		>5 <i>m</i> m	5 <i>m</i> m– 0.08 <i>m</i> m	0.08 mm— 0.002 mm	<0.002 <i>m</i> m		
BH-02 (SS-14/SS- 15)	11.43- 12.80	8	22	42	36		SM	
BH-02 (SS-19)	15.24- 15.85	8	26	40	А		SM	
BH-03 (SS-18)	18.29- 18.90	9	25	45	23	7	SM	

Three representative till deposit samples recovered during the field investigation were also subjected to Atterberg Limit determinations. The plasticity chart indicating the test results are presented in Appendix E. The results are also summarized in Table 5.8 below.

# Table 5.8Summary of the Atterberg Limits Test Results – Glacial Till<br/>Deposit

		Water	Atterberg	Limits			
Sounding (Sample) N <sup>o.</sup>	Sample Depth (m)	Content, w <sub>o</sub> (%)	Liquid Limit, w∟ (%)	Plastic Limit, w <sub>P</sub> (%)	Plastic Index, I⊵ (%)	Liquid Index, I∟(%)	Classification (USCS)
BH-02 (SS- 14/SS-15)	11.43- 12.80	8	14	12	2		SM
BH-02 (SS-19)	15.24- 15.85	8	13	11	2		SM
BH-03 (SS-18)	18.29- 18.90	9	15	13	2		SM

Based on these analysis results, the glacial till deposits can be characterized as a "SM" soil in accordance with the USCS classification system.

All CPT soundings were terminated upon probe refusal at depths varying between 15.6 m and 21.9 m (Elevations comprised between 68.6 m and 74.9 m). Note that these refusals do not necessarily equate to compact or dense glacial till nor bedrock levels as probe refusals may be a function of both end bearing refusal or probe deviation.

The boreholes N<sup>os.</sup> BH-01, BH-04 to BH-06, BH-12 and BH-13 were terminated with standard penetration tests to refusal on probable very dense glacial till or bedrock, to depths varying between 17.5 m to 22.7 m (Elevations comprised between 72.78 m and 67.77 m).



### 5.6 Bedrock

Directly below the glacial till deposit, bedrock was encountered and recovered within borehole  $N^{os.}$  BH-02 and BH-03 at respective depths of 22.13 m and 19.97 m (Elevations of 68.48 m and 70.55 m).

The cored bedrock consists of a grey dolomite (sedimentary rock). The recovered bedrock within both boreholes can be described as fair to good rock quality with recorded rock quality designation (RQD) values varying between 61% to 86% and overall core recovery value varying between 74% and 86 %.

The boreholes N<sup>os.</sup> BH-01, BH-04 to BH-06, BH-12 and BH-13 were completed with a standard penetration tests to refusal on probable bedrock, down to depths ranging between 17.5 m to 22.7 m (Elevations comprised between 72.78 m and 67.77 m).

The borehole N<sup>os.</sup> BH-02 and BH-03 were terminated within the bedrock at depths of 23.62 m and 22.81 m (Elevations of 66.99 m and 67.71 m), respectively.

### 6. Groundwater Conditions

Groundwater levels were measured on May 6<sup>th</sup> and May 19<sup>,</sup> 2020, within the piezometers (PZ) and open standpipes (OS) installed within selected boreholes. The recorded values are presented in Table 6.1.

Borehole	Installation	Installation		Probe	Water Depth	Water Elevation	Water Depth	Water Elevation
Na	N°	Elevation	Depth	Elevation	levation 6/5/2021		19/05/20	021
BH-01	OS-01	90.59	9.15	81.44	1.01	89.58	0.83	89.76
	PZ-02a		7.55	83.06	1.09	89.52	1.10	89.51
BH-02	PZ-02b	90.61	13.61	77.00	1.40	89.21	1.35	89.26
	OS-02		4.85	85.76	1.02	89.59	0.93	89.68
	PZ-03a		7.70	82.82	1.12	89.40	1.10	89.42
BH-03	PZ-03b	90.52	13.23	77.29	1.09	89.43	1.31	89.21
	OS-03		6.76	83.76	0.89	89.63	0.86	89.66
BH-04	OS-04	90.50	6.10	84.40	0.81	89.69	0.81	89.69
BH-05	OS-05	90.47	6.10	84.37	1.03	89.44	0.92	89.55
BH-06	OS-06	90.53	5.96	84.57	1.08	89.45	1.10	89.43
BH-11	OS-11	95.01	10.67	84.34	8.74	86.27	5.40	89.61
BH-12	OS-12	90.31	5.99	84.32	1.18	89.13	1.12	89.19
BH-13	OS-13	90.38	10.46	79.92	1.08	89.30	0.80	89.58

### Table 6.1 Groundwater Depths and Elevations (m)

OS: Open Standpipe PZ: Piezometer



Table 6.2 below summarizes the results of the dissipation tests recorded upon CPT penetration refusal.

Sounding N <sup>o.</sup>	Test Depth	Corresponding Elevation	At-rest Pore Pressure (kPa)	Piezometric Level Depth	Piezometric Level Elevation		
CPT-01	19.11	71.48	173	1.46	89.13		
CPT-02	20.89	69.65	197	0.79	89.75		
CPT-03	20.79	69.79	192	1.20	89.38		
CPT-04	18.92	71.56	167	1.88	88.60		
CPT-05	14.1	76.56	131	0.73	89.93		
CPT-06	17.11	73.35	149	1.91	88.55		
CPT-07*	15.65	74.88					
CPT-08*	21.97	68.58					
CPT-14	10.13	80.46	92	0.74	89.85		
CPT-16	13.08	77.38	120	0.84	89.62		
CPT-18	12.56	78.33	105	1.85	89.04		
Notes:	*: Unstabilized test : Not interpreted						

 Table 6.2
 Dissipation Tests Results (m)

The water level reading results and dissipation test results suggest (almost)<sup>1</sup> hydrostatic conditions across the entire site within the silt and clay and underlying clayey silt deposits

It should be noted, however, that water levels may vary seasonally or after periods of heavy precipitation.

### 7. Discussion and Recommendations

### 7.1 Description of the Project

According to the information provided by Medusa LP, the project will consist in the construction a single storey sortation facility located just west of the Leikin Drive/Merivale Road Intersection in Nepean, Ontario.

The proposed sortation facility building will encompass an area of 25,090 m<sup>2</sup> (270,000 ft<sup>2</sup>).

Currently, a finished floor elevation of 91.8 m has been established by Medusa LP. As such, a site grade raise, up to 1.3 m will be required within the proposed sortation facility building footprint.

The proposed building will be surrounded to the North, East and South by concrete loading dock areas and subsequently heavy-duty asphaltic pavement trailer circulation and parking areas. The loading dock areas will be located roughly 1.2 m below the top of the future interior slab on grade, near an approximate elevation of 90.6 m. In addition, a light-duty asphaltic parking area is proposed

<sup>&</sup>lt;sup>1</sup> A slight downward flow gradient of about 0.04 was measured from the piezometers installed in BH-03.



just West of the sortation facility building footprint. Based on these proposed elevations, it is assumed that the final exterior light and heavy duty pavement grades will be placed near existing site grades.

Trailer access to the site will be possible along a proposed private road along the southern limit of the site, running East to West between Paragon Avenue and Leikin Drive. A second trailer access is proposed along Longfield Drive, at the western limit of the site. Employee access is also proposed along Longfield Drive.

Details with respect to typical column loads were currently unavailable at the time this report was prepared. However, a slab live load of 25 kPa was considered for foundation and slab design comments and recommendations.

Based on the aforementioned information, the geotechnical findings at the sounding locations, and assuming they are representative of the subsoil conditions across the entire Site, the following geotechnical recommendations and comments are presented.

### 7.2 Geotechnical Summary

Below the surficial topsoil/reworked native the majority of the soundings completed within the sortation facility building footprint revealed the presence of a thick silty clay/clayey silt deposit followed by a generally loose to compact glacial till deposit and ultimately bedrock.

Considering the relatively firm nature of the silty clay/clayey silt deposit beyond its initial stiff layer (initial 3 m) and to significant depth, the proposed site grade raise, proposed slab loading and subsequent foundation loads would render the said deposit to a normally consolidated state. This consolidation state is illustrated on Figure D2 presented in Appendix D<sup>2</sup>.

As such, based on the proposed site development requirements, the site, in its current condition, is not suitable to support a normal slab on grade nor conventional foundations as such a construction would lead to excessive plastic settlements.

According to existing site conditions, four foundation and slab options present themselves for this site in order to allow for the proposed development:

#### **Option 1:**

Building foundations and slab supported by a deep piled foundation system that could consist of steel (H-pile or tube) piles driven torefusal upon or within the underlying bedrock.

#### **Option 2:**

The installation of a rigid inclusion system in order to improve current site conditions and render the site suitable for a conventional slab and foundations.

<sup>&</sup>lt;sup>2</sup> This graph shows only effective stresses after site raise and slab loads. Footing loads are not considered in the graph and may move the stresses state closer to yield conditions.



#### **Options 3 and 4:**

Building foundations either structurally supported by a deep pile foundations or conventional foundations supported by rigid inclusions combined with the use of light weight fill below the building footprint to allow for construction of a standard slab on grade

Geotechnical comments and recommendations of these four options aimed at preventing excessive settlement while obtaining a uniform performance of the building expansion elements are presented in the subsections below.

### 7.3 Site Preparation

Based on the conditions encountered in the boreholes and test pits, the majority Site is covered by a surficial topsoil/reworked native layer overlying a native silty clay to clayey silt deposit. The topsoil/reworked native layer contains rootlets and organics. Locally, where earth mounds are present, a layer of fill overlies the underlying native silty clay to clayey silt deposit.

The surficial topsoil/reworked native soils and fill should be removed/stripped from the footprint of the proposed building and pavement areas prior to site grading activities and should not be used as backfill.

All excavated materials should be managed off-Site in accordance with current environmental regulations.

The subgrade soils exposed after the removal of the surficial topsoil, reworked native and unsuitable fill will consist of competent native silty clay / clayey silt soils. Prior to Site grading activity, the exposed subgrade soils should be visually inspected, compacted, and proof rolled using large axially loaded equipment. Any soft, organic, or unacceptable areas should be removed as directed by the Geotechnical Engineer and replaced with suitable engineered materials.

If imported materials are required to raise Site grades to design levels, then potential source Sites should be evaluated for geotechnical and environmental quality prior to acceptance. It is recommended that any proposed engineered fill be comprised of clean earth material, free of topsoil and deleterious materials, and is at a moisture content ±2% of the laboratory optimum for compaction.

Any new engineered backfill used to raise Site grades should be composed of clean granular materials meeting the OPSS.MUNI 1010 Granular "A" specifications.

All engineered backfill should be placed in thin lifts not exceeding 300 mm and should be uniformly compacted to at least 98 percent of the SPMDD.

The geotechnical properties of all materials used for grading must be reviewed and approved by the Client's geotechnical consultant, prior to beginning backfilling operations.

The silty clay soils cannot be reused as engineered fill. Furthermore, the use of recycled materials beneath the building expansion footprint is strictly prohibited.

It is important to note that the exposed native subsoil will be extremely sensitive to disturbance by water, traffic, and circulation of mechanical equipment. As such construction operations should be carried out in a fashion to avoid excessive remoulding of the subsoil and to minimize the necessity of



over-excavation. Given this, proper drainage of the site will need to be implemented prior to any construction works. If required, depending on climatic conditions and traffic loading, hauling roads could be built to promote stable access and to prevent remoulding of the exposed subsoil during construction activities.

### 7.4 Excavation Slope

The Occupational Health and Safety Act (OHSA) regulations require that if workmen must enter an excavation deeper than 1.2 m, the excavation must be suitably sloped and/or braced in accordance with the OHSA requirements. OHSA specifies maximum slope of the excavations for four broad soil types as summarized in the following table:

### Table 7.1 Maximum Slope Inclinations based on Soil Types (OHSA)

Soil Type	Base of Slope	Maximum Slope Inclination
1	Within 1.2 m of bottom	One horizontal to one vertical
2	Within 1.2 m of bottom of trench	One horizontal to one vertical
3	From bottom of excavation	One horizontal to one vertical
4	From bottom of excavation	Three horizontal to one vertical

OHSA Section 226 defines the four soil types as follows:

### Type 1 Soil:

- 1. Hard, very dense and only able to be penetrated with difficulty by a small sharp object;
- 2. Has a low natural moisture content and a high degree of internal strength;
- 3. Has no signs of water seepage;
- 4. Can be excavated only by mechanical equipment.

#### Type 2 Soil:

- 1. Very stiff, dense and can be penetrated with moderate difficulty by a small sharp object;
- 2. Has a low to medium natural moisture content and a medium degree of internal strength; and
- 3. Has a damp appearance after it is excavated.

#### Type 3 Soil:

- 1. Stiff to firm and compact to loose in consistency or is previously excavated soil;
- 2. Exhibits signs of surface cracking;
- 3. Exhibits signs of water seepage;
- 4. If it is dry may run easily into a well-defined conical pile; and
- 5. Has a low degree of internal strength.

#### Type 4 Soil:

- 1. Soft to very soft and very loose in consistency, very sensitive and upon disturbance is significantly reduced in natural strength;
- 2. Runs easily or flows unless it is completely supported before excavating procedures;



- 3. Has almost no internal strength;
- 4. wet or muddy; and
- Exerts substantial fluid pressure on its supporting system. Ontario Regulation 213/91, s. 226 (5).

The native silty clay/clayey silt soils underlying the Site can be considered Type 3 soils above groundwater level, and Type 4 below groundwater table.

Unsupported side slopes should, however, be adjusted depending on the true subsoil conditions encountered during excavation work and flatter side slopes than those mentioned above may be required locally. Furthermore, no vertical unbraced excavations should be performed in the soil.

Depending on the climatic conditions and duration of the work, impermeable membranes may be required in order to prevent erosion and the development of local instabilities in the excavation slopes (soils).

During the excavation, excavated material, machinery or equipment should not be placed closer than one meter or to the equivalent excavation depth (whichever is larger) from the top of the excavation sidewalls and the safety guidelines provided by OHSA (Section 226) should be strictly adhered to for the open cut excavations.

Considering the necessity of excavations close to or below the underground water table, water infiltration during the earthworks operations should be anticipated. However, due to the relatively low permeability of the native subsoil and depth of excavation, no major groundwater problems are foreseen at this time for such operations. Infiltration into the excavations should be readily handled with ordinary sumps and pumps.

A smooth bucket (blade) should be used for all excavations within the underlying native silty clay/clayey silt deposit in order to avoid excessive disturbance to the bottom of the excavation.

### 7.5 **Building Foundations and Interior Slabs**

As previously mentioned in Section 7.2, given the firm nature of the silty clay deposit to significant depth which covers the site, the required site grade raise as well as slab and foundation loading conditions would result in the normally consolidated deposit to experience significant <u>differential</u> and <u>total settlement</u> of all elements founded directly on the existing subgrade.

As such, the site in its current condition, is not suitable to support a conventional slab on grade nor a conventional foundation system.

As previously stated, according to existing site conditions, four foundation and slab options present themselves for this site in order to allow for the proposed development:

#### **Option 1:**

Building foundations and slab supported by a deep piled foundation system that could consist of steel (H-pile or tube) piles driven to refusal upon or within the underlying bedrock.



#### **Option 2:**

The installation of a rigid inclusion system in order to improve current site conditions and render the site suitable for a conventional slabs and foundations.

*Options 3 and 4:* Building foundations either structurally supported by a deep pile foundations or conventional foundations supported by rigid inclusions combined with the use of light weight fill below the building footprint to allow for construction of a standard slab on grade.

All four building slab and foundation options are discussed in the subsequent subsections.

### 7.5.1 Deep Foundation System for Both Building Foundations and Slab

As previously stated, a deep foundation system to support both the building foundations and slab systems would consist of steel (H-pile or circular) piles driven to refusal within or upon the underlying bedrock.

The ultimate axial capacity for piles driven to refusal upon bedrock may be determined using the method provided in Section 18 of the Canadian Foundation Engineering Manual (CFEM), 2006, 4<sup>th</sup> Edition, while using the parameters given in Table N<sup>o.</sup> 7.4.

Control Perspectary	Symbol	Driven Piles			
Geotechnical Parameters	(11.1.1)	Silty Clay	Glacial Till	Bedrock	
Submerged Unit Weight	γ' (kN/m³)	6	10	16	
Friction Coefficient	β	0,3	0,5	-	
End Bearing Coefficient	Nt			150	

#### Table 7.2 Geotechnical Design Parameters for Driven Piles

Within Limit States calculations, the factored geotechnical axial resistance obtained with the geotechnical resistance factor  $\Phi$  of 0.4 must be compared to the coefficients and load combinations obtained from the CNB 2005. This coefficient should be applied during design of the piles and the actual capacities confirmed by on-Site testing.

In the event that the structural engineer wishes to calculate the pile's capacity based on allowable calculations, the pile's allowable bearing capacity can be obtained by dividing the ultimate axial capacity obtained by the geotechnical method listed above by a factor of 3.

Based on the borehole results, pile driving should not be particularly difficult or damageable to the piles down to the dense till deposits. From this point onwards, the pile-driving conditions may be more challenging.

The pile lengths will be a function of the chosen type of piles, driving/drilling method, the presence of a driving shoe and the embedment criteria.. For practical purposes, end bearing piles should be embedded a minimum of 3.0 m within the bearing strata (in this case the dense till deposit, if present, or the underlying bedrock surface).

The type of pile shoe will depend on the type of pile selected, however, for steel tubes and H-piles, a conical point or hard bite, as provided by the Associated Pile and Fitting (APF) would be suitable for



penetrating dense till and potential fractured bedrock. These recommendations are provided by the pile manufacturer.

It is recommended that a wave equation analysis be carried out for the final design of driven steel piles based on the information obtained from the geotechnical investigation and the equipment used on site. This method will allow the best possible match between hammer type and weight and the type of pile and soil conditions. It will also allow driving stresses to be validated.

The pile design should be reviewed based on the analysis. A driving record for each pile, including pile dimensions, hammer type and weight, number of blows, etc. should be kept. Any particular behaviour, such as uplift of adjacent piles should be noted and reported such that corrective measures can be taken.

In order to validate pile design and refusal characteristics, it is recommended that load tests be carried out on selected piles in order to confirm the allowable working load of the piles, as determined during design. Maximum test loads should be limited to twice the allowable design load on the pile, and 90% of the structural resistance of the pile during driving conditions.

Once the load tests are completed, a resistance factor  $\Phi$  of 0.5 could be applied in order to obtain factored axial resistance at ultimate limit states.

Furthermore, a pile driving analysis (PDA) should be considered during pile construction in order to help establish the termination criteria of the piles. PDA testing is beneficial as it allows the designer to implement a higher soil resistance factor ( $\Phi = 0.5$ ) and can assist in detecting problems during installation, such as poor hammer performance or high driving stresses.

Full time inspection by a qualified geotechnical personnel, independent of the contractor, is required during pile driving operations.

The anticipated settlement of the structure with a properly installed piled foundation system would be negligible and would be a function of the elastic compression of the support members. The settlement value of the piles under maximum live and dead loads should be confirmed by load tests.

The structural slab foundation should incorporate a granular base layer consisting of at least 300 mm of Granular 'A' material as per Ontario Provincial Standard Specifications (OPSS form 1010), compacted to at least 100% of the material's SPMDD. It is also recommended that a vapour barrier be installed to limit vapour emission through the concrete slab.

### 7.5.2 Slab on Grade and Shallow Foundations Placed on a Rigid Inclusion System

Rendering the site suitable to support a conventional slab on grade and shallow conventional footings would require site improvement operations. Based on the site stratigraphic profile, which includes a thick firm silty clay/clayey silt deposit across the site, such site improvement operations would involve the installation of rigid inclusions in order to transfer the loads induced by a conventional construction (loads from conventional footings and slab) to the competent deeper stratum below the firm silty clay/clayey silt and loose to very loose silty sand/sandy silt deposits, in this particular case, the underlying bedrock.



Rigid inclusions are composed of concrete columns with diameters generally ranging between 300 to 450 mm and spaced approximately 1 to 2 m center to center depending on soils characteristics and loading requirements. The rigid inclusions are drilled using a hallow stem auger system and filled with concrete upon drilling to practical refusal within the underlying dense to very dense substratum, in this case the underlying bedrock. To adequately distribute loads from building foundations and slabs to the rigid inclusions and subsequently the competent substratum, a transfer pad usually composed of Granular 'A' or Granular 'B Type 2' crushed stone material as per Ontario Provincial Standard Specifications (OPSS form 1010) crushed stone (generally a minimum of 600 mm thick) is placed between the top of the rigid inclusions and the bottom the foundation and slabs elements.

Note that the rigid inclusion sizes, spacing as well as the minimum transfer pad thickness presented above are for information purposes only and should be confirmed by the soil improvement designer and contractor.

Specifically, the design and methodology for the implementation of the rigid inclusions should be completed by a specialized contractor having experience with this type of soil improvement technique. As the soil improvement design (inclusion size, depth and spacing, transfer pad composition and thickness, permanent long-term water table conditions, required site grade raise, etc.) is integral to the optimum and uniform performance of the building foundation and slab on grade systems within the required soil improvement area, the soil improvement designer/contractor is responsible for their design and subsequent construction of the improved soil area.

The inclusions should be designed to account for long-term stabilized water conditions as well as the development of negative skin friction.

Static load tests must be completed on selected inclusions. These load tests are required to validate the serviceability and ultimate bearing capacity values considered for design.

Once the site prepared as prescribed in Section N<sup>o.</sup> 7.3 and improved using the appropriate soil improvement techniques discussed above (installation of a rigid inclusion system), the site would be suitable to support a conventional foundation system.

As the bearing capacity values are an integral part of the rigid inclusion design, these values must be determined and confirmed by the soil improvement designer and contractor. However, serviceability bearing capacities in the range of 150 to 250 kPa are generally achievable for such designs. Serviceability design values should be provided for a maximum of 25 mm of total settlement and maximum of 19 mm differential settlement.

Similarly, the site would also be suitable to support a normal slab on grade, structurally separated from the columns and foundation walls following the completion of the site preparation works prescribed in Section N<sup>o.</sup> 7.3 and the implementation of the appropriate soil improvement techniques described above (installation of a rigid inclusion system).

The slab on grade foundation should incorporate a final granular base layer consisting of at least 300 mm of Granular 'A' material as per Ontario Provincial Standard Specifications (OPSS form 1010), compacted to at least 100% of the material's SPMDD. It is also recommended that a vapour barrier be installed to limit vapour emission through the concrete slab.



The modulus of subgrade reaction within the soil improvement zone is an integral part of the soil improvement design and thus should be confirmed by the soil improvement designer/contractor.

# 7.5.3 Foundations on Piles or Rigid Inclusions Combined with a Slab on Grade using Lightweight Fill

Two additional construction options that may be considered would involve the use of either piles or rigid inclusions to support the building foundations combined with light weight fill in order to render the site suitable for a slab on grade construction.

The requirements stated in Section N° 7.3 regarding site preparation would also apply for these options. Based on the soil stratigraphy and underlying silty clay/clayey silt strength parameters combined with a 25 kPa slab live load, the site is not permissible for any grade raise below the building footprint.

The slab on grade foundation should incorporate a final granular base layer consisting of at least 300 mm of Granular 'A' material as per Ontario Provincial Standard Specifications (OPSS form 1010), compacted to at least 100% of the material's SPMDD. It is also recommended that a vapour barrier be installed to limit vapour emission through the concrete slab.

As such, the lightweight fill thickness would need to account for the entirely of the site grade raise including the required 300 mm of crushed stone immediately below the slab.

### 7.5.4 General Comments

From a strict engineering point of view options N<sup>os.</sup> 1 and 2 would ensure optimal performance and behavior of the slab and foundation elements as both would rest on the same supporting structure. As such, both of these options present minimal risk of differential behaviour between both the building slabs and foundations.

Both remaining options (which involve the use of light weight fill) have also been successfully completed on various projects. However such designs cannot eliminate all risk of differential movement or behavior between both structures as the slab would be considered as a "floating element" while the building foundations would be supported on rigid elements, in this case, piles or rigid inclusions. That being said, the financial benefits of such a design may outweigh such a risk and could be evaluated by the developer depending on building performance requirements.

### 7.5.5 Frost Depth

All of the exterior building foundations (exterior pile caps, grade beams, footings, etc) for heated structures should be placed at least 1.5 m beneath the final exterior grade in order to provide adequate frost protection.

Building foundations for unheated structures or isolated exterior foundations (retaining walls, signs, lamp posts, etc.) should be placed at least 1.8 m beneath the final exterior grade in order to provide adequate frost protection

Note that exterior building foundation sections (even for a heated structure) with exposed foundation walls, such as foundation walls at dock areas must be considered unheated for frost protection design purposes.



#### 7.5.6 Seismic Classification

Based on the soil characteristics, on the stratigraphy and strength parameters within the boreholes, the piezocone soundings, laboratory test results and in accordance with Table 4.1.8.4.A of the 2010 National Building Code of Canada, the Site can be classified as Site Class "D".

### 7.6 Exterior Slabs

In order to avoid the potential detrimental effects of freeze-thaw cycles on the good behaviour of exterior concrete slabs around the proposed building, we recommend that a non-frost susceptible base layer, such as a Granular 'A' as per Ontario Provincial Standard Specifications (OPSS Form 1010), be used under the exterior slabs down to a depth of 1.8 m below the top of the slabs.

This base layer should be placed in thin lifts not exceeding 300 mm and compacted to a minimum of 98 percent SPMDD.

The base layer should also be properly drained by means of a French drain in order to prevent water accumulation under the slabs. Note that this requirement also applies to the exterior concrete aprons.

Transition slopes of 3.0 H / 1.0 V should be provided at the edges of the various slabs between the non-frost susceptible granular foundation and the surrounding soils (silty clay/clayey silt deposit), over the entire frost depth of 1.8 m.

A possible alternative to the placement of non-frost susceptible base material to a depth of 1.8 m below exterior slabs grades could include the use of sufficient insulation material under the slabs to replace the equivalent amount granular base backfill omitted to frost depth. As a general rule of thumb, one inch 25 mm of insulation is equivalent to 300 mm of non-frost susceptible material.

In any case, the slabs should incorporate a granular base layer consisting of at least 300 mm of OPSS Granular 'A' compacted to at least 100% of the material's SPMDD.

Exterior slab designs specific to the concrete aprons, including minimum granular base thicknesses are presented in the following section.

### 7.7 Exterior Pavement Structures

The recommended pavement structures provided below are based on an estimate of the subgrade soil properties determined from the field tests, and visual examination/textural classification of the soil samples as well as the following preliminary traffic design parameters:

- 20-year light and heavy flexible pavement design.
- 30-year heavy duty rigid pavement design
- 2,400-passenger vehicles 2 way (1215 in and 1215 out)
- 700 tractor trailers 2 way (350 in and 350 out)



- The assumption of unilateral directional flow
- Assumption of 1 lane per direction
- Vehicle factor of 1.97 for trailers and 0.00209 for passenger vehicles

The following flexible (asphaltic concrete) and rigid (concrete) preliminary pavement designs for the proposed local driveways and parking areas can be considered. These design values should be considered preliminary and should be confirmed once precise traffic data is obtained from the traffic study.

	- 20- Year Design Life									
Pavement	Compaction	Layer Thickness (mm)								
Structure Element	Requirement	Light-Duty (Car Parking Areas) Option 1	Light-Duty (Car Parking Areas) Option 2	Heavy-Duty (Delivery Areas)						
Surface Course OPSS 1150 HL1 Hot Mix	OPSS 310, Table 8	40	70	40						
Base Course OPSS 1150 HL8 HS Hot Mix Asphalt	OPSS 310, Table 8	50	-	120 (in two lifts)						
Granular A Base (19mm crusher run limestone)	100 % SPMDD	300	300	300						
Granular B Type II Subbase (50 mm crusher run limestone)	100 % SPMDD	400	400	500						

# Table 7.3 Recommended Pavement Design (Flexible Pavement Structure) - 20-Year Design Life

# Table 7.4Recommended Pavement Design (Rigid Pavement Structure) –<br/>30-Year Design Life

Pavement Structure Element	Compaction Requirement	Layer Thickness (mm)
Concrete Aprons		
Reinforced Concrete	N/A	225
Base Course: Granular A (19 mm crusher run limestone)	100 Percent of SPMDD ASTM D698	300
Granular B Type II Subbase (50 mm crusher run limestone)	100 Percent of SPMDD ASTM D698	300
Granular B Type I Subbase (Sand and Gravel)	100 Percent of SPMDD ASTM D698	975



Note that two light-duty options are provided. Option 1 presents the conventional light-duty design with typical asphalt lift thicknesses. A second option is also provided with a single thicker lift thickness as an economic benefit. Note that the pavement contractor is responsible for ensuring adequate compaction of the asphalt and base layers as per OPSS.

The rigid pavement structure above ensures 30-year structural design life as well as complete protection against frost down to a depth of 1.8 m below exterior grade. As previously mentioned in Section N°. 7.7, the possible alternative to the placement of non-frost susceptible base material to a depth of 1.8 m below exterior slabs grades could include the use of sufficient insulation material under the slabs to replace the equivalent amount granular base backfill omitted to frost depth. As a general rule of thumb, one inch 25 mm of insulation is equivalent to 300 mm of non-frost susceptible material. In any case the minimum concrete, Granular A and Granular B type II thicknesses (825 mm) would apply to ensure aequate structural capacity of the concrete aprons for a 30-year design life.

It is noted that the pavement granular base and subbase layers can consist of sand and gravel or crushed limestone, as specified above. The material gradation and durability requirements of the selected granular courses should meet OPSS 1010 specifications.

The pavement design considers that construction will be carried out during dry periods of the year and that the subgrade is competent. If the subgrade becomes excessively wet or rutted during construction activities, additional subbase material may be required. The need for additional subbase material is best determined during construction.

Concrete slabs will crack randomly from natural actions during curing such as shrinkage or curling. Therefore, joints are vital for concrete pavements to control cracking and horizontal movements of the slabs. Proper joints should be installed including transverse and longitudinal contraction and construction joints, and isolation joints. Joint design and construction should be carried out in accordance with the OPSS/OPSD requirements.

The installation of additional reinforcing steel within the concrete slabs are to the discretion of the design engineers. Where required a preliminary Subgrade Reaction Modulus (MSR) of 20 MPa/m could be used for the design of the rigid pavement reinforcement.

The installation of a geotextile membrane at the subgrade level is required to prevent contamination of the sub-base layers with fines particles.

Transitions should be provided between new rigid and adjacent flexible pavement structures that do not offer complete protection against frost to avoid differential movement between both adjoining structures as well as premature deterioration. Alternatively soil transition suggested in section 7.7 remains applicable.

To maintain the integrity of the pavement at the Site, subdrains should be installed at all catchbasins and along the perimeter of the parking lot.

Grading adjacent to pavement areas should be designed so that water is not allowed to pond adjacent to the outside edges of the pavement.



Although current design does not include any site grade raise within the exterior pavement areas, maximum permissible site grade raise for such areas should be limited to 1.2 m in order to avoid plastic settlements.

# 7.8 Underground Service Trenches

Underground service lines, if any, can be founded on either undisturbed native soils or a prepared fill subgrade. The suitability of the foundation soils to provide adequate support for buried services must be verified and confirmed on the Site at the time of construction/installation by qualified geotechnical personnel experienced in such work.

The frost penetration depth for the region of Ottawa is considered as 1.8 m in accordance with Ontario Provincial Standard Drawing (OPSD) 3090.101. Accordingly, underground services should be located below the depth of frost penetration and in accordance with City of Ottawa specifications.

Note that the City of Ottawa specifies that watermains and sewer require respective minimum soil cover above of 2.4 and 2.0 m. Where the available cover is less than required, thermal rigid insulation should be used as specified in the City of Ottawa specifications.

The bedding and sand cover materials should be adequately compacted to provide support and protection to the service pipes. Provided the base area of the underground service line is free of all soft/loose and deleterious materials, the pipe bedding should comply with a Class B bedding configuration as per the requirements of OPSD 802.031 and OPSD 802.032 (rigid pipe) and/or OPSD 802.010 (flexible pipe). Where disturbance of the trench base has occurred, because of surface water or groundwater seepage and the like, the disturbed soils should be sub-excavated and replaced with suitably compacted granular fill.

Backfilling of trenches can be accomplished by reusing the excavated soils or similar fill material or imported granular soil, provided the moisture content of the material is maintained within  $\pm 2\%$  of optimum and the fill is free of topsoil, organics and any deleterious material. The fill placed in excavated trenches should be in loose lifts not exceeding 200 mm thick and compacted to not less than 95% of its Standard Proctor Maximum Dry Density (SPMDD).

Due to the relatively low permeability of the native subsoil and depth of excavation, no major groundwater problems are foreseen at this time for such excavations. Infiltration into the excavations should be readily handled with ordinary sumps and pumps.

To avoid draining the surrounding clay deposit we recommend that clay plugs be placed within the trenches. The plug thicknesses, spacing and height could be established once Civil drawing completed and should comply with City of Ottawa detail S8.

# 7.9 General Construction

## 7.9.1 Frost Depth

A frost-penetration depth of 1.8 m (for non-heated structures) and 1.5 m (for heated structures) should be used for the design depth the foundations. Adequate coverage by soil backfill or thermal insulation should be provided to this depth to protect against detrimental-frost-action during the winter season.



## 7.9.2 Sensitivity of the Subsoils

The native subsoil is saturated and susceptible to strength loss and deformation by construction traffic. Therefore, care must be taken to protect the exposed subgrade from excess moisture and from construction traffic.

## 7.9.3 Site Inspection

It is recommended that all of the excavations be inspected and approved by qualified soil personnel to ensure that soil conditions correspond to those encountered in the boreholes and test pits, and that all the excavations are dry and free of disturbed soils and the like.

All of the backfilling operations should also be supervised to ensure that proper material is employed and that full compaction is achieved.

It is recommended that all piling operations be controlled under full-time supervision by qualified geotechnical personnel. A strict control on the refusal set and elevation, as well as on the deviation and verticality of steel piles, is essential for adequate performance.

The effect of vibrations upon adjacent structures caused by pile driving should be monitored and pre-construction surveys of existing defects within nearby structures should be carried out where necessary.

### 7.9.4 Winter Construction

The subsoil encountered across the Site is frost-susceptible and freezing conditions could cause problems to the structure. As preventive measures, the following recommendations are presented:

- During winter construction, exposed surfaces to support foundations and slabs must be protected-against-freezing by means of loose straw and tarpaulins, heating, etc.
- Alternatively, frost depth design for unheated conditions would apply for all buildings foundations which are not adequately protected against frost during winter season construction.
- Care must be exercised so that the sidewalks and/or asphalt pavements do not interfere with the
  opening of doors during the winter when the soils are subject to frost heave. This problem may
  be minimized by any one of several means, such as keeping the doors well above outside
  grade, installing structural slabs at the doors, and by using well-graded backfill and positive
  drainage, etc.
- Because of the frost heave potential of the soils during winter, it is recommended that the trenches for exterior underground services be excavated with shallow transition slopes in order to minimize the abrupt change in density between the granular backfill, which is relatively non-frost susceptible, and the more frost-susceptible native soils.

# 8. Limitations of the Investigation

This report is intended solely for Medusa LP and other parties explicitly identified in the report, and is prohibited for use by others without GHD's prior written consent. This report is considered GHD's professional work product and shall remain the sole property of GHD. Any unauthorized reuse,



redistribution of, or reliance on the report shall be at the Client and recipient's sole risk, without liability to GHD. The Client shall defend, indemnify and hold GHD harmless from any liability arising from, or related to, the Client's unauthorized distribution of the report. No portion of this report may be used as a separate entity; it is to be read in its entirety and shall include all supporting drawings and appendices.

The recommendations made in this report are in accordance with our present understanding of the project, the current Site use, ground surface elevations and conditions, and are based on the work scope approved by the Client and described in the report. The services were performed in a manner consistent with that level of care and skill ordinarily exercised by members of geotechnical engineering professions currently practising under similar conditions in the same locality. No other representations, and no warranties or representations of any kind, either expressed or implied, are made. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

All details of design and construction are rarely known at the time of completion of a geotechnical study. The recommendations and comments made in this report are based on our subsurface investigation and resulting understanding of the project, as defined at the time of the study. We should be retained to review our recommendations when the drawings and specifications are complete. Without this review, GHD will not be liable for any misunderstanding of our recommendations or their application and adaptation into the final design. By issuing this report, GHD is the geotechnical engineer of the record. It is recommended that GHD be retained during construction of all foundations and during earthwork operations to confirm the conditions of the subsoil are actually similar to those observed during our study. The intent of this requirement is to verify that conditions encountered during construction are consistent with the findings in the report and that inherent knowledge developed as part of our study is correctly carried forward to the construction phases.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments included in this report are based on the results obtained at the test locations of only nine (9) boreholes, thirteen (13) piezocone soundings and thirty-two (32) test pits. The subsurface conditions confirmed at the fifty-four (54) test locations may vary at other locations. The subsurface conditions can also be significantly modified by the construction activities on Site (ex. : excavation, dewatering and drainage, blasting, pile driving, etc.). These conditions can also be modified by exposure of soils or bedrock to humidity, dry periods or frost. Soil and groundwater conditions between and beyond the test locations may differ both horizontally and vertically from those encountered at the test locations and conditions may become apparent during construction which could not be detected or anticipated at the time of our investigation. Should any conditions at the Site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations. If changed conditions are identified during construction, no matter how minor, the recommendations in this report shall be considered invalid until sufficient review and written assessment of said conditions by GHD is completed.



All of Which is Respectfully Submitted.

GHD

MAG

Marc-Andre Richard, B.Eng. OIQ No.: 5090394

Alex Fintle

Alexander Fiorilli, P.Eng. OIQ No.: 146002



Kamel Hamouche, P.Eng, Ph. D. OIQ No.: 120072

# **Appendices**

# Appendix A Site Location Plan (Drawing No. 11227097-A1-1)



Source: Map data © 2015 Google or Image © 2015 Google, DigitalGlobe.

SCALE = 1:3000       0     30     60     90m       BENCHMARK:       RTCM-REF 3696 (GPS Antenna)       EL. 98.527m (Geodetic)	DRAWN BY: T. NGUYEN / I. CARON CHECKED BY: MA. RICHARD	GHD	MEDUSA LP LEIKIN DRIVE AND MERIVALE ROAD I PROPOSED SORTATION FACILITY GEOTECHNICAL INVESTIGAT SOUNDING LOCATIONS
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# 11227097-A1-1A

# NTERSECTION, NEPEAN, ONTARIO

11227097-A1 31/05/2021

# Appendix B GHD Borehole Reports and Rock Photographs



### A- Soil Sampling

Soil samples are normally recovered with a split-spoon sampler or a thin-walled Shelby tube. The split spoon is dynamically driven into the ground and takes a remoulded sample of the soil found at depth. A standard penetration test is thereby obtained, and is described in the following paragraph. The Shelby tube is pushed into the ground to obtain undisturbed samples of clay or clayey soils. Rock samples are obtained by drilling a core barrel into the rock formation; the diameter of the recovered sample varies with the size of the drilling bit used.

### **B-** Standard Penetration Test (SPT)

A standard penetration test consists of driving a standard split-spoon sampler into the soil be dropping a 140 lb. weight (63.5 kg) from a height of 30 inches (76 cm). The sampler is driven 18 inches (45 cm) into the soil and the number of blows of the drop weight is recorded for every 6 inches (15 cm) of penetration. The total number of blows for the last 12 inches (30 cm) of penetration is the standard penetration index ("N" value). This value obtained at regular intervals provides vital information from which the density, compressibility and bearing capacity of the various soil horizons can be estimated. The test is however seldom used in clayey soils.

#### **C-** Dynamic Penetration Test

A dynamic penetration test (or cone penetration test) is similar to a standard penetration test with the difference that the split-spoon sampler is replaced by a conical point 10 cm<sup>2</sup> in area. The number of blows is recorded continuously for every foot of penetration (30 cm) thus obtaining a systematic indication of the relative density of the materials encountered at depth. This test also helps in determining the depth to a dense soil horizon or bedrock.

**Note:** The presence of large gravel, cobbles or boulders in the subsoil may distort the results of both the standard penetration test and the dynamic penetration test by giving abnormally high resistance values. When it becomes impossible to drive the cone deeper a refusal ("R") is then recorded.

#### **D- Shear Test**

An undrained shear test may be carried out by pushing into the undisturbed soil a vane shear apparatus consisting of a four-bladed vane connected to a rod and by measuring the torque value required to shear the clay. This test may be repeated at regular intervals and the torque values calculated to obtain the undrained shear strength of the clay at each test level. The shear strength profiles permit the calculation of the allowable bearing capacity of the clay. The apparatus used is the "Nilcon" of Scandinavian origin.

#### E- Permeability Test (Lefranc)

This test consists of determining the coefficient of permeability K of the soil around a permeable lens of known dimensions and which has been formed below the driving shoe. The procedure used is the falling head method. Tests of the Lefranc type are carried out in soils with average granulometry and average permeability.

#### F- Packer Test

This test is conducted in bedrock by sealing off a section of the borehole with one or two inflatable rubber packers and then pumping water into the isolated section of the hole. The permeability of the rock adjacent to the isolated section of the borehole is measured as a function of the pumping head (pressure) and rate of water loss (absorption) from the sealed-off section over a fixed period of time.

#### **G- Menard Pressuremeter Test**

The pressuremeter test developed by Menard (1956) consists of laterally loading the sidewalls of a borehole by dilating a cylindrical probe. The test permits the determination of the modulus  $E_M$  and the limit pressure  $p_I$ , which are a measure of the strength of the soil, and enables the calculation of the bearing capacity and settlements for foundations.



# **Notes on Borehole and Test Pit Reports**

#### Soil description :

Each subsurface stratum is described using the following terminology. The relative density of granular soils is determined by the Standard Penetration Index ("N" value), while the consistency of clayey sols is measured by the value of undrained shear strength (Cu).

		(Unified system)			Termin	ology	
Clay	< 0.002 mm						
Silt	0.002 to 0.075 mm			"tra	ice"	1-10%	
Sand	0.075 to 4.75 mm	fine 0.075 to 4.25 mm		"SO	me"	10-20%	
		medium 0.425 to 2.0 mm		adje	ective (silty, san	dy) 20-35%	
		coarse 2.0 to 4.75 mm		"an	d"	35-50%	
Gravel	4.75 to 75 mm	fine 4.75 to 19 mm coarse 19 to 75 mm					
Cobbles Boulders	75 to 300 mm >300 mm						
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		(BLOWS/ft - 300 mm)				(P.S.F)	(kPa)
				Ve	ery soft	<250	<12
V	ery loose	0-4			Soft	250-500	12-25
	Loose	4-10			Firm	500-1000	25-50
C	Compact	10-30			Stiff	1000-2000	50-100
	Dense	30-50		Ve	ery stiff	2000-4000	100-200
Ve	ery dense	>50			Hard	>4000	>200
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	75-90	Good					
	75-90 >90	Good Excellent		Silt	Clay	$\begin{array}{c} & & & \\ & & & \\ & & & \\ \end{array}$ Organic soil	Fill
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	ENT: DJECT: CATION: SCRIBED	PF	IKIN DF	ED SORTAT	ERIV	FACILITY ALE ROAD INTERSECTIO RIFIED BY: MA. RICHA	,	,	(MTM X Y Z	ETIC COO , NAD-83) ( : 366599.6 : 5018011.4 : 90.61	m)	ATES	0	<ul> <li>✓ - WATER LEVEL</li> <li>Date : 2021-05-19</li> <li>Depth (m) : 1.1 0.93 ; 1.35</li> <li>Location plan : 11220797-A1-1</li> </ul>
Bore Core Ham Ener Date	e bit size : amer type : rgy ratio : e (start) : e (finish) :	: Au B+ Au 20: 20:	ger + Cas NQ tomatic 21-04-21 21-04-22	sing	SAMPLE TYPE	SS(E) - Split Spoon (Enviro RC(E) - Rock diamond core AU(E) - Auger TEE - Sampling Tube Environment ST - Shelby tube GS(E) - Grab sample	nment)		SAMPLE STATE	Rem	nond		TEST SYMBOL	GSA: grain size analysis CA: chemical analysis w <sub>i</sub> : liquid limit w <sub>p</sub> : plastic limit w : water content C <sub>u</sub> : undrained shear strength S <sub>r</sub> : sensitivity Dup: duplicate sample TESTS RESULTS
(	epth m) .00	(m) (m)	Symbol			escription	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	$ \begin{array}{c} \bigcirc & \text{Water content (\%)} & \bigtriangleup & C_u (Field, kPa) \\ \hline & & \text{Atterberg limits (\%)} & \Box & C_u (Lab, kPa) \\ \hline & & \text{"N" Standard penetration test value} \\ \hline & & \text{"N_c" Dynamic penetration test value} \\ \hline 10 \ 20 \ 30 \ 40 \ 50 \ 60 \ 70 \ 80 \ 90 & \hline \\ \hline \end{array} $
	0.10	90.51		Native se	lt, tra <b>oil:</b> ery sti	ces of sand/	0	SS-1A SS-1A	54	0	<u>ц</u>	<u>оп</u> 1-2-4-4	6	• • • • • • • • • • • • • • • • • • •
1.0 -	 	89.61		 becomino				SS-2	100			3-4-6-6	10	
2.0 —	- 1.52 - - - -	89.09		beddings		presence of sand		SS-3	82	GSA A w		2-3-3-3	6	
- 3.0 -	2.28	88.33		becomin	g stiff			SS-4	100			1-1-1-1	2	
-	- - - - - - - -	87.21		becomin	 g firm	, saturated		SS-5	100			1-0-0-1	0 •	
4.0 -								SS-6	100			1-0-0-1	0 •	
5.0 —								ST-7	100	A w				
6.0 -	- - - - - - - - - - - - - - - - - - -	84.51			g with	presence of silt		SS-8	100			1-0-0-1	0 •	
- 7.0 -	-			beddings			X	SS-9	100			1-0-0-1	0 •	
- 1.0								,						
	-							SS-10	100			1-0-0-1	0	

See the attached explicative note for the complete list of symbols and abbreviations

FO-030.82/IA/12-14

	G	HD		В	OR	EHOLE	REI	PORT				Borehole N	0.	BH-02
LOC	JECT: ATION:	PR LE	IKIN DR ITARIO	ED SORTATION FACILITY RIVE AND MERIVALE ROAD INTERSECTION		EPEAN,	(MTM X : Y :	ETIC COO NAD-83) ( 366599.6 5018011.4 90.61	(m)	ATES		<ul> <li>✓ - WATER</li> <li>Date : 2021-05-1</li> <li>Depth (m) : 1.1</li> <li>Location plan :</li> </ul>	9	
Boreh Core I Hamn Energ Date (	ole type : bit size : ner type : y ratio : (start) : (finish) :	Aug B+1 Aut 202 202	ger + Cas NQ tomatic 21-04-21 21-04-22	sing H C(E) - Split Spoon (Enviro RC(E) - Rock diamond core AU(E) - Auger TEE - Sampling Tube Environment ST - Shelby tube GS(E) - Grab sample	onment)		SAMPLE STATE	Intac Dian drillin	nond ng		TEST SYMBOL	$\begin{array}{c} \text{GSA: grain siz} \\ \text{CA: chemical} \\ \text{w}_{L}: \mbox{ liquid limit} \\ \text{w}_{p}: \mbox{ plastic limit} \\ \text{w}: \mbox{ plastic limit} \\ \text{w}: \mbox{ water cont} \\ \text{C}_{u}: \mbox{ undrainec} \\ \text{S}_{T}: \mbox{ sensitivity} \\ \mbox{ Dup: duplicate} \end{array}$	analysis it ent d shear strengt e sample	th
			TRATIG	RAPHY			s T	AMPLE		â	0	O Water conte	ent (%)	∆ C <sub>u</sub> (Field, kPa)
Dej (n	ר)	Elevation (m)	Symbol	Description	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	$\rm N_{\rm c}$ or RQD	H Atterberg lir W <sub>P</sub> W <sub>L</sub> Atterberg lir ● "N" Stand ▲ "N <sub>c</sub> " Dynar	nits (%) ard penetration nic penetration	□ C <sub>u</sub> (Lab, kPa) n test value n test value
8.0	00	82.61	AXX	Ground surface	st V	ŕź	<u>ل</u> ي ا	Ö	<u> </u>	© B O	ź	10 20 30 40	50 60 70 8	0 90 level
9.0 -	-													
	9.15	81.46		Stiff, grey clayey silt, traces of sand, saturated		SS-11	49	GSA A w		1-0-0-0	0			
10.0	- - - - -					SS-12	51			4-3-2-2	5			
1.0-	10.67		0 0 0	Loose to very loose, grey silty and gravelly sand, traces of clay, saturated		SS-13	100			1-2-2-2	4	• •		
2.0	- - - - - -		0			SS-14	71	GSA A w		1-1-4-1	5	•••H		
13.0-	- - - - -		<u>    0    0    </u>			SS-15	100			2-1-0-3	1			
			a 0 o			SS-16	57			3-1-1-2	2	•		
14.0-	- - - - -		0 0 0			SS-17	100			1-1-1-3	2			
15.0			0 0 0			SS-18	13			1-1-0-1	1			· · · · · · · · · · · · · · · · · · ·
			0. o e			SS-19	72	GSA A w		1-5-1-1	6			

G	HD				B	OR	EHOLE	ERE	PORT				Borehole No.	BH-02
CLIENT: PROJECT: LOCATION: DESCRIBED	PF LE ON	IKIN DF	ED SORTAT	ERIV	ACILITY ALE ROAD INTERSECTION RIFIED BY: MA. RICHA			(MTN X Y	DETIC COOI 1, NAD-83) (1 : 366599.6 : 5018011.4 : 90.61	m)	ATES	[	▼ - WATER LEVEL Date : 2021-05-19 Depth (m) : 1.1 0.93 ; 1.3 Location plan : 112207	
Borehole type : Core bit size : Hammer type : Energy ratio : Date (start) : Date (finish) :	Au B+ Au 20: 20:	ger + Cas NQ tomatic 21-04-21 21-04-22	sing	SAMPLE TYPE	SS(E) - Split Spoon (Enviro RC(E) - Rock diamond core AU(E) - Auger TEE - Sampling Tube Environment ST - Shelby tube GS(E) - Grab sample	onment)		SAMPLE STATE	Rem	ond		TEST SYMBOL	$\begin{array}{c} \text{GSA: grain size analysis} \\ \text{CA: chemical analysis} \\ \text{W}_{i}: liquid limit \\ \text{w}_{p}: plastic limit \\ \text{w: water content} \\ \text{C}_{u}: undrained shear streng \\ \text{S}_{T}: sensitivity \\ \text{Dup: duplicate sample} \end{array}$	
Depth (m) 16.00	(m) (m)	Symbol			escription und surface	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	O       Water content (%)         ▲       Atterberg limits (%)         ■       "N" Standard penetration         ▲       "N <sub>c</sub> " Dynamic penetration         10       20       30       40       50       60       70	$\triangle C_u (Field, kPa)$ $\square C_u (Lab, kPa)$ on test value on test value
	72.32		becoming	 ] com			SS-22 SS-22 SS-22	28 28	0	<u> </u>	2-1-2-9 4-1-1-1 4-5-5-6 15-7-13-8	2 3 10 20		
21.0	69.40 68.48 67.83			: pmite, g goo	fair rock quality		SS-24 RC-25 RC-26	62 74 95			17-21 29-28	50 61 86		

See the attached explicative note for the complete list of symbols and abbreviations

Page: 3 of 3



Photo 1 : BH-02 Core box – Dry rock



Photo 2 : BH-02 Core box – Wet rock



Proposed Sortation Facility Leikin Drive and Merivale Road Intersection, Nepean, Ontario

GHD | Geotechnical Investigation | 11227097-A1(1)

**Borehole No. BH-02** 

	G	HD			В	ORI	EHOLE	REI	PORT				Borehole No.	B	3H-03
PRO	ENT: DJECT: CATION:	PR	IKIN DR ITARIO	ED SORTATION	FACILITY /ALE ROAD INTERSECTIC ERIFIED BY: MA. RICHA			(MTM) X : Y : 7	ETIC COO NAD-83) ( 366427.8 5017867.9 90.52	(m)	ATES			′EL 36 ; 1.31 11220797-/	 A1-1
Core Ham Ener Date	hole type : bit size : mer type : gy ratio : (start) : (finish) :	B+ Aut 202 202	ger + Cas NQ tomatic 21-04-19 21-04-20	SAMPLE TYPE	SS(E) - Split Spoon (Enviro RC(E)- Rock diamond core AU(E) - Auger TEE - Sampling Tube Environment ST - Shelby tube GS(E) - Grab sample			SAMPLE STATE	Intac Dian drillin	nond ng		TEST SYMBOL	GSA: grain size ar CA: chemical anal w <sub>L</sub> : liquid limit w <sub>5</sub> : plastic limit w : water content C <sub>u</sub> : undrained she S <sub>T</sub> : sensitivity Dup: duplicate sar	ysis ear strength nple	
			TRATIG	RAPHY		-		s	AMPLE	1			TESTS R		
(1	epth m)	Elevation (m)	Symbol		Description	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	, N <sub>c</sub> or RQD		enetration te	st value
0.	.00	90.52		Gro <b>Topsoil</b> :	ound surface	5	FŹ SS-1A	ž	Ó	₫	6 (s	ź	10 20 30 40 50	60 70 80	90 level
_	- 0.13 - - -	90.39		Clayey silt, tra Native soil:	iff, brown silt and clay,		SS-1B	48			2-3-4-5	7			
1.0 —	 	89.42		becoming bre	y-brown		SS-2	100			4-8-7-7	15	→		
 2.0 —	 1.52 	89.00		becoming stift sand bedding	f, grey with presence of s		SS-3	100			2-2-3-4	5	• •		
							SS-4	100			1-2-2-2	4	•		
_	 	87.02		becoming firm	n, saturated		SS-5	100			1-1-1-1	2	•		
4.0 —							SS-6	100			1-0-0-1	0	• 4 • 1		
5.0 —	4.57	85.95		becoming with	n presence of cobbles		SS-7	69			6-5-4-4	9			
- 6.0 -	-						SS-8	100			2-1-0-0	1			
_							SS-9	100			1-0-0-1	0	↓ ↑ ↓ 1 ↓ 1		
7.0 —							ST-10	0							

G			OREHOL	.E RE	PORT				Borehole No.	BH-03
CLIENT: PROJECT: LOCATION: DESCRIBED		LP ED SORTATION FACILITY RIVE AND MERIVALE ROAD INTERSECTIO	DN, NEPEAN,	GEOE (MTM X Y 7	DETIC COO I, NAD-83) ( : 366427.8 : 5017867.9 : 90.52	m)	TES		<ul> <li>✓ - WATER LEVEL</li> <li>Date : 2021-05-19</li> <li>Depth (m) : 1.1 0.86 ; 1.3</li> <li>Location plan : 112207</li> </ul>	1 97-A1-1
Borehole type : Core bit size : Hammer type : Energy ratio : Date (start) : Date (finish) :	Auger + Ca B+NQ Automatic 2021-04-19 2021-04-20	sing SS(E) - Split Spoon (Enviro) RC(E)- Rock diamond core AU(E) - Auger TEE - Sampling Tube Environment ST - Shelby tube GS(E) - Grab sample	nment)	SAMPLE STATE	Intac Dian drillir Lost	nond 1g		TEST SYMBOL	GSA: grain size analysis CA: chemical analysis $w_L$ : liquid limit $w_c$ ; plastic limit w: water content $C_{u}$ : undrained shear stren $S_T$ : sensitivity Dup: duplicate sample	-
Depth (m)	Elevation (m) Symbol	Description	State Type and Number	0	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	ž	O       Water content (%)         H       Atterberg limits (%)         ●       "N" Standard penetrati         ▲       "Nc" Dynamic penetration	$  \begin{array}{c} \Delta & C_u \text{ (Field, kPa)} \\ \hline & C_u \text{ (Lab, kPa)} \\ \end{array} $ on test value
8.00	82.52	Ground surface	ss-1		GSA A	PIC	2-1-1-1	2 2		80 90 Water level
9.0			ST-1	2 100	w					
			ST-1	3 100	A w					
12.0	78.33	Firm to stiff, grey clayey silt, traces of sand, saturated	SS-1	4 100	GSA - H A w		1-0-0-0	0 •		
4.0			ST-1	5 0						
		r the complete list of symbols and abbreviations	SS-1	6 100			1-1-1-1	2	• · · · · · · · · · · · · · · · · · · ·	

G	HD			E	BORI	EHOLE	E RE	PORT				Borehole No.	BH-	03
CLIENT: PROJECT: LOCATION: DESCRIBEI	PR LE ON	IKIN DR ITARIO	ED SORTATION F	ACILITY ALE ROAD INTERSECTI RIFIED BY: MA. RICH/			(MTM X Y 7	DETIC COO I, NAD-83) ( : 366427.8 : 5017867.9 : 90.52	(m)	ATES		▼ - WATER LEVEL Date : 2021-05-19 Depth (m) : 1.1 0.86 		
Borehole type Core bit size : Hammer type Energy ratio : Date (start) : Date (finish) :	B+1 : Aut 202 202	ger + Cas NQ omatic 21-04-19 21-04-20	SAMPLE TYPE	SS(E) - Split Spoon (Enviro RC(E) - Rock diamond cor AU(E) - Auger TEE - Sampling Tube Environment ST - Shelby tube GS(E) - Grab sample	,		SAMPLE STATE	Rem Intac Dian drillir Lost	nond ng		TEST SYMBOL	GSA: grain size analy CA: chemical analysis w <sub>L</sub> : liquid limit w <sub>F</sub> : plastic limit w : water content C <sub>u</sub> : undrained shear s S <sub>T</sub> : sensitivity Dup: duplicate sample TESTS RESI	strength	
Depth (m)	Elevation (m)	Symbol	De	escription	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	O       Water content (%)         H       Atterberg limits (%)         ●       "N" Standard pene "N <sub>c</sub> " Dynamic pene	△ C <sub>u</sub> (F □ C <sub>u</sub> (L etration test va	lue ue
			Compact to loo silty sand, trac Bedrock: Grey dolomite, - joint from 20.	n 21.26 to 21.36m		F∃         SS-17         SS-18         SS-19         RC-20         RC-21	#         .           59         .           64         .           43         .           97         .           92         .	GSA-H A W		2-6-6-7 3-3-6-7 27 50/8cm	2 12 9 R 79 76			Atter 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,



Photo 3 : BH-03 Core box – Dry rock



Photo 4 : BH-03 Core box – Wet rock



Proposed Sortation Facility Leikin Drive and Merivale Road Intersection, Nepean, Ontario

GHD | Geotechnical Investigation | 11227097-A1(1)

**Borehole No. BH-03** 

G	HD				В	ORI	EHOLE	E REI	PORT				Borehole No. BH-04
CLIENT:	ME	EDUSA	LP						ETIC COO		TES		- WATER LEVEL
PROJECT:	PF	ROPOSE	ED SORTAT	ION F	ACILITY			(MTM,	NAD-83) (	m)			 Date : 2021-05-19
LOCATION:	ON	ITARIO			ALE ROAD INTERSECTIO			Y:	366567.3 5017946.1 90.50				Depth (m) : 0.81
DESCRIBED	BY: F.	ARGUI	N	VE	RIFIED BY: MA. RICHA	RD / A	A. FIORILL	· ·					•
Borehole type : Core bit size : Hammer type : Energy ratio : Date (start) : Date (finish) :	B Au 202	ger tomatic 21-04-19 21-04-19		SAMPLE TYPE	SS(E) - Split Spoon (Enviro RC(E)- Rock diamond core AU(E)- Auger TEE - Sampling Tube Environment ST - Shelby tube GS(E)- Grab sample			SAMPLE STATE	Rem	ond		TEST SYMBOL	GSA: grain size analysis CA: chemical analysis wt: liquid limit ws: plastic limit w: water content Cw: undrained shear strength Sr: sensitivity Dup: duplicate sample
	5	STRATIG	RAPHY	I				s	AMPLE				TESTS RESULTS
Depth (m)	Elevation (m)	Symbol		De	escription	State	Type and Number	Recovery %	Other tests	(mqq) C	6 in / 15 cm Blow counts (sampler size)	$N_{\rm c}$ or RQD	<ul> <li>"N" Standard penetration test value</li> <li>"N<sub>c</sub>" Dynamic penetration test value</li> </ul>
0.00	90.50			Gro	und surface	St		Re	đ	PID	6 i Blo (\$8	ź	10 20 30 40 50 60 70 80 90 Water level
- 0.13 	90.37		Native so Stiff to ve	oil:	ces of sand		SS-1A SS-1B	64			2-3-4-5	7	• • 0.81.m
0.61 1.0 —	89.89		becoming	g grey	/ /-brown		SS-2	100			5-5-5-5	10	
2.0	88.98		sand bed	ldings			SS-3	100			2-2-3-2	5	
3.0	88.22		becoming	g stiff,	very moist		SS-4	100			1-1-1-1	2	
- <u>-</u> - <u>3.25</u> 	87.25		becoming	g firm	, saturated		SS-5	100			1-0-1-1	1	
4.0							SS-6	100			1-0-0-1	0	
5.0							ST-7	100					
6.0	85.17		becoming beddings		presence of silt		SS-8	100			1-0-0-1	0 •	
- 6.71	83.79		End of sa	amolir	n		SS-9	100			1-0-0-0	0	+ 0
7.0	00.10				ynamic penetration test								+ 0 + 0
												•	
													0

G	HD				B	ORE	EHOLE	ERE	PORT				Bore	ehol	le No	).	E	3H-(	)4
CLIENT:	ME	DUSA I	LP						DETIC COOF /I, NAD-83) (r		TES		¥ -	WA	TER L	EVEL			
PROJECT:	PR	OPOSE	ED SORTATI	ION F	ACILITY				: 366567.3	11)			Date : 2						
LOCATION:		IKIN DR ITARIO		ERIVA	ALE ROAD INTERSECTIO	N, NE	PEAN,	Y	: 5017946.1				Depth (						
DESCRIBED	BY: F.	ARGUI	N	VE	RIFIED BY: MA. RICHA	RD / A	. FIORILL		: 90.50			L	ocation				20797-	A1-1	
Borehole type :		ger			SS(E) - Split Spoon (Enviror RC(E)- Rock diamond core	iment)		 Ш	Remo	oulded		_	CA	A: che	ain size mical a		is		
Core bit size : Hammer type :	B Aut	tomatic		Т	AU(E) - Auger			STA	Intact			SYMBOL	W <sub>P</sub>	: plas	id limit tic limit				
Energy ratio : Date (start) :	202	21-04-19		SAMPLE TYPE	TEE - Sampling Tube Environment ST - Shelby tube			SAMPLE STATE	Diam drillin			sτsγ	C,	;: und	r contei rained s		trength		
Date (finish) :	202	21-04-19		SA	GS(E) - Grab sample			SAI	Lost			TEST		: sens up: du	sitivity plicate :	sample			
	S	TRATIG	RAPHY						SAMPLE						TESTS	6 RESU	LTS		
	ion	<u>م</u>									n ts ize)	RQD			r conter erg limi				eld, kPa) ab, kPa)
Depth (m)	Elevation (m)	Symbol		De	escription		and er	ery %	tests	(mdd)	5 cr coun	or R	W <sub>P</sub> W <sub>1</sub>		-		tration t		-
. ,		S				State	Type and Number	Recovery	Other tests	PID (p	6 in / 15 cm Blow counts (sampler size)	ع					tration te		ue Water
8.00	82.50			Grou	und surface	ŭ	ŕź	Å	ō	٩	© BI	ź	10 2	20 30	) 40 5	0 60	70 80	90	level
-													0						
_													0	$\left  \right $					
-																		+	
-													0						
9.0													0						
-													0						
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10.0														$\left  \right $					
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11.0-													1						
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13.0													2						
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-													<b>4</b> 3					_	
14.0													4						
													15	$\left  \right $			+	+	
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													1						
15.0													8						
														16					
																		+	
													47	$\left  \right $				+	
													<b>†</b> 6	$\left  \right $	_				

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GHD	В	OREHOLE	E REPORT		Borehole No. BH-04
CLIENT: MEDUSA LF	 P		GEODETIC COORDIN	NATES	- WATER LEVEL
PROJECT: PROPOSED	D SORTATION FACILITY		(MTM, NAD-83) (m)		Date : 2021-05-19
	IVE AND MERIVALE ROAD INTERSECTIO	N, NEPEAN,	X : 366567.3 Y : 5017946.1		Depth (m) : 0.81
DESCRIBED BY: F. ARGUIN	VERIFIED BY: MA. RICHAF	rd / A. Fiorill	7 . 90 50		Location plan : 11220797-A1-1
Borehole type :       Auger         Core bit size :       B         Hammer type :       Automatic         Energy ratio :       Date (start) :       2021-04-19         Date (finish) :       2021-04-19	SS(E) - Split Spoon (Environ RC(E)- Rock diamond core AU(E) - Auger TEE - Sampling Tube Environment ST - Shelby tube GS(E) - Grab sample		HELLS Remoulde Intact Diamond drilling Lost	ed	$\begin{tabular}{ c c c c c } \hline GSA: grain size analysis \\ CA: chemical analysis \\ CA: chemical analysis \\ w_t: liquid limit \\ w_p: plastic limit \\ w : water content \\ C_u: undrained shear strength \\ S_{\tau}: sensitivity \\ Dup: duplicate sample \\ \hline \end{tabular}$
STRATIGR	(APHY		SAMPLE		TESTS RESULTS
Debth (m)	Description	State Type and Number	Recovery % Other tests PID (ppm)	6 in / 15 cm Blow counts (sampler size)	$ \begin{array}{c} \bigcirc \\ \bigcirc $
16.00 74.50	Ground surface	rg r	D G R	(s, Blo	
	End of dynamic penetration test End of borehole				

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	G	HD				E	BORI	EHOLE	RE	PORT				Borehole No.	BH-05	5
CLIEN	T:	ME	DUSA	LP						ETIC COO		TES		▼ - WATER LEVEL		
PROJE	ECT:	PF	OPOSE	ED SORTAT	'ION F	FACILITY			(MTM	, NAD-83) (	m)			Date : 2021-05-19		
LOCA		O	ITARIO			ALE ROAD INTERSECTI	,	,	Y Z	: 366518.8 : 5017869.4 : 90.47	Ļ			Depth (m) : 0.92	0707 01 1	
DESCI	RIBED	BY: F.	ARGUI	N	VE	ERIFIED BY: MA. RICH	ARD / A	A. FIORILL		. 30.47				•	20797-A1-1	
Borehol Core bit Hamme Energy Date (st	t size : er type : ratio : tart) :	B Au 20:	tomatic 21-04-28		SAMPLE TYPE	SS(E) - Split Spoon (Enviro RC(E) - Rock diamond com AU(E) - Auger TEE - Sampling Tube Environment ST - Shelby tube			SAMPLE STATE	Intac	nond		TEST SYMBOL	GSA: grain size analys CA: chemical analysis W <sub>L</sub> : liquid limit W <sub>F</sub> : plastic limit W: water content C <sub>u</sub> : undrained shear st S <sub>T</sub> : sensitivity		
Date (fir	nisn):	20.	21-04-28		S	GS(E) - Grab sample			s	Lost			-	Dup: duplicate sample		
			TRATIG	RAPHY				1	5	SAMPLE				TESTS RESU	LTS	
Dept (m)		Elevation (m)	Symbol		D	Description	fe	Type and Number	Recovery %	Other tests	(mqq)	6 in / 15 cm Blow counts (sampler size)	$N_{\rm c}$ or RQD	$ \begin{array}{c} \bigcirc & \text{Water content (\%)} \\ \hline H & \text{Atterberg limits (\%)} \\ \bullet & \text{"N" Standard pener} \\ \hline & \text{"Nc," Dynamic penet} \end{array} $		, kPa)
0.00	)	90.47			Gro	ound surface	State	Nur	Rec	Oth	PID	6 in Blov (sar	z Ź	10 20 30 40 50 60	70 80 90	Water level
Ŀ			T MM	Topsoil:				SS-1A								
	0.15	90.32		Native so	oil:	iff, brown silt and clay,		SS-1B	92			1-3-5-5	8	•		0.92 m
1.0 -	0.81	89.66		becoming	g grey			SS-2	82			2-5-6-5	11	• • • • • • • • • • • • • • • • • • •		
	1.52	88.95		becoming sand bed		y with presence of		SS-3	100			2-2-3-3	5			
2.0 -	2.28	88.19					$\square$	2								
3.0	2.20	00.19		becoming	g stim	f, very moist		SS-4	100			1-2-1-2	3			
	3.27	87.20		 becomino	 g firm	n, saturated		SS-5	100			1-0-1-0	1			
4.0 -								SS-6	100			1-0-0-1	0			
5.0 -								ST-7	100							
								SS-8	100			1-0-0-0	0 •	•		
6.0	5.94 6.10	84.53 84.37		End of sa Beginning test		ng dynamic penetration								• 0		
				1031									4	0		
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7.0 -													'	<b>≜</b> ♥		
ļ														0		
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G	HD				B	ORE	EHOLE	ERE	PORT				Во	oreho	ole I	No.		Bł	H-0	5
CLIENT:	ME	DUSAI	LP					GEOD	DETIC COO	RDINA	ATES		¥	_ \//		RLEVE	FI			
PROJECT:			ED SORTAT	ION F	ACILITY			(MTN	I, NAD-83) (	m)				: 202						
LOCATION:	LE	IKIN DR	RIVE AND M	ERIVA	ALE ROAD INTERSECTIO	DN, NE	PEAN,		: 366518.8					h (m)						
DESCRIBED	ON	ITARIO			RIFIED BY: MA. RICHA			7	: 5017869.4 : 90.47	ŧ		L	_ocat	tion pla	an :	1	1220	797-A1	-1	
Borehole type :	Aug	ger			SS(E) - Split Spoon (Enviror				Rem	oulded						size ana al analy				
Core bit size :	В			SAMPLE TYPE	RC(E) - Rock diamond core AU(E) - Auger			SAMPLE STATE	Intac	rt		SYMBOL		w <sub>L</sub> : liq	uid lin	nit	313			
Hammer type : Energy ratio :	Aut	omatic		Ē	TEE - Sampling Tube Environment			LES	Diam			SYM		w <sub>P</sub> : pla w : wa	ter co	ntent				
Date (start) : Date (finish) :		21-04-28 21-04-28		AMF	ST - Shelby tube			SAMF	LU drillir	-		TEST		C <sub>u</sub> : ur S <sub>T</sub> : sei		ed shea ty	ar stre	ngth		
					GS(E) - Grab sample										luplica	ate sam	-			
		TRATIG	RAPHY				<del></del>	;	SAMPLE		_					STS RE				
	ion								(0		ts ize)	B				ntent (% limits (%	'			eld, kPa) ıb, kPa)
Depth (m)	Elevation (m)	Symbol		De	escription		er d	ny %	test	(mqq)	5 cr oun er s	or RQD	W <sub>P</sub> W	/. /	-			tion test		
(11)	Ŭ	S				State	Type and Number	Recovery	Other tests	d) (b	6 in / 15 cm Blow counts (sampler size)	z		"N <sub>c</sub> "	' Dyna	amic pe	enetrat	tion test	valu	
8.00	82.47			Grou	und surface	Sta	Nu	Re	Oth	PID	6 ir Blc (sa	ź	10	20 3	30 40	) 50 6	30 70	80 90	С	Water level
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9.0 —																				
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12.0													<b>†</b> 3							
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13.0													2	_		—	++			
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													<b>†</b> 4			_	+-+			
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14.0													<b>†</b> 5							
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													<b>†</b> 4			_	$\square$	$\square$		
15.0													<b>3</b>		$\square$	_	+	+	-	
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															$\square$		++	+		
													<b>4</b>		$\square$	+	++	+	_	

G	HD				В	ORE	EHOLE	RE	PORT				Borehole No.	BH-	05
CLIENT:	ME	DUSA	LP						DETIC COOP		ATES		- WATER LEVE		
PROJECT:	PR	OPOSE	ED SORTATIC	DN F.	ACILITY			(MTN	1, NAD-83) (I	m)			Date : 2021-05-19		
LOCATION:				RIVA	ALE ROAD INTERSECTIO	N, NE	PEAN,		: 366518.8 : 5017869.4				Depth (m) : 0.92		
DESCRIBED		NTARIO ARGUII		VEF	RIFIED BY: MA. RICHAF	RD / A	. FIORILL	7	: 90.47			L	Location plan : 11	220797-A1-1	
Borehole type :	Au	ger			SS(E) - Split Spoon (Environ	nment)			Rem	oulded			GSA: grain size analy CA: chemical analysi		
Core bit size :	В	-		SAMPLE TYPE	RC(E) - Rock diamond core AU(E) - Auger			SAMPLE STATE	Intac	t		BOL	w <sub>L</sub> : liquid limit	,	
Hammer type : Energy ratio :	Au	tomatic		Ē	TEE - Sampling Tube Environment			LES	Diam	ond		TEST SYMBOL	w <sub>P</sub> : plastic limit w : water content		
Date (start) : Date (finish) :		21-04-28 21-04-28		SAMF	ST - Shelby tube			SAMF	LU drillin	g		IEST	C <sub>u</sub> : undrained shear S <sub>T</sub> : sensitivity	strength	
				"	GS(E) - Grab sample								Dup: duplicate sampl		
		STRATIG	RAPHY						SAMPLE				TESTS RES		
	(	<u> </u>							S		n its size)	g	O Water content (%)		Field, kPa) .ab, kPa)
Depth (m)	Elevation (m)	Symbol		De	escription		and er	ery %	test	(md	15 cl coun	or RQD	W <sub>P</sub> W <sub>L</sub> ● "N" Standard per		
. ,	Ξ	0				State	Type and Number	Recovery	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	ž			-
16.00	74.47			Grou	und surface	ŝ	Σ́	Re	đ	٩	6 i Ble (s;	ź	10 20 30 40 50 60	70 80 90	Water level
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20.0													51		-
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23.0															
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G	HD				В	ORE	EHOLE	ERE	PORT				Borehole I	No.	BH-	-06
CLIENT:	ME	DUSA	LP						ETIC COO		ATES		🗶 - WATEF	RLEVEL		
PROJECT:	PF	ROPOSE	ED SORTAT	ION F	FACILITY				, NAD-83) (	m)			- Date : 2021-05-	-19		
LOCATION:				ERIV	ALE ROAD INTERSECTIO	ON, NE	PEAN,	1	: 366640.1 : 5017937.4	Ļ			Depth (m) : 1.1			
DESCRIBED		ITARIO ARGUII		VE	ERIFIED BY: MA. RICHA	ARD / A	. FIORILL	7	90.53			L	ocation plan :	1122	20797-A1-1	
Borehole type :	Au	ger			SS(E) - Split Spoon (Enviro				Rem	oulded			GSA: grain CA: chemic		is	
Core bit size :	В	tomatic		SAMPLE TYPE	RC(E) - Rock diamond core AU(E) - Auger	•		SAMPLE STATE	Intac	:t		BOL	w <sub>L</sub> : liquid lin	nit		
Hammer type : Energy ratio :	Au	lomatic		LE 1	TEE - Sampling Tube Environment			LE S	Dian	nond		SYMBOL	w <sub>P</sub> : plastic li w : water co	ntent		
Date (start) : Date (finish) :		21-04-28 21-04-28		SAME	ST - Shelby tube			SAMF	Lost	ıg		TEST	C <sub>u</sub> : undrain S <sub>⊤</sub> : sensitivi		rength	
					GS(E) - Grab sample							· ·	Dup: duplica	ate sample STS RESU		
		STRATIG							SAMPLE		â	0	O Water cor			Field, kPa)
Depth	atior (۱	Symbol		_			_	%	ts	(	nts size	RQD		limits (%)		Lab, kPa)
(m)	Elevation (m)	Syn		De	escription		anc	very	r tes	(mdd)	15 cou cou	or	"N" Star	•	tration test v	
0.00	ш 90.53			Gro	ound surface	State	Type and Number	Recovery	Other tests	PID (	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub>	▲ "N <sub>c</sub> " Dyn 10 20 30 40		ration test va	Water
0.00	30.33	\$  \$  \$  \$	Topsoil:	010				<u> </u>	0	ш.	СШС	~				
_ 0.16	90.37		\Clayey sil		aces of sand	17	SS-1	44			2-3-5-5	8	•			
-			Native so Stiff to ve		iff, brown silt and clay,	$ \rangle$										
_ 0.61	89.92				/`	$\checkmark$										E E
			becoming	g com	npact, grey-brown	X	SS-2	100			3-4-6-6	10	•			
1.0 —						$ \rangle$										
-							1									
- 1.52	89.01	Ĥ	becoming	verv			1									
-				, ,	'		SS-3	46			2-3-3-4	6				
2.0 —						$  \wedge$					2001					
2.28	88.25		becoming	g stiff,	f, saturated	$\mathbb{N}$	1									
			1			X	SS-4	89			2-1-2-1	3	•			-1::=::1
-			1			$\square$										
3.0	87.48				presence of silt		1									
-	01.10		beddings			$\mathbb{N}$	SS-5	100			1-1-1-1	2				
-							00-0				1-1-1-1	2	Ī			
-						$\vdash$										
4.0 - 3.81	86.72		becoming	g firm	n, saturated	$\mathbf{N}$	1									
-			1			IX	SS-6	100			1-0-0-1	0				
-						$\backslash$										
-						$\mathbb{N}$	SS-7	100			1-0-0-0	0				
5.0 -						$  \wedge$	33-1	100			1-0-0-0					
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G	HD				B	ORE	EHOLE	ERE	PORT				Во	oreho	ole N	10.	E	3H-(	)6
CLIENT:	ME	DUSA	LP					GEOD	DETIC COO	RDINA	ATES		¥	- W/A					
PROJECT:			ED SORTAT	ION F	ACILITY			(MTN	1, NAD-83) (	m)				: 2021					
					ALE ROAD INTERSECTIO				: 366640.1					. 202 i h (m) :		19			
LOCATION:	ON	ITARIO						7	: 5017937.4 : 90.53	1			-	tion pla		112	20797-/	A1-1	
DESCRIBED	BY: F.	ARGUI	N		RIFIED BY: MA. RICHA	RD/F	A. FIORILL						1						
Borehole type :		ger			SS(E) - Split Spoon (Enviror RC(E) - Rock diamond core			ш	Rem	oulded						ize analy: I analysis			
Core bit size : Hammer type :	B Aut	omatic		SAMPLE TYPE	AU(E) - Auger			SAMPLE STATE	Intac	t		SYMBOL		w <sub>L</sub> : liqu w <sub>P</sub> : pla					
Energy ratio :				LE.	TEE - Sampling Tube Environment			LE .	Diam drillin			NKS.		w:wat	er cor	ntent			
Date (start) : Date (finish) :		21-04-28 21-04-28		<b>AMI</b>	ST - Shelby tube			SAMF	LL drillin	-		TEST		C <sub>u</sub> : un S <sub>T</sub> : ser		ed shear s v	strength		
					GS(E) - Grab sample										uplica	te sample			
		TRATIG	RAPHY				1	:	SAMPLE		1		1			STS RESI			
	Elevation (m)	ō									ts ize)	RQD	ĥ			itent (%) limits (%)			ield, kPa)
Depth	(m)	Symbol		De	escription		r d	رم ۲	ests	(mdd)	5 cr ount	or R	w <sub>P</sub> w		-	dard pene			ab, kPa) lue
(m)	Ele	Ś				e	e a nbe	Recovery	Other tests	d d	w cc/	د ع				, amic pene			
8.00	82.53			Gro	und surface	State	Type and Number	Rec	Oth	E	6 in / 15 cm Blow counts (sampler size)	z,	10	203	0 40	50 60	70 80	90	Water level
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See the attached explicative note for the complete list of symbols and abbreviations

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GI	HD				В	ORE	EHOLE	ERE	PORT				Borehole No.	BH-0	06
CLIENT:	ME	DUSA	LP						DETIC COO		ATES		- WATER LEVE		
PROJECT:	PR	OPOSE	ED SORTATI	ON F	ACILITY				/I, NAD-83) (I	m)			Date : 2021-05-19		
LOCATION:	LE		RIVE AND ME	ERIVA	ALE ROAD INTERSECTIO	DN, NE	PEAN,		: 366640.1 : 5017937.4	L			Depth (m) : 1.1		
DESCRIBED	ON	ITARIO			RIFIED BY: MA. RICHA			7	: 90.53	r		L	Location plan : 11	220797-A1-1	
Borehole type :	Au	qer			SS(E) - Split Spoon (Enviro				Rem	oulded			GSA: grain size anal CA: chemical analysi		
Core bit size :	В	-		YPE	RC(E) - Rock diamond core AU(E) - Auger			SAMPLE STATE	Intac	:t		BOL	w <sub>L</sub> : liquid limit	5	
Hammer type : Energy ratio :	Au	tomatic		SAMPLE TYPE	TEE - Sampling Tube Environment			LES	Diam	nond		TEST SYMBOL	w <sub>P</sub> : plastic limit w : water content		
Date (start) : Date (finish) :		21-04-28 21-04-28		AMF	ST - Shelby tube			SAMF	drillin	-		'EST	C <sub>u</sub> : undrained shear S <sub>T</sub> : sensitivity	strength	
Date (million).	202	1-04-20			GS(E) - Grab sample							_	Dup: duplicate samp		
		TRATIG	RAPHY				<u></u>		SAMPLE				TESTS RES		
Depth (m)	Elevation (m)	Symbol		De	escription	0	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)		O Water content (%) ↓↓↓ W <sub>P</sub> W <sub>L</sub> Atterberg limits (% ● "N" Standard per ▲ "N <sub>c</sub> " Dynamic pen	) C <sub>u</sub> (La	ab, kPa) ue
16.00	74.53			Gro	und surface	State	Jype	Seco	Othe	Ö	3 in / Blow	N, Nc	10 20 30 40 50 60		Water
	1 1.00			0.0		0,				<u> </u>	с Ш С Ш С	~	4		level
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-													16		
17.0-															
17.0													<b>4</b> 5		
-													<b>↓</b> 5		
													3		
-													<b>1</b>		
18.0-													<b>↓</b> 5		
E													<b>↑</b> 7		
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_ 21.97	00.00		End of dyr End of boi		c penetration test e										
23.0															
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G	HD			E	BOR	EHOLE	ERE	PORT				Borehole No. BH-11
CLIENT: PROJECT: LOCATION: DESCRIBED	PR LE ON	IKIN DR ITARIO	D SORTATION F	FACILITY ALE ROAD INTERSECTI RIFIED BY: MA. RICH		-	(MTM	ETIC COO , NAD-83) ( : 366474.0 : 5017740.7 : 95.01	m)	ATES	0	▼ - WATER LEVEL Date : 2021-05-19 Depth (m) : 5.4 Location plan : 11220797-A1-1
Borehole type : Core bit size : Hammer type : Energy ratio : Date (start) : Date (finish) :	B Aut 202 202	ger tomatic 21-04-29 21-04-29	SAMPLE TYPE	SS(E) - Split Spoon (Envir RC(E)- Rock diamond cor AU(E) - Auger TEE - Sampling Tube Environment ST - Shelby tube GS(E) - Grab sample		)	SAMPLE STATE	Rem	nond ng		TEST SYMBOL	GSA: grain size analysis CA: chemical analysis w <sub>i</sub> : liquid limit w <sub>p</sub> : plastic limit w : water content C <sub>u</sub> : undrained shear strength S <sub>T</sub> : sensitivity Dup: duplicate sample TESTS RESULTS
Depth (m)	Elevation (m)	Symbol	De	escription	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	ž	$ \begin{array}{c c} & \text{Water content (\%)} & \Delta & C_u \text{ (Field, kPa)} \\ \hline & \\ & \\ & \\ & \\ & \\ & \\ & \\ & \\ & \\$
0.00	95.01	5 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	Gro Topsoil:	ound surface	<u>5</u>	<sup>2</sup> ź	Re	ō	Ē	(s; Blo Si	ź	10 20 30 40 50 60 70 80 90 evel
0.30	94.71		Clayey silt, trac Fill:	ces of sand ff, brown clayey silt,		SS-1 SSE-1	48			2-2-4-7	6	
1.0			Presence of to	opsoil		SS-2 SSE-2	66			4-5-7-7	12	
<u>1.42</u>	93.59		becoming grey and gravel	with traces of sand		SS-3A SSE-3A SS-3B SSE-3B	01			4-7-9-9	16	
2.0 - 1.83	93.18		becoming with inclusion	presence of topsoil		SS-4 SSE-4	82			3-5-9-8	14	
3.0						SS-5 SSE-5	48			3-4-8-8	12	
						SS-6 SSE-6	89			3-4-6-6	10	
4.0						SS-7 SSE-7	54			2-4-5-5	9	
						SS-8 SSE-8	64			2-4-5-6	9	
5.0						SS-9 SSE-9	70			5-8-10-10	18	
6.0 -	89.37		Native soil: Stiff to very sti moist. Presence of to	ff, brown silt and clay,		SS-10A SSE-10A SS-10B SSE-10E	82			2-3-5-5	8	
				r"		SS-11 SSE-11	100			2-2-2-2	4	
7.0						SS-12	100			2-2-2-1	4	
				of symbols and abbreviation		SS-13	100			1-1-2-2	3	

G	HD				B	ORE	EHOLE	ERE	PORT				Bor	rehol	le No	).	B	H-1	1
CLIENT:	MED	USA L	.P						ETIC COO		ATES		¥.	- WAT	TER L	EVEL			
PROJECT:	PRO	POSE	D SORTAT	ION F	ACILITY				, NAD-83) (i	m)					05-19				
LOCATION: DESCRIBED	ONT	ARIO			ALE ROAD INTERSECTIC			Y 7	: 366474.0 : 5017740.7 : 95.01				-	(m) : { on plar		1122	20797-A	.1-1	
Borehole type : Core bit size : Hammer type : Energy ratio : Date (start) : Date (finish) :	: Auger B	natic 04-29	<u>.</u>	SAMPLE TYPE	SS(E) - Split Spoon (Enviror RC(E)- Rock diamond core AU(E)- Auger TEE - Sampling Tube Environment ST - Shelby tube GS(E)- Grab sample	nment)		SAMPLE STATE	Rem	ond		TEST SYMBOL		CA: che $v_L$ : liqui $v_P$ : plast v : wate $C_u$ : und $S_T$ : sens	mical a id limit tic limit r conte rained s	nt shear st			
	STR	RATIGF	RAPHY						SAMPLE						TESTS	S RESU	LTS		
Depth (m)	Elevation (m)	Symbol		De	escription	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	$N_{\rm c}$ or RQD		Atterb		its (%) rd penel		C <sub>u</sub> (Lab st valu	e
8.00	87.01			Gro	und surface	St.	r∑n	Re	Õť	ШЦ	6 i Blo (\$8	ź	10	20 30	0 40 5	0 60 7	70 80 9	0	Water level
9.0	86.68				very moist with ddings of sand		SS-14	100			1-1-2-1	3	•						
10.0							ST-15 SS-16	100 100			1-0-0-1	0 •							
11.0 12.0 13.0 14.0 15.0 15.0	84.50		End of bo	vrehol	e														

	G	HD			В	ORI	EHOLE	ERE	PORT				Borehole No. BH-1	2
LOC	JECT: ATION:	PF	IKIN DR ITARIO	ED SORTATION F	FACILITY ALE ROAD INTERSECTIC RIFIED BY: MA. RICHA			(MTN X Y 7	DETIC COO I, NAD-83) ( : 366605.0 : 5017606.5 : 90.31	m)	ATES	[ [		
Core Hamr Energ Date	nole type : bit size : ner type : gy ratio : (start) : (finish) :	B Au 20: 20:	ger tomatic 21-04-28 21-04-28	SA	SS(E) - Split Spoon (Enviro RC(E)- Rock diamond core AU(E) - Auger TEE - Sampling Tube Environment ST - Shelby tube GS(E)- Grab sample			SAMPLE STATE	Intac Dian drillir Lost	nond ng		TEST SYMBOL	GSA: grain size analysis CA: chemical analysis $w_L$ : liquid limit $w_c$ : plastic limit w: water content C <sub>u</sub> : undrained shear strength S <sub>T</sub> : sensitivity Dup: duplicate sample	
			STRATIG	RAPHY					SAMPLE		â	0	C Water content (%) △ C <sub>u</sub> (Fie	ld kPa)
De (n	n)	Elevation (m)	Symbol		escription	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N $_{\rm C}$ or RQD	H Atterberg limits (%) □ C <sub>u</sub> (Lat W <sub>P</sub> , W <sub>L</sub> "N" Standard penetration test valu "N <sub>c</sub> " Dynamic penetration test valu	b, kPa) le
0.0		90.31	<del>573737</del>	Gro	und surface	رن ر	FZ SS-1A	Ř	0		©⊡©	z	10 20 30 40 50 60 70 80 90	
	- 0.05 - - -	90.26		Loose, dark br Fill: Stiff, brown silt			SS-1B	57			2-3-3-3	6	•	
1.0 —	- 0.61 - - - -	89.70		Native soil: Stiff to very sti moist	ff, brown silt and clay,		SS-2	100			4-5-6-8	11		1.12
	-						SS-3	100			4-4-5-5	9		
2.0 -	- - - - - 2.28	88.03												
	-	00.00			giey-biowii	$\square$	SS-4	100			2-1-2-1	3		
3.0 -	- <u>3</u> .05	87.26		becoming grey			ST-5	100						
4.0 -	- <u>3.8</u> 1	86.50		becoming firm	 , very moist		SS-6	100			1-0-0-1	0 •		
5.0 —	4.57 - - -	85.74		becoming satu	 irated		SS-7	100			1-0-0-0	0 •		
	-						SS-8	100			1-0-0-0	0 •		
6.0	- 5.94 - 6.10 -	84.37 84.21		End of samplir Beginning of d test	ng ynamic penetration									
7.0	-												3	
	- - - -												↓3 ↓3	
	-			r the complete list o									<b>↓</b> 3	

G	HD				B	ORE	EHOLE	ERE	PORT				Borehole No.	BH-12
CLIENT:	ME	EDUSA	LP						DETIC COO		ATES		▼ - WATER LEVEL	
PROJECT:			ED SORTAT	ION F	ACILITY			(MTN	/I, NAD-83) (	m)			Date : 2021-05-19	
					ALE ROAD INTERSECTIO				: 366605.0				Depth (m) : 1.12	
LOCATION: DESCRIBED	ON	ITARIO			RIFIED BY: MA. RICHAI			7	: 5017606.5 : 90.31	5			Location plan : 1122079	17-A1-1
Borehole type :	· ^	aor			SS(E) - Split Spoon (Enviror	nment)			Rem	oulded			GSA: grain size analysis	
Core bit size :	: Aug B	Jei		۳.	RC(E) - Rock diamond core			SAMPLE STATE				ğ	CA: chemical analysis w <sub>i</sub> : liquid limit	
Hammer type : Energy ratio :	Aut	tomatic		SAMPLE TYPE	AU(E) - Auger TEE - Sampling Tube Environment			E ST	Intac			TEST SYMBOL	w <sub>P</sub> : plastic limit w : water content	
Date (start) :	202	21-04-28		MPL	Environment ST - Shelby tube			MPL	drillin			STS	C <sub>u</sub> : undrained shear streng	th
Date (finish) :	202	21-04-28		2 S	GS(E) - Grab sample			SA	Lost			⊨₽	S <sub>⊤</sub> : sensitivity Dup: duplicate sample	
	s	STRATIG	RAPHY						SAMPLE				TESTS RESULTS	
	u										(e)	Q	O Water content (%)	△ C <sub>u</sub> (Field, kPa)
Depth	n)	Symbol		De	escription		σ	%	sts	Ê	cm unts r siz	or RQD	W <sub>D</sub> W <sub>L</sub>	🔲 C <sub>u</sub> (Lab, kPa)
(m)	Elevation (m)	Syr		De	sonption		e an ber	very	r te	(mqq)	15 cou	o o	<ul> <li>● "N" Standard penetration</li> <li>▲ "N<sub>c</sub>" Dynamic penetration</li> </ul>	
8.00	82.31			Grou	und surface	State	Type and Number	Recovery	Other tests	PID	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub>	10 20 30 40 50 60 70 8	Water
	52.01			5,00				<u> </u>				~		level
													<b>↓</b> 3	
													2	
-														
-													<b>≜</b> 3	
9.0 —													3	
-														
-													<b>1</b> 4	
-													15	
-														
10.0													4	
-													15	
- -														
-													<b>≜</b> 6	
11.0													<u> </u> 5	
_													<b>≜</b> 6	
+													6	
-														
12.0-													10	
-													12	
-														
-														
-													9	
13.0-														
-													7	
													8	
													12	
_														
14.0													9	
													8	
													16	
													34	
15.0														
													<b>44</b>	
													51	
													54	

GHD BOREHOLE REPOR								PORT				Bore	ehole	No.		Bł	H-12	2
CLIENT:       MEDUSA LP         PROJECT:       PROPOSED SORTATION FACILITY         LOCATION:       LEIKIN DRIVE AND MERIVALE ROAD INTERSECTION, NEPEAN, ONTARIO         DESCRIBED BY:       F. ARGUIN         VERIFIED BY:       MA. RICHARD / A. FIORIL								GEODETIC COORDINATES (MTM, NAD-83) (m) X : 366605.0 Y : 5017606.5 Z : 90.31										
Borehole type : Auger Core bit size : B Hammer type : Automatic Energy ratio : Date (start) : 2021-04-28 Date (finish) : 2021-04-28				SS(E) - Split Spoon (Enviro RC(E) - Rock diamond core AU(E) - Auger TEE - Sampling Tube Environment ST - Shelby tube GS(E) - Grab sample		Remoulded F S H H C Intact Diamond drilling Lost				TEST SYMBOL	C <sub>u</sub> : undrained shear strength           S <sub>T</sub> : sensitivity           Dup: duplicate sample							
Depth (m)	Elevation (m)	loquing	C	escription	State	Type and Number	Recovery %	Other tests	PID (ppm) 6 in / 15 cm Blow counts (sampler size)			TESTS RESULTS         ○       Water content (%)       △       C <sub>u</sub> (Field, kP         W <sub>P</sub> M <sub>L</sub> Atterberg limits (%)       □       C <sub>u</sub> (Lab, kPa         "N"       Standard penetration test value       "N <sub>c</sub> " Dynamic penetration test value         10       20       30       40       50       60       70       80       90       Max				o, kPa) e		
	72.78			ic penetration test ble											<b>`</b> *66	_	×93	Ievel

GHD				BOREHOLE REPORT								Borehole	BH	BH-13				
				TION FACILITY IERIVALE ROAD INTERSECTION, NEPEAN,			GEODETIC COORDINATES (MTM, NAD-83) (m) X : 366809.6 Y : 5017824.8				<ul> <li>✓ - WATER LEVEL</li> <li>Date : 2021-05-19</li> <li>Depth (m) : 0.8</li> </ul>							
UNTARIO					VERIFIED BY: MA. RICHARD / A. FIORILI				7 . 90 38				Location plan : 11220797-A1-1					
Borehole type :AugerCore bit size :BHammer type :AutomaticEnergy ratio :Date (start) :Date (start) :2021-04-29Date (finish) :2021-04-29				SAMPLE TYPE	SS(E) - Split Spoon (Environment) RC(E) - Rock diamond core AU(E) - Auger TEE - Sampling Tube Environment ST - Shelby tube GS(E) - Grab sample				Remoulded Remoulded Intact Diamond drilling Lost			TEST SYMBOL						
		STRATIG	RAPHY					s	AMPLE					ESTS RES				
Depth (m)				D	escription	State	Type and Number	Recovery % Other tests		PID (ppm)	6 in / 15 cm Blow counts (sampler size)	$N_{\rm c}$ or RQD	$\label{eq:constraint} \begin{array}{c} \bigcirc & \text{Water content (\%)} & \bigtriangleup & C_u \mbox{(Field, kPa)} \\ \hline & Herberg limits (\%) & \hfill & C_u \mbox{(Lab, kPa)} \\ \hline & "N" \mbox{ Standard penetration test value} \\ \hline & "N_c" \mbox{ Dynamic penetration test value} \end{array}$					
0.00	90.38			Gro	und surface	St		Re	õ	ШЩ	6 i Blc (\$\$	ź	10 20 30 4	10 50 60	70 80 90	Water level		
0.09	90.29		Native so	oil:	rown silt, moist /	X	SS-1A SS-1B	84			2-3-4-4	7	•					
	88.86		hooming		presence of beddings		SS-2	100			6-5-7-8	12						
2.0	88.10		of sand				S-S3	100			2-3-3-3	6						
3.0 - 3.05							SS-4	100			1-1-1-1	2						
	87.33		becoming				SS-5	100			1-0-1-0	1						
	60.57		presence		, saturated with nells		SS-6	100			1-0-0-1	0 •						
5.0							SS-7	100			1-0-0-1	0 •	•					
6.0							SS-8	100			1-0-0-0	0						
F						V///	ST-9	100								]		

See the attached explicative note for the complete list of symbols and abbreviations

FO-030.82/IA/12-14

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G	HD				E	BORI	eholi	ER	PORT				Boreho	le No.		BH-1	13
CLIENT:	ME	DUSA L	_P						DETIC COO		ATES		▼ - WA	TER LEV	EL		
PROJECT:	PR	OPOSE	D SORTAT	ION F	ACILITY			(MT	M, NAD-83) (	(m)			Date : 2021				
LOCATION:			IVE AND M	IERIV	ALE ROAD INTERSECTI	ON, NE	EPEAN,	1	K : 366809.6 Y : 5017824.8	3			Depth (m) :				
DESCRIBED		ITARIO ARGUIN	N	VE	RIFIED BY: MA. RICH	ARD / A	A. FIORILI		Z : 90.38	5		L	Location pla	ın: 1	122079	7-A1-1	
Borehole type :	Aug	ger			SS(E) - Split Spoon (Enviro			ш	Rem	noulded				rain size an emical analy			
Core bit size : Hammer type :	B	omatic		SAMPLE TYPE	RC(E) - Rock diamond core AU(E) - Auger	e		SAMPLE STATE	Intac	ct		TEST SYMBOL	w <sub>L</sub> : liqu				
Energy ratio :				БГЕ	TEE - Sampling Tube Environment			PLE	Dian drillir			NVS-	w : wat	er content			
Date (start) : Date (finish) :		21-04-29 21-04-29		SAM	ST - Shelby tube GS(E)- Grab sample			SAM	Lost	-		TESI	S <sub>T</sub> : sen		-	л	
		TRATIG			GG(L)- Grab sample				SAMPLE				Dup: di	uplicate sam	-		
									SAWFEE				O Wate	er content (%			eld, kPa)
Depth	Elevation (m)	Symbol		-			-	%	sts	Ē	cm size	or RQD	H Atter	berg limits (	%) [	🗆 C <sub>u</sub> (La	ab, kPa)
(m)	Elev (r	Syn		D	escription		ber	Verv	r tes	(mqq)	15 cou	° or	• "N"	Standard p Dynamic p			
8.00	82.38			Gro	ound surface	State	Type and Number	Recoverv	Other tests	PID (	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub>		0 40 50 (			Water
-	02.00	<i>an</i> d		010						ш.		~					
-																	
-																	
-																	
9.0 —							7										
-						$\mathbb{N}$	00.40	10			4000						
+						$  \wedge$	SS-10	10	J		1-0-0-0	0 •	<b>•</b>				
-						$\vdash$											
10.0																	
_																	
- 10.67	79.71	H			presence of beddings	-	7										
F	10.11		of silt	g with	presence of beddings	$\mathbb{N}$	SS-11	10			1-0-0-0	0					
11.0-							33-11				1-0-0-0	0					
11.28	79.10	скил	End of bo	oreho	le	<u> </u>	N						<b>↑</b> <sup>1</sup>				
+			Beginning	g of d	lynamic penetration test								2				
-													3				
12.0-													<b>A</b> <sup>3</sup>				
-													<b>4</b> 3				
Ē													2				
-																	
-													<b>4</b> 3				
13.0													•9				
-													8				
-													Ţ				
													8				
14.0-													11				
													$  \uparrow \rangle$	27			
													Ţ				
													<u>/</u> 20				
													́13				
15.0													1				
													\ ↑17				
													<b>↓</b> 14				
Ⅰ ⊢ │													17				

See the attached explicative note for the complete list of symbols and abbreviations

G	HD			В	ORE	EHOLE	ERE	PORT				Borehole No.	BH	-13
CLIENT: PROJECT: LOCATION: DESCRIBEI	PF LE ON	IKIN DF ITARIO	ED SORTATION	FACILITY ALE ROAD INTERSECTIO RIFIED BY: MA. RICHA			(MTN X Y	DETIC COO 1, NAD-83) ( : 366809.6 : 5017824.8 : 90.38	m)	ATES			- 220797-A1-	1
Borehole type Core bit size : Hammer type Energy ratio : Date (start) : Date (finish) :	B Au 20: 20:	tomatic 21-04-29 21-04-29	SA		SAMPLE STATE	Intac Dian drillir Lost	nond ng		TEST SYMBOL	GSA: grain size analy CA: chemical analysi w <sub>i</sub> : liquid limit w <sub>p</sub> : plastic limit w : water content C <sub>u</sub> : undrained shear S <sub>1</sub> : sensitivity Dup: duplicate sampl	s strength e			
Depth (m)	Elevation (m)	Ioquiós		escription	State	Type and Number	Recovery %	Other tests	PID (ppm)	6 in / 15 cm Blow counts (sampler size)	N, N <sub>c</sub> or RQD	O       Water content (%)         H       Atterberg limits (%)         ●       "N" Standard per         ▲       "Nc" Dynamic pen	$\triangle C_u$ $\Box C_u$ etration test v	alue
	74.38			ic penetration test le		ΓZ		0						Water level

See the attached explicative note for the complete list of symbols and abbreviations

# Appendix C GHD Test Pit Reports and Photographs

Reference N	o. 11227097-	A1						Page:	1 of 1
	GHD			TEST PIT RE	PORT	т	EST PIT No	o. TP-	-01
CLIENT: PROJECT: LOCATION:		SORTATIO	ON FACILITY RIVALE ROAD	) INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366239.2 Y : 5017861.2 Z : 90.67		- INFILTRATION - WATER LEVE	
DESCRIBED I DATE: VERIFIED BY: DATE:	3Y: M. CHÉNIEF 2021-05-03 MA. RICHA 2021-05-03		ORILLI	CA : Chemical analysis MSS: Manual split spoon RC : Rock core	AU: Au	e roctor Sample	PA : Pan PP : Port DP: Dyna	Manual tests da (q <sub>d</sub> ) able penetromete amic penetromete onor Vane tester	er (E <sub>25</sub> )
Depth (m) 0,0	Elevation (m) 90.67	Symbol		STRATIG	RAPHY		Sample type & Number	Tests Type	¥ <
			Clayey silt, tr	native soil / topsoil: races of sand. ots and organics			GS-1 GSE-1		
0.5			Native soil: Stiff to very s	stiff, brown-grey silt and clay, ve	ry moist		GS-2		
			becoming gro	ey			GS-3	w = 33.0% WI = 63.0% Wp = 26.0 %	
	50 89.17		becoming sti	ff, saturated			GS-4		
- 2.8	80 87.87		End of test p	it			_		<
			Note: Slight water i	infiltration at 2.80m					



Photo 1 : TP-01 excavation.



Photo 2 : TP-01 materials.



# Test Pit No. TP-01 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD			TEST PIT RE	PORT	. ті	EST PIT No	. ТР	9-02
CLIENT: PROJECT: LOCATION:		SORTATIO	ON FACILITY RIVALE ROAD	INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366350.8 Y : 5017942.4 Z : 90.59	_	- INFILTRATIO - WATER LEVI	
DESCRIBED BY	: M. CHÉNIEF	२		Sa	ample typ	De	N	lanual tests	
DATE:	2021-05-03			CA : Chemical analysis	PS : F	Proctor Sample	PA : Pand		
VERIFIED BY:	MA. RICHA	ARD / A. FIC	RILLI	MSS: Manual split spoon	AU: A	-		ible penetrome mic penetrome	
DATE:	2021-05-03			RC : Rock core	GS(E)	: Grab sample (environment)		nor Vane teste	
Depth (m)	Elevation (m)	Symbol		STRATIG	RAPHY		Sample type &	Tests	<b>_</b>
0,0	90.59	S	Pomouldad	native soil / topsoil:			Number	Туре	<
_			Clayey silt, tr	races of sand. ots and organics			GS-1		
0.30	90.29		Native soil: Stiff to very s	tiff, brown silt and clay, moist			GS-2		
	- <del>89.89</del>		becoming gre				GS-3		
	<u>89.09</u> -		becoming sti	ff, saturated			GS-4		
3.0 - - - - - - - - - - - - -	87.59		End of test p Note: No water infil						



Photo 1 : TP-02 excavation.



Photo 2 : TP-02 materials.



# Test Pit No. TP-02 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	äHD		TEST PIT REF	PORT		TEST PIT No	o. TP	-03
CLIENT: PROJECT: LOCATION:	MEDUSA LP PROPOSED SORT LEIKIN DRIVE AND ONTARIO		INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366431.0 Y : 5017938.4 Z : 90.52	< ¥	- INFILTRATIO	
DESCRIBED B	Y: M. CHÉNIER		Sa	mple type	•		Manual tests	
DATE: VERIFIED BY: DATE:	2021-05-03 MA. RICHARD / A 2021-05-03	A. FIORILLI	CA : Chemical analysis MSS: Manual split spoon RC : Rock core	AU: Aug	octor Sample ger Grab sample (environmer	DP: Dyna	da (q <sub>d</sub> ) able penetromet amic penetromet onor Vane tester	er (E 25)
Depth (m) 0,0	Elevation (m)		STRATIGE	RAPHY		Sample type & Number	Tests Type	¥ <
-		Clayey silt, tr Traces of roo	<b>native soil / topsoil:</b> aces of sand. ots and organics			GS-1		
0.5	90.22	Native soil: Stiff to very s	tiff, brown silt and clay, moist			GS-2		
			ey, very moist			GS-3		
	88.72	becoming stil	ff with traces of sand, saturated			GS-4		
	87.62	End of test pi						

See the attached explicative note for the complete list of symbols and abbreviations

Reference No. 11227097-A1



Photo 1 : TP-03 excavation.



Photo 2 : TP-03 materials.



### Test Pit No. TP-04 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD			TEST PIT RE	PORT		TEST PIT No	. TF	P-04
CLIENT: PROJECT: LOCATION:		SORTATIO	ON FACILITY RIVALE ROAD	INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366476.0 Y : 5018013.0 Z : 90.46		- INFILTRATIC - WATER LEV	
DESCRIBED BY	: M. CHÉNIEF	ર		Sa	ample typ	De	-	lanual tests	
DATE:	2021-05-03			CA : Chemical analysis		Proctor Sample	PA : Pano PP : Porta	la (q <sub>d</sub> ) Ible penetrome	eter (C.)
VERIFIED BY: DATE:	MA. RICHA 2021-05-03	ARD / A. FIC	ORILLI	MSS: Manual split spoon RC : Rock core	AU: A	uger ) : Grab sample (environment	DP: Dyna	mic penetrome	ter (E <sub>25</sub> )
					65(L)		GVT: Geo Sample	nor Vane teste	
Depth (m)	Elevation (m)	Symbol		STRATIG	RAPHY		type &	Tests	_ <b>▼</b>
0,0	90.46	S S					Number	Туре	<
-			Clayey silt, tr	native soil / topsoil: aces of sand. ots and organics			GS-1 GSE-1		
0.30	90.16		Native soil: Stiff to very s	tiff, brown silt and clay, moist			GS-2		
	89.76		becoming ve				GS-3		
2.0	88.86		becoming sti	ff with traces of sand, grey, satu	irated		GS-4		
3.0							GS-5		
3.10	87.36		End of test p	it					<
			Note:						
3.5 —			Slight water i	infiltration at 3.10m					
_									
4.0									
4.5 — — — —									
-									

See the attached explicative note for the complete list of symbols and abbreviations

Reference No. 11227097-A1



Photo 1 : TP-04 excavation.



Photo 2 : TP-04 materials.



Test Pit No. TP-04 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

Reference No.	11227097-	A1						Page	:1 of 1
G	HD			TEST PIT REI	PORT	٢	EST PIT No.	TF	P-05
CLIENT: PROJECT:		SORTATI				GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366565.4			
LOCATION:	ONTARIO	E AND ME	RIVALE ROAD	INTERSECTION, NEPEAN,		Y : 5018013.4 Z : 90.60	¥ -	WATER LEV	EL
DESCRIBED BY DATE: VERIFIED BY: DATE:	<ol> <li>M. CHÉNIEF</li> <li>2021-05-03</li> <li>MA. RICHA</li> <li>2021-05-03</li> </ol>		DRILLI	CA : Chemical analysis MSS: Manual split spoon RC : Rock core	AU: Au	octor Sample	PA : Panda PP : Portal DP: Dynan	anual tests a (q <sub>d</sub> ) ble penetrome nic penetrome nor Vane teste	ter (E <sub>25</sub> )
Depth (m) 0,0	Elevation (m) 90.60	Symbol		STRATIG	RAPHY		Sample type & Number	Tests Type	
-			Clayey silt, tr Traces of roc	native soil / topsoil: races of sand. ots and organics			GS-1		
0.5	90.30		Native soil: Stiff to very s	tiff, brown silt and clay, moist			GS-2		
	- <del></del>		becoming gre	ey, very moist			 GS-3		
2.0							GS-4		
2.5	88.40		becoming sti	ff, saturated			GS-5		
	87.60		End of test p Note: No water infil						
- 4.0									
-									

See the attached explicative note for the complete list of symbols and abbreviations



Photo 1 : TP-05 excavation.



Photo 2 : TP-05 materials.



# Test Pit No. TP-05 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

Reference No	. 11227097-A	\1						Page:	1 of 1
G	HD			TEST PIT RE	PORT	1	EST PIT No	). TP	-06
CLIENT:	MEDUSA LP					GEODETIC COORDINATES (m) (MTM, NAD-83)	<	- INFILTRATION	d
PROJECT: LOCATION:	PROPOSED S LEIKIN DRIVE ONTARIO			) INTERSECTION, NEPEAN,		X : 366603.7 Y : 5018084.5 Z : 90.61	_	- WATER LEVE	
DESCRIBED BY				S	ample typ		N	/anual tests	
DATE:	2021-05-04			CA : Chemical analysis	PS : P	roctor Sample	PA : Pano		(2)
VERIFIED BY: DATE:	MA. RICHAF 2021-05-04	RD / A. FIO	RILLI	MSS: Manual split spoon RC : Rock core	AU: Au GS(E)	uger : Grab sample (environment	DP: Dyna	able penetrometer ( $C_u$ ) mic penetrometer ( $E_{25}$ )	
Depth (m)	Elevation	ō				• •	Sample	onor Vane tester Tests	(C <sub>u</sub> )
0,0	— (m)	Symbol		STRATIG	RAPHY		type & Number	Туре	- - -
_	90.61			native soil / topsoil: races of sand.			GS-1		
			Traces of roc	ots and organics			GSE-1		
0.5	90.31		Native soil: Stiff to very s	stiff, brown silt and clay, moist			GS-2		
				ey, very moist			GS-3		
			becoing stiff,				GS-4		
	87.61		End of test p Note: No water infil						



Photo 1 : TP-06 excavation.



Photo 2 : TP-06 materials.



# Test Pit No. TP-06 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

Reference No.	11227097-	A1						Page:	1 of 1
G	HD			TEST PIT RE	PORT	т	EST PIT No	o. TP-	-15
CLIENT: PROJECT: LOCATION:		SORTATIO	ON FACILITY RIVALE ROAD	) INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366292.5 Y : 5017826.9 Z : 90.65		- INFILTRATION	
DESCRIBED BY DATE: VERIFIED BY: DATE:	<ul> <li>M. CHÉNIEF</li> <li>2021-05-03</li> <li>MA. RICHA</li> <li>2021-05-03</li> </ul>		PRILLI	CA : Chemical analysis MSS: Manual split spoon RC : Rock core	AU: Au	e roctor Sample	PA : Pano PP : Porta DP: Dyna	Manual tests da (q <sub>d</sub> ) able penetrometo mic penetrometo onor Vane tester	er (E <sub>25</sub> )
Depth (m) 0,0	Elevation (m) 90.65	Symbol		STRATIO	RAPHY		Sample type & Number	Tests Type	Ĭ. ▼ <
-			Clayey silt, tr Traces of roo	native soil / topsoil: races of sand. ots and organics			GS-1		
0.30	90.35		Native soil: Stiff to very s	stiff, brown silt and clay, moist			GS-2		
				ey, very moist			GS-3		
2.0 — 2.5 —	<u>89.05</u> -		becoming sti	iff, saturated			GS-4		
3.0 - 2.80	87.85		End of test p Note:				_		<
			Slight water i	infiltration at 2.80m					
3.5 —									
4.0									
- - 4.5									



Photo 1 : TP-15 excavation.



Photo 1 : TP-15 materials.



## Test Pit No. TP-15 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

Reference No.	. 11227097-A1						Page:	1 of 1
G	HD		TEST PIT RE	PORT	т	EST PIT No	. TP-	-16
CLIENT: PROJECT: LOCATION:	MEDUSA LP PROPOSED SORTATI LEIKIN DRIVE AND ME ONTARIO		DINTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366351.7 Y : 5017860.4 Z : 90.62			
DESCRIBED BY DATE: VERIFIED BY: DATE:	<ul> <li>M. CHÉNIER</li> <li>2021-05-03</li> <li>MA. RICHARD / A. FI</li> <li>2021-05-03</li> </ul>	ORILLI	CA : Chemical analysis MSS: Manual split spoon RC : Rock core	AU: Au	roctor Sample	PA : Pand PP : Porta DP: Dynar	lanual tests a (q <sub>d</sub> ) ble penetromete nic penetromete nor Vane tester	er (E <sub>25</sub> )
Depth (m) 0,0	Elevation 0 (m) E		STRATIG	RAPHY		Sample type & Number	Tests Type	¥ <
_		Clayey silt, to Traces of roo	native soil / topsoil: races of sand. ots and organics			GS-1 GSE-1		
0.30	90.32	Native soil: Stiff to very s	stiff, brown silt and clay, moist			GS-2		
1.0		becoming gr	ey, very moist			GS-3		
	89.12	becoming st	iff, saturated			GS-4		
2.5 — - - - -						GS-5		
3.0 <u>3.00</u> - <u>3.00</u> - <u>-</u> 3.5 <u>-</u> 4.0 <u>-</u> 4.5 <u>-</u> - <u>-</u> 4.5 <u>-</u>	87.62	End of test p Note: No water infi						

See the attached explicative note for the complete list of symbols and abbreviations



Photo 1 : TP-16 excavation.



Photo 2 : TP-16 materials.



Test Pit No. TP-16 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD			TEST PIT REI	PORT		TEST PIT No	o. TP	-17
CLIENT: PROJECT: LOCATION:	MEDUSA LP PROPOSED S LEIKIN DRIVE ONTARIO			INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366450.1 Y : 5017904.3 Z : 90.59		- INFILTRATIO	
DESCRIBED BY	: M. CHÉNIER			Sa	mple typ	e		Manual tests	
DATE:	2021-05-03			CA : Chemical analysis	PS : P	roctor Sample	PA : Pan		
VERIFIED BY:	MA. RICHAR	RD / A. FIC	RILLI	MSS: Manual split spoon	AU: Au	uger		able penetromet	
DATE:	2021-05-03			RC : Rock core	GS(E)	: Grab sample (environme		amic penetromet onor Vane tester	
Depth (m)	Elevation (m)	Symbol		STRATIG	RAPHY		Sample type &	Tests	<u> </u>
0,0	90.59	Syı					م Number	Туре	<
			Clayey silt, tr	native soil / topsoil: aces of sand. ots and organics			GS-1		
0.5 - 0.30	90.29		Native soil: Stiff to very s	tiff, brown silt and clay, moist			GS-2		
1.0			becoming gre	ey, very moist			GS-3		
1.5 - 1.45	89.14		End of test p Note: No water infil						
2.0									
2.5									
3.0									
3.5 —									
4.0									
4.5 —									



Photo 1 : TP-17 excavation.



Photo 10 : TP-17 materials.



# Test Pit No. TP-17 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

Reference No.	11227097-/	A1						Page:	1 of 1
G	HD			TEST PIT RE	PORT	т	EST PIT No	o. TP-	-18
CLIENT: PROJECT: LOCATION:		SORTATIO	ON FACILITY RIVALE ROAD	) INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366524.8 Y : 5017946.2 Z : 90.55	<u> </u>	- INFILTRATION - WATER LEVE	
DESCRIBED BY DATE: VERIFIED BY: DATE:	<ul> <li>M. CHÉNIEF</li> <li>2021-05-03</li> <li>MA. RICHA</li> <li>2021-05-03</li> </ul>		DRILLI	CA : Chemical analysis MSS: Manual split spoon RC : Rock core	AU: Au	roctor Sample	PA : Pan PP : Port DP: Dyna	Manual tests da (q <sub>d</sub> ) able penetromete imic penetromete onor Vane tester	er (E <sub>25</sub> )
Depth (m) 0,0	Elevation (m) 90.55	Symbol		STRATIO	RAPHY		Sample type & Number	Tests Type	¥ <
-			Clayey silt, tr Traces of roo	<b>native soil / topsoil:</b> aces of sand. ots and organics			GS-1		
0.30	90.25		Native soil: Stiff to very s	stiff, brown silt and clay, moist			GS-2		
1.0			becoming gro	ey, very moist			GS-3		
1.5 <u> </u>	89.05		End of test p Note: No water infil				_		
2.5 —									
3.0									
- - 3.5 - - -									
4.0									
4.5 —									



Photo 1 : TP-18 excavation.



Photo 2 : TP-18 materials.



# Test Pit No. TP-18 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD			TEST PIT RE	PORT		TEST PIT No	o. TP	-19
CLIENT: PROJECT: LOCATION:	MEDUSA LP PROPOSED S LEIKIN DRIVE ONTARIO			INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366584.3 Y : 5017980.1 Z : 90.68	< ¥	- INFILTRATIO	
DESCRIBED BY	: M. CHÉNIER			Sa	ample typ	e		Manual tests	
DATE:	2021-05-04			CA : Chemical analysis	PS : P	roctor Sample	PA : Pan		
VERIFIED BY:	MA. RICHARI	d / A. Fiof	RILLI	MSS: Manual split spoon	AU: A			able penetrome amic penetrome	
DATE:	2021-05-04			RC : Rock core	GS(E)	: Grab sample (environmen		onor Vane teste	
Depth (m)	Elevation (m)	Symbol		STRATIG	RAPHY		Sample type &	Tests	Ţ
0,0	90.68	δ XXXXX					Number	Туре	<
			Clayey silt, tr	native soil / topsoil: aces of sand. ots and organics			GS-1 GSE-1		
0.5	90.38		Native soil: Stiff to very s	tiff, brown silt and clay, moist			GS-2		
				ey, very moist			GS-3		
	89.18		End of test pi Note: No water infil						
2.5 —									
3.0									
3.5									
4.0									
4.5 —									



Photo 1 : TP-19 excavation.



Photo 1 : TP-19 materials.



# Test Pit No. TP-19 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

Reference No.	. 11227097-A1					Page: 1 of 1
G	HD		TEST PIT RE	PORT	TEST PIT No	o. TP-20
CLIENT: PROJECT: LOCATION:	MEDUSA LP PROPOSED SORTAT LEIKIN DRIVE AND M ONTARIO		) INTERSECTION, NEPEAN,	GEODETIC COORDINATES (m (MTM, NAD-83) X : 366653.2 Y : 5017996.1 Z : 90.52	<	- INFILTRATION - WATER LEVEL
DESCRIBED BY DATE: VERIFIED BY: DATE:	<ul> <li>M. CHÉNIER</li> <li>2021-05-04</li> <li>MA. RICHARD / A. FI</li> <li>2021-05-04</li> </ul>	ORILLI	CA : Chemical analysis MSS: Manual split spoon RC : Rock core	Sample type       CA : Chemical analysis     PS : Proctor Sample       MSS: Manual split spoon     AU: Auger		
Depth (m) 0,0	Elevation (m)		STRATIG	RAPHY	Sample type & Number	onor Vane tester (C <sub>u</sub> ) Tests  ⊈ Type  ≮
0.30		Clayey silt, to Traces of roo Native soil:	native soil / topsoil: races of sand. ots and organics stiff, brown silt and clay, moist		GS-1 GSE-1	
		becoming gr	ey, very moist		GS-2 GS-3	
	89.12	becoming st	iff with traces of sand, saturated		GS-4	
2.5					GS-5	
	87.52	End of test p Note: Slight water	infiltration at 3.0m			



Photo 1 : TP-20 excavation.



Photo 2 : TP-20 materials.



Test Pit No. TP-20 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

Reference No.	11227097-A1				Page: 1 of 1	
6	HD	TEST PIT R	EPORT	TEST PIT No.	TP-24	
CLIENT: PROJECT: LOCATION:	MEDUSA LP PROPOSED SORTAT LEIKIN DRIVE AND M ONTARIO	ION FACILITY ERIVALE ROAD INTERSECTION, NEPEAN,	GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366263.6 Y : 5017757.8 Z : 90.68	83) <b>C</b> - INFILTRATION		
DESCRIBED BY DATE: VERIFIED BY: DATE:	<ol> <li>M. CHÉNIER</li> <li>2021-05-03</li> <li>MA. RICHARD / A. FI</li> <li>2021-05-03</li> </ol>	CA : Chemical analysis	Sample type CA : Chemical analysis PS : Proctor Sample MSS: Manual split spoon AU: Auger			
Depth (m) 0,0	Elevation (m) ــــــــــــــــــــــــــــــــــــ	STRAT	IGRAPHY	Sample type	Vane tester (C <sub>u</sub> ) Tests Type ✔	
0.5		Remoulded native soil / topsoil: Clayey silt, traces of sand. Traces of roots and organics		GS-1		
	90.18	Native soil: Stiff to very stiff, brown silt and clay, moist		GS-2		
- 1.00 	89.68	becoming grey, very moist		GS-3		
	88.68	becoming stiff, saturated		GS-4		
3.0 - 3.00 - - - - - - - - - - - - -	87.68	End of test pit Note: No water infiltration				



Photo 1 : TP-24 excavation.



Photo 2 : TP-24 materials.



## Test Pit No. TP-24 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD			TEST PIT REI	PORT		TEST PIT No	o. TP	-25
CLIENT: PROJECT: LOCATION:	MEDUSA LP PROPOSED SC LEIKIN DRIVE A ONTARIO			INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366327.0 Y : 5017764.9 Z : 90.71		- INFILTRATION	
DESCRIBED BY	: M. CHÉNIER			Sa	imple typ	)e		Manual tests	
DATE:	2021-05-03			CA : Chemical analysis	PS : P	roctor Sample	PA : Pan		
VERIFIED BY:	MA. RICHARD	) / A. FIO	RILLI	MSS: Manual split spoon	AU: AI			able penetromet	
DATE:	2021-05-03			RC : Rock core	GS(E)	: Grab sample (environmen		mic penetromet onor Vane tester	
Depth (m)	Elevation	-					Sample	Tests	(C <sub>u</sub> )
	(m)	Symbol		STRATIG	RAPHY		type &		
0,0	90.71	ŝ					Number	Туре	<
		TATA	Remoulded Clayey silt, tra	native soil / topsoil: races of sand			GS-1		
-		IJJA		ots and organics			GSE-1		
0.30	90.41		Native soil: Stiff to very s	tiff, brown silt and clay, moist			GS-2		
	88.61 87.81		Firm, grey sa	ey, very moist to saturated			GS-3 GS-4	w = 37.0% WI = 53.0% Wp = 24.0 %	
							GS-5		
3.30	87.41		End of test pi	it					
3.5 —			Note:						
			No water infil	Itration					
4.0									
4.5									
-									



Photo 1 : TP-25 excavation.



Photo 2 : TP-25 materials.



# Test Pit No. TP-25 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD			TEST PIT RE	PORT		TEST PIT No	o. TF	9-26	
CLIENT: PROJECT: LOCATION:		SORTATIO	ON FACILITY RIVALE ROAD	INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366386.2 Y : 5017798.3 Z : 90.68				
DESCRIBED BY	: M. CHÉNIEF	२		Sa	ample typ	De		Manual tests		
DATE:	2021-05-03			CA : Chemical analysis	PS : F	Proctor Sample	PA : Pan			
VERIFIED BY:	MA. RICHA	ARD / A. FIC	ORILLI	MSS: Manual split spoon	AU: A	uger		able penetrome		
DATE:	2021-05-03			RC : Rock core	GS(E)	) : Grab sample (environme		amic penetrome onor Vane teste		
Depth (m)	Elevation (m)	Symbol		STRATIG	RAPHY	,	Sample type &	Tests	Ţ	
0,0	90.68	0 8/3/3/3/3/3					Number	Туре	/ <	
-			Clayey silt, tr Traces of roc	native soil / topsoil: aces of sand. ots and organics			GS-1			
0.30	90.38		Native soil: Stiff to very s	tiff, brown silt and clay, moist			GS-2			
				ey, very moist			GS-3			
2.0	88.88		becoming sti	ff, saturated			GS-4			
3.0 - 2.90	87.78		End of test p	it						
-			Note:							
			No water infi	Itration						
-										
3.5 —										
-										
4.0										
4.5										

See the attached explicative note for the complete list of symbols and abbreviations

Reference No. 11227097-A1



Photo 1 : TP-26 excavation.



Photo 2 : TP-26 materials.



Test Pit No. TP-26 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD		TEST PIT REPOR	гт -	FEST PIT No	o. TP-	27
CLIENT: PROJECT: LOCATION:	MEDUSA LP PROPOSED SORTA LEIKIN DRIVE AND M ONTARIO						
DESCRIBED BY	: M. CHÉNIER		Sample	type		Manual tests	
DATE:	2021-05-03		CA : Chemical analysis PS	: Proctor Sample	PA : Pan		
VERIFIED BY:	MA. RICHARD / A. F	IORILLI		Auger		able penetromete	
DATE:	2021-05-03		RC : Rock core GS	(E) : Grab sample (environment		amic penetromete onor Vane tester	
Depth (m)	Elevation (m) Elevation		STRATIGRAPH	łΥ	Sample type &	Tests	Ţ
0,0	90.58 Ú		L		Number	Туре	<
-		Clayey silt, t Traces of ro	I native soil / topsoil: traces of sand. tots and organics		GS-1 GSE-1	_	
0.30	90.28	Native soil: Stiff to very	stiff, brown silt and clay, moist		GS-2		
	89.08	becoming g	rey, very moist		GS-3		
2.0		Note: No water inf	ïltration				
2.5 —							
3.0							
- - 3.5 - -							
4.0							
- - 4.5 - -							



Photo 1 : TP-27 excavation.



Photo 2 : TP-27 materials.



### Test Pit No. TP-27 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD			TEST PIT REI	PORT		TEST PIT No	o. TP	-28
CLIENT: PROJECT: LOCATION:	MEDUSA LP PROPOSED LEIKIN DRIVE ONTARIO	SORTATIC		INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366545.7 Y : 5017908.9 Z : 90.71	_	- INFILTRATIO	
DESCRIBED BY	: M. CHÉNIER			Sa	mple typ	De	I	Vanual tests	
DATE: VERIFIED BY: DATE:	2021-05-03 MA. RICHAF 2021-05-03	rd / A. Fio	RILLI	CA : Chemical analysis MSS: Manual split spoon RC : Rock core	AU: A	Proctor Sample uger ) : Grab sample (environme	DP: Dyna	da (q <sub>d</sub> ) able penetromet amic penetromet onor Vane tester	ter (E <sub>25</sub> )
Depth (m) 0,0	Elevation (m) 90.71	Symbol		STRATIG	RAPHY		Sample type & Number	Tests Type	¥ <
	90.41		Clayey silt, tra	native soil / topsoil: aces of sand. ots and organics			GS-1 GSE-1		
0.5	30.41			tiff, brown silt and clay, moist			GS-2		
	89.21		becoming gree	ey, very moist			GS-3		
			Note: No water infil	tration					



Photo 1 : TP-28 excavation.



Photo 2 : TP-28 materials.



## Test Pit No. TP-28 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD		TEST PIT REF	PORT	ı	EST PIT No	). TP	-29	
CLIENT: PROJECT: LOCATION:	MEDUSA LP PROPOSED SORTAT LEIKIN DRIVE AND MI ONTARIO		ODETIC OORDINATES (m) TM, NAD-83) : 366605.4 : 5017942.6 : 90.72	<ul><li>INFILTRATION</li><li>WATER LEVEL</li></ul>					
DESCRIBED BY			Sa	mple type		1	Vanual tests		
DATE: VERIFIED BY: DATE:	2021-05-04 MA. Richard / A. Fi 2021-05-04	ORILLI	CA : Chemical analysis MSS: Manual split spoon RC : Rock core				PA : Panda ( $q_d$ ) PP : Portable penetrometer ( $C_u$ ) DP: Dynamic penetrometer ( $E_{25}$ ) GVT: Geonor Vane tester ( $C_u$ )		
Depth (m) 0,0	Elevation (m)		STRATIG	RAPHY		Sample type & Number	Tests Type	× <	
_	30.72	Clayey silt, t	native soil / topsoil: races of sand. ots and organics			GS-1			
0.30	90.42	Native soil: Stiff to very	stiff, brown silt and clay, moist			GS-2			
1.0	90.02	becoming gr	rey, very moist			 GS-3			
1.5 — 1.45 - - - - -	89.27	End of test p Note: No water inf				_			
2.0									
2.5 — — — —									
3.0									
3.5 —									
4.0									
- - 4.5 -									

Reference No. 11227097-A1



Photo 1 : TP-29 excavation.



Photo 2 : TP-29 materials.



# Test Pit No. TP-29 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

Reference No.	. 11227097-	A1						Page:	1 of 1	
G	HD			TEST PIT RE	PORT	T T	EST PIT No	. TP	-30	
CLIENT:	MEDUSA LP	þ				N				
PROJECT: LOCATION:			ON FACILITY RIVALE ROAD	INTERSECTION, NEPEAN,		(MTM, NAD-83) X : 366492.8 Y : 5017827.9 Z : 90.56	<ul> <li>INFILTRATION</li> <li>WATER LEVEL</li> </ul>			
DESCRIBED BY		२		Sa	N	lanual tests				
DATE:	2021-05-03			CA : Chemical analysis		roctor Sample	PA : Panc	la (q <sub>d</sub> )		
VERIFIED BY:	MA. RICHA	ARD / A. FIC	RILLI	MSS: Manual split spoon	AU: A		PP : Portable penetrometer (C			
DATE:	2021-05-03	-		RC : Rock core	GS(E)	: Grab sample (environment)		DP: Dynamic penetrometer (E 25) GVT: Geonor Vane tester (C <sub>u</sub> )		
Depth (m)	Elevation (m)	Symbol		STRATIG	RAPHY		Sample type	Tests	<b>¥</b>	
0,0	90.56	Syr					& Number	Туре	<	
_			Clayey silt, tr	native soil / topsoil: aces of sand.			GS-1			
0.30	90.26		Native soil:	ots and organics			GSE-1			
0.5 —			Stiff to very s	tiff, brown silt and clay, moist			GS-2			
	89.86		becoming gro	ey, very moist			_			
1.0										
-							GS-3			
1.5 —										
1.70	88.86		becoming sti	ff with traces of sand			_			
2.0							GS-4			
2.5	87.96		Stiff grov oo	ndy and clayey silt, saturated						
	01.00		Sun, grey sa	nuy anu dayey sin, saturateu			GS-5			
3.0 - 3.00	87.56		End of test p	it			-			
-			Note: No water infi	Itration						
-			No water initi	alon						
3.5 —										
4.0										
4.5 —										
1										

See the attached explicative note for the complete list of symbols and abbreviations



Photo 1 : TP-30 excavation.



Photo 2 : TP-30 materials.



# Test Pit No. TP-30 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

Reference No	. 11227097-/	A1						Page:	1 of 1	
G	HD			TEST PIT RE	PORT	-	EST PIT No	o. TP-	-31	
CLIENT: PROJECT: LOCATION:	MEDUSA LP PROPOSED LEIKIN DRIV ONTARIO	SORTATIO		INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366627.4 Y : 5017903.3 Z : 90.41				
DESCRIBED BY DATE: VERIFIED BY: DATE:	<ul> <li>M. CHÉNIER</li> <li>2021-05-04</li> <li>MA. RICHA</li> <li>2021-05-04</li> </ul>		RILLI	CA : Chemical analysis MSS: Manual split spoon RC : Rock core	PA : Pan PP : Port DP: Dyna	$\begin{tabular}{ c c c c } \hline Manual tests \\ \hline PA : Panda (q_d) \\ PP : Portable penetrometer (C_u) \\ DP: Dynamic penetrometer (E_{25}) \\ GVT: Geonor Vane tester (C_u) \\ \hline \end{tabular}$				
Depth (m) 0,0	Elevation (m) 90.41	Symbol		STRATIO	Sample type & Number	Tests Type	Ĭ			
0.30			Clayey silt, tr	native soil / topsoil: races of sand. ots and organics			GS-1 GSE-1			
0.5	00.11			tiff, brown silt and clay, moist			GS-2			
				ey, very moist			GS-3			
			becoming sti	ff with traces of sand, saturated	Ι		GS-4			
	87.41		End of test p Note: No water infil							

See the attached explicative note for the complete list of symbols and abbreviations



Photo 1: TP-31 excavation.



Photo 2 : TP-31 materials.



# Test Pit No. TP-31 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

Reference No	. 11227097-A1						Page:	1 of 1		
9	HD		TEST PIT RE	PORT	TI	EST PIT No	o. TP-	-35		
CLIENT: PROJECT: LOCATION:	ROJECT: PROPOSED SORTATION FACILITY (MTM, NAD-83) LEIKIN DRIVE AND MEDIVALE DOAD INTERSECTION NEDEAN X: 366558.2							l		
DESCRIBED BY DATE: VERIFIED BY: DATE:	<ul> <li>Y: M. CHÉNIER</li> <li>2021-05-05</li> <li>MA. RICHARD / A. FIG</li> <li>2021-05-05</li> </ul>	ORILLI	Sample type     Manual te       CA : Chemical analysis     PS : Proctor Sample     PA : Panda (q_d)       MSS: Manual split spoon     AU: Auger     PP : Portable pene       RC : Rock core     GS(E) : Grab sample (environment)     DP: Dynamic pene					netrometer (C <sub>u</sub> ) netrometer (E <sub>25</sub> )		
Depth (m) 0,0	Elevation 0 (m) E		STRATIG	RAPHY		Sample type & Number	Tests Type	¥ <		
-		<b>Topsoil:</b> Brown clayey silt, Traces of roots ar				GS-1				
0.30	90.16	Native soil: Stiff to very stiff, b	brown silt and clay, moist			GS-2				
		becoming grey, v				GS-3	w = 30.0% WI = 59.0% Wp = 25.0 %			
			ery moist to saturated			GS-4				
3.0 - 3.00 	87.46	End of test pit Note: No water infiltratio	on							

See the attached explicative note for the complete list of symbols and abbreviations



Photo 1 : TP-35 excavation.



Photo 2 : TP-35 materials.



## Test Pit No. TP-35 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD			TEST PIT REI	PORT		TEST PIT No	o. TP	9-36
CLIENT: PROJECT: LOCATION:		SORTATIO	ON FACILITY RIVALE ROAD	) INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366701.1 Y : 5017889.7 Z : 90.34	< ¥	- INFILTRATIO - WATER LEVI	
DESCRIBED BY	Y: M. CHÉNIEF	R		Sa	ample typ	be		Manual tests	
DATE:	2021-05-05			CA : Chemical analysis	PS : P	Proctor Sample	PA : Pan	da (q <sub>d</sub> )	
VERIFIED BY:	MA. RICHA	RD / A. FIC	ORILLI	MSS: Manual split spoon	AU: A			able penetrome	
DATE:	2021-05-05			RC : Rock core	GS(E)	: Grab sample (environmer	T)	amic penetrome onor Vane teste	
Depth (m)	Elevation (m)	Symbol		STRATIG	RAPHY		Sample type &	Tests	Ţ
0,0	90.34	ŝ					Number	Туре	<
			Topsoil: Brown clayey Traces of roo	y silt, moist. ots and organics			GS-1		
0.30	90.04		Native soil: Stiff to very s	stiff, brown silt and clay, moist			GS-2		
	89.64		becoming sti	ff, grey, very moist to saturated			GS-3		
							GS-4		
	87.34		End of test p Note: No water infi						

Reference No. 11227097-A1



Photo 1 : TP-36 excavation.



Photo 2 : TP-36 materials.



## Test Pit No. TP-36 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

Reference No.	. 11227097-A1					Page: 1	of 1		
G	HD		TEST PIT REPO	ORT 1	EST PIT No	). TP-40	0		
CLIENT: PROJECT: LOCATION:		RTATION FACILITY ND MERIVALE ROAD	INTERSECTION, NEPEAN,	GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366658.9 Y : 5017827.6 Z : 90.51	_				
DESCRIBED BY DATE: VERIFIED BY: DATE:	<ul> <li>M. CHÉNIER</li> <li>2021-05-06</li> <li>MA. RICHARD /</li> <li>2021-05-06</li> </ul>	/ A. FIORILLI	CA : Chemical analysis MSS: Manual split spoon RC : Rock core	PA : Pano PP : Porta DP: Dyna	$\begin{tabular}{lllllllllllllllllllllllllllllllllll$				
Depth (m) 0,0	Elevation (m) 90.51	Symbol	STRATIGR	APHY	Sample type & Number		¥ <		
		Topsoil: Brown clayey Traces of roc	/ silt, moist. ts and organics		GS-1 GSE-1				
0.5 —					GS-2				
	89.91		and clay, very moist		GS-3				
2.0	88.91	becoming stri	ff with traces of sand, very moist to	o saturated	GS-4				
					GS-5		,		
	87.51	End of test pi Note: Slight water i	it nfiltration at 3.0m				× ·		



Photo 7 : TP-40 excavation.



Photo 8 : TP-40 materials.



### Test Pit No. TP-40 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

Reference No	. 11227097-/	A1						Page:	1 of 1
9	HD			TEST PIT REP	ORT	TES	ST PIT No	. TP-	43
CLIENT: PROJECT: LOCATION:		SORTATI	ON FACILITY RIVALE ROAD	) INTERSECTION, NEPEAN,	GEODETIC COORDINAT (MTM, NAD-8 X : 366526.6 Y : 5017723. Z : 93.75	3)	<ul><li>INFILTRATION</li><li>WATER LEVEL</li></ul>		
DESCRIBED BY DATE: VERIFIED BY: DATE:	<ul> <li>Y: M. CHÉNIER</li> <li>2021-05-05</li> <li>MA. RICHA</li> <li>2021-05-05</li> </ul>		DRILLI	Sample type         CA : Chemical analysis       PS : Proctor Sample         MSS: Manual split spoon       AU: Auger         RC : Rock core       GS(E) : Grab sample (environment)			Manual tests PA : Panda (q <sub>d</sub> ) PP : Portable penetrometer (C DP: Dynamic penetrometer (E GVT: Geonor Vane tester (C <sub>u</sub> )		
Depth (m) 0,0	Elevation (m) 93.75	Symbol		STRATIGR	APHY		Sample type & Number	Tests Type	<b>⊻</b> <
	93.70		Fill: Stiff, brown o	clayey silt mixed with roots and org	anics, moist		GS-1		/
0.5 - 0.50	93.25		Grey to brow	n clayey silt, moist			GS-2		
						-	GS-3		
						-	GS-4		
- - - 2.5 —							GS-5		
3.0						-	GS-6		
- 3.35 3.5	90.40		End of test p Note: No water infi						
4.0									
4.5 — – – – –									



Photo 1 : TP-43 excavation.



Photo 2 : TP-43 materials.



# Test Pit No. TP-43 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD			TEST PIT REI	PORT	· -	EST PIT No	o. TP-	-44	
CLIENT: PROJECT: LOCATION:	MEDUSA LP PROPOSED SC LEIKIN DRIVE A ONTARIO			INTERSECTION, NEPEAN,	_	- INFILTRATION				
DESCRIBED BY	: M. CHÉNIER			Sa	ample typ	ple type Manual tests				
DATE:	2021-05-05			CA : Chemical analysis PS : Proctor Sample				PA : Panda (q <sub>d</sub> )		
VERIFIED BY:	MA. RICHARD	) / A. FIOF	RILLI	MSS: Manual split spoon	AU: Au			able penetromete		
DATE:	2021-05-05			RC : Rock core	GS(E)	: Grab sample (environment		imic penetromete onor Vane tester		
Depth (m)	Elevation (m)	Symbol		STRATIGI	RAPHY		Sample type &	Tests	<u>(Gu)</u> <u>▼</u>	
0,0	90.55	Sy					Number	Туре	<	
0.5 - 0.50				v silt, moist. ts and organics			GS-1			
0.50	90.05		Native soil: Stiff to very st	tiff, brown silt and clay, moist			GS-2			
			becoming gre				GS-3	w = 39.0% WI = 74.0% Wp = 34.0 %		
				ff with traces of sand			GS-4			
	87.55		End of test pil							

See the attached explicative note for the complete list of symbols and abbreviations

Reference No. 11227097-A1



Photo 1 : TP-44 excavation.



Photo 2 : TP-44 materials.



## Test Pit No. TP-44 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD			TEST PIT REI	PORT		TEST PIT No	o. TP	-45	
CLIENT: PROJECT: LOCATION:		SORTATIO	ON FACILITY RIVALE ROAD	) INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366763.1 Y : 5017843.2 Z : 90.52		- INFILTRATIO - WATER LEVI		
DESCRIBED BY	: M. CHÉNIER	R		Sa	mple typ	be	n	Manual tests		
DATE:	2021-05-06			CA : Chemical analysis	PS : P	roctor Sample	PA : Pano			
VERIFIED BY:	MA. RICHA	RD / A. FIC	RILLI	MSS: Manual split spoon	AU: Au	uger		able penetrome mic penetrome		
DATE:	2021-05-06			RC : Rock core	GS(E)	: Grab sample (environmen	t) (	onor Vane teste		
Depth (m)	Elevation (m)	Symbol		STRATIG	RAPHY		Sample type &	Tests	Y	
0,0	90.52	ى ئەرىچىچىچ	Tanasila				Number	Туре	<	
-				y silt, moist. ots and organics			GS-1 GSE-1			
0.30	90.22			stiff, brown silt and clay, moist			GS-2			
							GS-3			
2.0			becoming sti	ff with traces of sand, very mois	to satur	ated	GS-4			
							GS-5			
3.0 - 3.00	87.52		End of test p Note: No water infil							
3.5 —										
4.0										
4.5										

See the attached explicative note for the complete list of symbols and abbreviations

Reference No. 11227097-A1



Photo 1 : TP-45 excavation.



Photo 2 : TP-45 materials.



### Test Pit No. TP-45 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD			TEST PIT REF	PORT	٦	EST PIT No	o. TP	9-46	
CLIENT: PROJECT: LOCATION:	MEDUSA LP PROPOSED S LEIKIN DRIVE ONTARIO			INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366877.5 Y : 5017907.6 Z : 90.36				
DESCRIBED BY	1: M. CHÉNIER			Sa	mple typ	e	Manual tests			
DATE:	2021-05-06			CA : Chemical analysis	PS : Pi	roctor Sample	PA : Pan			
VERIFIED BY:	MA. RICHARI	D / A. FIO	RILLI	MSS: Manual split spoon	AU: Au			able penetrome		
DATE:	2021-05-06			RC : Rock core	GS(E)	: Grab sample (environment		onor Vane teste		
Depth (m) 0,0	Elevation (m)	Symbol		STRATIG	RAPHY		Sample type &	Tests Type	<b>Y</b>	
0,0	90.36		Topsoil:				Number	Туре	$\leftarrow$	
			Brown clayey Traces of roo	y silt, moist. ots and organics			GS-1 GSE-1			
0.30	90.06		Native soil: Stiff to very s	tiff, brown silt and clay, moist			GS-2			
				ey with traces of sand, very mois	.t		GS-3			
2.5	87.36		End of test p	it			GS-4			
			Note: No water infi							

Reference No. 11227097-A1



Photo 1 : TP-46 excavation.



Photo 2 : TP-46 materials.



### Test Pit No. TP-46 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD			TEST PIT REP	PORT	т	EST PIT No	). TP	9-47	
CLIENT: PROJECT: LOCATION:		SORTATIO	ON FACILITY RIVALE ROAD	) INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366973.4 Y : 5017961.2 Z : 90.31		- INFILTRATIO		
DESCRIBED BY:	M. CHÉNIEF	2		Sa	imple typ	De	n	Manual tests		
DATE:	2021-05-06			CA : Chemical analysis	PS : P	Proctor Sample	PA : Pano			
VERIFIED BY:	MA. RICHA	RD / A. FIC	RILLI	MSS: Manual split spoon	AU: A			able penetromet		
DATE:	2021-05-06			RC : Rock core	GS(E)	: Grab sample (environment)		amic penetromet onor Vane teste		
Depth (m)	Elevation (m)	Symbol		STRATIG	RAPHY		Sample type &	Tests	Ţ	
0,0	90.31	Sy					Number	Туре	<	
			<b>Topsoil:</b> Brown clayey Traces of roc	y silt, moist. ots and organics			GS-1			
0.5 —							GS-2			
	89.71			stiff, brown silt and clay, moist			GS-3			
	88.61			iff with traces of sand, vert moist	to satur	ated	GS-4			
	87.31		End of test pi Note: No water infil							

Reference No. 11227097-A1



Photo 1 : TP-47 excavation.



Photo 2 : TP-47 materials.



## Test Pit No. TP-47 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD			TEST PIT RE	PORT		TEST PIT No	o. TP	9-49		
CLIENT: PROJECT: LOCATION:		SORTATI	ON FACILITY RIVALE ROAD	) INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366510.8 Y : 5017662.8 Z : 90.87		- INFILTRATIO - WATER LEVE			
DESCRIBED BY	: M. CHÉNIEF	२		S	ample typ	De		Manual tests PA : Panda (q₀)			
DATE:	2021-05-05			CA : Chemical analysis	CA : Chemical analysis PS : Proctor Sample						
VERIFIED BY:	MA. RICHA	ARD / A. FIC	ORILLI	MSS: Manual split spoon	AU: A			able penetrome	,		
DATE:	2021-05-05			RC : Rock core	GS(E)	) : Grab sample (environmer		onor Vane teste			
Depth (m)	Elevation (m)	Symbol		STRATIG	RAPHY	,	Sample type &	Tests	Ţ		
0,0	90.87	ίο <sup>΄</sup>	<b></b>				Number	Туре	<		
- - - - 0.5 — -			Fill: Brown clayey Presence of	y silt, moist. roots and organics			GS-1				
	90.17			stiff, brown silt and clay, moist			GS-2				
1.5	89.57		becoming sti	ff, grey, very moist to saturated			GS-3				
							GS-4				
	87.87	<u> </u>	End of test p Note: No water infi								

See the attached explicative note for the complete list of symbols and abbreviations

Reference No. 11227097-A1



Photo 1 : TP-49 excavation.



Photo 2 : TP-49 materials.



# Test Pit No. TP-49 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

				TEST PIT RE	PORT		TEST PIT No	. TP-4	9PILE
PROJECT:	MEDUSA LP PROPOSED LEIKIN DRIVI ONTARIO	SORTATIC		INTERSECTION, NEPEAN,		GEODETIC COORDINATES (m) (MTM, NAD-83) X : Y : Z : 92.90		INFILTRATIO	
DESCRIBED BY:							N	lanual tests	
DATE: VERIFIED BY:	Y: M. CHENIER 2021-05-05 MA. RICHARD / A. FIORILLI 2021-05-05		Sample type       CA : Chemical analysis     PS : Proctor Sample       MSS: Manual split spoon     AU: Auger       RC : Rock core     GS(E) : Grab sample (environmer)			PA : Pand PP : Porta DP: Dynar	PA : Panda (q <sub>d</sub> ) PP : Portable penetrometer (C <sub>u</sub> )		
Depth (m) 0,0	Elevation (m) 92.90	Symbol		STRATIG	RAPHY		Sample type & Number	Tests Type	<b>Y</b>
			Fill: Brown clayey	y silt, moist			GS-1 GSE-1		
- - - 1.0							GS-2 GSE-2		
- - - 1.5 —							GS-3 GSE-3		
-							GS-4 GSE-4		
2.0 <u>2.00</u> - 2.00 - 2.00        -	90.90		End of test p Note: No water infil						

L

Reference No. 11227097-A1



Photo 1 : TP-49-PILE excavation.



# Test Pit No. TP-49-PILE Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

Reference No	. 11227097-A1		Page: 1 of 1		
G	TEST PIT REPORT	TEST PIT No	. TP-50		
CLIENT: PROJECT: LOCATION:	MEDUSA LP     COC (MTN       PROPOSED SORTATION FACILITY     X : 3       LEIKIN DRIVE AND MERIVALE ROAD INTERSECTION, NEPEAN,     Y : 4	366472.0			
DESCRIBED BY DATE: VERIFIED BY: DATE:	CHÉNIER       Sample type         2021-05-05       CA : Chemical analysis       PS : Proctor Sa         MA. RICHARD / A. FIORILLI       MSS: Manual split spoon       AU: Auger	ample PA : Pand PP : Porta DP: Dynar	$\begin{tabular}{ c c c c } \hline Manual tests \\ \hline PA : Panda (q_d) \\ PP : Portable penetrometer (C_u) \\ DP: Dynamic penetrometer (E_{25}) \\ GVT: Geonor Vane tester (C_u) \\ \hline \end{tabular}$		
Depth (m) 0,0	Elevation G (m) E 90.55 O STRATIGRAPHY	Sample type & Number	Tests Type		
_	Topsoil: Brown clayey silt, moist.	GS-1			
0.20		GS-2			
		GS-3			
2.0	89.05 becoming stiff, saturated	GS-4			
- 2.5 - - - - -		GS-5			
3.0 <u>3.00</u> - 3.00 	87.55 End of test pit Note: Slight water infiltration at 3.0m				



Photo 1 : TP-50 excavation.



Photo 1 : TP-50 materials.



### Test Pit No. TP-50 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

Reference No	. 11227097-A1			Page: 1 of 1	
9	äHD	TEST PIT REP	ORT TE	ST PIT No. TP-51	
CLIENT: PROJECT: LOCATION:	MEDUSA LP PROPOSED SORTATI LEIKIN DRIVE AND ME ONTARIO	ON FACILITY ERIVALE ROAD INTERSECTION, NEPEAN,	INTERSECTION, NEPEAN, GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366550.3 Y : 5017657.8 Z : 90.42		
DESCRIBED BY DATE: VERIFIED BY: DATE:	Y: M. CHÉNIER 2021-05-05 MA. RICHARD / A. Fig 2021-05-05	CA : Chemical analysis	Sample type     Mi       CA : Chemical analysis     PS : Proctor Sample       MSS: Manual split spoon     AU: Auger		
Depth (m) 0,0	Elevation 0 (m) E 90.42	STRATIGR	АРНҮ	Sample typeTests▼& & NumberType✓	
-		Topsoil: Brown clayey silt, moist. Traces of roots and organics		GS-1	
0.5		Native soil: Stiff to very stiff, brown silt and clay, moist		GS-2	
		becoming grey		GS-3	
		becoming stiff with traces of sand, moist to ve	ry moist	GS-4	
	87.42	End of test pit Note: No water infiltration			



Photo 1 : TP-51 excavation.



### Test Pit No. TP-51 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

G	HD		TEST PIT RE	PORT	-	EST PIT No	o. TP	-52		
CLIENT: PROJECT: LOCATION:	MEDUSA LP PROPOSED SORTATION FACILITY LEIKIN DRIVE AND MERIVALE ROAD INTERSECTION, NEPEAN, ONTARIO				GEODETIC COORDINATES (m) (MTM, NAD-83) X : 366538.8 Y : 5017605.5 Z : 92.69	<ul> <li>- INFILTRATION</li> <li>- WATER LEVEL</li> </ul>				
DESCRIBED BY	: M. CHÉNIER		Sa	ample typ	e	I	Manual tests			
DATE:	2021-05-05		CA : Chemical analysis	CA : Chemical analysis PS : Proctor Sample			PA : Panda (q <sub>d</sub> )			
VERIFIED BY:	: MA. RICHARD / A. FIORILLI		MSS: Manual split spoon AU: Auger			able penetrome amic penetrome				
DATE:	2021-05-05		RC : Rock core GS(E) : Grab sample (environment			onor Vane teste				
Depth (m) 0,0	Elevation 00 minutes (m)		STRATIG	RAPHY		Sample type &	Tests Type	¥ <		
0,0	92.69 O	Fill:				Number	Турс			
0.5		Brown claye	ey silt, moist			GS-1				
						GS-2				
						GS-3				
						GS-4				
2.5						GS-5				
3.0			ayey silt, very moist			GS-6				
3.5	89.37	End of test Note: No water inf								
4.0										
4.5										

Reference No. 11227097-A1



Photo 1 : TP-52 excavation.



Photo 2 : TP-52 materials.



# Test Pit No. TP-52 Proposed Sortation Facility

Leikin Drive and Merivale Road Intersection, Nepean, Ontario

Appendix D GHD Piezocone (CPT) Reports Preconsolidation Profile Graphs D1 and D2 Dissipation Profile Graph D3

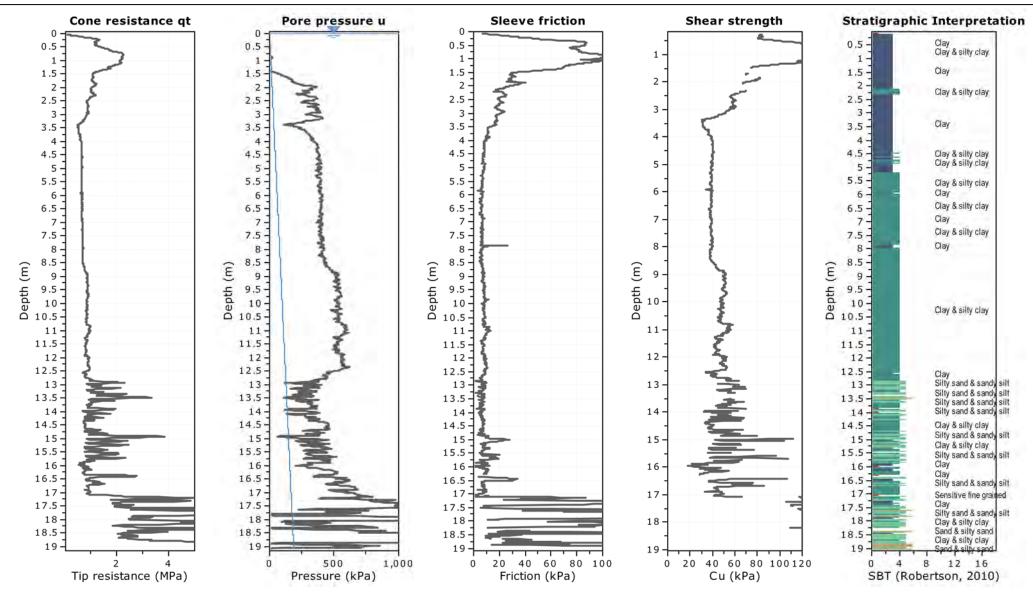


11227097-A1

Performed by Stratum CPT Interpreted by Marc-Andre Richard, ing. jr Verified by Kamel Hamouche, ing. Ph. D.

#### Project: Geotechnical Investigation - Proposed Sortation Facility Location: Leikin Drive and Merival Road Intersection, Nepean, Ontario



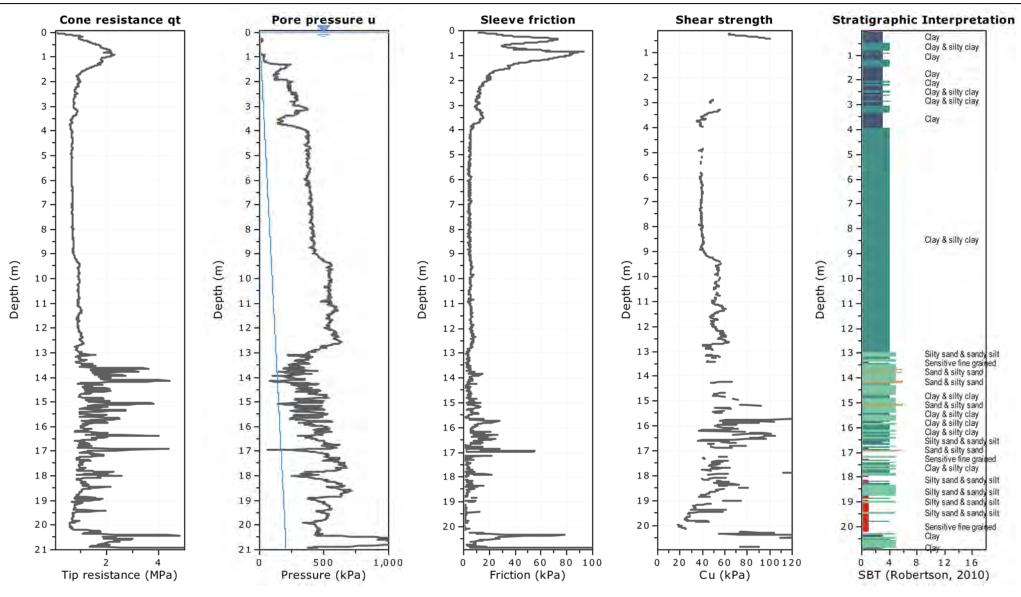




**11227097-A1** Performed by Stratum CPT Interpreted by Marc-Andre Richard, ing. jr Verified by Kamel Hamouche, ing. Ph. D.

#### Project: Geotechnical Investigation - Proposed Sortation Facility Location: Leikin Drive and Merival Road Intersection, Nepean, Ontario

#### CPT-02 Total depth: 20.92 m

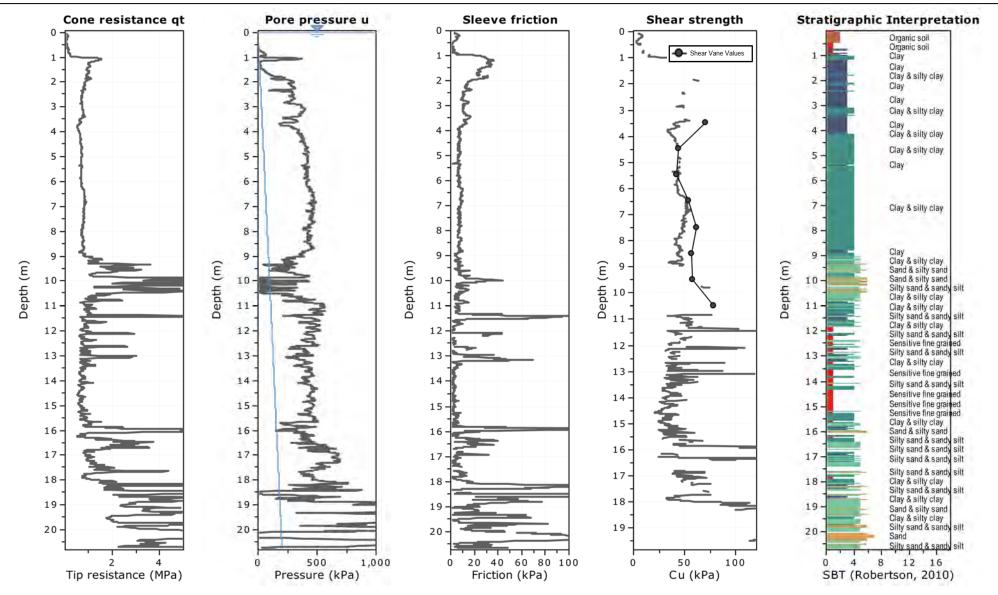




**11227097-A1** Performed by Stratum CPT Interpreted by Marc-Andre Richard, ing. jr Verified by Kamel Hamouche, ing. Ph. D.

#### Project: Geotechnical Investigation - Proposed Sortation Facility Location: Leikin Drive and Merival Road Intersection, Nepean, Ontario





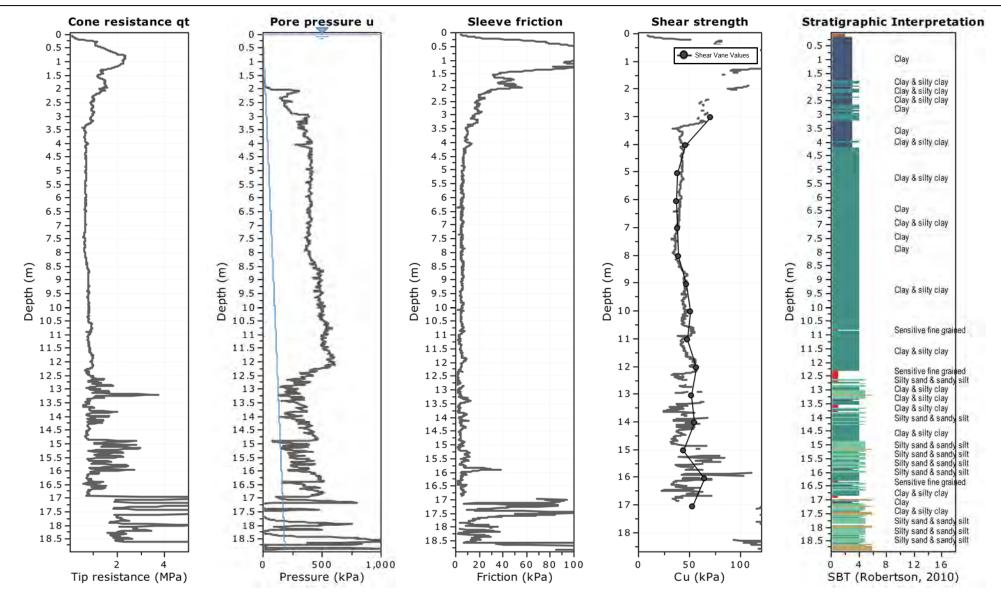


11227097-A1

Performed by Stratum CPT Interpreted by Marc-Andre Richard, ing. jr Verified by Kamel Hamouche, ing. Ph. D.

#### Project: Geotechnical Investigation - Proposed Sortation Facility Location: Leikin Drive and Merival Road Intersection, Nepean, Ontario

#### CPT-04 Total depth: 18.89 m



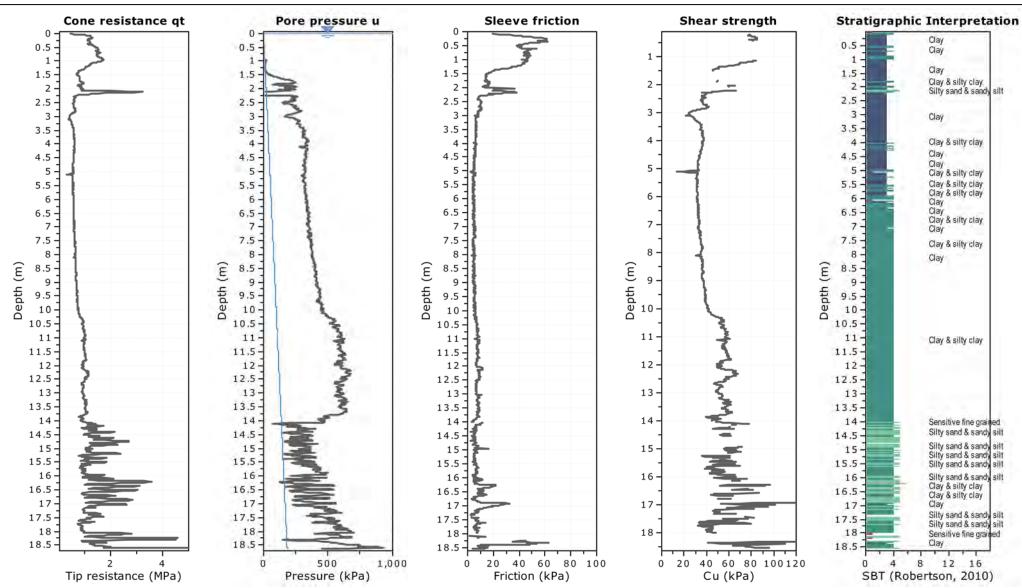


11227097-A1

Performed by Stratum CPT Interpreted by Marc-Andre Richard, ing. jr Verified by Kamel Hamouche, ing. Ph. D.

#### Project: Geotechnical Investigation - Proposed Sortation Facility Location: Leikin Drive and Merival Road Intersection, Nepean, Ontario





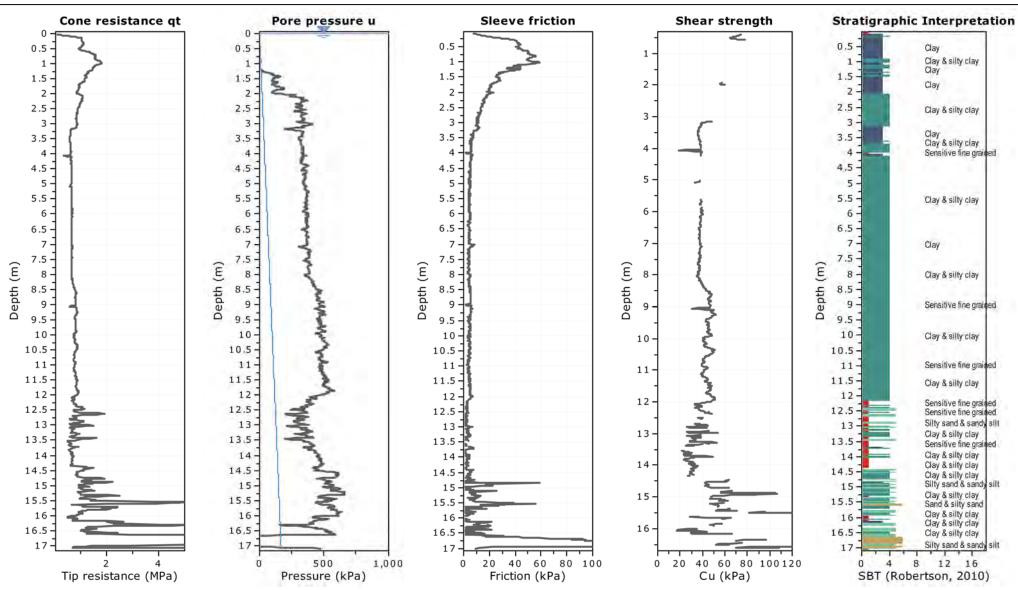


**11227097-A1** Performed by Stratum CPT

Interpreted by Marc-Andre Richard, ing. jr Verified by Kamel Hamouche, ing. Ph. D.

#### Project: Geotechnical Investigation - Proposed Sortation Facility Location: Leikin Drive and Merival Road Intersection, Nepean, Ontario

#### CPT-06 Total depth: 17.10 m



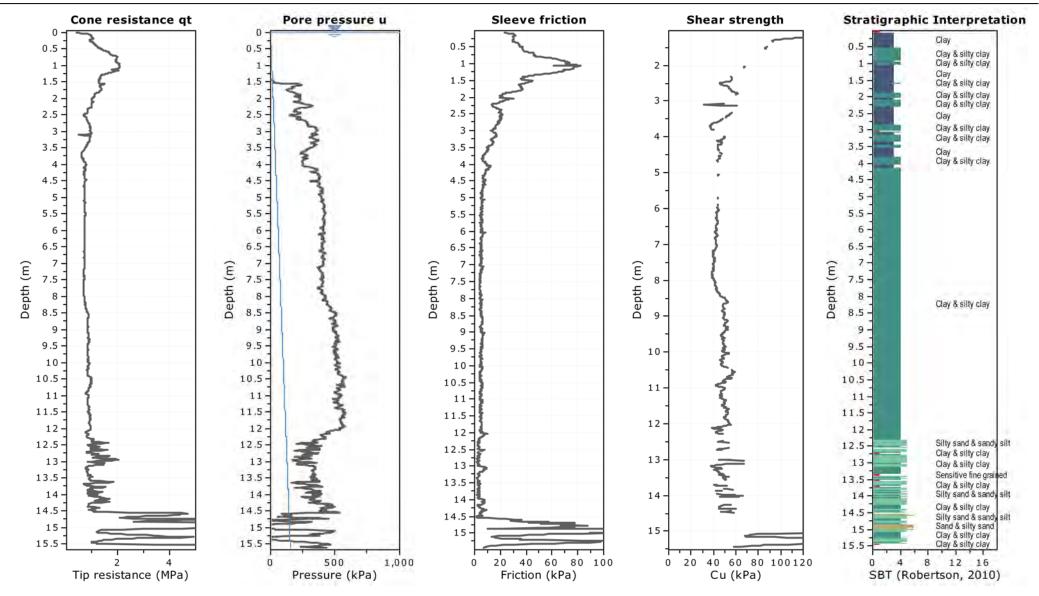


11227097-A1 Performed by Stratum CPT

Interpreted by Marc-Andre Richard, ing. jr Verified by Kamel Hamouche, ing. Ph. D.

#### Project: Geotechnical Investigation - Proposed Sortation Facility Location: Leikin Drive and Merival Road Intersection, Nepean, Ontario



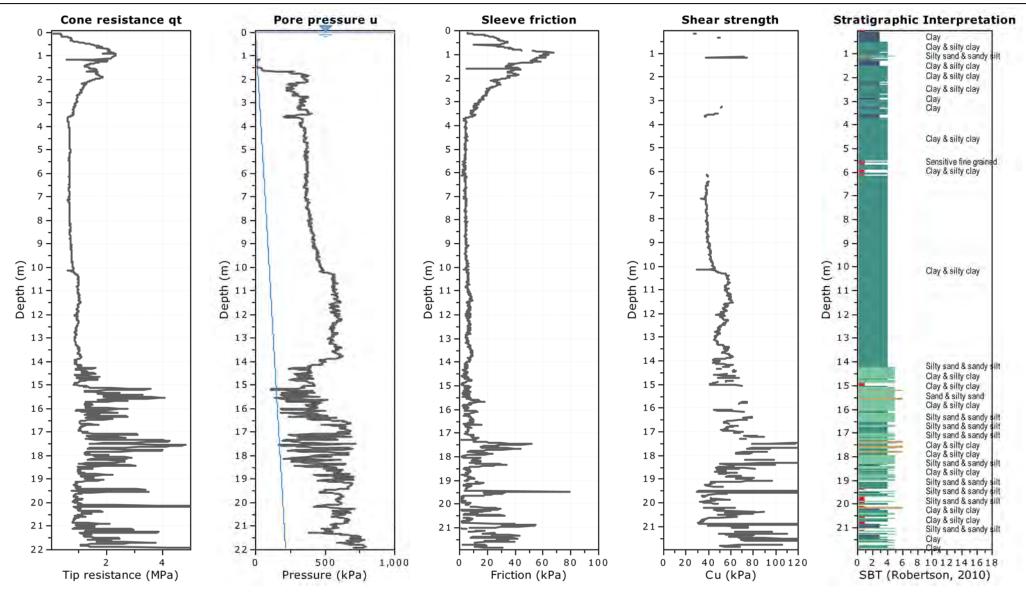




**11227097-A1** Performed by Stratum CPT Interpreted by Marc-Andre Richard, ing. jr Verified by Kamel Hamouche, ing. Ph. D.

#### Project: Geotechnical Investigation - Proposed Sortation Facility Location: Leikin Drive and Merival Road Intersection, Nepean, Ontario

#### CPT-08 Total depth: 21.93 m



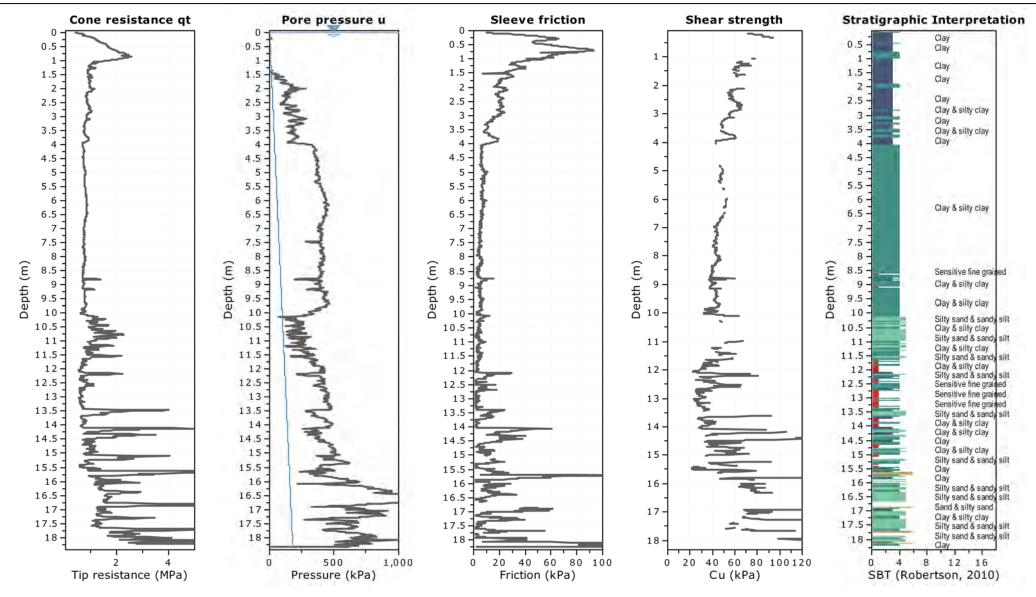


**11227097-A1** Performed by Stratum CPT

Interpreted by Marc-Andre Richard, ing. jr Verified by Kamel Hamouche, ing. Ph. D.

#### Project: Geotechnical Investigation - Proposed Sortation Facility Location: Leikin Drive and Merival Road Intersection, Nepean, Ontario



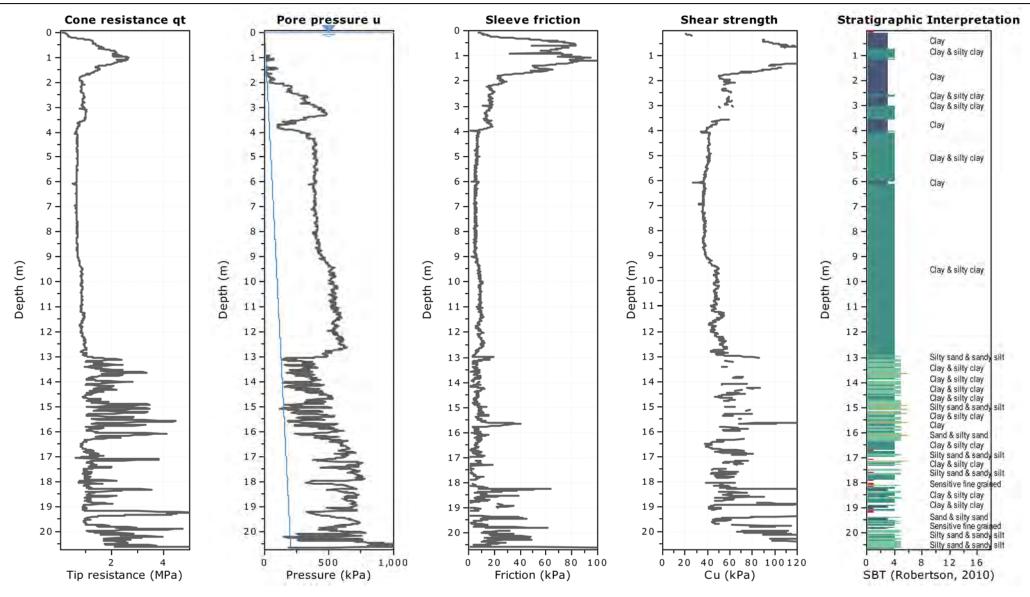




**11227097-A1** Performed by Stratum CPT Interpreted by Marc-Andre Richard, ing. jr Verified by Kamel Hamouche, ing. Ph. D.

#### Project: Geotechnical Investigation - Proposed Sortation Facility Location: Leikin Drive and Merival Road Intersection, Nepean, Ontario

#### CPT-16 Total depth: 20.66 m



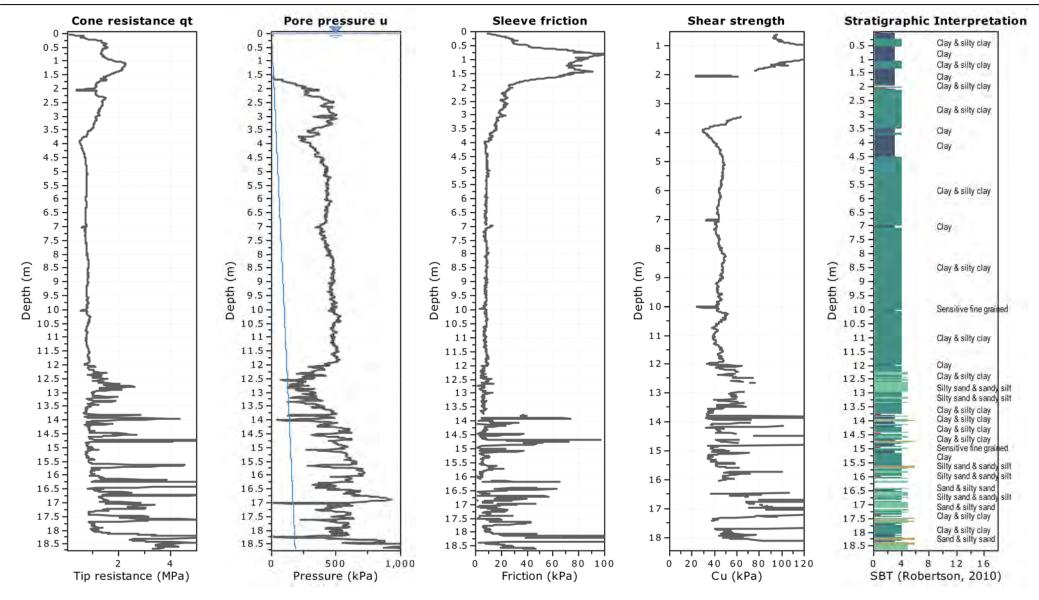


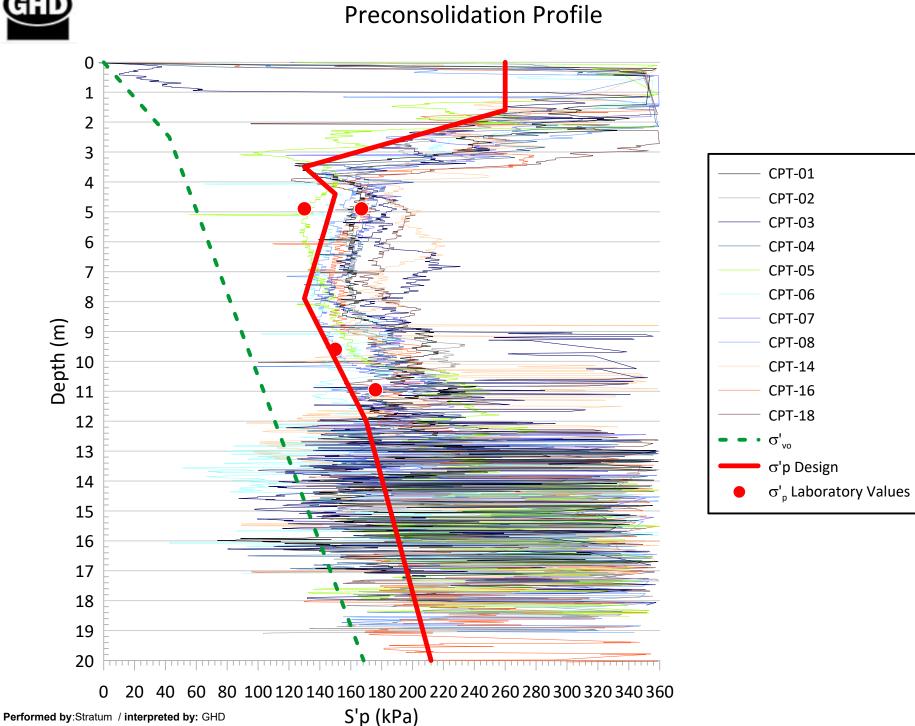
11227097-A1

Performed by Stratum CPT Interpreted by Marc-Andre Richard, ing. jr Verified by Kamel Hamouche, ing. Ph. D.

### Project:Geotechnical Investigation - Proposed Sortation FacilityLocation:Leikin Drive and Merival Road Intersection, Nepean, Ontario



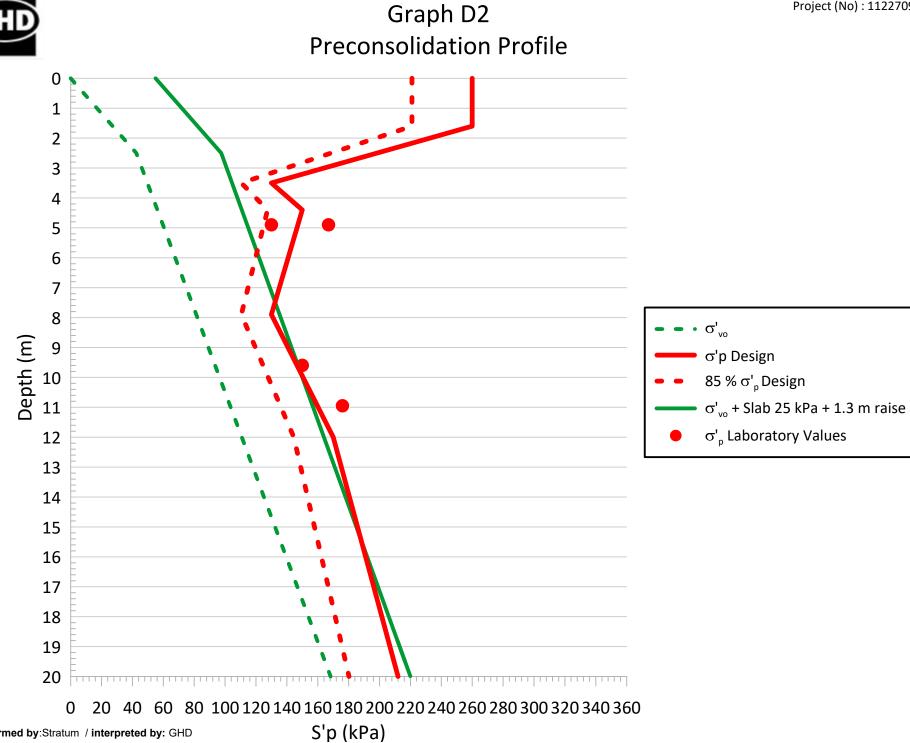


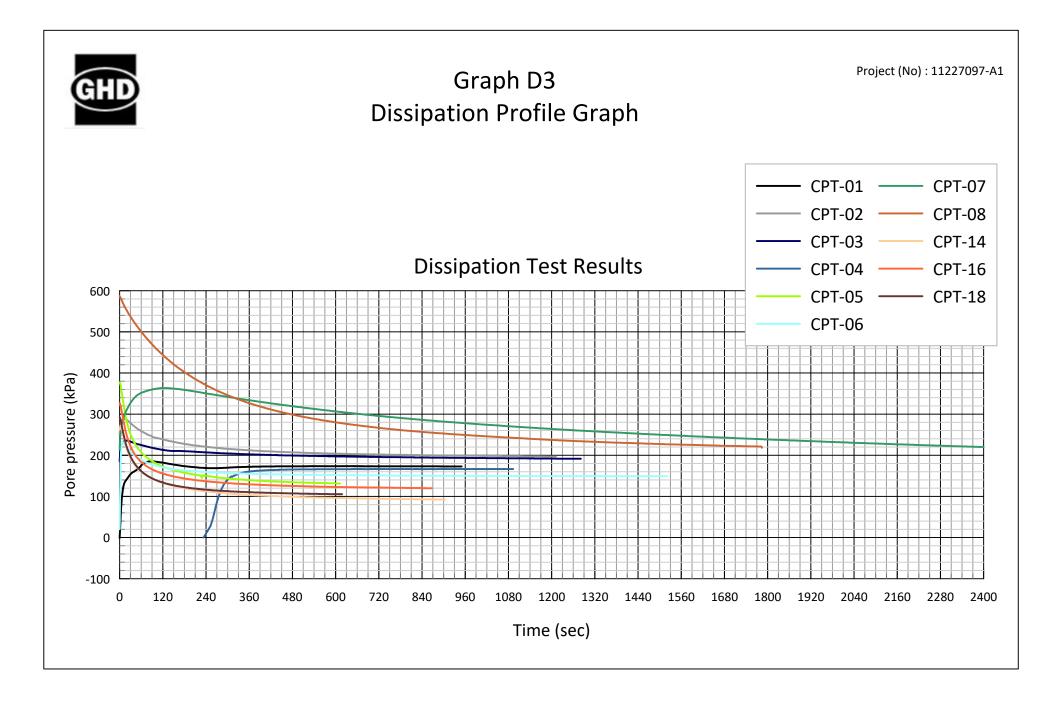


Graph D1

Project (No) : 11227097-A1







## Appendix E Fondex Borehole Reports, November 1991

		Page 1 of 2
O-A756 -A	FONDEX	BOREHOLE BH-91-3
	Highway 16 Names Oat	- REPORT DATE Nov/91
GEOLOGIC PROFILE	SAMPLES DYNAMIC PENETRATION	CONSISTENCY :
Elev. Depth DESCRIPTION (m)	And Constraints     Resistance blows       0     20     40     60     80       0     20     40     60     80       0     SHEAR STRENGTH     kPa       Field Vane Shear     1       10     150     200	NATURAL MOISTURE CONTENT (W) LIQUID LIMIT (W ) PLASTIC LIMIT (Wp)
89.42 0.00 <u>Silty Clay</u>		<u>i0 0 20 40 60 80</u>
-very stiff, brown, occasional oxidation 1.00 stains and silty seams trace white shells, moist.		
2.00	1 SS 2	
3.00	2 SS 4	
-becoming, grey, stiff. wet 4.00		
5.00 -becoming, layered, with silty seams.	3 SS WH	
6.00 82.42	4 SSWH	
7.00 (continued on next page)	remolded	

							Page 2 of 2
0-,	A756-A				Fo	NI	DEX BOREHOLE BH-91-3
LOC		Hig	hw	ay	16,	N.	epean, Ont. DRILLING DATE Oct 18/9 5, Hollow Stem DRAWN BY M.K.
	GEOLOGIC PROFILE	T		MPL			DYNAMIC PENETRATION CONSISTENCY :
		È			ŝ	Rγ	RESISTANCE BLOWS NATURAL MOISTURE
Elev. Depth	DESCRIPTION	STRATIGRAPHY	NUMBER	түрЕ	BLOWS	RECOV	LAB VANE SHEAR
2.42	Clavay Silt	S1	ž		B	%	0 50 100 150 200 250 0 20 40 60
.00	Clayey Silt	N.					
	-Loose to compact,	N	 				
	grey interbeded clay	NÌ	5	SS	wн		
8.00	seams, wet.	N	ļ				
		KN					$\mathbf{O}$
		N		2			
9.00		N		r F			
5.00		IN		-			
		N	6	ss	2		
		IN	<u> </u>			-	
10.00		N					
		N	×			:	
		N		<u> </u>		•	
		N	7	SS	ь		
8.19	- End of Borehole-	<u> ```</u>		1		1	
	Notes						
	-piezometer installed and destroyed						
	and destroyed						
			-	ļ	1		

0	-A756 -A	<b>FONDEX</b>	BOREHOLE NUMBER BH-91-4
LOC	UM <u>Ass. Geodetic</u> boreh	Highway 16, Nepean, Ont.	DRILLING DATE Oct 21/91
	GEOLOGIC PROFILE	SAMPLES DYNAMIC PENETRATION	CONSISTENCY :
Elev. Deptn (m) 89.70		HAVE HAVE SHEAR OF THE LAB VANE SHEAR	NATURAL MOISTURE CONTENT (W) LIQUID LIMIT (W ) PLASTIC LIMIT (Wp) 0 20 40 60 80
0.00	-very stiff, brown occasional oxidation		
2.00	-becoming grey with occasional white shells	1 SS 5	
4.00	-becoming stiff, wet with interbeded layered silty seams.	2 SS 2	G.W.L. (elev. 85.3)
5.00			
82.70 7.00	(continued on next page)	4 SS WH	

			•					Pac	ge 2 of 2	
	O-A756 -A				٢O	N	DEX	BOREHOL	е ВН-91	-4
LOC	DJECT South Meriva CATION Merivale Rd. JM Ass. Geodetic вояен	3	Hic	Jhwa	iy	16,	Nepean, Ont.	REPORT C	DATE Oct DATE NOV Y M.K.	<u>21/91</u> /91
	GEOLOGIC PROFILE			MPLE			DYNAMIC PENETRATION	CONSIST		
<u>Eiev.</u> Depth (m) 82,70	DESCRIPTION	STRATIGRAPHY	NUMBER	TYPE	BLOWS (N)	% RECOVERY	LAB VANE SREAR 🛛 🐨	NATURAL CONTENT LIQUID LIN PLASTIC L	MOISTURE (W) AIT (W ) IMIT (Wp)	60
7.00			5	ss v				0	20 40	60 {
8.00						£				
9.00			6 5	5S V	VH					
78.47	End of Borehole		7 5	is L						
	<u>Notes</u> 1. Piezometer installed	<u></u>			<b></b>					
	2. Water Level <u>date depth</u> Nov 1 4.4 m			** *****	-1 ]					

		0 A700 A						Page 1 of 2
		O-A756-A					DEX	BOREHOLE BH-91-5
	LOCA	ECT South Meriva TION Merivale Rd. Ass. Geodetic волен	13	ligh	way	16,	Nepean, Ont.	
	G	EOLOGIC PROFILE		SAM	PLES		DYNAMIC PENETRATION	CONSISTENCY :
	Elev. Depth (m) 89.76	DESCRIPTION	STRATIGRAPHY	NUMBER	BLOWS (N)	% RECOVERY	LAB VANE SHEAR 🛛 😨	NATURAL MOISTURE           CONTENT (W)
	0.00	Silty Clay Hard to stiff, brown, ccasional oxidation tains, and silty seams ioist						
	2.00			1 59	5 5			
	3.00 0	becoming grey, occasional white shells, wet		2 55	<b>1</b>			G.W.L. (elev. 86.8)
	4.00							
	5.00 -I 5.00	becoming layered with silt seams		3 55	WH			
	2.76			ss	WH		undisturbed	
7		continued on next bage)					O remoided	

LOC	JECT <u>South Meriva</u> ATION <u>Merivale Rd.</u> JM <u>Ass. Geodetic</u> Borer	3	Hig	hwa	эу Г	16,	Nepean, Ont.		
	GEOLOGIC PROFILE							DRAWN BY M.K.	
		+		MPL	ES 2		DYNAMIC PENETRATION RESISTANCE BLOWS	CONSISTENCY : NATURAL MOISTURE	
		HOV			•	KER.	0 20 40 60 80	CONTENT (W)	
<u>Elev.</u> Depth	DESCRIPTION		i E		S	RECOVERY	SHEAR STRENGTH KPa	LIQUID LIMIT (W) PLASTIC LIMIT (Wp)	<del></del>
(m) 82.76		STRATIGRADHV	NUMBER	TYPE	BLOWS	۳ ۳	LAB VANE SHEAR 🛛 🕢		<del>}</del>
	Clayey Silt					<u>ە</u> ر	0 <u>50 100 150 200 250</u> ΨΨ	<u>0 20 40</u>	60
		N	N						
	-loose to compact, grey interbeded with	N	N						
	clay seams, wet.	M	N						
8.00		$\mathbb{N}$	5	ss	WН				<u> </u>
		IN							
		N		-					
9.00		N		<u> </u>		Ì			
		N			ĺ				
		N	6	ss	₩Н				
		IN			1	ļ			
10.00		N			:				
		N				-			
		N		 		-			
		ΗÌ	7	ss V	۷н∣				
78.53	End of Borehole	R							
11.23						-			T
<u> </u>	<u>Notes</u>								
1	· Piezometer installed					-			
	. water level			-					
	Date Level								
<b>  </b>	Nov 1 3.0 m					Ъ			
						Η			
			1						
						H			 
1		1	1			Π			

0	)-A756-A				FC	) N	DEX	BOREHOLE BH-91-	-6				
	DJECT South Merival							DRILLING DATE OC	t 21/9				
LOC	CATION Merivale Rd.	8 1	Hig	hwa	<u>y</u>	16,	Nepean, Ont.		/91				
DATI		OLE				<u>2-5</u>	5, Hollow Stem	DRAWN BY M.K.					
<del>~~:</del>	GEOLOGIC PROFILE	Ļ		MPL				CONSISTENCY : NATURAL MOISTURE					
		APH			2	νепγ		CONTENT (W)					
Elev. Depth	DESCRIPTION	LIGR	EA		s	ECO ECO		LIQUID LIMIT (W)					
(m)		STRATIGRAPHY	NUMBER	Эдүү	BLOWS	CE.	LAB VANE SHEAR	PLASTIC LIMIT (Wp)	<del> </del>				
89.36 0.00		S	z	4	Ð	%		0 20 40	60				
	<u>oner</u> ony	N											
		$\mathbb{N}$											
	-very stiff, brown,	$\mathbb{N}^{\mathbb{N}}$											
1 00	occalsional oxidation stains and silty seams	$\mathbb{N}$											
1.00	moist	[N]											
		$\mathbb{N}$											
		N											
2.00		N	1	ss	5								
2.00				<u> </u>	 								
		ΚŊ											
[		N			i i j								
	_ becoming stiff, grey,	N	1										
3.00	presence of white shells, wet	N		į									
	SHERS, WEL	N	2	ss	2								
		Ŋ		<u> </u>				<b></b>					
		XI	-			ŀ							
4.00		N											
		$\sum$				ļ							
		$\langle N$				-							
		$\mathbf{N}$	,	~~ .	ĺ	╞							
5.00			3 5	ss	WH	1							
		$\mathbb{N}$				Ĺ							
	-becoming layered	[N]			111								
	with silty seams.	N,				╞							
5.00	ļ	$\mathbb{N}$				ļ							
		Ν				L							
		N	4 😫	ss M	/Н	ŀ							
2.36						L							
.00						┢							
	(continued on next					ľ	• undisturbed						
	page)					F	• remolded		-				
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0	-A756-A				70	NI	DEX	Page 2 of 2 BOREHOLE BH-91	-6
LOC	JECT South Merival ATION Merivale Rd. M Ass. Geodetic BORE	<u>в н</u> і	igh	way	16		Nepean, Ont. 5, Hollow Stem	DRILLING DATE OCT	21/91 /91
	GEOLOGIC PROFILE			MPLE	_		DYNAMIC PENETRATION	CONSISTENCY :	
<u>Elev.</u> Depth (m) 32.36	DESCRIPTION	STRATIGRAPHY	NUMBER		õ	RECOV	RESISTANCE BLOWS 0 20 40 60 80 <u>SHEAR STRENGTH</u> kPg FIELD VANE SHEAR LAB VANE SHEAR 0 50 100 100 000 000	NATURAL MOISTURE CONTENT (W) LIQUID LIMIT (W ) PLASTIC LIMIT (Wp)	
7.00	<u>Clayey Silt</u> loose to compact, grey interbeded clay seams, wet.			55 W			0 50 100 150 200 250		60 8
9.00			6 5	ssw					
78.13	_ End of Borehole _		7 5	<u>s wi</u>	······				
	<u>Notes</u> - Piezometer installed and destroyed	лания. —							
					de a sera maio calca de la sera empletencia de la sera minima de la sera emp				

	O-A756-A		·		FC	Ni	DEX	Page 1 BOREH NUMBE	ÖLF	3 <u>H-91-7</u>	
LOC	DJECT South Merivale CATION Merivale Rd. & UM Ass. Geodetic BOREH	Hi	ghy	мау	16	. N	epean, Ont. 5, Hollow Stem	REPORT	DATE!	Oct 21 Nov/91 .K.	L/91
	GEOLOGIC PROFILE		SA	MPL			DYNAMIC PENETRATION		STENC		
		YHA			2	ΈЯΥ	RESISTANCE BLOWS 0 20 40 60 80	NATURA CONTEN		TURE	
Elev. Depth (M)	DESCRIPTION	STRATIGRAPHY	NUMBER	TYPE	BLOWS	RECOVERY	LAB VANE SHEAR 🛛 🐨 :		LIMIT (W		
38.97	Silty Clay	ST	ž	4	8	%	0 <u>50 100 150 200 250</u>	0	20	40 60	80
	-very stiff, borwn, occasional silty seams and oxidation stains, presence of white fossils, moist.	<u> </u>					Number         Number<				
2.00			1	SS	3						
3.00			2	SS	3						
4.00	- becoming grey, stiff, wet	<u> </u>			· · · · · · · · · · · · · · · · · · ·	F			<b>-</b> (Ele	1 1	;
5.00			3 :	ss	WH						-
	-becoming layered with silty seams	N			-						r or a sa s
5.00			4 <	s	WH						
31.97	(continued on next page)						undisturbed				

	-A756-A	Föndex	BOREHOLE NUMBER <u>BH-91-</u>
LOC		Highway 16 Nemon Out	
	GEOLOGIC PROFILE	SAMPLES DYNAMIC PENETRATION	CONSISTENCY :
Elev. Depth (m) 81.97	DESCRIPTION	Hardware     Resistance Blows       Area     0     20     40     60     80       0     20     40     60     80       0     SHEAR STRENGTH     kPc       FIELD VANE SHEAR     1       Win z     %     0     50     100     150     200     250	NATURAL MOISTURE CONTENT (W) LIQUID LIMIT (W ) PLASTIC LIMIT (Wp)
7.00	Clayey Silt -loose to compact, grey, interbeded with clay seams, wet.	5     SSWH     Image: Control of the second	
9.00		6 SS 1	
77.74	End of Borehole <u>Notes</u> -piezometer installed - Water Level <u>Date</u> <u>Depth</u> Nov 1 4.0 m	7 SS 1       1 <td></td>	

LOCA	VECT <u>Ceotechnical Inv</u> ATION South Merivale B M <u>Geodetic</u> BOREHO	estigation Business Par	·k			REPORT D/	ATELUIY.	22/9		
	GEOLOGIC PROFILE	SAMPLES			TRATION		DRAWN BY M. T. W CONSISTENCY: NATURAL MOISTURE CONTENT (W)			
Elev Depih 89.53	DESCRIPTION	STRATIGRAPHY NUMBER TYPE BLOWS (N)	% RECOVERY	SHEAR STRE FIELD VANE SHE LAR VANE SHE 50 TRO	EAR v	PLASHG	MIT (W ) LIMIT (Wp)			
0.0	Corn and 330 mm clayey topsoil over									
1.0	Silty Clay: occasional thin beds of silt and fine sand, trace shells; hard to stiff, olive-brown,	1 SS 9					<b>▶4</b>			
2.0	moist	3 SS 2					ł	v.∟ ⊊ iy 12, tip '		
3.0 85.72 3.81	_ becoming firm to		-				► ►			
4.0		5 SS -	· · · · · · · · · · · · · · · · · · ·	<ul> <li>**</li> <li>**</li> <li>**</li> <li>**</li> </ul>				•		
5.0										
5.0 82.82 6.71	-Trace charcoal-grey organic spots becoming stiff	7 SS -								
7.0		+ 8 SS 1								
8.0										
9.0		9 55 1			in-situ	(p	G. Ju Ju	"≢ ₩.L. Iy 12/		
	Continued on next sheet			re-m	oulded					

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PRO.	JECTGeotechnical In	ves	stig	atio	n											22/90
	ATION <u>South Merivale</u> M Geodetic BOREHO											REPOR	IT DATE	14	uly/9 1.T.Y	
	GEOLOGIC PROFILE	T		AMPL			DYN		ENETRA					ENCY:		······
		үнч			ŝ	VERY	RESI	STANC	E BLOW	60 60	80	4	URAL N TENT (V	IOISTUR VI	۹ε.	_ <del></del>
Elev. Depth	DESCRIPTION	STRATIGRAPHY	NUMBEA		ş	RECOVERY	SHE	ARS	RENG	ITH.	kPa		IIO LIMI STIC LIN	T (W ) Aft (Wp)	-	
79.53	· · · · · · · · · · · · · · · · · · ·	STR	NUM	ГУРЕ	BLOWS	<u>×</u>		VANE S	SHEAR HEAR	1	* ×			40 6		80 *
10.0	<u>Silty Clay:</u> Stiff, Grey, wet	Ľ	•		•	ľ										
		H	٢									-				ł
78.53		μ	-	:		}						ļ		_		
11.0			••													
12.0			-									·	ļ	<u> </u>	ļ	ļ
12.0	Clayey Silt:		, 10	SS	4											
	stratified, thin clay layers, loose, grey,	T		; ; 												
	wet							· ,				-		<u> </u>	 	
13.0				•												
				:												
14.0					1		+ . ; .	• 1						<u> </u>		<u> </u>
_75.20 14.33	······································	IT L	÷	· :												
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15.0		r	-	:	ļ	l	- 1 <sup>-</sup>	<u>.                                     </u>	. i <u>:</u> i :			<u> </u>				
	Silt/Clay Till: some sand and gravel.	H	11	SŞ	4				• • •							
	loose to compact, grey, wet	H			 ;		1 	•				-	<b>P4</b>			
16.0			•	-					· · · ·				<u> </u>			
		4	• . - :													
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17.0		T	ĺ			ſ										
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		H				ļ										
18.0		.h														
			12	ss	1											
0.33	Auger Refusal	- L				┝										
19.20	Sandstone Bedrock horizontal bedding,		Ì	;	 											
	sound, light grey							1 1 1 1 1								
20.0	Continued next sheet	i														
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	O-A756					(DE)					BOREHO					
LOCA	JECT <u>Ceotechnical Inv</u> ATION <u>South Merivale</u> M <u>Geodetic</u> BOREHO	.Busi	ne	ss. Pa	ink						ORILLING REPORT DRAWN	OATE.		uly/s	10	
	GEOLOGIC PROFILE	1		APLES							- <u>r</u>				· · · · ·	
Elev. Depin	DESCRIPTION	STRATIGRAPHY	ЕЯ	s S	12	AESI O SHE	20	BLOW	60	80 , kPa		CONSISTENCY: NATURAL MOISTURE CONTENT (W) LIQUID LIMIT (W)		RE -		
	CANTINUED	STRAI	NUMB	TYPE BLOWS		FIELD		SHEAR		* ×	PLAST		fi (YV),	i ;	•	
	Sandstone Bedrock horizontal bedding, sound, light grey. Becoming less sandy and more dolimitic		ł	RC55	1											
21.0	with depth		4 R	C 64	100											
22.0 56.82			15	RC 6/	4100											
22.71	End of Borehole				}		1.1									
	Notes: 1. Two piezometer standpipes installed: A) Piezometer tip 'A' , installed at 18.3m;			-												
	B) Plezometer tip 'B' . at 6.1 m;															
	C) 500 mm thick Bentonite Seals at 18.0 m, 6.7m,			1						+						
	and 5.5 m. 2. Water Level Record		ł													
	<u>Time</u> <u>Water Level (m)</u> June 25/90 2.0 ( in	aug	! ers	:)												
	A B June 26/90 13.3 4. July 6/90 7.9 2.1 July 12/90 9.0 2.4	5 4		_												
· · · · ·	<ul> <li>3. Pocket Penetrometer</li> <li>4. The low blow counts in the till may be a to saturated and dist conditions due to drill</li> </ul>	s in ttrib urbe	val ute	ues												
		7														

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	ECT Geotechnical Inv												DRILLIN				
	TION South Merivale B Geodetic BOREHO												REPOR				l
	· ··· ·· ·	LE 11 T				33	·····						ORAWN			α <u>.</u>	
	GEOLOGIC PROFILE		SA T	MPL T	ES Ē	TF	1	NMIC P STANC			ON		3	ISISTE	NCY: DISTURI	=	
		APH				RECOVERY	0	20	40	6	o	80	CONT	ENT (W	3		-+-
Elev. Depth	DESCRIPTION	DESCRIPTION USER BUILDEN			Ś	1ECC	SHE	SHEAR STRENGTH kPa						D UMIT TIC UM	' (W ) IT (Wo)		
90.07		TAA	NUMBER	JYPE	BLOWS		FIELI	ONE 9	SHE.	4R 8 1 5	n -	* 200×			0 60	, 80	
0.0	Corn and 250 mm	535			<u>.</u>	1.2	111	<b>İ</b> iii	TIT	ŢŢ				<u> </u>	ŤŤŤ		
	clayey topsoil over	11	•					i!!									
		11															
		μ	1	SS	7	1											
1.0	Silty Clay	ŀ			•	ĺ	111			<u>i i l</u>	i i i i i i i i i i i i i i i i i i i		$\square$				
	occasional silt and		:	i .								N III					
	fine sand lenses, trace shells, very stiff to			SS		İ											
	stiff, olive-brown,	1.		33								++++			_G.W	, ,	, <u>,</u>
2.0	moist	h		1		-							┼──				
				• SS	2	1							Į		Juiy	6/9	0
									11		!!!;						
		М						*						•			
3.0				· · ·	; 2	•		1	+		<u></u>   [ ]			<u> </u>			
			4	, <b>5</b> 5	, 2			1									
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6.26 3.81	_becoming firm to soft, grey, wet		 5	SS		-	11-1										
4.0	3.011		j	و د ا		-	$\frac{1}{1}$		+ -	1.			+				
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5.0						Ì		::!	İ.		11						*****
		М				!	1.1.1										
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	<b>-</b>																
6.0	Trace charcoal-grey organic spots	$\mathbb{H}$	7	ss			: <u> </u> } *	1.				114					
			.														
83.37		Щ	•				e ×-									-	
6.7	End of Borehole			1	İ		1:1		1						l		
							ιλ, '		in∽s								
	Notes:							_ re	-mo	uld	ed			·			
	1. Pocket Penetro-									111		111			ļ		
	meter values						1111		11								
	2. Standpipe piezo-																
	meter installed to 6.1 m													- [			
							!!	ļ									
	3. Chemical Analysis							- 11			111						····-
	performed on water sample obtained															I	
	from 5 m depth			3										1	Ĭ		
	4. Water Level Record														ļ		
	Time Water Level (m) on compl. 5.0 (in a			1				· []		Щ							
1	ou combi 210 (10 s	ug	er S	1													
	June 25/90 1.8	-		1			1111	1111	1111	1111	111		1	,	1	- 1	
	June 25/90 1.8 June 26/90 1.8 July 6/90 1.9																

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PROJI	-A756 ECT <u>Geotechnical Inve</u> TION South Merivale Bi Geodetic source	usi	nes	ion s Pa	rk		DEX		BOREHOLE BH-8 NUMBER June 22/90 DRILLING DATE JULY /90					
	Geodetic BOREHOL	<b>[</b>	\$A	MPLE	5	-	OYNAMIC PENETRATION RESISTANCE BLOWS		CONSISTENCY: NATURAL MOISTURE					
Elev. Depth	DESCRIPTION	STRATIGRAPHY	NUMBER		LOWS BECOVE	1	0 20 40 60 80 <u>SHEAR STRENGTH</u> kPa FIELD VANE SHEAR LAB <b>10</b> NE S <b>150</b> 150 200		CONTENT (W)					
0.0	Corn and 275 mm clayey topsoil over								20 40 60 80					
1.0	Silty Clay: Trace fine sand, trace shells, very stiff to stiff, olive-brown, moist			SS I										
2.0			3	SS 7	2			······································	.G.W.L.					
3.0			•	\$5         										
4.0 85.52 4.27	becoming soft to firm, grey, wet			SS ·										
5.0	Average of a second second second second second second second second second second second second second second		. :											
6.0 <u>3.19</u> 5.7	trace charcoal, grey organic spots		7	5S -										
2.1	End of Borehole <u>Note:</u> I.A Pocket Penetro- meter Values 2. Standpipe Piezo						in situ re-moulded							
	meter installed to 6.1 m. 3. Water Level Recor <u>Time</u> Water Level (m on comp. dry (in ad	ds	rs)											
			· · · · · · · · · · · · · · · · · · ·											

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0	-A756				F	ĴN	DE)	(				BOREH( NUMBE	DLE R	<u>BH-9</u>	<u>} [1</u>	of_3
	ECT Geotechnical Inv											DRILLIN				
	TION South Merivale E											REPORT				
DATUN	Ceodetic 8085HO		PE		CME	5-5						DRAWN	BY	M.T.	.W	
	GEOLOGIC PROFILE	ļ	SA	MPL				MIC PE					SISTE RAL MI			
		STRATIGRAPHY			Z	RECOVERY	0	20	40	60	80		ENT (W			<b>.</b>
<u>Elev.</u> Depth	DESCRIPTION	fiGR/	ER		s	ECO'	SHE	AR ST	RENC	STH_	kPa		D LIMIT FIC LIM		-	
90.65		TRA	NUMBER	TYPE	BLOWS	œ		VANE VANE S			* X					
0.0	Grass and 200 mm	\$ }}{					5			150 	200 <sup>×</sup>	2	0 41	}6	0_81	]
<b>v.v</b>	clayey topsoil over															
1.0	Silty Clay:	H	1	ss	8							<u> </u>			ļ	
1.0	Trace fine sand and silt lenses				<u></u> i					4			<b>}</b>		0	
	occasional shells,			SS										G. Y	 ¥.∟.	ן קיי
	very stiff to stiff, olive-brown, moist	H	2	1 33	3					ŀ	╽╻╄╍┥┝┿			í í	y 12	
z.0		1.		i :	1					1.1				1	zo 'E	
		1.	3	SS	- ;	:										l
					 	:										
87.65	becoming firm,	μH			i		*	*				ļ				Ē
3.0	grey and wet		4	SS	- :									,	.W.L	
		H	<u> </u>	.   .			1.1						-	1 · · · ·	ily 1	
86.84 3.81	_ Trace charcoal- grey organic spots		5	ŚŚ		\$	* *							Pi	ezo	'A'
4.0	to bottom of clay											1			<b> </b>	<b>†</b>
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		Кſ			i											
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7.0											• • • • • • • •					
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		المهم مرا										<u>                                     </u>				
9.0		11	9	SS	-											
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10.0	Continued on next sheet															
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	A756		BOREHOLE NUMBER BH-9 (2 of 3)									
	ECT <u>Geotechnical In</u>				······	-	DRILLING DATE June 26/90					
DATUN	Geodetic BOREHO	Busine	ss <u>Pari</u> CMF	<u>د م</u>		-	REPORT DATE July / 90					
	GEOLOGIC PROFILE	······	MPLES		DYNAMIC PENETRATION	-	CONSISTENCY:					
Ī				RY	RESISTANCE BLOWS 0 20 40 60 80		NATURAL MOISTURE					
Elev. Depth	DESCRIPTION	STRATEGRAPHY NUMBER		RECOVERY		LIQUID LIMIT (W)						
	• • • • •	STRATIGR NUMBER	TYPE BLOWS	¥.	SHEAR STRENGTH ki	*	PLASTIC LIMIT (Wp)					
80.65 10.0	Continued	12 Z		*	LAB VANE SHEAR 50 100 150 20	ř	<u>70 40 60 80 ×</u>					
	<u>Silty Clay</u> : firm, grey, wet	+										
11.0												
12.0		10	SS									
13.0												
1/1 0						11						
14.0												
75.41 15.24	<ul> <li>Transition to very loose <u>clavey silt</u> with occasional silty clay layers, grey, wet</li> </ul>		SS -	<b>.</b>			*					
16.0		+	· · · · · · · · · · · · · · · · · · ·									
3.43				ŀ								
7.22	Gay/Silt/Sand/Gravel <u>Till</u> : occasional boulders, compact to dense,											
8.0	grey, wet	5   12 S	S 22				<b>be-</b>					
19.0												
0.0	Continued on next page											

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	O-A756				F	ŌN	DEX					BOREH NUMBE	ol£ R	BH	-9 (:	Lat.
PRO.	ECT <u>Geotechnical Inve</u>	stj	gat	lon												
	ATION <u>South Merivale B</u> M <u>Geodetic</u> воявної											AEPOR				
	GEOLOGIC PROFILE	T		MPL			DYNAM	C PE	NETRAT	ION		1	SISTE			
		APHY			N)	RECOVERY	AESISTA 0 20		8LOWS		80		IRAL M	OISTUR /}	e _	
Elev. Depth	DESCRIPTION	STRATIGRAPHY	NUMBER	(PE	BLOWS	RECC	SHEAF	NE	SHEAR	<u>H</u>	kPa ★ X	PLAS				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
20.0	Continued Clay/Silt/Sand/Gravel Till : dense, grey	-	2		ĕ	Ľ.	metr				Î		20 4	0 60	) 80	
	<u>Till</u> : dense, grey, wet, occasional boulders	90					1.1111									
21.0	(auger refusal at	t	, ,	RC												
	Split spoon refusal	H	14	SS	40											
21.74	End of Borehole					1						<u> </u>	 			
	Notes:															
	<ol> <li>Pocket Penetrometer values</li> <li>Two Piezometer standpipe insta- lied.</li> </ol>															
	A) Piezometer tip 'A' installed at 21.3 m															
	<li>B) piezometer tip 'B' installed at 6.1 m</li>															
	C) 500 mm thick Bentonite seals at 20.7 m, 6.4 m, and 5.5 m.															
	3. Water Level Record <u>Time</u> <u>Water Level (m)</u>															
	<u>'A'</u> <u>'B'</u> July 6/90 <u>3.0</u> <u>1.5</u> July 12/90 <u>3.1</u> 1.7															
	4. 300 m of rock coring at a depth			*** ~**** -				11								
	of 20.7 m (sample RC-13) confirmed the existence of a boulder															
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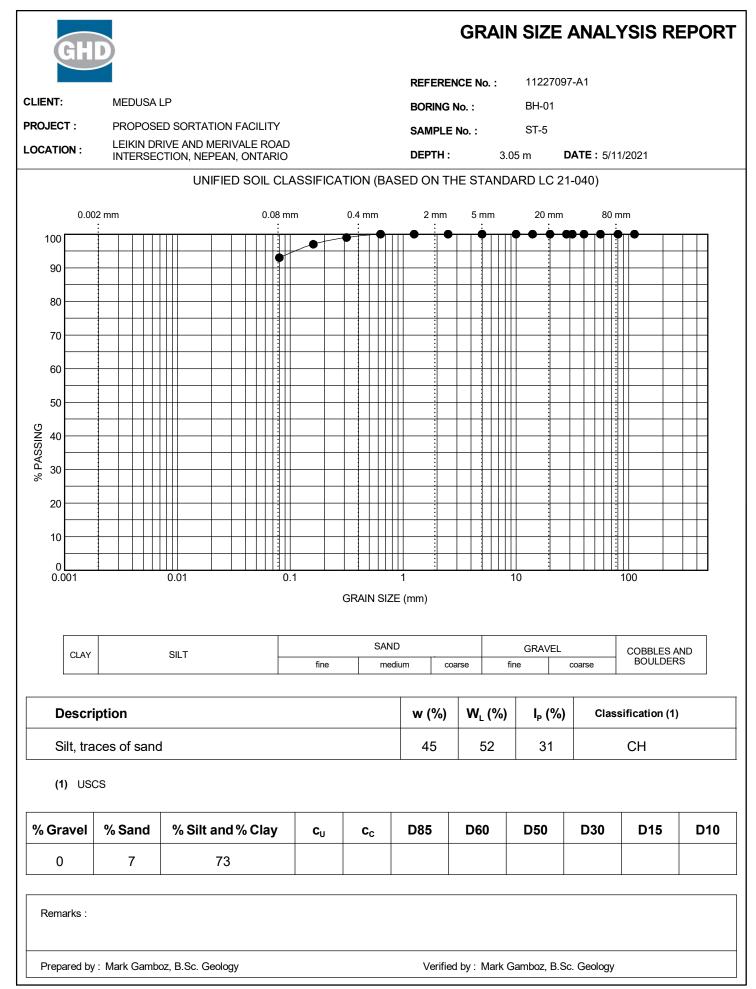
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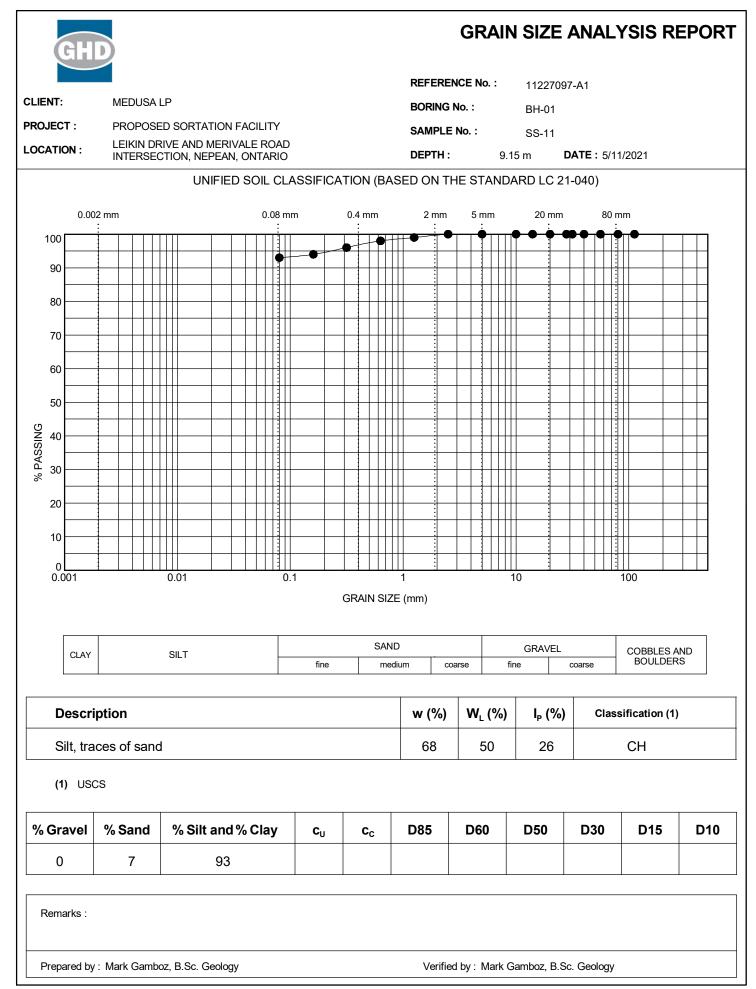
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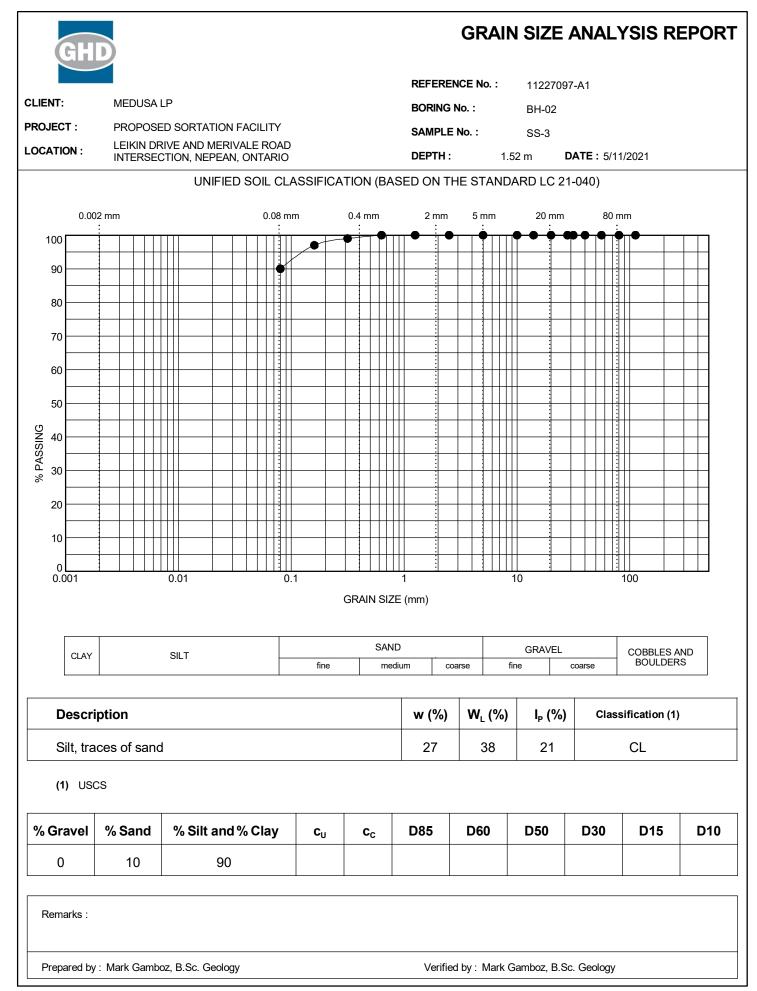
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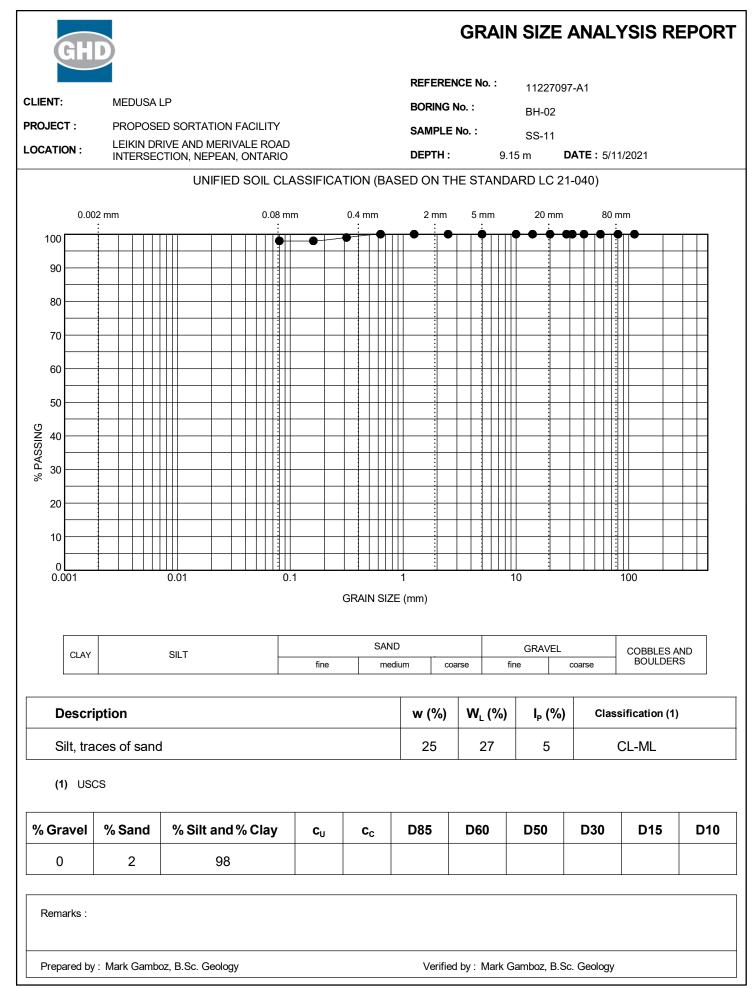
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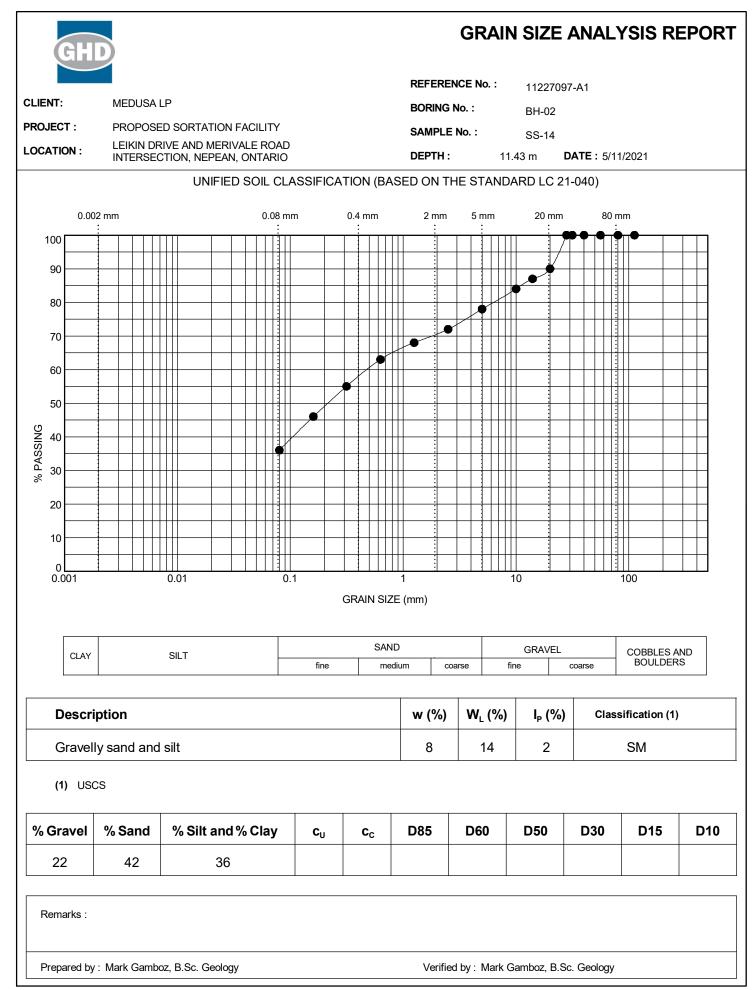
## Appendix F Geotechnical Laboratory Results

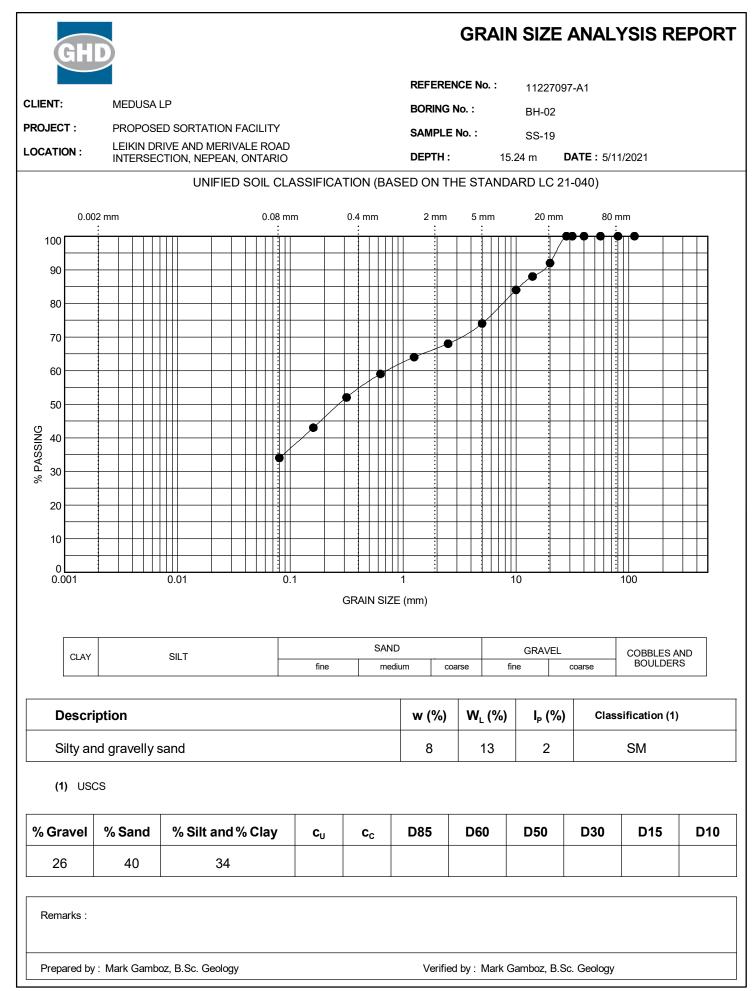


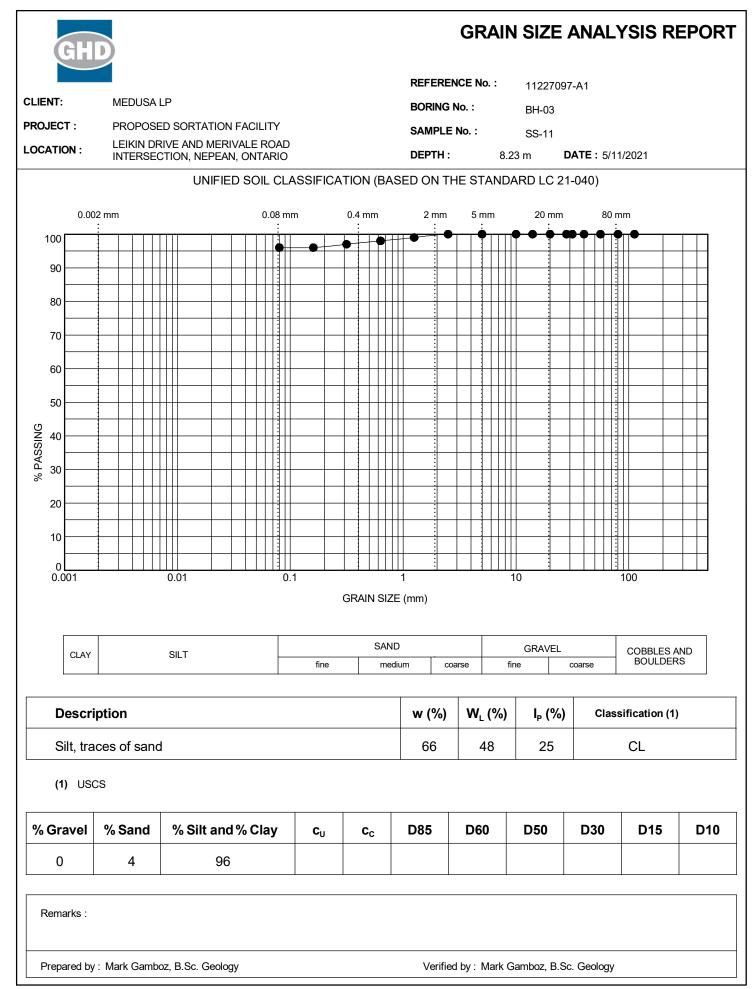


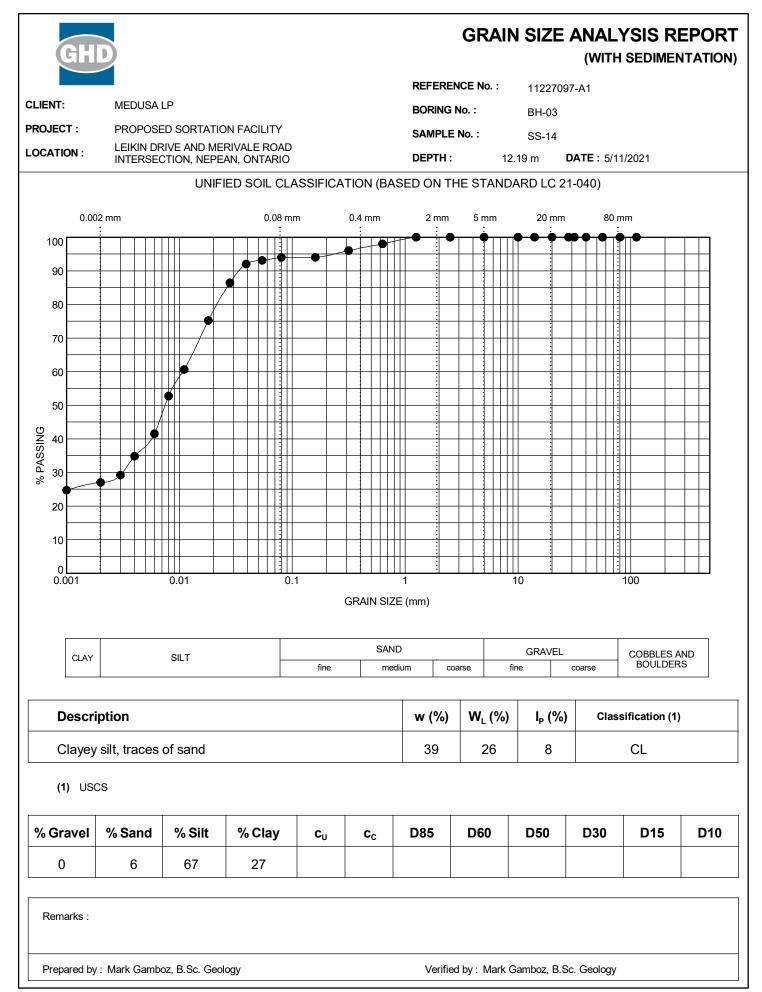


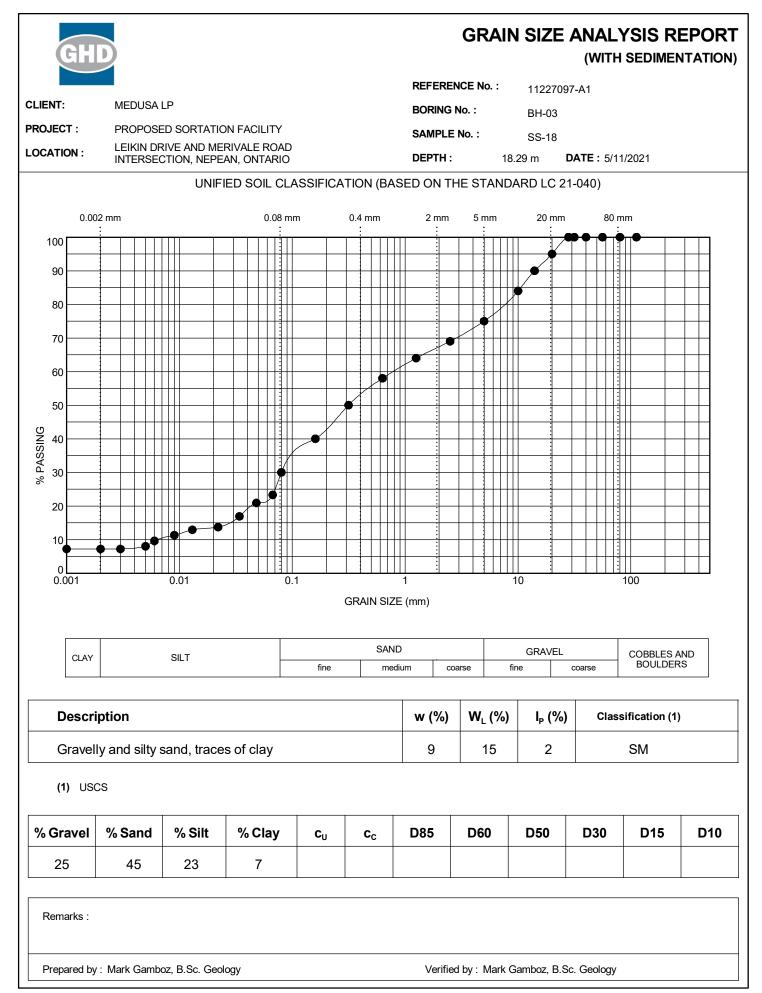


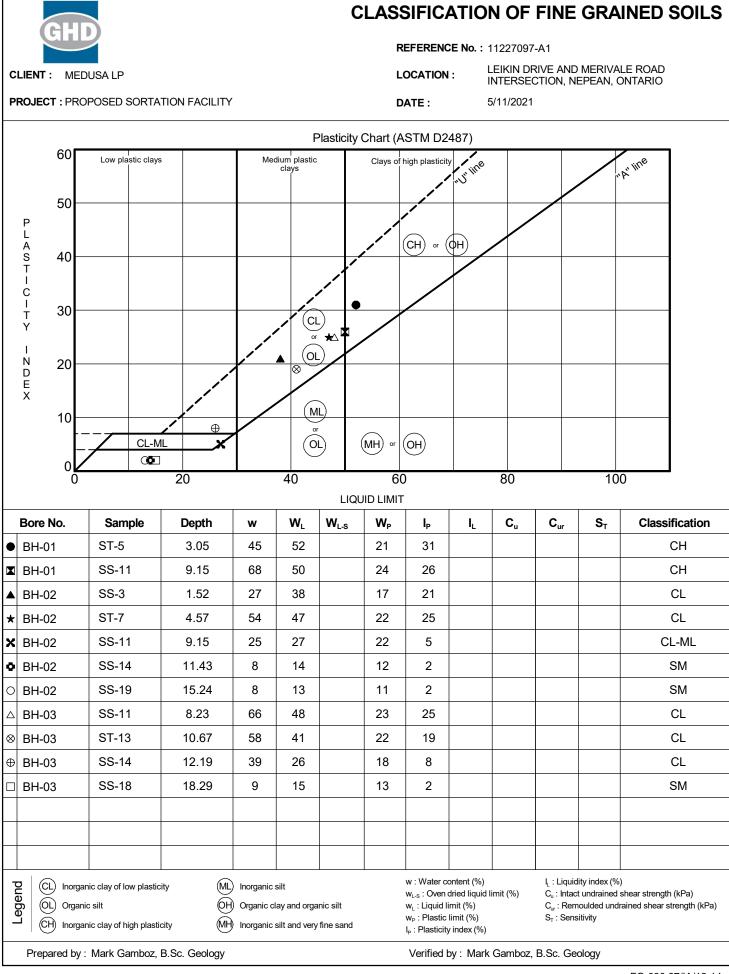








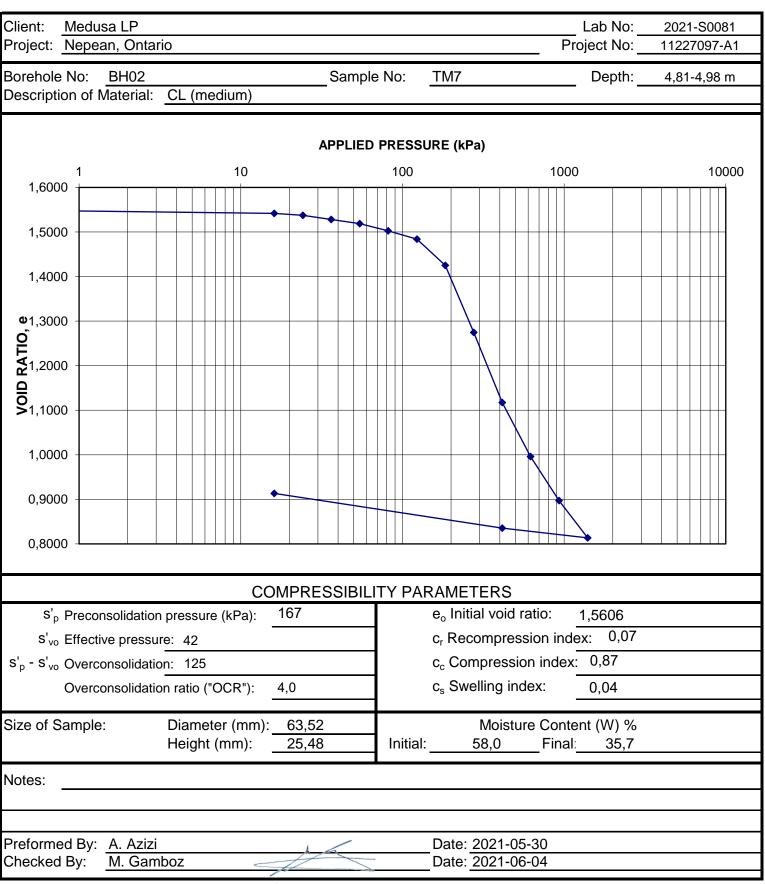




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c	LIENT	: MED	OUSA LP					L	OCATION			RIVE AND CTION, N		LE ROAD ONTARIO	
Р	ROJEC	T:PRC	POSED SORT	ATION FACILITY	(			0	DATE :		5/31/202 <sup>-</sup>	1			
						F	Plasticit	y Chart (A	ASTM D2	2487)					
		60	Low plastic clay	ys	Me	dium plastic clays	;	Clays of	high plastici	ty nu' line				A" line	
		50-													
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	l N	20-			1										
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		-		ML /	$\mathbf{I}$			(MH) or	(OH)						
		0						$\smile$	$\bigcirc$						
		0		20		40	LIC	6 QUID LIMIT			80		10	0	
	Bore	No.	Sample	Depth	w	WL	W <sub>L-S</sub>	W <sub>P</sub>	I <sub>P</sub>	١L	Cu	C <sub>ur</sub>	ST	Classification	
•	TP-0	1	GS-3	0.80	33	63		26	37					СН	
	TP-2	5	GS-3	0.70	37	53		24	29					СН	
	TP-3		GS-3	0.70	30	59		25	34					СН	
*	TP-4	4	GS-3	0.75	39	74		34	40					СН	
_															
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┢															
													<u> </u>		
	Legend	<u> </u>	nic clay of low plasti ic silt	icity (ML (OH		silt silt silt	anic silt		w : Water c w <sub>L-S</sub> : Oven w <sub>L</sub> : Liquid	dried liquid	limit (%)	C <sub>u</sub> : Intac		) shear strength (kPa) rained shear strength (kPa	)
-		~	nic clay of high plas	č		silt and very			w <sub>P</sub> : Plastic I <sub>P</sub> : Plasticit	: limit (%)		S <sub>⊤</sub> : Sens		ũ (	

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Client: <u>Medusa LP</u> Project: <u>Nepean, Onta</u>	rio				2021-S0081 11227097-A1
Borehole No: <u>BH03</u> Description of Material:	CL (medium)	Sample No:	TM13	Depth:	10,87-11,02 m
		APPLIED PRES	SURE (kPa)		
1 1,5000 +	10	100		1000	10000
1,4000					
1,3000					
<b>0</b> 1,2000					
•1,2000 OF V 1,1000 OF V 1,0000					
>1,0000					
0,9000					
0,8000					
0,7000					
	COMPRE	ESSIBILITY PA	ARAMETERS		
S'p Preconsolidatior			e <sub>o</sub> Initial void	-	
s' <sub>vo</sub> Effective pressu				sion index: 0,06	
s' <sub>p</sub> - s' <sub>vo</sub> Overconsolidatio			c <sub>c</sub> Compressi		
Overconsolidatio	on ratio ("OCR"): 2,2		c <sub>s</sub> Swelling in	dex: 0,04	
Size of Sample:	Diameter (mm): 63,5 Height (mm): 25,4			ire Content (W) % Final: 32,2	
Notes:					
Preformed By: <u>A. Azizi</u> Checked By: <u>M. Gam</u>		$\leq$	Date: <u>2021-0</u> Date: <u>2021-0</u>		



# about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

Alexander Fiorilli alexander.fiorilli@ghd.com 514.339.0100

Kamel Hamouche kamel.hamouche@ghd.com 418.425.0817

www.ghd.com