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Geotechnical Investigation
Proposed Industrial Development
3112 Carp Road
Ottawa, Ontario

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Submitted to:

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Proposed Industrial Development
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Ottawa, Ontario

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GEMTEC Project: 102151.001

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1.0 INTRODUCTION

This report presents the results of the preliminary subsurface investigation carried out for the proposed industrial development to be located at 3112 (formerly 3160) Carp Road, Ottawa, Ontario.

The purpose of the investigation was to identify the general subsurface and groundwater conditions at the site by means of a limited number of boreholes and monitoring wells and, based on the information obtained, to provide engineering guidelines and recommendations on the geotechnical design aspects of the project, including construction considerations that could influence design decisions.

This report is subject to the Conditions and Limitations of This Report, which follows the text of the report, and which are considered an integral part of the report.

2.0 BACKGROUND

2.1 Project Description

The site consists of an about 22 hectare land parcel located at 3112 Carp Road in Ottawa, Ontario. The site is currently undeveloped grassland with occasional small trees and alders; more mature trees can be found along the northern and eastern border of the site.

The proposed industrial development at the site will consist of 13 blocks, with 11 blocks for development, with sizes ranging from about 1.1 to 4.8 hectares in size. One of the proposed blocks (block 1, located on the west corner of the site) was severed since the carrying out the fieldwork.

Based on observations made on site during the fieldwork (in April 2023), a large stockpile of fill material was being placed on the site. The stockpile at the time of the fieldwork had a height of about 5 metres above the existing ground surface.

2.2 Previous Investigation

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) has completed a hydrogeological investigation for the proposed development. The results were provided in the following report:

- Report to Novatech Engineering Consultants Ltd., titled “Hydrogeological Investigation & Terrain Analysis, Proposed Industrial Subdivision, 3160 Carp Road, Ottawa, Ontario” dated July 10, 2020 (Report No. 64819.03).

As part of the hydrogeological investigation, 15 test pits, five boreholes with monitoring wells, and four test wells were advanced across the site. The following should be noted about the test holes advanced as pert of the previous hydrogeological investigation:

- The test pit information was provided on Record of Borehole Sheets (in Appendix C of this report) and are referred to as test pits in this report and on the site plan.
- The test wells on the Well Records are labelled as Test Well 1 of 4, 2 of 4, 3 of 4, and 4 of 4 and correspond to TW-1, TW-2, TW-3, and TW-4, respectively, on the Site Plan, Figure 1.
- Boreholes 19-1 D and 19-1S, 19-3D and 19-3S, and 19-4S were advanced adjacent to test wells TW-1, TW-3, and TW-4, respectively. No boreholes were advanced adjacent to test well TW-2.

The subsurface conditions encountered in the previously advanced test pits and boreholes consisted of topsoil over native deposits of silty sand to sandy silt, over weathered silty clay crust, over glacial till. Some of the test pits and boreholes were advanced to practical refusal at depths ranging from about 1.8 to 9.2 metres. The refusal likely occurred on cobbles and/or boulders within the glacial till deposit or on the bedrock surface. Based on the laboratory testing carried out on select samples of the silty clay, the deposit is more likely to be glacial till.

The depth to groundwater was measured on various dates at depths ranging from about 1.5 to 5.5 metres below the existing ground surface.

2.3 Site Geology

Published geology maps indicate the subsurface conditions at the site are composed of silty sand and silty clay over glacial till. Bedrock geology maps indicate the bedrock in the area of the site consists of limestone and shale of the Verulam formation. Drift thickness mapping indicates that the bedrock is expected at depths ranging from about 3 to 15 metres, sloping down to the north.

The ground conditions encountered in the test holes during the previous investigation are generally consistent with the surficial geology mapping for the area of the site.

3.0 METHODLOGY

The fieldwork for the current investigation was carried out between April 18 and 20, 2023. At that time, 11 boreholes (numbered 23-01, 23-03, 23-04, 23-06, 23-07, 23-08, 23-10, 23-11, 23-13, 23-14, and 23-15) were advanced adjacent to the corresponding 18-series test pits, with the exception of borehole 23-14, at the approximate locations shown on the Site Plan, Figure 1.

The boreholes were advanced using a track mounted drill rig supplied and operated by CCC Geotechnical & Environmental Drilling Ltd. of Ottawa, Ontario. The boreholes were advanced to depths ranging from 2.6 to 9.0 metres below the existing ground surface.

Standard penetration tests were carried out in the boreholes and samples of the soils encountered were recovered using a 50 millimetre diameter split spoon sampling equipment. In situ vane testing was carried out, where possible, in the boreholes to measure the undrained shear strength of the silty clay.

A well screen was installed in the overburden in borehole 23-07 to measure the groundwater levels and for hydraulic conductivity testing. The groundwater level was measured on April 27, 2023 and March 18, 2026.

The fieldwork was supervised throughout by a member of our engineering staff who directed the drilling operations, logged the samples and carried out the in-situ testing. Following the fieldwork, the soil samples were returned to our laboratory for examination by a geotechnical engineer. Selected samples of soil were tested for water content testing, Atterberg Limit testing, and grain size distribution testing. One soil sample was submitted to an accredited laboratory for chemical testing relating to corrosion of buried steel and concrete.

The borehole locations were selected and positioned at the site relative to existing site features by GEMTEC personnel. The locations and ground surface elevations of the boreholes were determined using high precision GPS survey instrumentation.

4.0 SUBSURFACE CONDITIONS

4.1 General

Descriptions of the subsurface conditions logged in the boreholes are provided on the Record of Borehole Sheets in Appendix A. The results of the soil classification testing are provided in Appendix B and on the Record of Borehole Sheets. The borehole records from the previous investigations are provided in Appendix C. A summary of the measured groundwater levels is provided in Appendix D. The results of chemical testing related to corrosion are provided in Appendix E.

The following presents an overview of the subsurface conditions encountered in the boreholes advanced during the current investigation. The results of the previous investigation are only referenced below with respect to refusal depths, bedrock and groundwater levels.

It should be noted that the deposits of grey silty clay that were encountered in the test pits were not encountered in the boreholes that were advanced adjacent to the respective test pits. The soil descriptions described herein supersede the descriptions in the test pits advanced adjacent to the current boreholes.

4.2 Fill Material Stockpile

At the time of the investigation, a stockpile of fill material was observed at the site, as shown in Figure 1, with an approximate height of about 5 metres, based on the as surveyed top of stockpile at about elevation 119 metres and the base of the stockpile at about elevation 114 metres.

No test holes were advanced through the stockpile, however, based on the observations made on site during the fieldwork, the stockpile consists of rock fill.

4.3 Topsoil

A layer of topsoil was encountered at the ground surface at all borehole locations with thicknesses ranging from about 150 to 300 millimetres.

4.4 Silty Sand to Sandy Silt, and Sand

Native deposits of silty sand to sandy silt and sand with varying amounts of gravel and clay were encountered below the topsoil in all the boreholes, with the exception of borehole 23-10. These deposits are collectively referred to further in this report as silty sand. The silty sand to sandy silt extends to depths ranging from about 0.8 to 3.4 metres below the existing ground surface. The silty sand deposits also contain trace to some clay or silty clay seams at some locations.

Standard penetration tests carried out in the sandy deposits gave N values ranging from 1 to 21 blows per 0.3 metres of penetration, which reflect a very loose to compact relative density.

The results of a grain size distribution test carried out on one sample of the silty sand are provided in Appendix B and summarized in Table 4.1.

Table 4.1 – Summary of Grain Size Distribution Testing (Silty Sand)

Borehole ID	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
23-04	3	1.5 to 2.1	1	44	35	20

The measured water contents of eight samples of the silty sand to sandy silt ranged between about 21 and 35 percent.

4.5 Weathered Silty Clay Crust

Native deposits of silty clay were encountered below the silty sand in boreholes 23-01, 23-03, 23-08, 23-13, and 23-15. The full depth of the silty clay in the boreholes has been weathered to a grey brown crust. The weathered crust extends to depths ranging from about 1.5 to 3.8 metres below the existing surface grade.

Standard penetration tests carried out in the weathered silty clay gave SPT N values ranging from 2 to 8 blows per 0.3 metres of penetration, which reflect a stiff to very stiff consistency.

The results of grain size distribution testing carried out on one sample of the weathered silty clay crust are provided in Appendix B and are summarized in Table 4.2.

Table 4.2 – Summary of Grain Size Distribution Testing (Weathered Crust)

Borehole ID	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
23-08	2	0.7 to 1.4	0	1	48	51

The results of Atterberg Limit testing carried out on five samples of the weathered crust are provided on the Plasticity Charts in Appendix B and are summarized in Table 4.3.

Table 4.3 – Summary of Atterberg Limit Testing (Weathered Crust)

Borehole ID	Sample Number	Sample Depth (metres)	Water Content (%)	LL (%)	PL (%)	PI
23-01	2	0.7 to 1.4	27	33	15	18
23-03	3	1.5 to 2.1	27	30	15	15
23-08	3	1.5 to 2.1	56	30	16	14
23-13	3	1.5 to 2.1	30	27	14	13
23-15	5B	3.0 to 3.6	39	32	15	17

Based on the results of the Atterberg Limit testing, the samples of the weathered crust have a low plasticity.

The measured water contents of seven samples of the weathered silty clay crust range from about 27 to 56 percent.

A sample of the weathered crust was tested in our laboratory to determine the Shrinkage Limit of the silty clay at the site. The testing was performed in general accordance with ASTM D4943. The modified plasticity index (PI_m) was also calculated for samples of the clay using the following formula and the results of the Atterberg limits and grain size distribution testing described previously:

$$PI_m = PI \times (\% \text{ passing the 425 micrometre sieve} / 100).$$

A summary of the test and calculation results is provided in Table 4.4.

Table 4.4 – Summary of Modified Plasticity Index

Borehole ID / Sample No.	Shrinkage Limit (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Modified Plasticity Index (%)
23-01 / 2	-	15	33	18	18
23-03 / 3	-	15	30	16	16
23-08 / 2	18	-	-	-	-
23-08 / 3	–	16	30	14	14
23-13 / 3	-	14	27	13	13
23-15 / 5B	-	15	32	17	17

4.6 Sand and Silt

A native deposit of sand and silt was encountered below the weathered silty clay crust in borehole 23-08. The sand and silt has a thickness of about 0.8 metres and extends to a depth of about 2.9 metres below the existing ground surface.

One standard penetration test carried out in the sand and silt deposit gave an SPT N value of weight of hammer per 0.3 metres of penetration indicating a very loose relative density.

The measured water content of one sample of the sand and silt was about 33 percent.

4.7 Glacial Till

Native deposits of glacial till were encountered below the topsoil, silty clay, and/or sand and silt deposits, where encountered, in the boreholes. The glacial till was not fully penetrated in the boreholes, but was proven to depths ranging from about 2.5 to 9.0 metres below the existing ground surface.

Glacial till is a heterogeneous mixture of all grain sizes, and at this site, the glacial till can be described as silty sand to sandy silt, with varying amounts of clay and gravel to sandy silt and clay with trace gravel. Although not directly encountered in the boreholes (due to the size of the split spoon sampler), the glacial till deposit is known to contain cobbles and boulders.

Standard penetration tests carried out in the glacial till gave N values ranging from weight of hammer to greater than 50 blows per 0.3 metres of penetration, which reflect a very loose to very dense relative density. The higher blow counts likely represent the presence of cobbles and boulders or the surface of the bedrock rather than the relative density of the glacial till.

Two in-situ vane shear strength tests carried out in the silt and clay glacial till gave undrained shear strengths of about 18 and 69 kilopascals. The undrained shear strengths measured in the glacial till are not considered accurate, with the low shear strength likely taken through disturbed soil and the high shear strength likely influenced by the amount of sand and gravel in the deposit.

The results of a grain size distribution testing carried out on one sample of the glacial till are provided in Appendix B and summarized in Table 4.5.

Table 4.5 – Summary of Grain Size Distribution Testing (Glacial Till)

Borehole ID	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
23-06	10B	7.0 to 7.5	21	46	22	10
23-08	5	3.1 to 3.2	2	27	35	35

The water contents of 29 samples of the glacial till range between about 4 and 35 percent.

4.8 Auger Refusal and Bedrock

Boreholes 23-06, 23-07, 23-08, 23-10, 23-14, and 23-15, from the current investigation encountered practical auger refusal at depths ranging from about 2.6 to 8.5 metres below the existing ground surface. Boreholes 19-1D, 19-3D, and 19-4S from the previous investigation encountered practical auger refusal at depths ranging from about 5.6 to 9.1 metres below the existing ground surface. Auger refusal may occur on cobbles and boulders within the glacial till or on the bedrock surface.

Practical refusal to excavating was encountered in test pits 18-2, 18-3, 18-6, 18-9, 18-10, 18-11, 18-12, 18-13, and 18-14 at depths ranging from about 1.8 to 3.1 metres below the existing ground surface.

Bedrock was encountered in the test wells at depths ranging from about 7.0 to 8.2 metres below the existing ground surface. The depth to bedrock at the test well locations was inferred from the drilling resistance and the drill cuttings.

A summary of the refusal depths and elevations from the current and previous investigation are summarized in Table 4.6.

Table 4.6 – Summary of Auger Refusal and Bedrock Depths and Elevations

Test hole ID	Ground Surface Elevation (metres)	Depth to Refusal (metres)	Refusal/Bedrock Elevation (metres)
BH 23-06	110.3	8.5[1]	101.8[1]
BH 23-07	112.8	3.3	109.6
BH 23-08	110.3	4.4	105.8
BH 23-10	114.1	4.2	109.9
BH 23-13	111.7	4.0[2]	107.6[2]
BH 23-14	116.3	2.6	113.8
BH 23-15	111.5	5.0	106.4
BH 19-1D	115.8	9.2	106.6
BH 19-3D	115.2	6.5	108.7
BH 19-4S	117.1	5.6	111.5
TW-1	115.8	7.9[3]	107.9[3]
TW-2	112.8	7.6[3]	105.2[3]
TW-3	115.3	7.0[3]	108.3[3]
TW-4	117.3	8.2[3]	109.1[3]
TP 18-2	114.7	2.9	111.8
TP 18-3	113.1	2.4	110.7
TP 18-6	114.5	2.9[4]	111.6[4]
TP 18-9	116.2	3.1[4]	113.2[4]
TP 18-10	114.1	3.1[4]	111.0[4]
TP 18-11	111.6	2.3[4]	109.4[4]
TP 18-12	116.3	2.9[4]	113.4[4]
TP 18-13	111.8	3.1[4]	108.8[4]
TP 18-14	115.5	1.8	113.6

Notes:

1. Practical auger refusal was encountered in borehole 23-06 at a depth of about 8.5 metres below the ground surface, however, an SPT advanced past auger refusal to a depth of about 9.0 metres below the existing ground surface.
2. Borehole 23-13 encountered SPT refusal (not auger refusal). SPT refusal likely represents cobbles and boulders, rather than the bedrock surface.
3. The depth to bedrock in the test wells is inferred from the drilling resistance and the drill cuttings.
4. Refusal to excavator advancement was encountered in test pits 18-6 and 18-9 to 18-13 on possible cobbles and boulders within the glacial till.

4.9 Groundwater Levels

Monitoring wells were installed in borehole 23-07 from the current investigation and boreholes 19-1D, 19-1S, 19-3D, 19-3S, and 19-4S from the previous investigation to measure the groundwater levels. Four test wells were advanced at the site for pumping testing and groundwater level measurements during the previous investigation.

The measured groundwater levels in the monitoring wells and test wells installed in the boreholes are presented in Appendix D and the highest recorded groundwater levels in each monitoring well are summarized in Table 4.7. The groundwater levels may be higher during wet periods of the year such as the early spring or following periods of precipitation.

Table 4.7 – Summary of Groundwater Levels

Borehole ID	Ground Surface Elevation (metres)	Groundwater Depth (metres below ground surface)	Groundwater Level Elevation (metres)	Date
BH 23-07	112.8	2.8	110.0	Apr 27, 2023
		1.4	111.4	March 18, 2026
TW 19-1	115.8	4.2	111.6	Aug 8, 2019
TW 19-2	112.8	1.5	111.3	Aug 8, 2019
TW 19-3	115.3	3.0	112.3	Apr 27, 2023
TW 19-4	117.3	3.9	113.4	Apr 27, 2023
BH 19-1D	115.8	4.6	111.2	Aug 8, 2019
		4.0	111.8	March 18, 2026
BH 19-1S	115.8	Dry	Dry	Aug 6, 2019
BH 19-3D	115.2	2.9	112.3	Apr 27, 2023
BH 19-3S	115.3	3.0	112.3	Apr 27, 2023
BH 19-4S	117.1	4.6	112.5	Apr 27, 2023
		4.4	112.7	March 18, 2026

4.10 Chemistry Relating to Corrosion

One sample of soil obtained from borehole 23-07 was sent to Paracel Laboratories for basic chemical testing relating to corrosion of buried concrete and steel. The results are provided in Appendix C and are summarized in Table 4.9.

Table 4.9 – Summary of Corrosion Testing

Parameter	Borehole 23-07 Sample No. 5
Chloride Content (µg/g)	<10
Resistivity (Ohm.m)	74.0
pH	7.74
Sulphate Content (µg/g)	68

5.0 RECOMMENDATIONS AND GUIDELINES

5.1 General

The professional services retained for this project include only the geotechnical aspects of the subsurface conditions. The implications of possible surface and/or subsurface contamination resulting from previous uses or activities of this site or adjacent properties, and/or resulting from the introduction onto the site from materials from offsite sources are outside the terms of reference for this report and have not been addressed.

Based on the information available at the time of preparing this report, the results of the subsurface investigation, and laboratory classification testing, it is considered that the site is suitable for the proposed development, from a geotechnical perspective

5.2 Site Grade Raise Restrictions

The soil conditions across the site generally consists of silty sand over discontinuous deposits of weathered silty clay crust over glacial till.

Based on the results of the subsurface investigation and laboratory classification testing, the maximum thickness of any grade raise filling should be limited to 1.5 metres above the existing surface grade. Higher grade raises may be considered but should be reviewed by GEMTEC to confirm they are feasible.

5.3 Excavations

The excavations for the foundations will extend through topsoil and into the native deposits of weathered silty clay crust, silty sand and/or glacial till. The sides of the excavations should be

sloped in accordance with the requirements in Ontario Regulation 213/91 under the Occupational Health and Safety Act. According to the Act, the shallow native overburden deposits above the groundwater level can be classified as Type 3 and, accordingly, allowance should be made for excavation side slopes of 1 horizontal to 1 vertical extending upwards from the base of the excavation. The sandy and till overburden deposits below the groundwater level can be classified as Type 4 soils and allowance should be made for excavation side slopes of 3 horizontal to 1 vertical, or flatter.

Based on the results of the subsurface investigation and laboratory testing, the weathered crust deposit is sensitive to disturbance from ponded water, vibration and construction traffic. As such, it is suggested that, where encountered at subgrade level, final trimming to subgrade level be carried out using a hydraulic shovel equipped with a flat blade bucket. An allowance should be made to remove and replace any disturbed silty clay with compacted sand and gravel, such as that meeting OPSS Granular A or Granular B Type II, where required.

Cobbles and boulders should be anticipated in the glacial till. As such, an allowance should be made for removal of boulders from the glacial till during excavation which may require use of larger excavation plant and slow excavation progress.

5.4 Groundwater Pumping

The groundwater level in the monitoring wells, within the overburden, installed during the current and previous investigations ranges from about 2.8 to 5.5 metres below ground surface (elevations ranging from about 110.0 to 112.5 metres). Additional water levels were measured within the test wells installed at the site, however, these are deep bedrock wells and are not considered representative of the water levels within the overburden.

Groundwater inflow from the overburden deposits into the excavations should be limited, provided that the excavations do not extend deeper than the groundwater levels. Excavations to limited depths below the groundwater levels will require more dewatering effort but it should be feasible to manage those inflows using typical construction dewatering methods.

If excavations below the groundwater level are required for the proposed buildings, an Environmental Activity and Sector Registry (EASR) in accordance with Environmental Protection Act Part II may be required, depending on the depth and size of the excavation. Further details could be provided as the design progresses.

It is noted that groundwater levels may be higher during wet periods of the year such as the early spring or following periods of precipitation.

It is not expected that short term pumping during excavation will have any significant affect on nearby structures and services.

5.5 Foundation Design

Based on the subsurface conditions which were encountered during the investigation as well as the laboratory classification testing, it is considered that the proposed buildings could be founded on spread footings bearing on or within the native overburden deposits. The topsoil and any fill material, if encountered, is not considered suitable for the support of the proposed structures. Therefore, any fill or deleterious material, if encountered, should be removed from the proposed building areas. Similarly, loose sand deposits, if encountered at subgrade level should be removed from the proposed building areas.

For exterior strip footings, up to 2.0 metres wide, founded, at a depth of up to 1.5 metres below the existing ground surface, on or within the native, undisturbed deposits of the silty sand, weathered silty clay crust, glacial till, or on a pad of compacted engineered fill above the native, undisturbed soil should be sized using a geotechnical reaction at Serviceability Limit State (SLS) of 100 kilopascals and a factored geotechnical resistance at Ultimate Limit State (ULS) of 250 kilopascals.

In areas where the underside of footing level is above the level of the native soil or where subexcavation of soil is required, the grade below the proposed buildings could be raised with granular material meeting Ontario Provincial Standard Specifications (OPSS) requirements for Granular B Type II. The granular material should be compacted in maximum 200 millimetre thick lifts to at least 98 percent of the material's standard Proctor maximum dry density value using suitably sized compaction equipment. To provide adequate spread of load below the footings, the granular material should extend at least 0.5 metres horizontally beyond the edge of the footings and down and out from this point at 1 horizontal to 1 vertical, or flatter.

Provided that the subgrade surface and engineered fill are prepared as described in this report, the post construction total and differential settlement of the footings at SLS should be less than 25 and 15 millimetres, respectively.

For adjacent footings founded at different elevations, we recommend that the underside of the adjacent lower footing not encroach within a zone extending 0.5 metres horizontally beyond the underside of the upper footing and then down and out from this point at 1 horizontal to 1 vertical, or flatter.

Given the level of information on the proposed structures available at this time, the above recommendations should be considered to be preliminary. GEMTEC should review the foundation settlement and bearing resistance if the footings of the proposed buildings on site are greater than 2.0 metres in width and at a depth of greater than 1.5 metres below the existing ground surface.

5.5.1 Seismic Site Class

Based on the results of the investigation, it is anticipated that the proposed foundations will be supported on deposit of silty sand and/or glacial till or on a pad of engineered fill constructed on the weathered silty clay crust, the sandy deposits, and/or glacial till.

Based on Table 4.1.8.4.A. of the 2012 Ontario Building Code, the seismic site class can be determined based on the Average Standard Penetration Resistance or the Soil Undrained Shear Strength. In the National Building Code of Canada (2015), Commentary J, sentence 98, the soil strata can be separated into the two profiles, one for the silty clay and another for the silty sand (glacial till) and bedrock. Based on the results of the boreholes, It was conservatively assumed that the silty clay has an undrained shear strength of stiff to very stiff (50 kPa < s_u ≤ 100 kPa) corresponding to a Site Class D. Based on the results of the boreholes, the glacial till and bedrock has an average standard penetration resistance of about 35 blows (assuming an N value of 100 blows for the bedrock to a depth of 30 metres) which corresponds to a Site Class D.

Based on the results of the standard penetration testing and assumed undrained shear strength of the weathered silty clay crust carried out as part of this investigation, it is recommended that seismic Site Class D be used for the design of structures in the commercial development.

Based on the measured water levels in the overburden in the Spring of 2023 and 2026, the water levels are generally below the base of the sandy deposits on site. As such, the overburden deposits at this site are not considered to be potentially liquefiable during the design seismic event.

An analysis was carried out on the silty clay soils, based on the results of the investigation and geotechnical classification testing, at the site to assess the potential for cyclic softening (i.e., liquefaction-like behaviour), using the method developed by Idriss and Boulanger (2006). The silty clay soils at this site are not considered susceptible to cyclic softening during the design earthquake event. These findings are consistent with previous analyses carried out for Champlain Sea clays which have generally indicated that these clays are not susceptible to cyclic softening.

5.6 Frost Protection of Foundations

All exterior footings should be provided with at least 1.5 metres of earth cover for frost protection purposes. Isolated (unheated) footings that are located in areas that are to be cleared of snow should be provided with at least 1.8 metres of earth cover for frost protection purposes. Alternatively, the required frost protection could be provided by means of a combination of earth cover and extruded polystyrene insulation. Further details regarding the insulation of foundations could be provided, if needed.

5.7 Slab on Grade Support

The topsoil is not considered suitable for support of the slab on grade. To prevent long term settlement of the floor slab, all organic material and any fill material, if encountered, should be removed from below the proposed slab to expose the native overburden deposits.

The grade within the proposed buildings could then be raised where necessary, with material meeting OPSS requirements for Granular A and Granular B Type I or II. The granular base for the proposed slab on grade should consist of at least 150 millimetres of OPSS Granular A.

OPSS documents allow recycled asphaltic concrete and concrete to be used in Granular A. Since the source of recycled material cannot be determined, it is suggested that any granular materials used beneath the floor slab be composed of virgin material only for environmental reasons.

All imported granular materials placed below the proposed floor slab should be compacted in maximum 200 millimetre thick lifts to at least 95 percent of the material's standard Proctor maximum dry density value using suitable vibratory compaction equipment.

Underfloor drainage is not considered necessary provided that the floor slabs are above the finished exterior ground surface level. If any areas of the buildings are to remain unheated during the winter period, thermal protection of the slab on grade may be required. Further details on the insulation requirements could be provided, if necessary.

The floor slabs should be wet cured to minimize shrinkage cracking and slab curling. The slab should be saw cut to about 1/3 the thickness of the slab as soon as curing of the concrete permits, in order to minimize shrinkage cracks.

Proper moisture protection with a vapour retarder should be used for floor slabs where the floor will be covered by moisture sensitive flooring materials or where moisture sensitive equipment, products or environments will exist. The "Guide for Concrete Floor and Slab Construction", ACI 302.1R-04 should be considered for the design and construction of vapour retarders below the floor slabs.

5.8 Backfill and Drainage

The native deposits at this site are frost susceptible and should not be used as backfill against foundations. To avoid frost adhesion and possible heaving, the foundations should be backfilled with imported, free-draining, non-frost susceptible granular material such as that meeting the requirements of OPSS Granular A, or Granular B Type I or II.

Where the backfill will ultimately support areas of hard surfacing (pavement, sidewalks or other similar surfaces), the backfill should be placed in maximum 200 millimetre thick lifts and should be compacted to at least 95 percent of the material's standard Proctor maximum dry density value using suitable vibratory compaction equipment. Light walk behind compaction equipment should

be used next to the foundation walls to avoid excessive compaction induced stress on the foundation walls.

Where future landscaped areas will exist next to the proposed structures and if some settlement of the backfill is acceptable, the backfill could be compacted to at least 90 percent of the material's standard Proctor maximum dry density value using suitable vibratory compaction equipment. Where areas of hard surfacing (concrete, sidewalks, pavement, etc.) abut the proposed structures, a gradual transition should be provided between those areas of hard surfacing underlain by non-frost susceptible granular wall backfill and those areas underlain by existing frost susceptible fill material to reduce the effects of differential frost heaving. It is suggested that granular frost tapers be constructed from 1.5 metres below finished grade to the underside of the granular subbase material for the hard surfaced areas. The frost tapers should be sloped at 1 horizontal to 1 vertical, or flatter. Further, we recommend that downspouts outlet in such a way as to prevent saturation of soils below hard surfaced areas.

The frost susceptible native soils could be considered for foundation wall backfill purposes in soft landscaped areas provided that a suitable bond break is applied to the surface of the foundations to prevent frost jacking. A suitable bond break could consist of at least 2 layers of 6 MIL polyethylene sheeting or a proprietary plastic drainage system. It is also pointed out that the native soils at this site can be impacted by changes in moisture content and this could affect the ability to compact this material to the required density.

Perimeter foundation drainage is not considered necessary for a slab on grade structure provided that the floor slab level is above the finished exterior ground surface level.

5.9 Roadway Construction

5.9.1 Subgrade Preparation

In preparation for roadway construction at this site, all surficial topsoil, fill material and any soft, wet, disturbed, or deleterious materials should be removed from the proposed roadways. Any subexcavated areas could be filled with compacted earth borrow.

Similarly, should it be necessary to raise the roadway grades at this site, material which meets OPSS specifications for Select Subgrade Material or Earth Borrow may be used.

The select subgrade material or earth borrow should be placed in maximum 300 millimetre thick lifts and compacted to at least 95 percent of the material's standard Proctor maximum dry density value using suitably sized vibratory compaction equipment. Prior to placing granular material for the roadways, the exposed subgrade should be heavily proof rolled under suitable (dry) conditions and inspected and approved by geotechnical personnel. Any soft areas evident from the proof rolling should be subexcavated and replaced with suitable earth borrow approved by the geotechnical engineer.

The subgrade should be shaped and crowned to promote drainage of the roadway granular materials.

Truck traffic should be avoided on the native soil subgrade within the roadways especially under wet conditions to prevent disturbance occurring.

5.9.2 Pavement Design

It is recommended that GEMTEC be provided the opportunity to review proposed typical traffic loadings to assess suitability of the above indicated pavement structure when additional details are made available.

Primary roads throughout the site proposed for eventual city hand-over are understood to be considered “Rural Local Roads”, and may be provided with the following pavement structure:

- 120 millimetres of hot mix asphaltic concrete (50 millimetres of Superpave 12.5 over 70 millimetres of Superpave 19.0 Traffic Level B), over
- 150 millimetres of OPSS Granular A base, over
- 450 millimetres of OPSS Granular B, Type II subbase

Private roadways or parking areas at this site planned to be used by light vehicles only (cars, etc.), may be provided with the following pavement structure:

- 90 millimetres of hot mix asphaltic concrete (40 millimetres of Superpave 12.5 over 50 millimetres of Superpave 12.5 Traffic Level B), over
- 150 millimetres of OPSS Granular A base, over
- 300 millimetres of OPSS Granular B, Type II subbase

The above pavement structure assumes that the access roadway subgrade surfaces are prepared as described in this report. If the subgrade surfaces become disturbed or wetted due to construction operations or precipitation, the granular subbase thicknesses given above may not be adequate and it may be necessary to increase the thickness of the subbase and/or to incorporate a woven geotextile separator between the subgrade surfaces and the granular subbase material. The adequacy of the design pavement thicknesses should be assessed by geotechnical personnel at the time of construction.

If the granular pavement materials are to be used by construction traffic, it may be necessary to increase the thickness of the granular subbase layer, install a woven geotextile separator between the roadway subgrade surface and the granular subbase material, or a combination of both, to prevent pumping and disturbance to the subbase material. The contractor should be made responsible for their construction access.

The required thickness of the subbase materials will depend on a number of factors, including contractor workmanship and schedule, contractor methodology, soil types and weather conditions, and should be assessed by geotechnical personnel at the time of construction. In our opinion, the preferred approach from a geotechnical point of view is to:

- Proof roll the subgrade conditions at the time of construction under the supervision of experienced geotechnical personnel.
- Adjust the thickness of the subbase material and include a woven geotextile separator, as required. Unit rate allowances should be made in the contract for subexcavation and replacement with OPSS Granular B Type II.

5.9.3 Granular Material Placement

The pavement granular materials should be compacted in maximum 300 millimetre thick lifts to at least 99 percent of the material's standard Proctor maximum dry density value using suitable vibratory compaction equipment.

5.9.4 Asphaltic Cement

Performance graded PG 58-34 asphaltic cement is recommended for local roadways while performance graded PG 64-34 asphalt is recommended heavy truck traffic, fire access, and garbage collection, etc.

5.9.5 Transition Treatments

In areas where the new pavement structure will abut existing pavements (e.g., Carp Road), the depths of the granular materials should taper up or down at 5 horizontal to 1 vertical, or flatter, to match the depths of the granular material(s) exposed in the existing pavement.

5.9.6 Pavement Drainage

Adequate drainage of the pavement granular materials and subgrade is important for the long-term performance of the pavement at this site. Where feasible, catch basins should be provided with minimum 3-metre-long perforated stub drains which extend in at least two directions from each catch basin at the pavement subgrade level. In addition, where catch basins are not feasible, we recommend that swales or ditches be implemented to promote drainage around the road surface areas. The granular base and subbase materials should be crowned and extend horizontally to the ditches or swales. Where possible, the bottom of the swales/ditches should be at least about 0.5 metres below the bottom of the Granular B Type II.

5.10 Corrosion of Buried Concrete and Steel

According to Canadian Standards Association (CSA) "Concrete Materials and Methods of Concrete Construction", the concentration of sulphate in the soil samples recovered from borehole BH 23-07 can be classified as low. For low exposure conditions, any concrete that will be in contact with the native soil or groundwater could be batched with General Use (GU) type cement.

The effects of freeze thaw in the presence of de-icing chemical (sodium chloride) near the building should be considered in selecting the air entrainment and the concrete mix proportions for any exposed concrete.

Based on the resistivity and pH of the soil samples tested, the soil can be generally classified as non-aggressive toward unprotected steel. It is noted that the corrosivity of the soil could vary throughout the year due to the application sodium chloride for de-icing.

5.11 Sensitive Marine Clay – Effects of Trees

The site is underlain by a discontinuous deposit of silty clay, a material which is known to be susceptible to shrinkage with a change/reduction in moisture content. Research by the Institute for Research in Construction (formerly the Division of Building Research) of the National Research Council of Canada has shown that trees can cause a reduction of moisture content in the silty clays in the Ottawa area, which can result in significant settlement/damage to nearby buildings supported on shallow foundations, or hard surfaced areas. Therefore, deciduous tree planting should be carried in accordance with the guidelines identified in the City of Ottawa document titled: “Tree Planting in Sensitive Marine Clay Soils – 2017 Guidelines”.

The City of Ottawa Tree Planting Guidelines indicates that sensitive marine clay soils with a modified plasticity index of less than 40 percent are considered to have a low/medium potential for soil volume change. Clay soils with a modified plasticity index that exceeds 40 percent are considered to have a high potential for soil volume change.

The modified plasticity index of the samples of weathered silty clay crust, provided in Table 4.4, ranges from about 13 to 18 percent. As such, the potential for soil volume change, as defined by the City of Ottawa, is low/medium.

In accordance with the City of Ottawa Tree Planting Guidelines, tree planting restrictions apply where clay soils with low/medium potential for volume change are present between the underside of footing and a depth of 3.5 metres below finished grade (refer to the City of Ottawa document titled: “Tree Planting in Sensitive Marine Soils - 2017 Guidelines”) – as is likely the case at this site.

According to the City of Ottawa 2017 Tree Planting Guidelines, the tree to foundation setbacks within the development can be reduced to 4.5 metres for small to medium sized trees (i.e., trees with a mature height of less than 14 metres) with further information and recommendations on planting trees near foundations provided in the City of Ottawa Tree Planting in Sensitive Marine Clay Soils – 2017 Guidelines.

6.0 ADDITIONAL CONSIDERATIONS

6.1 Effects of Construction Induced Vibration

Some of the construction operations (such as granular material compaction, excavation, etc.) will cause ground vibration on and off of the site. The vibrations will attenuate with distance from the source but may be felt at nearby structures. The magnitude of the vibrations will be much less than that required to cause damage to the nearby structures or services in good condition.

6.2 Monitoring Well Abandonment

Monitoring well installed as part of this investigation should be decommissioned by a licensed well technician. The well abandonment could be carried out in advance of or during construction.

6.3 Winter Construction

If construction is required during freezing temperatures, the native soil subgrade below the footings should be protected immediately from freezing using straw, propane heaters and insulated tarpaulins, or other suitable means. The frost susceptibility potential of the bedrock should be assessed by geotechnical personnel to determine if frost protection is required for bedrock subgrades.

Any service trenches should be opened for as short a time as practicable and the excavations should be carried out only in lengths which allow all of the construction operations, including backfilling, to be fully completed in one working day. The materials on the sides of the trenches should not be allowed to freeze. In addition, the backfill should be excavated, stored and replaced without being disturbed by frost or contaminated by snow or ice.

7.0 CLOSURE

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.

Alex Meacoe, P.Eng.
Senior Geotechnical Engineer

Bill Cavers, P.Eng.
Principal Geotechnical Engineer

GEOTECHNICAL REPORT CONDITIONS & LIMITATIONS

STANDARD OF CARE: GEMTEC has prepared this report in a manner consistent with generally accepted engineering or environmental consulting practice in the jurisdiction in which the services are provided at the time of the report. No other warranty, expressed or implied is made.

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COMPLETE REPORT: This report is of a summary nature and is not intended to stand alone without reference to the instructions given to GEMTEC by the Client, communications between GEMTEC and the Client and to any other reports prepared by GEMTEC for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. GEMTEC can not be responsible for use of portions of the report without reference to the entire report.

BASIS OF REPORT: This Report has been prepared for the specific site, development, design objectives and purposes that were described to GEMTEC by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document, subject to the limitations provided herein, are only valid to the extent that this report expressly addresses the proposed development, design objectives and purposes. Any change of site conditions, purpose or development plans may alter the validity of the report and GEMTEC cannot be responsible for use of this report, or portions thereof, unless GEMTEC is requested to review any changes and, if necessary, revise the report.

TIME DEPENDENCE: If the proposed project is not undertaken by the Client within 18 months following the issuance of this report, or within the timeframe understood by GEMTEC to be contemplated by the Client, the guidance and recommendations within the report should not be considered valid unless reviewed and amended or validated by GEMTEC in writing.

USE OF THIS REPORT: The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without GEMTEC's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, GEMTEC may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

NO LEGAL REPRESENTATIONS: GEMTEC makes no representations whatsoever concerning the legal significance of its findings, or as to other legal matters touched on in this report, including but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

DECREASE IN PROPERTY VALUE: GEMTEC shall not be responsible for any decrease, real or perceived, of the property or site's value or failure to complete a transaction, as a consequence of the information contained in this report.

RELIANCE ON PROVIDED INFORMATION: The evaluation and conclusions contained in this report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations. information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of misstatements, omissions, misrepresentations. or fraudulent acts of the Client or other persons providing information relied on by us. We are entitled to rely on such representations, information and instructions and are not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

INVESTIGATION LIMITATIONS: Site investigation programs are a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions but even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions.

The data derived from the site investigation program and subsequent laboratory testing are interpreted by trained personnel and extrapolated across the site to form an inferred geological representation and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Conditions between and beyond the borehole/test hole locations may differ from those encountered at the borehole/test hole locations and the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies. Accordingly, GEMTEC does not warrant or guarantee the exactness of the subsurface descriptions.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination-or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

In addition, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

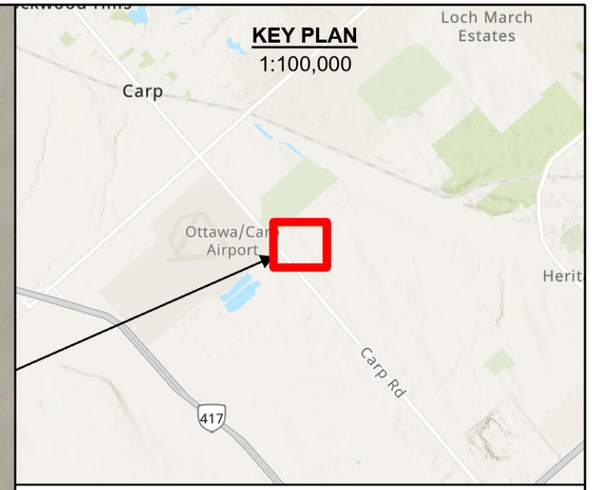
SAMPLE DISPOSAL: GEMTEC will dispose of all uncontaminated soil and/or rock samples 60 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

FOLLOW-UP AND CONSTRUCTION SERVICES: All details of the design were not known at the time of submission of GEMTEC's report. GEMTEC should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of GEMTEC's report.

During construction, GEMTEC should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of GEMTEC's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in GEMTEC's report. Adequate field review, observation and testing during construction are necessary for GEMTEC to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, GEMTEC's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

CHANGED CONDITIONS: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that GEMTEC be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that GEMTEC be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

DRAINAGE: Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. GEMTEC takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



LEGEND

BH/MW # ← BOREHOLE / MONITORING WELL ID
XX.XX ← GROUND SURFACE ELEVATION, IN METERS
GEODETIC DATUM

BOREHOLE LOCATION
(current investigation)

TEST PIT LOCATION
(previous investigation by GEMTEC, No. 64819.03)

APPROXIMATE PROPERTY BOUNDARY
(previous investigation by GEMTEC, No. 64819.03)

PROPOSED ROADS

APPROXIMATE OUTLINE OF ROCKFILL

Service Layer Credits: World Imagery: Microsoft, Vantor
World Topographic Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
World Hillshade: Esri, NASA, NGA, USGS, FEMA

Scale
1:3,000
0 20 40 80 120 160 200 Meters

Drawing
SITE PLAN

Client:
TLC HOLDINGS LTD.

Project
GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
3112 CARP ROAD
OTTAWA, ONTARIO

Drwn By:	E.P./S.L.	Chkd By:	W.A.M.
Project No.	102151.001	Revision No.	2
Date	APRIL 2026		**FIGURE: 1**

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APPENDIX A

Records of Borehole Logs – Current Investigation
List of Abbreviations and Symbols
Borehole 23-01, 23-03, 23-04, 23-06, 23-07, 23-08,23-10,
23-11, 23-13, 23-14, and 23-15

ABBREVIATIONS AND TERMINOLOGY USED ON RECORDS OF BOREHOLES AND TEST PITS

SAMPLE TYPES	
AS	Auger sample
CA	Casing sample
CS	Chunk sample
BS	Borros piston sample
GS	Grab sample
MS	Manual sample
RC	Rock core
SS	Split spoon sampler
ST	Slotted tube
TO	Thin-walled open shelby tube
TP	Thin-walled piston shelby tube
WS	Wash sample

SOIL TESTS	
w	Water content
PL, w_p	Plastic limit
LL, w_L	Liquid limit
C	Consolidation (oedometer) test
D_R	Relative density
DS	Direct shear test
G_S	Specific gravity
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	Organic content test
UC	Unconfined compression test
γ	Unit weight

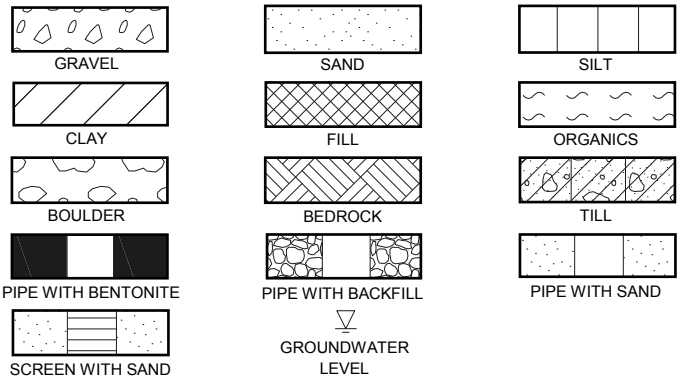
PENETRATION RESISTANCE

Standard Penetration Resistance, N
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 millimetres (30 in.) required to drive a 50 mm split spoon sampler for a distance of 300 mm (12 in.). For split spoon samples where less than 300 mm of penetration was achieved, the number of blows is reported over the sampler penetration in mm.

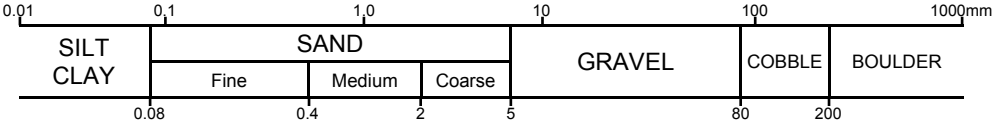
Dynamic Penetration Resistance
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive a 50 mm (2 in.) diameter 60° cone attached to 'A' size drill rods for a distance of 300 mm (12 in.).

WH	Sampler advanced by static weight of hammer and drill rods
WR	Sampler advanced by static weight of drill rods
PH	Sampler advanced by hydraulic pressure from drill rig
PM	Sampler advanced by manual pressure

COHESIONLESS SOIL Compactness		COHESIVE SOIL Consistency	
SPT N-Values	**Description**	**Cu, kPa**	**Description**
0-4	Very Loose	0-12	Very Soft
4-10	Loose	12-25	Soft
10-30	Compact	25-50	Firm
30-50	Dense	50-100	Stiff
>50	Very Dense	100-200	Very Stiff
		>200	Hard

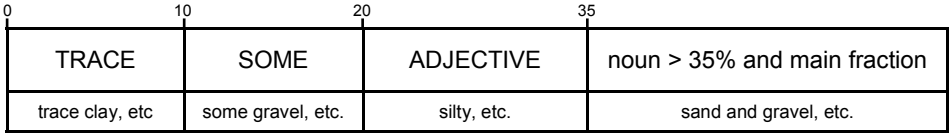


GRAIN SIZE



DESCRIPTIVE TERMINOLOGY

(Based on the CANFEM 4th Edition)



RECORD OF BOREHOLE 23-01

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 18 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger / Hollow Stem Auger (210mm OD)	Ground Surface		115.75							
		TOPSOIL		115.50							
		Loose, brown SILTY SAND, with rootlets		0.25	1	SS	405	7			
				114.99							
1		Grey brown SILTY SAND, trace to some clay		0.76 / 114.79							
		Stiff to very stiff, grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)		0.96	2	SS	535	7			
				114.23							
2		Compact to very dense, grey brown SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		1.52	3	SS	155	27			Auger Cuttings
					4	SS	430	26			
3					5	SS	155	87			
				111.94							
4		Dense, grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		3.81	6	SS	405	46			
				111.33							
		End of Borehole		4.42							
5											
6											
7											
8											
9											
10											

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CHECKED: TM

GEO - BOREHOLE LOG 102151.001_BH_LOGS_2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-03

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 18 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface		112.76							
		TOPSOIL		112.61							
		Very loose, grey brown SILTY SAND, trace to some clay		0.15	1	SS	380	WH			
				112.00							
1		Compact, grey brown SILTY SAND, some clay		0.76	2	SS	585	21			
				111.24							
2		Stiff to very stiff, grey brown SILTY CLAY, trace sand (WEATHERED CRUST)		1.52	3	SS	610	8			Auger Cuttings
				110.48							
		Loose to compact, grey brown SILTY SAND to SANDY SILT, some gravel, with cobbles and boulders (GLACIAL TILL)		2.28	4	SS	380	8			
3					5	SS	535	20			
				109.11							
		End of Borehole		3.65							
4											
5											
6											
7											
8											
9											
10											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

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CHECKED: TM

GEO - BOREHOLE LOG 102151.001_BH_LOGS_2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-04

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 18 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		110.49						
0	Power Auger Hollow Stem Auger (210mm OD)	TOPSOIL		110.29						
		Loose, grey brown SILTY SAND, with rootlets		0.20	1	SS	510	4		
				109.73						
1		Loose to compact, grey brown SAND, some silt, with silty clay seams		0.76	2	SS	510	9		
					3	SS	460	12	MH	
2				108.21						Auger Cuttings
		Dense to very dense, grey brown SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		2.28	4	SS	405	51		
3					5	SS	430	57		
4					6	SS	205	49		
				106.07						
		End of Borehole		4.42						
5										
6										
7										
8										
9										
10										

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

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Consulting Engineers and Scientists

LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001_BH_LOGS_2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-06

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 20 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		110.29						
0		TOPSOIL		109.99	1	SS	355	5		
		Grey brown SILTY SAND, trace clay, with rootlets		0.30						
				109.53						
1	Power Auger / Hollow Stem Auger (210mm OD)	Loose to very dense, grey brown SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		0.76	2	SS	560	6		
					3	SS	305	46		
2					4	SS	610	41		
3					5	SS	305	50		
4					6	SS	405	>50		Auger Cuttings
5					7	SS	510	72		
					8	SS	305	62		
6					9	SS	480	36		
7					10	SS	480	82	MH	
8					11	SS	330	77		
					12	SS	330	59		
9		End of Borehole Note: Auger refusal occured at 8.53 metres depth		101.30 8.99						
10										

SOIL PROFILE / SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

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Consulting Engineers and Scientists

LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001_BH_LOGS_2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-07

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

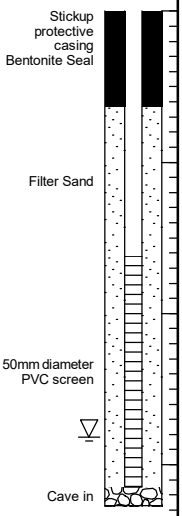
SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 20 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface		112.82				
		TOPSOIL		112.52	1	SS	355	1
		Brown SILTY SAND, with rootlets		0.30 / 112.06				
1		Loose, grey brown SILTY SAND, some gravel, trace clay		0.76	2	SS	405	7
				111.30				
2		Dense, grey brown SILTY SAND, trace to some gravel, with cobbles and boulders (GLACIAL TILL)		1.52	3	SS	460	43
					4	SS	330	>50
3					5	SS	50	> 50
		End of Borehole Auger Refusal		109.55 / 3.27				
4								
5								
6								
7								
8								
9								
10								

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P, W, W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
23/04/27	2.82 ▽	110.0

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LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001_BH_LOGS_2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-08

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 18 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		110.28						
0	Power Auger Hollow Stem Auger (210mm OD)	TOPSOIL		110.08						
		Brown SILTY SAND, trace clay, with rootlets		0.20	1	SS	430	7		
				109.52						
1		Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)		0.76	2	SS	610	5	MH	
					3	SS	610	3		
2				108.15						Auger Cuttings
		Very loose, grey SILT and SAND		2.13	4	SS	175	WH		
				107.39						
3		Very loose, grey sandy SILT and CLAY, with cobbles and boulders (GLACIAL TILL)		2.89	5	SS	380	WH	MH	
				105.84						
4		End of Borehole Auger Refusal		4.44						
5										
6										
7										
8										
9										
10										

SOIL PROFILE / SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

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LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001_BH_LOGS_2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-10

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		114.14						
0	Power Auger / Hollow Stem Auger (210mm OD)	TOPSOIL		113.99 / 0.15						
		Grey SAND and GRAVEL, with cobbles and boulders (GLACIAL TILL)			1	SS	205	17		
				113.38 / 0.76						
1		Loose, grey brown, SILTY SAND, trace gravel (GLACIAL TILL)			2	SS	405	4		
				112.62 / 1.52						
2		Very dense, grey brown, SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)			3	SS	75	>50		
					4	SS	180	>50		
3					5	SS	0	>50		
4					6	SS	355	>50		
		End of Borehole Auger Refusal		109.90 / 4.24						
5										
6										
7										
8										
9										
10										

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

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LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001_BH_LOGS_2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-11

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 18 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger, Hollow Stem Auger (210mm OD)	Ground Surface		111.49							
		TOPSOIL		111.29							
		Loose to compact, grey brown SILTY SAND, trace to some clay		0.20	1	SS	510	11			Auger Cuttings
1					2	SS	510	11			
2					3	SS	610	5			
				109.21							
		Dense to very dense, grey brown SILTY SAND and GRAVEL, with cobbles and boulders (GLACIAL TILL)		2.28	4	SS	205	32			
3					5	SS	510	72			
4					6	SS	305	102			
				107.07							
		End of Borehole		4.42							
5											
6											
7											
8											
9											
10											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

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LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001_BH_LOGS_2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-13

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface		111.69							
		TOPSOIL		111.41							
		Loose to compact, grey brown SILTY SAND, trace to some gravel		0.28	1	SS	405	4			
1					2	SS	330	10			
		Still to very stiff, grey brown SILTY CLAY, with silty sand seams (WEATHERED CRUST)		110.17 1.52	3	SS	610	2			Auger Cuttings
2				109.41	4	SS	50	>50			
		Very dense, grey SILTY SAND and GRAVEI, with cobbles and boulders (GLACIAL TILL)		2.28							
3					5	SS	405	100			
					6	SS	205	>50			
4		End of Borehole Spoon Refusal		107.63 4.06							
5											
6											
7											
8											
9											
10											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

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Consulting Engineers and Scientists

LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001_BH_LOGS_2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-14

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		116.33							
0	Power Auger Hollow Stem Auger (210mm OD)	TOPSOIL		116.05							
		Loose, grey brown SILTY SAND		0.28	1	SS	50	6			
1					2	SS	380	7			Auger Cuttings
				114.96							
		Very dense, grey brown SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		1.37	3	SS	25	>50			
2					4	SS	180	>50			
				113.77							
		End of Borehole Auger Refusal		2.56							
3											
4											
5											
6											
7											
8											
9											
10											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

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LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001_BH_LOGS_2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-15

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger, Hollow Stem Auger (210mm OD)	Ground Surface		111.47							
		TOPSOIL		111.27							
		Loose, brown SILTY SAND, with rootlets		0.20	1	SS	330	7			
				110.71							
1		Compact, grey brown SILTY SAND, trace clay		0.76	2	SS	460	11			
				109.95							
		Compact, brown SILTY SAND		1.52	3	SS	355	17			
2				109.19							
		Very loose, grey SANDY SILT		2.28	4	SS	560	1			Auger Cuttings
				108.42							
3		Grey brown SAND, some silt		3.05	5	SS	430	20			
				108.12							
		Grey brown SILTY CLAY with sand seams (WEATHERED CRUST)		3.35							
				107.66							
4		Dense to very dense, grey brown SILTY SAND and GRAVEL, trace clay, with cobbles and boulders (GLACIAL TILL)		3.81	6	SS	330	38			
					7	SS	230	>50			
5				106.44							
		End of Borehole Auger Refusal		5.03							
6											
7											
8											
9											
10											

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Consulting Engineers and Scientists

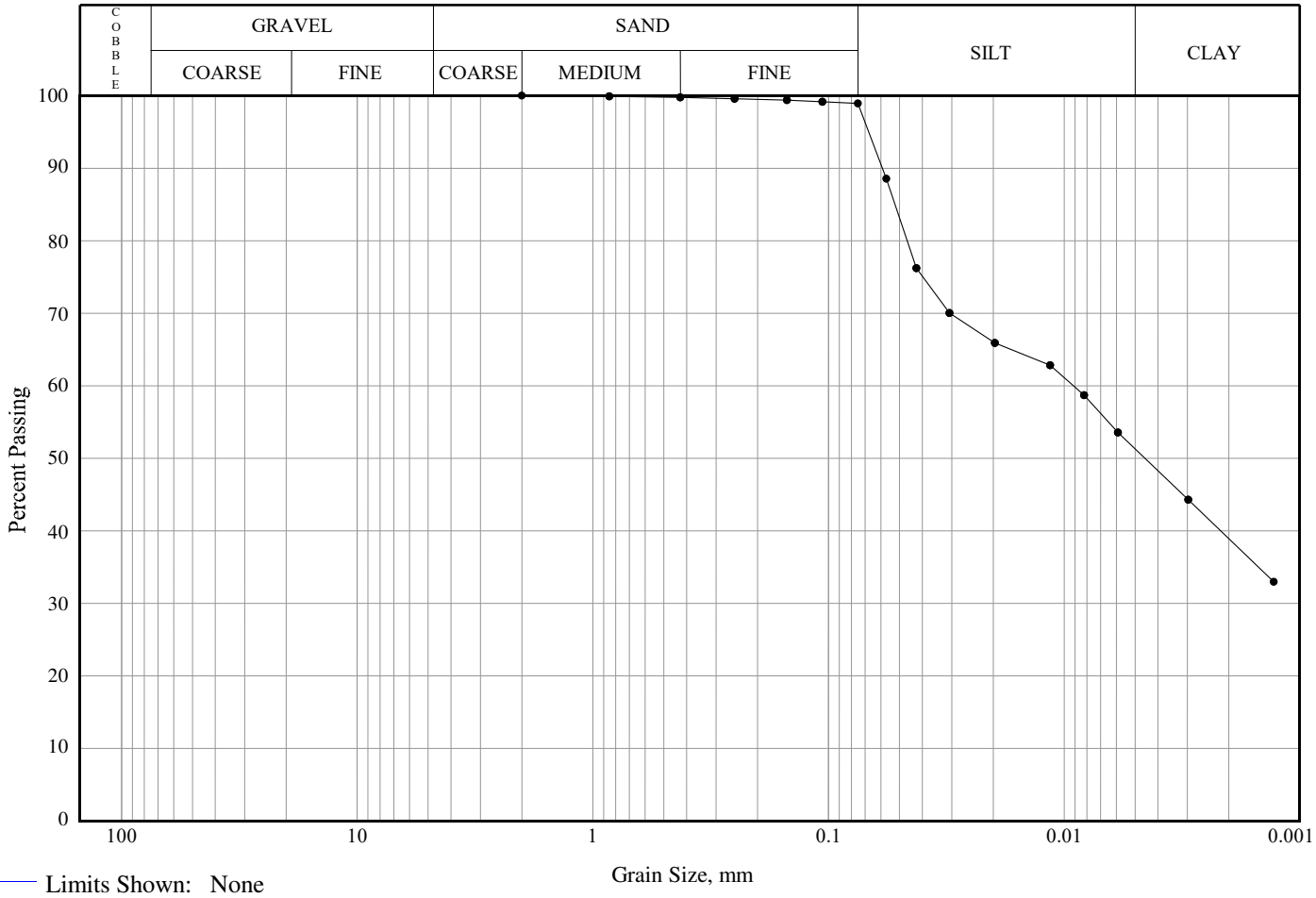
LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001_BH_LOGS 2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

APPENDIX B

Laboratory Test Results

GEMTEC Consulting Engineers and Scientists	Client: TLC Holdings Inc	Soils Grading Chart (LS-702/ ASTM D-422)
	Project: Geotechnical Investigation and Environmental Impact St	
	Project #: 102151001	



Limits Shown: None

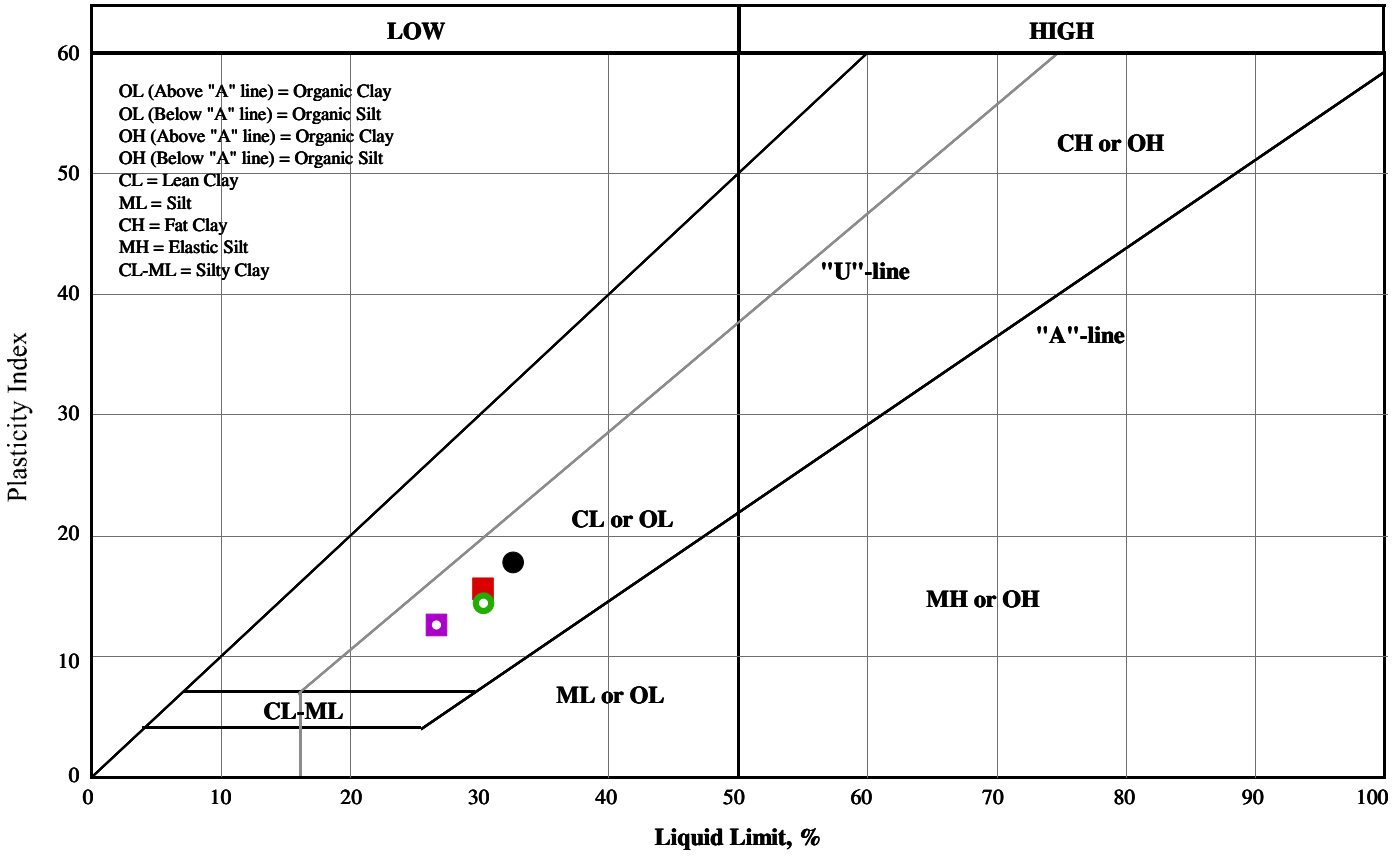
Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
—●—	WEATHERED CRUST	23-08	02	0.76-1.37	0.0	1.1	47.6	51.3

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
—●—	Clay and silt , trace sand	N/A	---	---	---	0.00	0.01	0.05	47.6

GEMTEC
Consulting Engineers and Scientists

Client:	TLC Holdings Inc
Project:	Geotechnical Investigation and Environmental Impact St
Project #:	102151001

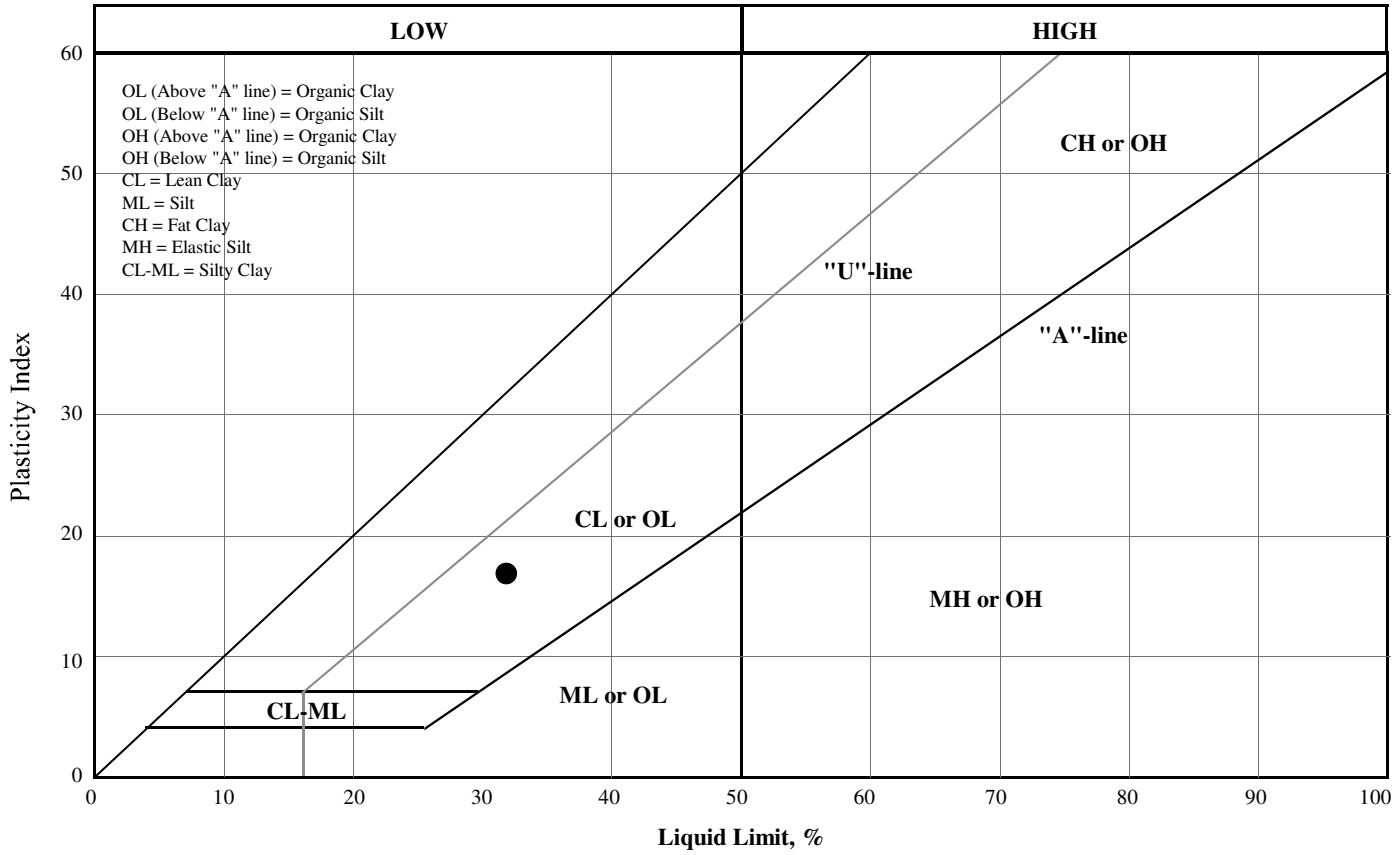
Plasticity Chart (D4318)



Symbol	Borehole /Test Pit	Sample Number	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Non-Plastic	Moisture Content, %
●	23-01	02	0.76-1.37	32.6	14.8	17.8	☐	27.07
■	23-03	03	1.52-2.13	30.3	14.7	15.6	☐	27.04
○	23-08	03	1.52-2.13	30.3	15.9	14.4	☐	55.94
◘	23-13	03	1.52-2.13	26.7	14.1	12.6	☐	29.50

Note: More information available upon request

GEMTEC Consulting Engineers and Scientists	Client: TLC Holdings Inc	Plasticity Chart (D4318)
	Project: Geotechnical Investigation and Environmental Impact St	
	Project #: 102151001	



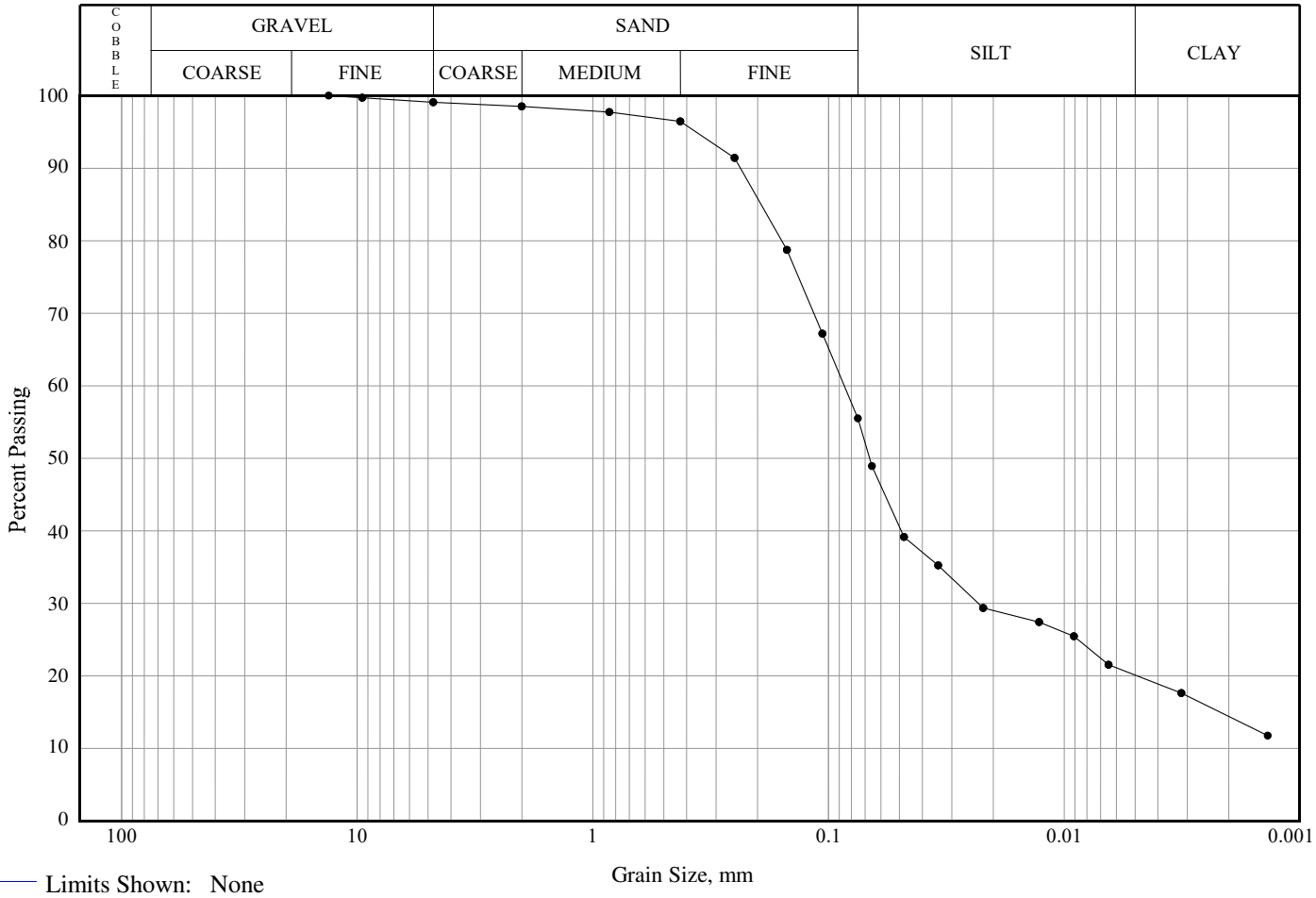
Symbol	Borehole /Test Pit	Sample Number	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Non-Plastic	Moisture Content, %
●	23-15	05B	3.05-3.66	31.8	15.0	16.9	□	39.07

Note: More information available upon request

GEMTEC
Consulting Engineers and Scientists

Client:	TLC Holdings Inc
Project:	Geotechnical Investigation and Environmental Impact St
Project #:	102151001

Soils Grading Chart (LS-702/ ASTM D-422)



Limits Shown: None

Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
—●—	SAND and SILT	23-04	03	1.52-2.13	0.9	43.6	35.4	20.1

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
—●—	Clayey sand and silt , trace gravel	N/A	---	0.00	0.02	0.07	0.09	0.19	35.4

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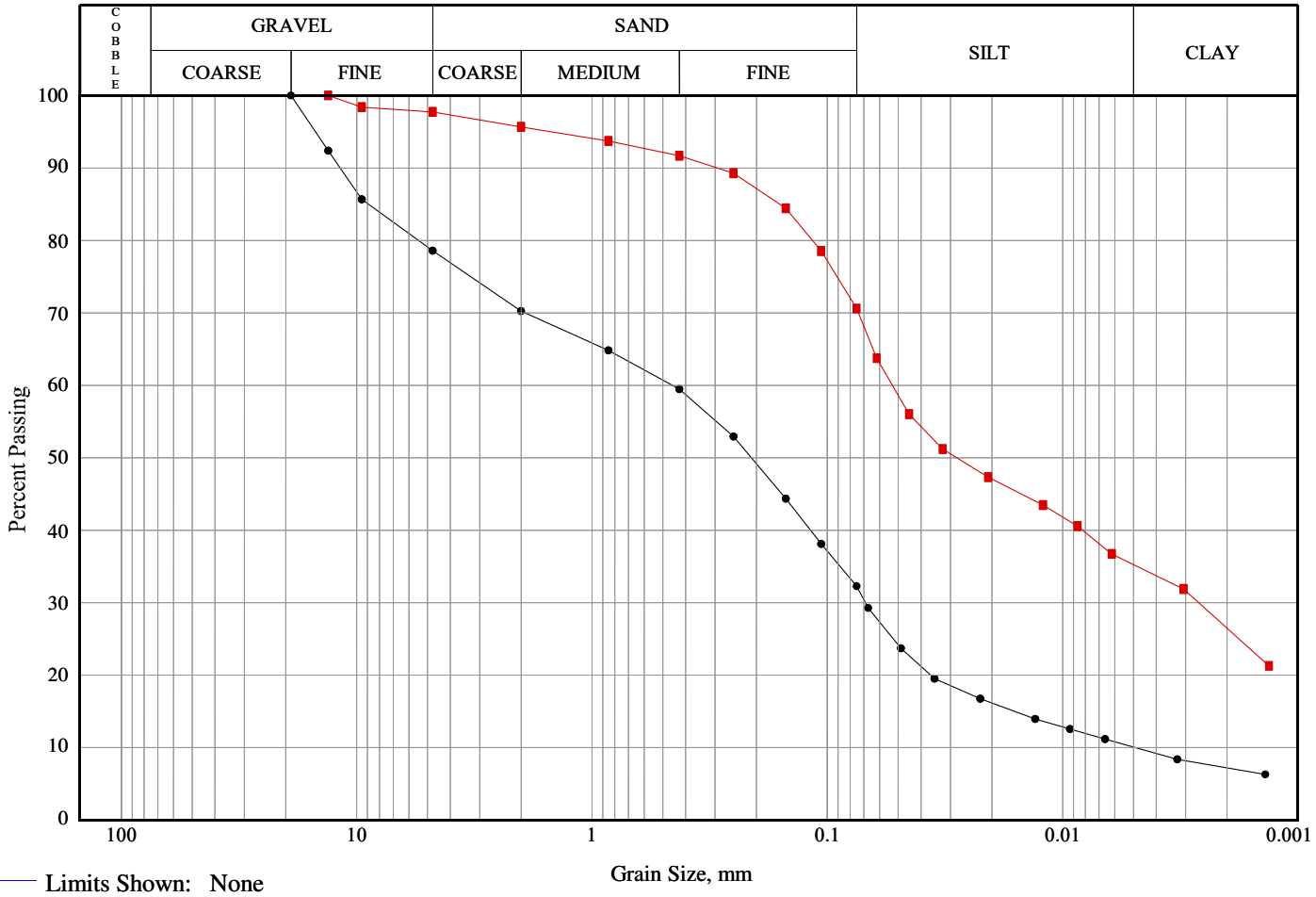
Client:	TLC Holdings Inc
Project:	Geotechnical Investigation and Environmental Impact St
Project #:	102151001

Soils Grading Chart (LS-702/ ASTM D-422)



Limits Shown: None

Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
●	GLACIAL TILL	23-06	10B	7.01-7.47	21.4	46.3	22.2	10.1
■	GLACIAL TILL	23-08	05	3.05-3.20	2.3	27.1	35.4	35.2

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
●	Gravelly silty sand , some clay	N/A	0.00	0.02	0.07	0.21	0.46	8.91	22.2
■	Sandy silt and clay , trace gravel	N/A	---	---	0.00	0.03	0.05	0.16	35.4

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Shrinkage Limit

ASTM D4943

Volume of Shrinkage Dish	
Mass of Glass Plate (g):	**37.33**
Mass of Shrinkage Dish (g) (m):	**20.70**
Mass of Shrinkage Dish, Plate, Grease and Water (g):	**75.40**
Mass of Water (g):	**17.37**
Volume of Shrinkage Dish:	**17.0**

Test Specimen	
Specimen No:	**1**
Mass of Shrinakge Dish, m (g):	**20.83**
Mass of Shrinkage Dish and Wet Soil, m_w (g):	**50.1**
Mass of Shrinkage Dish and Dry Soil, m_d (g):	**40.42**
Mass of Wax-Coated Soil in Air, m_{sxa} (g):	**20.09**
Mass of Wax-Coated Soil in Water, m_{sxw} (g):	**8.8**

Calculated Shrinkage Limit	
Specimen No:	**1**
Mass of Dry Soil, m_s (g):	**19.59**
Water Content of Soil when Placed in Dish, w (%):	**49.41**
Mass of Water Displaced by Wax-Coated Soil, m_{wsx} (g):	**11.29**
Volume of Dry Soil and Wax, V_{dx} (cm^3):	**11.29**
Mass of Wax, m_x (g):	**0.50**
Volume of Wax, V_x (cm^3):	**0.56**
Volume of Dry Soil, V_d (cm^3):	**10.73**
Shrinkage Limit, SL	**17.43**

Specific Gravity of Wax = 0.908 at15.5°C

Specific Gravity of Wax = 0.900 at 20°C

Density of Water (g/cm^3) = 1.000 (g/cm^3)

Project No.: 102151.001	**Tested By: KN**
Project Name:	**Checked By:**
Date Tested: May 15, 2023	**Sample No: BH23-08 SA2**
Sample Date:	**Source:**
Remarks:	**Depth: 2'6"-4'6"**

APPENDIX C

Record of Test hole Logs – Previous Investigation
Boreholes 19-1 to 19-4, Test Pits 18-1 to 18-15,
and Test Wells TW-1 to TW-4

RECORD OF BOREHOLE 19-1D

CLIENT: Novatech
PROJECT: Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Borehole Location Plan, Figure 1

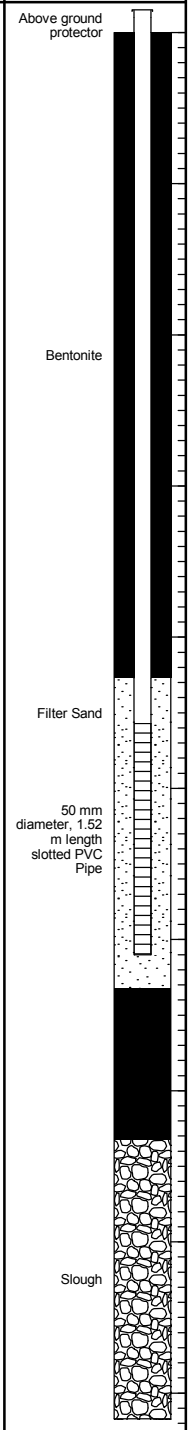
SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 9 2019

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0	Power Auger, Hollow Stem Auger (210mm OD)	Ground Surface						
		Dark brown silty sand, with organic material (TOPSOIL)		0.20				
		Brown SILTY SAND		0.31	1	SS	533	5
		Grey brown SILTY CLAY, some sand						
		Brown SILTY SAND, trace clay		0.61	2	SS	610	11
1		Grey brown SILTY CLAY		0.91				
		Brown SILTY SAND, trace clay		1.04				
		Grey brown SILTY CLAY with silty sand seems		1.22	3	SS	610	10
		Grey brown silty sand, some gravel, trace to some clay (GLACIAL TILL)		1.65				
2		Grey sandy silt / silty sand, some gravel, cobbles, and boulders (GLACIAL TILL)		1.83	4	SS	610	26
					5	SS	610	33
3					6	SS	406	89
					7	SS	200	65
4					8	SS	100	68
5					9	SS	279	59
					10	SS	483	43
6					11	SS	381	50
					12	SS	76	50
7					13	SS	51	50
8					14	SS	127	50
					15	SS	203	90
9		Auger refusal on inferred bedrock		9.17				
		End of borehole						
10								

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



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LOGGED: A.N.
CHECKED:

GEO - BOREHOLE LOG 64819.03_BOREHOLE LOGS_GNT_V01_2019-07-10.GPJ GEMTEC 2018.GDT 21/8/19

RECORD OF BOREHOLE 19-1S

CLIENT: Novatech
PROJECT: Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 9 2019

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m; DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED); WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface							10 20 30 40 50 60 70 80 90		Above ground protector
		Soil conditions not logged									Bentonite
1											
2											Filter Sand
3				3.05							50 mm diameter, 1.52 m length slotted PVC Pipe
4											
5											
6											
7											
8											
9											
10											

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LOGGED: A.N.
CHECKED:

GEO - BOREHOLE LOG 64819.03_BOREHOLE LOGS_GNT_V01_2019-07-10.GPJ GEMTEC 2018.GDT 21/8/19

RECORD OF BOREHOLE 19-3D

CLIENT: Novatech
PROJECT: Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Borehole Location Plan, Figure 1

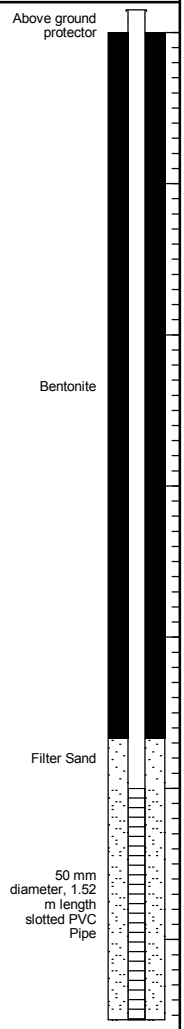
SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 10 2019

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface						
		Dark brown silty sand, with organic material (TOPSOIL)		0.13	1	SS	330	16
		Grey brown sandy silt / silty sand, some gravel cobbles boulders (GLACIAL TILL)			2	SS	178	103
1					3	SS	229	85
2					4	SS	150	110
3					5	SS	610	58
					6	SS	381	84
4					7	SS	178	66
5					8	SS	310	92
6					9	SS	53	50
		Auger refusal on inferred bedrock End of borehole		6.53				
7								
8								
9								
10								

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA
NATURAL REMOULDED
WATER CONTENT, %
W_P W W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



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CHECKED:

GEO - BOREHOLE LOG 64819.03_BOREHOLE LOGS_GNT_V01_2019-07-10.GPJ GEMTEC 2018.GDT 21/8/19

RECORD OF BOREHOLE 19-3S

CLIENT: Novatech
PROJECT: Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 10 2019

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger / Hollow Stem Auger (210mm OD)	Ground Surface							10 20 30 40 50 60 70 80 90		Above ground protector
		Soil conditions not logged									
1											Bentonite
2											
3											Filter Sand
4											50 mm diameter, 1.52 m length slotted PVC Pipe
				4.57							
5											
6											
7											
8											
9											
10											

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED:

GEO - BOREHOLE LOG 64819.03_BOREHOLE LOGS_GNT_V01_2019-07-10.GPJ GEMTEC 2018.GDT 21/8/19

RECORD OF BOREHOLE 19-4S

CLIENT: Novatech
PROJECT: Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 10 2019

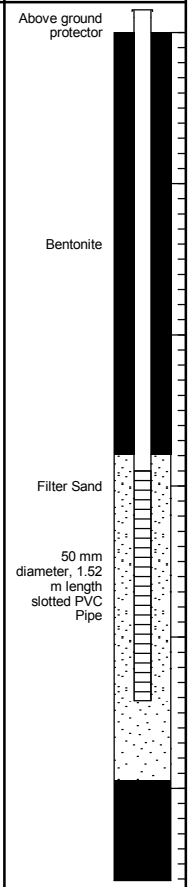
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0		Ground Surface						
	Power Auger Hollow Stem Auger (210mm OD)	Dark brown silty sand, with organic material (TOPSOIL)						
		Reddish brown SILTY SAND, trace gravel		0.20	1	SS	406	9
1		Grey brown silty sand, some gravel, cobbles and boulders (GLACIAL TILL)		0.41	2	SS	254	8
					3	SS	330	43
2					4	SS	559	77
					5	SS	610	76
3								
		Grey brown silty sand / sandy silt, some gravel cobbles and boulders (GLACIAL TILL)		3.10	6	SS	381	92
					7	SS	406	83
4								
					8	SS	356	36
5								
		Auger refusal on boulders End of borehole		5.61				
6								
7								
8								
9								
10								

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA
+ NATURAL ⊕ REMOULDED
WATER CONTENT, %
W_P W W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



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LOGGED: A.N.
CHECKED:

GEO - BOREHOLE LOG 64819.03_BOREHOLE LOGS_GNT_V01_2019-07-10.GPJ GEMTEC 2018.GDT 21/8/19

RECORD OF BOREHOLE 18-1

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface									
		Dark brown silty sand, with organic material (TOPSOIL)			1	GS					Test pit backfilled with excavated material
		Brown, fine to medium grained SAND, trace to some silt		0.23	2	GS					
1		Grey brown, fine to coarse grained SAND, trace silt, trace to some gravel, cobbles and boulders, some sandy silt pockets with depth (GLACIAL TILL)		0.91	3	GS					
2											
3					4	GS					
		End of Test Pit		3.05							No groundwater observed upon completion of test pit
4											
5											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P W W_L
10 20 30 40 50 60 70 80 90

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LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-2

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0		Ground Surface						
		Dark brown silty sand, with organic material (TOPSOIL)						
		Brown SILTY SAND, some roots		0.18	1	GS		
1		Grey brown SILTY SAND		0.61	2	GS		
	Excavator CASE CX135 sr	Grey SANDY SILT / SILTY SAND, some gravel cobbles and boulders (GLACIAL TILL)		1.14	3	GS		
2					4	GS		
3		Practical shovel refusal on possible bedrock End of Test Pit		2.90				
4								
5								

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

Test pit backfilled with excavated material

No groundwater observed upon completion of test pit

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LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-3

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m; DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m; SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED); WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface							10 20 30 40 50 60 70 80 90		
		Dark brown silty sand, with organic material (TOPSOIL)									
		Grey brown SILTY SAND		0.15	1	GS					
		Grey brown SILTY CLAY (WEATHERED CRUST)		0.41	2	GS					
1	Excavator CASE CX135 sr	Grey brown, silty sand, some gravel, cobbles and boulders (GLACIAL TILL)		0.94	3	GS					Test pit backfilled with excavated material
2		Practical shovel refusal at 1.52 m on possible bedrock at two locations within test pit End of Test Pit		2.44							No groundwater observed upon completion of test pit
3											
4											
5											

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LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-4

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, mm	SAMPLES BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface								Test pit backfilled with excavated material
		Dark brown silty sand, with organic material (TOPSOIL)								
		Grey brown SILTY CLAY (WEATHERED CRUST)		0.18	1	GS				
1		Grey brown silty sand, trace clay, some gravel, cobbles and boulders (GLACIAL TILL)		0.53	2	GS				
		Grey brown silty sand, trace clay, some gravel, cobbles and boulders, with pockets of grey SILTY CLAY on one side of test pit (GLACIAL TILL)		1.17						
2					3	GS				
3					4	GS				Groundwater seepage at 0.91 m below ground surface
		End of Test Pit		3.05						
4										
5										

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

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LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-5

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m; DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m; SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED); WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface									
		Dark brown silty sand, with organic material (TOPSOIL)									Test pit backfilled with excavated material
		Brown SILTY SAND		0.23							
1		Grey silty sand, some gravel, cobbles, and boulders (GLACIAL TILL)		0.97							
2											
3		End of Test Pit		3.05							No groundwater observed upon completion of test pit
4											
5											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P, W, W_L
10 20 30 40 50 60 70 80 90

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LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-6

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface									
		Dark brown silty sand, with organic material (TOPSOIL)									Test pit backfilled with excavated material
		Brown SILTY SAND		0.36	1	GS					
1		Grey brown SILTY CLAY (WEATHERED CRUST)		0.61	2	GS					
		Grey silty sand, some gravel, cobbles and boulders (GLACIAL TILL)		1.02	3	GS					
2											
3		Practical shovel refusal within Glacial Till End of Test Pit		2.90							No groundwater observed upon completion of test pit
4											
5											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

GEMTEC
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LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-7

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface							10 20 30 40 50 60 70 80 90		
		Dark brown silty sand, with organic material (TOPSOIL)									Test pit backfilled with excavated material
		Brown SILTY SAND		0.20							
1		Grey silty sand, some gravel, cobbles and boulders (GLACIAL TILL)		0.76							
2											
3		End of Test Pit		3.05							No groundwater observed upon completion of test pit
4											
5											

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LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-8

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface									
		Dark brown clayey silt, with organic material (TOPSOIL)									Test pit backfilled with excavated material
		Grey brown SILTY CLAY, trace sand (WEATHERED CRUST)		0.23							
1	Excavator CASE CX135 sr										
		Grey brown SILTY SAND, trace clay		1.70	1	GS					
2		Boulder encountered underlain by grey SILTY CLAY Note: Unable to determine depth of SILTY CLAY due to side wall shearing		1.98	2	GS					Groundwater seepage at 1.52 metres below ground surface
3		Test pit lost due to side wall shearing End of Test Pit		3.05							
4											
5											

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LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-9

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m; DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m; SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED); WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface									
		Dark brown silty sand, with organic material (TOPSOIL)									Test pit backfilled with excavated material
		Grey brown SILTY SAND		0.20							
1		Grey brown silty sand, some gravel, cobbles, and boulders (GLACIAL TILL)		0.48							
2											
3		Practical shovel refusal within Glacial Till End of Test Pit		3.05							No groundwater observed upon completion of test pit
4											
5											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

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LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-10

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m	SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface										
		Dark brown silty sand, with organic material (TOPSOIL)										
		Grey brown SILTY CLAY (WEATHERED CRUST)		0.15								
1		Grey brown silty sand, trace clay, some gravel, cobbles and boulders (GLACIAL TILL)		0.94								
2												
3		Practical shovel refusal within Glacial Till End of Test Pit		3.05								
4												
5												

10 20 30 40 50 60 70 80 90

Test pit backfilled with excavated material

No groundwater observed upon completion of test pit

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-11

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m	SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface										
		Dark brown clayey silt, with organic material (TOPSOIL)										Test pit backfilled with excavated material
				0.23								
1	Excavator CASE CX135 sr	Grey brown SILTY CLAY (WEATHERED CRUST)										
				1.32								
2		Grey silty sand, some gravel, cobbles and boulders (GLACIAL TILL)										
		Practical shovel refusal within Glacial Till End of Test Pit		2.29								No groundwater observed upon completion of test pit
3												
4												
5												

10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-12

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface							10 20 30 40 50 60 70 80 90		
		Dark brown silty sand, with organic material (TOPSOIL)									Test pit backfilled with excavated material
		Brown SILTY SAND		0.23							
1		Grey brown, silty sand, some gravel cobbles and boulders (GLACIAL TILL)		0.76							
2											
3		Practical shovel refusal within Glacial Till End of Test Pit		2.90							No groundwater observed upon completion of test pit
4											
5											

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-13

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface									
		Dark brown clayey silt, with organic material (TOPSOIL)									
1		Grey brown SILTY SAND, some gravel and cobbles		0.31							
		Grey brown SILTY CLAY (WEATHERED CRUST)		1.14							
		Grey brown SILTY SAND		1.27							
2	Excavator CASE CX135 sr	Grey brown SILTY CLAY (WEATHERED CRUST)		1.32							
		Grey silty sand, some gravel, cobbles and boulders (GLACIAL TILL)		2.59							
3		Practical shovel refusal within Glacial Till End of Test Pit		3.05							
4											
5											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

Test pit backfilled with excavated material

Groundwater seepage at 1.27 metres below ground surface

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-14

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Excavator CASE CX135 sr	Dark brown silty sand, with organic material (TOPSOIL)			1	GS					Test pit backfilled with excavated material
		Brown SANDY SILT		0.23	2	GS					
1		Grey brown sandy silt, trace to some gravel, cobbles and boulders (GLACIAL TILL)		0.79	3	GS					
2		Practical shovel refusal on possible bedrock End of Test Pit		1.83							No groundwater observed upon completion of test pit
3											
4											
5											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-15

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m; DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m; SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED); WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface							10 20 30 40 50 60 70 80 90		
		Dark brown clayey silt, with organic material (TOPSOIL)									Test pit backfilled with excavated material
		Grey brown SILTY CLAY, some sand (WEATHERED CRUST)		0.53							
1		Grey brown SILTY SAND		1.07							
2											
		Grey SILTY CLAY		2.57							
3											
		Grey silty clay, some gravel cobbles and boulders (GLACIAL TILL)		3.66							
4											
		Test pit lost due to side walls shearing End of Test Pit		4.27							Groundwater seepage at about 2.57 metres below ground surface
5											

GEMTEC
Consulting Engineers and Scientists

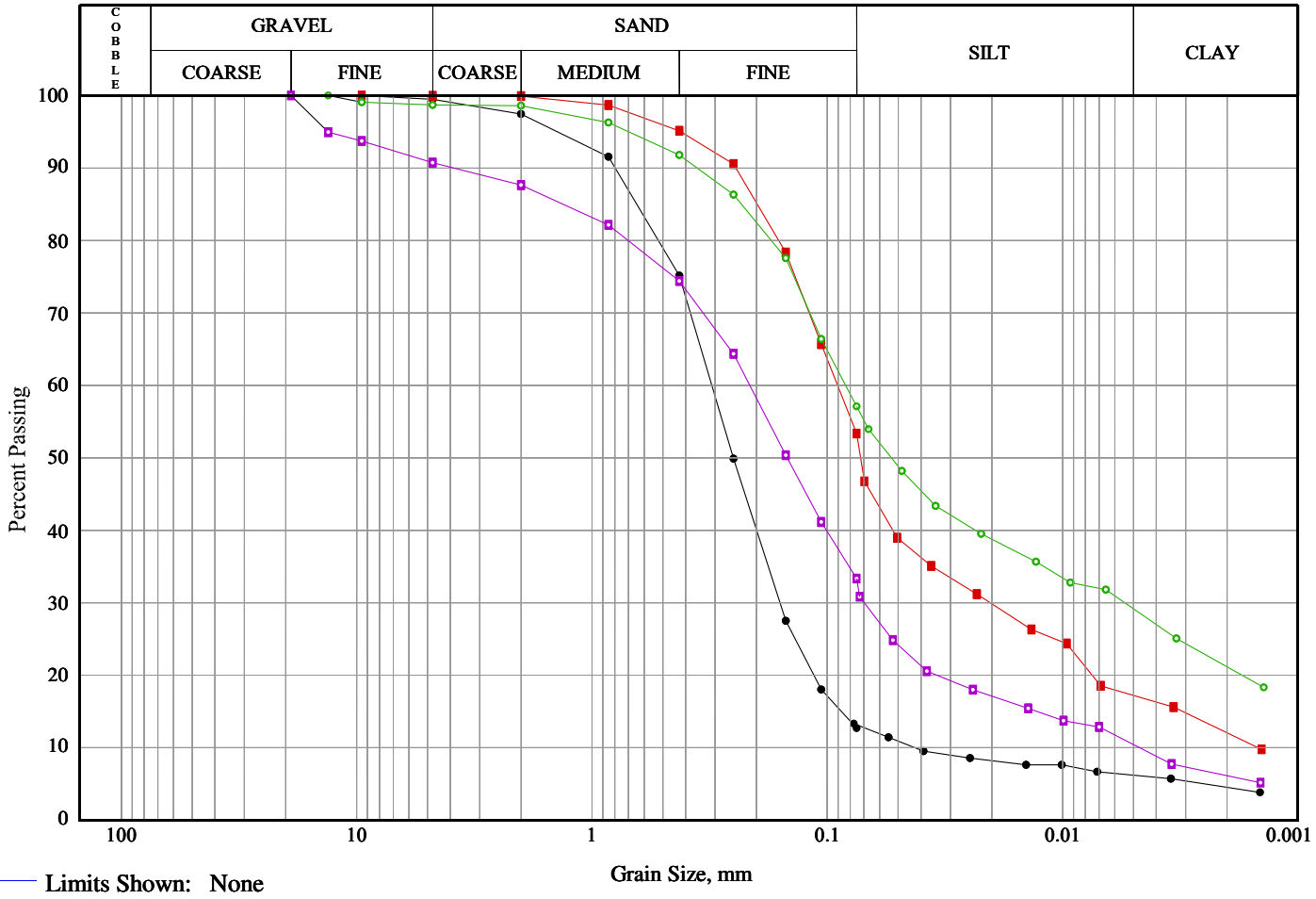
LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

GEMTEC
Consulting Engineers and Scientists

Client:	Novatech
Project:	(Client: Alan Gale Agencies Limited) Site: 3160 Carp Ro
Project #:	6481903

Soils Grading Chart



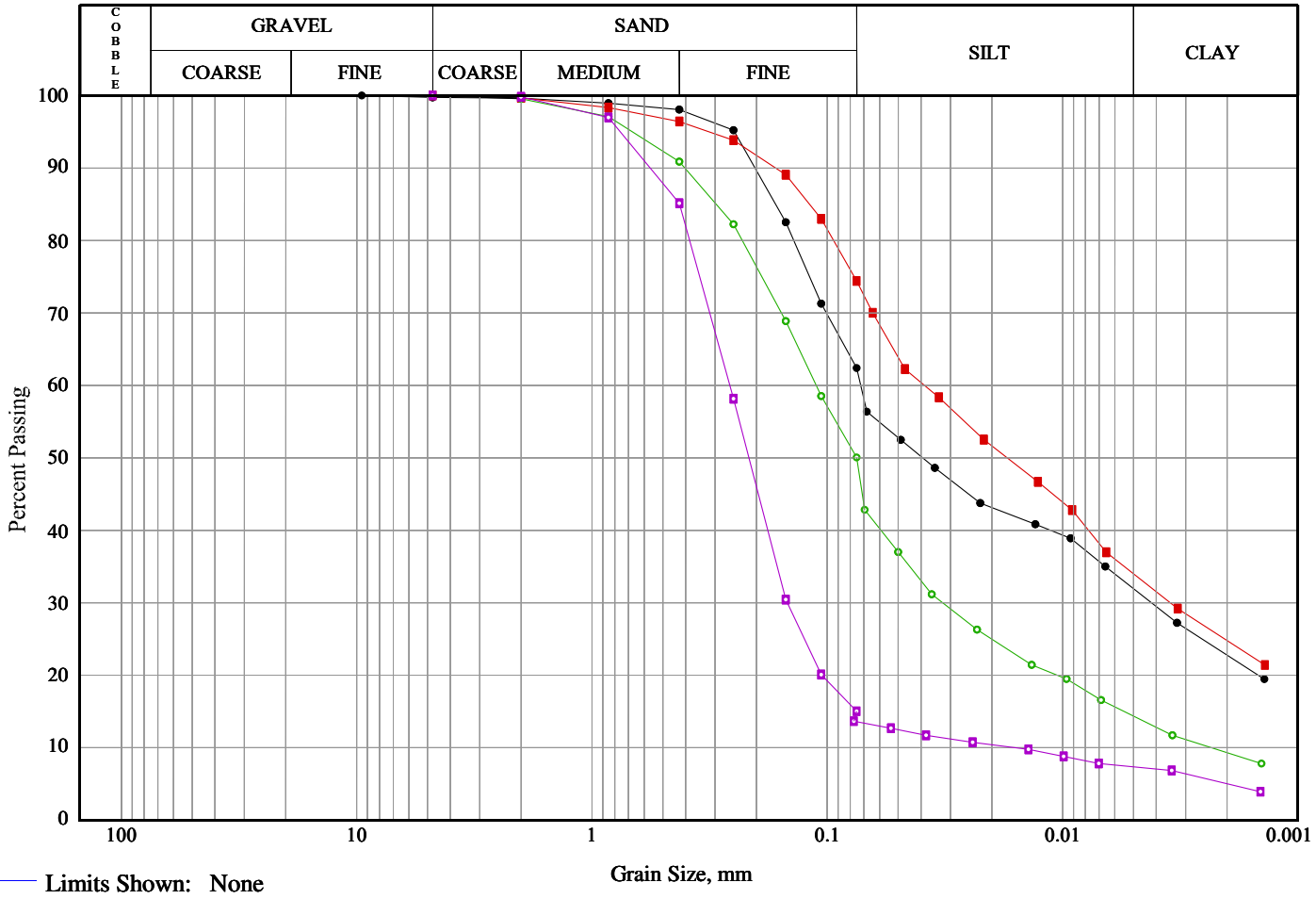
Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
		18-1	2	0.23-0.85	0.5	86.8	6.5	6.2
		18-14	2	0.23-0.79	0.1	46.6	36.1	17.2
		18-3	2	0.41-0.94	1.3	41.6	27.9	29.2
		18-4	2	0.53-1.17	9.3	57.4	22.9	10.4

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
	Sand , trace gravel, trace silt, trace clay	N/A	0.04	0.09	0.16	0.25	0.31	0.64	6.5
	Sand and silt , some clay , trace gravel	N/A	0.00	0.00	0.02	0.07	0.09	0.20	36.1
	Silty clayey sand , trace gravel	N/A	---	---	0.01	0.05	0.08	0.23	27.9
	Silty sand , some clay , trace gravel	N/A	0.00	0.01	0.07	0.15	0.21	1.33	22.9

GEMTEC
Consulting Engineers and Scientists

Client:	Novatech
Project:	(Client: Alan Gale Agencies Limited) Site: 3160 Carp Ro
Project #:	6481903

Soils Grading Chart



Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
		18-8	2	2.2-2.45	0.3	37.4	30.4	31.9
		GP 18-10S	1	0.4-0.55	0.0	25.6	40.4	34.0
		GP 18-14S	1	0.3-0.45	0.0	50.0	35.7	14.3
		GP 18-1S	1	0.3-0.45	0.0	85.0	7.7	7.3

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
	Silty clayey sand , trace gravel	N/A	---	---	0.00	0.04	0.07	0.17	30.4
	Sandy clayey silt	N/A	---	---	0.00	0.02	0.04	0.12	40.4
	Sand and silt , some clay	N/A	0.00	0.01	0.03	0.07	0.11	0.30	35.7
	Sand , trace silt, trace clay	N/A	0.02	0.08	0.15	0.22	0.26	0.42	7.7

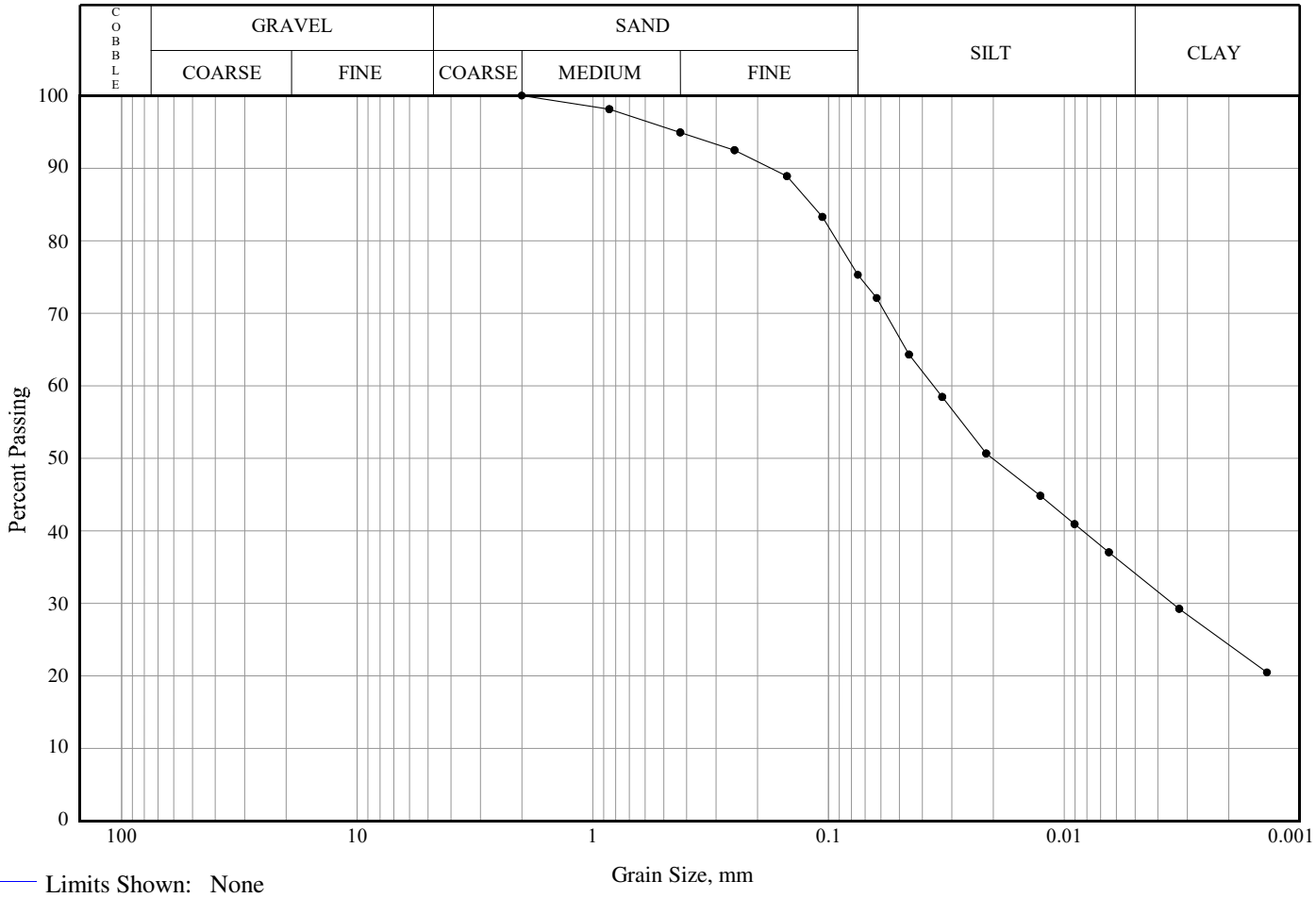
GEMTEC
Consulting Engineers and Scientists

Client: Novatech

Project: (Client: Alan Gale Agencies Limited) Site: 3160 Carp Ro

Project #: 6481903

Soils Grading Chart



Limits Shown: None

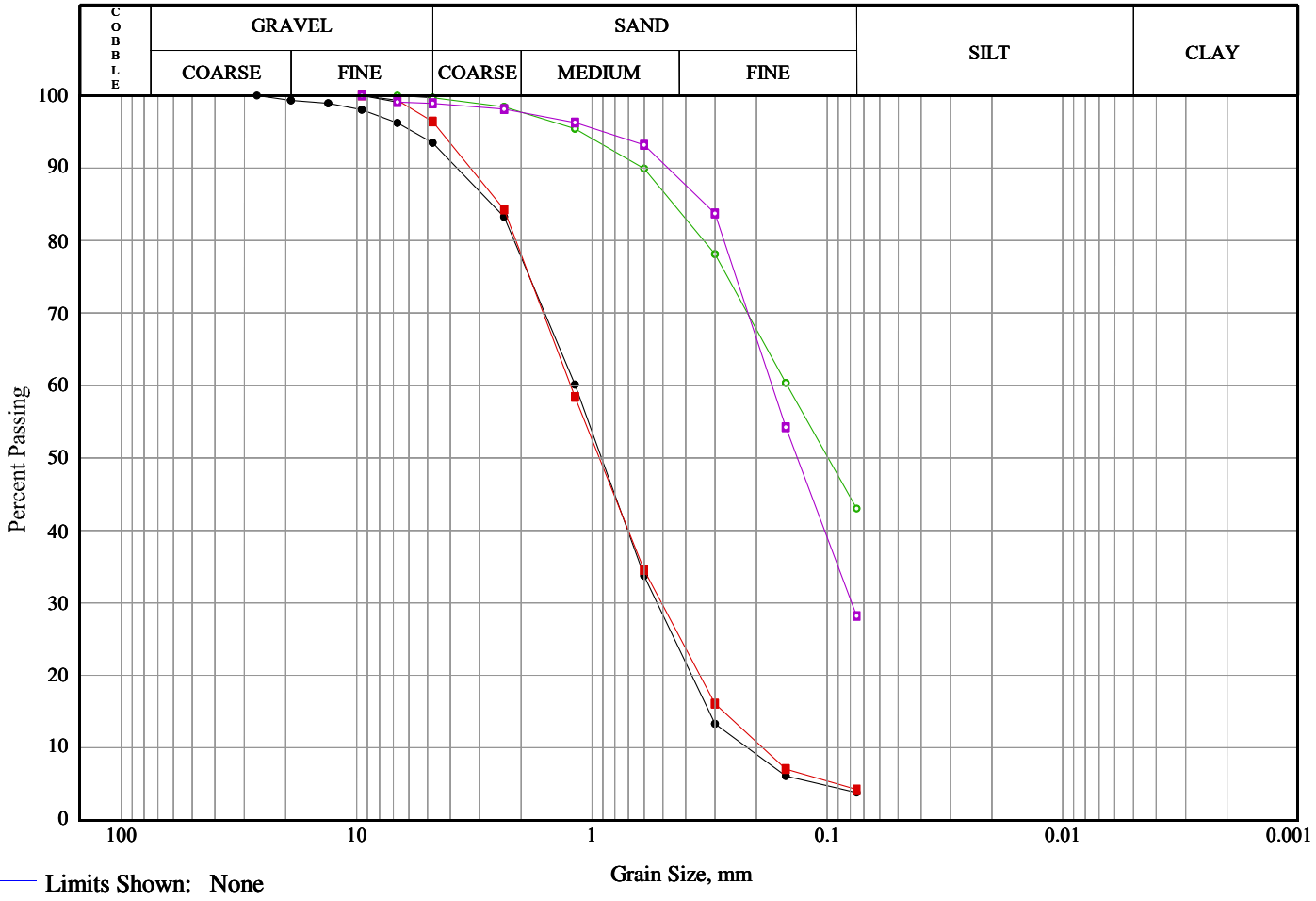
Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
—●—		GP 18-3S	1	0.5-0.6	0.0	24.7	41.2	34.1

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
—●—	Sandy clayey silt	N/A	---	---	0.00	0.02	0.04	0.12	41.2

GEMTEC
Consulting Engineers and Scientists

Client:	Novatech
Project:	(Client: Alan Gale Agencies Limited) Site: 3160 Carp Ro
Project #:	6481903

Soils Grading Chart



Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
		18-1	3	0.91-1.25	6.5	89.7	3.8	
		GP 18-1D	1	1.0-1.15	3.6	92.2	4.2	
		GP 18-5S	1	0.25-0.40	0.3	56.7	43.0	
		GP 18-9S	1	0.25-0.40	1.1	70.7	28.2	

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
	Sand , trace gravel, trace silt	SP	0.22	0.32	0.53	0.91	1.18	2.66	---
	Sand , trace gravel, trace silt	SW	0.19	0.28	0.51	0.93	1.23	2.46	---
	Sand and silt , trace gravel	N/A	---	---	---	0.10	0.15	0.45	---
	Silty sand , trace gravel	N/A	---	---	0.08	0.13	0.17	0.33	---

CERTIFICATE OF WELL COMPLIANCE

I (Jeremy Hanna) AIR ROCK DRILLING CO. LTD. - DO HEREBY CERTIFY

that I am licensed to drill water wells in the Province of Ontario, and that I have

supervised the drilling of the water well on the property of :

OWNER: ALAN GALE AGENCIES LIMITED

Location: #3160 CARP ROAD, CARP

LOT: Part 11 & 12 **CON:** 2 **PLAN #** RP-5R-7272 **S/L #** Parts 1 & 3

Ottawa-Carleton / Geographical Township of West Carleton

I CERTIFY FURTHER that, I am aware of the well drilling requirements, the guidelines, recommendations and regulations of the Ministry of the Environment governing well installations in the Province of Ontario, and the standards specified in any subdivision agreement and hydrogeological report applicable to this site and City Standards.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased, grouted (cement or bentonite) as applicable and constructed in strict conformity with the standards required.

Signed this 18TH Day of JUNE, 2019

Jeremy Hanna (T3632) Air Rock Drilling Co. Ltd. (C-7681)

The Engineer on behalf of the Landowner set out above, Certifies that he/she has inspected the well and it was constructed in accordance with the specifications in O.Reg 903, ~~and~~ this report ~~and the Hydrogeological Report~~ with regards to casing length and grouting requirements.

Signed this 29 day of July 2019

A. C. HOULE
July 29/19

A. C. Houle, P. Eng.
Gemtec

(Engineer)

2019342
TW# 1 of 4
A260857

Shaping our future together
Ensemble, formons notre avenir

City of Ottawa
Client Service Centre

Ville d'Ottawa
Centre de service

Ontario — Ministry of the Environment and Climate Change

Tag#:A260857 (Print Below)
A260857

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Alan Gale Agencies Limited		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1870 Sixth Line Road RR1	Dunrobin	ON	K0A 1T0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
3160 Carp Road	West Carleton	P/L 11 & 12	2

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa Carleton	Carp	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	421243	5019125	RP-5R-7272	Parts 1 & 3

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Clay			0'	8'
	Gravel		(Packed)	8'	26'
Grey	Limestone			26'	137'
Grey	Sandstone	w/ Grey	Limestone Mix	137'	190'
Grey	Sandstone	w/ Grey	Limestone Mix	190'	200'
	TEST WELL # 1 OF 4				

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
42'	32'	Neat cement	10.9
32'	0'	Bentonite slurry	12.6

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify HYDROFRACKED

Well Use

☐ Public ☐ Commercial ☐ Not used
☒ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	42'
5 15/16"	Open Hole		42'	200'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify
190		

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	42'	9 3/4"
42'	200'	5 15/16"

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify **Not tested**

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 190'

Pumping rate (l/min / GPM): 3

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 21.2'

If flowing give rate (l/min / GPM): X

Recommended pump depth (m/ft): 190'

Recommended pump rate (l/min / GPM): 3+

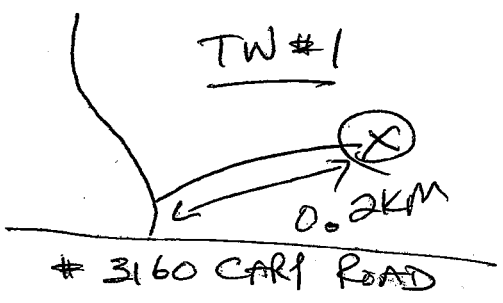
Well production (l/min / GPM): 3+

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	13.8'		21.2'
1	16	1	17
2	17.1	2	15.8
3	18	3	15.4
4	18.6	4	15.1
5	19.2	5	14.8
10	20.5	10	14.2
15	20.9	15	14
20	21	20	13.9
25	21.1	25	13.9
30	21.1	30	13.8
40	21.1	40	13.8
50	21.2	50	13.8
60	21.2'	60	13.8'

Map of Well Location

Please provide a map below following instructions on the back.



Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality
6650 Franktown Road	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
13632		2019 07 31

Comments: 1/2HP-5GPM Set @ 190 ft

Well owner's information package delivered	Date Package Delivered (Y Y Y Y M M D D)	Ministry Use Only
☒ Yes ☐ No	2019 06 19	Audit No. Z302284
	Date Work Completed (Y Y Y Y M M D D)	Received
	2019 06 19	

0506E (2014/11)

Ministry's Copy

CERTIFICATE OF WELL COMPLIANCE

Ottawa

I (Jeremy Hanna) AIR ROCK DRILLING CO. LTD. - DO HEREBY CERTIFY

that I am licensed to drill water wells in the Province of Ontario, and that I have

supervised the drilling of the water well on the property of :

OWNER: ALAN GALE AGENCIES LIMITED

Location: #3160 CARP ROAD, CARP

LOT: Part 11 & 12 **CON:** 2 **PLAN #** RP-5R-7272 **S/L #** Parts 1 & 3

Ottawa-Carleton / Geographical Township of West Carleton

I CERTIFY FURTHER that, I am aware of the well drilling requirements, the guidelines, recommendations and regulations of the Ministry of the Environment governing well installations in the Province of Ontario, and the standards specified in any subdivision agreement and hydrogeological report applicable to this site and City Standards.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased, grouted (cement or bentonite) as applicable and constructed in strict conformity with the standards required.

Signed this 17TH Day of JUNE, 2019

Jeremy Hanna (T3632) Air Rock Drilling Co. Ltd. (C-7681)

The Engineer on behalf of the Landowner set out above, Certifies that he/she has inspected the well and it was constructed in accordance with the specifications in O.Reg 903, this report and the Hydrogeological Report with regards to casing length and grouting requirements.

Signed this 29 day of July 2019

LICENSED PROFESSIONAL ENGINEER A. C. HOULE PROVINCE OF ONTARIO July 29/19

A.C. Houle, P.Eng.
Gemtec

(Engineer)

2019343
TW# 2 OF 4
A260858

Ontario — Ministry of the Environment and Climate Change

Tag#: A260858 (Print Below)

A260858

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Alan Gale Agencies Limited		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1870 Sixth Line Road RR1	Dunrobin	ON	K0A 1T0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
3160 Carp Road	West Carleton	PtL 11 & 12	2

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa Carleton	Carp	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	421451	5019245	RP-5R-7272	Parts 1 & 3

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Clay			0'	7'
	Gravel		(Packed)	7'	25'
Grey	Limestone			25'	53'
Grey	Limestone			53'	170'
Grey	Limestone			170'	175'
Grey	Sandstone	w/ Grey	Limestone	175'	200'
	TEST WELL # 2 OF 4				

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³)
40'	30'	Neat cement	10.9
30'	0'	Bentonite slurry	12.6

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☒ Air percussion ☐ Other, specify HYDROFRACED

Well Use

☐ Public ☐ Commercial ☒ Not used ☒ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	40'
5 15/16"	Open Hole		40'	200'

Status of Well

☒ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Water Details

Water found at Depth	Kind of Water	Hole Diameter Depth (m/ft) From	To	Diameter (cm/in)
53 (m/ft) ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify			
170 (m/ft) ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify	0'	40'	9 3/4"
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	40'	200'	5 15/16"

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify Not tested

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 190'

Pumping rate (l/min / GPM): 5

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 26.4'

If flowing give rate (l/min / GPM): X

Recommended pump depth (m/ft): 190'

Recommended pump rate (l/min / GPM): 5

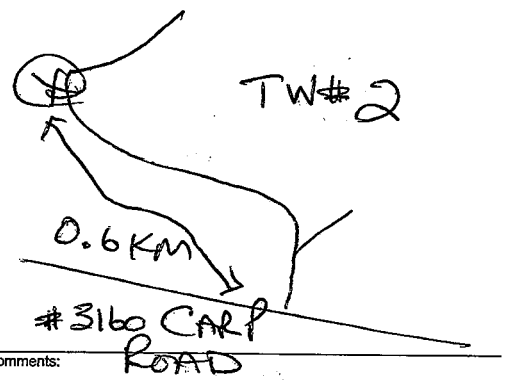
Well production (l/min / GPM): 5

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	4'6"		26.4'
1	8.3	1	19
2	10.9	2	16.5
3	12.5	3	14.7
4	14	4	13
5	15.3	5	11.7
10	19.6	10	7.6
15	21.9	15	6
20	23.3	20	4.8
25	24.2	25	4.6
30	24.8	30	4.6
40	25.5	40	4.6
50	26	50	4.6
60	26.4'	60	4'6"

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 4/2HF-5GPM Set @ 190' Ft

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
6859 Franktown Road	Richmond	ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
6138382170	Hanna, Jeremy	T3632		2019 07 31

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2019 07 14	2019 06 19

Ministry Use Only

Audit No. Z302285

Received

0506E (2014/11)

Ministry's Copy

CERTIFICATE OF WELL COMPLIANCE

Ottawa

I (Jeremy Hanna) AIR ROCK DRILLING CO. LTD. - DO HEREBY CERTIFY

that I am licensed to drill water wells in the Province of Ontario, and that I have

supervised the drilling of the water well on the property of :

OWNER: ALAN GALE AGENCIES LIMITED

Location: #3160 CARP ROAD. Carp

Part 11
LOT: 12 **CON:** 2 **PLAN #** RP-5R-7272 **S/L #** Parts 1+3

Ottawa-Carleton / Geographical Township of West Carleton

I CERTIFY FURTHER that, I am aware of the well drilling requirements, the guidelines, recommendations and regulations of the Ministry of the Environment governing well installations in the Province of Ontario, and the standards specified in any subdivision agreement and hydrogeological report applicable to this site and City Standards.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased, grouted (cement or bentonite) as applicable and constructed in strict conformity with the standards required.

Signed this 7TH Day of MARCH, 2019

Jeremy Hanna (T3632) Air Rock Drilling Co. Ltd. (# 1119)

The Engineer on behalf of the Landowner set out above, Certifies that he/she has inspected the well and it was constructed in accordance with the specifications in O.Reg 903, this report and the Hydrogeological Report with regards to casing length and grouting requirements.

Signed this 13 day of May, 2019

LICENSED PROFESSIONAL ENGINEER
May 13/19
A. C. HOULE
A.C. Houle
PROVINCE OF ONTARIO

Test Well # 3/4
209070
A260960

A.C. Houle, P.Eng.
Gemtec

(Engineer)

Shaping our future together
Ensemble, formons notre avenir

City of Ottawa
Client Service Centre
8243 Victoria Street

Ville d'Ottawa
Centre de service
8243 rue Victoria

2001
International Year of Volunteers

Ontario — Ministry of the Environment and Climate Change

Tag#:A260960 (or Print Below)

A260960

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Alan Gale Agencies Limited		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1870 Sixth Line Road.RR1	Dunrobin	ON	K0A 1T0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
3160 Carp Road	West Carleton	P/L 11+12	2

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa-Carleton	Carp	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	421648	5019008	RP-5R-7272	Parts 1 & 3

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Sand	& Gravel	& Boulders	0'	23'
Grey	Limestone			23'	185'
Grey	Limestone			185'	200'

TEST WELL # 3 OF 4

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/gal)
38'	28'	Neat cement	9.36
28'	0'	Bentonite slurry	8.4

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Public ☐ Commercial ☐ Not used
☐ Rotary (Conventional) ☐ Jetting ☒ Domestic ☐ Municipal ☐ Dewatering
☐ Rotary (Reverse) ☐ Driving ☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Boring ☐ Digging ☐ Irrigation ☐ Cooling & Air Conditioning
☒ Air percussion HYDRORACKED ☐ Industrial
☐ Other, specify ☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	38'
6 1/8"	Open Hole		38'	200'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth From (m/ft)	Depth To (m/ft)	Diameter (cm/in)
185 (m/ft) ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify	0'	38'	9 3/4"
(m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify	38'	200'	6 1/8"
(m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify			

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify **Not tested**

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 190

Pumping rate (l/min / GPM): 5

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 29.8"

If flowing give rate (l/min / GPM): X

Recommended pump depth (m/ft): 190'

Recommended pump rate (l/min / GPM): 5

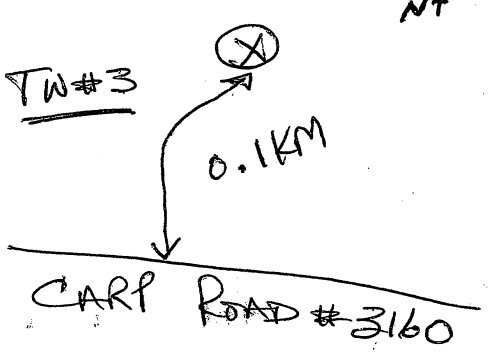
Well production (l/min / GPM): 5

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	91.5"		29.8"
1	16.5	1	23.6
2	18	2	21.4
3	19.1	3	20.4
4	20.1	4	19.4
5	20.9	5	18.7
10	23.8	10	16.5
15	25.4	15	15.3
20	26.5	20	14.5
25	27.3	25	14
30	27.9	30	13.7
40	28.7	40	13.1
50	29.3	50	12.5
60	29.8"	60	12'

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 1/2 HP - 7 GPM SET @ 190 FEET

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	1119

Business Address (Street Number/Name)	Municipality
6659 Franktown Road, RR#1	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	Purcell, Shannon

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted Y Y Y Y M M D D
[redacted] T4033		2019 04 30

Well owner's information package delivered	Date Package Delivered Y Y Y Y M M D D	Ministry Use Only
☒ Yes ☐ No	2019 03 20	Audit No. Z302436
	Date Work Completed 2019 03 07	Received

0506E (2014/11) Ministry's Copy

CERTIFICATE OF WELL COMPLIANCE

Ottawa

I (Jeremy Hanna) AIR ROCK DRILLING CO. LTD. - DO HEREBY CERTIFY

that I am licensed to drill water wells in the Province of Ontario, and that I have

supervised the drilling of the water well on the property of :

OWNER: ALAN GALE AGENCIES LIMITED

Location: #3160 CARP ROAD, Carp

Part 11
LOT: 12 **CON:** 2 **PLAN #** RP-5R-7272 **S/L #** Parts 1+3

Ottawa-Carleton / Geographical Township of West Carleton

I CERTIFY FURTHER that, I am aware of the well drilling requirements, the guidelines, recommendations and regulations of the Ministry of the Environment governing well installations in the Province of Ontario, and the standards specified in any subdivision agreement and hydrogeological report applicable to this site and City Standards.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased, grouted (cement or bentonite) as applicable and constructed in strict conformity with the standards required.

Signed this 6TH Day of MARCH, 2019

Jeremy Hanna (T3632) Air Rock Drilling Co. Ltd. (# 1119)

The Engineer on behalf of the Landowner set out above, Certifies that he/she has inspected the well and it was constructed in accordance with the specifications in O.Reg 903, this report and the Hydrogeological Report with regards to casing length and grouting requirements.

Signed this 13 day of May, 2019

PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO — May 13/19 — A. C. HOULE' — A.C. Houle

Test well # 4/4
209069
A260961

A.C. Houle, P.Eng.
Gemtec

(Engineer)

Shaping our future together
Ensemble, formons notre avenir

City of Ottawa
Client Service Centre
8763 Victoria Street

Ville d'Ottawa
Centre de service
8763, rue Victoria

2001 International Year of Volunteers Année internationale

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☒ Imperial

Tag#:A260961 (Print Below)

A260961

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Alan Gale Agencies Limited		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1870 Sixth Line Road RR1	Dunrobin	ON	K0A 1T0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
3160 Carp Road	West Carleton	P/L 11 & 12	2

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa-Carleton	Carp	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	421446	5018944	RP-5R-7272	Parts 1 & 3

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
	Sand	& Stones		0'	15'
	Sand	& Gravel		15'	27'
Grey	Limestone			27'	187'
Grey	Sandstone	w/ Grey Limestone	Mix	187'	200'

TEST WELL #4 OF #4

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
42'	32'	Neat cement	10.92 [redacted]
32'	0'	Bentonite slurry	16.8

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify HYDROFRACKED

Well Use

☐ Public ☐ Commercial ☐ Not used
☒ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6 1/4"	Steel	.188"	+2'	42'
6 1/8"	Open Hole		42'	200'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
193	☐	☐ Fresh ☒ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	42'	9 3/4"
42'	200'	6 1/8"

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify Not tested

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 190

Pumping rate (l/min / GPM): 3

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 63.2'

If flowing give rate (l/min / GPM): X

Recommended pump depth (m/ft): 190'

Recommended pump rate (l/min / GPM): 3

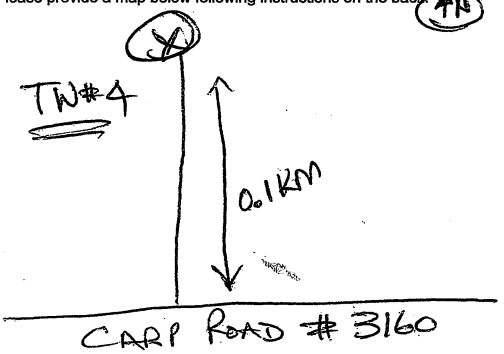
Well production (l/min / GPM): 3

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	13'5"		63.2'
1	20.3	1	52.3
2	23	2	50.6
3	25.2	3	48.4
4	27.1	4	46.3
5	28.5	5	44.4
10	36.6	10	35.7
15	42.7	15	30.6
20	40.4	20	25.1
25	49.8	25	21.3
30	54.5	30	17.5
40	57.8	40	13.5
50	60.7	50	13.5
60	63.2"	60	13.5"

Map of Well Location

Please provide a map below following instructions on the back. #4



Comments:

1/2 HP - 5 GPM SET @ 190 FEET

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	1119

Business Address (Street Number/Name)	Municipality
6659 Franktown Road, RR#1	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	Purcell, Shannon

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
[redacted] T4033		2019 04 30

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2019 05 08	2019 03 06

Ministry Use Only

Audit No. Z302437

Received

0506E (2014/11) — Ministry's Copy

APPENDIX D

Groundwater Level Measurements

Borehole ID	Ground Surface Elevation (metres)	Groundwater Depth (metres below ground surface)	Groundwater Level Elevation (metres)	Date
BH 23-07	112.8	2.8	110.0	Apr 23, 2023
TW 19-1	115.8	4.3	111.5	Aug 6, 2019
		4.3	111.6	Aug 7, 2019
		4.2	111.6	Aug 8, 2019
		4.4	111.4	Aug 22, 2019
		4.4	111.5	Jan 10, 2020
		3.1	112.7	Apr 27, 2023
TW 19-2	112.8	1.5	111.3	Aug 6, 2019
		1.5	111.3	Aug 7, 2019
		1.5	111.4	Aug 8, 2019
		1.6	111.3	Aug 12, 2019
		1.7	111.2	Aug 22, 2019
		1.6	111.3	Jan 10, 2020
TW 19-3	115.3	3.9	111.3	Aug 6, 2019
		3.8	111.4	Aug 7, 2019
		3.9	111.4	Aug 8, 2019
		4.1	111.2	Aug 22, 2019
		3.9	111.4	Jan 10, 2020
		3.0	112.3	Apr 27, 2023
TW 19-4	117.3	5.3	112.01	Aug 6, 2019
		5.3	112.0	Aug 7, 2019
		5.2	112.1	Aug 8, 2019
		5.5	111.8	Aug 22, 2019
		5.4	111.9	Jan 10, 2020
		3.9	113.4	Apr 27, 2023
BH 19-1D	115.8	4.7	111.2	Aug 7, 2019
		4.6	111.2	Aug 8, 2019
		4.8	111.0	Aug 22, 2019
		4.6	111.2	Jan 10, 2020
		3.6	112.3	Apr 27, 2023

Borehole ID	Ground Surface Elevation (metres)	Groundwater Depth (metres below ground surface)	Groundwater Level Elevation (metres)	Date
BH 19-1S	115.8	Dry	Dry	Aug 6, 2019
		Dry	Dry	Aug 7, 2019
		Dry	Dry	Aug 8, 2019
		Dry	Dry	Aug 12, 2019
		Dry	Dry	Aug 22, 2019
		Dry	Dry	Jan 10, 2020
		2.4	113.4	Apr 27, 2023
BH 19-3D	115.2	4.0	111.2	Aug 7, 2019
		4.0	111.2	Aug 8, 2019
		4.2	111.1	Aug 22, 2019
		4.0	111.3	Jan 10, 2020
		2.9	112.3	Apr 27, 2023
BH 19-3S	115.3	4.1	111.2	Aug 7, 2019
		4.1	111.2	Aug 8, 2019
		4.3	111.1	Aug 22, 2019
		4.1	111.3	Jan 10, 2020
		3.0	112.3	Apr 27, 2023
BH 19-4S	117.1	Dry	Dry	Aug 7, 2019
		Dry	Dry	Aug 8, 2019
		Dry	Dry	Aug 12, 2019
		Dry	Dry	Aug 22, 2019
		Dry	Dry	Jan 10, 2020
		Dry	Dry	Apr 27, 2023

APPENDIX E

Chemical Analysis of Soil Samples
Samples Relating to Corrosion
(Paracel Laboratories Ltd. Order No. 2319294)

Certificate of Analysis

Report Date: 16-May-2023

Client: GEMTEC Consulting Engineers and Scientists Limited

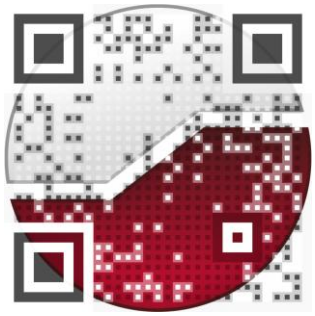
Order Date: 10-May-2023

Client PO:

Project Description: 102151.001

	Client ID:	BH23-07 SA5 10'0"-10'6"	-	-	-
	Sample Date:	20-Apr-23 14:00	-	-	-
	Sample ID:	2319294-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	83.6	-	-	-
General Inorganics					
Conductivity	5 uS/cm	179	-	-	-
pH	0.05 pH Units	7.74	-	-	-
Resistivity	0.1 Ohm.m	74.0	-	-	-
Anions					
Chloride	10 ug/g dry	<10	-	-	-
Sulphate	10 ug/g dry	68	-	-	-

experience • knowledge • integrity



civil	civil
geotechnical	géotechnique
environmental	environnement
structural	structures
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité