



Foundation Investigation Report

*Highway 11 – 2+1 Roadway Model Project: **Site SW2***

Assignment No. 5021-E-0038
GWP 5151-21-00
Geocres No. 31L12-004
(Latitude: 46.575311; Longitude: -79.629389)

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PART I – FOUNDATION INVESTIGATION REPORT

1 FACTUAL INFORMATION

1.1 Introduction

This report presents the results of the geotechnical investigation completed by EXP Services Inc. (EXP) for the proposed widening of Highway 11 and the corresponding embankment/roadway construction at the site SW2. The site is located approximately 32 km north of the intersection of McKeown Avenue and Highway 11 from approximately Station 15+960 to 16+060 in the Township of Notman in the District of Nipissing, Ontario (Latitude: 46.575311; Longitude: -79.629389). The work was undertaken under Agreement No. 5021-E-0038, and the terms of reference (TOR) provided by AECOM. The AutoCAD drawings for Highway 11 at the site were also provided by AECOM.

The purpose of the investigation was to assess the subsurface conditions along the proposed Highway 11 widening and, using this information, develop a borehole location plan, subsurface cross-section profiles, borehole records, laboratory test results, and a detailed description of soil and groundwater conditions. These results support the detailed design and construction recommendations for the new embankment and roadway associated with the highway widening. Preliminary observations on the existing embankment drainage conditions have also been included. The site-specific geotechnical investigation consisted of field activities such as visual inspections, drilling, soil sampling, and laboratory testing.

This foundation investigation report has been prepared specifically and solely for the project described herein. It contains the factual results of the investigation and the laboratory testing completed for this project.

1.2 Site Description and Geological Setting

1.2.1 Site Description

The site is located approximately 32 km north of the intersection of McKeown Avenue and Highway 11 from approximately Station 15+960 to 16+060 in the Township of Notman in the District of Nipissing, Ontario. Within the project limits, Highway 11 runs predominantly in a north-south orientation with a posted speed limit of 90 km/h. The existing roadway platform varies from approximately 9.8 m to 10.7 m in width, with a 2.5 m paved shoulder on the east (northbound) side and a 1.3 m to 1.8 m paved shoulder on the west (southbound) side, resulting in a total roadway width of up to 15 m.

The highway profile is sloped, with the pavement centerline elevation ranging from approximately Elev. 298.4 m to Elev. 303.7 m, based on AECOM's AutoCAD drawings. Based on the existing surrounding ground level measured in off-road boreholes and drawings from AECOM, the height of embankment ranges from 9 m to 10 m on the west side and 7.5 m to 13.5 m on east side. The slope of the existing embankment is estimated to range from 1.5H:1V to 1.25H:1V based on EXP survey and field observations.

Select photographs of the site are presented in Appendix A. The site plan and cross-section profiles along the existing highway alignment are shown on the drawings attached in Appendix B.

The general site conditions were assessed during a site visit September 13, 2023 as well as during the field investigation works between November 8, 2023, and April 4, 2024 for boreholes BH2-2 to BH2-7. Probeholes (PH2-1 to PH2-8), which replaced BH2-1, were subsequently advanced on July 31, 2025.

Both sides of the embankment were observed to be mostly comprised of rockfill. Marshland was observed on both sides of the embankment with vegetation consisting primarily of large conifers and wild bushes. In general, the highway is founded on top of a built-up embankment while the natural terrain in the surrounding area slopes down towards the north. The water accumulation of an existing creek was observed on the east side of the embankment where the water level was measured to be at about Elev. 288.9 m. No signs of sinkholes/instabilities were observed on the SW2 section of highway.

Photographs 1 to 6 in Appendix A shows the site and activities during drilling photographed between November 2023 and April 2024 by EXP. Photograph 1 shows the surrounding area of the east side of the highway embankment, including the existing rockfill and vegetation. Photograph 2 shows the field investigation being carried out on the south bound lane at borehole BH2-5. Photograph 3 shows the field investigation being carried out at borehole BH2-6 in a swamp location using a tripod setup. Photograph 4 shows a surface spoon during sampling and highlights the condition of the swamped area at borehole BH2-7. Photograph 5 shows the accumulated water on the east side of the embankment. Photograph 6 shows the hand-held Honda GX35 Portable Soil Sampler used for advancing probeholes on the east side of the embankment.

1.2.2 Geological Setting

According to the Ministry of Northern Development and Mines, Map 2555 (Quaternary Geology of Ontario, East-Central Sheet, 1991) the surface conditions in the vicinity of the project area are expected to consist of Precambrian bedrock: undifferentiated igneous and metamorphic rock, exposed at surface or covered by a discontinuous, thin layer of drift. According to Map 2543 (Bedrock Geology of Ontario, East-Central Sheet, 1991), the bedrock geology of the site is of migmatic rocks and gneisses of undetermined protolith: commonly layered biotite gneisses and migmatites; locally includes quartz of feldspathic gneisses, orthogneisses, paragneisses.

1.3 Previous Investigations

There are no available previous geotechnical reports at the location of the site in the MTO GEOCRETS library; the nearest available reports on Highway 11 are approximately 11.4 km southeast and 9.3 km northwest, respectively, from the site:

- *Geocres No. 31L-209: "Foundation Investigation and Design Report, Temporary Protection System for Culvert STA 11+622, Highway 11, Blythe Township, North Bay, Ontario, GWP 5186-14-00", Prepared by Golder Associates Ltd., dated February 26, 2018.*
- *Geocres No. 31L-080: "Final Report on Detailed Foundation Investigation and Design, Tomiko River Bridge, Highway 11, North Bay, GWP 711-92-00 (WP 344-00-01), Site Number 43-10", Prepared by Golder Associates Ltd., dated December, 2001.*

1.4 Investigation Procedures

1.4.1 Site Investigation and Field Testing

A site reconnaissance was conducted by an EXP representative on September 13, 2023 to evaluate the general site conditions for the proposed borehole locations. Initially, the proposed field program consisted of drilling seven (7) sampled boreholes; three (3) boreholes on the road (BH2-2, BH2-3 and BH2-5), one (1) borehole on the east side of the embankment (BH2-1) and three (3) boreholes on the west side of the embankment (BH2-4, BH2-6 and BH2-7).

The boreholes were strategically located along the highway and slightly beyond the footprint of the proposed expansion to provide subsurface information for the widening of the highway.

The site investigation for the three (3) roadway borehole (BH2-2, BH2-3 and BH2-5) was carried out between November 8, 2023 and November 20, 2023. The investigation of the three (3) off-road boreholes at the west side (BH2-4, BH2-6 and BH2-7) was completed between March 25, 2024 and April 8, 2024, while the investigation at the east side was conducted on July 31, 2025.

Roadway boreholes BH2-3 and BH2-5 were advanced on the west side (southbound lane) of the highway, while BH2-2 was advanced on the east side (northbound lane). Off-road boreholes BH2-4, BH2-6, and BH2-7 were drilled beyond the toe of the existing embankment on the west side of the highway. Due to access constraints, including a high, steep embankment and soft ground conditions, boreholes BH2-4 and BH2-6 were positioned slightly north of the SW2 north boundary. These boreholes were advanced either using a standard track-mounted drill rig or a mobile tripod system.

Access for a standard track-mounted drill rig or mobile tripod system was not feasible on the east side of the embankment because of its steep elevation and the presence of dense, mature trees and an open water body at its base. As a result, a hand-held Honda GX35 portable soil sampler was used to determine the depth to refusal and to collect samples from the loose to soft overburden soils. Probeholes (PH2-1 to PH2-8), replacing the originally planned BH2-1, were advanced at eight (8) locations along the east embankment toe. These probeholes were situated at the bottom of the steep embankment and extended northward from an area of accumulated water toward the SW2 north boundary.

The locations of all boreholes/probeholes advanced during this investigation are shown on Drawing 1 in Appendix B. Roadway boreholes BH2-2, BH2-3 and BH2-5 were advanced to depths of between 18.1 m and 22.9 m below ground surface. Off-road boreholes BH2-4, BH2-6 and BH2-7 were advanced to depths between 6.5 m to 10.1 m below ground surface. Probeholes on the east side were advanced to depths of 0.15 m to 0.60 m before refusal was encountered using the hand-held soil sampler.

Roadway boreholes drilled during this fieldwork was advanced using a truck mounted CME 75 drill rig, operated by a specialist drilling contractor, Marathon Drilling Ltd, while the off-road boreholes drilled during the site investigation were advanced using a Hilti DD250 alongside a mobile tripod setup, also operated by specialist drilling contractor, Marathon Drilling Ltd. All drill rigs were equipped with hollow stem augers, NW casing/NQ coring or HW casing/HQ coring, and standard soil sampling equipment. The hand-held Honda GX35 portable soil sampler was operated by EXP personnel. Traffic control was provided by Demora Construction Services Inc.

The borehole locations (referenced to the MTM NAD83 Zone 10) and their ground surface elevations were surveyed by EXP personnel using a Trimble DA2 GNSS receiver with Trimble Catalyst GNSS positioning, having an accuracy of ± 0.1 m in the horizontal and vertical directions. Elevations for each borehole were referenced from the benchmark "HCP 150", which was a stake located on the northbound lane shoulder at Elev. 300.568 m by the surveyor. Ground surface elevations of the boreholes are summarized in Table 1.1.

During the drilling of the boreholes, a combination of Standard Penetration Tests (SPT) and rock coring was attempted to obtain soil and rock samples. Soil samples were obtained using a 51 mm outside diameter (O.D.) split-spoon sampler in accordance with Standard Penetration Test (SPT) procedures (ASTM D1586) at intervals ranging

from 0.75 m to 1.5 m in depth, as shown on the attached borehole logs (Appendix C). The original field (uncorrected) SPT “N” values were recorded on the borehole logs as recommended in the Canadian Foundation Engineering Manual (CFEM, pg. 103) and used to provide an assessment of the in-situ compactness of cohesionless soils or consistency of cohesive soils. The SPT “N” values taken within the particles larger than diameter of split spoon sampler may not be reliable and collected samples are possibly not representative of the layer. When a hard stratum was reached (refusal of split spoon), sampling of hard material was performed by diamond core drilling using a 1.5 m long NQ double tube wireline core barrel.

Where possible, groundwater level measurements were carried out in the boreholes before coring and at the completion of the boreholes, in accordance with MTO guidelines. However, all boreholes at this site were advanced using diamond casing/coring procedures. Water was used during advancement from ground surface; therefore groundwater could not be measured in open boreholes during drilling. A standpipe piezometer was installed in BH2-6 to permit monitoring of the groundwater level on the west side of Highway 11. The recorded groundwater levels are presented in the borehole log sheets in Appendix C. All other drilled boreholes were decommissioned by bentonite/cement mixtures in accordance with the Ministry of the Environment Regulation 903, as amended by Regulation 128/03 (the well regulation under the Ontario Water Resources Act) upon completion of drilling.

The fieldwork was supervised by an EXP geotechnical representative who directed the drilling and sampling operations, logged borehole data in accordance with MTO and/or ASTM Standards for Soils Classification and retrieved soil samples for subsequent laboratory testing and identification.

All recovered soil samples were placed in labelled moisture-proof bags and returned to EXP’s laboratory for additional visual, textual, and olfactory examination, and selective testing. The rock cores were placed in wooden core boxes and photographed as shown in Appendix E.

Table 1.1. Summary of boreholes completed

Borehole No.	Location	Location (MTM NAD 83 Zone 10)		Latitude	Longitude	Ground Surface Elevation ¹ (m)	Borehole Depth ² (m)
		Northing	Easting				
Probeholes PH2-1 to PH2-8 replacing BH2-1	Off-road beyond toe of existing slope: East side of highway	Reference Drawing 1				289.5 to 290.8	0.15 to 0.60
BH2-2	East side (northbound lane) of highway	5159526.4	294876.6	46.575298	-79.629466	301.0	20.4
BH2-3	East side (northbound lane) of highway	5159568.7	294842.7	46.575677	-79.629909	298.4	18.1
BH2-4	Off-road beyond toe of existing slope: West side of highway	5159555.4	294812.4	46.575558	-79.630304	289.0	8.7
BH2-5	West side (southbound lane) of highway	5159515.0	294885.1	46.575195	-79.629354	301.7	19.8

Borehole No.	Location	Location (MTM NAD 83 Zone 10)		Latitude	Longitude	Ground Surface Elevation ¹ (m)	Borehole Depth ² (m)
		Northing	Easting				
BH2-6	Off-road beyond toe of existing slope: West side of highway	5159572.5	294795.8	46.575711	-79.630521	288.9	10.1
BH2-7	Off-road beyond toe of existing slope: West side of highway	5159538.8	294822.8	46.575409	-79.630168	289.2	6.5

Notes:

1. The ground surface elevations are referenced from HCP 150.
2. Depths are relative to ground surface.

1.4.2 Laboratory Testing

All samples returned to the laboratory were visually examined and classified. The laboratory testing program included natural moisture content determination on all samples and particle size distribution testing on approximately 25% of the recovered soils, where feasible. Due to the presence of rockfill, cobbles, and boulders, sample recovery was limited in several boreholes, which in turn restricted the extent of particle size distribution testing. All laboratory testing was performed in accordance with applicable MTO and ASTM standards.

1.5 Subsurface Conditions

The detailed subsurface conditions encountered in the boreholes advanced during this investigation are presented on the borehole log sheets in Appendix C. The "Explanation of Terms Used in Report" preceding the borehole logs in Appendix C forms an integral part of and should be read in conjunction with this report.

A borehole location plan and cross section subsurface profiles are provided in Appendix B. It should be noted that the stratigraphic boundaries indicated on the borehole log and cross section stratigraphic profiles are inferred from semi-continuous sampling, observations of drilling progress and results of Standard Penetration Tests (SPT). These boundaries typically represent transitions from one soil type to another and should not be regarded as exact planes of geological change. Furthermore, subsurface conditions may vary between and beyond the borehole locations.

Below the roadway, the subsurface conditions encountered within the investigated depths of the geotechnical investigation (BH2-2, BH2-3, BH2-5) indicates the general subsurface sequence: sand and gravel/gravelly sand fill underlain by rockfill underlain by a mixture of native cohesionless soils consisting of gravelly sand/sand and gravel/silty sand with cobbles and boulders. Bedrock was encountered in boreholes BH2-3 and BH2-5.

On the west side of the embankment, subsurface conditions encountered in the off-road boreholes (BH2-4, BH2-6, and BH2-7) indicate a general stratigraphic sequence consisting of topsoil or peat (organic materials) underlain by cohesionless soils, including silt, sand, and sand-and-gravel deposits containing cobbles and boulders. On the east side of the embankment, the probeholes encountered topsoil or peat overlying native silt and sand, with refusal reached at shallow depths ranging from 0.15 m to 0.60 m using the hand-held sampler. No bedrock was encountered in any of the boreholes advanced during this investigation.

A detailed description of the subsurface conditions encountered is discussed further in subsequent sections.

1.5.1 Subsoils

1.5.1.1 Asphalt Treatment

Asphalt treatment was encountered at the ground surface in boreholes BH2-2, BH2-3 and BH2-5. The thickness of the layer ranged from approximately 100 mm to 200 mm. Asphalt thicknesses may further vary beyond the borehole location.

1.5.1.2 Topsoil/Peat (Organics)

Topsoil/peat (organics) was encountered at the ground surface in boreholes BH2-4, BH2-6 and BH2-7 as well as probeholes PH2-1 to PH2-8. The depths and elevations of this layer encountered are listed in Table 1.2. All probeholes were terminated upon reaching these depths due to refusal encountered at those locations. Some sand was also observed in these probeholes within this depth range.

Table 1.2. Summary of topsoil/peat (organics)

Probehole/Borehole No.	Elevation ¹ (m)		Layer Surface Depth ² (m)	Layer Thickness (m)
	Top	Bottom		
PH2-1	289.5	289.1	0.0	0.4 ³
PH2-2	289.5	288.9	0.0	0.6 ³
PH2-3	289.5	289.3	0.0	0.2 ³
PH2-4	290.4	289.9	0.0	0.5 ³
PH2-5	290.8	290.3	0.0	0.5 ³
PH2-6	290.4	290.0	0.0	0.4 ³
PH2-7	290.2	290.0	0.0	0.2 ³
PH2-8	290.6	290.2	0.0	0.4 ³
BH2-4	289.0	287.8	0.0	1.2
BH2-6	288.9	288.1	0.0	0.8
BH2-7	289.2	288.4	0.0	0.8

Notes:

1. The elevations are referenced from HCP 150.
2. Depths are relative to ground surface.
3. Refusal encountered.

The topsoil/peat consisted of silt and clay with grass and rootlets. The fill was generally brown to black in colour and moist to saturated. The SPT “N” values obtained within this material ranged from WH (weight of hammer) to 3 blows per 0.3 m penetration, suggesting that this layer was very loose in compactness or very soft to soft in consistency.

Laboratory testing performed on selected samples consisted of five (5) moisture content tests. The test results are as follows:

Moisture Content:

- 94% to 308%

The results of the moisture content tests are provided on the record of borehole sheets in Appendix C.

1.5.1.3 Cohesionless Fill: Sand and Gravel/Gravelly Sand

Cohesionless fill material consisting of predominantly sand and gravel was encountered below the asphalt treatment in boreholes BH2-2, BH2-3 and BH2-5. The depths and elevations of this layer encountered are listed in Table 1.3.

Table 1.3. Summary of cohesionless fill: sand and gravel/gravelly sand

Borehole No.	Elevation ¹ (m)		Layer Surface Depth ² (m)	Layer Thickness (m)
	Top	Bottom		
BH2-2	300.9	299.5	0.2	1.4
BH2-3	298.2	296.3	0.2	1.9
BH2-5	301.6	298.1	0.1	3.6

Notes:

1. The elevations are referenced from HCP 150.
2. Depths are relative to ground surface.

The composition of this fill material generally consisted of sand and gravel. The fill was generally brown to grey in colour and moist to wet. It should be noted that increased moisture content in fill soils is likely affected by water that was introduced for casing/coring procedures during drilling. The SPT “N” values obtained within this material ranged from 17 to 138 blows per 0.3 m penetration, suggesting that this layer was compact to very dense in compactness condition.

Laboratory testing performed on selected samples consisted of eight (8) moisture content tests, and three (3) grain size distribution tests. The test results are as follows:

Moisture Content:

- 3% to 22%

Grain Size Distribution:

- 34% to 44% gravel
- 47% to 58% sand
- 8% to 9% silt and clay

The results of the moisture content, and grain size distribution tests are provided on the record of borehole sheets in Appendix C. The results of the grain size distribution test are also provided on Figure 1 in Appendix D.

1.5.1.4 Rockfill

Rockfill consisting of various sized fragments of rock in a soil matrix (gravel, sand and silt sized particles) was encountered in boreholes BH2-2, BH2-3 and BH2-5 below the sand and gravel/gravelly sand fill layer. The depths and elevations of this layer encountered are listed in Table 1.4.

Table 1.4. Summary of rockfill

Borehole No.	Elevation ¹ (m)		Layer Surface Depth ² (m)	Layer Thickness (m)
	Top	Bottom		
BH2-2	299.5	290.3	1.5	9.2
BH2-3	296.3	289.3	2.1	7.0
BH2-5	298.1	290.3	3.6	7.8

Notes:

1. The elevations are referenced from HCP 150.
2. Depths are relative to ground surface.

The composition of this rockfill layer generally consisted of cobbles and boulders with silt, sand and gravel sized particles within the in-fill soil matrix. The particle size within the rockfill varies from silt to boulder size.

A combination of SPT and coring was carried out during the exploration of this layer. Where possible, split spoon sampling was attempted to obtain samples from this layer. However, it should be noted that in most cases, obtained samples from this layer were either not adequate or did not accurately represent the particle size distribution of this material as particles larger than 35 mm (inside diameter of SPT sampler) could not be obtained.

The silt/sand/gravel observed within the rockfill layer was generally brown and moist to wet (due to casing/coring procedures). The SPT "N" values obtained within the layers of silt/sand/gravel ranged from 18 to 100 blows per 0.3 penetration, suggesting that these soils were compact to very dense in compactness. However, refusal was generally encountered due to a cobble or boulder when the split spoon could not penetrate 0.3 m.

Laboratory testing performed on selected samples consisted of three (3) moisture content tests. The test results are as follows:

Moisture Content:

- 21% to 25%

The results of the moisture content tests are provided on the record of borehole sheets in Appendix C.

1.5.1.5 Glacial Till: Cobbles and Boulders

Glacial till comprised of cobbles and boulders in a silt, sand, and gravel soil matrix was encountered in below the rockfill layer in boreholes BH2-2 and BH2-3, below a native sand/silt layer in boreholes BH2-4 and BH2-6 and below a native sand and gravel layer in BH2-7. The depths and elevations of this layer encountered are listed in Table 1.5.

As noted in Section 1.5.1.2, all probeholes advanced on the east side of the embankment were terminated at shallow depths (0.2 m to 0.6 m) due to refusal encountered at those locations. It is suspected that the refusal was caused by a layer of boulders and cobbles at these depths; however, coring was not performed because only hand-operated equipment could be used, and therefore the presence of boulders and cobbles could not be confirmed.

Table 1.5. Summary of glacial till: cobbles and boulders

Borehole No.	Elevation ¹ (m)		Layer Surface Depth ² (m)	Layer Thickness (m)
	Top	Bottom		
BH2-2	290.3	284.2	10.7	6.1
BH2-3	289.3	283.9	9.1	5.4
BH2-4	283.4	280.9	5.6	2.5
BH2-6	287.8	285.9	1.1	1.9
BH2-7	284.6	282.7	4.6	1.9

Notes:

1. The elevations are referenced from HCP 150.
2. Depths are relative to ground surface.

The composition of this layer generally consisted of cobbles and boulders with silt, sand and gravel sized particles within the soil matrix. The particle size varies from silt to boulder size.

A combination of SPT and coring was carried out during the exploration of this layer. Where possible, split spoon sampling was attempted to obtain samples from this layer. However, it should be noted that in most cases, obtained samples from this layer were either not adequate or did not accurately represent the particle size distribution of this material as particles larger than 35 mm (inside diameter of SPT sampler) could not be obtained.

The SPT “N” values obtained within the cobbles and boulders ranged from 14 to 100 blows per 0.3 penetration, suggesting that these soils were compact in compactness. In general, refusal was generally encountered due to a cobble or boulder when the split spoon could not penetrate 0.3 m.

Laboratory testing performed on selected samples consisted of one (1) moisture content test. The test result is as follows:

Moisture Content:

- 25%

The results of the moisture content test is provided on the record of borehole sheets in Appendix C.

1.5.1.6 Sand/Silty Sand/Silt

Native sand/silty sand/silt layers were encountered in boreholes BH2-2, BH2-4, BH2-6. The depths and elevations of this layer encountered are listed in Table 1.6.

Table 1.6. Summary of sand/silty sand/silt

Borehole No.	Elevation ¹ (m)		Layer Surface Depth ² (m)	Layer Thickness (m)
	Top	Bottom		
BH2-2	284.2	281.2	16.8	3.0
BH2-4	287.8	283.4	1.2	4.4
	280.9	280.3	8.1	0.6
BH2-6	288.1	287.8	0.8	0.3
BH2-6	285.9	278.8	3.0	7.1

Notes:

1. The elevations are referenced from HCP 150.
2. Depths are relative to ground surface.

The composition of this layer predominately consisted of sand and silt with trace to some gravel and trace to some clay. Cobbles and boulders were also encountered within this layer. This layer was generally brown to grey in colour and moist to saturated. The SPT "N" values obtained within this material ranged from 3 to 30 blows per 0.3 m penetration, suggesting that this layer was loose to very dense, but generally loose to compact in compactness. Refusal blow counts were also encountered due to cobbles and boulders. Coring was carried out during the exploration of this layer when cobbles/boulders were encountered.

Laboratory testing performed on selected samples consisted of thirteen (13) moisture content tests and two (2) grain size distribution tests. The test results are as follows:

Moisture Content:

- 10% to 24%

Grain Size Distribution:

- 0% gravel
- 5% to 6% sand

- 83% to 90% silt
- 5% to 11% clay

The results of the moisture content and grain size distribution tests are provided on the record of borehole sheets in Appendix C. The results of the grain size distribution tests are also provided on Figure 2 in Appendix D.

1.5.1.7 Sand and Gravel to Gravelly Sand

Native sand and gravel to gravelly sand layers were encountered in boreholes BH2-2 (below the silty sand layer), BH2-3 (below the glacial till layer), BH2-5 (below rockfill) and BH2-7 (below the organic silty/clay layer). The depths and elevations of this layer encountered are listed in Table 1.7.

Table 1.7. Summary of sand and gravel to gravelly sand

Borehole No.	Elevation ¹ (m)		Layer Surface Depth ² (m)	Layer Thickness (m)
	Top	Bottom		
BH2-2	281.2	280.6	19.8	0.6
BH2-3	283.9	283.2	14.5	0.7
BH2-5	290.3	281.9	11.4	8.4
BH2-7	288.4	284.6	0.8	3.8

Notes:

1. The elevations are referenced from HCP 150.
2. Depths are relative to ground surface.

The composition of this layer predominately consisted of sand and gravel with trace to some silt. Cobbles and boulders were also encountered within this layer. This layer was generally grey to brown in colour and moist to wet. The SPT “N” values obtained within this material ranged from 6 to 127 blows per 0.3 m penetration, suggesting that this layer was loose to very dense, but generally compact to dense in compactness.

Laboratory testing performed on selected samples consisted of eight (8) moisture content tests and four (4) grain size distribution tests. The test results are as follows:

Moisture Content:

- 3% to 18%

Grain Size Distribution:

- 21% to 28% gravel
- 59% to 72% sand
- 7% to 13% silt and clay

The results of the moisture content and grain size distribution tests are provided on the record of borehole sheets in Appendix C. The results of the grain size distribution tests are also provided on Figure 3 in Appendix D.

1.5.2 Bedrock

Bedrock was only encountered beneath sand and gravel and gravelly sand layers in on-road boreholes BH2-3 and BH2-5 respectively. The elevations at the top of bedrock ranged between 281.9 m to 283.2 m. The presence of bedrock at these locations was confirmed by coring approximately 3.0 m into the stratum. The depths and elevations of the bedrock surface at these borehole locations are provided in Table 1.8, and photographs of recovered rock cores are included in Appendix E.

Table 1.8. Summary of bedrock

Borehole No.	Elevation ¹ (m)		Layer Surface Depth ² (m)
	Top	Bottom	
BH2-3	283.2	280.3	15.2
BH2-5	281.9	278.8	19.8

Notes:

1. The elevations are referenced from HCP 150.
2. Depths are relative to ground surface.

Based on the bedrock NQ cores (~ core diameter 47 mm) recovered, the bedrock at the site consisted of quartzofeldspathic gneiss. In general, the rock samples are described as grey with pink embedment in colour. The Rock Quality Designation (RQD) measured on the core samples typically ranged from approximately 60% to 94%, indicating a rock mass of fair to excellent quality. The total core recovery (TCR) of bedrock cores ranged from 93% to 100%.

1.6 Groundwater and Surface Water Conditions

All boreholes at this site were advanced using casing/coring procedures where water was used during advancement from ground surface, therefore groundwater was not measured in boreholes due to the drilling method.

Groundwater levels would be expected to reflect levels in the adjacent open water and to fluctuate seasonally. Seasonal variations in the water table should be expected, with higher levels occurring during wetter periods of the year and lower levels during drier periods. The water accumulation of an existing creek was observed on the east side of the embankment where the water level was measured to be at about Elev. 288.9 m.

The groundwater level measured in the piezometer installed in borehole BH2-6 is shown in Table 1.9 and on the record of borehole sheet in Appendix C. The groundwater was not measured in the open holes since water was used for drilling.

Table 1.9. Summary of observed groundwater levels

Borehole	Ground Surface Elevation ¹ (m)	Water level Depth ² / Elevation ¹ (m)	Date
BH2-6	288.9	0.1/288.8	In piezometer (Apr 24, 2024)
		0.0/288.9	In piezometer (May 15, 2024)
		0.4/288.5	In piezometer (May 28, 2024)
		0.7/288.2	In piezometer (Jun 18, 2024)
		0.5/288.4	In piezometer (Jul 31, 2024)

Notes:

1. The elevations are referenced from HCP 150.
2. Depths are relative to ground surface.

1.7 Chemical Analyses

One (1) soil sample was selected for chemical analyses during field investigation. The soil sample collected by EXP was tested at Bureau Veritas, a CALA-certified and accredited laboratory in Mississauga, Ontario.

The sample SS1B from borehole BH2-6 was subjected to corrosivity chemical analyses. The analytical results are summarized in Table 1.10 below and are presented in Appendix D.

Table 1.10. Summary of chemical analysis results

Sample Identification	pH (unitless)	Soluble Chloride (ppm)	Soluble Sulphate (ppm)	Resistivity (ohm-cm)	Conductivity (mS/cm)	Redox Potential (mV)
BH2-6, SS1B	5.35	400	48	1400	709	260

2 CLOSURE

A subsurface investigation is a limited sampling of a site; the subsurface conditions have been established only at the test hole locations. Should conditions at the site be encountered which differ from those reported at the test locations, we require that we be notified immediately in order to assess this additional information and our recommendations, as appropriate. It may then be necessary to perform additional investigations and analyses.

Contractors bidding on or undertaking any proposed work at this site should, relative to the subsurface conditions, decide on their own investigations, if deemed necessary, as well as their own interpretations of the factual results provided herein, so they may draw their own conclusions as to how the subsurface conditions may affect them.

This Foundation Investigation Report has been prepared by Elvis Lu, M.Eng., P.Eng., and Thomas Lardner, Ph.D., P.Eng. It was reviewed by TaeChul Kim, M.E.Sc., P.Eng. and by Stan E. Gonsalves, M.Eng., P.Eng., Designated MTO Foundation Contact. The field investigation was supervised by Daniel Mroz, M.E.Sc., P.Eng., Stephen Fredericks, M.Eng, P.Eng. and Bijaya Bhujel.

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 Designated MTO Foundation Contact



REFERENCES

Canadian Geotechnical Society, 2023. Canadian Foundation Engineering Manual, 5th Edition. The Canadian Geotechnical Society, British Columbia.

Canadian Standards Association (CSA), 2019. Canadian Highway Bridge Design Code and Commentary on CAN/CSA-S6-19. CSA Special Publication.

Ministry of Northern Development and Mines, Map 2555. Quaternary Geology of Ontario, East-Central Sheet, 1991

Ministry of Northern Development and Mines Map 2543. Bedrock Geology of Ontario, East-Central Sheet, 1991

Ministry of Transportation, April 2022. Guideline for MTO Foundation Engineering Services, Version 03

ASTM International:

ASTM D1586 Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils

Ontario Water Resources Act:

R.R.O 1990, Regulation 903 Wells, under Ontario Water Resources Act, R.S.O. 1990, c. O.40

LIMITATIONS AND USE OF REPORT

BASIS OF REPORT

This report ("Report") is based on site conditions known or inferred by the geotechnical investigation undertaken as of the date of the Report. Should changes occur which potentially impact the geotechnical condition of the site, or if construction is implemented more than one year following the date of the Report, the recommendations of EXP may require re-evaluation.

The Report is provided solely for the guidance of design engineers and on the assumption that the design will be in accordance with applicable codes and standards. Any changes in the design features which potentially impact the geotechnical analyses or issues concerning the geotechnical aspects of applicable codes and standards will necessitate a review of the design by EXP. Additional field work and reporting may also be required.

Where applicable, recommended field services are the minimum necessary to ascertain that construction is being carried out in general conformity with building code guidelines, generally accepted practices and EXP's recommendations. Any reduction in the level of services recommended will result in EXP providing qualified opinions regarding the adequacy of the work. EXP can assist design professionals or contractors retained by the Client to review applicable plans, drawings, and specifications as they relate to the Report or to conduct field reviews during construction.

Contractors contemplating work on the site are responsible for conducting an independent investigation and interpretation of the borehole results contained in the Report. The number of boreholes necessary to determine the localized underground conditions as they impact construction costs, techniques, sequencing, equipment and scheduling may be greater than those carried out for the purpose of the Report.

Classification and identification of soils, rocks, geological units, contaminant materials, building envelopment assessments, and engineering estimates are based on investigations performed in accordance with the standard of care set out below and require the exercise of judgment. As a result, even comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations or building envelope descriptions involve an inherent risk that some conditions will not be detected. All documents or records summarizing investigations are based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated. Some conditions are subject to change over time. The Report presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, these should be disclosed to EXP to allow for additional or special investigations to be undertaken not otherwise within the scope of investigation conducted for the purpose of the Report.

RELIANCE ON INFORMATION PROVIDED

The evaluation and conclusions contained in the Report are based on conditions in evidence at the time of site inspections and information provided to EXP by the Client and others. The Report has been prepared for the specific site, development, building, design or building assessment objectives and purpose as communicated by the Client. EXP has relied in good faith upon such representations, information and instructions and accepts no responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of any misstatements, omissions,

misrepresentation or fraudulent acts of persons providing information. Unless specifically stated otherwise, the applicability and reliability of the findings, recommendations, suggestions or opinions expressed in the Report are only valid to the extent that there has been no material alteration to or variation from any of the information provided to EXP.

STANDARD OF CARE

The Report has been prepared in a manner consistent with the degree of care and skill exercised by engineering consultants currently practicing under similar circumstances and locale. No other warranty, expressed or implied, is made. Unless specifically stated otherwise, the Report does not contain environmental consulting advice.

COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment form part of the Report. This material includes, but is not limited to, the terms of reference given to EXP by its client ("Client"), communications between EXP and the Client, other reports, proposals or documents prepared by EXP for the Client in connection with the site described in the Report. In order to properly understand the suggestions, recommendations and opinions expressed in the Report, reference must be made to the Report in its entirety. EXP is not responsible for use by any party of portions of the Report.

USE OF REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. No other party may use or rely upon the Report in whole or in part without the written consent of EXP. Any use of the Report, or any portion of the Report, by a third party are the sole responsibility of such third party. EXP is not responsible for damages suffered by any third party resulting from unauthorised use of the Report.

REPORT FORMAT

Where EXP has submitted both electronic file and a hard copy of the Report, or any document forming part of the Report, only the signed and sealed hard copy shall be the original documents for record and working purposes. In the event of a dispute or discrepancy, the hard copy shall govern. Electronic files transmitted by EXP have utilized specific software and hardware systems. EXP makes no representation about the compatibility of these files with the Client's current or future software and hardware systems. Regardless of format, the documents described herein are EXP's instruments of professional service and shall not be altered without the written consent of EXP.

Appendix A –
Site Photographs



Photograph 1. Embankment slope facing southeast (April 08, 2024)



Photograph 2. SPT sampling in the southbound lane (November 20, 2023)



Photograph 3. SPT sampling at SW2 at borehole BH2-6 using tripod setup in swamp (April 09, 2024)



Photograph 4. Surface spoon in swamp at SW2 at borehole BH2-7 (March 25, 2024)



Photograph 5. East side of embankment near proposed location of BH2-1 (April 8, 2024)



Photograph 6. Honda GX35 Portable Soil Sampler used for the probeholes on the east side of the embankment

Appendix B –
Drawings

METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.

CONT No. 5021-E-0038
ASSIG No.
GWP No. 5151-21-00

Highway 11 from Sand Dam Road Northerly 13.8 Km
to Ellesmere Road (SW2)
Latitude: 46.575311°; Longitude: -79.629389°

BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET 1

exp. EXP SERVICES INC.



KEY PLAN
N.T.S.

- LEGEND
- Borehole Location (Drilled)
 - Probehole Location
 - Borehole Location (Replaced by Probeholes)
 - N Blows/0.3m (Std. Pen. Test, 475 J/blow)
 - Water Level in Piezometer (most recent) (W. L. STABILIZED)
 - Piezometer

- SOIL STRATA SYMBOLS
- TOPSOIL
 - ASPHALT
 - FILL
 - SILTY SAND
 - PEAT/ ORGANIC SILT
 - SAND
 - SAND & GRAVEL TO GRAVELLY SAND
 - COBBLES & BOULDERS
 - BEDROCK

BOREHOLE COORDINATES/ NAD 83/ MTM ON-10

BH No.	ELEV.	NORTHING	EASTING
BH2-2	301.0	5159526.4	294876.6
BH2-3	298.4	5159568.7	294842.7
BH2-4	289.0	5159555.4	294812.4
BH2-5	301.7	5159515.0	294885.1
BH2-6	288.9	5159572.5	294795.8
BH2-7	289.2	5159538.8	294822.8

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

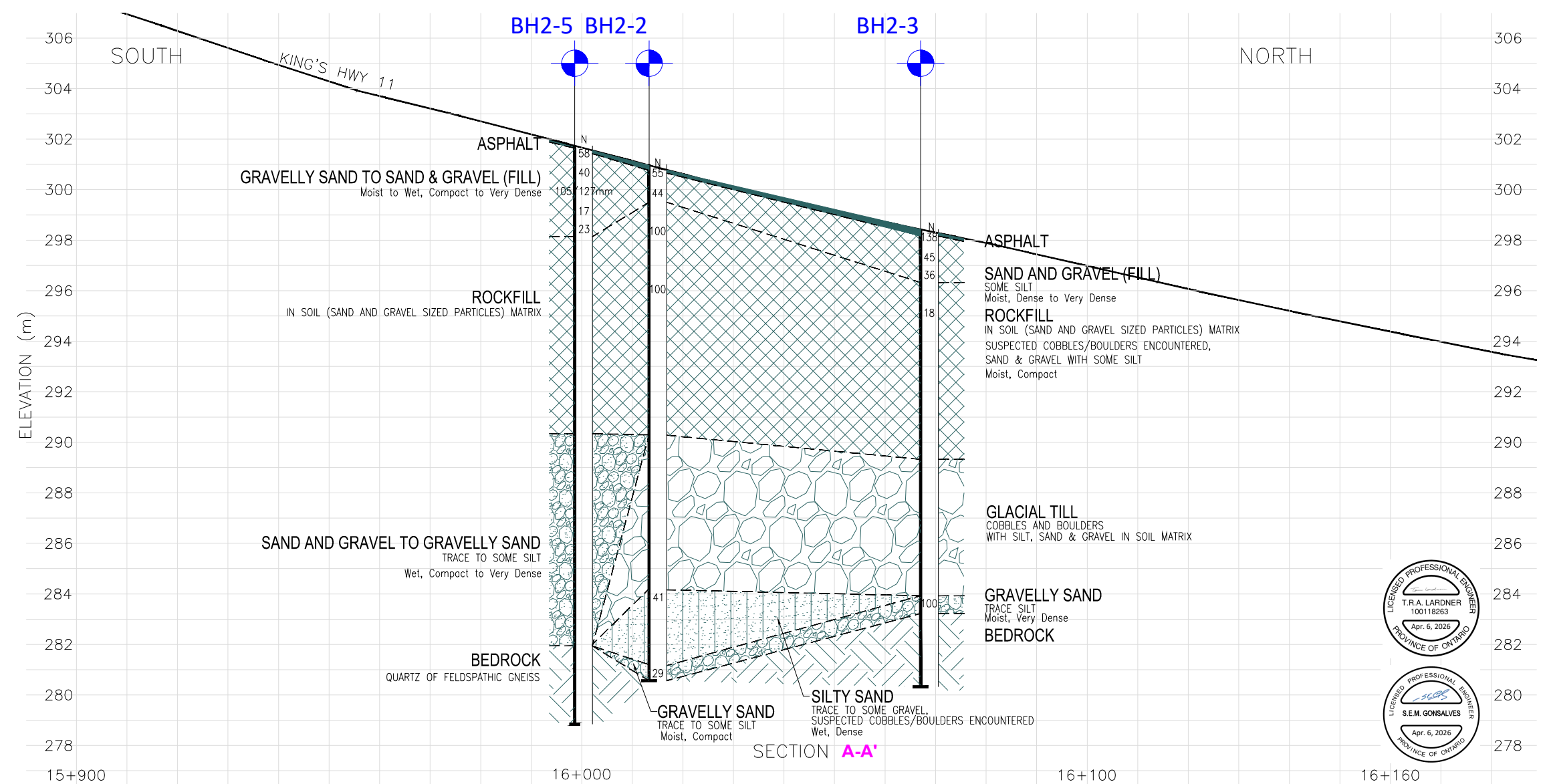
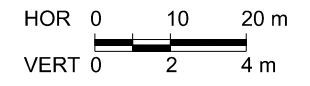
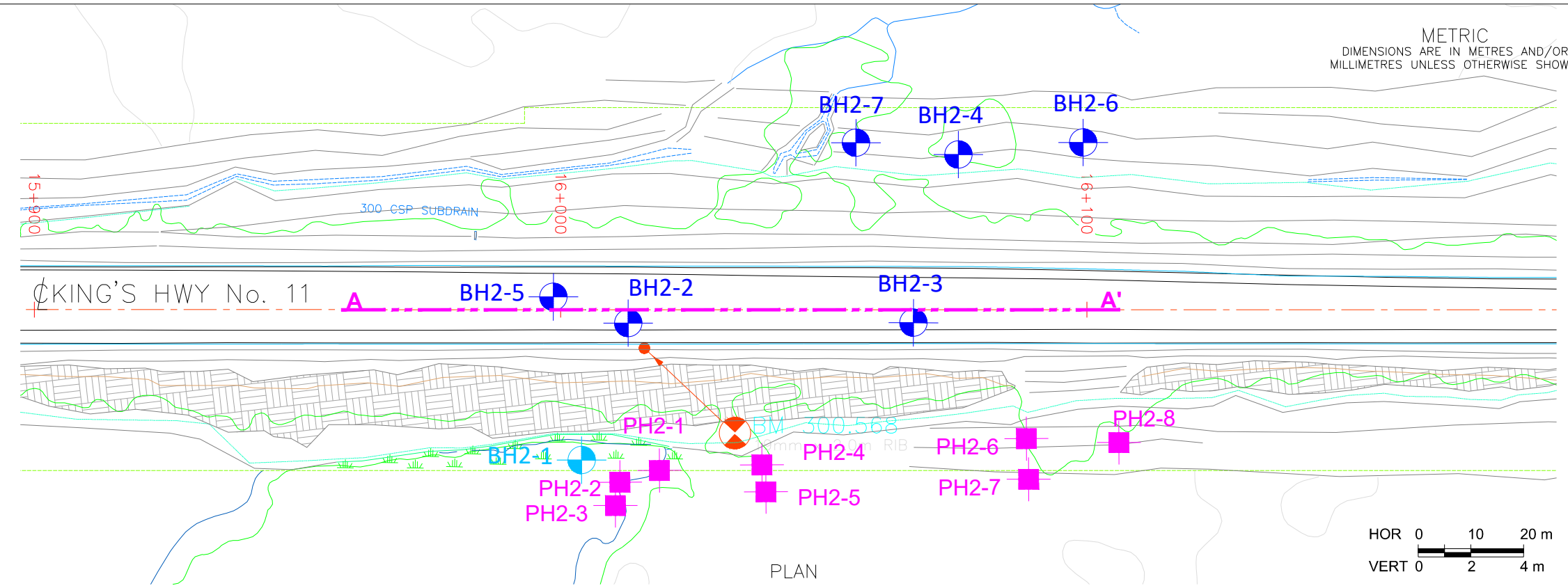
The complete foundation investigation and design report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in the report and related documents are specifically excluded in accordance with the conditions of Section GC 2.01 of OPS Gen. Cond.

REVISIONS

NO	DATE	BY	DESCRIPTION

SUBMISSION FOR MTO REVIEW

PROJECT No.	ADM-23010055-A0	GEOCRETS No.	31L12-004
SUBM'D SH	CHKD. TL	DATE	Jan 12, 2026
DRAWN SH	CHKD. TL	APPRD	SG
		SITE	SW2
		DWG	01



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CONT No. 5021-E-0038
ASSIG No.
GWP No. 5151-21-00
Highway 11 from Sand Dam Road Northerly 13.8 Km
to Ellesmere Road (SW2)
Latitude: 46.575311°; Longitude: -79.629389°
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
2

exp. EXP SERVICES INC.



KEY PLAN
N.T.S.

- LEGEND
- Borehole Location (Drilled)
 - Probehole Location
 - Borehole Location (Replaced by Probeholes)
 - Blows/0.3m (Std. Pen. Test, 475 J/blow)
 - Water Level in Piezometer (most recent) (W. L. STABILIZED)
 - Piezometer

- SOIL STRATA SYMBOLS
- | | | |
|--|--|--|
| | | |
| | | |
| | | |
| | | |

BOREHOLE COORDINATES/ NAD 83/ MTM ON-10

BH No.	ELEV.	NORTHING	EASTING
BH2-2	301.0	5159526.4	294876.6
BH2-3	298.4	5159568.7	294842.7
BH2-4	289.0	5159555.4	294812.4
BH2-5	301.7	5159515.0	294885.1
BH2-6	288.9	5159572.5	294795.8
BH2-7	289.2	5159538.8	294822.8

NOTES

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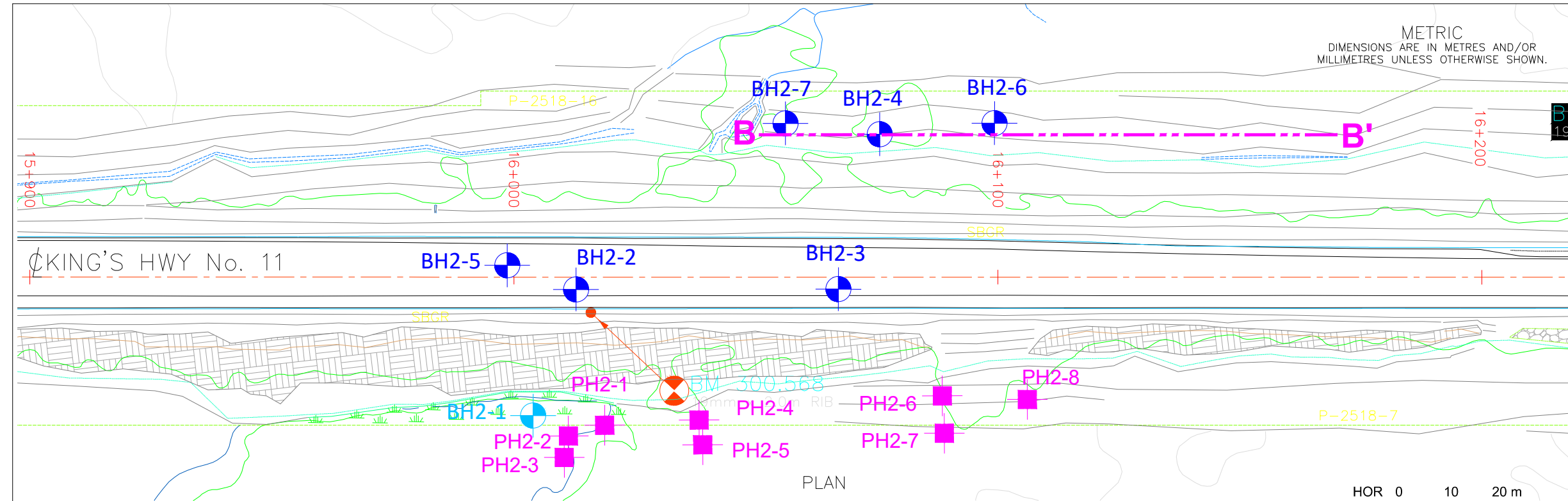
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REVISIONS

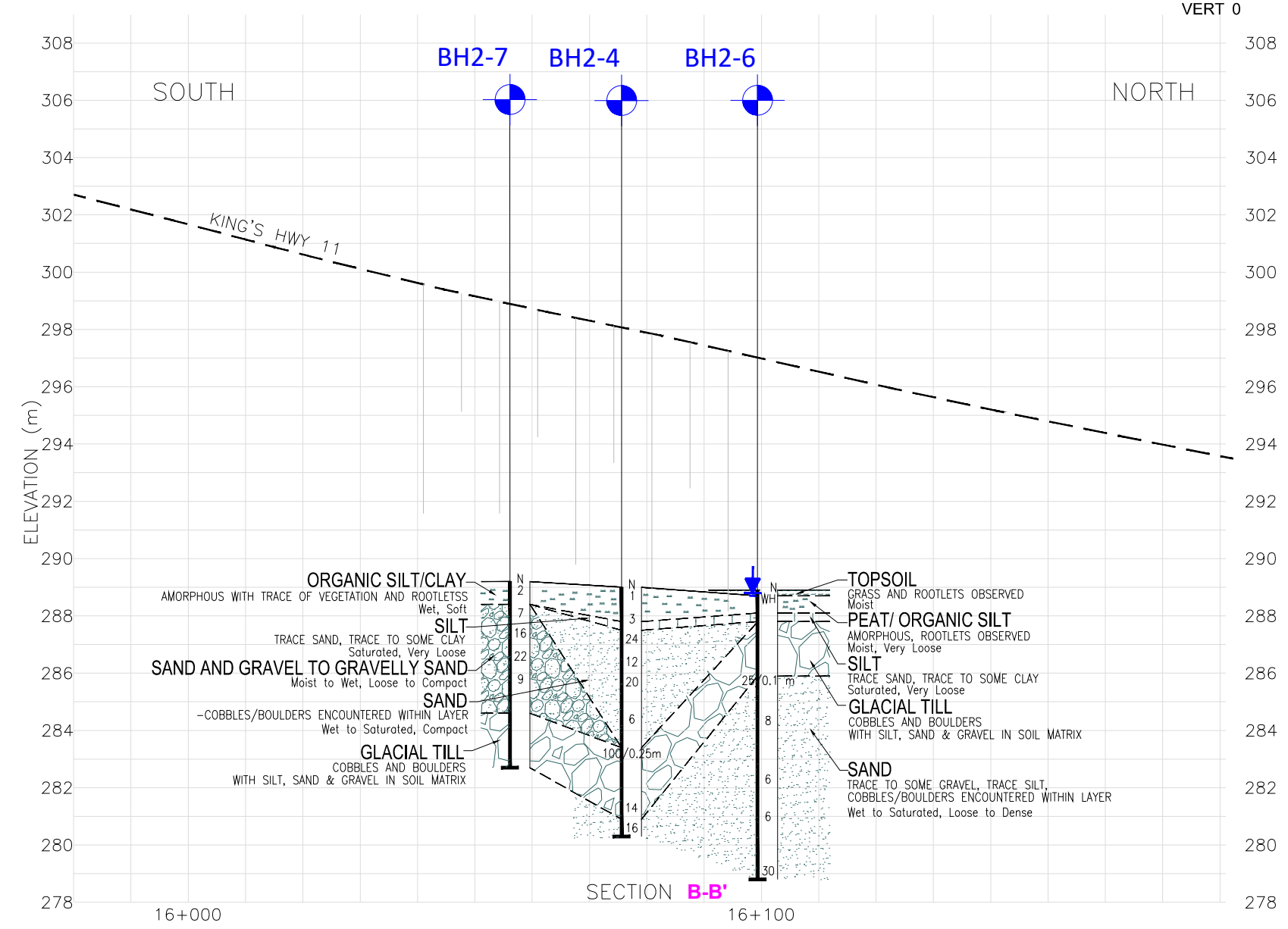
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SUBMISSION FOR MTO REVIEW

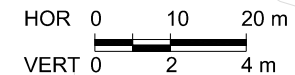
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SUBM'D SH	CHKD. TL	DATE	Jan 12, 2026 SITE SW2
DRAWN SH	CHKD. TL	APPRD	SG DWG 02



PLAN



SECTION B-B'



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CONT No. 5021-E-0038
ASSIG No.
GWP No. 5151-21-00
Highway 11 from Sand Dam Road Northerly 13.8 Km
to Ellesmere Road (SW2)
Latitude: 46.575311°; Longitude: -79.629389°
BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET
3

exp. EXP SERVICES INC.



KEY PLAN
N.T.S.

LEGEND

- Borehole Location (Drilled)
- Probehole Location
- Borehole Location (Replaced by Probeholes)
- Blows/0.3m (Std. Pen. Test, 475 J/blow)
- Water Level in Piezometer (most recent) (W. L. STABILIZED)
- Piezometer

SOIL STRATA SYMBOLS

- TOPSOIL
- ASPHALT
- FILL
- SILTY SAND
- PEAT/ ORGANIC SILT
- SAND
- SAND & GRAVEL TO GRAVELLY SAND
- COBBLES & BOULDERS
- BEDROCK

BOREHOLE COORDINATES/ NAD 83/ MTM ON-10

BH No.	ELEV.	NORTHING	EASTING
BH2-2	301.0	5159526.4	294876.6
BH2-3	298.4	5159568.7	294842.7
BH2-4	289.0	5159555.4	294812.4
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BH2-6	288.9	5159572.5	294795.8
BH2-7	289.2	5159538.8	294822.8

NOTES

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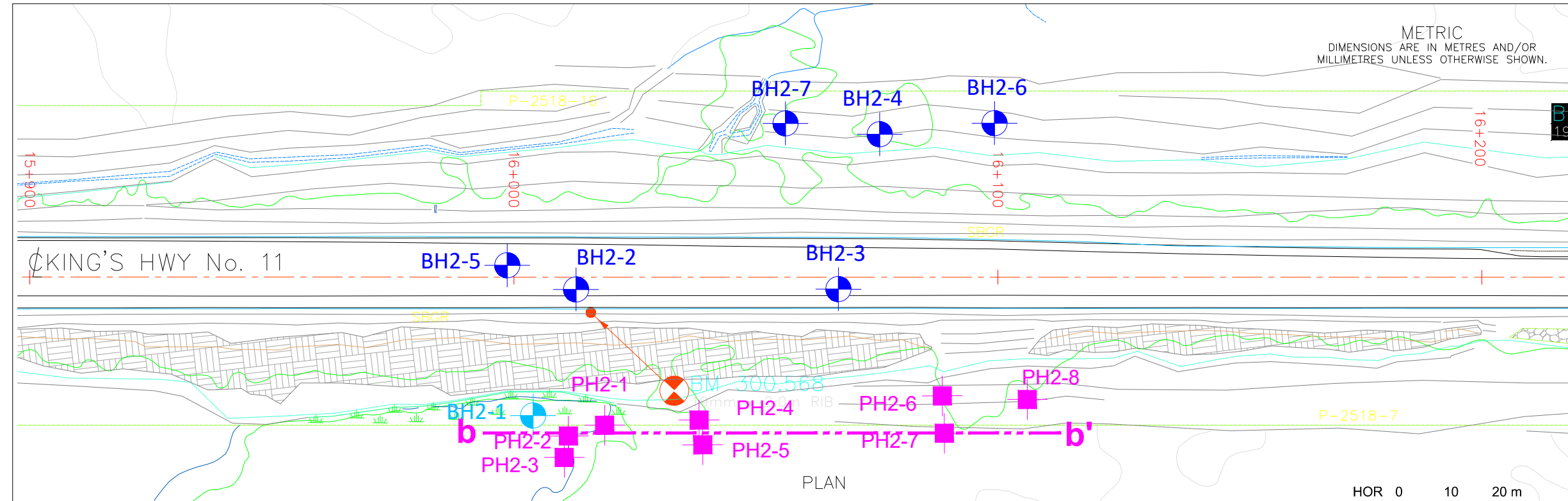
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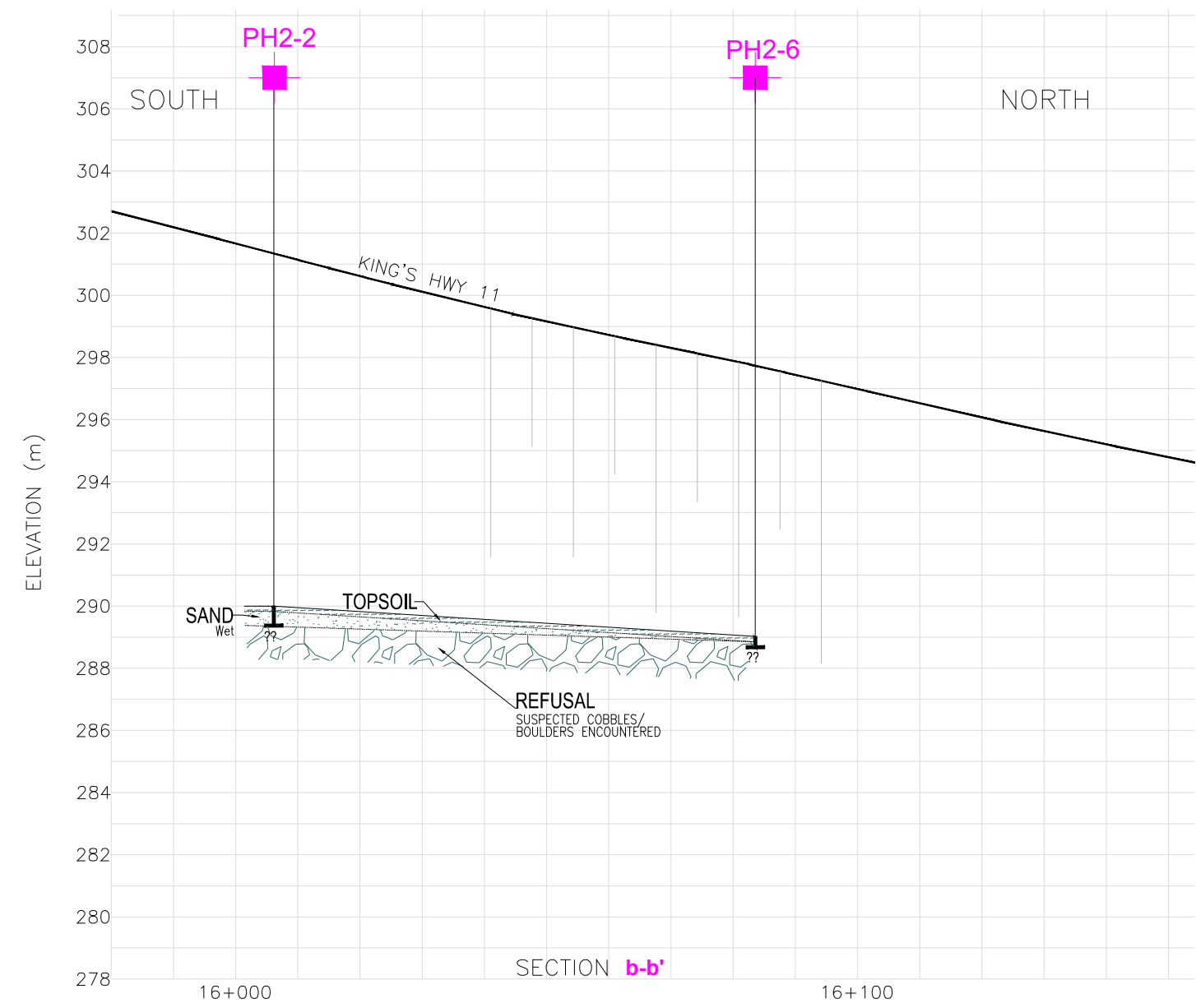


REVISIONS			
NO	DATE	BY	DESCRIPTION

SUBMISSION FOR MTO REVIEW			
PROJECT No.	ADM-23010055-A0	GEOCRETS No.	31L12-004
SUBM'D SH	CHKD. TL	DATE	Jan 12, 2026 SITE SW2
DRAWN SH	CHKD. TL	APPRD	SG DWG 03



PLAN



SECTION b-b'

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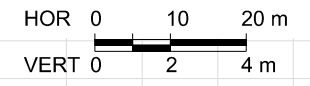
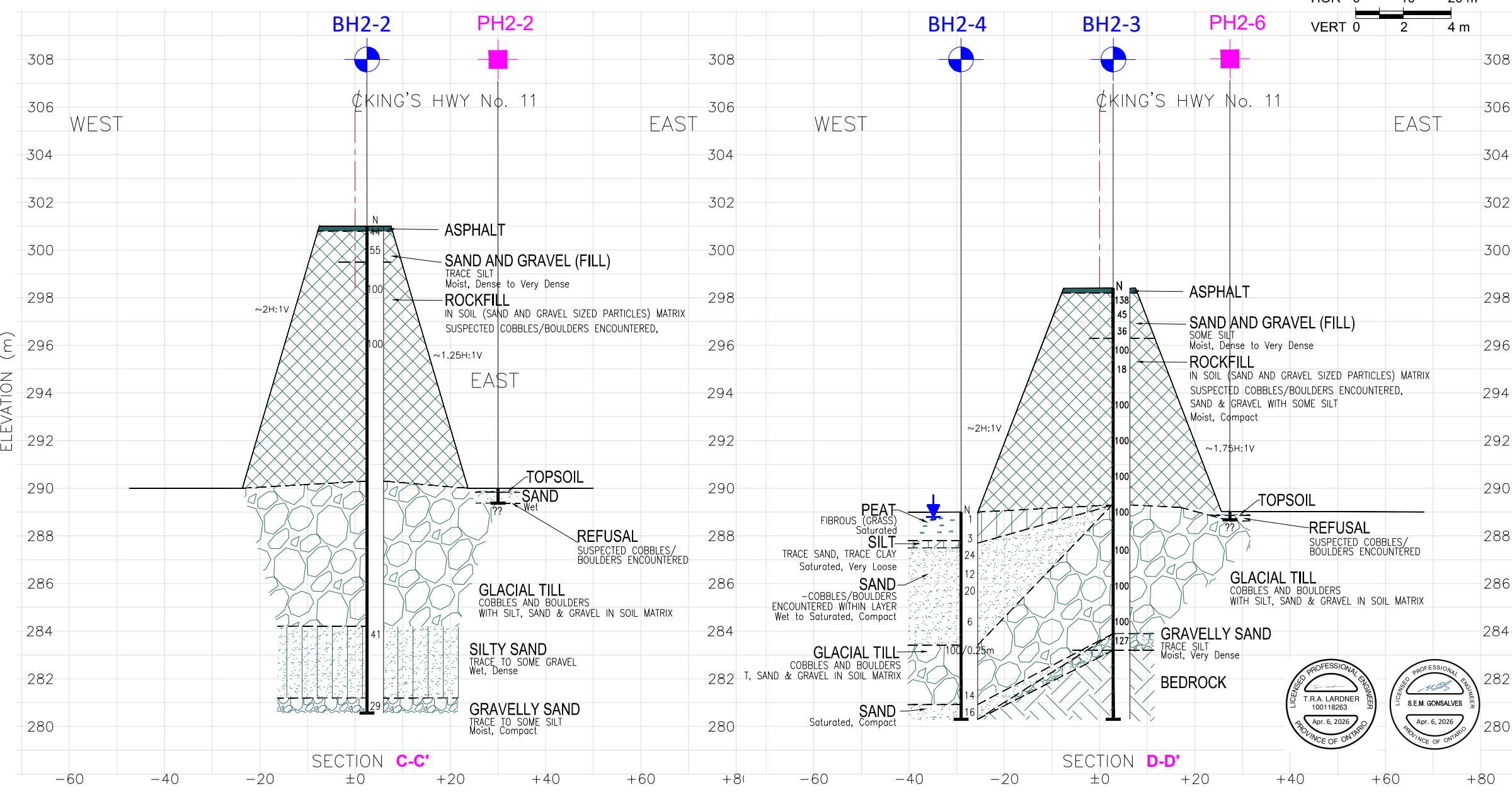
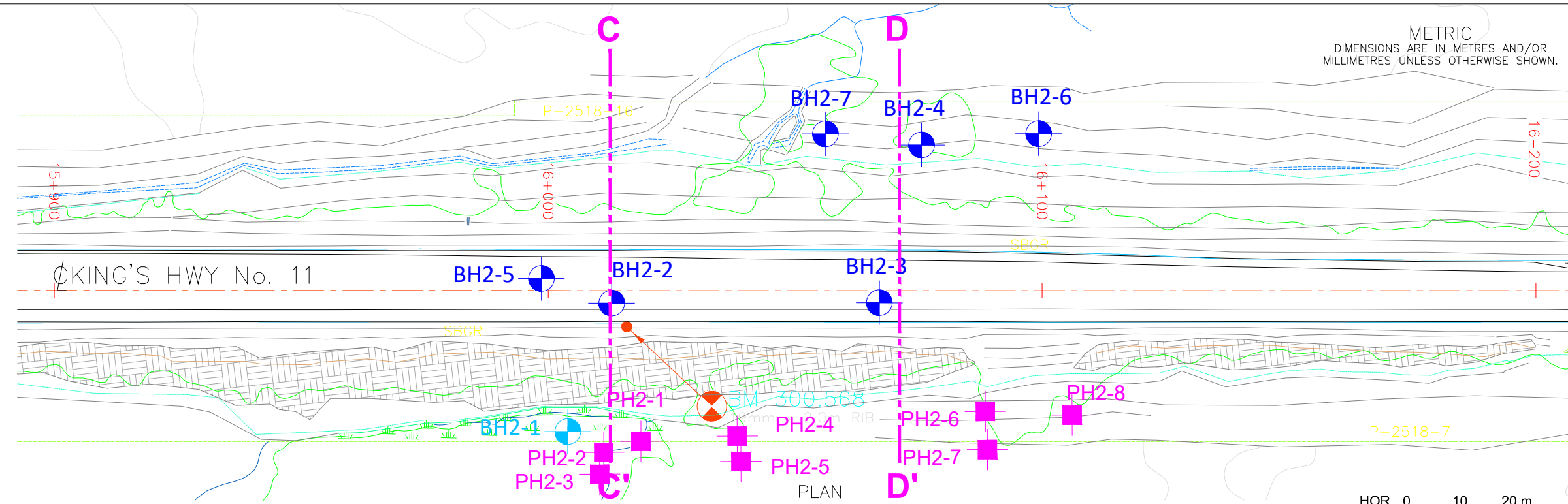
CONT No. 5021-E-0038
ASSIG No.
GWP No. 5151-21-00

Highway 11 from Sand Dam Road Northerly 13.8 Km
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Latitude: 46.575311°; Longitude: -79.629389°

BOREHOLE LOCATION PLAN & SOIL STRATA

SHEET 4

exp. EXP SERVICES INC.



- LEGEND
- Borehole Location (Drilled)
 - Probehole Location
 - Borehole Location (Replaced by Probeholes)
 - N Blows/0.3m (Std. Pen. Test, 475 J/blow)
 - Water Level in Piezometer (most recent) (W. L. STABILIZED)
 - Piezometer

- SOIL STRATA SYMBOLS
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 - SILTY SAND
 - PEAT/ ORGANIC SILT
 - SAND
 - SAND & GRAVEL TO GRAVELLY SAND
 - COBBLES & BOULDERS
 - BEDROCK

BOREHOLE COORDINATES/ NAD 83/ MTM ON-10

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BH2-2	301.0	5159526.4	294876.6
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BH2-4	289.0	5159555.4	294812.4
BH2-5	301.7	5159515.0	294885.1
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REVISIONS

NO	DATE	BY	DESCRIPTION

SUBMISSION FOR MTO REVIEW

PROJECT No.	ADM-23010055-A0	GEOCRETS No.	31L12-004
SUBM'D SH	CHKD. TL	DATE	Jan 12, 2026
DRAWN SH	CHKD. TL	APPRD	SG
		SITE	SW2
		DWG	04

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Appendix C –
Borehole Logs

Explanation of Terms Used on Borehole Records

SOIL DESCRIPTION

Terminology describing common soil genesis:

Topsoil: mixture of soil and humus capable of supporting good vegetative growth.

Peat: fibrous fragments of visible and invisible decayed organic matter.

Fill: where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc.; none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

Till: the term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Terminology describing soil structure:

Desiccated: having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.

Stratified: alternating layers of varying material or color with the layers greater than 6 mm thick.

Laminated: alternating layers of varying material or color with the layers less than 6 mm thick.

Fissured: material breaks along plane of fracture.

Varved: composed of regular alternating layers of silt and clay.

Slickensided: fracture planes appear polished or glossy, sometimes striated.

Blocky: cohesive soil that can be broken down into small angular lumps which resist further breakdown.

Lensed: inclusion of small pockets of different soil, such as small lenses of sand scattered through a mass of clay; not thickness.

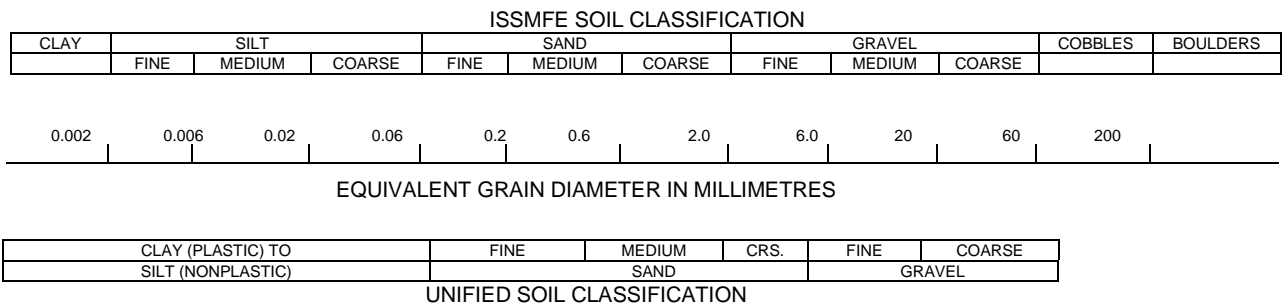
Seam: a thin, confined layer of soil having different particle size, texture, or color from materials above and below.

Homogeneous: same color and appearance throughout.

Well Graded: having wide range in grain sized and substantial amounts of all predominantly on grain size.

Uniformly Graded: predominantly on grain size.

All soil sample descriptions included in this report follow generally the ASTM D2487-11 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) with some modification to reflect current MTO practices. The system divides soils into three major categories: (1) coarse grained, (2) fine-grained, and (3) highly organic. The soil is then subdivided based on either gradation or plasticity characteristics. The system provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification. The classification excludes particles larger than 76 mm. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually in accordance with ASTM D2488-09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems. Others may use different classification systems; one such system is the ISSMFE Soil Classification.



Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present and as described below in accordance with Canadian Foundation Engineering Manual (CFEM):

Table a: Percent or Proportion of Soil

Term	Description	Criteria
“trace”	trace gravel, trace sand, etc.	1% - 10%
“some”	some gravel, some sand, etc.	10% - 20%
Adjective	gravelly, sandy, silty and clayey	20% - 35%
“and”	and gravel, and sand, etc.	>35%
Noun	gravel, sand, silt, clay	>35% and main fraction

The standard terminology to describe cohesionless soils includes the compactness as determined by the Standard Penetration Test ‘N’ value:

Table b: Apparent Density of Cohesionless Soil

	‘N’ Value (blows/0.3 m)
Very Loose	N<5
Loose	5≤N<10
Compact	10≤N<30
Dense	30≤N<50
Very Dense	50≤N

The standard terminology to describe cohesive soils includes consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression tests or similar field and laboratory analysis, Standard Penetration Test 'N' values can also be used to provide an approximate indication of the consistency and shear strength of fine grained, cohesive soils:

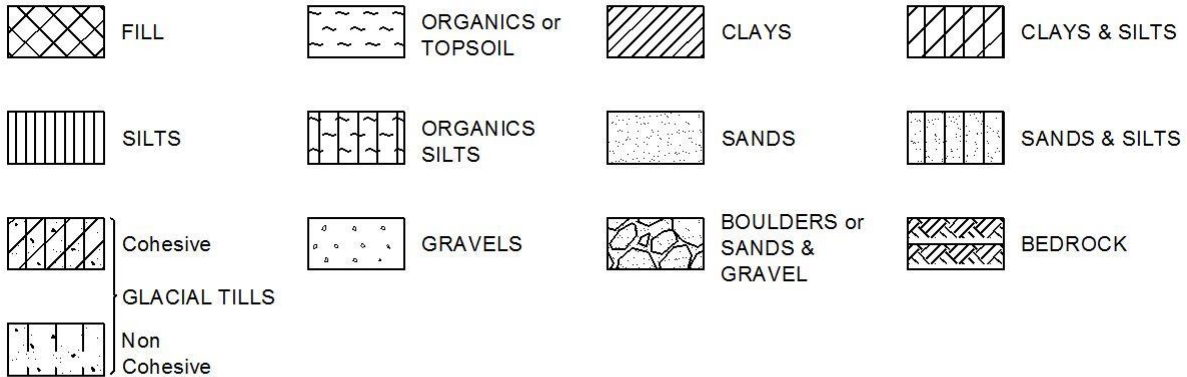
Table c: Consistency of Cohesive Soil

Consistency	Vane Shear Measurement (kPa)	'N' Value
Very Soft	<12.5	<2
Soft	12.5-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

Note: 'N' Value - The Standard Penetration Test records the number of blows of a 140 pound (64kg) hammer falling 30 inches (760mm), required to drive a 2 inch (50.8mm) O.D. split spoon sampler 1 foot (305mm). For split spoon samples where full penetration is not achieved, the number of blows is reported over the sampler penetration in meters (e.g. 50/0.15).

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:



WATER LEVEL MEASUREMENT



Open Borehole or Test Pit



Monitoring Well, Piezometer or Standpipe

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

SS	Split spoon sample (obtained from the Standard Penetration Test)
WS	Wash sample
BS	Bulk sample
TW	Thin wall sample or Shelby tube
PS	Piston sample
AS	Auger sample
VT	Vane test
GS	Grab sample
HQ, NQ, etc.	Rock core samples obtained with the use of standard size diamond drilling bits

STRESS AND STRAIN

u_w	kPa	Pore water pressure
r_u	1	Pore pressure ratio
σ	kPa	Total normal stress
σ'	kPa	Effective normal stress
τ	kPa	Shear stress
$\sigma_1, \sigma_2, \sigma_3$	kPa	Principal stresses
ε	%	Linear strain
$\varepsilon_1, \varepsilon_2, \varepsilon_3$	%	Principal strains
E	kPa	Modulus of linear deformation
G	kPa	Modulus of shear deformation
μ	1	Coefficient of friction

MECHANICAL PROPERTIES OF SOIL

m_v	kPa ⁻¹	Coefficient of volume change
c_c	1	Compression index
c_s	1	Swelling index
c_r	1	Recompression index
c_v	m ² /s	Coefficient of consolidation
H	m	Drainage path
T _v	1	Time factor
U	%	Degree of consolidation
σ'_{v0}	kPa	Effective overburden pressure
σ'_p	kPa	Preconsolidation pressure
τ_f	kPa	Shear strength
c'	kPa	Effective cohesion intercept
ϕ'	—°	Effective angle of internal friction
c_u	kPa	Apparent cohesion intercept
ϕ_u	—°	Apparent angle of internal friction
τ_R	kPa	Residual shear strength
τ_r	kPa	Remoulded shear strength
S_t	1	Sensitivity = c_u/τ_r

PHYSICAL PROPERTIES OF SOIL

P_s	kg/m ³	Density of solid particles
γ_s	kN/m ³	Unit weight of solid particles
ρ_w	kg/m ³	Density of water
γ_w	kN/m ³	Unit weight of water
ρ	kg/m ³	Density of soil
γ	kN/m ³	Unit weight of soil
ρ_d	kg/m ³	Density of dry soil
γ_d	kN/m ³	Unit weight of dry soil
ρ_{sat}	kg/m ³	Density of saturated soil
γ_{sat}	kN/m ³	Unit weight of saturated soil
ρ'	kg/m ³	Density of submerged soil
γ'	kN/m ³	Unit weight of submerged soil
e	1, %	Void ratio
n	1, %	Porosity
w	1, %	Water content
S_r	%	Degree of saturation
W_L	%	Liquid limit
W_P	%	Plastic limit
W_s	%	Shrinkage limit
I_P	%	Plasticity index = $(W_L - W_P)$
I_L	%	Liquidity index = $(W - W_P)/I_P$
I_C	%	Consistency index = $(W_L - W)/I_P$
e_{max}	1, %	Void ratio in loosest state
e_{min}	1, %	Void ratio in densest state
I_D	1	Density index = $(e_{max} - e)/(e_{max} - e_{min})$
D	mm	Grain diameter
D_n	mm	N percent - diameter
C_u	1	Uniformity coefficient
h	m	Hydraulic head or potential
q	m ³ /s	Rate of discharge
v	m/s	Discharge velocity
i	1	Hydraulic gradient
k	m/s	Hydraulic conductivity
j	kN/m ³	Seepage force

Brampton, Ontario

RECORD OF BOREHOLE No BH2-2

1 OF 3

METRIC

W.P. GWP 5151-21-00 LOCATION 5159526.4N, 294876.6E, NAD83 MTM Zone 10 ORIGINATED BY ST
 DIST NER HWY 11 BOREHOLE TYPE Truck Mounted CME 75 COMPILED BY EL
 DATUM Geodetic DATE 2023.11.15 - 2023.11.16 LATITUDE 46.575298 LONGITUDE -79.629466 CHECKED BY TL

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20	40	60	80						100	20
301.0	GROUND SURFACE																	
300.8	ASPHALT ~150 mm thick																	
0.2	SAND AND GRAVEL (FILL), trace silt, brown, moist, dense to very dense		SS1	SS	55													
						300												38 53 (9)
299.5	ROCKFILL, in soil (sand and gravel sized particles) matrix																	
1.5	- spoon refusal; suspected cobbles/boulders encountered, no recovery			NR	100													
						299												
	- sand with some gravel, brown, wet, very dense		SS3	SS	100													
						298												
	- spoon refusal; suspected cobbles/boulders encountered, no recovery			NR	100													
						297												
	- sand with some gravel, brown, wet, very dense		SS4	SS	100													
						296												
						295												
	- spoon refusal; suspected cobbles/boulders encountered, no recovery			NR	100													
						294												
	- spoon refusal; suspected cobbles/boulders encountered, no recovery			NR	100													

ONTARIO MTO HWY 11-2+1-SW2-V2.GPJ ONTARIO MTO.GDT 5/29/24

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+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Brampton, Ontario

RECORD OF BOREHOLE No BH-2

2 OF 3

METRIC

W.P. GWP 5151-21-00 LOCATION 5159526.4N, 294876.6E, NAD83 MTM Zone 10 ORIGINATED BY ST
 DIST NER HWY 11 BOREHOLE TYPE Truck Mounted CME 75 COMPILED BY EL
 DATUM Geodetic DATE 2023.11.15 - 2023.11.16 LATITUDE 46.575298 LONGITUDE -79.629466 CHECKED BY TL

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20	40	60	80						100	20
	ROCKFILL , in soil (sand and gravel sized particles) matrix <i>(continued)</i>																	
	- spoon refusal; suspected cobbles/boulders encountered, no recovery			NR	100													
290.3						292												
10.7	COBBLES AND BOULDERS , in soil (sand and gravel sized particles) matrix - spoon refusal; suspected boulders/rock fragments encountered			NR	100													
	- spoon refusal; suspected cobbles/boulders encountered, no recovery			NR	100													
						289												
	- spoon refusal; suspected cobbles/boulders encountered, no recovery			NR	100													
						288												
	- spoon refusal; suspected cobbles/boulders encountered, no recovery			NR	100													
						287												
						286												

ONTARIO MTO HWY 11-2+1-SW2-V2.GPJ ONTARIO MTO.GDT 5/29/24

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+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Brampton, Ontario

RECORD OF BOREHOLE No BH2-2

3 OF 3

METRIC

W.P. GWP 5151-21-00 LOCATION 5159526.4N, 294876.6E, NAD83 MTM Zone 10 ORIGINATED BY ST
 DIST NER HWY 11 BOREHOLE TYPE Truck Mounted CME 75 COMPILED BY EL
 DATUM Geodetic DATE 2023.11.15 - 2023.11.16 LATITUDE 46.575298 LONGITUDE -79.629466 CHECKED BY TL

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20	40	60	80						100	20
284.2	COBBLES AND BOULDERS , in soil (sand and gravel sized particles) matrix (<i>continued</i>) - spoon refusal; suspected cobbles/boulders encountered, no recovery			NR	100													
16.8	SILTY SAND , trace to some gravel, brown, wet, dense - spoon refusal; suspected cobbles/boulders encountered, no recovery		SS5	SS	41							o						
281.2	GRAVELLY SAND , trace to some silt, grey, moist, compact		SS6	SS	29							o						28 62 (10)
280.6	BOREHOLE TERMINATED AT ~ 20.4 m DEPTH Notes: 1. Groundwater level not measured due to water used for coring. 2. Borehole backfilled upon completion.																	

ONTARIO MTO HWY 11-2+1-SW2-V2.GPJ ONTARIO MTO.GDT 5/29/24

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Brampton, Ontario

RECORD OF BOREHOLE No BH2-3

2 OF 3

METRIC

W.P. GWP 5151-21-00 LOCATION 5159568.7N, 294842.7E, NAD83 MTM Zone 10 ORIGINATED BY ST
 DIST NER HWY 11 BOREHOLE TYPE Truck Mounted CME 75 COMPILED BY EL
 DATUM Geodetic DATE 2023.11.08 - 2023.11.10 LATITUDE 46.575677 LONGITUDE -79.629909 CHECKED BY TL

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20	40	60	80						100	20
289.3	ROCKFILL , in soil (sand and gravel sized particles) matrix <i>(continued)</i>																	
289.1	COBBLES AND BOULDERS , in soil (sand and gravel sized particles) matrix - spoon refusal; suspected boulders/rock fragments encountered			NR	100													
	- spoon refusal; suspected cobbles/boulders encountered, no recovery			NR	100													
	- spoon refusal; suspected cobbles/boulders encountered, no recovery			NR	100													
	- spoon refusal; suspected cobbles/boulders encountered, no recovery			NR	100													
283.9	GRAVELLY SAND , trace silt, brown, moist, very dense		SS5	SS	127													21 72 (7)
283.2	BEDROCK , grey with pink embedments, quartzofeldspathic gneiss		RUN 1	NQ														

ONTARIO MTO HWY 11-2+1-SW2-V2.GPJ ONTARIO MTO.GDT 5/29/24

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+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Brampton, Ontario

RECORD OF BOREHOLE No BH2-3

3 OF 3

METRIC

W.P. GWP 5151-21-00 LOCATION 5159568.7N, 294842.7E, NAD83 MTM Zone 10 ORIGINATED BY ST
 DIST NER HWY 11 BOREHOLE TYPE Truck Mounted CME 75 COMPILED BY EL
 DATUM Geodetic DATE 2023.11.08 - 2023.11.10 LATITUDE 46.575677 LONGITUDE -79.629909 CHECKED BY TL

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa								
						20	40	60	80	100	20	40	60		GR SA SI CL	
	BEDROCK , grey with pink embedments, quartzofeldspathic gneiss (<i>continued</i>) Run 1: Start/End: 15.2 to 16.6 m Recovery: 100% RQD: 60% Run 2: Start/End: 16.6 to 18.1 m Recovery: 100% RQD: 94%					282										
			RUN 2	NQ			281									
280.3 18.1	BOREHOLE TERMINATED AT ~ 18.1 m DEPTH Notes: 1. Groundwater level not measured due to water used for coring. 2. Borehole backfilled upon completion.															

ONTARIO MTO HWY 11-2+1-SW2-V2.GPJ ONTARIO MTO.GDT 5/29/24

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Brampton, Ontario

RECORD OF BOREHOLE No BH2-4

1 OF 2

METRIC

W.P. GWP 5151-21-00 LOCATION 5159555.4N, 294812.4E, NAD83 MTM Zone 10 ORIGINATED BY AM
 DIST NER HWY 11 BOREHOLE TYPE Hilti DD250 COMPILED BY EL
 DATUM Geodetic DATE 2024.03.28 - 2024.04.02 LATITUDE 46.575558 LONGITUDE -79.630304 CHECKED BY TL

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20	40	60	80						100	20
289.0	GROUND SURFACE																	
0.0	PEAT, fibrous (grass), black, saturated		SS1	SS	1													
287.8			SS2	SS	3													
1.2	SILT, trace sand, trace clay, brown, saturated, very loose																	
287.5																		
1.5	SAND, brown to grey, wet to saturated, compact -cobble/boulders encountered within layer		SS3	SS	24													
			SS4	SS	12													
			SS5	SS	20													
	-NQ Coring procedures commenced			NQ														
				NQ														
			SS6	SS	6													
283.4	COBBLES AND BOULDERS, in soil (sand and gravel sized particles) matrix - spoon refusal; suspected boulders/rock fragments encountered		SS7	SS	100/ 0.25m													
5.6																		
	- pushed a rock, no recovery			NR	14													

ONTARIO MTO HWY 11-2+1-SW2-V2.GPJ ONTARIO MTO.GDT 5/29/24

Continued Next Page

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE


Brampton, Ontario

RECORD OF BOREHOLE No BH2-4

2 OF 2

METRIC

W.P. GWP 5151-21-00 LOCATION 5159555.4N, 294812.4E, NAD83 MTM Zone 10 ORIGINATED BY AM
 DIST NER HWY 11 BOREHOLE TYPE Hilti DD250 COMPILED BY EL
 DATUM Geodetic DATE 2024.03.28 - 2024.04.02 LATITUDE 46.575558 LONGITUDE -79.630304 CHECKED BY TL

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20	40	60	80						100	20
280.9 8.1	SAND , grey, saturated, compact		SS8	SS	16													
280.3 8.7	BOREHOLE TERMINATED AT ~ 8.7 m DEPTH Notes: 1. Groundwater level not measured due to water used for coring. 2. Borehole backfilled upon completion.																	

ONTARIO MTO HWY 11-2+1-SW2-V2.GPJ ONTARIO MTO.GDT 5/29/24

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Brampton, Ontario

RECORD OF BOREHOLE No BH2-5

2 OF 3

METRIC

W.P. GWP 5151-21-00 LOCATION 5159515.0N, 294885.1E, NAD83 MTM Zone 10 ORIGINATED BY SF
 DIST NER HWY 11 BOREHOLE TYPE Truck Mounted CME 75 COMPILED BY EL
 DATUM Geodetic DATE 2023.11.20 - 2023.11.20 LATITUDE 46.575195 LONGITUDE -79.629354 CHECKED BY TL

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20	40	60	80						100	20
	ROCKFILL , in soil (sand and gravel sized particles) matrix <i>(continued)</i>			NQ		293												
				NQ		292												
				NQ		291												
290.3 11.4	SAND AND GRAVEL TO GRAVELLY SAND , trace to some silt, brown to grey, wet, compact to very dense		SS6	SS	28	290												
			SS7	SS	34	289												
						288												
						287												
						286												

ONTARIO MTO HWY 11-2+1-SW2-V2.GPJ ONTARIO MTO.GDT 5/29/24

Continued Next Page

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Brampton, Ontario

RECORD OF BOREHOLE No BH2-6

1 OF 2

METRIC

W.P. GWP 5151-21-00 LOCATION 5159572.5N, 294795.8E, NAD83 MTM Zone 10 ORIGINATED BY DM
 DIST NER HWY 11 BOREHOLE TYPE Hilti DD250 COMPILED BY EL
 DATUM Geodetic DATE 2024.04.08 - 2024.04.08 LATITUDE 46.575711 LONGITUDE -79.630521 CHECKED BY TL

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)								
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20						40	60	80	100	20	40	60	GR
288.9	GROUND SURFACE																				
0.0	TOPSOIL, ~150 mm thick, black, moist - grass and rootlets observed		SS1	SS	WH							308									
288.7																	149				
0.2	ORGANIC SILT, amorphous, brown, moist, very loose, - rootlets observed																				
288.1																					
0.8	SILT, some clay, trace sand, brown, moist, loose		SS2	SS	7													0	6	83	11
287.8	COBBLES AND BOULDERS, in soil (sand and gravel sized particles) matrix -NQ Coring procedures commenced																				
287.1																					
1.1	SAND, trace to some gravel, trace silt, brownish grey to grey, wet to saturated, loose to dense -cobbles/boulders encountered within layer		SS3	SS	25/ 0.1 m																
285.9																					
3.0																					
285.0																					
			SS4	SS	8																
284.0																					
283.0																					
			SS5	SS	6																
282.0																					
281.0																					

ONTARIO MTO HWY 11-2+1-SW2-V2.GPJ ONTARIO MTO.GDT 5/29/24

Continued Next Page

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Brampton, Ontario

RECORD OF BOREHOLE No BH2-6

2 OF 2

METRIC

W.P. GWP 5151-21-00 LOCATION 5159572.5N, 294795.8E, NAD83 MTM Zone 10 ORIGINATED BY DM
 DIST NER HWY 11 BOREHOLE TYPE Hilti DD250 COMPILED BY EL
 DATUM Geodetic DATE 2024.04.08 - 2024.04.08 LATITUDE 46.575711 LONGITUDE -79.630521 CHECKED BY TL

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)													
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20	40	60	80						100	20	40	60	GR	SA	SI	CL					
278.8	SAND, trace to some gravel, trace silt, brownish grey to grey, wet to saturated, loose to dense -cobbles/boulders encountered within layer (continued)																												
10.1			BOREHOLE TERMINATED AT ~ 10.1 m DEPTH Notes: 1. Groundwater level not measured due to water used for coring. 2. 40 mm inside diameter piezometer installed upon completion screened from approximately 3.1 m to 6.1 m below ground surface 3. Water level measured in piezometer below ground surface: <table border="1"> <tr> <th>Date (m)</th> <th>Depth(m)</th> <th>Elev.</th> </tr> <tr> <td>4/24/24</td> <td>0.1</td> <td>288.8</td> </tr> <tr> <td>5/15/24</td> <td>0.0</td> <td>288.9</td> </tr> <tr> <td>5/28/24</td> <td>0.4</td> <td>288.5</td> </tr> </table>	Date (m)	Depth(m)	Elev.	4/24/24	0.1	288.8	5/15/24	0.0	288.9	5/28/24	0.4	288.5														
Date (m)	Depth(m)	Elev.																											
4/24/24	0.1	288.8																											
5/15/24	0.0	288.9																											
5/28/24	0.4	288.5																											

ONTARIO MTO HWY 11-2+1-SW2-V2.GPJ ONTARIO MTO.GDT 5/29/24

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Brampton, Ontario

RECORD OF BOREHOLE No BH2-7

1 OF 1

METRIC

W.P. GWP 5151-21-00 LOCATION 5159538.8N, 294822.8E, NAD83 MTM Zone 10 ORIGINATED BY BK
 DIST NER HWY 11 BOREHOLE TYPE Hilti DD250 COMPILED BY EL
 DATUM Geodetic DATE 2024.03.25 - 2024.03.27 LATITUDE 46.575409 LONGITUDE -79.630168 CHECKED BY TL

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20	40	60	80						100	20	40	60
289.2	GROUND SURFACE																			
0.0	ORGANIC SILT/CLAY , amorphous with trace of vegetation and rootless, dark brown to black, wet, soft		SS1	SS	2															
288.4	SAND AND GRAVEL TO GRAVELLY SAND , grey, moist to wet, loose to compact		SS2	SS	7															
			SS3	SS	16															
			SS4	SS	22															
			SS5	SS	9															
284.6	COBBLES AND BOULDERS , in soil (sand and gravel sized particles) matrix																			
4.6																				
282.7	BOREHOLE TERMINATED AT ~ 6.5 m DEPTH																			
6.5	Notes: 1. Groundwater level not measured due to water used for coring. 2. Borehole backfilled upon completion.																			

ONTARIO MTO HWY 11-2+1-SW2-V2.GPJ ONTARIO MTO.GDT 5/29/24

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Highway 11 – 2+1 Roadway Model Project: Site SW2
Proboholes
Drilling Date: July 31, 2025

PH2-1 Latitude: 46.575496, Longitude: -79.629231

0 – 125 mm Topsoil, dark brown, wet
125 – 375 mm Sand, trace gravel, grey, wet
Refusal at 375 mm

PH2-5 Latitude: 46.575662, Longitude: -79.629353

0 – 150 mm Topsoil, dark brown, wet
150 – 475 mm Silt, some sand, trace gravel,
brown, moist
Refusal at 475 mm

PH2-2 Latitude: 46.575457, Longitude: -79.629145

0 – 125 mm Topsoil, dark brown, wet
125 – 600 mm Sand, trace gravel, grey, wet
Refusal at 600 mm

PH2-6 Latitude: 46.575952, Longitude: -79.629857

0 – 125 mm Topsoil, dark brown, wet
125 – 375 mm Silty sand, trace gravel, brown,
moist
Refusal at 375 mm

PH2-3 Latitude: 46.575476, Longitude: -79.629093

0 – 175 mm Topsoil, dark brown, wet
Refusal at 175 mm

PH2-7 Latitude: 46.575999, Longitude: -79.629785

0 – 150 mm Topsoil, dark brown, wet
Refusal at 150 mm

PH2-4 Latitude: 46.575628, Longitude: -79.629399

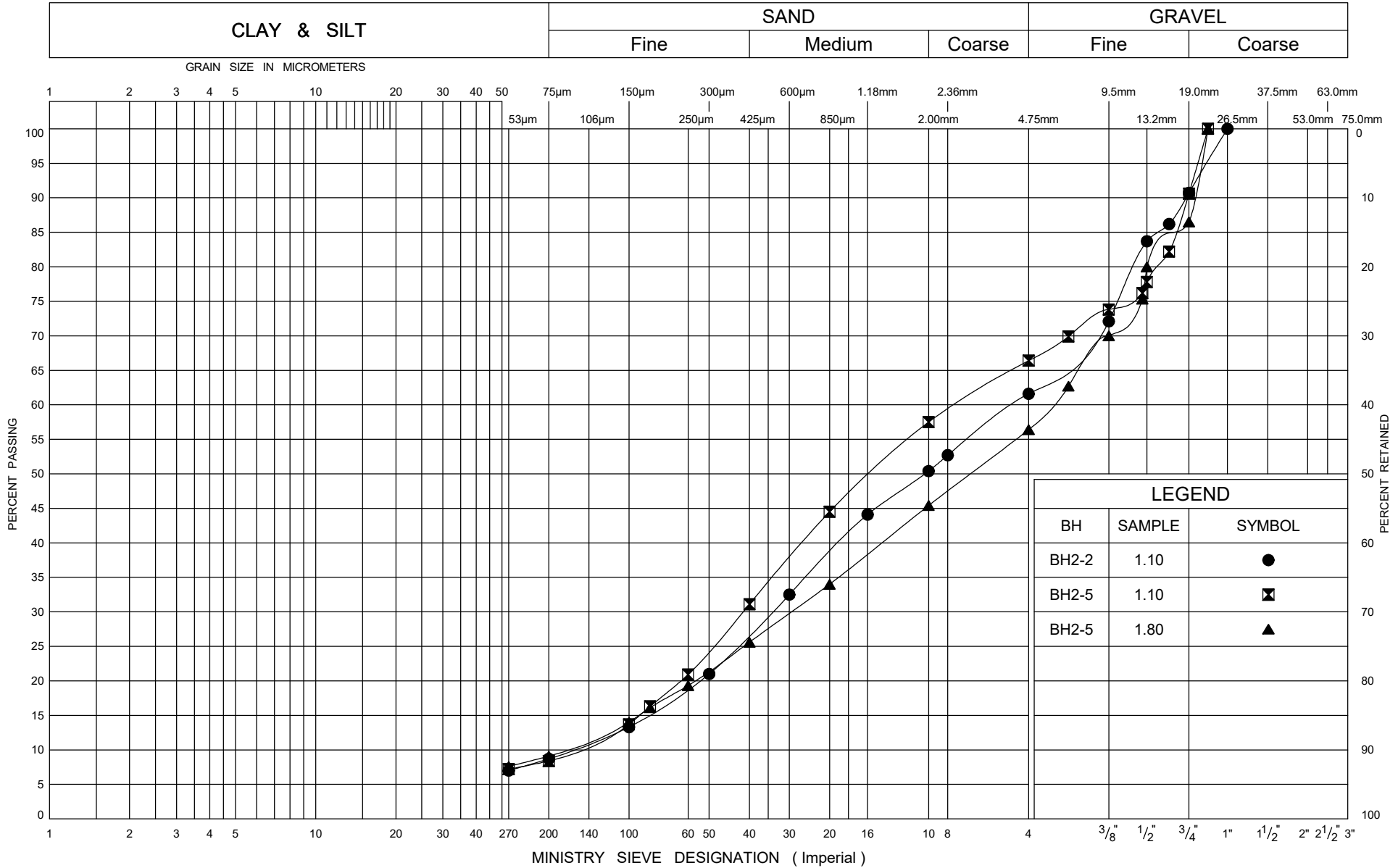
0 – 100 mm Topsoil, dark brown, wet
100 – 475 mm Silt, some sand, trace gravel,
brown, moist
Refusal at 475 mm

PH2-8 Latitude: 46.576080, Longitude: -79.629996

0 – 125 mm Topsoil, dark brown, wet
125 – 375 mm Silty sand, trace gravel, brown,
moist
Refusal at 375 mm

Appendix D –
Laboratory Data

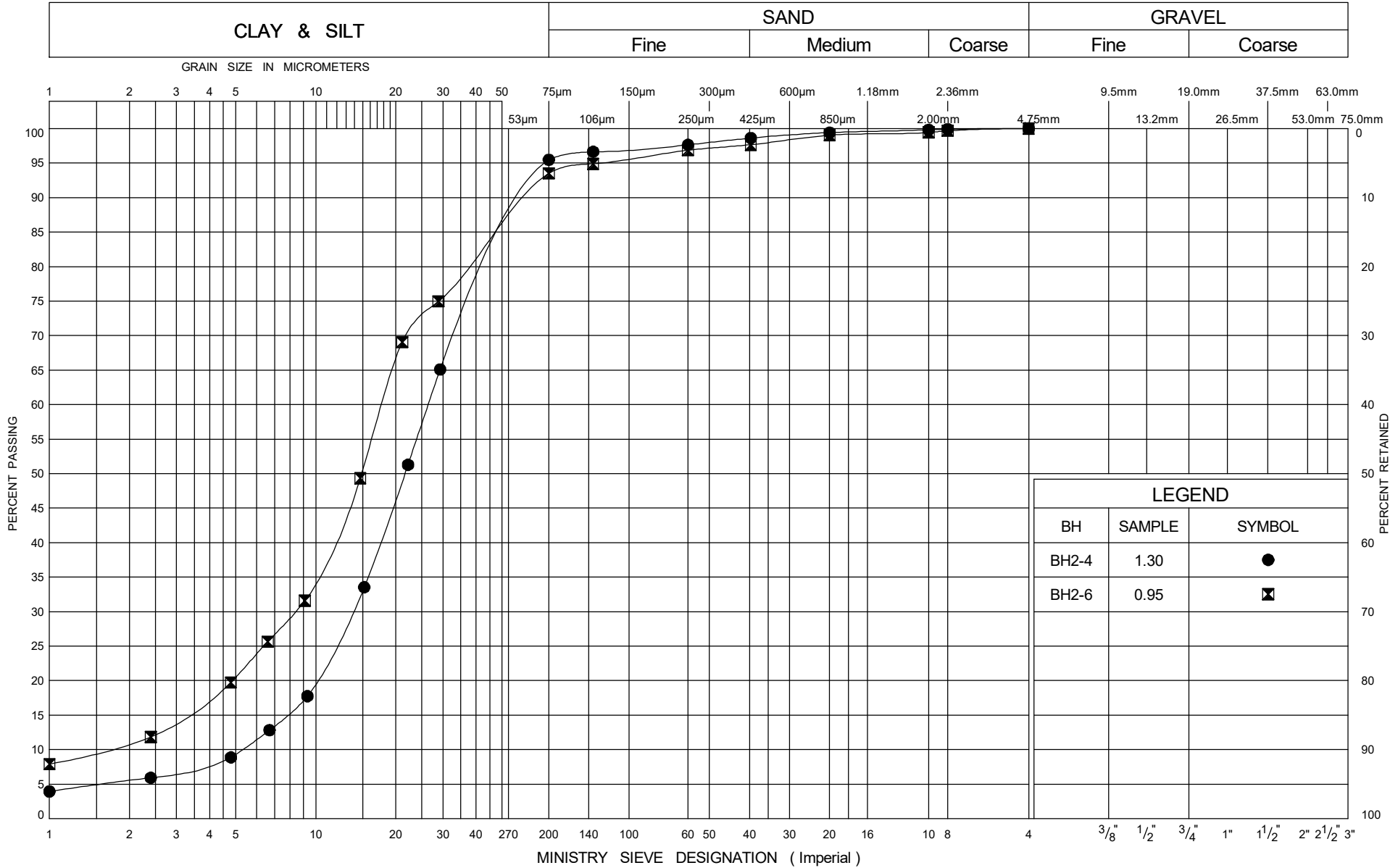
UNIFIED SOIL CLASSIFICATION SYSTEM



GRAIN SIZE DISTRIBUTION
Cohesionless Fill: Sand and Gravel/Gravelly Sand

FIG No 1
W PGWP 5151-21-00
Highway 11 2+1 - SW2

UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND		
BH	SAMPLE	SYMBOL
BH2-4	1.30	●
BH2-6	0.95	⊠



GRAIN SIZE DISTRIBUTION

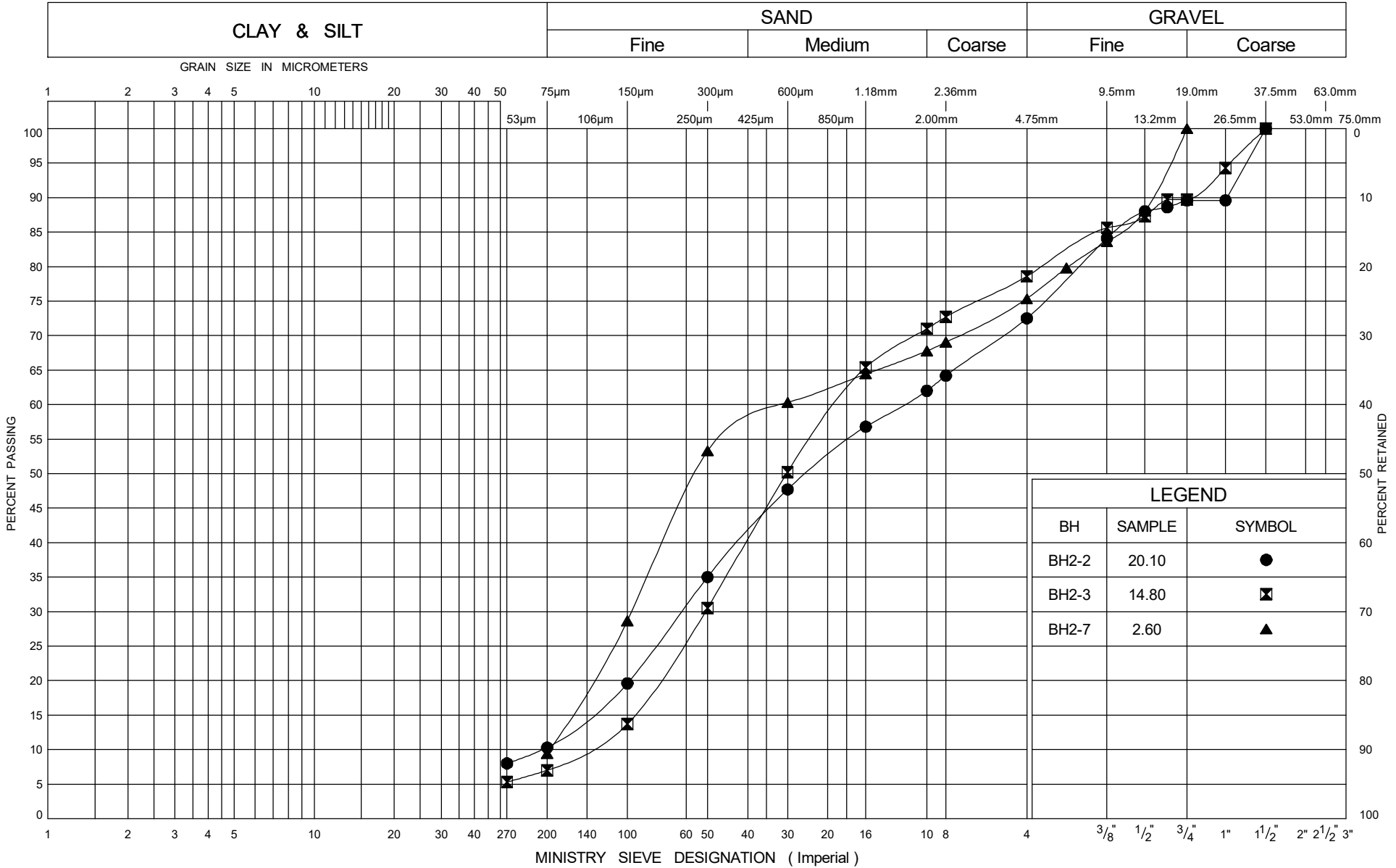
Silt

FIG No 2

W P GWP 5151-21-00

Highway 11 2+1 - SW2

UNIFIED SOIL CLASSIFICATION SYSTEM



GRAIN SIZE DISTRIBUTION
Sand and Gravel to Gravelly Sand

FIG No 3
W P GWP 5151-21-00
Highway 11 2+1 - SW2



Your Project #: ADM-23010055-A0
 Site Location: SW2, HWY 11 2+1
 Your C.O.C. #: 139121

Attention: Thomas Lardner

exp Services Inc
 Brampton Branch
 1595 Clark Blvd
 Brampton, ON
 CANADA L6T 4V1

Report Date: 2024/04/24
 Report #: R8120667
 Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C4B2854

Received: 2024/04/16, 16:27

Sample Matrix: Soil
 # Samples Received: 1

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Chloride (20:1 extract)	1	2024/04/19	2024/04/19	CAM SOP-00463	MOE E3013 m
Conductivity	1	2024/04/19	2024/04/19	CAM SOP-00414	OMOE E3530 v1 m
Moisture (Subcontracted) (1, 2)	1	N/A	2024/04/20	AB SOP-00002	CCME PHC-CWS m
Sulphide in Soil (1)	1	N/A	2024/04/21	AB SOP-00080	EPA9030B/SM4500S2-DF
pH CaCl2 EXTRACT	1	2024/04/18	2024/04/18	CAM SOP-00413	EPA 9045 D m
Redox Potential (3)	1	2024/04/19	2024/04/19	CAM SOP-00421	SM 24 2580 B
Resistivity of Soil	1	2024/04/16	2024/04/19	CAM SOP-00414	SM 24 2510 m
Sulphate (20:1 Extract)	1	2024/04/19	2024/04/19	CAM SOP-00464	MOE E3013 m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, EPA, APHA or the Quebec Ministry of Environment.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested. This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

- (1) This test was performed by Bureau Veritas Calgary (19th), 4000 19th Street NE, Calgary, AB, T2E 6P8
- (2) Offsite analysis requires that subcontracted moisture be reported.



Your Project #: ADM-23010055-A0
Site Location: SW2, HWY 11 2+1
Your C.O.C. #: 139121

Attention: Thomas Lardner

exp Services Inc
Brampton Branch
1595 Clark Blvd
Brampton, ON
CANADA L6T 4V1

Report Date: 2024/04/24
Report #: R8120667
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C4B2854

Received: 2024/04/16, 16:27

(3) Oxidation-Reduction Potential (ORP) values are determined using a Ag/AgCl reference electrode. The test is therefore, not SCC accredited for this matrix.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:

Patricia Legette, Project Manager
Email: Patricia.Legette@bureauveritas.com
Phone# (905)817-5799

=====

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SOIL CORROSIVITY PACKAGE (SOIL)

Bureau Veritas ID		YXK801		
Sampling Date		2024/04/10 16:00		
COC Number		139121		
	UNITS	BH2-6, SS1B (2-3')	RDL	QC Batch
Calculated Parameters				
Resistivity	ohm-cm	1400		9336736
CONVENTIONALS				
Redox Potential	mV	260	N/A	9343452
Inorganics				
Soluble (20:1) Chloride (Cl-)	ug/g	400	20	9343427
Conductivity	umho/cm	709	2	9344150
Available (CaCl2) pH	pH	5.35		9341419
Soluble (20:1) Sulphate (SO4)	ug/g	48	20	9343428
Sulphide	mg/kg	<1.3 (1)	1.3	9349164
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable (1) Detection limits raised due to high moisture content, samples contain => 50% moisture. Sample contained greater than 10% headspace at time of extraction.				



**BUREAU
VERITAS**

Bureau Veritas Job #: C4B2854
Report Date: 2024/04/24

exp Services Inc
Client Project #: ADM-23010055-A0
Site Location: SW2, HWY 11 2+1
Sampler Initials: DM

RESULTS OF ANALYSES OF SOIL

Bureau Veritas ID		YXK801		
Sampling Date		2024/04/10 16:00		
COC Number		139121		
	UNITS	BH2-6, SS1B (2-3')	RDL	QC Batch
Physical Testing				
Moisture-Subcontracted	%	61	0.30	9349163
RDL = Reportable Detection Limit QC Batch = Quality Control Batch				



BUREAU
VERITAS

Bureau Veritas Job #: C4B2854
Report Date: 2024/04/24

exp Services Inc
Client Project #: ADM-23010055-A0
Site Location: SW2, HWY 11 2+1
Sampler Initials: DM

TEST SUMMARY

Bureau Veritas ID: YXK801
Sample ID: BH2-6, SS1B (2-3')
Matrix: Soil

Collected: 2024/04/10
Shipped:
Received: 2024/04/16

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	SKAL/EC	9343427	2024/04/19	2024/04/19	Alina Dobreanu
Conductivity	AT	9344150	2024/04/19	2024/04/19	Gurparteek KAUR
Moisture (Subcontracted)	BAL	9349163	N/A	2024/04/20	Ashley Henderson
Sulphide in Soil	SPEC	9349164	N/A	2024/04/21	Irene Donita Villanueva
pH CaCl2 EXTRACT	AT	9341419	2024/04/18	2024/04/18	Kien Tran
Redox Potential	COND	9343452	2024/04/19	2024/04/19	Gurparteek KAUR
Resistivity of Soil		9336736	2024/04/19	2024/04/19	Automated Statchk
Sulphate (20:1 Extract)	SKAL/EC	9343428	2024/04/19	2024/04/19	Alina Dobreanu



BUREAU
VERITAS

Bureau Veritas Job #: C4B2854
Report Date: 2024/04/24

exp Services Inc
Client Project #: ADM-23010055-A0
Site Location: SW2, HWY 11 2+1
Sampler Initials: DM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.0°C
-----------	-------

Results relate only to the items tested.



BUREAU
VERITAS

Bureau Veritas Job #: C4B2854

Report Date: 2024/04/24

QUALITY ASSURANCE REPORT

exp Services Inc

Client Project #: ADM-23010055-A0

Site Location: SW2, HWY 11 2+1

Sampler Initials: DM

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9341419	Available (CaCl2) pH	2024/04/18			100	97 - 103			1.1	N/A
9343427	Soluble (20:1) Chloride (Cl-)	2024/04/19	95	70 - 130	96	70 - 130	<20	ug/g	NC	35
9343428	Soluble (20:1) Sulphate (SO4)	2024/04/19	NC	70 - 130	96	70 - 130	<20	ug/g	6.4	35
9343452	Redox Potential	2024/04/19			102	95 - 105			0.75	35
9344150	Conductivity	2024/04/19			104	90 - 110	<2	umho/cm	0.24	10
9349163	Moisture-Subcontracted	2024/04/20					<0.30	%		
9349164	Sulphide	2024/04/21	80	75 - 125	103	75 - 125	<0.5	mg/kg		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).



BUREAU
VERITAS

Bureau Veritas Job #: C4B2854
Report Date: 2024/04/24

exp Services Inc
Client Project #: ADM-23010055-A0
Site Location: SW2, HWY 11 2+1
Sampler Initials: DM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Cristina Carriere

Cristina Carriere, Senior Scientific Specialist

Veronica Falk

Veronica Falk, B.Sc., P.Chem., QP, Scientific Specialist, Organics

Suwan

Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

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6740 Campbell Road, Mississauga, Ontario L5N 2L8
 Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266
 CAM FCD-01191/5

REC'D IN LONDON

CHAIN OF CUSTODY RECORD

139121 Page ____ of ____

Invoice Information		Report Information (if differs from invoice)				Project Information (where applicable)				Turnaround Time (TAT) Required			
Company Name: #17488 exp Services Inc.		Company Name: exp Services inc				Quotation #:				<input type="checkbox"/> Regular TAT (5-7 days) Most analyses			
Contact Name: Accounts Payable		Contact Name: Daniel Mroz				P.O. #/ AFE#:				PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS			
Address: 1595 Clark Blvd. Brampton, ON L6T 4V1		Address: Also email: thomas.lardner@exp.com				Project #: ADM-23010055-A0				Rush TAT (Surcharges will be applied)			
Phone: 905-793-9800 Fax:		Phone: 519-317-6526 Fax:				Site Location: SW2, Hwy 11 Z+1				<input type="checkbox"/> 1 Day <input type="checkbox"/> 2 Days <input type="checkbox"/> 3-4 Days			
Email: AP@exp.com		Email: daniel.mroz@exp.com				Site #:				Date Required:			
MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS LABORATORIES' DRINKING WATER CHAIN OF CUSTODY						Site Location Province:				Rush Confirmation #:			
Regulation 153		Other Regulations				Analysis Requested							
<input type="checkbox"/> Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Med/ Fine <input type="checkbox"/> Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse <input type="checkbox"/> Table 3 <input type="checkbox"/> Agri/ Other <input type="checkbox"/> Table _____ FOR RSC (PLEASE CIRCLE) Y / N		<input type="checkbox"/> CCME <input type="checkbox"/> Sanitary Sewer Bylaw <input type="checkbox"/> IMISA <input type="checkbox"/> Storm Sewer Bylaw <input type="checkbox"/> PWQO Region <input type="checkbox"/> Other (Specify) _____ <input type="checkbox"/> REG 558 (MIN. 3 DAY TAT REQUIRED)				# OF CONTAINERS SUBMITTED FIELD FILTERED (CIRCLE) Metals / Hg / CrVI BTEX/ PHC F1 PHCs F2 - F4 VOCs REG 153 METALS & INORGANICS REG 153 ICPMS METALS REG 153 METALS (Hg, Cr VI, ICPMS Metals, HWS - B) Corrosivity Suite						LABORATORY USE ONLY CUSTODY SEAL Present Intact Y/N Y/N N/N 4/4/4 6/9/9 COOLING MEDIA PRESENT: Y/N	
Include Criteria on Certificate of Analysis: Y / N													
SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS													
SAMPLE IDENTIFICATION		DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX									
1	BH2-6, SS1B (2-3')	2024/04/10	16:00	Soil									
2													
3													
4													
5													
6													
7													
8													
9													
10													
RELINQUISHED BY: (Signature/Print)		DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)		DATE: (YYYY/MM/DD)	TIME: (HH:MM)	BV JOB #					
Daniel Mroz Daniel Mroz		2024/04/16	16:30	S. P. Sowmya Raganani		2024/04/16	16:27						
				Alan		2024/04/16	17:55						



NONT-2024-04-1497

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COC-1004 (06/19)

752406

White: Maxxam ~ Yellow: Client

Appendix E –
Bedrock Core Photograph



Photograph E1. Rock cores from BH2-5. Top: Run 1, Middle: Run 2, Bottom: Run 2 continued.