

APPENDIX

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HYDROGEOLOGICAL ASSESSMENT



Hydrogeological Investigation

Environmental Assessment Study of Arterial Roads within
Highway 427 Industrial Secondary Plan Area 47
Brampton, Ontario
Project No. TP115086

Prepared for:

Corporation of the City of Brampton

2 Wellington Street West, Brampton, Ontario, L6Y 4R2

May 2, 2022

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1.0 Introduction

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood), was retained by the City of Brampton (City) to conduct Phases 3 and 4 of a Municipal Class Environmental Assessment (MCEA) for improvements to existing roads and construction of new roads in the Highway 427 Industrial Secondary Plan Area 47 (SPA47) (Site) in Brampton, Ontario. The improvements will include widening of existing roads Coleraine Drive, Clarkway Drive and Countryside Drive, and building of two new arterial roads named Arterial A2 and East-West Arterial. Figure 1 shows the location of the Site and the sections of roads to be improved and built. This report provides the results of a hydrogeological investigation conducted as part of this MCEA.

At the time of writing this report, access has not yet been provided to conduct the geotechnical and hydrogeological investigations along the middle portion of East-West Arterial and along the northwestern section of Arterial A2 southeast of Mayfield Road. Therefore, no assessment for these areas could be provided in this report. These areas will be assessed during the detailed design stage of the project.

1.1 Purpose and Scope of Work

The purpose of this hydrogeological investigation was to characterize the soil, groundwater and surface water conditions at the Site, as well as to investigate the use of private water wells within 500 m of the road alignments.

The scope of work for the hydrogeological investigation included the following:

- Installation of monitoring wells along the road alignments.
- Monitoring of groundwater levels in monitoring wells.
- Identification of the presence of groundwater seeps near the proposed creek crossings.
- Completion of single well response tests and estimation of hydraulic conductivity.
- Characterization of local streams and monitoring of surface water levels and flows at stream crossings.
- Preparation of stratigraphical profiles along the road alignments.
- Review of private water wells within 500 m of the road alignments.
- Preliminary estimation of dewatering rates at culvert locations and recommendations on permitting requirements.
- Review of existing conditions and identification of potential groundwater impacts from the planned works.
- Preparation of a report to provide the results of the hydrogeological investigation.

2.0 Coleraine Drive

The section of Coleraine Drive that will be reconstructed and widened is 2.3 km long between Mayfield Road in the northwest and Highway 50 in the southeast (Figure 1). The proposed widening of Coleraine Drive will increase the number of lanes from two to four. The reconstruction of Coleraine Drive includes replacing one box culvert to allow for water in Rainbow Creek to continue to cross underneath Coleraine Drive approximately 625 m southeast of Mayfield Road (Figure 2). There is also a small pipe culvert approximately 985 m southeast of Mayfield Road.

2.1 Existing Conditions

Existing conditions were evaluated within a 500-m study area around the section of Coleraine Drive that will be reconstructed. The entire Coleraine Drive study area is in the Peel Plain physiographic region consisting of bevelled till plains (Figure 3). Surface geology along the majority of the Coleraine Drive study area consists of glaciolacustrine deposits of clay and silt. Along the northwestern portion, clay to silt till predominates (Figure 4). The underlying bedrock is composed of limestone, interbedded with shale at depth, in the Georgian Bay Formation from the Ordovician Period.

A Site plan showing the locations of the boreholes and monitoring wells is provided as Figure 5a and the borehole logs are provided in Appendix A. Twenty-four boreholes and one monitoring well were installed along Coleraine Drive, designated A1 to A31, S1 and S2. The monitoring well was designated A23/S1 but is referred to in this report only as S1 for simplicity. The A-series boreholes were drilled to depths ranging from 1.2 to 5 metres below ground surface (m BGS) and S1 and S2 were drilled to 9.4 m BGS. The S-series boreholes are structural boreholes and monitoring wells installed at stream crossings where culverts will be replaced or installed.

A geological profile around Culvert S1 is shown on Figure 5b. The stratigraphy beneath the road alignment consists of one to two metres of fill, underlain by stiff to hard silty clay to clayey silt with trace sand and gravel, occasionally some sand, to the maximum depth of investigation, up to 9.4 m BGS. Monitoring well S1 was screened from 6.1 to 9.2 m BGS in the native clay and silt. The static groundwater level in S1 was measured on 4 May 2020 to be 0.87 m BGS, equivalent to 221.93 metres above mean sea level (m AMSL) (Table 1).

Wood identified the presence of 78 water well records within 500 m of the proposed road reconstruction, shown on Figure 5c. Of the 78 water well records, 29 are listed as water supply wells. These wells are spread out throughout the study area.

Land use around Coleraine Drive is shown on Figure 5d. The majority of the land use around Coleraine Drive is agricultural, with a few rural residential areas, some wetlands and meadows, along with a large vacant lot and an industrial lot both situated northeast of Coleraine Drive at the southeastern end of the study area. The land use data are from the Toronto Region Conservation Authority (TRCA – 2017).

Most of the Coleraine Drive study area is within the Humber River Watershed, as shown on Figure 5f. The Humber River Watershed has an area of 911 km² and is the largest within the jurisdiction of the TRCA.

Rainbow Creek is the main watercourse that provides drainage in the study area and is part of the headwaters for the Humber River. Rainbow Creek starts around Mayfield Road, approximately 400 m northeast of Coleraine Drive, and flows south-southeast across the Site, intersecting Coleraine Drive approximately 625 m southeast of Mayfield Road at monitoring well S1 (Figure 5e). From here, some water flows beneath Coleraine Drive through a box culvert, named Culvert S1, and continues along a channel along the southwestern side of the road and some water flows along the northeastern side of the road. Approximately 360 m farther downstream at a smaller pipe culvert, from which the stream continues to flow south-southeast of Coleraine Drive. These are the only two culverts along Coleraine Drive within the study area.

Streamflow monitoring was completed in Rainbow Creek upstream and downstream of Culvert S1 on 12 May 2020. The water depths at both stations were approximately 0.2 m but there was no measurable flow upstream, while the flow downstream of the box culvert was approximately 1.1 litres per second (l/s), equivalent to 99 m³/day (Table 2).

Table 2: Streamflow along Coleraine Drive

Culvert	Upstream (m ³ /day)	Downstream (m ³ /day)
S1	0	99

The natural habitat within the study area includes a few disconnected meadows, wetlands and one wooded area, most along Rainbow Creek (Figure 5g). One larger strip of land is classified as a meadow that extends from Coleraine Drive southwest to Rainbow Creek in the southeastern portion of the study area.

2.2 Water Taking

Culvert S1 along Coleraine Drive is underlain by silty clay to clayey silt fill overlying silty clay to clayey silt till. A rising head single well response test (SWRT) was completed in monitoring well S1 adjacent to Culvert S1 on 4 May 2020. Water was purged from the well and the water level then monitored using a pressure transducer installed in the well as it recovered back to the static condition. Water levels were also measured manually to verify the transducer readings. Recovery data were analyzed using the Bouwer-Rice solution in AQTESOLV version 4.5. The software incorporates the transducer water level data collected during the SWRT and monitoring well construction details to estimate the hydraulic conductivity of the soil formation at the well screen level. The estimated hydraulic conductivity in S1 was calculated to be 1.2×10⁻⁶ m/s (Table 1). The results of the hydraulic conductivity analysis are provided in Appendix B.

2.2.1 Dewatering Rates

During the road reconstruction and culvert replacement, open trench excavations will be used for the installation of utilities and new structures. Dewatering rate estimates for both installation of a box culvert and installation of underground utilities were calculated. In addition to potential removal of groundwater, runoff water from precipitation events may also need to be removed.



2.2.1.1 Assumptions

The following assumptions were used in calculating estimates of dewatering rates, which are based on information provided and Site conditions encountered during the investigation:

- ▶ culvert dimensions of 10 m long, 9 m wide and 4 m deep
- ▶ utility excavation dimensions of 15 m long, 3 m wide and 4 m deep
- ▶ only one excavation is open at any one time
- ▶ hydraulic conductivity of 1.2×10^{-6} m/s from monitoring well S1
- ▶ groundwater depth of 0.87 m in monitoring well S1 on 4 May 2020 with seasonal variation up to 0.5 m higher
- ▶ maximum aquifer thickness of 5 m
- ▶ radial, steady-state flow is assumed for inflow to trench ends
- ▶ linear, steady-state flow is assumed for inflow to trench sides
- ▶ the surficial aquifer is assumed to be unconfined and hydrogeologically homogeneous
- ▶ any surface water is beyond the dewatering radius of influence such that it does not provide potential recharge to groundwater
- ▶ an uncertainty factor of 3 has been incorporated into the dewatering rate estimations to account for:
 - potential variability in the hydraulic conductivity
 - initial depletion of aquifer storage, a temporary response to dewatering; i.e. the initial dewatering rate should decrease to the expected rate once equilibrium conditions are reached
 - infiltration or runoff from precipitation events.

2.2.1.2 Analytical Equation

The amount of groundwater flow into an excavation that is trench-shaped under unconfined hydrogeological conditions is estimated using the following analytical expression (corrected from Powers et al., 2007):

$$Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$$

where

Q = groundwater flow rate (m^3/s)

K = hydraulic conductivity (m/s)

H_0 = static groundwater level head above the top of the aquitard (m) – measured during investigation

h_e = dewatered groundwater level head above the top of the aquitard at the excavation (m) – assumed to be 1.0 m below the proposed excavation depth and assumes there is no significant groundwater upflow from depths greater than 1.0 m below the excavation

w = trench width (m)

l = trench length (m)

R_i = radius of influence (m), estimated using Sichardt equation:

$$R_i = 3000(H_0 - h_e)\sqrt{K}$$

2.2.1.3 Estimated Dewatering Rates

Table 3: Dewatering Rates along Coleraine Drive

Structure	Dewatering Rate (no uncertainty factor) (m ³ /day)	Dewatering Rate (with uncertainty factor) (m ³ /day)
Culvert S1	6.9	20.7
Utilities	5.7	17.1

Details of the dewatering rate calculations for the replacement of Culvert S1 and the utility installations along Coleraine Drive using the assumptions and equations listed above are provided in Appendix C. The dewatering estimates are summarized in Table 3.

The dewatering rates for box Culvert S1 have been estimated for a trench excavation 10 m long, 9 m wide and 4 m deep. The estimated dewatering rate for this culvert indicates that the groundwater inflow rate of approximately 6.9 m³/day can be expected. A conservative dewatering rate has been determined by multiplying the maximum groundwater inflow by an uncertainty factor of three, which results in an estimated groundwater inflow of approximately 20.7 m³/day.

The dewatering rate for the utility installations has been estimated for a trench excavation 15 m long, 3 m wide and 4 m deep. The estimated dewatering rate for the utility installations indicates that the groundwater inflow rate of approximately 5.7 m³/day can be expected. A conservative dewatering rate has been determined by multiplying the maximum groundwater inflow by an uncertainty factor of three, which results in an estimated groundwater inflow of approximately 17.1 m³/day.

These dewatering estimates do not include the direct influx of surface water from streams or wetlands into the excavations; it includes only the groundwater that would be expected to infiltrate into the excavation from the soil. In addition to groundwater extraction, stream diversion is expected to be necessary to install the culverts. Any dewatering system should be designed by a dewatering contractor and should take the stream surface water flow into consideration.

Based on the dewatering calculations, no registration in the Environmental Activity and Sector Registry (EASR) nor a Permit To Take Water (PTTW) would be required for groundwater extraction because the dewatering rates are below both the threshold of 50 m³/day for EASR registration and below the threshold of 400 m³/day for a PTTW.

2.2.2 Water Taking Impact Assessment

2.2.2.1 Zone of Influence

The zone of influence from the excavations for both the box Culvert S1 and the utility installations was estimated to be approximately 12 m, with a conservative estimate of approximately 21 m using an uncertainty factor of three (Table 4).



Table 4: Zones of Influence along Coleraine Drive

Structure	Zone of Influence (no uncertainty factor) (m)	Zone of Influence (with uncertainty factor) (m)
Culvert S1	11.9	20.7
Utilities	11.9	20.7

The calculated radius of influence is 21 m from the point of groundwater dewatering; however, the actual radius of influence may be influenced by the presence of nearby streams and wetlands. Streams and wetlands may act as boundaries to the zone of influence if they are hydraulically connected to the groundwater being abstracted, thus reducing the zone of influence. While the zone of influence may be buffered somewhat by a stream or wetland, dewatering immediately adjacent to a stream or wetland may also significantly increase the amount of dewatering required. Water supply wells, creeks and wetlands adjacent to the construction Site could be affected by the dewatering.

2.2.2.2 Water Well Impact Assessment

Twenty-nine water supply wells were identified in the MECP database of water well records that are within 500 m of Coleraine Drive. Well depths range from 9 to 45 m BGS, below the expected maximum depth of excavation of 4 m BGS. Most of the identified water supply wells are more than 10 m deep and outside the zone of influence of 21 m and are thus not expected to be affected by construction dewatering, especially if the pump intakes are below the excavation depth.

Two water supply wells between Countryside Drive and Highway 50 are less than 10 m deep and near Coleraine Drive. Well 4907185 is 9.4 m deep and within the zone of influence of 21 m. Well 4904154 is 9.1 m deep and approximately 50 m from Coleraine Drive. To be diligent, it is recommended that a private well survey be completed to confirm the location of, depth of and water level in these two wells.

As the maximum zone of influence around the excavations is 21 m, it is not expected that the construction dewatering will impact any of the private wells within the study area because most of them are outside the zone of influence. While some private wells near the road may be within the zone of influence, significant dewatering effects are not anticipated because the dewatering rates are relatively low, dewatering is expected to be of short duration and the excavations are expected to be relatively shallow.

2.2.2.3 Surface Water Impact Assessment

Wood observed no visual evidence of groundwater seeps near the existing box Culvert S1 along Coleraine Drive or along Rainbow Creek within 50 m upstream and downstream of the culvert. Given that the groundwater level in monitoring well S1 was approximately 0.9 m BGS in May 2020 (Table 1), there may be a hydraulic connection to the creek, with some groundwater recharge possibly occurring along the creek.

The potential for dewatering to affect Rainbow Creek or a wetland will depend on the duration of the dewatering and the degree of hydraulic connection between groundwater and surface water. The dewatering effect on the creek or wetland may be mitigated if the abstracted groundwater is returned into the creek or wetland downstream. However, the water quality will need to meet upstream (i.e. background) water quality and/or regulatory requirements and treatment of the discharge water may be necessary.

During construction, Rainbow Creek may need temporary diversion using coffer dams with pumping (i.e. active diversion) or using an artificial stream channel without a pump (i.e. passive diversion). Such temporary surface water diversions for construction purposes are exempt from Section 34 of the *Ontario Water Resources Act* and do not require EASR registration or a PTTW. The key criteria for this exemption to be valid include:

- diversion does not affect the stream water levels and quality upstream and downstream
- water remains in or is directly returned to the same water body
- water does not contain visible contaminants
- erosion and sediment control measures are installed and maintained properly.

Widening of the road will add pavement and thus decrease groundwater recharge and increase runoff. Runoff will be diverted to roadside ditches and storm sewers and will thus be returned to the local watershed and allowed to infiltrate along roadside ditches or on the adjacent land.

Dewatering effects on surface water are expected to be localized and temporary. With the stream temporarily diverted around the culvert to be replaced, local dewatering may only be required on a temporary basis to maintain dry working conditions long enough for the culvert to be installed and no permanent impact is expected from the culvert.

3.0 Countryside Drive

The section of Countryside Drive that will be reconstructed and widened is 2.9 km long between approximately 675 m northeast of The Gore Road in the southwest and Highway 50 in the northeast (Figure 1). The proposed widening of Countryside Drive will increase the number of lanes from two to four. The reconstruction of Countryside Drive includes replacing three box culverts to allow for water in Rainbow Creek, Clarkway Drive Tributary and Gore Road Tributary to continue to cross underneath Countryside Drive approximately 1.6, 1.4 and 1.0 km northeast of The Gore Road (Figure 2). There is also a pipe culvert approximately 675 m northeast of The Gore Road.

3.1 Existing Conditions

Existing conditions were evaluated within a 500-m study area around the section of Countryside Drive that will be reconstructed. The entire Countryside Drive study area is in the Peel Plain physiographic region consisting of bevelled till plains (Figure 3). Surface geology along the Countryside Drive study area consists of glaciolacustrine deposits of clay and silt, with clay and silt till and modern alluvial deposits of clay, silt, sand, gravel and organics along the two tributaries that cross Countryside Drive (Figure 4). The underlying

bedrock is composed of limestone, interbedded with shale at depth, in the Georgian Bay Formation from the Ordovician Period.

A Site plan showing the locations of the boreholes and monitoring wells is provided as Figure 6a and the borehole logs are provided in Appendix A. Twenty-nine boreholes and three monitoring wells were installed along Countryside Drive, designated C1 to C37, S7, S8, S9, S10, S11 and S12. The three monitoring wells were designated C27/S7, S10 and S12 but C27/S7 is referred to in this report only as S7 for simplicity. The C-series boreholes were drilled to depths ranging from 1.2 to 5.2 m BGS and the S-series boreholes and monitoring wells were drilled to depths ranging from 5.8 to 9.8 m BGS. The S-series boreholes are structural boreholes and monitoring wells installed at stream crossings where culverts will be replaced or installed.

Geological profiles around Culverts S7, S10 and S12 are shown on Figures 6b-i, 6b-ii and 6b-iii. The stratigraphy beneath the road alignment consists of one to two metres of fill, underlain by stiff to hard silty clay to clayey silt with trace sand and gravel, occasionally some sand, to the maximum depth of investigation, up to 9.8 m BGS. Silty sand to sandy silt was encountered above the silty clay to clayey silt in S11 and S12, approximately 6 m thick, possibly reflecting the modern alluvial deposits along the Gore Road Tributary. Monitoring wells S7 and S10 were screened from 6.1 to 9.2 m BGS in the native clay and silt. Monitoring well S12 was screened from 2.7 to 5.8 m BGS in the silt and sand layer. The static groundwater levels in S7, S10 and S12 were measured on 4 May 2020 to range from 0.9 to 1.7 m BGS, equivalent to a range from 212.06 to 216.09 m AMSL (Table 1).

Wood identified the presence of 71 water well records within 500 m of the proposed road reconstruction, shown on Figure 6c. Of the 71 water well records, 49 are listed as water supply wells. These wells are spread out throughout the study area.

Land use around Countryside Drive is shown on Figure 6d. The majority of the land use around Countryside Drive is agricultural, with a few rural residential areas and some meadows and forests. The land use data are from the TRCA (2017).

Most of the Countryside Drive study area is within the Humber River Watershed, as shown on Figure 6f. The Humber River Watershed has an area of 911 km² and is the largest within the jurisdiction of the TRCA. All the streams that provide drainage in the study area are part of the headwaters for the Humber River. The streams generally flow from northwest to southeast across the Site (Figure 6e).

At the southwestern end of the Site, there is a small stream that collects water at the side of the farm fields and flows for approximately 500 m before crossing beneath Countryside Drive through a pipe culvert located approximately 675 m northeast of The Gore Road. This stream is at the edge of the reconstruction area.

The Gore Road Tributary starts northwest of Healey Road between The Gore Road and Humber Station Road and flows southeast towards Countryside Drive. Numerous branches connect along the way to form a larger stream, including branches starting on the northeast side of Humber Station Road, which flow south to connect to this tributary system. The Gore Road Tributary flows beneath Countryside Drive through a box culvert, named S12, approximately 1.0 km northeast of The Gore Road.

The Clarkway Drive Tributary has branches that start northwest of Healey Road, between Humber Station Road and Coleraine Drive, as well as northeast of Coleraine Drive. The branches flow underneath either Healey Road and Coleraine Drive, connecting and then flowing southeast towards Countryside Drive. The Clarkway Drive Tributary flows beneath Countryside Drive through a box culvert, named S10, just northeast of Clarkway Drive.

Rainbow Creek starts around Mayfield Road, approximately 400 m northeast of Coleraine Drive, and flows south-southeast across the Site, intersecting Countryside Drive through a box culvert, named S7, approximately 115 m southwest of Coleraine Drive.

Streamflow monitoring was completed in the streams upstream and downstream of Culverts S7, S10 and S12 on 11 and 12 May 2020. The water depths at the six stations ranged approximately from 0.2 to 0.3 m and the streamflows were measured to range from 0.4 to 10 l/s, equivalent to 38 to 875 m³/day (Table 5). The highest flows were measured at Culvert S10 in the Clarkway Drive Tributary and the lowest flows were measured at Culvert S12 in the Gore Road Tributary.

Table 5: Streamflow along Countryside Drive

Culvert	Upstream (m ³ /day)	Downstream (m ³ /day)
S7	132	142
S10	567	875
S12	84	38

The natural habitat within the study area includes a few disconnected meadows, wetlands, successional habitat and forests, most along the streams (Figure 6g).

3.2 Water Taking

Culverts S7 and S10 along Countryside Drive are underlain by silty clay to clayey silt fill overlying silty clay to clayey silt till. Culvert S12 is underlain by silty clay to clayey silt fill overlying silty sand to sandy silt. Rising head SWRTs were completed in monitoring wells S7, S10 and S12 adjacent to the three culverts on 4 to 14 May 2020. Water was purged from each well and the water level then monitored using a pressure transducer installed in the well as it recovered back to the static condition. Water levels were also measured manually to verify the transducer readings. Recovery data were analyzed using the Bouwer-Rice solution in AQTESOLV version 4.5. The software incorporates the transducer water level data collected during the SWRT and monitoring well construction details to estimate the hydraulic conductivity of the soil formation at the well screen level. The estimated hydraulic conductivity values in S7, S10 and S12 were calculated to be 4.0×10⁻⁷, 4.7×10⁻⁸ and 2.9×10⁻⁸ m/s, respectively (Table 1). The results of the hydraulic conductivity analyses are provided in Appendix B.



3.2.1 Dewatering Rates

During the road reconstruction and culvert replacements, open trench excavations will be used for the installation of utilities and new structures. Dewatering rate estimates for installation of each box culvert and installation of underground utilities were calculated. In addition to potential removal of groundwater, runoff water from precipitation events may also need to be removed.

3.2.1.1 Assumptions

The following assumptions were used in calculating estimates of dewatering rates, which are based on information provided and Site conditions encountered during the investigation:

- ▶ culvert dimensions of 10 m long, 9 m wide and 4 m deep
- ▶ utility excavation dimensions of 15 m long, 3 m wide and 4 m deep
- ▶ only one excavation is open at any one time
- ▶ hydraulic conductivities of 4.0×10^{-7} , 4.7×10^{-8} and 2.9×10^{-8} m/s from monitoring wells S7, S10 and S12, respectively
- ▶ groundwater depths of 1.71, 0.9 and 1.44 m in monitoring wells S7, S10 and S12 on 4 May 2020, respectively, with seasonal variation up to 1.0 m higher
- ▶ maximum aquifer thickness of 5 m
- ▶ radial, steady-state flow is assumed for inflow to trench ends
- ▶ linear, steady-state flow is assumed for inflow to trench sides
- ▶ the surficial aquifer is assumed to be unconfined and hydrogeologically homogeneous
- ▶ any surface water is beyond the dewatering radius of influence such that it does not provide potential recharge to groundwater
- ▶ an uncertainty factor of 3 has been incorporated into the dewatering rate estimations to account for:
 - potential variability in the hydraulic conductivity
 - initial depletion of aquifer storage, a temporary response to dewatering; i.e. the initial dewatering rate should decrease to the expected rate once equilibrium conditions are reached
 - infiltration or runoff from precipitation events.

3.2.1.2 Analytical Equation

The amount of groundwater flow into an excavation that is trench-shaped under unconfined hydrogeological conditions is estimated using the following analytical expression (corrected from Powers et al., 2007):

$$Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$$

where

- Q = groundwater flow rate (m³/s)
- K = hydraulic conductivity (m/s)

- H_0 = static groundwater level head above the top of the aquitard (m) – measured during investigation
- h_e = dewatered groundwater level head above the top of the aquitard at the excavation (m) – assumed to be 1.0 m below the proposed excavation depth and assumes there is no significant groundwater upflow from depths greater than 1.0 m below the excavation
- w = trench width (m)
- ℓ = trench length (m)
- R_i = radius of influence (m), estimated using Sichardt equation:

$$R_i = 3000(H_0 - h_e)\sqrt{K}$$

3.2.1.3 Estimated Dewatering Rates

Details of the dewatering rate calculations for the replacement of Culverts S7, S10 and S12 and the utility installations along Countryside Drive using the assumptions and equations listed above are provided in Appendix C. The estimates are summarized in Table 6.

Table 6: Dewatering Rates along Countryside Drive

Structure	Dewatering Rate (no uncertainty factor) (m ³ /day)	Dewatering Rate (with uncertainty factor) (m ³ /day)
Culvert S7	3.1	9.4
Culvert S10	1.0	3.1
Culvert S12	0.7	2.2
Utilities	2.6	7.8

The dewatering rates for the box culverts have been estimated for a trench excavation 10 m long, 9 m wide and 4 m deep. The estimated dewatering rates for these culverts indicate that groundwater inflow rates ranging approximately from 0.7 to 3.1 m³/day can be expected. Conservative dewatering rates have been determined by multiplying the maximum groundwater inflow by an uncertainty factor of three, which results in estimated groundwater inflows ranging approximately from 2.2 to 9.4 m³/day.

The dewatering rate for the utility installations has been estimated for a trench excavation 15 m long, 3 m wide and 4 m deep. The estimated dewatering rate for the utility installations indicates that the groundwater inflow rate of approximately 2.6 m³/day can be expected. A conservative dewatering rate has been determined by multiplying the maximum groundwater inflow by an uncertainty factor of three, which results in an estimated groundwater inflow of approximately 7.8 m³/day.

These dewatering estimates do not include the direct influx of surface water from streams or wetlands into the excavations; it includes only the groundwater that would be expected to infiltrate into the excavation from the soil. In addition to groundwater extraction, stream diversion is expected to be necessary to install the culverts. Any dewatering system should be designed by a dewatering contractor and should take the stream surface water flow into consideration.

Based on the dewatering calculations, no registration in the EASR nor a PTTW would be required for groundwater extraction because the dewatering rates are below both the threshold of 50 m³/day for EASR registration and below the threshold of 400 m³/day for a PTTW.

3.2.2 Water Taking Impact Assessment

3.2.2.1 Zone of Influence

The zones of influence from the excavations for the box culverts and the utility installations were estimated to be up to approximately 6 m, with a conservative estimate of up to approximately 12 m using an uncertainty factor of three (Table 7).

Table 7: Zones of Influence along Countryside Drive

Structure	Zone of Influence (no uncertainty factor) (m)	Zone of Influence (with uncertainty factor) (m)
Culvert S7	6.2	10.8
Culvert S10	2.6	4.5
Culvert S12	1.8	3.2
Utilities	6.2	11.9

The calculated radius of influence is up to 12 m from the point of groundwater dewatering; however, the actual radius of influence may be influenced by the presence of nearby streams and wetlands. Streams and wetlands may act as boundaries to the zone of influence if they are hydraulically connected to the groundwater being abstracted, thus reducing the zone of influence. While the zone of influence may be buffered somewhat by a stream or wetland, dewatering immediately adjacent to a stream or wetland may also significantly increase the amount of dewatering required. Water supply wells, creeks and wetlands adjacent to the construction Site could be affected by the dewatering.

3.2.2.2 Water Well Impact Assessment

Forty-nine water supply wells were identified in the MECP database of water well records that are within 500 m of Countryside Drive. Well depths range from 14 to 30 m BGS, below the expected maximum depth of excavation of 4 m BGS. All the identified water supply wells are more than 10 m deep and most are outside the zone of influence of 12 m and are thus not expected to be affected by construction dewatering, especially if the pump intakes are below the excavation depth.

As the maximum zone of influence around the excavations is 12 m, it is not expected that the construction dewatering will impact any of the private wells within the study area because most of them are outside the zone of influence. While some private wells near the road may be within the zone of influence, significant dewatering effects are not anticipated because the dewatering rates are relatively low, dewatering is expected to be of short duration and the excavations are expected to be relatively shallow.



3.2.2.3 Surface Water Impact Assessment

Wood observed no visual evidence of groundwater seeps near the existing box culverts along Countryside Drive or along Rainbow Creek, Clarkway Drive Tributary or Gore Road Tributary within 50 m upstream and downstream of the culverts. Given that the groundwater levels in monitoring wells S7, S10 and S12 ranged from 0.9 to 1.9 m BGS in May 2020 (Table 1), there may be a hydraulic connection to the creeks, with some groundwater recharge possibly occurring along the creeks.

The potential for dewatering to affect the creeks or a wetland will depend on the duration of the dewatering and the degree of hydraulic connection between groundwater and surface water. The dewatering effect on the creek or wetland may be mitigated if the abstracted groundwater is returned into the creek or wetland downstream. However, the water quality will need to meet upstream (i.e. background) water quality and/or regulatory requirements and treatment of the discharge water may be necessary.

During construction, the creeks may need temporary diversion using coffer dams with pumping (i.e. active diversion) or using an artificial stream channel without a pump (i.e. passive diversion). Such temporary surface water diversions for construction purposes are exempt from Section 34 of the *Ontario Water Resources Act* and do not require EASR registration or a PTTW. The key criteria for this exemption to be valid include:

- diversion does not affect the stream water levels and quality upstream and downstream
- water remains in or is directly returned to the same water body
- water does not contain visible contaminants
- erosion and sediment control measures are installed and maintained properly.

Widening of the road will add pavement and thus decrease groundwater recharge and increase runoff. Runoff will be diverted to roadside ditches and storm sewers and will thus be returned to the local watershed and allowed to infiltrate along roadside ditches or on the adjacent land.

Dewatering effects on surface water are expected to be localized and temporary. With the streams temporarily diverted around the culverts to be replaced, local dewatering may only be required on a temporary basis to maintain dry working conditions long enough for the culverts to be installed and no permanent impact is expected from the culverts.

4.0 Clarkway Drive

The section of Clarkway Drive that will be reconstructed and widened is 4.3 km long between Mayfield Road in the northwest and Castlemore Road in the southeast (Figure 1). The proposed widening of Clarkway Drive will increase the number of lanes from two to four. The reconstruction of Clarkway Drive includes replacing two box culverts to allow for water in Clarkway Drive Tributary to continue to cross underneath Clarkway Drive approximately 130 and 765 m southeast of Countryside Drive (Figure 2). There is an additional pipe approximately two kilometres southeast of Countryside Drive.

4.1 Existing Conditions

Existing conditions were evaluated within a 500-m study area around the section of Clarkway Drive that will be reconstructed. The entire Clarkway Drive study area is in the Peel Plain physiographic region consisting of bevelled till plains (Figure 3). Surface geology along the Clarkway Drive study area consists of glaciolacustrine deposits of clay and silt, with modern alluvial deposits of clay, silt, sand, gravel and organics along the Clarkway Drive Tributary that crosses Clarkway Drive (Figure 4). The underlying bedrock is composed of limestone, interbedded with shale at depth, in the Georgian Bay Formation from the Ordovician Period.

Site plans showing the locations of the boreholes and monitoring wells are provided as Figures 7a and 7e and the borehole logs are provided in Appendix A. Forty-four boreholes and two monitoring wells were installed along Clarkway Drive, designated D1 to D37, S13, S14, S15 and S16. The two monitoring wells were designated S13 and S16. The D-series boreholes were drilled to depths ranging from 0.9 to 5.2 m BGS and the S-series boreholes and monitoring wells were drilled to depths ranging from 9.3 to 9.8 m BGS. The S-series boreholes are structural boreholes and monitoring wells installed at stream crossings where culverts will be replaced or installed.

Geological profiles around Culverts S13 and S16 are shown on Figures 7b-i and 7b-ii. The stratigraphy beneath the road alignment consists of one to four metres of fill, underlain by stiff to hard silty clay to clayey silt with trace sand and gravel, occasionally some sand, to the maximum depth of investigation, up to 9.8 m BGS. Silty sand to sandy silt was encountered below the silty clay to clayey silt in S13 and S14, possibly reflecting the modern alluvial deposits along the Clarkway Drive Tributary. Monitoring well S13 was screened from 4.6 to 7.7 m BGS in the native clay and silt and underlying silt and sand. Monitoring well S16 was screened from 6.1 to 9.2 m BGS in the native clay and silt. The static groundwater levels in S13 and S16 were measured on 22 April 2020 to be 1.2 and 3.1 m BGS, respectively, equivalent to 209 to 210 m AMSL (Table 1).

Wood identified the presence of 90 water well records within 500 m of the proposed road reconstruction, shown on Figure 7c. Of the 90 water well records, 45 are listed as water supply wells. These wells are spread out throughout the study area.

Land use around Clarkway Drive is shown on Figure 7d. The majority of the land use around Clarkway Drive is agricultural, with a few rural residential areas and some meadows and forests. The land use data are from the TRCA (2017).

Most of the Clarkway Drive study area is within the Humber River Watershed, as shown on Figure 7f. The Humber River Watershed has an area of 911 km² and is the largest within the jurisdiction of the TRCA. The Clarkway Drive Tributary is the main watercourse that provides drainage in the study area and is part of the headwaters for the Humber River. The Clarkway Drive Tributary has branches that start northwest of Healey Road, between Humber Station Road and Coleraine Drive, as well as northeast of Coleraine Drive. The branches flow underneath either Healey Road and Coleraine Drive, connecting and then flowing southeast towards Countryside Drive and Clarkway Drive. The Clarkway Drive Tributary flows beneath Clarkway Drive through a box culvert, named S16, 130 m southeast of Countryside Drive.

Two small tributaries start in the farm fields northeast of Clarkway Drive and cross Clarkway Drive through a culvert, named S13, 765 m southeast of Countryside Drive, and through a culvert 2 km southeast of Countryside Drive, and then both joining the Clarkway Drive Tributary.

Streamflow monitoring was completed in the streams upstream and downstream of Culverts S13 and S16 on 11 May 2020. The water depths at the four stations ranged approximately from 0.03 to 0.4 m. The depth of water in the small tributary upstream of Culvert S13 was only 3 cm and flow could thus not be measured. And while the depth of water downstream of Culvert S13 was up to 0.3 m, the water was measured not to be flowing. In the Clarkway Drive Tributary at Culvert S16, the flow upstream was measured to be 7 l/s, equivalent to 600 m³/day, and the flow downstream was measured to be 2 l/s, equivalent to 170 m³/day (Table 8).

Table 8: Streamflow along Clarkway Drive

Culvert	Upstream (m ³ /day)	Downstream (m ³ /day)
S13	could not measure	0
S16	600	170

The natural habitat within the study area includes a series of disconnected meadows, wetlands, successional habitat and forests along the streams (Figure 7g).

4.2 Water Taking

Culvert S13 along Clarkway Drive is underlain by silty clay to clayey silt fill overlying silty clay to clayey silt till and silty sand to sandy silt. Culvert S16 is underlain by silty clay to clayey silt fill overlying silty clay to clayey silt till. Rising head SWRTs were completed in monitoring wells S13 and S16 adjacent to the two culverts on 4 May and 17 June 2020, respectively. Water was purged from each well and the water level then monitored using a pressure transducer installed in the well as it recovered back to the static condition. Water levels were also measured manually to verify the transducer readings. Recovery data were analyzed using the Bouwer-Rice solution in AQTESOLV version 4.5. The software incorporates the transducer water level data collected during the SWRT and monitoring well construction details to estimate the hydraulic conductivity of the soil formation at the well screen level. The estimated hydraulic conductivity values in S13 and S16 were calculated to be 8.1×10^{-7} and 3.7×10^{-9} m/s, respectively (Table 1). The results of the hydraulic conductivity analyses are provided in Appendix B.

4.2.1 Dewatering Rates

During the road reconstruction and culvert replacements, open trench excavations will be used for the installation of utilities and new structures. Dewatering rate estimates for installation of each box culvert and installation of underground utilities were calculated. In addition to potential removal of groundwater, runoff water from precipitation events may also need to be removed.

4.2.1.1 Assumptions

The following assumptions were used in calculating estimates of dewatering rates, which are based on information provided and Site conditions encountered during the investigation:

- ▶ culvert dimensions of 10 m long, 9 m wide and 4 m deep
- ▶ utility excavation dimensions of 15 m long, 3 m wide and 4 m deep
- ▶ only one excavation is open at any one time
- ▶ hydraulic conductivities of 8.1×10^{-7} and 3.7×10^{-9} m/s from monitoring wells S13 and S16, respectively
- ▶ groundwater depths of 1.4 and 3.2 m in monitoring wells S13 and S16 on 4 May 2020, respectively, with seasonal variation up to 1.0 m higher
- ▶ maximum aquifer thickness of 5 m
- ▶ radial, steady-state flow is assumed for inflow to trench ends
- ▶ linear, steady-state flow is assumed for inflow to trench sides
- ▶ the surficial aquifer is assumed to be unconfined and hydrogeologically homogeneous
- ▶ any surface water is beyond the dewatering radius of influence such that it does not provide potential recharge to groundwater
- ▶ an uncertainty factor of 3 has been incorporated into the dewatering rate estimations to account for:
 - potential variability in the hydraulic conductivity
 - initial depletion of aquifer storage, a temporary response to dewatering; i.e. the initial dewatering rate should decrease to the expected rate once equilibrium conditions are reached
 - infiltration or runoff from precipitation events.

4.2.1.2 Analytical Equation

The amount of groundwater flow into an excavation that is trench-shaped under unconfined hydrogeological conditions is estimated using the following analytical expression (corrected from Powers et al., 2007):

$$Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$$

where

Q = groundwater flow rate (m^3/s)

K = hydraulic conductivity (m/s)

H_0 = static groundwater level head above the top of the aquitard (m) – measured during investigation

h_e = dewatered groundwater level head above the top of the aquitard at the excavation (m) – assumed to be 1.0 m below the proposed excavation depth and assumes there is no significant groundwater upflow from depths greater than 1.0 m below the excavation

w = trench width (m)

l = trench length (m)

R_i = radius of influence (m), estimated using Sichardt equation:

$$R_i = 3000(H_0 - h_e)\sqrt{K}$$

4.2.1.3 Estimated Dewatering Rates

Details of the dewatering rate calculations for the replacement of Culverts S13 and S16 and the utility installations along Clarkway Drive using the assumptions and equations listed above are provided in Appendix C. The estimates are summarized in Table 9.

Table 9: Dewatering Rates along Clarkway Drive

Structure	Dewatering Rate (no uncertainty factor) (m ³ /day)	Dewatering Rate (with uncertainty factor) (m ³ /day)
Culvert S13	5.3	16
Culvert S16	0.2	0.5
Utilities	4.4	13

The dewatering rates for the box culverts have been estimated for a trench excavation 10 m long, 9 m wide and 4 m deep. The estimated dewatering rates for Culverts S13 and S16 indicate that groundwater inflow rates of approximately 5.3 and 0.2 m³/day can be expected, respectively. Conservative dewatering rates have been determined by multiplying the maximum groundwater inflow by an uncertainty factor of three, which results in estimated groundwater inflows of 16 and 0.5 m³/day.

The dewatering rate for the utility installations has been estimated for a trench excavation 15 m long, 3 m wide and 4 m deep. The estimated dewatering rate for the utility installations indicates that the groundwater inflow rate of approximately 4.4 m³/day can be expected. A conservative dewatering rate has been determined by multiplying the maximum groundwater inflow by an uncertainty factor of three, which results in an estimated groundwater inflow of approximately 13 m³/day.

These dewatering estimates do not include the direct influx of surface water from streams or wetlands into the excavations; it includes only the groundwater that would be expected to infiltrate into the excavation from the soil. In addition to groundwater extraction, stream diversion is expected to be necessary to install the culverts. Any dewatering system should be designed by a dewatering contractor and should take the stream surface water flow into consideration.

Based on the dewatering calculations, no registration in the EASR nor a PTTW would be required for groundwater extraction because the dewatering rates are below both the threshold of 50 m³/day for EASR registration and below the threshold of 400 m³/day for a PTTW.



4.2.2 Water Taking Impact Assessment

4.2.2.1 Zone of Influence

The zones of influence from the excavations for the box culverts and the utility installations were estimated to be up to approximately 10 m, with a conservative estimate of up to approximately 17 m using an uncertainty factor of three (Table 10).

Table 10: Zones of Influence along Clarkway Drive

Structure	Zone of Influence (no uncertainty factor) (m)	Zone of Influence (with uncertainty factor) (m)
Culvert S13	10	17
Culvert S16	0.3	0.6
Utilities	5	13

The calculated radius of influence is up to 17 m from the point of groundwater dewatering; however, the actual radius of influence may be influenced by the presence of nearby streams and wetlands. Streams and wetlands may act as boundaries to the zone of influence if they are hydraulically connected to the groundwater being abstracted, thus reducing the zone of influence. While the zone of influence may be buffered somewhat by a stream or wetland, dewatering immediately adjacent to a stream or wetland may also significantly increase the amount of dewatering required. Water supply wells, creeks and wetlands adjacent to the construction Site could be affected by the dewatering.

4.2.2.2 Water Well Impact Assessment

Forty-five water supply wells were identified in the MECP database of water well records that are within 500 m of Clarkway Drive. Well depths range from 5 to 39 m BGS, below the expected maximum depth of excavation of 4 m BGS. Within 50 m of Clarkway Drive, all the identified water supply wells are more than 9 m deep and most are outside the zone of influence of 17 m and are thus not expected to be affected by construction dewatering, especially if the pump intakes are below the excavation depth.

Three water supply wells within 50 m of Clarkway Drive are the shallowest. Well 4902856 near Mayfield Road is 10.1 m deep and potentially within the zone of influence of 17 m. Well 4902866, approximately halfway between Countryside Drive and Castlemore Road, is 11.3 m deep and potentially within the zone of influence. Well 4905894 is 9.1 m deep, adjacent to Clarkway Drive Tributary and approximately 50 m southwest of Culvert S13. To be diligent, it is recommended that a private well survey be completed to confirm the location of, depth of and water level in these three wells.

As the maximum zone of influence around the excavations is 17 m, it is not expected that the construction dewatering will impact any of the private wells within the study area because most of them are outside the zone of influence. While some private wells near the road may be within the zone of influence, significant dewatering effects are not anticipated because the dewatering rates are relatively low, dewatering is expected to be of short duration and the excavations are expected to be relatively shallow.



4.2.2.3 Surface Water Impact Assessment

Wood observed no visual evidence of groundwater seeps near the existing box culverts along Clarkway Drive or along Clarkway Drive Tributary within 50 m upstream and downstream of the culverts. Given that the groundwater levels in monitoring wells S13 and S16 were 1.4 and 3.2 m BGS in May 2020, respectively (Table 1), there may be a hydraulic connection to the creek at S13, with some groundwater recharge possibly occurring along the creek.

The potential for dewatering to affect Clarkway Drive Tributary or a wetland will depend on the duration of the dewatering and the degree of hydraulic connection between groundwater and surface water. The dewatering effect on the creek or wetland may be mitigated if the abstracted groundwater is returned into the creek or wetland downstream. However, the water quality will need to meet upstream (i.e. background) water quality and/or regulatory requirements and treatment of the discharge water may be necessary.

During construction, Clarkway Drive Tributary may need temporary diversion using coffer dams with pumping (i.e. active diversion) or using an artificial stream channel without a pump (i.e. passive diversion). Such temporary surface water diversions for construction purposes are exempt from Section 34 of the *Ontario Water Resources Act* and do not require EASR registration or a PTTW. The key criteria for this exemption to be valid include:

- diversion does not affect the stream water levels and quality upstream and downstream
- water remains in or is directly returned to the same water body
- water does not contain visible contaminants
- erosion and sediment control measures are installed and maintained properly.

Widening of the road will add pavement and thus decrease groundwater recharge and increase runoff. Runoff will be diverted to roadside ditches and storm sewers and will thus be returned to the local watershed and allowed to infiltrate along roadside ditches or on the adjacent land.

Dewatering effects on surface water are expected to be localized and temporary. With the stream temporarily diverted around the culverts to be replaced, local dewatering may only be required on a temporary basis to maintain dry working conditions long enough for the culverts to be installed and no permanent impact is expected from the culverts.

5.0 Arterial A2

The section of Arterial A2 that will be built is 3.4 km long between Mayfield Road in the northwest and Highway 50 in the east. However, this report includes an assessment for only the 2.9-km long section between approximately 500 m southeast of Mayfield Road and Highway 50 (Figure 1) because access to the remaining section has not been provided yet to be able to conduct the geotechnical and hydrogeological investigations. The remaining section of Arterial A2 will be assessed during the detailed design stage of the project.

The construction of the investigated section of Arterial A2 includes installing one new box culvert to allow for water in Rainbow Creek to cross beneath the new road approximately 635 m west of Highway 50 and replacing one box culvert to allow water in a tributary to Rainbow Creek to continue to cross underneath Highway 50 at the new Arterial A2 intersection.

5.1 Existing Conditions

Existing conditions were evaluated within a 500-m study area around the proposed Arterial A2 section that will be constructed. The entire Arterial A2 study area is in the Peel Plain physiographic region consisting of bevelled till plains (Figure 3). Surface geology along the Arterial A2 study area consists of glaciolacustrine deposits of clay and silt (Figure 4). The underlying bedrock is composed of limestone, interbedded with shale at depth, in the Georgian Bay Formation from the Ordovician Period.

A Site plan showing the locations of the boreholes and monitoring wells is provided as Figure 8a and the borehole logs are provided in Appendix A. Twenty-nine boreholes and two monitoring wells were installed along Arterial A2, designated B1 to B28, S3, S4, S5 and S6. The two monitoring wells were designated S4 and B7/S5 but B7/S5 is referred to in this report only as S5 for simplicity. The B-series boreholes were drilled to depths ranging from 1.5 to 5.2 m BGS and the S-series boreholes and monitoring wells were drilled to depths ranging from 9.4 to 9.8 m BGS. The S-series boreholes are structural boreholes and monitoring wells installed at stream crossings where culverts will be replaced or installed.

A geological profile around Culvert S5 is shown on Figure 8b. The stratigraphy beneath the proposed road alignment consists of 0.2 m of topsoil and 0.5 m of reworked soil (i.e. fill), underlain by stiff to hard silty clay to clayey silt with trace sand and gravel, occasionally some sand, to the maximum depth of investigation, up to 9.8 m BGS. Between 2 and 4 m of fill was encountered at Countryside Drive and Highway 50. Silty sand to sandy silt was encountered below the silty clay to clayey silt in S3 and S4 at Highway 50, but below 7 m deep. Monitoring wells S4 and S5 were screened from 6.1 to 9.2 m BGS in the native clay and silt. The static groundwater level in S5 was measured on 4 and 12 May 2020 to be -0.7 and -0.5 m BGS, equivalent to 210 and 209.8 m AMSL, indicating artesian conditions (Table 1). On 4 May 2020, water was observed to be flowing out of the above-ground protective casing and on 12 May 2020, the water level was below the top of the protective casing but 0.5 m above the ground surface.

Wood identified the presence of 96 water well records within 500 m of the proposed road construction, shown on Figure 8c. Of the 96 water well records, 31 are listed as water supply wells. These wells are spread out throughout the study area.

Land use around Arterial A2 is shown on Figure 8d. The majority of the land use around Arterial A2 is agricultural, with two meadows and wetlands, one at Countryside Drive and one at Rainbow Creek. One rural residential lot and industrial areas are located near Highway 50. Rural residential lots are also near Mayfield Road. The land use data are from the TRCA (2017).

Most of the Arterial A2 study area is within the Humber River Watershed, as shown on Figure 8f. The Humber River Watershed has an area of 911 km² and is the largest within the jurisdiction of the TRCA. Rainbow Creek is the main watercourse that provides drainage in the study area and is part of the

headwaters for the Humber River. Rainbow Creek starts around Mayfield Road, approximately 400 m northeast of Coleraine Drive, and flows south-southeast across the Site, and will intersect the proposed Arterial A2 through a new box culvert, named S5, approximately 630 m west of Highway 50 (Figure 8e). A tributary to Rainbow Creek also starts near Highway 50 and flows east beneath Highway 50 through a box culvert, named S4. A channel directing surface runoff to Clarkway Drive Tributary crosses the proposed Arterial A2 alignment between Mayfield Road and Countryside Drive. No culvert is planned at this crossing as it is not a permanent surface water feature and any runoff is assumed to be directed to ditches along the new road alignment.

Streamflow monitoring was completed in Rainbow Creek downstream of the proposed Culvert S5 on 12 May 2020. The water depth was approximately 0.1 m and the water flow was approximately 0.2 l/s, equivalent to 16 m³/day (Table 11).

Table 11: Streamflow along Arterial A2

Culvert	Downstream (m ³ /day)
S5	16

The natural habitat within the study area includes meadows and wetlands near Mayfield Road, Countryside Drive and Rainbow Creek (Figure 8g). The meadow at Rainbow Creek extends from the stream to Coleraine Drive in the northeast.

5.2 Water Taking

Proposed Culvert S5 along Arterial A2 is underlain by silty clay to clayey silt fill overlying silty clay to clayey silt till. A rising head SWRT was completed in monitoring well S5 adjacent to proposed Culvert S5 on 13 May 2020. Water was purged from the well and the water level then monitored using a pressure transducer installed in the well as it recovered back to the static condition. Water levels were also measured manually to verify the transducer readings. Recovery data were analyzed using the Bouwer-Rice solution in AQTESOLV version 4.5. The software incorporates the transducer water level data collected during the SWRT and monitoring well construction details to estimate the hydraulic conductivity of the soil formation at the well screen level. The estimated hydraulic conductivity in S5 was calculated to be 7.8×10^{-9} m/s (Table 1). The results of the hydraulic conductivity analysis are provided in Appendix B.

5.2.1 Dewatering Rates

During the road construction and culvert installations, open trench excavations will be used for the installation of utilities and new structures. Dewatering rate estimates for both installation of a box culvert and installation of underground utilities were calculated. In addition to potential removal of groundwater, runoff water from precipitation events may also need to be removed.

5.2.1.1 Assumptions

The following assumptions were used in calculating estimates of dewatering rates, which are based on information provided and Site conditions encountered during the investigation:

- ▶ culvert dimensions of 10 m long, 9 m wide and 4 m deep
- ▶ utility excavation dimensions of 15 m long, 3 m wide and 4 m deep
- ▶ only one excavation is open at any one time
- ▶ hydraulic conductivity of 7.8×10^{-9} m/s from monitoring well S5
- ▶ groundwater depth at ground surface (i.e. 0 m BGS) in monitoring well S5 on 4 May 2020
- ▶ maximum aquifer thickness of 5 m
- ▶ radial, steady-state flow is assumed for inflow to trench ends
- ▶ linear, steady-state flow is assumed for inflow to trench sides
- ▶ the surficial aquifer is assumed to be unconfined and hydrogeologically homogeneous
- ▶ any surface water is beyond the dewatering radius of influence such that it does not provide potential recharge to groundwater
- ▶ an uncertainty factor of 3 has been incorporated into the dewatering rate estimations to account for:
 - potential variability in the hydraulic conductivity
 - initial depletion of aquifer storage, a temporary response to dewatering; i.e. the initial dewatering rate should decrease to the expected rate once equilibrium conditions are reached
 - infiltration or runoff from precipitation events.

5.2.1.2 Analytical Equation

The amount of groundwater flow into an excavation that is trench-shaped under unconfined hydrogeological conditions is estimated using the following analytical expression (corrected from Powers et al., 2007):

$$Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$$

where

Q = groundwater flow rate (m^3/s)

K = hydraulic conductivity (m/s)

H_0 = static groundwater level head above the top of the aquitard (m) – measured during investigation

h_e = dewatered groundwater level head above the top of the aquitard at the excavation (m) – assumed to be 1.0 m below the proposed excavation depth and assumes there is no significant groundwater upflow from depths greater than 1.0 m below the excavation

w = trench width (m)

l = trench length (m)

R_i = radius of influence (m), estimated using Sichardt equation:

$$R_i = 3000(H_0 - h_e)\sqrt{K}$$

5.2.1.3 Estimated Dewatering Rates

Details of the dewatering rate calculations for the installation of proposed Culvert S5 and the utility installations along Arterial A2 using the assumptions and equations listed above are provided in Appendix C. The estimates are summarized in Table 12.

Table 12: Dewatering Rates along Arterial A2

Structure	Dewatering Rate (no uncertainty factor) (m ³ /day)	Dewatering Rate (with uncertainty factor) (m ³ /day)
Culvert S5	0.4	1.2
Utilities	0.3	1

The dewatering rates for box Culvert S5 have been estimated for a trench excavation 10 m long, 9 m wide and 4 m deep. The estimated dewatering rate for this culvert indicates that the groundwater inflow rate of approximately 0.4 m³/day can be expected. A conservative dewatering rate has been determined by multiplying the maximum groundwater inflow by an uncertainty factor of three, which results in an estimated groundwater inflow of approximately 1.2 m³/day. It is important to remember that artesian conditions have been observed at this location.

The dewatering rate for the utility installations has been estimated for a trench excavation 15 m long, 3 m wide and 4 m deep. The estimated dewatering rate for the utility installations indicates that the groundwater inflow rate of approximately 0.3 m³/day can be expected. A conservative dewatering rate has been determined by multiplying the maximum groundwater inflow by an uncertainty factor of three, which results in an estimated groundwater inflow of approximately 1 m³/day.

These dewatering estimates do not include the direct influx of surface water from streams or wetlands into the excavations; it includes only the groundwater that would be expected to infiltrate into the excavation from the soil. In addition to groundwater extraction, stream diversion is expected to be necessary to install the culverts. Any dewatering system should be designed by a dewatering contractor and should take the stream surface water flow into consideration.

Based on the dewatering calculations, no registration in the EASR nor a PTTW would be required for groundwater extraction because the dewatering rates are below both the threshold of 50 m³/day for EASR registration and below the threshold of 400 m³/day for a PTTW.

5.2.2 Water Taking Impact Assessment

5.2.2.1 Zone of Influence

The zone of influence from the excavations for both the proposed box Culvert S5 and the utility installations was estimated to be approximately 1 m, with a conservative estimate of approximately 2 m using an uncertainty factor of three (Table 13).



Table 13: Zones of Influence along Arterial A2

Structure	Zone of Influence (no uncertainty factor) (m)	Zone of Influence (with uncertainty factor) (m)
Culvert S5	1.1	1.8
Utilities	1.1	1.8

The calculated radius of influence is 2 m from the point of groundwater dewatering; however, the actual radius of influence may be influenced by the presence of nearby streams and wetlands. Streams and wetlands may act as boundaries to the zone of influence if they are hydraulically connected to the groundwater being abstracted, thus reducing the zone of influence. While the zone of influence may be buffered somewhat by a stream or wetland, dewatering immediately adjacent to a stream or wetland may also significantly increase the amount of dewatering required. Water supply wells, creeks and wetlands adjacent to the construction Site could be affected by the dewatering.

5.2.2.2 Water Well Impact Assessment

Thirty-one water supply wells were identified in the MECP database of water well records that are within 500 m of Arterial A2. Well depths range from 9 to 38 m BGS, below the expected maximum depth of excavation of 4 m BGS. All the identified water supply wells are more than 9 m deep and all are outside the zone of influence of 2 m and are thus not expected to be affected by construction dewatering, especially if the pump intakes are below the excavation depth.

As the maximum zone of influence around the excavations is 2 m, it is not expected that the construction dewatering will impact any of the private wells within the study area because they are outside the zone of influence. Significant dewatering effects are not anticipated because the dewatering rates are relatively low, dewatering is expected to be of short duration and the excavations are expected to be relatively shallow.

5.2.2.3 Surface Water Impact Assessment

Wood observed no visual evidence of groundwater seeps near the proposed box Culvert S5 along Arterial A2 or along Rainbow Creek within 50 m upstream and downstream of the proposed culvert. Given that the groundwater level in monitoring well S5 was approximately 0.5 m above the ground surface in May 2020 (Table 1), there may be a hydraulic connection to the creek at S5, with groundwater discharge possibly occurring into the creek.

The potential for dewatering to affect Rainbow Creek or a wetland will depend on the duration of the dewatering and the degree of hydraulic connection between groundwater and surface water. The dewatering effect on the creek or wetland may be mitigated if the abstracted groundwater is returned into the creek or wetland downstream. However, the water quality will need to meet upstream (i.e. background) water quality and/or regulatory requirements and treatment of the discharge water may be necessary.



During construction, Rainbow Creek may need temporary diversion using coffer dams with pumping (i.e. active diversion) or using an artificial stream channel without a pump (i.e. passive diversion). Such temporary surface water diversions for construction purposes are exempt from Section 34 of the *Ontario Water Resources Act* and do not require EASR registration or a PTTW. The key criteria for this exemption to be valid include:

- diversion does not affect the stream water levels and quality upstream and downstream
- water remains in or is directly returned to the same water body
- water does not contain visible contaminants
- erosion and sediment control measures are installed and maintained properly.

Construction of the new road will add pavement and thus decrease groundwater recharge and increase runoff. Runoff will be diverted to roadside ditches and storm sewers and will thus be returned to the local watershed and allowed to infiltrate along roadside ditches or on the adjacent land.

Dewatering effects on surface water are expected to be localized and temporary. With the stream temporarily diverted around the culvert to be installed, local dewatering may only be required on a temporary basis to maintain dry working conditions long enough for the culvert to be installed and no permanent impact is expected from the culvert.

6.0 East-West Arterial

The section of East-West Arterial that will be built is 3.1 km long between The Gore Road in the southwest and Coleraine Drive in the northeast (Figure 1). However, this report includes an assessment for only the end portions of the East-West Arterial where access has been granted and boreholes were advanced (Figure 9a). The remaining 1.4-km long section in the middle has not yet been investigated because access to the remaining section has not been provided to be able to conduct the geotechnical and hydrogeological investigations. The remaining section of East-West Arterial will be assessed during the detailed design stage of the project.

The construction of the investigated sections of East-West Arterial includes installing two new box culverts to allow for water in Gore Road Tributary and Rainbow Creek to cross beneath the new road (Figure 2). The box culvert at Rainbow Creek is at the proposed intersection between Arterial A2 and East-West Arterial and was discussed in Section 5.0 above as well. A box culvert will also be constructed at the Clarkway Drive Tributary where it will cross the proposed East-West Arterial; however, the investigation of this area will need to be conducted during the detailed design stage of the project.

6.1 Existing Conditions

Existing conditions were evaluated within a 500-m study area around the proposed East-West Arterial section that will be constructed. The entire East-West Arterial study area is in the Peel Plain physiographic region consisting of bevelled till plains (Figure 3). Surface geology along the East-West Arterial study area consists of glaciolacustrine deposits of clay and silt, with modern alluvial deposits of clay, silt, sand, gravel and organics along the Gore Road and Clarkway Drive Tributaries that cross the proposed East-West Arterial



(Figure 4). The underlying bedrock is composed of limestone, interbedded with shale at depth, in the Georgian Bay Formation from the Ordovician Period.

A Site plan showing the locations of the boreholes and monitoring wells is provided as Figures 9a and 9e and the borehole logs are provided in Appendix A. Nineteen boreholes, two instrumented as monitoring wells, were installed along East-West Arterial, designated E1 to E7, E23 to E32, S5, S17 and S18. The two monitoring wells were designated S5 (installed as part of Arterial A2 investigation) and S17. The E-series boreholes were drilled to depths ranging from 2.1 to 5.2 m BGS and the S-series boreholes and monitoring wells were drilled to depths ranging from 7 to 9.8 m BGS. The S-series boreholes are structural boreholes and monitoring wells installed at stream crossings where culverts will be replaced or installed.

A geological profile around Culvert S17 is shown on Figure 9b. The stratigraphy beneath the proposed road alignment consists of 0.1 m of topsoil and 0.6 m of reworked soil (i.e. fill), underlain by stiff to hard silty clay to clayey silt with trace sand and gravel, occasionally some sand. The silty clay is approximately 1.5 to 4.5 m thick and underlain by dense sandy silt to silty sand. At S17 at Gore Road Tributary, the silty clay is absent and the sandy silt is underlain by weathered shale at 5.5 to 8.5 m BGS. Monitoring well S5 was screened from 6.1 to 9.2 m BGS in the native silty clay and S17 was screened from 3.8 to 6.9 m BGS across the native sandy silt and weathered shale. The static groundwater level in S5 was measured on 4 and 12 May 2020 to be -0.7 and -0.5 m BGS, equivalent to 210 and 209.8 m AMSL, indicating artesian conditions (Table 1). On 4 May 2020, water was observed to be flowing out of the above-ground protective casing and on 12 May 2020, the water level was below the top of the protective casing but 0.5 m above the ground surface. The static groundwater level in S17 was measured on 26 January 2022 to be 3.3 m BGS, equivalent to 199 m AMSL.

Wood identified the presence of 52 water well records within 500 m of the proposed road construction, shown on Figure 9c, many of which were listed as water supply wells. These wells are spread out throughout the study area.

Land use around East-West Arterial is shown on Figure 9d. The majority of the land use around East-West Arterial is agricultural, with natural areas around the streams and rural residential lots at The Gore Road and Clarkway Drive. There is a meadow and wetland north of Rainbow Creek, a meadow at Clarkway Drive Tributary and a forest around Gore Road Tributary. The land use data are from the TRCA (2017).

Most of the East-West Arterial study area is within the Humber River Watershed, as shown on Figure 9f. The Humber River Watershed has an area of 911 km² and is the largest within the jurisdiction of the TRCA. Gore Road Tributary, Clarkway Drive Tributary and Rainbow Creek are the main watercourses that provide drainage in the study area and are part of the headwaters for the Humber River. The streams flow south-southeast across the Site and will intersect the proposed East-West Arterial through new box culverts S5 at Rainbow Creek, approximately 630 m west of Highway 50, a box culvert at Clarkway Drive Tributary, approximately 250 m southwest of Clarkway Drive, and S17 at Gore Road Tributary, approximately 500 m northeast of Gore Road (Figure 9e). The area for the box culvert around Clarkway Drive Tributary has not yet been investigated.

Streamflow monitoring was completed in Rainbow Creek downstream of the proposed Culvert S5 on 12 May 2020. The water depth was approximately 0.1 m and the water flow was approximately 0.2 l/s, equivalent to 16 m³/day (Table 14).

Table 14: Streamflow along East-West Arterial

Culvert	Downstream (m ³ /day)
S5	16

Streamflow monitoring was not completed in Gore Road Tributary or Clarkway Drive Tributary at the proposed East-West Arterial. However, streamflow in these streams was measured farther upstream at Countryside Drive and Clarkway Drive on 12 May 2020 as reported in Sections 3.1 and 4.1. Streamflow in Gore Road Tributary at Countryside Drive (S12) was 84 m³/day upstream and 38 m³/day downstream (Table 5). Streamflow in Clarkway Drive Tributary at Clarkway Drive (S16) was 600 m³/day upstream and 170 m³/day downstream (Table 8).

The natural habitat within the study area includes meadows, wetlands and forests along the three streams crossing the proposed East-West Arterial alignment (Figure 9g). The meadow at Rainbow Creek extends from the stream to Coleraine Drive in the northeast.

6.2 Water Taking

Proposed Culvert S5 along East-West Arterial, at intersection with proposed Arterial A2, is underlain by silty clay to clayey silt fill overlying silty clay to clayey silt till. Proposed culvert S17 is underlain by sandy silt fill overlying silty sand to sandy silt till and weathered shale at depth. Rising head SWRTs were completed in monitoring wells S5 and S17 adjacent to the two proposed culverts on 13 May 2020 and 26 January 2022, respectively. Water was purged from the well and the water level then monitored using a pressure transducer installed in the well as it recovered back to the static condition. Water levels were also measured manually to verify the transducer readings. Recovery data were analyzed using the Bouwer-Rice solution in AQTESOLV version 4.5. The software incorporates the transducer water level data collected during the SWRT and monitoring well construction details to estimate the hydraulic conductivity of the soil formation at the well screen level. The estimated hydraulic conductivity values in S5 and S17 were calculated to be 7.8×10⁻⁹ and 1.1×10⁻⁷ m/s, respectively (Table 1). The results of the hydraulic conductivity analyses are provided in Appendix B.

6.2.1 Dewatering Rates

During the road construction and culvert installations, open trench excavations will be used for the installation of utilities and new structures. Dewatering rate estimates for installation of each box culvert and installation of underground utilities were calculated. In addition to potential removal of groundwater, runoff water from precipitation events may also need to be removed.

6.2.1.1 Assumptions

The following assumptions were used in calculating estimates of dewatering rates, which are based on information provided and Site conditions encountered during the investigation:

- ▶ culvert dimensions of 10 m long, 9 m wide and 4 m deep
- ▶ utility excavation dimensions of 15 m long, 3 m wide and 4 m deep
- ▶ only one excavation is open at any one time
- ▶ hydraulic conductivities of 7.8×10^{-9} and 1.1×10^{-7} m/s from monitoring wells S5 and S17, respectively
- ▶ groundwater depth at ground surface (i.e. 0 m BGS) in monitoring well S5 on 4 May 2020 and 3.3 m in monitoring well S17 on 26 January 2022 with seasonal variation up to 1.0 m higher
- ▶ maximum aquifer thickness of 5 m
- ▶ radial, steady-state flow is assumed for inflow to trench ends
- ▶ linear, steady-state flow is assumed for inflow to trench sides
- ▶ the surficial aquifer is assumed to be unconfined and hydrogeologically homogeneous
- ▶ any surface water is beyond the dewatering radius of influence such that it does not provide potential recharge to groundwater
- ▶ an uncertainty factor of 3 has been incorporated into the dewatering rate estimations to account for:
 - potential variability in the hydraulic conductivity
 - initial depletion of aquifer storage, a temporary response to dewatering; i.e. the initial dewatering rate should decrease to the expected rate once equilibrium conditions are reached
 - infiltration or runoff from precipitation events.

6.2.1.2 Analytical Equation

The amount of groundwater flow into an excavation that is trench-shaped under unconfined hydrogeological conditions is estimated using the following analytical expression (corrected from Powers et al., 2007):

$$Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$$

where

- Q = groundwater flow rate (m³/s)
- K = hydraulic conductivity (m/s)
- H₀ = static groundwater level head above the top of the aquitard (m) – measured during investigation
- h_e = dewatered groundwater level head above the top of the aquitard at the excavation (m) – assumed to be 1.0 m below the proposed excavation depth and assumes there is no significant groundwater upflow from depths greater than 1.0 m below the excavation
- w = trench width (m)
- ℓ = trench length (m)
- R_i = radius of influence (m), estimated using Sichardt equation:



$$R_i = 3000(H_0 - h_e)\sqrt{K}$$

6.2.1.3 Estimated Dewatering Rates

Details of the dewatering rate calculations for the installation of proposed Culverts S5 and S17 and the utility installations along East-West Arterial using the assumptions and equations listed above are provided in Appendix C. The estimates are summarized in Table 15.

Table 15: Dewatering Rates along East-West Arterial

Structure	Dewatering Rate (no uncertainty factor) (m ³ /day)	Dewatering Rate (with uncertainty factor) (m ³ /day)
Culvert S5	0.4	1.2
Culvert S17	0.9	2.8
Utilities	0.8	2.3

The dewatering rates for the box culverts have been estimated for a trench excavation 10 m long, 9 m wide and 4 m deep. The estimated dewatering rates for Culverts S5 and S17 indicate that the groundwater inflow rates of approximately 0.4 and 0.9 m³/day can be expected, respectively. Conservative dewatering rates have been determined by multiplying the maximum groundwater inflow by an uncertainty factor of three, which results in estimated groundwater inflows of 1.2 and 2.8 m³/day. However, it is important to remember that artesian conditions have been observed at S5.

The dewatering rate for the utility installations has been estimated for a trench excavation 15 m long, 3 m wide and 4 m deep. The estimated dewatering rate for the utility installations indicates that the groundwater inflow rate of approximately 0.8 m³/day can be expected. A conservative dewatering rate has been determined by multiplying the maximum groundwater inflow by an uncertainty factor of three, which results in an estimated groundwater inflow of approximately 2.3 m³/day.

These dewatering estimates do not include the direct influx of surface water from streams or wetlands into the excavations; it includes only the groundwater that would be expected to infiltrate into the excavation from the soil. In addition to groundwater extraction, stream diversion is expected to be necessary to install the culverts. Any dewatering system should be designed by a dewatering contractor and should take the stream surface water flow into consideration.

Based on the dewatering calculations, no registration in the EASR nor a PTTW would be required for groundwater extraction because the dewatering rates are below both the threshold of 50 m³/day for EASR registration and below the threshold of 400 m³/day for a PTTW.



6.2.2 Water Taking Impact Assessment

6.2.2.1 Zone of Influence

The zones of influence from the excavations for the box culverts and the utility installations were estimated to be up to approximately 2 m, with a conservative estimate of approximately 4 m using an uncertainty factor of three (Table 16).

Table 16: Zones of Influence along East-West Arterial

Structure	Zone of Influence (no uncertainty factor) (m)	Zone of Influence (with uncertainty factor) (m)
Culvert S5	1.1	1.8
Culvert S17	1.7	2.9
Utilities	2.1	3.6

The calculated radius of influence is 4 m from the point of groundwater dewatering; however, the actual radius of influence may be influenced by the presence of nearby streams and wetlands. Streams and wetlands may act as boundaries to the zone of influence if they are hydraulically connected to the groundwater being abstracted, thus reducing the zone of influence. While the zone of influence may be buffered somewhat by a stream or wetland, dewatering immediately adjacent to a stream or wetland may also significantly increase the amount of dewatering required. Water supply wells, creeks and wetlands adjacent to the construction Site could be affected by the dewatering.

6.2.2.2 Water Well Impact Assessment

Up to 52 water supply wells were identified in the MECP database of water well records that are within 500 m of Arterial A2. Well depths range from 9 to 38 m BGS, below the expected maximum depth of excavation of 4 m BGS. All the identified water supply wells are more than 9 m deep and all are outside the zone of influence of 4 m and are thus not expected to be affected by construction dewatering, especially if the pump intakes are below the excavation depth.

As the maximum zone of influence around the excavations is 4 m, it is not expected that the construction dewatering will impact any of the private wells within the study area because they are outside the zone of influence. Significant dewatering effects are not anticipated because the dewatering rates are relatively low, dewatering is expected to be of short duration and the excavations are expected to be relatively shallow.

6.2.2.3 Surface Water Impact Assessment

Wood observed no visual evidence of groundwater seeps near the proposed box Culvert S5 along East-West Arterial or along Rainbow Creek within 50 m upstream and downstream of the proposed culvert. Given that the groundwater level in monitoring well S5 was approximately 0.5 m above the ground surface in May 2020 (Table 1), there may be a hydraulic connection to the creek at S5, with groundwater discharge possibly occurring into the creek.

The potential for dewatering to affect Gore Road Tributary, Clarkway Drive Tributary, Rainbow Creek or a wetland will depend on the duration of the dewatering and the degree of hydraulic connection between groundwater and surface water. The dewatering effect on the creek or wetland may be mitigated if the abstracted groundwater is returned into the creek or wetland downstream. However, the water quality will need to meet upstream (i.e. background) water quality and/or regulatory requirements and treatment of the discharge water may be necessary.

During construction, the streams may need temporary diversion using coffer dams with pumping (i.e. active diversion) or using an artificial stream channel without a pump (i.e. passive diversion). Such temporary surface water diversions for construction purposes are exempt from Section 34 of the *Ontario Water Resources Act* and do not require EASR registration or a PTTW. The key criteria for this exemption to be valid include:

- diversion does not affect the stream water levels and quality upstream and downstream
- water remains in or is directly returned to the same water body
- water does not contain visible contaminants
- erosion and sediment control measures are installed and maintained properly.

Construction of the new road will add pavement and thus decrease groundwater recharge and increase runoff. Runoff will be diverted to roadside ditches and storm sewers and will thus be returned to the local watershed and allowed to infiltrate along roadside ditches or on the adjacent land.

Dewatering effects on surface water are expected to be localized and temporary. With the streams temporarily diverted around the culverts to be installed, local dewatering may only be required on a temporary basis to maintain dry working conditions long enough for the culverts to be installed and no permanent impact is expected from the culverts.

7.0 Summary and Conclusions

The results of the hydrogeological assessment are summarized as follows:

1. The Site is in the Peel Plain physiographic region consisting of bevelled till plains and the surface geology consists of glaciolacustrine deposits of clay and silt, with modern alluvial deposits of clay, silt, sand, gravel and organics along some of the streams. The underlying bedrock is composed of limestone, interbedded with shale at depth, in the Georgian Bay Formation from the Ordovician Period.
2. The stratigraphy beneath the road alignments consists of one to four metres of fill, underlain by stiff to hard silty clay to clayey silt with trace sand and gravel, occasionally some sand. The silty clay is underlain by silty sand to sandy silt in eight of the deep structural boreholes S3, S4, S11, S12, S13, S14, S17 and S18, possibly reflecting the modern alluvial deposits along some of the streams. The silty clay is absent some boreholes near the streams, it extends up to 9.8 m BGS, the maximum

depth of investigation. Shale bedrock was encountered at 5.5 to 8.5 m BGS at S17 and S18 near Gore Road Tributary and the proposed East-West Arterial.

3. Primary land use across the Site is agricultural with a few rural residences and scattered wetlands, meadows and forests along the streams. Numerous private wells were identified across the Site.
4. The main watercourses are Rainbow Creek, Clarkway Drive Tributary and Gore Road Tributary flowing southeast across the Site. Streamflows measured in these three watercourses in May 2020 ranged from 0.2 l/s (16 m³/day) to 10 l/s (875 m³/day). The greatest flows were measured in Clarkway Drive Tributary and the lowest flows were measured in Gore Road Tributary. Significant reductions in flow were observed at the stations downstream of proposed Culvert S5 along Rainbow Creek and existing Culvert S16 along Clarkway Drive Tributary because of relatively large wetland meadows at these locations which probably serve to retain and retard flow and also provide multiple channels for water to flow through, all of which may not have been captured during the flow measurements.
5. The results of the single well response tests in seven of the eight monitoring wells across the Site indicated hydraulic conductivity values of the clay, silt and sand to range from 3.7×10^{-9} to 1.2×10^{-6} m/s.
6. Dewatering rates were based on the design dimensions of the excavations, with only one excavation open at any one time, which were assumed to be 10 m long, 9 m wide and 4 m deep for box culverts and 15 m long, 3 m wide and 4 m deep for underground utilities. The conservatively estimated dewatering rates calculated using an uncertainty factor of three ranged from 1 to 21 m³/day for the proposed excavations to install culverts and underground utilities. These rates include only groundwater influx and not surface water influx from streams, storms or wetlands. No EASR registration nor a PTTW would be required for groundwater extraction based on the assumptions used in preparing these calculations.
7. The conservatively estimated zones of influence calculated using an uncertainty factor of three ranged from 2 to 21 m.
8. Most of the identified water supply wells are more than 10 m deep, below the expected maximum depth of excavation of 4 m BGS and outside the zones of influence and are thus not expected to be affected by construction dewatering because the dewatering rates are relatively low, dewatering is expected to be of short duration and the excavations are expected to be relatively shallow. Five water supply wells may need to be investigated further (see recommendation in Section 7.0).
9. Wood observed no visual evidence of groundwater seeps near the existing or proposed box culverts or along the creeks within 50 m upstream and downstream of the culverts. Given that the groundwater levels in the monitoring wells at the existing culverts ranged from 0.9 to 3.2 m BGS in May 2020 and January 2022, there may be a hydraulic connection to sections of the creeks, with some groundwater recharge occurring, although this was not measured. The groundwater level in

S5 at proposed Culvert S5 was above the ground surface, indicating possible groundwater discharge into Rainbow Creek.

10. Dewatering effects on surface water are expected to be localized and temporary. With the streams temporarily diverted around the culverts to be installed, local dewatering may only be required on a temporary basis to maintain dry working conditions long enough for the culverts to be installed and no permanent impact is expected from the culverts.
11. Should the infrastructure design change, the estimated dewatering rates and zones of influence, as well as the conclusions and recommendations provided in this report will need to be reviewed and updated.

8.0 Recommendations

Based on the results of the hydrogeological assessment as summarized above, the following recommendations are provided:

1. While a permit to take water for groundwater extraction from excavations is not anticipated to be needed, permitting may be required if dewatering rates exceed the thresholds for EASR registration and a PTTW because of surface water, storm water and wetland water influx into excavations.
2. Conduct on-going water level monitoring during detailed design to determine seasonal water level fluctuations. Record the amount of water taking during each day of dewatering to ensure the maximum water taking does not exceed the thresholds for EASR registration or a PTTW.
3. To be diligent, it is recommended that a private well survey be completed during detailed design to confirm the location of, depth of and water level in water supply wells 4907185 and 4904154 near Coleraine Drive and water supply wells 4902856, 4902866 and 4905894 near Clarkway Drive.
4. In addition to groundwater extraction, stream diversion may be necessary to install the culverts. Any dewatering system should be designed by a dewatering contractor and should take the stream surface water flow into consideration.
5. Use standard erosion and sediment control measures that meet or exceed Ontario Provincial Standards and Specifications to discharge the abstracted water into the adjacent wetlands, streams or other natural surface water body. The measures should be implemented prior to work and be maintained during construction until disturbed areas have been effectively stabilized and restored. Removing sediment from the abstracted water could be achieved by filter bags or for higher amounts by collecting the abstracted water in a weir tank to allow sediment to settle out of the water first.
6. The quality of the water discharged into the adjacent wetlands, streams or other natural surface water body should meet upstream (i.e. background) water quality and/or the Ontario Provincial Water Quality Objectives (PWQOs).

9.0 Limitations

The assessment presented in this report is based on data obtained by means of a limited number of boreholes and in-situ and laboratory tests. Borehole characterization may not effectively determine all the factors that may affect construction methods and costs. Subsurface and groundwater conditions between and beyond the boreholes may differ from those encountered at the boreholes, and conditions may become apparent during construction, which could not be detected or anticipated at the time of Site investigation.

The anticipated construction conditions were discussed only to the extent of the permitting process. Construction methods discussed express Wood’s opinion only and are not intended to direct the contractors on how to carry out the construction. Contractors should also be aware that the data and interpretation presented in this assessment may not be sufficient to assess all the factors that may have an effect upon the construction.

The assessment was prepared with the condition that the design will be in accordance with all applicable standards and codes, regulations of authorities having jurisdiction and good engineering practice. Further, the findings in this assessment are applicable only to the project as described above. On-going liaison with Wood during the final design and construction phase of the project is recommended to confirm that the findings in this assessment are applicable and/or correctly interpreted and implemented. Also, any queries concerning the hydrogeological aspects of the project should be directed to Wood for further elaboration and/or clarification. This report is further subject to the limitations contained in Appendix D.

10.0 Closure

We trust the information presented in this report meets your current requirements. Should you have any questions or concerns, please contact the undersigned.

Yours truly,

**Wood Environment & Infrastructure Solutions,
 a Division of Wood Canada Limited**

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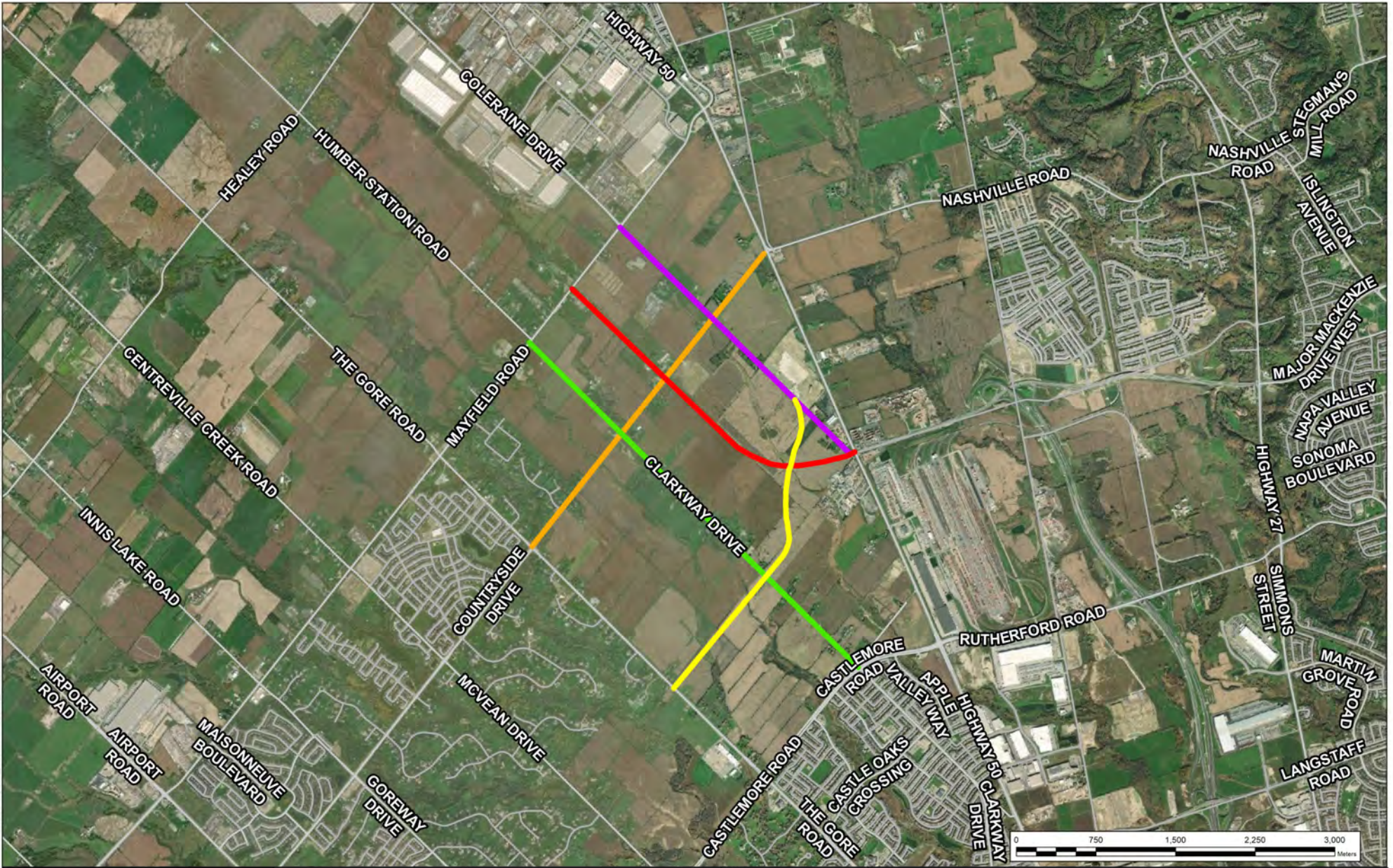


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Figures



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LEGEND	
Site Location	
—	Arterial A2
—	Clarkway Drive
—	Coleraine Drive
—	Countryside Drive
—	East-West Arterial

NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE

 This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

 SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

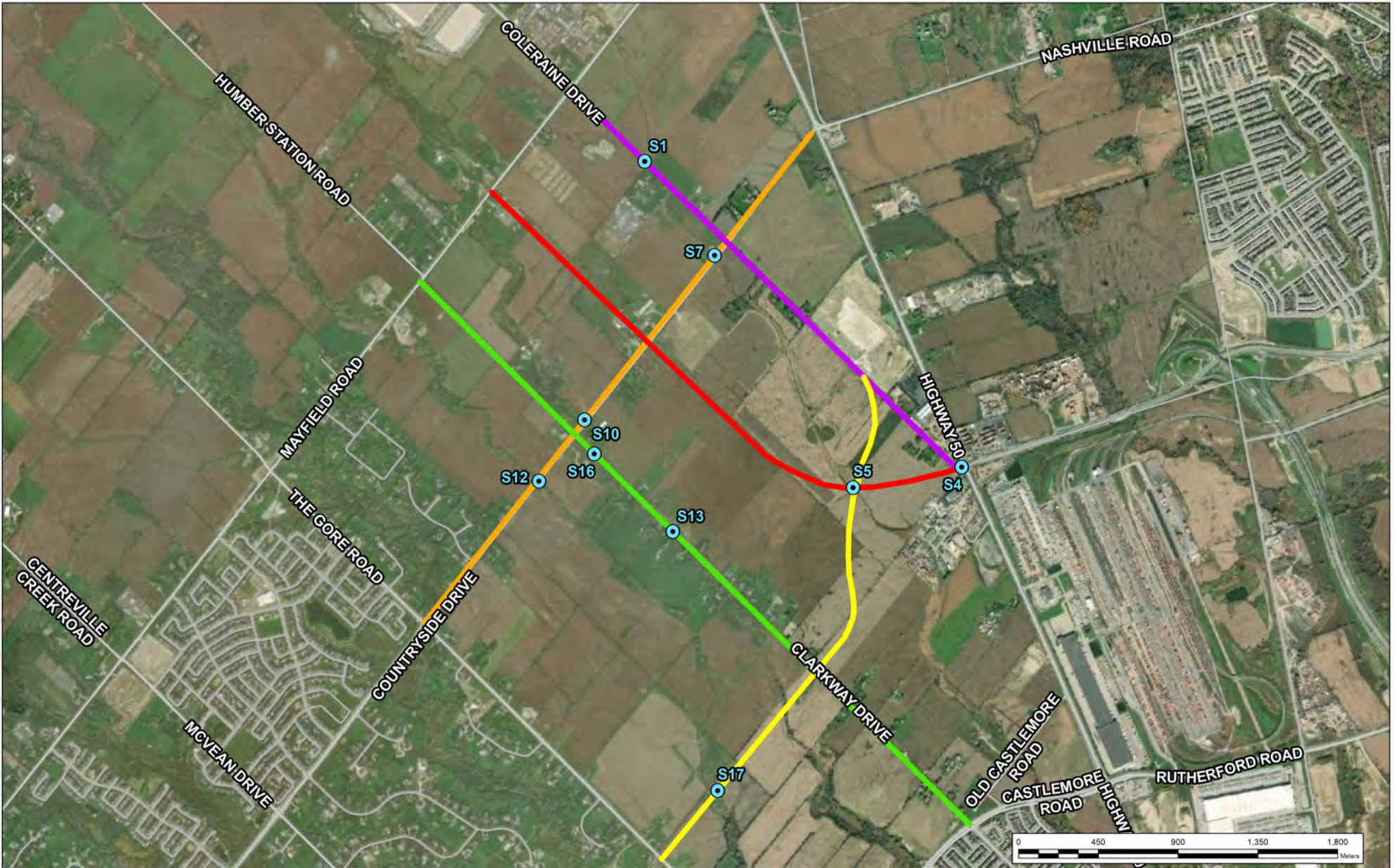
CLIENT:

Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:50,000	

HYDROGEOLOGICAL INVESTIGATION	
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario	
Site Location	
PROJECT N°: TP115086.1.6200	FIGURE: 1
DATE: March 2022	
Wood Environment & Infrastructure Solutions 3450 Harvester Rd, Suite 100., Burlington, Ontario, L7N 3W5 tel: 905-335-2353 www.woodplc.com	



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LEGEND

— Arterial A2
— Clarkway Drive
— Coleraine Drive
— Countryside Drive
— East-West Arterial

● Culvert Structure (labelled with ID)

NOTES:

LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:

Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:30,000	

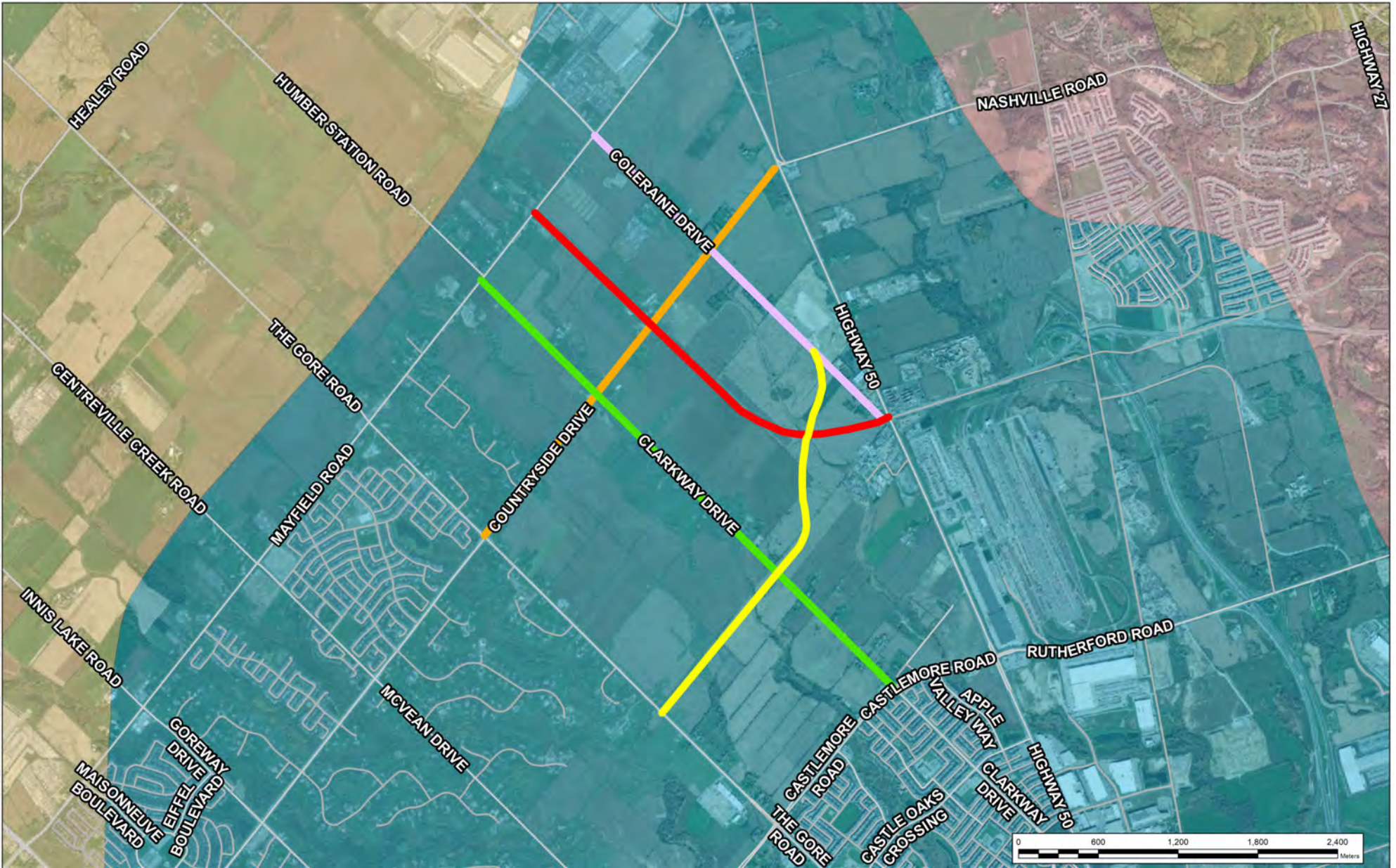
HYDROGEOLOGICAL INVESTIGATION
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Site Plan and Culvert Structures

PROJECT N°: TP115086.1.6200	FIGURE: 2
DATE: March 2022	

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LEGEND

Site Location

- Arterial A2
- Clarkway Drive
- Coleraine Drive
- Countryside Drive
- East-West Arterial

Physiographic Unit and Description

- Bevelled Till Plains
- 16: Sand Plains
- Till Plains (Drumlinized)

Physiographic Region (shown in inset map)

- Iroquois Plain
- Niagara Escarpment
- Oak Ridges Moraine
- Peel Plain
- South Slope

NOTES:

LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:

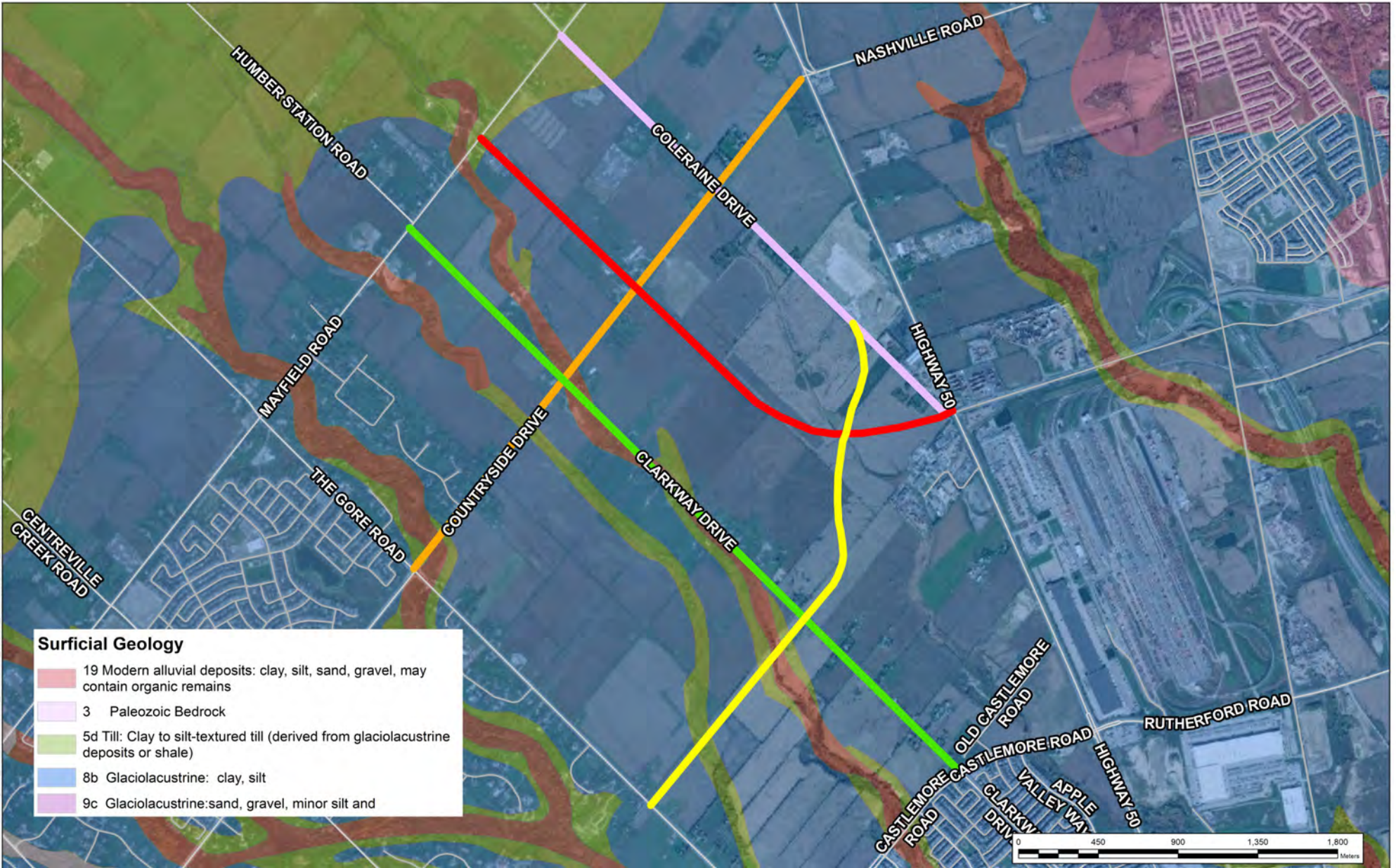
Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:40,000	

HYDROGEOLOGICAL INVESTIGATION
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Physiography

PROJECT N°: TP115086.1.6200	FIGURE: 3
DATE: March 2022	

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Surficial Geology

- 19 Modern alluvial deposits: clay, silt, sand, gravel, may contain organic remains
- 3 Paleozoic Bedrock
- 5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)
- 8b Glaciolacustrine: clay, silt
- 9c Glaciolacustrine: sand, gravel, minor silt and



LEGEND

Site Location

- Arterial A2
- Clarkway Drive
- Coleraine Drive
- Countryside Drive
- East-West Arterial

NOTES:


LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:

Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:30,000	




HYDROGEOLOGICAL INVESTIGATION

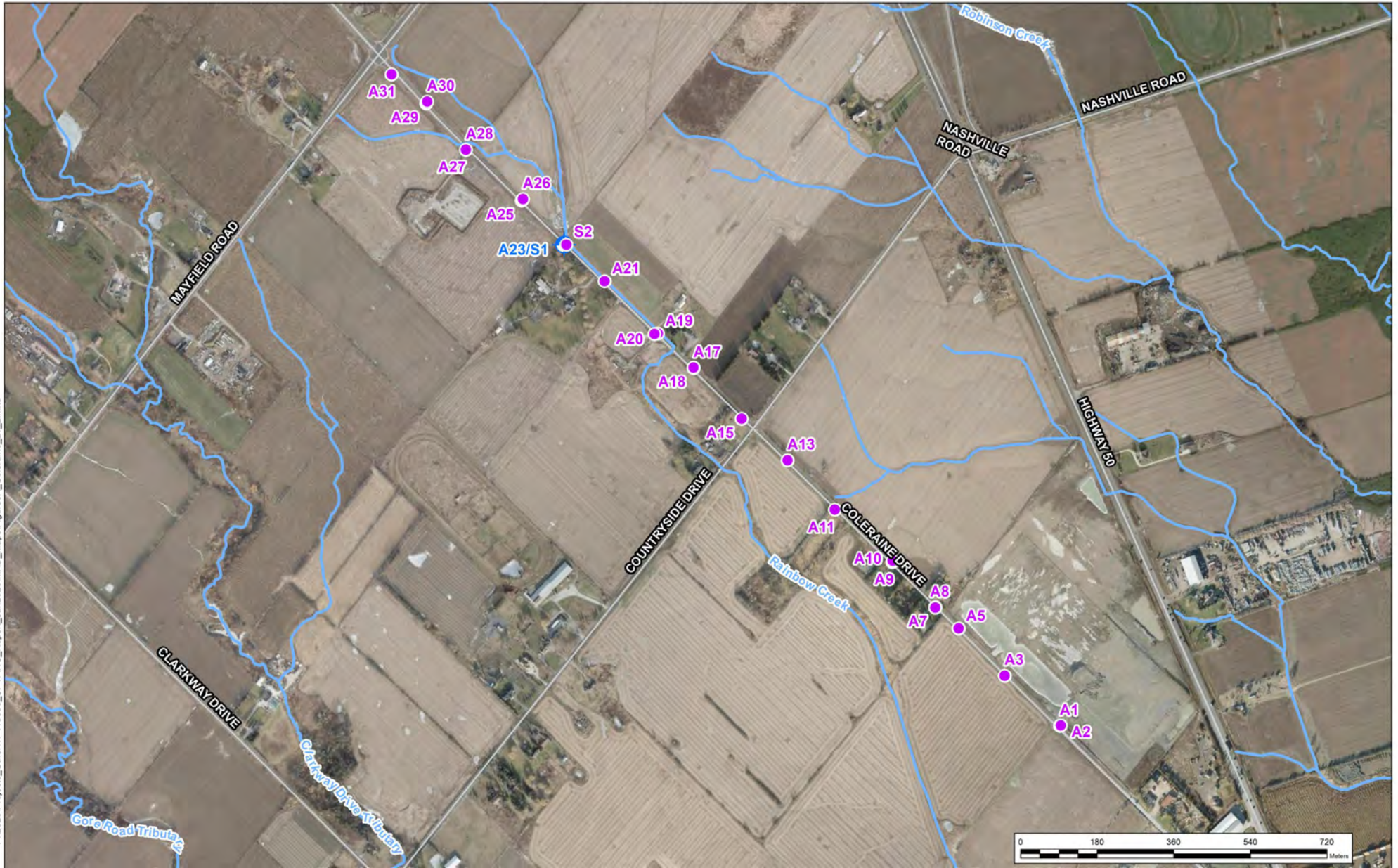
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Surficial Geology

PROJECT N°: TP115086.1.6200	FIGURE: 4
DATE: March 2022	

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LEGEND

- Borehole
- ⊕ Monitoring Well
- Watercourse

NOTES:

LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:	
Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:12,500	

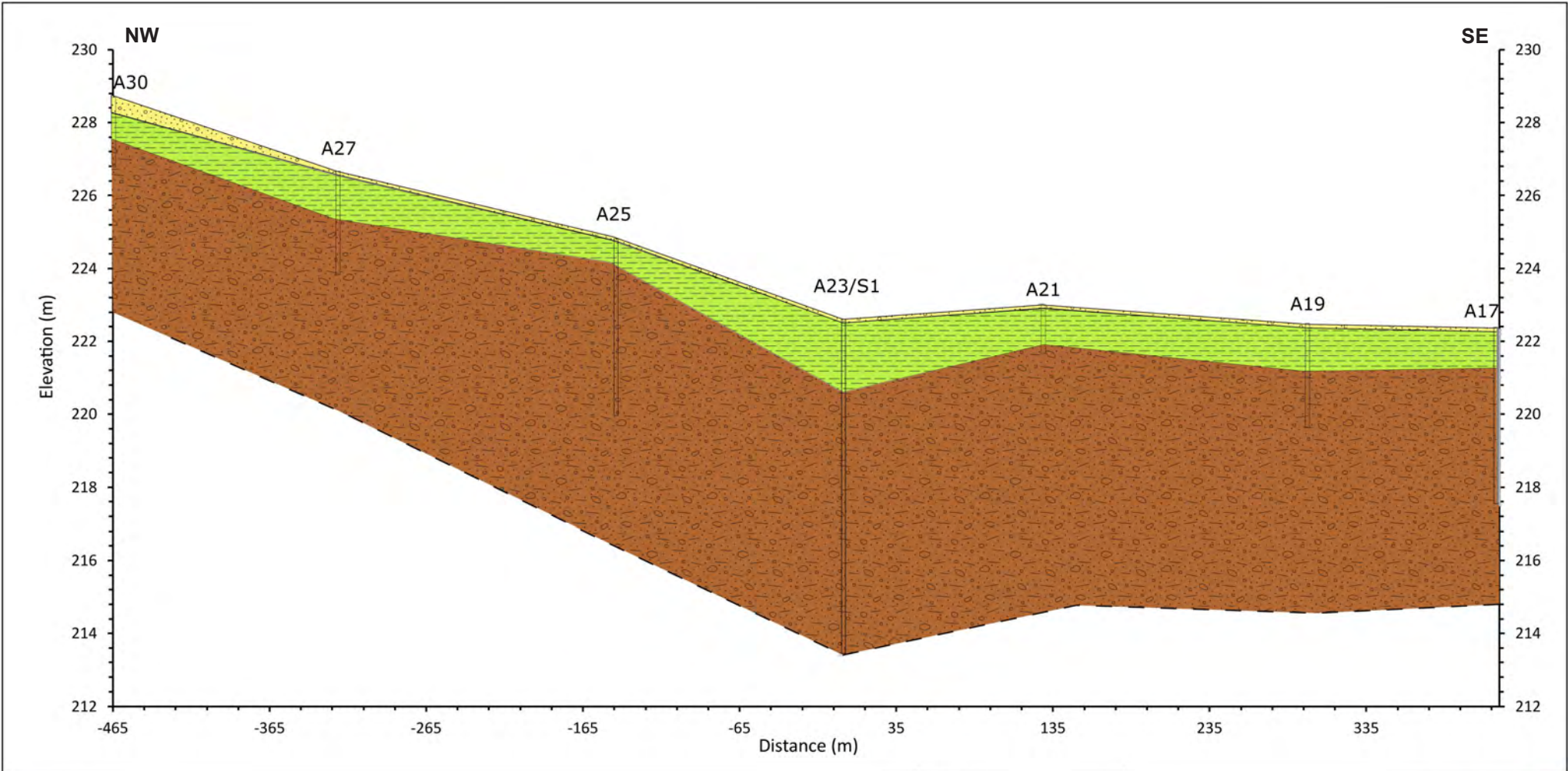
HYDROGEOLOGICAL INVESTIGATION
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Coleraine Drive - Boreholes / Monitoring Wells




PROJECT N°: TP115086.6200	FIGURE: 5a
DATE: January 2021	

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wood.



LEGEND

-  SAND AND GRAVEL FILL
-  SILTY CLAY/CLAYEY SILT FILL
-  SILTY CLAY/CLAYEY SILT TILL

NOTES:

Datum: NAD83
Projection: UTM Zone 17N



HYDROGEOLOGICAL INVESTIGATION

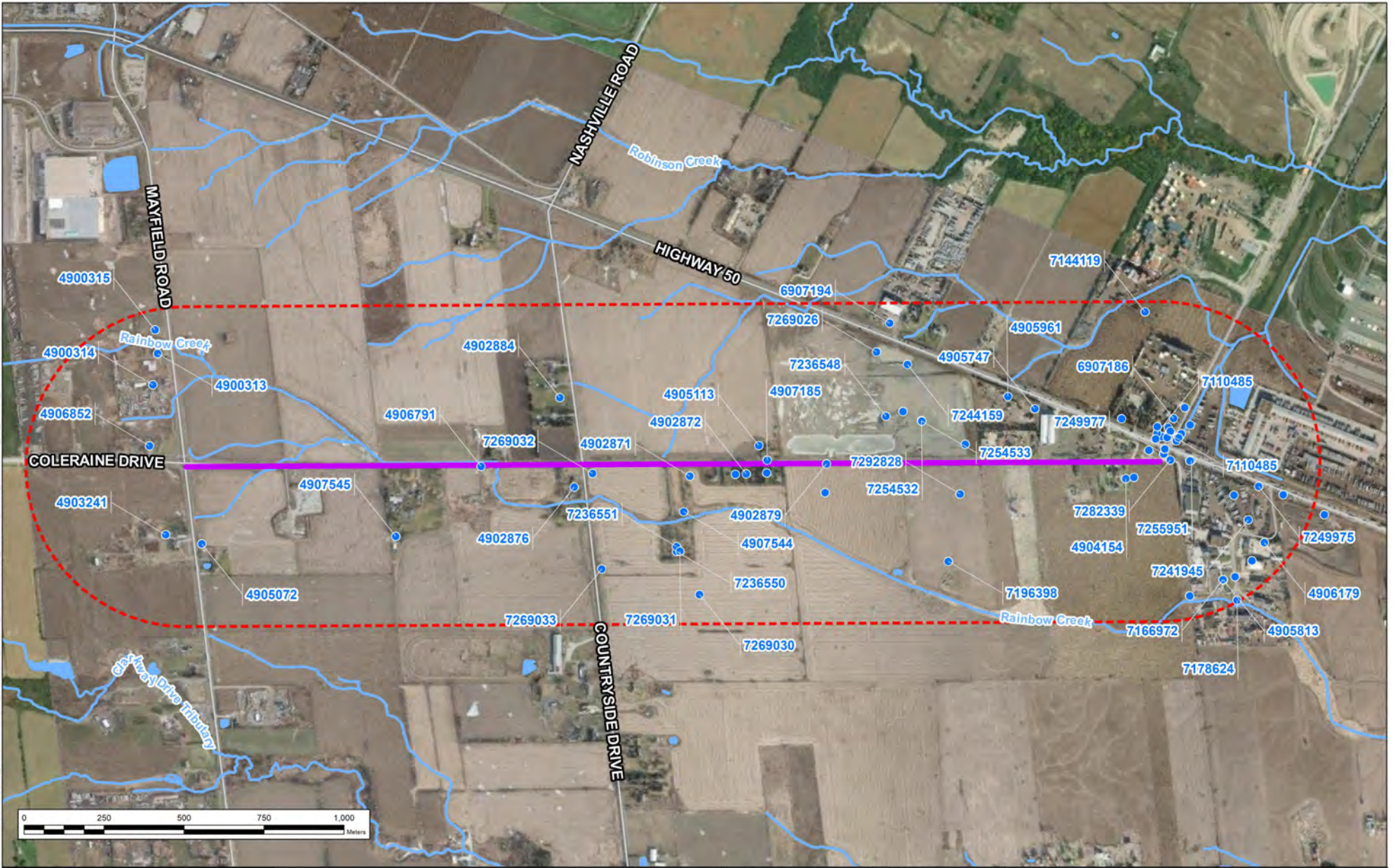
Coleraine Drive - Geological Profile around
Culvert S1

PROJECT N^o: TP115086

FIGURE 5b

SCALE: NTS

DATE: Sep2020



LEGEND

- Water well
- ▭ 500-m Study area
- Site Location
- Coleraine Drive
- Watercourse
- Waterbody

NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE

 This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

 SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:

Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:16,584	

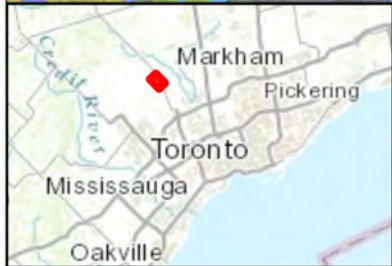
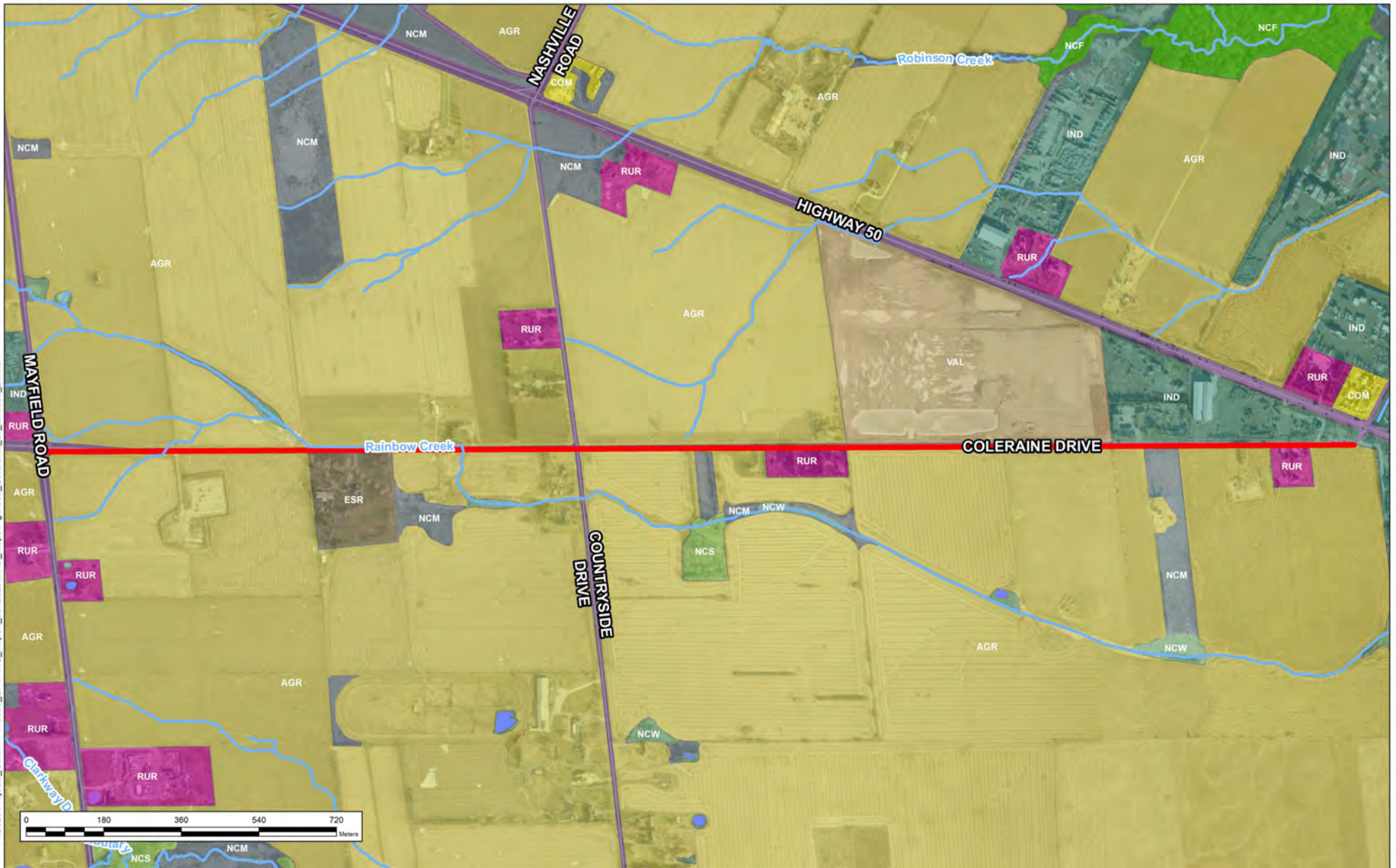
HYDROGEOLOGICAL INVESTIGATION
 Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Coleraine Drive - Water Wells within 500 m

PROJECT N°: TP115086.6200	FIGURE: 5c
DATE: January 2021	

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LEGEND	
Watercourse	Lacustrine, OWL
Coleraine Drive	Meadow, NCM
Landuse (TRCA, 2017)	Roads, RDS
Agricultural, AGR	Rural Residential, RUR
Commercial, COM	Successional Forest, NCS
Estate Residential, ESR	Vacant Land, VAL
Forest, NCF	Wetland, NCW
Industrial, IND	Waterbody

NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE

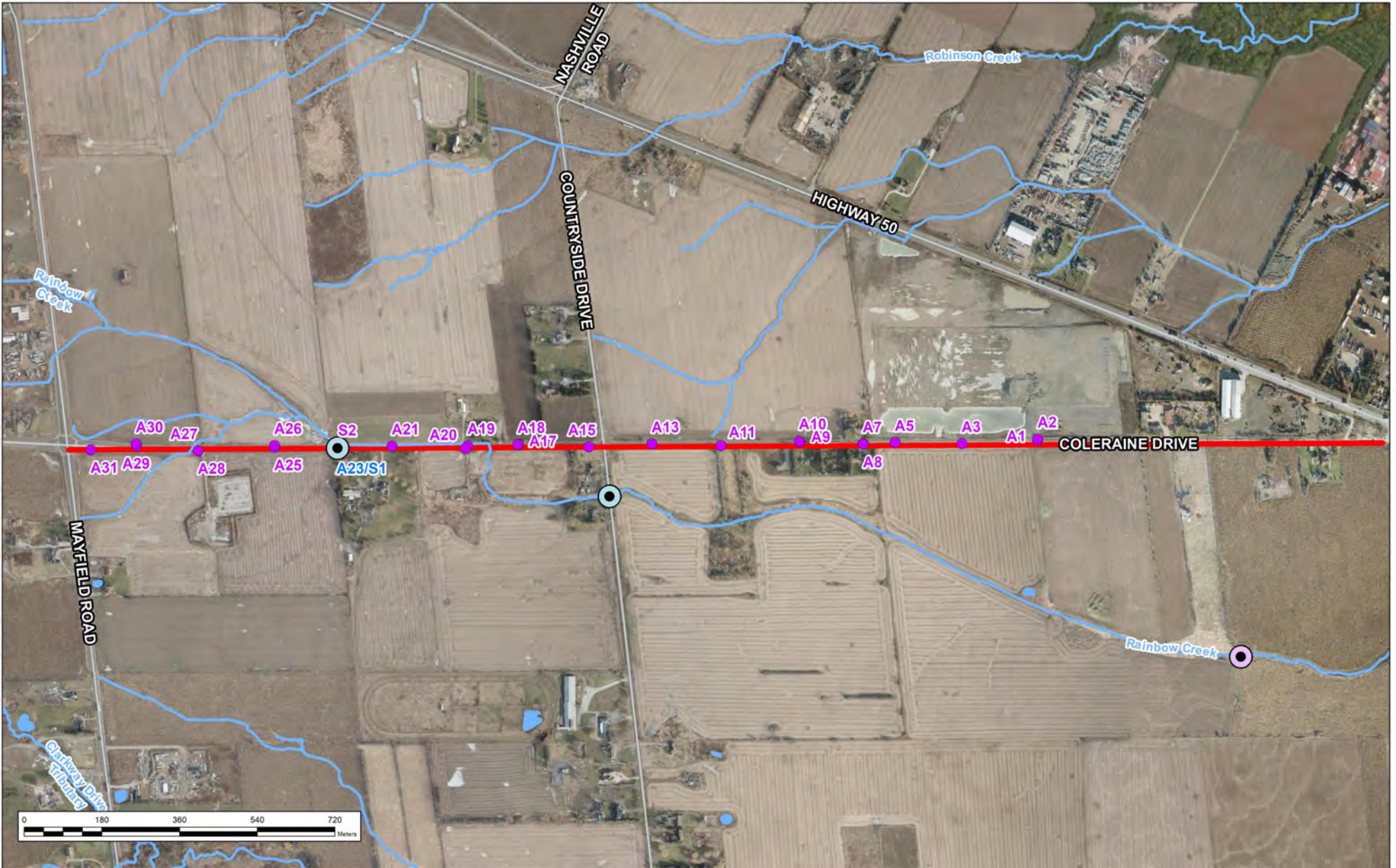
 This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

 SOURCE: Some data presented in this figure is from the Ontario open dataset: Hishade (2012); ORN, 2012.

CLIENT:	
Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:12,325	

HYDROGEOLOGICAL INVESTIGATION	
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario	
Coleraine Drive - Land Use	
PROJECT N°: TP115086.6200	FIGURE: 5d
DATE: January 2021	
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LEGEND

- Existing Culvert
- Proposed Culvert
- Borehole
- Monitoring Well
- Watercourse
- Coleraine Drive
- Waterbody

NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE
 This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200
 SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:	
Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:12,322	

HYDROGEOLOGICAL INVESTIGATION
 Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

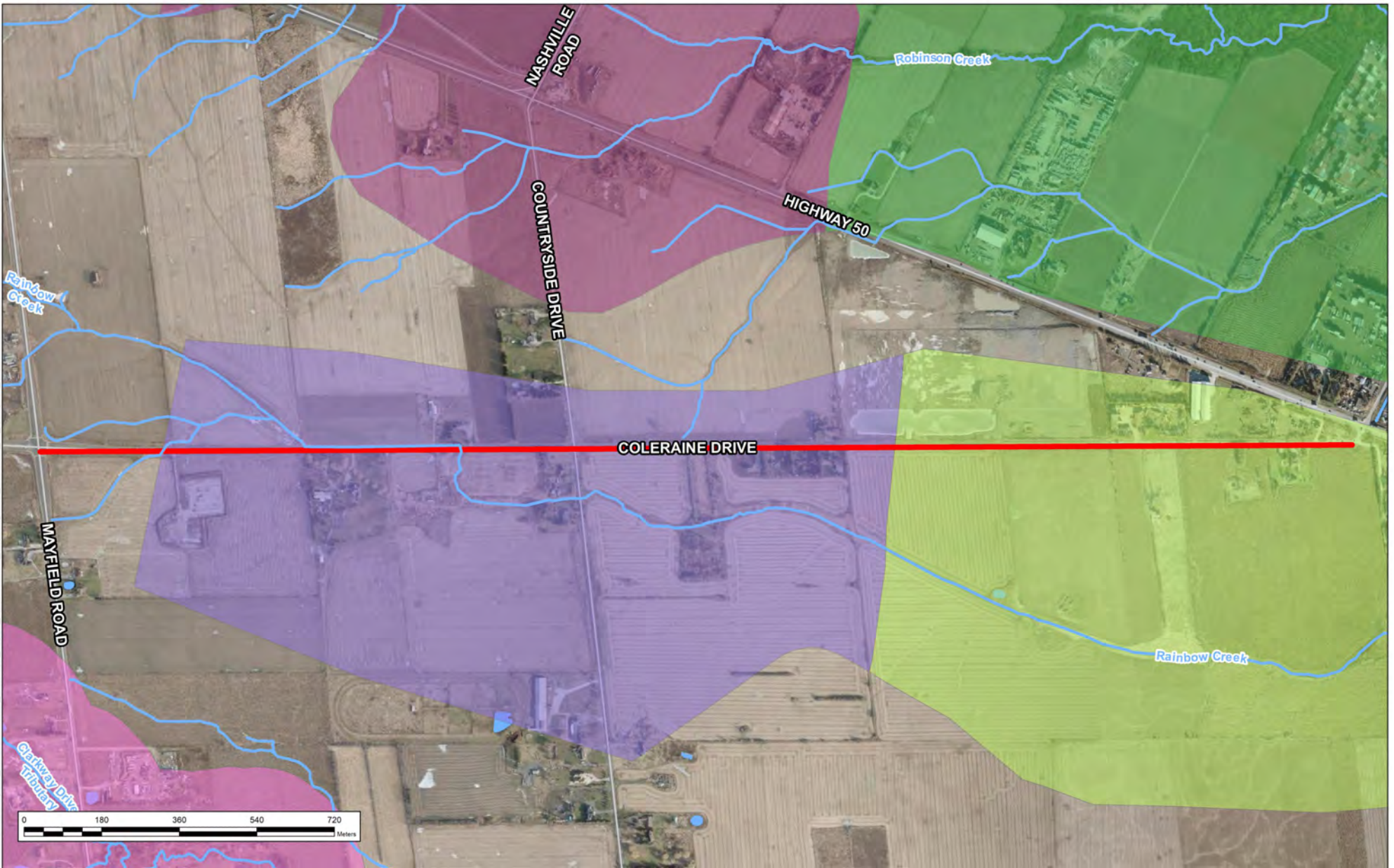
Coleraine Drive - Surface Water Drainage and Structures

PROJECT N°: TP115086.6200	FIGURE: 5e
DATE: January 2021	

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wood.

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LEGEND	
	Coleraine Drive Flood Plain Mapping Index (TRCA)
	Waterbody
	Watercourse
Humber Watershed	
	hum_151
	hum_152
	hum_154
	hum_155
	hum_170

NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE

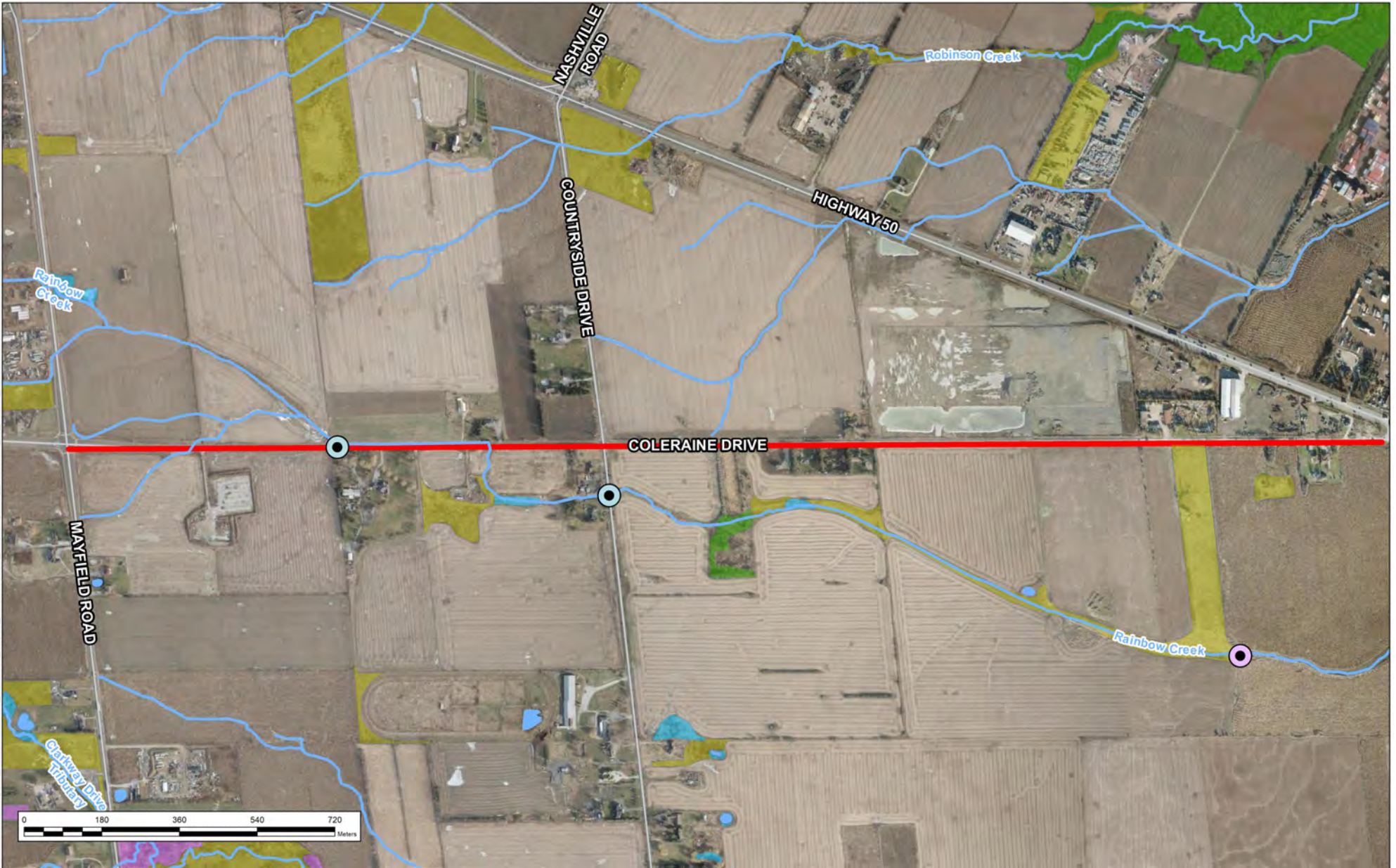
 This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

 SOURCE: Some data presented in this figure is from the Ontario open dataset: Hiltshade (2012); ORN, 2012.

CLIENT:	
Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:12,322	

HYDROGEOLOGICAL INVESTIGATION	
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario	
Coleraine Drive - Regulatory Flood Plain	
PROJECT N ^o :	TP115086.6200
DATE:	January 2021
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FIGURE:	5f

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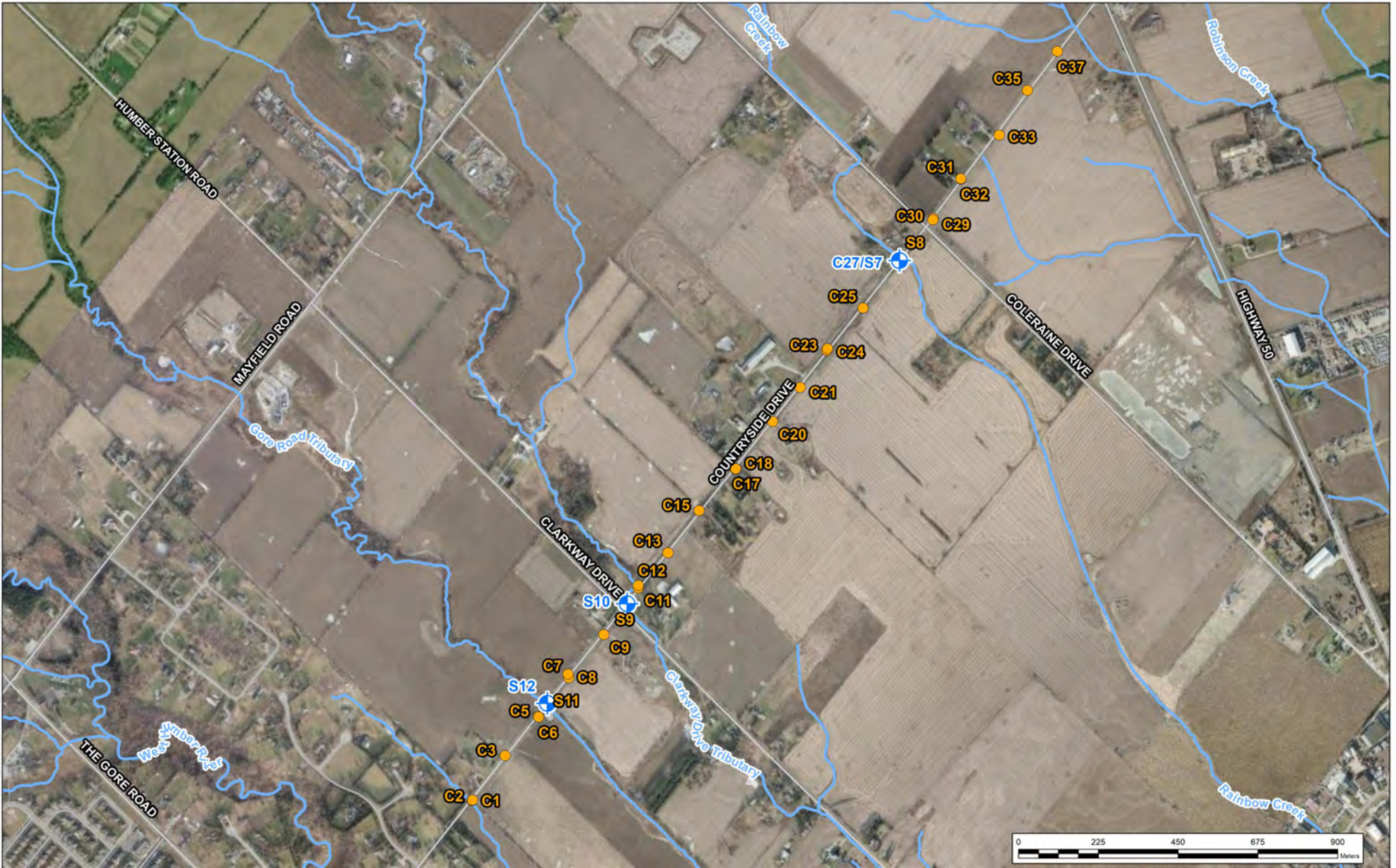
LEGEND		HABITAT	
Coleraine Drive	Existing Culvert	Forest	Meadow
Watercourse	Proposed Culvert	Successional	Wetland
Waterbody			

NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE
 This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200
 SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:	
Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:12,325	

HYDROGEOLOGICAL INVESTIGATION	
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario	
Coleraine Drive - Habitats	
PROJECT N°: TP115086.6200	FIGURE: 5g
DATE: January 2021	
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LEGEND

- Borehole
- ⊕ Monitoring Well
- Watercourse

NOTES:


LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:

Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:15,000	




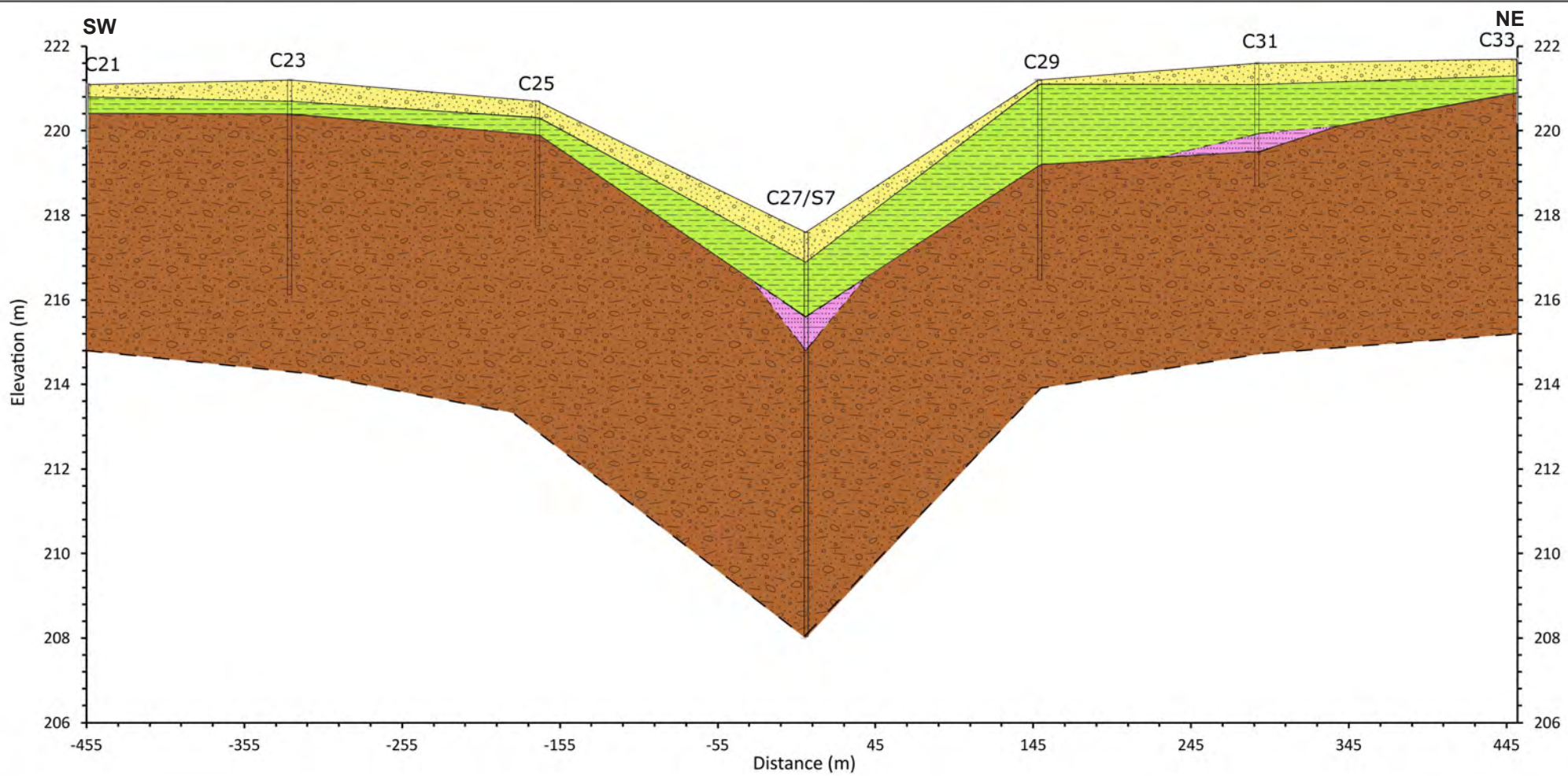
HYDROGEOLOGICAL INVESTIGATION
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Countryside Drive - Boreholes / Monitoring Wells





PROJECT N°: TP115086.6200	FIGURE: 6a
DATE: February 2021	

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LEGEND

-  SAND AND GRAVEL FILL
-  SILTY CLAY/CLAYEY SILT FILL
-  SILTY CLAY/CLAYEY SILT TILL
-  SAND AND SILT

NOTES:

Datum: NAD83
Projection: UTM Zone 17N



HYDROGEOLOGICAL INVESTIGATION

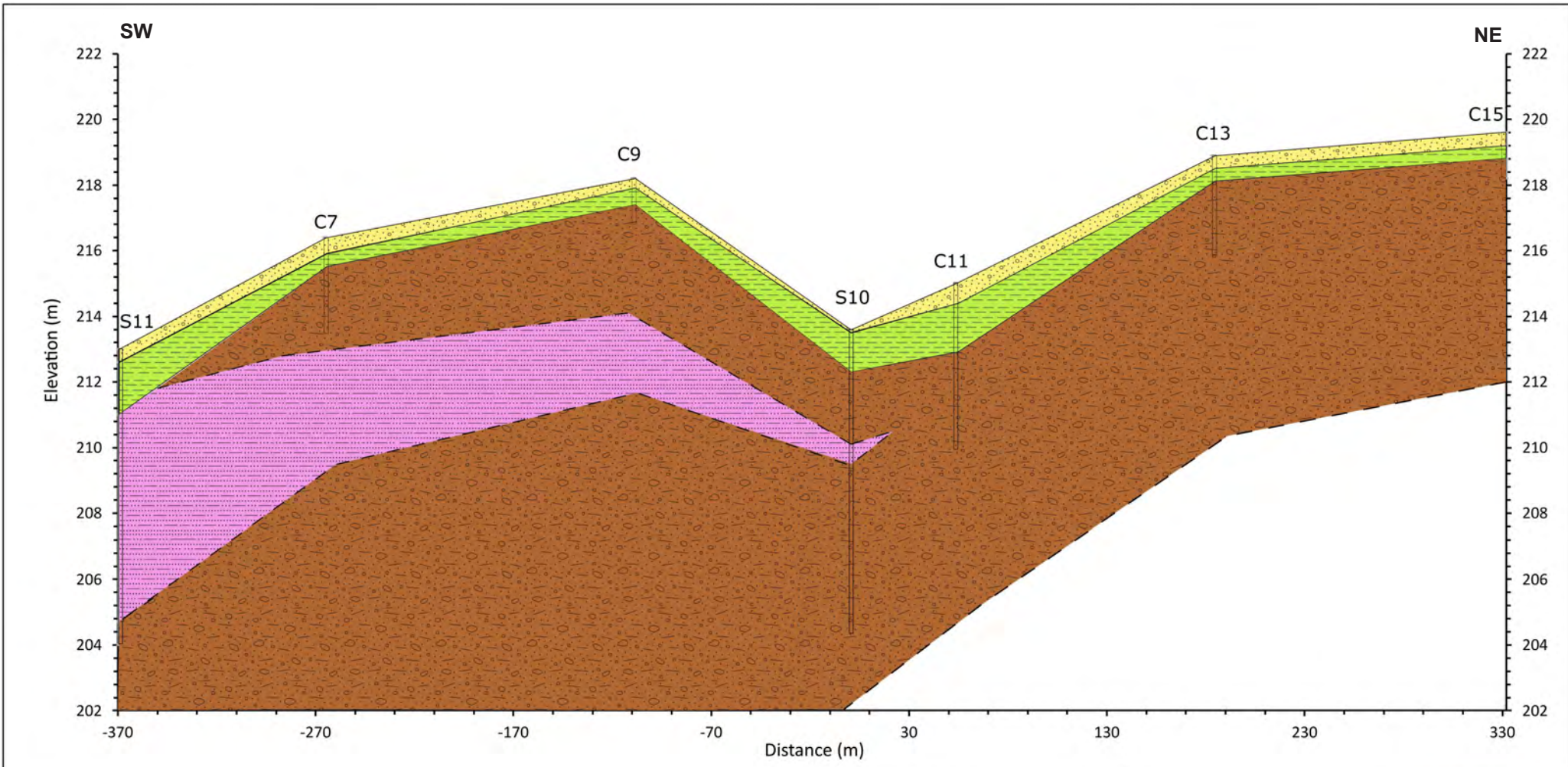
Countryside Drive - Geological Profile
around Culvert S7

PROJECT N^o TP115086

FIGURE 6b-i

SCALE: NTS

DATE: Sep2020



LEGEND

- SAND AND GRAVEL FILL
- SILTY CLAY/CLAYEY SILT FILL
- SILTY CLAY/CLAYEY SILT TILL
- SANDY SILT

NOTES:



HYDROGEOLOGICAL INVESTIGATION

Countryside Drive - Geological Profile
around Culvert S10

Datum: NAD83
Projection: UTM Zone 17N

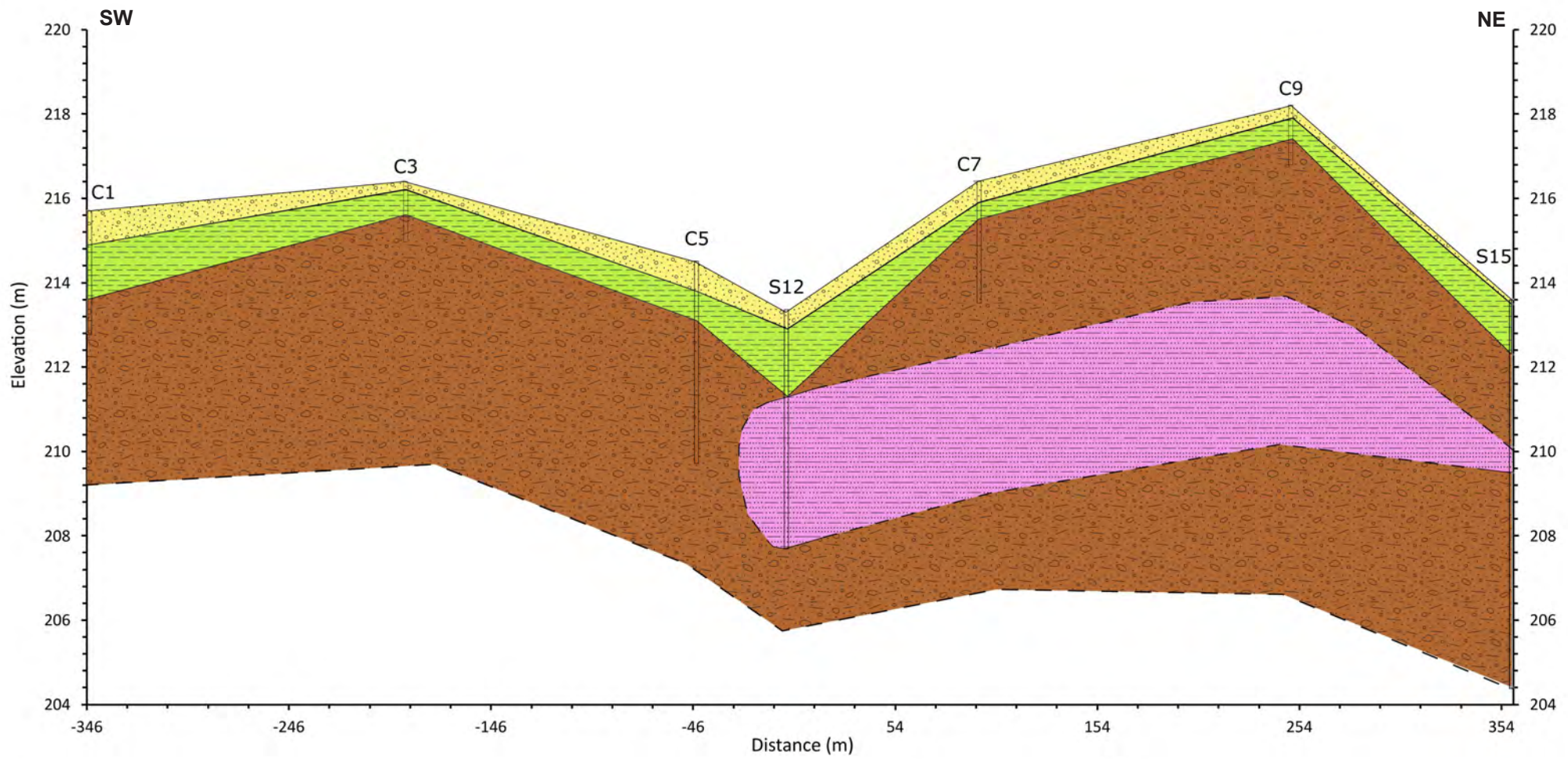


PROJECT N^o: TP115086

FIGURE 6b-ii

SCALE: NTS

DATE: Sep2020



LEGEND

- SAND AND GRAVEL FILL
- SILTY CLAY/CLAYEY SILT FILL
- SILTY CLAY/CLAYEY SILT TILL
- SANDY SILT

NOTES:

Datum: NAD83
Projection: UTM Zone 17N



HYDROGEOLOGICAL INVESTIGATION

Countryside Drive - Geological Profile
around Culvert S12

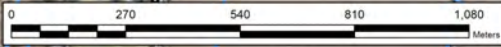
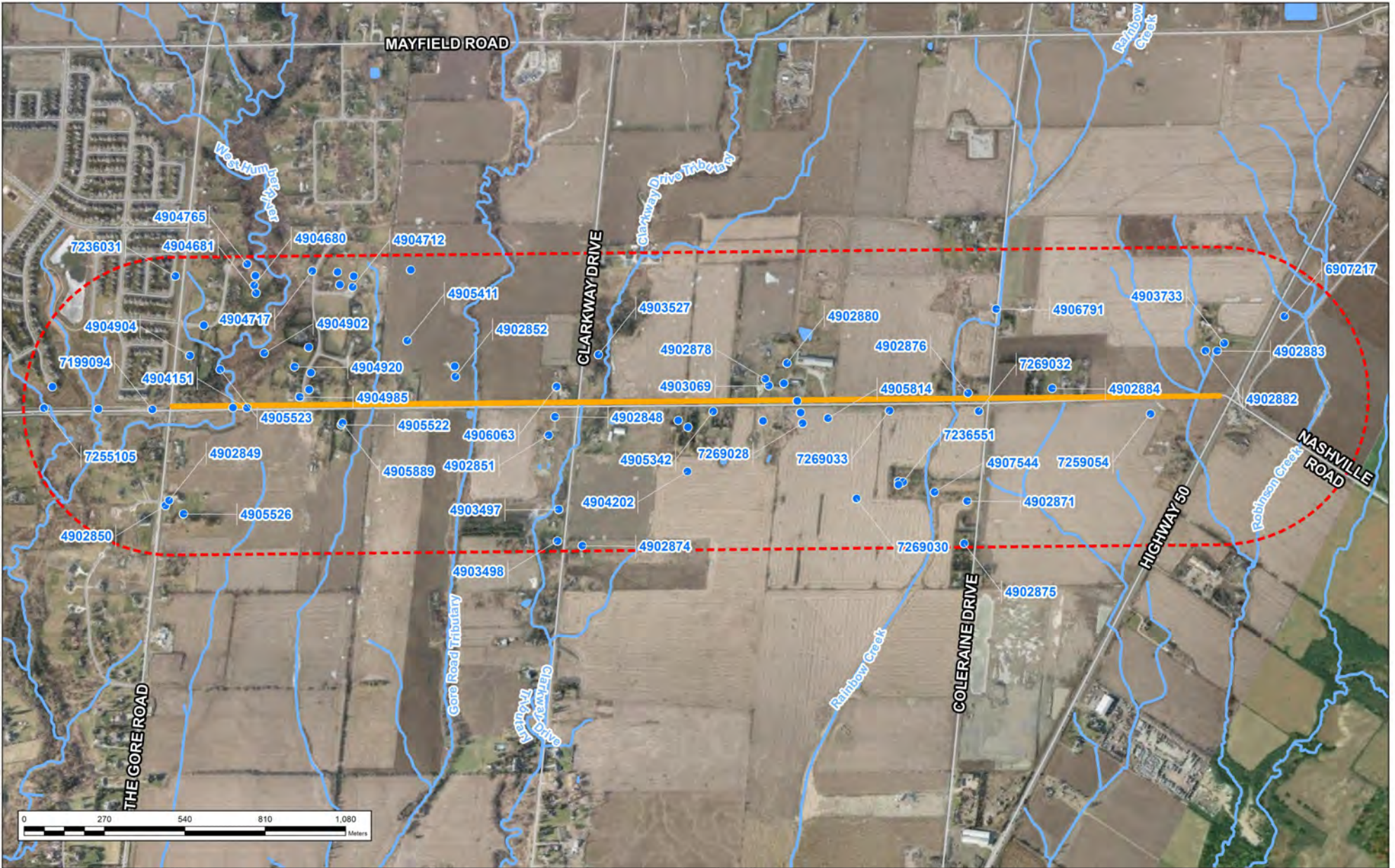
PROJECT N^o TP115086

FIGURE 6b-iii

SCALE: NTS

DATE: Sep2020

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LEGEND

- Water Well
- 500-m study area
- Countryside Drive
- Watercourse
- Waterbody

NOTES:

LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:

HYDROGEOLOGICAL INVESTIGATION
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

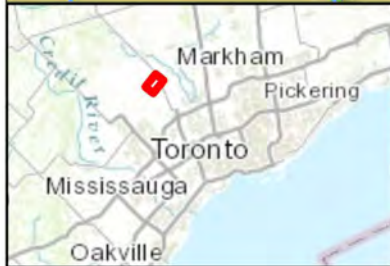
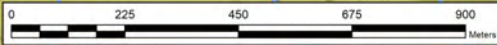
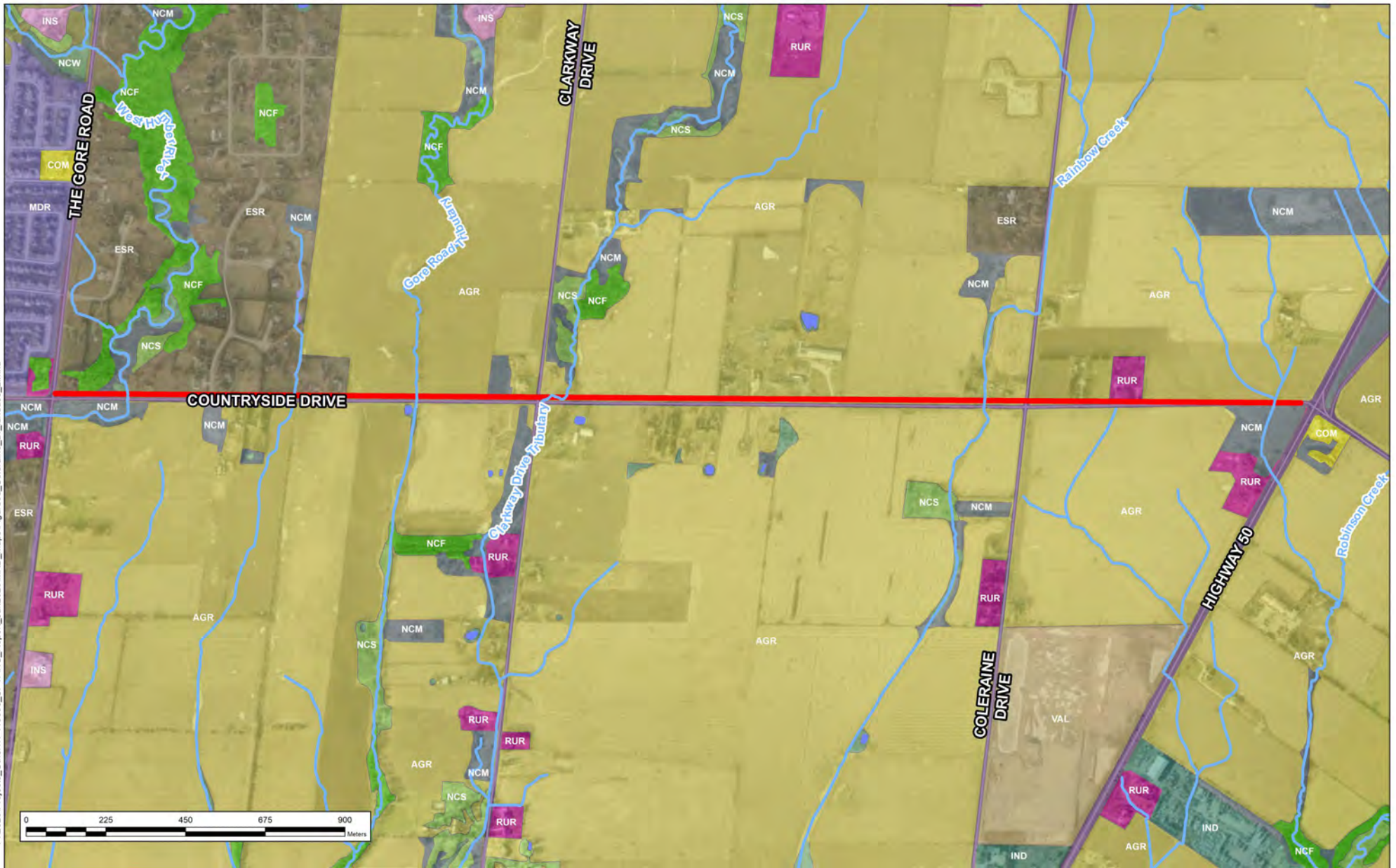
Countryside Drive - Water Wells within 500 m

Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:17,855	

PROJECT N°: TP115086.6200	FIGURE: 6c
DATE: February 2021	

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LEGEND					
	Waterbody		Forest, NCF		Riverine, OWR
	Watercourse		Industrial, IND		Roads, RDS
	Countryside Drive		Institutional, INS		Rural Residential, RUR
Landuse (TRCA, 2017)					Successional Forest, NCS
	Agricultural, AGR		Meadow, NCM		Vacant Land, VAL
	Commercial, COM		Medium Density Residential, MDR		Wetland, NCW
	Estate Residential, ESR		Recreational/Open Space, REC		

NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE

 This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

 SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:	
Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:15,000	

HYDROGEOLOGICAL INVESTIGATION	
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario	
Countryside Drive - Land Use	
PROJECT N°: TP115086.6200	FIGURE: 6d
DATE: February 2021	
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LEGEND

- Waterbody
- Watercourse
- CountrySide Drive
-  Existing Culvert
- Borehole
-  Monitoring Well


NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:

Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:15,000	




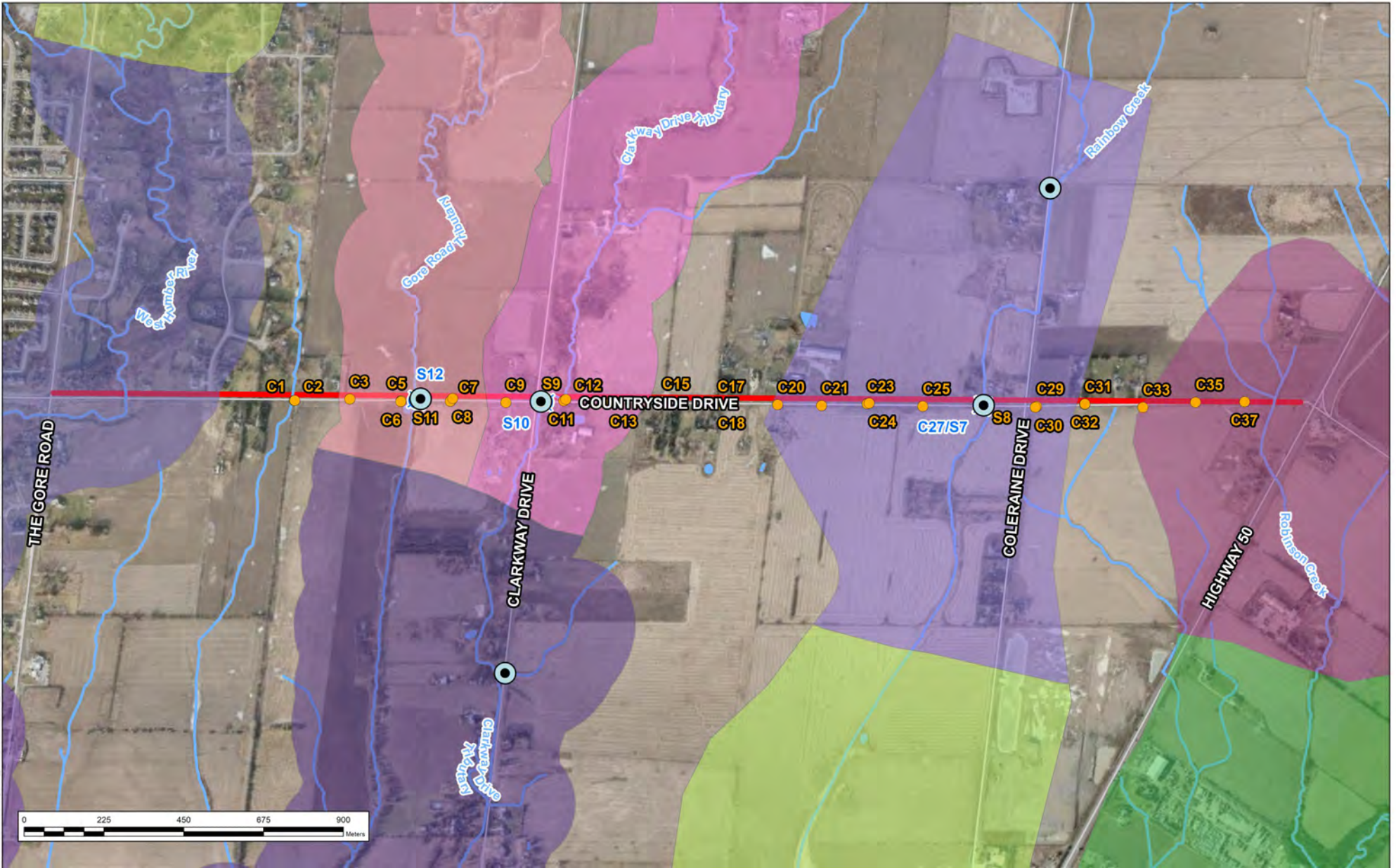
HYDROGEOLOGICAL INVESTIGATION
 Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Countryside Drive - Surface Water Drainage and Structures

PROJECT N°: TP115086.6200	FIGURE: 6e
DATE: February 2021	

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LEGEND

Waterbody	Existing Culvert	Flood Plain Mapping Index (TRCA)	hum_144
Watercourse	Borehole	Humber Watershed	hum_151
Countryside Drive	Monitoring Well	hum_134	hum_152
		hum_136	hum_154
		hum_137	hum_155
		hum_143	hum_170

NOTES:

LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:

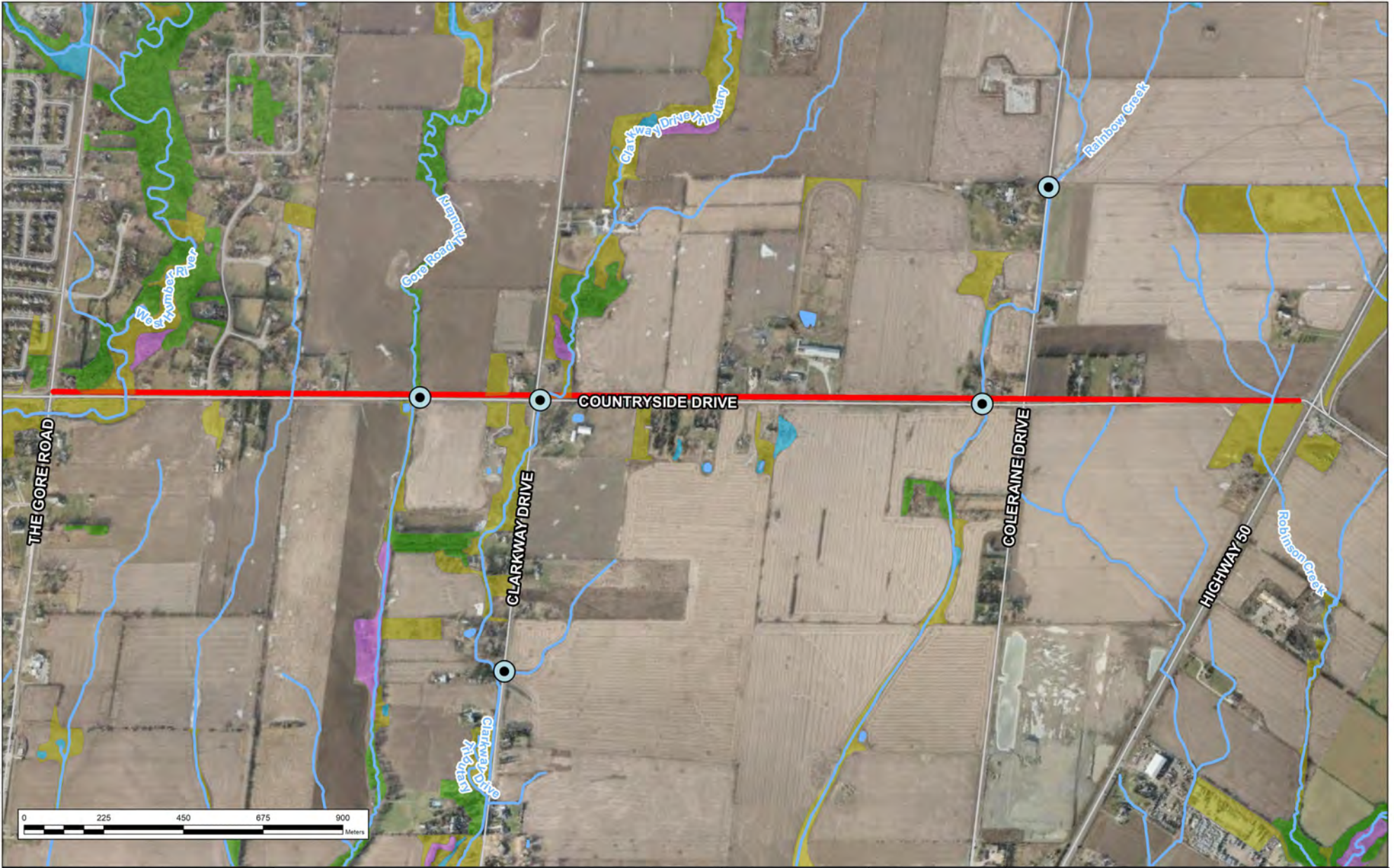
Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:15,000	

HYDROGEOLOGICAL INVESTIGATION
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Countryside Drive - Regulatory Flood Plain

PROJECT N°: TP115086.6200	FIGURE: 6f
DATE: February 2021	

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LEGEND

- Countryside Drive **HABITAT**
- Existing Culvert
- Waterbody
- Watercourse
- Forest
- Meadow
- Successional
- Wetland

NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:

Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:15,000	

HYDROGEOLOGICAL INVESTIGATION
 Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

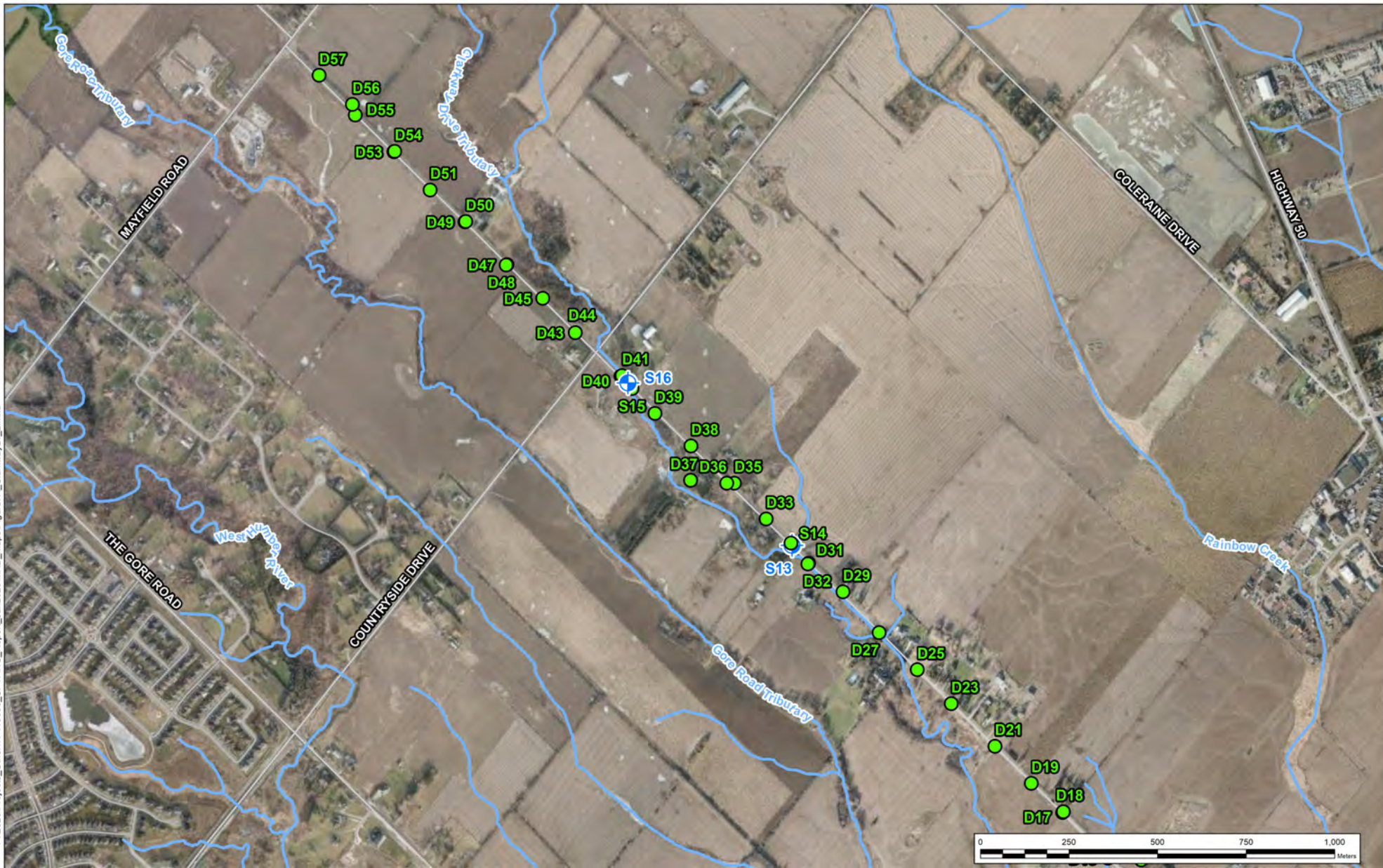
Countryside Drive - Habitats

PROJECT N°: TP115086.6200	FIGURE: 6g
DATE: February 2021	

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LEGEND

- Borehole
- ⊕ Monitoring Well
- Watercourse

NOTES:


LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hilschade (2012); ORN, 2012.

CLIENT:

Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:15,000	




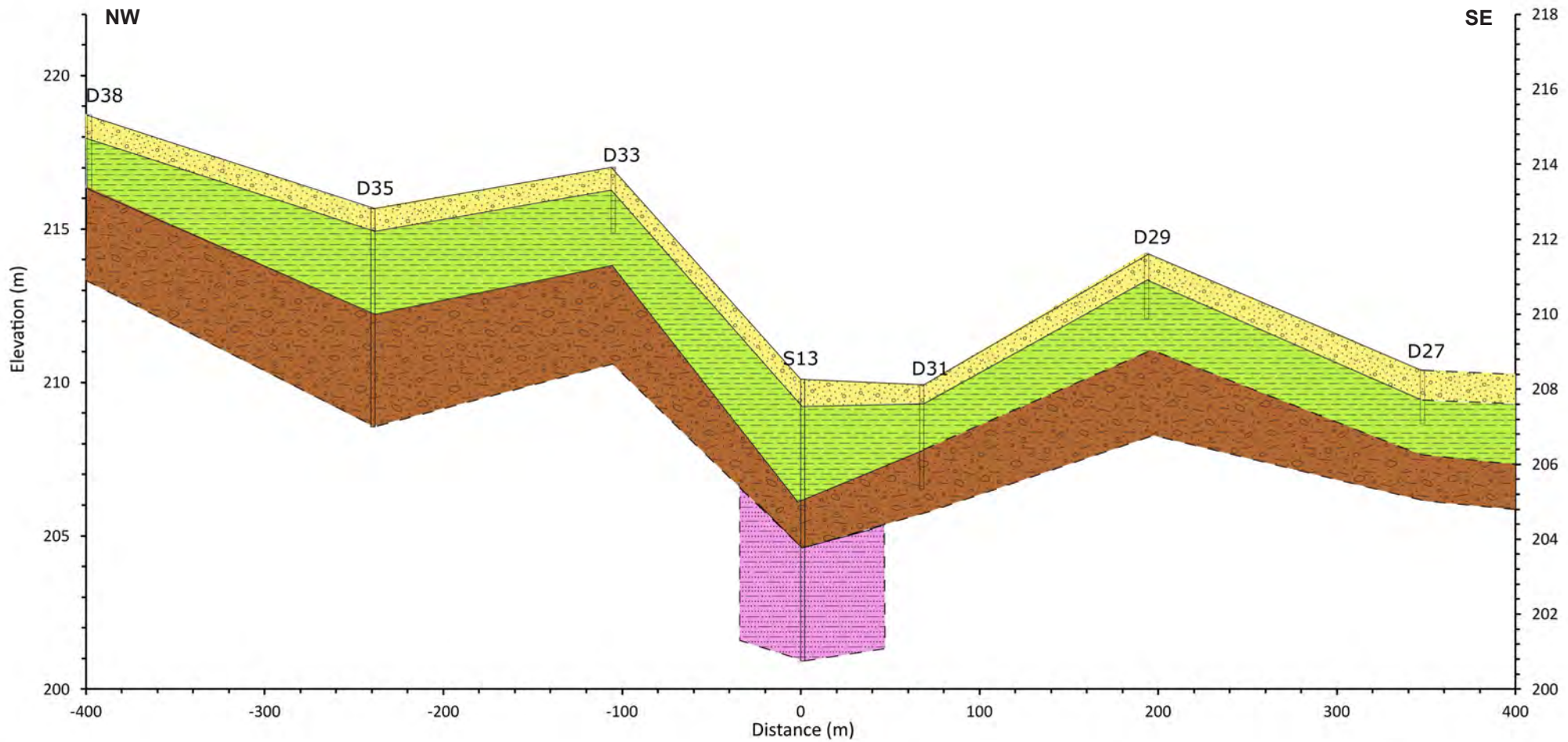
HYDROGEOLOGICAL INVESTIGATION
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Clarkway Drive - Boreholes / Monitoring Wells

PROJECT N°: TP115086.6200	FIGURE: 7a
DATE: February 2021	

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LEGEND

- SAND AND GRAVEL FILL
- SILTY CLAY/CLAYEY SILT FILL
- SILTY CLAY/CLAYEY SILT TILL
- SILTY SAND/SANDY SILT

NOTES:

Datum: NAD83
Projection: UTM Zone 17N



HYDROGEOLOGICAL INVESTIGATION

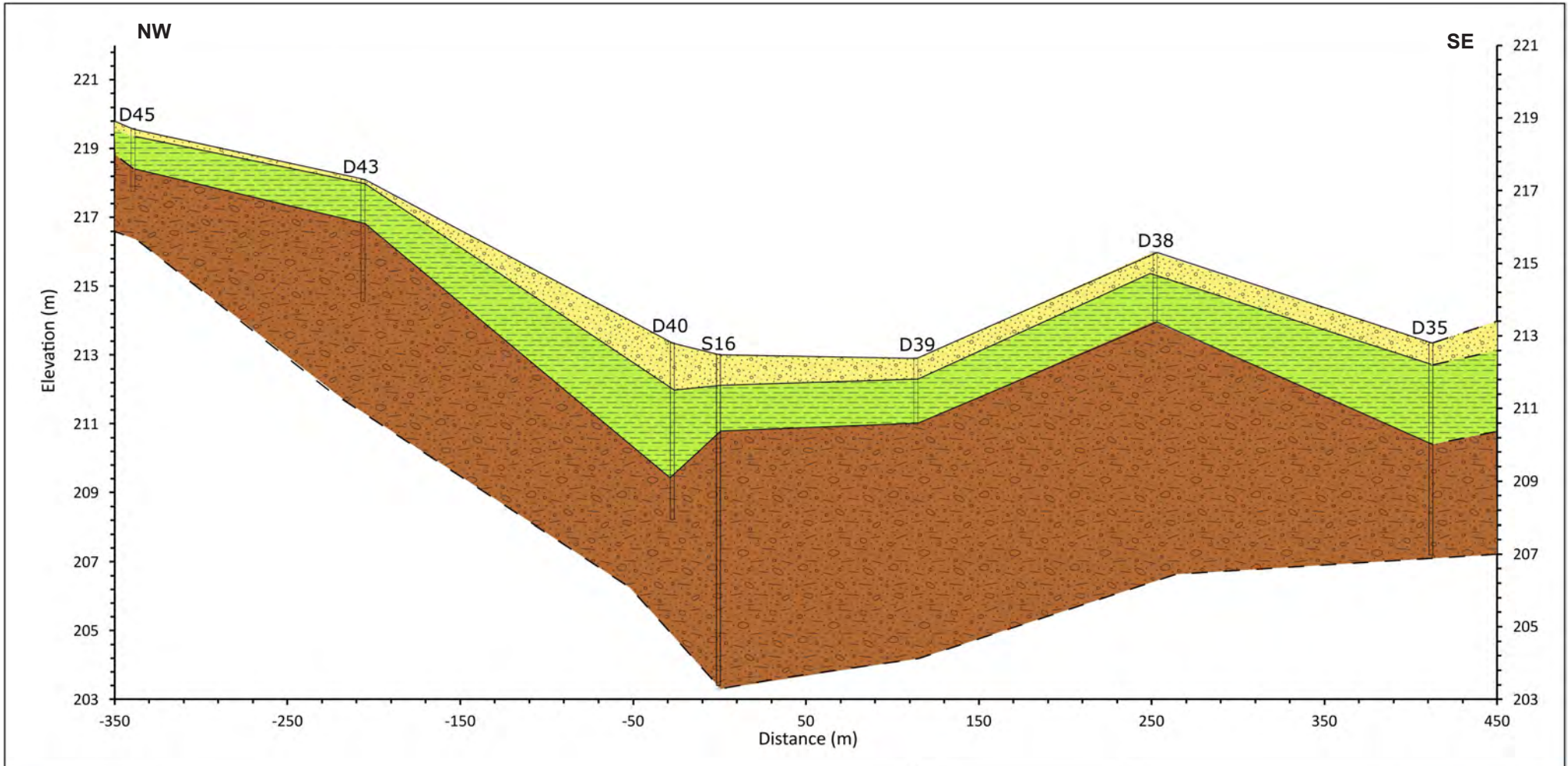
Clarkway Drive - Geological Profile around
Culvert S13

PROJECT N^o: TP115086

FIGURE 7b-i

SCALE: NTS

DATE: Sep2020



LEGEND SAND AND GRAVEL FILL SILTY CLAY/CLAYEY SILT FILL SILTY CLAY/CLAYEY SILT TILL	NOTES:	
	Datum: NAD83 Projection: UTM Zone 17N	

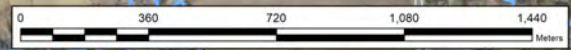
wood.

HYDROGEOLOGICAL INVESTIGATION

Clarkway Drive - Geological Profile around
Culvert S16

PROJECT N ^o : TP115086	FIGURE 7b-ii
SCALE: NTS	DATE: Sep2020

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LEGEND

- Water Well
- Watercourse
- ▭ 500-m study area

NOTES:


LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:

Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:21,305	




HYDROGEOLOGICAL INVESTIGATION
 Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

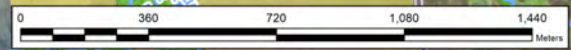
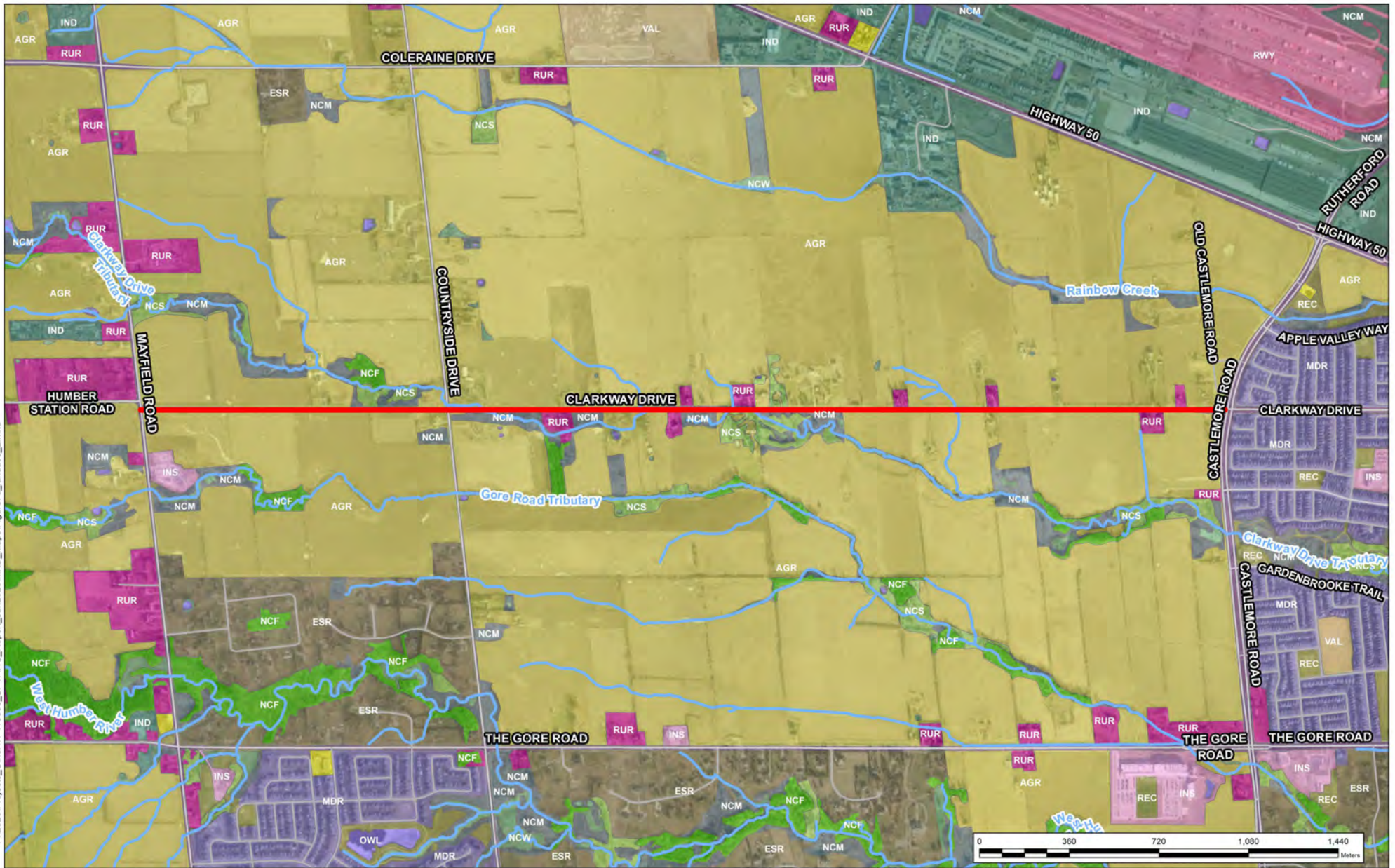
Clarkway Drive - Water Wells within 500 m

PROJECT N°: TP115086.6200	FIGURE: 7c
DATE: February 2021	

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LEGEND		
— Clarkway Drive	■ Forest, NCF	■ Recreational/O... Space, REC
— Watercourse	■ Industrial, IND	■ Riverine, OWR
Landuse (TRCA, 2017)	■ Institutional, INS	■ Roads, RDS
Landuse_Fu, landuse_co	■ Lacustrine, OWL	■ Rural Residential, RUR
■ Agricultural, AGR	■ Meadow, NCM	■ Successional Forest, NCS
■ Commercial, COM	■ Medium Density Residential, MDR	■ Vacant Land, VAL
■ Estate Residential, ESR	■ Railway, RWY	■ Wetland, NCW

NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE
 This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200
 SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:	
Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:21,305	

HYDROGEOLOGICAL INVESTIGATION	
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario	
Clarkway Drive - Land Use	
PROJECT N°: TP115086.6200	FIGURE: 7d
DATE: February 2021	
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LEGEND

- Clarkway Drive
- Watercourse
- Existing Culvert
- Proposed Culvert
- Borehole
- Monitoring Well

NOTES:

LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:

Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:15,000	

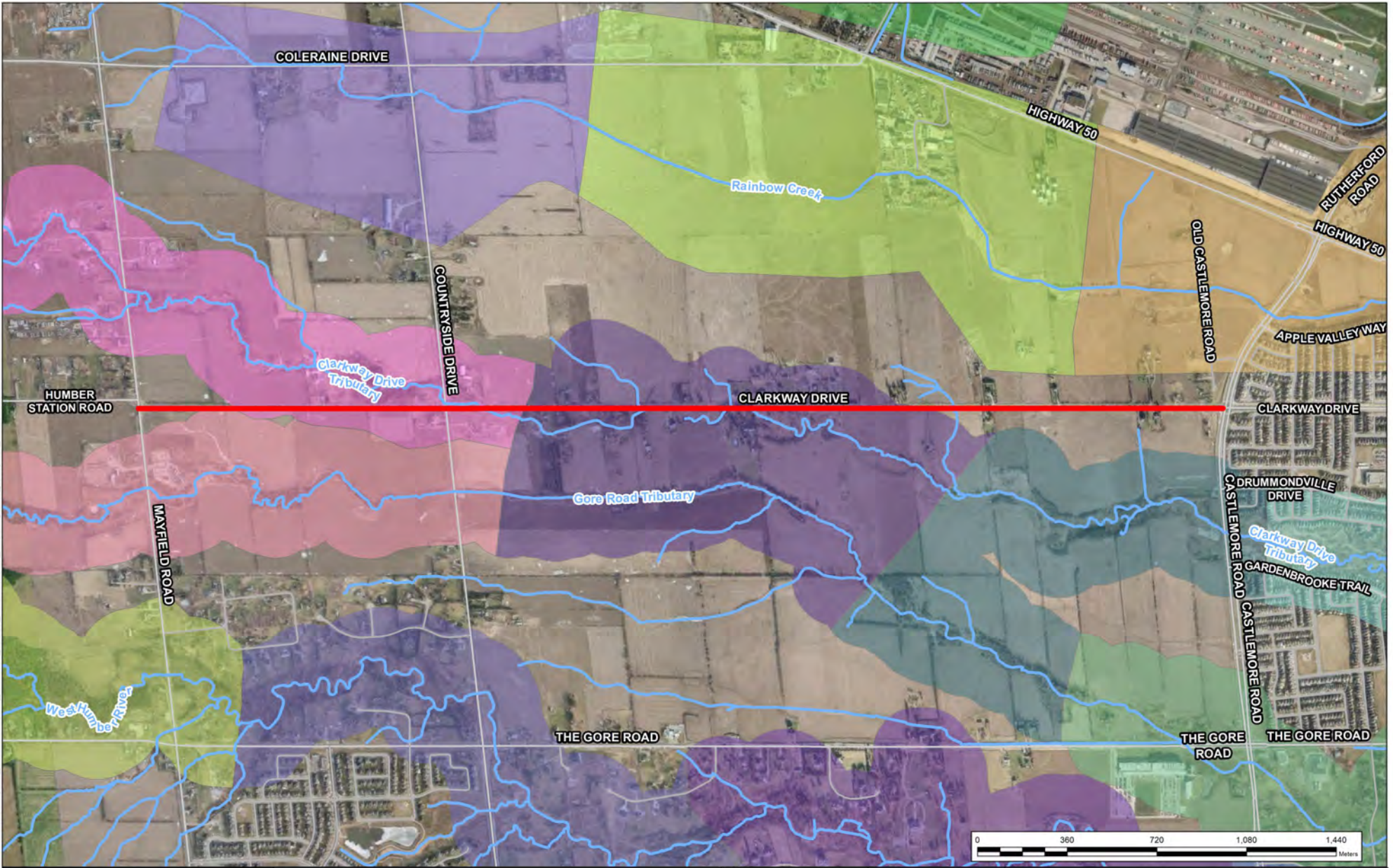
HYDROGEOLOGICAL INVESTIGATION
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Clarkway Drive - Surface Water Drainage and Structures

PROJECT N°: TP115086.6200	FIGURE: 7e
DATE: February 2021	

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LEGEND	
Clarkway Drive	Flood Plain Mapping Index (TRCA)
Watercourse	hum_129
	hum_134
	hum_136
	hum_137
	hum_141
	hum_142
	hum_143
	hum_144
	hum_149
	hum_150
	hum_151
	hum_152
	hum_154
	hum_170
	hum_171

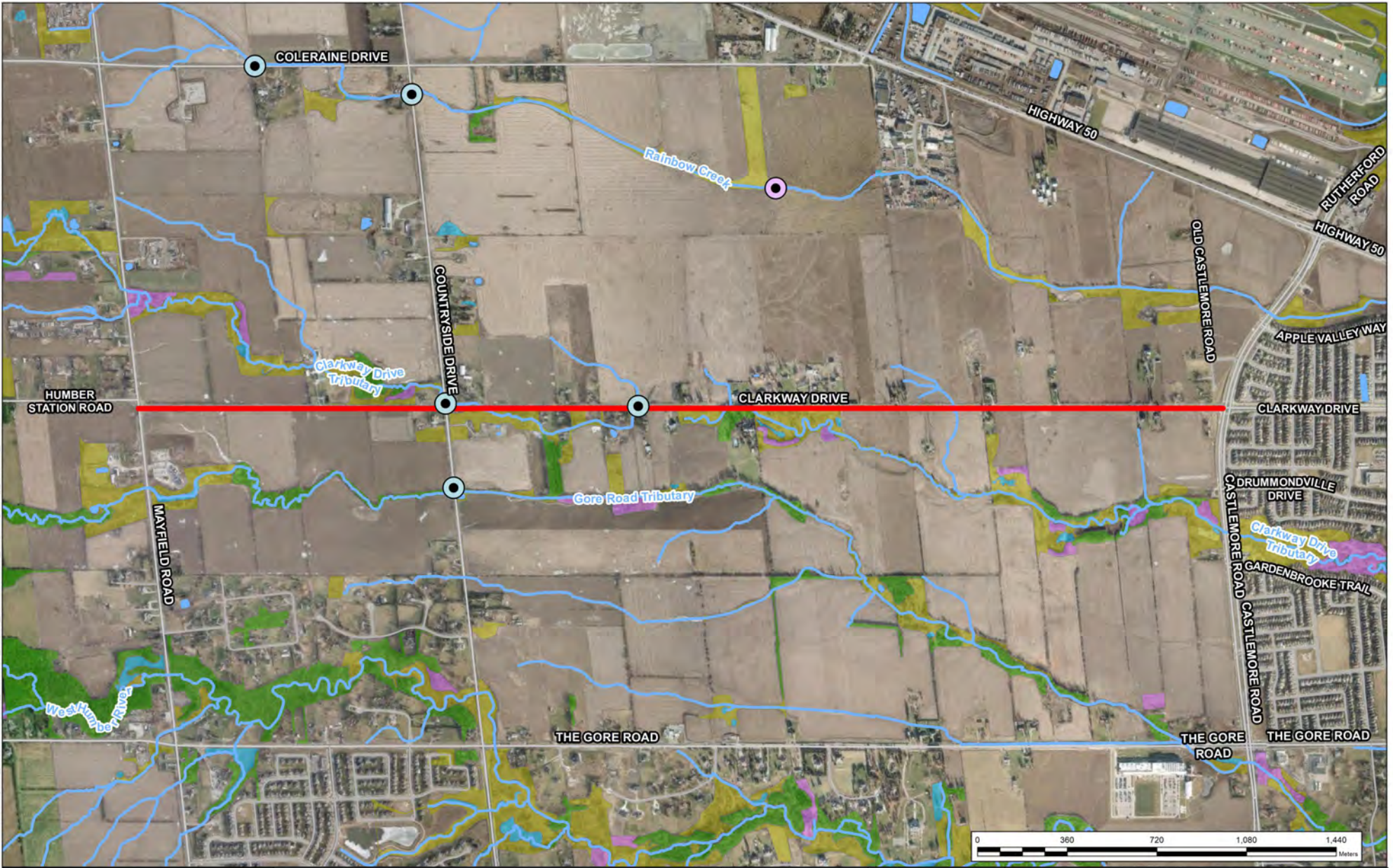
NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE
 This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200
 SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:
 Drawn By: KB
 Checked By: CM
 Revision: A
 Projection: UTM Zone 17N
 SCALE: 1:21,305

HYDROGEOLOGICAL INVESTIGATION	
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario	
Clarkway Drive - Regulatory Flood Plain	
PROJECT N°: TP115086.6200	FIGURE: 7f
DATE: February 2021	
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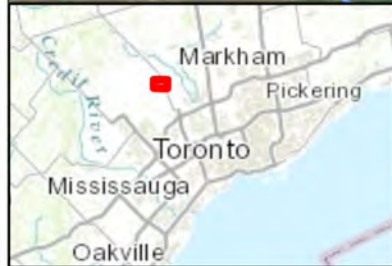
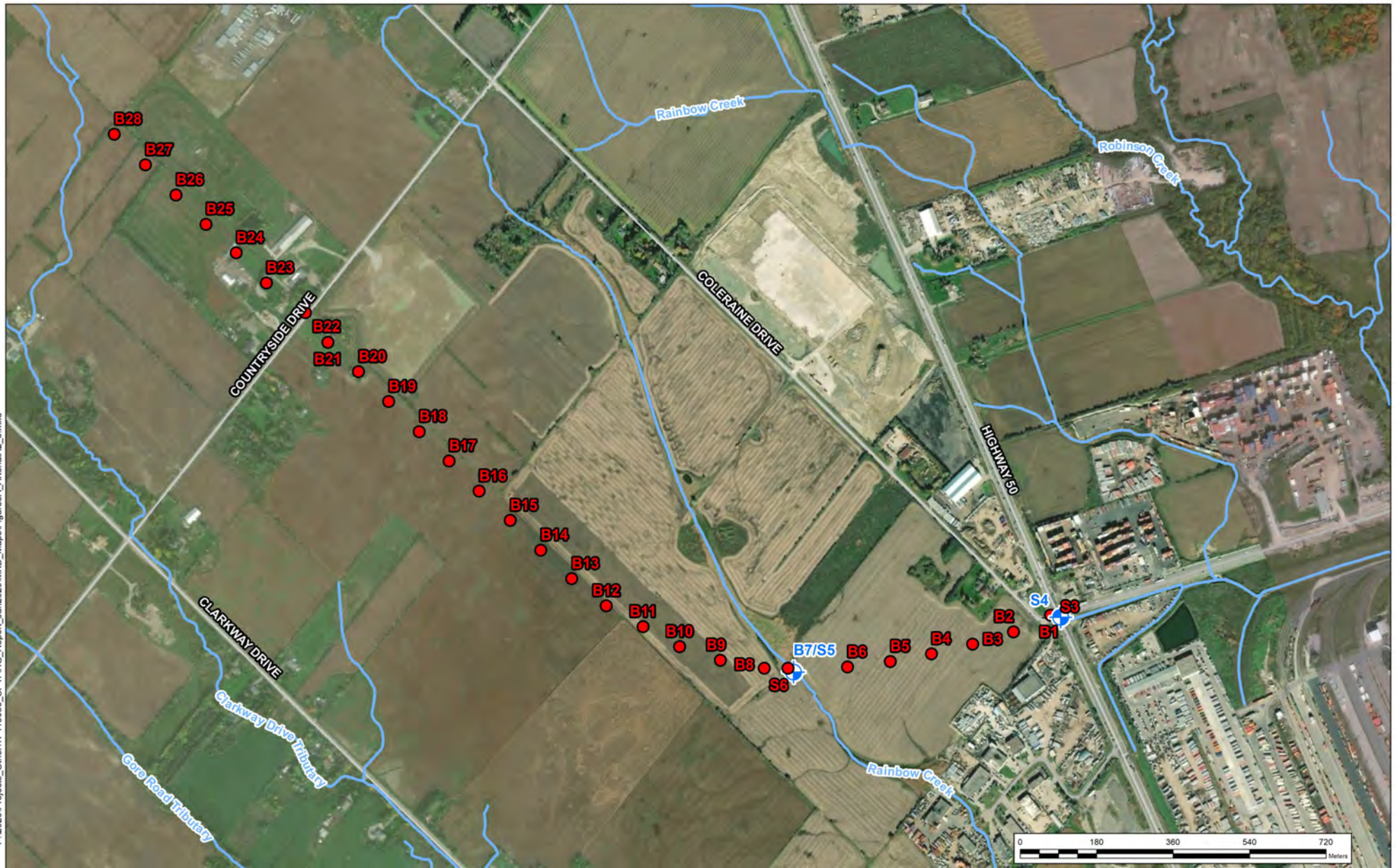


LEGEND		HABITAT	
	Clarkway Drive		Forest
	Watercourse		Meadow
	Waterbody		Successional
	Existing Culvert		Wetland
	Proposed Culvert		

NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE
 This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200
 SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:	
Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:21,305	

HYDROGEOLOGICAL INVESTIGATION	
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario	
Clarkway Drive - Habitats	
PROJECT N°: TP115086.6200	FIGURE: 7g
DATE: February 2021	
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LEGEND

- Borehole
- ⊕ Monitoring Well
- Watercourse

NOTES:

LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:

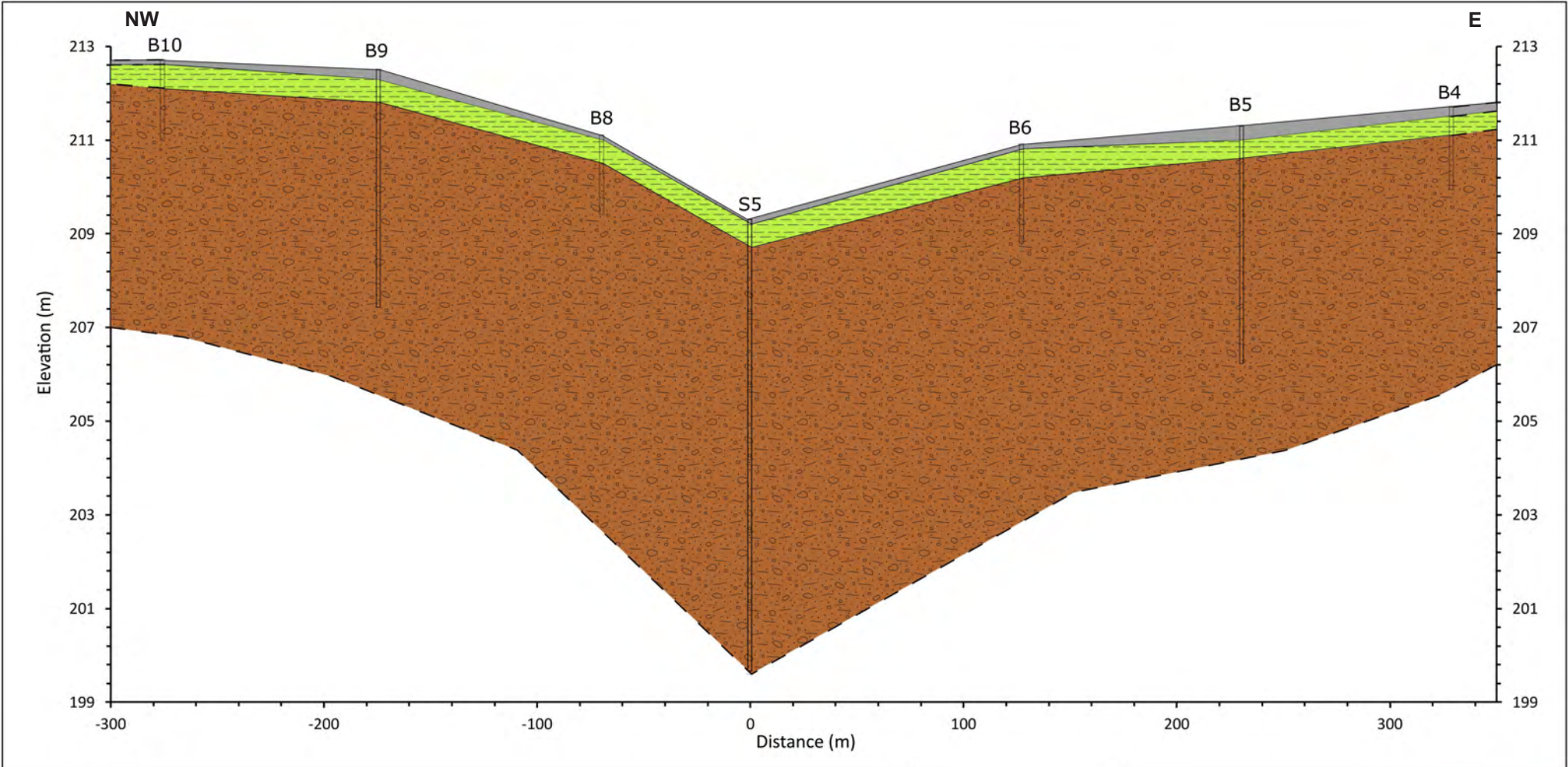
Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:12,500	

HYDROGEOLOGICAL INVESTIGATION
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Arterial A2 - Boreholes / Monitoring Wells

PROJECT N°: TP115086.1.6200	FIGURE: 8a
DATE: March 2022	

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LEGEND

- TOPSOIL
- SAND AND GRAVEL FILL
- SILTY CLAY/CLAYEY SILT FILL
- SILTY CLAY/CLAYEY SILT TILL

NOTES:

Datum: NAD83
Projection: UTM Zone 17N



HYDROGEOLOGICAL INVESTIGATION

Arterial A2 - Geological Profile around
Culvert S5

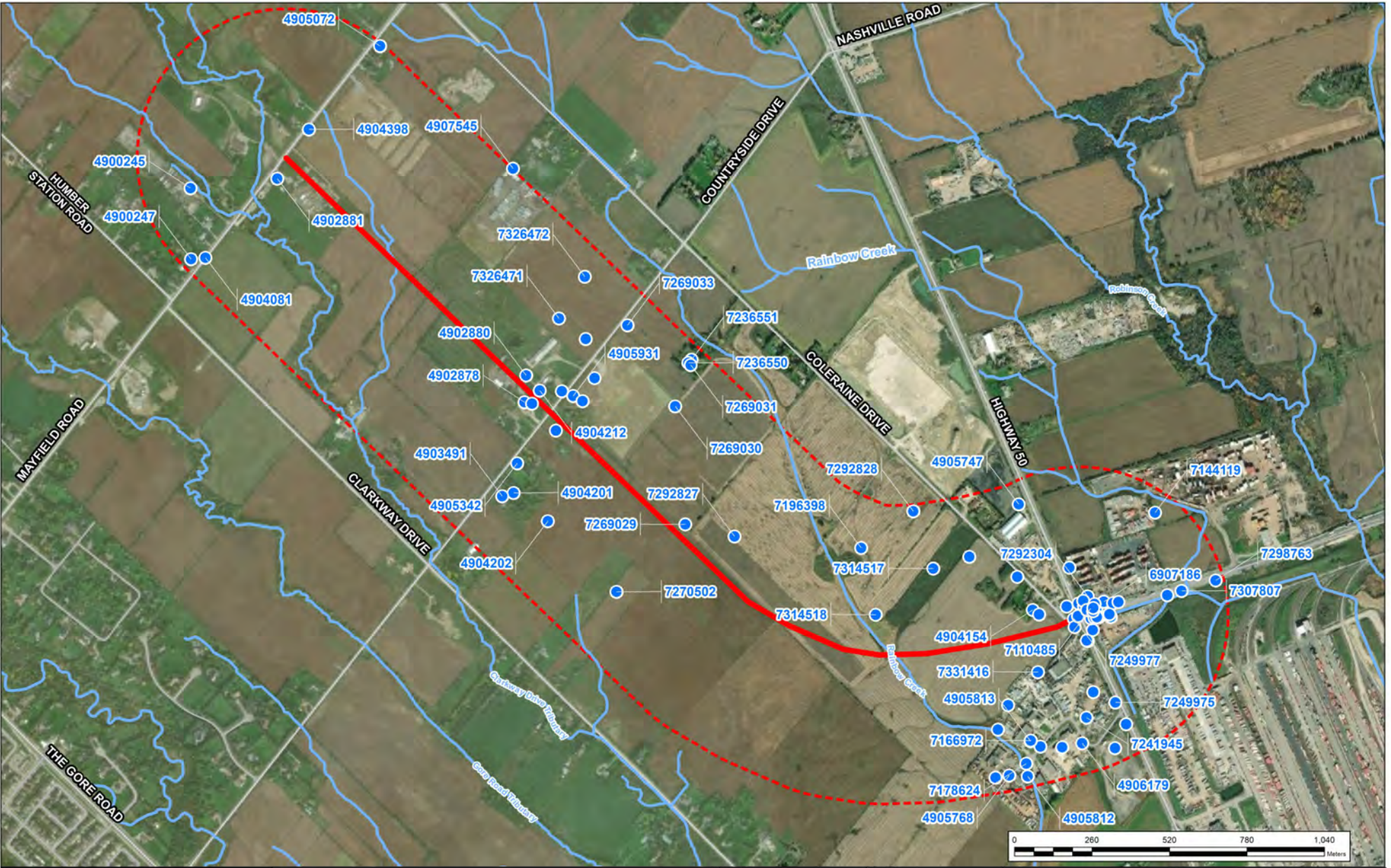
PROJECT N^o: TP115086

FIGURE 8b

SCALE: NTS

DATE: Sep2020

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LEGEND

- Arterial A2
- Water Well
- Watercourse
- 500-m study area

NOTES:

LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hiltshade (2012); ORN, 2012.

CLIENT:

HYDROGEOLOGICAL INVESTIGATION
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Arterial A2 - Water Wells within 500 m

Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:17,800	

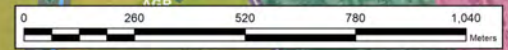
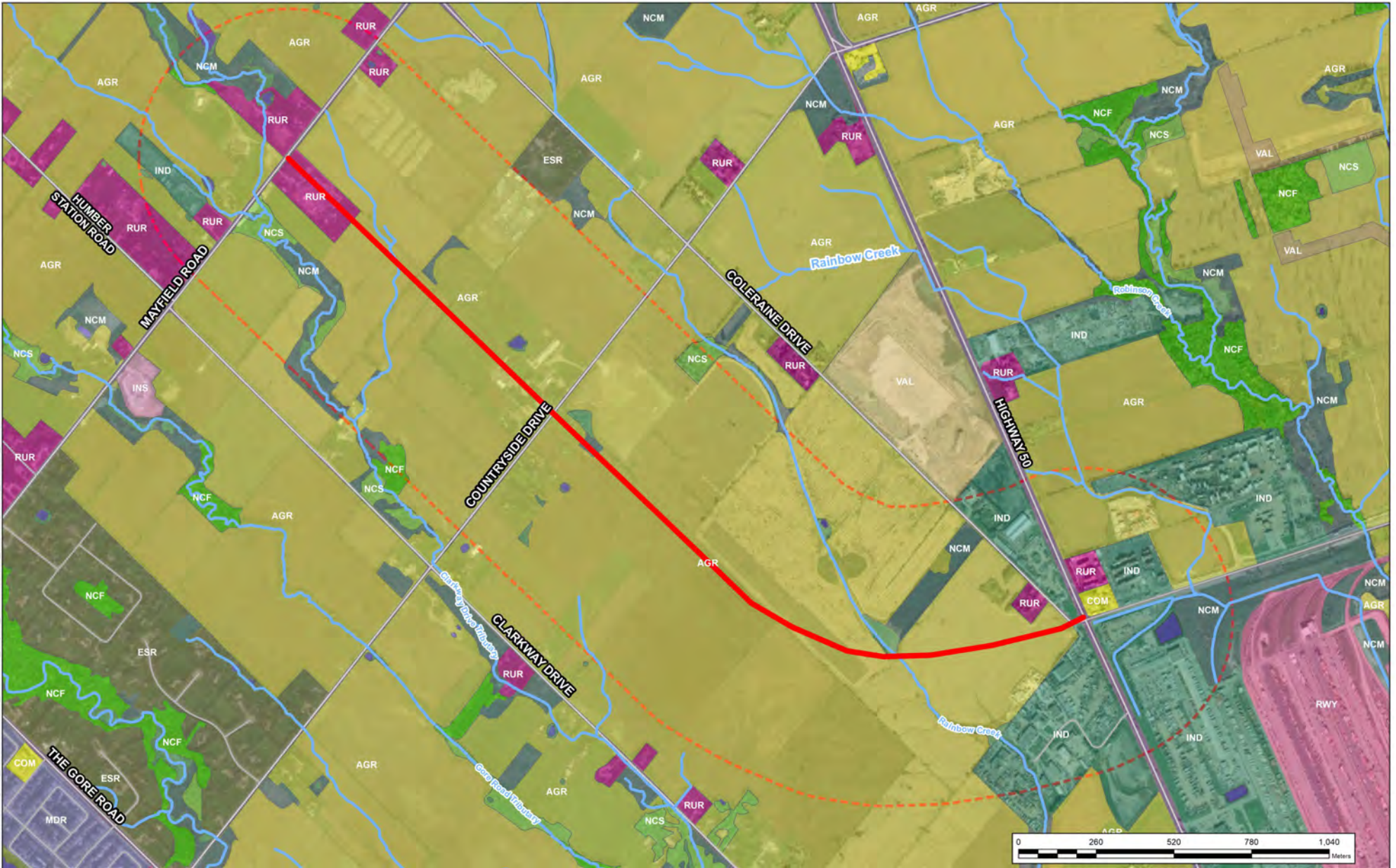
PROJECT N^o: TP115086.1.6200 **FIGURE: 8c**

DATE: March 2022

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LEGEND	
500-m study area	Industrial, IND
Arterial A2	Institutional, INS
Watercourse	Lacustrine, OWL
Landuse (TRCA, 2017)	
Agricultural, AGR	Meadow, NCM
Commercial, COM	Medium Density Residential, MDR
Estate Residential, ESR	Railway, RWY
Forest, NCF	Recreational/Open Space, REC
Riverine, OWR	Roads, RDS
Rural Residential, RUR	Successional Forest, NCS
Vacant Land, VAL	Wetland, NCW

NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE

 This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

 SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:	
Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:17,800	

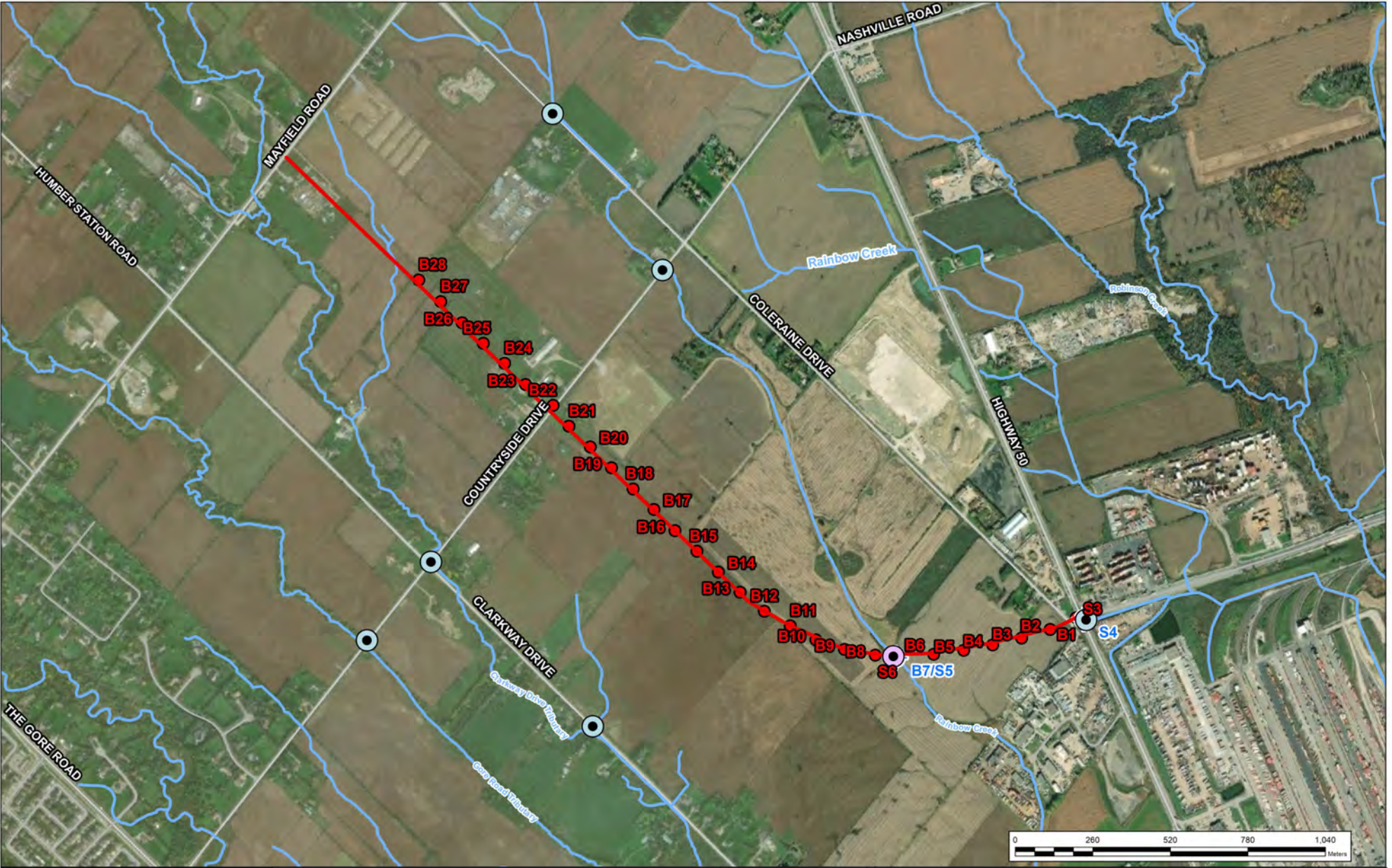
HYDROGEOLOGICAL INVESTIGATION
 Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Arterial A2 - Land Use

PROJECT N°:	TP115086.1.6200	FIGURE:	8d
DATE:	March 2022		

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LEGEND

- Arterial
- Borehole
- + Monitoring Well
- Watercourse
- Existing Culvert
- Proposed Culvert

NOTES:

LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:

Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
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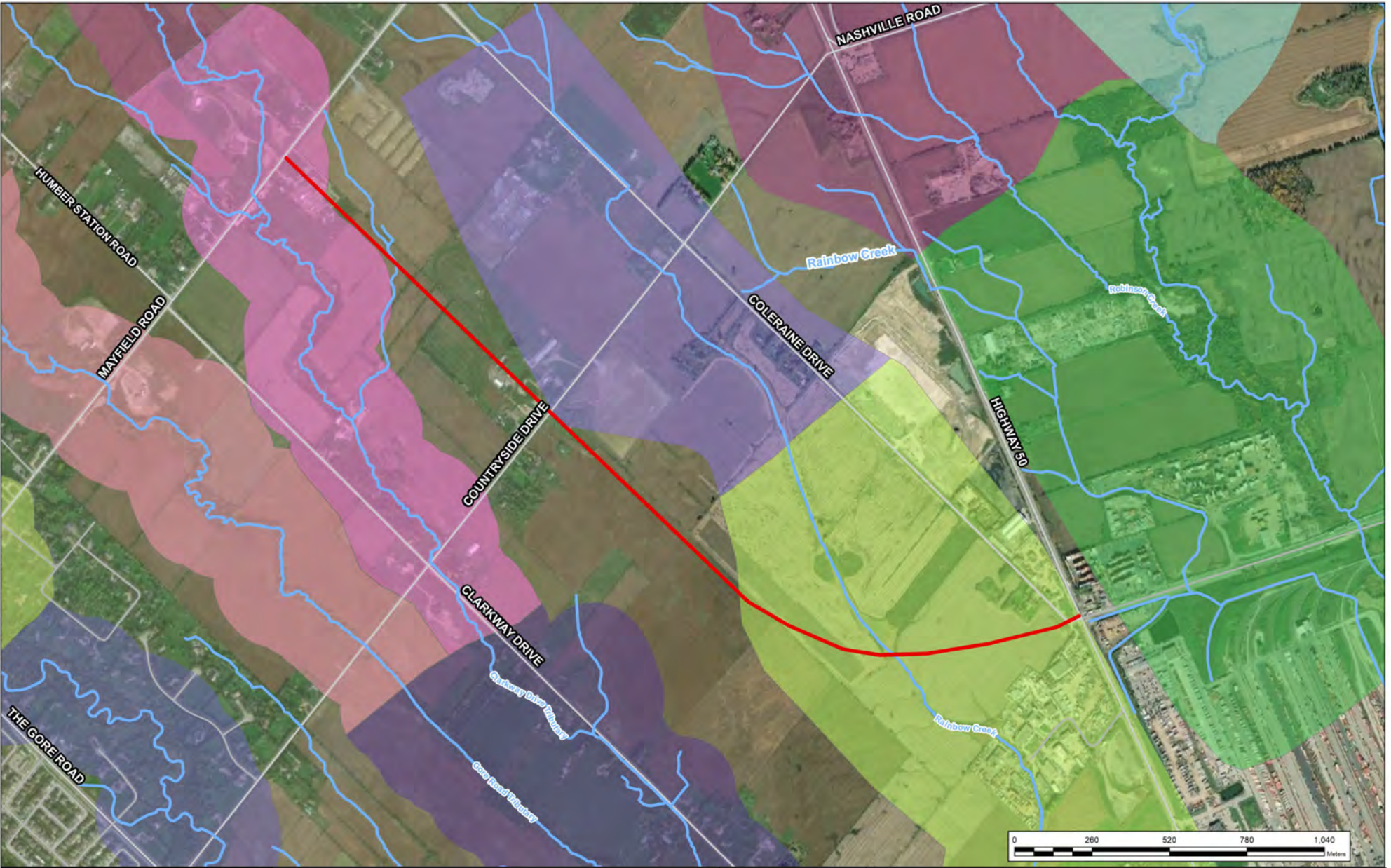
HYDROGEOLOGICAL INVESTIGATION

Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Arterial A2 - Surface Water Drainage and Structures

PROJECT N°: TP115086.1.6200	FIGURE: 8e
DATE: March 2022	

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LEGEND

- Arterial A2
- Watercourse

Flood Plain Mapping Index (TRCA)

 hum_143	 hum_154
 hum_144	 hum_155
 hum_145	 hum_156
 hum_151	 hum_170
 hum_136	 hum_171
 hum_137	

Humber Watershed

NOTES:

LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:

Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:17,800	

HYDROGEOLOGICAL INVESTIGATION
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Arterial A2 - Regulatory Flood Plain

PROJECT N°: TP115086.1.6200	FIGURE: 8f
DATE: March 2022	

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LEGEND

Arterial A2	HABITAT
Watercourse	Forest
	Meadow
	Successional
	Wetland

NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012.

CLIENT:

Drawn By: KB	Checked By: CM
Revision: A	Projection: UTM Zone 17N
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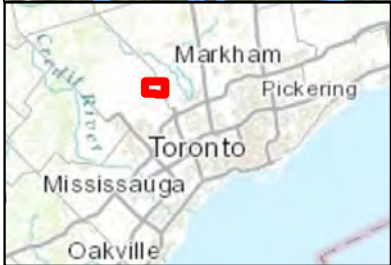
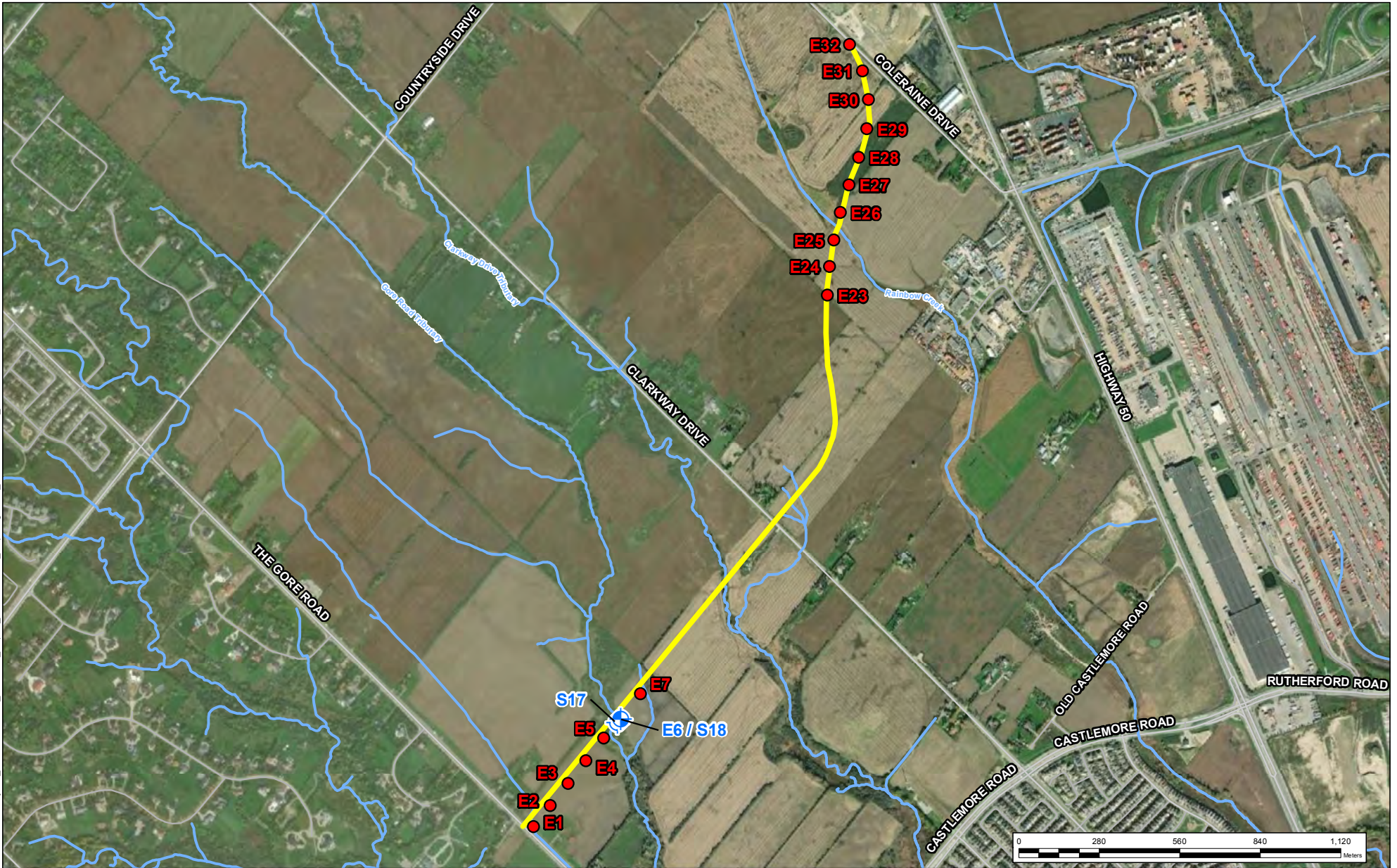
HYDROGEOLOGICAL INVESTIGATION
 Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

Arterial A2 - Habitats

PROJECT N°:	TP115086.1.6200	FIGURE:	8g
DATE:	March 2022		

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LEGEND	
	East-West Arterial
	Watercourse
	Borehole
	Monitoring Well

NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE

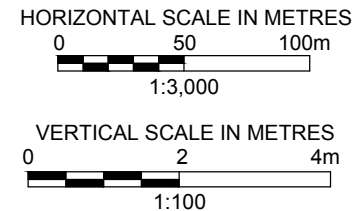
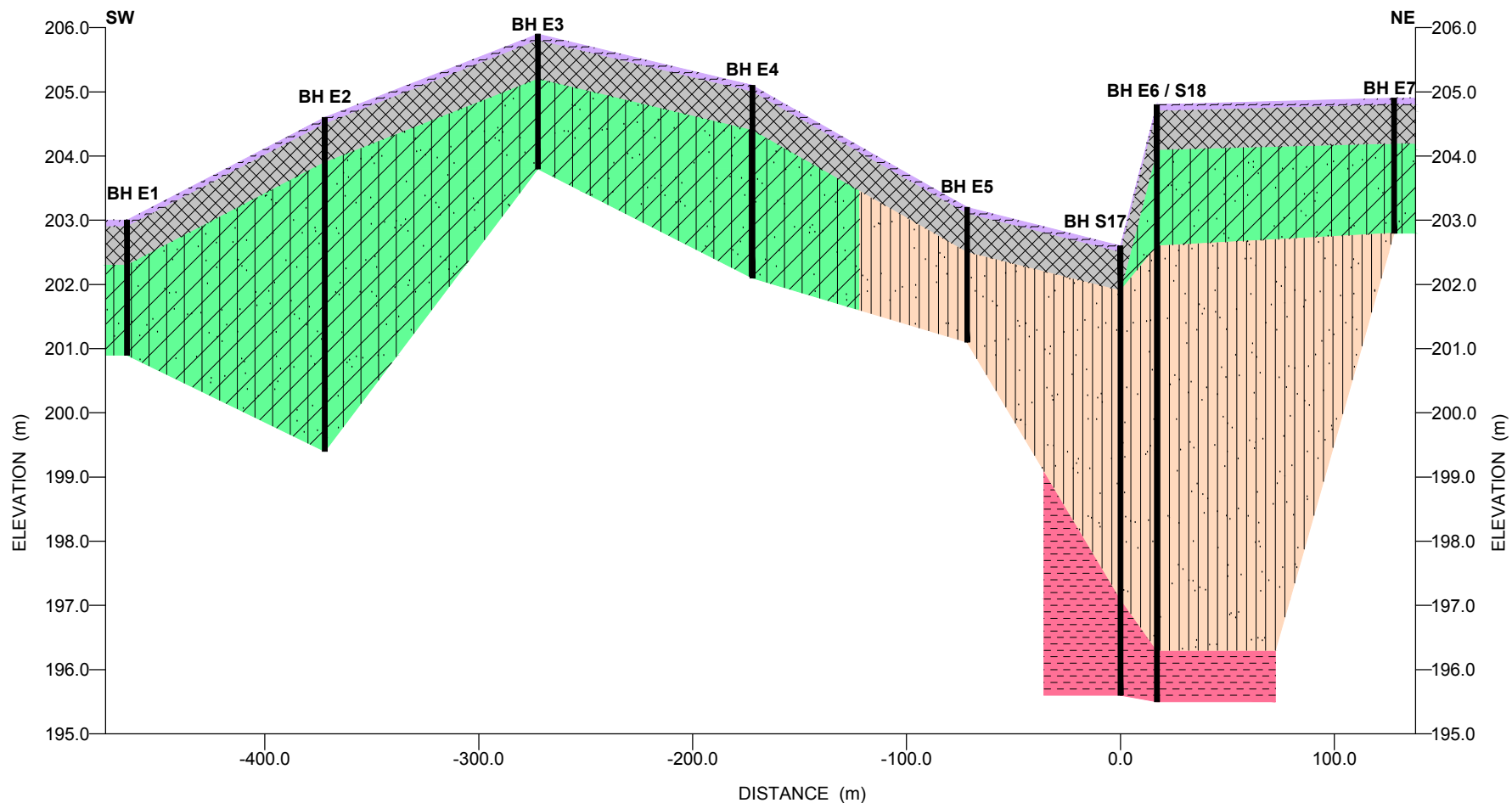
 This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

 SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012;

CLIENT:	
Drawn By: AF	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:18,500	

HYDROGEOLOGICAL INVESTIGATION	
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario	
East-West Arterial - Boreholes / Monitoring Wells	
PROJECT N°: TP115086.1.6200	FIGURE: 9a
DATE: March 2022	
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DATE PLOTTED: 4/19/2022 5:34:22 PM
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SIMPLIFIED STRATIGRAPHY

- FILL
- TOPSOIL
- SILTY CLAY TILL
- SHALE
- SANDY SILT TILL

LEGEND:

- BOREHOLE

NOTES:
ALL LOCATIONS ARE APPROXIMATE.
ORIGINAL PAPER SIZE: 8 1/2 x 11

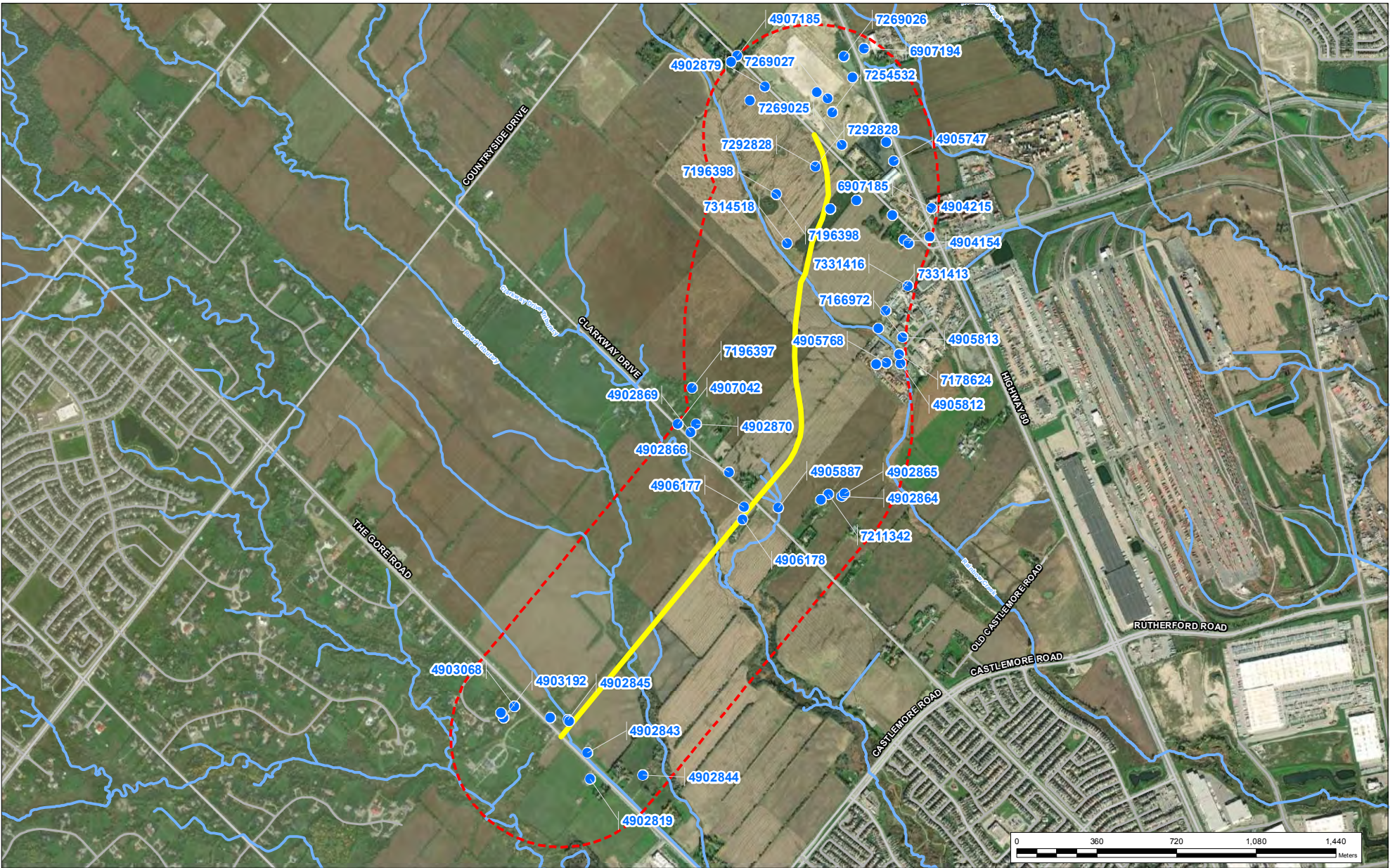
Wood
Environment & Infrastructure Solutions
3450 HARVESTER ROAD, SUITE 100
BURLINGTON, ONTARIO, L7N 3W5,
905-335-2353



DWN BY:
LMK
CHK'D BY:
TC
DATUM:
NAD83
PROJECTION:
UTM Zone 17
SCALE:
AS SHOWN

PROJECT:
**HYDROGEOLOGICAL INVESTIGATION
ARTERIAL ROADS WITHIN HIGHWAY 427 INDUSTRIAL
SECONDARY PLAN AREA 47, BRAMPTON, ONTARIO**
TITLE:
**EAST-WEST ARTERIAL GEOLOGICAL PROFILE
AROUND CULVERT S17**

DATE:
APR. 19, 2022
PROJECT No:
TP115086
REV. No:
0
FIGURE No:
9B



LEGEND

- - - 500-m study area
- East-West Arterial
- Watercourse
- Water Well

NOTES:

LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No.TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hilshade (2012); ORN, 2012;

CLIENT:

Drawn By: AF Checked By: CM

Revision: A Projection: UTM Zone 17N

SCALE: 1:24,000

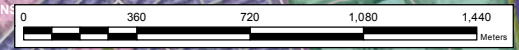
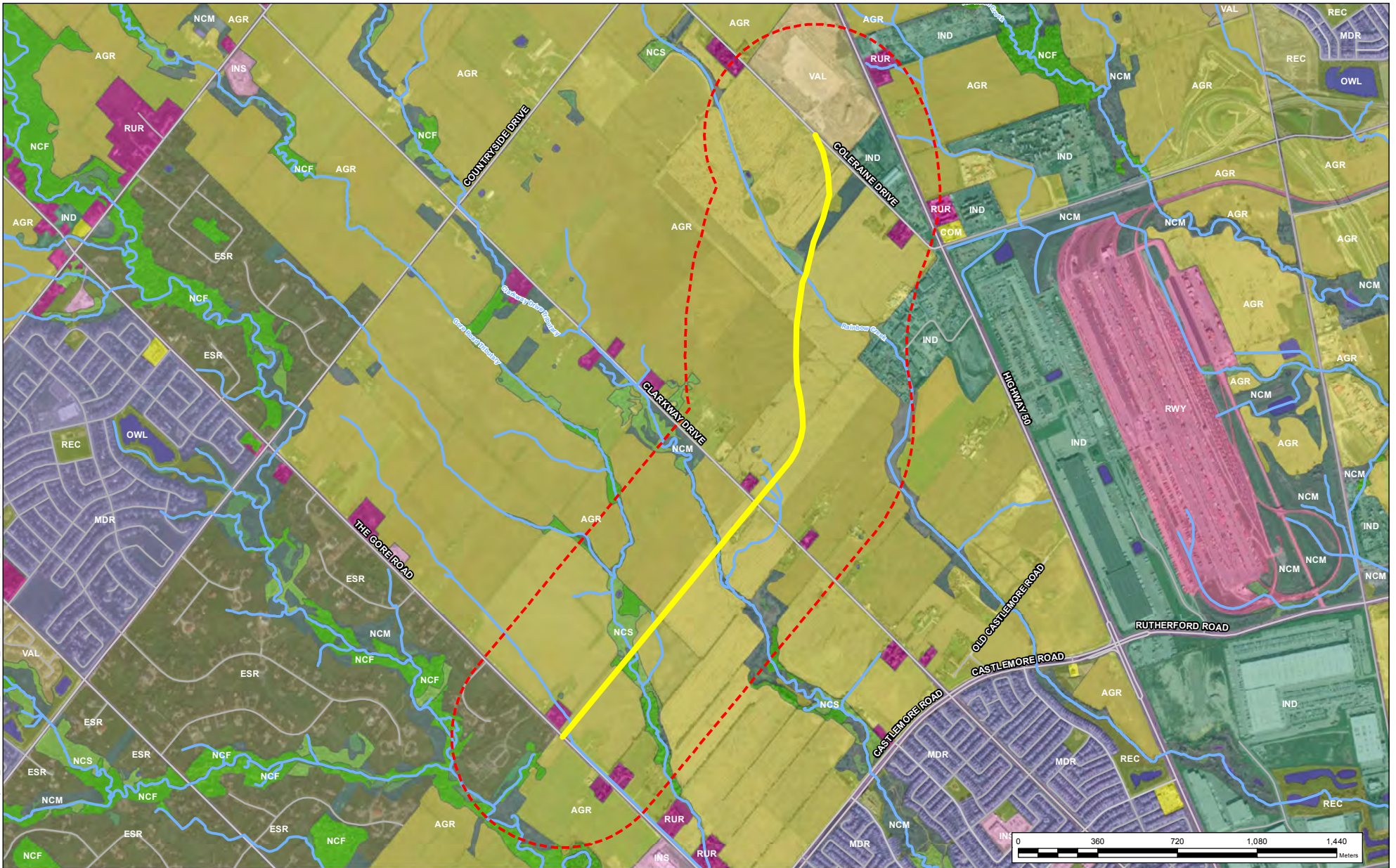
HYDROGEOLOGICAL INVESTIGATION
 Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

East-West Arterial - Water Wells within 500m

PROJECT N°: TP115086.1.6200 **FIGURE: 9c**

DATE: March 2022

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LEGEND			
	500-m study area		Industrial, IND
	East-West Arterial		Institutional, INS
	Watercourse		Lacustrine, OWL
Landuse (TRCA, 2017)			Meadow, NCM
	Agricultural, AGR		Medium Density Residential, MDR
	Commercial, COM		Railway, RWY
	Estate Residential, ESR		Successional Forest, NCS
	Forest, NCF		Vacant Land, VAL
	Recreational/Open Space, REC		Wetland, NCW
			Riverine, OWR
			Roads, RDS
			Rural Residential, RUR

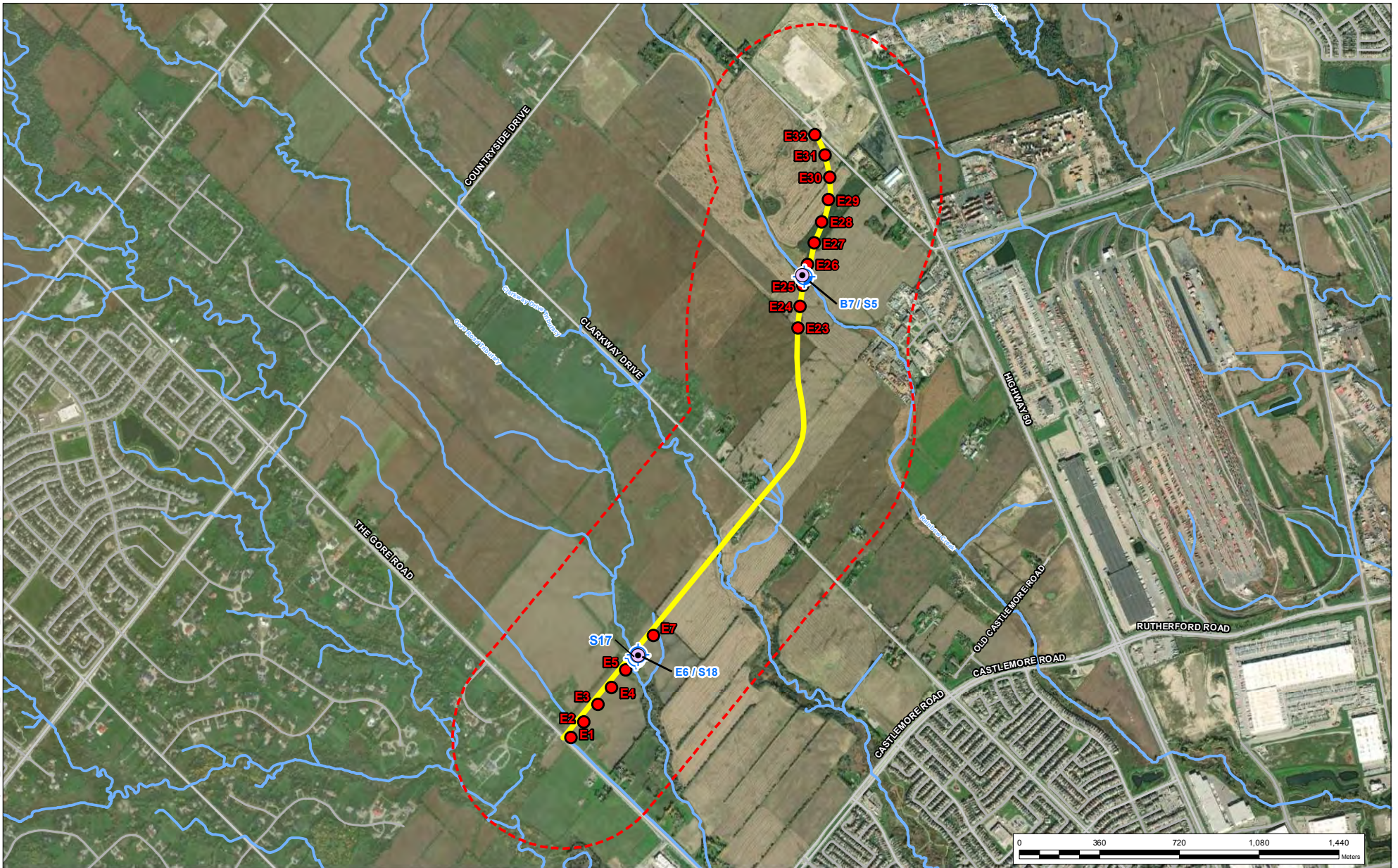
NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE

 This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No.TP115086.6200

 SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012;

CLIENT:	
Drawn By: AF	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:24,000	

HYDROGEOLOGICAL INVESTIGATION	
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario	
East-West Arterial - Land Use	
PROJECT N°: TP115086.1.6200	FIGURE: 9d
DATE: March 2022	
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LEGEND

- 500-m study area
- East-West Arterial
- Watercourse
- Proposed Culvert
- Borehole
- ⊕ Monitoring Well

NOTES:


LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hilshade (2012); ORN, 2012;

CLIENT:


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Checked By: CM
Revision: A
Projection: UTM Zone 17N
SCALE: 1:24,000

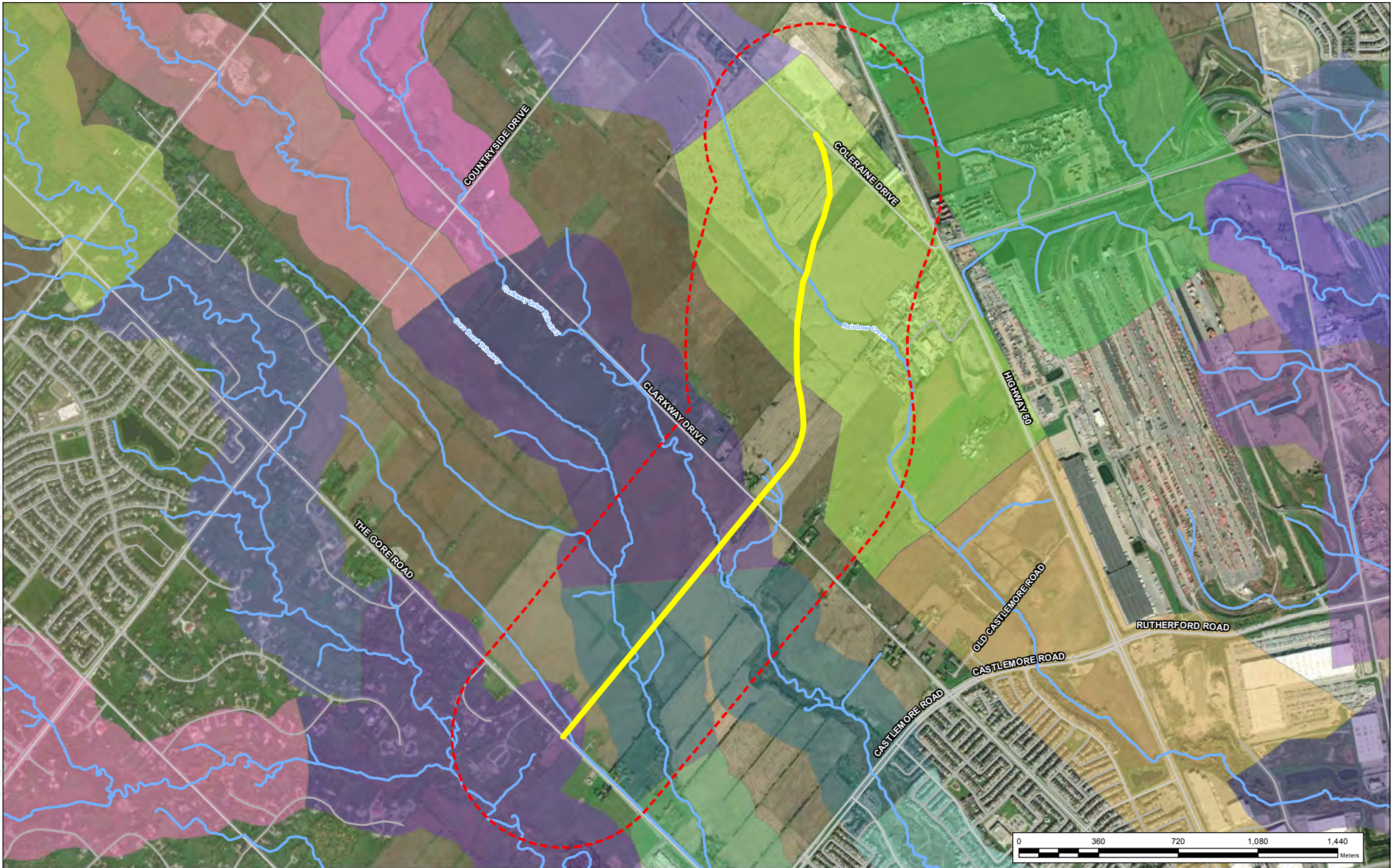


HYDROGEOLOGICAL INVESTIGATION
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

East-West Arterial - Surface Water Drainage and Structures

PROJECT N°: TP115086.1.6200	FIGURE: 9e
DATE: March 2022	
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LEGEND					
	500-m study area		hum_137		hum_152
	East-West Arterial		hum_141		hum_153
	Watercourse		hum_142		hum_154
Flood Plain Mapping Index (TRCA)					hum_158
Humber Watershed					hum_159
	hum_134		hum_143		hum_170
	hum_135		hum_144		hum_31
	hum_136		hum_149		hum_44
			hum_150		
			hum_151		

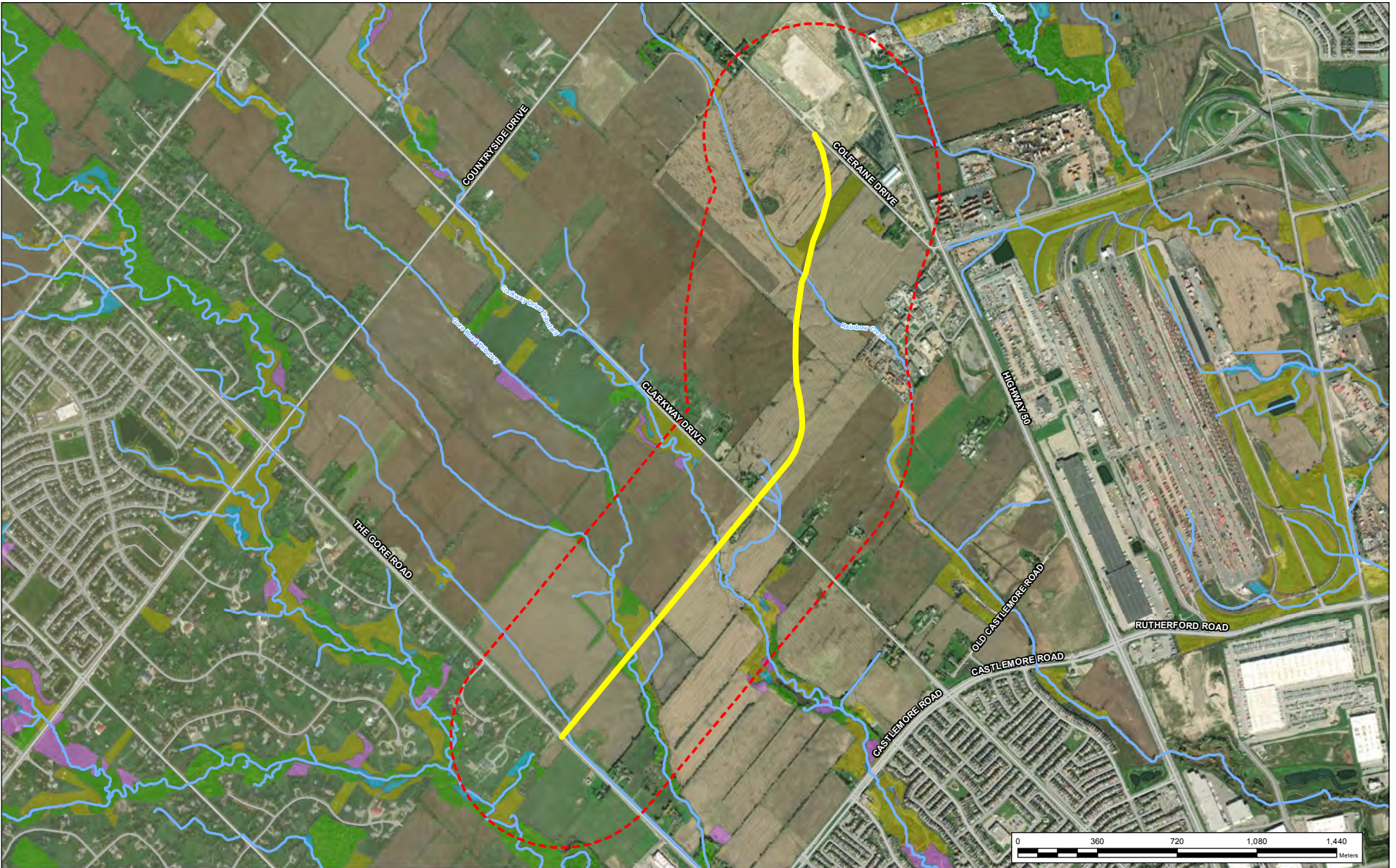
NOTES:
 LOCATION OF FEATURES ARE APPROXIMATE

 This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No.TP115086.6200

 SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012;

CLIENT:	
Drawn By: AF	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:24,000	

HYDROGEOLOGICAL INVESTIGATION	
Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario	
East-West Arterial - Regulatory Flood Plain	
PROJECT N°: TP115086.1.6200	FIGURE: 9f
DATE: March 2022	
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LEGEND

- 500-m study area
- East-West Arterial
- Watercourse

HABITAT

- Forest
- Meadow
- Successional
- Wetland

NOTES:

LOCATION OF FEATURES ARE APPROXIMATE

This drawing should be read in conjunction with the Wood Environment & Infrastructure Report No. TP115086.6200

SOURCE: Some data presented in this figure is from the Ontario open dataset: Hillshade (2012); ORN, 2012;

CLIENT:

Drawn By: AF	Checked By: CM
Revision: A	Projection: UTM Zone 17N
SCALE: 1:24,000	

HYDROGEOLOGICAL INVESTIGATION

Arterial Roads within Highway 427 Industrial Secondary Plan Area 47, Brampton, Ontario

East-West Arterial - Habitats

PROJECT N°: TP115086.1.6200	FIGURE:
DATE: March 2022	9g

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Table 1

**Monitoring Well Details and
Groundwater Levels**

Table 1: Monitoring Well Details and Groundwater Levels

Well Name	S1		S4		S5		S7		S10		S12		S13		S16		S17	
Screened Unit	silty clay		silty clay, sandy silt		silty clay, clayey silt		silty clay, clayey silt		silty clay, clayey silt		silty sand, sandy silt		silty clay / clayey silt, silty sand / sandy silt		silty clay, clayey silt		silty sand / sandy silt shale	
K (m/s)	1.2 × 10 ⁻⁶		--		7.8 × 10 ⁻⁹		4.0 × 10 ⁻⁷		4.7 × 10 ⁻⁸		2.9 × 10 ⁻⁸		8.1 × 10 ⁻⁷		3.7 × 10 ⁻⁹		1.1 × 10 ⁻⁷	
Ground Surface Elevation (m AMSL)	222.8		210.6		209.3		217.8		213.8		213.5		210.2		213.1		202.6	
Stickup (m AGS)	-0.13		--		0.66		-0.13		-0.14		-0.08		-0.11		-0.17		0.87	
Screen Top (m BGS)	6.1		6.1		6.1		6.1		6.1		2.7		4.6		6.1		3.8	
Screen Bottom (m BGS)	9.2		9.2		9.2		9.2		9.2		5.8		7.7		9.2		6.9	
Well Depth (m BGS) measured	9.1		--		8.0		9.2		9.3		5.5		7.6		9.2		6.4	
Date	WL (m BGS)	WL (m AMSL)	WL (m BGS)	WL (m AMSL)	WL (m BGS)	WL (m AMSL)	WL (m BGS)	WL (m AMSL)	WL (m BGS)	WL (m AMSL)	WL (m BGS)	WL (m AMSL)	WL (m BGS)	WL (m AMSL)	WL (m BGS)	WL (m AMSL)	WL (m BGS)	WL (m AMSL)
24-Apr-20	1.80	221.00	--	--	--	--	1.72	216.08	--	--	--	--	1.17	209.03	3.08	210.02	--	--
4-May-20	0.87	221.93	--	--	-0.68	209.98	1.71	216.09	0.90	212.90	1.44	212.06	1.39	208.81	3.22	209.88	--	--
12-May-20	0.91	221.89	--	--	-0.49	209.79	1.87	215.93	1.04	212.76	1.50	212.00	1.41	208.79	3.16	209.94	--	--
26-Jan-22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.31	199.3

NOTES:
 K - hydraulic conductivity m AGS - metres above ground surface -- not measured
 WL - groundwater level m BGS - metres below ground surface Screen tops and bottoms are from borehole logs.
 m/s - metres per second m AMSL - metres above mean sea level



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Appendix A
Borehole Logs

EXPLANATION OF BOREHOLE LOG

This form describes some of the information provided on the borehole logs, which is based primarily on examination of the recovered samples, and the results of the field and laboratory tests. Additional description of the soil/rock encountered is given in the accompanying geotechnical report.

GENERAL INFORMATION

Project details, borehole number, location coordinates and type of drilling equipment used are given at the top of the borehole log.

SOIL LITHOLOGY

Elevation and Depth

This column gives the elevation and depth of inferred geologic layers. The elevation is referred to the datum shown in the Description column.

Lithology Plot

This column presents a graphic depiction of the soil and rock stratigraphy encountered within the borehole.

Description

This column gives a description of the soil strata, based on visual and tactile examination of the samples augmented with field and laboratory test results. Each stratum is described according to the *Modified Unified Soil Classification System*.

The compactness condition of cohesionless soils (SPT) and the consistency of cohesive soils (undrained shear strength) are defined as follows (*Ref. Canadian Foundation Engineering Manual*):

Compactness of		Consistency of		Undrained Shear Strength	
<u>Cohesionless</u>	<u>SPT N-Value</u>	<u>Cohesive Soils</u>	<u>kPa</u>	<u>psf</u>	
<u>Soils</u>					
Very loose	0 to 4	Very soft	0 to 12	0 to 250	
Loose	4 to 10	Soft	12 to 25	250 to 500	
Compact	10 to 30	Firm	25 to 50	500 to 1000	
Dense	30 to 50	Stiff	50 to 100	1000 to 2000	
Very Dense	> 50	Very stiff	100 to 200	2000 to 4000	
		Hard	Over 200	Over 4000	

Soil Sampling

Sample types are abbreviated as follows:

SS	Split Spoon	TW	Thin Wall Open (Pushed)	RC	Rock Core
AS	Auger Sample	TP	Thin Wall Piston (Pushed)	WS	Washed Sample

Additional information provided in this section includes sample numbering, sample recovery and numerical testing results.

Field and Laboratory Testing

Results of field testing (e.g., SPT, pocket penetrometer, and vane testing) and laboratory testing (e.g., natural moisture content, and limits) executed on the recovered samples are plotted in this section.

Instrumentation Installation

Instrumentation installations (monitoring wells, piezometers, inclinometers, etc.) are plotted in this section. Water levels, if measured during fieldwork, are also plotted. These water levels may or may not be representative of the static groundwater level depending on the nature of soil stratum where the piezometer tips are located, the time elapsed from installation to reading and other applicable factors.

Comments

This column is used to describe non-standard situations or notes of interest.

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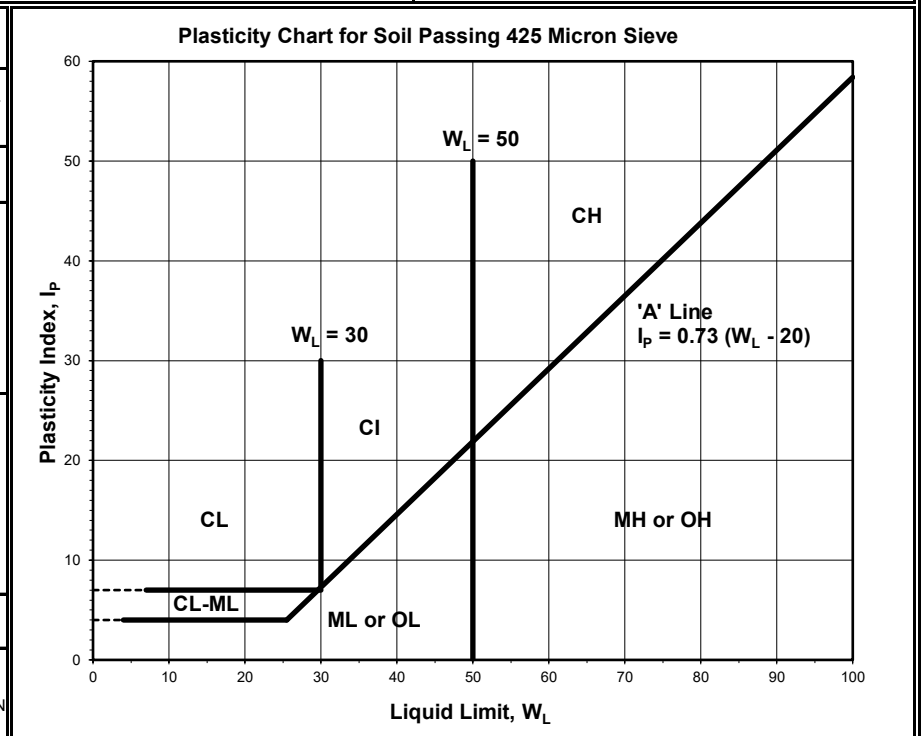
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MODIFIED * UNIFIED CLASSIFICATION SYSTEM FOR SOILS
 *The soil of each stratum is described using the Unified Soil Classification System (Technical Memorandum 36-357 prepared by Waterways Experiment Station, Vicksburg, Mississippi, Corps of Engineers, U.S Army. Vol. 1 March 1953.) modified slightly so that an inorganic clay of "medium plasticity" is recognized.

MAJOR DIVISION		GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA			
COARSE GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN 75µm)	GRAVELS MORE THAN HALF THE COARSE FRACTION LARGER THAN 4.75mm	CLEAN GRAVELS (TRACE OR NO FINES)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4; C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$		
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS		
		DIRTY GRAVELS (WITH SOME OR MORE FINES)	GM	SILTY GRAVELS, GRAVEL-SAND- SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I LESS THAN 4		
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE OR P.I MORE THAN 7		
	SANDS MORE THAN HALF THE COARSE FRACTION SMALLER THAN 4.75mm	CLEAN SANDS (TRACE OR NO FINES)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 6; C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$		
			SP	POORLY GRADED GRAVELS, GRAVEL- SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS		
		DIRTY SANDS (WITH SOME OR MORE FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I LESS THAN 4		
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE OR P.I MORE THAN 7		
		FINE-GRAINED SOILS (MORE THAN HALF BY WEIGHT SMALLER THAN 75µm)	SILTS BELOW "A" LINE NEGLIGIBLE ORGANIC CONTENT	$W_L < 50$	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)
				$W_L > 50$	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	
CLAYS ABOVE "A" LINE NEGLIGIBLE ORGANIC CONTENT	$W_L < 30$		CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY OR SILTY CLAYS, LEAN CLAYS			
	$30 < W_L < 50$		CI	INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS			
	$W_L > 50$		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS			
ORGANIC SILTS & CLAYS BELOW "A" LINE	$W_L < 50$		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	WHENEVER THE NATURE OF THE FINES CONTENT HAS NOT BEEN DETERMINED, IT IS DESIGNATED BY THE LETTER "F", E.G SF IS A MIXTURE OF SAND WITH SILT OR CLAY		
	$W_L > 50$		OH	ORGANIC CLAYS OF HIGH PLASTICITY			
HIGH ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR, AND OFTEN FIBROUS TEXTURE		

SOIL COMPONENTS					
FRACTION	U.S STANDARD SIEVE SIZE			DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
		PASSING	RETAINED	PERCENT	DESCRIPTOR
GRAVEL	COARSE	76 mm	19 mm	35-50	AND
		19 mm	4.75 mm	20-35	Y/EY
SAND	COARSE	4.75 mm	2.00 mm	10-20	SOME
	MEDIUM	2.00 mm	425 µm	1-10	TRACE
	FINE	425 µm	75 µm		
FINES (SILT OR CLAY BASED ON PLASTICITY)		75 µm			
OVERSIZED MATERIAL					
ROUNDED OR SUBROUNDED: COBBLES 76 mm TO 200 mm BOULDERS > 200 mm				NOT ROUNDED: ROCK FRAGMENTS > 76 mm ROCKS > 0.76 CUBIC METRE IN VOLUME	



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Note 1: Soils are classified and described according to their engineering properties and behaviour.
 Note 2: The modifying adjectives used to define the actual or estimated percentage range by weight of minor components are consistent with the Canadian Foundation Engineering Manual.

RECORD OF BOREHOLE No. BH A1



Project Number: TP115086 Drilling Location: Coleraine Dr., NBL, Sta. 0+000 E:605646 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4853212
150 mm Solid Stem Augers Compiled by: PR
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Truck Mounted Drill Reviewed by: SM/DP
Secondary Plan Area (Area 47) Date Started: Jan 21, 2020 Date Completed: Jan 21, 2020 Revision No.: 0, 12/1/20
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 215.5 m										
about 180 mm ASPHALT						215.3				
Sand and Gravel FILL moist						216.2				
dark grey/brown Silty Clay FILL trace gravel, trace organics	SS	1	100	10		215	○	●	○	25
	SS	2	83	25	1		○	●	○	14
	SS	3	100	37	2	214	○	●	○	18
brown/grey SILTY CLAY TILL trace sand, trace gravel very stiff to hard						214.0				
----- cobbles/boulders	SS	4	83	37		213	○	●	○	14
	SS	5	100	38	3		○	●	○	12
----- grey	SS	6	100	25	4	212	○	●	○	10
	SS	7	100	33		211	○	●	○	13
END OF BOREHOLE						210.5				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.




Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH A2



Project Number: TP115086 Drilling Location: Coleraine Dr., NBL, Sta. 0+000 E:605648 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4853213
150 mm Solid Stem Augers Compiled by: PR
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Truck Mounted Drill Reviewed by: SM/DP
Secondary Plan Area (Area 47) Date Started: Jan 21, 2020 Date Completed: Jan 21, 2020 Revision No.: 0, 12/1/20
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 215.4 m										
 Sand and Gravel FILL moist 214.9	SS	1	100	61	215					Ground frozen to about 300 mm below surface..
 dark grey/brown Silty Clay FILL trace sand, trace gravel, with oxidation 214.1	SS	2	100	10	214					
 brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel very stiff 213.5	SS	3	100	29	214					
END OF BOREHOLE 1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH A3**



Project Number: **TP115086** Drilling Location: **Coleraine Dr., SBL, Sta. 0+150 E:605516** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Truck Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 21, 2020** Date Completed: **Jan 21, 2020** Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 216.3 m										
Lithology Plot	about 200 mm ASPHALT					216.1				
	Sand and Gravel FILL moist					216.0				
	dark grey/brown Silty Clay FILL trace gravel, trace organics	SS	1	50	9	216	○	●		
		SS	2	100	12	215	○	●		
		SS	3	100	7	215	○	●		
	brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel very stiff	SS	4	100	21	214	○	●		3 18 52 27
	END OF BOREHOLE					213.3				

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▽ Groundwater encountered on completion of drilling on 1/21/2020 at a depth of: 2.7 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH A5**



Project Number: **TP115086** Drilling Location: **Coleraine Dr., NBL, Sta. 0+300 E:605408** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4853441 150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Truck Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 21, 2020** Date Completed: **Jan 21, 2020** Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 216.5 m										
about 200 mm ASPHALT						216.3				
Sand and Gravel FILL moist						216.2				
brown Silty Clay FILL trace gravel, trace organics	SS	1	79	12		216	○	■		
215.3						215.3				
brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel very stiff	SS	2	100	18		215	○	■		
215.0						215.0				
1.5						215				
END OF BOREHOLE										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. BH A7



Project Number: TP115086 Drilling Location: Coleraine Dr., SBL, Sta. 0+450 E:605353 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4853491
150 mm Solid Stem Augers Compiled by: PR
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Truck Mounted Drill Reviewed by: SM/DP
Secondary Plan Area (Area 47) Date Started: Jan 21, 2020 Date Completed: Jan 21, 2020 Revision No.: 0, 12/1/20
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 218.2 m										
					218.0	218				
					218.0					
	SS	1	75	11	217.2					
	SS	2	100	20	216.6	217				
					1.5					

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH A8**



Project Number: **TP115086** Drilling Location: **Coleraine Dr., SBL, Sta. 0+450 E:605353** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4853490 150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 23, 2020** Date Completed: **Jan 23, 2020** Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 217.9 m										
Sand and Gravel FILL trace organics moist 217.5	SS	1	100	14						
brown Silty Clay FILL trace gravel 0.5	SS	2	83	8	1	217				
brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel very stiff 1.2	SS	3	25	20						
216.1										
216.1										
END OF BOREHOLE 1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH A9**



Project Number: **TP115086** Drilling Location: **Coleraine Dr., NBL, Sta. 0+600 E:605252** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4853597 150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Truck Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 21, 2020** Date Completed: **Jan 21, 2020** Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 219.1 m										
about 190 mm ASPHALT					218.9	219				
Sand and Gravel FILL moist					218.8					
dark grey/dark brown Silty Clay FILL trace gravel	SS	1	75	10	218.2					
brown/grey SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel, trace cobbles very stiff to hard	SS	2	63	21	218.0	1				
	SS	3	100	72	217.9	2				
	SS	4	100	44	217.8	3				
	SS	5	100	66	217.7	4				
grey	SS	6	100	34	217.6	5				
	SS	7	100	33	217.5	6				
END OF BOREHOLE					214.1	5				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. BH A10



Project Number: TP115086 Drilling Location: Coleraine Dr., NBL, Sta. 0+600 E:605253 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4853600
150 mm Solid Stem Augers Compiled by: PR
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM/DP
Secondary Plan Area (Area 47) Date Started: Jan 23, 2020 Date Completed: Jan 23, 2020 Revision No.: 0, 12/1/20
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 219.0 m										
 Sand and Gravel FILL some topsoil moist	SS	1	100	8						GR 27 SA 60 SI (13) CL
brown/grey Silty Clay FILL trace gravel	SS	2	83	12	1	218				
217.8 brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel very stiff	SS	3	83	24						
217.2 END OF BOREHOLE										
1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH A11**



Project Number: **TP115086** Drilling Location: **Coleraine Dr., SBL, Sta. 0+750 E:605117** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4853720 150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Truck Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 21, 2020** Date Completed: **Jan 21, 2020** Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 219.9 m										
about 200 mm ASPHALT 219.7										
Sand and Gravel FILL moist 219.6										
dark grey Silty Clay FILL trace gravel, trace organics, trace cobbles 219.0	SS	1	25	12						
brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel, cobbles/boulders stiff to hard 0.9	SS	2	58	14	1	219				
	SS	3	83	28	2	218				
	SS	4	100	38	3	217				
END OF BOREHOLE 216.8 3.0										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH A13**



Project Number: **TP115086** Drilling Location: **Coleraine Dr., NBL, Sta. 0+900 E:605006** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4853836 150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Truck Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 21, 2020** Date Completed: **Jan 21, 2020** Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 220.2 m										
about 200 mm ASPHALT 220.0					220					
Sand and Gravel FILL moist 0.3										
dark grey/grey Silty Clay FILL trace sand, trace gravel, trace organics	SS	1	67	9						
	SS	2	83	14	1					
218.6										
brown SILTY CLAY / CLAYEY SILT TILL trace sand to sandy, trace gravel, cobbles/boulders hard 1.5	SS	3	100	36	2					
217.9										
brown SILTY SAND trace clay, trace gravel very dense wet 2.3	SS	4	100	82						
217.3										
END OF BOREHOLE 2.9										

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∇ Groundwater encountered on completion of drilling on 1/21/2020 at a depth of: 2.4 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH A15**



Project Number: **TP115086** Drilling Location: **Coleraine Dr., SBL, Sta. 1+050 E:604898** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4853934 150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Truck Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 22, 2020** Date Completed: **Jan 22, 2020** Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 221.5 m										
	about 190 mm ASPHALT					221.3				
	About 110 mm CONCRETE					220.2				
	dark grey Silty Clay FILL trace gravel, trace organics	SS	1	46	10	221	○	■		
	brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel firm to stiff	SS	2	100	8	220.6	○	■		
	END OF BOREHOLE					220.0				
						1.5				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH A17



Project Number: TP115086 Drilling Location: Coleraine Dr., NBL, Sta. 1+200 E:604785 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4854053
150 mm Solid Stem Augers Compiled by: PR
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Truck Mounted Drill Reviewed by: SM/DP
Secondary Plan Area (Area 47) Date Started: Jan 22, 2020 Date Completed: Jan 22, 2020 Revision No.: 0, 12/1/20
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 222.5 m										
about 200 mm ASPHALT						222.3				
Sand and Gravel FILL moist						222.2				
grey/brown Silty Clay FILL trace sand and gravel	SS	1	83		9	222	○	■		23
	SS	2	83		6	221	○	■		32
brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel very stiff to hard	SS	3	100		20	221.0	○	■		26
cobbles /boulders	SS	4	100		41	220	○	■		13
	SS	5	100		101	219	○	■		101, 14
greyish brown	SS	6	100		45	218	○	■		11
	SS	7	100		34	217.5	○	■		25
END OF BOREHOLE						217.5				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH A18**



Project Number: **TP115086** Drilling Location: **Coleraine Dr., NBL, Sta. 1+200 E:604785** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4854054 150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Truck Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 22, 2020** Date Completed: **Jan 22, 2020** Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 222.9 m										
Lithology Plot	Sand and Gravel FILL trace organics moist 222.5	SS	1	100	17					
	brown/dark brown Silty Clay FILL trace gravel, with oxidation 0.4	SS	2	83	12	1	222			
	brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel very stiff 221.7	SS	3	100	22					
	221.1									
	END OF BOREHOLE 1.8									

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH A19**



Project Number: **TP115086** Drilling Location: **Coleraine Dr., SBL, Sta. 1+350 E:604701** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4854134 150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Truck Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 22, 2020** Date Completed: **Jan 22, 2020** Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 222.6 m										
about 200 mm ASPHALT 222.4										
Sand and Gravel FILL 220.3 moist 0.3										
dark grey/brown Silty Clay FILL trace sand, trace organics										
SS 1 100 12 222										
SS 2 67 12 221										
brown SILTY CLAY / CLAYEY SILT TILL 221.1 trace sand, trace gravel 1.5 hard										
SS 3 100 34 220										
SS 4 100 57 219.6										
END OF BOREHOLE 3.0										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH A20



Project Number: TP115086 Drilling Location: Coleraine Dr., SBL, Sta. 1+350 E:604693 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4854133 150 mm Solid Stem Augers Compiled by: PR
 Project Name: Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47) Drilling Machine: Track Mounted Drill Reviewed by: SM/DP
 Project Location: Brampton, Ontario Date Started: Jan 23, 2020 Date Completed: Jan 23, 2020 Revision No.: 0, 12/1/20

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 222.4 m										
Sand and Gravel FILL moist	SS	1	100	26	222					
222.1 0.3 dark grey/brown Silty Clay FILL trace gravel, trace organics, trace cobbles										
221.3 brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel stiff	SS	2	100	12	1					
221.2 1.2 END OF BOREHOLE										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. BH A21



Project Number: TP115086 Drilling Location: Coleraine Dr., NBL, Sta. 1+500 E:604576 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4854257
150 mm Solid Stem Augers Compiled by: PR
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Truck Mounted Drill Reviewed by: SM/DP
Secondary Plan Area (Area 47) Date Started: Jan 22, 2020 Date Completed: Jan 22, 2020 Revision No.: 0, 12/1/20
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 223.2 m										
about 200 mm ASPHALT 223.0										
Sand and Gravel FILL moist 222.9										
dark grey Silty Clay FILL trace sand, trace organics 0.3	SS	1	50	10						
221.9										
greyish brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel stiff 221.7	SS	2	58	9						
1.5										
END OF BOREHOLE										

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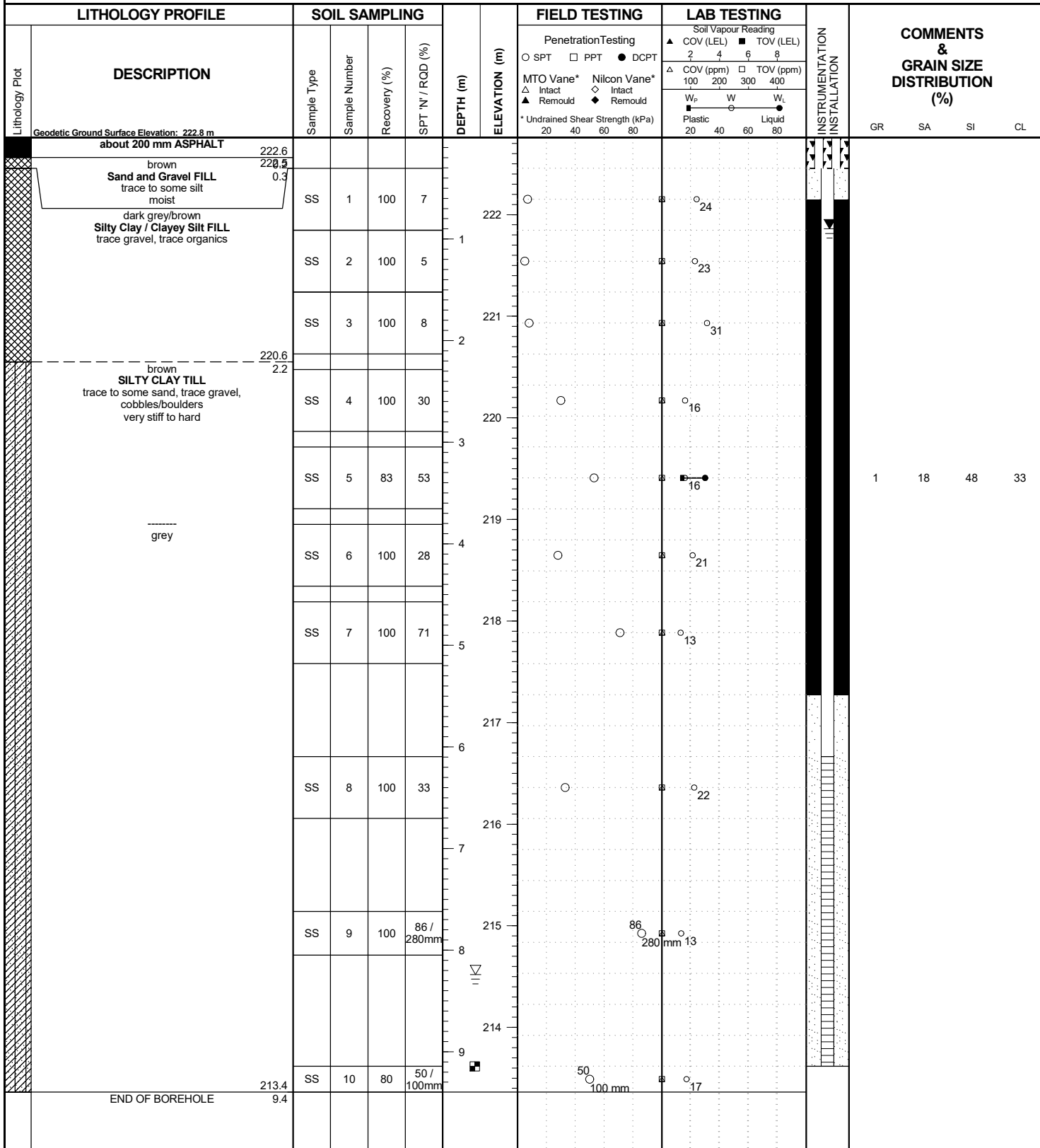
∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH A23 / BH S1**



Project Number: **TP115086** Drilling Location: **Coleraine Dr., SBL, Sta. 1+650 E:604481** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4854343 150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Truck Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Coleraine Drive, Brampton, Ontario** Date Started: **Jan 20, 2020** Date Completed: **Jan 20, 2020** Revision No.: **0, 3/30/21**



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▽ Groundwater encountered on completion of drilling on 1/20/2020 at a depth of: **8.2 m**. ■ Cave in depth after removal of augers: **9.1 m**.
 ▼ Groundwater depth observed on 5/12/2020 at a depth of: **0.9 m**.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH A23 / BH S1**



Project Number: **TP115086**

Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Coleraine Drive, Brampton, Ontario**

Lithology Plot	LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing	Soil Vapour Reading	Soil Vapour Reading	Soil Vapour Reading		
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Concrete: 0.0 - 0.3 m Sand: 0.3 - 0.6 m Bentonite: 0.6 - 5.5 m Sand Filter: 5.5 - 6.1 m Screen: 6.1 - 9.1 m Groundwater measurements in monitoring well (depth below ground surface): 24 Apr 2020: 1.8 m 4 May 2020: 0.9 m 12 May 2020: 0.9 m												

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH A25**



Project Number: **TP115086** Drilling Location: **Coleraine Dr., NBL, Sta. 1+800 E:604381** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4854447 150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Truck Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 22, 2020** Date Completed: **Jan 22, 2020** Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)	△ COV (ppm) □ TOV (ppm)		
Geodetic Ground Surface Elevation: 225.0 m												
	about 200 mm ASPHALT					224.8						
	Sand and Gravel FILL moist					224.7						
	grey/brown Silty Clay FILL trace gravel, trace cobbles	SS	1	100	13	224.1	○	▲	○	13		
	brown/grey SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel, cobbles/boulders very stiff to hard	SS	2	100	25	224.0	○	▲	○	13		
		SS	3	75	31	223.9	○	▲	○	13		
		SS	4	100	76 / 180mm	223.8	○	▲	○	13		
		SS	5	100	91	222.8	○	▲	○	12		
	grey	SS	6	92	57	221.8	○	▲	○	11		
		SS	7	100	74	220.8	○	▲	○	12		
	END OF BOREHOLE					220.0						

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH A26



Project Number: TP115086 Drilling Location: Coleraine Dr., NBL, Sta. 1+800 E:604384 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4854450
150 mm Solid Stem Augers Compiled by: PR
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Truck Mounted Drill Reviewed by: SM/DP
Secondary Plan Area (Area 47) Date Started: Jan 22, 2020 Date Completed: Jan 22, 2020 Revision No.: 0, 12/1/20
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 224.4 m										
	Sand and Gravel FILL trace organics moist	SS	1	100	19	224	○	■		
	dark grey/brown Silty Clay FILL trace gravel, trace cobbles	SS	2	100	18	223	○	■		
	brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel hard	SS	3	100	40	223	○	■		
	END OF BOREHOLE					1.8				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH A27



Project Number: TP115086 Drilling Location: Coleraine Dr., SBL, Sta. 1+950 E:604250 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4854566
150 mm Solid Stem Augers Compiled by: PR
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Truck Mounted Drill Reviewed by: SM/DP
Secondary Plan Area (Area 47) Date Started: Jan 22, 2020 Date Completed: Jan 22, 2020 Revision No.: 0, 12/1/20
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 226.8 m										
about 250 mm ASPHALT 226.6										
Sand and Gravel FILL moist 226.5 0.3										
brown Silty Clay FILL trace gravel, trace cobbles	SS	1	100	13	226	1	○	●	○	16
225.3 1.5										
brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel, cobbles/boulders hard	SS	2	100	29	225	2	○	●	○	13
	SS	3	100	41	225	2	○	●	○	12
	SS	4	100	57	224	3	○	●	○	12
223.8 3.0										
END OF BOREHOLE										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH A28**



Project Number: **TP115086** Drilling Location: **Coleraine Dr., SBL, Sta. 1+950 E:604250** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4854566 150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Truck Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 22, 2020** Date Completed: **Jan 22, 2020** Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 226.8 m 	SS	1	100	46		226.2	○			
brown 	SS	2	100	12		225.6	○			
END OF BOREHOLE 1.2										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH A29



Project Number: TP115086 Drilling Location: Coleraine Dr., NBL, Sta. 2+100 E:604157 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4854675
150 mm Solid Stem Augers Compiled by: PR
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Truck Mounted Drill Reviewed by: SM/DP
Secondary Plan Area (Area 47) Date Started: Jan 22, 2020 Date Completed: Jan 22, 2020 Revision No.: 0, 12/1/20
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 228.6 m										
about 200 mm ASPHALT										
Sand and Gravel FILL moist	SS	1	100	44	228					
brown Silty Clay FILL trace gravel, trace cobbles	SS	2	100	18	227.7					
END OF BOREHOLE					227.1					

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. BH A30



Project Number: TP115086 Drilling Location: Coleraine Dr., NBL, Sta. 2+100 E:604159 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4854679
150 mm Solid Stem Augers Compiled by: PR
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM/DP
Secondary Plan Area (Area 47) Date Started: Jan 23, 2020 Date Completed: Jan 23, 2020 Revision No.: 0, 12/1/20
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 228.7 m										
 Sand and Gravel FILL some topsoil moist 228.2	SS	1	100	16			○	■		30 57 (13)
 dark grey/brown Silty Clay FILL trace gravel, with oxidation 227.5	SS	2	100	13	1	228	○	■		
 brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel, cobbles/boulders hard 226.9	SS	3	100	38		227	○	■		
END OF BOREHOLE 1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH A31**



Project Number: **TP115086** Drilling Location: **Coleraine Dr., SBL, Sta. 2+250 E:604075** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4854743 150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Truck Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 22, 2020** Date Completed: **Jan 22, 2020** Revision No.: **0, 12/1/20**

Lithology Profile	DESCRIPTION	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing ○ SPT □ PPT ● DCPT	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)	△ COV (ppm) □ TOV (ppm)	W _p W _L		
	Geodetic Ground Surface Elevation: 230.7 m												
	about 200 mm ASPHALT					230.5							
	Sand and Gravel FILL moist	SS	1	100	38	230							
	grey/brown Silty Clay FILL trace gravel	SS	2	100	16	229.8							
	brown/brownish grey SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel, cobbles/boulders very stiff to hard	SS	3	100	27	229.2							
		SS	4	100	29	228							
		SS	5	100	39	227							
		SS	6	92	44	226							
		SS	7	100	36	225.7							
	END OF BOREHOLE					225.0							

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH S2**



Project Number: **TP115086** Drilling Location: **Coleraine Dr., NBL, Sta. 1+650 E:604486** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4854343**
150 mm Solid Stem Augers Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
Secondary Plan Area (Area 47) Date Started: **Jan 20, 2020** Date Completed: **Jan 20, 2020** Revision No.: **0, 12/1/20**
 Project Location: **Brampton, Ontario**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)	△ COV (ppm) □ TOV (ppm)		
Geodetic Ground Surface Elevation: 222.4 m												
about 200 mm ASPHALT						222.3						
brown						222.2						
Sand and Gravel FILL trace to some silt moist	SS	1	100	8		222	○	■	○ ₂₄			
dark grey/brown Silty Clay / Clayey Silt FILL trace gravel, trace organics	SS	2	42	8	1	221	○	■	○ ₂₆			
brown	SS	3	75	7	2	221	○	■	○ ₂₆			
brown						220.2						
SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel, cobbles/boulders very stiff to hard	SS	4	100	29		220	○	■	○ ₁₃			
	SS	5	46	42	3	219	○	■	○ ₁₂			
grey						218						
	SS	6	100	28	4	218	○	■	○ ₂₁			
						217						
	SS	7	100	19	5	217	○	■	○ ₁₆			
						216						
	SS	8	100	35	6	216	○	■	○ ₂₁			
						215						
	SS	9	100	36	7	215	○	■	○ ₁₁			
						214						
	SS	10	100	50 / 100mm	8	214	○	■	○ ₁₀			
END OF BOREHOLE						213.1						
						9.4						

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∇ No freestanding groundwater measured in open borehole on completion of drilling. ■ Cave in depth after removal of augers: 7.9 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. BH C1



Project Number: TP115086 Drilling Location: Countryside Dr., EBL, Sta. 0+000 E:603645 Logged by: MS
 Project Client: City of Brampton Drilling Method: 150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM / DP
 Project Location: Brampton, Ontario Date Started: Mar 25, 2020 Date Completed: Mar 25, 2020 Revision No.: 0, 2/8/21

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 215.8 m about 100 mm ASPHALT brown Sand and Gravel FILL moist										
	SS	1	83	12						
214.9 0.9 grey Silty Clay / Clayey Silt FILL trace to some sand, trace gravel, trace organics	SS	2	92	8	1					
	SS	3	100	8	2					0 14 48 38
213.6 2.2 brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, cobbles/boulders hard	SS	4	100	40	3					
END OF BOREHOLE					3.0					

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH C2**



Project Number: **TP115086** Drilling Location: **Countryside Dr., EBL, Sta. 0+000 E:603646** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4852295 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 25, 2020** Date Completed: **Mar 25, 2020** Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE		SOIL SAMPLING				FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)	
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing		Soil Vapour Reading				
								<input type="radio"/> SPT <input type="checkbox"/> PPT <input type="radio"/> DCPT MTO Vane* Nilcon Vane* <input type="triangle-up"/> Intact <input type="diamond"/> Intact <input type="triangle-down"/> Remould <input type="diamond"/> Remould * Undrained Shear Strength (kPa) 20 40 60 80	<input type="triangle-up"/> COV (LEL) <input type="square"/> TOV (LEL) 2 4 6 8 <input type="triangle-up"/> COV (ppm) <input type="square"/> TOV (ppm) 100 200 300 400 W _p W W _L Plastic Liquid 20 40 60 80					
	Geodetic Ground Surface Elevation: 215.1 m													
	brown Sand and Gravel FILL moist 214.5	SS	1	75	6									
	dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel 0.6	SS	2	100	7	1	214							
	213.2	SS	3	100	19									
	END OF BOREHOLE 1.8													

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH C3**



Project Number: **TP115086** Drilling Location: **Countryside Dr., WBL, Sta. 0+150 E:603738** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 25, 2020** Date Completed: **Mar 25, 2020** Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)						
Geodetic Ground Surface Elevation: 216.5 m										
	about 90 mm ASPHALT					216.4				
	brown Sand and Gravel FILL moist					216.2				
	dark brown / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	1	83	5	216				
	brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel stiff	SS	2	100	9	215.6				
	END OF BOREHOLE					215.0				
						1.5				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH C5**



Project Number: **TP115086** Drilling Location: **Countryside Dr., EBL, Sta. 0+300 E:603831** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4852531 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 25, 2020** Date Completed: **Mar 25, 2020** Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT	MTO Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)		
Geodetic Ground Surface Elevation: 214.6 m												
about 100 mm ASPHALT brown Sand and Gravel FILL moist	SS	1	83	30	214	0.1						
dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	2	100	38	213	0.8						
brown SILTY SAND / SANDY SILT TILL trace to some clay, trace gravel dense to very dense moist to wet	SS	3	83	46	213	1.5						
grey	SS	4	100	82	212							
	SS	5	100	69	211							
	SS	6	79	52	210							
END OF BOREHOLE	SS	7	100	55 / 150mm	209.7	4.9						

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∇ Groundwater encountered on completion of drilling on 3/25/2020 at a depth of: 3.0 m. ■ Cave in depth after removal of augers: 4.0 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. BH C6



Project Number: TP115086 Drilling Location: Countryside Dr., EBL, Sta. 0+300 E:603832 Logged by: MS
 Project Client: City of Brampton Drilling Method: 150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM / DP
 Project Location: Brampton, Ontario Date Started: Mar 25, 2020 Date Completed: Mar 25, 2020 Revision No.: 0, 2/8/21

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 214.6 m										
brown Sand and Gravel FILL moist 214.0	SS	1	83	11						
brown Silty Clay / Clayey Silt FILL trace sand, trace to some gravel 0.6 213.4	SS	2	88	34	1					
brown SILTY SAND / SANDY SILT TILL trace to some clay, trace gravel very dense moist 213.0 1.7	SS	3	100	75						
END OF BOREHOLE										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH C7**



Project Number: **TP115086** Drilling Location: **Countryside Dr., WBL, Sta. 0+450 E:603917** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4852640 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 25, 2020** Date Completed: **Mar 25, 2020** Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE		SOIL SAMPLING				FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W _p W W _L Plastic Liquid 20 40 60 80			
	Geodetic Ground Surface Elevation: 216.5 m												
	about 100 mm ASPHALT brown Sand and Gravel FILL moist					0.1	216.4						
	dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel	SS	1	50	15	0.6	215.9	○		●	3		
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff to hard	SS	2	100	16	1.1	215.5	○		●	13		
	grey	SS	3	100	28	2.0	215.0	○		●	16		
		SS	4	100	32	3.0	213.5	○		●	15		
	END OF BOREHOLE					3.0	213.5						

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH C8**



Project Number: **TP115086** Drilling Location: **Countryside Dr., WBL, Sta. 0+450 E:603915** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 25, 2020** Date Completed: **Mar 25, 2020** Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE		SOIL SAMPLING				FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT □ PPT ● DCPT		Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)			
								MTO Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould	Nilcon Vane* ◇ Intact ◆ Remould	2 4 6 8	100 200 300 400		
	Geodetic Ground Surface Elevation: 216.6 m												
	brown Sand and Gravel FILL moist 216.0	SS	1	42	9		216	○		▲			
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff to hard 0.6	SS	2	100	22		215.4	○		▲			
	214.8	SS	3	58	49		215	○		▲			
	END OF BOREHOLE 1.8												

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∇ No freestanding groundwater measured in open borehole on completion of drilling.





Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH C9**



Project Number: **TP115086** Drilling Location: **Countryside Dr., EBL, Sta. 0+600 E:604016** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4852761 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 25, 2020** Date Completed: **Mar 25, 2020** Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 218.3 m										
 about 110 mm ASPHALT					218.2					
 Sand and Gravel FILL					217.9					
 Silty Clay / Clayey Silt FILL	SS	1	83	10	217.4					
 SILTY CLAY / CLAYEY SILT TILL	SS	2	100	20	216.8					
END OF BOREHOLE					216.8					

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH C11**



Project Number: **TP115086** Drilling Location: **Countryside Dr., WBL, Sta. 0+750 E:604113** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4852893 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 27, 2020** Date Completed: **Mar 27, 2020** Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 215.2 m										
	about 120 mm ASPHALT brown					215.0				
	Sand and Gravel FILL moist	SS	1	83	21	214.4	○	● 2		
	dark grey / grey Silty Clay / Clayey Silt FILL trace sand, trace to some gravel, trace organics	SS	2	100	18	214.4	○	● 9		
	dark grey / grey Silty Clay / Clayey Silt FILL trace sand, trace to some gravel, trace organics	SS	3	92	7	213.4	○	● 20		
	brown / brownish grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff to hard	SS	4	100	17	212.9	○	● 17		
	brown / brownish grey Silty Clay / Clayey Silt FILL trace to some sand, trace gravel very stiff to hard	SS	5	100	29	212.2	○	● 17		
	grey	SS	6	83	22	211.2	○	● 13		
	grey	SS	7	83	34	210.2	○	● 12		
END OF BOREHOLE										

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▽ Groundwater encountered on completion of drilling on 3/27/2020 at a depth of: 4.9 m.

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RECORD OF BOREHOLE No. **BH C12**



Project Number: **TP115086** Drilling Location: **Countryside Dr., WBL, Sta. 0+750 E:604113** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4852900** **150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 25, 2020** Date Completed: **Mar 25, 2020** Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 213.6 m about 100 mm TOPSOIL 213.5 brown 0.1 Sand and Gravel FILL moist 213.0 dark brown / brown 0.6 Silty Clay / Clayey Silt FILL trace sand, trace gravel 212.4 END OF BOREHOLE 1.2	SS	1	75	6		213				
	SS	2	100	6		1				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH C13**



Project Number: **TP115086** Drilling Location: **Countryside Dr., EBL, Sta. 0+900 E:604197** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4852992 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 27, 2020** Date Completed: **Mar 27, 2020** Revision No.: **0, 2/8/21**

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Geodetic Ground Surface Elevation: 219.0 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing	Soil Vapour Reading	COV (LEL)	TOV (LEL)	COV (ppm)	TOV (ppm)		
	about 140 mm ASPHALT	218.9														
	0.1 brown Sand and Gravel FILL	218.5														
	0.6 dark brown / brown Silty Clay / Clayey Silt FILL	218.1	SS	1	83	11										
	0.9 brown/grey SILTY CLAY / CLAYEY SILT TILL		SS	2	100	17	1	218								
	trace sand, trace gravel, trace organics		SS	3	100	23	2	217								
			SS	4	100	30	3	216								
	215.9 END OF BOREHOLE	3.0														

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH C15



Project Number: TP115086 Drilling Location: Countryside Dr., WBL, Sta. 1+050 E:604285 Logged by: MS
 Project Client: City of Brampton Drilling Method: 150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM / DP
 Project Location: Brampton, Ontario Date Started: Mar 27, 2020 Date Completed: Mar 27, 2020 Revision No.: 0, 2/8/21

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing	Soil Vapour Reading	COV (LEL)	TOV (LEL)	COV (ppm)	TOV (ppm)		
	Geodetic Ground Surface Elevation: 219.7 m															
	about 130 mm ASPHALT	219.6														
	brown	0.1														
	Sand and Gravel FILL	219.2														
	moist	0.6														
	dark grey / brown		SS	1	100	16		219								
	Silty Clay / Clayey Silt FILL	198.8														
	trace sand, trace to some gravel, trace organic															
	brown	0.9						1								
	SILTY CLAY / CLAYEY SILT TILL		SS	2	100	10										
	trace to some sand, trace gravel															
	firm to stiff															
	END OF BOREHOLE	218.2														
		1.5														

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

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RECORD OF BOREHOLE No. BH C17



Project Number: TP115086 Drilling Location: Countryside Dr., EBL, Sta. 1+200 E:604386 Logged by: MS
 Project Client: City of Brampton Drilling Method: 150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47) Drilling Machine: Track Mounted Drill Reviewed by: SM / DP
 Project Location: Brampton, Ontario Date Started: Mar 27, 2020 Date Completed: Mar 27, 2020 Revision No.: 0, 2/8/21

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING			LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing	MTO Vane*	Nilcon Vane*	Soil Vapour Reading	COV (LEL)	TOV (LEL)	COV (ppm)		TOV (ppm)	W _p	W _L	GR
	Geodetic Ground Surface Elevation: 219.9 m																			
	about 130 mm ASPHALT	219.8																		
	brown	0.1																		
	Sand and Gravel FILL	219.5																		
	moist	0.4																		
	dark brown / brown		SS	1	100	11		219	○	○	○	○	○	○	○					
	Silty Clay / Clayey Silt FILL	219.0																		
	trace sand, trace gravel, trace organics																			
	brown / brownish grey	0.9						1												
	SILTY CLAY TILL		SS	2	88	14			○	○	○	○	○	○	○					
	trace to some sand, trace gravel																			
	stiff to hard																			
			SS	3	100	24		2	○	○	○	○	○	○	○					
			SS	4	100	41		3	○	○	○	○	○	○	○					
			SS	5	100	30			○	○	○	○	○	○	○					
	grey																			
			SS	6	50	14		4	○	○	○	○	○	○	○					
			SS	7	100	20		5	○	○	○	○	○	○	○					
	END OF BOREHOLE	214.9																		
		5.0																		

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

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RECORD OF BOREHOLE No. BH C18



Project Number: TP115086 Drilling Location: Countryside Dr., EBL, Sta. 1+200 E:604388 Logged by: MS
 Project Client: City of Brampton Drilling Method: 150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM / DP
 Project Location: Brampton, Ontario Date Started: Apr 1, 2020 Date Completed: Apr 1, 2020 Revision No.: 0, 2/8/21

LITHOLOGY PROFILE		SOIL SAMPLING				FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Soil Vapour Reading					
								Penetration Testing		COV (LEL)		TOV (LEL)	
								O SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	2 4 6 8 100 200 300 400 W _p W W _L Plastic Liquid 20 40 60 80				
	Geodetic Ground Surface Elevation: 219.9 m												
	brown Sand and Gravel FILL moist 219.3	SS	1	88	5								
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel stiff to very stiff 0.6	SS	2	100	12	1	219						
		SS	3	100	19								
	218.1 END OF BOREHOLE 1.8												

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

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RECORD OF BOREHOLE No. BH C19 / BH B22



Project Number: TP115086 Drilling Location: Countryside Dr., WBL, Sta. 1+350 E:604448 Logged by: MS
 Project Client: City of Brampton Drilling Method: 150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM / DP
 Project Location: Brampton, Ontario Date Started: Jan 23, 2020 Date Completed: Jan 23, 2020 Revision No.: 0, 2/8/21

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing ○ SPT □ PPT ● DCPT	MTO Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) △ COV (ppm) □ TOV (ppm)	W _p	W	W _l		GR	SA	SI	CL
	Geodetic Ground Surface Elevation: 209.0 m																		
	about 200 mm ASPHALT	208.8																	
	Sand and Gravel FILL moist	0.2																	
		208.4																	
	brown/dark grey Silty Clay FILL trace gravel	0.6	SS	1	75	9													
		207.5																	
	END OF BOREHOLE	1.5	SS	2	100	18													

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH C20



Project Number: TP115086 Drilling Location: Countryside Dr., WBL, Sta. 1+350 E:604492 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4853362
150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM / DP
Secondary Plan Area (Area 47) Date Started: Apr 1, 2020 Date Completed: Apr 1, 2020 Revision No.: 0, 2/8/21
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 220.2 m brown Sand and Gravel FILL moist 219.8	SS	1	100	16	220	○	■			
dark grey / brown Silty Clay / Clayey Silt FILL trace sand, trace to some gravel, trace organics 0.5 219.0	SS	2	67	11	1	○	■			
END OF BOREHOLE 1.2 Borehole was terminated due to the close proximity of existing watermain										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

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RECORD OF BOREHOLE No. BH C21



Project Number: TP115086 Drilling Location: Countryside Dr., EBL, Sta. 1+500 E:604570 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4853458
150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM / DP
Secondary Plan Area (Area 47) Date Started: Mar 27, 2020 Date Completed: Mar 27, 2020 Revision No.: 0, 2/8/21
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 221.3 m										
about 200 mm ASPHALT					221.1					
brown Sand and Gravel FILL					220.8					
dark grey / brown Silty Clay / Clayey Silt FILL	SS	1	100	9	220.4					
brown SILTY CLAY / CLAYEY SILT TILL	SS	2	100	14	219.7					
END OF BOREHOLE					1.5					

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

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RECORD OF BOREHOLE No. **BH C23**



Project Number: **TP115086** Drilling Location: **Countryside Dr., WBL, Sta. 1+650 E:604645** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4853563 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 27, 2020** Date Completed: **Mar 27, 2020** Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE		SOIL SAMPLING				FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)	
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Soil Vapour Reading						
								Penetration Testing		COV (LEL)		TOV (LEL)		COV (ppm)
Geodetic Ground Surface Elevation: 221.3 m														
	about 150 mm ASPHALT						221.2							
	brown Sand and Gravel FILL						221.0							
	moist						220.7							
	dark grey Silty Clay / Clayey Silt FILL	SS	1	100	16		220.6	○		●	5			
	trace sand, trace gravel, trace organics						220.4							
	brown / brownish grey SILTY CLAY / CLAYEY SILT TILL	SS	2	100	8		220.4	○		●	16			
	trace to some sand, trace gravel, cobbles/boulders						220.3							
	firm to hard						220.2							
		SS	3	100	23		220.1	○		●	14			
							219.9							
		SS	4	100	41		219.8	○		●	13			
							219.7							
		SS	5	100	44		218.8	○		●	10			
							218.7							
		SS	6	100	30		217.8	○		●	14			
							217.7							
		SS	7	100	18		216.8	○		●	15			
							216.7							
	grey						216.6							
	END OF BOREHOLE						216.1							
							5.2							

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

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RECORD OF BOREHOLE No. BH C24



Project Number: TP115086 Drilling Location: Countryside Dr., WBL, Sta. 1+650 E:604647 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4853568
150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM / DP
Secondary Plan Area (Area 47) Date Started: Apr 1, 2020 Date Completed: Apr 1, 2020 Revision No.: 0, 2/8/21
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 220.9 m										
brown Sand and Gravel FILL moist 220.3	SS	1	67	5						
dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics 219.7	SS	2	100	15	1	220				
brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, cobbles/boulders very stiff 219.1	SS	3	58	22						
END OF BOREHOLE 1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH C25**



Project Number: **TP115086** Drilling Location: **Countryside Dr., EBL, Sta. 1+800 E:604747** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4853682 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 27, 2020** Date Completed: **Mar 27, 2020** Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 220.9 m										
about 150 mm ASPHALT brown Sand and Gravel FILL moist										
220.7 0.1 220.3										
dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	1	100	11		220	○	■ 4		
0.6 219.9 0.4 brown / brownish grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel stiff to hard	SS	2	100	14	1		○	■ 12		
	SS	3	100	25	2	219	○	■ 13		
	SS	4	100	46	3	218	○	■ 12		
217.8 3.0 END OF BOREHOLE										

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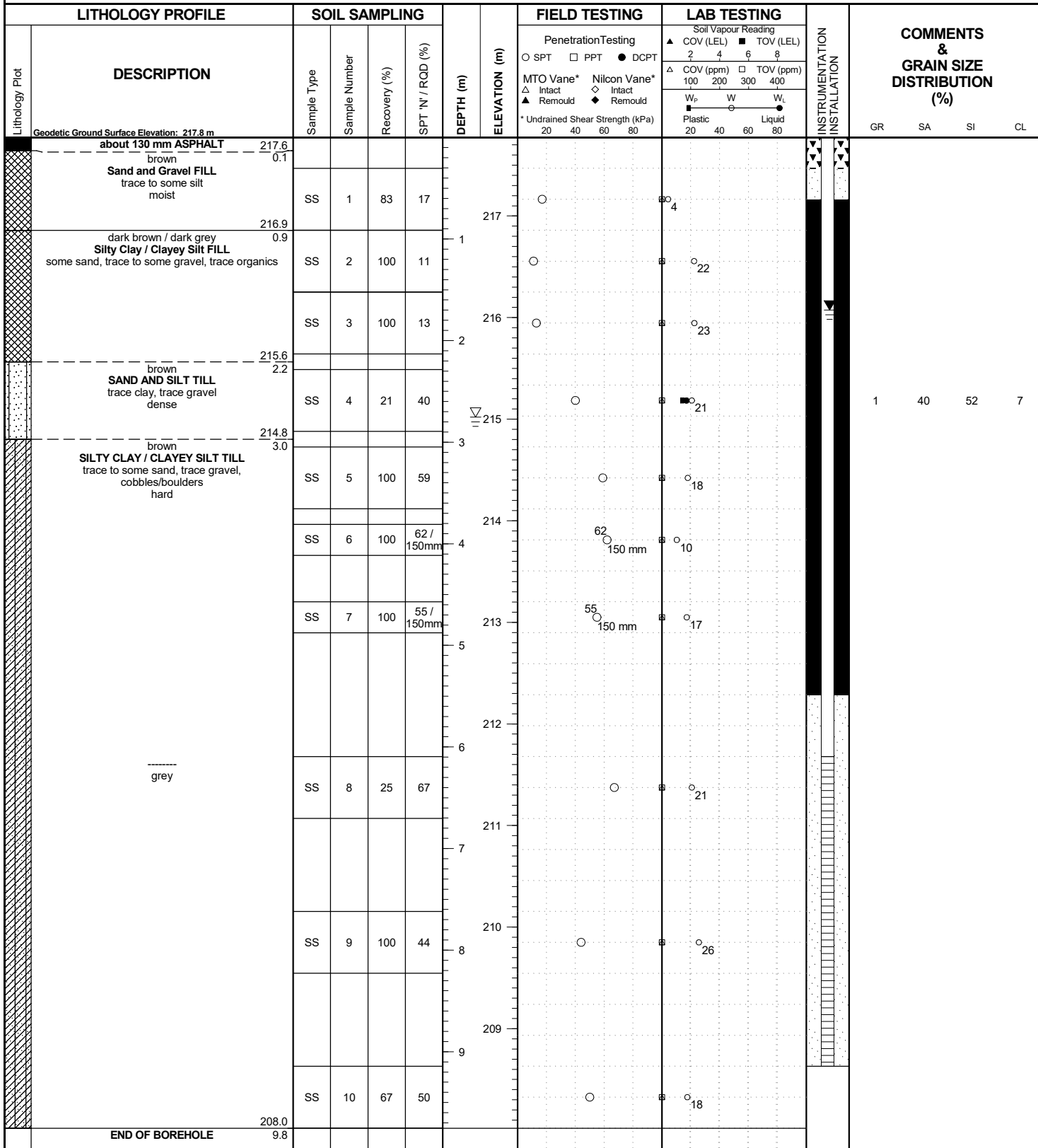
∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH C27 / BH S7**



Project Number: **TP115086** Drilling Location: **Countryside Dr., WBL, Sta. 1+950 E:604850** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4853816 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 26, 2020** Date Completed: **Mar 26, 2020** Revision No.: **0, 4/1/21**



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▽ Groundwater encountered on completion of drilling on 3/26/2020 at a depth of: 2.7 m.
 ▼ Groundwater depth observed on 5/4/2020 at a depth of: 1.7 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH C27 / BH S7**



Project Number: **TP115086**

Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Brampton, Ontario**

Lithology Plot	LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing	Soil Vapour Reading	Soil Vapour Reading	Soil Vapour Reading		
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Concrete: 0.0 - 0.3 m Sand: 0.3 - 0.6 m Bentonite: 0.6 - 5.5 m Sand Filter: 5.5 - 6.1 m Screen: 6.1 - 9.1 m Groundwater measurement in the monitoring well (depth below ground): 24 Apr 2020: 1.7 m 4 May 2020: 1.7 m 12 May 2020: 1.9 m												

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH C29**



Project Number: **TP115086** Drilling Location: **Countryside Dr., EBL, Sta. 2+100 E:604945** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4853935**
150 mm Solid Stem Augers Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
Secondary Plan Area (Area 47) Date Started: **Mar 19, 2020** Date Completed: **Mar 19, 2020** Revision No.: **0, 2/8/21**
 Project Location: **Brampton, Ontario**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 221.4 m about 150 mm ASPHALT brown Sand and Gravel FILL moist dark grey / grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel hard grey END OF BOREHOLE										
221.2										
220.1										
0.3										
	SS	1	100	18	221					
					1					
	SS	2	83	11	220					
					2					
219.9										
1.5										
	SS	3	100	36	219					
	SS	4	100	55 / 150mm	219	55	150 mm			
	SS	5	100	50 / 100mm	218	50	100 mm			
	SS	6	100	50 / 100mm	218	50	100 mm			
	SS	7	100	74 / 150mm	217	74	150 mm			
216.5										
4.9										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH C30



Project Number: TP115086 Drilling Location: Countryside Dr., EBL, Sta. 2+100 E:604944 Logged by: MS
 Project Client: City of Brampton Drilling Method: 150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM / DP
 Project Location: Brampton, Ontario Date Started: Mar 19, 2020 Date Completed: Mar 19, 2020 Revision No.: 0, 2/8/21

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 221.0 m										
Lithology Plot	brown Sand and Gravel FILL moist	SS	1	83	10					
	220.7 0.3 dark grey / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	2	100	19	1	220			
	219.8 1.2 brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff	SS	3	25	17					
	219.2 1.8 END OF BOREHOLE									

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH C31**



Project Number: **TP115086** Drilling Location: **Countryside Dr., WBL, Sta. 2+250 E:605023** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 19, 2020** Date Completed: **Mar 19, 2020** Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)						
Geodetic Ground Surface Elevation: 221.7 m										
about 150 mm ASPHALT brown Sand and Gravel FILL moist					221.6 0.1					
221.1 0.6 dark grey / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	1	83	11	221	○	○ 5 ○ 12			
220.2 1.5 brown SILTY SAND TILL trace to some clay, trace gravel dense to very dense wet to moist	SS	2	100	9	220	○	○ 21			
	SS	3	100	38	219	○	○ 15			- 67 31 2
	SS	4	100	94	218.7	■	○ 15			
END OF BOREHOLE					3.0					

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▽ Groundwater encountered on completion of drilling on 3/19/2020 at a depth of: 1.5 m. ■ Cave in depth after removal of augers: 2.7 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH C32



Project Number: TP115086 Drilling Location: Countryside Dr., WBL, Sta. 2+250 E:605023 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4854047
150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM / DP
Secondary Plan Area (Area 47) Date Started: Mar 19, 2020 Date Completed: Mar 19, 2020 Revision No.: 0, 2/8/21
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 221.7 m										
Sand and Gravel FILL brown moist 221.1	SS	1	50	8						
Silty Clay / Clayey Silt FILL dark grey trace sand, trace gravel, trace organics 220.5	SS	2	100	13	1					
SILTY SAND / SANDY SILT TILL brown trace to some clay, trace gravel dense wet 219.8	SS	3	100	33						
END OF BOREHOLE 1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH C33



Project Number: TP115086 Drilling Location: Countryside Dr., EBL, Sta. 2+400 E:605131 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4854170
150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM / DP
Secondary Plan Area (Area 47) Date Started: Mar 19, 2020 Date Completed: Mar 19, 2020 Revision No.: 0, 2/8/21
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 221.8 m about 100 mm ASPHALT brown Sand and Gravel FILL moist dark grey / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff END OF BOREHOLE										
221.7 0.1										
221.3 0.6										
220.9 0.9	SS	1	83	12	221	○				
220.2 1.5	SS	2	100	22	1	○				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.





Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH C35



Project Number: TP115086 Drilling Location: Countryside Dr., WBL, Sta. 2+550 E:605211 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4854296
150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM / DP
Secondary Plan Area (Area 47) Date Started: Mar 19, 2020 Date Completed: Mar 19, 2020 Revision No.: 0, 2/8/21
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 220.6 m										
	about 100 mm ASPHALT					220.5				
	brown					0.1				
	Sand and Gravel FILL					220.2				
	moist					0.6				
	dark grey / brown Silty Clay / Clayey Silt FILL	SS	1	100	10	220	○			
	trace sand, trace gravel									
	brownish grey SILTY CLAY / CLAYEY SILT TILL	SS	2	100	45	1	○			
	trace to some sand, trace gravel									
	hard									
	END OF BOREHOLE					1.5				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. BH C37



Project Number: TP115086 Drilling Location: Countryside Dr., WBL, Sta. 2+700 E:605295 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4854406
150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM / DP
Secondary Plan Area (Area 47) Date Started: Mar 19, 2020 Date Completed: Mar 19, 2020 Revision No.: 0, 2/8/21
 Project Location: Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 220.0 m										
 about 90 mm ASPHALT					0.1	220.0				
 Sand and Gravel FILL					0.4	219.6				
 Silty Clay / Clayey Silt FILL	SS	1	100	16						
 SILTY CLAY / CLAYEY SILT TILL	SS	2	83	47	1	219				
END OF BOREHOLE					1.5	218.5				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH S8**



Project Number: **TP115086** Drilling Location: **Countryside Dr., EBL, Sta. 1+950 E:604854** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4853824 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 26, 2020** Date Completed: **Mar 26, 2020** Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 219.5 m										
about 140 mm ASPHALT brown										
Sand and Gravel FILL trace to some silt moist	SS	1	42	15	219					
218.6										
dark brown Silty Clay / Clayey Silt FILL some sand, trace to some gravel, trace organics	SS	2	92	6	218					
218.6										
0.9										
SS	3	83	6		218					
217.3										
brown SILTY SAND / SANDY SILT TILL trace to some clay, trace gravel very dense moist	SS	4	100	56	217					
217.3										
2.2										
SS	5	33	45		216					
216.6										
brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, cobbles/boulders hard	SS	6	100	72 / 150mm	215					
216.6										
3.0										
SS	7	100	50 / 80mm		215					
216.6										
trace to some shale fragments										
215										
214										
grey	SS	8	100	60	213					
213										
212										
SS	9	100	31		211					
211										
210										
SS	10	100	50		210					
209.9										
9.7										
END OF BOREHOLE										

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▽ Groundwater encountered on completion of drilling on 3/26/2020 at a depth of: 2.4 m.

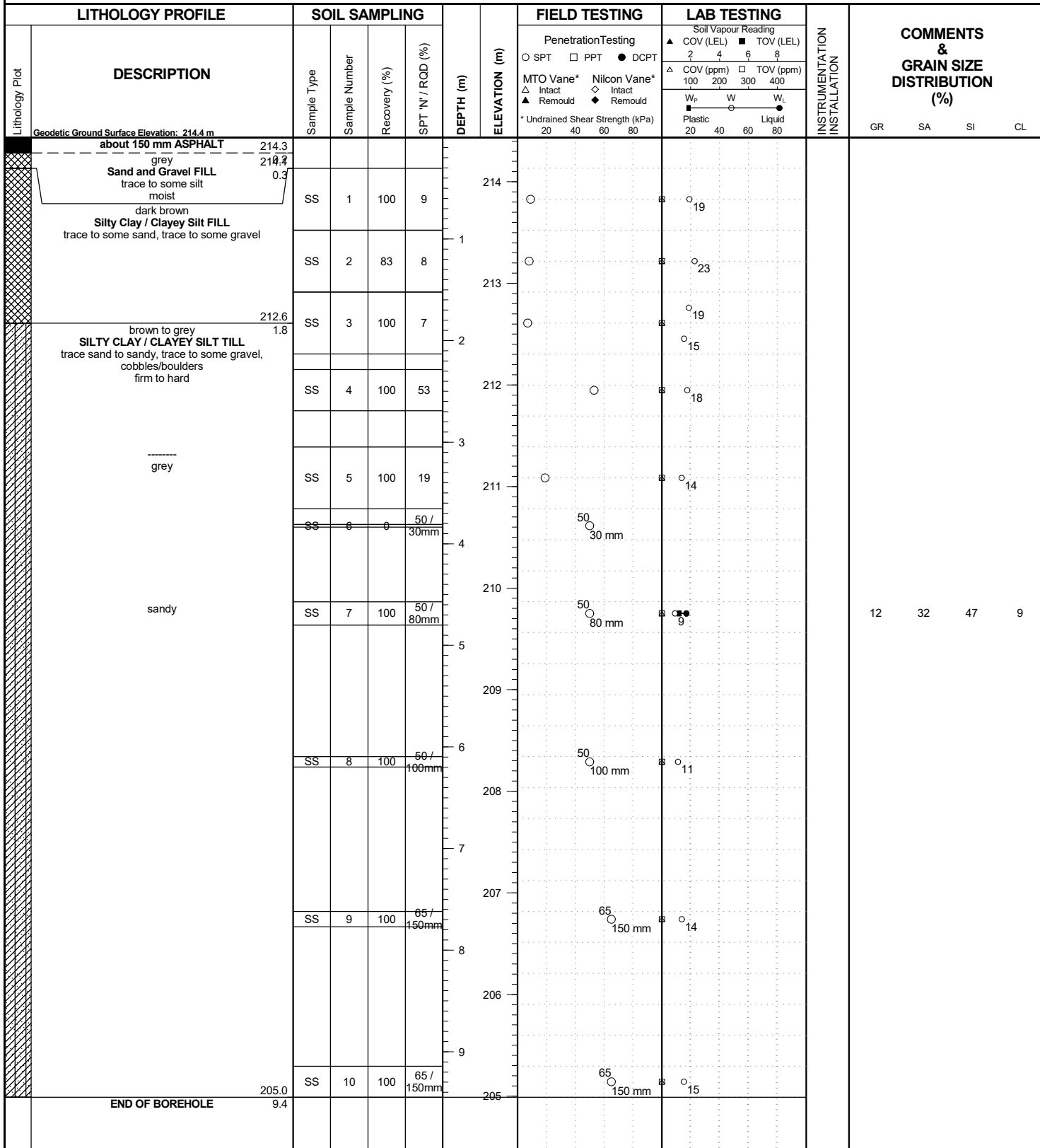
Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH S9**



Project Number: **TP115086** Drilling Location: **Countryside Dr., WBL, Sta. 0+700 E:604080** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4852848**
150 mm Solid Stem Augers Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
Secondary Plan Area (Area 47) Date Started: **Mar 18, 2020** Date Completed: **Mar 18, 2020** Revision No.: **0, 2/8/21**
 Project Location: **Brampton, Ontario**



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∇ No freestanding groundwater measured in open borehole on completion of drilling.

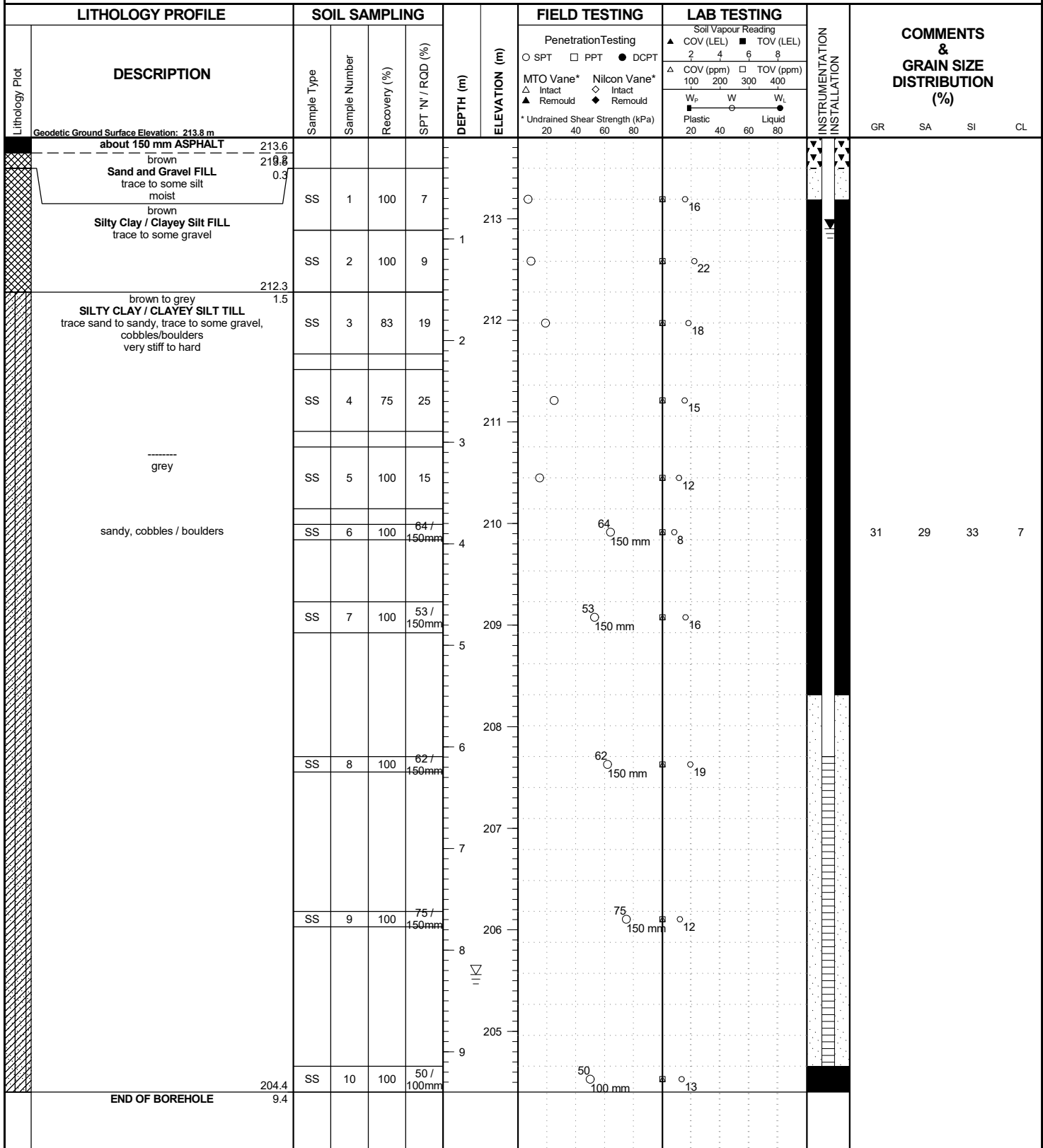
Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH S10**



Project Number: **TP115086** Drilling Location: **Countryside Dr., EBL, Sta. 0+700 E:604082** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4852848**
150 mm Solid Stem Augers Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
Secondary Plan Area (Area 47) Date Started: **Mar 18, 2020** Date Completed: **Mar 18, 2020** Revision No.: **0, 3/30/21**
 Project Location: **Brampton, Ontario**



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▽ Groundwater encountered on completion of drilling on 3/18/2020 at a depth of: **8.2 m.**
 ▼ Groundwater depth observed on 5/4/2020 at a depth of: **0.9 m.**
 Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH S10



Project Number: TP115086

Project Name: Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)

Project Location: Brampton, Ontario

Lithology Plot	LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			MTO Vane*	Nilcon Vane*	Soil Vapour Reading	COV (LEL)		
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Concrete: 0.0 - 0.3 m Sand: 0.3 - 0.6 m Bentonite: 0.6 - 5.5 m Sand Filter: 5.5 - 6.1 m Screen: 6.1 - 9.1 m Groundwater measurement in the monitoring well (depth below ground): 4 May 2020: 0.9 m 12 May 2020: 1.0 m												

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH S11**



Project Number: **TP115086** Drilling Location: **Countryside Dr., WBL, Sta. 0+350 E:603849** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4852560 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 24, 2020** Date Completed: **Mar 24, 2020** Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 213.2 m										
about 200 mm ASPHALT					213.0					
brown					213.0					
Sand and Gravel FILL	SS	1	100	9	212.6					
trace to some silt moist					212.6					
dark grey/brown					212.6					
Silty Clay / Clayey Silt FILL	SS	2	83	7	212.0					
trace to some gravel, trace organics					212.0					
	SS	3	100	16	211.0					
					211.0					
brown to grey					211.0					
SILTY SAND / SANDY SILT / SAND AND SILT TILL	SS	4	100	46	210.0					
trace clay, trace gravel dense to very dense moist to wet					210.0					
	SS	5	83	39	209.0					
					209.0					
grey					209.0					
	SS	6	83	44	208.0					
					208.0					
	SS	7	83	35	207.0					
					207.0					
	SS	8	88	35	206.0					
					206.0					
	SS	9	100	55 / 150mm	205.4					
grey					205.4					
SILTY CLAY / CLAYEY SILT TILL					205.4					
trace sand to sandy, trace to some gravel, cobbles/boulders, shale fragments hard					205.4					
	SS	10	100	50 / 80mm	204.0					
					204.0					
END OF BOREHOLE					204.0					

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▽ Groundwater encountered on completion of drilling on 3/24/2020 at a depth of: 2.1 m. ■ Cave in depth after removal of augers: 7.6 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH S12**



Project Number: **TP115086** Drilling Location: **Countryside Dr., EBL, Sta. 0+350 E:603857** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4852567 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM / DP**
 Project Location: **Brampton, Ontario** Date Started: **Mar 24, 2020** Date Completed: **Mar 24, 2020** Revision No.: **0, 3/30/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa)		
Geodetic Ground Surface Elevation: 213.5 m										
Lithology Plot	about 140 mm ASPHALT brown					213.3				
	Sand and Gravel FILL trace to some silt moist	SS	1	100	12	212.9	○	■		
	dark grey/ brown Silty Clay / Clayey Silt FILL trace to some gravel, trace organics	SS	2	67	6	212.0	○	■		
		SS	3	83	7	211.3	○	■		
	brown to grey SILTY SAND / SANDY SILT TILL trace gravel compact to very dense moist to wet	SS	4	75	20	211.3	○	■		
	grey	SS	5	83	36	210.0	○	■		
		SS	6	100	91	209.0	○	■		
		SS	7	100	104	208.0	○	■		
		SS	8	100	50/30mm	207.7	○	■		
	END OF BOREHOLE (Borehole terminated due to Auger refusal at 5.8 m depth.) 50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Concrete: 0.0 - 0.3 m Sand: 0.3 - 0.6 m Bentonite: 0.6 - 2.1 m Sand Filter: 2.1 - 2.7 m Screen: 2.7 - 5.8 m Groundwater measurement in the monitoring well (depth below ground): 4 May 2020: 1.4 m 12 May 2020: 1.5 m									

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∇ No freestanding groundwater measured in open borehole on completion of drilling.
 ▼ Groundwater depth observed on 5/4/2020 at a depth of: 1.4 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. BH D1



Project Number: TP115086 Drilling Location: Clarkway Dr., NBL, Sta. 0+000 E:606251 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4850676
150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM
Secondary Plan Area (Area 47) Date Started: Feb 18, 2020 Date Completed: Feb 18, 2020 Revision No.: 0, 3/25/21
 Project Location: Clarkway Drive, Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 205.6 m										
about 150 mm ASPHALT					205.5					
brown Sand and Gravel FILL moist	SS	1	100	94	205					
brown Silty Clay / Clayey Silt FILL trace sand, trace gravel	SS	2	100	29	204.8					
brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff to hard	SS	3	100	27	204.1					
	SS	4	100	36	202.6					
END OF BOREHOLE					3.0					

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D2**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 0+000 E:606254** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4850680**
150 mm Solid Stem Augers Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
Secondary Plan Area (Area 47)
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 18, 2020** Date Completed: **Feb 18, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 206.0 m										
about 50 mm TOPSOIL					206.8					
brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	1	75	6	205.5					
brown Sand and Gravel FILL					206.4					
brown Silty Clay / Clayey Silt FILL trace sand, trace gravel	SS	2	100	15	204.8	1				
brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, cobbles/boulders hard	SS	3	100	36	204.1					
END OF BOREHOLE					1.8					

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH D3**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 0+150 E:606138** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4850776 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 18, 2020** Date Completed: **Feb 18, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 206.0 m										
about 130 mm ASPHALT brown										
Sand and Gravel FILL moist										
205.8 0.1										
205.4 0.6	SS	1	79	12	1	205	○			
Silty Clay / Clayey Silt FILL brown trace sand, trace gravel										
204.6 204.4 1.5	SS	2	100	16			○			
SILTY CLAY / CLAYEY SILT TILL brown trace to some sand, trace gravel very stiff										
END OF BOREHOLE										

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▽ Groundwater encountered on completion of drilling on 2/18/2020 at a depth of: 0.6 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH D5**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 0+300 E:606039** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4850884 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 18, 2020** Date Completed: **Feb 18, 2020** Revision No.: **0, 3/25/21**

Lithology Profile	DESCRIPTION	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing ○ SPT □ PPT ● DCPT	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)	△ COV (ppm) □ TOV (ppm)	W _p W _L		
	Geodetic Ground Surface Elevation: 205.7 m												
	about 110 mm ASPHALT brown Sand and Gravel FILL moist					205.6 0.1							
	205.1 0.6 brown Silty Clay / Clayey Silt FILL trace sand, trace gravel	SS	1	100	20	205	○	○	○	○			
	204.5 1.2 brown/grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, cobbles/boulders stiff	SS	2	100	9	204	○	○	○	○			
		SS	3	58	11	204	○	○	○	○			
		SS	4	0	9	203	○	○	○	○			
		SS	5	17	14	202	○	○	○	○			
		SS	6	75	10	201	○	○	○	○			
	200.7 5.0 END OF BOREHOLE	SS	7	100	11	201	○	○	○	○			

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∇ No freestanding groundwater measured in open borehole on completion of drilling. ■ Cave in depth after removal of augers: 5.0 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.
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RECORD OF BOREHOLE No. **BH D6**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 0+300 E:606040** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4850886 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 18, 2020** Date Completed: **Feb 18, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 206.1 m										
 brown Sand and Gravel FILL moist	SS	1	100	17	206					36 49 (15)
205.5 0.6 brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel firm to stiff	SS	2	33	8	205					
204.3	SS	3	25	8						
END OF BOREHOLE					1.8					

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▽ Groundwater encountered on completion of drilling on 2/18/2020 at a depth of: 0.6 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D7**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 0+450 E:605935** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4850986 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 18, 2020** Date Completed: **Feb 18, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 205.9 m										
about 100 mm ASPHALT brown Sand and Gravel FILL moist	SS	1	100	36	1	205	○	▲ 11		
dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	2	100	10	2	204	○	▲ 23		
	SS	3	100	6	2	204	○	▲ 28		
brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff	SS	4	100	20	3	203	○	▲ 15		
END OF BOREHOLE										

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∇ Groundwater encountered on completion of drilling on 2/18/2020 at a depth of: 1.8 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D8**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 0+450 E:605935** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4850984 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 18, 2020** Date Completed: **Feb 18, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 205.6 m										
 Sand and Gravel FILL brown trace cobbles moist	SS	1	83	22						
204.7	SS	2	0	NA						
END OF BOREHOLE 0.9 Borehole was terminated due to the existing Bell cable.										Borehole was terminated due to the existing utility cables.

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▽ Groundwater encountered on completion of drilling on 2/18/2020 at a depth of: 0.6 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D9**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 0+600 E:605832** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4851092 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 19, 2020** Date Completed: **Feb 19, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 207.0 m about 100 mm ASPHALT brown Sand and Gravel FILL moist										
206.9 0.1										
SS	1	75	27							
206.1 0.9					1	206				
grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, cobbles	SS	2	83	12						
205.5 1.5										
END OF BOREHOLE										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH D11**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 0+750 E:605720** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4851199 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 19, 2020** Date Completed: **Feb 19, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 207.9 m										
	about 90 mm ASPHALT					207.9				
	Sand and Gravel FILL brown moist					207.6				
	Silty Clay / Clayey Silt FILL brown trace sand, trace gravel	SS	1	75	38	207	○	6		
	Silty Clay / Clayey Silt TILL brown trace to some sand, trace gravel stiff to very stiff	SS	2	100	14	206	○	15		
	Silty Clay / Clayey Silt TILL brown trace to some sand, trace gravel stiff to very stiff	SS	3	83	11	205	○	20		
	Silty Clay / Clayey Silt TILL brown trace to some sand, trace gravel stiff to very stiff	SS	4	100	11	204	○	15		
	Silty Clay / Clayey Silt TILL brown trace to some sand, trace gravel stiff to very stiff	SS	5	100	22	203	○	16		
	grey	SS	6	92	19	204	○	14		
	Silty Clay / Clayey Silt TILL brown trace to some sand, trace gravel stiff to very stiff	SS	7	100	16	203	○	15		
	END OF BOREHOLE					202.9				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D13**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 0+900 E:605607** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4851318 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 19, 2020** Date Completed: **Feb 19, 2020** Revision No.: **0, 3/25/21**

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)	
	DESCRIPTION	Geodetic Ground Surface Elevation: 209.3 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing ○ SPT □ PPT ● DCPT	MTO Vane* △ Intact ▲ Remould	Nilcon Vane* ◇ Intact ◆ Remould	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)	△ COV (ppm) □ TOV (ppm)	W _p			W _L
	about 100 mm ASPHALT brown Sand and Gravel FILL moist	209.2 0.1	SS	1	100	50 / 150mm	209	○ 50 ○ 150 mm	● 4	▲ 4	□ 4	W _p 4	W _L 4	Plastic 4	Liquid 4		
	brown / grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, cobbles/boulders	208.6 0.7	SS	2	83	10	208	○ 13	● 13	▲ 13	□ 13	W _p 13	W _L 13	Plastic 13	Liquid 13		
	brown / grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, cobbles/boulders stiff to very stiff	207.9 1.4	SS	3	54	18	207	○ 14	● 14	▲ 14	□ 14	W _p 14	W _L 14	Plastic 14	Liquid 14		
	END OF BOREHOLE	206.2 3.0	SS	4	100	19	207	○ 14	● 14	▲ 14	□ 14	W _p 14	W _L 14	Plastic 14	Liquid 14		

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D15**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 1+050 E:605513** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4851403 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 19, 2020** Date Completed: **Feb 19, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)						
Geodetic Ground Surface Elevation: 209.5 m										
	about 100 mm ASPHALT brown					209.4				
	Sand and Gravel FILL moist	SS	1	100	44	209	○	■		
	dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel	SS	2	67	15	208.6	○	■		
	END OF BOREHOLE					208.0				

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▽ Groundwater encountered on completion of drilling on 2/19/2020 at a depth of: 0.9 m. ■ Cave in depth after removal of augers: 1.4 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH D17**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 1+200 E:605385** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4851532**
150 mm Solid Stem Augers Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
Secondary Plan Area (Area 47) Date Started: **Apr 1, 2020** Date Completed: **Apr 1, 2020** Revision No.: **0, 3/25/21**
 Project Location: **Clarkway Drive, Brampton, Ontario**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT	MTO Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)		
Geodetic Ground Surface Elevation: 210.5 m												
	about 100 mm ASPHALT brown Sand and Gravel FILL moist	SS	1	83	37	210						
	209.3 1.2 brown / dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	2	92	9	209						
		SS	3	88	10	208						
		SS	4	100	11	207						
		SS	5	100	10	206.7 3.7						
	grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel stiff	SS	6	100	10	206						
		SS	7	83	11	205.3						
END OF BOREHOLE					205.3 5.2							

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▽ Groundwater encountered on completion of drilling on 4/1/2020 at a depth of: 4.6 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. BH D18



Project Number: TP115086 Drilling Location: Clarkway Dr., NBL, Sta. 1+200 E:605387 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4851534
150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM
Secondary Plan Area (Area 47)
 Project Location: Clarkway Drive, Brampton, Ontario Date Started: Apr 1, 2020 Date Completed: Apr 1, 2020 Revision No.: 0, 3/25/21

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 210.1 m										
brown Sand and Gravel FILL moist	SS	1	83	12						
209.0					1	209				
1.1 dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	2	75	13						
208.2										
END OF BOREHOLE										
1.8										

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▽ Groundwater encountered on completion of drilling on 4/1/2020 at a depth of: 1.2 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH D19**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 1+350 E:605297** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4851614 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 19, 2020** Date Completed: **Feb 19, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)				
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT	MTO Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) △ COV (ppm) □ TOV (ppm)		W _p W _L Plastic Liquid	GR	SA	SI	CL
Geodetic Ground Surface Elevation: 210.6 m																
about 90 mm ASPHALT brown Sand and Gravel FILL moist					210.5 0.1											
brown / dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel	SS	1	100	47	210.0 0.6	210	○	●	5							
grey SILTY CLAY TILL trace to some sand, trace gravel stiff to very stiff	SS	2	58	13	209.7 0.9	209	○	●	19							
	SS	3	79	23		209	○	●	16			2	22	49	27	
	SS	4	83	29		208	○	●	16							
END OF BOREHOLE					207.6 3.0	208										

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∇ Groundwater encountered on completion of drilling on 2/19/2020 at a depth of: 1.2 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. BH D21



Project Number: TP115086 Drilling Location: Clarkway Dr., NBL, Sta. 1+500 E:605194 Logged by: MS
 Project Client: City of Brampton Drilling Method: N:4851719
150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM
Secondary Plan Area (Area 47)
 Project Location: Clarkway Drive, Brampton, Ontario Date Started: Feb 19, 2020 Date Completed: Feb 19, 2020 Revision No.: 0, 3/25/21

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Lithology Plot Geodetic Ground Surface Elevation: 209.0 m about 90 mm ASPHALT brown Sand and Gravel FILL cobbles/boulders moist										
	SS	1	79	48	1	208	○			
	SS	2	42	29			○			
END OF BOREHOLE										

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▽ Groundwater encountered on completion of drilling on 2/19/2020 at a depth of: 1.2 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D23**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 1+650 E:605071** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 19, 2020** Date Completed: **Feb 19, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 209.2 m										
about 90 mm ASPHALT brown Sand and Gravel FILL moist	SS	1	58	35	209		○	▲ 4		
208.3 0.9 grey Silty Clay / Clayey Silt FILL trace sand, trace gravel	SS	2	75	11	208	∇	○	▲ 16		
207.7 1.5 brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel hard to very stiff	SS	3	100	30	207		○	▲ 19		
grey	SS	4	100	36	207		○	▲ 20		
	SS	5	100	22	206		○	▲ 20		
	SS	6	0	18	205		○	▲ 19		
	SS	7	22	19	204.2		○	▲ 21		
END OF BOREHOLE					5.0					

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∇ Groundwater encountered on completion of drilling on 2/19/2020 at a depth of: 1.2 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D25**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 1+800 E:604975** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4851935 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 24, 2020** Date Completed: **Feb 24, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE		SOIL SAMPLING				FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT □ PPT ● DCPT		Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)			
								MTO Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould	Nilcon Vane* ◇ Intact ◆ Remould	△ COV (ppm) □ TOV (ppm)	W _p W W _L Plastic Liquid		
	Geodetic Ground Surface Elevation: 209.1 m												
	about 90 mm ASPHALT brown					0.1	209.0						
	Sand and Gravel FILL moist	SS	1	100	28			○		●	5		
	grey Silty Clay / Clayey Silt FILL trace sand, trace gravel	SS	2	100	12	1	208	○		●	14		
	grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel stiff to firm	SS	3	83	10	2	207	○		●	13		
		SS	4	83	7			○		●	18		
	END OF BOREHOLE					3	206.0						

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▽ Groundwater encountered on completion of drilling on 2/24/2020 at a depth of: 1.2 m. ■ Cave in depth after removal of augers: 2.4 m.



Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH D27**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 1+950 E:604867** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4852040 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 24, 2020** Date Completed: **Feb 24, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 208.6 m										
	about 90 mm ASPHALT brown Sand and Gravel FILL moist	SS	1	100	26	208	○	■		
	dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	2	100	7	207.1	○	■		
	END OF BOREHOLE					207.1				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D29**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 2+100 E:604765** Logged by: **MM**
 Project Client: **City of Brampton** Drilling Method: **N:4852155 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 25, 2020** Date Completed: **Feb 25, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 211.7 m										
about 150 mm TOPSOIL 211.6										
brown Silty Clay / Clayey Silt FILL 0.2 trace sand, trace gravel	SS	1	83	7	211					
	SS	2	100	17	211					
	SS	3	92	20	210					
209.9										
END OF BOREHOLE 1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D31**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 2+250 E:604668** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 210.0 m										
	about 130 mm ASPHALT					209.9				
	brown Sand and Gravel FILL moist	SS	1	94	68	209.3	○	■		
	dark brown Sandy Silt FILL trace to some clay, trace gravel	SS	2	100	9	209.7	○	■		
	grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel firm to stiff	SS	3	100	9	207.9	○	■		
	grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel firm to stiff	SS	4	100	8	207.1	○	■		
	grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel firm to stiff	SS	5	100	9	206.5	○	■		
	END OF BOREHOLE					3.5				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D32**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 2+250 E:604666** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **N:4852234 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 208.3 m										
 about 110 mm ASPHALT					208.1	208				
brown Sand and Gravel FILL moist	SS	1	100	41			○	▲		
207.6										
 brown / dark brown Sandy Silt FILL trace clay, trace gravel moist	SS	2	92	10		1	○	▲		
207.0										
 brown Silty Clay / Clayey Silt FILL some sand, trace gravel	SS	3	83	13		207	○	▲		
206.4										
END OF BOREHOLE					1.8					

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D33**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 2+400 E:604548** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **N:4852361 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 13, 2020** Date Completed: **Feb 13, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE		SOIL SAMPLING				FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT □ PPT ● DCPT		Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)			
								MTO Vane* △ Intact ▲ Remould	Nilcon Vane* ◇ Intact ◆ Remould	△ COV (ppm) 100 200 300 400	□ TOV (ppm) 100 200 300 400		
	Geodetic Ground Surface Elevation: 214.0 m												
	about 110 mm ASPHALT brown Sand and Gravel FILL moist	SS	1	89	41								
	213.9 0.1												
	dark brown Silty Clay / Clayey Silt FILL trace sand, trace gravel	SS	2	100	14	1	213						
	213.3 0.7												
		SS	3	100	20								
	212.0												
	END OF BOREHOLE												
	2.0												

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D35**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 2+550 E:604458** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **N:4852462 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020** Revision No.: **0, 3/25/21**

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Geodetic Ground Surface Elevation: 212.9 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing	Soil Vapour Reading	COV (LEL)	TOV (LEL)		
	brown Sand and Gravel FILL moist about 130 mm ASPHALT	212.8 0.1	SS	1	89	46								
	grey Silty Clay / Clayey Silt FILL trace to some sand, trace gravel, trace wood fragments in SS2	212.2 0.7	SS	2	100	11	1	212	○	○	○	○		
			SS	3	67	5	2	211	○	○	○	○		
			SS	4	89	9			○	○	○	○		
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff to stiff	210.0 2.9	SS	5	89	16	3	210	○	○	○	○		
	grey						4	209						
			SS	6	89	14			○	○	○	○		
	END OF BOREHOLE	207.9 5.0					5	208						

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D36**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 2+550 E:604437** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **N:4852462 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 211.9 m										
brown Sand and Gravel FILL moist	SS	1	75	34						
211.3										
grey Silty Clay / Clayey Silt FILL trace to some sand, trace gravel	SS	2	83	13	1	211				
0.6										
	SS	3	75	13						
210.1										
END OF BOREHOLE										
1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. BH D37



Project Number: TP115086 Drilling Location: Clarkway Dr., NBL, Sta. 2+700 E:604335 Logged by: MD
 Project Client: City of Brampton Drilling Method: N:4852470
150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM
Secondary Plan Area (Area 47) Date Started: Feb 13, 2020 Date Completed: Feb 13, 2020 Revision No.: 0, 3/25/21
 Project Location: Clarkway Drive, Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 214.5 m										
	about 110 mm ASPHALT					214.3				
	brown Sand and Gravel FILL moist	SS	1		17	214	○	▲		
	grey / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel	SS	2	100	9	213.8	○	▲		
		SS	3	0	0	213	○	▲		
		SS	4	100	16	212	○	▲		
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff	SS	5	22	27	211.6	○	▲		
	END OF BOREHOLE					210.9				

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∇ No freestanding groundwater measured in open borehole on completion of drilling. ■ Cave in depth after removal of augers: 2.1 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH D38**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 2+700 E:604336** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **N:4852567 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 13, 2020** Date Completed: **Feb 13, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 215.3 m										
brown Sand and Gravel FILL moist	SS	1	75	18	215					
214.7										
0.6 grey / brown Silty Clay / Clayey Silt FILL trace to some sand, trace gravel	SS	2	83	12	214					
213.4										
END OF BOREHOLE										
1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D39**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 2+850 E:604234** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **N:4852659 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE		SOIL SAMPLING				FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)	
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing		Soil Vapour Reading				
								○ SPT	□ PPT	● DCPT	▲ COV (LEL)	■ TOV (LEL)	△ COV (ppm)	□ TOV (ppm)
Geodetic Ground Surface Elevation: 213.0 m														
	about 150 mm ASPHALT brown Sand and Gravel FILL moist	SS	1	89	34			○		▲				
	212.3 0.7 dark brown / grey Sandy Silt FILL trace to some clay, trace gravel	SS	2	100	9	1	212	○		▲				
		SS	3	72	9			○		▲				
	211.0 2.0 END OF BOREHOLE													

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D40**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 2+850 E:604138** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **N:4852764 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 13, 2020** Date Completed: **Feb 13, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 212.9 m										
about 150 mm ASPHALT										Topsoil in the ditch ~ 216 mm thick.
0.1 brown Sand and Gravel FILL moist	SS	1	100	50	1	212	○ 50 ○ 150 mm			
211.5 1.4 grey Silty Clay / Clayey Silt FILL trace to some sand, trace gravel	SS	2	89	20	2	211	○			
	SS	3	83	10			○			
	SS	4	56	7			○			
	SS	5	50	16			○			
208.9 4.0 grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel firm to stiff	SS	6	94	8			○			
207.9 5.0 END OF BOREHOLE					5	208	○			

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▽ Groundwater encountered on completion of drilling on 2/13/2020 at a depth of: 2.7 m.

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RECORD OF BOREHOLE No. BH D41



Project Number: TP115086 Drilling Location: Clarkway Dr., NBL, Sta. 3+000 E:604141 Logged by: MD
 Project Client: City of Brampton Drilling Method: N:4852766
150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM
Secondary Plan Area (Area 47)
 Project Location: Clarkway Drive, Brampton, Ontario Date Started: Feb 13, 2020 Date Completed: Feb 13, 2020 Revision No.: 0, 3/25/21

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W _p W W _L Plastic Liquid 20 40 60 80	GR	SA	SI
Lithology Plot Geodetic Ground Surface Elevation: 213.9 m about 110 mm ASPHALT brown Sand and Gravel FILL moist	SS	1	100	50 / 150mm	213.8	0.1	○ 50 ○ 150mm	▲ 4 ■ 4		35	50	13	2
	SS	2	89	45	213	1	○	▲ 7 ■ 7					
	SS	3	100	12	212	2	○	▲ 16 ■ 16					
grey Silty Clay / Clayey Silt FILL trace to some sand, trace gravel END OF BOREHOLE					211.7	2.1							

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

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RECORD OF BOREHOLE No. BH D43



Project Number: TP115086 Drilling Location: Clarkway Dr., SBL, Sta. 3+150 E:604009 Logged by: MD
 Project Client: City of Brampton Drilling Method: 150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM
 Project Location: Clarkway Drive, Brampton, Ontario Date Started: Feb 11, 2020 Date Completed: Feb 11, 2020 Revision No.: 0, 3/25/21

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 217.5 m about 130 mm ASPHALT brown Sand and Gravel FILL moist dark grey / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff to hard grey END OF BOREHOLE										
217.3										
217.2										
0.3	SS	1	83	12	217					
	SS	2	100	12	1	217				
216.1										
1.4										
	SS	3	100	27	2	216				
	SS	4	100	44	2	215				
	SS	5	89	44	3	215				
214.0										
3.5										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D44**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 3+150 E:604007** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **N:4852886 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 11, 2020** Date Completed: **Feb 11, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 216.8 m										
Lithology Plot	Sand and Gravel FILL brown / dark grey Silty Clay / Clayey Silt FILL trace to some sand, trace gravel, trace organics	SS	1	83	8	216	○	■		
		SS	2	75	16	215.6	○	■		
	Silty Clay / Clayey Silt TILL brown trace to some sand, trace gravel very stiff	SS	3	88	27	215.0	○	■		
END OF BOREHOLE 1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH D45



Project Number: TP115086 Drilling Location: Clarkway Dr., NBL, Sta. 3+300 E:603917 Logged by: MD
 Project Client: City of Brampton Drilling Method: N:4852984
150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM
 Project Location: Clarkway Drive, Brampton, Ontario Date Started: Feb 11, 2020 Date Completed: Feb 11, 2020 Revision No.: 0, 3/25/21

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 218.8 m										
	about 130 mm ASPHALT					218.7				
	Sand and Gravel FILL					218.5				
	brown / grey Silty Clay / Clayey Silt FILL trace sand, trace gravel	SS	1	100	9	218.3	○	▲		
	brown / grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel hard	SS	2	83	14	218.1	○	▲		
	brown / grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel hard	SS	3	100	36	217.6	○	▲		
	END OF BOREHOLE					217.0				
						217.0				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D47**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 3+450 E:603816** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **N:4853079 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 11, 2020** Date Completed: **Feb 11, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 219.9 m										
about 160 mm ASPHALT						219.8				
Sand and Gravel FILL						219.6				
dark brown / grey Silty Clay / Clayey Silt FILL trace sand, trace gravel	SS	1	83	8		219.3	○	○21		
	SS	2	89	12	1	219.0	○	○17		
brown / grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff to hard	SS	3	100	18	2	218.5	○	○14		
	SS	4	100	41		218.1	○	○14		
	SS	5	100	37	3	217.5	○	○14		
grey					4	216.5				
	SS	6	94	17	5	215.5	○	○17		
END OF BOREHOLE						214.9				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. BH D48



Project Number: TP115086 Drilling Location: Clarkway Dr., SBL, Sta. 3+450 E:603814 Logged by: MD
 Project Client: City of Brampton Drilling Method: N:4853078
150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM
Secondary Plan Area (Area 47)
 Project Location: Clarkway Drive, Brampton, Ontario Date Started: Feb 11, 2020 Date Completed: Feb 11, 2020 Revision No.: 0, 3/25/21

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 219.9 m										
Lithology Plot	Sand and Gravel FILL 219.7 dark grey Silty Clay / Clayey Silt FILL 0.1 trace sand, trace gravel	SS	1	75	4	219 1	○	■		
		SS	2	100	12					
	SILTY CLAY / CLAYEY SILT TILL 218.6 brown 1.2 trace to some sand, trace gravel very stiff	SS	3	100	24					
END OF BOREHOLE 218.0 1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH D49



Project Number: TP115086 Drilling Location: Clarkway Dr., NBL, Sta. 3+600 E:603698 Logged by: MD
 Project Client: City of Brampton Drilling Method: N:4853200
150 mm Solid Stem Augers Compiled by: SN
 Project Name: Arterial Road Network within Highway 427 Industrial Drilling Machine: Track Mounted Drill Reviewed by: SM
Secondary Plan Area (Area 47) Date Started: Feb 12, 2020 Date Completed: Feb 12, 2020 Revision No.: 0, 3/25/21
 Project Location: Clarkway Drive, Brampton, Ontario

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 220.8 m										
about 120 mm ASPHALT 220.6										
Sand and Gravel FILL 220.4										
brown / grey Silty Clay / Clayey Silt FILL 0.3 trace sand, trace gravel										
SS 1 83 6										
220										
SS 2 89 10 1										
219										
SS 3 100 8 2										
218.6										
brown SILTY CLAY TILL 2.1 trace to some sand, trace gravel very stiff										
SS 4 100 23										
218										
grey										
SS 5 100 28 3										
217.3										
END OF BOREHOLE 3.5										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D50**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 3+600 E:603700** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **N:4853201 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 220.8 m										
	Sand and Gravel FILL 220.7 brown / grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	1	79	7	220	○	■		
	219.6	SS	2	83	13	219	○	■		
	SILTY CLAY / CLAYEY SILT TILL 1.2 brown trace to some sand, trace gravel very stiff	SS	3		24	219	○	■		
END OF BOREHOLE 1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D51**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 3+750 E:603599** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **N:4853290**
150 mm Solid Stem Augers Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
Secondary Plan Area (Area 47)
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 11, 2020** Date Completed: **Feb 11, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)	
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80			Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W _p W W _L Plastic Liquid 20 40 60 80
Geodetic Ground Surface Elevation: 221.5 m											
	about 100 mm ASPHALT				221.4						
	Sand and Gravel FILL				229.2						
	dark brown Silty Clay / Clayey Silt FILL				0.2						
	SS	1	89	9		221	○	▲			
	SS	2	100	7	1		○	■			
	brown / grey SILTY CLAY / CLAYEY SILT TILL				220.1						
	SS	3	100	27		220	○	■			
	trace to some sand, trace gravel very stiff				219.5						
	END OF BOREHOLE				2.0						

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D53**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 3+900 E:603497** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **N:4853398 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 222.0 m										
about 130 mm ASPHALT 221.9										
Sand and Gravel FILL 221.7										
brown / dark grey Silty Clay / Clayey Silt FILL 0.3 trace sand, trace gravel, trace organics										
	SS	1	94	13			○	● 6		
	SS	2	100	10	1	221	○	● 13		
	SS	3	100	16			○	● 15		
brown / grey SILTY CLAY / CLAYEY SILT TILL 219.9 trace to some sand, trace gravel very stiff to hard 2.1										
	SS	4	100	29			○	● 15		
grey										
	SS	5	100	22	3	219	○	● 16		
	SS	6	100	36	4	218	○	● 13		
END OF BOREHOLE 217.0 5.0										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D54**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 3+900 E:603499** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020** Revision No.: **0, 3/25/21**

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING			LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing ○ SPT □ PPT ● DCPT	MTO Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)	Soil Vapour Reading △ COV (ppm) □ TOV (ppm)	W _p	W	W _L		
	Geodetic Ground Surface Elevation: 221.7 m																
	Sand and Gravel FILL	221.6															
	brown / dark brown Silty Clay / Clayey Silt FILL trace sand, trace gravel	0.1 221.1	SS	1	100	6											
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel firm to very stiff	0.6 219.9	SS	2	83	7	1										
			SS	3	33	23											
	END OF BOREHOLE	1.8															

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D55**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 4+050 E:603388** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 11, 2020** Date Completed: **Feb 11, 2020** Revision No.: **0, 3/25/21**

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing ○ SPT □ PPT ● DCPT	MTO Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)	△ COV (ppm) □ TOV (ppm)		
	Geodetic Ground Surface Elevation: 222.5 m													
	about 150 mm ASPHALT	222.4												
	Sand and Gravel FILL	222.2												
	brown / grey Silty Clay / Clayey Silt FILL	0.3	SS	1	89	12								
	trace sand, trace gravel						1							
			SS	2	94	24								
							2							
	brown	221.1												
	SILTY CLAY / CLAYEY SILT TILL	1.4	SS	3	100	30								
	trace to some sand, trace gravel						3							
	hard													
			SS	4	100	59								
			SS	5	100	38								
	END OF BOREHOLE	219.0												
		3.5												

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D56**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 4+050 E:603380** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **N:4853532 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 11, 2020** Date Completed: **Feb 11, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE		SOIL SAMPLING				FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Soil Vapour Reading					
								Penetration Testing		COV (LEL)		TOV (LEL)	
								O SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould		W _p W W _L Plastic Liquid			
Geodetic Ground Surface Elevation: 222.0 m													
	Sand and Gravel FILL brown / dark brown												
	0.2 Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	1	75	8								
	0.6 SILTY CLAY / CLAYEY SILT TILL brown trace to some sand, trace gravel stiff to very stiff	SS	2	92	15	1	221						
	220.2	SS	3	46	26								
	END OF BOREHOLE												
	1.8												

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH D57**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 4+200 E:603286** Logged by: **MD**
 Project Client: **City of Brampton** Drilling Method: **N:4853614 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020** Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 223.6 m										
						223.5				
						223.4				
	SS	1	94	6		223				
						222.9				
	SS	2	100	13	1	222				
						221.6				
END OF BOREHOLE						2.0				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH S13**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 2+275 E:604621** Logged by: **MM**
 Project Client: **City of Brampton** Drilling Method: **N:4852286 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 25, 2020** Date Completed: **Feb 25, 2020** Revision No.: **0, 3/30/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing	Soil Vapour Reading	COV (LEL)		
Geodetic Ground Surface Elevation: 210.2 m												
about 80 mm ASPHALT					210							
brown Sand and Gravel FILL trace to some silt moist	SS	1	100	62								
209.2					1							
greyish brown Silty Clay / Clayey Silt FILL trace to some sand, trace to some gravel, trace organics	SS	2	63	8								
209					2							
	SS	3	100	15								
208					3							
	SS	4	100	9								
207					4							
	SS	5	100	7								
206.1					5							
grey SILTY CLAY TILL some sand, trace gravel very stiff	SS	6	100	27								3 16 50 31
206					6							
204.6					7							
grey SILTY SAND / SAND AND SILT TILL trace clay, trace gravel, cobbles/boulders loose to very dense moist to wet	SS	7	133	22								
204					8							
	SS	8	100	9								
203					9							
	SS	9	100	55 / 130mm								
200.9					10							
END OF BOREHOLE					9.3							

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▽ Groundwater encountered on completion of drilling on 2/25/2020 at a depth of: 4.3 m. ■ Cave in depth after removal of augers: 1.5 m.
 ▼ Groundwater depth observed on 5/12/2020 at a depth of: 1.4 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH S13**



Project Number: **TP115086**

Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Clarkway Drive, Brampton, Ontario**

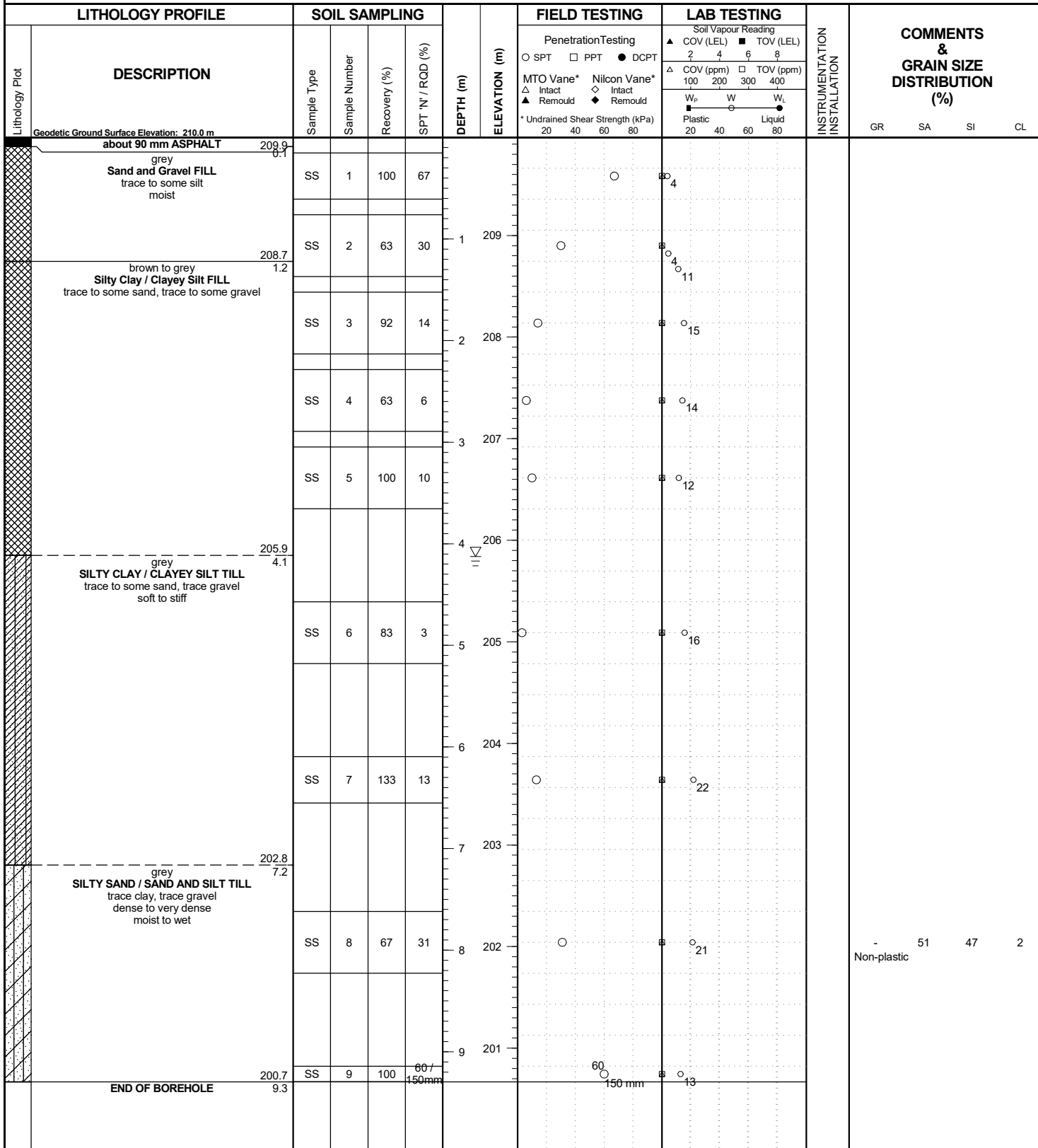
Lithology Plot	LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing	Soil Vapour Reading	COV (LEL)	TOV (LEL)		
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Sand: 0.0 - 0.6 m Bentonite: 0.6 - 4.0 m Sand Filter: 4.0 - 7.6 m Screen: 4.6 - 9.1 m Groundwater measurements in monitoring well (depth below ground surface): 12 May 2020: 1.4 m							Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W _p W W _L Plastic Liquid			GR SA SI CL	

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH S14**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 2+275 E:604618** Logged by: **MM**
 Project Client: **City of Brampton** Drilling Method: **N:4852293
150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial
Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 25, 2020** Date Completed: **Feb 25, 2020** Revision No.: **0, 3/25/21**



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▽ Groundwater encountered on completion of drilling on 2/25/2020 at a depth of: 4.1 m.

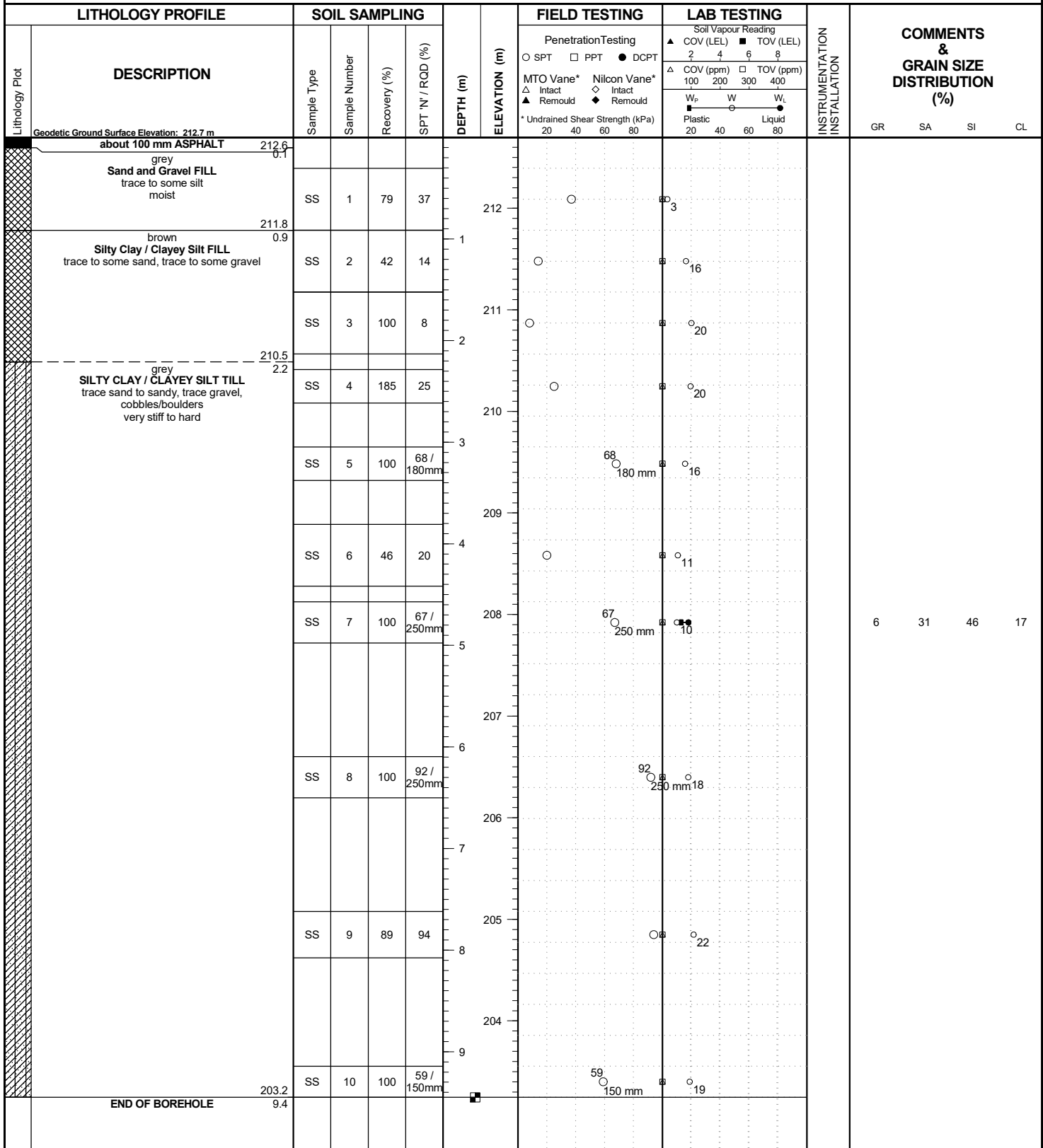
Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH S15**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., SBL, Sta. 3+325 E:604169** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4852729 150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 24, 2020** Date Completed: **Feb 24, 2020** Revision No.: **0, 3/25/21**



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∇ No freestanding groundwater measured in open borehole on completion of drilling. ■ Cave in depth after removal of augers: 9.4 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH S16**



Project Number: **TP115086** Drilling Location: **Clarkway Dr., NBL, Sta. 3+325 E:604158** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **N:4852745
150 mm Solid Stem Augers** Compiled by: **SN**
 Project Name: **Arterial Road Network within Highway 427 Industrial
Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM**
 Project Location: **Clarkway Drive, Brampton, Ontario** Date Started: **Feb 24, 2020** Date Completed: **Feb 24, 2020** Revision No.: **0, 3/30/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing	Soil Vapour Reading	COV (LEL)		
Geodetic Ground Surface Elevation: 213.0 m												
about 90 mm ASPHALT						213.0						
grey Sand and Gravel FILL trace to some silt moist	SS	1	100	32		212.1						
dark grey Silty Clay / Clayey Silt FILL trace to some sand, trace to some gravel	SS	2	83	14	1	212.0						
	SS	3	100	8		211.0						
brown to grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, cobbles/boulders very stiff to hard	SS	4	100	22		210.8						
	SS	5	100	37		210.0						
	SS	6	100	29		209.0						
grey	SS	7	100	62		208.0						
	SS	8	100	50 / 100mm		207.0						
	SS	9	100	70 / 150mm		206.0						
	SS	10	100	71		204.0						
END OF BOREHOLE						203.3						

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∇ No freestanding groundwater measured in open borehole on completion of drilling.
 ▼ Groundwater depth observed on 5/12/2020 at a depth of: 3.2 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH S16**



Project Number: **TP115086**

Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Clarkway Drive, Brampton, Ontario**

Lithology Plot	LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING				LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing	MTO Vane*	Nilcon Vane*	Soil Vapour Reading	COV (LEL)	TOV (LEL)	COV (ppm)	TOV (ppm)		
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Concrete: 0.0 - 0.3 m Sand: 0.3 - 0.6 m Bentonite: 0.6 - 5.5 m Sand Filter: 5.5 - 6.1 m Screen: 6.1 - 9.1 m Groundwater measurements in monitoring well (depth below ground surface): 12 May 2020: 3.2 m																

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH B1**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 0+000 E:606238 N:4852654** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Truck Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 10, 2020** Date Completed: **Jan 10, 2020** Revision No.: **0, 1/5/21**

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING			LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing ○ SPT □ PPT ● DCPT	MTO Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould	Nilcon Vane* ◇ Intact ◆ Remould	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)	△ COV (ppm) □ TOV (ppm)	W _p	W		W _L	GR	SA	SI
	Geodetic Ground Surface Elevation: 211.5 m																			
	about 140 mm ASPHALT	211.4																		
	brown Sand and Gravel FILL	0.1																		
	moist		SS	1	100	27		211	○									32	56	(12)
	brown/dark grey Silty Clay FILL	210.7																		
	some sand, trace to some gravel, trace organics	0.8																		
			SS	2	100	12		1	○											
	END OF BOREHOLE	210.0						240												
		1.5																		

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH B2**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 0+100 E:606151 N:4852615** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 23, 2020** Date Completed: **Jan 23, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 210.2 m										
about 300 mm TOPSOIL										
						210				
	209.9	SS	1	75	7	210	○	□		
	0.3									
	209.5									
	0.7									
		SS	2	100	17	1	○	□		
						209				
		SS	3	100	22	2	○	□		
						208				
		SS	4	100	45		○	□		
						207.2				
	3.0	SS	5	75	65	3	○	□		
						207				
	206.5									
	3.7	SS	6	83	34	4	○	□		
						206				
		SS	7	100	27		○	□		
						205.2				
	5.0					5				

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▽ Groundwater encountered on completion of drilling on 1/23/2020 at a depth of: 3.7 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH B3**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 0+200 E:606056 N:4852586** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 23, 2020** Date Completed: **Jan 23, 2020** Revision No.: **0, 1/5/21**

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing	Soil Vapour Reading	COV (LEL)	TOV (LEL)		
	Geodetic Ground Surface Elevation: 211.8 m													
	about 200 mm TOPSOIL	211.6												
	dark grey/brown Silty Clay FILL trace gravel, trace organics (reworked soil)	0.2	SS	1	58	5								
	brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel, cobbles/boulders very stiff to hard	211.1												
		0.7	SS	2	100	21	1	211						
			SS	3	100	28		210						
	brownish grey		SS	4	100	46		209						
	END OF BOREHOLE	208.8						3						
		3.0												

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH B4**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 0+300 E:605958 N:4852563** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 23, 2020** Date Completed: **Jan 23, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 211.7 m										
about 200 mm TOPSOIL 211.5										
dark brown Silty Clay FILL trace gravel, trace organics (reworked soil) 211.1	SS	1	83	5						
brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel stiff to very stiff 209.9	SS	2	100	13	211					
	SS	3	100	24	210					
END OF BOREHOLE 1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH B5**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 0+400 E:605861 N:4852545** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 23, 2020** Date Completed: **Jan 23, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 211.3 m about 300 mm TOPSOIL										
211.0 dark grey/brown Silty Clay FILL trace gravel (reworked soil)	SS	1	83	6	211		○	□		
210.6 brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel, cobbles/boulders stiff to hard	SS	2	100	10	210		○	□		
209.7 grey	SS	3	100	18	209		○	□		
	SS	4	100	35	208		○	□		
	SS	5	100	28	207		○	□		
	SS	6	100	20	206.2		○	□		
END OF BOREHOLE	SS	7	100	17	5.0		○	□		

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH B6**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 0+500 E:605759 N:4852529** Logged by: **MM**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Feb 7, 2020** Date Completed: **Feb 7, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 210.9 m										
about 150 mm TOPSOIL brown Silty Clay / Clayey Silt FILL trace sand, trace rootlets (reworked soil)	SS	1	83	6	0.2	210.8				
210.2 brown SILTY CLAY / CLAYEY SILT TILL trace sand to sandy, trace gravel very stiff	SS	2	100	20	0.7	210.2				
208.8	SS	3	100	29	2.1	208.8				
END OF BOREHOLE										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH B7 / BH S5**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 0+600 E:605633 N:4852520** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Feb 26, 2020** Date Completed: **Feb 26, 2020** Revision No.: **0, 3/30/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)		
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing	Soil Vapour Reading	COV (LEL)			TOV (LEL)	
Geodetic Ground Surface Elevation: 209.3 m														
about 150 mm TOPSOIL dark brown	SS	1	100	6	209	○	○	40						
Silty Clay / Clayey Silt FILL trace to some gravel, trace organics					208.7									
brown to grey SILTY CLAY / CLAYEY SILT TILL trace sand to sandy, trace to some gravel firm to hard	SS	2	100	8	208	○	○	25						
					207									
grey	SS	3	100	27	207	○	○	12						
					206									
	SS	4	100	50	206	○	○	13						
					205.6									
grey SAND AND SILT TILL trace clay, trace gravel firm to hard	SS	5	100	69	205	○	○	11						
					204.8									
grey SILTY CLAY / CLAYEY SILT TILL trace sand to sandy, trace to some gravel, cobbles/boulders hard	SS	6	83	58	204	○	○	12			4	43	50	3
					204.5									
					204									
					203									
	SS	7	100	64 / 150mm	203	○	○	10						
					202									
					201									
	SS	8	100	62 / 150mm	201	○	○	13						
					200									
					200									
	SS	9	100	66	200	○	○	24						
					199.6									
END OF BOREHOLE					199.6									
					9.8									

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▽ Groundwater encountered on completion of drilling on 2/26/2020 at a depth of: 5.8 m. ■ Cave in depth after removal of augers: 9.1 m.
 ▼ Groundwater depth observed on 5/4/2020 at a depth of: -0.7 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH B7 / BH S5**



Project Number: **TP115086**

Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Brampton, Ontario**

Lithology Plot	LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing	Soil Vapour Reading	COV (LEL)	TOV (LEL)		
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Sand: 0.0 - 0.6 m Bentonite: 0.6 - 5.5 m Sand Filter: 5.5 - 9.1 m Screen: 6.1 - 9.1 m Groundwater measurements in monitoring well (depth below ground surface): 4 May 2020: -0.7 m (above ground) 12 May 2020: -0.5 m (above ground)												

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH B8**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 0+700 E:605564 N:4852529** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Feb 20, 2020** Date Completed: **Feb 20, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 211.1 m										
about 100 mm TOPSOIL dark brown Silty Clay FILL trace gravel, trace organics (reworked soil)	SS	1	100	9	211	211.0				
brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel very stiff to hard	SS	2	100	22	210	210.5				
	SS	3	44	36		209.4				
END OF BOREHOLE						209.4				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH B9**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 0+800 E:605461 N:4852548** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Feb 20, 2020** Date Completed: **Feb 20, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 212.5 m about 100 mm TOPSOIL dark brown Silty Clay FILL trace gravel, trace organics (reworked soil)	SS	1	100	15		212	○	▲ 36		
brown SILTY CLAY / CLAYEY SILT TILL trace sand and sandy, trace gravel, cobbles/boulders stiff to hard	SS	2	100	13	1	211	○	▲ 19		
	SS	3	100	34	2	211	○	▲ 18		
grey	SS	4	100	68	3	210	○	▲ 11		
	SS	5	100	48	4	209	○	▲ 11		
	SS	6	100	72	4	208	○	▲ 11		
	SS	7	100	49	5	207.4	○	▲ 13		
END OF BOREHOLE						207.4				

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∇ Groundwater encountered on completion of drilling on 2/20/2020 at a depth of: 4.3 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH B10**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 0+900 E:605365 N:4852580** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Feb 20, 2020** Date Completed: **Feb 20, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 212.7 m about 150 mm TOPSOIL 212.6 dark brown Silty Clay FILL 0.2 trace gravel, trace organics (reworked soil) 212.1 brown/brownish grey SILTY CLAY / CLAYEY SILT TILL 0.6 trace sand, trace gravel very stiff to hard 211.0 END OF BOREHOLE 1.7	SS	1	79	8						
	SS	2	100	18	1					
	SS	3	100	54						

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH B11**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 1+000 E:605279 N:4852627** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Feb 20, 2020** Date Completed: **Feb 20, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 212.3 m										
about 100 mm TOPSOIL dark brown/brown Silty Clay FILL trace gravel, trace organics (reworked soil)	SS	1	100	16	212	0.1	○	○ 25		
211.6 brown SILTY CLAY TILL trace sand to sandy, trace gravel very stiff to hard	SS	2	100	25	211	0.7	○	○ 13		
brownish grey	SS	3	100	43	210		○	○ 13	2	24 49 25
209.3 END OF BOREHOLE	SS	4	100	56	209.3	3.0	○	○ 13		

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH B12**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 1+100 E:605192 N:4852676** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Feb 20, 2020** Date Completed: **Feb 20, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 214.3 m										
about 150 mm TOPSOIL 214.1										
dark brown Silty Clay FILL 0.2	SS	1	83	17	214					
trace gravel, trace organics (reworked soil) 213.6										
greyish brown SILTY CLAY / CLAYEY SILT TILL 0.6	SS	2	100	24	213					
trace sand, trace gravel very stiff to hard										
212.6	SS	3	100	69						
END OF BOREHOLE 1.7										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH B13**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 1+200 E:605111 N:4852740** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Feb 20, 2020** Date Completed: **Feb 20, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 215.7 m about 100 mm TOPSOIL dark brown/brown Silty Clay FILL trace gravel, trace organics (reworked soil)	SS	1	75	8		215.6				
brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel, cobbles/boulders hard to very stiff	SS	2	54	36	1	215.0				
	SS	3	100	44	2	214.0				
	SS	4	100	64	3	213.0				
	SS	5	100	39	4	212.0				
grey	SS	6	100	19	4	211.5				
END OF BOREHOLE	SS	7	100	21	5	210.7				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH B14**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 1+300 E:605038 N:4852807** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 24, 2020** Date Completed: **Jan 24, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 217.1 m										
about 200 mm TOPSOIL 216.9										
dark brown / brown Silty Clay FILL trace gravel, trace organics (reworked soil) 216.5	SS	1	100	7						
brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel very stiff to hard 215.2	SS	2	100	25	1	216				
	SS	3	100	56						
END OF BOREHOLE 1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH B15**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 1+400 E:604966 N:4852877** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 24, 2020** Date Completed: **Jan 24, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 217.3 m										
about 150 mm TOPSOIL					217.2					
dark brown / brown Silty Clay FILL trace gravel (reworked soil)	SS	1	100	6	217.0					
216.8										
0.6										
brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel hard	SS	2	100	32	216.2					
	SS	3	100	35	215.7					
	SS	4	100	52	215.3					
214.3										
3.0										
END OF BOREHOLE										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH B16**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 1+500 E:604893 N:4852946** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 24, 2020** Date Completed: **Jan 24, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 217.9 m										
about 150 mm TOPSOIL					217.8					
dark brown / brown Silty Clay FILL trace gravel (reworked soil)	SS	1	100	8	217.4					
brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel very stiff to hard	SS	2	100	21	217.1					
	SS	3	100	56	216.6					
END OF BOREHOLE					216.1					
					1.8					

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH B17**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 1+600 E:604822 N:4853017** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 24, 2020** Date Completed: **Jan 24, 2020** Revision No.: **0, 1/5/21**

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
	DESCRIPTION	Geodetic Ground Surface Elevation: 218.5 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing ○ SPT □ PPT ● DCPT	MTO Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)	△ COV (ppm) □ TOV (ppm)		W _p W _L	Plastic Liquid	GR	SA
	about 150 mm TOPSOIL	218.3															
	dark brown / brown Silty Clay FILL (reworked soil)	217.9	SS	1	100	8	218	○			31						
	brown SILTY CLAY TILL trace sand to sandy, trace gravel, cobbles/boulders very stiff to hard	217.9	SS	2	100	21	218	○			16						
		0.6					217										
			SS	3	100	30	217	○			19			5	21	47	27
							216										
			SS	4	100	42	216	○			15						
							215										
			SS	5	100	50	215	○			13						
							214										
			SS	6	100	39	214	○			14						
							213										
			SS	7	100	29	213	○			13						
	END OF BOREHOLE	213.4					213										
		5.0					5										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH B18



Project Number: TP115086 Drilling Location: Arterial A2, Sta. 1+700 E:604752 N:4853086 Logged by: MS
 Project Client: City of Brampton Drilling Method: 150 mm Solid Stem Augers Compiled by: PR
 Project Name: Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47) Drilling Machine: Track Mounted Drill Reviewed by: SM/DP
 Project Location: Brampton, Ontario Date Started: Jan 24, 2020 Date Completed: Jan 24, 2020 Revision No.: 0, 1/5/21

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 219.2 m										
about 150 mm TOPSOIL 219.1										
dark brown / brown Silty Clay FILL trace gravel (reworked soil) 218.6	SS	1	100	8	219					
brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel, cobbles/boulders very stiff to hard 218.6	SS	2	100	20	218					
217.4	SS	3	100	43						
END OF BOREHOLE 1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH B19**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 1+800 E:604680 N:4853157** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 24, 2020** Date Completed: **Jan 24, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 219.5 m										
about 200 mm TOPSOIL										
219.3										
dark brown/brown Silty Clay FILL trace gravel (reworked soil)	SS	1	100	7						
218.9										
0.6										
brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel very stiff to hard	SS	2	100	29	1					
	SS	3	83	37	2					
greyish brown										
	SS	4	100	40						
216.5										
3.0										
END OF BOREHOLE										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH B20**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 1+900 E:604609 N:4853227** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 24, 2020** Date Completed: **Jan 24, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 219.9 m										
	about 100 mm TOPSOIL				219.8					
	drak grey / brown Silty Clay FILL trace gravel (reworked soil)	SS	1	75	9					
	219.3									
	brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel very stiff to hard	SS	2	100	26	1				
	0.6									
	218.1									
	END OF BOREHOLE				1.8					

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▽ Groundwater encountered on completion of drilling on 1/24/2020 at a depth of: 1.2 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH B21**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 2+000 E:604537 N:4853296** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 24, 2020** Date Completed: **Jan 24, 2020** Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT	MTO Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)		
Geodetic Ground Surface Elevation: 220.8 m												
about 200 mm TOPSOIL 220.6 0.2												
dark grey / dark brown / brown Silty Clay FILL trace gravel, trace organics (reworked soil)	SS	1	100	12			○	●	○	○		
	SS	2	100	9	1	220	○	●	○	○		
	SS	3	100	9	2	219	○	●	○	○		
218.6 2.2												
brown SILTY CLAY / CLAYEY SILT TILL trace sand, trace gravel stiff to hard	SS	4	100	13	3	218	○	●	○	○		
	SS	5	100	27			○	●	○	○		
	SS	6	100	22	4	217	○	●	○	○		
grey												
	SS	7	22	30	5	216	○	●	○	○		
215.8 5.0												
END OF BOREHOLE												

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▽ Groundwater encountered on completion of drilling on 1/24/2020 at a depth of: 2.7 m. ■ Cave in depth after removal of augers: 4.3 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. BH B22



Project Number: TP115086 Drilling Location: Arterial A2, Sta. 2+100 (Countryside Dr.) Logged by: MS
 Project Client: City of Brampton Drilling Method: 150 mm Solid Stem Augers Compiled by: PR
 Project Name: Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47) Drilling Machine: Truck Mounted Drill Reviewed by: SM/DP
 Project Location: Brampton, Ontario Date Started: Jan 23, 2020 Date Completed: Jan 23, 2020 Revision No.: 0, 1/5/21

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing ○ SPT □ PPT ● DCPT	MTO Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould	Nilcon Vane* ◇ Intact ◆ Remould	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)	△ COV (ppm) □ TOV (ppm)	W _p		W	W _L	GR	SA
	Geodetic Ground Surface Elevation: 220.5 m																		
	about 200 mm ASPHALT	220.3																	
	Sand and Gravel FILL moist	0.2																	
		219.9					220												
	brown/dark grey Silty Clay FILL trace gravel	0.6	SS	1	75	9													
		219.0					1												
			SS	2	100	18													
	END OF BOREHOLE	1.5					219												

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH B23**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 2+200 E:604392 N:4853436** Logged by: **AS**
 Project Client: **City of Brampton** Drilling Method: **Solid Stem Augers** Compiled by: **KC/ZF**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **MST Bomb** Reviewed by: **SM/DP**
 Project Location: **Proposed East-West Arterial Road, Brampton** Date Started: **Jan 26, 2022** Date Completed: **Jan 26, 2022** Revision No.: **0, 3/10/22**

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT			MTO Vane* △ Intact ▲ Remould	Nilcon Vane* ◇ Intact ◆ Remould	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8	△ COV (ppm) □ TOV (ppm) 100 200 300 400		
	Geodetic Ground Surface Elevation: 221.1 m													
	brown Silty Clay FILL some sand, trace gravel, trace organics, oxidation	SS	1	100	36		221		○		○	22		
		SS	2	38	18	1	220		○		○	20		
		SS	3	100	22	2	219		○		○	20		
	218.8 brown SILTY CLAY TILL trace to some sand, trace to some gravel, oxidation hard	SS	4	100	31	3	218.0		○		○	14		
	END OF BOREHOLE					3.0								

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH B24**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 2+300 E:604321 N:4853507** Logged by: **AS**
 Project Client: **City of Brampton** Drilling Method: **Solid Stem Augers** Compiled by: **KC/ZF**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **MST Bomb** Reviewed by: **SM/DP**
 Project Location: **Proposed East-West Arterial Road, Brampton** Date Started: **Jan 26, 2022** Date Completed: **Jan 26, 2022** Revision No.: **0, 3/10/22**

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT			MTO Vane* △ Intact ▲ Remould	Nilcon Vane* ◇ Intact ◆ Remould	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8	△ COV (ppm) □ TOV (ppm) 100 200 300 400		
	Geodetic Ground Surface Elevation: 221.9 m													
	dark brown Gravelly Sand FILL trace clay, organics moist	SS	1	100	100						○ 6			
	221.3 ----- 0.6 brown Silty Clay FILL some sand, trace gravel, trace organics, oxidation	SS	2	54	19	1	221	○			○ 15			
	trace cobbles	SS	3	83	15		220	○			○ 30			
	219.8 ----- 2.1 END OF BOREHOLE					2					○ 18			

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH B25**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 2+400 E:604250 N:4853574** Logged by: **AS**
 Project Client: **City of Brampton** Drilling Method: **Solid Stem Augers** Compiled by: **KC/ZF**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **MST Bomb** Reviewed by: **SM/DP**
 Project Location: **Proposed East-West Arterial Road, Brampton** Date Started: **Jan 26, 2022** Date Completed: **Jan 26, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)				SPT 'N' / RQD (%)	Soil Vapour Reading		
Geodetic Ground Surface Elevation: 222.5 m											
black to light brown Silty Clay FILL some sand, trace gravel, trace organics, oxidation	SS	1	92	15		222	○	○	22		
----- brown 221.8 0.7											
SILTY CLAY / CLAYEY SILT TILL some sand, trace to some gravel, trace cobbles, trace organics, oxidation very stiff to hard	SS	2	100	16	1	221	○	○			
	SS	3	100	26	2	220	○	○	17		
	SS	4	100	38	3	220	○	○	16		
----- grey											
	SS	5	100	36	4	219	○	○	16		
	SS	6	100	19	5	218	○	○	19 35 20	1	10 49 40
	SS	7	75	16	5	218	○	○	18		
END OF BOREHOLE 217.3 5.2											

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH B26**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 2+500 E:604179 N:4853643** Logged by: **AS**
 Project Client: **City of Brampton** Drilling Method: **Solid Stem Augers** Compiled by: **KC/ZF**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **MST Bomb** Reviewed by: **SM/DP**
 Project Location: **Proposed East-West Arterial Road, Brampton** Date Started: **Jan 26, 2022** Date Completed: **Jan 26, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 222.9 m										
brown Silty Clay FILL some sand, trace gravel, trace organics, oxidation	SS	1	100	17			○ 15			
	SS	2	100	13	1	222	○ 30			
221.5 brown SILTY CLAY / CLAYEY SILT TILL some sand, trace gravel, oxidation very stiff	SS	3	100	28		221	○ 15			
220.8 END OF BOREHOLE					2					
2.1										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH B27**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 2+600 E:604107 N:4853714** Logged by: **AS**
 Project Client: **City of Brampton** Drilling Method: **Solid Stem Augers** Compiled by: **KC/ZF**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **MST Bomb** Reviewed by: **SM/DP**
 Project Location: **Proposed East-West Arterial Road, Brampton** Date Started: **Jan 26, 2022** Date Completed: **Jan 26, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 223.4 m										
brown Silty Clay FILL some sand, trace gravel, trace organics, oxidation	SS	1	71	9	223	○	○	31		
	SS	2	100	15	222	○	○	26		
	SS	3	100	52	221.9	○	○	18 31 16	1	18 53 28
	SS	4	100	73	220.3	○	○	17		
END OF BOREHOLE					3.0					

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH B28**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 2+700 E:604034 N:4853786** Logged by: **AS**
 Project Client: **City of Brampton** Drilling Method: **Solid Stem Augers** Compiled by: **KC/ZF**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **MST Bomb** Reviewed by: **SM/DP**
 Project Location: **Proposed East-West Arterial Road, Brampton** Date Started: **Jan 26, 2022** Date Completed: **Jan 26, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 223.4 m										
dark brown and black Silty Clay FILL some sand, trace gravel	SS	1	83	22		223	○	○ 28		
222.7 0.7 brown SILTY CLAY / CLAYEY SILT TILL some sand, trace gravel, trace organics, oxidation very stiff	SS	2	100	23	1	222	○	○ 15		
221.2	SS	3	100	27	2		○	○ 16		
2.1 END OF BOREHOLE										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

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RECORD OF BOREHOLE No. **BH S3**



Project Number: **TP115086** Drilling Location: **Arterial A2 at Hwy 50 E:606278 N:4852633** Logged by: **MS / RM**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 10, 2022** Date Completed: **Jan 10, 2022** Revision No.: **0, 3/31/21**

Lithology Plot	LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
		DESCRIPTION	Sample Type	Sample Number	Recovery (%)						
	Geodetic Ground Surface Elevation: 210.7 m										
	dark grey / brown Sand and Gravel FILL moist	SS	1	100	30						
	210.0										
	0.7										
	dark grey / grey Silty Clay / Clayey Silt FILL trace to some sand, trace to some gravel, trace organics	SS	2	75	16	1					
		SS	3	83	10	2					
		SS	4	100	10						
	207.7										
	3.0										
	brown SILTY CLAY TILL some sand to sandy, trace gravel, cobbles/boulders stiff to hard	SS	5	100	15	3					
		SS	6	100	88	4					3 33 46 18
		SS	7	100	90 / 250mm	5					
	grey										
		SS	8	100	44	6					
	203.5										
	7.2										
	grey SANDY SILT TILL trace clay, trace gravel, cobbles/boulders very dense moist to wet	SS	9	100	87 / 280mm	7					1 35 56 8 Non-plastic
	wet										
	201.2										
	9.4										
	END OF BOREHOLE	SS	10	100	50 / 150mm	9					

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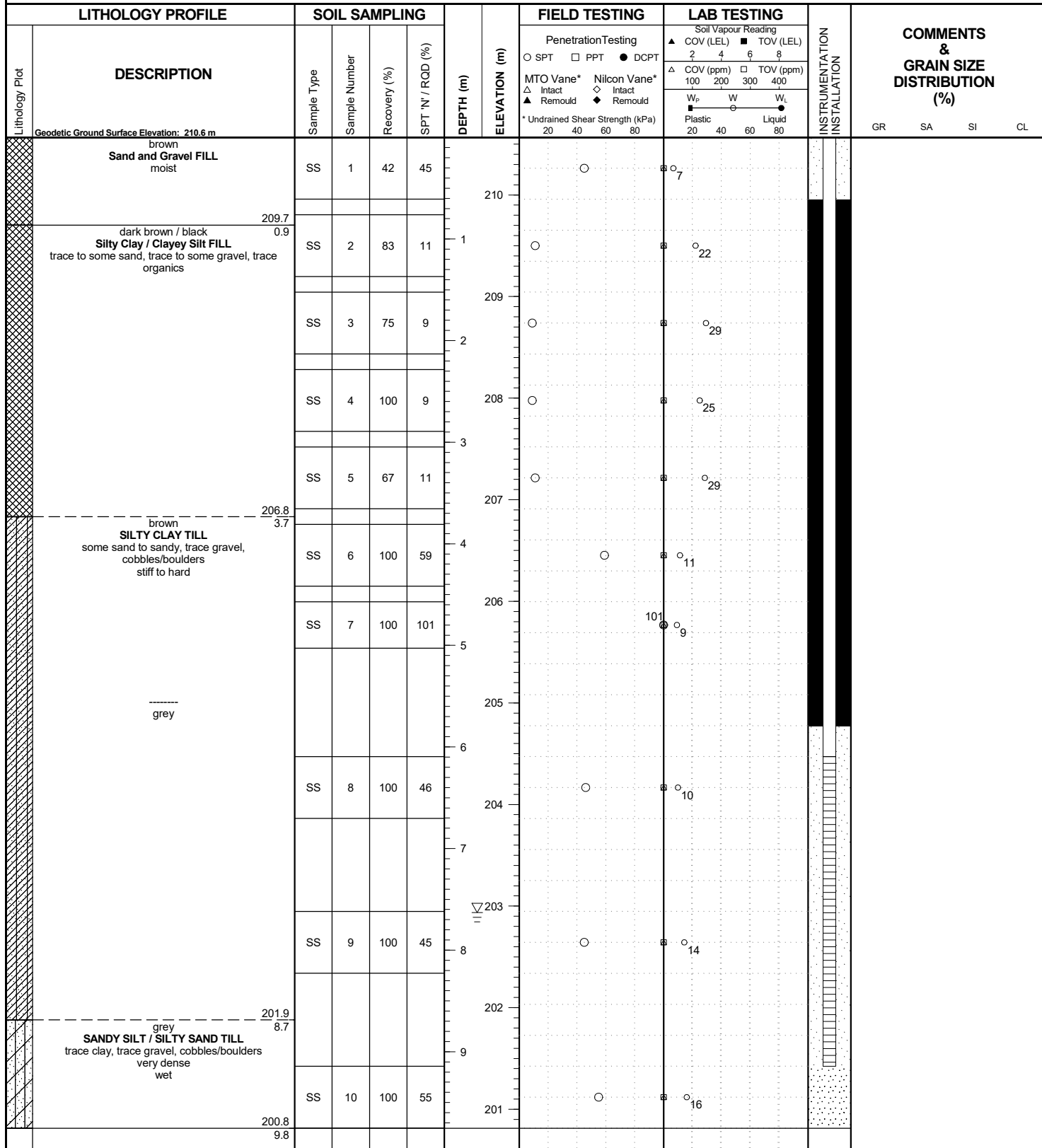
▽ Groundwater encountered on completion of drilling on 1/10/2022 at a depth of: 7.0 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH S4**



Project Number: **TP115086** Drilling Location: **Arterial A2 at Hwy 50 E:606254 N:4852631** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 10, 2022** Date Completed: **Jan 10, 2022** Revision No.: **0, 3/31/21**



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▽ Groundwater encountered on completion of drilling on 1/10/2022 at a depth of: 7.6 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH S4**



Project Number: **TP115086**

Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Brampton, Ontario**

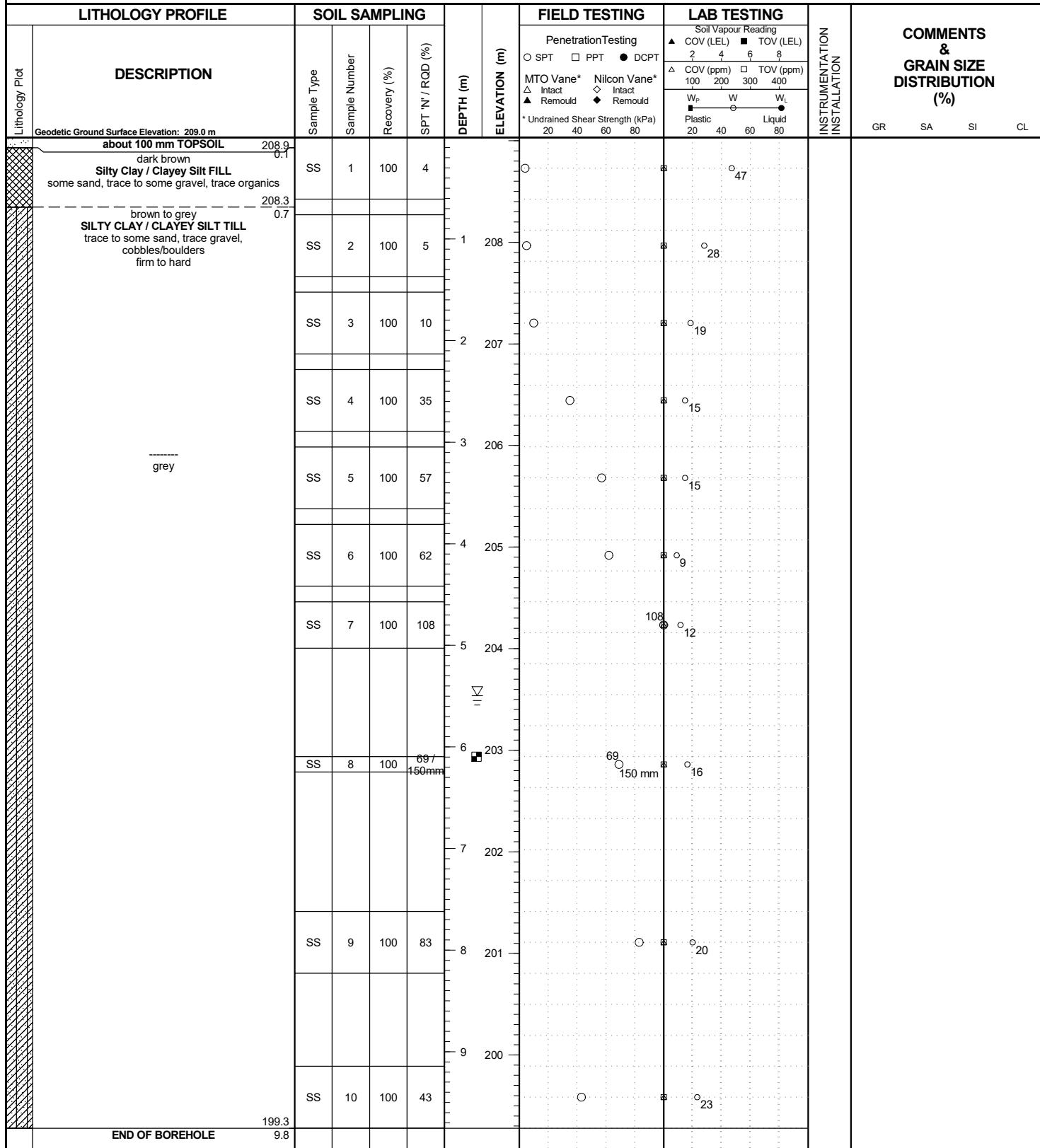
Lithology Plot	LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing	Soil Vapour Reading	COV (LEL)	TOV (LEL)		
	<p>END OF BOREHOLE</p> <p>50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface):</p> <p>Sand: 0.0 - 0.6 m Bentonite: 0.6 - 5.8 m Sand Filter: 5.5 - 9.1 m Screen: 6.1 - 9.1 m</p>												

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH S6**



Project Number: **TP115086** Drilling Location: **Arterial A2, Sta. 0+600 E:605620 N:4852529** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **PR**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Feb 26, 2020** Date Completed: **Feb 26, 2020** Revision No.: **0, 1/5/21**



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▽ Groundwater encountered on completion of drilling on 2/26/2020 at a depth of: 5.5 m. ■ Cave in depth after removal of augers: 6.1 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.
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RECORD OF BOREHOLE No. **BH E1**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 0+000 E:604583 N:4850435** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Truck Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 11, 2022** Date Completed: **Jan 11, 2022** Revision No.: **0, 3/10/22**

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Penetration Testing			Soil Vapour Reading	W _p	W	W _L		
	Geodetic Ground Surface Elevation: 203.0 m													
	about 100 mm TOPSOIL brown Silty Clay FILL trace gravel, trace organics	SS	1	42	10		202.9 0.1							
	202.4 0.7 brown SILTY CLAY / CLAYEY SILT TILL trace gravel, oxidation firm to stiff	SS	2	46	10	1	202							
	grey	SS	3	75	7									
	END OF BOREHOLE					2	200.9 2.1							

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH E2**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 0+100 E:604641 N:4850507** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 11, 2022** Date Completed: **Jan 11, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 204.6 m										
about 76 mm TOPSOIL dark brown Silty Clay FILL trace gravel, trace cobbles, trace organics/rootlets	SS	1	38	7		204.5	○	▲ 28		
----- brown SILTY CLAY TILL trace sand, trace gravel, oxidation very stiff to hard	SS	2	100	15	1	203.9	○	▲ 14		
----- brownish grey	SS	3	50	26	2	203.0	○	▲ 14		
----- grey	SS	4	100	44	3	202.0	○	▲ 14		
	SS	5	83	32	4	201.0	○	▲ 11		
	SS	6	71	26	5	200.0	○	▲ 13		
about 100 mm of sandy seam with gravel	SS	7	79	29	6	199.4	○	▲ 4		
END OF BOREHOLE						199.4		▲ 17		

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH E3**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 0+200 E:604703 N:4850585** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 11, 2022** Date Completed: **Jan 11, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	DESCRIPTION	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W _p W W _L Plastic Liquid 20 40 60 80		
	Geodetic Ground Surface Elevation: 205.9 m										
	about 76 mm TOPSOIL dark brown Silty Clay FILL some sand, trace gravel, trace organics	SS	1	42	7						
	205.2 brown / brownish grey SILTY CLAY TILL some sand to sandy, trace gravel, oxidation stiff to very stiff	SS	2	100	14	1	205				
	203.7 END OF BOREHOLE	SS	3	100	21	2	204				1 22 50 27

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH E4**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 0+300 E:604766 N:4850663** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 11, 2022** Date Completed: **Jan 11, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 205.1 m										
about 76 mm TOPSOIL dark brown Silty Clay FILL trace sand, trace gravel, trace organics	SS	1	79	7		205	○	○ 26		
204.4 brown SILTY CLAY TILL trace to some sand, trace gravel, oxidation stiff to hard	SS	2	100	12	1	204	○	○ 15		
0.7	SS	3	100	21	2	203	○	○ 14		
trace cobbles	SS	4	33	49	3	202	○	○ 14		
202.0 END OF BOREHOLE					3	202.0				
3.0										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH E5**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 0+400 E:604828 N:4850742** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 11, 2022** Date Completed: **Jan 11, 2022** Revision No.: **0, 3/10/22**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 203.2 m										
about 100 mm TOPSOIL dark brown / brown Silty Clay FILL some sand, trace gravel, trace organics	SS	1	83	7	203	○	●			
202.6 brown SANDY SILT TILL trace clay, trace gravel, oxidation clay seams in SS2 loose to compact moist	SS	2	100	6	202	○	●			
201.1 END OF BOREHOLE	SS	3	100	29	201	○	●			

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF MONITORING WELL No. **BH S17**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Culvert E:604874 N:4850797** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 12, 2022** Date Completed: **Jan 12, 2022** Revision No.: **0, 3/10/22**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 202.6 m										
about 100 mm TOPSOIL dark brown / brown Sandy Silt FILL trace clay, trace gravel, trace cobbles, trace organics moist brown	SS	1	100		9	202.5 0.1	○	▲ 17		
SILT SAND / SANDY SILT TILL trace clay, trace gravel, trace cobbles, oxidation in SS2 and SS3 very dense moist	SS	2	100		68	201.9 0.7	○	▲ 8		
grey	SS	3	100		88	201	○	▲ 11		
wet	SS	4	100		50+	200	○	▲ 9		
WEATHERED SHALE grey	SS	5	100		50+	199	○	▲ 7		7 41 49 3
mixed with clayey soil	SS	6	100		50+	198	○	▲ 7		
END OF BOREHOLE 50 mm dia. monitoring well with 1.0 m stick-up protective casing installed (depth below ground surface). Bentonite: 0.0 - 3.5 m Sand Filter: 3.5 - 6.9 m Screen: 3.8 - 6.9 m	SS	7	100		50+	197	○	▲ 9		
	SS	8	100		72	196	○	▲ 7		
	SS	9	100		60+	195.6 7.0	○	▲ 6		

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▽ Groundwater level was inferred from soil conditions during drilling

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RECORD OF BOREHOLE No. **BH E6 / S18**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 0+500 E:604885 N:4850810** Logged by: **MM**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 12, 2022** Date Completed: **Jan 12, 2022** Revision No.: **0, 3/10/22**

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)				
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80			Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W _p W W _L Plastic Liquid 20 40 60 80	GR	SA	SI		CL				
	Geodetic Ground Surface Elevation: 204.8 m																	
	about 76 mm TOPSOIL dark brown / brown Silty Clay FILL trace gravel, trace cobbles, trace organics	SS	1	100	6		204.7											
	brown SILTY CLAY TILL trace gravel, trace cobbles, oxidation hard	SS	2	100	30		204.1											
	brown SILTY SAND / SANDY SILT TILL trace clay, trace gravel, trace cobbles, oxidation in SS5 very dense moist	SS	3	100	36		202.6											
	grey and wet	SS	4	100	50+		202.2											
		SS	5	100	50+		201											
		SS	6	100	84+		200											
		SS	7	100	50+		199											
		SS	8	100	50+		198											
		SS	9	100	50+		197											
	grey Weathered SHALE						196.3											
	END OF BOREHOLE	SS	10	100	50+		195.4											
							195.3											

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▽ Groundwater level was inferred from soil conditions during drilling ■ Cave in depth after removal of augers: 4.6 m.

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RECORD OF BOREHOLE No. **BH E7**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 0+600 E:604955 N:4850896** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 12, 2022** Date Completed: **Jan 12, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 204.9 m										
about 76 mm TOPSOIL dark brown / brown Silty Clay FILL some sand, trace gravel, trace organics	SS	1	33	5						
204.9 204.2 0.7 brown SILTY CLAY / CLAYEY SILT TILL some sand, trace gravel, oxidation very stiff to hard	SS	2	100	17	1	204				
202.8 2.1 END OF BOREHOLE	SS	3	100	36	2	203				5 17 46 32

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH E23**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 2+200 E:605606 N:4852284** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 13, 2022** Date Completed: **Jan 13, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 210.7 m										
about 76 mm TOPSOIL dark brown / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics, oxidation	SS	1	100	3		210.6				
210.0 brown / light brown SILTY CLAY / CLAYEY SILT TILL some sand to sandy, trace gravel, oxidation stiff to very stiff	SS	2	100	10	1	210.0				
208.5	SS	3	100	27	2	208.5				1 28 51 20
END OF BOREHOLE						208.5				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH E24**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 2+300 E:605614 N:4852383** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 13, 2022** Date Completed: **Jan 13, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	DESCRIPTION	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W _p W W _L Plastic Liquid		
	Geodetic Ground Surface Elevation: 210.7 m										
	about 76 mm TOPSOIL dark brown / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	1	100	10		210.7	○	○		
	210.1 brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, trace cobbles, oxidation very stiff to hard	SS	2	100	22	1	210	○	○		
		SS	3	100	27	2	209	○	○		
	brownish grey	SS	4	100	36	3	208	○	○		
	207.7 END OF BOREHOLE						207.7				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH E25**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 2+400 E:605628 N:4852476** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 13, 2022** Date Completed: **Jan 13, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 209.3 m										
about 76 mm TOPSOIL dark brown / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	1	100	11		209	○	○ 30		
brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, trace cobbles, oxidation stiff to hard	SS	2	100	12	1	208.6	○	○ 13		
sandy/silty seams	SS	3	100	32		208	○	○ 13		
END OF BOREHOLE					2	207.2				
						2.1				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH E26**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 2+500 E:605650 N:4852571** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 13, 2022** Date Completed: **Jan 13, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 210.0 m										
about 76 mm TOPSOIL dark brown / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	1	100	12		209.9	○	○ 22		
----- brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, oxidation to SS5 very stiff to hard	SS	2	100	17	1	209.3	○	○ 13		
----- grey	SS	3	100	20	2	208.7	○	○ 12		
----- grey SANDY SILT / SILT TILL trace clay, trace gravel, dense to very dense moist to wet	SS	4	100	40	3	207.0	○	○ 12		
----- grey SANDY SILT / SILT TILL trace clay, trace gravel, dense to very dense moist to wet	SS	5	100	23	4	206.3	○	○ 12		
----- clayey seams	SS	6	100	55	5	206.3	○	○ 11		
----- clayey seams	SS	7	79	37	5	205.6	○	○ 12		
END OF BOREHOLE						204.8				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH E27**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 2+600 E:605680 N:4852668** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 13, 2022** Date Completed: **Jan 13, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 211.1 m										
about 100 mm TOPSOIL dark brown / brown Silty Clay FILL trace sand, trace gravel, trace organics	SS	1	75	5	0.1	211	○ 29			
brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, trace cobbles, oxidation very stiff	SS	2	100	21	0.7	210	○ 12			
	SS	3	100	27			○ 11			
END OF BOREHOLE					2.1	209				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

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RECORD OF BOREHOLE No. **BH E28**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 2+700 E:605714 N:4852764** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 13, 2022** Date Completed: **Jan 13, 2022** Revision No.: **0, 3/10/22**

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Penetration Testing			Soil Vapour Reading	Soil Vapour Reading	Soil Vapour Reading			
	Geodetic Ground Surface Elevation: 212.4 m													
	about 100 mm TOPSOIL dark brown / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace cobbles	SS	1	83	3	0.1	212	○	○	○	○	○		
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, trace cobbles, oxidation sandy pockets in SS2 stiff to hard	SS	2	100	12	0.7	211.7	○	○	○	○	○		
		SS	3	13	32		211	○	○	○	○	○		
		SS	4	8	40		210	○	○	○	○	○		
	END OF BOREHOLE					3.0	209.4							

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH E29**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 2+800 E:605743 N:4852863** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 13, 2022** Date Completed: **Jan 13, 2022** Revision No.: **0, 3/10/22**

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Penetration Testing			Soil Vapour Reading	COV (LEL)	TOV (LEL)	COV (ppm)		
	Geodetic Ground Surface Elevation: 213.5 m													
	about 76 mm TOPSOIL dark brown / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	1	92	9	213								
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, oxidation very stiff	SS	2	100	15	212.8								
		SS	3	100	20	212								
	END OF BOREHOLE					211.3								

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH E30**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 2+900 E:605749 N:4852965** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 13, 2022** Date Completed: **Jan 13, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 214.3 m										
about 76 mm TOPSOIL dark brown / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	1	100	6	214	○	○	○		
----- brown SILTY CLAY / CLAYEY SILT TILL some sand to sandy, trace gravel, oxidation very stiff to hard	SS	2	100	17	213	○	○	○		
	SS	3	100	20	212	○	○	○		
	SS	4	100	33	212	○	○	○		
----- greyish brown	SS	5	100	28	211	○	○	○		
----- grey	SS	6	100	23	210	○	○	○		
	SS	7	100	20	210	○	○	○		
END OF BOREHOLE					209.2					

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH E31**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 3+000 E:605728 N:4853064** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 13, 2022** Date Completed: **Jan 13, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' / RQD (%)	Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80		
Geodetic Ground Surface Elevation: 214.9 m										
about 76 mm TOPSOIL dark brown / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	SS	1	100	10		214.9	○	○ 29		
214.2 brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, oxidation very stiff	SS	2	100	19	1	214.2	○	○ 12		
212.7 END OF BOREHOLE	SS	3	100	20	2	212.7	○	○ 12		

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. **BH E32**



Project Number: **TP115086** Drilling Location: **E-W Arterial Road, Sta. 3+100 E:605683 N:4853156** Logged by: **MS**
 Project Client: **City of Brampton** Drilling Method: **150 mm Solid Stem Augers** Compiled by: **ZF/KC**
 Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)** Drilling Machine: **Track Mounted Drill** Reviewed by: **SM/DP**
 Project Location: **Brampton, Ontario** Date Started: **Jan 13, 2022** Date Completed: **Jan 13, 2022** Revision No.: **0, 3/10/22**

Lithology Profile	DESCRIPTION	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W _p W W _L Plastic Liquid 20 40 60 80		
	Geodetic Ground Surface Elevation: 215.0 m										
	about 76 mm TOPSOIL dark brown / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace cobbles, trace organics	SS	1	100	5		214.9				
	214.3 brown SILTY CLAY / CLAYEY SILT TILL some sand, trace gravel, trace cobbles, oxidation very stiff to hard	SS	2	100	17	1	214				
	214.3 brown SILTY CLAY / CLAYEY SILT TILL some sand, trace gravel, trace cobbles, oxidation very stiff to hard	SS	3	100	18	2	213				
	211.9 brownish grey	SS	4	100	33	3	212				
	END OF BOREHOLE					3	212				

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Appendix B
Hydraulic Conductivity Analyses

Report: Hydrogeological Investigation



Location: Coleraine Drive, Brampton, ON

Title: Single Well Response Test Analysis - BH S1

Project: Arterial Road within Highway 427 Industrial Secondary Plan Area (Area 47)

Wood Project No.: TP115086

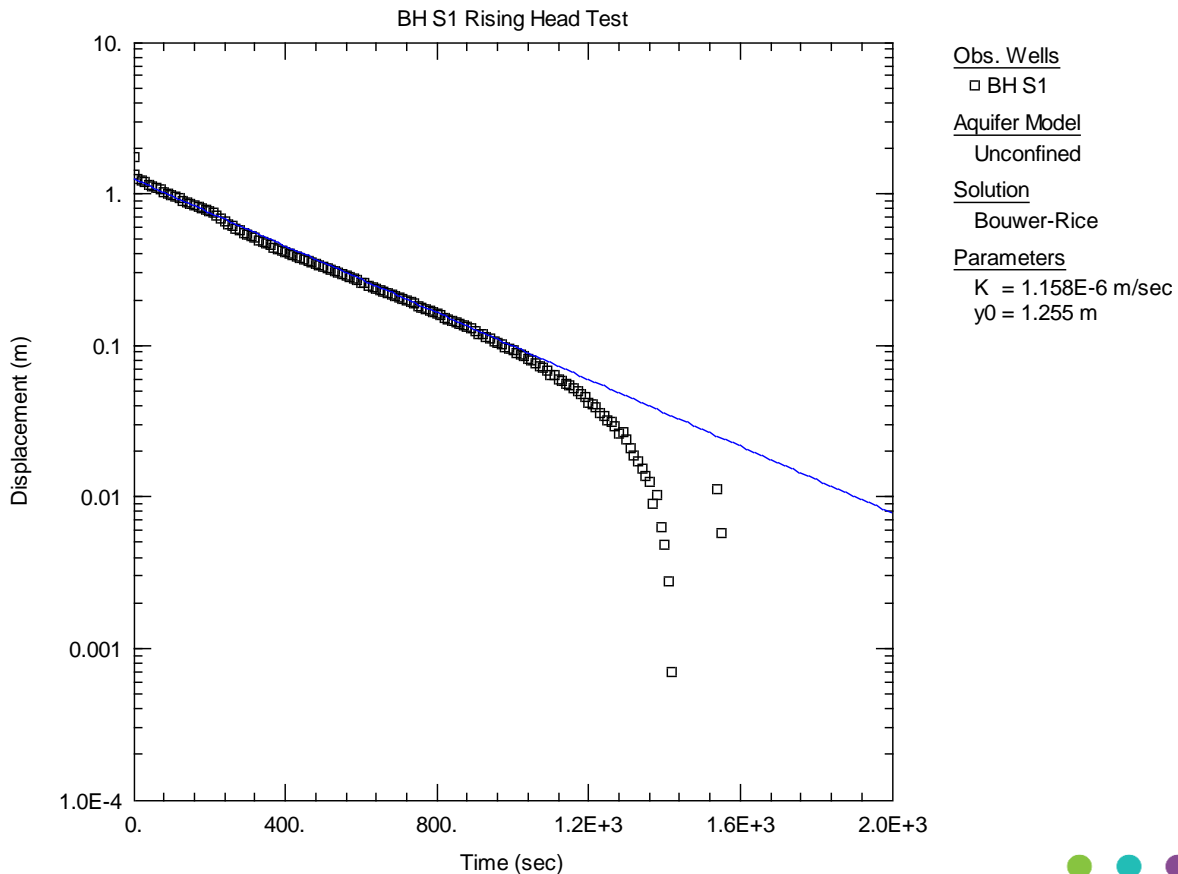
Client: City of Brampton

Monitoring Well Details

Well ID:	BH S1		
Ground Surface:	-	mASL	
Casing Radius:	0.025	metres	
Borehole Radius:	0.076	metres	
Top of screen:	6.10	mBGS	93.90 mASL
Bottom of screen:	9.10	mBGS	90.90 mASL
Bottom of borehole:	9.40	mBGS	90.60 mASL
Screened Material:	Silty Clay/ Clayey Silt Till		

Test Analysis

Solution Method:	Bouwer-Rice
Test Method:	Rising Head Test
Aquifer Model:	Unconfined
Estimated K value:	1.2E-06 m/s



Report: Hydrogeological Investigation



Location: Countryside Drive, Brampton, ON

Title: Single Well Response Test Analysis - BH S7

Project: Arterial Road within Highway 427 Industrial Secondary Plan Area (Area 47)

Wood Project No.: TP115086

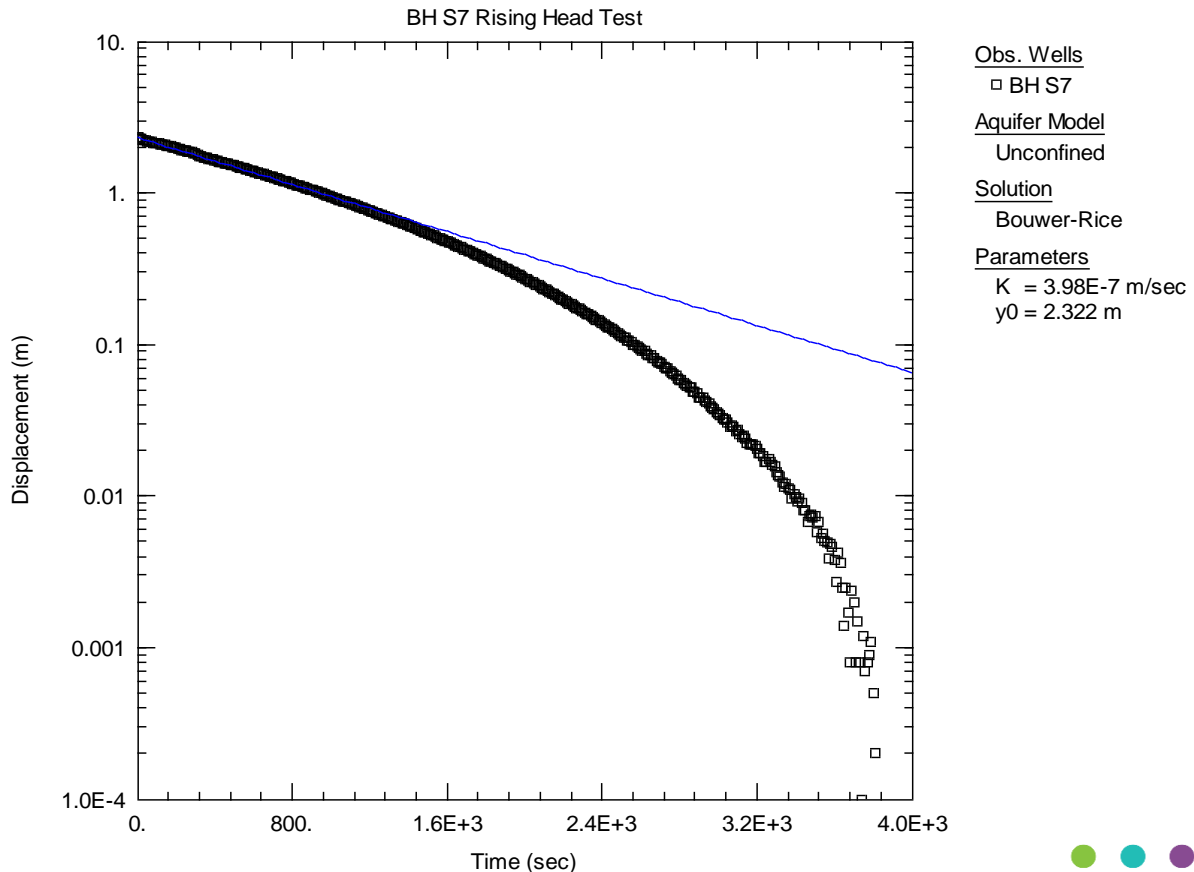
Client: City of Brampton

Monitoring Well Details

Well ID:	BH S7			
Ground Surface:	-	mASL		
Casing Radius:	0.025	metres		
Borehole Radius:	0.076	metres		
Top of screen:	6.10	mBGS	93.90	mASL
Bottom of screen:	9.10	mBGS	90.90	mASL
Bottom of borehole:	9.80	mBGS	90.20	mASL
Screened Material:	Silty Clay/ Clayey Silt Till			

Test Analysis

Solution Method:	Bouwer-Rice
Test Method:	Rising Head Test
Aquifer Model:	Unconfined
Estimated K value:	4.0E-07 m/s



Report: Hydrogeological Investigation



Location: Countryside Drive, Brampton, Ontario

Title: Single Well Response Test Analysis - BH S10

Project: Arterial Road within Highway 427 Industrial Secondary Plan Area (Area 47)

Wood Project No.: TP115086

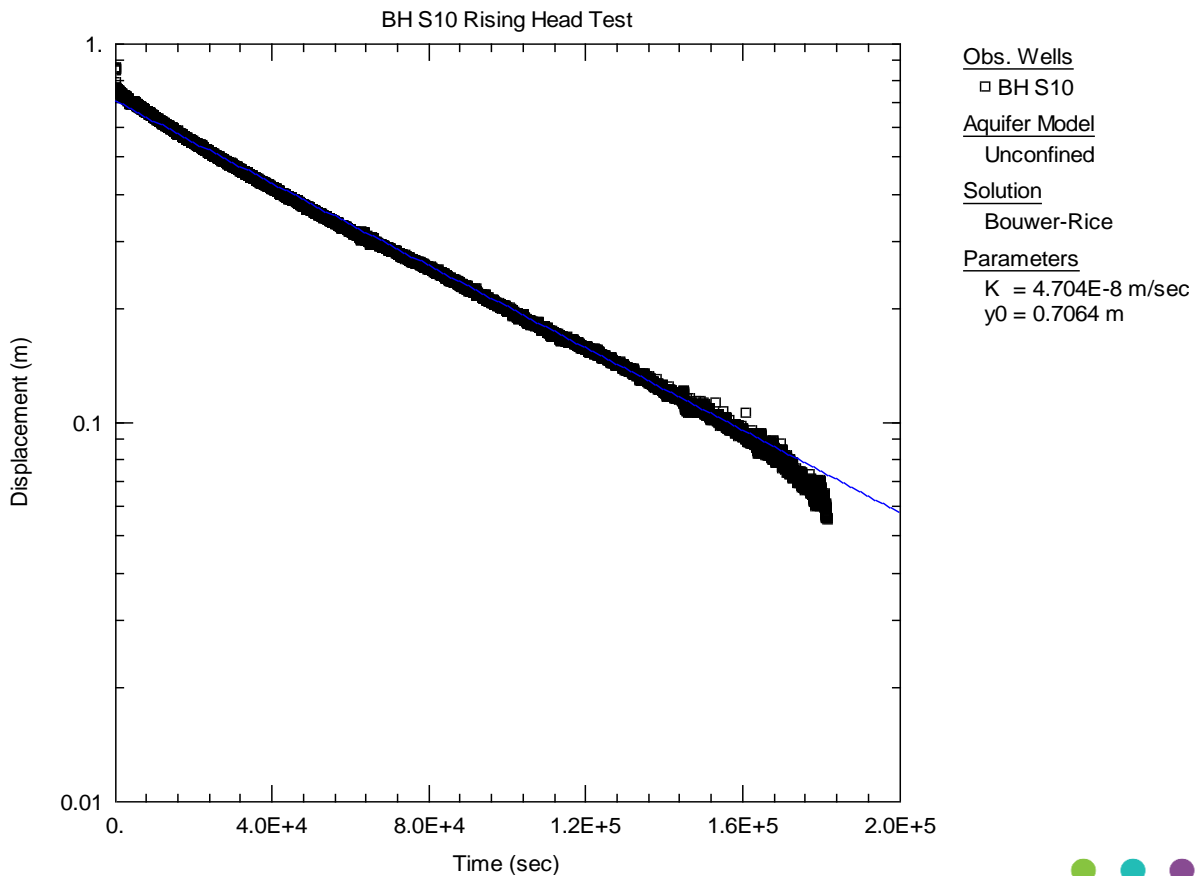
Client: City of Brampton

Monitoring Well Details

Well ID:	BH S10		
Ground Surface:	-	mASL	
Casing Radius:	0.025	metres	
Borehole Radius:	0.076	metres	
Top of screen:	6.10	mBGS	93.90 mASL
Bottom of screen:	9.10	mBGS	90.90 mASL
Bottom of borehole:	9.40	mBGS	90.60 mASL
Screened Material:	Silty Clay/ Clayey Silt Till		

Test Analysis

Solution Method:	Bouwer-Rice
Test Method:	Rising Head Test
Aquifer Model:	Unconfined
Estimated K value:	4.7E-08 m/s



Report: Hydrogeological Investigation



Location: Countryside Drive, Brampton, Ontario

Title: Single Well Response Test Analysis - BH S12

Project: Arterial Road within highway 427 Industrial Secondary Plan Area (Area 47)

Wood Project No.: TP115086

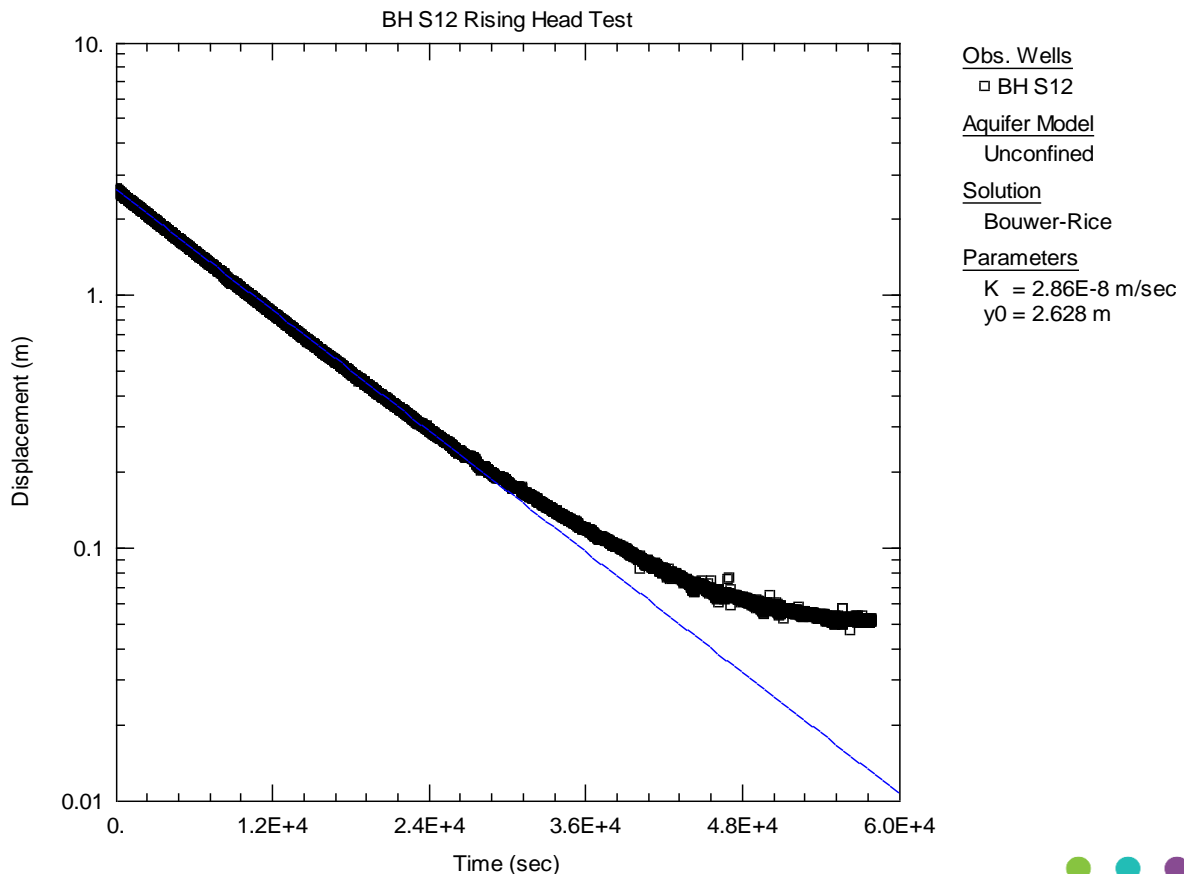
Client: City of Brampton

Monitoring Well Details

Well ID:	BH S12		
Ground Surface:	-	mASL	
Casing Radius:	0.025	metres	
Borehole Radius:	0.076	metres	
Top of screen:	2.70	mBGS	97.30 mASL
Bottom of screen:	5.80	mBGS	94.20 mASL
Bottom of borehole:	5.80	mBGS	94.20 mASL
Screened Material:	Silty Sand/Sandy Silt		

Test Analysis

Solution Method:	Bouwer-Rice
Test Method:	Rising Head Test
Aquifer Model:	Unconfined
Estimated K value:	2.9E-08 m/s



Report: Hydrogeological Investigation



Location: Clarkway Drive, Brampton, ON

Title: Single Well Response Test Analysis - BH S13

Project: Arterial Road within Highway 427 Industrial Secondary Plan Area (Area 47)

Wood Project No.: TP115086

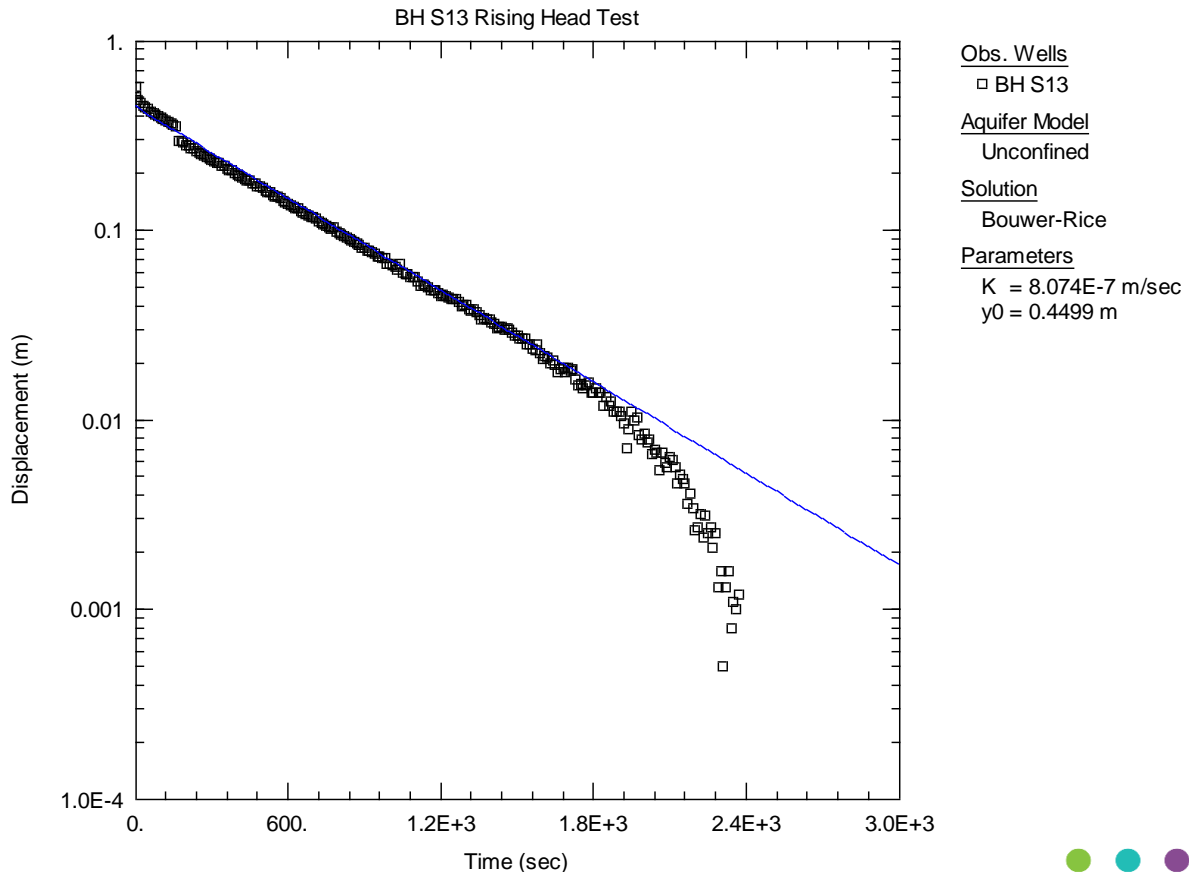
Client: City of Brampton

Monitoring Well Details

Well ID:	BH S13		
Ground Surface:	-	mASL	
Casing Radius:	0.025	metres	
Borehole Radius:	0.076	metres	
Top of screen:	4.60	mBGS	95.40 mASL
Bottom of screen:	7.60	mBGS	92.40 mASL
Bottom of borehole:	9.80	mBGS	90.20 mASL
Screened Material:	Silty Clay/Clayey Silt Till & Sandy Silt/Silty Sand		

Test Analysis

Solution Method:	Bouwer-Rice
Test Method:	Rising Head Test
Aquifer Model:	Unconfined
Estimated K value:	8.1E-07 m/s



Report: Hydrogeological Investigation



Location: Clarkway Drive, Brampton, ON

Title: Single Well Response Test Analysis - BH S16

Project: Arterial Road within Highway 427 Industrial Secondary Plan Area (Area 47)

Wood Project No.: TP115086

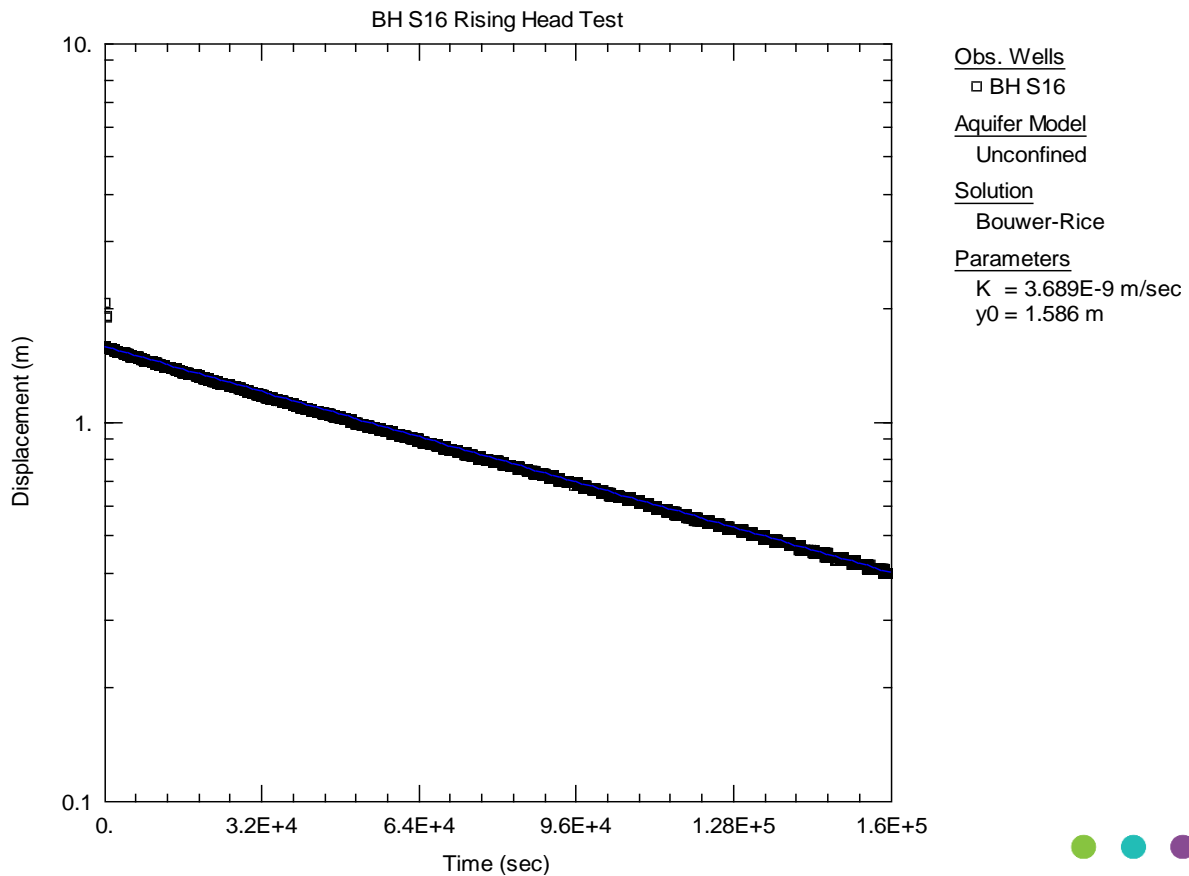
Client: City of Brampton

Monitoring Well Details

Well ID: BH S16
Ground Surface: - mASL
Casing Radius: 0.025 metres
Borehole Radius: 0.076 metres
Top of screen: 6.10 mBGS 93.90 mASL
Bottom of screen: 9.10 mBGS 90.90 mASL
Screened Material: Silty Clay/Clayey Silt Till

Test Analysis

Solution Method: Bouwer-Rice
Test Method: Rising Head Test
Aquifer Model: Unconfined
Estimated K value: **3.7E-09 m/s**



Report: Hydrogeological Investigation



Location: Arterial A2, Brampton, ON

Title: Single Well Response Test Analysis - BH S5

Project: Arterial Road within Highway 427 Industrial Secondary Plan Area (Area 47)

Wood Project No.: TP115086

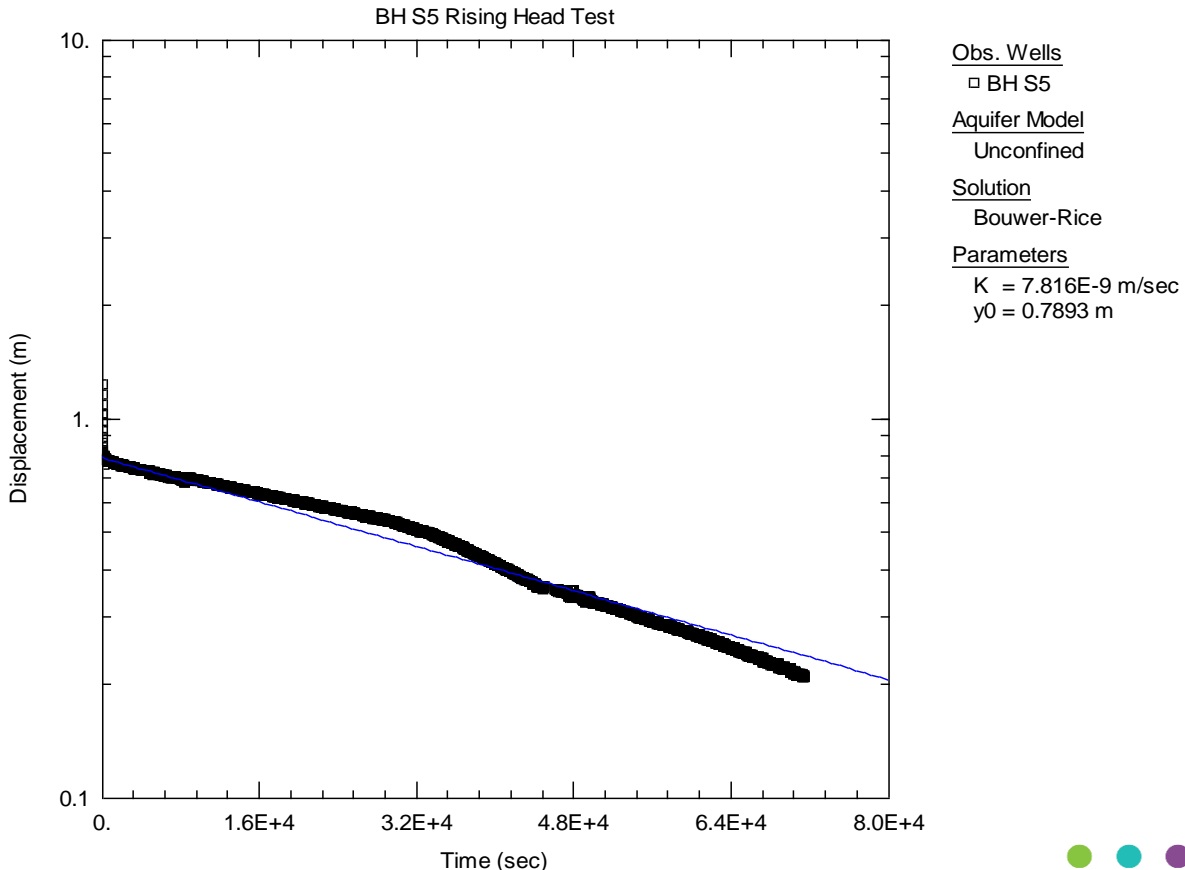
Client: City of Brampton

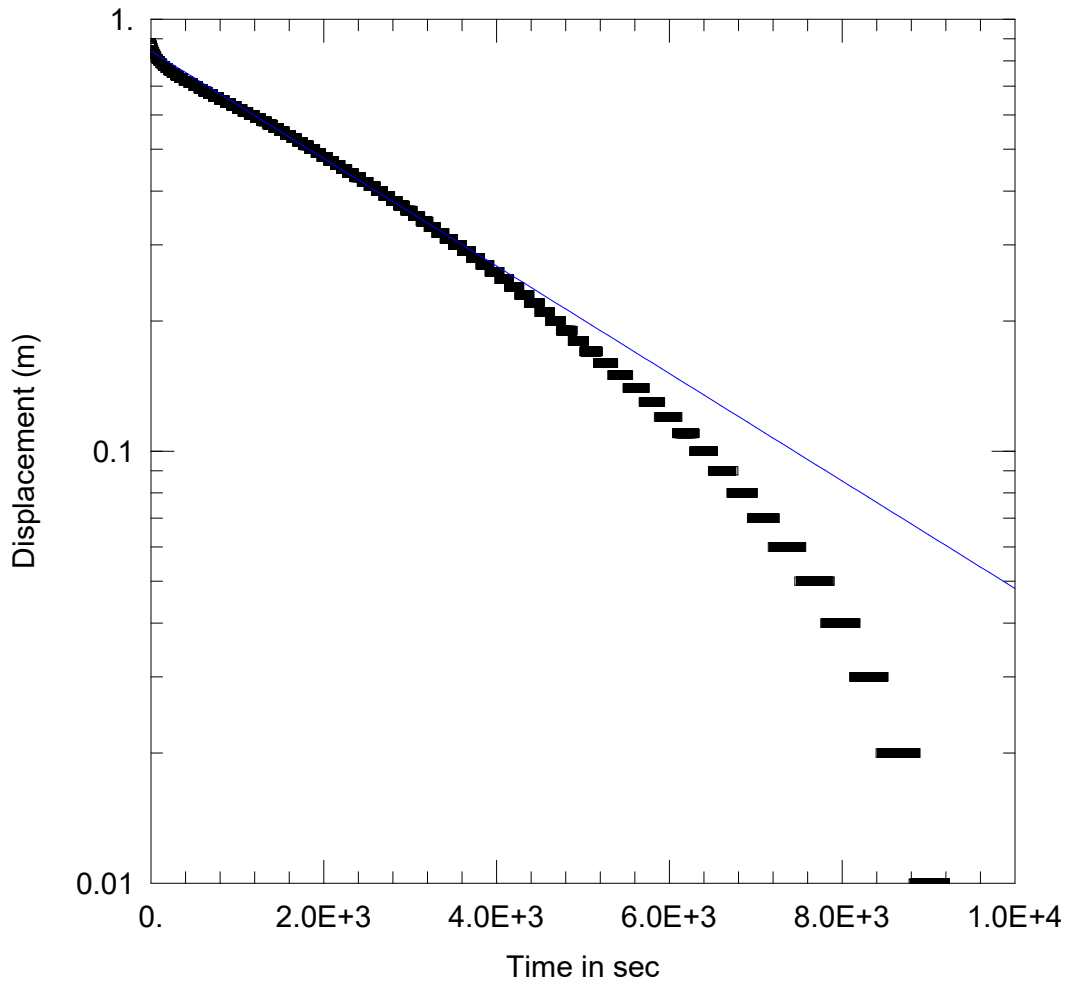
Monitoring Well Details

Well ID:	BH S5		
Ground Surface:	-	mASL	
Casing Radius:	0.025	metres	
Borehole Radius:	0.076	metres	
Top of screen:	6.10	mBGS	93.90 mASL
Bottom of screen:	9.10	mBGS	90.90 mASL
Bottom of borehole:	9.80	mBGS	90.20 mASL
Screened Material:	Silty Clay/ Clayey Silt Till		

Test Analysis

Solution Method:	Bouwer-Rice
Test Method:	Rising Head Test
Aquifer Model:	Unconfined
Estimated K value:	7.8E-09 m/s



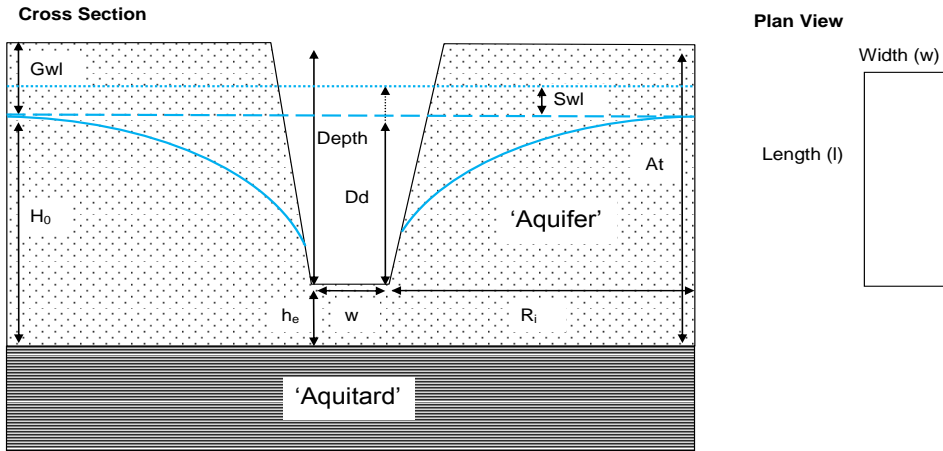


<u>WELL TEST ANALYSIS</u>	
<u>PROJECT INFORMATION</u>	
Company: <u>Wood</u> Client: <u>City of Brampton</u> Project: <u>TP115086</u> Location: <u>Brampton (Area 47)</u> Test Well: <u>BH S17</u> Test Date: <u>26 Jan 22</u>	
<u>AQUIFER DATA</u>	
Saturated Thickness: <u>3.56 m</u>	Anisotropy Ratio (Kz/Kr): <u>0.1</u>
<u>WELL DATA (BH S17)</u>	
Initial Displacement: <u>0.88 m</u>	Static Water Column Height: <u>3.56 m</u>
Total Well Penetration Depth: <u>3.56 m</u>	Screen Length: <u>3.1 m</u>
Casing Radius: <u>0.025 m</u>	Well Radius: <u>0.075 m</u>
<u>SOLUTION</u>	
Aquifer Model: <u>Unconfined</u>	Solution Method: <u>Bouwer-Rice</u>
K = <u>1.113E-7 m/sec</u>	y0 = <u>0.8436 m</u>

Appendix C
Dewatering Rate Estimates

Dewatering Rate Estimation - Unconfined Trench		wood.
Project No.:	TP115086 / 1 / 6200	
Project Name:	Environmental Assessment Study of Arterial Roads within Hwy. 427 Industrial SPA47	
Client:	City of Brampton	
Location:	Brampton, Ontario	Performed by: Cameron McCann
Description:	Installation of box Culvert S1 across Coleraine Dr. using open-cut excavation	Checked by: Tomas Cihula
Date:	19 January 2021	

EXCAVATION INFO	
Length, l (m)	10.0
Width, w (m)	9.0
Depth (m BGS)	4.0



Radius of Influence (R) calculated with the Sichardt equation $R_i = 3000(H_0 - h_e)\sqrt{K}$

Groundwater Inflow (Q) to the excavation calculated with the Dupuit solution combining:
 1) radial steady-state for inflow to trench ends; and
 2) linear steady-state for inflow to trench sides.

$$Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$$

Bh	Gwl Measured Groundwater Level (m BGS)	Swl Estimated Seasonal Fluctuation above Gwl (m)	K Hydraulic Conductivity (m/s)	At 'Aquifer' Thickness (m BGS)	H ₀ Ambient Head above 'Aquitard' (m)	h _e Head above 'Aquitard' at Excavation (m)	Dd Drawdown (m)	R _i Sichardt Calculation (m)	R _i User Defined (m)	Q Groundwater Inflow (m ³ /d)
S1	0.87	0.50	1.2E-06	5.0	4.6	1.0	3.6	11.9		6.9
Maximum										6.9
K Geometric Mean			1.2E-06	5.00	4.63	1.00	3.63	11.9		6.9
K Arithmetic Mean			1.2E-06	5.00	4.63	1.00	3.63	11.9		6.9

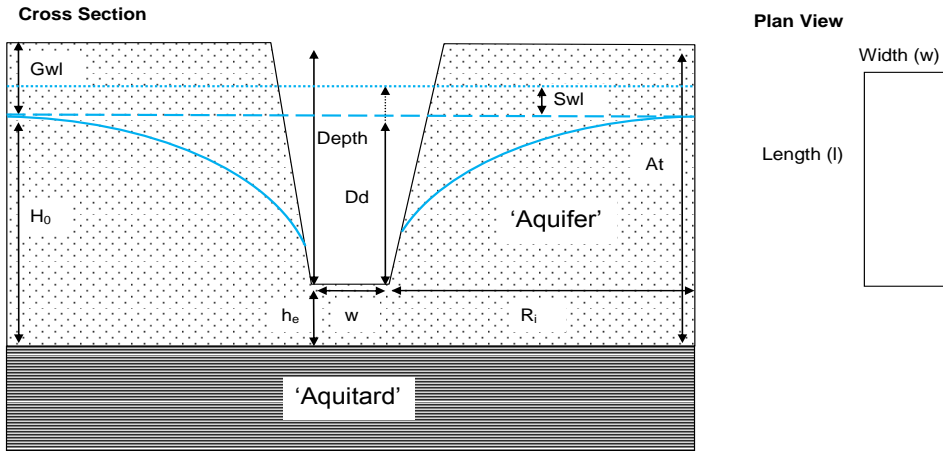
Uncertainty Factor	3	Maximum x SF	(K Geometric Mean) x SF	(K Arithmetic Mean) x SF
Q Groundwater Inflow (m ³ /d)		20.7	20.7	20.7
Uncertainty Factor	3	S(Maximum K x SF)	S(K Geometric Mean x SF)	S(K Arithmetic Mean x SF)
R _i Radius of Influence, Sichert (m)		20.7	20.7	20.7

- Notes**
- 1 m BGS = metres below ground surface
 - 2 The user defined R_i is used for the calculation of groundwater inflow (Q) if specified
 - 3 Geometric mean calculation is applied only to the hydraulic conductivity (K) - other input parameters for the Dupuit and Sichardt equation use the arithmetic average
 - 4 The calculated groundwater inflows for the arithmetic and geometric mean both use the Sichardt R_i calculated from the respective mean K
 - 5 If the depth of the excavation is below the base of the 'Aquifer' then the head at the excavation is set at the top of the 'Aquitard' (i.e. h_e = 0)

Comments

Dewatering Rate Estimation - Unconfined Trench		wood.
Project No.:	TP115086 / 1 / 6200	
Project Name:	Environmental Assessment Study of Arterial Roads within Hwy. 427 Industrial SPA47	
Client:	City of Brampton	
Location:	Brampton, Ontario	Performed by: Cameron McCann
Description:	Installation of utilities beneath Coleraine Dr. using open-cut excavation	Checked by: Tomas Cihula
Date:	19 January 2021	

EXCAVATION INFO	
Length, l (m)	15.0
Width, w (m)	3.0
Depth (m BGS)	4.0



Radius of Influence (R) calculated with the Sichardt equation $R_i = 3000(H_0 - h_e)\sqrt{K}$

Groundwater Inflow (Q) to the excavation calculated with the Dupuit solution combining:
 1) radial steady-state for inflow to trench ends; and
 2) linear steady-state for inflow to trench sides.

$$Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$$

Bh	Gwl Measured Groundwater Level (m BGS)	Swl Estimated Seasonal Fluctuation above Gwl (m)	K Hydraulic Conductivity (m/s)	At 'Aquifer' Thickness (m BGS)	H ₀ Ambient Head above 'Aquitard' (m)	h _e Head above 'Aquitard' at Excavation (m)	Dd Drawdown (m)	R _i Sichardt Calculation (m)	R _i User Defined (m)	Q Groundwater Inflow (m ³ /d)
S1	0.87	0.50	1.2E-06	5.0	4.6	1.0	3.6	11.9		5.7
Maximum										5.7
K Geometric Mean			1.2E-06	5.00	4.63	1.00	3.63	11.9		5.7
K Arithmetic Mean			1.2E-06	5.00	4.63	1.00	3.63	11.9		5.7

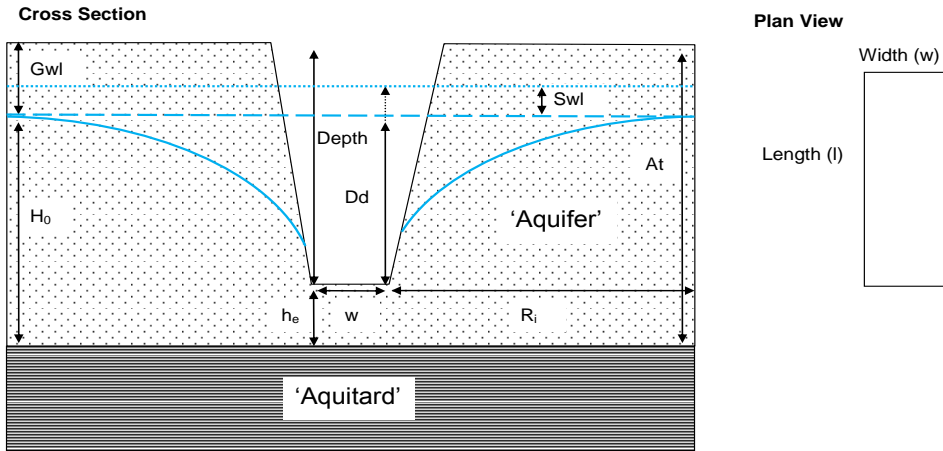
Uncertainty Factor	3	Maximum x SF	(K Geometric Mean) x SF	(K Arithmetic Mean) x SF
Q Groundwater Inflow (m ³ /d)	17.1	17.1	17.1	17.1
Uncertainty Factor	3	S(Maximum K x SF)	S(K Geometric Mean x SF)	S(K Arithmetic Mean x SF)
R _i Radius of Influence, Sichert (m)	20.7	20.7	20.7	20.7

- Notes**
- 1 m BGS = metres below ground surface
 - 2 The user defined R_i is used for the calculation of groundwater inflow (Q) if specified
 - 3 Geometric mean calculation is applied only to the hydraulic conductivity (K) - other input parameters for the Dupuit and Sichardt equation use the arithmetic average
 - 4 The calculated groundwater inflows for the arithmetic and geometric mean both use the Sichardt R_i calculated from the respective mean K
 - 5 If the depth of the excavation is below the base of the 'Aquifer' then the head at the excavation is set at the top of the 'Aquitard' (i.e. h_e = 0)

Comments

Dewatering Rate Estimation - Unconfined Trench		wood.	
Project No.:	TP115086 / 1 / 6200		
Project Name:	Environmental Assessment Study of Arterial Roads within Hwy. 427 Industrial SPA47		
Client:	City of Brampton		
Location:	Brampton, Ontario	Performed by:	Cameron McCann
Description:	Installation of box Culvert S7 across Countryside Dr. using open-cut excavation	Checked by:	Tomas Cihula
Date:	19 January 2021		

EXCAVATION INFO	
Length, l (m)	10.0
Width, w (m)	9.0
Depth (m BGS)	4.0



Radius of Influence (R) calculated with the Sichardt equation $R_i = 3000(H_0 - h_e)\sqrt{K}$

Groundwater Inflow (Q) to the excavation calculated with the Dupuit solution combining:
 1) radial steady-state for inflow to trench ends; and
 2) linear steady-state for inflow to trench sides.

$$Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$$

Bh	Gwl Measured Groundwater Level (m BGS)	Swl Estimated Seasonal Fluctuation above Gwl (m)	K Hydraulic Conductivity (m/s)	At 'Aquifer' Thickness (m BGS)	H ₀ Ambient Head above 'Aquitard' (m)	h _e Head above 'Aquitard' at Excavation (m)	Dd Drawdown (m)	R _i Sichardt Calculation (m)	R _i User Defined (m)	Q Groundwater Inflow (m ³ /d)
S7	1.71	1.00	4.0E-07	5.0	4.3	1.0	3.3	6.2		3.1
Maximum										3.1
K Geometric Mean			4.0E-07	5.00	4.29	1.00	3.29	6.2		3.1
K Arithmetic Mean			4.0E-07	5.00	4.29	1.00	3.29	6.2		3.1

Uncertainty Factor	3	Maximum x SF	(K Geometric Mean) x SF	(K Arithmetic Mean) x SF
Q Groundwater Inflow (m ³ /d)		9.4	9.4	9.4
Uncertainty Factor	3	S(Maximum K x SF)	S(K Geometric Mean x SF)	S(K Arithmetic Mean x SF)
R _i Radius of Influence, Sichert (m)		10.8	10.8	10.8

- Notes**
- 1 m BGS = metres below ground surface
 - 2 The user defined R_i is used for the calculation of groundwater inflow (Q) if specified
 - 3 Geometric mean calculation is applied only to the hydraulic conductivity (K) - other input parameters for the Dupuit and Sichardt equation use the arithmetic average
 - 4 The calculated groundwater inflows for the arithmetic and geometric mean both use the Sichardt R_i calculated from the respective mean K
 - 5 If the depth of the excavation is below the base of the 'Aquifer' then the head at the excavation is set at the top of the 'Aquitard' (i.e. h_e = 0)

Comments

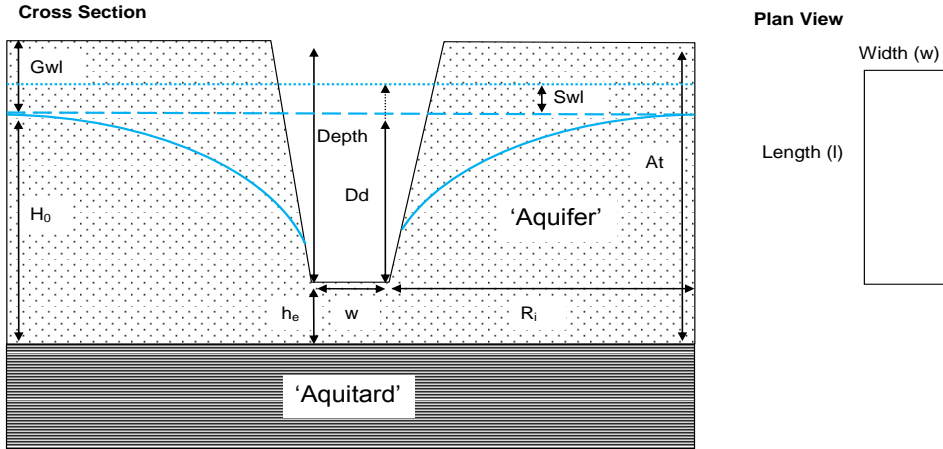
Dewatering Rate Estimation - Unconfined Trench											wood.
Project No.: TP115086 / 1 / 6200 Project Name: Environmental Assessment Study of Arterial Roads within Hwy. 427 Industrial SPA47 Client: City of Brampton Location: Brampton, Ontario Description: Installation of box Culvert S10 across Countryside Dr. using open-cut excavation Date: 19 January 2021										Performed by: Cameron McCann	
										Checked by: Tomas Cihula	
EXCAVATION INFO											
Length, l (m)	10.0										
Width, w (m)	9.0										
Depth (m BGS)	4.0										
<p>Cross Section</p>						<p>Plan View</p>					
<p>Radius of Influence (R) calculated with the Sichardt equation $R_i = 3000(H_0 - h_e)\sqrt{K}$</p> <p>Groundwater Inflow (Q) to the excavation calculated with the Dupuit solution combining: 1) radial steady-state for inflow to trench ends; and 2) linear steady-state for inflow to trench sides.</p> $Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$											
Bh	Gwl Measured Groundwater Level (m BGS)	Swl Estimated Seasonal Fluctuation above Gwl (m)	K Hydraulic Conductivity (m/s)	At 'Aquifer' Thickness (m BGS)	H ₀ Ambient Head above 'Aquitard' (m)	h _e Head above 'Aquitard' at Excavation (m)	Dd Drawdown (m)	R _i Sichardt Calculation (m)	R _i User Defined (m)	Q Groundwater Inflow (m ³ /d)	
S10	0.90	0.90	4.7E-08	5.0	5.0	1.0	4.0	2.6		1.0	
Maximum										1.0	
K Geometric Mean			4.7E-08	5.00	5.00	1.00	4.00	2.6		1.0	
K Arithmetic Mean			4.7E-08	5.00	5.00	1.00	4.00	2.6		1.0	
Uncertainty Factor		3	Maximum x SF		(K Geometric Mean) x SF		(K Arithmetic Mean) x SF				
Q Groundwater Inflow (m³/d)			3.1		3.1		3.1				
Uncertainty Factor		3	S(Maximum K x SF)		S(K Geometric Mean x SF)		S(K Arithmetic Mean x SF)				
R_i Radius of Influence, Sichert (m)			4.5		4.5		4.5				
Notes											
1 m BGS = metres below ground surface											
2 The user defined R _i is used for the calculation of groundwater inflow (Q) if specified											
3 Geometric mean calculation is applied only to the hydraulic conductivity (K) - other input parameters for the Dupuit and Sichardt equation use the arithmetic average											
4 The calculated groundwater inflows for the arithmetic and geometric mean both use the Sichardt R _i calculated from the respective mean K											
5 If the depth of the excavation is below the base of the 'Aquifer' then the head at the excavation is set at the top of the 'Aquitard' (i.e. h _e = 0)											
Comments											

Dewatering Rate Estimation - Unconfined Trench											wood.
Project No.: TP115086 / 1 / 6200 Project Name: Environmental Assessment Study of Arterial Roads within Hwy. 427 Industrial SPA47 Client: City of Brampton Location: Brampton, Ontario Description: Installation of box Culvert S12 across Countryside Dr. using open-cut excavation Date: 19 January 2021										Performed by: Cameron McCann Checked by: Tomas Cihula	
EXCAVATION INFO											
Length, l (m)	10.0										
Width, w (m)	9.0										
Depth (m BGS)	4.0										
Cross Section 						Plan View 					
Radius of Influence (R) calculated with the Sichardt equation $R_i = 3000(H_0 - h_e)\sqrt{K}$ Groundwater Inflow (Q) to the excavation calculated with the Dupuit solution combining: 1) radial steady-state for inflow to trench ends; and 2) linear steady-state for inflow to trench sides.											
$Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$											
Bh	Gwl Measured Groundwater Level (m BGS)	Swl Estimated Seasonal Fluctuation above Gwl (m)	K Hydraulic Conductivity (m/s)	At 'Aquifer' Thickness (m BGS)	H ₀ Ambient Head above 'Aquitard' (m)	h _e Head above 'Aquitard' at Excavation (m)	Dd Drawdown (m)	R _i Sichardt Calculation (m)	R _i User Defined (m)	Q Groundwater Inflow (m ³ /d)	
S12	1.44	1.00	2.9E-08	5.0	4.6	1.0	3.6	1.8		0.7	
Maximum										0.7	
K Geometric Mean			2.9E-08	5.00	4.56	1.00	3.56	1.8		0.7	
K Arithmetic Mean			2.9E-08	5.00	4.56	1.00	3.56	1.8		0.7	
Uncertainty Factor		3	Maximum x SF		(K Geometric Mean) x SF		(K Arithmetic Mean) x SF				
Q Groundwater Inflow (m³/d)			2.2		2.2		2.2				
Uncertainty Factor		3	S(Maximum K x SF)		S(K Geometric Mean x SF)		S(K Arithmetic Mean x SF)				
R_i Radius of Influence, Sichert (m)			3.2		3.2		3.2				
Notes											
1 m BGS = metres below ground surface											
2 The user defined R _i is used for the calculation of groundwater inflow (Q) if specified											
3 Geometric mean calculation is applied only to the hydraulic conductivity (K) - other input parameters for the Dupuit and Sichardt equation use the arithmetic average											
4 The calculated groundwater inflows for the arithmetic and geometric mean both use the Sichardt R _i calculated from the respective mean K											
5 If the depth of the excavation is below the base of the 'Aquifer' then the head at the excavation is set at the top of the 'Aquitard' (i.e. h _e = 0)											
Comments											

Dewatering Rate Estimation - Unconfined Trench										
Project No.: TP115086 / 1 / 6200 Project Name: Environmental Assessment Study of Arterial Roads within Hwy. 427 Industrial SPA47 Client: City of Brampton Location: Brampton, Ontario Description: Installation of utilities beneath Countryside Dr. using open-cut excavation Date: 19 January 2021										wood. Performed by: Cameron McCann Checked by: Tomas Cihula
EXCAVATION INFO										
Length, l (m)	15.0									
Width, w (m)	3.0									
Depth (m BGS)	4.0									
Cross Section						Plan View				
Radius of Influence (R) calculated with the Sichardt equation $R_i = 3000(H_0 - h_e)\sqrt{K}$						$Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$				
Groundwater Inflow (Q) to the excavation calculated with the Dupuit solution combining: 1) radial steady-state for inflow to trench ends; and 2) linear steady-state for inflow to trench sides.										
Bh	Gwl Measured Groundwater Level (m BGS)	Swl Estimated Seasonal Fluctuation above Gwl (m)	K Hydraulic Conductivity (m/s)	At 'Aquifer' Thickness (m BGS)	H ₀ Ambient Head above 'Aquitard' (m)	h _e Head above 'Aquitard' at Excavation (m)	Dd Drawdown (m)	R _i Sichardt Calculation (m)	R _i User Defined (m)	Q Groundwater Inflow (m ³ /d)
S7	1.71	1.00	4.0E-07	5.0	4.3	1.0	3.3	6.2		2.6
S10	0.90	0.90	4.7E-08	5.0	5.0	1.0	4.0	2.6		0.9
S12	1.44	1.00	2.9E-08	5.0	4.6	1.0	3.6	1.8		0.6
Maximum										2.6
K Geometric Mean			8.2E-08	5.00	4.62	1.00	3.62	3.1		1.1
K Arithmetic Mean			1.6E-07	5.00	4.62	1.00	3.62	4.3		1.6
Uncertainty Factor		3	Maximum x SF		(K Geometric Mean) x SF		(K Arithmetic Mean) x SF			
Q Groundwater Inflow (m³/d)			7.8		3.3		4.8			
Uncertainty Factor		3	S(Maximum K x SF)		S(K Geometric Mean x SF)		S(K Arithmetic Mean x SF)			
R_i Radius of Influence, Sichert (m)			11.9		5.4		7.5			
Notes										
1 m BGS = metres below ground surface										
2 The user defined R _i is used for the calculation of groundwater inflow (Q) if specified										
3 Geometric mean calculation is applied only to the hydraulic conductivity (K) - other input parameters for the Dupuit and Sichardt equation use the arithmetic average										
4 The calculated groundwater inflows for the arithmetic and geometric mean both use the Sichardt R _i calculated from the respective mean K										
5 If the depth of the excavation is below the base of the 'Aquifer' then the head at the excavation is set at the top of the 'Aquitard' (i.e. h _e = 0)										
Comments										

Dewatering Rate Estimation - Unconfined Trench		wood.
Project No.:	TP115086 / 1 / 6200	
Project Name:	Environmental Assessment Study of Arterial Roads within Hwy. 427 Industrial SPA47	
Client:	City of Brampton	
Location:	Brampton, Ontario	Performed by: Cameron McCann
Description:	Installation of box Culvert S13 across Clarkway Dr. using open-cut excavation	Checked by: Tomas Cihula
Date:	19 January 2021	

EXCAVATION INFO	
Length, l (m)	10.0
Width, w (m)	9.0
Depth (m BGS)	4.0



Radius of Influence (R) calculated with the Sichardt equation $R_i = 3000(H_0 - h_e)\sqrt{K}$

Groundwater Inflow (Q) to the excavation calculated with the Dupuit solution combining:
 1) radial steady-state for inflow to trench ends; and
 2) linear steady-state for inflow to trench sides.

$$Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$$

Bh	Gwl Measured Groundwater Level (m BGS)	Swl Estimated Seasonal Fluctuation above Gwl (m)	K Hydraulic Conductivity (m/s)	At 'Aquifer' Thickness (m BGS)	H ₀ Ambient Head above 'Aquitard' (m)	h _e Head above 'Aquitard' at Excavation (m)	Dd Drawdown (m)	R _i Sichardt Calculation (m)	R _i User Defined (m)	Q Groundwater Inflow (m ³ /d)
S13	1.39	1.00	8.1E-07	5.0	4.6	1.0	3.6	9.7		5.3
Maximum										5.3
K Geometric Mean			8.1E-07	5.00	4.61	1.00	3.61	9.7		5.3
K Arithmetic Mean			8.1E-07	5.00	4.61	1.00	3.61	9.7		5.3

Uncertainty Factor	3	Maximum x SF	(K Geometric Mean) x SF	(K Arithmetic Mean) x SF
Q Groundwater Inflow (m ³ /d)		16.0	16.0	16.0
Uncertainty Factor	3	S(Maximum K x SF)	S(K Geometric Mean x SF)	S(K Arithmetic Mean x SF)
R _i Radius of Influence, Sichert (m)		16.9	16.9	16.9

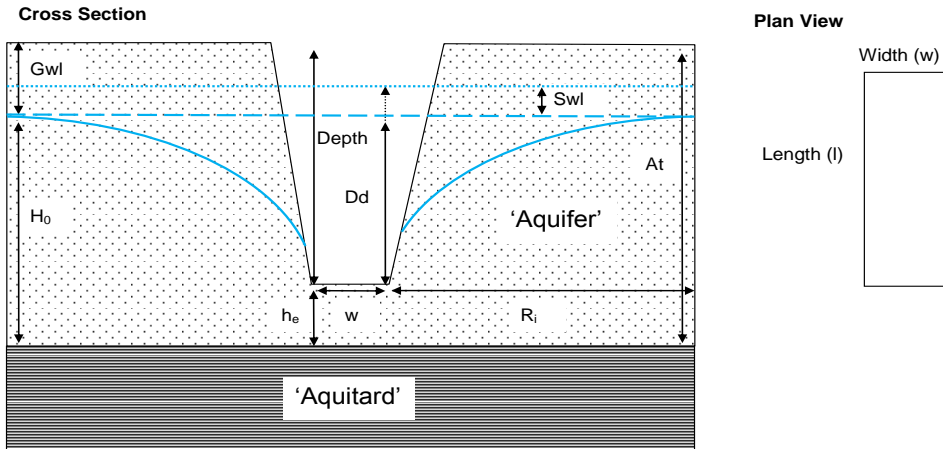
- Notes**
- 1 m BGS = metres below ground surface
 - 2 The user defined R_i is used for the calculation of groundwater inflow (Q) if specified
 - 3 Geometric mean calculation is applied only to the hydraulic conductivity (K) - other input parameters for the Dupuit and Sichardt equation use the arithmetic average
 - 4 The calculated groundwater inflows for the arithmetic and geometric mean both use the Sichardt R_i calculated from the respective mean K
 - 5 If the depth of the excavation is below the base of the 'Aquifer' then the head at the excavation is set at the top of the 'Aquitard' (i.e. h_e = 0)

Comments

Dewatering Rate Estimation - Unconfined Trench											wood.
Project No.: TP115086 / 1 / 6200 Project Name: Environmental Assessment Study of Arterial Roads within Hwy. 427 Industrial SPA47 Client: City of Brampton Location: Brampton, Ontario Description: Installation of box Culvert S16 across Clarkway Dr. using open-cut excavation Date: 19 January 2021										Performed by: Cameron McCann Checked by: Tomas Cihula	
EXCAVATION INFO											
Length, l (m)	10.0										
Width, w (m)	9.0										
Depth (m BGS)	4.0										
Cross Section 						Plan View 					
Radius of Influence (R) calculated with the Sichardt equation $R_i = 3000(H_0 - h_e)\sqrt{K}$ Groundwater Inflow (Q) to the excavation calculated with the Dupuit solution combining: 1) radial steady-state for inflow to trench ends; and 2) linear steady-state for inflow to trench sides.											
$Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$											
Bh	Gwl Measured Groundwater Level (m BGS)	Swl Estimated Seasonal Fluctuation above Gwl (m)	K Hydraulic Conductivity (m/s)	At 'Aquifer' Thickness (m BGS)	H0 Ambient Head above 'Aquitard' (m)	he Head above 'Aquitard' at Excavation (m)	Dd Drawdown (m)	Ri Sichardt Calculation (m)	Ri User Defined (m)	Q Groundwater Inflow (m³/d)	
S16	3.20	1.00	3.7E-09	5.0	2.8	1.0	1.8	0.3		0.2	
Maximum										0.2	
K Geometric Mean			3.7E-09	5.00	2.80	1.00	1.80	0.3		0.2	
K Arithmetic Mean			3.7E-09	5.00	2.80	1.00	1.80	0.3		0.2	
Uncertainty Factor		3	Maximum x SF		(K Geometric Mean) x SF		(K Arithmetic Mean) x SF				
Q Groundwater Inflow (m³/d)			0.5		0.5		0.5				
Uncertainty Factor		3	S(Maximum K x SF)		S(K Geometric Mean x SF)		S(K Arithmetic Mean x SF)				
Ri, Radius of Influence, Sichert (m)			0.6		0.6		0.6				
Notes											
1 m BGS = metres below ground surface											
2 The user defined Ri, is used for the calculation of groundwater inflow (Q) if specified											
3 Geometric mean calculation is applied only to the hydraulic conductivity (K) - other input parameters for the Dupuit and Sichardt equation use the arithmetic average											
4 The calculated groundwater inflows for the arithmetic and geometric mean both use the Sichardt Ri, calculated from the respective mean K											
5 If the depth of the excavation is below the base of the 'Aquifer' then the head at the excavation is set at the top of the 'Aquitard' (i.e. he = 0)											
Comments											

Dewatering Rate Estimation - Unconfined Trench		wood.
Project No.:	TP115086 / 1 / 6200	
Project Name:	Environmental Assessment Study of Arterial Roads within Hwy. 427 Industrial SPA47	
Client:	City of Brampton	
Location:	Brampton, Ontario	Performed by: Cameron McCann
Description:	Installation of utilities beneath Clarkway Dr. using open-cut excavation	Checked by: Tomas Cihula
Date:	19 January 2021	

EXCAVATION INFO	
Length, l (m)	15.0
Width, w (m)	3.0
Depth (m BGS)	4.0



Radius of Influence (R) calculated with the Sichardt equation $R_i = 3000(H_0 - h_e)\sqrt{K}$

Groundwater Inflow (Q) to the excavation calculated with the Dupuit solution combining:
 1) radial steady-state for inflow to trench ends; and
 2) linear steady-state for inflow to trench sides.

$$Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$$

Bh	Gwl Measured Groundwater Level (m BGS)	Swl Estimated Seasonal Fluctuation above Gwl (m)	K Hydraulic Conductivity (m/s)	At 'Aquifer' Thickness (m BGS)	H ₀ Ambient Head above 'Aquitard' (m)	h _e Head above 'Aquitard' at Excavation (m)	Dd Drawdown (m)	R _i Sichardt Calculation (m)	R _i User Defined (m)	Q Groundwater Inflow (m ³ /d)
S13	1.39	1.00	8.1E-07	5.0	4.6	1.0	3.6	9.7		4.4
S16	3.20	1.00	3.7E-09	5.0	2.8	1.0	1.8	0.3		0.1
Maximum										4.4
K Geometric Mean			5.5E-08	5.00	3.71	1.00	2.71	1.9		0.7
K Arithmetic Mean			4.1E-07	5.00	3.71	1.00	2.71	5.2		2.2

Uncertainty Factor	3	Maximum x SF	(K Geometric Mean) x SF	(K Arithmetic Mean) x SF
Q Groundwater Inflow (m ³ /d)		13.2	2.1	6.7
Uncertainty Factor	3	S(Maximum K x SF)	S(K Geometric Mean x SF)	S(K Arithmetic Mean x SF)
R _i Radius of Influence, Sichert (m)		12.7	3.3	9.0

- Notes**
- 1 m BGS = metres below ground surface
 - 2 The user defined R_i is used for the calculation of groundwater inflow (Q) if specified
 - 3 Geometric mean calculation is applied only to the hydraulic conductivity (K) - other input parameters for the Dupuit and Sichardt equation use the arithmetic average
 - 4 The calculated groundwater inflows for the arithmetic and geometric mean both use the Sichardt R_i calculated from the respective mean K
 - 5 If the depth of the excavation is below the base of the 'Aquifer' then the head at the excavation is set at the top of the 'Aquitard' (i.e. h_e = 0)

Comments

Dewatering Rate Estimation - Unconfined Trench											wood.
Project No.: TP115086 / 1 / 6200 Project Name: Environmental Assessment Study of Arterial Roads within Hwy. 427 Industrial SPA47 Client: City of Brampton Location: Brampton, Ontario Description: Installation of box Culvert S5 across Arterial A2 using open-cut excavation Date: 19 January 2021										Performed by: Cameron McCann	
										Checked by: Tomas Cihula	
EXCAVATION INFO											
Length, l (m)	10.0										
Width, w (m)	9.0										
Depth (m BGS)	4.0										
Cross Section						Plan View					
<p>Radius of Influence (R) calculated with the Sichardt equation $R_i = 3000(H_0 - h_e)\sqrt{K}$</p> <p>Groundwater Inflow (Q) to the excavation calculated with the Dupuit solution combining: 1) radial steady-state for inflow to trench ends; and 2) linear steady-state for inflow to trench sides.</p> $Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$											
Bh	Gwl Measured Groundwater Level (m BGS)	Swl Estimated Seasonal Fluctuation above Gwl (m)	K Hydraulic Conductivity (m/s)	At 'Aquifer' Thickness (m BGS)	H ₀ Ambient Head above 'Aquitard' (m)	h _e Head above 'Aquitard' at Excavation (m)	Dd Drawdown (m)	R _i Sichardt Calculation (m)	R _i User Defined (m)	Q Groundwater Inflow (m ³ /d)	
S5	0.00	0.00	7.8E-09	5.0	5.0	1.0	4.0	1.1		0.4	
Maximum										0.4	
K Geometric Mean			7.8E-09	5.00	5.00	1.00	4.00	1.1		0.4	
K Arithmetic Mean			7.8E-09	5.00	5.00	1.00	4.00	1.1		0.4	
Uncertainty Factor		3	Maximum x SF		(K Geometric Mean) x SF		(K Arithmetic Mean) x SF				
Q Groundwater Inflow (m³/d)			1.2		1.2		1.2				
Uncertainty Factor		3	S(Maximum K x SF)		S(K Geometric Mean x SF)		S(K Arithmetic Mean x SF)				
R_i Radius of Influence, Sichert (m)			1.8		1.8		1.8				
Notes											
1 m BGS = metres below ground surface											
2 The user defined R _i is used for the calculation of groundwater inflow (Q) if specified											
3 Geometric mean calculation is applied only to the hydraulic conductivity (K) - other input parameters for the Dupuit and Sichardt equation use the arithmetic average											
4 The calculated groundwater inflows for the arithmetic and geometric mean both use the Sichardt R _i calculated from the respective mean K											
5 If the depth of the excavation is below the base of the 'Aquifer' then the head at the excavation is set at the top of the 'Aquitard' (i.e. h _e = 0)											
Comments											

Dewatering Rate Estimation - Unconfined Trench										wood.					
Project No.: TP115086 / 1 / 6200										<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Performed by:</td> <td>Cameron McCann</td> </tr> <tr> <td>Checked by:</td> <td>Tomas Cihula</td> </tr> </table>		Performed by:	Cameron McCann	Checked by:	Tomas Cihula
Performed by:	Cameron McCann														
Checked by:	Tomas Cihula														
Project Name: Environmental Assessment Study of Arterial Roads within Hwy. 427 Industrial SPA47															
Client: City of Brampton															
Location: Brampton, Ontario															
Description: Installation of utilities beneath Arterial A2 using open-cut excavation															
Date: 19 January 2021															
EXCAVATION INFO															
Length, l (m)										15.0					
Width, w (m)										3.0					
Depth (m BGS)										4.0					
Cross Section						Plan View									
<p>Radius of Influence (R_i) calculated with the Sichardt equation $R_i = 3000(H_0 - h_e)\sqrt{K}$</p> <p>Groundwater Inflow (Q) to the excavation calculated with the Dupuit solution combining: 1) radial steady-state for inflow to trench ends; and 2) linear steady-state for inflow to trench sides.</p> $Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$															
Bh	Gwl Measured Groundwater Level (m BGS)	Swl Estimated Seasonal Fluctuation above Gwl (m)	K Hydraulic Conductivity (m/s)	At 'Aquifer' Thickness (m BGS)	H ₀ Ambient Head above 'Aquitard' (m)	h _e Head above 'Aquitard' at Excavation (m)	Dd Drawdown (m)	R _i Sichardt Calculation (m)	R _i User Defined (m)	Q Groundwater Inflow (m ³ /d)					
S5	0.00	0.00	7.8E-09	5.0	5.0	1.0	4.0	1.1		0.3					
Maximum										0.3					
K Geometric Mean			7.8E-09	5.00	5.00	1.00	4.00	1.1		0.3					
K Arithmetic Mean			7.8E-09	5.00	5.00	1.00	4.00	1.1		0.3					
Uncertainty Factor		3	Maximum x SF		(K Geometric Mean) x SF		(K Arithmetic Mean) x SF								
Q Groundwater Inflow (m³/d)			1.0		1.0		1.0								
Uncertainty Factor		3	S(Maximum K x SF)		S(K Geometric Mean x SF)		S(K Arithmetic Mean x SF)								
R_i Radius of Influence, Sichert (m)			1.8		1.8		1.8								
Notes															
1 m BGS = metres below ground surface															
2 The user defined R _i is used for the calculation of groundwater inflow (Q) if specified															
3 Geometric mean calculation is applied only to the hydraulic conductivity (K) - other input parameters for the Dupuit and Sichardt equation use the arithmetic average															
4 The calculated groundwater inflows for the arithmetic and geometric mean both use the Sichardt R _i calculated from the respective mean K															
5 If the depth of the excavation is below the base of the 'Aquifer' then the head at the excavation is set at the top of the 'Aquitard' (i.e. h _e = 0)															
Comments															

Dewatering Rate Estimation - Unconfined Trench											wood.
Project No.: TP115086 / 1 / 6200 Project Name: Environmental Assessment Study of Arterial Roads within Hwy. 427 Industrial SPA47 Client: City of Brampton Location: Brampton, Ontario Description: Installation of box Culvert S17 across East-West Arterial using open-cut excavation Date: 19 April 2022										Performed by: Tomas Cihula Checked by: Nick Schmidt	
EXCAVATION INFO											
Length, l (m)	10.0										
Width, w (m)	9.0										
Depth (m BGS)	4.0										
Cross Section 						Plan View 					
Radius of Influence (R) calculated with the Sichardt equation $R_i = 3000(H_0 - h_e)\sqrt{K}$ Groundwater Inflow (Q) to the excavation calculated with the Dupuit solution combining: 1) radial steady-state for inflow to trench ends; and 2) linear steady-state for inflow to trench sides.											$Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_i + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_i}$
Bh	Gwl Measured Groundwater Level (m BGS)	Swl Estimated Seasonal Fluctuation above Gwl (m)	K Hydraulic Conductivity (m/s)	At 'Aquifer' Thickness (m BGS)	H0 Ambient Head above 'Aquitard' (m)	he Head above 'Aquitard' at Excavation (m)	Dd Drawdown (m)	Ri Sichardt Calculation (m)	Ri User Defined (m)	Q Groundwater Inflow (m³/d)	
S17	3.31	1.00	1.1E-07	5.0	2.7	1.0	1.7	1.7		0.9	
Maximum										0.9	
K Geometric Mean			1.1E-07	5.00	2.69	1.00	1.69	1.7		0.9	
K Arithmetic Mean			1.1E-07	5.00	2.69	1.00	1.69	1.7		0.9	
Uncertainty Factor		3	Maximum x SF		(K Geometric Mean) x SF		(K Arithmetic Mean) x SF				
Q Groundwater Inflow (m³/d)			2.8		2.8		2.8				
Uncertainty Factor		3	S(Maximum K x SF)		S(K Geometric Mean x SF)		S(K Arithmetic Mean x SF)				
Ri, Radius of Influence, Sichert (m)			2.9		2.9		2.9				
Notes											
1 m BGS = metres below ground surface											
2 The user defined Ri is used for the calculation of groundwater inflow (Q) if specified											
3 Geometric mean calculation is applied only to the hydraulic conductivity (K) - other input parameters for the Dupuit and Sichardt equation use the arithmetic average											
4 The calculated groundwater inflows for the arithmetic and geometric mean both use the Sichardt Ri, calculated from the respective mean K											
5 If the depth of the excavation is below the base of the 'Aquifer' then the head at the excavation is set at the top of the 'Aquitard' (i.e. he = 0)											
Comments											

Dewatering Rate Estimation - Unconfined Trench											
Project No.: TP115086 / 1 / 6200 Project Name: Environmental Assessment Study of Arterial Roads within Hwy. 427 Industrial SPA47 Client: City of Brampton Location: Brampton, Ontario Description: Installation of utilities beneath East-West Arterial using open-cut excavation Date: 19 April 2022						Performed by: Tomas Cihula Checked by: Nick Schmidt					
EXCAVATION INFO											
Length, l (m)						15.0					
Width, w (m)						3.0					
Depth (m BGS)						4.0					
Cross Section				Plan View							
Radius of Influence (R) calculated with the Sichardt equation $R_l = 3000(H_0 - h_e)\sqrt{K}$				$Q = \pi K \frac{(H_0^2 - h_e^2)}{\ln\left(\frac{2R_l + w}{w}\right)} + 2lK \frac{(H_0^2 - h_e^2)}{2R_l}$							
Groundwater Inflow (Q) to the excavation calculated with the Dupuit solution combining: 1) radial steady-state for inflow to trench ends; and 2) linear steady-state for inflow to trench sides.											
Bh	Gwl Measured Groundwater Level (m BGS)	Swl Estimated Seasonal Fluctuation above Gwl (m)	K Hydraulic Conductivity (m/s)	At 'Aquifer' Thickness (m BGS)	H ₀ Ambient Head above 'Aquitard' (m)	h _e Head above 'Aquitard' at Excavation (m)	Dd Drawdown (m)	R _l Sichardt Calculation (m)	R _l User Defined (m)	Q Groundwater Inflow (m ³ /d)	
S5	0.00	0.00	7.8E-09	5.0	5.0	1.0	4.0	1.1		0.3	
S17	3.31	1.00	1.1E-07	5.0	2.7	1.0	1.7	1.7		0.8	
Maximum										0.8	
K Geometric Mean			2.9E-08	5.00	3.85	1.00	2.85	1.5		0.5	
K Arithmetic Mean			5.9E-08	5.00	3.85	1.00	2.85	2.1		0.8	
Uncertainty Factor											
Q Groundwater Inflow (m ³ /d)		3	Maximum x SF		2.3	(K Geometric Mean) x SF		1.6	(K Arithmetic Mean) x SF		2.3
Uncertainty Factor		3	S(Maximum K x SF)		4.9	S(K Geometric Mean x SF)		2.5	S(K Arithmetic Mean x SF)		3.6
R _l Radius of Influence, Sichert (m)		3			4.9			2.5			3.6
Notes											
1 m BGS = metres below ground surface											
2 The user defined R _l is used for the calculation of groundwater inflow (Q) if specified											
3 Geometric mean calculation is applied only to the hydraulic conductivity (K) - other input parameters for the Dupuit and Sichardt equation use the arithmetic average											
4 The calculated groundwater inflows for the arithmetic and geometric mean both use the Sichardt R _l calculated from the respective mean K											
5 If the depth of the excavation is below the base of the 'Aquifer' then the head at the excavation is set at the top of the 'Aquitard' (i.e. h _e = 0)											
Comments											



wood.

Appendix D
Limitations

LIMITATIONS

1. The work performed in the preparation of this report and the conclusions presented are subject to the following:
 - (a) The Standard Terms and Conditions which form a part of our Professional Services Contract
 - (b) The Scope of Services
 - (c) Time and Budgetary limitations as described in our Contract
 - (d) The Limitations stated herein.
2. No other warranties or representations, either expressed or implied, are made as to the professional services provided under the terms of our Contract, or the conclusions presented.
3. The conclusions presented in this report were based, in part, on visual observations of the Site and attendant structures. Our conclusions cannot and are not extended to include those portions of the Site or structures, which are not reasonably available, in Wood's opinion, for direct observation.
4. The environmental conditions at the Site were assessed, within the limitations set out above, having due regard for applicable environmental regulations as of the date of the inspection. A review of compliance by past owners or occupants of the Site with any applicable local, provincial or federal by-laws, orders-in-council, legislative enactments and regulations was not performed.
5. The Site history research included obtaining information from third parties and employees or agents of the owner. No attempt has been made to verify the accuracy of any information provided, unless specifically noted in our report.
6. Where testing was performed, it was carried out in accordance with the terms of our contract providing for testing. Other substances, or different quantities of substances testing for, may be present on Site and may be revealed by different or other testing not provided for in our contract.
7. Because of the limitations referred to above, different environmental conditions from those stated in our report may exist. Should such different conditions be encountered, Wood must be notified in order that it may determine if modifications to the conclusions in the report are necessary.
8. The utilization of Wood's services during the implementation of any remedial measures will allow Wood to observe compliance with the conclusions and recommendations contained in the report. Wood's involvement will also allow for changes to be made as necessary to suit field conditions as they are encountered.
9. This report is for the sole use of the party to whom it is addressed unless expressly stated otherwise in the report or contract. Any use which any third party makes of the report, in whole or the part, or any reliance thereon or decisions made based on any information or conclusions in the report is the sole responsibility of such third party. Wood accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on the report or anything set out therein.
10. This report is not to be given over to any third party for any purpose whatsoever without the written permission of Wood.
11. Provided that the report is still reliable, and less than 12 months old, Wood will issue a third-party reliance letter to parties that the client identifies in writing, upon payment of the then current fee for such letters. All third parties relying on Wood's report, by such reliance agree to be bound by our proposal and Wood's standard reliance letter. Wood's standard reliance letter indicates that in no event shall Wood be liable for any damages, howsoever arising, relating to third-party reliance on Wood's report. No reliance by any party is permitted without such agreement.