REPORT

Hydrogeological Desktop Report

Airport Road from Braydon Boulevard/Stonecrest Drive to Countryside Drive City of Brampton

Submitted to:

HDR Inc.

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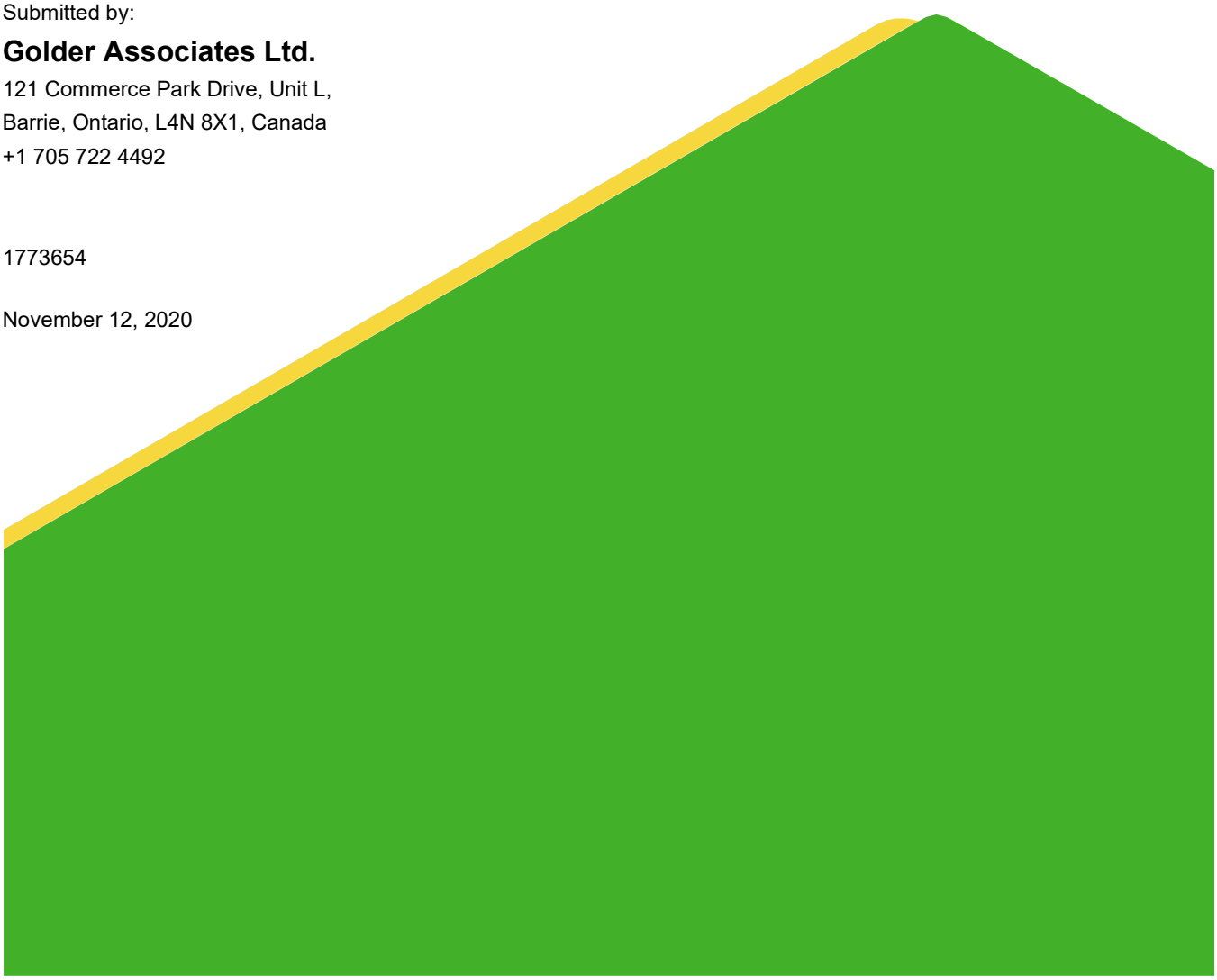
1773654

November 12, 2020



Distribution List

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1.0 INTRODUCTION

The Region of Peel (Region) intends to widen Airport Road (Regional Road 7) to six lanes and rehabilitate the existing lanes from 300 m south of Braydon Boulevard/Stonecrest Drive to 300 m north of Countryside Drive in the City of Brampton, a distance of approximately 2.2 km (the "Site", as shown in Figure 1). The Region has retained HDR Inc. (HDR) as the Design Consultant and HDR in turn has retained Golder Associates Ltd. (Golder) to carry out a desktop hydrogeological assessment in support of the preliminary design as part of a Schedule 'C' Class Environmental Assessment.

The terms of reference and scope of work for the investigation and design services were outlined in the Request for Proposal (RFP) 2017-079P, issued by the Region dated January 17, 2017, Addenda 1 to 2, and Golder's proposal to HDR dated February 8, 2017.

This report should be read in conjunction with the "Important Information and Limitations of this Report" attached at the end of the report in Appendix A The reader's attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report.

2.0 PROJECT UNDERSTANDING

The existing road consists of four through lanes with additional left and right turn lanes near intersections. The proposed improvements include widening to accommodate six through lanes and a centre median of varying widths. The purpose of the hydrogeological investigation was to conduct a preliminary desktop investigation into the existing groundwater conditions, identify potential water wells and septic beds in the vicinity of the Site, evaluate potential dewatering requirements, assess the potential for off-Site impacts associated with the proposed construction activities, and comment on the potential infiltration capacity of the native soil to support a Low Impact Development (LID) infiltration strategy.

3.0 GEOTECHNICAL INVESTIGATION

Golder conducted a geotechnical investigation at the Site during October and November 2019. The work included advancing a total of 42 boreholes to a depth of 1.5 m, advancing two deeper boreholes to a maximum depth of 8 m, collecting samples of the granular base, subbase and subgrade soils to assess the material characteristics including grain size distribution, Atterberg Limits and water content, and provide pavement analysis and design recommendation. The drilling locations are illustrated in Figure 2. The deep borehole logs are provided in Appendix B. Borehole BH18F-2 was completed with a standpipe piezometer to permit the collection of water level measurements.

4.0 TOPOGRAPHY AND DRAINAGE

The ground elevation along Airport Road slopes downward gradually to the southeast, mimicking the topography of the surrounding area. The ground surface declines from an elevation of about 225 masl at the intersection of Countryside Drive and Airport Road, to approximately 212 masl at the intersection of Stonecrest Drive and Airport Road, resulting in an average slope of 0.8% over a distance of 1.6 km. The entire stretch of Airport Road encompassed by the Site limits appears to be drained by the municipal storm sewer system which captures rainfall and surface runoff. Airport Road is bisected by two water features, both tributaries of the Humber River, which pass under Airport Road via culverts.

5.0 PHYSIOGRAPHY, GEOLOGY AND HYDROGEOLOGY

Chapman and Putnam (1984) provide information on the regional physiography; the information provided therein is summarized as follows. The Site is located near the boundary of the South Slope and Peel Plain physiographic regions. The South Slope region is the south slope of the Oak Ridges Moraine. In the area of the Site the slope is smoothed and scored at intervals by valley tributaries of the Humber River. There are no large, undrained depressions. Surface soil in the South Slope region generally consists of till derived from the underlying (shale) bedrock, occasionally overlain by clay deposits. In various areas the stream valleys are bordered by areas of sandy alluvium. The overburden is reportedly not deep, the till is dense, and there are few beds of sand to serve as aquifers.

Figure 2 presents a stratigraphic section along Airport Road, based on local borehole data available from the Ministry of the Environment, Conservation and Parks (MECP) Water Well Database. The borehole logs indicate that the majority of the surficial deposits (i.e. less than 10 m below grade) consist of clay or clay till. Borehole records indicate that surficial peat/loam deposits were historically encountered at several locations in the vicinity of the Site. It is expected that any surficial organic deposits were thereafter removed during the construction of Airport Road. A confined, sand and gravel aquifer is present in the area of Site, at a depth of between 10 to 15 mbgs. Based on water level data presented in the various well records, the hydrostatic head in the confined aquifer (at the time of measurement) ranged from about 215 masl at the north end of the Site to 208 masl at the south end of the Site. This correlates to a confined hydrostatic head at a depth of about 10 m below grade at the north end of the Site, and about 3 m below grade at the south end of the Site. The MECP records also indicate the depth to the shale bedrock in the area of the Site is approximately 20 mbgs.

Geological mapping by the Ontario Geological Survey (OGS; 2010) is provided in Figure 3. The surficial geology in the area is broadly consistent with the well drilling results, with the majority of the Site reportedly underlain by either glaciolacustrine silt and clay, or till derived from fine-grained glaciolacustrine deposits. The OGS mapping indicates an area of alluvial deposits of limited lateral extent is present at the north end of the Site, however the few drilling records within the indicated area did not report the presence of such material.

A standpipe piezometer was installed at borehole BH18-F2, in close proximity the stream feature bisecting the Site, to evaluate the groundwater level in the vicinity. The groundwater level at the piezometer was measured to be 3.2 m below the existing ground surface on January 7th, 2020, about 6 weeks after completion of drilling. These observations reflect the groundwater conditions encountered in the monitoring well during the time of the field investigation (January 2020). It is expected that the shallow groundwater surface (i.e. the water table) in the area of the Site reflects the surface topography, with groundwater flow from north to south. Shallow groundwater likely reports, at least locally, to the various surface water features.

6.0 WELL RECORDS

Appendix C presents the results of a MECP Water Well Information System database query. The database indicates a total of 42 water well records within a 500 m radius of the Site. Of the listed records:

- 13 were indicated as being for domestic water supply use;
- 2 were indicated as being for either stock or commercial water supply;
- 15 were indicated as either abandoned or not use;
- 6 were observation wells or test holes; and
- 1 was a municipal supply well.

Five of the records had no listed use and no detailed information. The depth of the various wells ranges from approximately 10 m to 30 m. Nearly all the wells listed for private water supply were drilled between the 1950s and 1970s. Based on the extent of development in the area, and the presence of infrastructure along the roadways (e.g. sewers, fire hydrants), it is assumed that all private property in the vicinity of the Site is connected to the municipal water supply system, and that the private supply wells listed in the database are no longer in use. Based on a review of the MECP Source Protection Information Atlas (MECP, 2020), the municipal well (drilled in 1949) is no longer active, and the MECP Permit to Take Water Mapping Database indicates no active water taking permits within approximately 5 km of the Site.

7.0 DISCUSSION

The project will consist of widening Airport Road from four to six lanes about the existing centreline, by shifting the curb locations by one lane on both sides. This will require partial depth replacement of the pavement structure, the relocation of catchbasins to the new curb locations, the installation of multi-use paths on both the east and west sides of Airport Road, and the relocation of the hydro poles on the west side of Airport Road. The improvements to Airport Road are not anticipated to require extensions of replacement of the existing concrete box culverts at the two tributary locations, nor is it anticipated that new drainage infrastructure (new storm sewer systems) will be required.

It is understood that subsurface infiltration trenches are proposed as part of the stormwater management system for the redevelopment (HDR, 2019). The trenches would be connected to, and receive water from, the storm sewer / catchbasin system. These trenches would underlie future boulevards on either side of the road and generally be installed at a depth of 1.5 to 2.0 m from finished grade with a trench width and depth of 1.0 m x 0.4 m. Specifics regarding pre-treatment, backfilled material, filter media and overflow conveyance has not been specified but is assumed to follow design guidance as provided in Low Impact Development Stormwater Management Planning and Design Guide (CVC, 2010).

7.1 Drilling Results

The borehole drilling results were consistent with publicly available geological information, and indicated the surficial deposits consisted of silty clay fill, overlying hard to very stiff silty clay till and silty clay. The available groundwater data suggests that the depth to the water table in the vicinity of the Site is on the order 3 m. Based on professional experience in Southern Ontario, it is expected that the water table elevation will fluctuate on the order of 1 to 2 m on a seasonal basis, and as such the shallow groundwater level may conservatively be expected to be shallower (e.g. 2 m below ground).

7.2 Infiltration Assessment

The use of LID infiltration features for stormwater storage and infiltration is being considered as part of the re-development, although final design details have not been confirmed. At this early stage Golder has been asked to comment on the general feasibility of employing infiltration trenches at the Site. To this end we note the following:

- It is anticipated that any infiltration features would be installed in areas above the water table but below the frost line, either in silty clay fill, or native silty clay deposits. As noted in Section 5.0, the depth to groundwater at the Site is anticipated to range from approximately 3 mbgs in the south, to 10 mbgs in the north, although the depth to water may be shallower due to seasonal fluctuations.

- The effectiveness of the infiltration trench will be in part dependent on the capacity of the surrounding soils to infiltrate water. The Low Impact Development Stormwater Management Planning and Design Guide (CVC, 2010) provides an approximate relationship between field saturated hydraulic conductivity (K_{fs}) and infiltration rate. No hydraulic conductivity testing was conducted as part of the current investigation; however, given the clay-based nature of the soils we would expect a K_{fs} at the low end of the range. The correlation in CVC (2010) (Appendix C, Table C1) has a lower K_{fs} limit of 1 x 10^{-8} m/s, for which the corresponding infiltration rate is indicated to be 12 millimetres per hour.
- Should LIDs be pursued at the Site, we concur with CVC (2010) which states that to "verify native soil infiltration rates it is strongly recommended that infiltration tests be carried out with a permeameter".

7.3 Dewatering Evaluation

The native clay-based surficial deposits at the Site are expected to have saturated hydraulic conductivity values on the order of 1 x 10^{-8} to 1 x 10^{-10} m/s (Freeze and Cherry, 1979). Shallow excavations into such material, assuming the excavations are below the water table, would be expected to have limited groundwater influx, and could typically be managed using in-pit controls (i.e. pumps and sumps) rather than an active dewatering system. Deeper excavations may also be manageable by in-excavation controls depending on their size and depth; however the presence of the deeper confined aquifer may pose a risk to excavation stability and would need to be evaluated for the potential need for depressurization. In the event alterations are required to the culvert structures, any associated dewatering activities (e.g. foundation installation, excavation adjacent to the stream) must consider the potential for impacts to the nearby surface water features. Based on the observed presence of municipal water supply servicing and (presumed) sanitary sewer servicing in the vicinity of the Site, it is considered unlikely that any extant private wells or septic bed systems are active in this area and are thus not a concern for project impact assessment.

In the event that dewatering or depressurization is required at the Site, assuming removal of greater than 50,000 L of groundwater per day (or combined groundwater and surface water), either an Environmental Activity and Sector Registry (EASR; for volumes less than 400,000 L/day) or Permit to Take Water (PTTW; for volumes more than 400,000 L/day) would be required from the MECP. Obtaining MECP approval for a PTTW can take up to three months; therefore, an allowance for this time should be included for in the overall planning process.

The above section provides a preliminary and general assessment of potential dewatering concerns based on the current results of the desktop hydrogeology assessment. The dewatering requirements should be re-assessed during detailed design, once design details and construction plans are available.

8.0 CLOSURE

We trust this report meets your current requirements; should you have any further questions please do not hesitate to contact the undersigned.

Signature Page

Golder Associates Ltd.

David Dillon, M.Sc., P.Geo.
Hydrogeologist

Devin Hannan, P.Eng.
Associate, Environmental Engineer

DD/DH/lb

9.0 REFERENCES

Chapman, L.J. and D.F. Putnam. 1984. The Physiography of Southern Ontario, Third Edition. Ministry of Natural Resources.

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Freeze, R.A. and J.A. Cherry. 1979. Groundwater. Prentice-Hall Publishing.

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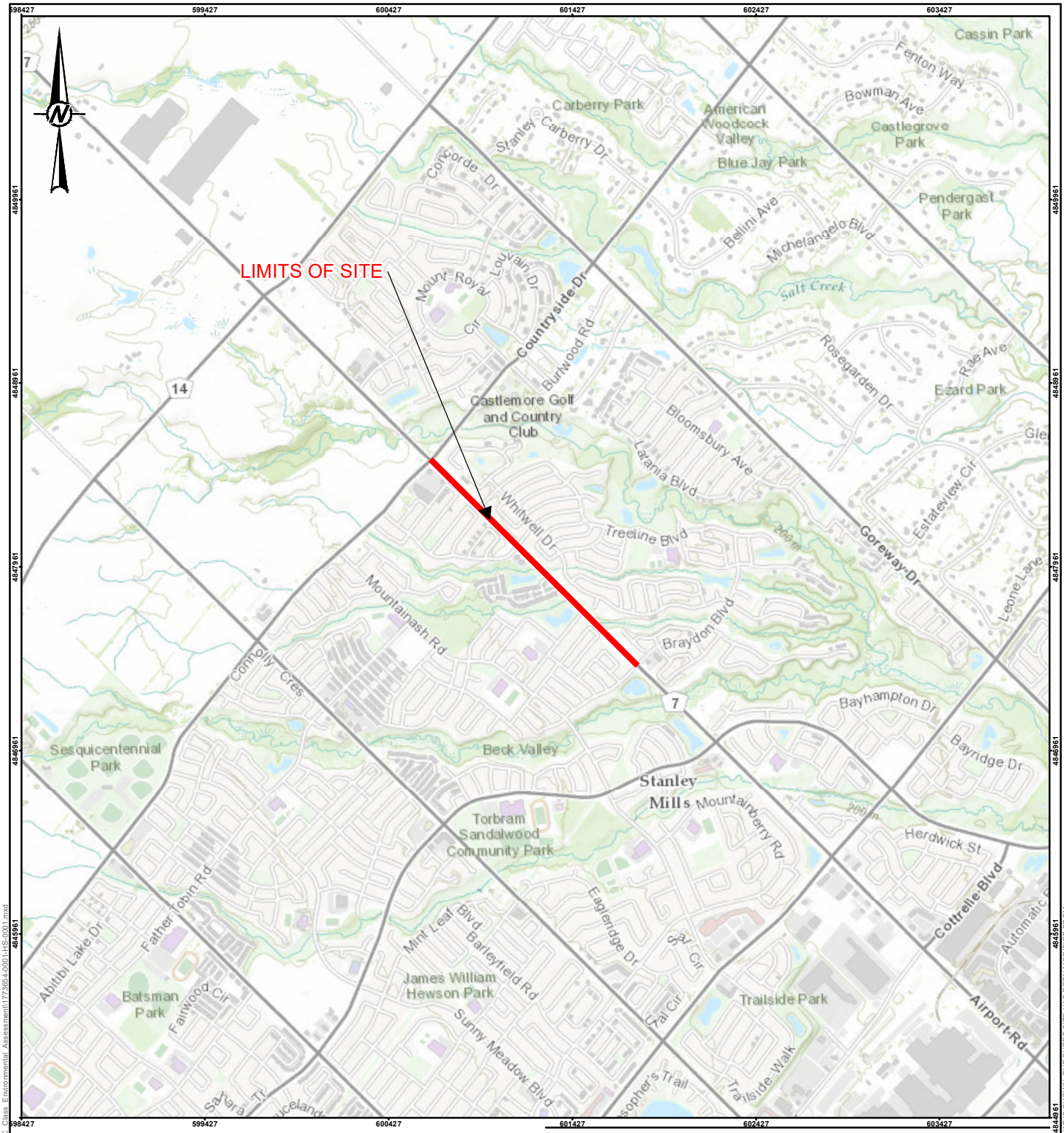
Ontario Geological Survey 2010. Surficial geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 128-REV

Figures



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PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
HDR CORPORATION

PROJECT
SCHEDULE 'C' CLASS ENVIRONMENTAL ASSESSMENT
AIRPORT ROAD FROM BRAYDON BOULEVARD TO COUNTRYSIDE DRIVE
CITY OF BRAMPTON, ONTARIO

TITLE
KEY PLAN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-01-21
DESIGNED	
PREPARED	MK
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
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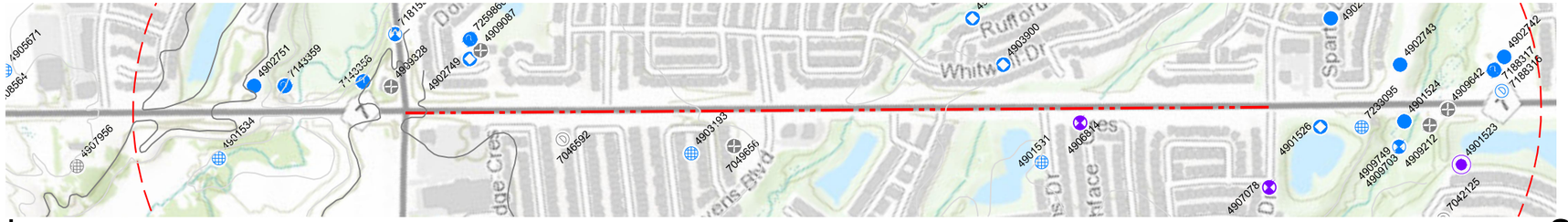

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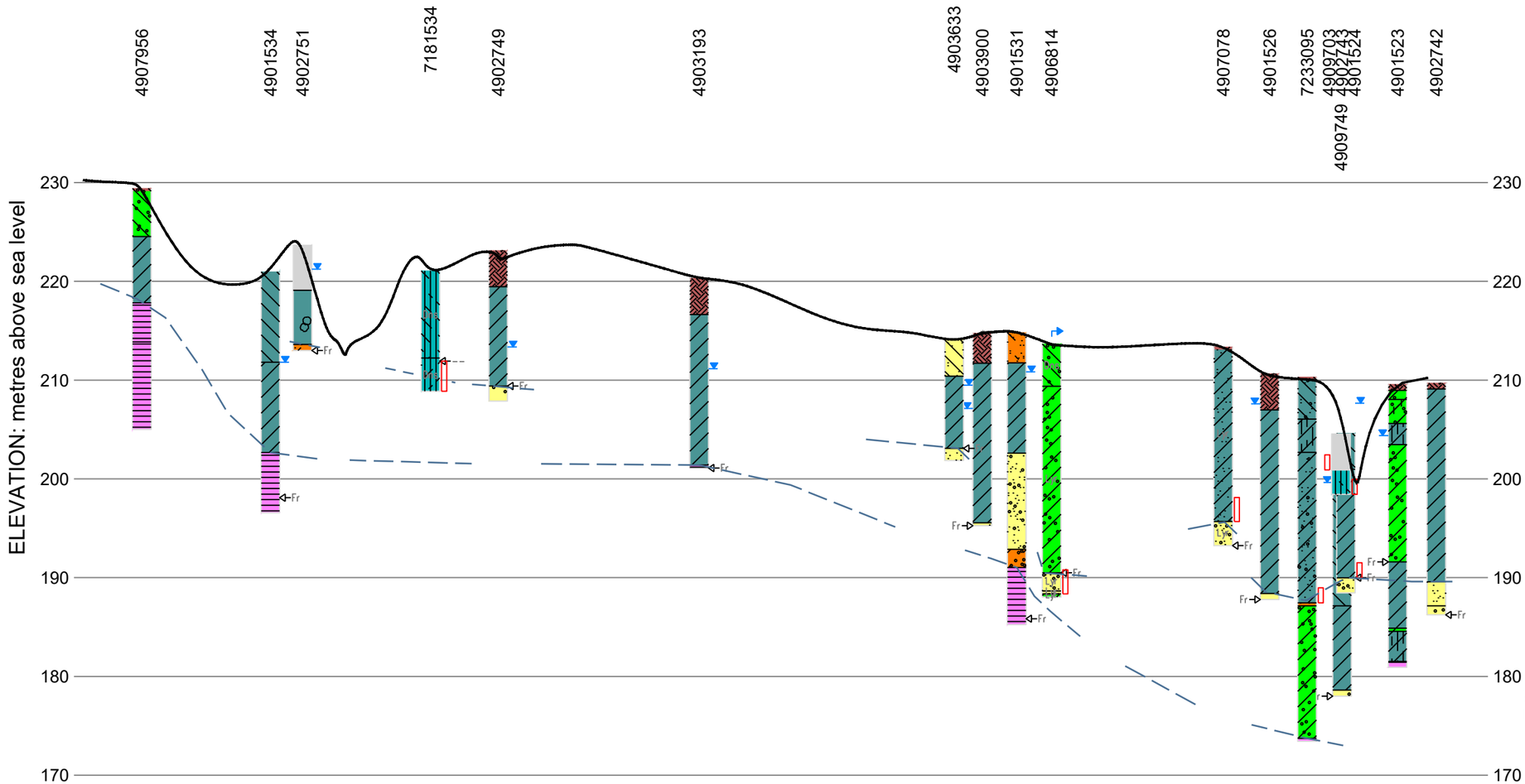

PLAN LEGEND

- Shallow Dug or Bored <10 m
- Sandpoint
- Deep Bored Well >10 m
- Drilled Overburden Well
- Test or Observation Well
- Drilled Bedrock Well
- Municipal / Public Supply
- Record of Abandonment
- Information Unrecorded
- Municipal Observation Well

SOIL PATTERN LEGEND AND GENERIC SHADING

- Unoxidized Clay Blue, Grey White, or Undefined
- Oxidized Clay Brown, Red, Yellow
- Silt
- Sand
- Gravel
- Stones, Pebbles
- Boulder
- Till
- Shale
- Limestone
- Unknown
- Peat/loam
- Sands & Gravels
- Granular Till
- Silt
- Silt Clayey
- Clay
- Till
- Limestones
- Shales

SECTION WELL SYMBOLS

- 23453 MOE Recorded Private Well
- Recorded Static Water Level
- Flowing Well
- Water Producing Zone
- Screen

NOTES:

Ministry of Environment Water Well Information System, Queen's Printer.
Location and elevations of field verified wells are subject to revision.

Boundaries between soil strata have been determined only at well and test well locations. Between the wells and test wells, boundaries are not proven but are assumed from geological evidence.

0 200 400 600 m

1:10000

Plotted 11x17" Tabloid

Projection is UTM NAD 83 Zone 17

CLIENT
HDR CORPORATION

PROJECT
HYDROGEOLOGICAL AND GEOTECHNICAL INVESTIGATIONS
AIRPORT ROAD FROM BRAYDON BLVD TO COUNTRYSIDE DR
CITY OF BRAMPTON, ONTARIO

TITLE
CROSS-SECTION A - A'

CONSULTANT
GOLDER

YYYY-MM-DD	2020-04-06
DESIGNED	----
PREPARED	JPR
REVIEWED	DPD
APPROVED	AO

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LEGEND

- 3 PALEOZOIC BEDROCK
- 5D CLAY TO SILT-TEXTURED TILL (DERIVED FROM GLACIOLACUSTRINE DEPOSITS OR SHALE)
- 20 ORGANIC DEPOSITS
- 9C FORESHORE AND BASINAL DEPOSITS
  19 MODERN ALLUVIAL DEPOSITS
- 8B INTERBEDDED SILT AND CLAY AND GRITTY, PEBBLY FLOW TILL AND RAINOUT DEPOSITS

0 500 1,000

1:20,000 METRES

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2019
SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
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PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
HDR CORPORATION

PROJECT
HYDROGEOLOGICAL ASSESSMENT
AIRPORT ROAD FROM BRAYDON BOULEVARD TO COUNTRYSIDE DRIVE
CITY OF BRAMPTON, ONTARIO

TITLE
SURFICIAL GEOLOGY

CONSULTANT
GOLDER

YYYY-MM-DD	2020-06-09
DESIGNED	
PREPARED	STB
REVIEWED	DD
APPROVED	

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APPENDIX A

Report Limitations

IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder cannot be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client can not rely upon the electronic media versions of Golder's report or other work products.

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

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Ground Water Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

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

Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

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

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

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

APPENDIX B

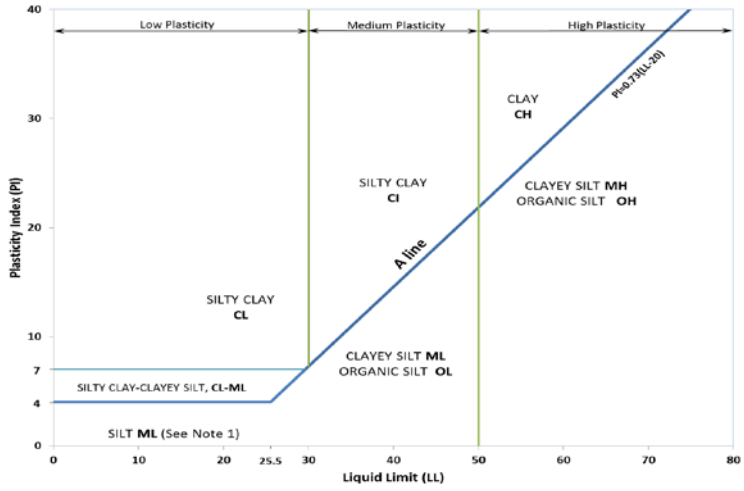
Borehole Logs

METHOD OF SOIL CLASSIFICATION

The Golder Associates Ltd. Soil Classification System is based on the Unified Soil Classification System (USCS)

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} x D_{60}}$	Organic Content	USCS Group Symbol	Group Name
INORGANIC (Organic Content ≤30% by mass)	COARSE-GRAINED SOILS (>50% by mass is larger than 0.075 mm)	GRAVELS (>50% by mass of coarse fraction is larger than 4.75 mm)	Gravels with ≤12% fines (by mass)	Poorly Graded	<4	≤1 or ≥3	≤30%	GP	GRAVEL
				Well Graded	≥4	1 to 3		GW	GRAVEL
			Gravels with >12% fines (by mass)	Below A Line	n/a			GM	SILTY GRAVEL
				Above A Line	n/a			GC	CLAYEY GRAVEL
		SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	Sands with ≤12% fines (by mass)	Poorly Graded	<6	≤1 or ≥3		SP	SAND
				Well Graded	≥6	1 to 3		SW	SAND
			Sands with >12% fines (by mass)	Below A Line	n/a			SM	SILTY SAND
				Above A Line	n/a			SC	CLAYEY SAND

Organic or Inorganic	Soil Group	Type of Soil	Laboratory Tests	Field Indicators					Organic Content	USCS Group Symbol	Primary Name
				Dilatancy	Dry Strength	Shine Test	Thread Diameter	Toughness (of 3 mm thread)			
INORGANIC (Organic Content ≤30% by mass)	FINE-GRAINED SOILS (≥50% by mass is smaller than 0.075 mm)	SILTS (Non-Plastic or PI and LL plot below A-Line on Plasticity Chart below)	Liquid Limit <50	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	<5%	ML	SILT
				Slow	None to Low	Dull	3mm to 6 mm	None to low	<5%	ML	CLAYEY SILT
				Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT
			Liquid Limit ≥50	Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	<5%	MH	CLAYEY SILT
				None	Medium to high	Dull to slight	1 mm to 3 mm	Medium to high	5% to 30%	OH	ORGANIC SILT
		CLAYS (PI and LL plot above A-Line on Plasticity Chart below)	Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	0% to 30% **(see Note 2)**	CL	SILTY CLAY
			Liquid Limit 30 to 50	None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium		CI	SILTY CLAY
			Liquid Limit ≥50	None	High	Shiny	<1 mm	High		CH	CLAY
HIGHLY ORGANIC SOILS (Organic Content >30% by mass)		Peat and mineral soil mixtures							30% to 75%	PT	SILTY PEAT, SANDY PEAT
		Predominantly peat, may contain some mineral soil, fibrous or amorphous peat							75% to 100%		PEAT



Note 1 – Fine grained materials with PI and LL that plot in this area are named (ML) SILT with slight plasticity. Fine-grained materials which are non-plastic (i.e. a PL cannot be measured) are named SILT.
Note 2 – For soils with <5% organic content, include the descriptor "trace organics" for soils with between 5% and 30% organic content include the prefix "organic" before the Primary name.

Dual Symbol — A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC and CL-ML.
For non-cohesive soils, the dual symbols must be used when the soil has between 5% and 12% fines (i.e. to identify transitional material between "clean" and "dirty" sand or gravel.
For cohesive soils, the dual symbol must be used when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart (see Plasticity Chart at left).

Borderline Symbol — A borderline symbol is two symbols separated by a slash, for example, CL/CI, GM/SM, CL/ML.
A borderline symbol should be used to indicate that the soil has been identified as having properties that are on the transition between similar materials. In addition, a borderline symbol may be used to indicate a range of similar soil types within a stratum.

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY AND MINOR CONSTITUENTS

Percentage by Mass	Modifier
>35	Use 'and' to combine major constituents (*i.e.,* SAND and GRAVEL)
> 12 to 35	Primary soil name prefixed with "gravelly, sandy, SILTY, CLAYEY" as applicable
> 5 to 12	some
≤ 5	trace

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.). Values reported are as recorded in the field and are uncorrected.

Cone Penetration Test (CPT)

An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); N_d:

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

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DD	Diamond Drilling
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
GS	Grab Sample
MC	Modified California Samples
MS	Modified Shelby (for frozen soil)
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size (Shelby tube)
TP	Thin-walled, piston – note size (Shelby tube)
WS	Wash sample

SOIL TESTS

w	water content
PL , w_p	plastic limit
LL , w_L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests anisotropically consolidated prior to shear are shown as CAD, CAU.

NON-COHESIVE (COHESIONLESS) SOILS

Compactness[2]

Term	SPT 'N' (blows/0.3m)[1]
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

1. SPT 'N' in accordance with ASTM D1586, uncorrected for the effects of overburden pressure.
2. Definition of compactness terms are based on SPT 'N' ranges as provided in Terzaghi, Peck and Mesri (1996). Many factors affect the recorded SPT 'N' value, including hammer efficiency (which may be greater than 60% in automatic trip hammers), overburden pressure, groundwater conditions, and grainsize. As such, the recorded SPT 'N' value(s) should be considered only an approximate guide to the soil compactness. These factors need to be considered when evaluating the results, and the stated compactness terms should not be relied upon for design or construction.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

COHESIVE SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N'[1,2] (blows/0.3m)
Very Soft	<12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.
2. SPT 'N' values should be considered ONLY an approximate guide to consistency; for sensitive clays (e.g., Champlain Sea clays), the N-value approximation for consistency terms does NOT apply. Rely on direct measurement of undrained shear strength or other manual observations.

Water Content

Term	Description
w < PL	Material is estimated to be drier than the Plastic Limit.
w ~ PL	Material is estimated to be close to the Plastic Limit.
w > PL	Material is estimated to be wetter than the Plastic Limit.

LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
ln x	natural logarithm of x
$\log_{10}$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
υ	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

* Density symbol is ρ. Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

(a) Index Properties (continued)

w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index = $(w_l - w_p)$
NP	non-plastic
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
c_v	coefficient of consolidation (vertical direction)
c_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = tan δ
c'	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p′	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

Notes: 1 $\tau = c' + \sigma' \tan \phi'$

2 shear strength = (compressive strength)/2

PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18F-1

SHEET 1 OF 1

LOCATION: SEE BOREHOLE LOCATION PLAN

BORING DATE: November 22, 2019

DATUM:

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○; 20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE									
0	MINIMOLE 102 mm SOLID STEM AUGER	TOPSOIL (51mm thick)		0.00 / 0.05							
		FILL - (CL) SILTY CLAY, some sand, some gravel; brown, rootlets; cohesive, w~PL, firm			1	SS	5				
1					2	SS	7				
		FILL - (OH) clayey ORGANIC SILT, some sand; dark brown; cohesive, w>PL, very stiff		1.37							
2					3	SS	17				
		(CL/ML) SILTY CLAY to CLAYEY SILT, some sand some gravel; brown, oxidation stains (TILL); cohesive, w<PL, hard		2.13	4	SS	15				
3					5	SS	31				
4		(CL) SILTY CLAY, trace sand, some gravel; grey (TILL); cohesive, w<PL, very stiff		4.04							
					6	SS	20				
5											
6					7	SS	19				
		END OF BOREHOLE		6.55							
7		NOTE:									
		1. Borehole was dry upon completion of drilling.									
8											
9											
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED:

CHECKED:

GTA-BHS 001 S:\CLIENTS\HDR_CORPORATION\BRAMPTON\02_DATA\GINT\1773654.GPJ GAL-MIS.GDT 20-1-23 NP

PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18F-2

SHEET 1 OF 1

LOCATION: SEE BOREHOLE LOCATION PLAN

BORING DATE: November 22, 2019

DATUM:

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE									
0	MINIMOLE 102 mm SOLID STEM AUGER	TOPSOIL (64mm thick)		0.00 / 0.06							
		FILL - (CL) SILTY CLAY, some sand, some gravel; brown; cohesive, w~PL, soft to firm -Rootlets found between the depths of 0 m and 0.61 m			1	SS	4				
1					2	SS	6				
					3	SS	8				
2		(CL/ML) SILTY CLAY to CLAYEY SILT, some sand, some gravel; brown (TILL); cohesive, w<PL, very stiff		2.13							Bentonite
					4	SS	25				
3					5	SS	31				January 7, 2020
4		(CL) SILTY CLAY, trace to some sand, trace gravel; grey; cohesive, w~PL to w>PL, very stiff to stiff		4.04							Sand
					6	SS	20				
5											
6											Sand and Screen
					7	SS	15				
7											
					8	SS	13				
8		END OF BOREHOLE		8.08							
9		NOTES: 1. Borehole was dry upon completion of drilling. 2. Groundwater level measured in monitoring well as follows: Date 07-Jan-20 Depth (m) 3.17 Elevation (m)									
10											

DEPTH SCALE

1 : 50

GOLDER

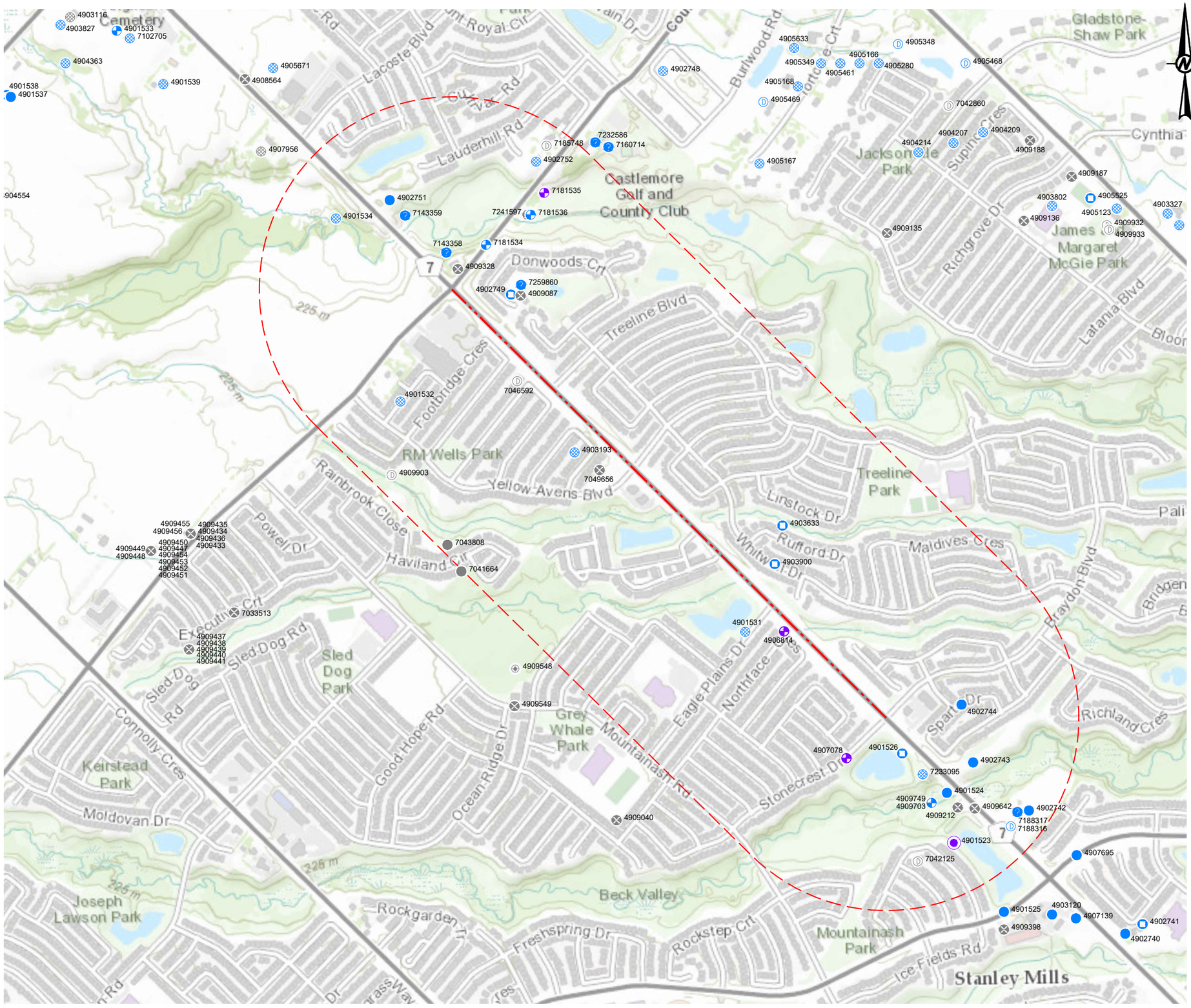
LOGGED:

CHECKED:

GTA-BHS 001 S:\CLIENTS\HDR_CORPORATION\BRAMPTON\02_DATA\GINT\1773654.GPJ GAL-MIS.GDT 20-1-23 NP

APPENDIX C

MECP Water Well Database Information



MAP KEY

PLAN LEGEND

- Development Boundary
- Shallow Dug or Bored <10 m
- Sandpoint
- Deep Bored Well >10 m
- Drilled Overburden Well
- Test or Observation Well
- Drilled Bedrock Well
- Municipal Observation Well
- Municipal / Public Supply
- Test Pit
- Dewatering Well
- Dewatering Point
- Test Borehole
- Monitoring Well
- Record of Abandonment
- Information Unrecorded

REFERENCES & DISCLAIMERS

Ministry of Environment Water Well Information System, Queen's Printer.
Location and elevations of mapped wells are subject to revision based on drill record or field verification.

Boundaries between soil strata have been determined only at well and test well locations. Between the wells and test wells, boundaries are not proven but are assumed from geological evidence.

Alignment of orthographic imagery is approximated to select features on Datum. Away from points of alignment the orthographic image may be dimensionally skewed or projected off the map Datum plane.

0 200 400 600 m

1:10000

Plotted 11x17" Tabloid

Projection is UTM NAD 83 Zone 17

CLIENT
HDR CORPORATION

PROJECT
HYDROGEOLOGICAL AND GEOTECHNICAL INVESTIGATIONS
AIRPORT ROAD FROM BRAYDON BLVD TO COUNTRYSIDE DR
CITY OF BRAMPTON, ONTARIO

TITLE
RECORDED WELLS

CONSULTANT
GOLDER

YYYY-MM-DD	2020-04-06
DESIGNED	
PREPARED	JPR
REVIEWED	DPD
APPROVED	AO

PROJECT NO.	CONTROL	REV.	FIGURE
1773654	0003	----	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25 mm

Path: \\golder.gds\comp\ekdata\office\mississauga\aim\Clients\HDR_Corporation\Brampton\99_PROJ\1773654\40_PROD\0003_HydroG\ | File Name: 1773654-0003-CH-0001.dwg | Last Edited By: jregier Date: 2020-04-06 Time:9:37:42 AM | Printed By: jregier Date: 2020-06-26 Time:11:43:54 AM

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
4901523	6 12	Jul-49	601960 4847099	209.7	18.0	Fr			5.2	91			4620 CT	WS MU	**MOE# 4901523** 0.0 TPSL 0.6 CLAY GRVL BLDR 1.5 CLAY GRVL HPAN 4.0 HPAN CLAY GRVL 6.1 CLAY GRVL 18.0 CLAY 24.7 CLAY GRVL 25.0 HPAN CLAY GRVL 28.0 BLUE SHLE 28.7
4901524	6 12	Oct-62	601942 4847229	204.5	14.6	Fr	13.1	-1.5	-3.0	91	240	5.5	4610 CT	WS DO	**MOE# 4901524** 0.0 BRWN CLAY 3.7 BLUE CLAY 14.6 MSND GRVL 16.2
4901526	6 13	Apr-63	601826 4847331	210.6	22.9	Fr			3.0	45			1307 BR	WS DO	**MOE# 4901526** 0.0 BRWN TPSL CLAY 3.7 GREY CLAY 22.3 GRVL 22.9
4901531	6 14	Sep-67	601418 4847647	214.9	29.0	Fr			4.0	14	120	29.6	2643 CT	WS ST	**MOE# 4901531** 0.0 BRWN MSND CLAY 3.0 BLUE CLAY 12.2 MSND GRVL 21.9 GRVL CLAY 23.8 BLUE SHLE 29.6
4901532	6 15	Jul-66	600523 4848245	230.1	19.5	Fr			9.1	14			1307 BR	WS DO	**MOE# 4901532** 0.0 BRWN TPSL CLAY 3.7 GREY CLAY 13.7 MSND 14.0 GREY CLAY 17.7 GREY SHLE 19.5
4901534	6 16	May-52	600355 4848720	221.0	22.9	Fr			9.1	14	120	24.4	4610 CT	WS DO	**MOE# 4901534** 0.0 BRWN CLAY 9.1 BLUE CLAY 18.3 BLUE SHLE 24.4
4902742	7 12	Aug-62	602155 4847183	209.7	23.5	Fr			NR				1612 CT	WS DO	**MOE# 4902742** 0.0 TPSL 0.6 BLUE CLAY 20.1 SAND 22.6 GRVL 23.5
4902743	7 13	Nov-65	602010 4847308	201.2	23.2	Fr			1.5	9	150	23.2	1612 CT	WS DO	**MOE# 4902743** 0.0 TPSL 0.6 BRWN CLAY 14.0 BLUE CLAY 22.6 BLUE GRVL 23.2
4902744	7 13	Sep-67	601980 4847458	209.7	21.9	Fr	20.7	-1.2	4.6	27	180	19.8	3512 CT	WS DO	**MOE# 4902744** 0.0 TPSL 0.3 YLLW CLAY 5.5 BLUE CLAY 21.3 SAND GRVL 22.9
4902749	7 15	Sep-65	600810 4848523	223.1	13.7	Fr			9.8	45			1307 BR	WS CO	**MOE# 4902749** 0.0 BRWN TPSL 3.7 GREY CLAY 13.7 GRVL 15.2
4902751	7 16	Sep-61	600495 4848768	223.7	10.7	Fr			2.4	5	60	10.7	4610 CT	WS DO	**MOE# 4902751** 0.0 PRDG 4.6 BLDR 10.1 SAND GRVL CLAY 10.7
4902752	7 16	Mar-64	600875 4848868	220.1	13.7	Fr			9.1				1307 BR	WS DO	**MOE# 4902752** 0.0 BRWN TPSL 5.5 GREY CLAY 12.2 GREY SHLE 13.7
4903193	6 15	Mar-69	600975 4848113	220.4	19.2	Fr			9.1				1307 BR	WS DO	**MOE# 4903193** 0.0 BRWN TPSL 3.7 GREY CLAY 18.9 GREY SHLE 19.2
4903633	7 14	Jun-71	601515 4847923	214.0	11.0	Fr			4.6	45	60	11.0	1307 BR	WS DO	**MOE# 4903633** 0.0 BRWN OBDN MSND 3.7 GREY CLAY 11.0 GREY MSND 12.2
4903900	7 14	Oct-72	601495 4847823	214.9	19.5	Fr			7.6	227	60	10.7	1307 BR	WS DO	**MOE# 4903900** 0.0 BRWN TPSL SAND 3.0 GREY CLAY 19.2 GREY SAND 19.5

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
4906814	6 14	Sep-87	601519 4847648	213.7	23.2 Fr	22.9 -2.4	FLW	336	5999	17.7	3903 RC	TH MU	**MOE# 4906814** 0.0 BRWN CLAY STNS DNSE 4.3 GREY CLAY STNS LYRD 23.2 GREY SAND GRVL LYRD 25.0 GREY SAND GRVL LYRD 25.3 GREY CLAY SHLE LYRD 25.6
4907078	6 14	Aug-88	601681 4847319	213.4	20.1 Fr	15.2 -2.4	NR	18	480		3903 RC	TH MU	**MOE# 4907078** 0.0 BRWN TPSL DNSE 0.3 GREY CLAY SAND LYRD 17.7 GREY SAND GRVL LYRD 20.1
4909087	6 15	Oct-02	600835 4848520	223.7			NR				1663 OTH	AB NU	**MOE# 4909087** 0.0
4909212	6 13	Jul-03	601970 4847191	206.3			NR				4011 -	AB NU	**MOE# 4909212** 0.0
4909328	6 15	Dec-03	600672 4848589	225.2			NR				6875 -	AB NU	**MOE# 4909328** 0.0
4909642	7 12	Sep-04	602014 4847188	207.0			NR				6607 BR	AB NU	**MOE# 4909642** 0.0
4909703	8 13	Mar-05	601902 4847203	204.5		2.1 -1.5	NR				7147 -	AB -	**MOE# 4909703 TAG#A019621** 0.0 3.7
4909749	8 13	Jan-05	601902 4847203	202.1		2.1 -1.5	NR				7147 OTH	OW NU	**MOE# 4909749 TAG#A019621** 0.0 BLCK SILT TPSL 0.3 BRWN SILT CLAY 3.7
4909903	8 10	Aug-05	600500 4848054	220.4	2.1 Un		NR				6875 DG	AB NU	**MOE# 4909903** 0.0
7041664	6 15	Feb-07	600681 4847804	222.2	3.0 Fr		NR				7147 -	AB -	**MOE# 7041664** 0.0 14.0 11.9 10.1
7042125	6 11	Feb-07	601866 4847051	212.8			NR				4011 -	AB -	**MOE# 7042125** 0.0 21.6 12.2 11.9 1.8 1.8 0.0
7043808	6 15	Apr-07	600645 4847873	221.0	3.0 Fr		NR				7147 OTH	AB -	**MOE# 7043808** 0.0 4.9
7046592		May-07	600826 4848298	221.9	1.5 Fr		NR				6875 DG	AB NU	**MOE# 7046592** 0.0
7049656	6 14	Jul-07	601040 4848067	218.5			1.5				7219 -	AB NU	**MOE# 7049656 TAG#A060383** 0.0
7143358	7 16	Jan-10	600642 4848632	218.2			NR				3108 -	- NU	**MOE# 7143358** 0.0
7143359	7 16	Jan-10	600535 4848728	214.9			NR				3108 -	- NU	**MOE# 7143359** 0.0
7160714		Dec-10	601063 4848906	218.8			NR				6988 -	- -	**MOE# 7160714 TAG#A098140** 0.0
7181534		Jan-12	600745 4848652	221.0	9.1 Un	9.1 -3.0	NR				7472 -	OW MO	**MOE# 7181534 TAG#A128584** 0.0 BRWN SILT CLAY DNSE 8.8 GREY SILT CLAY DNSE 12.2
7181535		Jan-12	600896 4848787	214.0	6.1 Un	4.3 -3.0	NR				7472 -	OW MU	**MOE# 7181535 TAG#A128625** 0.0 BRWN SILT CLAY PCKD 4.6 GREY SHLE HARD 7.3
7181536		Jan-12	600861 4848730	210.3	2.4 Un	9.1 -3.0	NR				7472 -	OW MO	**MOE# 7181536 TAG#A128626** 0.0 BRWN SILT CLAY LOOS 2.1 BRWN SAND SILT PCKD 6.1 BRWN SAND GRVL PCKD 12.2

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
7185748	7 16	Aug-12	600902 4848909	223.1	3.0 Fr		NR				7147 -	AB -	**MOE# 7185748** 0.0
7188316	7 12	Sep-12	602108 4847142	208.8			NR				7147 -	- -	**MOE# 7188316** 0.0
7188317	7 12	Sep-12	602125 4847179	208.8			NR				7147 -	- -	**MOE# 7188317** 0.0
7232586		Oct-14	601029 4848918	220.7			NR				4102 -	- -	**MOE# 7232586** 0.0
7233095	6 13	Jul-14	601879 4847277	210.3		21.3 -1.5	NR	23	80	14.6	1663 RC	WS DO	**MOE# 7233095 TAG#A147005** 0.0 BRWN TPSL 0.3 BRWN CLAY SNDY GRVL 4.3 GREY CLAY SLTY GRVL 7.6 GREY CLAY SNDY GRVL 22.9 GREY SAND GRVL CLAY 23.2 GREY CLAY GRVL 36.6 GREY SHLE 36.9
7241597		May-15	600853 4848730	210.6			NR				4102 -	AB -	**MOE# 7241597** 0.0
7259860		Dec-15	600836 4848548	223.4			NR				7230 -	- -	**MOE# 7259860 TAG#A199763** 0.0

QUALITY:

Fr	Fresh
Mn	Mineral
Sa	Salty
Su	Sulphur
--	Unrecorded

TYPE:

WS	Water Supply
AQ	Abandoned Quality
AS	Abandoned Supply
AB	Abandonment Record
TH	Test Hole or Observation

USE:

CO	Comercial
DO	Domestic
MU	Municipal
PU	Public
ST	Stock
NU	Not Used
IR	Irrigation
AL	Alteration
MO	Monitoring
-	Not Recorded

METHOD :

CT	Cable Tool
JT	Jetting
RC	Rotary Conventional
RA	Rotary Air
BR	Boring

Easting and Northings UTM NAD 83 Zone 17, Translated from Recorded UTM NAD, subject to Field Verified Location or Improved Location Accuracy.

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