Triple Crown Line Development Inc.

Geotechnical Investigation
Proposed Residential Development
Airport Road and Cranston Drive
Caledon East, Ontario

Project Number
BRM-00235186-D0

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1. Introduction

This report presents the results of a geotechnical investigation carried out for a proposed residential development on the east side of Airport Road and straddling the intersection with Cranston Drive in Caledon East, Ontario. The site occupies an area of approximately 44 hectares (~110 acres). The work was authorized by Mr. Jordan Archer of Triple Crown Line Development Inc.

The project involves the design and construction of single family residential dwellings together with the necessary municipal infrastructure such as roads, sewers, water and other services and a potential stormwater management pond.

The purpose of the geotechnical investigation was to determine the subsurface soil and groundwater conditions at the site and, based on this information, to provide an engineering report with geotechnical recommendations pertaining to the design and construction of the proposed residential development.

The comments and recommendations given in this report are based on the assumption that the above-described design concept will proceed into construction. If changes are made either in the design phase or during construction, this office must be retained to review these modifications. The result of this review may be a modification of our recommendations or it may require additional field or laboratory work to check whether the changes are acceptable from a geotechnical viewpoint.

2. Site Description

The Site occupies an area east of Airport Road, north of the farmland located at address 15521 Airport Road, and south of the commercial plaza located at 15771 Airport Road, in Caledon East, Ontario, as shown on Figure 1. The Site is irregular in shape and occupies an area of approximately 44 hectares (~110 acres).

The majority of the Site consists of an open field, largely covered in soya bean plants. The north, east, and southeast boundaries of the property consist of a tree-line, which extends into a forested area in the southeast corner of the property. In general, the Site property and surrounding area appeared to rise from south to north, though the topography was found to undulate significantly across the Site. The south-central and east sides of the property slope sharply downward toward unnamed streams in valley lands which flow into Innis Lake southeast of the Site. The property comprises mainly farmland and is currently developed with two (2) residential dwellings and nine (9) major outbuildings.

3. Fieldwork

The field work comprised drilling of sixty-three (63) sampled boreholes designated Boreholes 1 to 27, 29, 31 to 36, 38 to 47 and 49 to 67. It should be noted that Boreholes 28, 30, 37 and 48 were eliminated from the program by the Client. Boreholes 1 to 4, 66 and 67 were drilled in the valley lands near the toes of slopes located at the south and east boundaries of the site. 50 mm diameter monitoring wells were installed in Boreholes 2, 6, 7, 20, 23, 25, 36, 39, 41, 56, 59, 61, 66 and 67. Nested configurations comprising deep and shallow monitoring wells were installed at locations of Boreholes 8, 18, 47, 51 and 64. The deep and shallow monitoring well logs were assigned the suffixes D and S respectively, following the borehole numbers. The fieldwork was carried out between April 26 and May 17, 2017. The sixty-three (63) sampled boreholes were drilled to depths of approximately 6 to 18 m below existing grades at the approximate locations shown on the attached Borehole Location Plan (Drawing No. 1).

The boreholes were advanced using continuous flight solid stem auger equipment owned and operated by a specialist drilling contractor. In each borehole, samples were recovered using conventional split spoon equipment in conjunction with the standard penetration test method.

Water levels were observed in the open boreholes during the course of the fieldwork and in monitoring wells as described earlier for subsequent groundwater level measurement, testing and sampling for hydrogeological purposes.

The fieldwork was supervised throughout by an **exp** Services Inc**. (exp)** geotechnical technologist who directed the drilling and sampling operations, prepared borehole logs, made groundwater observations during and upon completion of drilling, and processed the recovered samples. In the laboratory, the samples were classified as to their olfactory, visual and textural characteristics. Natural moisture content and density tests were carried out for selected recovered samples, with results presented on the Log of Borehole sheets.

The locations of the boreholes were established in the field by Holding Jones Vanderveen Inc., Ontario Land Surveyors, who were retained by the Client. The top of borehole elevations (Geodetic) were provided to **exp** by Holding Jones Vanderveen Inc. through the Client.

4. Laboratory Testing

The laboratory testing program comprised the following:

- Moisture content and unit weight determination on selected recovered soil samples, with results presented on the Log of Borehole sheets.
- Grain Size Analysis on the following four (4) selected soil samples:
  - ❖ BH 23 SS2 Borehole 23 – 0.8 to 1.2 m depth
  - ❖ BH 39 SS2 Borehole 39 – 0.8 – 1.2 m depth
  - ❖ BH2 SS7 Borehole 2 – 6.1 – 6.5 m depth
  - ❖ BH45 SS5 Borehole 45 – 3.1 – 3.5 m depth

5. Subsurface Conditions

5.1 Soil

The detailed profiles encountered in each borehole and the results of laboratory moisture content and unit weight are indicated on the attached borehole logs. It should be noted that the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect transition zones, for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The "Notes on Sample Description" preceding the borehole logs are an integral part of and should be read in conjunction with this report.

The stratigraphy encountered at the site, as revealed in the boreholes, generally comprised surficial topsoil and ploughed soil, fill and native deposits of sandy silt till, clayey silt till, silty sand, clayey silt, peat and sand and gravel.

A brief description of the soil profiles follows.

Topsoil / Ploughed Soil

A surficial layer of topsoil 75 to 450 mm thick was encountered in all Boreholes. However, given use of the property for agricultural purposes disturbed (ploughed) soil should be expected to typical ploughing depths of up to 600 to 800 mm.

It should be noted that topsoil and disturbed (ploughed) soil measurements were carried out at the borehole locations only and could differ at other locations on the site. Consequently, topsoil and disturbed (ploughed) soil quantities should not be established from the information provided at the borehole locations. If required, a more detailed test pit program should be carried out to more accurately quantify the amount of topsoil and disturbed (ploughed) soil to be removed for construction purposes.

Fill

Fill underlies the topsoil in Boreholes 1, 7, 9 to 11, 15 to 17, 23 to 27, 31 to 33, 36, 38, 43 to 46, 49 to 52, 56 to 58, 60, 61 and 65. Fill was not encountered in Boreholes 66 and 67 drilled at the toes of the slopes off the south-central and northeastern portions of the property. The fill extends to depths of approximately 1.0 to 4.1 m (~Elevation 292.5 to 310.2 m). Typically the thickness of fill ranged from approximately 1.0 to 2.2 m except in Boreholes 10, 27, 43 and 58 where the fill extends to approximately 4.1 m depth. The fill typically comprises various combinations of brown sand, sandy silt and clayey silt

with trace gravel. Locally, topsoil stained pockets, rock fragments and rootlets were observed in the fill. Moisture contents in the fill ranged from approximately 10 to 27 %.

Native Soils

The native soils were intersected below the topsoil or fill at all borehole locations. The native soils comprise sand, silty sand, clayey silt, clayey silt till, sandy silt till, sand and gravel and peat and exist in various thicknesses, sequences, degrees of compactness and consistencies depending on location. Moisture contents in the native soils were recorded as follows:

- Sand/Silty Sand - approximately 3 to 23 %
- Clayey Silt – approximately 13 to 24 %
- Clayey Silt Till – approximately 11 to 26 %
- Sandy Silt Till – approximately 6 to 26 %
- Sand and Gravel – approximately 10 to 12 %
- Peat – approximately 270 and 450 %

Peat

Peat was encountered locally in Boreholes 16 and 24 in the southeastern portion of the site. Locations, depths below grade and elevations where peat was noted are summarized in the following table.

Table 1: Peat Summary

Borehole No.	Depth Interval below Grade (m)	Elevation Interval (m)
16	1.0 – 2.5	292.4 – 293.7
24	2.1 – 4.0	291.5 – 293.7

Wet Sand

Wet sand was interpreted to be present in boreholes in the northern and southern thirds of the site. Locations, depths below grade and elevations where wet sand was noted are summarized in the following table.

Table 2: Wet Sand Summary

Borehole No.	Depth Interval below Grade (m)	Elevation Interval (m)
3	5.6 – 7.1	293.9 – 295.4
4	5.0 – 6.6 (end of borehole)	290.1 – 291.7
7	8.5 – 10.2	283.7 – 285.4
11	5.6 – 6.2	295.2 – 295.8
14	0.5 – 2.2	292.7 – 294.4
16	2.5 – 4.1	290.8 – 292.4
24	4.0 – 4.8	290.7 – 291.5
25	2.9 – 4.0	299.6 – 300.7
43	4.0 – 5.6	300.8 – 302.4
44	4.1 – 7.0	301.2 – 304.1
45	2.2 – 5.6	303.2 – 306.6
46	1.4 – 4.0	303.1 – 305.7
51	5.6 – 10.2	299.8 – 304.4
52	4.0 – 8.1 (end of borehole)	302.5 – 306.6
53	4.1 – 7.2	303.5 – 306.6
55	1.4 – 4.1	305.0 – 307.7
60	4.8 – 8.7	301.3 – 305.2
62	0.2 – 4.0	303.2 – 307.0
63	7.1 – 8.6	304.0 – 305.5
64	7.0 – 8.6	303.7 – 305.3
65	4.0 – 5.6	306.0 – 307.6

Seasonal variations in the interpreted wet sand intervals should be anticipated.

5.2 Groundwater

Groundwater conditions were observed in the open boreholes during the course of the fieldwork and in the monitoring wells installed at nineteen (19) selected borehole locations for subsequent groundwater measurements.

Upon completion of drilling, free water was detected at depths of approximately 0.1 to 12.2 m in Boreholes 7, 8D, 18D, 19, 24 to 46, 47D, 49, 51D, 52 to 55, 57, 58, 60 and 66. All other boreholes were dry upon completion of drilling. A summary of groundwater observations in the monitoring wells is presented in the following table.

Table 3: Groundwater Level Readings

Borehole No.	Elapsed Time	Water Level (m)	Elevation (m)
2*	After 22 Days	8.8	293.3
6	After 17 days	7.6	290.4
7	After 15 Days	8.2	285.7
8D	After 11 Days	10.5	284.7
8S	After 11 Days	Dry	--
18D	After 11 Days	11.3	291.4
18S	After 11 Days	5.8	296.9
20	After 10 Days	5.8	294.3
23	After 11 Days	Dry	--
25	After 23 days	2.9	300.7
36	After 17 Days	5.8	297.2
39	After 17 days	6.0	298.7
41	After 10 Days	2.1	302.1
47D	After 8 Days	10.4	293.0
47S	After 8 Days	Dry	--
51D	After 4 Days	9.5	300.5
51S	After 4 Days	5.9	304.1
56	After 11 Days	Dry	--

Borehole No.	Elapsed Time	Water Level (m)	Elevation (m)
59	After 8 Days	Dry	--
61	After 3 days	Dry	--
64D	After 2 Days	12.1	300.2
64S	After 2 Days	Dry	--
66*	After 16 Days	-0.6 (above grade)	284.1
67*	After 9 days	Dry	--

*** Located at toe of slope.**

Based on the information observed in the boreholes, the groundwater originates from the wet silty sand and the more pervious seams within the glacial sandy silt till.

The groundwater elevations reflect the conditions at the time of the investigation. Groundwater elevations are subject to seasonal fluctuations.

The monitoring wells were installed in general accordance with the Ontario Water Resources Act-R.R.O. 1990, Regulation 903 – Amended to O. Reg. 128/03 by CSD, by a licensed well contractor. When the use of the monitoring wells is no longer required, they must be decommissioned in accordance with the procedure outlined in the Ontario Water Resources Act – R.R.O. 1990, Regulation 903 – Amended to O. Reg. 128/03.

6. Engineering Discussion and Recommendations

6.1 General

The project involves the design and construction of single family residential dwellings together with the necessary municipal infrastructure such as roads, sewers, water and other services and a potential stormwater management pond.

The following subsections provide geotechnical engineering guidelines for the design and construction of the proposed residential development.

6.2 Site Grading

Final site grades have not been established at the time of this investigation. However, in view of the relief of approximately 18 m measured at the borehole locations excluding those in the valley lands, it is anticipated that regrading (cut and fill operations) will be carried out. The following procedures are recommended for the construction of structural fill for building lots and pavement areas, where required.

- All vegetation, topsoil, disturbed (ploughed) soil, loose fill, peat, loose native soil, gravel pavement structure and building floor slabs/foundations should be removed from proposed building and pavement areas. Any existing septic tile field should also be removed. Potable water wells and all monitoring wells installed for this investigation should be properly decommissioned.

- The exposed subgrade surface should be proofrolled with a heavy roller and examined by a geotechnical engineer from **exp**. Any soft or loose spots encountered during the process should be subexcavated and replaced with approved on-site or imported materials, compacted to 100 % standard Proctor maximum dry density (SPMDD).

- Low areas can then be brought up to final subgrade level with approved on-site or imported material placed in lifts not exceeding 300 mm and compacted to 100% SPMDD within building areas (“engineered fill”) and 95% SPMDD to within 600 mm of final subgrade level and 98% SPMDD for the upper 600 mm in pavement areas. The moisture content of the fill to be placed should be at or near its optimum moisture content in order to assure the specified densities can be achieved with reasonable compactive effort. Some of the on-site soils, particularly from the lower elevations, will require partial drying before they can be properly compacted. Any organic or excessively wet or otherwise deleterious material should not be used for backfilling purposes.

- Fill and cut slopes should not be steeper than two horizontal to one vertical and should be protected from surface erosion.

- All imported borrow fill material from local sources should be free from organic material and foreign objects (i.e. trees, roots, debris, etc.) and should be tested geotechnically by **exp** prior to transport to the site. In addition, the chemical quality of the borrow fill material should be assessed by **exp** in accordance with applicable soil criteria listed in the Ministry of the Environment and Climate Change Standards (Ontario Regulation 153), dated April 15, 2011.

- All excavation, backfilling and compaction operations should be monitored on a full-time basis by qualified geotechnical staff to approve materials and to confirm that the specified degrees of compaction have been obtained.

6.3 Site Servicing

6.3.1 Watermain and Sewer Installation

6.3.1.1 Open Cut Excavation

The sewer and watermain invert levels have not yet been determined at the time of investigation, but based on the specified borehole depths, they are expected to extend to the typical depths of approximately 6 m below existing grades at the southern portion of the site and up to approximately 10 m below existing grades on the north portion of the site. Based on the results of the investigation, excavation will generally be carried out within the fills and into the native deposits of sandy silt till, clayey silt till and silty sand.

Subject to groundwater control measures discussed in the following sub-section, excavation may be carried out in open cuts using conventional equipment. Side slopes of temporary excavation must conform to the Occupational Health and Safety Act (OHSA) and local regulations. Within the meaning of OHSA, the fills and sandy silt till deposit where wet, are classified as Type 3 soil. The silty sand, where wet is classified as Type 4 soil. The compact sandy silt till and silty sand above the groundwater table are classified as Type 2 soils. In areas where localized seepage of groundwater is encountered it may be necessary to flatten the side slopes. Locally, due to spatial restrictions, vertical trenching may be required. It is our opinion that steeper temporary slopes may be permitted if a trench box is utilized, subject to on-site inspection.

It should also be noted that occasional boulders were noted within the till deposits and their presence may influence the progress of excavation. Consequently, provisions should be made in the contract documents to cover any delays caused by boulder obstructions.

6.3.1.2 Groundwater Control

Given the recorded groundwater conditions and the anticipated depths of installations of services, positive groundwater control measures such as well points or eductor wells will be required to facilitate construction particularly in the northern and southern one-thirds of the site. Such groundwater control measures will be required where excavation below the groundwater table in the silty sand encountered at the site as summarized in Section 5 of this report, is to be carried out. The groundwater level should be lowered to at least 0.5 m below service trench base elevations and maintenance hole structures prior to construction and be maintained until backfill above the groundwater table has been completed. Any residual localized seepage of groundwater into the trenches can be handled using conventional sump pumping techniques. Grain Size Analyses of representative samples of the subsurface soils to assist with design of the groundwater control measures are compiled in Appendix A.

Above the groundwater table, seepage into the trenches is expected to primarily originate from perched conditions in the fill and wet sand seams and layers in the sandy silt till and clayey silt till deposits. The quantity of water from these sources will vary depending upon the extent and thickness of individual wet seams and layers. It should be recognized that groundwater levels are also influenced by the effects of precipitation as well as seasonal fluctuations. It is our opinion that the seepage produced by these sources can be handled using conventional sump pumping in conjunction with oversized excavations.

6.3.1.3 Pipe Bedding

It is anticipated that the sewer and watermain pipes will be founded on competent native soils or on engineered fill. Provided adequate groundwater control measures are implemented, no bearing capacity problems are envisaged.

In general, the pipe bedding may consist of a minimum thickness of 150 mm of compacted OPSS Granular “A” material. Where wet conditions are encountered, the pipe bedding may comprise 150 mm of 19 mm clear stone or HL-6 stone material. However, the clear stone or HL-6 stone bedding must be completely wrapped in a geotextile filter fabric to prevent the migration of fines from the surrounding soils, which may result in settlement of the pipes. The chosen geotextile should be compatible with the existing soils on site. It is anticipated Terrafix 270R or similar should suffice.

The base of the excavations in the competent compact to very dense soils should remain stable provided excavations are not left open for extended periods of time and the work is done in accordance with good construction practice.

The bedding material should be placed in 150 mm lifts and compacted to at least 98% SPMDD. Particular attention should be given to ensure material placed beneath the bottom quadrants of the pipe is adequately compacted. Compaction is not required for clear stone or HL-6 stone bedding.

Pipe cover material should consist of fine sand which can be more readily compacted with light equipment to avoid damaging the pipes. The cover material should be placed in 150 mm lifts, compacted to 98% SPMDD and extend to 300 mm above the top of the pipe.

6.3.1.4 Backfilling Operations

The existing native soils which are not contaminated with topsoil and other obviously unsuitable material may be reused as trench backfill if the moisture contents are within 2% of their optimum values. In this regard, portions of the excavated native soils as identified in Section 5.1 and the majority of the fill soils would be wet and will require drying for proper compaction.

Excavated topsoil and peat should not be used for trench backfilling purposes. These materials may be used in landscaping areas. Any organic or excessively wet or otherwise deleterious material should not be used for backfill purposes. Any shortfall of suitable on-site excavated material can be made up with imported clean approved fill or granular material, OPSS Granular 'B' or equivalent.

In general, the on-site native soils are not free draining and therefore should not be used where this characteristic is required, or in confined areas. Imported granular material conforming to OPSS Granular 'B' would also be suitable for these purposes.

In areas where substantial cutting and filling is required, the compaction of the fill should be monitored on a full-time basis by qualified geotechnical personnel.

All backfilling and compaction operations must be closely examined by qualified geotechnical personnel to confirm that uniform compaction to specification requirements is achieved, especially in the vicinity of sewer maintenance holes and catchbasins, near the ends of compaction runs, and in all areas that are not readily accessible to compaction equipment, etc. All backfilling should be placed in maximum 300 mm horizontal lifts and uniformly compacted to 95% SPMDD. Within the upper 600 mm of road subgrade, the fill material should be compacted to at least 98% SPMDD. Smaller lifts may be required depending on the size of compaction equipment used by the contractor and the moisture content of fill at the time of construction.

To minimize potential problems, backfilling operations should follow closely after excavation so that only minimal length of trench slope is exposed. This will minimize wetting of the subgrade material. Should

construction extend to the winter season, particular attention should be given to ensure that frozen material is not used as backfill.

6.3.2 Pavement Design and Construction

The pavement subgrade is expected to comprise native sandy silt till, sand, clayey silt till and compacted engineered fill. Grain Size Analyses of representative near surface soils used to assist in assessment of frost susceptibility are compiled in Appendix A. Based on estimated CBR values, the frost susceptibility of the anticipated subgrade materials, expected traffic loading, and assuming adequate drainage, the following minimum pavement structure component thicknesses specified by the Town of Caledon (Table 3) are considered satisfactory. Other thickness combinations can be used provided the Granular Base Equivalency (GBE) is maintained and any minimum component thickness specified by the Town of Caledon is met.

Table 4: Recommended Pavement Structure Thicknesses

Pavement Layer	Compaction Requirements	Local Roadway	Collector Roadway	Driveway
Asphaltic Concrete (OPSS 310)	Minimum 92 % MRD	40 mm HL3 65 mm HL8	40 mm HL3 90 mm HL8	65 mm HL3 (placed in 2 lifts)
OPSS Granular A Base (OPSS 1010)	100% SPMDD*	150 mm	150 mm	150 mm
OPSS Granular B Subbase (OPSS 1010)	100% SPMDD*	300 mm	450 mm	-

* Denotes standard Proctor maximum dry density, ASTM-D698

The foregoing design assumes construction is carried out during dry periods and the subgrade is stable under the load of construction equipment. If construction is carried out during wet weather and heaving or rolling of the subgrade is experienced, additional thickness of subbase course material may be required.

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free

of depressions and sloped to provide effective surface drainage toward catchbasins. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas.

Additional comments on the construction of proposed roadways are as follows:

1. As part of the subgrade preparation, proposed roadways should be stripped of topsoil and other obviously unsuitable material. Soft or spongy subgrade areas identified during proofrolling should be subexcavated and replaced with suitable approved backfill. Fill required to raise the grades to design elevations should be organic-free and at a moisture content which will permit compaction to 98% SPMDD. The final subgrade surface should be properly shaped and crowned.

2. The location and extent of subdrainage required within the paved areas should be reviewed by this office in conjunction with the proposed site grading. In view of the silty nature of the subgrade soils, we recommend subdrains be installed on both sides of the roadways at least 300 m below the granular subbase. This will ensure no water collects in the granular courses which could result in pre-mature pavement failure during the spring thaw.

3. To minimize problems of differential movement between the pavement and catchbasins/sewer maintenance holes due to frost action, backfill around these structures should consist of free-draining granular material. The granular material should be compacted to 98% SPMDD with a small tamper to avoid damaging the structures. In addition, catchbasins should be perforated just above the drain and the holes screened with filter cloth.

4. The most severe loading conditions on light-duty pavement areas and the subgrade may occur during construction. Consequently, special provisions such as restricted lanes, half-loads during paving, etc. may be required, especially if construction is carried out during unfavorable weather.

6.4 Residential Dwelling Construction

6.4.1 Foundation Considerations

Soil conditions on the site are considered suitable for construction of single family dwellings. Since final site grades have not yet been established, two (2) foundation schemes are being presented for consideration; namely footings on native soils and footings on engineered fill.

6.4.1.1 Footings on Native Soil

The proposed structures may be supported on conventional spread and strip footings founded on the compact sandy silt till, stiff to hard clayey silt till or compact silty sand, below all existing topsoil, fill, peat and loose soils. Footings founded on the native sandy silt till, clayey silt till or silty sand may be designed for a Geotechnical Reaction of 150 kPa at Serviceability Limit States (SLS), subject to adequate groundwater control and inspection during construction. The factored Geotechnical Resistance at Ultimate Limit States (ULS) is 225 kPa. At isolated locations where weaker native soils were encountered, reduced Geotechnical Reaction at SLS and corresponding factored Geotechnical Resistance at ULS of 75 kPa and 110 kPa respectively, are recommended. Given the presence of basements it is anticipated that founding levels would be at or below approximately 2.5 m depth. The following Table 4 shows the highest elevations at the borehole locations where the above mentioned geotechnical reactions/resistances can be applied.

Table 5: Highest Elevation at Borehole Locations Where Recommended Geotechnical Reactions/Resistances Can Be Applied

Borehole No.	Footing SLS 150 kPa / ULS 225 kPa ~ Elevation (Depth Below Existing Grade (m))
5	298.8 (2.5)
6	295.5 (2.5)
7	291.4 (2.5)
8	292.7 (2.5)
9	299.9 (2.5)
10*	297.2 (5.0)
11	294.0 (2.5)
12	298.9 (2.5)
13	294.9 (2.5)
14	292.4 (2.5)
15	297.0 (2.5)
16**	291.4 (3.5)
17	300.3 (2.5)
18	300.2 (2.5)

Table 5 (Continued): Highest Elevation at Borehole Locations Where Recommended Geotechnical Reactions/Resistances Can Be Applied

Borehole No.	Footing SLS 150 kPa / ULS 225 kPa ~ Elevation (Depth Below Existing Grade (m))
19	297.8 (2.5)
20	297.6 (2.5)
21***	295.3 (3.5)
22	300.7 (2.5)
23	299.3 (2.5)
24**	290.5 (5.0)
25	301.1 (2.5)
26	300.9 (2.5)
27*	297.4 (4.5)
29	300.2 (2.5)
31	298.2 (2.5)
32	299.9 (2.5)
33	299.4 (2.5)
34	301.3 (2.5)
35	300.6 (2.5)
36	300.5 (2.5)
38	301.9 (2.5)
39	302.2 (2.5)
40	302.2 (2.5)
41	301.9 (2.5)
42	300.9 (2.5)
43*	301.9 (4.5)
44	305.7 (2.5)
45	306.3 (2.5)

Table 5 (Continued): Highest Elevation at Borehole Locations Where Recommended Geotechnical Reactions/Resistances Can Be Applied

Borehole No.	Footing SLS 150 kPa / ULS 225 kPa ~ Elevation (Depth Below Existing Grade (m))
46***	304.6 (2.5)
47	300.9 (2.5)
49	303.6 (2.5)
50	306.7 (2.5)
51	307.5 (2.5)
52	308.1 (2.5)
53	308.2 (2.5)
54	308.7 (2.5)
55	306.6 (2.5)
56	303.4 (2.5)
57	305.8 (2.5)
58*	303.9 (4.5)
59	306.9 (2.5)
60	307.5 (2.5)
61	304.1 (2.5)
62	304.7 (2.5)
63	310.1 (2.5)
64	309.8 (2.5)
65	309.1 (2.5)

Notes: * Deep Fill

** Peat

*** 75 kPa (SLS)/110 kPa (ULS)

6.4.1.2 Engineered Fill

The proposed structures may also be supported on footings founded on engineered fill developed over the competent sandy silt till, clayey silt till or silty sand and designed for a Geotechnical Reaction of 150 kPa at SLS and factored Geotechnical Resistance of 225 kPa at ULS. If engineered fill is constructed in the vicinities of Boreholes 21 and 46, the Geotechnical Reaction at SLS and factored Geotechnical Resistance at ULS should be lowered to 75 kPa and 110 kPa, respectively. The engineered fill should be constructed to above the level of the garage footings for the single family dwellings.

The engineered fill should be constructed by removing all topsoil, topsoil-stained soil, fill and peat down to the competent native subgrade. The engineered fill should extend at least 3 m beyond the outside edge of exterior footings. The required extent of engineered fill should be determined based on a known fixed location for the structures and adherence to the conditions outlined above. The boundaries of the engineered fill should be laid out by a surveyor in consultation with qualified engineering staff**.**

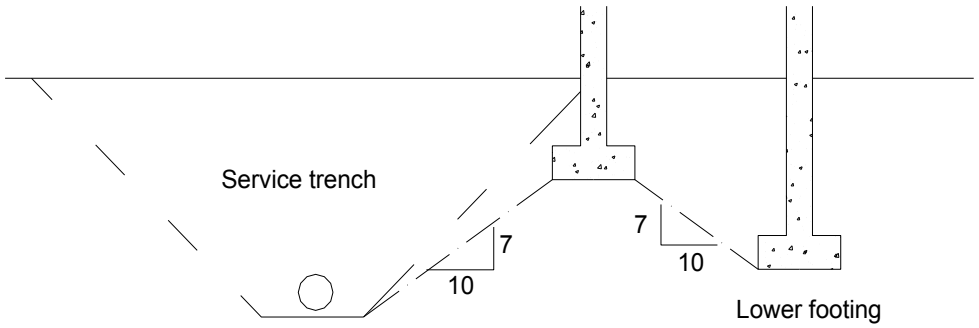
As mentioned in the 'Site Grading' subsection, the exposed subgrade surface should be proof-rolled and examined by qualified geotechnical personnel prior to placement of engineered fill. Any loose or soft areas detected during proofrolling should be removed and replaced with approved material compacted to 100% SPMDD. The areas can then be brought up to design subgrade level with approved on-site or imported material placed in lifts not exceeding 300 mm and compacted to 100% SPMDD. Some of the on-site soils will require partial drying before they can be compacted to 100% SMPDD.

The engineered fill construction should be monitored on a full-time basis by qualified geotechnical personnel to examine and approve backfill materials, to evaluate placement operations, and to verify the specified degree of compaction is being achieved uniformly throughout the fill.

It is recommended that nominal reinforcing steel be installed in the footings and foundation walls of structures supported on engineered fill to minimize cracking from differential settlement. The basement walls should be reinforced continuously with 2-15M bars above the footings and below the window sill. If the basement walls are made from concrete blocks, equivalent top and bottom reinforcing should be provided as designed by a structural engineer.

6.4.1.3 Foundations General

Footings which are to be placed at different elevations should be located such that the higher footings are set below a line drawn up at 10 horizontal to 7 vertical from the near edge of the lower footing. This concept should also be applied to excavations for new foundations in relation to existing footings or underground services. This concept is illustrated in the following sketch:



FOOTINGS NEAR SERVICE TRENCHES OR AT DIFFERENT ELEVATIONS

All footings exposed to seasonal freezing conditions should be protected from frost action by at least 1.2 m of soil cover or equivalent insulation, depending on the final design requirements.

The on-site soils are susceptible to disturbance. It is therefore recommended that a concrete skim coat be placed over the founding surface as soon as possible after approval to protect it from disturbance from construction traffic.

The total and differential settlements of well designed and constructed footings placed in accordance with the above recommendations, are expected to be less than 25 mm and 20 mm, respectively.

It should be noted that the recommended bearing capacities have been calculated by **exp** from the borehole information for the design stage only. The investigation and comments are necessarily ongoing as new information on underground conditions becomes available. For example, it should be appreciated that modifications to bearing levels may be required if unforeseen subsoil conditions are revealed after the excavation is exposed to full view or if final design decisions differ from those assumed in this report. For this reason, this office should be retained to review final foundation drawings and to examine footing conditions.

6.4.2 Excavation and Groundwater Control

Excavation for single family dwellings with a basement will extend to about 2 to 2.5 m below finished grade. Where excavations will be undertaken below the groundwater table, the groundwater must be

lowered to at least 0.5 m below foundation base elevations prior to construction and be maintained until permanent perimeter and underfloor drainage systems for the structures as may be required, have been installed and commissioned. Subject to implementation of proper groundwater control measures where required, excavation should be relatively straightforward and must be carried out in accordance with the latest edition of the OHSA and local regulations. For preliminary guidance, side slopes of one vertical to one horizontal may be used, subject to geotechnical inspection. Where loose soil is encountered, it may be necessary to locally flatten the side slopes.

Even with implementation of proper groundwater control measures as required, residual groundwater seepage from trapped pockets in the fill and native soils into the excavation(s) should be anticipated during construction. It should be possible to control and remove residual seepage water entering the excavation(s), using conventional construction dewatering techniques, i.e., pumping from sumps.

It should be noted boulders frequently occur in till deposits and their presence may influence the progress of excavation. Consequently, provisions should be made in the contract documents to cover any delays caused by the presence of boulders.

6.4.3 Floor Slab Construction and Permanent Drainage

The floor slab may be constructed as a slab-on-grade on a properly prepared subgrade (i.e., on native undisturbed soils or engineered fill). In this regard, all topsoil, fill and other obviously unsuitable material should be removed from the entire underfloor area and the exposed subgrade thoroughly proofrolled. Any soft spots detected should be sub-excavated and the area brought up to design grades using approved clean fill in the manner described in the "Site Grading" section of this report.

A 200 mm layer of 19 mm clear stone should be placed between the prepared subgrade and the floor slab to serve as a moisture barrier.

It is recommended that the foundation walls be covered with a bituminous damp-proofing spray and a drainage sheet. In addition, a weeping tile surrounded with 300 mm of 19 mm clear stone and wrapped with a filter cloth should be installed around the perimeter of the basement and connected to a frost free outlet.

In areas where the subgrade consists of wet/saturated soil (below the groundwater table) or where persistent groundwater seepage is encountered during excavation, underfloor subdrains should also be installed. The subdrains should consist of 100 mm diameter perforated pipe surrounded by 150 mm of 19 mm clear stone all wrapped in Terrafix 270R or equivalent. The drainage system should lead to frost

free sumps or outlets from which the water can be removed. The need for underfloor subdrains should be further assessed upon basement excavation.

6.4.4 Earth Pressure on Subsurface Walls

The lateral earth pressure acting on subsurface walls (i.e., basement walls) may be calculated from the following equation:

$$p = k(\gamma h + q)$$

where:

- p = the pressure in kPa acting against any subsurface wall at depth, h, below the ground surface;
- k = the earth pressure coefficient considered to be appropriate for the subsurface walls, for this case, 0.4;
- γ = the bulk unit weight of the backfill, use 22.5 kN/m^3;
- h = the depth in m below the ground surface at which the pressure, p, is to be computed; and,
- q = the value of any adjacent surcharge in kPa which may be acting close to the wall.

The above expression assumes an effective perimeter tile drain system will be incorporated to prevent the build-up of hydrostatic pressure behind the subsurface wall. All subsurface walls should be waterproofed. To minimize infiltration of surface water, the upper 600 mm of backfill should comprise compacted relatively impervious material sloped away from the structure.

6.4.5 Earthquake Considerations

The recommendations for the geotechnical aspects to determine the earthquake loading are presented below.

6.4.5.1 Subsoil Conditions

The subsoil and groundwater information at this site have been examined in relation to Section 4.1.8.4 of OBC 2012. The subsoil consisted of topsoil, fill, compact to very dense sandy silt till, compact to very dense silty sand and stiff to hard clayey silt till. The foundations will be founded on the competent native

soil or on engineered fill. The reported N-values for the soil below the anticipated floor slab level ranged from 5 to 50 for 80 mm.

There have been no shear wave velocity measurements carried out at this site and therefore, N-values will be used to determine the site classification.

6.4.5.2 Depth of Boreholes

Table 4.1.8.4.A. Site Classification for Seismic Site Response in OBC 2012 indicated that to determine the site classification, the average properties in the top 30 m are to be used. The boreholes at this site were advanced to depths of about 6.6 to 15.7 m. Shale bedrock was not contacted within the depths of investigation.

6.4.5.3 Site Classification

Based on the soil conditions, the Site Class for this site is “D” as per Table 4.1.8.4.A, Site Classification for Seismic Site Response, OBC 2012.

7. Stormwater Management Pond

A potential stormwater management pond is being considered for the southwestern corner of the site. Based on a supplied drawing, it was noted that the base elevation of the pond is set at approximate Elevation 295.0 m.

Boreholes drilled in the area of the potential stormwater management pond encountered loose to very dense sandy silt till over loose to very dense silty sand. A stabilized groundwater level of ~293.3 m was recorded in the monitoring well installed in Borehole 2 during the course of this investigation. At this elevation, the subsurface soil comprises dense silty sand. It should be noted that the fieldwork was carried out during the spring thaw when the groundwater level is likely at its highest with fluctuations of approximately 1 m.

Based on the results of the boreholes it is **exp's** opinion that construction of a stormwater management pond in this area is feasible. The material at the base and sides of the pond will primarily comprise sandy silt till and silty fine sand. It is anticipated that the sandy silt till will exhibit coefficients of hydraulic conductivity in the order of 10^{-5} to 10^{-6} cm/sec which is considered relatively low. The silty fine sand is expected to exhibit coefficients of hydraulic conductivity in the order of 10^{-4} to 10^{-5} cm/sec which is considered moderate. As such it is recommended that a liner be incorporated into the pond design to mitigate infiltration of surrounding groundwater into the pond and exfiltration of stormwater to the surrounding soils. The pond base is above the observed groundwater level and should not pose the risk of base heave when emptied for cleaning.

The supplied drawing indicates sides of the pond being sloped between 3 Horizontal:1 Vertical and 5 Horizontal:1 Vertical which is acceptable. The pond slopes should be vegetated to prevent surface erosion. Where wet sand is encountered, a layer of armour stone with filter cloth backing should be placed on the slope face to prevent sloughing. It is suggested that a layer of rip-rap be placed at the base of the pond to serve as a marker during cleaning.

More detailed comments can be provided once the design specifications of the pond have been finalized.

8. General Comments

Exp should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, **exp** will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc. would be greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

More specific information with respect to the conditions between samples, or the lateral and vertical extent of materials may become apparent during excavation operations. The interpretation of the borehole information must, therefore, be validated during excavation operations. Consequently, during the future development of the property, conditions not observed during this investigation may become apparent; should this occur, **exp** should be contacted to assess the situation, and additional testing and reporting may be required. **Exp** has qualified personnel to provide assistance in regards to future geotechnical and environmental issues related to this property.

Yours truly,

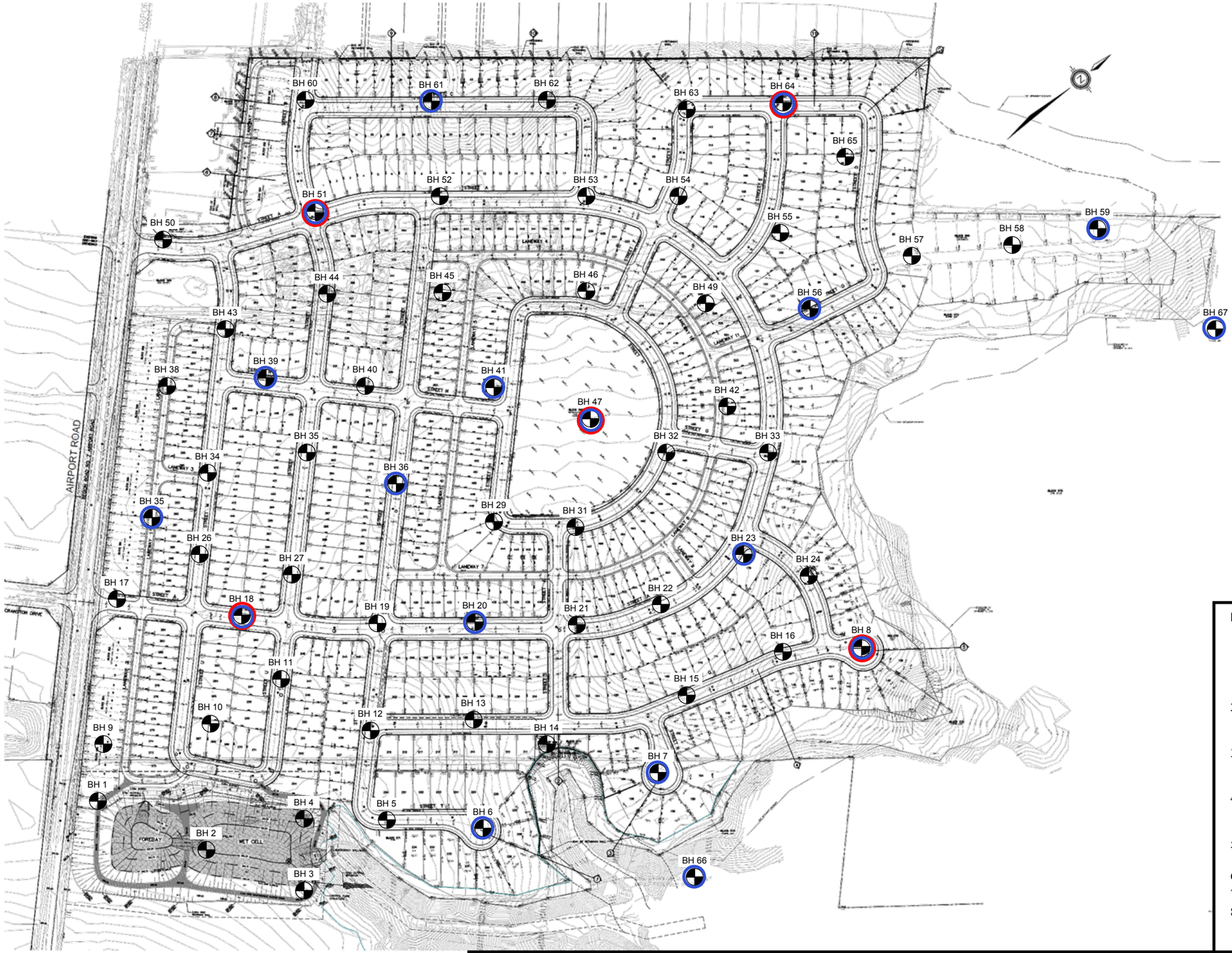
Exp Services Inc.

LICENSED PROFESSIONAL ENGINEER
D. H. DENNISON
SEP. 11/18
PROVINCE OF ONTARIO

David Dennison, P.Eng.
Senior Engineer
Geotechnical Division

Peter T.L. Chan, P. Eng.
Senior Manager, Central Ontario
Geotechnical Services

Drawings:
Borehole Location Plan
Notes on Sample Description
Borehole Logs



LEGEND:

BH 58	Borehole
BH 56	Monitoring Well
BH 47	Nested Monitoring Wells

Note:

1. The boundaries and soil types have been established only at the borehole locations. Between boreholes the boundaries are assumed and may be subject to considerable error.
2. Soil samples will be retained in storage for 3 months and then destroyed unless the client advises otherwise.
3. Topsoil quantities and/or volumes of unsuitable fill should not be established from the information provided at the borehole locations.
4. Borehole elevations should not be used to design building(s), or floor slab(s), or parking lot(s) grades.
5. This drawing to be read with subject report, project number as shown below.
6. See report text for site datum.
7. Test hole locations are approximate.
8. Dimensions shown on this drawing are in metric units, unless otherwise noted.

EXP Services Inc.
1595 Clark Boulevard
Brampton, Ontario L6T 4V1
exp.com

DRAWN: HAL
CHECKED: TA
P.M.: JKF
SCALE 0 20 40 60 80 100

Borehole Location Plan
Proposed Residential Subdivision
Airport Road and Cranston Drive
Caledon East, Ontario

Reference: BRM-00235186-D0
Drawing: 1

I:\2003-Brampton\Projects\Geotechnical Engineering\0200000\0235000\235186-G0 -Triple Crown Additional Slope Stability\235186-

Notes on Sample Descriptions and Soil Types — Drawing 1A

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by **exp** also follow the same system. Others may use different classification systems; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		

0.002 0.006 0.02 0.06 0.2 0.6 2.0 6.0 20 60 200

EQUIVALENT GRAIN DIAMETER IN MILLIMETERS

CLAY (PLASTIC) TO SILT (NONPLASTIC)	FINE	MEDIUM	COARSE	FINE	COARSE
	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

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

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

till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

4. Excerpt from “OHSA Regulations for Construction Projects,” Part III, Section 226:

- **Soil Types**

Type 1 Soil

a) is hard, very dense and only able to be penetrated with difficulty by a small sharp object;
b) has a low natural moisture content and a high degree of internal strength;
c) has no signs of water seepage; and
d) can be excavated only by mechanical equipment.

Type 2 Soil

a) is very stiff, dense and can be penetrated with moderate difficulty by a small sharp object;
b) has a low to medium natural moisture content and a medium degree of internal strength; and
c) has a damp appearance after it is excavated.

Type 3 Soil

a) is stiff to firm and compact to loose in consistency or is previously excavated soil;
b) exhibits signs of surface cracking;
c) exhibits signs of water seepage;
d) if it is dry, may run easily into a well-defined conical pile; and
e) has a low degree of internal strength.

Type 4 Soil

a) is soft to very soft and very loose in consistency, very sensitive and upon disturbance is significantly reduced in natural strength;
b) runs easily or flows, unless it is completely supported before excavating procedures;
c) has almost no internal strength;
d) is wet or muddy; and
e) exerts substantial fluid pressure on its supporting system. O. Reg. 213/91, s. 226.

Log of Borehole 1

Project No. BRM-00235186-D0 | Drawing No. 2

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 26, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○—|
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Weight kN/m³
~125 mm Topsoil over **FILL:** Sandy silt, trace clay, trace gravel, clayey silt pockets, brown, moist.	300.85	0	7		
		1	7		21.0
		2	7		20.4
SANDY SILT TILL: Trace gravel, trace clay, brown oxidized fissures, moist to wet, compact to loose.	~298.9	2	13		21.5
		3	6		21.3
	~296.1	5	7		
SILTY SAND: Medium grained, brown, moist, very dense.		6	84		
	~292.8	7	46		
END OF BOREHOLE.					

SPT (N Value): 20 40 60 80
Shear Strength kPa: 100 200
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	7.16

EXPLOGBRAMPTON AIRPORT ROAD AND CRANSTON DRIVE GINT LOGS - COPY.GPJ NEW.GDT 5/6/17

Log of Borehole 2

Project No. BRM-00235186-D0 | Drawing No. 3

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 27, 2017

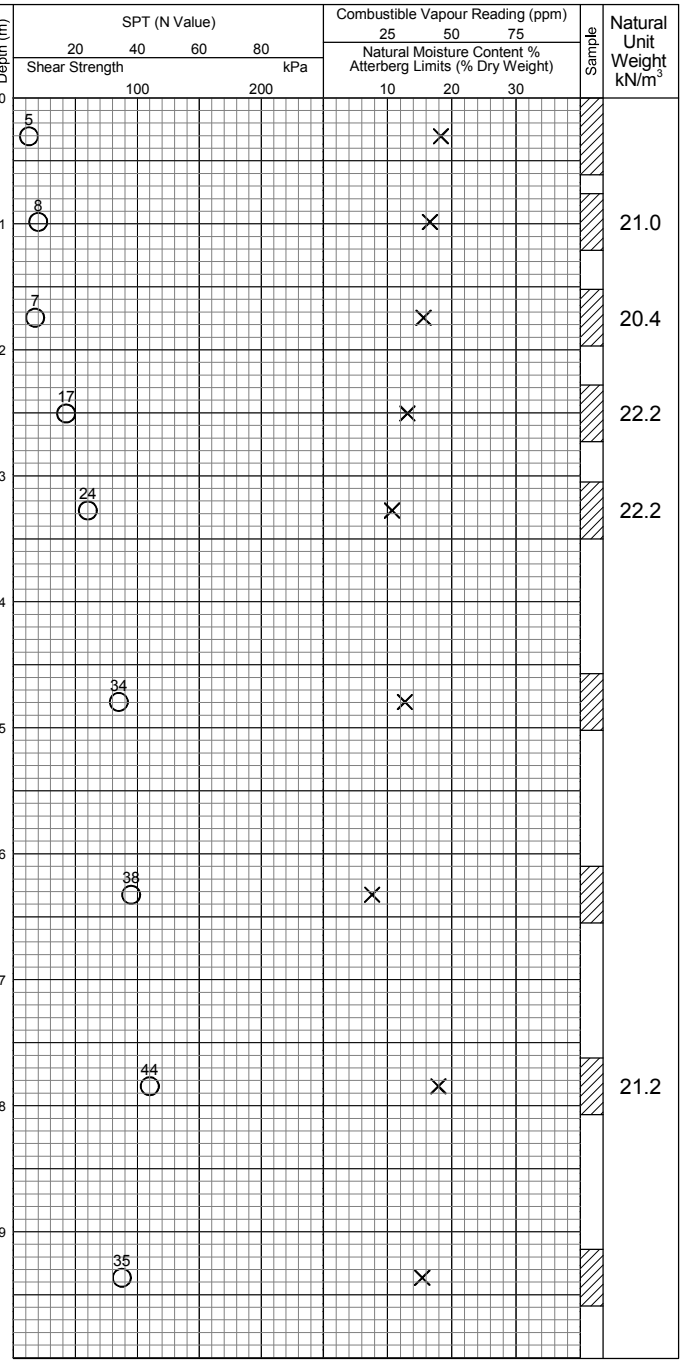
Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m
~250 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, trace clay, occasional boulder fragments, brown, wet, loose.	302.06
Becoming compact, moist.	~300.0
SILTY SAND: Fine to medium grained, brown, moist with wet layers, dense.	~297.4
END OF BOREHOLE.	~292.5



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	9.14
May 15, 2017	8.82	
May 19, 2017	8.77	

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Log of Borehole 3

Project No. BRM-00235186-D0 | Drawing No. 4

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 27, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Weight kN/m³
~125 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, occasional boulder and shale fragments, brown, moist, compact.	300.99	0	6		
		1	10		21.5
		2	12		21.6
Becoming dense to very dense.	~298.9		31		22.2
		3	69		22.5
SILTY SAND: Fine grained, brown, moist, very dense.	~297.0	4			
		5	80		
Becoming compact, wet.	~295.4	6	29		
Becoming dense, moist.	~293.9	7	47		
END OF BOREHOLE.	~292.9				

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	7.47

EXPLOGBRAMPTON AIRPORT ROAD AND CRANSTON DRIVE GINT LOGS - COPY.GPJ NEW.GDT 5/6/17

Log of Borehole 4

Project No. BRM-00235186-D0 | Drawing No. 5

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 27, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~100 mm Topsoil over **SANDY SILT TILL:** Trace gravel, brown, wet, loose.	296.65	0	6			
				1	5			
				2	3			18.9
		SILTY SAND: Fine to medium grained, brown, moist, loose.	~294.6		7			
				3	4			
				4				
		Becoming wet, compact.	~291.7	5	5			
				6	21			
		END OF BOREHOLE.	~290.1					

SPT (N Value): 20 40 60 80
Shear Strength kPa: 100 200
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	5.79

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Log of Borehole 5

Project No. BRM-00235186-D0 | Drawing No. 6

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 2, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) 20 40 60 80 / Shear Strength kPa 100 200	Combustible Vapour Reading (ppm) 25 50 75 / Natural Moisture Content % Atterberg Limits (% Dry Weight) 10 20 30	Sample	Natural Unit Weight kN/m³
		~300 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, trace clay, brown, wet, compact.	301.33	0	3	×		
				1	12	×		20.9
					15	×		21.5
		Becoming moist, compact to dense.	~299.2	2	31	×		22.6
				3	27	×		22.3
				4				
				5	41	×		22.3
		Becoming wet.	~295.7					
				6	44	×		
		SILTY SAND: Fine grained, brown, black pockets, moist, very dense.	~294.2	7	65	×		
			~293.2					
		END OF BOREHOLE.						

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Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	8.07

Log of Borehole 6

Project No. BRM-00235186-D0

Drawing No. 7

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 2, 2017

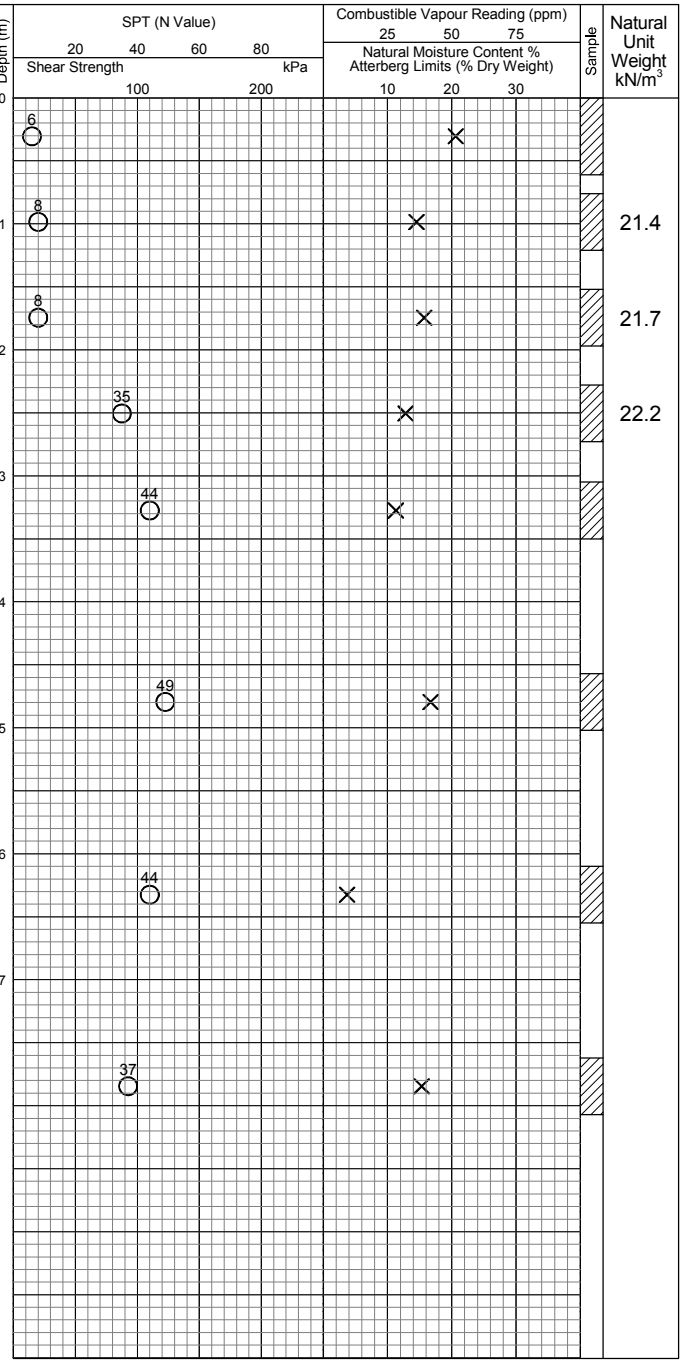
Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m	Natural Unit Weight kN/m³
~200 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, occasional boulder fragments, brown, moist to wet, loose.	298.04	
		21.4
		21.7
Becoming moist, dense.	~295.9	
		22.2
SILTY SAND: Fine grained, brown to reddish brown, moist, dense.	~294.0	
END OF BOREHOLE.	~289.9	



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	8.07
May 15, 2017	7.58	
May 19, 2017	7.55	

EXPLOGBRAMPTON AIRPORT ROAD AND CRANSTON DRIVE GINT LOGS - COPY.GPJ NEW.GDT 5/6/17

Log of Borehole 7

Project No. BRM-00235186-D0 | Drawing No. 8

Project: Geotechnical Investigation | Sheet No. 1 of 2

Location: Airport Road and Cranston Drive

Date Drilled: May 4, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m	Natural Unit Weight kN/m³
~350 mm Topsoil over **FILL:** Sand, fine grained, brown, black stained pockets, wet.	293.85	
	~292.5	20.9
CLAYEY SILT TILL: Fine sand seams, trace gravel, occasional boulder fragments, brown, oxidized pockets, moist, hard.		21.6
Becoming wet.	~291.0	22.9
	~288.3	
SANDY SILT TILL: Fine sand seams, trace gravel, brown, moist, compact to very dense.		22.2
	~285.4	22.0
SILTY SAND: Medium grained, grey, wet, very dense.		

SPT (N Value): 20 40 60 80 — Shear Strength: 100 200 kPa

Combustible Vapour Reading (ppm): 25 50 75 — Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

Depth (m): 0 1 2 3 4 5 6 7 8 9 10

SPT values: 1, 9, 20, 24, 20, 26, 28, 50 for 150mm, 55

Continued Next Page

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	12.19	15.69
May 15, 2017	8.18	
May 19, 2017	8.2	

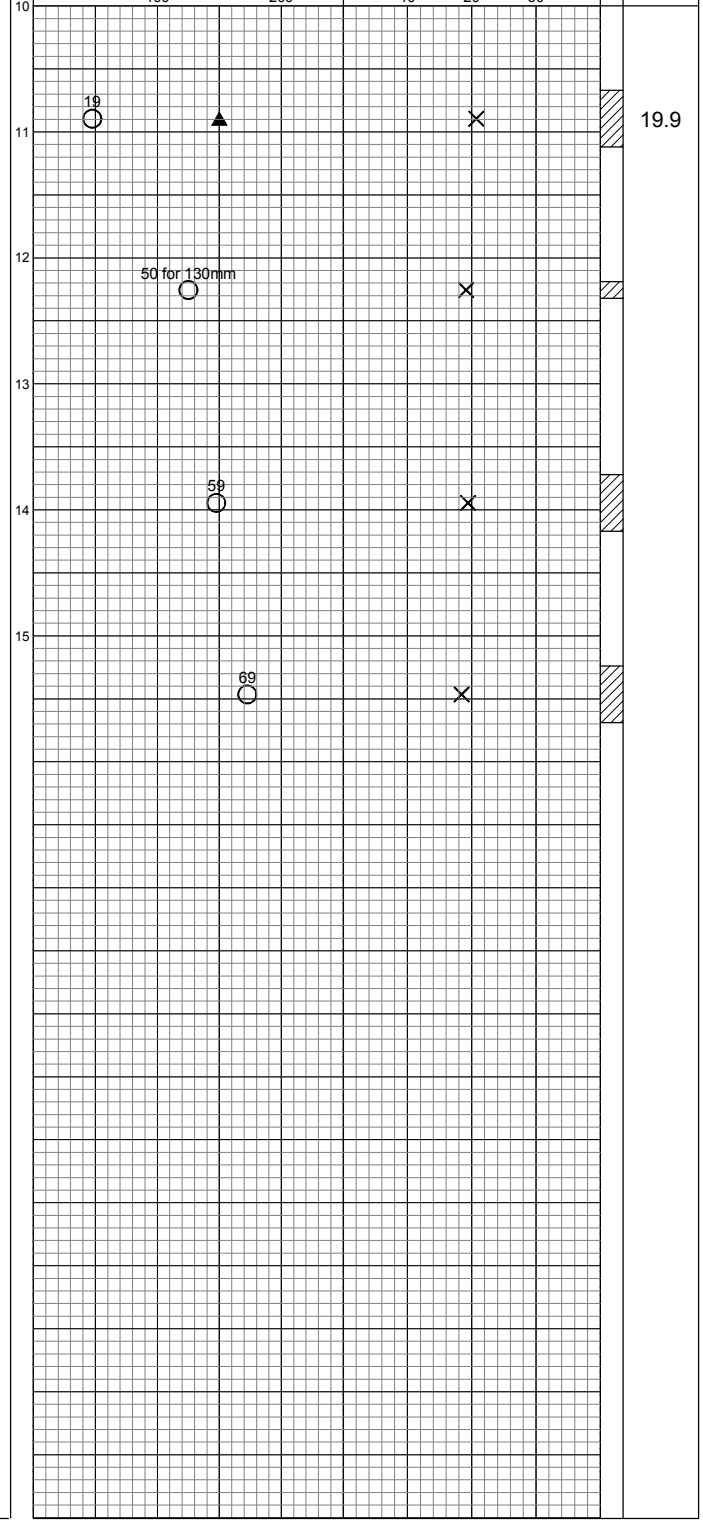
EXPLOGBRAMPTON AIRPORT ROAD AND CRANSTON DRIVE GINT LOGS - COPY.GPJ NEW.GDT 5/6/17

Log of Borehole 7

Project No. BRM-00235186-D0 Drawing No. 8

Project: Geotechnical Investigation Sheet No. 2 of 2

Soil Description	ELEV. m
	283.85
	~283.7
CLAYEY SILT: Brown to grey, wet, stiff.	
	~282.2
SILTY SAND: Fine grained, brown and grey, wet, very dense.	
	~278.2
END OF BOREHOLE.	



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	12.19	15.69
May 15, 2017	8.18	
May 19, 2017	8.2	

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Log of Borehole 8D

Project No. BRM-00235186-D0 | Drawing No. 9

Project: Geotechnical Investigation | Sheet No. 1 of 2

Location: Airport Road and Cranston Drive

Date Drilled: May 8, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Weight kN/m³
~300 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, trace clay, occasional rock fragments, brown, oxidized pockets, moist, compact to dense.	295.23	0	5		
		1	12		20.6
		2	23		22.4
		3	29		
		4	32		22.9
	~291.1	5	27		
SILTY SAND: Fine grained, brown, moist, compact to dense.		6	29		
		7			
		8	34		
		9			
		10	39		20.6

Continued Next Page

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	10.53	12.65
May 15, 2017	10.49	
May 19, 2017	10.49	

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Log of Borehole 8D

Project No. BRM-00235186-D0 Drawing No. 9

Project: Geotechnical Investigation Sheet No. 2 of 2

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) 20 40 60 80 / Shear Strength kPa 100 200	Combustible Vapour Reading (ppm) 25 50 75 / Natural Moisture Content % Atterberg Limits (% Dry Weight) 10 20 30	Sample	Natural Unit Weight kN/m³
		285.23		10				
		Becoming wet, compact.	~285.0					
				11	25	×		
				12	28	×		
			~282.5					
		END OF BOREHOLE.						

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	10.53	12.65
May 15, 2017	10.49	
May 19, 2017	10.49	

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Log of Borehole 8S

Project No. BRM-00235186-D0 | Drawing No. 9A

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 8, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~300 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, trace clay, occasional rock fragments, brown, oxidized pockets, moist, compact to dense.	295.23	0	5			
				1	12			20.6
				2	23			22.4
					29			
				3	32			22.9
		SILTY SAND: Fine grained, brown, moist, compact to dense.	~291.1	4				
				5	27			
				6	29			
		END OF BOREHOLE.	~288.7					

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Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	6.10
May 15, 2017	Dry	
May 19, 2017	Dry	

Log of Borehole 9

Project No. BRM-00235186-D0 | Drawing No. 10

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 26, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○—|
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m	Natural Unit Weight kN/m³
~225 mm Topsoil over **FILL:** Silty sand to sandy silt, trace gravel, clayey silt pockets, brown, moist.	302.38	
	~300.5	21.8
SANDY SILT TILL: Fine sand seams, trace gravel, occasional boulder fragments, brown, oxidized fissures, moist, compact.		18.3
		21.7
	~297.3	22.0
SILTY SAND: Fine to medium grained, scattered gravel, brown, moist.		
	~295.8	
END OF BOREHOLE.		

SPT (N Value) 20 40 60 80 — Shear Strength 100 200 kPa

Combustible Vapour Reading (ppm) 25 50 75 — Natural Moisture Content % Atterberg Limits (% Dry Weight) 10 20 30

Depth (m) 0 1 2 3 4 5 6

SPT values: 7, 6, 7, 13, 15, 22, 19

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	5.79

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Log of Borehole 10

Project No. BRM-00235186-D0 | Drawing No. 11

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 27, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~150 mm Topsoil over **FILL:** Sandy silt, trace gravel, trace clay, scattered rock fragments, brown, moist.	302.16	0	5			
				1	7			19.7
				2	9			21.9
					28			22.6
		Layer of dark brown silt, sand and gravel.	~299.0	3	7			
			~298.1	4				
		SANDY SILT TILL: Fine sand seams and layers, trace gravel, moist, loose to dense.		5	8			22.3
				6	39			
			~295.6					
		END OF BOREHOLE.						

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	5.79

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Log of Borehole 11

Project No. BRM-00235186-D0 | Drawing No. 12

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 27, 2017

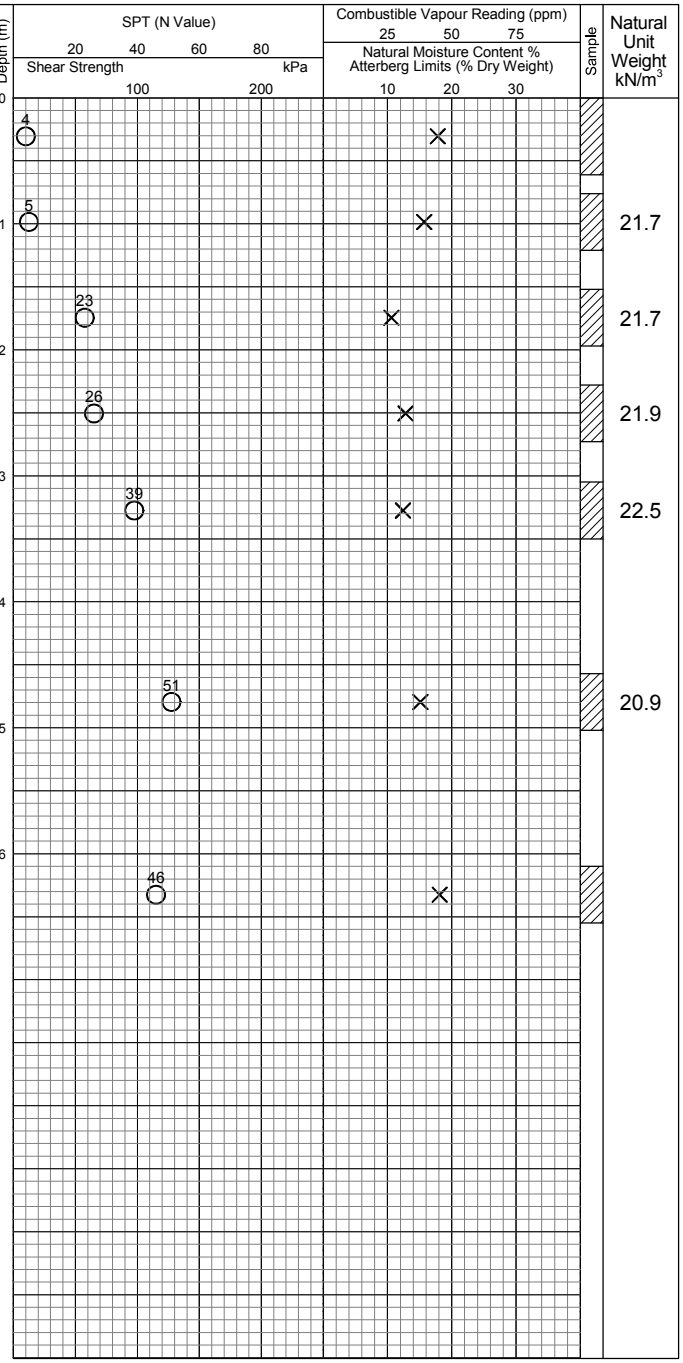
Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Soil Description	ELEV. m	Natural Unit Weight kN/m³
~225 mm Topsoil over **FILL:** Sandy silt to clayey silt, trace gravel, brown, moist to wet.	301.41	
	~300.0	21.7
SANDY SILT TILL: Fine sand seams, trace gravel, occasional shale and boulder fragments, brown, moist, compact to very dense.		21.7
		21.9
		22.5
	~295.8	
Becoming wet.		20.9
	~295.2	
SILTY SAND: Fine grained, brown, moist, dense.	~294.8	
END OF BOREHOLE.		



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	5.94

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Log of Borehole 12

Project No. BRM-00235186-D0 | Drawing No. 13

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 27, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~200 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, occasional boulder fragements, brown, moist, compact.	301.37	0	5			
				1	10			22.4
				2	16			22.1
		Sand and gravel layer ~225 mm thick.	~298.9		29			22.3
				3	21			22.0
		Find sand layers.	~297.4	4				
				5	27			21.9
		SILTY SAND: Fine grained, brown, moist, dense.	~295.8	6	35			20.8
		END OF BOREHOLE.	~294.8					

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	5.94

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Log of Borehole 13

Project No. BRM-00235186-D0 | Drawing No. 14

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 2, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~300 mm Topsoil over **FILL:** Sandy silt to clayey silt, trace gravel, brown, topsoil stained pockets, moist to wet.	297.44	0	6			
				1	9			21.9
				2	4			21.7
		SANDY SILT TILL: Fine sand seams, trace gravel, trace clay, brown, moist, dense to very dense.	~295.2		30			
				3	51			22.6
		SILTY SAND: Fine grained, silt seams, brown, moist, dense to very dense.	~293.3	4	50 for 130mm			
				5				
				6	44			21.7
		END OF BOREHOLE.	~290.8					

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Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	6.55

Log of Borehole 14

Project No. BRM-00235186-D0 | Drawing No. 15

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 2, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Soil Description	ELEV. m
~450 mm Topsoil over **SAND:** Medium to coarse grained, trace gravel, brown, wet, loose to compact.	294.85
	~292.7
CLAYEY SILT TILL: Fine sand seams, trace gravel, brown, wet, stiff to very stiff.	
Becoming grey, wet.	~290.9
	~289.3
SANDY SILT TILL: Medium grained sand seams, trace gravel, brown, wet, dense.	
	~288.3
END OF BOREHOLE.	

SPT (N Value): 3, 6, 10, 29, 14, 15, 31

Shear Strength (kPa): 20 40 60 80 | 100 200

Combustible Vapour Reading (ppm): 25 50 75

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Depth (m): 0 1 2 3 4 5 6

Natural Unit Weight kN/m³: 21.4

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	6.55

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Log of Borehole 15

Project No. BRM-00235186-D0 | Drawing No. 16

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 3, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~250 mm Topsoil over **FILL:** Sandy silt to clayey silt, trace rootlets, trace gravel, brown, moist.	299.46	0
		SANDY SILT TILL: Fine sand seams, trace gravel, occasional boulder fragments, brown, oxidized partings, moist, compact to dense.	~297.3	2
		Becoming wet, compact.	~293.9	5
		END OF BOREHOLE.	~292.9	6

SPT (N Value): 20 40 60 80 — Shear Strength: 100 200 kPa

Combustible Vapour Reading (ppm): 25 50 75

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Sample

Natural Unit Weight kN/m³

SPT values: 5; >50lb for 12"; 8; 26; 45; 26; 22

Natural Unit Weight: 20.1; 20.2; 22.3; 22.5; 21.9

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	6.10	6.55

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Log of Borehole 16

Project No. BRM-00235186-D0 | Drawing No. 17

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 3, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~250 mm Topsoil over **FILL:** Clayey silt, trace gravel, brown to grey, oxidized pockets, moist.	294.92	0
			~293.9	1
		PEAT: Fibrous decayed vegetation, wood fragments, black, wet, very loose.		2
			~292.4	3
		SILTY SAND: Fine grained, clayey silt and gravel layers, grey, wet, loose.		4
			~290.8	5
		CLAYEY SILT TILL: Silt seams, trace gravel, grey, moist, stiff to hard.		6
			~288.6	
		END OF BOREHOLE.		

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

SPT values: 5, 2, 1, 2, 9, 16, 50 for 150mm

Sample: 398.8, 450

Natural Unit Weight kN/m³: 10.1, 10.3, 22.0

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	6.25

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Log of Borehole 17

Project No. BRM-00235186-D0 | Drawing No. 18

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 26, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒ | Combustible Vapour Reading □

SPT (N) Value ○ ▨ | Natural Moisture ×

Dynamic Cone Test — | Plastic and Liquid Limit ⊢○

Shelby Tube ■ | Undrained Triaxial at % Strain at Failure ⊕

Field Vane Test S | Penetrometer ▲

Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Weight kN/m³
~225 mm Topsoil over **FILL:** Sandy silt to clayey silt, trace gravel, brown, moist.	302.81	0	6	×	
		1	7	×	19.9
	~301.5				
SANDY SILT TILL: Fine sand seams, trace gravel, trace clay, occasional boulder fragments, brown, oxidized pockets, moist, compact.		2	15	×	22.3
			29	×	22.7
		3	28	×	22.6
Becoming dense.	~298.8	4			
		5	43	×	22.3
SILTY SAND: Fine grained, brown, moist, very dense.	~297.2	6	50 for 150mm	×	
END OF BOREHOLE.	~296.5				

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	6.04

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Log of Borehole 18D

Project No. BRM-00235186-D0 | Drawing No. 19

Project: Geotechnical Investigation | Sheet No. 1 of 2

Location: Airport Road and Cranston Drive

Date Drilled: May 8, 2017

Drill Type: D-90-Tire

Datum: Geodetic

Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Field Vane Test (S)

Combustible Vapour Reading | Natural Moisture | Plastic and Liquid Limit | Undrained Triaxial at % Strain at Failure | Penetrometer

Soil Description	ELEV. m	Natural Unit Weight kN/m³
~150 mm Topsoil over **CLAYEY SILT TILL:** Trace to some gravel, fine sand seams, brown, moist with wet seams, stiff to very stiff.	302.71	
		21.3
		22.2
	~300.5	
SANDY SILT TILL: Fine sand seams, trace gravel, occasional boulder fragments, brown, moist, dense to very dense.		22.3
	~298.7	
SILTY SAND: Fine grained, brown, moist, dense to very dense.		21.7
		20.7

Depth (m): 0 1 2 3 4 5 6 7 8 9 10

SPT (N Value): 20 40 60 80 — Shear Strength: 100 200 kPa

SPT values: 7, 11, 26, 38, 57, 49, 70, 40, 45

Combustible Vapour Reading (ppm): 25 50 75

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Sample

Continued Next Page

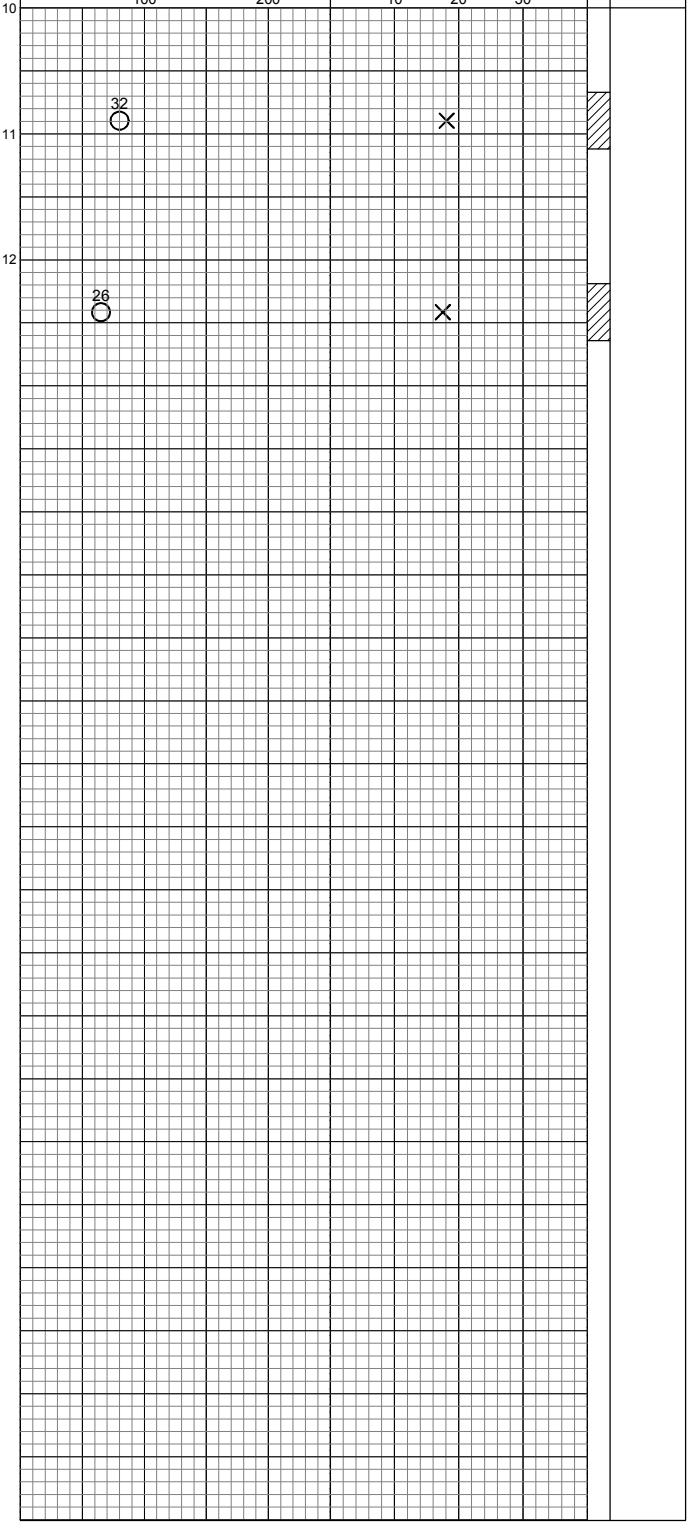
Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	11.58	12.19
May 15, 2017	11.46	
May 19, 2017	11.34	

Log of Borehole 18D

Project No. BRM-00235186-D0 Drawing No. 19

Project: Geotechnical Investigation Sheet No. 2 of 2

Soil Description	ELEV. m
	292.71
Becoming wet, compact.	~291.0
	~290.1
END OF BOREHOLE.	~290.1



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	11.58	12.19
May 15, 2017	11.46	
May 19, 2017	11.34	

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Log of Borehole 18S

Project No. BRM-00235186-D0 | Drawing No. 19A

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 8, 2017

Drill Type: D-90-Tire

Datum: Geodetic

Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Field Vane Test (S)

Combustible Vapour Reading | Natural Moisture | Plastic and Liquid Limit | Undrained Triaxial at % Strain at Failure | Penetrometer

Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Weight kN/m³
~150 mm Topsoil over **CLAYEY SILT TILL:** Trace to some gravel, fine sand seams, brown, moist with wet seams, stiff to very stiff.	302.71	0	7		
		1	11		21.3
		2	26		22.2
SANDY SILT TILL: Fine sand seams, trace gravel, occasional boulder fragments, brown, moist, dense to very dense.	~300.5	2	38		
		3	57		22.3
SILTY SAND: Fine grained, brown, moist, dense to very dense.	~298.7	4			
		5	49		
		6	70		21.7
END OF BOREHOLE.	~296.2				

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	6.10
May 15, 2017	5.88	
May 19, 2017	5.83	

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Log of Borehole 19

Project No. BRM-00235186-D0 | Drawing No. 20

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 27, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) 20 40 60 80 Shear Strength kPa 100 200	Combustible Vapour Reading (ppm) 25 50 75 Natural Moisture Content % Atterberg Limits (% Dry Weight) 10 20 30	Sample	Natural Unit Weight kN/m³
		~200 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, occasional boulder fragments, brown oxidized pockets and silt partings, moist, compact.	300.26	0	6			
				1	12			22.4
				2	17			
					19			21.9
				3	26			22.0
				4				
				5	29			22.7
		Becoming wet, dense.	~294.7	6	42			21.6
		END OF BOREHOLE.	~293.7					

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	5.03	5.79

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Log of Borehole 20

Project No. BRM-00235186-D0 | Drawing No. 21

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 9, 2017

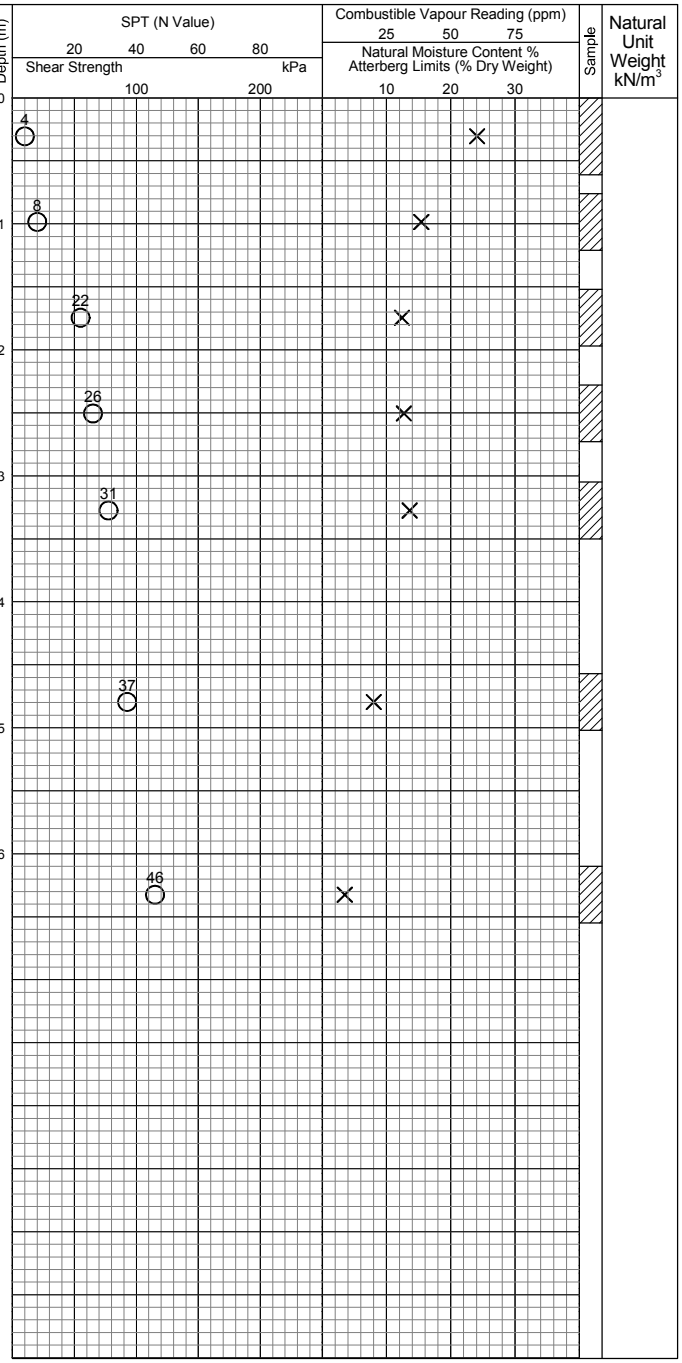
Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○—|
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m
~250 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, trace clay, occasional boulder fragments, brown, moist, loose to dense.	300.12
	~296.0
SILTY SAND: Fine grained, brown, moist, dense.	
	~293.5
END OF BOREHOLE.	



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	6.10
May 15, 2017	5.85	
May 19, 2017	5.82	

Groundwater | Soil/Rock Symbol

EXPLOGBRAMPTON AIRPORT ROAD AND CRANSTON DRIVE GINT LOGS - COPY.GPJ NEW.GDT 5/6/17

Log of Borehole 21

Project No. BRM-00235186-D0 | Drawing No. 22

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 9, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~450 mm Topsoil over **SANDY SILT TILL:** Trace gravel, brown, moist to wet, loose.	298.77	0
				1
			~297.4	
		SILTY SAND: Stratified, fine grained, brown, moist, loose to very loose.		2
				3
				4
				5
			~293.2	
		Becoming cemented, compact.		6
			~292.2	
		END OF BOREHOLE.		

SPT (N Value) 20 40 60 80
Shear Strength kPa 100 200
Combustible Vapour Reading (ppm) 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight) 10 20 30
Sample
Natural Unit Weight kN/m³

SPT values: 6, 5, 4, 3, 4, 8, 11

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	6.10

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Log of Borehole 22

Project No. BRM-00235186-D0 | Drawing No. 23

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 9, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~300 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, occasional boulder fragments, brown, moist, compact to dense.	303.22	0
		Becoming wet.	~301.0	1
				2
				3
			~299.1	4
		SILTY SAND: Fine grained, brown, moist, compact.		5
				6
			~296.6	
		END OF BOREHOLE.		

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30
Sample
Natural Unit Weight kN/m³

SPT values: 5, 10, 45, 25, 26, 25, 26

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	5.49	6.10

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Log of Borehole 23

Project No. BRM-00235186-D0 | Drawing No. 24

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 8, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
~300 mm Topsoil over **FILL:** Sandy silt to clayey silt, trace gravel, brown to dark brown, moist.	301.81	0	5	×		
		1	4	×		
SANDY SILT TILL: Fine sand seams, trace gravel, trace clay, brown, moist, compact to dense.	~300.4		14	×		22.1
		2	37	×		22.4
SILTY SAND: Fine grained, brown, moist, dense to very dense.	~298.9	3	50 for 150mm	×		
		4				
		5	50	×		
		6	38	×		
END OF BOREHOLE.	~295.2					

SPT (N Value): 20 40 60 80
Shear Strength kPa: 100 200
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	6.10
May 15, 2017	Dry	
May 19, 2017	Dry	

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Log of Borehole 24

Project No. BRM-00235186-D0 | Drawing No. 25

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 8, 2017

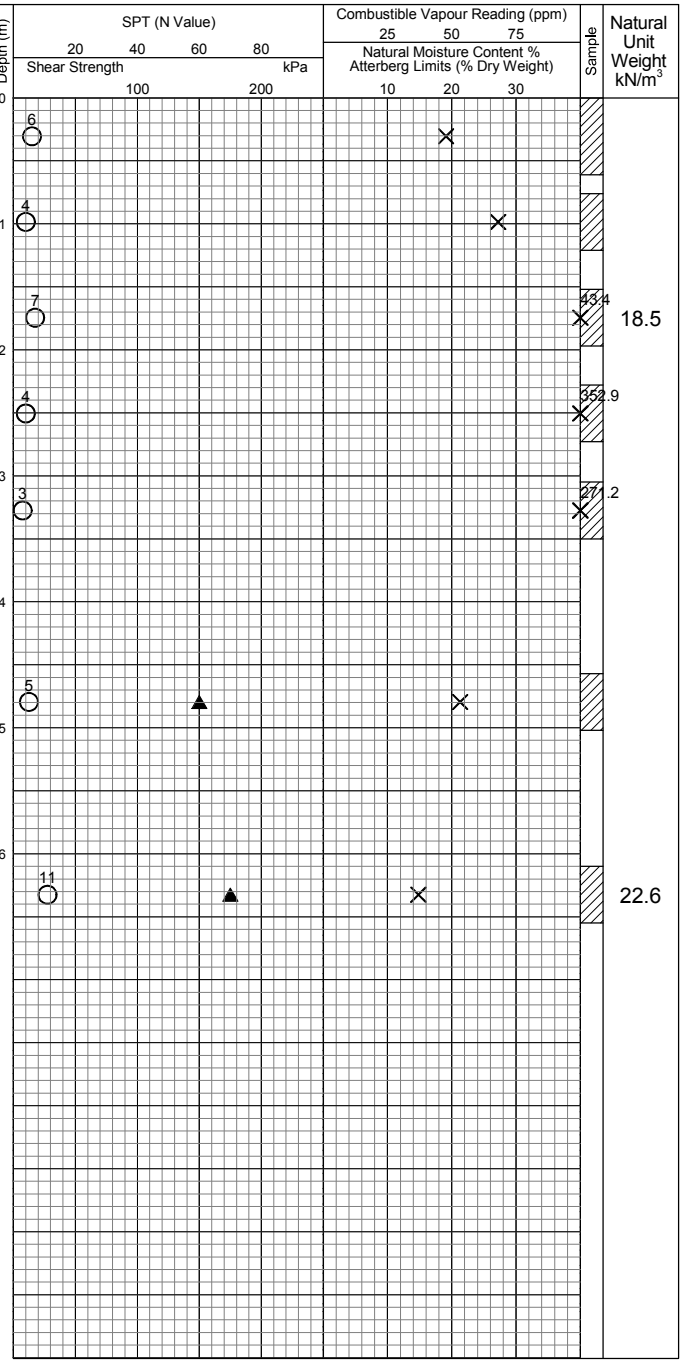
Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m
~300 mm Topsoil over **FILL:** Clayey silt, trace gravel, trace black decayed vegetation, brown, wet.	295.53
	~293.4
PEAT: Fibrous decayed vegetation, wood fragments, black, wet, very loose.	
	~291.5
SILTY SAND: Fine to medium grained, grey, wet, loose.	
	~290.7
CLAYEY SILT TILL: Trace gravel, grey, moist, stiff.	
	~288.9
END OF BOREHOLE.	



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	1.52	1.83

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Log of Borehole 25

Project No. BRM-00235186-D0 | Drawing No. 26

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 26, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Weight kN/m³
~175 mm Topsoil over **FILL:** Silt to clayey silt, trace gravel, brown, moist to wet.	303.63	0	5	×	
		1	6	×	21.8
		2	6	×	20.0
SANDY SILT TILL: Trace gravel, occasional boulder fragments, brown, moist, compact.	~301.5		27	×	
SILTY SAND: Medium grained, trace gravel, brown, wet, compact.	~300.7	3	18	×	
SANDY SILT TILL: Fine sand seams, trace gravel, occasional boulder fragments, brown, moist, dense to very dense.	~299.6	4			
		5	45	×	22.4
		6	75	×	22.9
END OF BOREHOLE.	~297.0				

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30
Sample

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	3.66	4.42
May 15, 2017	2.53	
May 19, 2017	2.92	

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Log of Borehole 26

Project No. BRM-00235186-D0 | Drawing No. 27

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 28, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~150 mm Topsoil over **FILL:** Sandy silt to clayey silt, trace gravel, brown, moist to wet.	303.38	0
				1
				2
			~301.3	
		SANDY SILT TILL: Fine sand seams and layers, trace gravel, occasional boulder fragments, brown, oxidized pockets, moist, compact to very dense.		3
				4
				5
			~297.8	
		SILTY SAND: Fine grained, brown, moist, very dense.		6
			~297.2	
		END OF BOREHOLE.		

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa

SPT values: 5, 6, 5, 15, 21, 77, 50 for 130mm

Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

Sample

Natural Unit Weight kN/m³: 20.1, 22.4, 22.2

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	5.33	5.87

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Log of Borehole 27

Project No. BRM-00235186-D0 | Drawing No. 28

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 2, 2017

Drill Type: D-90-Tire

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~150 mm Topsoil over **FILL:** Clayey silt, trace to some gravel, sand pockets, brown, moist to wet.	301.92	0	8			
				1	11			
				2	5			19.8
				2	6			
				3	4			
		SILTY SAND: Fine to medium grained, widely scattered rock fragments, brown, moist, very dense.	~297.9	4				
				5	98			
				6	85			
		END OF BOREHOLE.	~295.3					

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	2.13	5.18

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Log of Borehole 29

Project No. BRM-00235186-D0 | Drawing No. 30

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 9, 2017

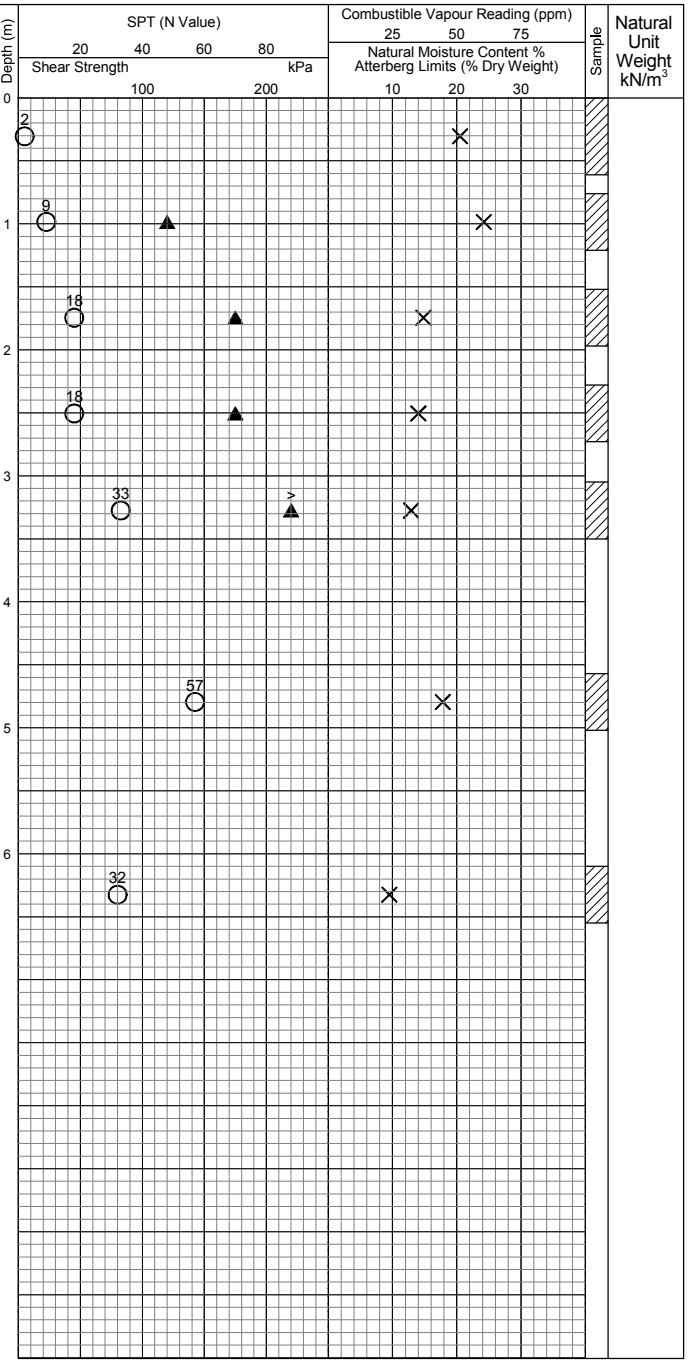
Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m
~300 mm Topsoil over **CLAYEY SILT TILL:** Fine sand seams, trace gravel, occasional boulder fragments, brown, wet, stiff to hard.	302.68
	~298.7
SANDY SILT TILL: Fine sand seams, trace gravel, brown, wet, very dense.	
	~297.1
SILTY SAND: Fine grained, stratified, brown, moist, dense.	
	~296.1
END OF BOREHOLE.	



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	3.35	6.10

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Log of Borehole 31

Project No. BRM-00235186-D0 | Drawing No. 32

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 9, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~300 mm Topsoil over **FILL:** Clayey silt to sandy silt, trace gravel, brown, wet.	300.71	0
		CLAYEY SILT TILL: Fine sand seams, trace gravel, brown, moist, very stiff to hard.	~299.3	1
				2
			~296.7	3
		SILTY SAND: Fine grained, silt seams, brown, moist, dense.		4
				5
			~294.1	6
		END OF BOREHOLE.		

SPT (N Value) 20 40 60 80
Shear Strength 100 200 kPa

Combustible Vapour Reading (ppm) 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight) 10 20 30

Sample | Natural Unit Weight kN/m³

4, 3, 13, 21, >, 34, >, 30, 41

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	1.83	3.96

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Log of Borehole 32

Project No. BRM-00235186-D0 | Drawing No. 33

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 9, 2017

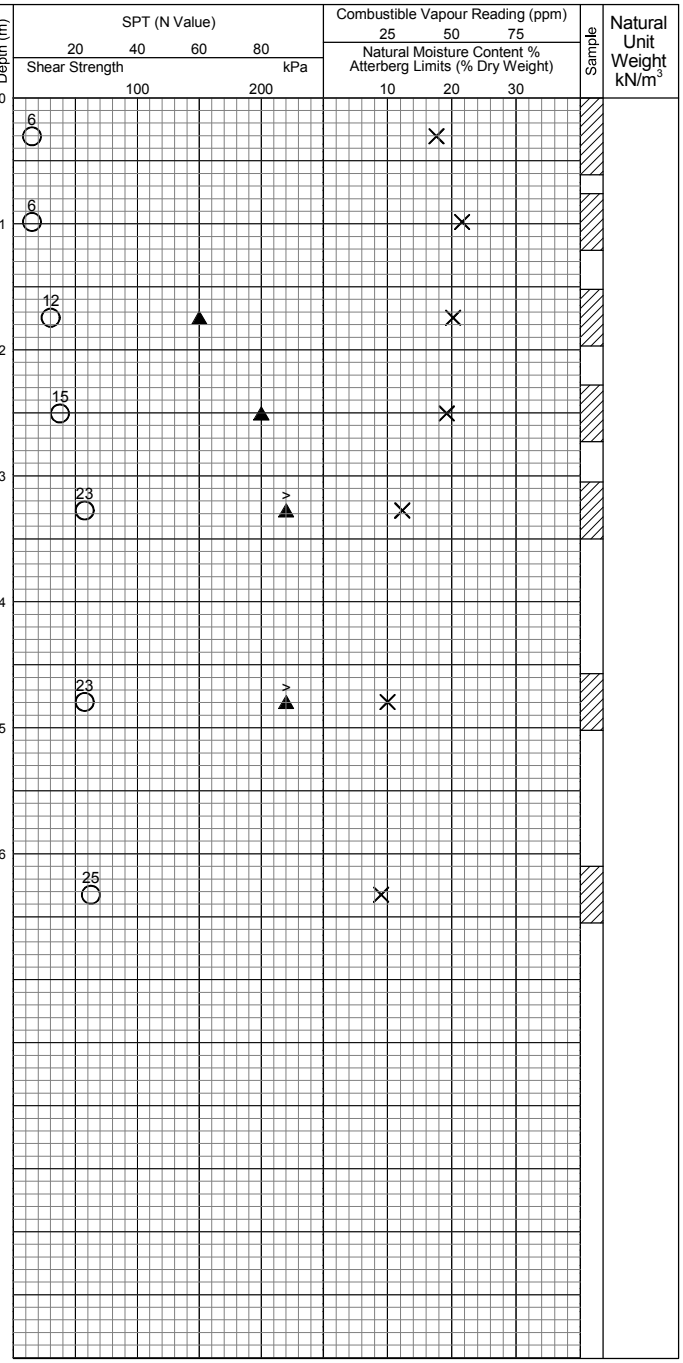
Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m
		~400 mm Topsoil over **FILL:** Silty sand changing to clayey silt, trace gravel, brown and grey, wet.	302.35
		CLAYEY SILT TILL: Fine sand and silt seams, trace gravel, occasional boulder fragments, brown and grey, oxidized partings, moist, stiff to hard.	~301.0
		Becoming grey.	~298.4
		SANDY SILT TILL: Fine sand seams, trace gravel, grey, moist, compact.	~296.8
		END OF BOREHOLE.	~295.8



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	6.10

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Log of Borehole 33

Project No. BRM-00235186-D0 | Drawing No. 34

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 9, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~250 mm Topsoil over **FILL:** Sandy silt to clayey silt, trace gravel, brown, wet.	301.89	0
			~300.8	1
		SANDY SILT TILL: Fine sand seams, sand and gravel layers, trace gravel, brown, moist, compact.		2
				3
		Becoming grey, occasional boulder fragments.	~297.9	4
				5
				6
			~295.3	
		END OF BOREHOLE.		

SPT (N Value): 20 40 60 80 — Shear Strength: 100 200 kPa

Combustible Vapour Reading (ppm): 25 50 75 — Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

Sample | Natural Unit Weight kN/m³

SPT values: 2, 3, 9, 25, 18, 15, 15

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	6.10

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Log of Borehole 34

Project No. BRM-00235186-D0 | Drawing No. 35

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 28, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m
		~250 mm Topsoil over **SANDY SILT TILL:** Fine sand seams and layers, trace gravel, occasional boulder fragments, brown, moist, compact to dense.	303.78
			~298.2
		SILTY SAND: Fine grained, trace gravel and shale fragments, brown, moist, very dense.	~297.6
		END OF BOREHOLE.	

Depth (m) 0 1 2 3 4 5 6

SPT (N Value) 20 40 60 80
Shear Strength 100 200 kPa

5 10 12 13 34 41 50 for 150mm

Combustible Vapour Reading (ppm) 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight) 10 20 30

Sample

Natural Unit Weight kN/m³
22.1
22.2

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	4.5	5.11

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Log of Borehole 35

Project No. BRM-00235186-D0 | Drawing No. 36

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 2, 2017

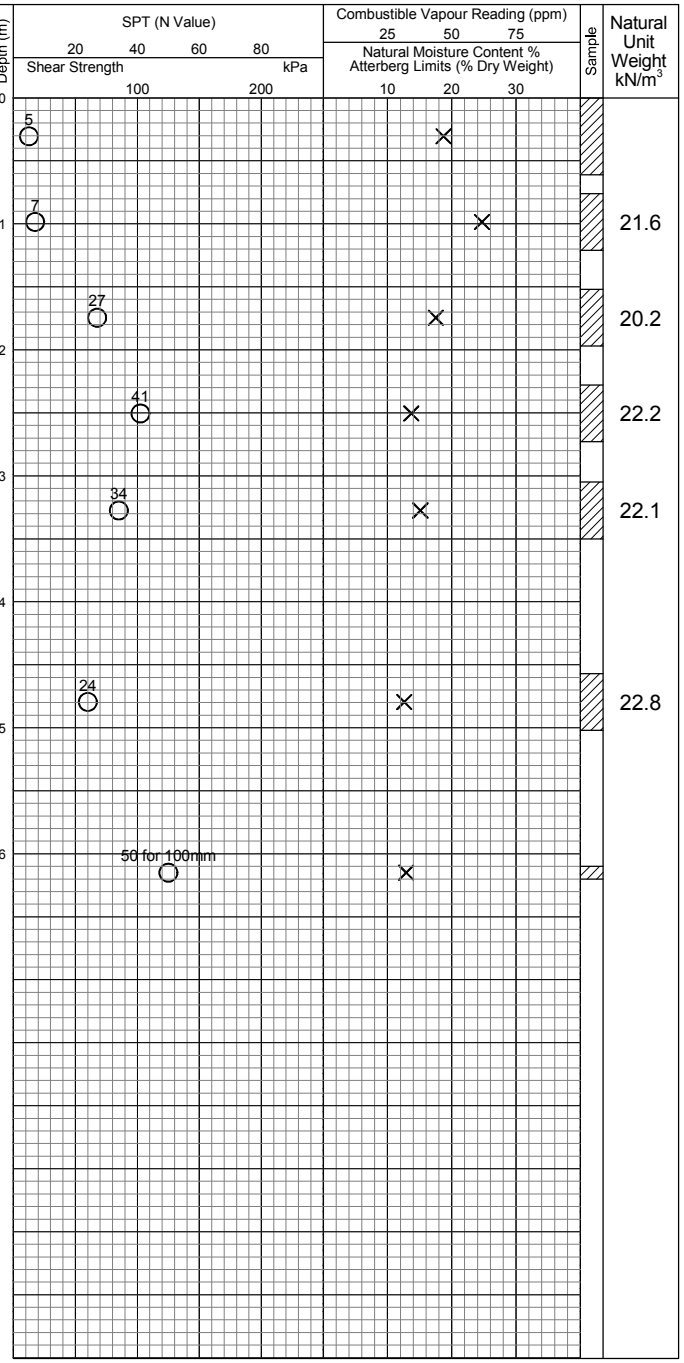
Drill Type: D-90-Tire

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m
~150 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, scattered clayey silt seams, brown, wet, loose to dense.	303.11
Becoming grey, occasional boulder fragments.	~299.1
Becoming very dense.	~297.6
END OF BOREHOLE.	~296.9



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	0.91	0.91

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Log of Borehole 36

Project No. BRM-00235186-D0 | Drawing No. 37

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 2, 2017

Drill Type: D-90-Tire

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~225 mm Topsoil over **FILL:** Clayey silt, some sand, trace gravel, brown, wet.	303.04	0	5			
				1	4			
			~301.6					
		SANDY SILT TILL: Fine sand seams, trace gravel, trace clay, brown, moist, compact to very dense.		2	14			22.0
					27			21.9
				3	35			22.6
				4				
				5	100			21.9
			~297.4					
		SILTY SAND: Fine to medium grained, brown, moist, very dense.		6	65			
			~296.4					
		END OF BOREHOLE.						

SPT (N Value): 20 40 60 80
Shear Strength kPa: 100 200
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	2.44	5.64
May 15, 2017	5.88	
May 19, 2017	5.81	

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Log of Borehole 38

Project No. BRM-00235186-D0 | Drawing No. 39

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 26, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○—|
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~200 mm Topsoil over **FILL:** Sandy silt, trace gravel, trace clay, rock fragments, brown, moist to wet.	304.43	0	4			
				1	9			22.0
					9			22.0
			~302.3	2				
		SANDY SILT TILL: Fine sand seams, trace gravel, occasional boulder fragments, brown, moist, compact.			19			22.4
				3	25			22.4
			~299.6	4				
		Black sand pockets and oxidized zones.			20			21.2
			~298.8	5				
		Becoming dense.						
				6	41			22.3
			~297.8					
		END OF BOREHOLE.						

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	5.03	5.79

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Log of Borehole 39

Project No. BRM-00235186-D0 | Drawing No. 40

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 2, 2017

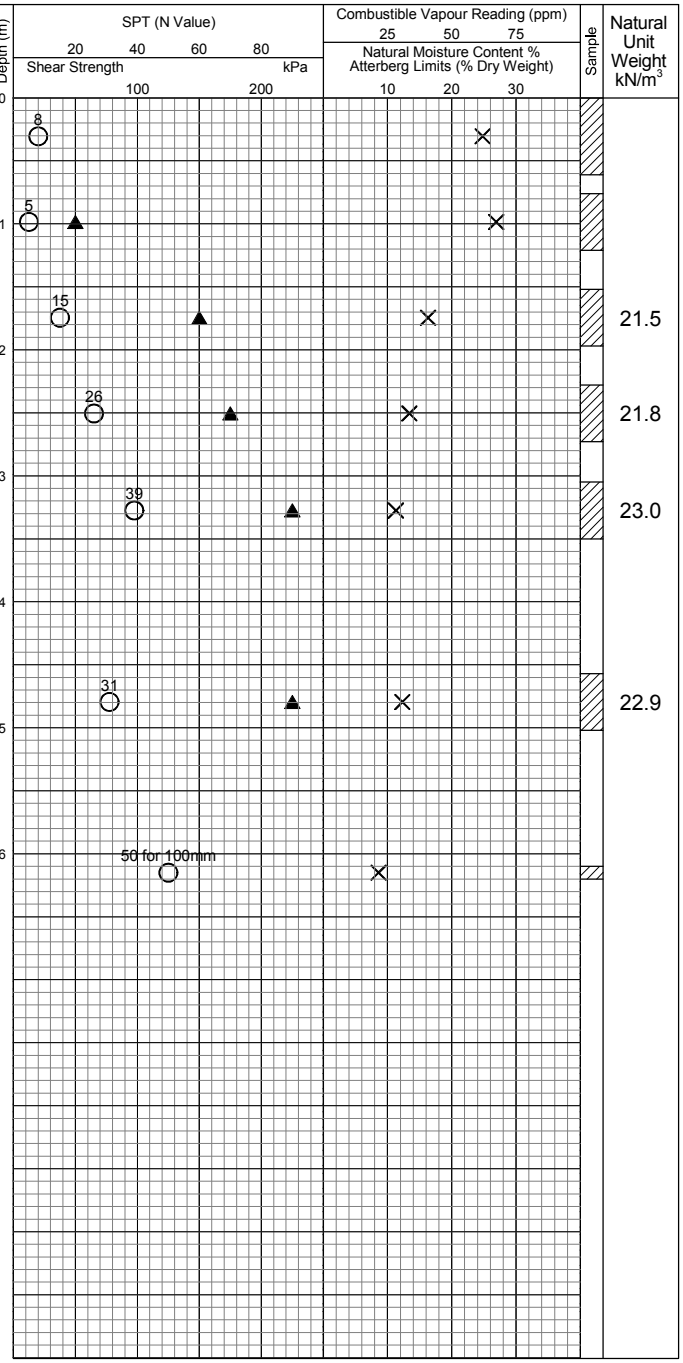
Drill Type: D-90-Tire

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Soil Description	ELEV. m
~225 mm Topsoil over **CLAYEY SILT TILL:** Fine sand seams, trace gravel, occasional boulder fragments, brown, wet changing to moist, firm to hard.	304.69
	~299.1
SILTY SAND: Fine grained, brown, moist, very dense.	
	~298.5
END OF BOREHOLE.	



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	5.94	6.10
May 15, 2017	5.99	
May 19, 2017	5.99	

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Log of Borehole 40

Project No. BRM-00235186-D0 | Drawing No. 41

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 28, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~250 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, occasional boulder fragments, brown, moist, compact.	304.72	0
		Becoming dense.	~300.7	4
		SILTY SAND: Fine grained, silt seams, brown, moist, very dense.	~299.1	
		END OF BOREHOLE.	~298.5	6

SPT (N Value) 20 40 60 80
Shear Strength 100 200 kPa

Combustible Vapour Reading (ppm) 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight) 10 20 30

Sample

Natural Unit Weight kN/m³

5 16 14 19 23 36 50 for 125mm

21.6 21.9 22.4 22.4

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	3.96	5.03

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Log of Borehole 41

Project No. BRM-00235186-D0 | Drawing No. 42

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 9, 2017

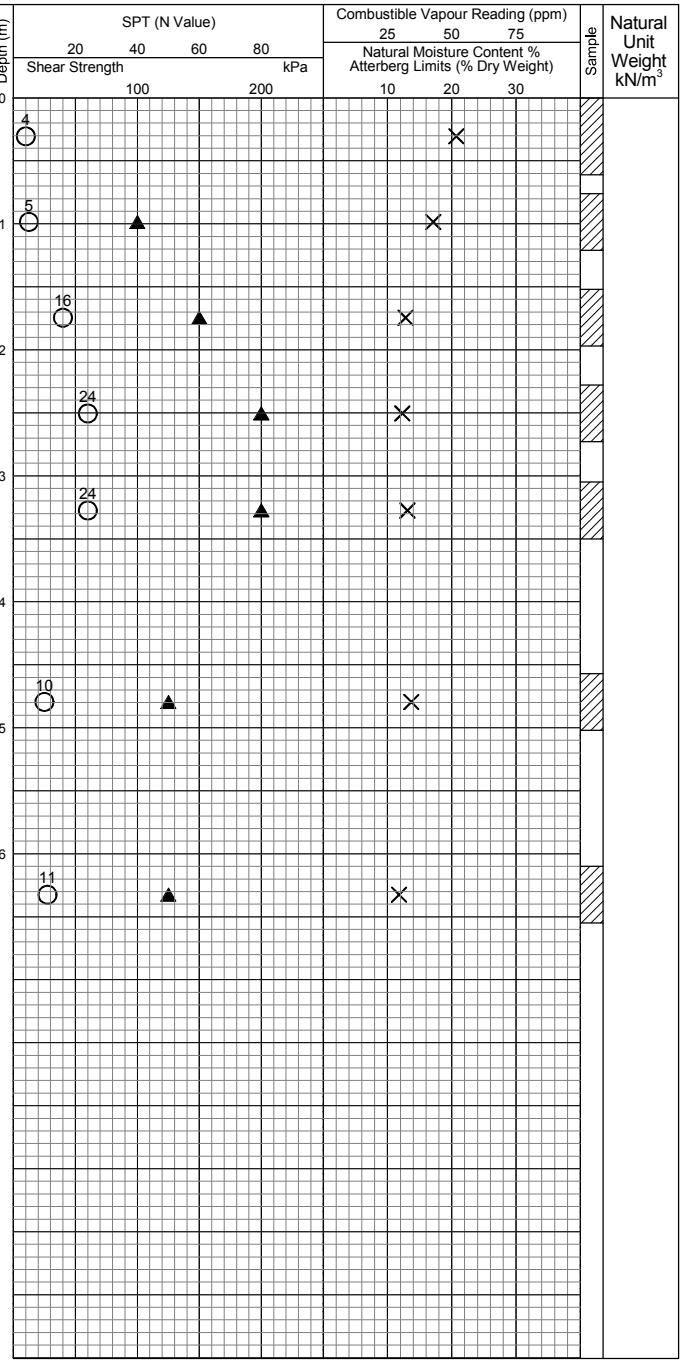
Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m
		~300 mm Topsoil over **CLAYEY SILT TILL:** Fine sand seams, trace gravel, brown, moist to wet, stiff to very stiff.	304.21
		Becoming grey, wet, stiff.	~300.2
		END OF BOREHOLE.	~297.6



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	1.67	6.10
May 15, 2017	1.82	
May 19, 2017	2.05	

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Log of Borehole 42

Project No. BRM-00235186-D0 | Drawing No. 43

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 9, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~300 mm Topsoil over **CLAYEY SILT TILL:** Fine sand seams, trace gravel, occasional boulder fragments, brown, oxidized pockets, moist, stiff to hard.	303.39	0
		Becoming grey.	~297.8	6
		END OF BOREHOLE.	~296.8	

SPT (N Value): 20 40 60 80 — Shear Strength: 100 200 kPa

Combustible Vapour Reading (ppm): 25 50 75 — Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

Sample | Natural Unit Weight kN/m³

SPT values: 2, 7, 10, 14, 20, >, 30, >, 24, >

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	1.22	1.22

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Log of Borehole 43

Project No. BRM-00235186-D0 | Drawing No. 44

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: April 28, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○—|
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m	Sample	Natural Unit Weight kN/m³
~200 mm Topsoil over **FILL:** Silty sand, fine to medium grained, brown, reddish brown and grey, moist with wet zones.	306.39		
	~302.4		
SILTY SAND: Fine grained, brown, wet, compact.			
	~300.8		
SANDY SILT TILL: Fine sand seams, trace gravel, brown, moist, compact.			21.7
	~299.8		
END OF BOREHOLE.			

Depth (m): 0, 1, 2, 3, 4, 5, 6

SPT (N Value): 20 40 60 80 — Shear Strength: 100 200 kPa

SPT values: 3, 3, 2, 8, 5, 25, 22

Combustible Vapour Reading (ppm): 25 50 75

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	0.05	4.57

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Log of Borehole 44

Project No. BRM-00235186-D0 | Drawing No. 45

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 8, 2017

Drill Type: CME 75-Marooka

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~225 mm Topsoil over **FILL:** Sandy silt to silty sand, trace clay, brown, moist to wet.	308.19	0	4			
				1	4			19.9
				2	8			21.9
			~306.0					
		SILTY SAND: Fine grained, brown, moist, compact to dense.		2	39			21.6
				3	25			
		Becoming wet, compact.	~304.1	4				
				5	14			21.5
				6	25			
			~301.2	7				
		SANDY SILT TILL: Fine sand seams, trace gravel, brown, moist, dense.			37			22.3
			~300.1					
		END OF BOREHOLE.						

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	7.5

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Log of Borehole 45

Project No. BRM-00235186-D0 | Drawing No. 46

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 8, 2017

Drill Type: CME 75-Marooka

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~150 mm Topsoil over **FILL:** Sandy silt, trace gravel, trace clay, brown, topsoil stained pockets, moist, loose.	308.82	0	7			
				1	8			21.5
				2	5			
		SILTY SAND: Fine to medium grained, brown, grey seams, wet, compact.	~306.6		14			
				3	14			
				4				
				5	20			
		CLAYEY SILT TILL: Silt seams, trace gravel, brown, wet, stiff.	~303.2	6	12 ▲			20.3
		END OF BOREHOLE.	~302.2					

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	2.89	2.89

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Log of Borehole 46

Project No. BRM-00235186-D0 | Drawing No. 47

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 8, 2017

Drill Type: CME 75-Marooka

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~330 mm Topsoil over **FILL:** Silty sand, clayey silt pockets, brown to dark brown, moist.	307.10	0
		SILTY SAND: Fine grained, stratified, brown, wet, loose.	~305.7	1
		SANDY SILT TILL: Fine sand seams and layers, trace gravel, brown, moist, compact to very dense.	~303.1	2
		END OF BOREHOLE.	~299.0	3

SPT (N Value) 20 40 60 80
Shear Strength kPa 100 200
Combustible Vapour Reading (ppm) 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight) 10 20 30
Sample
Natural Unit Weight kN/m³

5, 7, 9, 7, 9, 12, 85, 98

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	2.89	2.89

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Log of Borehole 47D

Project No. BRM-00235186-D0 | Drawing No. 48

Project: Geotechnical Investigation | Sheet No. 1 of 2

Location: Airport Road and Cranston Drive

Date Drilled: May 11, 2017

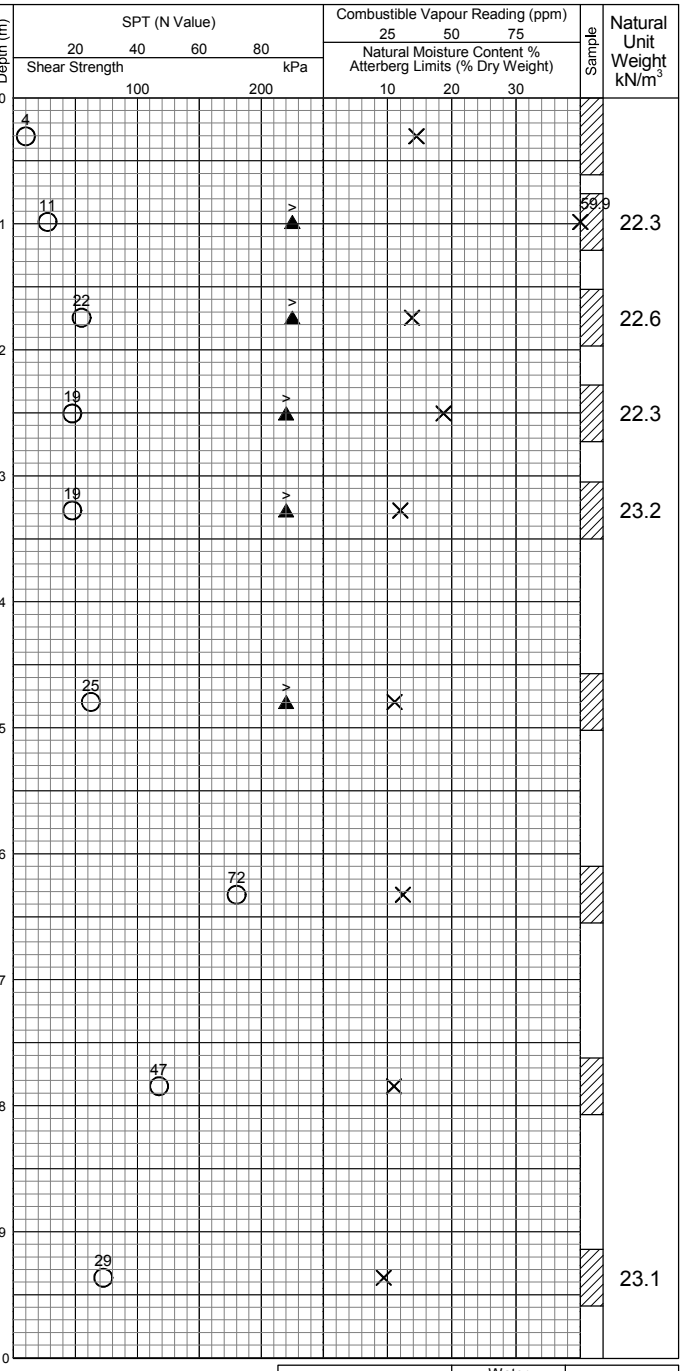
Drill Type: CME 55 - Rubber Track

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Soil Description	ELEV. m
~230 mm Topsoil over **CLAYEY SILT TILL:** Fine sand seams, trace gravel, occasional boulder fragments, brown, oxidized seams and fissures, moist, hard.	303.35
Becoming grey, shale fragments, wet.	~299.4
SAND AND GRAVEL: Clayey silt layers, brown, moist, very dense.	~297.8
SANDY SILT TILL: Fine sand seams, trace gravel, trace clay, occasional boulder fragments, brown, moist, dense.	~296.3
Becoming grey, compact.	~294.7



Continued Next Page

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	11.73	11.89
May 15, 2017	10.14	
May 19, 2017	10.44	

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Log of Borehole 47D

Project No. BRM-00235186-D0 Drawing No. 48

Project: Geotechnical Investigation Sheet No. 2 of 2

Soil Description	ELEV. m	Depth (m)
	293.35	10
SILTY SAND: Fine grained, brown, moist, very dense.	~293.3	
		11
Becoming wet, dense.	~291.7	
		12
END OF BOREHOLE.	~290.7	

SPT (N Value) 20 40 60 80

Shear Strength kPa 100 200

Combustible Vapour Reading (ppm) 25 50 75

Natural Moisture Content % Atterberg Limits (% Dry Weight) 10 20 30

Sample

Natural Unit Weight kN/m³

61

38

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	11.73	11.89
May 15, 2017	10.14	
May 19, 2017	10.44	

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Log of Borehole 47S

Project No. BRM-00235186-D0 | Drawing No. 48A

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 11, 2017

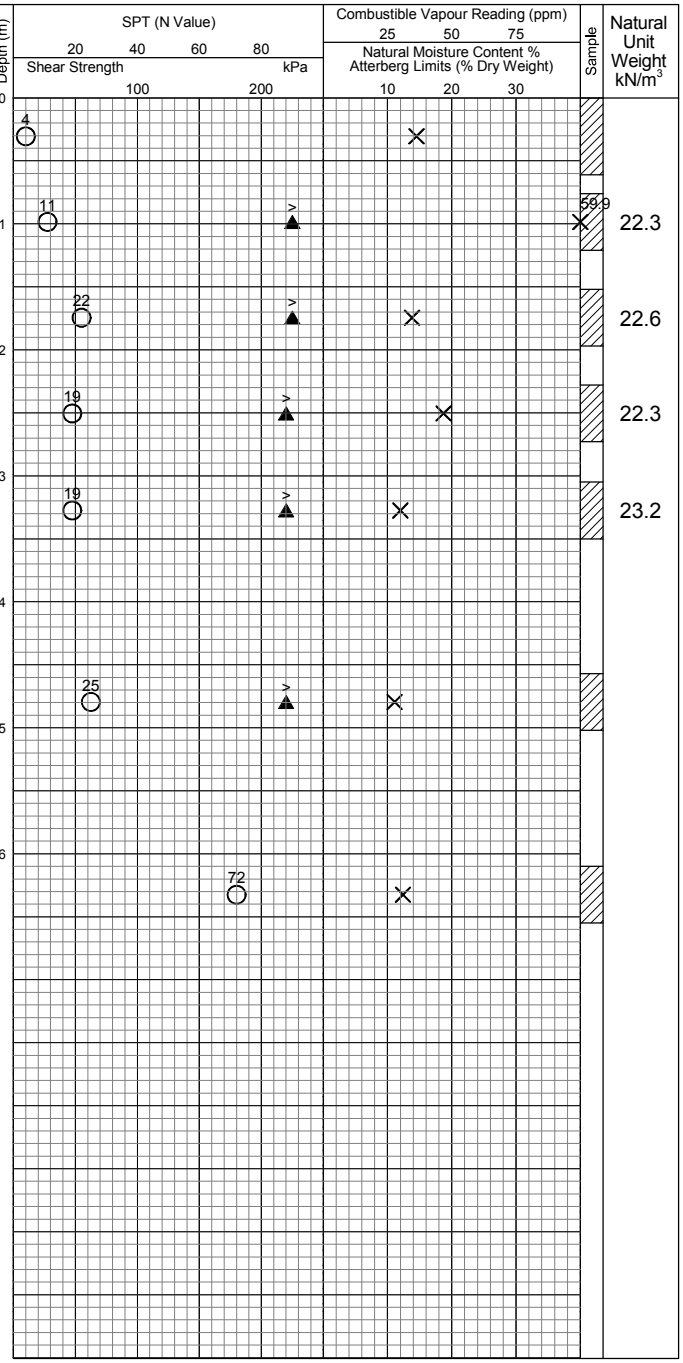
Drill Type: CME 55- Rubber Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○—|
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m
~230 mm Topsoil over **CLAYEY SILT TILL:** Fine sand seams, trace gravel, occasional boulder fragments, brown, oxidized seams and fissures, moist, hard.	303.35
Becoming grey, shale fragments, wet.	~299.4
SAND AND GRAVEL: Clayey silt layers, brown, moist, very dense.	~297.8
END OF BOREHOLE.	~296.8



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	6.10
May 15, 2017	3.93	
May 19, 2017	4.37	

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Log of Borehole 49

Project No. BRM-00235186-D0 | Drawing No. 50

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 8, 2017

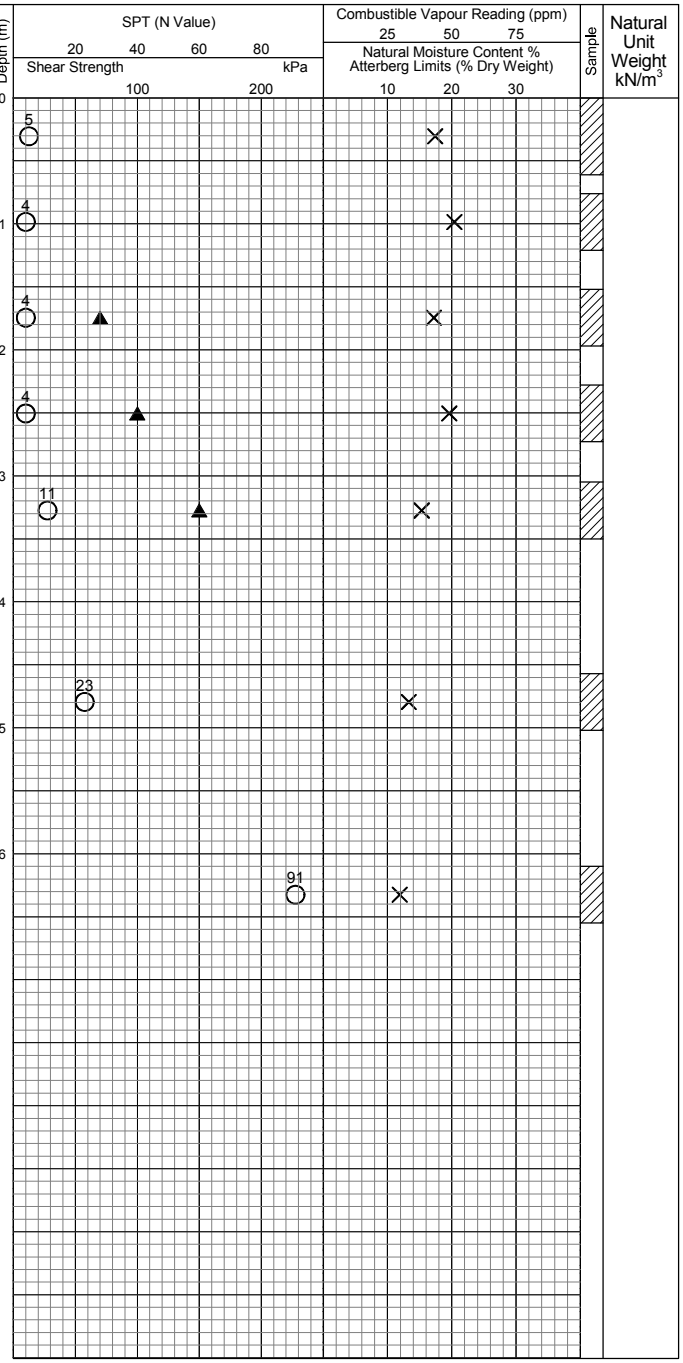
Drill Type: CME 75-Marooka

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m
		~330 mm Topsoil over **FILL:** Clayey silt to sandy silt, trace gravel, brown, wet.	306.06
		CLAYEY SILT TILL: Fine sand seams, trace gravel, occasional gravel pockets, brown, moist, firm to very stiff.	~304.7
		SANDY SILT TILL: Fine sand seams, trace gravel, brown, moist, compact.	~302.0
		SILTY SAND: Medium grained, widely scattered gravel, brown, moist, very dense.	~299.9
		END OF BOREHOLE.	~299.5



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	2.74	2.89

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Log of Borehole 50

Project No. BRM-00235186-D0 | Drawing No. 51

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 8, 2017

Drill Type: CME 75-Marooka

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○—|
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m	Depth (m)
~150 mm Topsoil over **FILL:** Sandy silt to clayey silt, trace gravel, brown to dark brown, moist.	309.19	0
	~308.2	1
SANDY SILT TILL: Fine sand seams, trace gravel, sand and gravel layer, brown, moist, loose.		
	~307.1	2
SILTY SAND: Fine grained, widely scattered gravel, brown, moist, dense to very dense.		3
		4
		5
	~303.6	
Increased silt content, becoming wet, loose.		6
	~302.6	
END OF BOREHOLE.		

SPT (N Value): 20 40 60 80 — Shear Strength: 100 200 kPa

Combustible Vapour Reading (ppm): 25 50 75 — Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

SPT values: 4, 9, 8, 38, 56, 30, 8

Natural Unit Weight kN/m³

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	5.72

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Log of Borehole 51D

Project No. BRM-00235186-D0 | Drawing No. 52

Project: Geotechnical Investigation | Sheet No. 1 of 2

Location: Airport Road and Cranston Drive

Date Drilled: May 15, 2017

Drill Type: CME 55 - Rubber Track

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Soil Description	ELEV. m	Natural Unit Weight kN/m³
FILL: Sandy silt to clayey silt, trace gravel, brown to dark brown, topsoil stained pockets, moist.	310.01	20.8
SILTY SAND: Fine grained, silt seams and layers, brown, moist, compact to dense.	~307.8	
Becoming wet, increased silt content.	~304.4	

SPT (N Value): 4, 4, 5, 25, 38, 33, 32, 39, 25

Shear Strength (kPa): 100, 200

Combustible Vapour Reading (ppm): 25, 50, 75

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10, 20, 30

Depth (m): 0 to 10

Continued Next Page

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	11.73	12.19
May 17, 2017	9.53	
May 19, 2017	9.45	

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Log of Borehole 51D

Project No. BRM-00235186-D0 Drawing No. 52

Project: Geotechnical Investigation Sheet No. 2 of 2

Soil Description	ELEV. m
	300.01
	~299.8
SANDY SILT TILL: Silt seams, trace gravel, brown, moist, very dense.	
	~297.7
END OF BOREHOLE.	

Depth (m): 10, 11, 12

SPT (N Value): 20 40 60 80

Shear Strength: 100 200 kPa

60 for 100mm

60 for 100mm

Combustible Vapour Reading (ppm): 25 50 75

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Sample

Natural Unit Weight kN/m³

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	11.73	12.19
May 17, 2017	9.53	
May 19, 2017	9.45	

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Log of Borehole 51S

Project No. BRM-00235186-D0 | Drawing No. 52A

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 15, 2017

Drill Type: CME 55-Rubber Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit |—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
FILL: Sandy silt to clayey silt, trace gravel, brown to dark brown, topsoil stained pockets, moist.	310.01	0	4	×		20.8
		1	4	×		
		2	5	×		
	~307.8		25	×		
SILTY SAND: Fine grained, silt seams and layers, brown, moist, compact to dense.		3	38	×		
		4				
		5	33	×		
Becoming wet, increased silt content.	~304.4					
		6	32	×		
	~303.5					
END OF BOREHOLE.						

SPT (N Value): 20 40 60 80
Shear Strength kPa: 100 200
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	6.10
May 17, 2017	5.87	
May 19, 2017	5.87	

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Log of Borehole 52

Project No. BRM-00235186-D0 | Drawing No. 53

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 12, 2017

Drill Type: CME 55 - Rubber Track

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Soil Description	ELEV. m	Natural Unit Weight kN/m³
~150 mm Topsoil over **FILL:** Silty sand, trace gravel, trace clay, brown, wet.	310.64	
	~308.4	
SANDY SILT TILL: Fine sand seams, trace gravel, occasional boulder fragments, brown, oxidized pockets, moist, compact.		21.6
	~306.6	
SILTY SAND: Fine grained, stratified, brown, wet, compact.		20.7
	~302.5	
END OF BOREHOLE.		

SPT (N Value) 20 40 60 80
Shear Strength 100 200 kPa
Combustible Vapour Reading (ppm) 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight) 10 20 30
Depth (m) 0 1 2 3 4 5 6 7
Sample
SPT values: 4, 0, 1, 16, 20, 19, 25, 21

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	6.25	6.25

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Log of Borehole 53

Project No. BRM-00235186-D0 | Drawing No. 54

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 12, 2017

Drill Type: CME 55 - Rubber Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~100 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, trace clay, brown, moist, loose.	310.73	0	4			
				1	6			22.3
				2	6			21.7
		SILTY SAND: Fine grained, cemented zones, brown, moist, compact.	~308.6		24			
				3	18			
		Becoming wet, increased silt content.	~306.6	4				
				5	13			19.7
		Becoming dense.	~305.1					
				6	31			
			~303.5	7				
		SANDY SILT TILL: Fine sand seams, trace gravel, trace clay, brown, wet, compact.		8	15			21.4
		Becoming moist, very dense.	~302.1					
			~301.5	9	50 for 80mm			22.1
		END OF BOREHOLE.						

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	7.32

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Log of Borehole 54

Project No. BRM-00235186-D0 | Drawing No. 55

Project: Geotechnical Investigation | Sheet No. 1 of 2

Location: Airport Road and Cranston Drive

Date Drilled: May 12, 2017

Drill Type: CME 55 - Rubber Track

Datum: Geodetic

Auger Sample ☒ | Combustible Vapour Reading □

SPT (N) Value ○ ▨ | Natural Moisture ×

Dynamic Cone Test — | Plastic and Liquid Limit I—○

Shelby Tube ■ | Undrained Triaxial at % Strain at Failure ⊕

Field Vane Test ✚ S | Penetrometer ▲

Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Weight kN/m³
~180 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, brown, moist to wet, compact.	311.23	0	3		
		1	11		21.7
		2	12		
	~309.0				
SILTY SAND: Fine grained, brown, moist, dense.		2	35		
		3	40		
	~307.2				
SANDY SILT TILL: Fine sand seams and layers, trace gravel, brown, moist, dense to very dense.		4			
		5	61		23.1
		6			
	~304.9				
Wet sand layer.		6	41		
		7			
		7	50 for 130mm		22.8
		8			
		9	50 for 100mm		
		10			

Continued Next Page

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	5.69	5.79

Log of Borehole 54

Project No. BRM-00235186-D0 Drawing No. 55

Project: Geotechnical Investigation Sheet No. 2 of 2

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
			301.23	0
				10
			~300.4	
		END OF BOREHOLE.		

SPT (N Value) 20 40 60 80

Shear Strength kPa 100 200

50 for 80mm

Combustible Vapour Reading (ppm) 25 50 75

Natural Moisture Content % Atterberg Limits (% Dry Weight) 10 20 30

Sample

Natural Unit Weight kN/m^3

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	5.69	5.79

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Log of Borehole 55

Project No. BRM-00235186-D0 | Drawing No. 56

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 12, 2017

Drill Type: CME 55 - Rubber Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		SILTY SAND: Fine grained, brown, moist, loose to compact.	309.13	0	5			
				1	9			
		Becoming wet, cemented.	~307.7	2	13			
				2	16			
				3	19			
			~305.0	4				
		SANDY SILT TILL: Fine sand seams, trace gravel, brown, moist, compact to very dense.		5	19			21.9
				6	34			22.2
				7	56 for 230mm			22.0
			~301.3					
		END OF BOREHOLE.						

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Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	3.81	4.27

Log of Borehole 56

Project No. BRM-00235186-D0 | Drawing No. 57

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 8, 2017

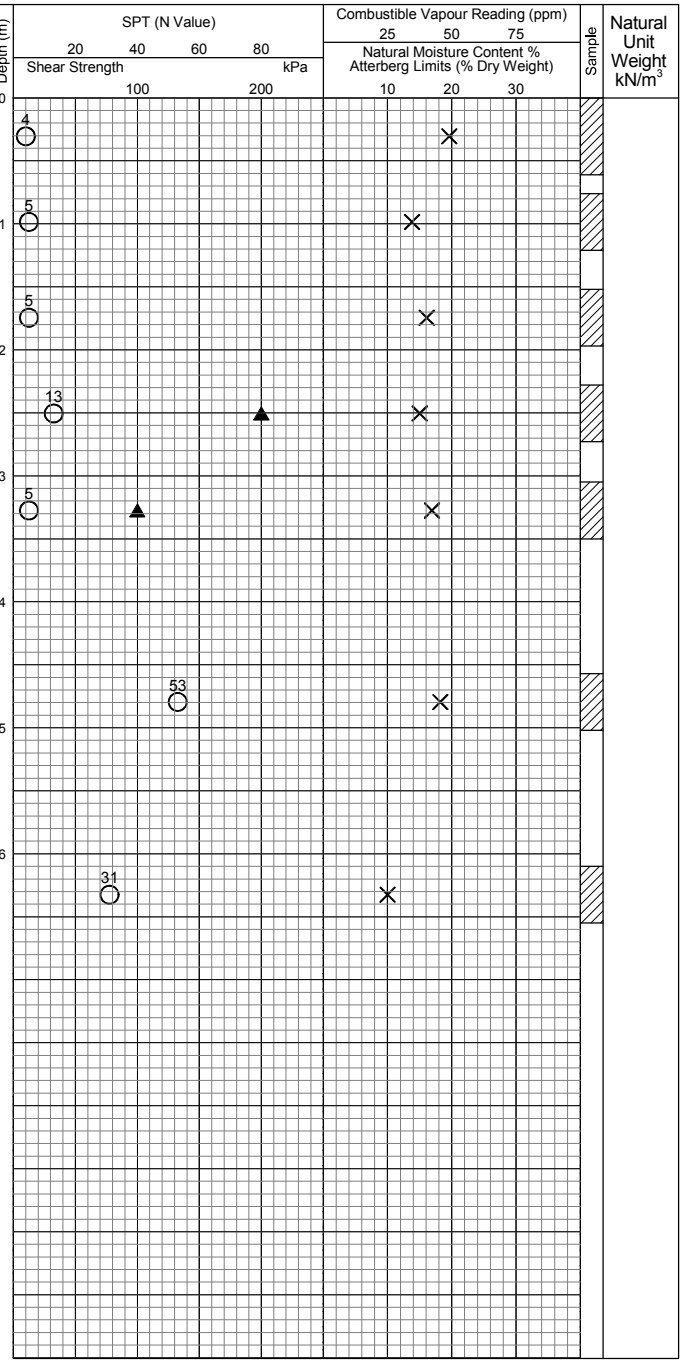
Drill Type: CME 75-Marooka

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Soil Description	ELEV. m
~200 mm Topsoil over **FILL:** Clayey silt, trace sand, trace gravel, brown, wet.	305.93
	~303.8
CLAYEY SILT TILL: Fine sand seams, trace gravel, brown, moist, very stiff changing to firm.	
	~301.9
SANDY SILT TILL: Fine sand seams, trace gravel, brown, wet, very dense.	
	~300.3
SILTY SAND: Fine grained, brown, moist, dense.	
	~299.3
END OF BOREHOLE.	



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	5.94
May 15, 2017	Dry	
May 19, 2017	Dry	

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Log of Borehole 57

Project No. BRM-00235186-D0 | Drawing No. 58

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 8, 2017

Drill Type: CME 75-Marooka

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Soil Description	ELEV. m
~180 mm Topsoil over **FILL:** Clayey silt, trace sand, trace gravel, brown to dark brown, wet.	308.31
	~306.2
CLAYEY SILT TILL: Fine sand seams, trace gravel, brown, moist, stiff to hard.	
	~302.7
SANDY SILT TILL: Fine sand seams and layers, trace gravel, brown, wet, dense to very dense.	
	~300.2
END OF BOREHOLE.	

SPT (N Value): 3, 3, 4, 5, 14, 34, >, 50, 41

Shear Strength (kPa): 100, 200

Combustible Vapour Reading (ppm): 25, 50, 75

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10, 20, 30

Depth (m): 0, 1, 2, 3, 4, 5, 6, 7

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	2.44	2.44

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Log of Borehole 58

Project No. BRM-00235186-D0 | Drawing No. 59

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 8, 2017

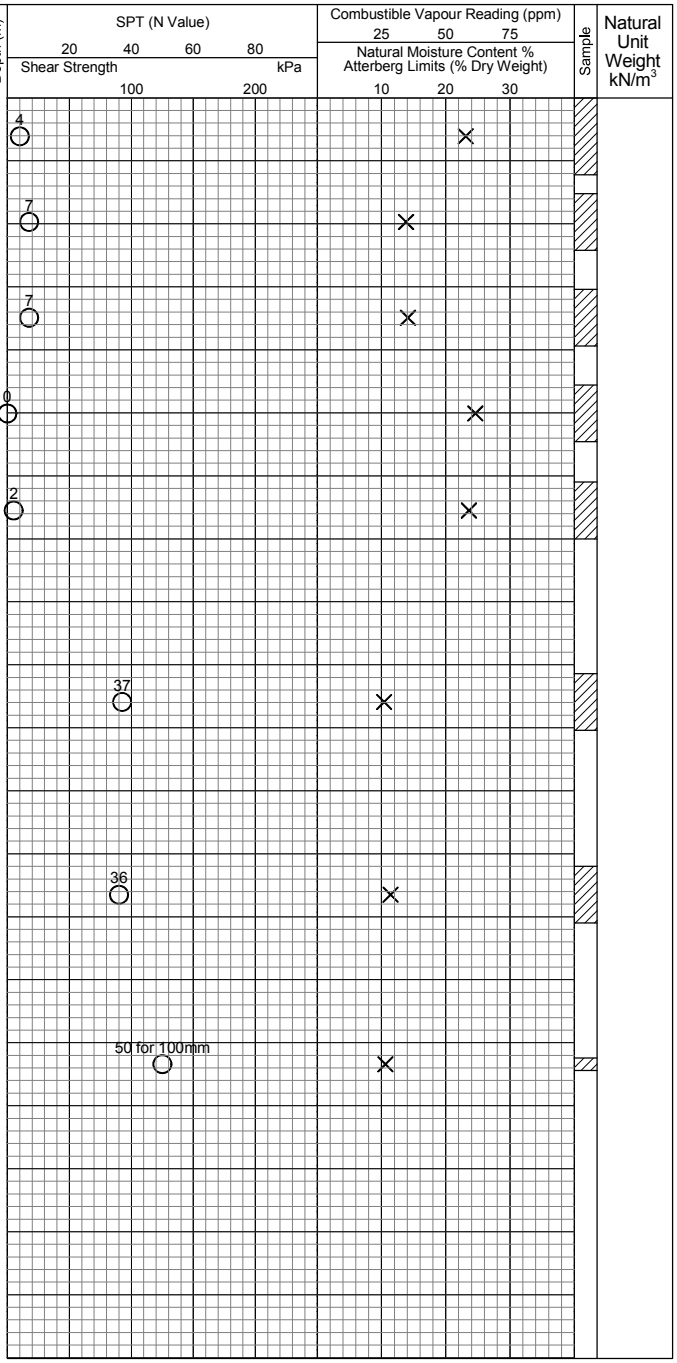
Drill Type: CME 75-Marooka

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m
		~180 mm Topsoil over	308.38
		FILL: Sandy silt to clayey silt, trace gravel, brown, moist.	
		Becoming mainly sandy silt, trace gravel, brown, wet.	~306.2
		SILTY SAND: Fine grained, brown, moist, dense.	~304.3
		SANDY SILT TILL: Fine sand seams, trace gravel, trace clay, brown, moist, dense.	~302.8
		SAND AND GRAVEL: Brown, wet, very dense.	~301.3
		END OF BOREHOLE.	~300.7



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	1.98	2.59

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Log of Borehole 59

Project No. BRM-00235186-D0 | Drawing No. 60

Project: Geotechnical Investigation | Sheet No. 1 of 2

Location: Airport Road and Cranston Drive

Date Drilled: May 10, 2017

Drill Type: CME 75-Marooka

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Weight kN/m³
~150 mm Topsoil over **SANDY SILT TILL:** Fine sand seams and layers, trace gravel, trace clay, occasional boulder fragments, brown, moist, compact to dense.	309.42	0	6		
		1	14		22.3
		2	11		22.3
			43		21.8
	~306.2	3	40		
SILTY SAND: Fine grained, sandy silt layers, cemented zones, widely scattered gravel, brown, moist, dense.		4			
		5	43		
		6			
			43		
		7			
		8	45		22.0
		9			
		10	34		

Continued Next Page

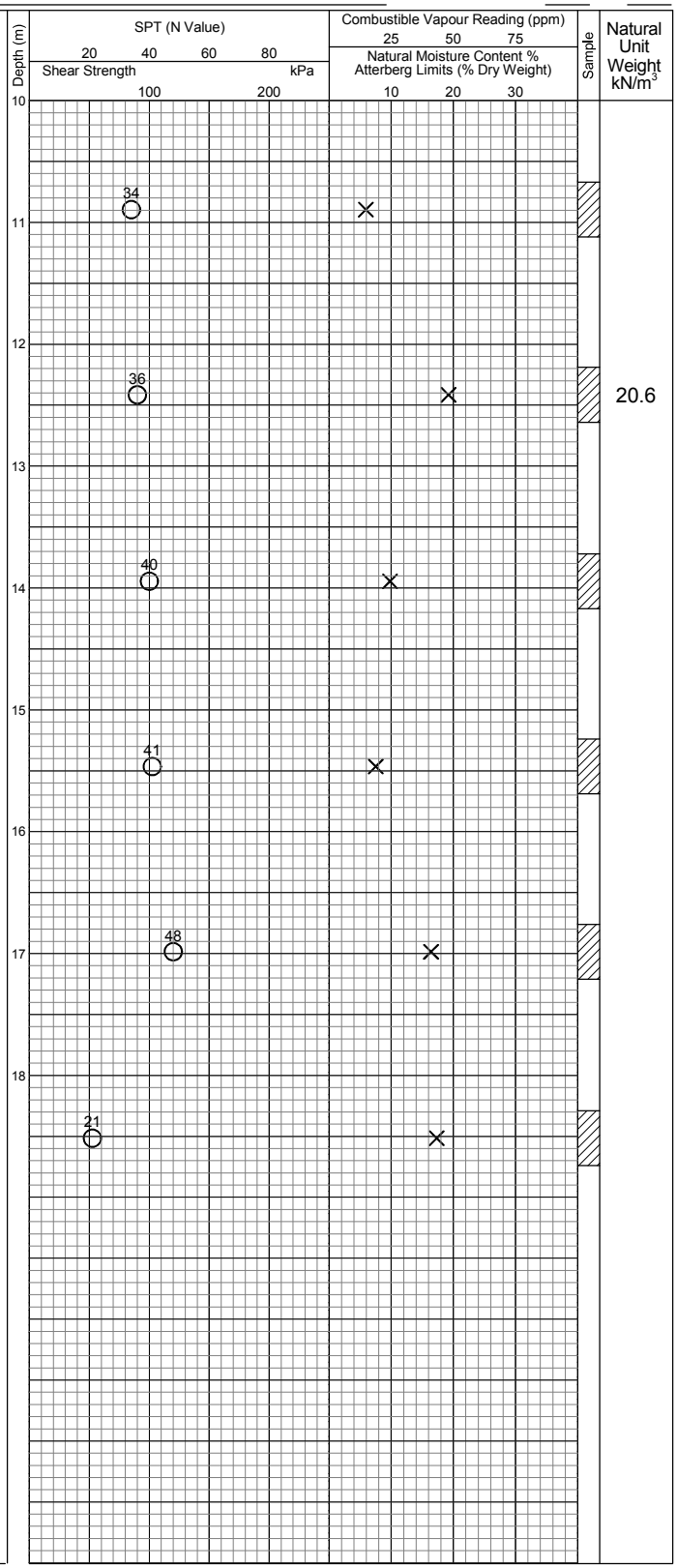
Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	18.29
May 15, 2017	Dry	
May 19, 2017	Dry	

Log of Borehole 59

Project No. BRM-00235186-D0 Drawing No. 60

Project: Geotechnical Investigation Sheet No. 2 of 2

Soil Description	ELEV. m	Natural Unit Weight kN/m³
	299.42	
Becoming wet, increased silt content.	~293.2	
Becoming compact.	~291.6	
END OF BOREHOLE.	~290.6	



20.6

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	18.29
May 15, 2017	Dry	
May 19, 2017	Dry	

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Log of Borehole 60

Project No. BRM-00235186-D0 | Drawing No. 61

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 16, 2017

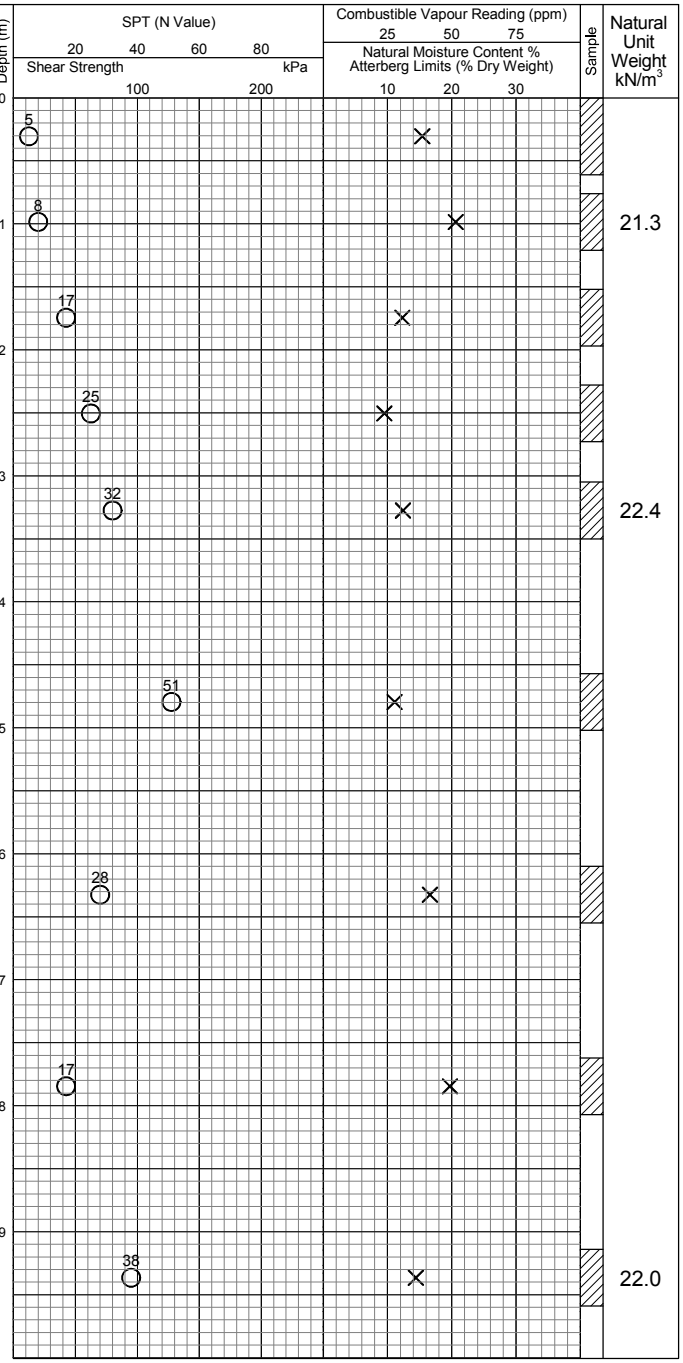
Drill Type: CME-55 Rubber Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m	Natural Unit Weight kN/m³
~150 mm Topsoil over **FILL:** Sandy silt, sand pockets, trace clay, brown, wet.	309.97	
	~308.6	21.3
SANDY SILT TILL: Fine sand seams and layers, trace gravel, occasional boulder fragments, brown, oxidized pockets, moist, compact to dense.		
	~305.2	22.4
SILTY SAND: Fine grained, silt seams and layers, brown, wet, compact.		
	~301.3	
SANDY SILT TILL: Fine sand seams, trace gravel, brown, moist, dense.		22.0
	~300.4	
END OF BOREHOLE.		



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	8.23	8.84

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Log of Borehole 61

Project No. BRM-00235186-D0 | Drawing No. 62

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 16, 2017

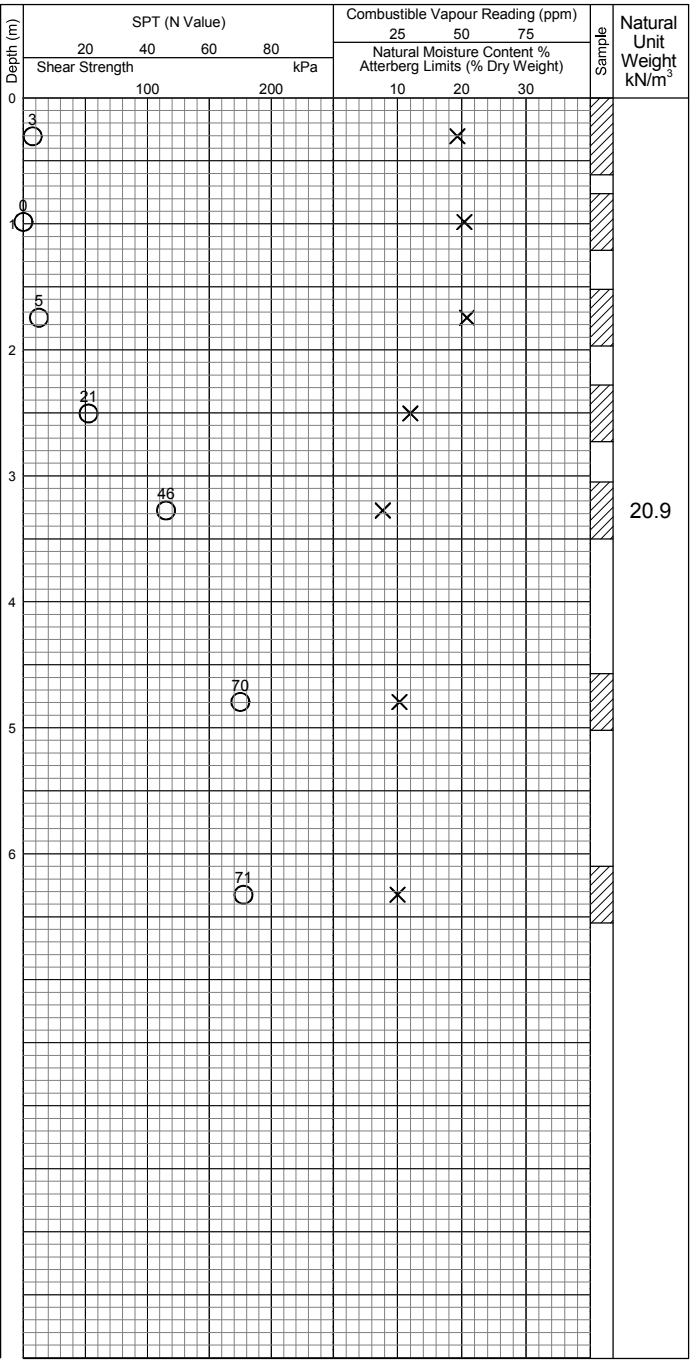
Drill Type: CME 55-Rubber Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m	Natural Unit Weight kN/m³
~75 mm Topsoil over **FILL:** Silty sand, trace clay, dark brown, wet.	306.60	
SANDY SILT TILL: Fine sand seams and layers, trace gravel, brown, moist, compact.	~304.7	
SILTY SAND: Fine grained, cemented zones, silt seams and layers, brown, moist, dense to very dense.	~303.7	20.9
END OF BOREHOLE.	~300.0	



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	5.99
May 17, 2017	Dry	
May 19, 2017	Dry	

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Log of Borehole 62

Project No. BRM-00235186-D0 | Drawing No. 63

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 16, 2017

Drill Type: CME 55- Rubber Track

Datum: Geodetic

Auger Sample ☒ | Combustible Vapour Reading □

SPT (N) Value ○ ▨ | Natural Moisture ×

Dynamic Cone Test — | Plastic and Liquid Limit ⊢○

Shelby Tube ■ | Undrained Triaxial at % Strain at Failure ⊕

Field Vane Test ✚ S | Penetrometer ▲

Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
~200 mm Topsoil over **SILTY SAND:** Fine grained, silt layers, brown, wet, compact.	307.21	0	3	×		
		1	11	×		
		2	13	×		
			19	×		
		3	14	×		
	~303.2	4				
SANDY SILT TILL: Fine sand seams and layers, trace gravel, occasional boulder fragments, brown, moist, dense to very dense.		5	31	×		
		6	78	×		22.4
	~300.1	7				
SILTY SAND: Fine grained, cemented zones, brown, moist, very dense.		8	75 for 250mm	×		22.4
	~297.6	9	79	×		
END OF BOREHOLE.						

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	3.05

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Log of Borehole 63

Project No. BRM-00235186-D0 | Drawing No. 64

Project: Geotechnical Investigation | Sheet No. 1 of 2

Location: Airport Road and Cranston Drive

Date Drilled: May 17, 2017

Drill Type: CME 55-Rubber Track

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~130 mm Topsoil over **SANDY SILT TILL:** Fine sand seams and layers, trace gravel, brown, moist, compact to very dense.	312.56	0	5			
				1	16			22.6
				2	17			22.5
					19			
				3	35			22.9
				4				
				5	81			
		SILTY SAND: Fine grained, silt seams and layers, widely scattered gravel, brown, moist to compact.	~307.0	6				
					21			
		Becoming wet, dense.	~305.5	7				
				8	45			
		SANDY SILT TILL: Fine sand seams and layers, trace gravel, brown, moist, dense to very dense.	~304.0	9				
					30			22.3
				10				

Continued Next Page

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	10.61

Log of Borehole 63

Project No. BRM-00235186-D0 Drawing No. 64

Project: Geotechnical Investigation Sheet No. 2 of 2

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) 20 40 60 80 / Shear Strength kPa 100 200	Combustible Vapour Reading (ppm) 25 50 75 / Natural Moisture Content % Atterberg Limits (% Dry Weight) 10 20 30	Sample	Natural Unit Weight kN/m^3
			302.56	10				
			~301.8		50 for 100mm			22.7
		END OF BOREHOLE.						

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	10.61

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Log of Borehole 64D

Project No. BRM-00235186-D0 | Drawing No. 65

Project: Geotechnical Investigation | Sheet No. 1 of 2

Location: Airport Road and Cranston Drive

Date Drilled: May 17, 2017

Drill Type: CME 55-Rubber Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~300 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, trace clay, occasional boulder fragments, brown, moist, compact.	312.27	0	5			
				1	14			22.3
				2	14			22.6
				3	17			
				4	18			22.6
		Becoming very dense.	~308.3	5	54			22.8
				6	92 for 280mm			21.2
		SILTY SAND: Fine grained, silt seams and layers, brown, wet, compact.	~305.3	7				
				8	21			
		SANDY SILT TILL: Fine sand seams and layers, trace gravel, brown, moist, compact to very dense.	~303.7	9				
				10	16			22.3

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Continued Next Page

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	12.19
May 19, 2017	12.05	

Log of Borehole 64D

Project No. BRM-00235186-D0 Drawing No. 65

Project: Geotechnical Investigation Sheet No. 2 of 2

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
			302.27	10
				11
				12
			~300.0	
		END OF BOREHOLE.		

SPT (N Value) 20 40 60 80

Shear Strength 100 200 kPa

Combustible Vapour Reading (ppm) 25 50 75

Natural Moisture Content % Atterberg Limits (% Dry Weight) 10 20 30

Sample

Natural Unit Weight kN/m³

84

50 for 80mm

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	12.19
May 19, 2017	12.05	

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Log of Borehole 64S

Project No. BRM-00235186-D0 | Drawing No. 65A

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 17, 2017

Drill Type: CME 55-Rubber Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Weight kN/m³
~300 mm Topsoil over **SANDY SILT TILL:** Fine sand seams, trace gravel, trace clay, occasional boulder fragments, brown, moist, compact.	312.27	0	5		
		1	14		22.3
		2	14		22.6
		3	17		
		4	18		22.6
Becoming very dense.	~308.3	5	54		22.8
		6	92 for 280mm		21.2
END OF BOREHOLE.	~305.9				

SPT (N Value): 20 40 60 80
Shear Strength kPa: 100 200
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	6.10
May 19, 2017	Dry	

EXPLOGBRAMPTON AIRPORT ROAD AND CRANSTON DRIVE GINT LOGS - COPY.GPJ NEW.GDT 5/6/17

Log of Borehole 65

Project No. BRM-00235186-D0 | Drawing No. 66

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 11, 2017

Drill Type: CME 55 - Rubber Track

Datum: Geodetic

Auger Sample ☒ | Combustible Vapour Reading □

SPT (N) Value ○ ▨ | Natural Moisture ×

Dynamic Cone Test — | Plastic and Liquid Limit I—○

Shelby Tube ■ | Undrained Triaxial at % Strain at Failure ⊕

Field Vane Test ✚ S | Penetrometer ▲

Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Weight kN/m³
~165 mm Topsoil over **FILL:** Clayey silt, trace gravel, brown to dark brown, moist.	311.56	0	5		
		1	5		19.9
SANDY SILT TILL: Fine sand seams and layers, trace gravel, occasional boulder fragments, brown, moist, compact to dense.	~310.2	2	10		21.8
			31		22.8
		3	23		22.7
	~307.6	4			
SILTY SAND: Fine grained, brown, wet, dense.		5	37		
	~306.0	6	21		22.7
CLAYEY SILT TILL: Fine sand seams, trace gravel, brown, moist, hard.		7	39		22.2
END OF BOREHOLE.	~303.5				

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	8.53

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Log of Borehole 66

Project No. BRM-00235186-D0 | Drawing No. 67

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 3, 2017

Drill Type: CME 55-Track

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
~250 mm Topsoil over **CLAYEY SILT TILL:** Fine sand seams, trace gravel, occasional boulder fragments, brown, moist, hard.	283.48	0	4			
		1	18			21.7
		2	12			22.9
Becoming grey, very stiff.	~281.4		Vane >50lb for 12"			22.5
CLAYEY SILT: Fine sand seams and layers, brown, wet, stiff.	~280.6	3	14			
		4				
		5	9			
		6	10			
END OF BOREHOLE.	~276.9					

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	6.10	6.55
May 15, 2017	-0.6	
May 19, 2017	-0.6	

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Log of Borehole 67

Project No. BRM-00235186-D0 | Drawing No. 68

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Airport Road and Cranston Drive

Date Drilled: May 10, 2017

Drill Type: CME 75-Marooka

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test ✚ S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~180 mm Topsoil over **CLAYEY SILT TILL:** Trace sand, trace gravel, brown, moist, stiff to very stiff.	296.43	0	5			
				1	6			21.4
				2	8			21.0
					11			22.7
				3	20			22.5
		SILTY SAND: Fine grained, silt seams, widely scattered gravel, brown, moist, compact.	~292.4	4				
				5	17			
				6	16			
		END OF BOREHOLE.	~289.8					

SPT (N Value): 20 40 60 80
Shear Strength kPa: 100 200
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion	Dry	5.69
May 15, 2017	Dry	
May 19, 2017	Dry	

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Appendix A:
Grain Size Analyses

exp Services Inc.
1595 Clark Boulevard, Brampton
Ontario, Canada, L6T 4V1
Telephone: (905) 793-9800
Fax: (905) 793-0641

Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 268600-2 **Report No.:** 1 **Date Reported:** 31-May-17

Project No.: brm-00235186-d0
Project Name: Airport Road and Cranston Drive, Caledon East, ON (east side of Airport Rd., north and south of Cranston

Grain Size Proportion (%)

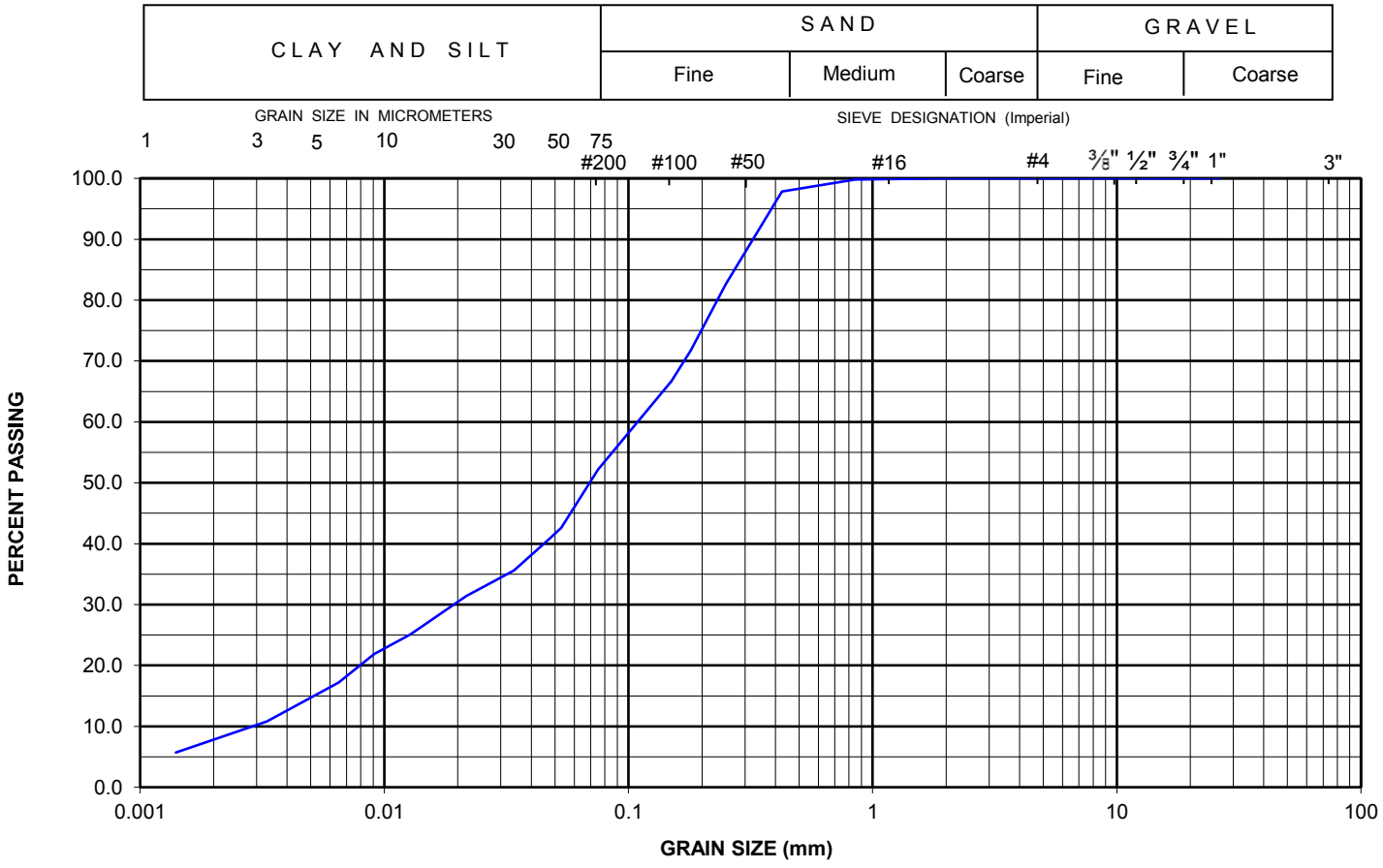
Gravel (> 4.75mm):	
Sand (> 75μm, < 4.75mm):	**47.8**
Silt (> 2μm), < 75μm):	**44.9**
Clay (< 2μm):	**7.3**
Total:	**100.0**

Sample Information

Location:	BH 2
Sample Method:	SS
Sample No.:	7
Depth:	6.1 - 6.6m
Sample Description:	Sand and Silt, trace Clay; Brown
Sampled By:	D. P.
Sampling Date:	4/27/2017
Date Received:	4/28/2017
Client Sample ID:	
Comments:	

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0471**	40.7
22.4	100.0	**0.0339**	35.6
19	100.0	**0.0217**	31.4
16	100.0	**0.0128**	25.1
13.2	100.0	**0.0091**	21.9
12.5	100.0	**0.0065**	17.2
9.5	100.0	**0.0033**	10.8
6.7	100.0	**0.0014**	5.7
4.75	100.0		
2	100.0		
0.85	99.8		
0.425	97.8		
0.25	82.6		
0.18	71.7		
0.15	66.7		
0.075	52.2		
0.053	42.6		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: David Dennison **Approved By:** *Original Signed By*
Willie Rodych, Lab Supervisor
Date Approved: 31-May-17

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Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 269141-2 **Report No.:** 2 **Date Reported:** 31-May-17

Project No.: brm-00235186-d0
Project Name: Airport Road and Cranston Drive, Caledon East, ON (east side of Airport Rd., north and south of Cranston

Grain Size Proportion (%)

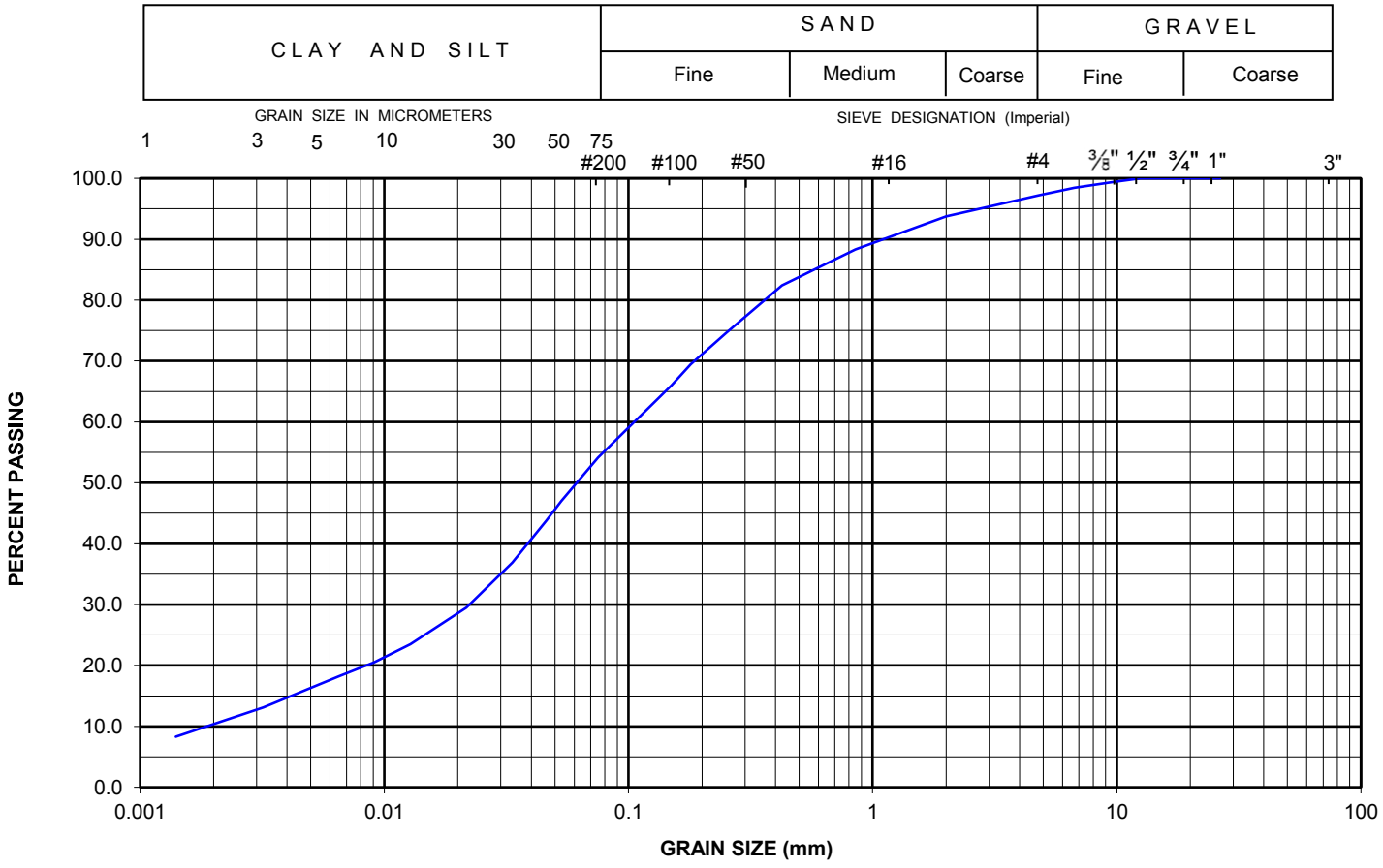
Gravel (> 4.75mm):	**2.8**
Sand (> 75μm, < 4.75mm):	**43.1**
Silt (> 2μm), < 75μm):	**44.2**
Clay (< 2μm):	**9.9**
Total:	**100.0**

Sample Information

Location: BH 23
Sample Method: SS
Sample No.: 2
Depth: 0.8 - 1.2m
Sample Description: Silt and Sand, trace Clay and Gravel; Brown
Sampled By: K. M.
Sampling Date: 5/8/2017
Date Received: 5/8/2017
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0462**	43.8
22.4	100.0	**0.0335**	36.9
19	100.0	**0.0217**	29.5
16	100.0	**0.0128**	23.5
13.2	100.0	**0.0091**	20.5
12.5	100.0	**0.0065**	18.2
9.5	99.3	**0.0032**	13.1
6.7	98.5	**0.0014**	8.3
4.75	97.2		
2	93.7		
0.85	88.3		
0.425	82.4		
0.25	74.5		
0.18	69.5		
0.15	66.0		
0.075	54.1		
0.053	47.0		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: David Dennison **Approved By:** *Original Signed By*
Willie Rodych, Lab Supervisor
Date Approved: 31-May-17

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Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 268958-2 **Report No.:** 3 **Date Reported:** 31-May-17

Project No.: brm-00235186-d0
Project Name: Airport Road and Cranston Drive, Caledon East, ON (east side of Airport Rd., north and south of Cranston

Grain Size Proportion (%)

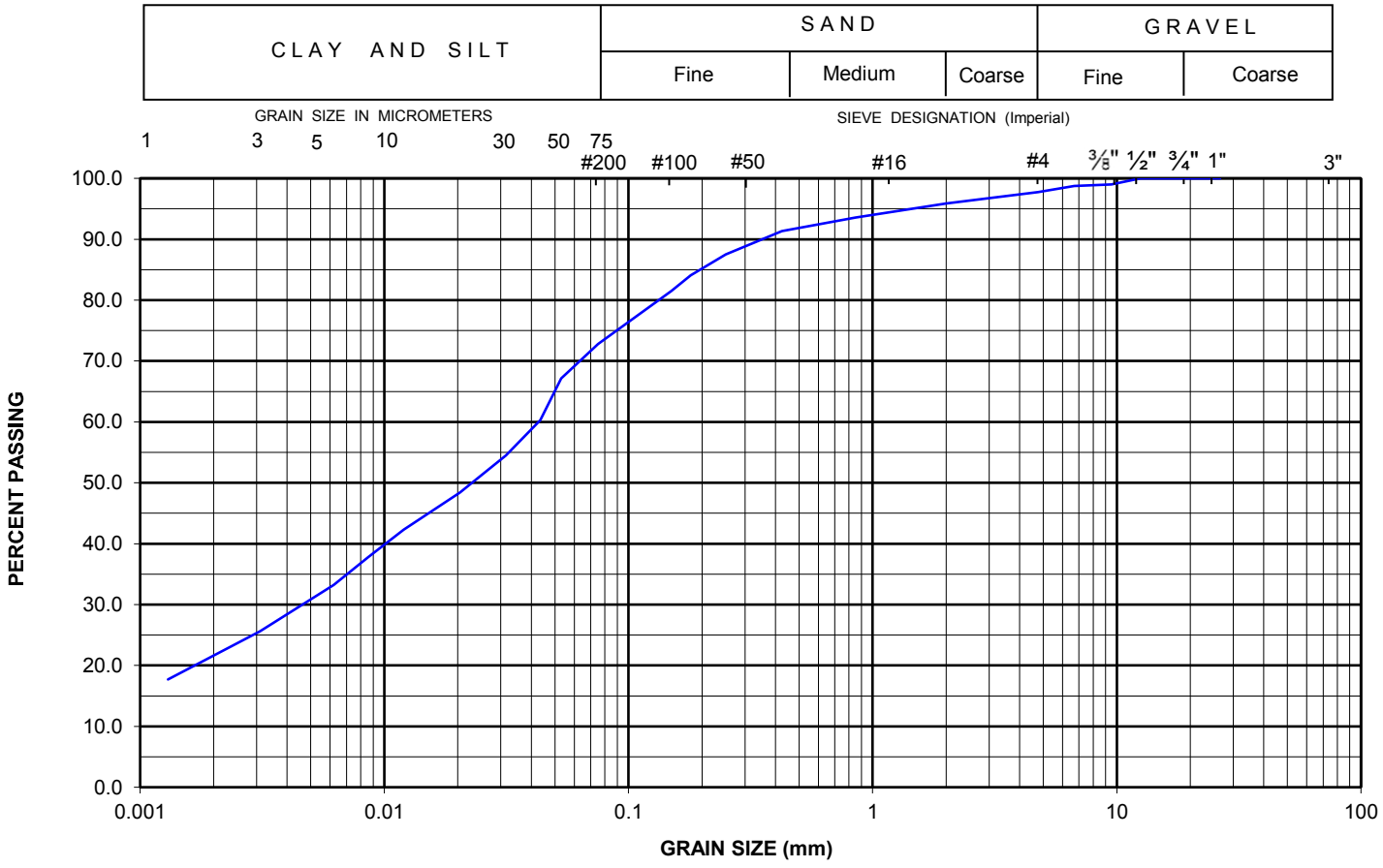
Gravel (> 4.75mm):	**2.3**
Sand (> 75μm, < 4.75mm):	**25.0**
Silt (> 2μm), < 75μm):	**51.9**
Clay (< 2μm):	**20.8**
Total:	**100.0**

Sample Information

Location:	BH 39
Sample Method:	SS
Sample No.:	2
Depth:	0.8 - 1.2m
Sample Description:	Clayey, Sandy Silt; trace Gravel; Brown
Sampled By:	K. M.
Sampling Date:	5/1/2017
Date Received:	5/4/2017
Client Sample ID:	
Comments:	

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0435**	60.3
22.4	100.0	**0.0315**	54.5
19	100.0	**0.0204**	48.4
16	100.0	**0.0120**	42.3
13.2	100.0	**0.0086**	37.8
12.5	100.0	**0.0062**	33.2
9.5	99.0	**0.0031**	25.6
6.7	98.7	**0.0013**	17.7
4.75	97.7		
2	95.9		
0.85	93.5		
0.425	91.3		
0.25	87.5		
0.18	84.1		
0.15	81.5		
0.075	72.8		
0.053	67.1		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: David Dennison **Approved By:** *Original Signed By*
Willie Rodych, Lab Supervisor
Date Approved: 31-May-17

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Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 269168-2 **Report No.:** 4 **Date Reported:** 31-May-17

Project No.: brm-00235186-d0
Project Name: Airport Road and Cranston Drive, Caledon East, ON (east side of Airport Rd., north and south of Cranston

Grain Size Proportion (%)

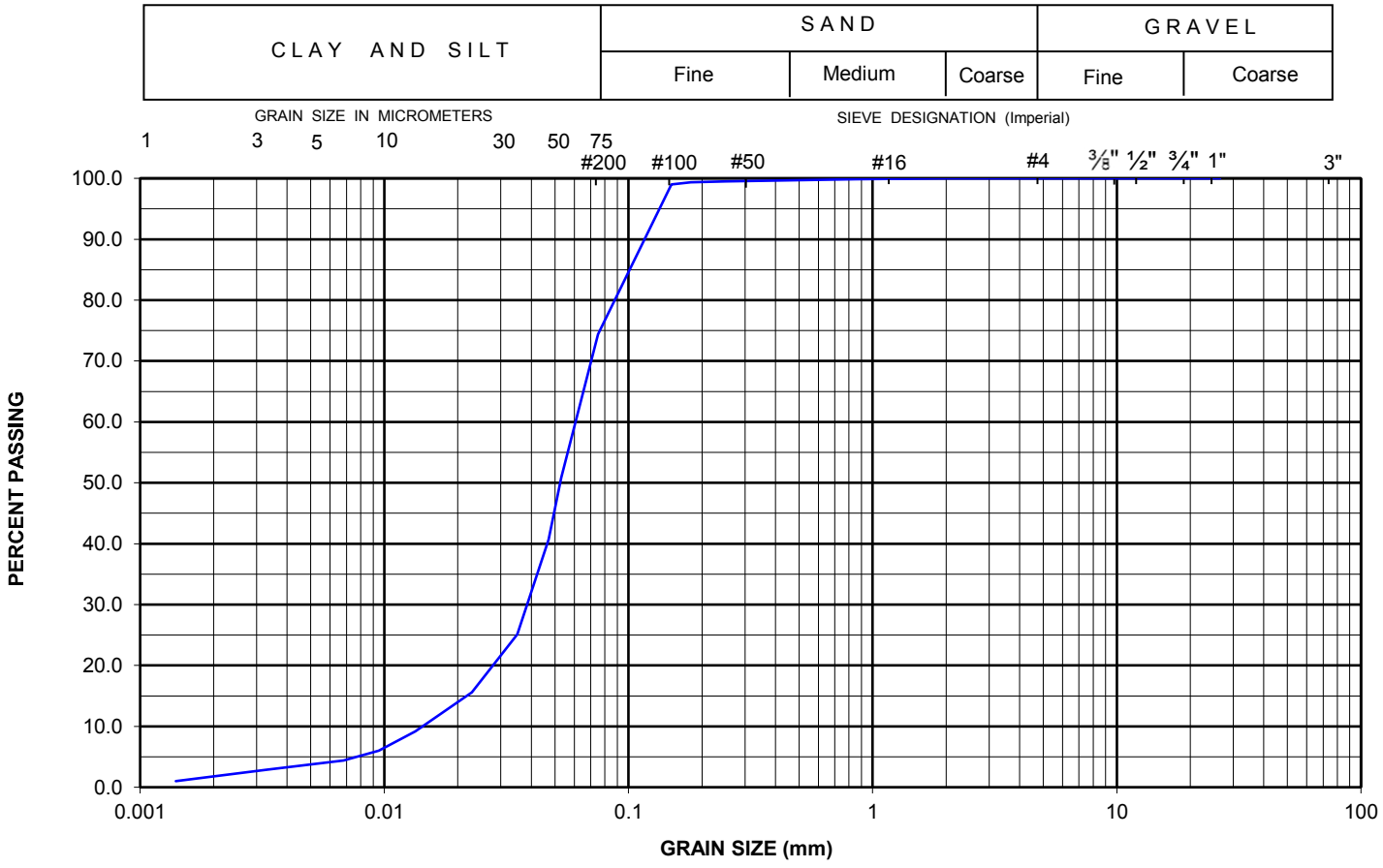
Gravel (> 4.75mm):	
Sand (> 75μm, < 4.75mm):	**25.6**
Silt (> 2μm), < 75μm):	**72.8**
Clay (< 2μm):	**1.6**
Total:	**100.0**

Sample Information

Location:	BH 45
Sample Method:	SS
Sample No.:	5
Depth:	3.0 - 3.5m
Sample Description:	Sandy Silt, trace Clay; Brown
Sampled By:	K. M.
Sampling Date:	5/8/2017
Date Received:	5/8/2017
Client Sample ID:	
Comments:	

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0471**	40.7
22.4	100.0	**0.0350**	25.1
19	100.0	**0.0228**	15.6
16	100.0	**0.0134**	9.2
13.2	100.0	**0.0095**	6.0
12.5	100.0	**0.0068**	4.4
9.5	100.0	**0.0033**	2.9
6.7	100.0	**0.0014**	1.0
4.75	100.0		
2	100.0		
0.85	99.8		
0.425	99.7		
0.25	99.5		
0.18	99.3		
0.15	99.0		
0.075	74.4		
0.053	50.8		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: David Dennison **Approved By:** *Original Signed By*
Willie Rodych, Lab Supervisor
Date Approved: 31-May-17