GEOTECHNICAL INVESTIGATION

DICKSON DRIVE EXTENSION (M6468C)
DICKSON DRIVE
FERGUS, ONTARIO
TOWNSHIP OF CENTRE WELLINGTON

CMT Project 21-279.R01

Prepared for:

Township of Centre Wellington
c/o Triton Engineering Services Limited

October 5, 2021

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October 5, 2021 21-279.R01

Township of Centre Wellington
c/o Triton Engineering Services Limited
105 Queen Street West, Unit 14
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Attention: Mr. Dustin Lyttle, P.Eng.

Dear Sir:

Re: Geotechnical Investigation
Dickson Drive Extension (M6468C)
Dickson Drive Street
Fergus, Ontario
Township of Centre Wellington

As requested, CMT Engineering Inc. conducted a geotechnical investigation at the above-referenced site, and we are pleased to present the enclosed report.

We trust that this information meets your present requirements and we thank you for allowing us to undertake this project. Should you have any questions, please do not hesitate to contact our office.

Yours truly,

Brandon Figg

Brandon R Figg, C.Tech.
Senior Soil Technician

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1cc: Banks Groundwater Engineering Limited - Bill Banks, P.Eng.

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1

2.0 EXISTING SITE CONDITIONS 1

3.0 FIELD AND LABORATORY PROCEDURES 1

4.0 SUBSOIL CONDITIONS 2

4.1. Topsoil 3
4.2. Sand Fill 3
4.3. Sand 3
4.4. Silt 3
4.5. Sandy Silt 3
4.6. Sand and Silt 4
4.7. Sandy Silt Till 4
4.8. Groundwater 4

5.0 DISCUSSION AND RECOMMENDATIONS 6

5.1. Serviceability and Ultimate Limit Pressure 6
5.2. Seismic Site Classification 8
5.3. Soil Design Parameters 8
5.4. Site Preparation 9
5.4.1. Topsoil Stripping/Vegetation Removal 9
5.4.2. Removal/Relocation of Existing Services 9
5.4.3. Site Grading/Structural Fill 9
5.5. Foundation Subgrade Preparation 11
5.6. Slab-on-Grade/Modulus of Subgrade Reaction 12
5.7. Excavations 13
5.8. Construction Dewatering Considerations 14
5.9. Service Pipe Bedding 15
5.10. Perimeter Building Drainage, Foundation Wall Backfill and Trench Backfill 15
5.11. Pavement Design/Drainage 17
5.12. Excess Soil Management 20
5.13. Radon 21

6.0 SITE INSPECTION 21

7.0 LIMITATIONS OF THE INVESTIGATION 21

Drawing 1 - Site Location Map
Drawing 2 - Site Plan Showing Borehole Locations

Appendix A - Borehole Logs
Appendix B - Grain Size Analyses
Appendix C - Well Records

1.0 INTRODUCTION

The services of CMT Engineering Inc. (CMT Inc.) were retained by Mr. Dustin Lyttle, P.Eng., of Triton Engineering Services Limited, on behalf of the Township of Centre Wellington, to conduct a geotechnical investigation and install monitoring wells that will be utilized for a hydrogeological investigation (by Banks Groundwater Engineering Limited) for the extension of Dickson Drive in the Township of Centre Wellington, Fergus, Ontario. The location of the site is shown on Drawing 1.

It is understood that the project will comprise the construction of a commercial and industrial subdivision and the extension of Dickson Drive. Municipal utilities will service the proposed development. It is understood that the development of the property will require area grading which will result in cut and fill areas throughout the site. It is understood that there is the potential that some of the proposed infrastructure will be constructed above the current existing ground surface elevation.

The purpose of the geotechnical investigation was to assess the existing soil and groundwater conditions encountered in the boreholes. Included in the assessment are the soil classification and groundwater observations, as well as comments and recommendations regarding geotechnical resistance (bearing capacity); serviceability limit states (anticipated settlement); dewatering considerations; site classification for seismic site response; recommendations for site grading, site servicing, excavations and backfilling; recommendations for slab-on-grade construction; pavement design/drainage; and a summary of the laboratory results.

2.0 EXISTING SITE CONDITIONS

The existing site currently comprises vacant farmland with topsoil and low-lying vegetation at the ground surface. Typically, the land is utilized for agricultural crop production. As well, there is an existing house and detached garage located in the southeast portion of the site. There is an existing pond located north of the house and there is another pond located in the northwest corner of the property. There is also a storage shed located in the north portion of the property and appears that the shed is part of the development at 6528 First Line; however; it does not appear to be on that property. The site generally slopes down toward the northwest. The site is bounded by First Line to the east, industrial development to the west, the Cataract Trail to the south, and bush to the north.

3.0 FIELD AND LABORATORY PROCEDURES

The field investigation was conducted on May 19 and 20, 2021 and comprised the advancement of nine (9) boreholes (referenced as Boreholes 1 to 9), using a Geoprobe 7822DT drillrig operated by employees of CMT Drilling Inc. Boreholes 1 to 3, inclusive, were advanced to depths of approximately 6.10 m (20.0 ft), Borehole 4 was advanced to a depth of approximately 9.14 m (30.0 ft), Borehole 5 was advanced to a depth of approximately 7.62 m (25.0 ft), and Boreholes 6 to 9, inclusive, were advanced to depths of approximately 5.18 m (17.0 m).

Standard penetration testing (SPT) and sampling was carried out in Boreholes 6 to 9, inclusive, using 38 mm inside diameter split spoon sampling equipment and an automatic hammer, in accordance with ASTM D 1586 "Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils". SPT soil sampling was generally conducted at 0.76 m (2.5 ft) intervals to approximately 3.05 m (10.0 ft) and about every 1.52 m (5.0 ft) thereafter to borehole termination in the majority of the boreholes. Macro Core (MC5) soil sampling was generally conducted continuously to borehole termination in Boreholes 1 to 5, inclusive, and between the SPT soil samples conducted below approximately 3.05 m (10.0 ft) depth in Boreholes 6 to 9, inclusive. Technical staff from CMT Inc. observed the drilling operation and collected and logged the recovered soil samples. A small portion of each sample was placed in a sealed, marked jar for moisture content determinations. Representative samples from the boreholes at the following depths were submitted to the CMT Inc. laboratory in St. Clements, Ontario for grain size analyses:

- Borehole 1 - depth 3.05 m to 4.57 m (10.0 ft to 15.0 ft)
- Borehole 2 - depth 4.57 m to 6.10 m (15.0 ft to 20.0 ft)
- Borehole 3 - depth 4.57 m to 6.10 m (15.0 ft to 20.0 ft)
- Borehole 4 - depth 0.28 m to 1.52 m (0.91 ft to 5.0 ft)
- Borehole 5 - depth 6.10 m to 7.36 m (20.0 ft to 24.1 ft)

The borehole logs are provided in Appendix A and the grain size analyses are provided in Appendix B.

The ground surface elevation at the borehole locations were surveyed by Triton Engineering Services Limited staff and reported to CMT Inc. on September 23, 2021. As such, the ground surface elevations at the borehole locations ranged from approximately 426.83 m to 433.05 m. The locations of the boreholes are shown on Drawing 2.

4.0 SUBSOIL CONDITIONS

The soils encountered in the boreholes are described briefly below and a more detailed stratigraphic description is provided on the borehole logs in Appendix A. The following paragraphs have been simplified into terms of major soil strata. The soil boundaries indicated have been inferred from non-continuous samples and observations of sampling and drilling resistance and typically represent transitions from one soil type to another rather than exact planes of geological change. Further, the subsurface conditions are anticipated to vary between and beyond the borehole locations.

4.1. Topsoil

Loose, moist, dark brown, silty organic topsoil was encountered at the ground surface in all boreholes, with buried topsoil being encountered below the fill in Boreholes 1 and 3. The thickness of the topsoil layer ranged from approximately 50 mm to 525 mm. It should be expected that topsoil thicknesses may vary outside of the location of the boreholes. Materials noted as topsoil in this report were classified based on visual and textural evidence. Testing of organic content or for other nutrients was not carried out.

4.2. Sand Fill

Dark brown, sand fill was encountered underlying the existing topsoil in Boreholes 1 and 3. The fill was considered to be moist, with moisture contents ranging between approximately 7.0% and 11.1% (average 9.1%).

4.3. Sand

Dark brown to brown sand, with trace silt and clay was encountered underlying the topsoil/buried topsoil in Boreholes 1 to 3, inclusive, Borehole 5, and underlying the sandy silt in Boreholes 8 and 9. The sand was considered to be loose to compact, with SPT N-values ranging from 9 to 23 blows per 0.3 m (average 16 blows per 0.3 m). The sand was considered to be moist to saturated, with moisture contents ranging from about 3.0% to 21.3% (average 12.2%).

4.4. Silt

Brown, silt, with trace clay, sand and gravel was encountered underlying the sand in Borehole 1, within the sand in Borehole 3, and underlying the sandy silt in Borehole 7. The silt was considered to be compact, with SPT N-values ranging from 16 to 18 blows per 0.3 m (average 17 blows per 0.3 m). The silt was considered to be moist to saturated, with moisture contents ranging from about 6.6% to 21.3% (average 14.0%).

4.5. Sandy Silt

Dark brown to brown, sandy silt, with some clay, trace gravel was encountered underlying the topsoil at Boreholes 6 to 9, inclusive. The sandy silt was considered to be very loose to compact, with SPT N-values ranging from 2 to 12 blows per 0.3 m (average 7 blows per 0.3 m). The sandy silt was considered to be moist, with moisture contents ranging from about 9.7% to 20.7% (average 15.2%).

4.6. Sand and Silt

Grey, sand and silt, with some clay, trace gravel was encountered within the sandy silt till in Borehole 5. The sand and silt was considered to be compact. The sand and silt was considered to be saturated, with a moisture content of approximately 16.9%.

4.7. Sandy Silt Till

Grey, sandy silt till, with some clay, trace gravel was encountered underlying the silt in Boreholes 3 and 7, underlying the topsoil at Borehole 4, underlying the sand/sand and silt in Borehole 5, and underlying the sandy silt in Borehole 6. The sandy silt till was considered to be dense to very dense, with SPT N-values ranging from 31 to greater than 100 blows per 0.3 m (average 66 blows per 0.3 m). The sandy silt was considered to be moist, with moisture contents ranging from about 7.1% to 9.1% (average 8.1%).

4.8. Groundwater

Wet to saturated soil conditions were encountered in the boreholes, excluding Borehole 6. It should be noted that the compact to very dense, fine-grained soils observed in the boreholes have the potential to create perched water conditions. These perched conditions would be expected to occur near the interface of the looser upper soils and the compact to very dense lower soils. Groundwater conditions (particularly perched water) are generally dependent on the amount of precipitation, control of surface water, as well as the time of year, and can fluctuate significantly in elevation and volume. The groundwater levels and wet to saturated soil conditions encountered in the boreholes could make excavations difficult and it should be expected that caving or sloughing of the excavation walls will occur when excavating into wet to saturated zones.

38 mm (1.5 inch) diameter monitoring wells were installed in Boreholes 1 to 5, inclusive, to measure the static groundwater level. The water levels in Boreholes 1 to 5, inclusive, were measured by Banks Groundwater Engineering Limited staff on July 28, 2021 and reported to CMT Inc. on July 28, 2021. The groundwater was measured to be approximately 3.26 m below ground surface at Borehole 1, approximately 1.77 m below ground surface at Borehole 2, approximately 3.61 m below ground surface at Borehole 3, approximately 2.11 m below the ground surface at Borehole 4, and approximately 2.54 m below the ground surface at Borehole 5.

The recorded groundwater elevations in the monitoring wells installed in Boreholes 1 to 5, inclusive, and the approximate zone of wet to saturated soils observed in all of the boreholes, as well as the ground surface and bottom of borehole elevations, are provided in the following table:

Borehole No.	Ground Surface Elevation (m)	Approximate Elevation of Water in the Monitoring Well (m) July 28, 2021 (Depth to Water)	Estimated Zone of Wet to Saturated Soil at the Time of Investigation Elevation (m)	Approximate Depth Below Ground Surface of Estimated Zone of Wet to Saturated Soil at the Time of Investigation (m)	Bottom of Borehole Elevation (m)
BH 1	426.83	423.57 (3.26)	425.05 to 420.73 (termination)	1.78 to 6.10 (termination)	420.73
BH 2	427.58	425.81 (1.77)	426.61 to 421.48 (termination)	0.97 to 6.10 (termination)	421.48
BH 3	430.23	426.62 (3.61)	427.69 to 424.13 (termination)	2.54 to 6.10 (termination)	424.13
BH 4	430.13	428.02 (2.11)	422.51 to 420.99 (termination)	7.62 to 9.14 (termination)	420.99
BH 5	428.15	425.61 (2.54)	422.05 to 420.53 (termination)	6.10 to 7.62 (termination)	420.53
BH 6	433.05	--	--	--	427.87
BH 7	428.29	--	426.79 to 426.00	1.50 to 2.29	423.11
BH 8	431.16	--	426.59 to 425.98 (termination)	4.57 to 5.18 (termination)	425.98
BH 9	429.92	--	425.83 to 424.74 (termination)	4.09 to 5.18 (termination)	424.74

Recommendations with respect to dewatering conditions are provided in Section 5.8 of this report.

The monitoring wells installed in the boreholes must be decommissioned by a licensed well driller when they are no longer required for monitoring the static water level or for sampling. CMT Drilling Inc. can provide decommissioning services when required.

5.0 DISCUSSION AND RECOMMENDATIONS

It is understood that the project will comprise the construction of a commercial and industrial subdivision and the extension of Dickson Drive, as well as associated streets and utilities. Utilizing the information gathered during the geotechnical investigation and assuming that the borehole information is representative of the subsoil conditions throughout the site, the following comments and recommendations are provided.

This section of the report provides CMT Inc.'s interpretation of the factual geotechnical data obtained during the investigation and is intended for the guidance of the owner and design engineer. Where comments are made on construction, they are provided only to highlight those aspects which could affect the design of the project. Contractors bidding on or undertaking the work should make their own independent interpretation of the factual subsurface information provided as it affects their proposed construction means and methods, equipment selection, scheduling, pricing, and the like.

5.1. Serviceability and Ultimate Limit Pressure

Based on the information obtained in Boreholes 6, 7, 8 and 9, the following table provides the estimated geotechnical reaction at the Serviceability Limit State (SLS) and the estimated factored geotechnical resistance at the Ultimate Limit State (ULS) at the various elevations, including soil type:

Borehole No.	Ground Surface Elevation (m)	SLS kPa (psf)	ULS kPa (psf)	Estimated Highest Founding Elevation (m)	Depth to Highest Founding Elevation (m)	Soil Type
BH 6	433.05	150 (3,000) 250 (5,000)	225 (4,500) 400 (8,000)	432.29 to 430.76 430.76 to 427.87 (termination)	0.76 2.29	Sandy Silt Sandy Silt Till
BH 7	428.29	150 (3,000) 250 (5,000)	225 (4.500) 400 (8,000)	427.53 to 426.00 426.00 to 423.11 (termination)	0.76 2.29	Silt Sandy Silt Till
BH 8	431.16	150 (3,000)	225 (4,500)	429.64 to 425.98 (termination)	1.52	Sandy Silt/Sand
BH 9	429.92	150 (3,000)	225 (4,500)	428.40 to 424.74 (termination)	1.52	Sand

The proposed founding elevations and required bearing capacities were not available at the time of report preparation. Based on the data provided in the table above, suitable founding elevations for any proposed buildings with conventional foundations designed with a minimum bearing capacity of 150 kPa (3,000 psf) at SLS range from depths of about 0.76 m to 1.52 m below the existing ground surface, while soils suitable of supporting conventional foundations designed with a bearing capacity of 250 kPa (5,000 psf) at SLS were typically encountered at approximately 2.29 m below the existing ground surface in Boreholes 6 and 7.

Due to the varying depth of the wet to saturated soils, as well as the anticipated area grading of the site, the founding soils must be assessed at the time of construction by qualified geotechnical personnel in order to confirm their founding suitability, and to determine whether or not drainage layers, mud mats and/or widened footings may be required.

Should footings be designed to be constructed at elevations higher than the elevations indicated in the table above, then structural fill will be required in order to achieve the design grades for the proposed foundations. It is expected that some areas of the site may have a significant amount of structural fill placed to achieve the design grades. The serviceability limit pressure for good quality granular structural fill placed and compacted in accordance with Section 5.4.3 of this report is estimated to be at least 150 kPa (3,000 psf) at SLS and 225 kPa (4,500 psf) at ULS. It is imperative that the founding soils be assessed at the time of construction by qualified geotechnical personnel in order to confirm their suitability.

It is recommended that structural foundation drawings be cross-referenced with site servicing drawings to ensure that service pipes do not conflict with building foundations (including the zone of influence down and away from the footings).

With respect to the Serviceability Limit State (SLS), the total and differential footing settlements are not expected to exceed the generally acceptable limits of 25 mm (1") and 19 mm (3/4") respectively, assuming a minimum foundation width of 0.6 m (2.0 ft).

All exterior foundations must be provided with a minimum of 1.4 m of soil cover or equivalent thermal insulation (sufficient thermal insulation is required to protect all footings and slab-on-grades during construction until such a time that the structure is heated) in order to provide protection against frost action.

CMT Inc. would be pleased to review design drawings when they become available and provide further recommendations with respect to bearing and foundation elevations.

5.2. Seismic Site Classification

The site classification for seismic response in Table 4.1.8.4 of the 2012 Ontario Building Code relates to the average properties of the upper 30.0 m of strata. The information obtained in the geotechnical field investigation was gathered from the upper 5.18 m to 9.14 m of strata. Based on the information gathered in the geotechnical field investigation, the site classification for seismic site response would be considered Site Class D (stiff soils) for structures founded on the soils at the recommended founding elevations provided in Section 5.1 of this report. For structures founded on structural fill placed in accordance with Section 5.4.3 of this report, a Site Class D (stiff soils) would be appropriate. The structural engineer responsible for the design of the structure should review the earthquake loads and effects.

5.3. Soil Design Parameters

The following table provides estimated soil design parameters for imported granular fill, as well as the existing native soils encountered on-site. It should be noted that earth pressure coefficients (Ka, Kp, Ko) provided are for flat ground surface conditions and will differ for areas with slopes or embankments. The estimated soil design parameters can be utilized for the design of perimeter shoring, foundations and retaining walls, as required:

Soil Type	Soil Density (kg/m^3)	Friction Angle (Degree)	Coefficient of Active Pressure (K_a)	Coefficient of Passive Pressure (K_p)	Coefficient of At-Rest Pressure (K_o)	Coefficient of Friction (μ)	Cohesion (Undrained) (kPa)
Imported Granular 'A'/ Granular 'B' (OPSS 1010)	2,100	34	0.28	3.54	0.44	0.45	0
Existing Fill	1,800	28	0.36	2.77	0.53	0.35	0
Sand	1,850	33	0.29	3.39	0.46	0.43	0
Silt	1,700	30	0.33	3.00	0.50	0.38	0
Sandy Silt	1,800	32	0.31	3.25	0.47	0.41	0
Sand and Silt	1,800	32	0.31	3.25	0.47	0.41	0
Sandy Silt Till	1,800	32	0.31	3.25	0.47	0.38	0

5.4. Site Preparation

The site preparation for the extension of Dickson Drive and the proposed new commercial/industrial subdivision is anticipated to comprise the stripping of topsoil, removal/relocation of any existing services, and then site grading to achieve the design grades.

5.4.1. Topsoil Stripping/Vegetation Removal

All topsoil and vegetation (including tree root structures as well as any loose soils that are typically associated with root structures) must be stripped prior to the site grading. The topsoil may be used in landscaped areas where some settlement can be tolerated; otherwise it should be properly disposed of off-site.

The volume of topsoil removed during the stripping process can be influenced by the equipment utilized for the stripping process as well as the moisture conditions at the time of stripping.

5.4.2. Removal/Relocation of Existing Services

Any existing servicing that may be located within the proposed building envelopes must be removed/relocated. This includes any existing field tiles that are present. Any piping that is left in place that is no longer active must be completely sealed with watertight mechanical covers, concrete or grout at termination points to prevent the migration of soils into pipe voids, which may result in potential settlement. All existing trench backfill material associated with any existing buried pipes must be subexcavated and the subsequent excavation must be backfilled with approved soils placed in accordance with Section 5.4.3 of this report.

Any monitoring wells that have been installed on the property to determine static water levels on-site should be decommissioned by a Ministry of the Environment, Conservation and Parks (MECP) licensed well contractor with a Class 1, Class 2 or Class 3 license in accordance with Reg. 903.

5.4.3. Site Grading/Structural Fill

Currently, there are no design site grades available. Following the removal of any unsuitable soils, the exposed subgrade must be proof-rolled, and any soft or unstable areas must be subexcavated and replaced with approved fill materials.

Any fill materials required to achieve the design site grades should be placed according to the following procedures:

- Should the native subgrade soils at the design founding elevation within proposed building envelope(s) comprise wet to saturated soils, as was observed in some of the boreholes, then a granular drainage layer, constructed in accordance with Section 9.14.4 of the current Ontario Building Code (OBC) may be required. Alternatively, a lean mix concrete mud mat may be placed overlying the subgrade soils to provide a stable base;

- Prior to placement of any structural fill or bulk fill, the subgrade must be prepared large enough to accommodate a 1:1 slope commencing a distance of 1.0 m beyond the outside edge of the proposed foundations down to the approved competent founding soils;

- Soils approved for use as structural fill must be placed in loose lifts not exceeding 0.3 m (12") in depth for granular soils (recommended fill material) and 0.2 m (8") in depth for silts and clays (not recommended for this application), or the capacity of the compactor (whichever is less);

- Approved imported granular fill materials (OPSS 1010 Type III Granular 'B' recommended for this application) can be compacted utilizing adequate heavy vibratory smooth drum or padfoot compaction equipment;

- Fine-grained silt and clay soils (not recommended) must be compacted utilizing adequate heavy padfoot vibratory compaction equipment;

- Approved fill materials must be at suitable moisture contents (at or near to the optimum moisture content as determined by laboratory Proctor testing) to achieve the specified compaction. Soil moisture will also be dependent on weather conditions at the time of construction. Granular soils may require the addition of water in order to achieve the specified compaction;

- Approved structural fill materials that will support structures (including industrial building foundations, interior slab-on-grades, sidewalks, large expansive exterior slabs and decks) must be compacted to a minimum of 100% standard Proctor maximum dry density (SPMDD). The native silt soils are generally not recommended for use as structural fill as they can be subject to excess void space and potential settlement if not properly placed and compacted;

- Approved bulk fill (foundation wall backfill, bulk fill under slab-on-grades that will not support footings or heavy point loading, bulk fill for driveways and parking lots) must be compacted to a minimum 95% SPMDD. It would be expected that the existing on-site soils, free of any deleterious materials, would be suitable for use as bulk fill; however, depending on the time of year and weather conditions when construction takes place, soils may require air-drying in order to achieve the specified density;

- Granular 'B' subbase and Granular 'A' base materials for the proposed new streets, driveways, and any paved areas must be compacted to 100% SPMDD.

Some of the existing wet to saturated native soils will require significant air-drying along with working of the soils in order to achieve the specified compaction of 100% SPMDD in building envelopes (including 1:1 as required) and 95% SPMDD for bulk fill for the driveways and parking areas. Utilizing the existing soils during site grading may be more achievable if work is completed during the generally drier summer months. Reuse of excavated soils on-site will be subject to approval from qualified geotechnical personnel.

Due to the fine-grained nature of the native soils encountered throughout the boreholes, they can be easily disturbed and subject to strength losses, making travel on this material somewhat difficult with conventional rubber-tired construction equipment such as dump trucks and even smooth drum vibratory compactors. Conditions should be expected to worsen, if the subgrade soils are in a wet to saturated condition. Therefore, it is recommended that construction traffic be minimized, where possible, from driving on the subgrade soils. Depending on the time of year, it may be required to construct a haul road utilizing a granular base.

5.5. Foundation Subgrade Preparation

The fine-grained soils encountered throughout the boreholes can be sensitive to changes in moisture content and can become loose/soft if the soils are subjected to additional water or precipitation, as well as severe drying conditions. The soils could also be easily disturbed if traveled on during construction. Once they become disturbed, they are no longer considered adequate for the support of foundations.

To ensure and protect the integrity of the founding soils during construction operations, the following is recommended:

- During construction, the subgrade soils should be sloped/ditched to a sump (as required) located outside the footprint of any foundations (if feasible) in the excavation to promote surface drainage of rainwater or seepage and the collected water should be pumped out of the excavation. It is critical that all water be

controlled (not allowed to pond) and that the subgrade and foundation preparation commence in dry conditions;

- There is the potential that some of the subgrade soils at the design founding elevation in the proposed building envelopes comprise wet soils, in which case a granular drainage layer, constructed in accordance with Section 9.14.4 of the current Ontario Building Code (OBC), may be required. Alternatively, a lean mix concrete mud mat may be poured over top of the subgrade soils to provide a stable base;

- Construction equipment travel and foot traffic on the founding soils should be minimized;

- If construction is to be undertaken during subzero weather conditions, the founding native soils and fill materials must be maintained above freezing;

- Prior to placing concrete for the footings, the founding soils must be cleaned of all disturbed, caved, soft or wet materials;

- The foundation formwork and concrete should be installed as soon as practical following the excavation, inspection and approval of the founding soils. The longer that the excavated soils remain open to weather conditions and groundwater seepage, the greater the potential for construction problems to occur;

- If it is expected that the founding soils will be left open to exposure for an extended period of time, it is recommended that a 75 mm concrete mud slab be poured in order to protect the structural integrity of the founding soils.

Due to the amount of cut and fill activities which are anticipated to be undertaken at this site, all foundation excavations must be reviewed to confirm the suitability of the founding soils prior to foundation placement.

5.6. Slab-on-Grade/Modulus of Subgrade Reaction

Prior to the placement of the granular base for the slab-on-grade construction, the subgrade soils should be proof-rolled. Any soft or weak zones, as well as any unsuitable fill in the subgrade, should be subexcavated and backfilled with approved fill materials (see Sections 5.4.3 and 5.10 of this report).

The following table provides the modulus of subgrade reaction (k) for imported granular fill, as well as the native soils encountered on-site:

Soil Type	Modulus of Subgrade Reaction (k)
Imported Granular 'A'/Granular 'B' (OPSS 1010)	81,000 kN/m^3 (300 lb/in^3)
Sand	48,000 kN/m^3 (175 lb/in^3)
Silt/Sandy Silt	41,000 kN/m^3 (150 lb/in^3)
Sand and Silt	34,000 kN/m^3 (125 lb/in^3)
Sandy Silt Till	54,000 kN/m^3 (200 lb/in^3)

In dry conditions, the slab-on-grade can be founded on a minimum thickness of 150 mm (6") of an OPSS 1010 granular material containing less than 10% fines and compacted to 100% SPMDD. Alternatively, (particularly in wet conditions), 150 mm (6") of 19 mm clear crushed stone (OPSS 1004) could be used instead of Granular 'A'. Utilizing clear crushed stone for the slab-on-grade base can assist in providing a moisture barrier by reducing the potential for capillary rise of moisture from the subgrade soils. Compactive effort is required to consolidate the clear stone. The 19 mm clear crushed stone should meet the physical property and gradation requirements of OPSS 1004.

It is recommended that areas of extensive exterior slab-on-grade be constructed with a Granular 'B' subbase (450 mm) and a Granular 'A' base (150 mm), as well as incorporating subdrains, to promote rapid drainage and reduce the effects of frost heaving. This is particularly critical at barrier-free access points and at the location of out-swinging doors. Alternatively, structural frost slabs could be designed and constructed, or sufficient thermal insulation could be provided, at all door entrances and areas of barrier-free access.

5.7. Excavations

All excavations must be carried out in accordance with Ontario Regulation 213/91 (Reg 213/91) of the Occupational Health and Safety Act and Regulations for Construction Projects.

Type 2 Soils - In general, the native sandy silt till soils encountered in the boreholes, in a drained state (not saturated), would be classified as Type 2 soils under Reg 213/91. Type 2 soils must be sloped from within 1.2 m of the bottom of the excavation at a minimum gradient of 1 horizontal to 1 vertical. Soils underlain by Type 3 or Type 4 soils that are exposed in the excavation must be treated accordingly as Type 3 or Type 4 soils (see below). Soils in a saturated condition (if encountered) must be treated as Type 4 soils, addressed below.

Type 3 Soils - In general, the fill soils as well as the native sand, silt, sandy silt and sand and silt soils encountered in the boreholes, in a drained state (not wet or saturated), would be classified as Type 3 soils under Reg 213/91. The Type 3 soils must be sloped from the bottom of the excavation at a minimum gradient of 1 horizontal to 1 vertical. All saturated soils encountered must be treated as Type 4 soils, as described below.

Type 4 Soils - In general, any wet to saturated soils would be classified as Type 4 soils under Reg 213/91. Type 4 soils must be sloped from the bottom of the excavation at a minimum gradient of 3 horizontal to 1 vertical.

If it is not practical to excavate according to the above requirements, then a trench support system (designed in accordance with the Ontario Health and Safety Act Regulations) may be utilized. When using a temporary trench support system consisting of trench boxes to reduce the lateral extent of the excavations, it should be noted that the support system is intended primarily to protect workers as opposed to controlling lateral soil movement. Any voids between the excavation walls and the support system should be immediately filled to reduce the potential for loss of ground and to provide support to existing adjacent utilities and structures, and it is recommended that the excavation be carried out in short sections, with the support system installed immediately upon excavation completion. It should be noted that the native soils were observed to be dense to very dense in places and may be slow and/or difficult to excavate by conventional means.

5.8. Construction Dewatering Considerations

Water levels in the monitoring wells installed in Boreholes 1 to 5, inclusive were measured by Banks Groundwater Engineering Limited staff and reported to CMT Inc. on July 28, 2021 (see Section 4.8 of this report). It should be noted that groundwater levels (particularly perched water) are generally dependent on the amount of precipitation, control of surface water, as well as the time of year, and can fluctuate significantly in elevation and volume. As such, provisions for site dewatering should be part of the site development and construction process.

Seepage control requirements during construction will depend upon the area of work on the site, the depth of the excavations, the time of year, the amount of precipitation and the control of surface water. As required, seepage should generally be adequately controlled using conventional construction dewatering techniques such as pumping from sump pits. However, if heavy seepage occurs, it may be necessary to increase the number of pumps during construction.

Dewatering should be performed in accordance with OPSS 517 and the control of water must be in accordance with OPSS 518. It is the responsibility of the contractor to propose a suitable dewatering system based on the groundwater elevation at the time of construction. Collected water should discharge a sufficient distance away from the excavation to prevent re-entry. Sediment control measures must be installed at the

discharge point of the dewatering system to avoid any potential adverse impacts on the environment.

5.9. Service Pipe Bedding

The existing native soils that are free of any organics or deleterious materials are generally considered suitable for indirect support of the site service pipes; however, wet to saturated soils maybe encountered. Should instability due to saturated soil conditions be encountered, it may be necessary to increase the thickness of the granular base and utilize 19 mm clear stone to create an adequate supporting base for the service pipes and/or manholes. Pipe embedment, cover and backfill for both flexible and rigid pipes should be in accordance with all current and applicable OPSD, OPSS and OBC standards and guidelines and as follows.

Flexible Pipes – The pipe bedding should be shaped to receive the bottom of the pipe. If necessary, pipe culvert frost treatment should be undertaken in accordance with OPSD-803.030 and 803.031. The trench excavations should be symmetrical with respect to the centre-line of the pipe. The granular material placed under the haunches of the pipe must be compacted to 95% SPMDD prior to the continued placement and compaction of the embedment material. The homogeneous granular material used for embedment should be placed and compacted uniformly around the pipe. Should wet conditions be encountered at the base of the trench, then the pipe bedding should consist of 19 mm clear stone (meeting OPS Specifications) wrapped completely in a geotextile fabric such as Terrafix 270 or equivalent.

Rigid Pipes - In general, the pipe installation recommendations for rigid pipes are the same as those for flexible pipes, except that the minimum bedding depth below a rigid pipe should be 0.15*D* (where *D* is the pipe diameter). In no case should this dimension be less than 150 mm or greater than 300 mm.

Any service pipes that are not provided with sufficient frost coverage must be protected with the necessary equivalent thermal insulation. The general contractor is responsible to protect existing and new service piping from damage by heavy equipment.

5.10. Perimeter Building Drainage, Foundation Wall Backfill and Trench Backfill

In order to assist in maintaining dry buildings with respect to surface water seepage, it is recommended that exterior grades around the buildings be sloped down and away at a 2% gradient or more, for a distance of at least 1.5 m. Any surface discharge rainwater leaders must be constructed with solid piping that discharges with positive drainage at least 1.5 m away from the building foundations and/or beyond external slab-on-grades to a drainage swale or appropriate storm drainage system.

Depending on the design founding elevations and groundwater levels at the time of construction, it may be necessary to install a granular drainage layer to provide a suitable base for the foundations. The granular drainage layer must conform to the general requirements listed in Section 9.14.4 of the OBC 2012.

Should any of the proposed structures have a basement, an exterior perimeter drainage tile system comprising perforated drainage pipe with a factory installed filter sock, bedded in 19 mm clear crushed stone and wrapped in a geotextile filter fabric such as Terrafix 270R (or equivalent), is recommended to improve drainage around the buildings. The drainage tile should be installed at the founding elevation and be constructed with positive drainage into a sump pit or other suitable outlet that provides positive drainage away from the structure. The portion of the piping that connects any exterior drainage tile system into an interior sump pit must comprise solid piping to prevent exterior water from being introduced into the interior subslab stone. It may be prudent to install perforated drainage pipe in the interior area as well to provide an outlet for any water that may collect in the subslab stone. It is also recommended that a capped cleanout port(s) be extended up to the ground surface elevation to provide future access (if required). Rainwater leaders must not be connected to the perimeter weeping tile system. Any foundation walls that are constructed below the water table must be waterproofed, not dampproofed. A waterproofing system should be installed in accordance with the OBC (2012). It is recommended that a waterproofing specialist be consulted for a waterproofing system to suit the site conditions.

In order to reduce the effects of surficial frost heave in areas that will be hard surfaced, it is recommended that the exterior foundation backfill consist of free-draining granular material such as imported sand or Granular 'B' Type I or Type III (OPSS 1010), with a maximum aggregate size not exceeding 100 mm, and that it extend a minimum lateral distance of 600 mm out from the foundation walls and/or beyond perimeter sidewalks and entranceway slabs. It is critical that particles greater than 100 mm in diameter are not in contact with the foundation wall to prevent point loading and overstressing. The backfill material used against the foundation walls must be placed so that the allowable lateral capacities of the foundation walls are not exceeded. Where only one side of a foundation wall will be backfilled, and the height of the wall is such that lateral support is required, or where the concrete strength has not been achieved, the wall must be braced or laterally supported prior to backfilling. In situations where both sides of the wall are backfilled, the backfill should be placed in equal lifts, not exceeding 200 mm differential on each side during backfill operations and the backfill should be compacted to a minimum of 98% SPMDD.

It is recommended that frost tapers be constructed (refer to OPSD 3101.150 for typical details) in order to minimize differential frost action between the foundation wall backfill and any paved areas. The frost taper must be constructed utilizing the OPSS 1010 granular material that is used for the foundation wall backfill.

The native mineral soils, free of any organics or deleterious materials, are generally considered suitable for reuse as trench backfill and bulk fill; however, wet soils encountered may require air-drying in order to achieve the specified compaction. Air-drying cannot typically be achieved during winter construction; therefore, depending on the time of year that construction takes place, it may be more feasible to utilize an imported granular fill for this project (keeping in mind that frost tapers, as noted above, would be recommended to minimize differential frost heave).

Backfilling operations should be carried out with the following minimum requirements:

- Adequate heavy smooth drum or padfoot vibratory compaction equipment should be used (depending on the soil type) for the compaction and to break down any large blocky pieces of soil;

- Loose lift thicknesses should not exceed 0.3 m (12") for granular soils or 0.2 m (8") for silt soils or the capacity of the compactor (whichever is less);

- The soils must be at suitable moisture contents to achieve compaction to a minimum 95% SPMDD in non-structural bulk fill areas. Service trenches excavated within the zone of influence of footings for structures must be compacted to a minimum of 100% SPMDD;

- It is recommended that inspection and testing be carried out during construction to confirm backfill quality, thickness and to ensure that compaction requirements are achieved;

- Service trench backfill materials may consist of approved excavated soils with no particles greater than 100 mm and no topsoil or other deleterious materials;

- If construction operations are undertaken in the winter, strict consideration should be given to the condition of the backfill material to make certain that frozen material is not used.

5.11. Pavement Design/Drainage

Any soils containing organics or other deleterious material must be subexcavated from within the proposed sidewalks, roadways, driveways and parking areas. It is recommended to either subexcavate any existing loose subgrade materials or provide further consolidation with vibratory compaction equipment in order to prepare a proper, stable subgrade. Prior to placement of the granular base, the subgrade must be proof-rolled, and any soft or unstable areas should be subexcavated and replaced with suitable drier materials. The subgrade should be graded smooth (free of depressions) and properly crowned to ensure positive drainage, with a minimum grade of 3% toward the drainage outlet or curb line. When service pipes are installed, pipe bedding and backfilling should be undertaken as indicated in Sections 5.9 and 5.10 of this report.

Rapid drainage of the pavement structure is critical to ensure long-term performance. As such, it is recommended to install subdrains for this project (provided gravity drainage to a suitable outlet can be provided). Subdrains should be designed and installed in accordance with OPSS 405 and OPSD 216.021. If Granular 'A' bedding (OPSS 1010) is utilized, the subdrains should be equipped with a factory installed filter sock. If 19 mm clear stone (OPSS 1004) is utilized as bedding for the subdrain (recommended for this application), then the bedding must be wrapped completely with geotextile filter fabric such as Terrafix 270R (or equivalent). Installation of rigid subdrains allows for better grade control and less potential for damage during installation or service. Positive drainage through grade control of subdrains is critical, as improperly installed subdrains can turn drainage systems into reservoirs, which can fuel frost action. The subdrains will hasten the removal of water, thereby reducing the risk and effects of frost heaving and load transfer in saturated conditions. It is suggested that subdrains be installed at regular intervals (to be designed based on layout of catch basins and storm sewers) through paved driveways and parking areas. It is also recommended to install subdrains through any areas that cannot tolerate differential frost heave such as accessibility ramps/sidewalks. The subdrains should be installed in a 0.3 m (1.0 ft) by 0.3 m (1.0 ft) trench in the subgrade and bedded approximately 50 mm (2") above the bottom of the trench. The subgrade must be prepared with positive drainage to the subdrains and the subdrains must be installed with positive drainage into a catch basin structure or other suitable outlet.

The native subgrade soils are highly sensitive to change in moisture content and can become loose or soft if the soils are subject to inclement weather and seepage or severe drying. Furthermore, the subgrade soils could be easily disturbed if traveled on during construction. As such, where this material will be exposed, it is recommended that the granular subbase be placed immediately upon completion of the subgrade preparation to protect the integrity of the subgrade soils.

Should wet to saturated conditions be encountered during construction, site assessments may be required to determine what options can be undertaken to construct a modified pavement base. These options may include subexcavation of loose/soft soils, increasing the thickness of the granular base, the use of reinforcing geotextiles or geogrids, or a combination of all.

Given that the development is to be a commercial/industrial subdivision, it is anticipated that the roadways and driveways will experience some light traffic (personal vehicles) and significant heavy traffic (trucks, maintenance and emergency vehicles).

Based on the anticipated vehicle loading and frost-susceptibility of the subgrade soils, the following pavement design is provided:

Material	**Recommended Thickness For New Pavement**
Asphaltic Concrete	HL3 - 50 mm (2.0") HL4 or HL8 - 63 mm (2.5")
Granular 'A' Base (OPSS 1010)	150 mm (6.0")
Granular 'B' Subbase (OPSS 1010)	450 mm (18.0")

Construction joints in the surface and intermediate binder asphalt must be offset a minimum of 150 mm to 300 mm (6" to 12") from construction joints in the binder asphalt so that longitudinal joints do not coincide.

Should any new asphalt be joined into existing asphalt, it is recommended that the existing asphalt be sawcut in a straight line prior to being milled to a depth of 40 mm and a width of 150 mm as per OPSD 509.010. It is recommended that a tackcoat in conformance with OPSS 308 be applied to the edge and surface of all milled asphalt prior to placement of new asphalt.

The granular base and subbase materials must conform to the physical property and gradation requirements of OPSS 1010 and must be compacted to 100% SPMDD. Asphaltic concrete should be supplied, placed and compacted to a minimum 92.0% Marshall maximum relative density, in accordance with OPSS 1150 and OPSS 310.

The pavement should be designed to ensure that water will not pond on the pavement surface. If the surface asphalt is not placed within a reasonable time following placement of the binder asphalt, it is recommended that the catch basin lids are set at a lower elevation or apertures provided to allow surface water to drain into the catch basins and not accumulate around the catch basins. The strength of the pavement structure relies on all of the components to be in place in order to provide the design strength; therefore, it is strongly recommended that the surface asphalt be placed shortly after placement of the binder asphalt so as to avoid undue stress on the binder asphalt by not having the complete pavement structure in place.

It should be noted that, currently, asphalt mixes tend to be more flexible and, as such, there is a tendency for damage to occur from vehicles turning their steering wheels or applying excessive brake pressure. The condition is further intensified during hot weather. In high traffic areas or areas subjected to frequent turning of heavy vehicles, it is recommended that rigid Portland cement pavement be considered.

5.12. Excess Soil Management

5.12.1. Chemical Testing was NOT Undertaken by CMT Engineering Inc.

Generally, if surplus soils are to be exported off-site, it will be necessary to perform chemical analysis of the soils. Chemical analysis was not undertaken as part of this geotechnical investigation. Should chemical analysis tests be required, the required tests vary and will be dependent on the disposal site utilized by the general contractor.

5.12.2. Leachate Testing Requirement

If soils are transported to a landfill facility, additional chemical testing in accordance with Ontario Regulation 347, Schedule 4, as amended to Ontario Regulation 558/00, dated March 2001, Toxicity Characteristic Leaching Procedure (TCLP) will be required.

When transporting soils off-site, the following is recommended:

- All chemical analyses and environmental assessment reports must be fully disclosed to the receiving site owners/authorities, who must agree to receive the material.
- An environmental consultant must confirm the land use at the receiving site is compatible to receive the material.
- An environmental consultant must monitor the transportation and placement of the materials to ensure that the material is placed appropriately at the pre-approved site.
- The excess materials may not be transported to a site that has previously had a Record of Site Condition (RSC) filed, unless the material meets the criteria outlined in the RSC.

It should be noted that landfill sites will generally only accept laboratory test results that have been completed within 30 days of exporting. Therefore, it is recommended that provisions for chemical analysis be included in the tender documents. It should also be noted that the laboratory testing generally takes five (5) working days to process with a regular turnaround time.

5.13. Radon

According to information provided by Health Canada, radon is a radioactive gas that is naturally formed through the breakdown of uranium in soil, rock and water. When radon escapes the earth in the outdoors, it mixes with fresh air, resulting in concentrations that are too low to be of concern. However, when radon enters an enclosed space, such as a building, high concentration of radon can accumulate and become a health concern. Health Canada indicates that most buildings and homes have some level of radon in them. Unfortunately, it is not possible to predict before construction whether or not a new building will have high radon levels as radon can only be detected by radon measurement devices, which would be installed in a building, post construction. Section 9.13.4.1 Soil Gas Control of the current 2012 Ontario Building Code (OBC) states that *"Where methane or radon gases are known to be a problem, construction shall comply with the requirements for soil gas control in MMAH Supplementary Standard SB-9, Requirements for Soil Gas Control"*.

6.0 SITE INSPECTION

Qualified geotechnical personnel should supervise excavation inspections as well as compaction testing for structural filling, site grading and site servicing. This will ensure that footings are founded in the proper strata and that proper material and techniques are used and the specified compaction is achieved. CMT Engineering Inc. would be pleased to review the design drawings and provide an inspection and testing program for the construction of the proposed subdivision.

7.0 LIMITATIONS OF THE INVESTIGATION

This report is intended for the Client named herein and for their Client. The report should be read in its entirety, and no portion of this report may be used as a separate entity. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

The recommendations made in this report are in accordance with our present understanding of the project. We request that we be permitted to review our recommendations when the drawings and specifications are complete, or if the proposed construction should differ from that mentioned in this report.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments are based on the results obtained at the test locations only. It is therefore assumed that these results are representative of the subsoil conditions across the site. Should any conditions at the site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations.

It should be noted that this report specifically addresses geotechnical aspects of the project and does not include any investigations or assessments relating to potential subsurface contamination. As such, there should be no assumptions or conclusions derived from this report with respect to potential soil or water contamination. Soil or water contamination is generally caused by the presence of xenobiotic (human-made) chemicals or other alteration processes in the natural soil and groundwater environment. If necessary, the investigation, assessment and rehabilitation of soil and water contaminants should be undertaken by qualified environmental specialists.

The samples obtained during the geotechnical investigation will be stored for a period of three months, after which time they will be disposed of unless alternative arrangements are made.

We trust that this report meets with your present requirements. Should you have any questions, please do not hesitate to contact our office.

Prepared by:

Brandon Figg

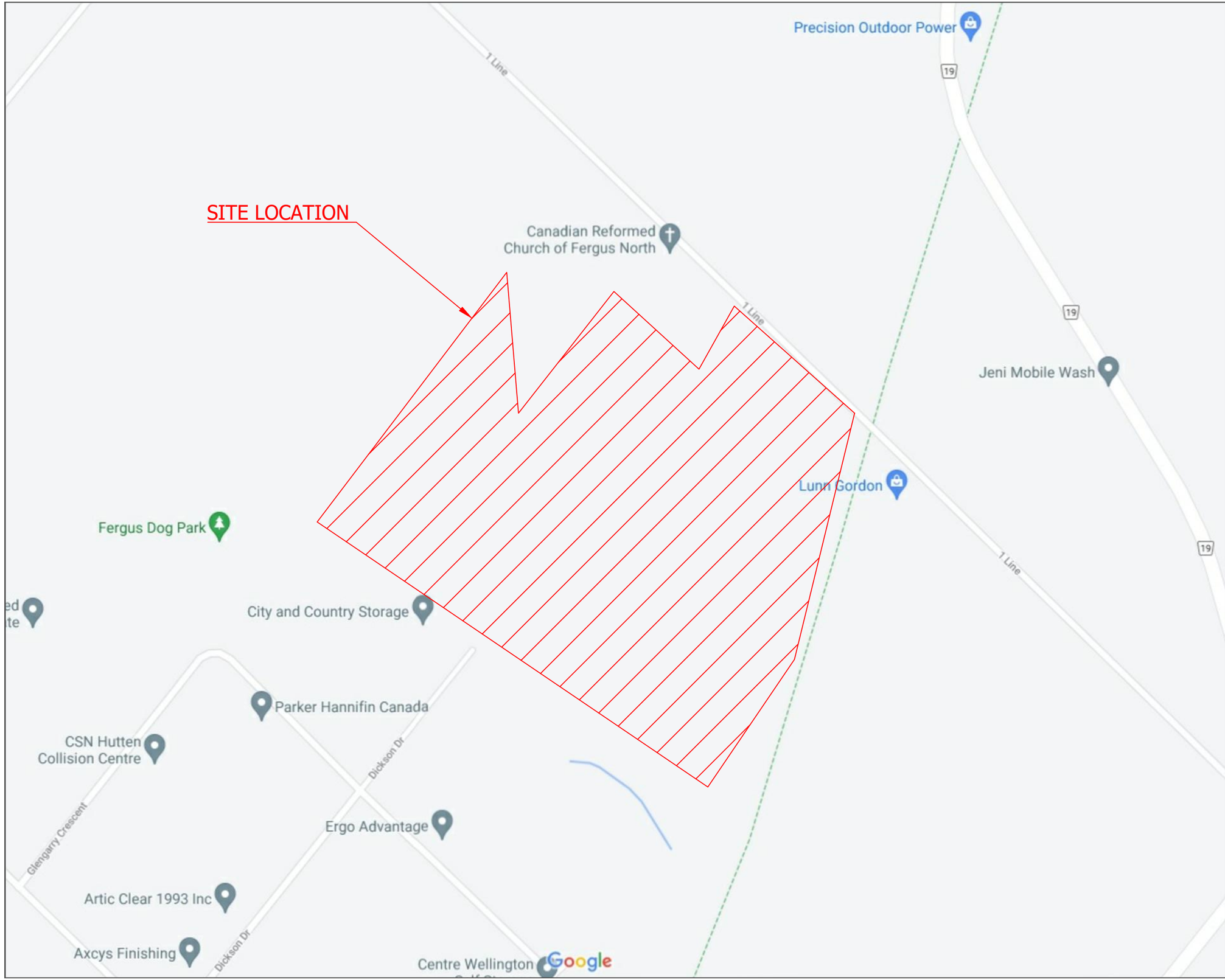
Brandon R Figg, C. Tech.
Senior Soil Technician



Reviewed by:

Nathan Chortos, P.Eng.
Senior Geotechnical Engineer

ks



NOTES:

1. BASE MAP PROVIDED BY GOOGLE MAPS

N

NO.	DESCRIPTION	DATE

REVISIONS

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

PROJECT:

DISCKSON DRIVE EXTENSION
(M6468C)
Dickson Drive,
Fergus, Ontario

DRAWING TITLE:

SITE LOCATION MAP

PROJECT NO.:	DATE:
21-279	September 23, 2021
SCALE:	DRAWING NO.
N.T.S.	1



NOTES:

Drawing provided by Triton Engineering Services Limited.

Legend

CMT Borehole (2021)

NO.	DESCRIPTION	DATE

REVISIONS

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1011 Industrial Crescent, Unit 1
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PROJECT:

DICKSON DRIVE EXTENSION
(M6468C)
Dickson Drive,
Fergus, Ontario

DRAWING TITLE:

SITE PLAN SHOWING
BOREHOLE LOCATIONS

PROJECT NO.:	DATE:
21-279	September 23, 2021
SCALE:	DRAWING NO.
N.T.S.	2

APPENDIX A

BOREHOLE LOGS

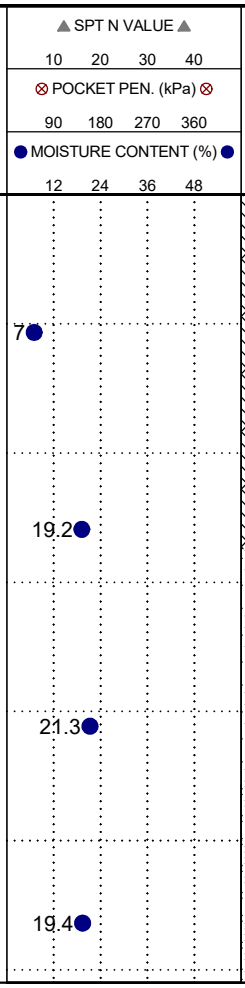
CMT Engineering Inc.
1011 Industrial Crescent
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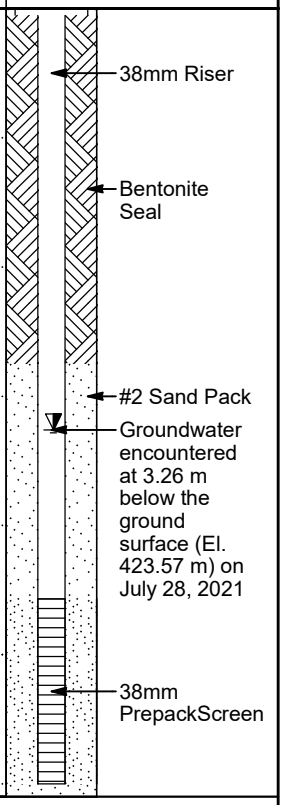
BOREHOLE NUMBER BH1

PROJECT: Dickson Drive Extension (M6468C)
PROJECT ADDRESS: Dickson Drive,
PROJECT LOCATION: Fergus, ON
PROJECT NUMBER: 21-279
DRILLING DATE: 21-5-20
GROUND ELEVATION: 426.83 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: MC5

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
0	**TOPSOIL:** Very loose, dark brown, silty organic topsoil, moist (150 mm)	0.00, 426.83	MC5 1	35	
	SAND FILL: Compact, dark brown, sand fill, moist	0.15, 426.68			
1					
	TOPSOIL: Loose, dark brown, silty organic topsoil, moist (50 mm)	1.63, 425.20			
2		1.73, 425.10	MC5 2	85	
	SAND: Compact, brown, sand, trace silt and clay, moist becoming wet	1.78, 425.05			
3	**SILT:** Compact, brown, silt, trace clay, sand and gravel, saturated	2.26, 424.57			
			MC5 3	90	
4					
5			MC5 4	100	
6					

Bottom of borehole at 6.10 m, Elevation 420.73 m.





WELL DIAGRAM

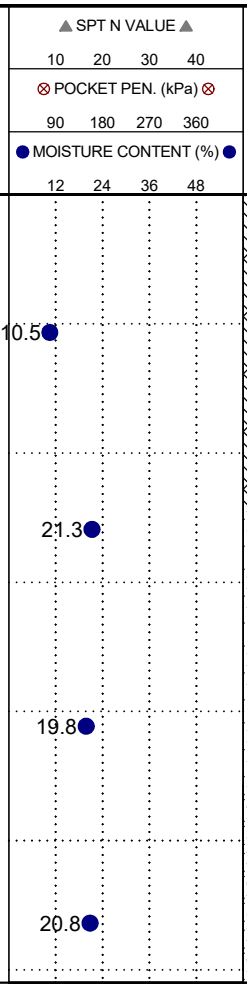
CMT Engineering Inc.
1011 Industrial Crescent
St. Clements, Ontario, N0B 2M0
Telephone: 519-699-5775
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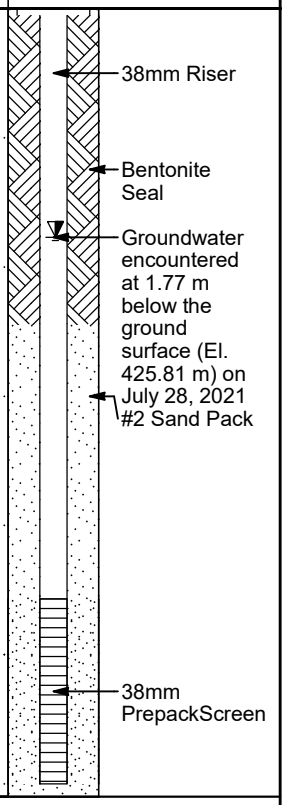
BOREHOLE NUMBER BH2

PROJECT: Dickson Drive Extension (M6468C)
PROJECT ADDRESS: Dickson Drive,
PROJECT NUMBER: 21-279
PROJECT LOCATION: Fergus, ON
DRILLING DATE: 21-5-20
GROUND ELEVATION: 427.58 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: MC5

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
0	**TOPSOIL:** Very loose, dark brown, silty organic topsoil, moist (525 mm)	0.00, 427.58			
0	**SAND:** Compact, dark brown, sand, trace silt and clay, moist	0.53, 427.06	MC5 1	85	
1	becoming wet	0.97, 426.61			
1	becoming brown and saturated	1.52, 426.06	MC5 2	93	
2					
3			MC5 3	85	
4					
5			MC5 4	95	
6					

Bottom of borehole at 6.10 m, Elevation 421.48 m.





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BOREHOLE NUMBER BH3

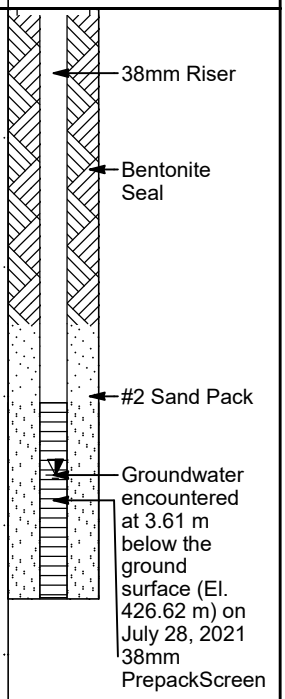
PROJECT: Dickson Drive Extension (M6468C)
PROJECT ADDRESS: Dickson Drive,
PROJECT LOCATION: Fergus, ON
PROJECT NUMBER: 21-279
DRILLING DATE: 21-5-20
GROUND ELEVATION: 430.23 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: MC5

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
1	**TOPSOIL:** Very loose, dark brown, silty organic topsoil, moist (450 mm)	0.00, 430.23	MC5 1	62	11.1
	SAND FILL: Compact, dark brown, sand fill, moist	0.45, 429.78			
2	**TOPSOIL:** Very loose, dark brown, silty organic topsoil, moist (150 mm)	1.52, 428.71	MC5 2	85	6.6
	SAND: Compact, brown, sand, trace silt and clay, moist	1.68, 428.55			
3	**SILT:** Compact, brown, silt, trace clay, sand and gravel, saturated	2.54, 427.69			
4	**SAND:** Compact, brown, sand, trace silt and clay, saturated	3.05, 427.18	MC5 3	90	16.6
	SILT: Compact, grey, silt, trace clay, sand and gravel, wet	3.81, 426.42			
5	**SANDY SILT TILL:** Compact, grey, sandy silt till, some clay, trace gravel, moist	4.57, 425.66	MC5 4	85	7.4
6					

Bottom of borehole at 6.10 m, Elevation 424.13 m.

SPT N VALUE: 10 20 30 40
POCKET PEN. (kPa): 90 180 270 360
MOISTURE CONTENT (%): 12 24 36 48

WELL DIAGRAM



CMT Engineering Inc.
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St. Clements, Ontario, N0B 2M0
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BOREHOLE NUMBER BH4

PROJECT: Dickson Drive Extension (M6468C)
PROJECT ADDRESS: Dickson Drive,
PROJECT LOCATION: Fergus, ON
PROJECT NUMBER: 21-279
DRILLING DATE: 21-5-20
GROUND ELEVATION: 430.13 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: MC5

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
0	**TOPSOIL:** Very loose, dark brown, silty organic topsoil, moist (275 mm)	0.00, 430.13	MC5 1	87	10.2
	SANDY SILT TILL: Compact, grey, sandy silt till, some clay, trace gravel, moist	0.28, 429.85	MC5 2	93	11
			MC5 3	90	7.2
			MC5 4	20	7.6
	becoming grey	6.40, 423.73			
	becoming wet	7.62, 422.51			
	Bottom of borehole at 9.14 m, Elevation 420.99 m.				

SPT N VALUE: 10 20 30 40
POCKET PEN. (kPa): 90 180 270 360
MOISTURE CONTENT (%): 12 24 36 48

WELL DIAGRAM:
- 38mm Riser
- Bentonite Seal
- Groundwater encountered at 2.11 m below the ground surface (El. 428.02 m) on July 28, 2021
- #2 Sand Pack
- 38mm PrepackScreen

BOREHOLE LOG WITH WELL2 21-279 BH LOGS.GPJ CMT_TEMPLATE_2020-05-15.GDT 21-10-5

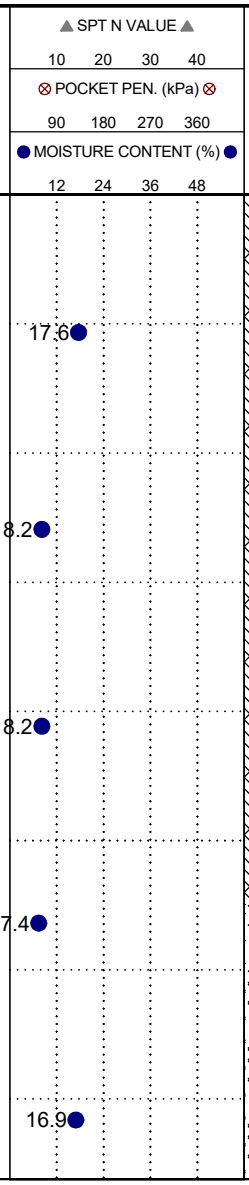
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Telephone: 519-699-5775
Fax: 519-699-4664

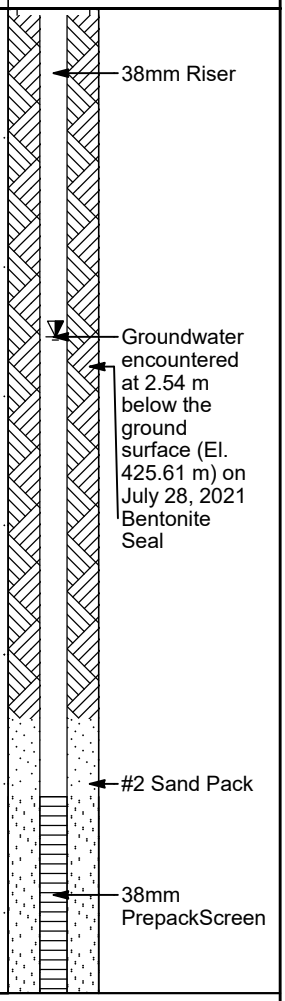
BOREHOLE NUMBER BH5

PROJECT: Dickson Drive Extension (M6468C)
PROJECT ADDRESS: Dickson Drive,
PROJECT LOCATION: Fergus, ON
PROJECT NUMBER: 21-279
DRILLING DATE: 21-5-20
GROUND ELEVATION: 428.15 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: MC5

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
0	**TOPSOIL:** Very loose, dark brown, silty organic topsoil, moist (400 mm)	0.00, 428.15			
	SAND: Compact, brown, sand, trace silt and clay, wet	0.40, 427.75	MC5 1	35	
1					
2	**SILTY SAND TILL:** Compact, brown, silty sand till, some clay, trace gravel, moist	1.88, 426.27			
	becoming dense	2.13, 426.02	MC5 2	43	
3					
4	becoming very dense	3.96, 424.19	MC5 3	100	
	becoming grey	4.57, 423.58			
5			MC5 4	95	
6					
	SAND AND SILT: Compact, grey, sand and silt, some clay, trace gravel, saturated	6.10, 422.05			
7			MC5 5	100	
	SANDY SILT TILL: Compact, grey, sandy silt till, some clay, trace gravel, moist	7.37, 420.78			

Bottom of borehole at 7.62 m, Elevation 420.53 m.





BOREHOLE LOG WITH WELL2 21-279 BH LOGS.GPJ CMT_TEMPLATE_2020-05-15.GDT 21-10-5

CMT Engineering Inc.
1011 Industrial Crescent
St. Clements, Ontario, N0B 2M0
Telephone: 519-699-5775
Fax: 519-699-4664

BOREHOLE NUMBER BH6

PROJECT: Dickson Drive Extension (M6468C)
PROJECT ADDRESS: Dickson Drive,
PROJECT LOCATION: Fergus, ON
PROJECT NUMBER: 21-279
DRILLING DATE: 21-5-19
GROUND ELEVATION: 433.05 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT/MC5

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	SPT N VALUE / POCKET PEN. (kPa) / MOISTURE CONTENT (%)	WELL DIAGRAM
0	**TOPSOIL:** Very loose, dark brown, silty organic topsoil, moist (375 mm)	0.00, 433.05	SPT 1	62	1-1-1-1 (2)	2	
	SANDY SILT: Very loose, brown, sandy silt, some clay, trace gravel, moist becoming compact	0.38, 432.68				17	
1		0.76, 432.29	SPT 2	152	3-4-6-8 (10)	10	
						10.7	
2			SPT 3	100	2-5-7-8 (12)	12	
						9.7	
	SANDY SILT TILL: Dense to very dense, brown, sandy silt till, some clay, trace gravel, moist	2.29, 430.76	SPT 4	408	50/0.13	7.9 >>	
3			SPT 5	92	25-38-29-34 (67)	8.2 >>	
4			MC5 6	100		7.2	
			SPT 7	62	50/0.13	7.1 >>	
5							

Caving was encountered upon completion of the borehole at a depth of approximately 4.27 m (El. 428.78 m) below ground surface. Accumulated groundwater was encountered in the borehole.

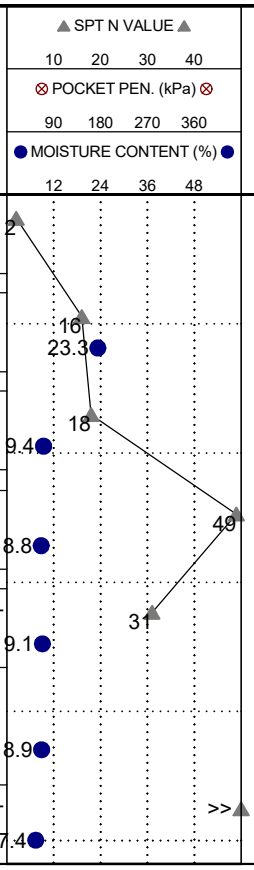
Bottom of borehole at 5.18 m, Elevation 427.87 m.

CMT Engineering Inc.
1011 Industrial Crescent
St. Clements, Ontario, N0B 2M0
Telephone: 519-699-5775
Fax: 519-699-4664

BOREHOLE NUMBER BH7

PROJECT: Dickson Drive Extension (M6468C)
PROJECT ADDRESS: Dickson Drive,
PROJECT LOCATION: Fergus, ON
PROJECT NUMBER: 21-279
DRILLING DATE: 21-5-19
GROUND ELEVATION: 428.29 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT/MC5

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
	TOPSOIL: Very loose, dark brown, silty organic topsoil, moist (225 mm)	0.00, 428.29	SPT 1	41	1-1-1-1 (2)
	SANDY SILT: Very loose, brown, sandy silt, some clay, trace gravel, moist	0.23, 428.07			
1	**SILT:** Compact, brown, silt, trace clay, sand and gravel, saturated	0.76, 427.53	SPT 2	100	4-9-7-8 (16)
	becoming grey and wet	1.50, 426.79	SPT 3	87	6-8-10-8 (18)
2					
	SANDY SILT TILL: Dense, grey, sandy silt till, some clay, trace gravel, moist	2.29, 426.00	SPT 4	92	7-37-12-12 (49)
3			SPT 5	100	21-12-19-14 (31)
4			MC5 6	100	
			SPT 7	79	21-23-33-34 (56)
5					



WELL DIAGRAM

Caving was encountered upon completion of the borehole at a depth of approximately 5.13 m (El. 423.16 m) below ground surface. Accumulated groundwater was encountered in the borehole.

Bottom of borehole at 5.18 m, Elevation 423.11 m.

CMT Engineering Inc.
1011 Industrial Crescent
St. Clements, Ontario, N0B 2M0
Telephone: 519-699-5775
Fax: 519-699-4664

BOREHOLE NUMBER BH8

PROJECT: Dickson Drive Extension (M6468C)
PROJECT ADDRESS: Dickson Drive,
PROJECT LOCATION: Fergus, ON
PROJECT NUMBER: 21-279
DRILLING DATE: 21-5-19
GROUND ELEVATION: 431.16 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT/MC5

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	SPT N VALUE / POCKET PEN. (kPa) / MOISTURE CONTENT (%)	WELL DIAGRAM
	TOPSOIL: Very loose, dark brown, silty organic topsoil, moist (225 mm)	0.00, 431.16	SPT 1	70	1-1-1-1 (2)	2, 14.5	
	SANDY SILT: Very loose, brown, sandy silt, some clay, trace gravel, moist	0.23, 430.94					
1	**SAND:** Loose, brown, sand, trace silt and clay, moist	0.76, 430.40	SPT 2	75	4-3-6-6 (9)	9, 13.1	
	becoming compact	1.52, 429.64	SPT 3	100	4-4-7-7 (11)	11, 4.8	
2			SPT 4	92	7-8-10-11 (18)	18, 4.4	
3			SPT 5	100	7-9-13-16 (22)	22, 3.4	
4			MC5 6	100		3	
	becoming wet	4.57, 426.59	SPT 7	100	3-7-14-14 (21)	21, 20	
5							

Caving was encountered upon completion of the borehole at a depth of approximately 4.72 m (El. 426.44 m) below ground surface. Accumulated groundwater was encountered in the borehole.

Bottom of borehole at 5.18 m, Elevation 425.98 m.

CMT Engineering Inc.
1011 Industrial Crescent
St. Clements, Ontario, N0B 2M0
Telephone: 519-699-5775
Fax: 519-699-4664

BOREHOLE NUMBER BH9

PROJECT: Dickson Drive Extension (M6468C)
PROJECT ADDRESS: Dickson Drive,
PROJECT LOCATION: Fergus, ON
PROJECT NUMBER: 21-279
DRILLING DATE: 21-5-20
GROUND ELEVATION: 429.92 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT/MC5

DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	SPT N VALUE / POCKET PEN. (kPa) / MOISTURE CONTENT (%)	WELL DIAGRAM
0		**TOPSOIL:** Very loose, dark brown, silty organic topsoil, moist (200 mm)	0.00, 429.92					
			0.20, 429.72	SPT 1	46	1-1-1-1 (2)	2 / 20.7	
1		**SANDY SILT:** Very loose, dark brown, sandy silt, some clay, trace gravel, moist		SPT 2	46	1-1-1-1 (2)	2 / 17.3	
		SAND: Compact, brown, sand, trace silt and clay, moist	1.52, 428.40	SPT 3	100	5-7-7-5 (14)	14 / 4.5	
2				SPT 4	87	6-7-9-11 (16)	16 / 5.3	
3				SPT 5	92	7-9-14-17 (23)	23 / 4.7	
4		becoming saturated	4.09, 425.83	MC5 6	81		17.9	
				SPT 7	95	6-9-9-11 (18)	18 / 20.2	
5								

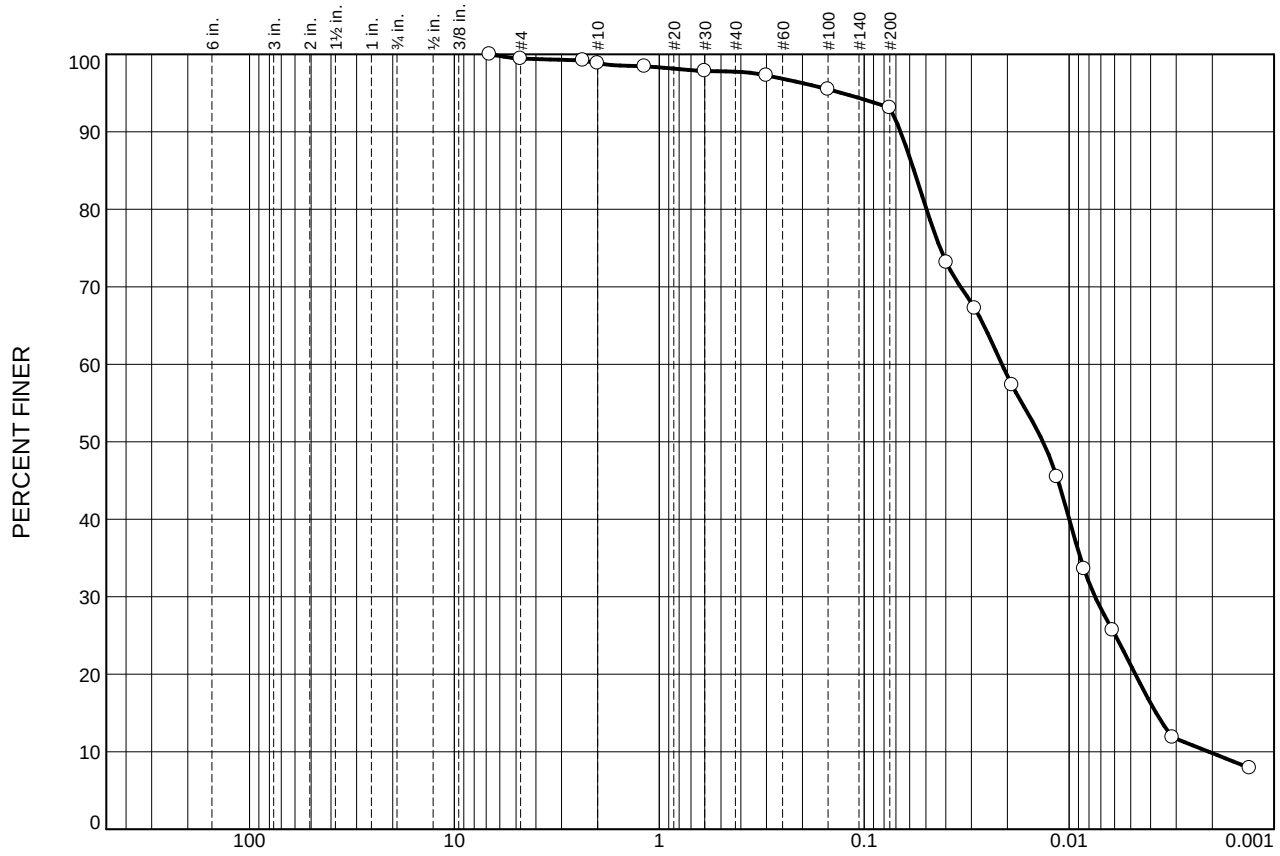
Caving was encountered upon completion of the borehole at a depth of approximately 4.57 m (El. 425.35 m) below ground surface. Accumulated groundwater was encountered in the borehole.

Bottom of borehole at 5.18 m, Elevation 424.74 m.

APPENDIX B

GRAIN SIZE ANALYSES

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.6	0.6	1.0	4.7	83.3	9.8

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH1	3	3.05-4.57m	silt, trace clay, sand and gravel	ML
				Sampled by BF of CMT Engineering Inc., May 20, 2021	
				Tested by JM of CMT Engineering Inc., May 28, 2021	

CMT Engineering Inc.

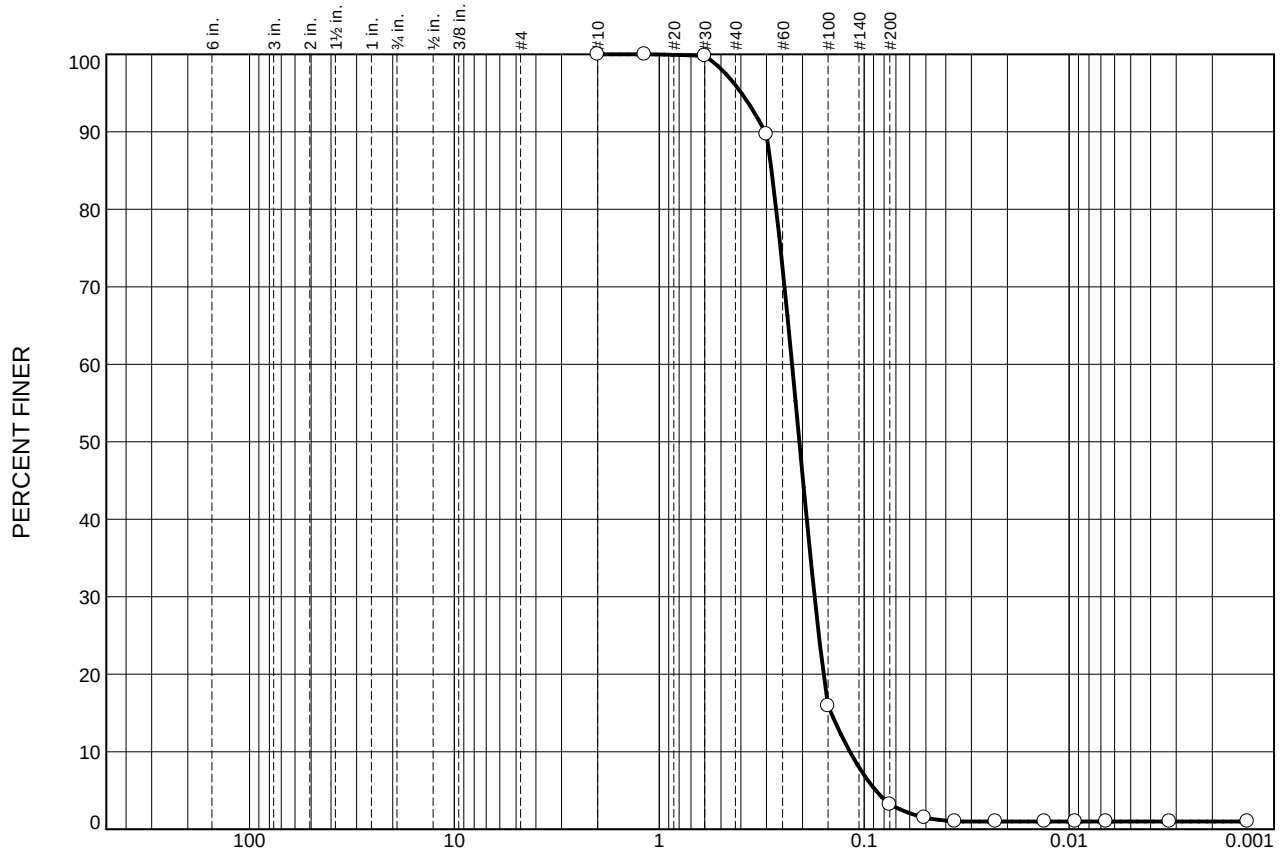
St. Clements, ON

Client: Township of Centre Wellington c/o Triton Engineering Services Limited

Project: Dickson Drive Extension (Reference M6468C)
Fergus, Ontario

Project No.: 21-279 **Figure** 1

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	4.0	92.8	2.2	1.0

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH2	4	4.57-6.10m	sand, trace silt and clay	SP
				Sampled by BF of CMT Engineering Inc., May 20, 2021	
				Tested by JM of CMT Engineering Inc., May 28, 2021	

CMT Engineering Inc.

St. Clements, ON

Client: Township of Centre Wellington c/o Triton Engineering Services Limited

Project: Dickson Drive Extension (Reference M6468C)
Fergus, Ontario

Project No.: 21-279 **Figure** 2

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	9.1	4.1	7.1	18.4	47.0	14.3

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH3	4	4.57-6.10m	sandy silt, some clay, trace gravel	ML
				Sampled by BF of CMT Engineering Inc., May 20, 2021	
				Tested by JM of CMT Engineering Inc., May 28, 2021	

CMT Engineering Inc.

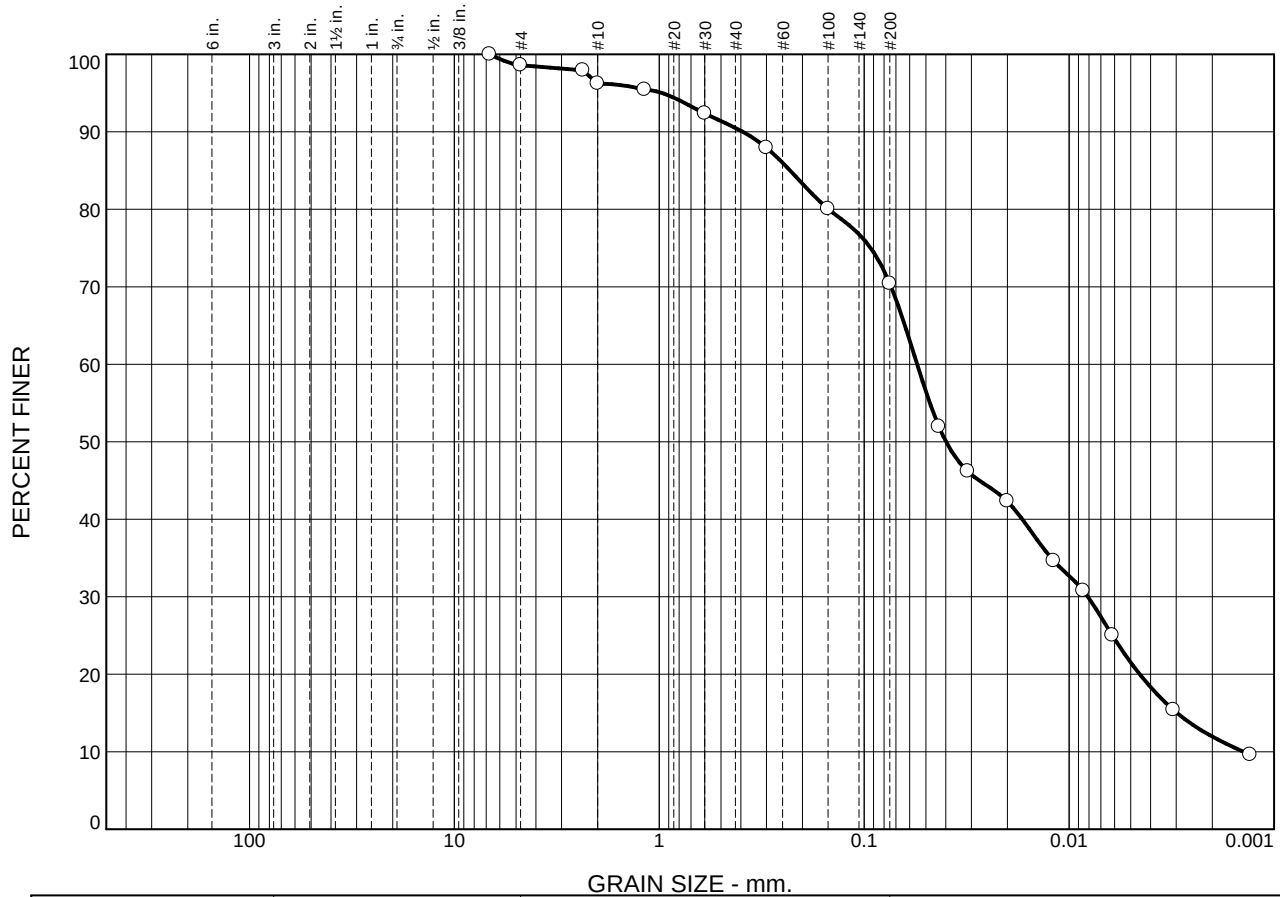
St. Clements, ON

Client: Township of Centre Wellington c/o Triton Engineering Services Limited

Project: Dickson Drive Extension (Reference M6468C)
Fergus, Ontario

Project No.: 21-279 **Figure** 3

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.4	2.4	5.7	20.1	58.4	12.0

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH4	1	0.28-1.52m	sandy silt, some clay, trace gravel	ML
				Sampled by BF of CMT Engineering Inc., May 20, 2021	
				Tested by JM of CMT Engineering Inc., May 28, 2021	

CMT Engineering Inc.

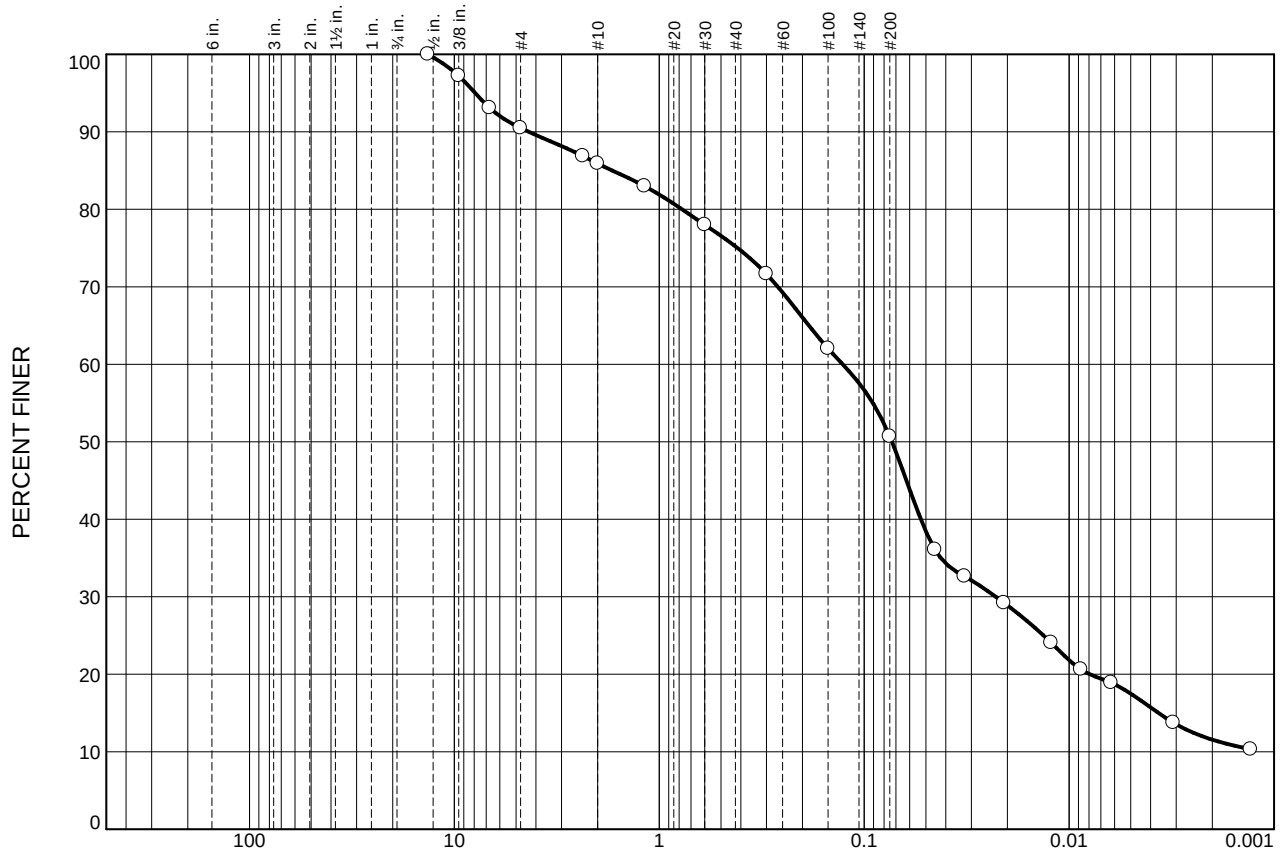
St. Clements, ON

Client: Township of Centre Wellington c/o Triton Engineering Services Limited

Project: Dickson Drive Extension (Reference M6468C)
Fergus, Ontario

Project No.: 21-279 **Figure** 4

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	9.5	4.6	10.7	24.5	39.1	11.6

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH5	5	6.10-7.36m	sand and silt, some clay, trace gravel	ML
				Sampled by BF of CMT Engineering Inc., May 20, 2021	
				Tested by JM of CMT Engineering Inc., May 28, 2021	

CMT Engineering Inc.

St. Clements, ON

Client: Township of Centre Wellington c/o Triton Engineering Services Limited

Project: Dickson Drive Extension (Reference M6468C)
Fergus, Ontario

Project No.: 21-279 **Figure** 5

APPENDIX C

WELL RECORDS

Ontario

Ministry of the Environment, Conservation and Parks

Well Record - Regulation 903

Ontario Water Resources Act

Notice of Collection of Personal Information

Personal information contained on this form is collected pursuant to sections 35-50 and 75(2) of the *Ontario Water Resources Act* and section 16.3 of the Wells Regulation. This information will be used for the purpose of maintaining a public record of wells in Ontario. This form and the information contained on the form will be stored in the Ministry's well record database and made publicly available. Questions about this collection should be directed to the Water Well Customer Service Representative at the Wells Help Desk, 125 Resources Road, Toronto Ontario M9P 3V6, at 1-888-396-9355 or wellshelpdesk@ontario.ca.

Fields marked with an asterisk (*) are mandatory.

Well Tag Number *
A 333576

Type *

☑ Construction ☐ Abandonment

Measurement recorded in: *

☐ Metric ☑ Imperial

1. Well Owner's Information

Last Name and First Name, or Organization is mandatory. *

Last Name	First Name

Organization	Email Address
TOWNSHIP OF CENTRE WELLINGTON	

Current Address

Unit Number	Street Number *	Street Name *	City/Town/Village
	1	MACDONALD SQ	ELORA

Country	Province	Postal Code	Telephone Number
CAN	ON	N0B 1S0	

2. Well Location

Address of Well Location

Unit Number	Street Number *	Street Name *	Township
IN	FIELD	NORTH OF DICKSON DR	

Lot	Concession	County/District/Municipality

City/Town	Province	Postal Code
FERGUS	Ontario	

UTM Coordinates	Zone *	Easting *	Northing *		Municipal Plan and Sublot Number
NAD 83	17	550657	4841699	Test UTM in Map	

Other

3. Overburden and Bedrock Material *

Well Depth * 25 (ft)

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

				(ft)	(ft)
Brown	Sand	Gravel		0	10
Brown	Silt	Till	Dense	10	25

4. Annular Space *

Depth From (ft)	Depth To (ft)	Type of Sealant Used (Material and Type)	Volume Placed (cubic feet)
0	18	3/8 HOLEPLUG	0.61
18	25	#2 SAND	0.2

5. Method of Construction *

☐ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Diamond
☐ Jetting ☐ Driving ☐ Digging ☐ Rotary (Air) ☑ Augering ☐ Direct Push
☐ Other (specify) _____

6. Well Use *

☐ Public ☐ Industrial ☐ Cooling & Air Conditioning
☐ Domestic ☐ Commercial ☐ Not Used
☐ Livestock ☐ Municipal ☑ Monitoring
☐ Irrigation ☐ Test Hole ☐ Dewatering
☐ Other (specify) _____

7. Status of Well *

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

8. Construction Record - Casing * (use negative number(s) to indicate depth above ground surface)

Inside Diameter (in)	Open Hole **or** Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness	Depth From (ft)	Depth To (ft)
1.5	Plastic	0.25	-3	20

9. Construction Record - Screen

Outside Diameter (in)	Material (Plastic, Galvanized, Steel)	Slot Number	Depth From (ft)	Depth To (ft)
1.75	Plastic	10	20	25

10. Water Details

Water found at Depth (ft)	☐ Gas	Kind of water ☐ Fresh	☐ Untested	☐ Other

11. Hole Diameter

Depth From (ft)	Depth To (ft)	Diameter (in)
0	25	4

12. Results of Well Yield Testing

☐ Pumping Discontinued

Explain _____

If flowing give rate

☐ Flowing _____ (GPM)

Draw down

Time (min)	Static Level	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)														

Recovery

Time (min)	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)													

After test of well yield, water was

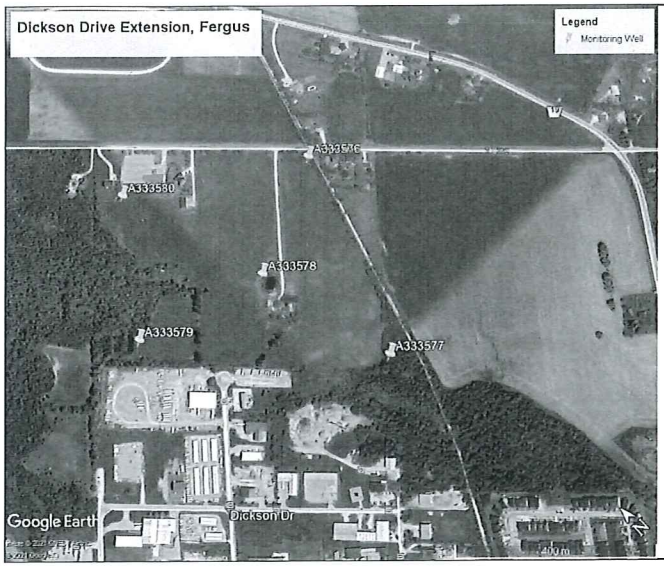
☐ Clear and sand free ☐ Other (specify)

Pump intake set at (ft)	Pumping rate (GPM)	Duration of pumping hrs + min	Final water level end of pumping (ft)	Disinfected? * ☐ Yes ☑ No

Recommended pump depth (ft)	Recommended pump rate (GPM)	Well production (GPM)

13. Map of Well Location *

Map 1. Please Click the map area below to import an image file to use as the map. ☐ Make map area bigger



14. Information

Well owner's information package delivered	Date Package Delivered (yyyy/mm/dd)	Date Work Completed (yyyy/mm/dd) *
☐ Yes ☐ No		2021/05/20

Comments

15. Well Contractor and Well Technician Information

Business Name of Well Contractor *	Well Contractor's License Number *
CMT DRILLING INC	7366

Business Address

Unit Number	Street Number	Street Name *
1	1011	INDUSTRIAL CRES

City/Town/Village *	Province	Postal Code *
ST CLEMENTS	ON	N0B 2M0

Business Telephone Number	Business Email Address
519-699-5775	info@cmtinc.net

Last Name of Well Technician *	First Name of Well Technician *	Well Technician's License Number *
BLACK	CHRIS	3711

16. Declaration *

☑ I hereby confirm that I am the person who constructed the well and I hereby confirm that the information on the form is correct and accurate.

Last Name	First Name	Email Address
BLACK	CHRIS	cblack@cmtinc.net

Signature		Date Submitted (yyyy/mm/dd)
Chris Black	Digitally signed by Chris Black Date: 2021.06.25 08:29:35 -04'00'	2021/06/25

17. Ministry Use Only

Audit Number

ACD4 AGXS

Ontario

Ministry of the Environment, Conservation and Parks

Well Record - Regulation 903

Ontario Water Resources Act

Notice of Collection of Personal Information

Personal information contained on this form is collected pursuant to sections 35-50 and 75(2) of the *Ontario Water Resources Act* and section 16.3 of the Wells Regulation. This information will be used for the purpose of maintaining a public record of wells in Ontario. This form and the information contained on the form will be stored in the Ministry's well record database and made publicly available. Questions about this collection should be directed to the Water Well Customer Service Representative at the Wells Help Desk, 125 Resources Road, Toronto Ontario M9P 3V6, at 1-888-396-9355 or wellshelpdesk@ontario.ca.

Fields marked with an asterisk (*) are mandatory.

Well Tag Number *
A 333577

Type *

☑ Construction ☐ Abandonment

Measurement recorded in: *

☐ Metric ☑ Imperial

1. Well Owner's Information

Last Name and First Name, or Organization is mandatory. *

Last Name	First Name

Organization	Email Address
TOWNSHIP OF CENTRE WELLINGTON	

Current Address

Unit Number	Street Number *	Street Name *	City/Town/Village
	1	MACDONALD SQ	ELORA

Country	Province	Postal Code	Telephone Number
CAN	ON	N0B 1S0	

2. Well Location

Address of Well Location

Unit Number	Street Number *	Street Name *	Township
IN	FIELD	NORTH OF DICKSON DR	

Lot	Concession	County/District/Municipality

City/Town	Province	Postal Code
FERGUS	Ontario	

UTM Coordinates	Zone *	Easting *	Northing *		Municipal Plan and Sublot Number
NAD 83	17	550488	4841268	Test UTM in Map	

Other

3. Overburden and Bedrock Material *

Well Depth * 20 (ft)

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

				(ft)	(ft)
Brown	Sand			0	20

4. Annular Space *

Depth From (ft)	Depth To (ft)	Type of Sealant Used (Material and Type)	Volume Placed (cubic feet)
0	9	3/8 HOLEPLUG	0.2

5. Method of Construction *

☐ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Diamond
☐ Jetting ☐ Driving ☐ Digging ☐ Rotary (Air) ☐ Augering ☑ Direct Push
☐ Other (specify) _____

6. Well Use *

☐ Public ☐ Industrial ☐ Cooling & Air Conditioning
☐ Domestic ☐ Commercial ☐ Not Used
☐ Livestock ☐ Municipal ☑ Monitoring
☐ Irrigation ☐ Test Hole ☐ Dewatering
☐ Other (specify) _____

7. Status of Well *

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

8. Construction Record - Casing * (use negative number(s) to indicate depth above ground surface)

Inside Diameter (in)	Open Hole **or** Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness	Depth From (ft)	Depth To (ft)
1.5	Plastic	0.25	-3	15

9. Construction Record - Screen

Outside Diameter (in)	Material (Plastic, Galvanized, Steel)	Slot Number	Depth From (ft)	Depth To (ft)
1.75	Plastic	10	15	20

10. Water Details

Water found at Depth (ft) ☐ Gas Kind of water ☐ Fresh ☐ Untested ☐ Other

11. Hole Diameter

Depth From (ft)	Depth To (ft)	Diameter (in)
0	20	3.5

12. Results of Well Yield Testing

☐ Pumping Discontinued

Explain _____

If flowing give rate

☐ Flowing _____ (GPM)

Draw down

Time (min)	Static Level	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)														

Recovery

Time (min)	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)													

After test of well yield, water was

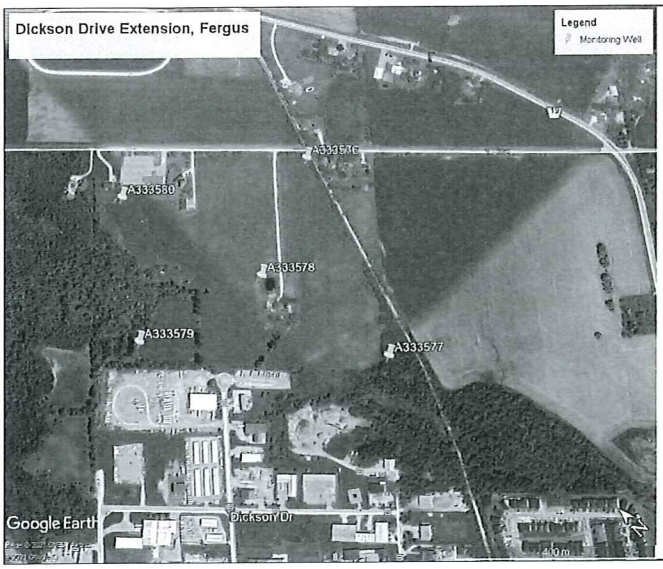
☐ Clear and sand free ☐ Other (specify)

Pump intake set at (ft)	Pumping rate (GPM)	Duration of pumping hrs + min	Final water level end of pumping (ft)	Disinfected? * ☐ Yes ☑ No

Recommended pump depth (ft)	Recommended pump rate (GPM)	Well production (GPM)

13. Map of Well Location *

Map 1. Please Click the map area below to import an image file to use as the map. ☐ Make map area bigger



14. Information

Well owner's information package delivered	Date Package Delivered (yyyy/mm/dd)	Date Work Completed (yyyy/mm/dd) *
☐ Yes ☐ No		2021/05/20

Comments

15. Well Contractor and Well Technician Information

Business Name of Well Contractor *	Well Contractor's License Number *
CMT DRILLING INC	7366

Business Address

Unit Number	Street Number	Street Name *
1	1011	INDUSTRIAL CRES

City/Town/Village *	Province	Postal Code *
ST CLEMENTS	ON	N0B 2M0

Business Telephone Number	Business Email Address
519-699-5775	info@cmtinc.net

Last Name of Well Technician *	First Name of Well Technician *	Well Technician's License Number *
BLACK	CHRIS	3711

16. Declaration *

☑ I hereby confirm that I am the person who constructed the well and I hereby confirm that the information on the form is correct and accurate.

Last Name	First Name	Email Address
BLACK	CHRIS	cblack@cmtinc.net

Signature		Date Submitted (yyyy/mm/dd)
Chris Black	Digitally signed by Chris Black Date: 2021.06.25 08:38:11 -04'00'	2021/06/25

17. Ministry Use Only

Audit Number

7RVV 7FD4

Ontario

Ministry of the Environment, Conservation and Parks

Well Record - Regulation 903

Ontario Water Resources Act

Notice of Collection of Personal Information

Personal information contained on this form is collected pursuant to sections 35-50 and 75(2) of the *Ontario Water Resources Act* and section 16.3 of the Wells Regulation. This information will be used for the purpose of maintaining a public record of wells in Ontario. This form and the information contained on the form will be stored in the Ministry's well record database and made publicly available. Questions about this collection should be directed to the Water Well Customer Service Representative at the Wells Help Desk, 125 Resources Road, Toronto Ontario M9P 3V6, at 1-888-396-9355 or wellshelpdesk@ontario.ca.

Fields marked with an asterisk (*) are mandatory.

Well Tag Number *
A 333578

Type *

☑ Construction ☐ Abandonment

Measurement recorded in: *

☐ Metric ☑ Imperial

1. Well Owner's Information

Last Name and First Name, or Organization is mandatory. *

Last Name	First Name

Organization	Email Address
TOWNSHIP OF CENTRE WELLINGTON	

Current Address

Unit Number	Street Number *	Street Name *	City/Town/Village
	1	MACDONALD SQ	ELORA

Country	Province	Postal Code	Telephone Number
CAN	ON	N0B1S0	

2. Well Location

Address of Well Location

Unit Number	Street Number *	Street Name *	Township
IN	FIELD	NORTH OF DICKSON DR	

Lot	Concession	County/District/Municipality

City/Town	Province	Postal Code
FERGUS	Ontario	

UTM Coordinates	Zone *	Easting *	Northing *		Municipal Plan and Sublot Number
NAD 83	17	550488	4841578	Test UTM in Map	

Other

3. Overburden and Bedrock Material *

Well Depth * 15 (ft)

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

				(ft)	(ft)
Brown	Sand			0	15

4. Annular Space *

Depth From (ft)	Depth To (ft)	Type of Sealant Used (Material and Type)	Volume Placed (cubic feet)
0	8	3/8 HOLEPLUG	0.2

5. Method of Construction *

☐ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Diamond
☐ Jetting ☐ Driving ☐ Digging ☐ Rotary (Air) ☐ Augering ☑ Direct Push
☐ Other (specify)

6. Well Use *

☐ Public ☐ Industrial ☐ Cooling & Air Conditioning
☐ Domestic ☐ Commercial ☐ Not Used
☐ Livestock ☐ Municipal ☑ Monitoring
☐ Irrigation ☐ Test Hole ☐ Dewatering
☐ Other (specify)

7. Status of Well *

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

8. Construction Record - Casing * (use negative number(s) to indicate depth above ground surface)

Inside Diameter (in)	Open Hole **or** Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness	Depth From (ft)	Depth To (ft)
1.5	Plastic	0.25	-3	10

9. Construction Record - Screen

Outside Diameter (in)	Material (Plastic, Galvanized, Steel)	Slot Number	Depth From (ft)	Depth To (ft)
1.75	Plastic	10	10	15

10. Water Details

Water found at Depth (ft) ☐ Gas Kind of water ☐ Fresh ☐ Untested ☐ Other

11. Hole Diameter

Depth From (ft)	Depth To (ft)	Diameter (in)
0	15	3.5

12. Results of Well Yield Testing

☐ Pumping Discontinued

Explain _____

If flowing give rate

☐ Flowing _____ (GPM)

Draw down

Time (min)	Static Level	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)														

Recovery

Time (min)	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)													

After test of well yield, water was

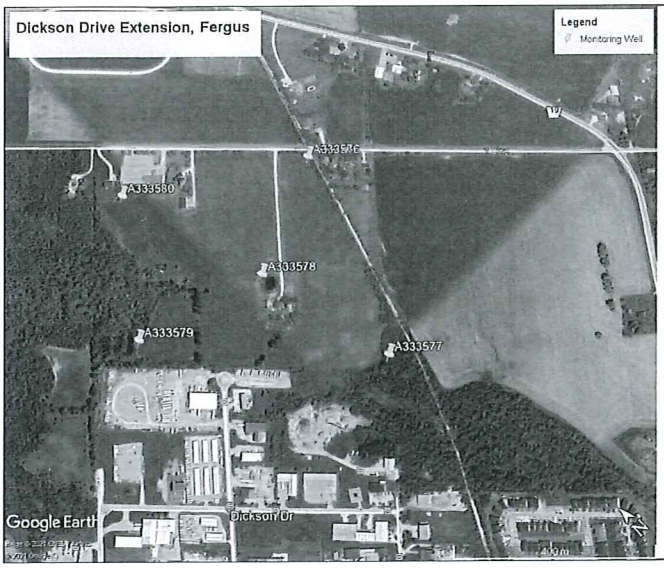
☐ Clear and sand free ☐ Other (specify)

Pump intake set at (ft)	Pumping rate (GPM)	Duration of pumping hrs + min	Final water level end of pumping (ft)	Disinfected? *
				☐ Yes ☑ No

Recommended pump depth (ft)	Recommended pump rate (GPM)	Well production (GPM)

13. Map of Well Location *

Map 1. Please Click the map area below to import an image file to use as the map. ☐ Make map area bigger



14. Information

Well owner's information package delivered	Date Package Delivered (yyyy/mm/dd)	Date Work Completed (yyyy/mm/dd) *
☐ Yes ☐ No		2021/05/20

Comments

15. Well Contractor and Well Technician Information

Business Name of Well Contractor *	Well Contractor's License Number *
CMT DRILLING INC	7366

Business Address

Unit Number	Street Number	Street Name *
1	1011	INDUSTRIAL CRES

City/Town/Village *	Province	Postal Code *
ST CLEMENTS	ON	N0B 2M0

Business Telephone Number	Business Email Address
519-699-5775	info@cmtinc.net

Last Name of Well Technician *	First Name of Well Technician *	Well Technician's License Number *
BLACK	CHRIS	3711

16. Declaration *

☑ I hereby confirm that I am the person who constructed the well and I hereby confirm that the information on the form is correct and accurate.

Last Name	First Name	Email Address
BLACK	CHRIS	cblack@cmtinc.net

Signature		Date Submitted (yyyy/mm/dd)
Chris Black	Digitally signed by Chris Black Date: 2021.06.25 09:54:52 -04'00'	2021/06/25

17. Ministry Use Only

Audit Number

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Ontario

Ministry of the Environment, Conservation and Parks

Well Record - Regulation 903

Ontario Water Resources Act

Notice of Collection of Personal Information

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Fields marked with an asterisk (*) are mandatory.

Well Tag Number *
A 333579

Type *

☑ Construction ☐ Abandonment

Measurement recorded in: *

☐ Metric ☑ Imperial

1. Well Owner's Information

Last Name and First Name, or Organization is mandatory. *

Last Name	First Name

Organization	Email Address
TOWNSHIP OF CENTRE WELLINGTON	

Current Address

Unit Number	Street Number *	Street Name *	City/Town/Village
	1	MACDONALD SQ	ELORA

Country	Province	Postal Code	Telephone Number
CAN	ON	N0B 1S0	

2. Well Location

Address of Well Location

Unit Number	Street Number *	Street Name *	Township
IN	FIELD	NORTH OF DICKSON DR	

Lot	Concession	County/District/Municipality

City/Town	Province	Postal Code
FERGUS	Ontario	

UTM Coordinates	Zone *	Easting *	Northing *		Municipal Plan and Sublot Number
NAD 83	17	550129	4841646	Test UTM in Map	

Other

3. Overburden and Bedrock Material *

Well Depth * 20 (ft)

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

				(ft)	(ft)
Brown	Sand			0	20

4. Annular Space *

Depth From (ft)	Depth To (ft)	Type of Sealant Used (Material and Type)	Volume Placed (cubic feet)
0	8	3/8 HOLEPLUG	0.2

5. Method of Construction *

☐ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Diamond
☐ Jetting ☐ Driving ☐ Digging ☐ Rotary (Air) ☐ Augering ☑ Direct Push
☐ Other (specify) _____

6. Well Use *

☐ Public ☐ Industrial ☐ Cooling & Air Conditioning
☐ Domestic ☐ Commercial ☐ Not Used
☐ Livestock ☐ Municipal ☑ Monitoring
☐ Irrigation ☐ Test Hole ☐ Dewatering
☐ Other (specify) _____

7. Status of Well *

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

8. Construction Record - Casing * (use negative number(s) to indicate depth above ground surface)

Inside Diameter (in)	Open Hole **or** Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness	Depth From (ft)	Depth To (ft)
1.5	Plastic	0.25	-3	15

9. Construction Record - Screen

Outside Diameter (in)	Material (Plastic, Galvanized, Steel)	Slot Number	Depth From (ft)	Depth To (ft)
1.75	Plastic	10	15	20

10. Water Details

Water found at Depth (ft) ☐ Gas Kind of water ☐ Fresh ☐ Untested ☐ Other

11. Hole Diameter

Depth From (ft)	Depth To (ft)	Diameter (in)
0	20	3.5

12. Results of Well Yield Testing

☐ Pumping Discontinued

Explain _____

If flowing give rate

☐ Flowing _____ (GPM)

Draw down

Time (min)	Static Level	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)														

Recovery

Time (min)	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)													

After test of well yield, water was

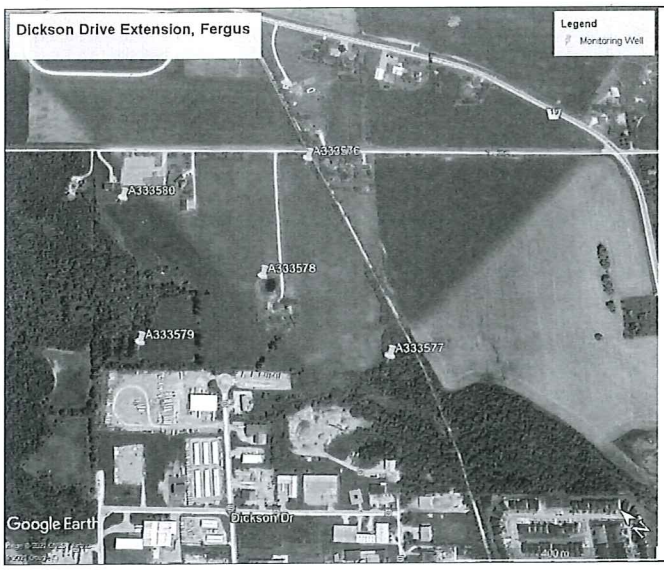
☐ Clear and sand free ☐ Other (specify)

Pump intake set at (ft)	Pumping rate (GPM)	Duration of pumping hrs + min	Final water level end of pumping (ft)	Disinfected? *
				☐ Yes ☑ No

Recommended pump depth (ft)	Recommended pump rate (GPM)	Well production (GPM)

13. Map of Well Location *

Map 1. Please Click the map area below to import an image file to use as the map. ☐ Make map area bigger



14. Information

Well owner's information package delivered	Date Package Delivered (yyyy/mm/dd)	Date Work Completed (yyyy/mm/dd) *
☐ Yes ☐ No		2021/05/20

Comments

15. Well Contractor and Well Technician Information

Business Name of Well Contractor *	Well Contractor's License Number *
CMT DRILLING INC	7366

Business Address

Unit Number	Street Number	Street Name *
1	1011	INDUSTRIAL CRES

City/Town/Village *	Province	Postal Code *
ST CLEMENTS	ON	N0B 2M0

Business Telephone Number	Business Email Address
519-699-5775	info@cmtinc.net

Last Name of Well Technician *	First Name of Well Technician *	Well Technician's License Number *
BLACK	CHRIS	3711

16. Declaration *

☑ I hereby confirm that I am the person who constructed the well and I hereby confirm that the information on the form is correct and accurate.

Last Name	First Name	Email Address
BLACK	CHRIS	cblack@cmtinc.net

Signature		Date Submitted (yyyy/mm/dd)
Chris Black	Digitally signed by Chris Black Date: 2021.06.25 10:00:28 -04'00'	2021/06/25

17. Ministry Use Only

Audit Number

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Ontario

Ministry of the Environment, Conservation and Parks

Well Record - Regulation 903

Ontario Water Resources Act

Notice of Collection of Personal Information

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Fields marked with an asterisk (*) are mandatory.

Well Tag Number *
A 333580

Type *

☑ Construction ☐ Abandonment

Measurement recorded in: *

☐ Metric ☑ Imperial

1. Well Owner's Information

Last Name and First Name, or Organization is mandatory. *

Last Name	First Name
Organization	**Email Address**
TOWNSHIP OF CENTRE WELLINGTON	

Current Address

Unit Number	Street Number *	Street Name *	City/Town/Village
	1	NORTH OF DICKSON DR	ELORA

Country	Province	Postal Code	Telephone Number
CAN	ON	N0B 1S0	

2. Well Location

Address of Well Location

Unit Number	Street Number *	Street Name *	Township
IN	FIELD	NORTH OF DICKSON DR	

Lot	Concession	County/District/Municipality

City/Town	Province	Postal Code
FERGUS	Ontario	

UTM Coordinates	Zone *	Easting *	Northing *		Municipal Plan and Sublot Number
NAD 83	17	550304	4841910	Test UTM in Map	

Other

3. Overburden and Bedrock Material *

Well Depth * 29 (ft)

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

				(ft)	(ft)
Brown	Sand	Gravel		0	10
Brown	Silt	Till	Dense	10	29

4. Annular Space *

Depth From (ft)	Depth To (ft)	Type of Sealant Used (Material and Type)	Volume Placed (cubic feet)
0	13	3/8 HOLEPLUG	0.28
13	29	#2 SAND	0.35

5. Method of Construction *

☐ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Diamond
☐ Jetting ☐ Driving ☐ Digging ☐ Rotary (Air) ☑ Augering ☐ Direct Push
☐ Other (specify) _____

6. Well Use *

☐ Public ☐ Industrial ☐ Cooling & Air Conditioning
☐ Domestic ☐ Commercial ☐ Not Used
☐ Livestock ☐ Municipal ☑ Monitoring
☐ Irrigation ☐ Test Hole ☐ Dewatering
☐ Other (specify) _____

7. Status of Well *

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

8. Construction Record - Casing * (use negative number(s) to indicate depth above ground surface)

Inside Diameter (in)	Open Hole **or** Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness	Depth From (ft)	Depth To (ft)
1.5	Plastic	0.25	-3	24

9. Construction Record - Screen

Outside Diameter (in)	Material (Plastic, Galvanized, Steel)	Slot Number	Depth From (ft)	Depth To (ft)
1.75	Plastic	10	25	29

10. Water Details

Water found at Depth (ft)	☐ Gas	Kind of water ☐ Fresh	☐ Untested	☐ Other

11. Hole Diameter

Depth From (ft)	Depth To (ft)	Diameter (in)
0	29	4

12. Results of Well Yield Testing

☐ Pumping Discontinued

Explain _____

If flowing give rate

☐ Flowing _____ (GPM)

Draw down

Time (min)	Static Level	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)														

Recovery

Time (min)	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)													

After test of well yield, water was

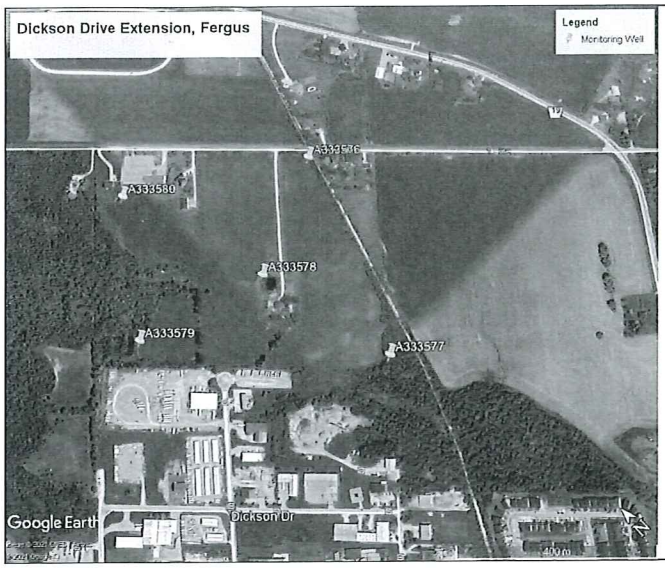
☐ Clear and sand free ☐ Other (specify)

Pump intake set at (ft)	Pumping rate (GPM)	Duration of pumping hrs + min	Final water level end of pumping (ft)	Disinfected? * ☐ Yes ☑ No

Recommended pump depth (ft)	Recommended pump rate (GPM)	Well production (GPM)

13. Map of Well Location *

Map 1. Please Click the map area below to import an image file to use as the map. ☐ Make map area bigger



14. Information

Well owner's information package delivered	Date Package Delivered (yyyy/mm/dd)	Date Work Completed (yyyy/mm/dd) *
☐ Yes ☐ No		2021/05/20

Comments

15. Well Contractor and Well Technician Information

Business Name of Well Contractor *	Well Contractor's License Number *
CMT DRILLING INC	7366

Business Address

Unit Number	Street Number	Street Name *
1	1011	INDUSTRIAL CRES

City/Town/Village *	Province	Postal Code *
ST CLEMENTS	ON	N0B 2M0

Business Telephone Number	Business Email Address
519-699-5775	info@cmtinc.net

Last Name of Well Technician *	First Name of Well Technician *	Well Technician's License Number *
BLACK	CHRIS	3711

16. Declaration *

☑ I hereby confirm that I am the person who constructed the well and I hereby confirm that the information on the form is correct and accurate.

Last Name	First Name	Email Address
BLACK	CHRIS	cblack@cmtinc.net

Signature		Date Submitted (yyyy/mm/dd)
Chris Black	Digitally signed by Chris Black Date: 2021.06.25 10:09:16 -04'00'	2021/06/25

17. Ministry Use Only

Audit Number

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