GEOTECHNICAL INVESTIGATION

CEDAR CRESCENT VILLAGE
101 GREEN STREET
PORT ELGIN, ONTARIO

CMT Project 21-005.R01

Prepared for:

2706913 Ontario Inc.
c/o The Cedar Crescent Village

February 16, 2021

CMT ENGINEERING INC.

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February 16, 2021 21-005.R01

2706913 Ontario Inc.
c/o The Cedar Crescent Village
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Attention: Mr. Pier Donnini

Dear Sir:

Re: Geotechnical Investigation
Cedar Crescent Village
101 Green Street
Port Elgin, Ontario

As requested, CMT Engineering Inc. conducted a geotechnical investigation and hydrogeological 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 R Figg, C.Tech.
Senior Soil Technician

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1.0 INTRODUCTION

The services of CMT Engineering Inc. (CMT Inc.) were retained by Mr. Pier Donnini to conduct a geotechnical investigation for the proposed Cedar Crescent Village Development that is to be constructed at 101 Green Street in Port Elgin, Ontario. The location of the site is shown on Drawing 1.

It is understood that the proposed development is to consist of a 2-storey restaurant, and a 2-storey tourism, harbour services, tuck shop, event space and washroom facility on the west side of the development. Additionally, a 1.5-storey indoor children's play space structure, a 1-storey food sales, recreation and market space structure is proposed for the central portion of the development. A new cul-de-sac will be constructed at the west end of Gang Way (Elgin Street). New services are proposed to be installed from Gang Way (Elgin Street). It is reported that the proposed sanitary service will be at an approximate depth of 2.0 m; the water service will be at an approximate depth of 1.8 m; and the storm sewer will be at an approximate depth of 1.2 m. New parking areas for approximately 284 vehicles are proposed in the east and south portions of the development. However, it is understood that the new parking lots will be constructed by the Town of Saugeen Shores and therefore are not included as part of this investigation.

The purpose of the geotechnical investigation and hydrogeological 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; deep foundations; site classification for seismic site response; recommendations for site grading, site servicing, excavations and backfilling; recommendations for slab-on-grade construction; pavement design/drainage; soil design properties; and a summary of the laboratory results.

It should be noted that a hydrogeological report will be completed by HCS (Hydrogeology Consulting Services) and the results and recommendations will be provided in a separate report.

The recommendations in this report are solely based on the soil conditions encountered in the boreholes located on the subject property.

2.0 EXISTING SITE CONDITIONS

A large portion of the proposed development area is currently comprised of an unpaved beach parking area. The previous structure(s) located in the development area have been recently demolished. There is an existing paved area in the vicinity of the proposed 1-storey food sales, recreation and market space structure. There was previously a mini golf course in the vicinity of the proposed 1.5-storey indoor children's play space structure. As well, there are existing services located throughout the proposed development area. The site is bounded by a condominium complex and harbour to the north; a beach, washroom facilities and a restaurant to the south; Harbour Street to the east; and a beach, boardwalk and Lake Huron to the west.

3.0 FIELD AND LABORATORY PROCEDURES

Prior to the commencement of the field drilling program, public and private underground utility locates were organized by CMT Engineering Inc. to ensure that existing utilities would not be damaged.

The initial field investigation was conducted on January 26 and 28, 2021 and comprised the advancement of seven (7) boreholes (referenced as Boreholes 1 to 7), utilizing a Geoprobe 7822DT drillrig operated by employees of CMT Drilling Inc. Boreholes 1 to 6, inclusive were advanced in the areas of the proposed structures and Borehole 7 was advanced in the area of the proposed cul-de-sac. Borehole 1 was advanced to a depth of approximately 8.23 m (27.0 ft) below the existing ground surface; Borehole 2 was advanced to a depth of approximately 7.62 m (25.0 ft) below the existing ground surface; Boreholes 3 to 6, inclusive, were advanced to depths of approximately 6.71 m (22.0 ft) below the existing ground surface; and Borehole 7 was advanced to a depth of approximately 5.18 m (17.0 ft).

Standard penetration testing and sampling was carried out in the boreholes 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 3.05 m (10.0 ft), and every 1.52 m (5.0 ft) thereafter, to borehole termination. Macro core (MC5) direct push sampling was conducted between the SPT soil samples conducted below 3.05 m (10.0 ft) depth. Macro core (MC5) direct push sampling was only conducted in Boreholes 5 and 7 as heaving sands encountered in the boreholes made MC5 sampling difficult. As well, macro core sampling was conducted from the surface at Borehole 7 due to the presence of frost.

Technical staff from CMT Inc. observed the drilling operation and collected and logged the recovered soil samples. A small portion of each soil sample was placed in a sealed, marked jar for moisture content determinations.

Representative soil samples from the following boreholes and depths were submitted to the CMT Inc. laboratory in St. Clements, Ontario for grain size analyses:

- Borehole 4 - depth 1.52 m to 2.13 m (5.0 ft to 7.0 ft)
- Borehole 5 - depth 6.10 m to 6.71 m (20.0 ft to 22.0 ft)
- Borehole 6 - depth 4.57 m to 5.18 m (15.0 ft to 17.0 ft)

The borehole logs are provided in Appendix A and the resulting grain size analyses can be found in Appendix B.

Boreholes 4 and 6 were equipped with 38 mm diameter PVC monitoring wells comprising a 1.5 m long prepacked screen, backfilled with #2 sand filter above the prepack screen and then riser pipe, backfilled with bentonite. The monitoring wells were installed according with the Ontario Water Resources Act, Regulation 903 (O.Reg. 903) by well technicians licensed by the

Ministry of the Environment, Conservation and Parks (MECP), working for a contractor also licensed by the MECP. The boreholes that were not instrumented with monitoring wells were backfilled with bentonite in accordance with O.Reg. 903. The monitoring wells are registered with the MECP and must be decommissioned in accordance with O.Reg. 903 prior to future construction. The well log records are provided in Appendix C.

The ground surface elevations at the borehole locations were surveyed (using laser survey equipment) by CMT Inc. staff upon completion of the boreholes. A Geodetic Survey of Canada Benchmark located on the harbour wall, north of the existing fuel tanks, was utilized as a temporary benchmark with a reported geodetic elevation of 177.86 m. As such, the ground surface elevations at the borehole locations ranged from approximately 177.68 m to 178.36 m. The locations of the boreholes and temporary benchmark are shown on Drawing 2.

4.0 SUBSOIL CONDITIONS

The soil 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 observed at the surface at Borehole 6. The thickness of the topsoil at the borehole location was approximately 200 mm. It should be expected that the topsoil thickness will vary outside of the borehole. 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. Asphalt

Asphaltic concrete (asphalt) was observed at the surface at Borehole 7. The asphalt was observed to be approximately 120 mm in thickness at the borehole location. Some variation in the asphalt thickness of the existing roadway should be expected outside of the sampled area.

4.3. Granular Base

Compact, brown sand and gravel fill (granular base) was encountered underlying the asphalt at Borehole 7. The granular base was observed to be approximately 200 mm in thickness at the borehole location. Some variation in the granular base thickness of the existing roadway should be expected outside of the sampled area.

4.4. Sand Fill

Dark brown and/or brown sand fill was encountered at the surface in Boreholes 1 to 5, inclusive, underlying the topsoil at Borehole 6, and underlying the granular base material at Borehole 7. The sand fill soils were considered to be loose to compact, with SPT N-values ranging from 6 to 30 blows per 0.30 m (average 18 blows per 0.30 m). The sand fill soils were considered to be moist to saturated, with moisture contents ranging from approximately 9.2% to 20.0% (average of 14.6%).

4.5. Sand

Reddish brown and/or grey sand with trace silt and clay was encountered underlying the fill at the borehole locations. The sand is considered to be loose to compact, with SPT N-values ranging from 4 to 22 blows per 0.30 m (average 13 blows per 0.30 m). The sand was considered to be moist to saturated, with moisture contents ranging from approximately 7.8% to 28.1% (average of 18.0%).

4.6. Clayey Silt

Grey, clayey silt with trace sand and gravel was encountered underlying the sand at the borehole locations. The clayey silt is considered to be very soft to very stiff, with SPT N-values ranging from 0 to 23 blows per 0.30 m (average 12 blows per 0.30 m). The clayey silt was considered to be moist to saturated, with moisture contents ranging from approximately 8.9% to 25.6% (average of 17.3%).

4.7. Sand and Silt Till

Grey sand and silt till, with some gravel and trace clay was encountered underlying the clayey silt at the borehole locations. The till is considered to be very dense, with SPT N-values ranging from 71 to greater than 100 blows per 0.30 m (average 86 blows per 0.30 m). The till was considered to be moist, with moisture contents ranging from approximately 7.8% to 12.0% (average of 9.9%).

4.8. Groundwater

Wet to saturated soil conditions were encountered in all boreholes. As well, heaving/flowing sands were encountered in all boreholes. It should be noted that the compact to very dense and/or firm to very stiff, 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 and/or firm to very stiff 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 are anticipated to 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.

A 38 mm (1.5 inch) diameter monitoring well was installed in Boreholes 4 and 6 to measure the static groundwater level and complete the hydrogeological study. The water levels in the boreholes were reported to CMT Inc. by HCS on February 11, 2021. The groundwater in Borehole 4 was measured to be approximately 0.77 m below ground surface. The groundwater in Borehole 6 was measured to be approximately 0.90 m below ground surface. All of the boreholes encountered groundwater upon completion of the borehole.

The recorded groundwater elevation in the monitoring wells installed in Boreholes 4 and 6 and the approximate zone of wet soils observed in all of the boreholes, 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 Monitoring Well (m) Reported to CMT Inc. on Feb. 11, 2021 (Depth to Water)	Estimated Zone of Wet Soil at the Time of Investigation Elevation (m)	Approximate Depth Below Ground Surface of Estimated Zone of Wet Soil at the Time of Investigation (m)	Bottom of Borehole Elevation (m)
BH 1	177.68	--	176.92 to 170.67	0.76 to 7.01	169.45
BH 2	177.80	--	177.04 to 171.70	0.76 to 6.10	170.18
BH 3	177.85	--	177.57 to 171.75	0.28 to 6.10	171.14
BH 4	178.34	177.57 (0.77)	177.58 to 172.24	0.76 to 6.10	171.63

Borehole No.	Ground Surface Elevation (m)	Approximate Elevation of Water in Monitoring Well (m) Reported to CMT Inc. on Feb. 11, 2021 (Depth to Water)	Estimated Zone of Wet Soil at the Time of Investigation Elevation (m)	Approximate Depth Below Ground Surface of Estimated Zone of Wet Soil at the Time of Investigation (m)	Bottom of Borehole Elevation (m)
BH 5	178.36	--	178.13 to 173.51	0.23 to 4.85	171.65
BH 6	178.32	177.42 (0.90)	177.56 to 172.30	0.76 to 6.02	171.61
BH 7	177.79	--	176.27 to 172.61 (termination)	1.52 to 5.18 (termination)	172.61

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

The monitoring wells installed in Boreholes 4 and 6 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 proposed development is to consist of a 2-storey restaurant; a 2-storey tourism, harbour services, tuck shop, event space and washroom facility; a 1.5-storey indoor children's play space structure; and a 1-storey food sales, recreation and market space structure. A new cul-de-sac will be constructed at the west end of Gang Way (Elgin Street). New services are proposed to be installed from Gang Way (Elgin Street).

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.

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.

5.1. Serviceability and Ultimate Limit Pressure

Based on the information obtained from the boreholes, the following table provides a summary of the estimated geotechnical reaction at the Serviceability Limit State (SLS) and the factored geotechnical resistance at the Ultimate Limit State (ULS) at 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 1	177.68	75 (1,500)	150 (3,000)	176.92 to 174.08	0.76	Sand
		25 (500)	50 (1,000)	174.08 to 170.67 (founding not recommended)	3.60	Sand/Clayey Silt
		300 (6,000)	400 (8,000)	170.67 to 169.45 (termination)	7.01	Till
BH 2	177.80	150 (3,0000)	225 4,500)	177.04 to 174.2	0.76	Sand
		50 (1,000)	75 (1,500)	174.2 to 170.79 (Founding not recommended)	3.60	Sand/Clayey Silt
		300 (6,000)	400 (8,000)	170.79 to 170.18 (termination)	7.01	Till
BH 3	177.85	150 (3,000)	225 (4,500)	177.55 to 175.50	0.30	Sand
		50 (1,000)	75 (1,500)	175.50 to 171.75 (founding not recommended)	2.35	Sand/Clayey Silt
		300 (6,000)	400 (8,000)	171.75 to 171.75 (termination)	6.10	Till
BH 4	178.34	75 (1,500)	150 (3,000)	176.82 to 174.77	1.52	
		25 (500)	50 (1,000)	174.77 to 172.34 (founding not recommended)	3.57	Sand Fill/Sand/Clay ey Silt
		300 (6,000)	400 (8,000)	172.24 to 171.63 (termination)	6.10	Till
BH 5	178.36	75 (1,500)	150 (3,000)	178.06 to 176.84	0.30	Sand
		25 (500)	50 (1,000)	176.84 to 173.51 (founding not recommended)	1.52	Sand/Clayey Silt
		300 (6,000)	400 (8,000)	173.51 to 171.65 (termination)	4.85	Till

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	178.32	75 (1,500)	150 (3,000)	177.56 to 175.66	0.76	Sand
		0 (0)	25 (500)	175.66 to 172.12 (founding not recommended)	2.66	Sand/Clayey Silt
		300 (6,000)	400 (8,000)	172.12 to 171.61 (termination)	6.20	Till

In general, shallow foundations may be less feasible on the subject site, due to the loose wet to saturated soils encountered during the investigation. As such, it is recommended that deep foundations such as helical piles, driven piles, or another deep structural method be utilized for the founding of the proposed development buildings. It should be noted, however, that the groundwater may pose to be an issue with respect to caisson type excavations and therefore, certain precautions or preventative measures should be taken if this founding method is utilized. Alternatively, helical piles or driven piles could be utilized as a deep foundation method since they should be able to be advanced through wet to saturated soils, founding in the very dense lower till soils. No large cobbles or boulders, which may hamper the advancement of piles, were encountered during the investigation. A structural engineer should determine the size, depth and number of piles that are required.

Should piles be chosen as the deep foundation option for this project, the majority of the resistance strength of the piles will come from end bearing resistance and skin friction should be ignored within any saturated zones. Pile drive shoes should be installed on each pile in accordance with all current OPSD standards. The structural resistance of the pile must be checked by the project structural engineer.

Piles must be driven a suitable depth to achieve the required end bearing resistance and the pile capacity must be verified in the field. Piles should be designed, installed and monitored in accordance with Ontario Provincial Standard Specification. It is recommended that a pile driving log be kept for the entire driving of the pile. Normal tolerances during pile driving of 2% plumbness and 75 mm in location should not be exceeded.

Due to the presence of fill, unsuitable native soil and the anticipation of wet to saturated soil conditions, it is imperative that the founding soils be assessed at the time of construction by qualified geotechnical personnel in order to confirm their founding suitability.

It is understood that during construction, the site grades will be raised approximately 1.0 m (3.0 ft) above the existing grade. 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. The

serviceability limit pressure for good quality granular structural fill placed and compacted in accordance with Section 5.4.5 of this report is estimated to be at least 150 kPa (3,000 psf) at SLS and 225 kPa (4,500 psf) at ULS. Alternatively, lean mix concrete fill could be used for this application.

Footings founded on soil may be placed at a higher elevation relative to another footing provided that the slope between the outside face of the footings is separated by a minimum slope of 10 horizontal to 7 vertical (10H:7V) with an imaginary line projected from the underside of the footings.

When constructing new footings adjacent to existing footings, such as those from neighbouring buildings, all existing disturbed backfill material from the existing footing must be subexcavated to ensure that new footings are founded on approved undisturbed soil. Any areas subexcavated to remove disturbed soils could be backfilled with mass concrete. It is imperative that excavations do not extend below the existing footings or the bottom of foundation walls without providing support to both the underside of the foundation wall through shoring or underpinning, as well as support the foundation wall structure itself (as designed by the structural engineer).

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.

All exterior footings must be provided with a minimum of 1.2 m of soil cover or equivalent thermal insulation 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 m of strata. The information obtained in the geotechnical field investigation was gathered from the upper 5.18 m to 8.23 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 native soils or structural fill, Class C (very dense soil and soft rock) for structures founded on native till soils at the recommended founding elevations provided in Section 5.1 of this report. 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 fill and 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 Sand 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
Clayey Silt	1,800 to 1,900	28° to 32°	0.36 to 0.31	2.77 to 3.25	0.53 to 0.47	0.35 to 0.42	0 to 20
Sand and Silt Till	1,850	32°	0.31	3.25	0.47	0.41	0

5.4. Site Preparation

The site preparation for the proposed development is anticipated to include the removal of any existing structures, removal or relocation of any existing services, the subexcavation of all unsuitable fill and native soils deemed not suitable for supporting of the design bearing capacity, followed by the placement of structural fill (approximately 1.0 m or as required) and/or installing a deep foundation system and site grading to achieve proposed grades.

5.4.1. Topsoil Stripping/Vegetation Grubbing

All existing topsoil, vegetation (including tree roots and all loose/disturbed soils associated with tree roots) and unsuitable soils must be removed from within the proposed building envelope to expose approved competent subgrade soils. The

topsoil or unsuitable soils may be used in landscaped areas where some settlement can be tolerated; otherwise, it should be properly disposed of off-site.

5.4.2. Fill/Loose Native Soil Removal

All existing fill as well as native soils in a loose to very loose state would be deemed unsuitable to support foundations as well as the interior slab-on-grade (without remedial action to improve the soil properties). Therefore, all existing fill (including any existing service trench backfill and backfill of the existing foundation walls), as well as any relatively loose native soils that are deemed to be unsuitable to support foundations or slab-on-grades, must be subexcavated from within the proposed building envelope, exterior entranceways, perimeter sidewalks and perimeter concrete slab areas to expose approved competent subgrade soils. Should it be decided to leave any relatively loose soils under the proposed slab-on-grade, remedial action may be required to further consolidate any existing fill and/or loose native soils or soil stabilization through the use of geotextiles and/or geogrids may be required. Review of the condition and suitability of the subgrade soils, as required, will be addressed at the time of construction.

5.4.3. Removal/Relocation of Existing Services

Any existing underground services that may be located within the proposed building envelopes should be removed/relocated. If left in place, the location of existing services must be reviewed to ensure that they do not conflict with proposed foundation locations. All terminated pipes must be completely sealed with watertight mechanical covers, concrete or grout at termination points to prevent the migration of soils into pipe voids which can result in potential settlement. All existing trench backfill material and any disturbed soils associated with the removal of any services must be subexcavated and the subsequent excavation must be backfilled with approved soils placed in accordance with Section 5.4.5 of this report.

5.4.4. Building Demolition

It is understood that there are no existing structure(s) to be demolished. If existing structures are to be demolished, all existing foundation walls, footings, slab-on-grades and other construction materials, as well as all associated backfill material, must be removed from areas of the demolished structure(s). The excavations must be inspected and backfilled according to the procedures outlined in Section 5.4.5 of this report. It is recommended that imported sand and gravel (OPSS 1010 Granular 'B' Type I or an approved alternative) be placed as structural fill to backfill the building demolition areas.

5.4.5. Site Grading

Following the subexcavation of any fill and any relatively loose fill or native soils deemed unsuitable of supporting the design bearing capacity, the exposed subgrade soils must be proof-rolled, and any soft or unstable areas must be subexcavated and replaced with approved fill materials.

The finished floor elevations for the proposed buildings were not available at the time of the investigation. If structural fill placement is required, the fill materials required to achieve the design site grades should be placed according to the following procedures:

- It is imperative that excavations do not extend below any of the existing adjacent footings or bottom of foundation walls without providing support to both the footings or underside of the foundation wall through shoring or underpinning, as well as support the foundation wall structure itself (as directed by the structural engineer). It is recommended that the condition of the below-grade section of the foundation walls (along with a review by the structural engineer) as well as the existing founding elevations be confirmed by means of a series of test pits (hydrovac truck or excavator required) prior to beginning mass excavation. This will allow time for a shoring/support system to be designed and priced (if required);

- Prior to placement of any structural fill, the subgrade for the proposed building and any hard surfaced areas 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 foundation or edge of asphalt/concrete down to the approved competent native 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 materials) and 0.2 m (8") in depth for silts and clays, or the capacity of the compactor (whichever is less). The native soils (non-organic) would generally be considered unsuitable for reuse as structural fill as it would be expected that significant air-drying would be required in order to achieve the specified density;

- Granular fill materials (OPSS 1010 Type II or Type III Granular 'B' is 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 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 foundations, interior slab-on-grades, sidewalks and large expansive exterior slabs) must be compacted to 100% standard Proctor maximum dry density (SPMDD);

- Approved bulk fill (exterior foundation wall backfill in landscaped areas, bulk fill for driveways) must be compacted to a minimum 95% SPMDD. It would be expected that the relatively loose native soils may be suitable for use as bulk fill following air-drying;

- Granular 'B' subbase and Granular 'A' base materials for driveways must be compacted to 100% SPMDD.

It should be noted that the existing native sand and silt till soils were observed to become very dense/hard with depth. It is imperative that when the very dense/hard soils are utilized as fill, the material must be broken down (pulverized) to minimize void space and reduce the potential for settlement. Problems associated with compacting dense/firm to very dense/hard soils include the potential for long-term settlement due to excessive void space caused by the generally blocky structure of the excavated soils. Therefore, it is not recommended to utilize this material as structural fill. The contractor must have equipment on-site that can effectively break down the firm to very stiff excavated soil into workable sizes (as required). Backfilling utilizing this material must be performed in thin lifts with considerable compactive effort applied, thereby reducing the void space and minimizing long-term settlement. This process could be difficult and time-consuming.

Excavated soils that are considered to be very moist to saturated may 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). Utilizing the existing soils during site grading may be more achievable if work is completed during the generally drier summer months. It should be noted, however, that due to the nature of some soils, during hot dry weather, the addition of water might be required in order to achieve the specified compaction. Reuse of excavated soils on-site will be subject to approval from qualified geotechnical personnel.

5.4.6. Shoring/Underpinning

It is imperative that excavations do not extend into the zone of influence of existing/neighbouring footings or bottom of the foundation walls of any adjacent structures or services without providing support through shoring or underpinning.

If required, it is anticipated that an H-pile (soldier pile) and timber lagging system or an overlapping concrete caisson wall could be utilized as a shoring system. Soldier piles should be installed in pre-augured holes. It should be noted that the relatively high water table and sand soils could make shoring systems difficult to install. Shoring systems installed on the subject site must be designed to prevent the loss of soil through the system as this has the potential to create loose soil zones and sinkholes around the exterior of the shoring system.

The shoring system design must be completed by a qualified structural engineer and must include appropriate factors of safety, and any possible surcharge loading (such as but not limited to loaded transport trucks) must be taken into account. The support system must comply with the current Occupational Health and Safety Act and Regulations for Construction Projects (O.Reg. 213/91). Soil design parameters for shoring design can be found in Section 5.3 of this report.

Underpinning may be required to ensure that foundations bear on suitable soils as outlined in Section 5.1. The existing adjacent footings could be undermined while subexcavating the unsuitable fill soils at the subject site. Any underpinning work required should be completed in sections not exceeding 1.2 m in width in a piano key style, or as directed by a structural engineer.

5.5. Foundation Subgrade Preparation

The native soils encountered in the boreholes are sensitive to change in moisture content and can become loose/soft if the soils are subjected to additional water from seepage or precipitation, as well as severe drying conditions. The native subgrade 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 shallow foundations.

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

- During construction, the subgrade should be sloped to a sump (as required) located outside the building footprint (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;

- 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 any potential fill materials must be maintained above freezing;

- Prior to pouring concrete for the footings, the footing area must be cleaned of all disturbed or caved 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.

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 the unsuitable fill or loose native soils in the subgrade, should be subexcavated and backfilled with approved fill materials (see Section 5.4.5 of this report).

The following table provides the estimated 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)
Granular 'A' /Granular 'B' (OPSS 1010)	81,000 kN/m^3 (300 lb/in^3)
Sand	41,000 kN/m^3 (150 lb/in^3)
Clayey Silt	34,000 kN/m^3 (125 lb/in^3)
Sand and Silt Till	68,000 kN/m^3 (250 lb/in^3)

The floor slabs should be founded on a minimum thickness of 150 mm (6") of coarse clean granular material containing not more than 10% of material that will pass a 4 mm sieve in accordance with the current OBC. The clean granular material should be consolidated to prevent future settlement. Utilizing clear crushed stone for the slab-on-grade base can assist in providing a moisture barrier. Compactive effort is required to

consolidate the clear stone. The clean granular material (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 (sidewalks and accessibility ramps) 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. 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 sand and silt till 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. Any 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, any existing fill and native sand and clayey silt soils 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, all wet to saturated soils including saturated soils encountered in the boreholes, 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.

5.8. Construction Dewatering Considerations

Wet to saturated soils were observed throughout the boreholes. The founding elevations for the proposed building were not available at the time of preparation of this report; however, it is expected that the excavations for the proposed development may extend into or through the wet to saturated soil zones observed in the boreholes. Sloughing of excavation walls should be expected when excavating into any wet to saturated soils. The relatively very dense/hard sand and silt till soils have the potential to create perched water conditions in the overlying soils. 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. It is anticipated that moderate steady seepage will be encountered during excavation work on the subject site, however, 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 native soils encountered in the geotechnical investigation are generally considered suitable for indirect support of the site service pipes. With instability due to wet or saturated soil conditions being anticipated, 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-803.031. 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. With wet to saturated conditions being anticipated 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 $0.15D$ (where D is the pipe diameter). In no case should this dimension be less than 150 mm or greater than 300 mm.

All service pipes must be installed a minimum of 1.2 m below the ground surface or be provided with an equivalent amount of rigid insulation to prevent freezing. The general contractor is responsible to protect 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 sidewalks to a drainage swale or appropriate storm drainage system.

Depending on the design founding elevations and groundwater conditions at the time of construction, it may be necessary to install a granular drainage layer to provide a suitable base for the foundations as well as the slab-on-grade. The granular drainage layer must conform to the requirements listed in Section 9.14.4 of the OBC 2012. It is expected that the proposed development will have a basement, in which case a perimeter drainage system will be required. The drainage system 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. Perforated subdrains should be installed around both the exterior and interior perimeter, and non-perforated pipe should be installed to direct the collected exterior water to a sump pit and good quality sump pump. It is recommended that sump pumps be equipped with a battery backup (in the event if a power outage). 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 drainage system. A foundation wall and slab-on-grade waterproofing system should be designed for the site by a qualified installer and must conform to current OBC regulations (as required).

The founding elevations for the proposed buildings were not available at the time of preparation of this report. CMT Inc. can provide further recommendations for building drainage once the design drawings are completed and the founding elevations have been confirmed.

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 approved 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. The design of bracing and lateral supports must be provided by the project structural engineer. 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.

The native soils, as well as approved fill materials (non-organic) are generally considered suitable for reuse as trench backfill however, any wet to saturated soils 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.

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

- Adequate heavy smooth drum or padfoot vibratory compaction equipment should be used 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 fine grained (silt/clay) 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.

As noted previously, the existing native sand and silt till soils were observed to become very dense/hard with depth. It is imperative that when the very dense/hard soils are utilized as backfill, the material must be broken down (pulverized) to minimize void space and reduce the potential for settlement.

5.11. Pavement Design/Drainage

Any soils containing organics or other deleterious materials must be subexcavated from within the proposed driveway 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 soils must be proof-rolled, and any soft or unstable areas should be subexcavated and replaced with suitable fill 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. The existing subgrade soils are considered highly frost-susceptible; therefore, 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). 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 the paved areas and ideally along the curb line. 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 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 wet soils and increasing the thickness of the granular base, the use of reinforcing geotextiles or geogrids, or a combination of all.

It is understood that any proposed driveways, loading areas and parking areas are to be for personal vehicles, delivery trucks and emergency vehicles and will be generally subject to light and moderate traffic and loading. Based on the anticipated loading, the following pavement design is provided:

Material	**Recommended Thickness For New Pavement**
Asphaltic Concrete	HL3 surface course - 40 mm (1.5") HL4 or HL8 binder course - 50 mm (2.0")
Granular 'A' Base (OPSS 1010)	150 mm (6.0")
Granular 'B' Subbase (OPSS 1010)	450 mm (18.0")

It is anticipated that all existing pavement on the site will be removed during the development; however, should the existing asphalt pavement structure differ significantly from the pavement structure presented above, then the new structure should match the existing pavement structure to prevent differential frost heave throughout the pavement area.

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.

Where new asphalt is joined into any 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 and intermediate binder 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 such as delivery trucks and tractor trailers, it is recommended that rigid Portland cement pavement be considered.

5.12. Excess Soil Management

5.12.1. Chemical Testing was NOT Undertaken

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.

Most commonly, the soils are tested for the following:

- Metals and Inorganics as per O.Reg. 153/04 as amended by R511;
- Sodium Absorption Ratio (SAR) as per O.Reg. 153/04 as amended by R511;
- VOC's and SVOC's as per O.Reg. 153/04 as amended by R511;
- BTEX F1-F4 as per O.Reg. 153/04 as amended by R511.

The chemical analysis results are than compared to Ontario Regulation 153/04 - as amended by O.Reg. 511 – April 15, 2011.

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, whom 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 development.

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 R Figg, C.Tech.
Senior Soil Technician

Reviewed by:

Nathan Chortos, P.Eng.
Senior Geotech. Engineer

ks

NOTES:

1. BASE MAP PROVIDED BY GOOGLE MAPS

NO.	DESCRIPTION	DATE

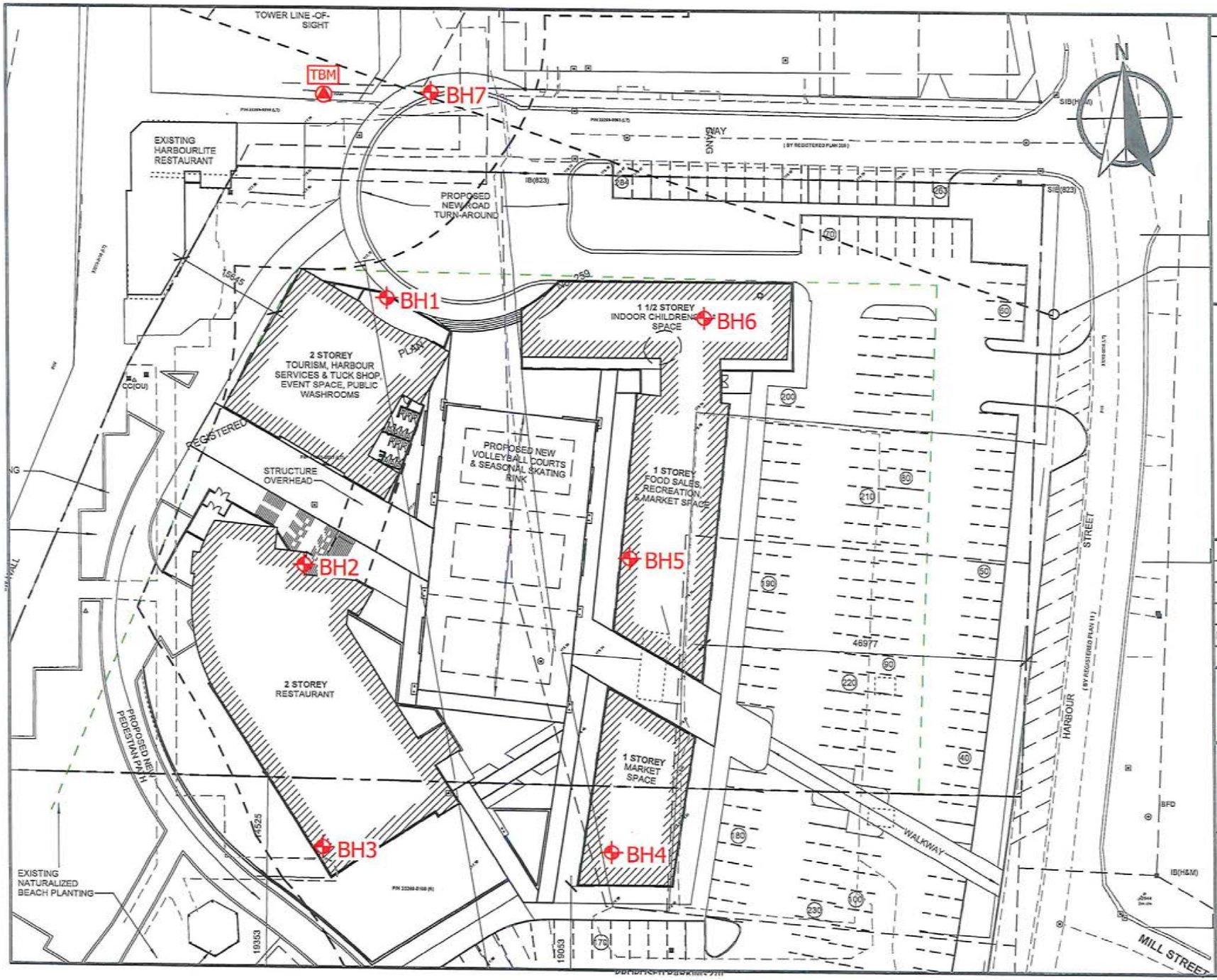
REVISIONS

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:
Geotechnical Investigation
Cedar Crescent Village,
101 Green Street,
Port Elgin, Ontario

DRAWING TITLE:
SITE LOCATION MAP

PROJECT NO.:	DATE:
21-005	February 16, 2021
SCALE: N.T.S.	DRAWING NO. 1



NOTES:

1. SITE PLAN PROVIDED BY CLIENT

CMT Borehole - 2021

Temporary Benchmark

NO.	DESCRIPTION	DATE

REVISIONS

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
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PROJECT:

Geotechnical Investigation
Cedar Crescent Village
101 Green Street,
Port Elgin, Ontario

DRAWING TITLE:

PROPOSED SITE PLAN SHOWING BOREHOLE LOCATIONS

PROJECT NO.:	DATE:
21-005	February 16, 2021
SCALE: N.T.S.	DRAWING NO. 2

APPENDIX A

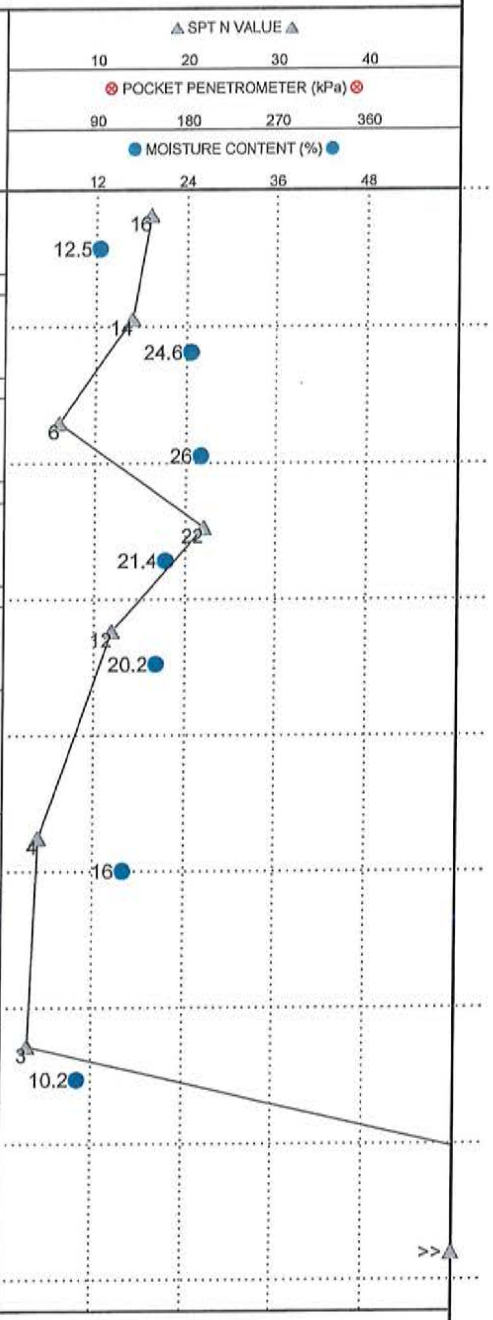
BOREHOLE LOGS

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

BOREHOLE NUMBER BH1

PROJECT: Cedar Crescent Village Development
PROJECT ADDRESS: 101 Green Street
PROJECT LOCATION: Port Elgin, ON
PROJECT NUMBER: 21-005
DRILLING DATE: 1-26-21
GROUND ELEVATION: 177.68 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT

DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
		SAND FILL: Compact, dark brown, sand fill, moist	0.00, 177.68	SPT 1	87	7-7-9-10 (16)
1		**SAND:** Compact, brown, sand, trace silt and clay, saturated	0.76, 176.92	SPT 2	100	6-6-8-8 (14)
		becoming loose	1.52, 176.16	SPT 3	100	0-0-6-6 (6)
2		becoming compact	2.29, 175.39	SPT 4	100	6-10-12-15 (22)
3				SPT 5	100	9-3-9-3 (12)
4						
5		**CLAYEY SILT:** Very soft, grey, clayey silt, saturated to wet	4.57, 173.11	SPT 6	100	1-2-2-7 (4)
6				SPT 7	100	1-1-2-2 (3)
7		**SAND AND SILT TILL:** Very dense, grey, sand and silt till, some gravel, trace clay, moist	7.01, 170.67			
8				SPT 8	100	50-50-50-50 (100)



Groundwater and caving of the borehole was encountered upon completion at a depth of approximately 0.91 m (El. 176.77m).

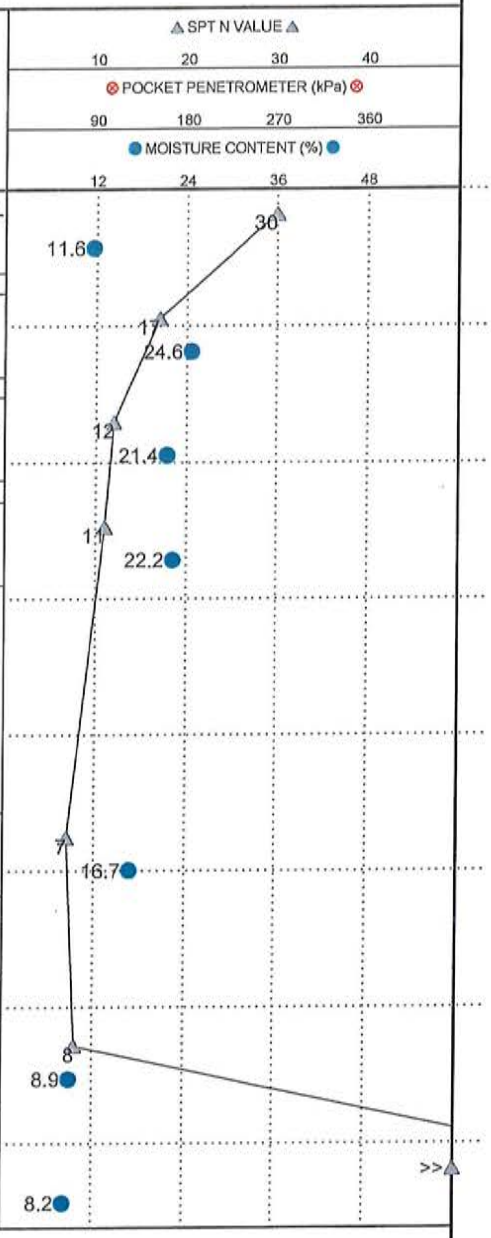
Bottom of borehole at 8.23 m, Elevation 169.45 m.

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

BOREHOLE NUMBER BH2

PROJECT: Cedar Crescent Village Development
PROJECT ADDRESS: 101 Green Street
PROJECT LOCATION: Port Elgin, ON
PROJECT NUMBER: 21-005
DRILLING DATE: 1-26-21
GROUND ELEVATION: 177.80 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT

DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
		SAND FILL: Compact, dark brown, sand fill, trace gravel, moist	0.00, 177.80	SPT 1	87	18-16-14-10 (30)
1		**SAND:** Compact, brown, sand, trace silt and clay, saturated	0.76, 177.04	SPT 2	100	8-8-9-9 (17)
2				SPT 3	100	2-2-10-7 (12)
3				SPT 4	100	3-3-8-7 (11)
4						
5		**CLAYEY SILT:** Firm to stiff, grey, clayey silt, trace sand and gravel, saturated	4.57, 173.23	SPT 5	100	0-0-7-7 (7)
6				SPT 6	100	4-4-4-3 (8)
7		**SAND AND SILT TILL:** Very dense, grey, sand and silt till, some gravel, trace clay, moist	7.01, 170.79	SPT 7	33	21-29-42-50 (71)



Groundwater and caving of the borehole was encountered upon completion at a depth of approximately 1.07 m (El. 176.73m).

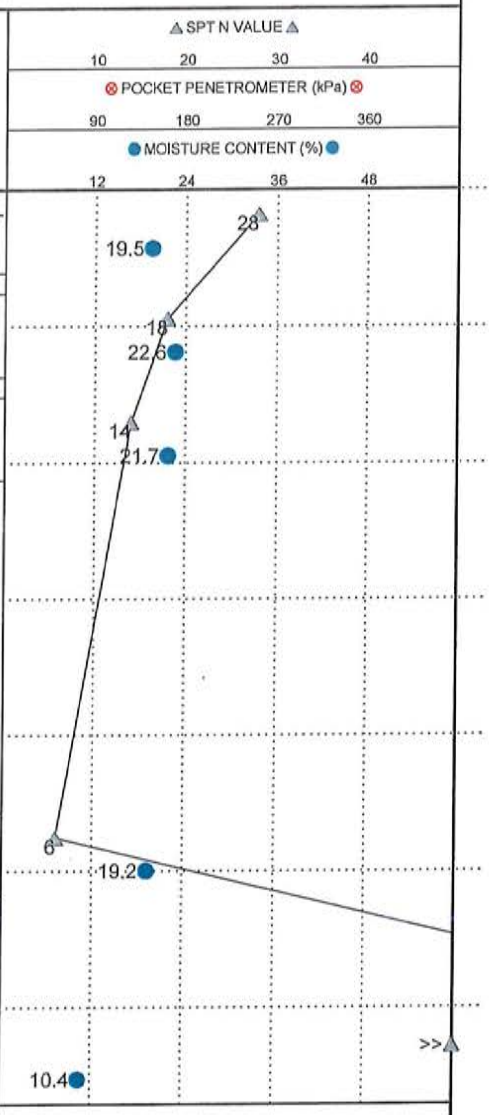
Bottom of borehole at 7.62 m, Elevation 170.18 m.

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

BOREHOLE NUMBER BH3

PROJECT: Cedar Crescent Village Development
PROJECT ADDRESS: 101 Green Street
PROJECT LOCATION: Port Elgin, ON
PROJECT NUMBER: 21-005
DRILLING DATE: 1-26-21
GROUND ELEVATION: 177.85 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT

DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
0		**SAND FILL:** Compact, dark brown, sand fill, trace asphalt, moist	0.00, 177.85	SPT 1	100	27-17-11-11 (28)
		SAND: Compact, brown, sand, trace silt and clay, moist to wet	0.28, 177.57			
1		becoming grey and saurated	0.76, 177.09	SPT 2	100	11-8-10-11 (18)
2				SPT 3	100	0-6-8-14 (14)
3						
4		**CLAYEY SILT:** Firm, grey, clayey silt, trace sand and gravel, saturated	3.35, 174.50			
5				SPT 4	100	4-4-2-2 (6)
6						
		SAND AND SILT TILL: Very dense, grey, sand and silt till, some gravel, trace clay, moist	6.10, 171.75	SPT 5	21	50-50-50-50 (100)



Groundwater and caving of the borehole was encountered upon completion at a depth of approximately 1.07 m (El. 176.78m).

Bottom of borehole at 6.71 m, Elevation 171.14 m.

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

BOREHOLE NUMBER BH4

PROJECT: Cedar Crescent Village Development
PROJECT ADDRESS: 101 Green Street
PROJECT LOCATION: Port Elgin, ON
PROJECT NUMBER: 21-005
DRILLING DATE: 1-28-21
GROUND ELEVATION: 178.34 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT

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		**SAND FILL:** Loose, dark brown, sand fill, wet to saturated	0.00, 178.34	SPT 1	33	1-3-5-7 (8)	8, 20.4	Bentonite Seal
1		**SAND:** Loose, grey, sand, trace silt and clay, wet	0.76, 177.58	SPT 2	70	2-2-2-2 (4)	4, 28.1	Water Level @ 0.77 m (El. 177.57 m)
		becoming saturated	1.17, 177.17					
2				SPT 3	87	5-3-6-9 (9)	9, 23	38mm Riser
								#2 Sand Pack
3								
				SPT 4	46	2-4-4-2 (8)	8, 23.7	
4								38mm PrepackScreen
5		**CLAYEY SILT:** Soft, grey, clayey silt, trace sand and gravel, saturated	4.57, 173.77	SPT 5	100	2-1-3-1 (4)	4, 10.2	
6		**SAND AND SILT TILL:** Very dense, grey, sand and silt till, some gravel, trace clay, moist	6.10, 172.24	SPT 6	21	20-50-50-50 (100)	>>, 12	

Groundwater in the monitoring well was measured at a depth of approximately 0.77 m (El. 177.57 m) below ground surface.
Top of riser pipe El. 179.30 m
Top of monument cover El. 179.40 m

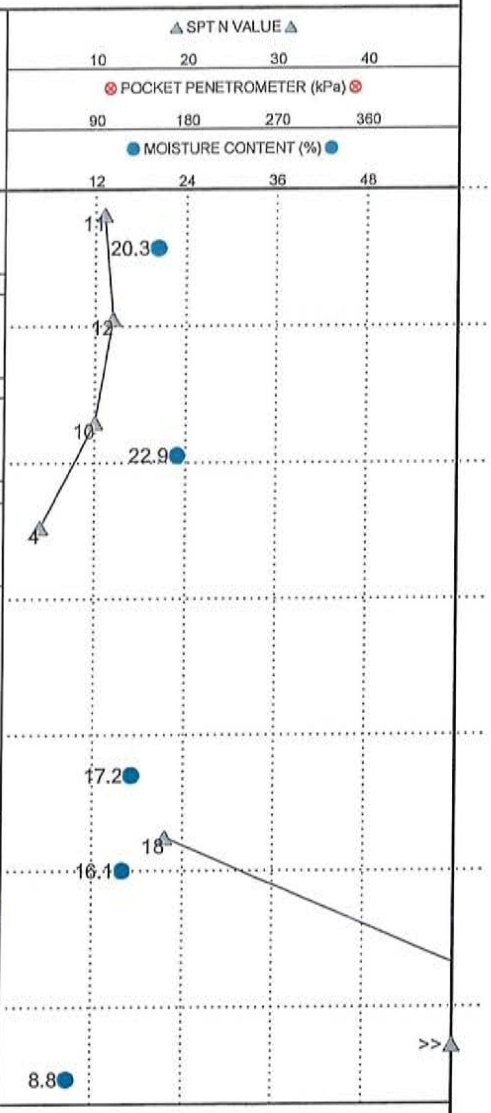
Bottom of borehole at 6.71 m, Elevation 171.63 m.

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

BOREHOLE NUMBER BH5

PROJECT: Cedar Crescent Village Development
PROJECT ADDRESS: 101 Green Street
PROJECT LOCATION: Port Elgin, ON
PROJECT NUMBER: 21-005
DRILLING DATE: 1-28-21
GROUND ELEVATION: 178.36 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)
0	**SAND FILL:** Compact, brown, sand fill, moist	0.00, 178.36	SPT 1	38	8-6-5-4 (11)
	SAND: Compact, brown, sand, trace silt and clay, moist	0.23, 178.13			
1	becoming grey and wet	0.76, 177.60	SPT 2	92	8-6-6-8 (12)
2	becoming saturated	1.52, 176.84	SPT 3	100	0-3-7-7 (10)
	becoming loose	2.29, 176.07	SPT 4	0	1-2-2-2 (4)
3					
4	**CLAYEY SILT:** Soft, grey, clayey silt, trace sand and gravel, wet	3.66, 174.70	MC5 5	100	
	becoming very stiff and wet	4.57, 173.79	SPT 6	100	7-9-9-8 (18)
5	**SAND AND SILT TILL:** Very dense, grey, sand and silt till, some gravel, trace clay, moist	4.85, 173.51			
6			SPT 7	33	22-21-50-50 (71)



Groundwater and caving of the borehole was encountered upon completion at a depth of approximately 1.07 m (El. 177.29m).

Bottom of borehole at 6.71 m, Elevation 171.65 m.

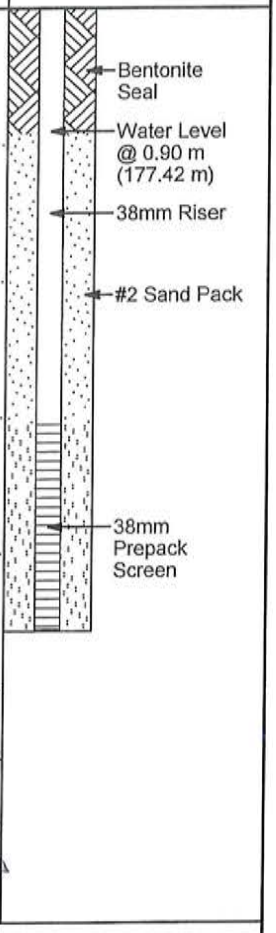
CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Telephone: 519-699-5775
Fax: 519-699-4664

BOREHOLE NUMBER BH6

PROJECT: Cedar Crescent Village Development
PROJECT ADDRESS: 101 Green Street
PROJECT LOCATION: Port Elgin, ON
PROJECT NUMBER: 21-005
DRILLING DATE: 1-28-21
GROUND ELEVATION: 178.32 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
	TOPSOIL: Loose, dark brown, silty organic topsoil, moist (200mm)	0.00, 178.32			
	SAND FILL: Loose, brown, sand fill, moist	0.20, 178.12	SPT 1	70	1-2-4-6 (6)
1	**SAND:** Compact, grey, sand, trace silt and clay, wet	0.76, 177.56	SPT 2	79	8-9-8-8 (17)
	becoming saturated	1.52, 176.80	SPT 3	87	0-5-5-8 (10)
2	becoming loose	2.29, 176.03	SPT 4	87	1-4-3-3 (7)
3					
4	**CLAYEY SILT:** Very soft, grey, clayey silt, trace sand and gravel, wet	3.66, 174.66			
5			SPT 5	92	0-0-0-40 (0)
6					
	SAND AND SILT TILL: Very dense, grey, sand and silt till, some gravel, trace clay, moist	6.20, 172.12	SPT 6	38	22-50-50-50 (100)

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



Groundwater in the monitoring well was measured at a depth of approximately 0.90 m (El. 177.42 m) below ground surface.
Top of riser pipe El. 179.31 m
Top of monument cover El. 179.42 m

Bottom of borehole at 6.71 m, Elevation 171.61 m.

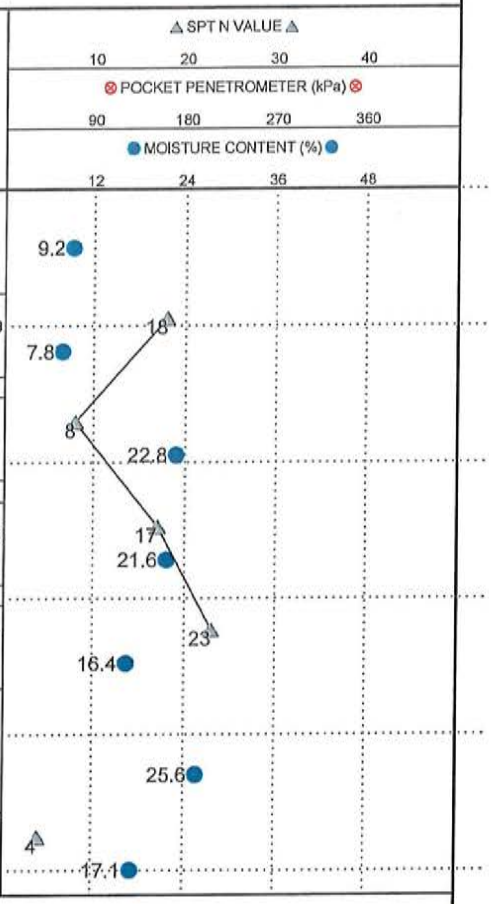
BOREHOLE LOG WITH WELL2 21-005 BH LOGS.GPJ CMT_TEMPLATE_2020-05-15.GDT 2-17-21

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

BOREHOLE NUMBER BH7

PROJECT: Cedar Crescent Village Development
PROJECT ADDRESS: 101 Green Street
PROJECT LOCATION: Port Elgin, ON
PROJECT NUMBER: 21-005
DRILLING DATE: 1-26-21
GROUND ELEVATION: 177.79 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)
	ASPHALT: Asphaltic Concrete (120mm)	0.00, 177.79	MC5 1	87	
	GRANULAR BASE: Compact, brown, sand and gravel fill, moist (200mm)	0.12, 177.67			
	SAND FILL: Compact, dark brown, sand fill, moist	0.33, 177.46			
1	**SAND:** Compact, brown, sand, trace silt and clay, moist	0.76, 177.03	SPT 2	70	11-8-10-9 (18)
	becoming loose and saturated	1.52, 176.27	SPT 3	87	0-2-6-7 (8)
2	becoming grey and compact	2.29, 175.50	SPT 4	100	6-5-12-15 (17)
3	**CLAYEY SILT:** Very stiff, grey, clayey silt, trace sand and gravel, saturated	3.05, 174.74	SPT 5	100	21-13-10-10 (23)
4			MC5 6	100	
	becoming soft	4.57, 173.22	SPT 7	87	0-2-2-5 (4)
5					



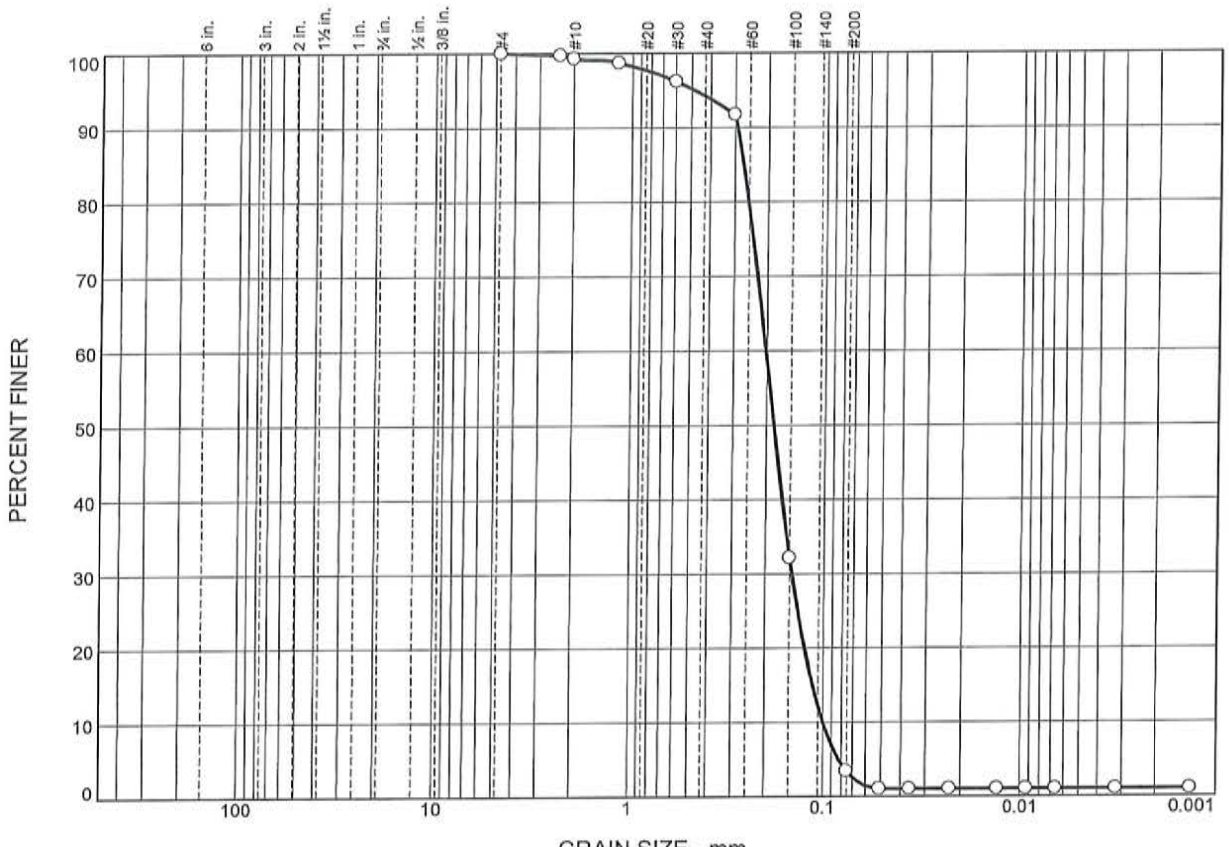
Groundwater and caving of the borehole was encountered upon completion at a depth of approximately 1.07 m (El. 176.72m).

Bottom of borehole at 5.18 m, Elevation 172.61 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	0.0	0.7	5.1	90.8	2.4	1.0

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH4	3	1.52-2.13m	sand, trace silt and clay	SP
				Sampled by BF of CMT Engineering Inc., January 28, 2021	
				Tested by MS of CMT Engineering Inc., February 2, 2021	

CMT Engineering Inc.

St. Clements, ON

Client: 2706913 Ontario Inc. c/o The Cedar Crescent Villages

Project: Cedar Crescent Village
101 Green Street, Town of Saugeen Shores, Port Elgin, Ontario

Project No.: 21-005 **Figure** 1

Particle Size Distribution Report

	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	12.9	6.6	11.5	23.4	38.4	7.2

SOIL DATA					
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH5	7	6.10-6.71m	sand and silt, some gravel, trace clay	SM
				Sampled by BF of CMT Engineering Inc., January 28, 2021	
				Tested by MS of CMT Engineering Inc., February 2, 2021	

CMT Engineering Inc.

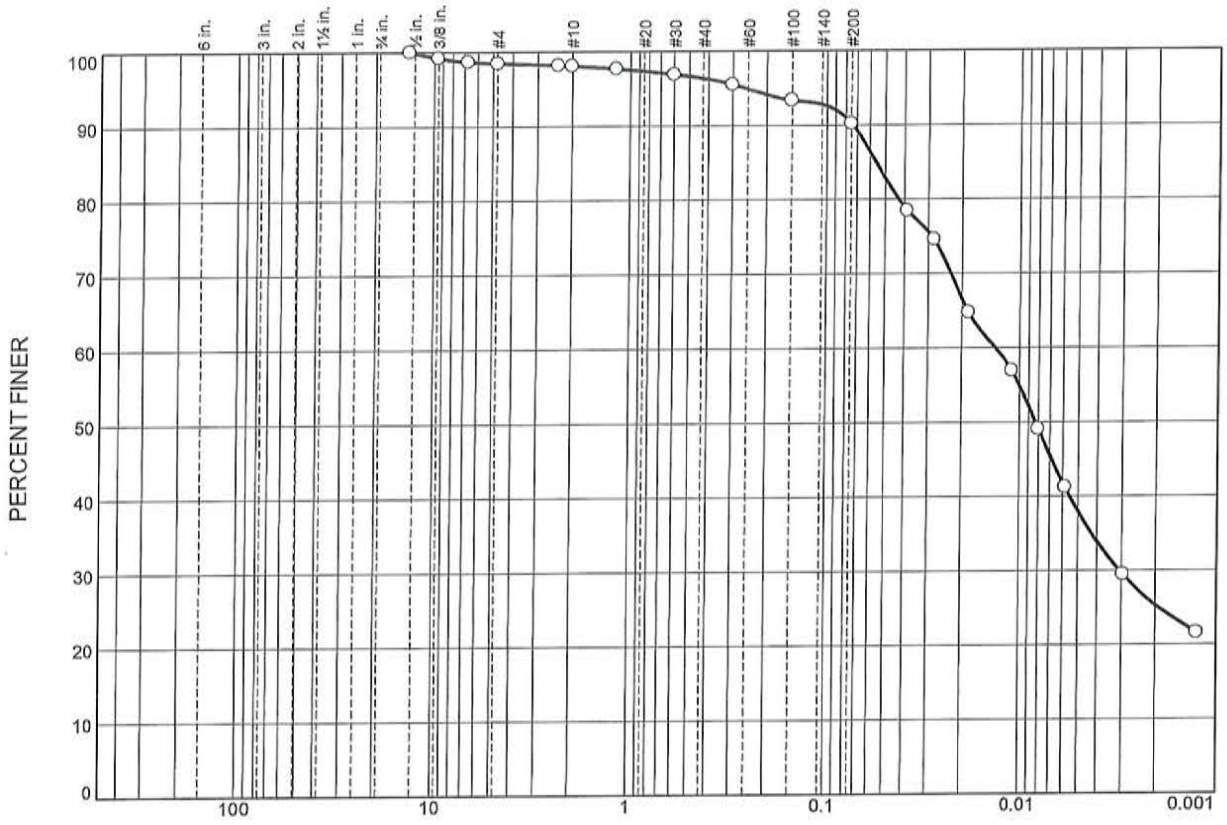
St. Clements, ON

Client: 2706913 Ontario Inc. c/o The Cedar Crescent Villages

Project: Cedar Crescent Village
101 Green Street, Town of Saugeen Shores, Port Elgin, Ontario

Project No.: 21-005 **Figure** 2

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.5	0.4	1.7	6.2	64.9	25.3

SOIL DATA					
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH6	5	4.57-5.18m	clayey silt, trace sand and gravel	ML
				Sampled by BF of CMT Engineering Inc., January 28, 2021	
				Tested by MS of CMT Engineering Inc., February 2, 2021	

CMT Engineering Inc.

St. Clements, ON

Client: 2706913 Ontario Inc. c/o The Cedar Crescent Villages

Project: Cedar Crescent Village
101 Green Street, Town of Saugeen Shores, Port Elgin, Ontario

Project No.: 21-005 **Figure** 3

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 *
A313272

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 TOWNSHIP OF SAUGEEN SHORES	**Email Address**

Current Address

Unit Number	Street Number *	Street Name *	City/Town/Village
	600	TOMLINSON DR.	PORT ELGIN

Country	Province	Postal Code	Telephone Number
Canada	ON		519-832-2008

2. Well Location

Address of Well Location

Unit Number	Street Number *	Street Name *	Township
	199	Green St.	Saugeen

Lot	Concession	County/District/Municipality

City/Town	Province	Postal Code
Port Elgin	Ontario	

UTM Coordinates	Zone *	Easting *	Northing *		Municipal Plan and Sublot Number
NAD 83	17	467966	4921186	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		Dry	0	2
Brown	Sand		Wet	2	15

4. Annular Space *

Depth From (ft)	Depth To (ft)	Type of Sealant Used (Material and Type)	Volume Placed (cubic feet)
0	9	3/8 BENTONITE	0.92

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	0	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		2021/01/28

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 *
	1011	INDUSTRIAL CRES.

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

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

Last Name of Well Technician *	First Name of Well Technician *	Well Technician's License Number *
HOPKINS	WYATT	4119

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
HOPKINS	WYATT	ginger__13@live.com

Signature		Date Submitted (yyyy/mm/dd)
Wyatt Hopkins	Digitally signed by Wyatt Hopkins Date: 2021.02.05 09:59:40 -05'00'	2021/02/05

17. Ministry Use Only

Audit Number

9D6Q Z8TM

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 *
A313281

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 TOWNSHIP OF SAUGEEN SHORES	**Email Address**

Current Address

Unit Number	Street Number *	Street Name *	City/Town/Village
	600	TOMILSON	PORT ELGIN

Country	Province	Postal Code	Telephone Number
CAN	ON		519-832-2008

2. Well Location

Address of Well Location

Unit Number	Street Number *	Street Name *	Township
	199	GREEN ST	Saugeen

Lot	Concession	County/District/Municipality

City/Town	Province	Postal Code
PORT ELGIN	Ontario	

UTM Coordinates	Zone *	Easting *	Northing *		Municipal Plan and Sublot Number
NAD 83	17	467953	4921288	**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	4	3/8 BENTONITE	0.92

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	0	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		2021/01/28

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 *
	1011	INDUSTRIAL CRES

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

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

Last Name of Well Technician *	First Name of Well Technician *	Well Technician's License Number *
HOPKINS	WYATT	4119

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
HOPKINS	WYATT	ginger__13@live.com

Signature		Date Submitted (yyyy/mm/dd)
Wyatt Hopkins	Digitally signed by Wyatt Hopkins Date: 2021.02.05 10:31:29 -05'00'	2021/02/05

17. Ministry Use Only

Audit Number

MG8X SZPS