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Geotechnical Investigation
Proposed Sanitary Sewer
570 Mach Road
Ottawa, Ontario

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Submitted to:

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Geotechnical Investigation
Proposed Sanitary Sewer
570 Mach Road
Ottawa, Ontario

July 23, 2025
Project: 103940.009

experience • knowledge • integrity

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1.0 INTRODUCTION

This report presents the results of a geotechnical investigation carried out by GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) for the proposed sanitary sewer to be installed as part of the redevelopment of the 570 / 600 March Road properties in Ottawa, Ontario.

The purpose of the investigation was to identify the general subsurface and groundwater condition, by means of a limited number of boreholes, and based on the factual information obtained, to provide engineering guidelines on the geotechnical design aspects of the project, including construction consideration that could influence design decisions.

This report is subject to the Conditions and Limitations of This Report, which are provided following the text of this report, and which are considered an integral part of this report.

2.0 BACKGROUND

2.1 Project Description

In parallel with redevelopment of the property at 570 and 600 March Road plans are being prepared to construct a section of sewer, part of which will be constructed beneath a new access roadway within the redevelopment, part beneath a new entranceway from Legget Drive and part below a section of Legget Drive. This area is referred to further as “the Site”.

The position of the proposed sewer is shown on drawing C100 titled “General Plan of Services”, prepared by Novatech Engineers, Planners & Landscape Architects – dated November 2024 and marked Not for Construction. The following is known about the proposed sanitary sewer from a review of the drawing:

- The sewer will be constructed below Lifestyle Street – and internal access roadway within the 570 / 600 March Road development, for a length of about 130 metres;
- The sewer will exit the development at a new entrance way onto Legget Drive to be constructed approximately 250 metres southeast of the intersection with Terry Fox Drive;
- The sewer will run for a length of about 115 metres southeast (i.e. away from Terry Fox) along Legget Drive where it will connect with an existing manhole.
- The design is not finalised, however the plans available at the time of submission of this report indicate that the sanitary sewer will have a diameter of about 250 millimetres and will be installed with an invert level about 2.4 to 4.3 metres below ground, being deepest within the 570 / 600 March Road Development area.
- Following installation of the sewer, the pavement along Legget Drive above the trench excavation will be reinstated.

Geotechnical investigation and recommendations for the internal roadway and sections of the sewer below the access roadway have been provided by others as described in Section 2.2.2 of this report. This report has been prepared for the remaining portions of the sewer.

2.2 Review of Existing Source of Information on Subsurface Conditions

2.2.1 Public Information Sources

Surficial geology maps indicate a range of soil conditions at the Site. The mapped conditions are summarised below:

- Near surface Paleozoic aged bedrock is mapped beneath Legget Drive near the Terry Fox Intersection.
- Fine textured glaciomarine deposits of silt and clay with minor sand and gravel are mapped within the majority of the Site along Legget Drive.

Bedrock geology maps indicate the presence of Paleozoic aged sandstone, dolomitic sandstone and dolostone of the March Formation below the soil cover. No faults are mapped within or nearby to the Site.

Ontario well records and public borehole records also indicate shallow bedrock at or in the vicinity of the Site.

In addition to the conditions described above, fill material associated with current and previous development in the area should also be anticipated. This may include materials associated with the existing roadways, parking areas, and below ground sewers and services / utilities.

2.2.2 Previous Investigations by Others

GEMTEC has considered the records of previous investigations carried out by others for the proposed redevelopment of the properties at 600 and 570 Legget Drive, which are contained in a report titled “Geotechnical Investigation and Hydrogeological Assessment, 600 March Road, Kanata (Ottawa), Ontario”, dated March 2024, which was provided to GEMTEC by Broccolini Investments Inc. This investigation and report are referred to further as GHD (2024). The GHD (2024) investigations encountered the following subsurface conditions:

- Fill Material – primarily comprised of asphaltic concrete and granular pavement layer work;
- Discontinuous layers of silty clay to clayey silt;
- Glacial till which is typically coarse-grained i.e. silty sand to gravelly sand with varying amounts of gravel and clay and containing cobbles and boulders, which overlies;
- Relatively shallow bedrock. The bedrock type was confirmed by rotary coring to be slightly weathered to fresh, thinly to medium bedded dolomitic sandstone, of fair to excellent quality according to the measured Rock Quality Designation (RQD) of the length of

recovered core. The unconfined compressive strength of samples of the rock core ranged from about 127 megapascals to about 155 megapascals.

- Groundwater level was variable but was typically found to be within the bedrock.

3.0 METHODOLOGY

3.1 Geotechnical Investigation

The fieldwork for this investigation was carried out on June 19 and 20, 2025. On those dates the following boreholes were advanced at the approximate locations shown on the Site Plan, Figure 1 following the text of this report.

- Boreholes 25-103 and 25-104 along Legget Drive;
- Boreholes 25-201 and 25-202 along Legget Drive; and
- Borehole 25-301 within the existing parking lot at 570 March Road.

The borehole locations were selected by GEMTEC personnel to avoid existing underground services and utilities and positioned relative to existing features.

The boreholes were advanced using a truck mounted hollow stem drill rig supplied and operated by George Downing Estate Drilling Ltd. of Hawkesbury, Ontario. The boreholes were advanced to depths ranging from approximately 0.6 to 3.5 metres. Standard penetration tests were carried out in the boreholes at regular intervals of depth and samples of the soils encountered were recovered using a 50-millimetre diameter split barrel sampler. Rotary coring using NQ size rotary drilling equipment was carried out below the level of auger refusal at one borehole to identify the material below the refusal level. Transient groundwater levels in the open boreholes were observed and measured at the time of drilling and a standpipe piezometer was installed in one borehole as described later in this report.

The fieldwork was supervised throughout by a member of our engineering staff who directed the drilling operations, observed the in-situ sampling, logged the soil stratigraphy and surveyed the locations and elevations of the ground investigation points using a precision GPS survey instrument. The coordinates are referenced to NAD83 (CSRS) Epoch 2010, vertical network CGVD28.

Following the fieldwork, the soil and bedrock samples were returned to our laboratory for examination by a geotechnical engineer. Selected samples of the soil were tested for water content and grain size distribution testing. One sample of the bedrock was tested to determine the unconfined compressive strength of the core. In addition, one sample of soil was sent to Paracel Laboratories Ltd. for basic chemical testing relating to corrosion of buried concrete and steel.

3.2 Hydrogeological Investigation

3.2.1 Monitoring Well Construction

A single well screen with sand filter pack was installed in borehole 25-103. Above the filter pack, bentonite pellets were used to seal the well screen from the soil above. Details of the well construction are presented on the Record of Borehole Logs in Appendix A. The monitoring well was fitted with a flush mounted protective cover.

3.2.2 Groundwater Level Reading, Hydraulic Conductivity Testing and Water Quality Screening

On June 27, 2025, the monitoring well at borehole 25-103 was inspected to measure groundwater levels, recover water quality screening samples and to perform hydraulic conductivity testing. Details of the observed water levels are provided later in this report. The level of water present in the monitoring well was insufficient to recover a sample, or to carry out insitu hydraulic conductivity testing. Reference should be made to GHD (2024) for the results of hydraulic conductivity testing performed in deeper boreholes nearby.

4.0 SUBSURFACE CONDITIONS

4.1 General

Descriptions of the subsurface conditions logged in the boreholes are provided on the Record of Borehole Sheets in Appendix A. The results of the laboratory classification testing are provided in Appendix B and also on the Record of Borehole Sheets. The results of the chemical analysis (corrosivity) are provided in Appendix C.

The following sections provide a description of the subsurface conditions encountered in the geotechnical boreholes.

4.2 Asphaltic Concrete

Asphaltic concrete is present from ground surface at each borehole location. The thicknesses are as follows:

- Along Legget Drive in boreholes 25-103, 25-104, 25-201 and 25-202; ranging from 100 to 160 millimetres; and
- Within the parking lot of 570/600 March Road in boreholes 25-104 and 25-301; 40 millimetres.

4.3 Existing Pavement Structure

The boreholes were advanced through the existing pavement structure of Legget Drive and the existing parking lot at 570 / 600 March Road. These consist of base and subbase layers of varying

mixtures of crushed, sand and gravel with trace to some non-cohesive silt, trace clay. The combined thickness of the base and subbase ranges from about 520 to 750 millimetres.

Grain size distribution testing was carried out on four samples of the pavement structure layers. The results are summarized in Table 4.1. The water content of the samples of the pavement layers was about 1 to 3 percent.

Table 4.1 – Summary of Grain Size Distribution Test, Base / Subbase Layers

Borehole ID	Sample Depth (millimetres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
25-201	115 – 350 (Base)	43.6	41.7	11.6	3.1
25-201	350 – 740 (Subbase)	28.3	43.9	21.0	6.7
25-301	40 – 240 (Base)	38.0	42.7	17.1	2.2
25-301	240 – 330 (Subbase)	58.5	30.7	8.7	2.1

4.4 Fill

Fill material was encountered in borehole 25-202 below the pavement structure materials. The fill material was proven to a depth of 2.0 metres and may extend to a greater depth.

The fill material is a mixture of sand and gravel, containing cohesive fine grained soils, cobbles and boulders. The fill material was observed to increase in cobble and boulder content below a depth of about 1.1 metres.

Two standard penetration tests carried out in the fill both gave N values ranging from 46 to greater than 50 blows per 0.3 metres of penetration. These N values may indicate a dense relative density, however, the higher N values may also be due to the presence of larger gravel, cobbles, or other hard material in the fill.

Grain size distribution testing was carried out on one sample of the fill layers. The results are summarized in Table 4.2.

Table 4.2 – Summary of Grain Size Distribution Test, Fill Layers

Borehole ID	Sample Depth (millimetres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
25-202	680 – 1120	34.1	36.8	17.0	12.1

4.5 Silty Sand

A layer of silty sand is present at the location of borehole 25-201 below the pavement materials at a depth of about 0.7 metres. The borehole was terminated at auger refusal at a depth of about 1.0 metres, likely on bedrock, or possibly other hard material.

4.6 Clayey Silt

A thin, native deposit of fine-grained cohesive soil was encountered below the pavement materials in boreholes 25-103. The deposit can be described as clayey silt with trace sand. The thickness of the clayey silt layer is about 100 millimetres which is insufficient for SPT N testing or other detailed assessment.

4.7 Sandstone Bedrock

Sandstone bedrock was proven at a depth of 1.0 metres by coring below the level of auger refusal at the location of borehole 25-103. At the location of boreholes 25-104, 25-201 and 25-301 the presence of bedrock is inferred from auger refusal at depths of 0.6 to 1.0 metres, respectively.

At the location of borehole 25-202 auger refusal occurred at a depth of about 1.5 metres, however, this is considered unlikely to represent the surface of bedrock, as an SPT could be carried out below this level.

At the location of borehole 25-103 the sandstone is fresh and generally very thinly to medium bedded. Based on the observations of the Rock Quality Designation (RQD) the bedrock within the depth of investigation can be classified as Good to Excellent, according to the system provided in the Canadian Foundation Engineering Manual, 5th Edition.

One sample of the bedrock core recovered from 25-103 at a depth of about 1.9 metres was tested to determine the unconfined compressive strength of the core. The determined value is 149 Megapascals. According to the core strength classification system set out in the Canadian Foundation Engineering Manual, 5th Edition, the core strength can be described as Very Strong (i.e. > 100 mPa).

4.8 Groundwater Observations

All of the boreholes were dry to the depth of auger refusal on June 20, 2025. During rotary coring at borehole 25-103 drill water was observed to drain rapidly from the corehole which suggests groundwater was below the level of coring.

On June 27, 2025, the monitoring well in borehole 25-103 was inspected to measure the groundwater level which is presented in Table 4.3. Minimal water had gathered at the base of the standpipe and it is likely that the groundwater level is below this level.

The groundwater levels may be higher during wet periods of the year such as the early spring or following periods of precipitation.

Table 4.3 – Groundwater Level Depths and Elevations, Monitoring Well

Borehole ID	Ground Surface Elevation (metres)	Groundwater Depth (metres)	Groundwater Elevation (metres)	Date of Reading
25-103	79.7	3.3	76.4	June 27, 2025

4.9 Groundwater Quality

Sampling of groundwater for assessment of groundwater quality was not possible due to the shallow groundwater level.

It is anticipated that groundwater, if encountered, will preferably be discharged to a City of Ottawa storm sewer. Water quality sampling should be carried to demonstrate that any groundwater discharge will meet the City of Ottawa Sewer Use by-law requirements. Should exceedances be observed, it may be necessary to discharge to a sanitary sewer, treat the groundwater, or dispose of it at an alternative suitable location.

4.10 Chemistry Relating to Corrosion

The results of chemical testing on soil samples recovered from borehole 25-202 are summarized in Table 4.4.

Table 4.4 – Soil Chemistry Related to Corrosion

Parameter	BH 25-202 680 – 1120 mm
Resistivity (ohm.m)	6.31
pH	7.74
Chloride Content (ug/g)	183
Sulphate Content (ug/g)	1920

5.0 GEOTECHNICAL RECOMMENDATIONS

5.1 General

At the time of preparing this report, limited information was available to GEMTEC on the details for the sanitary sewer. If the details identified in Section 2.1 are not in alignment with the proposed design, the following sections may require review as the design of the project progresses and further details are made available to GEMTEC.

5.2 Excavation

Based on the results of the investigation, excavations for the proposed sewer will generally be carried out through the roadway and parking lot asphaltic concrete surfacing and underlying granular pavement layers, thin discontinuous layers of fill material and clayey silt, and into the sandstone bedrock. Increased thickness of fill material may be encountered should existing bedrock trench excavations for current / former sewers or services be encountered, similar to the conditions at borehole 25-202.

The bedrock will likely break at a horizontal bedding plane below the design depth of the trench base, which may necessitate thickening the sewer bedding material. As such, overbreak should be expected in any bedrock removal.

5.2.1 Overburden Excavation

The overburden (fill material and native soil) is anticipated to be readily excavatable using conventional hydraulic excavation equipment, in general, noting that fill material can contain boulders and other hard materials.

The sides of the excavations within overburden soils should be sloped in accordance with the requirements in Ontario Regulation 213/91 under the Occupational Health and Safety Act.

According to the Act, the soils at the Site, above the groundwater level, can be classified as Type 3. Therefore, for design purposes, allowance should be made for 1 horizontal to 1 vertical, or flatter, excavation slopes above the groundwater level.

If groundwater is encountered within the excavations, the coarse-grained soils would be classified as Type 4 Soil and the excavations should be sloped at 3 horizontal to 1 vertical, or flatter, unless the groundwater level is lowered to below the excavation floor during construction. Refer to Section 5.2.3 for commentary on the use of excavation bracing.

5.2.2 Bedrock Excavation

Bedrock removal at the Site could be carried out using hoe ramming techniques in conjunction with line drilling on close centres. For the bedrock at the Site, it is suggested that allowance be made for line drilling 75 to 100 millimetre diameter holes on 200 to 300 millimetre centres. However, excavation rates will likely be slower by this method than could be achieved using blasting, noting that strong to very strong bedrock is anticipated – according to the results of compressive strength testing by GEMTEC and GHD (2024). Significant ware of excavation equipment should also be anticipated. The vibration effects of hoe ramming are usually minor and localized. Monitoring of the hoe ramming could be carried out, at least initially, to measure the vibrations to ensure that they are below the acceptable threshold value.

Provided that good bedrock excavation techniques are used, the bedrock could be excavated using near vertical side walls. Any loose bedrock should be scaled from the sides of the excavation for worker safety.

An alternative to mechanical excavation is drilling and basting which could be used to increase excavation rates if permissible in this area and provided existing below and above ground structures will not to be impacted to an unacceptable level.

The effects due to vibration from blasting can be controlled by limiting the size and amount of charge, using delayed detonation techniques, and the like. As a guideline for blasting, the peak vibration limits suggested at the nearest structure or service are provided in Table 5.1, below. It is pointed out that the limits provided, although conservative, were established to prevent damage to existing buildings and services in good condition. More stringent criteria may be required to prevent damage to freshly placed (uncured) concrete or vibration sensitive equipment or utilities. A blasting specialist should be consulted on the effects of vibration on nearby services and separation distance between any blasting and existing underground services. Any blasting should be carried out under the supervision of a blasting specialist and monitoring of the blasting should be carried out to ensure that the blasting meets the limiting vibration criteria. Pre-construction condition surveys of the nearby structures and existing buried services and utilities are considered essential.

Table 5.1 – Peak Vibration Limits

Frequency of Vibration (Hz)	Vibration Limits (millimetres/second)
<10	5
10 to 40	5 to 50 (interpolated)
>40	50

5.2.3 Braced Excavations

As an alternative to sloping / battering the excavation side slopes or where space constraints dictate, installation of the sewer could be carried out within a tightly fitting, braced steel trench box, which is specifically designed for this purpose. It is noted that some unavoidable inward horizontal movement and settlement of the ground behind the trench box should be anticipated, which could affect existing services located behind the trench box. Additional information on impacts to adjacent services is provided in Section 5.2.5.

Cobbles and boulders should be anticipated in the fill material as were found at the location of borehole 25-202. In order to advance the trench box, even boulders that partially intrude into the sides of the excavation must be removed, which may result in a wider excavation than anticipated. As such, an allowance should be made for removal of boulders from the fill material during excavation. Further, additional backfill and bedding material may be required to fill any voids left from the removal of boulders.

5.2.4 Groundwater Management

Along Legget Drive, excavation depths of up to about 3.0 metres have been assumed. Some groundwater inflow to the excavations is anticipated in the lower portion of the excavation, depending on the time of year the works are carried out – noting that in borehole 06-22 from GHD (2024) which was also advanced in the parking lot area, groundwater was measured at a depth of about 2.8 metres in April 2023. Perched groundwater will likely be encountered within the pavement and fill materials over any fine grained soils, such as the clayey silt encountered in borehole 25-103.

GHD (2024) estimates the hydraulic conductivity of the sandstone bedrock to range from 2.1×10^{-8} m/s to 9.2×10^{-6} m/s with an average of about 3.9×10^{-7} m/s, which is within the typical published range of values (Freeze & Cherry, 1979). Groundwater inflow from the bedrock, if encountered, could likely be managed by conventional dewatering techniques by pumping from sumps within the trench excavation. For reasonably shallow excavations, it is not expected that short term pumping during excavation will have a significant effect on nearby structures.

Confirmatory measurement of groundwater levels could be obtained closer to the time of construction to verify the depth to groundwater.

During construction, should the volume of pumped groundwater exceed 50,000 litres per day, an Environmental Activity and Sector Registry (EASR) may be required. However, based on the available subsurface conditions at the Site, this is not considered likely; a hydrogeological assessment can be carried out to confirm whether registration is necessary.

5.2.5 Excavation Adjacent to Existing Services

We recommend that that the excavations not encroach within a line extending downwards and outwards at an inclination of 1 vertical to 1 horizontal from the base of the existing services. As previously indicated, some unavoidable inward horizontal movement and settlement of the ground behind the trench box should be anticipated, which could affect existing services located behind the trench box. Where this is not possible, a more rigid shoring system may be required to support the excavation. Additional information could be provided as the design progresses.

It is noted that caution must be exercised during excavation near the existing gas line along Legget Drive. We recommend that the final design drawings be reviewed by a geotechnical engineer to assess whether or not the excavations can be carried out without negatively impacting this service. In addition, a provision should be made in the contract for the contractor to retain a geotechnical engineer during construction to review their excavations near existing buried services / utilities.

5.3 Pipe Bedding

Pipe bedding material should consist of well graded crushed stone meeting Ontario Provincial Standards Specifications (OPSS) requirements for Granular A. The minimum bedding thickness should be 150 millimetres. In accordance with City of Ottawa standards (refer to S.P. No: F-3147), granular materials used in sewer trench should be composed of virgin (i.e., not recycled) material only. As discussed below, we recommend that a contingency allowance be made in the contract for a sub-bedding layer in the event that unavoidable overexcavation of the bedrock occurs during construction, or where boulders are encountered at subgrade level. In these cases, additional bedding material may be required to fill any voids left following the removal of boulders or overexcavated bedrock. For these areas, or in areas where the subsoil is disturbed, or where unsuitable material exists below the base of trench excavation, a sub-bedding layer of compacted granular material, such as that meeting OPSS Granular B Type II (50 or 100 millimetre minus crushed stone) should be installed.

Extensive zones of silty clay are unlikely to be encountered at the base of the trench excavation. However, should such soils be encountered it should be noted that these deposits are susceptible to weakening under vibration and/or repeated loading.

Cover material, from pipe spring line to at least 300 millimetres above the top of the pipe, should consist of granular material, such as OPSS Granular A.

The sub-bedding, bedding and cover materials should be compacted in maximum 300 millimetre thick lifts to at least 98 percent of the standard Proctor dry density value.

5.4 Trench Backfill

The backfill materials within the zone of seasonal frost penetration (i.e., within 1.8 metres of finished grade) should match the frost behaviour of the materials exposed on the trench walls – which in this case is likely to be sandstone bedrock, or existing roadway base/subbase material (i.e. non-frost susceptible). This will reduce the potential for differential frost heaving between the area over the trench and the adjacent roadway. Backfill below the zone of seasonal frost penetration could consist of either acceptable native material or imported granular material conforming to OPSS Granular B Type I or II.

To minimize future settlement of the backfill and achieve an acceptable subgrade for any roadways, curbs, etc., the trench backfill should be compacted in maximum 300 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density value.

5.5 Seepage Barriers

Seepage barriers are not required, from a geotechnical perspective, but may be considered for other purposes. If these are to be implemented, the seepage barriers should begin at subgrade level and extend vertically through the granular pipe bedding and granular surround to within the native backfill materials, and horizontally across the full width of the service trench excavation. The seepage barriers could consist of 1.5 metre wide dykes of compacted silty clay. The silty clay should be compacted in maximum 300 millimetre thick lifts to at least 95 percent of the standard Proctor dry density value.

5.6 Pavement Design

5.6.1 Design Sections

It is understood that pavement work related to the watermain reconstruction along Legget Drive is limited to trench reinstatement.

5.6.2 Traffic Data

Detailed traffic data was not available at the time of preparation of this work. However, according to OC Transpo mapping, it is understood that Legget Drive is designated as a bus route with approximately 100 busses per day.

5.6.3 Pavement Structure – Trench Reinstatement

The pavement structure for excavation reinstatement should incorporate the following minimum asphaltic concrete and granular thicknesses following compaction of backfill material:

- 40 millimetres of Superpave 12.5 Traffic Level D with PG 64-34; placed over
- Two (2) lifts each of 60 millimetres of Superpave 19 Traffic Level D with PG 64-34; over
- 150 millimetres of Granular A; over
- 450 millimetres of Granular B Type II.

The above indicated pavement structure should perform as intended while meeting the City of Ottawa minimum standard for bus routes. Furthermore, the layer thicknesses have been selected to closely match the existing pavement structure identified in the boreholes.

5.6.4 Granular Material Compaction

All imported granular materials should be placed in maximum 200-millimetre-thick lifts and should be compacted to at least 99 percent of the Standard Proctor dry density value using suitable vibratory compaction equipment.

5.6.5 Pavement Transitions

As part of the roadway construction, it is anticipated that new pavement will abut the existing pavement at various locations. The following is suggested to improve the performance of the joint between the new and the existing pavements:

- Neatly saw cut the existing asphaltic concrete;
- Remove the asphaltic concrete and slope the bottom of the excavation within the existing granular base and subbase at 1 horizontal to 1 vertical (1H:1V), or flatter, to avoid undermining the existing asphaltic concrete;
- To avoid cracking of the asphaltic concrete due to an abrupt change in the thickness of the roadway granular materials where new pavement areas join with the existing pavements, the granular depths should taper up or down at 5 horizontal to 1 vertical (5H:1V), or flatter, to match the existing pavement structure; and
- Remove (mill off) the existing asphaltic concrete to a depth matching the thickness of the new surface course recommended in this report (typically 40 to 60 millimetres) to a distance of 300 millimetres at the joint and tack coat the asphaltic concrete at the joint in accordance with the requirements in OPSS 310.

It is GEMTEC's experience that joint separation can occur at the joint between the existing granular material and any new (imported) granular materials for the reinstated roadway areas. To reduce the potential for reflective cracking at this location, it is suggested that the joint between the new and existing granular materials be located about 500 millimetres beyond the joint in the asphaltic concrete. Furthermore, a stepped or sloped joint (at 1 horizontal to 1 vertical (1H:1V), or flatter) is suggested to provide a gradual transition and facilitate compaction. Where possible,

the thickness of the granular materials in the widened section of the roadway should match those exposed in the adjacent section of the existing roadway.

5.6.6 Effects of Existing Service Trenches

Differential frost heaving could occur in areas where abrupt changes in the frost susceptibility of the subgrade materials exist. The locations of any service trenches that cause differential frost heaving issues during the winter period should be identified at the design stage. To mitigate future differential frost heaving at these locations, granular frost tapers (sloped at 5 horizontal to 1 vertical, or flatter) and/or some subexcavation of materials could be carried out as part of the rehabilitation. The frost heave treatment could be assessed at the time of the construction by geotechnical personnel.

5.7 Corrosion of Buried Concrete and Steel

The measured sulphate concentration in the sample of soil recovered from borehole 25-202 was 1920 micrograms per gram. According to Canadian Standards Association (CSA) “Concrete Materials and Methods of Concrete Construction”, the concentration of sulphate can be classified as moderate, and this should be considered in the preparation of concrete mix designs for concrete in contact with the native soil. The effects of freeze thaw in the presence of de-icing chemical (sodium chloride) use on the roadway should be considered in selecting the air entrainment and the concrete mix proportions for any concrete.

Based on the resistivity and pH of the sample, the soil in this area can be classified as non-aggressive to aggressive towards unprotected steel. It should be noted that the corrosivity of the soil/groundwater could vary throughout the year due to the application sodium chloride for de-icing.

6.0 ADDITIONAL CONSIDERATIONS

6.1 Winter Construction

In order to carry out the work during freezing temperatures, trenches should be opened for as short a time as practicable and the excavations should be carried out only in lengths which allow all of the construction operations, including backfilling, to be fully completed in one working day. The materials on the sides of the trenches should not be allowed to freeze. In addition, the backfill should be excavated, stored and replaced without being disturbed by frost or contaminated by snow or ice.

6.2 Excess Soil Management Plan

Refer to GEMTEC’s Sol Quality Report for presentation and discussion of the results of a soil sampling program completed by GMETEC to support excess soil beneficial re-use planning for the project. The report was prepared for Broccolini Real Estate Group (Ontario) Inc. and is dated July 2025.

6.3 Design Review and Construction Observation

It is recommended that the final design drawings be reviewed by GEMTEC to ensure that the guidelines provided in this report have been interpreted as intended.

The engagement of the services of GEMTEC during construction is recommended to confirm that the subsurface conditions throughout the proposed excavations do not materially differ from those given in the report and that the construction activities do not adversely affect the intent of the design. The subgrade surfaces for the proposed services and roadway reconstruction should be inspected by experienced geotechnical personnel to ensure that suitable materials have been reached and properly prepared. The placing and compaction of earth fill and imported granular materials should be inspected to ensure that the materials used conform to the grading and compaction specifications.

7.0 CLOSURE

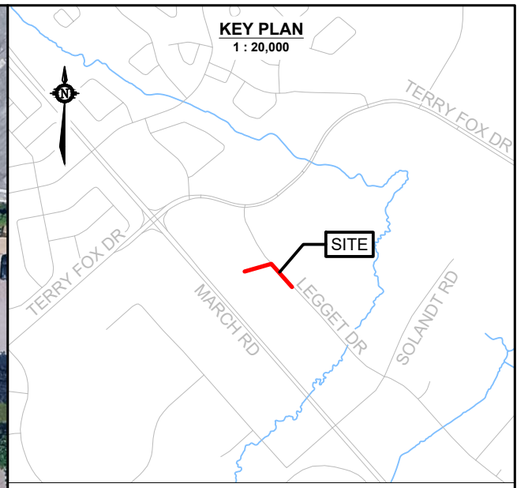
We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.

Daire Cummins M.Sc.
Geotechnical Specialist

Brent Wiebe, P.Eng.
Principal Geotechnical Engineer

DC/AB/BW

KEY PLAN
1 : 20,000



LEGEND

BH # — BOREHOLE ID
XX.XX — GROUND SURFACE ELEVATION, IN METRES

APPROXIMATE BOREHOLE LOCATION
(current investigation by GEMTEC)

PROJECT LIMIT

DATA SOURCES AND REFERENCES

1. Coordinate system: CSRS.UTM-18N
2. Distances, elevations, and coordinates are shown in metres unless denoted otherwise
3. This drawing is a schematic representation and should not be taken as a substitute for a legal survey.
4. Image @2025 Google Maps, CNES / Airbus, First Base Solutions, Maxar Technologies
5. Contains information licensed under the Open Government Licence – Ontario
6. Geographic dataset source: Ontario GeoHub

SCALE
1:1,000
0 20 40 60m

DRAWING
SITE PLAN

CLIENT
Broccolini Real Estate Group (Ontario) Inc.

PROJECT
GEOTECHNICAL INVESTIGATION
PROPOSED SANITARY SEWER
570 MARCH ROAD
OTTAWA, ONTARIO

DRAWN BY	CHECKED BY
SL	DC
PROJECT NO. 103940.009	REVISION NO. 0
DATE JULY 2025	FIGURE NO. **FIGURE 1**

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N:\PROJECTS\103900\103940.009\06_CIVIL DRAFTING\GSP R0\103940.009_GSP_R0_2025_07.DWG

GEOTECHNICAL REPORT CONDITIONS & LIMITATIONS

STANDARD OF CARE: GEMTEC has prepared this report in a manner consistent with generally accepted engineering or environmental consulting practice in the jurisdiction in which the services are provided at the time of the report. No other warranty, expressed or implied is made.

COPYRIGHT: The contents of this report are subject to copyright owned by GEMTEC, save to the extent that copyright has been legally assigned by us to another party or is used by GEMTEC under license. To the extent that GEMTEC owns the copyright in this report, it may not be copied without our prior written agreement for any purpose other than the purpose indicated in this report. The methodology (if any) contained in this report is provided to the Client in confidence and must not be disclosed or copied to third parties without the prior written agreement of GEMTEC. Disclosure of that information may constitute an actionable breach of confidence or may otherwise prejudice our commercial interests.

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

BASIS OF REPORT: This Report has been prepared for the specific site, development, design objectives and purposes that were described to GEMTEC by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document, subject to the limitations provided herein, are only valid to the extent that this report expressly addresses the proposed development, design objectives and purposes. Any change of site conditions, purpose or development plans may alter the validity of the report and GEMTEC cannot be responsible for use of this report, or portions thereof, unless GEMTEC is requested to review any changes and, if necessary, revise the report.

TIME DEPENDENCE: If the proposed project is not undertaken by the Client within 18 months following the issuance of this report, or within the timeframe understood by GEMTEC to be contemplated by the Client, the guidance and recommendations within the report should not be considered valid unless reviewed and amended or validated by GEMTEC in writing.

USE OF THIS REPORT: The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without GEMTEC's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, GEMTEC may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

NO LEGAL REPRESENTATIONS: GEMTEC makes no representations whatsoever concerning the legal significance of its findings, or as to other legal matters touched on in this report, including but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

DECREASE IN PROPERTY VALUE: GEMTEC shall not be responsible for any decrease, real or perceived, of the property or site's value or failure to complete a transaction, as a consequence of the information contained in this report.

RELIANCE ON PROVIDED INFORMATION: The evaluation and conclusions contained in this report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations. information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of misstatements, omissions, misrepresentations. or fraudulent acts of the Client or other persons providing information relied on by us. We are entitled to rely on such representations, information and instructions and are not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

INVESTIGATION LIMITATIONS: Site investigation programs are a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions but even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions.

The data derived from the site investigation program and subsequent laboratory testing are interpreted by trained personnel and extrapolated across the site to form an inferred geological representation and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Conditions between and beyond the borehole/test hole locations may differ from those encountered at the borehole/test hole locations and the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies. Accordingly, GEMTEC does not warrant or guarantee the exactness of the subsurface descriptions.

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

In addition, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

SAMPLE DISPOSAL: GEMTEC will dispose of all uncontaminated soil and/or rock samples 60 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

FOLLOW-UP AND CONSTRUCTION SERVICES: All details of the design were not known at the time of submission of GEMTEC's report. GEMTEC should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of GEMTEC's report.

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

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

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

APPENDIX A

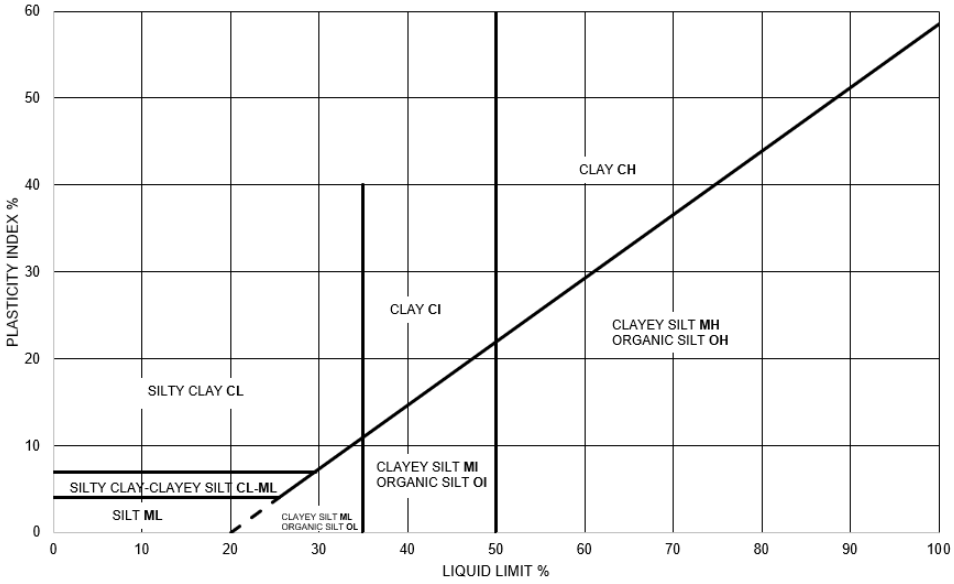
Record of Borehole Sheets
List of Abbreviations and Symbols
Boreholes 25-103, 25-104, 25-201, 25-202, and 25-301

Method of Soil Classification

GEMTEC's Soil Classification is based on the MTC Soil Classification Manual (January 1980)

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} X D_{60}}$	USCS Group Symbol	Group Name
Inorganic (Organic Content less than 30%)	Coarse Grained Soils (>50% is larger than 0.075 mm)	Gravel (>50% of coarse fraction is > 4.75 mm)	Gravel with ≤12% fines	Poorly Graded	<4	≤1 or ≥3	GP	Gravel
				Well Graded	≥4	1 to 3	GW	Gravel
			Gravel with >12% fines	Below A Line	N/A		GM	Silty Gravel
				Above A Line	N/A		GC	Clayey Gravel
		Sand (≥50% coarse fraction is > 4.75 mm)	Sand with ≤12% fines	Poorly Graded	<6	≤1 or ≥3	SP	Sand
				Well Graded	≥6	1 to 3	SW	Sand
			Sand with >12% fines	Below A Line	N/A		SM	Silty Sand
				Above A Line	N/A		SC	Clayey Sand

Soil Group	Type of Soil	Liquid Limit	Field Tests			USCS Group Symbol	Group Name
			Dilatancy	Thread Diameter	Toughness		
Fine Grained Soils (≥50% is smaller than 0.075 mm)	Silts (Non-Plastic or PI and LL plot below A-Line)	<50	Rapid	>6 mm	N/A	ML	Silt
			Slow	3 to 6 mm	None to low	ML	Clayey Silt
			Slow to V. Slow	3 to 6 mm	Low	OL	Organic Silt
		≥50	Slow to V. Slow	3 to 6 mm	Low to Medium	MH	Clayey Silt
			None	1 to 3 mm	Medium to High	OH	Organic Silt
	Clays (PI and LL plot above A-Line)	Liquid Limit <35	None	~3 mm	Low to Medium	CL	Silty Clay
		Liquid Limit 35 to 50	None	1 to 3 mm	Medium	CI	Silty Clay
		Liquid Limit >50	None	<1 mm	High	CH	Clay
Highly Organic (> 30%)	Peat (Amorphous or Fibrous)					PT	Peat



Dual Symbol – Is used to indicate when soils are transitional. For coarse grained soils, it is used when the soil has between 5 and 12% fines (e.g., SP-SC, Sand to Silty Sand). For fine-grained soils it is used when the plasticity index and liquid limit values plot in the area shown in the plasticity chart on this page.

Borderline Symbol – Is used to indicate soils that are not clearly in one soil type but have similar behaviour and properties as similar materials (e.g., CL/CI or GM/SM).

ABBREVIATIONS AND TERMINOLOGY USED ON RECORDS OF BOREHOLES AND TEST PITS

SAMPLE TYPES	
AS	Auger sample
CA	Casing sample
CS	Chunk sample
BS	Borros piston sample
GS	Grab sample
MS	Manual sample
RC	Rock core
SS	Split spoon sampler
ST	Slotted tube
TO	Thin-walled open shelby tube
TP	Thin-walled piston shelby tube
WS	Wash sample

SOIL TESTS	
w	Water content
PL, w_p	Plastic limit
LL, w_L	Liquid limit
C	Consolidation (oedometer) test
D_R	Relative density
DS	Direct shear test
G_S	Specific gravity
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	Organic content test
UC	Unconfined compression test
γ	Unit weight

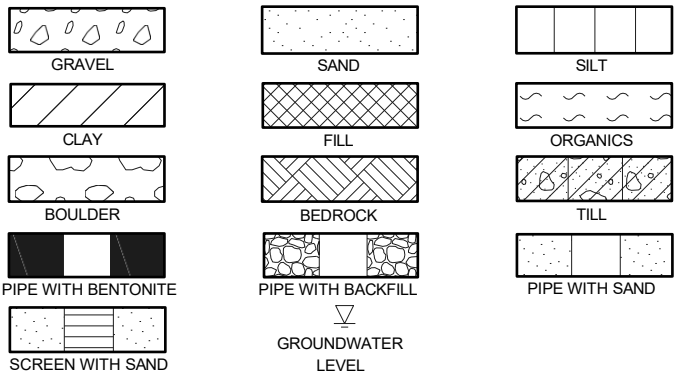
PENETRATION RESISTANCE

Standard Penetration Resistance, N
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 millimetres (30 in.) required to drive a 50 mm split spoon sampler for a distance of 300 mm (12 in.). For split spoon samples where less than 300 mm of penetration was achieved, the number of blows is reported over the sampler penetration in mm.

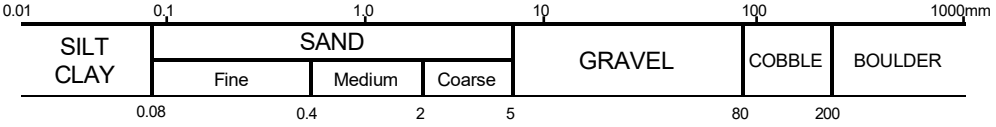
Dynamic Penetration Resistance
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive a 50 mm (2 in.) diameter 60° cone attached to 'A' size drill rods for a distance of 300 mm (12 in.).

WH	Sampler advanced by static weight of hammer and drill rods
WR	Sampler advanced by static weight of drill rods
PH	Sampler advanced by hydraulic pressure from drill rig
PM	Sampler advanced by manual pressure

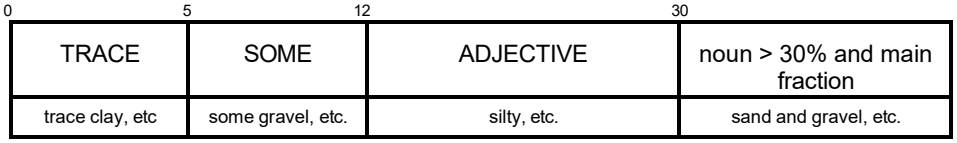
COHESIONLESS SOIL Compactness		COHESIVE SOIL Consistency	
SPT N-Values	**Description**	**Cu, kPa**	**Description**
0-4	Very Loose	0-12	Very Soft
4-10	Loose	12-25	Soft
10-30	Compact	25-50	Firm
30-50	Dense	50-100	Stiff
>50	Very Dense	100-200	Very Stiff
		>200	Hard



GRAIN SIZE



DESCRIPTIVE TERMINOLOGY



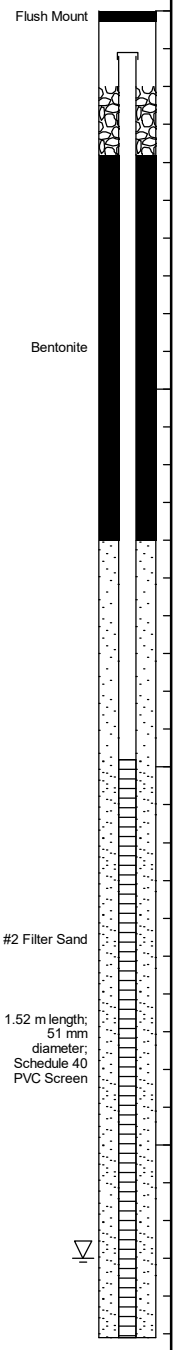
RECORD OF BOREHOLE 25-103

CLIENT: Broccolini Real Estate Group (Ontario) Inc.
PROJECT: Nokia March Road Campus Municipal Watermain
JOB#: 103940.007
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jun 20 2025

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface		79.65							
		ASPHALTIC CONCRETE		79.50							
		BASE - (SP-GP) SAND and GRAVEL, trace to some silt; grey, crushed; non-cohesive, moist		0.16 79.39							
		SUBBASE - (SM-GM) SILTY SAND and GRAVEL, trace to some clay; grey, crushed; non-cohesive, moist, very dense		0.26	1	SS	279	84		MH	
					2	SS	178	86 for 0.18 m			
1		(CL-ML) CLAYEY SILT, trace sand; grey brown; cohesive, moist		0.91 78.74 78.63							
	Diamond Rotary Core HQ (89mm OD)	Fresh, grey SANDSTONE, very thinly to medium bedded. Good to Excellent quality.		1.02	3	RC	254	TCR= 100%; SCR= 70%; RQD= 75%			
2					4	RC	1549	TCR= 98%; SCR= 75%; RQD= 80%		UC	
3					5	RC	660	TCR= 100%; SCR= 90%; RQD= 94%			
		End of borehole		76.14 3.51							
4											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P, W, W_L
10 20 30 40 50 60 70 80 90



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
25/06/27	3.30 ▽	76.4

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GEO - BOREHOLE LOG 103940.007_LOG_BH 101 TO 104_2025-07-07.GPJ GEMTEC 2018.GDT 7/11/25

BOREHOLE: 25-101
BORING DATE: MAY 26, 2025
DEPTH: 1.07 TO 3.53 METRES BELOW GROUND SURFACE

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Project
BROCCOLINI REAL ESTATE GROUP INC.
SUBSURFACE INVESTIGATION
PROPOSED WATERMAIN
570 LEGGET DRIVE TO TERRY FOX DRIVE
OTTAWA, ONTARIO

Drawing
ROCKCORE PHOTOGRAPH
BOREHOLE 25-101

FIGURE A1

Project No.	Drwn By	Chkd By	Rev No.	Date
103940.007	SL	DC	0	JULY 2025

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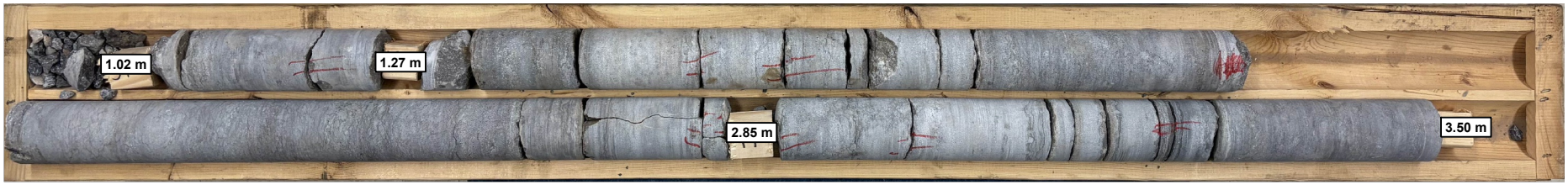
BOREHOLE: 25-103
BORING DATE: MAY 26, 2025
DEPTH: 1.02 TO 3.50 METRES BELOW GROUND SURFACE



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Project
BROCCOLINI INVESTMENT INC.
SUBSURFACE INVESTIGATION
PROPOSED WATERMAIN
570 LEGGET DRIVE TO TERRY FOX DRIVE
OTTAWA, ONTARIO

Drawing
ROCKCORE PHOTOGRAPH
BOREHOLE 25-103

FIGURE A2

Project No.	Drwn By	Chkd By	Rev No.	Date
103940.007	SL	DC	0	JULY 2025

N:\PROJECTS\103900\103940.007\06_CIVIL DRAFTING\RC R0\103940.007_RC_R0_2025_07.DWG

RECORD OF BOREHOLE 25-104

CLIENT: Broccolini Real Estate Group (Ontario) Inc.
PROJECT: Nokia March Road Campus Municipal Watermain
JOB#: 103940.007
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jun 19 2025

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface		79.73						
		ASPHALTIC CONCRETE		79.70 / 0.04						Asphaltic cold patch
		BASE - (GM-SM) SILTY GRAVEL and SAND, trace clay; grey, crushed; non-cohesive, moist		79.49 / 0.24						Auger cuttings
		SUBBASE - (GP) SANDY GRAVEL, trace silt; grey, crushed; non-cohesive, moist		79.17 / 0.56	1	SS	229	68 for 0.23 m	MH	Borehole dry upon completion
		Auger refusal on inferred bedrock End of borehole								
1										
2										
3										
4										

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, % — W_P W W_L
10 20 30 40 50 60 70 80 90

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CHECKED: M.R.

GEO - BOREHOLE LOG 103940.007_LOG_BH 101 TO 104_2025-07-07.GPJ GEMTEC 2018.GDT 7/11/25

RECORD OF BOREHOLE 25-201

CLIENT: Broccolini Real Estate Group (Ontario) Inc.
PROJECT: Nokia March Road Campus Sanitary Sewer & Supplemental Site Condition Investigation
JOB#: 103940.009
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jun 20 2025

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface		79.61					MH	Asphaltic cold patch
		ASPHALTIC CONCRETE		79.50 / 0.12						
		BASE - (GP-SP) GRAVEL and SAND, some silt, trace clay; grey, crushed; non-cohesive, moist		79.26 / 0.35						Auger cuttings
		SUBBASE - (SM) SILTY GRAVELLY SAND, some clay; grey, crushed; non-cohesive, moist			1	SS	356	56		
		(SM) SILTY SAND, some gravel; brown; non-cohesive, moist		78.87 / 0.74	2	SS	76	56 for 0.20 m		Borehole dry upon completion.
1		Auger refusal on inferred bedrock End of borehole		78.62 / 0.99						
2										
3										
4										

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

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CHECKED: M.R.

GEO - BOREHOLE LOG 103940.009_LOG_BH 201 202_2025-07-07.GPJ GEMTEC 2018.GDT 7/15/25

RECORD OF BOREHOLE 25-202

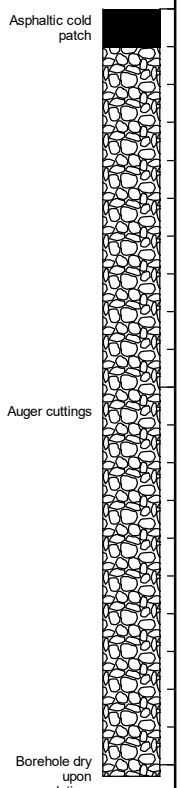
CLIENT: Broccolini Real Estate Group (Ontario) Inc.
PROJECT: Nokia March Road Campus Sanitary Sewer & Supplemental Site Condition Investigation
JOB#: 103940.009
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jun 20 2025

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING
0	Power Auger	Ground Surface		79.42					
		ASPHALTIC CONCRETE		79.32 / 0.10					
		BASE - (GP-SP) SAND and GRAVEL, trace silt; grey, crushed; non-cohesive, moist		79.10 / 0.32					
	Hollow Stem Auger (210mm OD)	SUBBASE - (GP - SP) SAND and GRAVEL, trace silt; grey, crushed; non-cohesive, moist, compact			1	SS	279	25	
				78.74 / 0.68					
1		FILL - (SP - GP) CLAYEY SILTY SAND and GRAVEL; grey brown, with cobbles and boulders; cohesive, moist, stiff			2A	SS	127	60 for 0.28 m	MH
		Increased boulder and cobble content		78.30 / 1.12	2B	SS	203		
	Drive Open Sampler				3	SS	203	46	
2		Auger refusal at 1.45 m Sampler advanced to 2.0 m End of borehole		77.39 / 2.03					
3									
4									

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

PIEZOMETER OR STANDPIPE INSTALLATION



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CHECKED: M.R.

GEO - BOREHOLE LOG 103940.009_LOG_BH 201 202_2025-07-07.GPJ GEMTEC 2018.GDT 7/15/25

RECORD OF BOREHOLE 25-301

CLIENT: Broccolini Real Estate Ontario (Group) Inc.
PROJECT: Nokia March Road Campus Sanitary Sewer & Supplemental Site Condition Investigation
JOB#: 103940.009
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jun 19 2025

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		80.48						
0	Power Auger Hollow Stem Auger (210mm OD)	ASPHALTIC CONCRETE		80.44						Asphaltic cold patch
		BASE - (SP-GP) SILTY SAND and GRAVEL, trace clay; grey, crushed; non-cohesive, moist		0.04 / 80.24	1	GS			MH	Auger cuttings
		SUBBASE - (GP-SP) GRAVEL and SAND, some silt, trace silt; grey, crushed; non-cohesive, compact		0.24 / 79.92	2	GS			MH	Borehole dry upon completion
		Auger refusal on inferred bedrock End of borehole		0.56						
1										
2										
3										
4										

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

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LOGGED: A.N.
CHECKED: M.R.

GEO - BOREHOLE LOG 103940.009_LOG_BH 201 202_2025-07-07.GPJ GEMTEC 2018.GDT 7/15/25

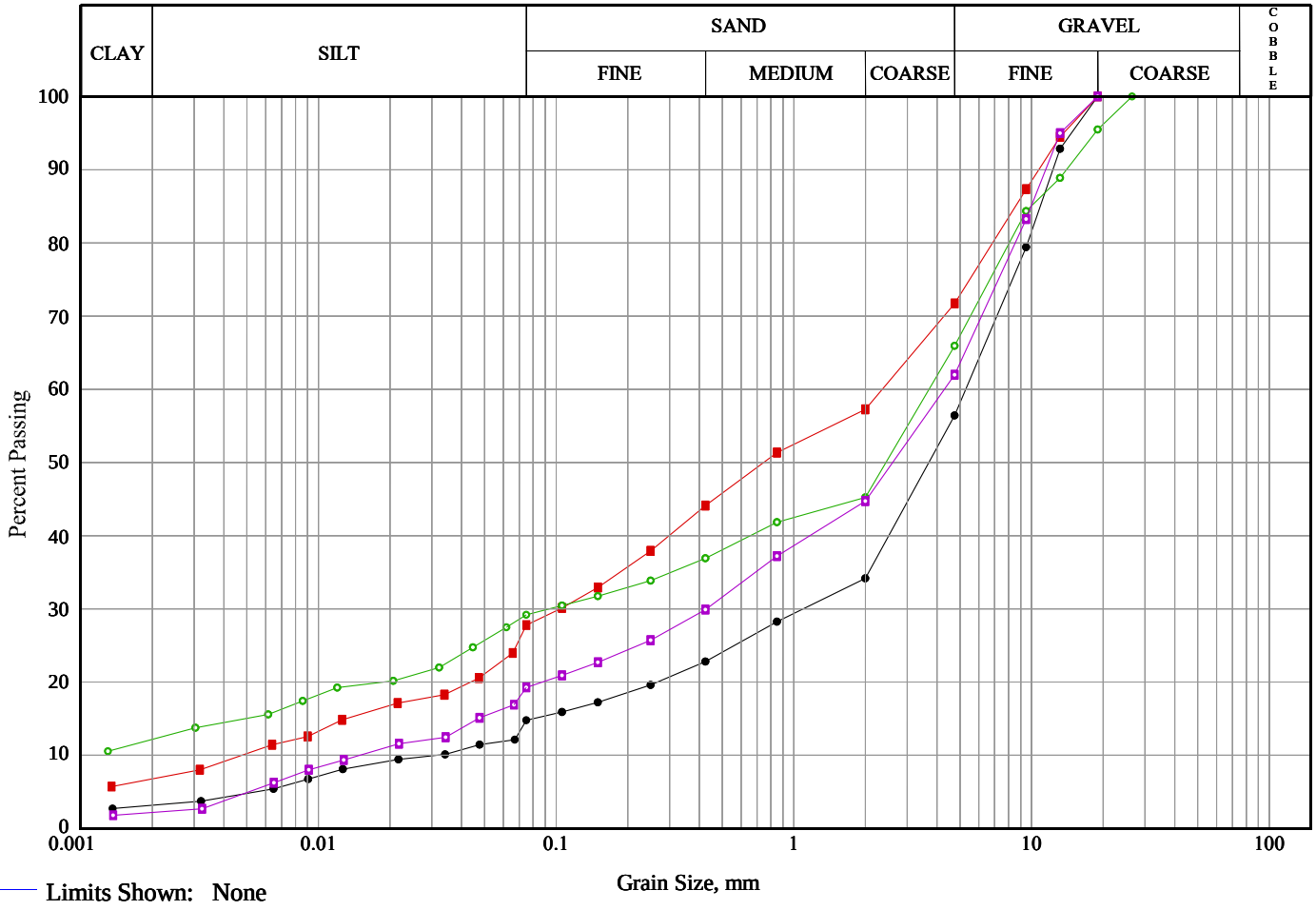
APPENDIX B

Laboratory Test Results
Grain Size Distribution Results

GEMTEC
Consulting Engineers and Scientists

Client:	Broccolini Real Estate Group (Ontario) Inc.
Project:	Nokia March Road Campus Sanitary Sewer along Legget
Project #:	103940009

Soils Grading Chart (LS-702/ ASTM D-422)

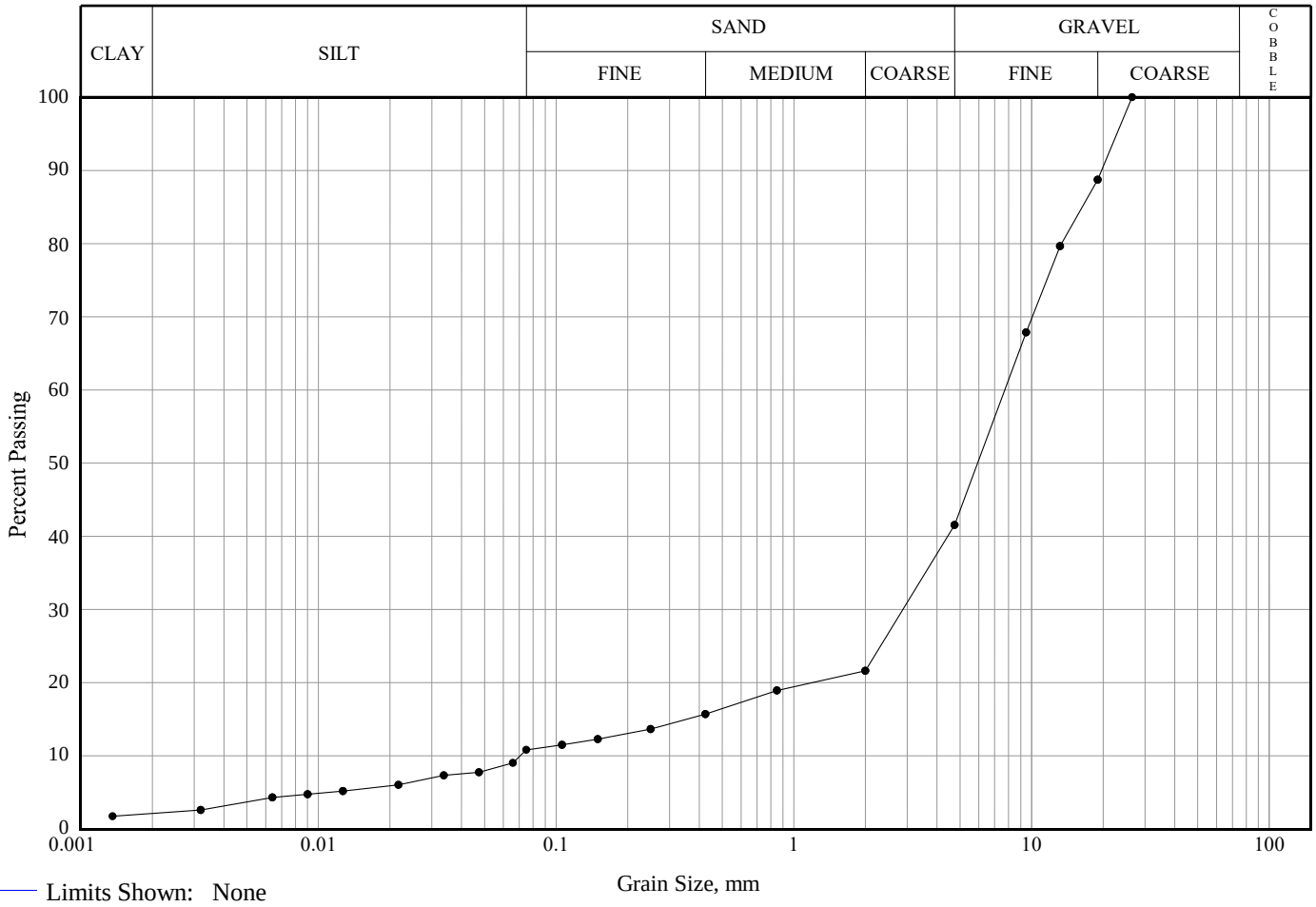


Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
	Base Material	25-201	A	115-350	43.6	41.7	11.6	3.1
	Subbase Material	25-201	B	350-740	28.3	43.9	21.0	6.7
	Fill Material	25-202	C	680-1.12	34.1	36.8	17.0	12.1
	Base Material	25-301	1	40-240	38.0	42.7	17.1	2.2

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
		N/A	0.032	0.081	1.10	3.70	5.29	10.89	11.6
		N/A	0.005	0.013	0.10	0.75	2.36	8.57	21.0
		N/A	---	0.005	0.09	2.44	3.71	9.97	17.0
		N/A	0.015	0.047	0.43	2.61	4.30	9.98	17.1

Note: More information available upon request

GEMTEC Consulting Engineers and Scientists	Client: Broccolini Real Estate Group (Ontario) Inc. Project: Nokia March Road Campus Sanitary Sewer along Legget Project #: 103940009	Soils Grading Chart (LS-702/ ASTM D-422)



Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
—●—	Subbase Material	25-301	2	240-330	58.5	30.7	8.7	2.1

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
—●—		N/A	0.071	0.357	2.88	5.94	7.73	16.37	8.7

Note: More information available upon request

APPENDIX C

Chemical Analysis of Soil Samples
Relating to Corrosion
(Paracel Laboratories Ltd. Order No.2526322)

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited
32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Matt Rainville

Client PO:
Project: 103940.009
Custody:

Report Date: 3-Jul-2025
Order Date: 26-Jun-2025

Order #: 2526322

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2526322-01	25-202 "C"

Approved By:

Alex Enfield, MSc
Lab Manager

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC, water extraction	30-Jun-25	2-Jul-25
Conductivity	MOE E3138 - probe @25 °C, water ext	2-Jul-25	3-Jul-25
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	3-Jul-25	3-Jul-25
Resistivity	EPA 120.1 - probe, water extraction	2-Jul-25	3-Jul-25
Solids, %	CWS Tier 1 - Gravimetric	30-Jun-25	2-Jul-25

Certificate of Analysis

Report Date: 03-Jul-2025

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 26-Jun-2025

Client PO:

Project Description: 103940.009

	Client ID:	25-202 "C"	-	-	-		
	Sample Date:	20-Jun-25 10:00	-	-	-	-	-
	Sample ID:	2526322-01	-	-	-		
	Matrix:	Soil	-	-	-		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	90.9	-	-	-	-	-
General Inorganics							
Conductivity	5 uS/cm	1580	-	-	-	-	-
pH	0.05 pH Units	7.74	-	-	-	-	-
Resistivity	0.10 Ohm.m	6.31	-	-	-	-	-
Anions							
Chloride	5 ug/g	183	-	-	-	-	-
Sulphate	5 ug/g	1920	-	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	5	ug/g					
Sulphate	ND	5	ug/g					
General Inorganics								
Conductivity	ND	5	uS/cm					
Resistivity	ND	0.10	Ohm.m					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	179	5	ug/g	183			2.0	20	
Sulphate	1910	5	ug/g	1920			0.6	20	
General Inorganics									
Conductivity	2970	5	uS/cm	2970			0.1	5	
pH	7.92	0.05	pH Units	7.91			0.1	10	
Resistivity	3.37	0.10	Ohm.m	3.36			0.1	20	
Physical Characteristics									
% Solids	83.6	0.1	% by Wt.	83.9			0.3	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	28.3	5	ug/g	18.3	99.8	80-120			
Sulphate	10.8	5	ug/g	ND	108	80-120			

Certificate of Analysis

Report Date: 03-Jul-2025

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 26-Jun-2025

Client PO:

Project Description: 103940.009

Qualifier Notes:

Sample Data Revisions:

None

Work Order Revisions / Comments:

Received at temperature > 25C

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

Soil results are reported on a dry weight basis unlesss otherwise noted.

Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

Any use of these results implies your agreement that our total liabilty in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.

PARACE LABORATORIES LTD

Paracel ID: 2526322

Head Office
300-2319 St. Laurent Blvd.
Ottawa, Ontario K1G 4J8
p: 1-800-749-1947
e: paracel@paracellabs.com

Chain of Custody
(Lab Use Only)

Page 1 of 1

Client Name: Gemtec	Project Reference: 103940.009
Contact Name: Matt Rainville	Quote #
Address: 32 Steacie Drive, Ottawa, Ontario, K2K 2A9	PO #
Telephone: 613-836-1422	Email Address: matthew.rainville@gemtec.ca

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☒ Regular
Date Required: _____

Criteria: ☐ O. Reg. 153/04 (As Amended) Table __ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☐ Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 2526322

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Chloride	pH/SO4	Elec. Conductivity	Elec. Resistivity	Required Analyses
1	25-202 "C"	S		1	20-06-2025	10:00am	☒	☒	☒	☒	
2							☐	☐	☐	☐	
3							☐	☐	☐	☐	
4							☐	☐	☐	☐	
5							☐	☐	☐	☐	
6							☐	☐	☐	☐	
7							☐	☐	☐	☐	
8							☐	☐	☐	☐	
9							☐	☐	☐	☐	
10							☐	☐	☐	☐	

Comments:

Method of Delivery: Courier

Relinquished By (Sign):	Received by Driver/Depot: 1342	Received at Lab: LTJ	Verified By:
Relinquished By (Print): Omar Abushaikha	Date/Time: June 25	Date/Time: 25/06/25 16:30	Date/Time: Jun 26 9:41
Date/Time: 25-06-2025 12:00 pm	Temperature: 30 °C	Temperature: 12.1.8 °C	pH Verified [ ] By: NA

Chain of Custody (Blank) - Rev 0.4 Feb 2016

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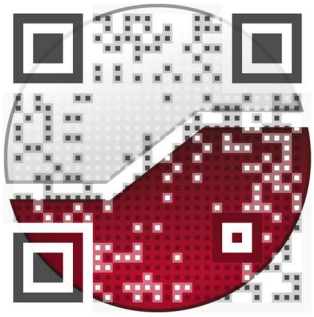

civil	civil
geotechnical	géotechnique
environmental	environnementale
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité