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# Geotechnical Investigation
# Proposed Residential Development
# Rows Corners Fairground
# 3823 County Road 6
Township of Elizabethtown-Kitley, Ontario

GEMTEC Project: 100030.029

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## Township of Elizabethtown-Kitley, Ontario

December 8, 2023
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## 1.0 INTRODUCTION

This report presents the results of the geotechnical investigation carried out for the proposed residential development, to be located in the Township of Elizabethtown-Kitley, Ontario (See Site Plan, Figure 1). The purpose of the investigation was to identify the general subsurface conditions at the site by means of a limited number of test pits and, based on the factual information obtained, to provide comments on the geotechnical design aspects of the proposed residential development located within the property of 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario.

The investigation was carried out in general accordance with our proposal dated October 31, 2023, and our scope change dated November 23, 2023.

This report is subject to the Conditions and Limitations, which follows the text of the report and which are considered an integral part of the report.

## 2.0 BACKGROUND

### 2.1 Project Description

It is understood that a proposed residential development is to be constructed at 3823 County Road 6, in the Township of Elizabethtown-Kitley, Ontario (see Site Plan, Figure 1). The subdivision includes an area of land bordered by undeveloped heavily vegetated land to the north-west side, residential homes to the south-east, and farmland to the north-east. The site location is provided on the Site Plan, Figure 1.

It is understood that the proposed development will consist of residential units with an internal roadway system. It is assumed that the proposed residences will be multi-unit residences, townhouses, and commercial space. The depth of the basements are not known at this time and it has been assumed for the purposes of this report that there will be one basement level for all buildings in the proposed residential development. In addition, water, sanitary, and storm services will be part of the proposed development.

It is also understood that a stormwater management pond is proposed at the west corner and a septic tank and bed area will be located at the north corner of the proposed development.

### 2.2 Review of Geology Maps

Surficial and bedrock geology maps of the area indicate near surface bedrock consisting of interbedded sandstone and dolostone of the March formation.

## 3.0 SUBSURFACE INVESTIGATION

### 3.1 Geotechnical Investigation

The fieldwork for this investigation was carried out on November 28, 2023. On that day, 15 test pits, numbered 23-01 to 23-15, inclusive, were advanced at the approximate locations shown on the Site Plan, Figure 1.

The test pits were advanced using a hydraulic excavator supplied and operated by Dave Wright Excavating of Kars, Ontario. The test pits were advanced to depths ranging from 0.1 metres to about 1.0 metres below the existing ground surface.

The subsurface and groundwater condition encountered in the test pits were identified by visual and tactile observation. The test pits were loosely backfilled with the excavated materials and tamped with the bucket of the excavator. As such, the test pits represent an area of soil disturbance.

The fieldwork was supervised throughout by a member of our engineering staff, who supervised the test pit excavation and logged the subsurface conditions. Following the fieldwork, the soil samples were returned to our laboratory for examination by a geotechnical engineer. Select samples of the soil were tested for water content and grain size distribution testing.

One soil sample of the soil obtained from test pit 23-06 was sent to Paracel Laboratories Ltd. for basic chemical testing relating to corrosion of exposed concrete and steel.

Test pit locations were selected by GEMTEC and positioned on the site relative to existing features. The ground surface elevations at the test pit locations were determined using precision GPS survey equipment. The elevations are referenced to geodetic datum NAD83 (CSRS) Epoch 2010, vertical network CGVD1928.



## 4.0 SUBSURFACE CONDITIONS

### 4.1 General

The approximate locations of the test pits are shown on the Site Plan, Figure 1. Descriptions of the subsurface conditions logged in the test pits are provided on the Record of Test Pit sheets in Appendix A. The results of the laboratory classification testing are provided on the Record of Test Pit sheets and in Appendix B. The results of the chemical analysis on the soil sample are provided in Appendix C.

The following presents an overview of the subsurface conditions encountered in the test pits advanced as part of this investigation.

### 4.2 Topsoil

A layer of topsoil was encountered at the ground surface at all test pit locations, excluding test pits 23-02 and 23-05, with thicknesses ranging from about 0.1 to 0.2 metres below the existing ground surface.

### 4.3 Fill

Fill, consisting of crushed silty sand and gravel underlain by silty sand with some gravel, was encountered at the ground surface at testpit 23-02 and extends to a depth of about 0.3 metres.

### 4.4 Sand and Silt to Silty Sand

Layers of sand and silt to silty sand were encountered in testpits 23-01 and 23-05 to 23-09, inclusive, and extending to depths ranging from about 0.1 metres to 1.0 metres below the existing ground surface.

The results of grain size distribution testing carried out on soil samples from the sandy deposits are provided in Appendix B and summarized in Tables 4.1 and 4.2, below.



**Table 4.1 - Summary of Grain Size Distribution Testing (Sand and Silt / Silty Sand)**

| Test Pit No. | Sample Number | Sample Depth (metres) | Gravel (%) | Sand (%) | Silt and Clay (%) |
|---|---|---|---|---|---|
| 23-01 | SA 1 | 0.09 – 0.23 | 20 | 40 | 40 |
| 23-06 | SA 1 | 0.10 – 0.30 | 30 | 49 | 21 |
| 23-08 | SA 1 | 0.17 – 0.38 | 3 | 64 | 33 |
| 23-09 | SA 1 | 0.24 – 0.35 | 1 | 58 | 41 |

**Table 4.2 – Summary of Hydrometer Testing (Sand and Silt / Silty Sand )**

| Test Pit No. | Sample Number | Sample Depth (metres) | Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|
| 23-01 | SA 2 | 0.23 – 0.50 | 0 | 57 | 35 | 9 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 23-06 | SA 2 | 0.30 – 1.04 | 0 | 80 | 14 | 6 |

### 4.5 Excavator Refusal

Refusal to excavationwas encountered in all test pits at depths ranging from about 0.1 to 1.0 metres below the existing ground surface. In test pits 23-12 and 23-14, a layer of fractured bedrock was encountered overlying the bedrock surface, with a thickness of about 0.1 metres.

### 4.6 Groundwater

No groundwater infiltration was encountered in any of the test pit locations.

Groundwater levels may be higher during wet periods of the year, such as the early spring or fall following periods of heavy precipitation.

### 4.7 Chemistry Relating to Corrosion

The results of the chemical testing on a soil sample recovered from test pit 23-06 are provided in Appendix C and summarized in Table 4.3 below.

**Table 4.3 – Summary of Corrosion Testing**

| Parameter | Test Pit 23-06 Sample 2 |
|---|---|
| Chloride Content (µg/g) | <10 |
| Resistivity (Ohm.m) | 94.6 |
| Conductivity (µS/cm) | 106 |
| pH | 7.13 |
| Sulphate Content (µg/g) | <10 |



## 5.0 GEOTECHNICAL GUIDELINES AND RECOMMENDATIONS

### 5.1 General

The services retained for this project include only the geotechnical aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or subsurface

contamination resulting from previous uses or activities of this site or adjacent properties, and/or resulting from the introduction onto the site from materials from off site sources are outside the terms of reference for this report.

## 5.2 Site Grade Raise Restriction

The subsurface conditions encountered in the test pits generally consist of topsoil overlying silty sand underlain by near surface bedrock.

Based on the results of the subsurface investigation, there are no practical limits to the thickness of grade raise fill that may be placed at the site. GEMTEC should however be consulted if more than 4 metres of grade raise fill is considered to assess the impacts for support of services and buildings.

## 5.3 Excavations

### 5.3.1 Overburden Excavations

The excavation for the foundations should be taken through the topsoil and into the native overburden deposits. The sides of the excavations should be sloped in accordance with the requirements in Ontario Regulations 213/91 under the Occupational Health and Safety Act. According to the Act, the shallow native overburden deposits above the groundwater level can be classified as Type 3 and, accordingly. Allowance should be made for excavation side slopes of 1 horizontal to 1 vertical extending upwards from the base of the excavation.

Excavation of the native soils above the groundwater should not present any excavation constraints. In contrast, excavation in the native sandy deposits below the groundwater level (if encountered) could present constraints. Groundwater inflow from the sandy deposits could cause sloughing of the sides of the excavation and disturbance to the soils at the bottom of the excavation. Flatter side slopes of 3 horizontal to 1 vertical will be required if excavations encounter the groundwater level in sandy deposits.



### 5.3.2 Bedrock Excavation

Limited and localized removal of competent bedrock at this site, if required, could be carried out using hoe ramming techniques in conjunction with line drilling on close centres, but it will be tedious and time-consuming. Significant bedrock removal will likely require blasting.

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

Line drilling on close centres could be used to reduce, not prevent, over break and under break of the bedrock excavation and to define the limit of excavation next to existing structures and services. For the bedrock at this site, it is suggested that allowance be made for line drilling 75 to 100 millimetres diameter holes on 200 to 300 millimetre centres, if hoe-ramming is used for

limited bedrock removal. 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 vibrations to ensure that they are below the acceptable threshold value.

If significant bedrock removal is required for the site development, guidelines on blasting could be provided upon request. Pre-blast surveys of existing buildings and infrastructure and vibration monitoring will be required for blasting.

### 5.3.3 Groundwater Management

It is noted that all test pits advanced as part of this investigation were dry upon completion. It is expected that any groundwater flow into the excavations can be handled with typical construction dewatering effort; although it is noted that where significant bedrock removal or deep excavations are required, groundwater lowering in advance of construction may be required. It is not expected that short term pumping during excavation will have a significant effect on nearby structures. Suitable detention and filtration will be required before discharging the water. The contractor should be required to submitted an excavation and groundwater management plan for review prior to construction.

Significant bedrock removal is expected for the installation of services and as such, the amount of water entering the excavation for the construction of the foundations and services (storm, sanitary, water) at this site could exceed 50,000 litres per day requiring a Permit from the Ministry of the environment, Conservation and Parks (MECP). A hydrogeological investigation is recommended to characterize the hydraulic conductivity of the bedrock in order to estimate the dewatering volumes.

A 'Water Taking and Discharge Plan' is required for groundwater pumping greater than 50,000 litres per day but less than 400,000 litres per day, prepared by a Qualified Professional which can then be registered through the My Ontario portal prior to construction. If groundwater inflows exceed 400,000 litres per day, a Category 3 Permit To Take Water (PTTW) is required, to be supported by a hydrogeological investigation report and submitted to the MECP for review and approval. To note, the MECP has a 90-day review period for Category 3 PTTW applications.

### 5.3.4 Placement of Engineered Fill

Imported granular material (engineered fill) should be used to raise the grade in areas where the proposed founding level is above the level of the native soil or where subexcavation of disturbed material is required below proposed founding level. The engineered fill should consist of granular material meeting Ontario Provincial Standard Specifications (OPSS) requirements for Granular B Type II and should be compacted in maximum 200 millimetre thick lifts to at least 95 percent of the material's standard Proctor maximum dry density using suitable vibratory compaction equipment. To allow spread of load beneath the footings, the engineered fill should extend horizontally at least 0.3 metres beyond the footings and then down and out from the edges of the footings at 1 horizontal to 1 vertical, or flatter. The excavations should be sized to accommodate this fill placement.

In areas where wet sandy soils are encountered at subgrade level, it may be necessary to place a woven geotextile meeting the requirements of OPSS 1860 Class I below the engineered fill and to statically compact the first lift of granular material to prevent subgrade disturbance. All seams in the geotextile should overlap at least 0.5 metres.

The test pits represent areas of disturbed soil. Any test pits which are located within building footprints should be subexcavated and backfilled with engineered fill material as described above. The sides of the subexcavated test pits should be sloped at 1 horizontal to 1 vertical, or flatter.

### 5.3.5 Spread Footing Design

Based on the near surface bedrock across the majority of the site, the proposed residential developments could be founded on spread footings bearing on bedrock or on native sands or engineered fill on native sands or rock. The topsoil is not considered suitable for the support of the proposed residential development or concrete floor slabs and should be removed from the proposed building areas.

Based on the results of the test pit investigation, the following allowable bearing pressures, in accordance with Part 9 of the Ontario Building Code (2012), should be used to size spread or strip footing foundations:

| Subgrade Material | Allowable Bearing Pressure for Foundations (kilopascals) |
|---|---|
| Bedrock | 500 |
| Engineered Fill or Native Sand | 150 |



Some of the native soils at this site are sensitive to construction operations, from ponded water and frost action. The construction operations should therefore be carried out in a manner that minimizes disturbance of the subgrade surfaces.

The post construction total and differential settlement of footings should be less than 25 and 15 millimetres, respectively, provided that all loose or disturbed soil is removed from the bearing surfaces and provided that any engineered fill material is compacted to the required density.

The foundation walls of the proposed residential developments should be reinforced, both top and bottom, in area where the footings transition from overburden to bedrock. The reinforcing steel should extend at least 3 metres on both sides of the transition zone.

The underside of footing level should be set a minimum of 0.3 metres above the seasonally high groundwater.

### 5.3.6 Frost Protection of Foundations

All exterior footings should be provided with at least 1.5 metres of earth cover for frost protection purposes. Isolated, unheated exterior footings adjacent to surfaces which are cleaned of snow cover during the winter months should be provided with a minimum of 1.8 metres of earth cover.

Alternatively, the required frost protection could be provided by means of a combination of earth cover and extruded polystyrene insulation. Further details regarding the insulation of foundations could be provided at the detailed design stage, if necessary.

### 5.3.7 Basement Foundation Wall Backfill and Drainage

In accordance with the Ontario Building Code, the following alternatives could be considered for drainage of the basement foundation walls:

- Damp proof the exterior of the foundation walls and backfill the walls with free draining, non-frost susceptible sand or sand and gravel such as that meeting OPSS requirements for Granular B Type I or II; or,
- Damp proof the exterior of the foundation walls and install an approved proprietary drainage material on the exterior of the foundation walls and backfill the walls with native material or imported soil.

A perforated plastic foundation drain with a surround of clear crushed stone should be installed on the exterior of the foundation walls at the underside of footing level. A nonwoven geotextile should be placed between the top of the clear stone and any sandy foundation wall backfill material to avoid loss of sand backfill into the voids in the clear stone (and possible post construction settlement of the ground around the houses). The top of the drain should be located below the bottom of the floor slab. The drain should outlet to a sump from which the water is pumped or should drain by gravity to a ditch or nearby storm sewer.

### 5.3.8 Basement Concrete Slab Support

To provide predictable settlement performance of the basement slab, all topsoil, disturbed soil, and any other deleterious materials should be removed from the slab area.

The base for the floor slab should consist of 19 millimetre clear crushed stone. Allowance should be made for between 150 and 200 millimetres of granular base material.

The clear crushed stone should be nominally compacted in maximum 300 millimetre thick lifts with at least 2 passes of a diesel plate compactor. In areas where the subgrade consists of silty sand, or sand and silt, a suitable nonwoven geotextile should be placed over the subgrade prior

to the placement of clear stone to prevent ingress into voids in the clear stone and possible settlement/cracking of the slab.

Underfloor drainage should be provided below the floor slab. If clear crushed stone is used below the floor slab, underfloor drains are not considered essential provided that stub drains are installed to link any hydraulically isolated areas in the basement. The clear stone below the floor slab should be hydraulically connected to the sump pit.

Basement floor slabs should be constructed in accordance with guidelines provided in ACI 302.1R-04 “Guide for Concrete Floor and Slab Construction”.

A polyethylene vapour barrier should be installed below the basement floor slabs.

#### 5.3.9 Seismic Site Classification and Liquefaction Potential

Based on the results of the test pits carried out as part of this investigation, it is recommended that Seismic Site Class B be used for the design of residential structures.

### 5.4 Site Services

#### 5.4.1 Overburden Excavation

The overburden excavations for the site services will likely be carried out through the topsoil, silty sand, and into the bedrock. This is due to there being near surface bedrock present across most of the site.

In the overburden, the excavation for flexible service pipes should be in accordance with Ontario Provincial Standard Drawing (OPSD) 802.010 for Type 3 Soil. The excavation for rigid service pipes should be in accordance with OPSD 802.031 for Type 3 soil.

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, most of the soils at this site can be classified as Type 3 soils. Therefore, for design purposes, allowance should be made for 1 horizontal to 1 vertical, or flatter, excavation slopes.

Excavation of the native soils above the groundwater should not present any excavation constraints. In contrast, excavation in the native silty sand and sand below the groundwater level could present constraints. Groundwater inflow from the silty sand and sand deposits could cause sloughing of the sides of the excavation and disturbance to the soils at the bottom of the excavation. Flatter side slopes may be required if excavation is required below the groundwater level in sand and silty sand deposits.

### 5.4.2 Bedrock Excavation

In bedrock, the excavation for flexible service pipes should be in accordance with OPSD 802.013 for bedrock. The excavation for rigid service pipes should be in accordance with OPSD 802.033 for bedrock.

Limited and localized removal of competent bedrock at this site could be carried out using hoe ramming techniques in conjunction with line drilling on close centres, but it will be tedious and time-consuming. Significant bedrock removal will likely require drilling and blasting.

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

Line drilling on close centres could be used to reduce, not prevent, over break and under break of the bedrock excavation and to define the limit of excavation next to existing structures and services. For the bedrock at this site, it is suggested that allowance be made for line drilling 75 to 100 millimetre diameter holes on 200 to 300 millimetre centres, if hoe-ramming is used for limited bedrock removal.

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.

If significant bedrock removal is required for the site development, guidelines on blasting could be provided upon request. Pre-blast surveys of existing buildings and infrastructure and vibration monitoring will be required for blasting.



### 5.4.3 Bedding and Cover

The bedding and cover for the proposed utilities should consist of least 150 millimetres of OPSS Granular A backfill placed in accordance with the applicable OPSD for the type of underground utility installed. The use of 19 millimetre clear stone is not recommended as bedding or cover.

The native silty sand deposits below the groundwater level are sensitive to disturbance. Allowance should be made for a subbedding composed of at least 300 millimetres of OPSS Granular B Type II where these materials are encountered at subgrade level below the pipe.

Bedding, subbedding and cover materials should be placed in lifts not exceeding 200 millimetres thick and compacted to at least 95 percent of the material's standard Proctor maximum dry density using suitably sized vibratory compaction equipment.

### 5.4.4 Trench Backfill

In areas where the service trench will be located below or in close proximity to existing or future areas of hard surfacing (i.e., roadways), acceptable native materials should be used as backfill

between the roadway subgrade level and the depth of seasonal frost penetration in order to reduce the potential for differential frost heaving between the area over the trench and the adjacent hard surfaced area. The depth of frost penetration in exposed areas can normally be taken as 1.8 metres below finished grade. Where native backfill is used, it should match the native materials exposed on the trench walls. 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.

It is anticipated that most of the inorganic overburden materials encountered during the subsurface investigation will be acceptable for reuse as trench backfill. Topsoil or other organic material should be wasted from the trench. If on-site blast rock is used as backfill within the service trench, it should be mostly 300 millimetres, or smaller, in size and should be well graded. To prevent ingress of fine material into voids in the blast rock, the upper surface of the blast rock should be covered with a thin layer of compacted, well graded crushed stone, such as OPSS Granular B Type II.

To minimize future settlement of the backfill and achieve an acceptable subgrade for the roadways, curbs, driveways, etc., the trench backfill should be compacted in maximum 300 millimetre thick lifts to at least 95 percent of the material's standard Proctor maximum dry density value using suitably sized vibratory compaction equipment. Rock fill should be placed in maximum 500 millimetre thick lifts and compacted with a large drum roller, the haulage and spreading equipment, or a combination of both. The specified density for compaction of the backfill materials may be reduced where the trench backfill is not located below or in close proximity to existing or future areas of hard surfacing and/or structures, provided that some settlement above the trench is acceptable.

The silty sand may have water contents that are too high for adequate compaction. Furthermore, depending on the weather conditions at the time of construction, some wetting of materials could occur. As such, the specified densities may not be possible to achieve and, as a consequence, some settlement of these backfill materials should be expected. Consideration could be given to implementing one or a combination of the following measures to reduce post construction settlement above the trenches, depending on the weather conditions encountered during the construction:

- Allow the overburden materials to dry prior to compaction;
- Reuse any wet materials in the lower part of the trenches and make provision to defer final paving of surface course (i.e., the Superpave 12.5 asphaltic concrete) in the roadways for 3 months, or longer, to allow the trench backfill settlement to occur and thereby improve the final roadway appearance.

## 6.0 INTERNAL ROADWAYS

### 6.1.1 Subgrade Preparation

In preparation for roadway construction at this site, all surficial topsoil, and any soft, wet, disturbed, or deleterious materials should be removed from the proposed roadways. Should it be necessary to raise the roadway grades at this site, material which meets OPSS specifications for Select Subgrade Material or Earth Borrow may be used. The select subgrade material or earth borrow should be placed in maximum 300-millimetre-thick lifts and compacted to at least 95 percent of the material's standard Proctor maximum dry density value using vibratory compaction equipment. Prior to placing granular material for the roadways, the exposed subgrade should be heavily proof rolled under suitable (dry) conditions and inspected and approved by geotechnical personnel. Any soft areas evident from the proof rolling should be subexcavated and replaced with suitable earth borrow, non-frost susceptible granular materials, or rock fill, as approved by the geotechnical engineer.

The subgrade should be shaped and crowned to promote drainage of the roadway granular materials.

### 6.1.2 Pavement Design

The following minimum pavement structure is suggested for local roadways at this site, assuming that the roadways will not be used as collector roads or bus routes:

- 90 millimetre thick layer of asphaltic concrete, comprising 40 millimetres of Superpave 12.5 Traffic Level B over 50 millimetres of Superpave 12.5 Traffic Level B; over
- 150-millimetre-thick layer of base (OPSS Granular A); over
- 300-millimetre-thick layer of subbase (OPSS Granular B Type II).

Bedrock was encountered within the area at depths ranging from 0.1 m to 1.0 m. Bedrock, where encountered for pavement excavations, should be removed to the bottom of the pavement and shattered to a depth of 300 mm below the bottom of the recommended pavement structure.

### 6.1.3 Effects of Soil Disturbance

The above pavement structures assumes that the roadway subgrade surface is prepared as described in this report. If the roadway subgrade surface is disturbed or wetted due to construction operations or precipitation, the granular thickness given above may not be adequate and it may be necessary to increase the thickness of the Granular B Type II subbase and/or to incorporate a woven geotextile separator between the roadway subgrade surface and the granular subbase material. The adequacy of the design pavement thickness should be assessed by geotechnical personnel at the time of construction. In our experience, a geotextile will likely be required in most cases where the subgrade consists of overburden, if the roadway construction is planned during the wet period of the year (such as the spring or fall).

Similarly, if the granular pavement materials are to be used by construction traffic, it may be necessary to increase the thickness of the Granular B Type II, install a woven geotextile separator between the roadway subgrade surface and the granular subbase material, or a combination of both, to prevent pumping and disturbance to the subbase material. The contractor should be made responsible for their construction access.

### 6.1.4 Granular Material Compaction

The pavement granular materials should be compacted in maximum 300-millimetre-thick lifts to at least 99 percent of the material's standard Proctor maximum dry density using suitable vibratory compaction equipment.

### 6.1.5 Asphaltic Cement

Performance graded PG 58-34 asphaltic cement is recommended for the local roadways within the proposed development.

### 6.1.6 Transition Treatments

In areas where the new pavement structure will abut existing pavements, the depths of the granular materials should taper up or down at 5 horizontal to 1 vertical, or flatter, to match the depths of the granular material(s) exposed in the existing pavement.

### 6.1.7 Pavement Drainage

Adequate drainage of the pavement granular materials and subgrade is important for the long term performance of the pavement at this site. It is suggested that the pavement granular material extend to suitable ditches. The bottom of the OPSS Granular B Type II should be at least 0.3 metres above the bottom of the ditch and the granular material should extend to the ditch slopes.

In the event that a perforated pipe subdrain system is preferred, the bottom of the subdrain trench should extend at least 0.3 metres below the surface of the subgrade with the perforated pipe installed approximately 50 millimetres above the bottom of the trench. The granular subbase layer should extend outward from the roadway to the top (and across) the subdrain trench to provide a continuous drainage path to the perforated pipe.

## 6.2 Corrosion of Buried Concrete and Steel

According to Canadian Standard Association (CSA_ "Concrete Materials and Methods of Concrete Construction", the concentration of sulphate in the soil samples recovered from test pit 23-06 can be classified as low. For low exposure conditions, any concrete that will be in contact with the native soil or groundwater could be batched with General Use (GU) type cement. The effects of freeze thaw in presence of de-icing chemical (sodium chloride) near the buildings should be considered in selecting the air entrainment and the concrete mix proportions for any exposed concrete.

Based on the resistivity and pH of the soil sample tested, the soil can generally be classified as non aggressive towards unprotect steel. It is noted that the corrosivity of the soil could vary throughout the year due to the application of sodium chloride for de-icing purposes.

## 6.3 Stormwater Management Pond

### 6.3.1 Excavation

The excavations for the stormwater management pond will likely extend through any surficial topsoil and native overburden deposits and into the bedrock. The excavations for the proposed stormwater management pond should be carried out as per Section 5.4. Appropriate permitting for groundwater management activities should be obtained in advance of construction.

### 6.3.2 Berm Construction

In preparation for berm construction at this site (if required), all surficial topsoil, and any soft, wet, disturbed, or deleterious materials should be removed from the proposed berm footprint.

For portions of a berm intended to restrict the flow of water, relatively low-permeability earth fill material could be considered (e.g., silty clay, clayey silt, etc.). An assessment of suitable materials should be made by geotechnical personnel. This material should be placed in maximum 300 millimetre thick lifts and compacted to at least 95 percent of the materials standard Proctor maximum dry density value, using “sheep’s foot” type compaction equipment.

Above the water retention level or if the restriction of water flow is not required, the berms could be constructed with the on site overburden deposits (e.g., silty sand) imported earth fill or well graded blast rock with a maximum particle size of about 100 millimetres. Earth fill material should be compacted in maximum 300 millimetre thick lifts to at least 95 percent of the materials standard Proctor maximum dry density value using suitable, vibratory compaction equipment. Well graded blast rock should be nominally compacted in 500 millimetre thick lifts with the hauling and spreading equipment.

The berm slopes should be constructed no steeper than 3 horizontal to 1 vertical. The berm side slopes should be protected from erosion immediately following construction using suitable erosion mats. Seeding and shrub/vegetation planting should then be implemented for long term erosion protection.

### 6.3.3 Inlet and Outlet Structures

Concrete inlet and outlet structures, if required, are likely to be founded on the native overburden deposits, a pad of engineered fill on the native overburden deposits or on the bedrock surface. The structures should be constructed in accordance with OPSD 804.040. All topsoil and loose or water softened soils should be removed from the footprint of the headwalls.

The engineered fill for the headwalls should be placed and compacted as discussed in Section 5.3.4, above.

For preliminary design purposes, the headwall footings should be sized using the bearing resistances indicated in the following table:

| Subgrade Material | Ultimate Limit States (ULS) Bearing Reaction | Servicability Limit States (SLS) Bearing Resistance |
|---|---|---|
| Bedrock | 500 | N/A* |
| Engineered Fill or Native Sand | 200 | 150 |

* The loading to induce 25 mm of settlement is greater than the ULS reaction and therefore the ULS reaction governs.

The post construction total and differential settlement of the footings should be less than 25 and 15 millimetres, respectively, provided that all loose or disturbed soil is removed from the bearing surfaces.

It is recommended that depth of earth cover for frost protection be taken as 1.8 metres. If the structures are bearing on engineered fill material, the required cover could be reduced by the thickness of the engineered fill. Where the foundation will be exposed or have minimal earth cover, the subgrade surface materials below founding level could be protected with a combination of earth cover and extruded polystyrene insulation.

The inlet and outlet structures should be backfilled with free draining, non-frost susceptible sand or sand and gravel. The material should meet OPSS gradation requirements for Granular B Type I or II. The structure backfill material should be compacted in maximum 200 millimetre thick liufts to at least 95 percent of the materials standard Proctor maximum dry density value using suitable vibratory compaction equipment. The granular backfill materials should extend at least 1.5 metres horizontally beyond the inside face of the headwall.

Light, hand operated equipment should be used to compact the backfill material to prevent excessive compaction induced stress on the structures.

### 6.3.4 Base of Pond

In areas where the proposed base of the stormwater management pond is above the level of the native soil, or where subexcavation of disturbed material is required below base of the stormwater management pond, the grade can be raised using imported material consisting of engineered fill meeting the requirements of OPSS Granular B Type II.

The engineered fill should be compacted in maximum 200 millimetre thick lifts to at least 95 percent of the materials standard Proctor maximum dry density.

### 6.3.5 Pond Liner Requirement

The decision to provide the proposed stormwater management pond with a pond liner, the appropriate liner type (consisting of natural materials or prefabricated materials), and any additional underdrainage works is the responsibility of the pond designer. Where a prefabricated liner is used, the liner manufacturer should be consulted for construction requirements particular to the liner.

The following commentary is provided from a geotechnical perspective for consideration by the pond designer (in combination with other important considerations);

- The depth of the pond is unknown and given the shallow bedrock encountered in test pits, the pond is likely to extend into bedrock. Estimates of bedrock hydraulic conductivity have not been completed as part of the geotechnical investigation.
- Long-term seasonal groundwater level monitoring of the bedrock is recommended to establish the seasonal variation in groundwater levels. Long-term groundwater level measurements would allow more detailed assessment of the range of groundwater levels that may occur within the bedrock and potential for uplift on the pond liner. The potential for groundwater inflow to the pond (either dry or wet) should be considered.

Please note that a hydrogeological investigation for the site and the surrounding areas has not been prepared. An assessment of the potential effect of the pond on nearby sensitive receivers, water extraction points, and potential sources of contamination that may be mobilised by the operation of the pond may influence the design approach for the pond (in particular if ongoing inflow to the pond is likely to occur).



## 7.0 ADDITIONAL CONSIDERATIONS

### 7.1 Design Review

Only conceptual information regarding the proposed development was available to GEMTEC at the time of this report. GEMTEC should be retained to review the design as it progresses to assess if the design is consistent with the information and guidance in this report or if additional information may be required.

### 7.2 Supplemental Investigation

It should be noted that if bedrock removal is required based on the proposed grades, an additional geotechnical investigation is recommended in order to determine type and quality of bedrock and the groundwater level within the bedrock.

### 7.3 Winter Considerations

Provision must be made to prevent freezing of any soil below the level of any footings, slabs or services. Freezing of the soil could result in heaving related damage.

Any service 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.

### 7.4 Effects of Construction Induced Vibration

Some of the construction operations (such as granular material compaction, excavation, hoe ramming, blasting, etc.) will cause ground vibration on and off of the site. The vibrations will attenuate with distance from the source but may be felt at nearby structures.

### 7.5 Disposal of Excess Soil

It is noted that the professional services retained for this project include only the geotechnical aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or subsurface contamination, including naturally occurring source of contamination, are outside the terms of reference for this report.

### 7.6 Construction Inspections

As previously indicated, 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 development should be inspected on a lot by lot basis 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.

## 8.0 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.

Tim Meighen, B.A.Sc.,
Geotechnical Scientist

Bill Cavers, P.Eng.,
Principal Geotechnical Engineer

GEMTEC
Consulting Engineers and Scientists

## CONDITIONS AND LIMITATIONS OF THIS REPORT

1. **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.
2. **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.
3. **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 cannot be responsible for use of portions of the report without reference to the entire report.
4. **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.
5. **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.
6. **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.
7. **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.
8. **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.
9. **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.

10. **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 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.

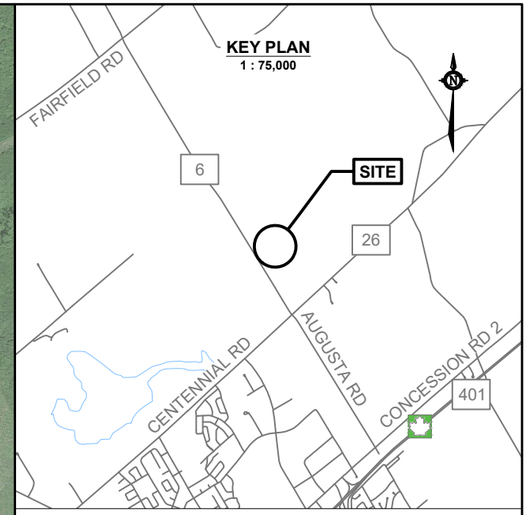
11. **Sample Disposal:** GEMTEC will dispose of all uncontaminated soil and/or rock samples 60 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fill materials 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.

12. **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.

13. **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.

14. **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.


**LEGEND**

- **BH #** — BOREHOLE ID
- **XX.XX** — GROUND SURFACE ELEVATION, IN METRES GEODETIC DATUM
- **BOREHOLE LOCATION** (current investigation by GEMTEC)
- **APPROXIMATE SITE BOUNDARY**

DRAFT

GENERAL NOTE(S)

1. Coordinate system: NAD83, UTM ZONE 18
2. Distances, elevations, and coordinates are shown in metres unless denoted otherwise
2. All boundaries and dimensions are approximate
3. Contains information licensed under the Open Government Licence – Ontario
4. Maps Data: Google, @2023 CNES / Airbus, First Base Solutions, Maxar Technologies
5. Geographic dataset source: Ontario GeoHub

SCALE

1:2,000

0 40 80 120m

DRAWING

TEST PIT LOCATION PLAN

CLIENT

ROBINSON CONSULTANTS INC.

PROJECT

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT, ROWS CORNERS FAIRGROUND
3823 COUNTY ROAD 6
TOWNSHIP OF ELIZABETHTOWN-KITLEY, ONTARIO

| DRAWN BY | CHECKED BY |
|---|---|
| S.L. | B.C. |
| PROJECT NO. | REVISION NO. |
| 100030.029 | 0 |
| DATE | FIGURE NO. |
| DECEMBER 2023 | **FIGURE 1** |

GEMTEC
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Ottawa, ON, K2K 2A9
Tel: (613) 836-1422
www.gemtec.ca
ottawa@gemtec.ca

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# APPENDIX A

Record of Test Pit logs
Test Pits 23-01 to 23-15

# RECORD OF TEST PIT 23-01

CLIENT: Robinson Consulting Inc.
PROJECT: Geotechnical Investigation, Proposed Residential Development, 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario
JOB#: 100030.029
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 28 2023

| DEPTH SCALE METRES | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLE NUMBER | SAMPLE TYPE | SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % (W, $W_P$, $W_L$) | ADDITIONAL LAB. TESTING | WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface | | 103.9 | | | 10 20 30 40 50 60 70 80 90 | | |
| | Topsoil | | 103.8 | | | | | |
| | Brown SILT and SAND, some gravel, with rootlets | | 0.1 | 1 | GS | | M | Backfilled with Cuttings |
| | Dark brown silty SAND, with rootlets | | 103.6 0.2 | 2 | GS | | MH | |
| | End of Test Pit Refusal on Bedrock | | 103.4 0.5 | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |



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LOGGED: PS
CHECKED: BC

# RECORD OF TEST PIT 23-02

CLIENT: Robinson Consulting Inc.
PROJECT: Geotechnical Investigation, Proposed Residential Development, 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario
JOB#: 100030.029
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 28 2023

| DEPTH SCALE METRES | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLE NUMBER | SAMPLE TYPE | SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % ($W_P$, W, $W_L$) | ADDITIONAL LAB. TESTING | WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface | | 103.7 | | | 10 20 30 40 50 60 70 80 90 | | Backfilled with Cuttings |
| | Brown, crushed silty sand and gravel (FILL) | | 103.6 / 0.1 | 1 | GS | | | |
| | Dark brown silty sand, some gravel (FILL) | | 103.4 / 0.3 | 2 | GS | | | |
| | End of Test Pit<br>Refusal on Bedrock | | | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |



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LOGGED: PS
CHECKED: BC

# RECORD OF TEST PIT 23-03

CLIENT: Robinson Consulting Inc.
PROJECT: Geotechnical Investigation, Proposed Residential Development, 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario
JOB#: 100030.029
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 28 2023

| DEPTH SCALE METRES | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLE NUMBER | SAMPLE TYPE | SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % (W, $W_P$, $W_L$) | ADDITIONAL LAB. TESTING | WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface | | 104.6 | | | 10 20 30 40 50 60 70 80 90 | | |
| | Topsoil | | | | | | | Backfilled with Cuttings |
| | | | 104.4 | | | | | |
| | End of Test Pit<br>Refusal on Bedrock | | 0.2 | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |



GEMTEC
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LOGGED: PS
CHECKED: BC

# RECORD OF TEST PIT 23-04

CLIENT: Robinson Consulting Inc.
PROJECT: Geotechnical Investigation, Proposed Residential Development, 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario
JOB#: 100030.029
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 28 2023

| DEPTH SCALE METRES | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLE NUMBER | SAMPLE TYPE | SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % (W, $W_P$, $W_L$) | ADDITIONAL LAB. TESTING | WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface | | 104.6 | | | 10 20 30 40 50 60 70 80 90 | | |
| | Topsoil | | | | | | | Backfilled with Cuttings |
| | | | 104.4 | | | | | |
| | End of Test Pit<br>Refusal on Bedrock | | 0.2 | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |



GEMTEC
Consulting Engineers and Scientists

LOGGED: PS
CHECKED: BC

# RECORD OF TEST PIT 23-05

CLIENT: Robinson Consulting Inc.
PROJECT: Geotechnical Investigation, Proposed Residential Development, 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario
JOB#: 100030.029
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 28 2023

| DEPTH SCALE METRES | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLE NUMBER | SAMPLE TYPE | SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % ($W_P$, W, $W_L$) | ADDITIONAL LAB. TESTING | WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface | | 103.5 | | | 10 20 30 40 50 60 70 80 90 | | |
| | Brown silty SAND, trace gravel, with rootlets | | 103.4 | 1 | GS | | | Backfilled with Cuttings |
| | End of Test Pit<br>Refusal on Bedrock | | 0.1 | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |



GEMTEC
Consulting Engineers and Scientists

LOGGED: PS
CHECKED: BC

# RECORD OF TEST PIT 23-06

CLIENT: Robinson Consulting Inc.
PROJECT: Geotechnical Investigation, Proposed Residential Development, 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario
JOB#: 100030.029
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 28 2023

| DEPTH SCALE METRES | DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLE NUMBER | SAMPLE TYPE | SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % ($W_P$, W, $W_L$) | ADDITIONAL LAB. TESTING | WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface | | 104.4 | | | 10 20 30 40 50 60 70 80 90 | | Backfilled with Cuttings |
| | Topsoil | | 104.3 / 0.1 | | | | | |
| | Brown, gravelly, silty SAND, some gravel, with cobbles | | | 1 | GS | | M | |
| | Dark brown silty SAND | | 104.1 / 0.3 | 2 | GS | | MH | |
| 1 | End of Test Pit<br>Refusal on Excavation | | 103.4 / 1.0 | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |



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LOGGED: PS
CHECKED: BC

# RECORD OF TEST PIT 23-07

CLIENT: Robinson Consulting Inc.
PROJECT: Geotechnical Investigation, Proposed Residential Development, 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario
JOB#: 100030.029
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 28 2023

| DEPTH SCALE METRES | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLE NUMBER | SAMPLE TYPE | SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % ($W_P$, W, $W_L$) | ADDITIONAL LAB. TESTING | WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface | | 104.3 | | | 10 20 30 40 50 60 70 80 90 | | |
| | Topsoil | | 104.2 | | | | | Backfilled with Cuttings |
| | Dark brown silty SAND, trace gravel, with cobbles and rootlets | | 0.2 | 1 | GS | | | |
| | End of Test Pit<br>Refusal on Bedrock | | 104.0<br>0.3 | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |



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Consulting Engineers and Scientists

LOGGED: PS
CHECKED: BC

# RECORD OF TEST PIT 23-08

CLIENT: Robinson Consulting Inc.
PROJECT: Geotechnical Investigation, Proposed Residential Development, 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario
JOB#: 100030.029
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 28 2023

| DEPTH SCALE METRES | DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLE NUMBER | SAMPLE TYPE | SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % ($W_P$, W, $W_L$) | ADDITIONAL LAB. TESTING | WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface | | 103.5 | | | 10 20 30 40 50 60 70 80 90 | | |
| | Topsoil | | 103.3 | | | | | |
| | Brown silty SAND, trace gravel, with rootlets | | 0.2 | 1 | GS | | M | Backfilled with Cuttings |
| 1 | | | 103.1 | | | | | |
| | End of Test Pit<br>Refusal on Bedrock | | 0.4 | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |



GEMTEC
Consulting Engineers and Scientists

LOGGED: PS
CHECKED: BC

# RECORD OF TEST PIT 23-09

CLIENT: Robinson Consulting Inc.
PROJECT: Geotechnical Investigation, Proposed Residential Development, 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario
JOB#: 100030.029
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 28 2023

| DEPTH SCALE METRES | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLE NUMBER | SAMPLE TYPE | SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % ($W_P$, W, $W_L$) | ADDITIONAL LAB. TESTING | WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface | | 103.7 | | | 10 20 30 40 50 60 70 80 90 | | |
| | Topsoil | | 103.5 | | | | | Backfilled with Cuttings |
| | Brown SILT and SAND, trace gravel, with rootlets | | 0.2 | 1 | GS | | M | |
| | End of Test Pit<br>Refusal on Bedrock | | 103.4<br>0.4 | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |



GEMTEC
Consulting Engineers and Scientists

LOGGED: PS
CHECKED: BC

# RECORD OF TEST PIT 23-10

CLIENT: Robinson Consulting Inc.
PROJECT: Geotechnical Investigation, Proposed Residential Development, 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario
JOB#: 100030.029
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 28 2023

| DEPTH SCALE METRES | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLE NUMBER | SAMPLE TYPE | SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % ($W_P$, W, $W_L$) | ADDITIONAL LAB. TESTING | WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface | | 104.4 | | | 10 20 30 40 50 60 70 80 90 | | |
| | Topsoil | | | | | | | Backfilled with Cuttings |
| | | | 104.2 | | | | | |
| | End of Test Pit<br>Refusal on Bedrock | | 0.2 | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |



GEMTEC
Consulting Engineers and Scientists

LOGGED: PS
CHECKED: BC

# RECORD OF TEST PIT 23-11

CLIENT: Robinson Consulting Inc.
PROJECT: Geotechnical Investigation, Proposed Residential Development, 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario
JOB#: 100030.029
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 28 2023

| DEPTH SCALE METRES | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLE NUMBER | SAMPLE TYPE | SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % (W, $W_P$, $W_L$) | ADDITIONAL LAB. TESTING | WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface | | 103.3 | | | 10 20 30 40 50 60 70 80 90 | | |
| | Topsoil | | | | | | | Backfilled with Cuttings |
| | | | 103.1 | | | | | |
| | End of Test Pit<br>Refusal on Bedrock | | 0.2 | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |



GEMTEC
Consulting Engineers and Scientists

LOGGED: PS
CHECKED: BC

# RECORD OF TEST PIT 23-12

CLIENT: Robinson Consulting Inc.
PROJECT: Geotechnical Investigation, Proposed Residential Development, 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario
JOB#: 100030.029
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 28 2023

| DEPTH SCALE METRES | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLE NUMBER | SAMPLE TYPE | SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % ($W_P$, W, $W_L$) | ADDITIONAL LAB. TESTING | WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface | | 103.2 | | | 10 20 30 40 50 60 70 80 90 | | |
| | Topsoil | | 103.0 | | | | | Backfilled with Cuttings |
| | Fractured BEDROCK | | 0.2 | 1 | GS | | | |
| | End of Test Pit<br>Refusal on Bedrock | | 102.9<br>0.3 | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |



GEMTEC
Consulting Engineers and Scientists

LOGGED: PS
CHECKED: BC

# RECORD OF TEST PIT 23-13

CLIENT: Robinson Consulting Inc.
PROJECT: Geotechnical Investigation, Proposed Residential Development, 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario
JOB#: 100030.029
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 28 2023

| DEPTH SCALE METRES | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLE NUMBER | SAMPLE TYPE | SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % ($W_P$, W, $W_L$) | ADDITIONAL LAB. TESTING | WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface | | 103.1 | | | 10 20 30 40 50 60 70 80 90 | | |
| | Topsoil | | | | | | | Backfilled with Cuttings |
| | | | 102.9 | | | | | |
| | End of Test Pit<br>Refusal on Bedrock | | 0.2 | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |



GEMTEC
Consulting Engineers and Scientists

LOGGED: PS
CHECKED: BC

# RECORD OF TEST PIT 23-14

CLIENT: Robinson Consulting Inc.
PROJECT: Geotechnical Investigation, Proposed Residential Development, 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario
JOB#: 100030.029
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 28 2023

| DEPTH SCALE METRES | DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLE NUMBER | SAMPLE TYPE | SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % ($W_P$, W, $W_L$) | ADDITIONAL LAB. TESTING | WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface | | 103.4 | | | 10 20 30 40 50 60 70 80 90 | | |
| | Topsoil | | 103.2 / 0.2 | | | | | Backfilled with Cuttings |
| | Fractured BEDROCK | | 103.1 / 0.3 | | | | | |
| | End of Test Pit<br>Refusal on Bedrock | | | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |



GEMTEC
Consulting Engineers and Scientists

LOGGED: PS
CHECKED: BC

# RECORD OF TEST PIT 23-15

CLIENT: Robinson Consulting Inc.
PROJECT: Geotechnical Investigation, Proposed Residential Development, 3823 County Road 6, Township of Elizabethtown-Kitley, Ontario
JOB#: 100030.029
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 28 2023

| DEPTH SCALE METRES | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLE NUMBER | SAMPLE TYPE | SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % (W, $W_P$, $W_L$) | ADDITIONAL LAB. TESTING | WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface | | 104.3 | | | 10 20 30 40 50 60 70 80 90 | | |
| | Topsoil | | 104.1 / 0.2 | | | | | Backfilled with Cuttings |
| | End of Test Pit<br>Refusal on Bedrock | | | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |



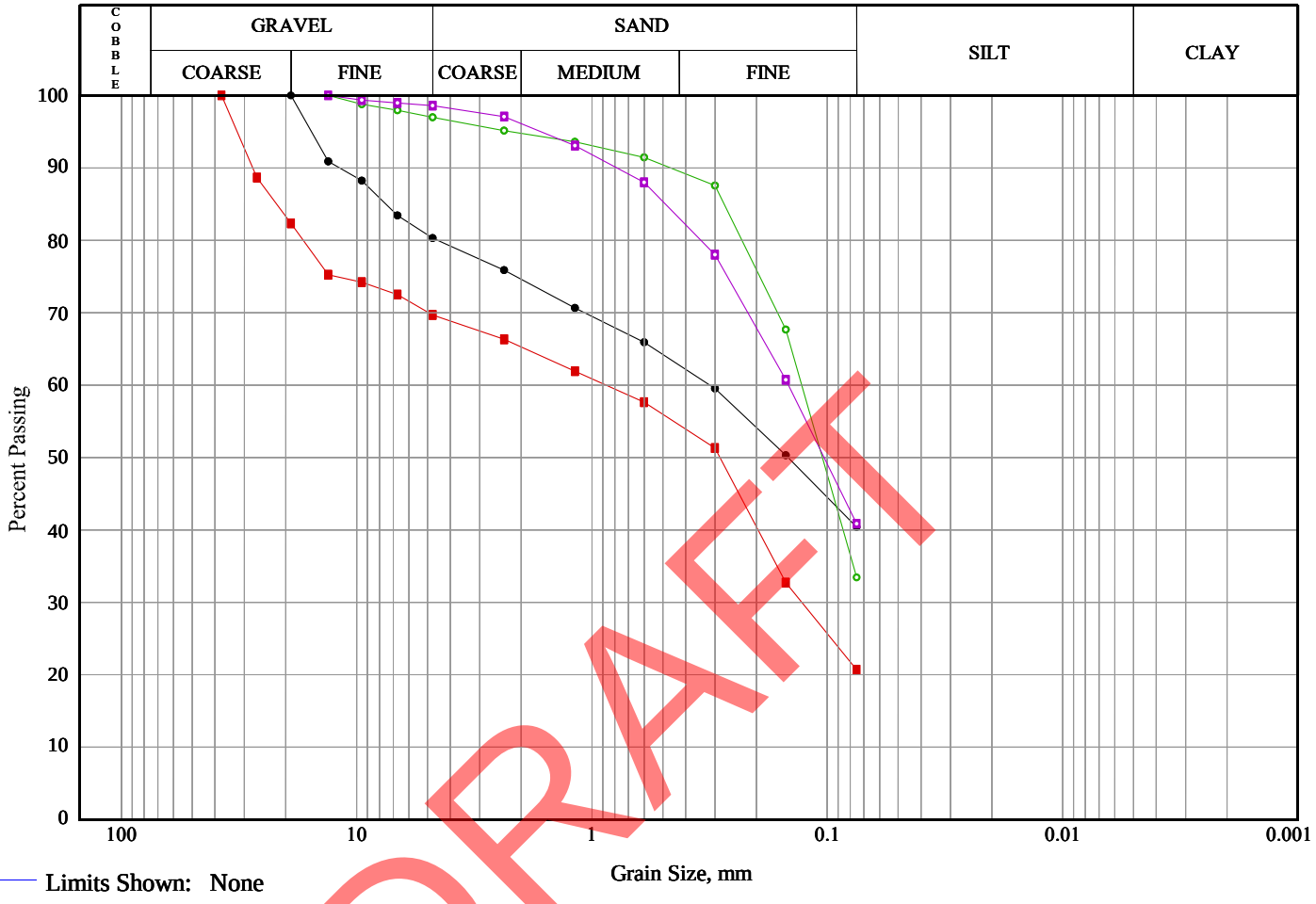
GEMTEC
Consulting Engineers and Scientists

LOGGED: PS
CHECKED: BC

# APPENDIX B

Laboratory Test Results
Grain Size Distribution

| GEMTEC Consulting Engineers and Scientists | Client: Robinson Consultants Inc. | Soils Grading Chart |
|---|---|---|
| | Project: Rows Corners Park, Elizabethtown | |
| | Project #: 100030029 | |

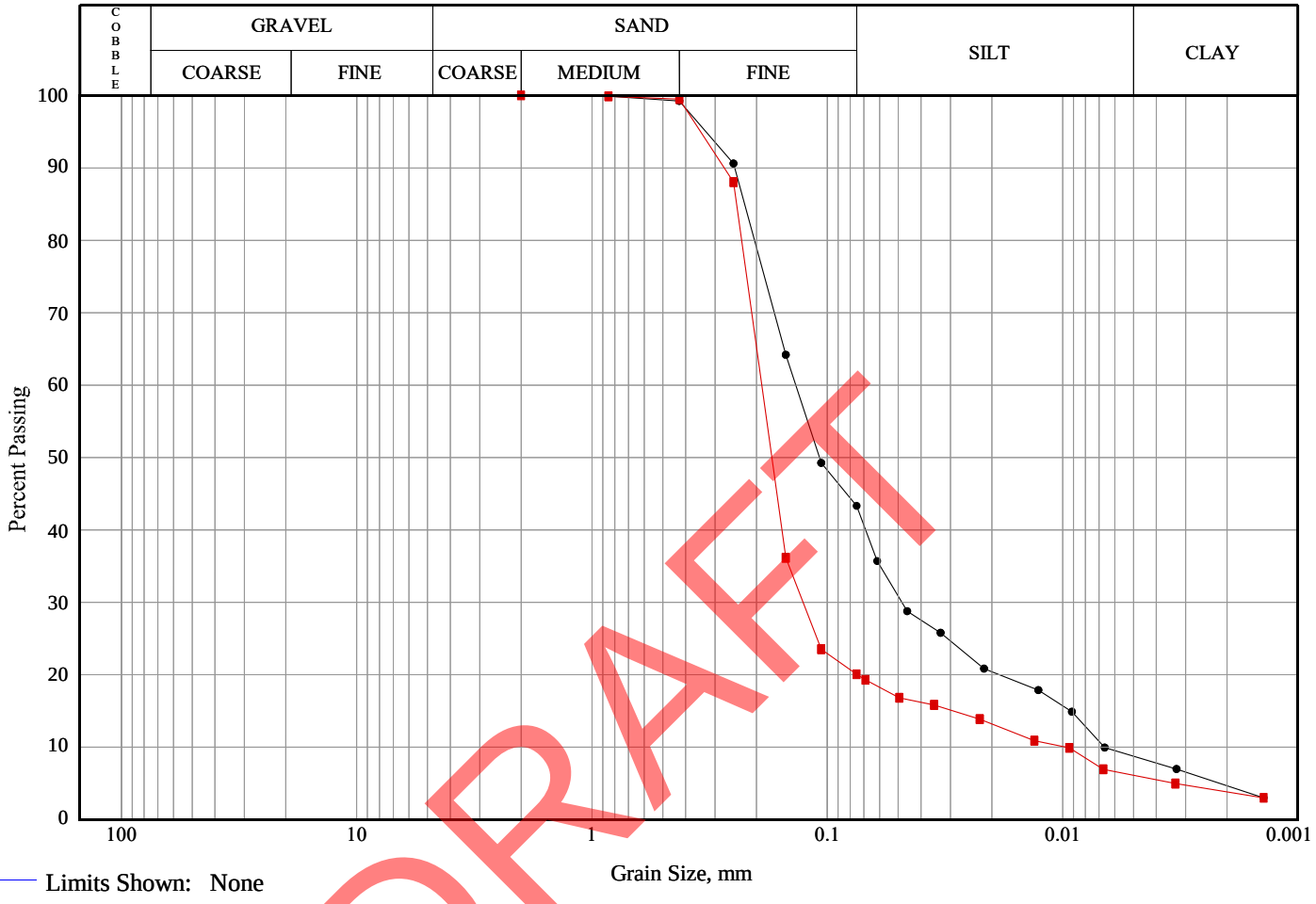





| Line Symbol | Sample | Borehole/ Test Pit | Sample Number | Depth | % Cob.+ Gravel | % Sand | % Silt | % Clay |
|---|---|---|---|---|---|---|---|---|
| | | TP23-01 | SA 1 | 0.09-0.23 | 19.7 | 39.9 | 40.4 | |
| | | TP23-06 | SA 1 | 0.10-0.30 | 30.3 | 49.0 | 20.7 | |
| | | TP23-08 | SA 1 | 0.17-0.38 | 3.0 | 63.6 | 33.4 | |
| | | TP23-09 | SA 1 | 0.24-0.35 | 1.4 | 57.8 | 40.8 | |

| Line Symbol | CanFEM Classification | USCS Symbol | $D_{10}$ | $D_{15}$ | $D_{30}$ | $D_{50}$ | $D_{60}$ | $D_{85}$ | % 5-75µm |
|---|---|---|---|---|---|---|---|---|---|
| | Silt and sand , some gravel | N/A | --- | --- | --- | 0.15 | 0.32 | 7.52 | --- |
| | Gravelly silty sand | N/A | --- | --- | 0.13 | 0.29 | 0.87 | 21.88 | --- |
| | Silty sand , trace gravel | N/A | --- | --- | --- | 0.10 | 0.13 | 0.27 | --- |
| | Sand and silt , trace gravel | N/A | --- | --- | --- | 0.10 | 0.15 | 0.49 | --- |

| GEMTEC Consulting Engineers and Scientists | Client: Robinson Consultants Inc. | Soils Grading Chart (LS-702/ ASTM D-422) |
|---|---|---|
| | Project: Rows Corners Park, Elizabethtown | |
| | Project #: 100030029 | |






| Line Symbol | Sample | Borehole/ Test Pit | Sample Number | Depth | % Cob.+ Gravel | % Sand | % Silt | % Clay |
|---|---|---|---|---|---|---|---|---|
| ● | | TP23-01 | SA 2 | 0.23-0.50 | 0.0 | 56.7 | 34.6 | 8.7 |
| ■ | | TP23-06 | SA 2 | 0.30-1.04 | 0.0 | 80.0 | 13.9 | 6.1 |
| | | | | | | | | |
| | | | | | | | | |

| Line Symbol | CanFEM Classification | USCS Symbol | $D_{10}$ | $D_{15}$ | $D_{30}$ | $D_{50}$ | $D_{60}$ | $D_{85}$ | % 5-75µm |
|---|---|---|---|---|---|---|---|---|---|
| ● | Silty sand , trace clay | N/A | 0.01 | 0.01 | 0.05 | 0.11 | 0.14 | 0.22 | 34.6 |
| ■ | Sand , some silt , trace clay | N/A | 0.01 | 0.03 | 0.13 | 0.17 | 0.19 | 0.24 | 13.9 |
| | | | | | | | | | |
| | | | | | | | | | |

# APPENDIX C

Chemical Analysis of Soil Sample
Sample Relating to Corrosion
(Paracel Laboratories Ltd. Order No. 2348407)

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Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

# Certificate of Analysis

**GEMTEC Consulting Engineers and Scientists Limited**
32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Tim Meighen

Client PO:
Project: 100030.029
Custody:

Report Date: 6-Dec-2023
Order Date: 29-Nov-2023

**Order #: 2348407**



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

| Paracel ID | Client ID |
|---|---|
| 2348407-01 | TP23-06 SA2 |

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 06-Dec-2023

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

Order Date: 29-Nov-2023

**Client PO:**

**Project Description: 100030.029**

## Analysis Summary Table

| Analysis | Method Reference/Description | Extraction Date | Analysis Date |
|---|---|---|---|
| Anions | EPA 300.1 - IC, water extraction | 5-Dec-23 | 6-Dec-23 |
| Conductivity | MOE E3138 - probe @25 °C, water ext | 4-Dec-23 | 4-Dec-23 |
| pH, soil | EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext. | 4-Dec-23 | 4-Dec-23 |
| Resistivity | EPA 120.1 - probe, water extraction | 4-Dec-23 | 4-Dec-23 |
| Solids, % | CWS Tier 1 - Gravimetric | 5-Dec-23 | 6-Dec-23 |

Certificate of Analysis

Report Date: 06-Dec-2023

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

Order Date: 29-Nov-2023

**Client PO:**

**Project Description: 100030.029**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Client ID:** | TP23-06 SA2 | - | - | - | | |
| | **Sample Date:** | 28-Nov-23 10:20 | - | - | - | - | - |
| | **Sample ID:** | 2348407-01 | - | - | - | | |
| | **Matrix:** | Soil | - | - | - | | |
| | **MDL/Units** | | | | | | |
| **Physical Characteristics** | | | | | | | |
| % Solids | 0.1 % by Wt. | 85.8 | - | - | - | - | - |
| **General Inorganics** | | | | | | | |
| Conductivity | 5 uS/cm | 106 | - | - | - | - | - |
| pH | 0.05 pH Units | 7.13 | - | - | - | - | - |
| Resistivity | 0.1 Ohm.m | 94.6 | - | - | - | - | - |
| **Anions** | | | | | | | |
| Chloride | 10 ug/g | <10 | - | - | - | - | - |
| Sulphate | 10 ug/g | <10 | - | - | - | - | - |

## Method Quality Control: Blank

| Analyte | Result | Reporting Limit | Units | %REC | %REC Limit | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|
| **Anions** | | | | | | | | |
| Chloride | ND | 10 | ug/g | | | | | |
| Sulphate | ND | 10 | ug/g | | | | | |
| **General Inorganics** | | | | | | | | |
| Conductivity | ND | 5 | uS/cm | | | | | |
| Resistivity | ND | 0.1 | Ohm.m | | | | | |

## Method Quality Control: Duplicate

| Analyte | Result | Reporting Limit | Units | Source Result | %REC | %REC Limit | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|
| **Anions** | | | | | | | | | |
| Chloride | 158 | 10 | ug/g | 152 | | | 3.5 | 35 | |
| Sulphate | 46.9 | 10 | ug/g | 44.4 | | | 5.5 | 35 | |
| **General Inorganics** | | | | | | | | | |
| Conductivity | 593 | 5 | uS/cm | 595 | | | 0.3 | 5 | |
| pH | 6.57 | 0.05 | pH Units | 6.57 | | | 0.0 | 2.3 | |
| Resistivity | 16.9 | 0.1 | Ohm.m | 16.8 | | | 0.3 | 20 | |
| **Physical Characteristics** | | | | | | | | | |
| % Solids | 80.2 | 0.1 | % by Wt. | 82.0 | | | 2.2 | 25 | |

## Method Quality Control: Spike

| Analyte | Result | Reporting Limit | Units | Source Result | %REC | %REC Limit | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|
| **Anions** | | | | | | | | | |
| Chloride | 254 | 10 | ug/g | 152 | 102 | 82-118 | | | |
| Sulphate | 144 | 10 | ug/g | 44.4 | 99.7 | 80-120 | | | |

Certificate of Analysis

Report Date: 06-Dec-2023

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

Order Date: 29-Nov-2023

**Client PO:**

**Project Description: 100030.029**

**Qualifier Notes:**

**Sample Data Revisions:**

None

**Work Order Revisions / Comments:**

None

**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.

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**Paracel ID: 2348407**

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: 100030.029 |
| Contact Name: Tim Meighen | Quote # |
| Address: 32 Steacie, Kanata | PO # |
| Telephone: 613-602-2691 | Email Address: Timothy.Meighen@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)

**Required Analyses**

**Paracel Order Number:** 2348407

| | Sample ID/Location Name | Matrix | Air Volume | # of Containers | Sample Taken Date | Sample Taken Time | PHCs F1-F4+BTEX | VOCs | PAHs | Metals by ICP | Hg | CrVI | B (HWS) | Chloride | Sulphate | Elec. Conductivity | Elec. Resistivity | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | TP 23-06 SA2 | S | | 1 | Nov 28/23 | 10:20AM | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ |
| 2 | | | | | | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | | | | | | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | | | | | | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | | | | | | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6 | | | | | | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 7 | | | | | | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 8 | | | | | | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 9 | | | | | | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 10 | | | | | | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Comments:

Method of Delivery: Walk-in

| | | | |
|---|---|---|---|
| Relinquished By (Sign): | Received by Driver/Depot: | Received at Lab: HP | Verified By: Hina |
| Relinquished By (Print): Karel Neil | Date/Time: Nov 29/23 3:45 pm | Date/Time: Nov 30, 23 11:05 | Date/Time: Nov 30, 23 15:30 |
| Date/Time: Nov. 29/23 12:52pm | Temperature: 14.7 °C | Temperature: 6.9 °C | pH Verified [ ] By: |

experience • knowledge • integrity

| | |
|---|---|
| civil | civil |
| geotechnical | géotechnique |
| environmental | environnement |
| structural | structures |
| field services | surveillance de chantier |
| materials testing | service de laboratoire des matériaux |



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