# Preliminary Geotechnical Investigation

*Sifton Properties Ltd.*

**Project Name:**
Proposed Development
10242 Glendon Drive
Komoka, Ontario

**Project Number:**
KCH-25002312-A0

**Prepared By:**
EXP Services Inc.
15701 Robins Hill Road
London, Ontario, N5V 0A5
t: +1.519.963.3000
f: +1.519.963.1152

**Date Submitted:**
February 14, 2025

# Preliminary Geotechnical Investigation

*Sifton Properties Ltd.*

**Type of Document:**

Preliminary Geotechnical Report

**Project Name:**

Proposed Development
10242 Glendon Drive
Komoka, Ontario

**Project Number:**

KCH-25002312-A0

**Prepared and Reviewed By:**

EXP Services Inc.
15701 Robins Hill Road
London, ON, N5V 0A5
t: +1.519.963.3000
f: +1.519.963.1152


Mark Bertens, P.Eng.
Geotechnical Services


Eric Buchanan, P.Eng.
Geotechnical Services

Geordy Fournier, P.Eng.
Geotechnical Services

**Date Submitted:**

February 14, 2025

# Table of Contents

## Appendices

# 1. Introduction and Background

## 1.1 Introduction

EXP Services Inc. (EXP) was retained by **Sifton Properties Ltd.** (Client) to update a geotechnical report previously prepared for another client. The scope of work was to carry out a preliminary geotechnical investigation and prepare a report relating to the proposed development at 10242 Glendon Drive in Komoka, Ontario, hereinafter referred to as the 'Site'.

Based on a draft plan of subdivision provided by the Client, it is understood the proposed development consists of a combination of low and medium density residential blocks and a mixed-use block. The proposed development is expected to have complete municipal servicing, paved local, collector or access roads, parking, and landscaped areas.

Based on an interpretation of the factual test hole data and a review of soil and groundwater information from test holes advanced at the site by EXP and others, EXP has provided geotechnical engineering guidelines to support the proposed Site development.

## 1.2 Terms of Reference

The purpose of the investigation was to examine the subsoil and groundwater conditions at the site by advancing a series of boreholes at the locations chosen by EXP and illustrated on the attached Borehole Location Plan (**Drawing 1**).

Based on an interpretation of the factual borehole data, and a review of soil and groundwater information from test holes advanced at the site, EXP Services Inc. has provided engineering guidelines for the geotechnical design and construction of the proposed development. More specifically, this report provides comments on site preparation, excavations, dewatering, foundations, slab-on-grade and basement construction, earthquake design considerations, pavement recommendations, and curbs and sidewalks.

This report is provided on the basis of the terms of reference presented above, and on the assumption that the design will be in accordance with applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning geotechnical aspects of the codes and standards, this office should be contacted to review the design.

The information in this report in no way reflects on the environmental aspects of the soil. Should specific information in this regard be needed, additional testing may be required.

Reference is made to **Appendix C** of this report, which contains further information necessary for the proper interpretation and use of this report.

# 2. Methodology

The fieldwork was carried out on July 13, 17, and 19, 2023. In general, the preliminary geotechnical investigation consisted of the advancement of eleven (11) boreholes at the locations shown on **Drawing 1** as BH1 to BH11. MW was suffixed to the borehole symbol (BH) where monitoring wells were installed.

Prior to the drilling, buried service clearances were obtained for the test hole locations by EXP.

The boreholes were completed by a specialist drilling subcontractor under the full-time supervision of EXP geotechnical staff. The boreholes were advanced to depths of 5.0 m to 6.7 m below ground surface (bgs) using a track-mounted drill rig equipped with continuous flight solid and hollow stem augers, soil sampling and soil testing equipment. In each borehole, disturbed soil samples were recovered at depth intervals of 0.75 m and 1.5 m using conventional split spoon sampling equipment and Standard Penetration Test (SPT) methods or auger samples.

During the drilling, the stratigraphy in the test holes was examined and logged in the field by EXP geotechnical personnel.

Short-term groundwater levels within the open boreholes were observed. These observations pertaining to groundwater conditions at the test hole locations are recorded in the borehole logs found in **Appendix A**. Following the drilling, the boreholes were backfilled with the excavated materials and bentonite, to satisfy the requirements of O.Reg. 903.

Representative samples of the various soil strata encountered at the test locations were taken to our laboratory in London for further examination by a Geotechnical Engineer and laboratory classification testing. Laboratory testing for this investigation comprised of routine moisture content determinations, with results presented on the borehole logs found in **Appendix A**.

The location of each test hole was established in the field in conjunction with information provided by the Client. Ground surface elevations at the borehole locations were surveyed by EXP personnel using a Trimble R12i Receiver.

# 3. Site and Subsurface Conditions

## 3.1 Site Description

The subject area is currently in agricultural use and bounded by commercial development and agricultural lands to the west, railway tracks to the north, Glendon Drive to the south and residential and agricultural land to the east.

The following sections provide a summary of the soil conditions and groundwater conditions.

## 3.2 Soil Stratigraphy

The detailed stratigraphy encountered in the boreholes is shown on the borehole logs found in **Appendix A** and summarized in the following paragraphs. It must be noted that the boundaries of the soil indicated on the test hole logs are inferred from non-continuous sampling and observations during excavation. These boundaries are intended to reflect transition zones for geotechnical design and should not be interpreted as exact planes of geological change.

### 3.2.1 Topsoil

All boreholes except for Boreholes BH10/MW and BH11/MW were surfaced with topsoil. The topsoil ranged in thickness from 75 mm to 530 mm.

*It should be noted that topsoil quantities should not be established from the information provided at the test hole locations only. If required, a more detailed analysis (involving shallow test pits) is recommended to accurately quantify the amount of topsoil to be removed for construction purposes.*

### 3.2.2 Fill

Below the topsoil in Borehole BH9/MW and surfacing boreholes BH10/MW and BH11/MW, fill was encountered. The fill generally comprised sand and gravel and contained trace silt. The fill was in a loose to compact relative density with Standard Penetration Test (SPT) N values of 7 to 28 blows for 300 mm sample spoon penetration and was moist based on *in-situ* moisture contents of 3 to 4 percent. The fill extended to depths of 1.4, 0.7 and 2.1 m below ground surface (bgs) in Boreholes BH9/MW, BH10/MW and BH11/MW, respectively.

### 3.2.3 Cohesionless Soils

The predominant stratum of soils on Site consisted of cohesionless soils that varied in composition from sand, sandy silt, silty sand, and sand and silt. The cohesionless soils were generally brown in colour and select samples contained trace gravel, trace clay, occasional cobbles. Trace organics and/or rootlets were noted in the upper sand/sandy silt in Boreholes BH1/MW, BH4 and BH6. The cohesionless soils were very loose to very dense relative density based on SPT N Values of 0 to more than 50 blows for less than 150 mm sample spoon penetration (refusal). The cohesionless soils were generally moist, becoming wet with depth based on tactile observations and *in-situ* moisture contents of 4 to 26 percent. All boreholes except for BH3 and BH10/MW were terminated in the cohesionless soils.

### 3.2.1 Silt

Underlying the sand and extending to termination depth in Borehole BH10/MW, silt was encountered. The silt was grey in colour and contained trace to some clay and some sand and was very dense in relative density based on SPT

N Values of more than 50 blows for less than 150 mm sample spoon penetration (refusal). Laboratory testing of the silt yielded *in-situ* moisture contents of 14 percent, indicative of moist conditions.

#### 3.2.2 Clayey Silt Till

Borehole BH3 was terminated in a stratum of clayey silt till. The till was grey in colour and contained some sand, trace gravel, and was very stiff in consistency based on SPT N Values of 30 blows for 300 mm sample spoon penetration. Laboratory testing of the till yielded *in-situ* moisture contents of 15 percent, indicative of moist conditions.

### 3.3 Groundwater Conditions

Four (4) monitoring wells were installed during the drilling on July 13 and 19, 2023 at the Site. The wells were installed to depths of approximately 6.1 m bgs. A summary of monitoring well construction details and water levels are presented in the tables below.

**Table 1 – Summary of Monitoring Well Construction Details**

| Borehole/Well ID | Ground Surface Elevation (m) | Completion Depth (m bgs) | Screen Length (m) |
|---|---|---|---|
| **BH1/MW** | 248.67 | 6.10 | 1.52 |
| **BH9/MW** | 250.35 | 6.10 | 1.52 |
| **BH10/MW** | 246.83 | 6.10 | 1.52 |
| **BH11/MW** | 249.49 | 6.10 | 1.52 |

**Table 2 – Groundwater Level Monitoring**

| Borehole/Well ID | Ground Surface Elevation (m) | Depth to Groundwater, m bgs (Groundwater Elevation, m) | | |
|---|---|---|---|---|
| | | August 2, 2023 | August 15, 2023 | January 31, 2025 |
| **BH1/MW** | 248.67 | 5.73 (242.94) | 5.59 (243.08) | 6.07 (242.60) |
| **BH9/MW** | 250.35 | 4.37 (245.98) | 4.61 (245.74) | 4.70 (245.65) |
| **BH10/MW** | 246.83 | 3.38 (243.45) | 3.61 (243.22) | 3.79 (243.04) |
| **BH11/MW** | 249.49 | 3.24 (246.25) | 3.34 (246.15) | 3.62 (245.87) |

The monitoring wells have been registered with the Ministry of Environment, Conservation and Parks (MECP), in accordance with Ontario Regulation 903, and remains intact for the purposes of ongoing monitoring of stabilized groundwater conditions, as needed.

Details of the groundwater conditions observed within the test holes are provided on the attached borehole logs. Upon completion of drilling, the open boreholes were examined for the presence of groundwater and groundwater seepage. Water was measured between 3.7 and 4.1 m bgs in Boreholes BH3 and BH7 upon completion. All other boreholes were open to depths of 3.7 to 5.5 m bgs and were dry upon completion of drilling.

It is noted that insufficient time was available for the measurement of the depth to the stabilized groundwater table prior to backfilling the test hole.

It is also noted that the depth to the groundwater table may vary in response to climatic or seasonal conditions, and, as such, may differ at the time of construction, with higher levels in wet seasons. Capillary rise effects should also be anticipated in fine-grained soil deposits.

### 3.4 Methane Gas

No methane gas producing materials or significant organic matter was encountered at the borehole locations, except a thin veneer of topsoil.

An RKI Gx-2003 Gas Detector was used in the upper levels of the open boreholes. The unit measures LEL combustibles, methane gas, oxygen content, carbon monoxide and hydrogen sulfide in standard confined space gases. No significant methane gas concentration was detected in the boreholes.

# 4. Discussion and Recommendations

Based on a draft plan of subdivision provided by the Client, it is understood the proposed development consists of a combination of low and medium density residential blocks and a mixed-use block. The proposed development is expected to have complete municipal servicing, paved local, collector or access roads, parking, and landscaped areas.

The following sections of this report provide geotechnical comments and recommendations regarding site preparation, excavations and dewatering, foundations, slab-on-grade and basement design, earthquake design considerations, pavement design and curbs and sidewalks.

## 4.1 Site Preparation

Prior to placement foundations and/or engineered fill, all surficial topsoil, vegetation and/or otherwise deleterious materials should be stripped. Thicker areas of topsoil may be anticipated in areas with trees and/or heavy vegetative cover. It is anticipated that the surficial topsoil may be stockpiled on site for possible reuse as landscaping fill.

Following the removal of the topsoil and unsuitable materials described above and prior to fill placement, the exposed subgrade should be inspected by a Geotechnical Engineer. Any loose or soft zones noted in the inspection should be over-excavated and replaced with an approved fill.

It is recommended that construction traffic be minimized on the finished subgrade, and that the subgrade be sloped to promote surface drainage and runoff.

In the building areas where the grade will be raised, the fill material should be comprised of imported granular or approved onsite (excavated) material. The fill material should be inspected and approved by a Geotechnical Engineer, placed in maximum 300 mm (12 inch) thick loose lifts and uniformly compacted to 100 percent Standard Proctor Maximum Dry Density (SPMDD) within 3 percent of optimum moisture content. The geometric requirements for engineered fill are provided on **Drawing 2**.

The natural and inorganic fill materials on Site would be suitable for reuse as engineered fill. The material should be examined and approved by a Geotechnical Engineer prior to reuse.

In areas along the proposed roadways, fill material used to raise grades may consist of onsite excavated soils, or imported granular fill approved by an Engineer. The fill should be placed in maximum 300 mm (12 inch) thick loose lifts and uniformly compacted to 95/98 percent SPMDD, depending on depth, within 3 percent of optimum moisture content in order to provide adequate stability for the new pavements.

*In situ* compaction testing should be carried out during the fill placement to ensure that the specified compaction is being achieved.

Excess materials should be removed from the Site and disposed of in accordance with Ministry of the Environment, Conservation and Parks (MECP) guidelines and requirements. Further analytical sampling and testing may be required in accordance with O. Reg. 406/19 for transportation and off-site disposal of excavated material.

If imported fill material is used at the Site, verification of the suitability of the fill may be required from an environmental standpoint. Conventional geotechnical testing will not determine the suitability of the material in this regard. Analytical testing and environmental site assessment may be required at the source. This will best be assessed prior to the selection of the material source. A quality assurance program should be implemented to ensure that the fill material will comply with the current (MECP) standards for placement and transportation. The disposal of excavated materials must also conform to the MECP Guidelines and requirements. EXP can be of assistance if an assessment of the materials is required.

## 4.2 Excavation and Groundwater Control

### 4.2.1 Excess Soil Management

It should be noted that Ontario Regulation 406/19 made under the Environmental Protection Act (November 28th, 2019) was implemented on January 1st, 2021. The new regulation dictates the testing protocol that will be required for the management and disposal of Excess Soils. As set forth in the Regulation, specific analytical testing protocols will need to be implemented and followed based on the volume of soil to be managed. The testing protocols are specific as to whether the soils are stockpiled or in situ. In either scenario, the testing protocols are far more onerous than have been historically carried out as part of standard industry practices. These decisions should be factored in and accounted for prior to the initiation of the project-defined scope of work. EXP would be pleased to assist with the implementation of a soil management and testing program that would satisfy the requirements of Ontario Regulation 406/19.

### 4.2.2 Excavations

All work associated with design and construction relative to excavations must be carried out in accordance with Part III of Ontario Regulation 213/91 under the Occupational Health and Safety Act. Based on the results of the geotechnical investigation and in accordance with Section 226 of Ontario Regulation 213/91, the very stiff clayey silt till is classified as Type 2 soil, while the moist fill, sandy silt/silty sand, silt and sand deposits encountered within the test holes are classified as Type 3 soils.

Excavations solely within Type 2 soils may be vertical in the bottom 1.2 m and then sloped at a minimal inclination of 1H:1V above that level. Where excavations extend into or through Type 3 soils, excavation side slopes must be cut back at a maximum inclination of about 1H:1V from the base of the excavation. Should groundwater egress loosen the side slopes of Type 2 or Type 3 soils, slopes of 3H:1V or flatter will be required.

Geotechnical inspection at the time of excavation can confirm the soil type present.

It should be noted that the presence of cobbles and boulders in natural glacial deposits may influence the progress of excavation and construction.

### 4.2.3 Excavation Support

The recommendations for side slopes given in the above section would apply to most of the conventional excavations expected for the proposed development. However, in areas adjacent to buried services that are located above the base of the excavations, side slopes may require support to prevent possible disturbance or distress to these structures. This concept also applies to connections to existing services. In granular soils above the groundwater and in cohesive natural soils, bracing will not normally be required if the structures are behind a 45-degree line drawn

up from the toe of the excavation. In wet sandy or silty soils, the setback should be about 3H to 1V if bracing is to be avoided.

For support of excavations such as for any deep manholes or to minimize disturbance to surrounding lands, shoring such as sheeting or soldier piles and lagging can be considered. Alternatively, the option of a prefabricated trench box system may be available depending on the required depths. The prefabricated trench box system, if utilized, must be designed by a professional engineer to withstand the soil and hydrostatic loading. The design and use of the support system should conform to the requirements set out in the most recent version of the Occupational Health and Safety Act for Construction Projects and approved by the Ministry of Labour. Excavations should conform to the guidelines set out in the proceeding section and the Safety Act.

The shoring should also be designed in accordance with the guidelines set out in the Canadian Foundation Engineering Manual, 4th Edition. Soil-related parameters considered appropriate for a soldier pile and lagging system are shown below.

Where applicable, the lateral earth pressure acting on the excavation shoring walls may be calculated from the following equation:

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

where, $p$ = lateral earth pressure in kPa acting at depth h;

$\gamma$ = natural unit weight, a value of 20.4 kN/m$^3$ may be assumed;

$h$ = depth of point of interest in m;

$q$ = equivalent value of any surcharge on the ground surface in kPa.

The earth pressure coefficient (K) may be taken as 0.25 where small movements are acceptable and adjacent footing or movement sensitive services are not above a line extending at 45 degrees from the bottom edge of the excavation; 0.35 where utilities, roads, sidewalks must be protected from significant movement; and 0.45 where adjacent building footings or movement sensitive services (gas and water mains) are above a line of 60 degrees from the horizontal extending from the bottom edge of the excavation.

For long term design, a K at rest ($K_o$) of a minimum of 0.5 should be considered.

The above expression assumes that no hydrostatic pressure will be applied against the shoring system. It should be recognized that the final shoring design will be prepared by the shoring contractor. It is not possible to comment further on specific design details until this design is completed.

If the shoring is exposed to freezing temperatures, appropriate insulation may be provided to prevent outward movement.

The performance of the shoring must be checked through monitoring for lateral movement of the walls of the excavation to ensure that the shoring movements remain within design limits. The most effective method for monitoring the shoring movements can best be devised by this office when the shoring plans become available. The shoring designer should however assess the specific site requirements and submit the shoring plans to the engineer for review and comment.

#### 4.2.4 Construction Dewatering

As noted in Section 3.3, groundwater was measured between 3.2 and 6.1 m below ground surface (bgs) (Elevations 246.3 m to 242.6 m) over the monitored period. In the open boreholes without monitoring wells, water was also measured near depths of 3.7 to 4.1 m bgs in Boreholes BH3 and BH7 upon completion of drilling. All other boreholes were dry upon completion.

Based on the soil texture encountered during the investigation, moderate to significant groundwater infiltration should be anticipated within the building and service trench excavations that extend below the groundwater table.

For excavations extending below the groundwater table, suitable water control measures will be required to maintain a dry and stable excavation base and sides. Depending on final site grading, dewatering may be required to maintain a stable, dry excavation base.

A positive dewatering system (such as a series of localized well-points) may be required to provide suitable groundwater control for servicing excavations and pipe installations in the sand units. A specialist dewatering contractor should be consulted in this regard. The design of the dewatering system should be left to the contractor's discretion, and the system should meet a performance specification to maintain and control the groundwater. Successful dewatering operations will depend on the contractor's own experience, construction techniques, seasonal influences, sequencing and scheduling of the work force.

Any minor groundwater infiltration encountered can likely be accommodated using conventional sump pumping techniques; however, if groundwater infiltration persists, more extensive dewatering measures may be required.

The collected water should be discharged a sufficient distance away from the excavated area to prevent the discharged water from returning to the excavation. Sediment control measures should be provided at the discharge point of the dewatering system. Caution should also be taken to avoid any adverse impacts to the environment.

It is important to mention that for any projects requiring positive groundwater control with a removal rate of 50,000 liters to less than 400,000 litres per day, an Environmental Activity and Sector Registry (EASR) will be required. Permit to Take Water (PTTW) applications are required for removal rates more than 400,000 L per day and will need to be approved by the MECP per Sections 34 and 98 of the Ontario Water Resources Act R.S.O. 1990 and the Water Taking and Transfer Regulation O. Reg. 387/04. It is noted that a standard geotechnical investigation will not determine all the groundwater parameters which may be required to support the application.

### 4.3 Foundations – Preliminary Comments

#### 4.3.1 Conventional Strip and Spread Footings

Based on a draft plan of subdivision provided by the Client, it is understood the proposed development consists of a combination of low and medium density residential blocks and a mixed-use block. Low- to mid-rise buildings can be supported on conventional spread and strip footings founded below the topsoil or unsuitable soils on the natural competent subgrade soils, or engineered fill.

The following allowable bearing pressures (net stress increase) can be used on the natural, undisturbed soils below a typical depth of approximately 1.2 m below existing grade throughout the Site:

| | |
|---|---|
| Bearing Resistance at Serviceability Limit States (SLS) | 145 kPa (3,000 psf) |
| Factored Bearing Resistance at Ultimate Limit States (ULS) | 215 kPa (4,500 psf) |

Fill and very loose/loose sand or sandy silt layers were noted in the upper 1.4 m to 2.9 m of Boreholes BH1/MW, BH6, BH7, BH9/MW and BH11/MW. In the area of these boreholes, localized improvements may be required if loose soils are encountered at the footing level including compaction of sand soils, base improvements, lowering the footings to found on compact soils or sub-excavation and engineered fill placement. Geotechnical inspection by a representative from this office at the time of excavation should be arranged to confirm the suitability of the founding soils.

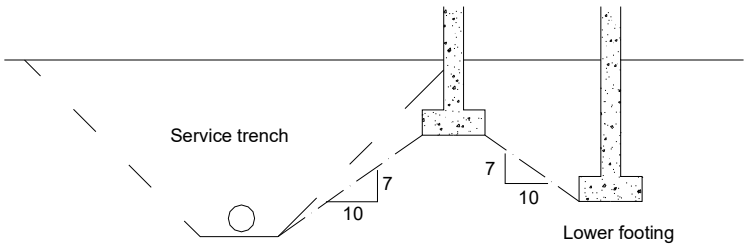
If the grades are to be raised or restored, engineered fill can be used for foundation support. The geometric requirements for the fill placement are shown on **Drawing 2**, appended. The available SLS bearing capacity for the engineered fill is 145 kPa (3,000 psf). For footings placed on engineered fill, it is recommended that the strip footings be widened to 500 mm (20 inches) and contain nominal concrete reinforcing steel. Verification of the soil conditions and the extent of reinforcement are best determined by the Geotechnical Engineer at the time of excavation.

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

In areas where very moist to wet sandy silt is exposed following removal of the loose and/or otherwise deleterious material, the exposed subgrade will likely be susceptible to disturbance by construction traffic. It is recommended that, in these areas, construction traffic be minimized on the finished subgrade, and the subgrade be sloped to promote surface water drainage. Where sensitive subgrade soils are exposed, tracked hydraulic excavators may be required to move the fill material.

### 4.3.2 Foundations - General

Footings at different elevations should be located such that the higher footings are set below a line drawn up at 10 horizontal to 7 vertical from the near edge of the lower footing. This concept should also be applied to service excavation, etc. to ensure that undermining is not a problem.




FOOTINGS NEAR SERVICE TRENCHES OR AT DIFFERENT ELEVATIONS

Provided that the footing bases are not disturbed due to construction activity, precipitation, freezing and thawing action, etc., and the aforementioned bearing pressures are not exceeded, the total and differential settlements of footings designed in accordance with the recommendations of this report and with careful attention to construction detail are expected to be less than 25 mm and 20 mm (1 and ¾ inch) respectively.

All footings exposed to seasonal freezing conditions should be protected from frost action by at least 1.2 m (4 ft) of soil cover or equivalent insulation.

It should be noted that the recommended bearing capacities have been calculated by EXP from the borehole information for the design stage only. The investigation and comments are necessarily on-going as new information of underground conditions becomes available. For example, if more specific information becomes available with respect to conditions between boreholes when foundation construction is underway. The interpretation between the boreholes and the recommendations of this report must therefore be checked through field inspections provided by EXP to validate the information for use during the construction stage.

### 4.4 Basements

If the development includes buildings with basements, the basement floors can be constructed using cast slab-on-grade techniques provided the subgrade is stripped of all topsoil and other obviously objectionable material. The subgrade should then be proof-rolled thoroughly. Any soft zones detected should be dug out and replaced with compactable excavated material placed in accordance with the requirements outlined in the previous Section 4.1.

A 200 mm (8 inch) compacted layer of 19 mm (¾ inch) clear stone should be placed between the prepared subgrade and the floor slab to serve as a moisture barrier. An alternative option would be to place 300 mm of OPSS Granular 'A' material compacted to 100 percent SPMDD.

The installation and requirement of a vapour barrier under the floor slab, where applicable, should conform to the flooring manufacturer's and designer's requirements. Moisture emission testing is recommended to determine the concrete condition prior to flooring installation.

All basement walls should be damp-proofed and must be designed to resist a horizontal earth pressure 'p' at any depth 'h' below the surface as given by the following expression:

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

where:

- $p$ = lateral earth pressure in kPa acting at a depth h:
- $K$ = earth pressure coefficient, assumed to be 0.4;
- $\gamma$ = unit weight of backfill, a value of 20.4 kN/m$^3$ may be assumed;
- $h$ = depth to point of interest in m and,
- $q$ = equivalent value of any surcharge on the ground surface.

If basements are planned, installation of perimeter drains is required. The above expression assumes that the perimeter drainage system prevents the build-up of any hydrostatic pressure behind the wall. Suggestions for permanent perimeter drainage are given on **Drawing 3**.

### 4.5 Slab-on-Grade Construction

Preparation of the subgrade should include the removal of all topsoil and/or deleterious material from the proposed building area. The entire floor slab area should then be thoroughly proof-rolled with a heavy roller and examined by a Geotechnical Engineer. Any excessively soft or loose areas should be sub-excavated and replaced with suitable compacted fill. Where the exposed subgrade requires reconstruction to achieve the design elevations, engineered fill should be used. It is recommended that structural fill comprises granular material, such as OPSS Granular 'B', or approved alternative material. The fill should be placed in maximum 300 mm thick lifts and compacted to a minimum of 98 percent SPMDD. For best compaction results, the *in situ* moisture content of the fill should be within about three percent of optimum, as determined by Standard Proctor density testing.

No underfloor drains are required provided that the exterior grades are lower than the floor slab, and positively sloped away from the slab. It is recommended that an impermeable soil seal such as clay, asphalt or concrete be provided on the surface to minimize water infiltration from the exterior of the building. See **Drawing 4** for Drainage and Backfill recommendations for slab-on-grade construction.

A moisture barrier, consisting of a 200 mm (8 in.) thick, compacted layer of 19 mm (3/4 in.) clear stone, should be then placed between the prepared granular sub-base and the floor slab. An alternative option would be to place 300 mm of OPSS Granular 'A' material compacted to 100 percent SPMDD.

The installation and requirement of a vapour barrier under a concrete slab should conform to the flooring manufacturer's and designer's requirements. Moisture emission testing will be required to determine the concrete condition prior to flooring installation.

In order to minimize the potential for excess moisture in the floor slab at the time of the flooring installation, a concrete mixture with a low water-to-cement ratio (i.e., 0.45 to 0.55) should be used. Chemical additives may be required at the time of placement to make the concrete workable, and should be used in place of additional water at the point of placement. Ongoing liaison from this office will be required.

The water-to-cement ratio and slump of concrete used in the floor slabs should be strictly controlled to minimize shrinkage of the slabs. Adequate joints should be provided in the floor slab to further control cracking. During placement of concrete at the construction site, testing should be performed on the concrete.

### 4.6 Foundation Backfill

In general, the existing non-saturated natural soils excavated from the foundation area should be suitable for re-use as foundation wall backfill if the work is carried out during relatively dry weather. The materials to be re-used should be within three percent of optimum moisture for best compaction results. Materials should be stockpiled per their composition ( i.e. sandy soils should not be mixed with clayey soils).

If the weather conditions are very wet during construction, then imported granular material such as OPSS Granular 'B' should be used. Site review by the geotechnical consultant may be advised.

The backfill must be brought up evenly on both sides of walls not designed to resist lateral earth pressures. The backfill materials should be compacted to 95 to 98 percent SPMDD. Drainage and backfill recommendations are given in **Drawing 3**.

The fill surface around the perimeter of structures should be sloped in such a way that the surface runoff water does not accumulate around the structure. It is recommended that an impermeable soil seal such as clay, asphalt or concrete be provided on the surface to minimize water infiltration.

### 4.7 Site Servicing

The subgrade soils beneath the water and sewer pipes which will service the Site are generally expected to consist of sandy silt, sand and till deposits. Although no bearing problems are anticipated for flexible or rigid pipes founded on the natural deposits, localized base improvement along the trench bottom may be required for excavations which terminate in wet silty soils or within zones having wet seams, especially in wet weather seasons. The extent of base improvement or stabilization is best determined in the field during construction, with consultation from a Geotechnical Engineer.

Groundwater was measured at depths of 3.2 and 6.1 m below ground surface (bgs) (Elevations 246.3 m to 242.6 m) in the monitoring wells at Site over the monitoring period. If excavations penetrates into these saturated sand/silty sand/sandy silt strata, positive groundwater control and base stabilization will be required. Ongoing liaison from this office will be needed.

For services constructed on the natural soils or engineered fill, the bedding should conform to OPS Standards. The bedding course may be thickened if portions of the subgrade become wet during excavation. Bedding aggregate should be placed around the pipe to at least 300 mm (12 inch) above the pipe, and be compacted to a minimum 95 percent SPMDD.

Water and sewer lines installed outside of heated areas should be provided with a minimum 1.2 m (4 ft.) of soil cover for frost protection.

To minimize disturbance to the base, pipe laying should be carried out in short sections, with backfilling following closely after laying and no section of trench should be left open overnight.

The trenches above the specified pipe bedding should be backfilled with inorganic on-site soils placed in 300 mm thick lifts and uniformly compacted to at least 95 percent SPMDD. For trench backfill within 1 metre below the roadway subbase, the fill should be uniformly compacted to at least 98 percent SPMDD. A program of *in situ* density testing should be set up to ensure that satisfactory levels of compaction are achieved.

Requirements for backfill in service trenches, etc. should also have regard for OPSS requirements. A summary of the general recommendations for trench backfill is presented on **Drawing 5** and **6**. A program of *in situ* density testing should be set up to ensure that satisfactory levels of compaction are achieved.

Based on the results of this investigation, the majority of the excavated natural soils may be used for construction backfill provided that reasonable care is exercised in handling. In this regard, the material should be within 3 percent of the optimum moisture as determined in the Standard Proctor density test, and stockpiling of material for prolonged periods of time should be avoided. This is particularly important if construction is carried out in wet or otherwise adverse weather.

Soils excavated from below the stabilized groundwater table may be too wet for reuse as backfill unless adequate time is allowed for drying, or if the material is blended with approved dry fill; otherwise, it may be stockpiled onsite for reuse as landscape fill.

As noted previously, disposal of excavated materials off site should conform to current MECP guidelines.

### 4.8 Earthquake Design Considerations

The recommendations for the geotechnical aspects to determine the earthquake loading for design using the OBC 2024 are presented below.

The subsoil and groundwater information at this Site have been examined in relation to Section 4.1.8.4 of the OBC 2024. The subsoils at the Site generally consist of topsoil and fill over sandy silt, sand and till deposits. It is anticipated that the proposed structures will be founded on the natural deposits, below any loose or soft zones.

Table 4.1.8.4.-B Site Classification for Seismic Site Response in OBC 2024 indicated that to determine the site classification, the average properties in the top 30 m (below the lowest basement level) are to be used. The boreholes advanced at this Site were excavated to a maximum depth of 6.7 m below existing grade. Therefore, the Site Classification recommendation would be based on the available information as well as our interpretation of conditions below the boreholes based on our knowledge of the soil conditions in the area.

Based on the above assumptions, interpretations in combination with the known local geological conditions, the Site Class for the proposed development is “D” as per Table 4.1.8.4.-B, Site Classification for Seismic Site Response, OBC 2024. Additional depth drilling may be advised to determine if the soil conditions below the current depth of exploration can support a higher Site Classification.

### 4.9 Site Pavement Design

Areas to be paved should be stripped of all topsoil, organics and other obviously unsuitable material. The exposed subgrade must then be thoroughly proof-rolled. Any soft areas revealed by this or any other observations must be over-excavated and backfilled with approved material. All fill required to backfill service trenches or to raise the subgrade to design levels must conform to requirements outlined previously. Preferably, the natural inorganic excavated soils should be used to maintain uniform subgrade conditions, provided adequate compaction can be achieved.

Provided the preceding recommendations are followed, the pavement thickness design requirements given in the following table are recommended for the anticipated traffic loading and subgrade conditions.

**Table 3 – Recommended Pavement Structure Thicknesses**

| Pavement Layer | Compaction Requirements | Local Road / Light Duty Pavement Structure (Cars) | Heavy Duty Pavement Structure (Cars and Trucks) |
|---|---|---|---|
| **Asphaltic Concrete** | 92% MRD[1] or 97% BRD[1] | 40 mm HL-3<br>50 mm HL-8 | 50 mm HL-3<br>60 mm HL-8 |
| **Granular 'A' (Base)** | 100% SPMDD[1] | 150 mm | 150 mm |
| **Granular 'B' (Subbase)** | 100% SPMDD[1] | 300 mm | 450 mm |

*Notes: 1) SPMDD denotes Standard Proctor Maximum Dry Density, MRD denotes Maximum Relative Density, BRD denotes Bulk Relative Density.
2) The subgrade must be compacted to 98% SPMDD.
3) The above recommendations are minimum requirements.

The recommended pavement structures provided in the above table are based on the existing subgrade soil properties determined from visual examination and textural classification of the soil samples. Consequently, the recommended pavement structures should be considered for preliminary design purposes only. Other granular configurations may also be possible provided the granular base equivalency (GBE) thickness is maintained. These recommendations on thickness design are not intended to support heavy and concentrated construction traffic, particularly where only a portion of the pavement section is installed.

If construction is undertaken under adverse weather conditions (i.e., wet or freezing conditions) subgrade preparation and granular sub-base requirements should be reviewed by the Geotechnical Engineer. If the sub-base is set on wet or dilatant silty soils, a geotextile will be required. A woven type geotextile such as Terrafix 200W or equivalent would be suitable for this application.

If only a portion of the pavement will be in place during construction, the granular subbase may have to be thickened. This is best determined in the field during the site servicing stage of construction, prior to road construction.

Samples of both the Granular 'A' and Granular 'B' aggregate should be checked for conformance to OPSS 1010 prior to use on Site, and during construction. The Granular 'B' subbase and the Granular 'A' base courses must be compacted to 100 percent SPMDD.

The asphaltic concrete paving materials should conform to the requirements of OPSS MUNI 1150. The asphalt should be placed in accordance with OPSS 310 and compacted to at least 97 percent of the Marshall mix design bulk relative density or 92% of maximum relative density. A tack coat should be applied between the surface and binder asphalt courses.

Good drainage provisions will optimize pavement performance. The finished pavement surface should be free of depressions and should be sloped (preferably at a minimum grade of two percent) to provide effective surface drainage toward catch basins. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. In low areas, sub-drains should be installed to intercept excess subsurface moisture and prevent

subgrade softening, as shown on **Drawing 7**. This is particularly important in heavier traffic areas at the site entrances. The locations and extent of sub-drainage required within the paved areas should be reviewed by this office in conjunction with the proposed grading.

A program of *in situ* density testing must be carried out to verify that satisfactory levels of compaction are being achieved.

To minimize the effects of differential settlements of service trench fill, it is recommended that wherever practical, placement of binder asphalt be delayed for approximately six months after the granular sub-base is placed. The surface course asphalt should be delayed for a further one year. Prior to the surface asphalt being placed, it is recommended that a pavement evaluation be carried out on the base asphalt to identify repair areas or areas requiring remedial works prior to surface asphalt being placed.

### 4.10 Curbs and Sidewalks

It is recommended that the concrete for curb and gutter and sidewalks should be proportioned, mixed, placed, and cured in accordance with the requirements of OPSS 353 and OPSS 1350.

During cold weather, the freshly placed concrete must be covered with insulating blankets to protect against freezing. Three cylinders from each day's pour should be taken for compressive strength testing. Air entrainment, temperature, and slump tests should be made from the same batch of concrete from which test cylinders are made.

The subgrade for the sidewalks should consist of undisturbed natural competent soil of well-compacted fill. A minimum 150 mm thick layer of compacted Granular 'A' type aggregate should be placed beneath the sidewalk slabs. It is recommended that the Granular 'A' be compacted to a minimum 100 percent SPMDD, to provide adequate support for the concrete sidewalk. Construction traffic should be kept off the placed curbs and sidewalks as they are not designed to withstand heavy traffic load.

### 4.11 Methane Gas Testing

No methane gas producing materials or significant organic matter was encountered at the borehole locations, except a thin veneer of topsoil.

An RKI Gx-2003 Gas Detector was used in the upper levels of the open boreholes. The unit measures LEL combustibles, methane gas, oxygen content, carbon monoxide and hydrogen sulfide in standard confined space gases. No significant methane gas was detected in any of the boreholes.

Based on the present information, no special methane gas abatement measures are indicated at this Site.

### 4.12 Inspection and Testing Requirements

An effective inspection and testing program is an essential part of construction monitoring. The Inspection and Testing Program typically includes the following items:

- Subgrade examination following the removal of existing services (if any), fill and organics, prior to foundation installation and engineered fill placement (if required);
- Inspection and Materials testing during engineered fill placement (full-time supervision is recommended) and site servicing works, including soil sampling, laboratory testing (moisture contents and Standard Proctor

density test on the pipe bedding, trench backfill and engineered fill material), monitoring of fill placement, and *in situ* density testing;

- Footing Base Examinations to confirm suitability to support the design bearing pressures and visual examination of concrete reinforcing steel placement in footings set on engineered fill;
- Materials testing for concrete foundations, floor slab, curbs and sidewalks;
- Inspection and Materials testing during paved area construction, including subgrade examination of the paved area subgrade soils following site servicing, laboratory testing (grain size analyses and Standard Proctor density tests on the Granular 'A' and 'B' material placed on site roadways), and *in situ* density testing;
- Inspection and Materials testing for base and surface asphalt, including laboratory testing on asphalt sampling to confirm conformance to project specifications and standards.

EXP would be pleased to prepare an inspection and testing work program prior to construction, incorporating the above items.

# 5. General Comments

The information presented in this report is based on the interpretation of geotechnical information provided to EXP and a limited investigation carried out by EXP designed to provide information to support an assessment of the current geotechnical conditions within the subject property. The conclusions and recommendations presented in this report reflect site conditions existing at the time of the investigation. Consequently, during the future development of the property, conditions not observed during this investigation may become apparent. Should this occur, EXP Services Inc. should be contacted to assess the situation, and the need for additional testing and reporting. EXP has qualified personnel to provide assistance in regards to any future geotechnical and environmental issues related to this property.

Our undertaking at EXP, therefore, is to perform our work within limits prescribed by our clients, with the usual thoroughness and competence of the engineering profession.

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

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

This report was prepared for the exclusive use of **Sifton Properties Ltd.** and may not be reproduced in whole or in part, without the prior written consent of EXP, or used or relied upon in whole or in part by other parties for any purposes whatsoever. Any use which a third party makes of this report, or any part thereof, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. EXP Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We trust that this report is satisfactory for your purposes. Should you have any questions, please do not hesitate to contact this office.

# Drawings


-LEGEND-

BH1/MW Approximate Borehole Location

-NOTES-

1. The boundaries and soil types have been established only at test hole locations. Between test holes they are assumed and may be subject to considerable error.
2. Topsoil quantities should not be established from the information provided at the test hole locations.
3. The site plan was reproduced from Google Earth Pro and should be read in conjunction with EXP Geotechnical Report KCH-25002312-A0.

Geotechnical Investigation

# Proposed Development

10242 Glendon Drive, Komoka, Ontario

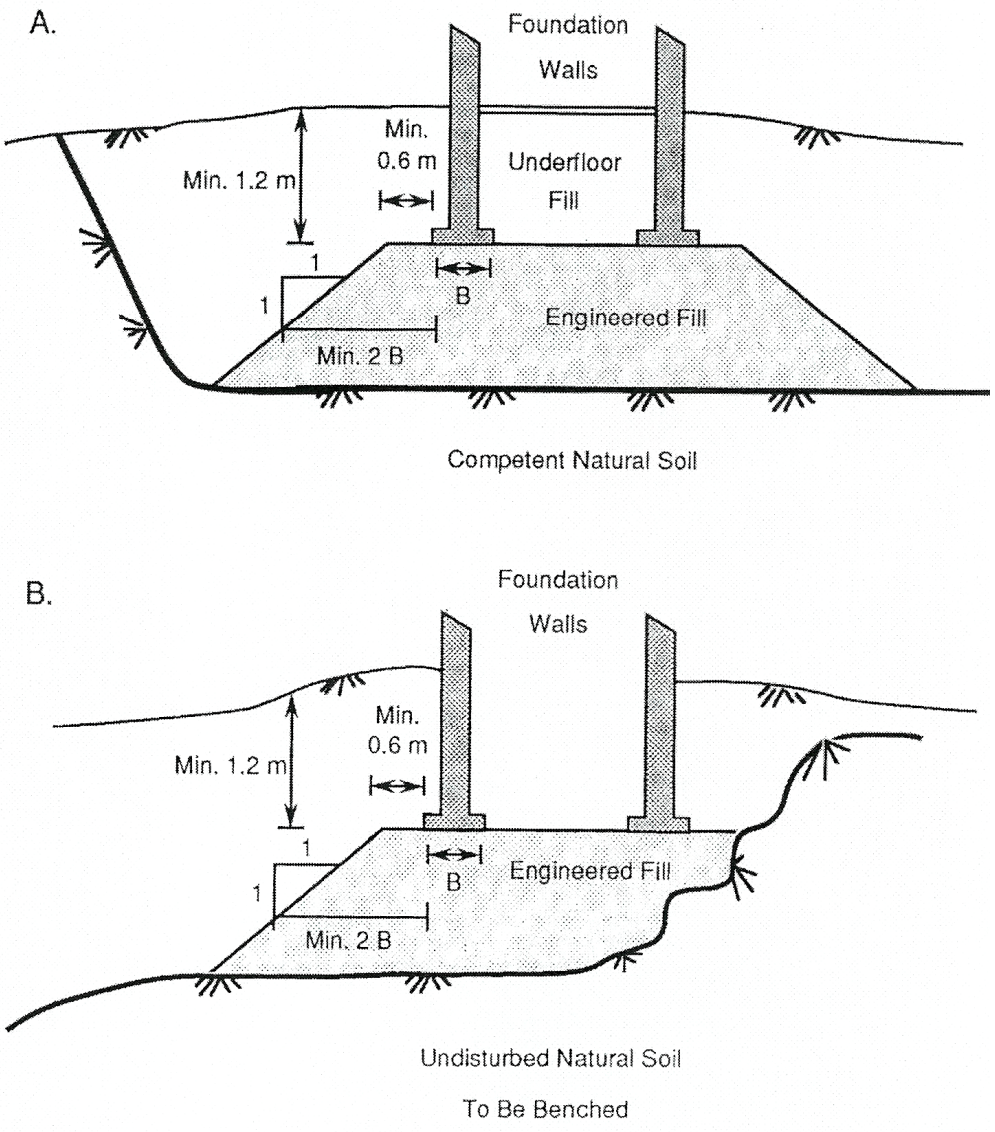
| | |
|---|---|
| CLIENT | Sifton Properties Ltd. |
| TITLE | Borehole Location Plan |
| Prepared By: E.B. | Reviewed By: G.F. |

EXP Services Inc.
15701 Robin's Hill Road, London, ON, N5V 0A5

| DATE | APPROXIMATE SCALE | PROJECT NO. | DWG. |
|---|---|---|---|
| FEBRUARY 2025 | 1:4,000 | KCH-25002312-A0 | 1 |

# DRAWING 2 – GEOMETRIC REQUIREMENTS FOR FOUNDATIONS ON ENGINEERED FILL

Schematic (Not to Scale)




**SECTION VIEW**

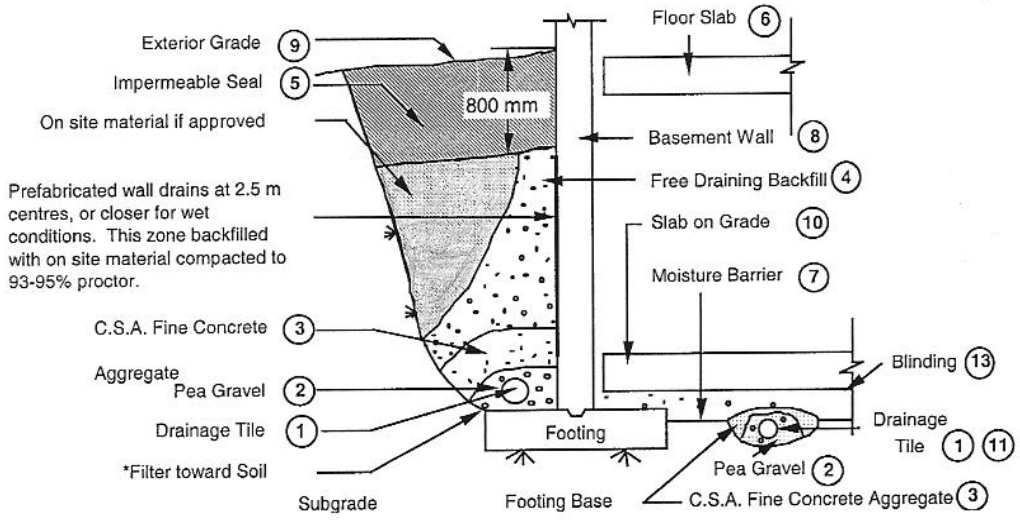
**Section A – Typical Section of Slab-on-Grade Building**
**Section B – Typical Section of Building with Basement**

**Refer to Detailed Notes on following page.**

## NOTES FOR ENGINEERED FILL PLACEMENT:

1. The area must be stripped of all topsoil contaminated fill material, and other unsuitable soils, and proof rolled. Soft areas must be dug out. The stripped natural subgrade must be examined and approved by an EXP Engineer prior to placement of engineered fill.
2. In areas where engineered fill is placed on a slope, the fill should be benched into the approved subgrade soils. EXP would be pleased to provide additional comments and recommendations in this regard, if required.
3. All excavations must be carried out in accordance with the Occupational Health and Safety Regulation of Ontario (Construction Projects - O.Reg. 213.91)
4. Material used for engineered fill must be free of topsoil, organics, frost and frozen material, and otherwise unsuitable or compressible soils, as determined by a Geotechnical Engineer. Any material proposed for use as engineered fill must be examined and approved by EXP, prior to use onsite. Clean compactable granular fill is preferred.
5. Approved engineered fill should be placed in maximum 300 mm thick lifts, and uniformly compacted to 100% Standard Proctor dry density throughout. For best compaction results, engineered fill should be within 3 percent of its optimum moisture content, as determined by the Standard Proctor density test. Imported fill should satisfy the MECP regulations and requirements.
6. Full time geotechnical monitoring, inspection and in situ density (compaction) testing by EXP is required during placement of the engineered fill.
7. Site grades should be maintained during area grading activities to promote drainage, and to minimize ponding of surface water on the engineered fill mat. Rutting by construction equipment should be kept to a minimum, where possible. Additional work to ensure suitability of engineered fill may be required if fill is placed in extreme (hot/cold) weather.
8. The fill must be placed such that the specified geometry is achieved. Refer to sketches (previous page) for minimum requirements. Proper environmental protection will be required, such as providing frost penetration during construction, and after the completion of the engineered fill mat.
9. An allowable bearing pressure of 145 kPa (3.\,000 psf) may be used provided that all conditions outlined above, and in the Geotechnical Report are adhered to.
10. These guidelines are to be read in conjunction with the attached Geotechnical Report. (EXP Project No. KCH-25002312-A0)
11. For foundations set on engineered fill, footing enhancement and/or concrete reinforcing steel placement is recommended. The footing geometry and extent of concrete reinforcing steel will depend on site specific conditions. In general, consideration may be given to having a minimum strip footing width of 500 mm (20 inches), containing nominal steel reinforcement. Alternatively, concrete reinforcement may be recommended in the top and bottom of the foundation wall strip. The final footing geometry and extent of reinforcement is best determined in the field, by a Geotechnical Engineer.

# DRAWING 3 – BACKFILL AND BASEMENT DRAINAGE DETAIL (NOT TO SCALE)

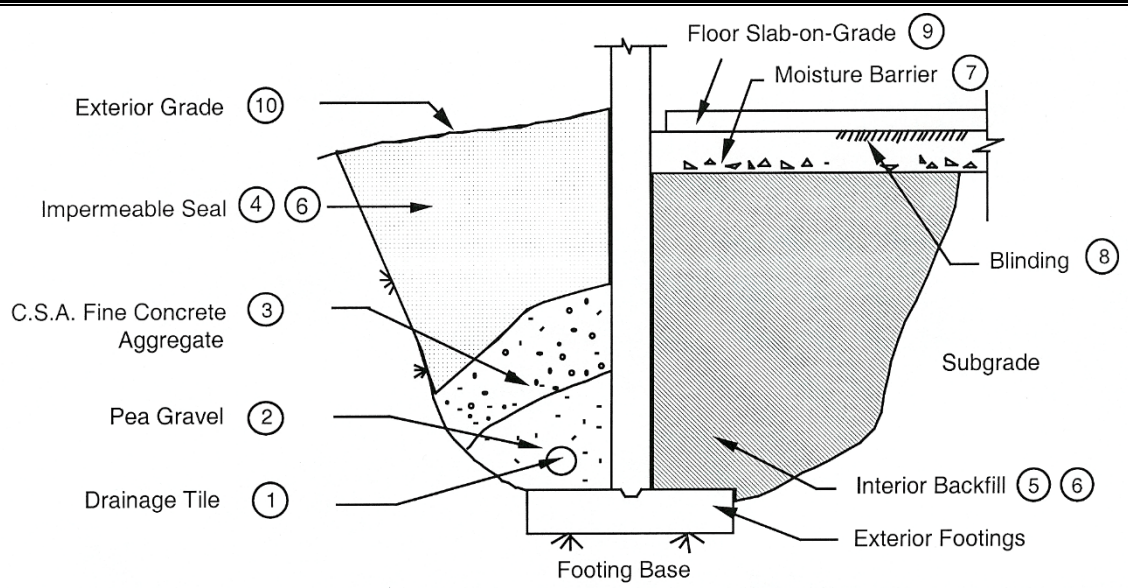



## NOTES:

1. Drainage tile to consist of 100 mm (4 in.) diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet. Invert to be minimum of 150 mm (6 in.) below underside of floor slab.
2. Pea gravel 150 mm (6 in.) top and sides of drain. If drain is not on footing, place 100 mm (4 in.) of pea gravel below drain. 20 mm (3/4 in.) clear stone may be used provided if it is covered by an approved porous geotextile fabric membrane (Terrafix 270R or equivalent).
3. C.S.A. fine concrete aggregate to act as filter material. Minimum 300 mm (12 in.) top and side of drain. This may be replaced by an approved porous geotextile membrane (Terrafix 270R or equivalent).
6. 4. Free-draining backfill - OPSS Granular B or equivalent compacted to 93 to 95 (maximum) percent Standard Proctor density. Do not compact closer than l.8 m (6 ft) from wall with heavy equipment. Use hand controlled light compaction equipment within 1.8 m (6 ft) of wall.
5. Impermeable backfill seal of compacted clay, clayey silt or equivalent. If original soil is free-draining, seal may be omitted.
6. Do not backfill until wall is supported by basement and floor slabs or adequate bracing.
7. Moisture barrier to consist of compacted 20 mm (3/4 in.) clear, crushed stone or equivalent free-draining material. Layer to be 200 mm (8 in.) minimum thickness.
8. Basement walls to be damp-proofed.
9. Exterior grade to slope away from wall.
10. Slab on grade should not be structurally connected to wall or footing.
11. Underfloor drain invert to be at least 300 mm (12 in.) below underside of floor slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25 ft.) centres one way. Place drain on 100 mm (4 in.) of pea gravel with 150 mm (6 in.) of pea gravel top and sides. CSA fine concrete aggregate to be provided as filter material or an approved porous geotextile membrane (as in 2 above) may be used.
12. Do not connect the underfloor drains to perimeter drains.
13. If the 20 mm (3/4 in.) clear stone requires surface binding, use 6 mm (1/4 in.) clear stone chips.

Note: a) Underfloor drainage can be deleted where not required (see report).
b) Free draining backfill, item 4 may be replaced by wall drains, as indicated, if more economical.

# DRAWING 4 – DRAINAGE AND BACKFILL RECOMMENDATIONS (NOT TO SCALE)

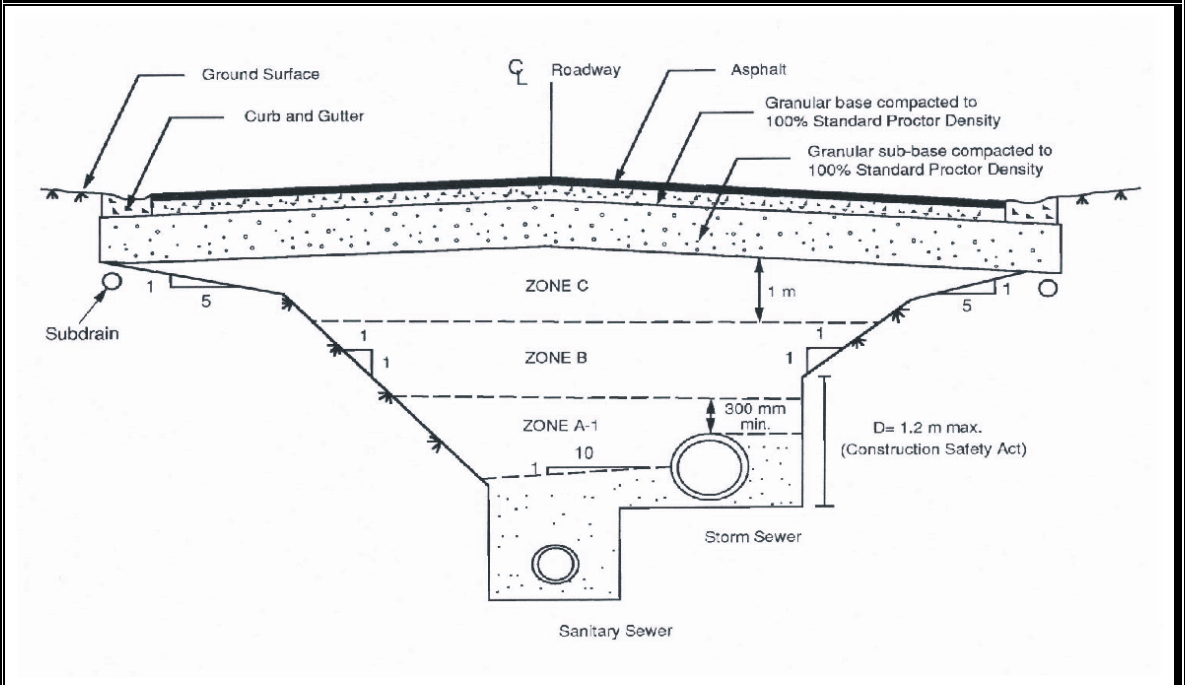



**NOTES:**

1. Drainage tile to consist of 100 mm (4 in.) diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet. Invert to be minimum of 150 mm (6 in.) below underside of interior floor slab.
2. Pea gravel 150 mm (6 in.) top and sides of drain. If drain is not on footing, place 100 mm (4 in.) of pea gravel below drain. 20 mm (3/4 in.) clear stone may be used provided if it is covered by an approved porous geotextile fabric membrane (Terrafix 270R or equivalent).
3. C.S.A. fine concrete aggregate to act as filter material. Minimum 300 mm (12 in.) top and side of drain. This may be replaced by an approved porous geotextile membrane (Terrafix 270R or equivalent).
4. Impermeable backfill seal of compacted clay, clayey silt or equivalent. If original soil is free-draining, seal may be omitted. Compact backfill to 95 percent Standard Proctor Maximum Dry Density.
5. The interior fill may be any clean, inorganic soil which may be compacted to at least 95 percent Standard Proctor density in this confined space.
6. Do not use heavy compaction equipment within 450 mm (18 in.) of the wall. Do not fill or compact within 1.8 m (6 ft) of wall unless fill is placed on both sides simultaneously.
7. Moisture barrier to be at least 200 mm (8 in.) of compacted 20 mm (3/4 in.) clear, crushed stone or equivalent free-draining material.
8. If the 20 mm (3/4 in.) clear stone requires surface binding, use 60 mm (1/4 in.) clear stone chips.
9. Slab on grade should not be structurally connected to wall or footing.
10. Exterior grade to slope away from building.

**This system is not normally required if the floor is at least 300 mm (1 ft.) above exterior grade.**

# DRAWING 5 – TYPICAL BACKFILL DETAIL
# STORM AND SANITARY SEWER (COMMON TRENCH)




**SECTION VIEW**

**NOTES:**

**ZONE A**
Granular bedding satisfying current OPS Standards compacted to 95% Standard Proctor maximum dry density.

**ZONE A-l**
To be compacted to 95% Standard Proctor maximum dry density.

**ZONE B**
To be compacted to 95% Standard Proctor maximum dry density.

**ZONE C**
To be compacted to 98% Standard Proctor maximum dry density.

The excavations shown above are for Type 1 or 2 soils. Where excavations extend through Type 3 soils, the side walls should be sloped back at a maximum inclination of 1 horizontal to 1 vertical from the base (Reference O.Reg 219/31).

# DRAWING 6 – TRENCH BACKFILL REQUIREMENTS

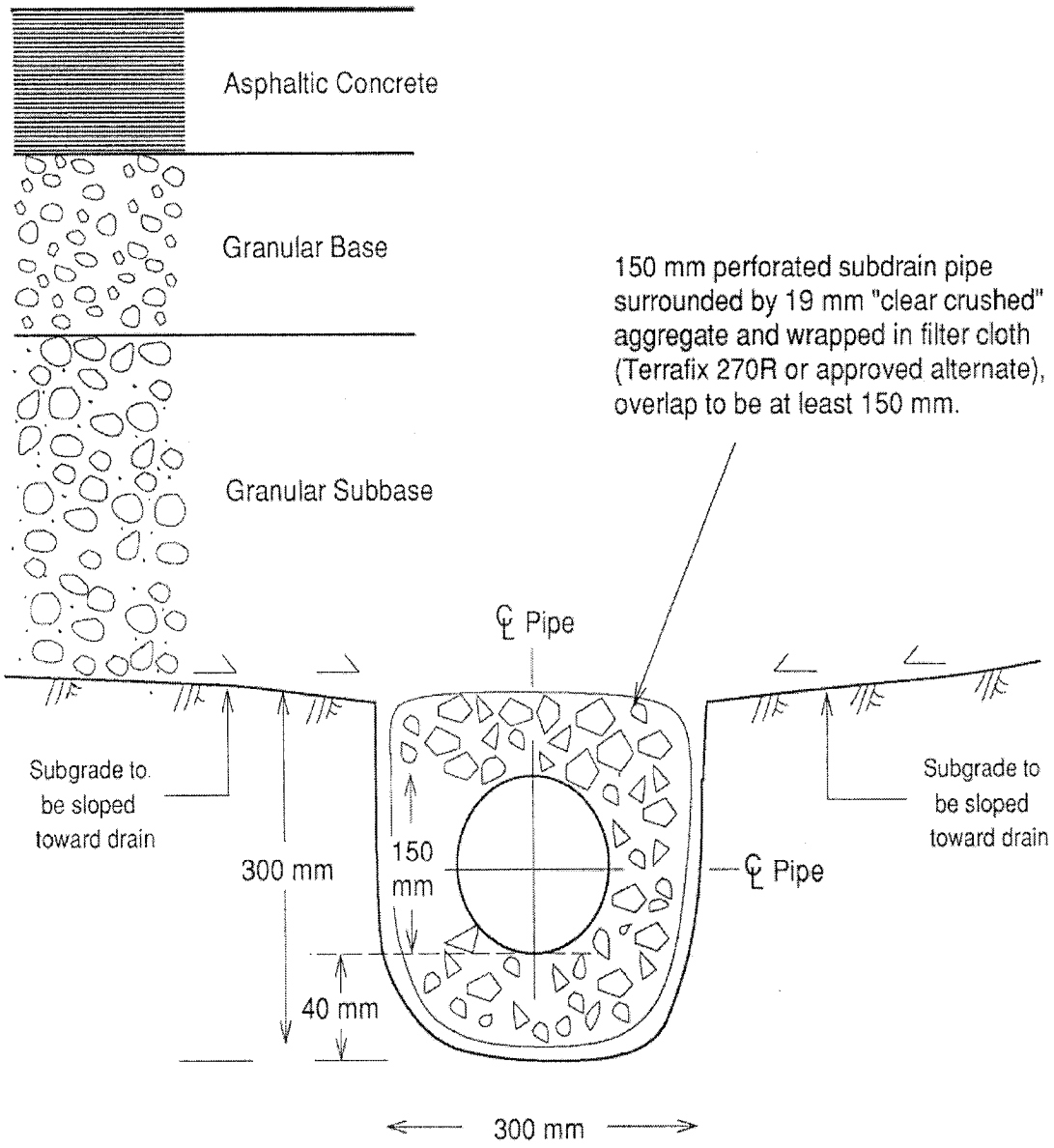
Requirements for backfill in service trenches, etc. should conform to current OPSS requirements. A summary of the general recommendations for trench backfill is presented on **Drawing 5**.

The bedding materials for the services designated as Zone A on the attached drawings should consist of approved granular material satisfying the current OPS minimum standards and specifications. (Class B bedding should provide adequate support for the pipes). These materials should be uniformly compacted to 95 percent of standard Proctor dry density. Some problems may be encountered in maintaining alignment when bedding pipes in wet sandy soil. If Granular 'A' or other sandy material is used for bedding, they may become 'spongy' when saturated. If significant amounts of clear stone are used to stabilize the base, a geotextile should be incorporated to avoid problems with migration of fine grained materials and differential settlement under the pipes as the groundwater rises after backfilling. For minor local use of crushed stone without a geotextile filter, a graded HL3 stone is preferable.

The backfill in Zone B will consist of the native material. This material should be placed in loose lifts not exceeding 300 mm (12 inches) and be uniformly compacted to 95 percent of the standard Proctor maximum dry density. Material wetter than 5 percent above optimum must be allowed to dry sufficiently or should be discarded or used in landscaped areas.

The upper 1 meter of the general backfill (i.e. Zone C) should be placed in loose lifts not exceeding 300 mm (12 inches) and be uniformly compacted to at least 98 percent of the standard Proctor maximum dry density. To achieve satisfactory compaction, the fill material should be within 3 percent of standard Proctor optimum moisture content at placement.

# DRAWING 7 – PAVEMENT SUBDRAIN DETAIL




**NOTES:**

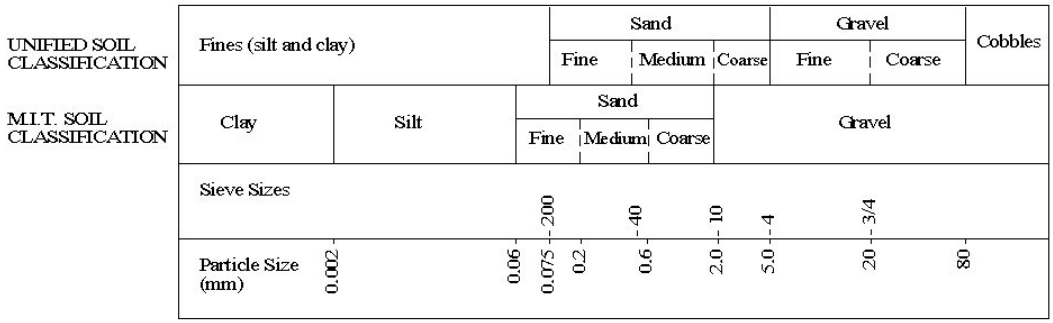
1. All dimensions in millimetres.
2. All sub drains to be set on at least 1% grade draining to a positive outlet.
3. Subgrade soil conditions should be verified onsite, during subgrade preparation works, following site servicing installations.

Scale: NTS

# Appendix A – Borehole Logs

# NOTES ON SAMPLE DESCRIPTIONS

1. All descriptions included in this report follow the 'modified' Massachusetts Institute of Technology (M.I.T.) soil classification system. The laboratory grain-size analysis also follows this classification system. Others may designate the Unified Classification System as their source; a comparison of the two is shown for your information. Please note that, with the exception of those samples where the grain size analysis has been carried out, all samples are classified visually and the accuracy of the visual examination is not sufficient to differentiate between the classification systems or exact grain sizing. The M.I.T. system has been modified and the EXP classification includes a designation for cobbles above the 75 mm size and boulders above the 200 mm size.




2. **Fill**: Where fill is designated on the test hole log, it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The test hole description therefore, may not be applicable as a general description of the site fill material. All fills should be expected to contain obstructions such as large concrete pieces or subsurface basements, floors, tanks, even though none of these obstructions may have been encountered in the test hole. Despite the use of test holes, the heterogeneous nature of fill will leave some ambiguity as to the exact and correct composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. The fill at this site has been monitored for the presence of methane gas and the results are recorded on the test hole logs. The monitoring process neither indicates the volume of gas that can be potentially generated or pinpoints the source of the gas. These readings are to advise of a potential or existing problem (if they exist) and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic waste that renders the material unacceptable for deposition in any but designated land fill sites; unless specifically stated, the fill on the site has not been tested for contaminants that may be considered hazardous. This testing and a potential hazard study can be carried out if you so request. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common, but not detectable using conventional geotechnical procedures.

3. **Glacial Till**: The term till on the test hole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process, the till must be considered heterogeneous in composition and as such, may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (75 to 200 mm in diameter) or boulders (greater than 200 mm diameter) and therefore, contractors may encounter them during excavation, even if they are not indicated on the test hole logs. It should be appreciated that normal sampling equipment can not differentiate the size or type of obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited area; therefore, caution is essential when dealing with sensitive excavations or dewatering programs in till material.

# BOREHOLE LOG

**BH1/MW**
Sheet 1 of 1

CLIENT **Sifton Properties Ltd.** PROJECT NO. **KCH-25002312-A0**

PROJECT **Proposed Development** DATUM **Geodetic**

LOCATION **10242 Glendon Drive, Komoka, ON** DATES: Boring **July 19, 2023** Water Level **Jan 31/25**

| DEPTH (m bgs) | ELEVATION (~m) | STRATA DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N VALUE (blows) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|
| 0 | 248.7 | | | | | | |
| | 248.4 | **TOPSOIL** - 290 mm | | | | | |
| 1 | | **SANDY SILT** - brown, trace clay, trace gravel, trace organics and rootlets, very loose to loose, very moist | SS | S1 | 450 | 2 | 20 |
| 2 | | | SS | S2 | 450 | 4 | 19 |
| | | - no organics or rootlets below 2.1 m bgs | SS | S3 | 450 | 6 | 18 |
| | 245.8 | | | | | | |
| 3 | | **SAND** - brown, fine to medium grained, trace silt, trace gravel, loose to compact, moist | SS | S4 | 600 | 11 | 9 |
| 4 | | | | | | | |
| 5 | | | SS | S5 | 600 | 27 | 7 |
| | | - becoming very moist near 5.6 m bgs | | | | | |
| 6 | | | SS | S6 | 600 | 20 | 12 |
| | 242.0 | - becoming gravelly and wet near 6.6 m bgs | | | | | |
| 7 | | **End of borehole at 6.7 m bgs.** | | | | | |

**SHEAR STRENGTH**
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

**Atterberg Limits and Moisture**
$W_P$ W $W_L$
SPT N Value Dynamic Cone
10 20 30 40

***NOTES***

1) Borehole Log interpretation requires assistance by EXP before use by others and must be read in conjunction with EXP Report KCH-25002312-A0.
2) bgs denotes below ground surface.
3) No significant methane gas concentration was detected upon completion.
4) Water Level Readings:
August 2, 2023 - 5.73 m bgs, Elevation 242.94 m
August 15, 2023 - 5.59 m bgs, Elevation 243.08 m
January 31, 2025 - 6.07 m bgs, Elevation 242.60 m

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

| | |
|---|---|
| G Specific Gravity | C Consolidation |
| H Hydrometer | CD Consolidated Drained Triaxial |
| S Sieve Analysis | CU Consolidated Undrained Triaxial |
| $\gamma$ Unit Weight | UU Unconsolidated Undrained Triaxial |
| P Field Permeability | UC Unconfined Compression |
| K Lab Permeability | DS Direct Shear |

WATER LEVELS
Apparent Measured Artesian (see Notes)

# BOREHOLE LOG

**BH2**
Sheet 1 of 1

CLIENT **Sifton Properties Ltd.** PROJECT NO. **KCH-25002312-A0**

PROJECT **Proposed Development** DATUM **Geodetic**

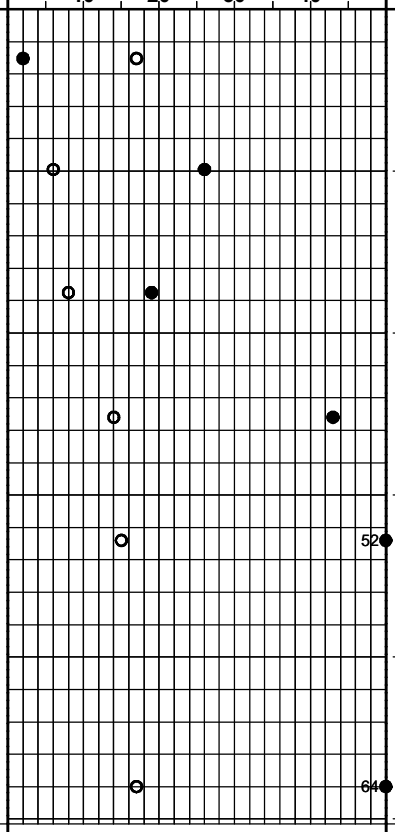
LOCATION **10242 Glendon Drive, Komoka, ON** DATES: Boring **July 17, 2023** Water Level

| DEPTH (m bgs) | ELEVATION (~m) | STRATA DESCRIPTION | STRATA PLOT | WELL LOG | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N VALUE (blows) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 250.9 | **TOPSOIL** - 330 mm | | | | | | | |
| | 250.6 | **SILTY SAND** - brown, fine grained, compact, moist | | | SS | S1 | 525 | 2 | 17 |
| 1 | | - occasional cobbles encountered near 0.9 m bgs | | | SS | S2 | 250 | 26 | 6 |
| | | | | | SS | S3 | 450 | 19 | 8 |
| 2 | 248.8 | | | | | | | | |
| | | **SAND AND SILT** - brown, dense to very dense, moist | | | SS | S4 | 450 | 43 | 14 |
| 3 | | - becoming very moist near 2.9 m bgs | | | SS | S5 | 450 | 52 | 15 |
| 4 | | | | | | | | | |
| | | | | | SS | S6 | 450 | 64 | 17 |
| 5 | 245.9 | | | | | | | | |
| | | **End of borehole at 5.0 m bgs.** | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |

**SHEAR STRENGTH**
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

**Atterberg Limits and Moisture**
$W_P$ W $W_L$

SPT N Value × Dynamic Cone
10 20 30 40




***NOTES***

1) Borehole Log interpretation requires assistance by EXP before use by others and must be read in conjunction with EXP Report KCH-25002312-A0.
2) bgs denotes below ground surface.
3) Borehole open to 3.7 m bgs and dry upon completion of drilling.
4) No significant methane gas concentration was detected upon completion.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

# BOREHOLE LOG

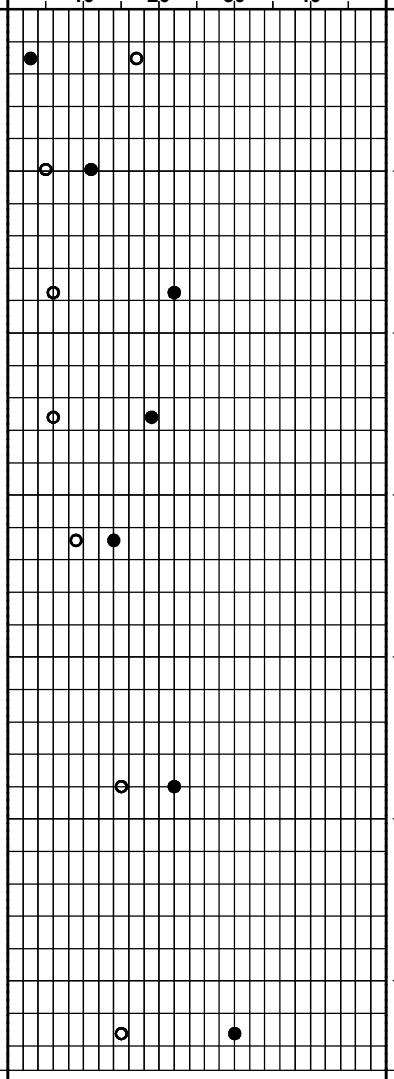
**BH3**
Sheet 1 of 1

CLIENT **Sifton Properties Ltd.** PROJECT NO. **KCH-25002312-A0**
PROJECT **Proposed Development** DATUM **Geodetic**
LOCATION **10242 Glendon Drive, Komoka, ON** DATES: Boring **July 17, 2023** Water Level

| DEPTH (m bgs) | ELEVATION (~m) | STRATA DESCRIPTION | STRATA PLOT | WELL LOG | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N VALUE (blows) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 250.1 | **TOPSOIL** - 410 mm | | | SS | S1 | 600 | 3 | 17 |
| | 249.7 | | | | | | | | |
| | 249.5 | **SANDY SILT** - brown, trace clay, trace gravel, very loose, moist | | | | | | | |
| 1 | | **SAND** - brown, fine grained, some to trace silt, trace gravel, compact, moist | | | SS | S2 | 450 | 11 | 5 |
| | | - becoming fine to medium grained near 1.4 m bgs | | | | | | | |
| | | - occasional cobbles encountered near 1.7 m bgs | | | SS | S3 | 450 | 22 | 6 |
| 2 | | | | | | | | | |
| | | | | | SS | S4 | 450 | 19 | 6 |
| 3 | | - becoming very moist near 2.9 m bgs | | | | | | | |
| | | | | | SS | S5 | 350 | 14 | 9 |
| | | - 200 mm thick sandy silt layer encountered near 3.4 m bgs | | ▽ | | | | | |
| 4 | | - becoming gravelly and wet near 4.0 m bgs | | | | | | | |
| | | | | | SS | S6 | 400 | 22 | 15 |
| 5 | | - sandy silt layer encountered near 4.9 m bgs | | | | | | | |
| | 244.6 | | | | | | | | |
| | | **CLAYEY SILT TILL** - grey, some sand, trace gravel, very stiff, moist | | | | | | | |
| 6 | | | | | SS | S7 | 450 | 30 | 15 |
| | 243.6 | | | | | | | | |
| 7 | | **End of borehole at 6.6 m bgs.** | | | | | | | |

**SHEAR STRENGTH**
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

**Atterberg Limits and Moisture**
$W_P$ W $W_L$
SPT N Value × Dynamic Cone
10 20 30 40



***NOTES***

1) Borehole Log interpretation requires assistance by EXP before use by others and must be read in conjunction with EXP Report KCH-25002312-A0.
2) bgs denotes below ground surface.
3) Borehole open to 4.0 m bgs and water measured near 3.7 m bgs upon completion of driling.
4) No significant methane gas concentration was detected upon completion.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
▽ Apparent ▼ Measured ▲ Artesian (see Notes)

# BOREHOLE LOG

**BH4**
Sheet 1 of 1

CLIENT **Sifton Properties Ltd.** PROJECT NO. **KCH-25002312-A0**
PROJECT **Proposed Development** DATUM **Geodetic**
LOCATION **10242 Glendon Drive, Komoka, ON** DATES: Boring **July 17, 2023** Water Level

| DEPTH (m bgs) | ELEVATION (~m) | STRATA DESCRIPTION | STRATA PLOT | WELL LOG | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N VALUE (blows) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 250.2 | **TOPSOIL** - 410 mm | | | | | | | |
| | 249.8 | | | | SS | S1 | 600 | 2 | 16 |
| | 249.6 | **SANDY SILT** - brown, trace clay, trace gravel, very loose, moist | | | | | | | |
| 1 | | **SAND** - brown, fine grained, trace silt, trace organics, compact, moist | | | SS | S2 | 400 | 13 | 4 |
| | 248.9 | | | | | | | | |
| | | **SILTY SAND** - brown, fine grained, compact to very dense, moist | | | SS | S3 | 450 | 15 | 8 |
| 2 | | | | | | | | | |
| | | | | | SS | S4 | 450 | 26 | 7 |
| 3 | | | | | | | | | |
| | | | | | SS | S5 | 450 | 56 | 8 |
| 4 | | - becoming very moist near 4.0 m bgs | | | | | | | |
| | | | | | SS | S6 | 450 | 44 | 17 |
| 5 | 245.2 | | | | | | | | |
| | | **End of borehole at 5.0 m bgs.** | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |

**SHEAR STRENGTH**
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

**Atterberg Limits and Moisture**
$W_P$ W $W_L$
SPT N Value Dynamic Cone
10 20 30 40

56

***NOTES***

1) Borehole Log interpretation requires assistance by EXP before use by others and must be read in conjunction with EXP Report KCH-25002312-A0.
2) bgs denotes below ground surface.
3) Borehole open to 3.7 m bgs and dry upon completion of drilling.
4) No significant methane gas concentration was detected upon completion.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
$\gamma$ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

# BOREHOLE LOG

**BH5**
Sheet 1 of 1

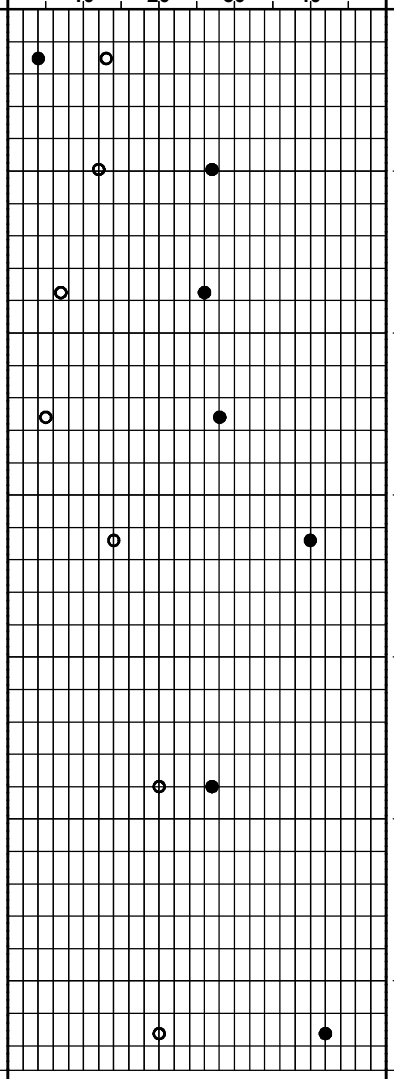
CLIENT **Sifton Properties Ltd.** PROJECT NO. **KCH-25002312-A0**
PROJECT **Proposed Development** DATUM **Geodetic**
LOCATION **10242 Glendon Drive, Komoka, ON** DATES: Boring **July 17, 2023** Water Level

| DEPTH (m bgs) | ELEVATION (~m) | STRATA DESCRIPTION | STRATA PLOT | WELL LOG | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N VALUE (blows) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 250.6 | **TOPSOIL** - 410 mm | | | | | | | |
| | 250.2 | | | | SS | S1 | 600 | 4 | 13 |
| | 249.9 | **SANDY SILT** - brown, weathered, trace clay, trace gravel, loose, very moist | | | | | | | |
| 1 | | **SILTY SAND** - brown, fine grained, compact to dense, moist | | | SS | S2 | 400 | 27 | 12 |
| | | | | | SS | S3 | 450 | 26 | 7 |
| 2 | | | | | | | | | |
| | | | | | SS | S4 | 450 | 28 | 5 |
| | | - trace silt near 2.5 m bgs | | | | | | | |
| 3 | | | | | SS | S5 | 450 | 40 | 14 |
| | 246.6 | | | | | | | | |
| 4 | | **SAND AND SILT** - brown, compact, very moist | | | | | | | |
| | | | | | SS | S6 | 450 | 27 | 20 |
| 5 | | | | | | | | | |
| | 245.0 | | | | | | | | |
| | | **SAND** - brown, fine to medium grained, trace silt, trace gravel, dense, wet | | | | | | | |
| 6 | | | | | SS | S7 | 450 | 42 | 20 |
| | 244.1 | | | | | | | | |
| | | **End of borehole at 6.6 m bgs.** | | | | | | | |
| 7 | | | | | | | | | |

**SHEAR STRENGTH**
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

**Atterberg Limits and Moisture**
$W_P$ W $W_L$

SPT N Value × Dynamic Cone
10 20 30 40



***NOTES***

1) Borehole Log interpretation requires assistance by EXP before use by others and must be read in conjunction with EXP Report KCH-25002312-A0.
2) bgs denotes below ground surface.
3) Borehole open to 5.2 m bgs and dry upon completion of driling.
4) No significant methane gas concentration was detected upon completion.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

# BOREHOLE LOG

**BH6**
Sheet 1 of 1

CLIENT **Sifton Properties Ltd.** PROJECT NO. **KCH-25002312-A0**
PROJECT **Proposed Development** DATUM **Geodetic**
LOCATION **10242 Glendon Drive, Komoka, ON** DATES: Boring **July 17, 2023** Water Level

| DEPTH (m bgs) | ELEVATION (~m) | STRATA DESCRIPTION | STRATA PLOT | WELL LOG | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N VALUE (blows) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 250.8 | **TOPSOIL** - 390 mm | | | | | | | |
| | 250.4 | | | | SS | S1 | 600 | 2 | 25 |
| | | **SANDY SILT** - brown, weathered, trace clay, trace gravel, trace organics, very loose, very moist | | | | | | | |
| 1 | | | | | SS | S2 | 225 | 0 | 17 |
| | | - becominging dilatant below 1.4 m bgs | | | | | | | |
| | 248.9 | | | | SS | S3 | 325 | 1 | 24 |
| 2 | | **SILTY SAND** - brown, fine grained, loose to compact, moist | | | | | | | |
| | | | | | SS | S4 | 450 | 20 | 9 |
| 3 | | - trace silt near 3.0 m bgs | | | SS | S5 | 450 | 23 | 8 |
| 4 | | | | | | | | | |
| | | | | | SS | S6 | 450 | 21 | 19 |
| 5 | | | | | | | | | |
| | 245.2 | | | | | | | | |
| | | **SAND** - brown, fine to medium grained, some silt, dense, wet | | | | | | | |
| 6 | | | | | | | | | |
| | | | | | SS | S7 | 450 | 31 | 20 |
| | 244.2 | | | | | | | | |
| 7 | | **End of borehole at 6.6 m bgs.** | | | | | | | |

**SHEAR STRENGTH**
S Field Vane Test (#=Sensitivity)
▲ Penetrometer ■ Torvane
100 200 kPa

**Atterberg Limits and Moisture**
$W_P$ W $W_L$
● SPT N Value × Dynamic Cone
10 20 30 40

***NOTES***

1) Borehole Log interpretation requires assistance by EXP before use by others and must be read in conjunction with EXP Report KCH-25002312-A0.
2) bgs denotes below ground surface.
3) Borehole open to 5.5 m bgs and dry upon completion of driling.
4) No significant methane gas concentration was detected upon completion.

SAMPLE LEGEND
☒ AS Auger Sample ▨ SS Split Spoon ■ ST Shelby Tube
▥ Rock Core (eg. BQ, NQ, etc.) ▥ VN Vane Sample

OTHER TESTS

| | |
|---|---|
| G Specific Gravity | C Consolidation |
| H Hydrometer | CD Consolidated Drained Triaxial |
| S Sieve Analysis | CU Consolidated Undrained Triaxial |
| γ Unit Weight | UU Unconsolidated Undrained Triaxial |
| P Field Permeability | UC Unconfined Compression |
| K Lab Permeability | DS Direct Shear |

WATER LEVELS
▽ Apparent ▼ Measured ▲ Artesian (see Notes)

# BOREHOLE LOG

**BH7**
Sheet 1 of 1

CLIENT **Sifton Properties Ltd.** PROJECT NO. **KCH-25002312-A0**
PROJECT **Proposed Development** DATUM **Geodetic**
LOCATION **10242 Glendon Drive, Komoka, ON** DATES: Boring **July 19, 2023** Water Level

| DEPTH (m bgs) | ELEVATION (~m) | STRATA DESCRIPTION | STRATA PLOT | WELL LOG | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N VALUE (blows) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 247.1 | | | | | | | | |
| | 246.8 | **TOPSOIL** - 280 mm | | | | | | | |
| | | **SANDY SILT** - brown, weathered, trace clay, trace gravel, very loose to compact, moist | | | SS | S1 | 550 | 3 | 15 |
| 1 | | | | | SS | S2 | 75 | 5 | 19 |
| | | - becoming dilatant and very moist near 1.4 m bgs | | | SS | S3 | 400 | 18 | 19 |
| 2 | | | | | SS | S4 | 450 | 17 | 20 |
| 3 | | | | | SS | S5 | 450 | 14 | 26 |
| 4 | | | | ▽ | | | | | |
| | 242.4 | | | | | | | | |
| 5 | 242.1 | **SAND** - brown, fine to medium grained, trace silt, trace gravel, compact, wet | | | SS | S6 | 400 | 16 | 20 |
| | | **End of borehole at 5.0 m bgs.** | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |

**SHEAR STRENGTH**
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa
**Atterberg Limits and Moisture**
$W_P$ W $W_L$
SPT N Value Dynamic Cone
10 20 30 40

***NOTES***

1) Borehole Log interpretation requires assistance by EXP before use by others and must be read in conjunction with EXP Report KCH-25002312-A0.
2) bgs denotes below ground surface.
3) Borehole open to 4.3 m bgs and water measured near 4.1 m bgs upon completion of driling.
4) No significant methane gas concentration was detected upon completion.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
▽ Apparent ▼ Measured ▲ Artesian (see Notes)

# BOREHOLE LOG

**BH8**
Sheet 1 of 1

CLIENT **Sifton Properties Ltd.** PROJECT NO. **KCH-25002312-A0**
PROJECT **Proposed Development** DATUM **Geodetic**
LOCATION **10242 Glendon Drive, Komoka, ON** DATES: Boring **July 19, 2023** Water Level

| DEPTH (m bgs) | ELEVATION (~m) | STRATA DESCRIPTION | STRATA PLOT | WELL LOG | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N VALUE (blows) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 249.4 | **TOPSOIL** - 530 mm | | | SS | S1 | 600 | 5 | 20 |
| | 248.9 | **SANDY SILT** - brown, weathered, trace clay, trace gravel, loose, moist | | | | | | | |
| 1 | 248.4 | **SAND** - brown, fine to medium grained, trace silt, trace gravel, compact, moist | | | SS | S2 | 450 | 13 | 15 |
| | | | | | SS | S3 | 450 | 13 | 7 |
| 2 | 247.3 | **SANDY SILT** - brown, trace clay, compact to dense, very moist to wet | | | | | | | |
| | | | | | SS | S4 | 450 | 36 | 17 |
| 3 | | | | | | | | | |
| | | | | | SS | S5 | 450 | 29 | 21 |
| 4 | | | | | | | | | |
| | | | | | SS | S6 | 450 | 36 | 17 |
| 5 | 244.4 | **End of borehole at 5.0 m bgs.** | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |

**SHEAR STRENGTH**
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

**Atterberg Limits and Moisture**
$W_P$ W $W_L$
SPT N Value Dynamic Cone
10 20 30 40

***NOTES***

1) Borehole Log interpretation requires assistance by EXP before use by others and must be read in conjunction with EXP Report KCH-25002312-A0.
2) bgs denotes below ground surface.
3) Borehole open to 4.3 m bgs and dry upon completion of drilling.
4) No significant methane gas concentration was detected upon completion.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

# BOREHOLE LOG

**BH9/MW**
Sheet 1 of 1

CLIENT **Sifton Properties Ltd.** PROJECT NO. **KCH-25002312-A0**

PROJECT **Proposed Development** DATUM **Geodetic**

LOCATION **10242 Glendon Drive, Komoka, ON** DATES: Boring **July 13, 2023** Water Level **Jan 31/25**

| DEPTH (m bgs) | ELEVATION (~m) | STRATA DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N VALUE (blows) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|
| 0 | 250.4 | | | | | | |
| | 250.3 | **TOPSOIL** - 75 mm | | | | | |
| | | **FILL** - sand and gravel, brown, trace silt, loose, moist | | | | | |
| 1 | | | SS | S1 | 225 | 7 | |
| | 249.0 | | | | | | |
| | | **SANDY SILT** - brown, trace clay, loose to compact, moist | | | | | |
| | | | SS | S2 | 450 | 5 | 10 |
| 2 | | | | | | | |
| | | | SS | S3 | 450 | 10 | 20 |
| 3 | | - becoming very moist to wet near 2.9 m bgs | | | | | |
| | | | SS | S4 | 450 | 26 | 21 |
| 4 | | | | | | | |
| | | | SS | S5 | 450 | 29 | 18 |
| 5 | | | | | | | |
| | | - becoming dense near 5.6 m bgs | | | | | |
| 6 | | | | | | | |
| | | | SS | S6 | 450 | 36 | 17 |
| | 243.8 | | | | | | |
| | | **End of borehole at 6.6 m bgs.** | | | | | |
| 7 | | | | | | | |

**SHEAR STRENGTH**
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

**Atterberg Limits and Moisture**
$W_P$ W $W_L$
SPT N Value Dynamic Cone
10 20 30 40

***NOTES***

1) Borehole Log interpretation requires assistance by EXP before use by others and must be read in conjunction with EXP Report KCH-25002312-A0.
2) bgs denotes below ground surface.
3) No significant methane gas concentration was detected upon completion.
4) Water Level Readings:
August 2, 2023 - 4.37 m bgs, Elevation 245.98 m
August 15, 2023 - 4.61 m bgs, Elevation 245.74 m
January 31, 2025 - 4.70 m bgs, Elevation 245.65 m

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

| | |
|---|---|
| G Specific Gravity | C Consolidation |
| H Hydrometer | CD Consolidated Drained Triaxial |
| S Sieve Analysis | CU Consolidated Undrained Triaxial |
| γ Unit Weight | UU Unconsolidated Undrained Triaxial |
| P Field Permeability | UC Unconfined Compression |
| K Lab Permeability | DS Direct Shear |

WATER LEVELS
Apparent Measured Artesian (see Notes)

# BOREHOLE LOG

**BH10/MW**
Sheet 1 of 1

CLIENT **Sifton Properties Ltd.** PROJECT NO. **KCH-25002312-A0**

PROJECT **Proposed Development** DATUM **Geodetic**

LOCATION **10242 Glendon Drive, Komoka, ON** DATES: Boring **July 19, 2023** Water Level **Jan 31/25**

| DEPTH (m bgs) | ELEVATION (~m) | STRATA DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N VALUE (blows) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|
| 0 | 246.8 | **FILL** - sand and gravel, brown, trace silt, loose, moist | SS | S1 | 500 | 7 | 4 |
| | 246.1 | | | | | | |
| 1 | | **SANDY SILT** - brown, trace clay, dense to very dense, moist to very moist | SS | S2 | 450 | 33 | 18 |
| | | - moist sand layer encountered near 1.6 m bgs | SS | S3 | 450 | 44 | 14 |
| 2 | | | SS | S4 | 450 | 55 | 14 |
| | 243.9 | | | | | | |
| 3 | | **SAND** - brown, fine to medium grained, trace silt, trace gravel, very dense, very moist<br>- silt layering encountered near 3.0 m bgs<br>- becoming wet near 3.2 m bgs | SS | S5 | 450 | 61 | 16 |
| 4 | | | | | | | |
| 5 | | | SS | S6 | 250 | 50* | 14 |
| | 241.3 | | | | | | |
| 6 | | **SILT** - grey, trace to some clay, some sand, very dense, moist | SS | S7 | 250 | 50* | 14 |
| | 240.3 | | | | | | |
| 7 | | **End of borehole at 6.6 m bgs.** | | | | | |

**SHEAR STRENGTH**
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

**Atterberg Limits and Moisture**
$W_P$ W $W_L$
SPT N Value × Dynamic Cone
10 20 30 40

55
61

***NOTES***

1) Borehole Log interpretation requires assistance by EXP before use by others and must be read in conjunction with EXP Report KCH-25002312-A0.
2) bgs denotes below ground surface.
3) No significant methane gas concentration was detected upon completion.
4) * denotes N=50 blows per less than 150 mm split spoon sampler penetration.
5) Water Level Readings:
August 2, 2023 - 3.38 m bgs, Elevation 243.45 m
August 15, 2023 - 3.61 m bgs, Elevation 243.22 m
January 31, 2025 - 3.79 m bgs, Elevation 243.04 m

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

# BOREHOLE LOG

**BH11/MW**
Sheet 1 of 1

CLIENT **Sifton Properties Ltd.** PROJECT NO. **KCH-25002312-A0**

PROJECT **Proposed Development** DATUM **Geodetic**

LOCATION **10242 Glendon Drive, Komoka, ON** DATES: Boring **July 13, 2023** Water Level **Jan 31/25**

| DEPTH (m bgs) | ELEVATION (~m) | STRATA DESCRIPTION | TYPE | NUMBER | RECOVERY (mm) | N VALUE (blows) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|
| 0 | 249.5 | **FILL** - sand and gravel, brown, trace silt, compact, moist | | | | | |
| 1 | | | SS | S1 | 280 | 16 | 3 |
| | | | SS | S2 | 400 | 28 | 3 |
| 2 | 247.4 | **SAND** - brown, fine to medium grained, trace silt, trace gravel, compact to very dense, moist to very moist<br>- occasional sandy silt lenses throughout | SS | S3 | 425 | 15 | 11 |
| 3 | | | SS | S4 | 450 | 83 | 16 |
| 4 | | - becoming wet near 4.0 m bgs | | | | | |
| | | | SS | S5 | 450 | 50* | 17 |
| 5 | | | | | | | |
| 6 | | | | | | | |
| | 242.9 | | SS | S6 | 290 | 50* | 12 |
| 7 | | **End of borehole at 6.6 m bgs.** | | | | | |

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa
Atterberg Limits and Moisture
$W_P$ W $W_L$
SPT N Value Dynamic Cone
10 20 30 40

***NOTES***

1) Borehole Log interpretation requires assistance by EXP before use by others and must be read in conjunction with EXP Report KCH-25002312-A0.
2) bgs denotes below ground surface.
3) No significant methane gas concentration was detected upon completion.
4) * denotes N=50 blows per less than 150 mm split spoon sampler penetration.
5) Water Level Readings:
August 2, 2023 - 3.24 m bgs, Elevation 246.25 m
August 15, 2023 - 3.34 m bgs, Elevation 246.15 m
January 31, 2025 - 3.62 m bgs, Elevation 245.87 m

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
$\gamma$ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

# Appendix B – Inspection and Testing Schedule

# INSPECTION & TESTING SCHEDULE

The following program outlines suggested minimum testing requirements during backfilling of service trenches and construction of pavements. In adverse weather conditions (wet/freezing), increased testing will be required. The testing frequencies are general requirements and may be adjusted at the discretion of the engineer based on test results and prevailing construction conditions.

## I TRENCH BACKFILL

| | |
|---|---|
| **ZONE A** | - one in situ density test per 100 cubic meters or 50 linear metres of trench whichever is less<br>- one laboratory grain size and Proctor density test per 50 density tests or 4000 cubic metres or on change of material (source, visual) |
| **ZONE A1** | - one in situ density test per 75 cubic metres of material or 25 linear metres of each lift of fill<br>- one laboratory grain size and Proctor density test per each 50 density tests or 4000 cubic metres of material placed or as directed by the engineer |
| **ZONES B & C** | - one in situ density test per 150 cubic metres of material or 50 linear metres or each lift whichever is less<br>- one laboratory grain size and Proctor density test per 50 density tests or 4000 cubic metres of material placed or as directed by the engineer |

## II PAVEMENT MATERIALS

| | |
|---|---|
| **GRANULAR SUBBASE** | - one in situ density test per 50 linear metres of road<br>- one laboratory grain size and standard Proctor test per 50 density tests or 4000 cubic metres or each change of material (visual, source), as determined by the engineer |
| **GRANULAR BASE** | - one in situ density test per 50 linear metres of road<br>- one laboratory grain size and Proctor per 50 density tests or 8000 cubic metres or change in material (visual, source), as determined by the engineer<br>- Benkelman beam testing at 10 metre intervals per lane, after final grading and compaction. Asphaltic concrete should not be placed until rebound criteria have been satisfied. |
| **ASPHALTIC CONCRETE** | - one in situ density test per 25 linear metres of roadway<br>- one complete Marshall Compliance test including stability flow, etc. for each mix type to check mix acceptability. One extraction and gradation test per each day of paving to be compared to job mix formula |

**NOTES:** Where testing indicates inadequate compaction, additional fill should not be placed until the area is recompacted and retested at the discretion of the engineer.

# Appendix C – Limitations and Use of Report

# LIMITATIONS AND USE OF REPORT

## BASIS OF REPORT

This report ("Report") is based on site conditions known or inferred by the geotechnical investigation undertaken as of the date of the Report. Should changes occur which potentially impact the geotechnical condition of the site, or if construction is implemented more than one year following the date of the Report, the recommendations of EXP may require re-evaluation.

The Report is provided solely for the guidance of design engineers and on the assumption that the design will be in accordance with applicable codes and standards. Any changes in the design features which potentially impact the geotechnical analyses or issues concerning the geotechnical aspects of applicable codes and standards will necessitate a review of the design by EXP. Additional field work and reporting may also be required.

Where applicable, recommended field services are the minimum necessary to ascertain that construction is being carried out in general conformity with building code guidelines, generally accepted practices and EXP's recommendations. Any reduction in the level of services recommended will result in EXP providing qualified opinions regarding the adequacy of the work. EXP can assist design professionals or contractors retained by the Client to review applicable plans, drawings, and specifications as they relate to the Report or to conduct field reviews during construction.

Contractors contemplating work on the site are responsible for conducting an independent investigation and interpretation of the test hole results contained in the Report. The number of test holes necessary to determine the localized underground conditions as they impact construction costs, techniques, sequencing, equipment and scheduling may be greater than those carried out for the purpose of the Report.

Classification and identification of soils, rocks, geological units, contaminant materials, building envelopment assessments, and engineering estimates are based on investigations performed in accordance with the standard of care set out below and require the exercise of judgment. As a result, even comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations or building envelope descriptions involve an inherent risk that some conditions will not be detected. All documents or records summarizing investigations are based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated. Some conditions are subject to change over time. The Report presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, these should be disclosed to EXP to allow for additional or special investigations to be undertaken not otherwise within the scope of investigation conducted for the purpose of the Report.

**RELIANCE ON INFORMATION PROVIDED**

The evaluation and conclusions contained in the Report are based on conditions in evidence at the time of site inspections and information provided to EXP by the Client and others. The Report has been prepared for the specific site, development, building, design or building assessment objectives and purpose as communicated by the Client. EXP has relied in good faith upon such representations, information and instructions and accepts no responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of any misstatements, omissions, misrepresentation or fraudulent acts of persons providing information. Unless specifically stated otherwise, the applicability and reliability of the findings, recommendations, suggestions or opinions expressed in the Report are only valid to the extent that there has been no material alteration to or variation from any of the information provided to EXP.

**STANDARD OF CARE**

The Report has been prepared in a manner consistent with the degree of care and skill exercised by engineering consultants currently practicing under similar circumstances and locale. No other warranty, expressed or implied, is made. Unless specifically stated otherwise, the Report does not contain environmental consulting advice.

**COMPLETE REPORT**

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment form part of the Report. This material includes, but is not limited to, the terms of reference given to EXP by its client ("Client"), communications between EXP and the Client, other reports, proposals or documents prepared by EXP for the Client in connection with the site described in the Report. In order to properly understand the suggestions, recommendations and opinions expressed in the Report, reference must be made to the Report in its entirety. EXP is not responsible for use by any party of portions of the Report.

**USE OF REPORT**

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. No other party may use or rely upon the Report in whole or in part without the written consent of EXP. Any use of the Report, or any portion of the Report, by a third party are the sole responsibility of such third party. EXP is not responsible for damages suffered by any third party resulting from unauthorized use of the Report.

**REPORT FORMAT**

Where EXP has submitted both electronic file and a hard copy of the Report, or any document forming part of the Report, only the signed and sealed hard copy shall be the original documents for record and working purposes. In the event of a dispute or discrepancy, the hard copy shall govern. Electronic files transmitted by EXP have utilize specific software and hardware systems. EXP makes no representation about the compatibility of these files with the Client's current or future software and hardware systems. Regardless of format, the documents described herein are EXP's instruments of professional service and shall not be altered without the written consent of EXP.

# Legal Notification

This report was prepared by EXP Services Inc. for the exclusive use of **Sifton Properties Ltd.** and may not be reproduced in whole or in part, or used or relied upon in whole or in part by any party other than **Sifton Properties Ltd.** any purpose whatsoever without the express permission of EXP in writing.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. EXP Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.