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Geotechnical Site Investigation
Proposed Residential Development
Southwest Quadrant of Eliza Street and Wells Street East
Arthur, Ontario

GEMTEC Project: 101764.038

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Submitted to:

Tribute/Sorbara Arthur Holdings Inc.
1815 Ironstone Manor, Unit 1
Pickering, Ontario
L1W 3W9

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Proposed Residential Development
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February 3, 2025
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experience • knowledge • integrity

GEMTEC Consulting Engineers and Scientists Limited
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February 3, 2025 File: 101764.038 – Rev1

Tribute/Sorbara Arthur Holdings Inc.
1815 Ironstone Manor, Unit 1
Pickering, Ontario
L1W 3W9

Attention: Frank Zadorozniak, C.E.T

Re: Geotechnical Site Investigation
Proposed Residential Development, Southwest Quadrant of Eliza Street and Wells Street East, Arthur, Ontario

Enclosed is our geotechnical site investigation report for the proposed residential development located at the southwest quadrant of Eliza Street and Wells Street East, in Arthur, in the Township of Wellington North, Ontario. The report presented herein is based on the scope of work summarized in the proposal dated May 9, 2024. Authorization to Proceed was provided by Tribute/Sorbara Arthur Holdings Inc. on May 29, 2024. This report was prepared by Pricilla Moore, B.Sc. and reviewed by Timi Olumuyiwa, M.Sc., P.Eng., PMP.

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1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) has been requested by Tribute/Sorbara Arthur Holdings Inc. (Tribute/Sorbara) to carry out a geotechnical site investigation to accompany a Draft Plan of Subdivision application for a proposed residential development located at the southwest quadrant of Wells Street East and Eliza Street (i.e., west side of 665 Eliza Street) in Arthur, Township of Wellington North, Ontario (herein referred to as the "site").

It should be noted that the site is considered the western parcel of a much larger development area. The eastern parcel located at 665 Eliza Street is covered in a separate Geotechnical Investigation Report.

The purpose of the geotechnical site investigation was to characterize the general subsurface and groundwater conditions at the site by means of a limited number of boreholes and monitoring wells and, based on the information obtained, to provide geotechnical recommendations to aid in the development approval process as well as additional relevant considerations, that could influence both design and construction of the development.

This report is subject to the Conditions and Limitations of This Report, which follows the text of the report, and are considered an integral part of the report (see Appendix A).

2.0 PROJECT AND SITE DESCRIPTION

2.1 Project Location and Description

The site is relatively triangular shaped (with a flat area at the northern boundary) and is located approximately 210 metres (m) to 670 m south of the intersection of Wells Street East and Eliza Street, and west of Eliza Street in the Town of Aruthur, Ontario.

The property has an approximate area of 17 hectares and consists of agricultural lands which was actively farmed at the time of preparing this report. The site is bordered by agricultural lands and a residential structure to the north, Eliza Street and Wells Street East to the east and west, and agricultural lands to the east, west, and south. A tributary of Farleys Creek is located outside the property at the northern and western portion of the site.

Topographically, the site is of a gentle slope and slopes downwards from east to west towards the creek.

Based on a Concept Site Plan (dated January 14, 2025, and shown in Appendix B) provided by Tribute/Sorbara, the proposed residential development will consist of single and semi-detached homes, townhouses, parklands, stormwater management (SWM) pond, and internal roadways. Considering that the project is still at the early stages, details of the proposed development (e.g.,

site grading, building structures, servicing depths, etc.) were unavailable at the time of issuing this report.

2.2 Site Geology

According to published physiographic mapping (*L.J. Chapman and Putnam, 1984; The Physiography of Southern Ontario, Third Edition*) the site is within a physiographic region known as the Stratford Till Plain.

The Stratford Till Plain refers to an area of broad clay plain extending from London in the south of Blyth and Listowel in the north with a projection toward Arthur and Grand Valley. The area is featured by moraines and interrupted by terminal moraines mostly at the southwestern portion and flat areas at the northern half of the region (modified by one or two moraines).

The soils encountered in this region consist of silty clay (heavy textured calcareous) till, silt, and clay mostly from previously deposited varved clays of the Lake Huron basin. The silt and clays are shallow deposits overlying the silty clay till. Sand or gravel is sometimes present in the intermorainal valleys south of St. Marys. The site is likely within the Brookston series which consist of an upper silt and clay loam, greyish brown/brownish grey mottled with olive/yellowish brown clay loam overlying a clay calcareous till.

3.0 SITE INVESTIGATION METHODOLOGY

3.1 Geotechnical Investigation

The field work for this geotechnical site investigation was carried out between June 27 and July 2, 2024. Eight boreholes, noted as Boreholes BH24-1A to BH24-8A were advanced between approximately 6.5 m and 9.6 m below ground surface.

The boreholes were advanced using a track mounted drill rig operated by TCI Field Services of Whitby, a MECP-licensed Water Well Contractor. The field work was observed throughout by a member of our geotechnical engineering staff who directed the drilling operations and logged the samples and boreholes.

Standard penetration tests (SPT) were carried out in the boreholes and samples of the soils encountered were recovered using a 50-millimetre diameter split spoon sampler. The SPT N values were measured directly in the field and are unfactored.

Single monitoring wells were installed at Boreholes BH24-1A, BH24-5A and BH24-8A. A bi-level monitoring well was installed at Borehole BH24-1A (S/D). The monitoring wells were constructed using nominal 50 mm diameter, Schedule 40 polyvinyl chloride (PVC) pipe with a No. 10 machine slotted screen (0.01-inch slot). The annular space between the monitoring well screen and surrounding soils was backfilled with a silica sand filter to a maximum of 0.3 m above the top of the screen, and the remainder of the annular space was sealed with bentonite. All monitoring

wells were completed with flush-mounted protective steel casings at ground surface. The monitoring well installation details are provided in the Record of Borehole Sheets (Appendix D).

Co-ordination for clearances of underground utilities was provided by GEMTEC. The borehole locations were selected by GEMTEC and positioned on site relative to existing features, and underground and above ground utility constraints. Upon completion of drilling, the ground surface and top of monitoring well standpipe elevations and coordinates at the borehole and monitoring well locations were completed by J.D. Barnes Ltd. on September 24, 2024, and provided to GEMTEC. The borehole elevations are geodetic and referenced to local datums (CGVD-1928:1978). The coordinates at the borehole and monitoring well locations were referenced to the Universal Transverse Mercator (UTM) Zone 17, NAD 1983).

Following completion of the drilling, the soil samples were returned to our Oshawa laboratory for examination by a geotechnical engineer. Selected samples were submitted for grain size distribution, Atterberg limits, and moisture content testing.

The borehole and monitoring well locations are shown on the Borehole Location Plan in Appendix C. Descriptions of the subsurface conditions observed in the boreholes are provided on the Record of Borehole Sheets in Appendix D. The results of the geotechnical laboratory tests are provided on the Record of Boreholes and in Appendix E.

4.0 SUBSURFACE CONDITIONS

As previously indicated, the soil and groundwater conditions identified in the boreholes are shown on the Record of Borehole Sheets in Appendix D. The Record of Boreholes indicate the subsurface conditions at the specific borehole locations only. Boundaries between the different soils on the Records are often not distinct, but rather are transitional and have been interpreted. The precision with which subsurface conditions are indicated depends on the method of drilling, the frequency and recovery of samples, the method of sampling, and the uniformity of the subsurface conditions. Subsurface conditions at locations other than the boreholes may vary from the conditions encountered in the boreholes, both laterally and with depth. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties.

The groundwater conditions described in this report refer only to those observed at the place and time of observation noted in the report. These conditions may vary seasonally or as a consequence of construction activities in the area.

The soil descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves judgement and GEMTEC does not guarantee descriptions as exact but infers accuracy to the extent that is common in current geotechnical practice.

In general, the subsurface conditions at the site consist of topsoil, underlain by a cohesive silty clay and non-cohesive silty sand deposit, underlain by glacial till deposits.

4.1 Topsoil

A veneer of topsoil was encountered at ground surface in all boreholes, with thickness ranging from approximately 150 mm to 690 mm.

4.2 Silty Clay (CL)

A cohesive silty clay deposit with trace to some sand, and trace gravel was encountered underlying topsoil in Boreholes BH24-1A (S/D) to BH24-7A, extending to depths ranging from about 1.1 m to 2.1 m below ground surface. it should be noted that the silty clay in Borehole BH24-2A was reworked due to agricultural activities.

Standard penetration tests carried out in the cohesive silty clay deposit gave SPT N-values ranging from about 4 blows to 24 blows per 0.3 m of penetration, which indicates a firm to very stiff consistency.

The water content measured on samples of the silty clay deposit ranged from about 13 percent to 20 percent.

4.3 Silty Sand (SM)

A non-cohesive silty sand deposit with some gravel was encountered in Borehole BH24-1A (D) only, underlying the silty clay deposit, and ranged between 1.4 m to 2.1 m below ground surface.

One standard penetration test carried out in the non-cohesive silty sand deposit gave an SPT N-value of 15 blows per 0.3 m of penetration, which indicates a compact compactness condition.

A grain size distribution testing was undertaken on one sample of the silty sand deposit from Borehole BH24-1A. The results are provided in Appendix E and are summarized in Table 4.1.

Table 4.1 – Summary of Grain Size Distribution Test (Silty Sand)

Location	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt / Clay (%)
BH24-1A	3	1.5 – 2.0	11.8	65.7	22.5

The water content measured on a sample of the non-cohesive silty sand was about 17 percent.

4.4 Glacial Till

Glacial till was predominant within the site and encountered in all boreholes below the topsoil, and non-cohesive and cohesive deposits. The glacial till is a heterogeneous mixture of all grain sizes, which at this site, consisted of cohesive silty clay till and non-cohesive sandy silt till.

It is anticipated that cobbles and / or boulders may be present within the glacially derived deposits which can be inferred from auger grinding and split spoon sampling not fully penetrating the tills during drilling operations.

Silty Clay Till (CL)

A cohesive silty clay glacial till, sandy to trace sand and trace to some gravel, was encountered in Boreholes BH24-1A to BH24-4A and BH24-8A, underlying the silty clay or silty sand deposits. Sand seams and silt seams were observed within the cohesive deposit at various borehole locations. Borehole BH24-2A was terminated within this deposit.

Standard penetration tests carried out in the cohesive till deposit gave SPT N-values ranging from about 14 blows to 93 blows per 0.3 m of penetration, which indicates a stiff to hard consistency.

Grain size distribution testing was undertaken on a sample of the cohesive till from Borehole BH24-2A. The results are provided in Appendix E and are summarized in Table 4.1.

Table 4.2 – Summary of Grain Size Distribution Test (Cohesive Silty Clay Till)

Location	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt / Clay (%)
BH24-2A	2B	0.8 – 1.2	5.8	14.5	79.7

Atterberg limit testing was carried out on two samples of the cohesive silty clay till deposit obtained from Boreholes BH24-2A and BH24-8A and the results gave plastic limits of about 15 and 16 percent, liquid limits of about 24 and 26 percent, and plasticity indices of about 9 and 10; and indicates a silty clay of low plasticity. The results are shown on the Record of Boreholes and in Appendix E.

The water contents measured on samples of the cohesive till deposit ranged from 9 percent to 15 percent.

Sandy Silt Till (ML)

A non-cohesive sandy silt till with trace gravel was encountered in Boreholes BH24-1A and BH24-3A to BH24-8A, underlying the silty clay and the cohesive till deposits.

Standard penetration tests carried out in the non-cohesive till deposit gave SPT N-values ranging from about 45 blows per 0.3 m of penetration to 80 blows per 0.13 m of penetration, which indicates a dense to very dense compactness condition.

Grain size distribution testing was undertaken on one sample of the sandy silt till from Borehole BH24-8A. The results are summarized in Table 4.3.

Table 4.3 – Summary of Grain Size Distribution Test (Sandy Silt Till)

Location	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt / Clay (%)
BH24-8A	7	6.1 – 6.6	6.7	28.2	65.1

The water contents measured on samples of the non-cohesive till deposit ranged from about 4 percent to 12 percent. The results are shown on the Record of Boreholes and in Appendix E.

4.5 Groundwater Levels

The unstabilized groundwater level was measured in the open borehole upon completion of drilling and ranged from 5.1 m to 7.3 m below ground surface. Boreholes BH24-3A, BH24-4A, BH24-6A and BH24-7A, were observed to be dry upon completion of drilling.

The groundwater levels were measured in the monitoring wells installed in Boreholes BH24-1A(S/D), BH24-5A and BH24-8A, after completion of drilling, in July and August 2024. The groundwater levels and elevations have been provided in Table 4.4.

Table 4.4 – Approximate Groundwater Depths and Elevations

Monitoring Wells	Groundwater Below Existing Ground Surface (metres)				Groundwater Elevation (metres)			
	09-Jul-24	18-Jul-24	02-Aug-24	16-Aug-24	09-Jul-24	18-Jul-24	02-Aug-24	16-Aug-24
BH24-1A(S)	1.3	0.4	1.2	1.3	461.0	461.9	461.1	461.0
BH24-1A(D)	3.0	3.4	3.5	3.8	459.3	458.9	458.8	458.5
BH24-5A	1.3	0.6	1.3	1.6	458.5	459.1	458.5	458.1
BH24-8A	1.2	0.9	1.3	1.5	462.0	462.3	462.0	461.8

It should be noted that the groundwater levels may be higher during wet periods of the year such as the early spring or following periods of precipitation.

5.0 GEOTECHNICAL DISCUSSION AND RECOMMENDATIONS

This section of the report provides guidance on the geotechnical engineering design aspects of the project based on our interpretation of the boreholes advanced as part of the preliminary site investigation. It is stressed that the information in the following sections is provided for the guidance of the designers and is intended for this project only. Additional geotechnical and hydrogeological investigation will be required as the development details become more available. Contractors bidding on or undertaking the works should examine the factual results of the

investigation, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of the factual data as it affects their construction techniques, schedule, safety, and equipment capabilities.

The professional services retained for this project include only the geotechnical engineering and hydrogeological aspects of the subsurface and groundwater conditions at this site. The presence or implications of possible surface and/or subsurface contamination resulting from previous uses or activities of this site or adjacent properties, and/or resulting from the introduction onto the site from materials from offsite sources are outside the terms of reference for this report and have not been investigated or addressed.

Based on the result of the investigation, the subsurface soil conditions encountered at the site are considered to be generally suitable for the proposed development, utilizing conventional shallow strip and spread footings, with slab-on-grade or basement construction, serviced underground utilities, and overall site development. Consideration will need to be given to groundwater control and management during both construction and, depending on the final grading, long-term operations (i.e., stormwater pond, and basement foundations).

5.1 Site Preparation and Site Grading

Existing water well (if any), weeping tiles, vegetation, topsoil, and any soil containing organics should be stripped/removed/decommissioned from the site prior to placement of engineered fill. Outside of road allowances, utility corridors, and building envelopes and the like, the topsoil may be reused for general grading in areas where the fill is not required to support settlement sensitive structures. Any oversize cobbles, boulders and other deleterious materials should be excluded from the reuse as site grading fill.

Where the topsoil is used as general lot fill (i.e., non-structural fill), its thickness should be limited to about 1.5 m. The topsoil fill should be placed in maximum 300 mm loose lifts and uniformly compacted to 95 percent of Standard Proctor Maximum Dry Density (SPMDD). To have any success in placing topsoil as lot grading fill, it must be placed at or very close (+/- 2%) to its optimum water content to achieve workability and adequate compaction, in order to minimize post-construction settlements and/or lateral movements (e.g., of fences, etc.).

Upon completion of topsoil stripping, the near surface silty clay deposit should be heavily proofrolled and compacted under the direction of qualified geotechnical personnel.

Preliminary grading plans were not available at the time of this report, however, due to the topography of the site, cut and fill operations is anticipated to be required in order to achieve final grades within the site.

Depending on the grade raise and based on the existing subsurface conditions, long-term settlements of the firm silty clay within 0.5 m and 1.2 m below existing grades (depending on the borehole location) should be anticipated. However, based on our local experience and

understanding of the subsurface conditions, this is anticipated to take 2 to 3 months to achieve 90 percent of the consolidation settlement assuming a grade raise of up to 2 m. Once the design is advanced, GEMTEC should be given the opportunity to review the available information and provide updated commentary on the impacts to underlying materials.

5.2 Engineered Fill

At the time of this report preparation, preliminary grading plans were not available. However, significant grade raise is anticipated to achieve final grades within the site. Any significant fills (greater than 1 m) should be reviewed by GEMTEC to assess the anticipated short and long-term settlements of the underlying soils and their potential impact on the overall site development.

Based on the soil classification and frost group described in Table 13.1 of the Canadian Foundation Engineering Manual (CFEM, 2006), the cohesive deposit and cohesive glacial till encountered on the site are regarded as being high frost susceptibility. This should be considered for any design elements exposed to freezing temperatures (concrete flatworks, exterior concrete slabs, and the like). The silty clay deposit is not suitable for reuse as engineered fill due to the potential to induce long-term and differential settlement below the residential building foundations.

The approved engineered fill should consist of imported material which meets the requirements for OPSS.PROV 1010 Select Subgrade Material (SSM), Granular A and placed in maximum 300 mm loose lifts and compacted to a minimum 98 percent SPMDD or as noted otherwise. The water contents at the time of placement should be within +/- 2 percent of its optimum moisture content to achieve the required compaction. Further to this, soft / loose / deleterious materials, and cobbles and boulders should be removed during fill placement.

After stripping and sub-excavating to the founding elevations (or sub-excavation depth, where required), the prepared subgrade should be proof rolled (where possible) and inspected by qualified geotechnical personnel to confirm that the foundation soils are uniform and consistent with those encountered in the boreholes and are free of any softened / loosened or deleterious materials. Locations where less competent subgrade conditions (i.e., soft / loose soil, organic soils, or other deleterious materials) are identified during subgrade inspection should be sub-excavated and replaced with engineered fill.

It is strongly recommended that construction should be carried out under dry conditions. If construction is required during freezing temperatures, the subgrade should be protected immediately from freezing by placing additional soil cover above the final subgrade, to be removed prior to continuing construction, to provide temporary frost protection.

5.3 Shallow Foundations

5.3.1 Residential Buildings

Shallow spread footings and strip foundations are considered feasible foundation elements for the proposed structures and buildings within engineered fill and competent native soils consisting

of firm to hard silty clay, compact silty sand, stiff to hard cohesive till deposit and dense to very dense non-cohesive till deposit.

Spread footings founded on or within the engineered fill and the native undisturbed deposit consisting of firm silty clay deposit may be designed using a factored geotechnical resistance at Ultimate Limit State (ULS) of 225 kPa and an unfactored geotechnical reaction at Serviceability Limit State (SLS) of 150 kPa.

Spread footings founded on or within the native undisturbed deposit consisting of compact silty sand or stiff to hard / dense to very dense till deposits may be designed using a factored geotechnical resistance at Ultimate Limit State (ULS) of 300 kPa and an unfactored geotechnical reaction at Serviceability Limit State (SLS) of 200 kPa.

The ULS factored geotechnical resistance values are based on resistance factor of 0.5, while the SLS unfactored reaction values are based on 25 mm and 19 mm of total and differential settlement, respectively; both for footing widths ranging between 900 mm and 2500 mm.

The geotechnical bearing resistance / reaction should be confirmed at the time of construction and assumes that all loose / soft, or otherwise deleterious materials are removed from the bearing surface. All footings should be provided with a minimum of 1.5 m of earth cover, otherwise frost protection measures should be included and can be provided upon request.

It is recommended that basement foundations be founded above the long term groundwater table. Depending on the final grading plan and assuming a basement level at approximately 3 m below final grade, the proposed basement elevations will be founded on the silty clay and cohesive and non-cohesive till deposits which will generally be below the groundwater table. As such, the basement foundations should be designed as a fully drained structure with perimeter and under slab drain at foundation level leading to a permanent frost-free outlet, such as a continuously pumped sump or a direct outlet to a sewer line, should be provided. For basement foundations located above the ground water table, perimeter subdrains will be sufficient.

If stepped spread footings are constructed at different founding levels, the difference in elevation between individual footings should not be greater than one half the clear distance between the footings. Should this not be possible, GEMTEC should be consulted to provide field inspection to ensure that the footings exceeding the above requirement are stable and the bearing for the upper (i.e., higher) footing is not compromised. In addition, the lower footings should be constructed first so that if it is necessary to construct the lower footings at a greater depth than anticipated, the elevations of the upper footings can be adjusted accordingly. Stepped strip footings, if required, should be constructed in accordance with the 2012 Ontario Building Code (2012 OBC), Section 9.15.3.9.

The founding materials are susceptible to disturbance by construction activity especially during wet weather and care should be taken to preserve the integrity of the bearing strata, including

engineered fill. Prior to pouring concrete for the footings, the foundation excavations must be inspected to confirm that the footings are located on a competent bearing stratum, which has been cleaned of ponded water and loosened or softened material and addressed the potential need to provide remedial work. Sub-excavated soils can be replaced with engineered fill or unshrinkable fill with a minimum compressive strength of 0.7 MPa or as directed by geotechnical personnel.

5.3.2 Slabs-on-Grade (Heated Areas Only)

For slab-on-grade foundations founded on a prepared subgrade, a modulus of subgrade reaction, k_{vb}, is typically used to represent the soil stiffness. The modulus of vertical subgrade reaction (k_{vb}) is not a fundamental soil property, and the value changes with footing size and / or the size of the loaded area(s). The current state of practise uses a standard reference vertical subgrade reaction, k_{v1}, associated with a 0.3 m x 0.3 m (i.e., 1 ft x 1 ft) plate. The modulus of vertical subgrade reaction can be estimated from the equations given below for foundations and / or slabs on non-cohesive or cohesive soils (CFEM, 2006). However, it should be noted that these methods are approximate only and it is generally considered that carrying out a detailed settlement analysis is the more rational approach (once design details are known) to obtaining more realistic values of k_{vb}.

For slab-on-grade foundations, the modulus of subgrade reaction is defined as:

$$k = \frac{q}{\delta}$$

Where:

k is the modulus of vertical subgrade reaction for actual foundation width, b (MPa/m);

q is the applied bearing or contact pressure on the foundation; and,

δ is the settlement of the foundation under the applied pressure q.

For cohesive soils:

$$k_{vb} = \frac{0.3\, k_{v1}}{b}\left[\frac{m + 0.5}{1.5m}\right]$$

Where:

k_{vb} is the modulus of vertical subgrade reaction for actual foundation dimension, b (MPa/m);

k_{v1} is the modulus of vertical subgrade reaction for a 1 ft x 1 ft plate (MPa/m);

b is the foundation width (m); and,

m is the ratio of foundation length to width (i.e., m = *L* / b).

For non-cohesive soils:

$$k_{vb} = k_{v1}\left[\frac{3.3b + 1}{6.6b}\right]^2$$

Where:

k_{vb} is the modulus of vertical subgrade reaction for actual foundation dimension, b (MPa/m);

k_{v1} is the modulus of vertical subgrade reaction for a 1 ft x 1 ft plate (MPa/m); and,

b is the foundation width (m).

The base for all floor slabs should consist of at least 200 mm of Ontario Provincial Standard Specification (OPSS) Granular A compacted to at least 100 percent SPMDD in suitable lift thicknesses (typically maximum 200 mm).

For the design of interior floor slabs using a spring constant, a modulus of vertical subgrade reaction, k_{v1}, of 30 MPa/m may be used for design for the design of slabs placed directly on granular fill. The design modulus of vertical subgrade reaction is derived based on the assumption that the subgrade is not disturbed during construction.

Again, the modulus of subgrade reaction is not a fundamental nor intrinsic soil property and will vary depending on the rigidity of the slab and the thickness of the granular bedding. Additional analysis and input may be required for the structural design to refine the range of k_{vb} values. Where designs are sensitive to the specific modulus value(s), a more rigorous method of analysis (i.e., settlement analysis) should be undertaken to obtain modulus value(s) that are more representative of the site conditions.

To assist in preventing potential long-term settlement of the floor slab, any soft / loose / disturbed, wet, or otherwise deleterious materials should be removed from below the floor slab. An underfloor drainage system is not considered necessary provided that the floor slab level is above the finished exterior ground surface.

A polyethylene vapour barrier / retarder is recommended below the floor slabs where the floor will be covered by moisture sensitive flooring material or where moisture sensitive equipment, products or environments will exist. The ACI 302.1R-04 "*Guide for Concrete Floor and Slab Construction*" should be referenced for design purposes.

The floor slabs should be structurally separate from the foundation walls and columns and sawcut control joints should be provided at regular intervals and along column lines to reduce shrinkage cracking and allow for any differential settlement of the floor slabs.

If any areas of the building are to remain unheated during the winter period, thermal protection of the slab on grade may be required. Further details on the insulation requirements could be provided, if necessary.

5.3.3 Foundation Walls and Isolated Piers

To avoid ad-freeze and possible jacking (heaving) of the foundations, the interior and exterior of the foundation walls should be backfilled with free draining, non-frost susceptible material that meets OPSS requirements for Granular B Type I or II. The backfill should be compacted in maximum 300 mm thick lifts to at least 95 percent SPMDD using suitable vibratory compaction equipment. Where the backfill will ultimately support areas of hard surfacing (pavement, sidewalks, or other similar surfaces), the backfill should be placed in maximum 200 mm thick lifts and compacted to 95 percent SPMDD using suitable compaction equipment.

Backfilling against isolated (unheated) walls or piers should consist of free draining, non-frost susceptible material meeting OPSS Granular B Type I or II requirements. Other measures to prevent frost jacking of foundation elements can be provided if required.

Where areas of hard surfacing (pavement etc.) abut the proposed structures, a gradual transition should be provided between those areas of hard surfacing underlain by non-frost susceptible granular wall backfill and those areas underlain by existing frost susceptible material to reduce the effects of differential frost heaving. It is suggested that granular frost tapers be constructed from 1.5 m below finished grade to the underside of the granular subbase material for the hard surfaced areas. The frost tapers should be sloped at 1 horizontal to 1 vertical (1H:1V), or flatter.

5.3.4 Seismic Site Class

Based on the results of the investigation, it is anticipated that the proposed structures will be founded on engineered fill or the native firm to very stiff cohesive till deposits.

The seismic design provisions of Table 4.1.8.4-A of the 2012 Ontario Building Code depend, in part, on the shear wave velocity of the upper 30 metres of soil and/or rock below founding level. Based on the subsurface conditions encountered and our experience with similar developments in the area, the foundations at the site may be designed using a Site Class D designation.

It is likely that the site class could be improved by in situ testing. If recommended by the structural engineer, in situ geophysical testing can be carried out at the site.

5.4 Temporary Excavation

Excavations for the proposed structures and underground utilities are anticipated to be through the engineered fill, and native firm to hard silty clay, compact silty sand, stiff to hard cohesive till and dense to very dense non-cohesive till deposits. Due to the nature of the glacial till, which is anticipated to contain cobbles and / or boulders, excavation equipment should be chosen that can handle removal of any cobbles / boulders.

The sides of the excavations should be sloped in accordance with the requirements in Ontario Regulation 213/91 under the Occupational Health and Safety Act (OHSA). According to the Act, the native soils can be generally classified as Type 3 and, accordingly, allowance should be made

for excavation side slopes of 1H:1V extending upwards from the base of the excavation. Please note that if the excavation extends below the groundwater table without adequate dewatering, the soil at the face of the excavation would be classified as Type 4. The soil type classifications indicated above are provisional and are subject to change based on field observations of the actual conditions at the time of exposure.

Excavations should be left open for as short a duration as possible and completely backfilled at the end of each working day. All excavated material should be stockpiled well away (i.e., minimum 2 m) from the sides / crest of the excavation.

Where side slopes of excavations are required to be steepened to limit the extent of the excavation, then some form of trench support system may be required. It is emphasized that 'trench box' support systems provide protection for construction personnel, but do not provide any lateral support for the adjacent excavation walls, underground services, or existing structures. Any voids between the excavation walls and the exterior of the trench box should be filled immediately to restore lateral support.

Flattening and / or blanketing of the side slopes may be required in the non-cohesive silty sand deposit depending on the weather conditions and construction procedure adopted by the contractor.

If there is insufficient space to excavate temporary open cuts, it is recommended that a shoring system consisting of braced steel sheet piles or potentially a slide rail system designed by a Professional Engineer, including assessment of the potential for basal heave be utilized. If shoring is implemented at the site, the requirements of OPSS.PROV 539 should be followed. The design of temporary works is (entirely) the responsibility of the contractor.

5.5 Lateral Earth Pressure (Temporary Shoring System)

The static active thrust (P_a) force acting (linearly) on the side of the temporary shoring should be calculated using the following formula:

$P_a = 0.5\ K_a\ \gamma\ H^2$

Where:

- P_a: Static active thrust component (kN per linear metre of wall);
- γ: Bulk material unit weight (kN/m^3);
- K_a: Coefficient of "Active" earth pressure (anticipated movement of the wall); and,
- H: Wall height (m).

The static thrust component (P_a) acts at a point located H/3 above the base of the wall. For design purposes, the soil parameters provided in Table 5.1 can be used to calculate the active thrust components acting on the wall.

Table 5.1 – Summary of Coefficient of Lateral Earth Pressures

Parameter	Engineered Fill and Silty Sand	Silty Clay[1]	Cohesive Till	Non-Cohesive Till
Material Unit Weight, γ (kN/m^3)	21	18	21	22
Estimated Friction Angle (degrees)	32	-	33	34
Coefficient of At-Rest Earth Pressure, K_o	0.47	0.5	0.46	0.44
Coefficient of Active Earth Pressure, K_a (assuming horizontal backfill behind the structure)	0.31	1.0	0.29	0.28

Notes:
1) Assumes short-term / total stress conditions and that the excavation is temporary and of short duration (i.e., 4 week).

Shoring system may include braced soldier pile and lagging, braced sheet piles or an engineered slide rail system. The shoring elements should extend into the competent native soils to provide adequate wall / soil stiffness at the embedment toe. Potential lateral pressures from the groundwater table may need to be considered in the shoring system design depending on the groundwater control measures selected by the contractor.

5.6 Temporary Groundwater Control

The highest groundwater levels measured in the monitoring wells ranged from about 0.4 m to 3.8 m below ground surface (between Elev. 458.8 m and Elev. 461.9 m).

The cohesive and non-cohesive glacial till and silty clay generally have a low hydraulic conductivity and low specific yield and as such are not expected to generate large quantities of groundwater for excavations open for a relatively short period of time. Where excavations are carried out within these low hydraulic conductive soils, groundwater can likely be controlled by pumping from properly constructed and filtered sumps located within the excavations.

Where excavations are carried out within any saturated non-cohesive deposit, groundwater may need to be controlled using well points and eductors, depending on the finished grade, thickness of layer, and depth of excavation.

The rate and volume required for dewatering will be dependent on the depth of the required excavations, the groundwater levels at the time of construction and the construction methods and staging chosen by the Contractor. Dewatering should be undertaken by a specialist dewatering contractor who is an MECP-licensed Water Well Contractor. The design of the dewatering array should be based on the dewatering contractor's independent assessment of site conditions, and on their experience and equipment.

Details regarding dewatering needs and anticipated volumes have been provided in the Hydrogeological assessment report provided in a separate cover.

5.7 Site Servicing

It should be noted that details of the underground utilities (i.e., watermain, storm and sanitary sewers etc.) have not been provided at the time of preparing this report. As such, we have assumed that underground infrastructure within the site will be located within 4 m from the existing site grades. Based on this, the founding soils for the proposed site services will likely consist of native firm to hard silty clay, compact silty sand, stiff to hard cohesive till or dense to very dense non-cohesive till which are suitable for supporting the proposed underground service.

In general, specifications for pipe bedding, cover, and trench backfill should be in accordance with the Township of Wellington North Municipal Servicing Standards dated March 2023.

5.7.1 Pipe Bedding and Cover

The pipe bedding material should consist of well graded crushed stone meeting OPSS gradation requirements for Granular A. The minimum bedding thickness should be 200 mm for pipes within the competent native soils. The use of clear crushed stone or ‘high-performance bedding' as bedding material should not be permitted.

Cover material, from pipe spring line to at least 300 mm above the top of the pipe, should consist of granular material, such as OPSS Granular B. The use of clear crushed stone or ‘high-performance bedding' as the cover material should not be permitted.

The bedding and cover materials should be compacted in maximum 200 mm loose lift thickness to at least 98 percent SPMDD.

5.7.2 Trench Backfill

Most of the excavated materials will consist of native silty clay, silty sand and non-cohesive or cohesive till. The soils within the anticipated excavated depths will mostly be below or at their estimated optimum water contents for compaction. Based on this, the excavated till materials at water contents of +/- 2 percent of their optimum water contents may be re-used as trench backfill, provided they are free of topsoil, organic or other deleterious materials. Some moisture conditioning may be required prior to placement as backfill. Contractors should make appropriate effort to promote positive surficial drainage of backfilled materials in order to minimize ponding and weakening of the backfilled materials to aid in the successful preparation of the pavement structure.

The silty clay deposit is not recommended to be used as trench backfill due to difficulty in breaking it down for compaction, high water contents which are above the anticipated optimum water contents, sensitivity upon contact with moisture, and potential long-term settlements.

Alternatively, the trench may be backfilled with imported free draining, non-frost susceptible granular or sandy material. The material should meet OPSS gradation requirements for SSM or Granular B Type II. To minimize future settlement of the backfill and achieve an acceptable subgrade for the roadways, curbs, driveways, etc., the backfill material should be compacted in maximum 300 mm loose lift thickness to a minimum 95 percent SPMDD from the top of the cover material to 1.0 m below the subgrade elevation. The upper 1 m of the backfill should consist of granular material and compacted to at least 98 percent SPMDD to support the pavement structure. Oversized cobbles and boulders (i.e., greater than 150 mm in size) should be removed from the backfill.

Normal post-construction settlement of the compacted trench backfill should be expected. As such, consideration could be given to implementing one or a combination of the following measures to reduce post construction settlement above the trenches, depending on the weather conditions encountered during the construction:

- Allow the overburden materials to dry prior to compaction; and / or,
- Make provision to defer final paving of the surface course asphalt in the roadway for 3 months, or longer, to allow the trench backfill settlement to occur and thereby improve the final roadway appearance.

Trench plugs (i.e., clay) may be required at a limited number of locations where the trenches are along steep grades to prevent preferential water flow through the granular bedding and trench backfill. These clay plugs could be constructed using the excavated silty clay (at least 2 percent above its optimum water content) or manufactured clay plugs. The need for and frequency of trench plugs should be evaluated during the detailed design phase, generally confirm to OPSD 802.095, and should be considered at the construction limits, and equally spaced at a maximum 100 m spacing (depending on pipe length, may be less.

5.8 Stormwater Management Pond

Based on the Concept Site Plan provided, the proposed SWM pond will be located at the northwest quadrant of the site in the vicinity of Boreholes BH24-1A and BH24-3A.

The following comments and recommendations are general in nature, should be considered to be preliminary and are provided to assist in the preliminary design of the SWM pond. Once the pond design is more advanced, the recommendations should be revised and updated as appropriate along with additional investigatory field work carried out, if required.

The proposed SWM pond base has been assumed to be located within about 4 m below ground surface depending on the final grade.

- Based on the subsurface conditions encountered within the proposed SWM pond, the subsurface soil conditions below the topsoil are expected to generally consist of firm silty

clay, compact silty sand, very stiff to hard cohesive till and very dense non-cohesive till deposits.

- The maximum groundwater level measured in the monitoring wells installed in Borehole BH24-1A (S/D) was about 0.4 m below ground surface (Elev. 461.9 m) in July 2024.
- The tills and cohesive soils are characterized by moderate to low hydraulic conductivity and low specific yield. Groundwater contributions from these units are not expected to be significant. Due to the relatively shallow silty sand deposit encountered, consideration should be given to removal and replacement of this non-cohesive unit with cohesive fill material (using silty clay encountered on site). Additional boreholes should be advanced in the vicinity of the SWM pond during detailed design to further investigate the lateral extent of the non-cohesive unit.
- In general, a clay liner (i.e., natural clay or geosynthetic), ballasted geomembrane, and perimeter/underdrain system is not required.
- Any constructed berms around the pond should have a top width of at least 3 m to allow access by maintenance vehicles. The material used to construct the berms should be approved by the geotechnical engineer prior to placement. In this regard, the silty clay and cohesive till materials would generally be suitable for reuse provided that the compaction water content is at, or up to 3 percent below, its optimum water content. The approved material used to construct berms should be placed in maximum 200 mm thick loose lifts and uniformly compacted to at least 98 percent of the material's SPMDD.
- Further to the above, care should be taken to ensure homogeneity of the constructed berm (i.e., no erodible layers). The prepared foundation for the berm should be inspected by the geotechnical engineer prior to placement of berm fill material. A key trench, a minimum of 0.6 m deep and 2 m wide, keyed into the till deposit, should be provided along the full length of the constructed berm.
- Pond side slopes above the permanent water level in the pond should be inclined no steeper than 3H:1V; side slopes below the permanent water table should be inclined at 4H:1V or flatter.
- Cut side slopes of the pond should be inspected by the geotechnical engineer during construction. Where erodible soil layers (i.e. silty sand and non-cohesive till) are encountered, some form of blanketing, flattening of the slope angles or the like would be required. The need for and the design of any blanketing or other remedial measures should be determined during construction by the geotechnical engineer.
- During construction, water accumulated in the pond should be removed and all soft, loosened, or disturbed soils at the base and slopes of the pond should be sub-excavated as recommended on site by GEMTEC. The native, undisturbed, competent soils should be exposed and heavily proofrolled in conjunction with an inspection by GEMTEC to confirm the base and slopes of the pond are cleaned of ponded water, loosened/softened soils, or other deleterious material. Any soft spots identified during proofrolling should be sub-excavated to expose competent soils prior to backfilling.

- The pond should be equipped with an emergency spillway or similar structure(s) designed to eliminate the possibility of over-topping of the berms.
- Where pipes enter or exit the pond, they should be provided with a concrete collar and be backfilled with a relatively impermeable material (e.g., native silty clay) to reduce preferential flow through the pipe bedding and backfill and possible loss of ground. Pipes entering or exiting the pond should be sized and designed to allow for cleaning. The exposed end of the riser portion should be provided with a protective wire mesh or the like to prevent unauthorized access (e.g., by children).
- Regular inspections by the geotechnical engineer should be carried out during the pond construction. The final pond side slopes should be sodded or otherwise similarly treated to reduce erosion. Maintenance will be required over the first several years until the vegetative mat has taken root.

Further comments and revisions on the above recommendation and construction of the pond will be provided once the design details and drawings are provided.

5.9 Asphalt Pavement Construction

5.9.1 Pavement Structure

Based on the results of the geotechnical investigation and on review of the Township of Wellington North Municipal Servicing Standards dated March 2023, the following minimum pavement structure is suggested for internal (local) roadways at this site:

Table 5.2 – Flexible Pavement Design Recommendations

Material	Thickness and Type of Pavement Elements
Surface Course	40 mm HL 3
Base Course	50 mm HL 4
Granular Base	150 mm Granular A
Granular Subbase	450 mm Granular B, Type I or II

5.9.2 Effects of Subgrade Disturbance

If the road subgrade surface becomes disturbed or wetted due to construction operations or precipitation, or the granular pavement materials are to be used by construction traffic, the Granular B thicknesses provided above may not be adequate and it may be necessary to increase the thickness of the Granular B subbase or exclusively use Granular B, Type II subbase. The contractor should be responsible for providing suitable access for construction equipment.

The required thickness of the subbase materials will depend on a number of factors, including contractor workmanship and schedule, contractor methodology, soil types, and weather conditions, and should be assessed by geotechnical personnel at the time of construction. In our opinion, the recommended approach for subgrade preparation from a geotechnical point of view is to:

- Proofroll the subgrade conditions at the time of construction under the supervision of experienced geotechnical personnel; and,
- Adjust the thickness or type of the subbase material and include a woven geotextile separator, as required. Unit rate allowances should be made in the contract for sub-excavation and replacement with OPSS Granular B, Type II (as required).

5.9.3 Granular Material Placement

The pavement granular materials should be compacted in maximum 300 mm thick lifts to at least 98 percent SPMDD using suitable vibratory compaction equipment.

5.9.4 Asphaltic Cement

Performance graded PG 58-28 asphaltic cement is recommended for the internal road construction.

5.9.5 Transition Treatments

In areas where the new pavement structure will abut existing pavements, the depths of the granular materials should taper up or down at 5H:1V, or flatter, to match the depths of the granular material(s) exposed in the existing pavement. Any undermining or broken edges resulting from the construction activities should be removed by saw cut. All milled surfaces and butt joints should be properly tack coated prior to asphalt placement.

5.9.6 Pavement Drainage

In order to provide drainage of the granular base and subbase, the granular material should extend to ditches or drainage outlets. The bottom of the granular subbase layer should be at least 0.3 m above the bottom of the ditch or drainage outlet and should have positive drainage away from the site.

If storm sewers and catch basins are installed, it is suggested that continuous subdrains connected to catch basins be provided along the perimeter of both sides of all roadways to assist with drainage of the pavement structure. These drains should be installed at the bottom of the subbase layer.

6.0 ADDITIONAL CONSIDERATIONS

6.1 Monitoring Well Abandonment

All monitoring wells installed as part of this investigation should be decommissioned when no longer required by a licensed Water Well Contractor in accordance with applicable legislation. A

licensed Water Well Contractor should also decommission any on-site water supply wells in accordance with applicable legislation. The well abandonment could be carried out in advance of or during construction.

6.2 Management of Excess Soil

It is noted that the professional services retained for this project include only the geotechnical and hydrogeological aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or subsurface contamination, including naturally occurring sources of contamination, are outside the terms of reference for this report. This report does not constitute a Phase II Environmental Site Assessment (ESA), nor does it constitute a contaminated material management plan.

It is recommended that soil samples be collected prior to and / or during construction to support the disposal or re-use of excess soil generated from the site.

6.3 Corrosion Considerations

The potential for the subsurface soil and groundwater conditions to corrode concrete and steel elements, or the like, should be considered in the final design. Additional sampling and / or testing may be required, or suitable protection measures (i.e., sulphate resistance concrete, sacrificial thickness, cathodic protection, etc.) should be considered by the designer.

6.4 Design Review and Construction Observation

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

7.0 CLOSURE

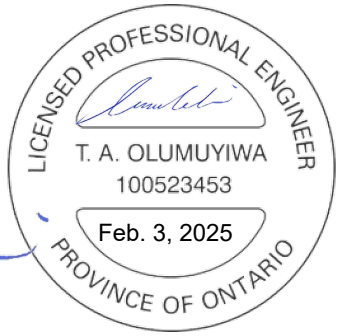
We trust that this report meets your immediate requirements. If conditions that differ from those assumed in this preliminary geotechnical investigation report are encountered during construction, GEMTEC should be given the opportunity to review the recommendations presented herein.

If you have any questions or require additional information, please contact the undersigned.

Regards,

GEMTEC Consulting Engineers and Scientists Limited

Pricilla Moore, B.Sc.
Geotechnical E.I.T.



Timi Olumuyiwa, M.Sc., P.Eng., PMP
Senior Geotechnical Engineer

APPENDIX A

Conditions and Limitations of This Report

Conditions and Limitations of This Report

1. **Standard of Care:** GEMTEC has prepared this report in a manner consistent with generally accepted engineering or environmental consulting practice in the jurisdiction in which the services are provided at the time of the report. No other warranty, expressed or implied is made.
2. **Copyright:** The contents of this report are subject to copyright owned by GEMTEC, save to the extent that copyright has been legally assigned by us to another party or is used by GEMTEC under license. To the extent that GEMTEC owns the copyright in this report, it may not be copied without our prior written agreement for any purpose other than the purpose indicated in this report. The methodology (if any) contained in this report is provided to the Client in confidence and must not be disclosed or copied to third parties without the prior written agreement of GEMTEC. Disclosure of that information may constitute an actionable breach of confidence or may otherwise prejudice our commercial interests.
3. **Complete Report:** This report is of a summary nature and is not intended to stand alone without reference to the instructions given to GEMTEC by the Client, communications between GEMTEC and the Client and to any other reports prepared by GEMTEC for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. GEMTEC can not be responsible for use of portions of the report without reference to the entire report.
4. **Basis of Report:** This Report has been prepared for the specific site, development, design objectives and purposes that were described to GEMTEC by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document, subject to the limitations provided herein, are only valid to the extent that this report expressly addresses the proposed development, design objectives and purposes. Any change of site conditions, purpose or development plans may alter the validity of the report and GEMTEC cannot be responsible for use of this report, or portions thereof, unless GEMTEC is requested to review any changes and, if necessary, revise the report.
5. **Time Dependence:** If the proposed project is not undertaken by the Client within 18 months following the issuance of this report, or within the timeframe understood by GEMTEC to be contemplated by the Client, the guidance and recommendations within the report should not be considered valid unless reviewed and amended or validated by GEMTEC in writing.
6. **Use of This Report:** The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without GEMTEC's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, GEMTEC may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process.

   Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.
7. **No Legal Representations:** GEMTEC makes no representations whatsoever concerning the legal significance of its findings, or as to other legal matters touched on in this report, including but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

8. **Decrease in property value:** GEMTEC shall not be responsible for any decrease, real or perceived, of the property or site's value or failure to complete a transaction, as a consequence of the information contained in this report.
9. **Reliance on Provided Information:** The evaluation and conclusions contained in this report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations. information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of misstatements, omissions, misrepresentations. or fraudulent acts of the Client or other persons providing information relied on by us. We are entitled to rely on such representations, information and instructions and are not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
10. **Investigation Limitations:** Site investigation programs are a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions but even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions.

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

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

    In addition, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.
11. **Sample Disposal:** GEMTEC will dispose of all uncontaminated soil and/or rock samples 60 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.
12. **Follow-Up and Construction Services:** All details of the design were not known at the time of submission of GEMTEC's report. GEMTEC should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of GEMTEC's report.

    During construction, GEMTEC should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not

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

13. **Changed Conditions:** Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that GEMTEC be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that GEMTEC be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.
14. **Drainage:** Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. GEMTEC takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

APPENDIX B

Concept Site Plan

LEGEND

- 36' AND 40' SINGLES
- 20' FREEHOLD TH
- 25' SEMIS
- PARK
- STORMWATER MANAGEMENT POND
- NHS
- ROADS
- MEANDER BELT LIMIT
- EROSION ACCESS ALLOWANCE
- EROSION HAZARD ALLOWANCE

Schedule of Land Use

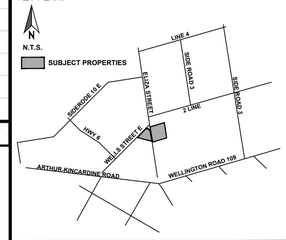
Description	Lot / Block No.	Residential Units	Area (ha)
Single Detached Residential	5, 21-24, 26, 27, 32-61	454-504	19.96
Semi-Detached	7, 15-20, 25, 31	112-113	3.21
Street Townhouse	1-4, 6, 8-14, 28-30	249	6.05
Net Developable Total		**815-866**	**29.22**
Park	62-64		3.62
Stormwater Management Pond	65, 66		4.38
Well	67		0.27
Natural Heritage Systems	68, 69		5.90
Sanitary Pumping Station	70		0.05
Servicing Block	71		0.02
Right of Way	STREET A-R		11.88
Total Site Area			**55.34**

TITLE:

DRAFT PLAN OF SUBDIVISION

LEGAL DESCRIPTION:
PART OF PARK LOTS 1 AND 2
NORTH OF MACAULEY STREET
CROWN SURVEY
AND
PART LOT 1 CONCESSION 2
WEST LUTHER AS IN RON74408
TOWNSHIP OF WELLINGTON NORTH
COUNTY OF WELLINGTON

KEY PLAN:



REQUIRED INFORMATION:

AS REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT R.S.O. 1990.

(a) SEE PLAN
(b) SEE PLAN
(c) SEE KEY MAP
(d) SEE SCHEDULE OF LAND USE
(e) SEE PLAN
(f) SEE PLAN
(g) SEE PLAN
(h) PIPED WATER TO BE PROVIDED
(i) SILTY CLAY, SILTY SAND, GLACIAL TILL
(j) SEE PLAN
(k) SANITARY & STORM SEWERS TO BE PROVIDED
(l) SEE PLAN
NOTE: CONTOURS RELATE TO CANADIAN GEODETIC DATUM

SURVEYOR'S CERTIFICATE:

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AS SHOWN ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATE AND CORRECTLY SHOWN IN ACCORDANCE WITH A PLAN OF SURVEY PREPARED BY J.D. BARNES LIMITED

RAYMOND J. SIBTHORP O.L.S.

DATE

OWNER'S CERTIFICATE:

I HEREBY AUTHORIZE THE BIGLIERI GROUP LTD. TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO THE COUNTY OF WELLINGTON

TRIBUTE/SORBARA ARTHUR HOLDINGS INC.

DATE

ARTHUR, WELLINGTON NORTH DEVELOPMENT

APPROVAL STAMP:

TRIBUTE/SORBARA ARTHUR HOLDINGS INC.

REVISIONS

No.	Description	Date	Int.
3			
2			
1			

PROJECT No.:	22853
DATE:	January 14, 2025
SCALE:	1:1750
DRAFTED BY:	EC
CHECKED BY:	MP
DRAWING No.:	DP-01

BIGLIERI GROUP
2472 Kingston Road, Toronto
21 King Street W, Suite 1502, Hamilton
(416) 693-9155
thebiglierigroup.com

C:\Users\erico\The Biglieri Group\TBG_Project - 2020\2024\20222853\2 - TBG Design\1 - TBG Working Drawings\1 - AutoCAD\2025-01\20853_DP_2025.01.28

APPENDIX C

Borehole Location Plan

KEY PLAN
1:45,000

Legend

BH # BOREHOLE ID
463.28 GROUND SURFACE ELEVATIONS, (m amsl)

- BOREHOLE LOCATION
- MONITORING WELL LOCATION
- WELL NEST LOCATION
- WATERCOURSE
- SITE BOUNDARY

NOTES:

1. Ground surface elevation and coordinates were surveyed by J.D. Barnes Ltd. on Sept 24, 2024
2. Coordinate system: NAD 1983 UTM Zone 17N
3. Geographic dataset source: Ontario GeoHub.
4. Contains information licensed under the Open Government Licence – Ontario.
5. m amsl= metres above mean sea level
6. Service Layer Credits: World Imagery: Maxar, Microsoft
World Street Map: Province of Ontario, Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada

Scale: 1:3,250

0 25 50 100 150 200 Meters

Drawing: BOREHOLE LOCATION PLAN

Client: TRIBUTE/SORBARA ARTHUR HOLDINGS INC.

Project: GEOTECHNICAL INVESTIGATION
PROPOSED DEVELOPMENT,
SOUTHWEST QUADRANT OF ELIZA STREET AND WELLS STREET, ARTHUR, ONTARIO

Drwn By:	K.C.	Chkd By:	T.O.
Project No.	101764.038	Revision No.	0
Date	SEPTEMBER 2024	**FIGURE 1**	

GEMTEC
Consulting Engineers and Scientists
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APPENDIX D

Abbreviations and Terminology Used on
Records of Boreholes
Record of Borehole Sheets BH24-1A to BH24-8A

ABBREVIATIONS AND TERMINOLOGY USED ON RECORDS OF BOREHOLES AND TEST PITS

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

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

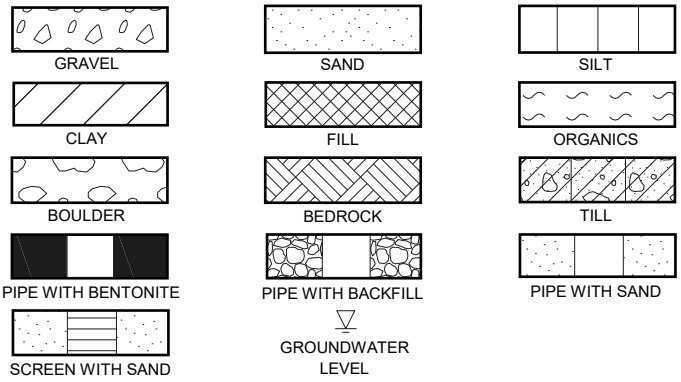
PENETRATION RESISTANCE

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

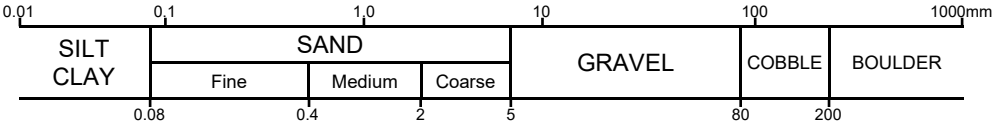
Dynamic Penetration Resistance
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive a 50 mm (2 in.) diameter 60° cone attached to 'A' size drill rods for a distance of 300 mm (12 in.).

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

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

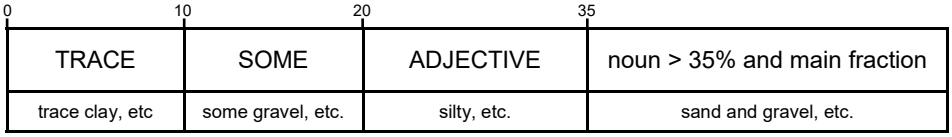


GRAIN SIZE



DESCRIPTIVE TERMINOLOGY

(Based on the CANFEM 4th Edition)



RECORD OF BOREHOLE : BH24-1A (D)

CLIENT: Tribute/Sorbara Arthur Holdings inc.
PROJECT: Southwest quadrant of Eliza Street and Wells Street East, Arthur, Ontario
JOB#: 101764.038
LOCATION: See Borehole Location Plan

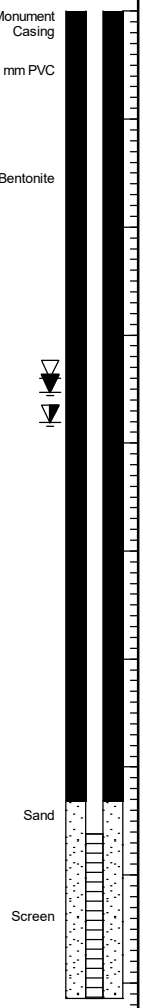
SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jun 27 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV.	DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		462.28					
0	Power Auger Hollow Stem Auger (150mm OD)	TOPSOIL		462.08	0.20	1A			
		(CL) SILTY CLAY, trace sand; brown; cohesive, w>PL, firm				1B	SS	229	7
1		- auger grinding between approximately 0.7 m and 1.1 m depths				2	SS	203	6
		(SM) SILTY SAND, some gravel; brown; non-cohesive, moist, compact		460.91	1.37	3	SS	381	15
2		(CL) SILTY CLAY, some sand, trace gravel; grey (TILL); cohesive, w<PL, very stiff to hard		460.15	2.13	4	SS	457	19
3		- sand seams between approximately 3.0 m and 4.0 m depths				5	SS	457	48
4									
5						6	SS	432	53
6		- auger grinding between approximately 6.4 m and 7.6 m depths				7	SS	356	93
7		(ML) sandy SILT, trace gravel; brown (TILL); non-cohesive, moist, very dense		455.20	7.08				
8		- auger grinding between approximately 7.6 m and 9.1 m depths				8	SS	381	114/ 0.13
9						9	SS	254	80/ 0.13
		End of Borehole		452.68	9.60				
10		Notes:							
11		1. Groundwater level measured at approximately 5.1 m below ground surface upon completion of drilling.							
12		2. Monitoring well installed as shown upon completion of drilling.							
13		3. Groundwater levels measured in the monitoring well are as follows:							
14		Date / Depth (m) / Elev. (m)							
		07/09/2024 / 3.0 / 459.3							
		07/18/2024 / 3.4 / 458.9							
		08/02/2024 / 3.5 / 458.8							
		08/16/2024 / 3.8 / 458.5							

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

ADDITIONAL LAB. TESTING: MH

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
24/07/18	3.4 ▽	458.9
24/08/02	3.5 ▼	458.8
24/08/16	3.8 ▼	458.5

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LOGGED: ED
CHECKED: PM

GEO - BOREHOLE LOG 101764 038(W).GPJ GEMTEC 2018.GDT 9/26/24

RECORD OF BOREHOLE : BH24-1A (S)

CLIENT: Tribute/Sorbara Arthur Holdings inc.
PROJECT: Southwest quadrant of Eliza Street and Wells Street East, Arthur, Ontario
JOB#: 101764.038
LOCATION: See Borehole Location Plan

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jun 27 2024

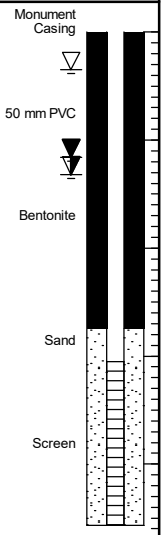
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0	Power Auger / Solid Stem Auger (100mm)	Ground Surface		462.29				
		See Borehole BH24-1 (D) for soil description						
				457.72				
		End of Borehole		4.57				

SOIL PROFILE | SAMPLES

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

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



Notes:

1. Borehole advanced through augering without sample collection to approximately 4.6 m depth. Adjacent to Borehole BH24-1 (D).

2. Monitoring well installed as shown upon completion of drilling.

3. Groundwater levels measured in the monitoring well are as follows:

Date	Depth (m)	Elev. (m)
07/09/2024	1.3	461.0
07/18/2024	0.4	461.9
08/02/2024	1.2	461.1
08/16/2024	1.3	461.0

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
24/07/18	0.4	461.9
24/08/02	1.2	461.1
24/08/16	1.3	461.0

GEMTEC Consulting Engineers and Scientists

LOGGED: ED
CHECKED: PM

RECORD OF BOREHOLE : BH24-2A

CLIENT: Tribute/Sorbara Arthur Holdings inc.
PROJECT: Southwest quadrant of Eliza Street and Wells Street East, Arthur, Ontario
JOB#: 101764.038
LOCATION: See Borehole Location Plan

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jun 27 2024

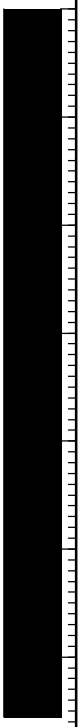
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0	Power Auger; Solid Stem Auger (100mm)	Ground Surface		463.02				
		TOPSOIL		462.87	1A			
		(CL) SILTY CLAY, trace sand, trace gravel; brown (REWORKED NATIVE); cohesive, w>PL, firm		0.15	1B	SS	305	6
1				461.96	2A			
		(CL) SILTY CLAY, sandy to some sand, trace gravel; brown to grey (TILL); cohesive, w~PL to w<PL, stiff to hard		1.07	2B	SS	457	14
					3	SS	457	26
2		- silt seams between approximately 1.5 m and 2.0 m depths						
					4	SS	457	37
3					5	SS	457	51
4		- auger grinding between approximately 4.0 m and 4.3 m depths						
		- sandy between approximately 4.0 m to 6.5 m depths			6	SS	457	55
5								
6					7	SS	457	88
				456.47				
7		End of Borehole		6.55				
		Notes:						
		1. Groundwater level measured at approximately 5.5 m below ground surface upon completion of drilling.						
8		2. Borehole was backfilled with bentonite upon completion of drilling.						
9								
10								
11								
12								
13								
14								

SAMPLES

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

ADDITIONAL LAB. TESTING: MH

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
24/06/27	5.5 ▽	457.5

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CHECKED: PM

GEO - BOREHOLE LOG 101764 038(W).GPJ GEMTEC 2018.GDT 9/26/24

RECORD OF BOREHOLE : BH24-3A

CLIENT: Tribute/Sorbara Arthur Holdings inc.
PROJECT: Southwest quadrant of Eliza Street and Wells Street East, Arthur, Ontario
JOB#: 101764.038
LOCATION: See Borehole Location Plan

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jun 28 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0		Ground Surface		461.68				
	Power Auger	TOPSOIL		461.15	1A	SS	152	5
				0.53	1B			
1		(CL) SILTY CLAY, some sand; brown, oxidation staining; cohesive, w~PL, firm			2	SS	406	5
				460.31				
		(CL) SILTY CLAY, some sand, trace gravel; brown (TILL); cohesive, w~PL, hard		1.37	3	SS	457	47
2		- auger grinding between approximately 2.4 m and 3.0 m depths						
				459.03	4A			
	Solid Stem Auger (100mm)	(ML) sandy SILT, trace gravel; brown (TILL); non-cohesive, moist, very dense		2.65	4B	SS	457	77
3		- auger grinding between approximately 3.0 m and 4.6 m depths			5	SS	203	54 /0.13
4								
		- auger grinding between approximately 4.6 m and 5.2 m depths			6	SS	229	66 /0.13
5								
6								
				455.13	7	SS	457	75
		End of Borehole		6.55				
7		Notes:						
		1. Borehole was dry upon completion of drilling.						
8		2. Borehole was backfilled with bentonite upon completion of drilling.						
9								
10								
11								
12								
13								
14								

SAMPLES

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

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

Backfilled with Bentonite

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CHECKED: PM

GEO - BOREHOLE LOG 101764 038(W).GPJ GEMTEC 2018.GDT 9/26/24

RECORD OF BOREHOLE : BH24-4A

CLIENT: Tribute/Sorbara Arthur Holdings inc.
PROJECT: Southwest quadrant of Eliza Street and Wells Street East, Arthur, Ontario
JOB#: 101764.038
LOCATION: See Borehole Location Plan

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 2 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		463.27				
0	Power Auger / Solid Stem Auger (100mm)	TOPSOIL		462.76	1A			
		(CL) SILTY CLAY, trace sand, trace gravel; brown; cohesive, w~PL, firm to very stiff		0.51	1B	SS	152	6
1					2	SS	457	20
		(CL) SILTY CLAY, trace sand, trace gravel; brown (TILL); cohesive, w~PL, very stiff to hard		461.90 1.37				
2		- auger grinding between approximately 1.5 m and 2.1 m depths			3	SS	457	29
					4	SS	457	56
3		(ML) sandy SILT, trace gravel; grey (TILL); non-cohesive, moist, dense to very dense		460.37 2.90	5	SS	457	46
4		- auger grinding between approximately 3.6 m and 4.1 m depths						
5					6	SS	229	54 /0.13
		- auger grinding between approximately 5.2 m and 6.1 m depths						
6					7	SS	279	52 /0.13
		End of Borehole		456.72 6.55				
7		Notes:						
		1. Borehole was dry upon completion of drilling.						
8		2. Borehole was backfilled with bentonite upon completion of drilling.						
9								
10								
11								
12								
13								
14								

SAMPLES

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

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

Backfilled with Bentonite

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LOGGED: ED
CHECKED: PM

GEO - BOREHOLE LOG 101764 038(W).GPJ GEMTEC 2018.GDT 9/26/24

RECORD OF BOREHOLE : BH24-5A

CLIENT: Tribute/Sorbara Arthur Holdings inc.
PROJECT: Southwest quadrant of Eliza Street and Wells Street East, Arthur, Ontario
JOB#: 101764.038
LOCATION: See Borehole Location Plan

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jun 28 2024

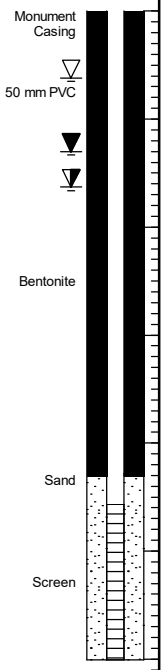
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		459.75				
0	Power Auger / Solid Stem Auger (100mm)	TOPSOIL		459.06	1	SS	152	3
		(CL) SILTY CLAY, trace sand, trace gravel; brown; cohesive, w>PL, firm to very stiff		0.69	2	SS	432	4
1								
					3	SS	457	24
2				457.62				
		(ML) sandy SILT, trace gravel; brown (TILL); non-cohesive, moist, dense to very dense		2.13	4	SS	457	50
3		- grey at approximately 3.0 m depth			5	SS	457	60
		- auger grinding between approximately 3.0 m and 4.6 m depths						
4								
		- auger grinding between approximately 4.6 m and 6.1 m depths			6	SS	279	72 /0.13
5								
6					7	SS	254	80 /0.13
				453.20				
		End of Borehole		6.55				
7								
8								
9								
10								
11								
12								
13								
14								

SAMPLES

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

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



Notes:

1. Groundwater level measured at approximately 5.5 m below ground surface upon completion of drilling.
2. Monitoring well installed as shown upon completion of drilling.
3. Groundwater levels measured in the monitoring well are as follows:

Date	Depth (m)	Elev. (m)
07/09/2024	1.3	458.5
07/18/2024	0.6	459.1
08/02/2024	1.3	458.5
08/16/2024	1.6	458.1

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
24/07/18	0.6	459.1
24/08/02	1.3	458.5
24/08/16	1.6	458.1

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LOGGED: ED
CHECKED: PM

GEO - BOREHOLE LOG 101764 038(W).GPJ GEMTEC 2018.GDT 9/26/24

RECORD OF BOREHOLE : BH24-6A

CLIENT: Tribute/Sorbara Arthur Holdings inc.
PROJECT: Southwest quadrant of Eliza Street and Wells Street East, Arthur, Ontario
JOB#: 101764.038
LOCATION: See Borehole Location Plan

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 2 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0		Ground Surface		461.97				
	Power Auger	TOPSOIL		461.46	1A	SS	229	5
		(CL) SILTY CLAY, trace sand, trace gravel; brown; cohesive, w>PL, stiff		0.51	1B			
1					2	SS	457	11
		(ML) sandy SILT, trace gravel; brown (TILL); non-cohesive, moist, dense to very dense		460.60 1.37				
2	Solid Stem Auger (100mm)				3	SS	432	45
					4	SS	178	53 /0.13
3					5	SS	203	51 /0.13
4								
5					6	SS	432	96
6		- grey at approximately 6.1 m depth			7	SS	457	76
		End of Borehole		455.42 6.55				
7		Notes:						
		1. Borehole was dry upon completion of drilling.						
8		2. Borehole was backfilled with bentonite upon completion of drilling.						
9								
10								
11								
12								
13								
14								

SAMPLES

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

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

Backfilled with Bentonite

GEMTEC
Consulting Engineers and Scientists

LOGGED: ED
CHECKED: PM

GEO - BOREHOLE LOG 101764 038(W).GPJ GEMTEC 2018.GDT 9/26/24

RECORD OF BOREHOLE : BH24-7A

CLIENT: Tribute/Sorbara Arthur Holdings inc.
PROJECT: Southwest quadrant of Eliza Street and Wells Street East, Arthur, Ontario
JOB#: 101764.038
LOCATION: See Borehole Location Plan

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 2 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		462.80							
		TOPSOIL		462.11	1	SS	130	6			
1		(CL) SILTY CLAY, trace sand, trace gravel; brown; cohesive, w~PL, stiff		0.69	2	SS	356	12			
		(ML) sandy SILT, trace gravel; brown (TILL); non-cohesive, moist, very dense		461.43 1.37	3	SS	406	53			
2					4	SS	457	75			Backfilled with Bentonite
3	Power Auger Solid Stem Auger (100mm)				5	SS	406	56 /0.13			
4											
		- grey at approximately 4.6 m depth			6	SS	356	58 /0.13			
5											
6					7	SS	457	92			
7											
				454.72	8	SS	457	88			
8		End of Borehole		8.08							
9		Notes: 1. Borehole was dry upon completion of drilling. 2. Borehole was backfilled with bentonite upon completion of drilling.									
10											
11											
12											
13											
14											

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

GEMTEC
Consulting Engineers and Scientists

LOGGED: ED
CHECKED: PM

GEO - BOREHOLE LOG 101764 038(W).GPJ GEMTEC 2018.GDT 9/26/24

RECORD OF BOREHOLE : BH24-8A

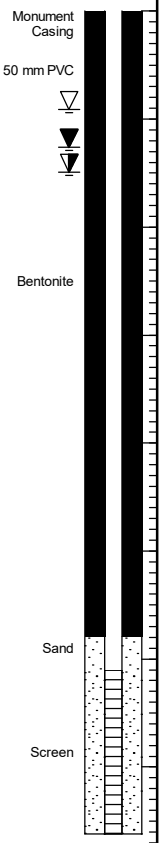
CLIENT: Tribute/Sorbara Arthur Holdings inc.
PROJECT: Southwest quadrant of Eliza Street and Wells Street East, Arthur, Ontario
JOB#: 101764.038
LOCATION: See Borehole Location Plan

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 2 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV.	DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING
0	Power Auger Solid Stem Auger (100mm)	Ground Surface		463.24						
		TOPSOIL		462.55	0.69	1	SS	152	6	
1		(CL) SILTY CLAY, some sand, trace to some gravel; brown (TILL); cohesive, w<PL, stiff to hard				2	SS	279	9	
2						3	SS	457	27	
						4	SS	381	60	
3						5	SS	457	43	
4				459.20	4.04					
		(ML) sandy SILT, trace gravel; grey (TILL); non-cohesive, moist, very dense				6	SS	229	57 /0.13	
5		- grey at approximately 4.6 m depth								
6						7	SS	229	60 /0.13	MH
7										
				455.44	7.80	8	SS	178	75 /0.13	
8		End of Borehole								

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

PIEZOMETER OR STANDPIPE INSTALLATION



Notes:

1. Groundwater level measured at approximately 7.3 m below ground surface upon completion of drilling.

2. Monitoring well installed as shown upon completion of drilling.

3. Groundwater levels measured in the monitoring well are as follows:

Date	Depth (m)	Elev. (m)
07/09/2024	1.2	462.0
07/18/2024	0.9	462.3
08/02/2024	1.3	462.0
08/16/2024	1.5	461.8

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
24/07/18	0.9 ▽	462.3
24/08/02	1.3 ▼	462.0
24/08/16	1.5 ▼	461.8

GEMTEC
Consulting Engineers and Scientists

LOGGED: ED
CHECKED: PM

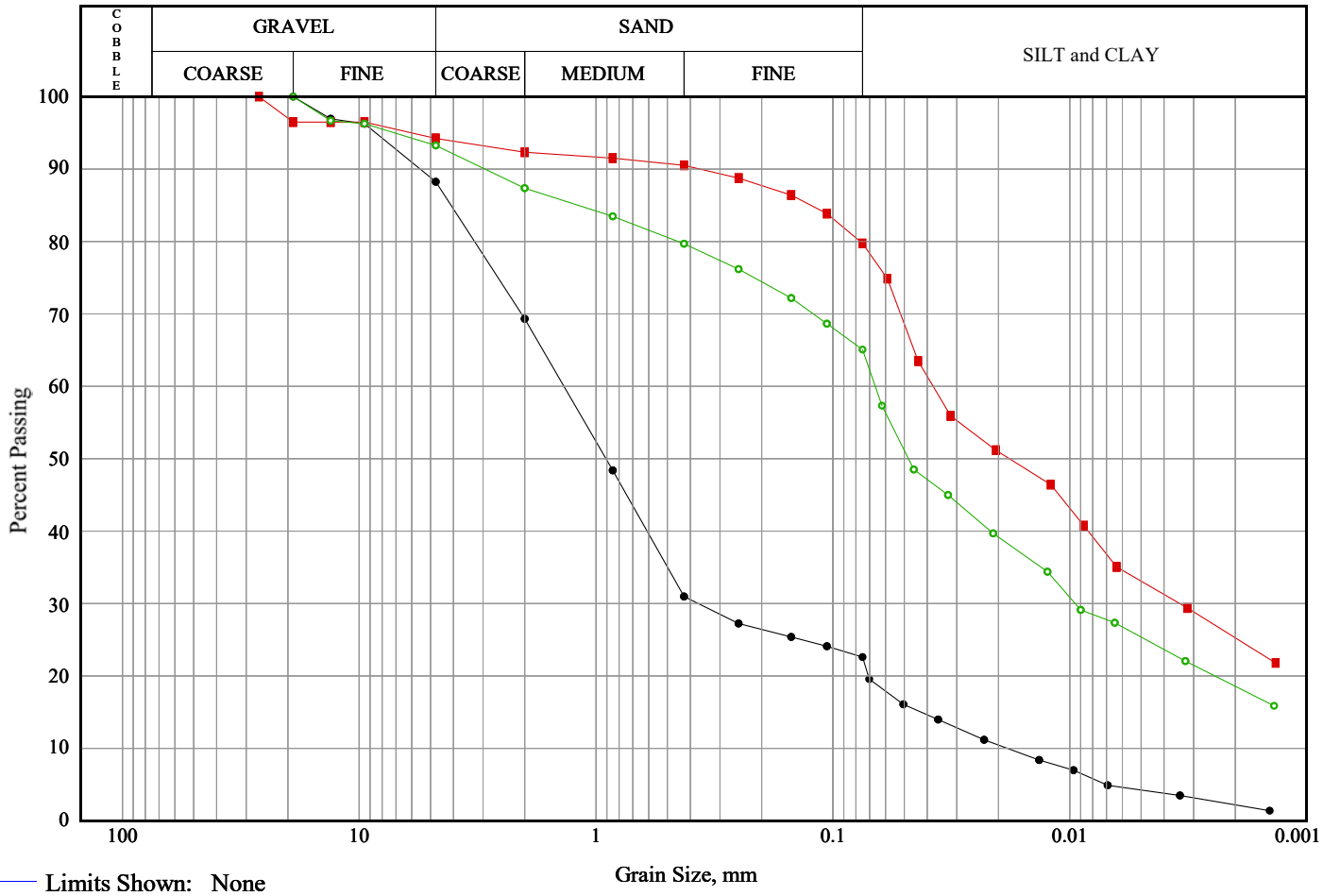
GEO - BOREHOLE LOG 101764 038(W).GPJ GEMTEC 2018.GDT 9/26/24

APPENDIX E

Geotechnical Laboratory Test Results

GEMTEC Consulting Engineers and Scientists	Client: Tribute/Sorbara Arthur Holdings Inc. Project: Proposed Development, Southwest quadrant of Eliza Street and Wells Street, Arthur, Ontario Project #: 101764038	Soils Grading LS-702/ASTM D-422

Note: More information available upon request



Limits Shown: None

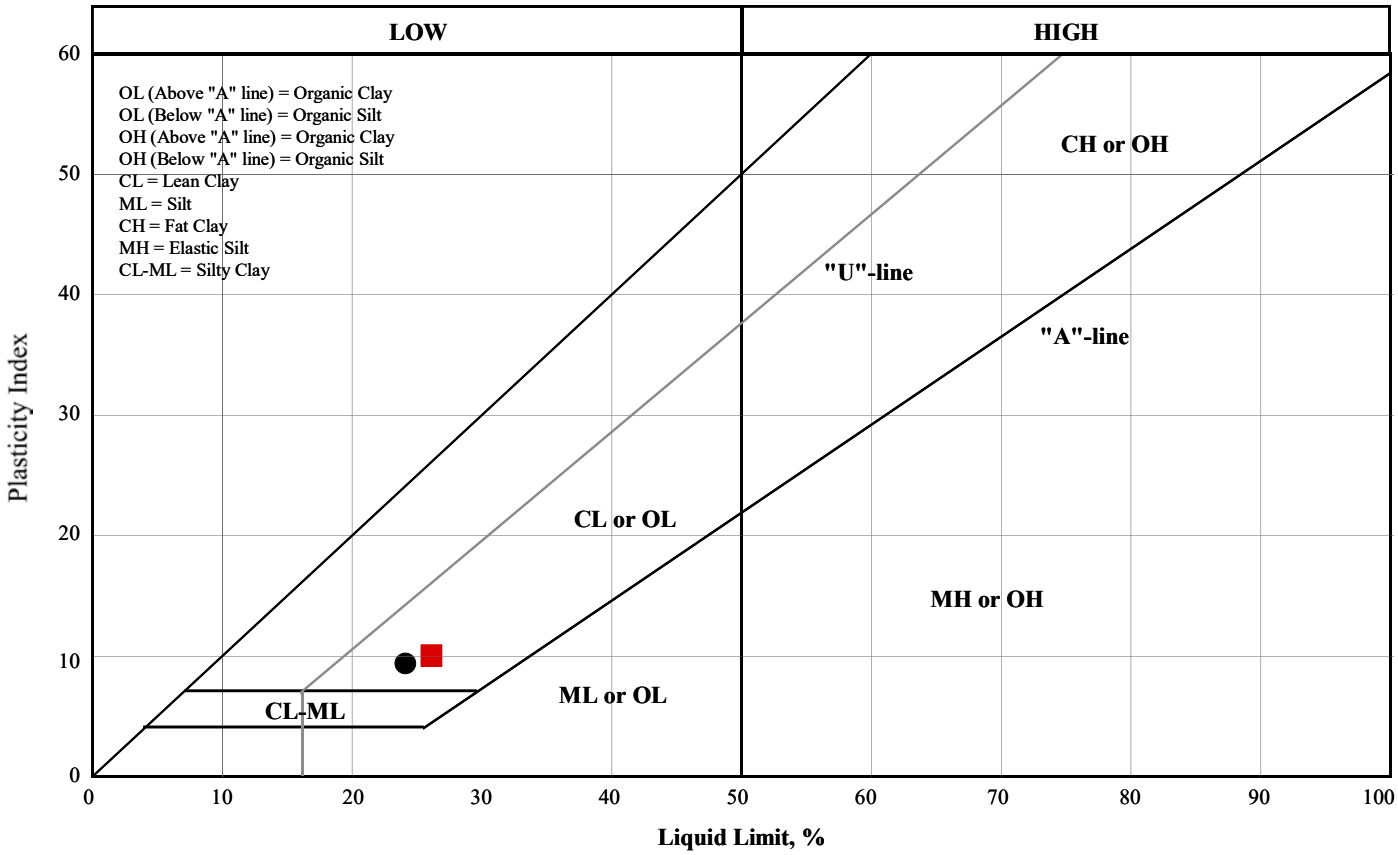
Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth (m)	% Cob.+ Gravel	% Sand	% Silt and Clay
●—	(SM) SILTY SAND	BH24-1A	SA-3	1.5-2.0	11.8	65.7	22.6
■—	(CL) SILTY CLAY (TILL)	BH24-2A	SA-2B	0.8-1.2	5.8	14.5	79.8
○—	(ML) sandy SILT (TILL)	BH24-8A	SA-7	6.1-6.6	6.7	28.2	65.1

Line Symbol	USCS Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
●—	Silty sand , some gravel	SM	0.018	0.042	0.37	0.91	1.37	4.09	20.4
■—	Silty clay, some sand , trace gravel	CL	---	---	0.00	0.02	0.04	0.12	54.5
○—	Sandy silt, trace gravel	ML	---	---	0.01	0.05	0.07	1.19	46.5

GEMTEC
Consulting Engineers and Scientists
Oshawa, ON

Client:	Tribute/Sorbara Arthur Holdings Inc.
Project:	Proposed Development, Southwest quadrant of Eliza Street and Wells Street, Arthur, Ontario
Project #:	101764038

Plasticity Chart
(LS-7034/ASTM D4318)



Symbol	Borehole /Test Pit	Sample Number	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Non-Plastic	Moisture Content, %
●	BH24-2A	SA-2B	0.8-1.2	24.1	14.7	9	N/A	14.9
■	BH24-8A	SA-2	0.8-1.2	26.1	16.0	10	N/A	13.4

Note: More information available upon request

experience • knowledge • integrity

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

expérience • connaissance • intégrité