ALMA Guelph Phase 2

Geotechnical Investigation Report

Project Location:
601 Scottsdale Drive, Guelph, Ontario

Prepared for:
Forum 601 Scottsdale LP
181 Bay Street East, Toronto, ON

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Engineers, Scientists, Surveyors.

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1.0 Introduction

MTE Consultants Inc. (MTE) was retained by Forum 601 Scottsdale LP to conduct a geotechnical investigation for a proposed residential development at 601 Scottsdale Drive, Guelph, Ontario (the site). The site is located on the northwest side of Stone Road West, between the Hanlon Parkway and Scottsdale Drive.

The site currently consists of a student residence building with asphalt-surfaced parking areas and access driveways on the east half of the site, and a vacant grass field on the west half of the site. The site is bordered by Stone Road West to the south, the Halon Parkway to the west, adjacent properties to the north, and Scottsdale Drive to the east. It is understood that the proposed development is to consist of two 7-storey student residence buildings, and a single-storey common hub area with one level of underground parking below the proposed buildings. Further, it is understood that new asphalt-surfaced parking and access driveways will be constructed at the site, including reworking some of the existing asphalt areas.

The ground surface at the site generally slopes down from the northeast end of the site to the southwest end of the site. Ground surface elevations measured at the borehole locations vary from Elevation 333.9 to 326.7 meters above sea level (masl), a grade change of up to 7.2 m.

The purpose of this geotechnical investigation is to determine the soil and groundwater conditions in the area of the proposed development and provide geotechnical engineering recommendations for site preparation, excavations and dewatering, site servicing, foundations, pavement design and sub-drainage requirements, and preliminary infiltration rates.

2.0 Field and Laboratory Program

The fieldwork for this investigation was carried out from February 21 to March 8, 2023 and involved drilling of sixteen (16) boreholes (Boreholes MW101-23 to BH116-23) to depths ranging from 3.5 m to 11.9 metres below ground surface (mbgs). The locations of the boreholes are shown on the Site Plan, **Figure 1 in Appendix A.**

Private and public utility companies were contacted prior to the start of drilling activities in order to isolate underground utilities near the boring locations.

The boreholes were advanced with track mounted drill rigs equipped with continuous flight hollow stem augers, supplied and operated by London Soil Test Ltd and Direct Environmental Drilling Inc.

Representative soil samples were recovered throughout the depths explored. Standard Penetration Tests (SPT) were carried out during sampling operations in the boreholes using conventional split spoon equipment. The SPT N-values recorded are plotted on the borehole logs in **Appendix B.**

Upon completion of drilling, three 50 mm diameter monitoring wells were installed in Boreholes MW101-23, MW108-23, and MW111-23 to allow measurement of stabilized groundwater levels and groundwater sampling and testing, if required. The installations comprised 1.5 m filtered screens with bentonite seals above the screens. Details of the installation and groundwater observations and measurements are provided on the appended borehole logs.

The monitoring wells were installed in accordance to Ontario Regulation 468/10. A licensed well technician must properly decommission all wells before construction. The construction, maintenance and abandonment of the wells are regulated under the province's Water Resources Act.

The remaining boreholes were backfilled with soil cuttings and bentonite in accordance with Ontario Regulation 468/10 (formerly O. Reg. 903) under the provinces Water Resources Act.

The fieldwork was monitored throughout by a member of our geotechnical engineering staff, who directed the drilling procedures; recorded SPT values; documented the soil stratigraphies; monitored the groundwater conditions and monitoring well installations; and transported the recovered soil samples to our office for further classification.

The geodetic ground surface elevations at the borehole locations were surveyed by MTE.

All of the soil samples collected were submitted for moisture content testing with the results provided on the borehole logs in **Appendix B**.

Additionally, five soil samples were submitted for particle size distribution analyses and the results are provided in **Appendix C**. The remaining soil samples will be stored for a period of 1 month and will be discarded of at that time without prior request from the client to extend storage time.

3.0 Soil Conditions

Reference is provided to the appended borehole logs for soil stratigraphy details, SPT N-values, moisture content profiles, and groundwater observations and measurements. Soil conditions encountered in the boreholes typically include asphalt or fill material overlying interlayered native sand and silt deposits.

3.1 Asphalt and Fill

Asphalt was encountered surficially in Boreholes BH109-23, BH110-23, and BH112-23 to BH116-23. The asphalt was 75 to 190 mm thick. Fill material was encountered below the asphalt in those boreholes, and surficially in the remaining boreholes. The fill extended to depths ranging from 0.8 to 3.0 mbgs. The fill varies in composition from sandy silt (topsoil) to sand and gravel. SPT N-Values measured in the fill were between 3 to 28 blows per 300 mm penetration of the split spoon sampler indicating very loose to compact conditions.

The fill material was generally moist to wet at the time of sampling.

3.2 Native Soil Deposits

Native interlayered sand and silt deposits were encountered beneath the fill in all of the boreholes and extend to the termination depth of each borehole. The native soil deposits range in composition from gravelly sand to sandy silt. The results of five particle size distribution analyses conducted on samples of the native soils are provided in **Table 101 in Appendix C** and summarized in the following table;

Table 1 - Results of Native Soil Particle Size Distribution Analyses

Borehole Number	Sample Depth (mbgs)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
MW101-23	10.7 – 11.1	23	37	29	11
MW108-23	9.1 – 9.8	0	1	80	19
MW111-23	3.0 – 3.7	15	6	61	18
MW111-23	7.6 – 8.2	0	1	86	13
BH115-23	1.5 – 2.1	28	32	31	9

SPT N-values measured in the sand and silt deposits range from 8 to grater than 50 blows per 300 mm penetration of the split spoon sampler indicating loose to very dense conditions.

The sand and silt deposits were generally damp to saturated at the time of sampling.

4.0 Groundwater Conditions

Groundwater observations and measurements were carried out in the open boreholes at the time of drilling and are summarized on the borehole logs. Saturated soil conditions encountered at the time of drilling are summarized in the following table;

Table 2 - Saturated Soil Conditions

Borehole Number	Saturated Soil Type	Depth of Saturated Soil (mbgs)	Elevation of Saturated Soil (masl)
MW101-23	Sandy Silt	6.1	320.6
BH102-23	Sandy Silt	6.1	321.2
BH103-23	Sandy Silt	6.1	321.1
BH104-23	Sandy Silt	6.1	320.9
BH105-23	Sandy Silt	6.1	320.3
BH106-23	Sandy Silt	4.6	322.9
BH107-23	Sandy Silt	7.6	319.4
MW108-23	Silt	9.1	319.4
BH109-23	Sandy Silt	6.1	321.9
MW111-23	Silt	6.1	321.6

Monitoring wells were installed within Boreholes MW101-23, MW108-23 and MW111-23 to facilitate the collection of groundwater samples and measurement of groundwater elevation. Water level measurements taken on March 22, 2023, are summarized in the following table;

Table 3 - Water Level Measurements Taken on March 22, 2023

Borehole Number	Borehole Elevation (masl)	Groundwater Depth (mbgs)	Groundwater Elevation (masl)
MW101-23	326.7	9.8	316.9
MW108-23	328.5	9.6	318.9
MW111-23	327.7	Dry	Dry

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations and local variations.

5.0 Discussion and Recommendations

5.1 General

It is understood that the proposed development is to consist of two 7-storey student residence buildings, and a single-storey common hub area with one level of underground parking below the proposed buildings. Further, it is understood that new asphalt-surfaced parking and access driveways will be constructed at the site, including reworking some of the existing asphalt areas. The subsurface stratigraphy at the site comprises asphalt pavement and fill overlying native interlayered sand and silt deposits.

Saturated conditions within the native soil deposits were encountered across the site at depths of 4.6 to 9.1 mbgs (Elevation 322.9 to 319.4 masl). Groundwater was measured in the installed monitoring wells at depths of 9.6 to 9.8 mbgs (Elevation 318.9 to 316.9 masl) on March 22, 2023. Additionally, isolated wet and saturated seams were present throughout the native soil deposits at the site.

Based on the results of this geotechnical investigation the site is suitable for the proposed residential development. The following subsections of this report contain geotechnical recommendations pertaining to development of the property including site preparation, excavations and dewatering, site servicing, foundations, pavement design and subdrainage requirements, and preliminary infiltration rates.

5.2 Site Preparation

Prior to carrying out any engineered fill operations, all asphaltic concrete, topsoil, fill, trees, vegetation and deleterious material should be removed from the development area. The depth of topsoil and fill material measured in the boreholes varied from 0.8 to 3.0 mbgs. It is recommended that the average depth of fill should be increased by 50 to 100 mm when calculating stripping volumes to account for uncertainty and overstripping. The fill could be used in landscaping areas to raise grades. The existing granular fill and inorganic fill within the reworked pavement areas can remain in place subject to proofroll inspection, and removal of any loose or organic materials at the subgrade level.

It is noted that the movement of excess soil from a project site is regulated under O.Reg. 406/19 and the associated Rules for Soil Management and Excess Soil Quality Standards. The Regulation and Rules have been enacted with various phase in dates between January 2021 and 2025. Depending on the proposed timing and final design of the project, excess soil management may be captured under the Regulation and associated Rules.

Following stripping and cutting operations, the subgrade should be inspected and proof rolled in the presence of qualified geotechnical personnel to verify if the subgrade will provide support as intended in the original design. The primary purpose of the inspection is to identify poorly performing areas which should be sub-excavated.

MTE considers the native site soils from above the groundwater table to be suitable to be used as structural fill at the site (including the excavated loose native soils in the areas noted above); however, the moisture content of the materials will need to be closely monitored to ensure proper compaction is able to be achieved. Any cutting and filling using the native materials as structural fill will need to occur during drier and warmer periods of the year to ensure the moisture content can be properly controlled.

Imported material to be used as structural fill for raising grades beneath the proposed buildings should comprise granular material such as OPSS 1010 Granular ‘B’ or OPSS 1010 Select Subgrade Material. Any imported fill should be tested and verified by qualified geotechnical personnel prior to placement.

All engineered fill should be placed in maximum 300 mm thick lifts and compacted to the following percentages;

Table 4 - Engineered Fill Requirements

Fill Use	Minimum Compaction Required
Structural fill to support buildings	100% SPMDD
Subgrade fill beneath pavements or services	98% SPMDD
Bulk fill in landscape areas	95% SPMDD

Structural fill pads should extend a minimum 1.0 m beyond the edge of the footing envelope of any building and down to subgrade at an angle of 45 degrees to the horizontal. Full time testing by geotechnical personnel is required during fill placement and compaction to monitor material quality, lift thickness, and verify the compaction by in-situ density testing (as per the 2012 Ontario Building Code).

The native subgrade soils are susceptible to disturbance and it is recommended that construction traffic on the subgrade be minimized.

In order to minimize the effects of weather and groundwater, fill operations onsite should be carried out in the dry summer months.

5.3 Excavations and Dewatering

All excavations must comply with the Ontario Occupational Health and Safety Act and Regulations for Construction Projects. The soils encountered at the site are generally classified as Type 3 soils (O. Reg. 213/91, s. 226 (4)). Temporary side slopes through this material must be cut at an inclination of 1.0 horizontal to 1.0 vertical or less from the base of the excavation. Where wet to saturated conditions are encountered, the soils would be classified as Type 4, and the excavation side slopes should be flattened to 3.0 horizontal to 1.0 vertical or flatter.

Excavation side slopes must be continuously inspected especially after periods of heavy rainfall or snow melt to identify areas of instability. Surface water should be directed away from entering the excavation.

Where spatial limitations (from utility poles, existing underground services, above ground structures, etc.) do not permit overburden cut slopes at the inclinations above, a steeper cut slope can be employed if trench boxes are used to protect workers. Some movement or slumping of the soils adjacent to the trench box should be expected if this option is used.

Saturated conditions within the native soil deposits were encountered across the site at depths of 4.6 to 9.1 mbgs (Elevation 322.9 to 319.4 masl). Groundwater was measured in the installed monitoring wells at depths of 9.6 to 9.8 mbgs (Elevation 318.9 to 316.9 masl) on March 22, 2023. Additionally, isolated wet and saturated seams were present throughout the native soil deposits at the site.

It is envisioned that nuisance dewatering for the isolated saturated seams at the site can be handled by conventional sump pumping techniques. Excavations for the proposed buildings and servicing are not expected to extend beyond conventional depths of 1.5 to 3.0 mbgs, however moderate to significant groundwater inflow should be expected where/if excavations extend into the wet to saturated deposits. It is our opinion that extensive pumping may be required to handle the groundwater infiltration for excavations extending into these deposits. The amount of groundwater inflow can potentially be reduced by limiting the size of the excavation and/or length of trench at one time.

It will be necessary to flatten or support the excavation side slopes where groundwater seepage is occurring to ensure stability. Every excavation that a worker may be required to enter shall be kept reasonably free of water (O. Reg. 213/91, s. 230).

It should be noted that an Environmental Activity and Sector Registry (EASR) or Permit to Take Water (PTTW), issued by the Ministry of Environment, Conservation and Parks, will be required if the dewatering system/sumps result in a water taking of more than 50,000L/day to 400,000L/day, respectively. The design of the dewatering system should be left to the contractor’s discretion to control groundwater at least 0.5 m below the invert level in order to provide stable excavation base. The contractor should notify the prime consultant in the event that they feel that an EASR/PTTW will be needed.

5.4 Site Servicing

5.4.1 Pipe Bedding

It is anticipated the invert elevation of the pipes will be at conventional 2 to 3 m depths below ground surface. No bearing problems are anticipated for pipes set on properly dewatered native inorganic subsoil or imported structural fill. The bedding material may need to be thickened if excavations encounter soft or spongy soil from the base of the service trench.

Pipe bedding for services should be conventional Class 'B' pipe bedding comprising a minimum 150 mm thick layer of OPSS 1010 Granular 'A' aggregate below the pipe invert. Granular 'A' type aggregate should be provided around the pipe to at least 300 mm above the pipe and the bedding aggregate should be compacted to a minimum 100% Standard Proctor Maximum Dry Density (SPMDD), as per the Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications for Municipal Services Document (DGSSMS), dated January 2019.

A well-graded clear stone such as Coarse Aggregate for HL4 Asphaltic Concrete (OPSS 1003) could be used in the sewer trenches as bedding below the spring line of the pipe to facilitate sump pump dewatering, if necessary. The clear stone should be compacted with a plate tamper and fully wrapped with a non-woven geotextile to prevent the migration of fine particles from the saturated soils.

5.4.2 Trench Backfilling

The trenches above the specified pipe bedding should be backfilled with inorganic onsite soils placed in maximum 300 mm thick lifts and compacted to at least 98% SPMDD, as per the DGSSMS. Where trenches enter the proposed residential buildings the backfill should be compacted to 100% SPMDD or 5 MPa lean-mix concrete may be used. Wet or saturated native soils are not considered suitable for reuse as trench backfill. Any additional material required to be imported at the site should meet OPSS Select Subgrade Material specifications.

To minimize potential problems, backfilling operations should follow closely after excavation so that only a minimal length of trench is exposed. Care should be taken to protect side slopes of excavations by diverting surface run-off away from the excavations. If construction extends into the winter, then additional steps should be taken to minimize frost and ensure that frozen material is not used as backfill.

5.5 Foundation Design

As previously discussed, it is assumed that the proposed student residences will be constructed as slab-on-grade buildings (i.e. no basement level).

In general, the undisturbed compact to very dense native soils are considered suitable to support conventional shallow foundations. The existing fill material is not considered suitable to support the proposed building foundations and should be subexcavated and removed. The following table provides the minimum recommended depth and elevation for footing and/or structural fill placement on suitable compact native soil;

Table 5 - Recommended Elevation for Footings and/or Structural Fill Placement

Borehole Number	Borehole Ground Surface Elevation (masl)	Depth Below Existing Ground Surface to Suitable Native Soil (mbgs)	Elevation of Suitable Native Soil (masl)
MW101-23	326.7	1.7	325.0
BH102-23	327.3	3.0	324.3
BH103-23	327.2	3.0	324.2

Borehole Number	Borehole Ground Surface Elevation (masl)	Depth Below Existing Ground Surface to Suitable Native Soil (mbgs)	Elevation of Suitable Native Soil (masl)
BH104-23	327.0	1.5	325.5
BH105-23	326.4	2.3	324.1
BH106-23	327.5	2.3	325.2
BH107-23	327.0	0.8*	326.2
MW108-23	328.5	0.8*	327.7
BH109-23	328.0	2.3	325.7
BH110-23	328.0	2.3	325.7
MW111-23	327.7	2.3	325.4
BH112-23	328.0	2.3	325.7

*Note: 1.2 m of soil cover is required for frost protection.

Conventional spread footings founded on the compact to very dense undisturbed native soils or approved structural fill may be designed for a factored geotechnical bearing resistance at Ultimate Limit States (ULS) of 225 kPa, and soil bearing resistance for 25 mm of settlement at Serviceability Limit States (SLS) of 150 kPa.

The founding native soils are susceptible to disturbance by construction activity, especially during wet weather and care should be taken to preserve the integrity of the material as bearing strata.

The footing areas must be inspected by qualified geotechnical personnel to ensure that the soil conditions encountered at the time of construction are suitable to support the design resistances prior to pouring concrete. Any loose, disturbed, organic and deleterious material identified during the inspection should be removed from the footing areas and replaced with concrete.

All exterior floor slabs and footings in unheated areas must be provided with a minimum 1.2 m of earth cover or equivalent insulation after final grading in order to minimize the potential of damage due to frost action, as per Ontario Provincial Standard Drawing, OPSD 3090.101, dated November 2010. If construction is undertaken during the winter, the subgrade soil and concrete should be protected from freezing.

Where spread footings are constructed at different elevations, the difference in elevation in the individual footing should not be greater than one half of the clear distance between the footings. The lower footing should be constructed first so that if it is necessary to construct the lower footings at a greater depth than anticipated, the elevation of the upper footings can be adjusted accordingly. Stepped strip footings should be constructed in accordance with OBC Section 9.15.3.9.

A Site Classification ‘D’ should be used for earthquake load and effects in accordance with Table 4.1.8.4.A. of the 2012 Ontario Building Code.

5.6 Underground Parking Garage Design

It is understood that the proposed buildings will be constructed with one level of underground parking, with a finished floor elevation of approximately 325.6 masl.

Saturated conditions within the native soil deposits were encountered across the site at depths of 4.6 to 9.1 mbgs (Elevation 322.9 to 319.4 masl). Groundwater was measured in the installed monitoring wells at depths of 9.6 to 9.8 mbgs (Elevation 318.9 to 316.9 masl) on March 22, 2023. Consequently, hydrostatic uplift is not a concern for the underground parking. Similarly, an underslab drainage system is also likely not required.

All subsurface walls should be waterproofed. To minimize potential frost movements from soil frost adhesion, the parking garage foundation backfill should consist of a free draining granular material, such as a Granular 'B' Type I or an approved sand fill, extending a minimum lateral distance of 600 mm beyond the foundation. The backfill material used against the foundation must be placed so that the allowable lateral capacity is achieved. All granular material is to be placed in maximum 200 mm thick lifts compacted to a minimum of 100% SPMDD. It is recommended that inspection and testing be carried out during construction to confirm backfill quality, thickness and to ensure compaction requirements are achieved. The walls must also be designed to resist lateral earth pressure. For calculating the lateral earth pressure, the coefficient of at-rest earth pressure (K_0) may be assumed at 0.5 for non-cohesive sandy soil. The bulk unit weight of the retained backfill may be taken as 20 kN/m^3 for well compacted soil. An appropriate factor of safety should be applied.

5.7 Concrete Slab-on-Grade Floors

It is understood that the floor slabs for the buildings will be constructed using conventional slab-on-grade techniques. Provided that the site is prepared in accordance with Section 5.2 – Site Preparation, the subgrade will likely comprise undisturbed native soil or structural fill. A minimum 100 mm thick layer of coarse clean granular material containing not more than 10% material that will pass a 4 mm sieve shall be placed beneath slabs in buildings as per Subsection 9.16.2 of the Ontario Building Code. If the subgrade soil is wet, we strongly recommend that subfloor weeping tiles be placed and connected to the sump pit.

A modulus of subgrade reaction of 25 to 30 MPa/m should be used in the design of the floor slabs.

If a moisture-sensitive floor finish is to be applied to the slab, then we recommend that a 15 mil polyethylene moisture vapour barrier be installed directly beneath the slab as per Article 9.13.2.7 of the Ontario Building Code. The purpose of the vapour barrier is to reduce moisture transfer by diffusion as per Article 5.5.1.2 of the Ontario Building Code. Joints in the vapour barrier should be lapped not less than 100 mm.

Concrete testing should be performed onsite to determine the slump, temperature, and air entrainment; and concrete cylinders should be cast for compressive strength testing.

5.8 Pavement Structure

It is understood that pavements will be constructed for drive aisles and parking areas at the site. Provided that the site is prepared in accordance with Section 5.2 – Site Preparation, the subgrade will likely comprise undisturbed native soil, structural fill, or existing inorganic fill material for the exiting pavement areas.

The pavement component thicknesses in the following table are recommended based on the proposed pavement usage and the frost-susceptibility and strength of the subgrade soils;

Table 6 - Pavement Design

Pavement Component	Light Duty Areas	Heavy Duty Fire Access Areas
Asphalt Hot Mix	90 mm	120 mm
OPSS 1010 Granular 'A' Base	150 mm	150 mm
OPSS 1010 Granular 'B' Subbase	400 mm	450 mm

Note: The pavement designs may need to be revised based on City of Guelph standards

Samples of aggregates should be checked for conformance to OPSS 1010 prior to utilization on site and during construction. The Granular 'B' subbase and Granular 'A' base courses must be compacted to 100% SPMDD, as verified by insitu density testing.

The asphaltic concrete paving materials should conform to the requirements of OPSS 1150. The asphalt should be placed and compacted in accordance with OPSS 310. The Performance Graded Asphalt Cement (PG-AC) designation for the asphaltic concrete is 58-28.

The asphaltic concrete should comprise 40 mm of the HL3 surface over 50 mm of HL4 or HL8 binder for the light duty areas, and 40 mm HL3 surface over 80 mm of HL4 or HL8 binder.

The pavement design is based on the assumption that construction will be carried out during the drier time of the year and that the subgrade soil is stable as determined by proof-rolling inspected by qualified geotechnical personnel. If the subgrade is wet and unstable, additional granular subbase will be required.

All materials and construction services required for the work should be in accordance with the relevant sections of the Ontario Provincial Standard Specifications.

It is recommended to install subdrains beneath the low lying areas of the pavement structure and connected to catchbasins. The purpose of the subdrains is to remove excess subsurface water in order to improve overall pavement serviceability and increase the pavement life.

The work of subdrain installation shall be in accordance with OPSS 405 and OPSD 216.021. The subdrain shall be 100 or 150 mm diameter perforated pipe conforming to OPSS 1801 or 1840, and wrapped with geotextile conforming to OPSS 1860.

5.9 Curbs and Gutter and Sidewalks

The concrete for curbs, gutters and sidewalks should be proportioned, mixed, placed and cured in accordance with the requirements of OPSS 353, and OPSS 1350 and shall meet the following specific requirements (OPSS 353.05.01), as per the City of Guelph specification CKSS 353:

- Minimum compressive strength = 32 MPa at 28 days;
- Maximum water to cement (w/c) ratio = 0.45;
- Coarse aggregate = 20.0 mm nominal max. size;
- Maximum slump = 45 mm (for curb) / 70 ± 20 mm (for sidewalk); and
- Air entrainment = 6.5 ± 1.5%.

A minimum of 150 mm of OPSS 1010 Granular ‘A’ material compacted to at least 100% SPMDD is required as a base for sidewalks. During cold weather any freshly placed concrete must be covered with insulating blankets to protect against freezing as per OPSS 904. Three cylinders from each day’s pour should be taken for compressive strength testing. Air entrainment, temperature and slump tests should be conducted on the same batch of concrete from the test cylinders made.

5.10 Preliminary Infiltration Rates

It is understood that at-source infiltration of stormwater runoff from the development may be considered for this site. Five (5) particle size distribution analyses were completed on the native soil deposits encountered at the site. The results are plotted on **Table 101 in Appendix C**.

The estimated vertical hydraulic conductivity (k) is derived from an empirical formulae by Kaubisch. The estimated infiltration rate is based on recommendations from the Sustainable Technologies Evaluation Program (STEP) produced by the Toronto and Region (TRCA), Lake Simcoe Region (LSRCA), and the Credit Valley (CVC) Conservation Authorities. A Factor of Safety has not been applied and should be selected by the designer of the infiltration facility.

Table 7 - Preliminary Infiltration Rates for Native Sand and Silt Soils

Borehole Number	Sample Depth (mbgs)	Soil Type	Estimated K-Value (m/sec)	Infiltration Rate (mm/hr)
BH104-22	10.7 – 11.1	Gravelly Silty Sand	3.1E-08	<1
BH107-22	9.1 – 9.8	Silt	3.5E-11	<1
MW108-22	3.0 – 3.7	Silt	1.5E-10	<1
BH112-22	7.6 – 8.2	Silt	3.5E-11	<1
BH118-22	1.5 – 2.1	Gravelly Silty Sand	3.7E-08	<1

It is recommended to conduct onsite infiltration testing once the location of the infiltration gallery is determined.

Any imported material to be placed below the infiltration gallery will need to be tested and approved prior to placement.

5.11 Construction Inspection and Testing

MTE recommends that geotechnical inspection and testing procedures be conducted throughout the various phases of the project.

Engineer site visits should be conducted to confirm geotechnical bearing resistances for footings. Soil compaction testing should be carried out on structural fill beneath the proposed townhouse buildings, foundation wall backfill, subslab granular fill and trench backfill. Laboratory and field testing of the pavement structure components (granulars and asphaltic concrete) should be conducted, as well as concrete testing for foundations, curbs and sidewalks.

MTE offers soil compaction, concrete, and asphalt testing, as well as soil inspection services through our Stratford, Kitchener and London offices.

6.0 Limitations of Report

Services performed by MTE Consultants Inc. (MTE) were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the Geotechnical Engineering & Consulting profession practicing under similar conditions in the same geographic area were the services are provided. No other warranty or representation expressed or implied as to the accuracy of the information, conclusions or recommendations is included or intended in this report.

This report was completed for the sole use of the Client. This report is not intended to be exhaustive in scope or to imply a risk-free site. As such, this report may not deal with all issues potentially applicable to the site and may omit aspects which are or may be of interest to the reader.

In addition, it should be recognized that a soil sample result represents one distinct portion of a site at the time it is collected, and that the findings of this report are based on conditions as they existed during the time period of the investigation. The material in the report reflects our best judgment using the information available at the time the report was written. The soil and groundwater conditions between and beyond the test holes may differ from those encountered in the test holes. Should subsurface conditions arise that are different from those in the test holes MTE should be notified to determine whether or not changes should be made as a result of these conditions.

It should be recognized that the passage of time may affect the views, conclusions and recommendations (if any) provided in this report because groundwater conditions of a property can change, along with regulatory requirements. All design details were not known at the time of submission of this report and it is recommended MTE should be retained to review the final design documents prior to construction to confirm they are consistent with our report recommendations. Should additional or new information become available, MTE recommends that it be brought to our attention in order that we may determine whether it affects the contents of this report.

Any use which another party makes of this report, or any reliance on, or decisions to be made based upon it, are the responsibility of such parties. MTE accepts no responsibility for liabilities incurred by or damages, if any, suffered by another party as a result of decisions made or actions taken, based upon this report. Others with interest in the site should undertake their own investigations and studies to determine how or if the condition affects them or their plans. The contractors bidding on this project or undertaking the construction should make their own interpretation of the factual information and draw their own conclusions as to how subsurface conditions may affect their work.

The benchmark and elevations provided in this report are primarily established to identify differences between the test hole locations and should not be used for other purposes such as, planning, development, grading, and excavation.

All of which is respectfully submitted,

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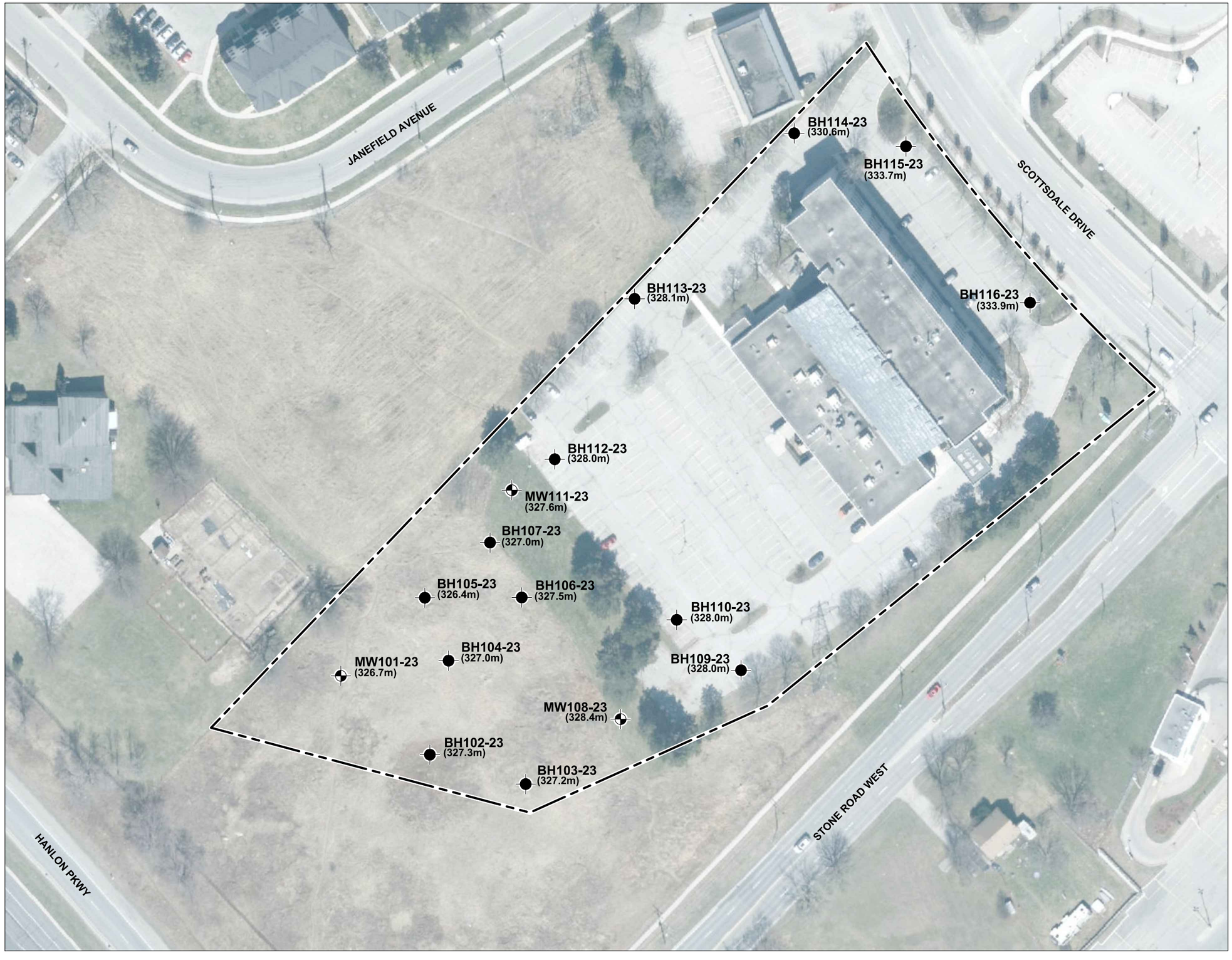
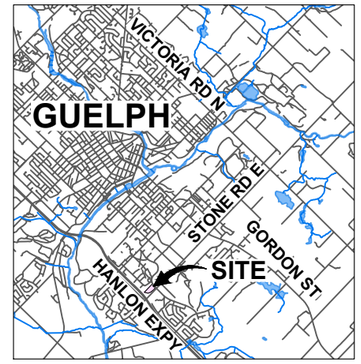
Appendix A

Figures

Figure 1 - Site Plan





KEY PLAN (nts)

N

LEGEND

- APPROXIMATE PROPERTY LINE
- BOREHOLE
- BOREHOLE/MONITORING WELL
- **(327.6m)** ELEVATION (m AMSL)

REFERENCES

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NOTES

THIS FIGURE IS SCHEMATIC ONLY AND TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

SCALE IN METRES
0 20 40m
1:1,000

MTE
Engineers, Scientists, Surveyors

PROJECT
GEOTECHNICAL INVESTIGATION
601 SCOTTDALE DRIVE
GUELPH, ONTARIO

TITLE
SITE PLAN

Drawn DCH	Scale AS SHOWN
Checked	Project No. 49791-200
Date Mar 24/23	Rev No. 0

FIGURE 1

Appendix B

Borehole Logs

Abbreviations and Symbols

Boreholes MW101-23 to BH116-23

The following are abbreviations and symbols commonly used on borehole logs, figures and reports.

Sample Types

AS	Auger Sample
CS	Chunk Sample
BS	Bulk Sample
GS	Grab Sample
WS	Wash Sample
SS	Split Spoon
RC	Rock Core
SC	Soil Core
TW	Thinwall, Open
TP	Thinwall, Piston

Soil Tests

PP	Pocket Penetrometer
FV	Field Vane
SPT	Standard Penetration Test
CPT	Cone Penetration Test
WC	Water Content
WL	Water Level

Penetration Resistance

Standard Penetration Test, N (ASTM D1586)	The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) open spilt spoon sampler for a distance of 300 mm (12 in.).
Dynamic Cone Penetration Resistance	The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive an uncased 50 mm (2 in.) diameter, 60o cone attached to “A” size drill rods for a distance of 300 mm (12 in.).

Soil Description

Cohesive Soils	Undrained Shear Strength (Cu)	
Consistency	kPa	psf
Very Soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1,000
Stiff	50 to 100	1,000 to 2,000
Very Stiff	100 to 200	2,000 to 4,000
Hard	Above 200	Above 4,000

Cohesionless Soils	
Relative Density	SPT N Value
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Above 50

WH	Sampler advanced by static weight of hammer
WR	Sampler advanced by static weight of drilling rods
PH	Sampler advanced by hydraulic force
PM	Sampler advanced by manual force

DTPL	Drier than Plastic Limit
APL	About Plastic Limit
WTPL	Wetter than Plastic Limit
mbgs	Metres below Ground Surface

ID No.: MW101-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

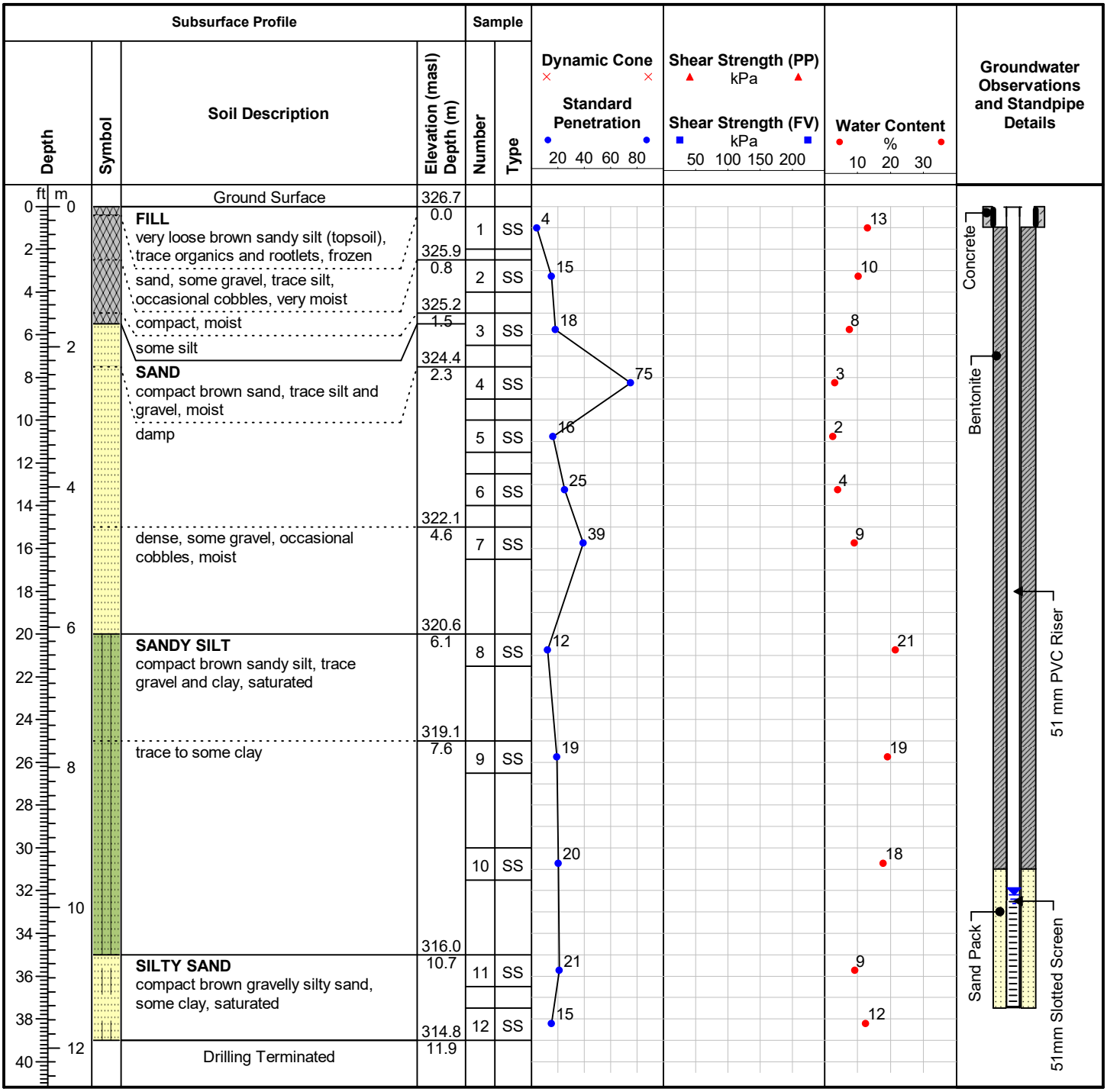
Date Completed: 3/8/2023

Drilling Contractor: Direct Environmental Drilling

Drill Rig: Geoprobe 7822DT

Drill Method: Hollow Stem Augers

Protective Cover: Stickup



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

Sheet: 1 of 1

Groundwater encountered at 6.1 mbgs (Elevation 320.6 masl) during drilling. Water measured at 9.8 mbgs (Elevation 316.9 masl) on March 22, 2023

ID No.: BH102-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)	Groundwater Observations and Standpipe Details
0 / 0		Ground Surface	327.3						
0 / 0		**FILL** loose dark brown sandy silt (topsoil), trace organics and rootlets, wet	0.0 / 326.5	1	SS	3		>40	
2 / 0		compact brown gravelly sand, trace silt, numerous cobbles, moist	0.8 / 325.8	2	SS	18		6	
4 / 2		sandy silt, trace to some gravel, very moist	1.5 / 325.0	3	SS	14		14	
6 / 2		sand, some silt, trace to some gravel	2.3 / 324.3	4	SS	12		13	
8 / 2		**SANDY SILT** compact brown sandy silt, trace to some clay, moist to wet	3.0 / 322.7	5	SS	13		9	
10 / 4								20	
12 / 4									
14 / 4		**SAND** dense brown sand, some gravel, trace silt, numerous cobbles, damp	4.6 / 321.2	6	SS	46		3	
16 / 4									
18 / 6									
20 / 6		**SANDY SILT** compact sandy silt, trace to some gravel, saturated, occasional gravelly sand seams	6.1 / 319.5	7	SS	12		26	
22 / 6									
24 / 6									
26 / 8		**SILT** compact brown silt, some sand, trace clay, saturated	7.8	8	SS	16		14	
26 / 8								20	
28 / 8		Drilling Terminated							
30 / 10									
32 / 10									
34 / 10									
36 / 10									
38 / 12									
40 / 12									

Cuttings

Bentonite

Wet Cave

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

Groundwater encountered at 6.1 mbgs (Elevation 321.2 masl) during drilling.

Sheet: 1 of 1

ID No.: BH103-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

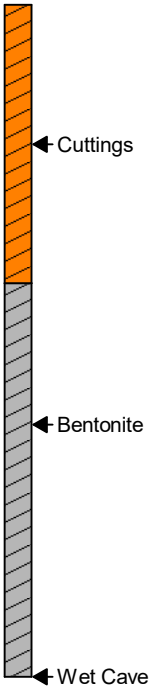
Protective Cover: N/A

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone – Standard Penetration	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %	Groundwater Observations and Standpipe Details
		Ground Surface	327.2						
0 / 0		**FILL** loose brown sandy silt (topsoil), trace organics and rootlets, frozen	0.0 / 326.4	1	SS	5		22	
2		compact brown gravelly sand, trace silt, occasional cobbles, moist	0.8 / 325.7	2	SS	14		7	
4		loose	1.5	3	SS	9		7	
6 / 2				4	SS	10		6	
8			324.2						
10		**SILTY SAND** compact brown silty fine sand, trace gravel and clay, very moist	3.0	5	SS	13		14	
12									
14 / 4			322.6						
16		**SAND** very dense brown sand, some gravel, trace silt, numerous cobbles, damp	4.6	6	SS	74		3	
18									
20 / 6			321.1						
22		**SANDY SILT** compact brown sandy silt, trace to some clay, saturated	6.1	7	SS	12		28	
24									
26 / 8				8	SS	17		19	
28									
30			318.1						
		grey	9.1 / 317.6	9	SS	15		25	
32 / 10		Drilling Terminated	9.6						
34									
36									
38									
40 / 12									

Dynamic Cone – Standard Penetration: 20 40 60 80

Shear Strength (PP) kPa / Shear Strength (FV) kPa: 50 100 150 200

Water Content %: 10 20 30



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

Sheet: 1 of 1

Groundwater encountered at 6.1 mbgs (Elevation 321.1 masl) during drilling.

ID No.: BH104-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

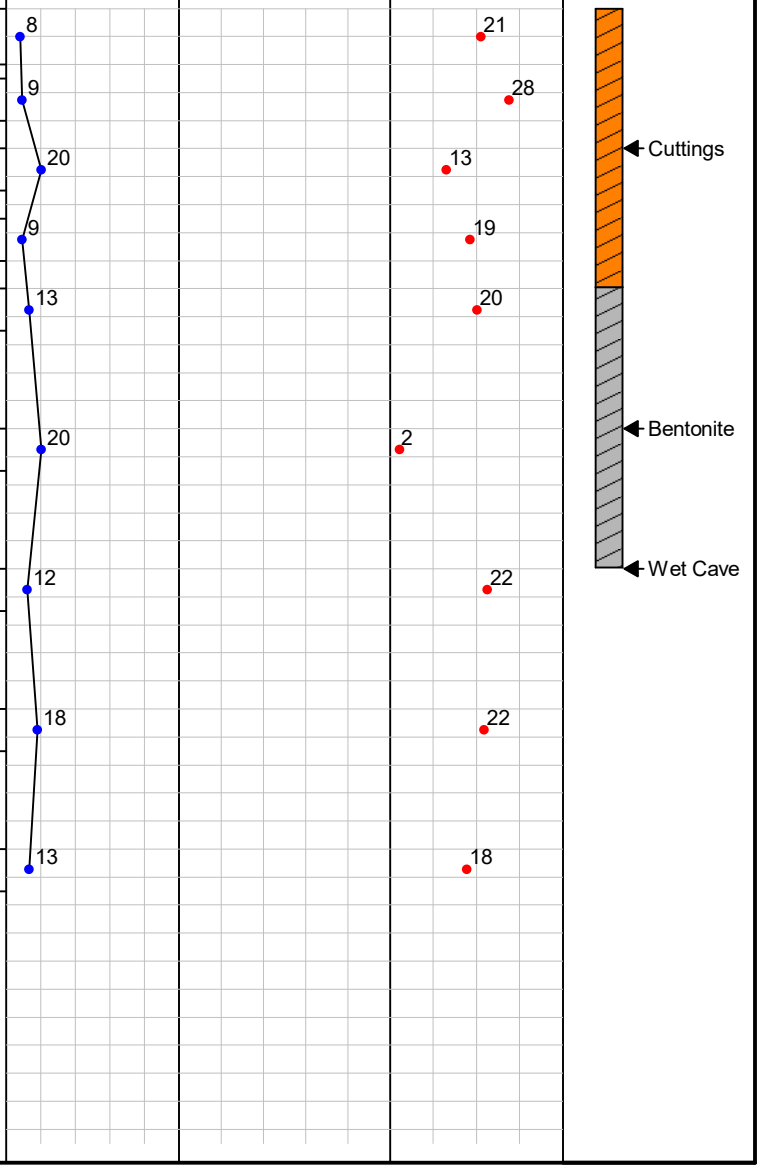
Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type
0 / 0		Ground Surface	327.0		
0 / 0		**FILL** loose dark brown sandy silt (topsoil), trace organics, wet	0.0 / 326.2	1	SS
2 / 0.8		sandy silt, trace gravel	0.8 / 325.5	2	SS
4 / 1.5		**SANDY SILT** compact brown sandy silt, trace gravel, very moist	1.5 / 324.7	3	SS
6 / 2		loose, occasional saturated sand seams, wet	2.3 / 324.0	4	SS
8 / 2.3		compact	3.0 / 322.4	5	SS
12 / 3.7		**GRAVELLY SAND** compact brown gravelly sand, some silt, occasional cobbles, wet	4.6 / 320.9	6	SS
16 / 4.6		**SANDY SILT** compact brown sandy silt, trace gravel, saturated	6.1	7	SS
20 / 6				8	SS
26 / 8		trace clay	9.1 / 317.4	9	SS
30 / 9.1		Drilling Terminated	9.6		



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

Groundwater encountered at 6.1 mbgs (Elevation 320.9 masl) during drilling.

ID No.: BH105-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

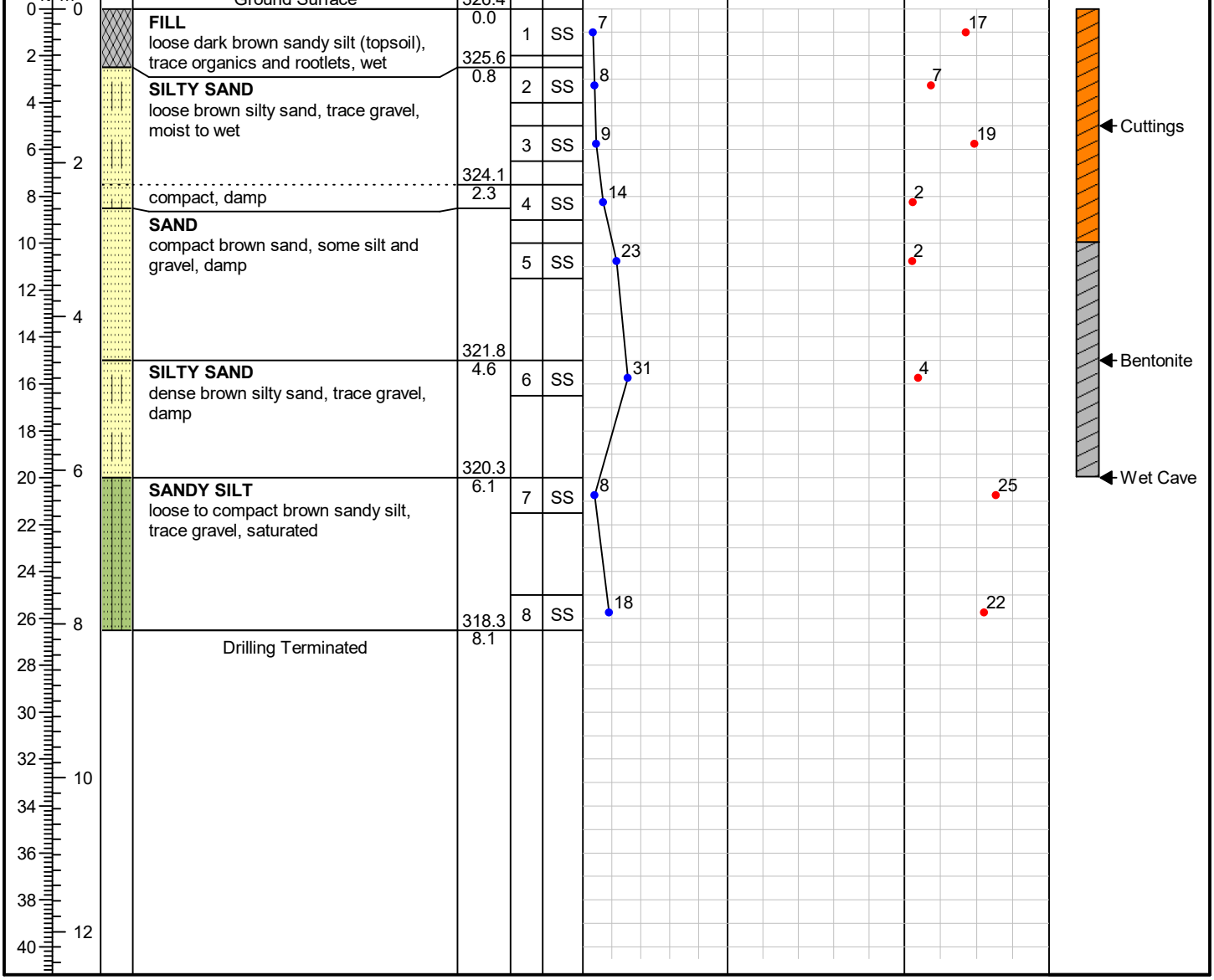
Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type
0 / 0		Ground Surface	326.4		
0 – 2 / 0 – 0.6		**FILL** loose dark brown sandy silt (topsoil), trace organics and rootlets, wet	0.0 / 325.6	1	SS
2 – 8 / 0.6 – 2.3		**SILTY SAND** loose brown silty sand, trace gravel, moist to wet	0.8 / 324.1	2	SS
				3	SS
8 / 2.3		compact, damp	2.3	4	SS
8 – 14 / 2.3 – 4.6		**SAND** compact brown sand, some silt and gravel, damp	321.8	5	SS
14 – 20 / 4.6 – 6.1		**SILTY SAND** dense brown silty sand, trace gravel, damp	4.6 / 320.3	6	SS
20 – 26 / 6.1 – 8.1		**SANDY SILT** loose to compact brown sandy silt, trace gravel, saturated	6.1 / 318.3	7	SS
				8	SS
26 / 8.1		Drilling Terminated	8.1		



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

Groundwater encountered at 6.1 mbgs (Elevation 320.3 masl) during drilling.

ID No.: BH106-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type
0 / 0		Ground Surface	327.5		
0 / 0		**FILL** loose dark brown sandy silt (topsoil), trace organics, wet	0.0	1	SS
				2	SS
			326.0		
6 / 2		compact, occasional cobbles and rootlets	1.5	3	SS
			325.2		
8 /		**SILTY SAND** compact brown silty sand, very moist	2.3	4	SS
			324.5		
10 /		**SANDY SILT** compact brown sandy silt, wet, occasional saturated sand seams	3.0	5	SS
14 / 4			322.9		
16 /		trace gravel, saturated	4.6	6	SS
20 / 6				7	SS
26 / 8			319.4	8	SS
		Drilling Terminated	8.1		

Dynamic Cone — Standard Penetration (20 40 60 80)

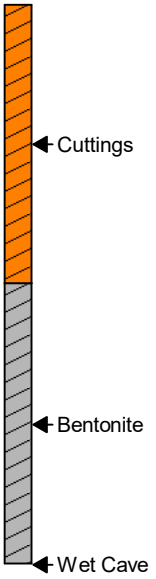
Sample	Standard Penetration
1	6
2	7
3	12
4	20
5	14
6	18
7	16
8	14

Shear Strength (PP) kPa — Shear Strength (FV) kPa (50 100 150 200)

Water Content % (10 20 30)

Sample	Water Content (%)
1	17
2	19
3	15
4	15
5	18
6	8
7	21
8	23

Groundwater Observations and Standpipe Details



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

Groundwater encountered at 4.6 mbgs (Elevation 322.9 masl) during drilling.

ID No.: BH107-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)	Groundwater Observations and Standpipe Details
0 / 0		Ground Surface	327.0						
0 / 0		**FILL** loose brown sandy silt (topsoil), trace organics, very moist	0.0	1	SS	9		14	
			326.2						
2 / 0		**SANDY SILT** compact brown sandy silt, trace gravel, occasional cobbles, moist	0.8	2	SS	12		10	
			325.5						
6 / 2		**GRAVELLY SAND** compact brown gravelly sand, some silt, damp	1.5	3	SS	13		3	
8 / 2				4	SS	12		3	
10 / 4				5	SS	10		3	
16 / 4				6	SS	18		4	
20 / 6			320.9						
20 / 6		**SANDY SILT** dense brown sandy silt, some gravel, occasional cobbles, moist	6.1	7	SS	33		7	
24 / 6			319.4						
26 / 8		compact, trace gravel and clay, saturated	7.6	8	SS	10		25	
30 / 8			317.4	9	SS	17		26	
32 / 10		Drilling Terminated	9.6						
40 / 12									

Groundwater Observations and Standpipe Details: Cuttings; Bentonite; Wet Cave

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

Groundwater encountered at 7.6 mbgs (Elevation 319.4 masl) during drilling.

ID No.: MW108-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 3/8/2023

Drilling Contractor: London Soil Test

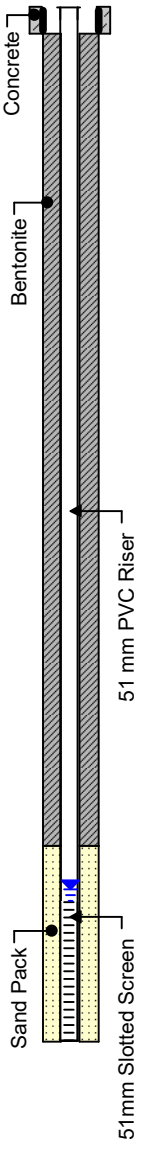
Drill Rig: Geoprobe 7822DT

Drill Method: Hollow Stem Augers

Protective Cover: Stickup

Depth (ft / m)	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type
0 / 0	Ground Surface	328.5		
0 / 0	**FILL** loose dark brown sandy silt (topsoil), trace organics and rootlets, frozen	0.0 / 327.7	1	SS
4 / 1	**SILTY SAND** compact brown to grey silty sand, trace gravel, frozen	0.8 / 327.0	2	SS
6 / 2	**SAND** compact brown sand, some gravel, trace to some silt, occasional cobbles, damp	1.5 / 325.5	3	SS
10 / 3	**SILTY SAND** compact to dense brown silty fine sand, trace to some gravel, occasional cobbles, moist to wet	3.0 / 320.9	4	SS
			5	SS
20 / 6			6	SS
26 / 8	**SILT** compact brown silt, some clay, trace sand, wet	7.6 / 319.4	7	SS
30 / 9	saturated	9.1 / 317.8	8	SS
34 / 10	loose to compact, grey	10.7 / 316.8	9	SS
38 / 12			10	SS
40 / 12	Drilling Terminated	11.7		

Depth (ft / m)	Dynamic Cone Penetration (Standard Penetration)	Shear Strength (PP) kPa	Shear Strength (FV) kPa	Water Content %
0 / 0	7			23
4 / 1	22			17
6 / 2	20			4
10 / 3	20			3
20 / 6	46			7
	24			11
26 / 8	29			17
30 / 9	14			21
34 / 10	8			23
38 / 12	13			24



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

Sheet: 1 of 1

Groundwater encountered at 9.1 mbgs (Elevation 319.4 masl) during drilling. Water measured at 9.6 mbgs (Elevation 318.9 masl) on March 22, 2023

ID No.: BH109-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone Standard Penetration	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %
	Ground Surface	328.0					
0	**ASPHALT** 75 mm	0.0	1	SS	14		6
		327.2					
2	**GRANULAR FILL** compact brown sand and gravel, some silt, moist	0.8	2	SS	7		20
4	gravelly sand, occasional cobbles		3	SS	18		22
6	**FILL** loose to compact dark brown sandy silt, wet	325.7 2.3	4	SS	22		3
8	**GRAVELLY SAND** compact brown gravelly sand, some silt, occasional cobbles, damp	325.0 3.0	5	SS	21		6
10	**SILTY SAND** compact brown silty sand, trace gravel, moist	323.4					
12	**GRAVELLY SAND** very dense brown gravelly sand, some silt, occasional cobbles, damp	4.6	6	SS	63		4
14		321.9					
16	**SANDY SILT** compact brown sandy silt, trace to some gravel, saturated, occasional silty sand seams	6.1	7	SS	14		22
18		320.4					
20	grey	7.6	8	SS	17		23
22		318.4	9	SS	11		11
24	Drilling Terminated	9.6					

Groundwater Observations and Standpipe Details: Cuttings; Bentonite; Wet Cave

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

Groundwater encountered at 6.1 mbgs (Elevation 321.9 masl) during drilling.

ID No.: BH110-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

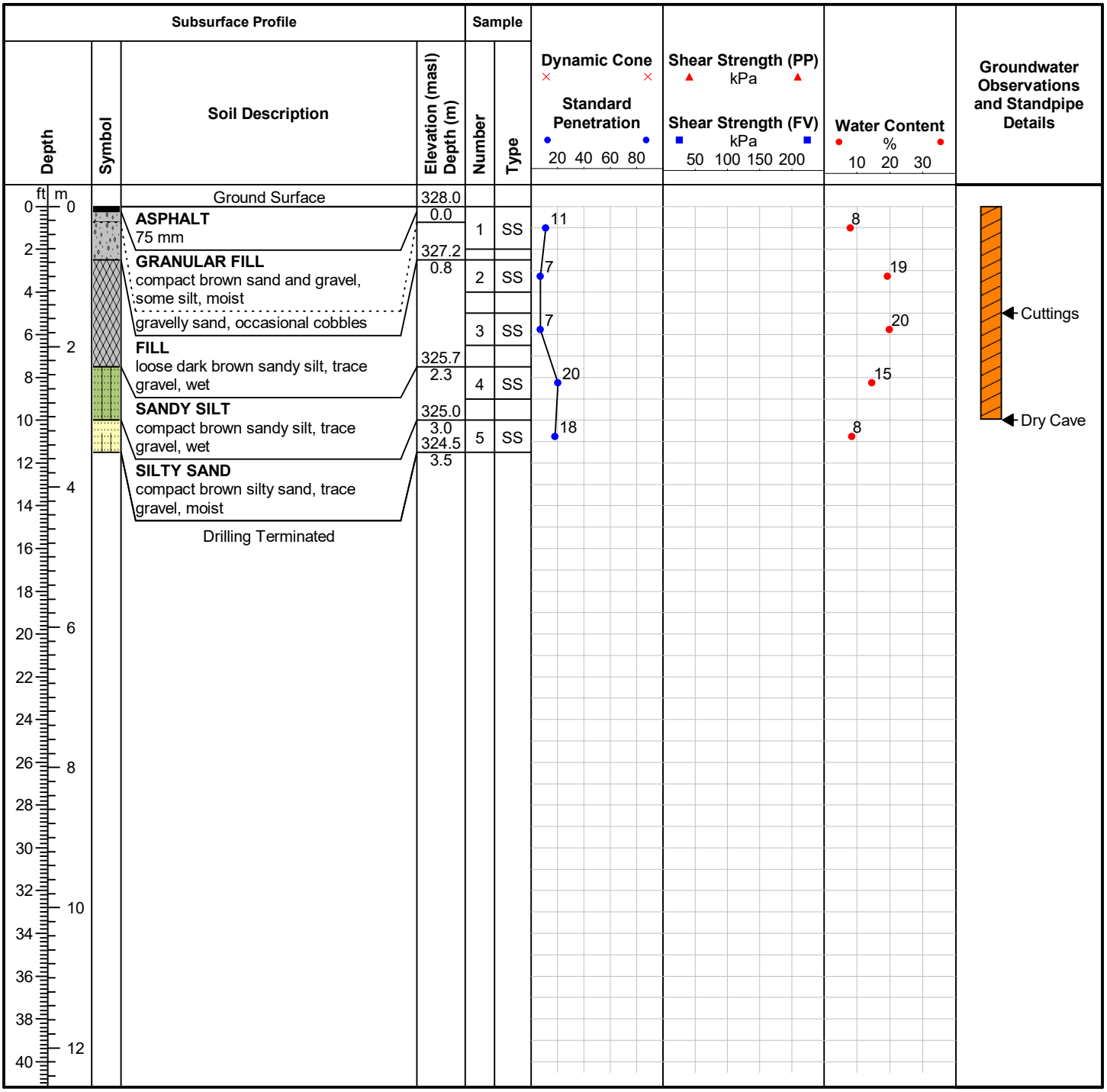
Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

Sheet: 1 of 1

ID No.: MW111-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 3/8/2023

Drilling Contractor: Direct Environmental Drilling

Drill Rig: Geoprobe 7822DT

Drill Method: Hollow Stem Augers

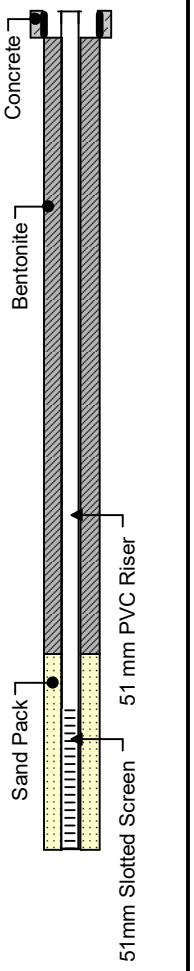
Protective Cover: Stickup

Depth (ft / m)	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type
	Ground Surface	327.7		
0 / 0	**FILL** loose dark brown sandy silt (topsoil), trace organics, frozen	0.0	1	SS
	wet	326.9 / 0.8	2	SS
6 / 2	brown	325.9 / 1.8	3	SS
	GRAVELLY SAND compact brown gravelly sand, some silt, occasional cobbles, damp	325.4 / 2.3	4	SS
	SILT compact brown silt, some clay and gravel, trace sand, moist	324.7 / 3.0	5	SS
14 / 4			6	SS
	occasional silty sand seams, very moist	323.1 / 4.6	7	SS
20 / 6	some gravel, occasional cobbles	321.6 / 6.1	8	SS
	saturated			
	some clay, trace sand	320.1 / 7.6	9	SS
26 / 8			10	SS
32 / 10	Drilling Terminated	318.1 / 9.6		

Dynamic Cone – Standard Penetration: 6, 6, 6, 26, 12, 12, 20, 26, 14, 20

Shear Strength (PP) kPa / Shear Strength (FV) kPa

Water Content %: 19, 30, 27, 3, 10, 14, 13, 12, 25, 21



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

Groundwater encountered at 6.1 mbgs (Elevation 321.6 masl) during drilling. Dry conditions measured on March 22, 2023

ID No.: BH112-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type
0 / 0		Ground Surface	328.0		
0 / 0		**ASPHALT** 90 mm	0.0	1	SS
2 / 0		**GRANULAR FILL** compact brown sand and gravel, some silt, moist	327.2		
4 / 1		gravelly sand, occasional cobbles	0.8	2	SS
6 / 2		**FILL** loose brown to dark brown sandy silt, trace gravel, wet	325.7	3	SS
8 / 2			2.3	4	SS
10 / 3		**GRAVELLY SAND** compact brown gravelly sand, some silt, occasional cobbles, moist	324.5	5	SS
12 / 4		Drilling Terminated	3.5		

Dynamic Cone – Standard Penetration (20 40 60 80): 15, 8, 5, 23, 10

Shear Strength (PP) kPa

Shear Strength (FV) kPa (50 100 150 200)

Water Content % (10 20 30)

Groundwater Observations and Standpipe Details: Cuttings; Dry Cave

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

MTE

Sheet: 1 of 1

ID No.: BH113-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)	Groundwater Observations and Standpipe Details
0 / 0		Ground Surface	328.1						
0 / 0		**ASPHALT** 75 mm	0.0	1	SS	13		16	
2 / 0		**GRANULAR FILL** compact brown sand and gravel, some silt, wet	327.3 / 0.8	2	SS	20		6	
4 / 2		gravelly sand, occasional cobbles		3	SS	9		12	
6 / 2		**FILL** compact to loose dark brown sandy silt, trace gravel, moist to very moist	325.8 / 2.3	4	SS	10		5	
8 / 2		**GRAVELLY SAND** compact brown silty gravelly sand, occasional cobbles, mosit to very moist	324.6 / 3.5	5	SS	10		14	
10 / 4		Drilling Terminated							Cuttings; Dry Cave
12 / 4									
14 / 4									
16 / 6									
18 / 6									
20 / 6									
22 / 6									
24 / 8									
26 / 8									
28 / 8									
30 / 8									
32 / 10									
34 / 10									
36 / 10									
38 / 10									
40 / 12									

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

MTE

Sheet: 1 of 1

ID No.: BH114-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Standard Penetration (Dynamic Cone)	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %	Groundwater Observations and Standpipe Details
	Ground Surface	330.6						
0	**ASPHALT** 75 mm	0.0	1	SS	13		9	
		329.8						
2	**GRANULAR FILL** compact brown sand and gravel, some silt, moist	0.8	2	SS	8		22	
4	gravelly sand, occasional cobbles	329.1						
6		1.5	3	SS	9		19	
2	**FILL** loose dark brown sandy silt, trace gravel, wet	328.3						
8		2.3	4	SS	23		9	
10	**SILTY SAND** loose brown silty sand, trace gravel, moist	327.1	5	SS	44		8	
12	**SANDY SILT** compact to dense brown sandy silt, trace gravel, occasional cobbles, moist	3.5						
4	Drilling Terminated							
14								
16								
18								
6								
20								
22								
24								
8								
26								
28								
30								
32								
10								
34								
36								
38								
12								
40								

Dynamic Cone: Standard Penetration (20 40 60 80)

Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)

Water Content % (10 20 30)

Groundwater Observations and Standpipe Details: Cuttings; Dry Cave

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

MTE

ID No.: BH115-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type
0 / 0		Ground Surface	333.7		
0 / 0		**ASPHALT** 150 mm	0.0	1	SS
2 / 0		**GRANULAR FILL** compact brown sand and gravel, some silt, damp	332.9 / 0.8	2	SS
4 / 1		gravelly sand, occasional cobbles	332.2 / 1.5	3	SS
6 / 2		**FILL** compact brown silty sand, wet	331.4 / 2.3	4	SS
8 / 2		**GRAVELLY SAND** compact brown gravelly silty sand, trace clay, occasional cobbles, moist	330.2 / 3.5	5	SS
12 / 4		**SANDY SILT** compact brown sandy silt, trace gravel, moist			
		Drilling Terminated			

Dynamic Cone — Standard Penetration: 24, 10, 14, 18, 25

Shear Strength (PP) kPa / Shear Strength (FV) kPa

Water Content %: 4, 20, 7, 9, 7

Groundwater Observations and Standpipe Details: Cuttings; Dry Cave

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

Sheet: 1 of 1

ID No.: BH116-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type
0 / 0		Ground Surface	333.9		
0 / 0		**ASPHALT** 190 mm	0.0	1	SS
2 / 0		**GRANULAR FILL** compact brown sand and gravel, some silt, moist	333.1 0.8	2	SS
6 / 2		**FILL** compact brown sandy silt, trace gravel, moist		3	SS
8 / 2		**GRAVELLY SAND** compact to dense brown gravelly sand, some silt, occasional cobbles, damp to moist		4	SS
10 / 3			330.4	5	SS
12 / 4		Drilling Terminated	3.5		

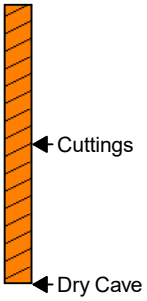
Dynamic Cone — Standard Penetration: 20 40 60 80

Shear Strength (PP) kPa ▲ ▲

Shear Strength (FV) kPa ■ ■: 50 100 150 200

Water Content % ● ●: 10 20 30

Groundwater Observations and Standpipe Details



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG

MTE

Appendix C

Tables

Table 101

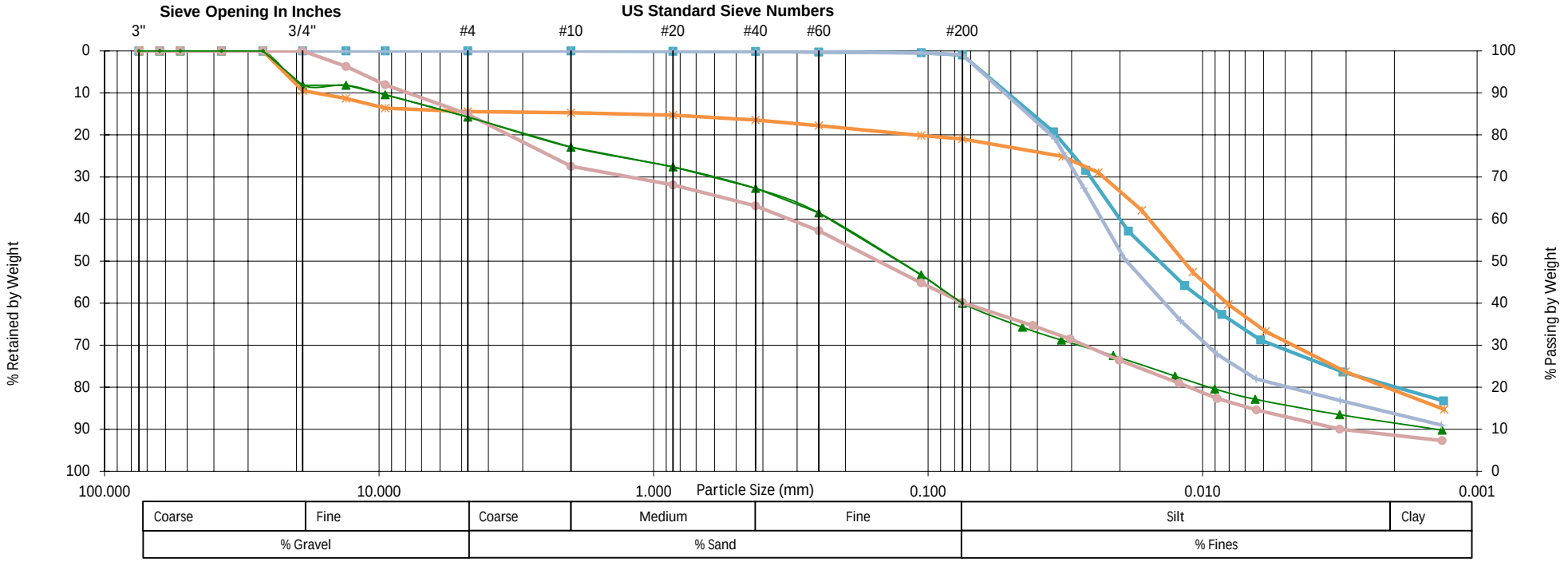
Particle Size Distribution Analysis Test Results

Project Name: ALMA Guelph Phase 2
Client: Forum 601 Scottsdale LP
Project Location: 601 Scottsdale Drive, Guelph, Ontario

Date Sampled: Feb. 21 to Mar. 8, 2023
Date Tested: March 20 to 22, 2023

MTE File No.: 49791-200
Table No: 101

Unified Soil Classification



Symbol	Borehole ID	Sample #	Sample Depth	Description
▲	MW101-23	SS-11	10.7 - 11.1 mbgs	Gravelly Silty SAND, some Clay
■	MW108-23	SS-8	9.1 - 9.8 mbgs	SILT, some Clay, trace Sand
✳	MW111-23	SS-5	3.0 - 3.7 mbgs	SILT, some Clay and Gravel, trace Sand
+	MW111-23	SS-9	7.6 - 8.2 mbgs	SILT, some Clay, trace Sand
●	BH115-23	SS-3	1.5 - 2.1 mbgs	Gravelly Silty SAND, trace Clay

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For specific tests as listed on www.ccil.com

NOTES: