Guelph Innovation District (GID) Lands, Blocks 1 & 2

Geotechnical Investigation Report

Project Location:

328 Victoria Road South and 588 Stone Road East,
Guelph, Ontario

Prepared for:

Fusion Homes
500 Hanlon Creek Boulevard
Guelph, ON N1C 0A1

Prepared by:

MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2T 1A8

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Engineers, Scientists, Surveyors.

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1.0 INTRODUCTION

MTE Consultants Inc. (MTE) was retained by Fusion Homes to conduct a geotechnical investigation for a proposed subdivision on the parcel of land to the northwest of Stone Road East and Victoria Road South, in Guelph, Ontario. The subject property comprises Blocks 1 and 2 of the Guelph Innovation District (GID) lands development and was formerly home to the Turfgrass Institute and the Wellington Detention Centre. The site is bounded to the south by Stone Road East, to the west by Victoria Road South, and to the north and east by conservation lands and the Eramosa River, as shown on **Figure 1 in Appendix A**.

It is understood that the proposed development will contain mixed-use low to high density residential, employment, parkland, and institutional zoned areas. New roadways will be constructed throughout the site as well as full municipal services, including stormwater management ponds.

The ground surface at the site generally slopes downward from the central portion of the site to the boundaries. Along the north and east edge of the site, there are slope features that are mapped by the Grand River Conservation Authority (GRCA) as erosion hazards, with portions of steep and oversteep slope.

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 regarding erosion hazards, site grading, site servicing, building construction, pavement design and subdrainage requirements, and preliminary infiltration rates.

2.0 CONCURRENT STUDIES

Concurrent with this investigation, MTE is providing Civil Engineering services and is conducting Phase One and Two Environmental Site Assessments (ESA) and a Hydrogeological Assessment at the subject site. The results of the concurrent assessments will be issued in separate reports.

3.0 FIELD AND LABORATORY PROGRAM

The initial fieldwork for this investigation was carried out from February 28 through March 7, 2022, and involved the drilling of twenty (20) borehole locations (Boreholes MW501-22 to MW520-22) to depths of 2.1 to 11.1 m. Subsequent to the initial fieldwork, two boreholes (Boreholes BH654-22 and BH655-22) were completed on October 25, 2022, to depth of 1.4 m. 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 initial boreholes were advanced with a Diedrich D50T track mounted drill rig equipped with continuous flight hollow stem augers, supplied and operated by Envirocore. The subsequent drilling was completed utilizing a CME75 track mounted drill rig equipped with continuous flight hollow stem augers supplied and operated by Geo-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 involves driving a 51 mm outside diameter, 35 mm inside diameter sampling tube using a 63.5 kg mass that is allowed to free fall 760 mm. The sample tube is driven into the ground a minimum of 450 mm and the number of blows taken to drive the tube each 150 mm increment is recorded.

The number of blows to drive the sampler tube over the second and third increment (i.e., from 150 mm to 450 mm) is summed and referred to as the N-value. The SPT N-values recorded are plotted on the borehole logs in **Appendix B**.

Upon completion of drilling, seven 50 mm diameter monitoring wells were installed in Boreholes MW501-22, MW507A-22, MW507B-22, MW512A-22, MW512B-22, MW514-22, and MW520-22 to allow measurement of stabilized groundwater levels and groundwater sampling and testing. The installations comprised 0.8 m and 1.5 m filtered screens with bentonite seals above the screens. Details of the installations and groundwater observations and measurements are provided on the appended borehole logs.

The monitoring wells were installed in accordance with Ontario Regulation 468/10. The construction, maintenance and abandonment of the wells is regulated under the province's Water Resources Act. The monitoring well network located on the site must be maintained or decommissioned in accordance with regulatory requirements.

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 and approximate shear strength 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 geomatics division.

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

4.0 SOIL CONDITIONS

Reference is provided to the appended borehole logs for soil stratigraphy details, SPT N-values, approximate shear strengths, moisture content profiles, and groundwater observations and measurements. Soil conditions encountered in the boreholes typically include topsoil overlying native peat, silt and sand, and glacial till deposits.

4.1 Topsoil

Topsoil or topsoil fill was encountered surficially in all of the boreholes except BH517-22 and was 50 to 760 mm thick (average thickness of 345 mm). The composition of the topsoil was typically dark brown sandy silt and the majority of the topsoil was frozen at the time of the fieldwork.

4.2 Fill

Fill was encountered underlying the topsoil fill at four borehole locations (Boreholes BH504-22, BH511-22, BH515-22 and BH519-22), as well as surficially in Borehole BH517-22 and extended to depths of 0.5 to 1.5 m below ground surface. The fill generally ranged from sand and silt to sand and gravel. SPT N-values measured in the fill range from 3 to 8 blows per 300 mm penetration of the split spoon sampler indicating loose conditions. Insitu moisture contents in the fill were in the range of 12 to 32% indicating wet to saturated conditions.

4.3 Native Overburden Deposits

The predominate native overburden deposits encountered at the subject site typically comprised either granular materials ranging from sand to sand and gravel or glacial till ranging from silt and sand till to gravelly silt till to silt till. In addition, localized silt and sand deposits were encountered below the topsoil at BH505-22 and BH513-22. In general, the density of the native overburden soil deposits increases with depth.

4.3.1 Granular Deposits

The results of four particle size distribution analyses conducted on samples of the native granular deposits are provided in **Appendix C** and summarized in the following table;

Table 1 – Results of Granular Deposits Particle Size Distribution Analyses

Borehole Number	Sample Depth (mbgs)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
MW501-22	2.3 – 2.9	33	59	6	2
MW501-22	9.1 – 9.8	41	38	19	2
MW520-22	2.3 – 2.9	55	40	4	1
MW520-22	6.1 – 6.7	3	69	25	3

SPT N-values measured in the granular deposits range from 7 to greater than 50 blows per 300 mm penetration of the split spoon sampler indicating loose to very dense conditions. It is noted that the loose conditions were only encountered locally at one borehole location (Borehole BH516-22) at a depth of 3.0 to 3.8 m and are not considered representative of the overall site conditions.

Insitu moisture contents in the granular deposits range from about 3 to 21% indicating moist to saturated conditions.

4.3.2 Glacial Till

The results of four particle size distribution analyses conducted on samples of the native glacial till deposits are provided in **Appendix C** and summarized in the following table;

Table 2 – Results of Glacial Till Particle Size Distribution Analyses

Borehole Number	Sample Depth (mbgs)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
MW507-22	4.6 – 5.1	9	42	39	10
MW512-22	6.1 – 6.7	4	20	64	12
MW514-22	6.1 – 6.7	26	36	30	8
MW514-22	6.9 – 7.5	17	42	30	11

SPT N-values measured in the till range from 2 to greater than 50 blows per 300 mm penetration of the split spoon sampler indicating very loose to very dense conditions. It is noted that the very loose to loose conditions were generally encountered within the upper portions of the till.

Insitu moisture contents in the glacial till range from about 3 to 23% indicating moist to saturated conditions.

4.4 Bedrock

Auger refusal on suspected bedrock was achieved at Boreholes MW501-22 through MW507-22, BH654-22 and BH655-22. The bedrock was not proven by coring; however, visible bedrock outcrops were observed within the conservation lands at a similar depth/elevation as the auger refusal on bedrock was encountered. The bedrock was encountered at depths in the range of 1.4 to 11.1 m below ground surface, corresponding to elevations ranging from 318.4 to 328.8 m.

Based on available bedrock mapping (MRD219 - Paleozoic Geology of Southern Ontario, Ontario Geological Society, 2007), the bedrock is anticipated to be comprised of dolostone. Based on the mapping, the upper bedrock underlying the subject site is part of the Guelph Formation, with the bedrock exposed in the conservation lands and Eramosa River valley part of the Amabel Formation.

5.0 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.

Seven monitoring wells were installed during the geotechnical investigation to facilitate the measurement of the groundwater elevation. Water level measurements taken on July 5, 2022, are summarized in the following table;

Table 3 – Water Level Measurements Taken on July 5, 2022

Monitoring Well Number	Monitoring Well Ground Surface Elevation (masl)	Groundwater Depth (mbgs)	Groundwater Elevation (masl)
MW501-22	329.5	--*	--*
MW507A-22	332.1	3.5	328.6
MW507B-22	332.2	5.6	326.6
MW512A-22	335.5	2.9	332.6
MW512B-22	335.5	3.3	332.2
MW514-22	344.6	2.5	342.1
MW520-22	332.0	6.4	325.6

*Note: Monitoring well was discovered to be damaged (cracked PVC pipe below grade) on July 5, 2022. Measurements completed on March 8, 2022 indicated that the monitoring well was dry.

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations and local variations. Reference is provided to the concurrent MTE Hydrogeological Assessment for further details and analysis regarding the groundwater conditions at the site.

6.0 SLOPE STABILITY ANALYSIS

MTE visited the site on April 5, 2022, to carry out a visual slope assessment and complete the Ministry of Natural Resources (MNR) Slope Rating Chart. A subsequent site inspection was also completed on August 12, 2022. The resulting slope stability rating value was 26, which classifies the slope as having a slight potential for instability. The completed MNR Slope Stability Rating tables are included in **Appendix D**. Photographs of the slope are included in **Appendix E.**

A slope of this category requires a site inspection and topographic survey, which are utilized to carry out a desktop study, complete with slope stability analyses of the slope geometry utilizing analytical software.

The MNR slope rating indicated that boreholes were not required to assess the slope; however, as boreholes were completed as part of the scope of work, they were utilized in the analysis. In order to analyze the stability of the existing slope, thirteen cross sections were prepared based on the information surveyed by MTE's Geomatics Division and a computer model was prepared using the GeoStudio 2019 Basic Edition Software by GEO-SLOPE International Ltd. The topographic survey and information utilized is included on MTE's Existing Conditions Plan, which is enclosed in **Appendix F.**

Based on the boreholes completed at the property, the general subsurface profile along the areas of the slopes consists of a thin layer of topsoil overlying native deposits of glacial till or granular deposits with bedrock at relatively shallow depths. Based on the visual slope inspection, significant portions of the slope comprise vertical or near vertical exposed bedrock faces.

The overburden soil parameters used in the slope stability analyses are noted in the table below. It is noted that bedrock was modelled as an impenetrable layer in the computer analyses.

Table 4 – Summary of Soil Strength Parameters Used for Slope Stability Analysis

Soil	Unit Weight (kN/m^3)	Effective Cohesion (kPa)	Angle of Internal Friction
Granular Deposits	19 to 22	0	30° to 34°
Glacial Till	19 to 22	1 to 5	28° to 30°

The groundwater levels used for the analyses were based on the monitoring wells installed at the site. It is noted that in the spring (rainy) season, groundwater pressure can be considerably higher than those measured during the rest of the year. Also, slope surface infiltration during significant rainfall and snow melt can increase the groundwater pressure by saturating the soil material above the water table and on the face of the slope.

The slope stability analyses were carried out for a number of potential failure modes. The various failures analyzed include shallow translational type failures of the residual soil, medium depth rotational failures at the top and bottom of the slope, and deep rotational failures though the entire height of the slope.

The results of the slope stability modeling indicate the existing overburden soil cross section profiles have factors of safety (FOS) against slope failure of greater than 1.5. The FOS is closely related to the steepness of the slope, porewater pressure and the soil strength.

For the near vertical to vertical exposed bedrock faces, it is MTE's recommendation that a FOS of 1.5 would be achieved with a setback of 1.0 horizontal to 1.0 vertical (1.0H to 1.0V). The stable slope line incorporating the 1.0H to 1.0V setback is illustrated on **Figure 1.**

6.1 Erosion Hazard Setback Limit

The follow subsections contain a discussion of MTE's Erosion Hazard Setback Limit (EHSL) based on the recommendations for the Stable Top of Slope as well as development setbacks in accordance the with GRCA and MNR guidelines. It is noted that on the east side of the site (Sections H-H' through M-M'), the inclination of the overburden slopes above the bedrock become less pronounced. In these areas, where the inclination is flatter than 5.0H to 1.0V, the lands would be classified as other valleylands and are not considered subject to slope stability setback limits.

The total EHSL consists of the summation of the erosion allowance, the stable slope allowance, and the erosion access allowance. The three allowances are discussed hereinafter.

The erosion component provides an allowance for slope regression due to erosion of the toe of the slope by river or wave action. During the site inspection, where access was feasible, the edge of the Eramosa River was comprised of exposed dolostone bedrock. No evidence of active erosion was noted during the inspection.

As per Table 3 of the MNR Understanding Natural Hazards document, the erosion allowance along the Eramosa River should be 2 m based on soft rock conditions with a bankfull width of greater than 30 m and no evidence of active erosion. The existing toe of the slope is greater than 2 m from the existing edge of the Eramosa River and accordingly the erosion allowance does not contribute to an EHSL.

It is noted that although no active erosion was observed, not all portions of the bank were able to be observed due to vegetation. If active erosion were to be present, the recommended erosion allowance as per Table 3 would be 2 to 5 m. The existing toe of the slope is greater than 5 m from the existing edge of the Eramosa River and accordingly the erosion allowance would not contribute to an EHSL.

As detailed, the slope achieves a FOS of 1.5 with the existing overburden inclination and with a bedrock inclination of 1.0H to 1.0V. Along most of the site the stable top of slope is considered to be match the existing top of slope, except for select locations along the east edge of the site where the top of slope is located at the top of near vertical bedrock faces and in these areas a minor setback has been applied.

The third component for determining the EHSL is the erosion access allowance. The purpose of this allowance is to permit access during emergencies, allow regular maintenance, or to repair failed structures, and to provide protection from external events that affect an erosion prone area (e.g. earth tremors). As per the MNR guidelines, the erosion access allowance can vary from 6 to 15 m. The erosion access allowance would be applied in addition to the erosion and stable slope allowances (i.e. offset from the stable top of slope). An erosion access allowance of 6 m is considered appropriate for the site.

The top of stable slope line and 6 m offset, which accordingly represents the EHSL, is illustrated on **Figure 1.**

6.2 Development Recommendations

The following recommendations are provided for the design of the development:

- No additional fill shall be placed within the EHSL or on the face of the slope;
- No excavation work should be carried out along the face or the bottom of the slope without geotechnical review;
- No new infiltration or stormwater management infrastructure shall be placed within the EHSL areas;
- Surface run-off should be directed away from the slope in order to prevent gullies from forming and expanding; and
- Though the conservation areas are currently well-vegetated, periodic planting might be required to maintain vegetation across the slope face.

7.0 DISCUSSION AND RECOMMENDATIONS

7.1 General

The project will involve a proposed mixed used subdivision on the parcel of land to the northeast of Stone Road East and Victoria Road South, in Guelph, Ontario. The subject property comprises Blocks 1 and 2 of the Guelph Innovation District (GID) lands development and was formerly home to the Turfgrass Institute and the Wellington Detention Centre.

It is understood that the proposed development will contain mixed-use low to high density residential, employment, parkland, and institutional zoned areas.

New roadways will be constructed throughout the site as well as full municipal services, including stormwater management ponds.

The ground surface at the site generally slopes downward from the central portion of the site to the boundaries. Along the north and east edge of the site, there are slope features that are mapped by the Grand River Conservation Authority (GRCA) as erosion hazards, with portions of steep and oversteep slope.

The subsurface stratigraphy at the site typically comprises topsoil overlying native granular and/or glacial till deposits. Groundwater was measured in the installed monitoring wells at depths of 2.5 to 6.4 m (Elevation 325.6 to 342.1 m) on July 5, 2022.

Based on the results of this geotechnical investigation development of the site will be geotechnically feasible. 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 regarding erosion hazards, site grading, site servicing, building construction, pavement design and subdrainage requirements, and preliminary infiltration rates.

7.2 Site Preparation

The first construction activity that will be required for the proposed development will be grading. Prior to carrying out any engineered fill operations, all topsoil, trees, vegetation, and deleterious material should be removed from the development area. The average depth of topsoil encountered in the boreholes was 345 mm. It is recommended that the average depth of topsoil should be increased by 50 to 100 mm when calculating stripping volumes to account for uncertainty and overstripping. It is also noted that areas of impacted topsoil have been documented on the subject site and reference is provided to MTE's concurrent ESA work for further details on the extent and volume of topsoil in these areas.

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.

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.

Structural fill used 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.

If the existing native soils or imported fine grained materials are utilized as structural fill at the site, the moisture content of the materials will need to be closely monitored to ensure proper compaction is able to be achieved. Additionally, the lift thicknesses may need to be reduced to a thickness 150 to 200 mm to ensure proper compaction is achieved. It is expected that cut-fill utilizing the native soils will need to occur during warmer summer months so that the moisture content can be properly controlled.

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).

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

Table 5 – Engineered Fill Requirements

Fill Use	Minimum Compaction Required
Structural fill for medium density residential and employment lands	100% SPMDD
Subgrade fill for low density residential areas and beneath pavements or services	98% SPMDD
Bulk fill in landscape areas	90% SPMDD

SPMDD: Standard Proctor Maximum Dry Density

The native subgrade soils are very 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.

7.3 Site Servicing

7.3.1 Excavations and Dewatering

The proposed development will be provided with municipal water services. It is anticipated that the invert levels of the sewers will be at conventional depths. MTE recommends that a review of the servicing invert elevations and water table elevations should be completed during detailed design of the site.

Temporary excavations to conventional depths for installation of underground pipes at this site must comply with the Ontario Occupational Health and Safety Act and Regulations for Construction Projects. The predominate soils encountered in the boreholes would be classified as Type 3 soils (O. Reg. 213/91, s. 226 (4)). Temporary side slopes must be cut at an inclination of 1.0 horizontal to 1.0 vertical or less from the base of the excavation for open cut pipe installation. Where wet to saturated conditions are encountered, excavation side slopes should be expected to slough to flatter inclinations, potentially 3.0 horizontal to 1.0 vertical or flatter.

Trench 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 trench.

Moderate to significant groundwater inflow should be expected where excavations extend into the groundwater regime at the site. Groundwater was measured in the installed monitoring wells at depths of 2.5 to 6.4 m (Elevation 325.6 to 342.1 m). It is noted that groundwater elevations greatly vary due to the ground surface elevation differences at the site.

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 50,000 L/day to 400,000 L/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.

7.3.2 Pipe Bedding

It is anticipated 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 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 February 2022.

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.

7.3.3 Trench Backfilling

The trenches above the specified pipe bedding should be backfilled with inorganic onsite soils placed in 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.

7.4 Pavement Structure

It is understood that new roadways will extend into and throughout the development. The existing topsoil, trees, vegetation, and deleterious material in the vicinity of the roadways would be removed and the subgrade soils will consist of native soils or approved engineered fill.

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

Table 6 – Pavement Design

Pavement Component	Local Roadways	Collector/Industrial Roadways
Asphalt Hot Mix	90 mm	135 mm
OPSS 1010 Granular 'A' Base	175 mm	175 mm
OPSS 1010 Granular 'B' Subbase	350 mm	450 mm

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 for local roadways should comprise 40 mm of the HL3 surface over 50 mm of HL8 binder. The asphaltic concrete for collector and industrial roadways should comprise 45 mm of the HL3 surface over 90 mm of HL8 binder.

The pavement design assumes 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 and/or a geogrid may 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 continuous subdrains beneath 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 150 mm diameter perforated pipe conforming to OPSS 1801 or 1840 and wrapped with geotextile conforming to OPSS 1860.

7.5 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):

- Minimum compressive strength = 32 MPa at 28 days;
- Coarse aggregate = 19.0 mm nominal max. size;
- Maximum slump = 60 mm for curbs and gutter, 70 mm for sidewalks; and
- Air entrainment = 6.5 ± 1.5%.

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.

7.6 Residential Building Design

It is understood that a variety of uses ranging from low density residential to employment lands are proposed for the development. It is anticipated the low-density residential buildings will be constructed with conventional strip and/or pad footing and will be provided with full basements and recommendations for such are provided hereinafter. It is recommended that site specific geotechnical investigations should be completed for higher density housing or site plan applications.

In general, the undisturbed native soils are considered suitable to support the proposed low density residential building foundations. Where very loose to loose conditions are encountered at the time of foundation excavation, the soils are not considered suitable to support foundations and should be removed.

Conventional spread footings founded on the remaining undisturbed native soils or approved structural fill may be designed as per Part 9 of the 2012 Ontario Building Code.

The founding native soils are **extremely 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. A mud mat following excavation and approval of the native soils is recommended if foundations cannot be poured the same day.

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.

All excavations at the site should be carried out as per the recommendations in Section 7.3.1 Excavation and Dewatering.

7.6.1 Basements

It is anticipated that conventional basements will be constructed for the proposed residential buildings, and they are anticipated to be constructed at typical 2 to 3 m depths.

Basements at this site must be provided with perimeter weeping tile systems as per the Ontario Building Code (Section 9.14). The drain tile or pipe should be laid on undisturbed or well-compacted soil so that the top of the tile or pipe (minimum 100 mm diameter) is below the bottom of the basement floor slab. The top and sides of the drain tile or pipe shall be surrounded with not less than 150 mm of crushed stone or other clean coarse granular material containing no more than 10% of material that will pass the 4 mm sieve. The crushed stone should be wrapped with filter cloth. The weeping tile must drain to a suitable frost-free outlet or sump equipped with an automatic pump that will discharge water into a storm sewer service.

The portion of the exterior basement wall and floor slab below finished ground level must be waterproofed as per the Ontario Building Code (Subsection 9.13.3). Free-draining sand materials should be used for basement wall backfill. The basement wall backfill should be graded to allow drainage away from the foundation.

The basement walls should be designed to resist the lateral earth pressure. For calculating the lateral earth pressure, the coefficient of earth pressure (K) may be assumed as 0.50 for cohesionless sandy soils and 1.0 for silt and clay (Section 24.12.3.3 Canadian Foundation Engineering Manual). The bulk unit weight of the retained backfill may be taken as 21 kN/m3 for well-compacted soil. An appropriate factor of safety should be employed.

The subgrade for the basement floor slabs should comprise undisturbed native soil or well-compacted 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 houses as per Subsection 9.16.2 of the Ontario Building Code. Based on the measured groundwater levels, it is recommended that subfloor weeping tiles be placed and connected to the sump pit.

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.

7.7 Preliminary Infiltration Rates

It is understood that an infiltration stormwater management pond is proposed within the vicinity of Borehole MW520-22. A particle size distribution analysis was completed on the native soils encountered above the groundwater table in this area.

The estimated vertical hydraulic conductivity (k) is derived from an empirical formula by Hazen. 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 of Native Soils

Location	Sample Depth (mbgs)	K-Value (m/sec)	Unfactored Infiltration Rate (mm/hr)	Soil Description
MW520-22	2.3	2.6E-4	>250	Sand and Gravel, trace Silt

Any imported or cut/fill material to be placed below the infiltration gallery will need to be tested and approved prior to placement. MTE recommends conducting insitu infiltration testing at the proposed infiltration gallery locations to determine the feasibility of at-source infiltration of stormwater runoff and for infiltration rates in the exact areas of the infiltration galleries.

7.8 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 residential 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.

8.0 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.

8.1 Signatures

All of which is respectfully submitted,

MTE Consultants Inc.

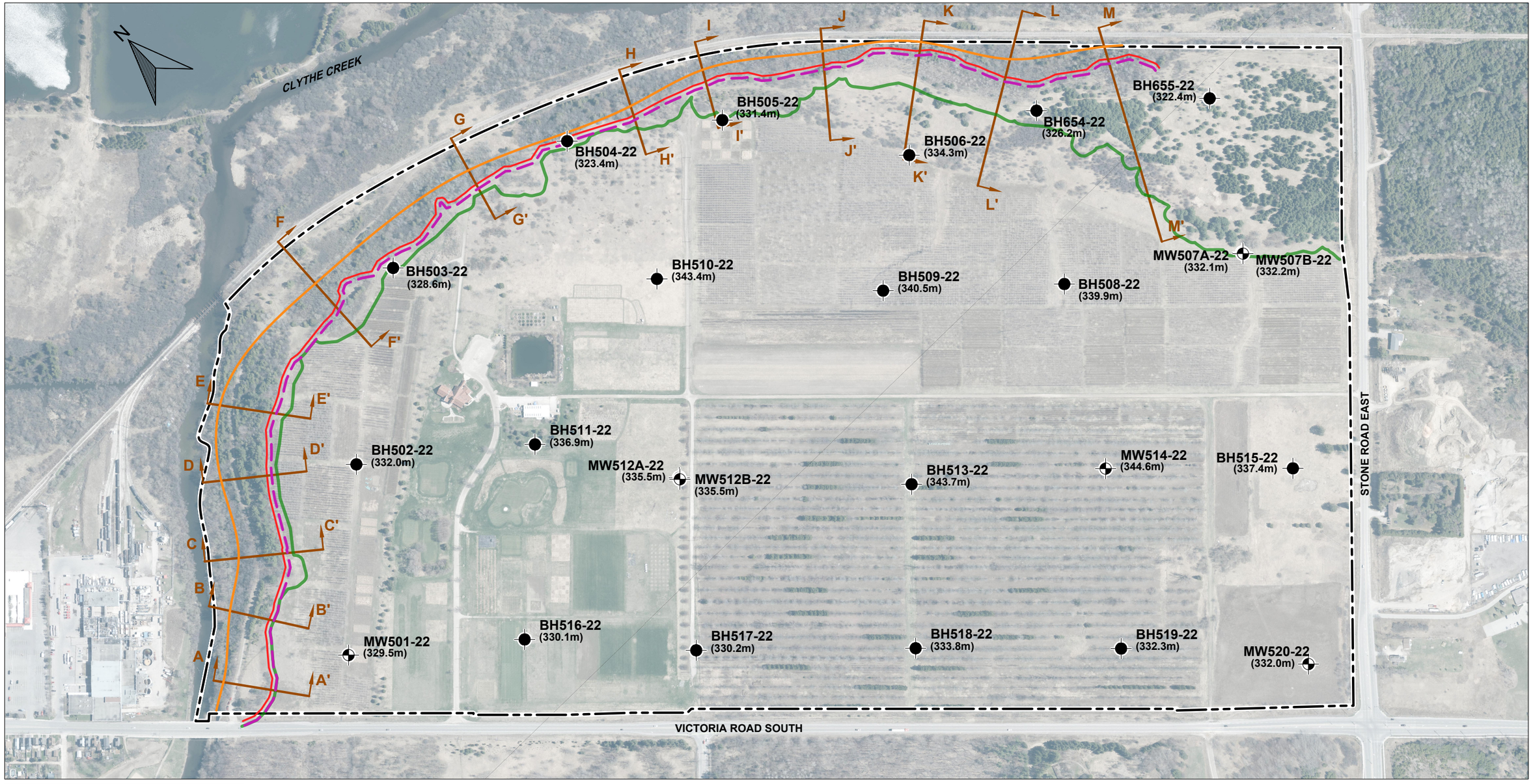
Dan Gonser, P.Eng.
Division Manager, Geotechnical
519-271-7952 ext. 2343
dgonser@mte85.com

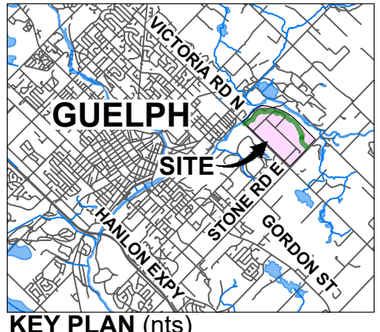
Kyle Rundle Drake, P.Eng.
Project Manager, Geotechnical
519-274-2546
krundledrake@mte85.com

DMG:jmm
M:\46927\104\02 - Reports\MTE Reports\Geotechnical\Geotech Reporting\Rev 1\46927-104_2025-03-11_rpt_Geotechnical Investigation.docx

Appendix A

Figures





KEY PLAN (nts)

LEGEND

- BOREHOLE
- BOREHOLE/MONITORING WELL
- (336.9m) ELEVATION (m AMSL)
- DEVELOPMENT LIMIT
- TOE OF SLOPE
- TOP OF STABLE SLOPE
- 6m OFFSET TOP OF SLOPE
- A A' CROSS-SECTION

SCALE IN METRES
0 100 200m
1:5,000

REFERENCES

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NOTES

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ALL LOCATIONS ARE APPROXIMATE.

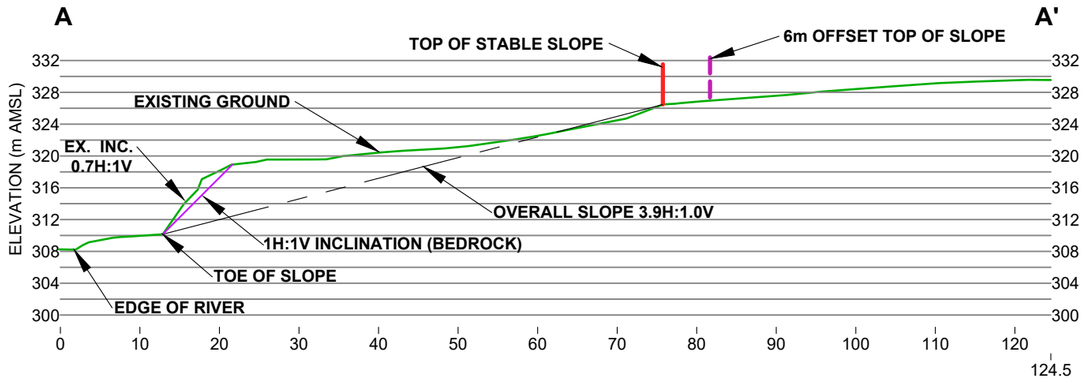
MTE
Engineers, Scientists, Surveyors

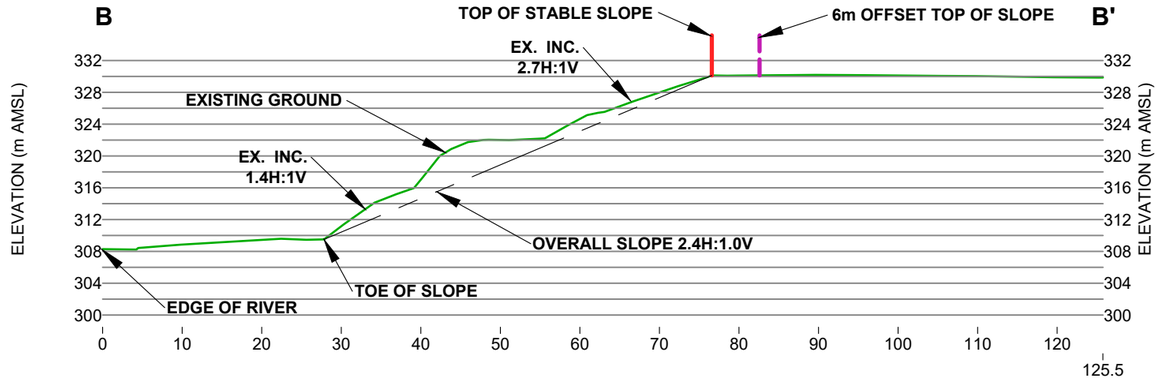
PROJECT
GEOTECHNICAL INVESTIGATION
GUELPH INNOVATION DISTRIC LANDS
588 STONE ROAD EAST
GUELPH, ONTARIO

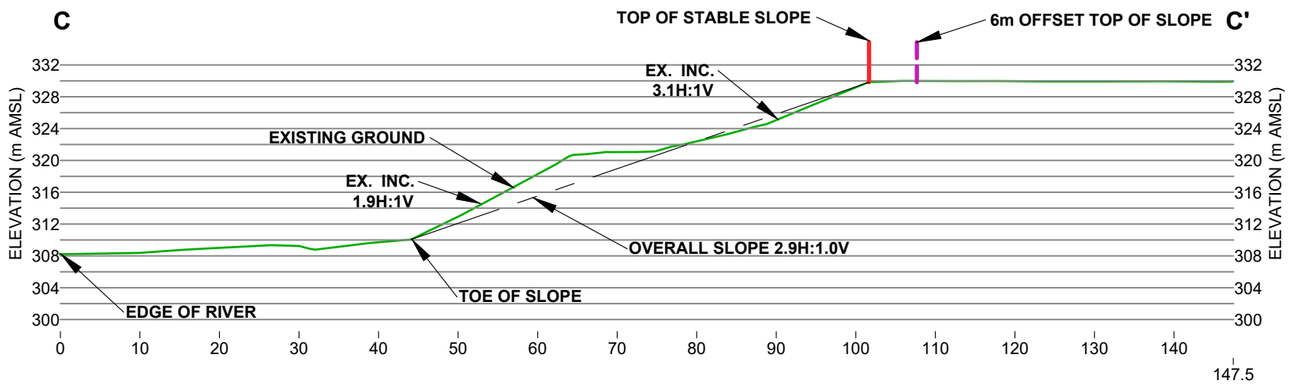
TITLE
SITE PLAN

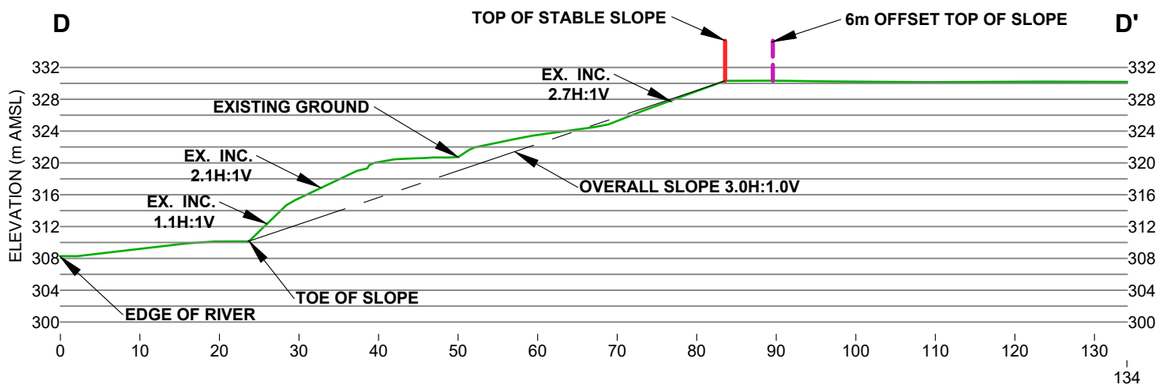
Drawn DCH	Scale AS SHOWN
Checked	Project No. 46927-104
Date March 11/25	Rev No. 0

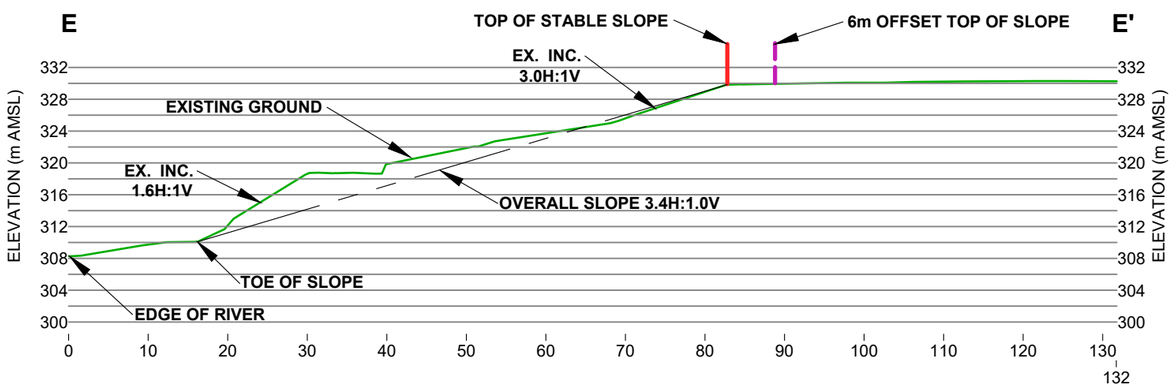
FIGURE 1











LEGEND

- TOP OF STABLE SLOPE
- 6m OFFSET TOP OF SLOPE
- 1H:1V INCLINATION (BEDROCK)

SCALE IN METRES
0 15 30m
1:750

NOTES

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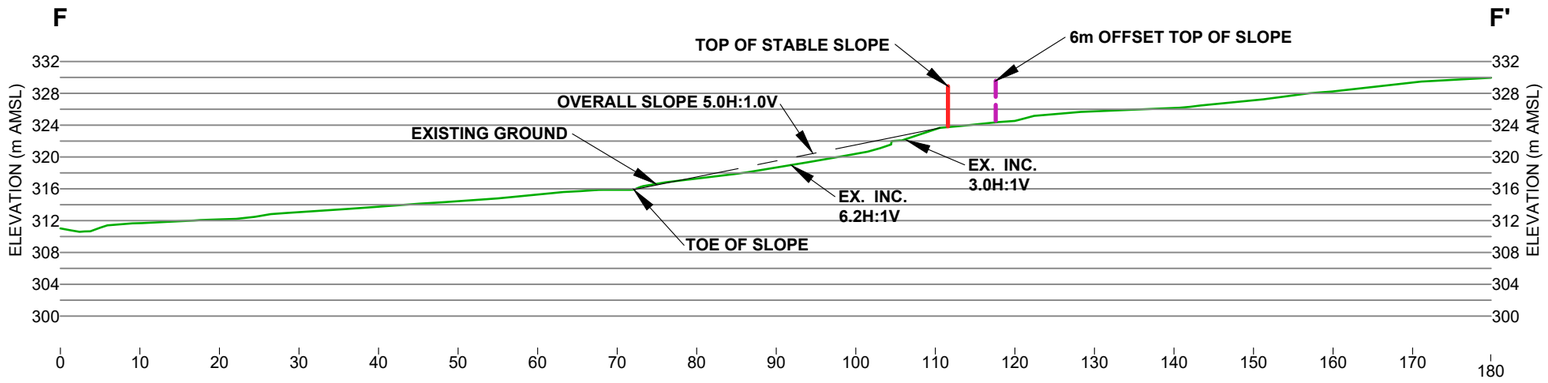
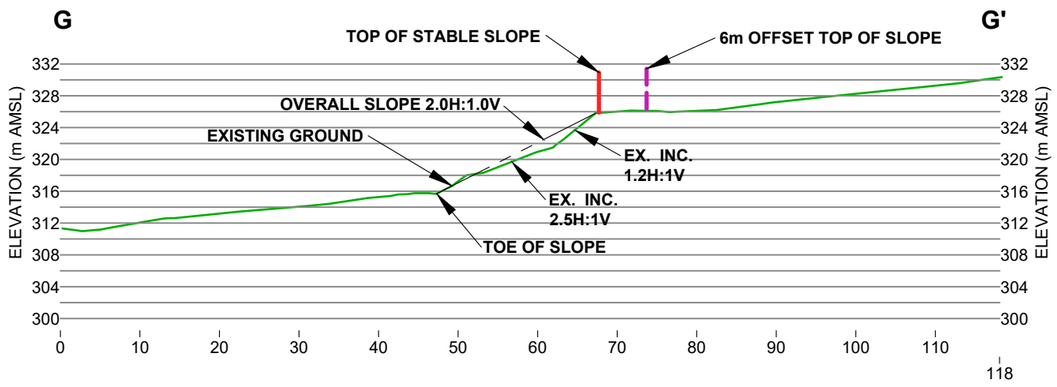
GUELPH INNOVATION DISTRICT LANDS
588 STONE ROAD EAST
GUELPH, ONTARIO

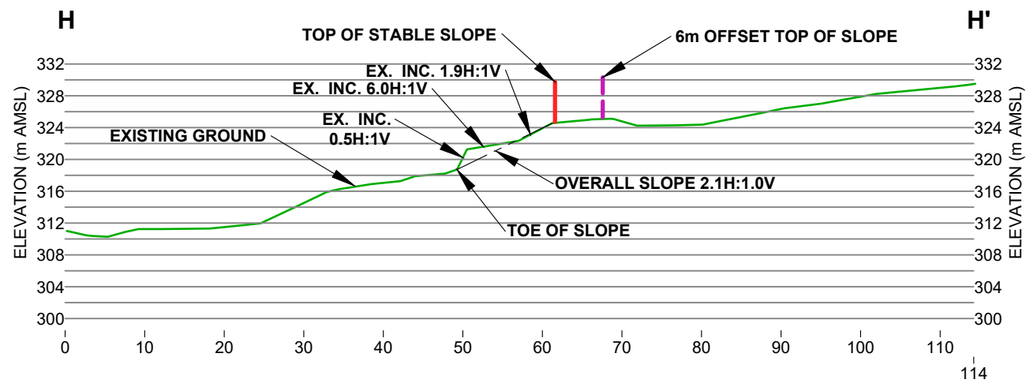
TITLE
CROSS-SECTIONS A to E

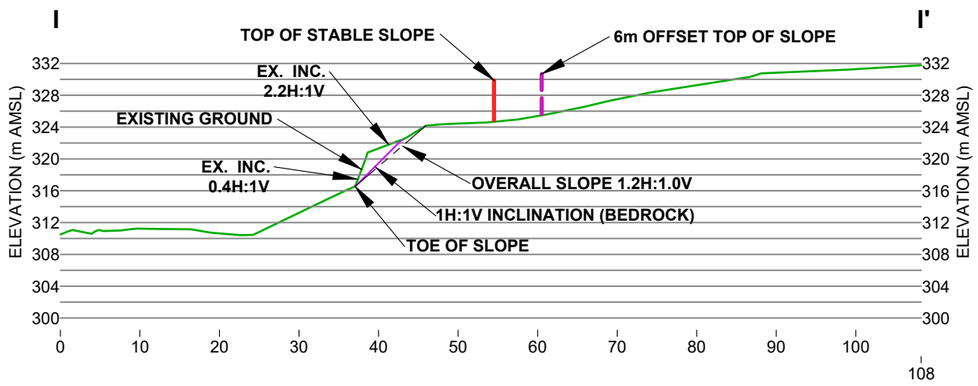
Drawn: DCH	Scale: AS SHOWN
Checked:	Project No.: 46927-104
Date: March 11/25	Rev No.: 0

FIGURE 2









LEGEND

- TOP OF STABLE SLOPE
- 6m OFFSET TOP OF SLOPE
- 1H:1V INCLINATION (BEDROCK)

SCALE IN METRES
0 15 30m
1:750

NOTES

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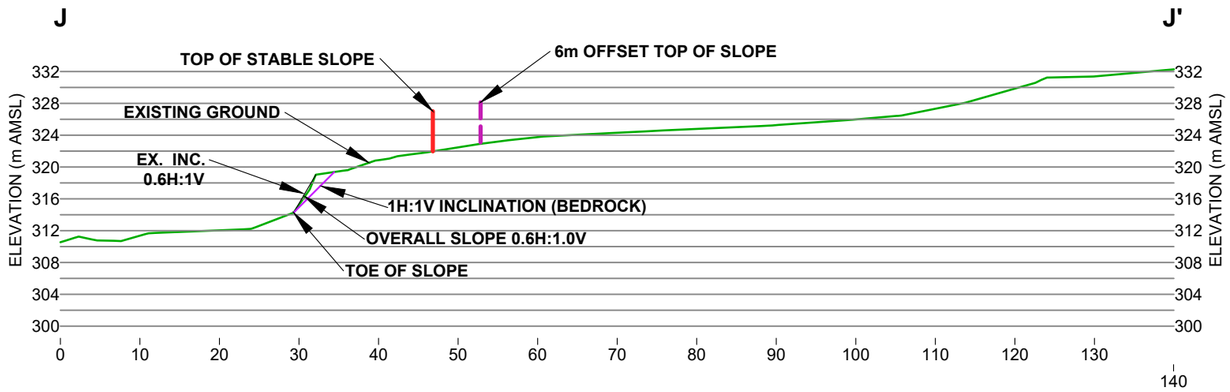
GUELPH INNOVATION DISTRIC LANDS
588 STONE ROAD EAST
GUELPH, ONTARIO

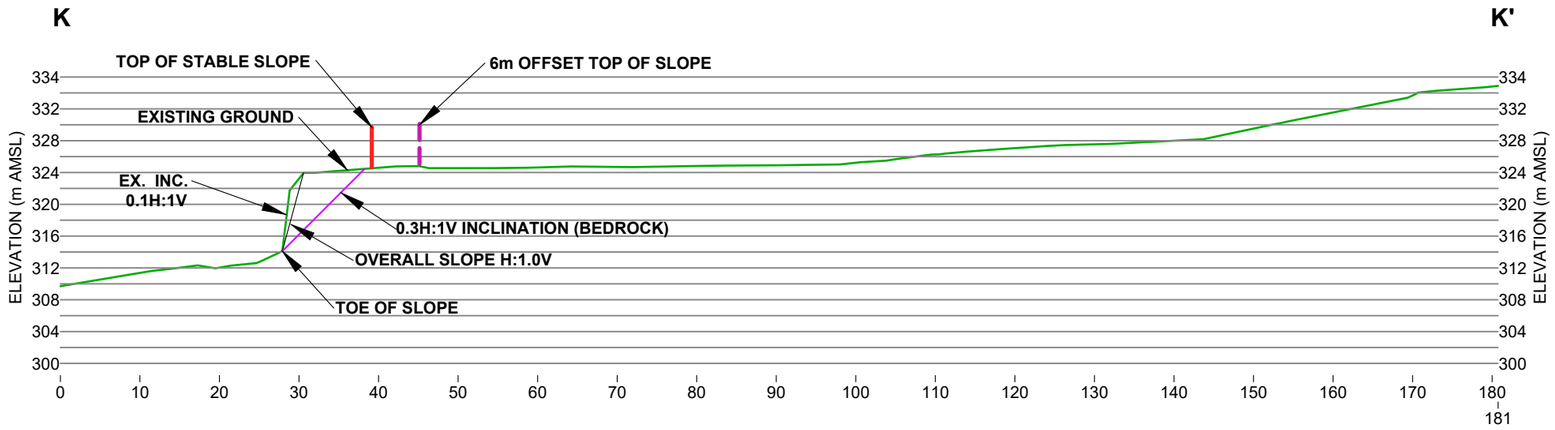
TITLE
CROSS-SECTIONS F to I

Drawn DCH	Scale AS SHOWN
Checked	Project No. 46927-104
Date March 11/25	Rev No. 0

FIGURE 3

Client: Fusion Homes
Time: 08:50:47
Plot Date: 11 March 2025
CAD: P:\P\46927\104\2_PROD\46927-104-R01 GEOTECHNICAL INVESTIGATION\46927-104-R01001.DWG
Original Format in Tabloid (279mm x 432mm; 11" x 17")
0 25mm





LEGEND

- TOP OF STABLE SLOPE
- 6m OFFSET TOP OF SLOPE
- 1H:1V INCLINATION (BEDROCK)

SCALE IN METRES
0 15 30m
1:750

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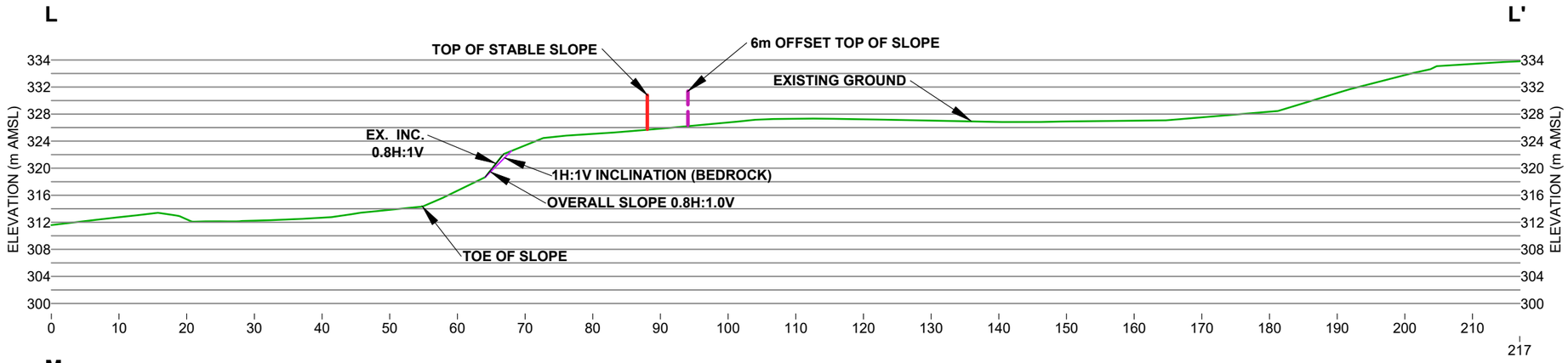
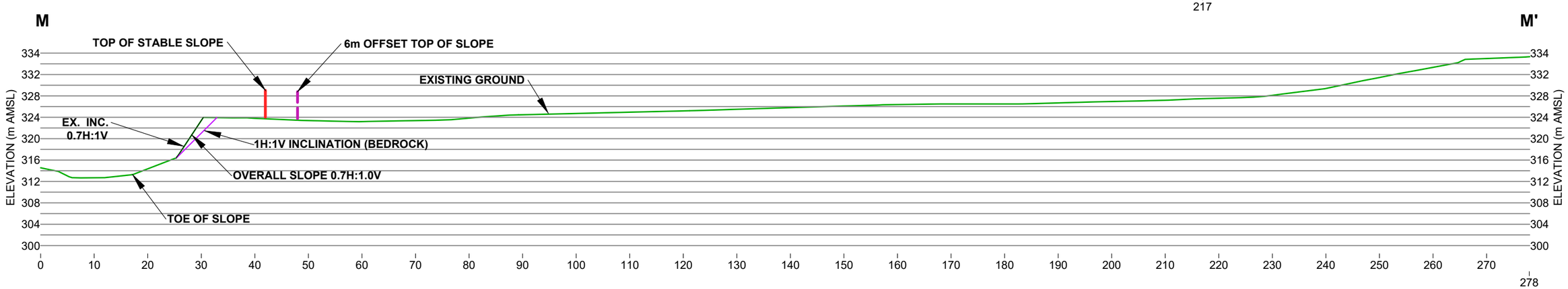
588 STONE ROAD EAST
GUELPH, ONTARIO

TITLE
CROSS-SECTIONS
J and K

Drawn: DCH	Scale: AS SHOWN
Checked	Project No.: 46927-104
Date: March 11/25	Rev No.: 0

FIGURE 4





LEGEND

- TOP OF STABLE SLOPE
- 6m OFFSET TOP OF SLOPE
- 1H:1V INCLINATION (BEDROCK)

SCALE IN METRES
0 15 30m
1:750

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

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GUELPH INNOVATION DISTRIC LANDS
588 STONE ROAD EAST
GUELPH, ONTARIO

TITLE
CROSS-SECTIONS
L and M

Drawn: DCH	Scale: AS SHOWN
Checked:	Project No.: 46927-104
Date: March 11/25	Rev No.: 0

FIGURE 5

Appendix B

Borehole Logs

Abbreviations and Symbols

MTE Boreholes MW501-22 to MW520-22 and BH654-22 and BH655-22

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.: MW501-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

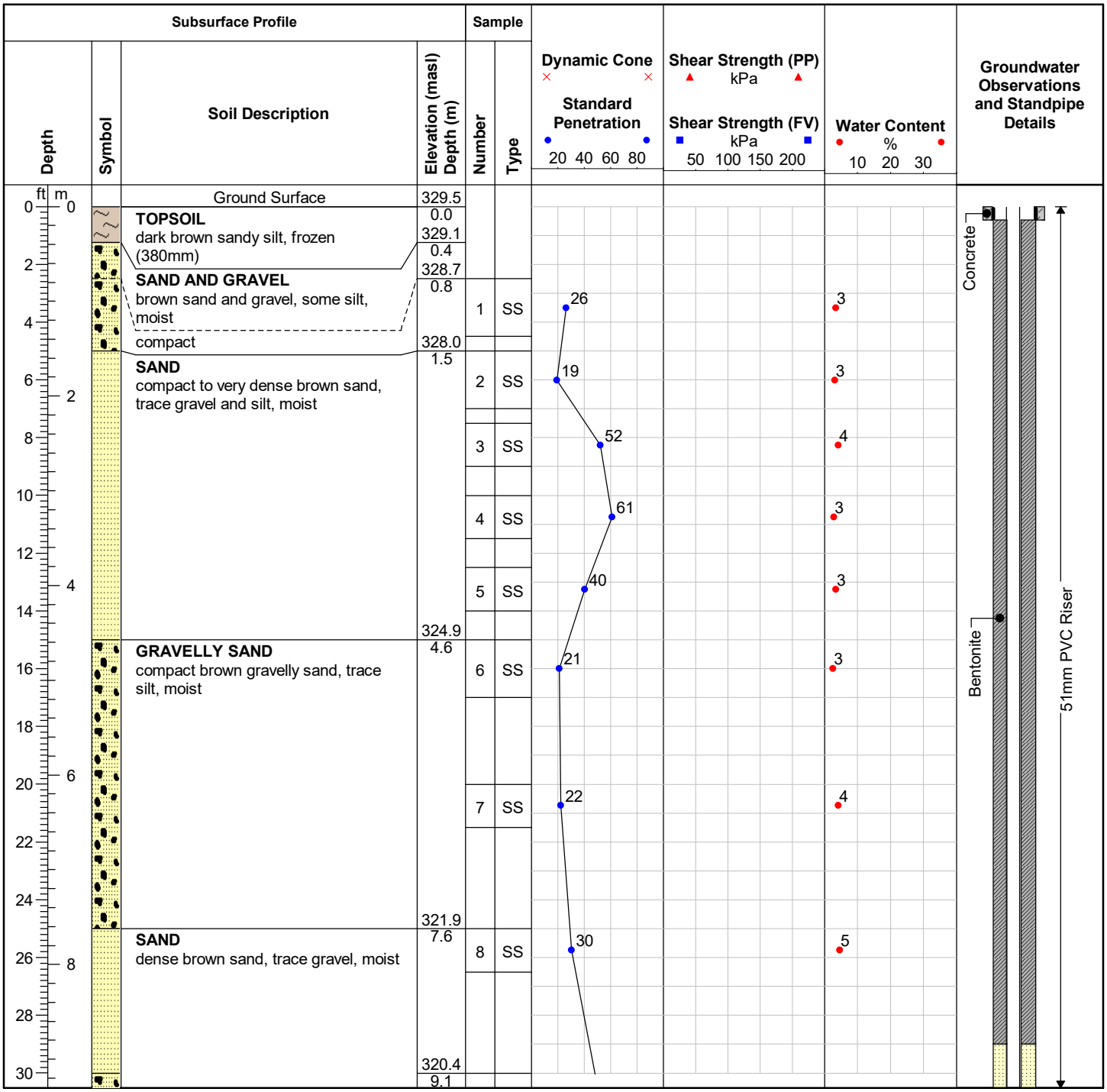
Date Completed: 2/28/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: Monument Casing



Field Technician: M. Dalgliesh

Drafted by: A. Challis

Reviewed by: D. Gonser

Sheet: 1 of 2

Notes:
Auger refusal at 11.1mbgs on suspected bedrock.
Borehole dry upon drilling completion.
Well dry on March 8, 2022.

ID No.: MW501-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

Date Completed: 2/28/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: Monument Casing

Depth	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
32		**SAND AND GRAVEL** very dense brown sand and gravel, trace silt, occasional cobbles, moist		9	SS	51		5	
34	10								
36				10	SS	50/80mm		8	
38		Drilling Terminated	318.4 / 11.1						
40	12								
42									
44									
46	14								
48									
50									
52	16								
54									
56									
58									
60	18								

Sand Pack

51mm Slotted Screen

Field Technician: M. Dalgliesh

Drafted by: A. Challis

Reviewed by: D. Gonser

Notes:
Auger refusal at 11.1mbgs on suspected bedrock.
Borehole dry upon drilling completion.
Well dry on March 8, 2022.

ID No.: BH502-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

Date Completed: 2/28/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

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 %	Groundwater Observations and Standpipe Details
0 / 0	Ground Surface	332.0						
	TOPSOIL dark brown sandy silt, frozen (360mm)	0.0 / 331.6						
		0.4 / 331.2						
2	**SILT TILL** light brown sandy silt, some gravel, trace clay, frozen/wet compact	0.8	1	SS	10		12	
4			2	SS	13		11	
6 / 2		329.7						
8	**GRAVELLY SILT TILL** compact light brown gravelly silt, some sand, trace clay, very moist	2.3	3	SS	18		8	
10			4	SS	24		11	
12		328.2						
14 / 4	**SANDY SILT TILL** compact to very dense brown sandy silt, some gravel, trace clay, very moist with occasional wet seams	3.8	5	SS	27		13	
16			6	SS	50/130mm		13	
18								Bentonite
20 / 6		325.9						
22	**SILT TILL** dense to very dense brown silt, some gravel and clay, trace sand, very moist to moist	6.1	7	SS	42		11	
24		324.4						
26 / 8	occasional cobbles and boulders	7.6	8	SS	50/50mm		6	Dry Cave
28								Borehole dry upon drilling completion
30		322.9 / 9.1	9					

Cuttings

Field Technician: M. Dalgliesh

Drafted by: A. Challis

Reviewed by: D. Gonser

Notes:
Auger refusal at 10.1mbgs on suspected bedrock

ID No.: BH502-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

Date Completed: 2/28/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Subsurface Profile				Sample		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
Depth	Symbol	Soil Description	Elevation (masl) Depth (m)	Number	Type				
32		**SAND AND GRAVEL** very dense brown sand and gravel, trace silt, occasional cobbles, damp to moist		9	SS	50/100mm		4	
10			321.9	10	SS	50/50mm		8	
34		Drilling Terminated	10.1						
36									
38									
12 40									
42									
44									
14 46									
48									
50									
16 52									
54									
56									
58									
18 60									

Field Technician: M. Dalgliesh

Drafted by: A. Challis

Reviewed by: D. Gonser

Notes:
Auger refusal at 10.1mbgs on suspected bedrock

ID No.: BH503-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

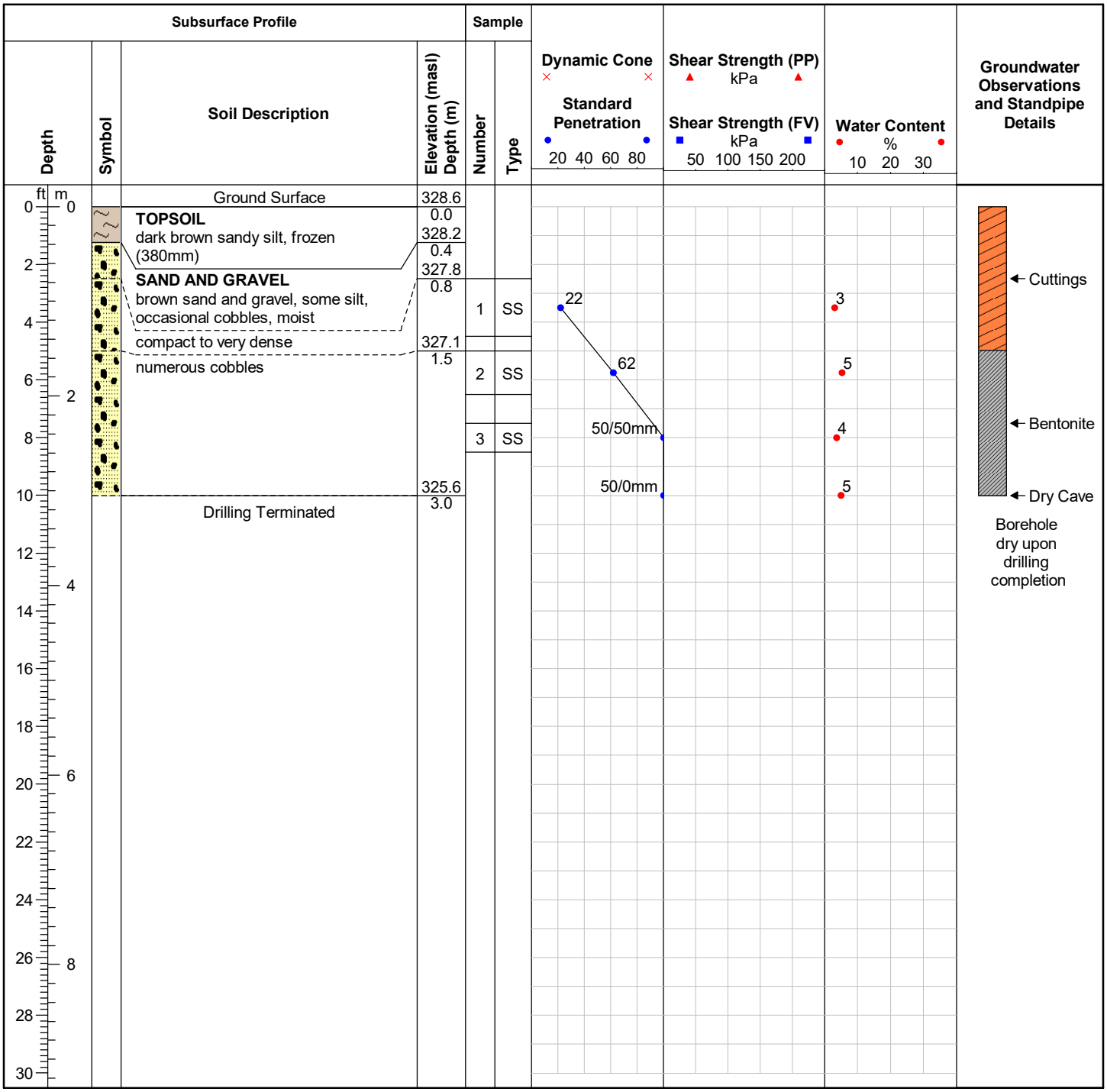
Date Completed: 2/28/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: M. Dalgliesh

Drafted by: A. Challis

Reviewed by: D. Gonser

Notes:
Auger refusal at 3.0mbgs on suspected bedrock

ID No.: BH504-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

Date Completed: 3/1/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

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 %
0 / 0	Ground Surface	323.4					
	FILL (TOPSOIL) dark brown sandy silt, frozen (760mm)	0.0	1	GS			4
2 /		322.6					
	FILL loose dark brown gravelly silt, some sand and organics, wet	0.8 / 322.2	2	SS	8		32
4 /		1.2			82/100mm		
	GRAVELLY SILT TILL compact to very dense brown gravelly silt, some sand, trace clay, moist	321.7	3	SS			5
6 / 2		1.7					
	BEDROCK limestone	321.3 / 2.1					
8 /	Drilling Terminated						
10 /							
12 / 4							
14 /							
16 /							
18 /							
20 / 6							
22 /							
24 /							
26 / 8							
28 /							
30 /							

Groundwater Observations and Standpipe Details

- Cuttings
- Bentonite
- Dry Cave

Borehole dry upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: D. Gonser

Notes:
Bedrock outcrops visible on slope near borehole.

ID No.: BH505-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

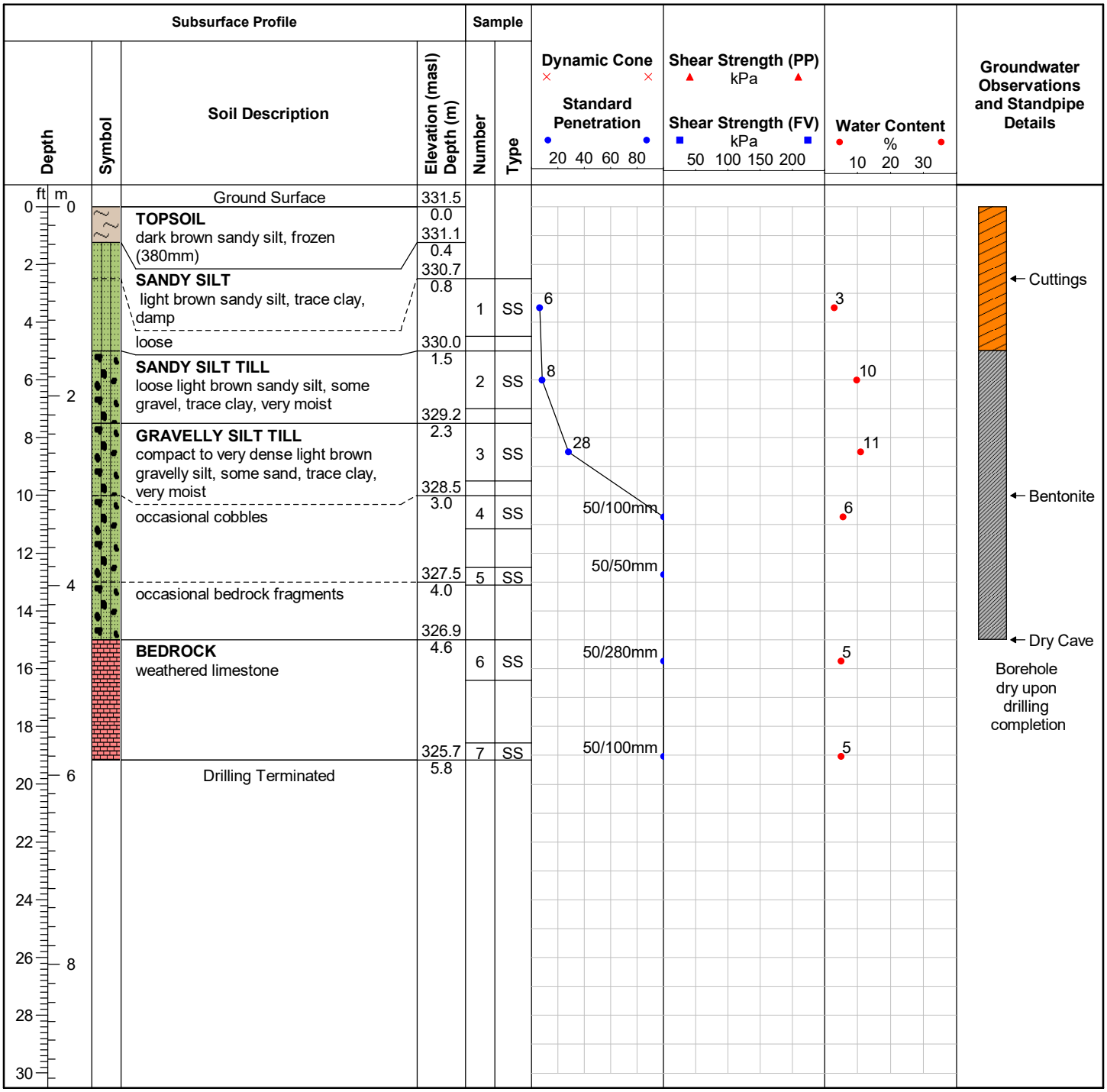
Date Completed: 3/1/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: D. Gonser

Sheet: 1 of 1

Notes:
Auger refusal at 5.8mbgs on suspected bedrock

ID No.: BH506-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

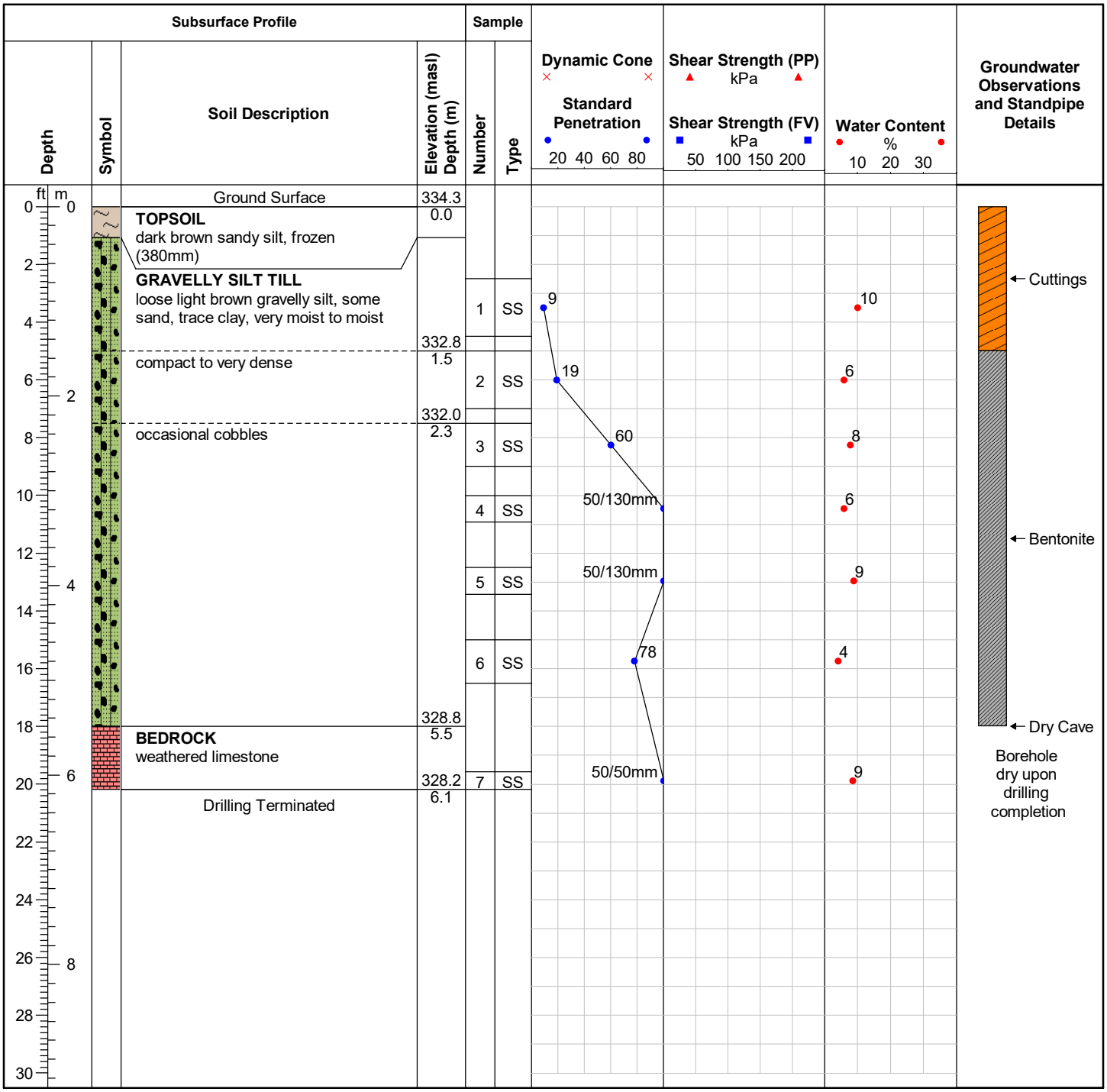
Date Completed: 3/1/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: D. Gonser

Sheet: 1 of 1

Notes:
Auger refusal at 6.1mbgs on suspected limestone bedrock

ID No.: MW507A-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

Date Completed: 3/2/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track

Drill Method: Hollow Stem Augers

Protective Cover: Monument Casing

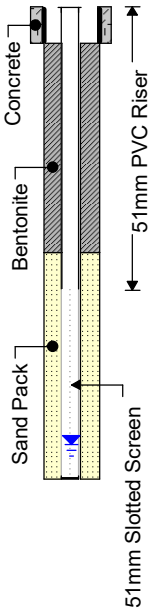
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type
0 / 0		Ground Surface	332.1		
		TOPSOIL dark brown sandy silt, frozen (360mm)	0.0 / 331.7		
2 /			0.4		
		SILT TILL brown silt, some sand and gravel, trace clay, wet to very moist			
6 / 2			329.8		
		GRAVELLY SILT TILL brown gravelly silt, some sand, trace clay, wet	2.3		
12 /			328.3		
		Drilling Terminated	3.8		
30 / 8					

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: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: D. Gonser

Sheet: 1 of 1

Notes:
Stratigraphy inferred from Borehole MW507B-22.
Water measured at 3.5mbgs (Elevation 328.6masl) on July 5, 2022.

ID No.: MW507B-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

Date Completed: 3/2/2022

Drilling Contractor: Envirocore

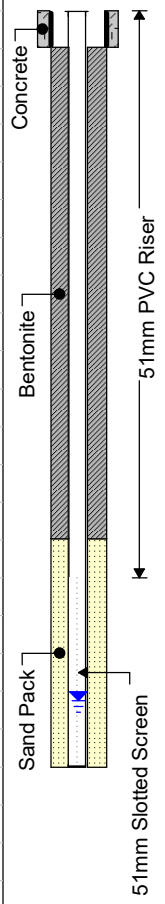
Drill Rig: D50T Track

Drill Method: Hollow Stem Augers

Protective Cover: Monument Casing

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 %
0 / 0	Ground Surface	332.2					
	TOPSOIL dark brown sandy silt, frozen (360mm)	0.0 / 331.8					
		0.4 / 331.4					
2 /	**SILT TILL** brown silt, some sand and gravel, trace clay, wet to very moist compact	0.8	1	SS	15		17
4 /			2	SS	17		11
6 / 2		329.9					
8 /	**GRAVELLY SILT TILL** compact brown gravelly silt, some sand, trace clay, wet	2.3	3	SS	18		10
10 /			4	SS	28		12
12 /		328.4					
14 / 4	**SILT TILL** compact brown silt, some gravel and sand, trace clay, very moist with occasional saturated sand seams	3.8	5	SS	19		10
16 /			6	SS	26		10
18 /							
20 / 6		326.1	7	SS	50/100mm		13
	SANDY SILT TILL very dense light brown sandy silt, some gravel, saturated	6.1					
22 /	Drilling Terminated						
24 /							
26 / 8							
28 /							
30 /							

Groundwater Observations and Standpipe Details



Field Technician: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: D. Gonser

Sheet: 1 of 1

Notes:
Auger refusal at 6.2mbgs on suspected bedrock.
Water encountered at 3.8mbgs during drilling.
Water measured at 5.6mbgs (Elevation 326.6masl) on July 5, 2022.

ID No.: BH508-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

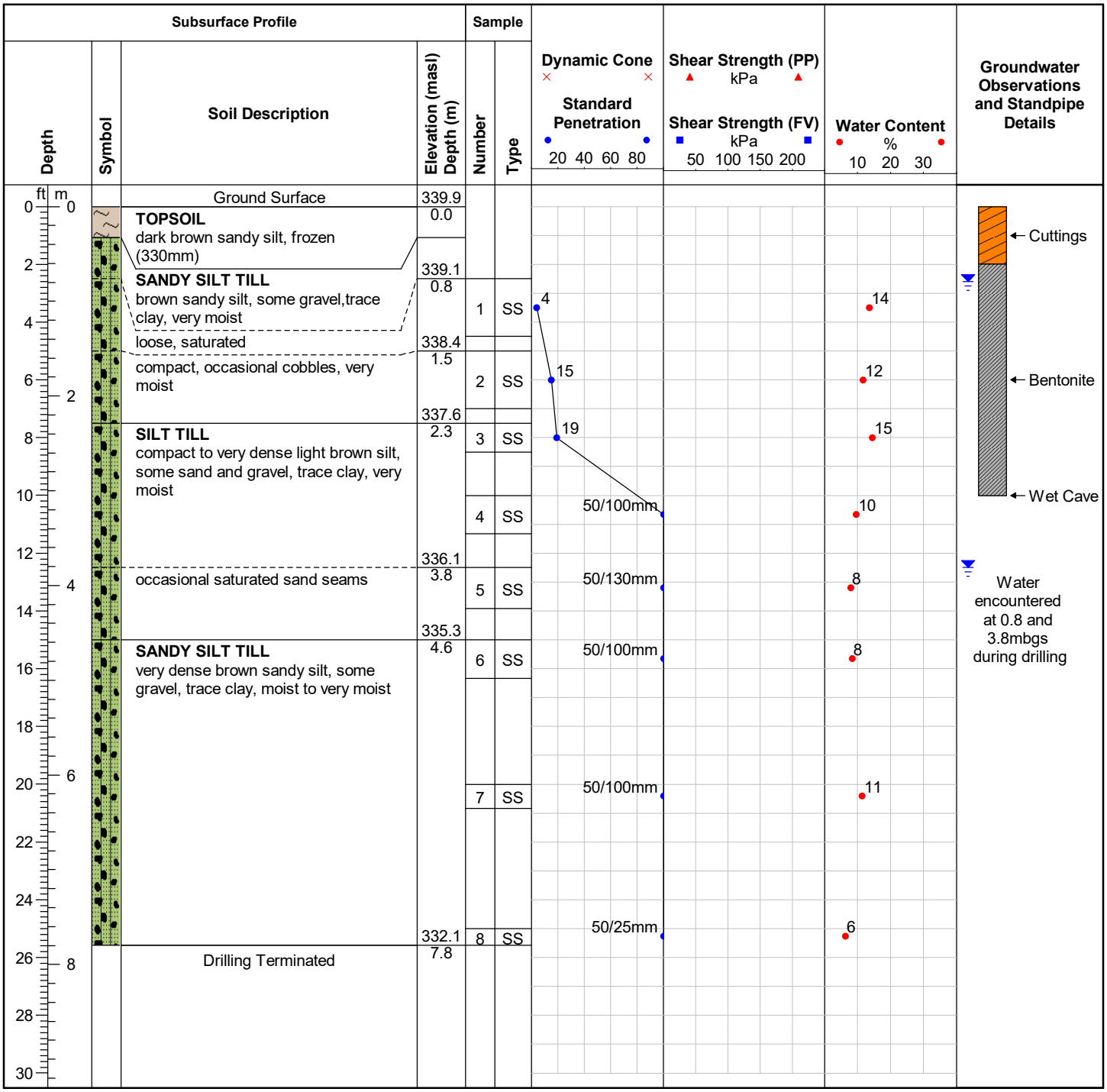
Date Completed: 3/3/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: A. Challis

Sheet: 1 of 1

ID No.: BH509-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

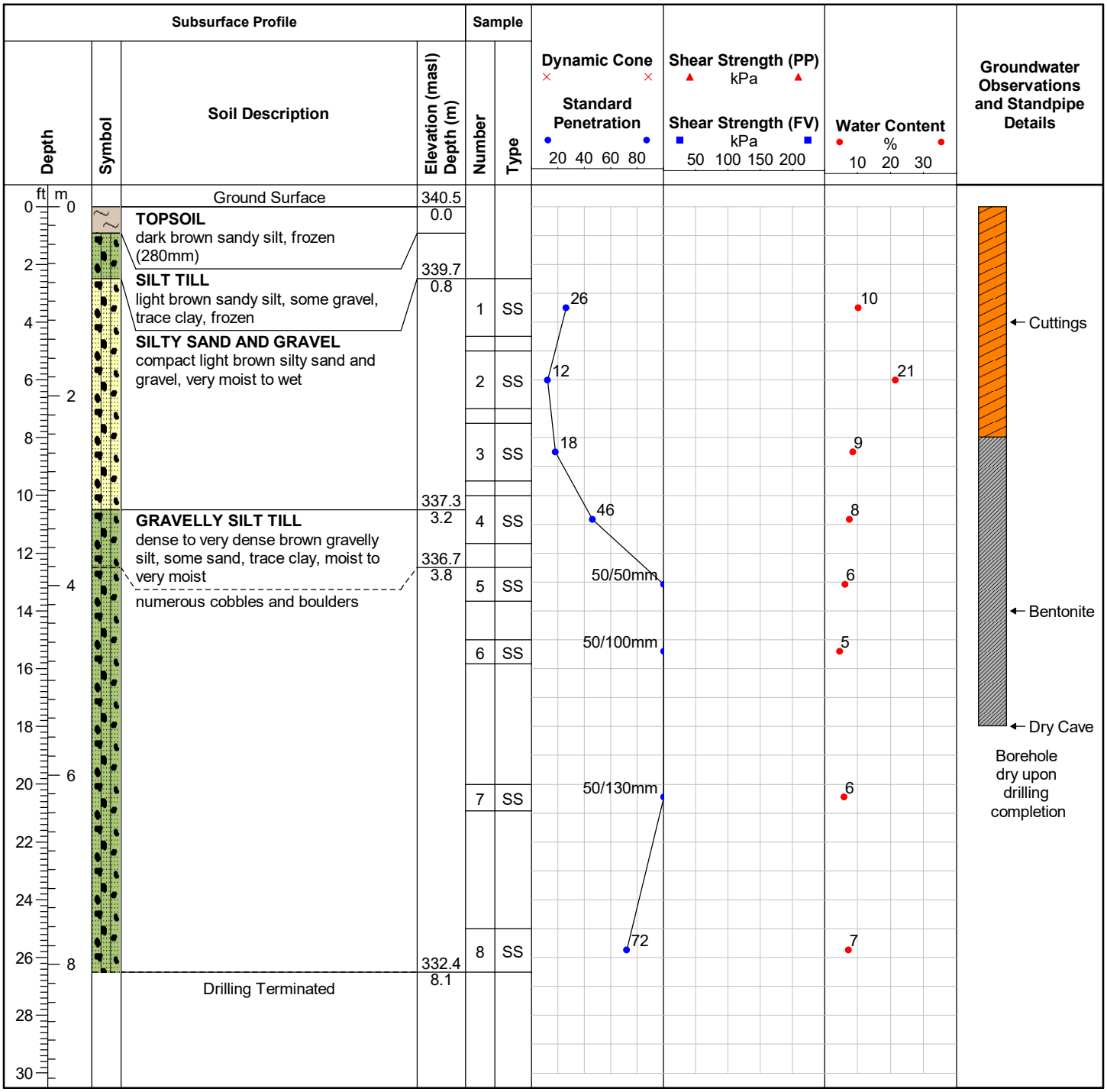
Date Completed: 3/3/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: D. Gonser

Sheet: 1 of 1

ID No.: BH510-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

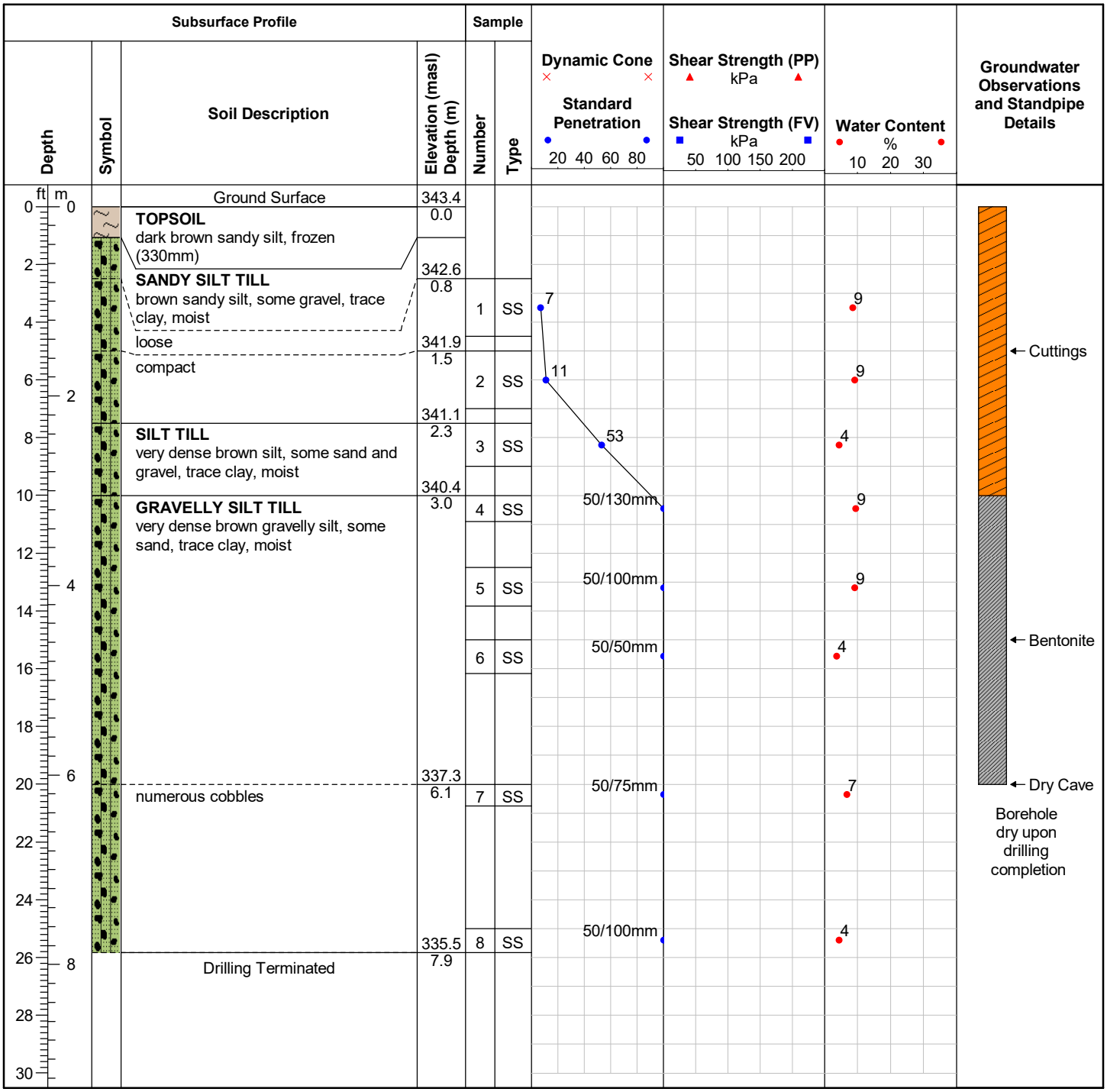
Date Completed: 3/1/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: D. Gonser

Sheet: 1 of 1

ID No.: BH511-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

Date Completed: 3/2/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

Drill Method: Hollow Stem Augers

Protective Cover: N/A

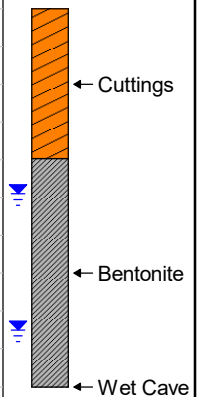
Depth (ft / m)	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Standard Penetration (Dynamic Cone)	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %
0 / 0	Ground Surface	336.9					
	FILL (TOPSOIL) dark brown sandy silt, frozen (50mm)	0.0 / 336.1					
2 /	**FILL** dark brown sandy silt, some organics, trace gravel, frozen/wet	0.8 / 335.4	1	SS	2		11
4 /	**SILT AND SAND TILL** very loose light brown silt and sand, trace to some gravel, wet	1.5 / 334.6	2	SS	12		14
6 / 2	compact, saturated						
8 /	**SILT TILL** compact brown silt, some gravel and sand, trace clay, very moist	2.3 / 333.9	3	SS	23		10
10 /	50mm saturated sand seam	3.0 / 332.3	4	SS	72		11
12 / 4	**SANDY SILT TILL** very dense brown sandy silt, some gravel, trace clay, very moist		5	SS	50/75mm		12
14 /							
16 /	**GRAVELLY SANDY SILT TILL** very dense brown gravelly sandy silt, trace clay, very moist	4.6 / 330.3	6	SS	50/130mm		10
18 /							
20 / 6			7	SS	77		9
22 /	Drilling Terminated	6.6					
24 /							
26 / 8							
28 /							
30 /							

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



Water encountered at 1.5 and 2.6mbgs during drilling

Field Technician: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: D. Gonser

MTE

ID No.: MW512A-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

Date Completed: 3/1/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: Monument Casing

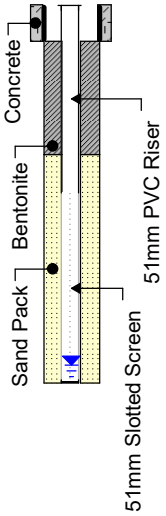
Depth (ft / m)	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type
0 / 0	Ground Surface	335.5		
	TOPSOIL dark brown sandy silt, frozen (250mm)	0.0		
2	**SILT TILL** light brown silt, some sand and gravel, trace clay, wet			
4		334.0		
	occasional saturated sand seams	1.5		
6 / 2		333.2		
8	**SANDY SILT TILL** brown sandy silt, some gravel, trace clay, saturated	2.3		
10		332.5		
	Drilling Terminated	3.0		
12 / 4				
14				
16				
18				
20 / 6				
22				
24				
26 / 8				
28				
30				

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: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: D. Gonser

Sheet: 1 of 1

Notes:
Stratigraphy inferred from Borehole MW512B-22.
Water measured at 2.9mbgs (Elevation 332.6masl) on July 5, 2022.

ID No.: MW512B-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

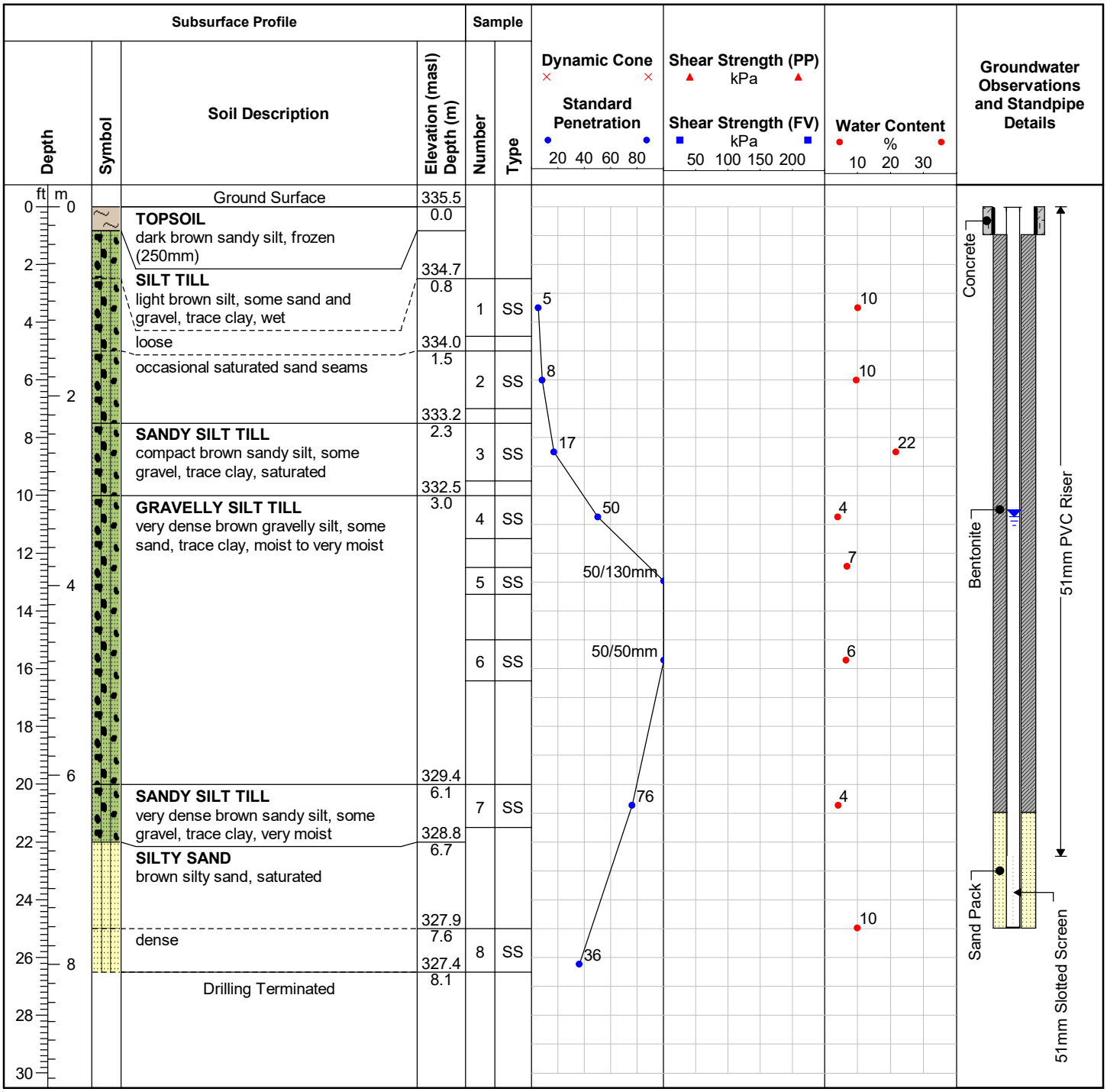
Date Completed: 3/1/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: Monument Casing



Field Technician: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: D. Gonser

Sheet: 1 of 1

Notes:
Water encountered at 1.5 and 6.7mbgs during drilling.
Water measured at 3.3mbgs (Elevation 332.2masl) on July 5, 2022.

ID No.: BH513-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

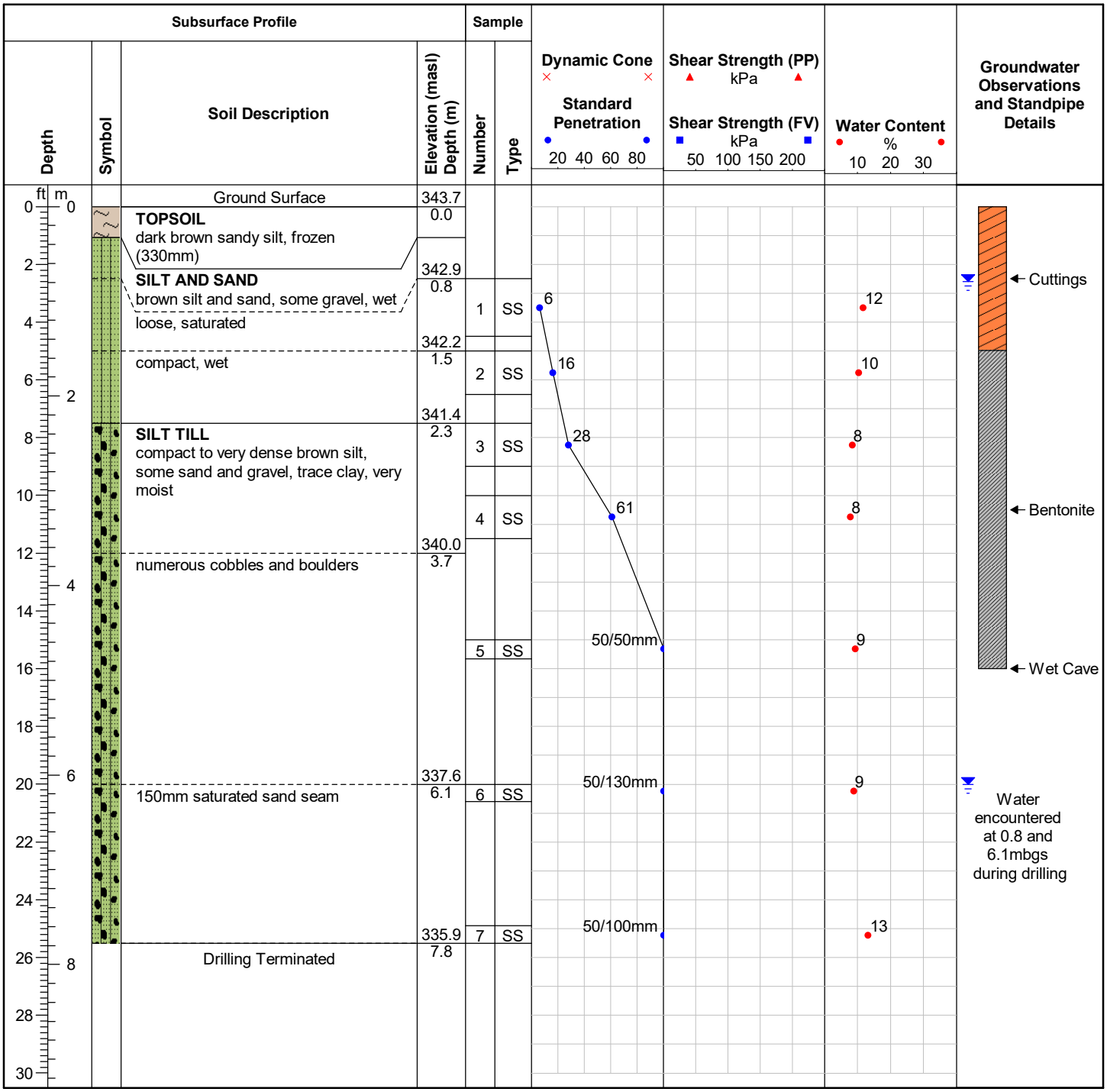
Date Completed: 3/7/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: M. Dalgliesh

Drafted by: A. Challis

Reviewed by: D. Gonser

Sheet: 1 of 1

ID No.: MW514-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

Date Completed: 3/3/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

Drill Method: Hollow Stem Augers

Protective Cover: Monument Casing

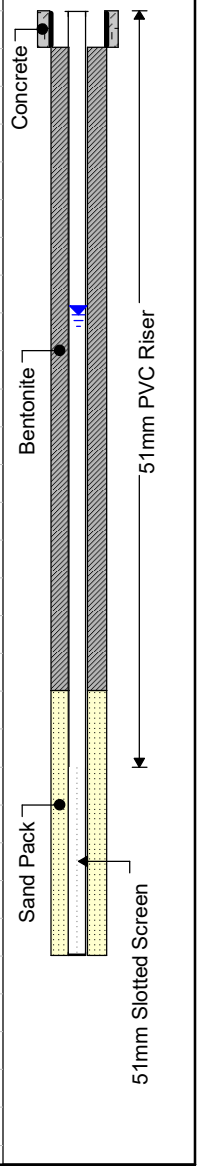
Depth (ft / m)	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone Standard Penetration	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %
	Ground Surface	344.6					
0	**TOPSOIL** dark brown sandy silt, frozen (360mm)	0.0 / 344.2 / 0.4					
2	**SANDY SILT TILL** brown sandy silt, some gravel, trace clay, moist	343.8 / 0.8	1	SS	16		11
4	compact to dense	343.1					
6	occasional cobbles	1.5	2	SS	35		7
		342.3					
8	**GRAVELLY SILT TILL** dense to very dense brown gravelly silt, some sand, trace clay, moist	2.3	3	SS	46		5
10		341.6					
	numerous cobbles and boulders	3.0	4	SS	50/130mm		8
12		340.9					
	SANDY GRAVELLY SILT TILL very dense brown sandy gravelly silt, trace clay, numerous boulders, very moist	3.7	5	SS	50/100mm		6
14							
16			6	SS	50/130mm		6
18							
20		338.3	7	SS	50/130mm		7
	wet to saturated	6.3					
22			8	SS	50/50mm		13
24		337.0					
	GRAVELLY SILT TILL very dense brown gravelly silt, some sand, trace clay, very moist	7.6	9	SS	50/75mm		7
26	Drilling Terminated						
28							
30							

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: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: A. Challis

Sheet: 1 of 1

Notes:
Water encountered at 6.3mbgs during drilling.
Water measured at 2.5mbgs (Elevation 342.1masl) on July 5, 2022.

ID No.: BH515-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

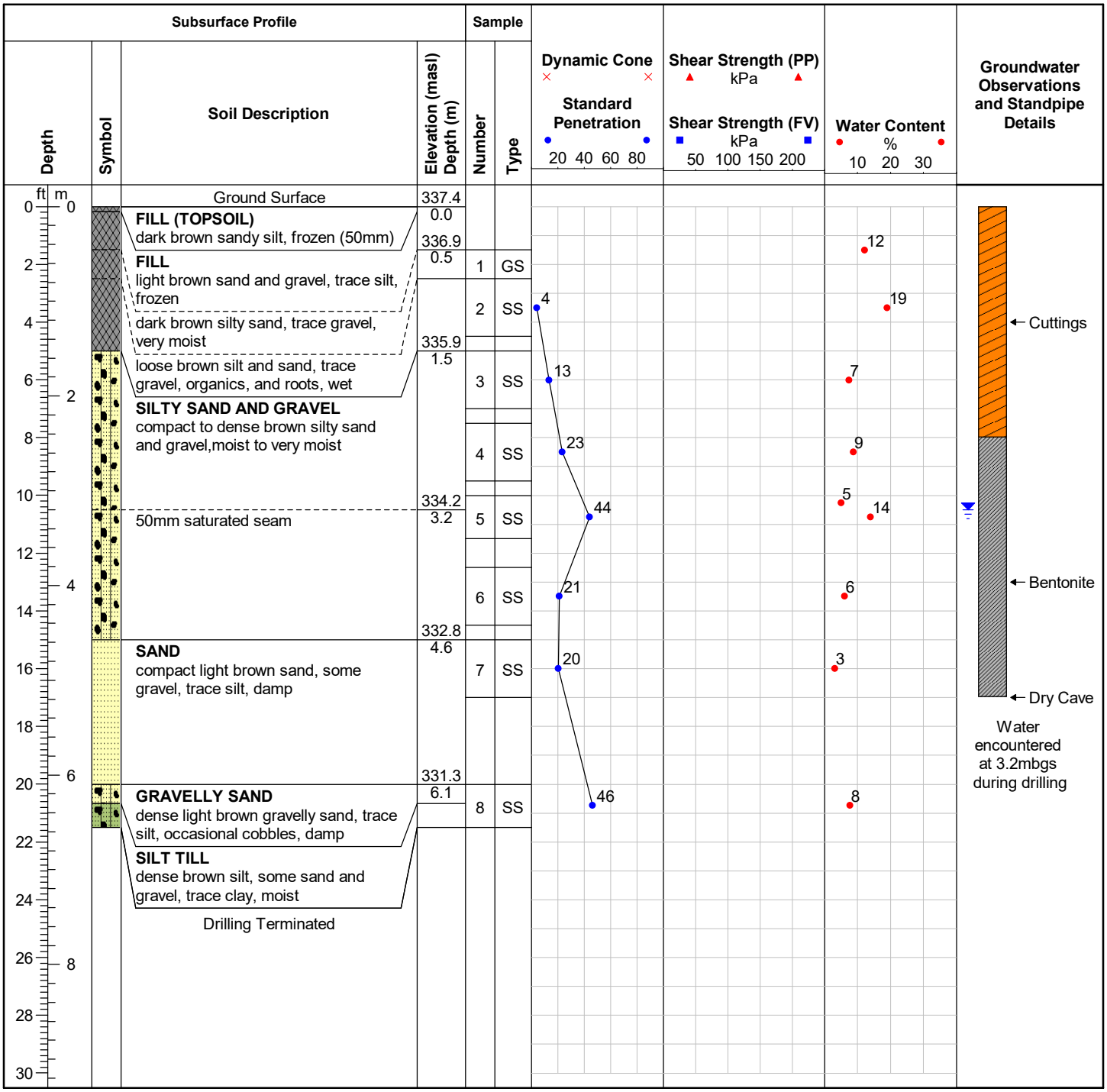
Date Completed: 3/2/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: D. Gonser

Sheet: 1 of 1

ID No.: BH516-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

Date Completed: 3/7/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

Drill Method: Hollow Stem Augers

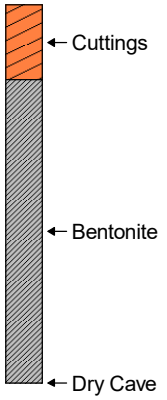
Protective Cover: N/A

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 %
0 / 0	Ground Surface	330.1					
	TOPSOIL dark brown sandy silt, frozen (250mm)	0.0					
2 /	**SAND** loose light brown sand, trace to some gravel and silt, very moist to wet		1	SS	9		13
4 /		328.6					
6 / 2	compact	1.5	2	SS	10		12
8 /			3	SS	11		12
10 /		327.1					
	loose	3.0	4	SS	7		10
12 /		326.3					
14 / 4	compact	3.8	5	SS	15		10
16 /		325.1	6	SS	16		10
	Drilling Terminated	5.0					
18 /							
20 / 6							
22 /							
24 /							
26 / 8							
28 /							
30 /							

Standard Penetration: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Water Content %: 10 20 30



Borehole dry upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID No.: BH517-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

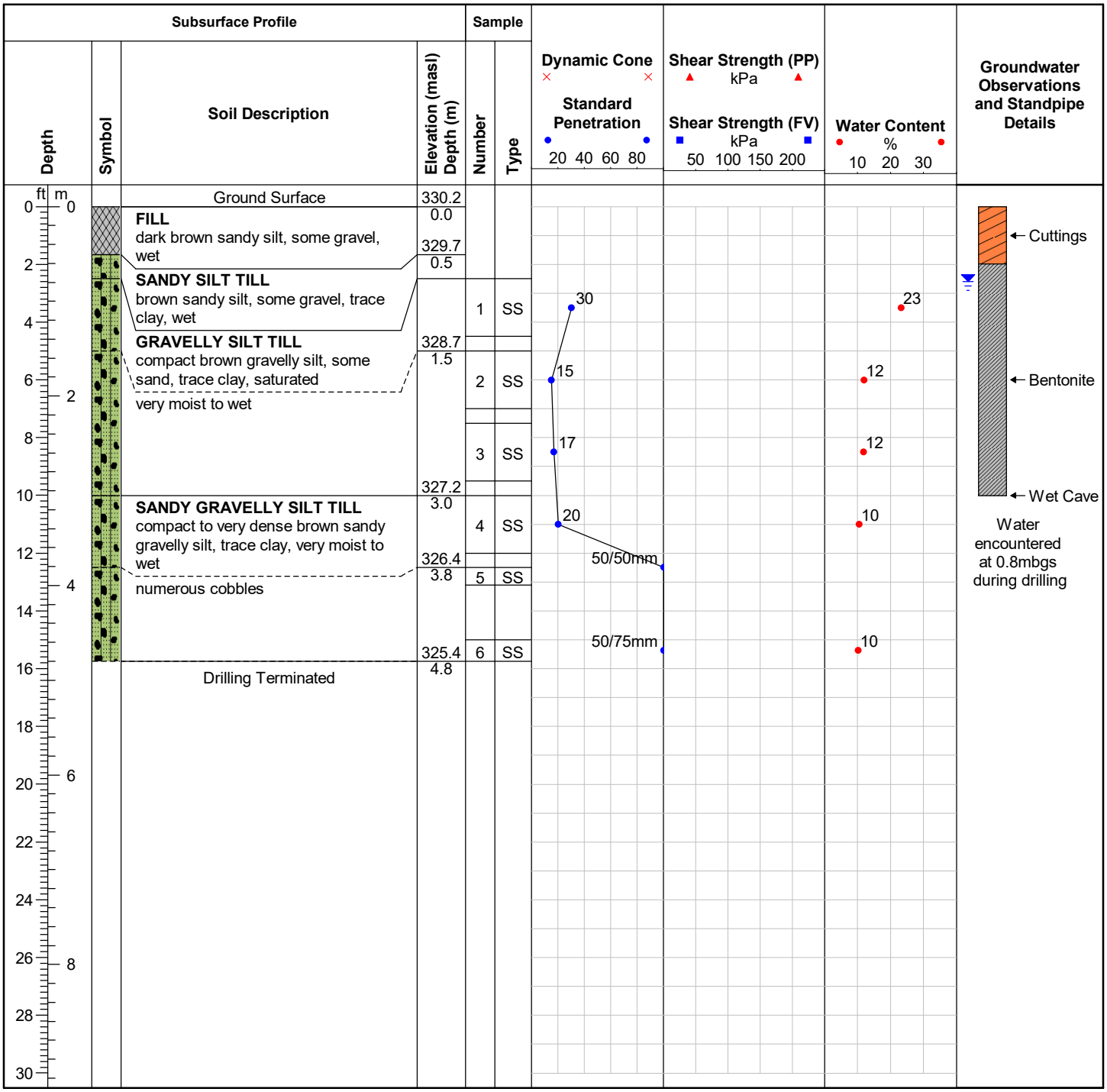
Date Completed: 3/7/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: D. Gonser

Sheet: 1 of 1

ID No.: BH518-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

Date Completed: 3/7/2022

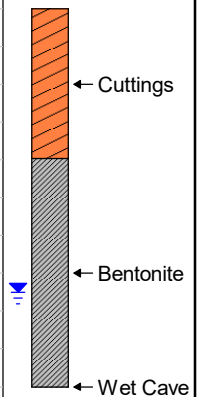
Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

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 %
0 / 0	Ground Surface	333.8					
	TOPSOIL dark brown sandy silt, frozen (280mm)	0.0 / 333.0					
2 /	**SANDY SILT TILL** light brown to brown sandy silt, some gravel, trace clay, very moist to wet	0.8	1	SS	15		9
4 /	compact to very dense		2	SS	18		11
6 / 2		331.5					
8 /	saturated	2.3	3	SS	20		17
10 /	very moist	330.8 / 3.0	4	SS	25		10
12 / 4			5	SS	20		10
14 /							
16 /			6	SS	50/50mm		9
18 /	numerous cobbles	328.3 / 5.5					
20 / 6		327.7	7	SS	50/50mm		13
	Drilling Terminated	6.1					
22 /							
24 /							
26 / 8							
28 /							
30 /							



Water encountered at 2.3mbgs during drilling

Field Technician: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: D. Gonser

Sheet: 1 of 1

ID No.: BH519-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

Date Completed: 3/7/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

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 %
0 / 0	Ground Surface	332.3					
	FILL (TOPSOIL) dark brown sandy silt, frozen (760mm)	0.0 / 331.5					
4 / 1	**FILL** very loose dark brown silt and sand, trace gravel, wet	0.8 / 330.8	1	SS	3		16
6 / 2	**SILTY SAND AND GRAVEL** compact light brown silty sand and gravel, wet	1.5 / 330.0	2	SS	10		19
8 / 3	**SAND AND GRAVEL** compact to very dense light brown to brown sand and gravel, some silt, moist	2.3	3	SS	17		4
12 / 4			4	SS	26		4
14 / 4			5	SS	27		6
	saturated	327.7 / 4.6					
16 / 5			6	SS	25		21
20 / 6	occasional cobbles and boulders, very moist	326.2 / 6.1	7	SS	50/130mm		10
26 / 8		324.2	8	SS	65		14
	Drilling Terminated	8.1					

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

Water encountered at 4.6mbgs during drilling

Field Technician: M. Dalgliesh

Drafted by: A. Challis

Reviewed by: D. Gonser

Sheet: 1 of 1

ID No.: MW520-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

Date Completed: 3/2/2022

Drilling Contractor: Envirocore

Drill Rig: D50T Track Mount

Drill Method: Hollow Stem Augers

Protective Cover: Monument Casing

Depth (ft / m)	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone – Standard Penetration (blows)	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %
0 / 0	Ground Surface	332.0					
	TOPSOIL dark brown sandy silt, some gravel (330mm)	0.0 / 331.2					
2	**GRAVELLY SILT TILL** light brown gravelly silt, some sand, trace clay, moist to very moist	0.8	1	SS	22		5
4	compact, occasional cobbles	330.5					
6 / 2	**SAND AND GRAVEL** compact to very dense brown sand and gravel, trace to some silt, very moist to moist	1.5	2	SS	25		14
8	numerous cobbles	329.7 / 2.3	3	SS	61		4
10			4	SS	50/130mm		7
12 / 4	**SAND** compact light brown fine sand, some silt, very moist	328.2 / 3.8	5	SS	27		12
14		327.4					
16	**SILTY SAND** dense to very dense light brown silty sand, trace to some gravel, wet	4.6	6	SS	32		20
18	saturated		7	SS	50/100mm		13
20 / 6			8	SS	50/75mm		15
22		324.4					
24							
26 / 8	**SAND** very dense light brown sand, some silt, trace gravel, occasional cobbles, saturated	7.6	9	SS	50/100mm		15
28	Drilling Terminated						
30							

Groundwater Observations and Standpipe Details: Concrete; Bentonite; 51mm PVC Riser; Sand Pack; 51mm Slotted Screen

Field Technician: M. Dalgliesh

Drafted by: H. Sandhu

Reviewed by: D. Gonser

Sheet: 1 of 1

Notes:
Water encountered at 4.9mbgs during drilling.
Water measured at 6.4mbgs (Elevation 325.6masl) on July 5, 2022.

ID No.: BH654-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

Date Completed: 10/25/2022

Drilling Contractor: Geo-Environmental Drilling Inc.

Drill Rig: CME 75 Track Mount

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	326.2						
0		**TOPSOIL** compact dark brown silty sand topsoil	0.0	1	SS	10		3	
2 / 1		**SAND AND GRAVEL** very dense brown sand and gravel, trace silt, moist		2	SS	50/100mm		6	
4 / 2			324.8	3		50/0mm			Bentonite
6 / 2		Drilling Terminated	1.4						
8 / 3									
10 / 3									
12 / 4									
14 / 4									
16 / 5									
18 / 5									
20 / 6									
22 / 7									
24 / 7									
26 / 8									
28 / 9									
30 / 9									

Field Technician: TXG

Drafted by: TXG

Reviewed by: D. Gonser

Notes: Auger refusal at 1.4m on suspected bedrock

Sheet: 1 of 1

ID No.: BH655-22

Project Name: Guelph Innovation District Lands

MTE File No.: 46927-104

Client: Fusion Homes

Site Location: 588 Stone Road East, Guelph, ON

Date Completed: 10/25/2022

Drilling Contractor: Geo-Environmental Drilling Inc.

Drill Rig: CME 75 Track Mount

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	322.4						
0 / 0		**TOPSOIL** dark brown sandy silt, moist	0.0	1	SS	35		3	
2 /		**SAND AND GRAVEL** very dense brown sand and gravel, trace silt, moist		2	SS	85/200mm		1	
4 /			321.0	3	SS	50/0mm			
6 / 2		Drilling Terminated	1.4						Bentonite
8 /									
10 /									
12 / 4									
14 /									
16 /									
18 /									
20 / 6									
22 /									
24 /									
26 / 8									
28 /									
30 /									

Field Technician: TXG

Drafted by: TXG

Reviewed by: D. Gonser

Notes: auger refusal at 1.4m on suspected bedrock

Appendix C

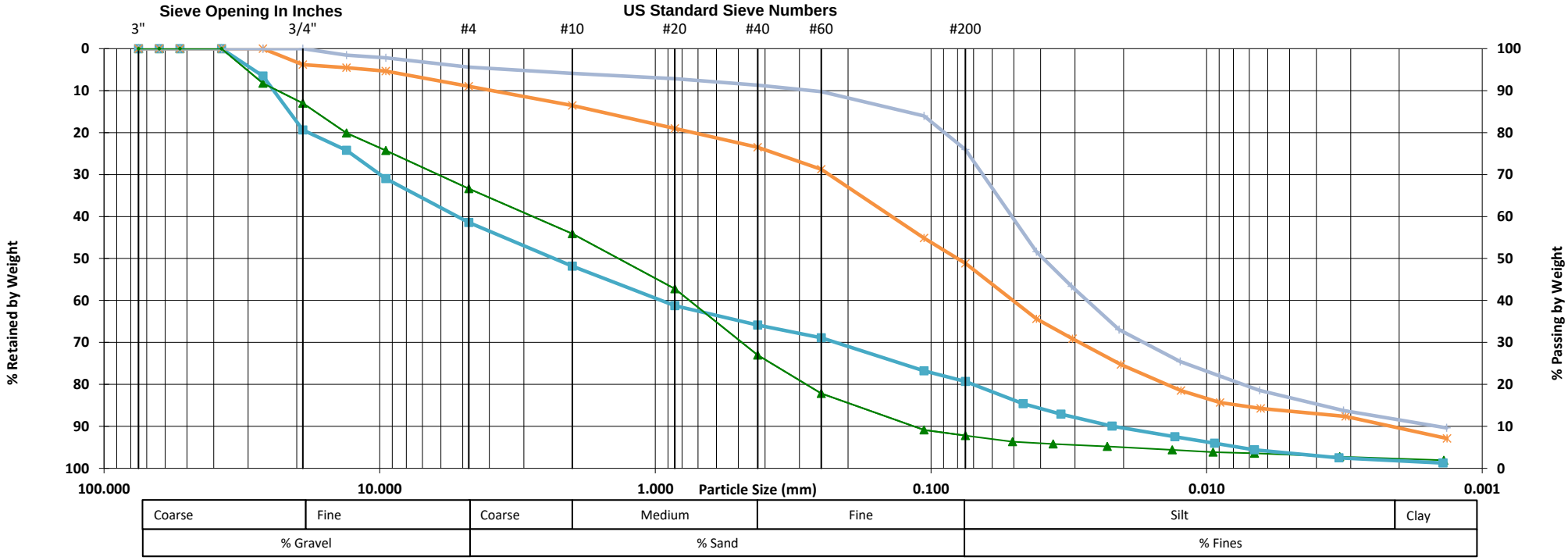
Laboratory Testing

Tables 101 & 102

Particle Size Distribution Analysis Test Results

Project Name:	**Guelph Innovation District Lands**	**Date Sampled:**	**Feb. 28 - Mar. 7, 2022**	**MTE File No.:**	**46927-104**
Client:	**Fusion Homes**	**Date Tested:**	**Mar. 21 - 24, 2022**	**Table No:**	**101**
Project Location:	**588 Stone Road, Guelph, ON**				

Unified Soil Classification



Symbol	Borehole ID	Sample #	Sample Depth	Description
▲	MW501-22	SS-3	2.3-2.9 mbgs	Gravelly SAND, trace Silt and Clay
■	MW501-22	SS-9	9.1-9.8 mbgs	GRAVEL and SAND, some Silt, trace Clay
✳	MW507-22	SS-6	4.6-6.1 mbgs	SAND and SILT, trace Clay and Gravel
+	MW512-22	SS-7	6.1-6.7 mbgs	SILT, some Sand and Clay, trace Gravel

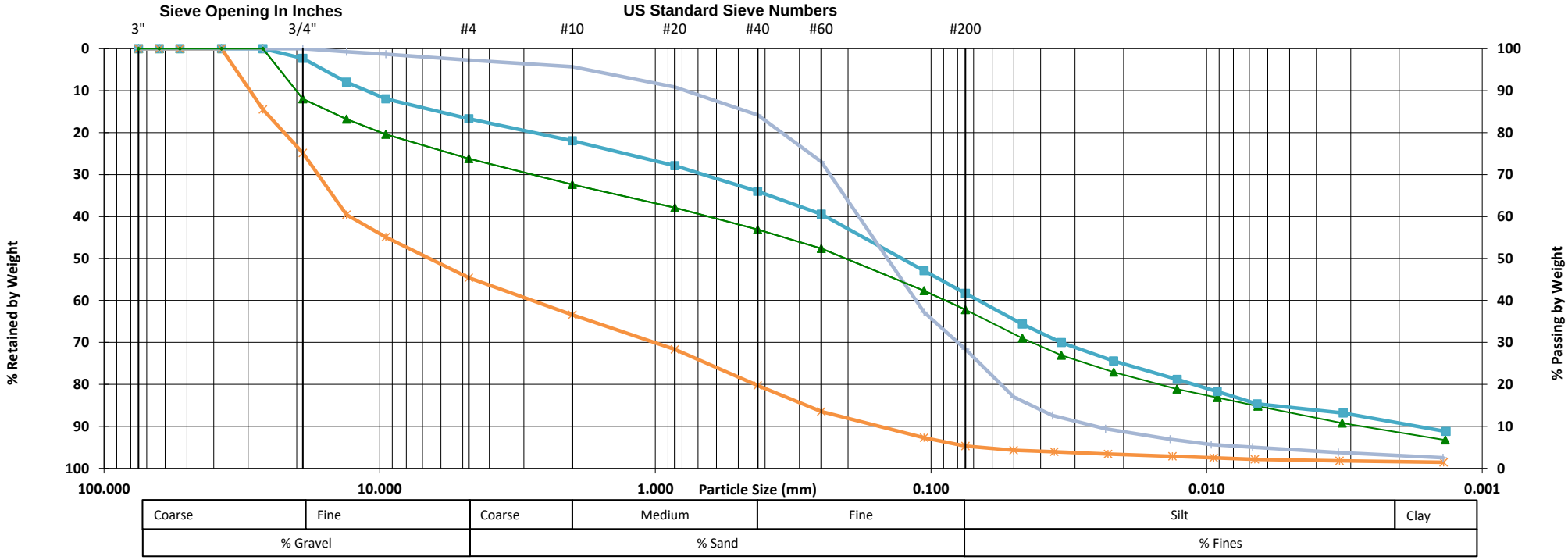
CERTIFIED BY CCIL
Canadian Council of Independent Laboratories
For specific tests as listed on www.ccil.com

NOTES:

Particle Size Distribution Analysis Test Results

Project Name:	**Guelph Innovation District Lands**	**Date Sampled:**	**Feb. 28 - Mar. 7, 2022**	**MTE File No.:**	**46927-104**
Client:	**Fusion Homes**	**Date Tested:**	**Mar. 21 - 24, 2022**	**Table No:**	**102**
Project Location:	**588 Stone Road, Guelph, ON**				

Unified Soil Classification



Symbol	Borehole ID	Sample #	Sample Depth	Description
▲	MW514-22	SS-7	6.1-6.7 mbgs	Silty Gravelly SAND, trace Clay
■	MW514-22	SS-8	6.9-7.5 mbgs	Silty SAND, some Gravel and Clay
✳	MW520-22	SS-3	2.3-2.9 mbgs	SAND and GRAVEL, trace Silt
+	MW520-22	SS-8	6.1-6.7 mbgs	Silty SAND, trace Clay and Gravel

CERTIFIED BY CCIL
Canadian Council of Independent Laboratories
For specific tests as listed on www.ccil.com

NOTES:

Appendix D

Table

MNR Slope Rating

TABLE 4.1 - Slope Inspection Record

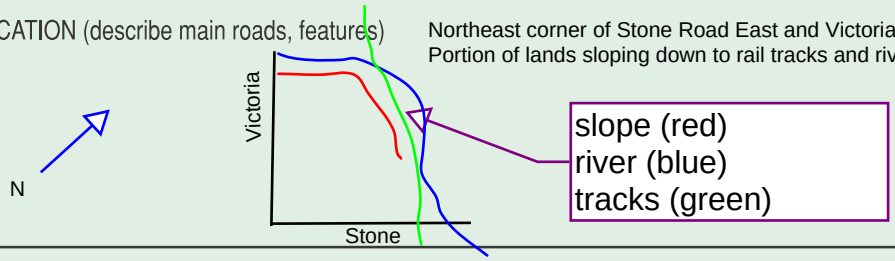
1. FILE NAME / NO. Victoria and Stone Road, Guelph 46927-104
INSPECTION DATE (DDMMYY): April 5, 2022
WEATHER (circle):

• sunny • partly cloudy • cloudy
• calm • breeze • windy
• clear • fog • rain • snow
• cold • cool • warm • hot
estimated air temperature: 15 degrees

INSPECTED BY (name): D. Gonser

2. SITE LOCATION (describe main roads, features) Northeast corner of Stone Road East and Victoria Road South, Guelph
Portion of lands sloping down to rail tracks and river.

SKETCH



3. WATERSHED GRCA

4. PROPERTY OWNERSHIP (name, address, phone): See report client details.

LEGAL DESCRIPTION
Lot
Concession
Township
County

CURRENT LAND USE (circle and describe)
• vacant -field, bush, woods, forest, wilderness, tundra,

The overall property has some structures but they are greater than 100 m from the slope. Slope area is generally bush/woods with a walking trail through it. Top of slope area (within 100m of top of slope) of either grass lands, light vegetation, or agricultural.

• passive -recreational parks, golf courses, non-habitable structures, buried utilities, swimming pools,

• active -habitable structures, residential, commercial, industrial, warehousing and storage,

• infra-structure or public use - stadiums, hospitals,
schools, bridges, high voltage power lines, waste management sites,

5. SLOPE DATA

HEIGHT • 3 - 6 m • 6 - 10 m • 10 - 15 m • 15 - 20 m
• 20 - 25 m • 25 - 30 m • > 30 m
estimated height (m):

Slope height is greatest on NW side of site (closer to Victoria), in the range of 20+ m height with this area having some exposed bedrock faces approaching vertical. As it moves further east, the overall height decreases but localized vertical exposed bedrock faces are still present.

INCLINATION AND SHAPE

• 4:1 or flatter 25 % 14°	• up to 3:1 33 % 18 °	• up to 2:1 50 % 26 °
• up to 1:1 100 % 45°	• up to :1 200 % 63 °	• steeper than :1 > 63 °

6. SLOPE DRAINAGE (describe)

TOP — The table lands generally sheet flows towards the face of the slope. No actively eroding gullies or ravines were noted during the course of inspection.

FACE — Over the face of the slope, minor natural drainage channels are present over, around, and/or through the exposed bedrock faces but none appear to be actively eroding or unstable.

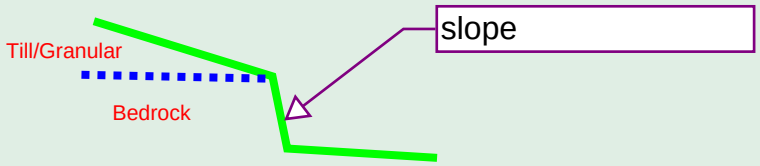
BOTTOM — On the NW side, water drains into Clythe Creek. On the NE side, drainage is to the swale created by the rail track.

7. SLOPE SOIL STRATIGRAPHY (describe, positions, thicknesses, types)

TOP

FACE

BOTTOM



8. WATER COURSE FEATURES (circle and describe)

SWALE, CHANNEL

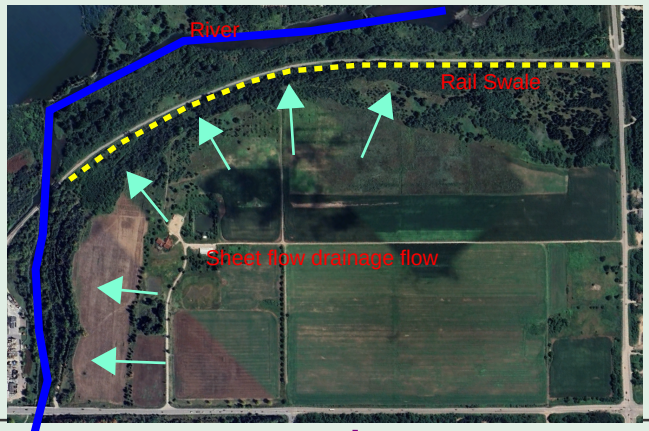
GULLY

STREAM, CREEK, RIVER

POND, BAY, LAKE

SPRINGS

MARSHY GROUND



9. VEGETATION COVER(grasses, weeds, shrubs, saplings, tre

TOP

FACE

BOTTOM

Dense, mature vegetation, trees, shrubs

medium dense, mature vegetation, trees, shrubs

young vegetation, agriculture, grasslands, with limited mature trees

10. STRUCTURES(buildings, walls, fences, sewers, roads, stai

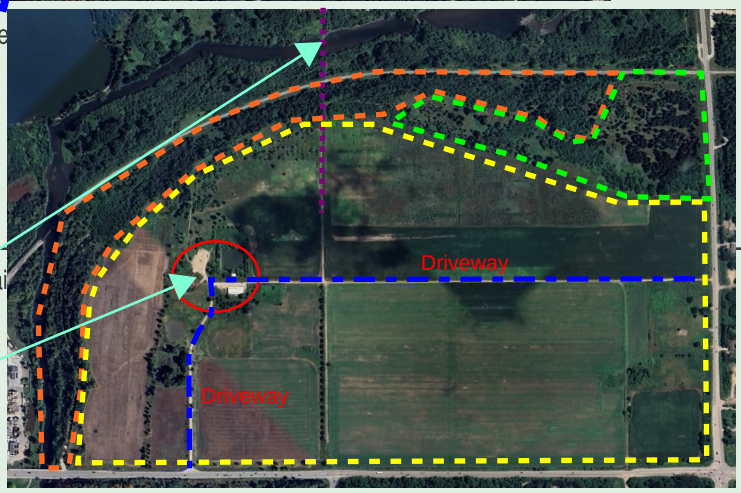
TOP

FACE

BOTTOM

Power lines crossing river

Building/structures are located within red circle



11. EROSION FEATURES(scour, undercutting, bare areas, piping, rills, gully)

TOP None

FACE None

BOTTOM None

12. SLOPE SLIDE FEATURES(tension cracks, scarps, slumps, bulges, grabens, ridges, bent trees)

TOP None

FACE None

BOTTOM None

13. PLAN SKETCH OF SLOPE Refer to Appendix A - Figures 1 through 5

14. PROFILE SKETCH OF SLOPE Refer to Appendix A - Figures 1 through 5

TABLE 4.2 - SLOPE STABILITY RATING CHART

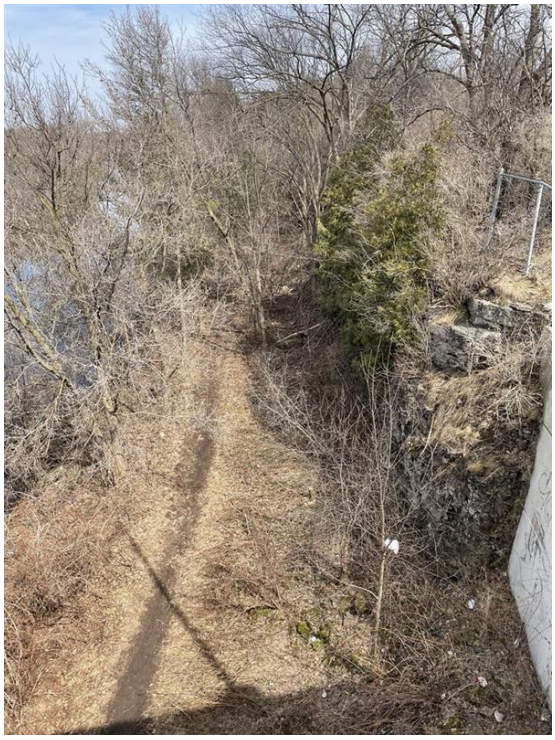
Site Location: Victoria Road and Stone Road File No. 46927-104
Property Owner: Fusion Homes Inspection Date: April 5, 2022
Inspected By: D. Gonser Weather: Sunny, Warm

1. SLOPE INCLINATION			
	degrees	**horiz. : vert.**	
a)	18 or less	3 : 1 or flatter	0
b)	18 - 26	2 : 1 to more than 3 : 1	6
c)	more than 26	steeper than 2 : 1	**16**
2. SOIL STRATIGRAPHY			
a)	Shale, Limestone, Granite (Bedrock)		**0**
b)	Sand, Gravel		6
c)	Glacial Till		9
d)	Clay, Silt		12
e)	Fill		16
f)	Leda Clay		24
3. SEEPAGE FROM SLOPE FACE			
a)	None or Near bottom only		**0**
b)	Near mid-slope only		6
c)	Near crest only or, From several levels		12
4. SLOPE HEIGHT			
a)	2 m or less		0
b)	2.1 to 5 m		2
c)	5.1 to 10 m		4
d)	more than 10 m		**8**
5. VEGETATION COVER ON SLOPE FACE			
a)	Well vegetated; heavy shrubs or forested with mature trees		**0**
b)	Light vegetation; Mostly grass, weeds, occasional trees, shrubs		4
c)	No vegetation, bare		8
6. TABLE LAND DRAINAGE			
a)	Table land flat, no apparent drainage over slope		0
b)	Minor drainage over slope, no active erosion		**2**
c)	Drainage over slope, active erosion, gullies		4
7. PROXIMITY OF WATERCOURSE TO SLOPE TOE			
a)	15 metres or more from slope toe		**0**
b)	Less than 15 metres from slope toe		6
8. PREVIOUS LANDSLIDE ACTIVITY			
a)	No		**0**
b)	Yes		6

SLOPE INSTABILITY RATING VALUES INVESTIGATION RATING SUMMARY **TOTAL** 26

Appendix E

Photographic Log



Photograph No. 1 – Looking from Victoria Street Bridge, view of steep exposed bedrock face on right with river on left.

Photograph No. 2 – View of crack in steep bedrock near Section A-A'.

Photograph No. 3 – Looking south from area of Section F-F'.

Photograph No. 4 – Looking south along top of slope near Section H-H'.

Photograph No. 5 – Looking down the slope at location of hydro crossing between Sections H-H' and I-I'.

Photograph No. 6 – View of other valley lands above top of slope. Looking north in area of Sections J-J', K-K', and L-L'.

Photograph No. 7 – View of other valley lands above top of slope. Looking north in area of Section M-M'.

Appendix F

Existing Conditions Plan

P:\P\46927\104\46927-104-EC1

MTE FILE PATH:

December 11, 2025 - 3:50:30 PM - Plotted By: Alin Nechita

LEGEND

- BH/MW-06 VARIOUS TESTPITS, BOREHOLE / MONITORING WELLS, MTE SURVEYED 2006
- BH/MW-10 VARIOUS TESTPITS, BOREHOLE / MONITORING WELLS, MTE SURVEYED 2010
- BH/MW-11 VARIOUS TESTPITS, BOREHOLE / MONITORING WELLS, MTE SURVEYED 2011
- BH/MW-17 VARIOUS TESTPITS, BOREHOLE / MONITORING WELLS, MTE SURVEYED 2017
- BH/MW-19 VARIOUS TESTPITS, BOREHOLE / MONITORING WELLS, MTE SURVEYED 2019
- BH/MW-20 VARIOUS TESTPITS, BOREHOLE / MONITORING WELLS, MTE SURVEYED 2020
- BH/MW-22 VARIOUS TESTPITS, BOREHOLE / MONITORING WELLS, MTE SURVEYED 2022

GUELPH JUNCTION RAILWAY

CLYTHE CREEK

STONE RD E

VICTORIA RD S

LEGEND

- SITE BOUNDARY
- EXISTING CONTOURS
- EXISTING EMBANKMENT (SLOPE AS NOTED)
- EXISTING WATERMAIN
- EXISTING SANITARY
- EXISTING STORM
- EXISTING FENCE
- EXISTING DRAINAGE DIRECTION
- EXISTING DRIPLINE
- GRCA REGULATION LIMIT
- TOP OF SLOPE
- 6m OFFSET TOP OF SLOPE
- FLAGGED DRIPLINE-OCT 2022
- DEVELOPMENT LIMIT
- NRSI 10.0m BUFFER (OCT. 2022)
- NRSI SURVEYED WETLAND BOUNDARY
- NRSI 30m WETLAND BUFFER
- GRCA FLOODLINE (CGVD28 DATUM)
- GRCA WETLAND
- WATERBODY
- HAND HOLE
- MONITORING WELL
- WELL
- BOREHOLE

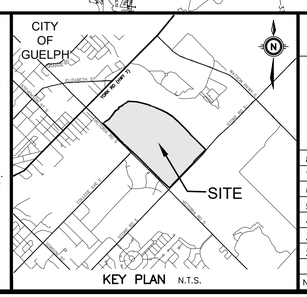
NOTE TO CONTRACTOR :

DO NOT SCALE DRAWINGS.

CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.

THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.



CITY of GUELPH

No.	REVISION	BY	DATE
8.			
7.			
6.			
5.			
4.	ISSUED FOR DRAFT PLAN APPROVAL	DFH	2025-12-12
3.	3RD BLOCK PLAN SUBMISSION	DFH	2025-07-16
2.	2ND BLOCK PLAN SUBMISSION-1ST DRAFT PLAN SUBMISSION	DFH	2025-03-11
1.	1ST BLOCK PLAN SUBMISSION	DFH	2024-04-19

GEODETIC BM ELEV. = m

SITE BENCHMARK ELEV. = 341.866m
CUT CROSS PN CONCRETE TRANSFORMER PAD LOCATED AT SOUTHEAST CORNER OF ADMINISTRATION BUILDING MTE PNO 9205

OWNER

FUSION HOMES

500 HANLON CREEK BOULEVARD GUELPH, ONTARIO

PROJECT

GUELPH INNOVATION DISTRICT LANDS

588 STONE ROAD EAST GUELPH, ONTARIO

DRAWING

EXISTING CONDITIONS PLAN

MTE

Engineers, Scientists, Surveyors

519-743-6500

Project Manager: D.HICKS	Project No.: 46927-104
Design By: ALN	Checked By: VAL
Drawn By: AXB	Checked By: ALN/CVP
Surveyed By: MTE	Drawing No.: EC1.1
Date: 11/7/2024	
Scale: 1:2000	Sheet of