GEOTECHNICAL INVESTIGATION REPORT
SUBDIVISION DEVELOPMENT (2ND PHASE)
1812 COUNTY ROAD 10
VILLAGE OF IDA, TOWNSHIP OF CAVAN-MONAGHAN, ONTARIO
REDSTONE PROJECT NO. 25R103

Prepared for:

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June 13, 2025

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1.0 INTRODUCTION

This report presents the results of a geotechnical investigation performed in support of the design and construction of the second phase (Ph2) of a residential subdivision to be located on the west side of Peterborough County Road 10 about 0.5km south of the intersection with Sharpe Line, immediately south of what Redstone understands is this development's first phase (Ph1) that is currently being constructed around a roadway identified as Cameron Court. The current subject site's proposed development is referred to herein as the Ph2 Development.

Redstone Engineering Inc. (Redstone) was retained by Mr. Ian Cameron (the Client) to conduct this geotechnical investigation. This work was carried out in accordance with Redstone's proposal #P1379 dated February 28, 2025, as authorized by Mr. Ian Cameron's March 26, 2025 execution of Redstone's proposal.

The following information was received from Engage Engineering Ltd (Engage) by way of email dated Feb 19, 2025:

- an aerial image showing the approximate outline of the Ph2 Development lands;
- a drawing by JBF Surveyors (JBF) titled "Plan of Survey of Part of Lot 12 Concession 10 Geographic Township of Cavan, Township of Cavan Monaghan, County of Peterborough", dated Nov 28 2014;
- a drawing by EcoLine Design Studio (EDS) titled "Site Plan – 1812 County Road 10, Ida, ON", Sheet No. A0, dated Sep 2024 (referred to herein as the Site Plan);
- a Peterborough County Record of Pre-Consultation dated Nov 25 2024 (herein referred to as the Pre-Consult Letter);
- an Otonabee Region Conservation Authority (ORCA) letter titled "Plan Review Pre-consultation Memo", dated Nov 27 2024; and
- a Peterborough County document titled "Study Requirements for Official Plan Amendments & Subdivision/Condominium Developments", undated.

Based on the information provided, it is Redstone's understanding that the proposed Ph2 Development will consist of constructing residential lots with an associated internal road network per the Site Plan. It is noted that the proposed layout as shown on the Site Plan has been used as the basis for the works performed for this study.

As of the fieldwork performed for this study, the Ph2 Development site contains an entrance and driveway to a house recently-constructed on Lot 4. Beyond this existing house the remainder of the Ph2 Development site is generally undeveloped, consisting of farm fields with some tree lines.

Information regarding the final proposed grading of the Ph2 Development (including road surfaces, service inverts, and house slabs) was not available to Redstone as of writing this report. It is Redstone's assumption that the final road and house grades will closely match the existing grades, that the buildings will be typical 1 or 2 storey residential structures with or without basements, and service inverts will be no deeper than 3m below existing grade (mbeg).

It is Redstone's understanding that the Client has retained Pigeonview Consulting Inc (PV) to conduct a hydrogeological study of the site in support of the proposed Ph2 Development.

2.0 PURPOSE & SCOPE

The purpose of this geotechnical investigation is to obtain subsurface information regarding the soil and groundwater conditions within the boreholes, and based on these findings, provide geotechnical engineering recommendations for design (including commentary regarding construction only as it may impact design of the Ph2 Development) for earthworks and ground preparations, general construction dewatering (hydrogeological details and reporting by others), bearing capacity for building foundations and slabs, retaining and basement walls, site servicing, and roads including pavement structure. Redstone's scope does not include any life-cycle costing, chemical or geochemical testing, excess soil works, hydrogeological work, EASR or PTTW, or environmental assessments.

The following scope of work was performed as part of this investigation.

1. The boreholes were laid out onsite as shown on the Borehole Location Plan (Figure 1).
2. Underground services were cleared prior to advancing the boreholes. While this investigation cleared underground utilities from the area of each borehole, it did not confirm the presence or location of all utilities / services at all areas or for the purpose of the project's design or construction.
3. The subsurface soil and groundwater conditions were explored by advancing, sampling and logging a total of seven (7) boreholes to depths ranging from 4.6 to 6.1 metres below existing grade (mbeg).
4. Groundwater monitoring wells were installed within three (3) boreholes.
5. The borehole conditions observed were recorded, and representative samples of the soils were obtained. The ground at the boreholes was reinstated as close as possible to its original condition upon completion of the fieldwork.
6. Groundwater observations were obtained from the open boreholes during their advancement. Further, groundwater depth measurements were obtained from the three (3) monitoring wells on subsequent dates as described herein.

7. Geotechnical laboratory analyses of representative soil samples were performed, consisting of moisture content testing on all recovered soil samples, and grain size distribution testing on six (6) samples.
8. Geotechnical engineering analysis of acquired field and laboratory data, and preparation of this report summarizing Redstone's geotechnical findings and recommendations.

3.0 FIELD & LABORATORY PROCEDURES

A field investigation was conducted under the supervision of Redstone staff on May 5, 2025. The work consisted of subsurface exploration by means of advancing, sampling and logging seven (7) exploratory boreholes. Detailed logs of the boreholes were maintained, and representative samples of the materials encountered were obtained. The location of each borehole is illustrated on the attached Borehole Location Plan (Figure 1).

The boreholes were advanced using a track-mounted drill rig equipped with 130mm (5") Outside Diameter (OD) solid stem augers. Representative, disturbed samples of the strata penetrated were obtained either directly off the augers, or using a split-barrel, 50mm OD spoon sampler advanced by a 63.5 kg hammer dropping approximately 760mm. The results of these standard penetration tests (SPT's) are reported as "N" values on the borehole logs at the corresponding depths.

Redstone's senior geotechnical engineer witnessed each borehole advancement, with accompanying logging of the conditions and sampling of the soils encountered. Soil samples were recovered, retained in labeled air-tight containers, and secured for subsequent review and laboratory testing. Borehole logs are provided in Appendix A. The depth to any groundwater and/or borehole "cave-in" was measured in the open boreholes during their advancement. The boreholes were backfilled immediately after completion with the excavated soil, with bentonite pellets added into the boreholes.

Groundwater monitoring wells were installed in three (3) boreholes using 50mm OD PVC casing and slot 10 screens. The monitoring well installation details are presented graphically on the borehole logs. A well screen length of 3.0m was used in BH-1 while a screen length of 1.5m was used in BH-4 and BH-6. The screen was surrounded by filter pack sand to about 0.3m above the screen, then a bentonite seal plug to about 0.3m below the ground surface, with a PVC pipe stick-up of about 0.9m above grade, and a protective steel above-grade monument. Groundwater depth measurements were obtained from these wells by a representative of PV on May 8, 12, and 27 2025 and shared with Redstone. These monitoring wells remain in place as of writing this report.

The northing and easting coordinates of each borehole, and the ground surface elevations (geodetic) were surveyed by Engage and provided to Redstone. These values are included on the borehole logs. Elevations contained in this report are strictly for geotechnical engineering

analytical purposes only, and should be verified prior to finalizing any design or construction parameters upon which they are based.

Laboratory testing was performed on soil samples, consisting of moisture content testing of all recovered soil samples, and grain size distribution analyses on six (6) soil samples. The results of the moisture content and grain size distribution testing are presented on the borehole logs, while the grain size distribution testing charts are attached in Appendix B.

4.0 SITE LOCATION & SURFACE CONDITIONS

The Ph2 Development site is situated on the west side of Peterborough County Road 10 about 0.5km south of the intersection with Sharpe Line, and immediately south of what Redstone understands is this development's first phase (Ph1) that is currently being constructed around a roadway identified as Cameron Court. The project site currently has a civic address of 1812 County Road 10, in the Township of Cavan -Monaghan, County of Peterborough, Ontario.

As of the fieldwork performed for this study, the Ph2 Development site contains an entrance and driveway to a house recently constructed on Lot 4 (per the Site Plan). Beyond this existing house the remainder of the Ph2 Development site is undeveloped, consisting of farm fields with some tree lines. The overall topography of the site drops in elevation from the north to the south; based on ground surface elevations measured by Engage at the borehole locations, the site's surface elevation changes on the order of about 17m.

Surrounding properties include the municipal road (County Road 10) running approximately north-south along the site's eastern boundary, residential lots to the north, northwest, and southeast, and otherwise surrounded by undeveloped properties containing farmland and/or brush.

5.0 SUBSURFACE CONDITIONS

5.1 GENERAL

Details of the subsurface conditions encountered in the boreholes are presented graphically on the logs (see Appendix A). It should be noted that the boundaries between the strata have been inferred from borehole observations and non-continuous samples. They generally represent a transition from one soil type to another, and should not be inferred to represent an exact plane of geological change. Further, conditions may vary between and beyond the boreholes. Following is a general and summarized account of the subsurface conditions encountered in the boreholes from a geotechnical perspective.

The boreholes generally encountered a surficial layer of topsoil (overlain by fill in one borehole), over shallow organic-bearing soils, over till with sand layers or sand seams occurring within the till in some boreholes. Some boreholes exhibited caving/sloughing soils; groundwater was encountered in all but one borehole, at depths ranging between 0.5mbeg to 5.2mbeg.

The following sections describe the major soil strata and groundwater conditions encountered during this investigation in more detail.

5.2 FILL

A surficial layer of fill was encountered in borehole BH-2, to a depth of about 0.8mbeg. This fill material was dark brown and consisted of sand with gravel and cobbles, in a damp in-situ state.

5.3 TOPSOIL / ORGANIC SILT

Boreholes BH-1 and BH-3 to BH-7 encountered a surficial layer of topsoil. Borehole BH-2 encountered a layer of topsoil/organics immediately beneath the fill material. This topsoil layer ranges in thickness from about 0.1m to 0.4m.

Beneath the surficial topsoil, boreholes BH-1 and BH-4 to BH-7 exhibited a layer of organic-bearing material described as organic silt (noting that there was a variable and at time significant amount of sand also contained in this soil). This material is generally described as dark brown to reddish brown silt or silt and sand with clay, containing organic matter, in a moist, loose in-situ state. (Note that due to the nature of many areas of the Ph2 Development site being farm fields, it is possible that at least some of the soils immediately beneath the surficial topsoil may represent a layer that has been disturbed and mixed with organics through farm field activities such as tilling).

The organic nutrients and/or fertility properties of the topsoil and organic silt layers were not assessed as part of this study. Moisture content tests performed on samples of the organic silt ranged from about 22 to 28% moisture by dry weight. Grain size distribution analyses performed on two (2) samples of the soils described as organic silt yielded the following compositional ranges: 1 to 6% gravel, 31 to 42% sand, 39 to 57% silt, and 11 to 13% clay.

5.4 SILT / SILT & CLAY / CLAYEY SANDY SILT

Layers of soil described as either silt or silt and clay or clayey sandy silt were encountered in boreholes BH-6 and BH-7. In BH-6, silt and clay was present between 1.1 and 1.5mbeg, then silt from 1.5 to 2.3mbeg. In BH-7, silt and clay was present from 0.8 to 2.3mbeg, then clayey sandy silt present from 2.3 to 2.4mbeg.

The silt and clay is described as brown in colour, while the layers of silt and clayey sandy silt appeared grey. The silt and clay contained trace to some sand, and existed in a damp to moist, firm to stiff in-situ state of consistency. The silt and the clayey sandy silt contained varying amounts of sand and clay with trace gravel, and existed in a moist, firm to stiff in-situ state of consistency, based on visual-tactile examination and N-counts of 6 to 14 blows per 0.3m.

Moisture content tests performed on samples of these soils yielded values ranging from about 11 to 29% moisture by dry weight. A grain size distribution test performed on a sample of the clayey sandy silt suggests the following composition: 3% gravel, 28% sand, 35% silt, and 34% clay.

5.5 SAND

Layers (or seams or pockets) of sand were encountered within the till in boreholes BH-1, BH-2, BH-4, and BH-5. The sand was first observed at depths ranging between 2.4mbeg to 3.2mbeg, and extended to depths ranging between 2.6mbeg to 3.5mbeg.

The sand was generally brown and appeared occasionally fine-grained to more typically medium to coarse-grained, with silt and trace gravel appearing in BH-5, and existed in a moist to wet, compact to dense in-situ state of compactness based on visual-tactile examination and N-counts of 41 blows per 0.3m.

Moisture content tests conducted on samples of the sand yielded values ranging from approximately 8 to 16% moisture by dry weight. A grain size distribution analysis performed on a sample of the sand suggests the following composition: 6% gravel, 78% sand, and 18% silt and clay.

5.6 TILL

An underlying layer of till was encountered in all the boreholes. This soil was encountered at depths ranging between 0.2mbeg (BH-3) to 2.4mbeg (BH-7), and extended to the full depth of investigation in each borehole.

The till generally appeared light brown to brown to light grey to grey, and consisted primarily of silt and sand with typically lesser amounts of gravel and clay, and including cobbles (inferred from occasional auger grinding while advancing the boreholes through the till). As noted in Section 5.5, layers (or seams or pockets) of sand were encountered within the till in boreholes BH-1, BH-2, BH-4, and BH-5. (Note that such sand seams or layers can provide hydraulically-conductive zones where groundwater will more readily seep or infiltrate). The till was in a damp to moist wet to saturated condition; some upper zones occasionally exhibiting wet to saturated conditions, grading to damp to moist with depth. The till existed in a very loose to very dense in-situ state of relative compactness, based on visual-tactile examination and N-counts of 2 to greater than 100 blows per 0.3m.

Moisture content tests conducted on samples of the till yielded values of about 5% to 20% moisture by weight. Grain size distribution analyses performed on samples of the till suggest the following compositional ranges: 6 to 12% gravel, 31 to 49% sand, 29 to 38% silt, and 10 to 25% clay.

5.7 GROUNDWATER / CAVE-IN

Observations related to the presence of any groundwater seepage and accumulation within the open boreholes were recorded upon final extraction of the augers. All of the open boreholes (with the exception of BH-7) exhibited accumulation of water within them, at depths ranging from about 1.5mbeg (BH-5) to 5.2mbeg (BH-6).

Monitoring wells were installed in boreholes BH-1, BH-4, and BH-6 (see installation details on the logs in Appendix A), and groundwater depth readings were obtained from these three wells on May 8, 12, and 27 2025.

The following table summarizes the groundwater depths observed in the open boreholes and monitoring wells between May 5 (during drilling) and May 27.

Table 1: Groundwater Depth

BOREHOLE	DEPTH (mbeg)			
	Open Borehole	Monitoring Wells		
	May 5/25	May 8/25	May 12/25	May 27/25
BH-1	1.8	1.45	1.63	1.36
BH-2	3.5	no monitoring well installed		
BH-3	2.4			
BH-5	3.0	0.56	0.75	0.50
BH-6	1.5	no monitoring well installed		
BH-7	5.2	2.34	2.66	2.15

Observations regarding any cave-in (sloughing) of the soils forming the borehole walls were made during advancement and completion of the boreholes. Cave-in (sloughing) was observed within four boreholes (BH2 to BH-5), below depths ranging from about 3.7mbeg to 4.3mbeg.

It must be noted that the groundwater levels (and any related cave-in) are subject to seasonal fluctuations and in response to weather events, and at any point in time may differ from those presented herein. Also, the tendency for soils to cave-in (or slough or otherwise collapse) is a function of factors including its gradation, density or consistency, presence and any movement of groundwater, as well as the slope and area of the exposed soil face.

6.0 DISCUSSION & RECOMMENDATIONS

6.1 GENERAL

Supporting data upon which these recommendations are based have been presented in the foregoing sections of this report. The following recommendations are governed by the physical properties of the subsurface materials that were encountered at the site and assume that they are representative of the overall site conditions. It should be noted that these conclusions and recommendations are intended for use by the designers only. Contractors bidding on or undertaking any work at the site should examine the factual results of the assessment, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of this factual data as it affects their proposed construction techniques, equipment capabilities, costs, sequencing, and the like. Comments, techniques, or recommendations pertaining to construction must not be construed as instructions to the contractor. These recommendations are based on the project understandings outlined within this report. Should any of these parameters or understandings change, Redstone must be allowed to review the proposed changes and provide updated recommendations if warranted. It is expected that all applicable laws, regulations, and any site-specific requirements will be adhered to by the designers and contractors.

Information regarding the final proposed grading of the Ph2 Development (including road surfaces, service inverts, and house slabs) was not available to Redstone as of writing this report. These recommendations are therefore based on the assumptions that the final road and lot grades will closely match the existing grades, that the buildings will be typical 1 or 2 storey residential structures with or without basements, and service inverts will be no deeper than 3m below existing grade (mbeg). Should this not be the case, Redstone must be notified and allowed the opportunity to review these recommendations in light of any such updated project information.

Details regarding Redstone's conclusions and recommendations are outlined in the following sections.

6.2 SITE PREPARATION, EXCAVATION, & BACKFILL

All topsoil, vegetation, fill, disturbed earth, organics, and organic-bearing materials (including organic silts) must be stripped and removed from all new pavement and building (foundations and floor slab) areas prior to commencing earthwork construction. The subexcavated surfaces must be inspected and approved by a qualified geotechnical engineer's representative prior to placement of any fill, formwork, slabs or foundations.

Excavations should be carried out to conform to the manner specified in Ontario Regulation 213/91 and the Occupational Health and Safety Act and Regulations for Construction Projects (OHSA). All excavations above the water table not exceeding 1.2 m in depth may be constructed

with unsupported slopes. The soils encountered are generally classed by OHSA as Type 3 soil, requiring unsupported walls of excavations to be sloped to the bottom of the excavation with a gradient of 1 horizontal to 1 vertical (1H: 1V) or flatter, with the exception of zones of overly wet to saturated till and/or non-cohesive soils (sand layers), which will tend to cave/slough when located below the groundwater table, and as such must be considered Type 4 soils requiring unsupported walls of excavations in such soils to be sloped at 3H:1V or flatter to the base of the excavation.

If space is restricted such that the side slopes of excavations cannot be safely cut back in accordance with OHSA, and/or cave-in and sloughing are encountered in the excavations, and/or where the excavations are in close proximity to an existing structure (including a road, building or infrastructure), temporary shoring must be provided. To avoid overstressing of any shoring, the excavated materials must be placed away from the excavation perimeter at a minimum distance equalling 2 times the excavation's depth. Materials must not be stockpiled in close proximity to open excavations, and construction traffic must avoid being in proximity to open excavations. To protect against the adverse effects of erosion during construction, all ground surface drainage runoff should be directed away from the excavation area(s).

Prior to any off-site movement of excess soils generated during construction, it is recommended that an assessment be performed in accordance with O.Reg.406/19.

Some excavated inorganic soils may be suitable for use as trench or pavement subgrade backfill, although it must be noted that the native soils contained varying and sometimes higher levels of silt and/or clay, which can be highly susceptible to frost and moisture and/or become unworkable if overly wet – the contractor must be aware of this, and the need for ideal conditions before any excavated soils will be considered appropriate for reuse as backfill. Due to their occasionally finer-grained silty and/or clayey nature and resulting sensitivity to climatic conditions, the site soils should not be considered suitable for reuse as engineered backfill beneath any structures (including foundations and slabs). The reuse of any existing excavated material as such is conditional on it being workable, at a suitable moisture content, containing no organics, debris or other unsuitable / deleterious materials, no stones larger than 150mm diameter, and must receive final review and any approval for such reuse at the time of construction. Soils that are otherwise acceptable, but overly wet, will require prior processing (such as aeration) to lower their moisture content before being considered for approval as backfill material.

6.3 GROUNDWATER CONTROL DURING CONSTRUCTION

Where any groundwater is present during construction, it is cautioned that exposed soils can be easily disturbed, loosened, and/or exhibit sloughing and flowing characteristics unless properly managed including lowering of the groundwater to at least 1m below the base of all excavations, and protection of the exposed final excavation subgrades from weather, construction traffic, and other potential sources of disturbances such as upwards groundwater flow that can potentially cause boils, heave, or other subgrade-compromising conditions.

Excavations remaining above the groundwater table are not expected to encounter significant groundwater infiltration, and in such shallow excavations, any groundwater encountered is expected to be controlled by pumping from collection sumps to an acceptable outlet.

Should excavations extend deeper and/or otherwise encounter groundwater, this may require more intensive dewatering and/or groundwater control, including the use of filtered sumps, and/or other suitable methods of dewatering and/or sheet piling or other suitable shoring. In all cases, any groundwater level must be lowered and controlled at least 1m below the base of all excavations. If any excavations will extend into the groundwater table, it is recommended the Contractor retain an experienced and qualified groundwater control specialist for this project should any excavations extend below the groundwater.

If short-term pumping of groundwater at volumes greater than 50,000 L/day and less than 400,000 L/day is required during the construction stage, the Environmental Activity Sector Registry (EASR) must be completed. The EASR streamlines the process and water pumping may begin once the EASR registration is completed, the fee paid and supporting document prepared. If water taking in excess of 400,000 litres/day is required, a Permit to Take Water (PTTW) must be obtained in advance. Pumping discharges must conform to any requirements from the local municipalities, conservation agencies and any other jurisdictional agencies, as well as the MECP permitting.

The preceding comments are intended for general reference and information only. The volume of any water-taking will be dependent on the design as well as the contractor's sequencing, equipment, techniques and overall methods. The Contractor is solely responsible for the design and implementation of any required unwatering and/or dewatering, including requirements for withdrawal, handling, treatment, and discharge.

6.4 SERVICE INSTALLATION (BEDDING & COVER)

Based on the results of this investigation, proposed new service pipes within the Ph2 Development's road network are expected to be founded in the native soil deposits, no deeper than 3mbeg. No pipe support issues are anticipated where the piping will be founded in the aforementioned deposits provided all the recommendations contained in this report are adhered to. It is recommended that further inspections be carried out at the time of construction to verify that the subgrade soils exposed at the trench base are consistent with the findings in this report. A soft, unstable foundation may result in unequal settlement of the pipe causing broken backs or broken bellies. Low density soils may collapse upon wetting. Very wet, loose, unstable soils must be sub-excavated down to competent soils and be replaced under the guidance of the geotechnical engineering's representative, or alternative treatments as per the geotechnical engineer's guidance at the time of construction. Also, any bedding materials disturbed during construction must be removed. The disturbed material may be compacted back in place or imported material may be used to replace the disturbed material and then compacted, with approval from the geotechnical engineer's representative.

With consideration for the above, the expected bedding subgrade soils will provide adequate support for the proposed utility pipes, and will allow the use of normal Class B type bedding. Class B bedding is Granular A, or 19mm crusher run limestone, as per Ontario Provincial Standard Specifications (OPSS). Clear stone as bedding material should be used only if it is completely wrapped in a non-woven geotextile filter fabric and only with prior consent of the Municipality and geotechnical engineer.

The bedding subgrade must be inspected and approved by a qualified geotechnical engineer's representative prior to placement of bedding material to confirm that the subgrade conditions are consistent with those on which the recommendations contained herein are based on. Where unsuitable subgrade conditions are observed, efforts should be made to establish remedial procedures in the field so as to minimize construction delays.

The minimum recommended bedding thickness for the underground services is 150mm; where the subgrade is overly wet or weak, the minimum bedding thickness should be increased to 250mm. If the subgrade becomes unduly wet during construction, an additional lift of bedding material should be used. Where crossings of existing underground utilities are encountered along the proposed pipe alignment, the bedding thickness should be increased to at least 300mm. Attention should be given to ensure material placed beneath the pipe haunches is adequately compacted.

It is recommended that cover backfilling of the underground services be accomplished using Granular A, sand, or other suitable material as allowed by the Municipality's standards, to a minimum of 300mm above the pipe. Backfill within a 600mm thick zone above the pipe should be compacted with light equipment to avoid damaging the pipes.

Embedment, bedding, and cover materials must be placed in thin lifts not more than 150mm thick and compacted to at least 98% Standard Proctor Maximum Dry Density (SPMDD), as per ASTM D-698 procedures. Bedding and backfill materials and their compaction must be inspected and tested.

To minimize any long-term drainage effects caused by the service bedding, it is recommended that trench plugs formed using clay or unshrinkable concrete be utilized within the service trenches at appropriate locations. For details of trench plugs, refer to OPSD 802.095.

6.5 PAVEMENT STRUCTURE (ROAD, PARKING & ACCESS AREAS)

This section contains recommendations regarding design and construction of the new asphalt-paved roads for the Ph2 Development. These recommendations are based on the expectation that the vehicles will be typical passenger vehicles, with occasional heavier/commercial trucks (snow clearing, emergency, delivery, etc).

The following recommendations are provided for the new road, parking, and access areas of the development.

1. Per Section 6.2, remove unsuitable materials including existing topsoil, fill, organics and organic-bearing materials, and any other obviously deleterious materials to their full depth, as well as frozen earth and cobbles/boulders larger than 150mm in diameter encountered at subgrade elevation for the full width of construction.
2. Carefully proof-roll the subgrade in the presence of the geotechnical engineer's representative. Any overly soft or wet areas or other obviously deleterious materials must be excavated and properly replaced with suitable, approved backfill material.
3. Backfilling of sub-excavated areas and fine grading may be carried out using OPSS 1010 Granular B Type I or Select Subgrade Material (SSM). Organics, organic-bearing materials, and overly wet or silty/clayey soils are not suitable for reuse as backfill. All subgrade backfill materials should be placed in uniform lifts not exceeding 200mm loose thickness and compacted to at least 98% SPMDD.
4. Adequate drainage must be achieved throughout the pavement areas. Ensure positive slopes (combined with subdrains if necessary) within the pavement subgrade, to allow drainage and avoid any water accumulation. All such features must appropriately drain either to a storm sewer system or daylight to side ditches.
5. In any areas where the subgrade exhibits excessive amounts of moisture or groundwater accumulation, maximize the subgrade drainage by installing subdrains in the subgrade, consisting of 150mm diameter perforated subdrain pipe wrapped with knitted sock geotextile placed in a trench excavated 300mm by 300mm into the subgrade. The trench should be backfilled with 19mm clear stone. A geotextile filter fabric wrapping completely surrounding the 19mm clear stone is required.
6. To minimize the effects of frost on differing subgrade materials, construct transitions between varying depths of granular base materials at a rate of 1:10 or flatter.
7. Granular materials should consist of Granular A and B conforming to the requirements of OPSS Form 1010 or equivalent. All granular materials should have an in-situ moisture content within 2% of their respective optimal moisture content, to assist in achieving appropriate compaction. Granular A and B materials must be in accordance with OPSS Form 1010 or equivalent. The granular courses should be compacted to a minimum 100% of their respective SPMDDs.
8. All asphaltic concrete layers should be placed, spread, and compacted confirming to OPSS Form 310 or equivalent. All asphaltic concrete should be compacted to a minimum 92.0% of their respective laboratory Maximum Relative Densities (MRDs).

The subgrade soils at this site are expected to generally consist of native till, possibly zones of more silt and clay; based on the grain size analyses performed, the frost susceptibility of these

soils is assessed as being moderate, but with higher silt content will become increasingly frost susceptible.

The following table outlines recommendations for the road pavement structure:

Table 2: Pavement Structure - Roads

Profile	Material	Minimum Thickness (mm)	Per OPSS
Asphalt Surface	HL 3	50	1150
Asphalt Base	HL 8	50	
Granular Base	Granular A	150	1010
Granular Subbase	Granular B Type I	450	

The above-recommended pavement structures are for the end use of the project. During construction of the project, the recommended granular depths may not be sufficient to support loadings encountered including construction traffic and equipment.

The foregoing design considers that construction is carried out during dry periods, at the appropriate above-freezing temperatures, and that the subgrade is stable under construction equipment loadings. If construction is carried out during wet weather and heaving or rolling of the subgrade is experienced from the proof-rolling program, additional thickness of granular materials, geo-grids reinforcement or a combination of the two may be required.

The requirement for additional granular materials and / or utilization of geo-grids is best determined during construction under the direction of the geotechnical engineer. However, in view of the above, it is recommended that contingency items be included in the contract for subgrade stabilization using either technique so that such methods are contractually available, if and when needed during construction.

All asphaltic concrete layers should be placed, spread, and compacted confirming to OPSS Form 310 or equivalent. All asphaltic concrete should be compacted to a minimum 92.0% of their respective laboratory Maximum Relative Densities (MRDs).

6.6 FOUNDATIONS

The recommendations provided herein are based on the borehole information obtained during Redstone's fieldwork. Updates to the commentary and recommendations can be on-going as new information of the underground conditions becomes available. For example, more specific subsurface information becomes available once excavations and foundation construction is underway. In all cases, prior to placement of any lean concrete, fill, formwork, or foundations, all excavations must be inspected and approved by a qualified geotechnical engineer's representative. This will ensure that the foundation bearing material has been prepared properly at the foundation subgrade level and that the founding subgrade materials exposed are similar to those encountered during this investigation. Under no circumstances should the foundations

be placed directly on organic materials, loose, frozen subgrade, construction debris, or within ponded water.

It is Redstone's assumption that the final lot grades will closely match the existing grades, and that the buildings will be typical 1 or 2 storey residential structures with or without basements.

Structural loading for the proposed buildings may be supported on reinforced strip and spread concrete footings placed on the undisturbed, compact to dense native soils, or on engineered fill placed directly on such soil.

The following table outlines the depths (and corresponding elevations) at which suitably competent soils were encountered in each borehole for foundation purposes.

Table 3: Depths (Elevations) to Suitably Competent Founding Soil

Borehole	Depth (mbeg)	Elevation (m)
BH-1	2.3	264.6
BH-2	1.2	273.1
BH-3	1.2	262.3
BH-4	1.2	260.8
BH-5	1.6	258.4
BH-6	2.3	255.5
BH-7	1.7	255.6

For design purposes, it is recommended that footing foundations be proportioned using the following parameters:

Table 4: Bearing Capacity Pressure / Geotechnical Resistance for Footings

PARAMETER (kPa)	UNDISTURBED COMPACT TO DENSE NATIVE SOIL	ENGINEERED FILL (1)	
		Rock-based	Granular
Bearing Capacity Pressure (SLS)	120	150	120
Geotechnical Resistance (ULS), resistance factor Φ = 0.5 applied	180	225	180

(1) At least 0.6m of Rock-based Fill, at least 0.3m of Granular Fill. Quality of material is to be approved prior to use as engineered fill.

The following steps are recommended for the construction of any engineered fill:

1. Prepare the subgrade in accordance with Section 6.2 of this report. This includes removing any and all existing vegetation, topsoil, fill, disturbed earth, construction debris, organics, and organic-bearing soils to the competent, undisturbed compact native soil from within the area of the proposed engineered fill.
2. The minimum area of the engineered fill should extend horizontally at least 1m beyond the outside edge of the proposed foundations and then extend downward at a 1:1 slope to the suitable subgrade.

3. The base of the engineered fill area must be approved by a qualified geotechnical engineer's representative prior to placement of any fill, to ensure that all unsuitable materials have been removed, that the materials encountered are similar to those observed during this investigation, and that the subgrade is suitable for the engineered fill.
4. All engineered fill material is to be approved by a qualified geotechnical engineer's representative at the time of construction prior to its use.
5. Place approved engineered fill, in maximum 200mm loose lifts, compacted to 100% of its SPMDD. Any fill material placed under wet conditions should consist of an approved, rock-based fill surrounded by an appropriate geotextile filter fabric should the rock fill be "clean" (i.e., contain voids due to lack of finer-grained particles).
6. Full time testing and inspection of the engineered fill will be required, to ensure compliance with material and compaction specifications.

Any engineered fill upon which the footings are placed must be a minimum thickness per the footnote to Table 4, and the quality of any material considered for engineered fill must be approved prior to its use. Rock-based fill must be completely surrounded with suitable filter fabric (placed in accordance with manufacturer's specifications) to minimize any migration of fines from surrounding soils into the rock fill voids.

Self-weight settlement of engineered fill soil compacted to 98% to 100% of its SPMDD will depend on soil texture but should be anticipated to be in the range of 0.5% to 0.75% of the fill height. The rate of the settlement will also be a function of soil texture. For engineered fill consisting of Granular B material, a major portion (80% or higher) of the settlement due to the self-weight is expected to be completed during the construction stage before the placement of overlying features.

Footings and foundation walls must be suitably reinforced; as a minimum, and unless specified otherwise on the structural drawings, such reinforcement should consist of 2 continuous runs of 15M rebar throughout the footings, and 2 continuous runs of 15M rebar throughout the top and bottom of the foundation walls.

For frost protection purposes, the footings must be covered by at least 1.2m of earth (or equivalent) in all directions. Backfill to foundations should be accomplished using non-frost susceptible Granular B material.

To assist in managing surficial drainage water and any infiltration of groundwater towards the buildings, any crawlspace or basement walls must be water-proofed with suitable membrane and drainage board elements, and accompanied by an appropriately-outletted perimeter foundation drainage system around the building's full perimeter.

For design purposes this site is classed as Site Class D for Seismic Site Response, in accordance with the Ontario Building Code (OBC). A higher seismic site classification may be achievable (but

not assured) through an assessment of the site's average shear wave velocities based on a Multi-channel Analysis of Surface Waves (MASW) or other suitable geophysical survey.

6.7 SLAB ON GRADE

The floors of the proposed new buildings may be constructed as normal slabs-on-grade, on granular or clearstone fill, over native, inorganic subsoils prepared in accordance with Section 6.2 of this report. The slabs should be formed over a base course consisting of at least 150mm of either Granular A backfill as per OPSS (beneath non-basement slabs) or 19mm clearstone backfill (beneath crawlspace and/or basement slabs), compacted to a minimum 100% of its SPMDD. All grade increases or infilling below the granular or clearstone should utilize well graded, free draining Granular B Type I backfill as per OPSS 1010, placed in lifts no thicker than 200mm before compaction, and compacted to a minimum of 100% of its SPMDD. All grade increases or infilling below the Granular A should be constructed in accordance with the engineered fill steps provided in Section 6.6 of this report.

All fill placed beneath the slabs must be inspected, approved and compaction verified by a qualified geotechnical engineer's representative. Drainage conditions below the slabs must be optimized in all cases, including surficial grading to redirect any surficial water flow away from the building. If basement excavations encounter sufficient groundwater, appropriately-outletted underslab drains may be required pending a geotechnical review of such conditions.

6.8 BASEMENT & EARTH RETAINING WALLS

Any subsurface structures retaining earth (including basement foundation walls and/or retaining walls) that are located above the groundwater table may be designed for lateral (horizontal) earth pressures using the following equation:

- $p = k (w\ h + q)$, where:
    - p = the lateral earth pressure in kPa acting on the subsurface structure at depth h;
    - k_a = the coefficient of active earth pressure;
        - = 0.3 for walls restrained from the bottom only;
        - = 0.5 for walls restrained at the top and bottom. (This value is recommended for rigid walls retaining compacted backfill);
    - k_p = the coefficient of passive earth pressure, (= 3.0);
    - w = the granular or native soil bulk density in kN/m^3;
        - = 21 kN/m^3 for well compacted, OPSS-approved Granular "B";
        - = 19 kN/m^3 for native soils;
    - h = the depth (in metres) below the exterior grade at which the earth pressure is being calculated; and
    - q = the equivalent value of any surcharge (in kN/m^3) acting on the ground surface adjacent to the structure.

The recommended value for the coefficient for sliding friction between the soil and the concrete is 0.4. In addition to the above, hydrostatic forces must be taken into account in the design where the retaining structure extends below the groundwater table. Also, any additional surcharge loading that will influence the retaining structure must be taken into account in its design.

6.9 GENERAL RECOMMENDATIONS

6.9.1 Subsoil Sensitivity

The native subgrade soils are susceptible to strength loss or deformation if saturated or disturbed by construction traffic. Therefore, where the subgrade consists of approved soil, care must be taken to protect the exposed subgrade from excess moisture and from construction traffic. If there is site work carried out during periods of wet weather and/or elevated groundwater levels, then it can be expected that the subgrade will be disturbed unless a suitable working surface is provided to protect the integrity of the subgrade soils from construction traffic. Subgrade soil preparation work cannot be adequately accomplished during overly wet weather, and the project must be scheduled accordingly.

6.9.2 Test Pits During Tendering

The Client may consider excavating test pits at representative locations of this site during the construction tendering phase, with mandatory attendance of bidding Contractors. This would ensure they make their own assessments of the ground conditions, and how these will affect their proposed construction methods, techniques and schedules.

6.9.3 Winter Construction

The subsoils encountered at the site can be frost-susceptible and freezing conditions could cause problems to preparations for foundation, sidewalks and/or pavement subgrades. As preventive measures, the following is recommended:

1. Exposed surfaces intended to support foundations must be protected against freezing by means of loose straw and tarpaulins, heating, etc.
2. Care must be exercised so that any sidewalks and/or asphalt pavements do not interfere with the opening of doors during the winter when the soils are subject to frost heave. This problem may be minimized by any one of several means including (but not necessarily limited to) keeping the doors well above outside grade, installing structural slabs at the doors, and/or by using well graded backfill and positive drainage.
3. Because of the potential for soils to experience frost heave during winter, it is recommended that exterior service trenches be excavated with shallow transition slopes to minimize the abrupt change in density and frost-susceptibility between the granular backfill (relatively non-frost susceptible) and native soils (generally more frost-susceptible).

6.9.4 Design Review & Construction Inspections

Due to the preliminary nature of the design details at the time of this report, Redstone must be allowed to review the design and proposed grading plans prior to their finalization, and provide updated recommendations if necessary at that time. In addition, it is strongly recommended that Redstone be retained to review the related earthworks specifications when they are available.

During construction, experienced geotechnical staff must observe construction activities and ensure geotechnical recommendations are carried out.

6.9.5 Hydrogeological Assessment

It is Redstone's understanding that a hydrogeological assessment is being performed for the Ph2 Development by Pigeonview Consulting Inc (Pigeonview) under direct contract with the Client. Pigeonview's hydrogeological assessment will utilize Redstone's borehole and geotechnical lab testing results (contained herein as Appendices A and B), and will be summarized under separate cover and reporting addressed to the Client. Pigeonview will make their own assessments and conclusions regarding the ground conditions as they relate to their hydrogeological commentary, conclusions, and recommendations

7.0 CLOSURE & STATEMENT OF LIMITATIONS

The recommendations made in this report are in accordance with Redstone's present understanding of the project. The subsurface investigation was performed in accordance with current, generally accepted guidelines. However, should any conditions at the site be encountered which differ from those at the borehole locations, it is requested that Redstone be notified immediately in order to permit a reassessment of these recommendations in light of the changed conditions and exact project details. Redstone requests that they be permitted to review the recommendations of this report after the drawings and specifications are complete, or if the final project details should differ from that mentioned in this report.

The attached Statement of Limitations is an integral part of this report. Should questions arise regarding any aspect of this report, please contact our office.

Sincerely yours,

Garnet Brenchley, P.Eng.
Principal Engineer

STATEMENT OF LIMITATIONS

This report is intended solely for Mr. Ian Cameron and other parties explicitly identified in the report and is prohibited for use by others without Redstone's prior written consent. This report is considered Redstone's professional work product and shall remain the sole property of Redstone. Any unauthorized reuse, redistribution of or reliance on the report shall be at the Client and recipient's sole risk, without liability to Redstone. Client shall defend, indemnify and hold Redstone harmless from any liability arising from or related to Client's unauthorized distribution of the report. No portion of this report may be used as a separate entity; it is to be read in its entirety and shall include all supporting drawings and appendices.

The recommendations made in this report are in accordance with our present understanding of the project, the current site use, ground surface elevations and conditions, and are based on the work scope approved by the Client and described in the report. The services were performed in a manner consistent with that level of care and skill ordinarily exercised by members of geotechnical engineering professions currently practicing under similar conditions in the same locality. No other representations, and no warranties or representations of any kind, either expressed or implied, are made. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

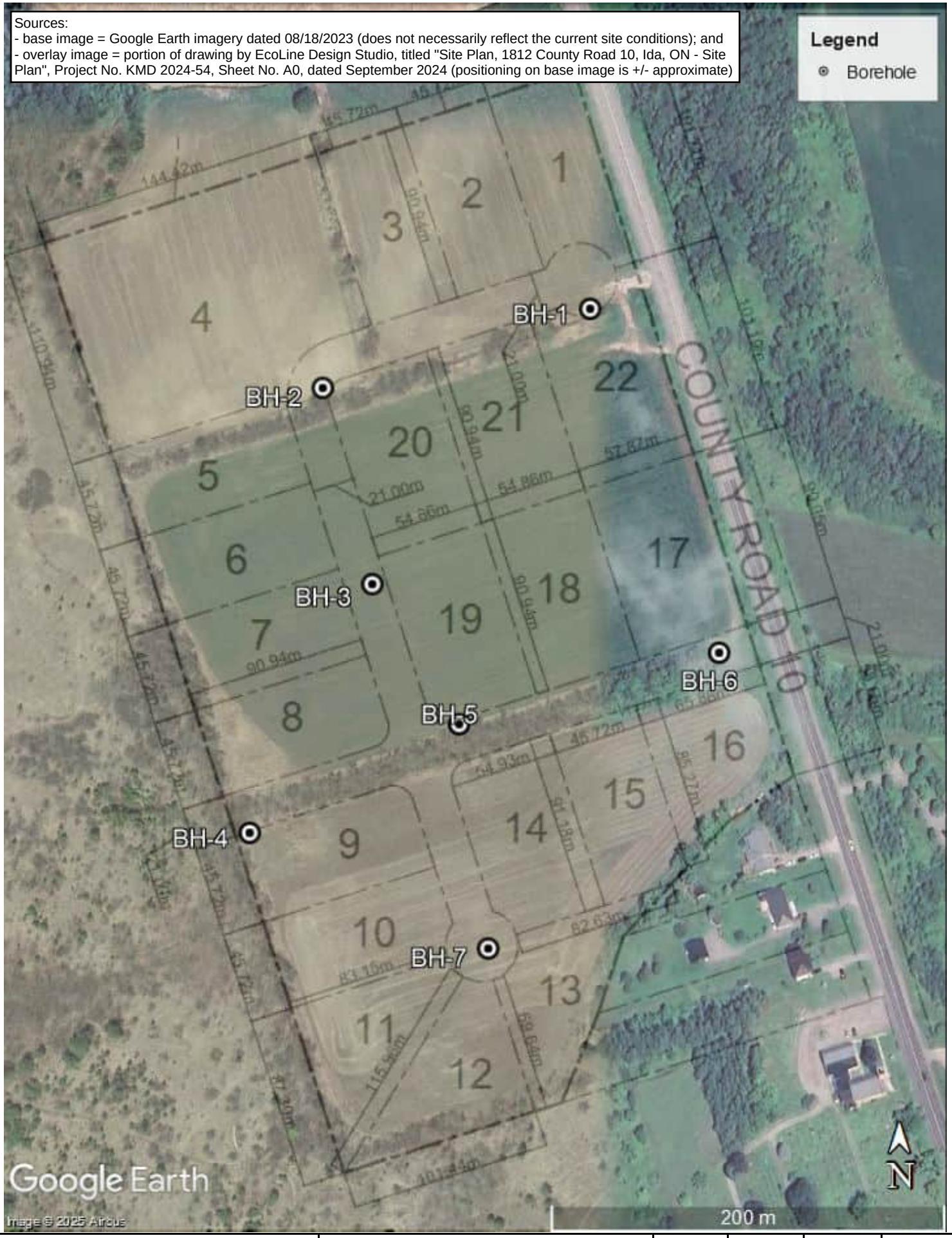
All details of design and construction are rarely known at the time of completion of a geotechnical study. The recommendations and comments made in the study report are based on our subsurface investigation and resulting understanding of the project, as defined at the time of the study. We should be retained to review our recommendations when the drawings and specifications are complete. Without this review, Redstone will not be liable for any misunderstanding of our recommendations or their application and adaptation into the final design.

By issuing this report, Redstone is the geotechnical engineer of record. It is recommended that Redstone be retained during construction of any and all foundations, and during earthwork operations to confirm the conditions of the subsoil are actually similar to those observed during our study. The intent of this requirement is to verify that conditions encountered during construction are consistent with the findings in the report and that inherent knowledge developed as part of our study is correctly carried forward to the construction phases.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments included in this report are based on the results obtained at the seven (7) borehole locations only. The subsurface conditions confirmed at these seven (7) locations may vary at other locations. The subsurface conditions can also be significantly modified by construction activities on site (ex. excavation, dewatering and drainage, blasting, pile driving, etc.). These conditions can also be modified by exposure of soils or bedrock to humidity, dry periods or frost. Soil and groundwater conditions between and beyond the test locations may differ both horizontally and vertically from those encountered at the test locations and conditions may become apparent during construction which could not be detected or anticipated at the time of our investigation. Should any conditions at the site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations. If changed conditions are identified during construction, no matter how minor, the recommendations in this report shall be considered invalid until sufficient review and written assessment of said conditions by Redstone is completed.

FIGURES

Sources:
- base image = Google Earth imagery dated 08/18/2023 (does not necessarily reflect the current site conditions); and
- overlay image = portion of drawing by EcoLine Design Studio, titled "Site Plan, 1812 County Road 10, Ida, ON - Site Plan", Project No. KMD 2024-54, Sheet No. A0, dated September 2024 (positioning on base image is +/- approximate)



Redstone Engineering	143 - 171A Rink St Peterborough, ON 705-768-9042 www.redstoneeng.ca	Drawing Title	Orientation	Scale	Date	Project #:
		BOREHOLE LOCATION PLAN GEOTECHNICAL INVESTIGATION SUBDIVISION DEVELOPMENT (2ND PHASE) 1812 PETERBOROUGH COUNTY ROAD 10, CAVAN-MONATHAN	see North arrow (above)	see scale bar (above)	May 14, 2025	25R103
					By	Figure #:
					GB	1

APPENDIX A

BOREHOLE LOGS

Redstone Engineering

BOREHOLE NO. MW-1 (aka BH-1)

PROJECT NUMBER 25R103	**DRILLING COMPANY** G.E.T. Drilling	**COORDINATES** 4899252.877, 701512.640
PROJECT NAME Subdivision Devpt (2nd Phase)	**LICENCE #** 7085	**COORDINATE SYSTEM** Northing / Easting
CLIENT Ian Cameron	**DRILLER** M. Turnbull	**GROUND SURFACE ELEV (m)** 266.875
SITE ADDRESS 1812 County Road 10	**DRILL RIG** Track-Mounted CME	**TOP OF WELL CASING ELEV (m)** 267.78
..... Village of Ida	**DRILLING METHOD** Solid Augers, Split Spoons	**TOTAL DEPTH (m)** 4.9
..... Twnp of Cavan-Monaghan, ON	**DATE DRILLED** May 5, 2025	**LOGGED BY** Garnet Brenchley, P.Eng.

WELL COMPLETION Well Tag #A420778 | **CASING** 0.90m above gr to 1.50m below gr | **SCREEN** 1.50m below gr to 4.55m below gr

COMMENTS Drill method: AU=Solid augers & split spoons. Coordinates and ground surface elevation surveyed and provided by Engage Engineering

Depth (m)	Drilling Method	Sample (Interval and Type)	SPT (N) value or TCR, SCR, RQD	Moisture Cont (%)	Groundwater	Well Monitor Details	Stratigraphy	Stratigraphic Description	Depth (m)	Additional Observations & Remarks	Elevation (m)
0	AU							TOPSOIL	0.4		266.5
0.5								ORGANIC SILT - dark brown reddish brown mottled Silt and Sand with Clay, Organics throughout, moist, loose (possible Fill or Disturbed Soil)			
1		SS-1	3 (2,2,1,3)	21.9					1.2	SS-1: 6% Gravel, 42% Sand, 39% Silt, 13% Clay	266
1.5					4 2			TILL - grey Silt and Sand with Gravel, wet to saturated, loose		Groundwater: 1) present in open borehole at about 1.8m below grade (bg) upon extraction of augers 2) May 8/25 = 1.45m bg 3) May 12/25 = 1.63m bg 4) May 27/25 = 1.36m bg	265.5
2		SS-2	2 (1,1,1)	18.3	3 1				2.3		265
2.5		SS-3	15 (7,9,6,5)	11.1				Wet, compact			264.5
3									3.2		264
3.5		SS-4	41 (9,17,24)	8.0				SAND - brown Sand, medium-grained, moist, compact	3.5		263.5
4								TILL - grey Silty Sand with Gravel, damp, dense to very dense		Slower auger advancement below 3.5m	263
4.5		SS-5	>100 (34,39, 50=2")	10.5					4.9	Borehole open to full depth upon final extraction of augers	262.5
5								Borehole terminated			262
5.5											261.5
6											261

Redstone Engineering

BOREHOLE NO. BH-2

PROJECT NUMBER 25R103	**DRILLING COMPANY** G.E.T. Drilling	**COORDINATES** 4899208.763, 701378.245
PROJECT NAME Subdivision Devpt (2nd Phase)	**LICENCE #** 7085	**COORDINATE SYSTEM** Northing / Easting
CLIENT Ian Cameron	**DRILLER** M. Turnbull	**GROUND SURFACE ELEV (m)** 274.341
SITE ADDRESS 1812 County Road 10	**DRILL RIG** Track-Mounted CME	**TOP OF WELL CASING ELEV (m)** n/a
..... Village of Ida	**DRILLING METHOD** Solid Augers, Split Spoons	**TOTAL DEPTH (m)** 4.6
..... Twnp of Cavan-Monaghan, ON	**DATE DRILLED** May 5, 2025	**LOGGED BY** Garnet Brenchley, P.Eng.

WELL COMPLETION no well | **CASING** no well | **SCREEN** no well

COMMENTS Drill method: AU=Solid augers & split spoons. Coordinates and ground surface elevation surveyed and provided by Engage Engineering

Depth (m)	Drilling Method	Sample (Interval and Type)	SPT (N) value or TCR, SCR, RQD	Moisture Cont (%)	Groundwater	Well Monitor Details	Stratigraphy	Stratigraphic Description	Depth (m)	Additional Observations & Remarks	Elevation (m)
0	AU	AS-1		8.8				FILL - dark brown Sand with Gravel, Cobbles present, damp	0.8		274
0.5								TOPSOIL / ORGANICS	0.9		273.5
1		SS-2	19 (2,9,10,17)	7.8				TILL - light brown Sandy Silt with Gravel, occasional Cobbles, damp, compact	1.5		273
1.5		SS-3	58 (8,50=6")	8.0				Dense	2.3		272.5
2		SS-4	48 (24,22,26)	8.3				Silty Sand with Gravel with Clay, brown	2.4	SS-4 (till portion): 12% Gravel, 49% Sand, 29% Silt, 10% Clay	272
2.5								SAND - brown Sand, fine-grained, moist to wet, compact to dense	2.6		
3		SS-5	64 (14,50=5")	4.8				TILL - grey Silty Sand with Gravel with Clay, moist, dense	3.1		271.5
3.5					▽			Grey Sandy Silt with Gravel, occasional Cobbles	3.7	Groundwater: present in open borehole at about 3.5m below grade (bg) on extraction of augers	271
4		AS-6		9.8						Borehole walls caved below 3.9m depth on extraction of augers	270.5
4.5									4.6		270
5								Borehole terminated			269.5
5.5											269
6											268.5

Redstone Engineering

BOREHOLE NO. BH-3

PROJECT NUMBER 25R103	**DRILLING COMPANY** G.E.T. Drilling	**COORDINATES** 4899110.492, 701406.420
PROJECT NAME Subdivision Devpt (2nd Phase)	**LICENCE #** 7085	**COORDINATE SYSTEM** Northing / Easting
CLIENT Ian Cameron	**DRILLER** M. Turnbull	**GROUND SURFACE ELEV (m)** 263.486
SITE ADDRESS 1812 County Road 10	**DRILL RIG** Track-Mounted CME	**TOP OF WELL CASING ELEV (m)** n/a
..... Village of Ida	**DRILLING METHOD** Solid Augers, Split Spoons	**TOTAL DEPTH (m)** 4.6
..... Twnp of Cavan-Monaghan, ON	**DATE DRILLED** May 5, 2025	**LOGGED BY** Garnet Brenchley, P.Eng.

WELL COMPLETION no well | **CASING** no well | **SCREEN** no well

COMMENTS Drill method: AU=Solid augers & split spoons. Coordinates and ground surface elevation surveyed and provided by Engage Engineering

Depth (m)	Drilling Method	Sample (Interval and Type)	SPT (N) value or TCR, SCR, RQD	Moisture Cont (%)	Groundwater	Well Monitor Details	Stratigraphy	Stratigraphic Description	Depth (m)	Additional Observations & Remarks	Elevation (m)
0	AU							TOPSOIL	0.2		263.5
0.5								TILL - brown Sandy Clayey Silt trace Gravel, stiff to hard, damp			263
1		SS-1	14 (3,4,10,10)	13.1						SS-1: 6% Gravel, 31% Sand, 38% Silt, 25% Clay	262.5
1.5									1.5		262
2		SS-2	22 (3,9,13)	10.3				With Gravel, compact / hard	2.1		261.5
2.5		SS-3	34 (11,20,14)	6.8	▽			Silty Sand with Gravel, damp, dense		Groundwater: present in open borehole at about 2.4m below grade (bg) on extraction of augers	261
3		SS-4	39 (9,16,23)	10.5				Grey, moist, dense	3.1		260.5
3.5											260
4		AS-5		14.8						Borehole walls caved below 4.3m depth on extraction of augers	259.5
4.5									4.6		259
5								Borehole terminated			258.5
5.5											258
6											257.5

Redstone Engineering

BOREHOLE NO. MW-4 (aka BH-4)

PROJECT NUMBER 25R103	**DRILLING COMPANY** G.E.T. Drilling	**COORDINATES** 4898982.964, 701348.097
PROJECT NAME Subdivision Devpt (2nd Phase)	**LICENCE #** 7085	**COORDINATE SYSTEM** Northing / Easting
CLIENT Ian Cameron	**DRILLER** M. Turnbull	**GROUND SURFACE ELEV (m)** 262.029
SITE ADDRESS 1812 County Road 10	**DRILL RIG** Track-Mounted CME	**TOP OF WELL CASING ELEV (m)** 262.87
..... Village of Ida	**DRILLING METHOD** Solid Augers, Split Spoons	**TOTAL DEPTH (m)** 4.6
..... Twnp of Cavan-Monaghan, ON	**DATE DRILLED** May 5, 2025	**LOGGED BY** Garnet Brenchley, P.Eng.

WELL COMPLETION Well Tag #A420780 | **CASING** 0.84m above gr to 2.47m below gr | **SCREEN** 2.47m below gr to 3.99m below gr

COMMENTS Drill method: AU=Solid augers & split spoons. Coordinates and ground surface elevation surveyed and provided by Engage Engineering

Depth (m)	Drilling Method	Sample (Interval and Type)	SPT (N) value or TCR, SCR, RQD	Moisture Cont (%)	Groundwater	Well Monitor Details	Stratigraphy	Stratigraphic Description	Depth (m)	Additional Observations & Remarks	Elevation (m)
0	AU							TOPSOIL	0.4		262
0.5					4 2			ORGANIC SILT - dark brown reddish brown Silt with Sand, Organics throughout, moist, loose	0.5	Groundwater: 1) present in open borehole at about 3.0m below grade (bg) upon extraction of augers 2) May 8/25 = 0.56m bg 3) May 12/25 = 0.75m bg 4) May 27/25 = 0.50m bg	261.5
1		SS-1	22 (15,7,15,17	7.3	3			TILL - light brown Silt and Sand with Gravel, trace to some Clay, damp, compact			261
1.5									1.5		260.5
2		SS-2	77 (25,27,50)	5.0				Brown Silty Sand with Gravel, damp, dense to very dense			260
2.5		SS-3	79 (29,50=6")	5.3							259.5
3		SS-4	100 (50=6")	15.5	1			SAND - brown Sand, medium to coarse-grained, wet, dense	3.1 3.2		259
3.5		AS-5		12.1				TILL - grey Silty Sand with Gravel, damp, dense to very dense		Slower auger advancement below 3.2m	258.5
4										Borehole walls caved below 3.9m depth on extraction of augers	258
4.5									4.6		257.5
5								Borehole terminated			257
5.5											256.5
6											256

Redstone Engineering

BOREHOLE NO. BH-5

PROJECT NUMBER 25R103	**DRILLING COMPANY** G.E.T. Drilling	**COORDINATES** 4899041.019, 701452.612
PROJECT NAME Subdivision Devpt (2nd Phase)	**LICENCE #** 7085	**COORDINATE SYSTEM** Northing / Easting
CLIENT Ian Cameron	**DRILLER** M. Turnbull	**GROUND SURFACE ELEV (m)** 259.968
SITE ADDRESS 1812 County Road 10	**DRILL RIG** Track-Mounted CME	**TOP OF WELL CASING ELEV (m)** n/a
..... Village of Ida	**DRILLING METHOD** Solid Augers, Split Spoons	**TOTAL DEPTH (m)** 4.6
..... Twnp of Cavan-Monaghan, ON	**DATE DRILLED** May 5, 2025	**LOGGED BY** Garnet Brenchley, P.Eng.

WELL COMPLETION no well | **CASING** no well | **SCREEN** no well

COMMENTS Drill method: AU=Solid augers & split spoons. Coordinates and ground surface elevation surveyed and provided by Engage Engineering

Depth (m)	Drilling Method	Sample (Interval and Type)	SPT (N) value or TCR, SCR, RQD	Moisture Cont (%)	Groundwater	Well Monitor Details	Stratigraphy	Stratigraphic Description	Depth (m)	Additional Observations & Remarks	Elevation (m)
0	AU							TOPSOIL	0.4		259.5
0.5								ORGANIC SILT - dark brown reddish brown Sandy Silt with Clay, Organics throughout, wet, loose			
1		SS-1	3 (1,1,2,2)	27.8						SS-1: 1% Gravel, 31% Sand, 57% Silt, 11% Clay	259
1.5					▽				1.5		258.5
2		SS-2	16 (6,10,6)	12.4				TILL - brown Silty Sand with trace Gravel, moist to wet, compact		Groundwater: present in open borehole at about 1.5m below grade (bg) on extraction of augers	258
2.5		SS-3a	76 (26,50=6")	11.5					2.4		257.5
		SS-3b		9.2				SAND - brown Sand (medium to coarse grained) with Silt, trace Gravel, wet, dense		SS-3b: 6% Gravel, 76% Sand, 18% Silt and Clay	
3		SS-4	>100 (16,30, 50=2")	7.2					3.3		257
3.5								TILL - grey Silty Sand with Gravel, moist, very dense			256.5
		AS-5		19.8						Borehole walls caved below 3.7m depth on extraction of augers	
4											256
4.5									4.6		255.5
5								Borehole terminated			255
5.5											254.5
6											254

Redstone Engineering

BOREHOLE NO. MW-6 (aka BH-6)

PROJECT NUMBER 25R103	**DRILLING COMPANY** G.E.T. Drilling	**COORDINATES** 4899081.192, 701583.366
PROJECT NAME Subdivision Devpt (2nd Phase)	**LICENCE #** 7085	**COORDINATE SYSTEM** Northing / Easting
CLIENT Ian Cameron	**DRILLER** M. Turnbull	**GROUND SURFACE ELEV (m)** 257.777
SITE ADDRESS 1812 County Road 10	**DRILL RIG** Track-Mounted CME	**TOP OF WELL CASING ELEV (m)** 258.65
..... Village of Ida	**DRILLING METHOD** Solid Augers, Split Spoons	**TOTAL DEPTH (m)** 6.1
..... Twnp of Cavan-Monaghan, ON	**DATE DRILLED** May 5, 2025	**LOGGED BY** Garnet Brenchley, P.Eng.

WELL COMPLETION Well Tag #A420779 | **CASING** 0.87m above gr to 4.58m below gr | **SCREEN** 4.58m below gr to 6.10m below gr

COMMENTS Drill method: AU=Solid augers & split spoons. Coordinates and ground surface elevation surveyed and provided by Engage Engineering

Depth (m)	Drilling Method	Sample (Interval and Type)	SPT (N) value or TCR, SCR, RQD	Moisture Cont (%)	Groundwater	Well Monitor Details	Stratigraphy	Stratigraphic Description	Depth (m)	Additional Observations & Remarks	Elevation (m)
0	AU							TOPSOIL	0.4		257.5
0.5								ORGANIC SILT - dark brown reddish brown mottled Silt with Sand, Organics throughout, moist, loose			
1		SS-1	6 (1,2,4,6)	18.9					1.1		257
1.5								SILT and CLAY - brown Silt and Clay, moist, firm to stiff	1.5		256.5
2		SS-2	10 (5,5,5)	10.9				SILT - grey Silt with sand and Clay, trace Gravel, moist, stiff	2.3		256
2.5		SS-3	24 (6,8,16)	8.1	▽4 ▽2 ▽3			TILL - light grey Silt and Sand with Clay, trace to some Gravel, moist, compact	3.1	Groundwater: 1) present in open borehole at about 5.2m below grade (bg) upon extraction of augers 2) May 8/25 = 2.34m bg 3) May 12/25 = 2.66m bg 4) May 27/25 = 2.15m bg	255.5
3		SS-4	69 (11,19, 50=6")	10.6				Increased Gravel, dense	3.7		255
3.5		AS-5		10.8				Damp		Slower auger advancement below 3.7m	254.5
4											254
4.5											253.5
5					▽1						253
5.5		AS-6		18.3							252.5
6									6.1	Borehole open to full depth upon final extraction of augers	252
								Borehole terminated			251.5

Redstone Engineering

BOREHOLE NO. BH-7

PROJECT NUMBER 25R103	**DRILLING COMPANY** G.E.T. Drilling	**COORDINATES** 4898928.208, 701470.842
PROJECT NAME Subdivision Devpt (2nd Phase)	**LICENCE #** 7085	**COORDINATE SYSTEM** Northing / Easting
CLIENT Ian Cameron	**DRILLER** M. Turnbull	**GROUND SURFACE ELEV (m)** 257.262
SITE ADDRESS 1812 County Road 10	**DRILL RIG** Track-Mounted CME	**TOP OF WELL CASING ELEV (m)** n/a
..... Village of Ida	**DRILLING METHOD** Solid Augers, Split Spoons	**TOTAL DEPTH (m)** 5.0
..... Twnp of Cavan-Monaghan, ON	**DATE DRILLED** May 5, 2025	**LOGGED BY** Garnet Brenchley, P.Eng.

WELL COMPLETION no well | **CASING** no well | **SCREEN** no well

COMMENTS Drill method: AU=Solid augers & split spoons. Coordinates and ground surface elevation surveyed and provided by Engage Engineering

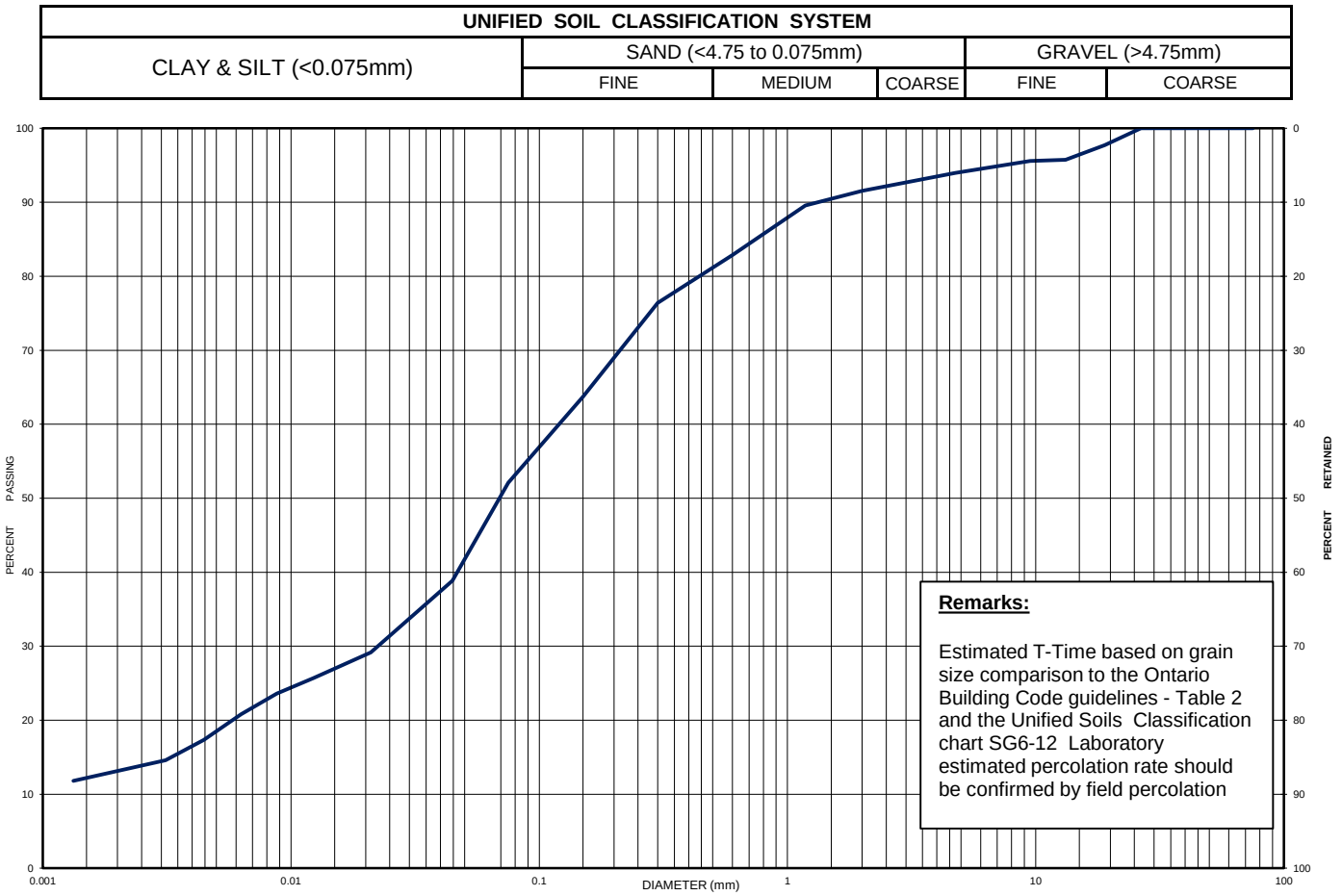
Depth (m)	Drilling Method	Sample (Interval and Type)	SPT (N) value or TCR, SCR, RQD	Moisture Cont (%)	Groundwater	Well Monitor Details	Stratigraphy	Stratigraphic Description	Depth (m)	Additional Observations & Remarks	Elevation (m)
0	AU							TOPSOIL	0.4		257
0.5								ORGANIC SILT - dark brown reddish brown Silt and Sand, Organics throughout, wet, loose	0.8		256.5
1		SS-1	10 (3,6,4,7)	28.6				SILT and CLAY - brown Silt and Clay, damp, firm to stiff			256
1.5									1.5		
2		SS-2	14 (4,6,8)	25.8				Trace to some Sand			255.5
								CLAYEY SANDY SILT - grey Clayey Sandy Silt, trace Gravel, moist, firm to stiff	2.3		255
2.5		SS-3	14 (4,5,9)	17.7				TILL - grey Silty Sand with trace Gravel trace Clay, moist, compact	2.4	SS-3 (Silt/Clay portion): 3% Gravel, 28% Sand, 35% Silt, 34% Clay	254.5
3		SS-4	17 (2,8,9)	10.9							254
3.5											253.5
4											253
4.5		SS-5	23 (5,8,15)	8.6						Borehole was open to full depth and free of any accumulated groundwater on extraction of augers	252.5
5									5.0		
								Borehole terminated			252
5.5											251.5
6											251

APPENDIX B

LABORATORY DATA

GRAIN SIZE DISTRIBUTION CHART

Client:	*Redstone Engineering*	Project No.:	*25R103*
Project:	*Ida Subdivision - Phase 2*	Location:	*Ida, Ontario*
Sampled By:	*Garnet Brenchley*	Date:	*May 7, 2025*
Sample No.:	*BH-1 - SS-1*	Depth:	*2.5 - 4.5'*

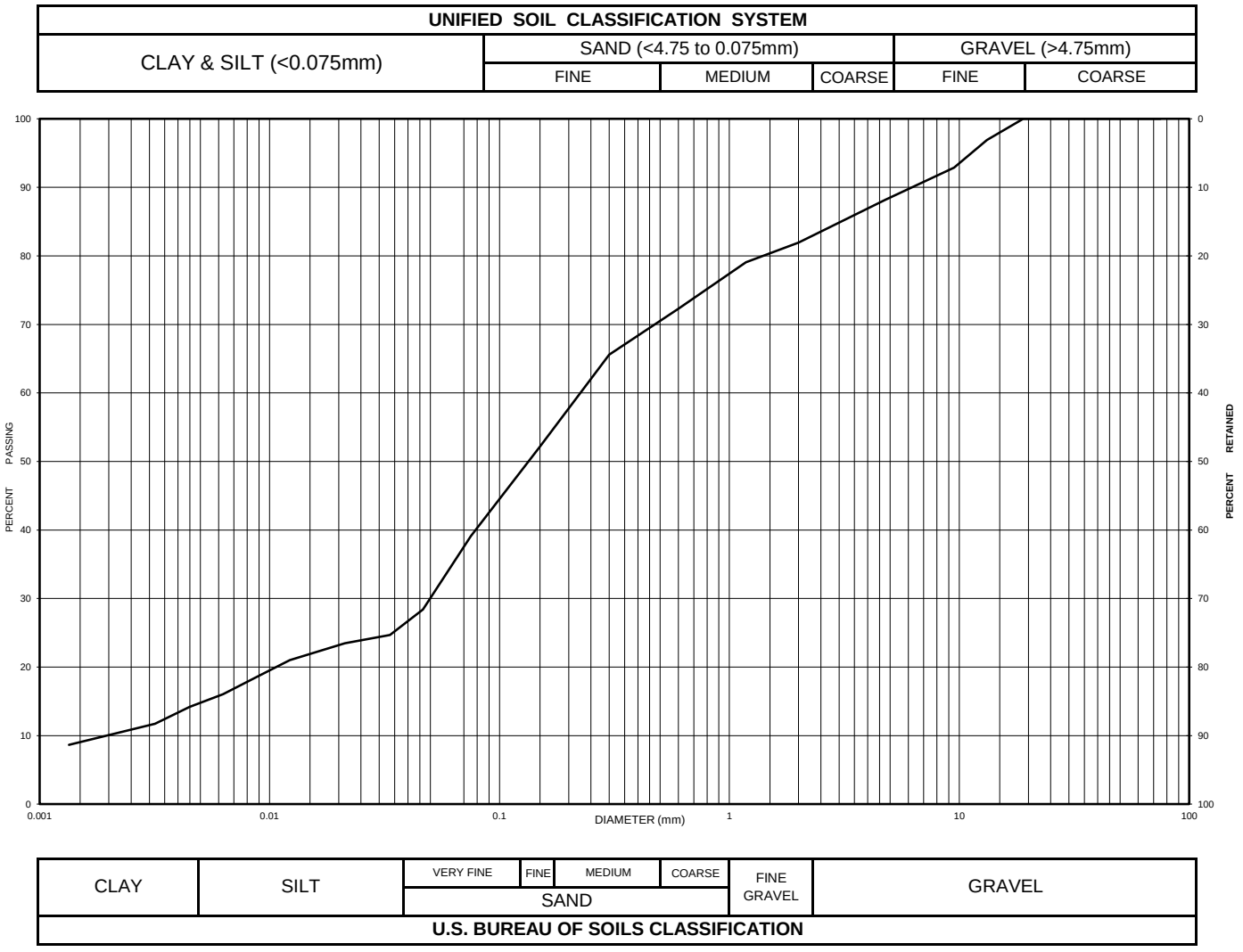


Sample No.	Description			Moisture (%)	Gravel	Sand	Silt	Clay	Class.
BH-1 - SS-1	*Silty SAND some clay trace of gravel*			*21.9*	*6*	*42*	*39*	*13*	*ML*
D_{60}	D_{30}	D_{10}	C_U	C_C	*Estimated Coefficient of Permeability*		*Estimated Percolation Time mins./cm.*		
0.140	*0.023*	--	--	--	10^{-5}		***30 - 35 mins./cm***		

Doughty Aggregates Revision 6 - Oct 12, 2021 Form LS-702H

GRAIN SIZE DISTRIBUTION CHART

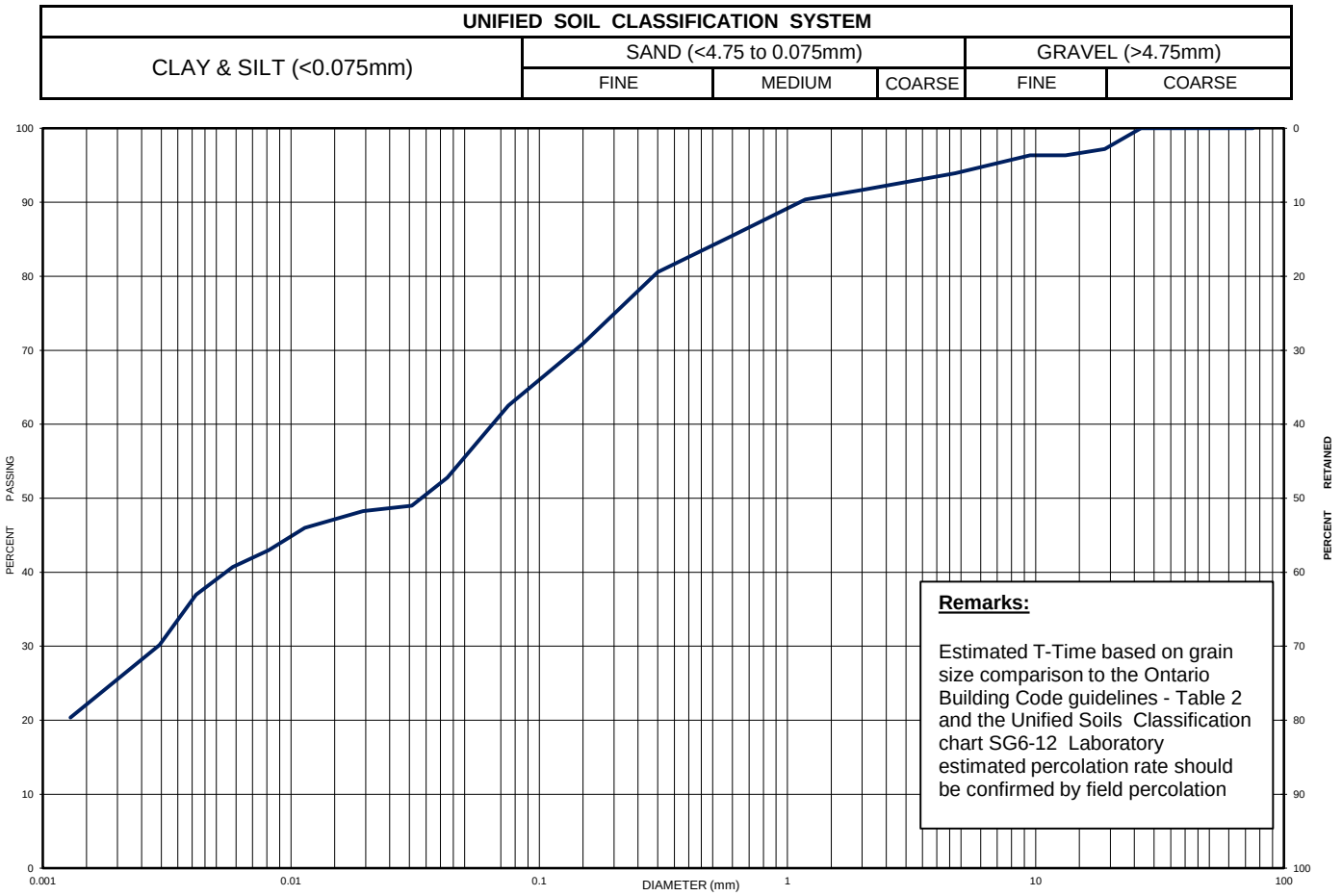
Client:	*Redstone Engineering*	Project No.:	*25R103*
Project:	*Ida Subdivision - Phase 2*	Location:	*Ida, Ontario*
Sampled By:	*Garnet Brenchley*	Date:	*May 7, 2025*
Sample No.:	*BH-2 SS-4*	Depth:	*7.5 - 9.0'*



Sample No.	Depth	Description	Moisture Content	Gravel	Sand	Silt	Clay	Class.
BH-2 SS-4	*7.5 - 9.0'*	*Silty SAND some gravel and clay*	*8.3*	*12*	*49*	*29*	*10*	*SM*

GRAIN SIZE DISTRIBUTION CHART

Client:	*Redstone Engineering*	Project No.:	*25R103*
Project:	*Ida Subdivision - Phase 2*	Location:	*Ida, Ontario*
Sampled By:	*Garnet Brenchley*	Date:	*May 7, 2025*
Sample No.:	*BH-3 - SS-1*	Depth:	*2.5 - 4.5'*



Sample No.	Description			Moisture (%)	Gravel	Sand	Silt	Clay	Class.
BH-3 - SS-1	*Sandy Clayey SILT trace of gravel*			*13.1*	*6*	*31*	*38*	*25*	*ML*
D_{60}	D_{30}	D_{10}	C_U	C_C	*Estimated Coefficient of Permeability*		*Estimated Percolation Time mins./cm.*		
0.070	*0.003*	--	--	--	10^{-6}		***35 - 40 mins./cm***		

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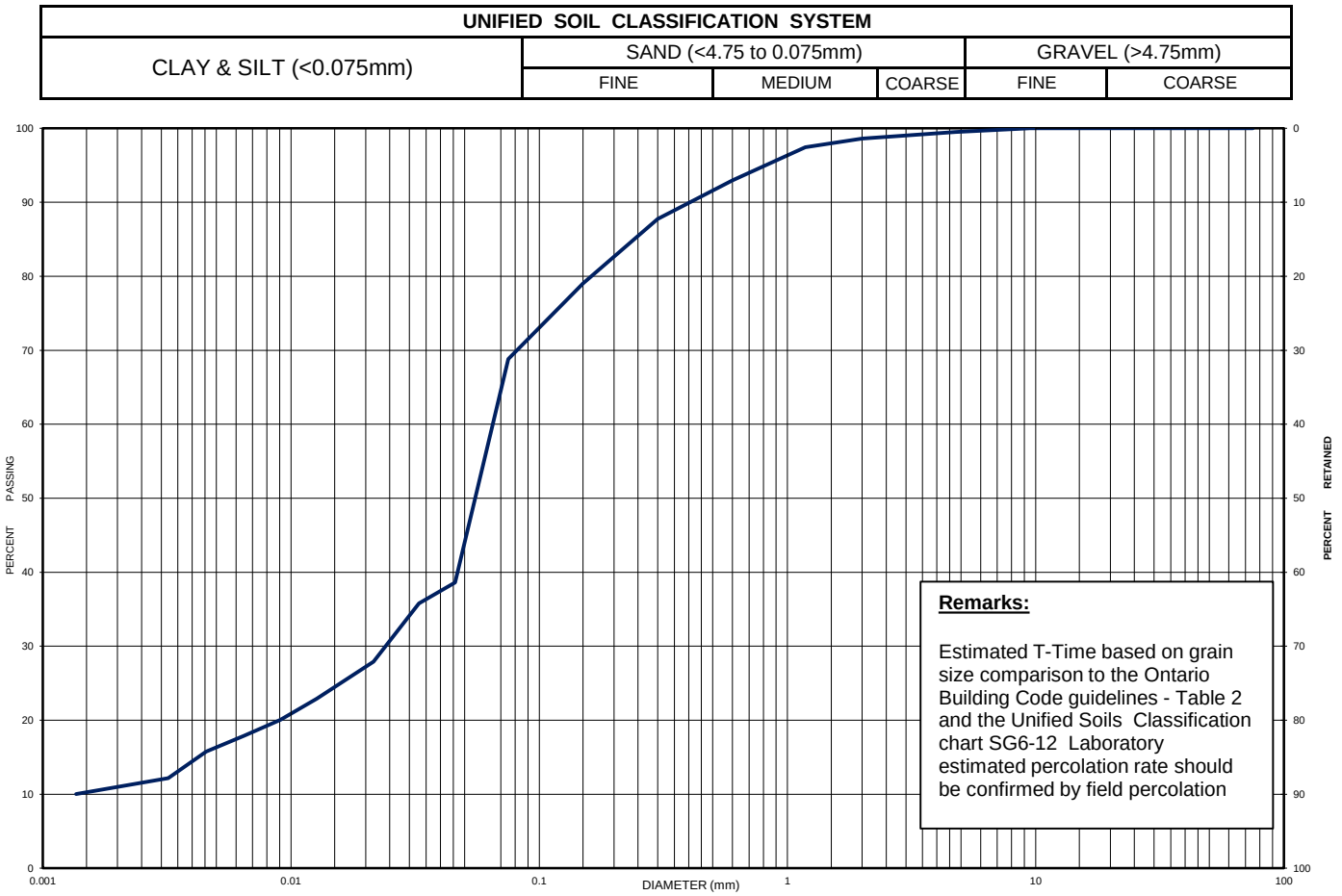
GRAIN SIZE DISTRIBUTION CHART

Client:	*Redstone Engineering*	Project No.:	*25R103*
Project:	*Ida Subdivision - Phase 2*	Location:	*Ida, Ontario*
Sampled By:	*Garnet Brenchley*	Date:	*May 7, 2025*
Sample No.:	*BH-5 - SS-1*	Depth:	*2.5 - 4.5'*

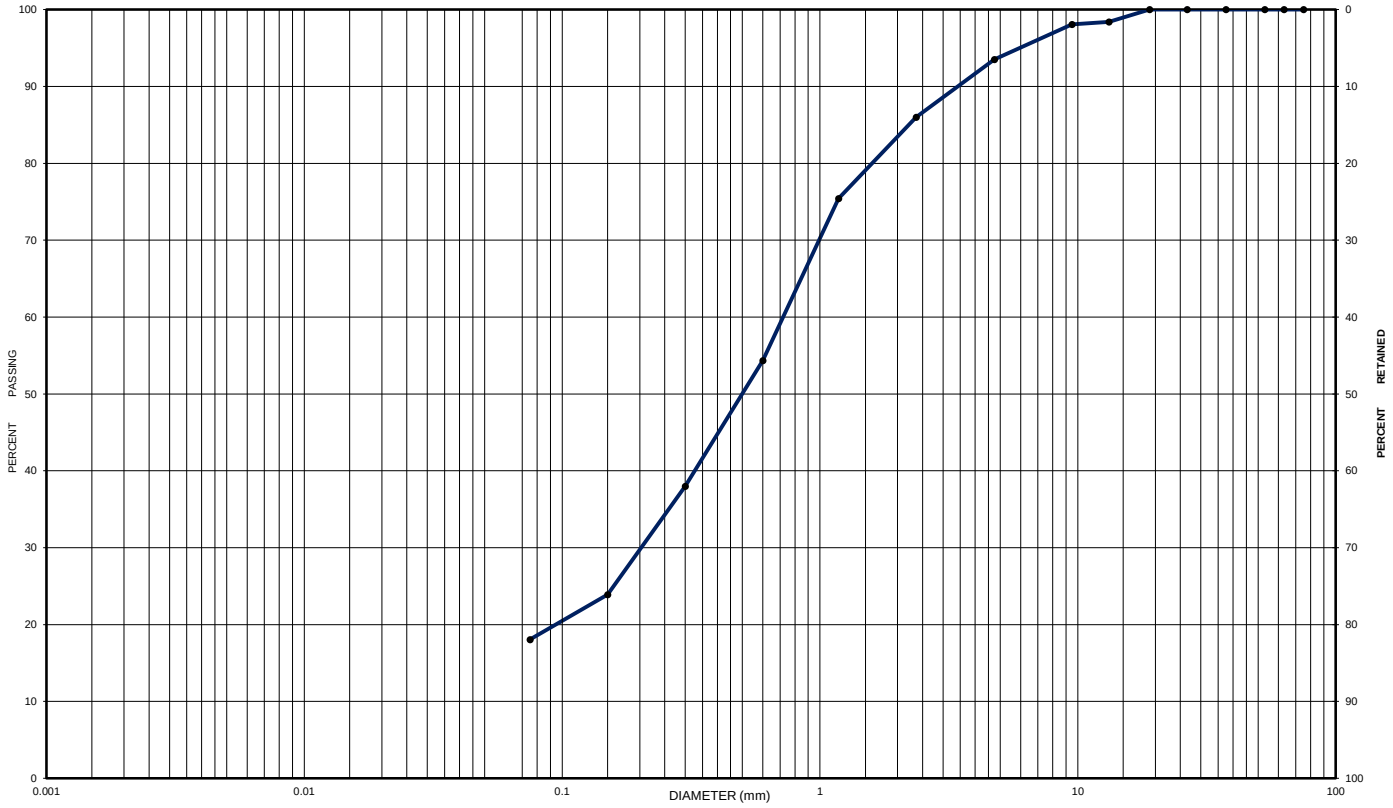


Sample No.	Description			Moisture (%)	Gravel	Sand	Silt	Clay	Class.
BH-5 - SS-1	*Sandy SILT some clay*			*27.8*	*1*	*31*	*57*	*11*	*ML*
D_{60}	D_{30}	D_{10}	C_U	C_C	*Estimated Coefficient of Permeability*		*Estimated Percolation Time mins./cm.*		
0.070	*0.025*	--	--	--	10^{-6}		***40 - 45 mins./cm***		

GRAIN SIZE DISTRIBUTION CHART

Client:	*Redstone Engineering*	Project No.:	*25R103*
Project:	*Ida Subdivision - Phase 2*	Location:	*Ida, Ontario*
Sample By:	*Garnet Brenchley*	Date:	*May 7, 2025*
Sample No.:	*BH5 SS-3B*	Depth:	*7.5- 9.0'*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075mm)	SAND (<4.75 to 0.075mm)			GRAVEL (>4.75mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE

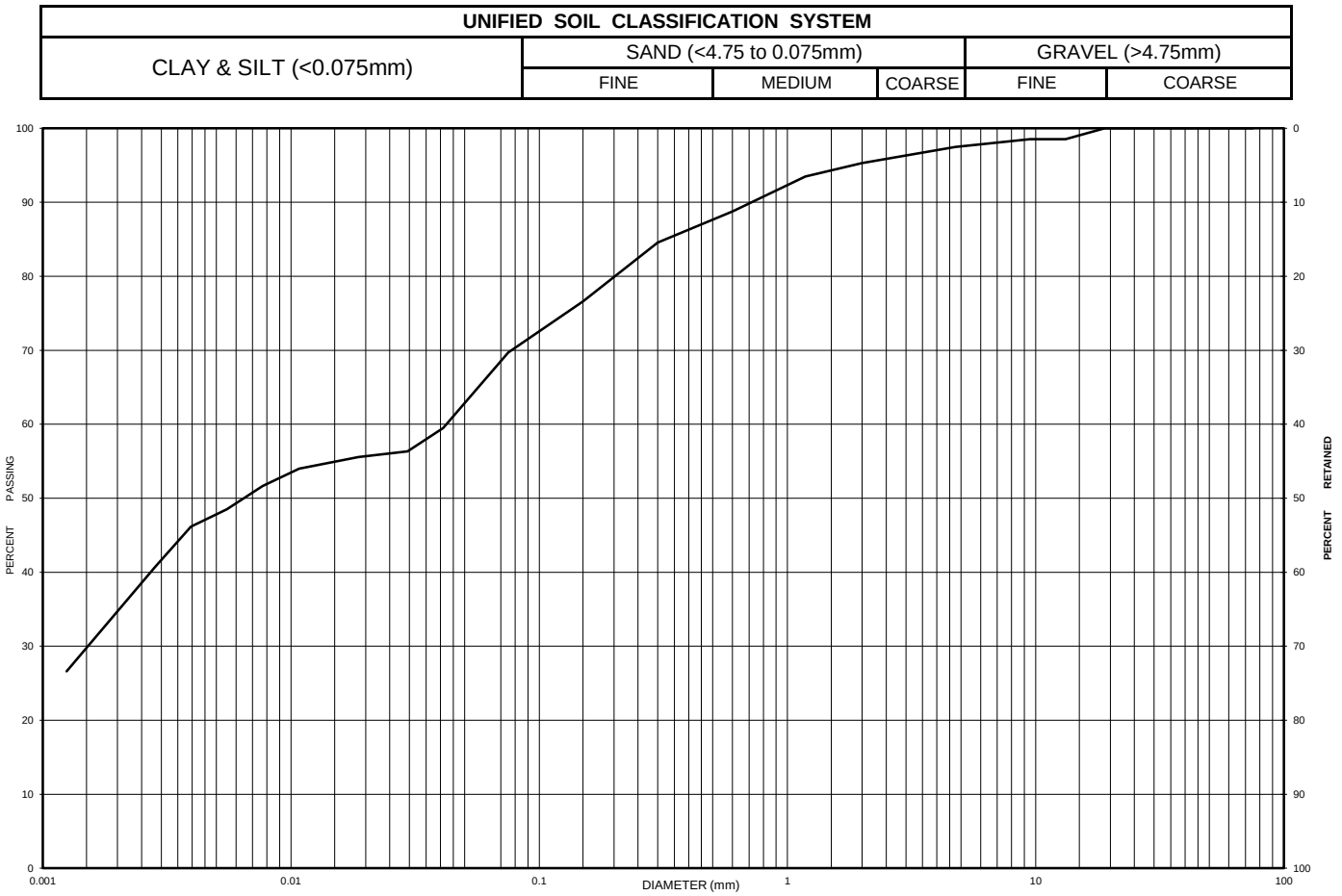


CLAY	SILT	SAND				FINE GRAVEL	GRAVEL
		VERY FINE	FINE	MEDIUM	COARSE		
U.S. BUREAU OF SOILS CLASSIFICATION							

Sample No.	Depth	Description	Moisture Content	Gravel	Sand	Silt & Clay	Class.
BH5 SS-3B	*7.5- 9.0'*	***SAND** some silt trace of gravel*	*9.2*	*6*	*76*	*18*	*SM*

GRAIN SIZE DISTRIBUTION CHART

Client:	*Redstone Engineering*	Project No.:	*25R103*
Project:	*Ida Subdivision - Phase 2*	Location:	*Ida, Ontario*
Sampled By:	*Garnet Brenchley*	Date:	*May 7, 2025*
Sample No.:	*BH-7 SS-3*	Depth:	*7.5 - 9.0'*



Sample No.	Depth	Description	Moisture Content	Gravel	Sand	Silt	Clay	Class.
BH-7 SS-3	*7.5 - 9.0'*	*Clayey Sandy **SILT***	*17.7*	*3*	*28*	*35*	*34*	*ML*