Proposed Long Term Care Facility & Retirement Homes

Schlegel Villages Inc.

Type of Document:
Preliminary Geotechnical Investigation – Final Report

Project Location:
Yonge Street and Country Lane, Barrie, Ontario

Project Number:
GTR-21023592-A0

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1. Introduction

This report presents the findings of a geotechnical investigation conducted for the proposed long term care facility and retirement homes at the southeast corner of Yonge Street and Country Lane in Barrie, Ontario. The work was authorized by Mr. Kevin Bushell of Schlegel Villages Inc.

Based on the latest drawings provided by the client, it is understood that the proposed site development will be carried out in four (4) phases. Phases I, II and III will consist of three (3) to twelve (12) storey connected buildings with areas with one (1) basement level. It is noted that this information was the only information available prior to EXP providing our proposal for this project and the carrying out of the fieldwork.

It is anticipated that the foundation depths of the Phase I, II and III building and elevators will be at about 3.5 m and 6.0 m below the ground floor elevation, respectively, however no drawings with design elevations have been provided to date.

Subsequent to the acceptance of EXP's geotechnical proposal and the fieldwork being completed, it was revealed that Phase IV would consist of two (2) standalone residential buildings of 18 and 26 storeys in height with up to two (2) levels of underground parking. Given the significant difference in building height and underground depths proposed for the Phase IV structures, in conjunction with the lack of design founding elevations for all buildings, this geotechnical investigation must be considered preliminary in nature.

The purpose of the geotechnical investigation was to determine the subsurface soil and groundwater conditions at the site by putting down a limited number of sampled boreholes and, based on an assessment of the factual borehole data, to provide geotechnical engineering guidelines pertaining to the design and construction of the proposed long term care facility and retirement homes.

Our terms of reference also include a Phase One Environmental Site Assessment, which was already reported, and a hydrogeological study, the results of which are presented under separate cover. Environmental assessment of the site soils was not a part of the terms of reference and no work was carried out in this regard.

The comments and recommendations given in this report are based on the assumption the above-described design concept will proceed into construction. If changes are made either in the design phase or during construction, this office must be retained to review these changes. The result of this review may be a modification of our recommendations or the requirement of additional field or laboratory work to check whether the changes are acceptable from a geotechnical viewpoint.

2. Site Description

The site is a located at the southeast corner of the intersection of Yonge Street and Country Lane in Barrie, Ontario.

The site is currently a vacant lot approximately 8.9 acres (3.6 ha) in size currently being utilized as agricultural lands. Natural windrows, the remnants of an old tree line, are located within the site. The topsoil thickness is variable due to farming operations.

A gentle downward slope is maintained across the site from the southeast to the northwest. A relief of approximately 3 m is noted before reaching a dug-out area approximately 0.6 m in depth at the north end of the site adjacent to Country Lane (Boreholes 1, 3, 19 and 20). The dug-out area resembles an old stormwater discharge area, potentially utilized during the construction of the surrounding subdivision.

The site is bordered by undeveloped lands to the east, Yonge Street to the north, Country Lane to the west and a residential subdivision to the south.

3. Fieldwork

The fieldwork was carried out between January 17 and 28, 2022. Twenty (20) boreholes (Boreholes 1 to 20) were advanced to a depths of 3.5 to 15.8 m below existing grade at the approximate locations shown on the attached Borehole Location Plan, Drawing 1, attached. Logs of the boreholes are also attached.

Prior to the commencement of drilling operations, underground services were cleared to minimize the risk of contacting any utilities during the drilling operations.

The boreholes were advanced using continuous flight hollow stem augering equipment owned and operated by a specialist drilling contractor. In each borehole, soil samples were recovered using conventional split spoon equipment in conjunction with the Standard Penetration Test (SPT) method.

Water levels were observed in the boreholes during the course of the fieldwork and in eight (8) groundwater monitoring wells installed in select boreholes for the hydrogeological investigation and to establish the short-term groundwater levels at the site.

The fieldwork was supervised throughout by an EXP geotechnical technologist who directed the drilling and sampling operations, prepared borehole logs, made groundwater observations during and upon completion of drilling, and processed the recovered samples. In the laboratory, the samples were classified as to their visual and textural characteristics. Natural moisture content tests were carried out for all recovered samples and grain size analysis was carried out on four representative soil samples.

The borehole locations and ground surface elevations were surveyed in the field by EXP. The ground surface elevation at the borehole locations were referenced to geodetic elevations.

4. Laboratory Testing

The laboratory testing program comprised the following:

- Moisture content determination on all recovered soil samples, with results presented on the Log of Borehole sheets.
- Grain size analysis on four (4) soil samples (BH 1 SS7, BH 3 SS6, BH 13 SS9 and BH 15 SS7), with results presented on the Grain Size Analysis Report.

5. Subsurface Conditions

5.1 Soil

The detailed soil profile encountered in each borehole and the results of laboratory moisture content determinations are indicated on the attached borehole logs. It should be noted the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The "Notes on Sample Descriptions" (Figure 1) preceding the borehole logs (Figures 2 to 21) form an integral part of, and should be read in conjunction with, this report.

The stratigraphy, as revealed in the boreholes, comprised a surficial topsoil over reworked native soils (sands) underlain by a major native sand deposit. Local sandy silt was also encountered. A brief description of the stratigraphy in general order of depth follows.

Topsoil

A surficial topsoil layer was encountered in all boreholes varying in thickness from about 20 mm to 600 mm. The topsoil typically comprised dark brown silty sand and was frozen in all boreholes.

It should be noted that topsoil measurements were carried out at the borehole locations only. A much more detailed analysis (i.e. shallow test pits) is required to accurately quantify the amount of topsoil to be removed for construction purposes. Consequently, topsoil quantities should not be established from the information provided at the borehole locations.

Reworked Native Soils

Reworked native soils, typically consisting of sands and silts were encountered underlying the topsoil in all boreholes with the exception of Borehole 20, extending as deep as 1.4 m. It is believed the soils were disturbed by farming operations carried out over years of operations at the site. Moisture contents of the reworked soils ranged from 4 to 26% with the material typically being frozen to moist with depth.

Sandy Silt

Below the topsoil in Borehole 20 a sandy silt deposit was uncovered extending to 2.9 m depth (Elev. 259.0 m). The sandy silt was loose to dense with depth (N-Values of 7 to 34) and was moist with a water content of 12 to 16%.

Sand

Below the reworked native soils or sandy silt, a major deposit of sand was encountered in all boreholes, extending to the 3.5 to 15.8 m depth of exploration. Four samples of the sand were submitted for gradation, with the results presented on the Grain Size Analysis Report, Figure 22, attached. The material generally graded as sand, trace to some silt, trace to some gravel, locally becoming siltier with depth. Trace clay or cobbles were noted locally. The relative density of the

sand is generally compact to very dense (N-Values of 10 to greater than 50) with depth (locally loose), however as wet sands were evident at depth across the site, some SPT N-Values appear to have been hydraulically disturbed and are not considered representative of the true ground strength. Moisture contents of the sand ranged from 1 to 25%, indicating moist to wet conditions, typically with depth. Higher moisture contents also typically coincided with siltier sand deposits.

5.2 Groundwater

Groundwater conditions were observed in the boreholes during the course of the fieldwork and in the eight (8) groundwater monitoring wells installed in Boreholes 1, 3, 5, 8, 12, 13, 15 and 18 for the hydrogeological investigation and to establish the stabilized short term groundwater conditions at the site. Upon completion of drilling, groundwater levels were measured in the boreholes at 4.5 to 7.6 m below existing grade within Boreholes 1 to 18. Boreholes 19 and 20, advanced to only 3.5 m depth, did not encounter groundwater.

Stabilized groundwater level measurements from the monitoring wells, obtained about two weeks after drilling, are recorded on the attached borehole logs and are presented in Table 1, below.

Table 1: Short-Term Groundwater Levels in Borehole Locations

Borehole No.	Approximate Ground Surface Elevation (m)	Groundwater Level below Existing Grade/Elevation in Groundwater Monitoring Well on February 10, 2022 (m)
1	261.99	4.11 / 257.88
3	261.97	3.90 / 258.07
5	263.04	5.11 / 257.93
8	263.75	5.36 / 258.39
12	265.32	6.77 / 258.55
13	265.56	7.72 / 257.84
15	265.85	7.28 / 258.57
18	265.55	6.83 / 258.72

The groundwater elevations reflect conditions at the time of the investigation. Seasonal fluctuation of the groundwater levels at the site should be anticipated.

For detailed groundwater conditions of the site, refer to the hydrogeological study.

6. Engineering Discussion and Recommendations

6.1 General

Based on the latest drawings provided by the client, it is understood that the proposed site development will be carried out in four (4) phases. Phases I, II and III will consist of three (3) to twelve (12) storey connected buildings with areas with one (1) basement level. It is noted that this information was the only information available prior to EXP providing our proposal for this project and the carrying out of the fieldwork.

It is anticipated that the foundation depths of the Phase I, II and III building and elevators will be at about 3.5 m and 6.0 m below the ground floor elevation, respectively, however no drawings with design elevations have been provided to date.

Subsequent to the acceptance of EXP's geotechnical proposal and the fieldwork being completed, it was revealed that Phase IV would consist of two (2) standalone residential buildings of 18 and 26 storeys in height with up to two (2) levels of underground parking. Given the significant difference in building height and underground depths proposed for the Phase IV structures, in conjunction with the lack of design founding elevations for all buildings, this geotechnical investigation must be considered preliminary in nature.

Based on the results of the limited boreholes drilled at the site, it is considered the site will be suitable for the construction of the proposed long-term care facility (Phases I, II and III). The site may also be suitable to support the Phase IV buildings, however additional investigation would be required to inform the foundation design.

The following subsections provide geotechnical engineering guidelines pertinent to the design and construction of the proposed structures.

6.2 Foundation Considerations

The overburden soils at the site are considered suitable for the proposed development. As final site grades have yet to be established, two (2) foundation schemes are presented for consideration: conventional footings on native soils and helical piles extending to practical refusal.

6.2.1 Conventional Footings on Native Soil

The proposed structures may be supported on conventional spread and strip footings founded on the competent undisturbed native sand below all existing topsoil, reworked native soils and loose soils. In general, footings founded on the native compact to very dense sand may be designed for a geotechnical resistance at Serviceability Limit States (S.L.S.) and corresponding factored geotechnical reaction at Ultimate Limit States (U.L.S.) as identified in the below Table 2, subject to inspection during construction. Table 2 provides a summary of the highest founding depth where the recommended geotechnical resistance at S.L.S. can be applied for footings.

Table 2: Summary of Approximate Founding Elevations where the Recommended Geotechnical Resistance at S.L.S./Factored Geotechnical Reaction at U.L.S. can be applied for Footings

Phase No.	Borehole No.	Approximate Ground Surface Elevation (m)	Approximate Founding Elevation (Depth below ex. Grade) (m)	Geotechnical Resistance at S.L.S./U.L.S. (kPa)
Phase I	1	261.99	~260.5 (1.5)	300 / 450
	2	262.67	~260.7 (2.0)	300 / 450
	3	261.97	~260.5 (1.5)	200 / 300
			~259.5 (2.5)	300 / 450
Phase II	4	262.69	~260.2 (2.5)	200 / 300
			~259.2 (3.5)	300 / 450
	5	263.04	~261.0 (2.0)	200 / 300
			~259.5 (3.5)	300 / 450
	6	263.22	~261.7 (1.5)	300 / 450
	7	263.22	~261.6 (2.0)	200 / 300
			~261.1 (2.5)	300 / 450
	8	263.56	~261.7 (2.0)	200 / 300
			~261.2 (2.5)	300 / 450
Phase III	9	264.27	~262.3 (2.0)	200 / 300
			~261.8 (2.5)	300 / 450
	10	264.70	~262.2 (2.5)	300 / 450
	11	265.08	~263.1 (2.0)	200 / 300
			~262.6 (2.5)	300 / 450
	12	265.32	~262.8 (2.5)	300 / 450
Phase IV*	13	265.56	~263.6 (2.0)	*300 / 450
	14	265.58	~263.6 (2.0)	*300 / 450
	15	265.85	~262.9 (3.0)	*300 / 450
	16	265.59	~262.6 (3.0)	*300 / 450

* - As noted previously, more thorough analysis (deeper boreholes) would be required to better inform the foundation design for buildings of this magnitude, the reported bearing resistances are preliminary in nature.

Prior to placement of concrete, all footing bases should be inspected by geotechnical personnel from EXP Services Inc. to verify the competency of the founding material.

6.2.2 Helical Piles

A deep foundation system may also be considered if desired. Considering the surrounding developments, in order to minimize harmful vibrations that may be associated with conventional driven piles, helical piles should be utilized.

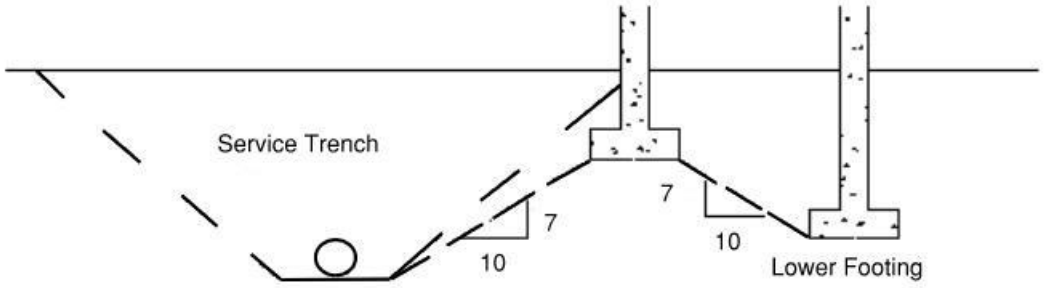
The installation of the helical piles is accomplished by applying torque to the steel shaft with auger plates and rotating it into the soil to the required depth. Installation of the helical piles generally requires no removal of soil and can be installed using portable hydraulic equipment.

Helical piles will need to be installed to practical refusal (dense to very dense soils), which based on the boreholes should be encountered across the site within the sand layer below elevations 259 to 262 m.

For helical piles extending to practical refusal, EXP anticipates that a 51 mm square shaft helical pile can achieve an SLS capacity of 500 kN with a corresponding ULS capacity of 670 kN. A load test on the helical piles would need to be carried out to verify that adequate bearing capacity is available to support the design load of any proposed structure. Helical piles are proprietary systems and should be designed and installed by a reputable specialist contractor experienced in this type of work.

6.2.3 Foundations General

Footings/pile caps which are to be placed at different elevations should be located such that the higher footing/pile cap is set below a line drawn up at 10 horizontal to 7 vertical from the near edge of the lower footing/pile cap, as indicated on the following sketch. This will be applicable for footings between phases and areas where there are/are not basement levels.



FOOTINGS NEAR SERVICE TRENCHES OR AT DIFFERENT ELEVATIONS

All footings/pile caps/grade beams exposed to seasonal freezing conditions should be protected from frost action by at least 1.2 m of soil cover or equivalent insulation, depending on the final design requirements.

The total and differential settlements of well designed and constructed footings placed in accordance with the above recommendations are expected to be less than 25 mm and 20 mm, respectively.

It should be noted the recommended bearing value has been calculated by EXP from the borehole information for the design stage only. The investigation and comments are necessarily ongoing as new information on underground conditions becomes available. For example, it should be appreciated modification to bearing levels may be required if unforeseen subsurface conditions are encountered or if final design decisions differ from those assumed in this report. For this reason, this office should be retained to review final foundation drawings and to provide field inspections during the construction stage.

6.3 Excavation and Groundwater Control

Based on the groundwater levels to date, for proposed structure areas without a basement, it is anticipated shallow foundation excavation will be carried out within the reworked native soils and native sand. Excavations within the overburden materials should be relatively straightforward and must be carried out in accordance with the Occupational Health and Safety Act (OHSA) and local regulations. The OHSA regulations require that if workmen must enter an excavation deeper than 1.2 m, the excavation must be suitably sloped and/or shored in accordance with OHSA requirements. OHSA specifies maximum slope of the excavation for the soil types encountered at the site as summarized in the following Table 3:

Table 3: Summary of the Soil Types encountered at the Site

Soil	Soil Type	Maximum Slope
Compact to Very Dense Sand, Loose to Dense Sandy Silt	Type 3*	1 horizontal to 1 vertical
Reworked Native Soils	Type 3*	1 horizontal to 1 vertical

*Note: Where loose soil is encountered or within zones of persistent seepage, it may be necessary to locally flatten the side slopes.

Based on the assumed founding levels, local groundwater seepage into the basement level(s) and foundation excavations from the wet sand layer should be anticipated during construction. The groundwater monitoring to date reveals it should be possible to control and remove the minor seepage using conventional construction dewatering techniques, i.e. pumping from sumps, for majority of the shallow excavations.

However, in the proposed elevator areas and areas with a second underground level (Phase IV), excavation will likely extend below the observed groundwater measurements to date based on the assumed founding levels. As such, it will be necessary to control the groundwater in these localized areas during the excavation utilizing more sophisticated techniques. The excavated soil is typically expected to be a dense to very dense sand which becomes water bearing with depth. Accordingly, it will be necessary to utilize local well points or equivalent to keep the excavation free of significant groundwater. Well points should be designed and installed by a specialist

dewatering contractor, who should determine the actual type and spacing of wells, cognizant of their own equipment and experience. In general, it is typically recommended to dewater to at least 1.0 m below the deepest excavation, prior to excavation.

For short and long-term groundwater control requirements, a Hydrogeological Study has been carried out under separate cover to determine if a PTTW/registry with the EASR is required from the Ministry of the Environment, Conservation and Parks (MECP).

It should be noted that local cobbles were noted in the boreholes. As such, provisions should be made in the tender documents to cover any delays caused by cobbles and boulders.

6.4 Backfill Considerations

Backfill used to satisfy underfloor slab requirements, footings and service trenches, etc., should be compactible fill, i.e., inorganic soil with its moisture content close to its optimum value determined in the Standard Proctor maximum dry density (SPMDD) test. The excavated materials will generally consist of topsoil, reworked native soils with organic content and sand. Reworked soils that are free of organics and otherwise deleterious materials are considered suitable for reuse as backfill. The native sand is also considered suitable for reuse as backfill material. The localized native sandy silt is suitable for reuse, however is not free draining and therefore should not be used where this characteristic is required, or in confined areas where smaller compaction equipment is required. Portions of the excavated materials may require moisture adjustments (i.e. drying) for proper compaction.

Any organic or excessively wet or otherwise deleterious material should not be used for backfilling purposes. Any shortfall of suitable on-site excavated material for backfilling in confined areas can be made up with imported granular material, OPSS Granular 'B' or equivalent. The backfill should be placed in lifts not more than 300 mm thick in the loose state with each lift being compacted to at least 98% SPMDD before subsequent lifts are placed. The degree of compaction achieved in the field should be checked by in-place density tests.

6.5 Floor Slab Construction and Permanent Drainage

The floor slab of the proposed structure can be constructed as a slab-on-grade at the site. Prior to slab-on-grade construction, all existing topsoil, fill (not encountered during the investigation), and disturbed/reworked native soils within the floor slab area must be removed. The exposed subgrade surface should be compacted and proof-rolled with a heavy vibratory roller and inspected by geotechnical personnel. Any soft areas identified during the proof-rolling operation should be sub-excavated and replaced with approved material compacted in the manner described in the "Backfill Considerations" subsection of the report.

A moisture barrier, consisting of a 200 mm thick layer of 19 mm clear crushed stone should be placed directly under the floor slab.

For areas where there is no basement, perimeter and underfloor drains are not required if the floor is set at least 200 mm above the exterior grade.

If the basement areas are constructed within an open cut excavation, permanent perimeter tile drains should be provided around the basement walls. The perimeter drains should consist of 100 mm diameter perforated pipe surrounded by 200 mm of 19 mm clear stone and wrapped with a filter fabric with a filtration size of 60 microns or smaller. The drainage system should be installed around the perimeter of the basement and connected to a frost-free outlet from which the water can be removed.

In addition, installation of an under-floor drain system is also recommended below basement slabs. For preliminary guidance, the underfloor drain system should consist of a 200 mm thick layer of clear stone, with 100 mm diameter perforated drain pipes installed at the base of the drainage stone, at 6 m intervals. The pipes and the stone must be completely wrapped in a non-woven geotextile. These drain pipes must be provided with a frost-free positive discharge (sump pits). Adequate clean-out ports should be installed to facilitate future cleaning of the pipes.

The perimeter and sub-floor drainage systems should be independent of any stormwater piping, such as rainwater leaders. Backflow prevention should be provided between the sumps and the drain headers.

Within the sidewalk and concrete aprons surrounding the building, Styrofoam insulation of minimum 50 mm thick should be provided below the concrete slab to protect against frost heave.

The floor slab should be above the exterior finished grades to eliminate the requirement of perimeter tile drains. Around the perimeter of the building with or without a basement, the ground surface should be sloped on a positive grade away from the structure to promote surface water run-off and to reduce groundwater infiltration adjacent to the foundation.

Since the elevator pit will be the lowest point within the building, there may not be sumps low enough to drain water trapped behind the pit walls. In this case, the walls should be designed to withstand hydrostatic pressure and waterproofed.

6.6 Earth Pressure on Subsurface Walls

Basement walls must be designed to resist the unbalanced lateral earth pressure due to the weight of the retained soil. The lateral earth pressure, p, acting on underground levels may be calculated from the following equation and assuming a triangular pressure distribution:

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

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

K = earth pressure coefficient, a value of 0.5 is recommended;

γ = unit weight of retained soil, a value of 22 kN/m^3 is recommended

h = depth to point of interest in m; and

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

The above expression assumes that the perimeter drainage system is effective to prevent the build-up of any hydrostatic pressure behind the perimeter walls. As noted in Section 6.5, where drainage is ineffective or impractical, such as elevator shafts, the walls should be designed to withstand hydrostatic pressure and waterproofed.

6.7 Earthquake Considerations

The recommendations for the geotechnical aspects to determine the earthquake loading are presented below.

6.7.1 Subsoil Conditions

The subsoil information at this site has been examined in relation to Section 4.1.8.4 of OBC 2012. The subsoil consisted of topsoil, reworked sands and silts, local native sandy silt and a major native sand deposit. The proposed structure will be supported on conventional footings or helical piles founded on the native sand.

There have been no shear wave velocity measurements carried out at this site and therefore, N-Values will be utilized to determine the site classification.

6.7.2 Depth of Boreholes

Table 4.1.8.4.A Site Classification for Seismic Site Response in OBC 2012 indicated that to determine the site classification, the average properties in the top 30 m are to be used. The boreholes were advanced to a depth of about 3.5 to 15.8 m below existing grade. No bedrock was encountered within the depths investigated.

6.7.3 Site Classification

Based on the known soil conditions, the Site Class for this site is “D” as per Table 4.1.8.4.A, Site Classification for Seismic Site Response, OBC 2012. A corresponding F_s of 1.6 is applicable.

Shear wave velocity measurements can be carried out to determine if a higher Site Class can be used at this site.

6.8 Parking Areas and Access Road

It is anticipated the subgrade material will comprise compacted fill and native soils. The recommended pavement structure provided in Table 4 is based upon an estimate of the subgrade soil properties determined from visual examination and textural classification of the soil samples. A functional design life of eight to ten years has been used to establish the pavement recommendations. This represents the number of years to the first rehabilitation, assuming regular maintenance is carried out.

Table 4: Recommended Pavement Structure Thicknesses

Pavement Layer	Compaction Requirements	Light-Duty Car Parking	Fire Route and Access Road
Asphaltic Concrete (OPSS 310)	OPSS 310	40 mm HL3 50 mm HL8	40 mm HL3 80 mm HL8
Granular A Base ** (OPSS 1010)	100% SPMDD*	150 mm	150 mm
Granular B Subbase ** (OPSS 1010)	100% SPMDD*	200 mm	350 mm

* Denotes standard Proctor maximum dry density, MTO LS-706

** Crusher-run limestone or recycled concrete are recommended for fall and winter construction

The foregoing design assumes construction is carried out during dry periods and the subgrade is stable under the load of construction equipment. If construction is carried out during wet weather and heaving or rolling of the subgrade is experienced, additional thickness of subbase course material may be required.

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be sloped to provide effective surface drainage. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas.

Additional comments on the construction of the parking area and driveway are as follows:

1. The proposed parking area and driveway should be stripped of vegetation, topsoil/organics, any local fill, topsoil-stained/reworked native soils and weak native subgrade material. The exposed subgrade surface should be compacted and proof-rolled in the presence of a geotechnical personnel. Soft or spongy subgrade areas should be further sub-excavated and replaced with suitable approved backfill compacted to 98% SPMDD for pavement areas. Fill required to raise the grades to design elevations should be organic-free and at a moisture content which will permit compaction to 98% SPMDD. The final subgrade surface should be properly shaped and crowned.

2. Perimeter subdrains should be provided around the parking area and along the access roads.

3. The most severe loading conditions on pavement areas and the subgrade may occur during construction. Consequently, special provisions such as half-loads during paving may be required, especially if construction is carried out during unfavorable weather.

7. General Comments

A geotechnical engineer should be retained for a general review of the final design and specifications to verify the recommendations in this report address all relevant geotechnical parameters regarding the design and construction of the proposed development.

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

More specific information with respect to the conditions between samples or the lateral and vertical extent of materials may become apparent during excavation operations. The interpretation of the borehole information must, therefore, be validated during excavation operations. Consequently, during the future development of the property, conditions not observed during this investigation may become apparent; should this occur, a geotechnical engineer should be contacted to assess the situation and additional testing and reporting may be required. EXP has qualified personnel to provide assistance in regard to future geotechnical issues related to this property.

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

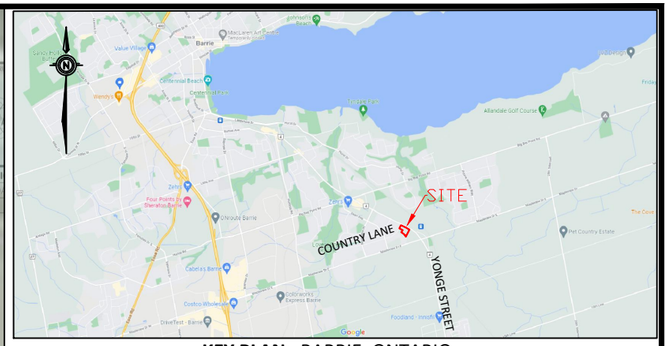
Yours truly,
EXP Services Inc.

Richard Blair, P. Eng.
Project Manager, Barrie Office
Geotechnical Services

Leigh Knegt, P. Eng.
Branch Manager, Barrie Office
Geotechnical Division

Drawings and Figures

Drawing 1 - Borehole Location Plan
Figure 1 – Notes on Sample Descriptions
Figures 2 to 21 – Log of Boreholes
Figure 22 – Grain Size Analysis Report



KEY PLAN: BARRIE, ONTARIO

LEGEND:

- SITE LIMITS
- BH/MW 1 EL. 261.99 — BOREHOLE/MONITORING WELL LOCATION SURFACE ELEVATION
- BH 2 EL. 262.67 — BOREHOLE LOCATION SURFACE ELEVATION

NOTES:
1. THE BOUNDARIES AND SOIL TYPES HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES THEY ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR.
2. SOIL SAMPLES WILL BE RETAINED IN STORAGE FOR 1 MONTH AND THEN DESTROYED UNLESS CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. GROUND SURFACE ELEVATIONS AT THE BOREHOLE LOCATIONS WERE DERIVED FROM CAN-NET ELEVATIONS WITH THE USE OF A TRIMBLE TSC3 CONTROLLER AND ARE SHOWN IN METRES ABOVE SEA LEVEL (masl).
4. BOREHOLE ELEVATIONS SHOULD NOT BE USED TO ESTABLISH SITE GRADES.
5. THIS DRAWING SHOULD BE REPRODUCED IN COLOUR.
6. SITE CONCEPT PLAN PROVIDED BY DIAMOND SCHMITT ARCHITECTS.

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PROJECT TITLE AND LOCATION:
GEOTECHNICAL INVESTIGATION
PROPOSED LONG TERM CARE FACILITY & RETIREMENT HOMES
800 YONGE STREET, BARRIE, ONTARIO

DRAWING TITLE:
BOREHOLE/MONITORING WELL LOCATION PLAN

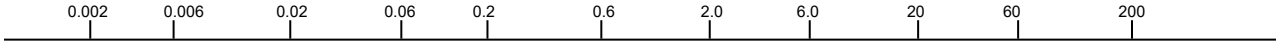
PROJECT#: GTR-21023592-A0	DWN.: RB
SCALE: NTS	CHKD.: LK
DATE: JAN. 2023	DWG. No.: 1

Notes On Sample Descriptions

1. All sample descriptions included in this report follow the Unified Soil Classification System (USCS) as outlined by the Ministry of Transportation. Different classification systems may be used by others; one such system is the International Society for Soil Mechanics and Foundation Engineering (ISSMFE), as outlined in the Canadian Foundation Engineering Manual. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

UNIFIED SOIL CLASSIFICATION

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

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

Notes On Sample Descriptions

4. The following table gives a description of the soil based on particle sizes. With the exception of those samples where grain size analyses have been performed, all samples are classified visually. The accuracy of visual examination is not sufficient to differentiate between this classification system or exact grain size.

Soil Classification		Terminology	Proportion
Clay and Silt	<0.075 mm		
Sand	0.075 to 4.75 mm	"trace" (e.g. Trace sand)	0% to 10%
Gravel	4.75 to 75 mm	"some" (e.g. Some sand)	10% to 20%
Cobbles	75 to 200 mm	with (e.g. with sand)	20% to 35%
Boulders	>200 mm	and (e.g. and sand)	35% to 50%

For a given material listed as an adjective (e.g. silty sand) means the predominant grain size is sand sized with 30 to 40% silt sized particles.

The compactness of Cohesionless soils and the consistency of the cohesive soils are defined by the following:

Cohesionless Soil		Cohesive Soil		
Compactness	**Standard Penetration Resistance "N" value Blows/ 0.3 m**	**Consistency**	**Undrained Shear Strength (kPa)**	**'N' Values**
Very Loose	0 to 4	Very soft	<12	<2
Loose	4 to 10	Soft	12 to 25	2 to 4
Compact	10 to 30	Firm	25 to 50	4 to 8
Dense	30 to 50	Stiff	50 to 100	8 to 15
Very Dense	Over 50	Very Stiff	100 to 200	15 to 30
		Hard	>200	>30

5. **ROCK CORING**

Where rock drilling was carried out, the term RQD (Rock Quality Designation) is used. The RQD is an indirect measure of the number of fractures and soundless of the rock mass. It is obtained from the rock cores by summing the length of the core covered, counting only those pieces of sound core that are 100 mm or more length. The RQD value is expressed as a percentage and is the ratio of the summed core lengths to the total length of core run. The classification based on the RQD value is given below.

RQD Classification	RQD (%)
Very Poor Quality	<25
Poor Quality	25 to 50
Fair Quality	50 to 75
Good Quality	75 to 90
Excellent Quality	90 to 100

Recovery Designation: $\%\ \text{Recovery} = \dfrac{\text{Length of Core Per Run}}{\text{Total Length of Run}} \times 100$

Log of Borehole 1

Project No. GTR-21023592-A0 | Figure No. 2

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911778 N 608960 E

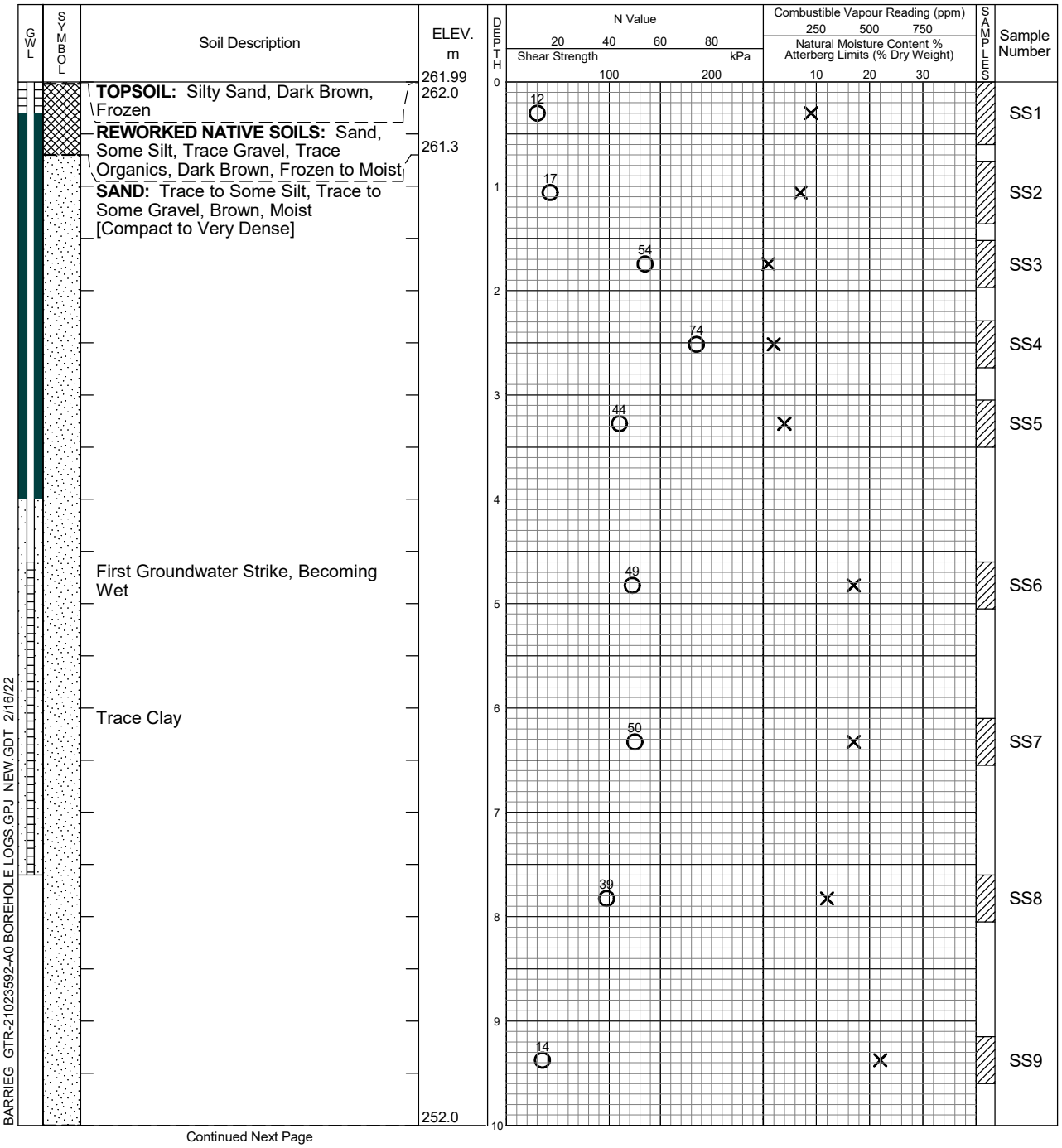
Date Drilled: January 27, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

Continued Next Page

EXP Services Inc.
14 Cedar Pointe Drive
Barrie, ON L4N 5R7
t: +1.705.719.1100
f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

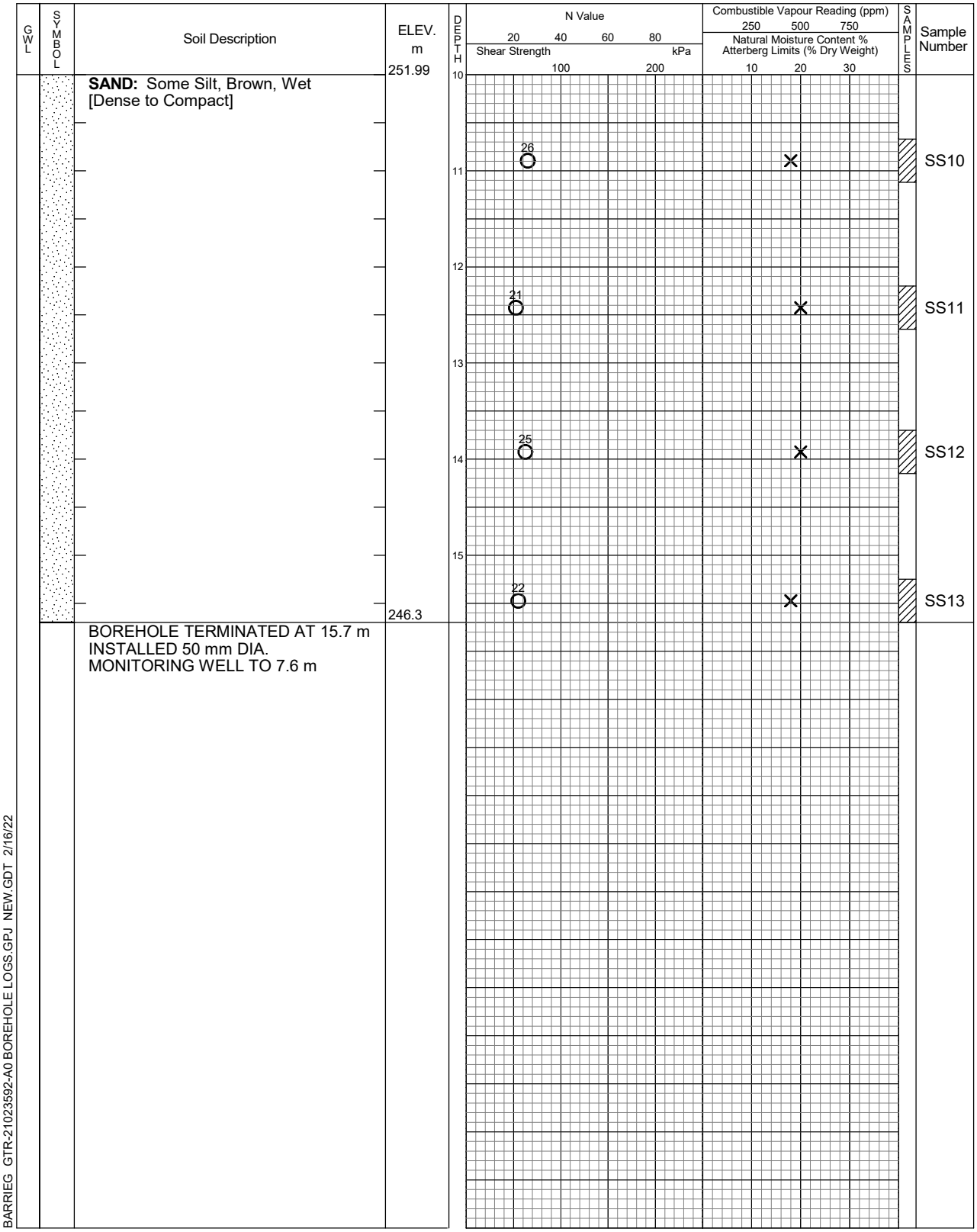
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	4.5	Install
Feb. 10, 2022	4.11 / 257.88	

Log of Borehole 1

Project No. GTR-21023592-A0 Figure No. 2

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



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See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	4.5	Install
Feb. 10, 2022	4.11 / 257.88	

Log of Borehole 2

Project No. GTR-21023592-A0 | Figure No. 3

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911759 N 608993 E

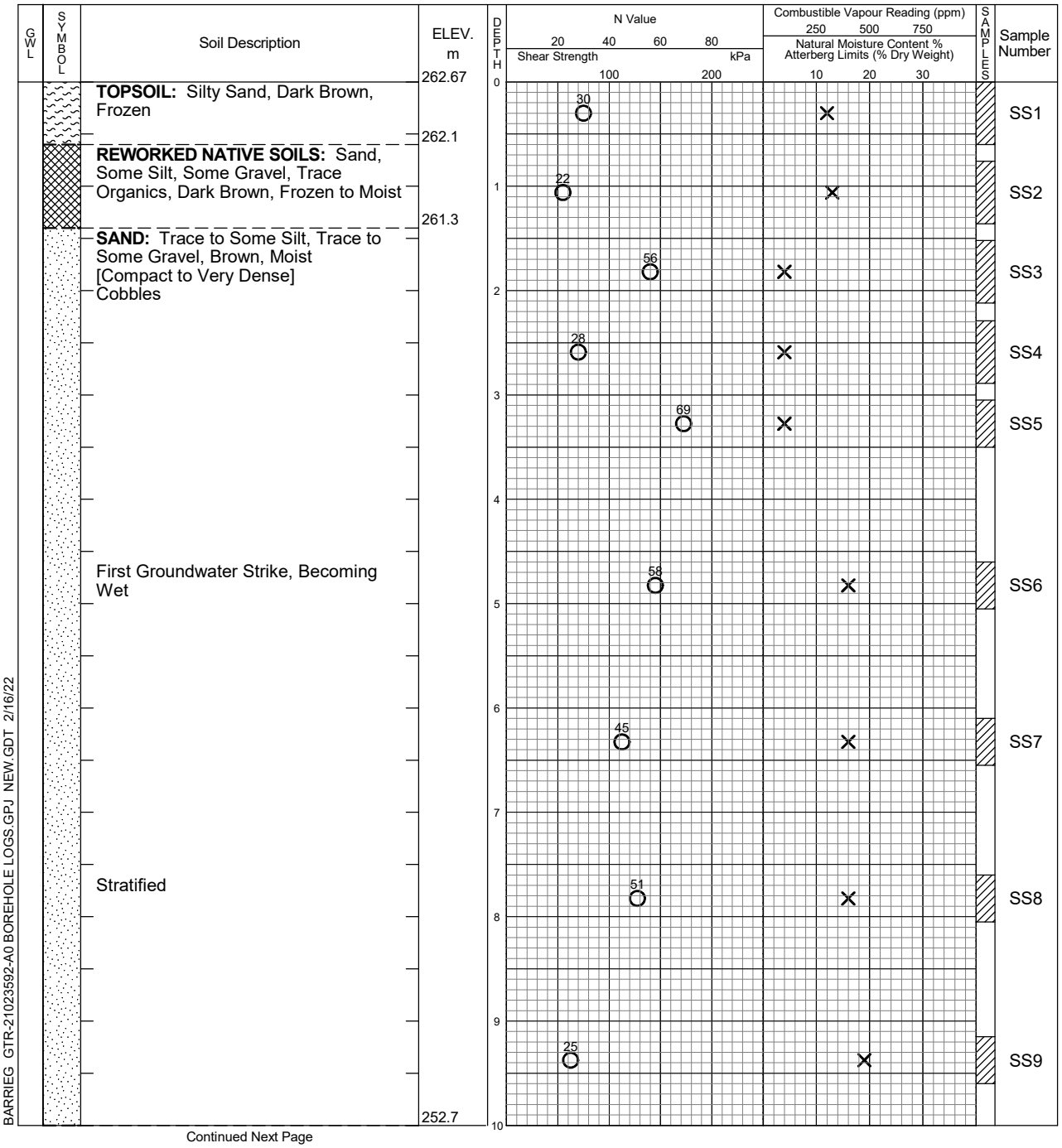
Date Drilled: January 19, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

Continued Next Page

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Borehole data requires interpretation assistance from EXP before use by others.

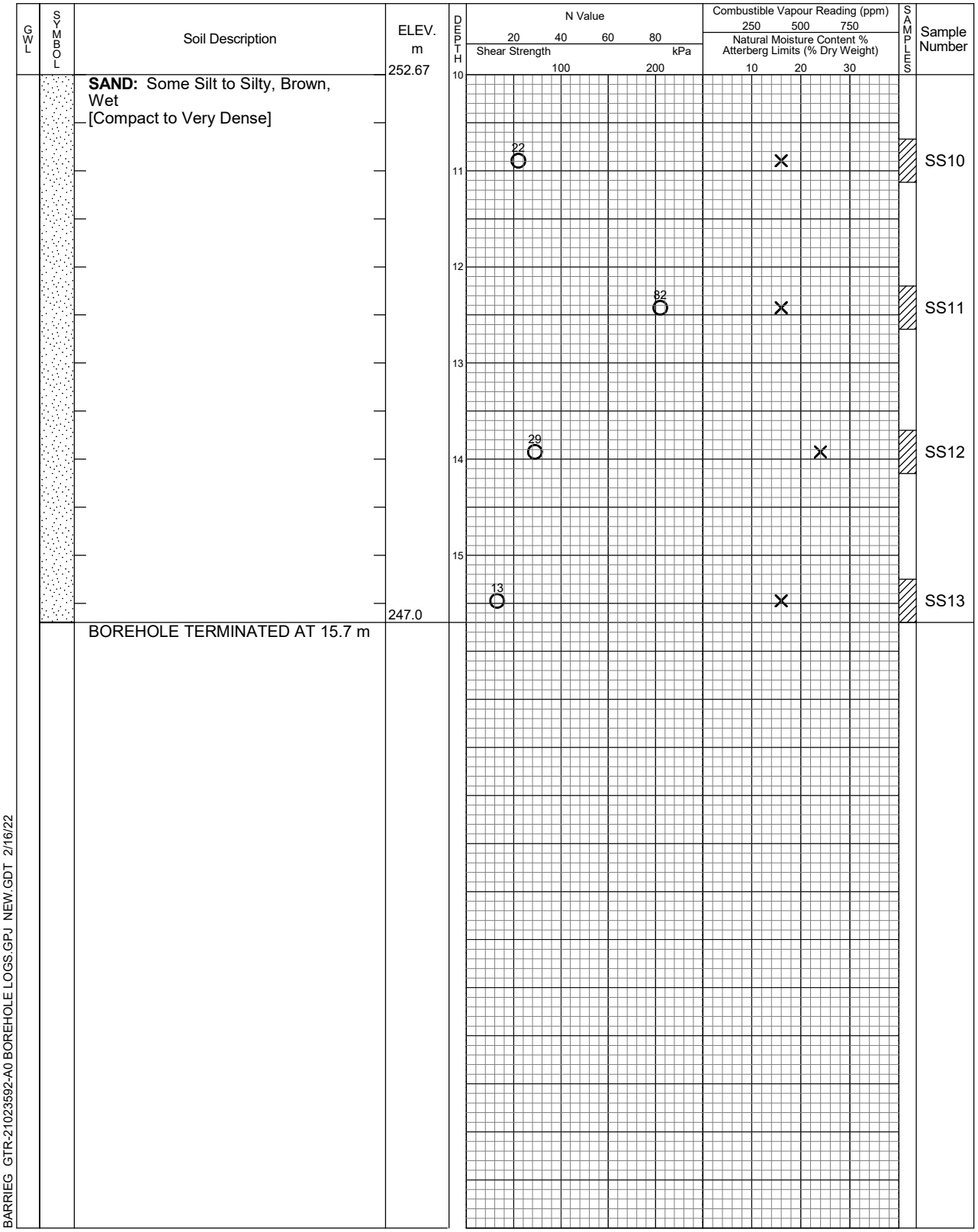
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	4.6	9,2

Log of Borehole 2

Project No. GTR-21023592-A0 Figure No. 3

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



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Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	4.6	9,2

Log of Borehole 3

Project No. GTR-21023592-A0 | Figure No. 4

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911735 N 608940 E

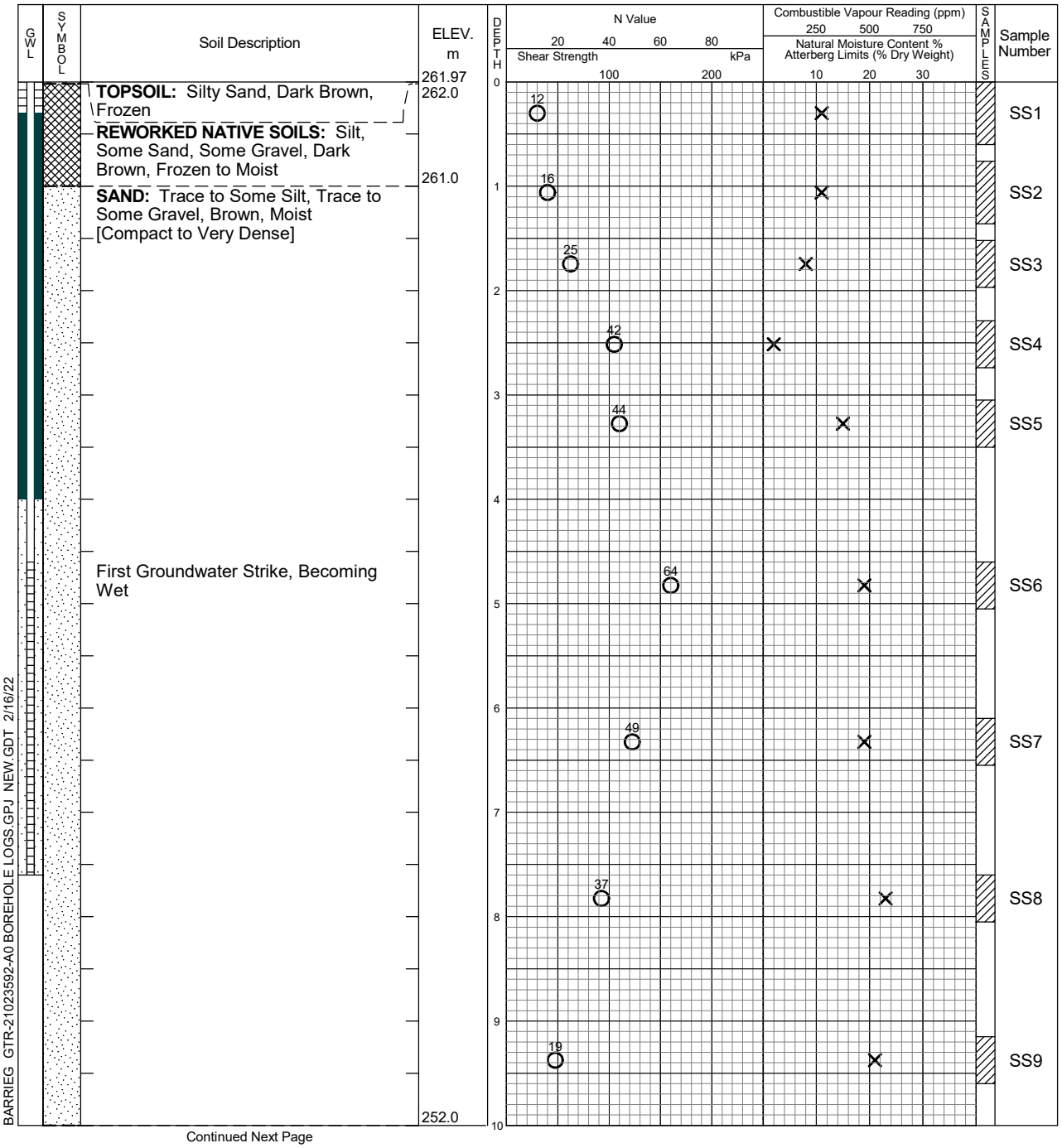
Date Drilled: January 26, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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Borehole data requires interpretation assistance from EXP before use by others.

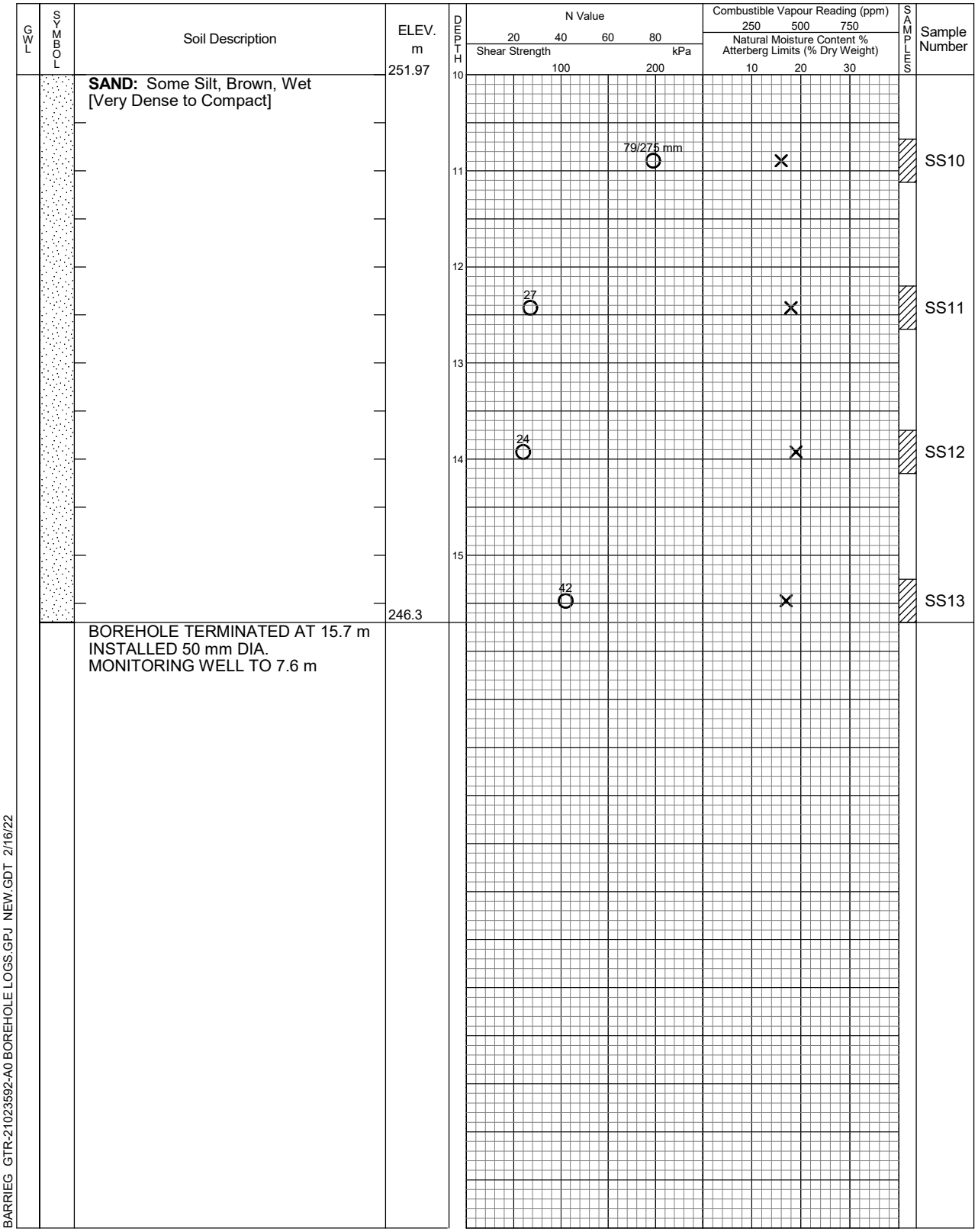
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	Install
Feb. 10, 2022	3.9 / 258.07	

Log of Borehole 3

Project No. GTR-21023592-A0 Figure No. 4

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



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f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	Install
Feb. 10, 2022	3.9 / 258.07	

Log of Borehole 4

Project No. GTR-21023592-A0 | Figure No. 5

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911721 N 608981 E

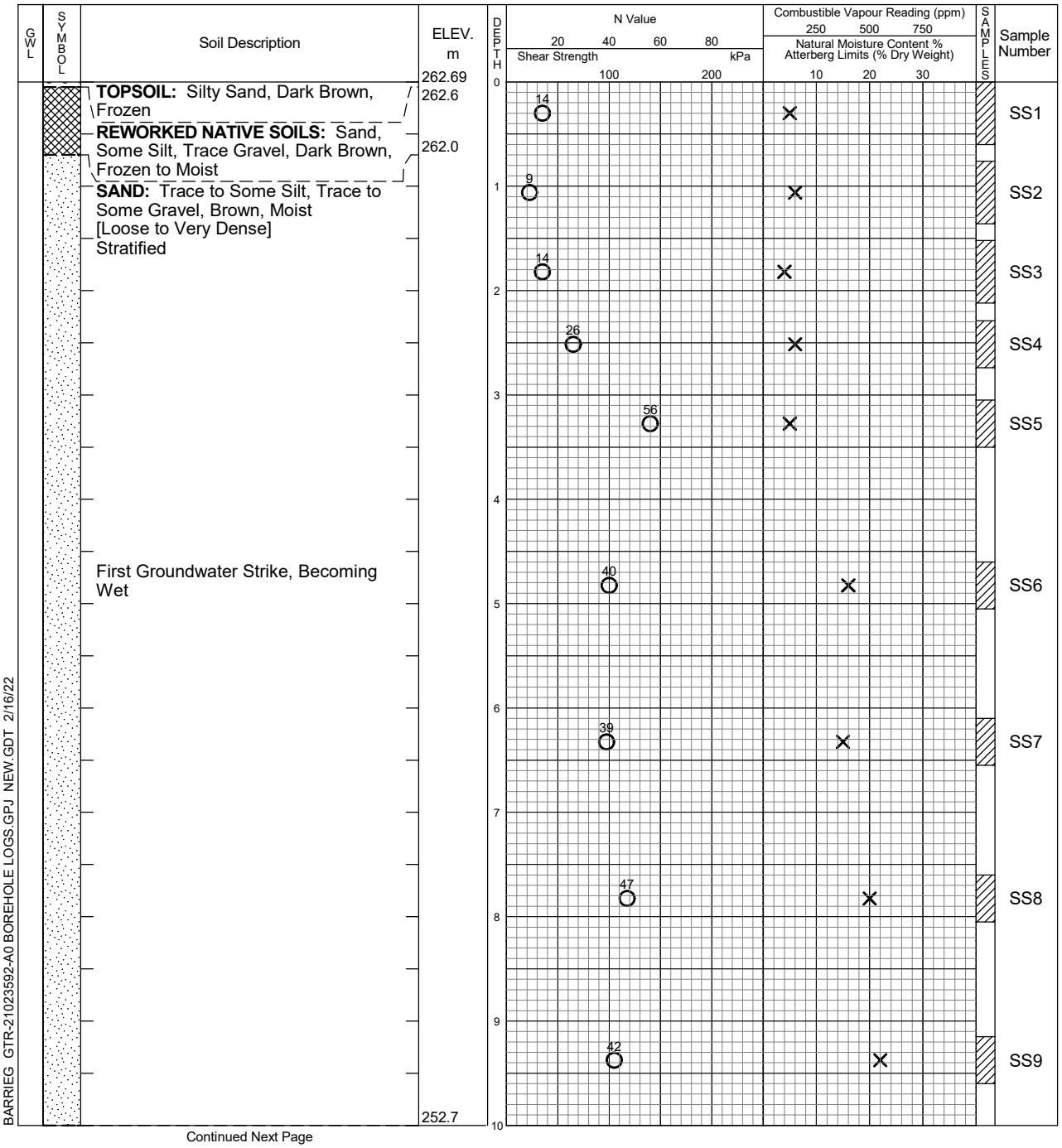
Date Drilled: January 27, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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Borehole data requires interpretation assistance from EXP before use by others.

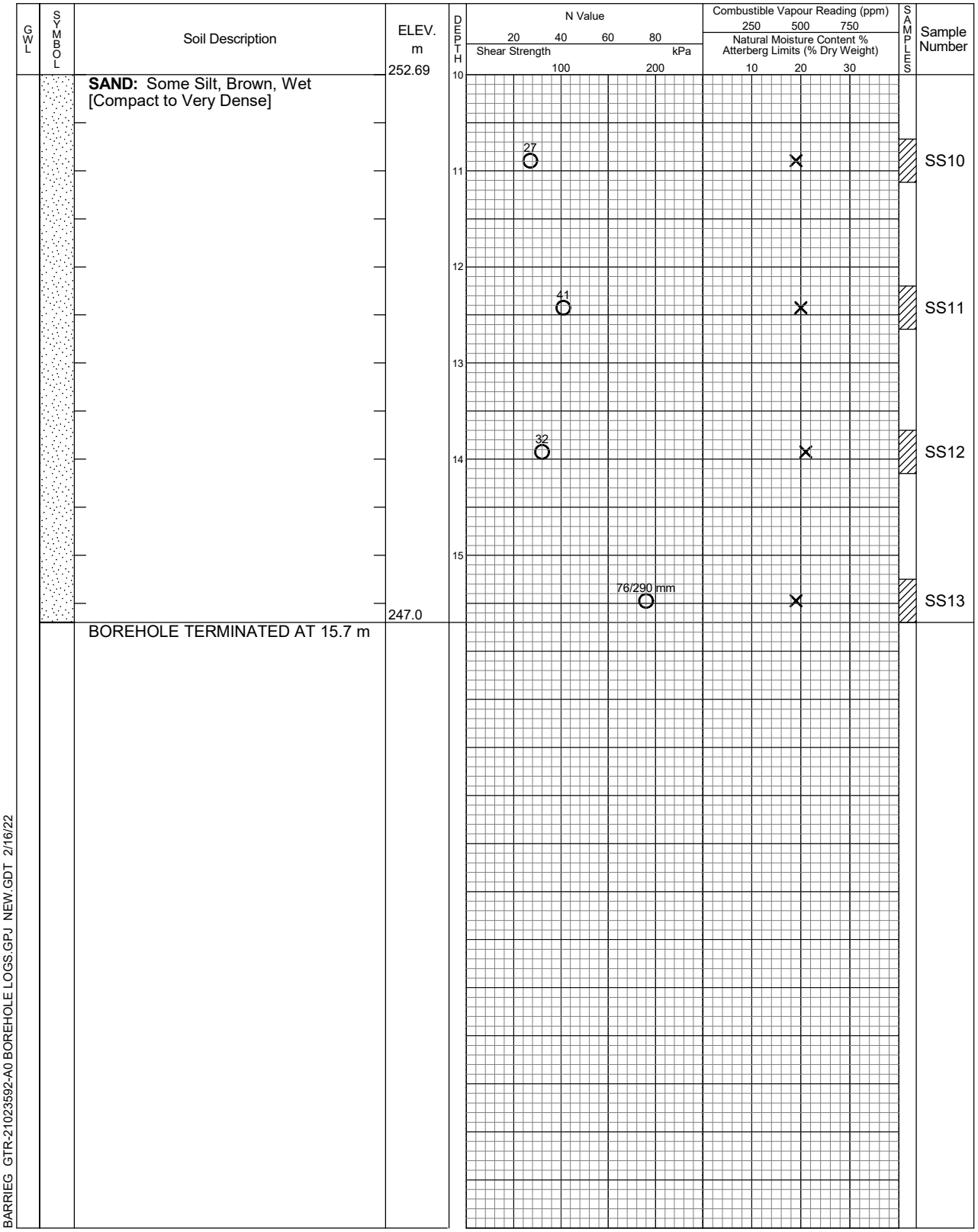
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	4.7	9.4

Log of Borehole 4

Project No. GTR-21023592-A0 Figure No. 5

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



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Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	4.7	9.4

Log of Borehole 5

Project No. GTR-21023592-A0 | Figure No. 6

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911739 N 609041 E

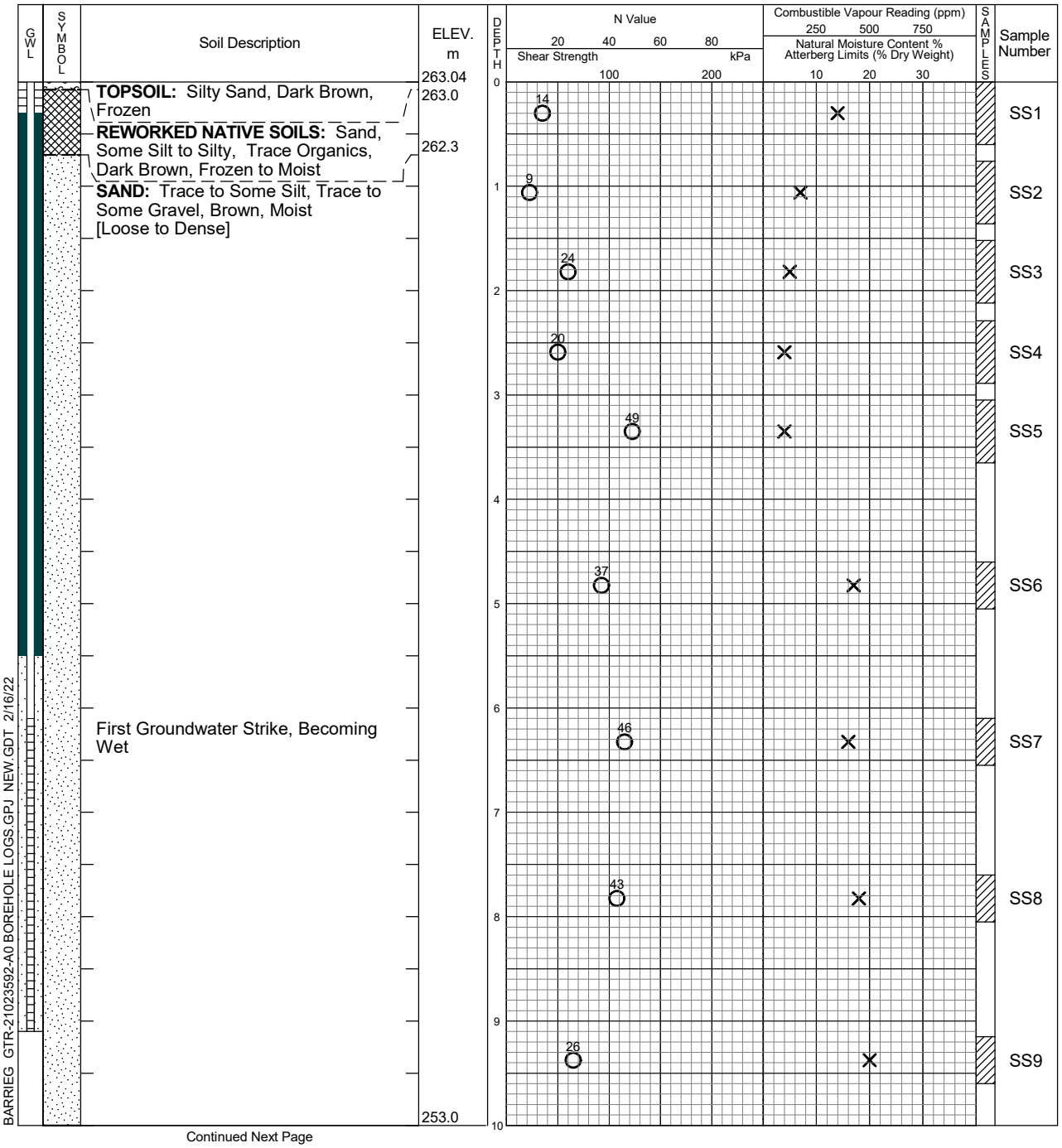
Date Drilled: January 18, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	6.0	Install
Feb. 10, 2022	5.11 / 257.93	

Log of Borehole 5

Project No. GTR-21023592-A0 Figure No. 6

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Sample Number
		SAND: Some Silt to Silty, Brown, Wet [Very Dense to Dense]	253.04	10	64/290 mm		SS10	
				11				
				12	48		SS11	
			250.4					
		BOREHOLE TERMINATED AT 12.6 m UPON REFUSAL OF PROGRESSION DUE TO WET SANDS INSTALLED 50 mm DIA. MONITORING WELL TO 9.1 m						

N Value: 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	6.0	Install
Feb. 10, 2022	5.11 / 257.93	

Log of Borehole 6

Project No. GTR-21023592-A0 | Figure No. 7

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911711 N 609028 E

Date Drilled: January 27, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value / Shear Strength (kPa)	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Sample Number
			263.22	0	20 40 60 80 / 100 200	250 500 750 / 10 20 30		
		TOPSOIL: Silty Sand, Dark Brown, Frozen	263.2					
		REWORKED NATIVE SOILS: Sand, Some Silt, Trace Gravel, Dark Brown, Frozen to Moist	262.6					
		SAND: Trace to Some Silt, Trace to Some Gravel, Brown, Moist [Dense to Very Dense]			17		SS1	
				1	30		SS2	
					43		SS3	
				2	38		SS4	
		Stratified			61		SS5	
				4				
					46		SS6	
				5				
				6	49		SS7	
		First Groundwater Strike, Becoming Wet						
				7				
					29		SS8	
				8				
				9				
					52		SS9	
			253.2	10				

BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

Continued Next Page

EXP Services Inc.
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f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

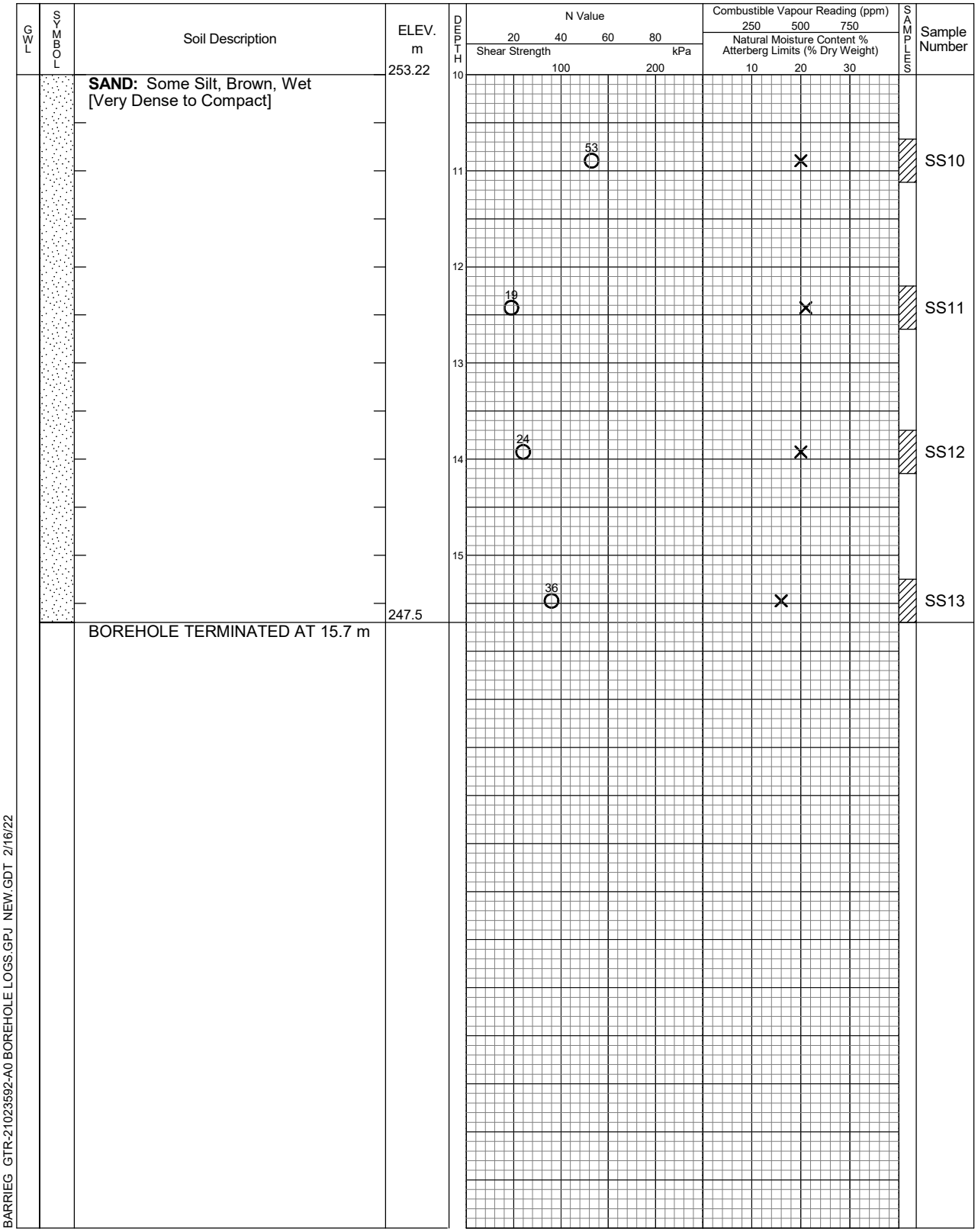
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	6.1	10.4

Log of Borehole 6

Project No. GTR-21023592-A0 Figure No. 7

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



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Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	6.1	10.4

Log of Borehole 7

Project No. GTR-21023592-A0 | Figure No. 8

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911675 N 609010 E

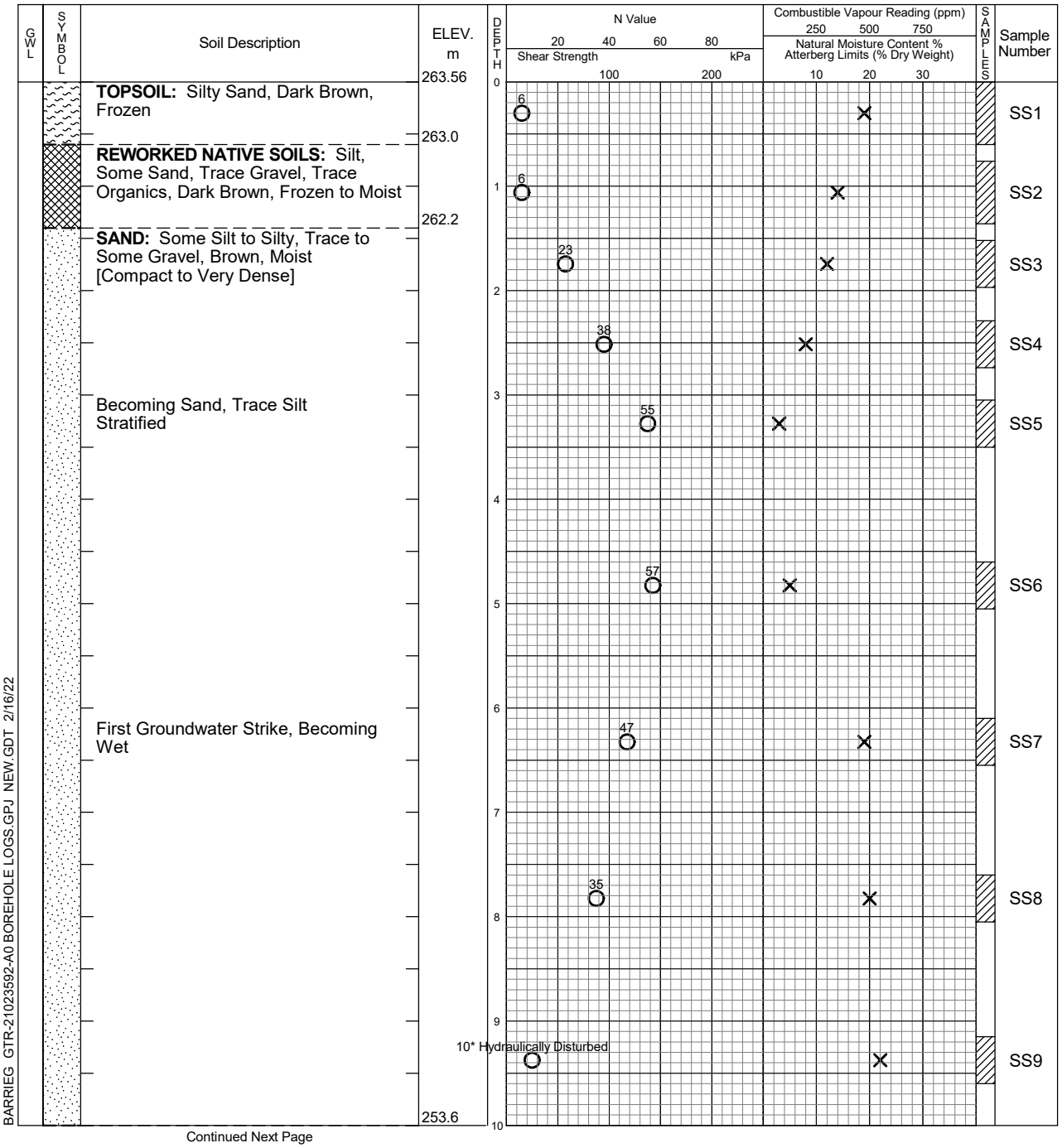
Date Drilled: January 28, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



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Borehole data requires interpretation assistance from EXP before use by others.

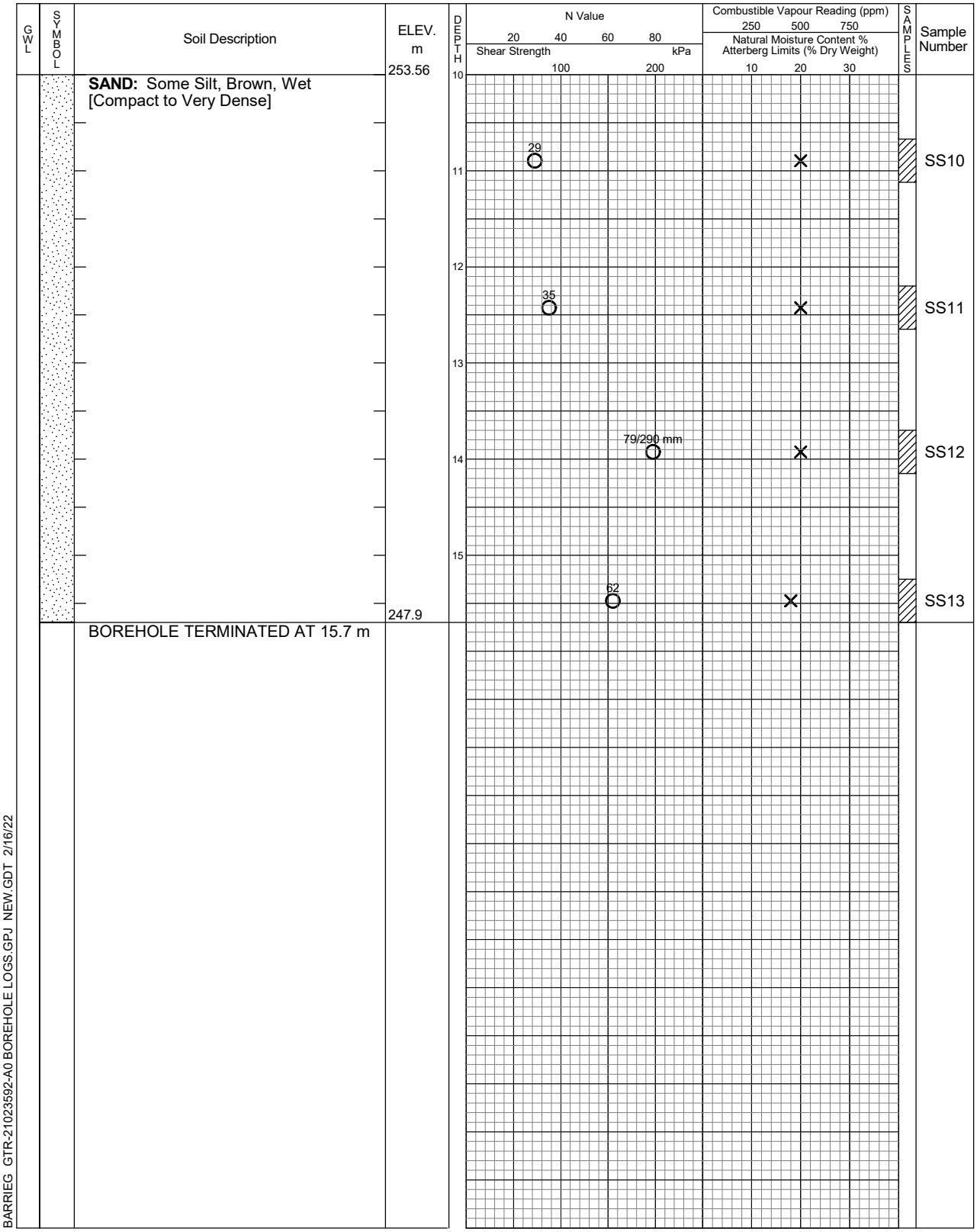
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	6.1	10.5

Log of Borehole 7

Project No. GTR-21023592-A0 Figure No. 8

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



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Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	6.1	10.5

Log of Borehole 8

Project No. GTR-21023592-A0 | Figure No. 9

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911644 N 608994 E

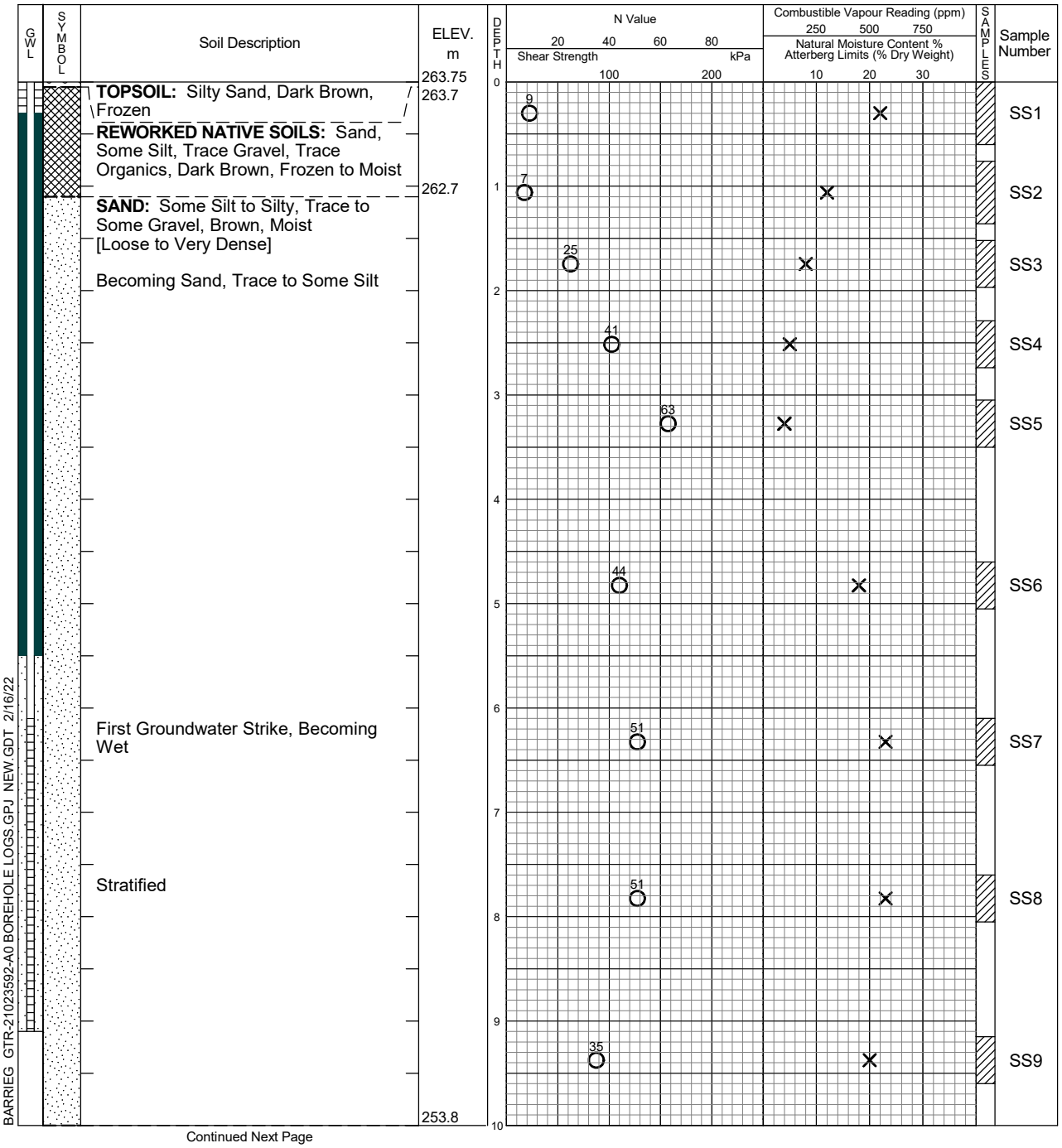
Date Drilled: January 26, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



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Borehole data requires interpretation assistance from EXP before use by others.

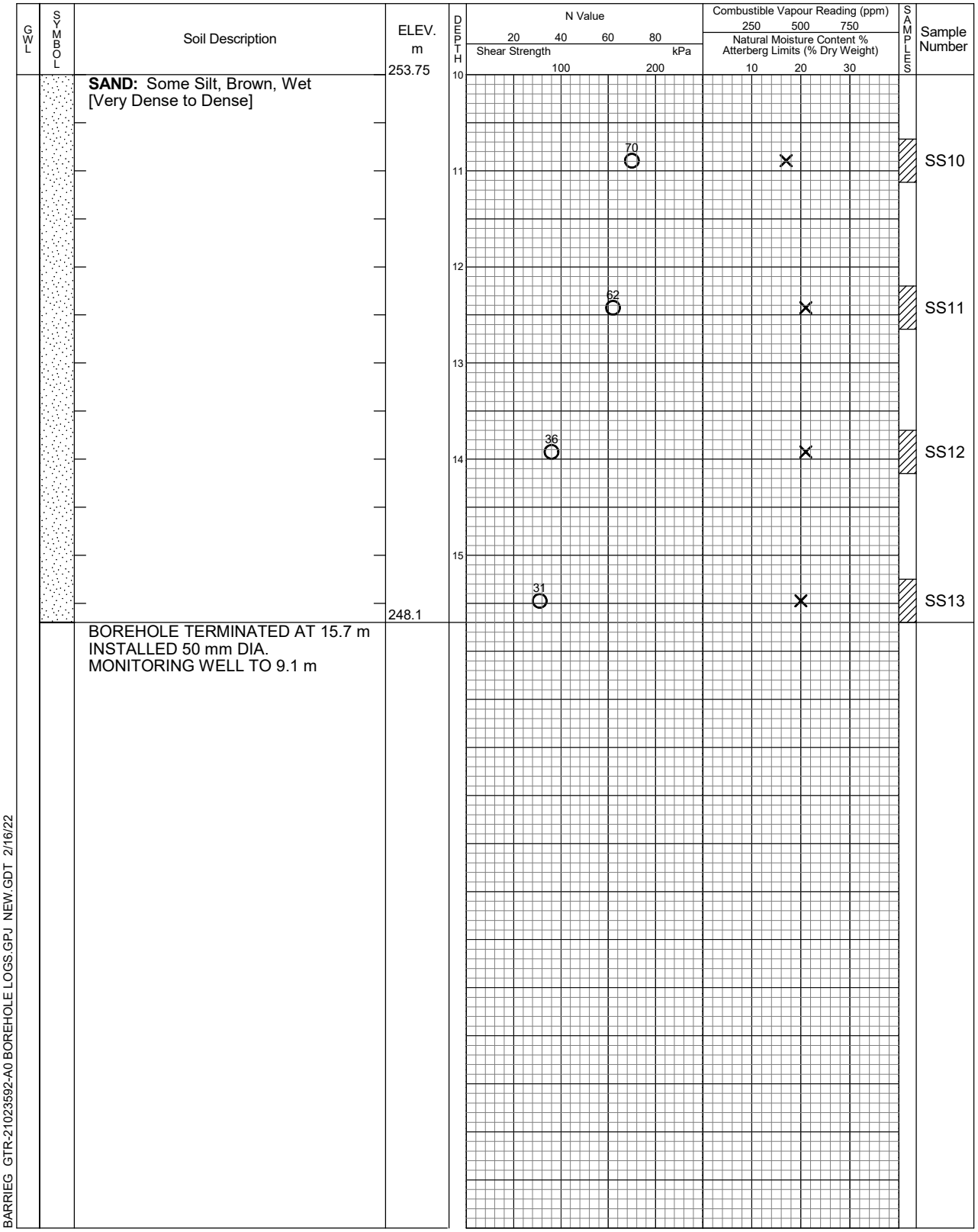
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	6.1	Install
Feb. 10, 2022	5.36 / 258.39	

Log of Borehole 8

Project No. GTR-21023592-A0 Figure No. 9

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

EXP Services Inc.
14 Cedar Pointe Drive
Barrie, ON L4N 5R7
t: +1.705.719.1100
f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	6.1	Install
Feb. 10, 2022	5.36 / 258.39	

Log of Borehole 9

Project No. GTR-21023592-A0 | Figure No. 10

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911714 N 609104 E

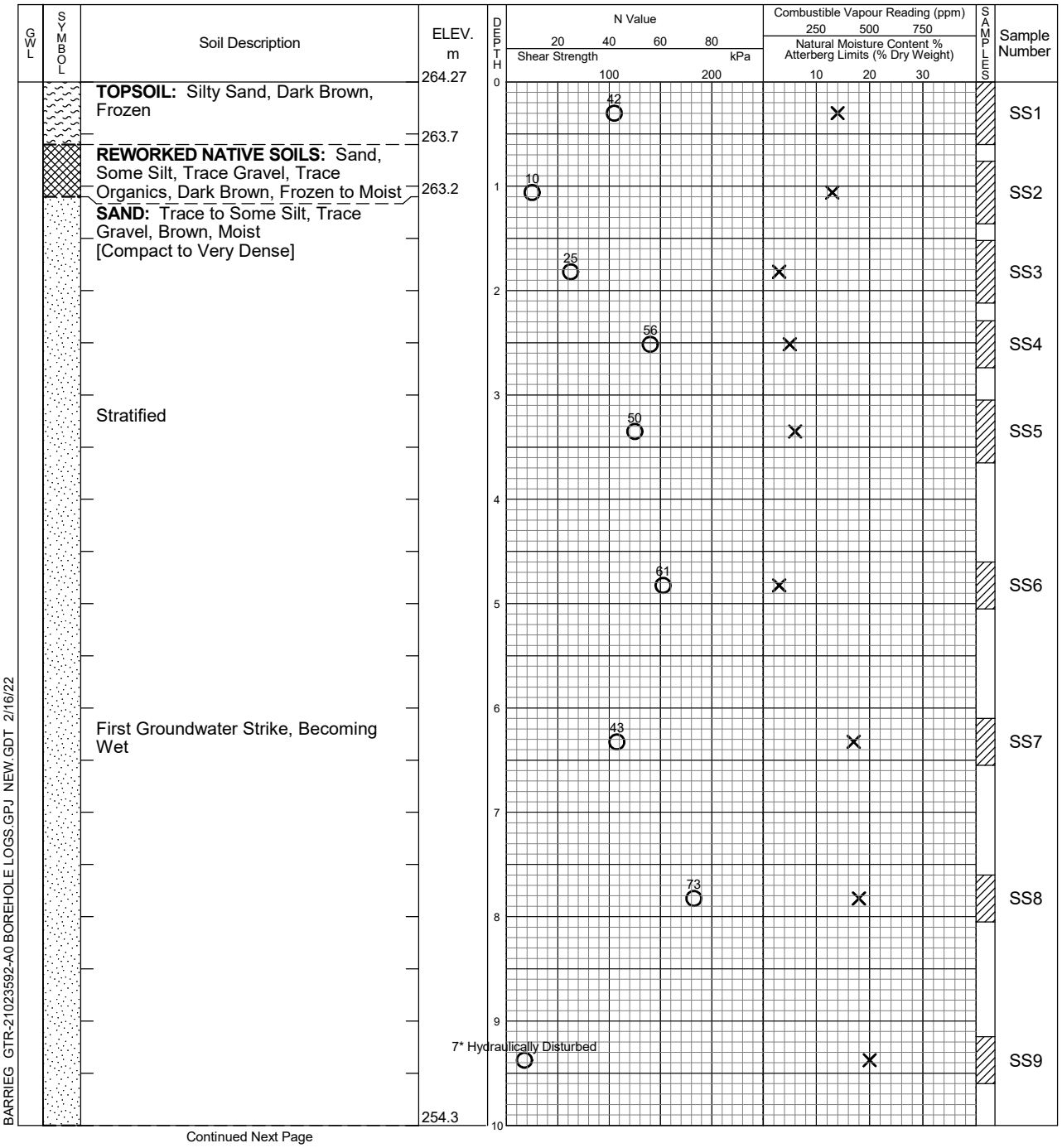
Date Drilled: January 18, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



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EXP Services Inc.
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Borehole data requires interpretation assistance from EXP before use by others.

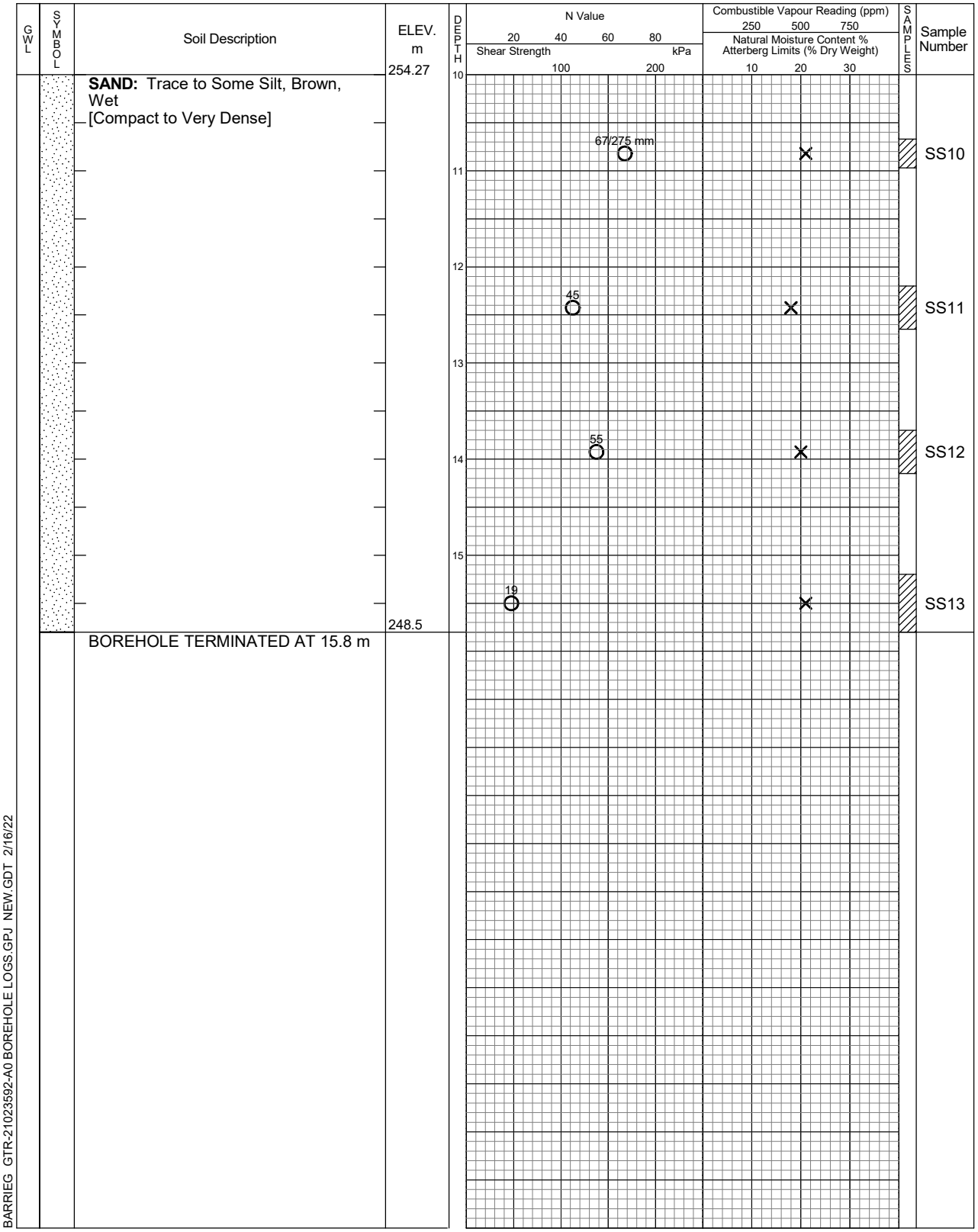
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	6.3	12.2

Log of Borehole 9

Project No. GTR-21023592-A0 Figure No. 10

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	6.3	12.2

Log of Borehole 10

Project No. GTR-21023592-A0 | Figure No. 11

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911682 N 609089 E

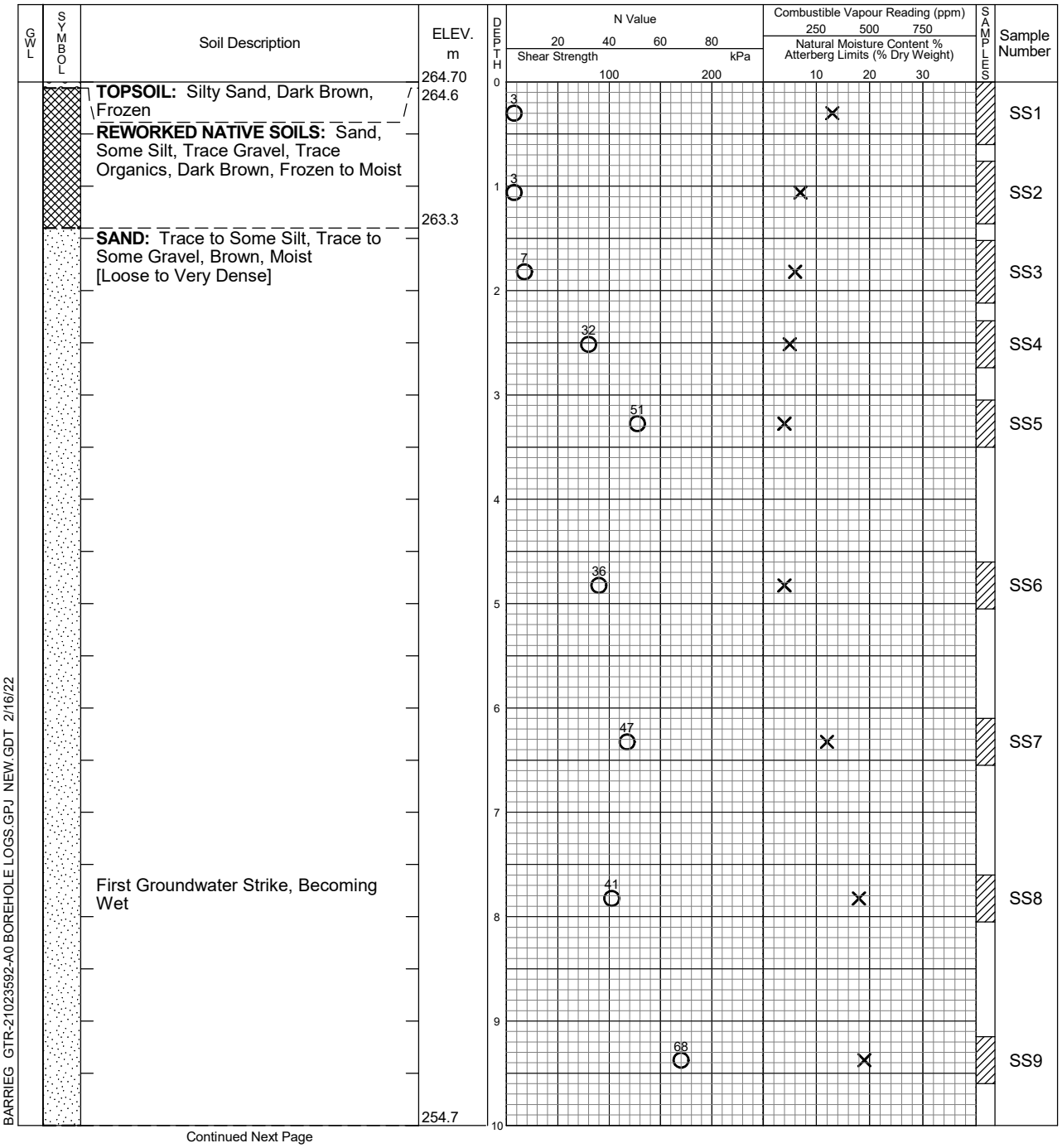
Date Drilled: January 25, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

Continued Next Page

EXP Services Inc.
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Borehole data requires interpretation assistance from EXP before use by others.

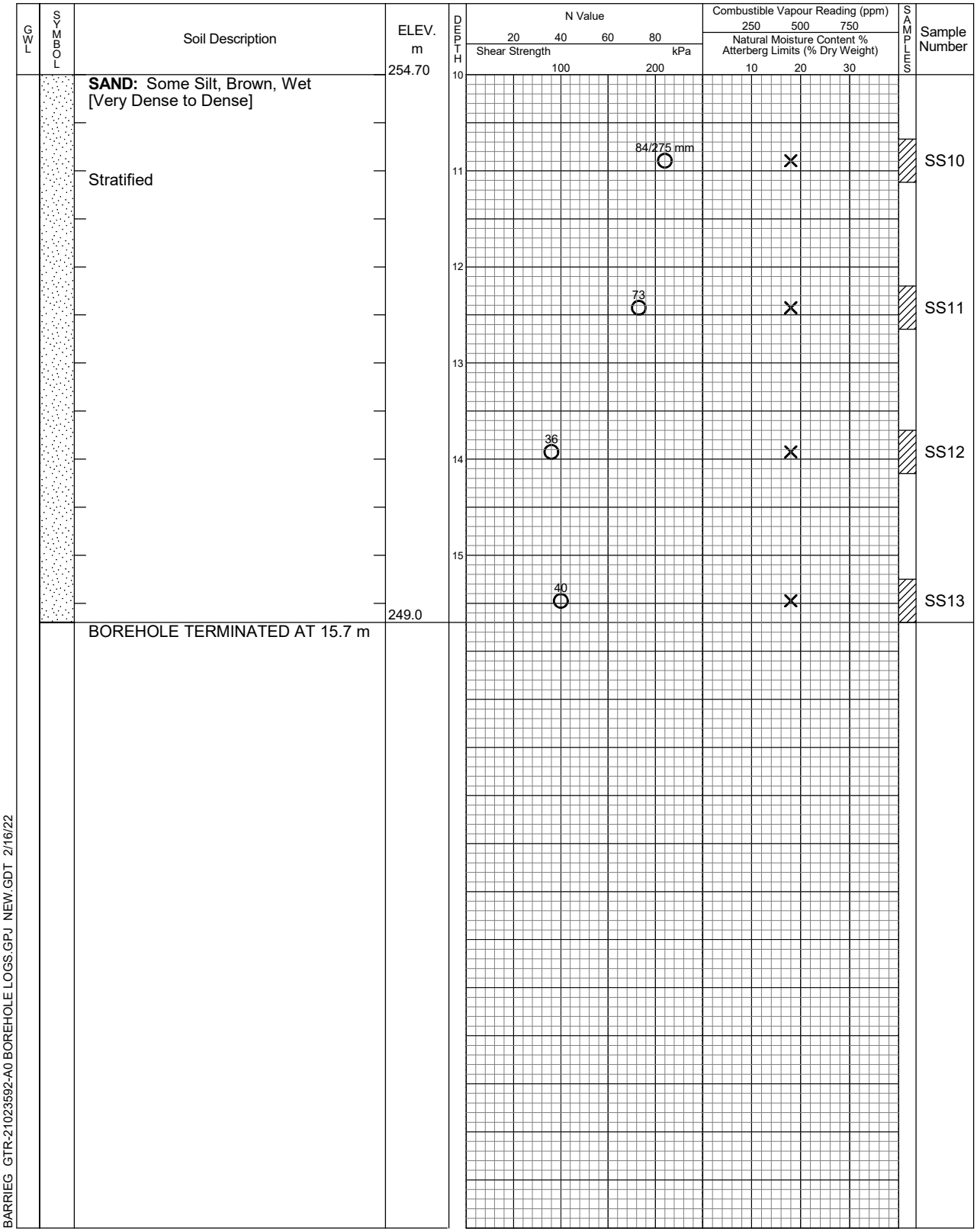
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	12.0

Log of Borehole 10

Project No. GTR-21023592-A0 Figure No. 11

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	12.0

Log of Borehole 11

Project No. GTR-21023592-A0 | Figure No. 12

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911646 N 609071 E

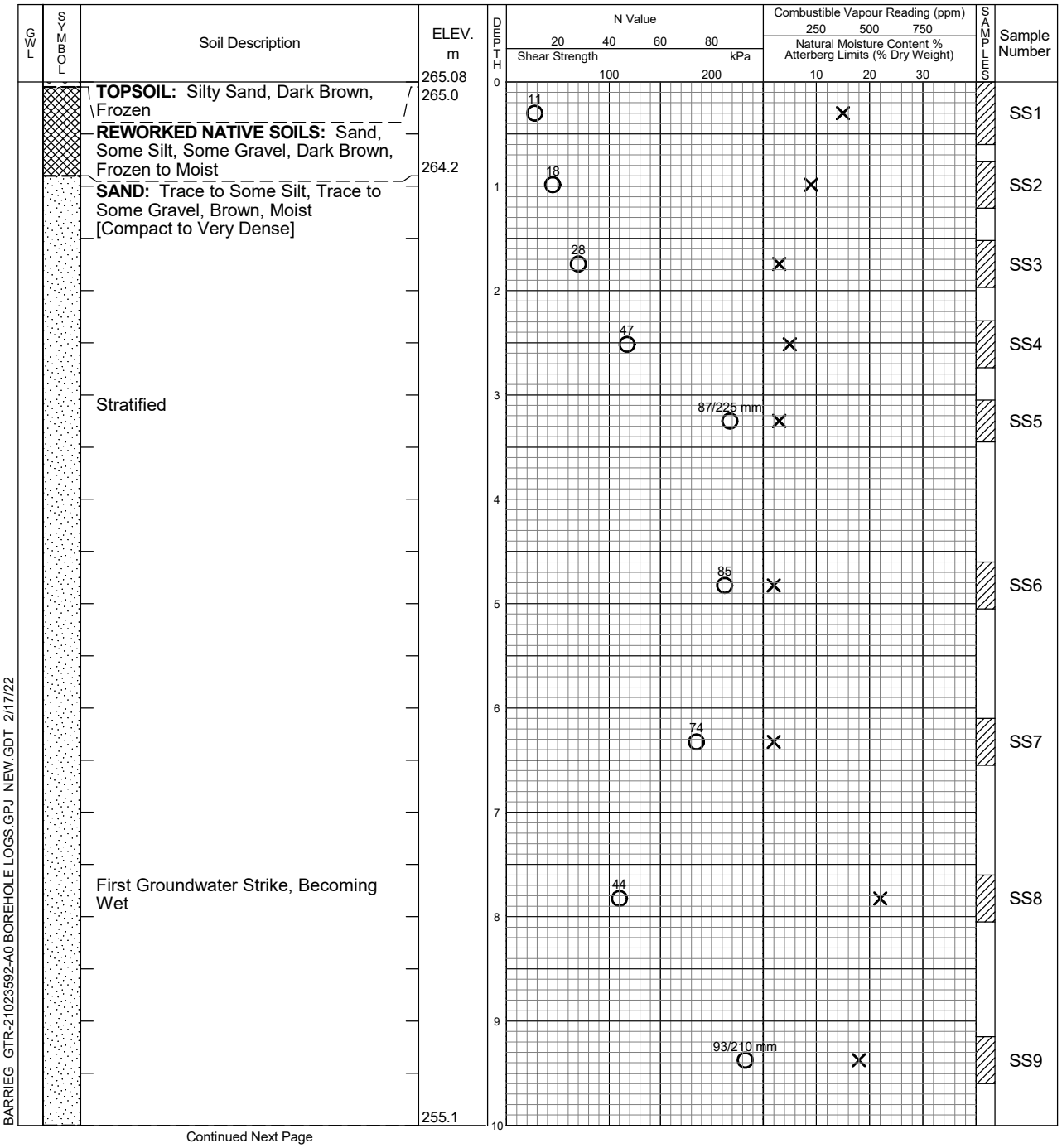
Date Drilled: January 25, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



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BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/17/22

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f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

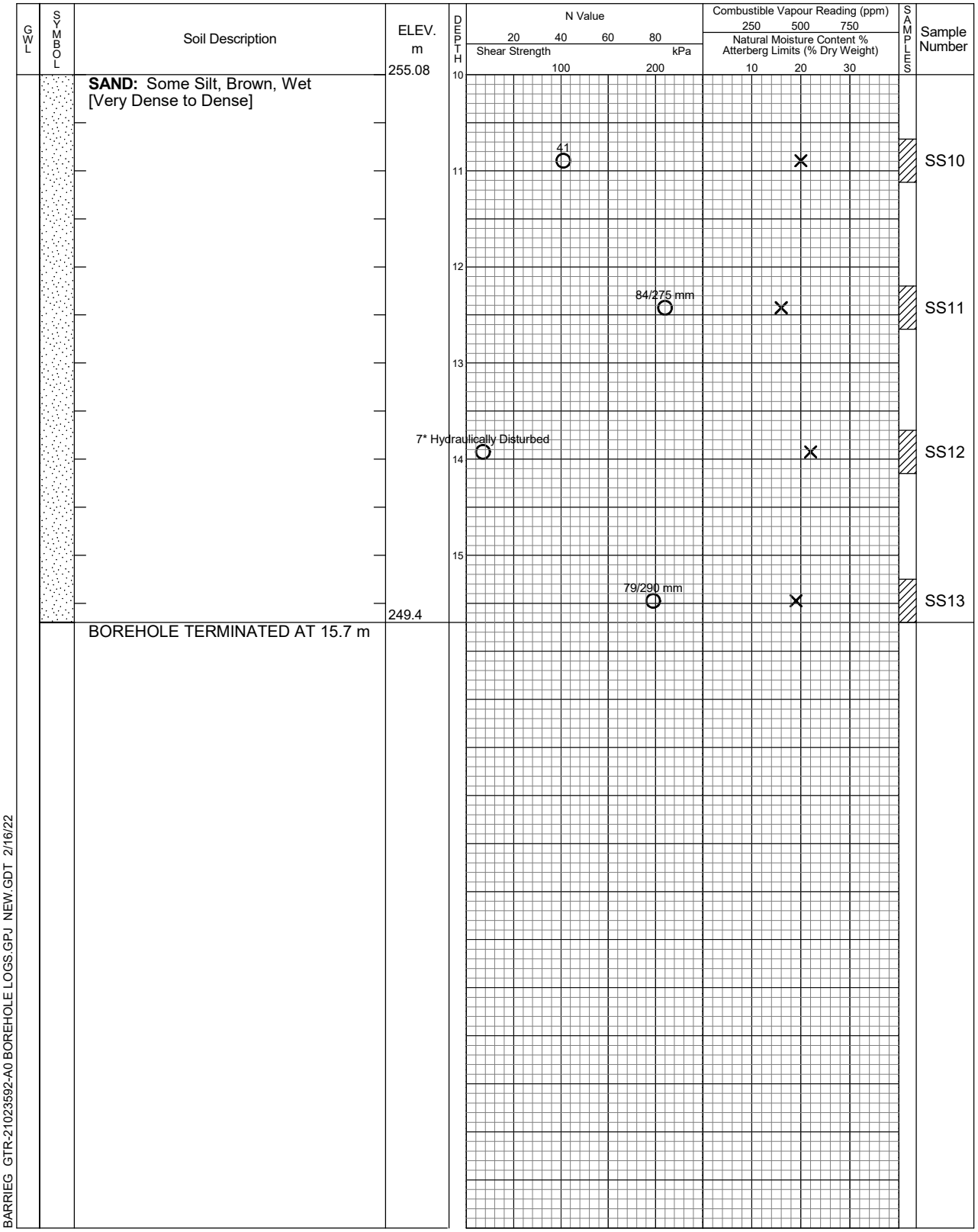
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	13.1

Log of Borehole 11

Project No. GTR-21023592-A0 Figure No. 12

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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Barrie, ON L4N 5R7
t: +1.705.719.1100
f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	13.1

Log of Borehole 12

Project No. GTR-21023592-A0 | Figure No. 13

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911612 N 609057 E

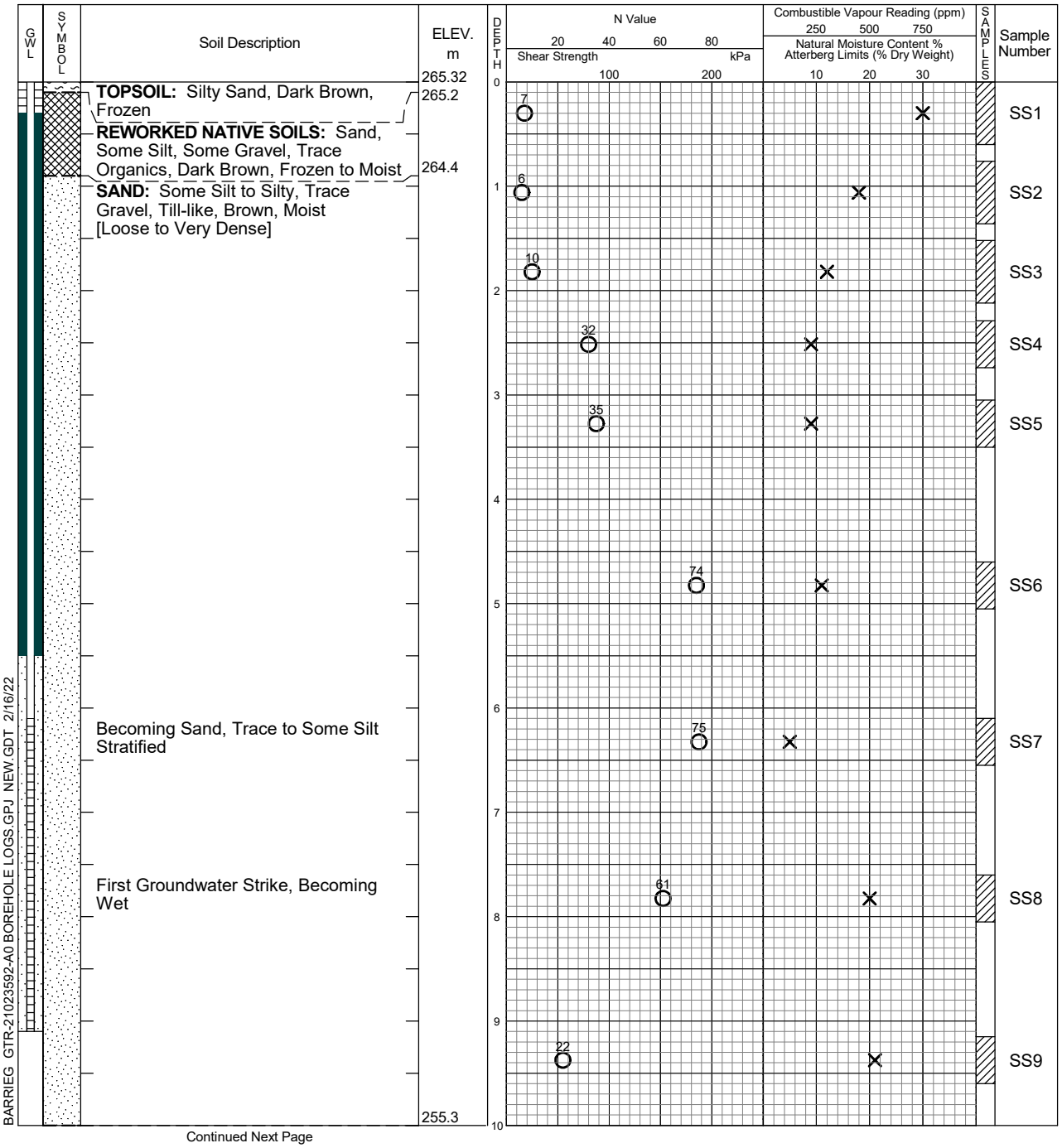
Date Drilled: January 24, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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EXP Services Inc.
14 Cedar Pointe Drive
Barrie, ON L4N 5R7
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f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

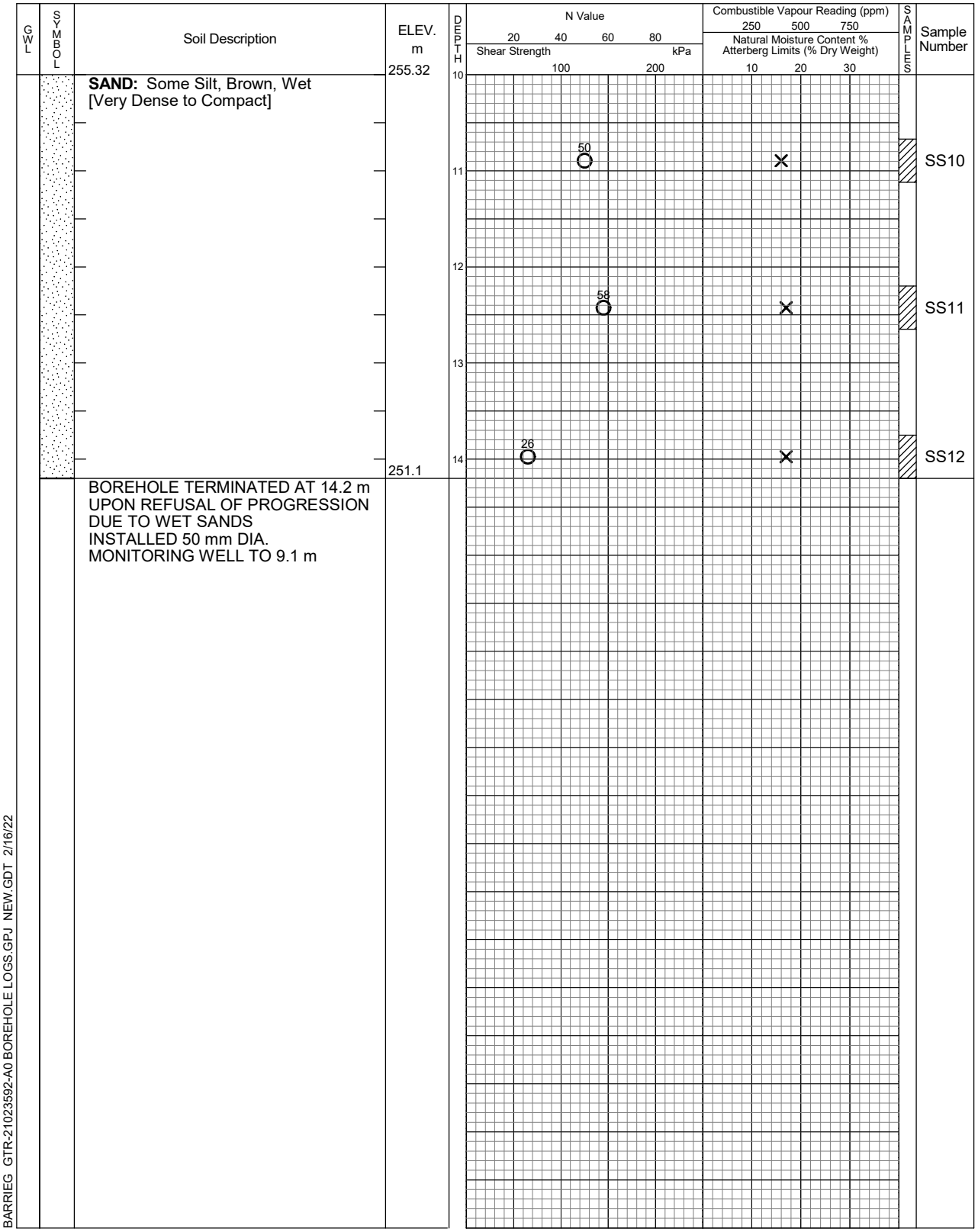
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	Install
Feb. 10, 2022	6.77 / 258.55	

Log of Borehole 12

Project No. GTR-21023592-A0 Figure No. 13

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	Install
Feb. 10, 2022	6.77 / 258.55	

Log of Borehole 13

Project No. GTR-21023592-A0 | Figure No. 14

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911693 N 609144 E

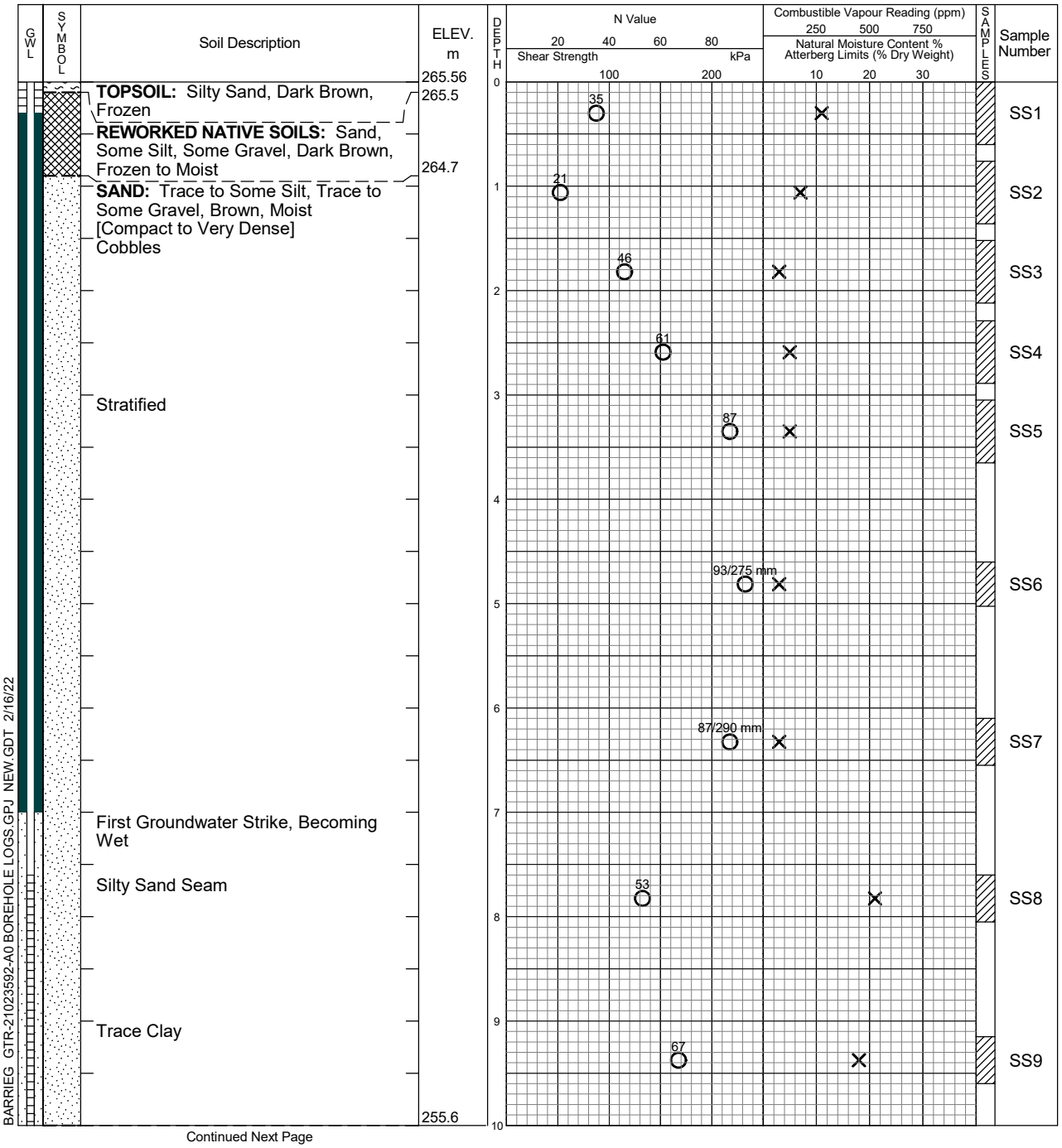
Date Drilled: January 17, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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EXP Services Inc.
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Borehole data requires interpretation assistance from EXP before use by others.

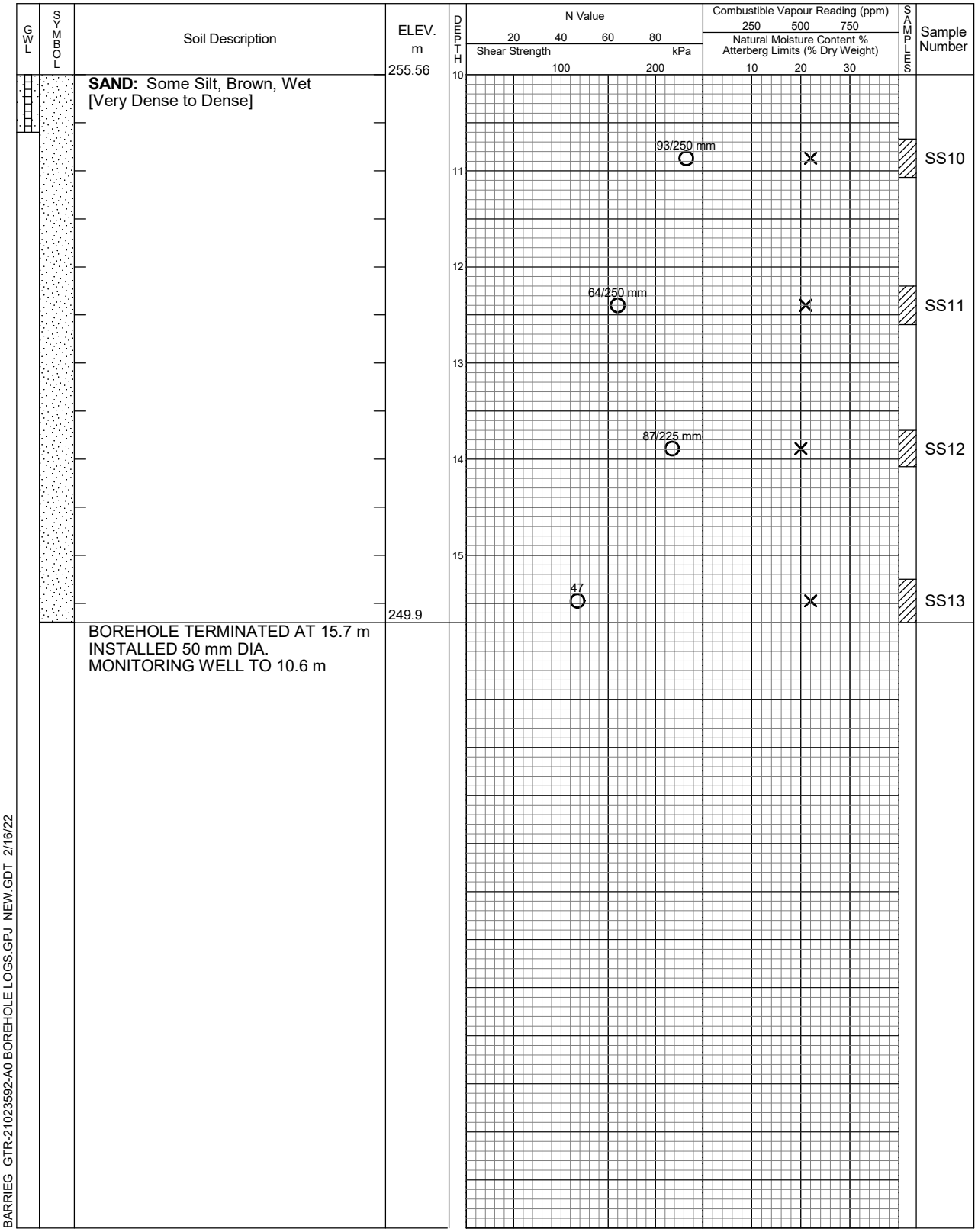
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	Install
Feb. 10, 2022	7.72 / 257.84	

Log of Borehole 13

Project No. GTR-21023592-A0 Figure No. 14

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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Barrie, ON L4N 5R7
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f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	Install
Feb. 10, 2022	7.72 / 257.84	

Log of Borehole 14

Project No. GTR-21023592-A0 | Figure No. 15

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911660 N 609131 E

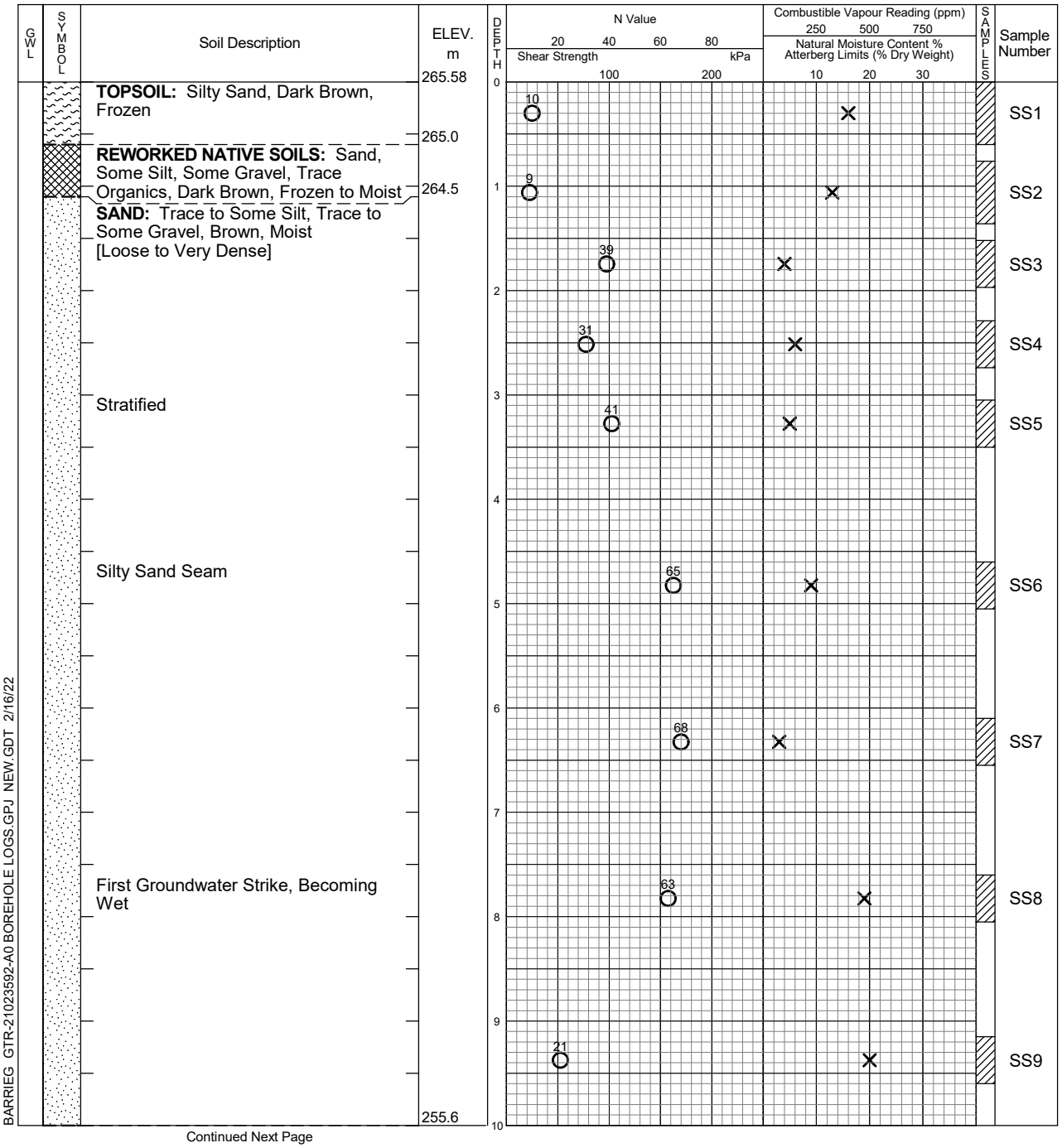
Date Drilled: January 20, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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EXP Services Inc.
14 Cedar Pointe Drive
Barrie, ON L4N 5R7
t: +1.705.719.1100
f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

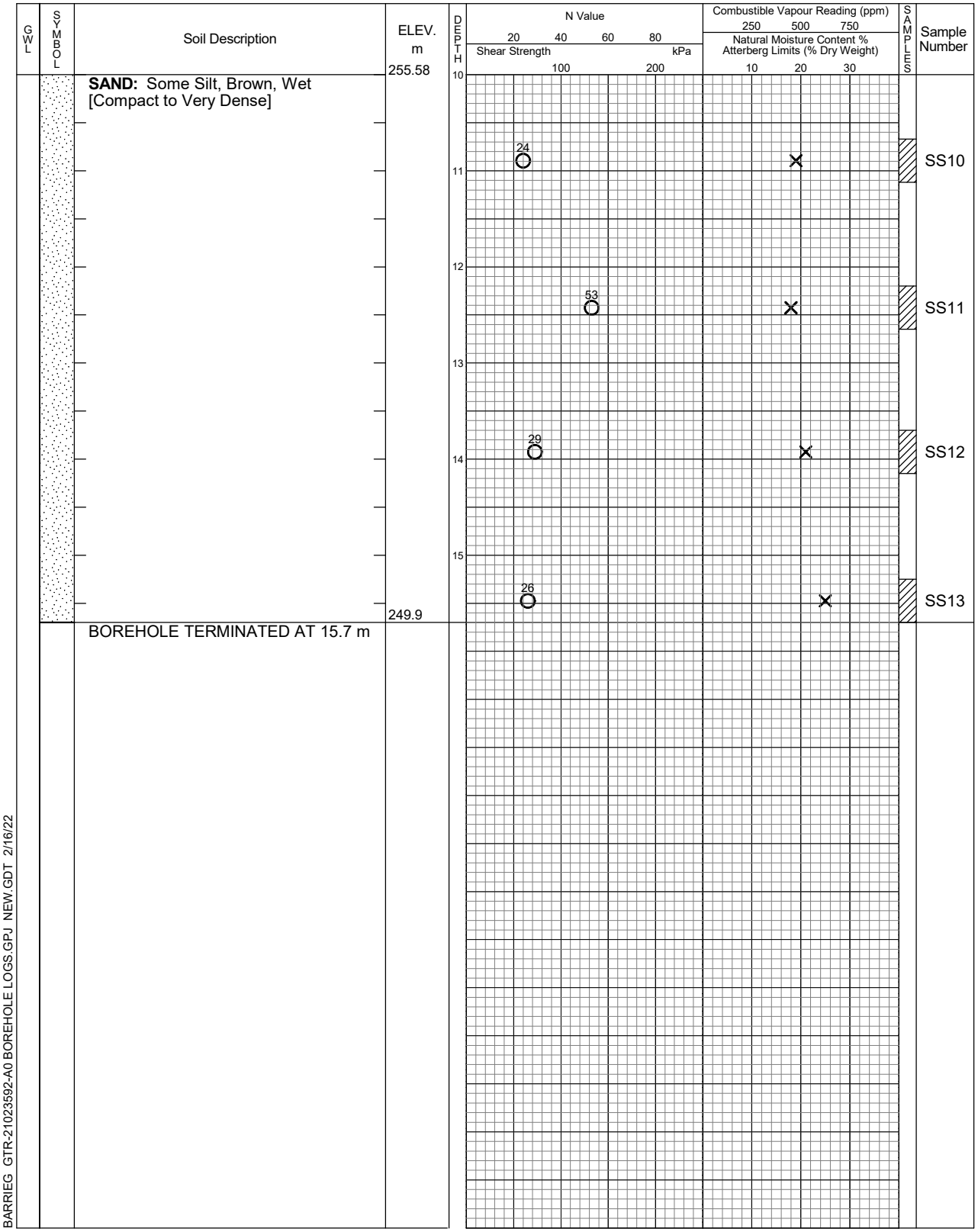
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	11.8

Log of Borehole 14

Project No. GTR-21023592-A0 Figure No. 15

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

EXP Services Inc.
14 Cedar Pointe Drive
Barrie, ON L4N 5R7
t: +1.705.719.1100
f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	11.8

Log of Borehole 15

Project No. GTR-21023592-A0 | Figure No. 16

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911625 N 609111 E

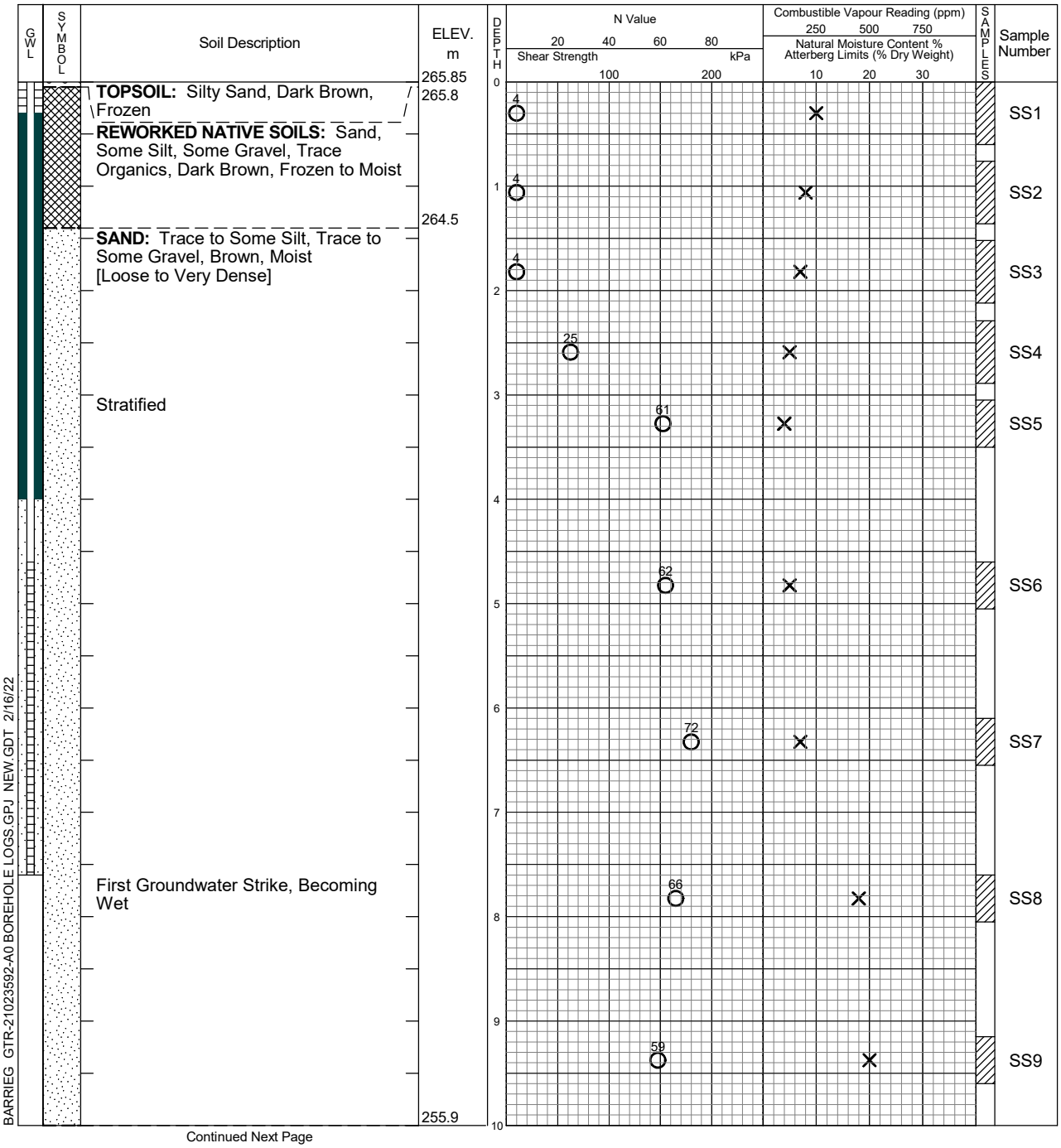
Date Drilled: January 21, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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EXP Services Inc.
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Barrie, ON L4N 5R7
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f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

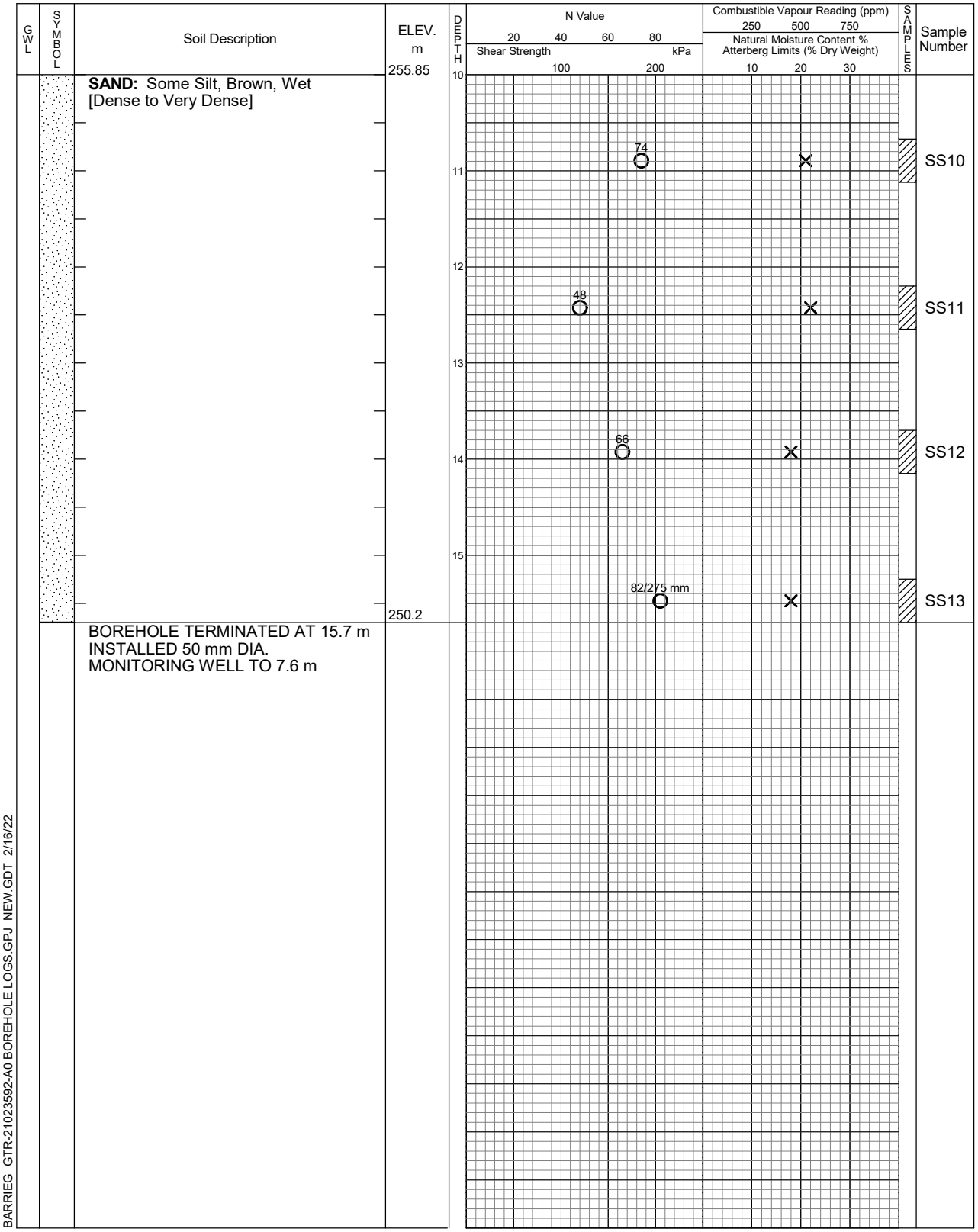
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	Install
Feb. 10, 2022	7.28 / 258.57	

Log of Borehole 15

Project No. GTR-21023592-A0 Figure No. 16

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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Barrie, ON L4N 5R7
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f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	Install
Feb. 10, 2022	7.28 / 258.57	

Log of Borehole 16

Project No. GTR-21023592-A0 | Figure No. 17

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911589 N 609094 E

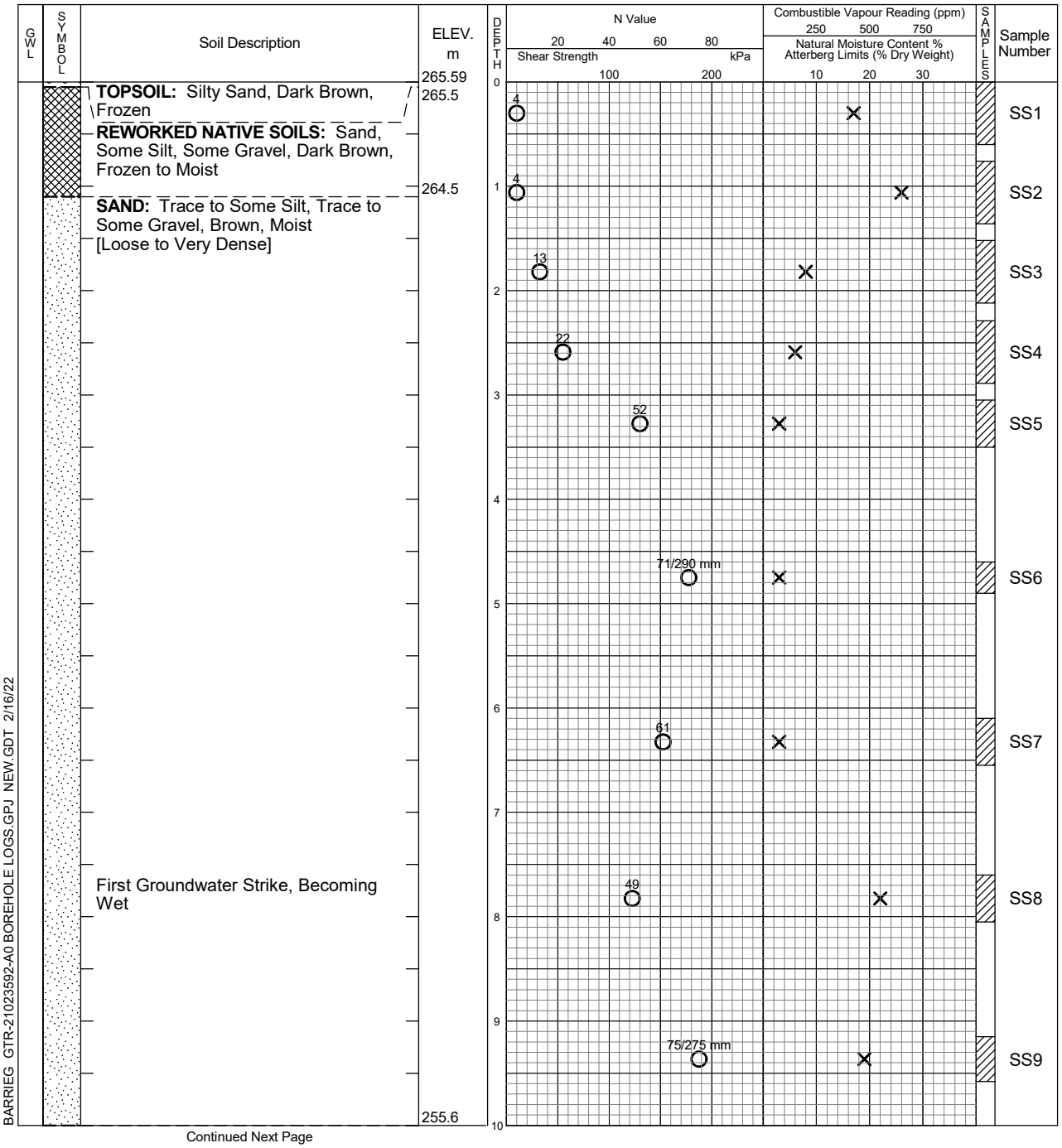
Date Drilled: January 20, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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EXP Services Inc.
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f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

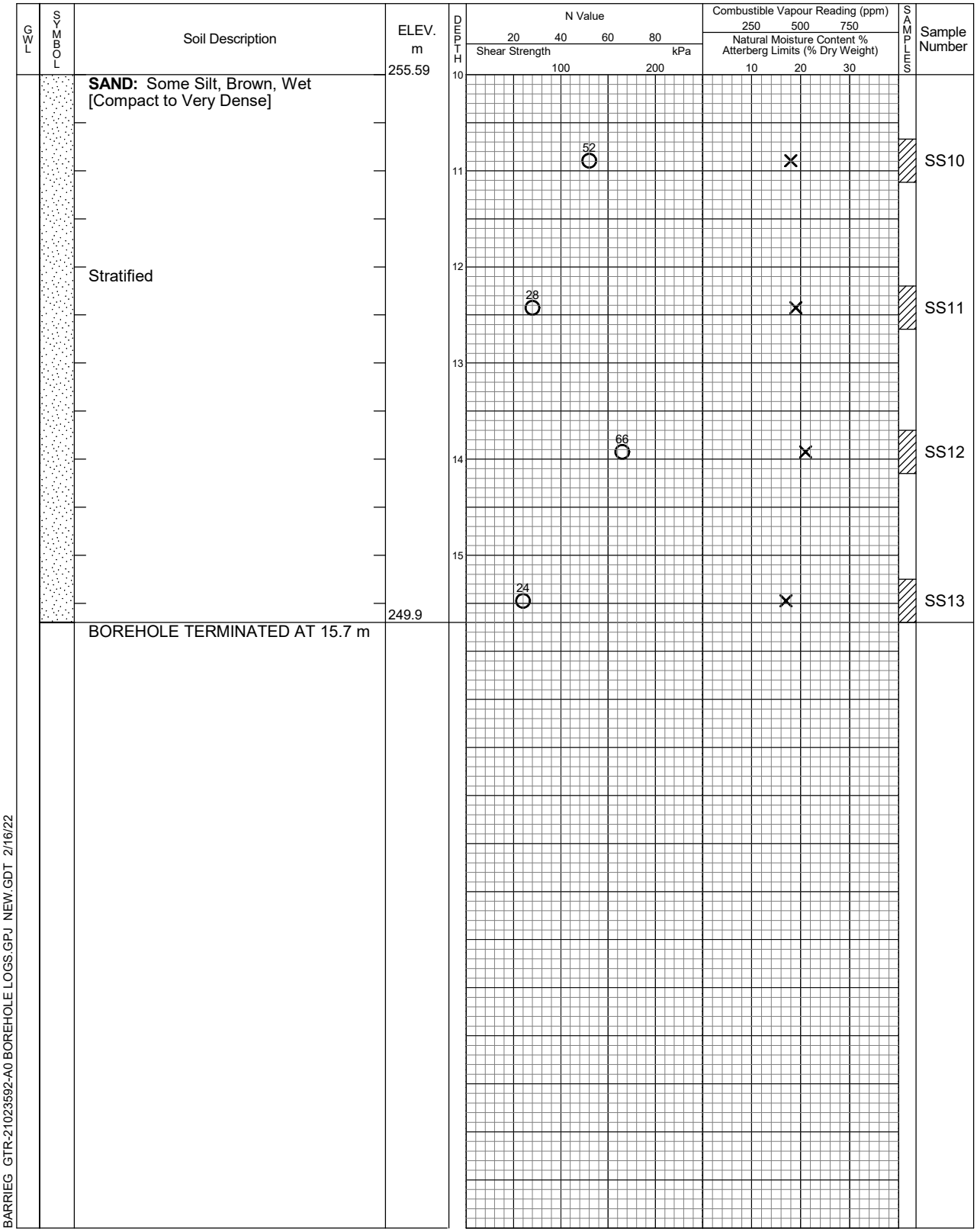
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	10.0

Log of Borehole 16

Project No. GTR-21023592-A0 Figure No. 17

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	10.0

Log of Borehole 17

Project No. GTR-21023592-A0 | Figure No. 18

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911574 N 609054 E

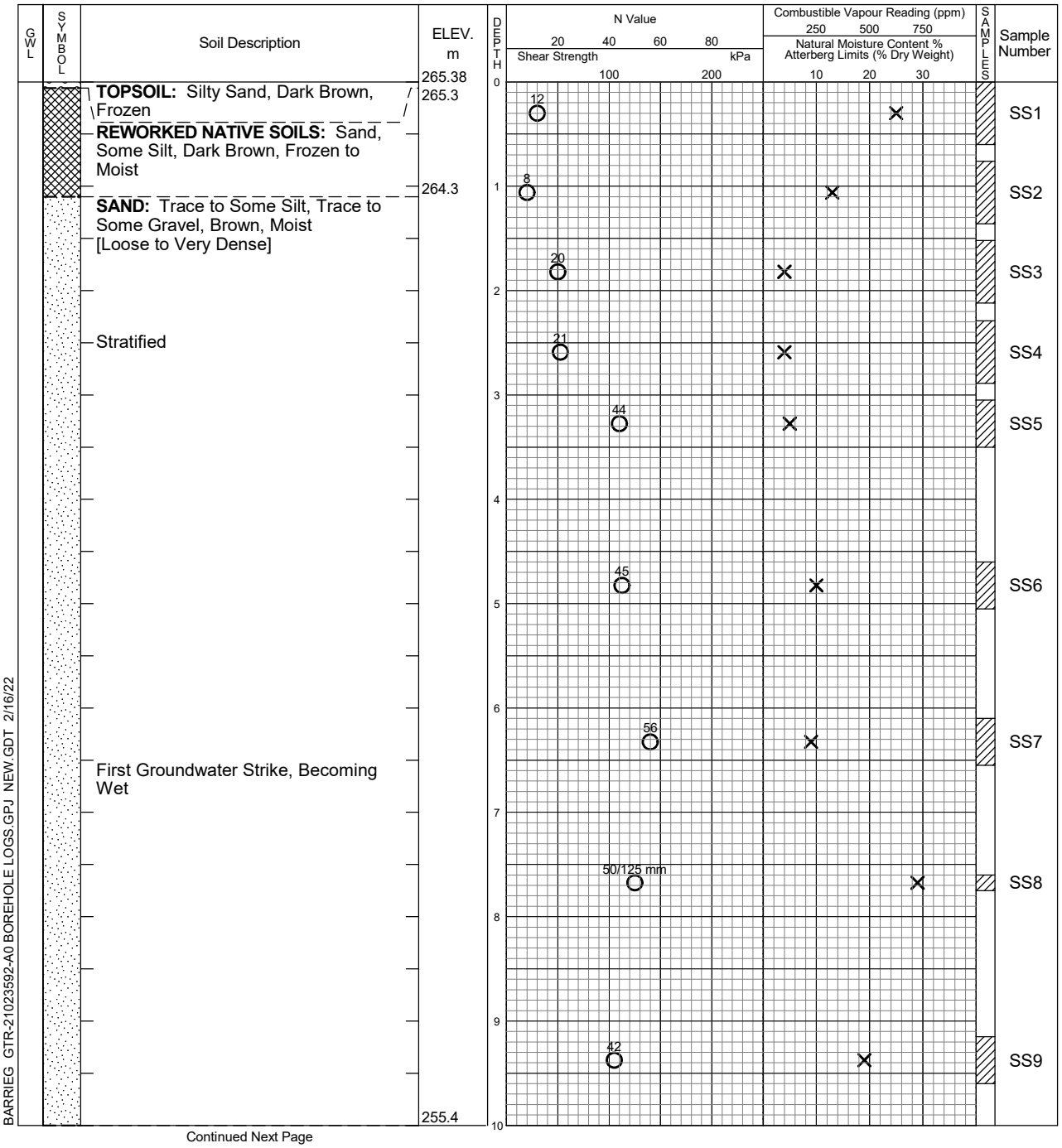
Date Drilled: January 24, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



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BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

EXP Services Inc.
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f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

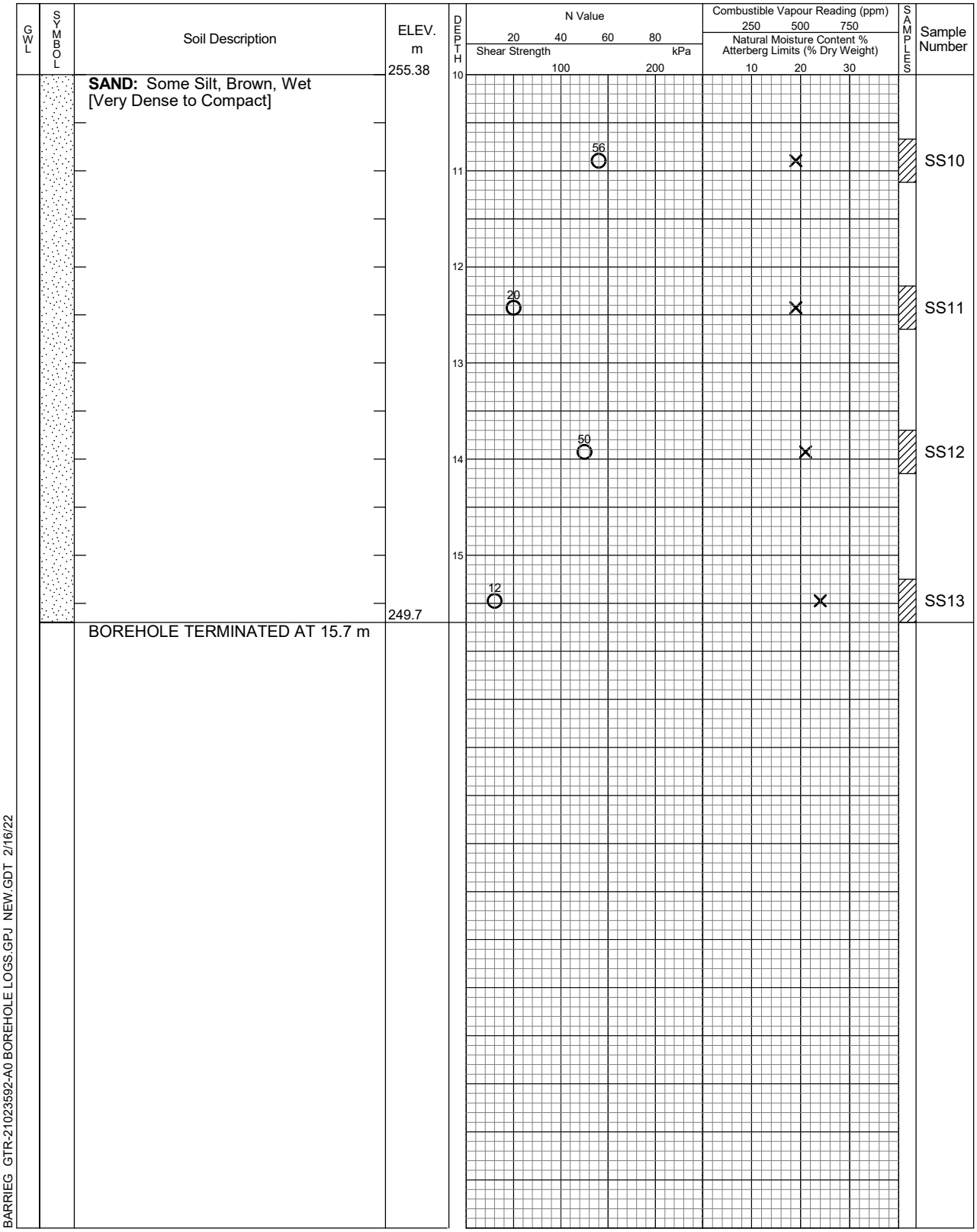
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	6.5	9.8

Log of Borehole 17

Project No. GTR-21023592-A0 Figure No. 18

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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Barrie, ON L4N 5R7
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f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	6.5	9.8

Log of Borehole 18

Project No. GTR-21023592-A0 | Figure No. 19

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 2

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911558 N 609087 E

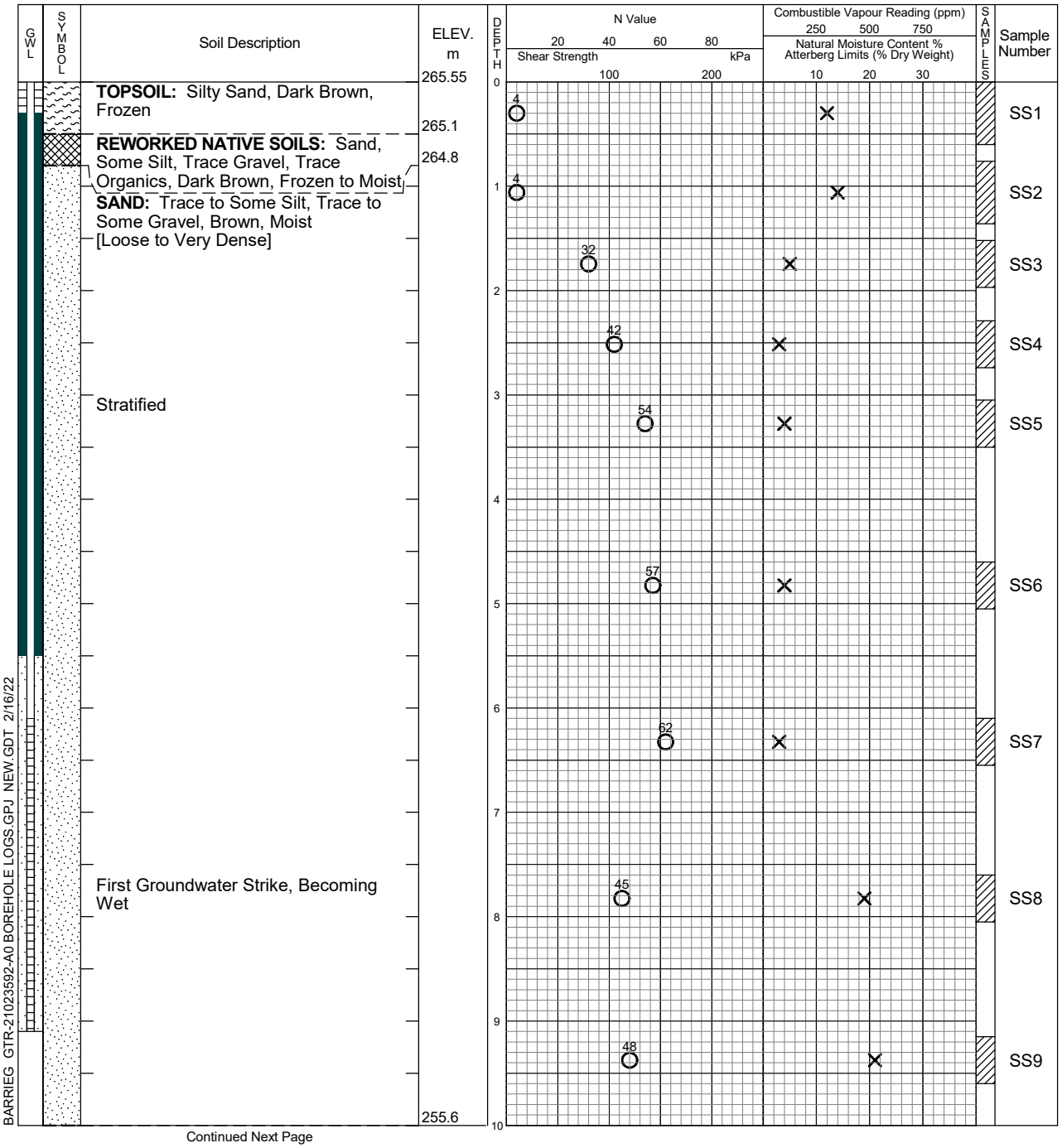
Date Drilled: January 21, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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EXP Services Inc.
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Barrie, ON L4N 5R7
t: +1.705.719.1100
f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

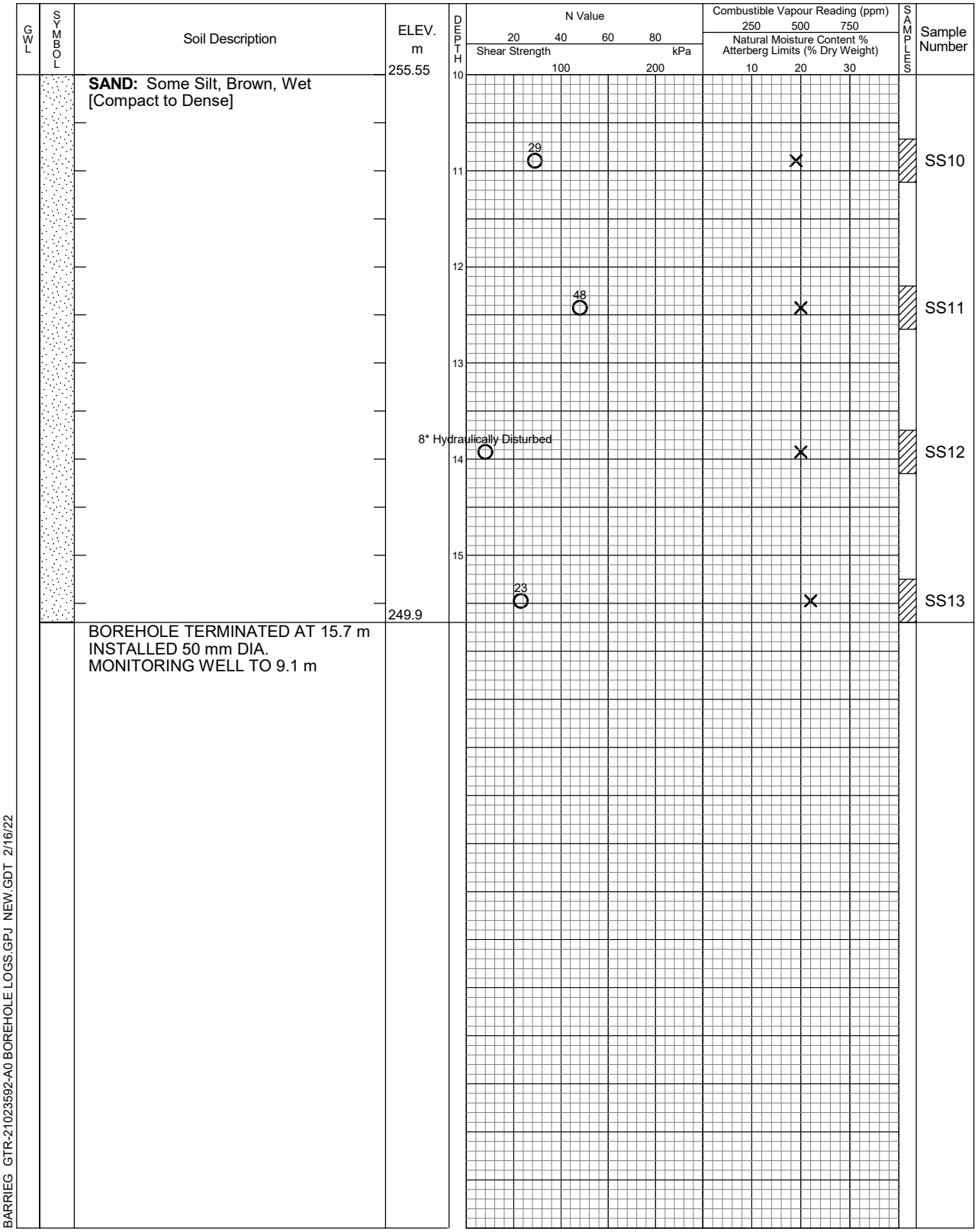
See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	Install
Feb. 10, 2022	6.83 / 258.72	

Log of Borehole 18

Project No. GTR-21023592-A0 Figure No. 19

Project: Proposed Long Term Care Facility & Retirement Homes Sheet No. 2 of 2



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

EXP Services Inc.
14 Cedar Pointe Drive
Barrie, ON L4N 5R7
t: +1.705.719.1100
f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	Install
Feb. 10, 2022	6.83 / 258.72	

Log of Borehole 19

Project No. GTR-21023592-A0 | Figure No. 20

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 1

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911776 N 608938 E

Date Drilled: January 19, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value / Shear Strength (kPa)	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Sample Number
		TOPSOIL: Silty Sand, Dark Brown, Frozen	261.98 261.9	0	10		SS1	SS1
		REWORKED NATIVE SOILS: Sand, Trace Silt, Trace Gravel, Trace Organics, Dark Brown, Frozen to Moist		1	16		SS2	SS2
		SAND: Trace to Some Silt, Trace to Some Gravel, Brown, Moist [Compact to Very Dense]	260.9	2	40		SS3	SS3
					37		SS4	SS4
				3	54		SS5	SS5
		BOREHOLE TERMINATED AT 3.5 m	258.5					

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Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	No Water	Open

Log of Borehole 20

Project No. GTR-21023592-A0 | Figure No. 21

Project: Proposed Long Term Care Facility & Retirement Homes | Sheet No. 1 of 1

City/ Municipality: 800 Yonge Street, Barrie, ON

Location: 17T 4911749 N 608924 E

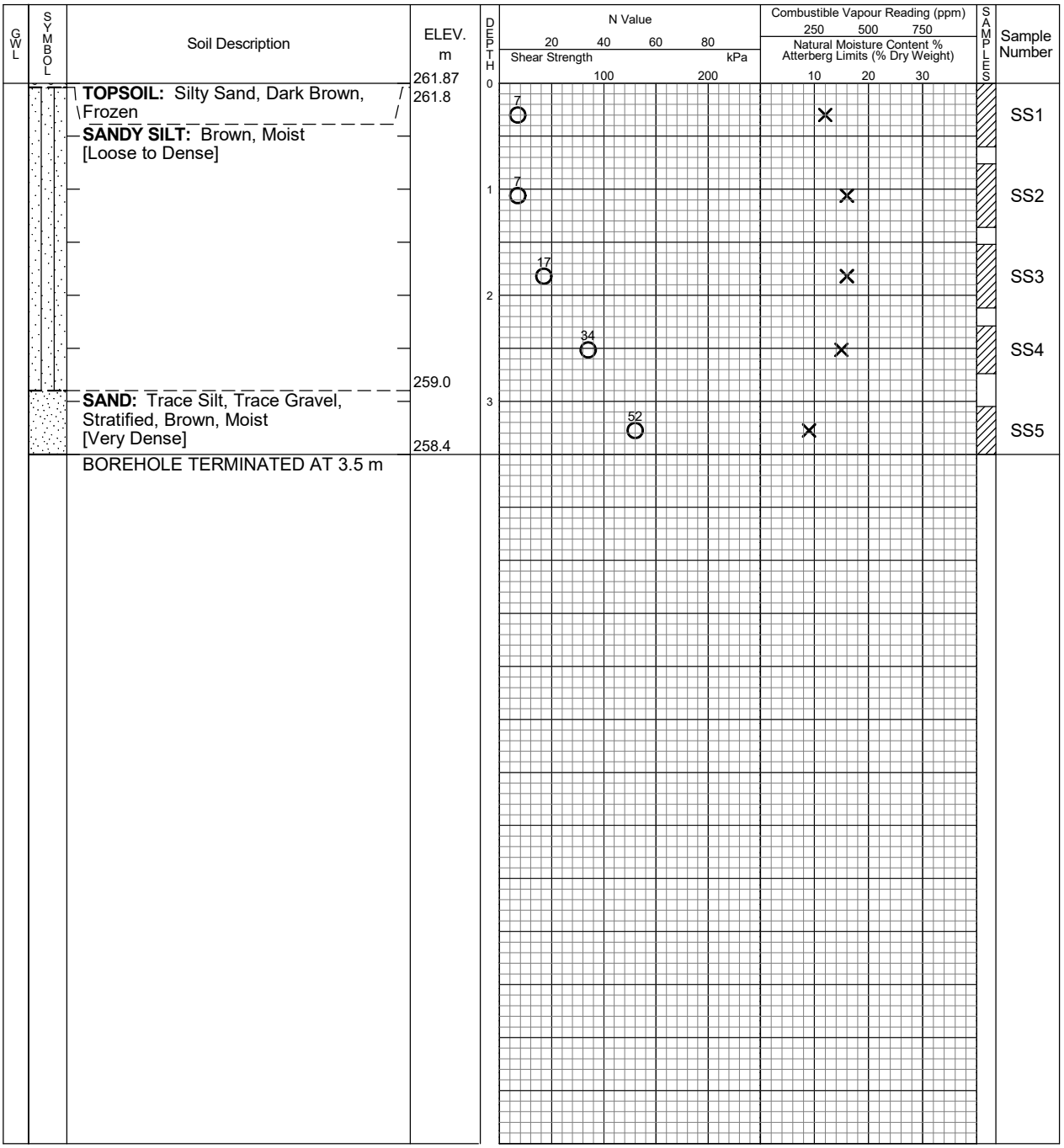
Date Drilled: January 19, 2022

Drill Type: Rubber Tire, Hollow Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG GTR-21023592-A0 BOREHOLE LOGS.GPJ NEW.GDT 2/16/22

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Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	No Water	Open

EXP Services Inc.
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Barrie, Ontario, Canada
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Tel.: +1.705.719.1100
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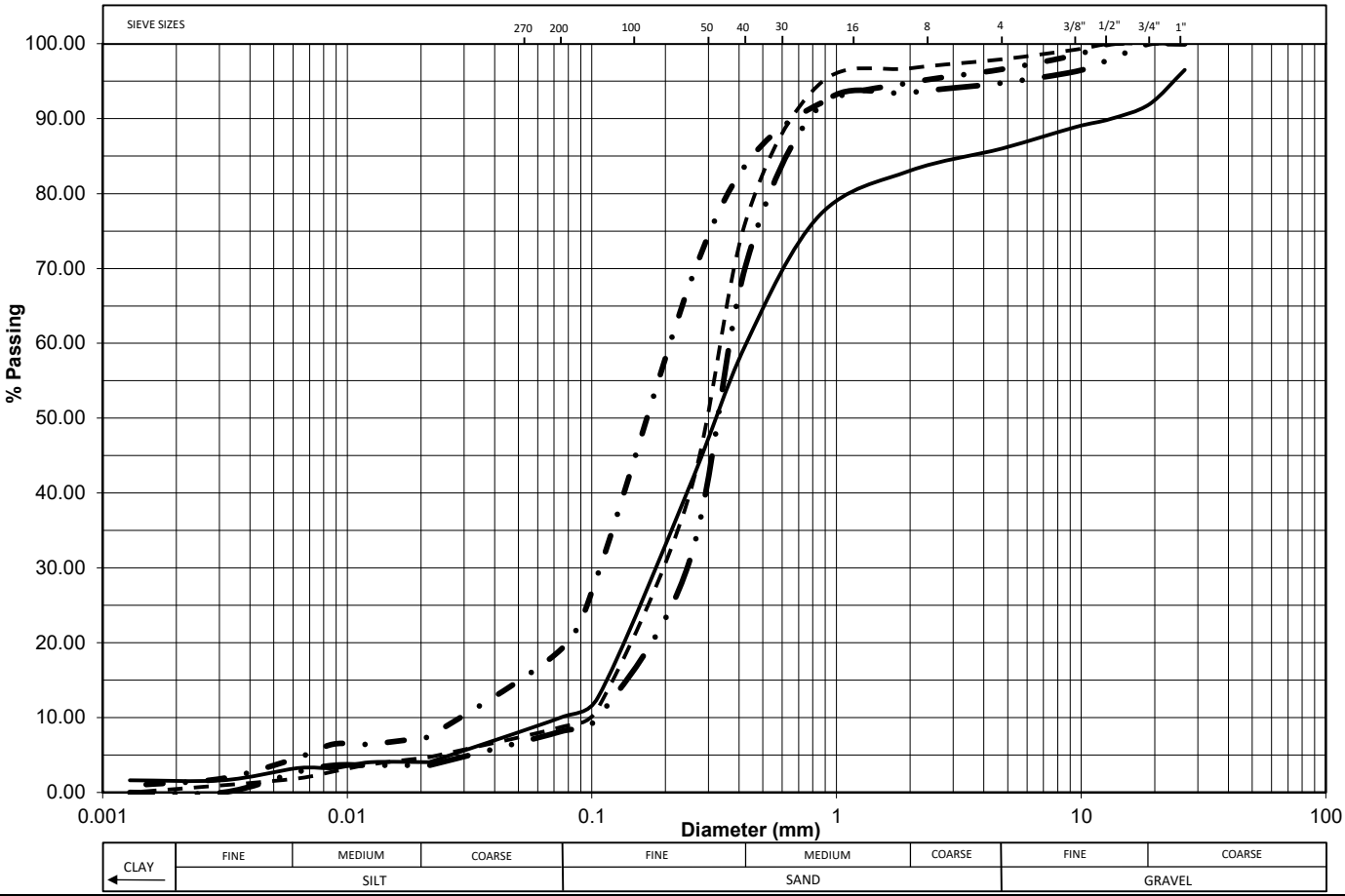
Grain Size Analysis Report

Project Name: Proposed Long Term Care Facility & Retirement Homes
Figure No.: 22
Project No.: GTR-21023592-A0
Date Tested: Feb. 9, 2022
Client: Schlegel Villages Inc.
Date Sampled: Jan. 17 to 28, 2022

SAMPLE INFORMATION

Material	Borehole No. and Sample No.	Sample Depth (m)	Material Description	Graph Line Type
1	BH1 SS7	6.1 - 6.5	SAND, Some Gravel, Trace Silt, Trace Clay	
2	BH3 SS6	4.6 - 5.0	SAND, Trace Silt, Trace Gravel	
3	BH13 SS9	9.1 - 9.5	SAND, Some Silt, Trace Gravel, Trace Clay	
4	BH15 SS7	6.1 - 6.5	SAND, Trace Silt, Trace Gravel	

Sieve & Hydrometer Analysis



DISTRIBUTION:

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