12035 Dixie Road Proposed Industrial Development

Geotechnical Investigation

Project Location:
12035 Dixie Road
Caledon, ON

Prepared for:
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1.0 Introduction

MTE Consultants Inc. (MTE) was retained by Tribal Partners to conduct a geotechnical investigation for the property located at 12035 Dixie Road in Caledon, Ontario, as shown on **Figure 1 in Appendix A**. The site is currently used for agricultural purposes and is approximately 125 acres in area. The site contains associated agricultural buildings, with exterior parking and driveway areas.

Based on the preliminary plan provided by Tribal Partners, the proposed development will consist of multiple large industrial buildings with associated stormwater management areas, driveways and parking lots.

The purpose of this geotechnical investigation is to determine the soil and groundwater conditions in the area of the proposed development and provide geotechnical engineering recommendations for site grading, site servicing, foundations, floor slabs, pavement design, and subdrainage requirements.

2.0 Field and Laboratory Program

The fieldwork for this investigation was carried out between October 30 and November 13, 2020 and February 4 and 5, 2021 and involved the drilling of fifty-five boreholes (Boreholes MW101-20 to MW155-21) to depths ranging from 3.5 to 12.8 m with Boreholes BH135-20 and BH142-20 only being drilled to a depth of 3 m due to auger refusal on boulders. The locations of the boreholes are shown on the Site Plan, **Figure 2 in Appendix A**.

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

The boreholes were advanced with a CME 75 track mounted drill rig and a Geoprobe 7822DT track mounted drill rig equipped with continuous flight solid stem and hollow stem augers, supplied and operated by Tri-Phase Group and Orbit Drilling Inc.

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

Cohesive soil samples were tested using a pocket penetrometer to determine approximate shear strengths. The results of the penetrometer testing are plotted on the appended borehole logs.

Upon completion of drilling, nine 51 mm diameter monitoring wells were installed in MW101-20 to MW108-20 and MW155-21 to allow measurement of stabilized groundwater levels and groundwater sampling and testing, if required. The installations comprised 1.5 or 3.0 m filtered screen and bentonite seals above the screen. The monitoring wells were installed in accordance with Ontario Regulation 468/10. A licensed well technician must properly decommission all wells before construction. The construction, maintenance and abandonment of the wells are regulated under the province's Water Resources Act. The remaining boreholes were backfilled with soil cuttings and bentonite in accordance with Ontario Regulation 468/10 (formerly O. Reg. 903) under the provinces Water Resources Act.

Stabilized water level measurements were taken by MTE on December 14, 2020. Details of the installation and groundwater observations and measurements are provided on the appended borehole logs.

The fieldwork was monitored throughout by a member of our geotechnical engineering staff, who directed the drilling procedures; documented SPT tests; conducted pocket penetrometer tests; documented the soil stratigraphies; monitored the groundwater conditions; and transported the recovered soil samples back to our office for further classification.

The ground surface elevations at the borehole locations were surveyed by MTE OLS Ltd. and referenced to geodetic datum.

All of the soil samples collected were submitted for moisture content testing, ten soil samples were submitted for particle size distribution analyses and one for Atterberg limit determinations. The results of the laboratory tests are provided in **Appendix C**. The remaining soil samples will be stored for a period of 1 month and will be discarded of at that time without prior request from the client to extend storage time.

3.0 Soil Conditions

Reference is provided to the appended borehole logs for soil stratigraphy details, SPT N-values, approximate shear strength values, moisture content profiles, and groundwater observations and measurements. Soil conditions encountered at the site typically include topsoil and/or fill overlying glacial till deposits interlayered with sand and silt deposits.

3.1 Topsoil

Topsoil was encountered surficially in all the boreholes except for MW106-20 and BH142-20. The topsoil was 150 to 760 mm thick (average thickness = 285 mm). The topsoil is dark brown in colour and typically ranges in composition from clayey silt to silt to sandy silt. Topsoil was determined through visual observation and no nutrient testing for applicable plant growth was performed as part of the scope of work for this project.

3.2 Granular Fill

Granular fill was encountered surficially in Boreholes MW106-20 and BH142-20. The granular fill was 300 to 400 mm thick. The granular fill is brown in colour and comprised of sand and gravel. Asphalt fragments were encountered in the granular fill in Borehole MW106-20. The SPT N-values measured in the fill were 17 and 28 blows per 300 mm penetration of the split spoon sampler indication compact conditions.

The insitu moisture content in the fill were about 3 and 11% indicating moist conditions.

3.3 Fill

Fill was encountered beneath the topsoil or granular fill in all the boreholes except for Boreholes MW108-20, BH132-20, and BH138-20. The fill extended to depths of 0.6 to 0.8 m and consisted of reworked native material caused by agricultural activities through the years. The fill is grey to brown to dark brown in colour with mottled to monochrome appearance and typically ranges in composition from clayey silt to silt to sandy silt. Organic content was encountered in the fill material in Boreholes BH113-21, BH117-20, BH120-21, BH125-20, BH146-20 and MW155-21. Sand seams were encountered in the fill in Borehole BH153-20. The SPT N-values measured in the fill ranged from 4 to 28 blows per 300 mm penetration of the split spoon sampler indicating loose to compact conditions or soft to very stiff conditions.

The insitu moisture content in the fill ranged from 3 to 24% indicating moist to very moist conditions or drier than the plastic limit to at the plastic limit.

3.4 Glacial Till Deposits

Glacial till was encountered beneath the topsoil and/or fill in all the boreholes with interlayered sand and silt deposits. The till extends to the termination depth of each borehole except for Borehole MW101-20, MW104-20, MW105-20, MW106-20, MW107-20, MW108-20, BH134-20, BH136-20, and BH148-20 where the till extends to depths between 2.5 to 11.0 m. The till is grey to brown in colour with mottled to monochrome appearance and typically ranges in composition from sandy clayey silt to sandy silt and gravel to silt. Seams of sand and silt were encountered throughout the till deposits. Cobbles were encountered in Boreholes MW107-20, MW108-20, BH136-20, BH137-20, BH148-20, and BH149-20 between the depths of 2.3 to 6.6 m. Boulders and cobbles should be expected in the glacial till strata. The results of five particle size distribution analyses conducted on the till are provided in **Appendix C** and summarized in the following table;

Table 1 - Results of Glacial Till Deposits Particle Size Distribution Analyses

Borehole Number	Sample Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
MW102-20	9.9 – 10.5	7	33	39	21
MW103-20	7.6 – 8.1	8	27	43	22
MW108-20	10.7 – 11.1	0	4	81	15
BH130-20	1.5 – 2.1	7	34	37	22
BH148-20	3.0 – 3.5	5	39	37	19

SPT N-values measured in the till typically increase with depth and ranged from 5 to above 50 blows per 300 mm penetration of the split spoon sampler indicating loose to very dense or firm to hard conditions. Shear strengths measured in the till ranged from 50 to above 200 kPa, indicating stiff to hard conditions. It is noted that firm and loose conditions were encountered in the upper portion of the till material in Boreholes BH117-20, BH130-20, and BH153-20.

Insitu moisture contents in the till ranged from 1 to 28% indicating damp to wet conditions or drier than the plastic limit to wetter than the plastic limit. The sandy clayey silt till had a liquid limit of 24% and plastic limit of 14% based on the Atterberg limit test conducted.

3.5 Sand Deposits

Sand deposits were encountered interlayered or beneath the till deposits in Boreholes MW101-20, MW105-20, MW106-20, MW107-20, MW108-20, BH109-20, BH134-20, BH136-20, BH137-20, BH148-20 and MW155-21. The sand deposits were about 0.2 to 3.9 m thick. The sand is grey to brown in colour and typically ranges in composition from sand to sand and silt to gravelly sand. Cobbles were encountered in Borehole MW105-20 between the depths of 3.0 to 5.3 m. The results of three particle size distribution analyses conducted on the sand deposits are provided in **Appendix C** and summarized in the following table;

Table 2 - Results of Sand Deposits Particle Size Distribution Analyses

Borehole Number	Sample Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
MW101-20	11.4 – 12	7	48	36	9
MW105-20	6.9 – 7.3	0	87	7	6
MW107-20	9.1 – 9.8	0	75	19	6

SPT N-values measured in the sand ranged from 22 to above 50 blows per 300 mm penetration of the split spoon sampler indicating compact to very dense conditions. Insitu moisture contents in the sand ranged from 3 to 21% indicating moist to saturated conditions.

3.6 Silt Deposits

Silt deposits were encountered interlayered or beneath the till deposits in Boreholes MW104-20, MW105-20, MW106-20, MW107-20 and MW155-21. The silt deposits were about 0.4 to 1.5 m thick. The silt is grey to brown in colour and typically range in composition from silt to sandy silt. The results of two particle size distribution analyses conducted on the silt deposits are provided in **Appendix C** and summarized in the following table;

Table 3 - Results of Silt Deposits Particle Size Distribution Analyses

Borehole Number	Sample Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
MW104-20	9.9 – 10.5	0	12	81	7
MW106-20	6.6 – 7.9	0	26	67	7

SPT N-values measured in the silt ranged from 30 to 48 blows per 300 mm penetration of the split spoon sampler indicating dense conditions. Insitu moisture contents in the silt ranged from 18 to 21% indicating very moist to wet conditions.

4.0 Groundwater Conditions

Groundwater observations were carried out in the open boreholes at the time of drilling and are summarized on the borehole logs. Groundwater was noted within the sand or silt in Boreholes MW101-20, MW105-20, MW106-20, MW108-20, BH137-20, MW155-21 at depths of 3.0 to 11.0 m below the ground surface. The remaining boreholes were dry during drilling.

Groundwater levels were measured in the monitoring wells installed in Boreholes MW101-20 to MW108-20 on December 14, 2020 at depths of 4.2 to 10.3 m beneath the ground surface (Elevations 244.3 to 252.2 m). The results of the measured groundwater levels are summarized in the table below:

Table 4 - Groundwater Measurements

Borehole	Ground Surface Elevation (m)	Measured Groundwater Level December 14, 2020	
		Depth (m)	Elevation (m)
MW101-20	258.4	7.1	251.3
MW102-20	257.2	10.3	246.9
MW103-20	254.3	4.2	250.1
MW104-20	254.5	10.2	244.3
MW105-20	256.0	5.4	250.6
MW106-20	257.9	6.7	251.2
MW107-20	256.5	8.4	248.1
MW108-20	261.3	9.1	252.2
MW155-21	254.4	7.3*	247.1

* Measurement taken on Feb. 4, 2021

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

5.0 Discussion and Recommendations

5.1 General

The project involves the design of the proposed development located at the southeast corner of Dixie Road and Mayfield Road near the property located at 12035 Dixie Road in Caledon, Ontario. Based on the preliminary plan provided by Tribal Partners, the proposed development will consist of multiple large industrial buildings with associated stormwater management areas, driveways and parking lots.

The subsurface stratigraphy at the site generally comprises topsoil and fill materials overlying glacial till deposits interlayered with sands and silts at depth. Groundwater levels were measured in the monitoring wells installed in Boreholes MW101-20 to MW108-20 on December 14, 2020 at depths of 4.2 to 10.3 m beneath the ground surface (Elevations 244.3 to 252.2 m).

Based on the results of this geotechnical investigation, the proposed development will be feasible. The following subsections of this report contain geotechnical recommendations pertaining to development of the property including site grading, site servicing, foundations, floor slabs, pavement design and subdrainage requirements.

5.2 Slope Stability Analysis

The site slopes down to the southeast from Elevation 261.3 to 254.0 towards the tributary watercourse on the east side of the site. It is understood the intent is to construct a development to the south and west of the creek with appropriate offsets. Given the slope feature to the north and east of the property, a slope stability analysis was completed and the results are provided in the following paragraphs.

The slope was inspected by MTE on February 4, 2021. The existing northeast valley slope is considered to be lightly vegetated with mostly grasses and weeds with occasional trees and bushes. The trees present on the slope are typically vertical. No evidence of rotational slides, tension cracks, slumps, or bulges were observed at the time of the site visit. Some bank erosion is present along the creek at the toe of the slope. The change in elevation over the north valley slope ranges from approximately 4 to 5 meters and is generally sloped at inclinations of about 3.7 to 9.0 horizontal to 1.0 vertical as shown on the **Cross Sections A-A' to C-C' on Figures 3 to 5 in Appendix A.**

In order to analyze the stability of the existing slope, boreholes were advanced to provide the subsurface stratigraphy (MW102-20, BH113-21 and BH120-21), detailed cross sections were surveyed by MTE OLS and a computer model was prepared using the GeoStudio 2019 Basic Edition Software by GEO-SLOPE International Ltd. The software calculates the factor of safety against failure by calculating all forces and moments for a series of idealized vertical slices through the ground with a bottom boundary chosen to represent a "trial" failure surface. A factor of safety for slope stability is then defined as the total forces or moments acting to destabilize the slope divided by the total forces acting to resist failure. A factor of safety of unity indicates incipient failure since the analytical destabilizing and stabilizing forces are equal. Typically, for permanent and engineered cut or fill slopes, a factor of safety of greater than 1.3 obtained using these methods of analysis is considered acceptable. The minimum factor of safety specified by the Toronto Region Conservation Authority (TRCA) is 1.5 and will be used for these analyses.

The general soil profile at the site comprises topsoil overlying native glacial till deposits. The composition of the glacial till deposits is generally sandy silt to clayey silt. Groundwater was measured in MW102-20 at 10.3 m below the ground surface or Elevation 246.9 m on December 14, 2020. No free groundwater was encountered in BH113-21 and BH120-21.

The soil parameters used in the slope stability analyses were based on field and laboratory testing from the boreholes advanced near the slope, as well as empirical correlations and are noted in the following table;

Table 5 – Soil Parameter used in Slope Analysis

Soil Type	Unit Weight (kN/m^3)	Effective Cohesion (kPa)	Angle of Internal Friction (°)
Topsoil and Fill	17.0	0	24
Glacial Till	22.0	0	32

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

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

The results of the slope stability modeling indicate the existing cross section profiles have factors of safety against slope failure of at least 1.5, indicating the slope is stable under the current conditions. The factors of safety are closely related to the steepness of the slopes, porewater pressure and the soil strength. The minimum Factor of Safety for an active habitable residence is 1.5 as per TRCA.

A minimum toe erosion allowance of 5 m should be allotted for the south valley slope as per the *Ontario Ministry of Natural Resources Technical Guide for River and Stream Systems: Erosion Hazard Limit, Table 3 Determination of Toe Erosion Allowance.*

The toe erosion allowance is plotted as the 'Stable Slope Setback' line on **Figures 2 to 5** (**Site Plan and Cross Sections A-A' to C-C') in Appendix A**. The development must be constructed outside (landward) of the Stable Slope Setback line.

No additional fill should be placed at the crest or face of the slope unless it is engineered free draining granular material to prevent build-up of pore water pressure within the soil structure. No excavation work should be conducted at the bottom of slope. All excavation work should be minimized as much as possible, and grading of the development should adhere to existing grades where it is feasible. No infiltration or stormwater management infrastructure should be placed within the slope setback areas. The tableland area surrounding the slopes should be topsoiled and seeded as soon as possible after construction to minimize surface erosion. It is recommended that excavations be monitored by a geotechnical engineer to verify subsoil conditions.

5.3 Site Preparation

The first construction activity that will be required for the proposed development will be grading. Prior to carrying out any cutting and engineering fill operations, the topsoil and any fill materials must be removed and stockpiled. The average topsoil thickness measured in the boreholes was about 285 mm thick. It is recommended that the average thickness across the site be increased by 100 mm for removal/stripping calculations to account for variations at the site. The fill soils at the site are anticipated to be the product of reworked native soils caused by agricultural activities. The fill soils vary in depth from 0.6 to 0.8 m and can be used in landscaping areas, as required.

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

The majority of the native soils above the groundwater table are suitable for reuse as engineered fill provided they are close to optimum water content for compaction purposes, if engineered fill is required. All fill should be placed in maximum 300 mm thick lifts and compacted to the following percentages;

Table 6 - Engineered Fill Requirements

Fill Use	Minimum Compaction Required
Structural fill to support buildings	100% SPMDD
Subgrade fill beneath pavements or services	95% SPMDD
Bulk fill in landscape area	90% SPMDD

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

Structural fill used for raising grades beneath the buildings should comprise granular material such as OPSS Granular ‘A’ or ‘B’. Subgrade fill material beneath the proposed pavement areas and services should meet the requirements of OPSS Select Subgrade Material. Any imported fill should be tested and verified by a geotechnical engineer prior to placement.

Structural fill pads should extend a minimum 0.3 m beyond the edge of the footing envelope of any building and down to subgrade at an angle of 45 degrees to the horizontal. Full time testing by geotechnical personnel is recommended during fill placement and compaction to monitor material quality, lift thickness, and verify the compaction by insitu density testing.

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

5.4 Site Servicing

5.4.1 Excavations and Dewatering

The development will be serviced with full municipal services. It is anticipated that the invert levels for the watermain and sewers will be at conventional depths.

Temporary excavations to conventional depths for installation of underground pipes at this site must comply with the Ontario Occupational Health and Safety Act and Regulations for Construction Projects. The fill materials, silt and sand soils would be classified as Type 3 soils and temporary side slopes must be cut at an inclination of 1 horizontal to 1 vertical or less above the base of the excavation, exclusive of groundwater effects. The glacial till deposits would be classified as Type 2 soils and temporary side slopes must be cut at an inclination of 1 horizontal to 1 vertical or less at a level 1.2 m above the base of the excavation.

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

Groundwater inflow should not be expected above 3.0 m below the ground surface. Significant groundwater inflow should be expected if excavations encounter saturated granular soils seams or layers in the glacial till deposits. Every excavation that a worker may be required to enter shall be kept reasonably free of water (O. Reg. 213/91, s. 230).

Permitting for dewatering at the site is provided in the hydrogeological assessment report provided under separate cover.

5.4.2 Pipe Bedding

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

Pipe bedding for water and sewer services should be conventional Class 'B' pipe bedding comprising a minimum 150 mm thick layer of OPSS Granular 'A' aggregate below the pipe invert. Granular 'A' type aggregate should be provided around the pipe to at least 300 mm above the pipe and the bedding aggregate should be compacted to a minimum 95% Standard Proctor Maximum Dry Density (SPMDD).

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

5.4.3 Trench Backfilling

The trenches above the specified pipe bedding should be backfilled with inorganic onsite soils placed in 300 mm thick lifts and compacted to at least 95% SPMDD. Wet or saturated native soils are not considered suitable for reuse as trench backfill. Any additional material required at the site should comprise imported granular soils such as OPSS Select Subgrade Material.

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

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

5.5 Foundation Design

It is understood that the proposed building design will be constructed with spread or strip footings and slab-on-grade floors.

In general, the undisturbed compact to very dense or very stiff to hard native glacial till soils or approved structural fill is considered suitable to support building foundations. Building footings constructed on the undisturbed native glacial till soils or approved structural fill may be designed for a factored geotechnical bearing resistance at Ultimate Limit States (ULS) of 300 kPa, and soil bearing resistance for 25 mm of settlement at Serviceability Limit States (SLS) of 200 kPa. The upper loose and firm to stiff soils in Boreholes MW106-20, BH117-20, BH122-20, BH130-20, BH138-20, BH140-20, BH141-20, BH144-20, and BH153-20 are not suitable for foundations and will need to be removed to depths between 0.6 to 2.3 m (Elevations 245.0 to 257.2 m). All fill soils should be removed from proposed building footprints.

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

The soil in trenches beneath footings for sewer and watermain services, if applicable, shall be compacted by tamping up to the level of the footing base, or shall be filled with concrete having a strength not less than 10 MPa, to support the footing.

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

All exterior floor slabs and footings in unheated areas must be provided with a minimum 1.4 m of earth cover after final grading in order to minimize the potential of damage due to frost action, as per Ontario Provincial Standard Drawing, OPSD 3090.101, dated November 2010. If construction is undertaken during the winter, the subgrade soil and concrete should be protected from freezing.

Where spread footings are constructed at different elevations, the difference in elevation in the individual footing should not be greater than one half of the clear distance between the footings. The lower footing should be constructed first so that if it is necessary to construct the lower footings at a greater depth than anticipated, the elevation of the upper footings can be adjusted accordingly. Stepped strip footings should be constructed in accordance with OBC Section 9.15.3.8.

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

All excavations at the site should be carried out in conformance with the Ontario Occupational Health and Safety Act and Regulations for Construction Projects. The sand soils would be classified as Type 3 soils and temporary side slopes must be cut at an inclination of 1 horizontal to 1 vertical or less above the base of the excavation, exclusive of groundwater effects. The glacial till, silt soils, and fill material would be classified as Type 2 soils and temporary side slopes must be cut at an inclination of 1 horizontal to 1 vertical or less at a level 1.2 m above the base of the excavation.

In general, the majority of the native soils excavated from the foundation trench areas will be suitable for reuse as foundation wall backfill. Wet to saturated native soils are not considered suitable to be used as foundation wall backfill and imported OPSS 1010 Granular 'B' material would need to be used. The backfill should be placed in maximum 300 mm thick lifts and compacted to at least 95% Standard Proctor Maximum Dry Density (SPMDD) on the outside of the building; and 100% SPMDD on the inside of the building. The backfill must be brought up evenly on both sides of walls not designed to resist lateral earth pressure.

5.5.1 Basements or Elevator Pits

It is understood that an elevator pit may be installed for the proposed building in the centre of the site. The elevator pit will be located at the approximate location of MW107-20 and excavations will encounter groundwater conditions in the granular soils or glacial till deposits at a depth of about 8.4 m beneath the ground surface (Elevations 248.0). Any excavations above 4.0 m for the elevator pit should not require proactive dewatering and sumps and pumps should adequately handle any nuisance dewatering. There are no bearing concerns for foundations in this area. We recommend the elevator pit floor levels be designed a minimum 0.5 m above the seasonal high groundwater elevations or else the basements will need to be waterproofed and design to resist hydrostatic pressures. For additional commentary on elevator pit dewatering, reference is given to the hydrogeological assessment report under separate cover.

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

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

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

The subgrade for the basement floor slabs should comprise undisturbed compact native soil or well compacted fill. A minimum 100 mm thick layer of coarse clean granular material containing

not more than 10% material that will pass a 4 mm sieve shall be placed beneath slabs in houses as per Subsection 9.16.2 of the Ontario Building Code. If the subgrade soil is wet, we strongly recommend that subfloor weeping tiles be placed and connected to the sump pit.

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

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

5.6 Concrete Slab-on-Grade

It is understood that the floor slab for the proposed buildings will be constructed using conventional concrete slab-on-grade techniques, following removal of any topsoil, and inspecting the subgrade soils.

Any additional material required to raise grades below the floor slab should be comprised of granular soil and be compacted to 98% SPMDD. A minimum 150 mm thick layer of Granular 'A' material uniformly compacted to 100% SPMDD should be provided directly beneath the slab for leveling and support purposes.

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

No special underfloor drains are required, provided the exterior grades are lower than the floor slab and positively sloped away from the building.

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

The water to cement ratio and slump of the concrete utilized in the floor slab should be strictly controlled to minimize shrinkage of the slab. Control joints should be sawed into the slabs at regular intervals within 12 hours of initial concrete placement in order to prelocate shrinkage cracks.

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

5.7 Pavements

It is understood pavements will be constructed for the proposed roadways and parking areas at the site. The pavement subgrade soils will comprise native inorganic soils or imported structural fill.

The pavement component thicknesses in the following table are recommended based on the proposed pavement usage, the frost-susceptibility and strength of the subgrade soils, and the Benkelman beam spring rebound coefficient for silt and clay glacial till soils;

Table 7 - Pavement Design

Pavement Component	Light Duty	Heavy Duty
Asphalt Hot Mix	90 mm	120 mm
OPSS 1010 Granular 'A' Base	150 mm	150 mm
OPSS 1010 Granular 'B' Subbase	350 mm	450 mm

Heavy duty pavements should be used for main access ways to the development and where large vehicles will frequently travel, such as garbage and fire trucks.

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

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

The asphaltic concrete should comprise 40 mm of HL3 surface over 50 mm of HL8 binder for the light duty pavement option and 50 mm of HL3 surface over 70 mm of HL8 binder for the heavy duty pavement option.

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

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

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

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

5.8 Stormwater Infiltration

It is understood that at-source infiltration of stormwater runoff from the development may also be considered for this site. Soak-away pits generally require soils with a minimum percolation rate of 15 mm/hr and a minimum separation between the bottom of the pit and the seasonally high water table of 1 m (MOE, 2003). Seven particle size distribution analyses were carried out on the soils encountered at the site. They are plotted on **Tables 101 and 102 in Appendix C**.

Due to the compactness of the native soils and the depth of the granular deposits, it is our opinion that conventionally designed at-source infiltration of stormwater runoff is not feasible for this development due to the low permeability of the upper glacial till soils. Insitu infiltration testing could be performed in the exact areas of proposed LID measures to accurately measure the infiltration of the soils in those areas. For further LID strategies for low permeable soils, reference is given to the hydrogeological assessment report under separate cover.

5.9 Stormwater Management Area

It is understood that Stormwater Management (SWM) areas are proposed for the industrial development.

SWM inlet/outlet structure footings constructed on the compact undisturbed native glacial till soils encountered at depths of at least 1.4 m may be designed for a factored geotechnical bearing resistance at Ultimate Limit States (ULS) of 300 kPa, and soil bearing resistance for 25 mm of settlement at Serviceability Limit States (SLS) of 200 kPa.

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

Embankments for the SWM blocks should be at an inclination of 3.0 horizontal to 1.0 vertical or less from the base of the excavation and can be constructed with onsite native soils. The native soils should be placed in 300 mm thick lifts and compacted to at least 95% SPMDD. The embankment surfaces should be topsoiled and sodded to prevent surface erosion. Inclination of steeper than 3.0 horizontal to 1.0 vertical would require the use of imported granular material and/or mechanical stabilization. If steeper inclinations are required, further geotechnical recommendations would be required, specific to the proposed design. If steeper inclinations are required, further geotechnical recommendations would be required, specific to the proposed design such as the use of geogrid within the berms.

Minor groundwater seepage should be expected where the excavations extend into sand/silt seams in the glacial till soils. Any groundwater seepage should be adequately handled by pumping with sumps.

A clay liner may be required as the native soils at the site have varying amounts of clay content. The soils used for a clay liner should have the following characteristics:

- A minimum of 20% clay content;
- Clay soils within 3% of optimum moisture content for compaction purposes;
- A minimum plastic limit of 20%; and,
- A minimum plasticity index of 10%.

5.10 Construction inspection and Testing

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

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

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

6.0 Limitations of Report

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

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

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

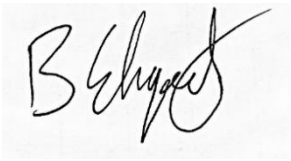
It should be recognized that the passage of time may affect the views, conclusions and recommendations (if any) provided in this report because groundwater conditions of a property can change, along with regulatory requirements. All design details were not known at the time of submission of this report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

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

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

All of which is respectfully submitted,

MTE Consultants Inc.



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bem:BXT:DMG

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Appendix A

Figures

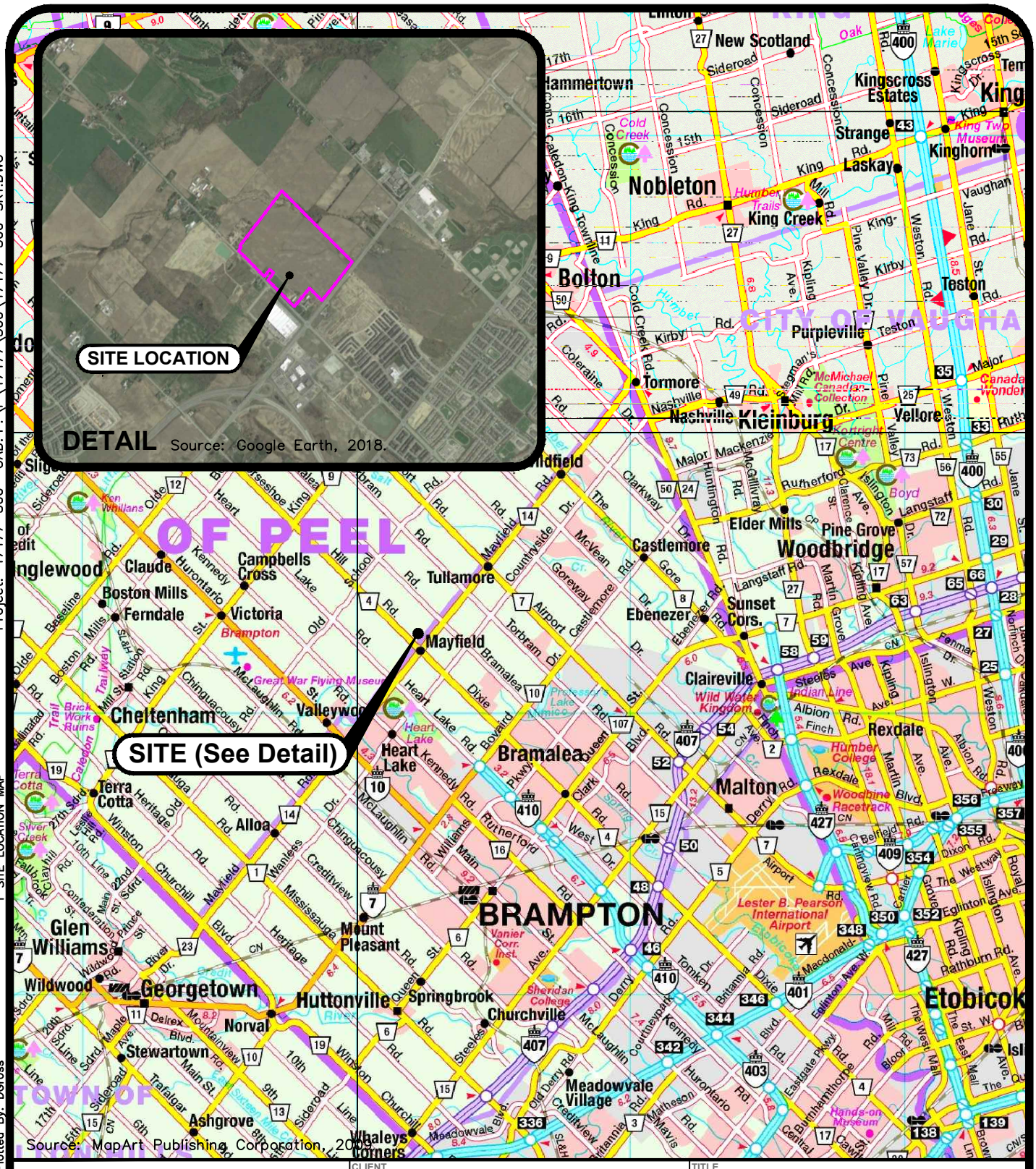
Figure 1- Location Plan

Figure 2- Site Plan

Figure 3- Cross Section A-A’

Figure 4- Cross Section B-B’

Figure 5- Cross Section C-C’



1 SITE LOCATION MAP — Plotted By: DGross — February 16, 2021 — 1:59 PM — Project: 47477-300 CAD: P:\47477\300\47477-300-SK1.DWG

MTE
Engineers, Scientists, Surveyors
Ph. (519) 743-6500

0 2 4 6 8 10km
Scale(8.5x11): 1:200 000

CLIENT: Tribal Partners

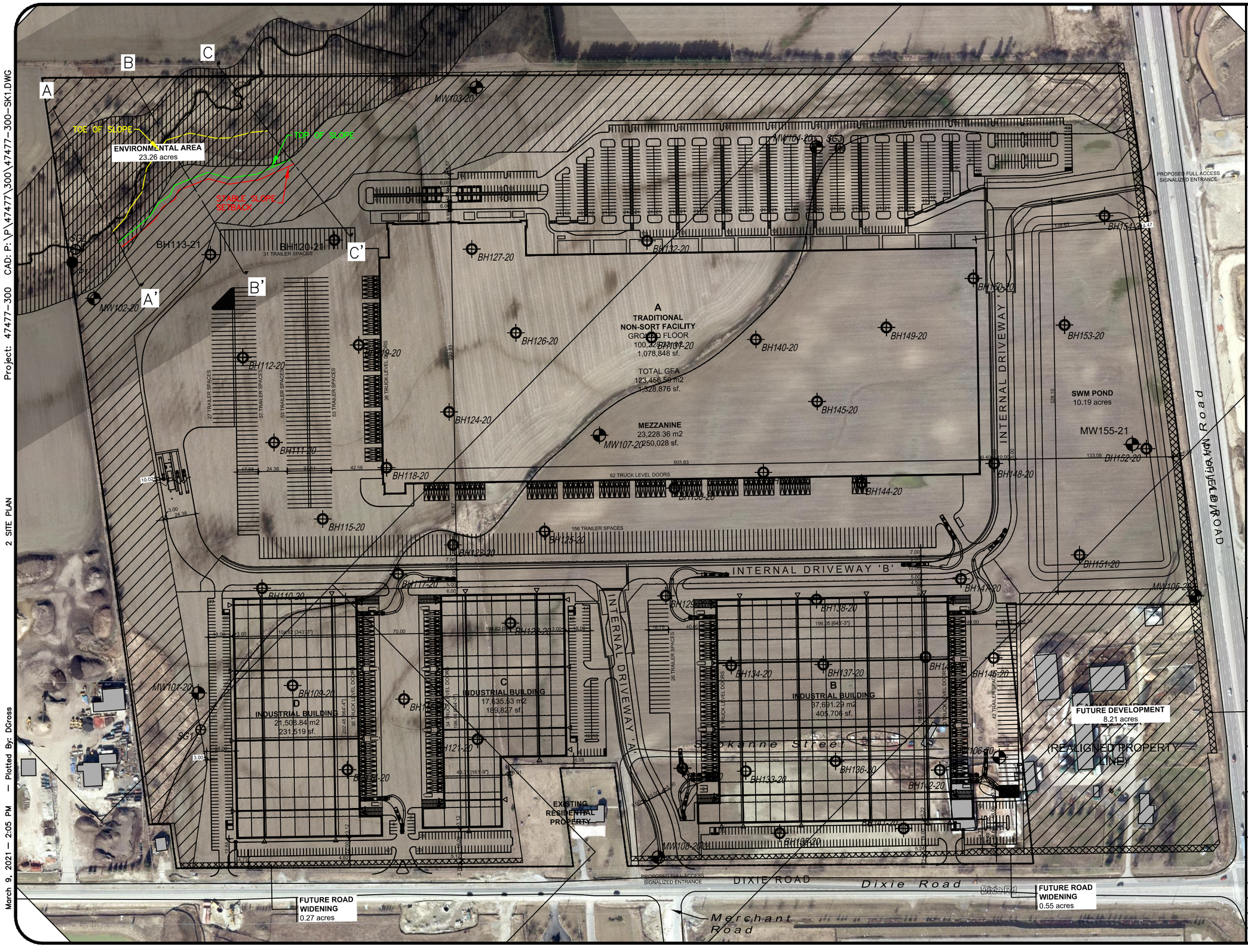
TITLE: SITE LOCATION MAP

PROJECT: Geotechnical Investigation

SITE: 12035 Dixie Road
Caledon, ON

Reviewed By	BRT
Prepared By	MFG
Drawn By	TXS
Date	January 2021
Project No.	47477-300
Figure No.	1

N
NORTH

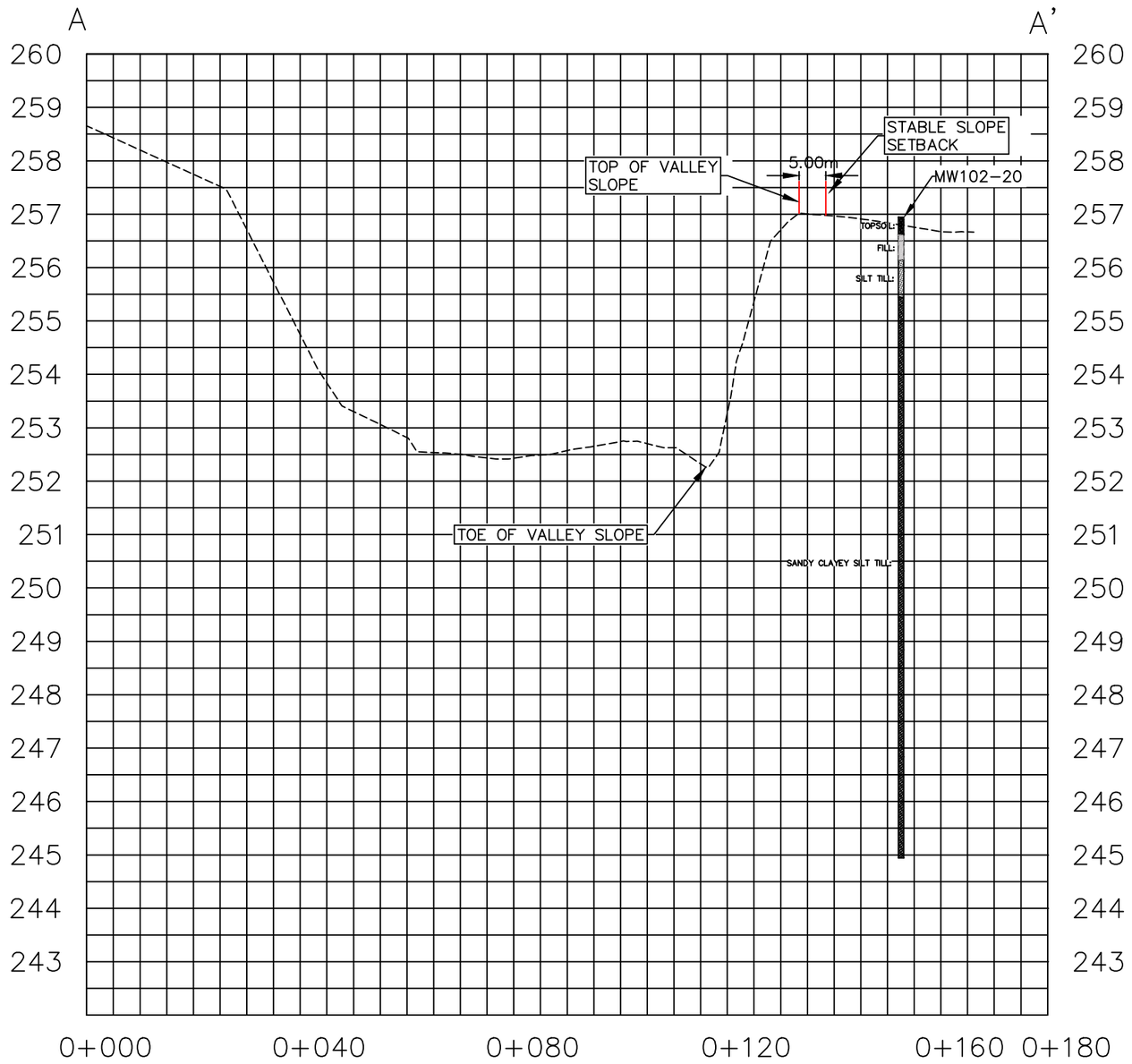


MTE
Engineers, Scientists, Surveyors
Ph. (519) 743-6500

CLIENT	Tribal Partners
PROJECT	Geotechnical Investigation
SITE	12035 Dixie Road Caledon, ON
TITLE	SITE PLAN
Reviewed By	BRT
Prepared By	MFG
Drawn By	TXS
Date	January 2021
Project No.	47477–300
Figure No.	2

Project: 47477–300 CAD: P:\47477\300\47477–300–SK1.DWG
2 SITE PLAN — Plotted By: DGross
March 9, 2021 — 2:05 PM

CROSS SECTION A–A' PROFILE



LEGEND

EXISTING GRADE

PROFILE SCALE: V= 1:10 H= 1:1

0 10 20 30 40 50m

Scale(11x17): 1:1000

MTE
Engineers, Scientists, Surveyors
519-204-6510

CLIENT: TRIBAL PARTNERS

PROJECT: GEOTECHNICAL INVESTIGATION

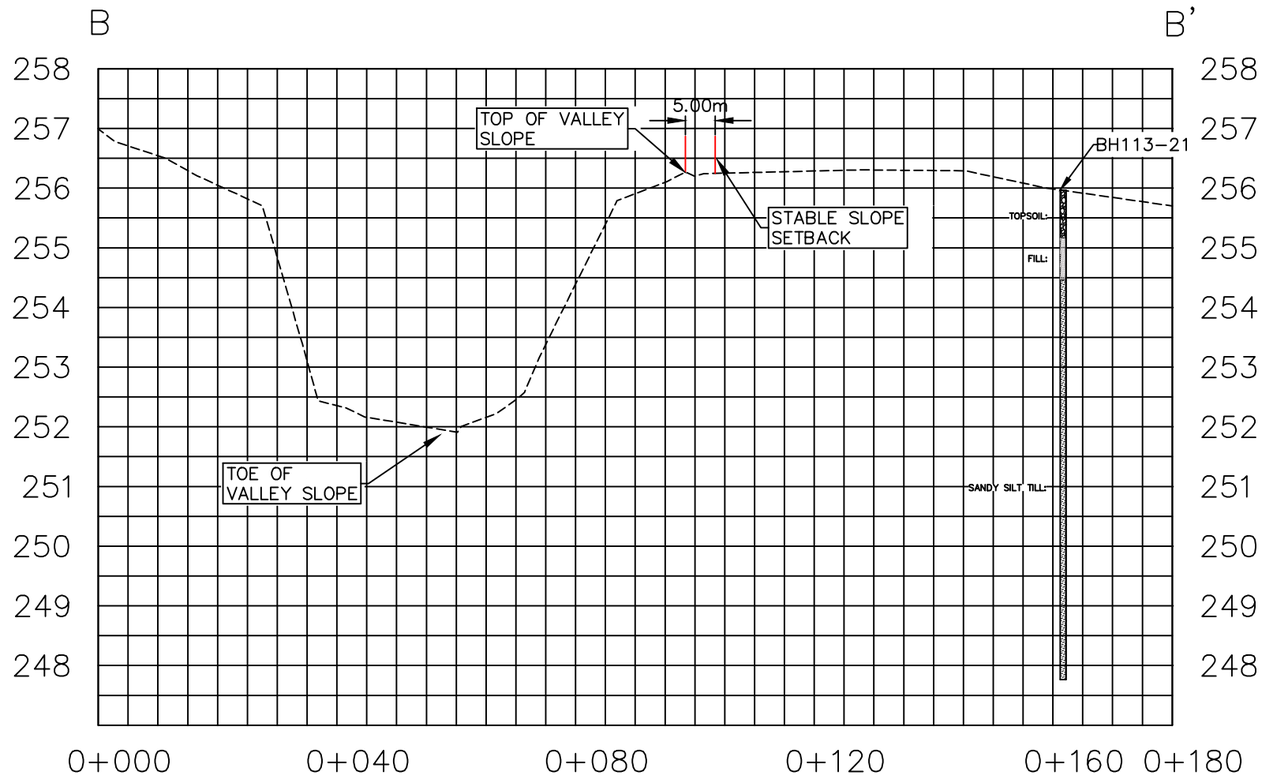
SITE: 12035 DIXIE ROAD CALEDON, ONTARIO

TITLE: CROSS SECTION A-A'

Reviewed By	BRT		
Prepared By	DXG	Project No.	47477–300
Drawn By	DXG	Figure No.	3
Date	JAN. 2021		

Project: 47477–300 CAD: P:\47477\300\47477–300–SK1.DWG 3 CROSS SECTION A–A'
June 2, 2020 – 1:00 p.m. – Plotted By: DGross

CROSS SECTION B–B' PROFILE



LEGEND

— — — — — — — — EXISTING GRADE

PROFILE SCALE: V= 1:10 H= 1:1

0 10 20 30 40 50m

Scale(11x17): 1:1000

MTE
Engineers, Scientists, Surveyors
519-204-6510

CLIENT: TRIBAL PARTNERS

PROJECT: GEOTECHNICAL INVESTIGATION

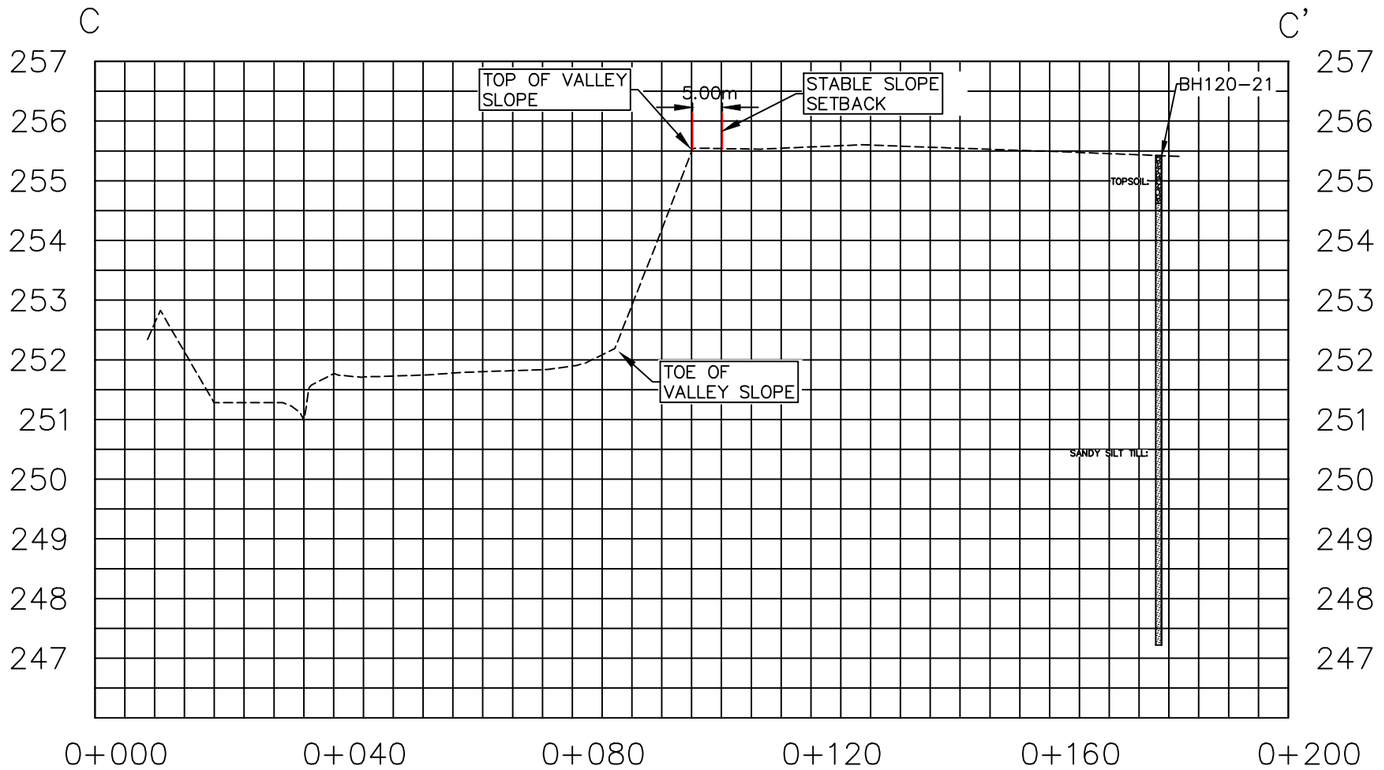
SITE: 12035 DIXIE ROAD CALEDON, ONTARIO

TITLE: CROSS SECTION B-B'

Reviewed By	BRT		
Prepared By	DXG	Project No.	47477–300
Drawn By	DXG	Figure No.	4
Date	JAN. 2021		

Project: 47477–300 CAD: P:\47477\300\47477–300–SK1.DWG
4 CROSS SECTION B–B'
June 2, 2020 – 1:00 p.m. – Plotted By: DGross

CROSS SECTION C–C' PROFILE



LEGEND

EXISTING GRADE

PROFILE SCALE: V= 1:10 H= 1:1

0 10 20 30 40 50m

Scale(11x17): 1:1000

MTE
Engineers, Scientists, Surveyors
519-204-6510

CLIENT: TRIBAL PARTNERS

PROJECT: GEOTECHNICAL INVESTIGATION

SITE: 12035 DIXIE ROAD CALEDON, ONTARIO

TITLE: CROSS SECTION C-C'

Reviewed By	BRT		
Prepared By	DXG	Project No.	47477-300
Drawn By	DXG	Figure No.	5
Date	JAN. 2021		

Appendix B

Borehole Logs

Abbreviations and Symbols

Boreholes MW101-20 to MW155-21

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

Sample Types

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

Soil Tests

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

Penetration Resistance

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

Soil Description

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

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

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

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

ID Number: MW101-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

Drill Date: 10/30/2020

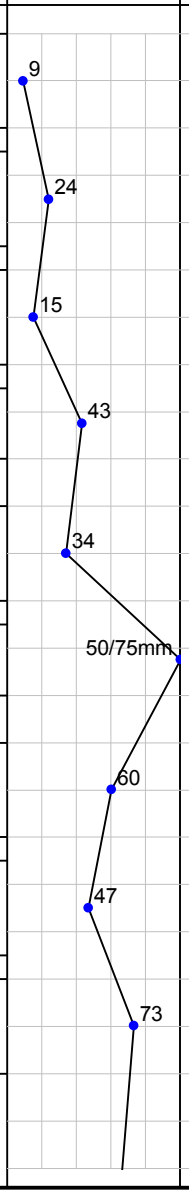
Drilling Contractor: Tri-Phase Group

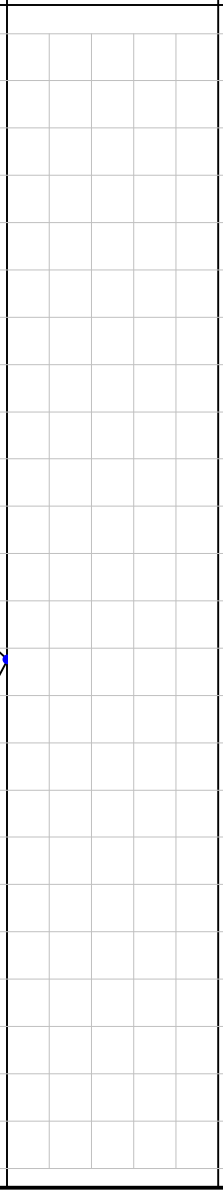
Drill Rig: CME 75

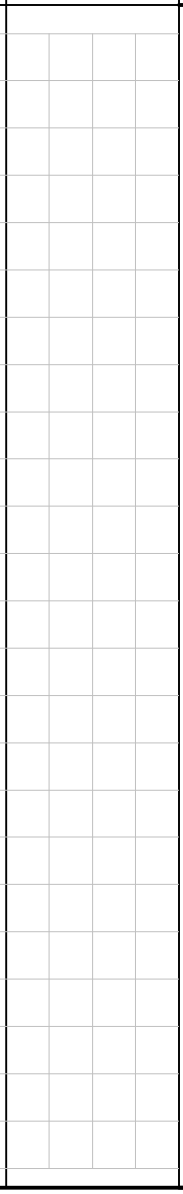
Drill Method: Hollow Stem Auger

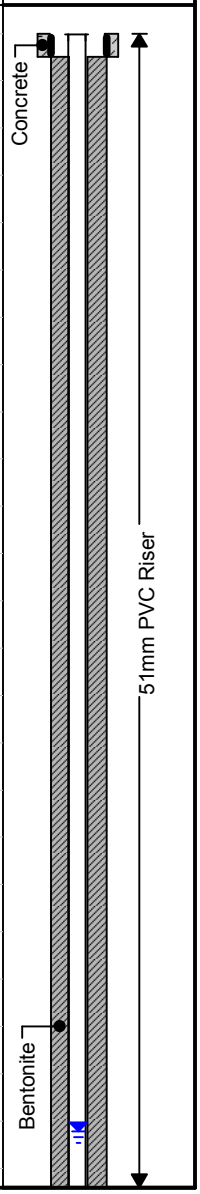
Protective Cover: Monument Casing

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type
0 / 0		Ground Surface	258.4		
		FILL (TOPSOIL) dark brown clayey silt, with rootlets, very moist (280mm)	0.0 / 258.2 / 0.3	1	SS
2		**FILL** stiff brown clayey silt, trace to some sand and gravel, grey mottling, moist	257.7 / 0.8	2	SS
4		**SILT TILL** very stiff brown silt, some clay and sand, trace to some gravel, with grey mottling and clayey silt layers, moist	256.9 / 1.5	3	SS
6 / 2		**CLAYEY SILT TILL** very stiff to hard brown clayey silt, trace to some sand and gravel, with grey mottling and sand seams, DTPL		4	SS
8					
10				5	SS
12 / 4		**SANDY SILT TILL** very dense brown sandy silt, some gravel, moist	254.6 / 3.8	6	SS
14			253.9 / 4.6		
16		**CLAYEY SILT TILL** hard brown clayey silt, some sand and gravel, with silt seams, DTPL		7	SS
18				8	SS
20 / 6		**SILT TILL** very dense grey silt, some clay, trace to some sand and gravel, very moist brown sand seam	252.5 / 5.9	9	SS
22					
24					









Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Water level measured at 7.1mbgs on Dec 14, 2020

ID Number: MW101-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

Drill Date: 10/30/2020

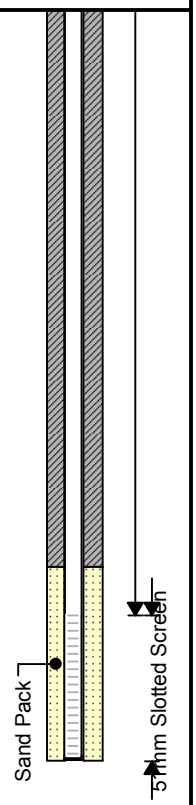
Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

Depth	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)	Groundwater Observations and Standpipe Details
			250.8						
26	8	very moist	7.6	10	SS	62			
28				11	SS	23			
30		dense, very moist to wet	249.4 9.0	12	SS	30			
32			248.5						
34	10	**CLAYEY SILT TILL** very stiff grey clayey silt, trace sand and gravel, with wet silt seams, APL	9.9	13	SS	24			
36		**SAND** dense grey sand, trace silt and clay, saturated	247.8 10.7	14	SS	45			
38		**SAND AND SILT** very dense grey sand and silt, trace clay and gravel, saturated	247.0 11.4	15	SS	54			
40	12	Drilling Terminated	246.4 12.0						
42									
44									
46	14								
48									



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Water level measured at 7.1mbgs on Dec 14, 2020

ID Number: MW102-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

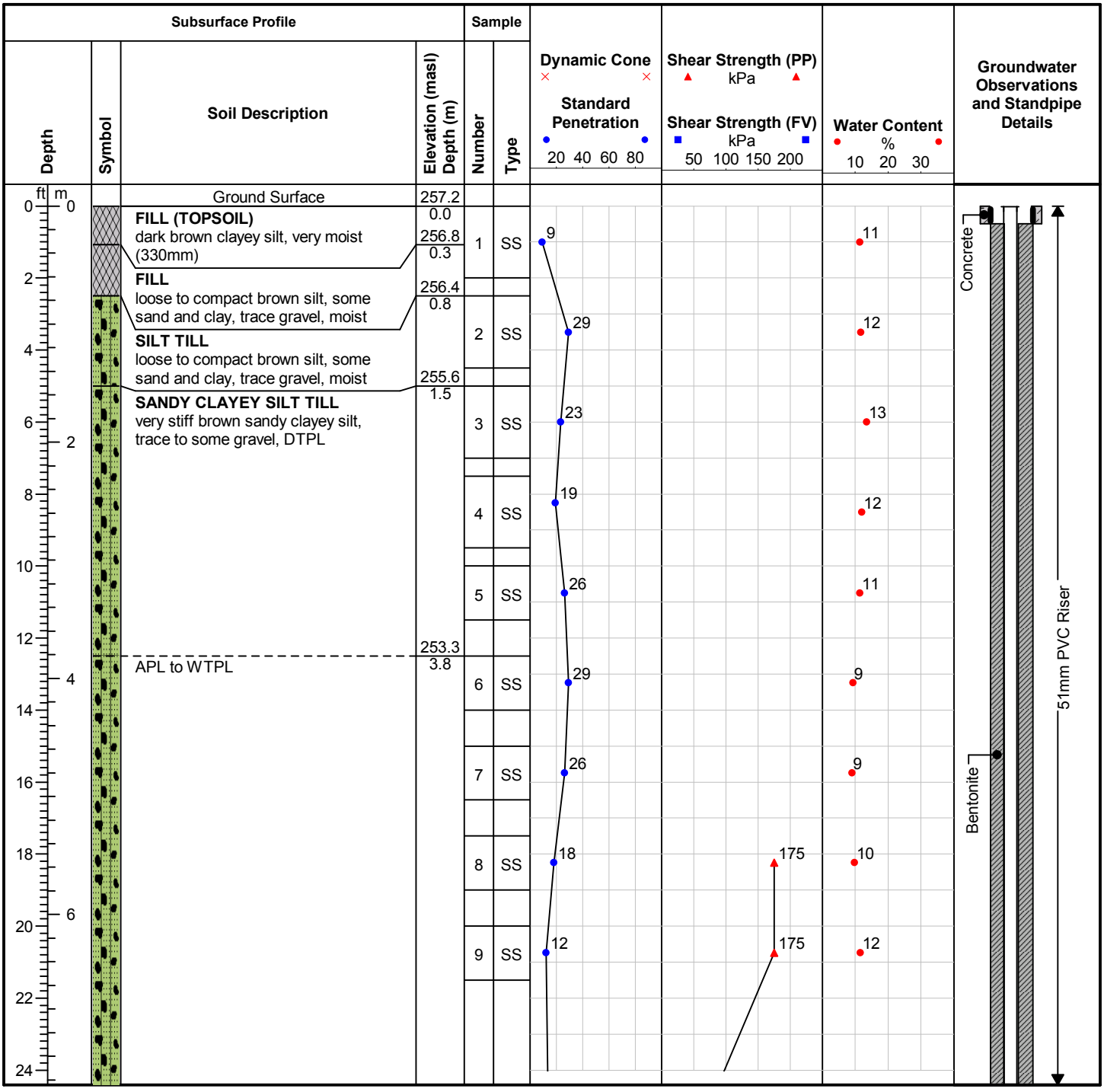
Drill Date: 11/3/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Water level measured at 10.3mbgs on Dec 14, 2020

ID Number: MW102-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

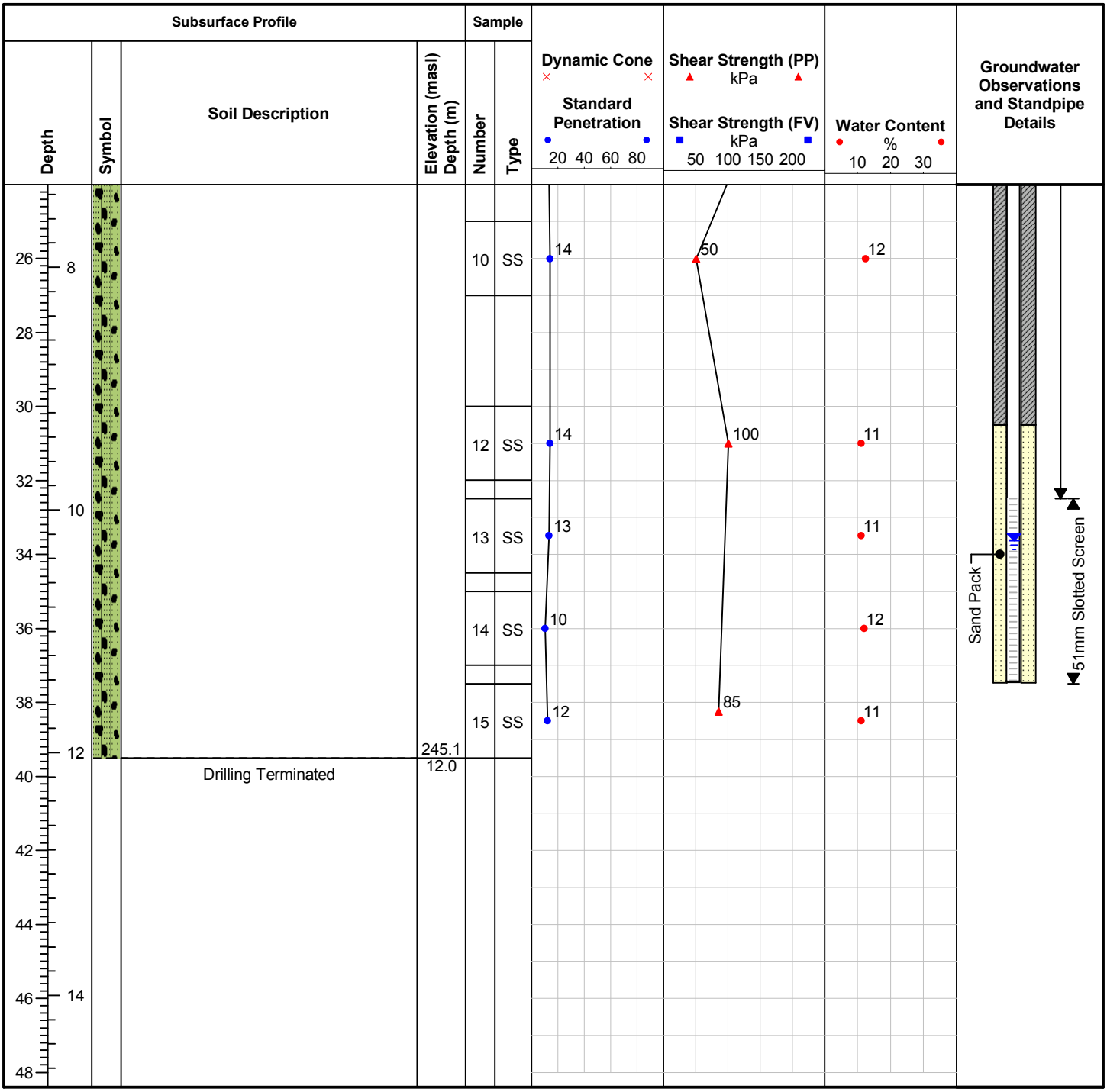
Drill Date: 11/3/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 2 of 2

Water level measured at 10.3mbgs on Dec 14, 2020

ID Number: MW103-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

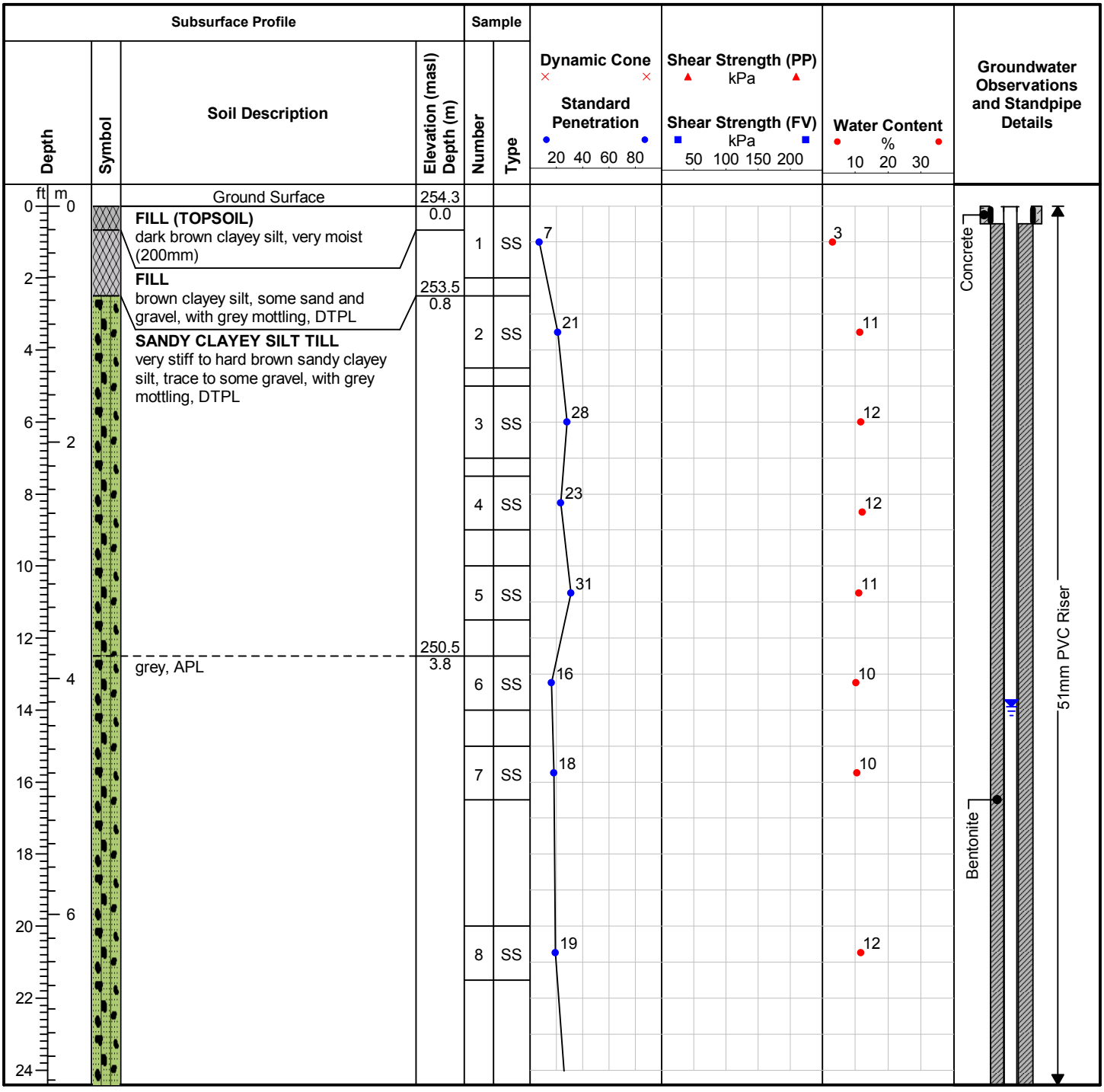
Drill Date: 11/3/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Water level measured at 4.2mbgs on Dec 14, 2020

ID Number: MW103-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

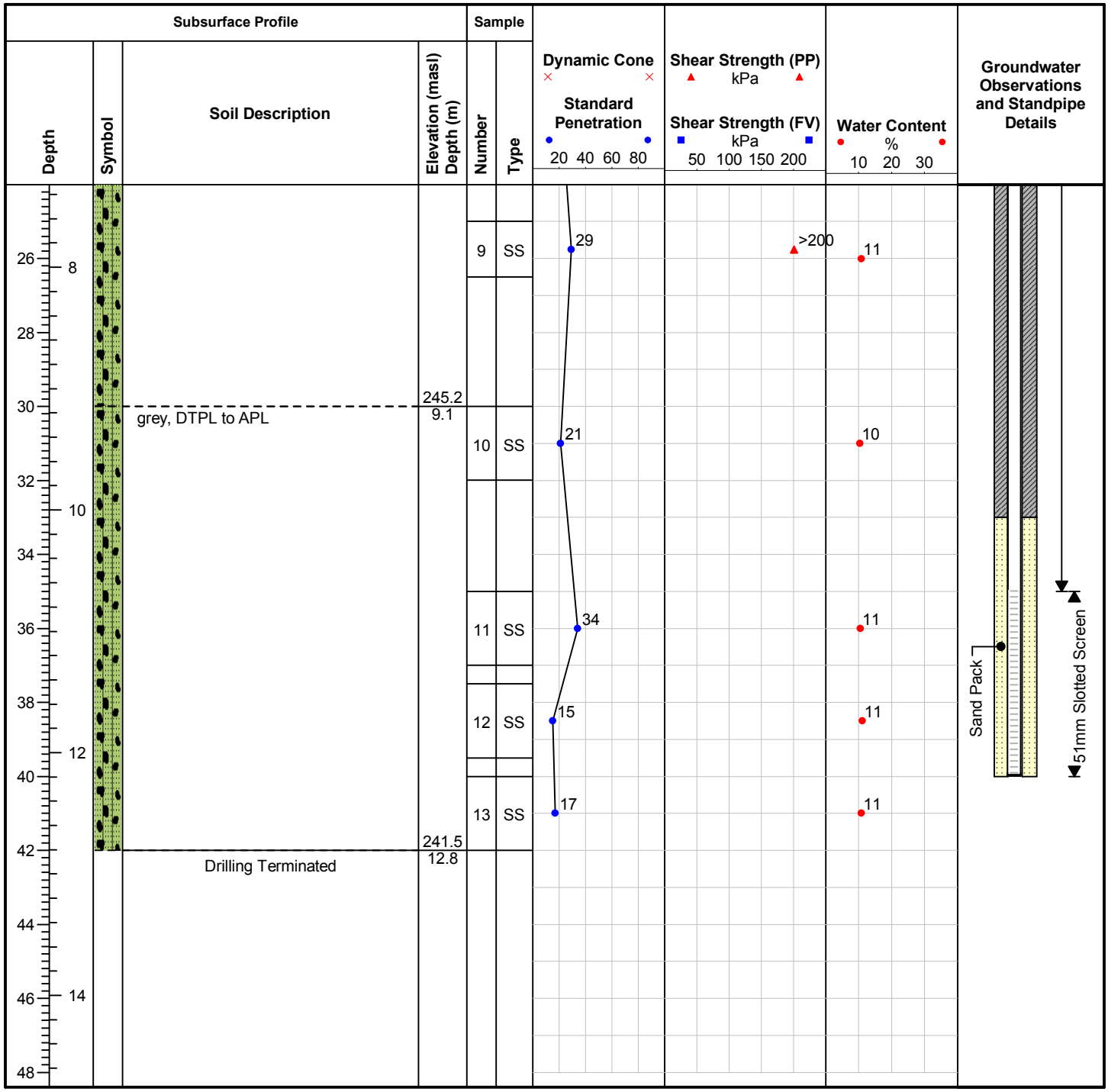
Drill Date: 11/3/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Water level measured at 4.2mbgs on Dec 14, 2020

ID Number: MW104-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

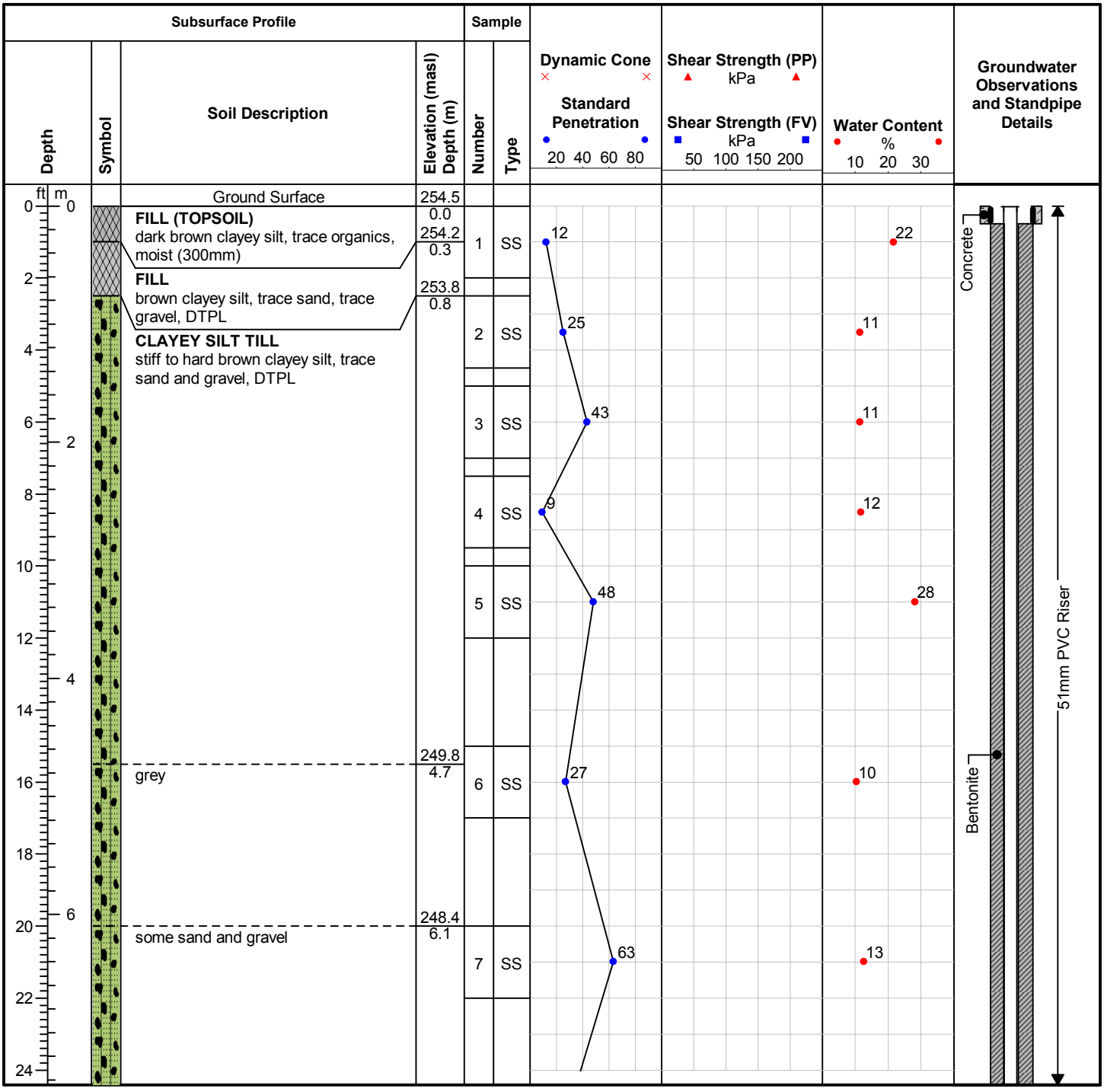
Drill Date: 11/4/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Water level measured at 10.2mbgs on Dec 14, 2020

ID Number: MW104-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

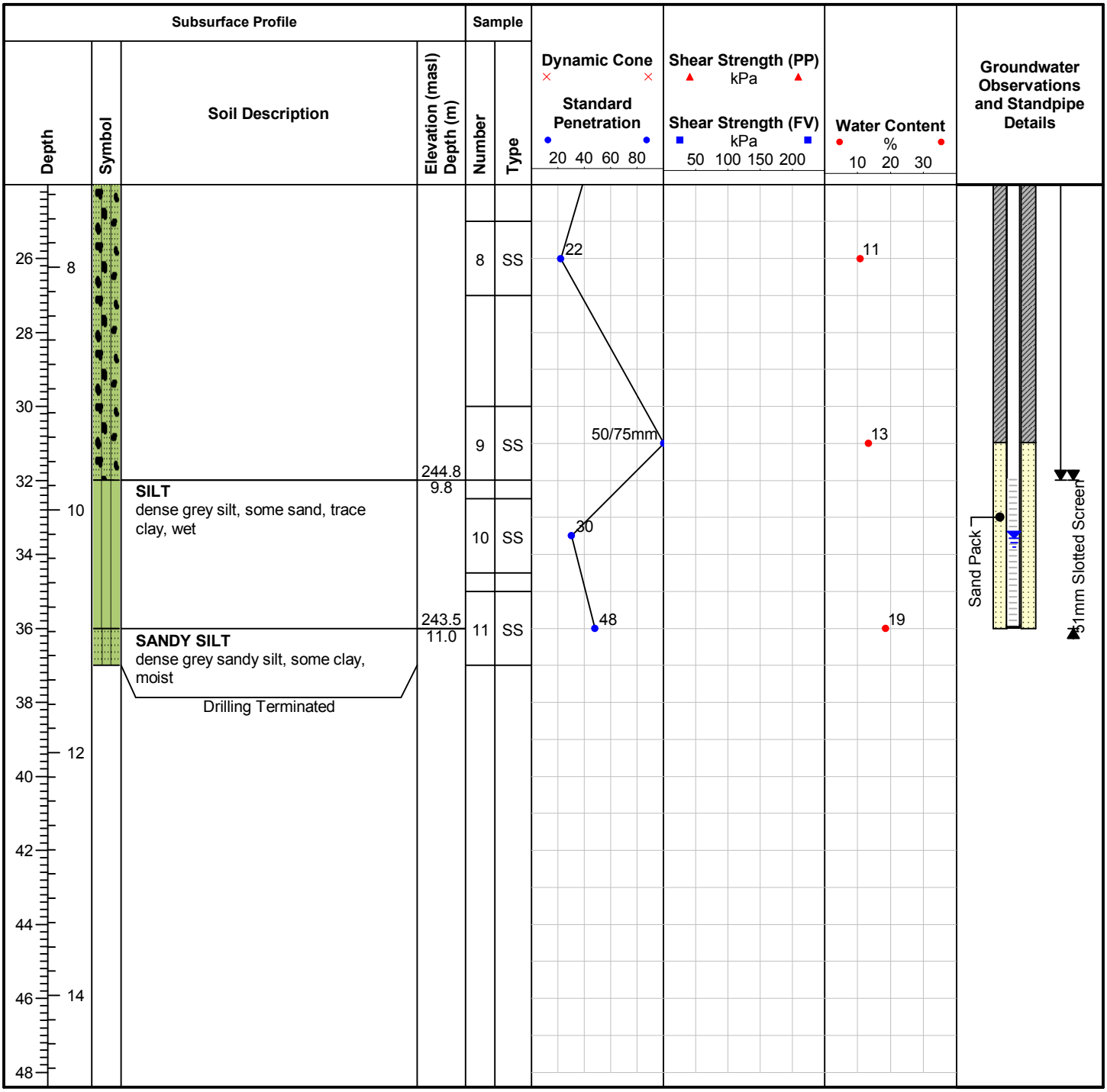
Drill Date: 11/4/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Water level measured at 10.2mbgs on Dec 14, 2020

ID Number: MW105-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

Drill Date: 11/10/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

Depth (ft / m)	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone – Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
0 / 0	Ground Surface	256.0					
	FILL (TOPSOIL) dark brown silt, very moist (300mm)	0.0 / 255.7	1	SS	20		12
	FILL compact brown silt, some clay and sand, trace gravel, moist	0.3 / 255.3					
2	**SILT TILL** compact brown silt, some clay and sand, trace gravel, moist	0.8 / 254.5	2	SS	19		12
4	**CLAYEY SILT TILL** hard brown clayey silt, some sand and gravel, with silt layers, DTPL	1.5 / 253.5	3	SS	32		11
6 / 2			4	SS	72		9, 14
8	**SILTY SAND** very dense brown silty sand, some clay, trace to some gravel, moist	2.5 / 253.0					
10	with cobbles	3.0	5	SS	68		9
12 / 4			6	SS	72/250mm		8
14		251.5					
16	trace clay, with cobbles	4.6 / 250.7	7	SS	75		13
18	**SILT** dense brown silt, some sand, with sand seams, very moist	5.3 / 249.9	8	SS	46		18
20 / 6	**SAND** dense brown sand, trace to some silt, saturated	6.1	9	SS	41		16
22			10	SS	42		21
24							

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

Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Water level measured at 5.4mbgs on Dec 14, 2020

ID Number: MW105-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

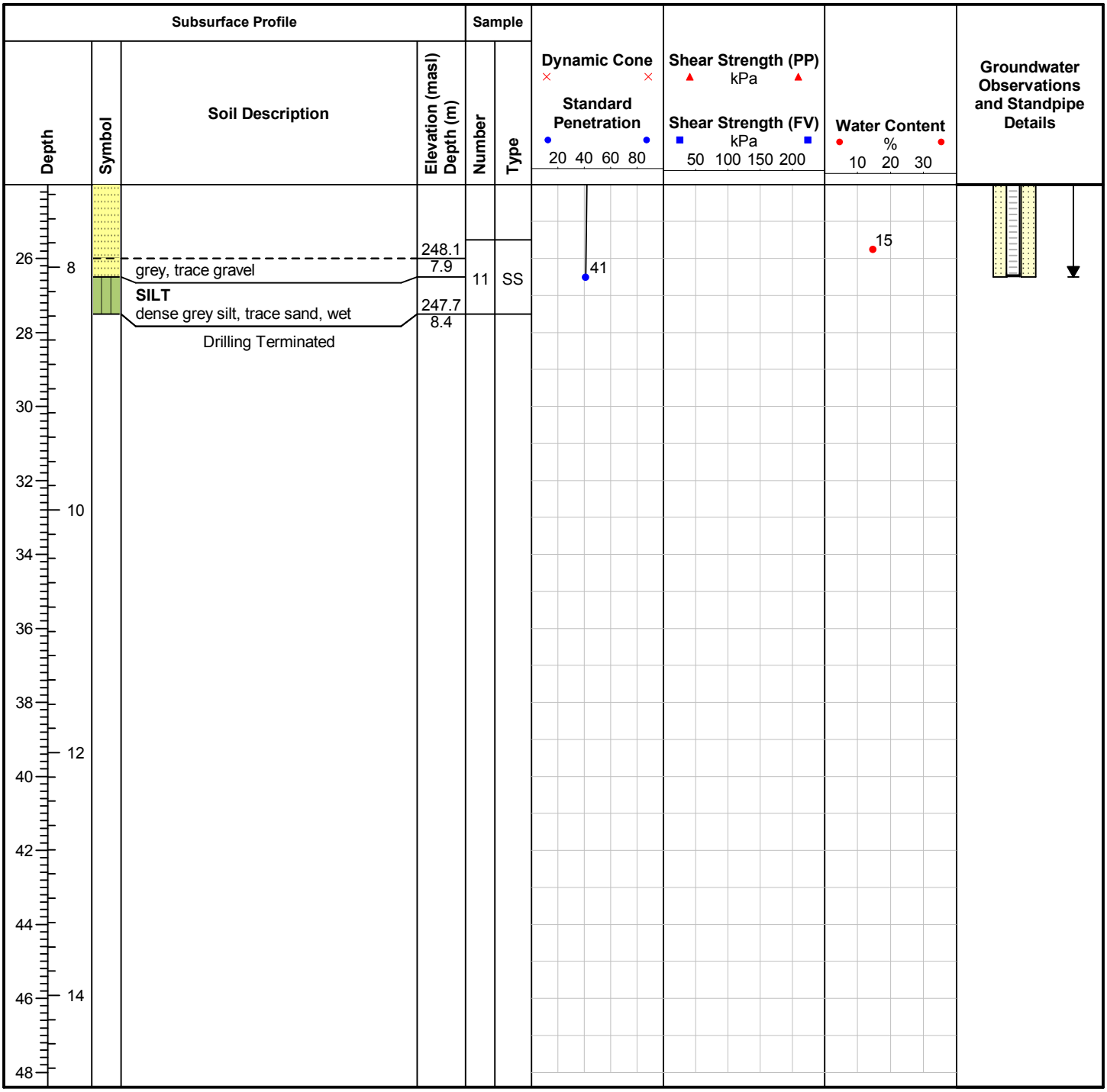
Drill Date: 11/10/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Water level measured at 5.4mbgs on Dec 14, 2020

ID Number: MW106-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

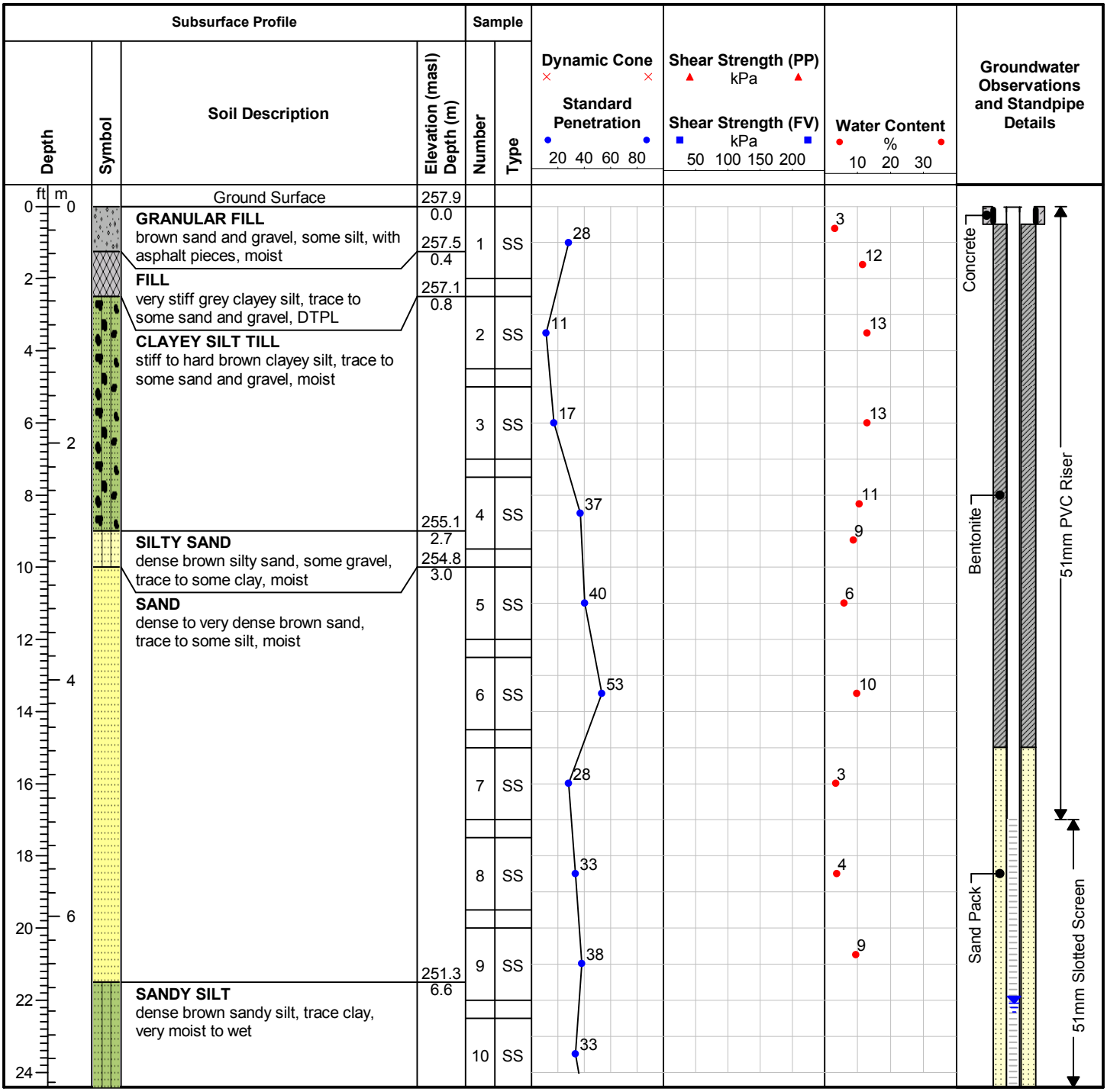
Drill Date: 11/10/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Water level measured at 6.7mbgs on Dec 14, 2020

ID Number: MW106-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

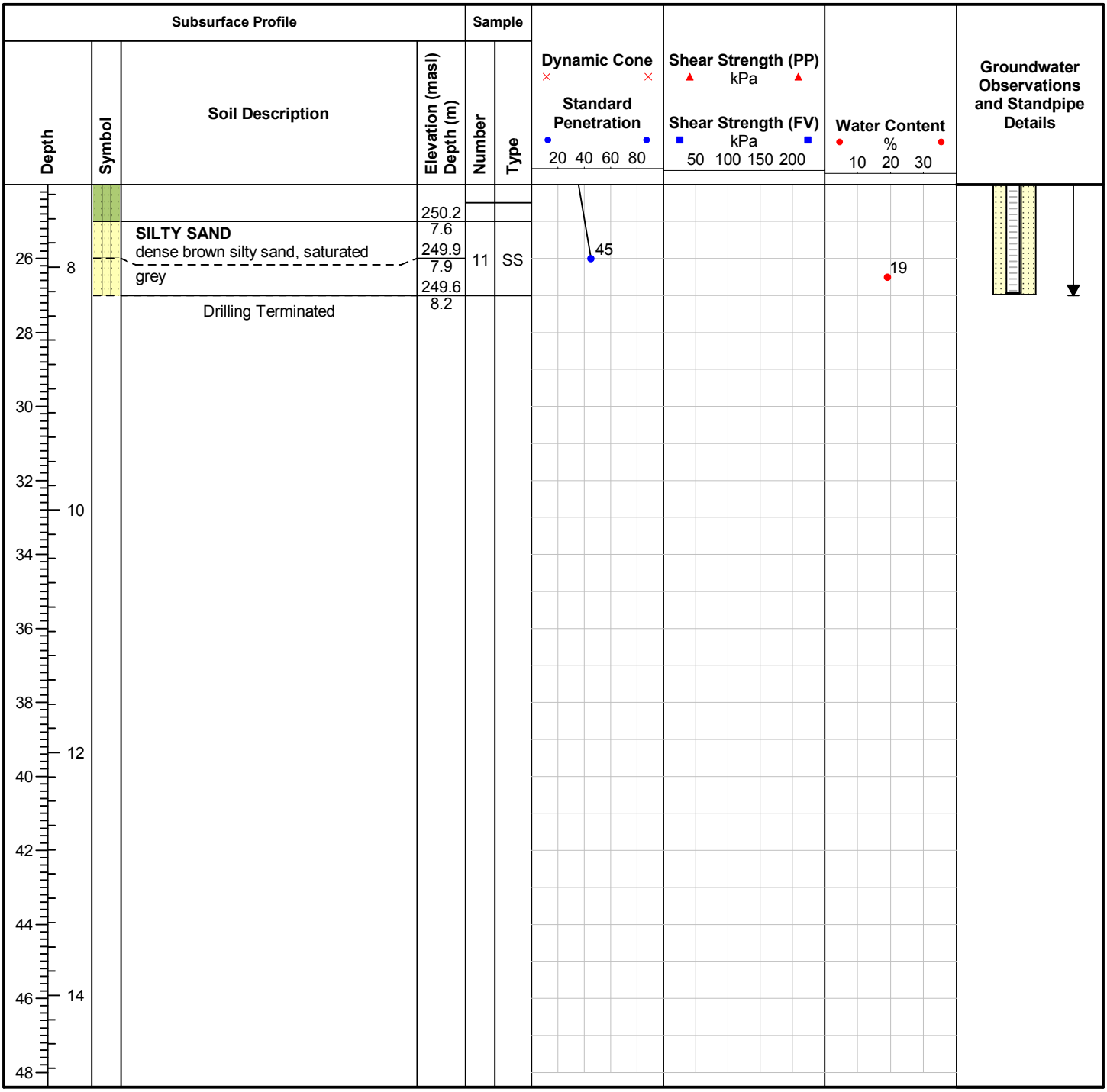
Drill Date: 11/10/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Water level measured at 6.7mbgs on Dec 14, 2020

ID Number: MW107-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

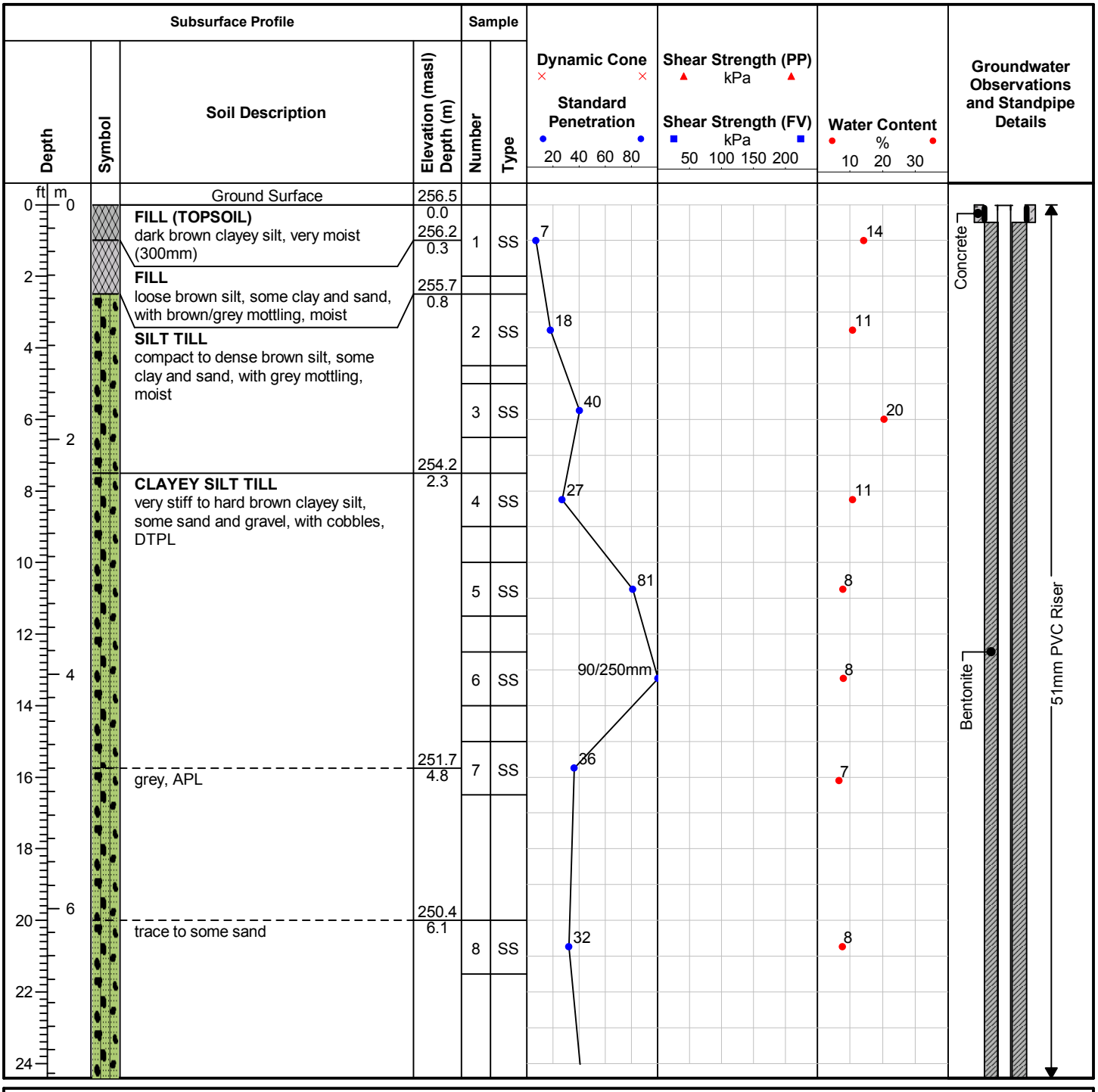
Drill Date: 11/11/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Water level measured at 8.4mbgs on Dec 14, 2020

ID Number: MW107-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

Drill Date: 11/11/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

Depth	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone / Standard Penetration	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %	Groundwater Observations and Standpipe Details
			248.6	9	SS	45		8	
26	8	**SANDY SILT TILL** dense grey sandy silt, trace clay, wet	7.9					15	
28				10	SS	35		18	
30			247.3						Sand Pack
		SAND compact grey sand, some silt, trace clay, wet	9.1	11	SS	22		18	
32			246.6						
34	10	**SILT** dense grey silt, trace to some clay, trace sand, wet	9.9	12	SS	37		21	
			246.0						51mm Slotted Screen
36		Drilling Terminated	10.5						
38									
40	12								
42									
44									
46	14								
48									

Dynamic Cone / Standard Penetration: 20 40 60 80

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

Water Content %: 10 20 30

Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Water level measured at 8.4mbgs on Dec 14, 2020

ID Number: MW108-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

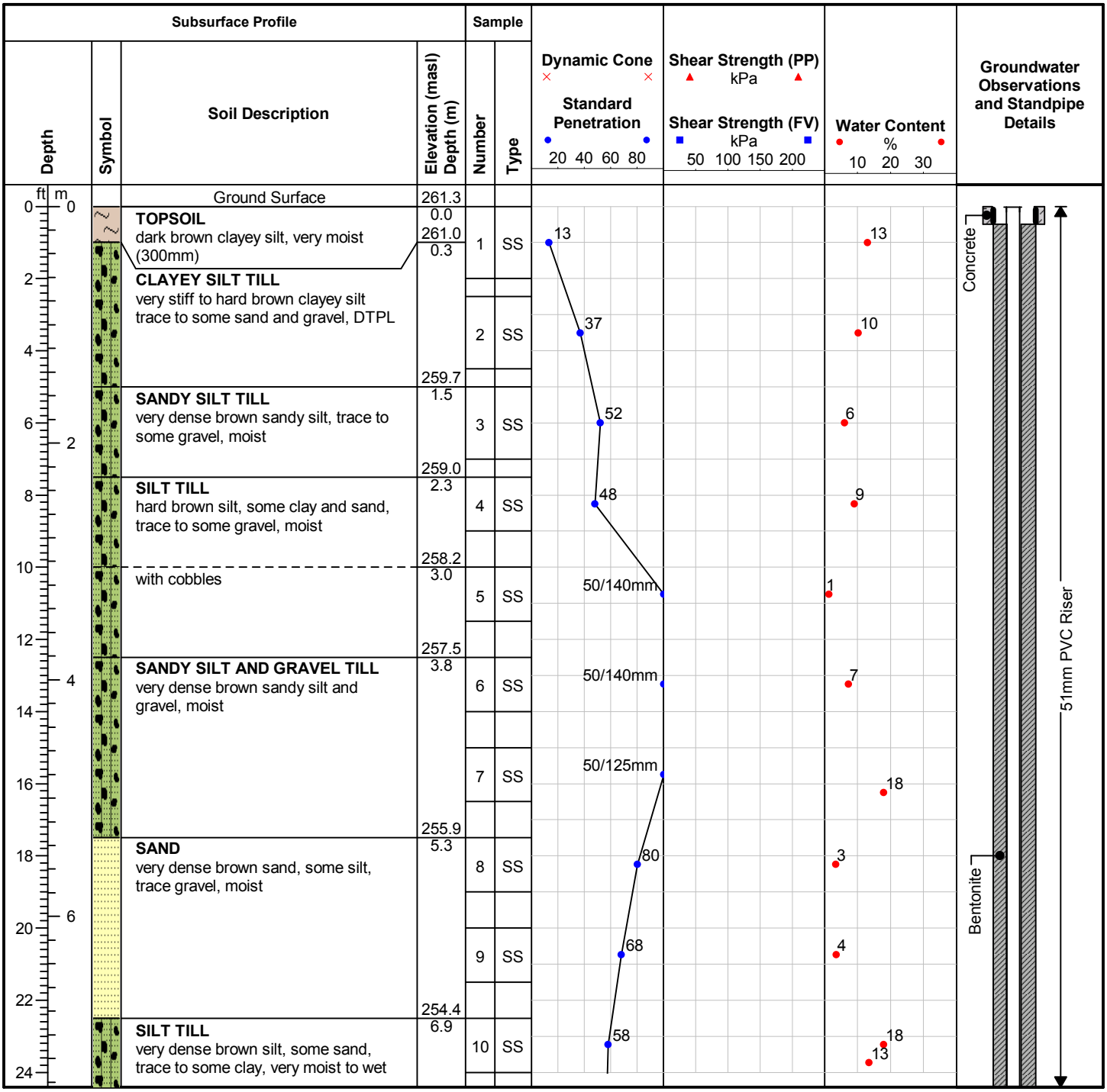
Drill Date: 11/9/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Water level measured at 9.1mbgs on Dec 14, 2020

ID Number: MW108-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

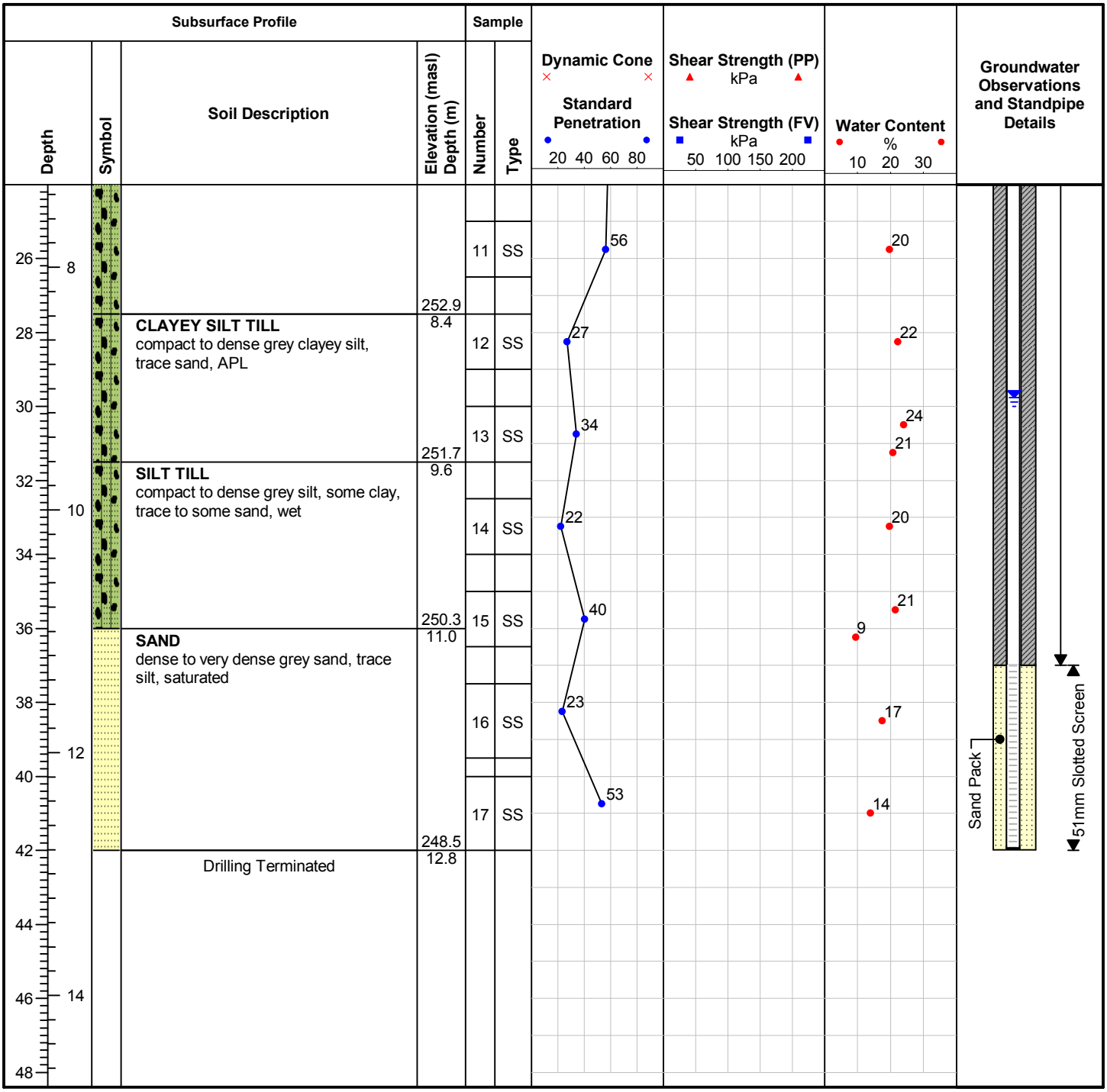
Drill Date: 11/9/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 2 of 2

Water level measured at 9.1mbgs on Dec 14, 2020

ID Number: BH109-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

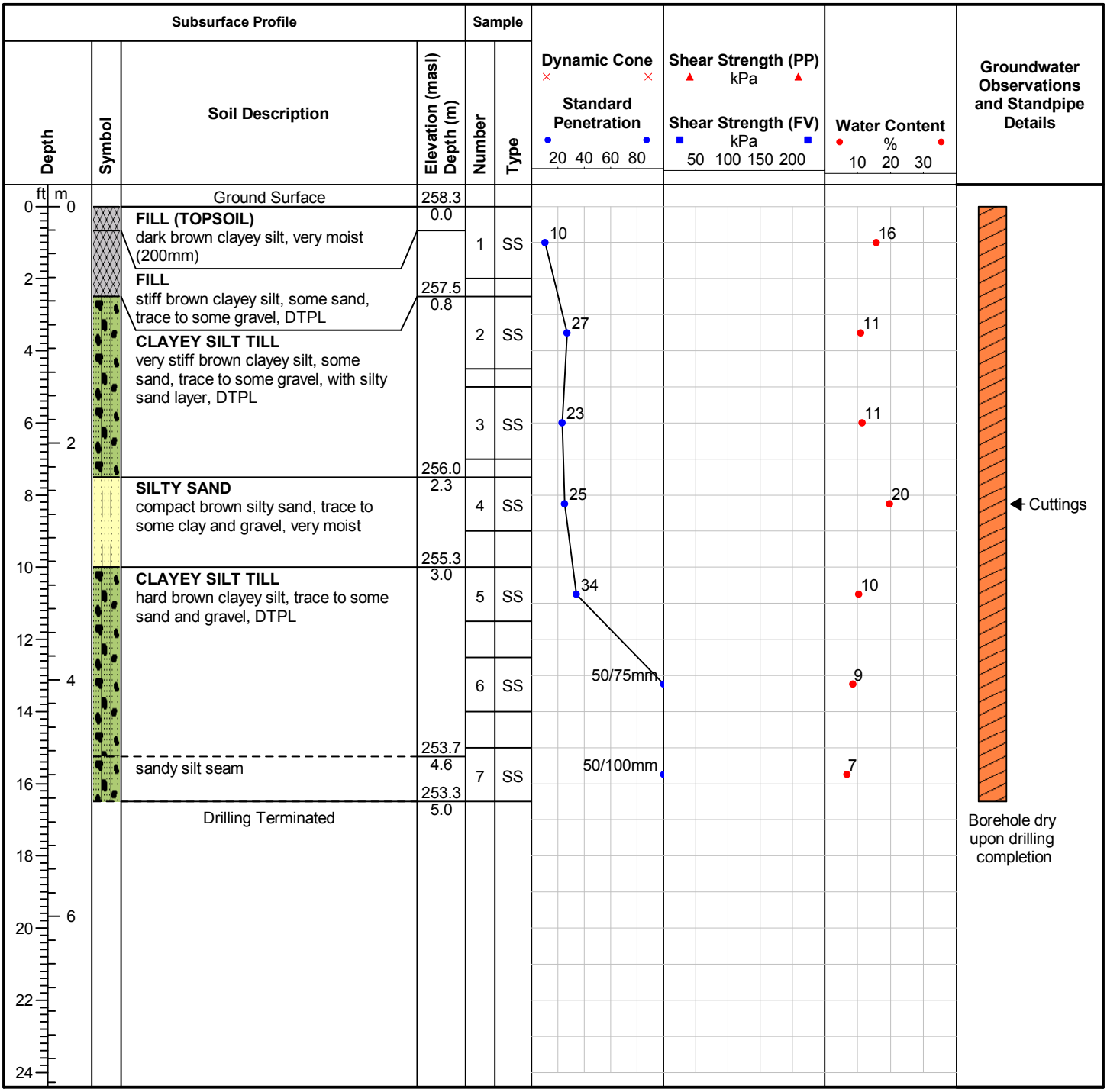
Drill Date: 11/5/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH110-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

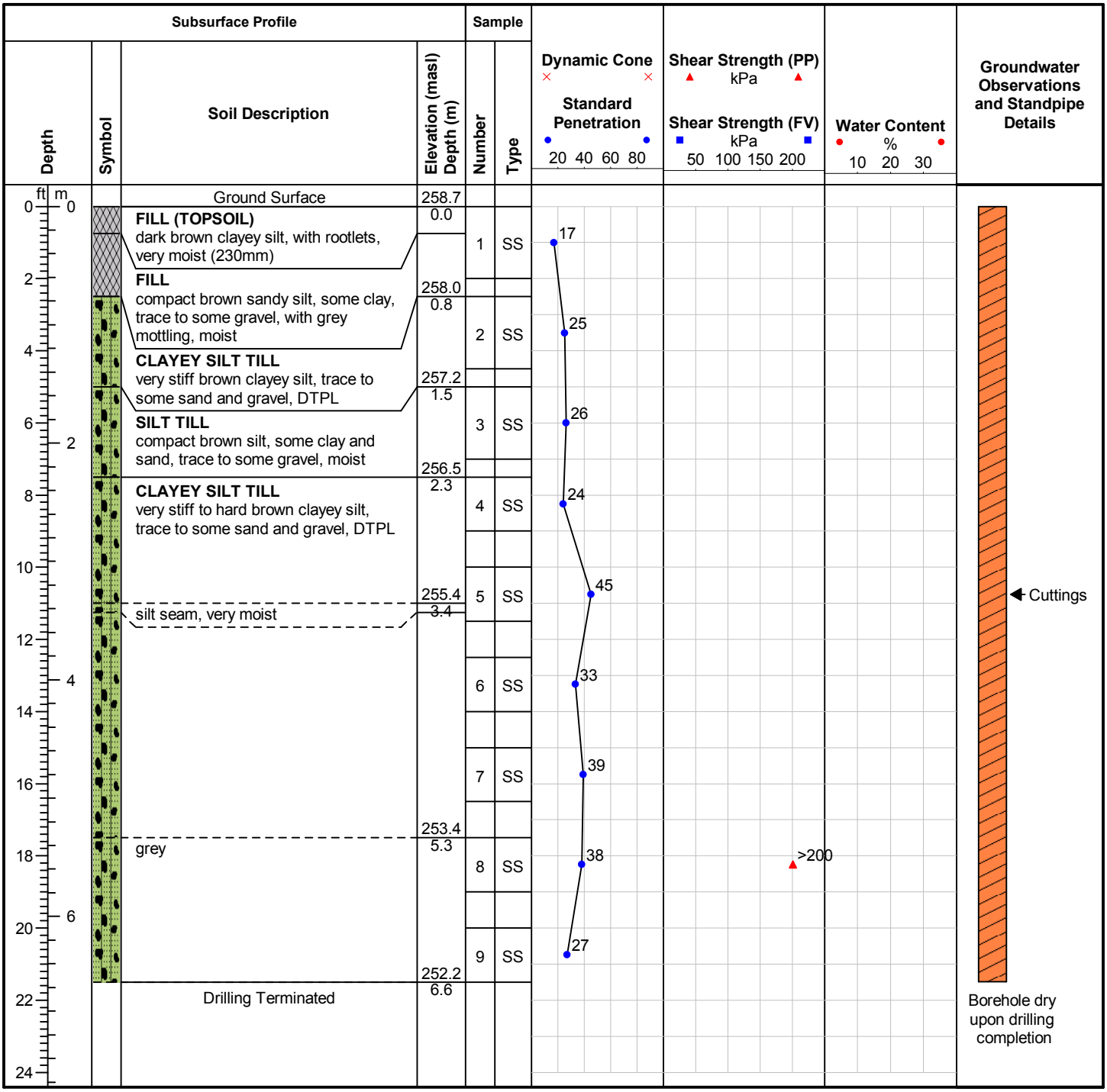
Drill Date: 10/30/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 1 of 1

ID Number: BH111-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

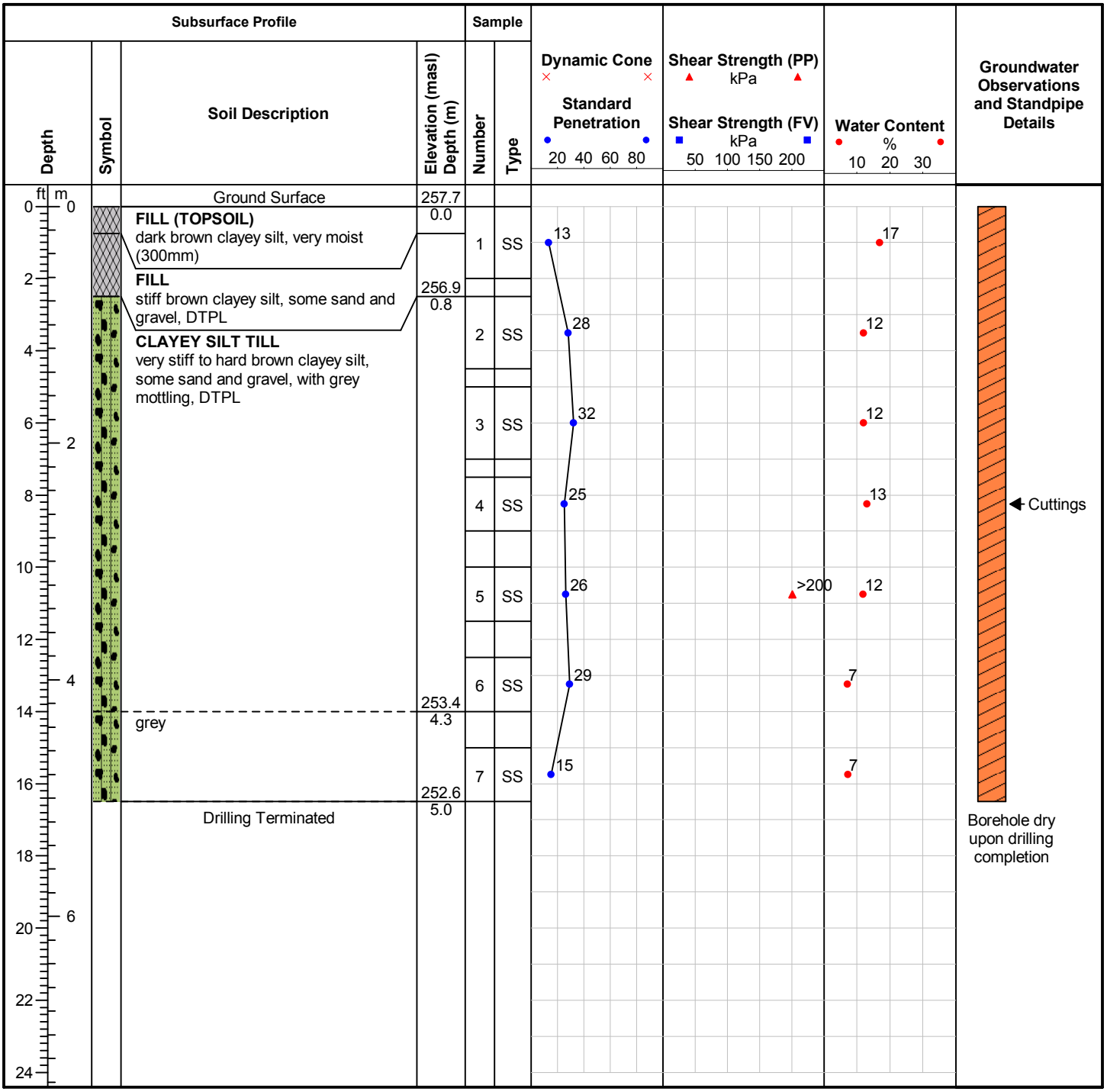
Drill Date: 11/2/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH112-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

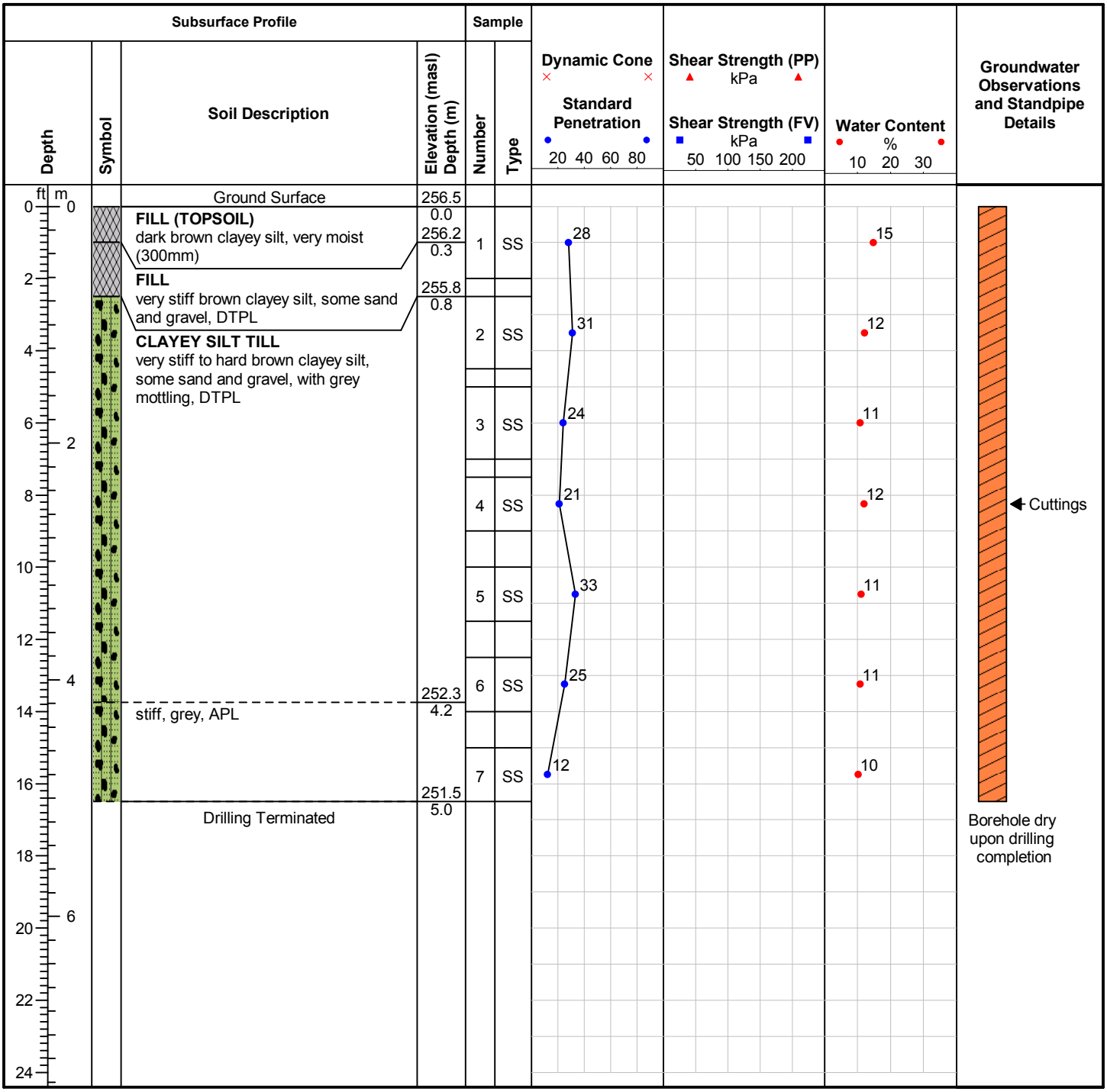
Drill Date: 11/2/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH113-21

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

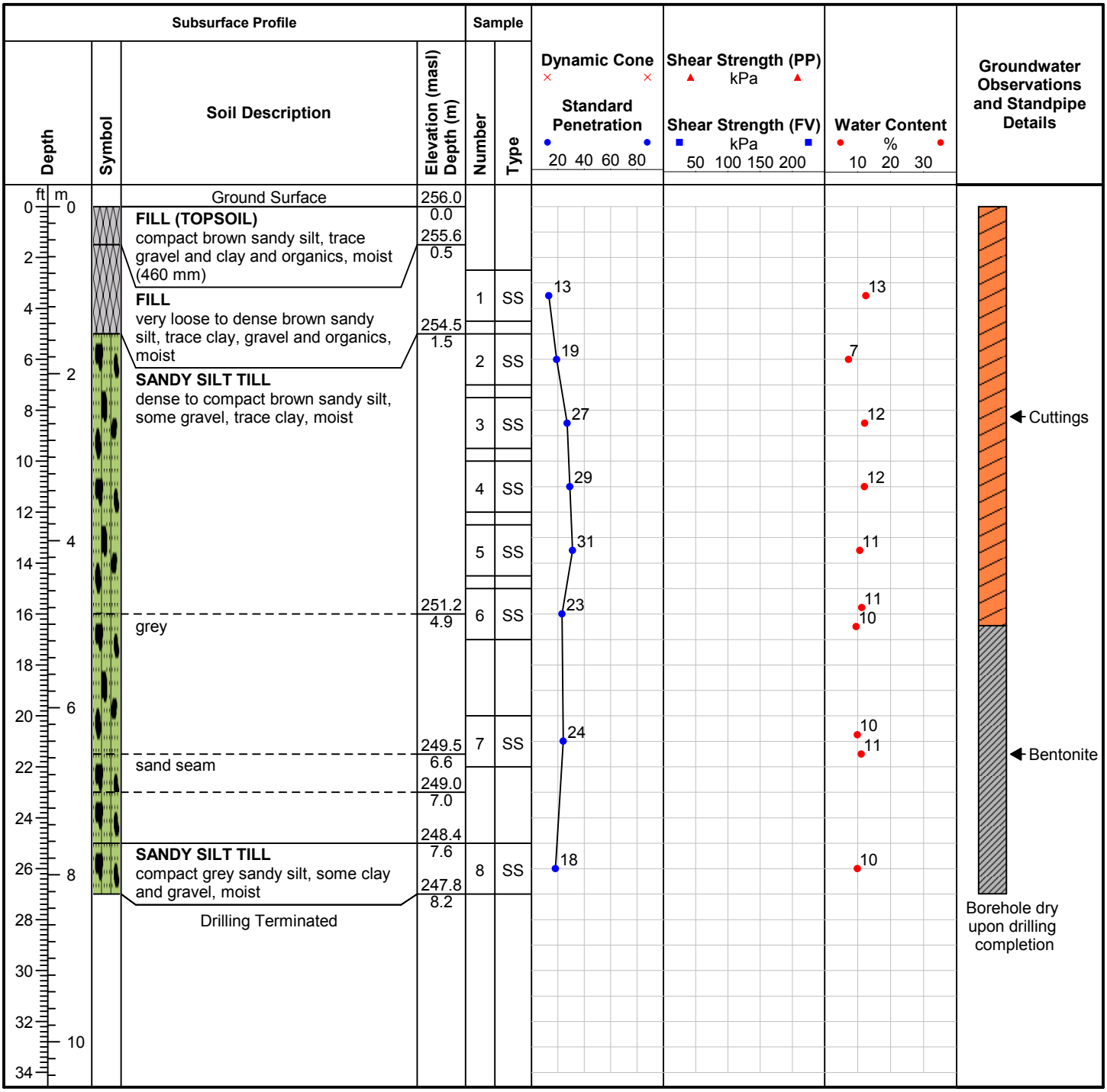
Drill Date: 2/5/2021

Drilling Contractor: Orbit Garant Drilling

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover:



Field Technician: B. Jagger

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 1 of 1

ID Number: BH114-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

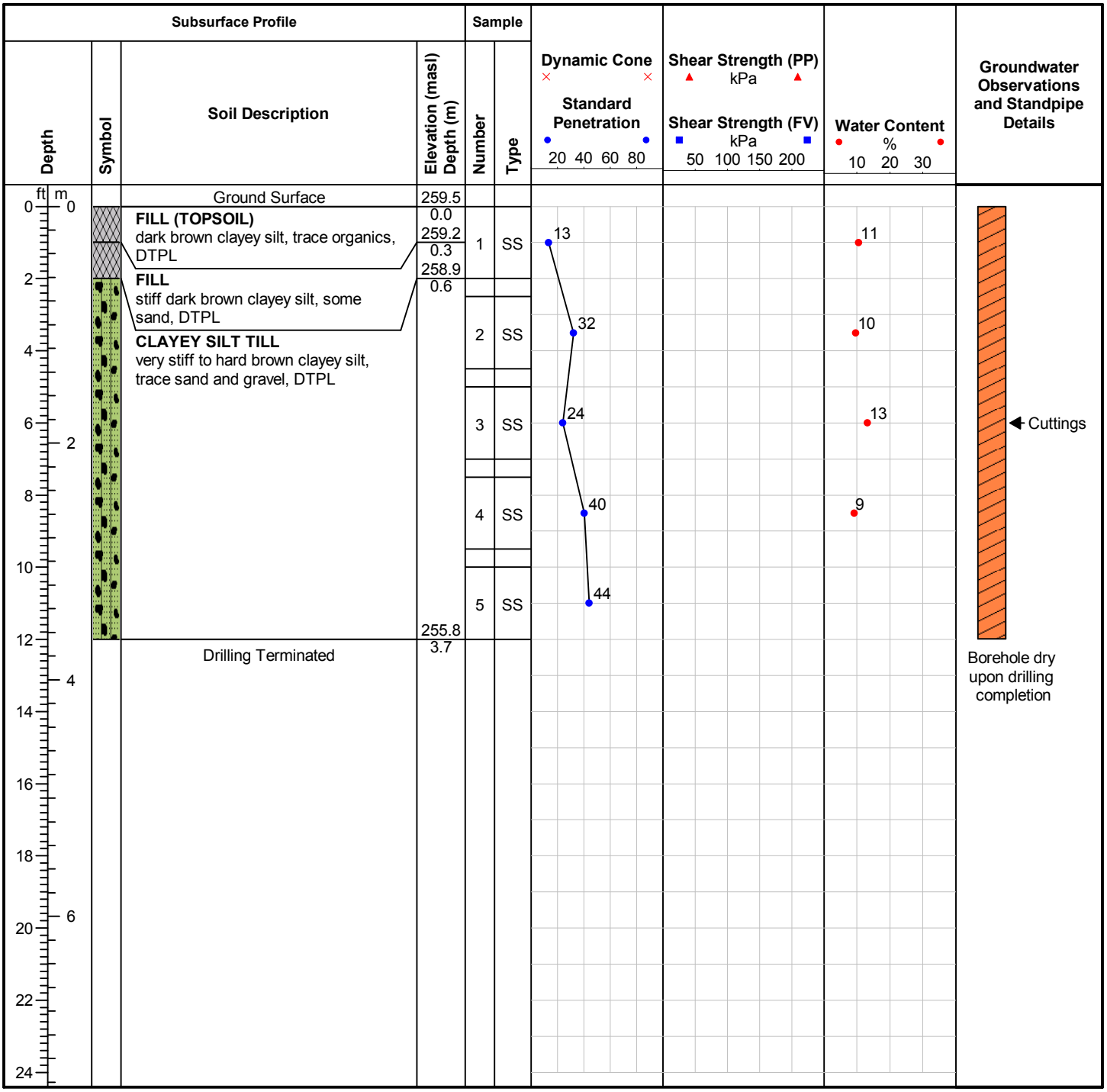
Drill Date: 11/3/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH115-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

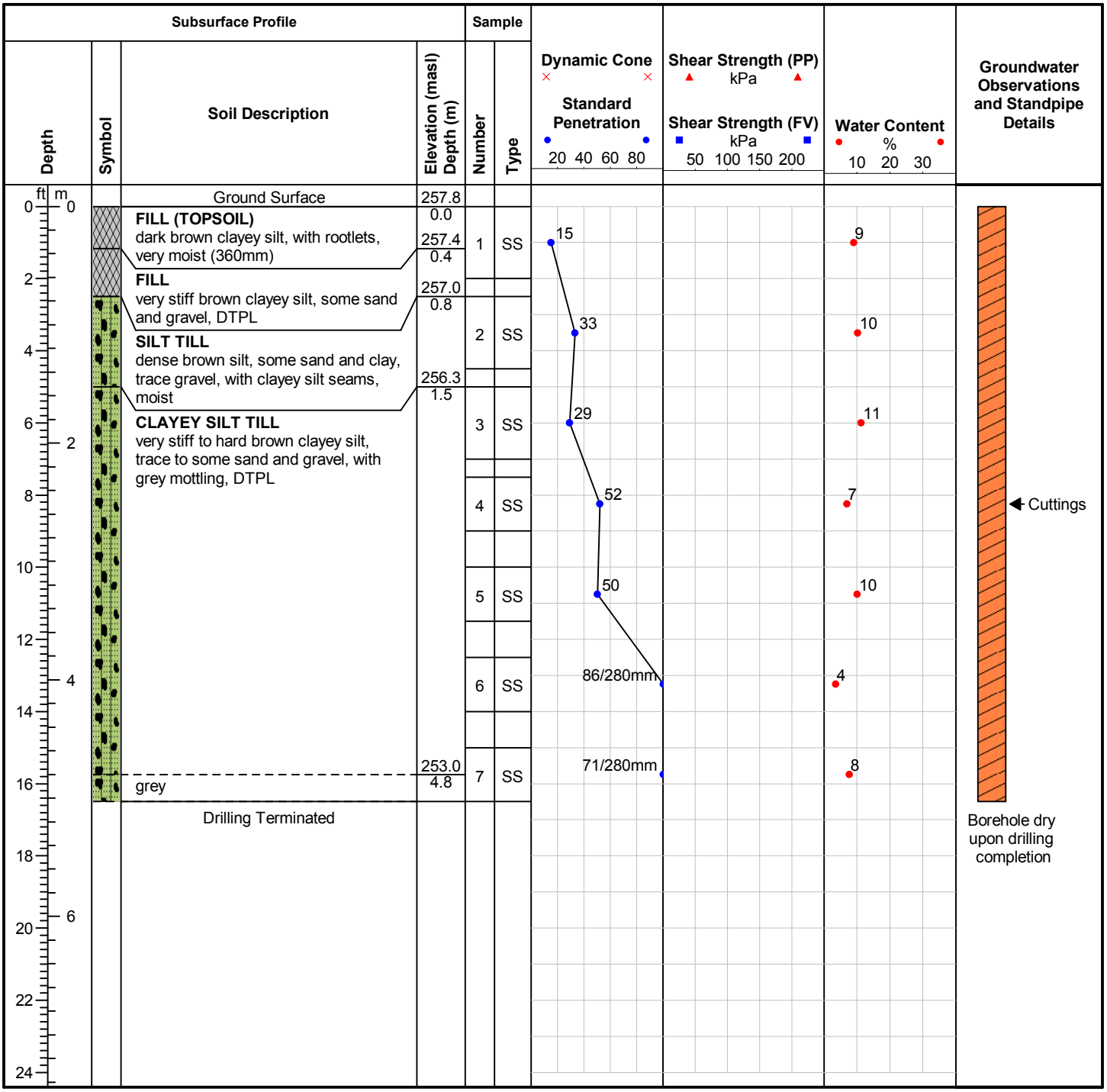
Drill Date: 11/2/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH116-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

Drill Date: 11/5/2020

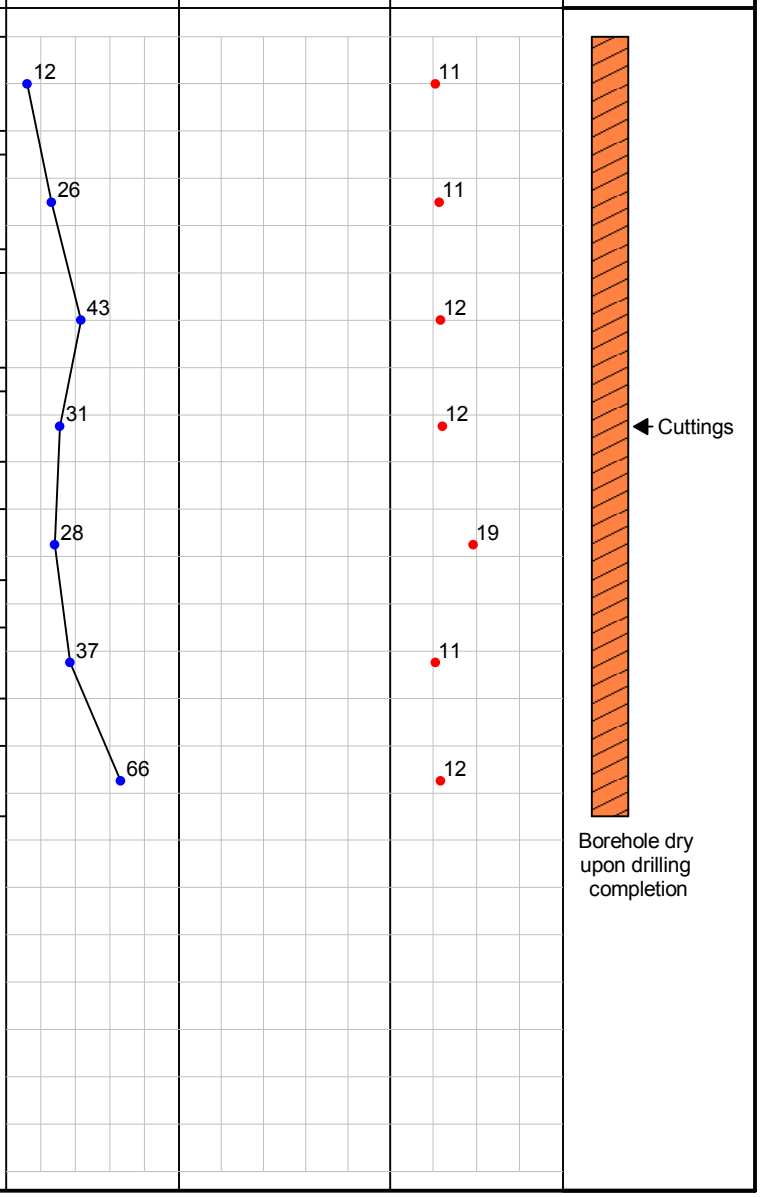
Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type
0 / 0		Ground Surface	258.7		
		FILL (TOPSOIL) dark brown clayey silt, very moist (200mm)	0.0	1	SS
2		**FILL** compact brown silt, some clay, trace to some sand and gravel, moist	257.9 / 0.8	2	SS
4		**SILT TILL** compact brown silt, some clay, trace to some sand and gravel, with grey mottling, moist	257.2 / 1.5	3	SS
6 / 2		**CLAYEY SILT TILL** hard brown clayey silt, some sand, trace to some gravel, DTPL	256.4 / 2.3	4	SS
8		**SILT TILL** dense brown silt, some clay, sand and gravel, moist	255.7 / 3.0	5	SS
10		**CLAYEY SILT TILL** very stiff to hard brown clayey silt, trace to some sand, trace gravel, DTPL		6	SS
12 / 4				7	SS
14					
16			253.7 / 5.0		
18		Drilling Terminated			
20 / 6					
22					
24					



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 1 of 1

ID Number: BH117-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

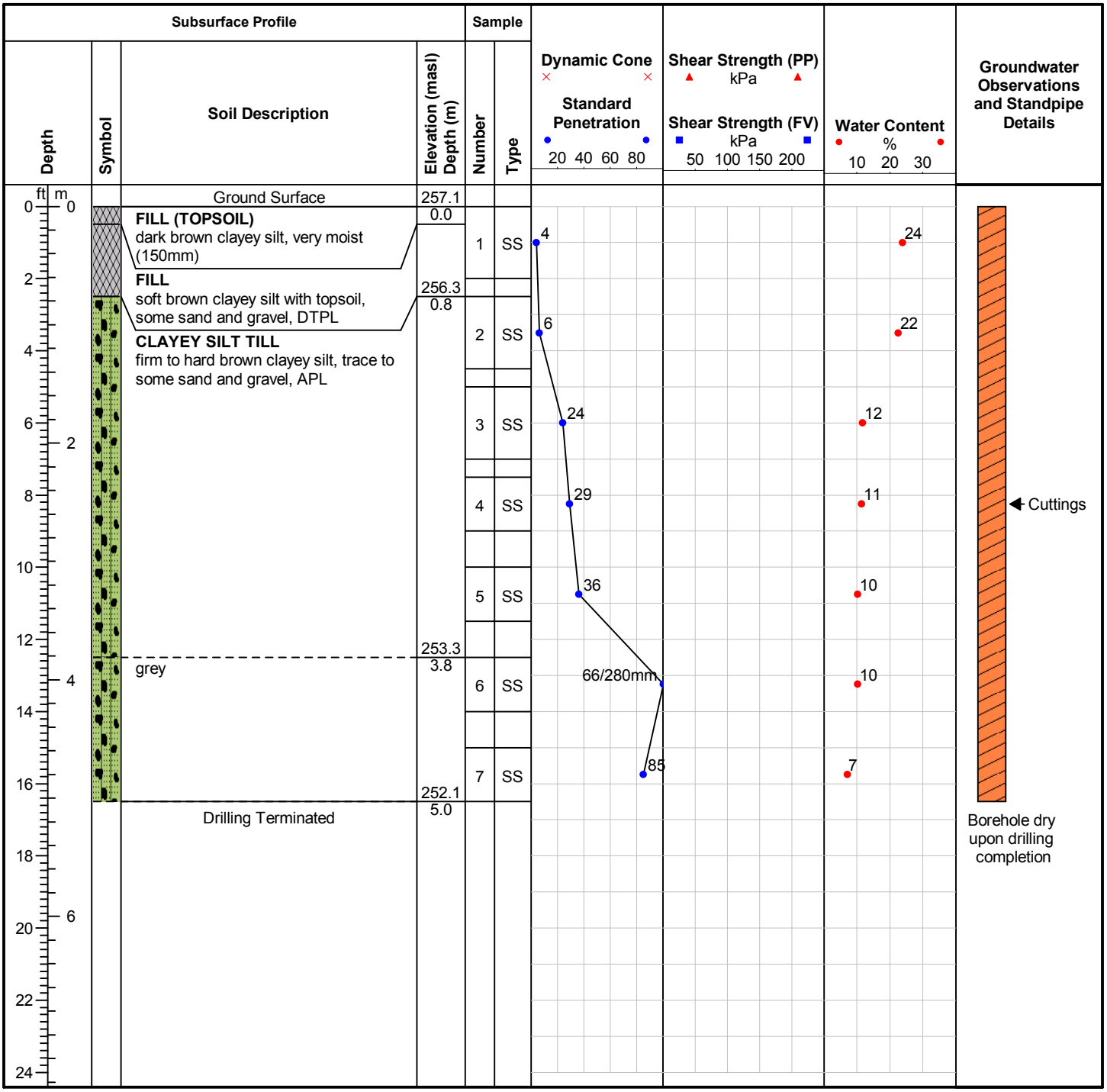
Drill Date: 11/2/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH118-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

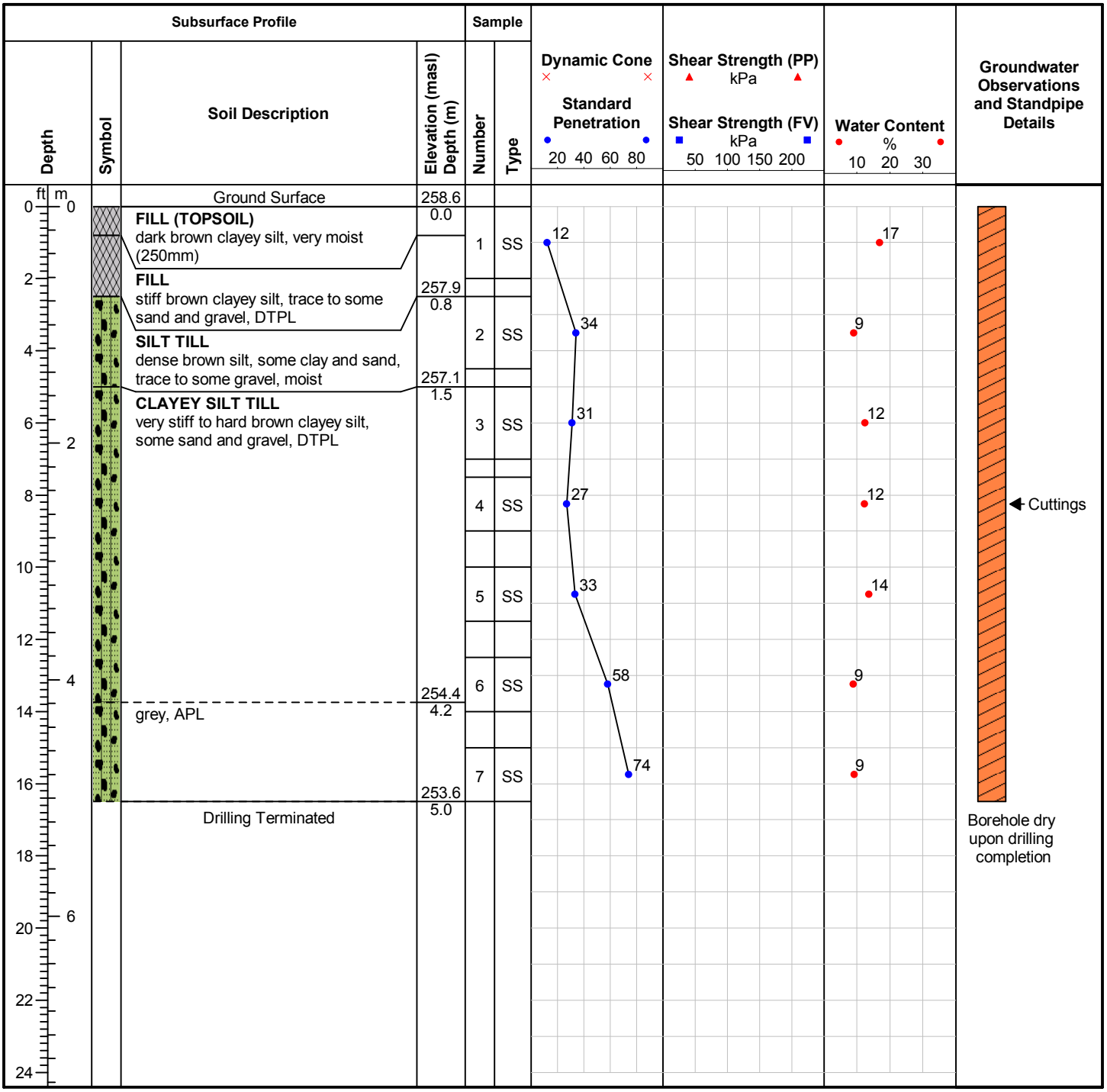
Drill Date: 11/2/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 1 of 1

ID Number: BH119-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

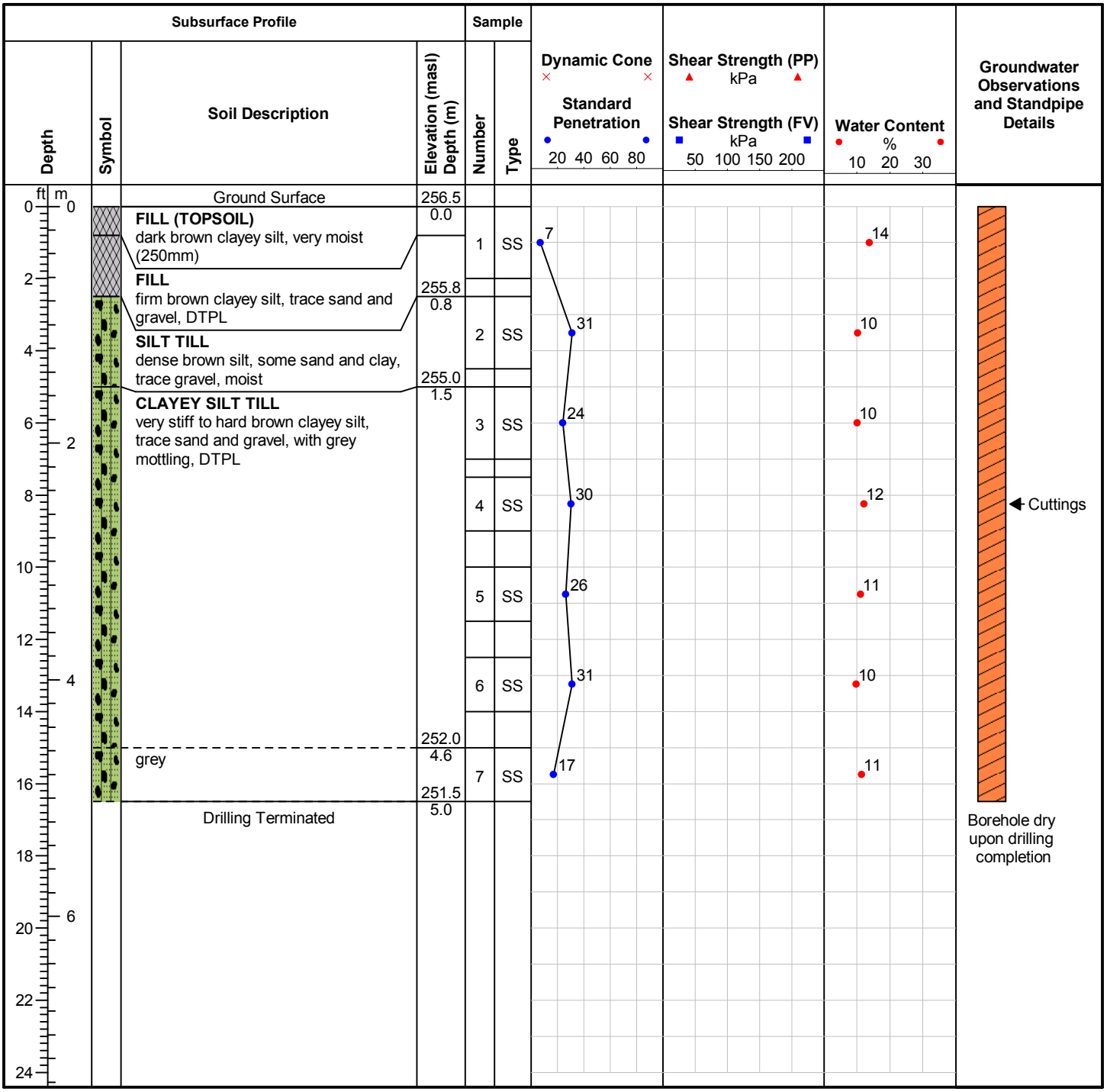
Drill Date: 11/2/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH120-21

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

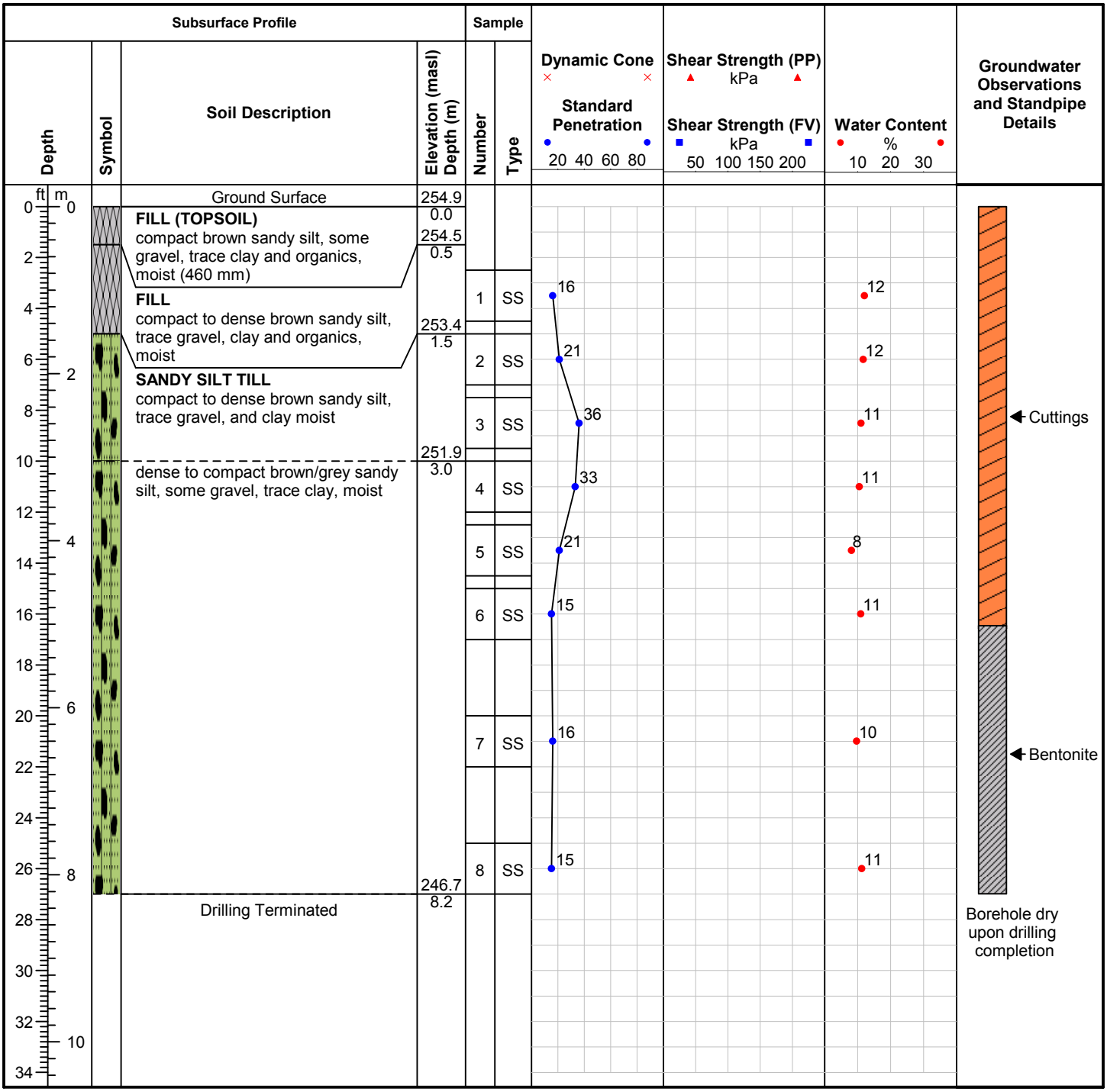
Drill Date: 2/5/2021

Drilling Contractor: Orbit Garant Drilling

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover:



Field Technician: B. Jagger

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 1 of 1

ID Number: BH121-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

Drill Date: 11/3/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type
0 / 0		Ground Surface	258.8		
		FILL (TOPSOIL) dark brown clayey silt, trace roots, DTPL	0.0 / 258.5	1	SS
			0.3 / 258.2		
2 /		**FILL** stiff brown clayey silt, trace sand and gravel, DTPL	0.6	2	SS
4 /		**CLAYEY SILT TILL** very stiff to hard brown clayey silt, trace sand and gravel, DTPL		3	SS
6 / 2					
8 /				4	SS
10 /			255.7		
		some sand and gravel	3.0	5	SS
12 / 4			255.1		
14 /		Drilling Terminated	3.7		
16 /					
18 /					
20 / 6					
22 /					
24 /					

Dynamic Cone — Standard Penetration: 20 40 60 80

Shear Strength (PP) kPa

Shear Strength (FV) kPa: 50 100 150 200

Water Content %: 10 20 30

Standard Penetration values: 10, 23, 32, 33, 64

Groundwater Observations and Standpipe Details: Cuttings

Borehole dry upon drilling completion

Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

ID Number: BH122-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

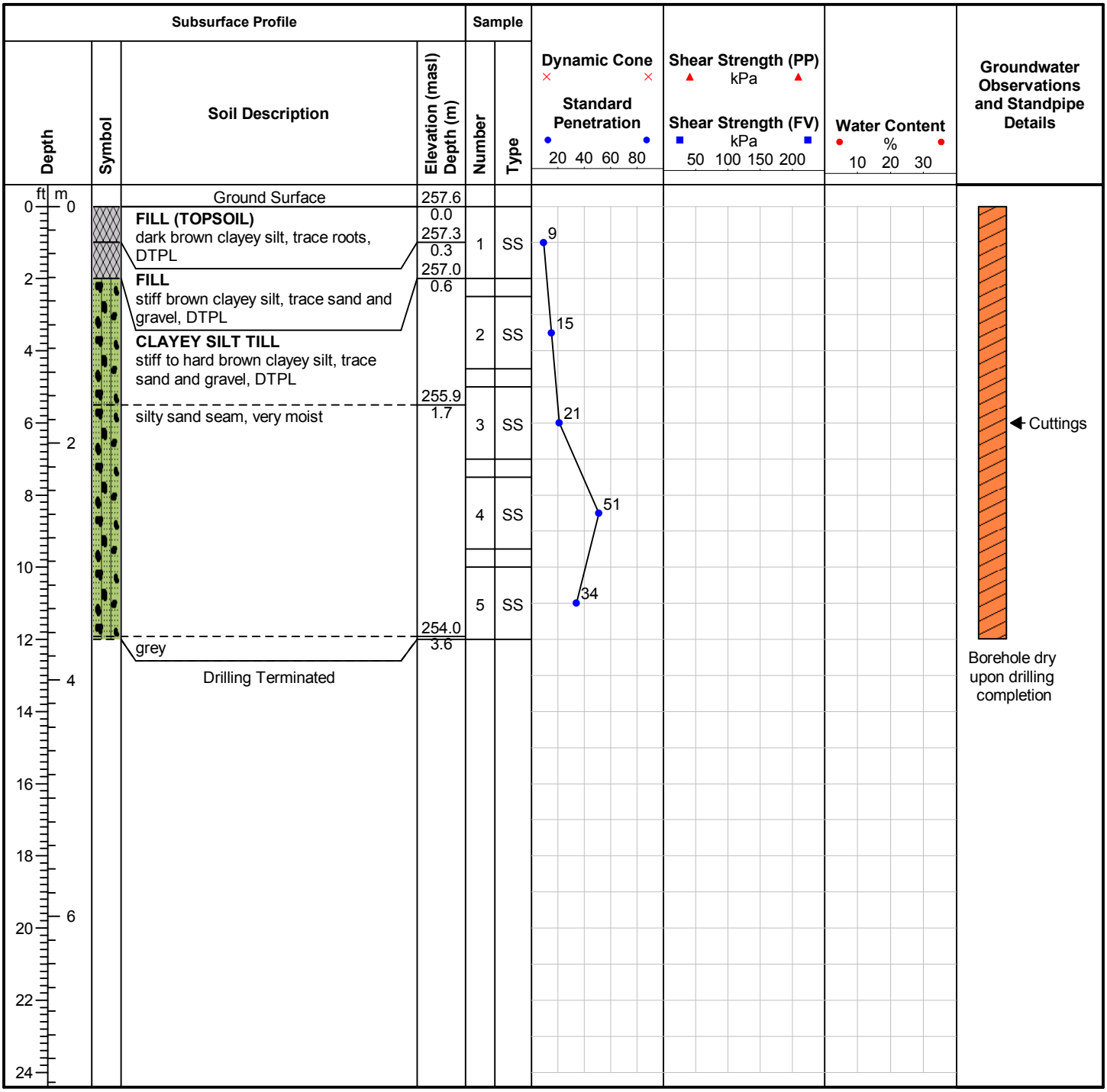
Drill Date: 11/3/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 1 of 1

ID Number: BH123-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

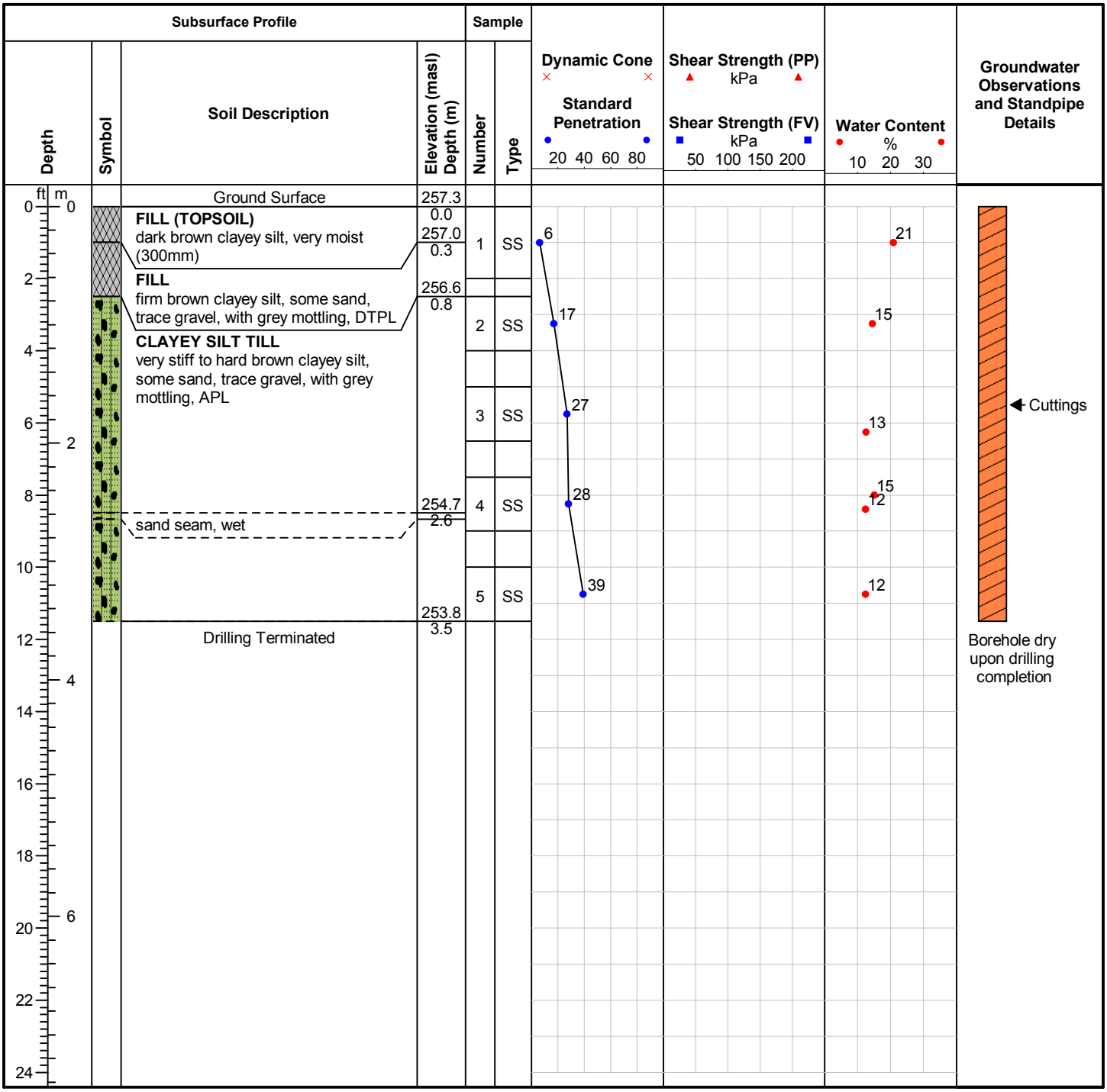
Drill Date: 11/12/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH124-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

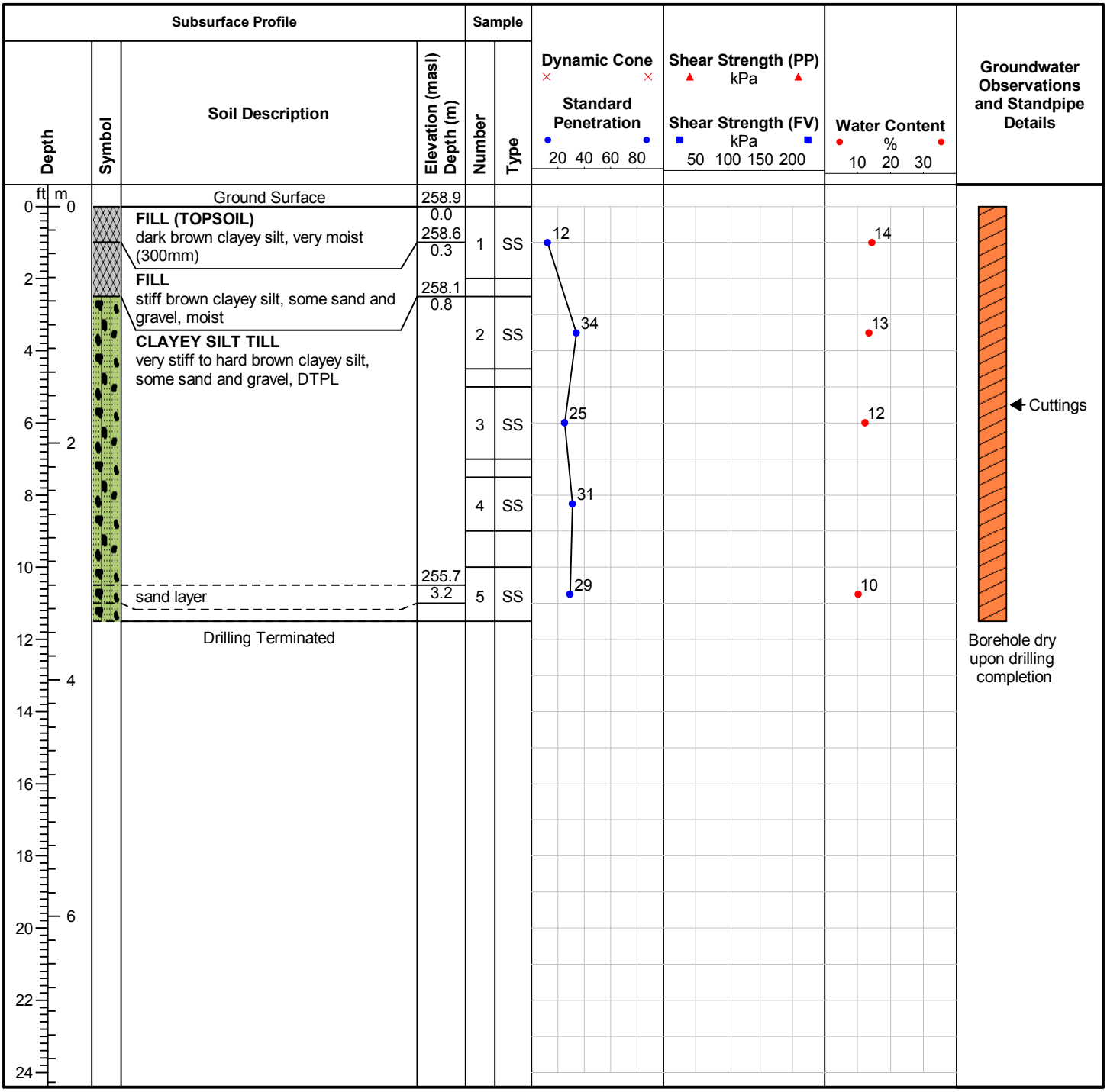
Drill Date: 11/2/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH125-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

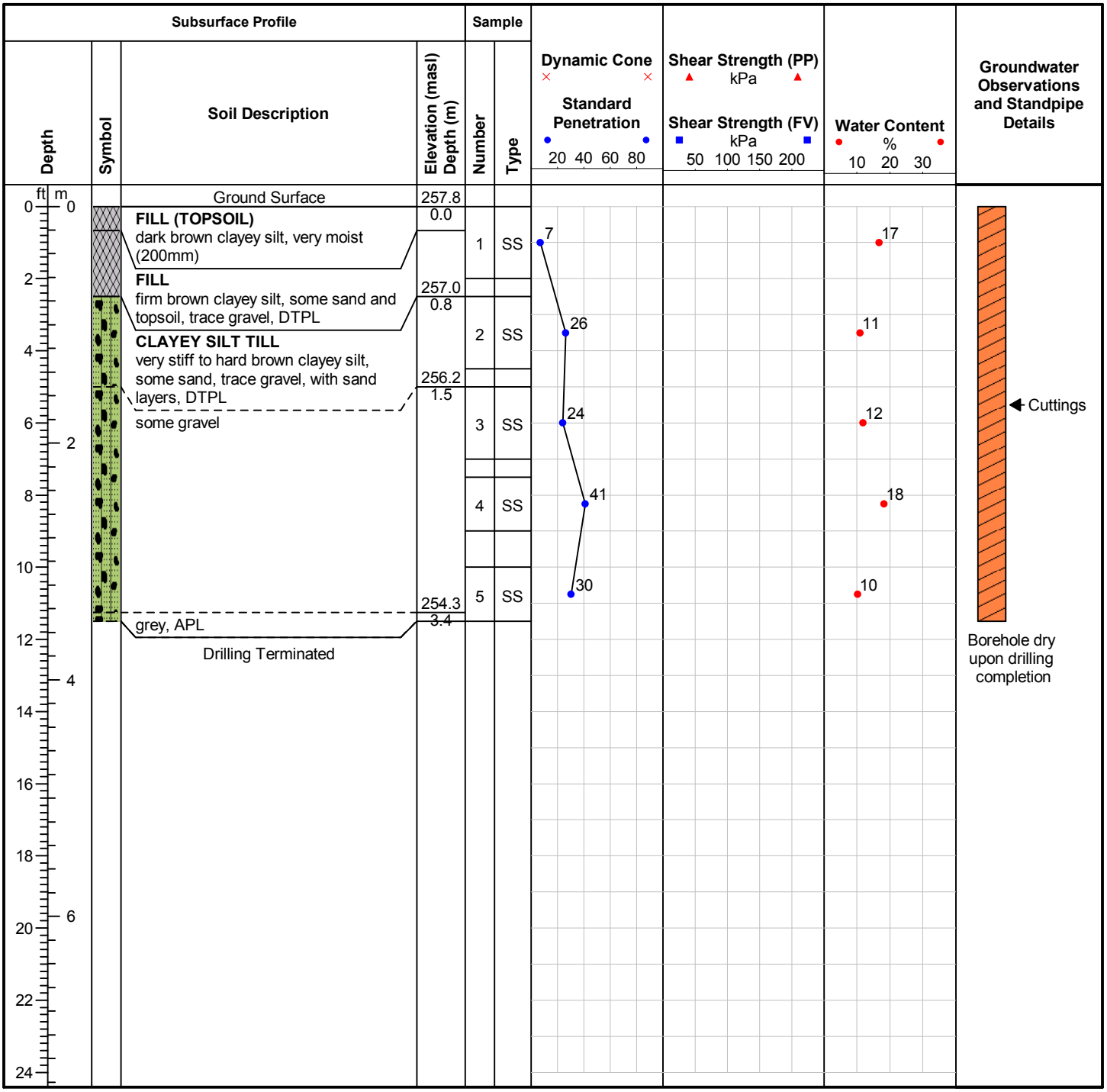
Drill Date: 11/6/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH126-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

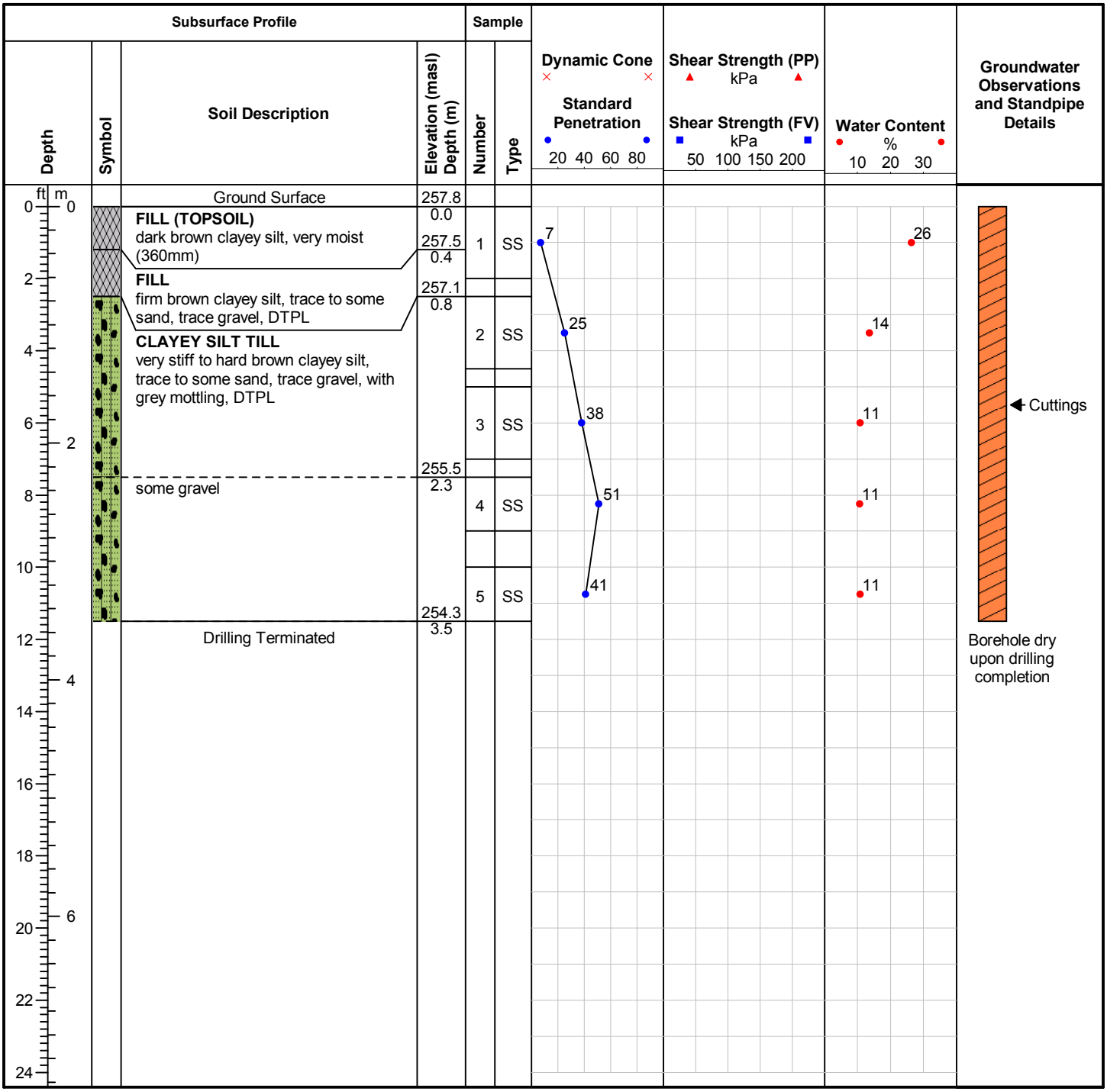
Drill Date: 11/2/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH127-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

Drill Date: 11/12/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone / Standard Penetration	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %	Groundwater Observations and Standpipe Details
		Ground Surface	257.3 / 0.0						
0		**FILL (TOPSOIL)** dark brown clayey silt, very moist (230mm)		1	SS	11		9	
2		**FILL** stiff brown clayey silt, trace to some sand and gravel, with grey mottling, DTPL	256.5 / 0.8	2	SS	33		10	
4		**CLAYEY SILT TILL** very stiff to hard brown clayey silt, trace to some sand and gravel, with grey mottling, DTPL		3	SS	24		12	
6				4	SS	31		12	
8				5	SS	34		11	
10			253.8 / 3.5						
12		Drilling Terminated							Cuttings; Borehole dry upon drilling completion
14									
16									
18									
20									
22									
24									

Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 1 of 1

ID Number: BH128-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

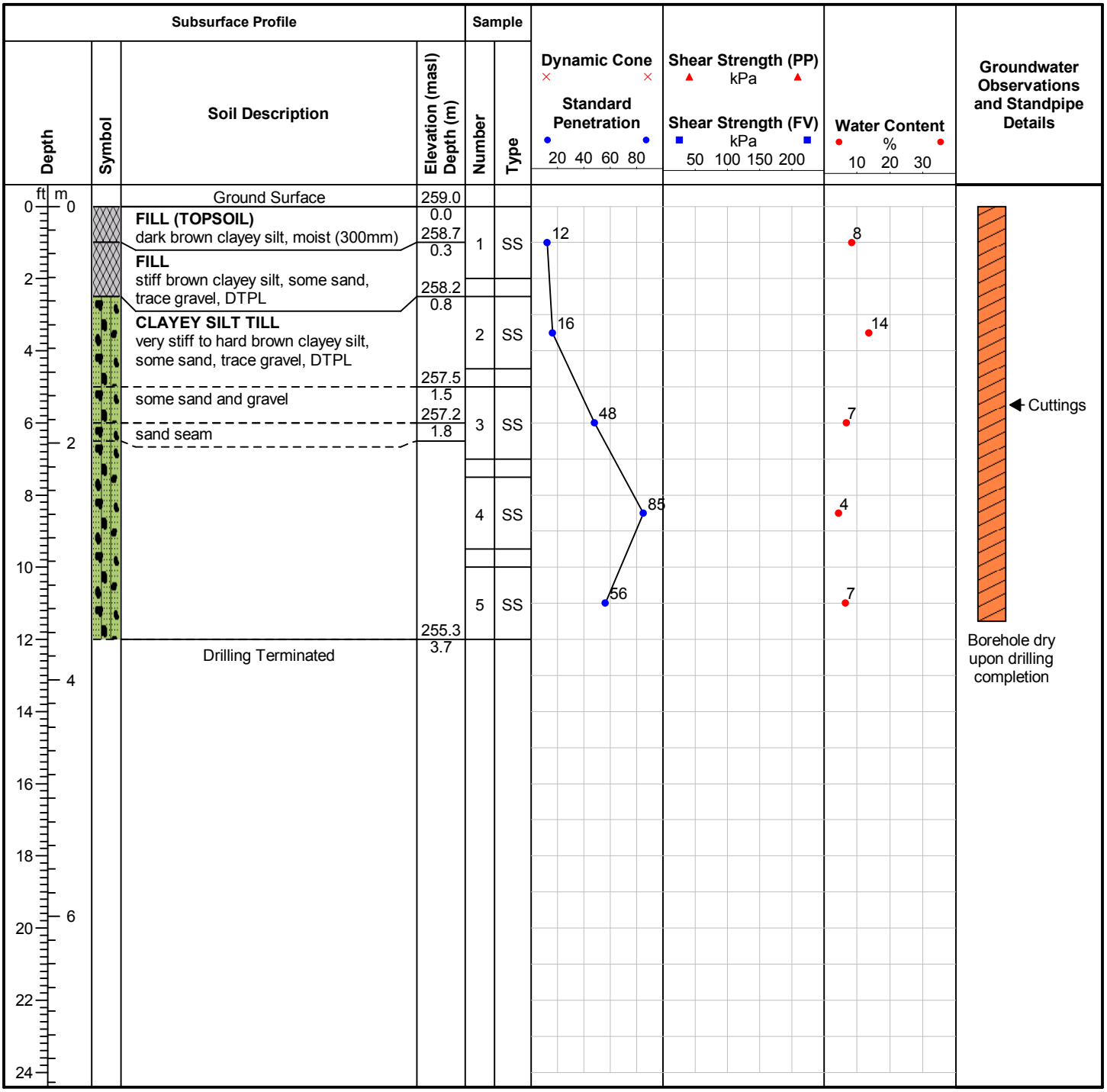
Drill Date: 11/3/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: Geoprobe 7822DT

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH129-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

Drill Date: 11/6/2020

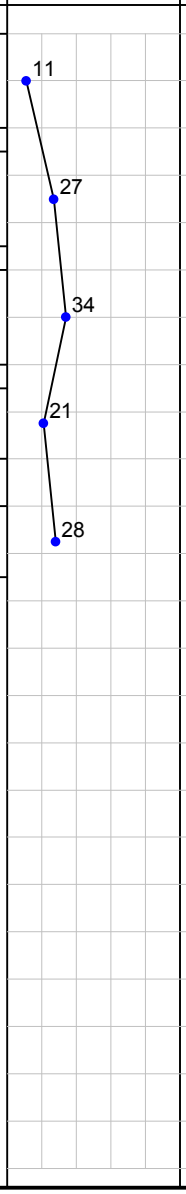
Drilling Contractor: Tri-Phase Group

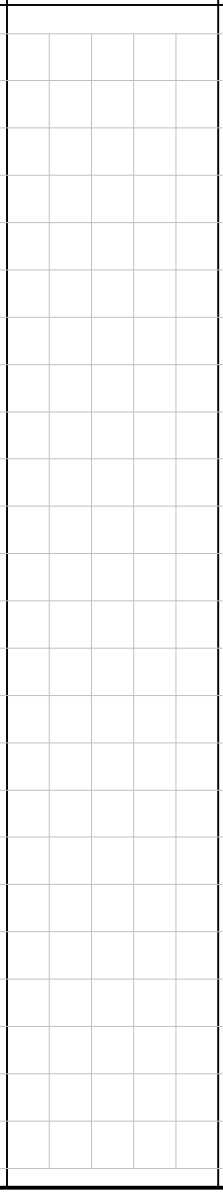
Drill Rig: Geoprobe 7822DT

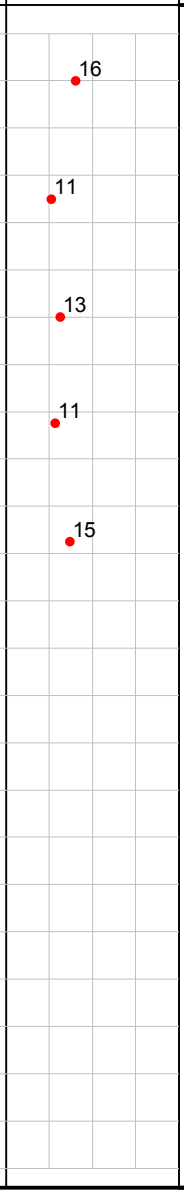
Drill Method: Solid Stem Auger

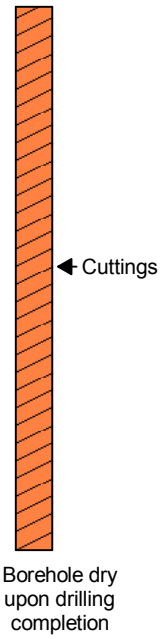
Protective Cover:

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type
0 / 0		Ground Surface	257.3		
		FILL (TOPSOIL) dark brown clayey silt, very moist (230mm)	0.0	1	SS
2		**FILL** stiff brown clayey silt, some sand and gravel, with grey mottling, DTPL	256.5 / 0.8	2	SS
4		**CLAYEY SILT TILL** very stiff to hard brown clayey silt, some sand and gravel, with grey mottling, DTPL		3	SS
6 / 2				4	SS
8					
10				5	SS
12 / 4		Drilling Terminated	253.8 / 3.5		
14					
16					
18					
20 / 6					
22					
24					









Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH130-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

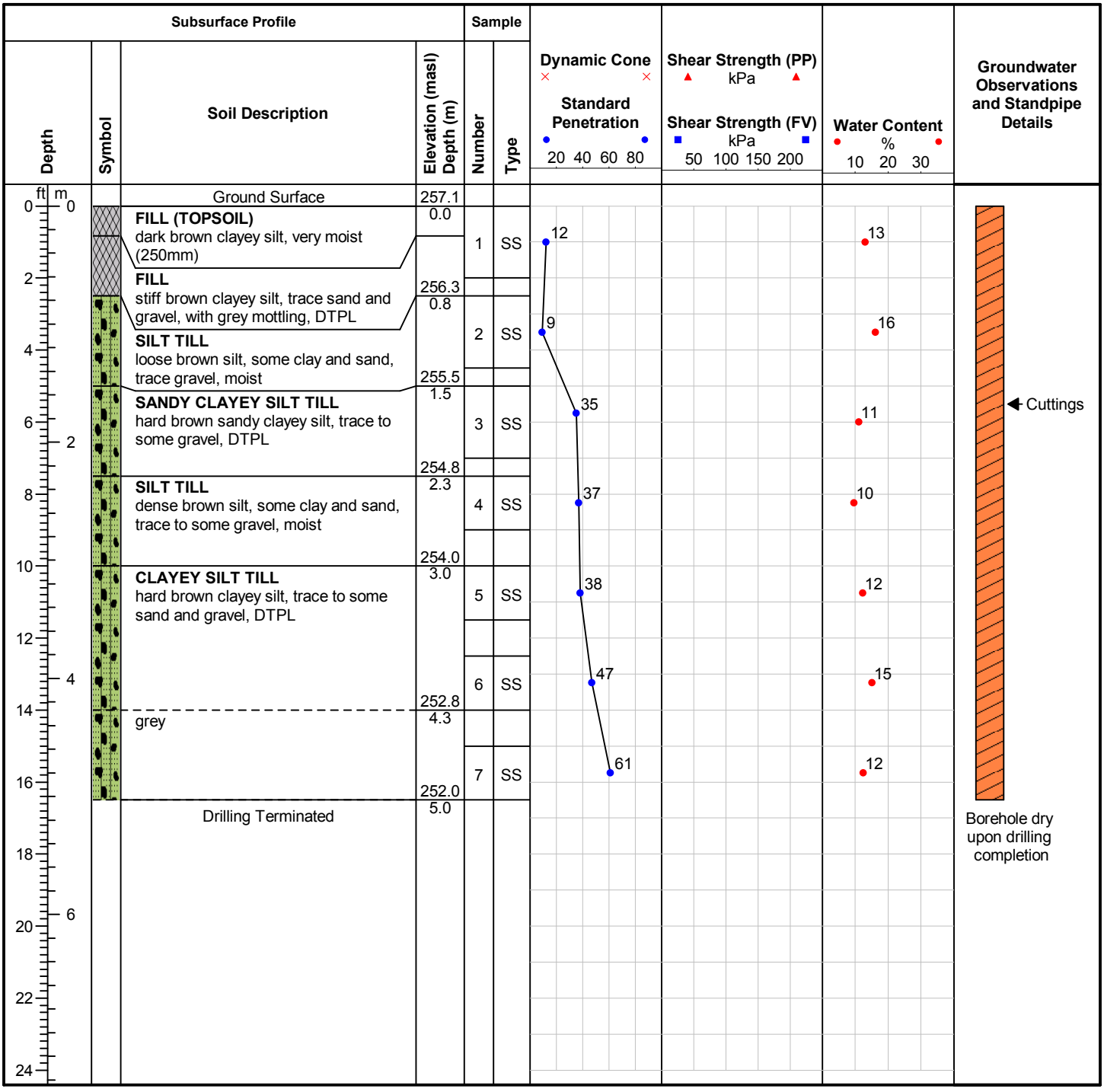
Drill Date: 11/5/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH131-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

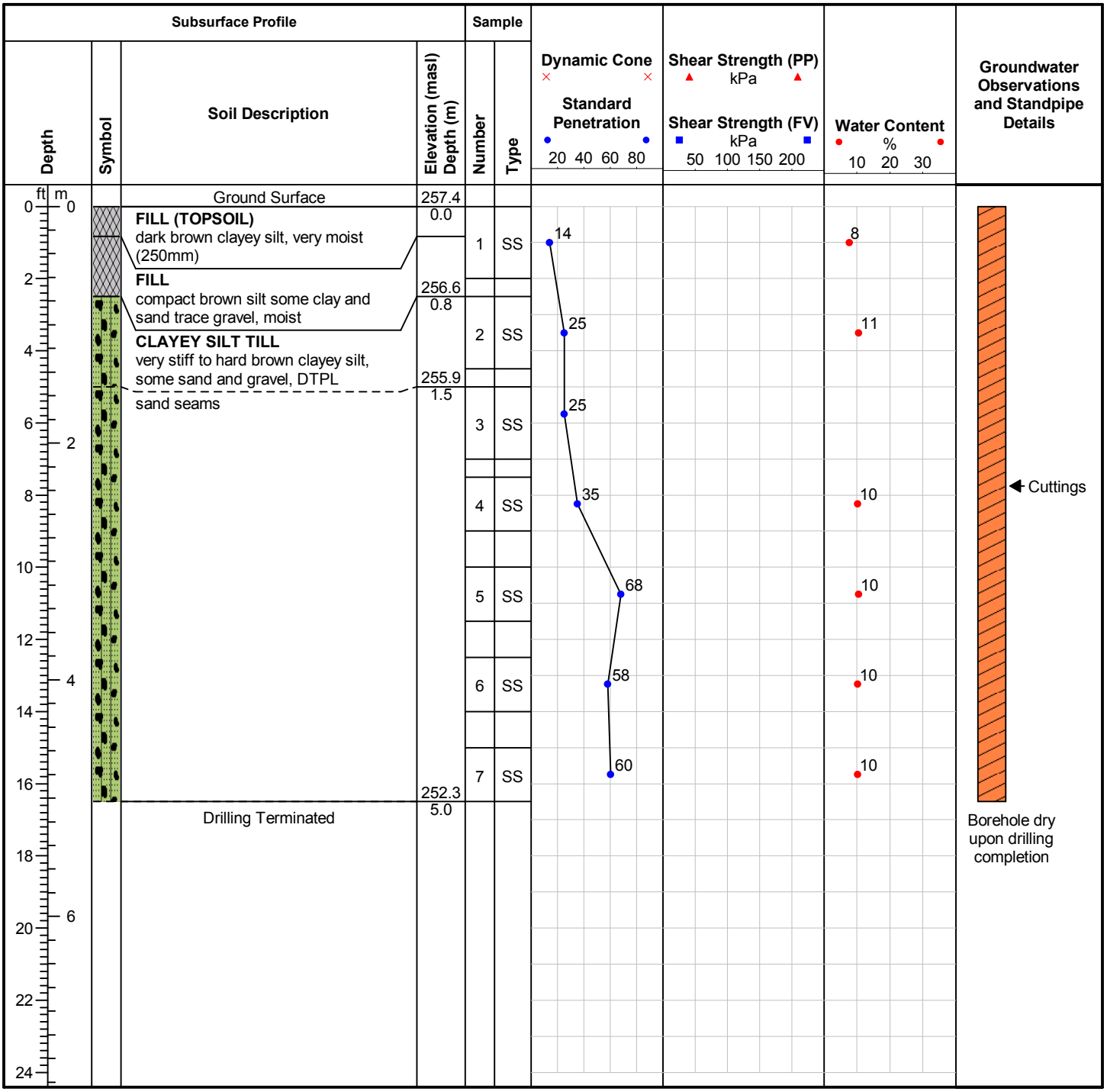
Drill Date: 11/5/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH132-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

Drill Date: 11/12/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone – Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)	Groundwater Observations and Standpipe Details
0 / 0		Ground Surface	256.8						
		TOPSOIL dark brown clayey silt, very moist (230mm)	0.0	1	SS	18		7	
2 /		**CLAYEY SILT TILL** very stiff to hard brown clayey silt, some sand and gravel, DTPL		2	SS	37		10	
4 /				3	SS	26		11	Cuttings
6 / 2				4	SS	25		11	
8 /				5	SS	38		10	
10 /			253.3						Borehole dry upon drilling completion
12 / 4		Drilling Terminated	3.5						
14 /									
16 /									
18 / 6									
20 /									
22 /									
24 /									

Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 1 of 1

ID Number: BH133-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

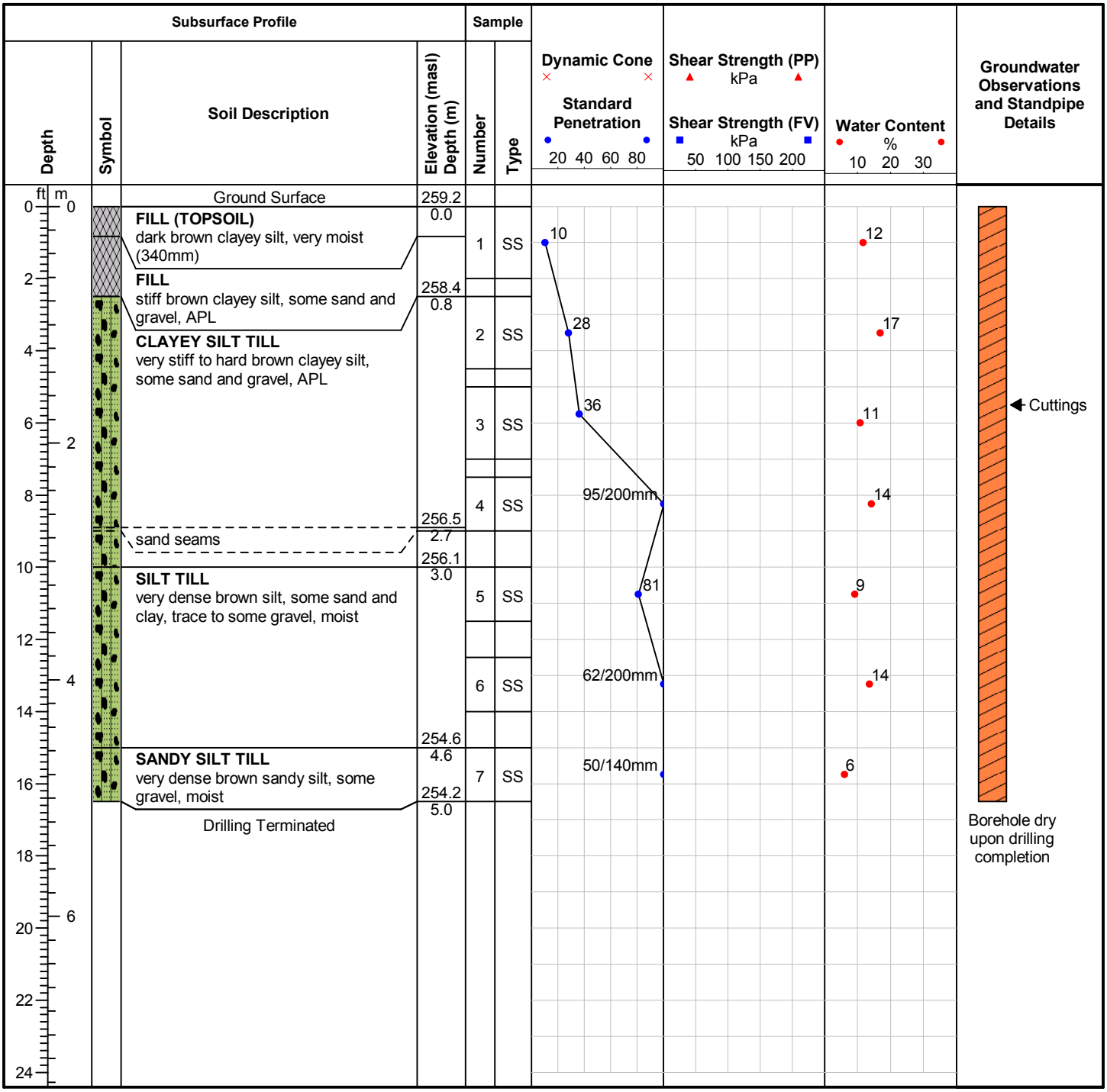
Drill Date: 11/9/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH134-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

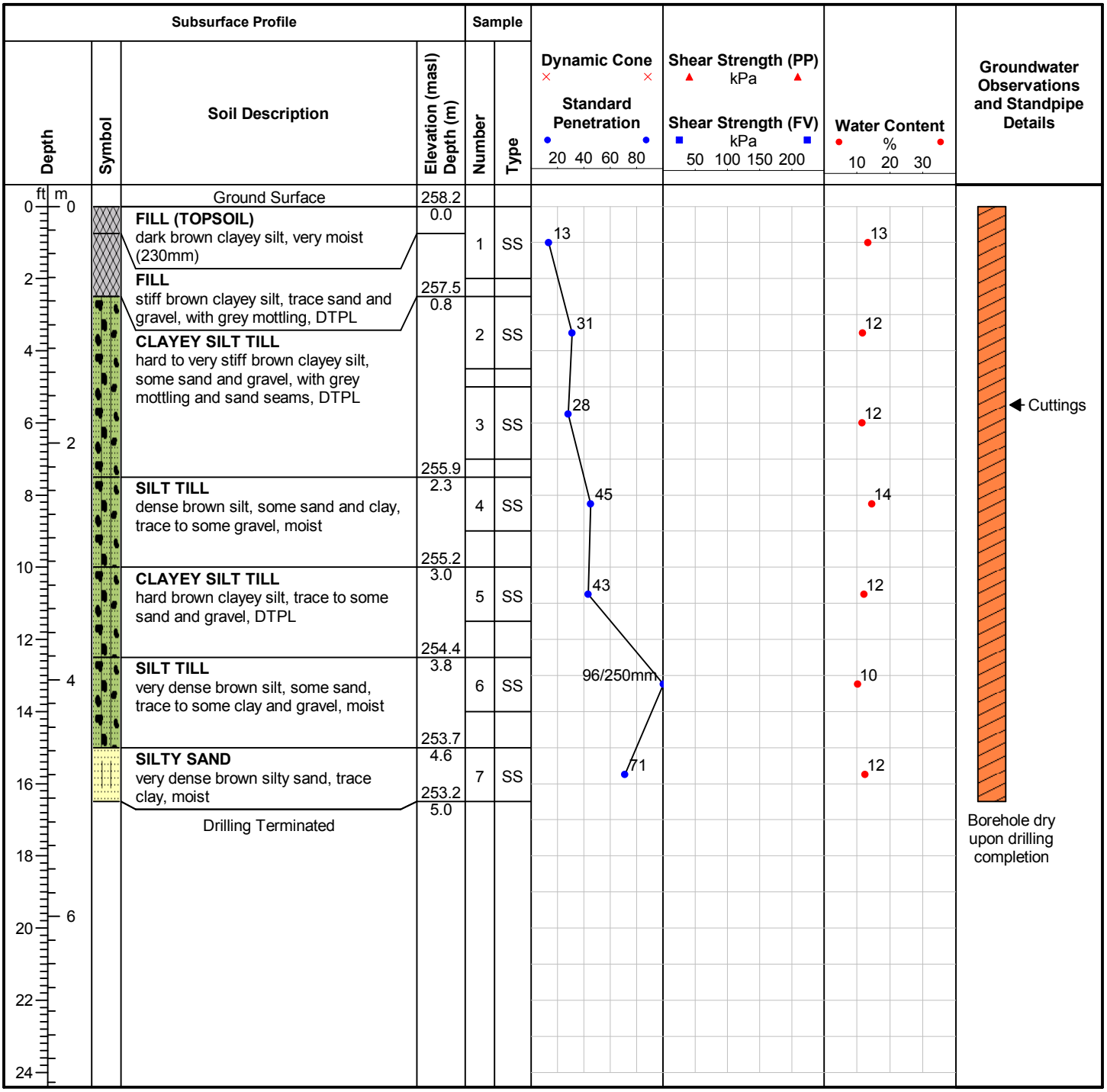
Drill Date: 11/5/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 1 of 1

ID Number: BH135-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

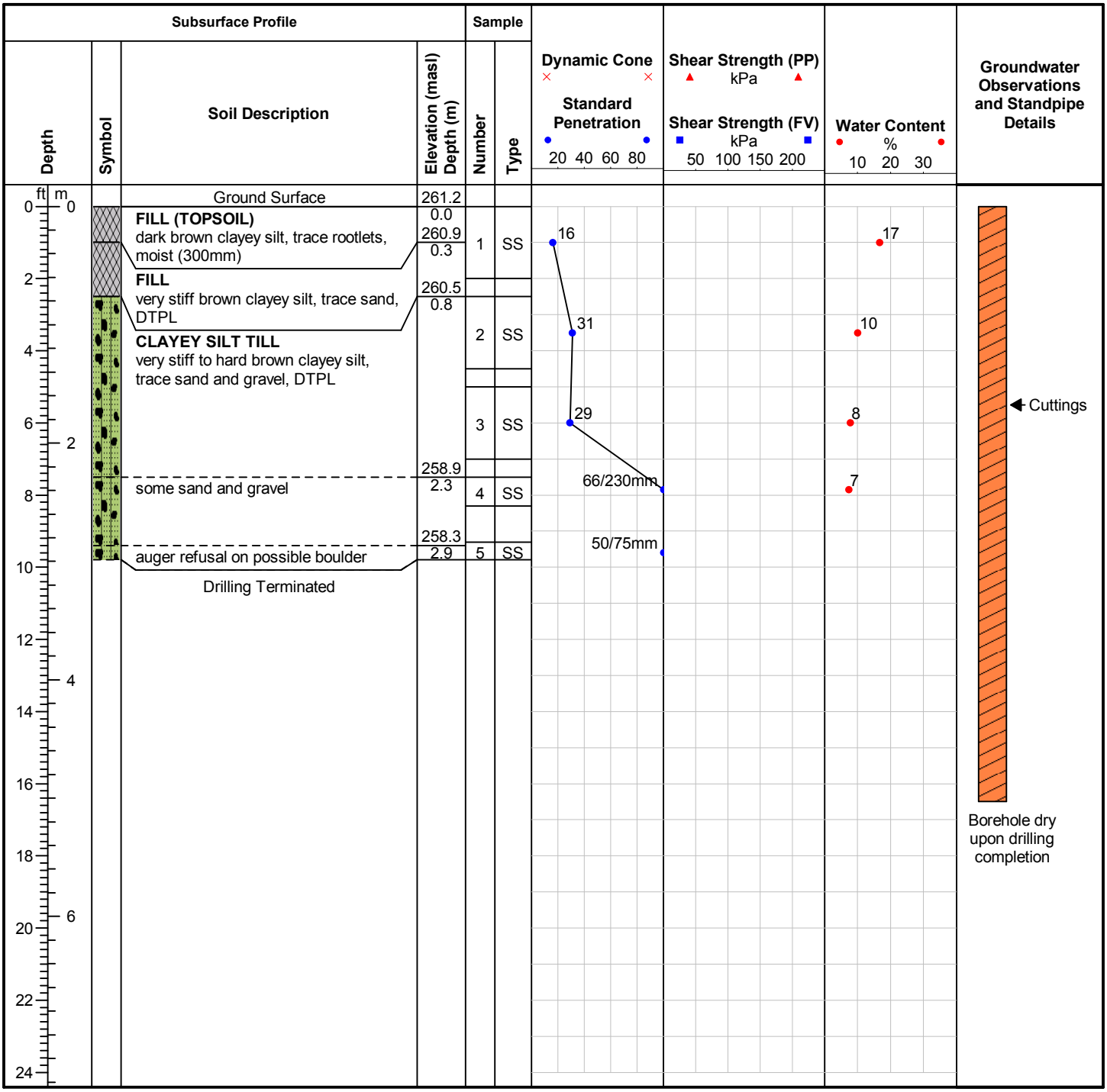
Drill Date: 11/3/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: Geoprobe 7822DT

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH136-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

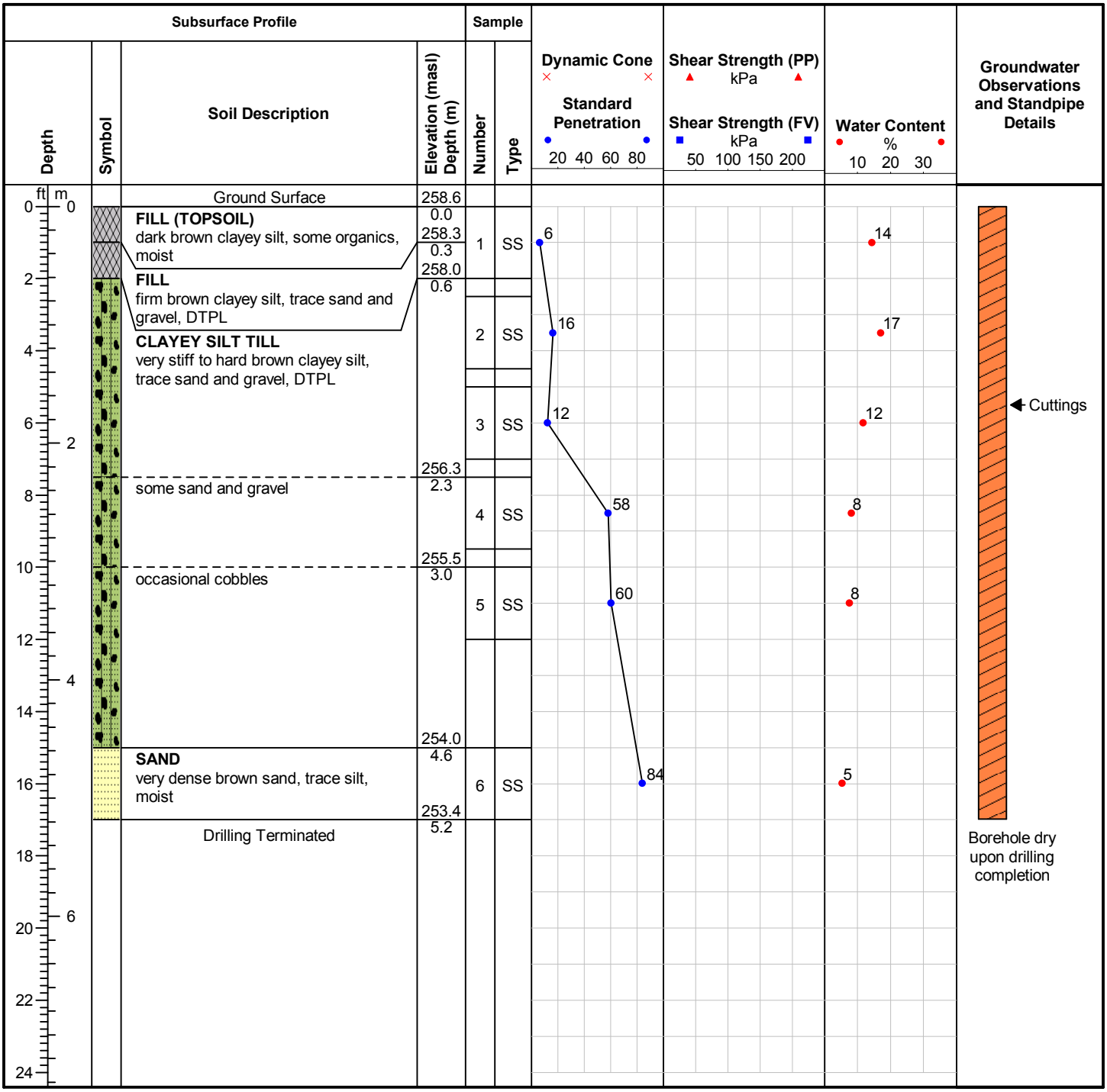
Drill Date: 11/3/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: Geoprobe 7822DT

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 1 of 1

ID Number: BH137-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

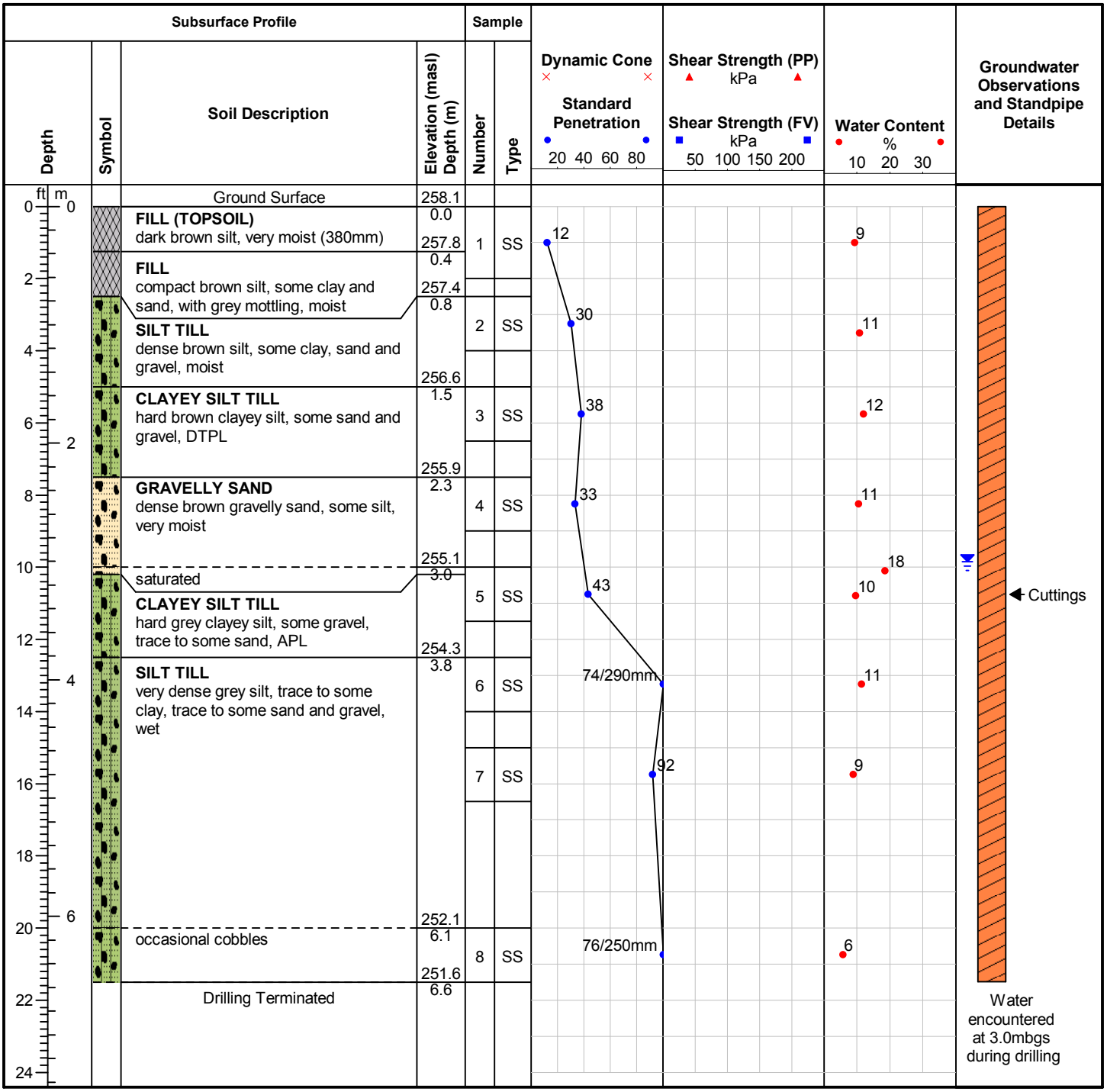
Drill Date: 11/13/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH138-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

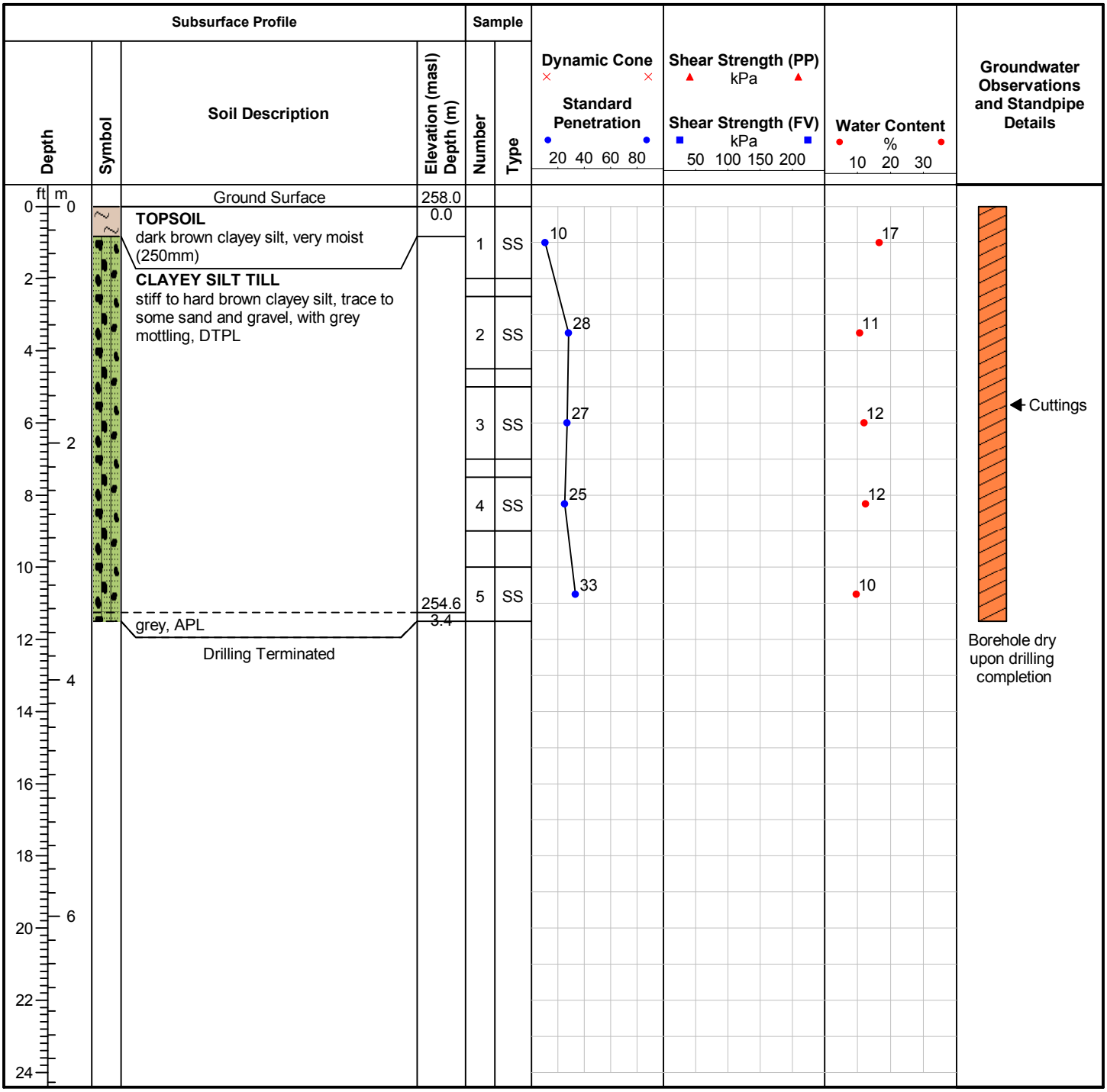
Drill Date: 11/6/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH139-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

Drill Date: 11/5/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)	Groundwater Observations and Standpipe Details
		Ground Surface	257.0						
0		**FILL (TOPSOIL)** dark brown clayey silt, very moist (300mm)	0.0 / 256.7 / 0.3	1	SS	10		16	
2		**FILL** stiff brown clayey silt, trace sand and gravel, with grey mottling, DTPL	256.2 / 0.8	2	SS	16		22	
4		**SILT TILL** compact brown silt, some clay and sand, trace to some gravel, with grey mottling, moist	255.7 / 1.2						
6		**CLAYEY SILT TILL** hard brown clayey silt, some sand and gravel, with grey mottling, DTPL	255.4 / 1.5	3	SS	58/230mm		19	
8		**SILT TILL** dense to very dense brown silt, some clay and sand, trace to some gravel, very moist	253.9	4	SS	39		11	
10		**CLAYEY SILT TILL** hard brown clayey silt, trace sand and gravel, DTPL	3.0 / 253.2	5	SS	72/280mm		14	
12		**SILT TILL** very dense brown silt, some sand, trace to some gravel and clay, moist	3.8 / 252.4	6	SS	77/280mm		7	
14		**CLAYEY SILT TILL** hard brown clayey silt, trace to some sand, DTPL	4.6 / 251.9	7	SS	97/250mm		8	
16		Drilling Terminated	5.0						Cuttings; Borehole dry upon drilling completion
18									
20									
22									
24									

Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 1 of 1

ID Number: BH140-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

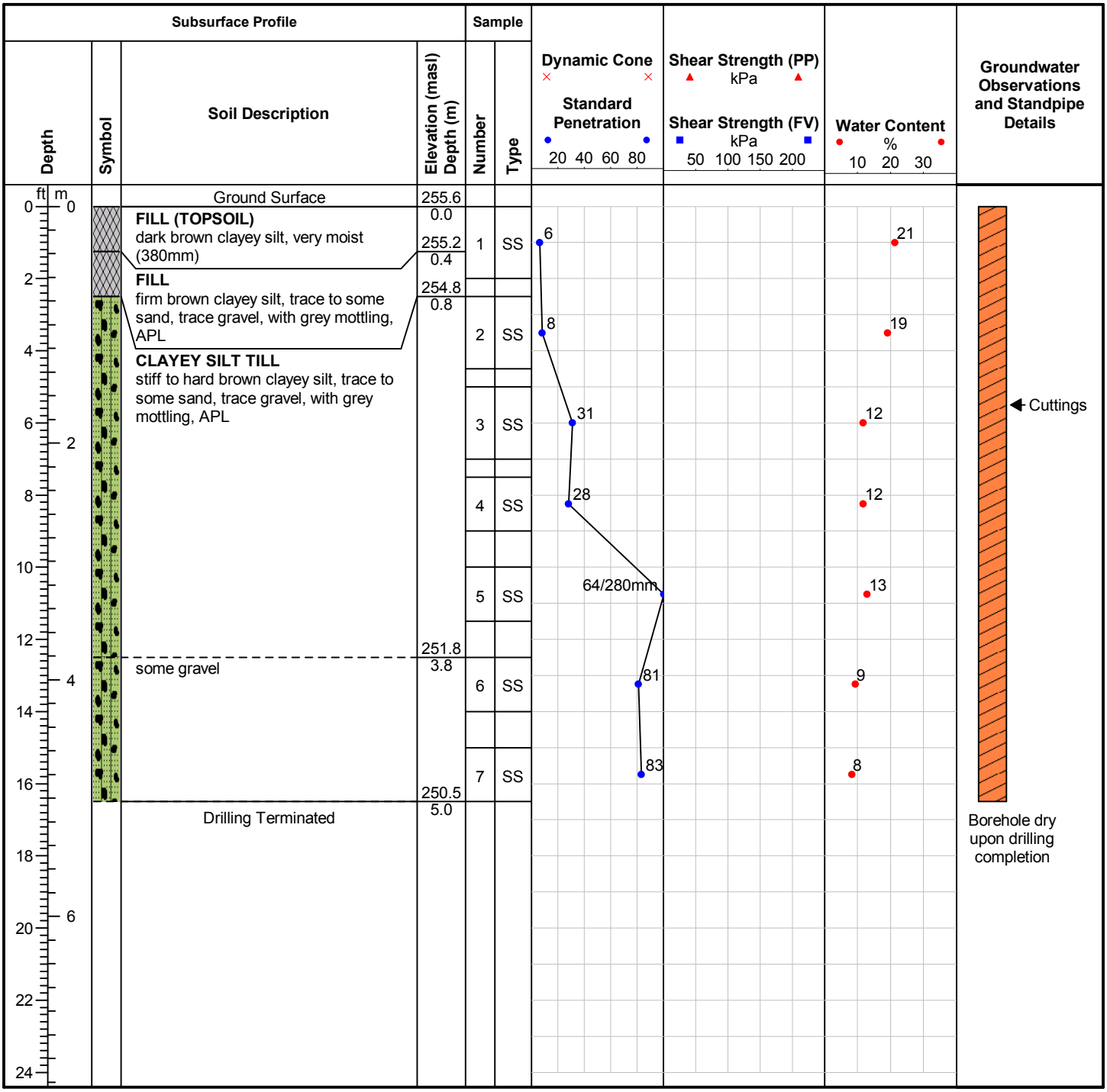
Drill Date: 11/5/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH141-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

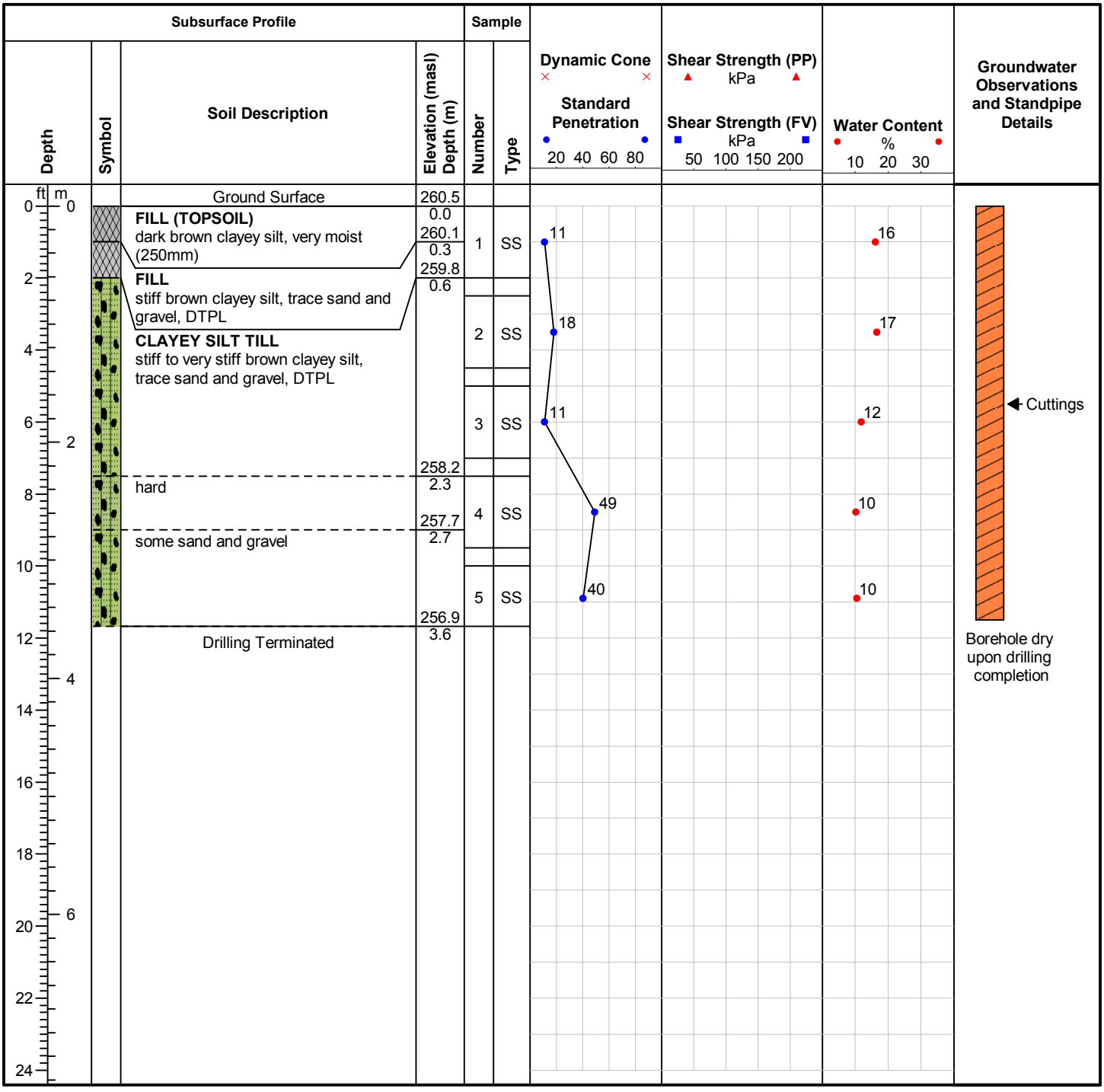
Drill Date: 11/3/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: Geoprobe 7822DT

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 1 of 1

ID Number: BH142-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

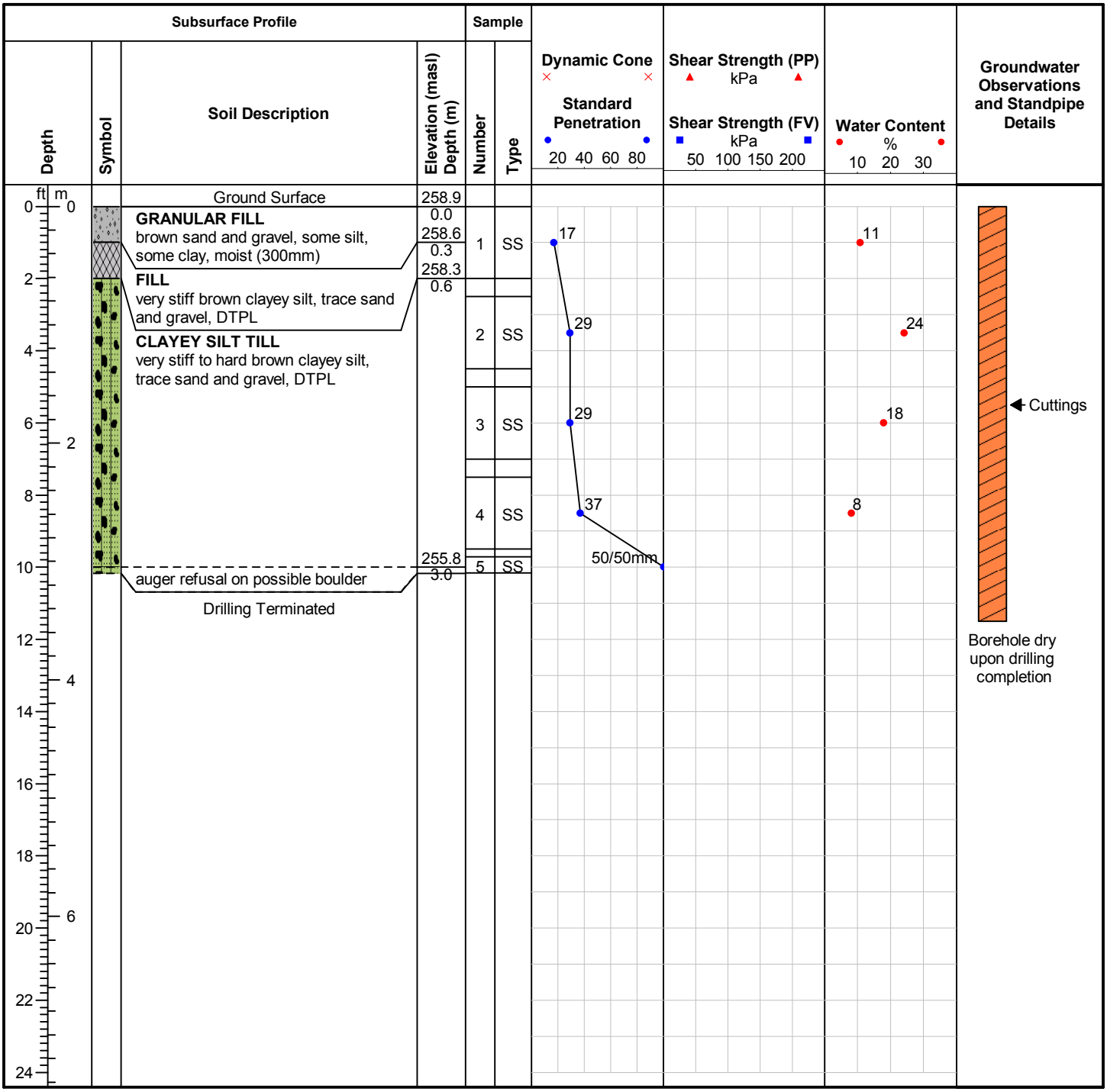
Drill Date: 11/3/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: Geoprobe 7822DT

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH143-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

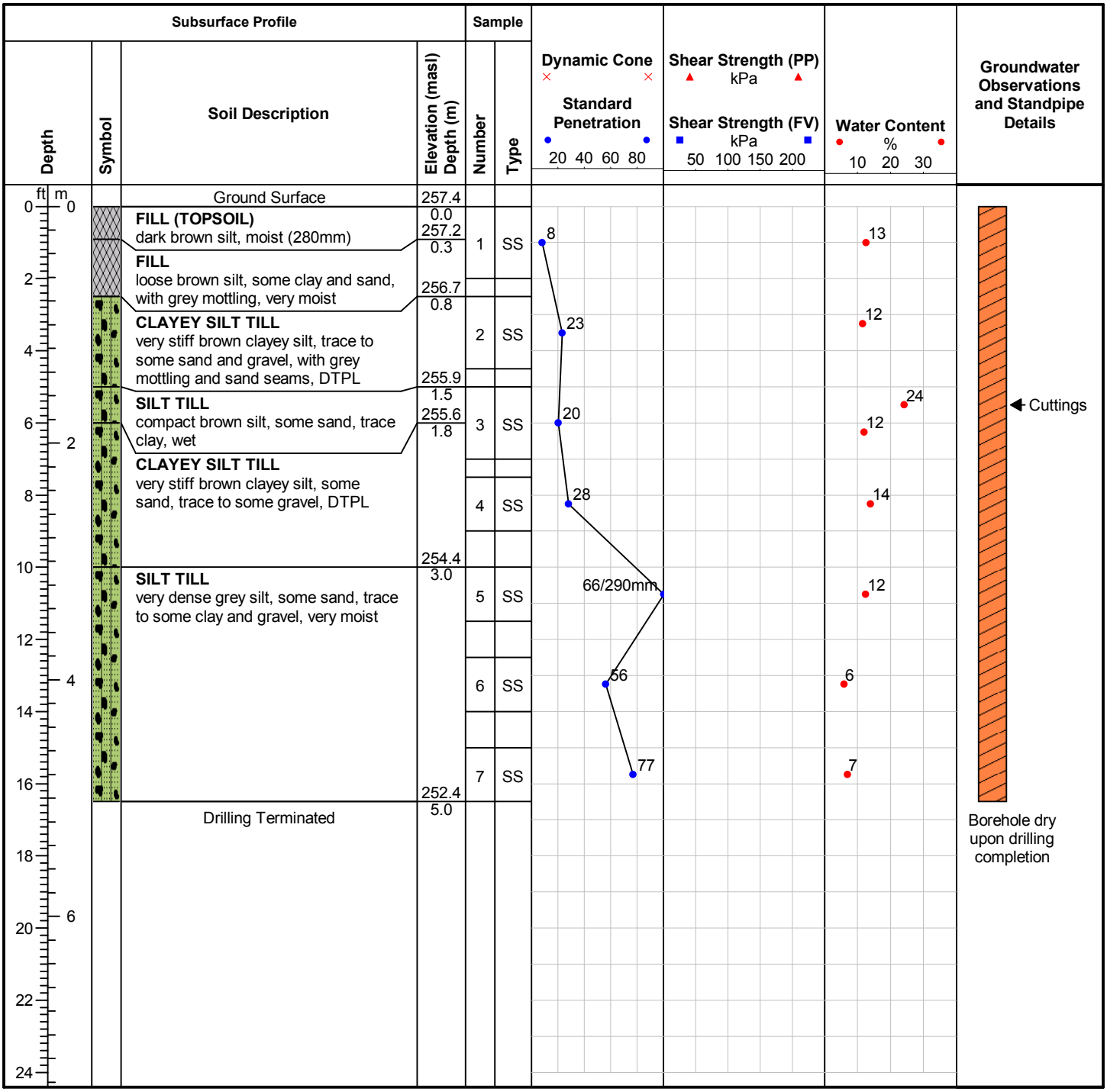
Drill Date: 11/13/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH144-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

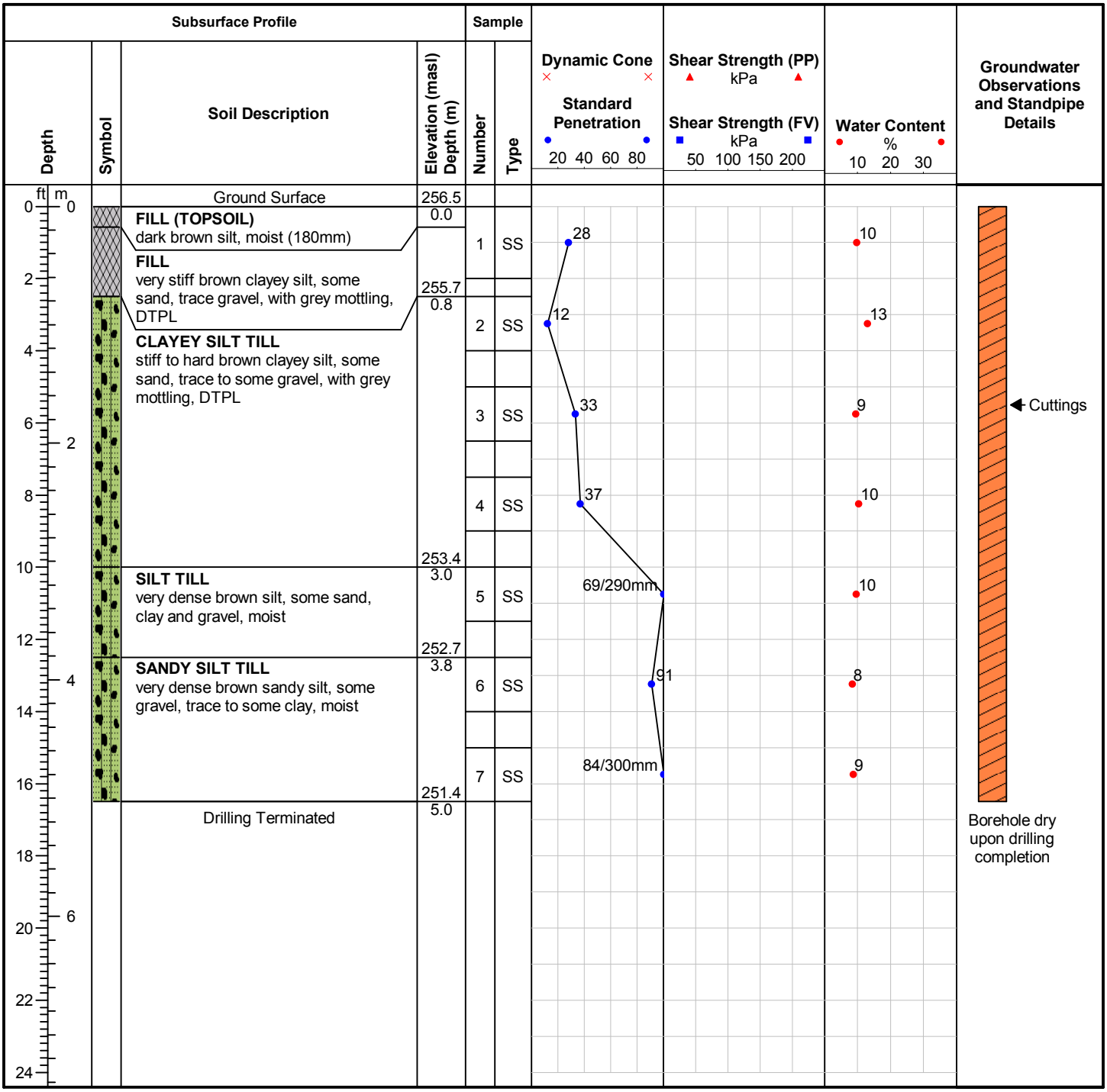
Drill Date: 11/13/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH145-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

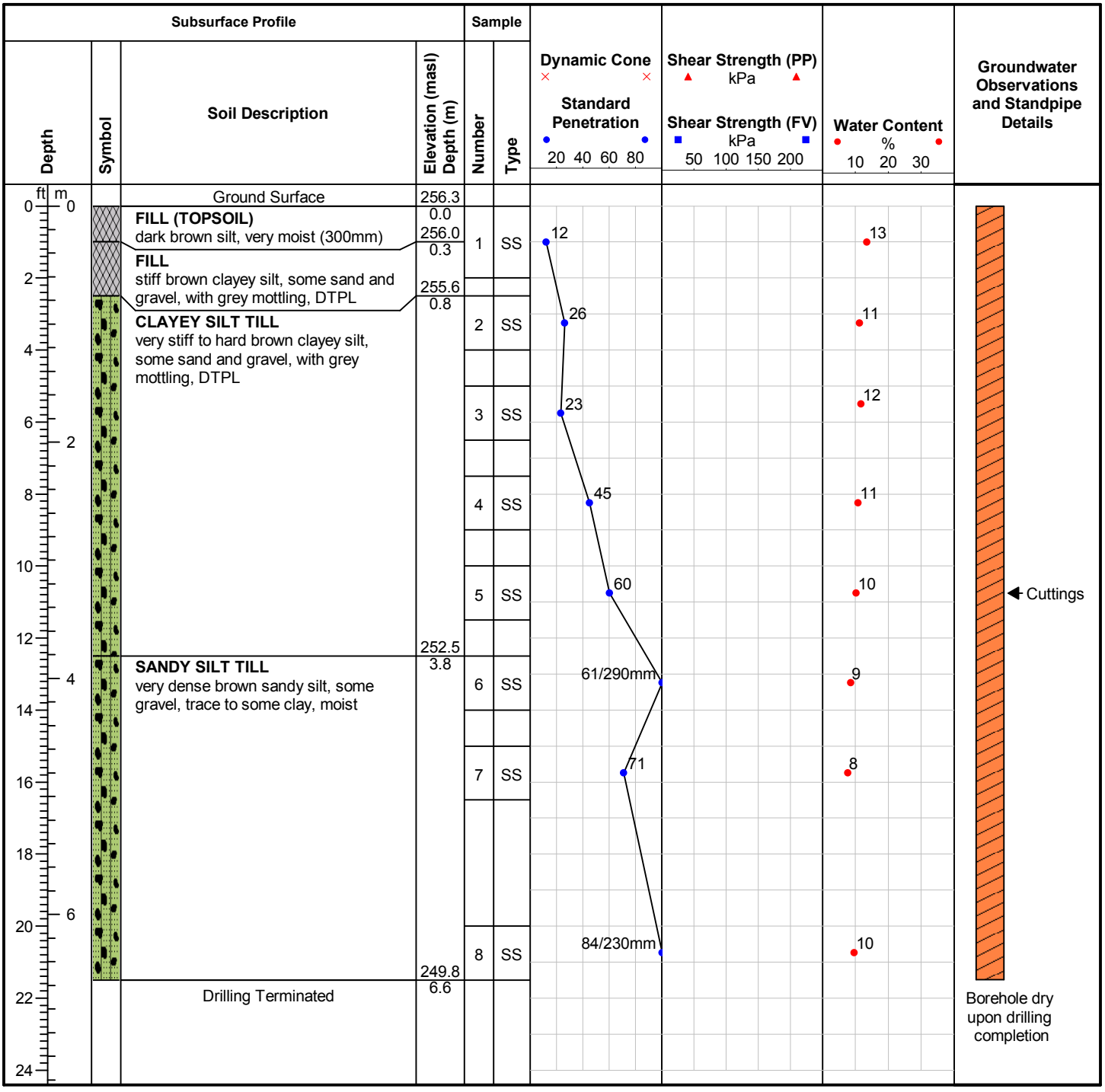
Drill Date: 11/12/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH146-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

Drill Date: 11/6/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone – Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)	Groundwater Observations and Standpipe Details
0 ft / 0 m		Ground Surface	257.1						
		FILL (TOPSOIL) dark brown clayey silt, very moist (180mm)	0.0	1	SS	5		19	
2 ft		**FILL** firm brown/dark brown clayey silt and topsoil, some sand, moist	256.3 0.8	2	SS	14		12	
4 ft		**SILT TILL** compact brown silt, some clay and sand, trace gravel, with grey mottling, moist	255.5 1.5	3	SS	33		11	
6 ft / 2 m		**CLAYEY SILT TILL** hard brown clayey silt, trace to some sand and gravel, with grey veins, DTPL	254.8 2.3	4	SS	74		12	
8 ft		**SILT TILL** very dense brown silt, some clay and sand, trace to some gravel, moist		5	SS	92/280mm		8	
10 ft									
12 ft / 4 m		Drilling Terminated	253.6 3.5						Cuttings; Borehole dry upon drilling completion
14 ft									
16 ft									
18 ft									
20 ft / 6 m									
22 ft									
24 ft									

Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 1 of 1

ID Number: BH147-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

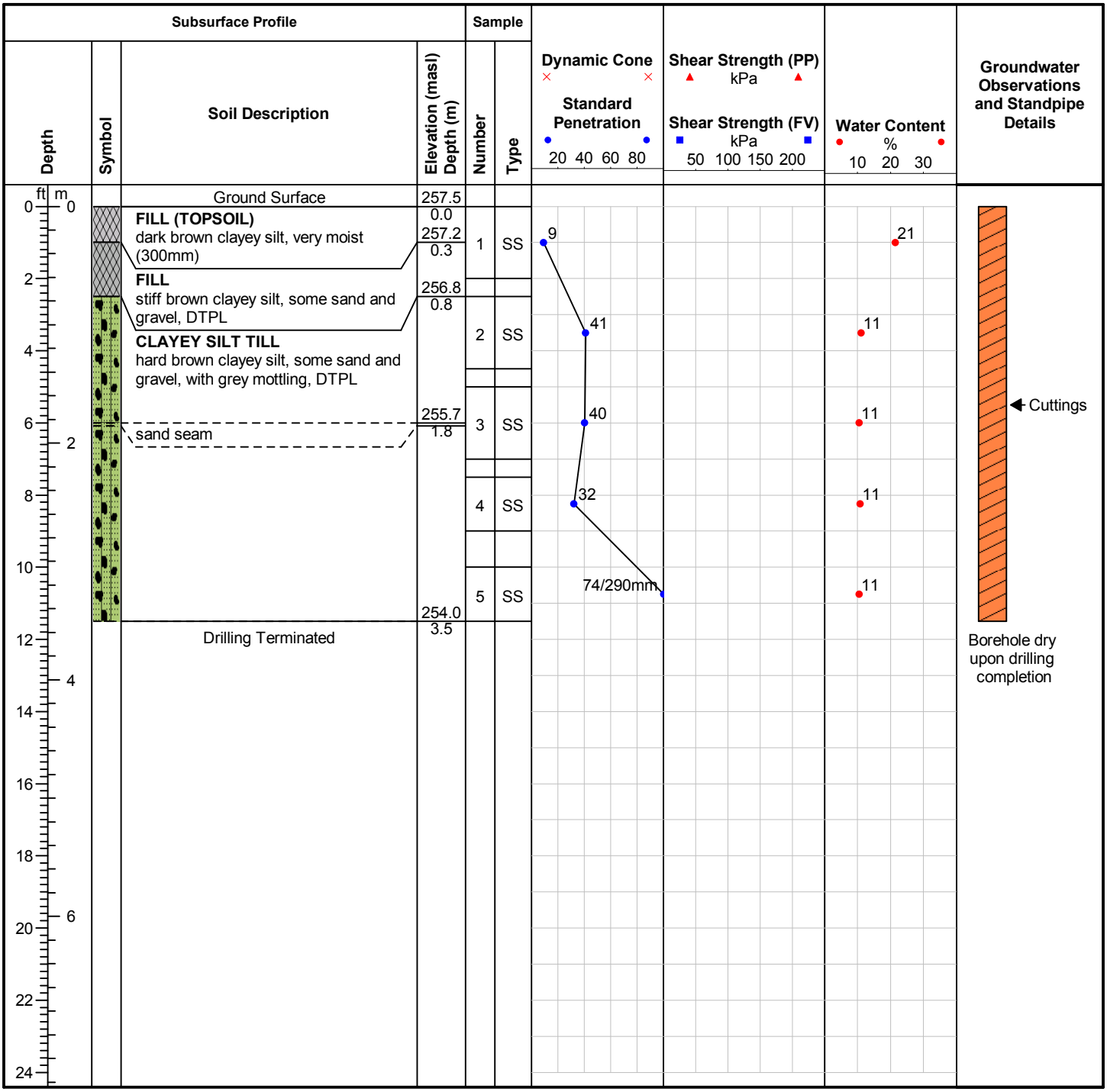
Drill Date: 11/6/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH148-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

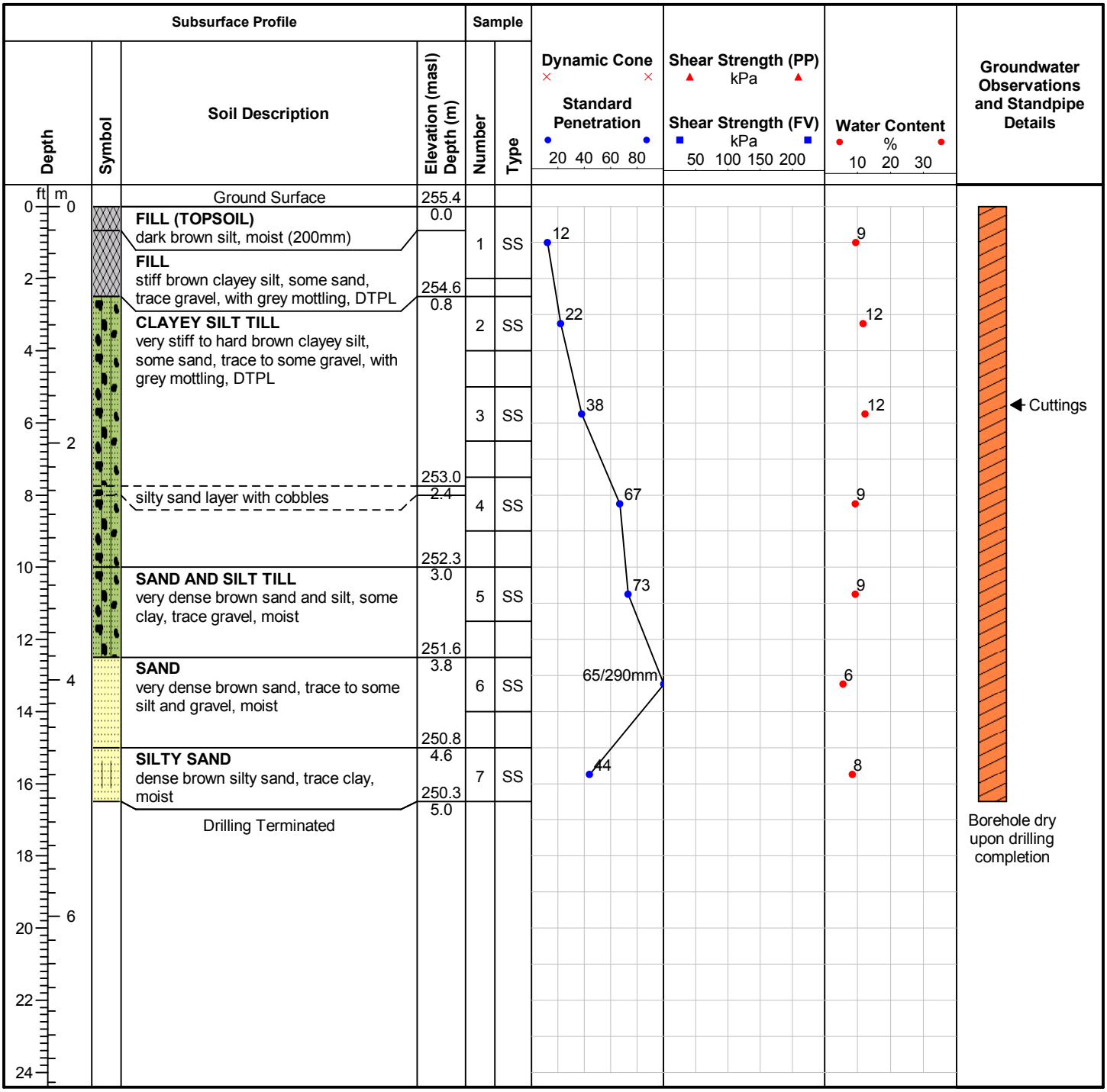
Drill Date: 11/13/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH149-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

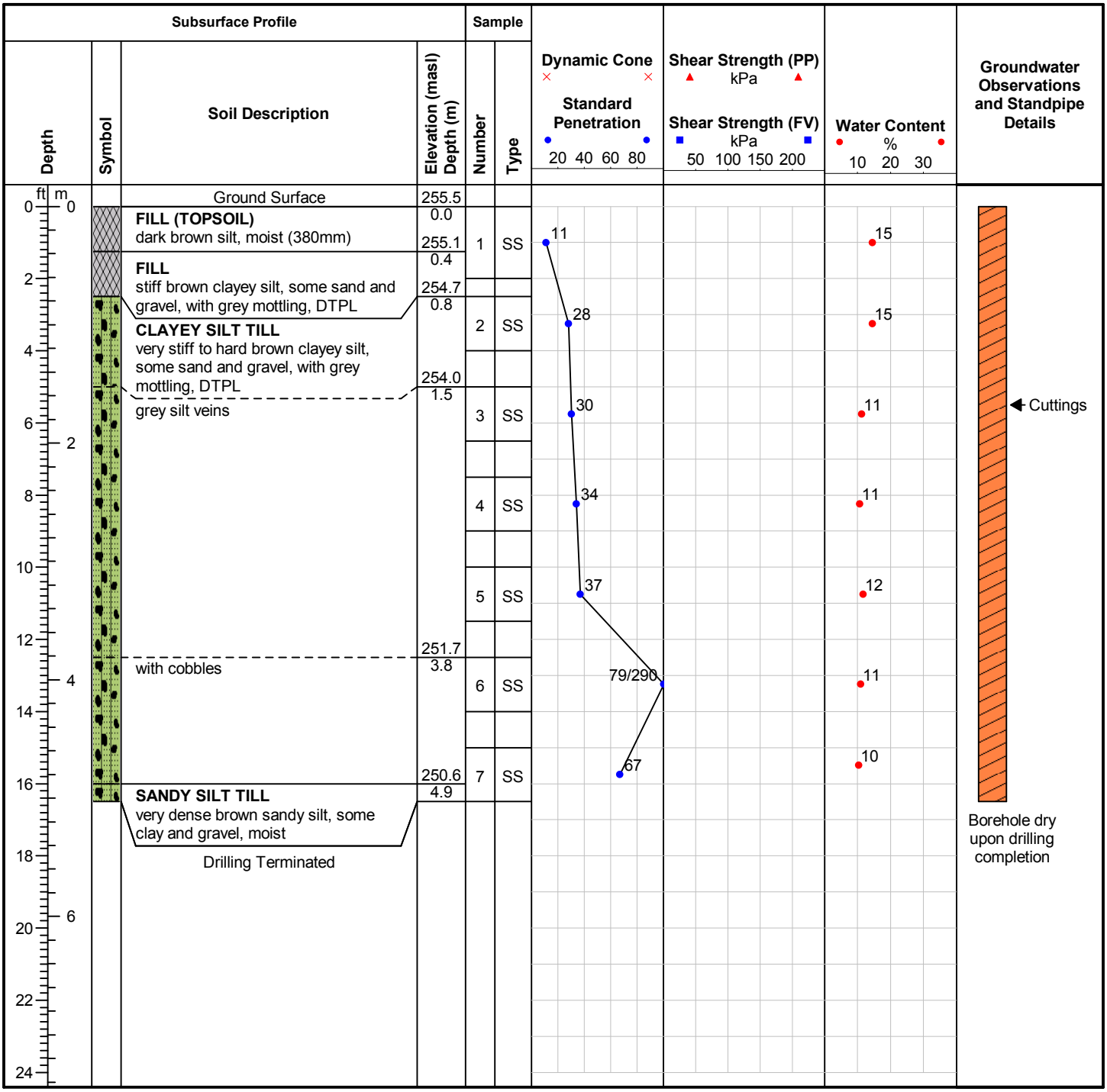
Drill Date: 11/12/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH150-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

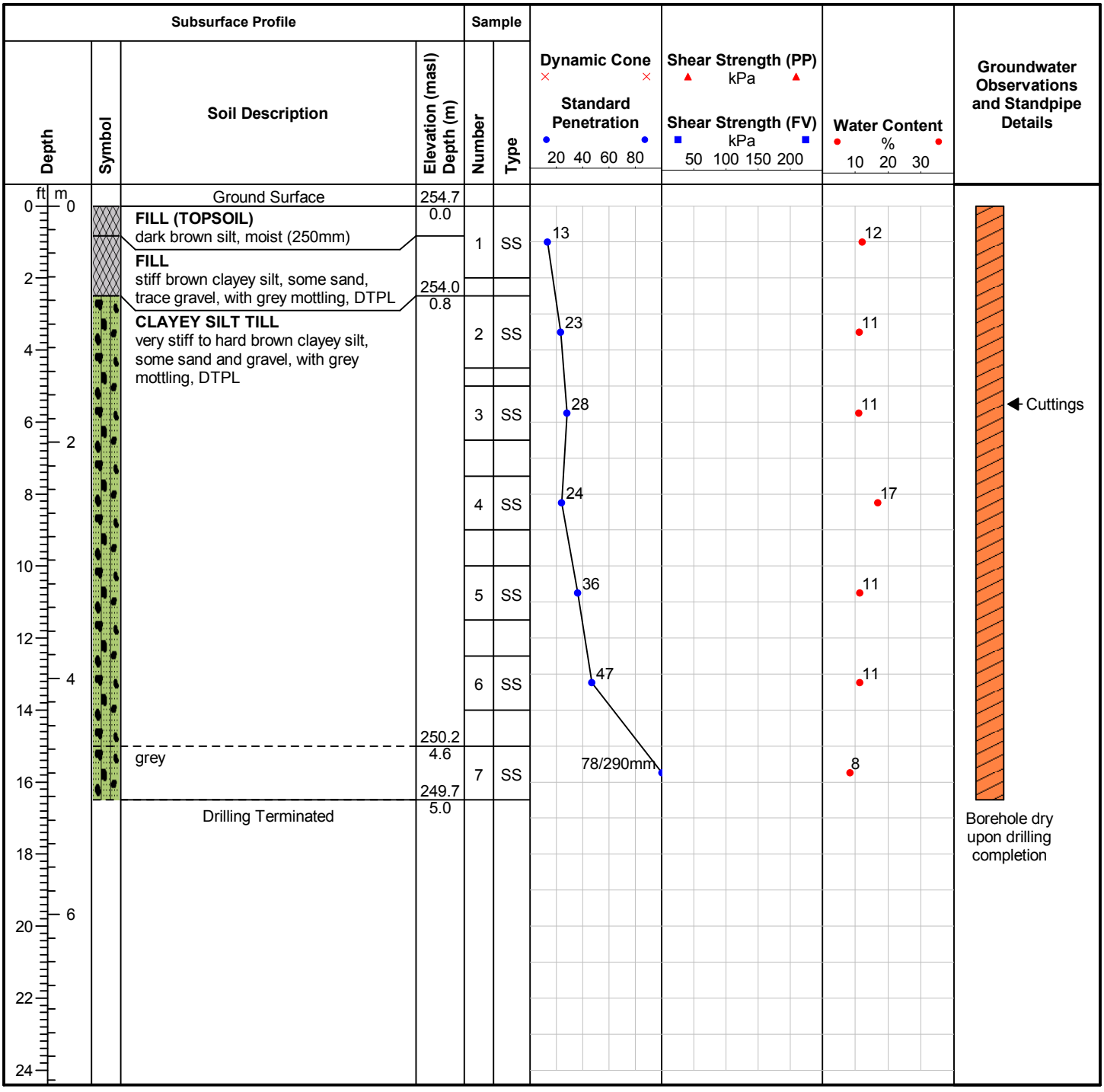
Drill Date: 11/12/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 1 of 1

ID Number: BH151-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

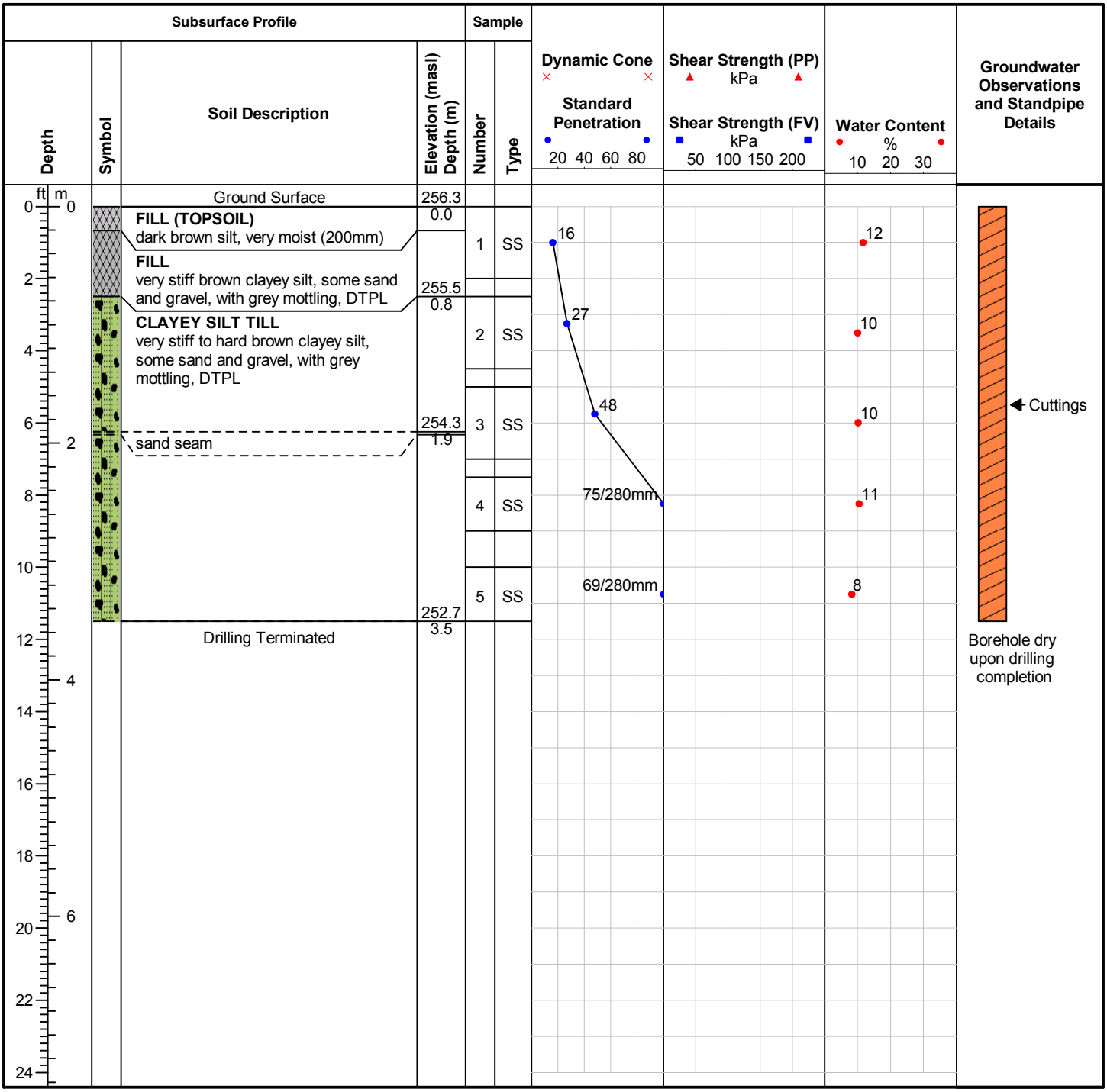
Drill Date: 11/6/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

Sheet: 1 of 1

ID Number: BH152-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

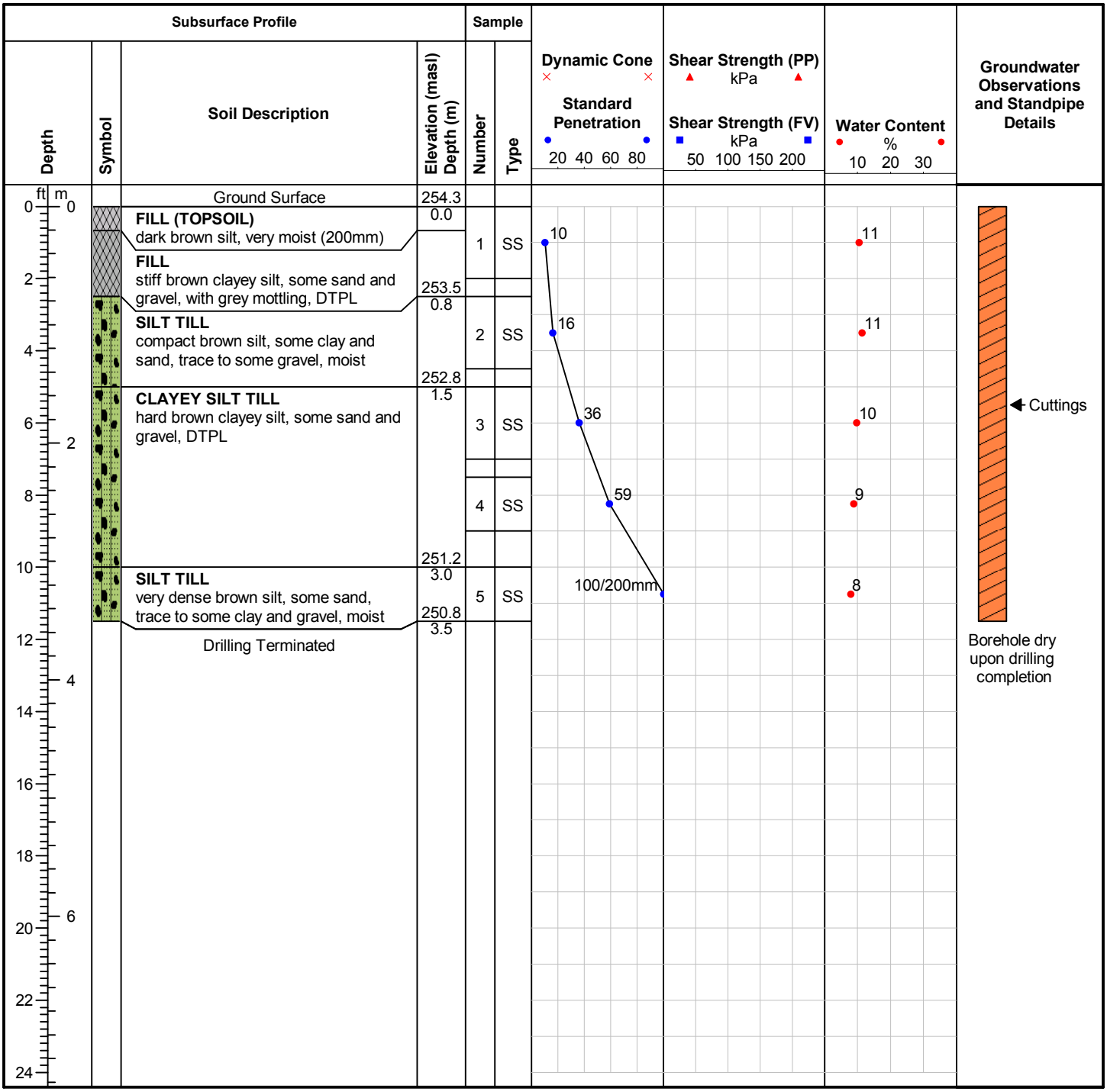
Drill Date: 11/6/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: BH153-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

Drill Date: 11/6/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: Geoprobe 7822DT

Drill Method: Solid Stem Auger

Protective Cover:

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)	Groundwater Observations and Standpipe Details
0 ft / 0 m		Ground Surface	254.0						
		FILL (TOPSOIL) dark brown silt, very moist (300mm)	0.0 / 253.7	1	SS	7		17	
			0.3						
		FILL firm brown clayey silt, some sand and gravel, with grey mottling and sand seam, DTPL	253.3						
			0.8	2	SS	5		21	
		CLAYEY SILT TILL firm to hard brown clayey silt, some sand and gravel, with grey mottling, DTPL		3	SS	40		13	
				4	SS	42		10	
				5	SS	33		12	
			250.5						
		Drilling Terminated	3.5						Cuttings; Borehole dry upon drilling completion

Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

MTE

ID Number: BH154-20

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

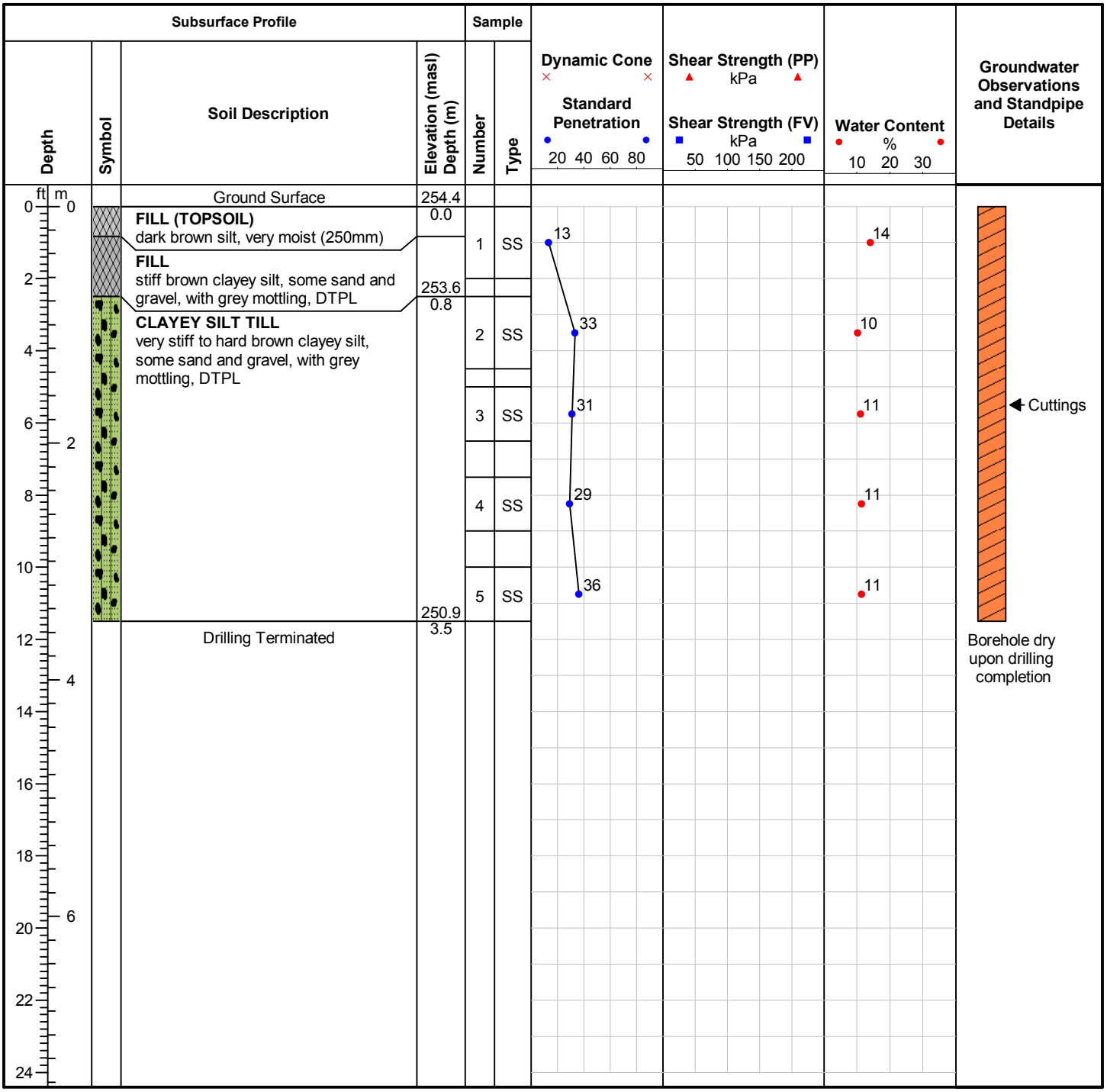
Drill Date: 11/12/2020

Drilling Contractor: Tri-Phase Group

Drill Rig: CME 75

Drill Method: Solid Stem Auger

Protective Cover:



Field Technician: MBC

Drafted by: B. Graul

Reviewed by: B. Thorner

Sheet: 1 of 1

ID Number: MW155-21

Project: 12035 Dixie Road: Engineering Consulting Services

Project No: 47477-300

Client: Tribal Partners (Canada) Inc.

Site Location: 12035 Dixie Road, Caledon, ON

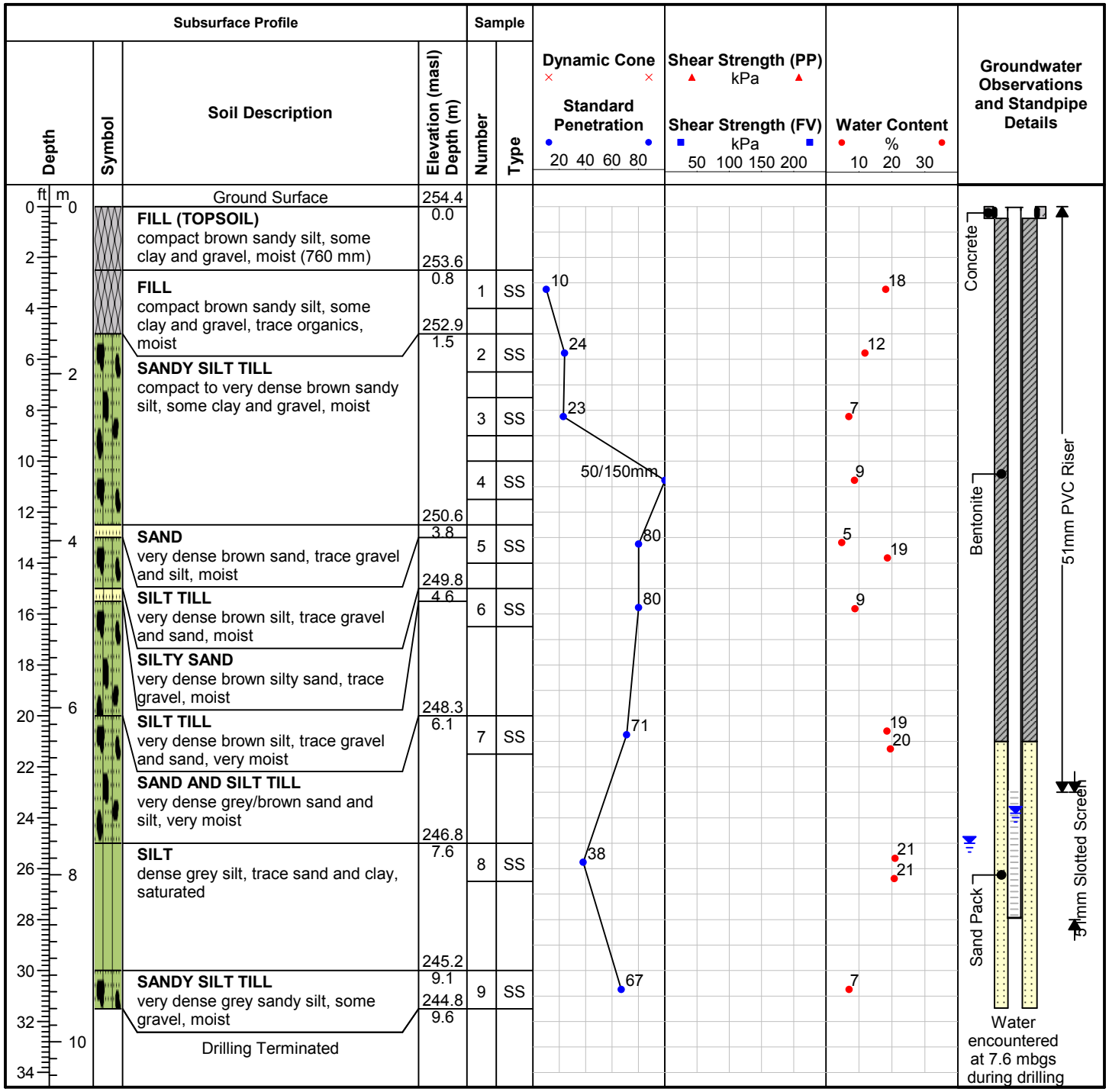
Drill Date: 2/4/2021

Drilling Contractor: Orbit Garant Drilling

Drill Rig: CME 75

Drill Method: Hollow Stem Auger

Protective Cover:



Field Technician: B. Jagger

Drafted by: B. Graul

Reviewed by: B. Thorner

Water level measured at 7.26 mbgs on Feb 4, 2021

Sheet: 1 of 1

Appendix C

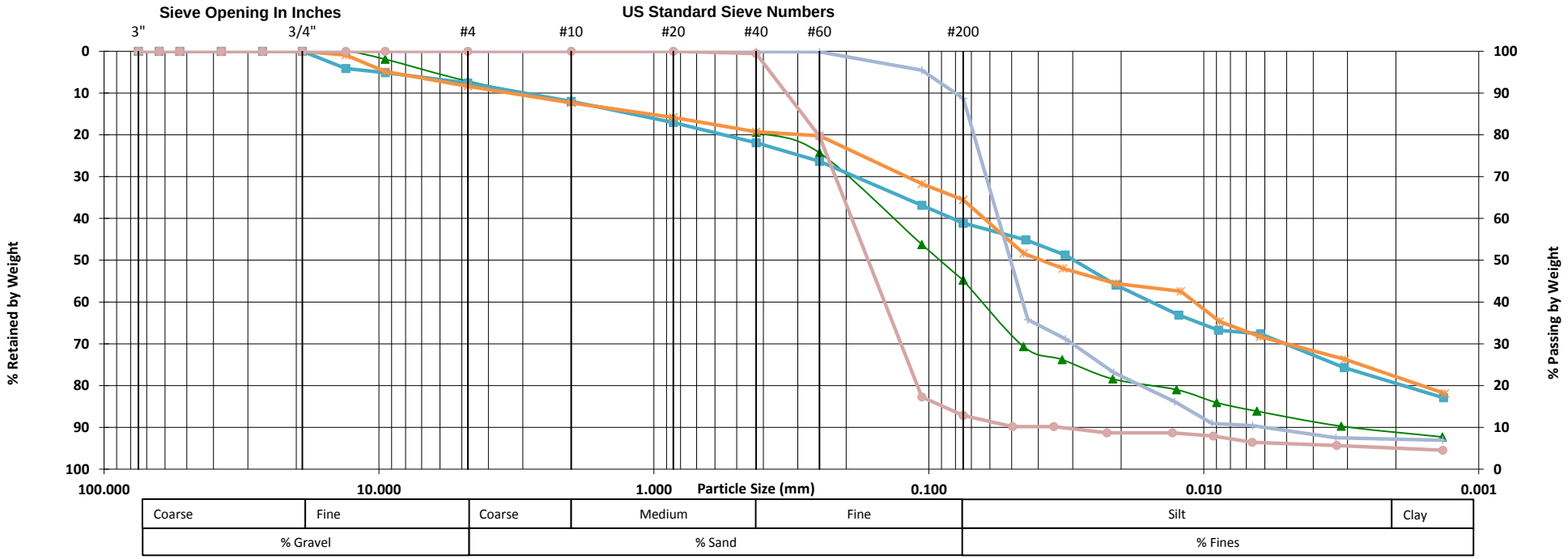
Laboratory Test Results

Tables 101 to 103

Particle Size Distribution Analysis Test Results

Project Name:	**12035 Dixie Road**	**Date Sampled:**	**November 30, 2020**	**MTE File No.:**	**47477-300**
Client:	**Tribal Partners**	**Date Tested:**	**December 16, 2020**	**Table No:**	**101**
Project Location:	**12035 Dixie Road, Caledon, ON**				

Unified Soil Classification



Symbol	Borehole ID	Sample #	Sample Depth	Description
▲	MW101-20	SS-15	11.4-12.0 mbgs	SAND and SILT, trace Clay and Gravel
■	MW102-20	SS-12	9.9-10.5 mbgs	Sandy Clayey SILT, trace Gravel
✳	MW103-20	SS-11	7.6-8.1 mbgs	Sandy Clayey SILT, trace Gravel
+	MW104-20	SS-10	9.9-10.5 mbgs	SILT, some Sand, trace Clay
●	MW105-20	SS-10	6.9-7.3 mbgs	SAND, trace Silt and Clay

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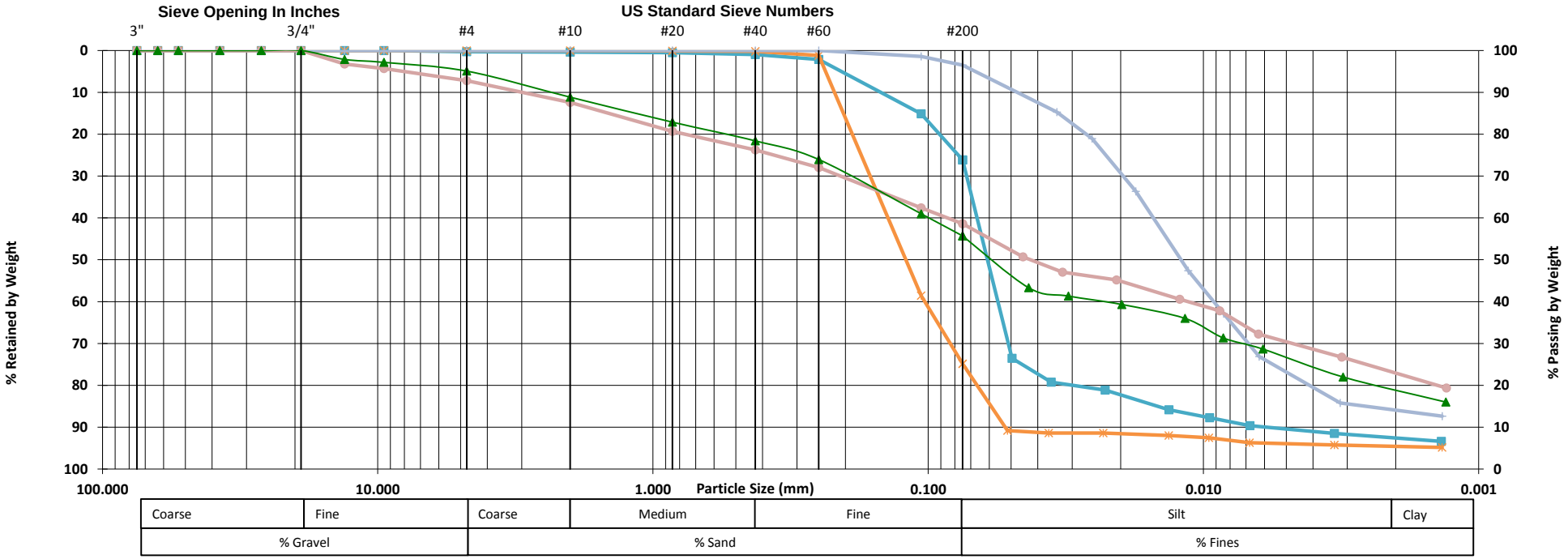
Canadian Council of Independent Laboratories
For specific tests as listed on www.ccil.com

NOTES:

Particle Size Distribution Analysis Test Results

Project Name:	**12035 Dixie Road**	**Date Sampled:**	**November 30, 2020**	**MTE File No.:**	**47477-300**
Client:	**Tribal Partners**	**Date Tested:**	**December 16, 2020**	**Table No:**	**102**
Project Location:	**12035 Dixie Road, Caledon, ON**				

Unified Soil Classification



Symbol	Borehole ID	Sample #	Sample Depth	Description
	MW106-20	SS-10	6.6-7.9 mbgs	Sandy SILT, trace Clay
	MW107-20	SS-11	9.1-9.8 mbgs	SAND, some Silt, trace Clay
	MW108-20	SS-15	10.7-11.1 mbgs	SILT, some Clay, trace Sand
	BH130-20	SS-3	1.5-2.1 mbgs	Sandy Clayey SILT, trace Gravel
	BH148-20	SS-5	3.0-3.5 mbgs	SAND and SILT, some Clay, trace Gravel

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

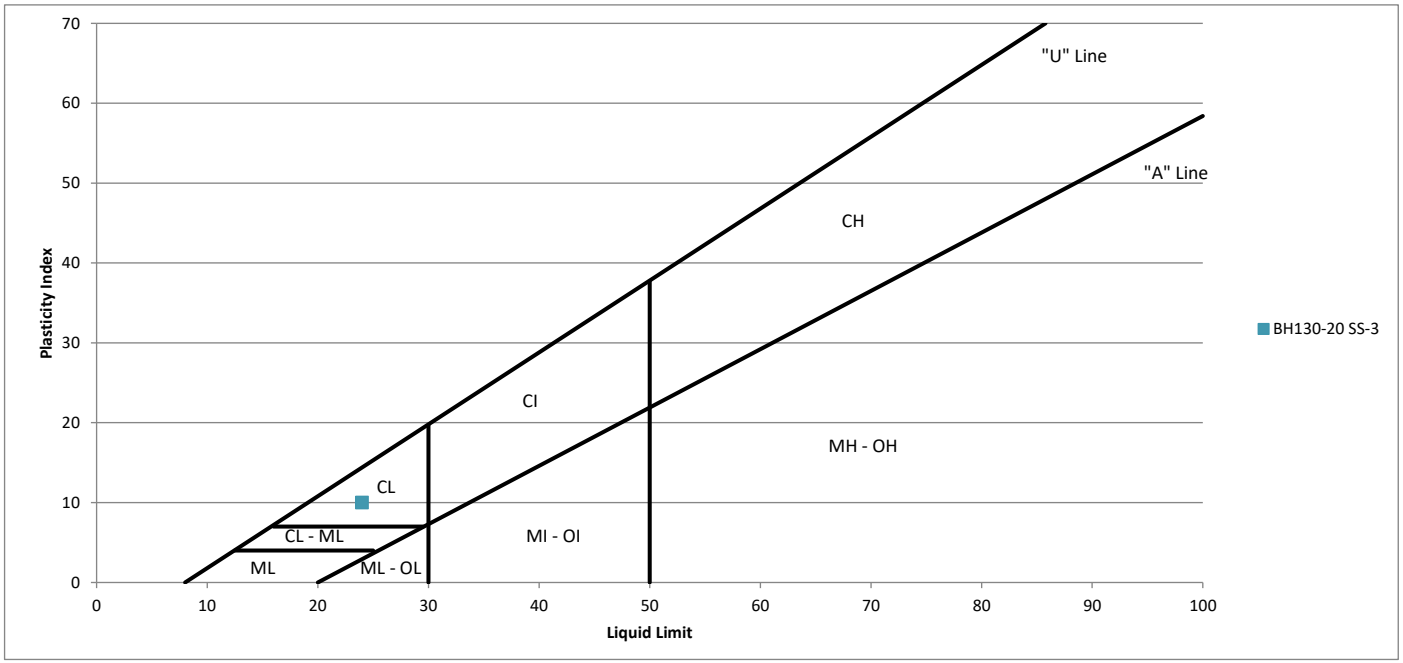
NOTES:

Atterberg Limit Test Results

Project Name: 12035 Dixie Road
Client: Tribal Partners
Project Location: 12035 Dixie Road, Caledon, ON

Date Sampled: Nov. 5, 2020
Date Tested: Jan. 4-20, 2021

MTE File No.: 47477-300
Table No.: 103



Borehole	Sample #	Sample Depth	Moisture Content (%)	Liquid Limit (W_L)	Plastic Limit (W_P)	Plasticity Index (I_P)
BH130-20	SS-3	1.5-2.1 mbgs	11	24	14	10

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NOTES: