PATERSON GROUP

Geotechnical Investigation

Proposed Commercial Development

301 Somme Street
Ottawa, Ontario

Prepared for W.O. Stinson & Son Ltd.

Report PG7567-1 dated November 14, 2025

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by W.O. Stinson & Son Ltd. to conduct a geotechnical investigation for the proposed industrial building to be located at 301 Somme Street in the City of Ottawa (refer to Figure 1 - Key Plan in Appendix 2 for the general site location).

The objectives of the geotechnical investigation were to:

- ❑ Determine the subsoil and groundwater conditions at this site by means of boreholes.
- ❑ Provide geotechnical recommendations for the design of the proposed development including construction considerations which may affect the design.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and includes geotechnical recommendations pertaining to the design and construction of the subject development as they are understood at the time of writing this report.

2.0 Proposed Development

Based on the available drawings, it is understood that the proposed development will consist of a Tank & Equipment Storage Building and a Vehicle Servicing Building with slabs-on-grade and approximate footprints of 3483 m^2 and 1,662 m^2, respectively. Propane storage tanks, a tank and equipment storage yard, and a future CNG station will be located along the eastern boundary of the site. A stormwater management pond (SWMP) is also proposed along the southern boundary of the site.

It is further understood that associated asphalt-paved access lanes, loading areas, and parking areas will surround the proposed buildings.

The site is to be serviced with a private well and septic system.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The current geotechnical investigation was carried out on June 2nd and 3rd, 2025 and consisted of a total of 4 boreholes (BH 1-25 through BH 4-25) advanced to a maximum depth of 14.3 m below the existing grade.

A previous investigation was conducted by Paterson within the subject site in May 2019 (BH 1 through BH 3). Previous investigations were also completed at the subject site by others in July 2021, August 2020, November 2008, October 2008, and July 2008.

The borehole locations were selected by Paterson to provide general coverage of the proposed development taking into consideration the existing site features and underground utilities.

All fieldwork by Paterson was conducted under the full-time supervision of our personnel under the direction of a senior engineer from the geotechnical division. The drilling procedure consisted of augering to the required depths at the selected borehole locations and sampling and testing the overburden. The test hole locations are shown on Drawing PG7567-1 – Test Hole Location Plan included in Appendix 2.

The boreholes were drilled using a low-clearance track-mounted drill rig operated by a two-person crew. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer.

Sampling and In Situ Testing

The soil samples were collected from the boreholes using a 50 mm diameter split-spoon (SS) sampler or from the drill auger (AU). The samples were initially classified on site, placed in sealed plastic bags, and transported to our laboratory. The depths at which the drill auger and split-spoon samples were recovered from the boreholes are shown as AU and SS, respectively, on the Soil Profile and Test Data sheets in Appendix 1.

A Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split spoon samples. The SPT results are recorded as "N" values on the Soil Profile and Test Data sheets. The "N" value is the number of blows required to drive the split spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

The subsurface conditions observed in the boreholes were recorded in detail in the field. The soil profiles are logged on the Soil Profile and Test Data Sheets in Appendix 1 of this report.

Groundwater

Four (4) monitoring wells were installed at boreholes BH 1-25, BH 2-25, BH 3B-25 and BH 4-25. The groundwater observations are discussed in Section 4.3 and are presented in the Soil Profile and Test Data Sheets in Appendix 1.

3.2 Field Survey

The borehole locations and the ground surface elevation at each borehole location, were surveyed by Paterson using a GPS unit with respect to a geodetic datum. The locations of the boreholes and the ground surface elevation at each borehole location are presented on Drawing PG7567-1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Review

Soil samples were recovered from the subject site and visually examined in our laboratory to review the results of the field logging. All samples from the current investigation will be stored in the laboratory for 1 month after this report is completed. They will then be discarded unless we are otherwise directed.

3.4 Analytical Testing

One (1) soil sample was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. The sample was submitted to determine the concentration of sulphate and chloride, the resistivity, and the pH of the samples. The results are presented in Appendix 1 and are discussed further in Section 6.7.

4.0 Observations

4.1 Surface Conditions

The central portion of the subject site consists of an engineered fill pad which has undergone a successful deep dynamic compaction program by others in June 2022. The remainder of the subject site is generally undeveloped and grass covered, with a slope and watercourse near the northern boundary of the site. Fill piles were also noted within the northern limits of the site, and a gravel surfaced access road bisects the southeast corner of the property.

Based on available aerial photographs, the subject site was densely forested as recently as 1991. By 1999, tree clearing and earthwork operations were ongoing within the subject site and overall business park. Aerial photographs taken between 1999 and 2017 indicate that the subject site was used for stockpiling fill and that numerous temporary access roads had bisected various areas throughout the site. By 2022, it was observed that the central portion of the subject site had been prepared for a ground improvement program. Reference should be made to Figure 1A – Aerial Photograph – 1991, Figure 1B – Aerial Photograph – 1999 and Figure 1C – Aerial Photograph – 2022.

The site is bordered to the north by Rideau Road, to the east by vacant properties located within the overall business park, and to the south and west by Somme Street. The ground surface across the subject site is generally level at an approximate geodetic elevation of 90 to 91 m, but slopes downward near the northern property boundary to an approximate geodetic elevation of 85 m.

4.2 Subsurface Profile

Generally, the subsurface profile encountered at the test hole locations consists of topsoil underlain by an approximate 2.3 to 10 m thickness of fill material, which is further underlain by a layer of clayey silt to silty clay and/or silty sand. Generally, the fill material was observed to consist of a silty sand and/or silty clay with varying amounts of organics, gravel, asphalt, concrete and bedrock fragments.

A deposit of glacial till consisting of a compact to dense, brown silty sand to sandy silt with gravel, cobbles and boulders was noted underlying the fill material. The silty sand to sandy silt was noted to be grey in colour by approximate depths ranging from 5.8 to 7.6 m below ground surface, and extended to maximum depths ranging from 6.9 to 11.9 m.

Coring through boulders within the glacial till deposit was completed by others at boreholes BH 1 and BH 3 at approximate depths of 7.3 and 10.0 m, respectively, below the ground surface.

A deposit of brown silty sand with gravel was noted underlying the fill material borehole BH 1 and BH 3 and extended to an approximate depth of 8.4 m below the existing ground surface.

Bedrock

Practical refusal to augering was encountered at approximate depths ranging from 5.3 to 12.0 m below ground surface. Practical refusal to the DCPT was noted at a depth of about 5.9 m at DCPT 5 by others. The bedrock was cored by others at boreholes BH 1-21, BH 2-21 and BH 1 through BH3, and was noted to consist of poor to excellent quality, grey limestone with interbedded sandstone. The bedrock was cored to a maximum depth of 18.9 m below the existing ground surface.

Uniaxial compressive strength (UCS) testing was carried out on a total of 2 bedrock samples by others. The test results indicate that the UCS of the bedrock samples were 139 and 125 MPa for the samples tested at borehole BH 2-21.

Reference should be made to the Soil Profile and Test Data Sheets in Appendix 1 for details of the soil and bedrock profile encountered at each borehole location.

Grain Size Distribution and Hydrometer Testing

A total of 11 grain size analyses and hydrometer tests were completed by others. The results are summarized in Table 1 on the following page and are presented in Appendix 1.

Table 1 – Summary of Grain Size Distribution Analysis					
Test Hole	**Sample**	**Gravel (%)**	**Sand (%)**	**Silt (%)**	**Clay (%)**
BH1-21	SS2B*	17	60	19	4
BH1-21	SS13	16	32	36	16
BH2-21	SS12	20	38	33	9
BH2-21	SS18	6	29	42	23
BH3-21	SS8	19	49	26	6
BH5-21	SS3*	25	38	29	8
BH5-21	SS7	10	38	41	11
BH1	SS3*	51	43	6	1
BH2	SS4*	1	2	36	61
BH2	SS7*	25	38	29	8
BH3	SS10	8	47	37	8

Note: * – Soil sample taken within the fill material.

Atterberg Limit Tests

A total of 6 soil samples were submitted for Atterberg Limits testing by others. The test results indicate that the selected soil samples were generally classified as an Inorganic Clay of Low Plasticity (CL) to an Inorganic Silt of Low Plasticity (ML). These classifications are in accordance with the Unified Soil Classification System. The results are summarized in Table 2 below.

Table 2 – Summary of Atterberg Limits Results							
Borehole	**Sample**	**Depth (m)**	**LL (%)**	**PL (%)**	**PI (%)**	**MC (%)**	**Classification**
BH 1-21	SS13	9.1 – 9.8	26	18	8.0	8.0	CL-ML
BH 2-21	SS12	8.4 – 9.0	25	17	8.0	8.9	CL-ML
BH 2-21	SS18	13.0 – 13.6	28	14	14	11.9	CL
BH 3-21	SS8	5.3 – 5.9	17	13	4.0	9.7	CL-ML
BH 5-21	SS7	4.6 – 5.2	20	13	7.0	15.0	CL-ML
BH 2	SS4*	2.3 – 3.0	69	21	48	56.0	CH

Notes: * – Soil sample taken within the fill material; LL: Liquid Limit; PL: Plastic Limit; PI: Plasticity Index; MC: Natural Moisture Content, CH: Inorganic Clay of High Plasticity; CL: Inorganic Clay of Low Plasticity; ML: Inorganic Silt of Low Plasticity

The results of the Atteberg Limits testing at this site generally indicate that the cohesive soils vary from a high plasticity clay (CH) to a low plasticity silt (ML). Further, the natural moisture contents indicate that the cohesive soils are below the plastic limit, or between the plastic limit and liquid limit.

4.3 Groundwater

Groundwater levels were measured in the monitoring wells and standpipe piezometers following completion of the respective drilling programs. The measured groundwater levels are presented on the Soil Profile and Test Data sheets in Appendix 1, and in Table 1 below:

Table 3 – Summary of Groundwater Levels

Borehole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Dated Recorded
		Depth (m)	Elevation (m)	
BH 1-25	91.31	3.44	87.87	June 5, 2025
BH 2-25	91.06	3.01	88.05	June 5, 2025
BH 3B-25	90.80	3.31	87.49	June 5, 2025
BH 4-25	92.18	7.54	84.64	June 5, 2025
BH 1	91.80	2.92	88.88	May 28, 2019
		3.09	88.71	November 10, 2020
BH 2	92.38	3.82	88.56	May 28, 2019
		3.17	89.21	November 10, 2020
BH1 (GHD)	90.21*	3.99	86.22	August 18, 2020
		2.95	87.26	June 3, 2022
MW7-08	93.81*	3.68	90.13	July 17, 2008
	92.85	2.95	89.90	November 10, 2020
B5-1	90.48*	7.63	82.85	-

Note: Ground surface elevations at borehole location are referenced to a geodetic datum.
* – Ground Surface elevations surveyed by others

However, it should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater levels could vary at the time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed development. Foundation support for the proposed buildings is recommended to consist of conventional spread footings bearing on the existing fill material which has undergone a successful ground improvement program, as approved by others. Documentation of the ground improvement program completed to date is provided in Appendix 3.

However, the ground improvement program was completed a few years ago for a different building configuration, and does not encompass the entirety of the currently proposed buildings, therefore additional ground improvement will be required. A letter discussing the additional ground improvement, prepared by the ground improvement contractor, is provided in Appendix 4.

Due to the presence of silty clay at this site, the proposed development will be subjected to grade raise restrictions. Our permissible grade raise recommendations are discussed in Section 5.3.

The current site plan shows the proposed development extending near the northern property boundary. This will require the construction of a retaining wall or mechanically stabilized earth (MSE) wall to stabilize and shift the existing slope. This is discussed further in Section 6.8.

The above and other considerations are discussed in the following paragraphs.

5.2 Site Grading and Preparation

Stripping Depth

Surficial topsoil and any fill containing significant amounts of deleterious or organic materials should be stripped from under the proposed buildings and other settlement sensitive structures.

However, it is anticipated that the existing fill underlying the proposed asphalt paved areas, free of deleterious material and significant amounts of organics, can be left in place. In this case, it is recommended that the existing fill layer be proof-rolled with several passes of a vibratory drum roller, under dry conditions and above freezing temperatures, and which is approved by Paterson personnel at the time of construction. Any poor performing areas noted during the proof-rolling operation should be removed and replaced with an approved fill.

Engineered Fill Placement

Engineered fill used for grading beneath the proposed buildings, where required, should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. This material should be tested and approved prior to delivery to the site. The fill should be placed in lifts no greater than 300 mm thick and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the building and paved areas should be compacted to at least 98% of the material's standard Proctor maximum dry density (SPMDD).

Non-specified existing fill, along with site-excavated soil, can be used as general landscaping fill where settlement of the ground surface is of minor concern. This material should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If this material is to be used to build up the subgrade level for areas to be paved, it should be compacted in thin lifts to at least 95% of the material's SPMDD.

Ground Improvement

As noted above in Section 5.1, additional ground improvement will be required at the subject site in order to encompass the entirety of the currently proposed buildings. This is discussed in the letter in Appendix 4, which has been prepared by the ground improvement contractor.

Ground improvement programs are based on the level of density and the depth of improved soil required.

The existing ground improvement at the site was completed by deep dynamic compaction, which uses a heavy weight dropped from a crane, and which is effective for compacting loose soils to significant depths. Currently, this same method of ground improvement is proposed for the remaining areas to be improved for the currently proposed development.

Ground improvement programs are completed by design-build contractors, many of which have proprietary systems. The ground improvement program should also account for loose fill soils below the groundwater table, and should sufficiently densify them such that they are not susceptible to the effects of liquefaction.

A detailed design submittal should then be provided for Paterson's review and comment prior to the commencement of additional ground improvement operations.

Vibration Considerations

Construction operations could be the cause of vibrations, and possibly, sources of nuisance to the community. Therefore, means to reduce the vibration levels as much as possible should be incorporated in the construction operations to maintain a cooperative environment with the residents.

The following construction equipment could be the source of vibrations: ground improvement, hoe ram, compactor, dozer, crane, truck traffic, etc. Vibrations, whether caused by the ground improvement or by other construction operations, could be the cause or the source of detrimental vibrations at the nearby buildings and structures. Therefore, it is recommended that all vibrations be limited.

Two parameters determine the permissible vibrations, the maximum peak particle velocity and the frequency. For low frequency vibrations, the maximum allowable peak particle velocity is less than that for high frequency vibrations. As a guideline, the peak particle velocity should be less than 15 mm/s between frequencies of 4 to 12 Hz, and 50 mm/s above a frequency of 40 Hz (interpolate between 12 and 40 Hz).

It should be noted that these guidelines are for current construction standards. These guidelines are above perceptible human level and, in some cases, could be very disturbing to some people. It is recommended that a pre-construction survey be completed to minimize the risks of claims during or following the construction of the proposed buildings.

5.3 Foundation Design

Bearing Resistance Values

Footings placed on an existing fill subgrade, which has undergone a ground improvement program, approved by others, can be designed using a bearing resistance value at serviceability limit states (SLS) of **200 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **275 kPa**, in accordance with the recommendations provided by the ground improvement specialists.

Footings bearing on an approved fill subgrade and designed using the bearing resistance values provided herein will be subjected to potential post-construction total and differential settlements of 25 and 19 mm, respectively, in accordance with the recommendations provided by the ground improvement specialists.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Above the groundwater level, adequate lateral support is provided to the in-situ bearing medium soils when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in situ soil.

Permissible Grade Raise Restrictions

Due to the presence of the silty clay soils observed within portions of this site, a permissible grade raise restriction is recommended for the proposed development at the subject site. Based on the testing results, a permissible grade raise restriction of **2.0 m** above the existing ground surface is recommended.

If higher than permissible grade raises are required, preloading with or without a surcharge, lightweight fill, and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction total and differential settlements.

5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Class X_D**. A higher seismic site class (such as Class X_C) may be achievable following completion of the ground improvement program, however, a site-specific shear wave velocity test would be required to accurately determine the higher seismic site classification for foundation design of the proposed buildings, as defined in Table 4.1.8.4.A of the Ontario Building Code (OBC) 2024.

If required, Paterson can conduct the site-specific shear wave velocity test. Following completion of the ground improvement program, the soils underlying the subject site will not be susceptible to liquefaction.

5.5 Slab on Grade Construction

With the removal of all topsoil and fill, containing significant amounts of deleterious or organic materials, the existing fill material, which has undergone a successful ground improvement program, approved by others, is considered to be an acceptable subgrade surface on which to commence backfilling for slab on grade construction.

It is recommended that the upper 200 mm sub-floor fill consists of OPSS Granular A crushed stone. All backfill materials within the footprint of the proposed buildings should be placed in a maximum of 300 mm thick loose layers and compacted to at least 98% of the material's SPMDD.

5.6 Pavement Design

For design purposes, the pavement structures presented in the following tables are recommended for the design of car only parking areas, access lanes, heavy truck parking and loading areas.

Table 4 – Recommended Pavement Structure – Car Only Parking Areas

Thickness (mm)	Material Description
50	**Wear Course** – HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
300	**SUBBASE** – OPSS Granular B Type II
SUBGRADE – Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill.	

Table 5 – Recommended Pavement Structure – Access Lanes and Heavy Truck Parking/Loading Areas	
Thickness (mm)	**Material Description**
40	**Wear Course** – HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course** – HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
450	**SUBBASE** – OPSS Granular B Type II
SUBGRADE – Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill.	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 99% of the material's SPMDD using suitable vibratory equipment.

5.7 SWMP Design

As noted above, it is understood that a SWMP will be constructed at the subject site. From a geotechnical perspective, the construction of the proposed SWM Pond is considered suitable for this site. However, it is recommended that Paterson complete a review of the detailed design, once available, as details such as pond bottom elevation, proposed side slopes, permanent pond elevation, 5-year and 100-year water elevations, were not known at the time of preparation of this report.

Generally, the subsoil conditions at the borehole locations throughout the proposed SWMP generally consist of a silty sand to silty clay fill underlain by glacial till and bedrock. Accordingly, a pond liner is recommended which may consist of one of the following:

- A 500 mm thick layer of workable, brown silty clay which is compacted with several passes of a sheepsfoot roller, and placed directly over the existing fill, or a

- 150 mm thick layer of 19 mm clear crushed stone placed over the fill subgrade, followed by a scrim-reinforced geosynthetic clay liner (such as the Bentofix Thermal Lock SRNWL Series Geosynthetic Clay Liner, or approved equivalent) which is capped with a 300 mm thick layer of OPSS Granular A material.

The long-term performance of the proposed SWMP will depend on the stability of its excavation side slopes. From a geotechnical perspective, the sidewall slopes should be constructed at 3H:1V or shallower.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Backfill against the exterior sides of the foundation walls should consist of free draining, non-frost susceptible granular materials. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, can be used for this purpose.

6.2 Protection of Footings Against Frost Action

Perimeter foundations of heated structures are required to be insulated against the deleterious effects of frost action. A minimum of 1.5 m of soil cover, or a minimum of 0.6 m of soil cover in conjunction with adequate foundation insulation, should be provided.

Exterior unheated foundations, such as those for isolated exterior piers, are more prone to deleterious movement associated with frost action than the exterior walls of the heated structure and require additional protection, such as soil cover of 2.1 m, or an equivalent combination of soil cover and foundation insulation.

6.3 Excavation Side Slopes

The temporary excavation side slopes anticipated should either be excavated to acceptable slopes or retained by shoring systems from the beginning of the excavation until the structure is backfilled. It is expected that sufficient room will be available for the greater part of the excavation to be undertaken by open-cut methods (i.e. unsupported excavations).

The excavation side slopes above the groundwater level, extending to a maximum depth of 3 m, should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below the groundwater level. The subsurface soil is considered to be mainly a Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should maintain a safe working distance from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by "cut and cover" methods and excavations will not be left open for extended periods of time.

6.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent Material Specifications and Standard Detail Drawings from the Department of Public Works and Services, Infrastructure Services Branch of the City of Ottawa.

A minimum of 150 mm of OPSS Granular A should be placed for bedding for sewer or water pipes when placed on a soil subgrade. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to a minimum of 300 mm above the obvert of the pipe, should consist of OPSS Granular A (concrete or PSM PVC pipes) or sand (concrete pipe). The bedding and cover materials should be placed in maximum 225 mm thick lifts and compacted to 98% of the SPMDD.

It should generally be possible to re-use the moist (not wet) site-generated fill above the cover material if the excavation and filling operations are carried out in dry weather conditions.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD. All cobbles larger than 200 mm in their longest direction should be segregated from re-use as trench backfill.

6.5 Groundwater Control

Based on our observations, it is anticipated that groundwater infiltration into the excavations should be low to moderate and controllable using open sumps. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

Groundwater Control for Building Construction

Under the current regulations enacted by the Ministry of Environment, Conservation and Parks (MECP), any dewatering in excess of 50,000 L/day requires a registration on the Environmental Activity and Sector Registry (EASR), provided that dewatering is related to construction. If the dewatering is not related to construction, a Permit to Take Water obtained from the MECP will be required.

In the event that an EASR is required to facilitate dewatering of the proposed development, a minimum of three to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan, to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. Should a Permit to Take Water be required, a minimum of five to six months should be allotted for completion of the permit, due to the minimum review period imposed by the MECP.

Impacts to Neighbouring Properties

The proposed buildings will be a slabs-on-grade construction; therefore, the excavations for these buildings are not expected to extend below the groundwater level. Accordingly, dewatering is not anticipated, and impacts to adjacent properties as a result of dewatering or excavation is not anticipated.

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project. The subsoil conditions at this site consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the use of straw, propane heaters and tarpaulins or other suitable means. In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

Trench excavations and pavement construction are also difficult activities to complete during freezing conditions without introducing frost in the subgrade or in the excavation walls and bottoms. Precautions should be taken if such activities are to be carried out during freezing conditions. Additional information could be provided, if required.

6.7 Corrosion Potential and Sulphate

The results of analytical testing on the soil samples retrieved by others show that the sulphate content is less than 0.1%. These results are indicative that Type 10 Portland cement (normal cement) would be appropriate for this site. The chloride content and the pH of the samples indicate that they are not significant factors in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity is indicative of an aggressive corrosive environment.

6.8 Slope Stability Assessment

The slope conditions at the northern limits of the site were reviewed by Paterson field personnel during the current investigation and previous geotechnical investigations. Two (2) slope cross-sections (Sections A-A' and B-B') were studied, which are considered to be the worst-case scenarios. The cross-section locations are presented on Drawing PG7567-1 – Test Hole Location Plan in Appendix 2.

The existing slope, which extends down to a ditch, was generally observed to be vegetated with trees. No signs of active or historic erosion were observed along the slope face.

Paterson completed two sets of analyses as part of the current study. The first analysis was completed with the slope unreinforced and in its current configuration; the second was completed taking into consideration a reinforced slope using a retaining wall or mechanically stabilized earth (MSE) wall.

Slope Stability Analysis

The analyses of the slope stability were carried out using SLIDE, a computer program which permits a two-dimensional slope stability analysis using several methods, including Bishop's method and Morgenstern-Price method, which are widely used and accepted analysis methods. The program calculates a factor of safety, which represents the ratio of the forces resisting failure to those favouring failure. Theoretically, a factor of safety of 1.0 represents a condition where the slope is stable.

However, due to intrinsic limitations of the calculation methods and the variability of the subsurface soil and groundwater conditions, a factor of safety greater than 1.0 is generally required for the failure risk to be considered acceptable. A minimum factor of safety of 1.5 is generally recommended for conditions where the slope failure would comprise permanent structures.

An analysis considering seismic loading was also completed. A horizontal acceleration of 0.2035 g was considered for the sections under seismic loading conditions. A factor of safety of 1.1 is considered to be satisfactory for stability analyses including seismic loading.

The cross-sections were analyzed taking into consideration the existing conditions observed during our site visit, and our review of the available soils information and topographic mapping. Subsoil conditions at the cross-sections were inferred based on nearby boreholes and general knowledge of the area's geology.

The effective and total soil strength parameters used for the analyses were chosen based on the subsoil information recovered during the previous investigations. The effective strength soil parameters used for the static and seismic analyses are presented in Table 6 below.

Table 6 – Total Effective and Total Soil and Material Parameters

Soil Layer	Unit Weight (kN/m^3)	Friction Angle (degrees)	Cohesion (kPa)
Dynamic Compacted Granular Fill	21	35	0
Engineered Fill	21	36	0
Existing Fill	20	34	0
Grey Silty Sand	20	35	0
Glacial Till	20	35	1
Bedrock	22	-	1,000

Static Loading Analysis

Paterson performed two sets of analyses for the slope, the first with the slope unreinforced, and the second reinforced using an MSE wall. The results of the static analyses for the unreinforced and reinforced slopes at Sections A-A' and B-B' are shown on Figures 2A, 2C, 3A, and 3C located in Appendix 2. For the proposed unreinforced conditions, the factor of safety was found to be 0.34 and 0.44 at Sections A-A' and B-B', respectively, while the factor of safety of the reinforced slope exceeded 1.5 at both cross-section locations.

Based on these results, the proposed reinforced slope is considered to be stable under static loading, while the unreinforced slope requires a Stable Slope Allowance to achieve a factor of safety of 1.5 under static conditions.

Seismic Loading Analysis

Paterson performed two sets of analyses for the slope, the first with the slope unreinforced, and the second reinforced using an MSE wall.The results of the seismic analyses for the unreinforced and reinforced slopes at Sections A-A' and B-B' are shown on Figures 2B, 2D, 3B, and 3D in Appendix 2. For the proposed unreinforced conditions, the factor of safety was found to be 0.386 and 0.254 at Sections A-A' and B-B', respectively, while the factor of safety of the reinforced slope exceeded 1.1 at both cross-section locations.

Based on these results, the proposed reinforced slope is considered to be stable under seismic loading, while the unreinforced slope requires a Stable Slope Allowance to achieve a factor of safety of 1.1 under seismic conditions.

Geotechnical Setback – Limit of Hazard Lands

Under the existing slope conditions (unreinforced), Stable Slope Allowances of 11.1 and 25.7 m are required at cross-sections A-A' and B-B' respectively to achieve the appropriate factors of safety under static and seismic conditions. In addition to the Stable Slope Allowances, Toe Erosion and Erosion Access Allowances of 2 m and 6 m, respectively, are required from the top of the slope. **Therefore, Limit of Hazards Lands setbacks of 19.1 and 33.7 m are required at cross-sections A-A' and B-B', this is shown on the attached Drawing PG7567-1 – Test Hole Location Plan in Appendix 2.**

However, for the reinforced case where the slope is supported with an MSE wall or retaining wall, sufficient factors of safety are present under static and seismic conditions such that Stable Slope Allowance setbacks are not required. Further, erosion protection will be incorporated into the MSE wall design such that a Toe Erosion Allowance is not required for the reinforced case. Also, since the slope will have suitable factors of safety and will have erosion protection, an Erosion Access Allowance will not be required for future repair of the slope. **Accordingly, no Limit of Hazard Lands setback is required for the reinforced case where the slope is supported with an MSE or retaining wall.**

The design of the MSE wall can be prepared during the detailed design stage of the project. The MSE wall design will need to be stamped by a Professional Engineer licensed in the province of Ontario, and will need to be reviewed by Paterson to confirm that it is in accordance with the geotechnical design recommendations provided in this report.

7.0 Recommendations

It is a requirement for the foundation data provided herein to be applicable that the following material testing, and observation program be performed by the geotechnical consultant.

- Observation of all bearing surfaces prior to the placement of concrete.
- Sampling and testing of the concrete and fill materials.
- Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- Observation of all subgrades prior to backfilling.
- Field density tests to determine the level of compaction achieved.
- Sampling and testing of the bituminous concrete including mix design reviews.

All excess soils, with the exception of engineered crushed stone fill, generated by construction activities that will be transported on-site or off-site should be handled as per *Ontario Regulation 406/19: On-Site and Excess Soil Management*.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued upon request, following the completion of a satisfactory material testing and observation program by Paterson

8.0 Statement of Limitations

The recommendations provided are in accordance with the present understanding of the project. Paterson requests permission to review the recommendations when the drawings and specifications are completed.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests immediate notification to permit reassessment of our recommendations.

The recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work. The latter should evaluate the factual information provided in this report and determine the suitability and completeness for their intended construction schedule and methods. Additional testing may be required for their purposes.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than W.O. Stinson & Son Ltd., or their agents, is not authorized without review by Paterson for the applicability of our recommendations to the alternative use of the report.

Paterson Group Inc.

Otillia McLaughlin, B.Eng.

Scott S. Dennis, P.Eng.

Report Distribution:

- ❑ W.O. Stinson & Son LTD. (e-mail copy)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

BOREHOLE LOGS BY OTHERS

STRATIGRAPHIC AND INSTRUMENTATION LOG BY OTHERS

TEST PIT REPORTS BY OTHERS

PARTICLE-SIZE ANALYSIS OF SOILS BY OTHERS

ATTERBERG LIMIT TESTING RESULTS BY OTHERS

UNIAXIAL COMPRESSION TESTING RESULTS BY OTHERS

ANALYTICAL TESTING RESULTS

SOIL PROFILE AND TEST DATA

Geotechnical Investigation & Slope Stability Study

301 Somme Street

COORD. SYS.: MTM ZONE 9 **EASTING:** 379013.78 **NORTHING:** 5019022.56 **ELEVATION:** 91.31

PROJECT: Proposed Commercial Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS:

DATE: June 2, 2025

FILE NO. : PG7567

HOLE NO. : BH 1-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
FILL: Gravel and crushed stone, trace sand 0.15m [91.16m]		0	AU 1						91
FILL: Compact to very dense, brown silty sand, with gravel, crushed stone, concrete and ash		1	SS 2	50	10-10-15-21 25				90
		2	SS 3	27	5-50-/-/ 50/0.13				89
		3	SS 4	50	12-9-8-9 17				88
			SS 5	42	4-6-6-11 12				
		4	SS 6	46	4-20-52-21 72				87
5.26m [86.05m]		5	SS 7	37	2-20-10-5 30				86
FILL: Brown silty sand to sandy silt, some gravel, cobbles and boulders			SS 8	42	2-3-5-13 8				
6.78m [84.53m]		6	SS 9	71	11-23-15-25 38				85
GLACIAL TILL: Loose to dense, silty sand to sandy silt, some gravel, cobbles and boulders		7	SS 10	46	9-12-12-23 24				84
		8	SS 11	33	6-15-12-16 27				83
			SS 12	37	11-12-15-12 27				
		9	SS 13	43	7-18-22-50 40				82
10.26m [81.05m]		10	SS 14	51	10-51-50-/ 101/0.2				81
End of Borehole Practical refusal to augering at 10.26 m depth (GWL at 3.44 m depth - June 5, 2025)		11							80
		12							79
		13							78
		14							

3.44 m 2025-06-05

4.09m

5.61m

SOIL PROFILE AND TEST DATA

Geotechnical Investigation & Slope Stability Study

301 Somme Street

COORD. SYS.: MTM ZONE 9 **EASTING:** 379026.72 **NORTHING:** 5019097.92 **ELEVATION:** 91.06

PROJECT: Proposed Commercial Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS:

DATE: June 2, 2025

FILE NO. : PG7567

HOLE NO. : BH 2-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80	REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80	PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE											91
FILL: Gravel and crushed stone, some sand 0.10m [90.96m]		0	AU 1								
FILL: Compact, brown silty sand to sandy silt, with gravel and crushed stone 1.45m [89.61m]		1	SS 2	58	6-9-4-6 13						90
FILL: Stiff, brown to grey silty clay 2.21m [88.85m]		2	SS 3	71	4-4-3-3 7						89
FILL: Stiff to firm, grey silty clay		3	SS 4	75	P		10	58		3.01 m – 2025-06-05	88
			SS 5	83	P		6	43			
		4	SS 6	25	P		10	58			87
		5	SS 7	50	P		7	56			86
			G 8	0			10	68			
5.79m [85.27m]		6	SS 9	67	2-3-9-20 12						85
FILL: Compact, grey silty clay, with gravel , cobbles and boulders 6.78m [84.28m]			SS 10	44	26-50-/-/ 50/0.08						
FILL: Very dense, brown silty sand, with gravel, cobbles and boulders 7.52m [83.54m]		7									84
End of Borehole Practical refusal to augering at 7.52 m depth (GWL at 3.01 m depth - June 5, 2025)		8									83
		9									82
		10									81
		11									80
		12									79
		13									78
		14									

SOIL PROFILE AND TEST DATA

Geotechnical Investigation & Slope Stability Study

301 Somme Street

COORD. SYS.: MTM ZONE 9 **EASTING:** 379085.67 **NORTHING:** 5019059.58 **ELEVATION:** 90.73

PROJECT: Proposed Commercial Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS:

DATE: June 2, 2025

FILE NO. : PG7567

HOLE NO. : BH 3-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.08m [90.65m]			AU 1						90
FILL: Compact to very dense, brown silty sand, some clay, trace gravel, crushed stone and asphalt		1	SS 2	43	3-10-50-/ 60/0.25				89
1.68m [89.05m]			SS 3	48	50-/-/-/ 50/0.15				
End of Borehole		2							88
Practical refusal to augering at 1.63 m depth		3							87
		4							86
		5							85
		6							84
		7							83
		8							82
		9							81
		10							80
		11							79
		12							78
		13							77
		14							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation & Slope Stability Study

301 Somme Street

COORD. SYS.: MTM ZONE 9 **EASTING:** 379084.55 **NORTHING:** 5019060.27 **ELEVATION:** 90.64

PROJECT: Proposed Commercial Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS:

DATE: June 2, 2025

FILE NO. : PG7567

HOLE NO. : BH 3A-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE: TYPE AND NO.	SAMPLE: RECOVERY (%)	SAMPLE: N OR RQD	SAMPLE: WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80	REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80	PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0									90
0.94m [89.70m]		1									89
End of Borehole		2									88
Practical refusal to augering at 0.94 m depth		3									87
		4									86
		5									85
		6									84
		7									83
		8									82
		9									81
		10									80
		11									79
		12									78
		13									77
		14									

SOIL PROFILE AND TEST DATA

Geotechnical Investigation & Slope Stability Study

301 Somme Street

COORD. SYS.: MTM ZONE 9 **EASTING:** 379087.71 **NORTHING:** 5019059.84 **ELEVATION:** 90.80

PROJECT: Proposed Commercial Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS:

DATE: June 2, 2025

FILE NO. : PG7567

HOLE NO. : BH 3B-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
Overburden									
1.52m [89.28m]									
FILL: Crushed stone, with concrete 1.83m [88.97m]									
FILL: Stiff, brown silty clay, some sand and gravel, trace asphalt			SS 1	17	24-25-7-12 32				
2.97m [87.83m]			SS 2	29	9-2-2-2 4				
FILL: Loose, brown silty sand, with rock fragments, trace clay 3.73m [87.07m]			SS 3	17	1-2-4-12 6				
FILL: Stiff, brown silty clay, some sand, trace gravel and crushed stone 4.50m [86.30m]			SS 4	12	1-7-2-3 9				
FILL: Loose, brown silty sand, with gravel 5.26m [85.54m]			SS 5	25	9-3-3-3 6				
FILL: Compact to dense, grey silty sand, with gravel, cobbles and boulders, trace clay			SS 6	8	1-9-22-25 31				
6.78m [84.02m]			SS 7	33	3-6-4-4 10				
FILL: Stiff, grey silty clay, some topsoil and organics, trace sand 7.54m [83.26m]			SS 8	33	27-9-3-4 12				
FILL: Very stiff, brown , silty clay			SS 9	50	5-4-4-6 8				
8.53m [82.27m]			SS 10	62	3-2-2-2 4				
FILL: Stiff, brown clayey silt, trace sand			SS 11	62	2-4-4-5 8		242		
- Trace gravel by 9.6 m depth			SS 12	50	7-4-1-1 5				
10.21m [80.59m]									
GLACIAL TILL: Stiff, grey silty clay, with gravel, cobbles and boulders, some sand			SS 13	42	P		△12 ▲68		
11.40m [79.40m]									
End of Borehole									
Practical refusal to augering at 11.40 m depth									
(GWL at 3.31 m depth - June 5, 2025)								3.31 m 2025-06-05	
								4.57m	
								6.10m	

SOIL PROFILE AND TEST DATA

Geotechnical Investigation & Slope Stability Study

301 Somme Street

COORD. SYS.: MTM ZONE 9 **EASTING:** 379135.75 **NORTHING:** 5019162.49 **ELEVATION:** 92.18

PROJECT: Proposed Commercial Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS:

DATE: June 3, 2025

FILE NO. : PG7567

HOLE NO. : BH 4-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									92
FILL: Stiff brown silty clay, some gravel, trace sand - trace organics to 0.08 m depth			AU 1						
1.22m [90.96m]		1	SS 2	33	3-5-5-25 10				91
FILL: Compact, brown silty sand, with gravel, trace topsoil and organics			SS 3	75	11-13-11-11 24				
2.21m [89.97m]		2							90
FILL: Stiff, brown silty clay, with gravel, some crushed stone and sand			SS 4	25	2-5-2-3 7				
2.97m [89.21m]		3							89
FILL: Loose, brown silty sand, some clay, trace wood and topsoil			SS 5	42	1-4-4-4 8				
3.73m [88.45m]		4	SS 6	12	1-2-2-4 4				88
FILL: Firm, brown silty clay, with gravel, some sand and crushed stone			SS 7	31	2-2-50-/ 52/0.25				
- Trace asphalt to 5.18 m depth		5							87
6.02m [86.16m]			SS 8	25	1-2-2-2 4				
FILL: Firm, grey silty clay, with gravel, cobbles and boulders, trace crushed stone and asphalt		6	SS 9	29	1-2-4-4 6				86
		7	SS 10	46	1-2-1-1 3				85
		8	SS 11	58	1-3-2-2 5				84
8.69m [83.49m]			SS 12	71	1-2-2-6 4				
TOPSOIL and organics		9							83
8.99m [83.19m]			SS 13	62	5-11-8-/ 19				
Compact, grey **SILTY SAND** to **SANDY SILT**		10	SS 14	83	1-1-1-1 2				82
9.45m [82.73m]			SS 15	100	1-1-1-2 2		242		
GLACIAL TILL: Firm to stiff, brown clayey silt, trace gravel and sand		11	SS 16	83	0-0-0-0 0		242		81
		12	SS 17	100	P		242		80
- Clay content increasing by 12.2 m depth			SS 18	100	1-2-3-1 5				
		13	SS 19						79
		14							

6.15m

7.54 m 2025-06-05

7.67m

SOIL PROFILE AND TEST DATA

Geotechnical Investigation & Slope Stability Study

301 Somme Street

COORD. SYS.: MTM ZONE 9 **EASTING:** 379135.75 **NORTHING:** 5019162.49 **ELEVATION:** 92.18

PROJECT: Proposed Commercial Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS:

DATE: June 3, 2025

FILE NO. : PG7567

HOLE NO. : BH 4-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
14.33m [77.85m]		14	SS 19	83	1-2-4-4 6		11 / 100		78
Dynamic cone penetration test commenced at 14.33 m depth		15							77
15.42m [76.76m]									
End of Borehole		16							76
Practical refusal to DCPT at 15.42 m depth		17							75
DCPT Pushed from 14.33 m to 15.01 m depth		18							74
(GWL at 7.54 m depth - June 5, 2025)		19							73
		20							72
		21							71
		22							70
		23							69
		24							68
		25							67
		26							66
		27							65
		28							

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 5123 Hawthorne Road - Part 1
Ottawa, Ontario

DATUM Ground surface elevations provided R. W. Tomlinson Limited.

FILE NO. PE4621

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** 2019 May 14

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	91.80
		AU	1				
FILL: Brown to black mixture of silt, clay, sand and gravel with asphalt, concrete and limestone						1	90.80
		SS	1	50			
		SS	2	10		2	89.80
		SS	3	60		3	88.80
3.96		SS	4	50			
		SS	5	60		4	87.80
Very stiff, grey **CLAYEY SILT/SILTY CLAY**		SS	6	60		5	86.80
6.00		SS	7	70			
		SS	8	70		6	85.80
Brown **SILTY FINE SAND,** some gravel		SS	9	30		7	84.80
		SS	10	30		8	83.80
8.35							
End of Borehole							
Practical refusal to augering at 8.35m depth							
(GWL @ 2.92m - May 28, 2019)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 5123 Hawthorne Road - Part 1
Ottawa, Ontario

DATUM Ground surface elevations provided R. W. Tomlinson Limited.

FILE NO. PE4621

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** 2019 May 15

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.38
FILL: Dark brown clayey sand		AU	1				
0.91						1	91.38
FILL: Dark grey gravelly clay, some shale		SS	1	70			
1.52						2	90.38
FILL: Dark grey gravelly silty sandy clay with shale and cobbles		SS	2	70			
2.30						3	89.38
		SS	3	90			
		SS	4	90			
Stiff to firm, grey **SILTY CLAY**						4	88.38
		SS	5				
		SS	6			5	87.38
5.30							
End of Borehole							
Practical refusal to augering at 5.30m depth							
(GWL @ 3.82m - May 28, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 5123 Hawthorne Road - Part 1
Ottawa, Ontario

DATUM Ground surface elevations provided R. W. Tomlinson Limited.

FILE NO. PE4621

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** 2019 May 14

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	91.00
FILL: Dark grey-brown gravelly sandy clay with shale		AU	1				
0.76							
		SS	1	50		1	90.00
		SS	2	50		2	89.00
		SS	3	50			
FILL: Dark grey mixture of clay, silt, sand and gravel with concrete, asphalt and shaley limestone		SS	4	60		3	88.00
		SS	5	50		4	87.00
		SS	6	60		5	86.00
5.79		SS	7	60			
						6	85.00
		SS	8	40		7	84.00
Grey **SILTY SAND**		SS	9	50		8	83.00
		SS	10	0			
9.45		SS	11			9	82.00
Light grey **SANDY SILT** with clay and gravel		SS	12			10	81.00
10.67							
End of Borehole							
Practical refusal to augering at 10.67m depth							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their "sensitivity". The sensitivity, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, if the bulk of the fractures caused by drilling stresses (called "mechanical breaks") are easily distinguishable from the normal in situ fractures.

RQD %	**ROCK QUALITY**
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC%	-	Natural water content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic Limit, % (water content above which soil behaves plastically)
PI	-	Plasticity Index, % (difference between LL and PL)
Dxx	-	Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2 / (D10 \times D60)$
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay (more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

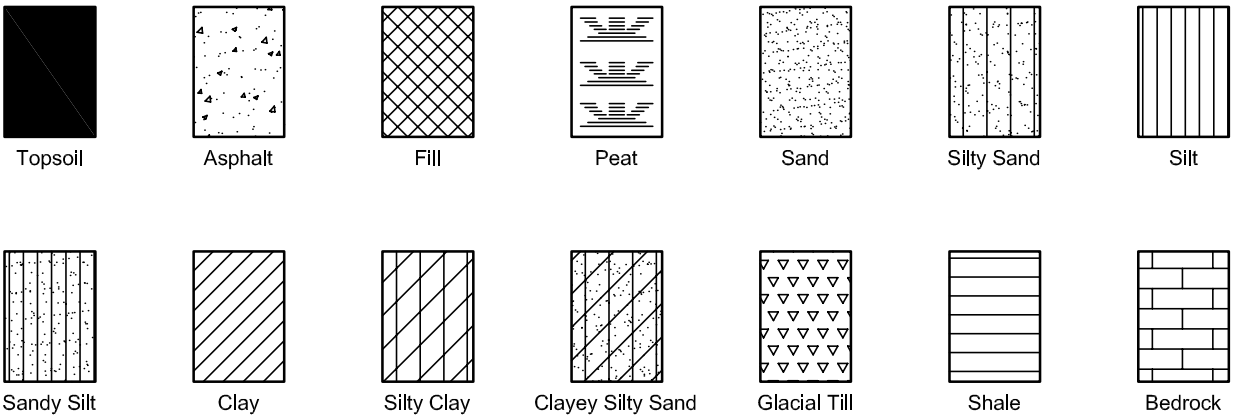
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

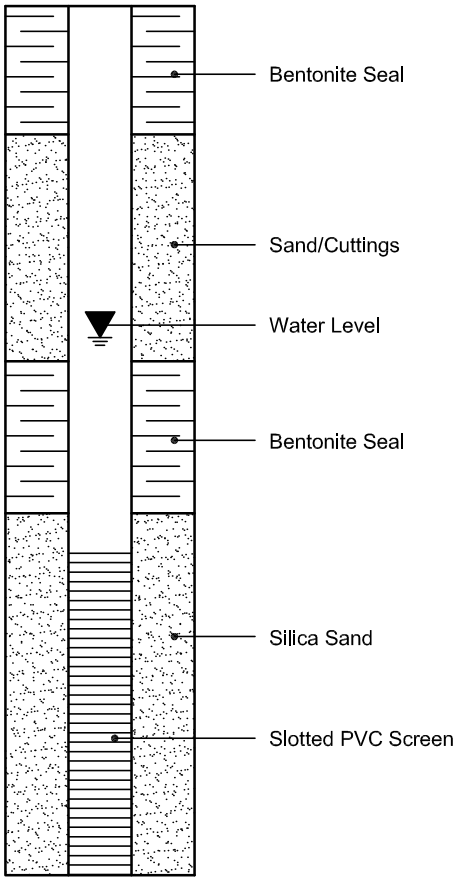
SYMBOLS AND TERMS (continued)

STRATA PLOT

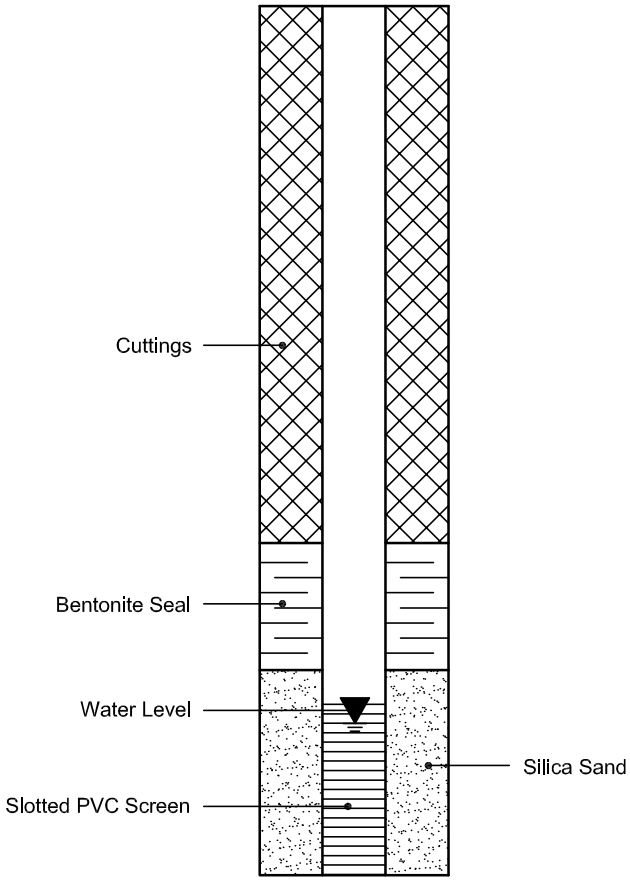


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



REFERENCE No.: 11231101 ENCLOSURE No.:

BOREHOLE No.: BH1-21

ELEVATION: 91.07 m

BOREHOLE LOG

Page: 1 of 2

CLIENT: Consolidated Fastfrate (Ottawa) Holdings Ltd.

PROJECT: ConFastfrate, New Warehouse & Offices

LOCATION: Somme Street, Ottawa, ON

DESCRIBED BY: J. Scott CHECKED BY: Leandro Ramos

DATE (START): 26 July 2021 DATE (FINISH): 27 July 2021

LEGEND

- SS Split Spoon
- ST Shelby Tube
- RC Rock Core
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Blows per 6 in. / 15 cm	Penetration Index / RQD %	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
metres	91.07		GROUND SURFACE			%		N	
	90.99		**TOPSOIL** (75 mm)						
			FILL - SILTY SAND, trace gravel, trace clay, dark grey, moist, compact		SS1	96	7-15-10-9	25	
					SS2A	71	9-6-3-4	9	
1.0	90.20		**FILL** - SAND, trace silt, trace gravel, brown, moist, loose Gravel - 17%, Sand - 60%, Silt - 19%, Clay - 4%		SS2B		--		
	89.54		**FILL** - SILTY SAND, with clay, trace gravel, dark grey, moist, dense cobble encountered at 1.83 mbgs		SS3	71	7-13-33-40	46	
2.0					SS4	42	5-2-3-50/76 mm	5	
3.0					SS5A	67	8-8-5-3	13	
			with organics and wood fragments		SS5B		--		>>
					SS6	0	50/51 mm	50/51 mm	
4.0			augers grinding at 3.96 mbgs, inferred boulders or construction debri						
	86.49		**SILTY SAND** - trace gravel, trace clay, brown, moist, dense to very dense		SS7	83	10-21-37 -50/127 mm	58	
5.0					SS8A	100	43-31-36-47	67	
6.0	85.27		grey, very moist, augers grinding at 9.85 mbgs, inferred boulder		SS8B		--		
					SS9	83	24-23-18-26	41	
7.0			cobble encoutered at 6.86 mbgs		SS10	75	13-11-15-12	26	
8.0					SS11	71	6-4-12-23	16	
					SS12	67	50-15-15-18	30	
9.0					SS13	67	13-17-19-17	36	
			Gravel - 16%, Sand - 32%, Silt - 36%, Clay - 16%						
10.0	81.21		**LIMESTONE** - interbedded sandstone, grey, poor to excellent quality based on RQD - highly weatherd from 9.86 mbgs to 9.93 mbgs		RC1	58	38	38	
11.0			silty sand seam at 10.92 mbgs						

NOTES:
mbgs: meters below ground surface
RQD: Rock Quality Designation

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BOREHOLE No.: BH1-21
ELEVATION: 91.07 m

BOREHOLE LOG

Page: 2 of 2

CLIENT: Consolidated Fastfrate (Ottawa) Holdings Ltd.
PROJECT: ConFastfrate, New Warehouse & Offices
LOCATION: Somme Street, Ottawa, ON
DESCRIBED BY: J. Scott CHECKED BY: Leandro Ramos
DATE (START): 26 July 2021 DATE (FINISH): 27 July 2021

LEGEND

- SS Split Spoon
- ST Shelby Tube
- RC Rock Core
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Blows per 6 in. / 15 cm	Penetration Index / RQD %	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
metres	91.07		GROUND SURFACE			%		N	
			vertical fracture at 11.58 mbgs		RC2	98	95	95	
12.0									
13.0					RC3	95	58	58	
14.0	77.25		Borehole terminated at 13.82 mbgs Note: Borehole Coordinate - UTM Zone 18 - Northing: 5017223.9 - Easting: 456487.2						
15.0									
16.0									
17.0									
18.0									
19.0									
20.0									
21.0									
22.0									

NOTES:
mbgs: meters below ground surface
RQD: Rock Quality Designation

REFERENCE No.: 11231101 ENCLOSURE No.:

BOREHOLE No.: BH2-21

ELEVATION: 90.79 m

BOREHOLE LOG

Page: 1 of 2

CLIENT: Consolidated Fastfrate (Ottawa) Holdings Ltd.

PROJECT: ConFastfrate, New Warehouse & Offices

LOCATION: Somme Street, Ottawa, ON

DESCRIBED BY: J. Scott CHECKED BY: Leandro Ramos

DATE (START): 27 July 2021 DATE (FINISH): 27 July 2021

LEGEND

- SS Split Spoon
- ST Shelby Tube
- RC Rock Core
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Blows per 6 in. / 15 cm	Penetration Index / RQD %	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
metres	90.79		GROUND SURFACE			%		N	
	90.71		**TOPSOIL** (75 mm)		SS1A	92	3-12-11-15	23	
			FILL - SILTY SAND, trace clay, trace bricks, trace asphalt, brown to black, moist, compact		SS1B		--		
	90.33		**FILL** - SAND AND GRAVEL, trace silt, brown, moist, compact		SS2	88	6-14-17-15	31	
1.0	90.03		**FILL** - SILTY SAND, with gravel, trace clay, brown to grey, moist, dense		SS3A	46	7-9-6-6	15	
			with clay at 1.65 mbgs		SS3B		--		
2.0			trace clay at 2.89 mbgs		SS4	67	28-13-12-38	25	
3.0			asphalt at 3.35 mbgs		SS5	63	8-7-5-12	12	
					SS6A	67	3-1-1-1	2	
4.0	86.93		**ORGANIC**		SS6B		--		
			FILL - SILTY SAND, trace gravel, trace clay, brown, wet, loose		SS6C		--		
	86.88		with topsoil at 4.57 mbgs		SS7A	88	2-3-7-8	10	
5.0			with clay, bricks fragments at 4.72 mbgs		SS7B		--		
	85.45		**SILTY SAND** - with clay, trace gravel, brown, moist to wet, compact to dense		SS8	83	8-19-22-40	41	
6.0			grey at 6.10 mbgs		SS9	54	9-14-12-13	26	
7.0					SS10	79	5-3-5-6	8	
8.0					SS11	75	5-7-8-10	15	
			Gravel - 20%, Sand - 38%, Silt - 33%, Clay - 9%		SS12	63	6-10-11-17	21	
9.0			wet at 9.14 mbgs		SS13	71	11-18-18-21	36	
10.0			augers grinding at 10.08 mbgs, inferred boulder		SS14	71	19-50/25 mm	50/25 mm	
11.0					SS15	25	11-14-15-21	29	

NOTES:
mbgs: meters below ground surface
RQD: Rock Quality Designation

File: \\GHDNET\GHD\CA\PETERBOROUGH\PROJECTS\662\11231101\WORKSHARE\FIELD\GINT LOG\11231101 LOGS.GPJ Library File: 11231101 GHD_GEOTECH_V10.GLB Report: 11231101 BOREHOLE LOG Date: 12/8/21

BOREHOLE No.: BH2-21
ELEVATION: 90.79 m

BOREHOLE LOG

Page: 2 of 2

CLIENT: Consolidated Fastfrate (Ottawa) Holdings Ltd.
PROJECT: ConFastfrate, New Warehouse & Offices
LOCATION: Somme Street, Ottawa, ON
DESCRIBED BY: J. Scott CHECKED BY: L. Ramos
DATE (START): 27 July 2021 DATE (FINISH): 27 July 2021

LEGEND

- SS Split Spoon
- ST Shelby Tube
- RC Rock Core
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Blows per 6 in. / 15 cm	Penetration Index / RQD %	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
metres	90.79		GROUND SURFACE			%		N	
	79.36		**SAND** - trace silt, grey, wet, dense		SS16A	92	11-15-18-31	23	
12.0	79.23		**SILTY CLAY** - with sand, trace gravel reddish brown, moist, hard		SS16B		–		
					SS17	0	21-31-31-40	62	
13.0					SS18	100	9-21-38-50/127 mm	59	
14.0					SS19	100	17-26-48-50/127 mm	59	
15.0	76.01		**LIMESTONE** - interbedded sandstone, grey, good quality based on RQD UCS = 139.1 MPa		RC1	100	78	78	
16.0									
					RC2	98	76	76	
17.0									
18.0					RC3	100	89	89	
19.0	71.92		Borehole terminated at 18.87 mbgs Note: Borehole Coordinates - UTM Zone 18N - Northing: 5017221.2 - Easting: 456581.5						
20.0									
21.0									
22.0									

NOTES:
m bgs: meters below ground surface
RQD: Rock Quality Designation

BOREHOLE No.: BH3-21
ELEVATION: 90.55 m

BOREHOLE LOG

Page: 1 of 1

CLIENT: Consolidated Fastfrate (Ottawa) Holdings Ltd.
PROJECT: ConFastfrate, New Warehouse & Offices
LOCATION: Somme Street, Ottawa, ON
DESCRIBED BY: J. Scott CHECKED BY: L. Ramos
DATE (START): 26 July 2021 DATE (FINISH): 26 July 2021

LEGEND

- SS Split Spoon
- ST Shelby Tube
- RC Rock Core
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Blows per 6 in. / 15 cm	Penetration Index / RQD %	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa
metres	90.55		GROUND SURFACE			%		N	10 20 30 40 50 60 70 80 90
	90.48		**TOPSOIL** (75 mm)						
			FILL - SILTY SAND, with gravel, trace clay, brown, moist, compact		SS1	71	2-6-4-10	10	
					SS2A	42	5-5-7-14	12	
1.0	89.64		with presence of organics/topsoil		SS2B		–		
					SS3	33	5-5-6-15	11	
2.0									
			with to trace clay at 2.5 m bgs		SS4	42	7-6-4-3	10	
3.0			grey at 3.0 m bgs		SS5	86	2-2-8-27	10	
			moist						
	87.20		**ASPHALT**						
4.0	87.15		**FILL** - SANDY GRAVEL, dark grey, wet, compact		SS6	46	12-12-5-7	17	
	86.74		**SILTY SAND** - trace gravel, some clay, brown, moist, compact						
5.0			loose at 4.75 m bgs		SS7	0	3-2-3-4	5	
			compact to very dense at 5.5 m bgs Gravel - 19%, Sand - 49%, Silt - 26%, Clay - 6%		SS8	73	10-16-21-46	37	H
6.0	WL6.2				SS9	100	13-26-27-41	53	
	2021-07-26								
7.0					SS10A	100	9-11-11-15	22	
	83.54		with clay, trace gravel, trace cobbles, grey, moist, compact		SS10B		–		
8.0					SS11	71	8-13-20-28	33	
					SS12	79	5-10-16-36	26	
9.0			wet at 9.14 m bgs		SS13	80	18-50/102 mm	100+	
	81.11		Borehole terminated due to auger refusal at 9.45 mbgs. Bedrock or boulder inferred						
10.0			Noted: Borehole Location - UTM Zone 18N - Northing: 5017286.1 - Easting: 456612.6						
11.0									

NOTES:
m bgs: meters below ground surface
RQD: Rock Quality Designation

BOREHOLE No.: BH4-21
ELEVATION: 90.23 m

BOREHOLE LOG

Page: 1 of 2

CLIENT: Consolidated Fastfrate (Ottawa) Holdings Ltd.
PROJECT: ConFastfrate, New Warehouse & Offices
LOCATION: Somme Street, Ottawa, ON
DESCRIBED BY: J. Scott CHECKED BY: L. Ramos
DATE (START): 8 July 2021 DATE (FINISH): 28 July 2021

LEGEND

- SS Split Spoon
- ST Shelby Tube
- RC Rock Core
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Blows per 6 in. / 15 cm	Penetration Index / RQD %	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa
metres	90.23		GROUND SURFACE			%		N	10 20 30 40 50 60 70 80 90
	90.16		**TOPSOIL** (75 mm)						
			FILL - SILTY SAND, with clay, trace rootlets, brown to grey, moist, stiff		SS1	43	1-2-7-4	9	
1.0			asphalt at 0.8 m bgs cobble at 0.9 m bgs		SS2	54	7-8-4-9	12	
			cobble at 1.5 m bgs		SS3	21	9-10-7-5	17	
2.0					SS4	0	4-2-1-2	3	
3.0	87.19		**FILL** - very loose fill mixed with organics/top soil and wood fragments - dark brown, moist		SS5	67	2-1-1-4	2	
4.0					SS6	13	5-1-0-1	1	
5.0					SS7	17	2-1-1-2	2	
					SS8	42	2-1-2-2	3	
6.0 ▼	WL6.1 2021-07-26				SS9A	83	1-3-2-3	5	
	83.68		**SILTY SAND** - with clay, trace rootlets, brown, moist		SS9B		–		
7.0			wet at 6.86 mbgs trace gravel, rootlets stopped at 7.01 mbgs		SS10	42	4-11-11-15	22	
8.0			brown with grey mottling, moist at 7.62 m bgs		SS11	83	5-10-12-11	22	
			wet at 8.69 mbgs		SS12	100	21-27-31-30	58	
9.0					SS13	0	22-22-19-36	41	
10.0					SS14	71	8-21-20-31	41	
11.0			moist at 10.82 mbgs		SS15	67	20-16-25-25	41	

NOTES:
m bgs: meters below ground surface
RQD: Rock Quality Designation

REFERENCE No.: 11231101 ENCLOSURE No.:

BOREHOLE No.: BH4-21

ELEVATION: 90.23 m

BOREHOLE LOG

Page: 2 of 2

CLIENT: Consolidated Fastfrate (Ottawa) Holdings Ltd.

PROJECT: ConFastfrate, New Warehouse & Offices

LOCATION: Somme Street, Ottawa, ON

DESCRIBED BY: J. Scott CHECKED BY: Leandro Ramos

DATE (START): 8 July 2021 DATE (FINISH): 28 July 2021

LEGEND

- SS Split Spoon
- ST Shelby Tube
- RC Rock Core
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Blows per 6 in. / 15 cm	Penetration Index / RQD %	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa
metres	90.23		GROUND SURFACE			%		N	10 20 30 40 50 60 70 80 90
	78.80		**SILTY CLAY** - with sand, trace gravel, reddish brown, moist, hard		SS16	100	13-24-26-22	50	
12.0	78.19		Borehole terminated due to auger refusal at 12.04 mbgs. Bedrock or boulder inferred Note: Borehole Coordinate - UTM 18 Zone - Northing: 5017343.6 - Easting: 456673.6						
13.0									
14.0									
15.0									
16.0									
17.0									
18.0									
19.0									
20.0									
21.0									
22.0									

NOTES:
mbgs: meters below ground surface
RQD: Rock Quality Designation

BOREHOLE No.: BH5-21
ELEVATION: 90.39 m

BOREHOLE LOG

Page: 1 of 1

CLIENT: Consolidated Fastfrate (Ottawa) Holdings Ltd.
PROJECT: ConFastfrate, New Warehouse & Offices
LOCATION: Somme Street, Ottawa, ON
DESCRIBED BY: J. Scott CHECKED BY: Leandro Ramos
DATE (START): 26 July 2021 DATE (FINISH): 26 July 2021

LEGEND

- SS Split Spoon
- ST Shelby Tube
- RC Rock Core
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Blows per 6 in. / 15 cm	Penetration Index / RQD %	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa
metres	90.39		GROUND SURFACE			%		N	10 20 30 40 50 60 70 80 90
	90.32		**TOPSOIL** (75 mm)						
			FILL - SILTY CLAY, trace sand, grey, moist, very soft		SS1	21	1-0-0-1	0	
					SS2A	24	2-5-6-7	11	
1.0	89.48		**FILL** - SANDY SILT, trace clay, trace gravel, dark brown, moist, compact		SS2B		--		
			loose at 1.52 mbgs		SS3	24	12-5-4-6	9	
2.0			Gravel - 25%, Sand - 38%, Silt - 29%, Clay - 8%						
			with clay, some gravel at 2.29 mbgs		SS4	24	5-4-2-5-6	6	
3.0									
			shale cobble at 3.2 mbgs		SS5	24	4-3-6-7	9	
4.0					SS6	24	4-3-3-5	6	
	85.82		**SILTY SAND** - trace clay, trace gravel, brown, moist, compact to very dense		SS7	24	3-5-8-9	13	
5.0			Gravel - 10%, Sand - 38%, Silt - 41%, Clay - 11% wet at 5.03 mbgs						
			moist, containing cobbles at 5.33 mbgs		SS8	24	14-20-42-42	62	
6.0			grey at 6.1 mbgs		SS9	24	8-16-20-20	36	
7.0			wet, with clay at 6.86 mbgs		SS10	16	15-34-50/102 mm	84/254 mm	
			moist at 7.62		SS11A	15	23-40-50/76 mm	90/229 mm	
8.0	82.52		**SANDY SILT** - trace clay, grey, moist, very loose		SS11B		--		
	82.39		Borehole terminated due to auger refusal at 8.0 mbgs. Bedrock or boulder inferred						
			Note: Borehole Coordinate - UTM 18 Zone - Northing: 5017293.2 - Easting: 456532.1						
9.0									
10.0									
11.0									

NOTES:
mbgs: meters below ground surface
RQD: Rock Quality Designation

BOREHOLE No.: BH1
ELEVATION: 90.21 m

BOREHOLE LOG

Page: 1 of 2

CLIENT: Consolidated Fastrate (Ottawa) Holdings Ltd.
PROJECT: New Warehouse
LOCATION: Somme Street, Ottawa, ON
DESCRIBED BY: RVT CHECKED BY: BV
DATE (START): 6 August 2020 DATE (FINISH): 6 August 2020

LEGEND
- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		MONITOR WELL	SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK		State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa
meters	90.21		GROUND SURFACE	1.01			%	ppm	N	10 20 30 40 50 60 70 80 90
	90.1		TOPSOIL (75 mm thickness)							
0.5			FILL - Silty sand, trace gravel, loose, brown, damp			SS1	50		5	
	89.4									
1.0			FILL - Gravel, trace sand, possible cobble/boulder, compact to dense, grey, damp			SS2	50		47	
1.5	88.7			Riser						
			FILL - Silty sand, some clay, trace gravel, compact, brown and grey, damp			SS3	42		20	
2.0				Cuttings						
2.5						SS4	58		19	
3.0	87.2									
			FILL - Silty clay, some sand, trace gravel, very stiff, brown and grey, damp			SS5	33		10	
3.5			becoming sandy at 3.8 mbgs							
	86.3									
4.0			FILL - Clayey silty sand, compact, grey and brown, moist	WL 3.99		SS6	58		14	
4.5				4.57						
				Bentonite		SS7	21		14	
5.0				5.18						
5.5				5.49		SS8	46		12	
	84.3									
6.0			SILTY SAND- some clay, trace to some gravel, compact, brown and grey, moist	Sand						
				Screen		SS9	54		12	
6.5										

NOTES:
mbgs: meters below ground surface
RQD: Rock Quality Designation

BOREHOLE No.: BH1
ELEVATION: 90.21 m

BOREHOLE LOG

Page: 2 of 2

CLIENT: Consolidated Fastrate (Ottawa) Holdings Ltd.
PROJECT: New Warehouse
LOCATION: Somme Street, Ottawa, ON
DESCRIBED BY: RVT CHECKED BY: BV
DATE (START): 6 August 2020 DATE (FINISH): 6 August 2020

LEGEND
- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		MONITOR WELL	SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK		State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa
meters	90.21		GROUND SURFACE				%	ppm	N	10 20 30 40 50 60 70 80 90
			Refusal encountered at 7.2 mbgs Cobbles and boulders encountered from 7.3 to 8.2 mbgs	7.01		SS10	71		50+	
7.5										
8.0						RC1	49			
	82.0		LIMESTONE- interbedded sandstone, grey, fair becoming good quality with depth based on RQD							
8.5										
9.0						RC2	94		73	
9.5										
10.0						RC3	100		82	
10.5										
11.0						RC4	100		90	
	78.9		Borehole terminated at 11.3 mbgs							
11.5										
12.0										
12.5										
13.0										
13.5										

NOTES:
mbgs: meters below ground surface
RQD: Rock Quality Designation

BOREHOLE No.: BH2
ELEVATION: 89.80 m

BOREHOLE LOG

Page: 1 of 2

CLIENT: Consolidated Fastrate (Ottawa) Holdings Ltd.
PROJECT: New Warehouse
LOCATION: Somme Street, Ottawa, ON
DESCRIBED BY: RVT CHECKED BY: BV
DATE (START): 6 August 2020 DATE (FINISH): 6 August 2020

LEGEND
- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	89.80		GROUND SURFACE			%	ppm	N	
	89.7		TOPSOIL (75 mm thickness)						
			FILL - Silty clay, firm to stiff, grey, moist		SS1	58		2	
0.5									
1.0					SS2	100		2	
1.5									
2.0					SS3	100		1	
2.5					SS4	100		WH	
3.0									
3.5					FV5				
	86.0		FILL - Clayey sand, some gravel, organics, loose, grey and brown, moist						
4.0					SS6	75		5	
4.5	85.2		FILL - Gravelly sandy silt, compact to very dense, brown and grey, saturated						
5.0					SS7	83		33	
5.5					SS8	63		70	
6.0	83.7		SILTY SAND- some gravel, compact to very dense, grey, moist to saturated						
6.5					SS9	100		27	

NOTES:
mbgs: meters below ground surface
RQD: Rock Quality Designation

BOREHOLE No.: BH2
ELEVATION: 89.80 m

BOREHOLE LOG

Page: 2 of 2

CLIENT: Consolidated Fastrate (Ottawa) Holdings Ltd.
PROJECT: New Warehouse
LOCATION: Somme Street, Ottawa, ON
DESCRIBED BY: RVT CHECKED BY: BV
DATE (START): 6 August 2020 DATE (FINISH): 6 August 2020

LEGEND
- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	89.80		GROUND SURFACE			%	ppm	N	
					SS10	83		57	
7.5									
					SS11	91		70	
8.0									
			Cobbles and boulders encountered from 8.4 to 9.3 mbgs		SS12	100		50+	
8.5									
9.0			Refusal encountered at 9.3 mbgs		SS13	100		50+	
	80.5		LIMESTONE- interbedded sandstone, grey, fair to good quality based on RQD						
9.5					RC1	100		85	
10.0									
10.5									
					RC2	100		83	
11.0									
11.5									
					RC3	100		52	
12.0									
	77.6		Borehole terminated at 12.2 mbgs						
12.5									
13.0									
13.5									

NOTES:
mbgs: meters below ground surface
RQD: Rock Quality Designation

BOREHOLE No.: BH3
ELEVATION: 90.88 m

BOREHOLE LOG

Page: 1 of 3

CLIENT: Consolidated Fastrate (Ottawa) Holdings Ltd.
PROJECT: New Warehouse
LOCATION: Somme Street, Ottawa, ON
DESCRIBED BY: RVT CHECKED BY: BV
DATE (START): 7 August 2020 DATE (FINISH): 7 August 2020

LEGEND
- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- ● N Penetration Index based on Split Spoon sample
- • N Penetration Index based on Dynamic Cone sample
- △ Cu Shear Strength based on Field Vane
- □ Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- ▲ Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	90.88		GROUND SURFACE			%	ppm	N	
	90.8		TOPSOIL (125 mm thickness)						
0.5			FILL - Clayey silty sand, trace to some gravel, compact, brown and grey, damp		SS1	63		11	
1.0	90.0		FILL - Crushed limestone, asphalt, compact, grey and black, damp		SS2	58		42	
1.5	89.4		FILL - Sand, trace gravel, clay pockets, asphalt, compact, grey and black, damp to moist		SS3	38		15	
2.0									
2.5	88.6		FILL - Silty sand, some gravel, trace clay, possible cobbles/boulders, compact , grey, moist		SS4	33		54	
3.0	87.8		FILL - Clayey sand, asphalt, loose to compact, grey and brown, moist		SS5	33		22	
3.5									
4.0					SS6	4		8	
4.5	86.3		FILL - Silty sand, trace gravel, trace to some clay, dense to very dense, brown and grey, damp to moist, possible cobbles/boulders		SS7	50		54	
5.0									
5.5					SS8	33		44	
6.0	84.8		SANDY SILT- some gravel, compact to very dense, grey, damp						
6.5					SS9	83		31	

NOTES:
mbgs: meters below ground surface
RQD: Rock Quality Designation

BOREHOLE No.: BH3
ELEVATION: 90.88 m

BOREHOLE LOG

Page: 2 of 3

CLIENT: Consolidated Fastrate (Ottawa) Holdings Ltd.
PROJECT: New Warehouse
LOCATION: Somme Street, Ottawa, ON
DESCRIBED BY: RVT CHECKED BY: BV
DATE (START): 7 August 2020 DATE (FINISH): 7 August 2020

LEGEND
- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- ○ Water content (%)
- Atterberg limits (%)
- ● N Penetration Index based on Split Spoon sample
- • N Penetration Index based on Dynamic Cone sample
- △ Cu Shear Strength based on Field Vane
- □ Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- ▲ Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	90.88		GROUND SURFACE			%	ppm	N	
					SS10	83		28	
7.5			Possible cobbles/boulders encountered from 7.6 to 9.1 mbgs						
8.0					SS11	83		24	
8.5					SS12	25		80	
9.0									
9.5					SS13	100		42	
			Refusal encountered at 10 mbgs						
10.0			Cobbles and boulders encountered from 10.0 to 11.9 mbgs						
10.5									
11.0					RC1	32			
11.5									
	79.0								
12.0			LIMESTONE- interbedded sandstone, grey, poor to fair quality based on RQD						
12.5					RC2	100		57	
13.0									
13.5			Rock core mechanical breaks during coring from 13.4 to 14.9 mbgs						

NOTES:
mbgs: meters below ground surface
RQD: Rock Quality Designation

BOREHOLE No.: BH3
ELEVATION: 90.88 m

BOREHOLE LOG

Page: 3 of 3

CLIENT: Consolidated Fastrate (Ottawa) Holdings Ltd.
PROJECT: New Warehouse
LOCATION: Somme Street, Ottawa, ON
DESCRIBED BY: RVT CHECKED BY: BV
DATE (START): 7 August 2020 DATE (FINISH): 7 August 2020

LEGEND
- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- ○ Water content (%)
- Atterberg limits (%)
- ● N Penetration Index based on Split Spoon sample
- • N Penetration Index based on Dynamic Cone sample
- △ Cu Shear Strength based on Field Vane
- □ Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- ▲ Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	90.88		GROUND SURFACE			%	ppm	N	
					RC3	92		37	
14.5									
15.0	75.9		Borehole terminated at 14.9 mbgs						
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									
19.0									
19.5									
20.0									
20.5									

NOTES:
mbgs: meters below ground surface
RQD: Rock Quality Designation

BOREHOLE No.: BH4
ELEVATION: 90.44 m

BOREHOLE LOG

Page: 1 of 2

CLIENT: Consolidated Fastrate (Ottawa) Holdings Ltd.
PROJECT: New Warehouse
LOCATION: Somme Street, Ottawa, ON
DESCRIBED BY: RVT CHECKED BY: BV
DATE (START): 7 August 2020 DATE (FINISH): 7 August 2020

LEGEND
- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- ● N Penetration Index based on Split Spoon sample
- • N Penetration Index based on Dynamic Cone sample
- △ Cu Shear Strength based on Field Vane
- □ Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- ▲ Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	90.44		GROUND SURFACE			%	ppm	N	
	90.3		TOPSOIL (125 mm thickness)						
0.5			FILL - Gravelly sand, compact, grey, damp		SS1	63		33	
	89.7		FILL - Sand and gravel, compact, grey, damp						
1.0					SS2	50		17	
1.5			Asphalt encountered at 1.5 mbgs						
2.0					SS3	54		27	
2.5					SS4	58		28	
3.0	87.4		FILL - Silty sand, trace clay, trace to some gravel, possible cobbles/boulders, brown and grey, damp to moist		SS5	100		50+	
3.5									
			Wood encountered at 3.8 mbgs						
4.0					SS6	17		19	
4.5									
5.0					SS7	0		4	
5.5					SS8	75		29	
6.0	84.3		SILTY SAND- trace to some gravel, trace clay, compact to dense, grey and brown, moist						
6.5					SS9	79		49	

NOTES:
mbgs: meters below ground surface

BOREHOLE No.: BH4
ELEVATION: 90.44 m

BOREHOLE LOG

Page: 2 of 2

CLIENT: Consolidated Fastrate (Ottawa) Holdings Ltd.
PROJECT: New Warehouse
LOCATION: Somme Street, Ottawa, ON
DESCRIBED BY: RVT CHECKED BY: BV
DATE (START): 7 August 2020 DATE (FINISH): 7 August 2020

LEGEND
- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	90.44		GROUND SURFACE			%	ppm	N	
					SS10	4		32	
7.5									
8.0					SS11	58		18	
8.5					SS12	58		44	
9.0									
9.5					SS13	67		50	
10.0									
10.5									
11.0	79.3		Borehole terminated at refusal at 11.1 mbgs		SS14	88		50+	
11.5									
12.0									
12.5									
13.0									
13.5									

NOTES:
mbgs: meters below ground surface

BOREHOLE No.: DCPT5
ELEVATION: 90.76 m

BOREHOLE LOG

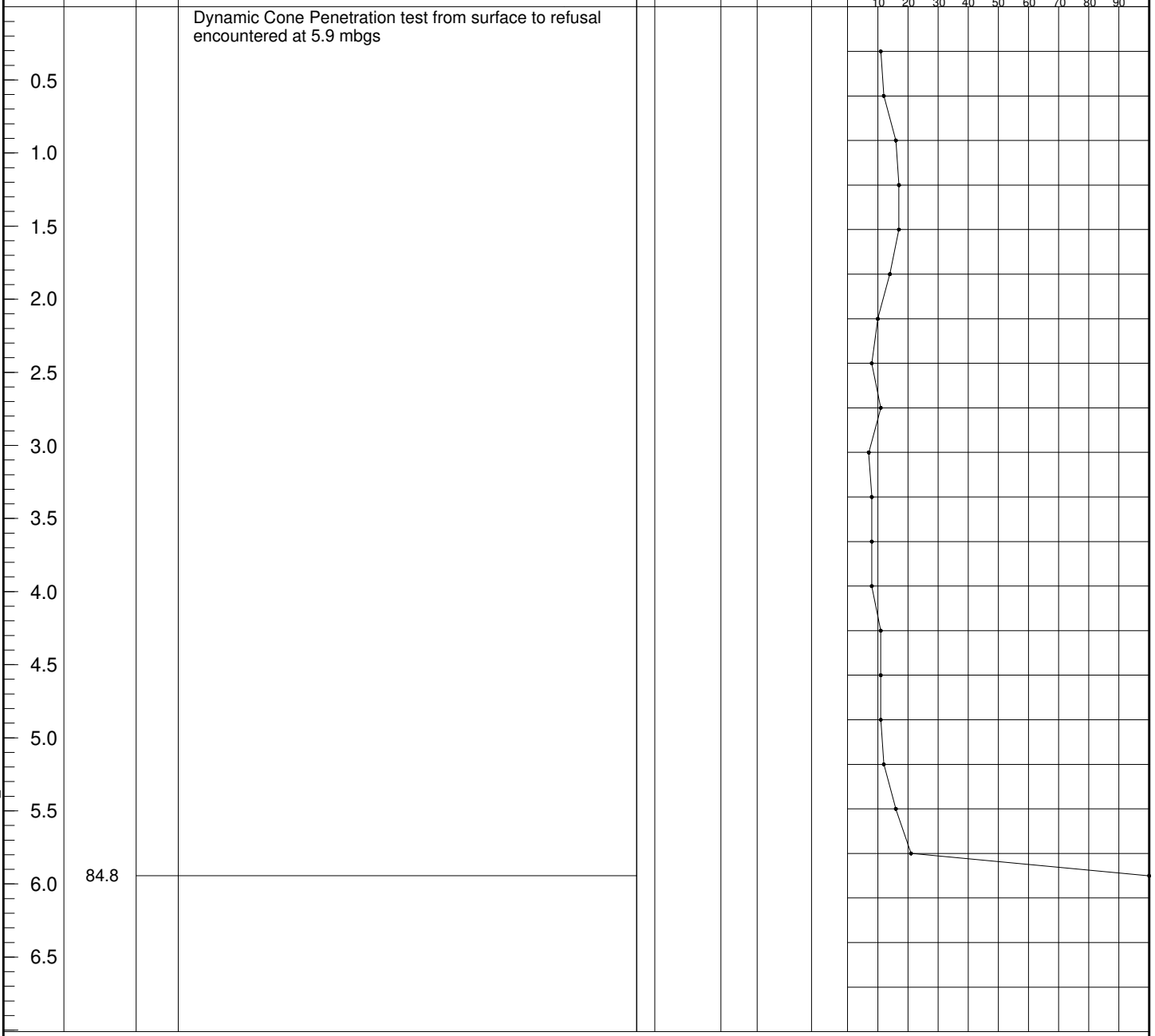
Page: 1 of 1

CLIENT: Consolidated Fastrate (Ottawa) Holdings Ltd.
PROJECT: New Warehouse
LOCATION: Somme Street, Ottawa, ON
DESCRIBED BY: RVT CHECKED BY: BV
DATE (START): 7 August 2020 DATE (FINISH): 7 August 2020

LEGEND
- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA				
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	OVC	Penetration Index / RQD
meters	90.76		GROUND SURFACE			%	ppm	N
			Dynamic Cone Penetration test from surface to refusal encountered at 5.9 mbgs					
	84.8							

SCALE FOR TEST RESULTS
50kPa 100kPa 150kPa 200kPa
10 20 30 40 50 60 70 80 90



NOTES:
mbgs: meters below ground surface

INSPEC-SOL

BOREHOLE No.: B5-1
ELEVATION: 90.48 m

BOREHOLE LOG

Page: 1 of 1

CLIENT: R.W.Tomlinson Ltd.
PROJECT: Geotechnical Investigation
LOCATION: Lot 26 and 27, concession 6, Ottawa, Ontario
DESCRIBED BY: B.Beveridge CHECKED BY: J.Bennett
DATE (START): October 30, 2008 DATE (FINISH): October 30, 2008

LEGEND

- SS Split Spoon
- ST Shelby Tube
- RC Rock Core
- Water Level
- o Water content (%)
- Atterberg limits (%)
- • N Penetration Index based on Split Spoon sample
- • N Penetration Index based on Dynamic Cone sample
- △ Cu Shear Strength based on Field Vane
- □ Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- ▲ Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		MONITOR WELL	SAMPLE DATA				
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK		State	Type and Number	Recovery	Organic Vapour ppm or %LEL	Penetration Index / RQD
meters	90.48		GROUND SURFACE	91.70 91.60			%	ppm	N
1.0			FILL - silty clay, some sand, gravel, concrete, asphalt and organics, loose to dense, green/brown/grey, moist			SS1	46		6
2.0						SS2	25		10
3.0						SS3	50		4
4.0						SS4	50		9
5.0						SS5	75		50+
6.0	85.15		SANDY SILT- some sand, gravel, trace oxidation, very stiff, greenish brown, moist			SS6	59		10
7.0	83.62		SANDY CLAY- some gravel, trace oxidation, very soft, red / green / grey, moist	6.98 7.29		SS7	67		50+
8.0	83.16		SILTY CLAY- some gravel, very stiff, grey, moist	WL 7.63		SS8	25		50+
9.0				8.81		SS9	42		50+
10.0	80.45		End of Borehole Auger Refusal Assumed Bedrock	10.03		SS10	0		R
11.0						SS11	50		R
12.0						SS12	46		R
13.0						SS13	17		R

SCALE FOR TEST RESULTS
50kPa 100kPa 150kPa 200kPa
10 20 30 40 50 60 70 80 90

NOTES:

BOREHOLE LOG T020556-A1-BH(OCT-31-08).GPJ INSPEC_SOL.GDT 5/12/09

INSPEC-SOL

BOREHOLE No.: B5-2
ELEVATION: 90.78 m

BOREHOLE LOG

Page: 1 of 1

CLIENT: R.W.Tomlinson Ltd.
PROJECT: Geotechnical Investigation
LOCATION: Lot 26 and 27, concession 6, Ottawa, Ontario
DESCRIBED BY: B.Beveridge CHECKED BY: J.Bennett
DATE (START): October 23, 2008 DATE (FINISH): October 23, 2008

LEGEND

- SS Split Spoon
- ST Shelby Tube
- RC Rock Core
- Water Level
- Water content (%)
- Atterberg limits (%)
- ● N Penetration Index based on Split Spoon sample
- • N Penetration Index based on Dynamic Cone sample
- △ Cu Shear Strength based on Field Vane
- □ Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- ▲ Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Organic Vapour ppm or %LEL	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	90.78		GROUND SURFACE			%	ppm	N	
			FILL - silty clay, some asphalt, sand and gravel, trace organics, compact to dense, brown/black, moist						
1.0					SS1	92		49	
2.0					SS2	55		12	
					SS3	75		50+	
3.0					SS4	63		17	
4.0					SS5	71		32	
	86.21		SILTY CLAY - some gravel, trace oxidation, firm to stiff, brown/grey, moist to wet		SS6	38		2	
5.0					SS7	100		7	
6.0					SS8	84		R	
	84.07		End of Borehole						
7.0									
8.0									
9.0									
10.0									
11.0									
12.0									
13.0									

NOTES:

BOREHOLE LOG T020556-A1-BH(OCT-31-08).GPJ INSPEC_SOL.GDT 5/12/09

INSPEC•SOL

BOREHOLE No.: B5-3

ELEVATION: 90.51 m

BOREHOLE LOG

Page: 1 of 1

CLIENT: R.W.Tomlinson Ltd.

PROJECT: Geotechnical Investigation

LOCATION: Lot 26 and 27, concession 6, Ottawa, Ontario

DESCRIBED BY: B.Beveridge CHECKED BY: J.Bennett

DATE (START): October 23, 2008 DATE (FINISH): October 23, 2008

LEGEND

- SS Split Spoon
- ST Shelby Tube
- RC Rock Core
- Water Level
- o Water content (%)
- Atterberg limits (%)
- • N Penetration Index based on Split Spoon sample
- • N Penetration Index based on Dynamic Cone sample
- △ Cu Shear Strength based on Field Vane
- □ Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- ▲ Shear Strength based on Pocket Penetrometer

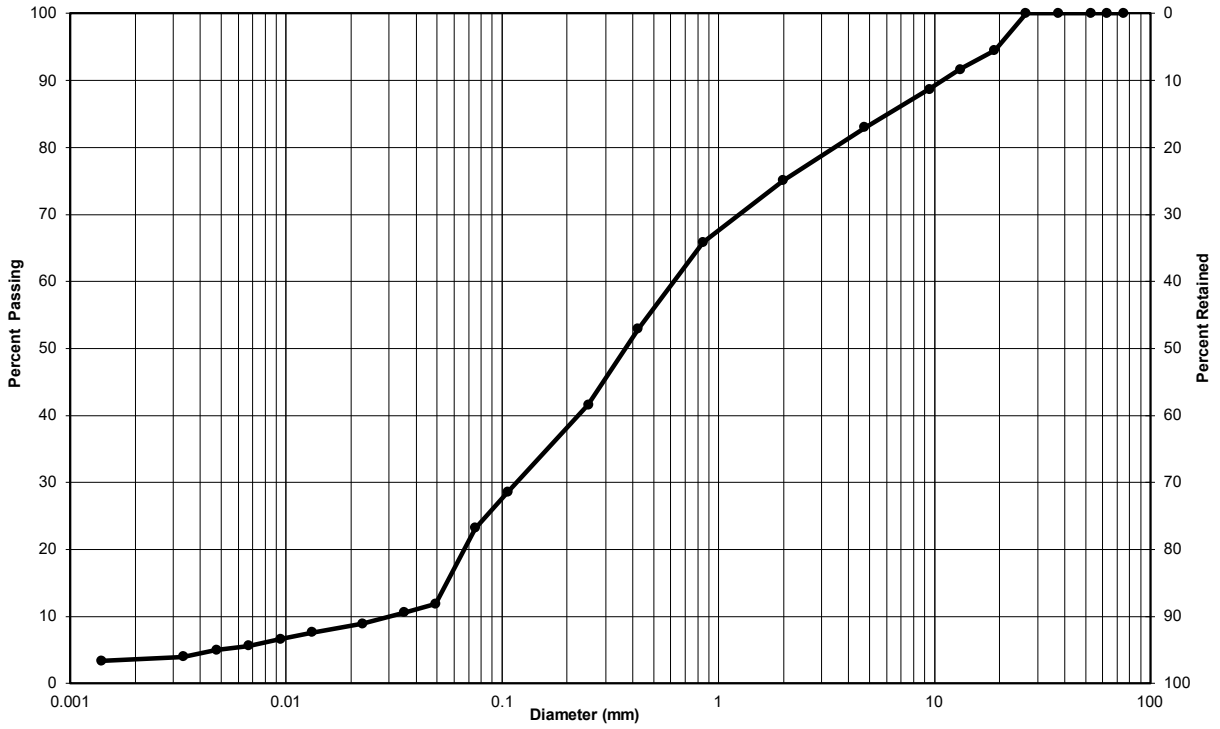
SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Organic Vapour ppm or %LEL	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	90.51		GROUND SURFACE			%	ppm	N	
			FILL- concrete and asphalt fragments, some sand, trace organics						
1.0	89.75		FILL- silty clay, some gravel, trace oxidation, stiff, brown, moist		SS1	42		50+	
2.0	88.99		FILL- sandy silt, some gravel, trace clay, organics, very stiff, brownish green, moist		SS2	58		15	
3.0	88.22		FILL- silty clay, some asphalt, gravel and sand, trace organics, hard, brown, moist		SS3	50		38	
					SS4	59		13	
4.0	86.70		FILL- silty clay, trace organics, oxidation, gravel, sand, hard, moist		SS5	21		17	
5.0			-becoming trace to some gravel		SS6	84		32	
			-becoming more asphalt fragments, hard to very stiff		SS7	71		22	
6.0	84.41		SILTY CLAY- some sand, trace organics, firm, grey, moist		SS8	25		7	
7.0			-becoming very stiff		SS9	59		39	
	82.89		End of Borehole						
8.0									
9.0									
10.0									
11.0									
12.0									
13.0									

NOTES:

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Consolidated Fastfrate (Ottawa) Holdings Inc.	**Lab No.:**	SS-21-66
Project/Site:	New Warehouse and Offices / Somme Street, Ottawa	**Project No.:**	11231101

Borehole no.:	BH1-21	Sample no.:	SS2B
Depth:	0.9 to 1.4m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty sand with gravel (SM)	17	60	23
Silt-size particles (%):	19		
Clay-size particles (%) (<0.002mm):	4		

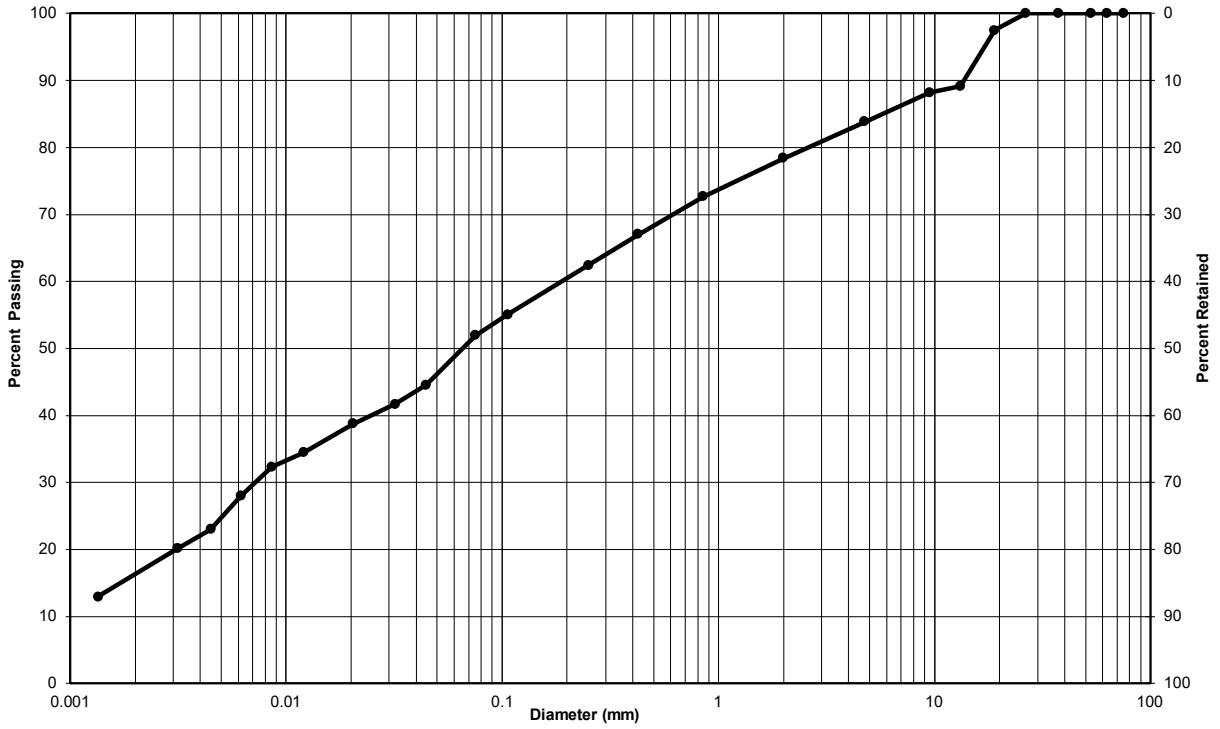
Remarks:

Performed by:	Jade Gorman	**Date:**	August 10, 2021
Verified by:	Joe Sullivan	**Date:**	August 11, 2021

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Consolidated Fastfrate (Ottawa) Holdings Inc.	**Lab No.:**	SS-21-66
Project/Site:	New Warehouse and Offices / Somme Street, Ottawa	**Project No.:**	11231101

Borehole no.:	BH1-21	Sample no.:	SS13
Depth:	9.1 to 9.8m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sandy lean clay with gravel (CL)	16	32	52
Silt-size particles (%):	36		
Clay-size particles (%) (<0.002mm):	16		

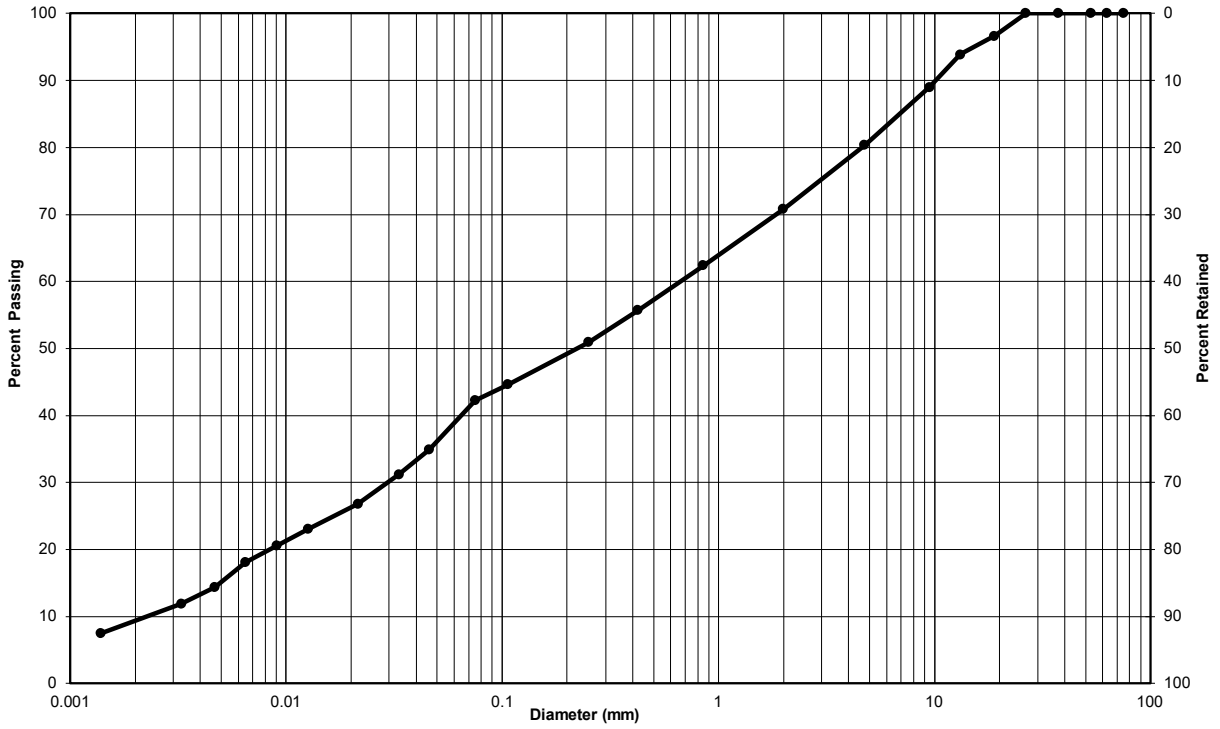
Remarks:

Performed by:	Jade Gorman	**Date:**	August 10, 2021
Verified by:	Joe Sullivan	**Date:**	August 11, 2021

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Consolidated Fastfrate (Ottawa) Holdings Inc.	**Lab No.:**	SS-21-66
Project/Site:	New Warehouse and Offices / Somme Street, Ottawa	**Project No.:**	11231101

Borehole no.:	BH2-21	Sample no.:	SS12
Depth:	8.4 to 9.0m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sandy lean clay with gravel (CL)	20	38	42
Silt-size particles (%):	33		
Clay-size particles (%) (<0.002mm):	9		

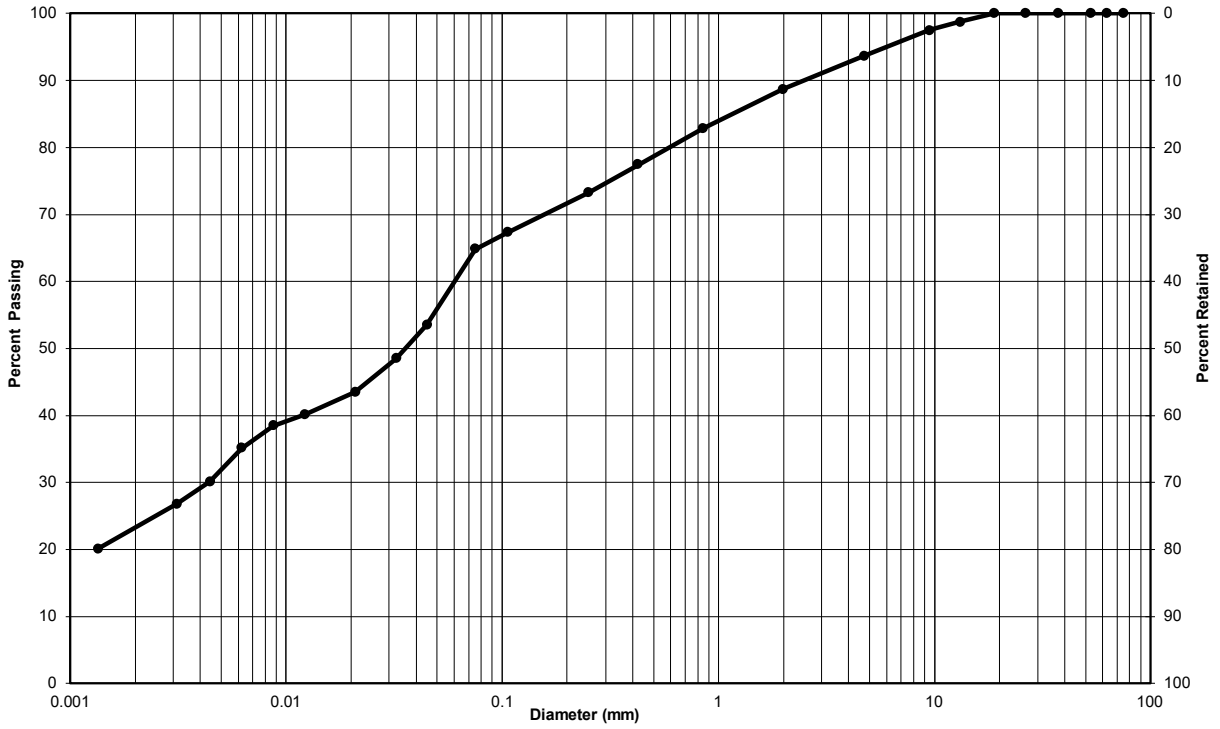
Remarks:

Performed by:	Jade Gorman	**Date:**	August 10, 2021
Verified by:	Joe Sullivan	**Date:**	August 11, 2021

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Consolidated Fastfrate (Ottawa) Holdings Inc.	**Lab No.:**	SS-21-66
Project/Site:	New Warehouse and Offices / Somme Street, Ottawa	**Project No.:**	11231101

Borehole no.:	BH2-21	Sample no.:	SS18
Depth:	13.0 to 13.6m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sandy lean clay (CL)	6	29	65
Silt-size particles (%):	42		
Clay-size particles (%) (<0.002mm):	23		

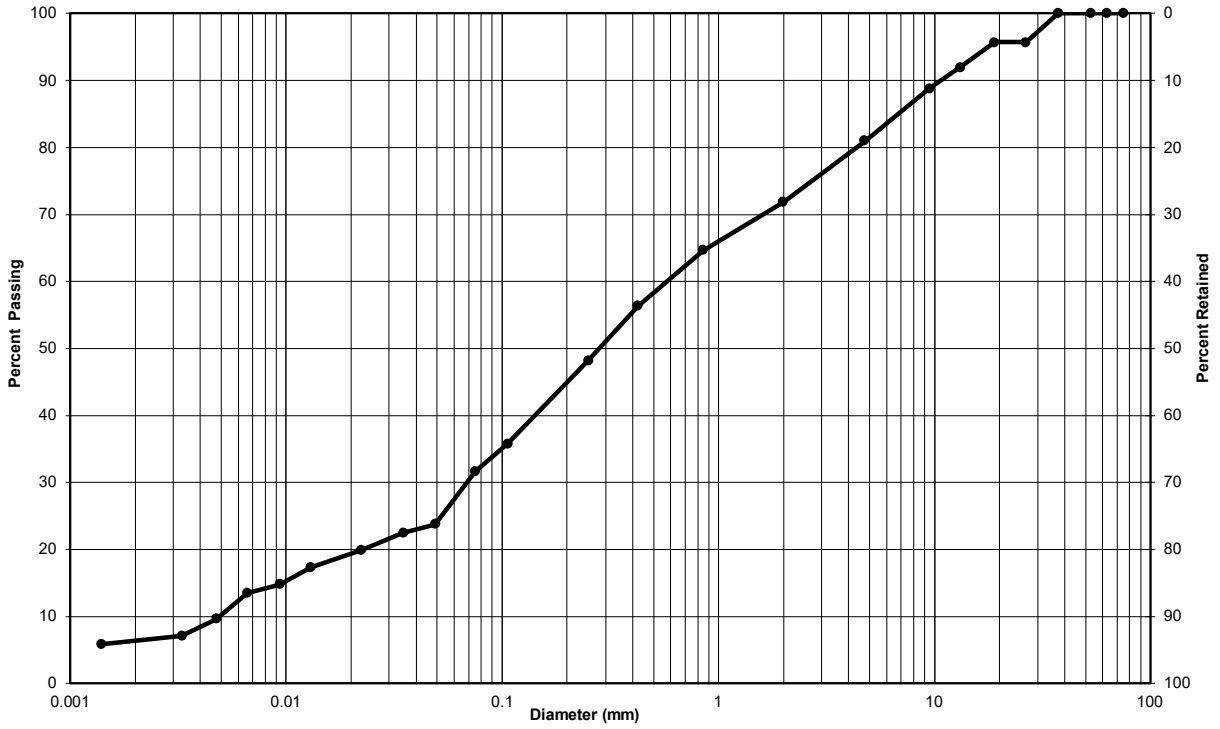
Remarks:

Performed by:	Josh Sullivan	**Date:**	September 9, 2021
Verified by:	Joe Sullivan	**Date:**	September 13, 2021

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Consolidated Fastfrate (Ottawa) Holdings Inc.	**Lab No.:**	SS-21-66
Project/Site:	New Warehouse and Offices / Somme Street, Ottawa	**Project No.:**	11231101

Borehole no.:	BH3-21	Sample no.:	SS8
Depth:	5.3 to 5.9m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sandy silty clay with gravel (CL-ML)	19	49	32
Silt-size particles (%):	26		
Clay-size particles (%) (<0.002mm):	6		

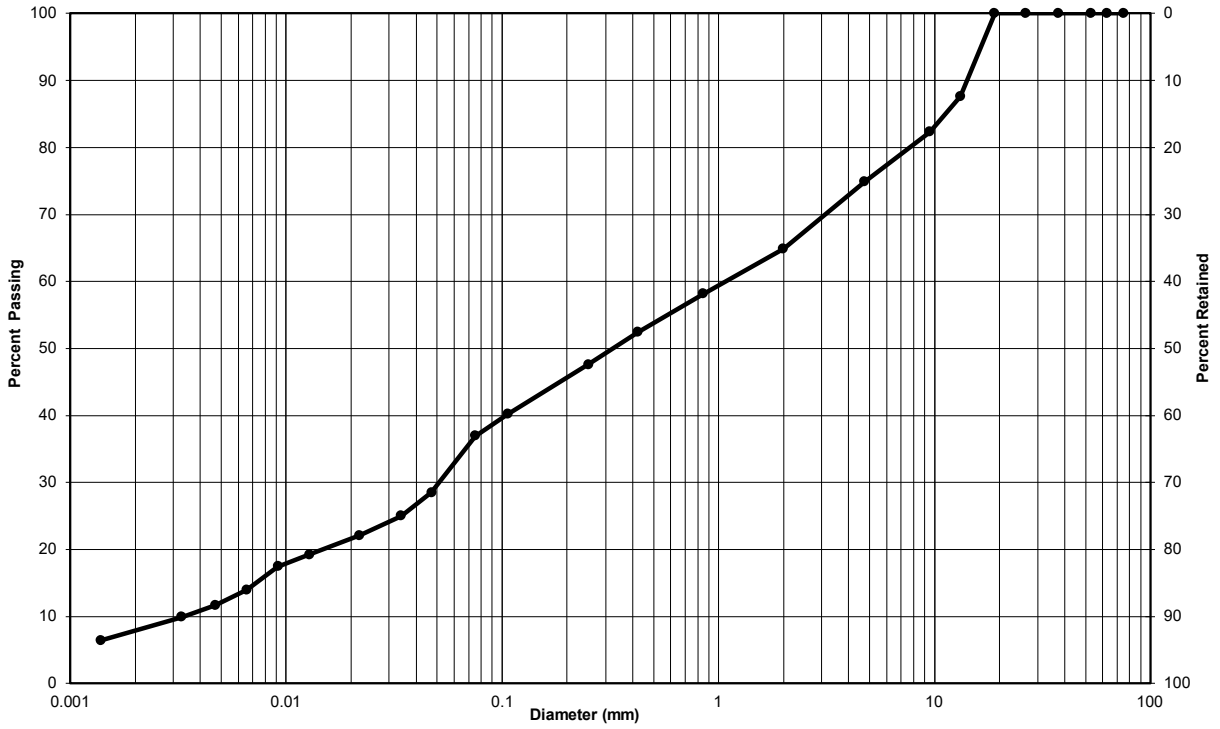
Remarks:

Performed by:	Jade Gorman	**Date:**	August 10, 2021
Verified by:	Joe Sullivan	**Date:**	August 11, 2021

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Consolidated Fastfrate (Ottawa) Holdings Inc.	**Lab No.:**	SS-21-66
Project/Site:	New Warehouse and Offices / Somme Street, Ottawa	**Project No.:**	11231101

Borehole no.:	BH5-21	Sample no.:	SS3
Depth:	1.5 to 2.1m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty sand with gravel (SM)	25	38	37
Silt-size particles (%):	29		
Clay-size particles (%) (<0.002mm):	8		

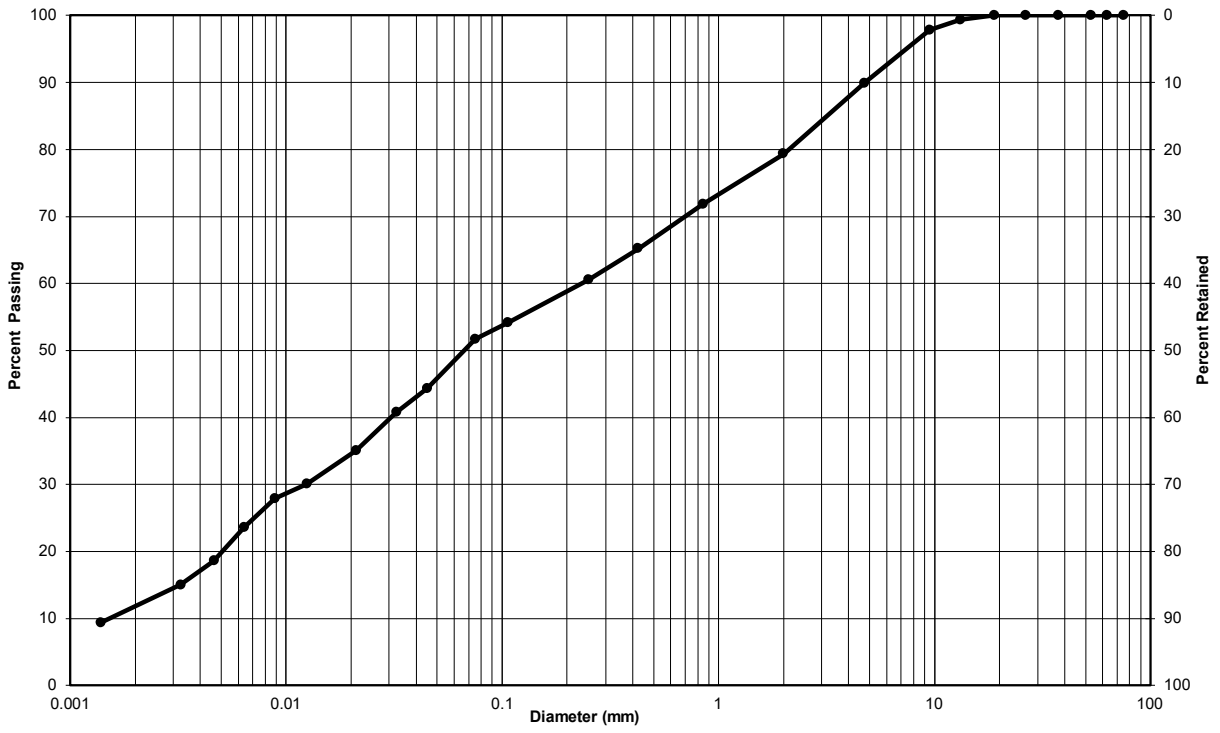
Remarks:

Performed by:	Jade Gorman	**Date:**	August 10, 2021
Verified by:	Joe Sullivan	**Date:**	August 11, 2021

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Consolidated Fastfrate (Ottawa) Holdings Inc.	**Lab No.:**	SS-21-66
Project/Site:	New Warehouse and Offices / Somme Street, Ottawa	**Project No.:**	11231101

Borehole no.:	BH5-21	Sample no.:	SS7
Depth:	4.6 to 5.2m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

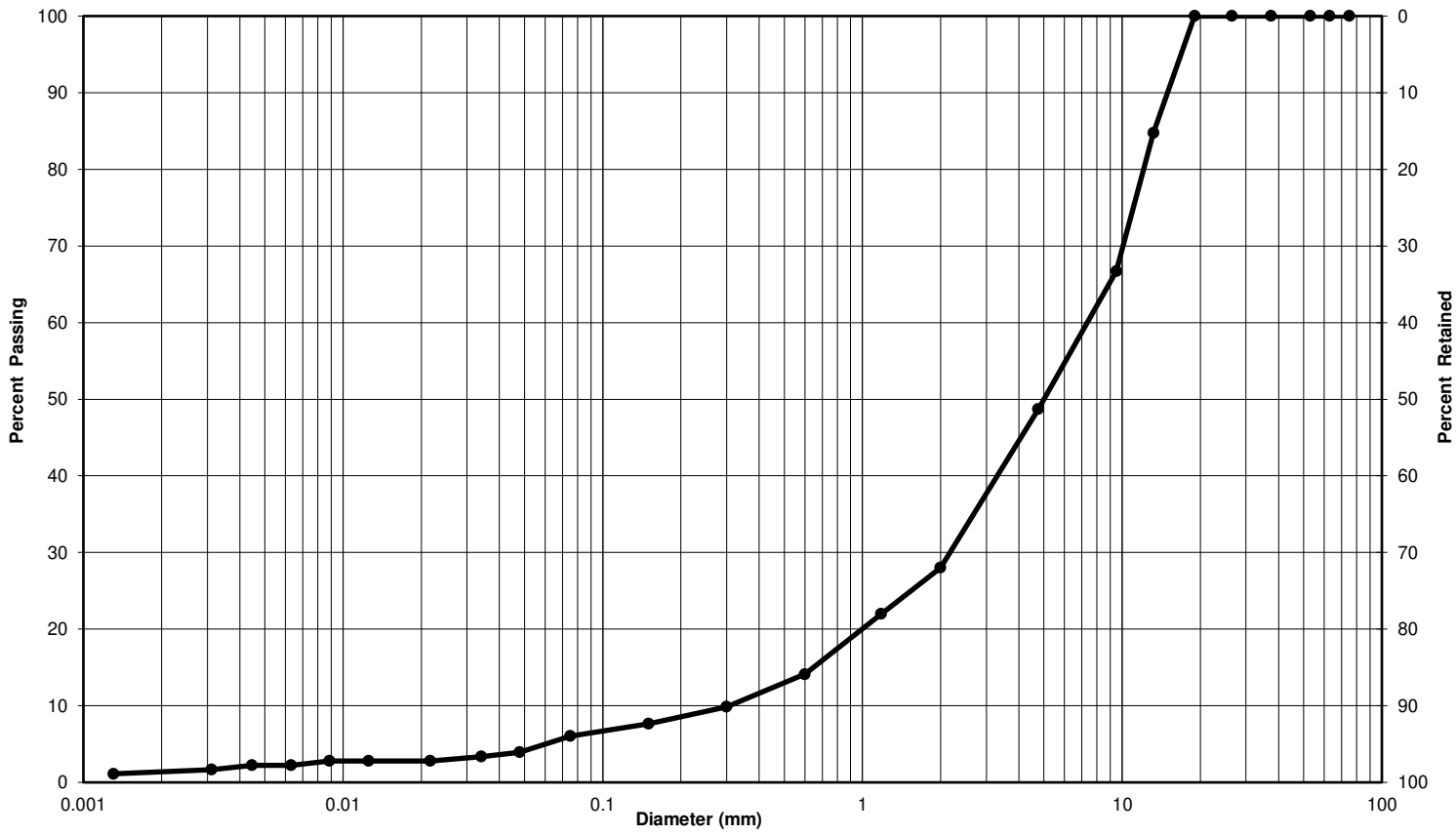
Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sandy silty clay with gravel (CL-ML)	10	38	52
Silt-size particles (%):	41		
Clay-size particles (%) (<0.002mm):	11		

Remarks:

Performed by:	Jade Gorman	**Date:**	August 10, 2021
Verified by:	Joe Sullivan	**Date:**	August 11, 2021

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Consolidated Fastrate (Ottawa) Holdings Ltd.	**Lab No.:**	G-20-13
Project, Site:	New Warehouse, Somme Street, Ottawa, ON	**Project No.:**	11215612
Borehole No.:	1	Sample No.:	3
Depth:	1.5 - 2.1m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

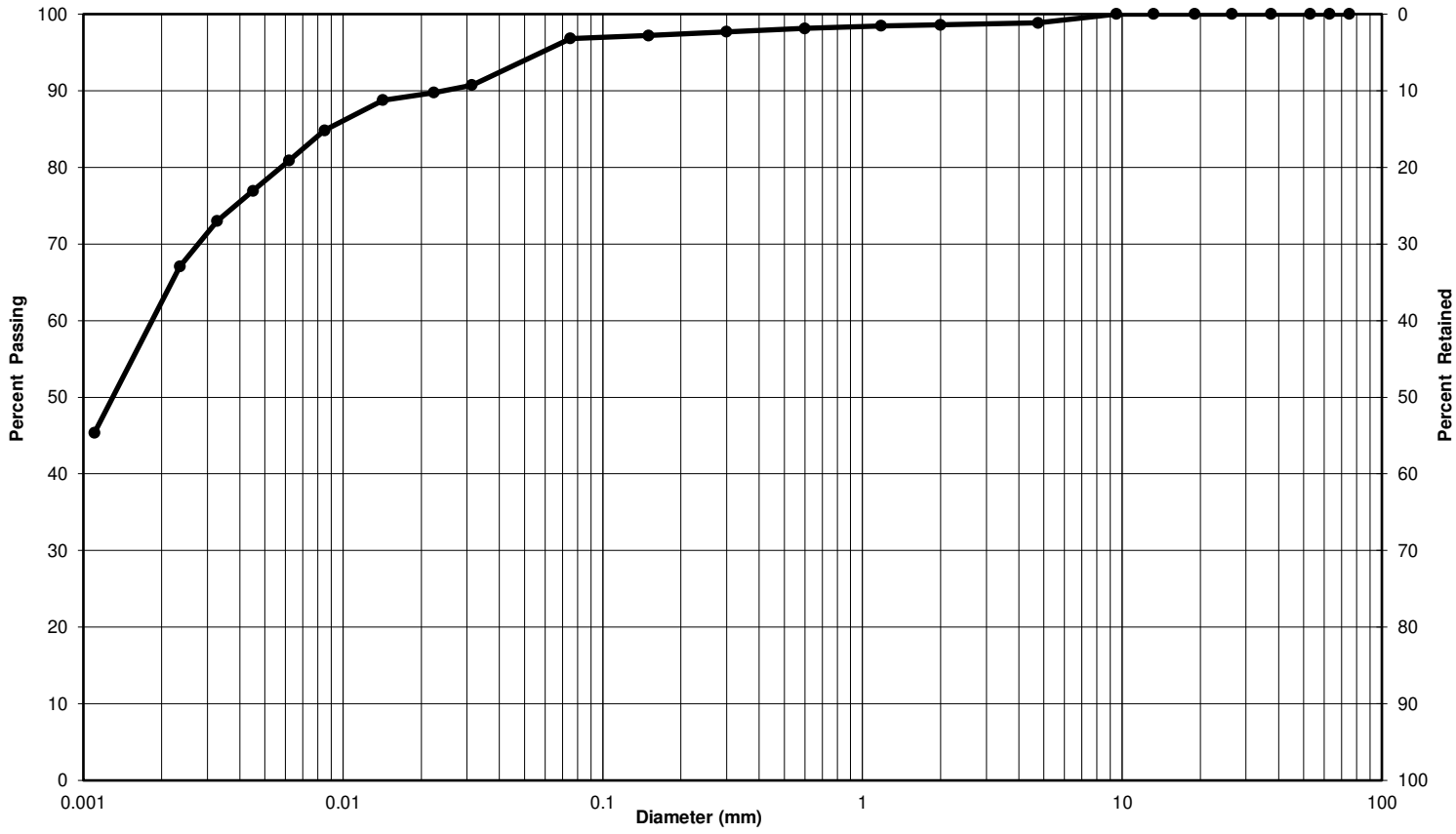
Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Gravel and Sand, trace Silt, trace Clay	51	43	6
			1 %

Remarks:

Performed by:	Z. Mathurin	**Date:**	August 27, 2020
Verified by:		**Date:**	September 4, 2020

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Consolidated Fastrate (Ottawa) Holdings Ltd.	**Lab No.:**	G-20-13
Project, Site:	New Warehouse, Somme Street, Ottawa, ON	**Project No.:**	11215612
Borehole No.:	2	Sample No.:	4
Depth:	2.3 - 3.0m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

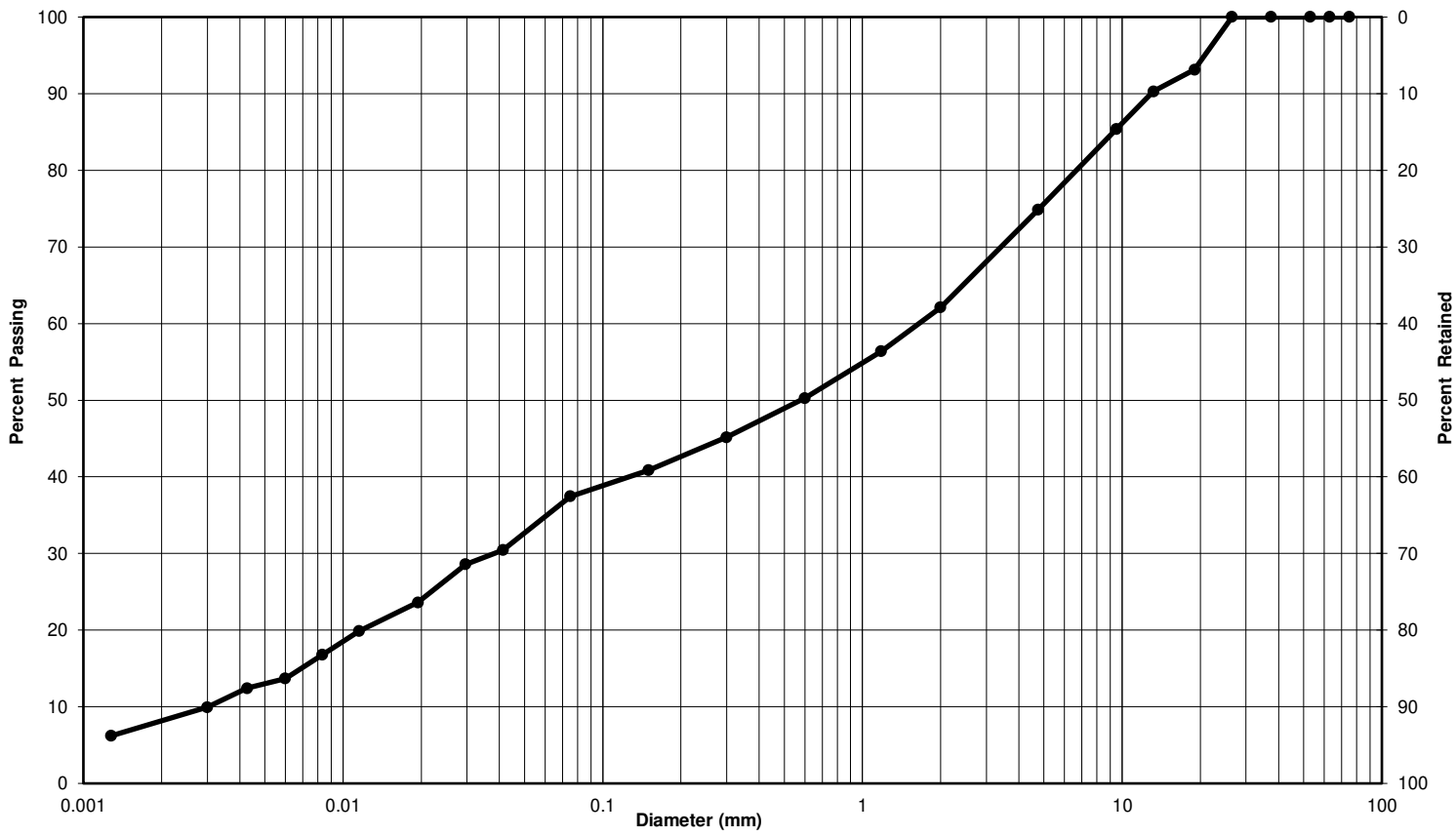
Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Clay and Silt, trace Sand, trace Gravel	1	2	97
Clay-size particles (<0.002 mm):			61 %

Remarks:

Performed by:	Z. Mathurin	**Date:**	August 27, 2020
Verified by:		**Date:**	September 4, 2020

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Consolidated Fastrate (Ottawa) Holdings Ltd.	**Lab No.:**	G-20-13
Project, Site:	New Warehouse, Somme Street, Ottawa, ON	**Project No.:**	11215612
Borehole No.:	2	Sample No.:	7
Depth:	4.5 - 6.1m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

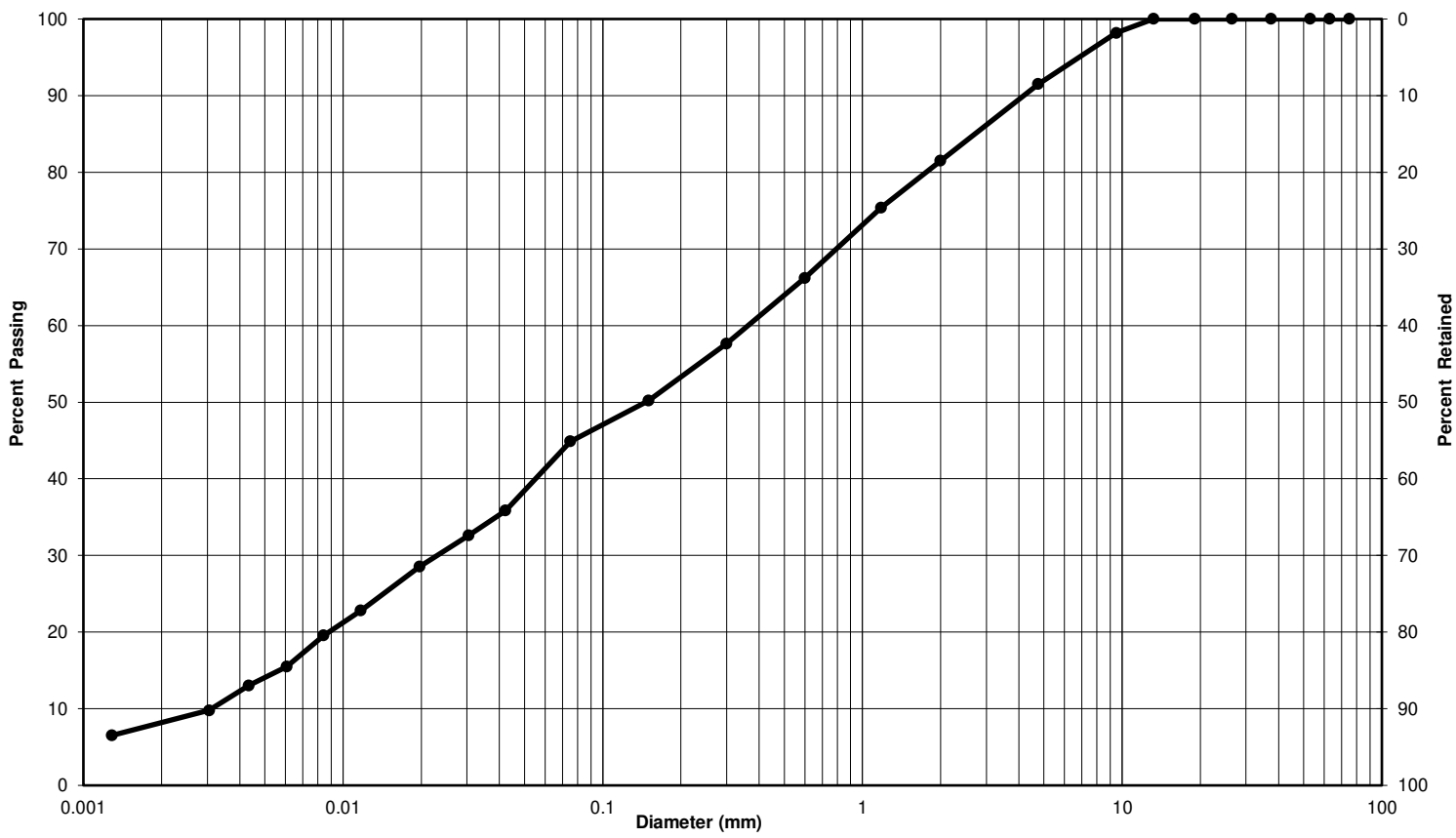
Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Gravelly, Silty, Sand, trace Clay	25	38	37
Clay-size particles (<0.002 mm):			8 %

Remarks:

Performed by:	Z. Mathurin	**Date:**	August 27, 2020
Verified by:		**Date:**	September 4, 2020

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Consolidated Fastrate (Ottawa) Holdings Ltd.	**Lab No.:**	G-20-13
Project, Site:	New Warehouse, Somme Street, Ottawa, ON	**Project No.:**	11215612
Borehole No.:	3	Sample No.:	10
Depth:	6.9 - 7.5m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sand and Silt, trace Gravel, trace Clay	8	47	45
Clay-size particles (<0.002 mm):			8 %

Remarks:

Performed by:	Z. Mathurin	**Date:**	August 27, 2020
Verified by:		**Date:**	September 4, 2020

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Consolidated Fastfrate (Ottawa) Holdings Inc.	**Lab no.:**	SS-21-66
Project/Site:	New Warehouse and Offices / Somme Street, Ottawa	**Project no.:**	11231101

Borehole no.:	BH1-21	Sample no.:	SS13	Depth:	9.1 to 9.8m
Soil Description:	Lean Clay (CL)			Date sampled:	

Apparatus:	Hand Crank	Balance no.:	10	Porcelain bowl no.:	1
Liquid limit device no.:	1	Oven no.:	B33-02667	Spatula no.:	1
Sieve no.:	n/a	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows	32	23	15
Water Content:			
Tare no.	1	8	43A
Wet soil+tare, g	26.69	30.76	28.34
Dry soil+tare, g	25.62	28.79	26.84
Mass of water, g	1.07	1.97	1.50
Tare, g	21.32	21.19	21.22
Mass of soil, g	4.30	7.60	5.62
Water content %	24.9%	25.9%	26.7%

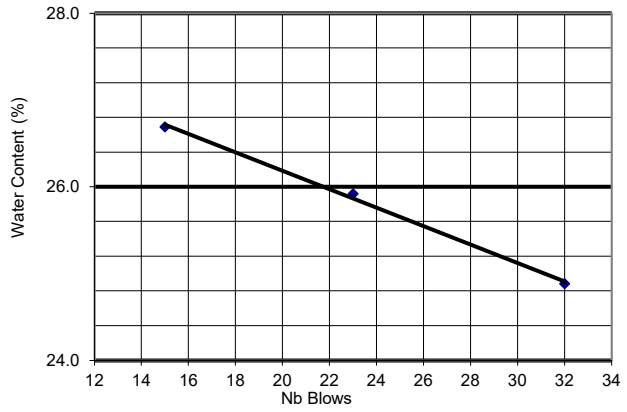
Plastic Limit (PL) - Water Content:		
Tare no.	20	22
Wet soil+tare, g	28.02	27.70
Dry soil+tare, g	26.99	26.75
Mass of water, g	1.03	0.95
Tare, g	21.36	21.56
Mass of soil, g	5.63	5.19
Water content %	18.3%	18.3%
Average water content %	18.3%	

Natural Water Content (W^n):		
Tare no.	N7	
Wet soil+tare, g	203.55	
Dry soil+tare, g	191.76	
Mass of water, g	11.79	
Tare, g	45.09	
Mass of soil, g	146.67	
Water content %	8.0%	

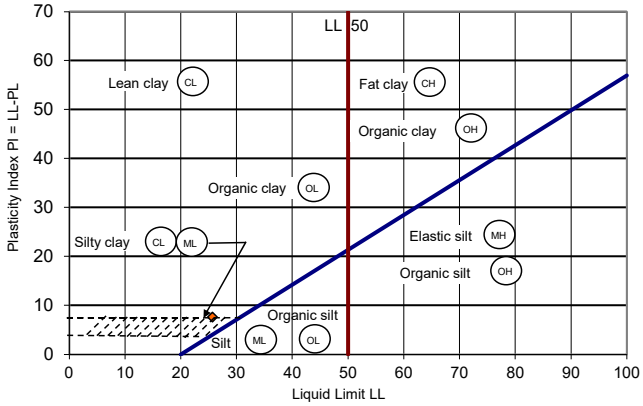
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart ASTM D2487



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n
26	18	8	8.0

Remarks:

Performed by:	Josh Sullivan	**Date:**	August 10, 2021
Verified by:	Joe Sullivan	**Date:**	August 11, 2021

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Consolidated Fastfrate (Ottawa) Holdings Inc.	**Lab no.:**	SS-21-66
Project/Site:	New Warehouse and Offices / Somme Street, Ottawa	**Project no.:**	11231101

Borehole no.:	BH2-21	Sample no.:	SS12	Depth:	8.4 to 9.0m
Soil Description:	Lean Clay (CL)			Date sampled:	

Apparatus:	Hand Crank	Balance no.:	10	Porcelain bowl no.:	1
Liquid limit device no.:	1	Oven no.:	B33-02667	Spatula no.:	1
Sieve no.:	n/a	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows	27	21	15
Water Content:			
Tare no.	1	8	43A
Wet soil+tare, g	29.51	29.53	29.71
Dry soil+tare, g	27.86	27.82	27.93
Mass of water, g	1.65	1.71	1.78
Tare, g	21.30	21.26	21.32
Mass of soil, g	6.56	6.56	6.61
Water content %	25.2%	26.1%	26.9%

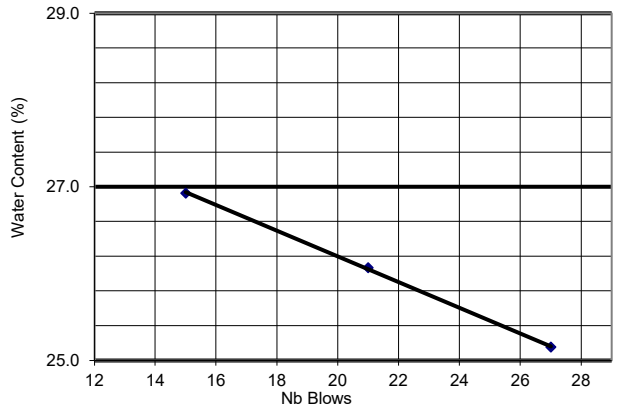
Plastic Limit (PL) - Water Content:		
Tare no.	20	22
Wet soil+tare, g	28.59	28.68
Dry soil+tare, g	27.57	27.62
Mass of water, g	1.02	1.06
Tare, g	21.57	21.36
Mass of soil, g	6.00	6.26
Water content %	17.0%	16.9%
Average water content %	17.0%	

Natural Water Content (W^n):		
Tare no.	Z57	
Wet soil+tare, g	194.57	
Dry soil+tare, g	182.50	
Mass of water, g	12.07	
Tare, g	47.10	
Mass of soil, g	135.40	
Water content %	8.9%	

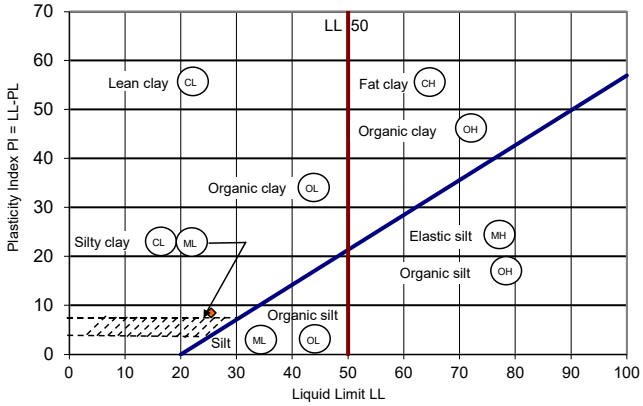
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart ASTM D2487



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n
25	17	8	8.9

Remarks:

Performed by:	Josh Sullivan	**Date:**	August 10, 2021
Verified by:	Joe Sullivan	**Date:**	August 11, 2021

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Consolidated Fastfrate (Ottawa) Holdings Inc.	**Lab no.:**	SS-21-66
Project/Site:	New Warehouse and Offices / Somme Street, Ottawa	**Project no.:**	11231101

Borehole no.:	BH2	Sample no.:	SS18	Depth:	13.0 to 13.6m
Soil Description:	Lean Clay (CL)			Date sampled:	

Apparatus:	Hand Crank	Balance no.:	10	Porcelain bowl no.:	1
Liquid limit device no.:	1	Oven no.:	B33-02667	Spatula no.:	1
Sieve no.:	n/a	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows	34	23	15
Water Content:			
Tare no.	116	117	118
Wet soil+tare, g	30.86	30.40	29.04
Dry soil+tare, g	28.88	28.46	27.37
Mass of water, g	1.98	1.94	1.67
Tare, g	21.48	21.50	21.60
Mass of soil, g	7.40	6.96	5.77
Water content %	26.8%	27.9%	28.9%

Plastic Limit (PL) - Water Content:

Tare no.	20	21
Wet soil+tare, g	27.84	27.84
Dry soil+tare, g	27.06	27.09
Mass of water, g	0.78	0.75
Tare, g	21.41	21.54
Mass of soil, g	5.65	5.55
Water content %	13.8%	13.5%
Average water content %	13.7%	

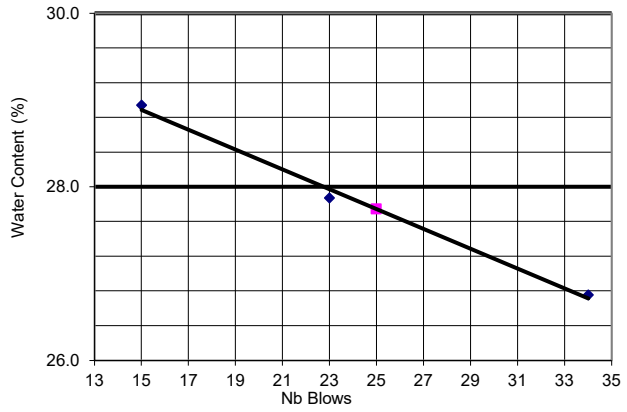
Natural Water Content (W^n):

Tare no.	S19	
Wet soil+tare, g	167.57	
Dry soil+tare, g	154.66	
Mass of water, g	12.91	
Tare, g	45.95	
Mass of soil, g	108.71	
Water content %	11.9%	

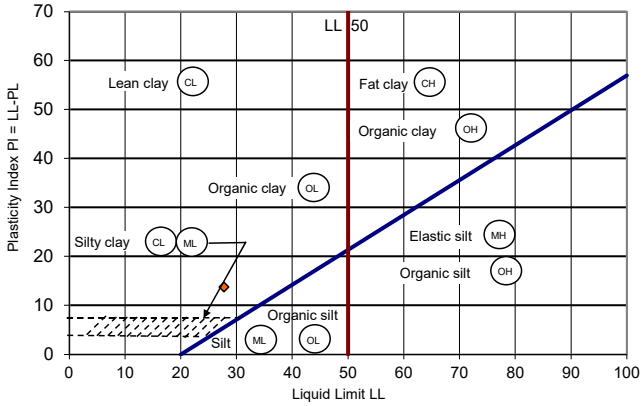
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart ASTM D2487



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n
28	14	14	11.9

Remarks:

Performed by:	Josh Sullivan	**Date:**	September 10, 2021
Verified by:	Joe Sullivan	**Date:**	September 13, 2021

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Consolidated Fastfrate (Ottawa) Holdings Inc.	**Lab no.:**	SS-21-66
Project/Site:	New Warehouse and Offices / Somme Street, Ottawa	**Project no.:**	11231101

Borehole no.:	BH3-21	Sample no.:	SS8	Depth:	5.3 to 5.9m
Soil Description:	Silty Clay (CL-ML)			Date sampled:	

Apparatus:	Hand Crank	Balance no.:	10	Porcelain bowl no.:	1
Liquid limit device no.:	1	Oven no.:	B33-026667	Spatula no.:	1
Sieve no.:	n/a	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows	25	21	15
Water Content:			
Tare no.	116	9	7
Wet soil+tare, g	32.73	31.64	30.02
Dry soil+tare, g	31.13	30.20	28.77
Mass of water, g	1.60	1.44	1.25
Tare, g	21.46	21.75	21.67
Mass of soil, g	9.67	8.45	7.10
Water content %	16.5%	17.0%	17.6%

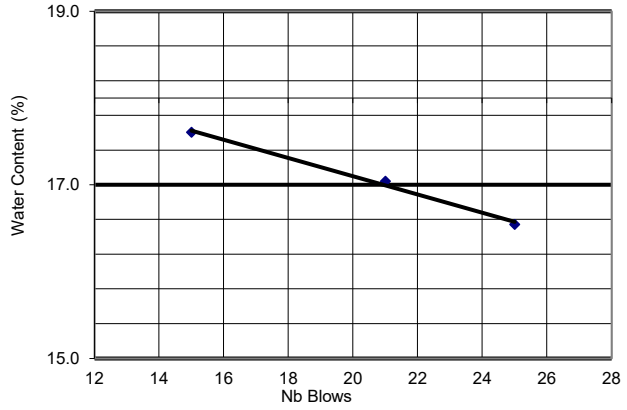
Plastic Limit (PL) - Water Content:		
Tare no.	100	117
Wet soil+tare, g	27.92	28.13
Dry soil+tare, g	27.17	27.33
Mass of water, g	0.75	0.80
Tare, g	21.53	21.48
Mass of soil, g	5.64	5.85
Water content %	13.3%	13.7%
Average water content %	13.5%	

Natural Water Content (W^n):		
Tare no.	T3	
Wet soil+tare, g	313.52	
Dry soil+tare, g	289.92	
Mass of water, g	23.60	
Tare, g	46.54	
Mass of soil, g	243.38	
Water content %	9.7%	

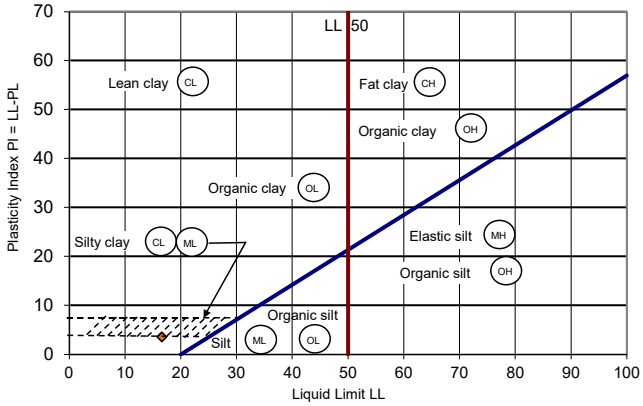
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart ASTM D2487



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n
17	13	4	9.7

Remarks:

Performed by:	Josh Sullivan	**Date:**	August 10, 2021
Verified by:	Joe Sullivan	**Date:**	August 11, 2021

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Consolidated Fastfrate (Ottawa) Holdings Inc.	**Lab no.:**	SS-21-66
Project/Site:	New Warehouse and Offices / Somme Street, Ottawa	**Project no.:**	11231101

Borehole no.:	BH5-21	Sample no.:	SS7	Depth:	4.6 to 5.2m
Soil Description:	Silty Clay (CL-ML)			Date sampled:	

Apparatus:	Hand Crank	Balance no.:	10	Porcelain bowl no.:	1
Liquid limit device no.:	1	Oven no.:	B33-02667	Spatula no.:	1
Sieve no.:	n/a	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows	25	20	15
Water Content:			
Tare no.	2	5	142
Wet soil+tare, g	28.96	28.31	27.50
Dry soil+tare, g	27.69	27.09	26.38
Mass of water, g	1.27	1.22	1.12
Tare, g	21.44	21.39	21.40
Mass of soil, g	6.25	5.70	4.98
Water content %	20.3%	21.4%	22.5%

Plastic Limit (PL) - Water Content:

Tare no.	19	21
Wet soil+tare, g	28.76	28.58
Dry soil+tare, g	27.93	27.75
Mass of water, g	0.83	0.83
Tare, g	21.58	21.39
Mass of soil, g	6.35	6.36
Water content %	13.1%	13.1%
Average water content %	13.1%	

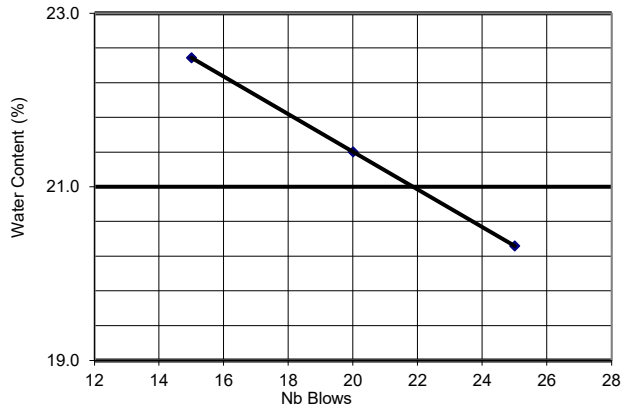
Natural Water Content (W^n):

Tare no.	N30	
Wet soil+tare, g	240.14	
Dry soil+tare, g	214.80	
Mass of water, g	25.34	
Tare, g	46.40	
Mass of soil, g	168.40	
Water content %	15.0%	

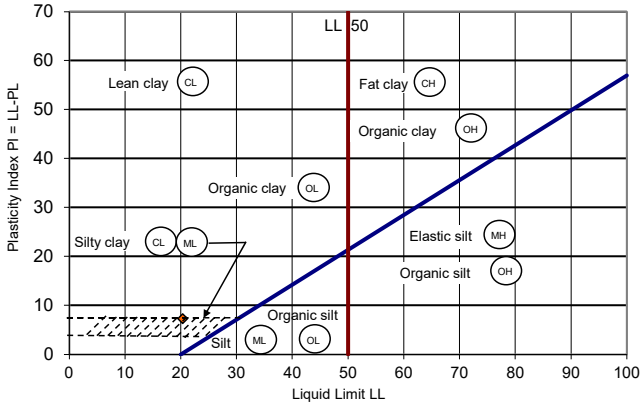
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart ASTM D2487



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n
20	13	7	15.0

Remarks:

Performed by:	Josh Sullivan	**Date:**	August 10, 2021
Verified by:	Joe Sullivan	**Date:**	August 11, 2021

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Consolidated Fastrate (Ottawa) Holdings ltd	**Lab no.:**	G-20-13
Project/Site:	New warehouse, Somme Street, Ottawa, On	**Project no.:**	11215612-A2

Borehole no.:	2	Sample no.:	4	Depth:	2.3 - 3.0m
Soil description:				Date sampled:	7-Aug-20

Apparatus:	Hand Crank/ Motor Driven	Balance no.:	1	Porcelain bowl no.:	1
Liquid limit device no.:	1	Oven no.:	1	Spatula no.:	1
Sieve no.:	1	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows	30	27	20
Water Content:			
Tare no.	S15	S16	S29
Wet soil+tare, g	43.61	38.30	40.40
Dry soil+tare, g	34.97	31.57	32.70
Mass of water, g	8.64	6.73	7.70
Tare, g	22.02	21.72	21.82
Mass of soil, g	12.95	9.85	10.88
Water content %	66.7%	68.3%	70.8%

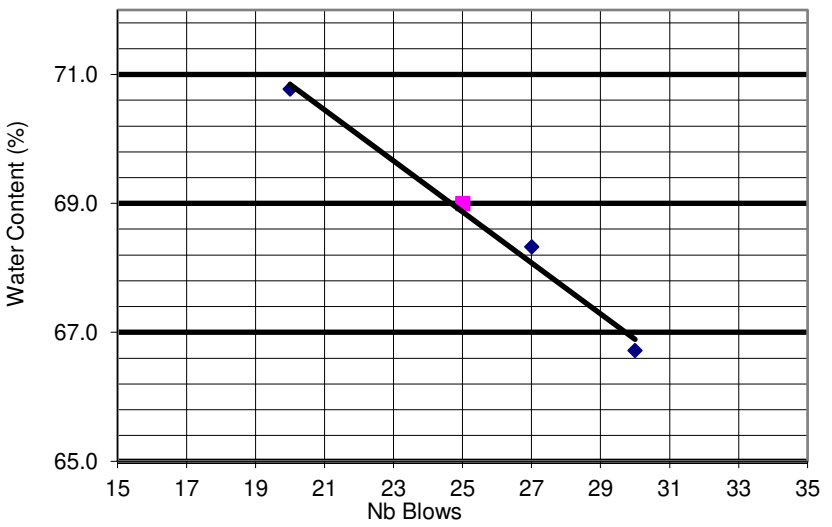
Plastic Limit (PL) - Water Content:		
Tare no.	S14	S20
Wet soil+tare, g	27.14	27.75
Dry soil+tare, g	26.20	26.85
Mass of water, g	0.94	0.90
Tare, g	21.84	22.53
Mass of soil, g	4.36	4.32
Water content %	21.6%	20.8%
Average water content %	21.2%	

Natural Water Content (W^n):		
Tare no.	S8	
Wet soil+tare, g	44.50	
Dry soil+tare, g	33.60	
Mass of water, g	10.90	
Tare, g	14.30	
Mass of soil, g	19.30	
Water content %	56.5%	

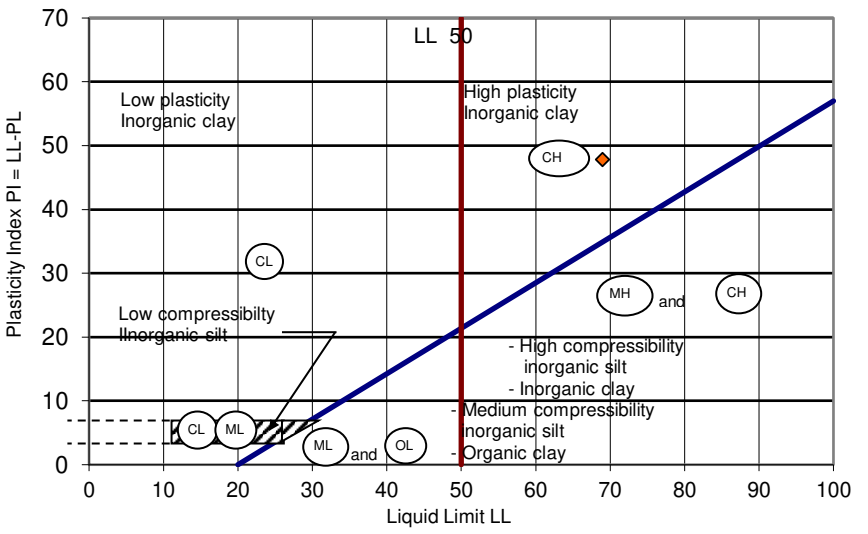
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☐ Dry preparation
- ☑ Wet preparation

Results



Soil Plasticity Chart



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n
69	21	48	56

Remarks:

Performed by:	Z. Mathurin	**Date:**	August 27, 2020
Verified by:		**Date:**	September 4, 2020

Uniaxial Compressive Strength of Intact Rock Core Specimens
(ASTM D7012 - Method C)

Client:	Consolidated Fastfrate (Ottawa) Holdings Inc	**Lab No.:**	SS-21-66
Project/Site:	New Warehouse and Offices Somme Street, Ottawa	**Project No.:**	11231101

Borehole No.:	BH2-21	**Sampled ID:**	Run #2
Depth:	51'5" - 51'8" (1570 to 1579.4cm)	**Date Sampled:**	n/a

Lithological Description: Limestone

Initial Specimen Parameters	
Diameter, mm	47.0
Height, mm	94.0
Height-to-Diameter Ratio	2.0
Volume, cm^3	163.1
Mass, g	466.5
Bulk Density, kg/m^3	2860
Moisture Condition	As Received
Moisture Content, %	0.2

Maximum Applied Load, kN	241.3
Compressive Strength, MPa	139.1

REMARKS:

PERFORMED BY: Jesse Carreau **DATE:** August 3, 2021

VERIFIED BY: Joe Sullivan **DATE:** August 5, 2021

Unconfined Compressive Strength of Intact Rock Core Specimen
ASTM D 7012, ASTM D 4543

Client : Consolidated Fastrate (Ottawa) Holdings ltd

Project : New Warehouse, Somme Street, Ottawa, O

Project N° : G-20-13

Sample N° : BH2-RC1

Depth : 30'11"- 31'5"

Sampling Date : August 7, 2020

Testing Apparatus Used : **Loading device N°** 1 **Caliper N°** 1

Technical Data

				Average	
Diameter :	47	46.9	47	47.0	(mm)
Length :	95	94.9	95.2	95.0	(mm)
Straightness (0.5mm maximum) (S1) :	0.3	0.3	0.3	0.3	(mm)
Flatness (25µm maximum) (FP2) :	Ok	Ok	Ok	Ok	
Parallelism (0.25 ° maximum) (FP2) :	0.15	0.2	0.2	0.15	(°)

Mass : 435.4 (g) Volume: 164644 (mm^3)

Density : 2644 (kg/m^3)

Moisture Conditions : Dry

Loading Rate (0.5 to 1.0 MPa / sec) : 0.8 (MPa/sec)

Type of Fracture : 3

Test Duration (2-15 Minutes) : 3 (minutes)

Maximum Applied Load : 216.97 ☑ kN ☐ lbs

Compressive Strength : 125.2 (MPa)

View of Specimen

Before Test :

After Test :

Remarks :

Analysed by : Z. Mathurin **Date :** September 4, 2020

Verified by : **Date :** September 4, 2020

Certificate of Analysis

Report Date: 09-Jun-2025

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 3-Jun-2025

Client PO: 63237

Project Description: PG7567

	Client ID:	BH2-25-SS3	-	-	-		
	Sample Date:	02-Jun-25 09:00	-	-	-	-	-
	Sample ID:	2523179-01	-	-	-		
	Matrix:	Soil	-	-	-		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	68.6	-	-	-	-	-
General Inorganics							
pH	0.05 pH Units	7.49	-	-	-	-	-
Resistivity	0.1 Ohm.m	18.3	-	-	-	-	-
Anions							
Chloride	10 ug/g	<10	-	-	-	-	-
Sulphate	10 ug/g	381	-	-	-	-	-

Client: GHD Limited (Ottawa)
400-179 Colonnade Rd.
Ottawa, ON
K2E 7J4
Attention: Mr. Ryan Vanden Tillaart
PO#: 73520576
Invoice to: GHD Limited (Ottawa)

Report Number: 1936331
Date Submitted: 2020-08-11
Date Reported: 2020-08-25
Project: 11215612-A2
COC #: 210163

				Lab I.D.	1509594
				Sample Matrix	Soil
				Sample Type	
				Sampling Date	2020-08-11
				Sample I.D.	BH3-SS3
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Anions	Cl	0.002	%		0.008
	SO4	0.01	%		0.08
General Chemistry	Electrical Conductivity	0.05	mS/cm		0.52
	pH	2.00			8.66
	Resistivity	1	ohm-cm		1920
Redox Potential	REDOX Potential		mV		205
Subcontract	Moisture-Humidite	0.25	%		8.54
	S2-	0.2	ug/g		<0.20

Guideline = *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

APPENDIX 2

FIGURE 1 - KEY PLAN

FIGURES 1A, 1B & 1C – AERIAL PHOTOGRAPHS

FIGURES 2 & 3 – SLOPE STABILITY ANALYSIS CROSS-SECTIONS

DRAWING PG7567 - 1 - TEST HOLE LOCATION PLAN

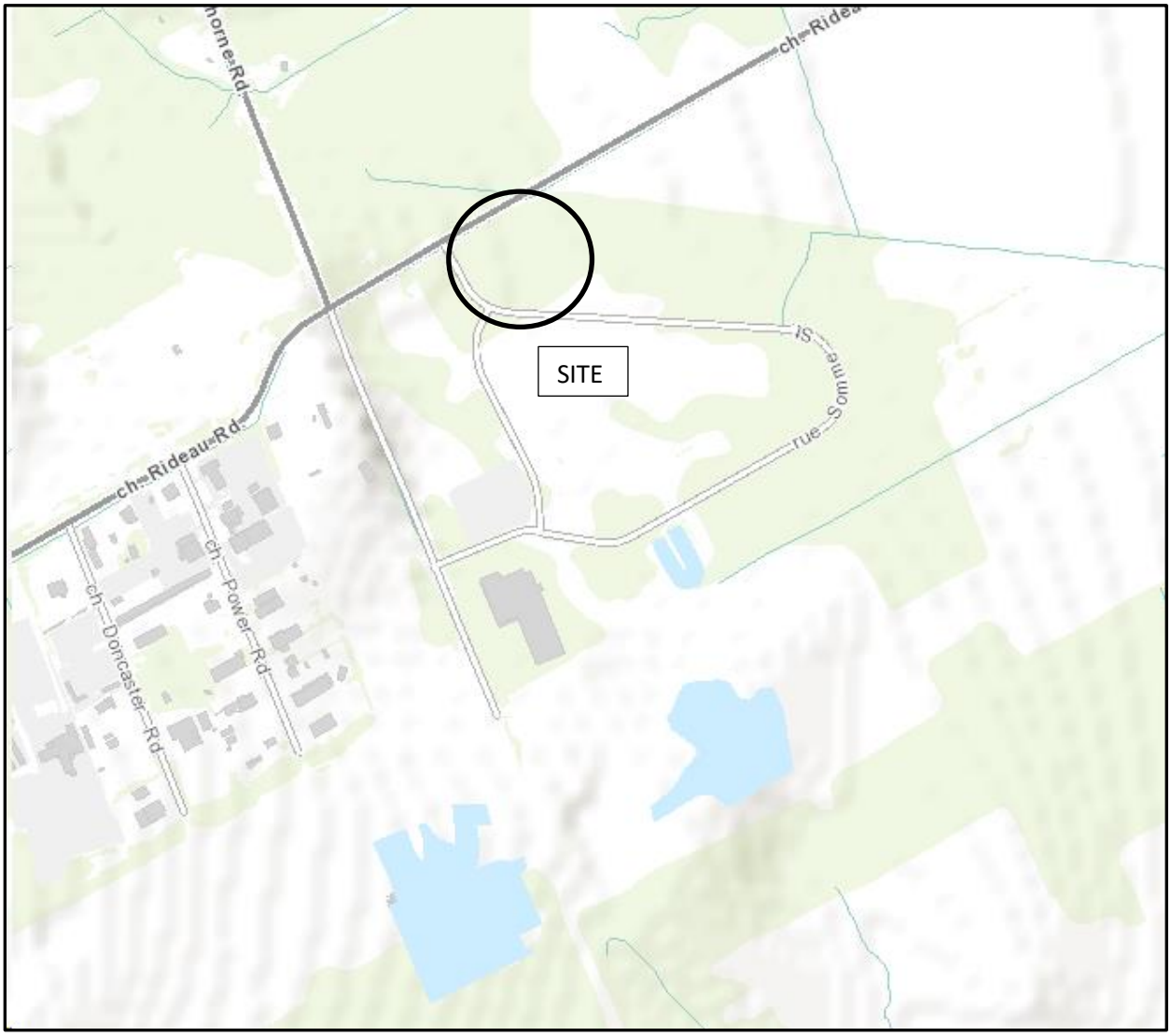


FIGURE 1

KEY PLAN

PATERSON GROUP

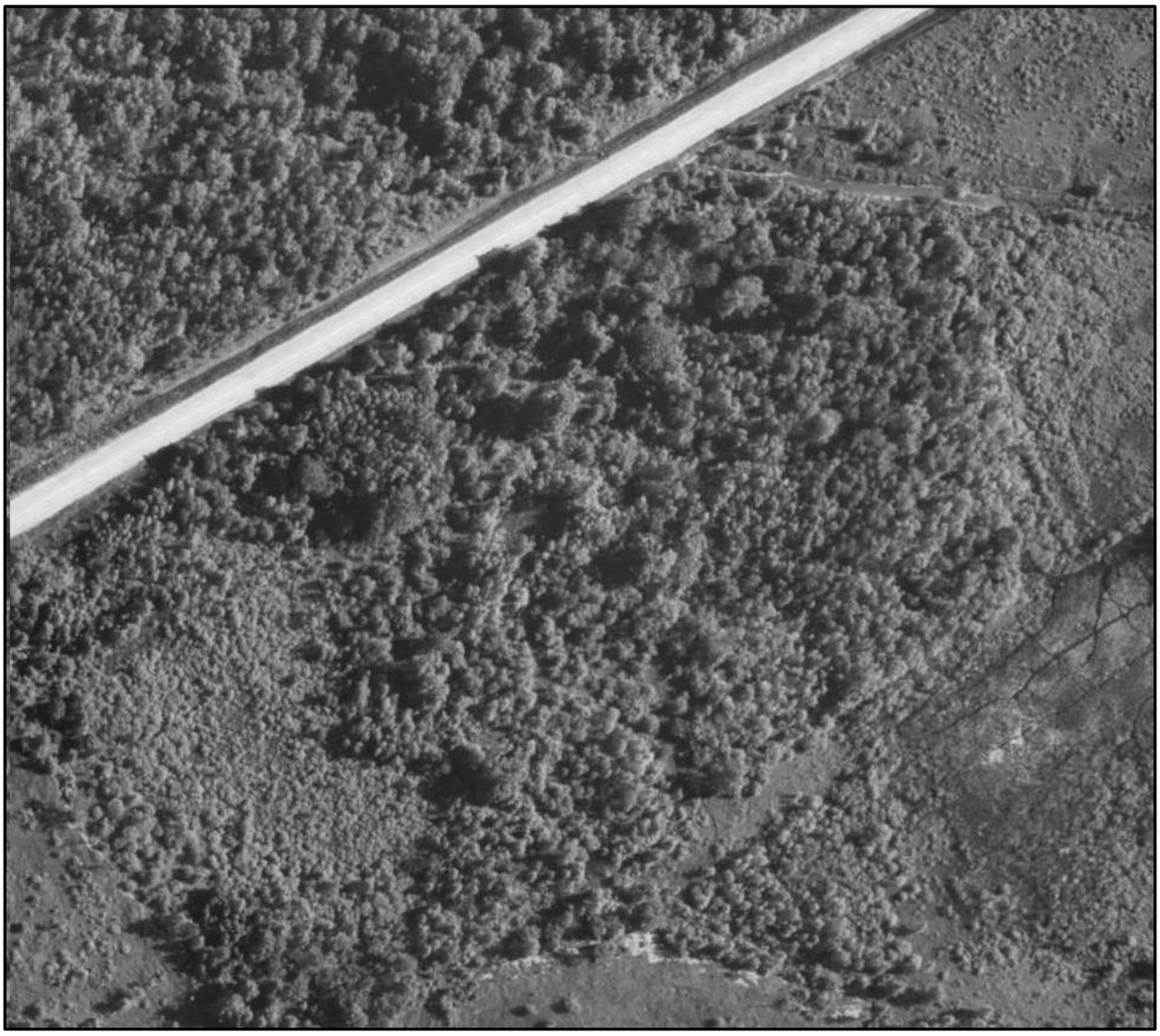


FIGURE 1A

Aerial Photgraph – 1991

PATERSON GROUP

FIGURE 1B

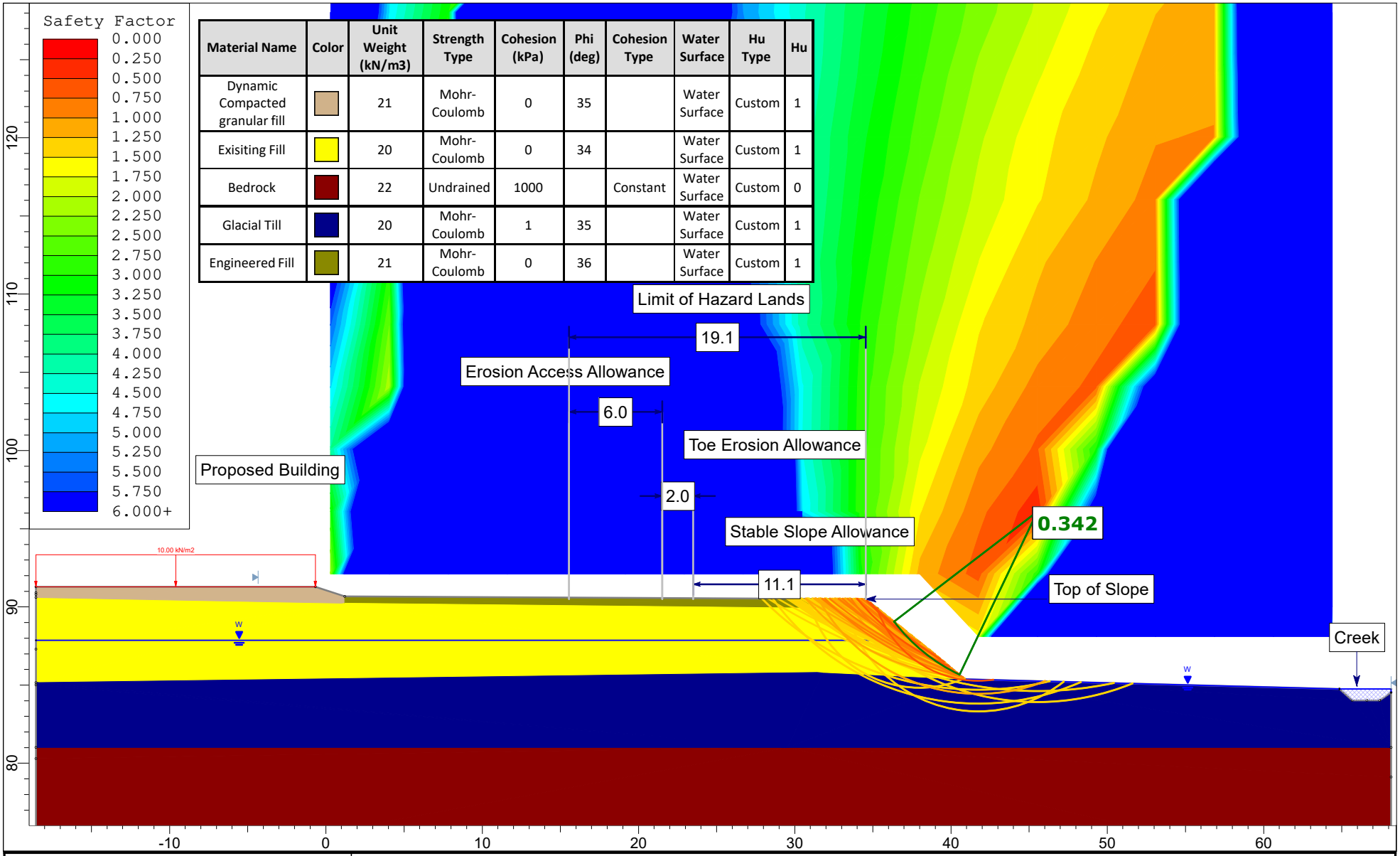
Aerial Photgraph – 1999

PATERSON GROUP

FIGURE 1C

Aerial Photgraph – 2022

PATERSON GROUP

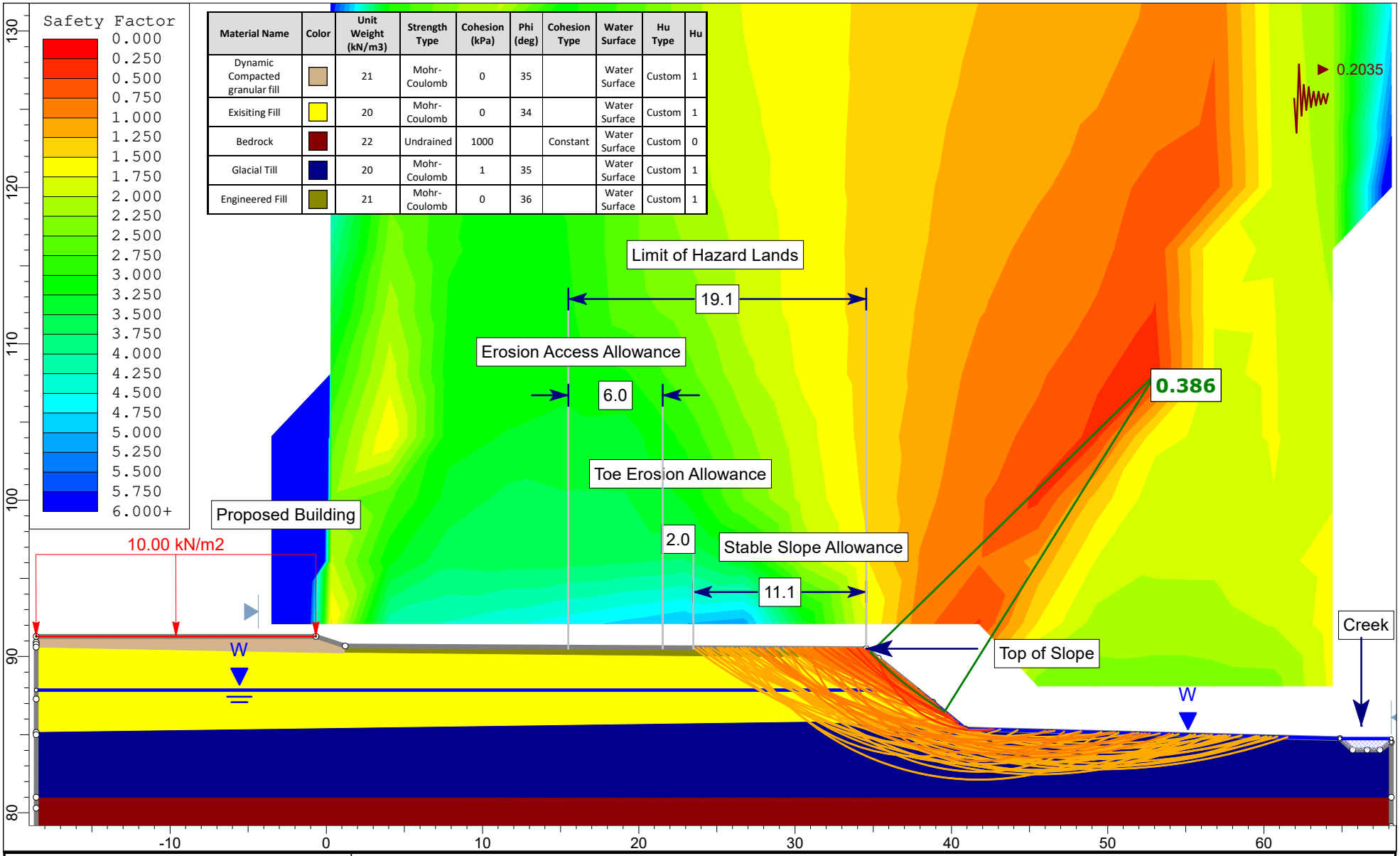


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu
Dynamic Compacted granular fill		21	Mohr-Coulomb	0	35		Water Surface	Custom	1
Exisiting Fill		20	Mohr-Coulomb	0	34		Water Surface	Custom	1
Bedrock		22	Undrained	1000		Constant	Water Surface	Custom	0
Glacial Till		20	Mohr-Coulomb	1	35		Water Surface	Custom	1
Engineered Fill		21	Mohr-Coulomb	0	36		Water Surface	Custom	1

PATERSON GROUP

SLIDEINTERPRET 9.025

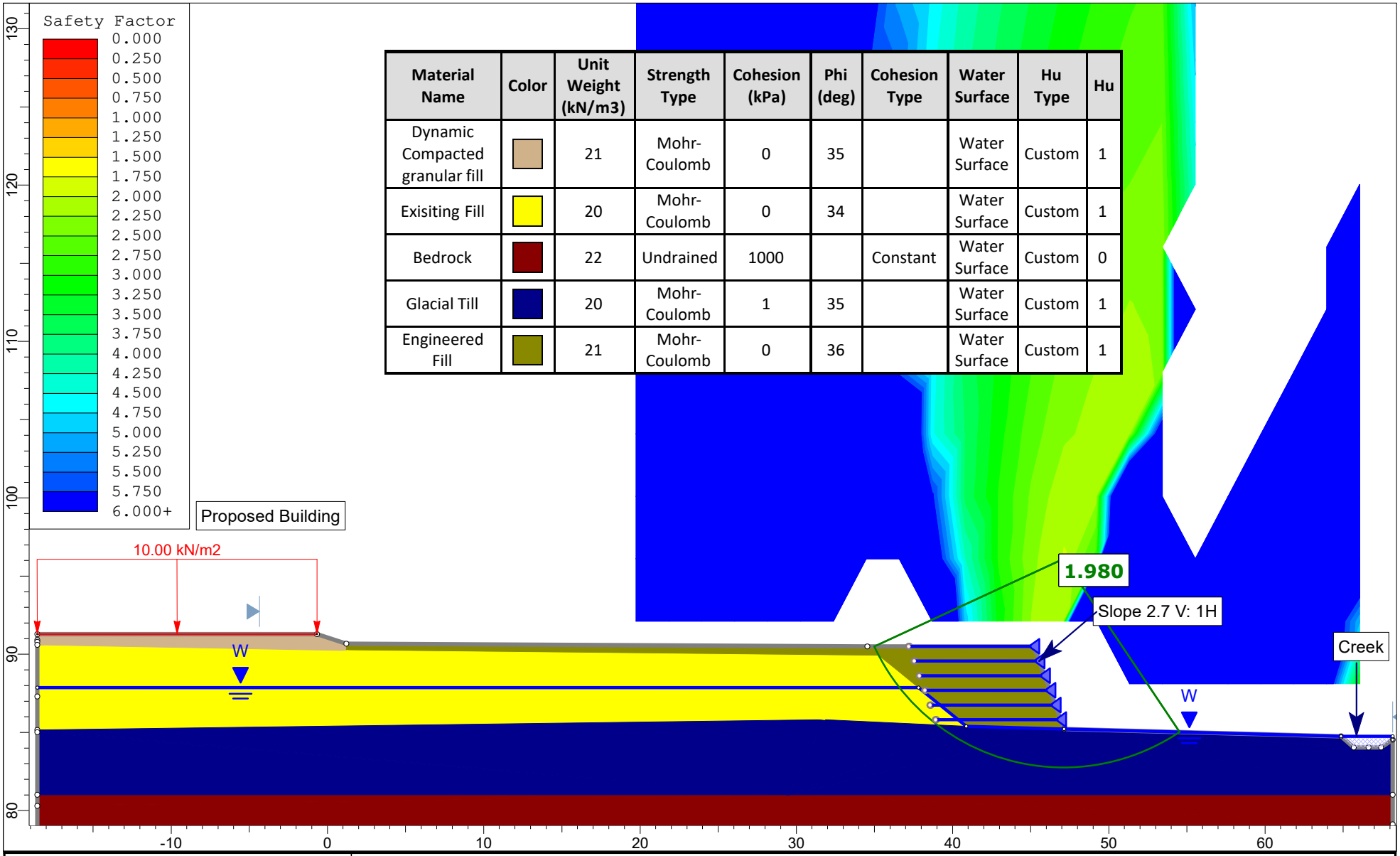
Project	PG7567 - 301 Somme Street		
Slope Section	A	*Scenario*	Exisiting Static Condition
Drawn By	DR	*Company*	W.O. Stinson & Son Ltd
Date	2025-06-27	*File Name*	Figure 2A



PATERSON GROUP

SLIDEINTERPRET 9.025

Project	PG7567 - 301 Somme Street		
Slope Section	A	*Scenario*	Exisiting Seismic Condition
Drawn By	DR	*Company*	W.O. Stinson & Son Ltd
Date	2025-06-27	*File Name*	Figure 2B

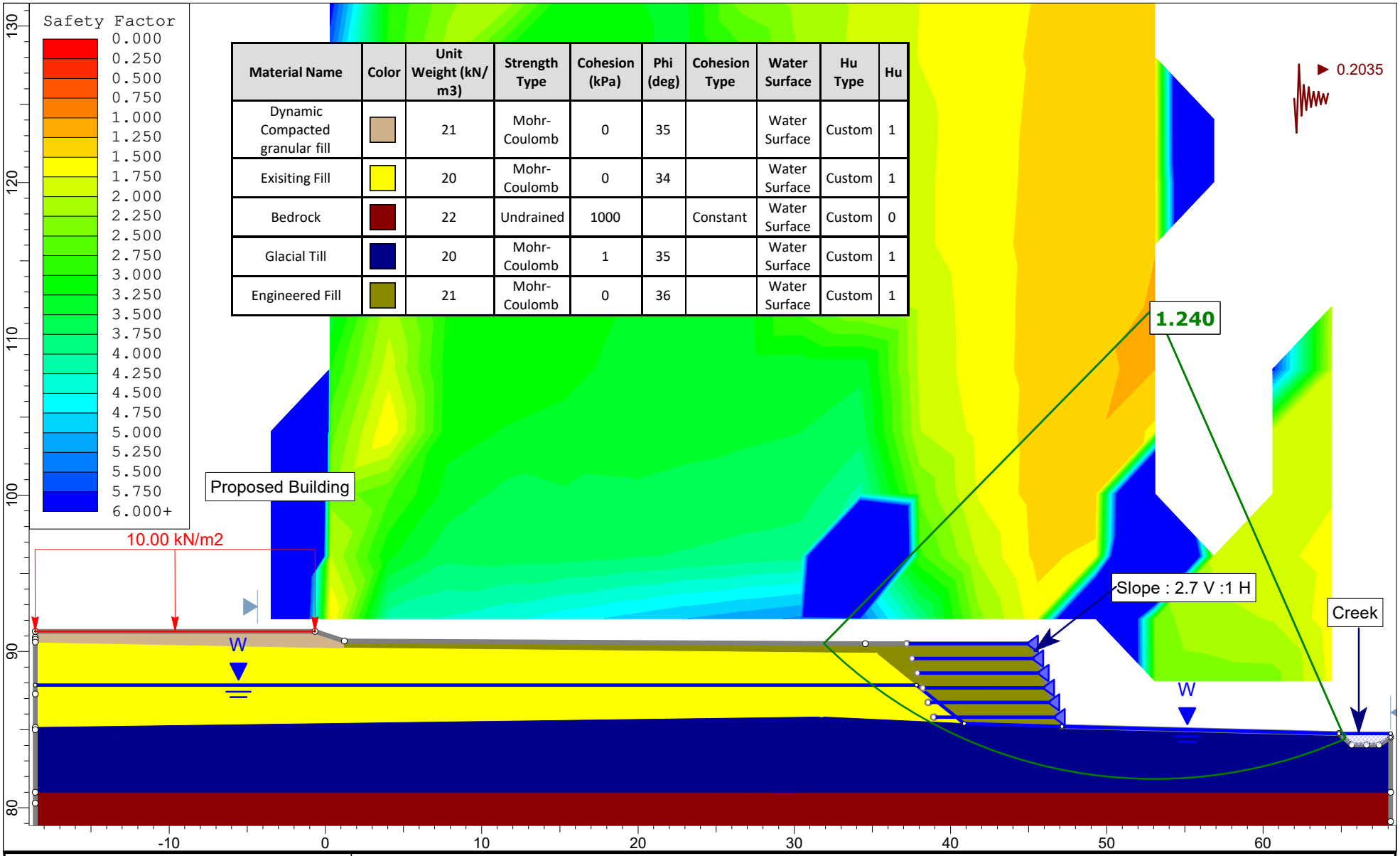


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu
Dynamic Compacted granular fill		21	Mohr-Coulomb	0	35		Water Surface	Custom	1
Exisiting Fill		20	Mohr-Coulomb	0	34		Water Surface	Custom	1
Bedrock		22	Undrained	1000		Constant	Water Surface	Custom	0
Glacial Till		20	Mohr-Coulomb	1	35		Water Surface	Custom	1
Engineered Fill		21	Mohr-Coulomb	0	36		Water Surface	Custom	1

PATERSON GROUP

SLIDEINTERPRET 9.025

Project	PG7567 - 301 Somme Street		
Slope Section	A	*Scenario*	Proposed Reinforced Static Condition
Drawn By	DR	*Company*	W.O. Stinson & Son Ltd
Date	2025-06-27	*File Name*	Figure 2C

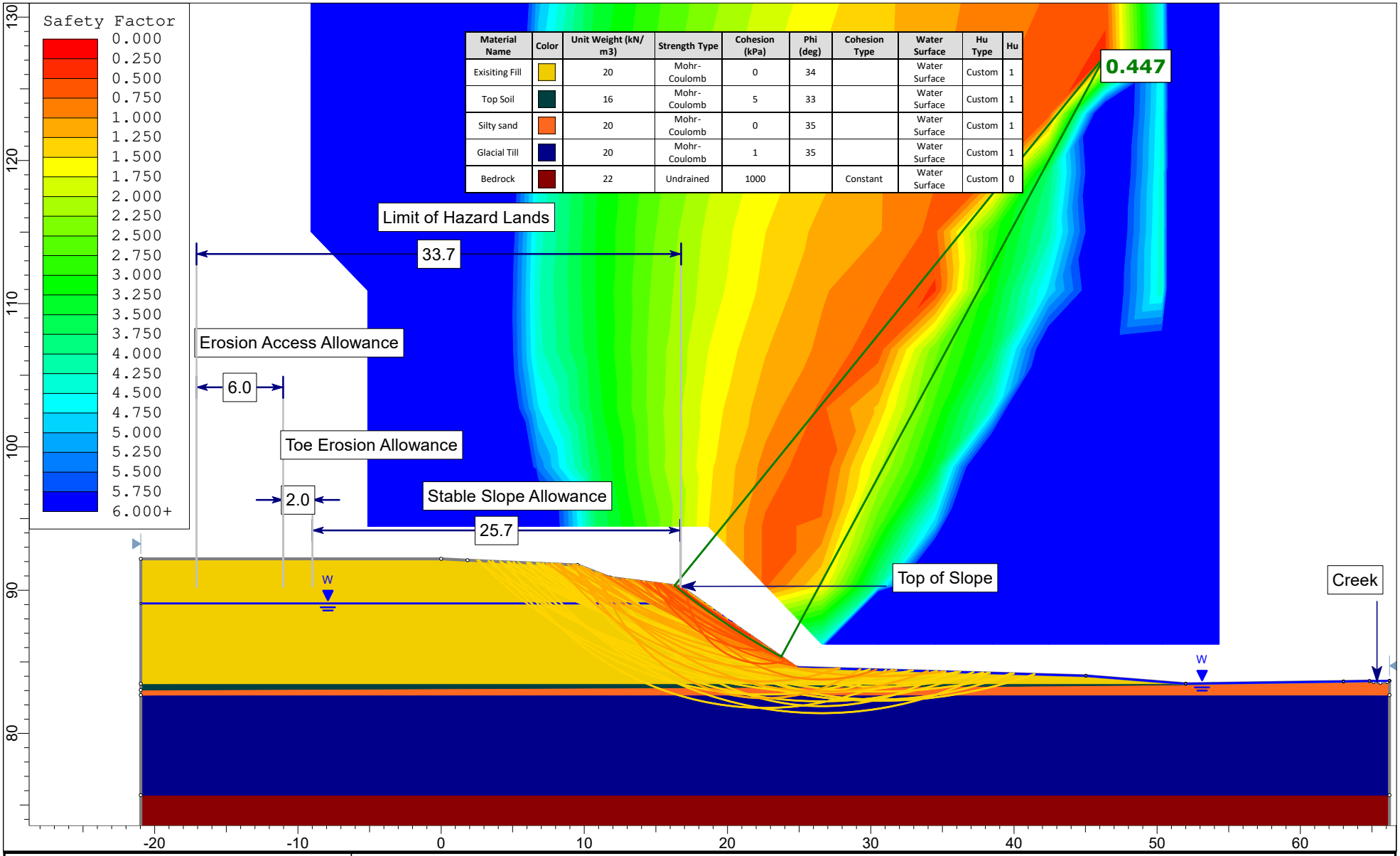


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu
Dynamic Compacted granular fill		21	Mohr-Coulomb	0	35		Water Surface	Custom	1
Exisiting Fill		20	Mohr-Coulomb	0	34		Water Surface	Custom	1
Bedrock		22	Undrained	1000		Constant	Water Surface	Custom	0
Glacial Till		20	Mohr-Coulomb	1	35		Water Surface	Custom	1
Engineered Fill		21	Mohr-Coulomb	0	36		Water Surface	Custom	1

PATERSON GROUP

SLIDEINTERPRET 9.025

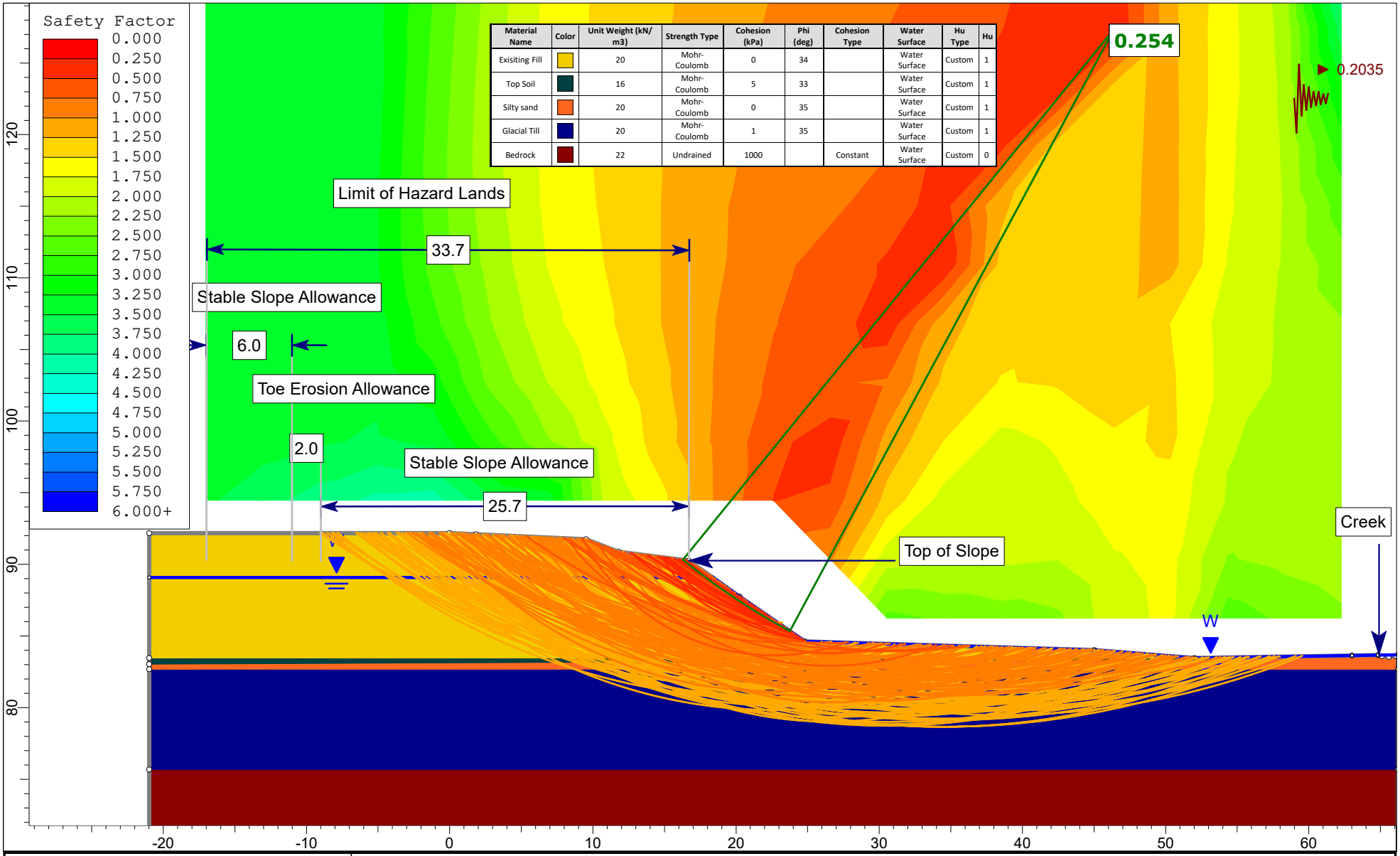
Project	PG7567 - 301 Somme Street		
Slope Section	A	*Scenario*	Proposed Reinforced Seismic Condition
Drawn By	DR	*Company*	W.O. Stinson & Son Ltd
Date	2025-06-27	*File Name*	Figure 2D



PATERSON GROUP

SLIDEINTERPRET 9.025

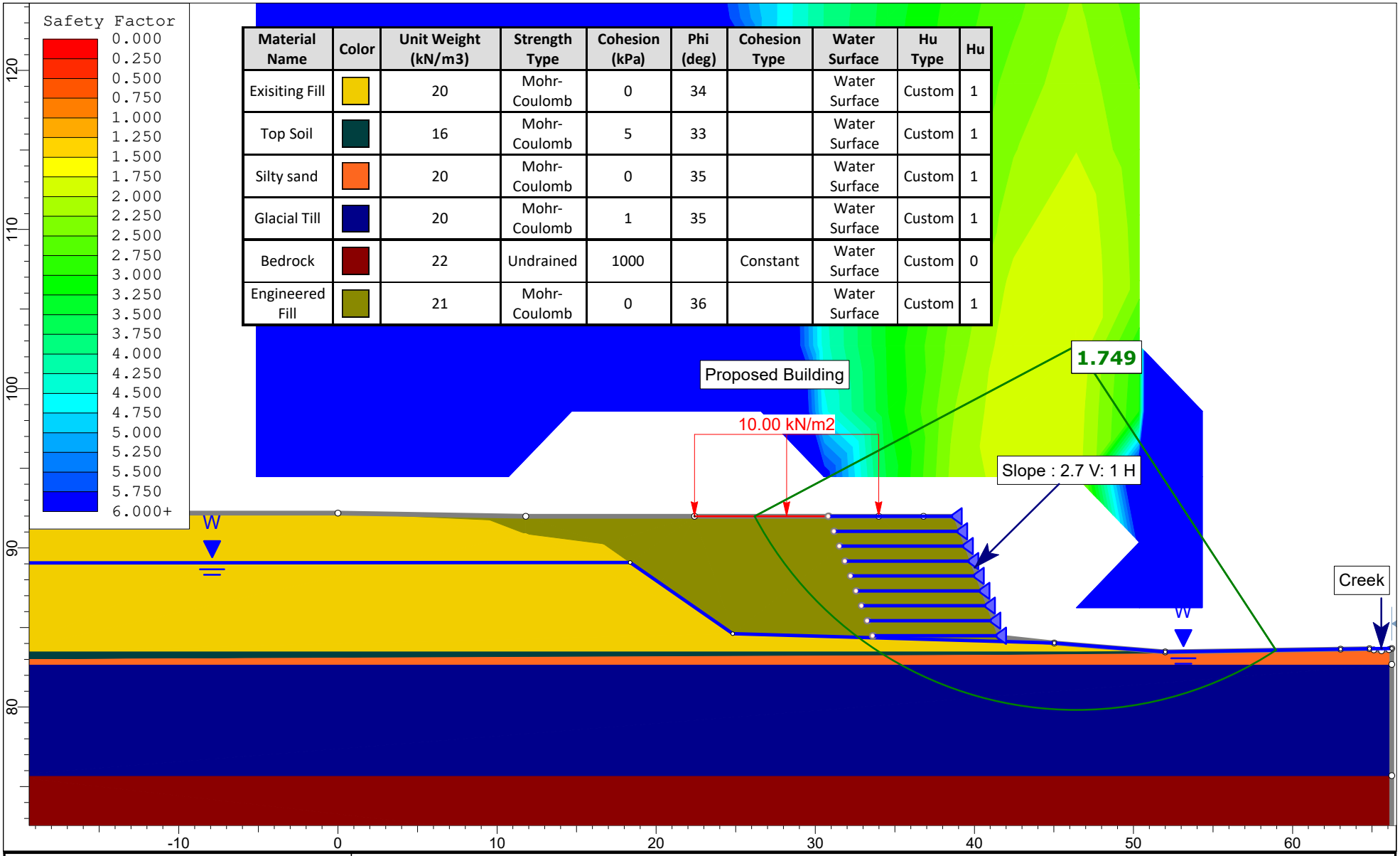
Project	PG7567- 301 Somme Street		
Slope Section	B	*Scenario*	Exisiting Static Condition
Drawn By	DR	*Company*	W.O. Stinson & Son Ltd
Date	2025-06-20	*File Name*	Figure 3A



PATERSON GROUP

SLIDEINTERPRET 9.025

Project	PG7567 - 301 Somme Street		
Slope Section	B	*Scenario*	Exisiting Seismic Condition
Drawn By	DR	*Company*	W.O. Stinson & Son Ltd
Date	2025-06-27	*File Name*	Figure 3B

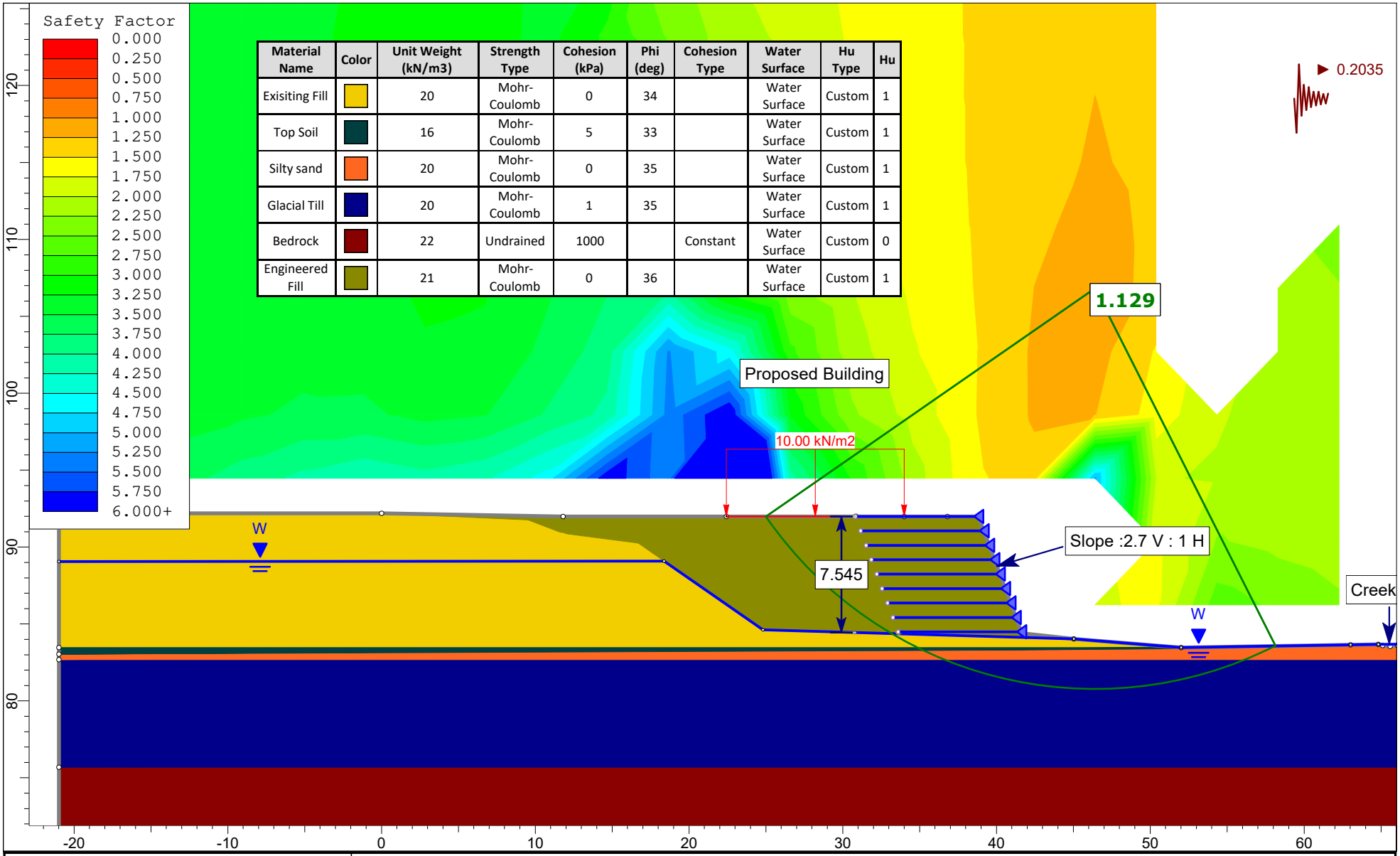


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu
Exisiting Fill		20	Mohr-Coulomb	0	34		Water Surface	Custom	1
Top Soil		16	Mohr-Coulomb	5	33		Water Surface	Custom	1
Silty sand		20	Mohr-Coulomb	0	35		Water Surface	Custom	1
Glacial Till		20	Mohr-Coulomb	1	35		Water Surface	Custom	1
Bedrock		22	Undrained	1000		Constant	Water Surface	Custom	0
Engineered Fill		21	Mohr-Coulomb	0	36		Water Surface	Custom	1

PATERSON GROUP

SLIDEINTERPRET 9.025

Project	PG7567 - 301 Somme Street		
Slope Section	B	*Scenario*	Proposed Reinforced Static Condition
Drawn By	DR	*Company*	W.O. Stinson & Son Ltd
Date	2025-06-27	*File Name*	Figure 3C

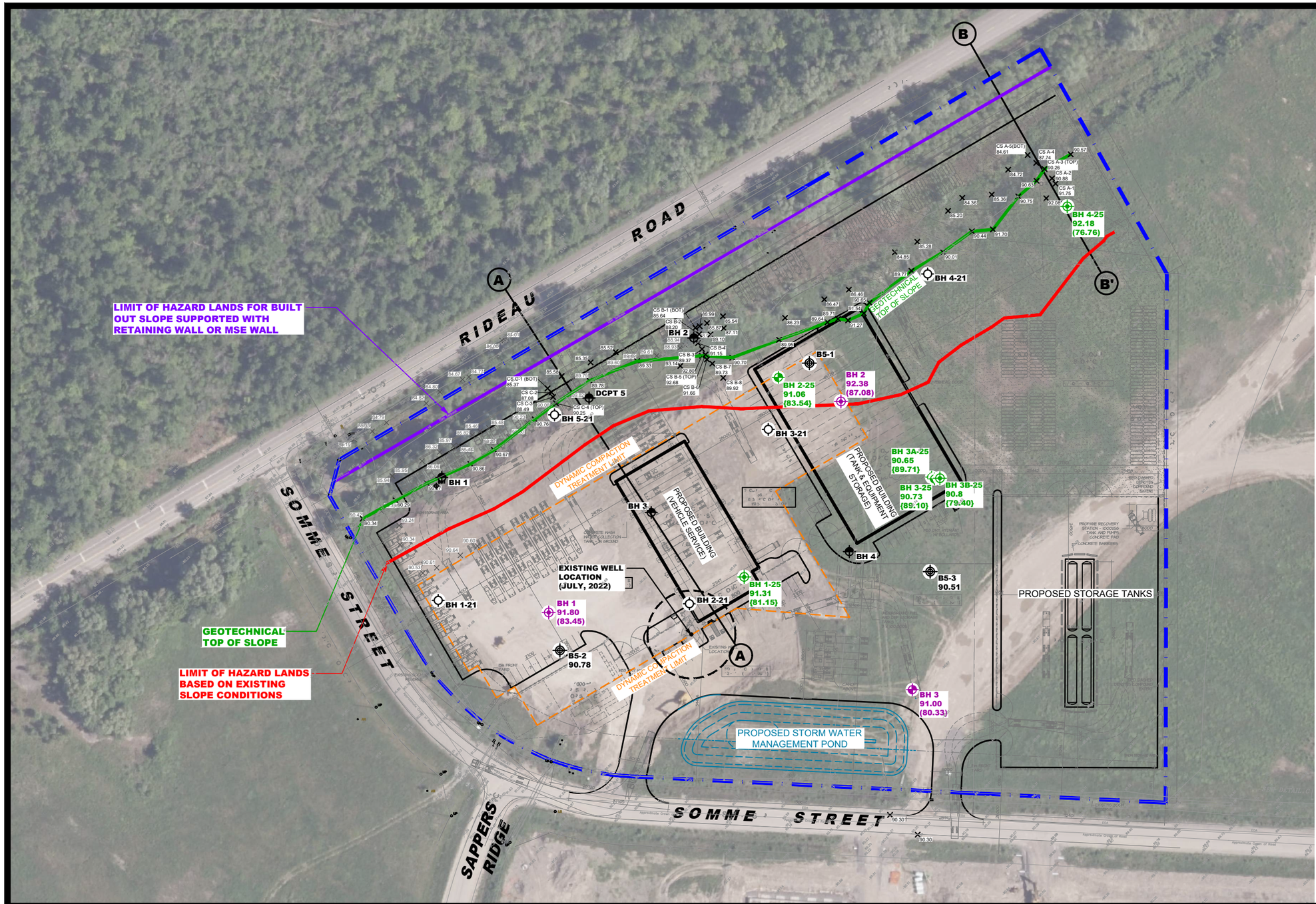


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu
Exisiting Fill		20	Mohr-Coulomb	0	34		Water Surface	Custom	1
Top Soil		16	Mohr-Coulomb	5	33		Water Surface	Custom	1
Silty sand		20	Mohr-Coulomb	0	35		Water Surface	Custom	1
Glacial Till		20	Mohr-Coulomb	1	35		Water Surface	Custom	1
Bedrock		22	Undrained	1000		Constant	Water Surface	Custom	0
Engineered Fill		21	Mohr-Coulomb	0	36		Water Surface	Custom	1

PATERSON GROUP

SLIDEINTERPRET 9.025

Project	PG7567 - 301 Somme Street		
Slope Section	B	*Scenario*	Proposed Reinforced Seismic Condition
Drawn By	DR	*Company*	W.O. Stinson & Son Ltd
Date	2025-06-27	*File Name*	Figure 3D



LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION (PATERSON GROUP REPORT: PE4621, MAY 2019)
- BOREHOLE WITH MONITORING WELL LOCATION (PATERSON GROUP REPORT: PE4621, MAY 2019)
- BOREHOLE LOCATION (GHD, JULY 2021)
- BOREHOLE LOCATION (GHD, AUGUST 2020)
- BOREHOLE LOCATION (INSPECSOL, 2008)
- 85.48 SURVEY SHOT LOCATION (DECEMBER 8, 2023)
- 85.48 SURVEY SHOTS LOCATION (JUNE 3, 2025)
- A—A' SLOPE STABILITY CROSS SECTION
- 92.85 GROUND SURFACE ELEVATION (m)
- {79.40} PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
- (89.90) PRACTICAL DCPT REFUSAL ELEVATION (m)

CONCEPTUAL PLAN PREPARED BY HOBIN ARCHITECTURE

GROUND SURFACE ELEVATION AT PATERSON 2019 BOREHOLE LOCATIONS WERE PROVIDED BY R.W. TOMLINSON LIMITED.

SCALE: 1:1500

0 25 50 75 100m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DD/MM/YYYY	INITIAL
1	UPDATED TO NEW CONCEPTUAL PLAN	14/08/2025	SD

W.O. STINSON & SON LTD.
GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
301 SOMME STREET
OTTAWA, ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:1500	Date: 07/2025
Drawn by: ZS	Report No.: PG7567-1
Checked by: PB	Dwg. No.: PG7567-1
Approved by: SD	Revision No.: 1

p:\autocad drawings\geotechnical\pg75xx\pg7567\pg7567-1-test hole location plan (rev.01).dwg

11x17

APPENDIX 3

22T010 – GROUND IMPROVEMENT FINAL REPORT PREPARED BY MENARD

DATED JULY 15, 2023

25O012 – GROUND IMPROVEMENT AT 301 SOMME STREET

DATED NOVEMBER 12, 2025

Fastfrate Ottawa Holdings Warehouse

22T010

Post Ground Improvement Report

ID	22T010 – Fastfrate Ottawa Holdings Warehouse – Final Report			Pages	7 + Appendices
Rev	Date	Author	Verified by	Modifications	
0	07/15/2022	MKE	JEG	Final Report – 100% Completion Progress	

Contents

Figures & Tables

Appendices

1. Introduction

Menard Canada Inc. (MENARD) was retained by Tomlinson Group of Companies (Tomlinson) on behalf of CBRE Ltd (CBRE) to perform the ground improvement scope of work for a site located at the southeast of the intersection of Rideau Street and Somme Street in the Hawthorne Industrial Park in Ottawa, Ontario. The proposed construction consists of a new 8,640m^2 warehouse for Fastfrate Ottawa Holdings.

This report summarizes the work performed on site including QA/QC information and related drawings.

2. Reference Documents

The following documents were used during the execution of the project:

- 2001 - Fastfrate - 33% Submission- 21.11.05-STR Drawings by Cunliffe & Associates.
- 200608 2009 05 Geotechnical Study Subdivision Plan Hawthorne Industrial Park by InspecSol date May 2009.
- 11215612-RPT-1-Geotchnical Investigation - Ottawa ON by GHD dated September 2020.
- 11231101-RPT-1-Supplementary Geotechnical Investigation by GHD dated January 2022.
- C006A_FASTFRATE_CIMA+_TOPOGRAPHICAL_SURVEY_PLAN_211216.
- GRADING_PLAN; SECTIONS by CIMA+ dated November 2021.
- C006A_FASTFRATE_CIMA+_GRADING_PLAN_211216 by Civitas Group dated December 16, 2021.

3. Design Criteria

The ground improvement scope of work was designed to achieve the following performance criteria:

- Improved bearing capacity of up to 200 kPa SLS (275 kPa ULS)
- Maximum total settlement of 25 mm and differential settlement of 19 mm.

4. Ground Improvement Works

Purpose

Dynamic Compaction (DC) is used to transmit high impacts to loose and soft soils that have an initial low bearing capacity, high compressibility and/or liquefaction potential in order to significantly improve their mechanical properties.

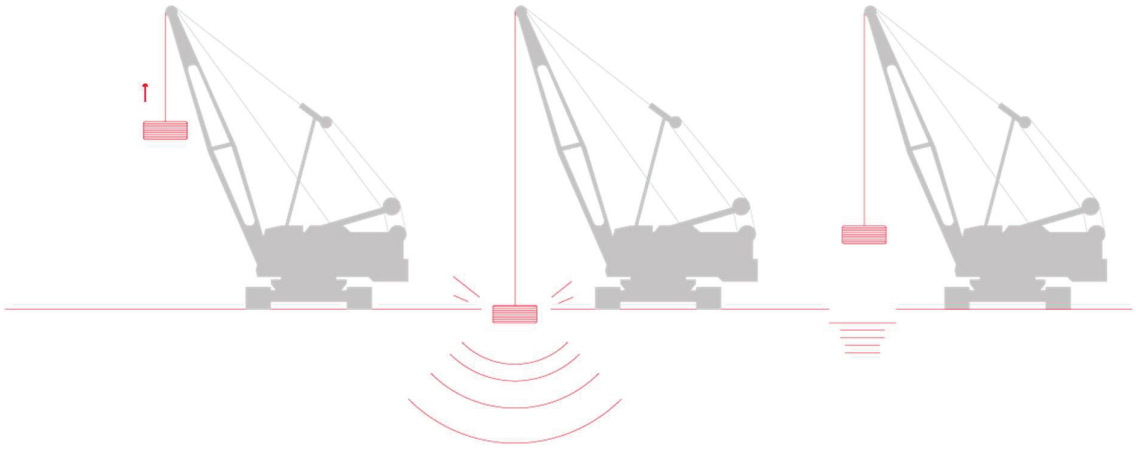


Figure 1 – Dynamic Compaction process

Site Preparation

Tomlinson prepared a working platform for the working pad by first stripping any topsoil and deleterious materials found at the surface and upfilling to 90.95 m using Granular B Type I recycled concrete. A 600 mm thick Granular B Type II fill layer was then placed and compacted to achieve a working pad at approximately 91.55 m EL. The pad was placed according to the building footprint as shown in the structural drawings 21.11.05-STR Drawings with an additional 4 m offset as per specifications. Please refer to drawing 22T010_DWG-200 in **Appendix A** for location of the working pad.

Work Performed

MENARD arrived at site on June 7th, 2022. The first two weeks on site, MENARD assembled and completed repairs on the crane. Dynamic Compaction work commenced on June 20th, 2022.

Dynamic compaction was performed using a conventional crawler crane dropping a 12.5-ton pounder from approximately 12 m high. The pattern of compaction points was based on a typical grid pattern with 3 phases and a final Ironing Phase. Phase 1 points were spaced out at approximately 8 m intervals. Phase 2 points were positioned to form a tighter square pattern around each Phase 1 point. Phase 3 points were positioned similarly around points of Phases 1 and 2. An additional, low impact Ironing Phase was performed over the compacted area to improve the surface zone and compact any disturbed surficial soils.

Dynamic compaction work was completed on Thursday, June 30th, 2022.

Please refer to the as-built drawing 22T010_DWG-200 in **Appendix A** for the location of the improved area and the compaction layout.

Modified Work

Compaction of the work area near the gas line required a reduced drop height (6m) and double the number of drops to minimize vibrations. This reduced the induced vibrations while maintaining the same energy for compaction.

5. In-Situ Testing

Pressuremeter Tests (PMTs) were completed concurrently with and following Dynamic Compaction to verify criteria achievement. A total of 4 PMTs were completed with varying testing depths verifying the optimal treatment criteria for all phases.

Please refer to drawing 22T010_DWG-200 in **Appendix A** for the location of the testing. The pressuremeter method was used to estimate the settlement of various footings, see below:

Table 1 - PMT Summary

	Estimated maximum total settlement	Estimated bearing capacity
PMT1	~ 19 mm	> 200 kPa
PMT2*	~ 24 mm	> 200 kPa
PMT3	~ 22 mm	> 200 kPa
PMT4	~ 16 mm	> 200 kPa

**PMT2 reached refusal after the first test depth, actual settlement will be lower as this model assumed ground below completed test depths was not improved.*

The test results for the PMTs are presented in **Appendix B**

6. Vibration Monitoring

Vibration monitoring was carried out by an external consultant (Explotech Engineering Ltd.). During the first point of compaction, an on-site representative was present with 4 seismographs to conduct vibration monitoring tests at 5 m intervals near the DC rig. Additional full-time vibration monitoring was conducted for the Enbridge gas main located to the west and south of the project area. No vibration exceeded the 25 mm/s PPV threshold.

Please refer to **Appendix C** for the vibration monitoring report.

7. Subsequent Works

Earthworks

It is important to perform any surface compaction that may be required after treatment. Granular materials that will be put in place to raise the grade and reach the intended final level will have to be compacted by layers according to the specifications and under the supervision of a geotechnical consultant. We recommend that all foundation work be checked and inspected by the geotechnical consultant.

Again, it should be noted that even following ground improvement, during excavation there may be local zones of deleterious fill including, but not limited to, organic soils, or soft cohesive soils. Excavation works should still follow the direction of the project's geotechnical consultant and some soils may need to be sub-excavated and replaced.

Foundations

The DC work was designed around the foundation details provided in 2001 - Fastfrate - 33% Submission-21.11.05-STR Drawings by Cunliffe & Associates

The building and foundation details were not finalized at the time of compaction. The DC work has been designed to achieve an improved bearing capacity up to 200 kPa SLS (275 kPa ULS) within the foundation limit (compaction zone, excluding 4m buffer along the compaction edge) in the provided structural package. The edge of all foundation elements must not extend beyond the final foundation limit to avoid the risk of intolerable settlements. See **Appendix A** for details on the foundation limits.

8. Conclusion

Dynamic Compaction was carried out using a crawler crane dropping a 12.5-ton pounder from a height of 12m. Works were performed between June 20th and June 30th, 2022. The treatment was applied on an effective area of approximately 8,640 m^2.

PMTs were completed concurrently and following Dynamic Compaction work to validate the design and verify the performance criteria were achieved. Based on the test results of the PMTs, the performance criteria were successfully achieved.

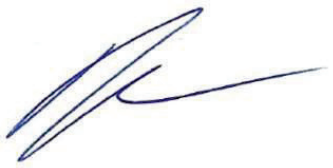
All of us at Menard have greatly appreciated the opportunity to take part in the construction of this project, and we wish to express our sincere gratitude for the continued confidence and cooperation extended by CBRE Ltd. And Tomlinson Group of Companies.

9. Closure

This Ground Improvement Final Report was written by Mr. Matthew Kerr, E.I.T., and reviewed by Mr. Julien Egron, P. Eng of Menard Canada.

Menard Canada Inc.

Julien Ergon, P. Eng.
Pre-construction Manager

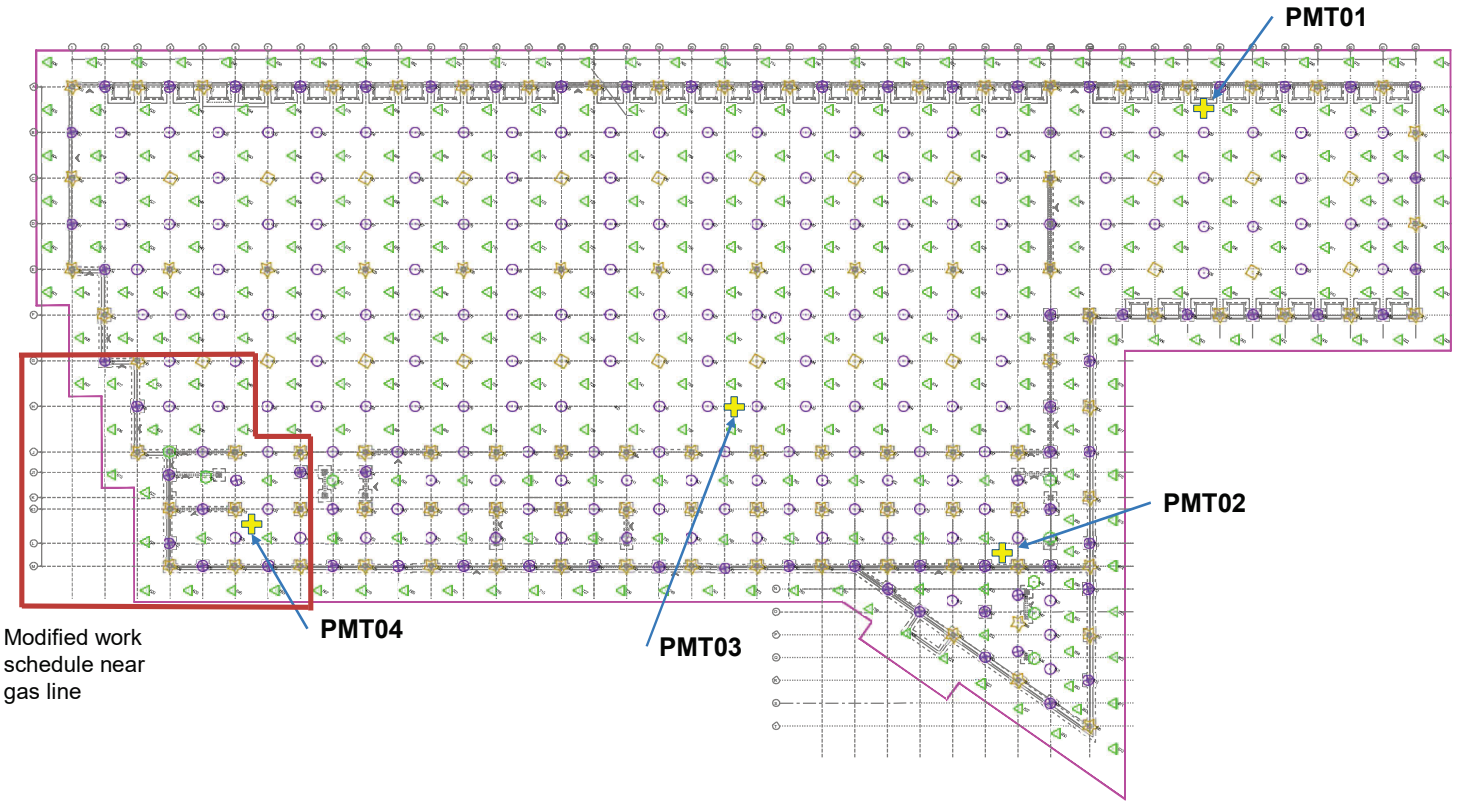


Matthew Kerr, E.I.T.
Project Manager

Appendix A:
As-built drawings

RIDEAU ROAD

SOMME STREET



LEGEND

- TREATMENT LIMIT
- PHASE 1 (24)
- PHASE 1 FOND. (95)
- PHASE 2 (179)
- PHASE 2 FOND. (71)
- PHASE 3 (327)
- PHASE 3 FOND. (8)

STAMP

REVISIONS

No.	DATE	DESCRIPTION
0	JUN. 06, 2022	FOR CONSTRUCTION
1	JUL. 15. 2022	AS-BUILT

DRAWN BY: S. DZANOUNI

DRAWING REFERENCE: 20-107 S100, S101 & S102

DESIGNED BY: T. BRUCE, P.Eng.

FROM: CUNLIFFE & ASSOCIATES

VERIFIED BY: J. HUNT, P.Eng.

DATE: OCT. 01, 2021

CLIENT: TOMLINSON

menard
2 Campbell Drive, Unit 101
Uxbridge, ON
L9P 1H6
info@menardcanada.ca
TÉL.: (905)862-9032
FAX: (647)528-3206

PROJECT: FASTFRATE HOLDINGS WAREHOUSE
SOMME STREET, OTTAWA, ON.

WORK: DYNAMIC COMPACTION

DRAWING TITLE: TREATMENT PROGRAM

SCALE: 1:600 (0 6 12 18 m)

FOLDER: 22T010

FORMAT: 11 x 17

SYSTEM: METRIC

DRAWING N°: 200

X:\ON\JOBS\2022\22T010 FastFrate Holdings Warehouse\06. Drawings\03 Construction\22T010_AS_BUILT.dwg

Appendix B: PMT Results

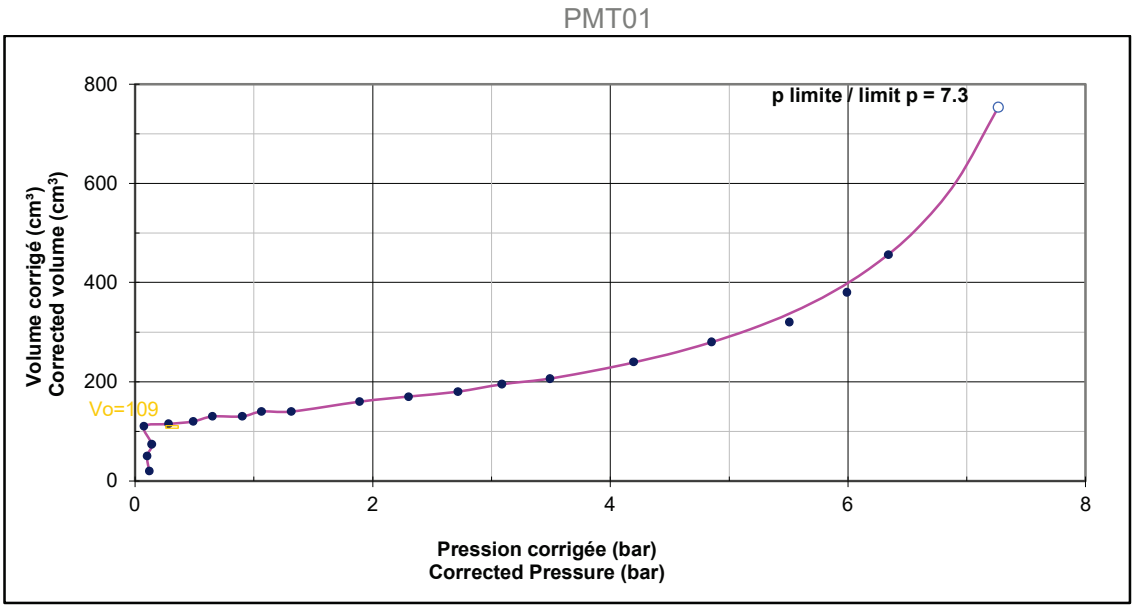


Figure 1: PMT01 curve at 1.5 m depth

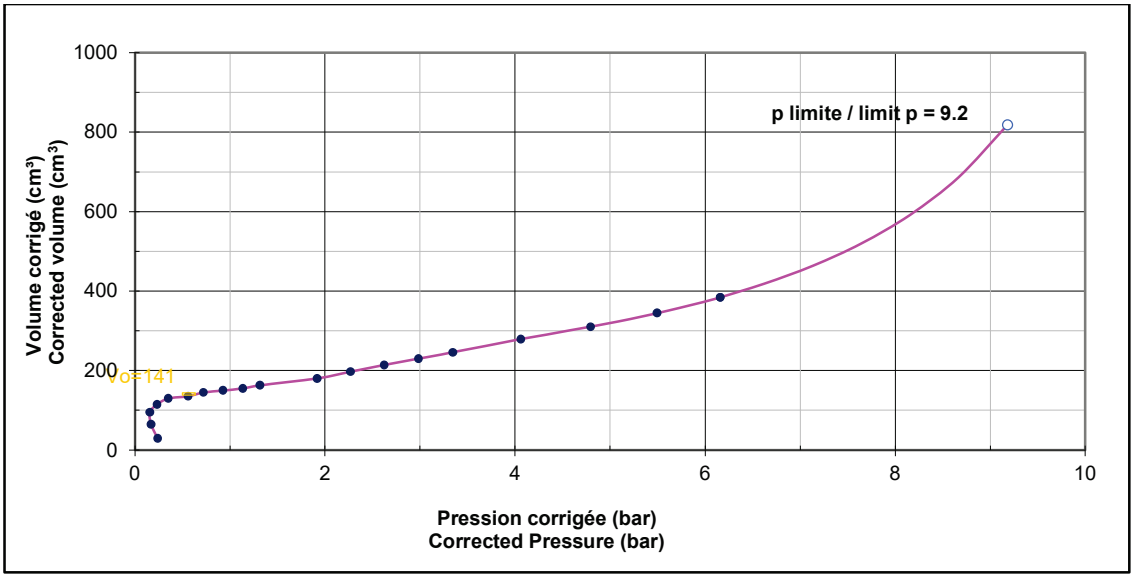


Figure 2: PMT01 curve at 3.5 m depth

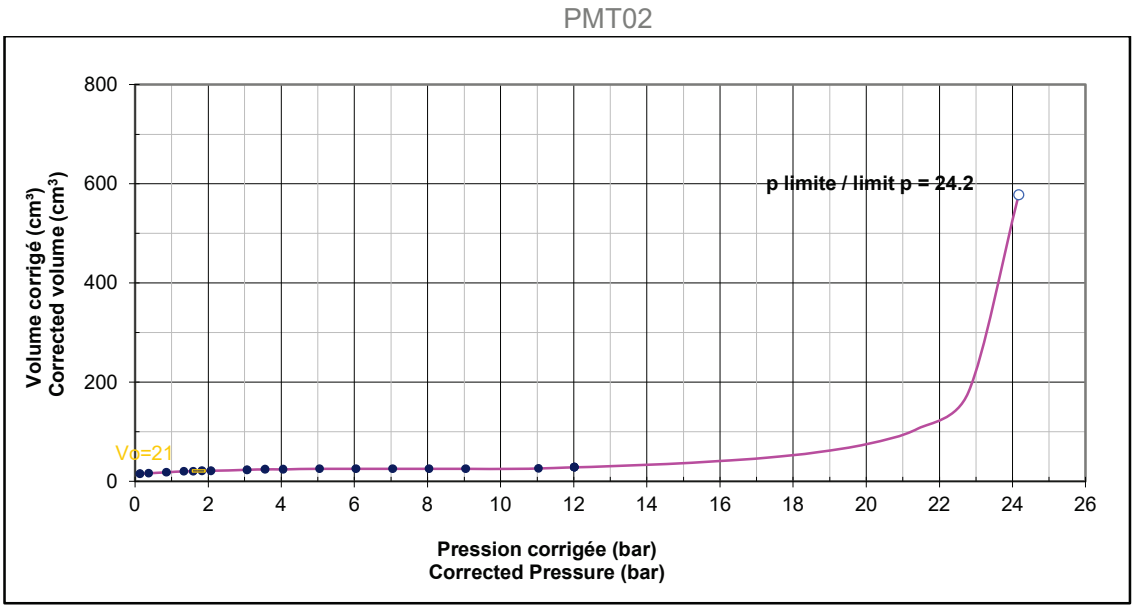


Figure 3: PMT02 curve at 1.2 m depth

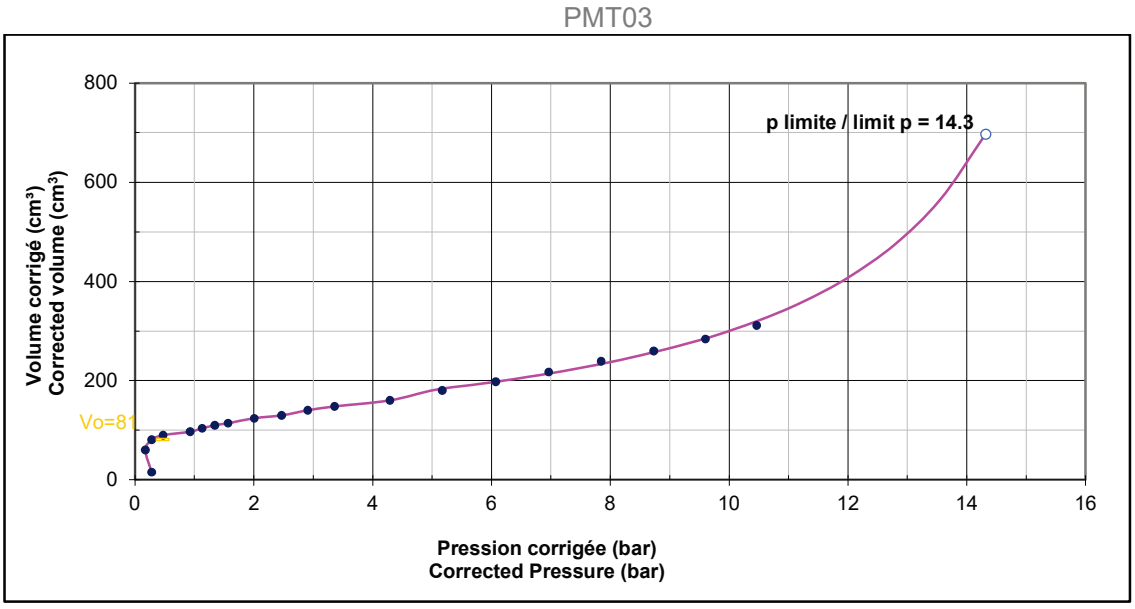


Figure 4: PMT03 curve at 3.0 m depth

PMT04

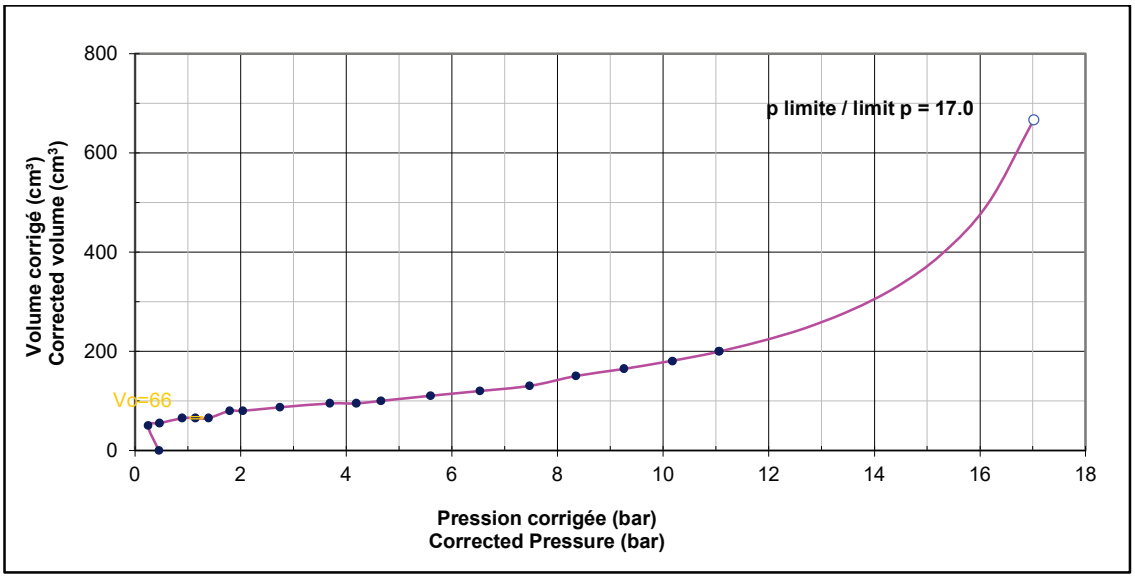


Figure 5: PMT04 curve at 3.0 m depth

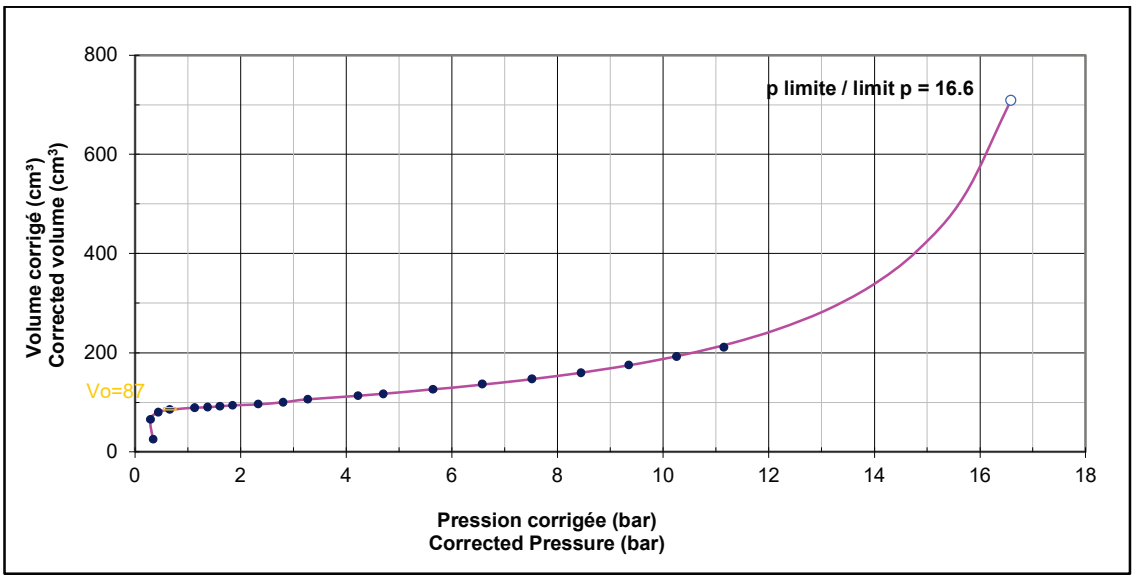


Figure 6: PMT03 curve at 4.5 m depth

Appendix C:
Vibration Monitoring Report

EXPLOTECH

Specialists in Explosives, Blasting and Vibration
Consulting Engineers

July 4, 2022

Menard Canada
1725 St. Laurent Blvd Unit 218
Ottawa, Ontario
K1G 3V4

Attention: Matthew Kerr

Re: South Gloucester Gas Main Monitoring Project
Final Vibration Monitoring Report – June 17, 2022 to June 30, 2022

Dear Mr. Kerr,

Attached please find the data detailing the results of the vibration monitoring program developed and implemented on site as part of the construction operations for the South Gloucester Gas Main Monitoring Project in Ottawa, Ontario. This vibration monitoring program was in place from June 17, 2022 to June 30, 2022 inclusive and was implemented to record vibrations present at the gas main adjacent to the construction operations in order to guard against possible adverse impacts.

A full time on site vibration monitoring program was implemented to delineate vibration intensities experienced on the gas main located near the required construction operations. The monitoring sensor listed below was installed above the gas main adjacent to construction operations during the time period specified above:

- **BE10016 – Gas Main**
    - Geophone was buried in the ground at the closest point over the gas main to monitor adjacent construction operations

The monitoring instrument installed consisted of an Instantel tri-directional digital seismograph capable of measuring vibration intensities up to 254mm/s at a frequency response of 1 – 315Hz. The unit was programmed to measure all vibration levels continuously at a sampling rate of 1024 samples per second. Following each five minute interval, the unit reviewed the 307,200 measured vibrations, and permanently recorded the peak particle velocity for that time interval while deleting all subordinate vibration intensities. This process was repeated for all subsequent five minute time intervals thereby providing maximum vibration intensities experienced at the structure throughout the day. Such a configuration permits continuous

monitoring of vibration levels and provides complete coverage of all vibrations, construction induced or otherwise, experienced at the monitored structure. Events recorded under this program mode are marked by an “H” on the vibrations summary report.

As an additional analytical tool, the unit was configured to record a more detailed waveform in the event that vibration intensities exceeded a pre-set trigger level set at 5mm/s. This feature permits advanced analysis in the event that anomalous elevated readings are recorded. Events recorded under this program mode are marked by a “W” on the vibrations summary report.

A review of the data collected on the project confirms that the maximum reading generated at the monitored location possibly related to the construction operations was as follows:

Maximum Vibration Readings at Monitored Location			
Location	***Date***	***Time***	***Velocity (mm/s)***
Gas Main	June 23, 2022	15:51	**18.41**

Effective June 30, 2022, the monitoring unit has been removed and the monitoring program has been terminated. Should you have any questions or concerns related to the information contained herein or the monitoring program undertaken, please do not hesitate to contact the undersigned at your leisure.

Kindest regards,

Jacob Adamczyk, B.A.Sc.
Explotech Engineering Ltd.

Vibration Summary
M8706A - Menard Canada
June 17, 2022 - June 30, 2022

Event Report: Event List - z:\7. monitoring data\archived seismo readings\m87xx\m8706a - menard - south gloucester gas main

Type	Serial No.	Date/Time	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (dB)	PVS1 (mm/s)	Description
H	BE10016	Jun 17 /22 09:42:47	0.381	0.381	0.254	***	0.475	Gas Main, South Gloucester, ON
H	BE10016	Jun 18 /22 07:05:22	0.254	0.254	0.254	***	0.381	Gas Main, South Gloucester, ON
H	BE10016	Jun 19 /22 07:01:58	0.381	0.254	0.254	***	0.421	Gas Main, South Gloucester, ON
H	BE10016	Jun 20 /22 07:01:57	2.667	2.794	4.064	***	4.465	Gas Main, South Gloucester, ON
H	BE10016	Jun 21 /22 07:01:57	3.302	2.794	3.556	***	4.034	Gas Main, South Gloucester, ON
H	BE10016	Jun 22 /22 07:01:57	1.905	1.016	2.159	***	2.703	Gas Main, South Gloucester, ON
H	BE10016	Jun 23 /22 07:01:59	5.080	3.429	4.572	***	5.882	Gas Main, South Gloucester, ON
W	BE10016	Jun 23 /22 15:44:54	5.080	2.667	3.302	***	5.882	Gas Main, South Gloucester, ON
H	BE10016	Jun 23 /22 15:46:57	5.842	2.413	4.064	***	7.137	Gas Main, South Gloucester, ON
W	BE10016	Jun 23 /22 15:47:18	5.842	2.413	4.064	***	7.137	Gas Main, South Gloucester, ON
H	BE10016	Jun 23 /22 15:49:16	5.080	5.334	16.00	***	16.27	Gas Main, South Gloucester, ON
W	BE10016	Jun 23 /22 15:49:36	5.080	5.334	16.00	***	16.27	Gas Main, South Gloucester, ON
H	BE10016	Jun 23 /22 15:51:35	7.239	4.572	18.41	***	18.56	Gas Main, South Gloucester, ON
W	BE10016	Jun 23 /22 15:51:35	7.239	4.572	18.41	***	18.56	Gas Main, South Gloucester, ON
H	BE10016	Jun 23 /22 15:53:34	2.921	2.540	5.842	***	6.268	Gas Main, South Gloucester, ON
W	BE10016	Jun 23 /22 15:54:11	2.921	2.540	5.842	***	6.268	Gas Main, South Gloucester, ON
H	BE10016	Jun 23 /22 15:56:10	3.810	2.413	5.334	***	6.008	Gas Main, South Gloucester, ON
W	BE10016	Jun 23 /22 15:59:59	3.810	2.413	5.334	***	6.008	Gas Main, South Gloucester, ON
H	BE10016	Jun 23 /22 16:01:59	4.953	2.921	6.731	***	7.663	Gas Main, South Gloucester, ON
W	BE10016	Jun 23 /22 16:02:01	4.953	2.921	6.731	***	7.663	Gas Main, South Gloucester, ON
H	BE10016	Jun 23 /22 16:04:00	5.461	2.794	6.223	***	6.892	Gas Main, South Gloucester, ON
W	BE10016	Jun 23 /22 16:05:02	5.461	2.794	6.223	***	6.892	Gas Main, South Gloucester, ON
H	BE10016	Jun 23 /22 16:07:02	5.334	2.540	6.731	***	7.632	Gas Main, South Gloucester, ON
W	BE10016	Jun 23 /22 16:07:03	5.334	2.540	6.731	***	7.632	Gas Main, South Gloucester, ON
H	BE10016	Jun 23 /22 16:09:01	5.207	2.794	7.747	***	8.607	Gas Main, South Gloucester, ON
W	BE10016	Jun 23 /22 16:09:12	5.207	2.794	7.747	***	8.607	Gas Main, South Gloucester, ON
H	BE10016	Jun 23 /22 16:11:11	4.572	2.921	4.318	***	5.157	Gas Main, South Gloucester, ON
H	BE10016	Jun 24 /22 07:01:52	3.937	2.667	5.969	***	7.137	Gas Main, South Gloucester, ON
W	BE10016	Jun 24 /22 07:15:26	3.937	2.667	5.969	***	7.137	Gas Main, South Gloucester, ON
H	BE10016	Jun 24 /22 07:17:27	4.572	3.302	6.858	***	8.299	Gas Main, South Gloucester, ON
W	BE10016	Jun 24 /22 07:17:43	4.572	3.302	6.858	***	8.299	Gas Main, South Gloucester, ON
H	BE10016	Jun 24 /22 07:19:42	3.937	2.921	5.715	***	6.912	Gas Main, South Gloucester, ON
W	BE10016	Jun 24 /22 07:38:37	3.937	2.921	5.715	***	6.912	Gas Main, South Gloucester, ON
H	BE10016	Jun 24 /22 07:40:38	2.667	2.413	3.048	***	3.365	Gas Main, South Gloucester, ON
H	BE10016	Jun 25 /22 07:01:56	0.254	0.254	0.254	***	0.440	Gas Main, South Gloucester, ON
H	BE10016	Jun 26 /22 07:01:57	0.254	0.254	0.254	***	0.440	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 07:01:57	4.572	3.048	5.207	***	6.248	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 09:15:01	4.064	2.667	5.207	***	5.694	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 09:17:02	5.080	2.921	5.715	***	7.064	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 09:17:19	5.080	2.921	5.715	***	7.064	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 09:19:17	4.191	3.175	5.969	***	6.539	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 09:37:41	4.064	3.175	5.969	***	6.539	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 09:39:40	5.080	4.191	7.493	***	8.706	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 09:40:01	5.080	4.191	7.493	***	8.706	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 09:42:00	4.318	4.191	6.731	***	7.497	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 09:42:05	4.318	4.191	6.731	***	7.497	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 09:44:01	4.572	4.318	7.493	***	8.345	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 09:44:15	4.572	4.318	7.493	***	8.345	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 09:46:57	5.842	4.826	11.05	***	12.11	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 09:47:08	5.842	4.826	11.05	***	12.11	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 09:49:07	6.096	4.826	11.30	***	12.41	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 09:49:22	6.096	4.826	11.30	***	12.41	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 09:52:01	3.048	3.937	10.54	***	10.55	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 09:52:44	3.048	3.937	10.54	***	10.55	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 09:54:44	7.366	5.461	16.13	***	16.35	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 09:54:47	7.366	5.461	16.13	***	16.35	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 09:56:45	4.699	2.413	5.334	***	5.550	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 09:56:51	4.699	2.413	5.334	***	5.550	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 09:58:50	5.969	4.445	13.21	***	13.34	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 09:59:01	5.969	4.445	13.21	***	13.34	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 10:01:01	5.842	4.953	14.35	***	14.49	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 10:01:19	5.842	4.953	14.35	***	14.49	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 10:03:18	3.683	2.413	5.080	***	5.650	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 10:05:06	3.683	2.413	5.080	***	5.650	Gas Main, South Gloucester, ON

Vibration Summary
M8706A - Menard Canada
June 17, 2022 - June 30, 2022

Event Report: Event List - z:\7. monitoring data\archived seismo readings\m87xx\m8706a - menard - south gloucester gas main

Type	Serial No.	Date/Time	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (dB)	PVS1 (mm/s)	Description
H	BE10016	Jun 27 /22 10:07:04	4.191	2.667	5.588	***	6.197	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 10:07:09	4.191	2.667	5.588	***	6.197	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 10:09:09	4.445	2.921	4.953	***	5.367	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 10:12:46	3.048	2.540	4.953	***	5.367	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 10:14:46	4.064	3.048	5.842	***	6.326	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 10:15:18	4.064	3.048	5.842	***	6.326	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 10:17:16	5.588	3.429	7.366	***	8.081	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 10:17:39	5.588	3.429	7.366	***	8.081	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 10:19:39	5.207	2.667	4.953	***	5.872	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 10:21:14	5.207	2.667	4.953	***	5.872	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 10:23:12	5.207	2.921	5.207	***	6.132	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 10:23:16	5.207	2.921	5.207	***	6.132	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 10:25:14	5.715	2.921	5.715	***	6.753	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 10:25:27	5.715	2.921	5.715	***	6.753	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 10:27:27	4.953	2.794	3.302	***	5.558	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 10:29:21	4.953	2.794	3.302	***	5.558	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 10:31:20	5.080	2.667	3.556	***	5.753	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 10:31:36	5.080	2.667	3.556	***	5.753	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 10:34:17	5.334	2.413	3.556	***	5.726	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 10:37:14	5.334	2.413	3.556	***	5.726	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 10:39:14	5.334	2.794	5.969	***	7.504	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 10:39:30	5.334	2.794	5.969	***	7.504	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 10:41:29	4.953	3.048	3.556	***	6.017	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 10:45:49	4.953	3.048	3.556	***	5.954	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 10:47:48	3.810	3.175	5.080	***	5.981	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 14:54:43	3.810	3.175	5.080	***	5.981	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 14:56:46	3.302	2.921	5.334	***	5.957	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 15:12:51	2.794	2.921	5.334	***	5.957	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 15:14:51	5.969	5.461	8.509	***	9.696	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 15:15:11	5.969	5.461	8.509	***	9.696	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 15:17:53	6.731	5.080	11.18	***	12.11	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 15:18:00	6.731	5.080	11.18	***	12.11	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 15:20:39	2.159	5.842	8.890	***	9.133	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 15:20:47	2.159	5.842	8.890	***	9.133	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 15:22:48	3.683	11.43	15.37	***	16.32	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 15:22:59	3.683	11.43	15.37	***	16.32	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 15:24:57	5.207	1.905	5.080	***	6.099	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 15:25:14	5.207	1.905	5.080	***	6.099	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 15:27:15	9.144	4.826	13.59	***	14.30	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 15:27:18	9.144	4.826	13.59	***	14.30	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 15:29:17	2.921	2.794	5.969	***	6.224	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 15:33:09	2.921	2.794	5.969	***	6.224	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 15:35:10	4.572	3.429	8.001	***	8.356	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 15:35:17	4.572	3.429	8.001	***	8.356	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 15:37:16	4.699	3.175	6.858	***	8.452	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 15:37:18	4.699	3.175	6.858	***	8.452	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 15:39:18	5.969	4.445	9.017	***	11.05	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 15:39:26	5.969	4.445	9.017	***	11.05	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 15:41:27	3.302	2.540	5.715	***	6.488	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 15:41:40	3.302	2.540	5.715	***	6.488	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 15:43:40	4.826	4.191	8.890	***	10.43	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 15:43:58	4.826	4.191	8.890	***	10.43	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 15:45:57	4.953	3.048	4.826	***	5.935	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 15:53:55	4.953	3.048	4.572	***	5.730	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 15:55:54	5.334	3.302	5.334	***	6.677	Gas Main, South Gloucester, ON
W	BE10016	Jun 27 /22 15:55:57	5.334	3.302	5.334	***	6.677	Gas Main, South Gloucester, ON
H	BE10016	Jun 27 /22 15:57:57	4.826	2.921	4.064	***	5.670	Gas Main, South Gloucester, ON
H	BE10016	Jun 28 /22 07:01:54	1.143	0.889	1.143	***	1.403	Gas Main, South Gloucester, ON
H	BE10016	Jun 29 /22 07:01:58	1.905	1.905	2.794	***	3.441	Gas Main, South Gloucester, ON
H	BE10016	Jun 30 /22 07:02:35	4.445	3.175	8.763	***	8.825	Gas Main, South Gloucester, ON
W	BE10016	Jun 30 /22 07:23:58	4.445	3.175	8.763	***	8.825	Gas Main, South Gloucester, ON
H	BE10016	Jun 30 /22 07:25:53	3.937	3.302	7.747	***	7.901	Gas Main, South Gloucester, ON
W	BE10016	Jun 30 /22 07:28:00	3.937	3.302	7.747	***	7.901	Gas Main, South Gloucester, ON
H	BE10016	Jun 30 /22 07:29:54	2.286	2.667	4.953	***	5.345	Gas Main, South Gloucester, ON

Vibration Summary
M8706A - Menard Canada
June 17, 2022 - June 30, 2022

Event Report: Event List - z:\7. monitoring data\archived seismo readings\m87xx\m8706a - menard - south gloucester gas main

Type	Serial No.	Date/Time	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (dB)	PVS1 (mm/s)	Description
W	BE10016	Jun 30 /22 07:32:54	2.159	2.667	4.953	***	5.345	Gas Main, South Gloucester, ON
H	BE10016	Jun 30 /22 07:34:52	5.588	6.858	10.79	***	11.49	Gas Main, South Gloucester, ON
W	BE10016	Jun 30 /22 07:55:32	5.588	6.858	10.79	***	11.49	Gas Main, South Gloucester, ON
H	BE10016	Jun 30 /22 07:57:27	3.302	2.921	5.207	***	5.843	Gas Main, South Gloucester, ON
W	BE10016	Jun 30 /22 07:57:56	3.302	2.921	5.207	***	5.843	Gas Main, South Gloucester, ON
H	BE10016	Jun 30 /22 07:59:50	2.667	2.159	3.048	***	3.735	Gas Main, South Gloucester, ON

APPENDIX 4

25O012 – GROUND IMPROVEMENT AT 301 SOMME STREET

DATED NOVEMBER 14, 2025

R.W. Tomlinson Limited
Jennifer Ailey
Address:100 CitiGate Drive, Ottawa, ON
Email: jailey@tomlinsongroup.com
November 14, 2025

Subject: *25O012 – Ground Improvement at 301 Somme Street, Ottawa, ON*

Project Summary

Menard Canada (Menard) has been contracted to assist in the design and future implementation of the ground improvement scope of work for the proposed development at 301 Somme Street in the Hawthorne Industrial Park in Ottawa, ON.

In 2022, Menard successfully completed a Dynamic Compaction (DC) campaign for the previous owner's proposed warehouse. Using the DC technique, Menard compacted the undocumented fill and increased in-situ bearing capacity up to 200kPa SLS (275kPa ULS) within the footprint of the previous warehouse. However, no warehouse was built on the site.

W.O Stinson & Son LTD. proposes to develop the site with a new building layout. A portion of the proposed building falls outside of the previously improved footprint. Therefore, additional DC work is required at site.

Ground improvement work has been designed to achieve a bearing capacity of at least 200kPa SLS and 275kPa ULS within the building footprint. Settlement will be limited to 25mm total settlement and 19mm differential. The performance of the Dynamic Compaction will be verified by post-compaction testing performed by Menard and will be certified with a final report stamped by a Professional Engineer licensed in the province of Ontario presenting the results of the testing.

Reference Documents:

- *Geotechnical Investigation, Proposed Commercial Development, by Paterson Group (Report PG7567-1), dated August 14, 2025*
- *Architectural Drawing, Vehicle Service & Storage Yard Site Plan, by Hobin Architecture (Project: 2502), Rev.9 Issued for Site Plan, dated September 9, 2025*
- *Post Ground Improvement Report (ID: 22T010), by Menard Canada, dated July 15, 2022*

Soil Conditions:

Based on the information provided, soils encountered at the borehole locations generally consisted of a layer of fill material, approximately 3 to 6m thick, overlying a native silty sand to sandy silt deposit. The fill material is highly variable. The three Geotechnical Reports, two written by GHD Limited (GHD) dated September 2020 and January 2022, and one by Paterson Group dated August 2025, show a fill consisting of sand, silt, and clay with various levels of compaction. The fill identified in BH2 (GHD - Elevation 89.80m) and BH2-25 (Paterson – Elevation 91.06m) consists mostly of clay with low to 'weight of hammer' SPT values, and shear vane tests between 43 and 68 kPa. The silty sand/sandy silt below the fill is in a compact to very dense state.

Existing ground level varies from 89.80m to 91.31m in elevation. During the Geotechnical investigation, groundwater level was measured 3m below ground surface.

It should be noted that a 600mm granular B type II pad was placed and compacted within the footprint of the previous work zone by RW Tomlinson Group (Tomlinson), the earthworks contractor, for the ground improvement scope of work completed in 2022

Proposed Ground Improvement Method

Dynamic Compaction (DC) involves the transmission of energy via high impacts to loose and soft soils that initially have low bearing capacity, high compressibility and/or liquefaction potential in order to significantly improve their mechanical properties. The Dynamic Compaction technique achieves ground densification using energy waves from a dropping a ±12.5 tonnes hammer from heights ranging from 9 to 36m from a crane. The weights are essentially dropped in a free fall to maximize energy transfer.

The arrangement of the impact points and the other parameters of the treatment (energy, phasing, rest periods) depend on the characteristics of the soil to be treated and on the results of the initial works. The depth of improvement is a function of the pounder weight and drop height, i.e. the amount of energy applied. Dynamic Compaction is used to increase the density and therefore bearing capacity and compressibility of in-situ soils. Using triggering criteria analysis outlined in Idriss and Boulanger (2014), CPT results or SPT results combined with grain size analysis of the targeted soils can be used to confirm that the FOS against liquefaction has increased following treatment with ground improvement.

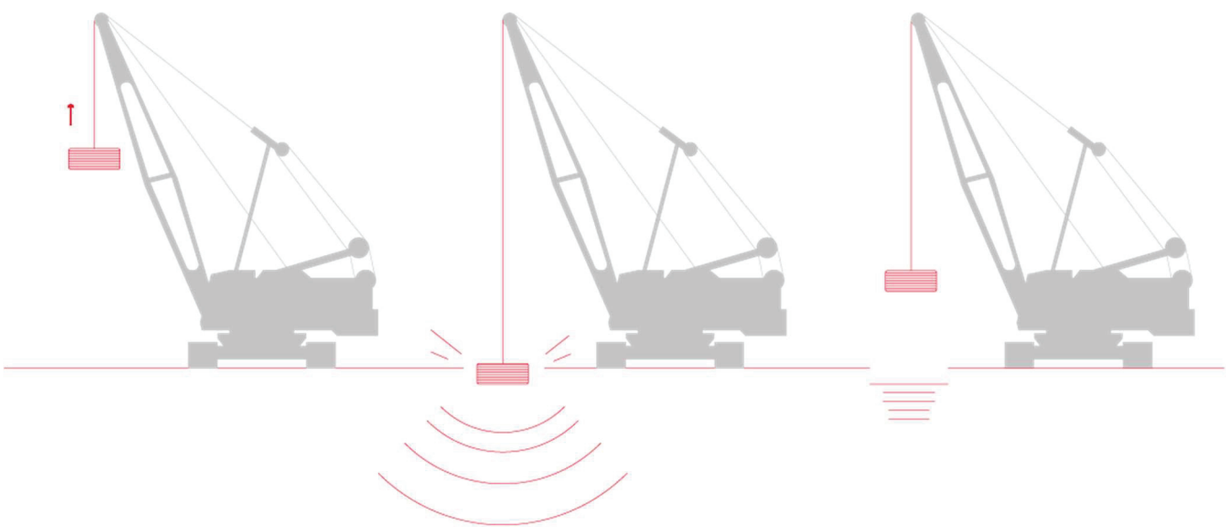


Figure 1 : Dynamic Compaction Densification Process

Based on the Site Plan drawings and Paterson's Geotechnical Investigation, the location of the newly proposed buildings are outside of the previously completed ground improvement scope of work. Menard will implement the DC work within the footprint of the newly proposed buildings with a 4m buffer zone outside of the footprints as shown in **Figure 2**.

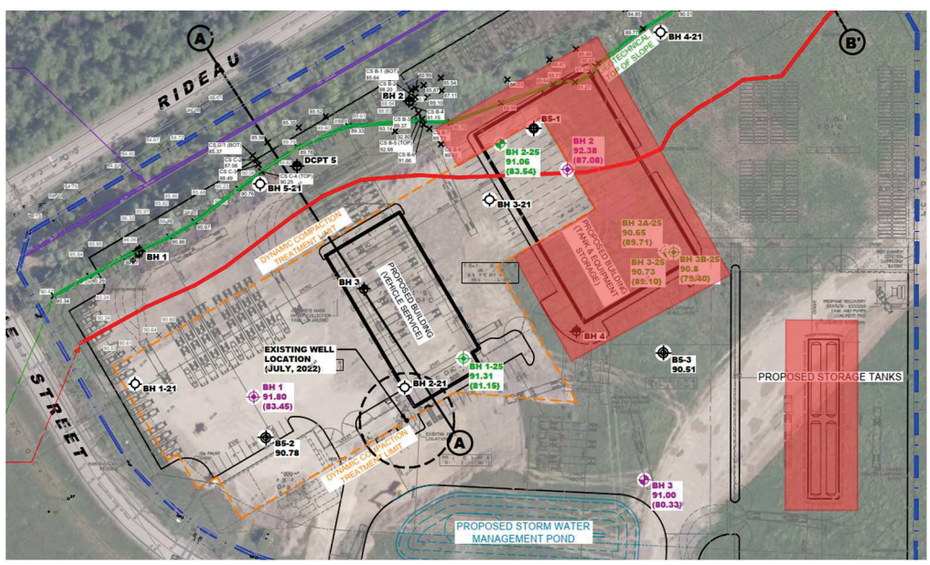


Figure 2 : Approximate Work Zone for Dynamic Compaction (photo: Paterson 2025)

It should be noted that the structural requirements of the new buildings are unknown at this time. Once the requirements become available the ground improvement scope of work can be finalized.

Design Criteria

As per the previous ground improvement work, the design criteria were as follows:

- Improved bearing capacity of up to 200 kPa SLS (275 kPa ULS)
- Maximum total settlement of 25 mm and differential settlement of 19 mm.

Conclusion

Menard Canada is pleased to present this preliminary design memorandum regarding the layout of the new proposed development and the ground improvement scope of work based on the available information.

Once structural designs and requirements are known, the ground improvement scope of work can be finalized.

Regards,

Justin Theoret
Project Manager

Julien Egron, P. Eng.
Branch Manager - Ottawa