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GEOTECHNICAL INVESTIGATION



1029-1033 WATERDOWN ROAD, BURLINGTON, ONTARIO

Prepared for:

Infinity Development Group

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Project No. FE-P 21-11236

July 26, 2021

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Project Name:	Proposed New Development
Project Address:	1029-1033 Waterdown Road, Burlington, ON.
Project Number:	FE-P 21-11236Geo
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1. INTRODUCTION

Fisher Engineering Limited was retained by Infinity Development Group to carry out a geotechnical subsurface investigation for the proposed new development at 1029-1033 Waterdown Road East in Burlington, Ontario.

The purpose of the geotechnical investigation was to determine the general subsurface conditions at the site and to provide geotechnical comments/recommendations for the design of the proposed development by means of seven (7) boreholes.

This report presents the results of the tests performed in accordance with the general terms of reference outlined in the scope of work.

The report has been prepared specifically and solely for the proposed new development in regards to geotechnical aspects of design & construction based on the conceptual lay out provided.

2. SITE AND PROJECT DESCRIPTION

The subject properties are located on the east side of Waterdown Road north of Plains Road East in a mixed-use area of Burlington, Ontario.

Two residential dwellings exist in the front portions of the lots. A few mature trees were observed at/near the east property lines.

Residential dwellings were observed towards north and across the road on the west side. Commercial buildings exist towards south and east sides.

The proposed development calls for a 29-story building with two levels of underground parking. Details of the proposed development such as finished geodetic ground/lowest parking floor levels, finished grades, footing founding levels etc were not available at the time of our investigation. We were advised that top of footing will be approximately 7m below existing grades.

3. SCOPE OF GEOTECHNICAL WORK

The geotechnical scope of work includes the following:

- Investigation of the subsurface conditions at the site by advancing boreholes, soil sampling and visual evaluation.

- Prepare a geotechnical report with comments and recommendations regarding:

  - Appropriate foundation depth, type and bearing capacity, and seismic classification.
  - Underground parking garage design/construction.
  - Excavation & shoring design parameters etc.

4. METHOD OF INVESTIGATION

The field work for this investigation was carried out on June 15, 16 & 17, 2021, in which a total of seven (7) boreholes (BH1 – BH7), were drilled to approximate depths ranging between 9.60m and 14.18m below prevailing grades. The approximate locations of the boreholes and elevations are shown on the attached Borehole Location Plan in Appendix A.

The ground surface elevation at each borehole was established by interpolation from the topographic survey plan provided.

All boreholes were advanced using solid stem auguring. The subsurface strata were sampled at regular intervals of depth using a split-spoon sampler following the procedure as detailed in ASTM Standard specification D1586 for Standard Penetration Test. Field tests to determine engineering parameters of the soil were carried out during drilling, which included Standard Penetration Tests (SPT).

Water level observations were made in each borehole on completion of drilling. Monitoring wells were installed in all boreholes for groundwater observations, water sampling and/or slug/pump testing purposes.

All soil samples were taken to our accredited laboratory for final visual assessment, classification and selected moisture content testing & grain size analyses. The samples were tested and classified in general accordance with the Unified Soil Classification System, ASTM D 2487, and Standard Practice for Classification of Soil for Engineering Purposes.

Soil Description and test results are given in the borehole Records attached to this report.

The soil samples recovered during the investigation will be stored in our laboratory for a period of 30 days after which they will be discarded unless further instructions are received.

5. SUBSURFACE CONDITIONS

The subsurface conditions encountered in the boreholes are shown on the Borehole Log Sheets provided in Appendix B.

The logs include soil stratification at the borehole locations along with detailed soil descriptions. Variations in soil stratification may occur and should be expected between borehole locations and elsewhere on the site.

FILL

Fill soils were found below the above surficial layer of all boreholes.

Fill extended to the following approximate depths below the prevailing grades.

Borehole No.	BH1	BH2	BH3	BH4	BH5	BH6	BH7
Surface Elevation (m asl)	103.18	103.75	103.83	102.40	102.84	102.64	102.80
Depth of Borehole (m)	12.65	14.18	9.60	11.13	14.18	12.65	9.60
Elevation at Bottom of Borehole (m asl)	90.53	89.57	94.23	91.27	88.66	89.99	93.20
Depth of Fill (m)	0.91	0.76	0.61	0.61	0.61	0.61	0.76
Elevation at Bottom of Fill (m asl)	102.27	102.99	103.22	101.79	102.23	102.03	102.04

The fill generally consisted of brown to dark brown sandy silt with some to trace of topsoil/roots and trace of gravel.

BROWN SILTY SAND TO SANDY SILT

Native soils of brown silty sand to sandy silt were found underlying the fill soils. Relative density of this layer varied from very loose to compact and it extended to approximate depths varying from 1.68m (no. 4) to 3.66m (no. 5).

REDDISH BROWN SILTY SAND/SANDY SILT

Reddish brown silty sand to sandy silt was encountered beneath the brown silty sand/sandy silt of boreholes 1 to 3. This layer was found to be compact in relative density and extended to approximate depths of 3.05m (nos. 1 & 2) & 2.59m (no. 3).

BROWN/GREYISH BROWN/GREY SAND/SILTY SAND/GRAVELLY SAND/GRAVEL & SAND

Brown silty sand/sandy silt of boreholes 4 to 7 and reddish-brown silty sand of boreholes 1 to 3 were followed by predominantly brown to grey sand/gravelly sand/gravel & sand deposits. These layers vary in composition across the site and with depth.

Their relative densities generally varied from dense to very dense and they extended to termination depths of 9.60m to 14.17m bgs. Occasional cobbles/boulders were encountered in the gravelly sand/gravel & sand.

REDDISH BROWN/GREY SILTY CLAY/CLAYEY SILT

Layers of reddish brown or grey clayey silt to silty clay were found interbedded in the sandy deposits between depths of 4.57m & 4.88m (no. 1), 4.88m & 5.49m (no. 2), 4.72m & 5.18m (no.3), 3.20m & 4.57m, 6.10m & 7.01m (no. 4), 4.88m & 5.49m (no. 6) and 4.72m & 6.10m (no. 7). Consistency of these layers varied substantially from firm in the upper layer to hard in lower layer of borehole 4, but generally very stiff in other boreholes.

6. GROUNDWATER CONDITIONS

Boreholes were advanced using dry solid stem auguring. Monitoring wells were installed in boreholes 1 to 6 to monitor groundwater levels and water sampling.

Groundwater depths/elevations as measured on completion of boreholes and from the monitoring wells are summarized in the following table.

No.	Elev. at Ground (m)	Depth of Well/BH, m bgs	On Completion		21-Jun-21		30-Jun-21		14-Jul-21	
			GW level, m bgs	GW Ele, m asl	GW level, m bgs	GW Ele, m asl	GW level, m bgs	GW Ele, m asl	GW level, m bgs	GW Ele, m asl
MW1	103.18	7.62/12.65	3.66	99.52	4.07	99.11	4.20	98.98	4.13	99.05
MW2	103.75	7.62/14.18	Dry	-	Dry	-	Dry	-	Dry	-
MW3	103.83	7.62/9.60	6.71	97.12	7.54	96.29	7.62	96.21	7.60	96.23
MW4	102.40	7.62/11.13	6.71	95.69	5.57	96.83	5.49	96.91	5.50	96.90
MW5	102.84	9.15/14.18	7.01	95.83	Dry	-	Dry	-	Dry	-
MW6	102.64	7.62/12.65	10.67	91.97	Dry	-	Dry	-	Dry	-
BH7	102.80	9.60	9.15	93.65	n/a	-	n/a	-	n/a	-

Based on the above information and visual examination of the soil samples, we conclude that groundwater exists in the wet sand/silty sand to sandy silt/gravelly sand overlying relatively impervious clayey silt and/or encountered towards the bottom of boreholes 2 to 7. Perched water may also be encountered from the wet seams/pockets/layers trapped inside the fill soils. We consider the water levels in monitoring wells 1 & 4 represent perched groundwater. This groundwater table may fluctuate with seasonal weather conditions; climate change; change in the surrounding land use or the water shed area etc. Groundwater in MW3 may be real groundwater table.

It should be noted that 'Fisher' also carried out a hydrogeological investigation in conjunction with this geotechnical investigation. Issues pertaining to the groundwater such as requirements for temporary dewatering, permanent drainage, amount/quality of water for discharge etc have been discussed/addressed separately in the hydrogeological investigation report. These reports should be read in conjunction in finalizing the sub-structure design process.

7. GEOTECHNICAL DISCUSSIONS AND RECOMMENDATIONS

7.1 General Discussion

We understand that the proposed development will comprise the construction of a 29-storey high-rise predominantly residential building with two levels of underground parking.

It should be noted that foundation plan indicating the underside/founding levels of footings was not available at the time of investigation. However, we were advised that top of footings will be approximately 7m below existing grades.

The following sections provide general geotechnical recommendations for design and construction.

7.2 Foundation Considerations

Boreholes indicate that dense to very dense undisturbed native soils of brown/greyish brown to grey sand/silty sand/sand & gravel/gravelly sand encountered below depth of 6.5m can be used for the building support using conventional strip and/or spread footing foundations.

For footings placed over undisturbed native soils between depths of 7.0m and 9.0m, factored geotechnical resistance at ULS of 600kPa & geotechnical reaction at SLS of 400kPa can be used for foundation design purposes.

SLS values are based on the current/general engineering practice of total settlement of 25mm and 19mm differential movements.

Based on the groundwater conditions encountered it appears that localised dewatering may be required.

A mud slab is always preferable to protect the integrity of the base and provide consistent earth cover for the reinforcing steel bars. If the footings are not formed, then footing excavations should be over-sized or sides sloped so that the caved materials do not end up in/under the footing area.

For footings founded at different levels in the vicinity of each other or located adjacent to excavated and backfilled areas, such as sewer/utility trenches etc., the slope of the imaginary line joining the bottom of two footings or the bottom of footing and excavation should not be steeper than 1.5 horizontal to 1 vertical. Preferably footings at the lower levels be excavated/poured first to prevent undermining of footings located at higher elevations.

The base conditions at the footing founding levels should be observed by a soil engineer from our office prior to pouring concrete, to ensure that the design bearing pressures are being attained. During sub-zero temperatures founding soils and footings must be adequately protected to prevent damage due to freezing/adfreezing/frost penetration using insulated or thermal blankets or straw.

For frost protection, a minimum 900 mm soil cover should be provided for the interior/isolated footings located in the unheated two level of underground parking garage areas. For perimeter wall footings 600mm depth is a common practice in GTA. However, in the garage entrance areas and air shaft/ventilation locations, a minimum 1.2 m earth cover should be provided or a combination of earth cover and insulation should be provided.

7.3 Earthquake Considerations

The 2012 OBC Subsection 4.1.8.7 stipulates that earthquake design for building should be based on the average properties of the top 30 m soil profile.

The parameters for determining the Site Classification for Seismic Site Response are given in Table 4.1.8.4A of the 2012 OBC. The Site Classification for Seismic Site Response (Table 4.1.8.4.A) is based on the average shear wave velocity or Standard Penetration Resistance (N60), or the undrained shear strength of the soils (Su).

Based on the results of the current geotechnical investigation, the site designation for seismic analysis applicable for the proposed building with two levels underground parking and for footings placed over undisturbed dense to very dense native soils is expected to be "**Class C**". However, shear wave velocity measurement may be required to confirm the classification.

7.4 Underground Parking Garage

The underground structure should be equipped with efficient permanent drainage system to dissipate perched groundwater accumulations, which includes the perimeter weeping tiles around the bottom of the garage wall footings and the interior weeping tiles below the floor slab. The perimeter weepers should be surrounded by clear stone or pea gravel encased in a granular filter or filter cloth. Both weepers should be connected to independently positive frost-free sump pits from where the water is constantly removed.

Where there is insufficient space for the installation of exterior perimeter weeping tiles, the drainage system can be modified by providing vertical drainage between the garage walls and the adjacent shoring. A series of drain holes should be precast through the walls below the garage floor slab level, forming a complete drainage path to the interior weeping tiles placed beside the garage wall footings.

Underfloor weeping tile drainage system should be provided under the floor slab to release any localised/potential uplift pressure on the slab-on-grade. We recommend that a field review should be carried out at the time of construction to determine the spacing requirements of the underfloor weepers. Top of the underfloor drain should be located below the bottom of granular bedding layer. The drains should be encased in 150 mm of clear stone/pea gravel wrapped in geotextile filter and connected positively to sump pit. The geotextile filter should have equipment opening size of less than 60 µm. A filter fabric should be provided for separation and to prevent migration of the subgrade soils where groundwater is anticipated to rise above the subgrade levels.

Damp or water proofing of garage floor slab will be required depending on the potential/anticipated highest groundwater table/elevations.

The entire drainage system should be designed by competent professionals, to ensure its capacity and effectiveness concerning the efficient transmittal of volume of water generated without any migration of fines from the surrounding soils.

A backup system should be designed for pumping/dewatering operations in the event of power or mechanical failure. Water relief valves/plates may be installed in the garage floor slab to relieve

any excess hydrostatic pressure in the event of malfunction of the drainage system. The floor slab should also be designed to accommodate the maximum allowable pressure for relief valves.

The lowest floor slab can be constructed as slab-on-grade. After excavating to the desired level, any loose or wet soil should be sub-excavated and replaced with granular material compacted to 98% of the Standard Proctor Maximum Dry Density. A 19 mm clear stone granular bedding of at least 200 mm in thickness should be provided.

The modulus of subgrade reaction for slab-on-grade design of 40MN/m^3 can be used provided the subgrade is undisturbed/adequately compacted & granular bedding is well compacted.

The parking garage walls under free drainage conditions, can be designed for a lateral earth pressure P, as given by the following expression:

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

where K = Coefficient of earth pressure
γ = Unit weight of soil
Q = Surcharge load, if any

Design parameters K, γ are suggested in section 7.5 of this report.

If the perimeter/underfloor drainage systems are not feasible or permitted, then a watertight structure (bathtub) design (full or partial) should be adopted and the impacted lowest parking garage floor slab must be designed to resist hydrostatic/uplift pressures and be water-proofed. Potential/anticipated highest groundwater level during the life of the structure should be used for determining the water pressures. Parking garage walls should be waterproofed to at least 1m above the highest water level.

For a waterproofed basement, the lateral earth pressures acting on basement walls may be calculated from the following expression:

$$p = K(\gamma h_1 + \gamma' h_2 + q) + \gamma_w h_2$$

where p = lateral earth pressure in kPa acting at depth h
K = earth pressure coefficient, assumed to be 0.4 for vertical walls and horizontal backfill
γ' = submerged unit weight of backfill of 12kN/m^3 may be assumed
γ_w = Unit weight of water, a value of 10kN/m^3 can be used
h_1 = depth to the highest groundwater table in metre

h_2 = depth below water table in metres

q = Equivalent value of surcharge on the ground surface in kPa

7.5 Excavation / Shoring

It is understood that the excavation for the proposed structure may extend to the depth of 7m or more. According to the Ontario Occupational Health and Safety Act, all excavations deeper than 1.2m should be adequately supported against ground collapse.

If the space will be limited for a safe excavation slope, then a vertical shoring system would be appropriate for the overall parking garage construction.

All structural members should be designed in accordance with relevant codes of practice.

The following soil parameters can be used in the evaluation of lateral earth pressures and design of the shoring system.

	FILL	COMPACT SILTY SAND	SILTY SAND/ SAND/GRAVELLY SAND
Unit weight, γ, kN/m^3	18	20.0	21.0
Coefficient of earth pressure at rest (K_0)	0.48	0.36	0.40
Coefficient of active earth pressure (Ka)	0.35	0.33	0.28
Coefficient of passive earth pressure (Kp)	2.86	3.00	3.57

Extra care will be required to install shoring support system due to anticipated groundwater at/below the approximate depth of 7.6m. Furthermore, obstructions from cobbles/boulders will likely be encountered while auguring shaft holes for soldier pile installation.

Excavations extending into water bearing sand/silty sand should not proceed until dewatering has been carried out to bring the wet sand into moist state.

The excavation sides should be protected to prevent any erosion/migration/flowing or washing out of soils from surface water ingress or water bearing wet pockets/layers. Provision of filler fabric may be required to prevent any migration of soils into the excavation. Any cavities behind the lagging should be filled with compacted soils or unshrinkable fill to prevent their progression into surrounding areas.

Temporary shoring/tie-backs should be designed in accordance with the Canadian Foundation Engineering Manual, 4th Edition. An estimated bond stress value of 60kN/m can be used for preliminary design of soil anchors. It should be noted that inclination, method of grouting/installation etc. influence the bond stress values. Design bond stress should be confirmed by load testing to 200% design load.

Raker pads if required can be designed using soil bearing pressure of 200kPa. Subsoil conditions at the raker founding levels must be observed by our field staff to ensure that they are placed over undisturbed native soils and surrounding soils are not disturbed due to groundwater conditions/excavation operations.

Due to presence of water bearing layers, tie-back holes should be cased during installation to minimize risk of caving. Shoring contractor must provide adequate measures to prevent any caving of loose soils or flow of soils due to groundwater into the augured holes during soldier pile installation operations. Temporary safety liners must be used during soldier pile installation and the withdrawal of liner should be slow and coordinated with pouring of concrete/u-fill.

8. EXCAVATION / VIBRATION MONITORING

We understand that two stage tie backs will be proposed for the proposed soldier pile/lagging support purposes. It should be noted that encroachment agreements will be required with the adjacent property owners. If the above agreements are not feasible/achievable then raker pads may be used for the soldier pile support purposes.

Zone of influence for excavation wall movements/displacements can be estimated as 11m to 12m beyond the property lines. All the control network points should be located outside the above zone of influence. Reflective targets should be installed at the top of each soldier pile and for each tie-back to monitor the movement of shored walls during and after excavation. Precision targets should be installed on the neighbouring structures within the zone of influence to ensure they are not being impacted by the construction activities on the subject site.

Construction activities for the proposed development such as drilled caissons, soil compaction etc. may generate vibrations which could be perceptible to the nearby residents or sensitive to the adjacent structures. Construction activity vibrations must be limited to the maximum peak particle velocity (PPV) as outlined/regulated by the local/regional/provincial authorities or an expert/qualified person in vibration monitoring and control. Frequency & duration of monitoring

and zone of influence due to vibration should also be established by or in accordance with the recommendations by the qualified person.

Pre and post construction surveys should be undertaken to document the existing conditions of properties/infrastructure/adjoining structures prior to the start of construction and at the end of project for determining/establishing any substantial changes resulting from construction within the zones of influence.

9. CHEMICAL ANALYSES & PRELIMINARY METHANE SCREENING

Three soil samples from boreholes 1 & 6 between depths of 3m & 8m, were submitted to Fisher Environmental laboratories for chemical analyses related to potential sulphate attack on buried concrete. Results of testing are presented in Appendix C.

The chemical analyses show that the sulphate concentration in the soil samples varies from 2.6 mg/kg to 8.6 mg/kg or 0.00026% to 0.00094%.

According to CSA-A23. 1-09 Table 3, the result indicates negligible degree of exposure to sulphate attack.

A Landtec GEM-5000 methane detector was used to conduct preliminary screening for methane in monitoring wells MW1, MW5 and MW6. No measurable quantity was detected in any of the three wells at the time of our screening.

10. GENERAL CONSIDERATIONS

This report is limited in scope to those items specifically referenced in the text. No other testing and design calculations have been performed except as specifically reported.

The discussions and recommendations presented in this report are intended for the sole guidance of the client named and the design consultants. It should not be relied upon for any other purpose.

The information on which these recommendations are based is subject to confirmation by engineering personnel at the time of construction.

The fact that localised variations in the subsurface conditions may be present between and beyond the boreholes and that those conditions may be significantly different from the general description provided for design purposes should be understood.

Contractors bidding on or undertaking the work should decide on their own investigations, as well as their own interpretations of the factual borehole results. This concern specifically applies to the classification of the subsurface soils and the potential reuse of these soils on/off Site. Contractors must draw their own conclusions as to how the near surface and subsurface conditions may affect them.

It is strongly urged that Fisher be contacted to provide assistance in the interpretation of the borehole records by anyone undertaking work on/or below the ground surface at this site prior to this work being carried out.

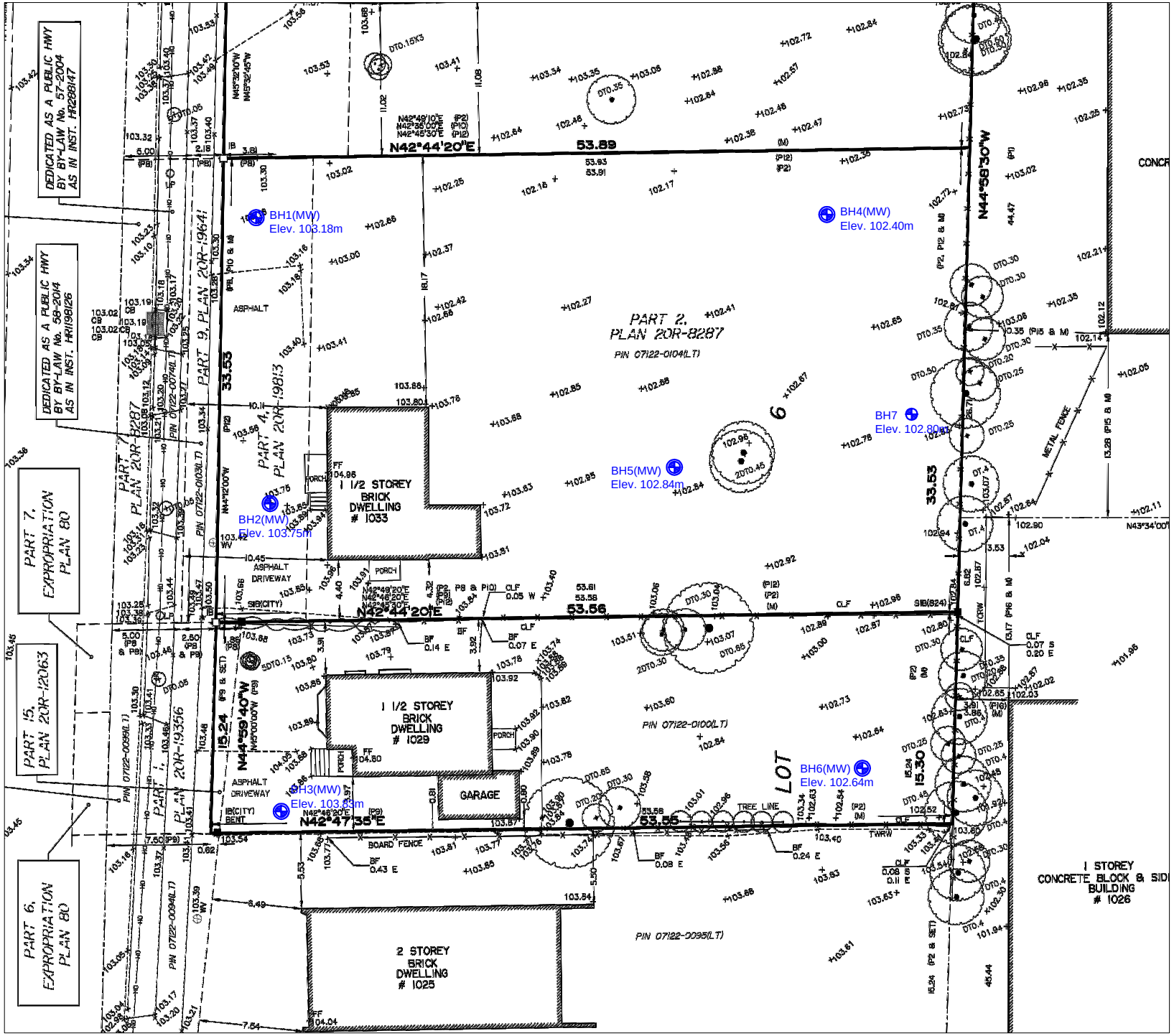
The client expressly agrees that it has entered into this agreement with Fisher, both on its own behalf and as agent on behalf of its employees and principals.

The client expressly agrees that Fisher's employees and principals shall have no personal liability to the client in respect of a claim, whether in contract, tort and/or any other cause of action in law. Accordingly, the client expressly agrees that it will bring no proceedings and take no action in any court of law against any of Fisher's employees or principals in their personal capacity.

11. CLOSING

We trust that the foregoing information is sufficient for your present needs and will be pleased to review the contents of this report in greater detail should you so require. Should you require our services further in this regard, please do not hesitate to contact our office.

APPENDIX A – SITE PLAN



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NORTH

LEGEND

Borehole/
Monitoring Well

PROJECT NAME AND ADDRESS

HYDROGEOLOGICAL & GEOTECHNICAL INVESTIGATIONS

1029-1033 WATERDOWN ROAD, BURLINGTON, ONTARIO

FIGURE 1:

SITE PLAN WITH BOREHOLE LOCATIONS

PROJECT NO.	SHEET NO.
FE-P 21-11236/37	1
DATE: NOVEMBER 2021	
SCALE: AS SHOWN	

APPENDIX B – LOG OF BOREHOLES

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LOG OF BOREHOLE NO. MW1 SHEET. 1 of 2

PROJECT NO.: FE-P 21-11236/ 37

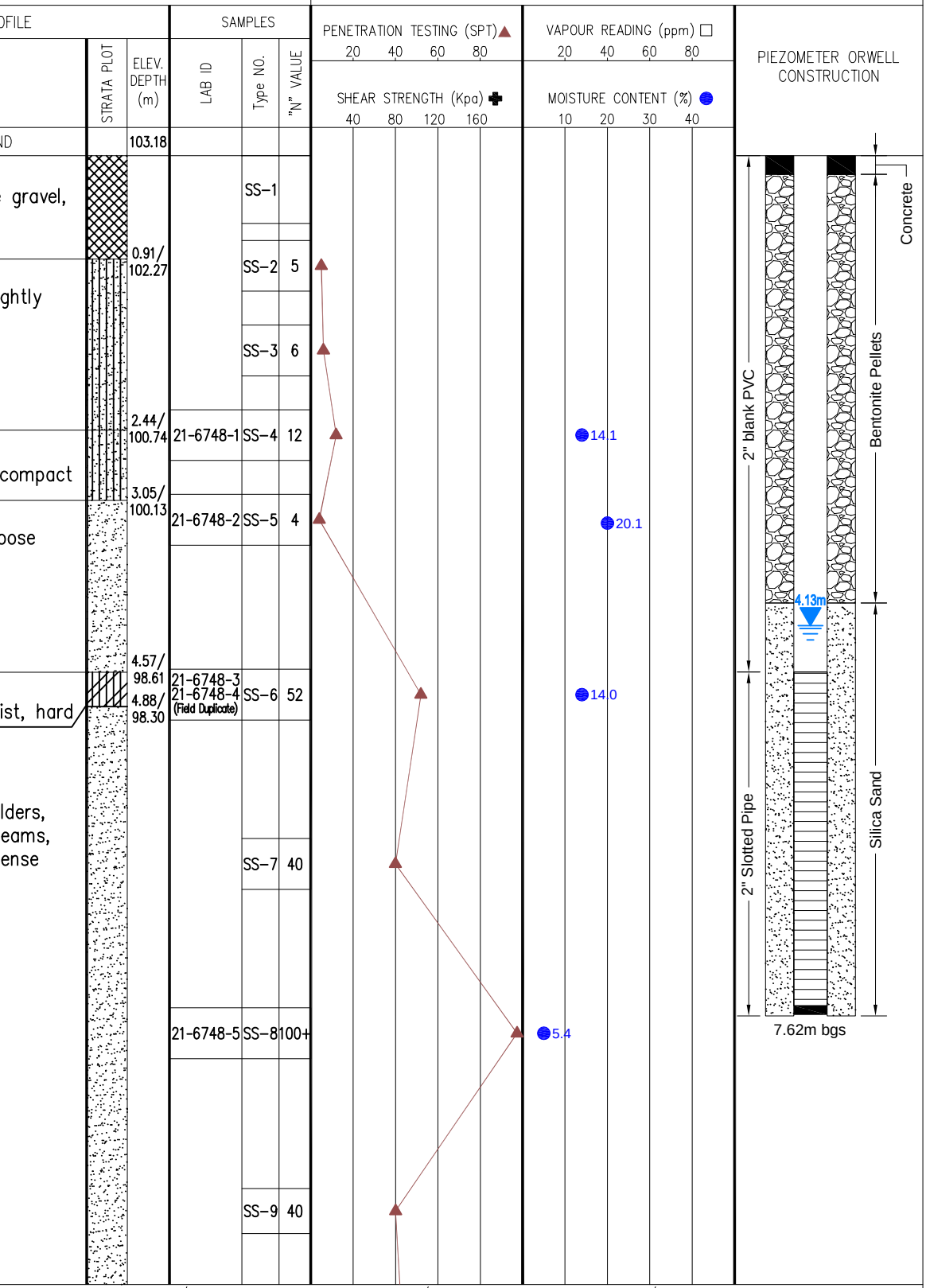
PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 1029-1033 Waterdown Road., Burlington, ON

DRILLING METHOD: CME-75 SOLID STEM

DRILLING DATE: June 15, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GRAVEL and SAND		103.18			
0	0	FILL (TOPSOIL): Brown sandy silt, some gravel, some roots, dry				SS-1	
2	1			0.91/ 102.27		SS-2	5
4		SANDY SILT: Brown, trace gravel, slightly moist, loose					
6	2					SS-3	6
8				2.44/ 100.74	21-6748-1	SS-4	12
		SILTY SAND: Reddish brown, moist, compact					
10	3			3.05/ 100.13	21-6748-2	SS-5	4
12	4	SAND: Brown, moist to wet, loose @ 3.66m, wet					
14				4.57/ 98.61	21-6748-3		
16	5	CLAYEY SILT: Red brown, slightly moist, hard		4.88/ 98.30	21-6748-4 (Field Duplicate)	SS-6	52
18		SAND: Grey, trace gravel, occasional cobbles/boulders, occasional clayey silt seams, moist, dense to very dense					
20	6					SS-7	40
22	7						
24							
26	8				21-6748-5	SS-8	100+
28							
30	9					SS-9	40
32	10						



Groundwater Depth: on completion: 3.66m/ On Jun 21, 2021: 4.07m/ On Jun 30, 2021: 4.20/ On Jul 21, 2021: 4.13m

DRAWN: AM LOGGED: CW CHECKED:

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LOG OF BOREHOLE

NO. MW1 SHEET. 2 of 2

PROJECT NO.:

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 1029–1033 Waterdown Road., Burlington, ON

DRILLING METHOD: CME–75 SOLID STEM

DRILLING DATE: June 15, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	SAMPLES Type NO.	SAMPLES "N" VALUE	PENETRATION TESTING (SPT) ▲ 20 40 60 80 / SHEAR STRENGTH (Kpa) ✚ 40 80 120 160	VAPOUR READING (ppm) □ 20 40 60 80 / MOISTURE CONTENT (%) ● 10 20 30 40	PIEZOMETER ORWELL CONSTRUCTION
		GROUND SURFACE (m asl)								
32	10	SAND: Grey, trace gravel, occasional cobbles/boulders, occasional clayey silt seams, moist, dense to very dense								
34										
36	11					SS–10	45			
38										
40	12					SS–11	50			
42	13	End of Borehole		12.65/ 90.53						
44										
46	14									
48										
50	15									
52	16									
54										
56	17									
58										
60	18									
62	19									
64										

Groundwater Depth: on completion: 3.66m/ On Jun 21, 2021: 4.07m/ On Jun 30, 2021: 4.20/ On Jul 21, 2021: 4.13m

DRAWN: AM LOGGED: CW CHECKED:

FISHER ENGINEERING

LOG OF BOREHOLE NO. MW2 SHEET. 1 of 2

PROJECT NO.: FE-P 21-11236/ 37

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 1029-1033 Waterdown Road., Burlington, ON

DRILLING METHOD: CME-75 SOLID STEM

DRILLING DATE: June 15, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	ELEV. DEPTH (m)	LAB ID	SAMPLES Type NO.	"N" VALUE
		GRAVEL and SAND	103.75			
0	0	FILL: Brown sandy silt, trace gravel, dry			SS-1	
2			0.76/ 102.99			
4	1	SANDY SILT/SILTY SAND: Brown, trace gravel, slightly moist, loose			SS-2	6
6	2				SS-3	7
8		SILTY SAND: Reddish brown, moist compact	2.29/ 101.46		SS-4	10
10	3	SAND: Brownish grey, moist, compact	3.05/ 100.70		SS-5	12
12	4					
14						
16	5	CLAYEY SILT/ SILTY CLAY: Red to brown, moist, very stiff	4.88/ 98.87		SS-6	18
18		SAND: grey, some gravel, moist to wet, dense to very dense	5.49/ 98.26			
20	6				SS-7	30
22	7					
24						
26	8				SS-8	100+
28						
30	9	GRAVEL: Grey, trace sand, trace cobbles, slightly moist, very dense	9.14/ 94.61		SS-9	100+
32	10					

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER ORWELL CONSTRUCTION

Concrete

Bentonite Pellets

2" blank PVC

2" Slotted Pipe

Silica Sand

7.62m bgs

Groundwater Depth: on completion: Dry/ On Jun 21, 2021: Dry/ On Jun 30, 2021: Dry/ On Jul 14, 2021: Dry

DRAWN: AM LOGGED: CW CHECKED:

FISHER ENGINEERING

LOG OF BOREHOLE

NO. MW2 SHEET. 2 of 2

PROJECT NO.:

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 1029–1033 Waterdown Road., Burlington, ON

DRILLING METHOD: CME–75 SOLID STEM

DRILLING DATE: June 15, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	SAMPLES Type NO.	SAMPLES "N" VALUE	PENETRATION TESTING (SPT) ▲ 20 40 60 80 / SHEAR STRENGTH (Kpa) ✚ 40 80 120 160	VAPOUR READING (ppm) □ 20 40 60 80 / MOISTURE CONTENT (%) ● 10 20 30 40	PIEZOMETER ORWELL CONSTRUCTION
		GROUND SURFACE (m asl)								
32	10	GRAVEL: Grey, trace sand, trace cobbles, slightly moist, very dense		10.67/ 93.08						
36	11	SAND: Grey, dry, very dense		11.58/ 92.17		SS–10	100+	▲		
38	12	GRAVEL: Grey, trace sand, trace cobbles, slightly moist, very dense				SS–11	100+	▲		
46	14					SS–12	100+	▲		
		End of Borehole		14.17/ 89.58						

Groundwater Depth: on completion: Dry/ On Jun 21, 2021: Dry/ On Jun 30, 2021: Dry/ On Jul 14, 2021: Dry

DRAWN: AM LOGGED: CW CHECKED:

FISHER ENGINEERING

LOG OF BOREHOLE

NO. MW3 SHEET. 1 of 1

PROJECT NO.: FE-P 21-11236/ 37

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 1029-1033 Waterdown Road., Burlington, ON

DRILLING METHOD: GEOPROBE SOLID STEM

DRILLING DATE: June 16, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		103.83			
0	0	FILL: Sandy gravel, grey, trace silt, dry				SS-1	
2				0.61/ 103.22			
4	1	SILTY SAND: Brown, trace gravel, slightly moist, loose to compact				SS-2	9
6	2	SANDY SILT: Red to brown, wet, compact		1.83/ 102.00		SS-3	13
8				2.59/ 101.24		SS-4	12
10	3	SAND: Grey, trace gravel, moist, compact				SS-5	22
12	4						
14				4.72/ 99.11	21-6748-6	SS-6	28
16	5	SILTY CLAY: Red to brown, moist, very stiff		5.18/ 98.65			
18		SAND with GRAVEL: Grey, occasional cobbles/ boulders, moist, very dense, wet @ 5.49m, occasional clayey/silty seams					
20	6					SS-7	60
22	7						
24					21-6748-7	SS-8	100+
26	8						
28	9						
30					21-6748-8	SS-9	100+
32	10	End of Borehole		9.60/ 94.23			

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

18.2

8.2

7.2

PIEZOMETER ORWELL CONSTRUCTION

Concrete

2" blank PVC

Bentonite Pellets

2" Slotted Pipe

Silica Sand

7.60m

7.62m bgs

Groundwater Depth: on completion: 6.71m/ On Jun 21, 2021: 7.54m/ On Jun 30, 2021: 7.62m/ On Jul 14, 2021: 7.60m

DRAWN: AM LOGGED: CW CHECKED:

LOG OF BOREHOLE

NO. MW4 SHEET. 1 of 2

PROJECT NO.: FE-P 21-11236/ 37

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 1029-1033 Waterdown Road., Burlington, ON

DRILLING METHOD: GEOPROBE SOLID STEM

DRILLING DATE: June 17, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)	102.40			
0	0	TOPSOIL: Brown sandy silt, trace gravel, dry	0.61/ 101.79		SS-1	
2	1	SILTY SAND to SANDY SILT: Brown, slightly moist, loose	1.68/ 100.72		SS-2	6
4					SS-3	6
6	2	SAND: Grey, wet, loose to compact	3.20/ 99.20		SS-4	12
8					SS-5	4
10	3	SILTY CLAY: Red to brown, moist, firm	4.57 97.83			
12	4					
14						
16	5	SAND: Grey, wet, compact	6.10/ 96.30		SS-6	13
18						
20	6	SILTY CLAY: red, brown, slightly moist, hard	7.01/ 95.39		SS-7	31
22	7					
24		SAND and GRAVEL: Brownish grey, wet, dense		21-6748-9	SS-8	32
26	8					
28						
30	9			21-6748-10	SS-9	33
32	10					

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

10.9

10.8

PIEZOMETER ORWELL CONSTRUCTION

Concrete

Bentonite Pellets

2" blank PVC

2" Slotted Pipe

Silica Sand

5.50m

7.62m bgs

Groundwater Depth: on completion: 6.71m/ On Jun 21, 2021: 5.57m/ On Jun 30, 2021: 5.49m/ On Jul 14, 2021: 5.50m

DRAWN: AM LOGGED: CW CHECKED:

FISHER ENGINEERING

LOG OF BOREHOLE

NO. MW4 SHEET. 2 of 2

PROJECT NO.:

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 1029–1033 Waterdown Road., Burlington, ON

DRILLING METHOD: GEOPROBE SOLID STEM

DRILLING DATE: June 17, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: LAB ID	SAMPLES: Type NO.	SAMPLES: "N" VALUE
		GROUND SURFACE (m asl)					
32	10	SAND and GRAVEL: Brownish grey, wet, dense					
				10.67/ 91.73			
34		SAND: Grey, fine to medium, moist, very dense				SS-10	52
36	11			11.13/ 91.27			
		End of Borehole					
38	12						
40							
42	13						
44							
46	14						
48							
50	15						
52	16						
54							
56	17						
58							
60	18						
62	19						
64							

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER ORWELL CONSTRUCTION

Groundwater Depth: on completion: 6.71m/ On Jun 21, 2021: 5.57m/ On Jun 30, 2021: 5.49m/ On Jul 14, 2021: 5.50m

DRAWN: AM LOGGED: CW CHECKED:

FISHER ENGINEERING

LOG OF BOREHOLE

NO. MW5 SHEET. 1 of 2

PROJECT NO.: FE-P 21-11236/ 37

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 1029-1033 Waterdown Road., Burlington, ON

DRILLING METHOD: GEOPROBE SOLID STEM

DRILLING DATE: June 17, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)	102.84			
0	0	TOPSOIL: Brown sandy silt, trace gravel, some roots, organics, moist	0.61/ 102.23		SS-1	
2	1	SAND: Brown, some roots, moist, very loose			SS-2	3
4						
6	2				SS-3	3
8					SS-4	3
10	3				SS-5	2
12			3.66/ 99.18			
	4	SAND and GRAVEL: Grey, moist, very dense				
14						
16	5				SS-6	64
18						
20	6		6.10/ 96.74		SS-7	23
		SAND and GRAVEL: Grey, moist, compact very dense				
22	7					
24			7.62/ 95.22			
	8	GRAVEL: Grey, trace sand, dry, very dense		21-6748-11	SS-8	100+
26						
28	9					
30					SS-9	100+
32	10					

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

● 4.6

PIEZOMETER ORWELL CONSTRUCTION

Concrete

Bentonite Pellets

2" blank PVC

2" Slotted Pipe

Silica Sand

9.14m bgs

Groundwater Depth: on completion: 7.01m/ On Jun 21, 2021: Dry/ On Jun 30, 2021: Dry/ On Jul 14, 2021: Dry

DRAWN: AM LOGGED: CW CHECKED:

FISHER ENGINEERING

LOG OF BOREHOLE

NO. MW5 SHEET. 2 of 2

PROJECT NO.:

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 1029–1033 Waterdown Road., Burlington, ON

DRILLING METHOD: GEOPROBE SOLID STEM

DRILLING DATE: June 17, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	SAMPLES Type NO.	SAMPLES "N" VALUE
		GROUND SURFACE (m asl)					
32	10	GRAVEL: Grey, trace sand, dry, very dense		10.67/ 92.17			
34							
36	11	GRAVELY SAND: Grey, moist, very dense				SS-10	60
38							
40	12	SAND: Grey, trace gravel, wet, very dense		12.19/ 90.65		SS-11	53
42	13						
44							
46	14			14.17/ 88.67		SS-12	60
		End of Borehole					
48	15						
50							
52	16						
54							
56	17						
58							
60	18						
62	19						
64							

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER ORWELL CONSTRUCTION

Groundwater Depth: on completion: 7.01m/ On Jun 21, 2021: Dry/ On Jun 30, 2021: Dry/ On Jul 14, 2021: Dry

DRAWN: AM LOGGED: CW CHECKED:

FISHER ENGINEERING

LOG OF BOREHOLE NO. MW6 SHEET. 1 of 2

PROJECT NO.: FE-P 21-11236/ 37

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 1029-1033 Waterdown Road., Burlington, ON

DRILLING METHOD: GEOPROBE SOLID STEM

DRILLING DATE: June 16, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	SAMPLES Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		102.64			
0	0	TOPSOIL: Dark brown sandy silt with roots, trace gravel, moist				SS-1	
2				0.61/ 102.03			
4	1	SILTY SAND to SANDY SILT: Brown, slightly moist, loose to compact				SS-2	7
6	2					SS-3	10
8				2.59/ 100.05		SS-4	11
10	3	SAND: Grey to greyish brown, trace gravel, moist, compact				SS-5	25
12	4						
14							
16	5			4.88/ 97.76		SS-6	26
		SILTY CLAY: Brown, moist very stiff		5.49/ 97.15			
18		SAND with GRAVEL: Grey, ccasional cobbles/boulders, moist, dense to very dense,					
20	6				21-6748-12	SS-7	40
22	7						
24							
26	8					SS-8	100+
28							
30	9			9.30/ 93.34		SS-9	24
32	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

● 6.0

PIEZOMETER ORWELL CONSTRUCTION

Concrete

Bentonite Pellets

2" blank PVC

2" Slotted Pipe

Silica Sand

7.62m bgs

Groundwater Depth: on completion: 10.67m/ On Jun 21, 2021: Dry/ On Jun 30, 2021: Dry/ On Jul 14, 2021: Dry

DRAWN: AM LOGGED: CW CHECKED:

FISHER ENGINEERING

LOG OF BOREHOLE

NO. MW6 SHEET. 2 of 2

PROJECT NO.:

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 1029–1033 Waterdown Road., Burlington, ON

DRILLING METHOD: GEOPROBE SOLID STEM

DRILLING DATE: June 16, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	SAMPLES Type NO.	SAMPLES "N" VALUE	PENETRATION TESTING (SPT) ▲ 20 40 60 80 / SHEAR STRENGTH (Kpa) ✚ 40 80 120 160	VAPOUR READING (ppm) □ 20 40 60 80 / MOISTURE CONTENT (%) ● 10 20 30 40	PIEZOMETER ORWELL CONSTRUCTION
		GROUND SURFACE (m asl)								
32	10	SAND: Grey, medium to fine, occasional cobbles/boulders, dry to wet, compact to dense wet @10.69m								
34										
36	11					SS-10	39			
38										
40	12					SS-11	44			
42		End of Borehole		12.65/ 89.99						
44	13									
46	14									
48										
50	15									
52	16									
54										
56	17									
58										
60	18									
62	19									
64										

Groundwater Depth: on completion: 10.67m/ On Jun 21, 2021: Dry/ On Jun 30, 2021: Dry/ On Jul 14, 2021: Dry

DRAWN: AM LOGGED: CW CHECKED:

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH7 SHEET. 1 of 1

PROJECT NO.: FE-P 21-11236/ 37

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 1029-1033 Waterdown Road., Burlington, ON

DRILLING METHOD: GEOPROBE SOLID STEM

DRILLING DATE: June 16, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	SAMPLES Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		102.80			
0	0	TOPSOIL: Brown sandy silt, trace gravel, debris, roots, moist				SS-1	
2				0.76/ 102.04			
4	1	SANDY SILT to SILTY SAND: Brown, trace gravel, moist, loose to compact				SS-2	8
6	2					SS-3	10
8				2.44/ 100.36		SS-4	12
10	3	SAND: Greyish brown, trace gravel, slightly moist, compact				SS-5	24
12	4						
14							
16	5	SILTY CLAY: Brown, most, very stiff		4.72/ 98.08		SS-6	24
18							
20	6	SAND and GRAVEL: grey, trace silt, occasional cobbles/boulders, moist, dense to very dense,		6.10/ 96.70		SS-7	37
22	7						
24							
26	8					SS-8	75
28							
30	9			9.14/ 93.66			
		SAND: Grey, medium to fine, moist, compact, wet				SS-9	27
32	10	End of Borehole		9.60/ 93.20			

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER ORWELL CONSTRUCTION

Groundwater Depth: on completion: 9.15m

DRAWN: AM LOGGED: CW CHECKED:

APPENDIX C – MOISTURE CONTENT AND GRAIN SIZE ANALYSES RESULTS

FISHER ENVIRONMENTAL LABORATORIES

FULL RANGE ANALYTICAL SERVICES • SOIL/WATER/AIR TESTING • ENVIRONMENTAL COMPLIANCE PACKAGES • 24 HOUR EMERGENCY RESPONSE • CALA ACCREDITED

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www.fisherenvironmental.com

Client: Infinity Development
Address: 1029/1033 Waterdown Road
Burlington ON

Tel.:
Email:
Attn.:

F.E. Job #: 21-6748
Project Name: Geotechnical and Hydrogeological
Project ID: FE-P 21-11236 & 21-11237
Date Sampled: 15-Jun-2021
Date Received: 18-Jun-2021
Date Reported: 25-Jun-2021
Location: 1029/1033 Waterdown Road
Burlington ON

Certificate of Analysis

Analyses	Matrix	Quantity	Date Extracted	Date Analyzed	Lab SOP	Method Reference
pH	Soil	5	22-Jun-21	22-Jun-21	pH-EC-SAR F-16	SW-846, 9045D
Chloride	Soil	2	N/A	24-Jun-21	Chloride F-20	SM 4500-Cl-E
Sulphate	Soil	3	24-Jun-21	24-Jun-21	Sulphate F-21	SM 4500-SO_4
Moisture Content	Soil	12	21-Jun-21	21-Jun-21	Support Procedures F-99	Carter (1993)
Grain Size	Soil	6	N/A	22-May-21	Grain Size F-28	ASTM D6913-04

Fisher Environmental Laboratories is accredited by CALA (the Canadian Association for Laboratory Accreditation Inc.) for specific parameters as required by Ontario Regulation 153/04. All analytical testing has been performed in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act published by Ontario Ministry of the Environment.

Authorized by:

Roger Lin, Ph. D., C. Chem.
Laboratory Manager

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
Ronggen (Roger) Lin
CHEMIST

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	12 Soil Sample(s)

Parameter	***21-6748-2*** BH1 3.00-3.45m	***21-6748-5*** BH1 7.55-8.05m	***21-6748-7*** BH3 7.55-8.05m	***21-6748-9*** BH4 7.55-8.05m	***21-6748-12*** BH6 6.05-6.50m	**Soil Standards** *
pH *(pH unit)*	7.85	8.40	8.51	8.17	7.08	(5-11) 5-9

* Surface soil pH value from 5 - 9, Sub-surface soil pH value from 5-11.

QA/QC Report

Parameter	**LCS**	**AR**	**Duplicate**	**AR**		
	Absolute Difference *(pH Unit)*					
pH *(pH unit)*	7.05	6.90-7.20	0.02	<0.3		

LEGEND:
LCS - Laboratory Control Sample
AR - Acceptable Range

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	12 Soil Sample(s)

Parameter	***21-6748-7*** BH3 7.55-8.05m	***21-6748-9*** BH4 7.55-8.05m				
	Concentration (µg/g)					
Chloride in Soil	70	56				

< result obtained was below RL (Reporting Limit).

QA/QC Report

Parameter	**Blank**	**RL**	**LCS**	**AR**	**MS**	**AR**
	(µg/g)		**Recovery (%)**		**Recovery (%)**	
Chloride in Soil	<10	10	97	70-130	108	70-130

Parameter	**Duplicate**	**AR**				
	RPD (%)					
Chloride in Soil	3.7	0-20				

LEGEND:

RL - Reporting Limit
LCS - Laboratory Control Sample
MS - Matrix Spike
AR - Acceptable Range
RPD - Relative Percent Difference

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	12 Soil Sample(s)

Parameter	***21-6748-2*** BH1 3.00-3.45m	***21-6748-5*** BH1 7.55-8.05m	***21-6748-12*** BH6 6.05-6.50m			
Sulphate *(mg/kg)*	8.6	2.6	3			

QA/QC Report

Parameter	**Blank**	**RL**	**LCS/Spike**	**AR**	**Duplicate**	**AR**
	(mg/kg)		**Recovery (%)**		**RPD (%)**	
Sulphate	<1	1	95	70-130	22	0-30

LEGEND:
RL - Reporting Limit
LCS - Laboratory Control Sample
AR - Acceptable Range
RPD - Relative Percent Difference

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	12 Soil Sample(s)

Parameter	***21-6748-1*** BH1 2.25-2.70m	***21-6748-2*** BH1 3.00-3.45m	***21-6748-3*** BH1 4.55-5.00m A	***21-6748-4*** BH1 4.55-5.00m B	***21-6748-5*** BH1 7.55-8.05m	***21-6748-6*** BH3 4.55-5.00m
Moisture Content (%)	14.1	20.1	14.6	13.3	5.4	18.2

Parameter	***21-6748-7*** BH3 7.55-8.05m	***21-6748-8*** BH3 9.15-9.55m	***21-6748-9*** BH4 7.55-8.05m	***21-6748-10*** BH4 9.15-9.55m	***21-6748-11*** BH5 7.55-8.05m	***21-6748-12*** BH6 6.05-6.50m
Moisture Content (%)	8.2	7.2	10.9	10.8	4.6	6.0

QA/QC Report

Parameter	**Blank**	**RL**	**LCS**	**AR**	**Duplicate**	**AR**
			Recovery (%)		**RPD (%)**	
Moisture Content (%)	<0.1	0.1	100	70-130	4.5	0-20

LEGEND:
RL - Reporting Limit
LCS - Laboratory Control Sample
AR - Acceptable Range
RPD - Relative Percent Difference

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	12 Soil Sample(s)

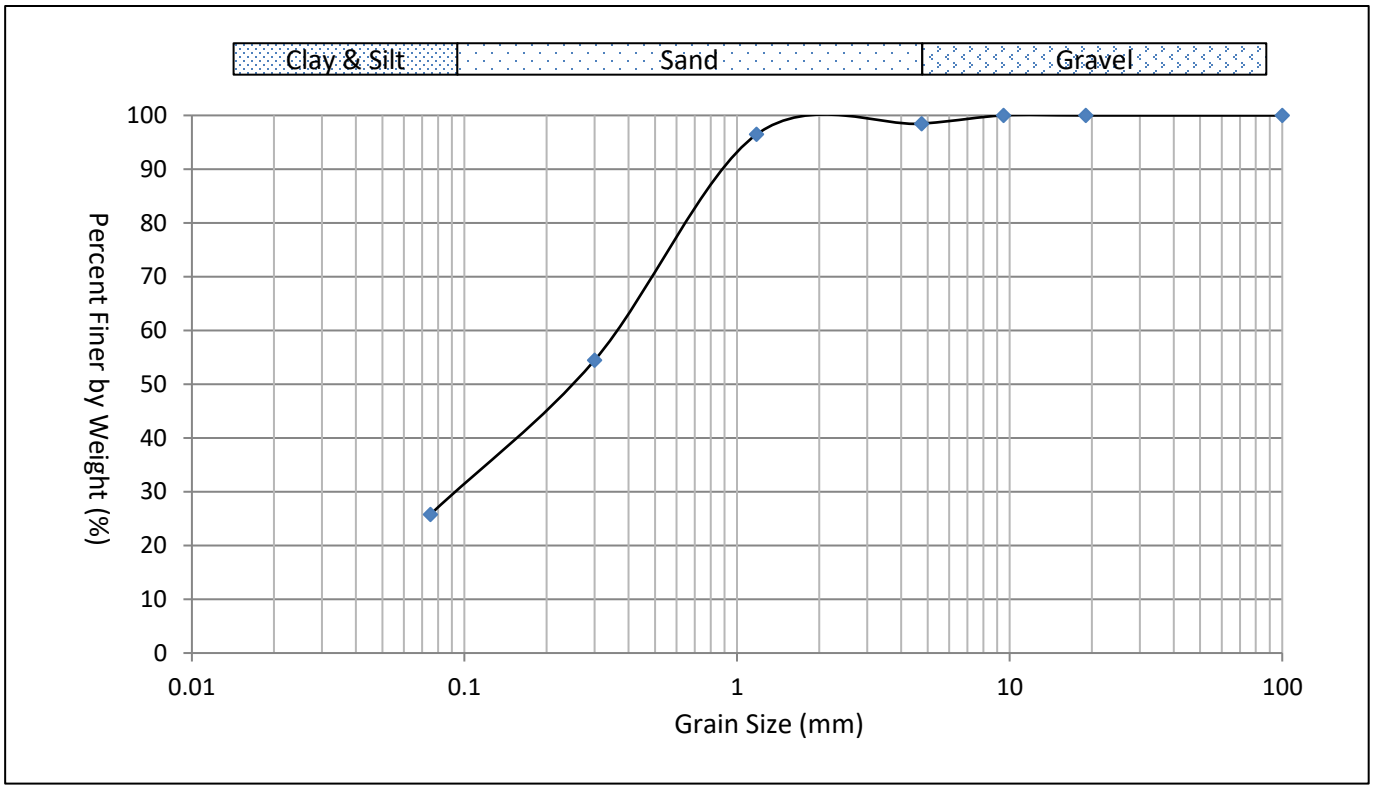
Parameter	***21-6748-3*** BH1 4.55-5.00m A	***21-6748-4*** BH1 4.55-5.00m B	***21-6748-7*** BH3 7.55-8.05m	***21-6748-9*** BH4 7.55-8.05m	***21-6748-11*** BH5 7.55-8.05m	***21-6748-12*** BH6 6.05-6.50m
Grain Size (%)						
>19mm	0.0	9.2	0.0	0.0	0.0	0.0
9.5mm-19mm	0.0	5.1	5.7	5.9	20.3	13.0
4.75mm-9.5mm	1.5	2.5	6.5	3.5	31.6	6.8
1.18m-4.75mmm	2.0	2.5	33.4	11.3	21.0	38.9
300um-1.18mm	42.0	8.5	32.4	42.4	4.7	20.8
75um-300um	28.7	19.9	10.7	20.2	9.8	6.0
<75um	25.8	52.2	11.4	16.7	12.7	14.5
Clay & Silt	**26**	**52**	**11**	**17**	**13**	**14**
Sand	**73**	**31**	**77**	**74**	**35**	**66**
Gravel	**2**	**17**	**12**	**9**	**52**	**20**

Results related only to the items tested

Grain Size Distribution

Sample ID: 21-6748-3 BH1 4.55-5.00m A

Clay & Silt: 26% Sand: 73% Gravel: 2%

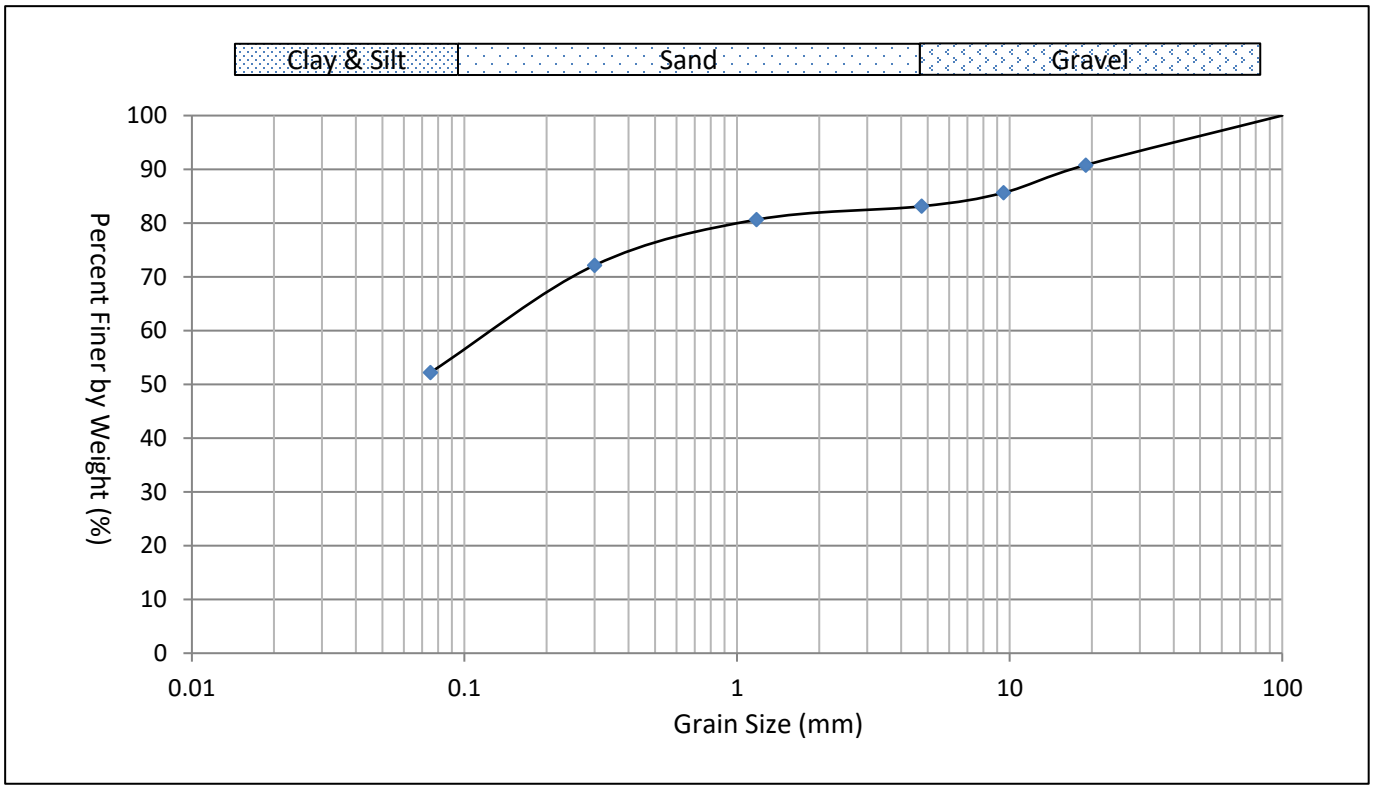


Results related only to the items tested

Grain Size Distribution

Sample ID: 21-6748-4 BH1 4.55-5.00m B

Clay & Silt: 52% Sand: 31% Gravel: 17%

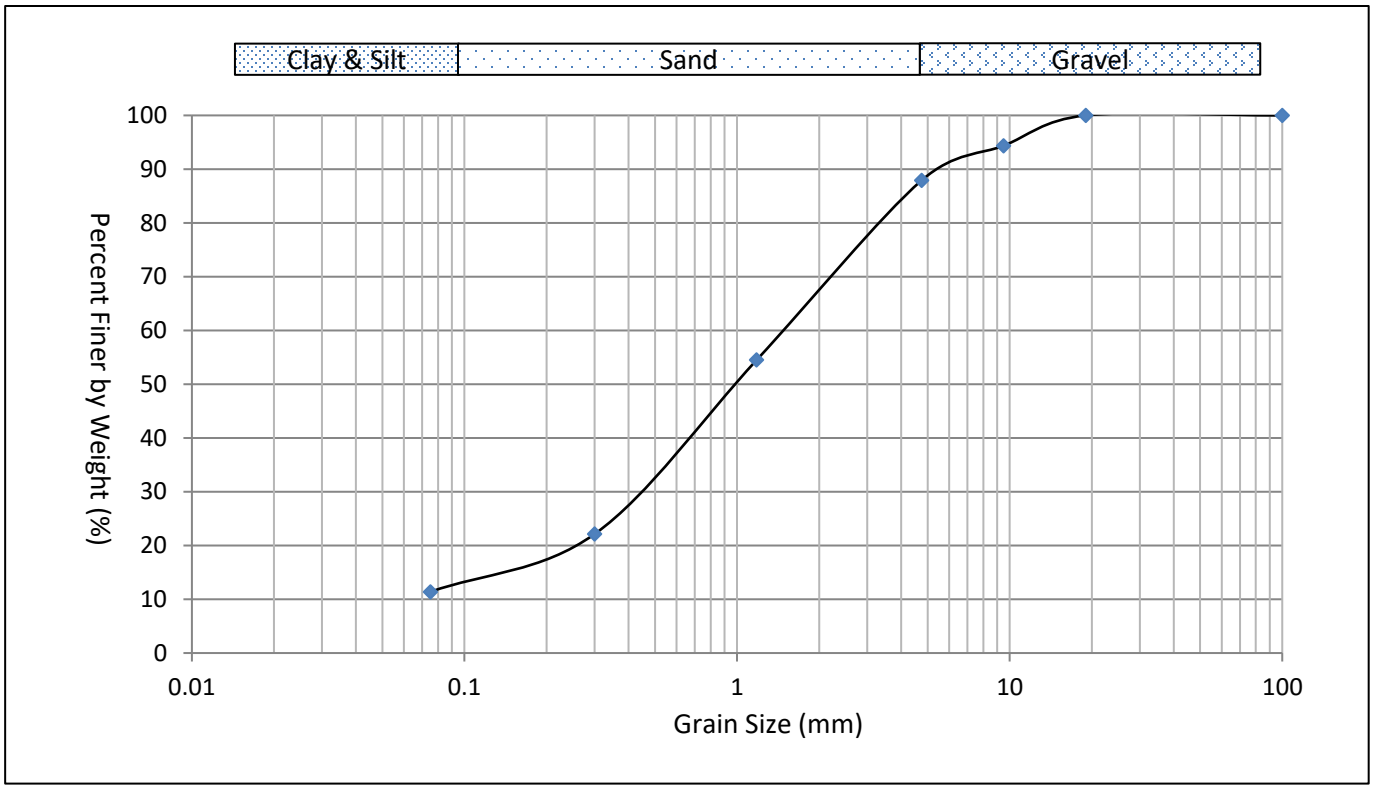


Results related only to the items tested

Grain Size Distribution

Sample ID: 21-6748-7 BH3 7.55-8.05m

Clay & Silt: 11% Sand: 77% Gravel: 12%

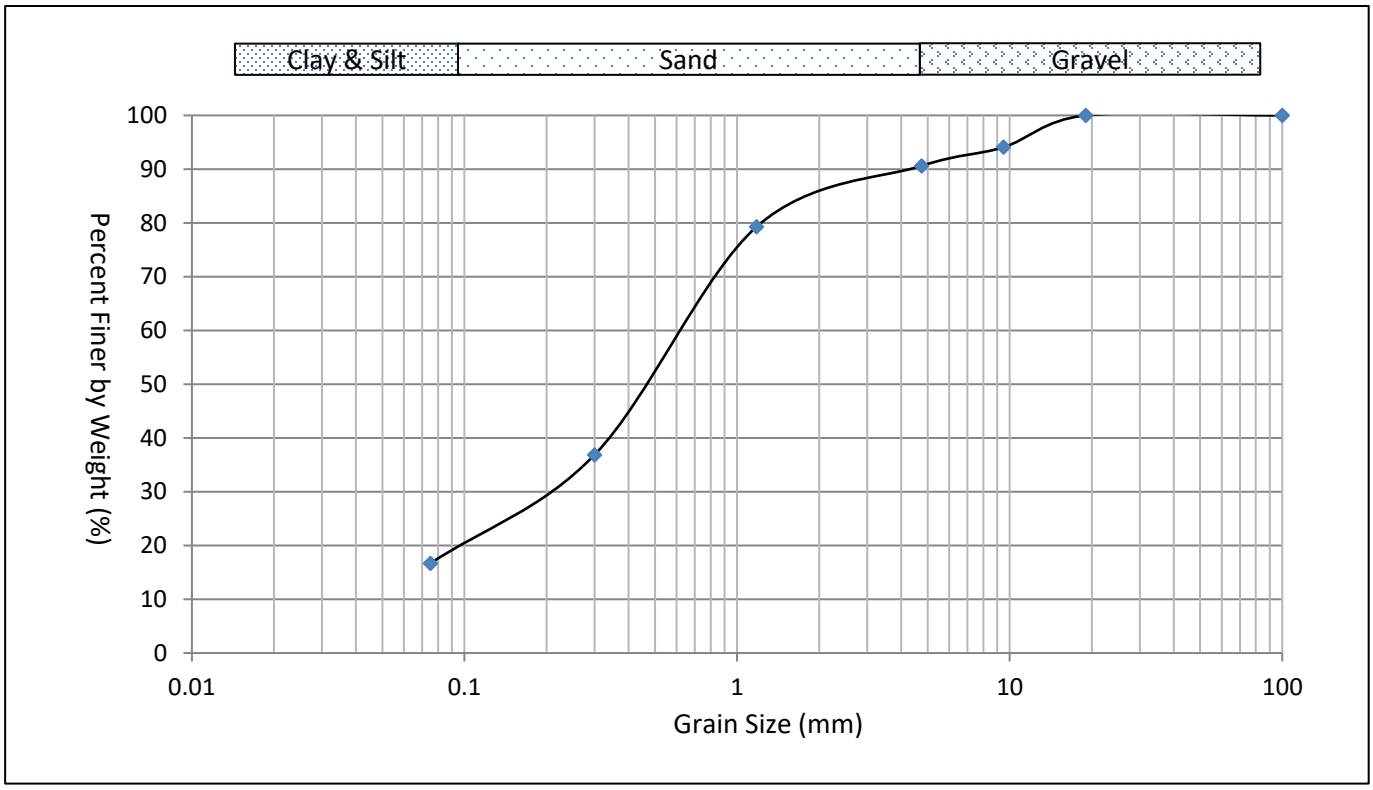


Results related only to the items tested

Grain Size Distribution

Sample ID: 21-6748-9 BH4 7.55-8.05m

Clay & Silt: 17% Sand: 74% Gravel: 9%

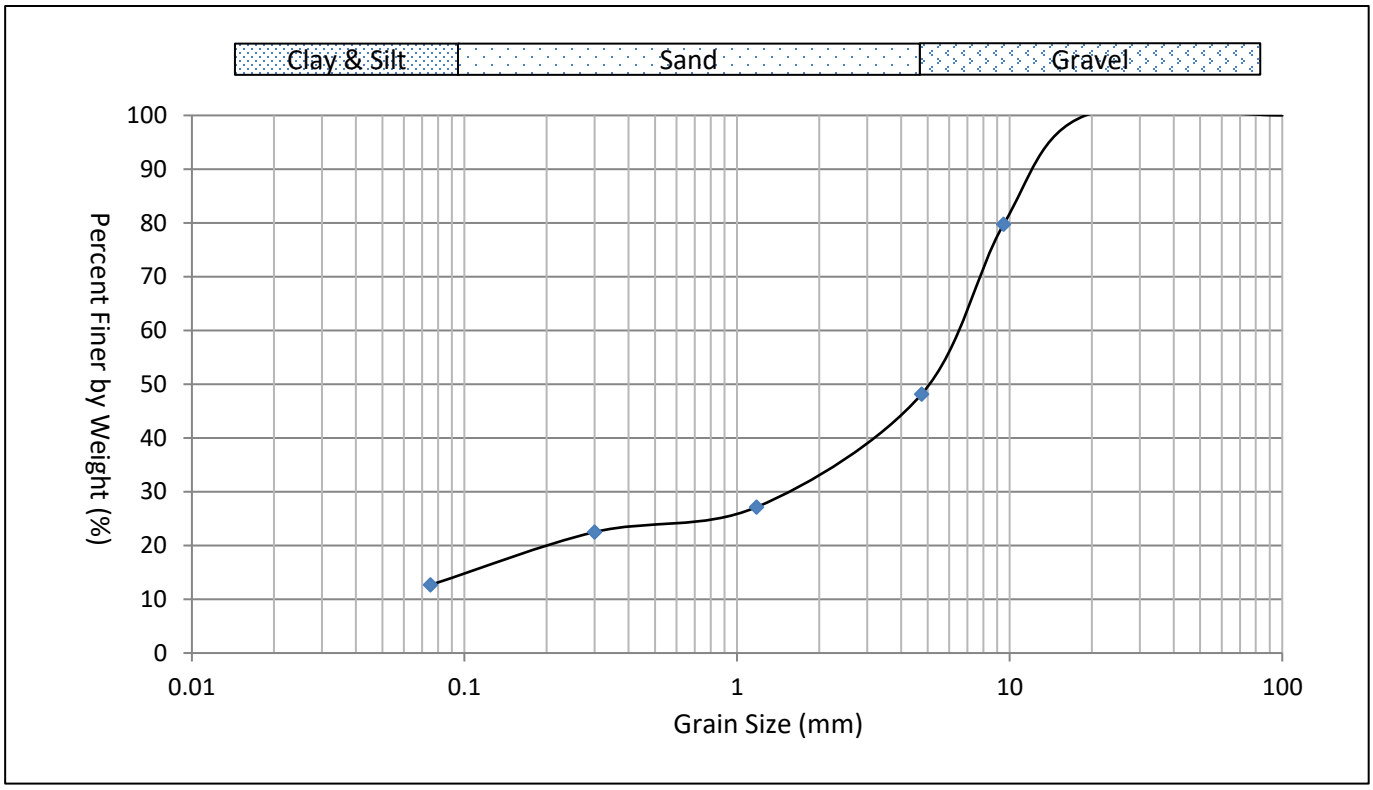


Results related only to the items tested

Grain Size Distribution

Sample ID: 21-6748-11 BH5 7.55-8.05m

Clay & Silt: 13% Sand: 35% Gravel: 52%



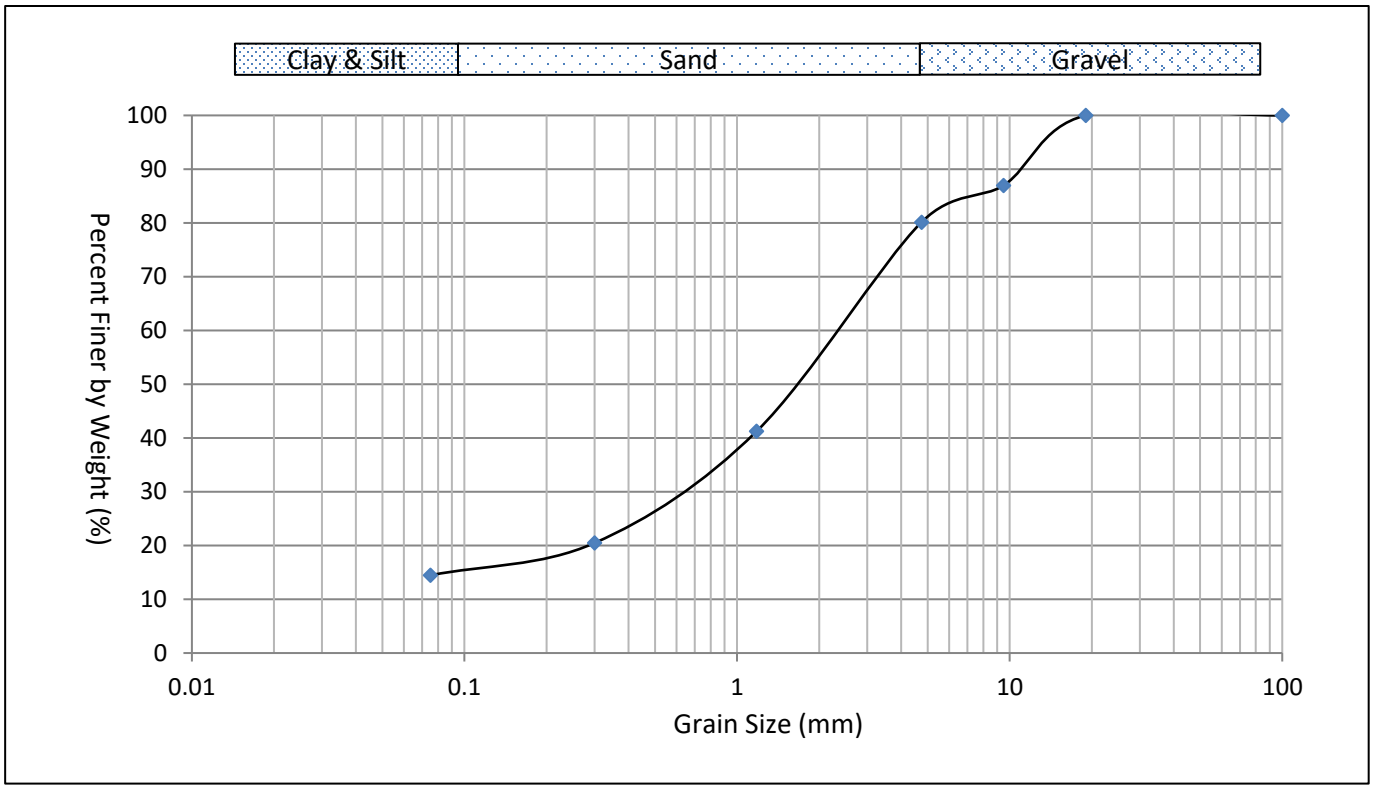
Results related only to the items tested

Client: Infinity Development ***F.E. Job #:*** 21-6748

Grain Size Distribution

Sample ID: 21-6748-12 BH6 6.05-6.50m

Clay & Silt: 14% Sand: 66% Gravel: 20%



Results related only to the items tested