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INFINITY DEVELOPMENT GROUP

HYDROGEOLOGICAL INVESTIGATION



1029 & 1033 WATERDOWN ROAD, BURLINGTON, ONTARIO

Prepared for:

Infinity Development Group

Project No. FE-P 21-11237H

August 9, 2021

Updated November 24, 2021

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1. INTRODUCTION

Fisher Engineering Limited was retained by Infinity Development Group to carry out a Hydrogeological Investigation for the proposed redevelopment at the property located at 1029 & 1033 Waterdown Road in Burlington, Ontario, hereinafter referred to as the 'Site'.

The purpose of the Hydrogeological Investigation was to evaluate the groundwater conditions with respect to the future redevelopment of the site.

The report has been prepared specifically and solely for the proposed development regarding hydrogeological aspects for design and construction.

The report was updated to reflect Architectual Plans by Zedd Architecture, dated August 24, 2021 and the results of long term groundwater level monitoring carried out over the period June to November 2021.

Changes to the report with respect to earlier versions are as follows:

- Construction groundwater dewatering flowrate of **45.18 m^3/day instead of 36.22 m^3/day** and
- Permanent drainage rate of **27.76 m^3/day instead of 25.22 m^3/day**.
- Elevations changed from assumed to geodetic based on topographic survey.

2. SITE AND PROJECT DESCRIPTIONS

Site Settings

The subject property is located on the east side of Waterdown Road, in a mixed commercial - residential neighborhood south of Highway 403, in the City of Burlington and is bounded by Waterdown Road to the west, beyond which are residences and a fire hall, houses to the north, commercial properties to the east and houses converted to offices to the south. The site has an approximate area of 2484m^2.

At the time of investigation, the site was occupied by single family dwellings. The property was generally landscaped with mature trees and unpaved driveways.

Topography

The site slopes gentle from west to east with relative elevations changing from approximately 103.83m at BH3 located at the southwest corner of the site, near Waterdown Road, to 102.64 at BH6 located at the southeast corner of the property.

Proposed Development

It was understood that the proposed development will consist of the construction of a 29-storey residential building with two underground levels extending to the property boundaries. Finished floor elevation for P2 underground level was given as 6.1m below grade according to site plans by Zedd Architecture, dated August 24, 2021. Conventional footings would be approximately 1m below FFE at 7m bgs according to the terms of reference provided to Fisher prior to the investigation.

3. SCOPE OF HYDROGEOLOGICAL INVESTIGATION

The Hydrogeological Investigation works were required to:

1) Establish groundwater conditions for the design of dewatering works, if required, prior to construction of the proposed building.
2) Determine the need for permanent drainage and
3) Conduct calculations/analyses of the groundwater quantity and quality to be used for the necessary applications for permits prior to proceeding with construction dewatering and design of permanent drainage, if necessary.

The scope of this work generally consisted of the following:

- **Drilling/locating Monitoring Wells.** Drilling of monitoring wells and reviewing / compiling the borehole logs and onsite / laboratory testing.
- **Data Evaluation.** Evaluating the results of soil types, groundwater static levels, ground surface elevation, groundwater quality, flow direction and other available hydrogeological data for the site and their potential impact on the proposed development.
- **Hydraulic Conductivity Tests.** Conduct single well response tests and record groundwater level drawdown and recovery to model/calculate hydraulic conductivity.
- **Groundwater Quality Analysis.** Carry out laboratory analyses on groundwater to determine compliance with the Ontario Halton Sewer Use Bylaws No. 02-03 (Mar 2003) – Halton Sanitary Sewer and Halton Storm Sewer.
- **Groundwater Level Monitoring.** Conduct long-term monitoring of the groundwater levels to determine the seasonal high-water levels.

- **Hydrogeological Report.** Prepare and submit a report detailing the findings and recommendations of the Hydrogeological Investigation.

4. FIELD AND LABORATORY WORKS

Subsurface exploration for the Hydrogeological Investigation was conducted concurrent with drilling for the Geotechnical Investigation on June 15, 16 & 17, 2021 and consisted of seven (7) boreholes advanced to depths of 9.60m to 14.18m below prevailing grades. The approximate locations of the boreholes and elevations are presented in Appendix A - Borehole Location Plan.

Boreholes BH1 to BH6 were instrumented as monitoring wells (MW1 to MW6) with 2" diameter screens on completion of drilling. A clean silica sand pack was placed around the well screens and isolated with bentonite to depths below prevailing grades as shown in the borehole details in Appendix B.

Track & truck mounted drill rigs equipped with solid stem augers, supplied by Terra Firma Services, was used for all drilling work.

Laboratory Analyses

Soil samples were taken to the Fisher Environmental laboratory for further visual assessment and classification. Twelve (12) representative soil samples from BH1, BH3, BH4, BH5 and BH6 were submitted for moisture content and six (6) for grain size analyses. Five (5) soil sample from BH1, BH3, BH4 and BH6 were submitted for pH, chloride and sulphate analyses. Two (2) soil samples from BH1 and BH4 were submitted to ALS Environmental laboratory for hydrometer tests. The laboratory 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.

One (1) groundwater sample from MW1 was submitted to ALS Environmental laboratory for analyses of water quality under the Ontario Halton Sewer Use Bylaws No. 02-03 (Mar 2003) – Halton Sanitary Sewer and Halton Storm Sewer. The results are presented in Appendix D.

The soil samples recovered during the investigation were stored in the Fisher Environmental laboratory for a period of 30 days after submitting the initital report and were discarded thereafter.

Site Survey

Ground surface elevations at borehole/monitoring well locations were interpolated from an undated topographic survey plan prepared by Ashenhurst nouwens & Associates Inc.

5. SUBSOIL CONDITIONS

Surface and subsurface conditions encountered at borehole locations are shown in Appendix B - Log of Boreholes and are summarized in the following sections. The logs include soil stratification at 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 surficial layer of all boreholes and extended to approximate depths below prevailing grades as shown in Table 1.

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

Table 1: Fill Depths and Elevations

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

Brown Silty Sand to Sandy Silt

Native brown, moist, loose to compact silty sand to sandy silt were encountered beneath the fill soils extending to approximate depths varying from 1.68m (BH4) to 3.66m (BH5).

Reddish Brown Silty Sand/Sandy Silt

Reddish brown, moist, compact, silty sand to sandy silt was encountered beneath the brown silty sand/sandy silt of BH1 to BH3 extending to approximate depths of 3.05m (BH1 & BH2) and 2.59m (BH3).

Brown/Greyish Brown/Grey Sand/Silty Sand/Gravelly Sand/Gravel & Sand

The brown silty sand/sandy silt of BH4 to BH7 and reddish-brown silty sand of BH1 to BH3 were underlain generally by brown to grey, moist to wet, dense to very dense sand/gravelly sand/gravel & sand deposits extending to termination depths of 9.60m to 14.17m bgs. These layers vary in composition across the site and with depth. Occasional cobbles/boulders were encountered in the gravelly sand/gravel & sand).

Reddish Brown/Grey Silty Clay/Clayey Silt

Layers of reddish brown or grey, moist, firm to very stiff clayey silt to silty clay were found interbedded in the sandy deposits between depths of 4.57m & 4.88m (BH1), 4.88m & 5.49m (BH2), 4.72m & 5.18m (BH3), 3.20m & 4.57m, 6.10m & 7.01m (BH4), 4.88m & 5.49m (BH6) and 4.72m and 6.10m (BH7). Consistency of these layers varied substantially from firm in the upper layer to hard in lower layer of BH4, but generally very stiff in other boreholes

6. HYDROGEOLOGICAL STUDY

A hydrogeological study for the subject site was conducted based on the boreholes/wells' exploration, observation and site/laboratory testing. Groundwater details from the six (6) newly installed monitoring wells were used in the Hydrogeological Study. The wells were constructed with 3.05m (10') long, 51mm diameter PVC slotted screen pipes, with the bases at approximate depths below existing grade as shown in Appendix B. Clean silica sand packs were placed around each well screen which was isolated with bentonite extending to slightly below existing grade.

Groundwater levels on completion of drilling varied from 3.66m to 10.67m below existing grade in the open borehole. MW2 was dry on completion of drilling.

6.1 Hydrogeological Conditions

Review of the available surficial geological and hydrogeological information for the area shows that the site is underlain generally with Coarse-textured glaciolacustrine deposits of sand, gravel, minor silt and

clay. Underlying bedrock is represented by shale, limestone, dolostone and siltstone of the Queenston Formation and is generally less than 20m below prevailing grade. Surficial geology and bedrock maps are presented in Appendix A.

The subsoils and hydrogeological conditions were observed and recorded during both the geotechnical and hydrogeological investigations. Based on the boreholes/wells' exploration, the saturated soil layers on the site were dominated by grey sand/sand and gravel observed at approximately 5m bgs and brown sand at 3m as observed in BH1.

All monitoring wells were purged/developed and allowed to fully recover prior to carrying out groundwater level measurements and sampling. Measured groundwater depths and elevations are summarized in Table 2.

Comments on Table 2:

The following general comments regarding groundwater conditions at the site are based on the groundwater level data and the geotechnical investigation:

- Static groundwater levels were observed at 3.94m to 7.62m below grade (elevations of 99.24m to 96.21m). MW6 (depth of 7.62m bgs) was observed to be dry throughout the investigation.
- Pockets of perched and seepage water from more pervious soils may be expected on the site.
- Grindstone Creek is located approximately 750m west of the site while Lake Ontario is located approximately 950m to the southwest.
- The site is located in a developed residential/commercial area, with no indication of active domestic wells within a 500m radius measured from the centre of the property. Water supply in the area is generally via municipal water system.
- Groundwater levels were monitored over the period June to November 2021 to determine highwater levels at the site.

Table 2: Groundwater Depths and Elevations

No.	Elev. at Ground (m)	Depth of Well/BH, m bgs	On Completion		21-Jun-21		30-Jun-21		14-Jul-21		22-Jul-21		04-Aug-21		01-Sep-21		15-Sep-21		13-Oct-21		27-Oct-21			10-Nov-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	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	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	4.19	98.99	4.36	98.82	5.15	98.03	5.00	98.18	4.06	99.12	3.94	99.24	3.95	99.23
MW2	103.75	7.62/14.18	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	7.60	96.15	7.51	96.24	7.53	96.22	7.54	96.21
MW3	103.83	7.62/9.60	6.71	97.12	7.54	96.29	7.62	96.21	7.60	96.23	7.62	96.21	7.62	96.21	7.60	96.23	7.59	96.24	7.53	96.30	7.50	96.33	7.52	96.31
MW4	102.40	7.62/11.13	6.71	95.69	5.57	96.83	5.49	96.91	5.50	96.90	Dry	-	6.21	96.19	6.25	96.15	6.05	96.35	5.53	96.87	4.98	97.42	4.99	97.41
MW5	102.84	9.15/14.18	7.01	95.83	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	9.10	93.74	9.14	93.70	9.10	93.74	9.14	93.70
MW6	102.64	7.62/12.65	10.67	91.97	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-
BH7	102.80	9.60	9.15	93.65	n/a	-	n/a	-	n/a	-	n/a	-	n/a	-	n/a	-	n/a	-	n/a	-	n/a	-	n/a	-

6.2 Hydraulic Conductivity K Modeling Results

Single Well Response Tests

Single well response tests (SWRT) were conducted in MW1 and MW3 on July 22, 2021. A rising head test was conducted in MW1 while a falling head test was carried out in MW3 due to limited groundwater in the well at the time of the tests. The water bearing media mainly consisted of layers of sand/sand and gravel, with layers of clayey silt/silty clay interbedded at various intervals, and were assumed to be unconfined, homogenous, isotropic and of uniform thickness. It was also assumed that the wells fully penetrated the water bearing soils. Data from the single well response tests were used to calculate the hydraulic conductivity values using Luthin's method.

Calculated values for hydraulic conductivity (k) are summarized in Table 3 and are representative of the water bearing soil characteristic consisting of sand/ sand and gravel at the screened depths. Details of the hydraulic conductivity analyses are presented in Appendix C.

Table 3: Summary of Single Well Response Tests and Hydraulic Conductivity Results

Test Wells	Well Surface Elevation (m asl)	Groundwater Depth (m)	Screen Elevation (m asl)	Variance of water head created (m)	30 Minutes/ Recovery Percentage	Hydraulic Conductivity, K (Luthin's Method)	
						m/s	m/day
MW1	103.18	4.19	95.56 – 98.61	0.38	27 min / 45%	4.54×10^{-6}	0.392
MW3	103.83	7.66	96.21 – 99.26	0.33	29 min / 97%	1.25×10^{-5}	1.046

6.3 Grain Size Analysis for Hydraulic Conductivity K

Representative samples from BH1 and BH4 were selected and submitted to ALS Environmental Laboratory for grain size distribution and hydrometer analyses. The results for the grain size distribution and hydrometer analyses are presented in Appendix C and summarized in Table 4.

The effective D_{10} sizes obtained from the Grain Size Distribution Graph were used to estimate the hydraulic conductivity (K) of the overburden soils using Hazen's expression, Equation 1:

$$K=10^{-2} D^2_{10} (m/s) \qquad \text{Equation 1}$$

Hydraulic conductivity values obtained for the sand with high clay content and the silty clay were generally in the order of 10^{-10} m/s and are expectedly lower than those obtained during the slug tests as the insitu

tests account for horizontal seams of sand and silt which are not adequately represented in the laboratory samples.

Table 4: Hydraulic Conductivity Estimated from Grain Size Analysis

Location	Depth of soil sample (m)	Soil Classification	Estimated Hydraulic Conductivity (Hazen Number)	
			m/s	m/day
BH1	5 - 6½'	Sand, some Clay, some Silt	1.0×10^{-10}	0.00000864
BH4	20 – 21½'	Silty Clay	1.0×10^{-11}	0.000000864

7. CONSTRUCTION DEWATERING & PERMANENT DRAINAGE

7.1 Construction Dewatering

It was understood that the development will consist of a proposed 29-storey residential building with two underground levels. Subsoil conditions were observed to be generally consistent across the site. Lowest finished floor elevation for P2 level was given as 6.1m below average grade (average grade is 103.06m based on borehole surface elevations) with lowest footings at 95.96m. Conventional strip and/or spread footing foundations were recommended, in the geotechnical investigation report, at depths between 7.0m and 9.0m below prevailing grades. Groundwater levels were observed between 3.94m and 7.62m bgs during the investigation. This means that the footings will likely extend below the groundwater levels observed during the investigation. The groundwater level should therefore be lowered to 1m below the designed footing depths to protect the footing subgrade from hydraulic pressure disturbance during construction.

Construction dewatering flowrate of **45.18 m^3/day (45,180 L/day)** is recommended with two underground levels. Factored dewatering rate of **67.76 m^3/day (FS of 1.5)** should be used for planning purposes.

Seasonal High Groundwater Levels

Installation of the monitoring wells was undertaken during the latter part of spring and groundwater monitoring continued into autumn. An average groundwater level of 4.31m, observed in MW1, was used

to calculate construction dewatering quantities. The highest groundwater level (3.94m) observed during the field investigation was used to calculate permanent drainage rates.

Accounting for Accumulated Precipitation

Provisions should be made to pump any accumulated water from the excavation areas during construction, particularly following a period of heavy rainfall. For example, 25mm rainfall in 24 hrs may result in accumulation of up to 62m^3 in the excavated area. Subsurface soils at the site are dominated by sandy materials with layers of silty clay/clayey silt interbedded. Consequently, some amount of ponding of rainwater may be expected. A conservative accumulated volume of **20 m^3/day** may therefore be assumed for planning purposes. Accumulated precipitation may be stored on site for subsequent disposal to an MOECC-licensed facility. If the water is to be discharged into the public sewer system, then an application for the discharge of private water will have to be made to Halton Region. The water quality, at the time of the application, will need to be ascertained to ensure compliance with Ontario Sewer Use Bylaws – Halton Sanitary Sewer Bylaw No. 02-03.

*Maximum construction discharge rates, taking into consideration accumulated precipitation volumes, are **65,180 L/day** (unfactored) and **87,760 L/day (factored**).*

7.2 Permanent Drainage

Permanent drainage rate of **27.76 m^3/day (27,760 L/day)** was obtained for two underground levels with the lowest P2 elevation of approximately 96.96m asl. A factored permanent drainage rate of **41.64 m^3/day (FS of 1.5)** should be used for planning purposes.

An application for permission to discharge to the municipal/regional sewer system will be required unless the subsurface structure of the building is designed as watertight or onsite disposal facilities are implemented.

It is further recommended that the subsurface portion of the elevator shaft, below P2 level, be designed as watertight to prevent the need to have deeper groundwater sump pits for permanent drainage.

7.3 Permit to Take Water (PTTW)

As the calculated construction dewatering flowrate for the building, including accumulated precipitation, is more than 50 m^3/day, registration on the MOECC Environmental Activity and Sector Registry (EASR) for Water Taking will be required for construction. An application for permission to take water (PTTW) will

not be required for neither construction dewatering nor permanent drainage as the daily flowrates are less than 400,000 and 50,000 L/day respectively.

7.4 Groundwater Quality

The results (June 2021) of analyses for groundwater quality under the Ontario Halton Sanitary Sewer Bylaw No. 02-03 (Mar 2003) show compliance with all parameters as shown in Appendix D.

Additional tests were conducted based on parameters and limits proposed for storm sewer guidelines by the City of Burlington/Halton Region. The tests revealed compliance with all parameters except those listed in Table 5.

Table 5: Exceedances of Proposed Storm Sewer Limits

Parameters	Proposed Storm Limits	Results (MW1)
Manganese (Total), mg/L	0.05	0.0942
Zinc (Total), mg/L	0.04	0.042

Based on the results, presented in Tables 4 & 5, *pre-treatment of the groundwater will be required prior to discharging to the storm sewer system*. The groundwater in its present form may be discharged to the public sanitary system.

It should be noted however that testing of groundwater at the depths observed during the investigation would not be representative of the water that might accumulate during a high rainfall event. Any accumulation of precipitation occurring in the excavation during construction, that may require offsite discharge, will have to be tested at the time of the event to determine the quality of water for discharge.

7.5 Dewatering Influence Zone

The estimated construction dewatering quantities are based on the worst-case groundwater conditions that might occur during the construction period. Calculated dewatering influence zone is expected to be up to 16.15m from the edge of the dewatering point in the predominantly sandy soils. Based on the field investigation, the soils to the proposed excavation depths are dominated by varying layers of sand/sand and gravel. Recharge was observed to be very fast during SWRT. Consequently, a dewatering system may be required if construction is to take place below the observed water table.

7.6 Hydrogeological Impact

During the investigation, it was determined that there will not be any negative impact to the natural environment, Halton Region Sewer works nor surrounding properties due to construction dewatering because of the depth at which groundwater was observed. No groundwater induced depression at surface level is expected. Consequently, it is not expected that construction will impact public infrastructure, the natural environment nor will there be any settlement issues.

8. DISCUSSION

Hydraulic conductivity values (k) calculated from onsite single well response tests are 4.54×10^{-6} and 1.21×10^{-5} m/s (0.392 to 1.046 m/day) in the wells screened within the sand/gravelly and sand/silt. These are representative of the water bearing soils comprising sandy material at the expected excavation depths for footings based on the geotechnical and hydrogeological field investigations.

An approximate construction dewatering discharge rate of 45.18 m^3/day will be required for the recommended footing depths for two underground level (lowest at 7.0m bgs). Permanent drainage of 27.76 m^3/day will be required. A factor of safety of 1.5 should be applied to construction dewatering and permanent drainage rates.

Registration on the MOECP's EASR Website for water taking will be required during construction however an application for PTTW will not be required under conditions observed on the site during the investigation.

The groundwater quality determined by laboratory analyses revealed compliance to parameters of the existing sanitary sewer limits and some exceedances of the proposed storm limits. Consequently, pre-treatment of the water will be required before it can be discharged to the public storm sewer under proposed conditions. Groundwater may be discharged to the public sanitary system under existing sewer use bylaw limits.

It should be noted that if it is intended that any accumulated water, following periods of heavy rainfall, be discharged into the public sewer, then a permit to discharge would be required along with laboratory analyses to ensure compliance with relevant sewer bylaws.

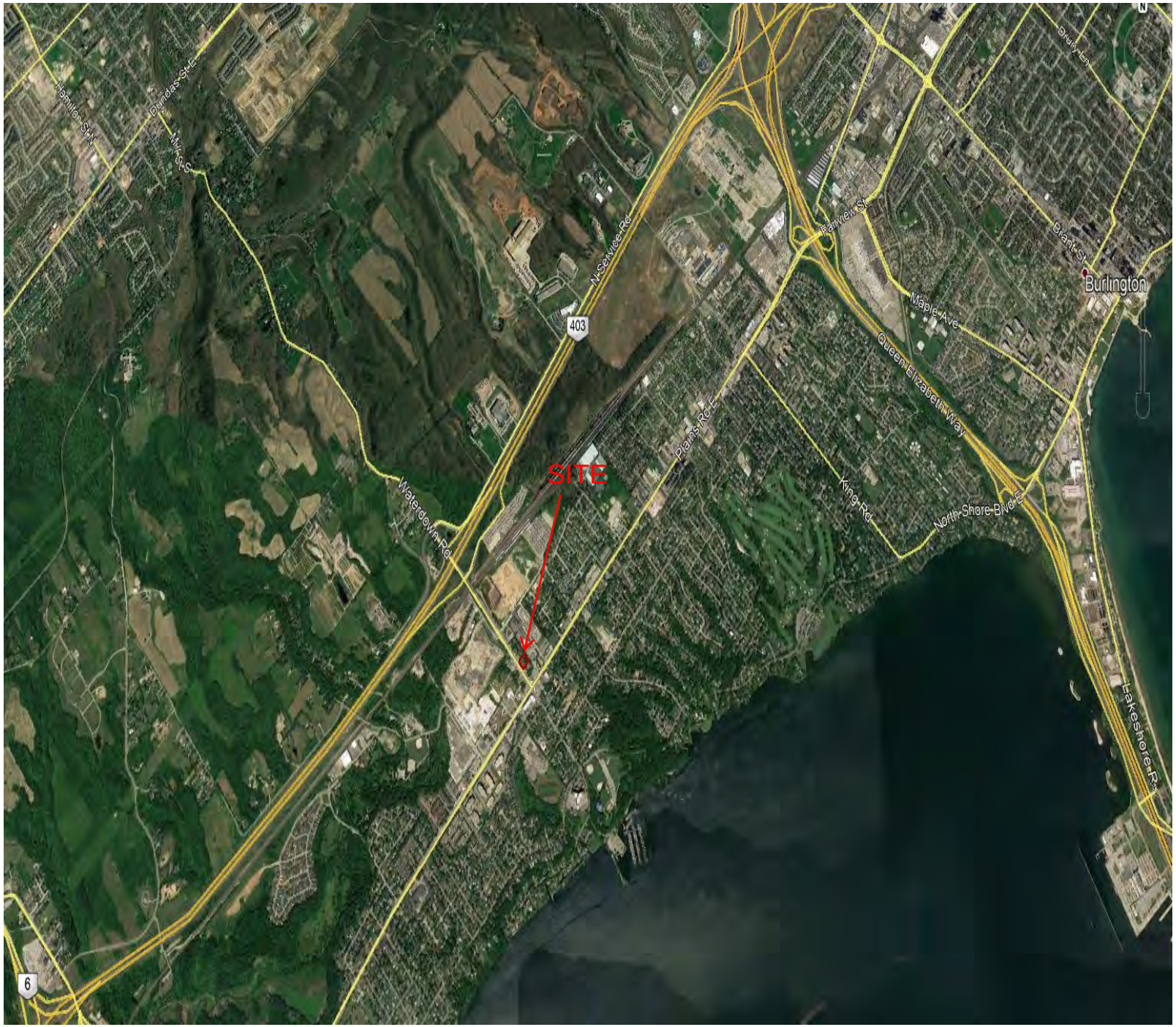
The discharge rates for construction dewatering and permanent drainage, given in the preceding, are based on common practice and reasonable assumption for excavation depths and are subject to further modifications when details of the structures become available.

9. LIMITATIONS

This report is limited in scope to those items specifically referenced in the text. The discussions and recommendations presented in this report are intended only as guidance for the named client, design engineers and those directly associated with implementing, regulating and monitoring of the project. The information on which these recommendations are based is subject to confirmation by engineering personnel at the time of construction. Localized variations in the subsoil conditions may be present between and beyond the boreholes and should be verified during construction.

As more specific subsurface information becomes available during excavations on the Site, this report should be updated. 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 soil and the potential reuse of these soils on/off Site. Contractors should draw their own conclusions as to how the near surface and subsurface conditions may affect them.

APPENDIX A – SITE AND LOCATION MAPS AND PLAN



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NORTH

N

LEGEND

SITE BOUNDARY

PROJECT NAME AND ADDRESS

HYDROGEOLOGICAL INVESTIGATION

1029 & 1033 Waterdown Road,
BURLINGTON,ONTARIO

FIGURE 1:

SITE LOCATION PLAN

SHEET NO.

A1

PROJECT NO.

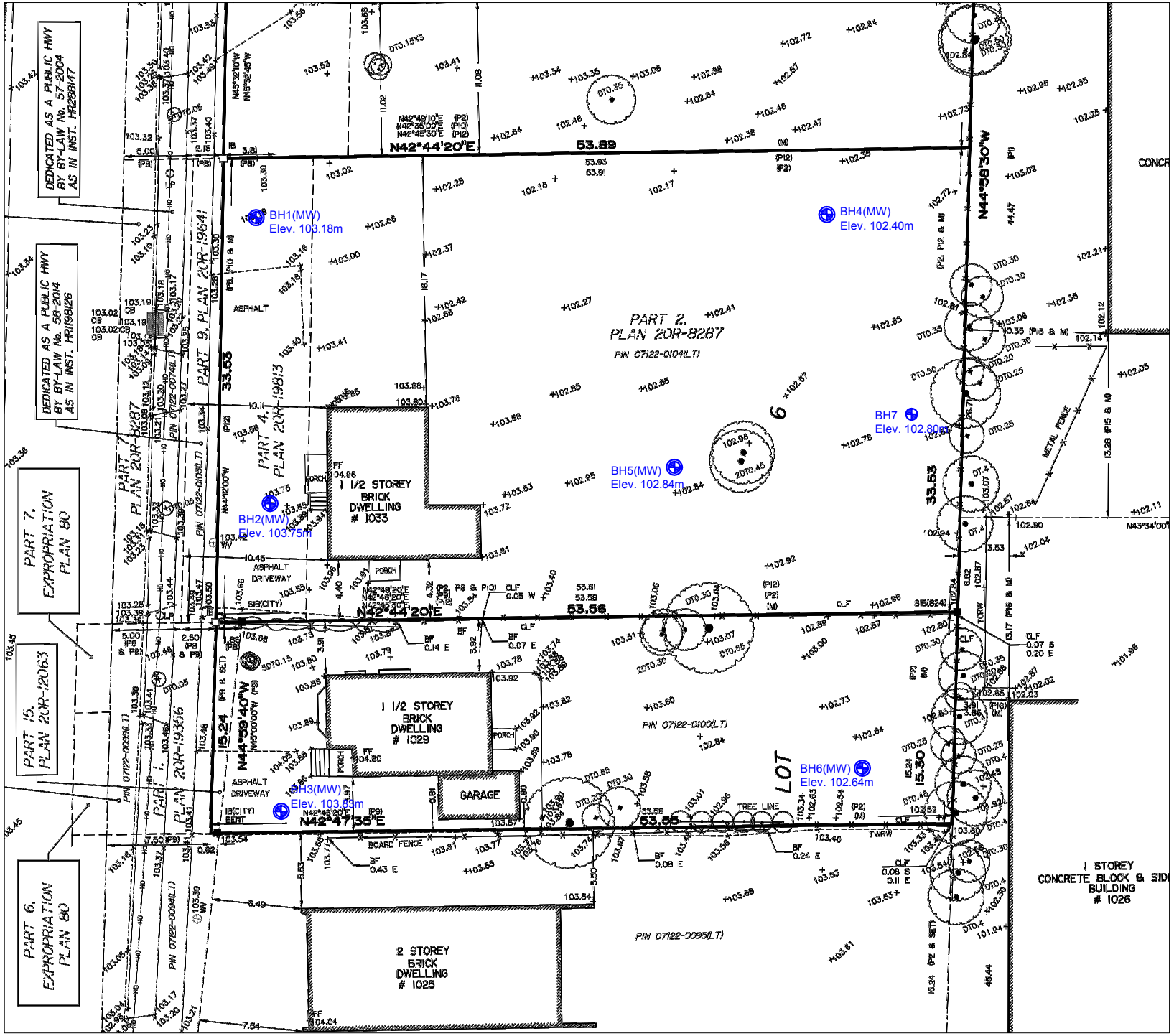
FE-P20-11237

DATE

JULY 2021

SCALE

AS SHOWN



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NORTH

LEGEND

Borehole/
Monitoring Well

PROJECT NAME AND ADDRESS

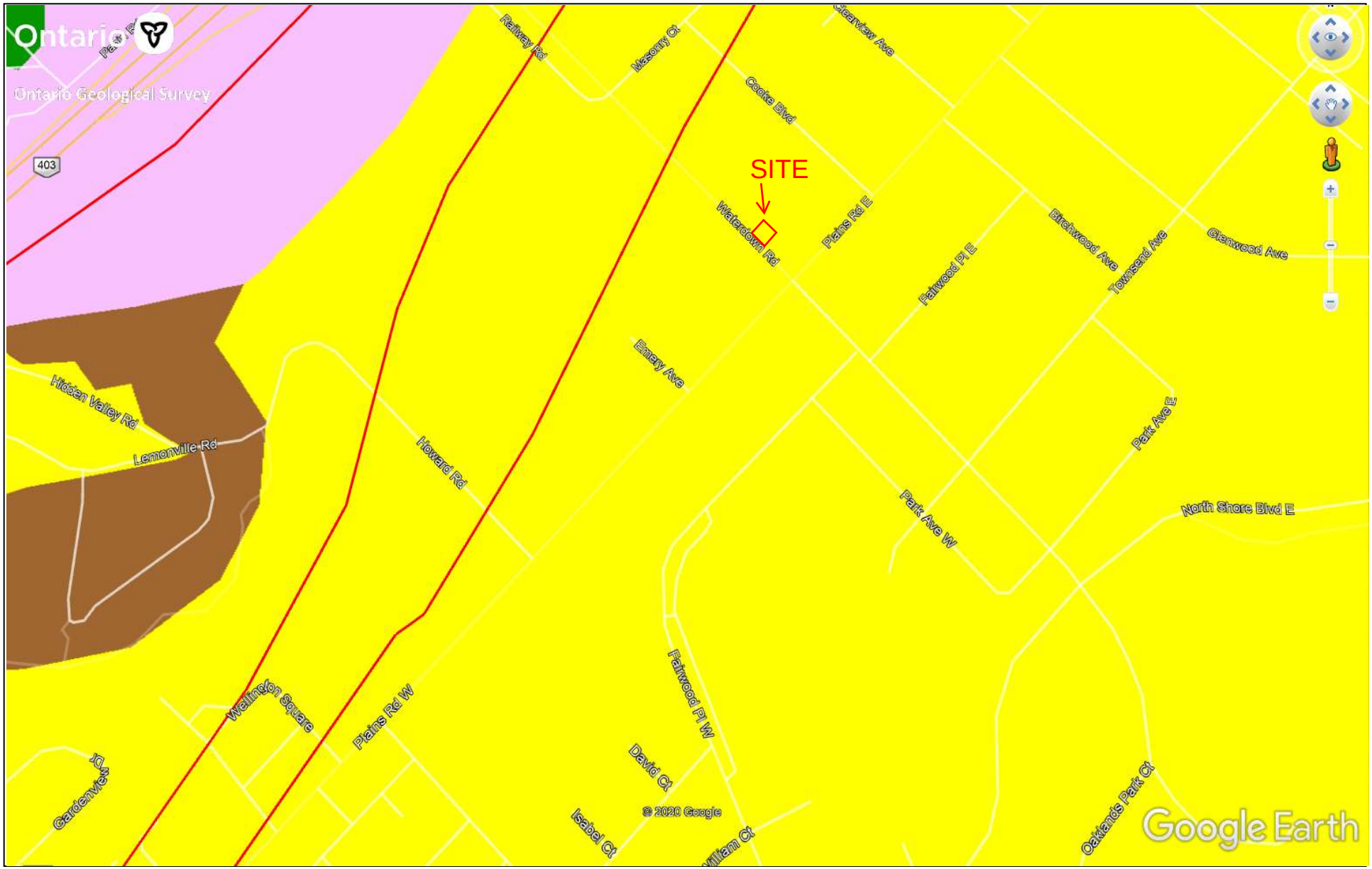
HYDROGEOLOGICAL & GEOTECHNICAL INVESTIGATIONS

1029-1033 WATERDOWN ROAD, BURLINGTON, ONTARIO

FIGURE 1:

SITE PLAN WITH BOREHOLE LOCATIONS

PROJECT NO.	SHEET NO.
FE-P 21-11236/37	2
DATE: NOVEMBER 2021	
SCALE: AS SHOWN	



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KEY PLAN

LEGEND

Coarse-textured glaciolacustrine deposits: sand, gravel, minor silt and clay

PROJECT NAME AND ADDRESS

HYDROGEOLOGICAL INVESTIGATION

1029 & 1033 Waterdown Road, Burlington, Ontario

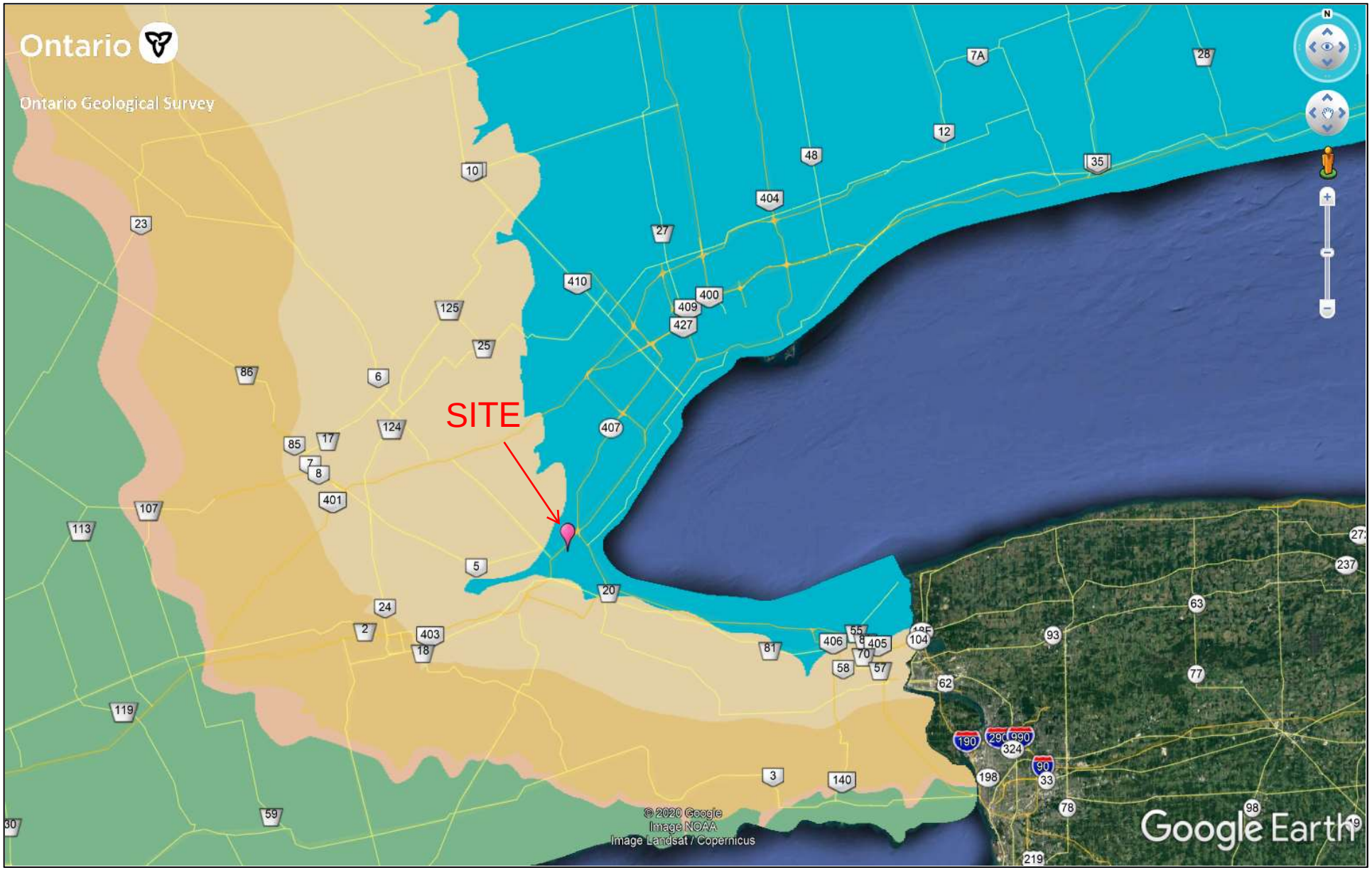
PROJECT NO. FE-P 21-11237H

DATE JULY 2021

SCALE

A3

Surficial Geology Map



FISHER ENGINEERING
400 Esna Park Dr., #15
Markham, Ontario
L3R 3K2
Tel: 905 475-7755
Fax: 905 475-7718

KEY PLAN

LEGEND

PROJECT NAME AND ADDRESS

HYDROGEOLOGICAL INVESTIGATION

1029 & 1033 Waterdown Road,
Burlington, Ontario

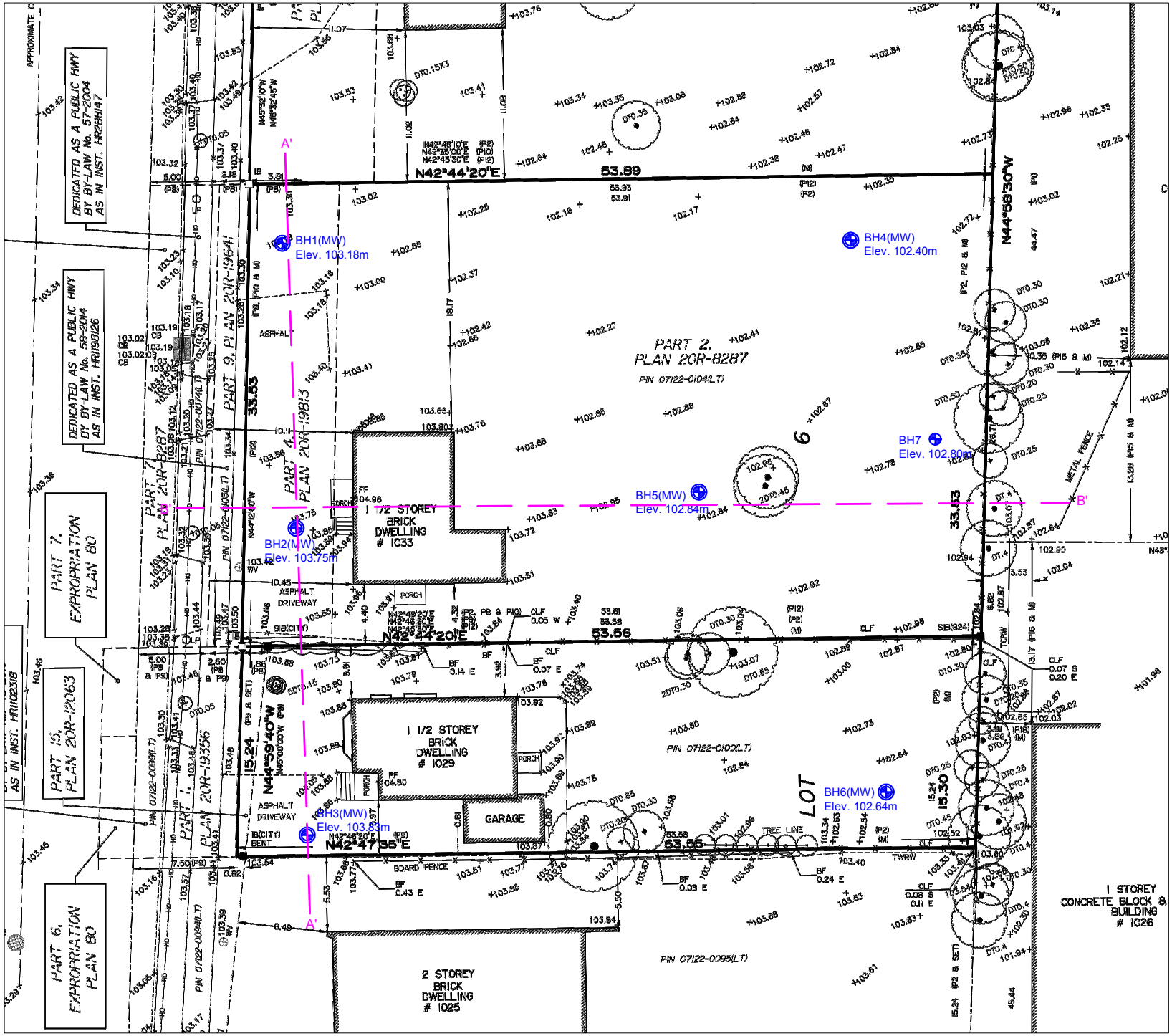
PROJECT NO.
FE-P 21-11237H

DATE
JULY 2021

SCALE

A4

Bedrock Geology Map



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400 Esna Park Dr., #15
Markham, Ontario
L3R 3K2
Tel: 905 475-7755
Fax: 905 475-7718

NORTH

LEGEND

- Borehole/ Monitoring Well
- Cross Section Line

PROJECT NAME AND ADDRESS

HYDROGEOLOGICAL & GEOTECHNICAL INVESTIGATIONS

1029-1033 WATERDOWN ROAD, BURLINGTON, ONTARIO

FIGURE 1:

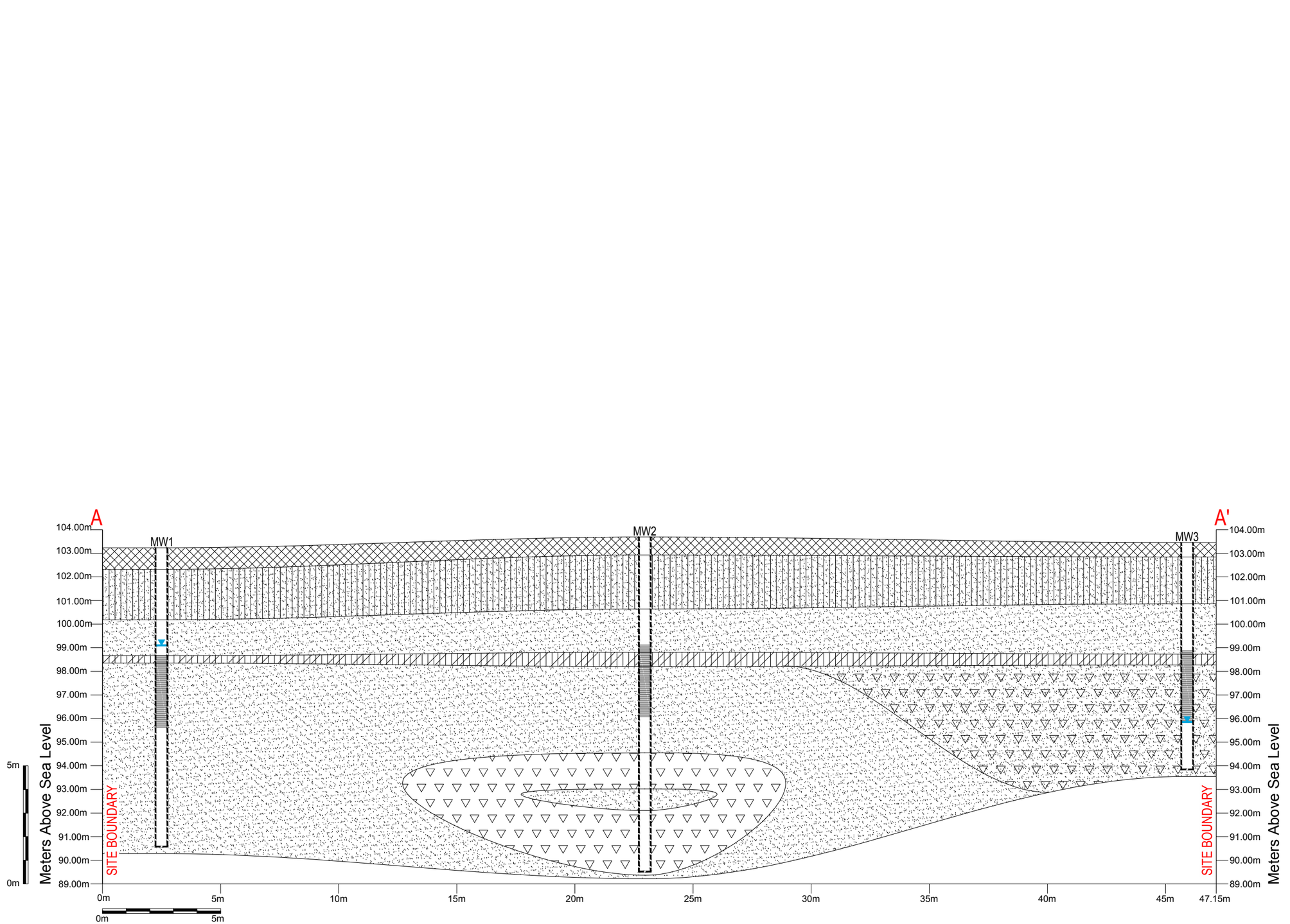
SITE PLAN WITH CROSS SECTION LINES

PROJECT NO.	SHEET NO.
FE-P 21-11236/37	A5
DATE: NOVEMBER 2021	
SCALE: AS SHOWN	

FISHER ENGINEERING

400 Esna Park Dr., #15
Markham, Ontario
L3R 3K2

Tel: 905 475-7755
Fax: 905 475-7718



NORTH

LEGEND

- ASPHALT
- FILL
- SAND
- SILT
- CLAY
- GRAVEL
- GROUNDWATER POTENTIOMETRIC LEVEL

PROJECT NAME AND ADDRESS

GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATION

1029-1033 Waterdown Road, Burlington, Ontario

FIGURE 5.1:

CROSS-SECTION A - A';

PROJECT NO.	SHEET NO.
FE-P 21-11236/ 37	5.1
DATE: 6 August 2021	
SCALE: AS SHOWN	

FISHER ENGINEERING

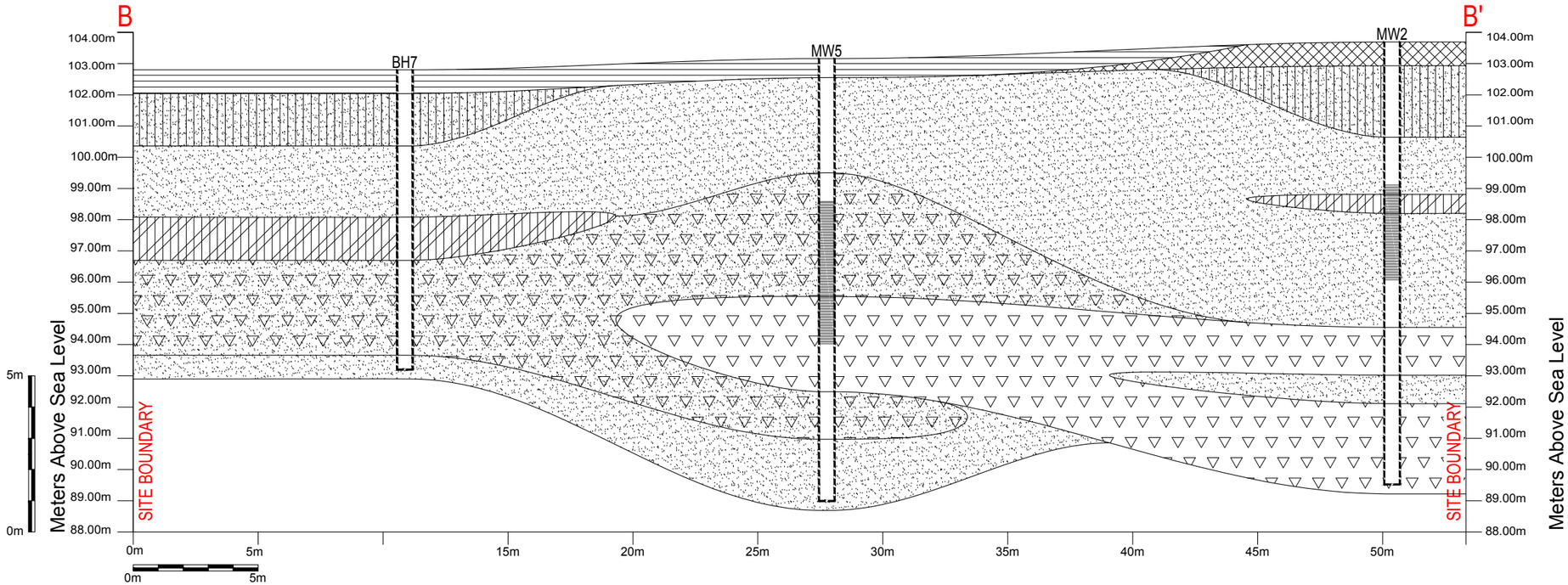
400 Esna Park Dr., #15
Markham, Ontario
L3R 3K2

Tel: 905 475-7755
Fax: 905 475-7718

NORTH

LEGEND

- FILL
- TOPSOIL
- SAND
- SILT
- CLAY
- GRAVEL
- GROUNDWATER POTENTIOMETRIC LEVEL



PROJECT NAME AND ADDRESS

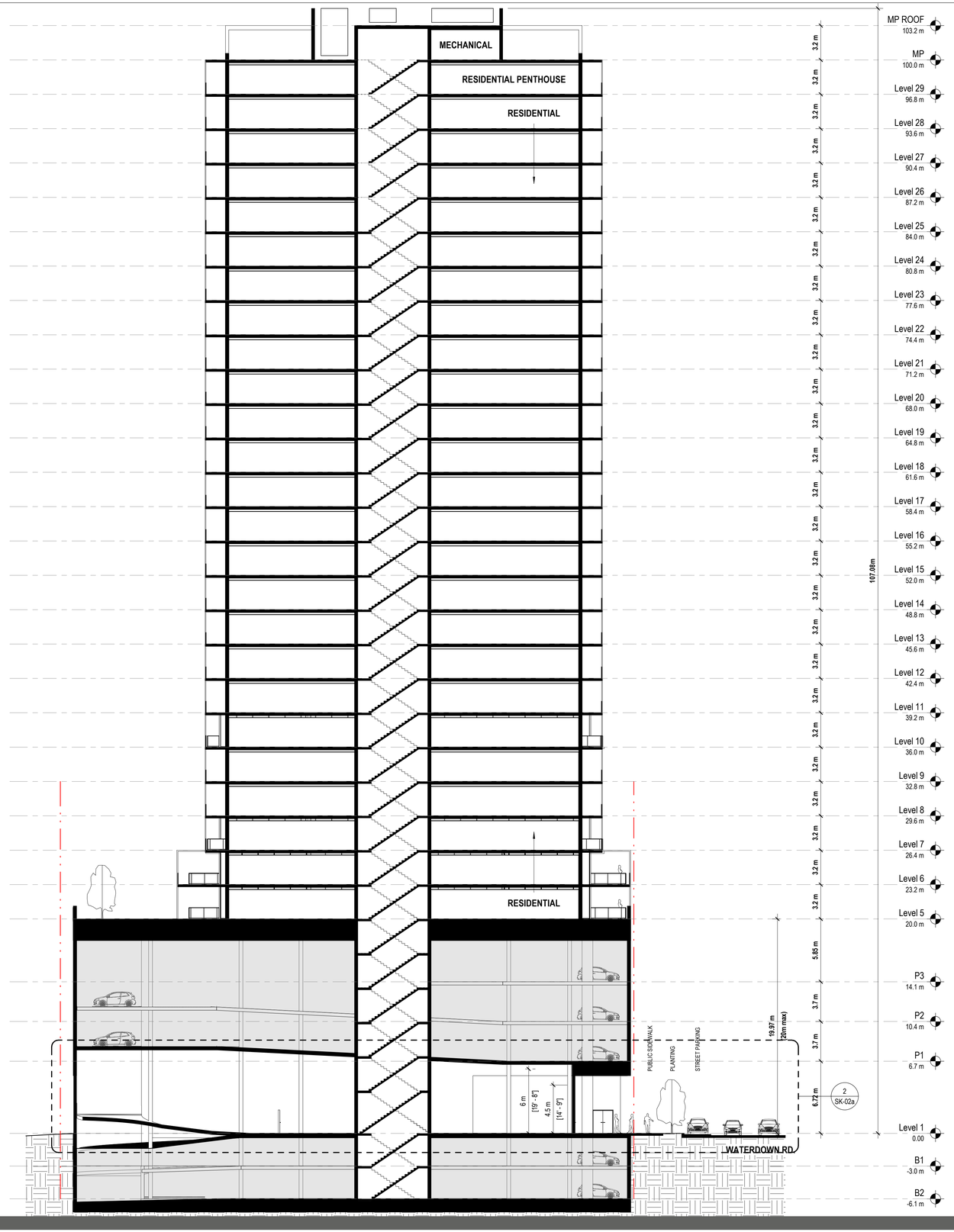
GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATION

1029-1033 Waterdown Road, Burlington, Ontario

FIGURE 5.2:

CROSS-SECTION B - B';

PROJECT NO.	SHEET NO.
FE-P 21-11236/ 37	5.2
DATE: 6 August 2021	
SCALE: AS SHOWN	



BUILDING STATS

Floor Level	Parking Count	Parking Area BG (Sqm)	Parking Area AG (sqm)	Retail (sqm)	Amenity (Sqm)	Floor Area (Sqm)	Total Units	Unit Types 1 Bed	Unit Types 2 Bed
29						750	6	0	6
28						750	12	10	2
27						750	12	10	2
26						750	12	10	2
25				0	0	750	12	10	2
24						750	12	10	2
23						750	12	10	2
22						750	12	10	2
21						750	12	10	2
20						750	12	10	2
19						750	12	10	2
18						750	12	10	2
17						750	12	10	2
16						750	12	10	2
15						750	12	10	2
14						750	12	10	2
13						750	12	10	2
12						750	12	10	2
11						750	12	10	2
10						750	12	10	2
9						750	12	10	2
8						750	12	10	2
7						750	12	10	2
6						1006	13	4	9
5				0	78	1006	12	4	8
4.5	41	0	1337						
4	53	0	1858			0	0	0	
3	56	0	1602			0	0	0	
2	42	0	1421			0	0	0	
1 (GRADE)	0			189	650	2177			
-2	64	2353							
-1	64	2353							
	320	4706	6218	189	728	21439	295	228	67

PARKING AREA BELOW GRADE = 4,706sqm
PARKING AREA ABOVE GRADE = 6,218sqm
BUILDING AREA ABOVE GRADE = 27,657sqm

TOTAL PARKING = 320
TOTAL UNITS = 295
TOTAL AMENITY = 728sqm

Site Development Stats

1029-1033 Waterdown Rd.

	ITEM	PROPOSED
1	ZONE - PROPOSED BUILDING PERMITTED USES	/
2	LOT AREA	2,614sqm (0.261 ha)
3	LOT FRONTAGE	48.67m
4	FRONT YARD SETBACK (podium)	0.0m
4.5	FRONT YARD SETBACK (tower)	3.77m
5	REAR YARD DEPTH (podium)	0m
5.5	REAR YARD DEPTH (tower)	13.55m
6	INTERIOR SIDEYARD DEPTH (podium)	0.25m (north) 1.21m (south)
6.5	INTERIOR SIDEYARD DEPTH (tower)	12.59m (north) 12.5 (south)
7	LANDSCAPE OPEN SPACE	6%
8	COVERAGE	94%
9	HEIGHT	107.08m
10	DENSITY	1130 uph (295 units)
11	RESIDENTIAL PARKING	320 spaces (1.08 per)
12	RESIDENTIAL BIKE PARKING	60 spaces (0.2 per)

VEHICLE PARKING:
RESIDENTIAL REQUIREMENTS
295 UNITS
RESIDENTIAL (1:1) = 295 REQUIRED **= 295 PROVIDED (1:1)**
VISITOR (1:0.25) = 75 REQUIRED **= 25 PROVIDED (1:0.08)**

BIKE PARKING:
RESIDENTIAL REQUIREMENTS
295 UNITS
SHORT TERM (0.05) = 15 REQUIRED = 15 PROVIDED
LONG TERM (0.5) = 150 REQUIRED = 60 PROVIDED

RETAIL REQUIREMENTS
189sqm
SHORT TERM (3 PLUS 1/1000sqm) = 4 REQUIRED = 4 PROVIDED
LONG TERM (2 PLUS 1/1000sqm) = 3 REQUIRED = 0 PROVIDED

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PROJECT NAME

ZONING PACKAGE
1029-1033 Waterdown Rd.
Burlington, ON

DRAWING TITLE

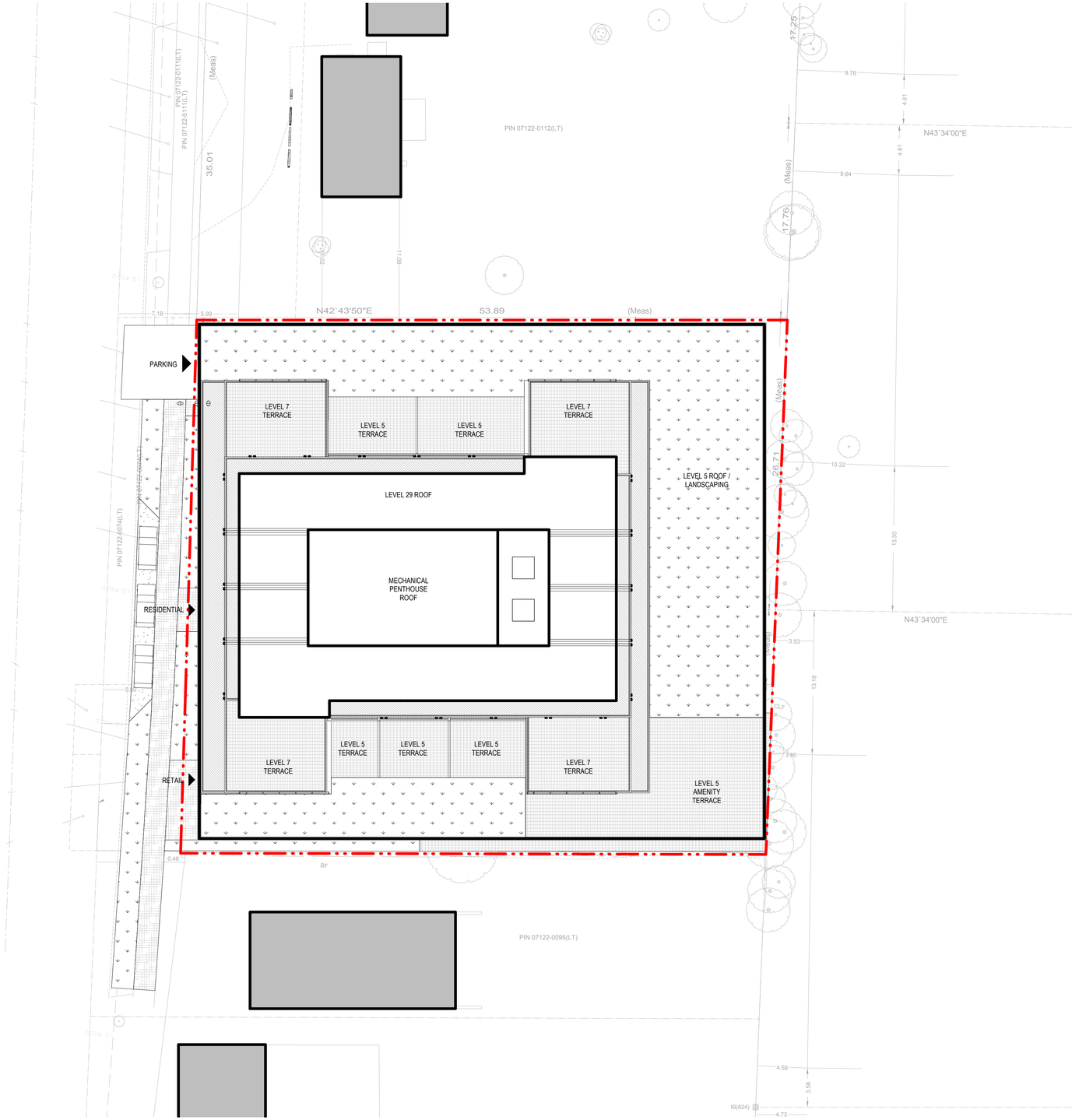
Stats

DRAWING INFO.

Project Number	20-026
Date	2021-08-24
Scale	1 : 200
Drawn by	STF
Checked by	DY

SHEET NO.

SK-01



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PROJECT NAME

ZONING PACKAGE
1029-1033 Waterdown Rd.
Burlington, ON

DRAWING TITLE

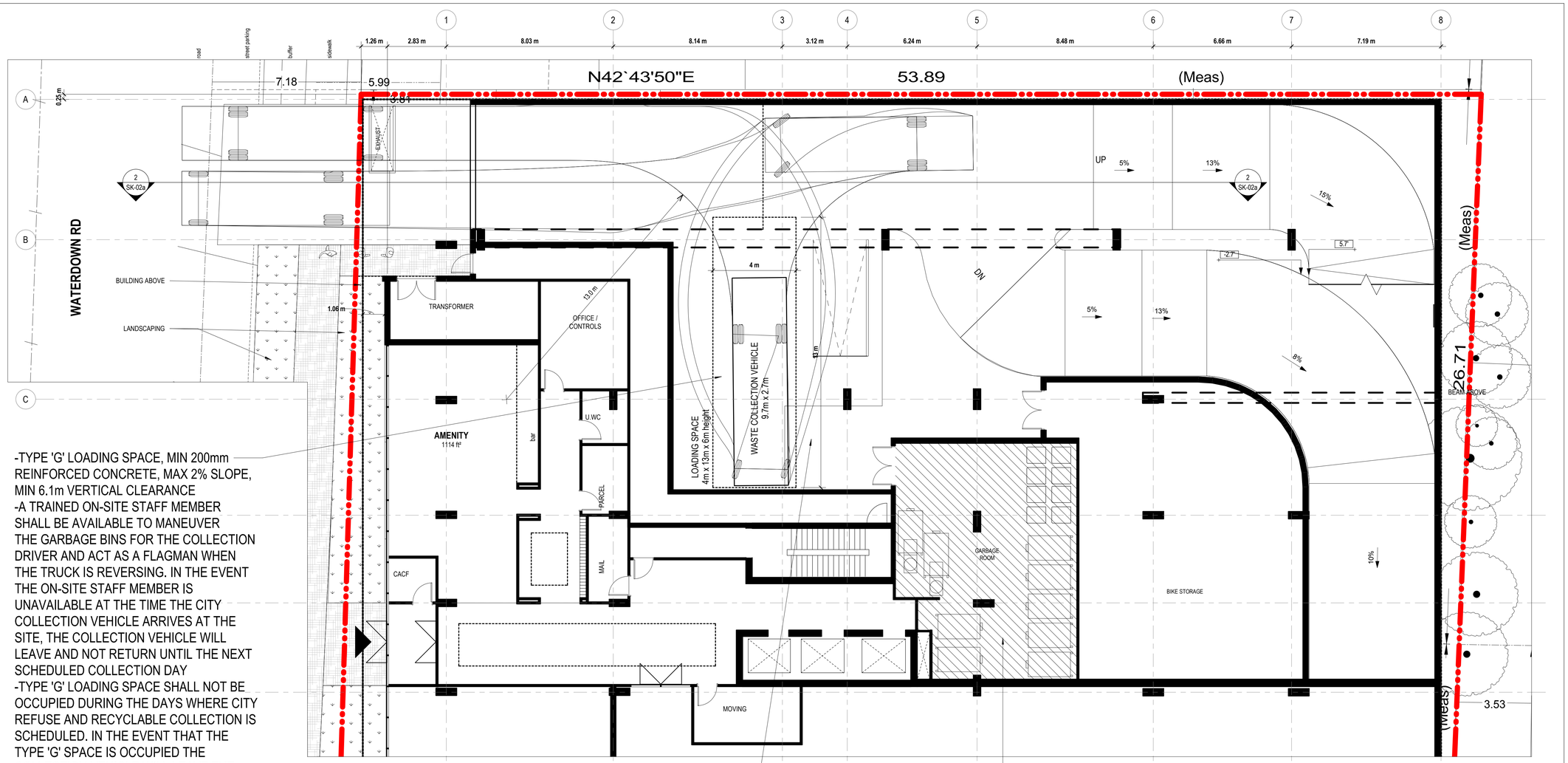
Site Plan

DRAWING INFO.

Project Number	20-026
Date	2021-08-24
Scale	1 : 200
Drawn by	STF
Checked by	DY

SHEET NO.

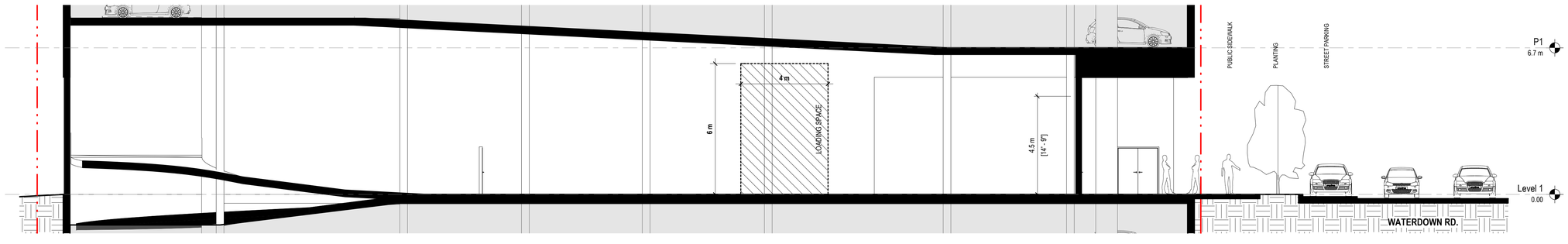
SK-02



-TYPE 'G' LOADING SPACE, MIN 200mm REINFORCED CONCRETE, MAX 2% SLOPE, MIN 6.1m VERTICAL CLEARANCE
-A TRAINED ON-SITE STAFF MEMBER SHALL BE AVAILABLE TO MANEUVER THE GARBAGE BINS FOR THE COLLECTION DRIVER AND ACT AS A FLAGMAN WHEN THE TRUCK IS REVERSING. IN THE EVENT THE ON-SITE STAFF MEMBER IS UNAVAILABLE AT THE TIME THE CITY COLLECTION VEHICLE ARRIVES AT THE SITE, THE COLLECTION VEHICLE WILL LEAVE AND NOT RETURN UNTIL THE NEXT SCHEDULED COLLECTION DAY
-TYPE 'G' LOADING SPACE SHALL NOT BE OCCUPIED DURING THE DAYS WHERE CITY REFUSE AND RECYCLABLE COLLECTION IS SCHEDULED. IN THE EVENT THAT THE TYPE 'G' SPACE IS OCCUPIED THE COLLECTION VEHICLE WILL LEAVE THE SITE AND NOT RETURN UNTIL THE NEXT SCHEDULED COLLECTION DAY
-ENTIRE SLAB STRUCTURE WHERE COLLECTION VEHICLE IS REQUIRED TO DRIVE ONTO TO BE DESIGNED TO COMPLY WITH OBC AND CITY OF TORONTO BULK LIFT VEHICLE TO SUPPORT FULLY LOADED COLLECTION VEHICLE

- CONCRETE STAGING PAD, MIN. 10sqm. MIN 200mm REINFORCED CONCRETE, MAX 2% SLOPE, MIN 6.1 CLEAR
- A TRAINED ON-SITE STAFF MEMBER MUST TRANSFER THE REFUSE FROM THE STAGING AREA TO THE COLLECTION VEHICLE AND BE PRESENT DURING COLLECTION FOR JOCKEYING OF BINS AND ENSURING SAFE BACK-UP MANEUVERS

NOTE: BINS TO BE FILLED AND STORED IN DESIGNATED WASTE/RECYCLING ROOMS AND BROUGHT TO LOADING / STAGING AREA ONLY ON DAY OF COLLECTION



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PROJECT NAME

ZONING PACKAGE
1029-1033 Waterdown Rd.
Burlington, ON

DRAWING TITLE

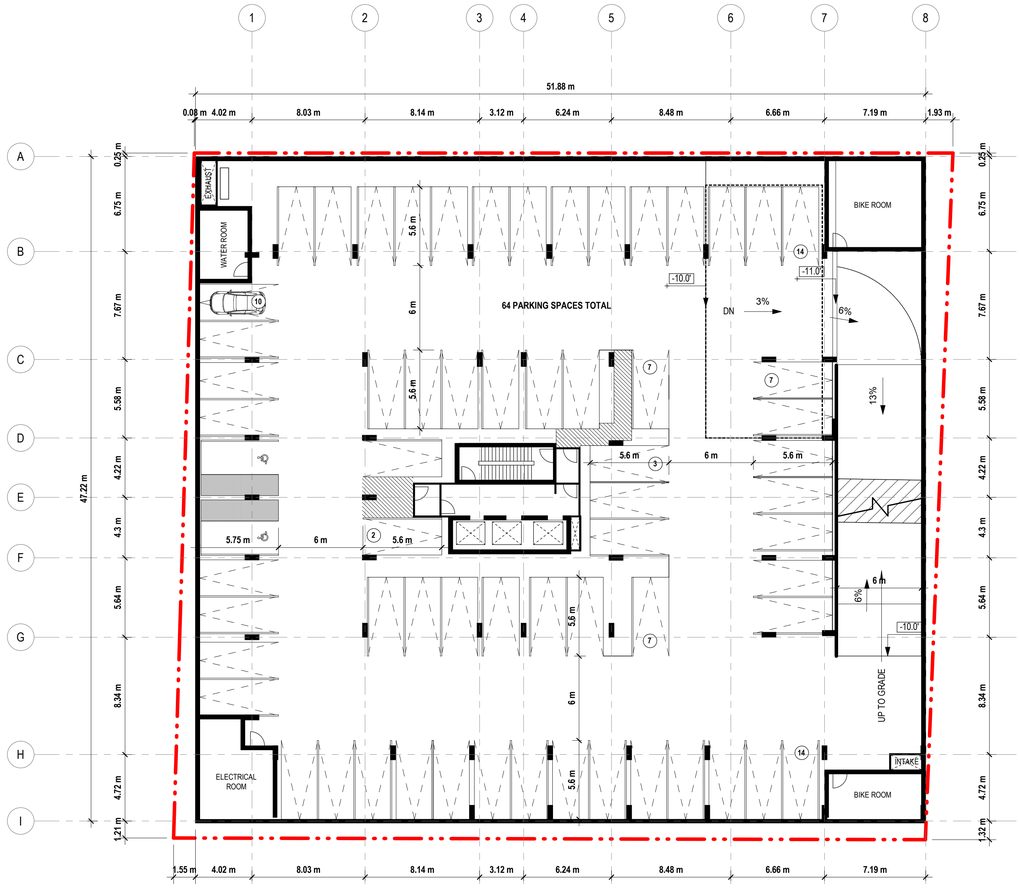
Waste Management Plan

DRAWING INFO.

Project Number	20-026
Date	2021-08-24
Scale	1 : 100
Drawn by	STF
Checked by	DY

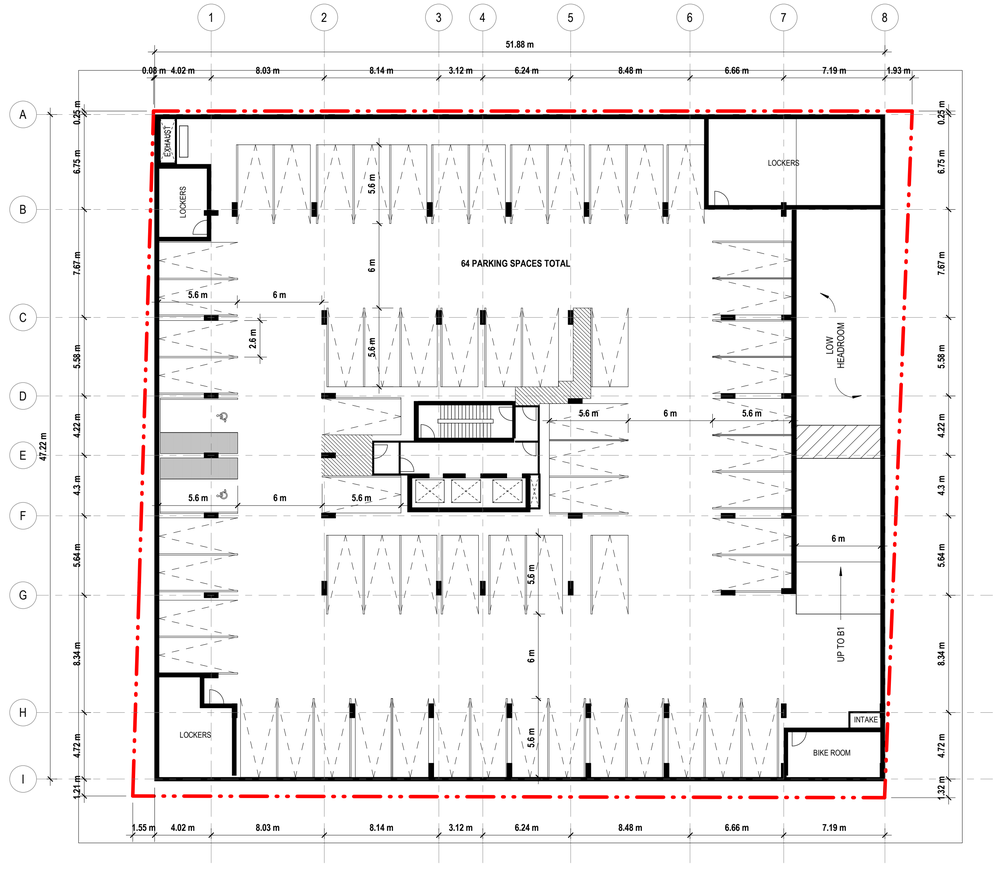
SHEET NO.

SK-02a



LEVEL B1
FLOOR PLATE:
25,330sf (2353sqm)

64 PARKING



LEVEL B2
FLOOR PLATE:
25,330sf (2353sqm)

64 PARKING

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PROJECT NAME

ZONING PACKAGE
1029-1033 Waterdown Rd.
Burlington, ON

DRAWING TITLE

Below Grade Parking

DRAWING INFO.

Project Number	20-026
Date	2021-08-24
Scale	1 : 200
Drawn by	STF
Checked by	DY

SHEET NO.

SK-03

APPENDIX B – LOG OF BOREHOLES

FISHER ENGINEERING

LOG OF BOREHOLE

NO. MW1 SHEET. 1 of 2

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

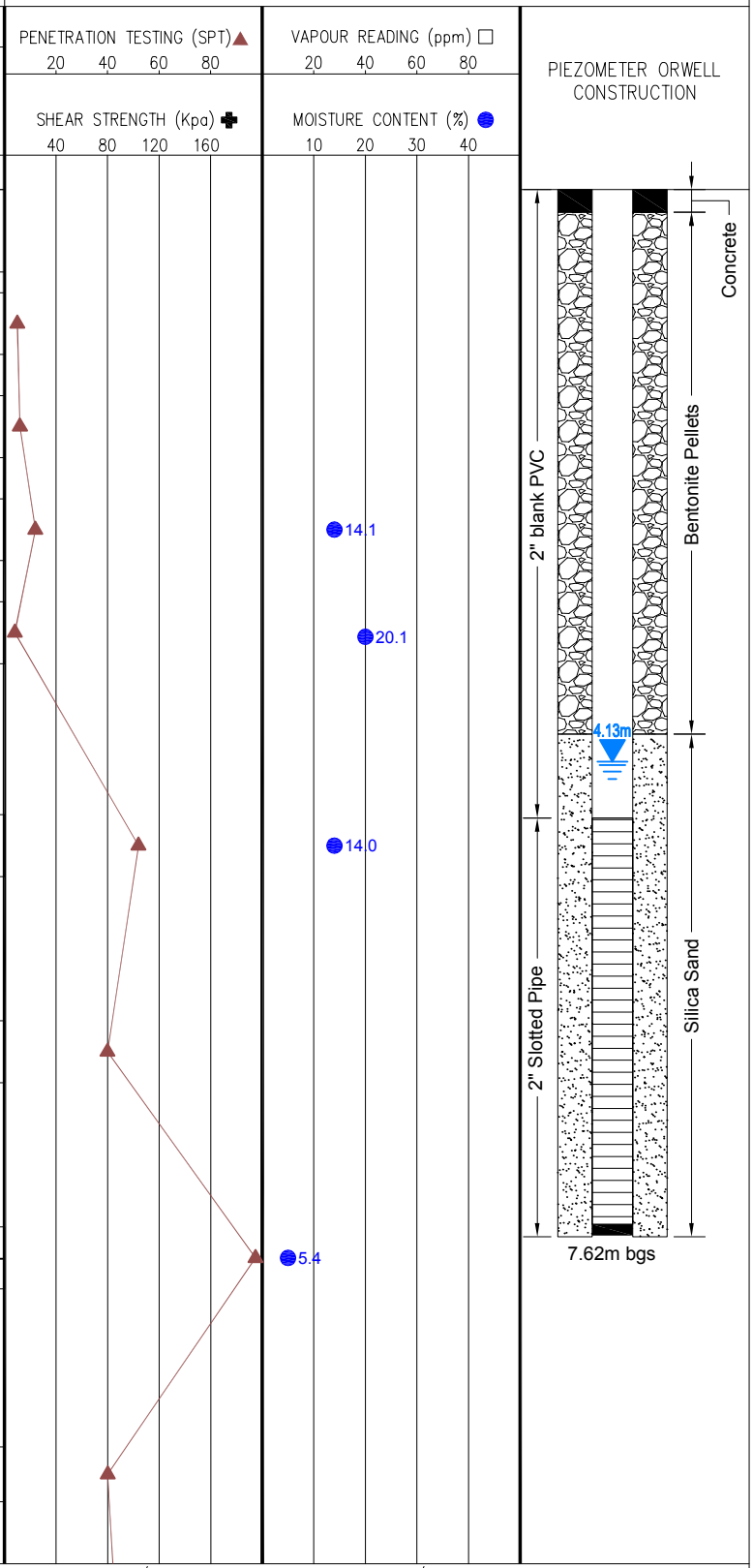
PROJECT NAME: Hydrogeological and Geotechnical Investigations

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:

FISHER ENGINEERING

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	STRATA PLOT	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						SS-3	7
	2			2.29/ 101.46			
8		SILTY SAND: Reddish brown, moist compact				SS-4	10
10	3	SAND: Brownish grey, moist, compact		3.05/ 100.70		SS-5	12
12							
	4						
14							
16				4.88/ 98.87		SS-6	18
	5	CLAYEY SILT/ SILTY CLAY: Red to brown, moist, very stiff		5.49/ 98.26			
18		SAND: grey, some gravel, moist to wet, dense to very dense					
20	6					SS-7	30
22							
	7						
24							
26						SS-8	100+
	8						
28							
30	9			9.14/ 94.61		SS-9	100+
32		GRAVEL: Grey, trace sand, trace cobbles, slightly moist, very dense					
	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						
34		SAND: Grey, dry, very dense				SS–10	100+			
36	11									
				11.58/ 92.17						
38		GRAVEL: Grey, trace sand, trace cobbles, slightly moist, very dense								
40	12					SS–11	100+			
42	13									
44										
46	14					SS–12	100+			
				14.17/ 89.58						
		End of Borehole								
48	15									
50										
52	16									
54										
56	17									
58										
60	18									
62	19									
64										

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	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)	103.83			
0	0	FILL: Sandy gravel, grey, trace silt, dry	0.61/ 103.22		SS-1	
2		SILTY SAND: Brown, trace gravel, slightly moist, loose to compact			SS-2	9
4	1				SS-3	13
6		SANDY SILT: Red to brown, wet, compact	1.83/ 102.00		SS-4	12
8	2		2.59/ 101.24			
10		SAND: Grey, trace gravel, moist, compact			SS-5	22
12	3					
14						
16	4		4.72/ 99.11	21-6748-6	SS-6	28
	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						
24	7					
26				21-6748-7	SS-8	100+
28	8					
30				21-6748-8	SS-9	100+
32	9		9.60/ 94.23			
	10	End of Borehole				

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

Bentonite Pellets

2" blank PVC

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:

FISHER ENGINEERING

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	STRATA PLOT	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		SILTY SAND to SANDY SILT: Brown, slightly moist, loose				SS-2	6
4	1			1.68/ 100.72		SS-3	6
6		SAND: Grey, wet, loose to compact				SS-4	12
8	2						
10				3.20/ 99.20		SS-5	4
12	3	SILTY CLAY: Red to brown, moist, firm					
14				4.57 97.83			
16	4	SAND: Grey, wet, compact				SS-6	13
18							
20	5			6.10/ 96.30		SS-7	31
22		SILTY CLAY: red, brown, slightly moist, hard					
24	6			7.01/ 95.39			
26		SAND and GRAVEL: Brownish grey, wet, dense			21-6748-9	SS-8	32
28	7						
30					21-6748-10	SS-9	33
32	8						
	9						
	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)	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						
	6		6.10/ 96.74			
20		SAND and GRAVEL: Grey, moist, compact very dense			SS-7	23
22	7					
24			7.62/ 95.22			
26	8	GRAVEL: Grey, trace sand, dry, very dense		21-6748-11	SS-8	100+
28						
30	9				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

2" blank PVC

Bentonite Pellets

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	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)	102.64			
0	0	TOPSOIL: Dark brown sandy silt with roots, trace gravel, moist	0.61/ 102.03		SS-1	
2	1	SILTY SAND to SANDY SILT: Brown, slightly moist, loose to compact			SS-2	7
4					SS-3	10
6	2					
8			2.59/ 100.05		SS-4	11
	3	SAND: Grey to greyish brown, trace gravel, moist, compact			SS-5	25
10						
12	4					
14						
			4.88/ 97.76		SS-6	26
16	5	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						
24	7					
					SS-8	100+
26	8					
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

2" blank PVC

Bentonite Pellets

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
		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
				12.65/ 89.99			
42		End of Borehole					
44	13						
46							
48	14						
50							
52	15						
54							
56	16						
58							
60	17						
62							
64	18						
	19						

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: 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				4.72/ 98.08		SS-6	24
16	5	SILTY CLAY: Brown, most, very stiff					
18				6.10/ 96.70			
20	6	SAND and GRAVEL: grey, trace silt, occasional cobbles/boulders, moist, dense to very dense,				SS-7	37
22	7						
24						SS-8	75
26	8						
28				9.14/ 93.66			
30	9	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 DISTRIBUTION ANALYSES

FISHER ENVIRONMENTAL
ATTN: CLIVE
15-400 ESNA PARK DRIVE
MARKHAM ON N/A

Date Received: 21-JUN-21
Report Date: 06-JUL-21 14:55 (MT)
Version: FINAL

Client Phone: 905-475-7755

Certificate of Analysis

Lab Work Order #: L2603951

Project P.O. #: NOT SUBMITTED
Job Reference: 1029 / 1033 WATERDOWN ROAD BURLINGTON
C of C Numbers: 17-796985
Legal Site Desc:

Emily Hansen
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2603951-1 BH1 5-6.5 Sampled By: CLIENT on 15-JUN-21 Matrix: SOIL							
Physical Tests							
Grain Size Curve	SEE ATTACHED				05-JUL-21	05-JUL-21	R5513314
Particle Size							
Gravel (4.75mm - 3in.)	<1.0		1.0	%	05-JUL-21	05-JUL-21	R5513314
Medium Sand (0.425mm - 2.0mm)	13.5		1.0	%	05-JUL-21	05-JUL-21	R5513314
Coarse Sand (2.0mm - 4.75mm)	<1.0		1.0	%	05-JUL-21	05-JUL-21	R5513314
Fine Sand (0.075mm - 0.425mm)	48.6		1.0	%	05-JUL-21	05-JUL-21	R5513314
Silt (0.002mm - 0.075mm)	15.2		1.0	%	05-JUL-21	05-JUL-21	R5513314
Silt (0.005mm - 0.075mm)	13.2		1.0	%	05-JUL-21	05-JUL-21	R5513314
Clay (<0.002mm)	22.8		1.0	%	05-JUL-21	05-JUL-21	R5513314
Clay (<0.005mm)	24.7		1.0	%	05-JUL-21	05-JUL-21	R5513314
L2603951-2 BH6 20-20.5 Sampled By: CLIENT on 15-JUN-21 Matrix: SOIL							
Physical Tests							
Grain Size Curve	SEE ATTACHED				05-JUL-21	05-JUL-21	R5513314
Particle Size							
Gravel (4.75mm - 3in.)	<1.0		1.0	%	05-JUL-21	05-JUL-21	R5513314
Medium Sand (0.425mm - 2.0mm)	<1.0		1.0	%	05-JUL-21	05-JUL-21	R5513314
Coarse Sand (2.0mm - 4.75mm)	<1.0		1.0	%	05-JUL-21	05-JUL-21	R5513314
Fine Sand (0.075mm - 0.425mm)	<1.0		1.0	%	05-JUL-21	05-JUL-21	R5513314
Silt (0.002mm - 0.075mm)	48.7		1.0	%	05-JUL-21	05-JUL-21	R5513314
Silt (0.005mm - 0.075mm)	26.2		1.0	%	05-JUL-21	05-JUL-21	R5513314
Clay (<0.002mm)	50.5		1.0	%	05-JUL-21	05-JUL-21	R5513314
Clay (<0.005mm)	72.9		1.0	%	05-JUL-21	05-JUL-21	R5513314

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
GRAIN SIZE-HYD-SK	Soil	Grain Size by Hydrometer	ASTM D6913/D7928

Particle size curve is generated from dry sieving (particles > 2 mm), wet sieving (particles 2 mm-75 um) and hydrometer readings (particles < 75 um)

ASTM D422-63 has been withdrawn, the ASTM D6913/D7928 standard serves as the successor method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA

Chain of Custody Numbers:

17-796985

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON N/A
Contact: CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
GRAIN SIZE-HYD-SK	**Soil**							
Batch R5513314								
WG3565120-2 IRM		**2020-PSA_SOIL**						
Medium Sand (0.425mm - 2.0mm)			7.8		%		2-12	05-JUL-21
Fine Sand (0.075mm - 0.425mm)			35.5		%		29.6-39.6	05-JUL-21
Silt (0.005mm - 0.075mm)			30.2		%		27.4-37.4	05-JUL-21
Clay (<0.005mm)			26.5		%		21-31	05-JUL-21
Silt (0.002mm - 0.075mm)			35.1		%		32.3-42.3	05-JUL-21
Clay (<0.002mm)			21.7		%		16.1-26.1	05-JUL-21

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

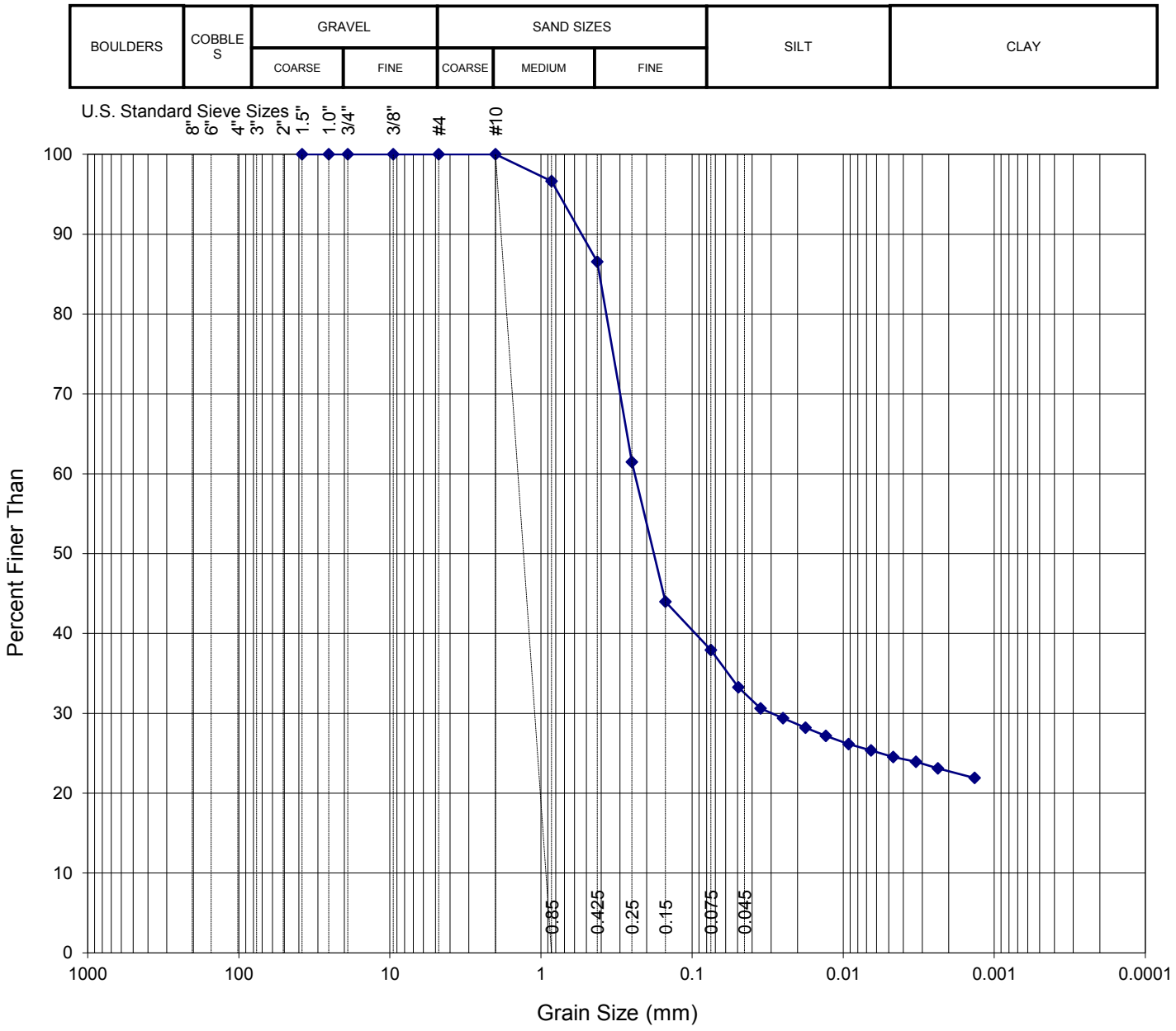
Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Laboratory Group

819-58th Street, Saskatoon,SK

PARTICLE SIZE DISTRIBUTION CURVE

Client Name:	FISHER ENVIRONMENTAL
Project Number:	
Client Sample ID	BH1 5-6.5
Lab Sample ID	L2603951-1
Date Sample Received	21-Jun-21
Test Completion Date:	06-Jul-21
Analyst:	HML



METHOD DESCRIPTION

Method Reference: ASTM D 422 - 63 (2002)

Dispersion method: Mechanical

Dispesion period: 1 minute cm/s

Soil classification system used: ASTM D422-63 Classification

DESCRIPTION OF SAND AND GRAVEL PARTICLES

Shape: Angular

Hardness: Hard

SUMMARY OF RESULTS

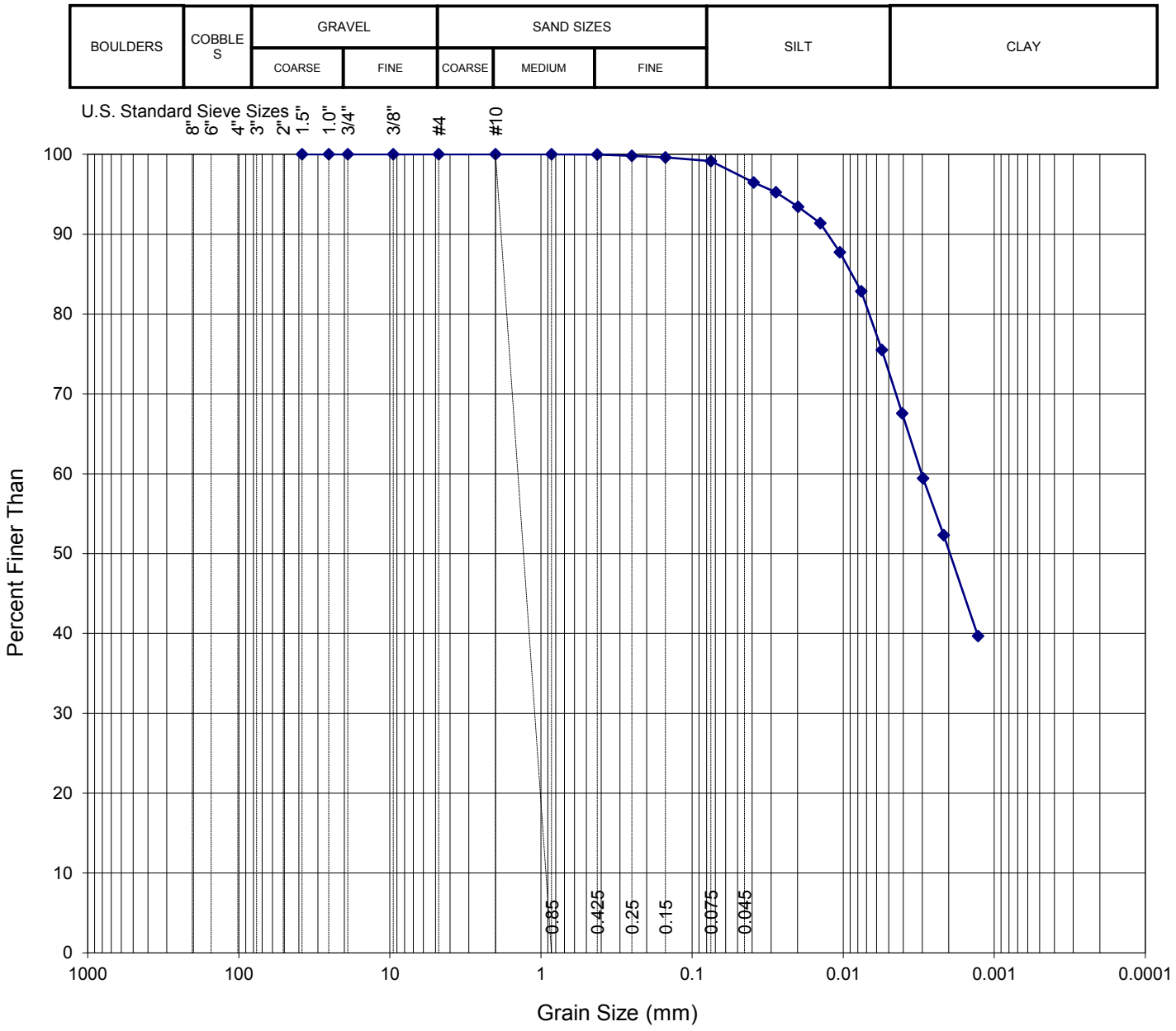
GRAIN SIZE	WT %	DIA. RANGE (mm)
% GRAVEL :	<1	> 4.75
% COARSE SAND :	<1	2.0 - 4.75
% MEDIUM SAND :	13.46	0.425 - 2.0
% FINE SAND :	48.63	0.075 - 0.425
% SILT :	13.21	0.075 - 0.005
% CLAY :	24.70	< 0.005

ALS Laboratory Group

819-58th Street, Saskatoon,SK

PARTICLE SIZE DISTRIBUTION CURVE

Client Name:	FISHER ENVIRONMENTAL
Project Number:	
Client Sample ID	BH6 20-20.5
Lab Sample ID	L2603951-2
Date Sample Received	21-Jun-21
Test Completion Date:	06-Jul-21
Analyst:	HML



METHOD DESCRIPTION

Method Reference: ASTM D 422 - 63 (2002)

Dispersion method: Mechanical

Dispesion period: 1 minute cm/s

Soil classification system used: ASTM D422-63 Classification

DESCRIPTION OF SAND AND GRAVEL PARTICLES

Shape: Angular

Hardness: Hard

SUMMARY OF RESULTS

GRAIN SIZE	WT %	DIA. RANGE (mm)
% GRAVEL :	<1	> 4.75
% COARSE SAND :	<1	2.0 - 4.75
% MEDIUM SAND :	<1	0.425 - 2.0
% FINE SAND :	<1	0.075 - 0.425
% SILT :	26.24	0.075 - 0.005
% CLAY :	72.90	< 0.005

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2603951-COFC

COC Number: 17 - 796985

Page of

Report To	Contact and company name below, will appear on the final report	Report Format / Distribution				Turn-around Time (TAT) Requested - Contact your AM to confirm all E&P TATs (surcharges may apply)			
Company:	Fisher Engineering	Select Report Format:	✓ PDF	EXCEL	EDD (DIGITAL)	Regular [R]	✓	Standard TAT if received by 3 pm - business days - no surcharges apply	
Contact:	Clive	Quality Control (QC) Report with Report		YES	NO	PRIORITY (Business Days) 4 day [P4-20%]		EMERGENCY 1 Business day [E - 100%]	
Phone:	416 605 9722	Compare Results to Criteria on Report - provide details below if box checked				3 day [P3-25%]		Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]	
	Company address below will appear on the final report	Select Distribution:	✓ EMAIL	MAIL	FAX	2 day [P2-50%]			
Street:		Email 1 or Fax	Clive			Date and Time Required for all E&P TATs:		dd-mmm-yy hh:mm	
City/Province:		Email 2	Frank			For tests that can not be performed according to the service level selected, you will be contacted.			
Postal Code:		Email 3							

Invoice To		Invoice Distribution			
	Same as Report To	YES	✓ NO	Select Invoice Distribution:	✓ EMAIL MAIL FAX
	Copy of Invoice with Report	YES	✓ NO	Email 1 or Fax	Elena
Company:				Email 2	Clive
Contact:					

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	1029/1033 Matadavis Road	Major/Minor Code:	Routing Code:
PO / AFE:	Burlington	Requisitioner:	
LSD:	AP	Location:	
ALS Lab Work Order # (lab use only):	L2603951	ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

NUMBER OF CONTAINERS: ✓ Hydrometer - Grain Size

SAMPLES ON HOLD

SUSPECTED HAZARD (see Special Instructions)

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type
	BH1 5-6½	15-06-21		Soil
	BH4 20-21½	"		"

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? [ ] YES [✓] NO	
Are samples for human consumption/ use? [ ] YES [✓] NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen		SIF Observations	Yes		No
Ice Packs	✓	Ice Cubes	Custody seal intact	Yes	No
Cooling Initiated					

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
					5.8		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Clive							6/21/21	15:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

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FAX: 905 475-7718
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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)

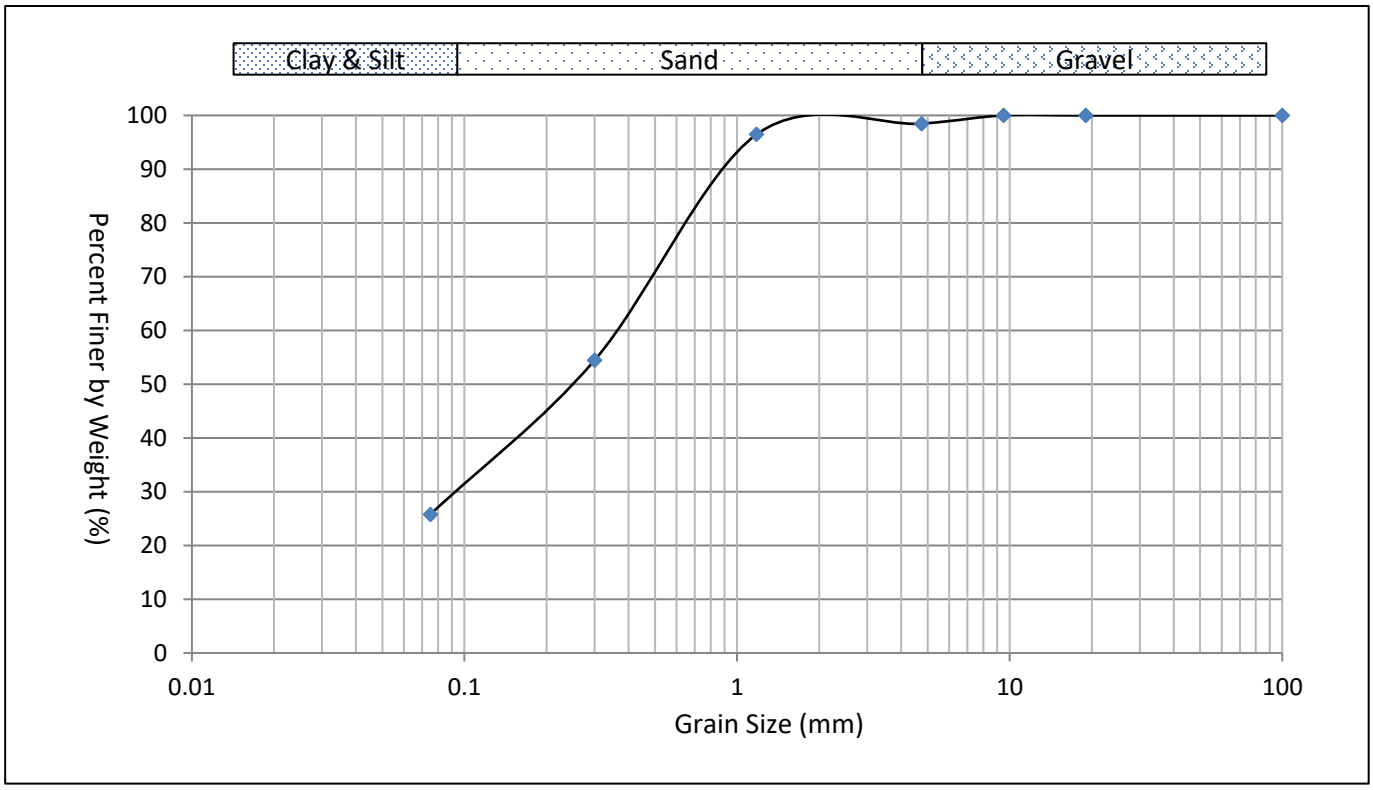
Parameter	***21-6748-3*** BH1 4.55-5.00m A	***21-6748-4*** BH1 4.55-5.00m B	***21-6748-7*** BH3 7.55-8.05m	***21-6748-9*** BH4 7.55-8.05m	***21-6748-11*** BH5 7.55-8.05m	***21-6748-12*** BH6 6.05-6.50m
Grain Size (%)						
>19mm	0.0	9.2	0.0	0.0	0.0	0.0
9.5mm-19mm	0.0	5.1	5.7	5.9	20.3	13.0
4.75mm-9.5mm	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%

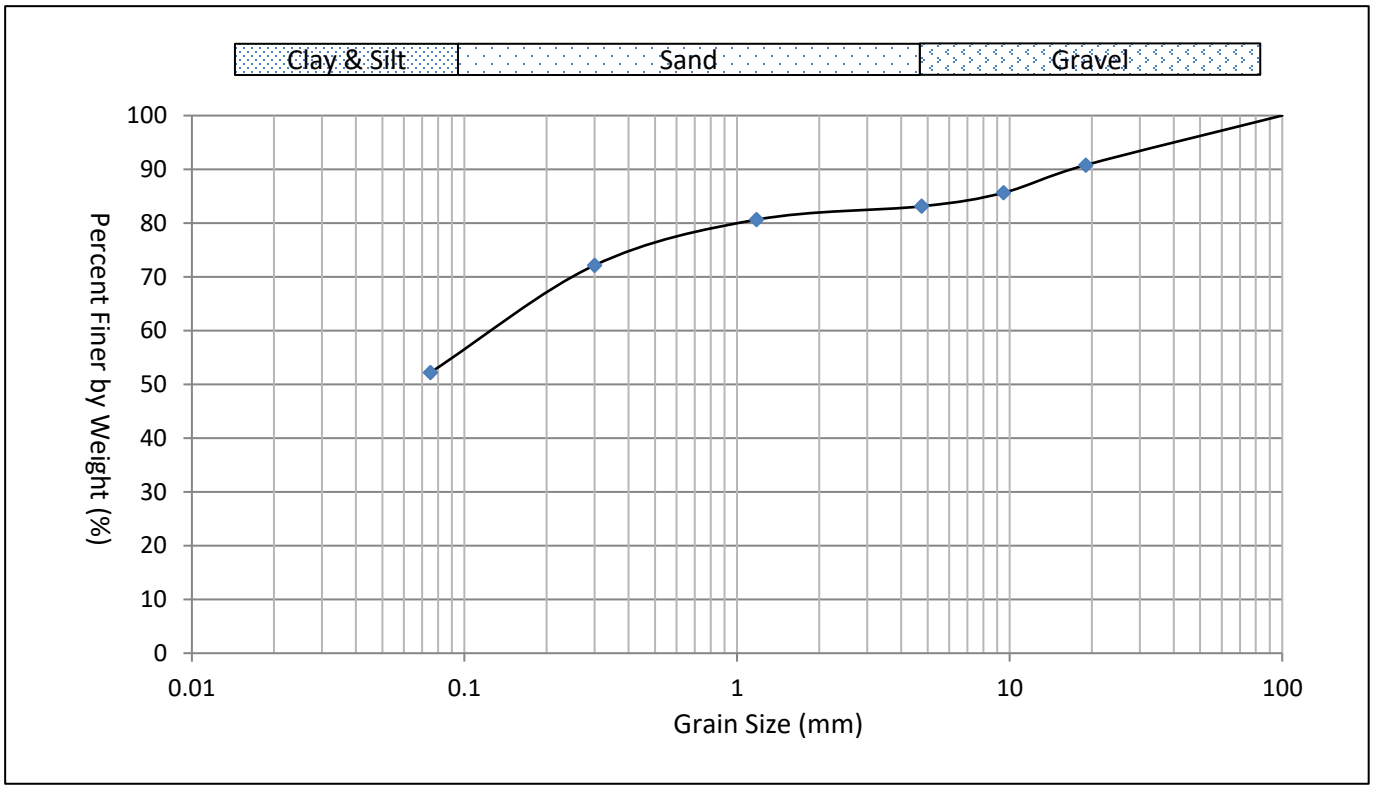


Results related only to the items tested

Grain Size Distribution

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

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

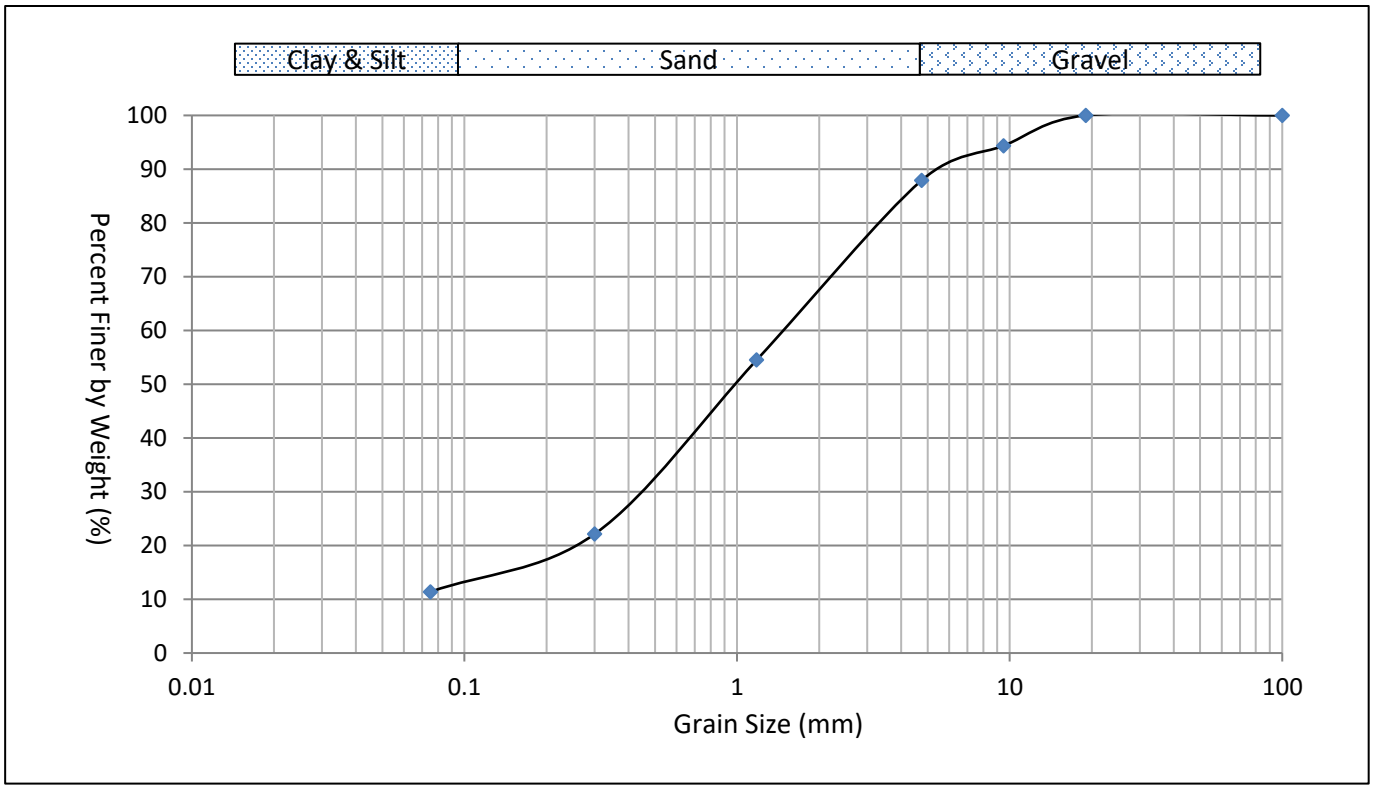


Results related only to the items tested

Grain Size Distribution

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

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

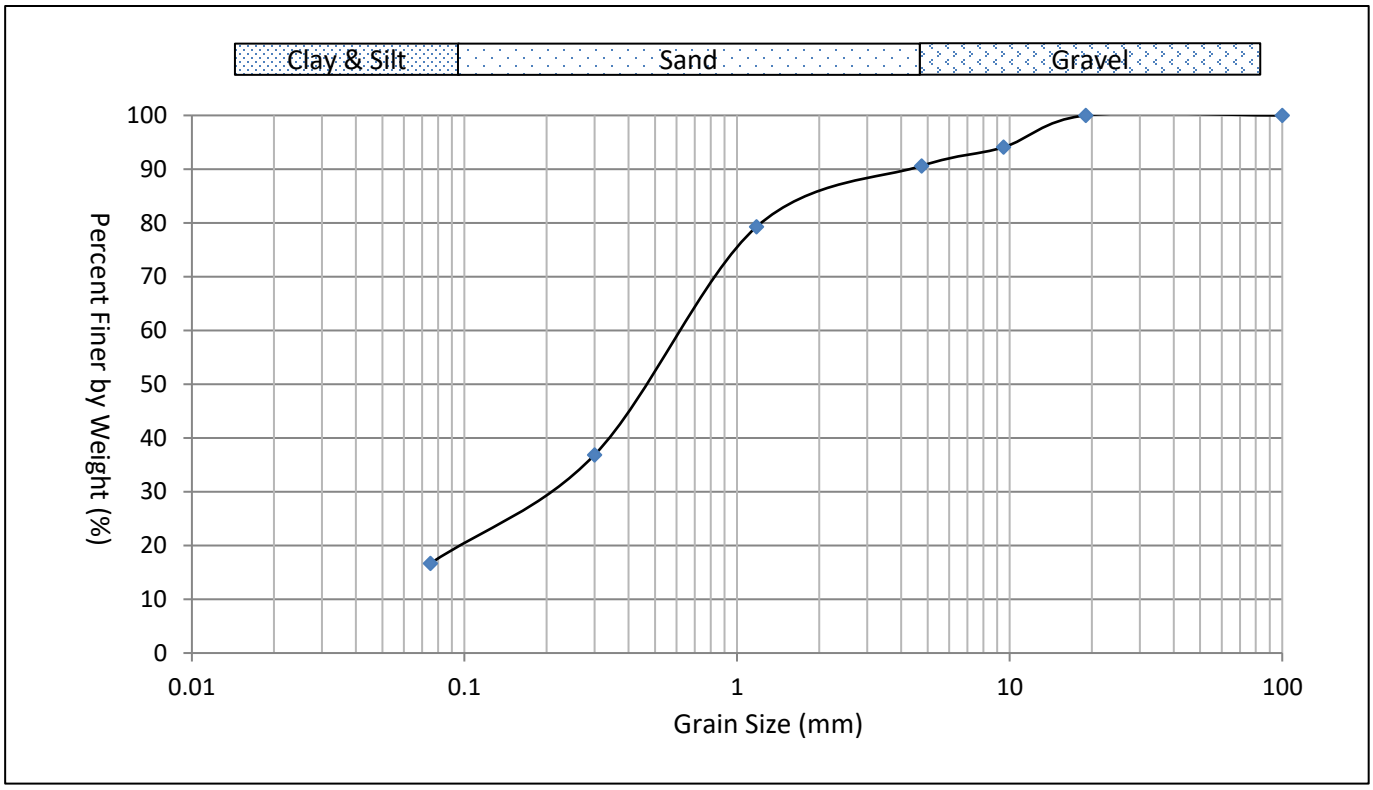


Results related only to the items tested

Grain Size Distribution

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

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

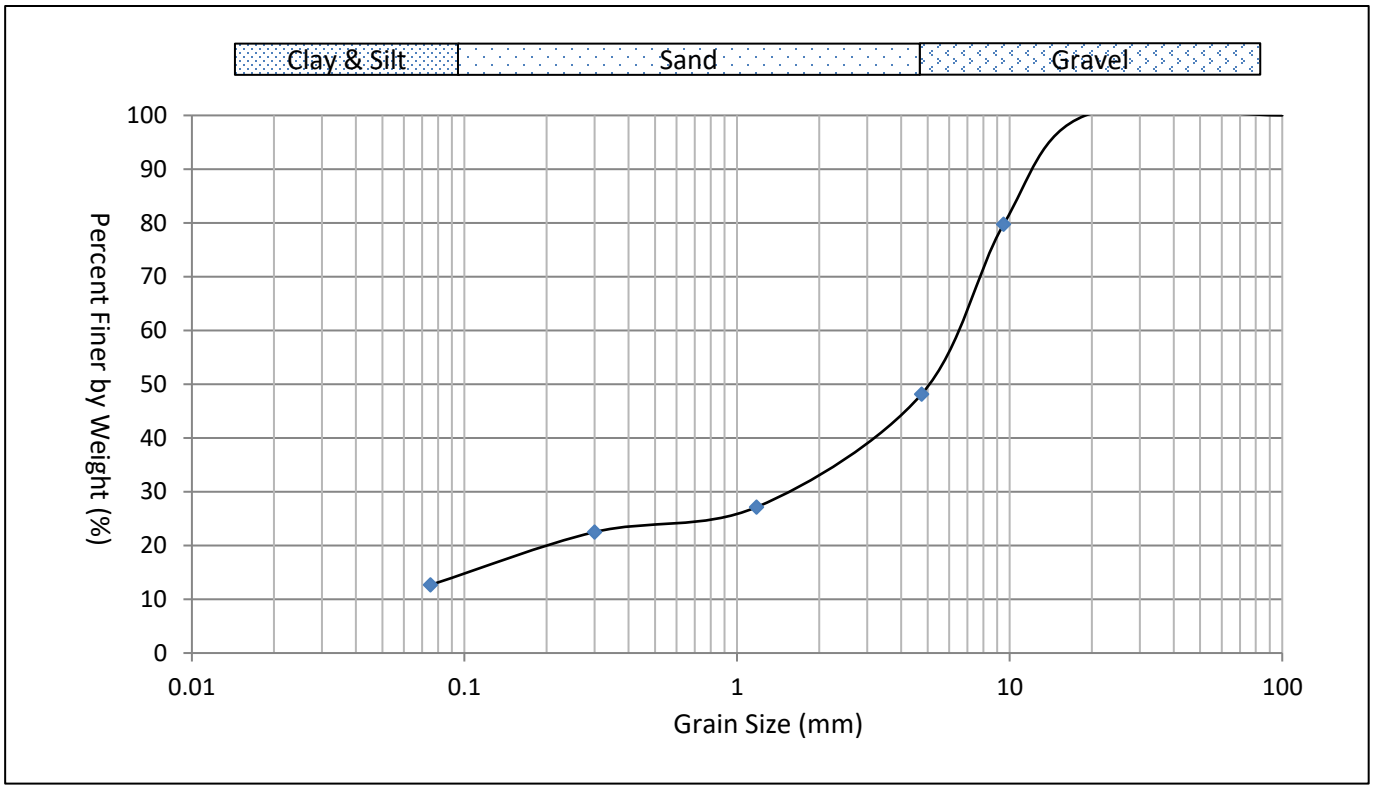


Results related only to the items tested

Grain Size Distribution

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

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



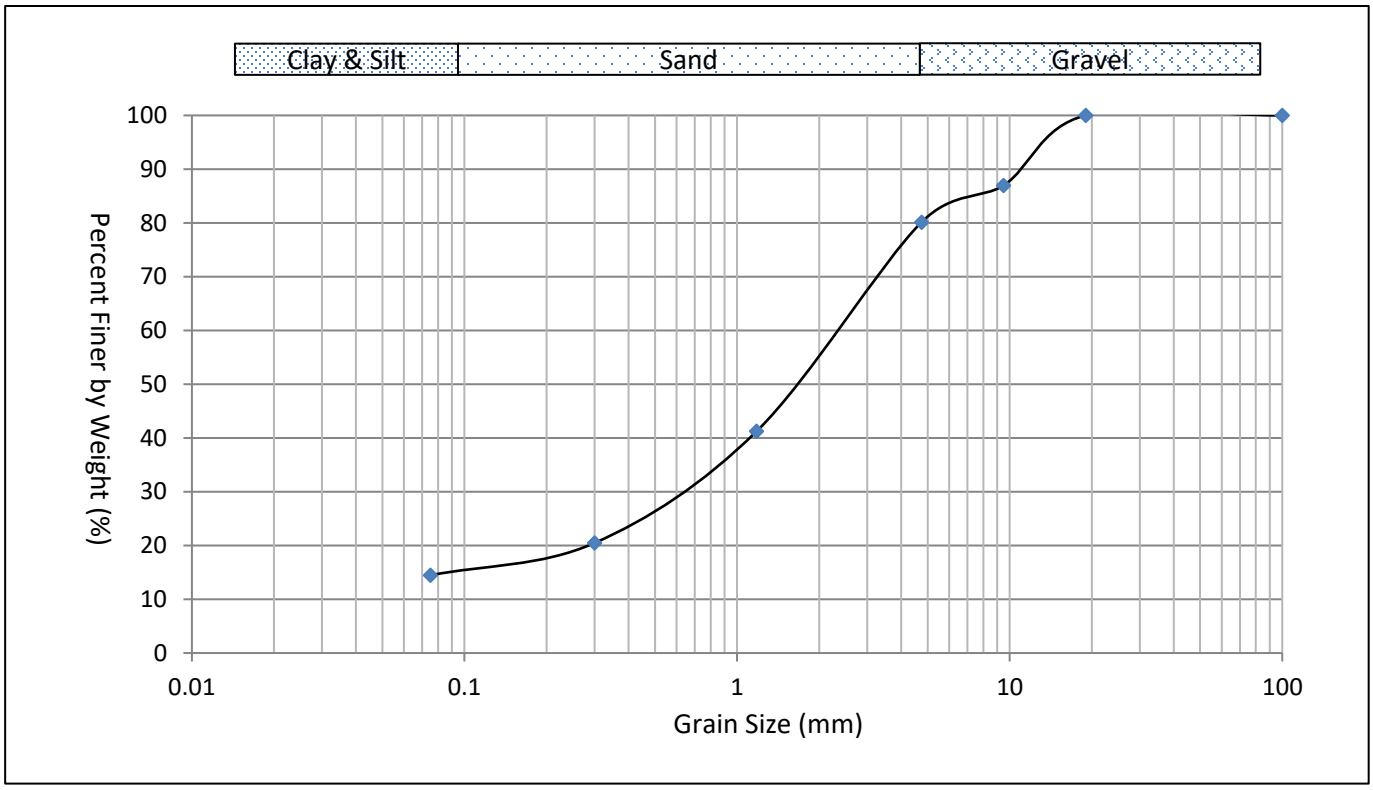
Results related only to the items tested

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

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LAB JOB #: 21-6748

CHAIN OF CUSTODY 2496

Page 1 of 1

CLIENT INFORMATION
Company Name: Infinity Development
Contact:
Address: 1029/1033 Waterdown Rd Burlington
Phone:
Fax:
Email:
Fax results? Y/N
Email results? Y/N

PROJECT INFORMATION
Project Name: Geotechnical & Hydrogeological Investigation
Project ID:
Sampled By: CAW

TURNAROUND TIME (TAT) REQUIRED
STD - Standard (5-7 working days)
SR - Semi Rush (48 hours) 50%
R - Rush (24 hours) 75%
SD - Same Day - 100%
Surcharges apply; Sample received after 2pm will be considered received the next business day
Working Time: Monday-Friday 9:00am-5:00pm

BILLING INFORMATION
Purchase Order #:
Verbal Authorization:
Credit Card (type):
Credit Card #:
Expiry Date:

LAB SAMPLE ID	CLIENT'S SAMPLE ID AND DESCRIPTION	SAMPLING DATE/TIME	SAMPLE MATRIX	CONTAINER # & TYPE	TAT (Above)	ANALYSIS REQUESTED (Check or Specify) Metals	PHCs	VOCs	PAHs	PCBs	Asbestos	GS	M		NOTES
1	BH1 7½-9	June 15-17	Soil	Bag									-		
2	10-11½	"	"	"			-	*	-				-		
3	15-16½ A	"	"	"								✓	-		
4	15-16½ B	"	"	"								✓	-		
5	25-26½	"	"	"			✓	*	-				-		
6	BH3 15-16½	"	"	"									-		
7	25-26½	"	"	"			✓	-	*			✓	✓		
8	30-31½	"	"	"									✓		
9	BH4 25-26½	"	"	"			✓	-	*			✓	✓		
10	30-31½	"	"	"									✓		
11	BH5 25-26½	"	"	"								✓	-		
12	BH6 20-22½	"	"	"			✓	*	-			✓	✓		

Relinquished by: (Signature & Print)
Date & Time:
Method of Shipment: By Hand

Received by: (Signature & Print)
Date & Time: June 18, 21.

Client's Comments:

Arrival Temperature (°C): 12°C
Laboratory Remarks:

Regulatory Requirements
Reg. 153
Table _____
☐ Residential / Parkland
☐ Industrial / Commercial
☐ Agricultural
Soil Texture
☐ Coarse ☐ Med/Fine

Sewer Use
☐ Sanitary
☐ Storm
Region _____

Reg. 558
☐ TCLP

Revision: 2.2

APPENDIX D – SEWER BYLAW RESULTS

FISHER ENVIRONMENTAL
ATTN: CLIVE
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2

Date Received: 17-JUN-21
Report Date: 29-JUN-21 12:06 (MT)
Version: FINAL

Client Phone: 905-475-7755

Certificate of Analysis

Lab Work Order #: L2602906

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: 20-892013
Legal Site Desc:

Emily Hansen
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ANALYTICAL REPORT

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit	Guideline

Ontario Halton Santitary Sewer By-law No. 02-03 (MAR, 2003) - Halton Sanitary Sewer By-Law No. 02-03

(No parameter exceedances)

Ontario Halton Santitary Sewer By-law No. 02-03 (MAR, 2003) - Halton Storm Sewer By-Law No, 02-03

(No parameter exceedances)

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2602906-1 Sample Date: 17-JUN-21 Sample ID: MW1 1029-1033 WATERDOWN RD BURLINGTON
pH	pH units	6.00-10.0	6.5-8.5	7.41
Total Suspended Solids	mg/L	350	-	6.2

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2602906-1 Sample Date: 17-JUN-21 Sample ID: MW1 1029-1033 WATERDOWN RD BURLINGTON
Fluoride (F)	mg/L	10	-	<0.20 DLDS
Total Kjeldahl Nitrogen	mg/L	100	-	0.330
Phosphorus, Total	mg/L	10.0	-	0.0912
Sulfate (SO4)	mg/L	1500	-	142 DLDS

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Cyanides - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2602906-1 Sample Date: 17-JUN-21 Sample ID: MW1 1029-1033 WATERDOWN RD BURLINGTON
Cyanide, Total	mg/L	2	-	0.0038

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Bacteriological Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2602906-1 Sample Date: 17-JUN-21 Sample ID: MW1 1029-1033 WATERDOWN RD BURLINGTON
E. Coli	CFU/100mL	-	200	0

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2602906-1 Sample Date: 17-JUN-21 Sample ID: MW1 1029-1033 WATERDOWN RD BURLINGTON
Aluminum (Al)-Total	mg/L	50	-	1.32 DLHC
Antimony (Sb)-Total	mg/L	5	-	<0.0010 DLHC
Arsenic (As)-Total	mg/L	1	-	<0.0010 DLHC
Beryllium (Be)-Total	mg/L	5	-	<0.0010 DLHC
Cadmium (Cd)-Total	mg/L	1	-	<0.000050 DLHC
Chromium (Cr)-Total	mg/L	3	-	<0.0050 DLHC
Cobalt (Co)-Total	mg/L	5	-	0.0011 DLHC
Copper (Cu)-Total	mg/L	3	-	0.0050 DLHC
Iron (Fe)-Total	mg/L	50	-	1.81 DLHC
Lead (Pb)-Total	mg/L	3	-	0.00114 DLHC
Manganese (Mn)-Total	mg/L	5	-	0.0942 DLHC
Mercury (Hg)-Total	mg/L	0.05	-	<0.0000050
Molybdenum (Mo)-Total	mg/L	5	-	<0.00050 DLHC
Nickel (Ni)-Total	mg/L	3	-	<0.0050 DLHC
Selenium (Se)-Total	mg/L	5	-	0.00111 DLHC
Silver (Ag)-Total	mg/L	5	-	<0.00050 DLHC
Tin (Sn)-Total	mg/L	5	-	<0.0010 DLHC
Titanium (Ti)-Total	mg/L	5	-	0.0256 DLHC
Zinc (Zn)-Total	mg/L	3	-	0.042 DLHC

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Aggregate Organics - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2602906-1 Sample Date: 17-JUN-21 Sample ID: MW1 1029-1033 WATERDOWN RD BURLINGTON
BOD Carbonaceous	mg/L	300	-	<3.0 BODL
Oil and Grease, Total	mg/L	-	-	<5.0
Animal/Veg Oil & Grease	mg/L	150	-	<5.0
Mineral Oil and Grease	mg/L	15	-	<2.5
Phenols (4AAP)	mg/L	1.0	-	<0.0010

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2602906-1 Sample Date: 17-JUN-21 Sample ID: MW1 1029-1033 WATERDOWN RD BURLINGTON
Benzene	ug/L	10	-	<0.50 OWP
Chloroform	ug/L	40	-	<1.0 OWP
1,4-Dichlorobenzene	ug/L	80	-	<0.50 OWP
Dichloromethane	ug/L	2000	-	<2.0 OWP
Ethylbenzene	ug/L	160	-	<0.50 OWP
Tetrachloroethylene	ug/L	1000	-	<0.50 OWP
Toluene	ug/L	16	-	<0.50 OWP
Trichloroethylene	ug/L	400	-	<0.50 OWP
Surrogate: 4-Bromofluorobenzene	%	-	-	90.2
Surrogate: 1,4-Difluorobenzene	%	-	-	98.8

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

			Lab ID	L2602906-1
			Sample Date	17-JUN-21
			Sample ID	MW1 1029-1033 WATERDOWN RD BURLINGTON
		Guide Limits		
Analyte	Unit	#1	#2	
Naphthalene	ug/L	140	-	<0.020
Surrogate: d8-Naphthalene	%	-	-	92.2

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
BODL	Limit of Reporting for BOD was increased to account for the largest volume of sample tested.
OWP	Organic water sample contained visible sediment (must be included as part of analysis). Measured concentrations of organic substances in water can be biased high due to presence of

sediment.

DLHC Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
BOD-C-WT	Water	BOD Carbonaceous	APHA 5210 B (CBOD)

This analysis is carried out using procedures adapted from APHA Method 5210B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.

CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EC-WW-MF-WT	Water	E. Coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

OGG-SPEC-CALC-WT	Water	Speciated Oil and Grease A/V Calc	CALCULATION

Sample is extracted with hexane, sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.

OGG-SPEC-WT	Water	Speciated Oil and Grease-Gravimetric	APHA 5520 B

The procedure involves an extraction of the entire water sample with hexane. Sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.			
PAH-NAPHTHALENE-WT	Water	Polyaromatic Hydrocarbons (PAHs)	SW846 8270
Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD.			
PH-WT	Water	pH	APHA 4500 H-Electrode
Water samples are analyzed directly by a calibrated pH meter.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days			
PHENOLS-4AAP-WT	Water	Phenol (4AAP)	EPA 9066
An automated method is used to distill the sample. The distillate is then buffered to pH 9.4 which reacts with 4AAP and potassium ferricyanide to form a red complex which is measured colorimetrically.			
SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.			
TKN-F-WT	Water	TKN in Water by Fluorescence	J. ENVIRON. MONIT., 2005,7,37-42,RSC
Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection			
VOC-ROU-HS-WT	Water	Volatile Organic Compounds	SW846 8260
Aqueous samples are analyzed by headspace-GC/MS.			

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

20-892013

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2602906 Report Date: 29-JUN-21

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2

Contact: CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BOD-C-WT	**Water**							
Batch R5497316								
WG3558317-6 DUP		**L2602823-1**						
BOD Carbonaceous		247	251		mg/L	1.6	30	18-JUN-21
WG3558317-7 LCS								
BOD Carbonaceous			99.5		%		85-115	18-JUN-21
WG3558317-5 MB								
BOD Carbonaceous			<2.0		mg/L		2	18-JUN-21
CN-TOT-WT	**Water**							
Batch R5496639								
WG3561439-3 DUP		**WG3561439-5**						
Cyanide, Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	23-JUN-21
WG3561439-2 LCS								
Cyanide, Total			91.3		%		80-120	23-JUN-21
WG3561439-1 MB								
Cyanide, Total			<0.0020		mg/L		0.002	23-JUN-21
WG3561439-4 MS		**WG3561439-5**						
Cyanide, Total			91.4		%		70-130	23-JUN-21
EC-WW-MF-WT	**Water**							
Batch R5493717								
WG3558406-3 DUP		**L2602906-1**						
E. Coli		0	<10	RPD-NA	CFU/100mL	N/A	65	18-JUN-21
WG3558406-4 DUP		**L2602909-1**						
E. Coli		0	<10	RPD-NA	CFU/100mL	N/A	65	18-JUN-21
WG3558406-1 MB								
E. Coli			0		CFU/100mL		1	18-JUN-21
F-IC-N-WT	**Water**							
Batch R5494522								
WG3558621-15 DUP		**WG3558621-13**						
Fluoride (F)		0.715	0.715		mg/L	0.0	20	18-JUN-21
WG3558621-12 LCS								
Fluoride (F)			104.8		%		90-110	18-JUN-21
WG3558621-11 MB								
Fluoride (F)			<0.020		mg/L		0.02	18-JUN-21
WG3558621-14 MS		**WG3558621-13**						
Fluoride (F)			101.5		%		75-125	18-JUN-21
HG-T-CVAA-WT	**Water**							

Quality Control Report

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2
Contact: CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-WT	**Water**							
Batch R5494458								
WG3558653-3 DUP		**L2602736-1**						
Mercury (Hg)-Total		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	21-JUN-21
WG3558653-2 LCS								
Mercury (Hg)-Total			99.2		%		80-120	21-JUN-21
WG3558653-1 MB								
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	21-JUN-21
WG3558653-4 MS		**L2601990-1**						
Mercury (Hg)-Total			86.9		%		70-130	21-JUN-21
MET-T-CCMS-WT	**Water**							
Batch R5493362								
WG3557811-4 DUP		**WG3557811-3**						
Aluminum (Al)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	18-JUN-21
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	18-JUN-21
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	18-JUN-21
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	18-JUN-21
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	18-JUN-21
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	18-JUN-21
Cobalt (Co)-Total		0.0014	0.0014		mg/L	3.2	20	18-JUN-21
Copper (Cu)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	18-JUN-21
Iron (Fe)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	18-JUN-21
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	18-JUN-21
Manganese (Mn)-Total		0.609	0.610		mg/L	0.2	20	18-JUN-21
Molybdenum (Mo)-Total		0.00404	0.00409		mg/L	1.3	20	18-JUN-21
Nickel (Ni)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	18-JUN-21
Selenium (Se)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	18-JUN-21
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	18-JUN-21
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	18-JUN-21
Titanium (Ti)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	18-JUN-21
Zinc (Zn)-Total		<0.030	<0.030	RPD-NA	mg/L	N/A	20	18-JUN-21
WG3557811-2 LCS								
Aluminum (Al)-Total			106.8		%		80-120	18-JUN-21
Antimony (Sb)-Total			105.8		%		80-120	18-JUN-21
Arsenic (As)-Total			106.9		%		80-120	18-JUN-21
Beryllium (Be)-Total			102.3		%		80-120	18-JUN-21
Cadmium (Cd)-Total			104.2		%		80-120	18-JUN-21

Quality Control Report

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2
Contact: CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5493362								
WG3557811-2 LCS								
Chromium (Cr)-Total			105.3		%		80-120	18-JUN-21
Cobalt (Co)-Total			106.7		%		80-120	18-JUN-21
Copper (Cu)-Total			105.9		%		80-120	18-JUN-21
Iron (Fe)-Total			106.3		%		80-120	18-JUN-21
Lead (Pb)-Total			105.2		%		80-120	18-JUN-21
Manganese (Mn)-Total			104.7		%		80-120	18-JUN-21
Molybdenum (Mo)-Total			104.6		%		80-120	18-JUN-21
Nickel (Ni)-Total			105.4		%		80-120	18-JUN-21
Selenium (Se)-Total			103.4		%		80-120	18-JUN-21
Silver (Ag)-Total			105.2		%		80-120	18-JUN-21
Tin (Sn)-Total			104.6		%		80-120	18-JUN-21
Titanium (Ti)-Total			104.7		%		80-120	18-JUN-21
Zinc (Zn)-Total			105.8		%		80-120	18-JUN-21
WG3557811-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	18-JUN-21
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	18-JUN-21
Arsenic (As)-Total			<0.00010		mg/L		0.0001	18-JUN-21
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	18-JUN-21
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	18-JUN-21
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	18-JUN-21
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	18-JUN-21
Copper (Cu)-Total			<0.00050		mg/L		0.0005	18-JUN-21
Iron (Fe)-Total			<0.010		mg/L		0.01	18-JUN-21
Lead (Pb)-Total			<0.000050		mg/L		0.00005	18-JUN-21
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	18-JUN-21
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	18-JUN-21
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	18-JUN-21
Selenium (Se)-Total			<0.000050		mg/L		0.00005	18-JUN-21
Silver (Ag)-Total			<0.000050		mg/L		0.00005	18-JUN-21
Tin (Sn)-Total			<0.00010		mg/L		0.0001	18-JUN-21
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	18-JUN-21
Zinc (Zn)-Total			<0.0030		mg/L		0.003	18-JUN-21
WG3557811-5 MS		**WG3557811-6**						
Aluminum (Al)-Total			99.2		%		70-130	18-JUN-21

Quality Control Report

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2
Contact: CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5493362								
WG3557811-5 MS		**WG3557811-6**						
Antimony (Sb)-Total			102.3		%		70-130	18-JUN-21
Arsenic (As)-Total			102.7		%		70-130	18-JUN-21
Beryllium (Be)-Total			102.3		%		70-130	18-JUN-21
Cadmium (Cd)-Total			99.0		%		70-130	18-JUN-21
Chromium (Cr)-Total			101.4		%		70-130	18-JUN-21
Cobalt (Co)-Total			99.8		%		70-130	18-JUN-21
Copper (Cu)-Total			95.2		%		70-130	18-JUN-21
Iron (Fe)-Total			91.7		%		70-130	18-JUN-21
Lead (Pb)-Total			97.5		%		70-130	18-JUN-21
Manganese (Mn)-Total			N/A	MS-B	%		-	18-JUN-21
Molybdenum (Mo)-Total			101.5		%		70-130	18-JUN-21
Nickel (Ni)-Total			96.9		%		70-130	18-JUN-21
Selenium (Se)-Total			100.4		%		70-130	18-JUN-21
Silver (Ag)-Total			98.3		%		70-130	18-JUN-21
Tin (Sn)-Total			101.6		%		70-130	18-JUN-21
Titanium (Ti)-Total			101.5		%		70-130	18-JUN-21
Zinc (Zn)-Total			91.4		%		70-130	18-JUN-21
OGG-SPEC-WT	**Water**							
Batch R5505647								
WG3564619-2 LCS								
Oil and Grease, Total			96.0		%		70-130	28-JUN-21
Mineral Oil and Grease			92.1		%		70-130	28-JUN-21
WG3564619-1 MB								
Oil and Grease, Total			<5.0		mg/L		5	28-JUN-21
Mineral Oil and Grease			<2.5		mg/L		2.5	28-JUN-21
P-T-COL-WT	**Water**							
Batch R5494354								
WG3558105-3 DUP		**L2602581-1**						
Phosphorus, Total		0.0638	0.0696		mg/L	8.7	20	21-JUN-21
WG3558105-2 LCS								
Phosphorus, Total			100.4		%		80-120	21-JUN-21
WG3558105-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	21-JUN-21
WG3558105-4 MS		**L2602581-1**						
Phosphorus, Total			98.1		%		70-130	21-JUN-21

Quality Control Report

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2
Contact: CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-NAPHTHALENE-WT	**Water**							
Batch R5495177								
WG3557874-2 LCS								
Naphthalene			70.0		%		50-130	22-JUN-21
WG3557874-1 MB								
Naphthalene			<0.020		ug/L		0.02	22-JUN-21
Surrogate: d8-Naphthalene			97.6		%		60-140	22-JUN-21
PH-WT	**Water**							
Batch R5493695								
WG3558166-4 DUP		**WG3558166-3**						
pH		7.75	7.78	J	pH units	0.03	0.2	18-JUN-21
WG3558166-2 LCS								
pH			6.99		pH units		6.9-7.1	18-JUN-21
PHENOLS-4AAP-WT	**Water**							
Batch R5496796								
WG3558246-3 DUP		**L2602728-2**						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	23-JUN-21
WG3558246-2 LCS								
Phenols (4AAP)			95.9		%		85-115	22-JUN-21
WG3558246-1 MB								
Phenols (4AAP)			<0.0010		mg/L		0.001	22-JUN-21
WG3558246-4 MS		**L2602728-2**						
Phenols (4AAP)			108.2		%		75-125	23-JUN-21
SO4-IC-N-WT	**Water**							
Batch R5494522								
WG3558621-15 DUP		**WG3558621-13**						
Sulfate (SO4)		27.9	27.9		mg/L	0.0	20	18-JUN-21
WG3558621-12 LCS								
Sulfate (SO4)			104.4		%		90-110	18-JUN-21
WG3558621-11 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	18-JUN-21
WG3558621-14 MS		**WG3558621-13**						
Sulfate (SO4)			102.8		%		75-125	18-JUN-21
SOLIDS-TSS-WT	**Water**							
Batch R5496203								
WG3560300-3 DUP		**L2602816-1**						
Total Suspended Solids		<3.0	3.2	RPD-NA	mg/L	N/A	20	23-JUN-21
WG3560300-2 LCS								
Total Suspended Solids			94.3		%		85-115	23-JUN-21

Quality Control Report

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2
Contact: CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TSS-WT	**Water**							
Batch R5496203								
WG3560300-1 MB								
Total Suspended Solids			<3.0		mg/L		3	23-JUN-21
TKN-F-WT	**Water**							
Batch R5493557								
WG3558182-3 DUP		**L2602909-1**						
Total Kjeldahl Nitrogen		0.300	0.300		mg/L	0.0	20	18-JUN-21
WG3558182-2 LCS								
Total Kjeldahl Nitrogen			89.5		%		75-125	18-JUN-21
WG3558182-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	18-JUN-21
WG3558182-4 MS		**L2602909-1**						
Total Kjeldahl Nitrogen			98.4		%		70-130	18-JUN-21
VOC-ROU-HS-WT	**Water**							
Batch R5502389								
WG3562830-4 DUP		**WG3562830-3**						
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-JUN-21
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-JUN-21
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	25-JUN-21
Dichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	25-JUN-21
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-JUN-21
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-JUN-21
Toluene		0.45	0.47		ug/L	4.2	30	25-JUN-21
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-JUN-21
WG3562830-1 LCS								
1,4-Dichlorobenzene			103.3		%		70-130	25-JUN-21
Benzene			93.9		%		70-130	25-JUN-21
Chloroform			98.4		%		70-130	25-JUN-21
Dichloromethane			97.6		%		70-130	25-JUN-21
Ethylbenzene			91.7		%		70-130	25-JUN-21
Tetrachloroethylene			103.6		%		70-130	25-JUN-21
Toluene			94.2		%		70-130	25-JUN-21
Trichloroethylene			103.7		%		70-130	25-JUN-21
WG3562830-2 MB								
1,4-Dichlorobenzene			<0.50		ug/L		0.5	25-JUN-21
Benzene			<0.50		ug/L		0.5	25-JUN-21

Quality Control Report

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2
Contact: CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5502389								
WG3562830-2 MB								
Chloroform			<1.0		ug/L		1	25-JUN-21
Dichloromethane			<2.0		ug/L		2	25-JUN-21
Ethylbenzene			<0.50		ug/L		0.5	25-JUN-21
Tetrachloroethylene			<0.50		ug/L		0.5	25-JUN-21
Toluene			<0.40		ug/L		0.4	25-JUN-21
Trichloroethylene			<0.50		ug/L		0.5	25-JUN-21
Surrogate: 1,4-Difluorobenzene			98.9		%		70-130	25-JUN-21
Surrogate: 4-Bromofluorobenzene			91.3		%		70-130	25-JUN-21
WG3562830-5 MS		**WG3562830-3**						
1,4-Dichlorobenzene			111.5		%		50-150	25-JUN-21
Benzene			95.9		%		50-150	25-JUN-21
Chloroform			101.1		%		50-150	25-JUN-21
Dichloromethane			100.2		%		50-150	25-JUN-21
Ethylbenzene			89.8		%		50-150	25-JUN-21
Tetrachloroethylene			104.6		%		50-150	25-JUN-21
Toluene			94.4		%		50-150	25-JUN-21
Trichloroethylene			106.2		%		50-150	25-JUN-21

Quality Control Report

Workorder: L2602906 Report Date: 29-JUN-21

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2
Contact: CLIVE

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS www.alsglobal.com

Chain of Cus

L2602906-COFC

COC Number: 20 - 892013

Page of

Report To	Contact and company name below will appear on the final report
Company:	Fisher Environmental
Contact:	Clwe
Phone:	416 605-9722
	Company address below will appear on the final report
Street:	15-400 Esna Park Dr.
City/Province:	Markham
Postal Code:	L3R 3K2
Invoice To	Same as Report To ☐ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	Fisher Environmental
Contact:	Clwe

Reports / Recipients

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Merge QC/QCI Reports with COA ☐ YES ☐ NO ☐ N/A

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Clwe @ FE

Email 2:

Email 3:

Invoice Recipients

Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax:

Email 2:

Turnaround Time (TAT) Requested

☑ Routine [R] if received by 3pm M-F - no surcharges apply

☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum

☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum

☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests

Date and Time Required for all E&P TATs:

For all tests with rush TATs requested, please contact your AM to confirm availability.

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Project Information

ALS Account # / Quote #:	
Job #:	
PO / AFE:	
LSD:	
ALS Lab Work Order # (ALS use only):	L2602906

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS: Halton Sewer discharge bylaws	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	1029-1033 Waterdown Rd Burlington. Halton Sewer discharge bylaws - MW1	17/06/21		Water				

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human consumption/ use? ☐ YES ☑ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☑ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
10.6				7.3			

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
Nnamdi	17/06/21	

INITIAL SHIPMENT RECEPTION (ALS use only)

Received by:	Date:	Time:
[illegible]	June 17/21	10:15

FINAL SHIPMENT RECEPTION (ALS use only)

Received by:	Date:	Time:
[illegible]	Jun 17/21	1730

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS 2020 FRONT

APPENDIX E – HYDRAULIC CONDUCTIVITY ANALYSES

FISHER ENGINEERING

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *1029-1033 Waterdown Road, Burlington, On*
Project: *FE-P-21-11237H*
Test Date: *2021-07-22*
Well No. *MW1*

Equilibrium Water level (from top of pipe) HE	*419*	*cm*
Initial Water level (from top of pipe) Ho	*457*	*cm*
Monitoring well inner diameter d	*0.05*	*m*
Initial Time offset To	*5*	*second*
Reverse of Luthin's reference system Ru = Ho - HE	*38.00*	*cm*
Slope of Log((ho-he)/(ht-he)) / T	*3.00E-04*	
G = Ru / (HT - HE)		

Hydraulic conductivity computed k =

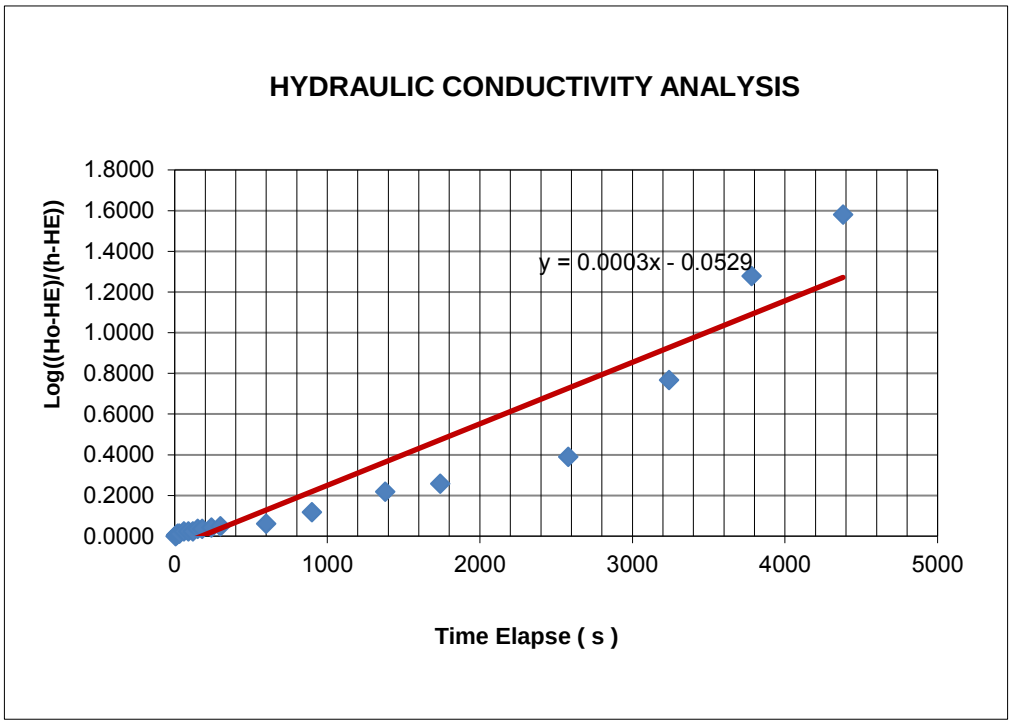
0.0004540	**cm/s**
4.54E-06	**m/s**
0.392	**m/day**

Time	HT (Water Drop)			G	LOG (G)
(Interval s)	(Elapsed s)	(m)	(cm)		
	0	4.57			
5	5	4.570	457.00	1.0000	0.0000
5	10	4.565	456.50	1.0133	0.0058
5	15	4.565	456.50	1.0133	0.0058
5	20	4.560	456.00	1.0270	0.0116
10	30	4.560	456.00	1.0270	0.0116
30	60	4.550	455.00	1.0556	0.0235
30	90	4.550	455.00	1.0556	0.0235
30	120	4.550	455.00	1.0556	0.0235
30	150	4.540	454.00	1.0857	0.0357
30	180	4.540	454.00	1.0857	0.0357
60	240	4.535	453.50	1.1014	0.0420
60	300	4.530	453.00	1.1176	0.0483
300	600	4.520	452.00	1.1515	0.0613
300	900	4.480	448.00	1.3103	0.1174
480	1380	4.420	442.00	1.6522	0.2181
360	1740	4.400	440.00	1.8095	0.2576
840	2580	4.345	434.50	2.4516	0.3895
660	3240	4.255	425.50	5.8462	0.7669
540	3780	4.210	421.00	19.0000	1.2788
600	4380	4.200	420.00	38.0000	1.5798

FISHER ENGINEERING

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *1029-1033 Waterdown Road, Burlington, On*
Project: *FE-P-21-11237H*
Test Date: *2021-07-22*
Well No. *MW1*



FISHER ENGINEERING

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *1029-1033 Waterdown Road, Burlington, On*
Project: *FE-P-21-11237H*
Test Date: *2021-07-22*
Well No. *MW3*

Equilibrium Water level (from top of pipe) HE	*766*	*cm*
Initial Water level (from top of pipe) Ho	*733*	*cm*
Monitoring well inner diameter d	*0.05*	*m*
Initial Time offset To	*5*	*second*
Reverse of Luthin's reference system Ru = Ho - HE	*33.00*	*cm*
Slope of Log((ho-he)/(ht-he)) / T	*8.00E-04*	
G = Ru / (HT - HE)		

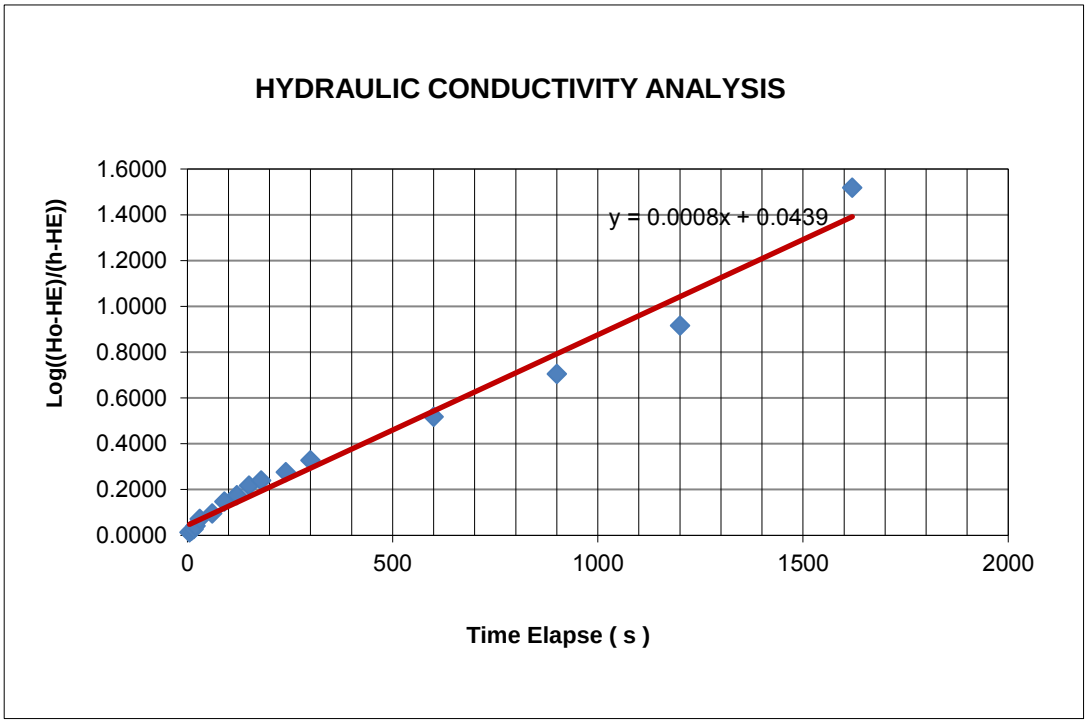
Hydraulic conductivity computed k =

0.0012106	**cm/s**
1.21E-05	**m/s**
1.046	**m/day**

Time		HT (Water Drop)		G	LOG (G)
(Interval s)	(Elapsed s)	(m)	(cm)		
	0	7.33			
5	5	7.340	734.00	1.0313	0.0134
5	10	7.345	734.50	1.0476	0.0202
5	15	7.350	735.00	1.0645	0.0272
5	20	7.360	736.00	1.1000	0.0414
10	30	7.380	738.00	1.1786	0.0714
30	60	7.395	739.50	1.2453	0.0953
30	90	7.425	742.50	1.4043	0.1474
30	120	7.440	744.00	1.5000	0.1761
30	150	7.460	746.00	1.6500	0.2175
30	180	7.470	747.00	1.7368	0.2398
60	240	7.485	748.50	1.8857	0.2755
60	300	7.505	750.50	2.1290	0.3282
300	600	7.560	756.00	3.3000	0.5185
300	900	7.595	759.50	5.0769	0.7056
300	1200	7.620	762.00	8.2500	0.9165
420	1620	7.650	765.00	33.0000	1.5185

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *1029-1033 Waterdown Road, Burlington, On*
Project: *FE-P-21-11237H*
Test Date: *2021-07-22*
Well No. *MW3*



APPENDIX F – CONSTRUCTION DEWATERING AND PERMANENT DRAINAGE

Construction Dewatering Calculation

Location: *1029-1033 Waterdown Road, Burlington*
Project: *FE-P-21-11237H*
Date: *2021-11-19*

Dupuit Forcheimer for Radial Flow to a Closely Welled System or Excavation

Construction Units	Finished lowest floor elevation (m asl)	Average Grade (m asl)	Lowest Footing Elevation (m asl)	Required Dewatering Elevation (m asl)	Static water level		Well base elevation	H (m)	h_w (m)	H-h_w (m)	R_0 (m)		r_w	ab (m^2)	K (m/s)	H^2-h_w^2	lnR_0	lnr_w	Q, (m^3/s)	Q, (m^3/day)
					BGS (m)	Elevation (m asl)	(m)				Model	Adjusted								
Building with two UG levels	96.96	103.06	95.96	94.96	4.31	98.75	94.66	4.09	0.3	3.79	16.15	44.27	28.12	2484	4.54E-06	16.64	3.79	3.34	5.23E-04	45.18

Dupuit Forcheimer Equation

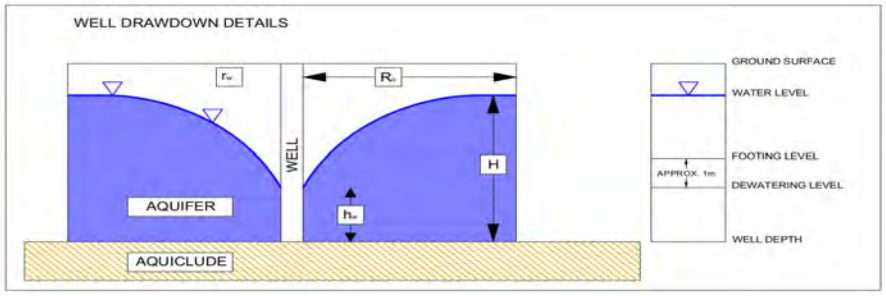
$$Q = \frac{\pi K(H^2 - h_w{}^2)}{lnR_0 - lnr_w}$$

Equivalent radius of well, r_w

$$r_w = \sqrt{\frac{ab}{\pi}}$$

Radius of influence in m, calculated from Sichardt's equation

$$R_0 = 2000(H - h_w)\sqrt{k}$$



Where:

r_w = equivalent radius of the well in m,
H = hydraulic head of the original water table (total saturated aquifer thickness) in m,
h_w = hydraulic head at maximum dewatering (proposed drawdown) in m,
R_0 = radius of influence in m, calculated from Sichardt's equation, and
K = hydraulic conductivity, in m/s
a = length of excavation area in m
b = width of excavation area in m

FISHER ENGINEERING

Permanent Drainage

Location: *1029-1033 Waterdown Road, Burlington*
Project: *FE-P-21-11237H*
Date: *2021-11-19*

Dupuit Forcheimer for Radial Flow to a Closely Welled System or Excavation

Construction Units	Finished lowest floor elevation (m asl)	Average Grade (m asl)	Lowest Footing Elevation (m asl)	Required Dewatering Elevation (m asl)	Static water level		Well base elevation	H (m)	h_w (m)	H-h_w (m)	R_0 (m)		r_w	ab (m^2)	K (m/s)	H^2-h_w^2	lnR_0	lnr_w	Q, (m^3/s)	Q, (m^3/day)
					BGS (m)	Elevation (m asl)	(m)				Model	Adjusted								
Building with two UG levels	96.96	103.06	95.96	96.71	3.94	99.12	96.46	2.66	0.3	2.41	10.27	38.39	28.12	2484	4.54E-06	7.01	3.65	3.34	3.21E-04	27.76

Dupuit Forcheimer Equation

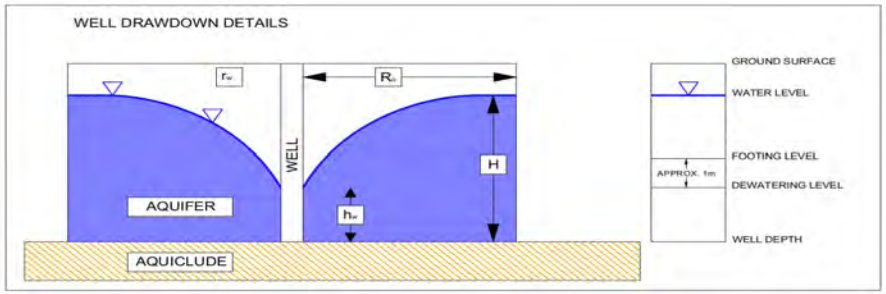
$$Q = \frac{\pi K(H^2 - h_w{}^2)}{lnR_0 - lnr_w}$$

Equivalent radius of well, r_w

$$r_w = \sqrt{\frac{ab}{\pi}}$$

Radius of influence in m, calculated from Sichardt's equation

$$R_0 = 2000(H - h_w)\sqrt{k}$$

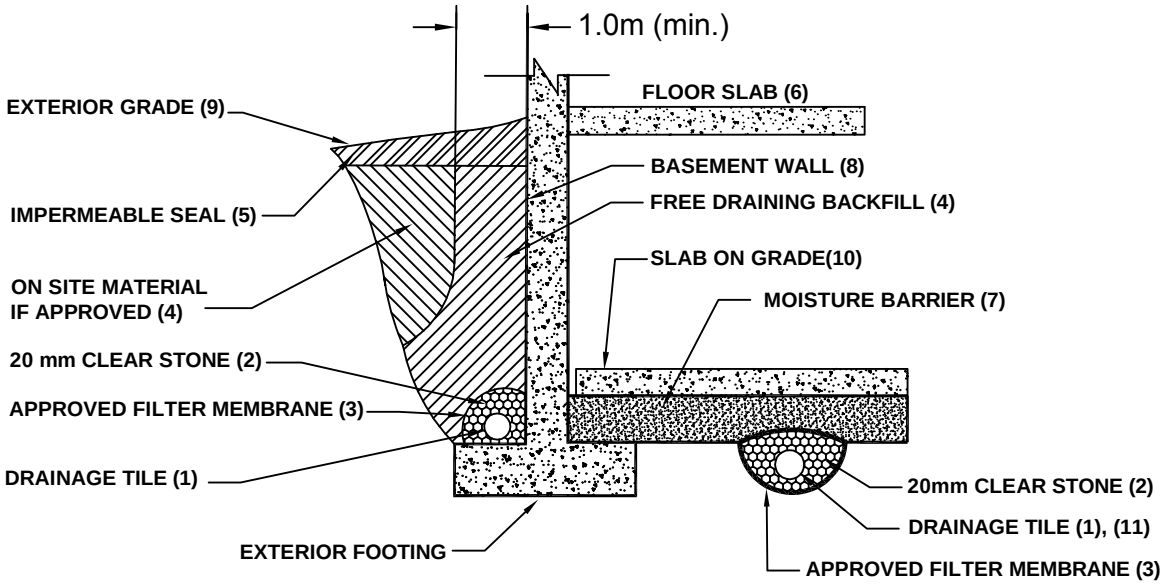


Where:

r_w = equivalent radius of the well in m,
H = hydraulic head of the original water table (total saturated aquifer thickness) in m,
h_w = hydraulic head at maximum dewatering (proposed drawdown) in m,
R_0 = radius of influence in m, calculated from Sichardt's equation, and
K = hydraulic conductivity, in m/s
a = length of excavation area in m
b = width of excavation area in m

APPENDIX G – BACKFILL AND DRAINAGE DESIGN

FISHER ENGINEERING



NOTES:

(1) DRAINAGE TILE TO CONSIST OF 100mm (4") DIAMETER WEEPING TILE OR EQUIVALENT PERFORATED PIPE LEADING TO A POSITIVE SUMP OR OUTLET.

(2) 20mm (3/4") CLEAR STONE - 150mm (6") TOP AND SIDE OF DRAIN. IF DRAIN IS NOT ON FOOTING, PLACE 100mm (4") OF STONE BELOW DRAIN.

(3) WRAP THE CLEAR STONE WITH AN APPROVED FILTER MEMBRANE (TERRAFIX 279R OR EQUIVALENT).

(4) FREE DRAINING BACKFILL - OPSS GRANULAR B OR EQUIVALENT COMPACTED TO THE SPECIFIED DENSITY. DO NOT USE HEAVY COMPACTION EQUIPMENT WITHIN 1.8m (6') OF WALL.

(5) IMPERMEABLE BACKFILL SEAL - COMPACTED CLAY, CLAYEY SILT OR EQUIVALENT. IF ORIGINAL SOIL IS FREE-DRAINING, SEAL MAY BE OMITTED. MAXIMUM THICKNESS OF SEAL TO BE 0.5m.

(6) DO NOT BACKFILL UNTIL WALL IS SUPPORTED BY BASEMENT AND FLOOR SLABS OR ADEQUATE BRACING.

(7) MOISTURE BARRIER TO BE AT LEAST 200mm (8") OF COMPACTED CLEAR 20mm (3/4") STONE OR EQUIVALENT FREE DRAINING MATERIAL. A VAPOUR BARRIER MAY BE REQUIRED FOR SPECIALTY FLOORS.

(8) BASEMENT WALL TO BE DAMP PROOFED.

(9) EXTERIOR GRADE TO SLOPE AWAY FROM BUILDING.

(10) SLAB ON GRADE SHOULD NOT BE STRUCTURALLY CONNECTED TO THE WALL OR FOOTING

(11) UNDERFLOOR DRAIN INVERT TO BE AT LEAST 300mm (12") BELOW UNDERSIDE OF FLOOR SLAB. DRAINAGE TILE PLACED IN PARALLEL ROWS 6 TO 8m (20-25') CENTERS ONE WAY. PLACE DRAIN ON 100mm (4") CLEAR STONE WITH 150mm (6") OF CLEAR STONE ON TOP AND SIDES. ENCLOSE STONE WITH FILTER FABRIC AS NOTED IN (3)

(12) THE ENTIRE SUBGRADE TO BE SEALED WITH APPROVED FILER FABRIC (TERRAFIX 270R OR EQUIVALENT) IF NON-COHESIVE(SANDY) SOILS BELOW GROUND WATER TABLE ENCOUNTERED.

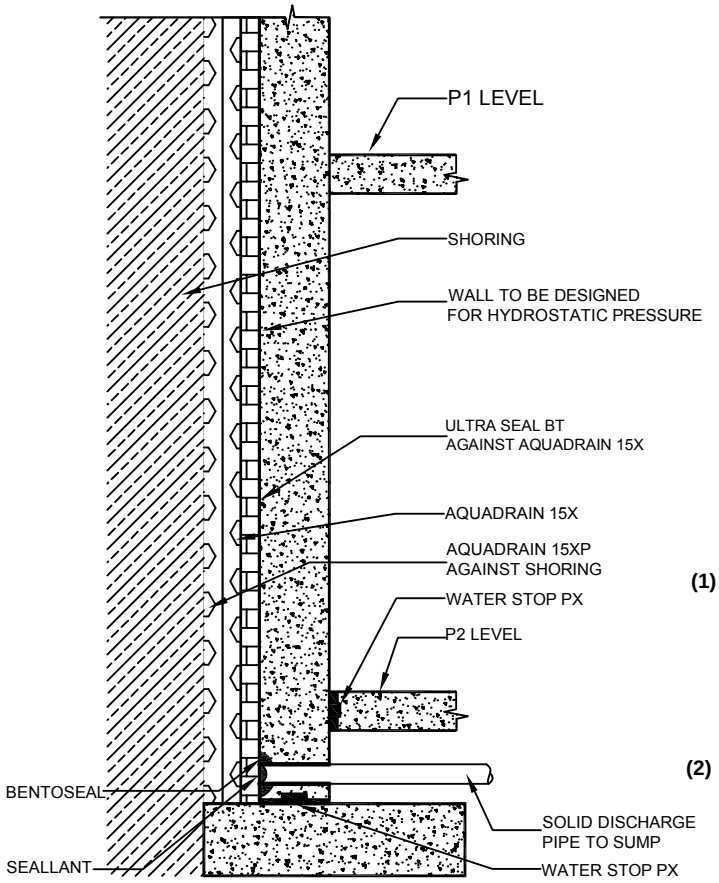
(13) DO NOT CONNECT THE UNDERFLOOR DRAINS TO PERIMETER DRAINS.

(14) REVIEW THE GEOTECHNICAL REPORT FOR SPECIFIC DETAILS.

DRAINAGE AND BACKFILL RECOMMENDATIONS

BASEMENT WITH UNDERFLOOR DRAINAGE

(NOT TO SCALE)



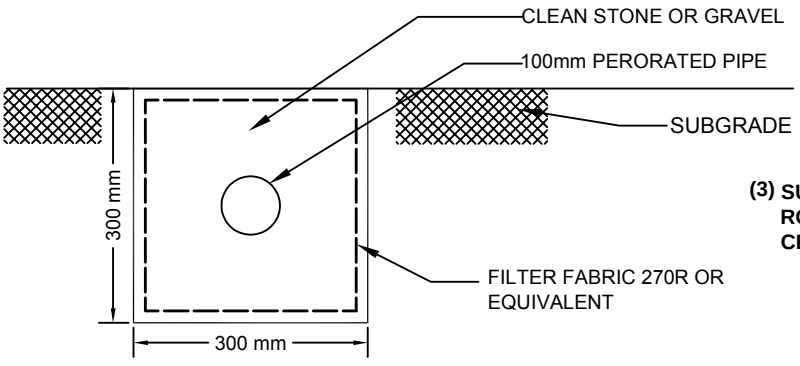
NOTES:

(1) ALL PERMANENT DRAINAGE PIPES MUST HAVE GEOTEXTILE FILTER SLEEVE TO PREVENT LONG TERM SILTING. TO FURTHER MINIMIZE SILTATION OF THE DRAINAGE SYSTEM, ALL DRAINAGE PIPE CONNECTION MUST BE SOLID PVC ELBOWS AND Ts. NO "BUTT" END CONNECTIONS SHOULD BE PERMITTED.

(2) PERIMETER COLLECTION PIPE TO BE SOLID PIPE,

SUGGESTED EXTERIOR DRAINAGE AGAINST SHORING

(NOT TO SCALE)



(3) SUBGRADE DRAIN TO BE PLACED IN PARALLEL ROWS 6-8 m (20'-25'), FROM CENTERLINE TO CENTERLINE.

DETAIL OF SUBGRADE DRAIN

(NOT TO SCALE)