ENGINEERING

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LABORATORY

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HYDROGEOLOGICAL INVESTIGATION

PROPOSED NEW DEVELOPMENT, 440 ESSA ROAD

BARRIE, ONTARIO

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Prepared for:
440 Essa Developments Inc. JV

Project No. FE-P 20-10637H

June 11, 2021

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Project Name:	Hydrogeological Investigation for Proposed New Development
Project Address:	440 Essa Road, Barrie, ON.
Project Number:	FE-P 20-10637H
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1. INTRODUCTION

Fisher Engineering Ltd (Fisher) was commissioned by 440 Essa Developments Inc. JV to carry out a Hydrogeological Investigation at the property municipally addressed as 440 Essa Road, Barrie, Ontario, hereinafter referred to as the 'Site'.

The purpose of the Hydrogeological Investigation was to evaluate groundwater conditions with respect to the proposed construction of an 8- storey mixed-use building with two underground parking levels.

2. SITE AND PROJECT DESCRIPTION

Site Settings

The site is located at the east side of Essa Road, approximately 1.34km west of Highway 400. The property is bounded by Essa Road to the west/northwest, beyond which are residential dwellings; a building under construction at 430 Essa Road to the northeast, beyond which is Veterans Drive and houses to the south/south-east, beyond which is Harvie Road. The property has an approximate area of 5,011m^2 and is roughly rectangular in shape.

At the time of the investigation the site was occupied by a single storey commercial building with a gas pump canopy in the middle portion along with asphalt paved driveways/parking areas.

Topography

The site is generally flat and is graded for drainage towards catch basins. Elevation changes from approximately 313.18 m asl at BH3 in the southeast corner to 312.96 m asl at BH6 in the northwest corner.

Proposed Development

Architectural Site plans/drawings, prepared by JCI, dated August 22, 2019, were provided to Fisher at the time of site investigation. Based on the drawings, the proposed development will consist of an 8- storey mixed-use building with two underground parking levels. The building is to be located in the central to eastern section of the site with an approximate footprint of 3370m^2. Proposed finish floor elevation (FFE) is 313.11m and lowest floor slab (P2 level) at 307.41m.

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 permits applications 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, and locating existing, monitoring wells and reviewing / compiling 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 pumping/single well response tests in two (2) monitoring wells and record groundwater level drawdown and recovery to model/calculate hydraulic conductivity.
- **Groundwater Quality Analysis.** Carry out laboratory analyses on soil and groundwater to determine compliance with Barrie Sanitary Sewer (2012-172) and Barrie Storm Sewer (2012-172).
- **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 WORK

Subsurface Investigation

Subsurface exploration for the Hydrogeological Investigation was conducted concurrent with drilling for the Geotechnical Investigation on February 10 and May 17 and 18, 2021 and consisted of the drilling of six (6) boreholes to depths varying from 12.50m to 15.54m below prevailing grades. All boreholes were instrumented as groundwater monitoring wells (MW1 to MW6) upon completion with bottom of screens at depths ranging from 6.10m to 15.24m bgs. The wells were installed with 50mm PVC slotted pipes and a clean silica sand pack placed around the well screens and isolated with bentonite to depths below existing grade as shown in the borehole details in Appendix B.

The boreholes were advanced using solid and hollow stem augers. Drilling and well installation were carried out by Terra Firma Services under direct supervision of Fisher Engineering personnel.

Laboratory Analyses

Thirteen (13) representative soil samples, from BH2, BH4 and BH6 were selected and submitted to Fisher Environmental laboratory for moisture content and grain size analyses. The laboratory results, which are presented in Appendix C, are consistent with the field descriptions for subsurface soils discussed in Section 5.0.

One groundwater sample from MW4 was submitted to ALS Environmental laboratory for analysis of groundwater quality under the Barrie Sanitary Sewer (2012-172) and Barrie Storm Sewer (2012-172) bylaws. The results are presented in Appendix D.

The soil samples recovered during the investigation will be stored in the Fisher Environmental laboratory for a period of 30 days after submitting this report and will be discarded thereafter unless otherwise instructed by the client.

Site Survey

Elevations at borehole/monitoring well locations were surveyed by Fisher personnel and referenced to a local benchmark (TBM) 'Top of a Double CB', which is located on the west edge of Essa Road, approximately 5m northeast of the property northeastern corner. The TBM has an elevation of 312.75m asl as shown on the Site Plan for 430 Essa Road which is currently under development. The site plan, dated July 2018, was prepared by Paul Marques- Architect Inc,

5. SUBSOIL CONDITIONS

Surface and subsurface conditions encountered at borehole locations are shown in Appendix B - Log of Boreholes, and are summarized as follows:

- **ASPHALT PAVEMENT / FILL LAYER** – Asphalt/granular material were encountered at the surface of all boreholes extending to depths of 0.30m to 0.46m and was underlain by fill materials. The fill generally consisted of dark brown and or some black organic silty sand/sand silt with some to trace of gravel. The encountered fill layers extended to depths of 0.61m to 2.29m bgs. Fill depths and elevations are presented in Table 1.
- **BROWN/GREYISH BROWN SILTY SAND TILL**– The fill and/or granular materials were underlain by brown to greyish brown, moist to wet, compact to dense silty sand till extending to depths varying from 6.10m to 7.62m (elevations from 306.7m to 305.35m asl).
- **GREY CLAYEY SILT TILL** – The brown/greyish brown sandy silt till were underlain by grey, moist, very stiff to hard clayey silt till extending to approximate depths of 9.15m bgs, elevations of 303.91m to 303.65m asl.
- **BROWN FINE SAND** – Brown, slightly moist, very dense fine sand was encountered underlying the clayey silt till. Boreholes BH2 to BH6 were terminated in the fine sand layer at the depth of 12.50m to 12.65m. The fine sand extended to 15.25m in BH1 and was underlain by brown, wet, medium sand towards the bottom of the borehole at 15.55m. SPT values in the sand were generally over 100 blows per 300mm of penetration.

Table 1: Fill Depths and Elevations

Borehole No.	MW1	MW2	MW3	MW4	MW5	MW6
Surface Elevation (m asl)	312.80	313.08	313.08	312.98	313.16	312.96
Depth of Borehole (m)	15.55	12.65	12.65	12.65	12.65	12.50
Elevation at Bottom of Borehole (m asl)	297.56	300.43	300.43	300.33	300.51	300.46
Depth of Fill (m)	1.52	0.91	1.52	0.91	2.29	0.61
Elevation at Bottom of Fill (m asl)	311.28	312.17	311.56	312.07	310.87	312.35

6. HYDROGEOLOGICAL STUDY

Hydrogeological study for the subject Site was conducted based on the boreholes/wells' exploration, observation and site/laboratory testing. Groundwater details from six (6) instrumented wells were used in the Hydrogeological Study. The wells were generally constructed with 3.05 (10') long, 51mm diameter PVC slotted screen pipes and risers 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.

6.1 Hydrogeological Conditions

Review of available surficial geological and hydrogeological information for the area (close to HWY 400) shows that the soils comprise generally of coarse textured glaciolacustrine deposits containing sand, gravel, and minor silt and clay (OGS, 2017). Bedrock is sufficiently deep (below 100m) in this area and does not influence the shallow hydrogeology of the site.

The subsoils and hydrogeological conditions were observed and recorded during the Geotechnical /Hydrogeological Investigations. Based on the boreholes/wells' exploration, the subsoils are dominated by layers of brown, compact to dense silty sand till, followed by grey, hard clayey till and very dense fine sand deposits at further depths. The upper aquifer, consisting of wet silty sand, generally extended to depths from 6.1m to 7.90m and was underlain by a layer of silty clay (aquiclude) to a depth of 9.15m. Further fine sand deposits underlaid the silty clay, and was in a generally dry, very dense condition.

The monitoring wells were purged/developed, and the groundwater levels measured. Measured groundwater depths and elevations are summarized in Table 2.

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

- BH2, BH3 and BH4 were dry on completion of drilling. Standing water was observed in BH1, BH5 and BH6 below 11.50m.
- Static groundwater levels in the shallow wells, less than 8m deep, were measured at 1.13m to 2.23m bgs, while water levels in the deep wells ranged from 10.80m to 13.70m bgs.
- Given the proposed development, with two underground levels and lowest P2 slab at approximately 307.41m asl, excavation for underground parking /footings will likely be below observed groundwater levels.
- The nearest body of surface water is Lake Simcoe located approximately 3580m northeast of the site.

- Groundwater levels are being monitored biweekly to determine the seasonal highwater levels.

Table 2: Groundwater Depths and Elevations

No.	Elev. at Ground (m)	Depth of Well, m bgs	On Completion		21-May21		27-May-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
MW1	312.80	15.24	11.50	301.30	--	-	13.70	299.10
MW2	313.08	10.67	Dry	-	10.80	302.28	--	--
MW3	313.18	12.19	Dry	-	11.35	301.83	--	--
MW4	312.98	6.10	dry	-	0.98	312.00	1.13	311.85
MW5	313.16	7.64	12.05	301.11	2.15	311.01	2.23	311.93
MW6	312..96	6.10	12.20	300.76	--	--	1.70	311.26

6.2 Hydraulic Conductivity K Modeling Results

Single Well Response Tests

Single well response tests (SWRT) were carried out in MW4, MW5 and MW6 on May 27, 2021. The water bearing media consist predominantly of wet silty sand with interbedded wet sands 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.

Details of the hydraulic conductivity analyses derived from single well response tests are presented in Appendix E and summarized in Table 3.

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
MW4	312.98	1.13	309.93 – 306.88	3.57	30 mins / 68.3%	7.57×10^{-6}	0.654
MW5	313.16	2.23	308.48-- 305.43	3.77	30 mins / 9.8%	3.03×10^{-7}	0.026
MW6	312..96	1.70	303.81--306.86	3.78	30 mins / 12.4%	3.03×10^{-7}	0.026

6.3 Grain Size Analysis for Hydraulic Conductivity K

Representative soil samples from BH2, BH3 and BH4 were selected from depths associated with recommended footing locations or change in soil stratigraphy and submitted to Fisher Laboratory for grain size distribution analyses. The results for the grain size distribution and hydrometer analyses are presented in Appendix C.

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:

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

The hydraulic conductivity values at various depths, based on grain size, are summarized in Table 4. The estimated K values are expectedly generally lower than those obtained during the single well response tests as the in-situ tests account for more permeable horizontal seams of coarser soils which are not 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
BH2	3.0-3.45	Sandy Silt, trace Gravel (Till)	4×10^{-6}	0.34
BH2	7.55-8.05	Clay silt, trace Gravel (Till)	$<1 \times 10^{-8}$	<0.0069
BH4	2.25-2.70	Sandy Silt, trace Gravel (Till)	2×10^{-6}	0.17
BH4	6.05-6.50	Sandy Silt, trace Gravel (Till)	4.9×10^{-7}	0.042
BH4	7.55-8.05	Clay silt, trace Gravel (Till)	$<1 \times 10^{-8}$	<0.0069
BH4	10.60-11.05	Fine sand, some silt	$<1 \times 10^{-6}$	<0.0069
BH3	9.15-9.55	Fine sand, some silt	4.5×10^{-6}	0.39

7. CONSTRUCTION DEWATERING & PERMANENT DRAINAGE

7.1 Construction Dewatering

Conventional strip or spread footings were recommended in the geotechnical Investigation report at depths below 5.50m where competent bearing soils were encountered. The proposed P2 level floor will be 307.41m asl, approximately 5.70m below prevailing grade with designed footing depths at or below 306.11m asl. To facilitate excavation for underground garage /footings and prevent hydraulic uplift/piping during construction for underground utilities below the water level, the groundwater will need to be lowered 1m below the underside of the footing, to 305.41m asl.

Based on the site plans provided to Fisher, the proposed underground parking will have an area of 3370m^2. Groundwater levels observed during the investigation ranged from 1.13m to 2.23m bgs in the three shallow wells with an average elevation of 311.69m asl. Based on the subsurface soils/ groundwater

conditions, an average hydraulic conductivity from MW4 and MW5 was used to calculate construction dewatering rates.

As calculated, details presented in Appendix F, a construction dewatering flowrate of **81.64 m^3/day (81,640 L/day)** was obtained for the proposed two underground parking levels with an approximate excavation area of 3370m^2. A factor of safety of 1.5 should be applied to the construction dewatering rate to give **122.46 m^3/day (122,460 L/day).**

Seasonal High Groundwater Levels

Groundwater levels are being monitored biweekly to determine seasonal highwater levels at the site. An average of the higher groundwater levels observed in the shallow wells (1.42m bgs) was used to calculate construction dewatering rates. The highest groundwater level observed so far (0.98m bgs) was used to calculate permanent drainage rates. Dewatering quantities will be updated on completion of the groundwater monitoring programme.

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 direct accumulation of approximately 85m^3 in the excavated basement area (predominantly silty sand till). Based on the types of soils, some of this water will likely accumulate in the excavation area. Consequently, a conservative accumulated volume of **25 m^3/day** may be assumed in the excavation. 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 the City of Barrie. The water quality, at the time of the application, will need to be ascertained to ensure compliance with the City of Barrie - **2021-002 SEWER USE BY-LAW**.

The **maximum construction discharge** rate, taking into consideration accumulated precipitation volumes, is **106.64 m^3/day (106,640 L/day).**

Permanent Drainage

The highest observed groundwater level was 0.98m bgs, at elevation of 312.00m asl. This is approximately 4.59m above the proposed P2 levels. Under these conditions, permanent subdrain for both perimeter drainage and under slab will be required for the underground levels. A permanent drainage discharge rate of **53.47 m^3/day (53,470 L/day)** was estimated**.** Factored permanent discharge rate of **80.20 m^3/day**

(80,200 L/day) should be used for planning purposes **(FS=1.5).** Details of the calculation are presented in Appendix F.

An application for permission to discharge to the municipal sewer will be required unless the subsurface portion 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 be designed as watertight.

Permission to take water (PTTW)

As the calculated construction dewatering flow rates for the building with two underground levels are larger than 50,000 L/day, registration on the MOECC Environmental Activity and Sector Registry (EASR) for Water Taking will be required. An application for permission to take water (PTTW) will not be required for temporary dewatering as the daily flow rates (including accumulated precipitation) are less than 400,000 litres. The quantities may need be revised once the excavation depths are finalized and long-term groundwater monitoring info becomes available. An application for PTTW will be required for permanent drainage as the discharge rate is more than 50,000 L/day.

7.2 Groundwater Quality

One groundwater sample was collected on MAY 21, 2021 and submitted to ALS Laboratory for testing. The results of analyses for water quality under the City of Barrie By-Law No. 2012-172 for Sanitary Sewer– Guide Limit #1 and Storm Sewer -Guide Limit #2 discharge are presented in Appendix D. The results show compliance with all parameters except those listed in Table 5.

Table 5: Results from Sewer Use Bylaw tests

Parameters	Guide Limits		Results
	Table 1	Table 2	MW102
Total suspended solids, mg/L	350	15	1240
Chloride, mg/L	1500	--	5070
Copper, mg/L	2.0	0.01	0.0487
Zinc, mg/L	2.0	0.04	0.096
Benzene, ug/L	10	--	20.9

Based on the results in Table 5, the groundwater will need to be treated before it can be discharged into the public storm sewer or sanitary sewer system under conditions observed during the investigation.

It should be noted however that testing of groundwater at 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.

7.3 Dewatering Influence Zone

Based on the preceding calculations for dewatering quantities during construction of the underground levels / footings, groundwater drawdown influence zones are up to 24.93m from the edge of the excavation for the building with two underground levels. Based on the quantity of groundwater estimated and wet soils to be dewatered, a well point dewatering system may be feasible. The services of a specialist dewatering company should be retained to determine the most effective dewatering method for the site.

Actual dewatering induced settlement may be ignored (less than 2mm beyond the property property boundaries).

Notwithstanding the preceding, it is recommended that a pre-construction survey of adjacent structures/roads be carried out prior to the dewatering/shoring construction stage. Potential adverse effects on adjacent structures, due to dewatering/shoring construction should be assessed, quantified and reviewed during construction.

7.4 Hydrogeological Impact

During the investigation and analysis, it was determined that there will not be any negative impact on the natural environment, City of Barrie Sewer works nor surrounding properties due to construction dewatering using a well point dewatering system. 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 from the single well response tests are **3.03 x 10^{-7} m/s** (0.026 m/day) to **7.57 x 10^{-6} m/s** (0.654 m/day) for the saturated water bearing soils. Groundwater flow/distribution is variable and controlled by wet sand /silt sand seams interbedded in the upper mainly silty sand till.

The observed groundwater levels in the shallow wells ranged from 0.98m to 2.15m bgs, with bottom of screens installed above 7.62m, while groundwater observed in the deep wells ranged from 10.80m to 11.55m. Groundwater conditions in the wet upper soil layers dominate the dewatering rates .

A maximum construction groundwater dewatering flowrate of **81.64m^3/day** was estimated for two underground levels using an average groundwater level of 1.42m bgs. Permanent drainage rate of **53.47 m^3/day** was estimated for two underground levels. Factors of safety of 1.5 should be applied to construction dewatering and permanent drainage rates. Accumulated precipitation volume of 25m^3/day should be included in the construction dewatering plan.

Based on the groundwater levels observed during the investigation and condition of the water bearing soils, a well point dewatering system may be required. A specialist dewatering company should be consulted to determine the most feasible dewatering method.

It should be noted that if it is intended that any accumulated water/groundwater, following periods of heavy rainfall, be discharged into the municipal sewer, then a permit to discharge would be required along with laboratory analyses to ensure compliance with City of Barrie sewer discharge bylaw 2012-172.

Based on the groundwater elevations observed during the investigation, registration on the MOEC EASR will be required for construction dewatering. An application for PTTW will not be required for construction dewatering. Application for PTTW will be required for permanent drainage.

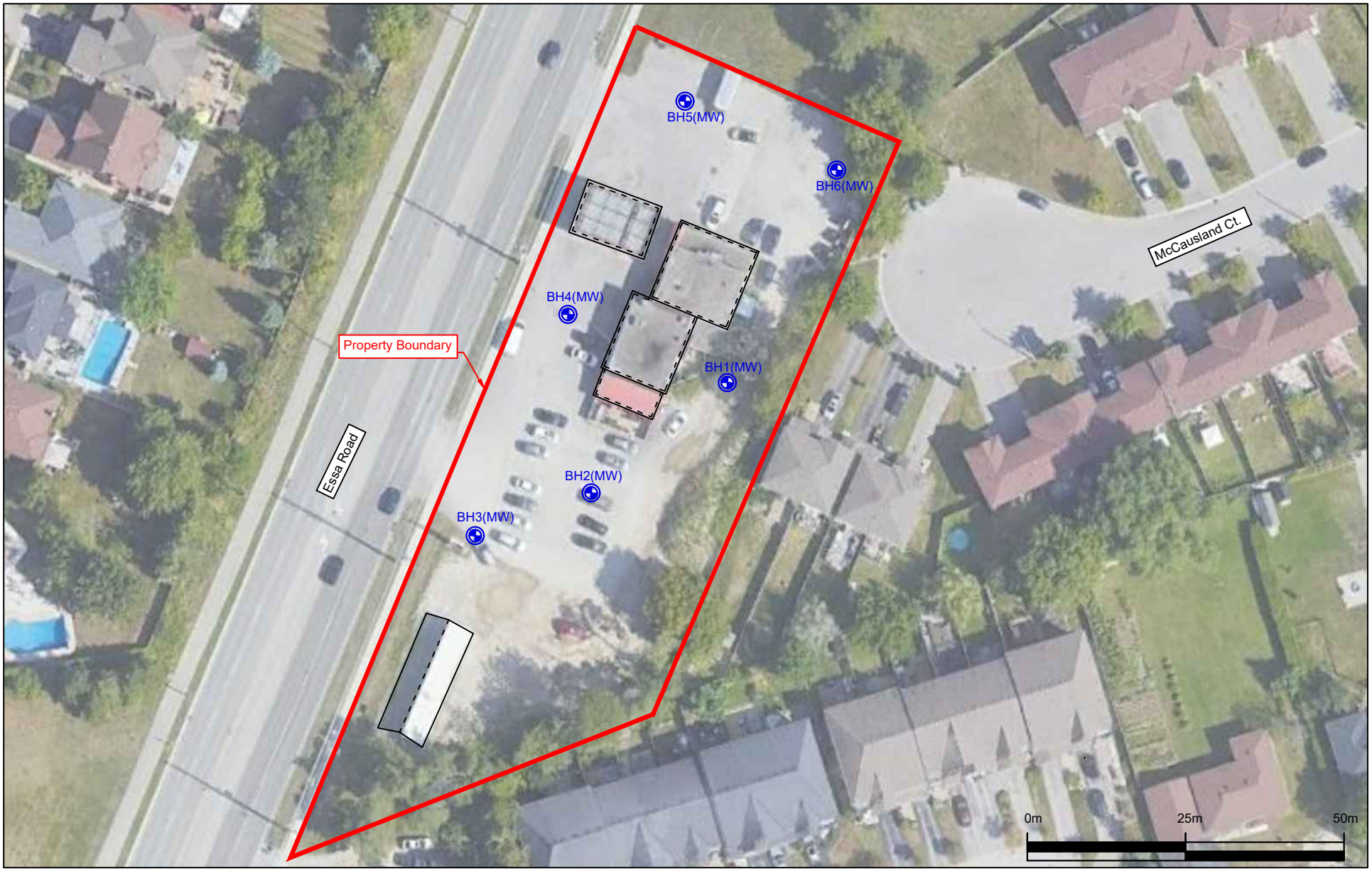
It should be noted that groundwater construction discharge and permanent drainage rates were calculated based on current proposed site plans and groundwater levels measured during the investigation. Dewatering quantities should be updated if the design changes.

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 the implementation 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 PLANS



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NORTH

LEGEND

Borehole and Monitoring Well Locations

PROJECT NAME AND ADDRESS

Geotechnical and Hydrological Investigation

440 Essa Road
Barrie, ON

PROJECT NO.
FE-P 20-10636/37

DATE
26 May 2021

SCALE
As Shown

FIGURE 1:

Site Plan with BH(MW) Locations

PROPOSED MIXED USE DEVELOPMENT

440 Essa Road

AUGUST 22, 2019

DRAWING LIST

ARCHITECTURAL

	COVER
A0.00	DEVELOPMENT STATISTICS
A1.00	CONTEXT PLAN
A1.01	SITE PLAN
A3.00	P2 & P1 LEVEL
A3.01	G.F. & 2ND FLOOR PLANS
A3.02	3RD & 4TH FLOOR PLANS
A3.03	5TH & 6TH FLOOR PLANS
A3.04	7TH & 8TH FLOOR PLANS
A3.05	ROOFTOP & ROOF PLANS
A6.00	BUILDING SECTION
A10.0	3D VIEWS

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PROPOSED MIXED USE DEVELOPMENT
440 Essa Road
AREA SUMMARY

Lot Area (existing): **5,011.0 m2** **53,938 sf** Density: **3.36** Lot Coverage: **53%**
Total Building GFA: **16,843.3 m2** **181,300 sf**

Level	COMMON AREA/ CIRCULATION		PARKING		RESIDENTIAL		**BALCONY		COMMERCIAL		INDOOR AMENITY		OUTDOOR AMENITY		CONSTRUCTION AREA		EFFICIENCY	GFA EXEMPTIONS*		TOTAL GFA**	
	m2	*sf*	*m2*	*sf*	*m2*	*sf*	*m2*	*sf*	*m2*	*sf*	*m2*	*sf*	*m2*	*sf*	*m2*	*sf*		*m2*	*sf*	*m2*	*sf*
P-2	209.4	2,254	3,548.9	38,200	190.9	2,055	0.0	0	0.0	0	0.0	0	0.0	0	**3,949.2**	**42,509**	*5%*	3,911.3	42,101	**37.9**	**408**
P-1	252.9	2,722	3,505.4	37,732	190.9	2,055	0.0	0	0.0	0	0.0	0	0.0	0	**3,949.2**	**42,509**	*0%*	3,911.3	42,101	**37.9**	**408**
Ground Floor	319.6	3,440	* 1,702.1	18,321	0.0	0	0.0	0	1,208.5	13,008	208.7	2,246	109.2	1,175	**1,736.8**	**18,695**	*70%*	271.9	2,927	**1,464.9**	**15,768**
Second Floor	367.9	3,960	0.0	0	1,886.9	20,310	0.0	0	0.0	0	0.0	0	0.0	0	**2,254.8**	**24,270**	*84%*	55.3	595	**2,199.5**	**23,675**
Third Floor	191.4	2,060	0.0	0	2,467.8	26,563	43.1	464	0.0	0	0.0	0	0.0	0	**2,659.2**	**28,623**	*93%*	55.3	595	**2,603.9**	**28,028**
Fourth Floor	191.4	2,060	0.0	0	2,467.8	26,563	43.1	464	0.0	0	0.0	0	0.0	0	**2,659.2**	**28,623**	*93%*	55.3	595	**2,603.9**	**28,028**
Fifth Floor	191.4	2,060	0.0	0	2,459.8	26,477	49.2	530	0.0	0	0.0	0	0.0	0	**2,651.2**	**28,537**	*93%*	55.3	595	**2,595.9**	**27,942**
Sixth Floor	193.8	2,086	0.0	0	2,053.6	22,105	452.7	4,873	0.0	0	0.0	0	0.0	0	**2,247.4**	**24,191**	*91%*	55.3	595	**2,192.1**	**23,596**
Seventh Floor	199.6	2,148	0.0	0	1,726.1	18,580	323.0	3,477	0.0	0	0.0	0	0.0	0	**1,925.7**	**20,728**	*90%*	62.4	672	**1,863.3**	**20,056**
Eighth Floor	132.3	1,424	0.0	0	1,171.8	12,613	621.6	6,691	0.0	0	0.0	0	0.0	0	**1,304.1**	**14,037**	*90%*	60.1	647	**1,244.0**	**13,390**
Rooftop Floor	111.3	1,198	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	699.2	7,526	**111.3**	**1,198**	*0%*	111.3	1,198	**0.0**	**0**
Total	**2361.0**	**25,414**	**8,756.4**	**94,253**	**14,233.8**	**153,211**	**1,532.7**	**16,498**	**1,208.5**	**13,008**	**208.7**	**2,246**	**808.4**	**8,702**	**25,448.1**	**273,921**	***88.6%***	**8,604.8**	**92,621**	**16,843.3**	**181,300**

Note: not including balcony area

* exterior surface parking at grade (not included in construction area)
** included in amenity space calculations

SHEETSET
440 Essa Road
UNIT SUMMARY

Level	RESIDENTIAL UNITS							COMMERCIAL UNITS
	Studio	*1B*	*1B+D*	*2B*	*2B+D*	*3B*	**Total**	
Ground Floor	-	-	-	-	-	-	0 units	1208.5
Second Floor	0	0	0	4	20	2	26 units	
Third Floor	0	0	0	8	23	3	34 units	
Fourth Floor	0	0	0	8	23	3	34 units	
Fifth Floor	0	0	0	9	22	3	34 units	
Sixth Floor	0	3	18	12	0	1	34 units	
Seventh Floor	2	1	1	1	12	15	32 units	
Eighth Floor	0	0	0	0	0	0	0 units	
ROOF							0 units	
Total	**2**	**4**	**19**	**42**	**100**	**27**	**194**	**residential units**
% Total	1.0%	2.1%	9.8%	21.6%	51.5%	13.9%		
Affordable Units	**0**	**4**	**19**	**42**	**10**	**0**	**75**	
	0.0%	100%	100%	100%	10%	0%	38.7%	

PROPOSED MIXED USE DEVELOPMENT
440 Essa Road
ZONING STATS

STANDARD	REQUIRED 'C4'		REQUIRED 'MU2'		PROPOSED	
	metric	*imperial*	*metric*	*imperial*	*metric*	*imperial*
LOT AREA *(MIN)*	450.0 *m2*	4844 *sf*	-		5011.0 *m2*	53938 *sf*
LOT FRONTAGE *(MIN)*	15.0 *m*	49.2 *ft*	-		132.59 *m*	435.0 *ft*
FRONT YARD SETBACK *(MIN)*	6.0 *m*	19.7 *ft*	1.0 *m (MIN)* 5.0 *m (MAX)*	3.3 *ft (75% FRONT* 16.4 *ft (25% FRONT*	0.57 *m* 2.52 *m*	1.87 *ft* 8.27 *ft*
SIDE YARD SETBACK *(MIN)*	3.0 *m*	9.8 *ft*	3.0 *m (MAX)*	9.8 *ft*	1.48 *m*	4.9 *ft (NORTH)*
SIDE YARD SETBACK - EXTERIOR (STREET OR LANE) *(MIN)*	5.0 *m*	16.4 *ft*	3.0 *m*	9.8 *ft*	N/A	
SIDE YARD SETBACK - ABUTTING RESIDENTIAL *(MIN)*	6.0 *m*	19.7 *ft*	3.0 *m*	9.8 *ft*	7.54 *m*	24.7 *ft (SOUTH)*
REAR YARD SETBACK *(MIN)*	7.0 *m*	23.0 *ft*	-		N/A	
REAR YARD SETBACK - EXTERIOR (STREET OR LANE) *(MIN)*	6.0 *m*	19.7 *ft*	1.5 *m*	4.9 *ft*	15.22 *m*	49.9 *ft*
REAR YARD SETBACK- ABUTTING RESIDENTIAL *(MIN)*	10.0 *m*	32.8 *ft*	7.0 *m*	23.0 *ft*	15.22 *m*	49.9 *ft*
LANDSCAPE OPEN SPACE *(MIN)*	-		-		-	
DWELLING UNIT FLOOR AREA *(MIN)*	35 *m2* + 10 *m2 PER BEDROOM*		35 *m2* + 10 *m2 PER BEDROOM*		35 *m2* + 10 *m2 PER BEDROOM MINIMUM* (SEE PLANS)	
LOT COVERAGE *(MAX)*	50%		-		53%	
GROSS FLOOR AREA *(MAX - % OF LOT AREA)*	-		-		3.36	
STREET LEVEL FLOOR HEIGHT *(MIN)*	-		4.5 *m*	14.8 *ft*	4.0 *m*	13.1 *ft*
BUILDING HEIGHT *(MAX)*	9.0 *m*	29.5 *ft*	7.5 *m (MIN)* 25.5 *m (MAX)*	24.6 *ft* 83.7 *ft*	25.5 *m*	83.7 *ft*
BUILDING HEIGHT - ABUTTING RESIDENTIAL *(MAX)*	14.0 *m*	45.9 *ft*	7.5 *m (MIN)* 25.5 *m (MAX)*	24.6 *ft* 83.7 *ft*	25.5 *m*	83.7 *ft*
FRONT FAÇADE STEP-BACK *(MIN)*	-		45 DEGREE ANGULAR PLANE @ 80% EQUIV. ROW USING 3M STEP-BACK		COMPLIES (SEE SECTION)	
SIDE FAÇADE STEP-BACK *(MIN)*	-		IF ADJACENT TO AN OS ZONE, 5.5M @ HEIGHT ABOVE 80% EQUIV. ROW		N/A	
REAR FAÇADE STEP-BACK *(MIN)*	-		45 DEGREE ANGULAR PLANE ABOVE 7.5m USING 3m STEP-BACK		COMPLIES (SEE SECTION)	
GROUND FLOOR COMMERCIAL *(MIN % OF 1ST FLOOR GFA)*	20%		50%		70%	
AMENITY AREAS FOR RESIDENTIAL USES *(MIN)*	12 m2 / UNIT (CONSOLIDATED + OUTDOOR) 2328.0 *m2* 25058 *sf*		12 m2 / UNIT (OPEN LANDSCAPE, ROOFTOP AMENITY, PRIVATE BALC., OR OTHER AMENITY FEATURES) 2328.0 *m2* 25058 *sf*		2341.1 *m2*	25199 *sf*
LANDSCAPE BUFFER AND FENCING *(MIN. ABUTTING RESIDENTIAL)*	3m BUFFER & 2m HIGHT TIGHT BOARD FENCE (ALONG LOT LINE)		3m BUFFER & 2m HIGHT TIGHT BOARD FENCE (ALONG LOT LINE)		COMPLIES (SEE SECTION & PLANS)	
PARKING *(MIN)*	1 / 24m2 OF GFA (MULTIPLE COMMERCIAL USES) & 1.5 SPACES/UNIT (RESIDENTIAL) 51 Com/291 Res		1 / 24m2 OF GFA (MULTIPLE COMMERCIAL USES) & 1.0 SPACES/UNIT (RESIDENTIAL) 51 Com/194 Res		51 Commercial Spaces 5 Replaced parking spots for 430 Essa 203 Residential Spaces (4 Type A & 3 Type B BF spaces included)	
PARKING COVERAGE APARTMENT DWELLING UNITS *(MAX % LOT)*	-		35%		16 % (8 RESIDENTIAL PARKING SPACES ABOVE GRADE)	
FRONT YARD PARKING *(MAX)*	-		0%		N/A	
PARKING STALL SIZE *(MIN)*	REGULAR: 2.7m x 5.5m PARALLEL: 2.7m x 6.7m		REGULAR: 2.7m x 5.5m PARALLEL: 2.7m x 6.7m		COMPLIES	
PARKING STALL SIZE - BARRIER FREE *(MIN)*	TYPE A 3.4m x 5.5m TYPE B 3.1m x 5.5m WITH 1.5m ACCESS AISLE		TYPE A 3.4m x 5.5m TYPE B 3.1m x 5.5m WITH 1.5m ACCESS AISLE		COMPLIES	
DRIVE AISLE WIDTH *(MIN)*	6.4 *m*	21.0 *ft*	6.4 *m*	21.0 *ft*	6.4 *m*	21.0 *ft*
LOADING SPACES *(MIN)*	1 SPACE 3m x 9m x 4m(w x l x h)		1 SPACE 3m x 9m x 4m(w x l x h)		1 SPACE 3m x 9m x 4m(w x l x h)	
ACCESSORY BUILDING	SUBJECT TO C4 STANDARDS		HEIGHT(MAX): 4M, CONNOT OCCUPY FRONT OR EXTERIOR SIDE YARDS. SIDE: 0.6m, LOT(MAX): LESSER OF 10% OR 50m2		N/A	

Revisions:

DESCRIPTION: DATE:

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Issued:

DESCRIPTION: DATE:

Consultants:

STRUCTURAL:

MECHANICAL:

ELECTRICAL:

ARCHITECT:

STUDIO JCI
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www.studiojci.com

PROPOSED MIXED USE DEVELOPMENT

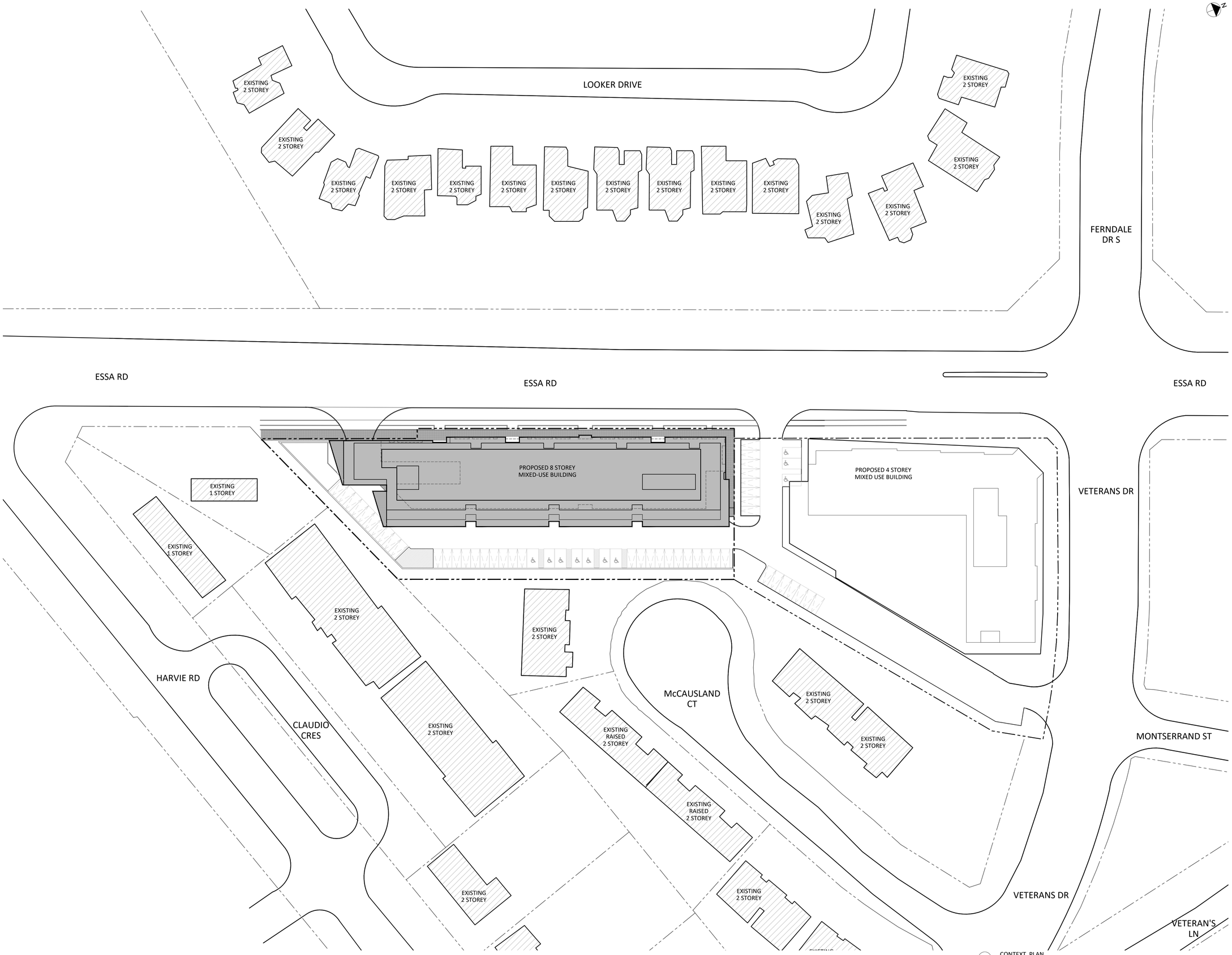
ADDRESS:
440 Essa Road, Barrie ON

DEVELOPMENT STATISTICS

PROJECT NO.: 1905
SCALE: 1 : 250
DATE: August 22, 2019
DRAWN BY:

DRAWING NO.:

A0.00



1 CONTEXT PLAN
Scale: 1 : 500

Revisions:

DESCRIPTION: DATE:

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PROPOSED MIXED USE DEVELOPMENT

ADDRESS:
440 Essa Road, Barrie ON

CONTEXT PLAN

PROJECT NO.: 1905
SCALE: 1:500
DATE: August 22, 2019
DRAWN BY:

DRAWING NO.:

A1.00

LEGEND:

- PROPOSED BUILDING FOOTPRINT
- PROPOSED SOD
- PROPOSED SOFT LANDSCAPING (PLANTING)
- PROPOSED NEW SIDEWALK
- PROPOSED LOW HEDGE
- PROPOSED MEDIUM GROWING NATIVE SHADE TREE
- PROPOSED LARGE GROWING NATIVE SHADE TREE
- BOUNDARY OF HEAVY DUTY ASPHALT
- PROPOSED ELEVATION
- EXISTING ELEVATION
- PROPOSED PEDESTRIAN ENTRY
- PROPOSED VEHICULAR ENTRY
- STOP SIGN
- MANHOLE (SANITARY)
- MANHOLE (STORM)
- CB CATCH BASIN
- ELS EXISTING LIGHT STANDARD - EXISTING
- PLS PROPOSED EXTERIOR LIGHT STANDARD - BOLLARD
- PLS PROPOSED EXTERIOR DOWN LIGHT STANDARD - SOFFIT
- PLS PROPOSED EXTERIOR LIGHT STANDARD - SCONCE
- PLS PROPOSED EXTERIOR LANDSCAPE DIRECTIONAL LIGHTING
- EM EMERGENCY VEHICLE SIGNAGE
- FH FIRE HYDRANT
- WATER VALVE
- H HYDRO SERVICE
- S SEWER CLEANOUT
- B BELL PEDESTAL BOX
- TP TELE COMM PEDESTAL
- GU U/G GAS MAIN
- T U/G TELEPHONE LINE
- TB TELE COMM BOX
- E ELECTRICAL BOX
- SIAMESE CONNECTION
- HB HOSEBIB

* REFER TO LANDSCAPE & CIVIC DRAWINGS FOR PLANTING & GRADING INFO

FINISHED GRADE LEVEL: 313.11
AS PER CITY OF BARRIE
COMPREHENSIVE ZONING BY-LAW 2009-141

34M RIGHT-OF-WAY AS PER OFFICIAL PLAN ROAD WIDENING

ESSA ROAD

APPROXIMATE LOCATION OF EXISTING WATERMAIN
APPROXIMATE LOCATION EXISTING CONC. STM
APPROXIMATE LOCATION OF EXISTING SAN SEWER
APPROXIMATE LOCATION OF HYDRO LINES ABOVE

136.53m [447'-11"]
45.08m [147'-11"]
91.45m [300'-1"]

PROPOSED DRIVEWAY
R12m [R39'-4"]
7m [23']
15.7m [51'-11"]
2.95m [9'-8"]
COMM. ENTRY
6.07m [19'-9"]
4.22m [13'-10"]
2.52m [8'-3"]
MAIN RESIDENTIAL ENTRANCE
WALK WAY
PROPERTY LINE
BALCONY
PROPOSED TRANSFORMER
OUTDOOR AMENITY
PARKING ENTRANCE
PROPOSED 8 STOREY MIXED-USE BUILDING HEIGHT: 25.5 m
OUTDOOR AMENITY
MECH. PENTHOUSE
GAS METER
LOADING 3mx9mx4m
2.49m [8'-2"]
3.97m [13']
9.67m [31'-9"]
1.46m [4'-10"]
43.57m [142'-11"]
EXISTING PARKING SPOTS AT 430 ESSA
R7.5m [R24'-7"]
2M HIGH TIGHT BOARD FENCE
7.5m [24'-9"]
5.5m [18'-1"]
6.4m [21']
56.61m [185'-9"]
3.9m [9'-10"]
BALCONY
8TH STOREY, HEIGHT: 22.42 m
7TH STOREY
6TH STOREY
2ND-5TH STOREY
RESIDENTIAL ENTRY
LOADING/ GARBAGE
EXISTING 1 STOREY
EXISTING 2 STOREY
TOTAL NUMBER OF COMMERCIAL PARKING SPOTS : 35
DASHED LINE OF GROUND FLOOR EXTENTS
20.42m [67']
22.82m [74'-10"]
20.01m [65'-8"]
17.22m [56'-6"]
15.22m [49'-11"]
8 RESIDENTIAL PARKING SPOTS
6.4m [21']
25.92m [85']
6 REPLACED PARKING SPOTS OF 430 ESSA
15.22m [49'-11"]
9.5m [31'-2"]
DESIGNATED SNOW STORAGE ZONE
5.5m [18'-1"]
2.7m [8'-10"]
5,5m [18'-1"]
R-1 TYPE A
R-2 TYPE B
R-3 TYPE A
R-4 TYPE B
R-5 TYPE A
1.5m [4'-11"]
R-6 TYPE B 3.1m [10'-2"]
R-7 TYPE A 3.4m [11'-2"]
R-8
RP-6 RP-5 RP-4 RP-3 RP-2 RP-1
7.6m [24'-11"]
3m [9'-10"]
3M LANDSCAPE BUFFER
2M HIGH TIGHT BOARD FENCE
96.97m [318'-2"]
EXISTING TREES
McCAUSLAND CT

1 SITE PLAN
Scale: 1 : 250

Revisions:

DESCRIPTION: DATE:

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PROPOSED MIXED USE DEVELOPMENT

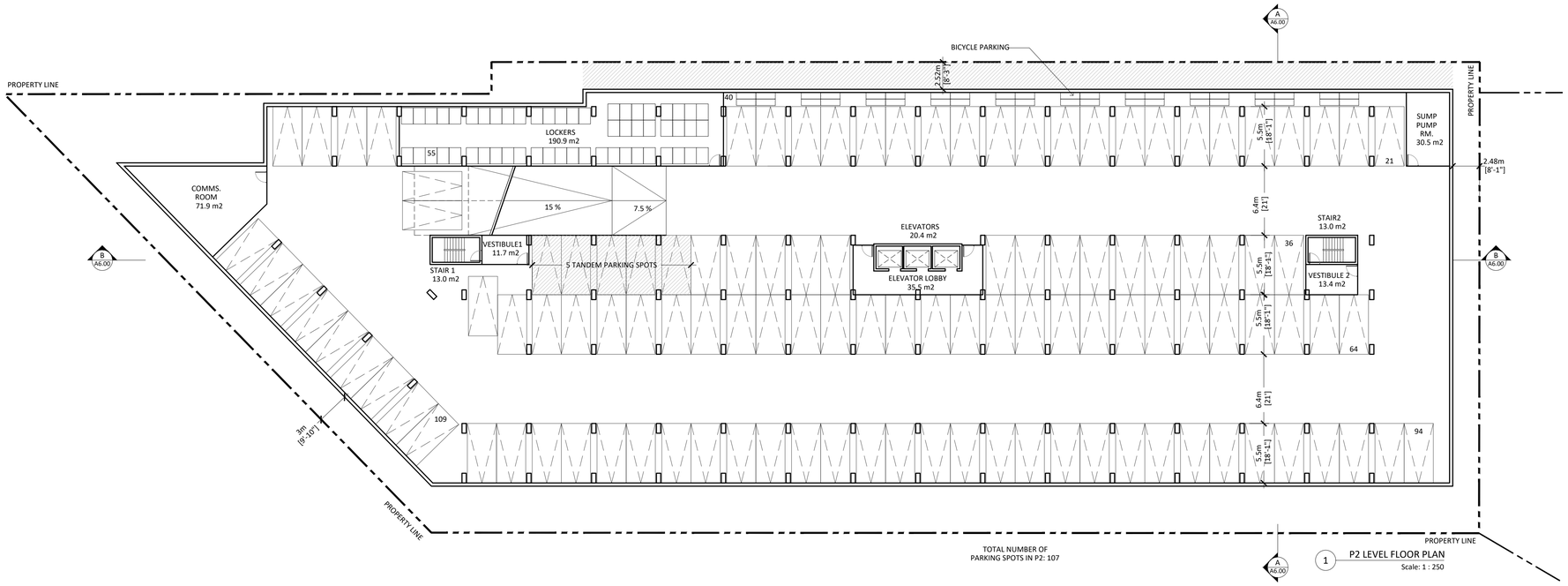
ADDRESS:
440 Essa Road, Barrie ON

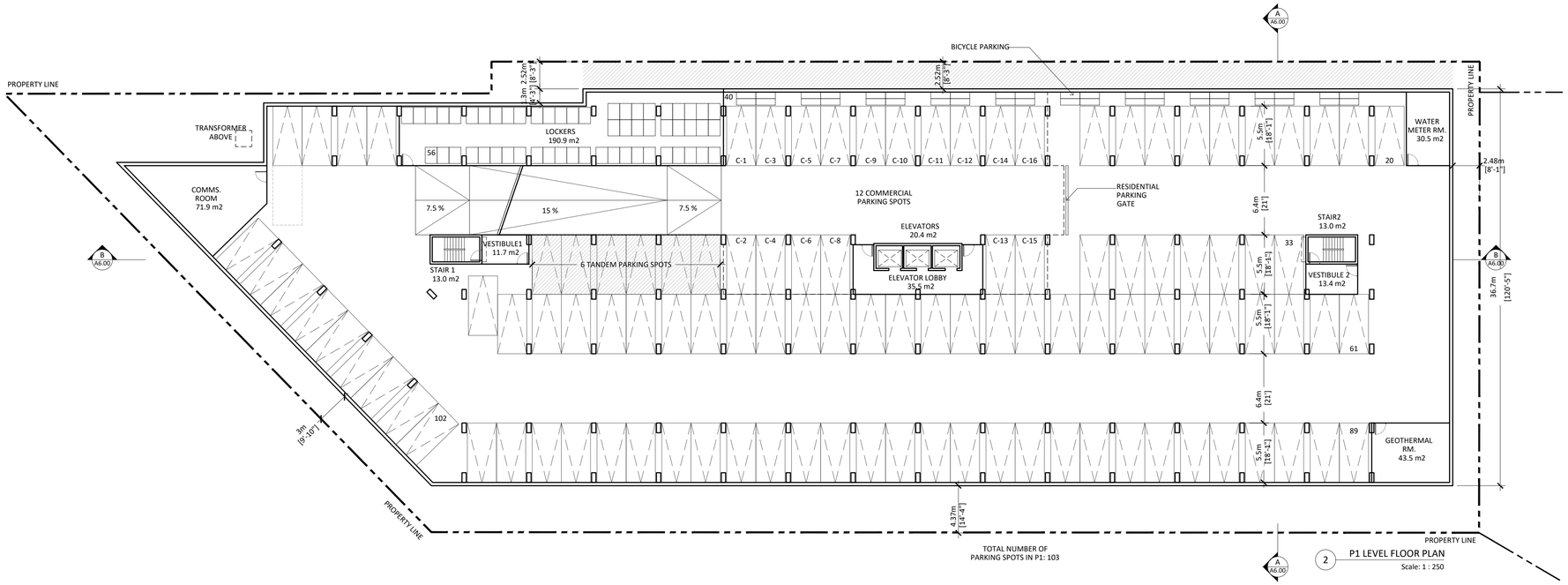
SITE PLAN

PROJECT NO.: 1905
SCALE: 1:250
DATE: August 22, 2019
DRAWN BY:

DRAWING NO.:

A1.01





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PROPOSED MIXED USE DEVELOPMENT

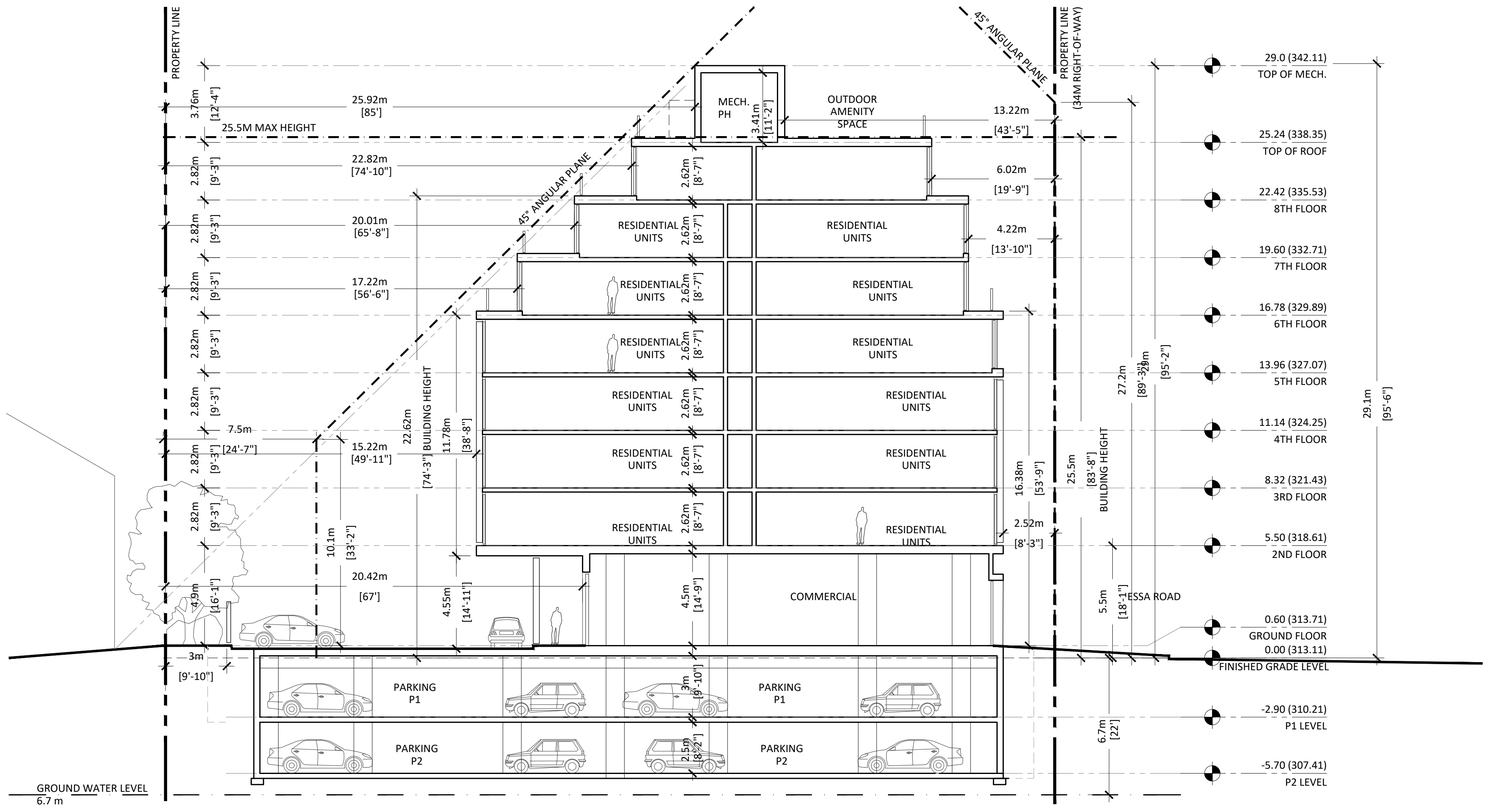
ADDRESS:
440 Essa Road, Barrie ON

P2 & P1 LEVEL FLOOR PLANS

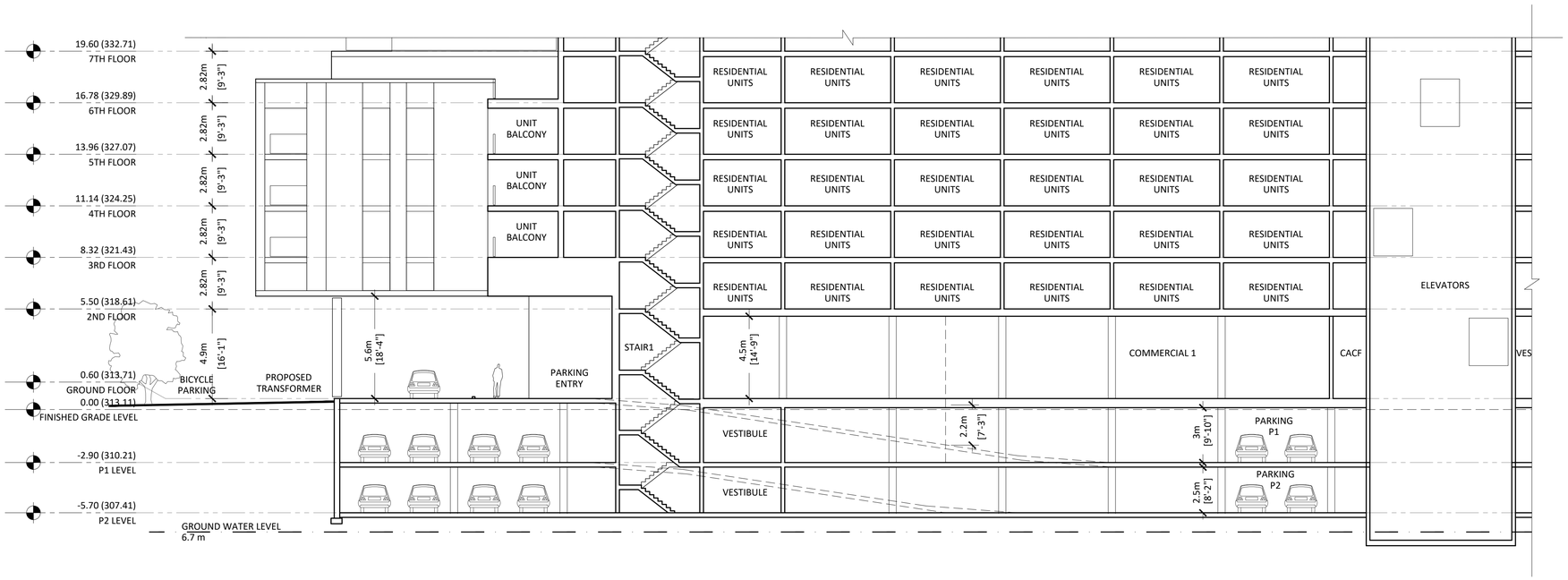
PROJECT NO.:	1905
SCALE:	1 : 250
DATE:	August 22, 2019
DRAWN BY:	

DRAWING NO.:

A3.00



1 CROSS SECTION A
Scale: 1 : 150



2 PARTIAL SECTION B
Scale: 1 : 150

Revisions:

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PROPOSED MIXED USE DEVELOPMENT

ADDRESS:
440 Essa Road, Barrie ON

BUILDING SECTION

PROJECT NO.: 1905
SCALE: 1:150
DATE: August 22, 2019
DRAWN BY:

DRAWING NO.:

A6.00

1 SOUTH WEST CORNER

2 NORTH WEST CORNER

3 SOUTH EAST CORNER

4 WEST (FRONT) ELEVATION

Revisions:

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PROPOSED MIXED USE DEVELOPMENT

ADDRESS:
440 Essa Road, Barrie ON

3D VIEWS

PROJECT NO.: 1905
SCALE: N/A
DATE: August 22, 2019
DRAWN BY:

DRAWING NO.:

A10.0

APPENDIX B – LOG OF BOREHOLES

FISHER ENGINEERING

LOG OF BOREHOLE NO. BH1(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 20-10636/37

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 440 Essa Road, Barrie, Ontario

DRILLING METHOD: CME-75, Hollow Stem

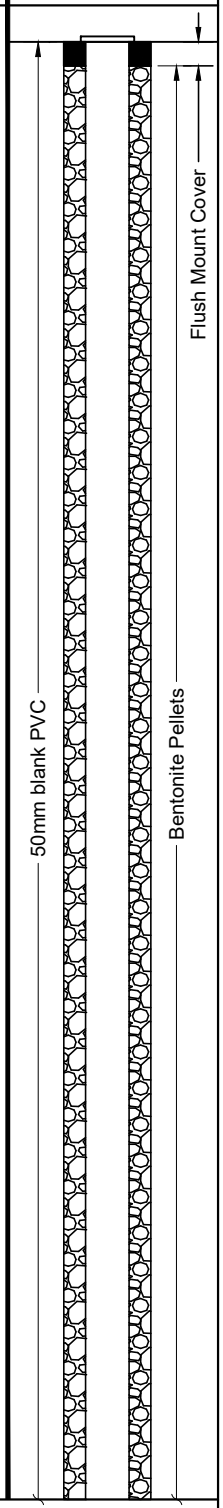
DRILLING DATE: February 10, 2020

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID:	SAMPLES TYPE NUMBER	P.I.D. Reading	"N" VALUE
		GROUND SURFACE (m asl)		312.80				
0	0	FILL: sand & gravel, sand trace gravel below 0.46m, trace organics, dark brown, moist, compact.				AS-1		
2								
4	1					SS-2		13
				1.52/ 311.28				
6	2	SILTY SAND TILL: trace gravel, greyish brown, wet to moist, compact to dense.				SS-3		8
8						SS-4		21
10	3					SS-5		18
12	4	moist below 4.57m.						
14								
16	5					SS-6		36
18								
20	6					SS-7		26
22	7							
24								
26	8			7.92/ 304.88		SS-8		28
28		CLAYEY SILT TILL: trace gravel, grey, moist, very stiff to hard.						
30	9			9.14/ 303.66				
32	10	FINE SAND: greyish brown, dry to moist, very dense.				SS-9		66

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 OR WELL CONSTRUCTION



Groundwater Depth: On Completion: 11.50m. on 21 May 2021: 13.70m

DRAWN: BL LOGGED: AC CHECKED: FF

FISHER ENGINEERING

LOG OF BOREHOLE NO. BH1(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 20-10636/37

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 440 Essa Road, Barrie, Ontario

DRILLING METHOD: CME-75, Hollow Stem

DRILLING DATE: February 10, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID:	SAMPLES TYPE NUMBER	P.I.D. Reading	"N" VALUE
		GROUND SURFACE (m asl)		312.80				
		wet below 13.72m.				SS-10		67
						SS-11		100+
						SS-12		58
		MEDIUM SAND: brown, wet, very dense.		15.54/ 297.26		SS-13		53
		End of Borehole at 15.54m						

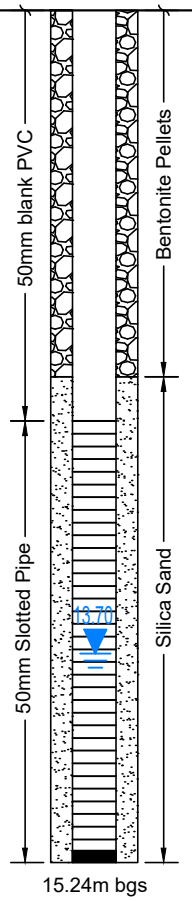
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth: On Completion: 11.50m. on 21 May 2021: 13.70m

DRAWN: BL LOGGED: AC CHECKED: FF

FISHER ENGINEERING

LOG OF BOREHOLE NO. BH2(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 20-10636/37

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 440 Essa Road, Barrie, Ontario

DRILLING METHOD: CME-75, Hollow Stem

DRILLING DATE: February 10, 2020

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: LAB ID:	TYPE NUMBER	P.I.D. Reading	"N" VALUE
		GROUND SURFACE (m asl)		313.08				
0	0	FILL: sand & gravel, brown to dark brown/black, moist, loose.				AS-1		
2				0.91/ 312.17		SS-2		5
4	1	SILTY SAND TILL: trace gravel, greyish brown, moist, compact.				SS-3		25
6	2					SS-4		14
8								
10	3					SS-5		16
12	4							
14		moist below 4.57m.						
16	5					SS-6		23
18								
20	6					SS-7		28
22	7							
24				7.62/ 305.46				
26	8	CLAYEY SILT TILL: grey, moist, hard.				SS-8		32
28								
30	9			9.30/ 303.78				
32	10	FINE SAND: brown, moist, very dense.				SS-9		100+

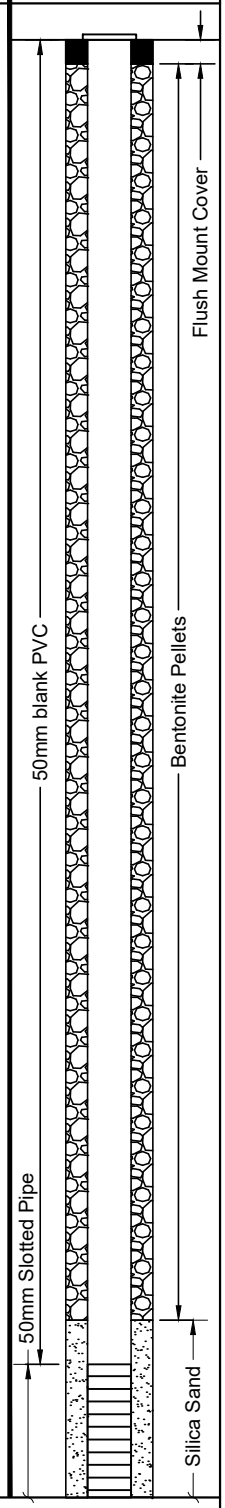
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth: On Completion: Dry on 21 May 2021: 10.80m

DRAWN: BL LOGGED: AC CHECKED: FF

FISHER ENGINEERING

LOG OF BOREHOLE NO. BH2(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 20-10636/37

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 440 Essa Road, Barrie, Ontario

DRILLING METHOD: CME-75, Hollow Stem

DRILLING DATE: February 10, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID:	SAMPLES TYPE NUMBER	P.I.D. Reading	"N" VALUE
		GROUND SURFACE (m asl)		313.08				
32	10							
34								
36	11					SS-10		82
38								
40	12					SS-11		100+
42	13	End of Borehole at 12.65m		12.65/ 300.43				
44								
46	14							
48								
50	15							
52	16							
54								
56	17							
58								
60	18							
62								
64	19							
66								

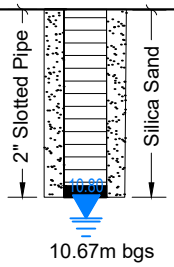
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth: On Completion: Dry on 21 May 2021: 10.80m

DRAWN: BL LOGGED: AC CHECKED: FF

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH3(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 20-10636/37

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 440 Essa Road, Barrie, Ontario

DRILLING METHOD: D-50 Solid Stem

DRILLING DATE: May 18, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		313.18			
0	0	Asphalt 50mm					
		Fill: SAND and GRAVEL, some SILT, black to dark brown, moist, compact			21-6236-1	SS-1	18
2	1	brown, moist, very loose				SS-2	4
4				1.52/ 311.66			
		SILTY SAND TILL: trace of GRAVEL, brown, moist, compact to dense				SS-3	26
6	2						
8						SS-4	37
10	3	wet at 3.35m				SS-5	20
12	4						
14							
16	5	wet at 4.88m				SS-6	27
18							
20	6					SS-7	35
22	7						
24				7.62/ 305.56			
		CLAYEY SILT TILL: trace of GRAVEL, some SILT pockets, grey, moist, hard				SS-8	+100
26	8						
28							
30	9			9.14/ 304.04			
		FINE SAND: light brown, slightly moist, very dense				SS-9	+100
32	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER ORWELL CONSTRUCTION

Flush Mount Cover

Bentonite Pellets

50mm blank PVC

50mm Slotted Pipe

Silica Sand

Groundwater Depth: On Completion: Dry. on 21 May 2021: 11.35m

DRAWN: ZA LOGGED: AC CHECKED: FF

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH3(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 20-10636/37

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 440 Essa Road, Barrie, Ontario

DRILLING METHOD: D-50 Solid Stem

DRILLING DATE: May 18, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: LAB ID	SAMPLES: Type NO.	SAMPLES: "N" VALUE
				313.18			
32	10						
34							
36	11						
38							
40	12					SS-10	100
				12.65/ 300.53			
42		End of Borehole at 12.65m					
44	13						
46							
48	14						
50	15						
52							
54	16						
56							
58	17						
60							
62	18						
64	19						

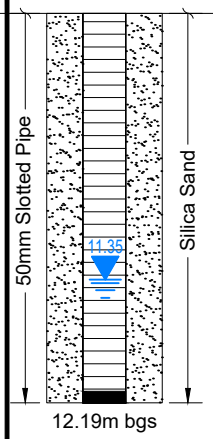
PENETRATION TESTING (SPT) ▲ 20 40 60 80

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: Dry. on 21 May 2021: 11.35m

DRAWN: ZA LOGGED: AC CHECKED: FF

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH4(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 20-10636/37

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 440 Essa Road, Barrie, Ontario

DRILLING METHOD: D-50 Solid Stem

DRILLING DATE: May 18, 2021

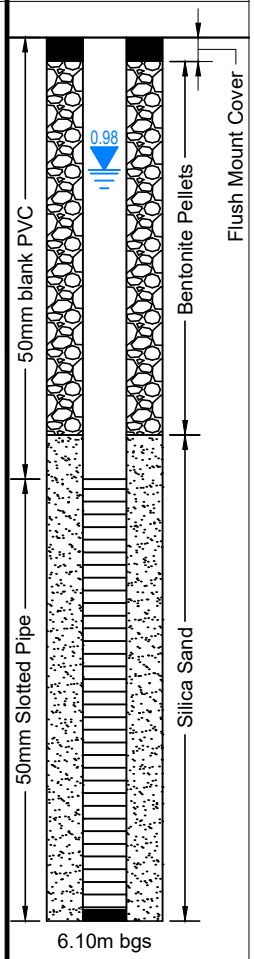
DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		312.98			
0	0	Asphalt 50mm					
		Fill: SAND and GRAVEL, some SILT, black to dark brown, moist, loose			21-6236-2	SS-1	6
2				0.91/ 312.07		SS-2	13
4	1	SILTY SAND TILL: trace of GRAVEL, moist, compact to dense					
6						SS-3	21
8	2	wet at 2.74m				SS-4	16
10	3					SS-5	10
12							
14	4						
16	5	wet at 4.88m				SS-6	35
18							
20	6					SS-7	33
22	7						
24				7.62/ 305.36			
26	8	CLAYEY SILT TILL: trace of GRAVEL, grey, moist, hard				SS-8	+100
28							
30	9			9.14/ 303.84			
		FINE SAND: light brown, slightly moist, very dense				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



Groundwater Depth: On Completion: Dry. on 21 May 2021: 0.98m

DRAWN: ZA LOGGED: AC CHECKED: FF

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH4(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 20-10636/37

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 440 Essa Road, Barrie, Ontario

DRILLING METHOD: D-50 Solid Stem

DRILLING DATE: May 18, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: 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
				312.98						
32	10									
34										
36	11					SS-10	+100			
38										
40	12					SS-11	+100			
				12.65/ 300.33						
42		End of Borehole at 12.65m								
	13									
44										
46	14									
48										
50	15									
52										
54	16									
56										
58	17									
60										
62	18									
64										
	19									

Groundwater Depth: On Completion: Dry. on 21 May 2021: 0.98m

DRAWN: ZA LOGGED: AC CHECKED: FF

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH5(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 20-10636/37

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 440 Essa Road, Barrie, Ontario

DRILLING METHOD: D-50 Hollow Stem

DRILLING DATE: May 17, 2021

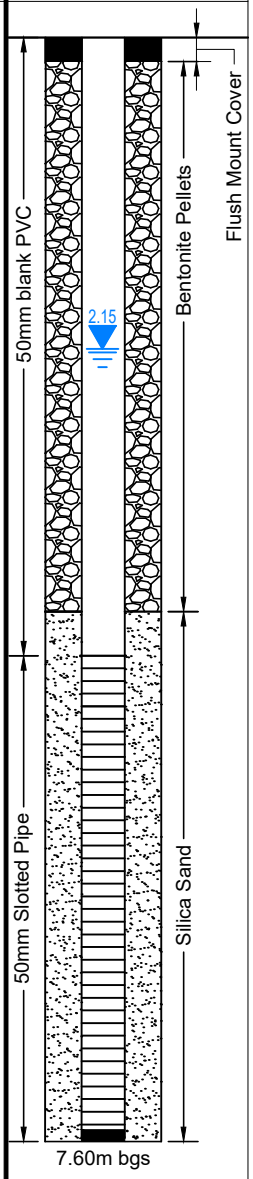
DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		313.16			
0	0	Asphalt 50mm					
		Fill: SILT and SAND, moist, brown loose to compact at 0.46m				SS-1	8
2							
4	1					SS-2	20
6	2				21-6236-3	SS-3	6
				2.29/ 310.87			
8		SILTY SAND: brown, moist, compact,				SS-4	14
10	3	wet at 3.05m				SS-5	14
12							
14	4			4.57/ 308.59			
16	5	SILTY SAND TILL: trace of GRAVEL, light brown to greyish brown, dry to moist, very dense				SS-6	50
18		some SAND and GRAVEL at 4.54m and 6.10m					
20	6					SS-7	50
22	7						
24							
26	8					SS-8	36
28							
30	9			9.14/ 304.02			
		CLAYEY SILT TILL: grey, dense to very dense, moist		9.60/ 303.56		SS-9	46
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



Groundwater Depth: On Completion: Dry. on 21 May 2021: 2.15m

DRAWN: ZA LOGGED: AC CHECKED: FF

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH5(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 20-10636/37

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 440 Essa Road, Barrie, Ontario

DRILLING METHOD: D-50 Hollow Stem

DRILLING DATE: May 17, 2021

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	SAMPLES Type NO.	"N" VALUE
				313.16			
32	10	FINE SAND: light brown, very dense, moist					
34							
36	11					SS-10	+100
38							
40	12	dry at 12.19m				SS-11	91
42	13	End of Borehole at 12.65m		12.65/ 300.51			
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: Dry. on 21 May 2021: 2.15m

DRAWN: ZA LOGGED: AC CHECKED: FF

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH6(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 20-10636/37

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 440 Essa Road, Barrie, Ontario

DRILLING METHOD: D-50 Hollow Stem

DRILLING DATE: May 17, 2021

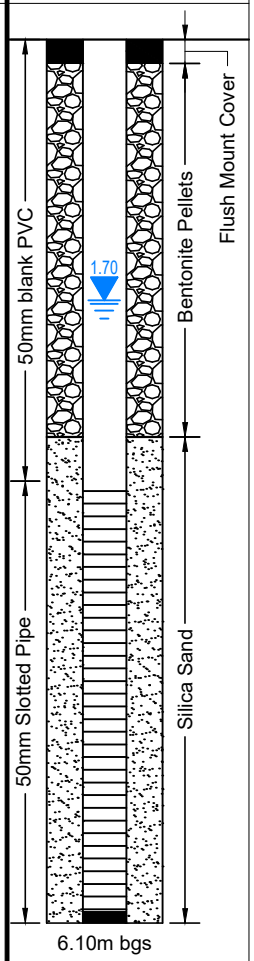
DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		312.96			
0	0	Asphalt 50mm					
		Fill: some stone, dark brown organic SILTY SAND, wet		0.61/ 312.35	21-6236-4	SS-1	6
2							
	1	SILTY SAND TILL: trace of GRAVEL, brown, moist, compact to very dense				SS-2	13
4							
						SS-3	16
6	2						
8						SS-4	17
	3	some CLAY, below 3.05m					
10						SS-5	16
12	4						
14							
16	5	little wet at 4.88m				SS-6	31
18							
20	6					SS-7	36
		grey below 6.40m					
22	7						
24				7.62/ 305.34			
		CLAYEY SILT TILL: trace of GRAVEL, grey, moist, to dry, hard				SS-8	92
26	8						
28							
	9			9.14/ 303.82			
30		FINE SAND: brown, moist to dry, very dense				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



Groundwater Depth: On Completion: 12.20m. on 21 May 2021: 1.70m

DRAWN: ZA LOGGED: AC CHECKED: FF

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH6(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 20-10636/37

PROJECT NAME: Hydrogeological and Geotechnical Investigations

LOCATION: 440 Essa Road, Barrie, Ontario

DRILLING METHOD: D-50 Hollow Stem

DRILLING DATE: May 17, 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
				312.96						
32	10									
34										
36	11	dry below 10.83m				SS-10	+100			
38										
40	12	dry at 12.19m		12.50/ 300.46		SS-11	+100			
42	13	End of Borehole at 12.50m								
44										
46	14									
48										
50	15									
52										
54	16									
56	17									
58										
60	18									
62										
64	19									

Groundwater Depth: On Completion: 12.20m. on 21 May 2021: 1.70m

DRAWN: ZA LOGGED: AC CHECKED: FF

APPENDIX C – GRAIN SIZE DISTRIBUTION ANALYSES

FISHER ENVIRONMENTAL LABORATORIES

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

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MARKHAM, ONT. L3R 3K2
TEL: 905 475-7755
FAX: 905 475-7718
www.fisherenvironmental.com

Client:	One Urban Developments Inc.	***F.E. Job #:***	21-6537
Address:	28 Rivalda Road	***Project Name:***	Geotechnical / Hydrogeological
	Toronto, ON	***Project ID:***	FE-P 20-10636 / 20-10637
	M9M 2M3	***Date Sampled:***	N/A
Tel.:		***Date Received:***	19-May-2021
Email:		***Date Reported:***	1-Jun-2021
Attn.:	Nick Stillo	***Location:***	440 Essa Road
	Principal, COO		Barrie, ON

Certificate of Analysis

Analyses	Matrix	Quantity	Date Extracted	Date Analyzed	Lab SOP	Method Reference
Moisture Content	Soil	13	N/A	25-May-21	Support Procedures F-99	Carter (1993)
Grain Size	Soil	7	N/A	31-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:	Moisture Content, Grain Size
Sample Description:	13 Soil Sample(s)

Parameter	***21-6537-1*** BH2 SS3 1.50-1.95m	***21-6537-2*** BH2 SS5 3.00-3.45m	***21-6537-3*** BH2 SS7 6.05-6.50m	***21-6537-4*** BH2 SS8 7.55-8.05m	***21-6537-5*** BH4 SS4 2.25-2.70m	***21-6537-6*** BH4 SS7 6.05-6.50m
Moisture Content (%)	11	10	5.8	22	8.5	9.2

Parameter	***21-6537-7*** BH4 SS8 7.55-8.05m	***21-6537-8*** BH4 SS10 10.60-11.05m	***21-6537-9*** BH6 SS2 0.75-1.20m	***21-6537-10*** BH6 SS5 3.00-3.45m	***21-6537-11*** BH6 SS7 6.05-6.65m	***21-6537-12*** BH6 SS8 7.55-8.05m
Moisture Content (%)	24	3.3	9.7	10	7.8	23

Parameter	***21-6537-13*** BH7 SS9 9.15-9.55m					
Moisture Content (%)	7.2					

QA/QC Report

Parameter	**Blank**	**RL**	**LCS**	**AR**	**Duplicate**	**AR**
			Recovery (%)		**RPD (%)**	
Moisture Content (%)	<0.1	0.1	100	70-130	1.1	0-20

LEGEND:

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

Certificate of Analysis

Analysis Requested:	Moisture Content, Grain Size
Sample Description:	13 Soil Sample(s)

Parameter	***21-6537-2*** BH2 SS5 3.00-3.45m	***21-6537-4*** BH2 SS8 7.55-8.05m	***21-6537-5*** BH4 SS4 2.25-2.70m	***21-6537-6*** BH4 SS7 6.05-6.50m	***21-6537-7*** BH4 SS8 7.55-8.05m	***21-6537-8*** BH4 SS10 10.60-11.05m
Grain Size (%)						
>19mm	0.0	0.0	0.0	6.4	0.0	0.0
9.5mm-19mm	5.7	0.0	0.0	4.8	0.0	0.0
4.75mm-9.5mm	4.4	0.0	5.5	2.6	0.0	0.0
1.18m-4.75mmm	4.4	0.3	5.4	3.5	0.5	0.1
300um-1.18mm	17.0	0.7	26.2	13.3	4.2	2.2
75um-300um	27.7	0.5	27.9	20.4	4.0	18.0
<75um	41.0	98.5	35.0	49.1	91.3	79.7
Clay & Silt	**41**	**98**	**35**	**49**	**91**	**80**
Sand	**49**	**2**	**60**	**37**	**9**	**20**
Gravel	**10**	**0**	**6**	**14**	**0**	**0**

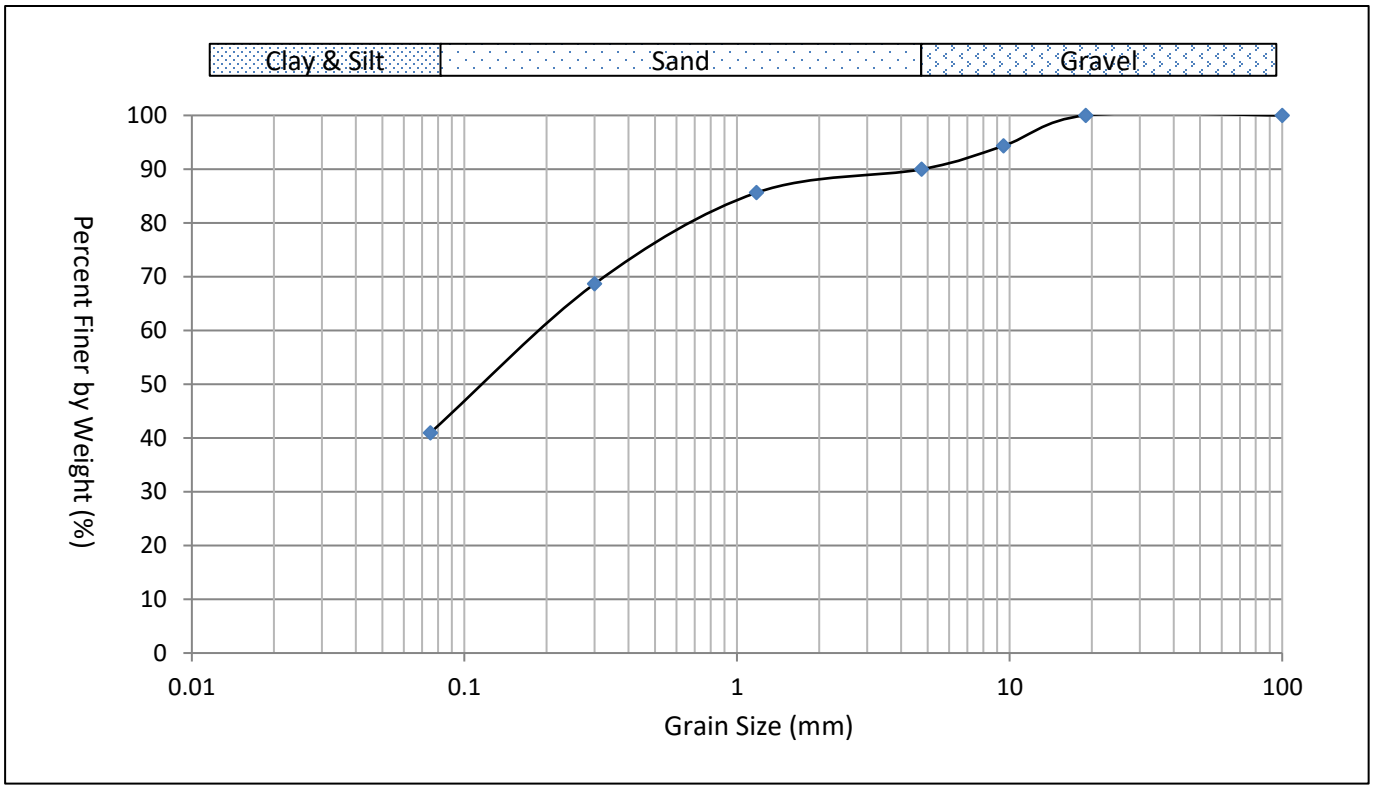
Parameter	***21-6537-13*** BH7 SS9 9.15-9.55m					
Grain Size (%)						
>19mm	0.0					
9.5mm-19mm	0.0					
4.75mm-9.5mm	0.0					
1.18m-4.75mmm	0.0					
300um-1.18mm	0.4					
75um-300um	62.4					
<75um	37.2					
Clay & Silt	**37**					
Sand	**63**					
Gravel	**0**					

Client: One Urban Developments Inc. ***F.E. Job #:*** 21-6537

Grain Size Distribution

Sample ID: 21-6537-2 BH2 SS5 3.00-3.45m

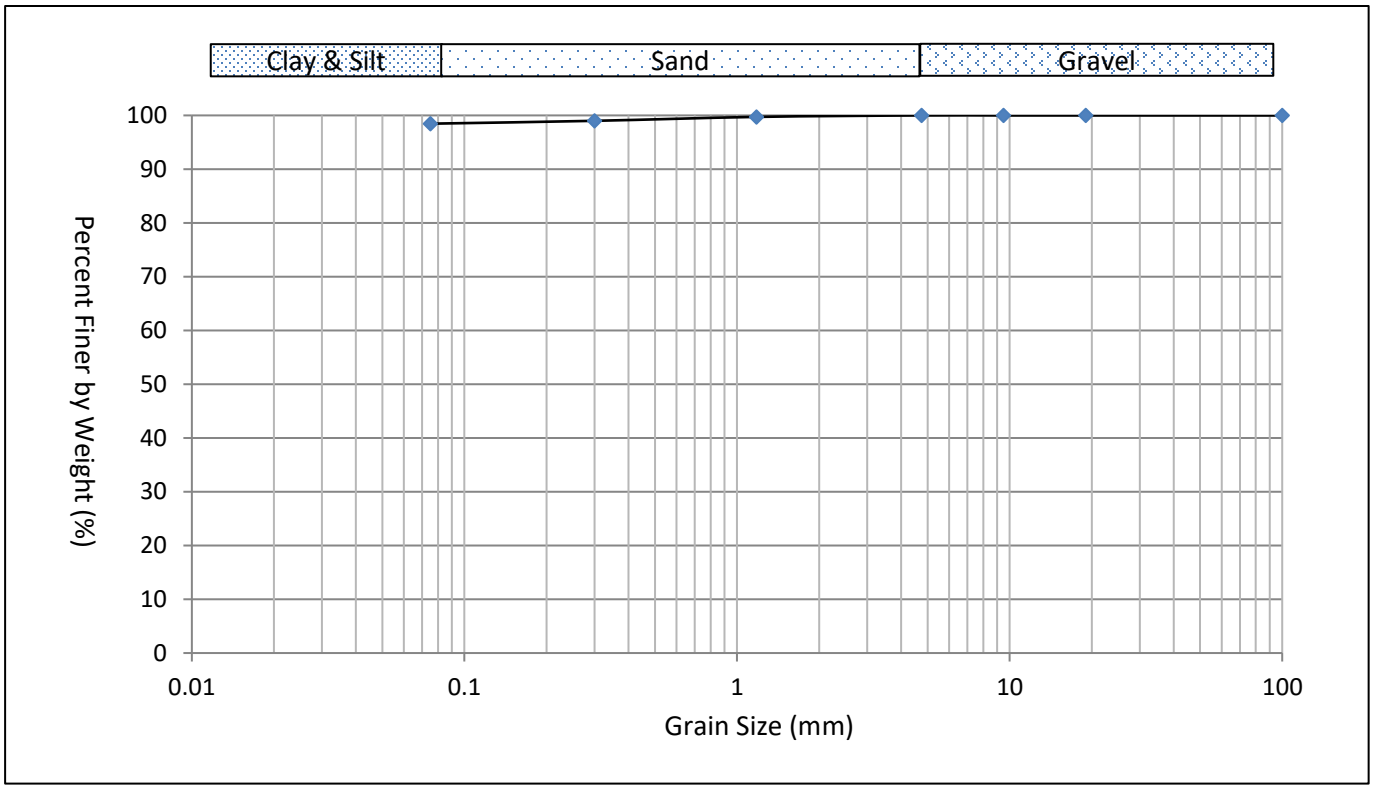
Clay & Silt: 41% Sand: 49% Gravel: 10%



Grain Size Distribution

Sample ID: 21-6537-4 BH2 SS8 7.55-8.05m

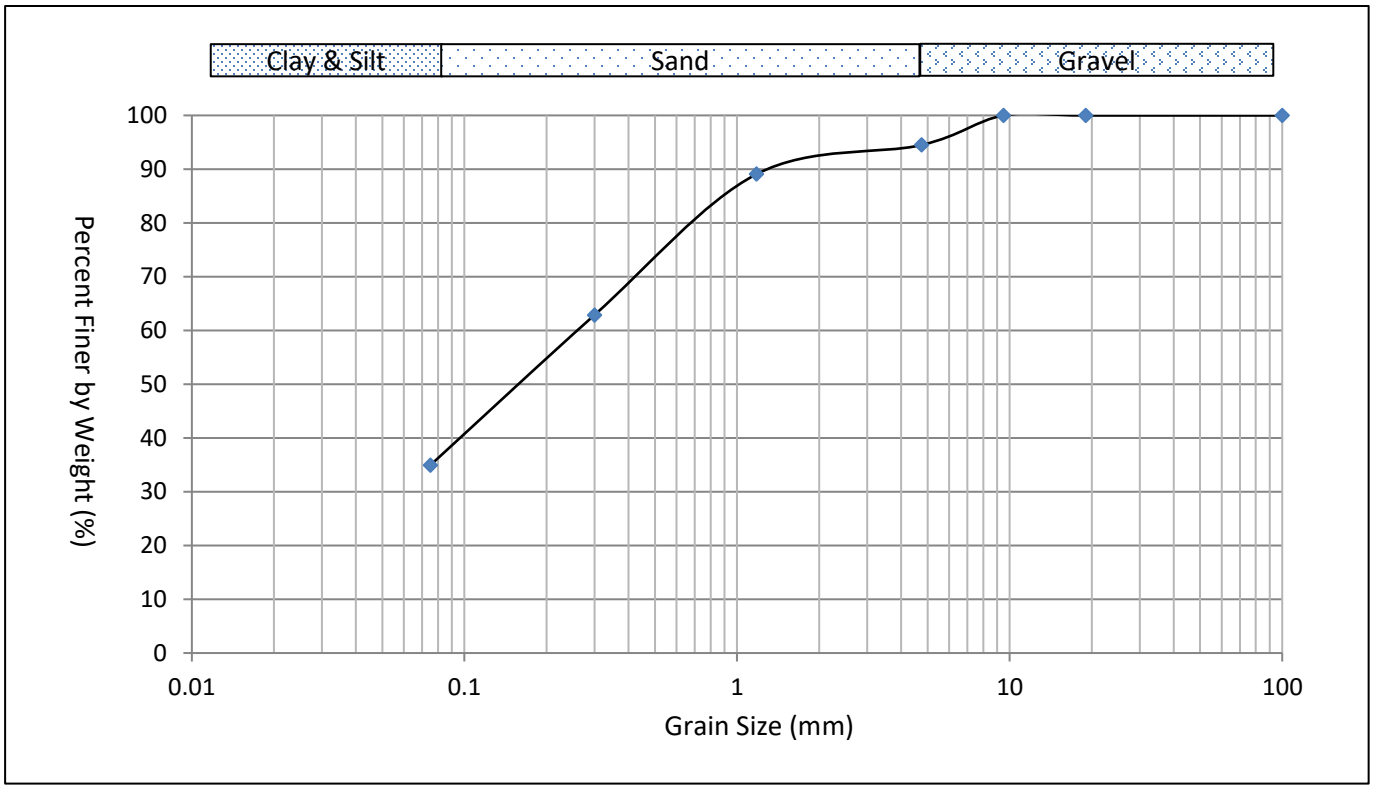
Clay & Silt: 98% Sand: 2% Gravel: 0%



Grain Size Distribution

Sample ID: 21-6537-5 BH4 SS4 2.25-2.70m

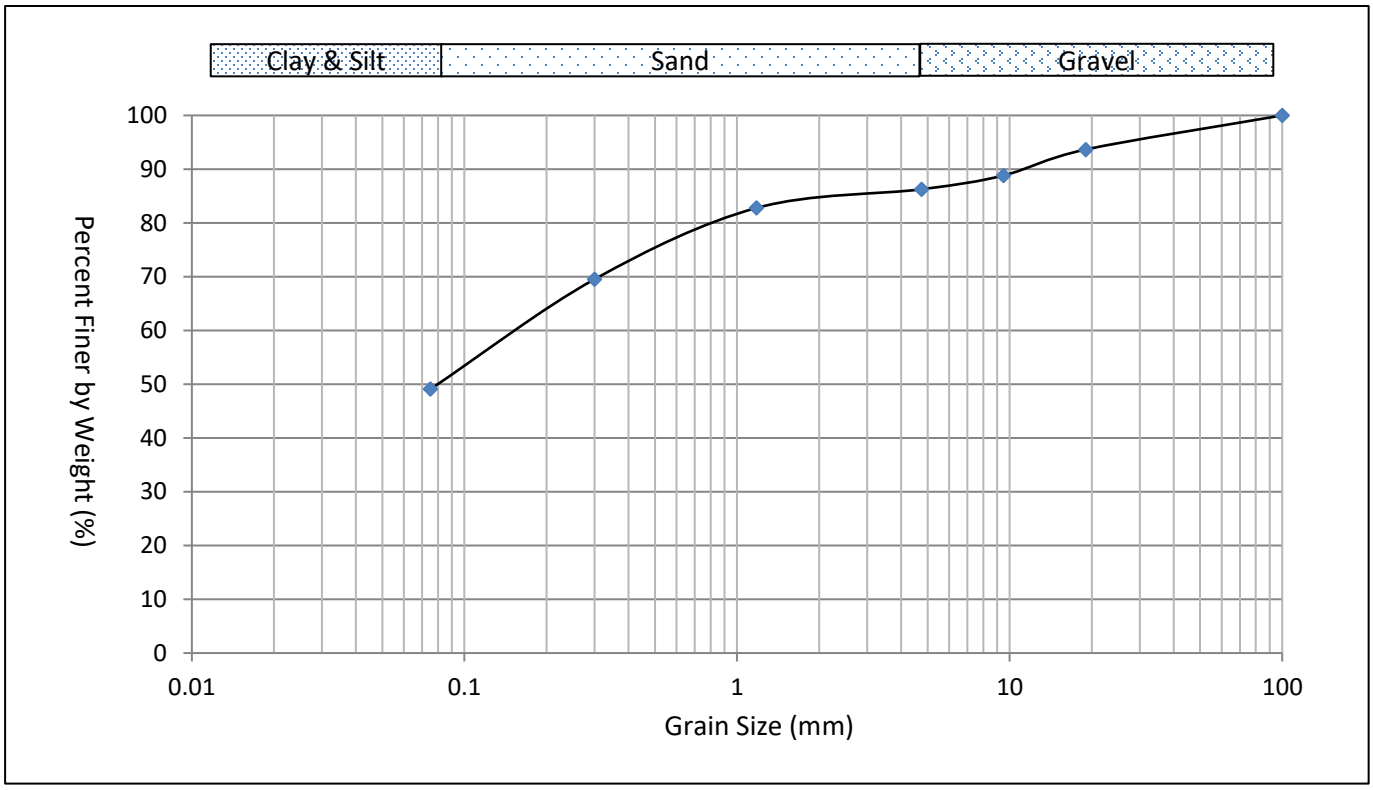
Clay & Silt: 35% Sand: 60% Gravel: 6%



Grain Size Distribution

Sample ID: 21-6537-6 BH4 SS7 6.05-6.50m

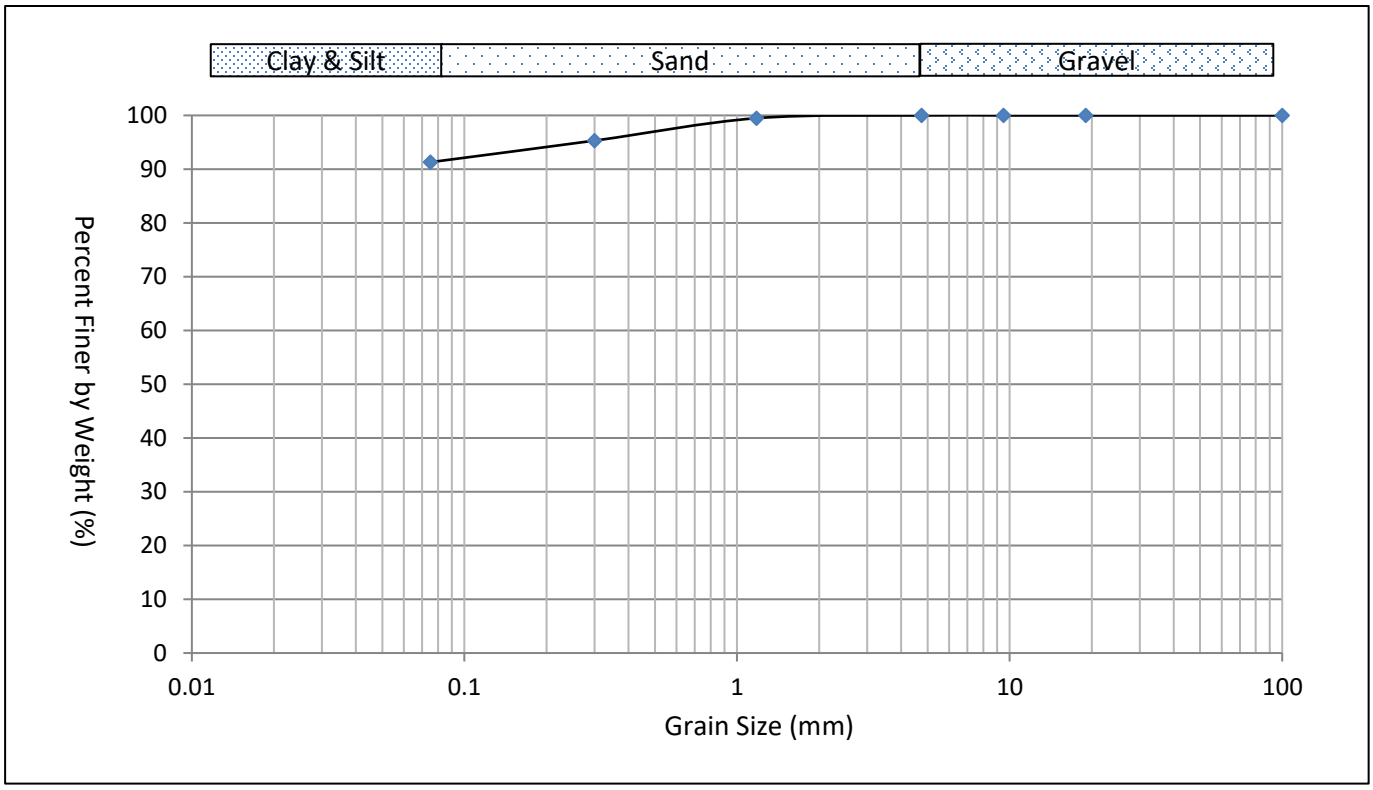
Clay & Silt: 49% Sand: 37% Gravel: 14%



Grain Size Distribution

Sample ID: 21-6537-7 BH4 SS8 7.55-8.05m

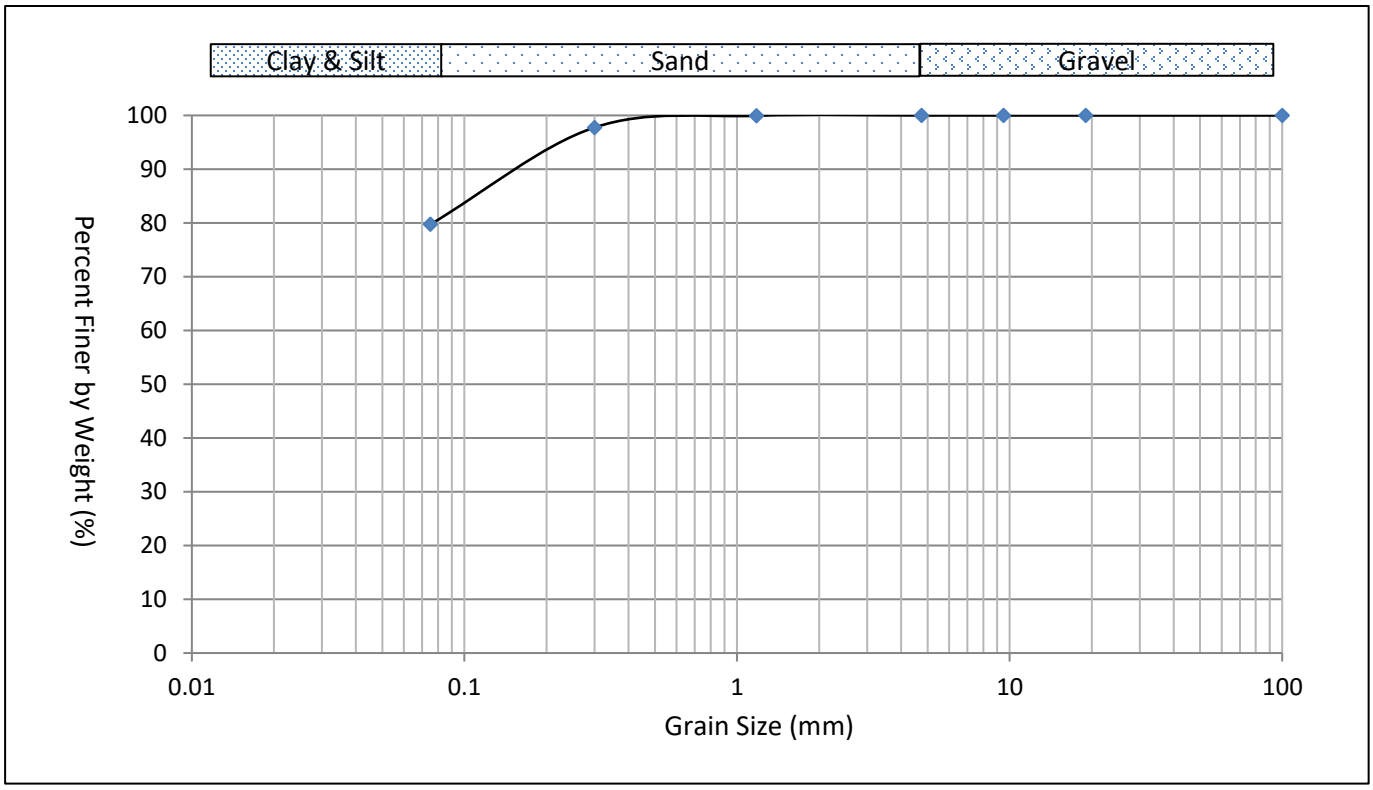
Clay & Silt: 91% Sand: 9% Gravel: 0%



Grain Size Distribution

Sample ID: 21-6537-8 BH4 SS10 10.60-11.05m

Clay & Silt: 80% Sand: 20% Gravel: 0%

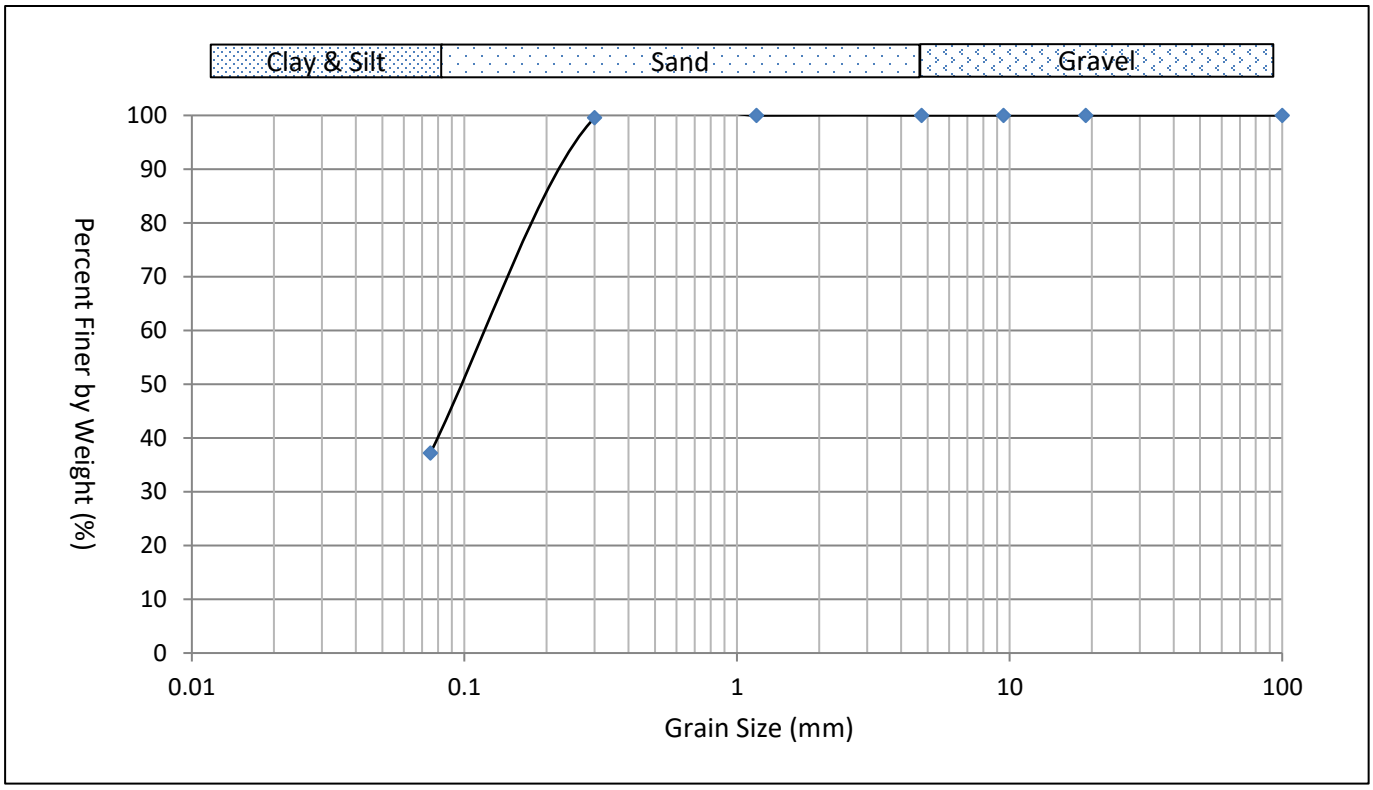


Client: One Urban Developments Inc. ***F.E. Job #:*** 21-6537

Grain Size Distribution

Sample ID: 21-6537-13 BH7 SS9 9.15-9.55m

Clay & Silt: 37% Sand: 63% Gravel: 0%



Results related only to the items tested

APPENDIX D – SEWER BYLAWS RESULTS

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

Date Received: 21-MAY-21
Report Date: 03-JUN-21 07:47 (MT)
Version: FINAL

Client Phone: 905-475-7755

Certificate of Analysis

Lab Work Order #: L2591571

Project P.O. #: NOT SUBMITTED
Job Reference: 20010637
C of C Numbers:
Legal Site Desc:

Emily Hansen
Account Manager

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Sewer Use Bylaws - Barrie Sanitary Sewer (2012-172)						
L2591571-1	440 ESSA ROAD BARRIE MW4	Physical Tests	Total Suspended Solids	1240	350	mg/L
		Anions and Nutrients	Chloride (Cl)	5070	1500	mg/L
		Volatile Organic Compounds	Benzene	20.9	10	ug/L
Ontario Sewer Use Bylaws - Barrie Storm Sewer (2012-172)						
L2591571-1	440 ESSA ROAD BARRIE MW4	Physical Tests	Total Suspended Solids	1240	15	mg/L
		Total Metals	Copper (Cu)-Total	0.0487	0.01	mg/L
			Zinc (Zn)-Total	0.096	0.04	mg/L

* 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: L2591571-1 Sample Date: 21-MAY-21 Sample ID: 440 ESSA ROAD BARRIE MW4
pH	pH units	6.0-9.5	6.0-9.5	7.05 PEHT
Total Suspended Solids	mg/L	350	15	1240 DLHC

Guide Limit #1: Barrie Sanitary Sewer (2012-172)
Guide Limit #2: Barrie Storm Sewer (2012-172)

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

			Lab ID	L2591571-1
			Sample Date	21-MAY-21
			Sample ID	440 ESSA ROAD BARRIE MW4
Analyte	**Unit**	**Guide Limits #1**	**#2**	
Chloride (Cl)	mg/L	1500	-	5070 DLDS
Fluoride (F)	mg/L	10	-	<0.40 DLDS
Total Kjeldahl Nitrogen	mg/L	100	-	1.50 DLM
Phosphorus, Total	mg/L	10	-	0.963
Sulfate (SO4)	mg/L	1500	-	39.1 DLDS
Sulphide (as S)	mg/L	-	-	<0.18 DLM
Sulphide (as H2S)	mg/L	1	-	<0.19

Guide Limit #1: Barrie Sanitary Sewer (2012-172)
Guide Limit #2: Barrie Storm Sewer (2012-172)

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

Cyanides - WATER

			Lab ID	L2591571-1
			Sample Date	21-MAY-21
			Sample ID	440 ESSA ROAD BARRIE MW4
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Cyanide, Total	mg/L	1.2	-	0.0026

Guide Limit #1: Barrie Sanitary Sewer (2012-172)
Guide Limit #2: Barrie Storm Sewer (2012-172)

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.

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2591571-1 Sample Date: 21-MAY-21 Sample ID: 440 ESSA ROAD BARRIE MW4
Aluminum (Al)-Total	mg/L	50	-	26.2 DLHC
Antimony (Sb)-Total	mg/L	5	-	<0.0010 DLHC
Arsenic (As)-Total	mg/L	1	-	0.0052 DLHC
Barium (Ba)-Total	mg/L	5	-	1.07 DLHC
Bismuth (Bi)-Total	mg/L	5	-	<0.00050 DLHC
Cadmium (Cd)-Total	mg/L	0.7	0.001	0.000198 DLHC
Chromium (Cr)-Total	mg/L	2	0.08	0.0379 DLHC
Cobalt (Co)-Total	mg/L	5.0	-	0.0215 DLHC
Copper (Cu)-Total	mg/L	2.0	0.01	0.0487 DLHC
Iron (Fe)-Total	mg/L	50	-	35.7 DLHC
Lead (Pb)-Total	mg/L	0.7	0.05	0.0146 DLHC
Manganese (Mn)-Total	mg/L	5	-	3.83 DLHC
Mercury (Hg)-Total	mg/L	0.01	-	0.0000139
Molybdenum (Mo)-Total	mg/L	5	-	0.00182 DLHC
Nickel (Ni)-Total	mg/L	2	0.05	0.0471 DLHC
Selenium (Se)-Total	mg/L	1.0	-	<0.00050 DLHC
Silver (Ag)-Total	mg/L	0.4	-	<0.00050 DLHC
Tin (Sn)-Total	mg/L	5	-	0.0016 DLHC
Titanium (Ti)-Total	mg/L	-	-	1.34 DLHC
Vanadium (V)-Total	mg/L	5.0	-	0.0549 DLHC
Zinc (Zn)-Total	mg/L	2.0	0.04	0.096 DLHC

Guide Limit #1: Barrie Sanitary Sewer (2012-172)
Guide Limit #2: Barrie Storm Sewer (2012-172)

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

			Lab ID	L2591571-1
			Sample Date	21-MAY-21
			Sample ID	440 ESSA ROAD BARRIE MW4
Analyte	**Unit**	**Guide Limits #1**	**#2**	
BOD	mg/L	300	15	<3.0 BODL
COD	mg/L	600	-	394
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	0.1	-	0.0023

Guide Limit #1: Barrie Sanitary Sewer (2012-172)
Guide Limit #2: Barrie Storm Sewer (2012-172)

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.

Volatile Organic Compounds - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2591571-1 Sample Date: 21-MAY-21 Sample ID: 440 ESSA ROAD BARRIE MW4
Acetone	ug/L	-	-	<20 OWP
Benzene	ug/L	10	-	20.9 OWP
Bromodichloromethane	ug/L	-	-	<1.0 OWP
Bromoform	ug/L	-	-	<1.0 OWP
Bromomethane	ug/L	-	-	<0.50 OWP
Carbon Disulfide	ug/L	-	-	<1.0 OWP
Carbon tetrachloride	ug/L	-	-	<0.20 OWP
Chlorobenzene	ug/L	-	-	<0.50 OWP
Dibromochloromethane	ug/L	-	-	<1.0 OWP
Chloroethane	ug/L	-	-	<1.0 OWP
Chloroform	ug/L	-	-	1.5 OWP
Chloromethane	ug/L	-	-	<1.0 OWP
1,2-Dibromoethane	ug/L	-	-	<0.20 OWP
1,2-Dichlorobenzene	ug/L	50	-	<0.50 OWP
1,3-Dichlorobenzene	ug/L	-	-	<0.50 OWP
1,4-Dichlorobenzene	ug/L	80	-	<0.50 OWP
Dichlorodifluoromethane	ug/L	-	-	<1.0 OWP
1,1-Dichloroethane	ug/L	-	-	<0.50 OWP
1,2-Dichloroethane	ug/L	-	-	<0.50 OWP
1,1-Dichloroethylene	ug/L	-	-	<0.50 OWP
cis-1,2-Dichloroethylene	ug/L	-	-	<0.50 OWP
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50 OWP
Dichloromethane	ug/L	90	-	<2.0 OWP
1,2-Dichloropropane	ug/L	-	-	<0.50 OWP
cis-1,3-Dichloropropene	ug/L	-	-	<0.30 OWP
trans-1,3-Dichloropropene	ug/L	-	-	<0.30 OWP
Ethylbenzene	ug/L	60	-	0.67 OWP
n-Hexane	ug/L	-	-	<0.50 OWP
2-Hexanone	ug/L	-	-	<20 OWP
Methyl Ethyl Ketone	ug/L	-	-	<20 OWP

Guide Limit #1: Barrie Sanitary Sewer (2012-172)
Guide Limit #2: Barrie Storm Sewer (2012-172)

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

Volatile Organic Compounds - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2591571-1 Sample Date: 21-MAY-21 Sample ID: 440 ESSA ROAD BARRIE MW4
Methyl Isobutyl Ketone	ug/L	-	-	<20 OWP
MTBE	ug/L	-	-	<0.50 OWP
Styrene	ug/L	-	-	<0.50 OWP
1,1,1,2-Tetrachloroethane	ug/L	-	-	<0.50 OWP
1,1,2,2-Tetrachloroethane	ug/L	60	-	<0.50 OWP
Tetrachloroethylene	ug/L	60	-	<0.50 OWP
Toluene	ug/L	20	-	1.09 OWP
1,1,1-Trichloroethane	ug/L	-	-	<0.50 OWP
1,1,2-Trichloroethane	ug/L	-	-	<0.50 OWP
Trichloroethylene	ug/L	50	-	<0.50 OWP
Trichlorofluoromethane	ug/L	-	-	<1.0 OWP
Vinyl chloride	ug/L	-	-	<0.50 OWP
o-Xylene	ug/L	-	-	<0.30 OWP
m+p-Xylenes	ug/L	-	-	<0.40 OWP
Xylenes (Total)	ug/L	300	-	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-	92.3
Surrogate: 1,4-Difluorobenzene	%	-	-	96.2

Guide Limit #1: Barrie Sanitary Sewer (2012-172)
Guide Limit #2: Barrie Storm Sewer (2012-172)

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.

Polycyclic Aromatic Hydrocarbons - WATER

			Lab ID	L2591571-1
			Sample Date	21-MAY-21
			Sample ID	440 ESSA ROAD BARRIE MW4
		Guide Limits		
Analyte	Unit	#1	#2	
Acenaphthene	ug/L	-	-	<0.020
Acenaphthylene	ug/L	-	-	<0.020
Anthracene	ug/L	-	-	<0.020
Benzo(a)anthracene	ug/L	-	-	<0.020
Benzo(a)pyrene	ug/L	-	-	<0.010
Benzo(b&j)fluoranthene	ug/L	-	-	<0.020
Benzo(g,h,i)perylene	ug/L	-	-	<0.020
Benzo(k)fluoranthene	ug/L	-	-	<0.020
Chrysene	ug/L	-	-	<0.020
Dibenz(a,h)anthracene	ug/L	-	-	<0.020
Fluoranthene	ug/L	-	-	<0.020
Fluorene	ug/L	-	-	<0.020
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.020
1-Methylnaphthalene	ug/L	-	-	0.023
2-Methylnaphthalene	ug/L	-	-	0.027
Naphthalene	ug/L	-	-	<0.050
Phenanthrene	ug/L	-	-	<0.020
Pyrene	ug/L	-	-	<0.020
Surrogate: Chrysene d12	%	-	-	95.1
Surrogate: Naphthalene d8	%	-	-	91.0
Surrogate: Phenanthrene d10	%	-	-	84.6
Total PAHs	ug/L	5	-	<0.095

Guide Limit #1: Barrie Sanitary Sewer (2012-172)
Guide Limit #2: Barrie Storm Sewer (2012-172)

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

Organochlorine Pesticides - WATER

			Lab ID	L2591571-1
			Sample Date	21-MAY-21
			Sample ID	440 ESSA ROAD BARRIE MW4
Analyte	**Unit**	**Guide Limits #1**	**#2**	
Hexachlorobenzene	ug/L	0.1	-	<0.0080
Surrogate: Tetrachloro-m-xylene	%	-	-	90.8

Guide Limit #1: Barrie Sanitary Sewer (2012-172)
Guide Limit #2: Barrie Storm Sewer (2012-172)

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.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
PEHT	Parameter Exceeded Recommended Holding Time Prior to Analysis
BODL	Limit of Reporting for BOD was increased to account for the largest volume of sample tested.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
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

Reference Information

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-WT	Water	BOD	APHA 5210 B

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.

CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

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

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).

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

COD-T-WT	Water	Chemical Oxygen Demand	APHA 5220 D

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.

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.

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).

OCP-ROUTINE-WT	Water	Pesticides, Organochlorine in Water	SW846 8270

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

Samples are extracted using a solvent mixture and the resulting extracts are analyzed on GC/MSD

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.

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-511-WT Water PAH-O. Reg 153/04 (July 2011) SW846 3510/8270

Aqueous samples, fortified with surrogates, are extracted using liquid/liquid extraction technique. The sample extracts are concentrated and then analyzed using GC/MS. Results for benzo(b) fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.

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), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

PAH-SUM-CALC-WT Water TOTAL PAH's CALCULATION

Total PAH represents the sum of all PAH analytes reported for a given sample. Note that regulatory agencies and criteria differ in their definitions of Total PAH in terms of the individual PAH analytes to be included.

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.

S2-T>H2S-CALC-WT Water Total Sulphide Calculated as H2S Calculation

This calculation converts Total Sulphide as (S2-) and reports it as Total Sulphide as (H2S). Total Sulphide as (S2-) is determined using procedures adapted from APHA 4500-S2 "Sulphide".

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.

SULPHIDE-WT Water Sulphide (as S) APHA 4500S2D

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		This analysis is carried out using procedures adapted from APHA Method 4500-S2-D "Methylene Blue Method". Sulphide is determined colourmetrically.	
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.	
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION
		Total xylenes represents the sum of o-xylene and m&p-xylene.	

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

Chain of Custody Numbers:

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

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: L2591571 Report Date: 03-JUN-21

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

Contact: FRANK/ CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BOD-WT	**Water**							
Batch R5475919								
WG3540880-14 DUP		**L2591469-46**						
BOD		<3.0	<3.0	RPD-NA	mg/L	N/A	30	25-MAY-21
WG3540880-15 LCS								
BOD			108.1		%		85-115	25-MAY-21
WG3540880-13 MB								
BOD			<2.0		mg/L		2	25-MAY-21
CL-IC-N-WT	**Water**							
Batch R5471959								
WG3541941-14 DUP		**WG3541941-13**						
Chloride (Cl)		4.86	4.85		mg/L	0.1	20	26-MAY-21
WG3541941-12 LCS								
Chloride (Cl)			100.9		%		90-110	26-MAY-21
WG3541941-11 MB								
Chloride (Cl)			<0.50		mg/L		0.5	26-MAY-21
WG3541941-15 MS		**WG3541941-13**						
Chloride (Cl)			98.3		%		75-125	26-MAY-21
CN-TOT-WT	**Water**							
Batch R5468138								
WG3540738-24 DUP		**WG3540738-23**						
Cyanide, Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	25-MAY-21
WG3540738-22 LCS								
Cyanide, Total			88.8		%		80-120	25-MAY-21
WG3540738-21 MB								
Cyanide, Total			<0.0020		mg/L		0.002	25-MAY-21
WG3540738-25 MS		**WG3540738-23**						
Cyanide, Total			84.5		%		70-130	25-MAY-21
COD-T-WT	**Water**							
Batch R5468777								
WG3541197-7 DUP		**L2591469-10**						
COD		<10	<10	RPD-NA	mg/L	N/A	20	26-MAY-21
WG3541197-6 LCS								
COD			105.0		%		85-115	26-MAY-21
WG3541197-5 MB								
COD			<10		mg/L		10	26-MAY-21
WG3541197-8 MS		**L2591469-10**						
COD			107.8		%		75-125	26-MAY-21
F-IC-N-WT	**Water**							

Quality Control Report

Workorder: L2591571 Report Date: 03-JUN-21

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

Contact: FRANK/ CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-WT	**Water**							
Batch R5471959								
WG3541941-14 DUP		**WG3541941-13**						
Fluoride (F)		0.728	0.725		mg/L	0.4	20	26-MAY-21
WG3541941-12 LCS								
Fluoride (F)			101.2		%		90-110	26-MAY-21
WG3541941-11 MB								
Fluoride (F)			<0.020		mg/L		0.02	26-MAY-21
WG3541941-15 MS		**WG3541941-13**						
Fluoride (F)			97.0		%		75-125	26-MAY-21
HG-T-CVAA-WT	**Water**							
Batch R5474789								
WG3542178-7 DUP		**WG3542178-5**						
Mercury (Hg)-Total		0.0000117	0.0000094	J	mg/L	0.0000023	0.00001	28-MAY-21
WG3542178-2 LCS								
Mercury (Hg)-Total			98.4		%		80-120	28-MAY-21
WG3542178-1 MB								
Mercury (Hg)-Total			<0.000005(		mg/L		0.000005	28-MAY-21
WG3542178-8 MS		**WG3542178-6**						
Mercury (Hg)-Total			101.1		%		70-130	28-MAY-21
MET-T-CCMS-WT	**Water**							
Batch R5468460								
WG3541113-4 DUP		**WG3541113-3**						
Aluminum (Al)-Total		0.0056	0.0055		mg/L	3.0	20	26-MAY-21
Antimony (Sb)-Total		0.00048	0.00048		mg/L	0.8	20	26-MAY-21
Arsenic (As)-Total		0.00067	0.00062		mg/L	7.6	20	26-MAY-21
Barium (Ba)-Total		0.138	0.139		mg/L	0.6	20	26-MAY-21
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	26-MAY-21
Cadmium (Cd)-Total		<0.0000050	<0.000005(	RPD-NA	mg/L	N/A	20	26-MAY-21
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	26-MAY-21
Cobalt (Co)-Total		0.00027	0.00028		mg/L	1.9	20	26-MAY-21
Copper (Cu)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	26-MAY-21
Iron (Fe)-Total		0.175	0.175		mg/L	0.1	20	26-MAY-21
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	26-MAY-21
Manganese (Mn)-Total		0.486	0.483		mg/L	0.5	20	26-MAY-21
Molybdenum (Mo)-Total		0.00517	0.00510		mg/L	1.3	20	26-MAY-21
Nickel (Ni)-Total		0.00162	0.00166		mg/L	2.6	20	26-MAY-21
Selenium (Se)-Total		0.000159	0.000181		mg/L	13	20	26-MAY-21

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5468460								
WG3541113-4 DUP		**WG3541113-3**						
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	26-MAY-21
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	26-MAY-21
Titanium (Ti)-Total		<0.00030	0.00035	RPD-NA	mg/L	N/A	20	26-MAY-21
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	26-MAY-21
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	26-MAY-21
WG3541113-2 LCS								
Aluminum (Al)-Total			100.5		%		80-120	26-MAY-21
Antimony (Sb)-Total			100.2		%		80-120	26-MAY-21
Arsenic (As)-Total			102.4		%		80-120	26-MAY-21
Barium (Ba)-Total			100.2		%		80-120	26-MAY-21
Bismuth (Bi)-Total			103.0		%		80-120	26-MAY-21
Cadmium (Cd)-Total			101.5		%		80-120	26-MAY-21
Chromium (Cr)-Total			102.8		%		80-120	26-MAY-21
Cobalt (Co)-Total			102.4		%		80-120	26-MAY-21
Copper (Cu)-Total			101.3		%		80-120	26-MAY-21
Iron (Fe)-Total			102.5		%		80-120	26-MAY-21
Lead (Pb)-Total			100.7		%		80-120	26-MAY-21
Manganese (Mn)-Total			98.6		%		80-120	26-MAY-21
Molybdenum (Mo)-Total			100.7		%		80-120	26-MAY-21
Nickel (Ni)-Total			100.6		%		80-120	26-MAY-21
Selenium (Se)-Total			105.0		%		80-120	26-MAY-21
Silver (Ag)-Total			102.5		%		80-120	26-MAY-21
Tin (Sn)-Total			100.6		%		80-120	26-MAY-21
Titanium (Ti)-Total			98.2		%		80-120	26-MAY-21
Vanadium (V)-Total			104.4		%		80-120	26-MAY-21
Zinc (Zn)-Total			102.7		%		80-120	26-MAY-21
WG3541113-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	26-MAY-21
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	26-MAY-21
Arsenic (As)-Total			<0.00010		mg/L		0.0001	26-MAY-21
Barium (Ba)-Total			<0.00010		mg/L		0.0001	26-MAY-21
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	26-MAY-21
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	26-MAY-21
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	26-MAY-21

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5468460								
WG3541113-1 MB								
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	26-MAY-21
Copper (Cu)-Total			<0.00050		mg/L		0.0005	26-MAY-21
Iron (Fe)-Total			<0.010		mg/L		0.01	26-MAY-21
Lead (Pb)-Total			<0.000050		mg/L		0.00005	26-MAY-21
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	26-MAY-21
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	26-MAY-21
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	26-MAY-21
Selenium (Se)-Total			<0.000050		mg/L		0.00005	26-MAY-21
Silver (Ag)-Total			<0.000050		mg/L		0.00005	26-MAY-21
Tin (Sn)-Total			<0.00010		mg/L		0.0001	26-MAY-21
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	26-MAY-21
Vanadium (V)-Total			<0.00050		mg/L		0.0005	26-MAY-21
Zinc (Zn)-Total			<0.0030		mg/L		0.003	26-MAY-21
WG3541113-5 MS		**WG3541113-6**						
Aluminum (Al)-Total			99.7		%		70-130	26-MAY-21
Antimony (Sb)-Total			98.9		%		70-130	26-MAY-21
Arsenic (As)-Total			102.4		%		70-130	26-MAY-21
Barium (Ba)-Total			N/A	MS-B	%		-	26-MAY-21
Bismuth (Bi)-Total			95.5		%		70-130	26-MAY-21
Cadmium (Cd)-Total			99.8		%		70-130	26-MAY-21
Chromium (Cr)-Total			102.3		%		70-130	26-MAY-21
Cobalt (Co)-Total			101.2		%		70-130	26-MAY-21
Copper (Cu)-Total			98.8		%		70-130	26-MAY-21
Iron (Fe)-Total			N/A	MS-B	%		-	26-MAY-21
Lead (Pb)-Total			92.8		%		70-130	26-MAY-21
Manganese (Mn)-Total			N/A	MS-B	%		-	26-MAY-21
Molybdenum (Mo)-Total			102.1		%		70-130	26-MAY-21
Nickel (Ni)-Total			98.4		%		70-130	26-MAY-21
Selenium (Se)-Total			104.1		%		70-130	26-MAY-21
Silver (Ag)-Total			98.9		%		70-130	26-MAY-21
Tin (Sn)-Total			100.4		%		70-130	26-MAY-21
Titanium (Ti)-Total			99.8		%		70-130	26-MAY-21
Vanadium (V)-Total			105.8		%		70-130	26-MAY-21
Zinc (Zn)-Total			97.2		%		70-130	26-MAY-21

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
OCP-ROUTINE-WT	**Water**							
Batch R5468889								
WG3541189-2 LCS								
Hexachlorobenzene			115.2		%		50-150	26-MAY-21
WG3541189-1 MB								
Hexachlorobenzene			<0.0080		ug/L		0.008	26-MAY-21
Surrogate: Tetrachloro-m-xylene			84.5		%		40-130	26-MAY-21
OGG-SPEC-WT	**Water**							
Batch R5475685								
WG3542976-2 LCS								
Oil and Grease, Total			93.3		%		70-130	28-MAY-21
Mineral Oil and Grease			82.3		%		70-130	28-MAY-21
WG3542976-1 MB								
Oil and Grease, Total			<5.0		mg/L		5	28-MAY-21
Mineral Oil and Grease			<2.5		mg/L		2.5	28-MAY-21
P-T-COL-WT	**Water**							
Batch R5476180								
WG3544532-3 DUP		**L2591961-1**						
Phosphorus, Total		0.210	0.205		mg/L	2.6	20	01-JUN-21
WG3544532-2 LCS								
Phosphorus, Total			95.9		%		80-120	01-JUN-21
WG3544532-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	01-JUN-21
WG3544532-4 MS		**L2591961-1**						
Phosphorus, Total			N/A	MS-B	%		-	01-JUN-21
PAH-511-WT	**Water**							
Batch R5468804								
WG3541166-2 LCS								
1-Methylnaphthalene			105.4		%		50-140	26-MAY-21
2-Methylnaphthalene			99.8		%		50-140	26-MAY-21
Acenaphthene			108.4		%		50-140	26-MAY-21
Acenaphthylene			104.6		%		50-140	26-MAY-21
Anthracene			118.4		%		50-140	26-MAY-21
Benzo(a)anthracene			119.1		%		50-140	26-MAY-21
Benzo(a)pyrene			114.3		%		50-140	26-MAY-21
Benzo(b&j)fluoranthene			122.4		%		50-140	26-MAY-21
Benzo(g,h,i)perylene			127.1		%		50-140	26-MAY-21
Benzo(k)fluoranthene			122.6		%		50-140	26-MAY-21

Quality Control Report

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

Contact: FRANK/ CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT	**Water**							
Batch R5468804								
WG3541166-2 LCS								
Chrysene			121.5		%		50-140	26-MAY-21
Dibenz(a,h)anthracene			114.2		%		50-140	26-MAY-21
Fluoranthene			123.3		%		50-140	26-MAY-21
Fluorene			112.2		%		50-140	26-MAY-21
Indeno(1,2,3-cd)pyrene			124.6		%		50-140	26-MAY-21
Naphthalene			93.4		%		50-140	26-MAY-21
Phenanthrene			126.0		%		50-140	26-MAY-21
Pyrene			122.4		%		50-140	26-MAY-21
WG3541166-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	26-MAY-21
2-Methylnaphthalene			<0.020		ug/L		0.02	26-MAY-21
Acenaphthene			<0.020		ug/L		0.02	26-MAY-21
Acenaphthylene			<0.020		ug/L		0.02	26-MAY-21
Anthracene			<0.020		ug/L		0.02	26-MAY-21
Benzo(a)anthracene			<0.020		ug/L		0.02	26-MAY-21
Benzo(a)pyrene			<0.010		ug/L		0.01	26-MAY-21
Benzo(b&j)fluoranthene			<0.020		ug/L		0.02	26-MAY-21
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	26-MAY-21
Benzo(k)fluoranthene			<0.020		ug/L		0.02	26-MAY-21
Chrysene			<0.020		ug/L		0.02	26-MAY-21
Dibenz(a,h)anthracene			<0.020		ug/L		0.02	26-MAY-21
Fluoranthene			<0.020		ug/L		0.02	26-MAY-21
Fluorene			<0.020		ug/L		0.02	26-MAY-21
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	26-MAY-21
Naphthalene			<0.050		ug/L		0.05	26-MAY-21
Phenanthrene			<0.020		ug/L		0.02	26-MAY-21
Pyrene			<0.020		ug/L		0.02	26-MAY-21
Surrogate: Naphthalene d8			94.1		%		60-140	26-MAY-21
Surrogate: Phenanthrene d10			106.2		%		60-140	26-MAY-21
PH-WT	**Water**							
Batch R5469196								
WG3541339-4 DUP		**WG3541339-3**						
pH		7.97	7.90	J	pH units	0.07	0.2	26-MAY-21
WG3541339-2 LCS								

Quality Control Report

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

Contact: FRANK/ CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-WT	**Water**							
Batch R5469196								
WG3541339-2 LCS								
pH			7.02		pH units		6.9-7.1	26-MAY-21
PHENOLS-4AAP-WT	**Water**							
Batch R5476957								
WG3544794-3 DUP		**L2591062-1**						
Phenols (4AAP)		0.0012	0.0010		mg/L	13	20	01-JUN-21
WG3544794-2 LCS								
Phenols (4AAP)			103.2		%		85-115	01-JUN-21
WG3544794-1 MB								
Phenols (4AAP)			<0.0010		mg/L		0.001	01-JUN-21
WG3544794-4 MS		**L2591062-1**						
Phenols (4AAP)			106.2		%		75-125	01-JUN-21
SO4-IC-N-WT	**Water**							
Batch R5471959								
WG3541941-14 DUP		**WG3541941-13**						
Sulfate (SO4)		13.1	13.1		mg/L	0.1	20	26-MAY-21
WG3541941-12 LCS								
Sulfate (SO4)			101.7		%		90-110	26-MAY-21
WG3541941-11 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	26-MAY-21
WG3541941-15 MS		**WG3541941-13**						
Sulfate (SO4)			97.1		%		75-125	26-MAY-21
SOLIDS-TSS-WT	**Water**							
Batch R5470418								
WG3541241-3 DUP		**L2591165-1**						
Total Suspended Solids		112	114		mg/L	1.8	20	27-MAY-21
WG3541241-2 LCS								
Total Suspended Solids			90.7		%		85-115	27-MAY-21
WG3541241-1 MB								
Total Suspended Solids			<3.0		mg/L		3	27-MAY-21
SULPHIDE-WT	**Water**							
Batch R5471579								
WG3542043-8 DUP		**WG3542043-10**						
Sulphide (as S)		<0.018	<0.018	RPD-NA	mg/L	N/A	20	27-MAY-21
WG3542043-7 LCS								
Sulphide (as S)			97.1		%		75-125	27-MAY-21

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SULPHIDE-WT	**Water**							
Batch R5471579								
WG3542043-6 MB								
Sulphide (as S)			<0.018		mg/L		0.018	27-MAY-21
WG3542043-9 MS		**WG3542043-10**						
Sulphide (as S)			76.2		%		65-135	27-MAY-21
TKN-F-WT	**Water**							
Batch R5476377								
WG3544540-3 DUP		**L2591914-3**						
Total Kjeldahl Nitrogen		0.310	0.390	J	mg/L	0.080	0.1	01-JUN-21
WG3544540-2 LCS								
Total Kjeldahl Nitrogen			106.8		%		75-125	01-JUN-21
WG3544540-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-JUN-21
WG3544540-4 MS		**L2591914-3**						
Total Kjeldahl Nitrogen			106.6		%		70-130	01-JUN-21
VOC-ROU-HS-WT	**Water**							
Batch R5477252								
WG3545958-4 DUP		**WG3545958-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	03-JUN-21
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
2-Hexanone		<20	<20	RPD-NA	ug/L	N/A	30	03-JUN-21
Acetone		<20	<20	RPD-NA	ug/L	N/A	30	03-JUN-21
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
Bromodichloromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	03-JUN-21
Bromoform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	03-JUN-21
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5477252								
WG3545958-4 DUP		**WG3545958-3**						
Carbon Disulfide		<1.0	<1.0	RPD-NA	ug/L	N/A	30	03-JUN-21
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	03-JUN-21
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
Chloroethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	03-JUN-21
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	03-JUN-21
Chloromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	03-JUN-21
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	03-JUN-21
Dibromochloromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	03-JUN-21
Dichlorodifluoromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	03-JUN-21
Dichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	03-JUN-21
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	03-JUN-21
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	03-JUN-21
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	03-JUN-21
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
MTBE		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	03-JUN-21
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
Toluene		<0.40	<0.40	RPD-NA	ug/L	N/A	30	03-JUN-21
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	03-JUN-21
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
Trichlorofluoromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	03-JUN-21
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	03-JUN-21
WG3545958-1 LCS								
1,1,1,2-Tetrachloroethane			103.5		%		70-130	02-JUN-21
1,1,2,2-Tetrachloroethane			114.4		%		70-130	02-JUN-21
1,1,1-Trichloroethane			102.2		%		70-130	02-JUN-21
1,1,2-Trichloroethane			110.4		%		70-130	02-JUN-21
1,2-Dibromoethane			112.4		%		70-130	02-JUN-21
1,1-Dichloroethane			117.4		%		70-130	02-JUN-21

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5477252								
WG3545958-1 LCS								
1,1-Dichloroethylene			116.4		%		70-130	02-JUN-21
1,2-Dichlorobenzene			105.3		%		70-130	02-JUN-21
1,2-Dichloroethane			124.8		%		70-130	02-JUN-21
1,2-Dichloropropane			122.8		%		70-130	02-JUN-21
1,3-Dichlorobenzene			103.2		%		70-130	02-JUN-21
1,4-Dichlorobenzene			104.2		%		70-130	02-JUN-21
2-Hexanone			143.1	MES	%		60-140	02-JUN-21
Acetone			139.2		%		60-140	02-JUN-21
Benzene			108.7		%		70-130	02-JUN-21
Bromodichloromethane			112.9		%		70-130	02-JUN-21
Bromoform			100.8		%		70-130	02-JUN-21
Bromomethane			110.1		%		60-140	02-JUN-21
Carbon Disulfide			102.9		%		70-130	02-JUN-21
Carbon tetrachloride			101.2		%		70-130	02-JUN-21
Chlorobenzene			104.4		%		70-130	02-JUN-21
Chloroethane			135.0	MES	%		70-130	02-JUN-21
Chloroform			113.3		%		70-130	02-JUN-21
Chloromethane			133.9		%		60-140	02-JUN-21
cis-1,2-Dichloroethylene			108.5		%		70-130	02-JUN-21
cis-1,3-Dichloropropene			122.0		%		70-130	02-JUN-21
Dibromochloromethane			103.2		%		70-130	02-JUN-21
Dichlorodifluoromethane			101.3		%		50-140	02-JUN-21
Dichloromethane			115.0		%		70-130	02-JUN-21
Ethylbenzene			107.6		%		70-130	02-JUN-21
m+p-Xylenes			109.8		%		70-130	02-JUN-21
Methyl Ethyl Ketone			117.1		%		60-140	02-JUN-21
Methyl Isobutyl Ketone			137.9		%		50-150	02-JUN-21
n-Hexane			119.1		%		70-130	02-JUN-21
MTBE			98.9		%		70-130	02-JUN-21
o-Xylene			120.4		%		70-130	02-JUN-21
Styrene			113.5		%		70-130	02-JUN-21
Tetrachloroethylene			91.8		%		70-130	02-JUN-21
Toluene			106.2		%		70-130	02-JUN-21

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5477252								
WG3545958-1 LCS								
trans-1,2-Dichloroethylene			120.6		%		70-130	02-JUN-21
trans-1,3-Dichloropropene			137.1	MES	%		70-130	02-JUN-21
Trichloroethylene			96.9		%		70-130	02-JUN-21
Trichlorofluoromethane			104.0		%		60-140	02-JUN-21
Vinyl chloride			122.4		%		60-140	02-JUN-21
WG3545958-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	02-JUN-21
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	02-JUN-21
1,1,1-Trichloroethane			<0.50		ug/L		0.5	02-JUN-21
1,1,2-Trichloroethane			<0.50		ug/L		0.5	02-JUN-21
1,2-Dibromoethane			<0.20		ug/L		0.2	02-JUN-21
1,1-Dichloroethane			<0.50		ug/L		0.5	02-JUN-21
1,1-Dichloroethylene			<0.50		ug/L		0.5	02-JUN-21
1,2-Dichlorobenzene			<0.50		ug/L		0.5	02-JUN-21
1,2-Dichloroethane			<0.50		ug/L		0.5	02-JUN-21
1,2-Dichloropropane			<0.50		ug/L		0.5	02-JUN-21
1,3-Dichlorobenzene			<0.50		ug/L		0.5	02-JUN-21
1,4-Dichlorobenzene			<0.50		ug/L		0.5	02-JUN-21
2-Hexanone			<20		ug/L		20	02-JUN-21
Acetone			<20		ug/L		20	02-JUN-21
Benzene			<0.50		ug/L		0.5	02-JUN-21
Bromodichloromethane			<1.0		ug/L		1	02-JUN-21
Bromoform			<1.0		ug/L		1	02-JUN-21
Bromomethane			<0.50		ug/L		0.5	02-JUN-21
Carbon Disulfide			<1.0		ug/L		1	02-JUN-21
Carbon tetrachloride			<0.20		ug/L		0.2	02-JUN-21
Chlorobenzene			<0.50		ug/L		0.5	02-JUN-21
Chloroethane			<1.0		ug/L		1	02-JUN-21
Chloroform			<1.0		ug/L		1	02-JUN-21
Chloromethane			<1.0		ug/L		1	02-JUN-21
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	02-JUN-21
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	02-JUN-21
Dibromochloromethane			<1.0		ug/L		1	02-JUN-21
Dichlorodifluoromethane			<1.0		ug/L		1	02-JUN-21

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5477252								
WG3545958-2 MB								
Dichloromethane			<2.0		ug/L		2	02-JUN-21
Ethylbenzene			<0.50		ug/L		0.5	02-JUN-21
m+p-Xylenes			<0.40		ug/L		0.4	02-JUN-21
Methyl Ethyl Ketone			<20		ug/L		20	02-JUN-21
Methyl Isobutyl Ketone			<20		ug/L		20	02-JUN-21
n-Hexane			<0.50		ug/L		0.5	02-JUN-21
MTBE			<0.50		ug/L		0.5	02-JUN-21
o-Xylene			<0.30		ug/L		0.3	02-JUN-21
Styrene			<0.50		ug/L		0.5	02-JUN-21
Tetrachloroethylene			<0.50		ug/L		0.5	02-JUN-21
Toluene			<0.40		ug/L		0.4	02-JUN-21
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	02-JUN-21
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	02-JUN-21
Trichloroethylene			<0.50		ug/L		0.5	02-JUN-21
Trichlorofluoromethane			<1.0		ug/L		1	02-JUN-21
Vinyl chloride			<0.50		ug/L		0.5	02-JUN-21
Surrogate: 1,4-Difluorobenzene			96.1		%		70-130	02-JUN-21
Surrogate: 4-Bromofluorobenzene			92.6		%		70-130	02-JUN-21
WG3545958-5 MS		**WG3545958-3**						
1,1,1,2-Tetrachloroethane			101.8		%		50-150	03-JUN-21
1,1,2,2-Tetrachloroethane			111.2		%		50-150	03-JUN-21
1,1,1-Trichloroethane			97.3		%		50-150	03-JUN-21
1,1,2-Trichloroethane			108.0		%		50-150	03-JUN-21
1,2-Dibromoethane			108.5		%		50-150	03-JUN-21
1,1-Dichloroethane			110.2		%		50-150	03-JUN-21
1,1-Dichloroethylene			105.4		%		50-150	03-JUN-21
1,2-Dichlorobenzene			97.8		%		50-150	03-JUN-21
1,2-Dichloroethane			119.4		%		50-150	03-JUN-21
1,2-Dichloropropane			116.6		%		50-150	03-JUN-21
1,3-Dichlorobenzene			90.7		%		50-150	03-JUN-21
1,4-Dichlorobenzene			89.2		%		50-150	03-JUN-21
2-Hexanone			139.7		%		50-150	03-JUN-21
Acetone			145.6		%		50-150	03-JUN-21
Benzene			101.0		%		50-150	03-JUN-21

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5477252								
WG3545958-5 MS		**WG3545958-3**						
Bromodichloromethane			108.0		%		50-150	03-JUN-21
Bromoform			98.6		%		50-150	03-JUN-21
Bromomethane			91.6		%		50-150	03-JUN-21
Carbon Disulfide			84.4		%		50-150	03-JUN-21
Carbon tetrachloride			95.9		%		50-150	03-JUN-21
Chlorobenzene			96.3		%		50-150	03-JUN-21
Chloroethane			122.0		%		50-150	03-JUN-21
Chloroform			107.7		%		50-150	03-JUN-21
Chloromethane			112.6		%		50-150	03-JUN-21
cis-1,2-Dichloroethylene			100.3		%		50-150	03-JUN-21
cis-1,3-Dichloropropene			95.5		%		50-150	03-JUN-21
Dibromochloromethane			101.1		%		50-150	03-JUN-21
Dichlorodifluoromethane			82.7		%		50-150	03-JUN-21
Dichloromethane			107.7		%		50-150	03-JUN-21
Ethylbenzene			99.6		%		50-150	03-JUN-21
m+p-Xylenes			100.2		%		50-150	03-JUN-21
Methyl Ethyl Ketone			113.2		%		50-150	03-JUN-21
Methyl Isobutyl Ketone			132.6		%		50-150	03-JUN-21
n-Hexane			107.5		%		50-150	03-JUN-21
MTBE			94.5		%		50-150	03-JUN-21
o-Xylene			112.7		%		50-150	03-JUN-21
Styrene			103.2		%		50-150	03-JUN-21
Tetrachloroethylene			83.0		%		50-150	03-JUN-21
Toluene			99.6		%		50-150	03-JUN-21
trans-1,2-Dichloroethylene			103.1		%		50-150	03-JUN-21
trans-1,3-Dichloropropene			104.3		%		50-150	03-JUN-21
Trichloroethylene			87.3		%		50-150	03-JUN-21
Trichlorofluoromethane			95.1		%		50-150	03-JUN-21
Vinyl chloride			104.7		%		50-150	03-JUN-21

Quality Control Report

Workorder: L2591571 Report Date: 03-JUN-21

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON N/A
Contact: FRANK/ 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.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
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.

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

31-May-2021

ALS Laboratory (Richmond Hill)
Attn : Emily Hansen

95 West Beaver Creek Road, Unit 1
Richmond Hill, ON
L4B 1H2, Canada

Phone: 905-881-9887
Fax:

Date Rec. : 26 May 2021
LR Report: **CA18725-MAY21**
Reference: Submission#: L2591571

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Gold (total) mg/L	Platinum (total) mg/L	Rhodium (total) mg/L
1: Analysis Start Date		---	28-May-21	28-May-21	28-May-21
2: Analysis Start Time		---	11:43	11:43	11:43
3: Analysis Completed Date		---	31-May-21	31-May-21	31-May-21
4: Analysis Completed Time		---	13:38	13:38	13:38
5: QC - Blank		---	< 0.00001	< 0.0001	< 0.0001
6: QC - STD % Recovery		---	99%	95%	93%
7: QC - DUP % RPD		---	ND	ND	ND
8: MDL		---	0.00001	0.0001	0.00001
9: L2591571-1 440 Essa Road Barrie MW4	21-May-21	13.0	< 0.00001	< 0.0001	< 0.00001

MDL - SGS Method Detection Limit
ND - Not Detected

Kimberley Didsbury
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002512373

L2591571-COFC

Chain of Custody (COC) / Analytical Request Form

COC Number: 20 - 891692

Canada Toll Free: 1 800 668 9878

Page of

Report To	Contact and company name below will appear on the final report
Company:	Fisdale
Contact:	Francie / Clive
Phone:	416 728 0746
Street:	
City/Province:	
Postal Code:	
Invoice To	Same as Report To ☐ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

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

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

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Date and Time Required for all E&P TATs:

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

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	PO	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (ALS use only):	L2591571	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	General Inorganics	Barrie Oil	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	440 Essa Road Barrie	21/05/20	2:00 pm	Water						
	MW4									
	SO# 20-10637									

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			
19.6				9.6			

SHIPMENT RELEASE (client use)

Released by: Francie Date: May 21, 2021 Time: 2:30pm

INITIAL SHIPMENT RECEPTION (ALS use only)

Received by: [illegible] Date: May 21/21 Time: 15:35

FINAL SHIPMENT RECEPTION (ALS use only)

Received by: [illegible] Date: 05/25/21 Time: 10am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

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**.

APPENDIX E – HYDRAULIC CONDUCTIVITY ANALYSES

FISHER ENGINEERING

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *440 Essa Road , Barrie, ontario*
Project: *FE-P-21010637HydroGeo*
Test Date: *2021-05-27*
Well No. *MW4*

Equilibrium Water level (from top of pipe) HE	*113*	*cm*
Initial Water level (from top of pipe) Ho	*470*	*cm*
Monitoring well inner diameter d	*0.05*	*m*
Initial Time offset To	*5*	*second*
Reverse of Luthin's reference system Ru = Ho - HE	*357.00*	*cm*
Slope of Log((ho-he)/(ht-he)) / T	*5.00E-04*	
G = Ru / (HT - HE)		

Hydraulic conductivity computed k =

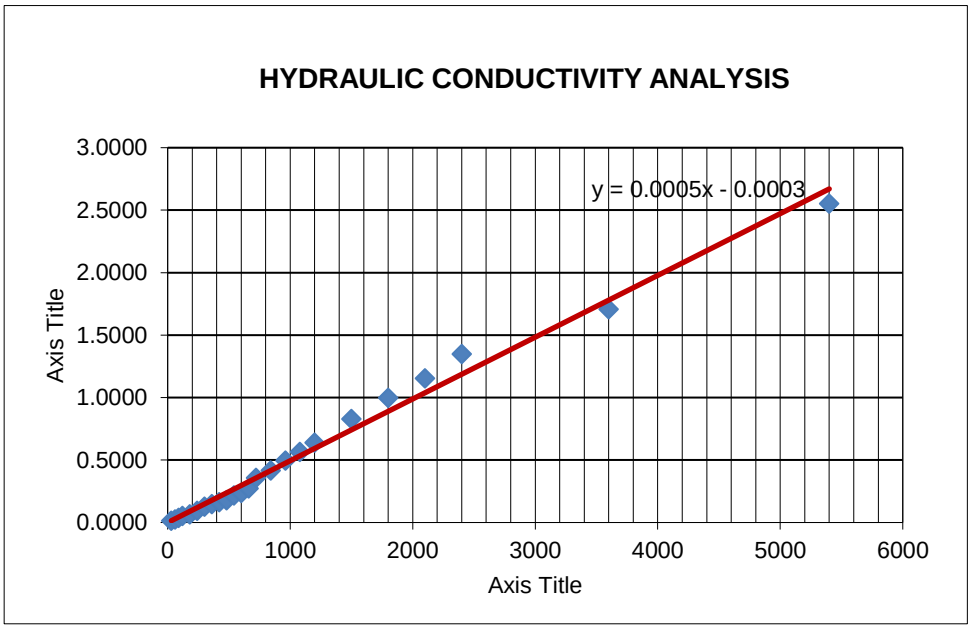
0.0007567	**cm/s**
7.57E-06	**m/s**
0.654	**m/day**

Time	HT (Water Drop)			G	LOG (G)
(Interval s)	(Elapsed s)	(m)	(cm)		
	0	4.7			
30	30	4.600	460.00	1.0288	0.0147
30	60	4.500	450.00	1.0593	0.0250
30	90	4.400	440.00	1.0917	0.0381
30	120	4.300	430.00	1.1262	0.0516
60	180	4.200	420.00	1.1629	0.0655
60	240	4.000	400.00	1.2439	0.0948
60	300	3.800	380.00	1.3371	0.1262
60	360	3.680	368.00	1.4000	0.1461
60	420	3.580	358.00	1.4571	0.1635
60	480	3.500	350.00	1.5063	0.1779
60	540	3.300	330.00	1.6452	0.2162
60	600	3.200	320.00	1.7246	0.2367
60	660	3.030	303.00	1.8789	0.2739
60	720	2.700	270.00	2.2739	0.3568
120	840	2.500	250.00	2.6058	0.4159
120	960	2.270	227.00	3.1316	0.4958
120	1080	2.100	210.00	3.6804	0.5659
120	1200	1.950	195.00	4.3537	0.6389
300	1500	1.660	166.00	6.7358	0.8284
300	1800	1.490	149.00	9.9167	0.9964
300	2100	1.380	138.00	14.2800	1.1547
300	2400	1.290	129.00	22.3125	1.3485
1200	3600	1.200	120.00	51.0000	1.7076
1800	5400	1.140	114.00	357.0000	2.5527

FISHER ENGINEERING

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *440 Essa Road , Barrie, ontario*
Project: *FE-P-21010637HydroGeo*
Test Date: *2021-05-27*
Well No. *MW4*



FISHER ENGINEERING

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *440 Essa Road , Barrie, ontario*
Project: *FE-P-21010637HydroGeo*
Test Date: *2021-05-27*
Well No. *MW5*

Equilibrium Water level (from top of pipe) HE	*223*	*cm*
Initial Water level (from top of pipe) Ho	*600*	*cm*
Monitoring well inner diameter d	*0.05*	*m*
Initial Time offset To	*1*	*second*
Reverse of Luthin's reference system Ru = Ho - HE	*377.00*	*cm*
Slope of Log((ho-he)/(ht-he)) / T	*2.00E-05*	
G = Ru / (HT - HE)		

Hydraulic conductivity computed k =

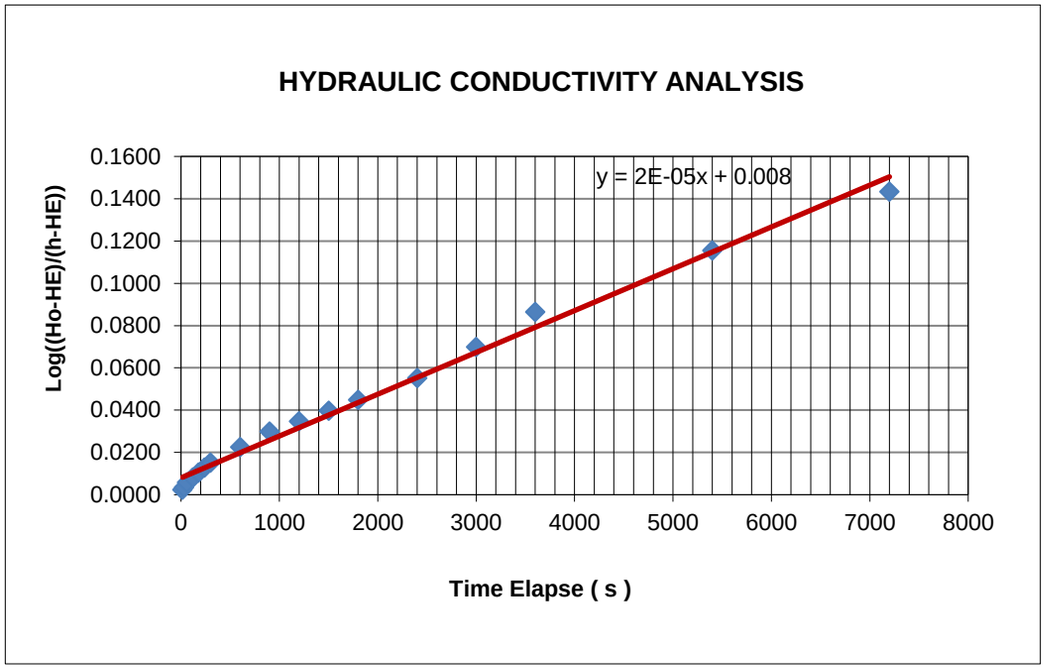
0.0000303	**cm/s**
3.03E-07	**m/s**
0.026	**m/day**

Time		HT (Water Drop)		G	LOG (G)
(Interval s)	(Elapsed s)	(m)	(cm)		
0	0	6.000	600.00	1.0000	0.0147
15	15	5.980	598.00	1.0053	0.0023
15	30	5.970	597.00	1.0080	0.0035
30	60	5.950	595.00	1.0134	0.0058
60	120	5.930	593.00	1.0189	0.0081
60	180	5.910	591.00	1.0245	0.0105
60	240	5.890	589.00	1.0301	0.0129
60	300	5.870	587.00	1.0357	0.0152
300	600	5.810	581.00	1.0531	0.0225
300	900	5.750	575.00	1.0710	0.0298
300	1200	5.710	571.00	1.0833	0.0348
300	1500	5.670	567.00	1.0959	0.0398
300	1800	5.630	563.00	1.1088	0.0449
600	2400	5.550	555.00	1.1355	0.0552
600	3000	5.440	544.00	1.1745	0.0698
600	3600	5.320	532.00	1.2201	0.0864
600	5400	5.120	512.00	1.3045	0.1154
1800	7200	4.940	494.00	1.3911	0.1434

FISHER ENGINEERING

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *440 Essa Road , Barrie, ontario*
Project: *FE-P-21010637HydroGeo*
Test Date: *2021-05-27*
Well No. *MW5*



FISHER ENGINEERING

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *440 Essa Road , Barrie, ontario*
Project: *FE-P-21010637HydroGeo*
Test Date: *2021-05-27*
Well No. *MW6*

Equilibrium Water level (from top of pipe) HE	*170*	*cm*
Initial Water level (from top of pipe) Ho	*548*	*cm*
Monitoring well inner diameter d	*0.05*	*m*
Initial Time offset To	*1*	*second*
Reverse of Luthin's reference system Ru = Ho - HE	*378.00*	*cm*
Slope of Log((ho-he)/(ht-he)) / T	*2.00E-05*	
G = Ru / (HT - HE)		

Hydraulic conductivity computed k =

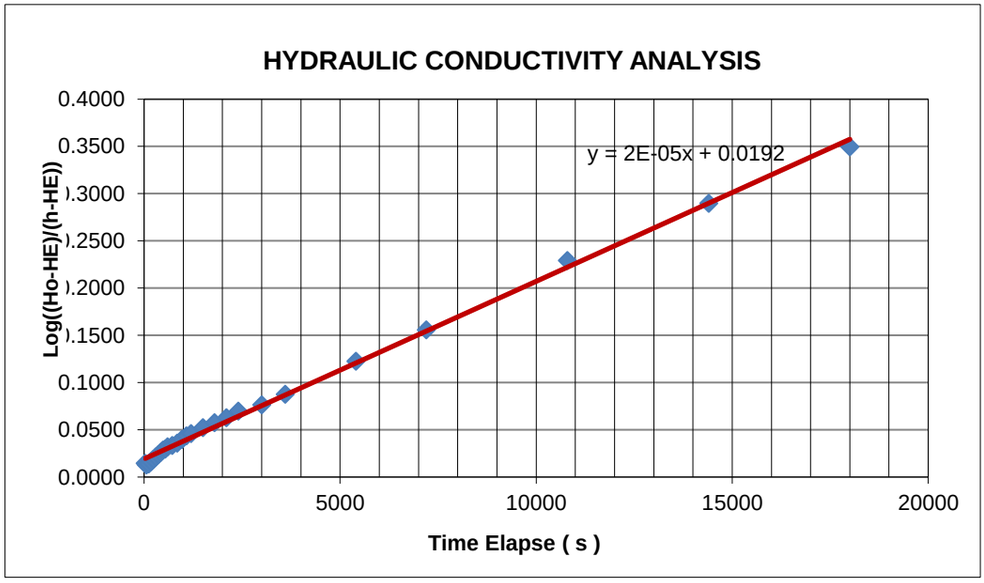
0.0000303	**cm/s**
3.03E-07	**m/s**
0.026	**m/day**

Time		HT (Water Drop)		G	LOG (G)
(Interval s)	(Elapsed s)	(m)	(cm)		
	0	**5.48**			
30	30	5.380	538.00	1.0272	0.0147
30	60	5.370	537.00	1.0300	0.0128
60	120	5.360	536.00	1.0328	0.0140
60	180	5.340	534.00	1.0385	0.0164
60	240	5.320	532.00	1.0442	0.0188
60	300	5.300	530.00	1.0500	0.0212
60	360	5.280	528.00	1.0559	0.0236
60	420	5.260	526.00	1.0618	0.0260
60	480	5.240	524.00	1.0678	0.0285
60	540	5.230	523.00	1.0708	0.0297
60	600	5.210	521.00	1.0769	0.0322
120	720	5.200	520.00	1.0800	0.0334
120	840	5.180	518.00	1.0862	0.0359
120	960	5.150	515.00	1.0957	0.0397
120	1080	5.120	512.00	1.1053	0.0435
120	1200	5.100	510.00	1.1118	0.0460
300	1500	5.050	505.00	1.1284	0.0524
300	1800	5.010	501.00	1.1420	0.0577
300	2100	4.970	497.00	1.1560	0.0629
300	2400	4.920	492.00	1.1739	0.0696
600	3000	4.870	487.00	1.1924	0.0764
600	3600	4.790	479.00	1.2233	0.0875
1800	5400	4.550	455.00	1.3263	0.1226
1800	7200	4.340	434.00	1.4318	0.1559
3600	10800	3.930	393.00	1.6951	0.2292
3600	14400	3.640	364.00	1.9485	0.2897
3600	18000	3.390	339.00	2.2367	0.3496

FISHER ENGINEERING

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *440 Essa Road , Barrie, ontario*
Project: *FE-P-21010637HydroGeo*
Test Date: *2021-05-27*
Well No. *MW6*



APPENDIX F –DEWATERING RATES AND RADIUS OF INFLUENCE

Construction Dewatering Calculation

Location: *440 Essa Road , Barrie, ontario*
Project: *FE-P-21010637HydroGeo*
Date: *2021-06-10*

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

Construction Units	Finished P2 Floor elevation (m asl)	Ground Surface Elev. (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_s (m^3/s)	Q_s (m^3/day)
					BGS (m)	Elevation (m asl)	(m)				Model	Adjusted								
Building with Two Underground Levels	307.41	313.11	306.41	305.41	1.42	311.69	305.11	6.58	0.3	6.28	24.93	57.68	32.75	3370	3.94E-06	43.21	4.05	3.49	9.45E-04	81.64

Dupuit Forcheimer Equation

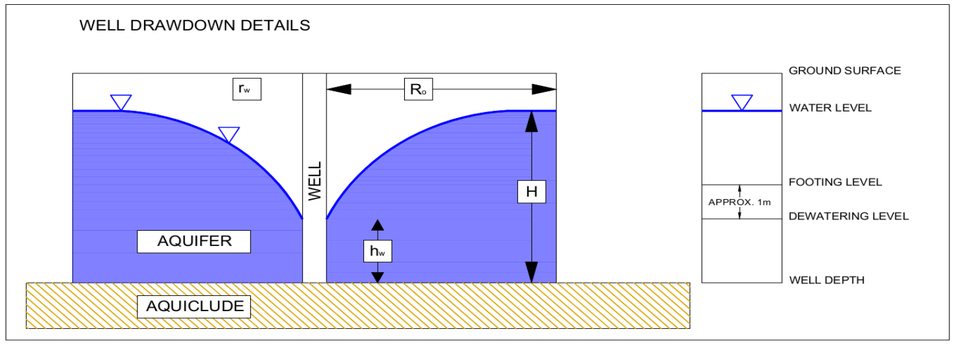
$$Q = \frac{\pi K(H^2 - {h_w}^2)}{lnR_0 - lnr_w}$$

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

Permanent Drainage Rates

Location: *440 Essa Road , Barrie, ontario*
Project: *FE-P-21010637HydroGeo*
Date: *2021-06-10*

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

Construction Units	Finished P2 Floor elevation (m asl)	Ground Surface Elev. (m asl)	Lowest Footing Elevation (m asl)	Required Dewatering Elevation (m asl)	Static water level		Well base elevation (m)	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)					Model	Adjusted								
Building with Two Underground Levels	307.41	313.11	306.41	306.91	1.42	311.69	306.91	4.78	0.0	4.78	18.98	51.73	32.75	3370	3.94E-06	22.85	3.95	3.49	6.19E-04	53.47

Dupuit Forcheimer Equation

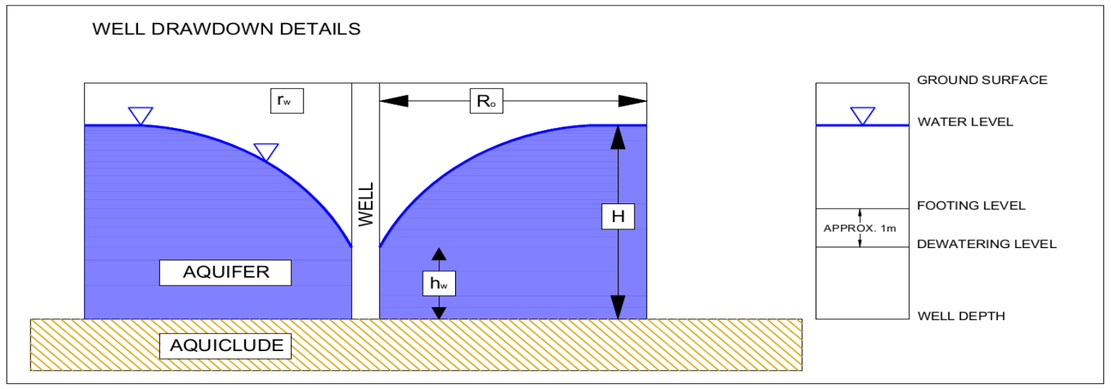
$$Q = \frac{\pi K(H^2 - h_w{}^2)}{lnR_0 - lnr_w}$$

Equivalent radius of well, r_w

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

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

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



Whe

r_w = equivalent radius of the well in m,

H = hydraulic head of the original water table (total saturated aquifer thickness) in m,

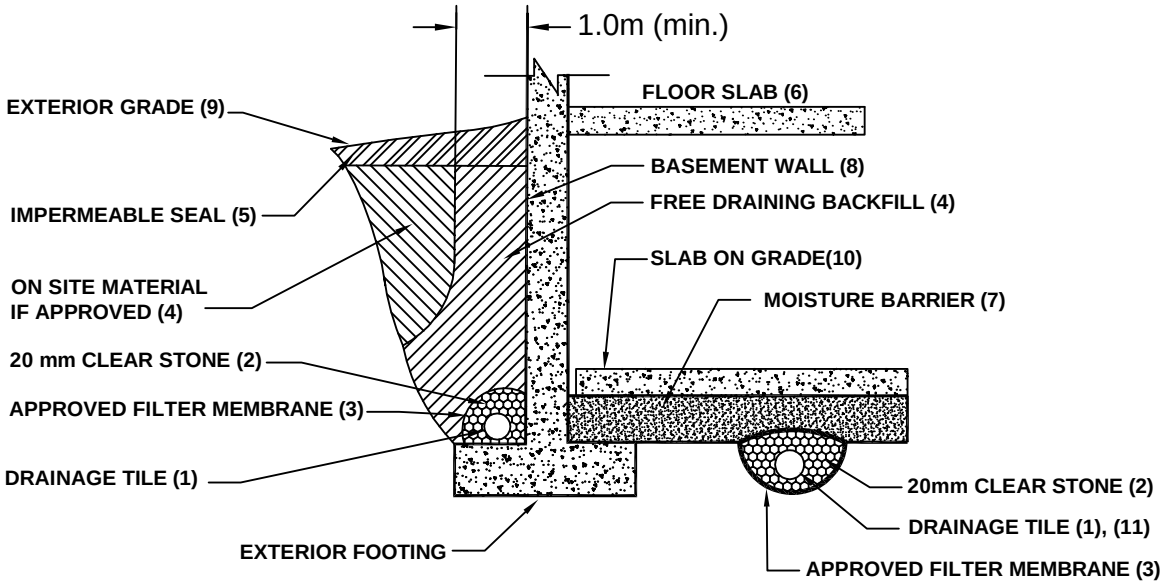
h_w = hydraulic head at maximum dewatering (proposed drawdown) in m,

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 – DRAINAGE AND BACKFILL DESIGN

FISHER ENVIRONMENTAL LTD.



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.

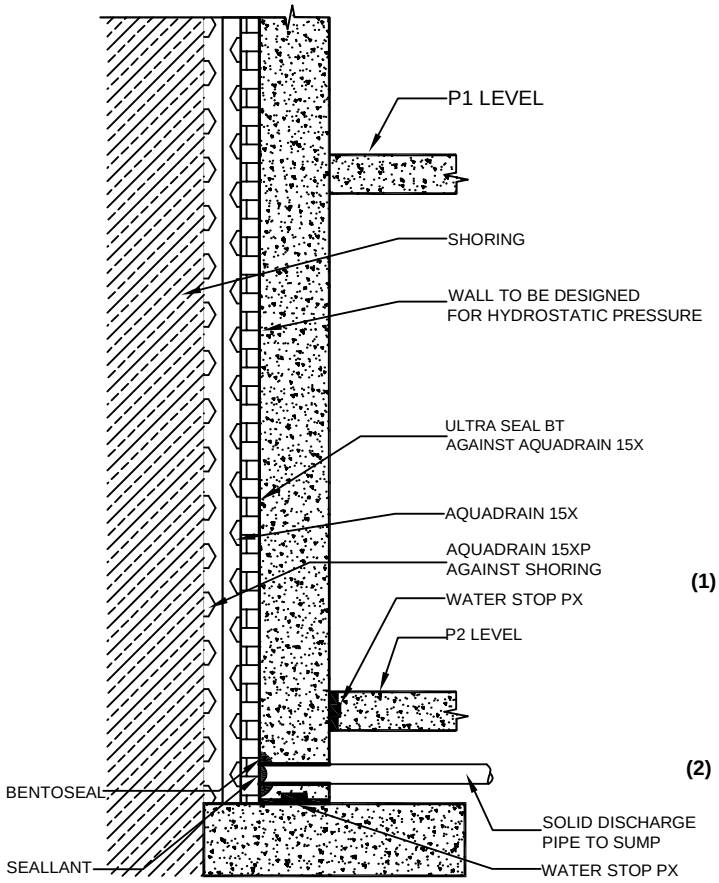
(14) REVIEW THE GEOTECHNICAL REPORT FOR SPECIFIC DETAILS.

DRAINAGE AND BACKFILL RECOMMENDATIONS

BASEMENT WITH UNDERFLOOR DRAINAGE

(NOT TO SCALE)

FISHER ENVIRONMENTAL LTD.



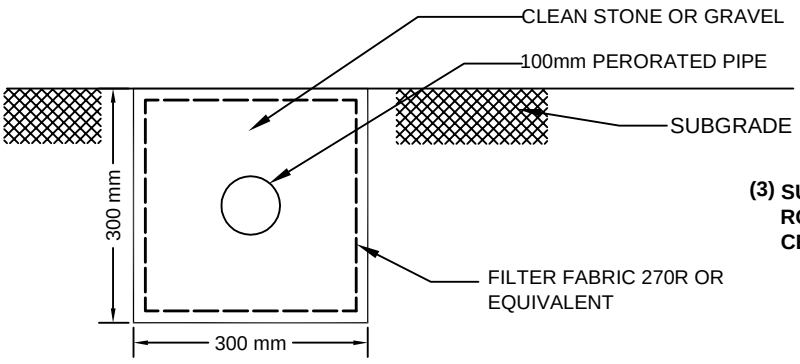
NOTES:

(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)