871 Equestrian Court, Unit 1, Oakville ON L6L 6L7
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Preliminary Hydrogeological Investigation – 149-153 Dunlop Street East, Barrie, Ontario

Palmer Project #
2001505

Prepared For
Watters Environmental Group Inc

October 13, 2023

871 Equestrian Court, Unit 1, Oakville ON L6L 6L7
Tel: 647-795-8153 | www.pecg.ca

October 13, 2023

Rob Watters, Ph.D., P.Geo.
Watters Environmental Group Inc.
9135 Keele Street, Unit A1, Concord, Ontario L4K 0J4

Re: Preliminary Hydrogeological Investigation - 149-153 Dunlop Street East, Barrie, ON
Project #: 2001505

Palmer is pleased to submit the attached report describing the results of our Preliminary Hydrogeological Investigation to support proposed development at 149-153 Dunlop Street East, Barrie, Ontario. The proposed development consists of a 25-storey mixed-use tower with two (2) levels of underground parking ranging in depth from 6.1 meters below ground surface (mbgs) to 7.5 mbgs or finished floor elevations of 218.00 to 219.70 meters above sea level (masl). The purpose of this hydrogeology study is to provide a series of hydrogeological design considerations and recommendations, as well as an effects assessment based on the findings our of field investigations and testing as part of a submission for a Zoning By-Law Amendment Application (ZBA).

The high groundwater table elevation at the site was measured at approximately 219.17 masl and is found within a highly permeable unconfined sand aquifer that is hydraulically connected to Kempenfelt Bay (Lake Simcoe), which is located approximately 25 m from the site boundary. Development with two (2) levels of underground parking is expected to be below the groundwater table and is estimated to require 7,905,000 L/day of dewatering to maintain a dry excavation assuming no water-tight methods are used. The dewatering is high due to the high permeability of the sand aquifer below the site and the hydraulic connection to Lake Simcoe creating a constant head boundary. Based on the results of the hydrogeological investigations, a Category 3 Permit to Take Water (PTTW) from the Ministry of the Environment, Conservation and Parks (MECP) will be required.

Long-term groundwater control will need to be managed using watertight shoring and/or foundation design methods as the City of Barrie does not permit long-term drainage into the sewer system.

It is important to note that during this early stage of development, conservative assumptions regarding the upper aquifer thickness and vertical/ horizontal permeability trends were made to assess dewatering risk. It is expected that as the design progresses, additional deep borehole drilling and hydraulic testing will be completed to better refine the hydrogeological conditions and provide updated recommendations for development approvals and permitting.

We trust that this report will be satisfactory for your current needs. If you have any questions or require further information, please contact our office at your convenience. This report is subject to the Statement of Limitations provided at the end of this report.

Yours truly,
Palmer Environmental Consulting Group Inc.

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Jason Cole, M.Sc., P.Geo.
VP, Principal Hydrogeologist

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1 Introduction

Palmer was retained by Watters Environmental Group Inc. (Watters) to conduct a Preliminary Hydrogeological Investigation to support a proposed development at 149 -153 Dunlop Street East, Barrie, Ontario (the "site"). The site is located directly east of the intersection at Dunlop Street East and Mulcaster Street, adjacent to Sam Cancilla Park and is located approximately 25 m northwest of Lake Simcoe (**Figure 1**). The site currently contains a multi-tenant commercial building and parking lot. A Hydrogeological Investigation is required to support design and permitting of the proposed development, specifically with the City of Barrie, the Lake Simcoe and Region Conservation Authority (LSRCA) and potentially, with the Ministry of Environment, Conservation and Parks (MECP).

This report has been updated form the previous October 19, 2020 draft submission based on the updated architectural drawings from Scott Shields Architects Inc (May, 2023) (**Appendix A**). Based on our understanding of the project, the proposed development consists of a 25-storey mixed-use tower with two (2) levels of underground parking ranging in depth from 6.1 meters below ground surface (mbgs) to 7.5 mbgs or finished floor elevations of 218.00 to 219.70 meters above sea level (masl).

This preliminary hydrogeological investigation is focused on characterizing hydrogeological conditions at the site to estimate dewatering and permitting requirements, as well as potential impacts to existing groundwater users (i.e., private and municipal wells) and the natural environment. Dewatering rates exceeding 50,000 L/day require registration on the Environmental Activity and Sector Registry (EASR), and rates exceeding 400,000 L/day require a Permit to Take Water (PTTW) with the MECP. As the site is located near to Kempenfelt Bay (Lake Simcoe), excavations below the water table along Lakeshore Mews (**Figure 1**) could be very challenging and require significant dewatering due to a potential hydraulic connection between the groundwater table and Lake Simcoe.

Barrie Water Supply Wells 11 and 14 are located approximately 90 m southwest of the site at Heritage Park and are two of the fourteen municipal supply wells for the City of Barrie. The Barrie Water Supply Wells 11 and 14 are constructed in an extensive sand and gravel overburden aquifer system to depths of 61.6 and 60.9 mbgs respectively (South Georgian Bay Lake Simcoe Protection Region, 2014). While these wells will not be impacted by the proposed shallow construction from the project, the Source Water Protection implications of building near these wells will need to be addressed.

In addition to the hydrogeological field investigations and site reconnaissance conducted by Palmer, information from the following sources was reviewed as part of the study:

- South Georgian Bay Lake Simcoe Protection Region, 2014- Nottawasaga Valley Source Protection Area Approved Assessment Report- Chapter 9: City of Barrie;
- Available geology, hydrogeology, physiography, and source water protection mapping (e.g., Ontario Geological Survey (OGS) Surficial and Palaeozoic Geology Mapping and the Source Protection Information Atlas); and,
- MECP water well records.

1.1 Scope of Work

The scope of work for the hydrogeological assessment includes:

- Review of subsurface data from three (3) boreholes and two (2) monitoring wells within the site installed as part of the geotechnical and Environmental Site Assessment (ESA) scope completed by Watters, and two (2) existing groundwater monitoring wells on site;
- Review of Source Water Protection and Lake Simcoe Protection Plan (LSPP) requirements;
- Water level measurements at the four (4) monitoring wells to characterize groundwater levels;
- Well development, single well response testing (i.e., slug tests) to measure hydraulic conductivity at the monitoring well locations;
- Collection and submission one (1) groundwater sample to a CALA Certified Laboratory to be compared against Barrie Sewer Discharge Criteria;
- Estimation of construction dewatering rates, the radius of water table drawdown, and groundwater discharge criteria; and,
- Preparation of a Hydrogeological Assessment report summarizing the findings, and recommendations for dewatering and permitting requirements of the project.

2 Hydrogeological Conditions

2.1 Regional Conditions

2.1.1 Physiography and Geology

The site is located within the Simcoe Lowlands physiographic region (Chapman and Putnam, 1984). The Simcoe lowlands border Lake Simcoe and extend along Kempenfelt Bay to the low-lying area west of Barrie. The lowlands are characterized by adjoining flat, low-lying plains and valley floors that are between 4 to 15 km wide and 0-30 km long (Mulligan, 2013). Surrounding Lake Simcoe, the lowlands lie between 218 and 259 meters above sea level. Approximately 12,500 years ago, the lowlands were flooded by Glacial Lake Algonquin meltwaters. Resultantly, the lowlands are underlain by glaciolacustrine sand, silt, and clay.

Available surficial and quaternary geology mapping by the Ontario Geological Survey (OGS) indicates the surficial geology is comprised of coarse-textured glaciolacustrine littoral deposits including sand, gravel, and minor silty and clay (**Figure 2**). The Newmarket Till underlies this unit and consists of dense to very dense, stone-poor, sandy silt to silty sand-textured till. Bedrock underlying the site is the Verulam Formation and is Middle Ordovician in age (**Figure 3)**. The Verulam Formation is part of the Simcoe Group and overlies the Bobycaygeon Formation. The Verulam Formation consists of interbedded bioclastic to very-fine grained limestone and shale (Armstrong and Dodge, 2007). The limestone is crystalline, light to dark brown-grey, and contains fossils. The bioclastic sediments include grainstones and rudstones. Bedrock in the region is at least below 70 mbgs (MECP Well ID 5727319), and the unit has not been encountered in existing MECP well records near the site.

LEGEND:

- Borehole *(Watters Environmental, Jun-2020)*
- Monitoring Well *(Watters Environmental, Jun-2020)*
- Monitoring Well *(Other)*
- Subject Property
- Surface Elevation Contour (1m)

Imagery (2018) provided by Simcoe County WMS.

0 5 10 15 20
metres

PROJECT NO.	2001505	REVISION:	1-1
DATE:	Oct 18, 2020	SCALE:	1:1000
DRAWN:	CV	DATUM:	NAD 1983
CHECKED:	SS	PROJECTION:	UTM zone 17

CLIENT: Watters Environmental Group Inc

PREPARED BY: Palmer

PROJECT: Dunlop Street Barrie - Hydrogeology Study

TITLE: **Site Location**

DRAFT

Figure 1

Document Path: G:\Shared drives\Projects 2020\2001505 - Watters Environmental Group Inc\2001505 - Dunlop Street Barrie - Hydrogeology Study\Mapping\Figures\5_ArcGIS\2001505_1-1_Site Location.mxd

LEGEND:

- Borehole *(Watters Environmental, Jun-2020)*
- Monitoring Well *(Watters Environmental, Jun-2020)*
- Monitoring Well *(Other)*
- Surface Elevation Contour (1m)
- Subject Property

Surficial Geology[1]

PHANEROZOIC

CENOZOIC
QUATERNARY
PLEISTOCENE

9 **Coarse-textured glaciolacustrine deposits:** sand, gravel, minor silt and clay
9b Littoral deposits
9c Foreshore and basinal deposits

1. Source: Ontario Geological Survey 2010 (Mapped at 1:50,000). Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release- Data 128 - Revised

0 25 50 75 100
metres

N

PROJECT NO.	2001505	REVISION:	1-1
DATE:	Aug 30, 2020	SCALE:	1:2000
DRAWN:	CV	DATUM:	NAD 1983
CHECKED:	SS	PROJECTION:	UTM zone 17

CLIENT: Watters Environmental Group Inc

PREPARED BY: Palmer

PROJECT: Dunlop Street Barrie - Hydrogeology Study

TITLE: **Surficial Geology**

DRAFT

Figure 2

Document Path: W:\Egnyte\Shared\Projects\Active\20015 - Watters Environmental Group Inc\2001505 - Dunlop Street Barrie - Hydrogeology Study\Mapping\Figures\5_ArcGIS\2001505_2-1_Surficial Geology.mxd

LEGEND:

- Borehole *(Watters Environmental, Jun-2020)*
- Monitoring Well *(Watters Environmental, Jun-2020)*
- Monitoring Well *(Other)*
- Surface Elevation Contour (1m)
- Subject Property

Paleozoic Bedrock Geology[1]

Ordovician, Simcoe Group

10: Verulam *limestone and shale*

1. Armstrong, D.K. and Dodge, J.E.P. Paleozoic Geology Map of Southern Ontario; Ontario Geological Survey, Miscellaneous Release --Data 219

0 25 50 75 100
metres

N

PROJECT NO.	2001505	REVISION:	1-1
DATE:	Aug 30, 2020	SCALE:	1:2000
DRAWN:	CV	DATUM:	NAD 1983
CHECKED:	SS	PROJECTION:	UTM zone 17

CLIENT: Watters Environmental Group Inc

PREPARED BY: Palmer

PROJECT: Dunlop Street Barrie - Hydrogeology Study

TITLE: **Paleozoic Bedrock Geology**

DRAFT

Figure 3

Document Path: W:\Egnyte\Shared\Projects\Active\20015 - Watters Environmental Group Inc\2001505 - Dunlop Street Barrie - Hydrogeology Study\Mapping\Figures\5_ArcGIS\2001505_3-1_Paleozoic Bedrock Geology.mxd

2.1.2 Hydrogeology

Hydrostratigraphic units can be subdivided into two distinct groups based on their ability to allow groundwater movement: an aquifer and an aquitard. An aquifer is defined as a layer of soil that is permeable enough to permit a usable supply of water to be extracted. An aquitard is a layer of soil that inhibits groundwater movement due to its low permeability. The major units that control groundwater at the site are described below:

Coarse-Textured Glaciolacustrine deposits comprised of sand and gravel with minor silt and clay are the native surficial unit within the study area and forms an overburden flow system. The bottom of the sand aquifer was identified to be 13.4 mbgs on site based on an MECP well record for a well located within the site boundary (MECP Well ID 5700288). Nearby the site, the coarse-textured deposits reach depths up to 16 mbgs (MECP Well ID 5727319). The hydraulic conductivity of this unit is estimated to be as high as $1.44x10^{-4}$ m/s (AquaResource et al., 2011).

The **Newmarket Till** forms a major regional aquitard within the study area, given its low hydraulic conductivity (10^{-11} to 10^{-6} m/s, Sharp *et al*., 1996) and consistent presence throughout the region. The Newmarket Till is found at surface north and northeast of the site. Where Newmarket Till is exposed at the surface, the water table is commonly high within the till because of the poorly drained till soils. In such areas, a well-developed surface drainage network can often be identified. Water flow within the dense till unit is typically in a downwards direction (Sharpe *et al.*, 1996).

2.1.3 Surface Water Features

Lake Simcoe is located approximately 25 m to the southeast of the site. Lake Simcoe water levels are managed by Parks Canada via the Trent-Severn Waterway (TSW), and water levels vary by about 0.4 to 0.5 m during any given year, with peak levels usually occurring between April to June (LRSCA, 2016). This water level range is expected to control the water table elevation range at the site due to the close proximity and likely hydraulic connection.

2.1.4 Source Water Protection and Municipal Water Supply

The southeastern part of the site is regulated under Ontario Regulation 179/06 by the Lake Simcoe Region Conservation Authority. The site is also located in the South Georgian Bay Lake Simcoe Source Protection Region which came into effect on July 1, 2015. The Source Water Protection Plan identifies four vulnerable areas under the *Clean Water Act (2006)* relating to local hydrogeology to consider for site development: Wellhead Protection Areas (WHPAs), Intake Protection Zones (IPZ), Highly Vulnerable Aquifers (HVAs), and Significant Groundwater Recharge Areas (SGRAs),

WHPAs are areas on the land around a municipal well and the size of the area is determined by how quickly water travels underground to the well (in years) (South Georgian Bay Lake Simcoe Source Protection Region, 2015). WHPA-A is a standard 100-meter radius circle provided around the municipal well required by the Clean Water Act, 2006 for source protection planning. WHPA-B represents the 2-year time of travel; WHPA-C represents the 5-year time of travel; and WHPA-D represents the 25-year time of travel. WHPA-E represents municipal wells that are under the direct influence of surface water. The size and shape of each WHPA (B, C, D or E) is a function of how water travels underground. WHPA-

E represents municipal wells that are under the direct influence of surface water and that therefore have the potential to be impacted by poor surface water quality.

The Ontario Source Water Protection Information Atlas identifies that the site is located within the Lakes Simcoe and Couchiching/Black River Source Protection Area. The southwest corner of the site is identified to be within WHPA-A due to the presence of the Barrie Municipal Supply Wells 11 and 14 located southwest of the site **(Figure 4)**. The remainder of the site area is in WHPA-B.

Wellhead Protection Areas (WHPA) Q1 and Q2 refer to areas where activities that take water without returning it to the same source may be a threat (Q1), and to areas where activities that reduce recharge may be a threat (Q2). The site is located in both WHPA-Q1 and Q2.

IPZs are the area on the water and land surrounding an municipal surface water intake. IPZ1 is a 1 km circle around the intake, IPZ-2 is the area where water can reach the intake in a specified time (in the South Georgian Bay Lake Simcoe Source Protection Region this time is defined to be 2 hours), and IPZ-3 is where activities further away from the intake may still impact water quality (South Georgian Bay Lake Simcoe Source Protection Region, 2015). The site is located in IPZ-3.

HVAs are aquifers that are susceptible to contamination as a result of the soil structure/material or due its location near the ground surface (South Georgian Bay Lake Simcoe Source Protection Region, 2015). The site was not found to be in an HVA.

Lastly, SGRAs are areas where recharge is important to maintain the water level in a community drinking water aquifer. The site was identified to be in an SGRA.

2.2 Site Specific Conditions

2.2.1 Watters Borehole Drilling and Monitoring Well Installation

Watters conducted a borehole drilling and groundwater monitoring well installation program on site between June 11 and June 12, 2020 as a part of the Phase Two ESA and geotechnical study. Three (3) boreholes were advanced at the site using hollow stem auger methods. The location of the boreholes and the monitoring wells are provided on **Figure 1**, and borehole logs are provided in **Appendix B**. Two wells were previously drilled on site (EW1 and EW2) prior to Watters' Phase II ESA and geotechnical study.

Following drilling, monitoring wells were installed in two (2) of the boreholes in accordance with Ontario Regulation 903 (Wells Regulation). The monitoring wells were completed with 51 mm (2 inch) diameter schedule 40 polyvinyl chloride (PVC) pipe, with 3 m (10 ft) long screened intervals at bottom of the well. The monitoring wells were sealed using bentonite grout and completed with flushmount casings. Additional details are provided in **Table 1**.

Table 1. Groundwater Monitoring Well and Borehole Details

Borehole/ Monitoring Well ID	Estimated Elevation (masl)*	Depth (mbgs)	Screened Depth Interval (mbgs)	Screened Geology
BH1/ MW1	225.5	9.1	6.1 – 9.1	Sand
BH2/ MW2	225.5	9.1	6.1 – 9.1	Sand
BH3	221.0	0.3**	–	Topsoil
EW1	221.0	6.1***	3.1 – 6.1	Sand
EW2	221.0	6.1***	3.1 – 6.1	Sand

Note: * *Elevations were estimated from Site Grading Plan (**Appendix C**)*
** *BH3 was drilled to a depth of 0.3 mbgs due to auger refusal*
*** *Estimated depth*

2.2.2 Geology and Soil Profile

The results of the borehole drilling investigations are consistent with regional OGS surficial geology mapping. The stratigraphy of the site as encountered during borehole drilling is described below and provided in **Appendix B**.

Topsoil: Topsoil was only encountered in BH3 from ground surface to a depth of 0.3 mbgs. The topsoil consisted of trace sand, trace gravel, and was moist.

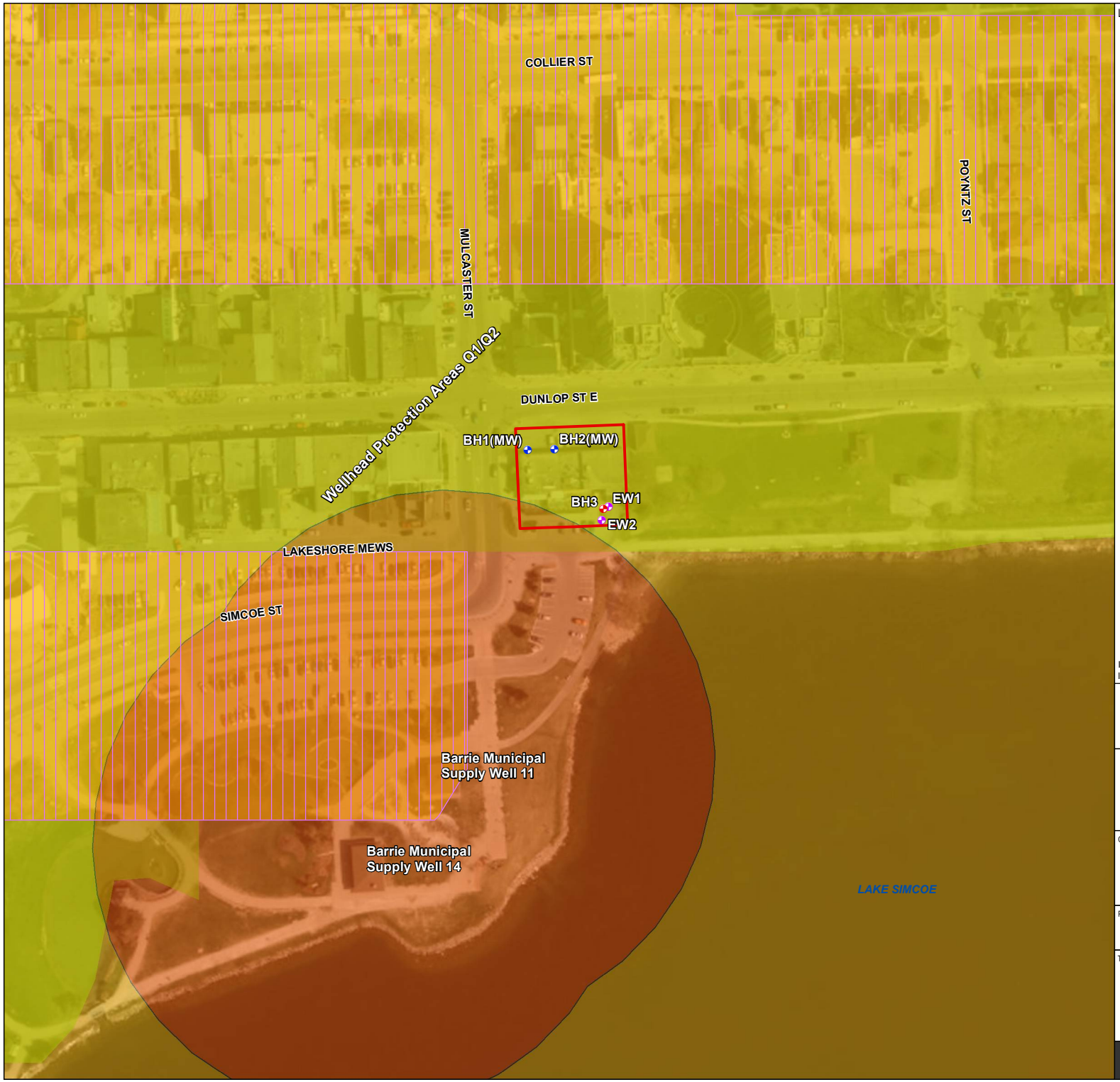
Asphalt: Asphalt was encountered at ground surface at BH1, BH2 and BH3 and had a unit thickness of 100 mm.

Fill Materials: Light to dark brown fill materials were encountered below asphalt in both BH1 and BH2. The fill extended from depths of 0.10 to 4.57 mbgs, with a unit thickness ranging from 4.01 (BH1) to 4.47 (BH2). The fill materials had two distinct compositions within the boreholes. A brown medium sand with some cobbles and trace clay was encountered first and made up the upper 0.66 to 1.42 m of the fill unit. This unit was moist and loose. The bottom 2.59 to 3.81 m of the fill unit was silty sand in composition with trace gravel and trace cobbles. The soils were brown, moist, and loose.

Coarse-Textured Glaciolacustrine Deposits:

Sand and Gravel: Brown sand and gravel was encountered below the fill materials in BH2. The sand and gravel extended from a depth of 4.57 to 5.33 mbgs with a unit thickness of 0.76 m. The composition of the sand and gravel included trace cobbles and trace oxidation. Soils were moist.

Sand: Brown sand was encountered in both BH1 and BH2. In BH1 the sand was encountered below the fill materials, whereas in BH2 the unit was encountered below the sand and gravel unit. The sand extended from depths of 4.11 to 9.14 mbgs. While the bottom of the unit was not encountered, the unit thickness ranged from 3.81 (BH2) to 5.03 m (BH1). The consistency of the sand was medium to coarse with trace to some cobble and trace gravel. Soils were moist but were found to be saturated at 6.71 mbgs in BH2 and at 7.3 mbgs at BH1.



LEGEND:

- Borehole *(Watters Environmental, Jun-2020)*
- Monitoring Well *(Watters Environmental, Jun-2020)*
- Monitoring Well *(Other)*
- Subject Property
- Highly Vulnerable Aquifer
- Wellhead Protection Area (WHPA-A)
- Wellhead Protection Area (WHPA-B)

Significant Groundwater Recharge Area

- *2*
- *4*
- *6*

0 25 50 75 100
metres

PROJECT NO.	2001505	REVISION:	1-1
DATE:	Aug 30, 2020	SCALE:	1:2000
DRAWN:	CV	DATUM:	NAD 1983
CHECKED:	SS	PROJECTION:	UTM zone 17

CLIENT: Watters Environmental Group Inc

PREPARED BY: Palmer

PROJECT: Dunlop Street Barrie - Hydrogeology Study

TITLE: **Source Water Protection Plan**

DRAFT

Figure 4

2.2.3 Groundwater Levels and Flow

The stabilized groundwater level at each monitoring was measured by Watters on May 22, 2020 and June 15, 2020, and by Palmer on August 20, 2020 and September 8, 2023. Water levels were measured using a water level tape and recorded to the nearest centimetre. **Table 2** provides a summary of the measured water level measurements.

Water levels on site ranged between 1.96 to 6.65 mbgs or between approximately 218.76 to 219.17 masl. The wells located along Lakeshore Mews (EW1 and EW2) are at an elevation approximately 3 to 4 m lower than BH1(MW1)) and BH2(MW2)). Based on the measured water levels across the site, it is expected that regional/deep groundwater flows southwestwards towards Lake Simcoe. It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to weather events. A 0.4 to 0.5 m lake level fluctuation is expected to control seasonal groundwater table fluctuations.

Table 2. Measured Groundwater Level and Estimated Elevation

Monitoring Well ID	Elevation*	Units	Groundwater Level and Estimated Elevation			
			May 22, 2020 (Watters)	June 15, 2020 (Watters)	August 20, 2020 (Palmer)	September 8, 2023 (Palmer)
BH1/MW1	225.5	mbgs	–	6.33	6.51	6.62
		masl*	–	219.17	218.99	218.88
BH2/MW2	225.5	mbgs	–	6.44	6.55	6.65
		masl*	–	219.06	218.95	218.85
EW1	221.0	mbgs	1.96	–	–	2.22
		masl*	219.04	–	–	218.78
EW2	221.0	mbgs	2.10	–	–	2.24
		masl*	218.90	–	–	218.76

Note: water level elevations in masl were estimated based on the Site Grading Plan (**Appendix C**)*

2.2.4 MECP Water Well Records

Based on a review of the MECP Water Well Records (WWR) database, seventy-five (75) well records are present within a 500 m radius of the site (**Figure 5**). Of these wells, thirty-three (33) are listed as monitoring wells, fifteen (15) are listed as monitoring and test holes, two (2) wells are listed as industrial wells, one (1) is listed as a test hole well (well ID 7166918), one (1) is listed as a cooling and AC well (5700290), one (1) is listed as a municipal well (5700235), one (1) is listed as a public well (5719264), two (2) are listed as other, and lastly five (5) wells are listed as not used. The remaining fourteen (14) wells have no use listed.

2.2.4.1 Municipal Supply Wells

Barrie Water Supply Wells 11 and 14 are located approximately 90 m southwest of the site at Heritage Park and are two of the fourteen municipal supply wells for the City of Barrie (**Figure 1**). The Barrie Water Supply Wells 11 and 14 are constructed in an overburden aquifer system to depths of 61.6 and 60.9 mbgs respectively (**Table 3**). The overburden aquifers underlying the City of Barrie are regionally extensive and complex. They are made up of four major sand and gravel aquifer units and are locally identified as the Upper Aquifer (A1), Intermediate (A2) and Lower (A3 and A4) aquifers (South Georgian Bay Lake Simcoe Protection Region, 2014). The Barrie Water Supply Wells 11 and 14 are constructed in

the Lower Aquifers (A3 and A4), which are extensive sand and gravel aquifers. Well 11 is screened from 47.2 to 61.3 m, and Well 14 is screened from 42.2 to 61.3 m. Generally, the elevation of the A3 aquifer ranges from 150 to 195 masl, and the elevation of A4 ranges from 115 to 160 masl across the City of Barrie. A3 and A4 aquifers comprise the major source of Barrie's groundwater supply, and it is interpreted that the aquifer is in contact with Kempenfelt Bay in areas to the east. The top of the aquifer is interpreted to be at 185.6 masl in Barrie Water Supply Wells 11 and 14 (AquaResource et al., 2011) which is approximately 34.9 mbgs.

2.2.5 Hydraulic Conductivity

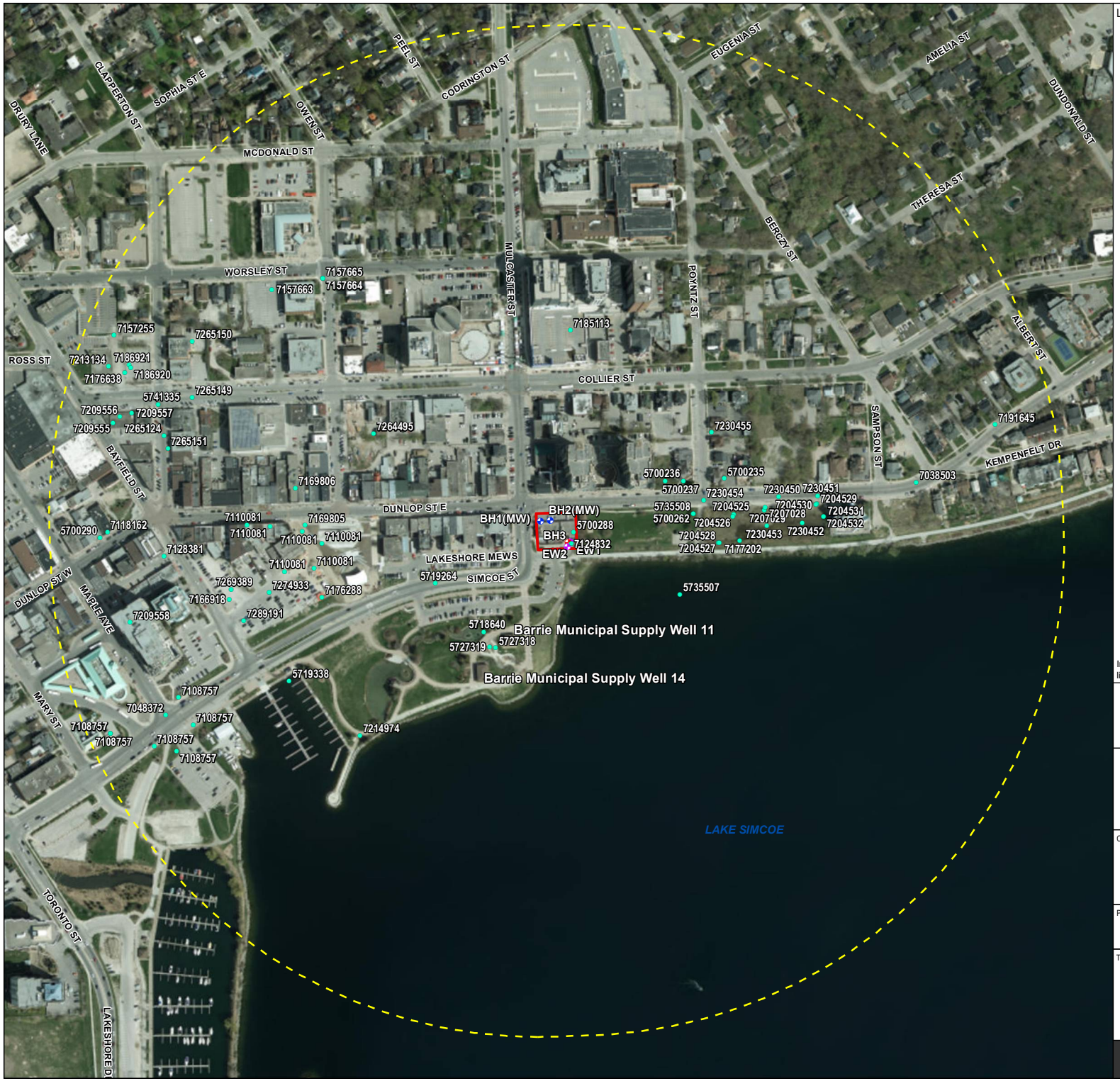
2.2.5.1 Single Well Response Test Analysis

On August 20, 2020 Palmer personnel conducted single well response testing (i.e., slug tests) at the monitoring wells (BH1(MW) and BH2(MW)) to determine the hydraulic conductivity (K) of the screened units. Both rising head (RH) and falling head (FH) tests were carried out by creating a head change through the insertion (FH test) or removal (RH test) of a 1 m long slug. The rate of recovery in each well was measured using a datalogger at the bottom of the well to record water levels at a 1-second frequency. During the tests, manual water level measurements were also recorded to gauge recovery to equilibrium. Tests were terminated when either 30 minutes had elapsed or an 80% recovery in water level was attained. Hydraulic conductivity (K) values were then calculated using the displacement-time data and were analysed using the Bouwer-Rice (1976) method for unconfined aquifers, modelled using Aqtesolv™ software. The analysis results are presented in **Appendix D**, and the range of calculated hydraulic conductivity values are summarized in **Table 3**.

Based on the results, the hydraulic conductivity calculated from slug tests ranged from $2.4x10^{-5}$ m/s to $3.2x10^{-5}$ m/s. The geomean hydraulic conductivity of the surficial glaciolacustrine sand aquifer was calculated to be $2.8x10^{-5}$ m/s, and the 90th percentile hydraulic conductivity was calculated to be $3.5x10^{-5}$ m/s.

Table 3. Hydraulic Conductivity Results from Single Well Response Tests

Monitoring Well ID	Hydrostratigraphy	Test Type	Hydraulic Conductivity (m/s)			
			Individual	Well Geomean	Hydrostratigraphic Unit Geomean	Hydrostratigraphic Unit 90th Percentile
BH1 (MW1)	Glaciolacustrine Sand Aquifer	Falling Head	$2.2 x10^{-5}$	$2.4 x10^{-5}$	$2.8 x10^{-5}$	$3.1 x10^{-5}$
		Rising Head	$3.3 x10^{-5}$			
		Falling Head	$1.4 x10^{-5}$			
		Rising Head	$3.1 x10^{-5}$			
		Falling Head	$1.8 x10^{-5}$			
		Rising Head	$3.2 x10^{-5}$			
BH2 (MW2)		Falling Head	$3.9 x10^{-5}$	$3.2x10^{-5}$		
		Rising Head	$3.2 x10^{-5}$			
		Falling Head	$3.0 x10^{-5}$			
		Rising Head	$2.9 x10^{-5}$			
		Falling Head	$3.6 x10^{-5}$			
		Rising Head	$2.9 x10^{-5}$			



LEGEND:

- MECP Water Well within 500m *w/Well ID*
- Borehole *(Watters Environmental, Jun-2020)*
- Monitoring Well *(Watters Environmental, Jun-2020)*
- Monitoring Well *(Other)*
- Subject Property
- Subject Property Buffer (500m)

0 25 50 75 100
metres

N

PROJECT NO.	2001505	REVISION:	1-1
DATE:	Aug 30, 2020	SCALE:	1:5500
DRAWN:	CV	DATUM:	NAD 1983
CHECKED:	SS	PROJECTION:	UTM zone 17

CLIENT: Watters Environmental Group Inc

PREPARED BY: Palmer

PROJECT: Dunlop Street Barrie - Hydrogeology Study

TITLE: DRAFT

MECP Water Wells within 500m

Figure 5

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2.2.6 Groundwater Chemistry

Groundwater chemistry samples were collected on August 20, 2020 from BH2(MW2) and analyzed for a suite of water quality parameters including total metals, anions and nutrients, volatile organic compounds (VOCs), and polycyclic aromatic hydrocarbons (PAHs).

A summary of the groundwater analysis results is presented in **Table 4**, and the Certificate of Analysis is provided in **Appendix E**. Results were compared against The City of Barrie Sewer Use By-law 2012-172 criteria. Total Suspended Solids (TSS), Copper, and Zinc exceeded Storm Sewer Discharge criteria. Chloride exceeded Sanitary Sewer discharge criteria.

Table 4. Groundwater Chemistry Results

Parameter	Units	Lowest Detection Limit	Barrie Sanitary Sewer Discharge Criteria	Barrie Storm Sewer Discharge Criteria	Sample Concentration MW2 (August 20, 2020)
Physical Tests					
pH	pH units	0.10	6 -> 9.5	6 -> 9.5	7.69
Total Suspended Solids (TSS)	mg/L	3.0	350	15	**100**
Anions and Nutrients					
Chloride (Cl)	mg/L	10	1500	-	4850
Fluoride (F)	mg/L	0.40	10	-	<0.40
Total Kjeldahl Nitrogen	mg/L	0.15	100	-	0.19
Phosphorus, Total	mg/L	0.0030	10	-	0.236
Sulfate (SO4)	mg/L	6.0	1500	-	178
Sulphide (As S)	mg/L	0.018	-	-	<0.018
Sulphide (as H2S)	mg/L	0.019	1	-	<0.019
Cyanides (Water)					
Cyanide, Total	mg/L	0.0020	1.2mg/L	-	0.0165
Total Metals					
Aluminum (Al)-Total	mg/L	0.050	50	-	11.3
Antimony (Sb)-Total	mg/L	0.0010	5	-	<0.0010
Arsenic (As)-Total	mg/L	0.0010	1	-	0.0030
Barium (Ba)- Total		0.0010	5	-	0.722
Bismuth (Bi)-Total	mg/L	0.00050	5	-	<0.00050
Cadmium (Cd)-Total	mg/L	0.000050	0.7	0.001	0.000074
Chromium (Cr)-Total	mg/L	0.0050	2	0.08	0.0182
Cobalt (Co)-Total	mg/L	0.0010	5	-	0.0079
Copper (Cu)-Total	mg/L	0.0050	2	0.01	**0.0234**
Gold (Au)- Total	mg/L	0.00001	5	-	0.0003

Parameter	Units	Lowest Detection Limit	Barrie Sanitary Sewer Discharge Criteria	Barrie Storm Sewer Discharge Criteria	Sample Concentration MW2 (August 20, 2020)
Iron (Fe)-Total	mg/L	0.10	50	-	14.4
Lead (Pb)-Total	mg/L	0.00050	0.7	0.05	0.00806
Manganese (Mn)-Total	mg/L	0.0050	5	-	0.742
Mercury (Hg)-Total	mg/L	0.0000050	0.01	-	0.0000184
Molybdenum (Mo)-Total	mg/L	0.00050	5	-	0.00220
Nickel (Ni)-Total	mg/L	0.0050	2	0.05	0.0147
Platinum (Pt)- Total	mg/L	0.0001	5	-	< 0.001
Rhodium (Rh)- Total	mg/L	0.00001	5	-	< 0.0001
Selenium (Se)-Total	mg/L	0.00050	1	-	0.00141
Silver (Ag)-Total	mg/L	0.00050	0.4	-	<0.00050
Tin (Sn)-Total	mg/L	0.0010	5	-	<0.0010
Titanium (Ti)-Total	mg/L	0.0030	-	-	0.500
Vanadium (V)- Total	mg/L	0.0050	5	-	0.0213
Zinc (Zn)-Total	mg/L	0.030	2	0.04	**0.044**
Aggregate Organics					
BOD	mg/L	3.0	300	15	6.0
COD	mg/L	10	600	-	167
Oil and Grease, Total	mg/L	5.0	-	-	<5.0
Animal/Veg Oil & Grease	mg/L	5.0	150	-	<5.0
Mineral Oil and Grease	mg/L	2.5	15	-	<2.5
Phenols (4AAP)	mg/L	0.0010	0.1	-	<0.0010
Volatile Organic Compounds (VOCs)					
Acetone	ug/L	20	-	-	<20
Benzene	ug/L	0.50	10	-	<0.50
Bromodichloromethane	ug/L	1.0	-	-	<1.0
Bromoform	ug/L	1.0	-	-	<1.0
Bromomethane	ug/L	0.50	-	-	<0.50
Carbon Disulfide	ug/L	1.0	-	-	<1.0
Carbon tetrachloride	ug/L	0.20	-	-	<0.20
Chlorobenzene	ug/L	0.50	-	-	<0.50
Dibromochloromethane	ug/L	1.0	-	-	<1.0
Chloroethane	ug/L	1.0	-	-	<1.0
Chloroform	ug/L	1.0	-	-	<1.0
Chloromethane	ug/L	1.0	-	-	<1.0
1,2-Dibromoethane	ug/L	0.20	-	-	<0.20

Parameter	Units	Lowest Detection Limit	Barrie Sanitary Sewer Discharge Criteria	Barrie Storm Sewer Discharge Criteria	Sample Concentration
					MW2 (August 20, 2020)
1,2-Dichlorobenzene	ug/L	0.50	50 (U)	-	<0.50
1,3-Dichlorobenzene	ug/L	0.50	-	-	<0.50
1,4-Dichlorobenzene	ug/L	0.50	80 (U)	-	<0.50
Dichlorodifluoromethane	ug/L	1.0	-	-	<1.0
1,1-Dichloroethane	ug/L	0.50	-	-	<0.50
1,2-Dichloroethane	ug/L	0.50	-	-	<0.50
1,1-Dichloroethylene	ug/L	0.50	-	-	<0.50
cis-1,2-Dichloroethylene	ug/L	0.50	-	-	<0.50
trans-1,2-Dichloroethylene	ug/L	0.50	-	-	<0.50
Dichloromethane	ug/L	2.0	90 (U)	-	<2.0
1,2-Dichloropropane	ug/L	0.50	-	-	<0.50
cis-1,3-Dichloropropene	ug/L	0.30	-	-	<0.30
trans-1,3-Dichloropropene	ug/L	0.30	-	-	<0.30
Ethylbenzene	ug/L	0.50	60 (U)	-	<0.50
n-Hexane	ug/L	0.50	-	-	<0.50
2-Hexanone	ug/L	20	-	-	<20
Methyl Ethyl Ketone	ug/L	20	-	-	<20
Methyl Isobutyl Ketone	ug/L	20	-	-	<20
MTBE	ug/L	0.50	-	-	<0.50
Styrene	ug/L	0.50	-	-	<0.50
1,1,1,2-Tetrachloroethane	ug/L	0.50	-	-	<0.50
1,1,2,2-Tetrachloroethane	ug/L	0.50	60 (U)	-	<0.50
Tetrachloroethylene	ug/L	0.50	60 (U)	-	<0.50
Toluene	ug/L	0.40	20 (U)	-	<0.40
1,1,1-Trichloroethane	ug/L	0.50	-	-	<0.50
1,1,2-Trichloroethane	ug/L	0.50	-	-	<0.50
Trichloroethylene	ug/L	0.50	50 (U)	-	<0.50
Trichlorofluoromethane	ug/L	1.0	-	-	<1.0
Vinyl chloride	ug/L	0.50	-	-	<0.50
o-Xylene	ug/L	0.30	-	-	<0.30
m+p-Xylenes	ug/L	0.40	-	-	<0.40
Xylenes (Total)	ug/L	0.50	300 (U)	-	<0.50
4-Bromofluorobenzene	%		-	-	96.9
1,4-Difluorobenzene	%		-	-	100.4
Polycyclic Aromatic Hydrocarbons (PAHs)					

Parameter	Units	Lowest Detection Limit	Barrie Sanitary Sewer Discharge Criteria	Barrie Storm Sewer Discharge Criteria	Sample Concentration MW2 (August 20, 2020)
Acenaphthene	ug/L	0.020	140	-	<0.020
Acenaphthylene	ug/L	0.020	-	-	<0.020
Anthracene	ug/L	0.020	-	-	<0.020
Benzo(a)anthracene	ug/L	0.020	-	-	<0.020
Benzo(a)pyrene	ug/L	0.010	-	-	<0.010
Benzo(b)fluoranthene	ug/L	0.020	-	-	<0.020
Benzo(g,h,i)perylene	ug/L	0.020	-	-	<0.020
Benzo(k)fluoranthene	ug/L	0.020	-	-	<0.020
Chrysene	ug/L	0.020	-	-	<0.020
Dibenzo(ah)anthracene	ug/L	0.020	-	-	<0.020
Fluoranthene	ug/L	0.020	-	-	<0.020
Fluorene	ug/L	0.020	-	-	<0.020
Indeno(1,2,3-cd)pyrene	ug/L	0.020	-	-	<0.020
1-Methylnaphthalene	ug/L	0.020	-	-	<0.020
2-Methylnaphthalene	ug/L	0.020	-	-	<0.020
Naphthalene	ug/L	0.050	-	-	<0.050
Phenanthrene	ug/L	0.020	-	-	<0.020
Pyrene	ug/L	0.020	-	-	<0.020
d10-Acenaphthene	%	-	-	-	100.2
d12-Chrysene	%	-	-	-	85.9
d8-Naphthalene	%	-	-	-	96.4
d10-Phenanthrene	%	-	-	-	96
Total PAHs	ug/L	0.095	5	-	<0.095
Organochlorine Pesticides					
Hexachlorobenzene	ug/L	0.0080	-	-	<0.0080
Tetrachloro-m-xylene	%	-	-	-	94.9

Notes:

1. **-** *In guideline row(s) denotes no criteria for that parameter*
2. **-** *In data row(s) denotes parameter not analyzed*
3. *Exceeds Sanitary Sewer Guideline Limit*
4. **BOLD** *Exceeds Storm Sewer Guideline Limit*
5. *Italics* *Detection Limit Exceeds Guideline*

3 Dewatering Assessment

3.1 Construction Dewatering

It is our understanding that the proposed development will consist of a 25 storey tower with two (2) levels of underground parking ranging in elevations of 218.0 to 219.70 masl or depths of 6.1 m at lakefront Level to 7.5 mbgs at the lower level. While there is a range in excavation depths based on the available architectural drawings (**Appendix A**) and site grading plan (**Appendix C**) the P2 level will be completed to 7.5 mbgs or 218.0 mASL. The excavation dimensions are estimated to be 35 m x 40 m based on the architectural drawings.

Based on the highest measured groundwater table elevation of 219.17 masl, which was measured during the spring, and the presence of high permeability glaciolacustrine sand aquifer at surface, excavations below the water table are expected to require significant dewatering to manage groundwater seepage. It is assumed that dewatering will be required to lower the groundwater level in the excavation to 0.5 m below the foundation depth.

It is important to note that all excavation dimensions used in this report are presented solely for the purposes of estimating groundwater dewatering rates. It is ultimately up to the successful Contractor to confirm both the building design and dewatering requirements.

3.2 Dewatering Rate Estimates - Parking Level 2

Based on the architectural drawings and site grading plan, the approximate depth of P2 is 7.5 mbgs or an elevation of 218.00 masl. However, the architectural drawings show the footing/foundation depth to be 1 m below this at approximately 8.5 mbgs or an elevation of 217.00 masl. It is further assumed that dewatering will be required to lower the groundwater level to 0.5 m lower than the excavation depth to 9.5 mbgs or 216.50 masl. At this depth, the excavation and dewatering are expected to be within the sand aquifer. To provide a conservative estimate, the 90th percentile hydraulic conductivity value for the sand aquifer ($3.5x10^{-5}$ m/s) was used to estimate the dewatering rate (**Table 5**) The bottom of the sand aquifer was identified to be 13.4 mbgs based on an MECP well record for a nearby well (MECP Well ID 5700288).

The dewatering risk is on this site is high based on the site-specific conditions. While assumptions can be made from nearby MECP wells for aquifer thickness, and SWRT data can be used to estimate hydraulic conductivity, additional deep borehole drilling on site and a pumping test will be required to refine these values. These additional investigations are planned for later design stages after the ZBA.

Resultantly, the following parameters were used to estimate dewatering rates:

- Approximate underground building dimensions: 37 m x 42 m
- Approximate bottom of excavation elevation: 216.50 masl
- Groundwater elevation before dewatering: 219.17 masl
- Groundwater elevation required after dewatering: 215.50 masl

Due to the presence of Lake Simcoe, a constant head boundary condition for R_0 was set to 25 m. As shown in **Table 5**, this set of conditions greatly increases the dewatering rate estimates as the groundwater level is influenced by the constant recharge effects from Lake Simcoe and will not drain over time. To account for precipitation that may fall within the excavation, a nominal two-year storm (25 mm in 24 hours) over the footprint of the excavation has been considered.

It should be noted that the highest dewatering flows are anticipated at the beginning of the dewatering process to achieve the target drawdown levels. After groundwater levels have been lowered to the target elevation, the dewatering flows are anticipated to be lower when maintaining the groundwater level at the target elevation during steady-state dewatering flow conditions, Dewatering rate estimates (Q) for the proposed building was calculated using the following equation from Powers et. al (2007) for an unconfined aquifer:

$$Q_{square} = \frac{\pi K(H^2 - h^2)}{\ln\left(\frac{R_o}{R_e}\right)} \, m^3/s$$

Where K = hydraulic conductivity (m/s)
H = saturated thickness (m)
h = saturated thickness after dewatering (m)
R_o = radius of influence (m)
R_e = equivalent radius of influence (m)

Table 5 presents a summary of the estimated dewatering rates for the proposed excavation to P2. The total dewatering rate is estimated to be 3,932,469 L/day, and with an uncertainty factor of 2, the dewatering is estimated to be 7,864,939 L/day. This dewatering estimation assumes that no groundwater cut-off structures (i.e., sheet-pile shoring) are present. Accounting for precipitation/stormwater considerations for a nominal two-year storm (25 mm in 24 hours) over the footprint of the excavation (38,850 L/day), the dewatering rate is estimated to be approximately 7,905,000 L/day.

Table 5. Dewatering Calculations – P2 Foundation

Parameter	Symbol	Unit	P2 – Sand Aquifer
Excavation Length	L	[m]	37
Excavation Width	W	[m]	42
90th Percentile Hydraulic Conductivity	K	[m/s]	3.5×10^{-5}
Saturated thickness	H	[m]	11.57
Dewatered saturated thickness	h	[m]	8.90
Radius of influence (from edge of excavation to the constant head boundary of Lake Simcoe)	R_o	[m]	25.0
Total Dewatering Rate	Q_{Total}	[L/day]	**3,932,469**
Total Dewatering Rate with 2x Uncertainty Factor	Q_{Total}	[L/day]	**7,864,939**
Nominal two-year storm (25 mm in 24 hours)	Q_{Total}	[L/day]	**38,850**
Total Dewatering Rate with 2x Uncertainty Factor + Stormwater for P2	Q_{Total}	[L/day]	**7,903,789**

4 Hydrogeological Considerations

4.1 Dewatering and Permitting

Short-term construction dewatering is required for the construction of the building foundation and the 2 levels of underground parking. It is expected that short-term construction-related dewatering will be managed through obtaining a temporary discharge permit from the City of Barrie or by discharging to Lake Simcoe.

Under the Environmental Activity and Sector Registry (EASR) system, water takings that are greater than 50,000 L/day and less than 400,000 L/day do not require a Permit To Take Water (PTTW) from the Ministry of the Environment, Conservation and Parks (MECP), however the project must be registered on the EASR system, and meet a series of environmental protection criteria. Above 400,000 L/day, a Category 3 PTTW from the MECP is required.

The dewatering rate including a 2x uncertainty factor, and stormwater considerations is estimated to be 7,905,000 L/day. This is high due as the water table is in a highly permeable unconfined sand aquifer that is expected to be hydraulically connected to Lake Simcoe, and P2 is located below the water table. As this is above 400,000 L/day, a Category 3 PTTW from the MECP will be required as will a discharge permit from the City of Barrie. Discharge to Lake Simcoe will require input from the LSRCA and require that the discharge meet PWQO parameters.

Long-term groundwater control is expected to be required using watertight construction/foundation methods.

4.2 Hydrogeological Construction Considerations

Based on an estimated high-water table elevation of approximately 219.17 masl, any construction below this level will require significant groundwater control (i.e., dewatering) or construction methods to cut-off groundwater seepage. Based upon the hydrogeological conditions, the following options could be considered for construction below 219.17 masl:

Active Dewatering – A perimeter dewatering array of well points or eductors could be installed around the outside of the excavation to lower the groundwater table to 1 m below the invert of the foundation. Additional hydrogeological information including a pumping test will be required to finalize the dewatering design and to obtain a Category 3 PTTW. A dewatering contractor should be retained to provide input into the dewatering plan. A temporary sewer discharge permit from the City of Barrie will be required to manage the dewatering discharge. Groundwater treatment will be required to meet City Storm and Sanitary Sewer Standards.

Watertight Shoring – To cut off the groundwater, watertight shoring (i.e., interlocking caisson walls) could be installed through the full depth of the surficial glaciolacustrine aquifer and keyed at least 1.5 m into the underlying Till unit at an estimated depth of 13.4 mbgs from Lakeshore Mews or an estimated elevation of 206.6 masl. Additional geotechnical and hydrogeological drilling will be required to confirm the depth and properties of the Newmarket Till confining unit. Groundwater will still need to be removed

from the inside of the watertight shoring, but this can be done at a rate of less than 400,000 L/day therefore, only requiring an EASR from the MECP rather than a full PTTW.

Long-Term Foundation Drainage – Watertight shoring or full water proofing of the underground basement levels will be required to manage long-term drainage as the City of Barrie does not permit long-term drainage into the sewer system.

4.3 Assessment of Impacts

4.3.1 Natural Environment

No adverse impacts to the natural environment are expected from construction dewatering of the project. Lake Simcoe is located 25 m away from the site, however the risk from construction dewatering is considered to be low, and no impacts on lake levels are expected.

4.3.2 Private Water Wells

It is not expected that private water wells will be impacted as a result of dewatering as the study area is serviced with municipal water, and no wells within the expected radius of influence are expected to be used for private water.

4.3.3 Municipal Supply Well

Barrie Water Supply Wells 11 and 14 are located approximately 90 m from the site and are installed in the deep, confined A3/A4 aquifers at a depth of 61.6 and 60.9 m respectively. If dewatering is required, it will be limited to the uppermost glaciolacustrine aquifer and due to the boundary condition of Lake Simcoe, the radius of influence will be limited to 25 m. Therefore, no impacts to Barrie Municipal Supply Wells 11 and 14 are expected. As the site is located in a WHPA-A, a spills response and mitigation plan is required under Source Water Protection Policies. Additional Source Water Protection implications are discussed in Section 4.4.

4.3.4 Ground Settlement

If construction below the water table was to occur, drawdown of the water table within a 25 m radius of the excavation within the unconsolidated glaciolacustrine sand deposits has the potential to cause ground settlement. A geotechnical assessment for ground settlement and a pre-conditions survey of local buildings and utilities is recommended.

4.3.5 Groundwater Treatment and Discharge

A groundwater sample was taken from MW2 and was compared against The City of Barrie Sewer Use By-law 2012-172 criteria. TSS, Copper, and Zinc exceeded the City of Barrie Storm Sewer Discharge criteria. Only Chloride exceeded the City of Barrie Sanitary Sewer discharge criteria. It is recommended that discharge be directed to nearby storm sewers within the study area following treatment for TSS and metals. A groundwater treatment contractor should be retained to confirm the appropriate treatment methods.

4.4 Source Water Protection

The site is situated within the Lakes Simcoe and Couchiching/Black River SPA (and is subject to the South Georgian Bay Lake Simcoe Source Protection Plan (SPP)). The SPP identifies four vulnerable areas: WHPAs (including WHPA-Q1 and WHPA-Q2), Intake Protection Zones (IPZs), HVAs, and SGRAs (**Figure 4**). A Wellhead Protection Area (WHPA) is the area around the wellhead where land use activities have the potential to affect the quality or quantity of water that flows into the well. These areas are delineated into zones of vulnerability (A, B, C, and D) based on the time of travel of water into the well. While only the southwest corner of the site is in WHPA-A (the remaining area of the site is in WHPA-B), the vulnerability score is 10 (significant). The portion of the site that is in WHPA-B has a vulnerability score of 6 (low). The site is in a SGRA, in an IPZ 3 with a vulnerability score of 5.6 and is not identified to be in an HVA.

The *Clean Water Act, 2006* identifies nineteen (19) potential chemical and pathogen threats set out in O.Reg. 287/07, and two (2) potential water quantity threats. Based on the proposed development, the following activities pose a significant threat for the site within the WHPA-A (**Figure 4**):

- The application of road salt;
- The application and storage of fertilizers and pesticides;
- The storage and handling of dense non-aqueous phase liquids (DNAPL); and
- The storage and handling of fuel.

The use of and storage of DNAPLs are prohibited in WHPA-As. Should any of the previously activities occur on site, mitigation measures under the Clean Water Act will need to be implemented and approved by the City.

As the site is located in a WHPA-A and within a WHPA-B with a vulnerability score greater than 2, the storage and use of DNAPLs is prohibited on site. In addition, bulk fuel storage of fuel is prohibited on site. It is recommended that all storage of fuel and re-fuelling during construction is completed outside of the WHPA-A (southwest corner of the site).

4.4.1 WHPA-Q2 (Recharge Management)

The site is located within a WHPA-Q2 and therefore, it is subject to the recharge management policy to maintain infiltration/recharge to the extent practical. A pre-to post-development water balance is typically completed to determine the % change in runoff and groundwater recharge from site development to determine an infiltration volume target.

Currently, the entire site area is covered by impervious concrete with little to no recharge function, and the proposed development will also be covered with impervious surfaces. Resultantly, there is no expected change in recharge from pre-development to post-development conditions, and therefore a formal pre-to-post development water balance assessment is not required.

4.4.2 City of Barrie Policies for Deep Drilling

Deep borehole drilling for foundations or test wells will require a risk management plan, approved by the City of Barrie. This will be provided prior to deep well drilling that is proposed for later design stages.

5 Conclusions and Recommendations

Based on the results of the Hydrogeological Investigation, the following summary of conclusions and recommendations is presented:

- The drilling program conducted by Watters comprised of the drilling and installation of three (3) boreholes, with two (2) completed as monitoring wells additionally, two wells were previously drilled on site (EW1 and EW2) prior to Watters' Phase II ESA and geotechnical study. OGS surficial geology of the region reveals coarse-textured glaciolacustrine deposits. This is consistent with the results of the drilling investigation.

- The stabilized groundwater levels were measured by Watters on May 22, 2020 and June 15, 2020, and by Palmer on August 20, 2020 and September 8, 2023; and levels ranged from 1.96 to 6.65 mbgs or between approximately 218.76 to 219.17 masl.

- The results of the single well response testing indicate an estimated geomean hydraulic conductivity of $2.8x10^{-6}$ m/s and a 90th percentile hydraulic conductivity of $3.1x10^{-5}$ m/s for the glaciolacustrine sand.

  The dewatering rate including a 2x uncertainty factor, and stormwater considerations is estimated to be 7,905,000 L/day. As this is above 400,000 L/day, a Category 3 PTTW from the MECP will be required as will a discharge permit from the City of Barrie. Long-term groundwater control is will need to be managed using watertight construction/foundation methods.

- A groundwater sample was taken from MW2 and was compared against The City of Barrie Sewer Use By-law 2012-172 criteria. Total Suspended Solids (TSS), Copper, and Zinc exceeded Storm Sewer Discharge criteria. Chloride exceeded Sanitary Sewer discharge criteria. It is recommended that discharge be directed to nearby storm sewers within the study area following treatment for TSS and metals. A groundwater treatment contractor should be retained to confirm the appropriate treatment methods.

- The Barrie Water Supply Wells 11 and 14 are located approximately 90 m southwest of the site at Heritage Park and are constructed in an extensive sand and gravel overburden aquifer system to depths of 61.6 and 60.9 mbgs respectively. No impacts to Barrie Water Supply Wells 11 and 14 are expected as dewatering will be limited to the uppermost glaciolacustrine aquifer and due to the boundary condition of Lake Simcoe, the radius of influence will be limited to 25 m.

- As the site is located in a WHPA-A and within a WHPA-B with a vulnerability score greater than 2, the storage and use of DNAPLs is prohibited on site. In addition, bulk fuel storage of fuel is prohibited on site. It is recommended that all storage of fuel and re-fuelling during construction is completed outside of the WHPA-A (southwest corner of the site).

- The site is located within WHPA-Q2 and is subject to the Source Water Protection recharge management policy to maintain infiltration/recharge to the extent practical. The entire site area is

currently covered by impervious concrete with little to no recharge function and the proposed development will also be covered with impervious surfaces. Resultantly, there is no change in recharge from pre-development to post-development conditions, and no water balance assessment is recommended.

- It is important to note that during this early stage of development, conservative assumptions regarding the upper aquifer thickness and vertical/ horizontal permeability trends were made to assess dewatering risk. It is expected that as the design progresses, additional deep borehole drilling and hydraulic testing will be completed to better refine the hydrogeological conditions and provide updated recommendations for development approvals and permitting.

- Deep borehole drilling for foundations or test wells will require a risk management plan, approved by the City of Barrie. This will be provided prior to deep well drilling that is proposed for later design stages.

6 Limitations of Report

The extent of this study was limited to the specific scope of work for which we were retained and that is described in this report. Palmer has assumed that the information provided by the client or any secondary sources of information are factual and accurate. Palmer accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or negligent acts from relied upon data. Judgment has been used by Palmer in the interpretation of the information provided but subsurface physical and chemical characteristics may differ from regional scale geology mapping and vary between or beyond well/borehole locations given the inherent variability in geological conditions.

Palmer is not a guarantor of the geological or groundwater conditions at the subject site, but warrants only that its work was undertaken and its report prepared in a manner consistent with the level of skill and diligence normally exercised by competent geoscience professionals practicing in the Province of Ontario. Our findings, conclusions and recommendations should be evaluated in light of the limited scope of our work.

The information and opinions expressed in the Report are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT PALMER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS PALMER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belongs to Palmer. Any use which a third party makes of the Report is the sole responsibility of such third party. Palmer accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Palmer's express written permission. Should the project design change following issuance of the Report, Palmer must be provided the opportunity to review and revise the Report in light of such alteration or variation.

7 Certification

This report was prepared and reviewed by the undersigned:

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Appendix A

Architectural Drawings

Scott Shields Architects Inc., 2023

149 DUNLOP STREET EAST

149 DUNLOP STREET EAST

Barrie, Ontario *Project No.: 27301*

General Notes

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Architectural Sheet List	
Sheet Number	Sheet Name
A0.00	COVER SHEET
A0.01	STATISTICS
A1.01	CONTEXT
A1.02	SITE PLAN
A1.03	SURVEY
A2.01	LEVEL P1
A2.02	LEVEL P2
A4.01	GROUND FLOOR PLAN
A4.02	LEVELS 2-3
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A4.09	MECH PENTHOUSE
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No.	Issue	Date
3	ISSUED FOR ZBLA	2023-May-29
2	ISSUED FOR COORDINATION	2023-Jan-24
1	ISSUED FOR PRE-CONSULTATION MEETING	2021-June-23

THIS SET IS ISSUED FOR:

ISSUED FOR ZBLA

May 29th, 2023

SSA

Scott Shields Architects Inc.
317 King Street West, Toronto, Ontario M5V 1J5
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scottarch.ca

Project

149 Dunlop

149 Dunlop Street East, Barrie, ON.

Drawing

COVER SHEET

Project number	27301
Date	Issue Date
Drawn by	AH, YL
Checked by	AS

A0.00

Scale

Project Statistics Summary

Client: Barrie Developments

Project: 149 Dunlop Street East — January 23, 2023

1. Municipal Address & Legal Description

149 Dunlop Street East
PART OF DUNLOP STREET REGISTERED PLAN 2 AND PARTS OF
WATER LOTS 17 AND 18 SOUTH SIDE OF DUNLOP STREET, CITY OF BARRIE

2. Site Area

2.1 Gross Site

	sq.m.	sq.ft.
Total	1,523.20	16,396
2.2 R.O.W Conveyance	88.75	955
2.3 Net Site	1,434.45	15,440

3.Proposed GFA

Level	GCA / Floor	GFA/Floor (w/ deductions)		Commercial GFA	Residential GFA		Indoor Amenity		Outdoor Amenity	
	sq.m.	sq.m.	Floors	sq.m.	sq.m.	sq.ft.	sq.m.	sq.ft.	sq.m.	sq.ft.
P2	1358.82	25.60	1	0.00	25.60	276	0	0	0	0
P1	1355.18	66.86	1	37.63	29.23	315	0.00	0	0.00	0
Level 1: Ground	1356.19	861.53	1	655.81	205.72	2,214	0.00	0	0.00	0
Level 2	1233.86	24.50	1	0.00	24.50	264	0.00	0	0.00	0
Level 3	1233.87	24.50	1	0.00	24.50	264	0.00	0	0.00	0
Level 4	1234.96	25.02	1	0.00	25.02	269	0.00	0	0.00	0
Level 5	1106.69	311.66	1	0.00	311.66	3,355	369.13	3,973	193.47	2,082
Level 6-21	886.83	707.74	16	0.00	11,323.84	121,889	0.00	0	0.00	0
Level 22-23	875.82	667.55	2	0.00	1,335.10	14,371	0.00	0	0.00	0
Level 24-25	825.88	609.46	2	0.00	1,218.92	13,120	0.00	0	0.00	0
Total	26,472.25	15,125.07	25	693.44	14,524.09	156,336	369.13	3,973	193.47	2,082
Total Proposed Residential GFA					**14,524.09**	**156,336**				
Commercial GFA					**693.44**	**7,464**				
Total Proposed GFA					**15,217.53**	**163,800**				

4. Proposed Density

Proposed Floor Space Index (Total Proposed GFA / Gross Site Area)	9.99

5. No. of Residential Units + Suite Mix

	Floors	S	1B	1B+D	2B	2B+D	3B+D	3B	Total
Level 1: Ground	1	0	0	0	0	0	0	0	0
Level 2	1	0	0	0	0	0	0	0	0
Level 3	1	0	0	0	0	0	0	0	0
Level 4	1	0	0	0	0	0	0	0	0
Level 5	1	1	1	0	1	0	0	1	4
Level 6-21	16	0	16	48	16	16	16	16	128
Level 22-23	2	0	4	2	4	2	4	0	16
Level 24-25	2	0	0	2	4	0	2	4	12
Total	**25**	**1**	**21**	**52**	**25**	**18**	**22**	**21**	**160**
		1	**73**		**43**		**43**		
15% BF Required		**0**	**11**		**6**		**3**		**21**
BF provided		**0**	**15**		**7**		**4**		**26**

6.Vehicular Parking

6.1 Required Parking

	sq. m	Min. per	Max. per	Min Req'd	Max Allowed
Commercial	693.44	NA	NA	NA	NA
Residential Type	# of Units	Min. Per Unit	Max. Per Unit	Min Req'd	Max Allowed
Tenant	160	1	NA	160	NA
Visitor	160	NA	NA	NA	NA
Total Required				**160**	

6.2 Provided Parking

Level	Tenant (Standard Parking -)	Tenant (Accessible Parking Space)	Total Tenant	Visitor (Standard Parking Space)	Visitor (Accessible Parking Space)	Total Visitor	Total Commercial	Total
P2	35	1	36	0	0	0	0	36
P1	22	1	23	0	0	0	0	22
L1	0	0	0	0	0	0	0	0
L2	30	1	31	0	0	0	0	31
L3	30	1	31	0	0	0	0	31
L4	25	1	26	0	0	0	0	26
Total Provided:	**142**	**5**	**147**	**0**	**0**	**0**	**0**	**147**

9. Bicycle Parking

9.1 Provided Bicycle Parking

Level	P2	P1	**Total Provided**
Total	16	11	**27**

7. Amenity Space

Type	No. of Units	Req. per Unit (sq.m.)	Total Required (sq.m.)	Total Provided. (sq.m.)
Indoor	160	NA	NA	369.13
Total Outdoor	160	NA	NA	193.47
Total Amenity (Indoor + Outdoor)				562.60

8. Height

Maximum Building Height per Current Zoning	15m
Proposed Building Height	70.66m
Proposed Number of Storeys	25

Zoning Matrix		
	Required by By-law (Table 6.3 of the	**Proposed**
Lot Area	-	1,523.20
Lot Frontage (min.)	-	39.3 m
Front Yard Setback (min.)	-	0m
Side Yard (min.)	-	0m
Rear Yard (min.)	-	0m
Lot Coverage	-	89%
Landscaped Open Space	-	22% - hardscaping
Building Height	-	70.66 m
GFA	-	999%
Minimum Coverage for Commercial	35%	55.50%
Parking	1 per every residential unit	160 units at 0.9 per unit - 144 spaces 147 provided
Loading Spaces	1 space required 3m x 9m, 4m of height clearance, must be buffered and hidden from the road	1 internal loading spaces provided
Minimum Dwelling Unit Floor Area	35m2 (+10m2 per bedroom)	Min. 1 bed size - 50m2
Drive Aisle (min.)	6.4m	6.4m
Landscape Buffer (Section 6.3.7.1)	N/A	Not provided

General Notes

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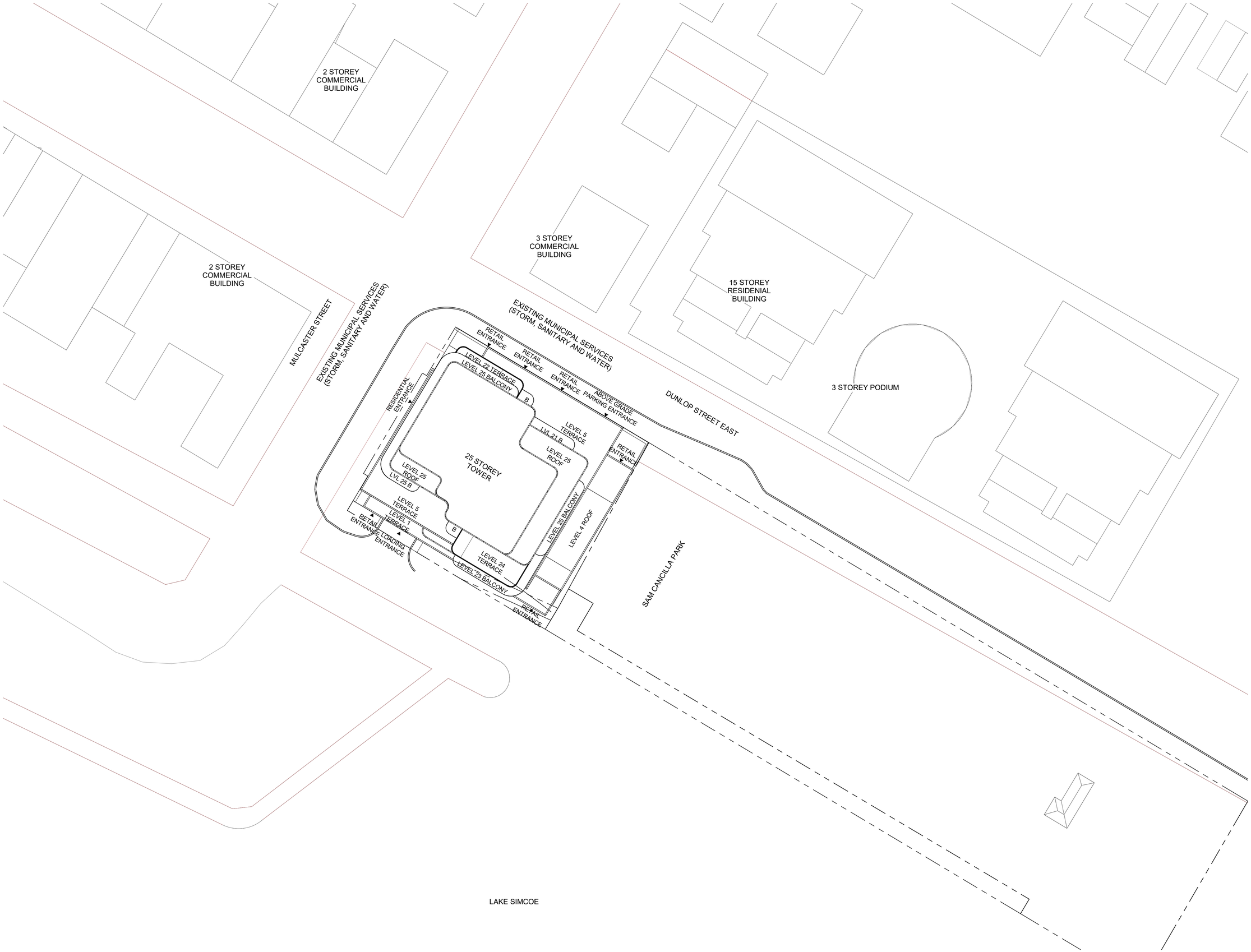
Project
149 Dunlop
149 Dunlop Street East, Barrie, ON.

Drawing
STATISTICS

Project number	27301
Date	Issue Date
Drawn by	AH, YL
Checked by	AS

A0.01

Scale



1 Context
1 : 300

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149 Dunlop

149 Dunlop Street East, Barrie, ON.

Drawing

CONTEXT

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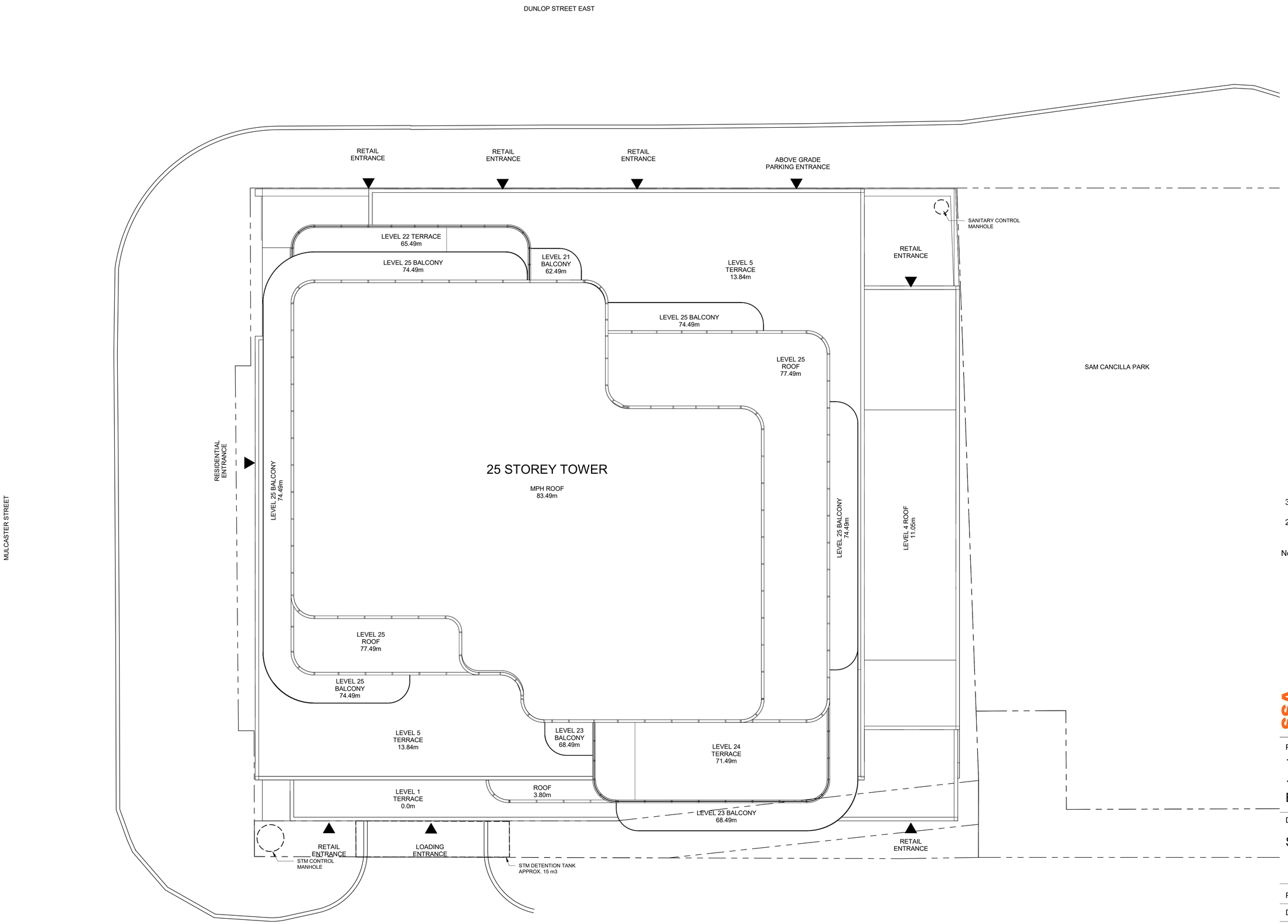
A1.01

Scale



1 Site plan
1 : 100

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Project
149 Dunlop

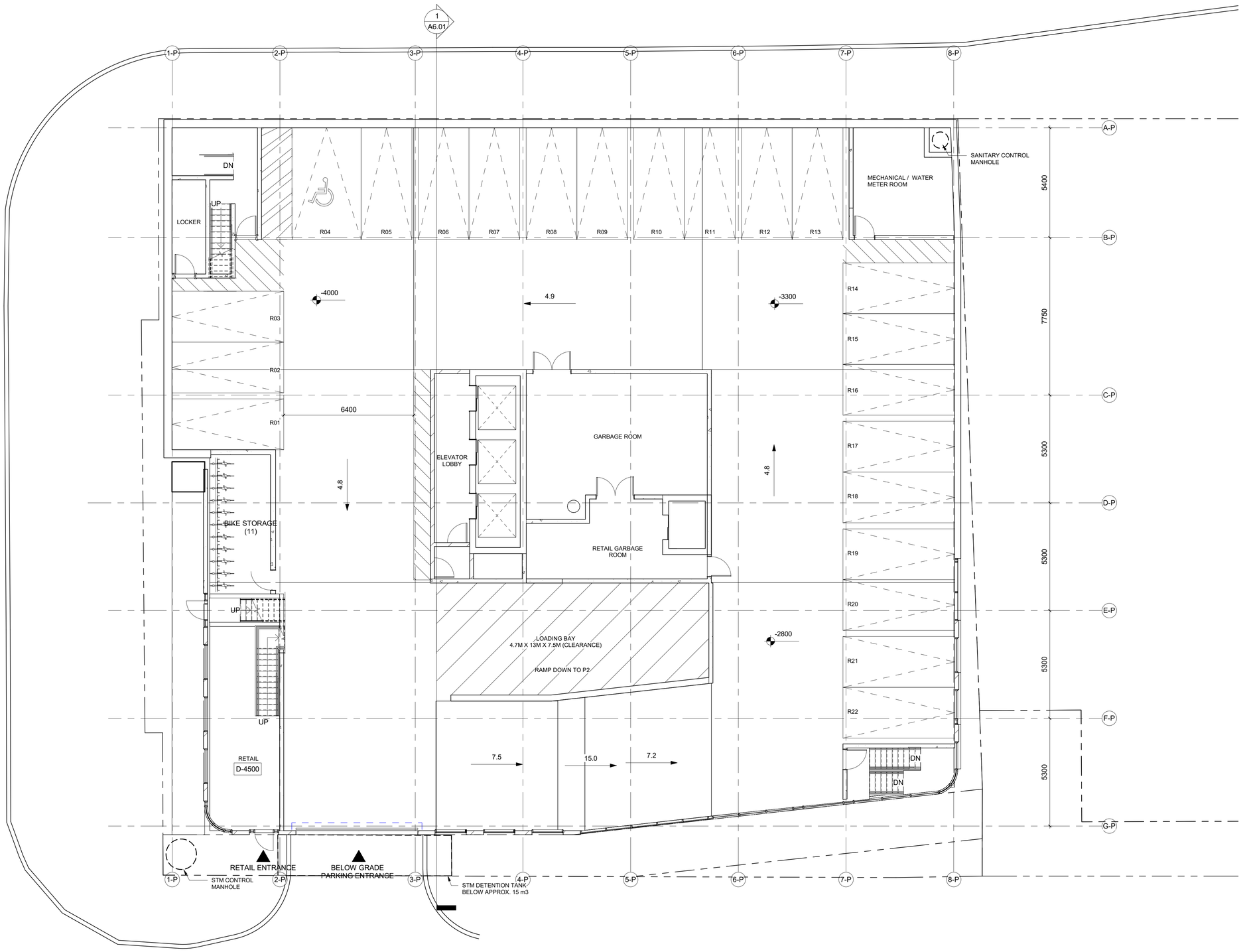
149 Dunlop Street East, Barrie, ON.

Drawing
SITE PLAN

Project number	27301
Date	Issue Date
Drawn by	Author
Checked by	Checker

A1.02

Scale



1 LEVEL P1
1 : 100

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LEVEL P1

Project number	27301
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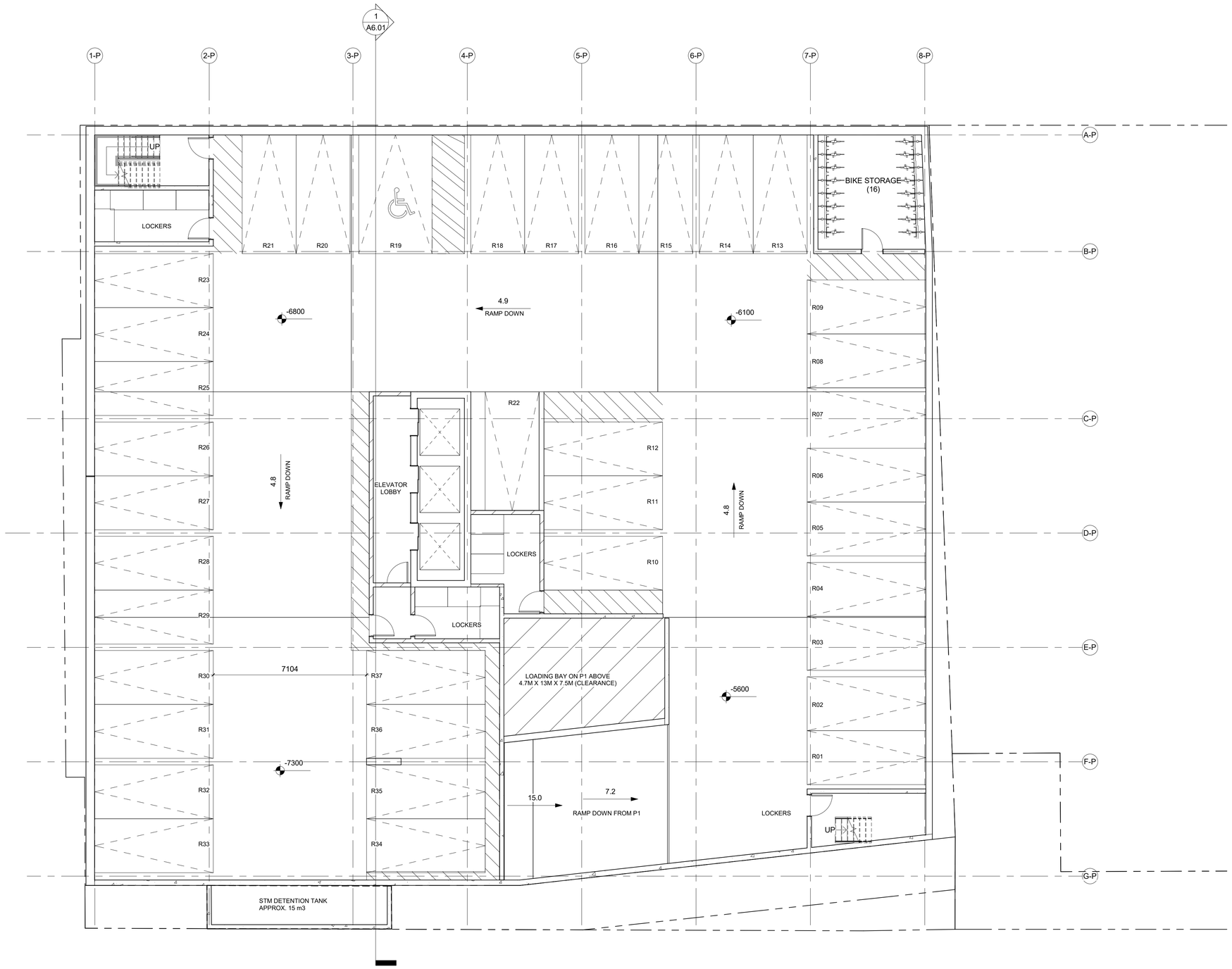
A2.01

Scale



1 LEVEL P2
1 : 100

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Drawing

LEVEL P2

Project number	27301
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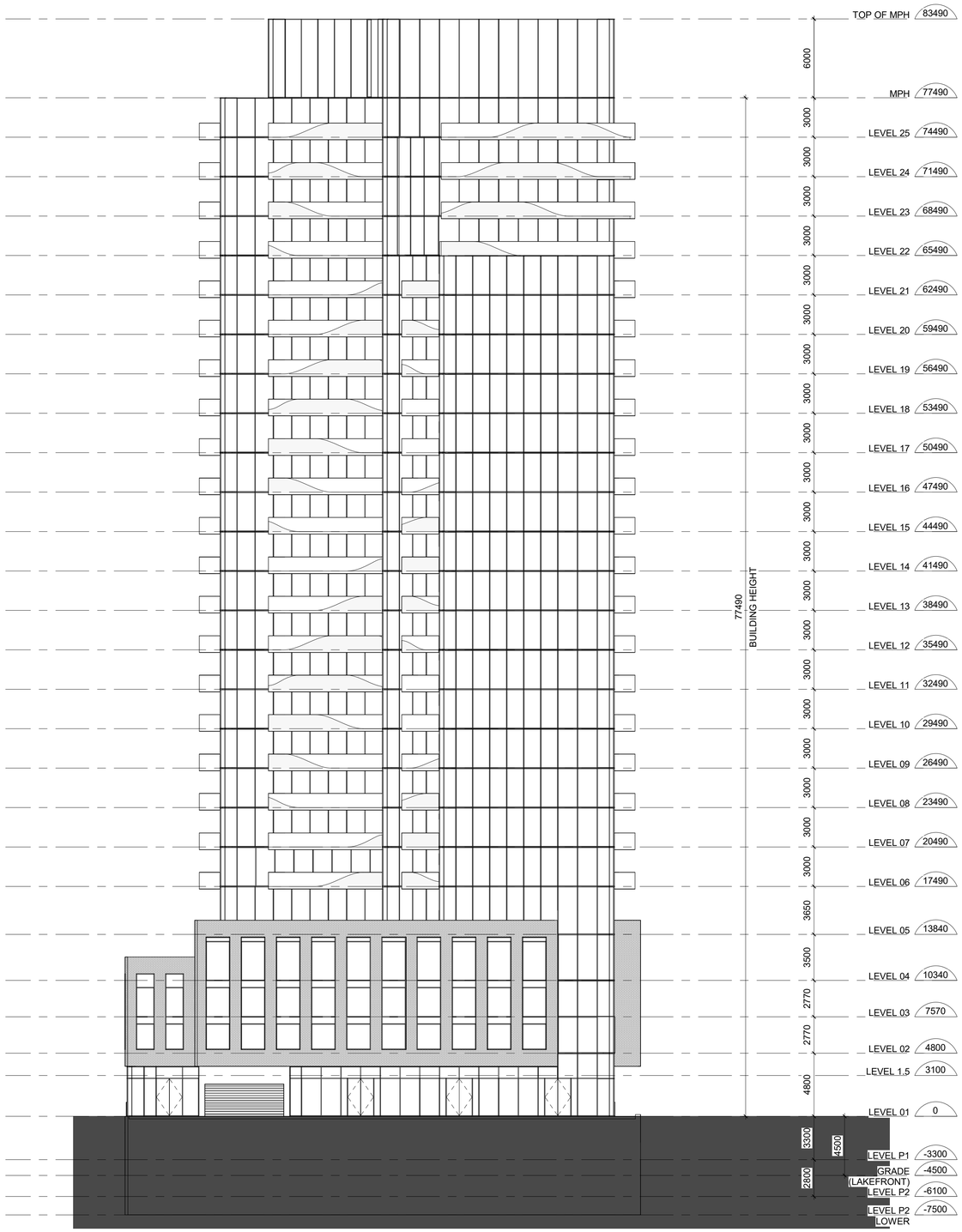
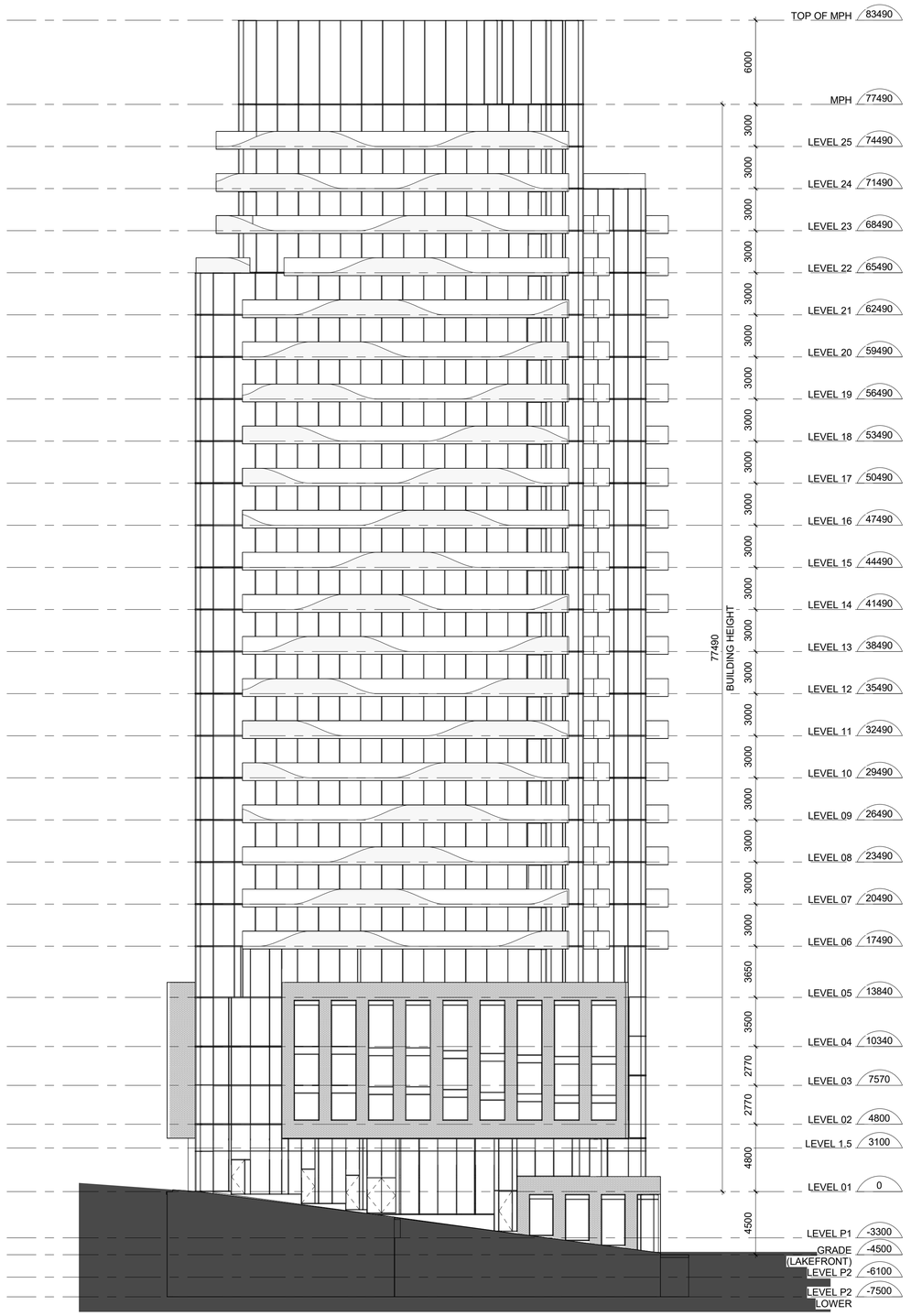
A2.02

Scale



1 North
1 : 200



2 West
1 : 200

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149 Dunlop

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Drawing
ELEVATIONS

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A5.03

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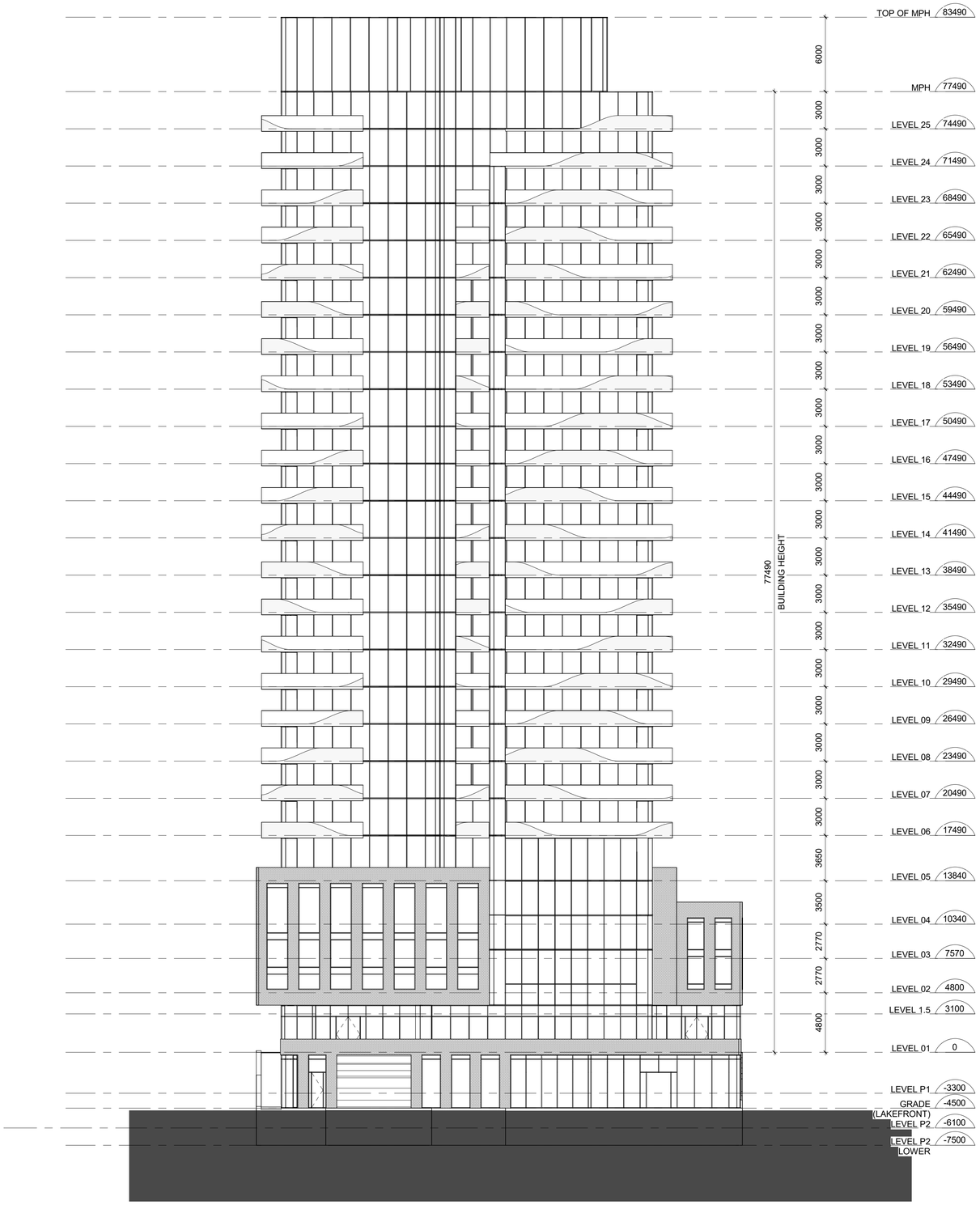
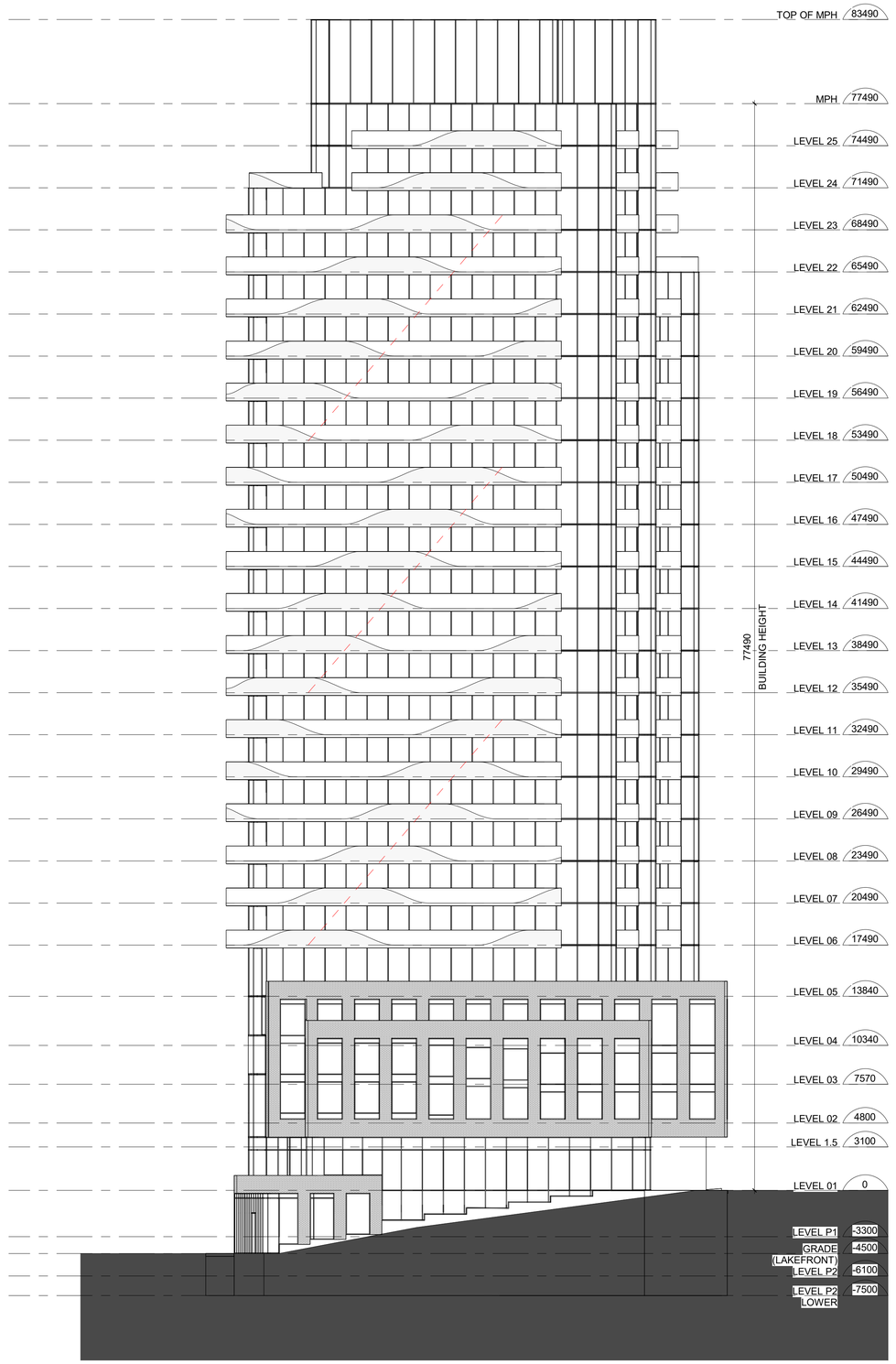


2 South
1 : 200



1 East
1 : 200

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Project
149 Dunlop
149 Dunlop Street East, Barrie, ON.

Drawing
ELEVATIONS

Project number	27301
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Drawn by	DD
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A5.04

Scale

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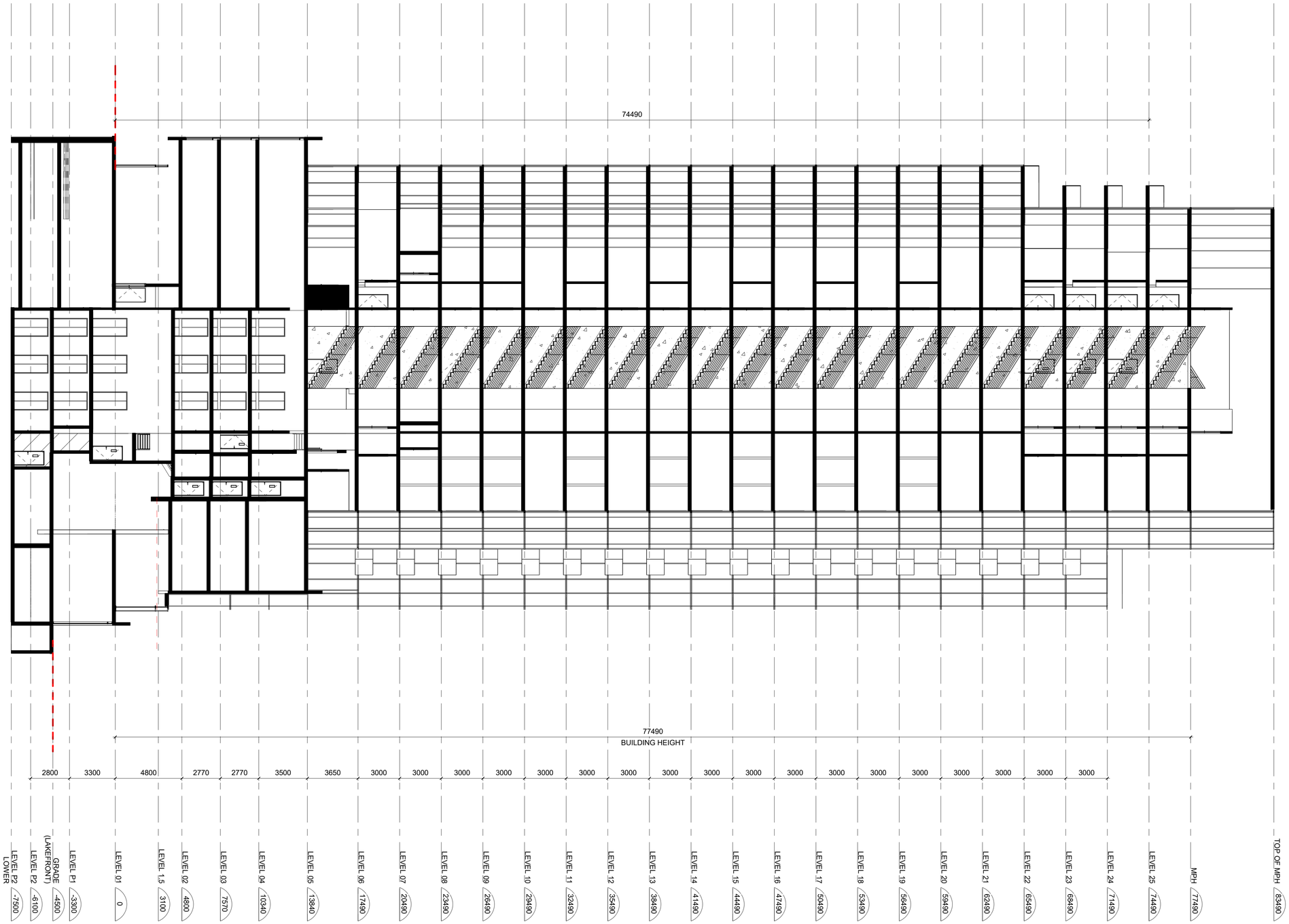

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Project

149 Dunlop

149 Dunlop Street East, Barrie, ON.

Drawing

BUILDING SECTION

Project number	27301
Date	Issue Date
Drawn by	Author
Checked by	Checker

A6.01

Scale

Appendix B

Borehole Logs

Watters Environmental Group Inc., 2020

WATTERS ENVIRONMENTAL GROUP INC.®
9135 Keele Street, Unit A1
Concord, Ontario L4K 0J4
www.wattersenvironmental.com
416-361-2407

Borehole No: BH1(MW)

Project No.: 20-0052.02

Client: Dunlop Developments (Barrie) Inc.

Location: 149-153 Dunlop Street East & 5 Mulcaster Street, Barrie, Ontario

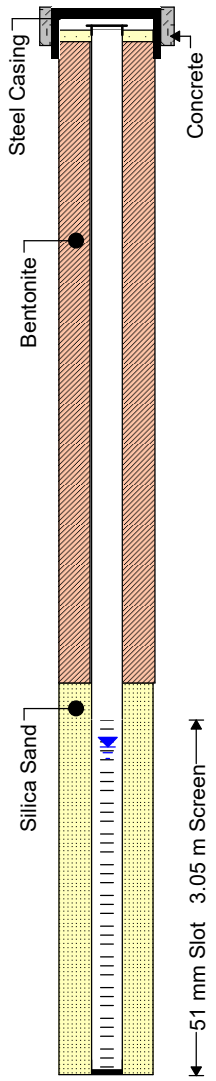
Ground Elevation: -

Total Depth: 9.14 m / 30 feet

Logged By: BDW

Project Manager: BW

SUBSURFACE PROFILE				SAMPLE						
Depth (ft / m)	Symbol	Description	Depth/Elev.	Number	Type	Blow Count	Recovery %	Vapour (CCG/PID)	Lab Submitted	Monitoring Well Completion Details
0 / 0		Ground Surface	0.00							
0 / 0		100mm ASPHALT	0.00	1	SS	3-5-5-4	75%	0,0	X	
1 / 0		FILL, medium sand, some cobbles, trace clay, medium brown to dark brown, moist, loose		2	SS	1-3-1-1	5%	-		
5 / 1			-1.52							
5 / 1		FILL, silty sand, trace gravel, trace cobbles, light to dark brown, moist, loose	1.52	3	SS	1-1-1-1	20%	0,0	X	
9 / 2		large cobble @ 2.74 m		4	SS	1-1-21-5	40%	0,0	X	
11 / 3		large cobble @ 3.35 m		5	SS	7-3-3-3	33%	0,0		
13 / 4			-4.11							
14 / 4		SAND, medium to coarse, some cobbles, light to medium brown	4.11	6	SS	7-23-9-5	40%	0,0		
16 / 5		trace organic material @ 5.03 m		7	SS	1-2-2-3	60%	0,0		
18 / 5		fine sand, some silt, trace organic material @ 5.49 m		8	SS	2-5-5-6	95%	0,0	X	
20 / 6				9	SS	3-5-6-7	66%	0,0		
23 / 7		saturated @ 7.32 m		10	SS	1-2-3-4	66%	0,0		
25 / 7		medium brown @ 7.62 m		11	SS	10-10-9-10	100%	0,0	X	
28 / 8		trace organic material @ 8.53 m		12	SS	3-6-7-10	100%	0,0		
30 / 9			-9.14							
30 / 9		End of Borehole	9.14							



Drilled By: Profile Drilling Inc., Mobile B-45 HD

Drill Method: Hollow Stem Augers & Split Spoon Sampling

Drill Date: June 11, 2020

Hole Size: 8"

Screening Tool: RKI Eagle II

Sheet: 1 of 1

WATTERS ENVIRONMENTAL GROUP INC.®
9135 Keele Street, Unit A1
Concord, Ontario L4K 0J4
www.wattersenvironmental.com
416-361-2407

Borehole No: BH2(MW)

Project No.: 20-0052.02

Client: Dunlop Developments (Barrie) Inc.

Location: 149-153 Dunlop Street East & 5 Mulcaster Street, Barrie, Ontario

Ground Elevation: -

Total Depth: 9.14 m / 30 feet

Logged By: BDW

Project Manager: BW

SUBSURFACE PROFILE				SAMPLE						
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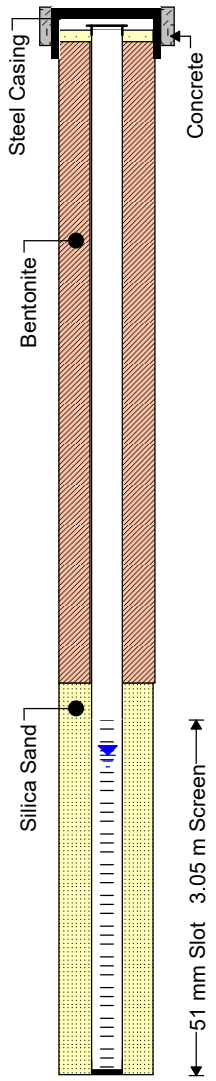
0 / 0		Ground Surface	0.00							
		100mm ASPHALT	0.00	1	SS	5-5-4-2	66%	0,0	X	
2		FILL, medium sand, some cobbles, trace gravel, brown, moist, loose	-0.76							
3 / 1		FILL, silty sand, trace gravel, trace cobbles, brown, moist, loose	0.76	2	SS	1-1-1-1	60%	0,0	X	
				3	SS	1-1-1	60%	0,0	X	
6 / 2				4	SS	1-1-1-1	45%	0,0		
9				5	SS	1-2-2-2	33%	0,0		
10 / 3										
13 / 4		large cobble @ 3.96 m		6	SS	2-5-11-16	15%	0,0	X	
15			-4.57							
16 / 5		SAND and GRAVEL, trace cobbles, trace oxidation, brown, moist	4.57	7	SS	11-17-19-27	50%	0,0		
17			-5.33							
18		SAND, coarse, trace cobble, trace gravel, brown, moist	5.33	8	SS	10-10-8-9	20%	0,0		
20 / 6				9	SS	4-8-14-19	60%	0,0		
22		saturated @ 6.71 m								
23 / 7				10	SS	3-4-5-10	100%	0,0	X	
25				11	SS	4-6-10-7	60%	0,0		
26 / 8										
28				12	SS	3-6-5-3	66%	0,0		
29 / 9										
30			-9.14							
		End of Borehole	9.14							
33 / 10										



Drilled By: Profile Drilling Inc., Mobile B-45 HD

Drill Method: Hollow Stem Augers & Split Spoon Sampling

Drill Date: June 12, 2020

Hole Size: 8"

Screening Tool: RKI Eagle II

Sheet: 1 of 1

WATTERS ENVIRONMENTAL GROUP INC.®
9135 Keele Street, Unit A1
Concord, Ontario L4K 0J4
www.wattersenvironmental.com
416-361-2407

Borehole No: BH3

Project No.: 20-0052.02

Client: Dunlop Developments (Barrie) Inc.

Location: 149-153 Dunlop Street East & 5 Mulcaster Street, Barrie, Ontario

Ground Elevation: -

Total Depth: 0.30 m / 1 foot

Logged By: BDW

Project Manager: BW

SUBSURFACE PROFILE				SAMPLE						
Depth (ft / m)	Symbol	Description	Depth/Elev.	Number	Type	Blow Count	Recovery %	Vapour (CCG/PID)	Lab Submitted	Monitoring Well Completion Details
0 / 0		Ground Surface	0.00							
0 / 0		TOPSOIL, trace sand, trace gravel, moist	0.00	1	SS		100%	0,0	X	
		End of Borehole (Refusal)								

ft: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33

m: 0 1 2 3 4 5 6 7 8 9 10

Drilled By: Profile Drilling Inc., Pionjar

Drill Method: Split Spoon Sampling

Drill Date: June 12, 2020

Hole Size: 2"

Screening Tool: RKI Eagle II

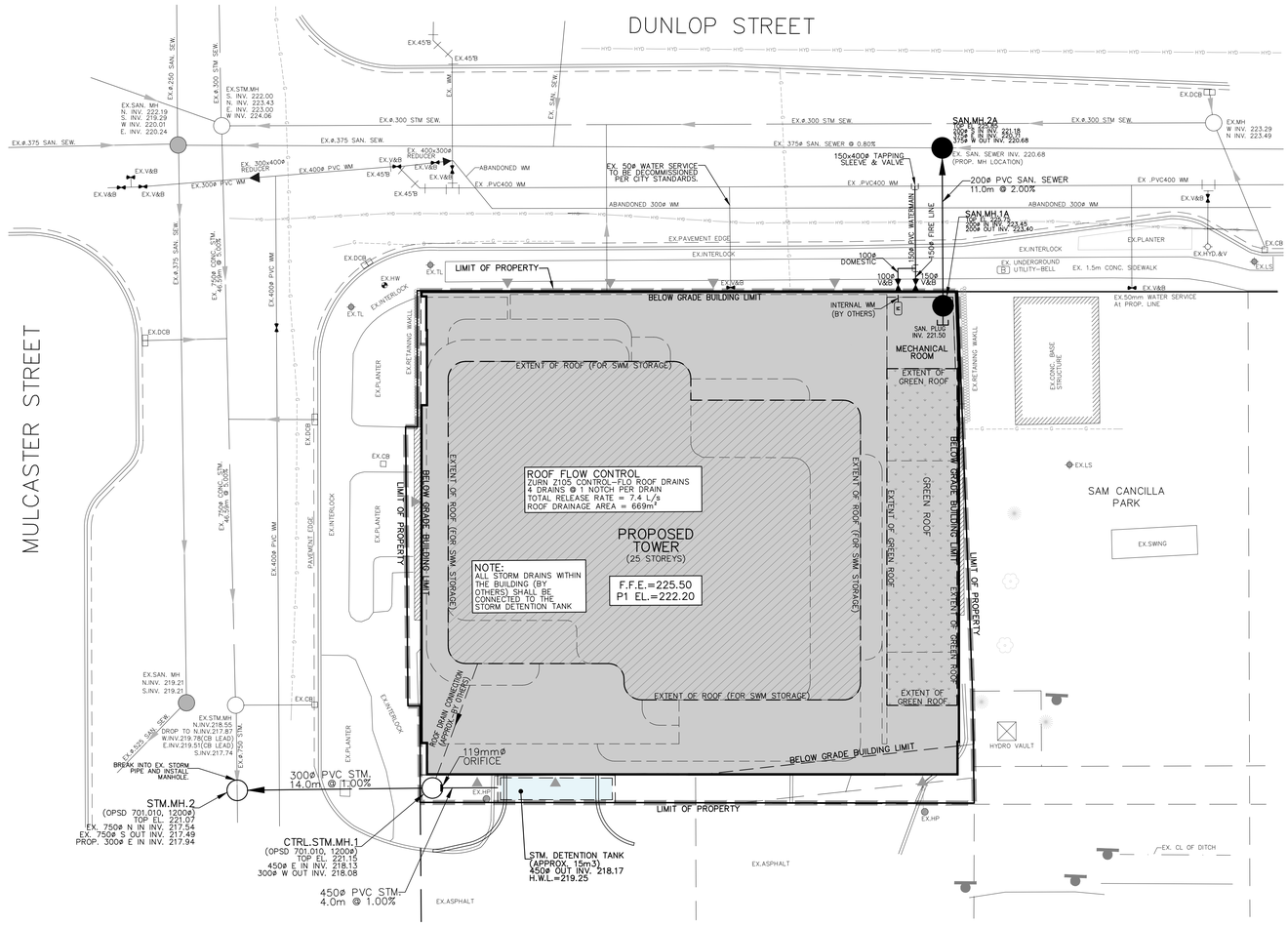
Sheet: 1 of 1

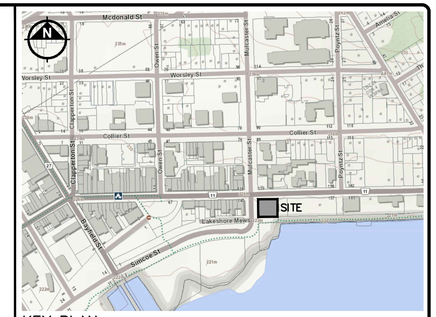
Appendix C

Site Grading Plan

Urban Works, 2022

ISSUED FOR DESIGN COORDINATION





KEY PLAN
N.T.S.

SUBMISSION HISTORY

No.	ISSUED FOR	DATE

REVISIONS

No.	DESCRIPTION	BY	DATE

BENCHMARK NOTE:
xxxxxxxx

CONSULTANT

MUNICIPAL APPROVAL

CITY OF BARRIE
APPROVED
DATE. . . . . .
. . . . . .

urbanworks
ENGINEERING CORPORATION
Toronto, Ontario, CANADA | tel. 416-503-4500
e. general@urbanworkseng.com | w. www.urbanworkseng.com

MIXED USE HIGH RISE DEVELOPMENT
149 DUNLOP STREET EAST

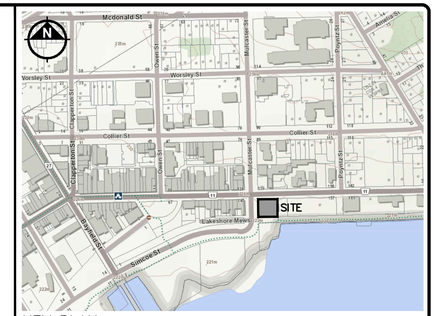
Barrie
ENGINEERING DEPARTMENT

SCALE
0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0m

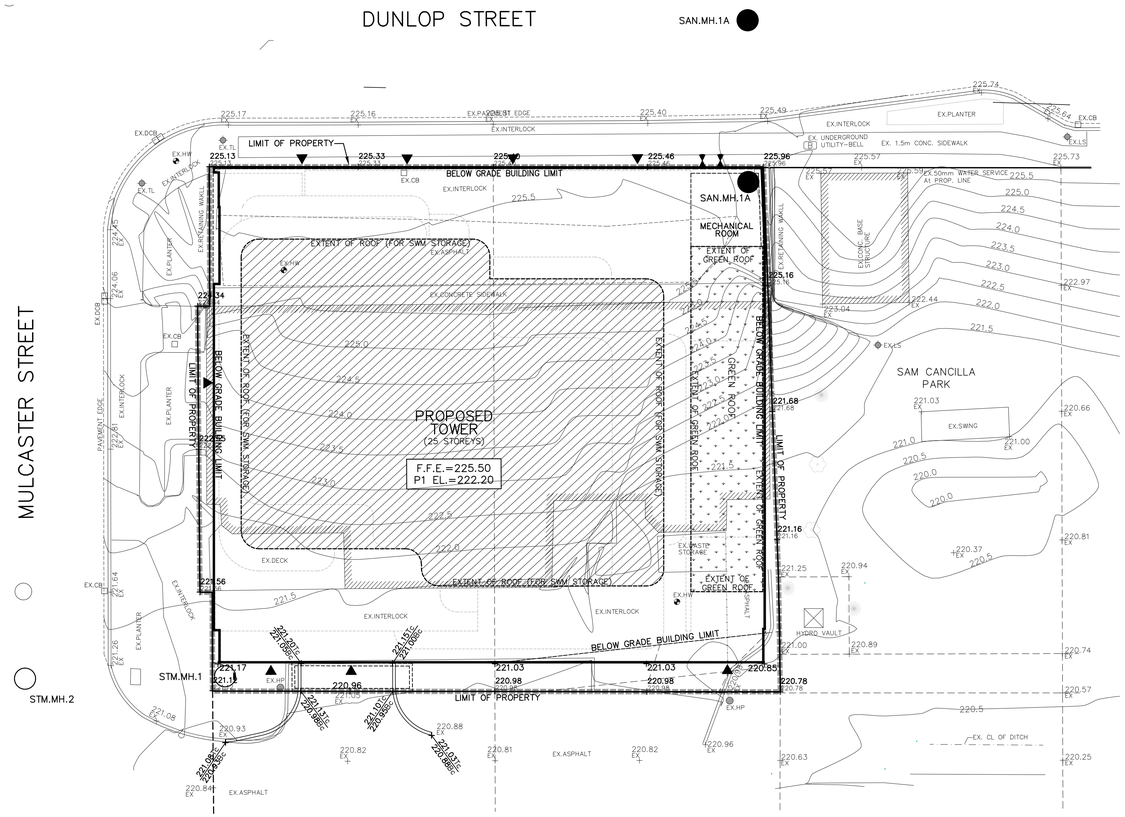
PRELIMINARY SERVICING PLAN

CITY FILE: D28-011-2022		PROJECT No.	22-0017BA
COUNTY FILE:			
DATE:	DESIGNED BY: M.M.	DWG. No.	SS-1
SCALE:	DRAWN BY: M.M.		
	CHECKED BY: T.D.		

ISSUED FOR DESIGN COORDINATION



KEY PLAN
N.T.S.



SUBMISSION HISTORY		
No.	ISSUED FOR	DATE

REVISIONS			
No.	DESCRIPTION	BY	DATE

BENCHMARK NOTE:
xxxxxxxx

CONSULTANT

MUNICIPAL APPROVAL

CITY OF BARRIE
APPROVED
DATE. . . . . .
. . . . . .

urbanworks
ENGINEERING CORPORATION
Toronto, Ontario, CANADA | tel. 416-503-4500
e. general@urbanworkseng.com | w. www.urbanworkseng.com

MIXED USE HIGH RISE DEVELOPMENT
149 DUNLOP STREET EAST

Barrie
ENGINEERING DEPARTMENT

SCALE

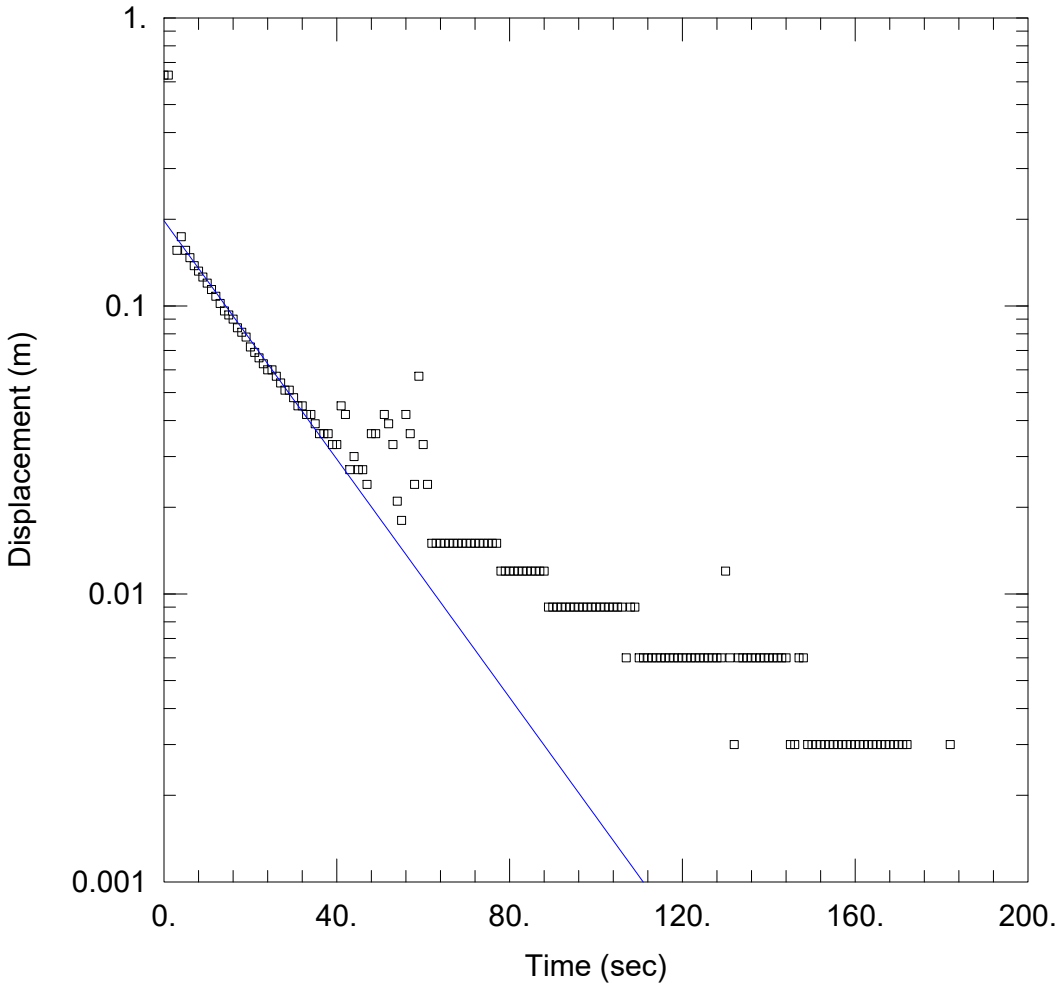
PRELIMINARY GRADING PLAN

CITY FILE: D28-011-2022		PROJECT No. 22-0017BA
COUNTY FILE:		
DATE:	DESIGNED BY: M.M.	DWG. No. SG-01
SCALE:	DRAWN BY: M.M.	
	CHECKED BY: T.D.	

Appendix D

Single Well Response Tests

Palmer, 2020



FALLING HEAD TEST #1

Data Set: Z:\...\MW1_FH1.aqt
Date: 08/27/20 Time: 12:14:16

PROJECT INFORMATION

Company: Palmer
Client: Watters Environmental Group
Project: 2001505
Location: 149-153 Dunlop Street E
Test Well: MW1
Test Date: August 20, 2020

AQUIFER DATA

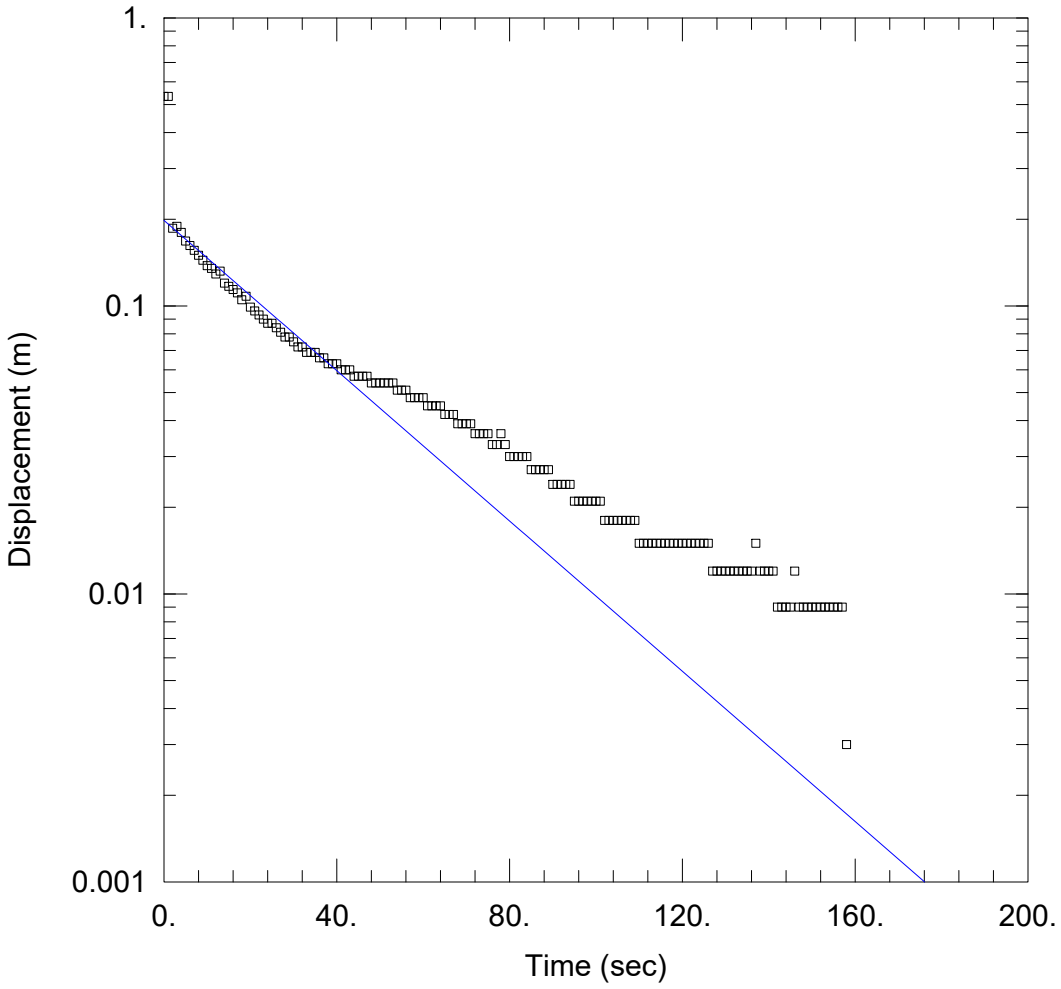
Saturated Thickness: 2.62 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW1)

Initial Displacement: 0.633 m
Total Well Penetration Depth: 3.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 2.62 m
Screen Length: 3.05 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 2.152E-5 m/sec
y0 = 0.1975 m



FALLING HEAD TEST #2

Data Set: Z:\...\MW1_FH2.aqt
Date: 08/27/20 Time: 12:22:52

PROJECT INFORMATION

Company: Palmer
Client: Watters Environmental Group
Project: 2001505
Location: 149-153 Dunlop Street E
Test Well: MW1
Test Date: August 20, 2020

AQUIFER DATA

Saturated Thickness: 2.62 m Anisotropy Ratio (Kz/Kr): 0.1

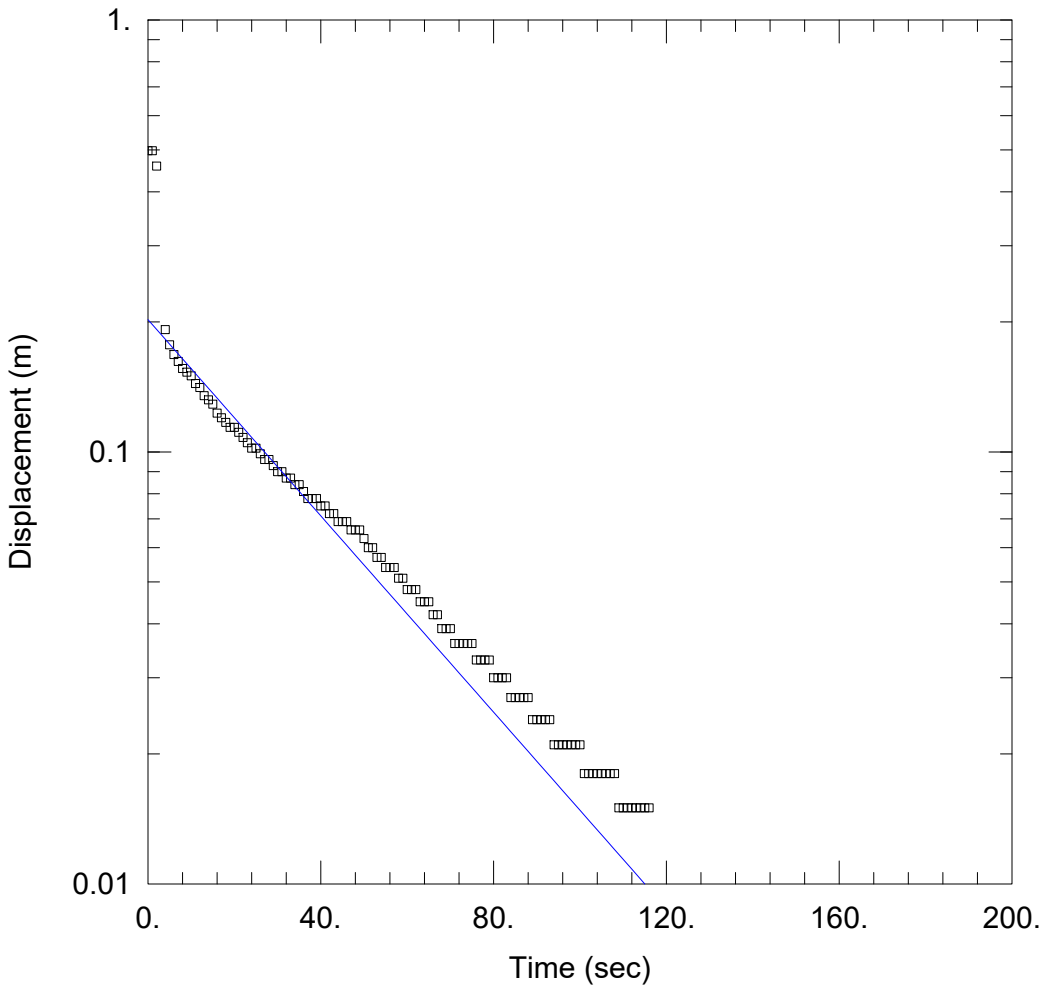
WELL DATA (MW1)

Initial Displacement: 0.534 m
Total Well Penetration Depth: 3.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 2.62 m
Screen Length: 3.05 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.356E-5 m/sec
y0 = 0.1981 m



FALLING HEAD TEST #3

Data Set: Z:\...\MW1_FH3.aqt
Date: 08/27/20 Time: 12:33:35

PROJECT INFORMATION

Company: Palmer
Client: Watters Environmental Group
Project: 2001505
Location: 149-153 Dunlop Street E
Test Well: MW1
Test Date: August 20, 2020

AQUIFER DATA

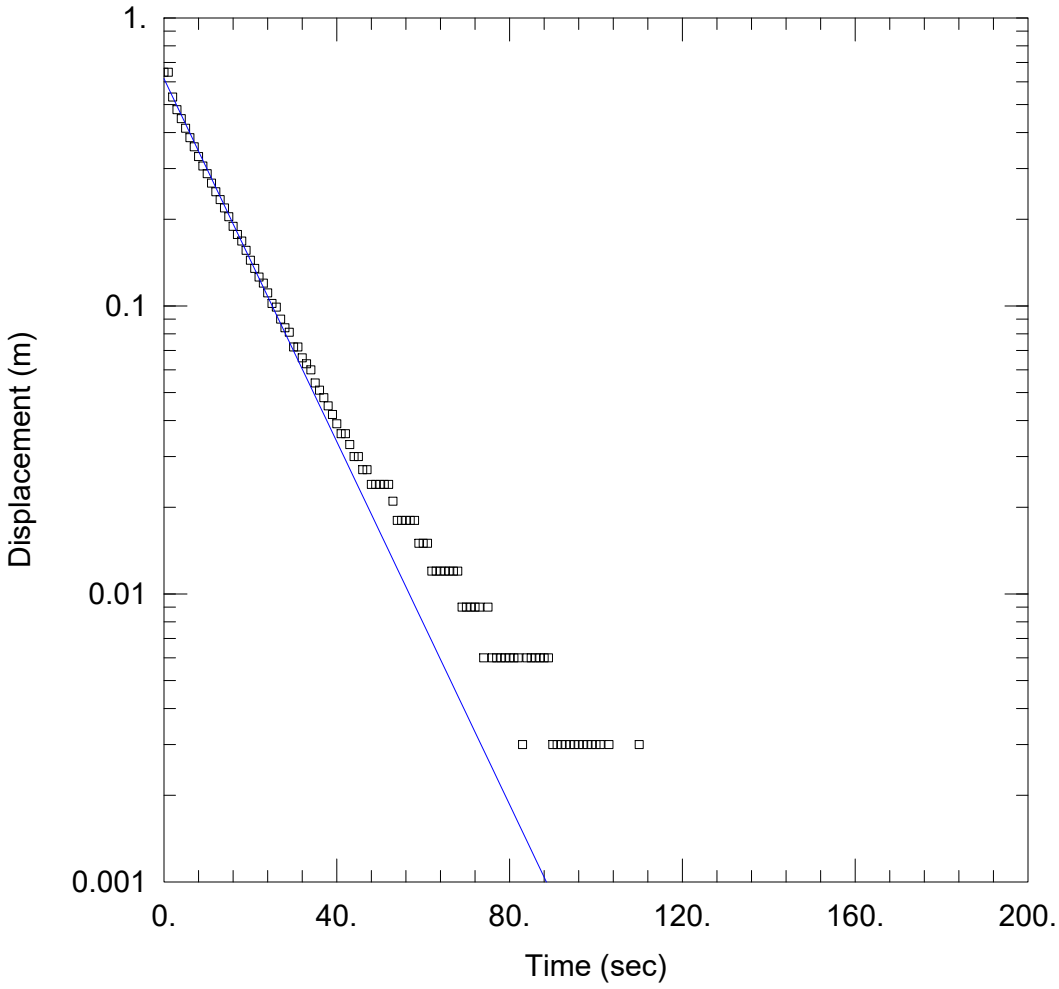
Saturated Thickness: 2.62 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW1)

Initial Displacement: 0.498 m
Total Well Penetration Depth: 3.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 2.62 m
Screen Length: 3.05 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 1.181E-5 m/sec
y0 = 0.2024 m



RISING HEAD TEST #1

Data Set: Z:\...\MW1_RH1.aqt
Date: 08/27/20 Time: 12:17:47

PROJECT INFORMATION

Company: Palmer
Client: Watters Environmental Group
Project: 2001505
Location: 149-153 Dunlop Street E
Test Well: MW1
Test Date: August 20, 2020

AQUIFER DATA

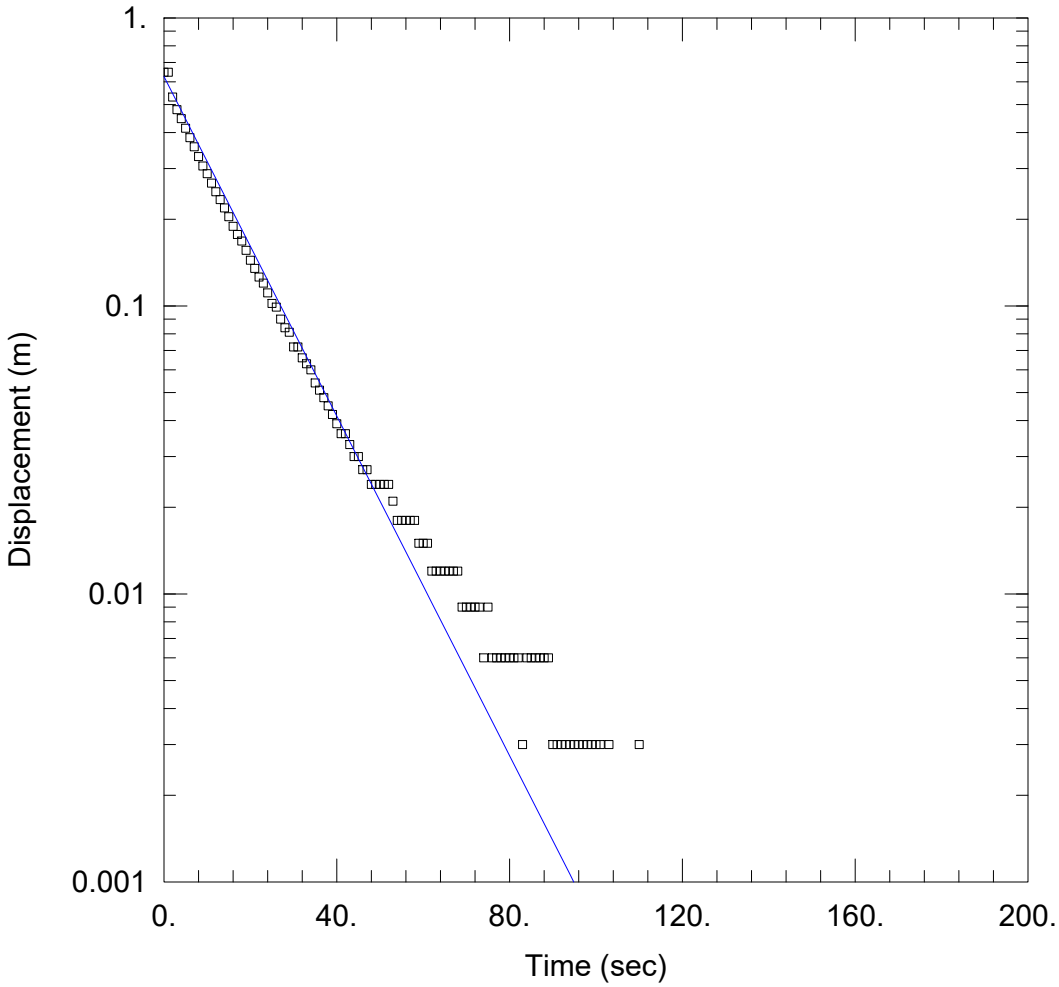
Saturated Thickness: 2.62 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW1)

Initial Displacement: 0.648 m
Total Well Penetration Depth: 3.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 2.62 m
Screen Length: 3.05 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.276E-5 m/sec
y0 = 0.6153 m



RISING HEAD TEST #2

Data Set: Z:\...\MW1_RH2.aqt
Date: 08/27/20 Time: 12:27:39

PROJECT INFORMATION

Company: Palmer
Client: Watters Environmental Group
Project: 2001505
Location: 149-153 Dunlop Street E
Test Well: MW1
Test Date: August 20, 2020

AQUIFER DATA

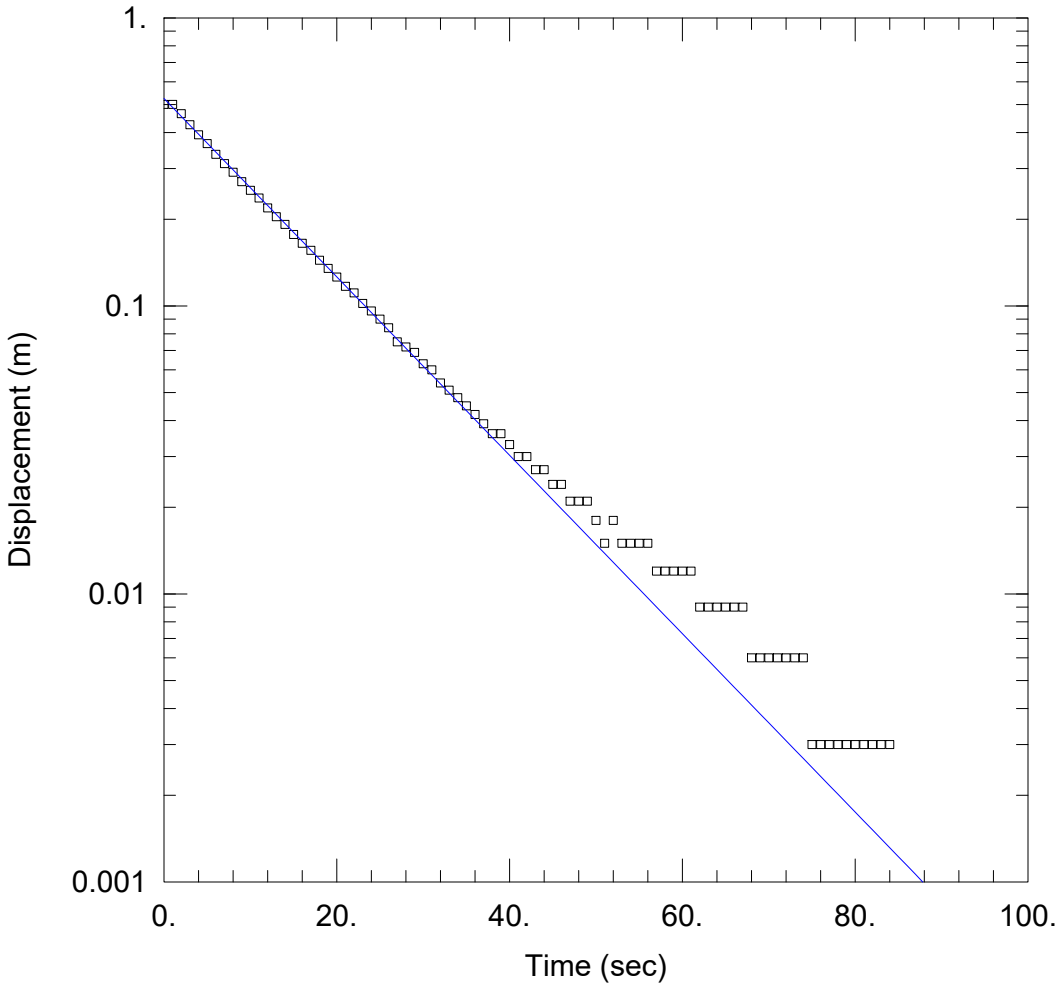
Saturated Thickness: 2.62 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW1)

Initial Displacement: 0.648 m
Total Well Penetration Depth: 3.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 2.62 m
Screen Length: 3.05 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.065E-5 m/sec
y0 = 0.6256 m



RISING HEAD TEST #3

Data Set: Z:\...\MW1_RH3.aqt
Date: 08/27/20 Time: 12:36:12

PROJECT INFORMATION

Company: Palmer
Client: Watters Environmental Group
Project: 2001505
Location: 149-153 Dunlop Street E
Test Well: MW1
Test Date: August 20, 2020

AQUIFER DATA

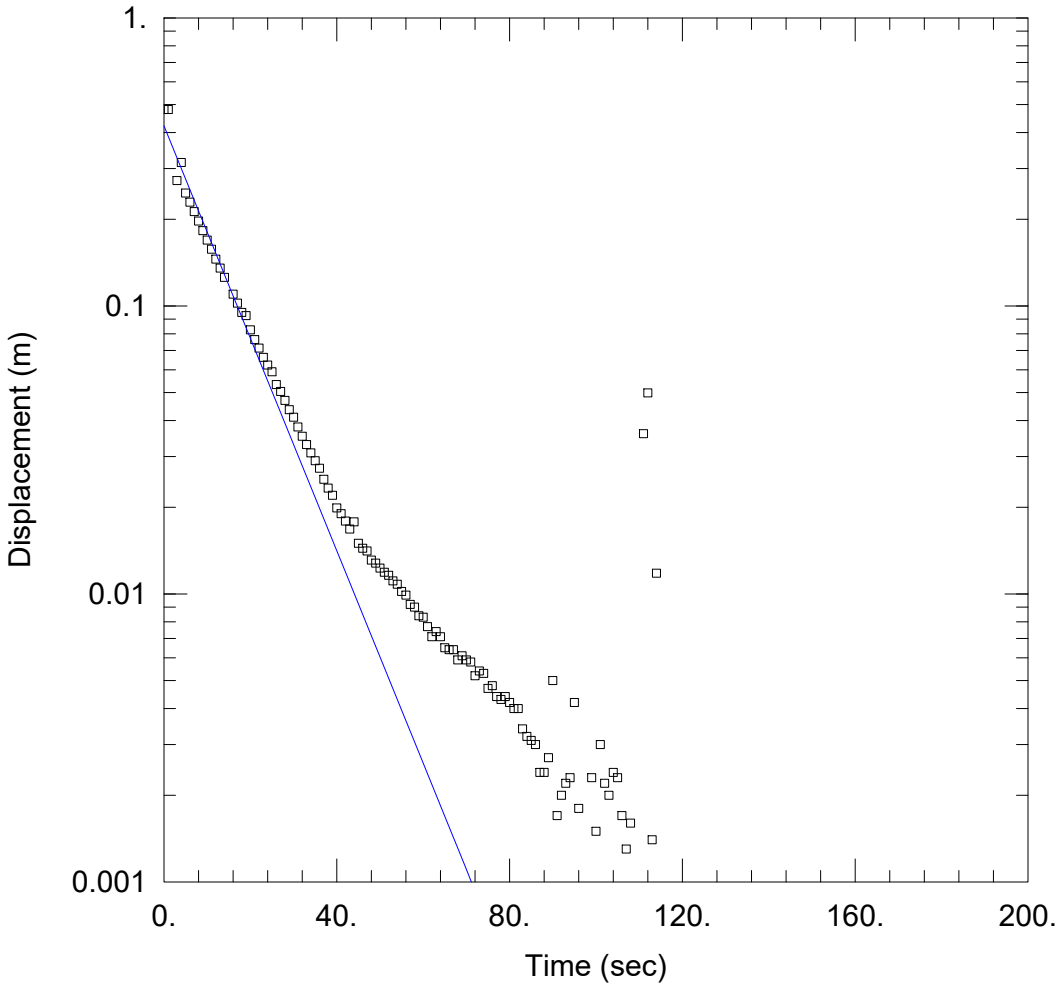
Saturated Thickness: 2.62 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW1)

Initial Displacement: 0.501 m
Total Well Penetration Depth: 3.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 2.62 m
Screen Length: 3.05 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.22E-5 m/sec
y0 = 0.5249 m



FALLING HEAD TEST #1

Data Set:
Date: 08/27/20 Time: 12:57:09

PROJECT INFORMATION

Company: Palmer
Client: Watters Environmental Group
Project: 2001505
Location: 149-153 Dunlop Street E
Test Well: MW2
Test Date: August 20, 2020

AQUIFER DATA

Saturated Thickness: 2.59 m Anisotropy Ratio (Kz/Kr): 0.1

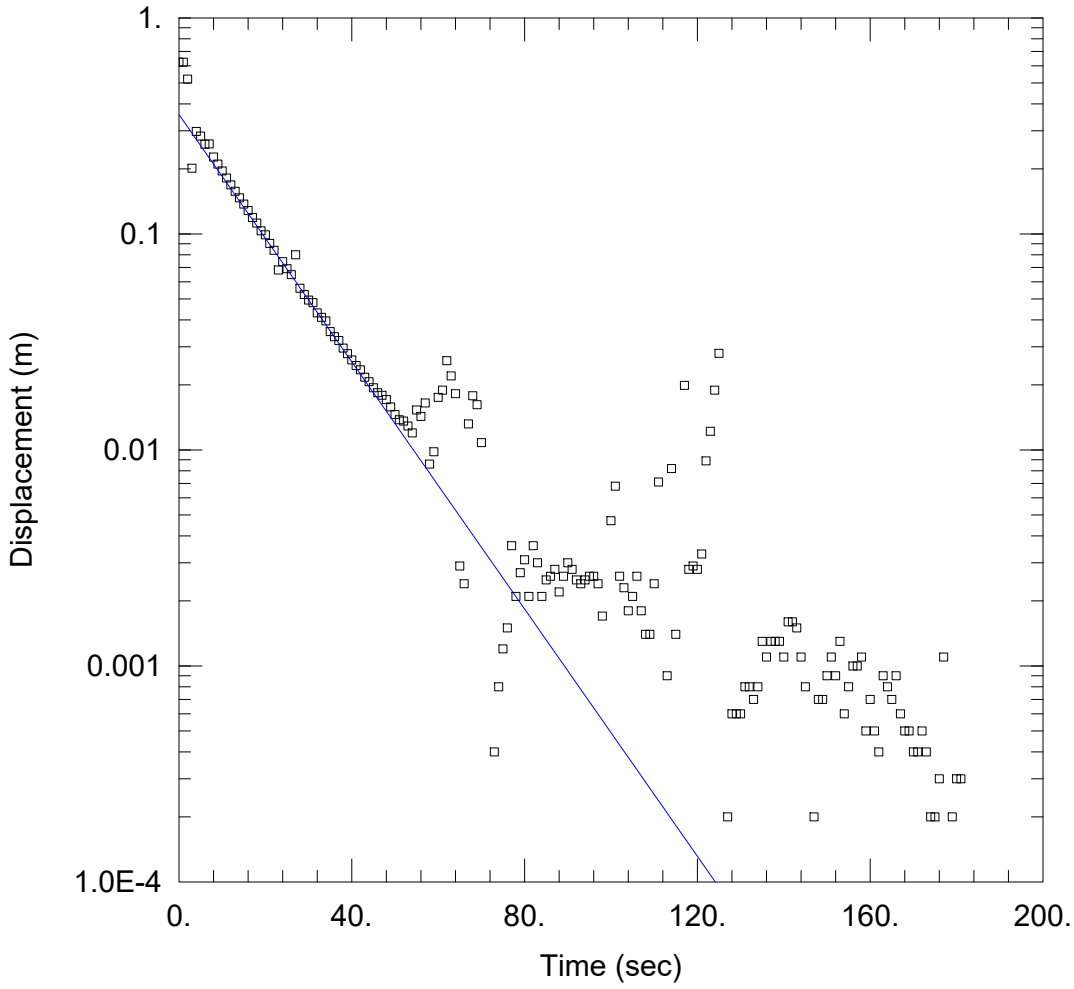
WELL DATA (MW2)

Initial Displacement: 0.4807 m Static Water Column Height: 2.59 m
Total Well Penetration Depth: 3.05 m Screen Length: 3.05 m
Casing Radius: 0.0254 m Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 3.877E-5 m/sec y0 = 0.4217 m



FALLING HEAD TEST #2

Data Set: Z:\...\MW2_FH2.aqt
Date: 08/27/20 Time: 13:08:33

PROJECT INFORMATION

Company: Palmer
Client: Watters Environmental Group
Project: 2001505
Location: 149-153 Dunlop Street E
Test Well: MW2
Test Date: August 20, 2020

AQUIFER DATA

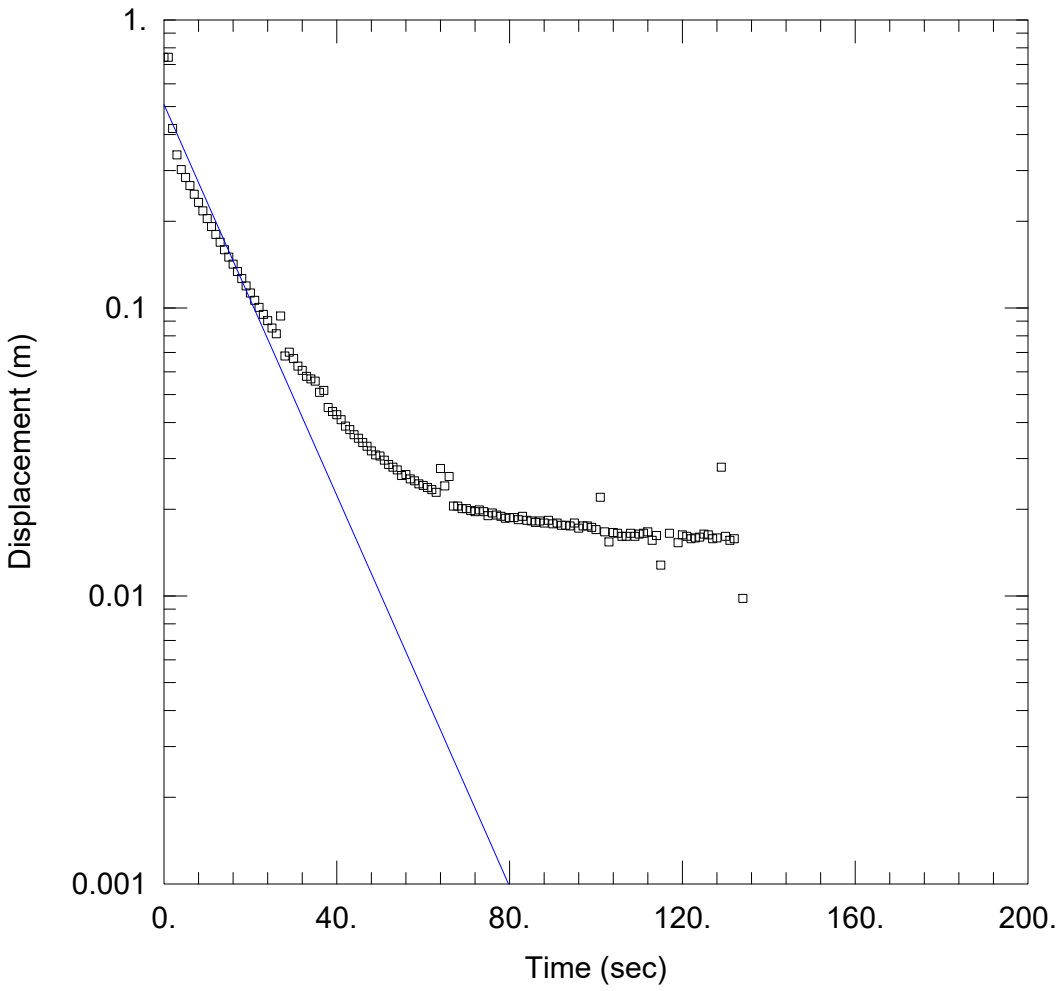
Saturated Thickness: 2.59 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW2)

Initial Displacement: 0.6243 m
Total Well Penetration Depth: 3.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 2.59 m
Screen Length: 3.05 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.008E-5 m/sec
y0 = 0.3566 m



FALLING HEAD TEST #3

Data Set: Z:\...\MW2_FH3.aqt
Date: 08/27/20 Time: 13:20:22

PROJECT INFORMATION

Company: Palmer
Client: Watters Environmental Group
Project: 2001505
Location: 149-153 Dunlop Street E
Test Well: MW2
Test Date: August 20, 2020

AQUIFER DATA

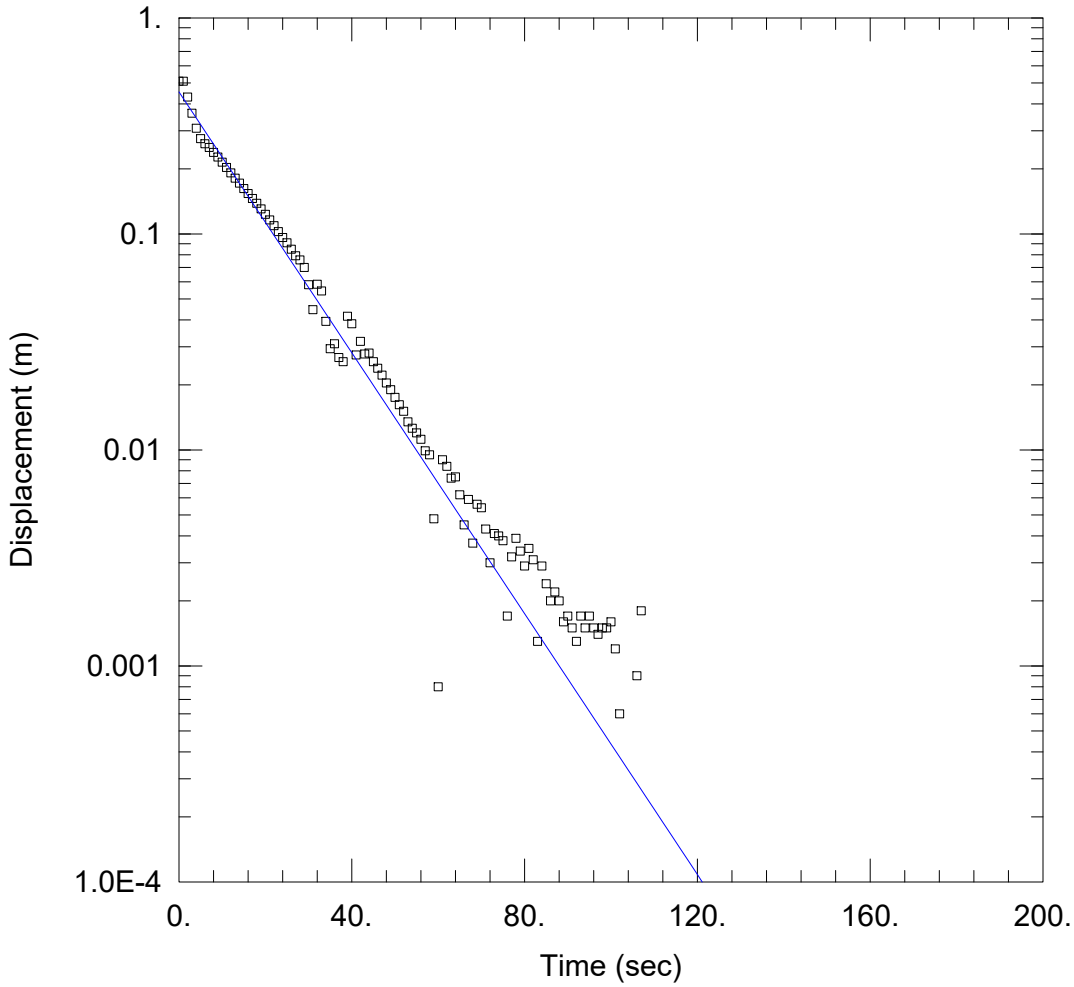
Saturated Thickness: 2.59 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW2)

Initial Displacement: 0.7415 m
Total Well Penetration Depth: 3.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 2.59 m
Screen Length: 3.05 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.568E-5 m/sec
y0 = 0.5087 m



RISING HEAD TEST #1

Data Set: Z:\...\MW2_RH1.aqt
Date: 08/27/20 Time: 12:59:32

PROJECT INFORMATION

Company: Palmer
Client: Watters Environmental Group
Project: 2001505
Location: 149-153 Dunlop Street E
Test Well: MW2
Test Date: August 20, 2020

AQUIFER DATA

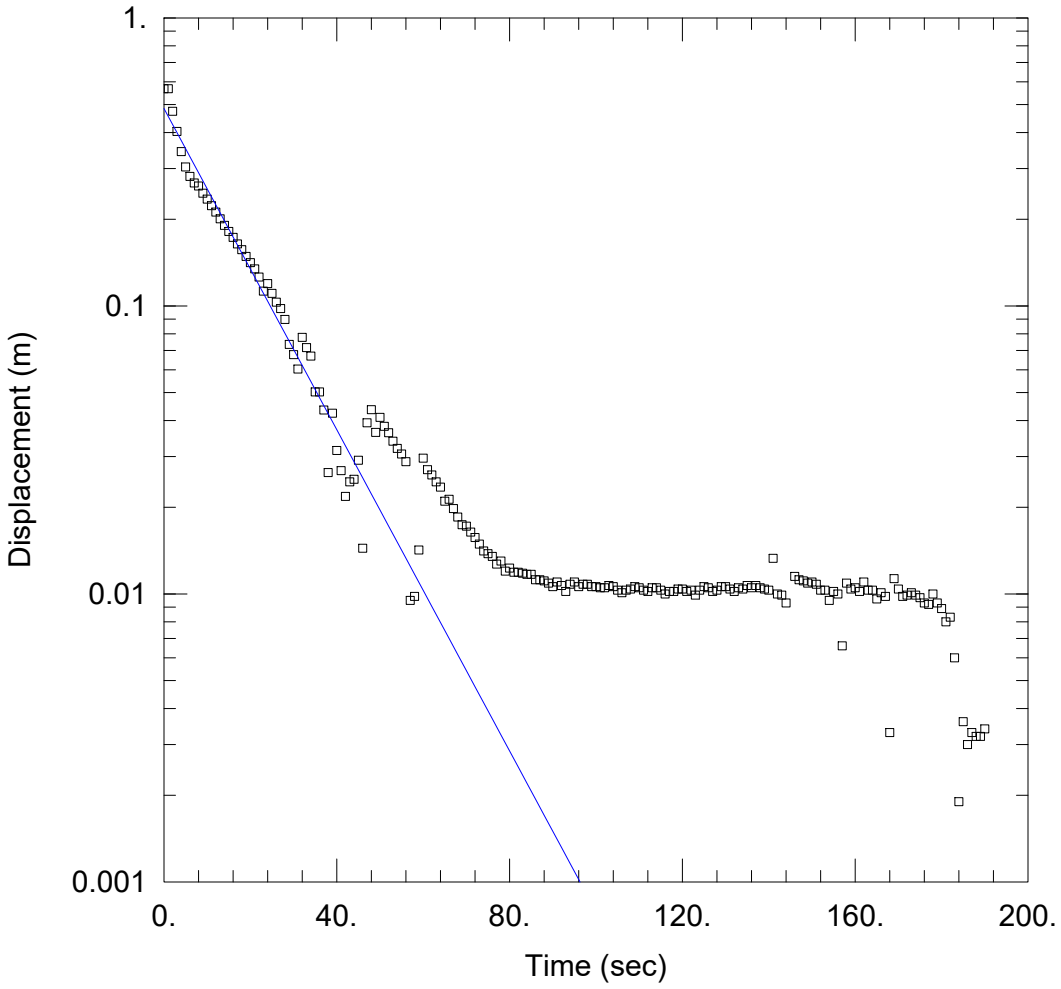
Saturated Thickness: 2.59 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW2)

Initial Displacement: 0.5093 m
Total Well Penetration Depth: 3.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 2.59 m
Screen Length: 3.05 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.174E-5 m/sec
y0 = 0.4543 m



RISING HEAD TEST #2

Data Set: Z:\...\MW2_RH2.aqt
Date: 08/27/20 Time: 13:18:35

PROJECT INFORMATION

Company: Palmer
Client: Watters Environmental Group
Project: 2001505
Location: 149-153 Dunlop Street E
Test Well: MW2
Test Date: August 20, 2020

AQUIFER DATA

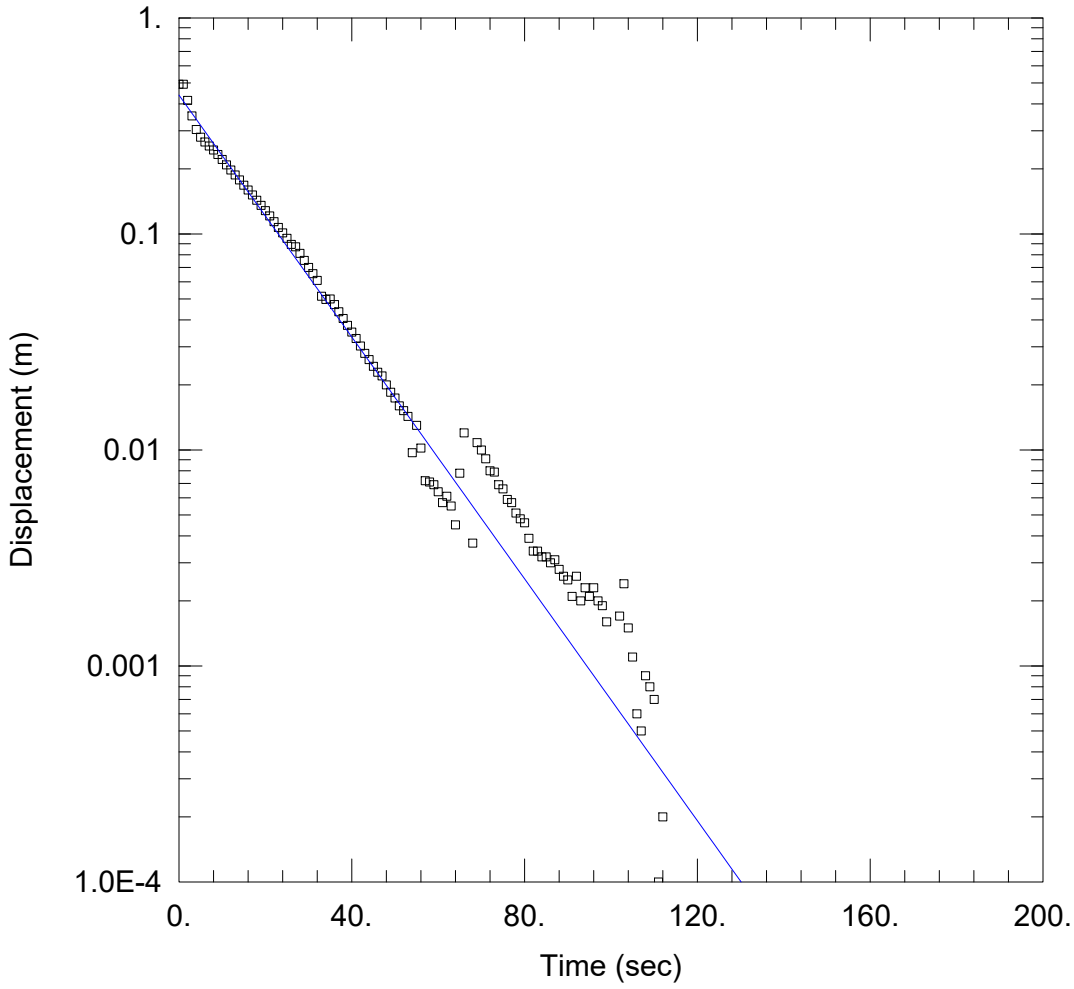
Saturated Thickness: 2.59 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW2)

Initial Displacement: 0.5675 m
Total Well Penetration Depth: 3.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 2.59 m
Screen Length: 3.05 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 2.932E-5 m/sec
y0 = 0.4847 m



RISING HEAD TEST #3

Data Set: Z:\...\MW2_RH3.aqt
Date: 08/27/20 Time: 13:22:30

PROJECT INFORMATION

Company: Palmer
Client: Watters Environmental Group
Project: 2001505
Location: 149-153 Dunlop Street E
Test Well: MW2
Test Date: August 20, 2020

AQUIFER DATA

Saturated Thickness: 2.59 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW2)

Initial Displacement: 0.4933 m
Total Well Penetration Depth: 3.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 2.59 m
Screen Length: 3.05 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 2.943E-5 m/sec
y0 = 0.4392 m

Appendix E

Certificate of Analysis

ALS, 2020

SGS, 2020

PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
ATTN: Supriya Singh
74 Berkeley Street
Toronto ON M5V 1E3

Date Received: 20-AUG-20
Report Date: 28-AUG-20 12:57 (MT)
Version: FINAL

Client Phone: 647-795-8153

Certificate of Analysis

Lab Work Order #: L2491857

Project P.O. #: NOT SUBMITTED
Job Reference: 2001505
C of C Numbers:
Legal Site Desc:

Jennifer Barkshire-Paterson
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)						
L2491857-1	MW2	Anions and Nutrients	Chloride (Cl)	4850	1500	mg/L
Ontario Sewer Use Bylaws - Barrie Storm Sewer (2012-172)						
L2491857-1	MW2	Physical Tests	Total Suspended Solids	100	15	mg/L
		Total Metals	Copper (Cu)-Total	0.0234	0.01	mg/L
			Zinc (Zn)-Total	0.044	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: L2491857-1 Sample Date: 20-AUG-20 Sample ID: MW2
pH	pH units	6.0-9.5	6.0-9.5	7.69
Total Suspended Solids	mg/L	350	15	100

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

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2491857-1 Sample Date: 20-AUG-20 Sample ID: MW2
Chloride (Cl)	mg/L	1500	-	4850 DLDS
Fluoride (F)	mg/L	10	-	<0.40 DLDS
Total Kjeldahl Nitrogen	mg/L	100	-	0.19
Phosphorus, Total	mg/L	10	-	0.236
Sulfate (SO4)	mg/L	1500	-	178 DLDS
Sulphide (as S)	mg/L	-	-	<0.018
Sulphide (as H2S)	mg/L	1	-	<0.019

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	L2491857-1
			Sample Date	20-AUG-20
			Sample ID	MW2
		Guide Limits		
Analyte	Unit	#1	#2	
Cyanide, Total	mg/L	1.2	-	0.0165

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: L2491857-1 Sample Date: 20-AUG-20 Sample ID: MW2
Aluminum (Al)-Total	mg/L	50	-	11.3 DLHC
Antimony (Sb)-Total	mg/L	5	-	<0.0010 DLHC
Arsenic (As)-Total	mg/L	1	-	0.0030 DLHC
Barium (Ba)-Total	mg/L	5	-	0.722 DLHC
Bismuth (Bi)-Total	mg/L	5	-	<0.00050 DLHC
Cadmium (Cd)-Total	mg/L	0.7	0.001	0.000074 DLHC
Chromium (Cr)-Total	mg/L	2	0.08	0.0182 DLHC
Cobalt (Co)-Total	mg/L	5.0	-	0.0079 DLHC
Copper (Cu)-Total	mg/L	2.0	0.01	0.0234 DLHC
Iron (Fe)-Total	mg/L	50	-	14.4 DLHC
Lead (Pb)-Total	mg/L	0.7	0.05	0.00806 DLHC
Manganese (Mn)-Total	mg/L	5	-	0.742 DLHC
Mercury (Hg)-Total	mg/L	0.01	-	0.0000184
Molybdenum (Mo)-Total	mg/L	5	-	0.00220 DLHC
Nickel (Ni)-Total	mg/L	2	0.05	0.0147 DLHC
Selenium (Se)-Total	mg/L	1.0	-	0.00141 DLHC
Silver (Ag)-Total	mg/L	0.4	-	<0.00050 DLHC
Tin (Sn)-Total	mg/L	5	-	<0.0010 DLHC
Titanium (Ti)-Total	mg/L	-	-	0.500 DLHC
Vanadium (V)-Total	mg/L	5.0	-	0.0213 DLHC
Zinc (Zn)-Total	mg/L	2.0	0.04	0.044 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	L2491857-1
			Sample Date	20-AUG-20
			Sample ID	MW2
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
BOD	mg/L	300	15	6.0
COD	mg/L	600	-	167
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	-	<0.0010

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

				Lab ID	L2491857-1
				Sample Date	20-AUG-20
				Sample ID	MW2
		Guide Limits			
Analyte	Unit	#1	#2		
Acetone	ug/L	-	-	<20	
Benzene	ug/L	10	-	<0.50	
Bromodichloromethane	ug/L	-	-	<1.0	
Bromoform	ug/L	-	-	<1.0	
Bromomethane	ug/L	-	-	<0.50	
Carbon Disulfide	ug/L	-	-	<1.0	
Carbon tetrachloride	ug/L	-	-	<0.20	
Chlorobenzene	ug/L	-	-	<0.50	
Dibromochloromethane	ug/L	-	-	<1.0	
Chloroethane	ug/L	-	-	<1.0	
Chloroform	ug/L	-	-	<1.0	
Chloromethane	ug/L	-	-	<1.0	
1,2-Dibromoethane	ug/L	-	-	<0.20	
1,2-Dichlorobenzene	ug/L	50	-	<0.50	
1,3-Dichlorobenzene	ug/L	-	-	<0.50	
1,4-Dichlorobenzene	ug/L	80	-	<0.50	
Dichlorodifluoromethane	ug/L	-	-	<1.0	
1,1-Dichloroethane	ug/L	-	-	<0.50	
1,2-Dichloroethane	ug/L	-	-	<0.50	
1,1-Dichloroethylene	ug/L	-	-	<0.50	
cis-1,2-Dichloroethylene	ug/L	-	-	<0.50	
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50	
Dichloromethane	ug/L	90	-	<2.0	
1,2-Dichloropropane	ug/L	-	-	<0.50	
cis-1,3-Dichloropropene	ug/L	-	-	<0.30	
trans-1,3-Dichloropropene	ug/L	-	-	<0.30	
Ethylbenzene	ug/L	60	-	<0.50	
n-Hexane	ug/L	-	-	<0.50	
2-Hexanone	ug/L	-	-	<20	
Methyl Ethyl Ketone	ug/L	-	-	<20	

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

				Lab ID	L2491857-1
				Sample Date	20-AUG-20
				Sample ID	MW2
		Guide Limits			
Analyte	Unit	#1	#2		
Methyl Isobutyl Ketone	ug/L	-	-	<20	
MTBE	ug/L	-	-	<0.50	
Styrene	ug/L	-	-	<0.50	
1,1,1,2-Tetrachloroethane	ug/L	-	-	<0.50	
1,1,2,2-Tetrachloroethane	ug/L	60	-	<0.50	
Tetrachloroethylene	ug/L	60	-	<0.50	
Toluene	ug/L	20	-	<0.40	
1,1,1-Trichloroethane	ug/L	-	-	<0.50	
1,1,2-Trichloroethane	ug/L	-	-	<0.50	
Trichloroethylene	ug/L	50	-	<0.50	
Trichlorofluoromethane	ug/L	-	-	<1.0	
Vinyl chloride	ug/L	-	-	<0.50	
o-Xylene	ug/L	-	-	<0.30	
m+p-Xylenes	ug/L	-	-	<0.40	
Xylenes (Total)	ug/L	300	-	<0.50	
Surrogate: 4-Bromofluorobenzene	%	-	-	96.9	
Surrogate: 1,4-Difluorobenzene	%	-	-	100.4	

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	L2491857-1
			Sample Date	20-AUG-20
			Sample ID	MW2
		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)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
Dibenzo(ah)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	-	-	<0.020
2-Methylnaphthalene	ug/L	-	-	<0.020
Naphthalene	ug/L	-	-	<0.050
Phenanthrene	ug/L	-	-	<0.020
Pyrene	ug/L	-	-	<0.020
Surrogate: d10-Acenaphthene	%	-	-	100.2
Surrogate: d12-Chrysene	%	-	-	85.9
Surrogate: d8-Naphthalene	%	-	-	96.4
Surrogate: d10-Phenanthrene	%	-	-	96.0
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	L2491857-1
			Sample Date	20-AUG-20
			Sample ID	MW2
		Guide Limits		
Analyte	Unit	#1	#2	
Hexachlorobenzene	ug/L	0.1	-	<0.0080
Surrogate: Tetrachloro-m-xylene	%	-	-	94.9

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.
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-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D

This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.

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: L2491857 Report Date: 28-AUG-20

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3
Contact: Supriya Singh

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BOD-WT	**Water**							
Batch R5201781								
WG3388590-6 DUP		**L2491385-7**						
BOD		<2.0	<2.0	RPD-NA	mg/L	N/A	30	21-AUG-20
WG3388590-7 LCS								
BOD			95.5		%		85-115	21-AUG-20
WG3388590-5 MB								
BOD			<2.0		mg/L		2	21-AUG-20
CL-IC-N-WT	**Water**							
Batch R5199222								
WG3388909-14 DUP		**WG3388909-13**						
Chloride (Cl)		66.1	66.2		mg/L	0.2	20	21-AUG-20
WG3388909-12 LCS								
Chloride (Cl)			101.3		%		90-110	21-AUG-20
WG3388909-11 MB								
Chloride (Cl)			<0.50		mg/L		0.5	21-AUG-20
WG3388909-15 MS		**WG3388909-13**						
Chloride (Cl)			96.6		%		75-125	21-AUG-20
CN-TOT-WT	**Water**							
Batch R5195529								
WG3388384-3 DUP		**WG3388384-5**						
Cyanide, Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	21-AUG-20
WG3388384-2 LCS								
Cyanide, Total			99.0		%		80-120	21-AUG-20
WG3388384-1 MB								
Cyanide, Total			<0.0020		mg/L		0.002	21-AUG-20
WG3388384-4 MS		**WG3388384-5**						
Cyanide, Total			97.8		%		70-130	21-AUG-20
COD-T-WT	**Water**							
Batch R5201792								
WG3391425-3 DUP		**L2492086-1**						
COD		11	<10	RPD-NA	mg/L	N/A	20	26-AUG-20
WG3391425-2 LCS								
COD			101.5		%		85-115	26-AUG-20
WG3391425-1 MB								
COD			<10		mg/L		10	26-AUG-20
WG3391425-4 MS		**L2492086-1**						
COD			121.0		%		75-125	26-AUG-20
F-IC-N-WT	**Water**							

Quality Control Report

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3
Contact: Supriya Singh

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-WT	**Water**							
Batch R5199222								
WG3388909-14 DUP		**WG3388909-13**						
Fluoride (F)		0.113	0.114		mg/L	0.3	20	21-AUG-20
WG3388909-12 LCS								
Fluoride (F)			103.4		%		90-110	21-AUG-20
WG3388909-11 MB								
Fluoride (F)			<0.020		mg/L		0.02	21-AUG-20
WG3388909-15 MS		**WG3388909-13**						
Fluoride (F)			97.4		%		75-125	21-AUG-20
HG-T-CVAA-WT	**Water**							
Batch R5198457								
WG3388657-4 DUP		**WG3388657-3**						
Mercury (Hg)-Total		<0.0000050	<0.000005(	RPD-NA	mg/L	N/A	20	24-AUG-20
WG3388657-2 LCS								
Mercury (Hg)-Total			117.0		%		80-120	24-AUG-20
WG3388657-1 MB								
Mercury (Hg)-Total			<0.000005(		mg/L		0.000005	24-AUG-20
WG3388657-6 MS		**WG3388657-5**						
Mercury (Hg)-Total			105.4		%		70-130	24-AUG-20
MET-T-CCMS-WT	**Water**							
Batch R5194819								
WG3388104-4 DUP		**WG3388104-3**						
Aluminum (Al)-Total		0.0106	0.0108		mg/L	2.0	20	21-AUG-20
Antimony (Sb)-Total		0.00035	0.00034		mg/L	1.5	20	21-AUG-20
Arsenic (As)-Total		0.00076	0.00073		mg/L	4.0	20	21-AUG-20
Barium (Ba)-Total		0.104	0.104		mg/L	0.4	20	21-AUG-20
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-20
Cadmium (Cd)-Total		0.0000084	0.0000097		mg/L	14	20	21-AUG-20
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	21-AUG-20
Cobalt (Co)-Total		0.00053	0.00052		mg/L	3.1	20	21-AUG-20
Copper (Cu)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	21-AUG-20
Iron (Fe)-Total		0.162	0.154		mg/L	4.6	20	21-AUG-20
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-20
Manganese (Mn)-Total		0.140	0.138		mg/L	1.5	20	21-AUG-20
Molybdenum (Mo)-Total		0.00394	0.00398		mg/L	1.1	20	21-AUG-20
Nickel (Ni)-Total		0.00218	0.00219		mg/L	0.4	20	21-AUG-20
Selenium (Se)-Total		0.000120	0.000122		mg/L	1.5	20	21-AUG-20

Quality Control Report

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3
Contact: Supriya Singh

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5194819								
WG3388104-4 DUP		**WG3388104-3**						
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-20
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-20
Titanium (Ti)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	21-AUG-20
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	21-AUG-20
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	21-AUG-20
WG3388104-2 LCS								
Aluminum (Al)-Total			104.4		%		80-120	21-AUG-20
Antimony (Sb)-Total			100.1		%		80-120	21-AUG-20
Arsenic (As)-Total			100.4		%		80-120	21-AUG-20
Barium (Ba)-Total			100.5		%		80-120	21-AUG-20
Bismuth (Bi)-Total			98.8		%		80-120	21-AUG-20
Cadmium (Cd)-Total			101.8		%		80-120	21-AUG-20
Chromium (Cr)-Total			102.1		%		80-120	21-AUG-20
Cobalt (Co)-Total			99.5		%		80-120	21-AUG-20
Copper (Cu)-Total			100.2		%		80-120	21-AUG-20
Iron (Fe)-Total			96.7		%		80-120	21-AUG-20
Lead (Pb)-Total			101.4		%		80-120	21-AUG-20
Manganese (Mn)-Total			102.2		%		80-120	21-AUG-20
Molybdenum (Mo)-Total			100.8		%		80-120	21-AUG-20
Nickel (Ni)-Total			100.5		%		80-120	21-AUG-20
Selenium (Se)-Total			101.6		%		80-120	21-AUG-20
Silver (Ag)-Total			97.5		%		80-120	21-AUG-20
Tin (Sn)-Total			97.2		%		80-120	21-AUG-20
Titanium (Ti)-Total			99.99		%		80-120	21-AUG-20
Vanadium (V)-Total			102.4		%		80-120	21-AUG-20
Zinc (Zn)-Total			101.4		%		80-120	21-AUG-20
WG3388104-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	21-AUG-20
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	21-AUG-20
Arsenic (As)-Total			<0.00010		mg/L		0.0001	21-AUG-20
Barium (Ba)-Total			<0.00010		mg/L		0.0001	21-AUG-20
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	21-AUG-20
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	21-AUG-20
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	21-AUG-20

Quality Control Report

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3
Contact: Supriya Singh

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5194819								
WG3388104-1 MB								
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	21-AUG-20
Copper (Cu)-Total			<0.00050		mg/L		0.0005	21-AUG-20
Iron (Fe)-Total			<0.010		mg/L		0.01	21-AUG-20
Lead (Pb)-Total			<0.000050		mg/L		0.00005	21-AUG-20
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	21-AUG-20
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	21-AUG-20
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	21-AUG-20
Selenium (Se)-Total			<0.000050		mg/L		0.00005	21-AUG-20
Silver (Ag)-Total			<0.000050		mg/L		0.00005	21-AUG-20
Tin (Sn)-Total			<0.00010		mg/L		0.0001	21-AUG-20
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	21-AUG-20
Vanadium (V)-Total			<0.00050		mg/L		0.0005	21-AUG-20
Zinc (Zn)-Total			<0.0030		mg/L		0.003	21-AUG-20
WG3388104-5 MS		**WG3388104-3**						
Aluminum (Al)-Total			97.8		%		70-130	21-AUG-20
Antimony (Sb)-Total			100.9		%		70-130	21-AUG-20
Arsenic (As)-Total			97.2		%		70-130	21-AUG-20
Barium (Ba)-Total			N/A	MS-B	%		-	21-AUG-20
Bismuth (Bi)-Total			90.0		%		70-130	21-AUG-20
Cadmium (Cd)-Total			97.1		%		70-130	21-AUG-20
Chromium (Cr)-Total			98.6		%		70-130	21-AUG-20
Cobalt (Co)-Total			93.2		%		70-130	21-AUG-20
Copper (Cu)-Total			95.1		%		70-130	21-AUG-20
Iron (Fe)-Total			N/A	MS-B	%		-	21-AUG-20
Lead (Pb)-Total			91.7		%		70-130	21-AUG-20
Manganese (Mn)-Total			N/A	MS-B	%		-	21-AUG-20
Molybdenum (Mo)-Total			97.2		%		70-130	21-AUG-20
Nickel (Ni)-Total			94.2		%		70-130	21-AUG-20
Selenium (Se)-Total			99.8		%		70-130	21-AUG-20
Silver (Ag)-Total			91.3		%		70-130	21-AUG-20
Tin (Sn)-Total			93.7		%		70-130	21-AUG-20
Titanium (Ti)-Total			95.6		%		70-130	21-AUG-20
Vanadium (V)-Total			99.5		%		70-130	21-AUG-20
Zinc (Zn)-Total			95.7		%		70-130	21-AUG-20

Quality Control Report

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3
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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
OCP-ROUTINE-WT	**Water**							
Batch R5199921								
WG3387743-2 LCS								
Hexachlorobenzene			118.4		%		50-150	25-AUG-20
WG3387743-1 MB								
Hexachlorobenzene			<0.0080		ug/L		0.008	25-AUG-20
Surrogate: Tetrachloro-m-xylene			91.8		%		40-130	25-AUG-20
OGG-SPEC-WT	**Water**							
Batch R5194357								
WG3388085-2 LCS								
Oil and Grease, Total			96.6		%		70-130	21-AUG-20
Mineral Oil and Grease			87.8		%		70-130	21-AUG-20
WG3388085-1 MB								
Oil and Grease, Total			<5.0		mg/L		5	21-AUG-20
Mineral Oil and Grease			<2.5		mg/L		2.5	21-AUG-20
P-T-COL-WT	**Water**							
Batch R5198138								
WG3387258-3 DUP		**L2491773-1**						
Phosphorus, Total		0.0040	0.0044		mg/L	10	20	24-AUG-20
WG3387258-2 LCS								
Phosphorus, Total			98.9		%		80-120	24-AUG-20
WG3387258-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	24-AUG-20
WG3387258-4 MS		**L2491773-1**						
Phosphorus, Total			96.9		%		70-130	24-AUG-20
PAH-511-WT	**Water**							
Batch R5199308								
WG3389415-2 LCS								
1-Methylnaphthalene			94.2		%		50-140	24-AUG-20
2-Methylnaphthalene			88.0		%		50-140	24-AUG-20
Acenaphthene			100.7		%		50-140	24-AUG-20
Acenaphthylene			98.1		%		50-140	24-AUG-20
Anthracene			107.4		%		50-140	24-AUG-20
Benzo(a)anthracene			106.0		%		50-140	24-AUG-20
Benzo(a)pyrene			95.8		%		50-140	24-AUG-20
Benzo(b)fluoranthene			82.2		%		50-140	24-AUG-20
Benzo(g,h,i)perylene			98.3		%		50-140	24-AUG-20
Benzo(k)fluoranthene			88.9		%		50-140	24-AUG-20

Quality Control Report

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3
Contact: Supriya Singh

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT	**Water**							
Batch R5199308								
WG3389415-2 LCS								
Chrysene			111.6		%		50-140	24-AUG-20
Dibenzo(ah)anthracene			101.3		%		50-140	24-AUG-20
Fluoranthene			101.7		%		50-140	24-AUG-20
Fluorene			100.0		%		50-140	24-AUG-20
Indeno(1,2,3-cd)pyrene			109.3		%		50-140	24-AUG-20
Naphthalene			94.3		%		50-140	24-AUG-20
Phenanthrene			103.4		%		50-140	24-AUG-20
Pyrene			103.7		%		50-140	24-AUG-20
WG3389415-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	24-AUG-20
2-Methylnaphthalene			<0.020		ug/L		0.02	24-AUG-20
Acenaphthene			<0.020		ug/L		0.02	24-AUG-20
Acenaphthylene			<0.020		ug/L		0.02	24-AUG-20
Anthracene			<0.020		ug/L		0.02	24-AUG-20
Benzo(a)anthracene			<0.020		ug/L		0.02	24-AUG-20
Benzo(a)pyrene			<0.010		ug/L		0.01	24-AUG-20
Benzo(b)fluoranthene			<0.020		ug/L		0.02	24-AUG-20
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	24-AUG-20
Benzo(k)fluoranthene			<0.020		ug/L		0.02	24-AUG-20
Chrysene			<0.020		ug/L		0.02	24-AUG-20
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	24-AUG-20
Fluoranthene			<0.020		ug/L		0.02	24-AUG-20
Fluorene			<0.020		ug/L		0.02	24-AUG-20
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	24-AUG-20
Naphthalene			<0.050		ug/L		0.05	24-AUG-20
Phenanthrene			<0.020		ug/L		0.02	24-AUG-20
Pyrene			<0.020		ug/L		0.02	24-AUG-20
Surrogate: d8-Naphthalene			95.0		%		60-140	24-AUG-20
Surrogate: d10-Phenanthrene			103.6		%		60-140	24-AUG-20
Surrogate: d12-Chrysene			107.3		%		60-140	24-AUG-20
Surrogate: d10-Acenaphthene			105.9		%		60-140	24-AUG-20
PH-WT	**Water**							

Quality Control Report

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74 Berkeley Street
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Contact: Supriya Singh

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-WT	**Water**							
Batch R5197143								
WG3389029-4 DUP		**WG3389029-3**						
pH		8.11	8.02	J	pH units	0.09	0.2	22-AUG-20
WG3389029-2 LCS								
pH			7.04		pH units		6.9-7.1	22-AUG-20
PHENOLS-4AAP-WT	**Water**							
Batch R5195797								
WG3388337-3 DUP		**L2491722-1**						
Phenols (4AAP)		0.0253	0.0271		mg/L	6.9	20	21-AUG-20
WG3388337-2 LCS								
Phenols (4AAP)			106.2		%		85-115	21-AUG-20
WG3388337-1 MB								
Phenols (4AAP)			<0.0010		mg/L		0.001	21-AUG-20
WG3388337-4 MS		**L2491722-1**						
Phenols (4AAP)			N/A	MS-B	%		-	21-AUG-20
SO4-IC-N-WT	**Water**							
Batch R5199222								
WG3388909-14 DUP		**WG3388909-13**						
Sulfate (SO4)		32.3	32.3		mg/L	0.2	20	21-AUG-20
WG3388909-12 LCS								
Sulfate (SO4)			102.0		%		90-110	21-AUG-20
WG3388909-11 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	21-AUG-20
WG3388909-15 MS		**WG3388909-13**						
Sulfate (SO4)			98.3		%		75-125	21-AUG-20
SOLIDS-TSS-WT	**Water**							
Batch R5200476								
WG3390430-3 DUP		**L2493231-1**						
Total Suspended Solids		<3.0	<3.0	RPD-NA	mg/L	N/A	20	26-AUG-20
WG3390430-2 LCS								
Total Suspended Solids			93.0		%		85-115	26-AUG-20
WG3390430-1 MB								
Total Suspended Solids			<3.0		mg/L		3	26-AUG-20
SULPHIDE-WT	**Water**							
Batch R5199625								
WG3390264-3 DUP		**L2491546-1**						
Sulphide (as S)		38.5	39.9		mg/L	3.6	20	25-AUG-20
WG3390264-2 LCS								

Quality Control Report

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74 Berkeley Street
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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SULPHIDE-WT	**Water**							
Batch R5199625								
WG3390264-2 LCS								
Sulphide (as S)			94.2		%		75-125	25-AUG-20
WG3390264-1 MB								
Sulphide (as S)			<0.018		mg/L		0.018	25-AUG-20
WG3390264-4 MS		**L2491546-1**						
Sulphide (as S)			N/A	MS-B	%		-	25-AUG-20
TKN-WT	**Water**							
Batch R5195528								
WG3387259-3 DUP		**L2491733-2**						
Total Kjeldahl Nitrogen		7.83	8.13		mg/L	3.7	20	21-AUG-20
WG3387259-2 LCS								
Total Kjeldahl Nitrogen			119.4		%		75-125	21-AUG-20
WG3387259-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	21-AUG-20
WG3387259-4 MS		**L2491733-2**						
Total Kjeldahl Nitrogen			N/A	MS-B	%		-	21-AUG-20
VOC-ROU-HS-WT	**Water**							
Batch R5199596								
WG3390118-4 DUP		**WG3390118-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	25-AUG-20
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
2-Hexanone		<20	<20	RPD-NA	ug/L	N/A	30	25-AUG-20
Acetone		<20	<20	RPD-NA	ug/L	N/A	30	25-AUG-20
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
Bromodichloromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	25-AUG-20

Quality Control Report

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74 Berkeley Street
Toronto ON M5V 1E3
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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5199596								
WG3390118-4 DUP		**WG3390118-3**						
Bromoform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	25-AUG-20
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
Carbon Disulfide		<1.0	<1.0	RPD-NA	ug/L	N/A	30	25-AUG-20
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	25-AUG-20
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
Chloroethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	25-AUG-20
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	25-AUG-20
Chloromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	25-AUG-20
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	25-AUG-20
Dibromochloromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	25-AUG-20
Dichlorodifluoromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	25-AUG-20
Dichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	25-AUG-20
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	25-AUG-20
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	25-AUG-20
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	25-AUG-20
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
MTBE		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	25-AUG-20
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
Toluene		<0.40	<0.40	RPD-NA	ug/L	N/A	30	25-AUG-20
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	25-AUG-20
Trichloroethylene		14.9	14.9		ug/L	0.3	30	25-AUG-20
Trichlorofluoromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	25-AUG-20
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-AUG-20
WG3390118-1 LCS								
1,1,1,2-Tetrachloroethane			91.7		%		70-130	25-AUG-20
1,1,2,2-Tetrachloroethane			101.2		%		70-130	25-AUG-20
1,1,1-Trichloroethane			99.8		%		70-130	25-AUG-20
1,1,2-Trichloroethane			100.5		%		70-130	25-AUG-20

Quality Control Report

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74 Berkeley Street
Toronto ON M5V 1E3
Contact: Supriya Singh

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5199596								
WG3390118-1 LCS								
1,2-Dibromoethane			100.4		%		70-130	25-AUG-20
1,1-Dichloroethane			96.8		%		70-130	25-AUG-20
1,1-Dichloroethylene			86.5		%		70-130	25-AUG-20
1,2-Dichlorobenzene			99.8		%		70-130	25-AUG-20
1,2-Dichloroethane			101.8		%		70-130	25-AUG-20
1,2-Dichloropropane			97.4		%		70-130	25-AUG-20
1,3-Dichlorobenzene			105.2		%		70-130	25-AUG-20
1,4-Dichlorobenzene			104.1		%		70-130	25-AUG-20
2-Hexanone			98.2		%		60-140	25-AUG-20
Acetone			107.4		%		60-140	25-AUG-20
Benzene			96.0		%		70-130	25-AUG-20
Bromodichloromethane			102.4		%		70-130	25-AUG-20
Bromoform			100.1		%		70-130	25-AUG-20
Bromomethane			117.8		%		60-140	25-AUG-20
Carbon Disulfide			101.7		%		70-130	25-AUG-20
Carbon tetrachloride			99.8		%		70-130	25-AUG-20
Chlorobenzene			96.3		%		70-130	25-AUG-20
Chloroethane			102.7		%		70-130	25-AUG-20
Chloroform			98.8		%		70-130	25-AUG-20
Chloromethane			113.0		%		60-140	25-AUG-20
cis-1,2-Dichloroethylene			94.1		%		70-130	25-AUG-20
cis-1,3-Dichloropropene			99.0		%		70-130	25-AUG-20
Dibromochloromethane			92.4		%		70-130	25-AUG-20
Dichlorodifluoromethane			83.1		%		50-140	25-AUG-20
Dichloromethane			96.4		%		70-130	25-AUG-20
Ethylbenzene			102.1		%		70-130	25-AUG-20
m+p-Xylenes			101.9		%		70-130	25-AUG-20
Methyl Ethyl Ketone			95.2		%		60-140	25-AUG-20
Methyl Isobutyl Ketone			99.4		%		50-150	25-AUG-20
n-Hexane			96.7		%		70-130	25-AUG-20
MTBE			96.6		%		70-130	25-AUG-20
o-Xylene			108.5		%		70-130	25-AUG-20
Styrene			95.9		%		70-130	25-AUG-20

Quality Control Report

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3
Contact: Supriya Singh

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5199596								
WG3390118-1 LCS								
Tetrachloroethylene			100.2		%		70-130	25-AUG-20
Toluene			92.5		%		70-130	25-AUG-20
trans-1,2-Dichloroethylene			97.5		%		70-130	25-AUG-20
trans-1,3-Dichloropropene			103.9		%		70-130	25-AUG-20
Trichloroethylene			93.7		%		70-130	25-AUG-20
Trichlorofluoromethane			93.4		%		60-140	25-AUG-20
Vinyl chloride			96.5		%		60-140	25-AUG-20
WG3390118-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	25-AUG-20
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	25-AUG-20
1,1,1-Trichloroethane			<0.50		ug/L		0.5	25-AUG-20
1,1,2-Trichloroethane			<0.50		ug/L		0.5	25-AUG-20
1,2-Dibromoethane			<0.20		ug/L		0.2	25-AUG-20
1,1-Dichloroethane			<0.50		ug/L		0.5	25-AUG-20
1,1-Dichloroethylene			<0.50		ug/L		0.5	25-AUG-20
1,2-Dichlorobenzene			<0.50		ug/L		0.5	25-AUG-20
1,2-Dichloroethane			<0.50		ug/L		0.5	25-AUG-20
1,2-Dichloropropane			<0.50		ug/L		0.5	25-AUG-20
1,3-Dichlorobenzene			<0.50		ug/L		0.5	25-AUG-20
1,4-Dichlorobenzene			<0.50		ug/L		0.5	25-AUG-20
2-Hexanone			<20		ug/L		20	25-AUG-20
Acetone			<20		ug/L		20	25-AUG-20
Benzene			<0.50		ug/L		0.5	25-AUG-20
Bromodichloromethane			<1.0		ug/L		1	25-AUG-20
Bromoform			<1.0		ug/L		1	25-AUG-20
Bromomethane			<0.50		ug/L		0.5	25-AUG-20
Carbon Disulfide			<1.0		ug/L		1	25-AUG-20
Carbon tetrachloride			<0.20		ug/L		0.2	25-AUG-20
Chlorobenzene			<0.50		ug/L		0.5	25-AUG-20
Chloroethane			<1.0		ug/L		1	25-AUG-20
Chloroform			<1.0		ug/L		1	25-AUG-20
Chloromethane			<1.0		ug/L		1	25-AUG-20
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	25-AUG-20
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	25-AUG-20

Quality Control Report

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3
Contact: Supriya Singh

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5199596								
WG3390118-2 MB								
Dibromochloromethane			<1.0		ug/L		1	25-AUG-20
Dichlorodifluoromethane			<1.0		ug/L		1	25-AUG-20
Dichloromethane			<2.0		ug/L		2	25-AUG-20
Ethylbenzene			<0.50		ug/L		0.5	25-AUG-20
m+p-Xylenes			<0.40		ug/L		0.4	25-AUG-20
Methyl Ethyl Ketone			<20		ug/L		20	25-AUG-20
Methyl Isobutyl Ketone			<20		ug/L		20	25-AUG-20
n-Hexane			<0.50		ug/L		0.5	25-AUG-20
MTBE			<0.50		ug/L		0.5	25-AUG-20
o-Xylene			<0.30		ug/L		0.3	25-AUG-20
Styrene			<0.50		ug/L		0.5	25-AUG-20
Tetrachloroethylene			<0.50		ug/L		0.5	25-AUG-20
Toluene			<0.40		ug/L		0.4	25-AUG-20
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	25-AUG-20
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	25-AUG-20
Trichloroethylene			<0.50		ug/L		0.5	25-AUG-20
Trichlorofluoromethane			<1.0		ug/L		1	25-AUG-20
Vinyl chloride			<0.50		ug/L		0.5	25-AUG-20
Surrogate: 1,4-Difluorobenzene			100.7		%		70-130	25-AUG-20
Surrogate: 4-Bromofluorobenzene			98.9		%		70-130	25-AUG-20
WG3390118-5 MS		**WG3390118-3**						
1,1,1,2-Tetrachloroethane			91.7		%		50-150	25-AUG-20
1,1,2,2-Tetrachloroethane			97.4		%		50-150	25-AUG-20
1,1,1-Trichloroethane			99.8		%		50-150	25-AUG-20
1,1,2-Trichloroethane			100.1		%		50-150	25-AUG-20
1,2-Dibromoethane			99.7		%		50-150	25-AUG-20
1,1-Dichloroethane			96.7		%		50-150	25-AUG-20
1,1-Dichloroethylene			84.3		%		50-150	25-AUG-20
1,2-Dichlorobenzene			99.2		%		50-150	25-AUG-20
1,2-Dichloroethane			103.2		%		50-150	25-AUG-20
1,2-Dichloropropane			97.6		%		50-150	25-AUG-20
1,3-Dichlorobenzene			105.2		%		50-150	25-AUG-20
1,4-Dichlorobenzene			103.3		%		50-150	25-AUG-20
2-Hexanone			94.9		%		50-150	25-AUG-20

Quality Control Report

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3
Contact: Supriya Singh

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5199596								
WG3390118-5 MS		**WG3390118-3**						
Acetone			108.4		%		50-150	25-AUG-20
Benzene			96.3		%		50-150	25-AUG-20
Bromodichloromethane			102.9		%		50-150	25-AUG-20
Bromoform			99.2		%		50-150	25-AUG-20
Bromomethane			112.3		%		50-150	25-AUG-20
Carbon Disulfide			98.8		%		50-150	25-AUG-20
Carbon tetrachloride			99.8		%		50-150	25-AUG-20
Chlorobenzene			96.2		%		50-150	25-AUG-20
Chloroethane			100.4		%		50-150	25-AUG-20
Chloroform			99.3		%		50-150	25-AUG-20
Chloromethane			106.1		%		50-150	25-AUG-20
cis-1,2-Dichloroethylene			94.0		%		50-150	25-AUG-20
cis-1,3-Dichloropropene			96.5		%		50-150	25-AUG-20
Dibromochloromethane			92.1		%		50-150	25-AUG-20
Dichlorodifluoromethane			72.7		%		50-150	25-AUG-20
Dichloromethane			96.5		%		50-150	25-AUG-20
Ethylbenzene			102.0		%		50-150	25-AUG-20
m+p-Xylenes			101.7		%		50-150	25-AUG-20
Methyl Ethyl Ketone			95.6		%		50-150	25-AUG-20
Methyl Isobutyl Ketone			98.5		%		50-150	25-AUG-20
n-Hexane			94.2		%		50-150	25-AUG-20
MTBE			97.6		%		50-150	25-AUG-20
o-Xylene			108.3		%		50-150	25-AUG-20
Styrene			95.0		%		50-150	25-AUG-20
Tetrachloroethylene			99.1		%		50-150	25-AUG-20
Toluene			91.6		%		50-150	25-AUG-20
trans-1,2-Dichloroethylene			96.4		%		50-150	25-AUG-20
trans-1,3-Dichloropropene			98.4		%		50-150	25-AUG-20
Trichloroethylene			92.9		%		50-150	25-AUG-20
Trichlorofluoromethane			90.9		%		50-150	25-AUG-20
Vinyl chloride			91.3		%		50-150	25-AUG-20

Quality Control Report

Workorder: L2491857 Report Date: 28-AUG-20

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3
Contact: Supriya Singh

Legend:

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

Sample Parameter Qualifier Definitions:

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

Hold Time Exceedances:

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

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

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

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

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L2491857-COFC

COC Number: 15 - 413

Page of

Report To	Contact and company name below will appear on the final report
Company:	PALMER ENVIRONMENTAL CONSULTING GROUP
Contact:	SUPRIYA SINGH
Phone:	~~647 786 8180~~ 416 837 1942
	Company address below will appear on the final report
Street:	74 BERKELEY ST
City/Province:	TORONTO/ON
Postal Code:	M5V 1E3
Invoice To	Same as Report To ☐ YES ☒ NO
	Copy of Invoice with Report ☐ YES ☒ NO
Company:	Palmer
Contact:	accounting@pecg.ca

Project Information

ALS Account # / Quote #:	24400/Q78950
Job #:	2001505
PO / AFE:	
LSD:	
ALS Lab Work Order # (lab use only)	L2491857 KP

Report Format / Distribution

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

Quality Control (QC) Report with Report ☑ YES ☐ NO

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

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax ~~supriya@pecg.ca~~ supriya.singh@pecg.ca

Email 2 jason.cole@pecg.ca

Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax accounting@pecg.ca

Email 2

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact: Jen Barkshire-Paterson	Sampler: SS

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
	4 day [P4] ☐		1 Business day [E1] ☐
	3 day [P3] ☐		Same Day, Weekend or Statutory holiday [E0] ☐
	2 day [P2] ☐		

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	ON-SAN+STM-BARRIE-WT	Number of Containers
	MW2	20-08-20	11:00	water	X	19

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

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

Are samples for human drinking water use? ☐ YES ☒ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

compare to Barrie storm & sanitary criteria

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
4.3			0.0		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Supriya Singh	20-08-2020			Aug 20/20	14:35		Aug 20/20	1705

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 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.

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

28-August-2020

ALS Laboratory (Waterloo)
Attn : Mary-Lynn Pike

60 Northland Road, Unit # 1
Waterloo, ON
N2V 2B8, Canada

Phone: 519-866-6910
Fax:

Date Rec. : 25 August 2020
LR Report: **CA17139-AUG20**
Reference: Submission#: L2491857

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		---	26-Aug-20	26-Aug-20	26-Aug-20
2: Analysis Start Time		---	15:31	15:31	15:31
3: Analysis Completed Date		---	28-Aug-20	28-Aug-20	28-Aug-20
4: Analysis Completed Time		---	11:45	11:45	11:45
5: QC - Blank		---	< 0.00001	< 0.0001	< 0.0001
6: QC - STD % Recovery		---	98%	98%	102%
7: QC - DUP % RPD		---	3%	ND	ND
8: MDL		---	0.00001	0.0001	0.00001
9: NR L2491857	20-Aug-20 11:00	7.0	0.0003	< 0.001	< 0.0001

MDL - SGS Method Detection Limit
NR - Not regulated / reportable under applicable Provincial drinking water regulations as per client.
ND - Not Detected

Kimberley Didsbury
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002236787