EDENSHAW SSR DEVELOPMENTS LIMITED

49 SOUTH SERVICE ROAD
FUNCTIONAL SERVICING REPORT

OCTOBER 13, 2022

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FUNCTIONAL SERVICING REPORT

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FUNCTIONAL SERVICING REPORT

PROJECT NO.: 221-08605
DATE: OCTOBER 13, 2022

WSP CANADA INC.
100 COMMERCE VALLEY DRIVE WEST
THORNHILL, ON, CANADA L3T 0A1

T: +1 905 668-3022
F: +1 905 668-9443
WSP.COM

SIGNATURES

PREPARED BY

Abilash

Abilash Sriranganathan
E.I.T

REVIEWED BY

Mark Mitchell, P.Eng.
Senior Project Engineer

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1.0 INTRODUCTION

WSP Canada Inc. has been retained by Edenshaw SSR Developments Limited to prepare a Functional Servicing Report to assess the servicing requirements relating to the proposed development at 49 South Service Road. The property is located at the east corner of the Queen Elizabeth Way (QEW) and Hurontario Street in the City of Mississauga.

A Stormwater Management Report outlining the proposed Stormwater quality and quantity controls on this site has been prepared under a separate cover, also by WSP Canada Inc. In preparing this report, WSP staff reviewed and secured available Region of Peel Plan and Profile Drawings, as well as the architectural site plans prepared by Kirkor Architects and Planners, topographical survey prepared by R. Avis Surveying Inc and a SUE survey prepared by T2 Utility Engineers Inc.

1.1 SITE DESCRIPTION

The site is a 0.44 ha parcel of land located at the east corner of the Queen Elizabeth Way (QEW) and Hurontario Street in the City of Mississauga. Currently the site is home to the Ontario Provincial Police (OPP) and consists of two (2) existing buildings, a main institutional building, and a separate garage. Parking lots surround the buildings and the remaining area is landscaped.

The proposed development is a 26-storey multi-unit residential building. The total estimated unit count for the development is 352. The building will have three (3) floors of below grade parking, covering the majority of the site.

The site will be serviced by existing local municipal sewers and watermains within the adjoining municipal rights-of-way. The existing service connections to the existing building within the municipal road allowance will be decommissioned at the owner's cost. The proposed service connections will be extended to the underground parking foundation wall and will be coordinated with the building design team. Refer to Figure 1 for the Location Map, Figure 2 for the Predevelopment Plan, and Figure 3 for an illustration of the Proposed Development Plan.

CLIENT

Edenshaw SSR Developments Limited

TITLE

49 SOUTH SERVICE ROAD
Mississauga, Ontario

LOCATION PLAN

wsp
100 Commerce Valley Dr. West, Thornhill, ON Canada L3T 0A1
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Date	OCT 2022	Proj. No.	221-08605
Scale	NTS	Figure No.	1

FILENAME: C:\Users\caas077425\ACCDocs\WSP Canada projects (AMER)\LDO\Files\221-08605 49 South Service Road\Mun\FSR\Figures\221-08605_Fig1.dwg
PLOTDATE: Oct 13, 2022 - 2:37pm, CAAS077425

LEGEND

LIMIT OF PROPERTY

CLIENT
Edenshaw SSR Developments Limited

TITLE
49 South Service Road
Mississauga, Ontario

PRE- DEVELOPMENT PLAN

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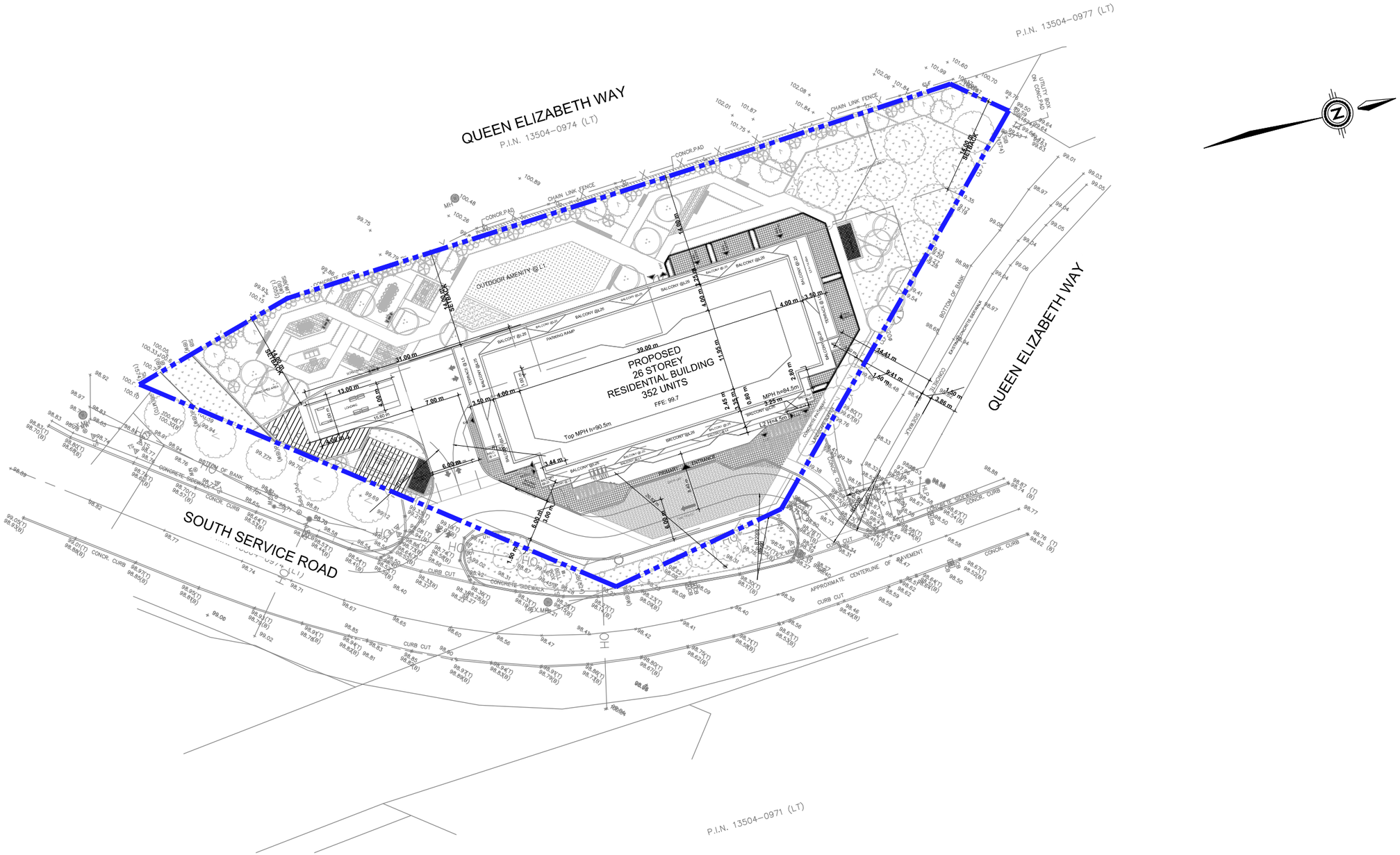
Scale 1: 600	Figure No. 2



LEGEND

- LIMIT OF PROPERTY
- PROPOSED SIAMESE
- PROPOSED FIRE HYDRANT

CLIENT
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TITLE
49 South Service Road
Mississauga, Ontario

PROPOSED DEVELOPMENT PLAN

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Scale: 1: 600	Figure No.: 3

2.0 WATER SUPPLY AND APPURTENANCES

2.1 EXISTING CONDITIONS

WSP has obtained existing Plan and Profile drawings from the Region of Peel for the area adjacent to the site. A subsurface Utility Engineering Report was completed by T2 Utility Engineers Inc. which identified all the underground infrastructure in the vicinity of the site. Locally, there is a 300mm watermain on South Service Road.

2.2 WATER SUPPLY

In accordance with Region of Peel Standards a 300mm diameter watermain is required to service high density residential. Therefore, it is proposed to provide one (1) domestic and one (1) fire service connection to the building from the existing 300mm watermain on South Service Road. Both services will include a valve and box at the property line. In addition, a water meter and backflow preventer will be installed on the domestic line and a double detector check valve will be installed on the fire lines, inside the mechanical room within the building in accordance with the Region standards. The domestic connection will be an h-style connection with a 150mm domestic service branching off a 200mm fire service. The mechanical room will need to be accessible by the Region and provide remote read-out locations for the Region's use in reading the meters. Refer to Figure 4 for proposed water servicing layout.

The estimated domestic water demand has been calculated using the Region of Peel Design Criteria and the preliminary site statistics provided by the architect. The Region of Peel Watermain Design Criteria also note that some new development can generate higher water demands during the first years of occupancy. Therefore, domestic water demands have been calculated for both the long term and the short term. For detailed calculations, see Appendix B.

Table 2.1 – Estimated Domestic Water Demand

	Long Term	**Short Term**
Average Water Consumption Rate (Long Term)	280 litres/person/day	409 litres/person/day
Residential Apartment Units	352 units	352 units
Office/Retail GFA	0m^2	0m^2
Total Residential Equivalent Population	950 people	950 people
Average Water Demand	3.08L/s	4.50L/s
Max Day Water Demand	6.16L/s	9.00L/s
Peak Hour Water Demand	9.24L/s	13.50L/s

The estimated fire flow has been calculated using the recommendations of the Fire Underwriters Survey. The fire flow calculation indicates that the recommended fire flow is 5000L/min (1320 US GPM) AT 20psi. The results of these calculations are included in Appendix A.

There is currently an existing hydrant approximately 66m from the proposed building. Since the distance between the existing hydrant and the proposed siamese connection will be greater than 45m, a hydrant will be installed within the South Service Road R.O.W. The siamese connection to the building will be located approximately 25.3m from the proposed hydrant. The proposed water servicing is shown on Figure 4.

2.3 HYDRANT FLOW TEST

The maximum estimated fire flow demand for the proposed development at 49 South Service Roads is 83.3L/s (1320US GPM), as noted above. A hydrant flow test was completed for the site on South Service Road. A flow of ~11700 USGPM (738L/s) could be achieved while maintaining a water pressure of 20psi. The hydrant flow test results can be found in Appendix A of this report. For all tests the fire flow available exceeds the fire demand calculated above. Therefore, we can conclude that the watermains adjacent to the site are adequate to support the domestic and fire water demand of the proposed development.

QUEEN ELIZABETH WAY

P.I.N. 13504–0974 (LT)

P.I.N. 13504–0977 (LT)

QUEEN ELIZABETH WAY

SOUTH SERVICE ROAD

P.I.N. 13504–0971 (LT)

BACKFLOW PREVENTOR

WATER METER AS PER REGION OF PEEL STD DWG 1-4-3

PROP.SIAMESE CONNECTION

PROP.FIRE HYDRANT

EX. 300mmØ WATERMAIN

EX. ABND. 200mmØ WATERMAIN

CUT AND CONNECT TO EX. 300mmØ

150mmØ DOMESTIC WATER

200mmØ FIRE WATER

CUT INTO EX. 300mmØ AND CONNECT WITH 300mm x 200mm TAPPING SLEEVE AND VALVE AND BOX AS PEEL STD DWG 1-6-4

2x45° VERT. BENDS

DETECTOR CHECK VALVE IN 1500mmØ CHAMBER AS PER REGION OF PEEL STD DWG 1-4-3

LEGEND

- LIMIT OF PROPERTY
- EX. WATERMAIN
- PROP. W/M CONNECTION
- PROP. VALVE & CHAMBER
- PROP. VALVE & BOX
- WATER METER
- DETECTOR ASSEMBLY
- PROP. SIAMESE
- PROP. FIRE HYDRANT

CLIENT

Edenshaw SSR Developments Limited

TITLE

49 South Service Road
Mississauga, Ontario

WATER SERVICING PLAN

wsp

100 Commerce Valley Dr. West, Thornhill, ON Canada L3T 0A1
t: 905.882.1100 f: 905.882.0055 www.wsp.com

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Scale 1: 600	Figure No. 4

3.0 SANITARY SEWAGE SYSTEM

3.1 EXISTING CONDITIONS

Locally, there is an existing 250mm sanitary sewer on South Service Road. The South Service Road sewer connects to the sewer on Hurontario Street which eventually connects to the 675mm sewer at the Hurontario Street and Inglewood Drive intersection.

3.2 DESIGN PARAMETERS

To calculate the theoretical peak sanitary flows, the following design criteria have been utilized taken from the Region of Peel Sanitary Sewer Design Criteria:

►302.8 L/cap/day average day domestic flow generation rate

►50 persons/hectare for Single Family Dwelling (>10m frontage)

►70 persons/hectare for Single Family Dwelling (<10m frontage)

►50 persons/hectare for Commercial Areas

►70 persons/hectare for Light Industrial Areas

►1/3 x number of students for Junior Public Schools (600 students minimum)

►1/2 x number of students for Senior Public Schools (900 students minimum)

►1/3 x number of students for Secondary Schools (1500 students minimum)

►2.7 persons/unit for apartment buildings (>475 ppl/ha)

►Peaking Factor – Harmon Peaking Factor

►Infiltration = 0.2 L/s/ha

The demand and peaking factors are based on Region of Peel Sanitary Sewer Design Criteria, March 2017.

3.3 EXISTING SANITARY SEWER FLOW

In the pre-development condition, there are 2 individual buildings as part of the OPP. For the purposes of the determining flows, a population equivalent of 70 persons/ hectare was used. Based on the design criteria noted above it is estimated that in the pre-development condition the site discharged an average of 0.20L/s to the sanitary sewer system and a peak of 0.56L/s to the sanitary sewer system, including infiltration. Refer to Appendix B for the detailed pre-development sanitary flow rate calculations.

3.4 POST-DEVELOPMENT SANITARY SEWER FLOW

An estimated post-development sanitary sewage flows to the downstream sanitary sewer system has been calculated based the Region of Peel Design Criteria and the preliminary site statistics provided by the architect. A summary of the calculations can be found below.

Table 3.4.1 – Estimated Proposed Sanitary Flow

Sanitary Demand Rate	302.8 litres/person/day
Residential Population	950 people
Avg. Residential Flow	3.33L/s
Infiltration	No infiltration (Entire Site U/G Parking)
Average Sanitary Flow from Site	3.33L/s
Groundwater Discharge	2.8L/s
Peaking Factor	Residential: Harmon Peaking Factor (3.81)
Peak Sanitary Flow from Site	15.50L/s

Refer to Appendix B for site statistics and detailed post-development flow calculations.

3.5 SANITARY SERVICE

It is proposed to connect the development to the existing 250mm sanitary sewer on South Service Road with one connection. The proposed connection will be 200mm diameter. A control manhole is proposed to be placed immediately inside the property line for the connection. The internal system inside the parking structure will be designed by the mechanical engineer. The proposed sanitary service connection within the private site will be designed to meet the Ontario Plumbing Code. The sanitary connection to the site within the municipal road allowance will be designed to the Region of Peel Standards. Refer to Figure 5 for proposed sanitary servicing layout.

3.6 GROUNDWATER DISCHARGE

As part of this development application, a Hydrogeological Investigation was prepared by Palmer™., dated August 25, 2022. The estimated long-term theoretical groundwater flows from the hydrogeological investigation is 238,052L/day (2.76L/s). A chemical analysis of the groundwater present on site was conducted and compared to the City of Mississauga and Region of Peel sewer use by-law. The results of this chemical analysis indicate that the groundwater did not meet the requirements for discharge to the storm sewer. However, the groundwater meets all the regional requirements to discharge into the sanitary sewer.

The water collected in the sump will be pumped to the municipal sanitary sewer. The groundwater pumps will be designed by the mechanical engineer. A sampling port and meter will be provided to allow Region staff to sample the groundwater flow upstream of the control manhole and prior to mixing with any sanitary flows from the site. The pumped groundwater rates have been included in the downstream sanitary sewer analysis as discussed in Section 3.8 of this report. From the sampling port, the groundwater discharge will flow by gravity to a sanitary control manhole and subsequently be discharged to the municipal sanitary sewer system.

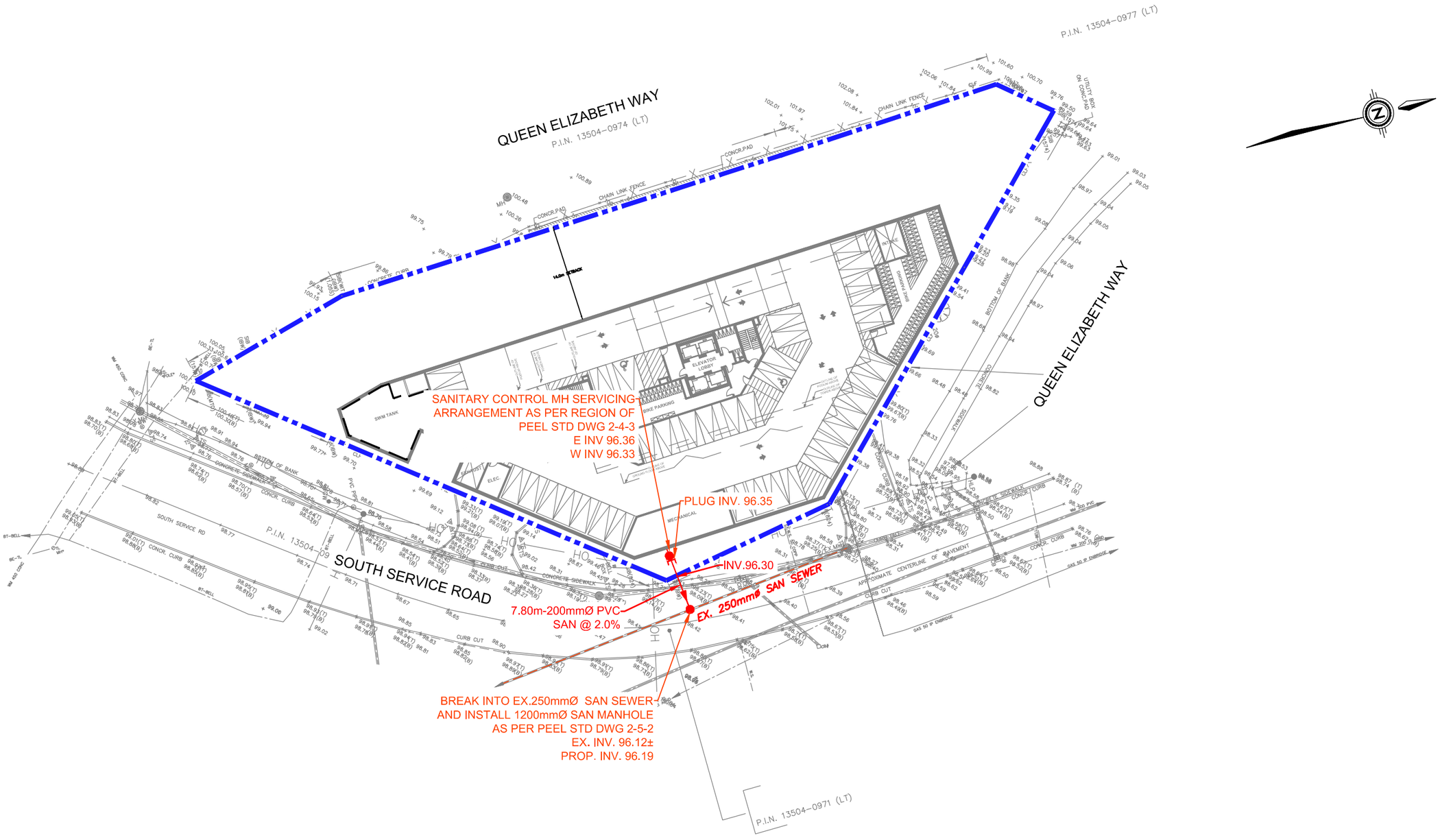
3.7 CONSTRUCTION DEWATERING

As part of this development application, a Hydrogeological Investigation was prepared by by Palmer™., dated August 25, 2022. The report found that the short term (Construction) dewatering quantity is 451,882L/day (5.23L/s). The water will be pumped and discharged to the sanitary sewer system.

3.8 DOWNSTREAM SEWER ANALYSIS

WSP has prepared a pre- and post-development downstream sanitary sewer analysis. The analysis includes calculations for the wet weather flow condition, where an infiltration (0.20 L/s/ha) has been added to the calculated sanitary flow. The sanitary flow for the sewershed was calculated using the Region of Peel Sanitary Sewer Design Criteria as outlined in Section 3.2. The sanitary generation determined in Section 3.4 was applied to the pre-development analysis to form the analysis of the post-development conditions. See Appendix C for the Sanitary Sewer Design Sheets. To facilitate this analysis, a Sanitary Sewer Drainage Area Plan has been created and is located in Appendix C.

In the post development condition, although some of the pipes in existing municipal system will be surcharged in the wet weather conditions, an HGL analysis shows that the HGL will be well below basements depths. Please note that the Region standard of 50 people per hectare seems too conservative for this area as the majority of the houses are located on large lots so in reality the density would be lower. Consequently, WSP Canada Inc. concludes that the existing municipal sewer can accept the flow from the proposed site and no external improvements are required.



LEGEND

- LIMIT OF PROPERTY
- EX. SANITARY SEWER
- PROP. SAN CONNECTION

CLIENT
Edenshaw SSR Developments Limited

TITLE
49 South Service Road
Mississauga, Ontario

SANITARY SERVICING PLAN

wsp
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t: 905.882.1100 f: 905.882.0055 www.wsp.com

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Scale 1: 600	Figure No. 5

4.0 STORM DRAINAGE

A Stormwater Management Report for this development has been prepared by WSP under a separate cover. It identifies the Stormwater quantity and quality controls under which this site will operate to comply with.

4.1 EXISTING CONDITIONS

In the pre-development condition, there are 2 individual buildings and a parking lot surrounding the buildings. Flows from the site are directed towards to 425mm/ 525mm storm sewer on South Service Road.

4.2 PROPOSED DEVELOPMENT

The proposed development is a 26-storey multi-unit residential building. The total estimated unit count for the development is 352. Additionally, there will be underground parking that will cover the majority of the entire site.

The majority of storm flow from the site will be captured and directed to the Stormwater storage tank. There will be some uncontrolled areas along South Service Road. The tank will be sized to control the 100-year post-development flows to the 2-year pre-development levels. A detailed Stormwater management report is being submitted under a separate cover.

4.3 MINOR STORM DRAINAGE SYSTEM

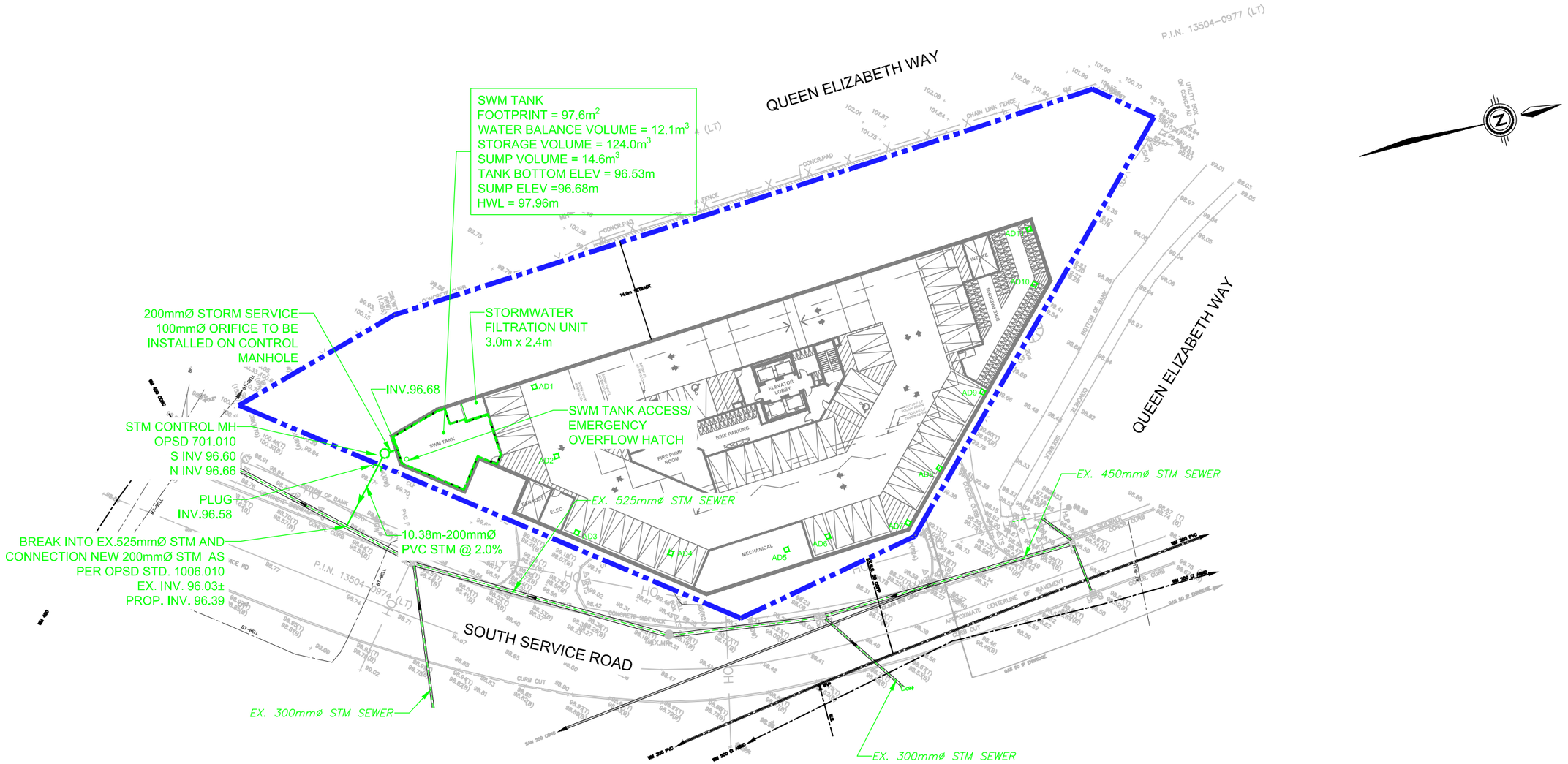
Storm flows will be directed to the Stormwater storage tank and controlled to an allowable release rate which will conform to the requirements of the City of Mississauga.

It is proposed to provide a new 200mm storm connection that will connect to the existing 525mm storm sewer on South Service Road. As per City requirements, a control manhole is proposed to be placed immediately inside the property line. The orifice from the Stormwater storage cistern to the control manhole will be sized to control the flow to the allowable release rate. The allowable release rate for the site is such that for all storm events the storm outflow from the site is reduced in the post development condition. It can therefore be concluded that during wet weather events, the development will produce a net reduction in the flows to the existing municipal storm sewer system. For further information on Stormwater management system being used for this site please see the Stormwater Management Report.

The new storm connection within the South Service Road right-of-way will be designed to the standards and specifications of the City of Mississauga. The new on-site storm sewers, which will be located within the parking garage, will be designed by a mechanical engineer to meet the standards of the Ontario Building Code. Refer to Figure 6 for the proposed storm sewer layout.

4.4 MAJOR STORM DRAINAGE SYSTEM

All storm flows will be collected by an internal storm drainage system and directed into the Stormwater storage tank. The flow will be controlled by a flow control device and release to the City's storm sewer at the allowable release rate for the site. In case of system failure, the system will be designed to have an emergency overflow access to the surface. Since all storm flows, up to 100-year storm events, will be reduced to pre-development levels, the existing storm sewer system will have reduced flows under the post-development condition. Refer to the separate Stormwater Management Report for Stormwater management calculation details.



LEGEND

- LIMIT OF PROPERTY
- EX. STORM SEWER
- PROP. STORM CONNECTION

CLIENT
Edenshaw SSR Developments Limited

TITLE
49 South Service Road
Mississauga, Ontario

STORM SERVICING PLAN

wsp
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t: 905.882.1100 f: 905.882.0055 www.wsp.com

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Scale: 1: 600	Figure No.: 6

5.0 CONCLUSION

5.1 WATER DISTRIBUTION

The proposed 49 South Service Road development will have one (1) domestic and one (1) fire service connection to the building from the existing 300mm watermain on South Service Road. A hydrant will be installed within the South Service Road R.O.W to ensure a maximum distance of 45m between the proposed hydrant and proposed siamese connection. A Hydrant flow test of watermains in the area has shown that the local watermains have sufficient capacity to provide fire protection to the proposed development. Water service design within Region's Right-of-Way will be designed to meet the standards and specifications of the Region of Peel, while services within the building are to be designed by the mechanical consultant per the Ontario Building Code and coordinated with WSP.

5.2 SANITARY SEWAGE

The 49 South Service Road development will have one (1) sanitary sewer service connection, which will be conveyed to the existing 250mm sanitary sewer on South Service Road. The connection will be 200mm diameter. The proposed sanitary service connection within the Region's right-of-way will be designed to meet the standards and specifications of the Region of Peel, while services within the building are to be designed by the mechanical consultant per the Ontario Building Code, and coordinated with WSP.

5.3 STORM SEWAGE

The proposed 49 South Service Road development will have one (1) Stormwater management system. Minor and major storm drainage for the proposed development will be collected by the internal site drainage system and directed into the proposed Stormwater storage tank. The flow will be controlled to the allowable flow levels and released to the existing 525mm storm sewer on South Service Road. The existing storm sewer system will not be adversely affected by the post-development condition as the rate of Stormwater release from this site will be decreased.

A separate Stormwater Management Report, has been prepared to address requirements concerning Stormwater management.

APPENDIX A – Fire Flow Calculations & Hydrant Flow Test Results

APPENDIX A
49 South Service Road
FIRE FLOW CALCULATIONS

Job No.: **211-08605**

Fire Flow Calculation Procedure per Water Supply for Public Fire Protection, 1999 by Fire Underwriter Survey, p 20.

$$F = 220\ C\sqrt{A}$$

where

F = Fire flow in Litres per minute (Lpm)
C = coefficient related to the type of construction
A = total floor area in square metres

A. **Determine Type of Construction**
=> Non-combustible Construction
Therefore C = 0.8

B. **Determine Ground Floor Area**
=> Fire-resistive building with vertical openings and exterior vertical communications properly protected
Therefore A = Largest Floor + 25% of 2 immediately adjoining floors
A = 1086 + 0.25*(1087 + 886)
A = 1,579 m2

C. **Determine Height in Storeys**
=> 26 Storeys

D. **Determined the Fire Flow**
F = 220 x 0.8 x √1579
F = 6,994 Lpm

E. **Determine Increase or Decrease for Occupancy**
=> Apartments are considered "Combustible"
Therefore 0% reduction

F. **Determine Decrease for Automatic Sprinkler Protection**
=> Has Automatic Sprinkler Protection (Per NFPA 13 Standards)
Therefore 30% reduction
30% reduction of 6994 Lpm = 2,098 Lpm

G. **Determine the Total Increase For Exposures**

Face	Distance (m)	Charge
West Side	390	0%
East Side	153	0%
North Side	218	0%
South Side	92	0%

Total 0% of 6,994 = 0 Lpm

H. **Req'd Fire Flow = D - F + G**
F = 4,896 Lpm
F = 5,000 Lpm (4,800 Lpm < F < 45,000 Lpm; OK)
F = 1,319 US GPM

Note

49 S Service Rd

HYDRANT FLOW TEST RESULTS

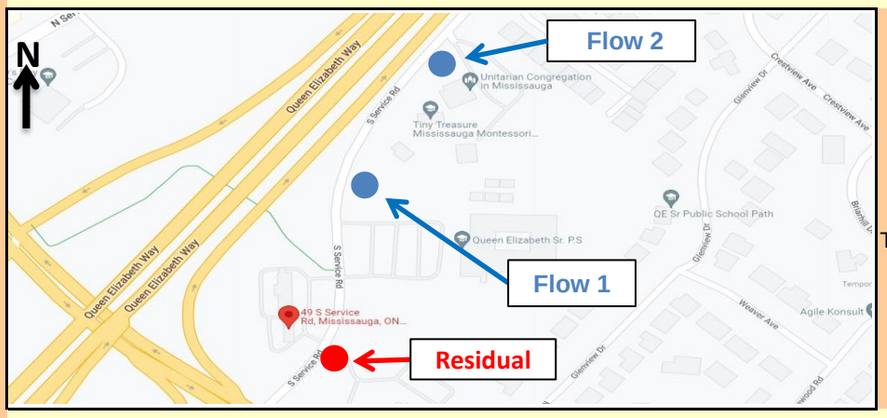
Date: 15-Sep-22 Time: 9:45 (hh/mm)

Municipality: Mississauga

Operator:

Tested By: Issac, Sen

Test No: **1**



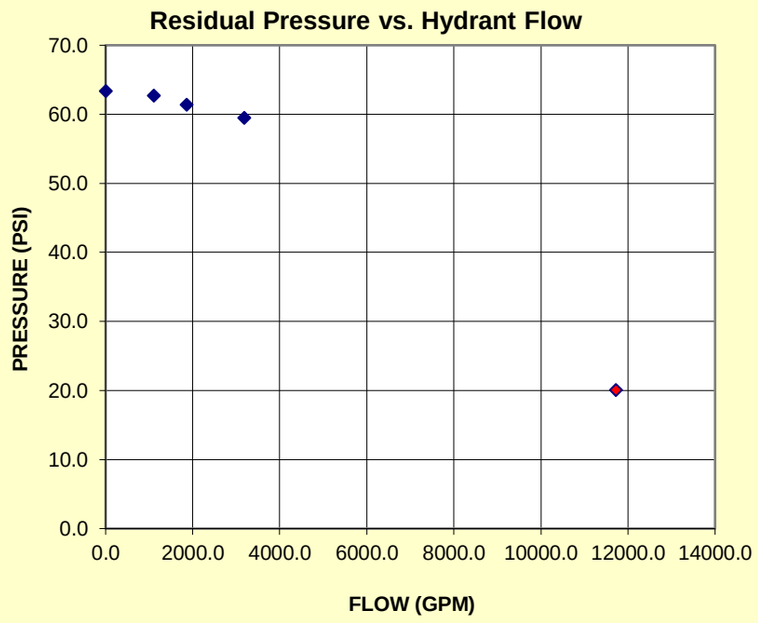
Conditions before Test (STATIC)

Residual Hydrant:	63.4 psi	437 kPa
Hydrant that will Flow:	63.4 psi	437 kPa
Δ pressure:	0.0 psi	0 kPa
Elevation Difference: (Flow El. - Residual El.)	0.0 ft	0.0 m

Test Notes:

TEST		TEST FLOW		RESIDUAL PRESSURE (psi)		Minimum Residual P_r (psi)	Fire Flow at Minimum Residual, Q_r (USGPM)	Fire Flow at Minimum Residual, Q_r (L/s)	10% Pressure Drop Achieved?
Port Size (in)	Nozzle Pressure (psi)	(USGPM)	(L/s)	Monitoring Hydrant	Flow Hydrant (Corrected) *				
STATIC	n/a	0	0	63.4	63.4				
Single Hydrant Test									
1 x 2"	44.1	1111.0	70.1	62.7	62.7	20	10466	660	NO
2 x 2"	31.1	1867.0	117.8	61.4	61.4	20	9884	624	NO
3 x 2"									
Hydrant 1	0.1	0.0	0.0			20			
Hydrant 2	0.0	0.0	0.0						
4 x 2"									
Hydrant 1	29.5	1818.0	114.7	59.5	59.5	20	11731	740	NO
Hydrant 2	19.2	1368.0	86.3						

* Pressure correction is equal to the elevation difference. Column 2 (and Table A) show the nozzle pressure while flowing.



Results			
Static Pressure		Flow at 20 psi (140kPa)*	
(psi)	(kPa)	(gpm)	(L/s)
63.4	437	11700	738

* Results carried to nearest 50 gpm or 100 gpm if over 1000 gpm

Hydrant Classification as per NFPA 291			
Class	AA	Color	BLUE

Water Discharged During Test:	38000 L

Rounded up to closest 100L

49 S Service Rd

Subject Watermain Details

Diameter:	300 mm	**Material:**	PVC
Area:	0.071 m2		

Subject Hydrant & Valve Details

Residual Hydrant:	
Flow Hydrant 1:	
Flow Hydrant 2:	

TABLE A: TESTED PRESSURES AND FLOWS

Point	Time		Residual		Flow Hydrant 1				Flow Hydrant 2				Total Flow		Velocity
			Residual (S1)		Flow 1 (S2)		Flow 2 (S3)		Flow 3 (S4)		Flow 4 (S5)				
	Start	Finish	(kPa)	(psi)	(L/s)	(GPM)	(L/s)	(GPM)	(L/s)	(GPM)	(L/s)	(GPM)	(L/s)	(GPM)	(m/s)
Static	49	129	437	63.4	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
1 x 2"	280	304	432	62.7	70.1	1111	0.0	0	0.0	0	0.0	0	70.1	1111	1.0
2 x 2"	391	450	423	61.4	58.1	921	59.7	946	0.0	0	0.0	0	117.8	1867	1.7
3 x 2"			0	0.0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
4 x 2"	570	634	410	59.5	57.0	903	57.7	915	43.6	691	42.7	677	201.0	3186	2.8

APPENDIX B – Site Statistics and Flow Calculations

APPENDIX B
49 South Service Road
Pre-Development Site Statistics

Industrial

Unit Type	Area (ha)	Pop Density (ppl/ha)	Population
Industrial Buidlings	0.44	70	31

Note: Population calculated per Region of Peel Sanitary Sewer Design Criteria Section 2.1. The pre-development site consists of 2 buildings, an industrial building and a garage. The population was based on a population density of 70 ppl/ha for light industrial areas.

Pre-Development Sanitary Flow

Population =	31	
Avg Flow =	0.11	L/s (assumes 302.8L/cap/d)
Peak Factor =	4.35	(Harmon Formula)
Peak Flow =	0.47	L/s
Infiltration =	0.09	L/s
Total Avg San Flow =	**0.20**	**L/s**
Total Peak San Flow =	**0.56**	**L/s**

Pre-Development Water Demand

Population =	31	
Res Demand =	0.10	L/s (assumes 280L/cap/d)
Max Day Factor =	2.00	
Max Day Flow =	**0.20**	**L/s**
Peak Hour Factor =	3.00	
Peak Hour Flow =	**0.30**	**L/s**

APPENDIX B
49 South Service Road
Post-Development Site Statistics

Residential Units

Unit Type	Quantity	Pop Density	Population
1 Bedroom	234	**2.7**	632
2 Bedroom	118	**2.7**	319
Total	352		950

Post-Development Sanitary Flow

Total Population =	950	(Residential + Commercial)
Avg Flow =	3.33	L/s (assumes 302.8L/cap/d)
Peak Factor =	3.81	(Harmon Formula)
Peak Flow =	12.70	L/s
Groundwater Discharge	2.80	L/s
Total Avg San Flow =	**3.33**	**L/s**
Total Peak San Flow =	**15.50**	**L/s**

Post-Development Water Demand - Short Term

	Residential	Commercial	Total	
Population =	950	0	950	
Consumption Rate =	409	300	---	
Avg Demand =	4.50	0.00	4.50	L/s
Max Day Factor =	2.00	2.00	---	
Max Day Flow =	9.00	0.00	9.00	L/s
Peak Hour Factor =	3.00	3.00	---	
Peak Hour Flow =	**13.50**	**0.00**	**13.50**	**L/s**
Fire Flow =	83.30		**83**	L/s
Maximum Day + Fire Flow =	**92.00**	**0.00**	**92.00**	**L/s**

Post-Development Water Demand - Long Term

	Residential	Commercial	Total	
Population =	950	0	950	
Consumption Rate =	280	300	---	
Avg Demand =	3.08	0.00	3.08	L/s
Max Day Factor =	2.00	1.40	---	
Max Day Flow =	6.16	0.00	6.16	L/s
Peak Hour Factor =	3.00	3.00	---	
Peak Hour Flow =	**9.24**	**0.00**	**9.24**	**L/s**
Fire Flow =	83.30		**83**	L/s
Maximum Day + Fire Flow =	**89.46**	**0.00**	**89.46**	**L/s**

APPENDIX C – Sanitary Sewer Downstream & HGL Analysis

NORTH SUBDIVISION
A=45.3 ha
RES: 2378
INST: 1450

A=1.52 ha
INSTIT: 31

A=0.78 ha
INSTIT: 39

A=0.31 ha
INSTIT: 16

A=0.18 ha
INSTIT: 9

A=0.20 ha
INSTIT: 10

MH1783591

SUBJECT SITE

QUEEN ELIZABETH WAY

A=0.86 ha
RES: 43

A=0.64 ha
RES:32

A=0.73 ha
RES: 37

A=0.73 ha
RES: 37

A=0.92 ha
RES: 46

A=0.61 ha
RES: 31

A=0.49 ha
RES: 25

A=0.45 ha
RES: 23

MH1783592

MH1783593

MH1783594

MH1783051

MH1783050

MH1783049

MH1783048

MH1783054

MH1783053

MH1783052

HURONTARIO
STREET SOUTH
A=5.04 ha
RES: 252

MH1783047

MH1783046

MH1783998

MH1783045

A=0.03
POP: 0

MH1783044

MH1784214

MH1784213

MH1784212

675mm SAN SEWER

675mm SAN SEWER

HURONTARIO STREET

MH1784211

A=0.75 ha
RES: 38

A=0.28 ha
POP: 0

A=0.47 ha
RES: 24

A=0.39 ha
RES: 20

A=0.05 ha
POP: 0

LEGEND

SANITARY SEWER DRAINAGE AREA

EXISTING SANITARY LOCAL SEWER

EXISTING SANITARY TRUNK SEWER

A=1.00ha
RES:
COMM:
INDUST:
INST:

CATCHMENT AREA & POPULATION

CLIENT
Edenshaw SSR Developments Limited

TITLE
49 South Service Road
Mississauga, Ontario

SANITARY DRAINAGE PLAN (PRE-DEVELOPMENT)

wsp
100 Commerce Valley Dr. West, Thornhill, ON Canada L3T 0A1
t: 905.882.1100 f: 905.882.0055 www.wsp.com

Checked M.M.	Drawn 10/12 Cad
Date SEPT 2022	Proj. No. 211-08605
Scale 1:5000	Figure No. C1

FILENAME: C:\Users\caas077425\ACCDocs\WSP Canada projects (AMER)\LDO\Files\221-08605 49 South Service Road\Mun\FSR\Figures\221-08605_Fig_DOWNSTREAM ANALYSIS.dwg
PLOTDATE: Sep 28, 2022 - 11:28am, CAAS077425

THE REGIONAL MUNICIPALITY OF PEEL
SANITARY DESIGN CHART
49 SOUTH SERVICE ROAD - CITY OF MISSISSAUGA
PRE-DEVELOPMENT CONDITION

CONSULTANT:
WSP CANADA INC

*** DESIGN FLOWS AS PER REGION OF**
PEEL SANITARY SEWER DESIGN FLOW

DATE: SEPTEMBER 2022
DESIGNED BY: A.S.
CHECKED BY: M.M.

DRAINAGE AREA PLAN NO.:

Manning's n= 0.013

LOCATION	FROM MH	TO MH	AREA (ha)	AREA DENSITY (ppha)	POP.	CUMM. AREA (ha)	CUMM. POP.	DESIGN SEWAGE FLOW (L/sec)	Peaking Factor	PEAK SEWAGE FLOW (L/sec)	INFILTRATION FLOW * 0.200 (L/sec/ha)	TOTAL FLOW (L/sec)	LENGTH (m)	GRADIENT (%)	PIPE SIZE (mm)	CAPACITY (L/sec)	% FULL	VELOCITY FULL (m/sec)	VELOCITY ACTUAL (m/sec)
MAIN LEG																			
South Service Road (Project Site)	-	-	0.44	70	31	-	-	0.00	4.50	0.0	0.0	0.0							
South Service Road	*1783591*	*1783592*	1.16	50	0	1.52	31	0.11	4.35	0.5	0.3	0.8	73.8	0.46	250	40.3	1.98%	0.82	0.31
South Service Road & Hurontario Street	*1783592*	*1783593*	0.78	50	39	2.30	70	0.24	4.28	1.0	0.5	1.5	64.0	0.31	250	33.1	4.53%	0.67	0.32
South Service Road & Hurontario Street	*1783593*	*1783594*	0.31	50	16	2.61	85	0.30	4.26	1.3	0.5	1.8	18.9	0.21	250	27.3	6.61%	0.56	0.30
Hurontario Street	*1783594*	1783054	0.18	50	9	2.79	94	0.33	4.25	1.4	0.6	2.0	24.1	0.15	250	23.0	8.68%	0.47	0.27
Hurontario Street	1783054	1783053	0.20	50	10	2.99	104	0.37	4.24	1.5	0.6	2.1	62.3	1.00	250	59.5	3.53%	1.21	0.53
Hurontario Street	1783053	1783052	0.86	50	43	3.85	147	0.52	4.19	2.2	0.8	3.0	92.0	1.00	250	59.5	5.04%	1.21	0.58
Hurontario Street	1783052	1783051	0.64	50	32	4.49	179	0.63	4.16	2.6	0.9	3.5	90.9	1.40	250	70.4	4.97%	1.43	0.69
Hurontario Street	1783051	1783050	0.73	50	37	5.22	216	0.76	4.14	3.1	1.0	4.1	82.5	1.40	250	70.4	5.83%	1.43	0.75
Hurontario Street	1783050	1783049	0.73	50	37	5.95	252	0.88	4.11	3.6	1.2	4.8	90.0	1.40	250	70.4	6.82%	1.43	0.77
Hurontario Street	1783049	1783048	0.92	50	46	6.87	298	1.05	4.08	4.3	1.4	5.7	92.2	1.20	250	65.1	8.75%	1.33	0.77
Hurontario Street	1783048	1783047	0.61	50	31	7.48	329	1.15	4.06	4.7	1.5	6.2	90.1	1.50	250	72.8	8.51%	1.48	0.86
Hurontario Street	1783047	1783046	0.49	50	25	7.97	353	1.24	4.05	5.0	1.6	6.6	93.0	1.70	250	77.5	8.51%	1.58	0.92
Hurontario Street	1783046	1783045	0.45	50	23	8.42	376	1.32	4.03	5.3	1.7	7.0	72.1	2.00	250	84.1	8.32%	1.71	0.94
Hurontario Street	1783045	1783044	0.03	50	2	8.45	377	1.32	4.03	5.3	1.7	7.0	22.4	2.00	250	84.1	8.32%	1.71	0.94
Hurontario Street	1783044	1783998	0.05	0	0	48.43	2755	9.66	3.47	33.5	9.7	43.2	20.7	0.68	300	79.7	54.18%	1.13	1.16
Hurontario Street	1783998	1784214	0.39	50	20	53.86	3027	10.61	3.44	36.5	10.8	47.3	91.4	0.15	300	37.5	126.29%	0.53	0.61
Hurontario Street	1784214	1784213	0.75	50	38	54.61	3064	10.74	3.43	36.9	10.9	47.8	91.6	0.30	300	53.0	90.25%	0.75	0.86
Hurontario Street	1784213	1784212	0.47	50	24	55.08	3088	10.82	3.43	37.1	11.0	48.1	60.5	0.37	300	58.8	81.77%	0.83	0.94
Hurontario Street	1784212	1784211	0.28	0	0	55.36	3088	10.82	3.43	37.1	11.1	48.2	88.4	0.91	300	92.2	52.25%	1.31	1.33
HURONTARIO STREET SOUTH																			
Residential	-	-																	
Commercial	-	-	5.04	50	252														
Institutional	-	-	-	-	-														
Hurontario Street	-	1783998	5.04	50	252	5.04	252	0.9	4.11	3.6	1.0	4.6	---	---	---	---	---	---	---
NORTH SUBDIVISION																			
Residential (Single Family Homes)	-	-	36.88	50	1844														
Residential (Row Dwellings)	-	-	3.05	175	534														
Commercial	-	-	-	50	0														
Institutional (Secondary School)	-	-	3.08	-	1000	3.08	1000	3.50	1.00	3.5	0.6	4.1							
Institutional (Senior Public School)	-	-	2.29	-	450	2.29	450	1.58	1.00	1.6	0.5	2.1							
Mineola Road	-	1783044	45.30	---	3828	39.93	2378	8.3	3.53	29.4	8.0	37.4	---	---	---	---	---	---	---

NOTE: (1) - For population of proposed development see Appendix B Post-Development Site Statistics

NORTH SUBDIVISION
A=45.3 ha
RES: 2378
INST: 1450

A=1.60 ha
RES: 950

A=0.78 ha
INSTIT: 39

A=0.31 ha
INSTIT: 16

A=0.18 ha
INSTIT: 9

A=0.20 ha
INSTIT: 10

SUBJECT SITE

A=0.86 ha
RES: 43

A=0.64 ha
RES:32

A=0.73 ha
RES: 37

A=0.73 ha
RES: 37

A=0.92 ha
RES: 46

A=0.61 ha
RES: 31

A=0.49 ha
RES: 25

A=0.45 ha
RES: 23

HURONTARIO
STREET SOUTH
A=5.04 ha
RES: 252

A=0.03
POP: 0

A=0.75 ha
RES: 38

A=0.47 ha
RES: 24

A=0.28 ha
POP: 0

A=0.39 ha
RES: 20

A=0.05 ha
POP: 0

MH1783591
MH1783592
MH1783593
MH1783594
MH1783054
MH1783053
MH1783052
MH1783051
MH1783050
MH1783049
MH1783048
MH1783047
MH1783046
MH1783998
MH1783045
MH1783044
MH1784214
MH1784213
MH1784212
MH1784211

QUEEN ELIZABETH WAY

HURONTARIO STREET

675mm SAN SEWER

675mm SAN SEWER

LEGEND

SANITARY SEWER DRAINAGE AREA

EXISTING SANITARY LOCAL SEWER

EXISTING SANITARY TRUNK SEWER

A=1.00ha
RES:
COMM:
INDUST:
INST:

CATCHMENT AREA & POPULATION

CLIENT
Edenshaw SSR Developments Limited

TITLE
49 South Service Road
Mississauga, Ontario

SANITARY DRAINAGE PLAN (POST-DEVELOPMENT)

wsp
100 Commerce Valley Dr. West, Thornhill, ON Canada L3T 0A1
t: 905.882.1100 f: 905.882.0055 www.wsp.com

Checked M.M.	Drawn 10/12 Cad
Date SEPT 2022	Proj. No. 211-08605
Scale 1:5000	Figure No. C2

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PLOTDATE: Sep 28, 2022 - 11:29am, CAAS077425

THE REGIONAL MUNICIPALITY OF PEEL
SANITARY DESIGN CHART
49 SOUTH SERVICE ROAD - CITY OF MISSISSAUGA
POST-DEVELOPMENT CONDITION

CONSULTANT:
WSP CANADA INC

*** DESIGN FLOWS AS PER REGION OF**
PEEL SANITARY SEWER DESIGN FLOW

DATE: SEPTEMBER 2022
DESIGNED BY: A.S.
CHECKED BY: M.M.

DRAINAGE AREA PLAN NO.:

Manning's n= 0.013

LOCATION	FROM MH	TO MH	AREA (ha)	AREA DENSITY (ppha)	POP.	CUMM. AREA (ha)	CUMM. POP.	DESIGN SEWAGE FLOW (L/sec)	Peaking Factor	PEAK SEWAGE FLOW (L/sec)	INFILTRATION FLOW * 0.200 (L/sec/ha)	GROUNDWATER FLOW (L/sec)	TOTAL FLOW (L/sec)	LENGTH (m)	GRADIENT (%)	PIPE SIZE (mm)	CAPACITY (L/sec)	% FULL	VELOCITY FULL (m/sec)	VELOCITY ACTUAL (m/sec)
MAIN LEG																				
South Service Road (Project Site)	-	-	0.44	-	950	-	-	0.00	4.50	0.0	0.0									
South Service Road	*1783591*	*1783592*	1.16	0	0	1.52	950	3.33	3.81	12.7	0.3	2.8	15.8	73.8	0.46	250	40.3	39.06%	0.82	0.77
South Service Road & Hurontario Street	*1783592*	*1783593*	0.78	50	39	2.30	989	3.47	3.80	13.2	0.5		13.7	64.0	0.31	250	33.1	41.38%	0.67	0.64
South Service Road & Hurontario Street	*1783593*	*1783594*	0.31	50	16	2.61	1005	3.52	3.80	13.4	0.5		13.9	18.9	0.21	250	27.3	51.01%	0.56	0.56
Hurontario Street	*1783594*	1783054	0.18	50	9	2.79	1014	3.55	3.80	13.5	0.6		14.1	24.1	0.15	250	23.0	61.22%	0.47	0.50
Hurontario Street	1783054	1783053	0.20	50	10	2.99	1024	3.59	3.79	13.6	0.6		14.2	62.3	1.00	250	59.5	23.88%	1.21	0.99
Hurontario Street	1783053	1783052	0.86	50	43	3.85	1067	3.74	3.78	14.1	0.8		14.9	92.0	1.00	250	59.5	25.06%	1.21	1.01
Hurontario Street	1783052	1783051	0.64	50	32	4.49	1099	3.85	3.77	14.5	0.9		15.4	90.9	1.40	250	70.4	21.89%	1.43	1.13
Hurontario Street	1783051	1783050	0.73	50	37	5.22	1135	3.98	3.76	15.0	1.0		16.0	82.5	1.40	250	70.4	22.74%	1.43	1.16
Hurontario Street	1783050	1783049	0.73	50	37	5.95	1172	4.11	3.75	15.4	1.2		16.6	90.0	1.40	250	70.4	23.59%	1.43	1.18
Hurontario Street	1783049	1783048	0.92	50	46	6.87	1218	4.27	3.74	16.0	1.4		17.4	92.2	1.20	250	65.1	26.71%	1.33	1.11
Hurontario Street	1783048	1783047	0.61	50	31	7.48	1248	4.37	3.74	16.3	1.5		17.8	90.1	1.50	250	72.8	24.44%	1.48	1.22
Hurontario Street	1783047	1783046	0.49	50	25	7.97	1273	4.46	3.73	16.6	1.6		18.2	93.0	1.70	250	77.5	23.47%	1.58	1.28
Hurontario Street	1783046	1783045	0.45	50	23	8.42	1295	4.54	3.72	16.9	1.7		18.6	72.1	2.00	250	84.1	22.12%	1.71	1.35
Hurontario Street	1783045	1783044	0.03	50	2	8.45	1297	4.54	3.72	16.9	1.7		18.6	22.4	2.00	250	84.1	22.12%	1.71	1.35
Hurontario Street	1783044	1783998	0.05	0	0	48.43	3674	12.88	3.37	43.3	9.7		53.0	20.7	0.68	300	79.7	66.46%	1.13	1.21
Hurontario Street	1783998	1784214	0.39	50	20	53.86	3946	13.83	3.34	46.2	10.8		57.0	91.4	0.15	300	37.5	152.19%	0.53	0.61
Hurontario Street	1784214	1784213	0.75	50	38	54.61	3983	13.96	3.33	46.6	10.9		57.5	*91.6*	0.30	300	53.0	108.56%	0.75	0.87
Hurontario Street	1784213	1784212	0.47	50	24	55.08	4007	14.04	3.33	46.8	11.0		57.8	60.5	0.37	300	58.8	98.26%	0.83	0.97
Hurontario Street	1784212	1784211	0.28	0	0	55.36	4007	14.04	3.33	46.8	11.1		57.9	88.4	0.91	300	92.2	62.77%	1.31	1.38
HURONTARIO STREET SOUTH																				
Residential	-	-																		
Commercial	-	-	5.04	50	252															
Institutional	-	-	-	-	-															
Hurontario Street	-	1783998	5.04	50	252	5.04	252	0.9	4.11	3.6	1.0		4.6	---	---	---	---	---	---	---
NORTH SUBDIVISION																				
Residential (Single Family Homes)	-	-	36.88	50	1844															
Residential (Row Dwellings)	-	-	3.05	175	534															
Commercial	-	-	-	50	0															
Institutional (Secondary School)	-	-	3.08	-	1000	3.08	1000	3.50	1.00	3.5	0.6		4.1							
Institutional (Senior Public School)	-	-	2.29	-	450	2.29	450	1.58	1.00	1.6	0.5		2.1							
Mineola Road	-	1783044	45.30	---	3828	39.93	2378	8.3	3.53	29.4	8.0		37.4	---	---	---	---	---	---	---

NOTE: (1) - For population of proposed development see Appendix B Post-Development Site Statistics

THE REGIONAL MUNICIPALITY OF PEEL
SANITARY DESIGN CHART
49 SOUTH SERVICE ROAD - CITY OF MISSISSAUGA
PRE-DEVELOPMENT CONDITION - HGL ANALYSIS

CONSULTANT:
WSP CANADA INC.

*** DESIGN FLOWS AS PER REGION OF**
PEEL SANITARY SEWER DESIGN FLOW

DATE: SEPTEMBER 2022
DESIGNED BY: AS
CHECKED BY: MM

DRAINAGE AREA PLAN NO.:

Manning's n= 0.013

LOCATION	FROM MH	TO MH	US INVERT (m)	DS INVERT (m)	US OBVERT (m)	DE OBVERT (m)	GROUND ELEV. @ US MH (m)	LENGTH (m)	SLOPE (%)	DIAMETER (mm)	PIPE CAPACITY (L/s)	PEAK FLOW (L/s)	HGL SLOPE (%)	US HGL (m)	DS HGL (m)	SURCHARGE ABOVE OBV @ US MH (m)	DISTANCE BELOW SURFACE @ US MH (m)
Hurontario Street	1783047	1783046	87.82	86.27	88.07	86.52	90.64	93.0	1.7	250.0	77.5	6.6	0.012	86.53	86.52	-1.54	4.11
Hurontario Street	1783046	1783045	86.25	84.81	86.50	85.06	89.37	72.1	2.0	250.0	84.1	7.0	0.014	85.07	85.06	-1.43	4.30
Hurontario Street	1783045	1783044	83.38	82.92	83.63	83.17	87.61	22.4	2.0	250.0	84.1	7.0	0.014	83.17	83.17	-0.46	4.44
Hurontario Street	1783044	1783998	82.79	82.65	83.09	82.95	87.12	20.7	0.7	300.0	79.7	43.2	0.200	82.99	82.95	-0.10	4.13
Hurontario Street	1783998	1784214	82.62	82.45	82.92	82.75	86.77	91.4	0.15	300	37.5	47.3	0.239	82.97	82.75	0.05	3.80
Hurontario Street	1784214	1784213	82.45	82.20	82.75	82.50	86.25	91.6	0.30	300	53.0	47.8	0.244	82.72	82.50	-0.03	3.53
Hurontario Street	1784213	1784212	81.14	80.85	81.44	81.15	85.27	60.5	0.37	300	58.8	48.1	0.247	81.30	81.15	-0.14	3.97
Hurontario Street	1784212	1784211	80.84	80.61	81.14	80.91	83.67	88.4	0.91	300	92.2	48.2	0.248	81.13	80.91	-0.01	2.54

NOTE: For population of proposed development see Appendix B.

THE REGIONAL MUNICIPALITY OF PEEL
SANITARY DESIGN CHART
49 SOUTH SERVICE ROAD - CITY OF MISSISSAUGA
POST-DEVELOPMENT CONDITION - HGL ANALYSIS

CONSULTANT:
WSP CANADA INC.

*** DESIGN FLOWS AS PER REGION OF**
PEEL SANITARY SEWER DESIGN FLOW

DATE: SEPTEMBER 2022
DESIGNED BY: AS
CHECKED BY: MM

DRAINAGE AREA PLAN NO.:

Manning's n= 0.013

LOCATION	FROM MH	TO MH	US INVERT (m)	DS INVERT (m)	US OBVERT (m)	DE OBVERT (m)	GROUND ELEV. @ US MH (m)	LENGTH (m)	SLOPE (%)	DIAMETER (mm)	PIPE CAPACITY (L/s)	PEAK FLOW (L/s)	HGL SLOPE (%)	US HGL (m)	DS HGL (m)	SURCHARGE ABOVE OBV @ US MH (m)	DISTANCE BELOW SURFACE @ US MH (m)
Hurontario Street	1783047	1783046	87.82	86.27	88.07	86.52	90.64	93.0	1.7	250.0	77.5	18.2	0.094	86.61	86.52	-1.46	4.03
Hurontario Street	1783046	1783045	86.25	84.81	86.50	85.06	89.37	72.1	2.0	250.0	84.1	18.6	0.098	85.13	85.06	-1.37	4.24
Hurontario Street	1783045	1783044	83.38	82.92	83.63	83.17	87.61	22.4	2.0	250.0	84.1	18.6	0.098	83.19	83.17	-0.44	4.42
Hurontario Street	1783044	1783998	82.79	82.65	83.09	82.95	87.12	20.7	0.7	300.0	79.7	53.0	0.300	83.01	82.95	-0.08	4.11
Hurontario Street	1783998	1784214	82.62	82.45	82.92	82.75	86.77	91.4	0.15	300	37.5	57.0	0.347	83.14	82.82	0.22	3.63
Hurontario Street	1784214	1784213	82.45	82.20	82.75	82.50	86.25	91.6	0.30	300	53.0	57.5	0.354	82.82	82.50	0.07	3.43
Hurontario Street	1784213	1784212	81.14	80.85	81.44	81.15	85.27	60.5	0.37	300	58.8	57.8	0.357	81.44	81.23	0.00	3.83
Hurontario Street	1784212	1784211	80.84	80.61	81.14	80.91	83.67	88.4	0.91	300	92.2	57.9	0.359	81.23	80.91	0.09	2.44

NOTE: For population of proposed development see Appendix B.

APPENDIX D – Hydrogeological Investigation

74 Berkeley Street, Toronto, ON M5A 2W7
Tel: 647-795-8153 | www.pecg.ca

DRAFT Hydrogeological Assessment

49 South Service Road, Mississauga, Ontario

Palmer Project #
2204701

Prepared For
Edenshaw SSR Developments Limited

August 25, 2022

74 Berkeley Street, Toronto, ON M5A 2W7
Tel: 647-795-8153 | www.pecg.ca

August 25, 2022

Roman Tsap
Edenshaw SSR Developments Limited
201-129 Lakeshore Rd E
Mississauga, ON L5G 1E5

Dear Roman:

Re: DRAFT Hydrogeological Assessment – 49 South Service Road, Mississauga, Ontario
Project #: 2204701

Palmer is pleased to submit the attached report describing the results of our Draft Hydrogeological Assessment for the proposed redevelopment located at 49 South Service Road, Mississauga, Ontario ("the site"). Palmer understands that our Hydrogeological Assessment is required for a development approval application with the City of Mississauga. It is understood that the proposed residential redevelopments consist of a 22-storey tower, 4-storey podium, and up to five (5) levels of underground parking. This report provides a characterization of the site hydrogeological conditions based on our records review, field investigations, laboratory testing and data analysis. In addition, a site-wide water balance and impact assessment was completed.

This report summarizes the results of the hydrogeological assessment including a characterization of site geology and hydrostratigraphy, groundwater levels, and estimates for construction dewatering rates based on a non-watertight foundation scenario. The total dewatering rate is estimated to be 1,646,724 L/day. As this value is greater than 400,000 L/day, a Category 3 Permit to Take Water (PTTW) would be required. A Short-Term Discharge Permit with the City of Mississauga and the Region of Peel will be required to discharge into the sewer system for the construction phase, and groundwater treatment will be required if discharge waters are directed into the storm sewer.

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

DRAFT

_____

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

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1. Introduction

Palmer was retained by Edenshaw SSR Developments Limited (the "client") to complete a Hydrogeological Assessment for the proposed redevelopment located at 49 South Service Road, Mississauga, Ontario (the "site") (**Figure 1**). We understand that the development will consist of a 22-storey tower, 4-storey podium, and up to five (5) levels of underground parking, located on a property that is approximately 0.44 ha in total area. The site is surrounded by undeveloped treed area to the west and north as well as institutional land use to the east and southeast. Highway QEW is found immediately to the northwest, and South Service Road surrounds the site along the east boundary of the property.

This Hydrogeological Assessment aims to characterize the existing hydrogeological conditions of the site, and the potential impacts to natural environmental features or groundwater users, where present. This assessment includes: the groundwater flow direction at the site, the chemistry of the groundwater on site and the hydraulic conductivity of the overburden soils. The data resulting from the field investigations, laboratory and data analyses allows an assessment of the hydrogeological and Source Water Protection constraints related to the proposed redevelopment, Low Impact Development (LID) considerations, the need for groundwater control (dewatering) measures during construction and to control long-term seepage, hydrogeological foundation design considerations, and groundwater monitoring and mitigation measure recommendations.

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:

- Available geology, hydrogeology, and physiography mapping (e.g., Ontario Geological Survey (OGS) Surficial and Palaeozoic Geology);
- Source Water Protection mapping; and,
- Ministry of the Environment, Conservation and Parks (MECP) water well records;
- Oak Ridges Moraine Groundwater Program (ORMGP) database.

1.1 Scope of Work

The scope of work for this Hydrogeological Investigation included:

- Complete a background review of hydrogeological data including watershed plans, MECP water well records, surficial and bedrock geology mapping, Source Water Protection mapping, and ORMCP database;
- Develop the four (4) monitoring wells drilled as part of Palmer's Geotechnical Investigation (Palmer, 2022);
- Conduct single well response testing (SWRT) (i.e., rising and/or falling head tests) in four (4) monitoring wells to determine the hydraulic conductivity of the overburden soils, fractured and competent bedrock found on site;
- Complete a short-duration pumping test in BH22-4 to more accurately estimate the hydraulic conductivity of the fractured bedrock found on site;
- Collect two (2) groundwater chemistry samples from BH22-4, with the analysis results compared against the Region of Peel Sanitary Sewer By-law and the City of Mississauga Storm Sewer By-law;

LEGEND

- Monitoring Well, Geotechnical (Palmer, 2022)
- Monitoring Well, EDD (Palmer, 2022)
- Monitoring Well, EDD (GHD, 2020)
- Subject Site

Key Map

0 5 10 20 30 40 50
METRE SCALE

North American Datum 1983
Universal Transverse Mercator Projection Zone 17

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PROJECT
49 South Service Road

TITLE
Site Location

Palmer

REF. NO. 2204701-MR-301-1

Figure 1

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- Complete groundwater monitoring on two (2) occasions, separated by one (1) month, to assess the groundwater table elevation and determine the groundwater flow direction at the site;
- Estimate percolation rates using an empirical relationship and the hydraulic conductivity values obtained from single well response testing;
- Assessment of the need for dewatering for the project and if required, an estimation of the dewatering rate and permitting requirements; and
- Completion of a Hydrogeological Assessment report to support design and permitting, and to demonstrate compliance with Source Water Protection and municipal policies.

2. Hydrogeological Conditions

2.1 Regional Conditions

2.1.1 Physiography and Geology

The site is located within the Iroquois Plain physiographic region (Chapman & Putnam, 1984), about 2.2 km from the shores of Lake Ontario in Mississauga. This area is characterized by fine to coarse grained glaciolacustrine sediments overlying till deposits or bedrock. Gravel beaches and nearshore sand deposits can be found along the shore of former Glacial Lake Iroquois, which grade to silts and clays in the calmer offshore areas.

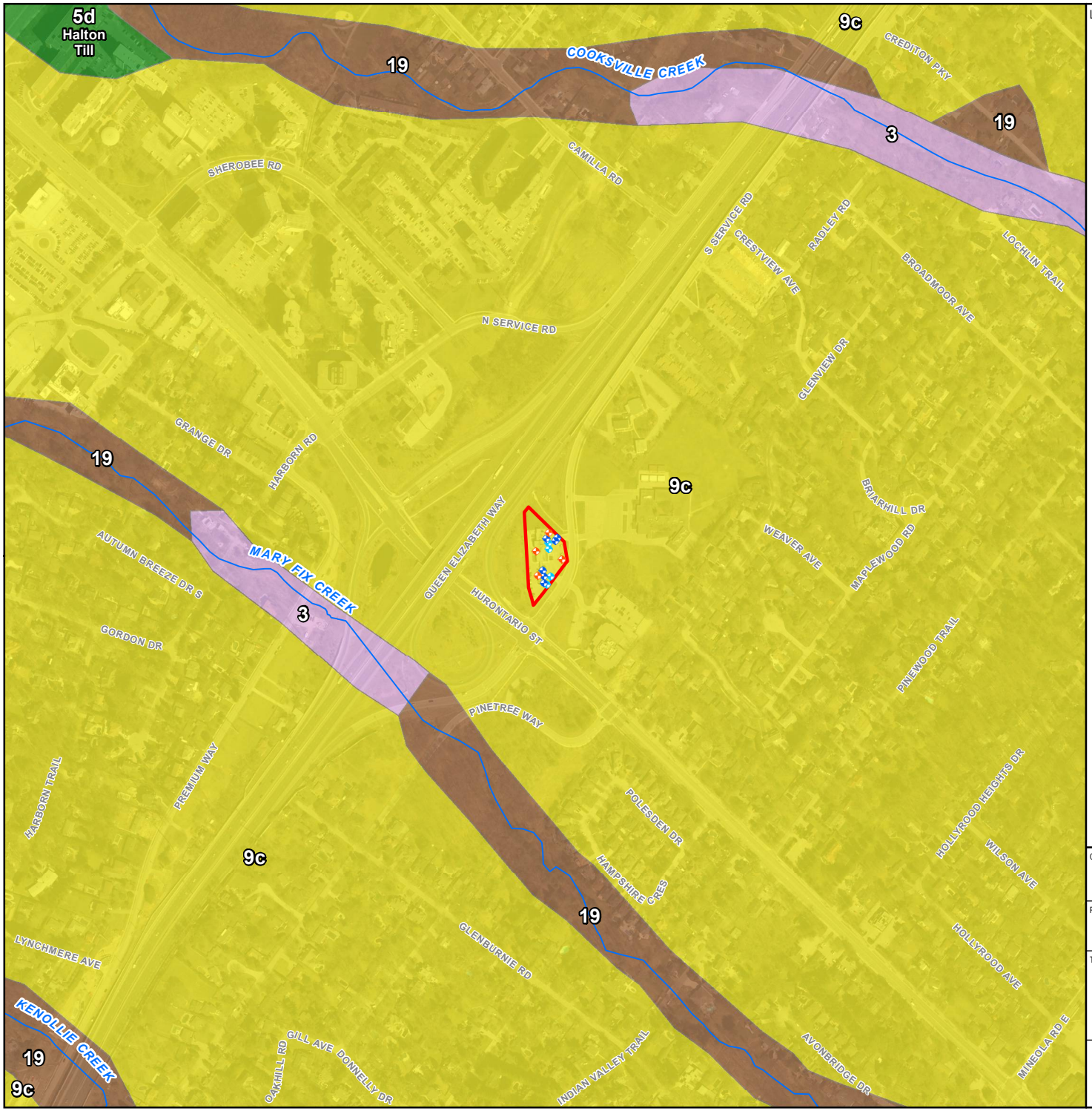
Available surficial and quaternary geology mapping by the Ontario Geological Survey (OGS) indicates that the native surficial geology is composed of coarse-textured glaciolacustrine deposits containing primarily sand and gravel with minor silt and clay (**Figure 2**). The bedrock found underlying the site is composed of the shales and limestones of the Georgian Bay Formation (**Figure 3**). Data from the Oak Ridges Moraine Groundwater Program (ORMGP) suggests that the bedrock can be found at a depth of 6 m at the site.

2.1.2 Drainage

The site is located within the Mary Fix Creek catchment of Subwatershed 9 (Norval to Port Credit) of Credit River watershed. The Mary Fix Creek originates in the mid of Mississauga and runs approximately 7.0 km from north to south before joining Credit River. The Credit River, which is about 1.5 km south of the site, discharges into Lake Ontario approximately 2.7 km southeast of the site. Mary Fix Creek is located approximately 210 m southwest of the site and Cooksville Creek approximately 590 m north of the site.

2.1.3 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 regional hydrostratigraphic units that control groundwater at the site are described below:



LEGEND

- Monitoring Well, Geotechnical (Palmer, 2022)
- Monitoring Well, EDD (Palmer, 2022)
- Monitoring Well, EDD (GHD, 2020)
- Watercourse[1]
- Subject Site

Surficial Geology[2]

Phanerozoic / Cenozoic / Quaternary / Recent

- 19: Modern alluvial deposits *(clay, silt, sand, gravel, may contain organic remains)*

Phanerozoic / Cenozoic / Quaternary / Pleistocene

- 9c: Coarse-textured glaciolacustrine deposits *(Foreshore and basinal deposits)*
- 5d: Tilll *(Clay to silt-textured till [derived from glaciolacustrine deposits or shale])*

Phanerozoic / Paleozoic

- 3: Paleozoic bedrock

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

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North American Datum 1983
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PROJECT
49 South Service Road

TITLE
Surficial Geology

Palmer

REF. NO. 2204701-MR-302-1

Figure 2

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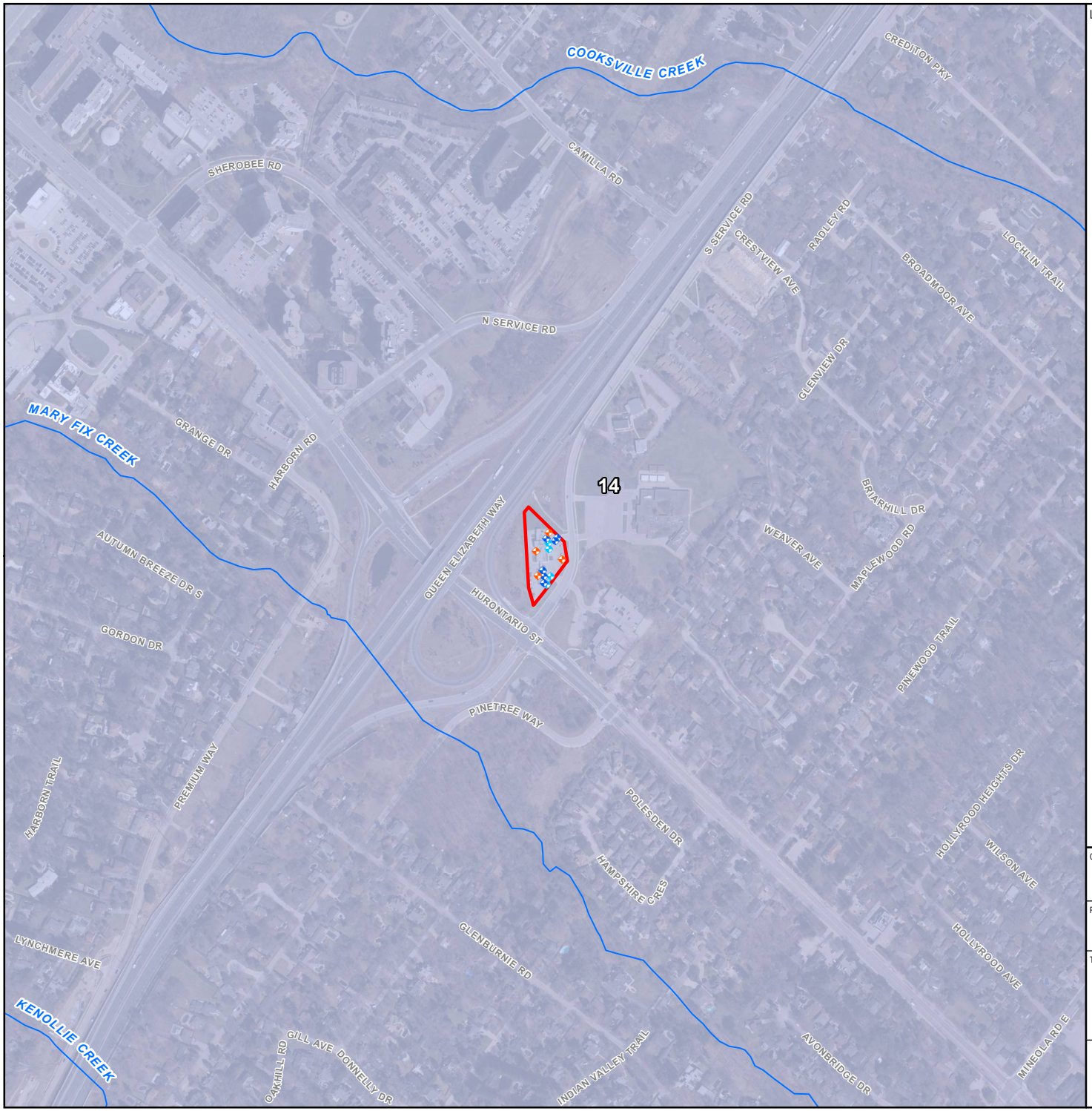

LEGEND

- Monitoring Well, Geotechnical (Palmer, 2022)
- Monitoring Well, EDD (Palmer, 2022)
- Monitoring Well, EDD (GHD, 2020)
- Watercourse[1]
- Subject Site

Paleozoic Bedrock Geology[2]

Upper Ordovician

14: Georgian Bay *(shale and limestone)*

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

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PROJECT
49 South Service Road

TITLE
Bedrock Geology

Palmer

REF. NO. 2204701-MR-303-1

Figure 2

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Coarse-textured glaciolacustrine deposits: Composed of sand and gravel with minor silt and clay, these were deposited during the last retreat of glacial ice, which blocked the St. Lawrence River outlet forming Glacial Lake Iroquois (approximately 12,500 years before present). Owing to their genesis in a glaciolacustrine environment, these deposits can be vertically stratified with layers containing more or less fine-textured materials (i.e., silt and clay). At the site, they form an unconfined aquifer with hydraulic conductivities that could vary between 10^{-5} and 10^{-3} m/s.

Weathered shale (Georgian Bay Formation): Directly underlying the overburden sediments at the site is the Georgian Bay Formation. Based on Palmer's Geotechnical Investigation at the site (Palmer, 2022), approximately the upper 50 cm of the bedrock is weathered shale containing sandy silt till. This unit was formed by erosion from glacial ice, which allowed the incorporation of till soils into the upper weathered bedrock horizon. The hydraulic conductivity of this unit could vary widely, depending on the degree of weathering present (e.g., from 10^{-3} to 10^{-7} m/s), but in general would act as an unconfined aquifer in combination with the coarse-textured glaciolacustrine deposits overlying.

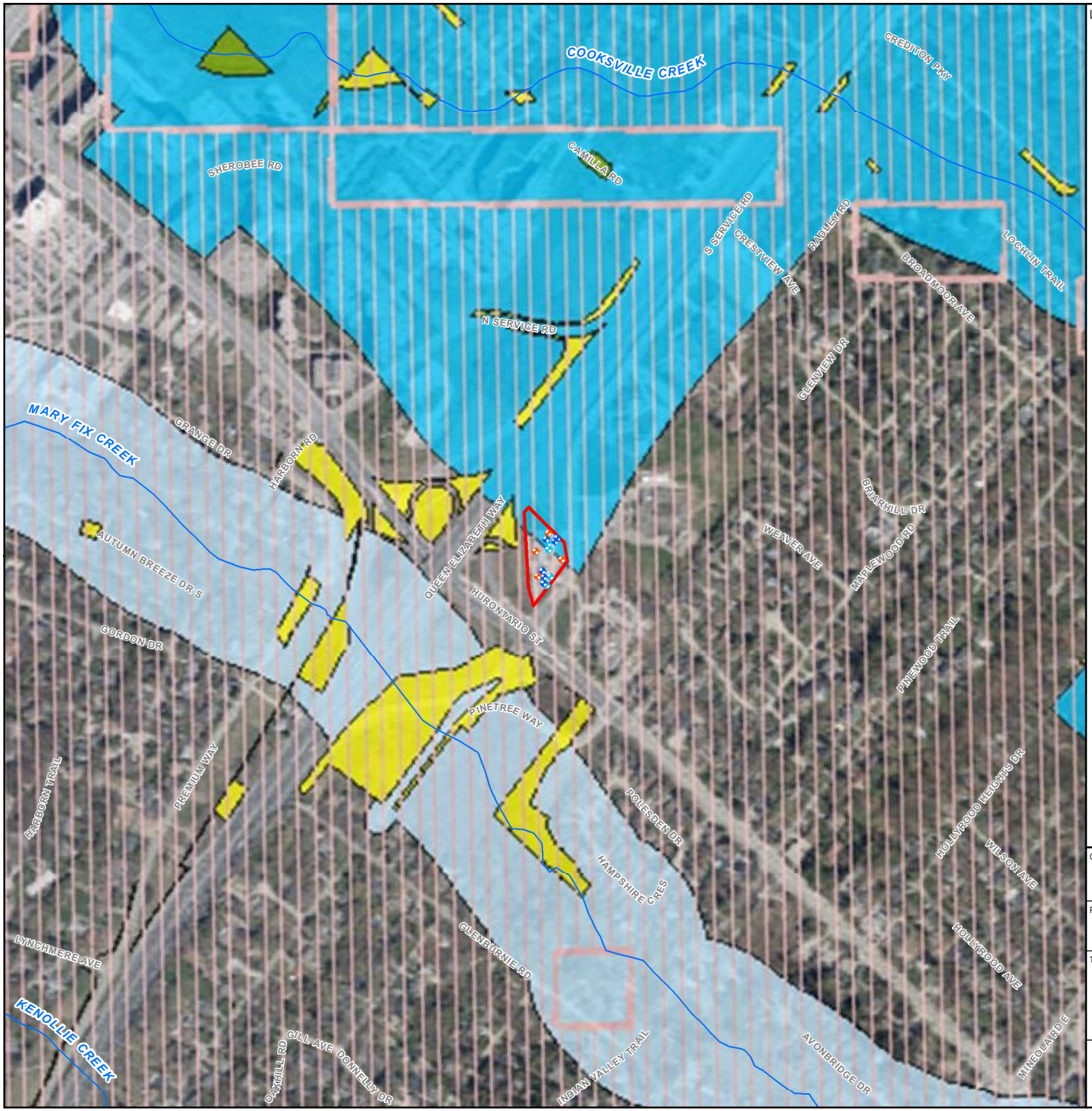
Shale and/or limestone bedrock (Georgian Bay Formation): Underlying the upper weathered zone is the shales and/or limestones of the Georgian Bay Formation. Despite not being as heavily weathered as the upper zone, the bedrock could vary in hydraulic conductivity depending on the degree of fracturing present (e.g., from 10^{-9} to 10^{-6} m/s). Owing to its sedimentary nature, horizontal or sub-horizontal bedding planes and vertical joints would be present. Fractures typically develop along bedding planes and joints.

2.1.4 Source Water Protection

The site is located within the Credit Valley Source Protection Area. The CTC Source Protection Plan (effective December 31, 2015), which encompasses the Credit Valley, Toronto and Region, and Central Lake Ontario Source Protection Areas, identifies four main regulatory factors under the *Clean Water Act (2006)* relating to local hydrogeology to consider for site development: Significant Groundwater Recharge Areas (SGRAs), Highly Vulnerable Aquifers (HVAs), and Wellhead Protection Areas (WHPAs), and Intake Protection Zones (IPZs).

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, and zones around a surface water body influencing a Groundwater Under Direct Influence (GUDI) (E, F). Other zones (Q1, and Q2) are defined as the areas where new water takings or reduced recharge could impact the quantity of water available to municipal supply wells. IPZs are the area on the water and land surrounding a municipal surface water intake. HVAs are aquifers that are susceptible to contamination as a result of the soil structure/material or due its location near the ground surface. Lastly, SGRAs are areas where recharge is important to maintain the water level in a community drinking water aquifer.

Figure 4 presents the site in the context of the relevant Source Protection regulatory zones. The site is located within an HVA with score of 6 and an IPZ-2 with score of 4.5, but is not located within a WHPA or SGRA.



LEGEND

- Monitoring Well, Geotechnical (Palmer, 2022)
- Monitoring Well, EDD (Palmer, 2022)
- Monitoring Well, EDD (GHD, 2020)
- Watercourse[1]
- Subject Site

Source Water Protection[2]

- Intake Protection Zone 2
- Intake Protection Zone 3
- Highly Vulnerable Aquifer
- Significant Groundwater Recharge Area - Score 6

1. LIO/MNRF
2. *Source Protection Information Atlas*, MECP 2022 © Queen's Printer for Ontario

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METRE SCALE

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49 South Service Road

TITLE
Source Water Protection

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REF. NO. 2204701-MR-304-1

Figure 4

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2.2 Site Specific Conditions

2.2.1 Borehole Drilling and Monitoring Well Installation

Boreholes from multiple previous field programs were used in this Hydrogeological Assessment. On December 7, 2020, ten (10) boreholes were drilled as part of a Phase Two environmental Site Assessment by GHD. The boreholes ranged from 3.1 to 4.6 m in depth, and four (4) were completed as monitoring wells (MW1-20 to MW4-20).

From May 26 to June 1, 2022 Palmer drilled four (4) boreholes at the site as part of a Geotechnical Investigation. BH22-1 and BH22-3 were drilled with solid stem augers through the overburden soils, and with a dynamic cone through the bedrock encountered. BH22-2 and BH22-4 were drilled with hollow stem augers through the overburden and rock coring through the bedrock. The boreholes ranged in depth from 8.5 to 25.0 metres. On June 22, 2022, Palmer drilled six (6) boreholes as part of a Phase Two Environmental Site Assessment. All boreholes were drilled to a depth of 5.3 m.

Monitoring wells were installed in all Palmer boreholes in accordance with Ontario Regulation 903 (Wells Regulation). Each monitoring well was completed with 51 mm (2 inch) diameter schedule 40 polyvinyl chloride (PVC) pipe, with a 3.1 m (10 ft) screened interval at bottom of the well. The monitoring wells were sealed using bentonite grout and completed with stick up casings. Additional details are provided in **Table 1**. Presented in **Figure 1** are the monitoring well locations; the borehole logs can be found in **Appendix B**.

Table 1. Borehole and Monitoring Well Installation Details

Borehole ID	Consultant	Surface Elevation (masl)	Depth (mbgs)	Screened Interval (mbgs)	Screened Unit
BH22-1	Palmer, 2022	99.90	8.5	3.0 - 6.1	Silty sand
BH22-2		99.70	25.0	21.3 - 24.4	Bedrock
BH22-3		99.60	8.8	3.0 - 6.1	Silty sand
BH22-4		99.60	25.0	12.0 - 15.1	Weathered Bedrock
BH22-5		99.66	5.3	3.8 - 5.3	Silty sand
BH22-6		99.56	5.3	3.8 - 5.3	Silty sand
BH22-7		99.55	5.3	3.8 - 5.3	Sandy silt
BH22-10		99.72	5.3	3.8 - 5.3	Silty sand
MW1-20	GHD, 2020	99.58	4.6	1.5 - 4.6	Sand
MW2-20		99.44	4.6	1.5 - 4.6	Sand
MW3-20		99.67	4.6	1.5 - 4.6	Sand
MW4-20		99.69	3.1	1.5 - 4.6	Sand
BH5-20		-	3.1	-	-
BH6-20		-	3.1	-	-
BH7-20		-	3.1	-	-
BH8-20		-	3.1	-	-
BH9-20		-	4.6	-	-
BH10-20		-	4.6	-	-

*Units are metres below ground surface (mbgs) and metres above seal level (masl)

2.2.2 Geology and Soil Profile

The stratigraphy of the site area encountered during both borehole drilling program is summarized below, and are generally consistent with the regional mapping presented in **Figure 2**. The specific stratigraphic descriptions below are based on the soils encountered by BH22-1 to BH22-4 during Palmer's Geotechnical Investigation, but they are also consistent with the soils encountered during the environmental drilling programs conducted by GHD (2020) and Palmer (2022).

Topsoil / Asphalt: In BH22-1, 100 mm of topsoil was encountered. In BH22-2 to BH22-4, 100 mm of asphalt was encountered.

Reworked or Disturbed Native Soils (Fill): The layer of fill encountered at the site ranged in thickness from 1.4 to 4.4 m. In BH22-1 to BH22-3, this layer had texture of silty sand with trace clay and trace gravel. In BH22-4, the fill layer alternated in texture. Underlying the asphalt, 1.4 m of sand and gravel with trace clay and trace silt was encountered, followed by 0.7 m of silt with trace clay, and lastly 0.8 m of silty sand with trace clay.

Coarse-textured glaciolacustrine deposits: In BH22-1 and BH22-3, silty sand with trace clay was encountered, and in BH22-2 and BH22-4, sand with some silt and trace clay. Underlying the silty sand in BH22-4 was a 1.2 m-thick layer of sand and gravel with trace silt. Owing to the similarity of these soil descriptions, they can be considered the same hydrostratigraphic unit. These soils represent the coarse-textured glaciolacustrine deposits identified by OGS mapping. These deposits, which includes the sand, silty sand and sand and gravel layers, ranged in thickness from 2.2 to 5.7 m.

Newmarket Till: In BH22-2 and BH22-4 a thin (0.5 to 1.2 m thick) layer of till was encountered. In BH22-2, 50 cm of sandy silt till and weathered shale was encountered from 7.2 to 7.7 mbgs. In BH22-4, sand and gravel with trace silt and boulder fragments was encountered from 7.2 to 8.4 mbgs

Weathered Bedrock: In BH22-2, the weathered bedrock layer was mixed with Newmarket Till, as described above. In BH22-4, weathered shale was encountered from 8.4 to 8.9 mbgs.

Grey Shale and Limestone: The unweathered Georgian Bay Formation bedrock was encountered in all boreholes at depths ranging from 6.7 to 8.9 m and extending to at least 25.0 mbgs, according to BH22-2 and BH22-4. The bedrock up to 25.0 mbgs at the site consisted of interbedded shale and limestone, with a higher proportion of shale (68-97%) vs. limestone (3-32%).

2.2.3 Groundwater Levels and Flow

On July 11, 2022 Palmer personnel developed the monitoring wells BH22-1, BH22-2, BH22-3 and BH22-4 using a hydrolift pump, Waterra tubing and a foot valve. All wells went dry during development after approximately 12 L, 40 L, 13 L and 35 L was purged from each well, respectively.

On July 18, July 20 and August 15, 2022, the static water level in all monitoring wells was measured. Water levels were measured manually using a water level tape and recorded to the nearest centimetre. **Table** 2 **2** provides a summary of the measured water level depths. With the exception of BH22-2, the water levels

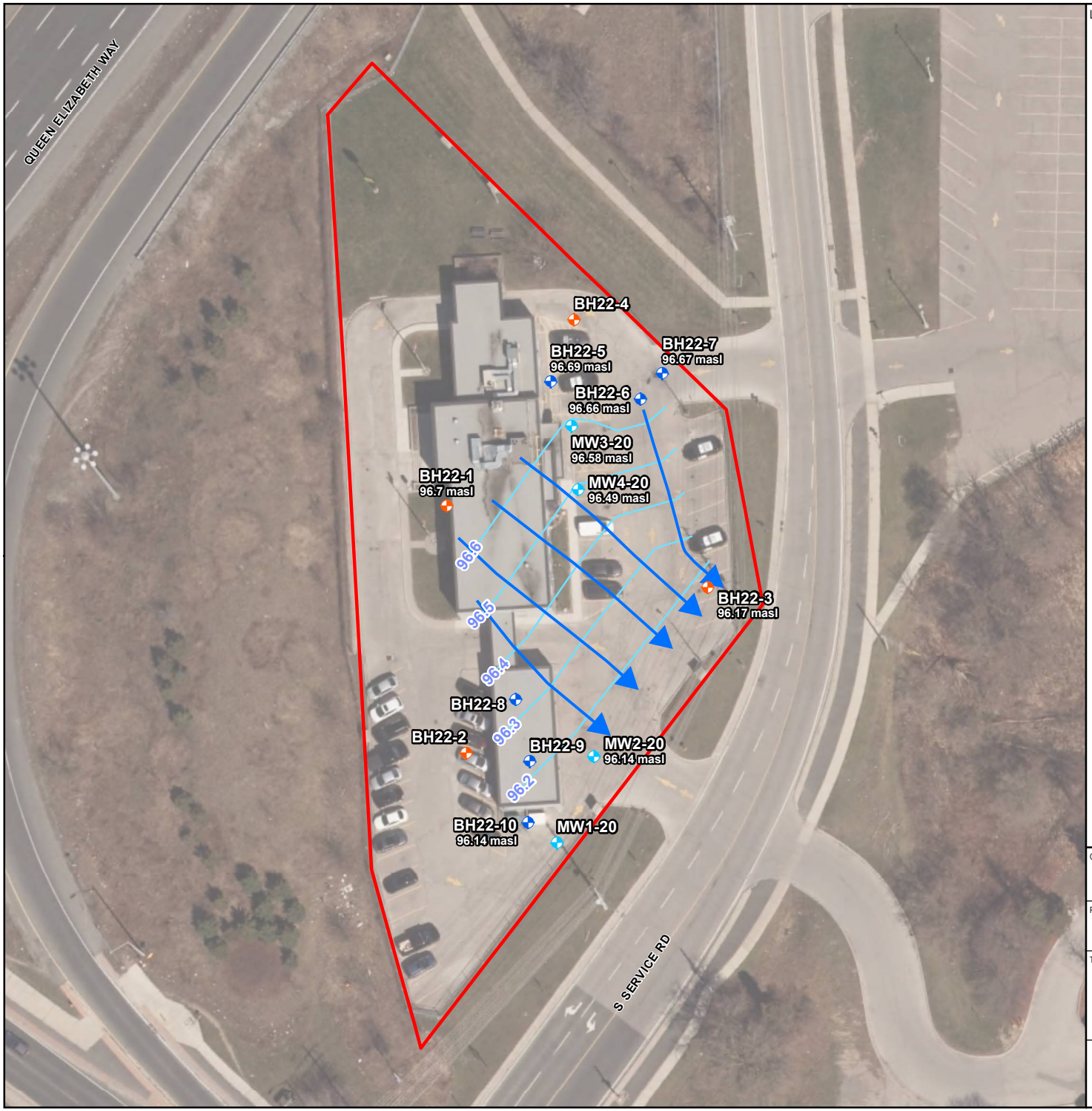
across the site varied from a minimum of 94.97 masl to a maximum of 96.70 masl. BH22-2 had water levels ranging from 77.70 masl to 80.75 masl, approximately 15 m to 20 m lower than the rest of the wells on site. BH22-2 is screened over a non-fractured interval in the shale bedrock. Its lack of direct hydraulic connection with productive fracture zones explains the low water level in BH22-2 compared to the other wells. The depths of groundwater levels increase with well depths, indicating the vertical gradient of groundwater flow is downward at the site. Based on the groundwater levels measured on July 18, 2022, the groundwater in the coarse-textured glaciolacustrine deposits flows from northwest to southeast (**Figure 5**).

Table 2. Groundwater Levels

Well Information			Water Levels					
			July 18, 2022		July 20, 2022		August 15, 2022	
Well ID	Elevation (masl)	Stick-up (m)	mbgs	masl	mbgs	masl	mbgs	masl
BH22-1	99.90	0.00	3.20	96.70	3.20	96.70	3.33	96.57
BH22-2	99.70	0.00	21.93	77.77	22.00	77.70	18.95	80.75
BH22-3	99.60	0.00	3.43	96.17	3.43	96.17	3.60	96.00
BH22-4	99.60	0.00	4.52	95.08	4.51	95.09	4.63	94.97
BH22-5	99.66	0.00	2.97	96.69	3.00	96.66	3.18	96.48
BH22-6	99.56	0.00	2.90	96.66	2.94	96.62	3.12	96.44
BH22-7	99.55	0.00	2.88	96.67	2.87	96.68	3.05	96.50
BH22-10	99.72	0.00	3.58	96.14	3.58	96.14	3.67	96.05
MW1-20	99.58	0.00	No longer exists					
MW2-20	99.44	0.00	3.30	96.14	3.30	96.14	3.41	96.03
MW3-20	99.67	0.00	3.09	96.58	3.12	96.55	3.28	96.39
MW4-20	99.69	0.00	3.20	96.49	3.23	96.46	3.37	96.32

2.2.4 MECP Water Well Records

Figure 6 shows the MECP Well Records within a 500 m radius of the site. In total, there are 25 well records within this radius. Of these 25 records, 3 are test holes, 3 test holes that are used for monitoring, 4 more are used for monitoring, 1 is not used, 11 are of unknown use, 1 is a domestic well, and the remaining 2 are dewatering wells. For the wells with depth value on record, they range in depth from 3.8 to 15.2 m. Only the domestic well (Well ID 4902195) has a static water level on record (4.6 mbgs). The depth to bedrock recorded at this same well was 4 m. None of the wells in a 500 m radius of the site are expected to be actively used for potable water, considering that there is full municipal water servicing in Mississauga, and most are dewatering wells.



LEGEND

- Monitoring Well, Geotechnical (Palmer, 2022)
- Monitoring Well, EDD (Palmer, 2022)
- Monitoring Well, EDD (GHD, 2020)
- Groundwater Elevation Contour
- Groundwater Flow Direction
- Subject Site

0 5 10 20 30 40

METRE SCALE

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PROJECT
49 South Service Road

TITLE
Groundwater Flow Direction

Palmer™

REF. NO. 2204701-MR-305-1

Figure 5

Document Path: G:\Shared drives\Projects 2022\22047 - Edenshaw Developments\2204701 - Edenshaw - 49 S. Service Rd\GIS\1_Workspace\Task 3 - HydroG Figures\2204701-MR-305-1 (Fig 5 - Groundwater Flow Direction).mxd

LEGEND

- Water Well Record within 500m[1]
- Monitoring Well, Geotechnical (Palmer, 2022)
- Monitoring Well, EDD (Palmer, 2022)
- Monitoring Well, EDD (GHD, 2020)
- Watercourse[2]
- Radius of Influence for Construction Dewatering
- 500m Site Buffer
- Subject Site

1. MECP
2. LIO/MNRF

0 25 50 100 150 200 250
METRE SCALE

North American Datum 1983
Universal Transverse Mercator Projection Zone 17

Scale: 1:5,800
Page Size: Letter (8.5 x 11 inches)

Drawn: CV
Checked: WC
Date: Aug 25, 2022

NORTH

Source Notes:
Imagery (2020) provided by Peel Region map service.
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CLIENT
Edenshaw SSR Developments Limited

PROJECT
49 South Service Road

TITLE
MECP Well Records within a 500 m Radius

Palmer

REF. NO. 2204701-MR-306-1

Figure 6

Document Path: G:\Shared drives\Projects 2022\22047 - Edenshaw Developments\2204701 - Edenshaw - 49 S. Service Rd\GIS\1_Workspace\Task 3 - HydroG Figures\2204701-MR-306-1 (Fig 6 - MECP Well Records).mxd

2.2.5 Hydraulic Conductivity

2.2.5.1 Single Well Response Tests

On July 18, 2022 Palmer personnel conducted single well response tests (SWRTs) in BH22-1, BH22-2, BH22-3 and BH22-4. Bail tests (i.e., rising-head tests) were conducted in BH22-1, BH22-2 and BH22- by removing a bailer of water (<1 L) from the well to create a change in hydraulic head. A slug test (i.e., one falling-head and one rising-head test) was conducted in BH22-4. Hydraulic conductivity values were estimated by measuring the rate of change in recovery of the water level after the water column was displaced by either the removal of a bailer or the insertion or removal of the slug. Water levels in each well were recorded using a datalogger set to record every second. Manual water level measurements were used to gauge recovery to equilibrium. Tests were terminated after the 80% recovery was achieved or 30 minutes had passed.

Hydraulic conductivity (K) values were then calculated using the displacement-time data. The data collected from BH22-1, BH22-2 and BH22-3 were analyzed with the Bouwer-Rice (1976) method for unconfined aquifers and the data from BH22-4 with the Hvorslev (1951) method for confined aquifers, all modelled using Aqtesolv™ software. The analysis results are presented in **Appendix C**, and the calculated hydraulic conductivity values are summarized in **Table 4**.

The hydraulic conductivity of the coarse-textured glaciolacustrine deposits ranged from $3.7x10^{-6}$ m/s to $1.4x10^{-5}$ m/s, with a geometric mean of $7.2x10^{-6}$ m/s and a 90th percentile of $1.3x10^{-5}$ m/s. Based on a falling and rising-head test, the hydraulic conductivity of the fractured shale and limestone that BH22-4 is screened in has a hydraulic conductivity between $1.2x10^{-6}$ m/s and $1.3x10^{-6}$ m/s. The hydraulic conductivity of the competent bedrock in BH22-2 had a measured hydraulic conductivity of $5.4x10^{-8}$ m/s.

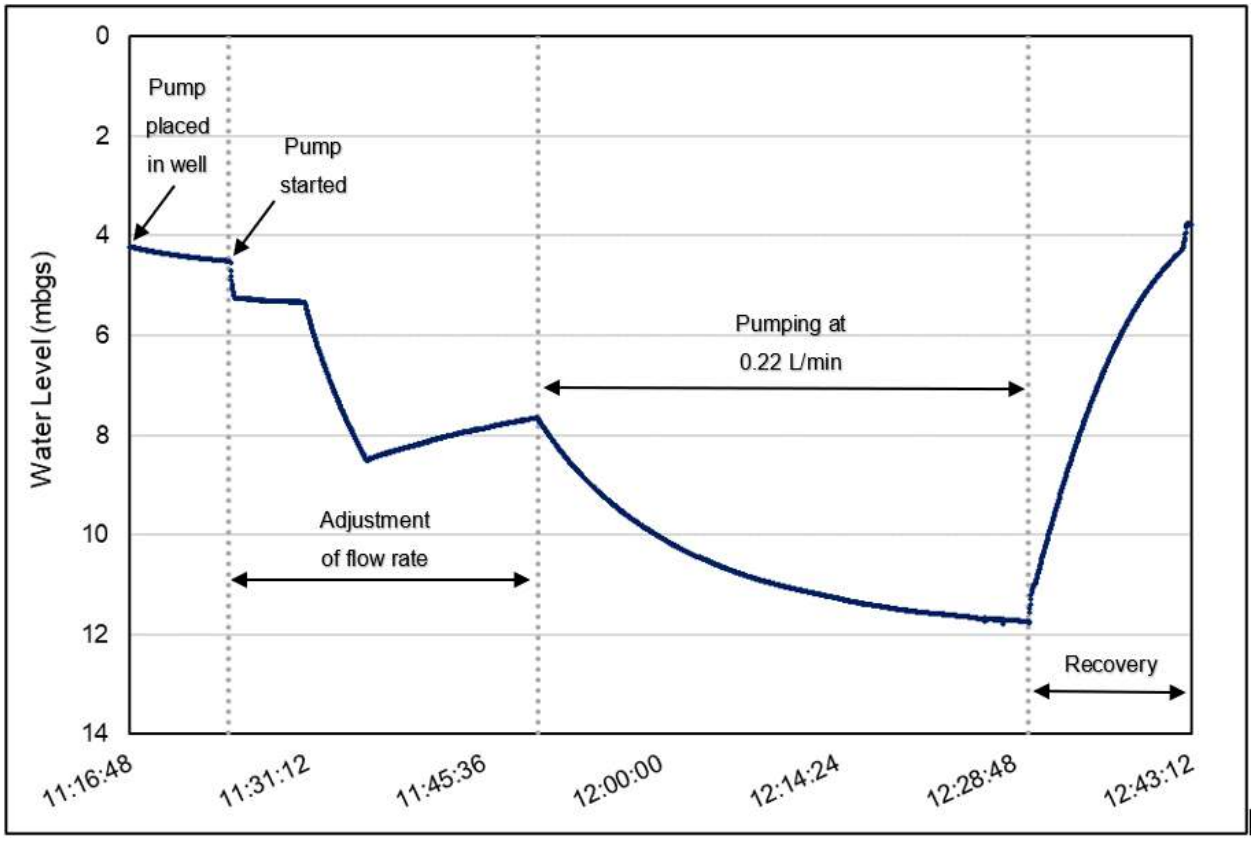
Table 3. Single Well Response Tests

Well ID	Screened Geology	Test Method	Analysis Method	Hydraulic Conductivity, K (m/s)	Geometric Mean K (m/s)	90th Percentile K (m/s)
BH22-1	Silty sand	Rising Head	Unconfined Bouwer-Rice	$4.4x10^{-6}$	$7.2x10^{-6}$	$1.3x10^{-5}$
				$4.1x10^{-6}$		
				$3.7x10^{-6}$		
BH22-3				$1.4x10^{-5}$		
				$1.2x10^{-5}$		
				$1.3x10^{-5}$		
BH22-2	Competent shale and limestone	Rising Head	Unconfined Bouwer-Rice	$5.4x10^{-8}$		
BH22-4	Fractured shale and limestone	Falling Head	Confined Hvorslev	$1.3x10^{-6}$		
		Rising Head		$1.2x10^{-6}$		

2.2.5.2 Short-Duration Pumping Test

On July 20, 2022, Palmer personnel conducted a short-duration pumping and recover test in BH22-4. Since this well is screened in the fractured bedrock from 12.0 to 15.1 mbgs, this test permitted an estimation of the hydraulic properties for the Georgian Bay Formation at the site. BH22-4 was pumped for a total of 65 mins before it was left to recover. It took 25 mins to calibrate a reasonable flow rate to test the well with. From 25 to 65 mins, BH22-4 was pumped at a flow rate of 0.22 L/min.

Figure 7. Short-Duration Pumping Test in BH22-4



The transmissivity (T) and storativity (S) were estimated using the drawdown data from 25 to 65 mins at 0.22 L/min, in addition to the recovery curve beginning at 12:30 pm. Aqtesolv™ software was used to analyze the drawdown and recovery data. For the drawdown data, the Cooper-Jacob (1946) method for confined aquifers was used. To analyze the recovery curve, the Hvorslev (1951) method for confined aquifers was used. **Table 4** summarizes the results of the pumping test analysis, and the analyzed curves can be found in **Appendix D**.

Based on the drawdown data, the transmissivity and storativity of the fractured aquifer screened by BH22-4 are 2.1×10^{-7} m^2/s and 0.086, respectively. Considering a saturated thickness of 6.2 m (measured from the bottom of the well screen to the top of bedrock), this corresponds to a hydraulic conductivity of 3.4×10^{-8} m/s. Based on the recovery data, a hydraulic conductivity of 1.7×10^{-6} m/s was estimated for the fractured bedrock. Considering the discretely fractured nature of the aquifer screened by BH22-4, the

Table 4. Short-Duration Pumping Test Results

Well ID	Geology	Curve Analyzed	Pumping Rate (L/min)	Analysis Method	Transmissivity (m^2/s)	Saturated Thickness (m)	Hydraulic Conductivity (m/s)	Storativity (-)
BH22-4	Fractured shale and limestone	Drawdown	0.22	Cooper-Jacob	$2.1x10^{-7}$	6.2	$3.4x10^{-8}$	0.086
		Recovery	0.00	Hvorslev	-		$1.7x10^{-6}$	-

recovery curve is interpreted to better estimate the hydraulic conductivity of the aquifer. The drawdown data would have captured the combined hydraulic properties of the fractured and competent bedrock screened by BH22-4; a lower hydraulic conductivity ($3.4x10^{-8}$ m/s), similar to the value estimated via the SWRT in BH22-2 ($5.4x10^{-8}$ m/s) is therefore expected.

2.2.5.3 Grain Size Analyses

The hydraulic conductivity of the soils at the site were estimated using empirical relationships derived by Sauerbrei (1932) which utilize grain size distribution curves of soil samples. During drilling, a soil sample was collected from 7.6 to 8.2 mbgs in BH22-2, from 9.1 to 9.7 mbgs in BH22-4 and from 6.1 to 6.7 mbgs in BH22-5. The grain size distribution curves are provided in **Appendix E**, and the results of the empirical analyses are provided in **Table 5.**

$$K\ (Sauerbrei, 1932) = \frac{\rho g}{\mu}[(3.75 \times 10^{-5}) \times \tau]\left[\frac{n^3}{(1-n)^2}\right] d_{17}^2\ \frac{cm}{s}$$

Where:

K = hydraulic conductivity (cm/s)
ρ = $3.1x10^{-8}T^3 - 7.0x10^{-6}T^2 + 4.19x10^{-5}T + 0.99985$
g = 980 cms^{-2}
μ = $-7.0x10^{-8}T^3 + 1.002x10^{-5}T^2 - 5.7x10^{-4}T + 0.0178$
τ = $1.093x10^{-4}T^2 + 2.102x10^{-2}T + 0.5889$
n = porosity as a fraction of aquifer volume
T = water temperature (°C)

Table 5. Empirical Grain Size Analyses

Borehole ID	Sample	Geology	Method of Analysis	Hydraulic Conductivity, K (m/s)	Geometric Mean K (m/s)	90th Percentile K (m/s)
BH22-1	SS6	Silty sand	Saurbrei	$1.6x10^{-6}$	$1.5x10^{-6}$	$4.7x10^{-6}$
BH22-2	SS7			$2.7x10^{-6}$		
BH22-3	SS5			$6.1x10^{-6}$		
BH22-3	SS7	Sand and silt		$9.1x10^{-7}$		
BH22-4	SS6	Sandy silt		$3.4x10^{-7}$		

The computed hydraulic conductivities ranged from $3.4x10^{-7}$ m/s (sandy silt in BH22-4, SS6) to $6.1x10^{-6}$ m/s (silty sand in BH22-3, SS5). The geometric mean and 90th percentile hydraulic conductivities are $1.5x10^{-6}$ and $4.7x10^{-6}$ m/s, respectively. The hydraulic conductivities calculated are consistent with those calculated from SWRTs conducted in BH22-1 and BH22-3, wells that are screened in the coarse-textured glaciolacustrine deposits.

2.2.6 Estimated Percolation Rates

An estimate of the infiltration rate for the study area was made based on an accepted formula from the Ontario Ministry of Municipal Affairs and Housing (OMMAH) Supplementary Guidelines to the Ontario Building Code 1997, and provided in the Low Impact Development Stormwater Management Planning and Design Guide (TRCA/CVC, 2010).

$$K = (6 \times 10^{-11}) I^{3.7363}$$

Where:

K = hydraulic conductivity (cm/s)
I = infiltration rate (mm/hr)

Rearranging for infiltration rate, we obtain the following relationship:

$$I = \left[\frac{K}{6 \times 10^{-11}}\right]^{\frac{1}{3.7363}}$$

Using the hydraulic conductivity values from **Tables 4** and **5**, on-site infiltration rates were estimated. Assuming a 2.5x factor of safety, the values in the coarse-textured glaciolacustrine deposits ranged from 13.9 to 37.3 mm/hr. The same infiltration rates estimated for the bedrock ranged from 8.5 to 19.6 mm/hr. The average estimated infiltration rate in the coarse-textured glaciolacustrine deposits, including the factor of safety, is 27.1 mm/hr.

Table 6. Estimated Percolation Rates

Borehole ID	Test Method	Geology	Hydraulic Conductivity, K (m/s)	Infiltration Rate (mm/hr)	Infiltration Rate with 2.5x Factor of Safety (mm/hr)
BH22-1	SWRT	Coarse-textured glaciolacustrine deposits	$4.4x10^{-6}$	68.6	27.4
			$4.1x10^{-6}$	67.5	27.0
			$3.7x10^{-6}$	65.7	26.3
BH22-3			$1.4x10^{-5}$	93.2	37.3
			$1.2x10^{-5}$	90.0	36.0
			$1.3x10^{-5}$	91.8	36.7
BH22-2	SWRT	Competent shale and limestone	$5.4x10^{-8}$	21.2	8.5
BH22-4		Fractured shale and limestone	$1.3x10^{-6}$	49.1	19.6
			$1.2x10^{-6}$	48.6	19.4

Borehole ID	Test Method	Geology	Hydraulic Conductivity, K (m/s)	Infiltration Rate (mm/hr)	Infiltration Rate with 2.5x Factor of Safety (mm/hr)
BH22-1	GSA	Coarse-textured glaciolacustrine deposits	$1.6x10^{-6}$	52.5	21.0
BH22-2			$2.7x10^{-6}$	60.4	24.1
BH22-3			$6.1x10^{-6}$	75.1	30.0
BH22-3			$9.1x10^{-7}$	45.1	18.0
BH22-4			$3.4x10^{-7}$	34.7	13.9

2.2.7 Groundwater Chemistry

On July 20, 2022 groundwater chemistry samples were collected from BH22-4 and submitted for analysis for a suite of water quality parameters, the results of which were compared to the Peel Region Storm and Sanitary Sewer By-Law criteria, in addition to the City of Mississauga Storm Sewer criteria. **Tables 7** and **8** presents a summary of the analysis results and the full analysis results can be found in **Appendix F**. The samples collected exceed the Peel Region Storm Sewer criteria for the following parameters: total suspended solids (TSS), Kjeldahl nitrogen (TKN), coliforms, manganese, zinc and phenols (4AAP). The samples exceeded the Mississauga Storm Sewer criteria for TSS, aluminum and manganese. The samples collected exceeded non of the Peel Region Sanitary Sewer criteria.

Table 7. Groundwater Chemistry Analyses (Region of Peel Storm and Sanitary)

Analyte	Guideline Limit		Lowest Detection Limit	Units	BH22-4 Water
	Peel Sanitary By-Law	Peel Storm By-Law			
Physical Tests (Matrix: Water)					
pH	5.5 -> 10	6 -> 9	0.10	pH units	7.93
solids, total suspended [TSS]	350	15	3.0	mg/L	**160**
Anions and Nutrients (Matrix: Water)					
Kjeldahl nitrogen, total [TKN]	100	1	0.050	mg/L	**5.57**
fluoride	10	-	0.020	mg/L	0.692
phosphorus, total	10	0.4	0.0020	mg/L	0.126
sulfate (as SO4)	-	-	0.30	mg/L	123
Cyanides (Matrix: Water)					
cyanide, strong acid dissociable (total)	2	0.02	0.0020	mg/L	<0.0020
Microbiological Tests (Matrix: Water)					
coliforms, Escherichia coli [E. coli]	-	200	1	CFU/100mL	<1
coliforms, thermotolerant [fecal]	-	1	1	CFU/100mL	**<2**
Total Metals (Matrix: Water)					
aluminum, total	50	-	0.0030	mg/L	1.44

Analyte	Guideline Limit		Lowest Detection Limit	Units	BH22-4 Water
	Peel Sanitary By-Law	Peel Storm By-Law			
antimony, total	5	-	0.00010	mg/L	<0.00100
arsenic, total	1	0.02	0.00010	mg/L	0.00171
cadmium, total	0.7	0.008	0.0000050	mg/L	<0.0000500
chromium, total	5	0.08	0.00050	mg/L	<0.00500
cobalt, total	5	-	0.00010	mg/L	0.00125
copper, total	3	0.05	0.00050	mg/L	0.0174
lead, total	3	0.12	0.000050	mg/L	0.000763
manganese, total	5	0.05	0.00010	mg/L	**0.271**
mercury, total	0.01	0.0004	0.0000050	mg/L	<0.0000050
molybdenum, total	5	-	0.000050	mg/L	0.00290
nickel, total	3	0.08	0.00050	mg/L	<0.00500
selenium, total	1	0.02	0.000050	mg/L	<0.000500
silver, total	5	0.12	0.000010	mg/L	<0.000100
tin, total	5	-	0.00010	mg/L	<0.00100
titanium, total	5	-	0.00030	mg/L	<0.0300
zinc, total	3	0.04	0.0030	mg/L	**0.0454**
Aggregate Organics (Matrix: Water)					
carbonaceous biochemical oxygen demand [CBOD]	300	15	2.0	mg/L	<3.0
oil & grease (gravimetric)	-	-	5.0	mg/L	<5.0
oil & grease, animal/vegetable (gravimetric)	150	-	5.0	mg/L	<5.0
oil & grease, mineral (gravimetric)	15	-	5.0	mg/L	<5.0
phenols, total (4AAP)	1	0.008	0.0010	mg/L	**0.0128**
Volatile Organic Compounds (Matrix: Water)					
benzene	10	2	0.50	µg/L	<0.50
chloroform	40	2	0.50	µg/L	<0.50
dichlorobenzene, 1,2-	50	5.6	0.50	µg/L	<0.50
dichlorobenzene, 1,4-	80	6.8	0.50	µg/L	<0.50
dichloroethylene, cis-1,2-	4000	5.6	0.50	µg/L	<0.50
dichloromethane	2000	5.2	1.0	µg/L	<1.0
dichloropropylene, trans-1,3-	140	5.6	0.30	µg/L	<0.30
ethylbenzene	160	2	0.50	µg/L	<0.50
methyl ethyl ketone [MEK]	8000	-	20	µg/L	<20

Analyte	Guideline Limit		Lowest Detection Limit	Units	BH22-4 Water
	Peel Sanitary By-Law	Peel Storm By-Law			
styrene	200	-	0.50	µg/L	<0.50
tetrachloroethane, 1,1,2,2-	1400	17	0.50	µg/L	<0.50
tetrachloroethylene	1000	4.4	0.50	µg/L	<0.50
toluene	270	2	0.50	µg/L	0.97
trichloroethylene	400	8	0.50	µg/L	<0.50
xylene, m+p-	-	-	0.40	µg/L	<0.40
xylene, o-	-	-	0.30	µg/L	<0.30
xylenes, total	1400	4.4	0.50	µg/L	<0.50
Volatile Organic Compounds Surrogates (Matrix: Water)					
bromofluorobenzene, 4-	-	-	1.0	%	82.4
difluorobenzene, 1,4-	-	-	1.0	%	103
Phthalate Esters (Matrix: Water)					
bis(2-ethylhexyl) phthalate [DEHP]	12	8.8	2.0	µg/L	<2.0
di-n-butyl phthalate	80	15	1.0	µg/L	<1.0
Semi-Volatile Organics Surrogates (Matrix: Water)					
fluorobiphenyl, 2-	-	-	1.0	%	100
terphenyl-d14, p-	-	-	1.0	%	99.6
Phenolics Surrogates (Matrix: Water)					
tribromophenol, 2,4,6-	-	-	0.20	%	126
Nonylphenols (Matrix: Water)					
nonylphenol diethoxylates [NP2EO]	-	-	0.10	µg/L	<0.10
nonylphenol ethoxylates, total	200	-	2.0	µg/L	<2.0
nonylphenol monoethoxylates [NP1EO]	-	-	2.0	µg/L	<2.0
nonylphenols [NP]	20	-	1.0	µg/L	<1.0
Polychlorinated Biphenyls (Matrix: Water)					
Aroclor 1016	-	-	0.020	µg/L	<0.020
Aroclor 1221	-	-	0.020	µg/L	<0.020
Aroclor 1232	-	-	0.020	µg/L	<0.020
Aroclor 1242	-	-	0.020	µg/L	<0.020
Aroclor 1248	-	-	0.020	µg/L	<0.020
Aroclor 1254	-	-	0.020	µg/L	<0.020
Aroclor 1260	-	-	0.020	µg/L	<0.020

Analyte	Guideline Limit		Lowest Detection Limit	Units	BH22-4 Water
	Peel Sanitary By-Law	Peel Storm By-Law			
Aroclor 1262	-	-	0.020	µg/L	<0.020
Aroclor 1268	-	-	0.020	µg/L	<0.020
polychlorinated biphenyls [PCBs], total	1	0.4	0.060	µg/L	<0.060
Polychlorinated Biphenyls Surrogates (Matrix: Water)					
decachlorobiphenyl	-	-	0.1	%	99.6
tetrachloro-m-xylene	-	-	0.1	%	94.7

Exceeds Guideline Limit

Table 8. Groundwater Chemistry Analyses (City of Mississauga Criteria)

Analyte	Guideline Limit	Lowest Detection Limit	Units	BH22-4 Water
	Mississauga Storm By-Law			
Physical Tests (Matrix: Water)				
pH	6 -> 9	0.10	pH units	7.98
solids, total suspended [TSS]	15	3.0	mg/L	**58.0**
Anions and Nutrients (Matrix: Water)				
phosphorus, total	0.4	0.0020	mg/L	0.0566
Cyanides (Matrix: Water)				
cyanide, strong acid dissociable (total)	0.02	0.0020	mg/L	<0.0020
Inorganic Parameters (Matrix: Water)				
chlorine, total	1	0.050	mg/L	<0.050
Microbiological Tests (Matrix: Water)				
coliforms, Escherichia coli [E. coli]	200	1	CFU/100mL	<1
Total Metals (Matrix: Water)				
aluminum, total	1	0.0030	mg/L	**1.57**
arsenic, total	0.02	0.00010	mg/L	0.00140
cadmium, total	0.008	0.0000050	mg/L	<0.0000500
chromium, total	0.08	0.00050	mg/L	<0.00500
copper, total	0.04	0.00050	mg/L	0.0121
lead, total	0.12	0.000050	mg/L	0.000704
manganese, total	0.05	0.00010	mg/L	**0.232**
mercury, total	0.0004	0.0000050	mg/L	<0.0000050
nickel, total	0.08	0.00050	mg/L	<0.00500

Analyte	Guideline Limit	Lowest Detection Limit	Units	BH22-4 Water
	Mississauga Storm By-Law			
selenium, total	0.02	0.000050	mg/L	<0.000500
silver, total	0.12	0.000010	mg/L	<0.000100
zinc, total	0.04	0.0030	mg/L	0.0331
Speciated Metals (Matrix: Water)				
chromium, hexavalent [Cr VI], total		0.00050	mg/L	<0.00050
Aggregate Organics (Matrix: Water)				
biochemical oxygen demand [BOD]	15	2.0	mg/L	<3.0
phenols, total (4AAP)	0.008	0.0010	mg/L	0.0068
Volatile Organic Compounds (Matrix: Water)				
benzene	2	0.50	µg/L	<0.50
dichlorobenzene, 1,2-	-	0.50	µg/L	<0.50
dichlorobenzene, 1,4-	-	0.50	µg/L	<0.50
dichloromethane	-	1.0	µg/L	<1.0
ethylbenzene	2	0.50	µg/L	<0.50
tetrachloroethane, 1,1,2,2-	-	0.50	µg/L	<0.50
tetrachloroethylene	-	0.50	µg/L	<0.50
toluene	2	0.50	µg/L	0.56
trichloroethylene	-	0.50	µg/L	<0.50
xylene, m+p-	-	0.40	µg/L	<0.40
xylene, o-	-	0.30	µg/L	<0.30
xylenes, total	4.4	0.50	µg/L	<0.50
Volatile Organic Compounds Surrogates (Matrix: Water)				
bromofluorobenzene, 4-	-	1.0	%	82.1
difluorobenzene, 1,4-	-	1.0	%	104
Polycyclic Aromatic Hydrocarbons (Matrix: Water)				
acenaphthene	-	0.010	µg/L	<0.010
acenaphthylene	-	0.010	µg/L	<0.010
anthracene	-	0.010	µg/L	<0.010
benz(a)anthracene	-	0.010	µg/L	<0.010
benzo(a)pyrene	-	0.0050	µg/L	<0.0050
benzo(b+j)fluoranthene	-	0.010	µg/L	0.021
benzo(g,h,i)perylene	-	0.010	µg/L	<0.010
benzo(k)fluoranthene	-	0.010	µg/L	<0.010

Analyte	Guideline Limit	Lowest Detection Limit	Units	BH22-4 Water
	Mississauga Storm By-Law			
chrysene	-	0.010	µg/L	<0.010
dibenz(a,h)anthracene	-	0.0050	µg/L	<0.0050
fluoranthene	-	0.010	µg/L	<0.010
fluorene	-	0.010	µg/L	<0.010
indeno(1,2,3-c,d)pyrene	-	0.010	µg/L	<0.010
methylnaphthalene, 1-	-	0.010	µg/L	<0.010
methylnaphthalene, 2-	-	0.010	µg/L	<0.010
naphthalene	-	0.050	µg/L	<0.050
phenanthrene	-	0.020	µg/L	<0.020
pyrene	-	0.010	µg/L	<0.010
PAHs, total (CCME Sewer 18)	2	0.070	µg/L	<0.070
Polycyclic Aromatic Hydrocarbons Surrogates (Matrix: Water)				
chrysene-d12	-	0.1	%	106
naphthalene-d8	-	0.1	%	110
phenanthrene-d10	-	0.1	%	107
Polychlorinated Biphenyls (Matrix: Water)				
Aroclor 1016	-	0.020	µg/L	<0.020
Aroclor 1221	-	0.020	µg/L	<0.020
Aroclor 1232	-	0.020	µg/L	<0.020
Aroclor 1242	-	0.020	µg/L	<0.020
Aroclor 1248	-	0.020	µg/L	<0.020
Aroclor 1254	-	0.020	µg/L	<0.020
Aroclor 1260	-	0.020	µg/L	<0.020
Aroclor 1262	-	0.020	µg/L	<0.020
Aroclor 1268	-	0.020	µg/L	<0.020
polychlorinated biphenyls [PCBs], total	-	0.060	µg/L	<0.060
Polychlorinated Biphenyls Surrogates (Matrix: Water)				
decachlorobiphenyl	-	0.1	%	86.4
tetrachloro-m-xylene	-	0.1	%	91.2

Exceeds Guideline Limit

3. Hydrogeological Conceptual Model

The site is immediately underlain by coarse-textured glaciolacustrine deposits. These deposits form an unconfined aquifer that is approximately 5 to 7 m thick. Based on single well response testing in BH22-1 and BH22-3, these deposits have a hydraulic conductivity ranging from $3.7x10^{-6}$ m/s to $1.4x10^{-5}$ m/s, with a geometric mean of $7.2x10^{-6}$ m/s and a 90^{th} percentile of $1.3x10^{-5}$ m/s. These deposits are directly underlain by a thin layer of Newmarket Till (approximately 0.5 to 1.2 m thick) that is sometimes mixed with weathered bedrock.

The bedrock was encountered at the site at depths ranging from 8.4 to 8.9 mbgs, and the upper 50 cm was weathered. The bedrock at the site is composed of the interbedded shales and limestones of the Georgian Bay Formation. In general, it contains a larger portion of shale (68-97%) than limestone (3-32%). Single well response testing in BH22-2 and BH22-4, as well as a short-duration pumping test in BH22-4 indicate that the hydraulic conductivity of the bedrock ranges from $3.4x10^{-8}$ to $1.7x10^{-6}$ m/s. The data from the recovery portion of the pumping test as well as single well response testing in BH22-4 suggest that fractured zone underlying the site, which constitute the main conduits for bedrock groundwater flow, have a hydraulic conductivity ranging from $1.2x10^{-6}$ to $1.7x10^{-6}$ m/s. The competent, less fractured zones of the bedrock have a hydraulic conductivity ranging from $3.4x10^{-8}$ to $5.4x10^{-8}$ m/s based on the drawdown portion of the pumping test and single well response testing in BH22-2.

Whether or not the bedrock aquifer underlying the site acts as an unconfined or a confined aquifer depends on the connectivity of fracture zones to the surface. Considering that the Georgian Bay Formation consists of relatively flat-lying stratified sedimentary beds, the fractured zones are most commonly found as horizontal features. Vertical fractures extending through multiple metres of interbedded shale and limestone are less common. The bedrock aquifer therefore likely acts primarily as a confined aquifer.

Groundwater levels across the site vary little for those wells screened in the coarse-textured glaciolacustrine deposits (56 to 57 cm during a given monitoring event). Groundwater flow in the unconfined granular aquifer formed by these deposits is expected to flow from northwest to southeast with a gradient of approximately 0.015. The water level in BH22-4 (screened in fractured bedrock from 12.0 to 15.1 mbgs) was approximately 1.0 to 1.7 m lower than the wells screened in the overburden, and BH22-2 (screened in competent bedrock from 21.3 to 24.4 mbgs) had a water level that was approximately 15 to 19 m lower in elevation than BH22-4. This difference in water level elevations suggests a downward hydraulic head gradient of approximately 0.85 to 1.05 at the site.

Considering the downward hydraulic head gradient present at the site and the coarse-textured glaciolacustrine deposits at the surface, the site would act as a groundwater recharge zone wherever the site is currently not covered by impermeable surfaces.

4. Preliminary Dewatering Assessment

4.1 Short-Term Dewatering Estimate

It is understood that the proposed redevelopment will consist of a 22-storey building and a 4-storety podium with up to five (5) levels of underground parking, which would extend to approximately 17.5 mbgs, considering 3.5 m per underground level.

For the proposed redevelopment, both the coarse-textured glaciolacustrine sediments and the fractured Georgian Bay Formation will contribute to the total rate of groundwater inflow. Based on single well response testing, the 90th percentile hydraulic conductivity of the overburden sediments is 1.3x10^{-5} m/s. From the recovery curve of the short-duration pumping test, the fractured bedrock has a hydraulic conductivity of 1.7x10^{-6} m/s. To estimate the bulk hydraulic conductivity over the entire depth of the excavation, the weighted arithmetic mean hydraulic conductivity was calculated:

$$K_{eq} = \frac{(Kb)_{overburden} + (Kb)_{bedrock}}{b_{overburden} + b_{bedrock}}$$

Where:

K = hydraulic conductivity (m/s)
b = saturated thickness (m)

Using BH22-4 as a guide, competent bedrock was encountered at a depth of 8.9 mbgs. To make a conservative estimate of the high water table, the shallowest water level on site, measured at 2.87 mbgs in BH22-7 minus 1 mbgs (i.e., 1.87 mbgs), was used to define the saturated thicknesses. The saturated thickness of the overburden was therefore estimated to be 6.03 m, and that of the bedrock was 8.60 m. The equivalent hydraulic conductivity based on these assumptions is 6.4x10^{-6} m/s.

Based on the concept plan drawings from the client, the floor area of underground parking is 2,526 m^2. The excavation footprint will be irregular. The excavation length was measured from the concept plan to be 60 m, and the excavation width was estimated to be 42 m. After one (1) meter allowance for structure and safety space is added, the excavation length and width will be 62 m and 44 m respectively.

For preliminary considerations, the dewatering rate (Q) or the steady-state groundwater inflow in m^3/s into an individual section described above can be calculated using Jacob's modified non-equilibrium equation for an unconfined aquifer (Powers *et al.*, 2007):

$$Q = \frac{\pi K(H^2 - h^2)}{\ln\left(\frac{R_O}{r_e}\right)} \quad m^3/s$$

Where:

K = hydraulic conductivity (m/s) – 6.4x10^{-6}
H = saturated thickness (m) – 15.63
h = saturated thickness after dewatering (m) – 0.00
r_e = equivalent radius of influence estimated by:

$r_e = \sqrt{\frac{a*x}{\pi}}$ (m)

R_O = radius of influence estimated by:
$3000(H-h)\sqrt{K}+r_e$ (m) – 118
Where a = width (m) – 44, x = length (m) – 62

Table 9. Estimated Short-Term Dewatering Rate

Parameter	Symbol	Unit	Value
Excavation Length	x	m	62
Excavation Width	a	m	44
Maximum Excavation Depth	-	m	17.5
Hydraulic conductivity	K	m/s	$6.4x10^{-6}$
Saturated thickness	H	m	15.63
Dewatered saturated thickness	h	m	0.00
Radius of influence (from edge of excavation)	R_o	m	118*
Equivalent Well Radius	r_e	m	29.5
Dewatering Rate	Q_{DW}	L/day	451,882
Total Dewatering Rate with 1.5x Factor of Safety	$1.5Q_{DW}$	L/day	677,823
Depletion of Storage	Q_{DS}	L/day	903,463
Nominal two-year storm (25 mm in 24 hours)	Q_{STORM}	L/day	65,438
Total Dewatering Rate ($1.5Q_{DW} + Q_{DS} + Q_{STORM} = Q_{TOTAL}$)	**Q_{TOTAL}**	**L/day**	**1,646,724**

**measured from excavation boundary*

Table 9 summarizes results of the short-term construction dewatering rate estimate. Based on the assumptions above, the estimated dewatering rate is 451,882 L/day. Adding a factor of safety of 1.5, this rate becomes 677,823 L/day. Adding pumping rate of storage depletion over 30 days (903,463 L/day) and the volume of a nominal two-year storm (25 mm in 24 hrs; 65,438 L/day) the total expected dewatering rate is 1,646,724 L/day. Dewatering rates are expected to be the highest at the start of dewatering and should decrease over time as equilibrium is reached and aquifer storage is depleted.

4.2 Construction Dewatering Permitting

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 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.

It is estimated that approximately 1,646,724 L/day of dewatering could be required for the project based on our assumptions of the proposed construction methods and dewatering rate calculations. As this is above 400,000 L/day, a Category 3 PTTW will be required from the MECP.

4.3 Hydrogeological Design Considerations

Based on a high water table of 1.87 mbgs at the site, any construction below this elevation 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 of the proposed building with five (5) levels of underground parking having a foundation depth of 17.5 mbgs:

Active Dewatering – A perimeter dewatering array of well points or deep wells could be considered around the outside of the excavation to lower the groundwater table to 1 m below the invert of the foundation floor. This hydrogeological assessment is meant to support water taking permit application. A dewatering contractor should be retained to design and execute construction dewatering for this project. Confirmation with the Region of Peel (for sanitary sewer) and the City of Mississauga (for storm sewer) will also be required to confirm the sewer capacity to accept the dewatering discharge. The groundwater chemistry samples taken from BH22-4 passed all Peel Region Sanitary Sewer criteria, but exceeded multiple Peel and Mississauga Storm Sewer criteria. Palmer recommends that groundwater from construction dewatering be directed (i.e., discharge) into the sanitary sewer, or go through appropriate treatment to bring the exceedances below the limits before discharging into storm sewer.

Watertight Shoring – To cut off the groundwater, watertight shoring (e.g., interlocking caisson walls) could be considered through the full depth of the overburden sediments and into the Georgian Bay Formation. Additional geotechnical and hydrogeological drilling might be required to confirm the depth and properties of the lower confining units up to the discretion of contractors. Groundwater will still need to be removed from the storage inside of the watertight shoring.

Long-Term Foundation Drainage – Without watertight shoring, full water proofing of the underground basement levels, the long-term groundwater seepage rate into the foundation drainage system around building foundation is estimated to be approximately 238,052 L/day. This is expected to exceed what would be allowable from the City of Mississauga, and therefore, design alternatives to reduce groundwater seepage are recommended. In addition, long-term seepage greater than 50,000 L/day, would require a long-term Category 3 PTTW from the MECP and would also be subject to CVC water balance policies, adding significant cost to the development.

Ground Settlement – Dewatering will reduce pore pressure and increase effective stress of soil within influence zone, and potentially lead to ground settlement. It is recommended that a settlement monitoring program is implemented for major building features and underground facilities within the influence zone of dewatering. The settlement monitoring program is meant to manage risk and eliminate potential litigation burden for the client. Settlement monitoring is usually implemented as part of geotechnical monitoring program which is designed and executed jointly by hydrogeological and geotechnical professionals.

As shown on **Figure 6**, major structures within the influence zone include Highway QEW, Hurontario Street, bridge and sewer pipes. Both deep and shallow settlement points should be considered.

4.4 LID Design Considerations

Based on satellite imagery, the site is currently covered by approximately 84% impermeable surfaces. From the preliminary architectural drawings (**Appendix A**), the proposed re-development's building and pavement will cover a combined area of approximately 71%. Given the coarse texture of the overburden sediments, infiltration galleries could be a useful LID design technique. In addition, the proportion of groundwater recharge could be increased through the use of green rooves and roof leaders that discharge to the infiltration galleries. Based on a preliminary estimate of the on-site percolation rates, stormwater

could be infiltrated into the overburden soils at a rate of 27 mm/hr. In-situ percolation testing at potential future infiltration gallery locations would be required to support LID design.

5. Source Water Protection

The site is not located within any WHPA, and therefore it will not be required to maintain the pre- to post-development water balance at the site. The site is located within an HVA with a score of 6 and an IPZ-2 with a score of 4.5. Based on vulnerability cores, the nature of operation of the proposed development and the provincial Drinking Water Threats Table, the proposed development should not impose a significant water quality threat to the HVA and IPZ.

6. Impact Assessment

6.1 Assessment of Impacts

7.1.1 Aquifers and Natural Environmental Features

Within a 500 m radius, there are no groundwater supported natural features, and the site is not located within any WHPA or SGRA. Neither the surficial unconfined aquifer nor the fractured Georgian Bay Formation is used in the area as a source of drinking water. Adverse impacts on aquifers and the natural environment are therefore expected to be null.

7.1.2 Groundwater Recharge and Runoff

Based on the available architectural drawings (**Appendix A**), the proposed redevelopment will increase the area of permeable surfaces by approximately 13%. The proposed redevelopment could therefore increase the quantity of on-site groundwater recharge and decrease the quantity of runoff if infiltration based LID design measures are implemented.

7.1.3 Private Water Wells

There is one (1) domestic well in the MECP Well Records within 500 m of the site, and there are only two (2) test holes within the estimated radius of influence from construction dewatering. In addition, the City of Mississauga has full municipal water servicing. The single domestic well is not expected to be active and the impacts on private groundwater wells is expected to be null.

7.1.4 Groundwater Treatment and Discharge

Palmer recommends that temporary construction discharge be directed to nearby storm or sanitary sewer. The groundwater samples collected from BH22-4 passed all Peel Region Sanitary Sewer criteria but exceeded multiple Peel Region and Mississauga Storm Sewer criteria. If groundwater from construction dewatering will be directed into the storm sewer, groundwater treatment will be required. Approval from the City of Mississauga or the Region of Peel will be required prior to discharging water to municipal storm or sanitary sewers.

7. Conclusions and Recommendations

Based on the results of this Hydrogeological Assessment, the following conclusions and recommendations are presented:

- As part of Palmer's Geotechnical Investigation (2022) and Phase Two ESA (2022) and GHD's Phase Two ESA (2020), fourteen (14) boreholes were drilled at the site, ranging in depth from 4.6 to 25.0 m. Monitoring wells were installed in all boreholes. MW1-20, drilled by GHD, no longer exists;

- The site is underlain by coarse-textured glaciolacustrine deposits which is approximately 5 to 7 m thick. Based on single well response testing, this stratigraphic unit has a 90th percentile hydraulic conductivity of 1.3x10^{-5} m/s. There exists a thin (0.5 to 1.2 m) layer of Newmarket Till underlying these deposits, which is sometimes mixed with weathered bedrock. Competent bedrock can be found at the site from approximately 8.4 to 8.9 mbgs. Single well response tests and a short-duration pumping test indicate that the hydraulic conductivity of the fractured bedrock ranges from 1.2x10^{-6} to 1.7x10^{-6} m/s at the site;

- Groundwater levels collected on July 18, July 20 and August 15, 2022 indicate that shallow groundwater flows from northwest to southeast with hydraulic gradient of 0.015. Groundwater levels in the coarse-textured glaciolacustrine deposits ranged from 96.00 to 96.70 masl and from 2.87 to 3.67 mbgs. Groundwater levels in BH22-4 (screened in fractured bedrock from 12.0 to 15.1 mbgs) ranged from 94.97 to 95.09 masl or 4.51 to 4.63 mbgs, and those in BH22-2 (screened in competent bedrock from 21.3 to 24.4 mbgs) ranged from 77.70 to 80.75 masl or 18.95 to 22.00 mbgs. A downward hydraulic gradient of approximately 0.85 to 1.05 is present at the site;

- The hydraulic conductivity of the coarse-textured glaciolacustrine deposits were estimated using empirical formula and grain size analysis results on five (5) soil samples. The estimated hydraulic conductivities (3.4x10^{-7} m/s to 6.1x10^{-6} m/s) are consistent with those estimated via single well response testing, considering that grain size analysis typically underestimates the hydraulic conductivity;

- One (1) groundwater chemistry sample was taken from BH22-4. The groundwater from this sample passed all Peel Region Sanitary Sewer criteria, but exceeded the Peel Region Storm Sewer criteria for TSS, TKN, coliforms, manganese, zinc and phenols (4AAP), and exceeded the City of Mississauga Storm Sewer criteria for TSS, aluminum and manganese;

- Palmer understands that the proposed redevelopment will consist of a 22-storey building and 4-storey podium with up to five (5) levels of underground parking. Considering an estimated high water level of 1.87 mbgs and a foundation depth of 17.5 mbgs, Palmer estimates that 1,646,724 L/day could be required for short-term construction dewatering. At this dewatering rate, a Category 3 PTTW would be required from the MECP;

- Watertight shoring could be considered to cut off groundwater flow. Groundwater will still need to be removed from the inside of the watertight shoring. The required pumping rate to deplete the

storage is more than 400,000 L/day, and therefore a PTTW is still required;

- Without watertight shoring or full water proofing of the underground basement level, the proposed redevelopment will require permanent foundation drainage into the Region of Peel and City of Mississauga sewer system. A long-term discharge agreement with the Region of Peel or the City of Mississauga will be required, depending on whether groundwater is discharged to the sanitary or storm sewer. Groundwater treatment would likely not be required for discharge to the sanitary sewer, but would be required for discharge to the storm sewer; and

- No groundwater supported natural features or active groundwater users are present within the predicted radius of influence for dewatering. It is recommended that LID measures are put in place to increase groundwater recharge and minimize runoff.

8. Signatures

This report was prepared and reviewed by the undersigned:

Prepared By: DRAFT

Wesley Campbell, M.A.Sc., G.I.T.
Environmental Scientist

Reviewed By: DRAFT

Frank Liu, P.Eng., P.Geo.
Senior Hydrogeologist

Approved By: DRAFT

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

9. 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.

10. References

Armstrong D.K. and Dodge J.E.P. 2007:
Paleozoic geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release-Data 219.

Chapman, L.J. and Putnam, D.F. 1984:
Physiography of Southern Ontario; Ontario Geological Survey.

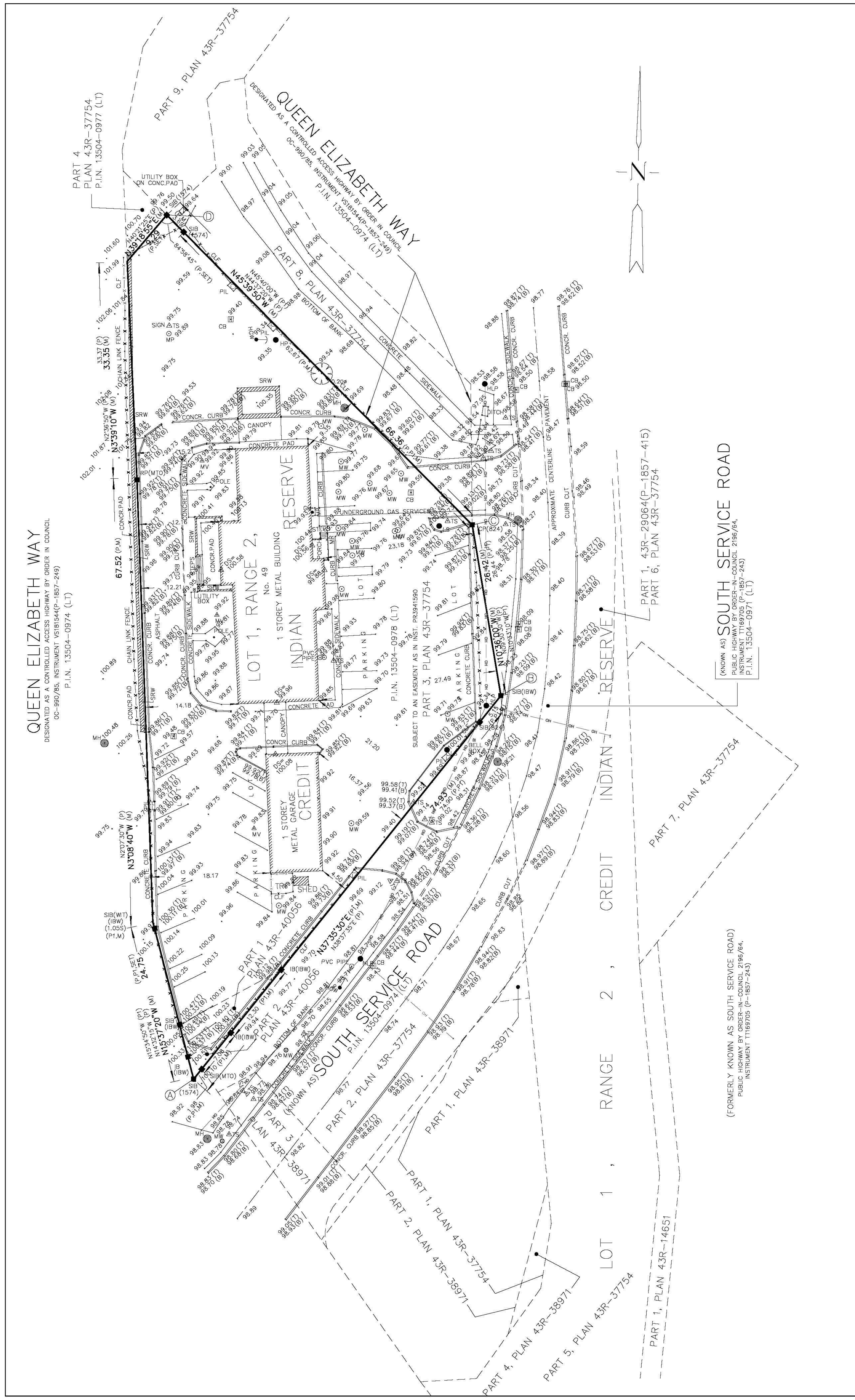
Ontario Geological Survey (OGS). 2007:
Paleozoic geology of Southern Ontario; Ontario Geological Survey, Map 2544

Ontario Geological Survey (OGS). 2003:
Surficial geology of Southern Ontario.

Appendix A

Site Plan

Kirkor Architects and Planners, 2022



PLAN OF SURVEY OF

PART OF LOT 1, RANGE 2 CREDIT INDIAN RESERVE

GEOGRAPHIC TOWNSHIP OF TORONTO

CITY OF MISSISSAUGA

REGIONAL MUNICIPALITY OF PEEL

SCALE 1 : 400

10m 5 0 10 20 30m

R. AVIS SURVEYING INC.

METRIC : DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

NOTES AND LEGEND

BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE DERIVED FROM OBSERVED REFERENCE POINTS A AND B HAVING A BEARING OF N37°35'55"E BY REAL TIME NETWORK(RTN) OBSERVATION , UTM ZONE 17, CENTRAL MERIDIAN 81° 00' WEST LONGITUDE.
(3° MODIFIED TRANSVERSE MERCATOR PROJECTION, NAD 83 (CSRS-2010)

6° UTM ZONE 17 COORDINATES
NAD83(CSRS-2010) (CENTRAL MERIDIAN 81° 00' WEST LONGITUDE)

	NORTHING	EASTING
A	4824807.213	613183.946
B	4824866.583	613229.664
C	4824892.548	613224.805
D	4824938.928	613177.338

(1) THE UTM COORDINATES LISTED ABOVE COMPLY WITH SUBSECTION 14(2) OF ONTARIO REGULATION 216/10 FILED UNDER THE SURVEYORS ACT

(2) THE UTM COORDINATES LISTED ABOVE ARE TO BE USED FOR GEOGRAPHIC INFORMATION SYSTEM INTEGRATION ONLY AND CANNOT BE USED TO RE-ESTABLISH THE PROPERTY CORNERS OR BOUNDARIES SHOWN HEREON

DISTANCES SHOWN HEREON ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 0.99972.

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO CITY OF MISSISSAUGA BENCH MARK No. BM300, HAVING AN ELEVATION = 97.563 metres.

■	DENOTES SURVEY MONUMENT FOUND
□	DENOTES SURVEY MONUMENT PLANTED
SIB	DENOTES STANDARD IRON BAR
CP	DENOTES CONCRETE PIN
IB	DENOTES IRON BAR
RP	DENOTES ROCK PIN
WIT	DENOTES WITNESS
MEAS/M	DENOTES MEASURED
N,S,E,W	DENOTES NORTH, SOUTH, EAST, WEST
MTO	DENOTES MINISTRY OF TRANSPORTATION, ONTARIO
824	DENOTES A. T. McLAREN LTD., O.L.S.
1574	DENOTES DELPH & JENKINS NORTH LTD.
IBW	DENOTES IBW SURVEYORS
P	DENOTES PLAN 43R-37754
P1	DENOTES PLAN 43R-40056
(B)	DENOTES BOTTOM OF CURB
CB	DENOTES CATCH BASIN
CLF	DENOTES CHAIN LINK FENCE
CONCR.	DENOTES CONCRETE
HLP	DENOTES HYDRO LIGHT POLE
HGW	DENOTES HYDRO GUY WIRE
HP	DENOTES HYDRO POLE
LS	DENOTES LIGHT STANDARD
MH	DENOTES MANHOLE
MR	DENOTES METAL RAIL
MP	DENOTES METAL PIPE
MW	DENOTES MONITORING WELL
PIL	DENOTES STONE PILLER
SRW	DENOTES STONE RETAINING WALL
(T)	DENOTES TOP OF CURB
TRF	DENOTES TRANSFORMER
TS	DENOTES TRAFFIC SIGN
0.10ø	DENOTES DECIDUOUS TREE WITH TRUNK DIAMETER 0.10 metres
000.00	DENOTES SPOT ELEVATION

AREA = 4377.4 sq. m.

SURVEYOR'S CERTIFICATE

I CERTIFY THAT

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE REGULATIONS MADE UNDER THEM.

2. THE SURVEY WAS COMPLETED ON THE 6TH DAY OF JULY, 2022.

JULY 13, 2022
DATE

PIRATHEEPAN RAMACHANDRAN
Ontario Land Surveyor

R. AVIS SURVEYING INC.
SUITE 203
235 YORKLAND BOULEVARD
TORONTO, ONTARIO
M2J 4Y8
TEL.: (416) 490-8352 FAX: (416) 491-6206
EMAIL : office@ravissurveying.com

CHECKED BY : J.B., O.L.S.	
CALCULATED BY : FM	PROJECT No. : 3592-0
DRAWN BY : FM/AM	DRAWING No. : 3592-OPS.DWG

Survey 1
NTS dA1.01

49 South Service Rd

Residential DEVELOPMENT
Mississauga, ON

Project Statistics
August 18,2022 — Project No. 22-073

1.0 Site Information

1.1 Total Lot Area	hectare	acres	sq.m	sq.ft
Lot Area	0.44	1.08	4,377.40	47,118
Total Lot Area	**0.44**	**1.08**	**4,377.40**	**47,118**

2.0 Proposed TFA (Total Floor Area)

means the area of a building, structure or part thereof measured from the exterior of outside walls, or from the midpoint of common walls (0225-2007)

2.1 Underground TFA		floors	sq.m.	sq.m.	sq.ft.
Level P3		1 x	2,526	2,526	27,189
Level P2		1 x	2,526	2,526	27,189
Level P1		1 x	2,526	2,526	27,189
Proposed Underground TFA				**7,578**	**81,567**

2.2 Above Ground TFA		floors	sq.m.	sq.m.	sq.ft.
Level 1		1 x	1,097	1,097	11,812
Levels 2	to 4	3 x	1,088	3,263	35,125
Level 5		1 x	782	782	8,416
Levels 6	to 26	21 x	886	18,602	200,233
Level MPH		1 x	466	466	5,016
Proposed Above Ground TFA				**24,211**	**260,602**

2.3 Total Proposed TFA	sq.m.	sq.ft.
Underground TFA	*7,578*	*81,567*
Above Ground TFA	*24,211*	*260,602*
Total Proposed TFA	**31,788**	**342,169**

3.0 Proposed GFA (Gross Floor Area)

means the sum of the areas of each storey of a building above or below established grade, measured from the exterior of outside walls of the building including floor area occupied by interior walls but excluding any part of the building used for mechanical floor area,stairwells, elevators, motor vehicle parking, bicycle parking, storage lockers, below-grade storage, any enclosed area used for the collection or storage of disposable or recyclable waste generated within the building, common facilities for the use of the residents of the building, a day care and amenity area. (0174-2017)

3.1 Residential GFA		floors	sq.m.	sq.m.	sq.ft.
Level P3		1 x	63	63	677
Level P2		1 x	63	63	677
Level P1		1 x	63	63	677
Level 1		1 x	522	522	5,622
Levels 2	to 4	3 x	1,032	3,095	33,309
Level 5		1 x	125	125	1,347
Levels 6	to 26	21 x	830	17,428	187,592
Proposed Residential GFA				**21,358**	**229,901**

3.2 Total Proposed GFA	sq.m.	sq.ft.
Total Proposed GFA	**21,358**	**229,901**

4.0 Proposed Floor Space Index

	FSI
"Floor Space Index" the gross floor area of all buildings on a lot divided by the lot area.	**4.88**

5.0 Amenity GFA

The greater of 5.6 m² per dwelling unit or 10% of the site area

5.1 Required Amenity GFA		sq.m.	sq.ft.
Indoor & Outdoor Amenity	*5.6 sqm / unit*	**1,938**	20,856
Total Required Amenity GFA		**1,938**	**20,856**

5.2 Proposed Amenity GFA	sq.m.	sq.ft.

5.3 Indoor Amenity	sq.m.	sq.ft.
Level 1	38	404
Level 5	597	6,426
Total Indoor Amenity	**635**	**6,830**

5.4 Outdoor Amenity	sq.m.	sq.ft.
Level 1	764	8,224
Total Outdoor Amenity	**764**	**8,224**

5.5 Total Proposed Amenity GFA		sq.m.	sq.ft.
Indoor Amenity	1.83 sq.m / Unit	635	6,830
Outoor Amenity	2.21 sq.m / Unit	764	8,224
Total Proposed Amenity GFA		**1,399**	**15,054**
Proposed Amenity Ratio		**4.04 sq.m/Unit**	

6.0 Unit Count

6.1		floors	1 bed	1bed +	2 bed (int)	2 bed	3 bed	units / floor	*Total*
Level 1		1 x			2	2		4	**4**
Levels 2	to 4	3 x	4	3	5	4		16	**48**
Levels 6	to 26	21 x	7	3		4		14	**294**
Total Unit Count			**159**	**72**	**17**	**98**			**346**
			46.0%	**20.8%**	**4.9%**	**28.3%**			**100%**

7.0 Parking

7.1 Proposed Parking *Ratio*	*Ratio*	*Number of Units*	
Residential	0.40 /unit	346	138
Visitor	0.10 /unit	346	35
Accessible*			7
Total Parking Required			**173**

**Accessible Parking as per AODA Requirements*

7.2 Parking Provided	*Residents*	*Visitors*	*Accessible*	
P3	50	0	2	52
P2	48	0	2	50
P1	14	32	3	49
Total Parking Provided	**116**	**35**	**7**	**151**
Parking Ratio Provided	**0.34**	**0.10**		**0.44**

7.3 Bicycle Parking Required	*Ratio**	*Number of Units*	
Resident- Long Term	0.60	346	208
Visitor-Short Term	0.05	346	17
Total Bicycle Parking Required			**225**

** Bicycle Parking Ratio as per " City of Mississauga Bicycle Parking Zoning By-Law Directions - Final Draft - Apr 19,2021"*

7.4 Bicycle Parking Provided	*Long Term*	*Short Term*	
P2	40		40
P1	100		100
L1	68	17	85
Total Parking Provided	**208**	**17**	**225**
Bicycle Parking Ratio Provided			**0.65**

Site Statistics 2
NTS dA1.01

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ARCHITECTS AND PLANNERS
20 De Boers Drive Suite 400
Toronto, ON M3J 0H1

Revisions:
No.: Revision: Date:

No.: Issued For: Date:

EDENSHAW

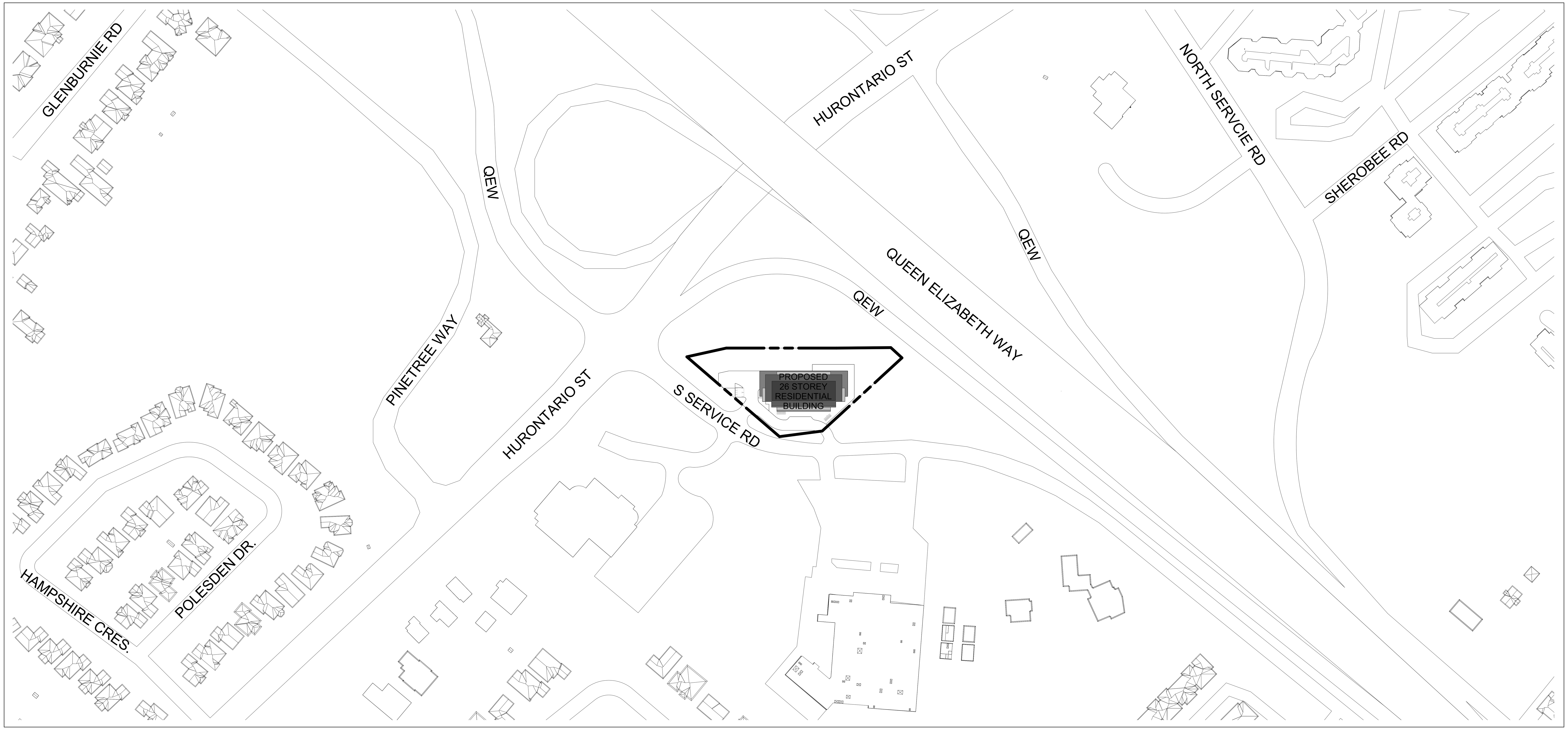
Client:
EDENSHAW

49 SOUTH SERVICE RD, MISSISAUGA , ON
Proposed Residential Development

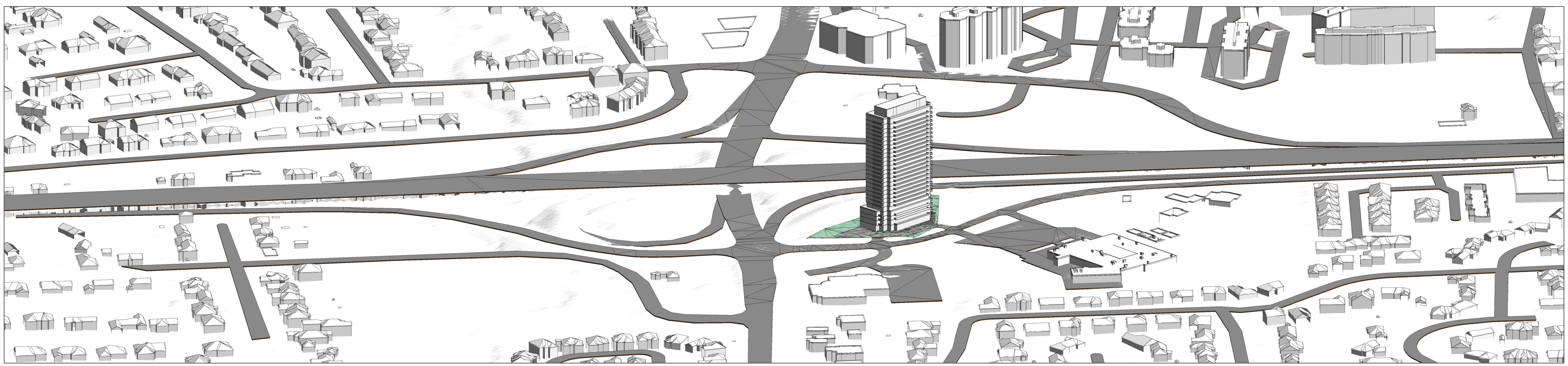
Drawing Title:
Survey & Site Statistics

Scale: 1 : 550
Drawn by: Author
Checked by: Checker
Project No.: 22-073
Date: August 18, 2022
Drawing No.:
dA1.01

Authorities Having Jurisdiction



Context Plan 1 dA1.02
1 : 1250



3D Context 2 dA1.02

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No.:	Issued For:	Date:

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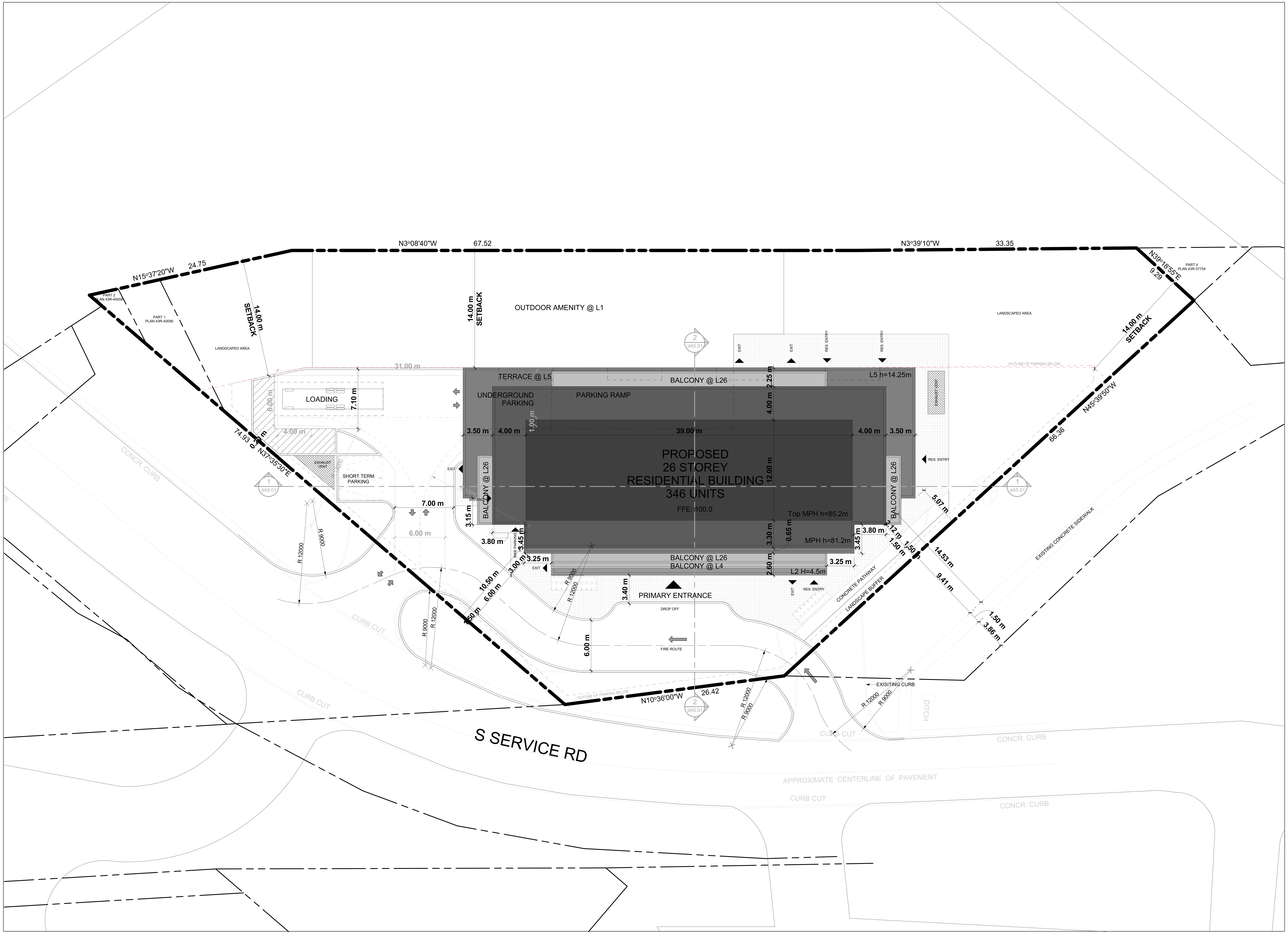
Client:
EDENSHAW

49 SOUTH SERVICE RD, MISSISAUGA , ON
Proposed Residential Development

Drawing Title:
Context Plan

Scale: 1 : 1250
Drawn by: Author
Checked by: Checker
Project No.: 22-073
Date: August 18, 2022
Drawing No.: **dA1.02**



SITE PLAN 1 : 200 (1 / dA1.03)

Authorities Having Jurisdiction

Do not scale the drawings.

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Revisions:

No.:	Revision:	Date:

No.:	Issued For:	Date:

EDENSHAW

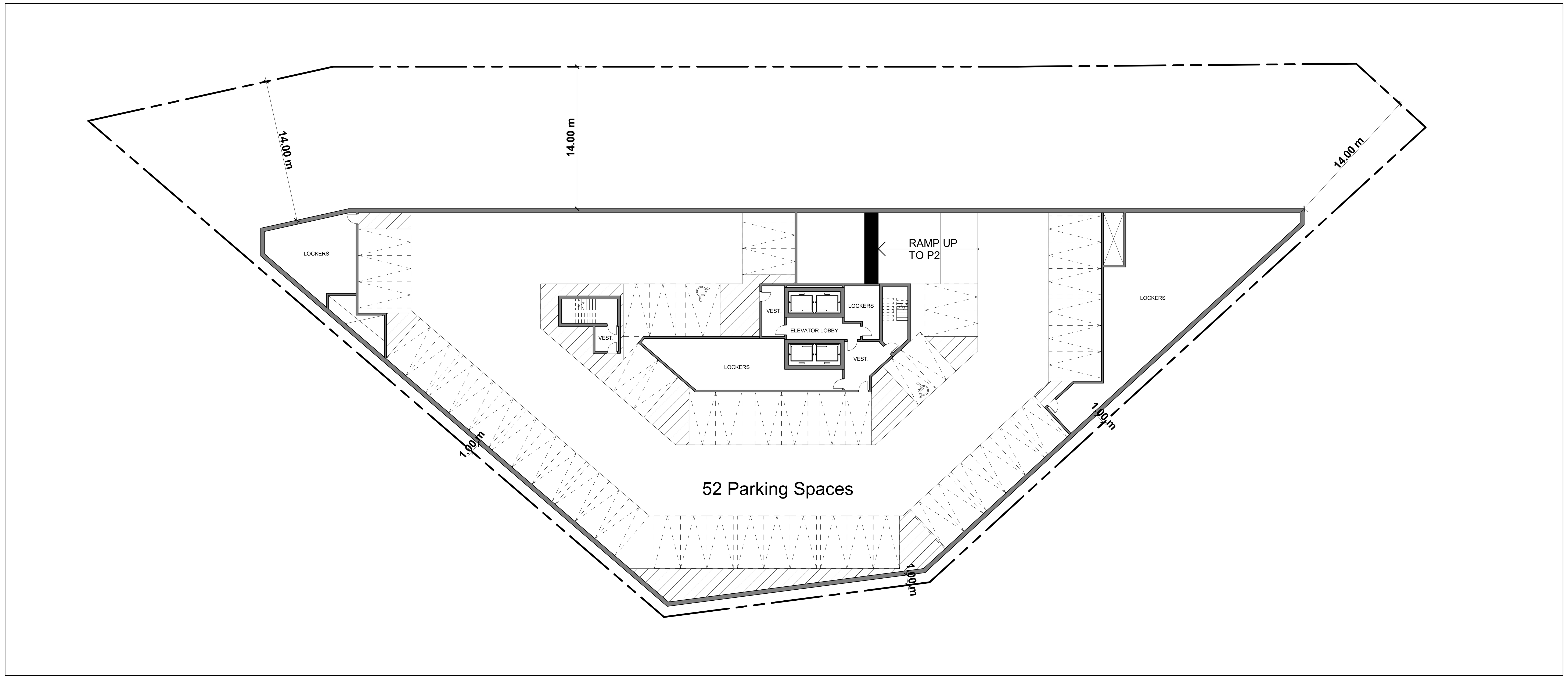
Client: EDENSHAW

49 SOUTH SERVICE RD, MISSISAUGA , ON
Proposed Residential Development

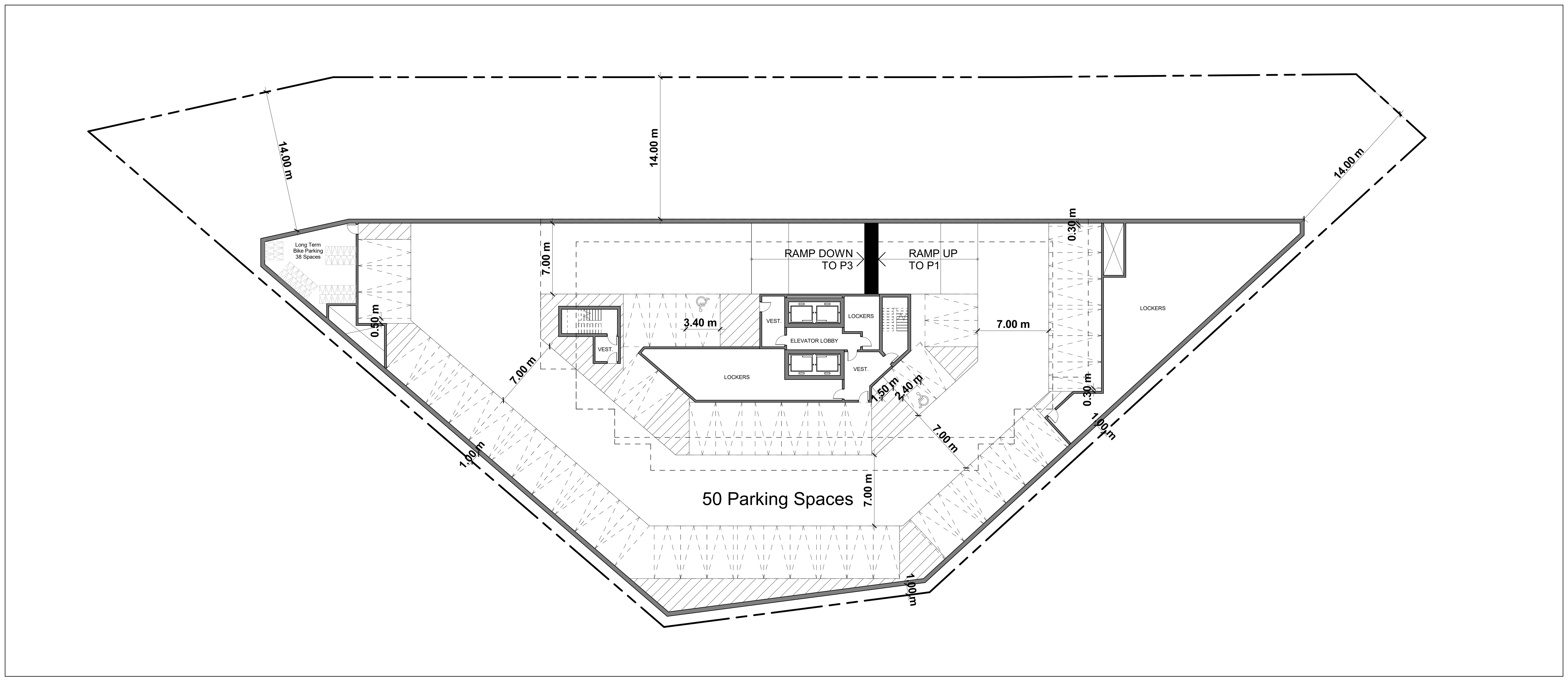
Drawing Title:
Site Plan

Scale: 1 : 200
Drawn by: Author
Checked by: Checker
Project No.: 22-073
Date: August 18, 2022
Drawing No.:

dA1.03



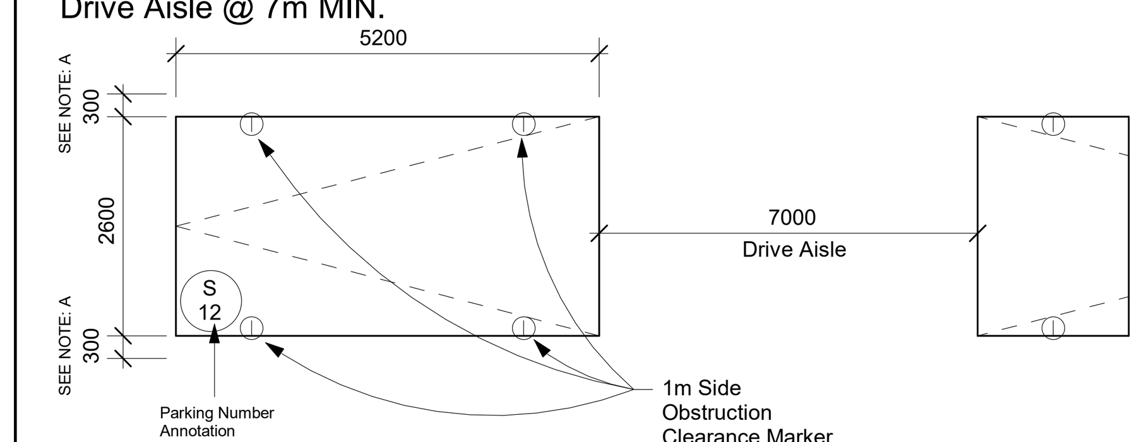
Level P3
1 : 250
1 dA2.01



Level P2
1 : 250
2 dA2.01

TYPICAL PARKING SPACE:

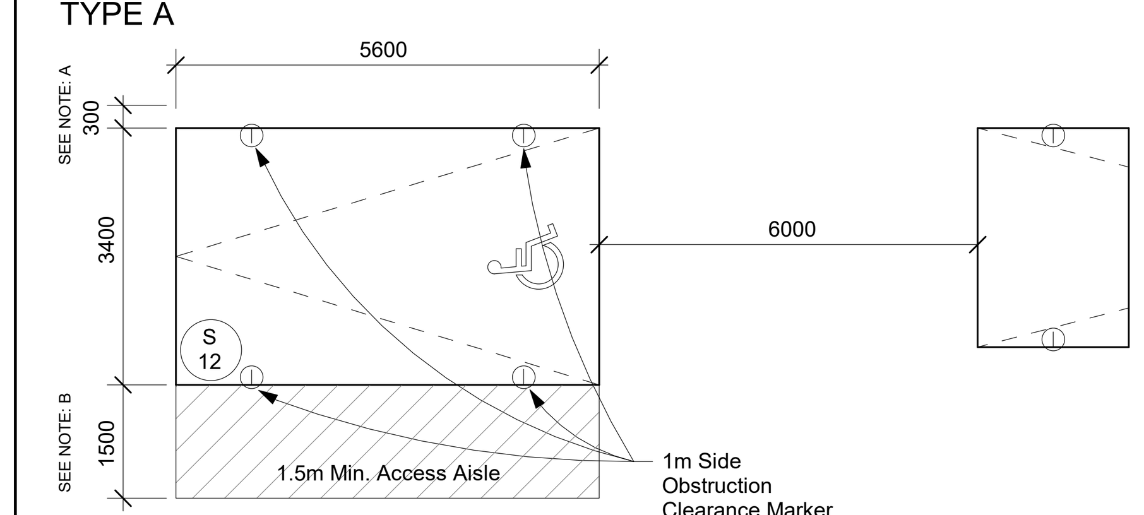
Drive Aisle @ 7m MIN.



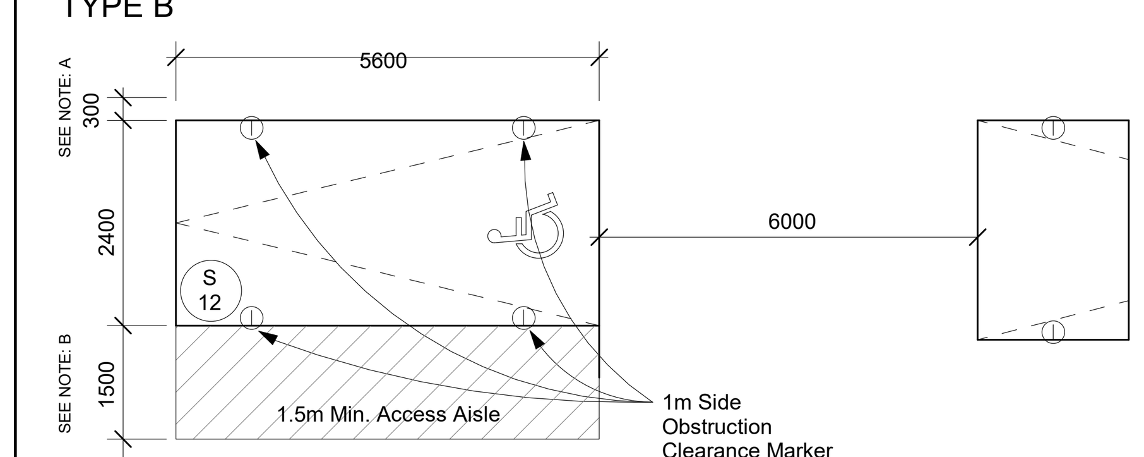
NOTE: A - PROVIDE AN ADDITIONAL 300mm FOR PARKING SPACE WIDTH WHEN OBSTRUCTIONS OCCUR BETWEEN THE FRONT AND REAR 1000mm

TYPICAL PARKING SPACE:

TYPE A



TYPE B



NOTES:
A - PROVIDE AN ADDITIONAL 300mm FOR PARKING SPACE WIDTH WHEN OBSTRUCTIONS OCCUR BETWEEN THE FRONT AND REAR 1000mm.
B - PROVIDE A 1500mm WALKWAY ON AT LEAST ONE SIDE OF A HANDICAP PARKING STALL. THIS WALKWAY MAY BE SHARED WITH ADJOINING HANDICAP SPACE.

General Typical Floor Notes
NTS
4 dA2.01

Authorities Having Jurisdiction

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No.:	Issued For:	Date:

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EDENSHAW

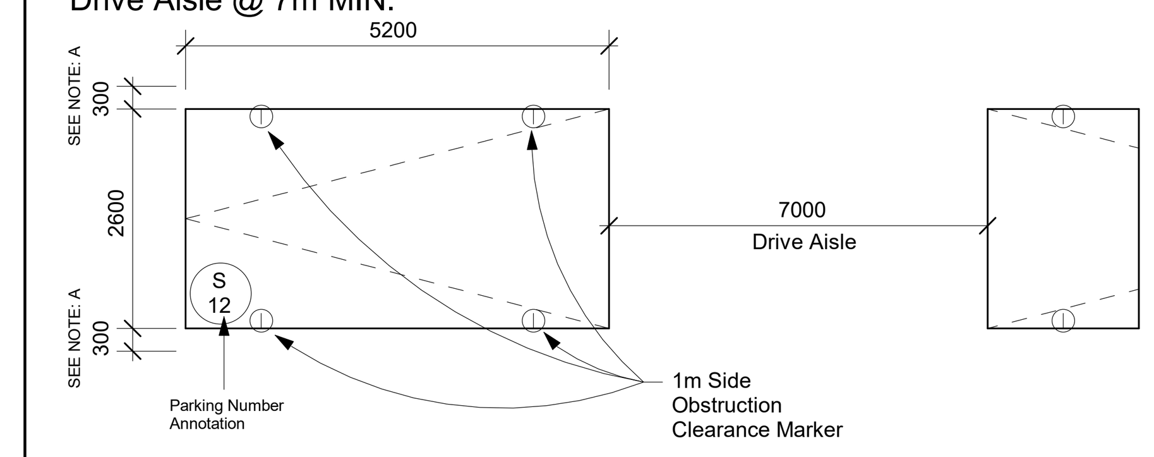
49 SOUTH SERVICE RD, MISSISAUGA , ON
Proposed Residential Development

Drawing Title:
Parking Level Floor Plans P3, P2

Scale: 1 : 250
Drawn by: Author
Checked by: Checker
Project No.: 22-073
Date: August 18, 2022
Drawing No.:
dA2.01

TYPICAL PARKING SPACE:

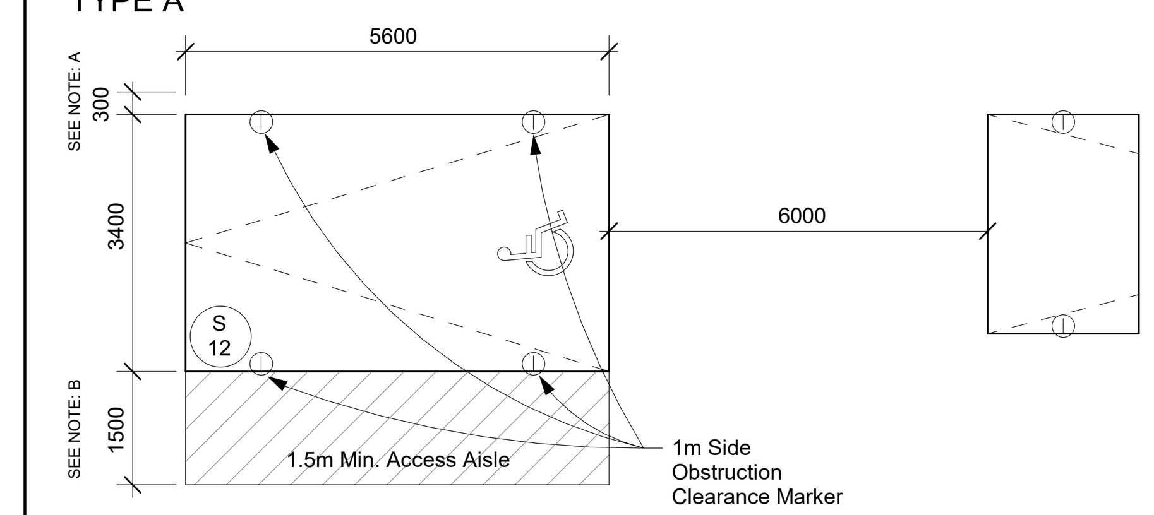
Drive Aisle @ 7m MIN.



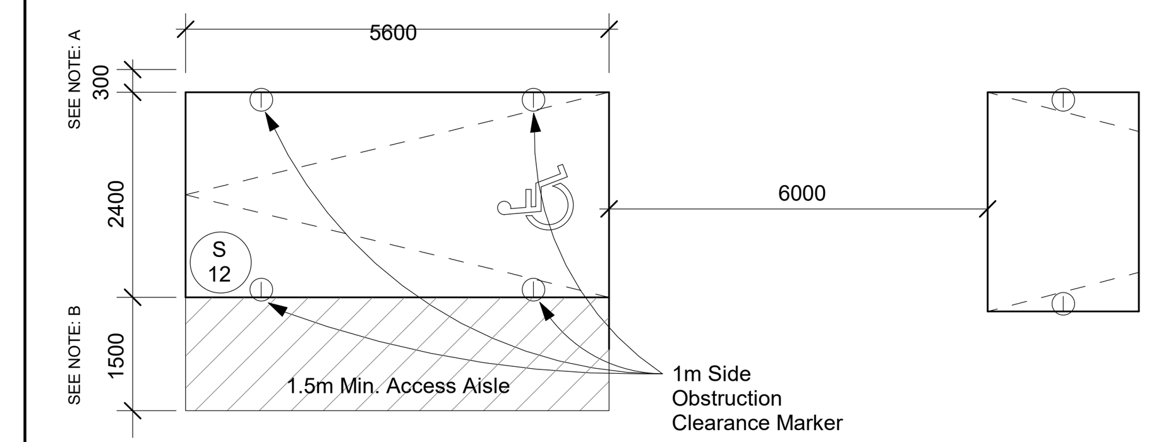
NOTE: A - PROVIDE AN ADDITIONAL 300mm FOR PARKING SPACE WIDTH WHEN OBSTRUCTIONS OCCUR BETWEEN THE FRONT AND REAR 1000mm

TYPICAL PARKING SPACE:

TYPE A

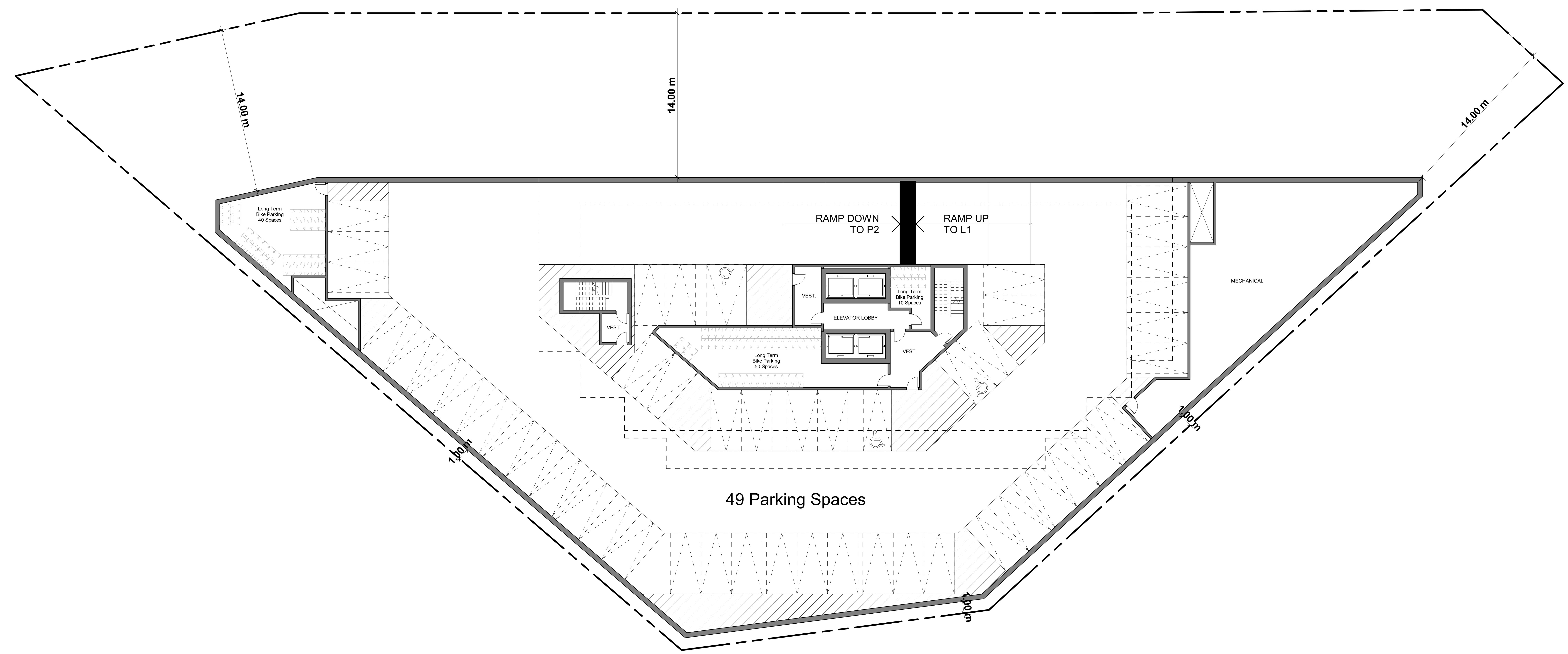


TYPE B



NOTES:
A - PROVIDE AN ADDITIONAL 300mm FOR PARKING SPACE WIDTH WHEN OBSTRUCTIONS OCCUR BETWEEN THE FRONT AND REAR 1000mm.
B - PROVIDE A 1500mm WALKWAY ON AT LEAST ONE SIDE OF A HANDICAP PARKING STALL. THIS WALKWAY MAY BE SHARED WITH ADJOINING HANDICAP SPACE.

General Typical Floor Notes 4 dA2.02
NTS



Level P1 1 dA2.02
1 : 200

Authorities Having Jurisdiction

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Revisions:

No.:	Revision:	Date:

No.:	Issued For:	Date:

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Client:
EDENSHAW

49 SOUTH SERVICE RD, MISSISAUGA , ON
Proposed Residential Development

Drawing Title:
Parking Level Floor Plan P1

Scale: 1 : 200
Drawn by: Author
Checked by: Checker
Project No.: 22-073
Date: August 18, 2022
Drawing No.:
dA2.02

Ground Floor Plan 1 dA2.03

1 : 200

Authorities Having Jurisdiction

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Revisions:

No.:	Revision:	Date:

No.:	Issued For:	Date:

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EDENSHAW

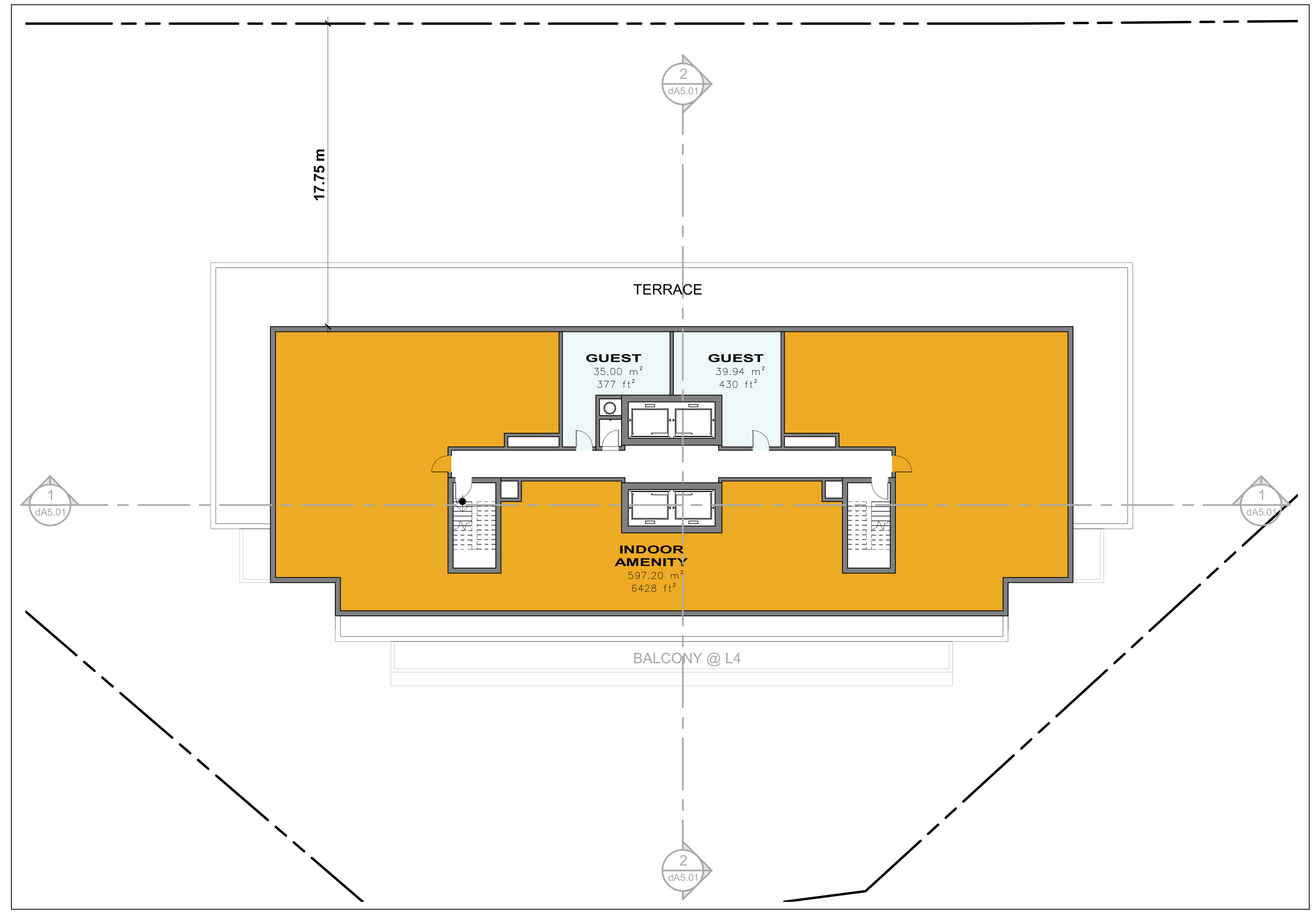
49 SOUTH SERVICE RD, MISSISAUGA , ON
Proposed Residential Development

Drawing Title:
Floor Plans LEVEL 1

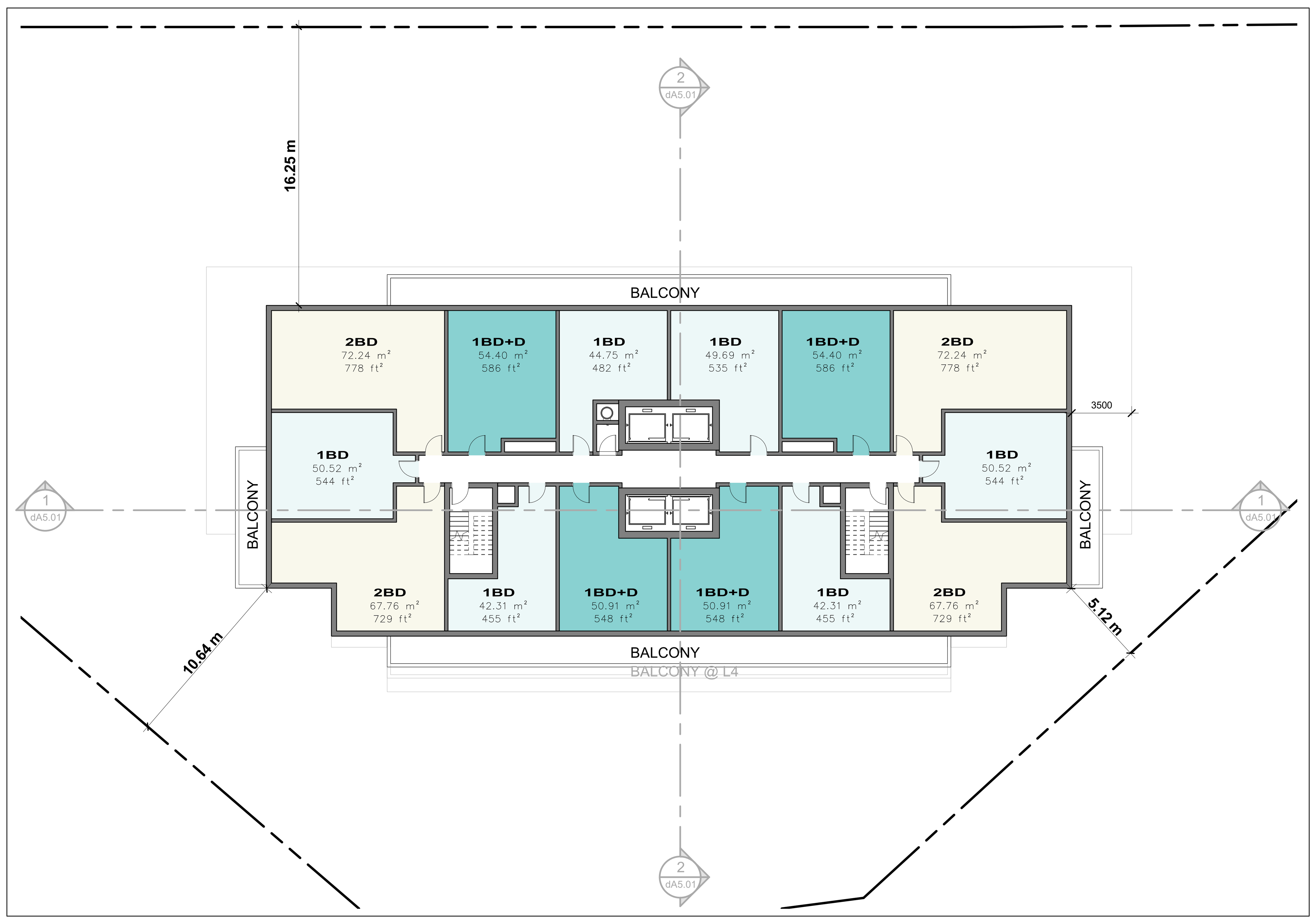
Scale: 1 : 200
Drawn by: Author
Checked by: Checker
Project No.: 22-073
Date: August 18, 2022
Drawing No.:

dA2.03

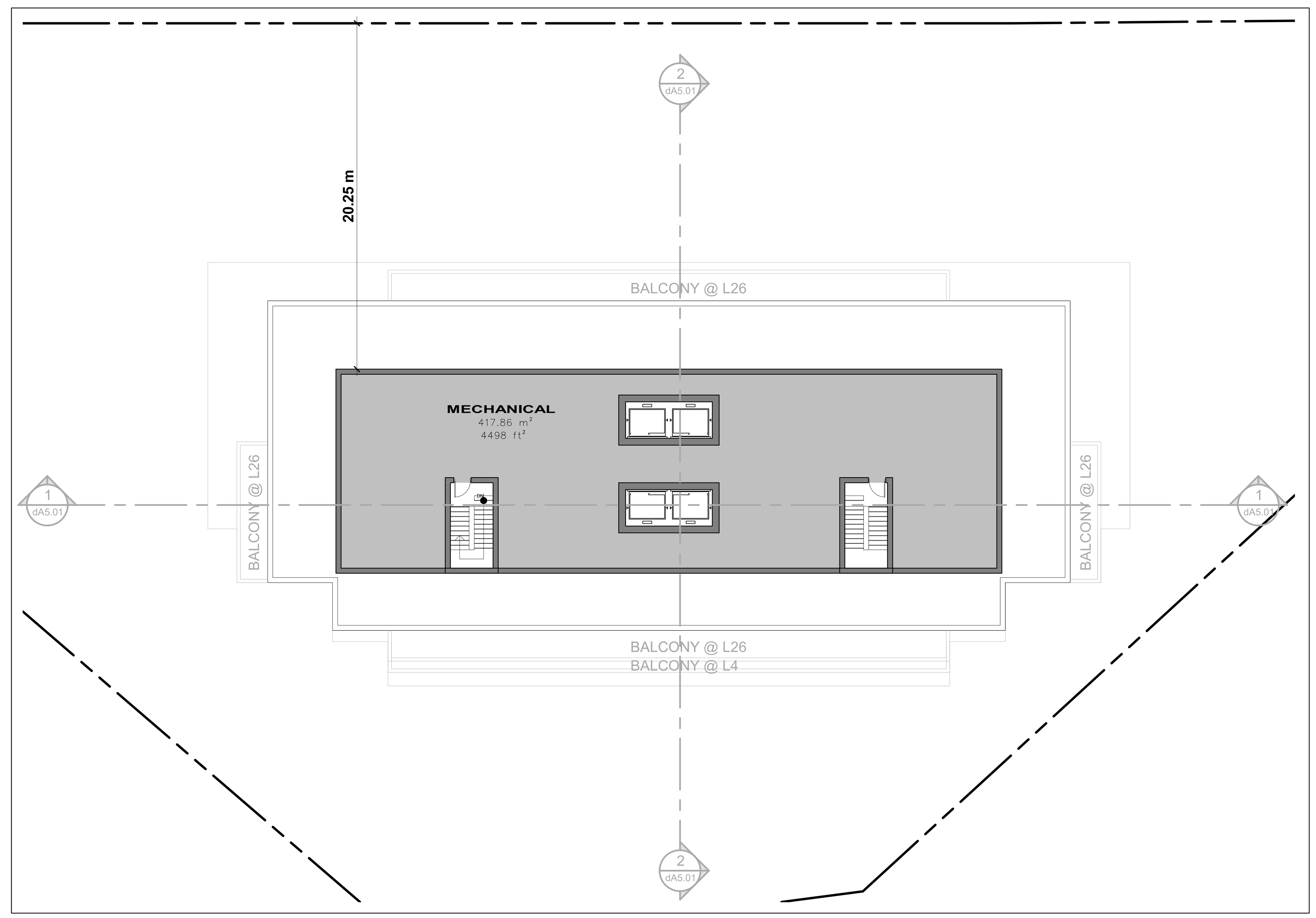
Level 2-4 1
1 : 200 dA2.04



Level 5 3
1 : 200 dA2.04



Level 6-26 4
1 : 200 dA2.04



MPH 2
1 : 200 dA2.04

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Revisions:

No.:	Revision:	Date:

No.:	Issued For:	Date:

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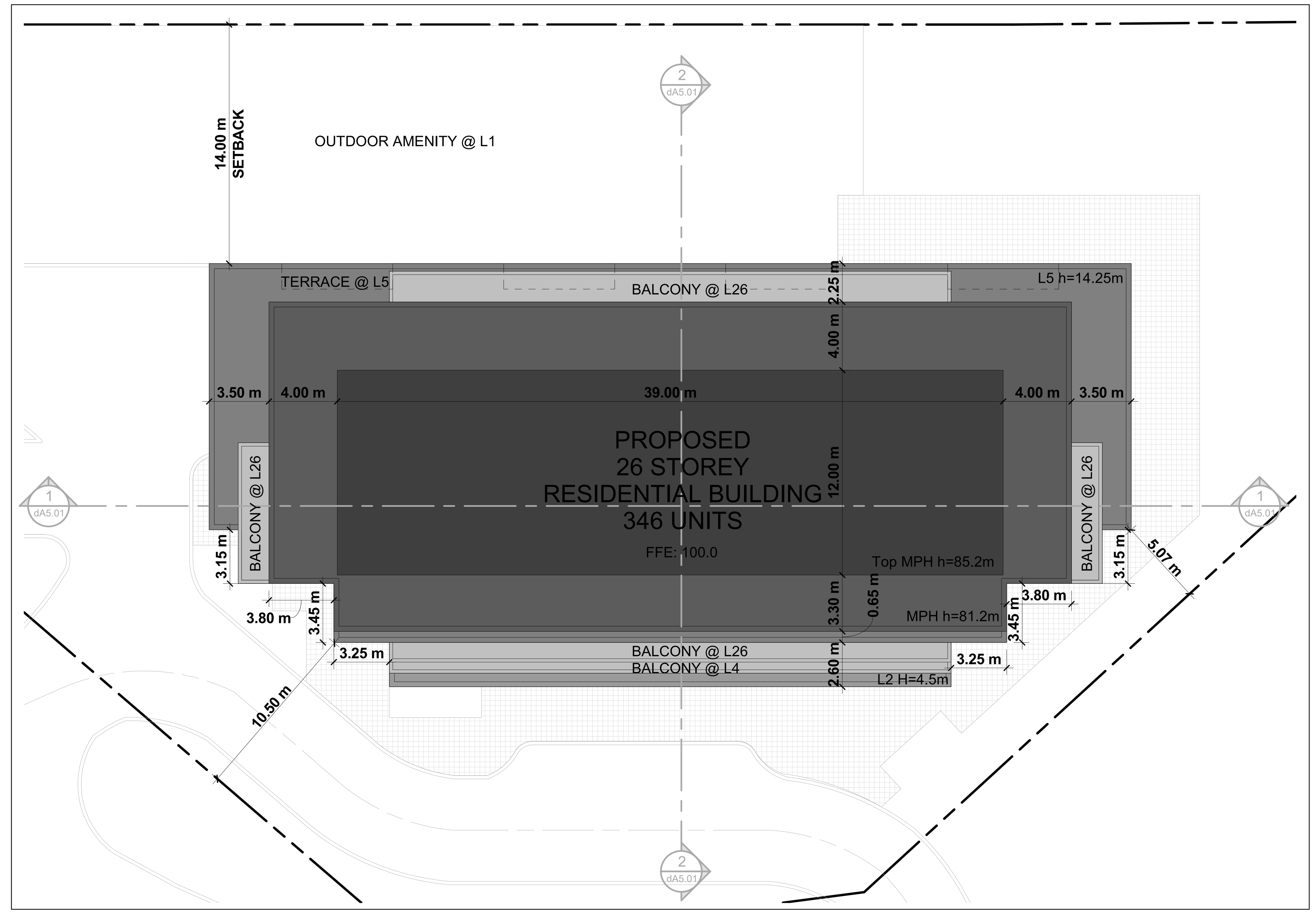
Client:
EDENSHAW

49 SOUTH SERVICE RD, MISSISAUGA , ON
Proposed Residential Development

Drawing Title:
Floor Plans LEVEL 2-4,5,6-26,MPH

Scale: 1 : 200
Drawn by: Author
Checked by: Checker
Project No.: 22-073
Date: August 18, 2022
Drawing No.:
dA2.04



Roof Plan 2 dA2.05
1 : 200

Authorities Having Jurisdiction

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No.:	Revision:	Date:

No.:	Issued For:	Date:

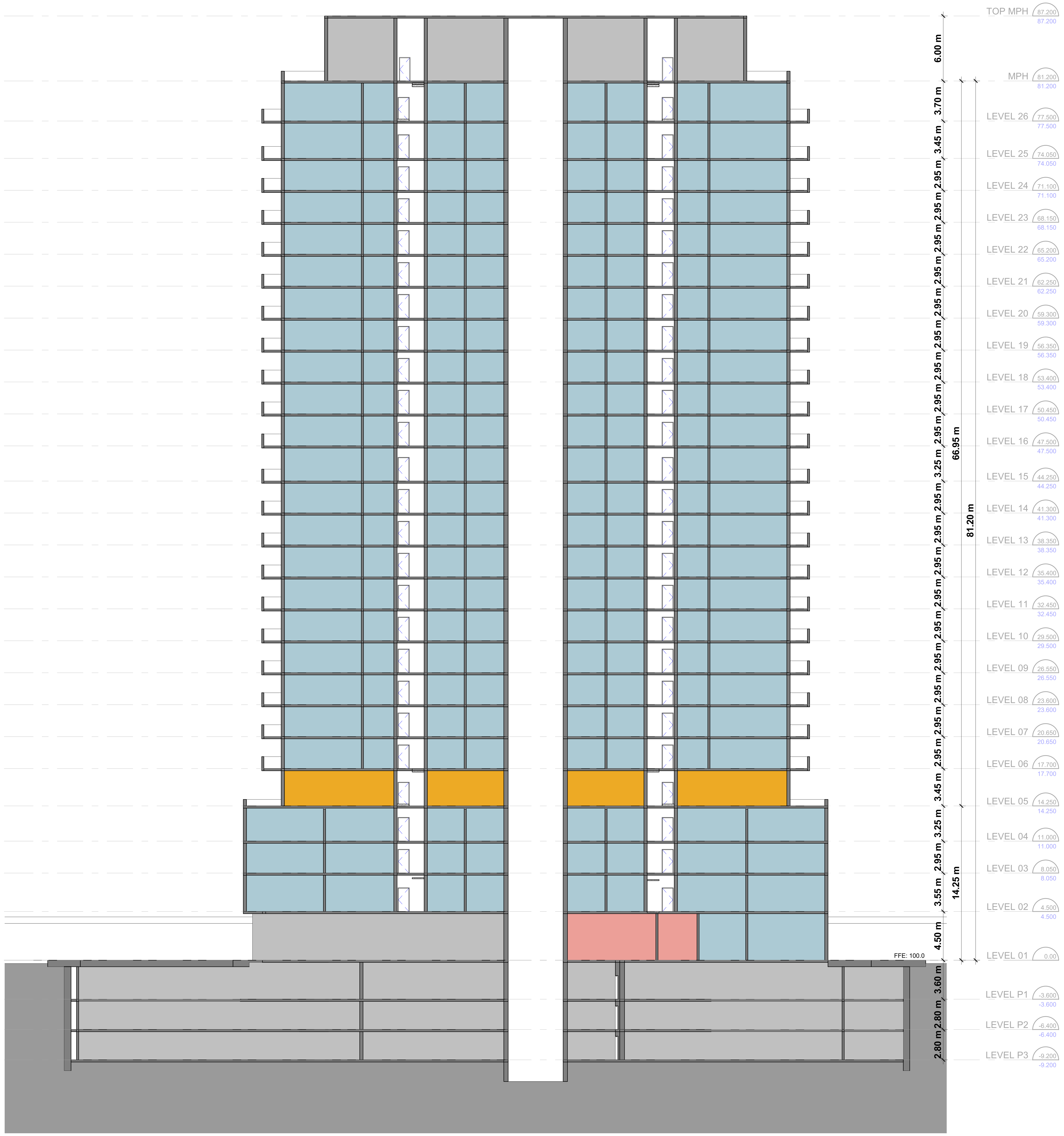
EDENSHAW

Client:
EDENSHAW

49 SOUTH SERVICE RD, MISSISSAUGA , ON
Proposed Residential Development

Drawing Title:
ROOF PLAN

Scale:
1 : 200
Drawn by:
Author
Checked by:
Checker
Project No.:
22-073
Date:
August 18, 2022
Drawing No.:
dA2.05



Section 1 (1 / dA5.01)
1 : 200

Section 2 (2 / dA5.01)
1 : 200

Authorities Having Jurisdiction

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Revisions:

No.:	Revision:	Date:

No.:	Issued For:	Date:

EDENSHAW

Client:
EDENSHAW

49 SOUTH SERVICE RD, MISSISAUGA , ON
Proposed Residential Development

Drawing Title:
Sections

Scale: As indicated
Drawn by: Author
Checked by: Checker
Project No.: 22-073
Date: August 18, 2022
Drawing No.:

dA5.01

Appendix B

Borehole Logs

Palmer, 2022 and GHD, 2020

Palmer

LOG OF BOREHOLE BH22-1

PROJECT: Geotechnical Investigation - 49 South Service Road

CLIENT: Edenshaw Developments

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

Method: Solid Stem Augers

Diameter: 150mm

Date: Jun 1, 2022

REF. NO.: 2204701

ENCL NO.: 1

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
99.9	Ground Surface				
99.8	**TOPSOIL:** 100mm				Concrete
0.1	**FILL:** silty sand, trace clay, trace gravel, brown, moist to wet, loose contains rootlets	1	SS	8	Sand
		2	SS	7	99
		3	SS	4	Bentonite 98
97.7					
2.2	**SILTY SAND:** trace clay, grey to brown, moist to wet, compact to dense wet below 2.3m	4	SS	24	Sand
		5	SS	36	W. L. 97.0 m Jun 2, 2022 96
		6	SS	31	Screen
		7	SS	44	95
					94
		8	SS	26	
93.2					
6.7	**UNSAMPLED:** Advanced dynamic cone penetration test				93 Bentonite
					92
91.3					
8.5	**END OF BOREHOLE** 1. Upon completion of drilling, one (1) 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (BGS) June 2, 2022 2.89m				

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

	GR	SA	SI	CL
Wet spoon below	0	64	32	4
Dynamic cone refusal				

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH22-2

PROJECT: Geotechnical Investigation - 49 South Service Road

CLIENT: Edenshaw Developments

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

Method: Hollow Stem Augers/Rock Coring

Diameter: 205mm/96mm

Date: May 27, 2022

REF. NO.: 2204701

ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
99.7	Ground Surface							
99.6	**ASPHALT:** 100 mm						Concrete	
99.6 / 0.1	**FILL:** silty sand, trace clay, trace gravel, brown, moist to wet, loose to compact		1	SS	12		Sand	
			2	SS	5		99	
98.3								
1.5	**SILTY SAND:** trace clay, trace gravel, brown, moist to wet, loose to compact		3	SS	4		98	
			4	SS	6			
	wet below 2.7m						97	Wet spoon below
			5	SS	9	▽		
							W. L. 96.1 m Jun 2, 2022	
			6	SS	15		95	
							94	
			7	SS	21			0 71 25 4
92.6							93	
7.2 / 92.1	**SANDY SILT TILL/SHALE COMPLEX:** trace clay, trace gravel, grey, wet, very dense							
7.7	**ROCK CORING STARTS, REFER TO ROCK CORE LOG**		8	SS	50/ initial 50mm		92	Spoon bouncing
							91	
							90	

DYNAMIC CONE PENETRATION RESISTANCE PLOT — 20 40 60 80 100

SHEAR STRENGTH (kPa) — ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE — 20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%) — 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

LOG OF BOREHOLE BH22-2

PROJECT: Geotechnical Investigation - 49 South Service Road

CLIENT: Edenshaw Developments

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

Method: Hollow Stem Augers/Rock Coring

Diameter: 205mm/96mm

Date: May 27, 2022

REF. NO.: 2204701

ENCL NO.: 2

SOIL PROFILE			SAMPLES												
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100; SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L; WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued											
	ROCK CORING STARTS, REFER TO ROCK CORE LOG(Continued)						Bentonite					
11							88					
12							87					
13							86					
14							85					
15							84					
16							83					
17							82					
18							81					
19							80					
20												

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

LOG OF BOREHOLE BH22-2

PROJECT: Geotechnical Investigation - 49 South Service Road

CLIENT: Edenshaw Developments

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

Method: Hollow Stem Augers/Rock Coring

Diameter: 205mm/96mm

Date: May 27, 2022

REF. NO.: 2204701

ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100); SHEAR STRENGTH (kPa): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE & Sensitivity, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L; WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued										
	ROCK CORING STARTS, REFER TO ROCK CORE LOG(Continued)										
21							79				
							Sand				
22							78				
							77				
23							Screen				
							76				
24											
							Bentonite				
25 74.7											
25.0	**END OF BOREHOLE** 1. Upon completion of drilling, one (1) 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (BGS) June 2, 2022 3.67m										

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

Palmer

LOG OF ROCK CORE BH22-2

PROJECT: Geotechnical Investigation - 49 South Service Road
CLIENT: Edenshaw Developments
LOCATION: City of Mississauga, ON
DATUM: Geodetic
BH LOCATION: See Borehole Location Plan

Method: Hollow Stem Augers/Rock Coring
Diameter: 205mm/96mm
Date: May-27-2022

REF. NO.: 2204701
ENCL NO.: 2

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
92.2	Rock Surface															
92.2 / 7.5	**GEORGIAN BAY FORMATION**		1	HQ	100	58	8	38	23, 6, 1	Soft Layer: 7.54m - 7.70m; Fragment Zone: 8.12m - 8.16m; Hard Layer: 8.16m - 8.20m Limestone	W4					
7.7	Highly weathered shale to complex, grey, weak															
91.5 / 8.2	**GEORGIAN BAY FORMATION** Moderately weathered to slightly weathered, laminated to thinly bedded, grey and light grey, weak to medium strong **SHALE** (95~97%), thinly laminated to medium bedded with slightly weathered to fresh, grey, medium strong to very strong **LIMESTONE** (3~5%).		2	HQ	100	87	5	35	15, 7, 6, 3, 8	Soft Layer: 9.08m - 9.12m; Fragment Zone: 8.20m - 8.25m, 8.31m - 8.52m, 9.55m - 9.64m	W3-W2					
90.0 / 9.7			3	HQ	55	50	3	10	5, 6, 7, 0, 0	Lost Zone: 10.57m - 11.25m; Fragment Zone: 10.47m - 10.52m						
88.5 / 11.3	**GEORGIAN BAY FORMATION** slightly weathered, laminated to thinly bedded, grey and light grey, weak to medium strong **SHALE** (88~93%), thinly laminated to medium bedded with slightly weathered to fresh, grey, medium strong to very strong **LIMESTONE** (7~12%).		4	HQ	100	98	12	75	3, 6, 3, 3, 1	Fragment Zone: 11.25m - 11.27m						
86.9 / 12.8			5	HQ	100	99	10	92	1, 2, 2, 1, 2							
85.4 / 14.3			6	HQ	100	99	8	96	0, 5, 1, 1, 1	Soft Layer: 14.80m - 14.85m						
83.9 / 15.8			7	HQ	100	100	7	95	2, 2, 2, 1, 1							
82.4 / 17.3									2	Fracture: 17.85m - 18.18m: 90° - 75°						

Continued Next Page

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered

θ = angle to the core axis

E = Modulus of Elasticity

*: UCS [Mpa] ≈ 24 $I_{S(50)}$

LOG OF ROCK CORE BH22-2

PROJECT: Geotechnical Investigation - 49 South Service Road

CLIENT: Edenshaw Developments | Method: Hollow Stem Augers/Rock Coring | REF. NO.: 2204701

LOCATION: City of Mississauga, ON | Diameter: 205mm/96mm | ENCL NO.: 2

DATUM: Geodetic | Date: May-27-2022

BH LOCATION: See Borehole Location Plan

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
	Continued															
18	**GEORGIAN BAY FORMATION** slightly weathered, laminated to thinly bedded, grey and light grey, weak to medium strong **SHALE** (88~93%), thinly laminated to medium bedded with slightly weathered to fresh, grey, medium strong to very strong **LIMESTONE** (7~12%). *(continued)*		8	HQ	100	100	8	88	2 3 0 2	Fracture: 17.85m - 18.18m: 90° - 75° *(continued)*	W2-W1					
80.8																
19 18.9									1	Soft Layer: 20.21m - 20.33m						
			9	HQ	100	100	12	91	0 1 2							
20									12							
79.3																
20.4									1	Hard Layer: 20.44m - 20.52m Limestone						
21			10	HQ	100	100	10	100	0 0 1							
77.8																
22 22.0									0							
			11	HQ	100	100	8	95	1 0 2 1						24.2	
23																
76.3																
23.5									0	Hard Layer: 24.57m - 24.64m Limestone						
24			12	HQ	100	100	8	100	1 1 1						42.1	
25 74.7																
25.0	**END OF BOREHOLE** 1. Upon completion of drilling, a 50 mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) June 2, 2022 3.67m															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered

θ = angle to the core axis

E = Modulus of Elasticity

*: UCS [Mpa] ≈ 24 $I_{S(50)}$

Palmer

LOG OF BOREHOLE BH22-3

PROJECT: Geotechnical Investigation - 49 South Service Road

CLIENT: Edenshaw Developments

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

Method: Solid Stem Augers

Diameter: 150mm

Date: Jun 1, 2022

REF. NO.: 2204701

ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS "N" 0.3 m	ELEVATION
99.6	Ground Surface				
99.6 / 0.0	**ASPHALT:** 100mm				Concrete
99.3 / 0.3	**FILL:** sand and gravel, trace silt, contains cobbles, grey, moist, loose				Sand
	FILL: silty sand, trace clay, trace gravel, brown to grey, moist to wet, very loose to loose	1	SS	7	99
		2	SS	9	
		3	SS	5	Bentonite
	wet below 2.7m	4	SS	3	97
96.6 / 3.0	**SILTY SAND TO SAND AND SILT:** trace clay, trace gravel, grey to brown, moist to wet, compact to very dense				Sand
		5	SS	16	W. L. 96.4 m Jun 2, 2022
		6	SS	20	96
		7	SS	39	Screen
		8	SS	60	94
92.9 / 6.7	**UNSAMPLED:** Advanced dynamic cone penetration test				93
					Bentonite
					92
90.7 / 8.8	**END OF BOREHOLE** 1. Upon completion of drilling, one (1) 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (BGS) June 2, 2022 3.21m				91

GROUND WATER CONDITIONS

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)	GR	SA	SI	CL
Wet spoon below				
	1	76	20	3
	3	36	57	4
Dynamic cone refusal				

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

LOG OF BOREHOLE BH22-4

PROJECT: Geotechnical Investigation - 49 South Service Road

CLIENT: Edenshaw Developments

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

Method: Hollow Stem Augers/Rock Coring

Diameter: 205mm/96mm

Date: May 26, 2022

REF. NO.: 2204701

ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
99.6	Ground Surface							
99.5	**ASPHALT:** 100 mm						Concrete	
0.1	**FILL:** sand and gravel, trace clay, trace silt, contains boulder fragments, contains brick fragments, redish brown, moist, loose to compact		1	SS	9		Sand	
			2	SS	11			
98.2								
1.5	**FILL:** silt, trace clay, trace sand, trace gravel, brown, moist, loose		3	SS	5			
97.4								
2.2	**FILL:** silty sand, trace clay, brown, saturated, compact		4	SS	11			Wet spoon below
96.7								
3.0	**SILTY SAND TO SANDY SILT:** trace clay, trace gravel, brown, saturated, compact to loose		5	SS	20			
			6	SS	26			3 30 60 7
			7	SS	25		W. L. 95.1 m Jul 14, 2022	
							Bentonite	
			8	SS	9			
92.5								
7.2	**SAND AND GRAVEL:** trace silt, contains boulder fragments, brown, moist, very dense		9	SS	65			
91.3								
8.4	**WEATHERED SHALE:** grey, moist, very dense		10	SS	76/ 250mm			
90.7								
8.9	**ROCK CORING STARTS, REFER TO ROCK CORE LOG**							

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

PROJECT: Geotechnical Investigation - 49 South Service Road
CLIENT: Edenshaw Developments
PROJECT LOCATION: City of Mississauga, ON
DATUM: Geodetic
BH LOCATION: See Borehole Location Plan

Method: Hollow Stem Augers/Rock Coring
Diameter: 205mm/96mm
Date: May 26, 2022

REF. NO.: 2204701
ENCL NO.: 4

SOIL PROFILE: (m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	TYPE	"N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE & Sensitivity ● QUICK TRIAXIAL × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT W_L — WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
Continued	**ROCK CORING STARTS, REFER TO ROCK CORE LOG**(Continued)					Sand; Screen	89, 88, 87, 86, 85, 84, 83, 82, 81, 80					

Depth scale (m): 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3, \times^3$: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH22-4

PROJECT: Geotechnical Investigation - 49 South Service Road

CLIENT: Edenshaw Developments

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

Method: Hollow Stem Augers/Rock Coring

Diameter: 205mm/96mm

Date: May 26, 2022

REF. NO.: 2204701

ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE & Sensitivity, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L; WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued										
	ROCK CORING STARTS, REFER TO ROCK CORE LOG(Continued)						Bentonite				
21							79				
22							78				
23							77				
24							76				
74.6							75				
25.0	**END OF BOREHOLE** 1. Upon completion of drilling, one (1) 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (BGS) July 14, 2022 4.57m										

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

Palmer

LOG OF ROCK CORE BH22-4

PROJECT: Geotechnical Investigation - 49 South Service Road

CLIENT: Edenshaw Developments | Method: Hollow Stem Augers/Rock Coring | REF. NO.: 2204701

LOCATION: City of Mississauga, ON | Diameter: 205mm/96mm | ENCL NO.: 4

DATUM: Geodetic | Date: May-26-2022

BH LOCATION: See Borehole Location Plan

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm³) E (GPa)
90.7	Rock Surface															
90.7 / 8.9	**GEORGIAN BAY FORMATION** Highly weathered shale to complex, grey, weak **SHALE** (27%), thinly laminated to medium bedded with highly weathered, grey **SOFT LAYER** (73%).		1	HQ	100	31	4	13	>25, 15, 17	Soft Layer: 8.94m - 9.29m; 9.46m - 9.72m. Hard Layer: 9.72m - 9.75m Limestone	W4-W3					
89.9 / 9.8	**GEORGIAN BAY FORMATION** slightly weathered, laminated to thinly bedded, grey and light grey, weak to medium strong **SHALE** (68~94%), thinly laminated to medium bedded with slightly weathered to fresh, grey, medium strong to very strong **LIMESTONE** (6~32%).		2	HQ	100	97	3	37	5, 4, 6, 6, 1	Fragment Zone: 9.86m - 9.91m. Fracture: 10.47m - 10.95m: 90°						
88.4 / 11.3			3	HQ	100	86	32	43	1, 8, 2, 4, 3	Hard Layer: 11.68m - 11.76m; 11.91m - 12.00m; 12.18m - 12.24m; 12.33m - 12.45m						
86.8 / 12.8			4	HQ	100	100	8	91	4, 3, 0, 4, 0	Hard Layer: 13.05m - 13.09m; 13.30m - 13.34m						
85.3 / 14.3			5	HQ	100	98	11	95	2, 2, 1, 1, 0	Fracture: 14.45m - 14.51m: 90°. Hard Layer: 14.45m - 14.51m; 14.63m - 14.69m; 15.08m - 15.13m						
83.8 / 15.9			6	HQ	100	98	15	98	0, 1, 1, 1, 1	Hard Layer: 16.18m - 16.32m; 17.00m - 17.10m	W2-W1					
82.3 / 17.4			7	HQ	100	100	10	93	1, 0, 1, 1, 0	Hard Layer: 18.75m - 18.80m						
80.7																

Continued Next Page

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered

θ = angle to the core axis

E = Modulus of Elasticity

*: UCS [Mpa] ≈ 24 $I_{S(50)}$

Palmer™

LOG OF ROCK CORE BH22-4

PROJECT: Geotechnical Investigation - 49 South Service Road

CLIENT: Edenshaw Developments | Method: Hollow Stem Augers/Rock Coring | REF. NO.: 2204701

LOCATION: City of Mississauga, ON | Diameter: 205mm/96mm | ENCL NO.: 4

DATUM: Geodetic | Date: May-26-2022

BH LOCATION: See Borehole Location Plan

(m) ELEV / DEPTH	ROCK DESCRIPTION (Continued)	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
18.9 – 79.2 / 20.5	**GEORGIAN BAY FORMATION** slightly weathered, laminated to thinly bedded, grey and light grey, weak to medium strong **SHALE** (68~94%), thinly laminated to medium bedded with slightly weathered to fresh, grey, medium strong to very strong **LIMESTONE** (6~32%). *(continued)*		8	HQ	100	92	22	45	3, 3, 2, 3, 1	Fracture: 18.92m - 19.02m: 75° Fragment Zone/Soft Layer: 19.94m - 19.99m 20.06m - 20.11m Hard Layer: 18.92m - 19.02m 19.44m - 19.58m 19.82m - 19.90m *(continued)*					40.4	
77.7 / 22.0			9	HQ	100	100	14	100	1, 0, 1, 1, 0	Fracture joint: 20.52m - 20.60m Hard layer: 20.52m - 20.60m						
76.1 / 23.5			10	HQ	100	100	8	92	0, 0, 0, 1, 2						25	
74.6 / 25.0			11	HQ	100	100	6	100	1, 0, 1, 1, 0							
25.0	**END OF BOREHOLE** 1. Upon completion of drilling, a 50 mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) July 14, 2022 4.57m															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered θ = angle to the core axis

E = Modulus of Elasticity

*: UCS [Mpa] ≈ 24 $I_{S(50)}$

Palmer

LOG OF BOREHOLE BH22-10

PROJECT: Phase Two ESA_49 S Service Road
CLIENT: Edenshaw SSR Developments Limited
PROJECT LOCATION: City of Mississauga, ON
DATUM: Geodetic
BH LOCATION:

Method: Solid Stem Auger
Diameter: 150 mm
Date: Jun-22-2001

REF. NO.: 2204701
ENCL NO.: 6
ORIGINATED BY SB & BF
CHECKED BY KN

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLE REMARKS	Head Space Combustible Vapor Reading (ppm) 50 100 150 200 250	LABORATORY ANALYSIS AND REMARKS	GROUND WATER CONDITIONS	WELL CONSTRUCTION DETAILS
Ground Surface									
0.0	**ASPHALT:** 100mm								Concrete
0.0	**SILTY SAND:** brown silty sand, trace gravel, fill		1	SS					
0.8	**SILTY SAND:** brown silty sand, trace gravel, trace clay, fill		2	SS					
	note, black asphalt fragments		3	SS			Analysis: pH+duplicate		
1.5	**SILTY SAND:** golden brown silty sand, trace gravel, fill		4	SS					W. L. 1.6 mBGL May 20, 2022
	note, metal debris								Bentonite
2.3	**SILTY SAND:** brown silty sand, trace clay, moist, fill		5	SS			Analysis: Grain Size		
3.1	**SILTY SAND:** greyish brown,silty sand, wet , native		6	SS					
			7	SS					
			8	SS			Analysis: PHC/VOC, metals		Sand Screen
5.3	**END OF BOREHOLE**"Notes: 1. Upon completion of drilling, one 50mm diameter monitoring well was installed in the borehole. 2. Borehole was open upon completion of drilling. 3. Water Level Readings: Date: June 2, 2022 W. L. Depth: 2.89 mBGS"								

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity; ε=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-5

PROJECT: Phase Two ESA_49 S Service Road
CLIENT: Edenshaw SSR Developments Limited
PROJECT LOCATION: City of Mississauga, ON
DATUM: Geodetic
BH LOCATION:

Method: Solid Stem Auger
Diameter: 150 mm
Date: Jun-22-2001

REF. NO.: 2204701
ENCL NO.: 1
ORIGINATED BY SB & BF
CHECKED BY KN

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLE REMARKS	Head Space Combustible Vapor Reading (ppm)	LABORATORY ANALYSIS AND REMARKS	GROUND WATER CONDITIONS	WELL CONSTRUCTION DETAILS
	Ground Surface					50 100 150 200 250			
0.0	**ASPHALT:** 100mm								Concrete
0.2	**SILTY SAND:** brown silty sand, trace gravel, fill		1	SS					
			2	SS					
			3	SS					
2.3	**SILTY SAND:** brown silty sand, trace gravel, wet, fill		4	SS				▽	W. L. 2.3 mBGL Jun 02, 2022
3.1	**SILTY SAND:** brown silty sand, trace gravel, wet, fill note, black asphalt fragments		5	SS					
3.8	**SILTY SAND:** greyish brown,silty sand, wet , native		6	SS			Analysis: PHC/BTEX+ duplicate		
			7	SS					Sand Screen
5.3	**END OF BOREHOLE**"Notes: 1. Upon completion of drilling, one 50mm diameter monitoring well was installed in the borehole. 2. Borehole was open upon completion of drilling. 3. Water Level Readings: Date: June 2, 2022 W. L. Depth: 2.26 mBGS"								

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-6

PROJECT: Phase Two ESA_49 S Service Road
REF. NO.: 2204701
CLIENT: Edenshaw SSR Developments Limited
Method: Solid Stem Auger
ENCL NO.: 2
PROJECT LOCATION: City of Mississauga, ON
Diameter: 150 mm
ORIGINATED BY SB & BF
DATUM: Geodetic
Date: Jun-22-2001
BH LOCATION:
CHECKED BY KN

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLE REMARKS	Head Space Combustible Vapor Reading (ppm)	LABORATORY ANALYSIS AND REMARKS	GROUND WATER CONDITIONS	WELL CONSTRUCTION DETAILS
	Ground Surface					50 100 150 200 250			
0.0	**ASPHALT:** 76 mm								Concrete
0.1	**SILTY SAND:** brown silty sand, trace gravel, fill		1	SS					
	SANDY GRAVEL: grey sandy gravel, fill								
0.8	**SILTY SAND:** brown silty sand, trace gravel, trace clay, fill		2	SS					
1	note, black staiing and PHC odours		3	SS					
1.5	**SILTY SAND:** brown silty sand, trace gravel, wet, fill		4	SS					
2	note, plastic fragments								
2.3	**SILTY SAND:** brown,silty sand, wet, fill								Bentonite
2.6	**SILTY SAND:** greyish brown,silty sand, wet, native		5	SS				▽	W. L. 2.7 mBGL Jun 02, 2022
3									
3.1	**SILTY SAND:** greyish brown,silty sand, wet, native		6	SS			Analysis: PHC/BTEX		
4			7	SS					
5			8	SS					Sand Screen
5.3	**END OF BOREHOLE**"Notes: 1. Upon completion of drilling, one 50mm diameter monitoring well was installed in the borehole. 2. Borehole was open upon completion of drilling. 3. Water Level Readings: Date: June 2, 2022 W. L. Depth: 2.71 mBGS"								

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-7

PROJECT: Phase Two ESA_49 S Service Road
CLIENT: Edenshaw SSR Developments Limited
PROJECT LOCATION: City of Mississauga, ON
DATUM: Geodetic
BH LOCATION:

Method: Solid Stem Auger
Diameter: 150 mm
Date: Jun-22-2001

REF. NO.: 2204701
ENCL NO.: 3
ORIGINATED BY SB & BF
CHECKED BY KN

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLE REMARKS	Head Space Combustible Vapor Reading (ppm)	LABORATORY ANALYSIS AND REMARKS	GROUND WATER CONDITIONS	WELL CONSTRUCTION DETAILS
	Ground Surface					50 100 150 200 250			
0.0	**ASPHALT:** 100mm								Concrete
0.2	**SILTY SAND:** brown silty sand, trace gravel, fill		1	SS					
			2	SS					
			3	SS					
1.8	**SILTY SAND:** black silty sand, fill		4	SS					
2.3	**SILTY SAND:** grey silty sand, trace clay, fill		5	SS					Bentonite
2.7	**SILTY CLAY:** black silty clay, trace roots, fill		6	SS					W. L. 2.6 mBGL Jun 02, 2022
3.1	**SILTY CLAY:** grey silty clay, fill		7	SS					
3.4	**SANDY SILT:** black sandy silt, fill note, black staining, slight odour		8	SS			Analysis: PHC/BTEX		
3.8	**SANDY SILT :** greyish brown, sandy silt, trace clay, native		9	SS					
			10	SS					Sand Screen
5.3	**END OF BOREHOLE**"Notes: 1. Upon completion of drilling, one 50mm diameter monitoring well was installed in the borehole. 2. Borehole was open upon completion of drilling. 3. Water Level Readings: Date: June 2, 2022 W. L. Depth: 2.59 mBGS"								

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-8

PROJECT: Phase Two ESA_49 S Service Road
CLIENT: Edenshaw SSR Developments Limited
PROJECT LOCATION: City of Mississauga, ON
DATUM: Geodetic
BH LOCATION:

Method: Solid Stem Auger
Diameter: 150 mm
Date: Jun-22-2001

REF. NO.: 2204701
ENCL NO.: 4
ORIGINATED BY SB & BF
CHECKED BY KN

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLE REMARKS	Head Space Combustible Vapor Reading (ppm)	LABORATORY ANALYSIS AND REMARKS	GROUND WATER CONDITIONS	WELL CONSTRUCTION DETAILS
	Ground Surface					50 100 150 200 250			
0.0	**ASPHALT:** 100mm								Concrete
0.2	**SILTY SAND:** brown silty sand, trace gravel, fill		1	SS					
			2	SS					
			3	SS					Bentonite
2.3	**SILTY SAND:** brown silty sand, trace gravel, wet, fill		4	SS					
3.1	**SILTY SAND:** brown silty sand, trace gravel, wet, fill		5	SS					W. L. 3.3 mBGL Jun 02, 2022
3.8	note, black asphalt fragments		6	SS			Analysis: PHC/VOC + duplicate, metals		Sand Screen
4.6	**END OF BOREHOLE**"Notes: 1. Upon completion of drilling, one 50mm diameter monitoring well was installed in the borehole. 2. Borehole was open upon completion of drilling. 3. Water Level Readings: Date: June 2, 2022 W. L. Depth: 2.26 mBGS"								

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity; ε=3% Strain at Failure

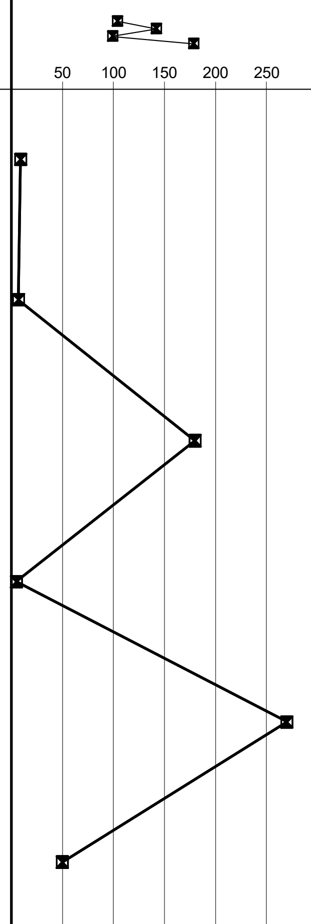
PROJECT: Phase Two ESA_49 S Service Road
CLIENT: Edenshaw SSR Developments Limited
PROJECT LOCATION: City of Mississauga, ON
DATUM: Geodetic
BH LOCATION:

Method: Solid Stem Auger
Diameter: 150 mm
Date: Jun-22-2001

REF. NO.: 2204701
ENCL NO.: 5
ORIGINATED BY SB & BF
CHECKED BY KN

(m) ELEV DEPTH	SOIL PROFILE – DESCRIPTION	SAMPLES – NUMBER	SAMPLES – TYPE	SAMPLE REMARKS	LABORATORY ANALYSIS AND REMARKS	WELL CONSTRUCTION DETAILS
	Ground Surface					
0.0	**CONCRETE:**					Concrete
0.2	**SILTY SAND:** brown silty sand, trace gravel, fill	1	SS			
0.8	**SILTY SAND:** brown silty sand, trace gravel, boulder fragments, fill	2	SS			
1.5	**SILTY SAND:** brown silty sand, trace gravel, fill	3	SS		Analysis: PHC/VOC, metals+duplicate	Bentonite
2.3	**SILTY SAND:** brown,silty sand, wet , native	4	SS			
		5	SS			W. L. 3.3 mBGL Jun 02, 2022
		6	SS			Sand Screen
4.6	**END OF BOREHOLE** "Notes: 1. Upon completion of drilling, one 50mm diameter monitoring well was installed in the borehole. 2. Borehole was open upon completion of drilling. 3. Water Level Readings: Date: June 2, 2022 W. L. Depth: 3.32 mBGS"					

Head Space Combustible Vapor Reading (ppm)



GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3 , × 3 : Numbers refer to Sensitivity ○ ε=3% Strain at Failure

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Phase Two Environmental Site Assessment
PROJECT NUMBER: 11220510
CLIENT: Infrastructure Ontario
LOCATION: 49 South Service Road, Mississauga, Ontario

HOLE DESIGNATION: MW1-20
DATE COMPLETED: December 7, 2020
DRILLING METHOD: Direct Push and Hollow Stem Augering
FIELD PERSONNEL: Chris Cini

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m BGS	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' Value	SAMPLE PID (ppm)
	GROUND SURFACE TOP OF RISER	99.58 99.46						
0	ASPHALT, 150 mm in thickness							
	FILL, sand and gravel, well graded, brown/grey, moist	99.43		1				2.8
0.5		98.97						
	SAND, trace silt, trace gravel, medium to fine grained, poorly graded, brown, moist		BENTONITE	2				2.5
1.0								
1.5				3				2.2
2.0			SAND	4				2.7
2.5				5				2.7
3.0			SCREEN					
	- wet at 3.35m BGS			6				2.8
3.5								
4.0				7				4.0
4.5		95.01		8				3.0
	END OF BOREHOLE @ 4.57m BGS							
5.0								
5.5								
6.0								
6.5								

WELL DETAILS
Screened interval:
98.06 to 95.01m BGS
1.52 to 4.57m BGS
Length: 3.05m
Diameter: 51mm
Slot Size: 10
Material: Aluminium
Seal:
99.28 to 98.36m BGS
0.30 to 1.22m BGS
Material: CEMENT
Sand Pack:
98.36 to 95.01m BGS
1.22 to 4.57m BGS
Material: SAND

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STATIC WATER LEVEL ▼ 12/9/2020

CHEMICAL ANALYSIS (1)

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Phase Two Environmental Site Assessment
PROJECT NUMBER: 11220510
CLIENT: Infrastructure Ontario
LOCATION: 49 South Service Road, Mississauga, Ontario

HOLE DESIGNATION: MW2-20
DATE COMPLETED: December 7, 2020
DRILLING METHOD: Direct Push and Hollow Stem Augering
FIELD PERSONNEL: Chris Cini

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m BGS	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' Value	SAMPLE PID (ppm)
	GROUND SURFACE TOP OF RISER	99.44 99.32						
0	ASPHALT, 150 mm in thickness							
	FILL, gravel and sand, well graded, brown/grey, moist	99.28		1				3.2
0.5								
	SAND, trace gravel, trace silt, fine to medium grained, poorly graded, brown, moist	98.68	BENTONITE	2				2.4
1.0								
1.5				3				3.2
	- wet at 1.83m BGS		SAND					
2.0				4				3.1
2.5				5				3.3
3.0			SCREEN					
				6				3.6
3.5	- grey spotting from 3.66 to 4.27m BGS							
4.0				7				2.8
4.5	END OF BOREHOLE @ 4.57m BGS	94.87		8				3.6
5.0								
5.5								
6.0								
6.5								

WELL DETAILS
Screened interval:
97.91 to 94.87m BGS
1.52 to 4.57m BGS
Length: 3.05m
Diameter: 51mm
Slot Size: 10
Material: Aluminium
Seal:
99.13 to 98.22m BGS
0.30 to 1.22m BGS
Material: CEMENT
Sand Pack:
98.22 to 94.87m BGS
1.22 to 4.57m BGS
Material: SAND

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STATIC WATER LEVEL ▼ 12/9/2020

CHEMICAL ANALYSIS (oval)

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Phase Two Environmental Site Assessment
PROJECT NUMBER: 11220510
CLIENT: Infrastructure Ontario
LOCATION: 49 South Service Road, Mississauga, Ontario

HOLE DESIGNATION: MW3-20
DATE COMPLETED: December 7, 2020
DRILLING METHOD: Direct Push
FIELD PERSONNEL: Chris Cini

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m BGS	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' Value	SAMPLE PID (ppm)
	GROUND SURFACE	99.67						
	TOP OF RISER	99.57						
	ASPHALT, 150 mm in thickness	99.52						
	FILL, sand and gravel, well graded, light grey/brown, moist	99.37		1				2.2
0.5	SAND, with gravel, trace silt, fine to medium grained, poorly graded, brown, moist		BENTONITE	2				3
1.0								
1.5				3				2.8
2.0			SAND	4				3
2.5				5				2.3
3.0	- wet at 2.90m BGS		SCREEN	6				2.5
3.5								
4.0				7				2.0
4.5	- grey at 4.27m BGS			8				2.0
	END OF BOREHOLE @ 4.57m BGS	95.10						
5.0								
5.5								
6.0								
6.5								

WELL DETAILS
Screened interval:
98.15 to 95.10m BGS
1.52 to 4.57m BGS
Length: 3.05m
Diameter: 51mm
Slot Size: 10
Material: Aluminium
Seal:
99.37 to 98.45m BGS
0.30 to 1.22m BGS
Material: CEMENT
Sand Pack:
98.45 to 95.10m BGS
1.22 to 4.57m BGS
Material: SAND

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STATIC WATER LEVEL ▼ 12/9/2020

CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Phase Two Environmental Site Assessment
PROJECT NUMBER: 11220510
CLIENT: Infrastructure Ontario
LOCATION: 49 South Service Road, Mississauga, Ontario

HOLE DESIGNATION: MW4-20
DATE COMPLETED: December 7, 2020
DRILLING METHOD: Direct Push
FIELD PERSONNEL: Chris Cini

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m BGS	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' Value	SAMPLE PID (ppm)
	GROUND SURFACE TOP OF RISER	99.69 99.54						
0	ASPHALT, 150 mm in thickness	99.54		1				2.3
	FILL, sand and gravel, well graded, brown, moist	99.23						
0.5	SAND, trace silt, trace gravel, fine to medium grained, poorly graded, brown, moist		BENTONITE	2				2.7
1.0								
1.5				3				2.4
2.0			SAND	4				2.7
2.5	- wet at 2.74m BGS			5				2.6
3.0			SCREEN					
3.5				6				1.4
4.0				7				1.0
4.5	- grey at 4.27m BGS			8				1.1
	END OF BOREHOLE @ 4.57m BGS	95.12						
5.0								
5.5								
6.0								
6.5								

WELL DETAILS
Screened interval:
98.17 to 95.12m BGS
1.52 to 4.57m BGS
Length: 3.05m
Diameter: 51mm
Slot Size: 10
Material: Aluminium
Seal:
99.39 to 98.47m BGS
0.30 to 1.22m BGS
Material: CEMENT
Sand Pack:
98.47 to 95.12m BGS
1.22 to 4.57m BGS
Material: SAND

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
STATIC WATER LEVEL ▼ 12/9/2020
CHEMICAL ANALYSIS (4)

STRATIGRAPHIC LOG
(OVERBURDEN)

PROJECT NAME: Phase Two Environmental Site Assessment
PROJECT NUMBER: 11220510
CLIENT: Infrastructure Ontario
LOCATION: 49 South Service Road, Mississauga, Ontario

HOLE DESIGNATION: BH5-20
DATE COMPLETED: December 7, 2020
DRILLING METHOD: Direct Push
FIELD PERSONNEL: Chris Cini

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' Value	SAMPLE PID (ppm)
	ASPHALT, 150 mm in thickness	0.15					
	FILL, sand and gravel, well graded, brown, moist	0.30					
	SAND, trace silt, trace gravel, fine to medium grained, poorly graded, brown, moist		1				2.9
			2				2.9
			3				3.3
	- with gravel at 1.83m BGS		4				3.5
	- wet, trace gravel from 2.44 to 3.05m BGS		5				3.0
	END OF BOREHOLE @ 3.05m BGS	3.05					

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (4)

File: \\GHDNET\GHD\CA\TORONTO\PROJECTS\662\11220510\TECH\GINT\LOG DATABASE\11220510-WA-012021.GPJ Library File: GHD_ENVIRO_V02.GLB Report: OVERBURDEN LOG Date: 1/25/21

STRATIGRAPHIC LOG
(OVERBURDEN)

PROJECT NAME: Phase Two Environmental Site Assessment
PROJECT NUMBER: 11220510
CLIENT: Infrastructure Ontario
LOCATION: 49 South Service Road, Mississauga, Ontario

HOLE DESIGNATION: BH6-20
DATE COMPLETED: December 7, 2020
DRILLING METHOD: Direct Push
FIELD PERSONNEL: Chris Cini

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' Value	SAMPLE PID (ppm)
	ASPHALT, 150 mm in thickness	0.15					
	FILL, sand and gravel, well graded, brown, moist	0.46	1				1.8
0.5	SAND, with silt, fine to medium grained, trace gravel, poorly graded, brown, moist						
1.0			2				3.0
1.5			3				2.8
2.0			4				2.4
2.5	- sand and gravel at 2.70m BGS		(5)				2.2
3.0	END OF BOREHOLE @ 3.05m BGS	3.05					
3.5							
4.0							
4.5							
5.0							
5.5							
6.0							
6.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (5)

File: \\GHDNET\GHD\CA\TORONTO\PROJECTS\662\11220510\TECH\GINT\LOG DATABASE\11220510-WA-012021.GPJ Library File: GHD_ENVIRO_V02.GLB Report: OVERBURDEN LOG Date: 1/25/21

STRATIGRAPHIC LOG
(OVERBURDEN)

PROJECT NAME: Phase Two Environmental Site Assessment
PROJECT NUMBER: 11220510
CLIENT: Infrastructure Ontario
LOCATION: 49 South Service Road, Mississauga, Ontario

HOLE DESIGNATION: BH7-20
DATE COMPLETED: December 7, 2020
DRILLING METHOD: Direct Push
FIELD PERSONNEL: Chris Cini

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' Value	PID (ppm)
	ASPHALT, 150 mm in thickness	0.15					
	FILL, sand and gravel, well graded, light brown, moist	0.46	1				3.0
0.5	SAND, trace silt, trace gravel, fine to medium grained, poorly graded, brown, moist		2				1.8
1.0							
1.5			3				3.1
2.0			4				2.7
	SANDY SILT, trace gravel, low plasticity, black, moist/wet, trace wood fragments	2.29					
2.5	SAND, with silt, trace gravel, fine to medium grained, poorly graded, brown, moist	2.59	5				3.0
3.0	END OF BOREHOLE @ 3.05m BGS	3.05					
3.5							
4.0							
4.5							
5.0							
5.5							
6.0							
6.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (3)

STRATIGRAPHIC LOG
(OVERBURDEN)

PROJECT NAME: Phase Two Environmental Site Assessment
PROJECT NUMBER: 11220510
CLIENT: Infrastructure Ontario
LOCATION: 49 South Service Road, Mississauga, Ontario

HOLE DESIGNATION: BH8-20
DATE COMPLETED: December 7, 2020
DRILLING METHOD: Direct Push
FIELD PERSONNEL: Chris Cini

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' Value	SAMPLE PID (ppm)
0	TOPSOIL		1				2.3
0.5	FILL, sand and gravel, well graded, grey, moist	0.46					
	SAND, trace silt, trace gravel, fine to medium grained, brown, moist	0.76	2				1.5
1.0							
1.5			3				2.4
2.0			4				1.5
	- wet at 2.29m BGS						
2.5			5				2.3
3.0	END OF BOREHOLE @ 3.05m BGS	3.05					
3.5							
4.0							
4.5							
5.0							
5.5							
6.0							
6.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (1)

File: \\GHDNET\GHD\CA\TORONTO\PROJECTS\662\11220510\TECH\GINT\LOG DATABASE\11220510-WA-012021.GPJ Library File: GHD_ENVIRO_V02.GLB Report: OVERBURDEN LOG Date: 1/25/21

STRATIGRAPHIC LOG
(OVERBURDEN)

PROJECT NAME: Phase Two Environmental Site Assessment
PROJECT NUMBER: 11220510
CLIENT: Infrastructure Ontario
LOCATION: 49 South Service Road, Mississauga, Ontario

HOLE DESIGNATION: BH9-20
DATE COMPLETED: December 7, 2020
DRILLING METHOD: Direct Push
FIELD PERSONNEL: Chris Cini

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' Value	PID (ppm)
	ASPHALT, 150 mm in thickness	0.15					
	FILL, sand and gravel, well graded, brown/grey, moist	0.46	1				1.5
0.5	SAND, trace gravel, trace silt, fine to medium grained, poorly graded, brown, moist						
1.0			2				1.4
1.5			3				1.6
2.0			4				1.3
2.5			5				1.4
3.0			6				3.7
3.5							
4.0			7				1.5
	SILT, with sand, trace gravel, fine grained sand, soft/firm, brown/grey	4.27					
4.5	- wet at 4.57m BGS	4.57	8				0.4
	END OF BOREHOLE @ 4.57m BGS						
5.0							
5.5							
6.0							
6.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (2)

File: \\GHDNET\GHD\CA\TORONTO\PROJECTS\662\11220510\TECH\GINT\LOG DATABASE\11220510-WA-012021.GPJ Library File: GHD_ENVIRO_V02.GLB Report: OVERBURDEN LOG Date: 1/25/21

STRATIGRAPHIC LOG
(OVERBURDEN)

PROJECT NAME: Phase Two Environmental Site Assessment
PROJECT NUMBER: 11220510
CLIENT: Infrastructure Ontario
LOCATION: 49 South Service Road, Mississauga, Ontario

HOLE DESIGNATION: BH10-20
DATE COMPLETED: December 7, 2020
DRILLING METHOD: Direct Push
FIELD PERSONNEL: Chris Cini

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' Value	PID (ppm)
	ASPHALT, 150 mm in thickness	0.15					
	FILL, sand and gravel, well graded, brown/grey, moist	0.46	1				2.9
0.5	SAND, trace gravel, trace silt, fine to medium grained, poorly graded, brown, moist						
1.0			2				2.8
1.5			3				2.8
2.0			4				3.5
2.5			5				3.1
3.0							
3.5	- wet at 3.35m BGS		6				1.0
4.0			7				1.1
4.5			8				1.4
	END OF BOREHOLE @ 4.57m BGS	4.57					
5.0							
5.5							
6.0							
6.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

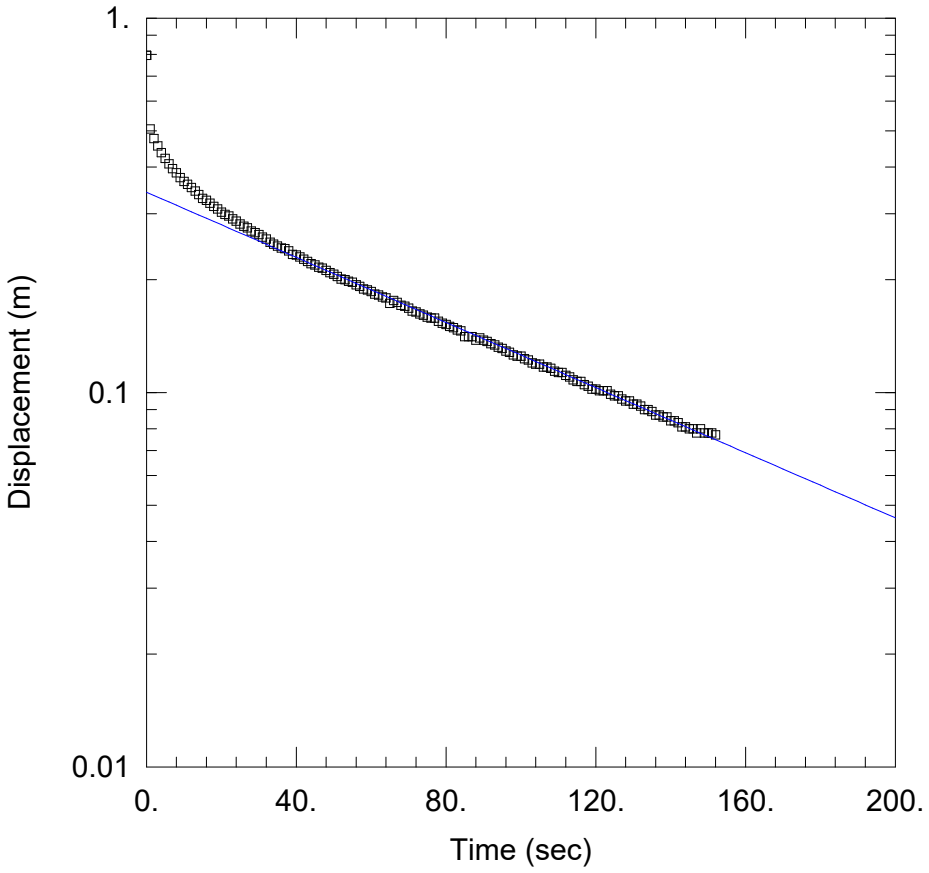
CHEMICAL ANALYSIS (2)

File: \\GHDNET\GHD\CA\TORONTO\PROJECTS\662\11220510\TECH\GINT\LOG DATABASE\11220510-WA-012021.GPJ Library File: GHD_ENVIRO_V02.GLB Report: OVERBURDEN LOG Date: 1/25/21

Appendix C

Single Well Response Tests

Palmer, 2022



RISING HEAD TEST #1

Data Set: G:\...\BH22-1_RH1.aqt
Date: 08/15/22 Time: 18:12:51

PROJECT INFORMATION

Company: Palmer
Client: Edenshaw SSR Developments Ltd.
Project: 2204701
Location: 49 S. Service Rd.
Test Well: BH22-1
Test Date: July 18, 2022

AQUIFER DATA

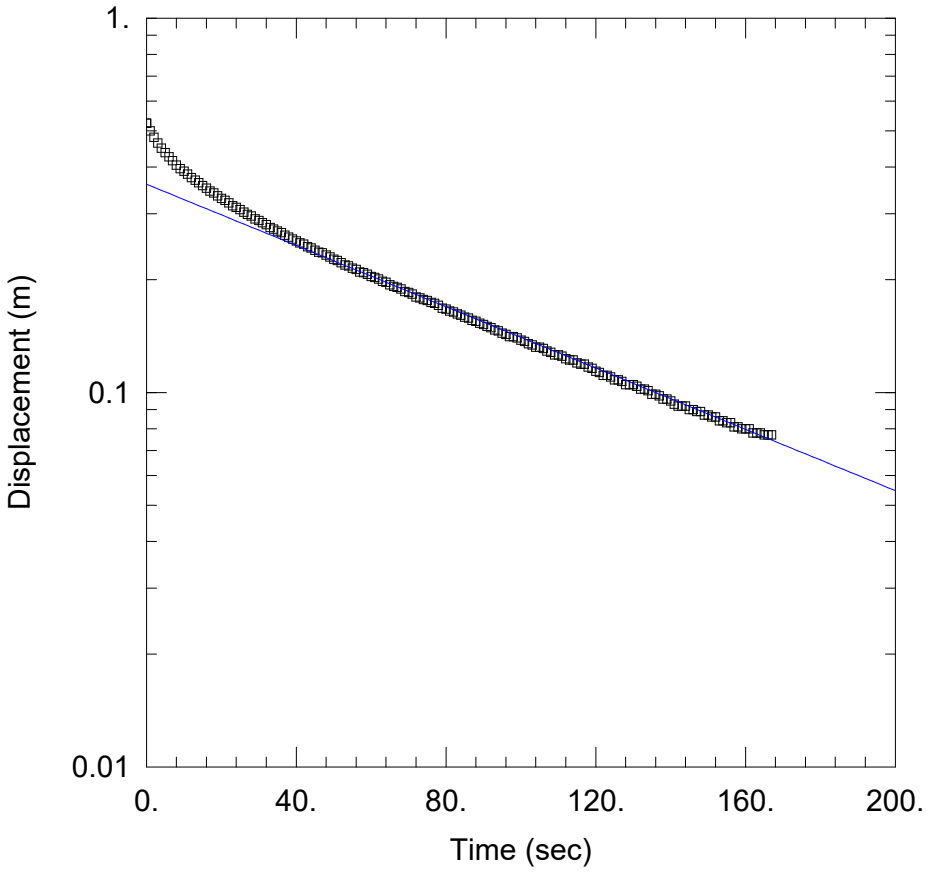
Saturated Thickness: 6.7 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH22-1)

Initial Displacement: 0.795 m Static Water Column Height: 3.5 m
Total Well Penetration Depth: 3.1 m Screen Length: 3.1 m
Casing Radius: 0.025 m Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 4.357E-6 m/sec y0 = 0.3427 m



RISING HEAD TEST #2

Data Set: G:\...\BH22-1_RH2.aqt
Date: 08/15/22 Time: 18:21:52

PROJECT INFORMATION

Company: Palmer
Client: Edenshaw SSR Developments Ltd.
Project: 2204701
Location: 49 S. Service Rd.
Test Well: BH22-1
Test Date: July 18, 2022

AQUIFER DATA

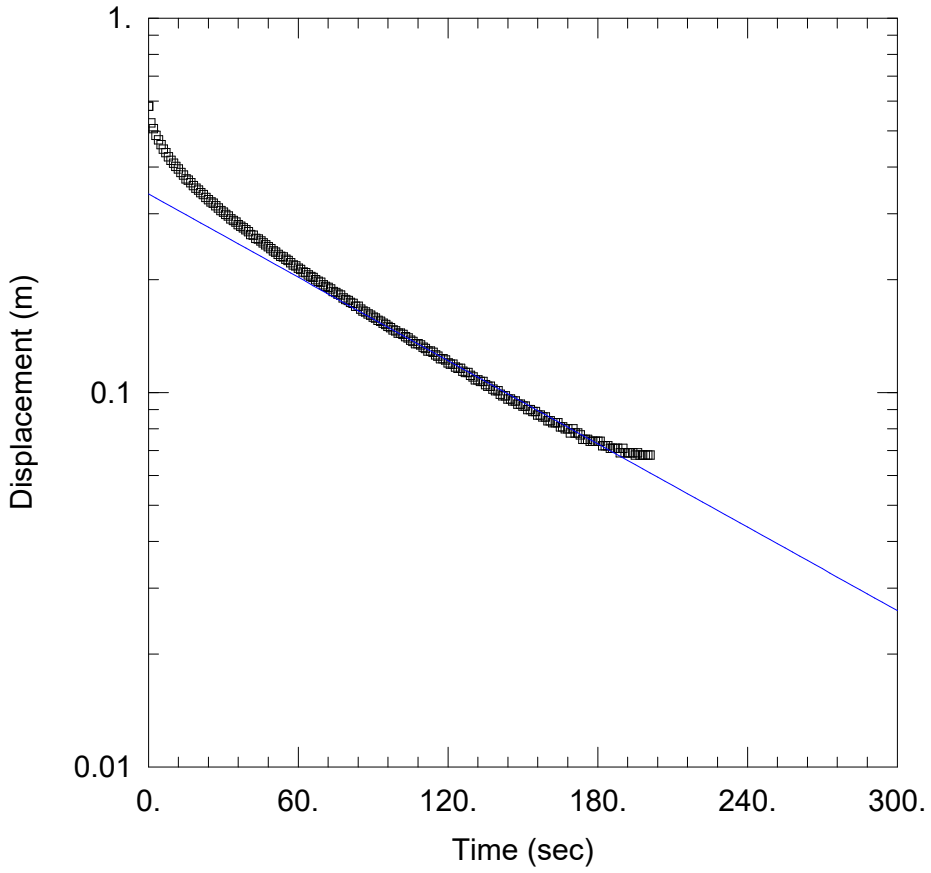
Saturated Thickness: 6.7 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH22-1)

Initial Displacement: 0.524 m Static Water Column Height: 3.5 m
Total Well Penetration Depth: 3.1 m Screen Length: 3.1 m
Casing Radius: 0.025 m Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 4.1E-6 m/sec y0 = 0.36 m



RISING HEAD TEST #3

Data Set: G:\...\BH22-1_RH3.aqt
Date: 08/15/22 Time: 18:24:34

PROJECT INFORMATION

Company: Palmer
Client: Edenshaw SSR Developments Ltd.
Project: 2204701
Location: 49 S. Service Rd.
Test Well: BH22-1
Test Date: July 18, 2022

AQUIFER DATA

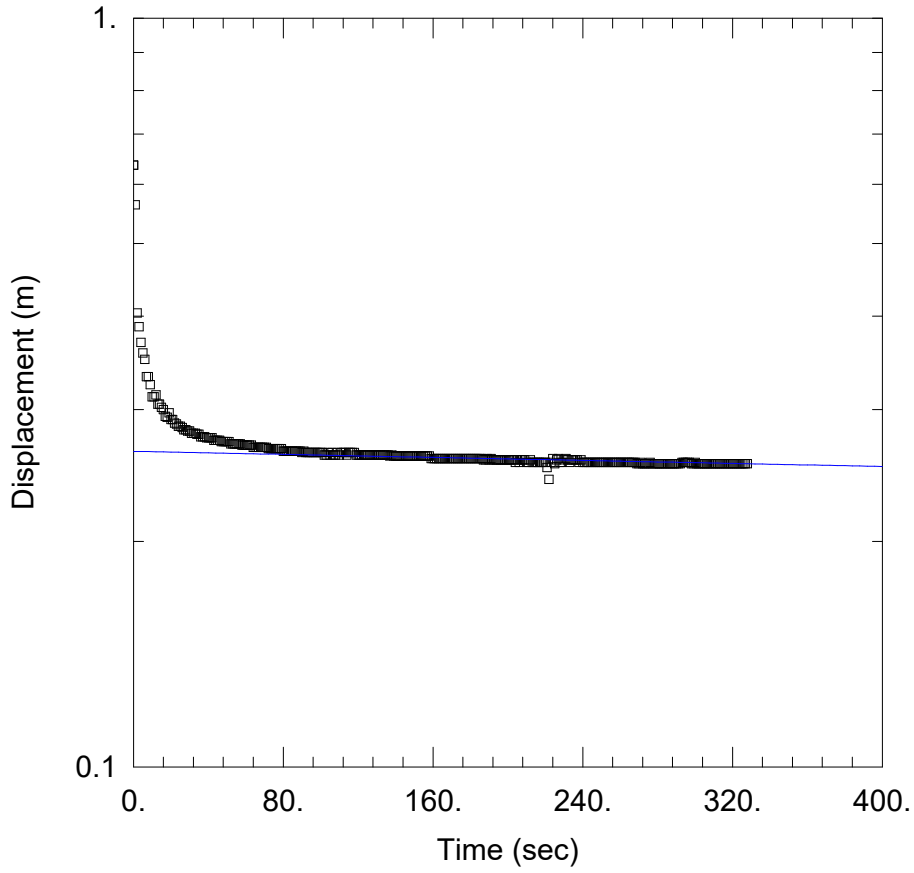
Saturated Thickness: 6.7 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH22-1)

Initial Displacement: 0.581 m Static Water Column Height: 3.5 m
Total Well Penetration Depth: 3.1 m Screen Length: 3.1 m
Casing Radius: 0.025 m Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 3.715E-6 m/sec y0 = 0.339 m



RISING HEAD TEST #1

Data Set: G:\...\BH22-2_RH1.aqt
Date: 08/17/22 Time: 11:34:58

PROJECT INFORMATION

Company: Palmer
Client: Edenshaw SSR Developments Ltd.
Project: 2204701
Location: 49 S. Service Rd.
Test Well: BH22-2
Test Date: July 18, 2022

AQUIFER DATA

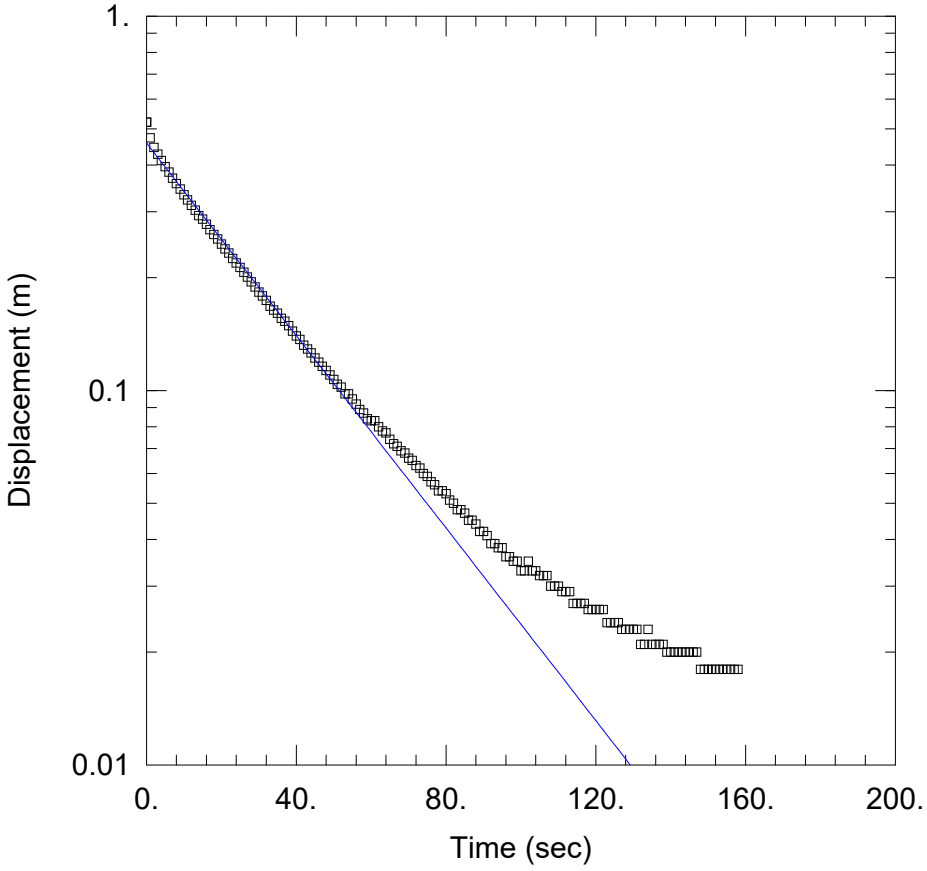
Saturated Thickness: 2.47 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH22-2)

Initial Displacement: 0.636 m Static Water Column Height: 2.47 m
Total Well Penetration Depth: 3.1 m Screen Length: 3.1 m
Casing Radius: 0.025 m Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 5.405E-8 m/sec y0 = 0.2639 m



RISING HEAD TEST #1

Data Set: G:\...\BH22-3_RH1.aqt
Date: 08/17/22 Time: 11:49:07

PROJECT INFORMATION

Company: Palmer
Client: Edenshaw SSR Developments Ltd.
Project: 2204701
Location: 49 S. Service Rd.
Test Well: BH22-3
Test Date: July 18, 2022

AQUIFER DATA

Saturated Thickness: 3.27 m Anisotropy Ratio (Kz/Kr): 0.1

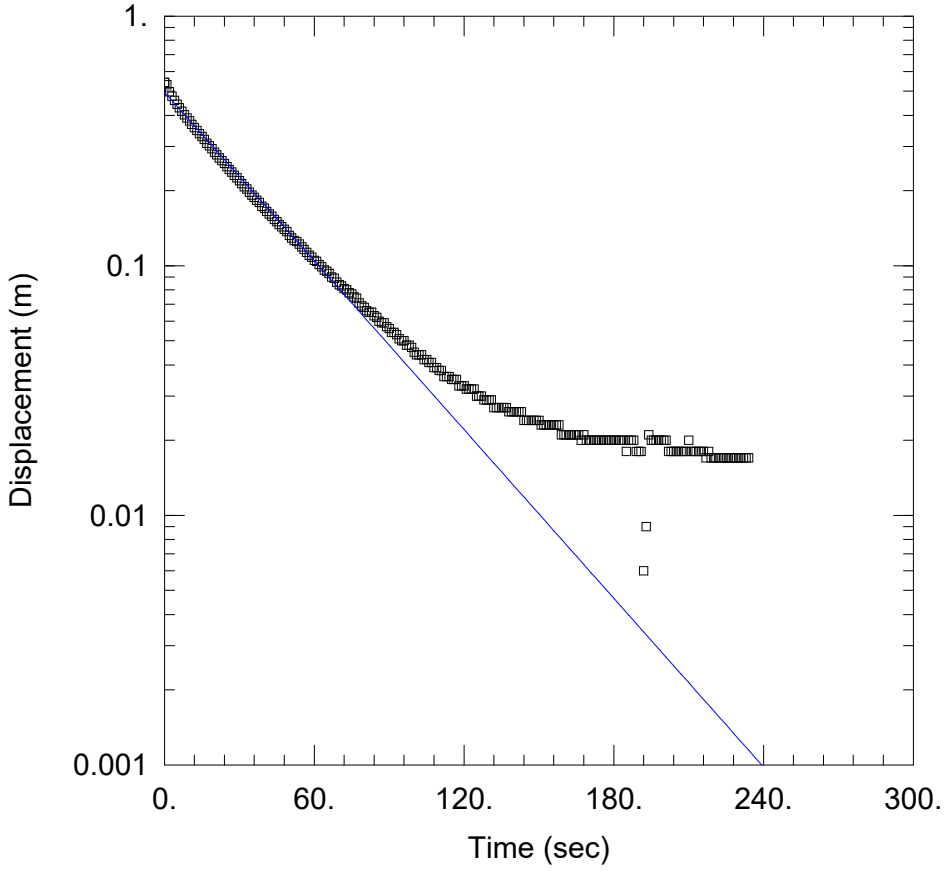
WELL DATA (BH22-3)

Initial Displacement: 0.521 m Static Water Column Height: 3.27 m
Total Well Penetration Depth: 3.1 m Screen Length: 3.1 m
Casing Radius: 0.025 m Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 1.368E-5 m/sec y0 = 0.4581 m



RISING HEAD TEST #2

Data Set: G:\...\BH22-3_RH2.aqt
Date: 08/17/22 Time: 11:51:52

PROJECT INFORMATION

Company: Palmer
Client: Edenshaw SSR Developments Ltd.
Project: 2204701
Location: 49 S. Service Rd.
Test Well: BH22-3
Test Date: July 18, 2022

AQUIFER DATA

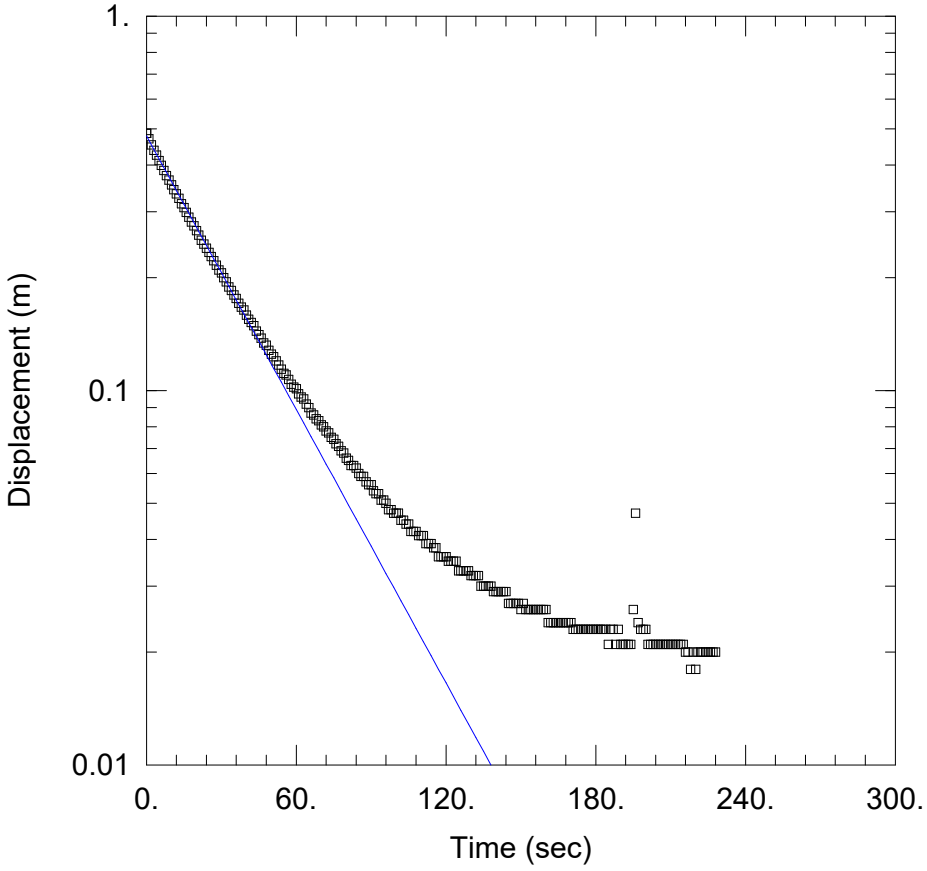
Saturated Thickness: 3.27 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH22-3)

Initial Displacement: 0.542 m Static Water Column Height: 3.27 m
Total Well Penetration Depth: 3.1 m Screen Length: 3.1 m
Casing Radius: 0.025 m Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 1.2E-5 m/sec y0 = 0.4962 m



RISING HEAD TEST #3

Data Set: G:\...\BH22-3_RH3.aqt
Date: 08/17/22 Time: 13:12:49

PROJECT INFORMATION

Company: Palmer
Client: Edenshaw SSR Developments Ltd.
Project: 2204701
Location: 49 S. Service Rd.
Test Well: BH22-3
Test Date: July 18, 2022

AQUIFER DATA

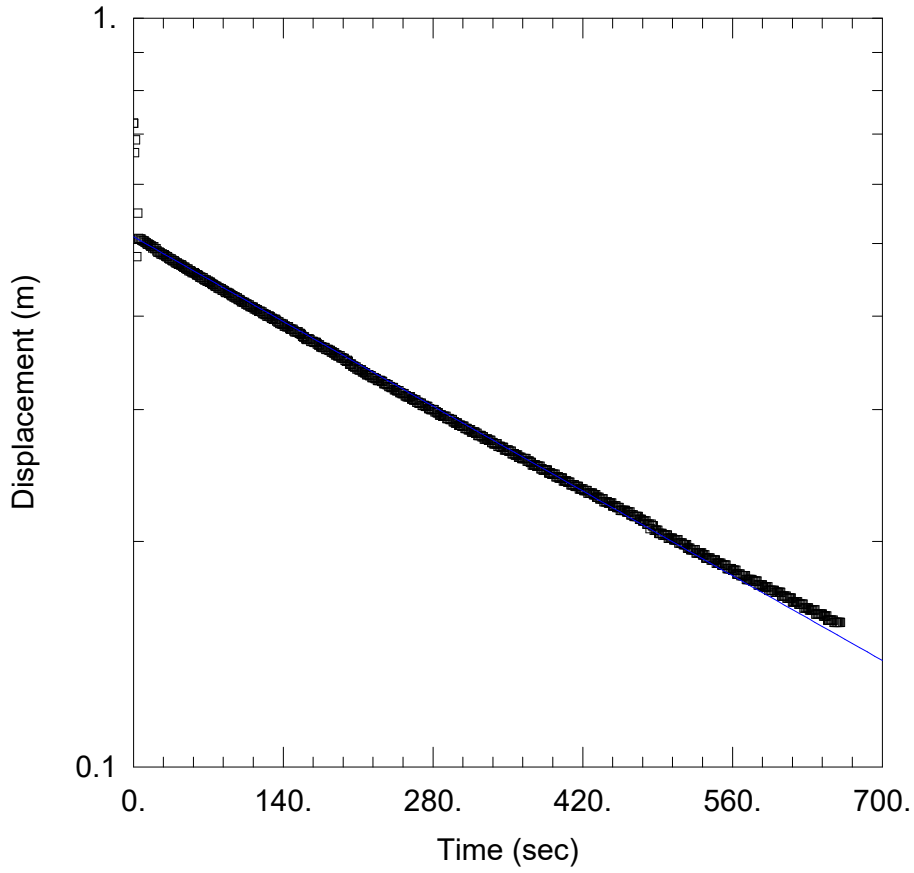
Saturated Thickness: 3.27 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH22-3)

Initial Displacement: 0.486 m Static Water Column Height: 3.27 m
Total Well Penetration Depth: 3.1 m Screen Length: 3.1 m
Casing Radius: 0.025 m Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 1.296E-5 m/sec y0 = 0.4786 m



FALLING HEAD TEST #1

Data Set: G:\...\BH22-4_FH11.aqt
Date: 08/17/22 Time: 13:30:32

PROJECT INFORMATION

Company: Palmer
Client: Edenshaw SSR Developments Ltd.
Project: 2204701
Location: 49 S. Service Rd.
Test Well: BH22-4
Test Date: July 18, 2022

AQUIFER DATA

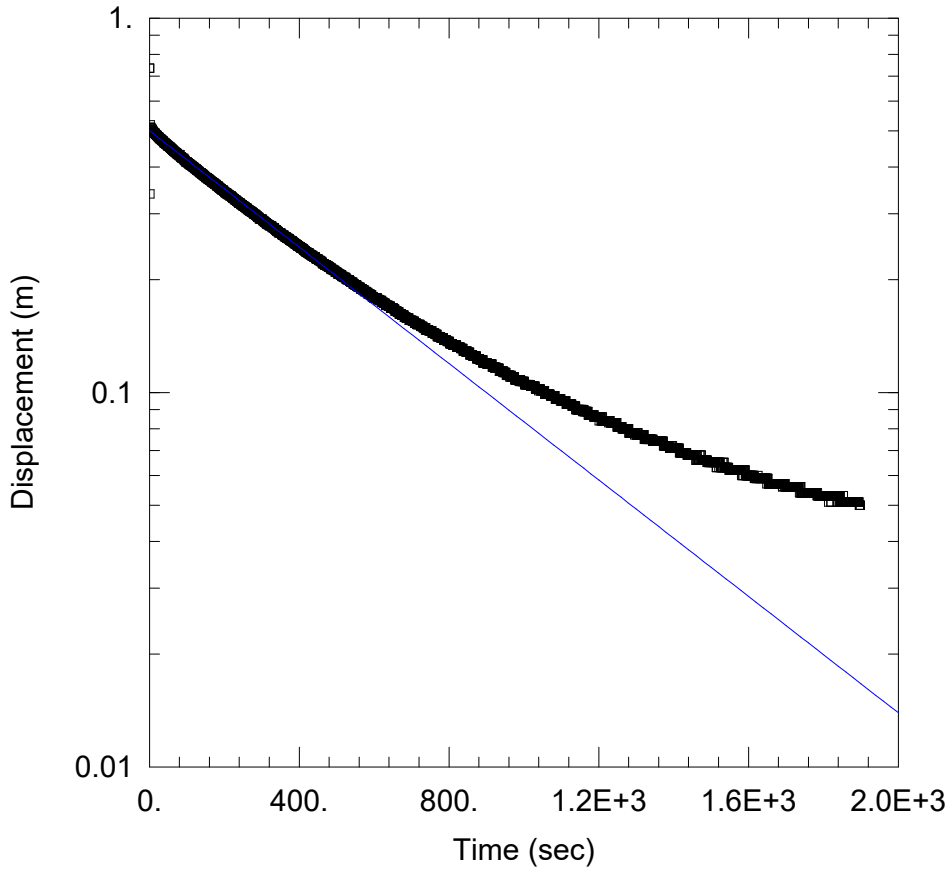
Saturated Thickness: 6.1 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH22-4)

Initial Displacement: 0.724 m Static Water Column Height: 10.48 m
Total Well Penetration Depth: 6.1 m Screen Length: 3.1 m
Casing Radius: 0.025 m Well Radius: 0.025 m

SOLUTION

Aquifer Model: Confined Solution Method: Hvorslev
K = 1.251E-6 m/sec y0 = 0.5105 m



RISING HEAD TEST #1

Data Set: G:\...\BH22-4_RH11.aqt
Date: 08/17/22 Time: 13:32:00

PROJECT INFORMATION

Company: Palmer
Client: Edenshaw SSR Developments Ltd.
Project: 2204701
Location: 49 S. Service Rd.
Test Well: BH22-4
Test Date: July 18, 2022

AQUIFER DATA

Saturated Thickness: 6.1 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH22-4)

Initial Displacement: 0.735 m Static Water Column Height: 10.48 m
Total Well Penetration Depth: 6.1 m Screen Length: 3.1 m
Casing Radius: 0.025 m Well Radius: 0.025 m

SOLUTION

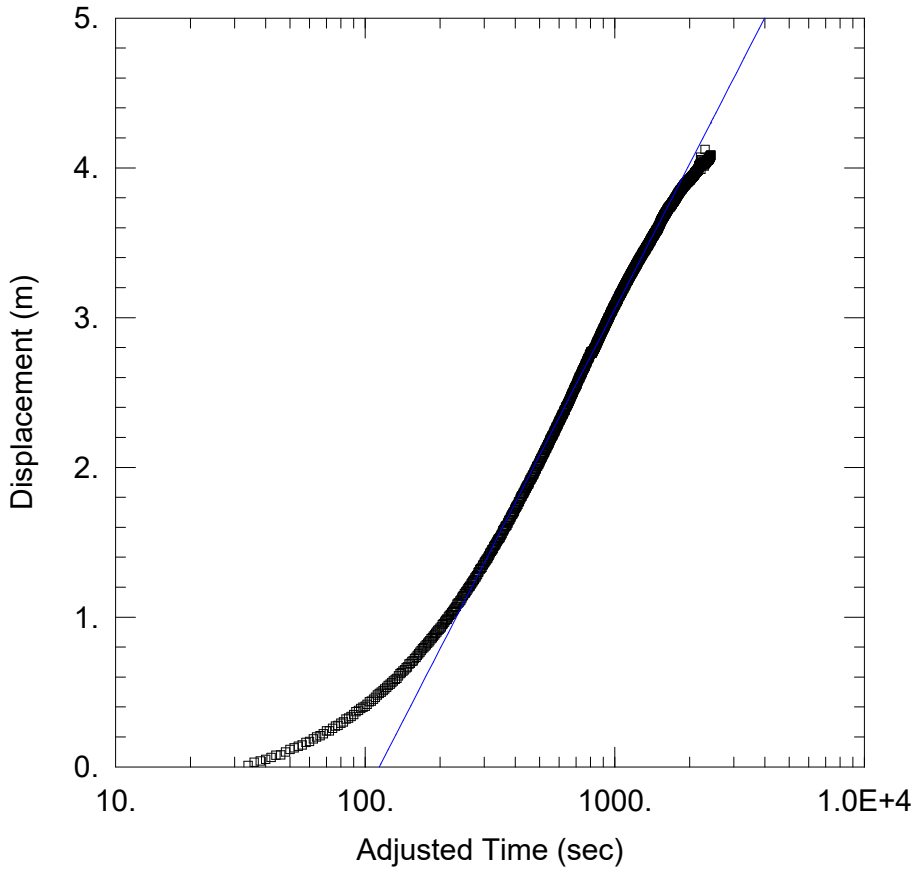
Aquifer Model: Confined Solution Method: Hvorslev

K = 1.203E-6 m/sec y0 = 0.5003 m

Appendix D

Pumping Test Analyses

Palmer, 2022



SHORT-DURATION PUMPING TEST #1

Data Set: G:\...\Pumping Test Drawdown.aqt
Date: 08/21/22 Time: 13:45:43

PROJECT INFORMATION

Company: Palmer
Client: Edenshaw SSR Developments Ltd.
Project: 2204701
Location: 49 S. Service Rd.
Test Well: BH22-4
Test Date: July 20, 2022

AQUIFER DATA

Saturated Thickness: 6.2 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH22-4	0	0

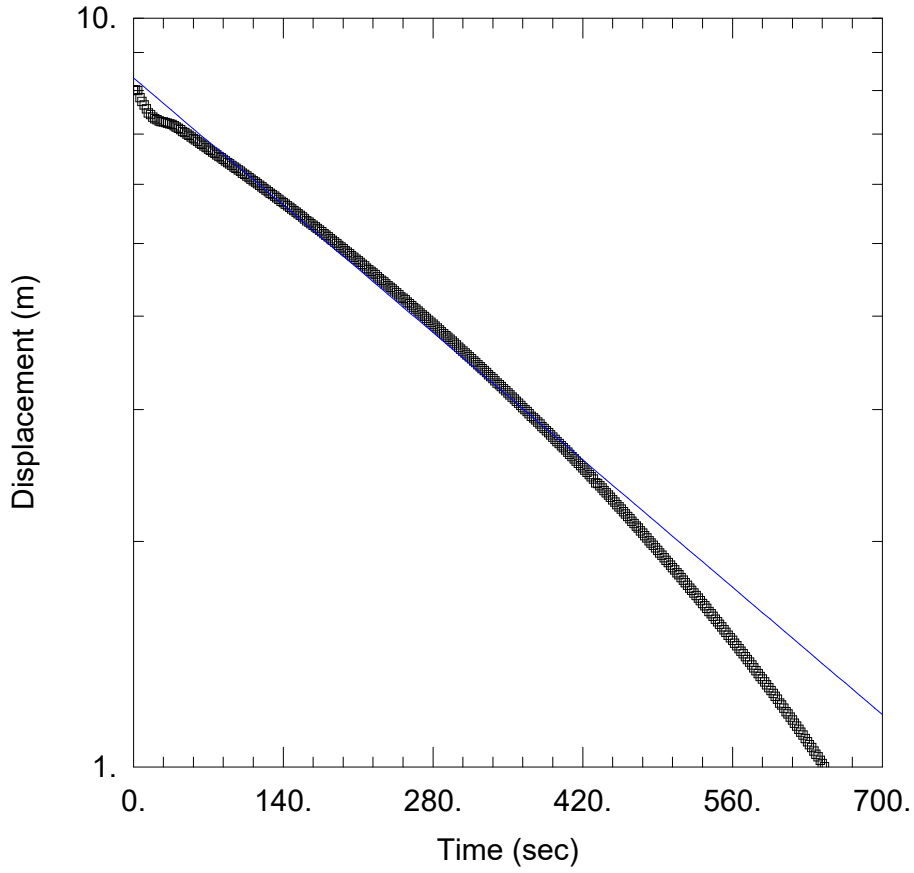
Observation Wells

Well Name	X (m)	Y (m)
▫ BH22-4	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 2.103E-7 m^2/sec S = 0.08619



SHORT-DURATION PUMPING TEST - RECOVERY

Data Set: G:\...\Pumping Test Recovery.aqt
Date: 08/21/22 Time: 13:49:45

PROJECT INFORMATION

Company: Palmer
Client: Edenshaw SSR Developments Ltd.
Project: 2204701
Location: 49 S. Service Rd.
Test Well: BH22-4
Test Date: July 20, 2022

AQUIFER DATA

Saturated Thickness: 10.6 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH22-4)

Initial Displacement: 8.02 m Static Water Column Height: 10.6 m
Total Well Penetration Depth: 6.2 m Screen Length: 3.1 m
Casing Radius: 0.025 m Well Radius: 0.025 m

SOLUTION

Aquifer Model: Confined Solution Method: Hvorslev

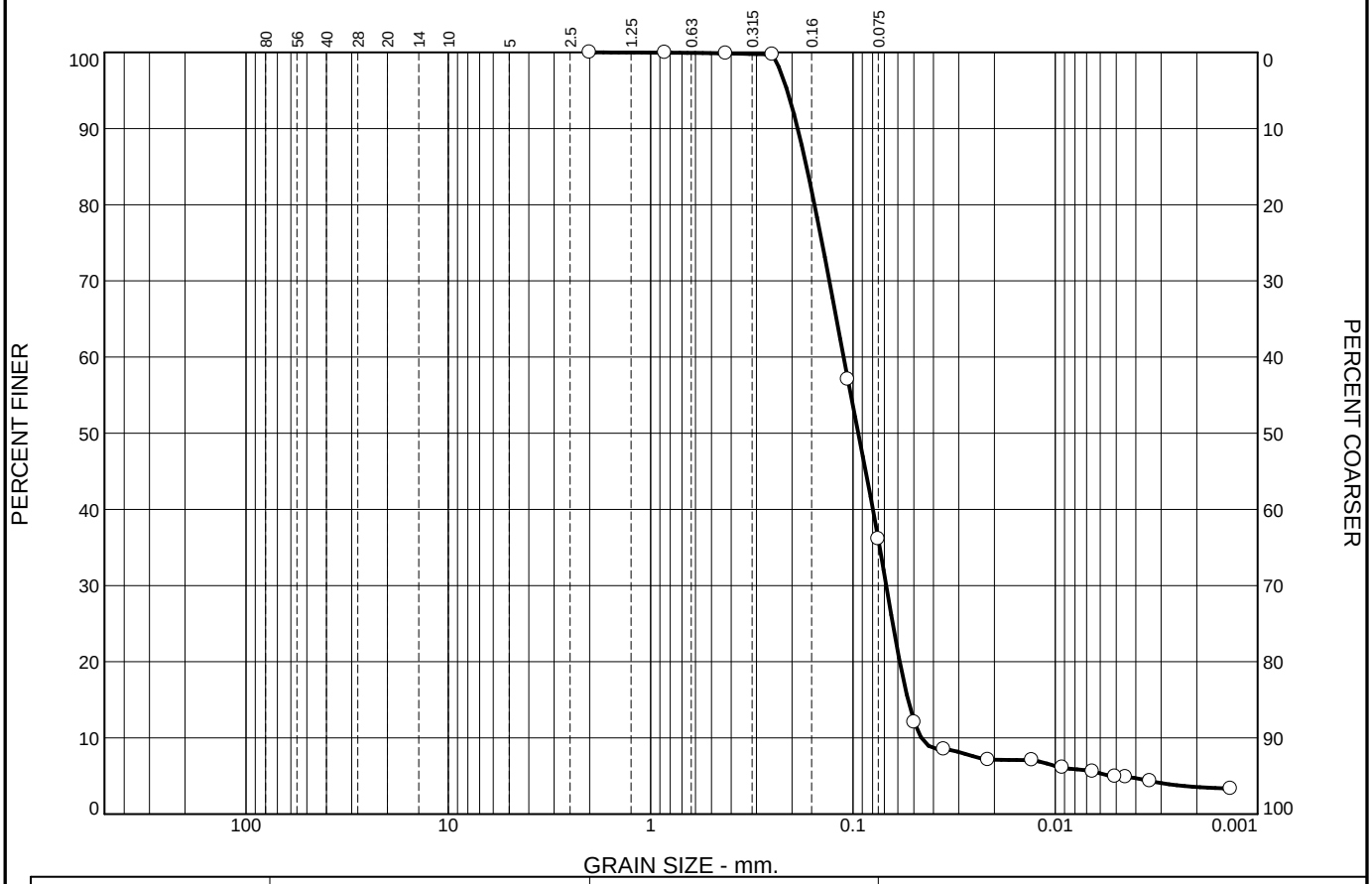
K = 1.683E-6 m/sec y0 = 8.319 m

Appendix E

Grain Size Distributions

Terrapex, 2022

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	0	0	64	32	4

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.1696	0.1113	0.0941	0.0685	0.0535	0.0459	0.92	2.42

Material Description	USCS	AASHTO
○ SILTY SAND trace clay		

Project No. CA19009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)

Project: PECG PRJ #2204701

○ **Sample Number:** BH 22-1, SS 6

Terrapex

Toronto, Ontario

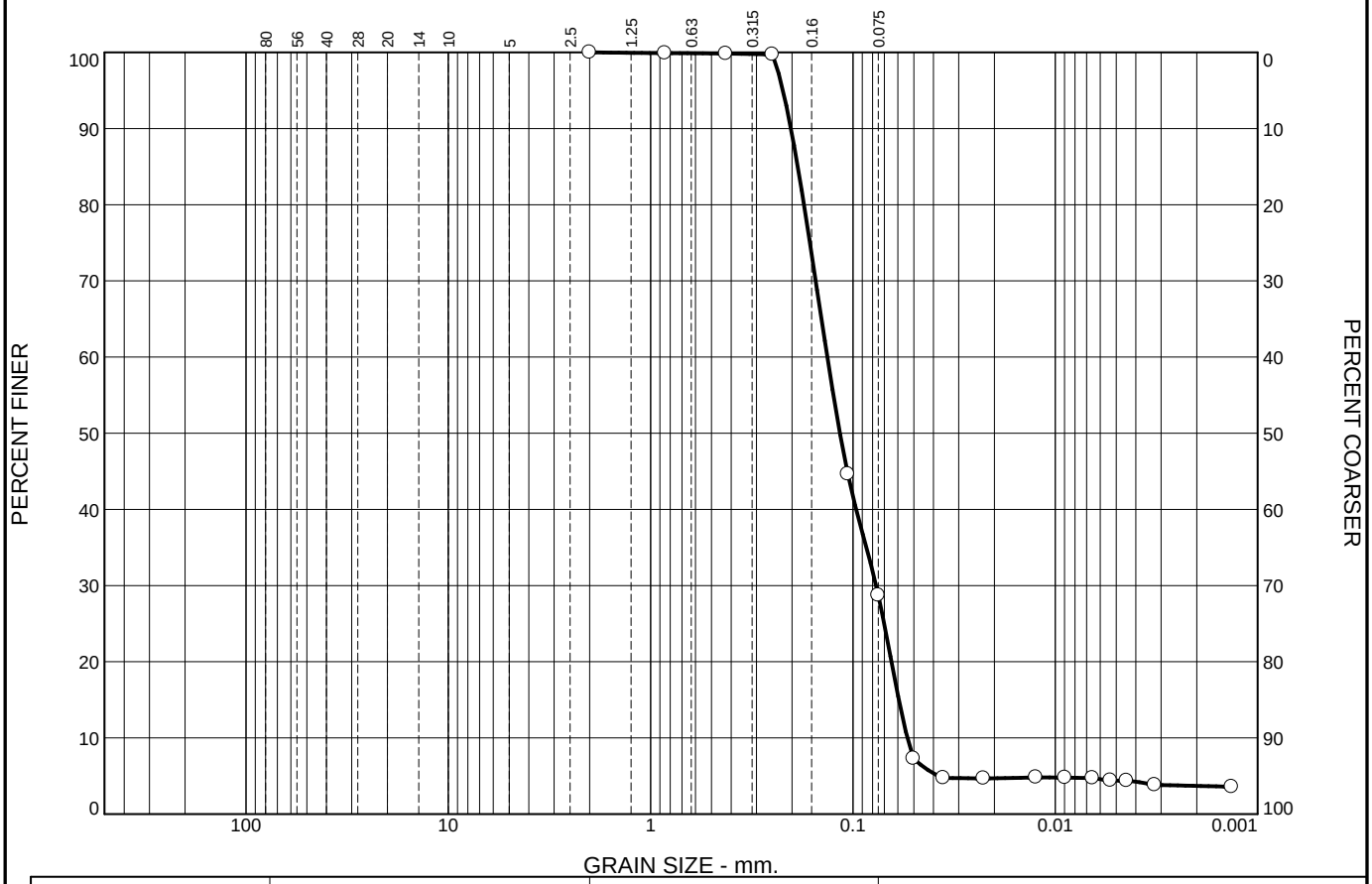
Remarks:

○HYDROMETER DETAILS: Spec. Grav. 2.75(assumed);Vb=53cm^3; L2=13.8cm; L1=10.7cm; hs= 0.16cm/Div; A=30.2cm^2; Mass of Disp. Agent=40g/1 Test Date: July 25, 2022

Figure 1

Tested By: AM/TH

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	0	0	71	25	4

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.1874	0.1339	0.1160	0.0769	0.0593	0.0538	0.82	2.49

Material Description	USCS	AASHTO
○ SILTY SAND trace clay		

Project No. CA19009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)

Project: PECG PRJ #2204701

○ **Sample Number:** BH 22-2, SS 7

Terrapex

Toronto, Ontario

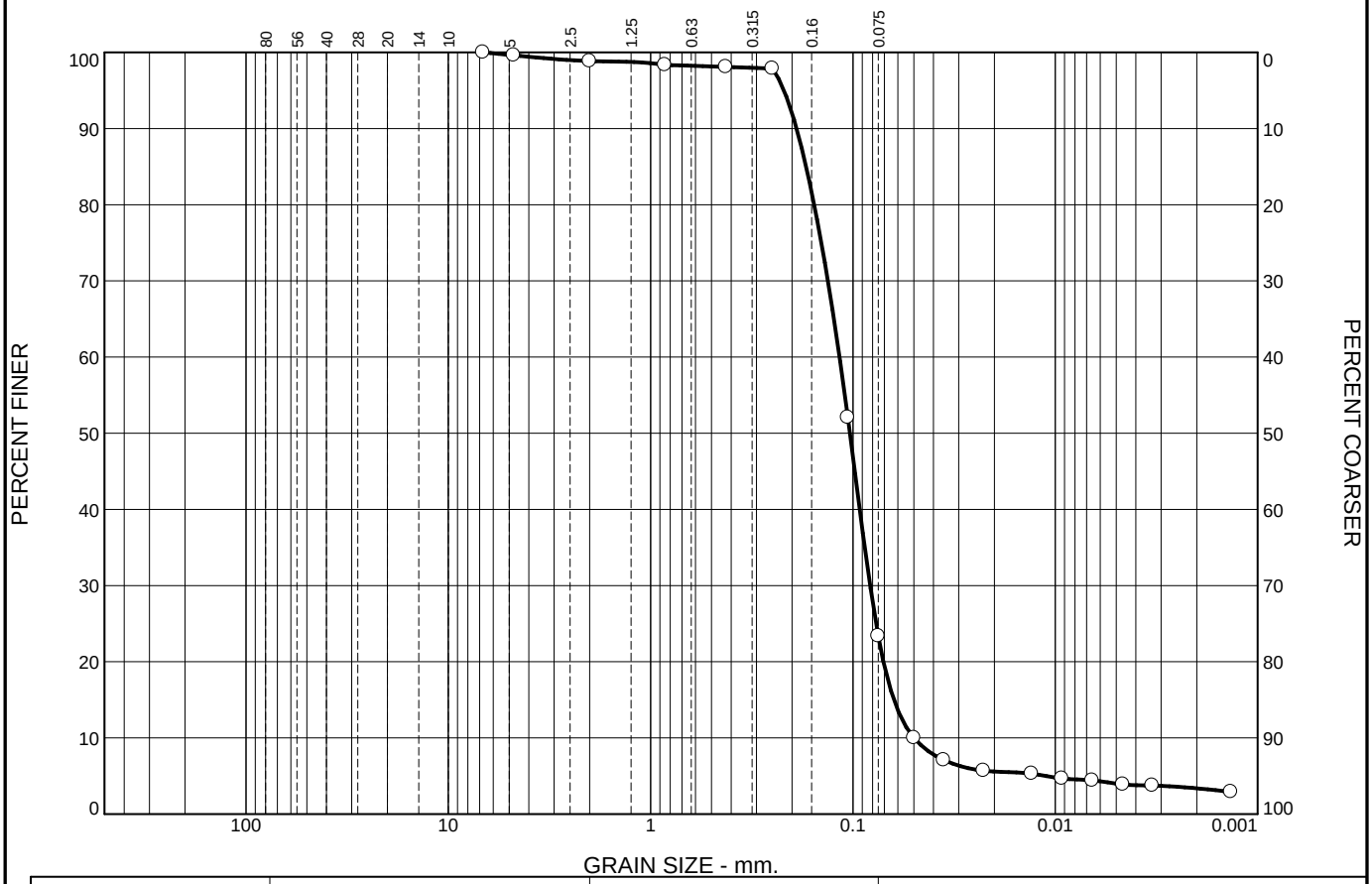
Remarks:

○HYDROMETER DETAILS: Spec. Grav. 2.75(assumed);Vb=53cm^3; L2=13.8cm; L1=10.7cm; hs= 0.16cm/Div; A=30.2cm^2; Mass of Disp. Agent=40g/1 Test Date: July 25, 2022

Figure 2

Tested By: AM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	1	1	75	20	3

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.1704	0.1165	0.1035	0.0823	0.0628	0.0499	1.16	2.34

Material Description	USCS	AASHTO
○ SILTY SAND trace clay trace gravel		

Project No. CA19009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)

Project: PECG PRJ #2204701

○ **Sample Number:** BH 22-3, SS 5

Terrapex

Toronto, Ontario

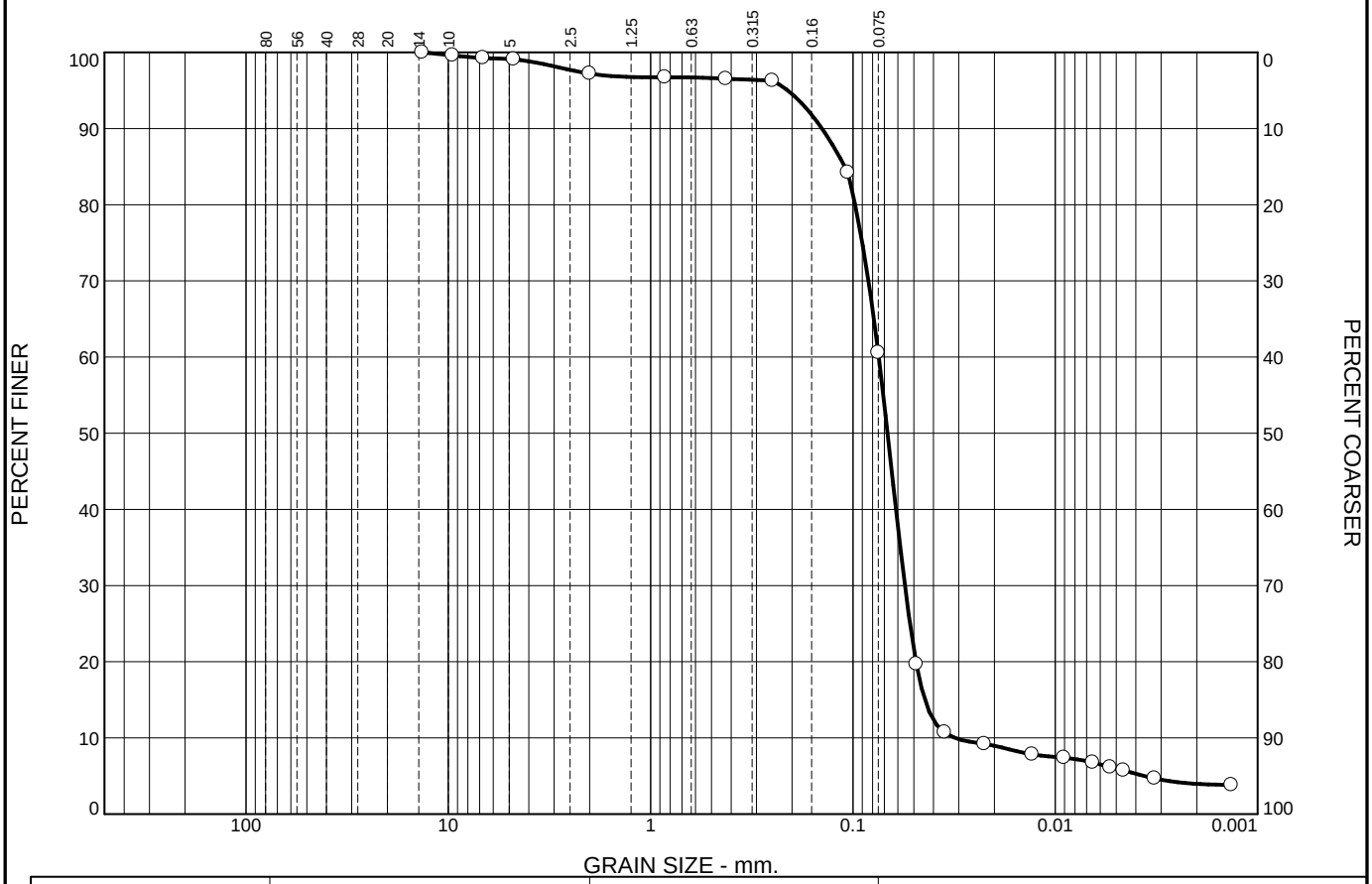
Remarks:

○HYDROMETER DETAILS: Spec. Grav. 2.75(assumed);Vb=53cm^3; L2=13.8cm; L1=10.7cm; hs= 0.16cm/Div; A=30.2cm^2; Mass of Disp. Agent=40g/1 Test Date: July 25, 2022

Figure 3

Tested By: AM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	3	0	36	57	4

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.1097	0.0745	0.0674	0.0554	0.0442	0.0313	1.32	2.38

Material Description	USCS	AASHTO
○ SAND AND SILT trace gravel and trace clay		

Project No. CA19009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)

Project: PECG PRJ #2204701

○ **Sample Number:** BH 22-3, SS 7

Terrapex

Toronto, Ontario

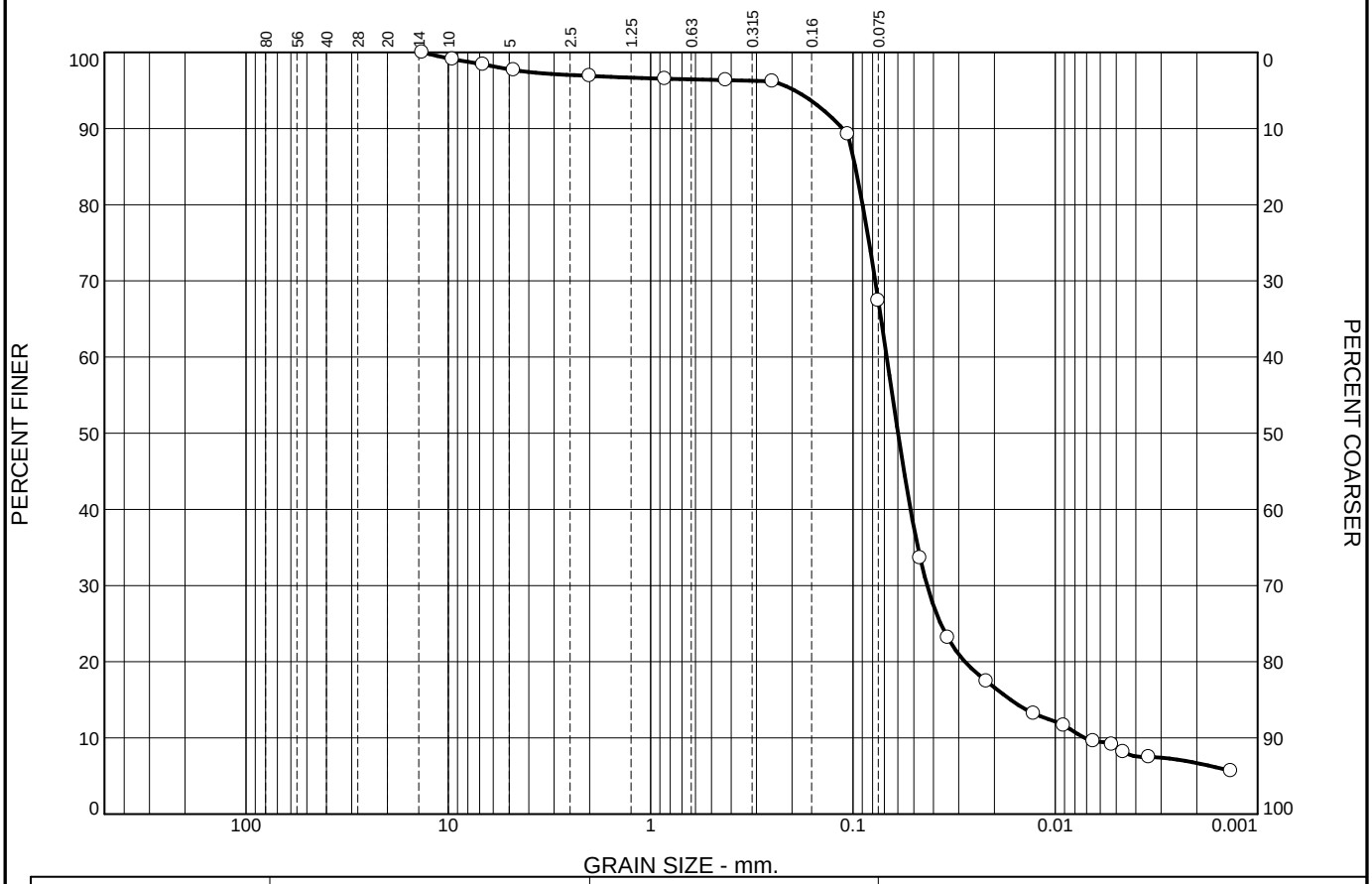
Remarks:

○HYDROMETER DETAILS: Spec. Grav. 2.75(assumed);Vb=53cm^3; L2=13.8cm; L1=10.7cm; hs= 0.16cm/Div; A=30.2cm^2; Mass of Disp. Agent=40g/1 Test Date: July 25, 2022

Figure 4

Tested By: AM/TH

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	3	1	29	60	7

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.0974	0.0681	0.0598	0.0430	0.0166	0.0072	3.79	9.52

Material Description	USCS	AASHTO
○ SANDY SILT trace clay trace gravel		

Project No. CA19009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)

Project: PECG PRJ #2204701

○ **Sample Number:** BH 22-4, SS 6

Terrapex

Toronto, Ontario

Remarks:

○HYDROMETER DETAILS: Spec. Grav. 2.75(assumed);Vb=53cm^3; L2=13.8cm; L1=10.7cm; hs= 0.16cm/Div; A=30.2cm^2; Mass of Disp. Agent=40g/1 Test Date: July 25, 2022

Figure 5

Tested By: AM/TH

Appendix F

Groundwater Chemistry Analyses

ALS, 2022

CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WT2208055**	Page	: 1 of 6
Client	: **Palmer Environmental Consulting Group Inc.**	Laboratory	: Waterloo - Environmental
Contact	: Sarah Sipak	Account Manager	: Karanpartap Singh
Address	: 74 Berkeley Street Toronto ON Canada M5V 1E3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: ----	Telephone	: 19055076910
Project	: 2204701	Date Samples Received	: 20-Jul-2022 15:30
PO	: ----	Date Analysis Commenced	: 20-Jul-2022
C-O-C number	: 20-952327	Issue Date	: 27-Jul-2022 16:12
Sampler	: Wes		
Site	: ----		
Quote number	: (Q88296) PALMER 2022 STANDING OFFER		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Adam Boettger	Team Leader - LCMS	LCMS, Waterloo, Ontario
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Microbiology, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Metals, Waterloo, Ontario
Jeremy Gingras	Team Leader - Semi-Volatile Instrumentation	Organics, Waterloo, Ontario
Joseph Scharbach		Organics, Waterloo, Ontario
Sarah Birch	Team Leader - Volatiles	Organics, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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. Guidelines 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.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
µg/L	micrograms per litre
CFU/100mL	colony forming units per 100 mL
mg/L	milligrams per litre
pH units	pH units

>: greater than.
<: less than.
Red shading is applied where the result is greater than the Guideline Upper Limit or the result is lower than the Guideline Lower Limit.
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit.

Qualifiers

Qualifier	*Description*
BODL	*Limit of Reporting for BOD was increased to account for the largest volume of sample tested.*
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).*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*
DLUI	*Detection Limit Raised: Unknown interference generated an apparent false positive test result.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	Method	LOR	Unit	Client sample ID: BH22-4 Sampling date/time: 20-Jul-2022 13:30 WT2208055-001		RMPSUB SAN	RMPSUB STM				
Physical Tests											
pH	E108	0.10	pH units	7.93		5.5 - 10 pH units	6 - 9 pH units				
solids, total suspended [TSS]	E160	3.0	mg/L	160		350 mg/L	15 mg/L				
Anions and Nutrients											
fluoride	E235.F	0.020	mg/L	0.692	DLDS	10 mg/L					
Kjeldahl nitrogen, total [TKN]	E318	0.050	mg/L	5.57	DLHC	100 mg/L	1 mg/L				
phosphorus, total	E372-U	0.0020	mg/L	0.126		10 mg/L	0.4 mg/L				
sulfate (as SO4)	E235.SO4	0.30	mg/L	123	DLDS						
Cyanides											
cyanide, strong acid dissociable (total)	E333	0.0020	mg/L	<0.0020		2 mg/L	0.02 mg/L				
Microbiological Tests											
coliforms, Escherichia coli [E. coli]	E012A.EC	1	CFU/100mL	<1			200 CFU/100mL				
coliforms, thermotolerant [fecal]	E012.FC	1	CFU/100mL	<2	DLM		1 CFU/100mL				
Total Metals											
aluminum, total	E420	0.0030	mg/L	1.44	DLHC	50 mg/L					
antimony, total	E420	0.00010	mg/L	<0.00100	DLHC	5 mg/L					
arsenic, total	E420	0.00010	mg/L	0.00171	DLHC	1 mg/L	0.02 mg/L				
cadmium, total	E420	0.0000050	mg/L	<0.0000500	DLHC	0.7 mg/L	0.008 mg/L				
chromium, total	E420	0.00050	mg/L	<0.00500	DLHC	5 mg/L	0.08 mg/L				
cobalt, total	E420	0.00010	mg/L	0.00125	DLHC	5 mg/L					
copper, total	E420	0.00050	mg/L	0.0174	DLHC	3 mg/L	0.05 mg/L				
lead, total	E420	0.000050	mg/L	0.000763	DLHC	3 mg/L	0.12 mg/L				
manganese, total	E420	0.00010	mg/L	0.271	DLHC	5 mg/L	0.05 mg/L				
mercury, total	E508	0.0000050	mg/L	<0.0000050		0.01 mg/L	0.0004 mg/L				
molybdenum, total	E420	0.000050	mg/L	0.00290	DLHC	5 mg/L					
nickel, total	E420	0.00050	mg/L	<0.00500	DLHC	3 mg/L	0.08 mg/L				
selenium, total	E420	0.000050	mg/L	<0.000500	DLHC	1 mg/L	0.02 mg/L				
silver, total	E420	0.000010	mg/L	<0.000100	DLHC	5 mg/L	0.12 mg/L				
tin, total	E420	0.00010	mg/L	<0.00100	DLHC	5 mg/L					
titanium, total	E420	0.00030	mg/L	<0.0300	DLHC DLUI	5 mg/L					
zinc, total	E420	0.0030	mg/L	0.0454	DLHC	3 mg/L	0.04 mg/L				
Aggregate Organics											

Analyte	Method	LOR	Unit	WT2208055-001 (Continued)	RMPSUB SAN	RMPSUB STM				
Aggregate Organics - Continued										
carbonaceous biochemical oxygen demand [CBOD]	E555	2.0	mg/L	<3.0 BODL	300 mg/L	15 mg/L				
oil & grease (gravimetric)	E567	5.0	mg/L	<5.0						
oil & grease, animal/vegetable (gravimetric)	EC567A.SG	5.0	mg/L	<5.0	150 mg/L					
oil & grease, mineral (gravimetric)	E567SG	5.0	mg/L	<5.0	15 mg/L					
phenols, total (4AAP)	E562	0.0010	mg/L	0.0128	1 mg/L	0.008 mg/L				
Volatile Organic Compounds										
benzene	E611D	0.50	µg/L	<0.50	10 µg/L	2 µg/L				
chloroform	E611D	0.50	µg/L	<0.50	40 µg/L	2 µg/L				
dichlorobenzene, 1,2-	E611D	0.50	µg/L	<0.50	50 µg/L	5.6 µg/L				
dichlorobenzene, 1,4-	E611D	0.50	µg/L	<0.50	80 µg/L	6.8 µg/L				
dichloroethylene, cis-1,2-	E611D	0.50	µg/L	<0.50	4000 µg/L	5.6 µg/L				
dichloromethane	E611D	1.0	µg/L	<1.0	2000 µg/L	5.2 µg/L				
dichloropropylene, trans-1,3-	E611D	0.30	µg/L	<0.30	140 µg/L	5.6 µg/L				
ethylbenzene	E611D	0.50	µg/L	<0.50	160 µg/L	2 µg/L				
methyl ethyl ketone [MEK]	E611D	20	µg/L	<20	8000 µg/L					
styrene	E611D	0.50	µg/L	<0.50	200 µg/L					
tetrachloroethane, 1,1,2,2-	E611D	0.50	µg/L	<0.50	1400 µg/L	17 µg/L				
tetrachloroethylene	E611D	0.50	µg/L	<0.50	1000 µg/L	4.4 µg/L				
toluene	E611D	0.50	µg/L	0.97	270 µg/L	2 µg/L				
trichloroethylene	E611D	0.50	µg/L	<0.50	400 µg/L	8 µg/L				
xylene, m+p-	E611D	0.40	µg/L	<0.40						
xylene, o-	E611D	0.30	µg/L	<0.30						
xylenes, total	E611D	0.50	µg/L	<0.50	1400 µg/L	4.4 µg/L				
bromofluorobenzene, 4-	E611D	1.0	%	82.4						
difluorobenzene, 1,4-	E611D	1.0	%	103						
Phthalate Esters										
bis(2-ethylhexyl) phthalate [DEHP]	E655F	2.0	µg/L	<2.0	12 µg/L	8.8 µg/L				
di-n-butyl phthalate	E655F	1.0	µg/L	<1.0	80 µg/L	15 µg/L				
Semi-Volatile Organics Surrogates										
fluorobiphenyl, 2-	E655F	1.0	%	100						
terphenyl-d14, p-	E655F	1.0	%	99.6						
Phenolics Surrogates										
tribromophenol, 2,4,6-	E655F	0.20	%	126						
Nonylphenols										

Analyte	Method	LOR	Unit	WT2208055-001 (Continued)	RMPSUB SAN	RMPSUB STM				
Nonylphenols - Continued										
nonylphenol diethoxylates [NP2EO]	E749B	0.10	µg/L	<0.10						
nonylphenol ethoxylates, total	E749B	2.0	µg/L	<2.0	200 µg/L					
nonylphenol monoethoxylates [NP1EO]	E749B	2.0	µg/L	<2.0						
nonylphenols [NP]	E749A	1.0	µg/L	<1.0	20 µg/L					
Polychlorinated Biphenyls										
Aroclor 1016	E687	0.020	µg/L	<0.020						
Aroclor 1221	E687	0.020	µg/L	<0.020						
Aroclor 1232	E687	0.020	µg/L	<0.020						
Aroclor 1242	E687	0.020	µg/L	<0.020						
Aroclor 1248	E687	0.020	µg/L	<0.020						
Aroclor 1254	E687	0.020	µg/L	<0.020						
Aroclor 1260	E687	0.020	µg/L	<0.020						
Aroclor 1262	E687	0.020	µg/L	<0.020						
Aroclor 1268	E687	0.020	µg/L	<0.020						
polychlorinated biphenyls [PCBs], total	E687	0.060	µg/L	<0.060	1 µg/L	0.4 µg/L				
decachlorobiphenyl	E687	0.1	%	99.6						
tetrachloro-m-xylene	E687	0.1	%	94.7						

Please refer to the General Comments section for an explanation of any qualifiers detected.

Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
BH22-4	Water	solids, total suspended [TSS]		RMPSUB	STM	160 mg/L	15 mg/L
	Water	Kjeldahl nitrogen, total [TKN]		RMPSUB	STM	5.57 mg/L	1 mg/L
	Water	coliforms, thermotolerant [fecal]		RMPSUB	STM	<2	1 CFU/100mL
	Water	manganese, total		RMPSUB	STM	0.271 mg/L	0.05 mg/L
	Water	zinc, total		RMPSUB	STM	0.0454 mg/L	0.04 mg/L
	Water	phenols, total (4AAP)		RMPSUB	STM	0.0128 mg/L	0.008 mg/L

Key:

RMPSUB	Ontario Reg. Mun. of Peel Sewer Bylaw #53-2010 (APR. 2011)
SAN	Reg. Mun. of Peel Sanitary by-law #53-2010
STM	Reg. Mun. of Peel Storm By-Law #53-2010

CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WT2208050**	Page	: 1 of 5
Client	: **Palmer Environmental Consulting Group Inc.**	Laboratory	: Waterloo - Environmental
Contact	: Sarah Sipak	Account Manager	: Karanpartap Singh
Address	: 74 Berkeley Street Toronto ON Canada M5V 1E3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: ----	Telephone	: 19055076910
Project	: 2204701	Date Samples Received	: 20-Jul-2022 15:30
PO	: ----	Date Analysis Commenced	: 20-Jul-2022
C-O-C number	: 20-952328	Issue Date	: 29-Jul-2022 12:29
Sampler	: Wes		
Site	: ----		
Quote number	: (Q88296) PALMER 2022 STANDING OFFER		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Microbiology, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Metals, Waterloo, Ontario
Jeremy Gingras	Team Leader - Semi-Volatile Instrumentation	Organics, Waterloo, Ontario
Sarah Birch	Team Leader - Volatiles	Organics, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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. Guidelines 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.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
µg/L	micrograms per litre
CFU/100mL	colony forming units per 100 mL
mg/L	milligrams per litre
pH units	pH units

>: greater than.
<: less than.
Red shading is applied where the result is greater than the Guideline Upper Limit or the result is lower than the Guideline Lower Limit.
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit.

Qualifiers

Qualifier	*Description*
BODL	*Limit of Reporting for BOD was increased to account for the largest volume of sample tested.*
DLHC	*Detection Limit Raised: Dilution required due to high concentration of test analyte(s).*
PEHR	*Parameter exceeded recommended holding time on receipt: Proceeded with analysis as requested.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	Method	LOR	Unit	Client sample ID: BH22-4 Sampling date/time: 20-Jul-2022 13:30 WT2208050-001		MISSUB STM
Physical Tests						
pH	E108	0.10	pH units	7.98		6 - 9 pH units
solids, total suspended [TSS]	E160	3.0	mg/L	58.0		15 mg/L
Anions and Nutrients						
phosphorus, total	E372-U	0.0020	mg/L	0.0566		0.4 mg/L
Cyanides						
cyanide, strong acid dissociable (total)	E333	0.0020	mg/L	<0.0020		0.02 mg/L
Inorganic Parameters						
chlorine, total	E326	0.050	mg/L	<0.050	PEHR	1 mg/L
Microbiological Tests						
coliforms, Escherichia coli [E. coli]	E012A.EC	1	CFU/100mL	<1		200 CFU/100mL
Total Metals						
aluminum, total	E420	0.0030	mg/L	1.57	DLHC	1 mg/L
arsenic, total	E420	0.00010	mg/L	0.00140	DLHC	0.02 mg/L
cadmium, total	E420	0.0000050	mg/L	<0.0000500	DLHC	0.008 mg/L
chromium, total	E420	0.00050	mg/L	<0.00500	DLHC	0.08 mg/L
copper, total	E420	0.00050	mg/L	0.0121	DLHC	0.04 mg/L
lead, total	E420	0.000050	mg/L	0.000704	DLHC	0.12 mg/L
manganese, total	E420	0.00010	mg/L	0.232	DLHC	0.05 mg/L
mercury, total	E508	0.0000050	mg/L	<0.0000050		0.0004 mg/L
nickel, total	E420	0.00050	mg/L	<0.00500	DLHC	0.08 mg/L
selenium, total	E420	0.000050	mg/L	<0.000500	DLHC	0.02 mg/L
silver, total	E420	0.000010	mg/L	<0.000100	DLHC	0.12 mg/L
zinc, total	E420	0.0030	mg/L	0.0331	DLHC	0.04 mg/L
Speciated Metals						
chromium, hexavalent [Cr VI], total	E532	0.00050	mg/L	<0.00050		
Aggregate Organics						
biochemical oxygen demand [BOD]	E550	2.0	mg/L	<3.0	BODL	15 mg/L
phenols, total (4AAP)	E562	0.0010	mg/L	0.0068		0.008 mg/L
Volatile Organic Compounds						
benzene	E611D	0.50	µg/L	<0.50		2 µg/L

Analyte	Method	LOR	Unit	WT2208050-001 (Continued)	MISSUB STM					
Volatile Organic Compounds - Continued										
dichlorobenzene, 1,2-	E611D	0.50	µg/L	<0.50						
dichlorobenzene, 1,4-	E611D	0.50	µg/L	<0.50						
dichloromethane	E611D	1.0	µg/L	<1.0						
ethylbenzene	E611D	0.50	µg/L	<0.50	2 µg/L					
tetrachloroethane, 1,1,2,2-	E611D	0.50	µg/L	<0.50						
tetrachloroethylene	E611D	0.50	µg/L	<0.50						
toluene	E611D	0.50	µg/L	0.56	2 µg/L					
trichloroethylene	E611D	0.50	µg/L	<0.50						
xylene, m+p-	E611D	0.40	µg/L	<0.40						
xylene, o-	E611D	0.30	µg/L	<0.30						
xylenes, total	E611D	0.50	µg/L	<0.50	4.4 µg/L					
bromofluorobenzene, 4-	E611D	1.0	%	82.1						
difluorobenzene, 1,4-	E611D	1.0	%	104						
Polycyclic Aromatic Hydrocarbons										
acenaphthene	E641A	0.010	µg/L	<0.010						
acenaphthylene	E641A	0.010	µg/L	<0.010						
anthracene	E641A	0.010	µg/L	<0.010						
benz(a)anthracene	E641A	0.010	µg/L	<0.010						
benzo(a)pyrene	E641A	0.0050	µg/L	<0.0050						
benzo(b+j)fluoranthene	E641A	0.010	µg/L	0.021						
benzo(g,h,i)perylene	E641A	0.010	µg/L	<0.010						
benzo(k)fluoranthene	E641A	0.010	µg/L	<0.010						
chrysene	E641A	0.010	µg/L	<0.010						
dibenz(a,h)anthracene	E641A	0.0050	µg/L	<0.0050						
fluoranthene	E641A	0.010	µg/L	<0.010						
fluorene	E641A	0.010	µg/L	<0.010						
indeno(1,2,3-c,d)pyrene	E641A	0.010	µg/L	<0.010						
methylnaphthalene, 1-	E641A	0.010	µg/L	<0.010						
methylnaphthalene, 2-	E641A	0.010	µg/L	<0.010						
naphthalene	E641A	0.050	µg/L	<0.050						
phenanthrene	E641A	0.020	µg/L	<0.020						
pyrene	E641A	0.010	µg/L	<0.010						
PAHs, total (CCME Sewer 18)	E641A	0.070	µg/L	<0.070	2 µg/L					
chrysene-d12	E641A	0.1	%	106						
naphthalene-d8	E641A	0.1	%	110						
phenanthrene-d10	E641A	0.1	%	107						
Polychlorinated Biphenyls										

Analyte	Method	LOR	Unit	WT2208050-001 (Continued)	MISSUB STM					
Polychlorinated Biphenyls - Continued										
Aroclor 1016	E687	0.020	µg/L	<0.020						
Aroclor 1221	E687	0.020	µg/L	<0.020						
Aroclor 1232	E687	0.020	µg/L	<0.020						
Aroclor 1242	E687	0.020	µg/L	<0.020						
Aroclor 1248	E687	0.020	µg/L	<0.020						
Aroclor 1254	E687	0.020	µg/L	<0.020						
Aroclor 1260	E687	0.020	µg/L	<0.020						
Aroclor 1262	E687	0.020	µg/L	<0.020						
Aroclor 1268	E687	0.020	µg/L	<0.020						
polychlorinated biphenyls [PCBs], total	E687	0.060	µg/L	<0.060						
decachlorobiphenyl	E687	0.1	%	86.4						
tetrachloro-m-xylene	E687	0.1	%	91.2						

Please refer to the General Comments section for an explanation of any qualifiers detected.

Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
BH22-4	Water	solids, total suspended [TSS]		MISSUB	STM	58.0 mg/L	15 mg/L
	Water	aluminum, total		MISSUB	STM	1.57 mg/L	1 mg/L
	Water	manganese, total		MISSUB	STM	0.232 mg/L	0.05 mg/L

Key:

MISSUB Ontario Mississauga Storm Sewer Use By-Law (0046-2022) (March 2022)

STM Mississauga Storm Sewer (0046-2022)