Blocks 201, 202, 204 & 205B, Chaudière Island, Ottawa, Ontario

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Hydrogeological Investigation

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1 Introduction

1.1 Project Description

EXP Services Inc. (EXP) was retained by Windmill Dream Ontario Holding LP. to prepare a Hydrogeological Investigation Report associated with the proposed development located at Blocks 201, 202, 204 & 205B, Chaudière Island, Ottawa, Ontario (hereinafter referred to as the 'Site'). The Site is at the southern provincial border between Quebec and Ontario. The Site location plan is shown on Figure 1.

Construction sequencing is Block 204 in 2023, Block 205B in 2024 to 2025 and Blocks 201 and 202 in 2026 and thereafter. Blocks 204 and 205B are east of Blocks 201 and 202 (Appendix F). It is our understanding that Blocks 201 and 202 in the west will have two levels (P2) of shared underground parking. Whereas the Blocks 204 and 205B will have one level (P1) of underground parking. To assess the dewatering rates during the construction (short-term) and post-construction phases (long-term), six (6) scenarios have been considered for numerical modeling simulations. The model scenarios are summarized below:

- Scenario 1: Construction of Block 204 with one level (P1) of underground parking.
- Scenario 2: Long-term dewatering of Block 204 (P1 with sub-drain).
- Scenario 3: Construction of Block 205B with one level (P1) of underground parking while long-term drainage system of Block 204 is in operation.
- Scenario 4: Long-term dewatering of 205B (P1 with sub-drain) while long-term drainage system of Block 204 is in operation.
- Scenario 5: Construction of Blocks 201 and 202 with two levels (P2) of underground parking while long-term drainage system of Blocks 204 and 205B is in operation.
- Scenario 6: Long-term dewatering of Blocks 201 and 202 (P2 with sub-drain) while long-term drainage system of Blocks 204 and 205B is in operation.

EXP conducted a Phase II Environmental Site Assessment (ESA) and a geotechnical investigation at the Site. The pertinent information gathered from the noted investigation is utilized for this report.

1.2 Project Objectives

The main objectives of the Hydrogeological Investigation are as follows:

- Establish the local hydrogeological settings within the Site;
- Provide recommendations on construction and long-term dewatering;
- Assess groundwater quality; and
- Prepare a Hydrogeological Investigation Report.

1.3 Scope of Work

To achieve the investigation objectives, EXP has completed the following scope of work:

- Reviewed available geological and hydrogeological information for the Site;

- Developed and conducted Single Well Response Tests (SWRT) on monitoring wells to assess hydraulic conductivities of the saturated soils at the Site;
- Completed two (2) round of groundwater level measurements at all monitoring wells.
- Collected two (2) groundwater samples, one from the western area (Blocks 201 and 2012) and another one from the eastern area (Blocks 204 and 205B) Blocks for analyses of parameters, as listed in the City of Ottawa Storm Sewer Use By-Law;
- Evaluated the information collected during the field investigation program, including borehole geological information, Water Well Records (WWR), SWRT results, groundwater level measurements and groundwater water quality;
- Prepared site plans, cross section, geological mapping and groundwater contour mapping for the Site;
- Estimated construction dewatering flow rates (short-term), and assessed potential impacts and recommend mitigation measures using a numerical groundwater flow model;
- Estimated post-construction dewatering flow rates (long-term) applying a numerical groundwater flow model;
- Provided recommendations on the Ministry of Environment, Conservation and Parks (MECP) Water Taking Permits and the City of Ottawa Sewer Discharge Agreements (SDA) for the construction and post-construction phases; and
- Prepared a Hydrogeological Investigation Report.

The Hydrogeological Investigation was prepared in accordance with the Ontario Water Resources Act, Ontario Regulation 387/04, and Ottawa's Sewer By-Law criteria. The scope of work outlined above was made to assess dewatering and did not include a review of Environmental Site Assessments (ESA).

1.4 Review of Previous Reports

EXP has conducted environmental and geotechnical investigations at the site. The reports that pertain to the site include the following:

- Current Site Environmental Status – Blocks 201 to 205B, Site Redevelopment – Zibi Property, West Chaudière (Part of 4 Booth Street), City of Ottawa, ON dated March 11, 2022 (pertains to Blocks 201 to 205B)
- Phase One Environmental Site Assessment, 315 and 330 Mìwàte Private and 505 Chaudière Private, West Chaudière Island, Ottawa, Ontario dated April 8, 2022 (pertains to Blocks 204 and 205B)
- Phase Two Environmental Site Assessment, 315 Mìwàte Private, West Chaudière Island, Ottawa, Ontario dated April 8, 2022 (pertains to part of Block 204)
- Geotechnical Investigation, Proposed Development Blocks 201, 202, 203, 204 & 205 B Chaudière Island, Ottawa, Ontario dated April 14, 2022

All of these reports have been submitted to the City of Ottawa as part of the Site Plan Application.

Part of Block 204 has been remediated. All soil and groundwater on that section of the site meets the Ministry of the Environment, Conservation and Parks (MECP) Table 7 and Table 9 Site Condition Standards (SCS). A Record of Site Condition (RSC) has been submitted to the MECP; acknowledgement is pending.

It is understood that an RSC must be filed for the remainder of Blocks 201 to 205B prior to issuance of a building occupancy permit. The RSC will be filed after all soil and groundwater is remediated. Remediation will occur in conjunction with construction of the parking garages on the site.

Any past and/or future geotechnical, hydrogeological, environmental and risk assessments, and updated development/architectural plans should be provided to update this hydrogeological report prior to submission of permits and approvals by the municipalities and agencies.

2 Hydrogeological Setting

2.1 Regional Setting

2.1.1 Regional Physiography

The Site is within a physiographic region known as the Ottawa Valley Clay Plains. The physiographic landform is named the Limestone Plains. The Russell and Prescott Sand Plains lie to the south of the Ottawa Valley Clay (Chapman & Putnam, 2007).

The topography of Ottawa Valley gradually slopes towards the Ottawa River.

2.1.2 Regional Geology and Hydrogeology

The surficial geology can be described as older alluvial deposits (Pleistocene sediments), consisting of sandy silt to silt. The bedrock primarily consists of the Upper Ordovician nodular to back laminated limestone unit of Lindsay Formation (Ministry of Northern Development and Mines, 2012).

The Site sits in a tectonic graben. Bedrock is broken into fault blocks, A fault striking NW-SE intersects the Site Chaudière Island. Karst and/or karstic features have not been identified on the island. The surficial and Paleozoic geology maps are provided in Figures 2A and 2B, respectively.

Regional groundwater flow across the area follows the surface water flow direction of the Ottawa River towards northeast. Local deviation from the regional groundwater flow pattern may occur in response to changes in topography and/or soils, as well as the presence of surface water features and/or existing subsurface infrastructure.

2.1.3 Existing Water Well Survey

Water Well Records (WWRs) from the database maintained by the Ministry of the Environment, Conservation and Parks (MECP) were reviewed to determine the number of water wells within a 500-m buffer form the Site centroid. The locations of the MECP WWR are shown on Figure 3. A summary of the WWR is included in Appendix A.

The MECP WWR database indicates a total of twenty-five (25) offsite and two (2) onsite well records. The offsite wells are located at an approximate distance of 63 m or greater from the Site centroid. The well records include water supply wells, monitoring and test holes, observation wells, abandoned and or listed with unknown use.

A total of two (2) offsite water supply wells were identified on a neighboring island, south of the Site, which seem to pertain to the same well which was initially installed in 1953 but re-drilled to a deeper depth in 1954 The offsite water supply well is located at an approximate distance of 401 m or greater from the Site centroid. Since the area is municipally serviced and these wells were installed in the 1950s, it is unlikely that the noted water supply wells are still active. The noted wells are highlighted in Appendix A.

The reported depth to groundwater for all well records vary between 3.4 and 54.9 meters below ground surface (mbgs).

2.2 Site Setting

2.2.1 Site Topography

The Site is on Chaudière Island, an Ottawa River island. The area was once heavily industrialized between 1853 and 2006. Today the island is mostly built up and is partially being redeveloped. The topography shows a steep northeasterly slope.

As indicated on the borehole logs included in Appendix B, the surface elevation of the Site ranges between approximately 53.51 to 55.82 meters above sea level (masl).

2.2.2 Local Surface Water Features

The Site is on Chaudière Island which lies on the Ottawa River. North of the island, a ring dam exists, where Chaudière Falls are located. The river flows from the Laurentian Mountains to the St. Laurance River. Before Chaudière Falls, part of the river water is diverted to the hydroelectric power stations on both the Ottawa and Gatineau sides of the Ottawa River at the Falls. The outlet of the Rideau Canal is approximately 1.75 km northwest of the Site boundary.

2.2.3 Local Geology and Hydrogeology

A summary of subsurface soil stratigraphy is provided in the following paragraphs. The soil descriptions are based on the Environmental Site Assessment borehole logs (EXP, 2021). They are summarized for the hydrogeological interpretations. As such, the information provided in this section shall not be used for construction design purposes.

The detailed soil profiles encountered in each borehole and the results of moisture content determinations are presented on the attached borehole logs (Appendix B). The interpreted geological cross-section is provided in Figure 5. The soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect approximate transition zones for the Hydrogeological Investigation and shall not be interpreted as exact planes of geological change.

The "Notes on Sample Description" preceding the borehole logs form an integral part of the logs and should be read in conjunction with this report. The following is a brief description of the soil conditions encountered during the investigation.

Based on the ESA's borehole logs, the subsurface lithology of the Site from top to bottom consists of fill material, native soil, and bedrock. Fill material which primarily consists of sand covers a large portion of overburden across the Site. No native soil was present in any of the boreholes. The thickness of overburden within the area of Blocks 204 and 205B varies between 1.0 and 3.0 m whereas around Blocks 201 and 202 it varies between 1.0 and 9.8 m. The thickest portion of overburden has been reported at BH21-114. Moreover, the borehole logs indicate that bedrock primarily consists of limestone.

3 Results

3.1 Monitoring Well Details

A total of nineteen (19) monitoring wells were installed across the Site as part of the Environmental Site Assessment. The details of monitoring network are as follows:

- Ten (10) shallow wells, including MW21-01, MW21-02, MW21-03, MW21-101, MW21-103, MW21-106, MW21-108, MW21-111, MW21-113, and MW-115 were installed to an approximated depth ranging from 5.8 to 7.1 mbgs;
- Six (6) intermediate wells, including MW21-104, MW21-105, MW21-109, MW21-112, MW21-114, and MW21-116 were installed to an approximate depth ranging from 8.7 to 9.1 mbgs;
- Three (3) deep wells, including MW21-102, MW21-107, and MW21-110 were installed to an approximate depth of 11.8 mbgs.

Each monitoring well is equipped with either 37-mm (1.5-inch) or 50-mm (2-inch) diameter PVC casing. Moreover, each monitoring well is equipped with either a flush mount or monument well protective casing, and with a three (3) meter-long screen. Borehole logs and monitoring well installation details are provided in Appendix B. The monitoring well locations are shown on Figure 4.

3.2 Water Level Monitoring

As part of the Phase 2 Environmental Site Assessment (ESA), static water levels in the monitoring wells were recorded in two (2) monitoring events, including February 3 and 16, 2022. The noted water level records were utilized for this hydrogeological assessment. A summary of all static water level data as it relates to the elevation survey is provided in Appendix C.

The groundwater elevations recorded for the shallow wells ranged from 47.38 masl (6.25 mbgs at MW21-01 on February 3, 2022) to 52.47 masl (1.8 mbgs at MW21-101 on February 16, 2022). The groundwater elevations recorded for the intermediate wells ranged from 46.68 masl (6.96 mbgs at MW21-109 on February 16, 2022) to 51.46 masl (2.99 mbgs at MW21-104 on February 16, 2022). The groundwater elevations recorded for the deep wells ranged from 46.51 mbgs (7 mbgs at MW21-110 on February 16, 2022) to 50.12 masl (3.8 mbgs at MW21-107 on February 16, 2022).

One (1) map was created for the Site to show groundwater contours of the shallow water-bearing zone (Figures 6). Accordingly, the groundwater flow direction is interpreted to be northeast of the Site, following the general flow direction of the Ottawa River.

Groundwater levels are expected to show seasonal fluctuations and vary in response to surface water levels and prevailing climate conditions. This may also affect the direction and rate of flow. It is recommended to conduct seasonal groundwater level measurements to provide more information on seasonal groundwater level fluctuations.

3.3 Hydraulic Conductivity Testing

Eighteen (18) Single Well Response Tests (SWRT's), including rising head and falling head tests were completed on eleven (11) monitoring wells across the Site in February and March 2022. The tests were completed to estimate the saturated hydraulic conductivity (K) of the screened lithology at each monitoring location.

The static water level within each monitoring well was measured prior to the start of testing. In advance of performing SWRTs, each monitoring well underwent development to remove fines introduced into the screens following construction. The development process involved purging of the monitoring wells to induce the flow of fresh formation water through the screen. Each monitoring well was permitted to fully recover prior to performing SWRTs. The water level displacements were recorded

manually and electronically. A data-logger was installed in each selected monitoring well to record water displacements electronically.

Hydraulic conductivity values were calculated from the SWRT and constant rate test data as per Hvorslev's solution included in the Aqtesolv Pro. V.4.5 software package. The semi-log plots for normalized drawdown versus time are included in Appendix D. A summary of the hydraulic conductivities (K-values) estimated from the SWRTs is provided in Table 3-1.

SWRTs provide K-estimates of the geological formation surrounding the well screens and may not be representative of bulk formation hydraulic conductivity. As shown in Table 3-1, the highest K-value of the tested water-bearing zone is 1.1E-5 m/s, and the arithmetic and geometric means of the K-values are 2.3E-6 m/s and 9.6E-7 m/s, respectively.

Table 3-1: Summary of Hydraulic Conductivity Testing

Blocks 204 and 205 B							
Monitoring Well	**Well Depth (mbgs)**	**Screen Interval (mbgs)**		**Screened Lithology***	**Test Type**	**Estimated Hydraulic Conductivity (m/s)**	
		from	**to**			**Per Test Type**	**Overall Test Result**
MW 21-102	11.8	8.8	11.8	Limestone/Shale	Rising Head	7.9E-6	7.9E-6
MW 21-103	7.1	4.1	7.1	Limestone/Shale	Falling Head	1.8E-7	4.5E-7**
					Rising Head	7.2E-7	
MW 21-104	8.8	5.80	8.80	Limestone/Shale	Falling Head	1.6E-6	1.7E-6**
					Rising Head	1.8E-6	
MW 21-105	8.7	5.7	8.7	Limestone/Shale	Falling Head	4.2E-7	4.6E-7**
					Rising Head	5.0E-7	
MW 21-107	11.8	8.8	11.8	Limestone/Shale	Falling Head	1.1E-5	1.1E-5**
					Rising Head	1.1E-5	
MW 21-110	11.8	8.8	11.8	Limestone/Shale	Falling Head	1.8E-7	1.8E-7**
					Rising Head	1.8E-7	
Blocks 201 and 202							
Monitoring Well	**Well Depth (mbgs)**	**Screen Interval (mbgs)**		**Screened Lithology***	**Test Type**	**Estimated Hydraulic Conductivity (m/s)**	
		from	**to**			**Per Test Type**	**Overall Test Result**
MW 21-111	5.8	2.8	5.8	Limestone/Shale	Rising Head	1.0E-6	1.0E-6
MW 21-112	8.8	5.8	8.8	Limestone/Shale	Falling Head	1.0E-6	1.2E-6**
					Rising Head	1.3E-6	
MW 21-113	6.3	3.3	6.3	Limestone/Shale	Falling Head	5.0E-7	5.0E-7
MW 21-115	6.3	3.3	6.3	Limestone/Shale	Rising Head	9.8E-8	1.9E-7**
					Falling Head	2.9E-7	
MW 21-116	9.1	6.1	9.1	Limestone/Shale	Rising Head	9.4E-7	9.4E-7
						Highest Estimated K Value	1.1E-5
						Arithmetic Mean of Estimated K Values	2.3E-6
						Geometric Mean of Estimated K Values	9.6E-7

Note:
mbgs: meter below ground surface
*based on the ESA borehole logs (EXP, 2021)
**arithmetic average of two (2) K-values obtained from two test results for a single well

3.4 Groundwater Quality

To assess the suitability for discharging pumped groundwater into the sewers owned by the City of Ottawa during dewatering activities, two (2) groundwater samples were collected from monitoring wells MW 21-104 and MW21-113 on March 4, 2022, using a peristaltic pump. The noted wells were installed in the eastern area (Blocks 204 and 205B) and in the western area (Blocks 204 and 205B), respectively. Based on the provided fieldnotes, the water samples collected from MW21-113 and MW21-104 were labeled as S1 and S2, respectively (Appendix E).

Prior to collecting a water sample, approximately three (3) standing well volumes of groundwater were purged from the referred well. The samples were collected unfiltered and placed into pre-cleaned laboratory-supplied vials and/or bottles provided with analytical test group specific preservatives, as required. Dedicated nitrile gloves were used during sample handling. The groundwater samples were submitted for analysis to Bureau Veritas Laboratory, a CALA certified independent laboratory in Ottawa, Ontario. Analytical results are provided in Appendix D. Table 3-2 summarizes exceedance(s) of the Storm Sewer Use By-Law parameters.

It is our understanding that the potential effluent from the dewatering system during both construction and post-construction phases will be discharged to a designated stormceptor in Block 208 (northwest corner of Booth Street and Buchanan Channel), from where it will be discharged to the Ottawa River. As such, the laboratory analytical results are compared to the Storm Sewer By-Law criteria.

When comparing the chemistry of the collected groundwater sample to the City of Ottawa Storm Sewer Discharge Criteria, the concentrations of Total Suspended Solids (TSS) and Total Manganese, as well as pH exceeded the applicable guideline. According to the laboratory's Certificate of Analysis (CoA), the reported detection limit for Total Nonylphenol Ethoxylate exceeded the applicable guideline.

Table 3-2: Summary of Analytical Results

Parameter	Units	City of Ottawa Storm Sewer Discharge Limit	Concentration March 4, 2022	
			Blocks 201 and 202 S1 (MW21-113)	Blocks 204 and 205B S2 (MW21-104)
pH	-	6.0 - 9.0	7.27	**9.42**
Total Suspended Solids (TSS)	mg/L	15	**22**	**35**
Total Nonylphenol Ethoxylate	mg/L	0.01	**<0.025**	**<0.025**
Total Manganese (Mn)	mg/L	0.05	**210**	0.02

Note:
Bold – Exceeds City of Ottawa Storm Sewer Discharge Limit.; **(<0.025**): Indicates that the laboratory detection limit exceeds the criteria

For the short-term dewatering system (construction phase), it is anticipated that TSS levels and some other parameters (for example, Total Metals) in the pumped groundwater may become elevated and exceed Storm Sewer Use By-Law limits. To control the concentration of TSS and associated metals, it is recommended that a suitable treatment method be implemented (filtration or decantation facilities and/ or any other applicable treatment system) during construction dewatering activities to discharge to a designated stormceptor at the Site. The specifications of the treatment system will need to be adjusted to the reported water quality results by the treatment contractor/process engineer.

For the long-term dewatering discharge to the designated stormceptor at the Site (post-development phase) and based on the water quality results, it is recommended to implement a suitable pre-treatment, as required. The water quality results presented in this report may not be representative of the long-term condition of groundwater quality onsite. As such, regular water quality monitoring is recommended for the post-construction phase, as required by the City of Ottawa. We understand that a Category 3 Permit to Take Water has been obtained for this project. The Environmental Site Assessment Report(s) and geotechnical investigation shall be reviewed for more information on the groundwater quality conditions at the Site.

4 Dewatering Assessment

It is our understanding that first Blocks 204 and 205B will be built in sequence with one level of underground parking (P1) and without cut-off walls. Subsequently, Blocks 201 and 202 will be constructed with two levels of shared underground parking (P2). Blocks 205A, 206, 207, 208 and B301 were already built with two levels of underground parking (P2). The referred Blocks 205A, 206, 207, 208 and B301 have long term drainage systems.

Moreover, cut-off wall segments exist along the Ottawa River and the northern border of Chaudière Island between a pedestrian bridge and the hydro dam, and along the southern channel and island border between Chaudière Private Road and Booth St. and southern. Also, a backfilled trench striking north-south lies west of Block 202. The trench is likely associated to a geological fault.

Six (6) steady-state modeling scenarios/simulations have been defined to assess the dewatering rates during the construction (short-term) and post-construction phases (long-term). The model scenarios are presented in Table 4-1 below. The assumptions utilized for simulating dewatering scenarios as well as the hydrostratigraphic units are provided in Tables 4-1 and 4-2, respectively.

Long term drainage of existing Blocks 205A, 206, 207, 208 and B301 was considered in all (6) scenarios for two levels of underground parking (P2). The dewatering invert elevations are 44.75 masl for Block 206, 47.95 masl for Blocks 207 and 208, and 48.65 masl for Blocks 205 A and B301.

The existing two (2) cut-off wall segments along the Ottawa River and the southern channel were also implemented in all scenarios. In the absence of specific information, both cut-off wall segments were assumed to be 0.5 m thick, to have a toe elevation of 48.44 m and a hydraulic conductivity 2.5E-7 m/s. The cut-off wall walls are illustrated on Figure G6 in plan view and on Figure G8 in section view.

A backfilled trench west of Block 202 which is aligned with a geological fault was also implemented in all scenarios. The assumed length and width of the trench are 86 m and 4 m, respectively. The hydraulic properties of the material backfilling the trench is expected to be equivalent as for fill. In the absence of field data below the backfilled trench, the geological fault west of Block 202 is assumed to have the same hydraulic properties as the surrounding bedrock. The backfilled trench is depicted on Figure G5 in plan view and on Figure G9 in section view.

The construction of a western cut-off wall is proposed before building Blocks 201 and 202 and is therefore only considered in scenarios N3A and N3B. The proposed western cut-off wall must prevent inflow from the Ottawa River to the area of Blocks 201 and 202. The proposed western cut-off wall is shown on Figure G5 in plan view and on Figure G9 in section view.

Table 4-1 Model Scenarios

Scenario	Block	Dewatering/Drainage	Cut-off wall
N1A	204	P1 construction dewatering	No western cut-off wall
N1B	204	P1 long-term drainage system	No western cut-off wall
N2A	205B	P1 construction dewatering (and Block 204 with P1 long-term drainage system)	No western cut-off wall
N2B	205B	P1 long-term drainage system (and Block 204 with P1 long-term drainage system)	No western cut-off wall

Scenario	Block	Dewatering/Drainage	Cut-off wall
N3A	201 and 202	P2 construction dewatering (and Blocks 204 and 205 with P1 long-term drainage system)	With proposed western cut-off wall
N3B	201 and 202	P2 long-term drainage system (and Blocks 204 and 205 with P1 long-term	With proposed western cut-off wall

Table 4-1 Assumptions for Construction and Long-Term Dewatering Estimates

Input Parameter		Assumption: Blocks 204 and 205B – P1	Assumption: Blocks 201 and 202 - P2	Units	Notes
Ground Surface Elevation		54.77		masl	The highest ground surface elevation at MW21-102 based on the ESA borehole logs (EXP, 2021)
Groundwater Elevation	Upgradient (West of Chaudière Crossing)	53.32		masl	Based on 100-year flooding records (Appendix H)
	Downgradient (East of Chaudière Crossing)	46.81			
Lowest Top of Slab Elevation		50.00	46.50	masl	Based on architectural drawing for Blocks 204 and 205B. P2 assumed to be 3.5 meters below P1 top of slab elevation for Blocks 201 and 202.
Long-Term Dewatering Elevation Target		49.50	46.00	masl	0.5 m below the lowest top of slab elevation
Lowest Foundation Elevation		48.5	45.00	masl	Assumed to be approximately 1.5 m below the top of slab elevation
Construction Dewatering Elevation Target		47.50	44.00	masl	Assumed to be approximately 1.0 m below the lowest foundation elevation
Excavation Area		3,825 and 1,227	3,936	m^2	Approximate areas
Bottom Elevation of Water-Bearing Zone		34.00		masl	Assumed to be 10 meters below the lowest dewatering elevation for P2

Table 4-2 Assumptions for Hydrostratigraphic Units

Input Parameter	Assumption	Units	Notes
Top of Fill	54.77	masl	The highest ground surface elevation at MW21-102 based on the ESA borehole logs
Top of Weathered Bedrock	51.44	masl	Average elevation based on the ESA borehole logs (EXP, 2021)
Bottom of Weathered Bedrock/Top of Sound Bedrock	48.44	masl	Assumed to be 3 meters below the average elevation of top of bedrock
Bottom of Existing/ Proposed Cut-Off Walls	48.44	masl	Assumed
Bottom of Backfilled Trench	44.50	masl	Projected elevation from MW21-114
Bottom of Sound Bedrock	34.00	masl	Assumed to be 10 meters below the lowest dewatering elevation of 44.00 masl for P2 (Table 4-1)

Input Parameter	Assumption				Units	Notes
	Fill/Backfilled Trench	Weathered Bedrock	Sound Bedrock	Existing/ Proposed Cut-Off Wall		
Hydraulic Conductivity	1.0E-4	1.1E-5	*2.8E-7	2.5E-7	m/s	The K-values for weathered and sound bedrock are based on the highest and lowest K-values for bedrock, respectively. The K-values for fill and cut-off wall are assumed
Porosity n	0.40	0.25	0.20	0.05	1	Assumed. Bedrock values from Table 2.4 in Freeze and Cherry (1979)
Specific Yield Sy	0.20	0.15	0.05	0.01	1	Assumed (Sy < n)
Specific Retention Sr	0.20	0.10	0.15	0.04	1	Inferred (Sr = n - Sy)

Note:
*The hydraulic conductivity was adjusted to match the long-term flow (drainage) rate of 26,600 L/day for existing Blocks 206 and 207.

4.1 Dewatering Flow Rate Estimates Using Numerical Modeling

To estimate flow rates into the proposed excavation areas during the construction phase (short-term), as well as to the future sub-drains for the post-construction phase (long-term), three-dimensional (3D) groundwater flow models based on the Richard's Equation were created with FEFLOW, Version 7.5. FEFLOW is a software founded on the finite element method (FEM). It is owned and developed by the Danish Hydrology Institute (DHI). Modeling results are presented in Appendix G in section view.

4.2 Stormwater

Additional pumping capacity may be required to maintain dry conditions within the excavation during and following significant precipitation events. Therefore, the dewatering rates at the Site should also include removing stormwater from the excavation.

A 15 mm precipitation event was utilized for estimating the stormwater volume. The calculation of the stormwater volume is included in Table 4-3.

Table 4-3 Assumed Stormwater Volumes

Proposed Construction Zone	Approximate Area (m^2)	Precipitation (mm)	Stormwater Volume per Event (L/day)
204	3,825	15	57,375
205B	1,227		18,405
201 and 202 (combined and including area between both blocks)	3,936		59,040

The estimate of the stormwater volume only accounts for direct precipitation into the excavation. The dimensions of the excavation are considered in the dewatering calculations. Runoff which originated outside of the excavation's footprint is excluded and should be directed away from the excavation.

During precipitation events greater than 15 mm (ex: 100-year storm), measures should be taken by the contractor to retain stormwater onsite in a safe manner to not exceed the allowable water taking and discharge limits, as necessary. A two (2) and a one hundred (100) year storm event over a 24-hour period are 51.3 and 113.7 mm, respectively (Ministry of Transportation, 2022).

4.3 Results of Dewatering Rate Estimates

4.3.1 Construction Dewatering Rate Estimate

For this assessment, it was assumed that the proposed construction plans include an excavation with shoring extending to the Site boundaries. EXP should be retained to review the assumptions outlined in this section, should the assumed shoring design change. Pits (elevator, sump pits) are assumed to have the same excavation depth and dewatering target as the main excavation; deeper pits may require localized dewatering and revised dewatering estimates.

Based on the assumptions provided in this report and on the numerical modeling results, the dewatering rate estimates are summarized in Table 4-4.

Table 4-4 Construction Dewatering Rates (Short-Term)

	Block 204 – P1 (L/day)	Block 205B – P1 (L/day)	Blocks 201 and 202 -P2 (L/day)
Scenario	N1A	N2A	N3A
Estimated Short-Term Dewatering Rate (without safety factor or precipitation)	373,000	349,000	496,000
From Precipitation Event of 15 mm in one day	57,375	18,405	59,040
With Factor of Safety of 1.5 (excluding stormwater) for permit	559,500	523,500	744,000
With Factor of Safety of 1.5 (including stormwater) for designs, and budgeting	616,875	541,905	803,040

Note:
***** When the Block 205B is under construction, Block 204 is in post-construction phase.
****** When the Blocks 201 and 202 are under construction, Blocks 204 and 205B are in post-construction phase.

The steady state dewatering rates are very sensitive to changes of the hydraulic conductivity of sound bedrock and insensitive to changes of storage parameters. The applied hydraulic conductivity of sound bedrock was adjusted to match the long-term flow (drainage) rate of 26,600 L/day for existing Blocks 206 and 207. A factor of safety is applied to account for higher-than-expected K-values. A sensitivity analysis was not completed.

The peak dewatering flow rates do not account for flow from utility beddings and variations in hydrogeological properties beyond those encountered during this investigation.

Local dewatering may be required for pits (elevator pits, sump pits), if these extend deeper than the dewatering target. Local dewatering is not considered to be part of this assessment, but contractor should be ready to install additional system to manage such conditions. Dewatering estimates should be reviewed once the pit dimensions are available.

All grading around the perimeter of the excavation should be graded away from the shoring the systems and ramp/site access to redirect runoff away from excavation.

Impervious faults are assumed to exist at the Site. The dewatering assumptions are also based on using a shoring system without open cuts and sloped excavations.

If groundwater cut-off systems (caisson walls or equivalent) are installed, these should be designed for maximum hydrostatic pressure for shallow and deep water levels, without dewatering on the outer side of the groundwater cut-off systems. Soldier pile and lagging and groundwater cut-off systems should be designed to account for shallow groundwater conditions and take into consideration that dewatering systems may not provide fully dewatered conditions of the lithological unit (s).

If groundwater cut-off systems (caisson walls, sheet piles or equivalent) are used for decreasing long-term dewatering rates, these should be designed as permanent structures to cutoff groundwater inflow in the long-term. All perforations should be sealed permanently (ex: tiebacks, breaches, and cold joints) with no leakages and inspected. Fillers should extend into low

permeability deposits (ex: sound bedrock or till) to cutoff groundwater from water bearing zones. Inspections should be conducted to confirm the depth of low permeability deposits along shoring system and that fillers are keyed into low permeability lithological unit(s).

The contractor is responsible for the design of the dewatering systems (depth of wells, screen length, number of wells, spacing sand pack around screens, prevent soil loss etc.) to ensure that dry conditions are always maintained within the excavation at all costs.

Dewatering should be monitored using dedicated monitoring wells within and around the perimeter of the excavation, and these wells should be monitored using manual measurements as well as electronic data loggers; Recorded data should be maintained on Site to track dewatering progress. Discharge rates should be monitored using calibrated flow meters and records of dewatering progress, and daily precipitation as per MECP's requirements should be maintained.

4.3.2 Post-Construction Dewatering Rate Estimate

It is our understanding that the development plan includes permanent foundation sub-drain systems that will ultimately discharge to the municipal sewer system if conventional footings are installed. The long-term dewatering was based on the same equations as construction dewatering shown in Section 4.1. The dewatering target for the foundation drainage system is taken at 0.5 m below the lowest slab elevation.

The foundation drain analysis provides a flow rate estimate. Once the foundation drain is built, actual flow rate measurements of the sump discharge will be required to confirm the estimated flow rate.

Based on the assumptions provided in this report, the estimated sub-drain discharge volumes are summarized in Table 4-5. Seasonal and daily fluctuations are expected. These estimates may be affected by hydrogeological conditions beyond those encountered at this time, fluctuations in groundwater regimes, surrounding Site alterations, and existing and future infrastructures.

Table 4-4 Post-Construction Dewatering Rates (Long-Term)

	Block 204 – P1 (L/day)	Block 205B – P1 (L/day)	Blocks 201 and 202 -P2 (L/day)
Scenario	N1B	N2B	N3B
Estimated Long-Term Dewatering Rate (without safety factor)	154,000	106,000	182,000
With Factor of Safety of 1.5 for permit	231,000	159,000	273,000

Note:
***** When the Block 205B is in post-construction phase, Block 204 is also in post-construction phase.
****** When the Blocks 201 and 202 are in post-construction phase, Blocks 204 and 205B are also in post-construction phase.

Intermittent cycling of sump pumps and seasonal fluctuation in groundwater regimes should be considered for pump specifications. A safety factor was applied to the flow rate to account for water level fluctuations due to seasonal changes.

These estimates assume that pits (elevator and/or sump pits) are made as watertight structures (without drainage), if their depths extend below the dewatering target, as previously stated. The dewatering assumptions are based on using shoring

system without open cuts. Open cuts can act as preferential groundwater pathways in the long-term and cause foundation drainage volumes to increase.

The sub-drain rate estimate is based on the assumptions outlined in this report. Any variations in hydrogeological conditions beyond those encountered as part of this investigation may significantly influence the sub-drain discharge volumes.

4.4 MECP Water Taking Permits

4.4.1 Short-Term Discharge Rate (Construction Phase)

In accordance with the Ontario Water Resources Act, if the water taking for the construction dewatering is more than 50,000 L/day but less than 400,000 L/day, then an online registration in the Environmental Activity and Sector Registry (EASR) with the MECP will be required. If groundwater dewatering rates onsite exceed 400,000 L/day, a Category 3 Permit to Take Water (PTTW) will be required from the MECP.

It is recognized that the maximum flow estimate calculated with a high K-value, provides a conservative estimate to account for higher-than-expected flow rates during construction dewatering. The dewatering estimates including a safety factor and excluding stormwater is stated below. The MECP construction dewatering rates exclude the precipitation amounts and they are the rates which will be used for the permit applications. Based on the MECP construction dewatering estimates summarized in Table 4-6, a Category 3 PTTW will be required to facilitate the construction dewatering program for all situations.

Table 4-6: MECP Construction Dewatering Rates (Short-Term)

	Block 204 – P1	Block 205B – P1	Blocks 201 and 202 - P2
Flow Rates **with Safety Factor of 1.5** and Stormwater Volume	616,875	541,905	803,040

Note:
***** When the Block 205B is under construction, Block 204 is in post-construction phase.
****** When the Blocks 201 and 202 are under construction, Blocks 204 and 205B are in post-construction phase.

It is our understanding that the existing Category 3 PTTW issued for this project is applicable for a water taking at a combined maximum rate of 1,961,820 L/day. The existing PTTW 1163-BG5R4K allows water taking for construction (2,000,000 L/day) and remediation (150,000 L/day) and expires on September 18, 2029 and will need to be amended to include the new construction sources on the PTTW.

A Discharge Plan (dewatering sketch, sewer discharge agreement) must be developed and applied for any discharges from the Site. Monitoring of both water quantity and water quality must be carried out for the entire duration of the construction dewatering phase. During this phase, the Discharge Plan and the daily water taking records must be available onsite.

The PTTW, Discharge Plan, hydrogeological investigation report, and geotechnical assessment of settlements must also be available at the construction Site during the entire construction dewatering. EXP should be notified immediately about any changes to the construction dewatering schedule or design, since the PTTW will need to be updated to reflect these modifications. Altogether, the hydrogeological report, PTTW, Discharge Plan and geotechnical assessment constitute the Water Taking Plan which needs to be available onsite during the construction dewatering.

4.4.2 Long-Term Discharge Rate (Post Construction Phase)

In accordance with the Ontario Water Resources Act, if the water taking for the post- development dewatering is more than 50,000 L/day, then an application for a Category 3 Permit to Take Water (PTTW) will be required from the MECP.

It is recognized that the maximum flow rate calculated with a high K-value, provides a conservative estimate to account for higher-than-expected flow rates during the post-development dewatering. Based on the dewatering estimates summarized in Table 4-7 with using a safety factor of 1.5 for this project, a Category 3 Permit to Take Water (PTTW) will be required to facilitate the post-development phase in all situations.

The safety factor for construction (short-term) dewatering is same as for (steady state/long-term) post- development due to the proximity to the hydraulic boundaries. If the distance prom the proposed dewatering area to the hydraulic boundaries would be longer then a larger safety factor would be used for short-term dewatering. In the present project, the hydraulic boundaries are assumed to be reached quickly by the cone of depression during construction (short-term) dewatering.

Table 4-7: MECP Post-Construction Dewatering Rates (Long-Term)

	Block 204 – P1	Block 205B – P1	Blocks 202 and 202 - P2
Dewatering Flow Rates **with Safety Factor of 1.5**	231,000	159,000	273,000

Note:
***** When the Block 205B is in post-construction phase, Block 204 is also in post-construction phase.
****** When the Blocks 201 and 202 are in post-construction phase, Blocks 204 and 205B are also in post-construction phase.

A Category 3 PTTW is required for the post-construction phase. .

5 Environmental Impact

5.1 Surface Water Features

The Site is on Chaudière Island which lies on the Ottawa River. North of the island, a ring dam exists, where Chaudière Falls are located. The river flows from the Laurentian Mountains to the St. Laurance River. Before Chaudière Falls, part of the river water is diverted to the hydroelectric power stations on both the Ottawa and Gatineau sides of the Ottawa River at the Falls. The outlet of Rideau Canal is approximately 1.75 km northwest of the Site boundary.

Groundwater taking at the Site is anticipated to be constantly fed by Ottawa River. Therefore, it is unlikely that the dewatering activities at the Site will have any impacts on the river next to the Site.

5.2 Groundwater Sources

Well Records from the MECP Water Well Record (WWR) Database were reviewed to determine the presence and number of water supply wells within a 500 m radius of the Site boundaries. Given that the dewatering zone of influence is limited to the island boundaries and no records of water supply well exist on the island, no detrimental dewatering impact is expected on water supply wells in the area.

The zone of influence of dewatering operations most likely will extent to the hydraulic boundaries along the island perimeter (Ottawa River and Buchanan Channel). This was observed in all steady state (short- and long-term) dewatering scenarios presented in this report.

5.3 Geotechnical Considerations

As per the MECP technical requirement for PTTW and EASRs, the geotechnical assessment of the stability of the soils due to water taking (ex: settlement, soil loss, subsidence, etc.) is required. The water taking should not have unacceptable interference on soils and underground structures (foundations, utilities, etc.).

This geotechnical assessment will be provided during the full geotechnical investigation for the Site as stated in the Geotechnical Investigation Report (EXP, 2022).

5.4 Groundwater Quality

It is our understanding that the potential effluents from the dewatering system during both construction and post-construction phases will be discharged in accordance with the terms outlined in the existing PTTW. This means diverting the water to a designated stormceptor in Block 208 (northwest corner of Booth Street and Buchanan Channel), from where it will be discharged to the Ottawa River. As such, the quality of groundwater discharge is required to conform the City of Ottawa Sewer Use By-Law.

For the short-term dewatering system (construction phase), it is anticipated that TSS levels and some other parameters (for example, Total Metals) in the pumped groundwater may become elevated and exceed Storm Sewer Use By-Law limits. To control the concentration of TSS and associated metals, it is recommended that a suitable treatment method be implemented (filtration or decantation facilities and/ or any other applicable treatment system) during construction dewatering activities to discharge to the applicable sewer system. The specifications of the treatment system will need to be adjusted to the reported water quality results by the treatment contractor/process engineer.

For the long-term dewatering discharge to the Ottawa River (post-development phase) and based on the water quality results, it is recommended to implement a suitable pre-treatment, as required.

Dewatering (short and long-term) may induce migration of contaminants within the zone of influence and beyond due to changing hydraulic gradients, hydrogeological conditions beyond Site boundaries and preferential pathways in utility beddings etc. The water quality sampling conducted as part of this assessment was performed under static conditions. As a result, monitoring may be required during dewatering activities (short and long-term) to monitor potential migration, and this should be performed more frequently during early dewatering stages.

The water quality results presented in this report may not be representative of the long-term condition of groundwater quality onsite. As such, regular water quality monitoring is recommended for the post-construction phase as required by the City of Ottawa. The Environmental Site Assessment Report(s) shall be reviewed for more information on the groundwater quality conditions at the Site.

5.5 Well Decommissioning

In conformance with Regulation 903 of the Ontario Water Resources Act, the installation and eventual decommissioning of any dewatering system wells or monitoring wells must be completed by a licensed well contractor. This will be required for all wells that are no longer in use.

6 Conclusions and Recommendations

Based on the findings of the Hydrogeological Investigation, the following conclusions and recommendations are provided:

- When comparing the chemistry of the collected groundwater sample to the City of Ottawa Storm Sewer Discharge Criteria, the concentrations of Total Suspended Solids (TSS) and Total Manganese, as well as pH exceeded the applicable guideline. According to the laboratory's Certificate of Analysis (CoA), the reported detection limit for Total Nonylphenol Ethoxylate exceeded the applicable guideline.
- Based on the assumptions outlined in this report, if one level of underground parking (P1) is constructed on the eastern part, we expect a construction dewatering rate of approximately 616,875 L/day for Block 204 and 541,905 L/day for Block 205B. Thereafter, if two levels of underground parking (P2) are constructed on the western part, we expect a combined construction dewatering rate of approximately 803,040 L/day for Blocks 201 and 202.
- The overall dewatering rate for the construction of Blocks 204, 205B, 201 and 202 is 1,961,820 L/day, including safety factor and stormwater collection.
- Anticipated long-term (post-construction) flow rates to future foundation sub-drains are approximately 231,000 L/day for Block 204, 159,000 L/day for Block 205B, and 273,000 L/day for Blocks 201 and 202 (combined). The stated rates include a factor of safety. It is recommended that once the sub-drain system is in place, a flow meter be installed at the sump(s) to record daily discharge volumes during the commissioning stage of the system. Regular maintenance/cleaning of the sub-drain system is recommended to ensure its proper operation.
- It is our understanding that both short-term and long-term effluents are intended to be released into the Ottawa River. According to the existing Category 3 PTTW issued for this project, the effluents at a maximum rate of 2,150,000 L/day are allowed to be released into the Ottawa River. The existing PTTW 1163-BG5R4K allows water taking for construction (2,000,000 L/day) and remediation (150,000 L/day) and expires on September 18, 2029. The PTTW will need to be amended to include the new sources.
- The existing PTTW 1163-BG5R4K does not apply to the post-construction phase and rates reported here. A Category 3 PTTW is required for the post-construction phase.
- The proposed western cut-off wall should be constructed before building Blocks 201 and 202. It is crucial to confirm in the field layout and depth of the trench west of Block 202. We recommend inspecting both critical locations of the western cut-off wall where it intersects the trench. We also recommend testing tightness of the wall (and geological fault) to effectively prevent inflow from the Ottawa River to the area of Blocks 201 and 202.
- The construction dewatering and the long-term flow rate estimates are based on the assumptions outlined in this report. Any variations in hydrogeological conditions beyond those encountered as part of this hydrogeological assessment may significantly influence the discharge volumes.
- For the short-term dewatering system (construction phase), it is anticipated that TSS levels and some other parameters (for example, Total Metals) in the pumped groundwater may become elevated and exceed both, Sanitary and Storm Sewer Use By-Law limits. To control the concentration of TSS and associated metals, it is recommended that a suitable treatment method be implemented (filtration or decantation facilities and/ or any other applicable treatment system) during construction dewatering activities to discharge to the applicable sewer system. The specifications of the treatment system will need to be adjusted to the reported water quality results by the treatment contractor/process engineer.
- For the long-term dewatering discharge to the storm sewer system (post-development phase) and based on the water quality results, it is recommended to implement a suitable pre-treatment as required.
- Groundwater taking at the Site is anticipated to be constantly fed by Ottawa River. Therefore, it is unlikely that the dewatering activities at the Site will have any negative impacts on the river next to the Site. Given that the dewatering

zone of influence is limited to the island boundaries and no records of water supply well exist on the island, no detrimental dewatering impact is expected on water supply wells in the area.

- A monitoring program (groundwater levels and water quality) and contingency plan will be required for the construction and post-construction phases and should be developed in consultation with the MECP at the time of the PTTW submission.
- As per the MECP technical requirement for PTTW, the geotechnical assessment of the stability of the soils due to water taking (ex: settlement, soil loss, subsidence etc.) is required. The water taking should not have unacceptable interference on soils and underground structures (foundations, utilities etc.). This geotechnical assessment will be provided during the full geotechnical investigation for the Site as stated in the Geotechnical Investigation Report (EXP, 2022)..
- The PTTW registration allows construction dewatering discharge greater than 400,000 L/day. A Discharge Plan (dewatering sketch, sewer discharge agreement) must be developed and applied for any discharges from the Site. The Discharge Plan and monitoring for both water quantity and water quality must be carried at the Site during the entire construction dewatering phase. The daily water taking records must be maintained onsite for the entire construction dewatering phase. The PTTW, Discharge Plan, hydrogeological investigation report, and geotechnical assessment of settlements must always also be available at the construction Site for the entire construction dewatering. EXP should be notified immediately about any changes to the construction dewatering schedule or design, since PTTW will need to be updated to reflect these modifications. The hydrogeological report, PTTW, Discharge Plan and geotechnical assessment constitutes the Water Taking Plan which needs to be available onsite for the duration of construction dewatering.
- In conformance with Regulation 903 of the Ontario Water Resources Act, the installation and eventual decommissioning of any dewatering system wells or monitoring wells must be completed by a licensed well contractor. This will be required for all wells that are no longer in use.

The conclusions and recommendations provided above should be reviewed in conjunction with the entirety of the report. They assume that the present design concept described throughout the report will proceed to construction. This report is solely intended for the construction and long-term dewatering assessments. Any changes to the design concept may result in a modification to the recommendations provided in this report.

7 Limitations

This report is based on a limited investigation designed to provide information to support an assessment of the current hydrogeological conditions within the study area. The conclusions and recommendations presented within this report reflect Site conditions existing at the time of the assessment. EXP must be contacted immediately, if any unforeseen Site conditions are experienced during construction activities. This will allow EXP to review the new findings and provide appropriate recommendations to allow the construction to proceed in a timely and cost-effective manner.

Our undertaking at EXP, therefore, is to perform our work within limits prescribed by our clients, with the usual thoroughness and competence of the geoscience/engineering profession. No other warranty or representation, either expressed or implied, is included or intended in this report.

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We trust that this information is satisfactory for your purposes. Should you have any questions or comments, please do not hesitate to contact this office.

Sincerely,

EXP Services Inc.

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Senior Hydrogeologist
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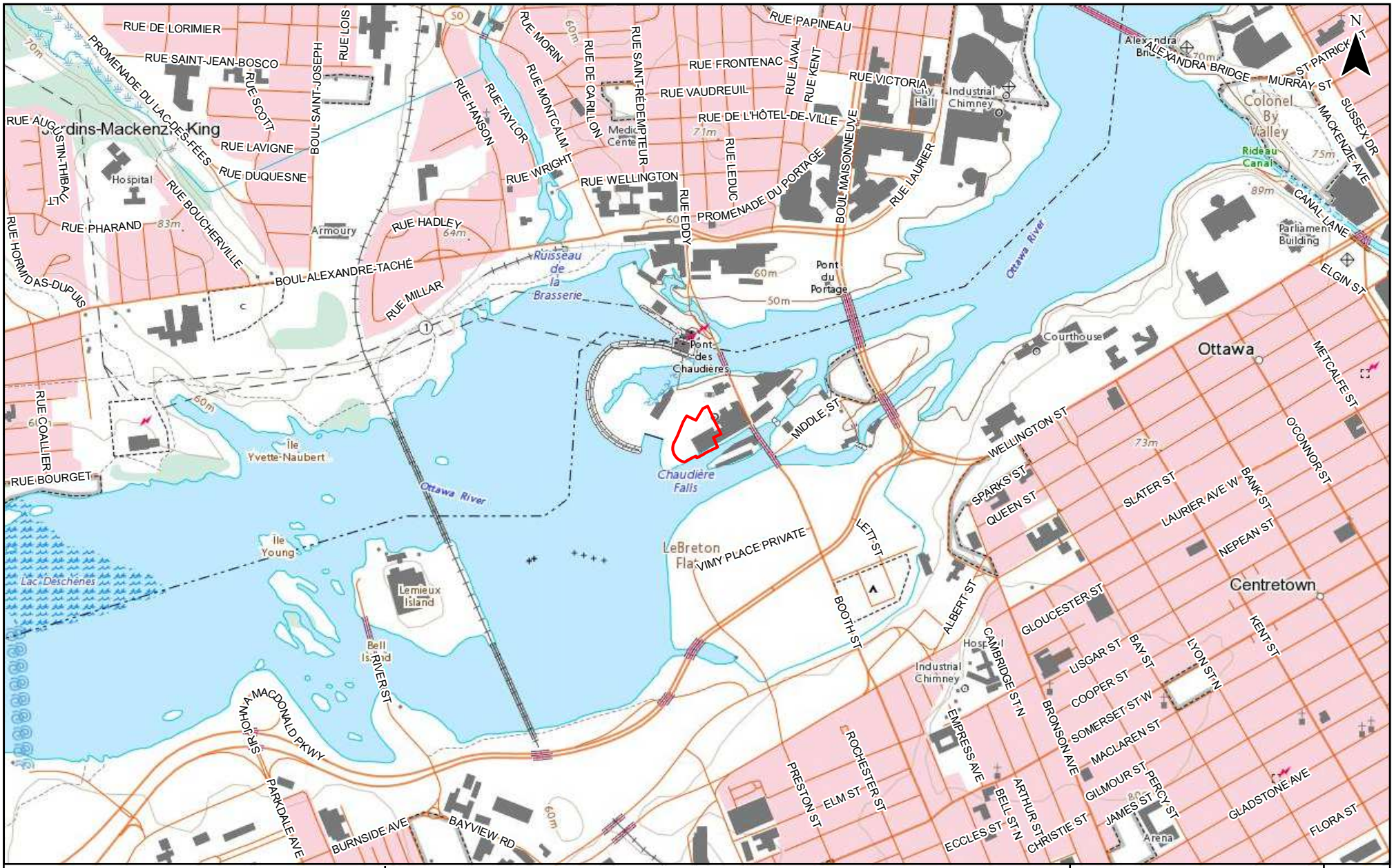
Figures



SCALE:

0 150 300 450 600 750 m

LEGEND:

APPROXIMATE SITE BOUNDARY

SITE LOCATION PLAN

FIGURE: 1

HYDROGEOLOGICAL INVESTIGATION
BLOCKS 201, 202, 203, 204 & 205B
CHAUDIÈRE ISLAND, OTTAWA

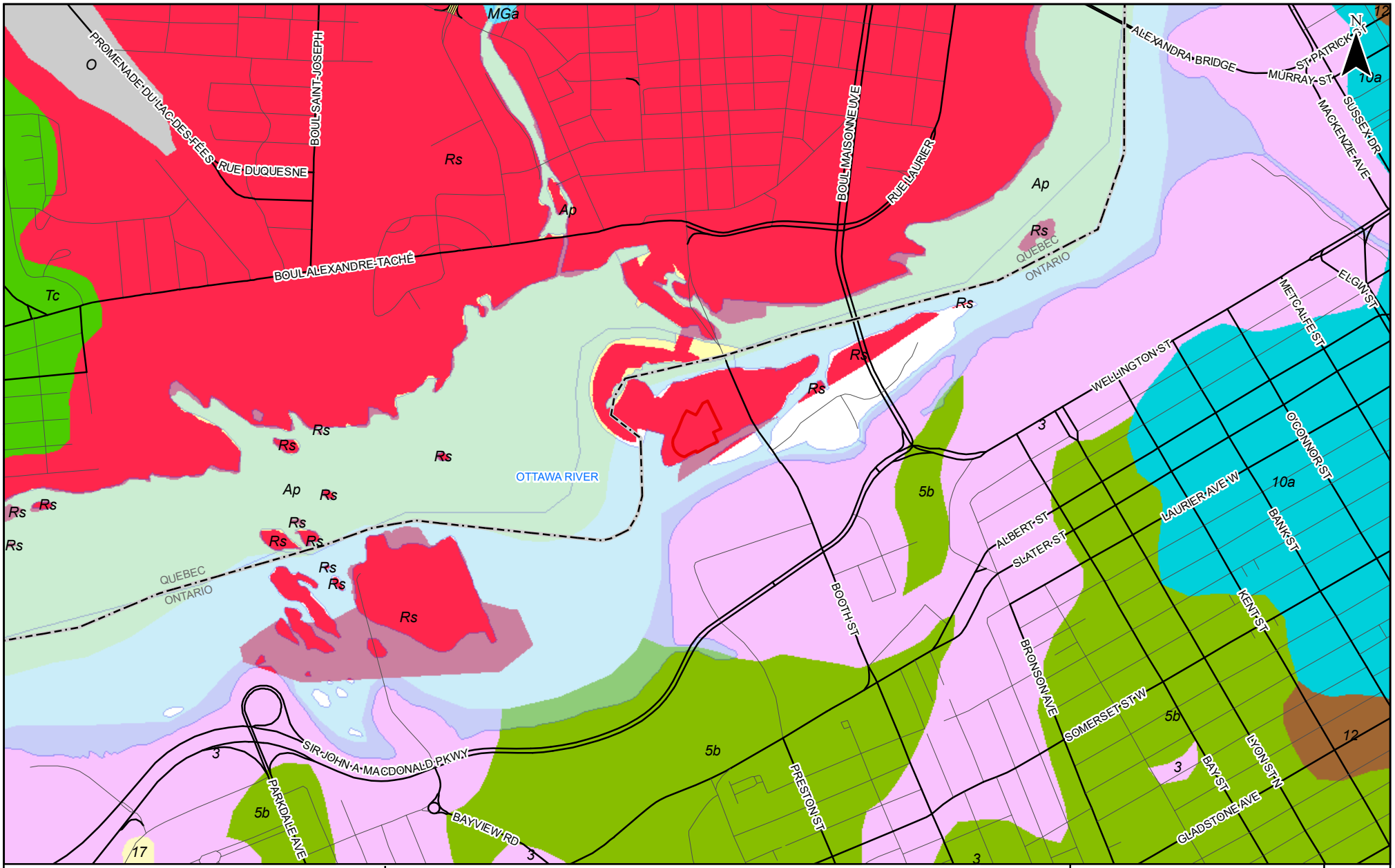
exp.

DRAWN BY: JA

CHECKED BY: PS

PROJECT NUMBER: OTT-00250193-S0

DATE: MARCH 2022



SCALE:

0 200 400 600 800 1,000 m

SOURCE:

BASED ON ONTARIO GEOLOGICAL SURVEY DATA PUBLISHED IN 2010

exp.

DRAWN BY:	CHECKED BY:
JA	PS

LEGEND:

- APPROXIMATE SITE BOUNDARY
- 12: OLDER ALLUVIAL DEPOSITS
- 5B: STONE-POOR, CARBONATE-DERIVED SILTY TO SANDY TILL
- 3: PALEOZOIC BEDROCK
- 17: EOLIAN DEPOSITS
- 10A: MASSIVE-WELL LAMINATED
- AP: ALLUVIAL
- TC: SURFICIAL TILL, GENERALLY CONTINUOUS
- O: NON-DIFFERENTIATED ORGANIC SEDIMENTS
- MGA: GLACIOMORAINE FINE SEDIMENTS
- RS: SEDIMENTARY AND/OR VOLCANIC ROCKS, GENERALLY SUB-HORIZONTAL

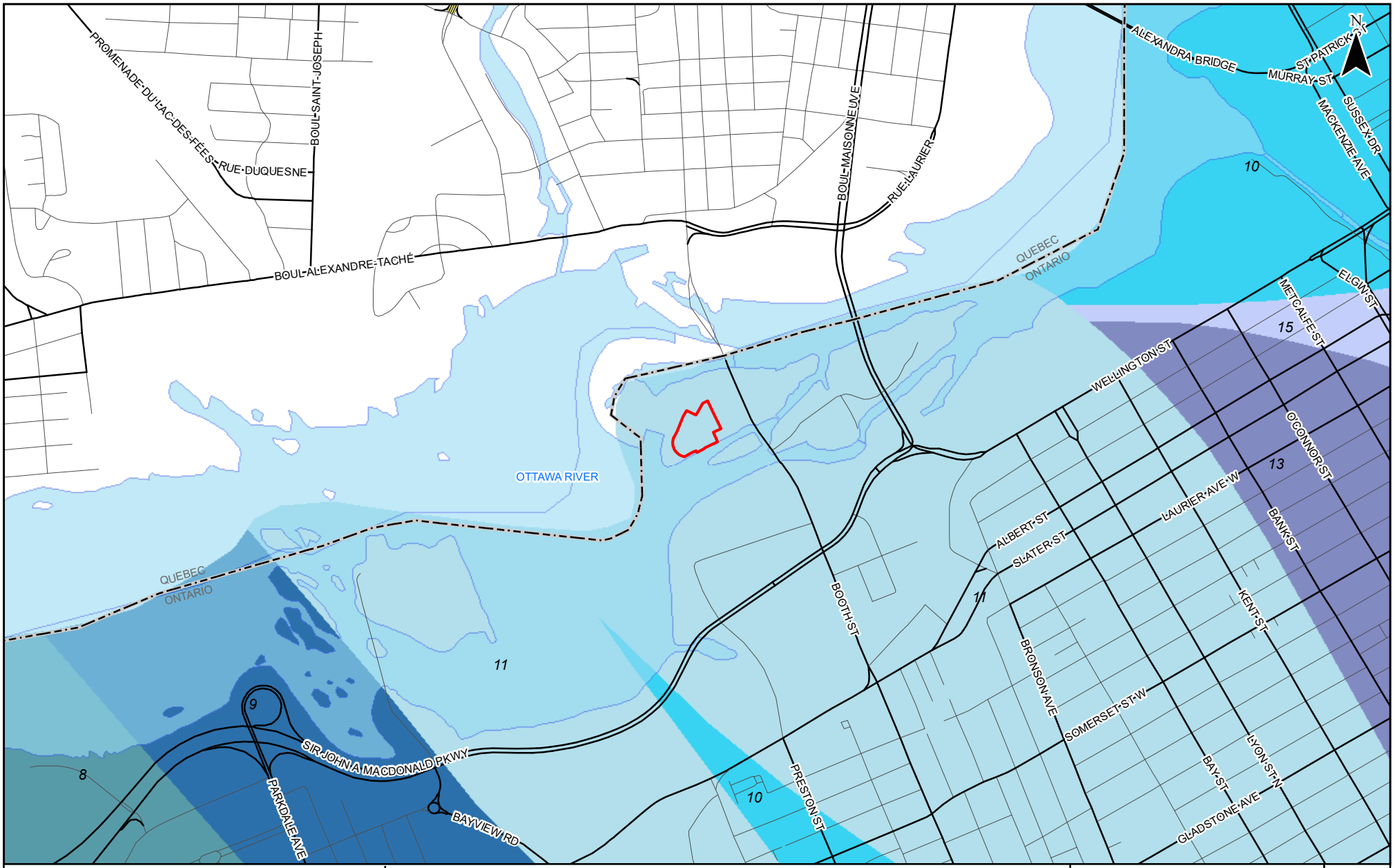
SURFICIAL GEOLOGY

FIGURE: 2A

HYDROGEOLOGICAL INVESTIGATION
BLOCKS 201, 202, 203, 204 & 205B
CHAUDIÈRE ISLAND, OTTAWA

PROJECT NUMBER: OTT-00250193-S0

DATE: MARCH 2022



SCALE:

0 200 400 600 800 1,000 m

SOURCE:

BASED ON ONTARIO GEOLOGICAL SURVEY DATA PUBLISHED IN 2010

exp.

DRAWN BY:	CHECKED BY:
JA	PS

LEGEND:

- APPROXIMATE SITE BOUNDARY
- 15: CARLSBAD
- 13: BILLINGS
- 11: LINDSAY
- 10: VERULAM
- 9: BOBCAYGEON
- 8: GULL RIVER

PALEOZOIC GEOLOGY

FIGURE: 2B

HYDROGEOLOGICAL INVESTIGATION
BLOCKS 201, 202, 203, 204 & 205B
CHAUDIÈRE ISLAND, OTTAWA

PROJECT NUMBER: OTT-00250193-S0

DATE: MARCH 2022

SCALE:

0 80 160 240 320 400 m

SOURCE:

BASED ON GOOGLE EARTH IMAGERY DATED 2020,
AVAILABLE WELL RECORD INFORMATION AS OF SEPTEMBER 2019

exp.

DRAWN BY:	CHECKED BY:
JA	PS

LEGEND:

- MONITORING WELL / TEST HOLE
- WATER SUPPLY WELL
- ABANDONED WELL
- UNCLASSIFIED / UNFINISHED WELL
- APPROXIMATE SITE BOUNDARY
- 500 m ZONE

MECP WATER WELL RECORDS MAP

FIGURE: 3

HYDROGEOLOGICAL INVESTIGATION
BLOCKS 201, 202, 203, 204 & 205B
CHAUDIÈRE ISLAND, OTTAWA

PROJECT NUMBER: OTT-00250193-S0

DATE: MARCH 2022

SCALE:

0 10 20 30 40 50 m

LEGEND:

- APPROXIMATE SITE BOUNDARY
- PROPOSED BUILDING FOOTPRINT
- CROSS SECTION AXIS
- BOREHOLE / MONITORING WELL (EXP, 2021)

exp.

DRAWN BY:	CHECKED BY:
JA	PS

BOREHOLE / MONITORING WELL LOCATION PLAN

FIGURE: 4

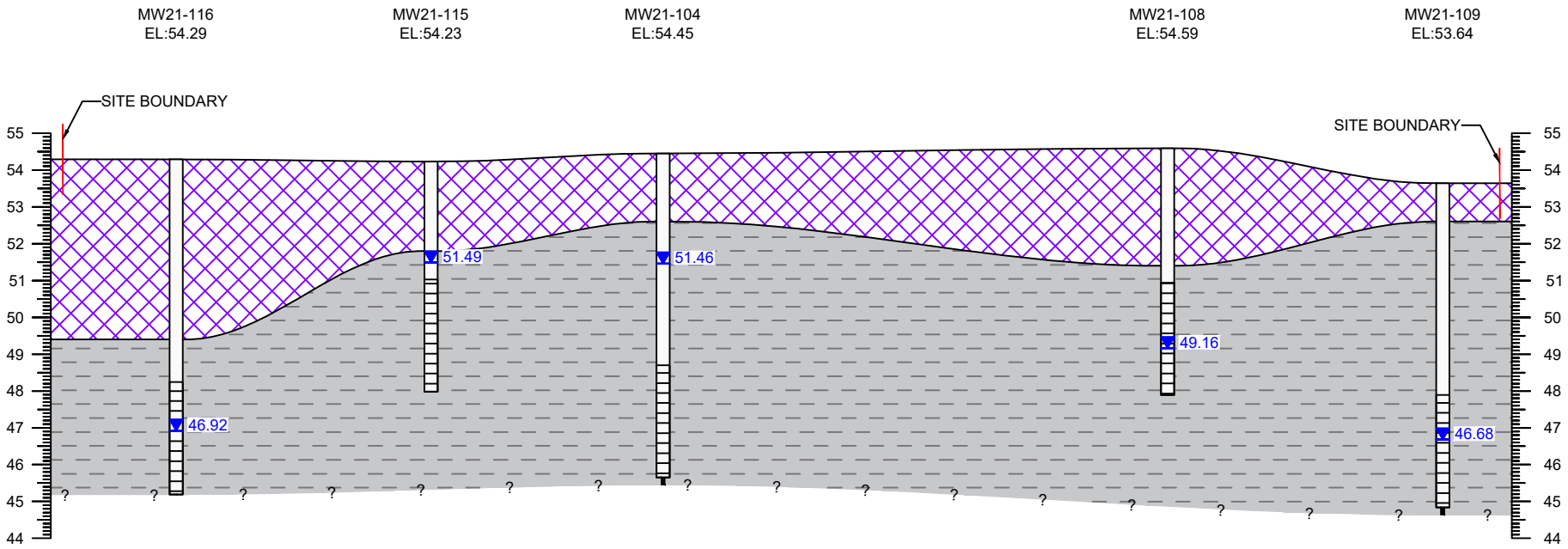
HYDROGEOLOGICAL INVESTIGATION
BLOCKS 201, 202, 203, 204 & 205B
CHAUDIÈRE ISLAND, OTTAWA

PROJECT NUMBER: OTT-00250193-S0

DATE: MARCH 2022

A
SOUTHWEST

A'
NORTHEAST



VERTICAL SCALE: AS SHOWN

HORIZONTAL SCALE:

0 8 16 24 32 40 m

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LEGEND:

FILL

LIMESTONE/SHALE BEDROCK

GROUNDWATER ELEVATION (masl)
AS MEASURED ON FEBRUARY 16, 2022

TITLE AND LOCATION:

CROSS SECTION A-A'

HYDROGEOLOGICAL INVESTIGATION
BLOCKS 201, 202, 203, 204 & 205B
CHAUDIÈRE ISLAND, OTTAWA

PROJECT NO.:	DWN.:
OTT-00250193-S0	JA
SCALE:	CK:
AS NOTED	PS
DATE:	FIG. NO.:
MARCH 2022	5

E:\OTT\OTT-00250193-S0\60 Execution\65 Drawings_Env\GIS\HG\Cross Sections\OTT-00250193-S0.dwg

SCALE:

0 10 20 30 40 50 m

exp.

DRAWN BY:	CHECKED BY:
JA	PS

LEGEND:

- APPROXIMATE SITE BOUNDARY
- PROPOSED BUILDING FOOTPRINT
- BOREHOLE / MONITORING WELL (EXP, 2021)
- GROUNDWATER CONTOUR
- GROUNDWATER FLOW DIRECTION
- [XX.XX] GROUNDWATER ELEVATION (m asl) AS MEASURED ON FEBRUARY 16, 2022

GROUNDWATER CONTOUR PLAN

FIGURE: 6

HYDROGEOLOGICAL INVESTIGATION
BLOCKS 201, 202, 203, 204 & 205B
CHAUDIÈRE ISLAND, OTTAWA

PROJECT NUMBER: OTT-00250193-S0

DATE: MARCH 2022

Appendix A – MECP WWR Summary Table

On-Site

BORE_HOLE_ID	WELL_ID	DATE	EAST83	NORTH83	ELEVATION (m ASL)	LOCATION ACCURACY	STREET	CITY	DISTANCE FROM SITE CENTROID (m)	CONSTRUCTION METHOD	WELL DEPTH (m bgs)	WATER FOUND (m BGS)	CASING DIAMETER (cm)	1st USE	2nd USE	FINAL STATUS
1007486331	7335660	2/25/2019	443657	5029747	0.0	argin of error : 30 m - 100 m		4 BOOTH STREET	Ottawa	Digging	-	2.7		Monitoring		Abandoned-Quality
1007435392	7333861	9/11/2018	443677	5029735	0.0	argin of error : 30 m - 100 m		Chaudiere Island	Ottawa	Air Percussion	4	-		Monitoring and Test Hole		Monitoring and Test Hole

Off-Site

BORE_HOLE_ID	WELL_ID	DATE	EAST83	NORTH83	ELEVATION (m ASL)	LOCATION ACCURACY	STREET	CITY	DISTANCE FROM SITE CENTROID (m)	CONSTRUCTION METHOD	WELL DEPTH (m bgs)	WATER FOUND (m BGS)	CASING DIAMETER (cm)	1st USE	2nd USE	FINAL STATUS
10030537	1508503	11/13/1953	444111	5029842	51.5	rgin of error : 100 m - 300			401	Cable Tool	43	30.5		Industrial		Water Supply
10030538	1508504	1/15/1954	444111	5029842	51.5	rgin of error : 100 m - 300			401	Cable Tool	138	18.6		Industrial		Water Supply
11172567	1534815	6/24/2004	443743	5029415	55.4	margin of error : 10 - 30 m	ET DEL P		366	Rotary (Air)	8	7		Not Used		Observation Wells
1003307217	7150373	8/5/2010	444164	5029866	48.1	argin of error : 30 m - 100 m	IDDLE S		457	Air Percussion	11	-		Monitoring and Test Hole		Monitoring and Test Hole
1003307219	7150374	8/5/2010	444180	5029856	44.8	argin of error : 30 m - 100 m	IDDLE S		471	Air Percussion	11	-		Monitoring and Test Hole		Monitoring and Test Hole
1004257813	7197842	11/28/2012	444072	5029416	55.5	argin of error : 30 m - 100 m	ONALD P	Ottawa	510		-	-		Monitoring		Abandoned Monitoring and Test Hole
1004896958	7222998	6/26/2014	444080	5029890	48.2	argin of error : 30 m - 100 m	5 MIDDLE	Ottawa	381		-	-				Abandoned-Supply
11691760	1536666	7/24/2006	443835	5029733	52.5	margin of error : 10 - 30 m	BOOTH S	OTTAWA	129	Diamond	6	-		Not Used		Test Hole
11761525	7038982	11/8/2006	443755	5029251	54.3	margin of error : 10 - 30 m	LLINGTO	OTTAWA	530	Other Method	9	-				Observation Wells
11550260	1536194	11/9/2005	443665	5029240	54.7	margin of error : 10 - 30 m	(BOORTH	OTTAWA	542	Air Percussion	12	-				Observation Wells
1001720831	7109378	5/7/2008	444188	5029632	55.3	margin of error : 10 - 30 m	NGTON S	Ottawa	496	Air Percussion	12	-		Monitoring		Test Hole
1001720831	7109378	5/7/2008	444188	5029632	55.3	margin of error : 10 - 30 m	NGTON S	Ottawa	496	Air Percussion	12	-		Monitoring		Test Hole
1002684402	7109378	5/7/2008	444180	5029518	52.3	margin of error : 10 - 30 m	NGTON S	Ottawa	534		12	-		Monitoring		Test Hole
1002684402	7109378	5/7/2008	444180	5029518	52.3	margin of error : 10 - 30 m	NGTON S	Ottawa	534		12	-		Monitoring		Test Hole
1007435380	7333857	9/12/2018	443939	5029960	0.0	argin of error : 30 m - 100 m	lidiere Isl	Ottawa	287	Air Percussion	11	-		Monitoring and Test Hole		Monitoring and Test Hole
1007435383	7333858	9/15/2018	443997	5029975	0.0	argin of error : 30 m - 100 m	udiere Isl	Ottawa	343	Air Percussion	7	-		Monitoring and Test Hole		Monitoring and Test Hole
1007435386	7333859	9/15/2018	444053	5029767	0.0	argin of error : 30 m - 100 m	udiere Isl	Ottawa	338	Air Percussion	11	-		Monitoring and Test Hole		Monitoring and Test Hole
1007435389	7333860	9/10/2018	443653	5029767	0.0	argin of error : 30 m - 100 m	udiere Isl	Ottawa	63	Air Percussion	10	-		Monitoring and Test Hole		Monitoring and Test Hole
1007435395	7333862	9/11/2018	443651	5029719	0.0	argin of error : 30 m - 100 m	udiere Isl	Ottawa	88	Air Percussion	10	-		Monitoring and Test Hole		Monitoring and Test Hole
1005405711	7242905	9/19/2013	443670	5029350	53.6	argin of error : 30 m - 100			432		-	-				
1007488487	7335688	2/25/2019	443883	5029936	0.0	argin of error : 30 m - 100			229		-	-				
1007565613	7338525	5/29/2019	443845	5029946	0.0	rgin of error : 100 m - 300	BOOTH S		211		-	-		Monitoring		Abandoned-Other
1007598076	7339940	6/12/2019	443875	5029942	0.0	rgin of error : 100 m - 300			228		-	-				

Appendix B – Survey Data and Borehole Logs

OTT-00250193-S0, Phase C100
Zibi West Chaudière Island
Monitoring Wells survey
Survey Instrument: Leica GPS
Survey Co-ordinate System: UTM18 NAD 83
Vertical Datum: CGVD28:78, Elevation 76.960m
Survey Date: December 21, 2021 and January 19, 2022
Surveyed By: Franki Lee

Point No.	UTM Northing (m)	UTM Easting (m)	PVC Pipe Top Elev. (m)	Ground Elev. (m)	Stick-Up/Stick-Down (+/-)
MW21-101	5029731.79	443724.08	54.201	54.27	-0.06
MW21-102	5029753.03	443748.43	54.668	54.78	-0.11
MW21-103	5029763.65	443773.60	55.645	55.82	-0.18
MW21-104	5029763.95	443720.60	54.306	54.45	-0.14
MW21-105	5029777.96	443754.33	54.622	54.71	-0.09
MW21-106	5029798.14	443713.35	54.007	54.09	-0.08
MW21-107	5029818.54	443726.24	53.749	53.92	-0.17
MW21-108	5029803.39	443756.11	55.462	54.59	0.87
MW21-109	5029836.03	443760.93	53.567	53.64	-0.08
MW21-110	5029841.60	443747.46	53.415	53.51	-0.09
MW21-111	5029828.62	443714.72	54.864	53.89	0.98
MW21-112	5029822.62	443691.81	55.022	54.04	0.98
MW21-113	5029775.86	443691.37	55.244	54.30	0.95
MW21-114	5029752.66	443673.98	54.182	54.29	-0.10
MW21-115	5029748.75	443700.83	55.171	54.23	0.94
MW21-116	5029726.02	443686.86	55.201	54.29	0.91
MW-01	5029837.84	443737.44	53.570	53.63	-0.05
MW-02	5029816.16	443753.93	54.070	53.94	0.13
MW-03	5029842.01	443758.87	53.44	53.57	-0.12

Note:
Accuracy of Leica GPS tie-in to COSINE Station No. 0011963U3603, level difference 10mm is acceptable.

Log of Borehole BH/MW21-01

Project No: OTT-00250193-P0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: April 28th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test (S)
Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL		Geodetic m	Depth
		Re-surveyed ground surface after remediation: 53.63 masl	53.287	0
		SAND AND GRAVEL FILL Brown, dry, no odours or staining	52.7	
		LIMESTONE AND SHALE BEDROCK		1
				2
				3
				4
				5
			47.2	6
		Borehole Terminated at 6.1 m Depth		

Standard Penetration Test N Value: 20 40 60 80
Shear Strength: 50 100 150 200 kPa
65/355mm
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60
0
SAMPLES
Natural Unit Wt. kN/m³

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 37mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-P0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BH LOGS - BLOCK 206 POST REMEDIATION.GPJ TROW OTTAWA.GDT 1/31/22

Log of Borehole BH/MW21-02

Project No: OTT-00250193-P0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: April 28th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test (S)
Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL		Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		Re-surveyed ground surface after remediation: 53.94 masl						
		SAND AND GRAVEL FILL Brown, dry, no odours or staining	53.732	0	64/432mm	45		
		LIMESTONE AND SHALE BEDROCK	53.1	1				
				2				
				3				
				4				
				5				
				6				
			47.0					
		Borehole Terminated at 6.7 m Depth						

Standard Penetration Test N Value: 20 40 60 80
Shear Strength: 50 100 150 200 kPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 37mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-P0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BH LOGS - BLOCK 206 POST REMEDIATION.GPJ TROW OTTAWA.GDT 1/31/22

Log of Borehole BH/MW21-03

Project No: OTT-00250193-P0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: April 28th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test

Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL		Geodetic m	Depth
		Re-surveyed ground surface after remediation: 53.57 masl	53.477	0
		SAND AND GRAVEL FILL Brown, dry, no odours or staining	52.9	
		LIMESTONE AND SHALE BEDROCK		1
				2
				3
				4
				5
			47.4	6
		Borehole Terminated at 6.1 m Depth		

Standard Penetration Test N Value: 20 40 60 80
Shear Strength: 50 100 150 200 kPa
60/280mm

Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60
45

SAMPLES

Natural Unit Wt. kN/m³

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 37mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-P0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BH LOGS - BLOCK 206 POST REMEDIATION.GPJ TROW OTTAWA.GDT 1/31/22

Log of Borehole BH/MW21-101

Project No: OTT-00250193-P0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: March 17th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test (S)
Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

Re-surveyed ground surface after remediation: 54.27 masl

Geodetic m	Depth	Description
54.792	0	**SAND AND GRAVEL FILL** Grey, dry turning moist, no odours or staining
53.6	1	**SILTY SAND AND GRAVEL** Grey, moist turning wet, no odours or staining
51.5	3	**LIMESTONE BEDROCK**
47.7	7	**Borehole Terminated at 7.1 m Depth**

Standard Penetration Test N Value: 20 40 60 80
Shear Strength kPa: 50 100 150 200
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60

10
14
26
37
70/152 mm

Natural Unit Wt. kN/m³

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 37mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-P0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
March 25th, 2021	5.5	
April 1st, 2021	5.5	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BH LOGS - ZIBI.GPJ TROW OTTAWA.GDT 4/1/21

Log of Borehole MW21-102

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 2

Date Drilled: December 16th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test

Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		SAND AND GRAVEL FILL Boulders and cobbles, trace brick, some metal, some charred material, brown, dry to moist, some odour present, (compact to very dense).	54.775	0		0	G1	
				1	50 for 100 mm	0	SS1	
				2	34	5	SS2	
				2	16	35	SS3	
		BEDROCK Good to excellent quality limestone/shale, grey, some poured concrete in top 200 mm.	51.9	3			RUN 1	
				5			RUN 2	
				7			RUN 3	
				8			RUN 4	
				10			RUN 5	

Continued Next Page

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	6.4	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	2.9 - 4.4	100	75
2	4.4 - 5.95	100	82
3	5.95 - 7.46	100	76
4	7.46 - 9	100	90
5	9 - 10.5	100	86
6	10.5 - 11.9	100	90

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

Log of Borehole MW21-102

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Figure No. 4

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa (20 40 60 80 / 50 100 150 200)	Combustible Vapour Reading (ppm) 250 500 750 / Natural Moisture Content % Atterberg Limits (% Dry Weight) 20 40 60	SAMPLES	Natural Unit Wt. kN/m³
		BEDROCK Good to excellent quality limestone/shale, grey, some poured concrete in top 200 mm. *(continued)*	44.775	10				
				11				RUN 6
			42.9					
		Borehole Terminated at 11.9 m Depth						

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	6.4	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	2.9 - 4.4	100	75
2	4.4 - 5.95	100	82
3	5.95 - 7.46	100	76
4	7.46 - 9	100	90
5	9 - 10.5	100	86
6	10.5 - 11.9	100	90

Log of Borehole BH/MW21-103

Project No: OTT-00250193-P0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: March 15th and 18th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test (S)

Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL		Geodetic m	Depth
		Re-surveyed ground surface after remediation: 55.82 masl	54.308	0
		ASPHALT	54.2	
		SAND AND GRAVEL FILL Brown, dry, no odours or staining	53.7	
		SAND Some gravel, brown to black, moist turning wet, no odours or staining		1
				2
			51.5	3
		LIMESTONE BEDROCK		4
				5
				6
			47.4	
		Borehole Terminated at 6.9 m Depth		

Standard Penetration Test N Value: 20 40 60 80
Shear Strength: 50 100 150 200 kPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60
SAMPLES
Natural Unit Wt. kN/m³

26
5
3
65/203 mm

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 37mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-P0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
March 25th, 2021	2.0	
April 1st, 2021	1.8	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BH LOGS - ZIBI.GPJ TROW OTTAWA.GDT 4/1/21

Log of Borehole MW21-104

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: December 14th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test (S)
Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		ASPHALT ~ 50mm	54.445	0		0	G1	
		SAND AND GRAVEL FILL Brown, dry, no odour or staining, (compact).	54.4					
				1	28	0	SS1	
					73 for 305 mm	0	SS2	
		BEDROCK Poor to excellent quality limestone/shale, grey.	52.6	2			RUN 1	
				3			RUN 2	
				4				
				5			RUN 3	
				6				
				7			RUN 4	
				8			RUN 5	
		Borehole Terminated at 9.0 m Depth	45.4	9				

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	2.7	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	1.88 - 2.99	100	48
2	2.99 - 4.49	93	73
3	4.49 - 6.02	98	85
4	6.02 - 7.49	100	96
5	7.49 - 9	100	90

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

Log of Borehole MW21-105

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: December 14th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test

Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		ASPHALT ~ 50mm	54.709	0				
		SAND AND GRAVEL FILL Some concrete, brown, dry, odour and staining present, (dense to very dense).	54.7			0	G1	
				1	50 for 152 mm	5	SS1	
				2	93 for 228 mm	25	SS2	
					88	25	SS3	
		BEDROCK Good to excellent quality limestone/shale, grey, some poured concrete at top.	51.8	3			RUN 1	
				4				
				5			RUN 2	
				6				
				7			RUN 3	
				8			RUN 4	
			45.9					
		Borehole Terminated at 8.84 m Depth						

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	3.9	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	2.9 - 4.37	100	79
2	4.37 - 5.86	100	100
3	5.86 - 7.46	100	92
4	7.46 - 8.84	100	95

Log of Borehole MW21-106

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: December 14th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test
Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		ASPHALT ~ 50mm	54.09	0				
		SAND AND GRAVEL FILL Trace clay, brown, dry, no odour or staining, (compact).	54.0			0	G1	
					60 for 228 mm	5	SS1	
		BEDROCK Fair to excellent quality limestone/shale, grey.	53.0	1			RUN 1	
				2				
				3			RUN 2	
				4				
				5			RUN 3	
		Borehole Terminated at 5.8 m Depth	48.3					

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	3.2	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	1.07 - 2.64	100	77
2	2.64 - 4.26	100	72
3	4.26 - 5.8	100	98

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

Log of Borehole MW21-107

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 2

Date Drilled: December 13th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test

Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		ASPHALT ~ 50mm	53.918	0				
		SAND AND GRAVEL FILL Some asphalt, some wood, brown to grey, dry, no odour or staining.	53.9			0		G1
				1	55 for 300 mm	0		SS1
		BEDROCK Fair to excellent quality limestone/shale, grey.	52.8	2				RUN 1
				3				RUN 2
				4				
				5				RUN 3
				6				
				7				RUN 4
				8				RUN 5
				9				
				10				RUN 6

Continued Next Page

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	3.9	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	1.04 - 2.64	100	66
2	2.64 - 4.26	100	100
3	4.26 - 5.83	100	92
4	5.83 - 7.35	100	86
5	7.35 - 8.9	100	96
6	8.9 - 10.4	100	90
7	10.4 - 11.9	100	100

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

Log of Borehole MW21-107

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Figure No. 4

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa (20 40 60 80 / 50 100 150 200)	Combustible Vapour Reading (ppm) 250 500 750 / Natural Moisture Content % Atterberg Limits (% Dry Weight) 20 40 60	SAMPLES	Natural Unit Wt. kN/m³
		BEDROCK Fair to excellent quality limestone/shale, grey. *(continued)*	43.918	10			RUN 7	
				11				
		Borehole Terminated at 11.9 m Depth	42.0					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	3.9	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	1.04 - 2.64	100	66
2	2.64 - 4.26	100	100
3	4.26 - 5.83	100	92
4	5.83 - 7.35	100	86
5	7.35 - 8.9	100	96
6	8.9 - 10.4	100	90
7	10.4 - 11.9	100	100

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

Log of Borehole MW21-108

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: December 15th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test (S)
Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		SAND AND GRAVEL FILL Some concrete, some charred material, some clay, brown, dry to moist, slight odour present, (loose to very dense).	54.589	0		0	G1	
				1	85	5	SS1	
				2	12	0	SS2	
					6	0	SS3	
				3	50 for 76 mm	0	SS4	
		BEDROCK Fair to excellent quality limestone/shale, grey.	51.4	4			RUN 2	
				5			RUN 3	
				6			RUN 4	
		Borehole Terminated at 6.7 m Depth	47.9					

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	4.5	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	3.2 - 4.47	100	55
2	4.47 - 6.04	100	90
3	6.04 - 6.7	88	69

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

Log of Borehole MW21-109

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: December 15th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test (S)
Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		GRAVEL FILL GRANULAR 'A' Some sand, some crushed stone, brown, dry, (compact).	53.643	0			G1	
					56 for 254 mm		SS1	
		BEDROCK Good to excellent quality limestone/shale, grey.	52.6	1			RUN 1	
				2				
				3			RUN 2	
				4				
				5			RUN 3	
				6				
				7			RUN 4	
				8				
							RUN 5	
			44.6	9				
		Borehole Terminated at 9 m Depth						

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	5.9	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	1.01 - 2.59	100	76
2	2.59 - 4.24	97	92
3	4.24 - 5.4	100	100
4	5.4 - 7.42	100	84
5	7.42 - 9	100	93

Log of Borehole MW21-110

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 2

Date Drilled: December 15th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test (S)
Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		GRAVEL FILL GRANULAR 'A' Some sand, some crushed stone, brown, dry, (compact).	53.505	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60	G1	
					56 for 203 mm		SS1	
		BEDROCK Fair to excellent quality limestone/shale, grey.	52.5	1			RUN 1	
				2				
				3			RUN 2	
				4				
				5			RUN 3	
				6				
				7			RUN 4	
				8			RUN 5	
				9				
				10			RUN 6	

Continued Next Page

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	7.0	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	0.96 - 2.59	95	61
2	2.59 - 4.16	100	92
3	4.16 - 5.69	100	95
4	5.69 - 7.26	97	97
5	7.26 - 8.78	100	92
6	8.78 - 10.41	100	95
7	10.41 - 11.9	100	76

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

Log of Borehole MW21-110

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Figure No. 4

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		BEDROCK Fair to excellent quality limestone/shale, grey. *(continued)*	43.505	10	20 40 60 80 Shear Strength kPa 50 100 150 200	250 500 750 Natural Moisture Content % Atterberg Limits (% Dry Weight) 20 40 60		
				11				RUN 7
			41.6					
		Borehole Terminated at 11.9 m Depth						

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	7.0	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	0.96 - 2.59	95	61
2	2.59 - 4.16	100	92
3	4.16 - 5.69	100	95
4	5.69 - 7.26	97	97
5	7.26 - 8.78	100	92
6	8.78 - 10.41	100	95
7	10.41 - 11.9	100	76

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

Log of Borehole MW21-111

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: December 13th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test
Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		SAND AND GRAVEL FILL Some clay, some brick, brown, dry, slight odour/staining.	53.887	0	50 for 127 mm	5	G1	
			52.9	1		0	SS1	
		BEDROCK Fair to excellent quality limestone/shale, grey.		1			RUN 1	
				2				
				3			RUN 2	
				4				
				5			RUN 3	
			48.1					
		Borehole Terminated at 5.8 m Depth						

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	4.7	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	1 - 2.6	100	74
2	2.6 - 4.2	100	95
3	4.2 - 5.8	100	92

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

Log of Borehole MW21-112

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: December 13th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test (S)
Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		SAND AND GRAVEL FILL Some clay, some wood slivers, brown, dry to moist, no odour or staining, (compact to dense).	54.038	0		0	G1	
				1	34	0	SS1	
				2	26	0	SS2	
					54 for 330 mm	5	SS3	
		BEDROCK Poor to excellent quality limestone/shale, grey.	51.2	3			RUN 1	
				4				
				5			RUN 2	
				6				
				7			RUN 3	
				8			RUN 4	
			45.2					
		Borehole Terminated at 8.84 m Depth						

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	3.1	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	2.79 - 4.34	100	83
2	4.34 - 5.84	100	46
3	5.84 - 7.36	100	90
4	7.36 - 8.84	100	92

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

Log of Borehole MW21-113

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: December 10th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test

Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		SAND AND GRAVEL FILL Some clay, trace brick, brown, dry, no odour or staining, (compact to very dense).	54.296	0	50 for 76 mm			
				1	41	0	SS1	
				1	14	0	SS2	
				2	80 for 330 mm	0	SS3	
		BEDROCK Fair quality limestone/shale, grey.	51.7	3			RUN 1	
				5			RUN 2	
				6			RUN 3	
		Borehole Terminated at 6.25 m Depth	48.0					

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	4.7	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	2.6 - 4.26	100	69
2	4.26 - 5.75	96	75
3	5.75 - 6.2	73	74

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

Log of Borehole MW21-114

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: December 10th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test (S)
Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		SAND AND GRAVEL FILL Boulders and cobbles, some clay, some wood, brown, dry to wet, no odour or staining, (loose to very dense).	54.286	0		10	G1	
				1	50	10	SS1	
				2	52	5	SS2	
					19	10	SS3	
				3	6	10	SS4	
				4	6	10	SS5	
					5	5	SS6	
				5	4			
				6	39	5	SS7	
				7	8	10	SS8	
					4	10	SS9	
				8	3			
				9				
		- Bedrock depth confirmed at 9.75 m	44.5					
		Borehole Terminated at 9.75 m Depth						

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
	dry	

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole MW21-115

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: December 10th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test (S)
Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		SAND AND GRAVEL FILL Boulders and cobbles, some charred material, some brick, brown, dry, no odour or staining, (loose to very dense).	54.231	0		15	G1	
				1	3	0	SS1	
				2	6	5	SS2	
					50 for 127 mm	5	SS3	
		BEDROCK Poor to excellent quality limestone/shale, grey.	51.8	3			RUN 1	
				4				
				5			RUN 2	
				6			RUN 3	
		Borehole Terminated at 6.25 m Depth	48.0					

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	3.6	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	2.4 - 4.1	100	44
2	4.1 - 5.7	97	92
3	5.7 - 6.25	100	100

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

Log of Borehole MW21-116

Project No: OTT-00250193-S0

Project: Phase II Environmental Site Assessment

Location: 4 Booth Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: December 10th, 2021

Drill Type: CME Truck Mount

Datum: Geodetic

Logged by: JE Checked by: PS

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test (S)
Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		SAND AND GRAVEL FILL Wood, some charred material, trace brick brick, brown, dry to wet, no odour or staining, (loose to very dense).	54.293	0		0		G1
				1		5		SS1
				2		5		SS2
				2		5		SS3
				3		15		SS4
				4		35		SS5
				4	61 for 100 mm	40		SS6
			49.4	5				RUN 1
		BEDROCK Fair to good quality limestone/shale, grey.		6				
				7				RUN 2
				8				
				8				RUN 3
			45.2	9				
		Borehole Terminated at 9.1 m Depth						

LOG OF BOREHOLE BH LOGS - BLOCK 201 - 205.GPJ TROW OTTAWA.GDT 1/13/22

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50mm PVC monitoring well was installed upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00250193-S0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
	8.1	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	4.51 - 6.4	95	63
2	6.4 - 7.9	100	65
3	7.9 - 9.1	100	77

Appendix C – Groundwater Elevation Summary

Appendix C: Groundwater Elevation Summary

Blocks 201, 202, 203, 204 & 205 B, Chaudiere Island, Ottawa
OTT-00250193-S0

Monitoring Well ID	Location	Ground Surface Elevation (masl)	Stick-Up/Down (+/-)	Approximate Full Well Depth (mbgs)	Depth	3-Feb-22	16-Feb-22
MW21-01 *	Eastern Blcoks	53.63	-0.05	6.1	mbTOP	6.20	5.44
					mbgs	6.25	5.49
					masl	47.38	48.14
MW21-02 *	Eastern Blcoks	53.94	0.13	6.7	mbTOP	5.08	4.80
					mbgs	4.95	4.67
					masl	48.99	49.27
MW21-03 *	Eastern Blcoks	53.57	-0.13	6.1	mbTOP	Inaccessible	2.99
					mbgs		3.12
					masl		50.45
MW21-101 *	On the Road	54.27	-0.06	7.1	mbTOP	Inaccessible	1.74
					mbgs		1.80
					masl		52.47
MW21-102	Eastern Blcoks	54.78	-0.11	11.80	mbTOP	6.37	6.12
					mbgs	6.48	6.23
					masl	48.30	48.55
MW21-103 *	Eastern Blcoks	55.82	-0.18	7.1	mbTOP	Inaccessible	5.50
					mbgs		5.68
					masl		50.14
MW21-104	Eastern Blcoks	54.45	-0.14	8.80	mbTOP	2.86	2.85
					mbgs	3.00	2.99
					masl	51.45	51.46
MW21-105	Eastern Blcoks	54.71	-0.09	8.70	mbTOP	4.41	4.34
					mbgs	4.50	4.43
					masl	50.21	50.28
MW 21-106	Eastern Blcoks	54.09	-0.08	5.8	mbTOP	3.59	3.21
					mbgs	3.67	3.29
					masl	50.42	50.80
MW21-107	Eastern Blcoks	53.92	-0.17	11.80	mbTOP	3.96	3.63
					mbgs	4.13	3.80
					masl	49.79	50.12
MW21-108	Eastern Blcoks	54.59	0.87	6.2	mbTOP	6.61	6.30
					mbgs	5.74	5.43
					masl	48.85	49.16
MW21-109	Eastern Blcoks	53.64	-0.08	8.80	mbTOP	Inaccessible	6.88
					mbgs		6.96
					masl		46.68
MW21-110	Eastern Blcoks	53.51	-0.09	11.80	mbTOP	Inaccessible	6.91
					mbgs		7.00
					masl		46.51
MW21-111	Western Blocks	53.89	0.98	5.80	mbTOP	4.83	4.60
					mbgs	3.85	3.62
					masl	50.04	50.27
MW21-112	Western Blocks	54.04	0.98	8.80	mbTOP	3.81	3.80
					mbgs	2.83	2.82
					masl	51.21	51.22
MW21-113	Western Blocks	54.30	0.95	6.30	mbTOP	4.73	4.59
					mbgs	3.78	3.64
					masl	50.52	50.66
MW21-114	Western Blocks	54.29	-0.10	8.80	mbTOP	Dry	Dry
					mbgs		
					masl		
MW21-115	Western Blocks	54.23	0.94	6.30	mbTOP	3.76	3.68
					mbgs	2.82	2.74
					masl	51.41	51.49
MW21-116	Western Blocks	54.29	0.91	9.10	mbTOP	8.26	8.28
					mbgs	7.35	7.37
					masl	46.94	46.92

Notes:

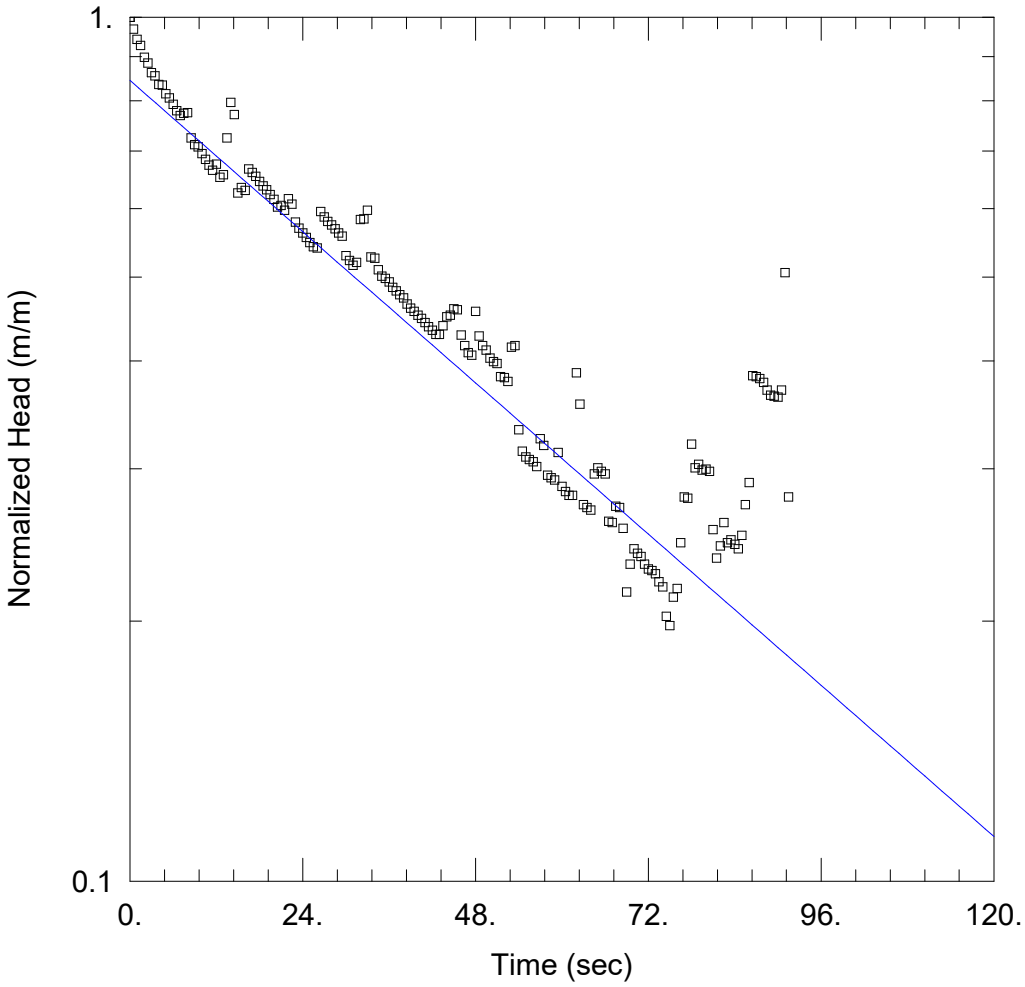
mbTOP - meters below top of the pipe

mbgs - meters below ground surface

masl - meters above mean sea level

* Re-surveyed after remediation

Appendix D – SWRT Procedures and Results



MW 21-102_RISING HEAD SWRT

Data Set: \...\MW 21-102 Rising Head.aqt
Date: 02/22/22 Time: 13:54:38

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-S0
Location: Blocks205West Chaudière Island
Test Date: 21 January 2022

AQUIFER DATA

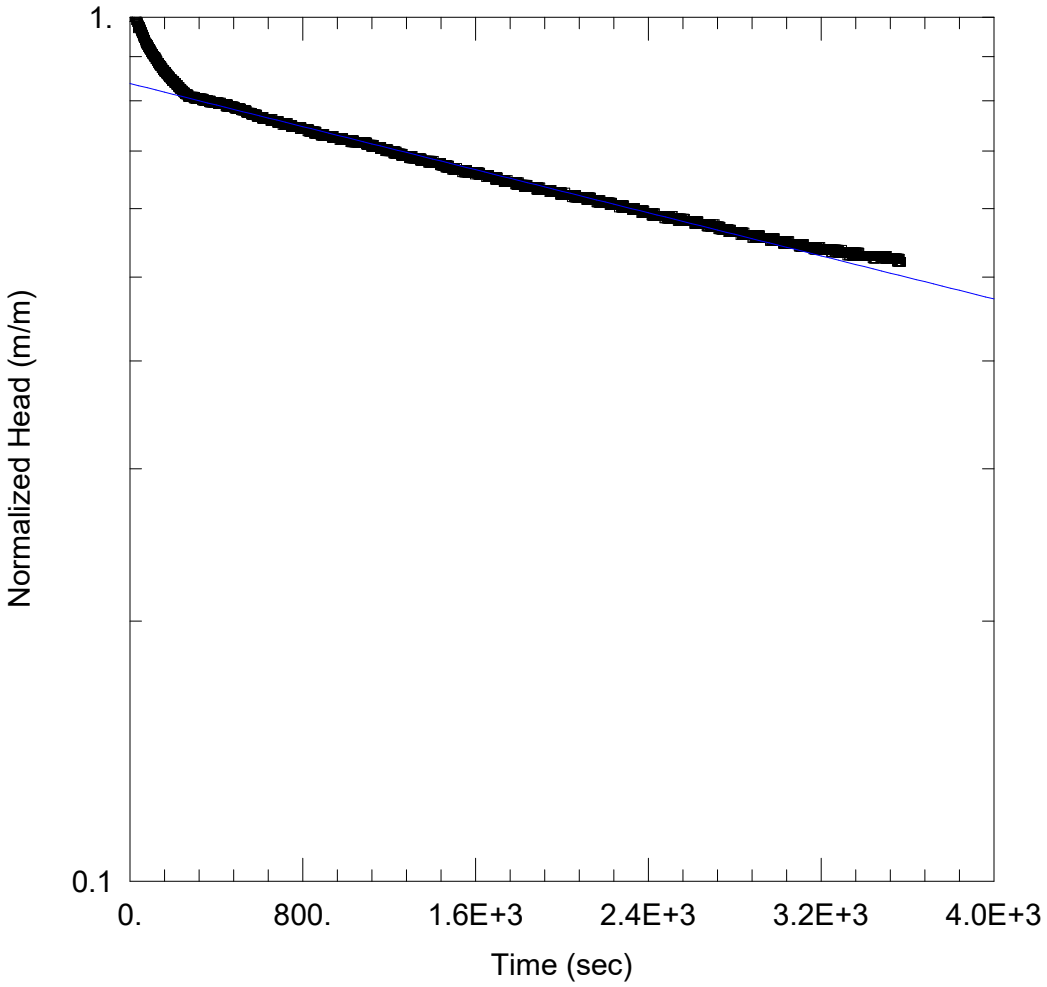
Saturated Thickness: 5.51 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW 21-102)

Initial Displacement: 1.027 m
Total Well Penetration Depth: 5.51 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.51 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 7.884E-6 m/sec
y0 = 0.8675 m



MW 21-103_FALLING HEAD SWRT

Data Set: \...\MW 21-103 - FH.aqt
Date: 03/15/22 Time: 13:23:06

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-A0
Location: West Chaudière Island, Ottawa
Test Date: 4 March 2022

AQUIFER DATA

Saturated Thickness: 1.37 m Anisotropy Ratio (Kz/Kr): 1.

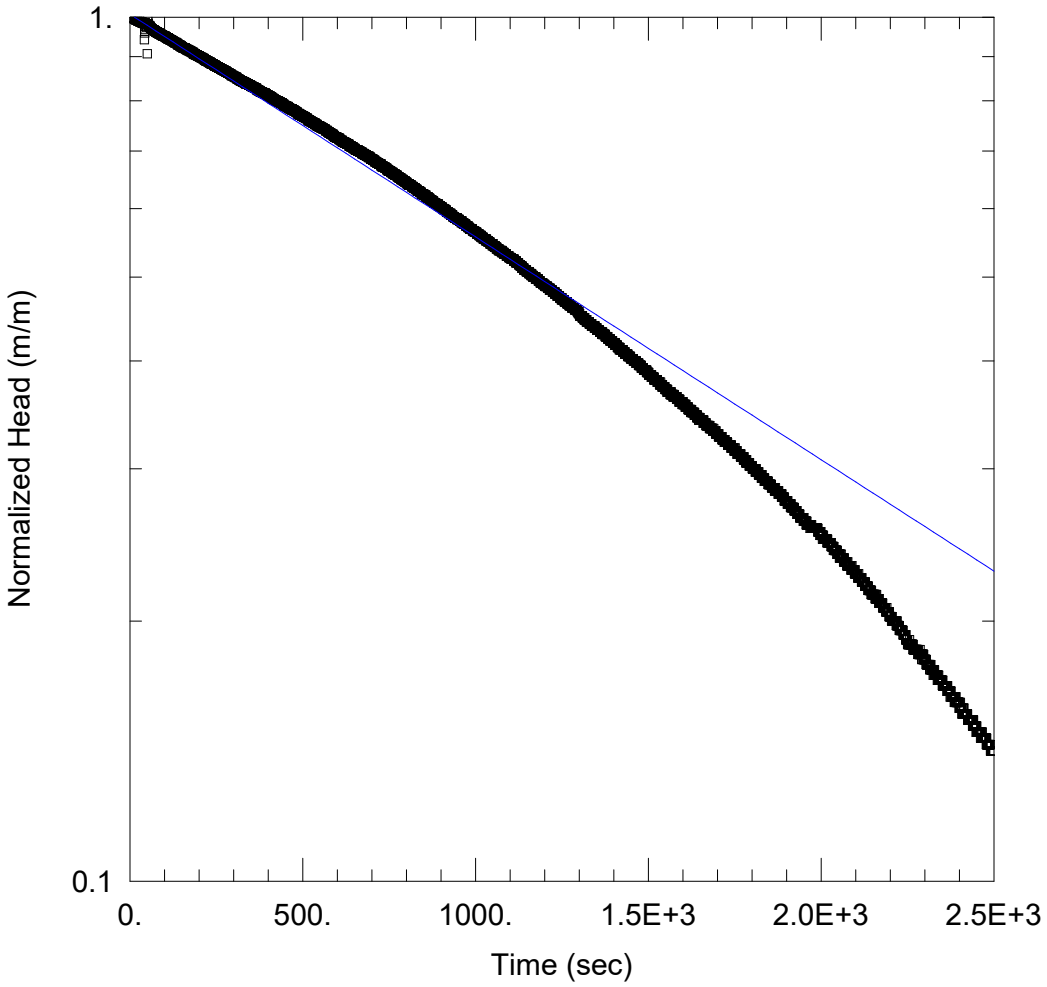
WELL DATA (MW 21-103)

Initial Displacement: 0.236 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 1.37 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.791E-7 m/sec y0 = 0.1977 m



MW 21-103_RISING HEAD SWRT

Data Set: \...\MW 21-103 - RH.aqt
Date: 03/15/22 Time: 13:28:56

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-A0
Location: West Chaudière Island, Ottawa
Test Date: 4 March 2022

AQUIFER DATA

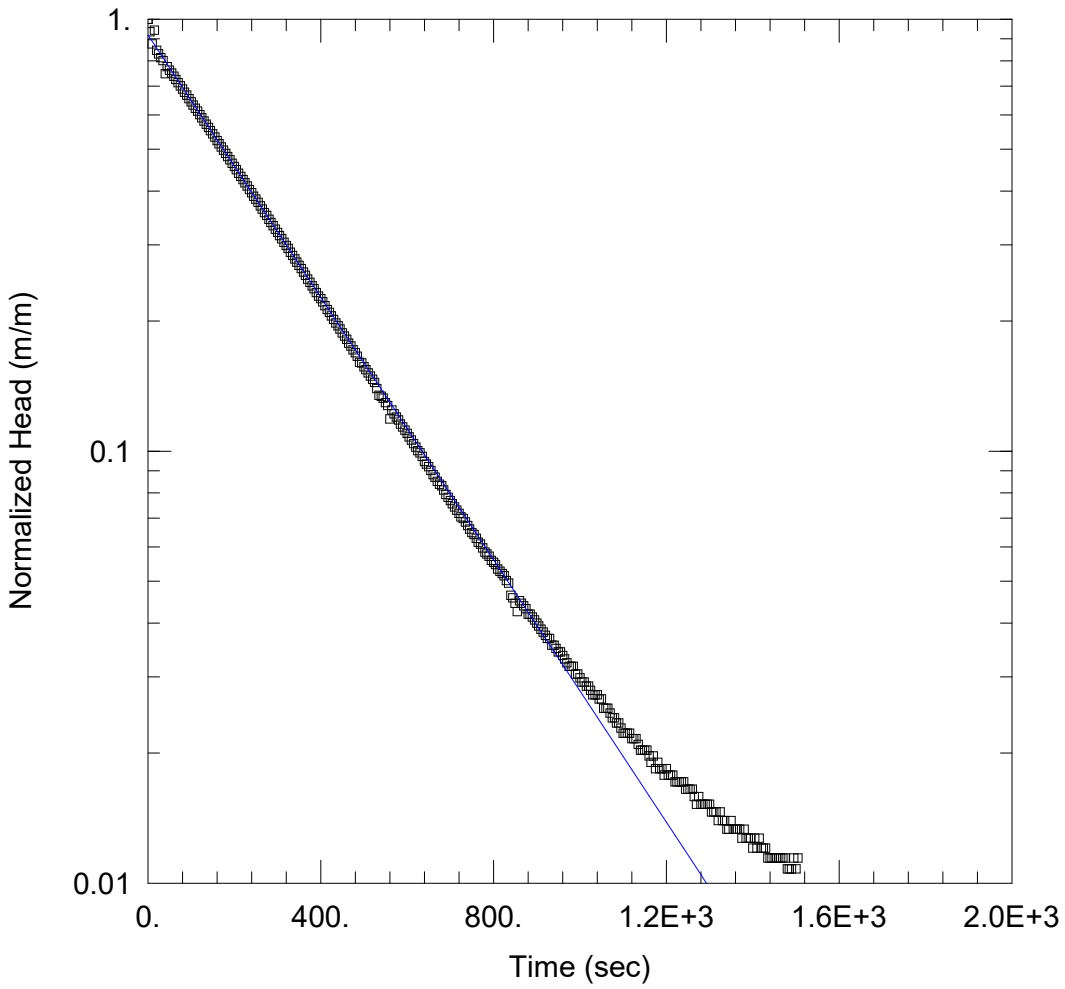
Saturated Thickness: 1.41 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW 21-103)

Initial Displacement: 0.41 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 1.41 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 7.195E-7 m/sec
y0 = 0.4132 m



MW 21-104_FALLING HEAD SWRT

Data Set: \...\MW 21-104 Falling Head.aqt
Date: 02/22/22 Time: 15:29:06

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-S0
Location: Blocks205West Chaudière Island
Test Date: 21 January 2022

AQUIFER DATA

Saturated Thickness: 6.27 m Anisotropy Ratio (Kz/Kr): 1.

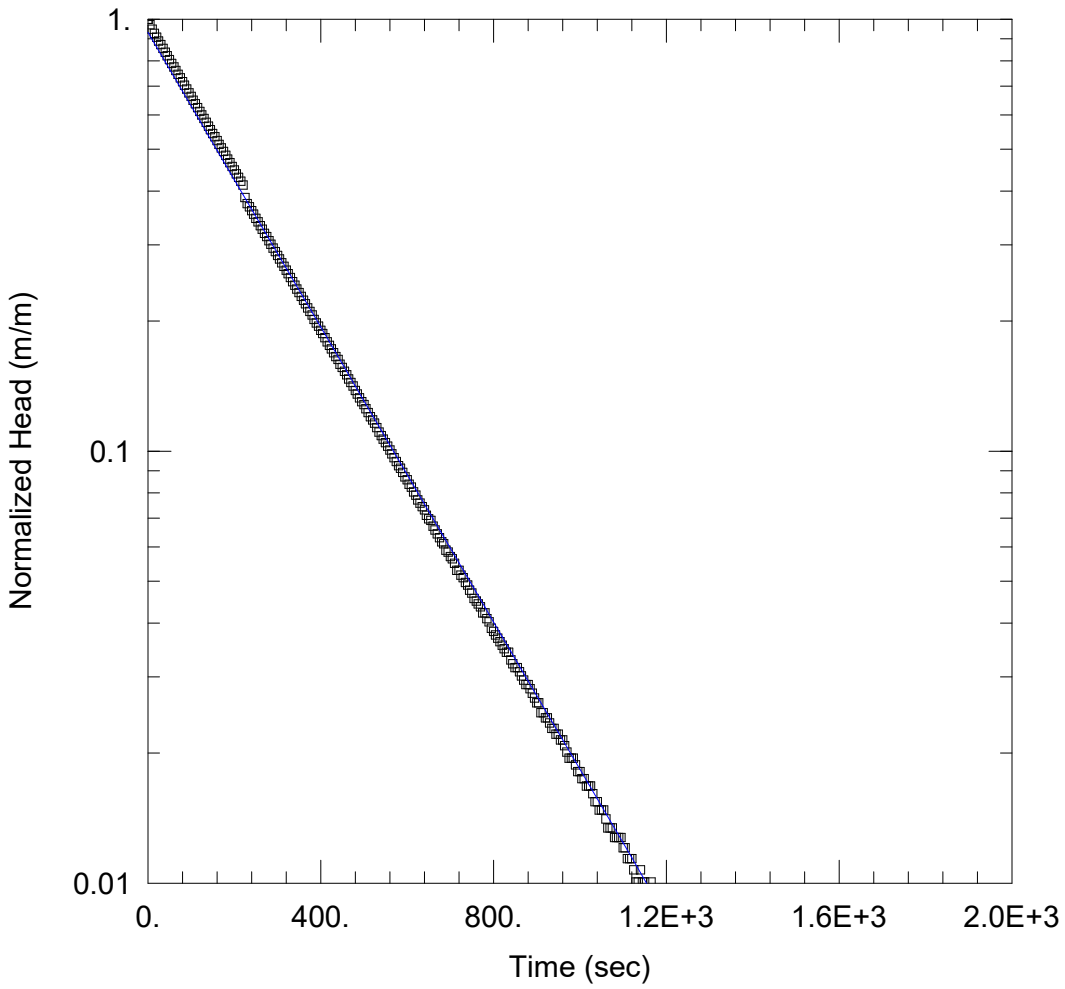
WELL DATA (MW 21-104)

Initial Displacement: 1.575 m
Total Well Penetration Depth: 6.27 m
Casing Radius: 0.0254 m
Static Water Column Height: 6.27 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.641E-6 m/sec y0 = 1.447 m



MW 21-104_RISING HEAD SWRT

Data Set: \...\MW 21-104 Rising Head.aqt
Date: 02/22/22 Time: 15:25:35

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-S0
Location: Blocks205West Chaudière Island
Test Date: 21 January 2022

AQUIFER DATA

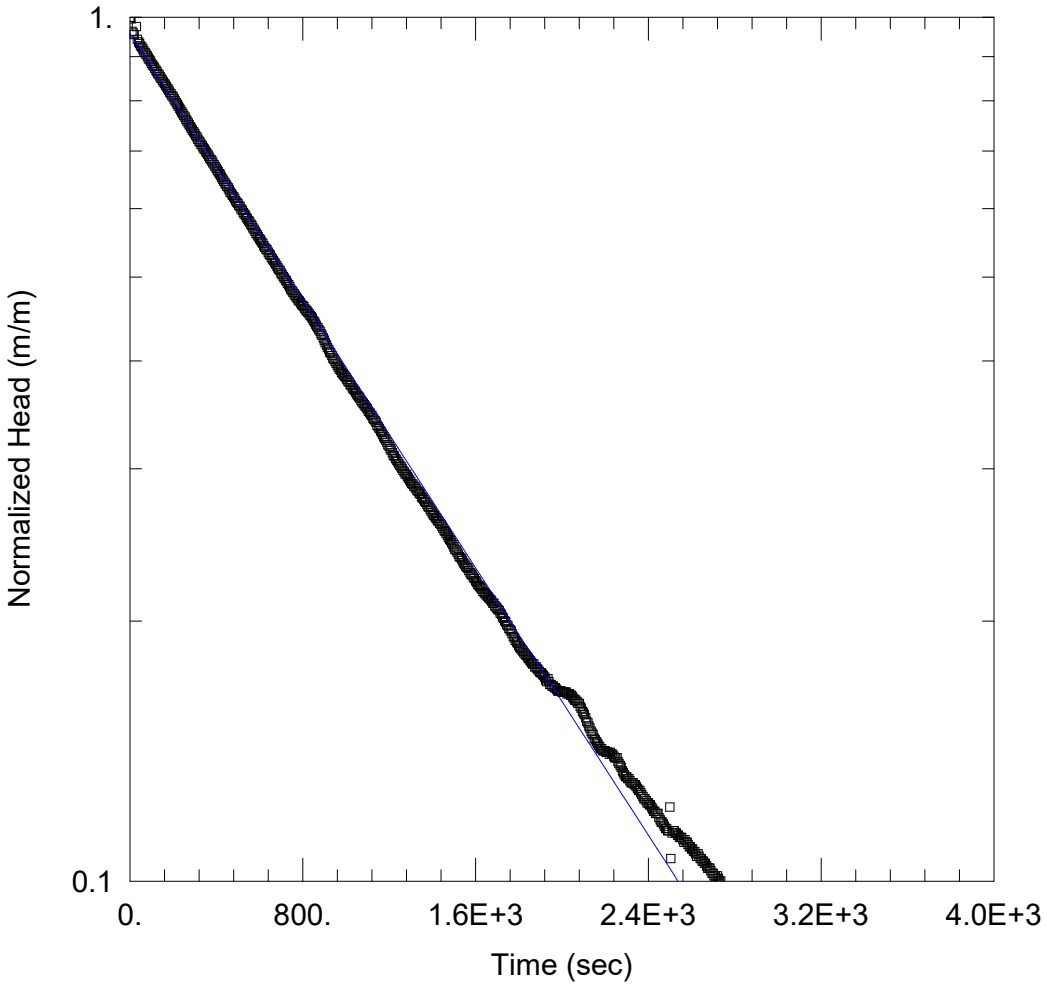
Saturated Thickness: 6.27 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW 21-104)

Initial Displacement: 1.491 m
Total Well Penetration Depth: 6.27 m
Casing Radius: 0.0254 m
Static Water Column Height: 6.27 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.844E-6 m/sec
y0 = 1.389 m



MW 21-105_FALLING HEAD SWRT

Data Set: \...\MW 21-105 Falling Head.aqt
Date: 02/22/22 Time: 15:35:51

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-S0
Location: Blocks205West Chaudière Island
Test Date: 21 January 2022

AQUIFER DATA

Saturated Thickness: 4.65 m Anisotropy Ratio (Kz/Kr): 1.

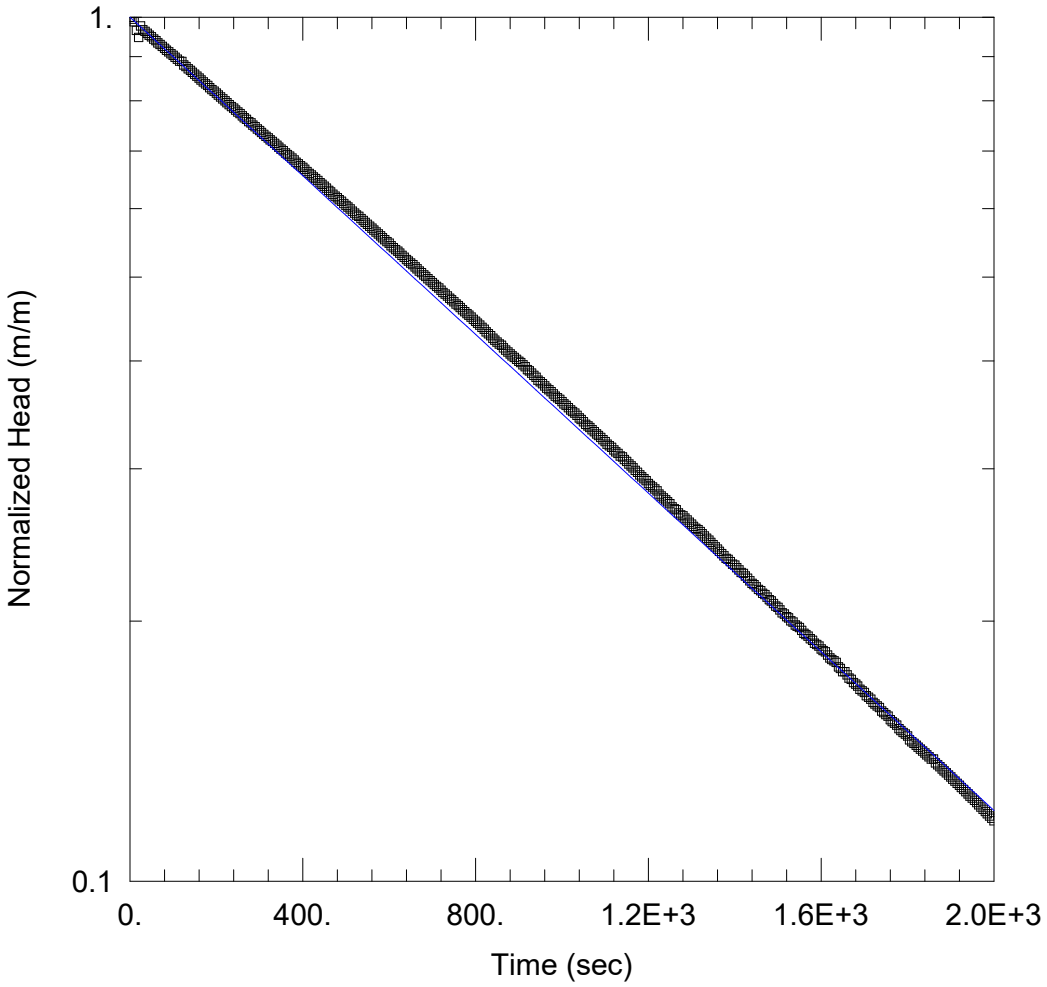
WELL DATA (MW 21-105)

Initial Displacement: 1.469 m
Total Well Penetration Depth: 4.65 m
Casing Radius: 0.0254 m
Static Water Column Height: 4.65 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 4.18E-7 m/sec y0 = 1.407 m



MW 21-105_RISING HEAD SWRT

Data Set: \...\MW 21-105 Rising Head.aqt
Date: 02/22/22 Time: 15:39:26

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-S0
Location: Blocks205West Chaudière Island
Test Date: 21 January 2022

AQUIFER DATA

Saturated Thickness: 4.65 m Anisotropy Ratio (Kz/Kr): 1.

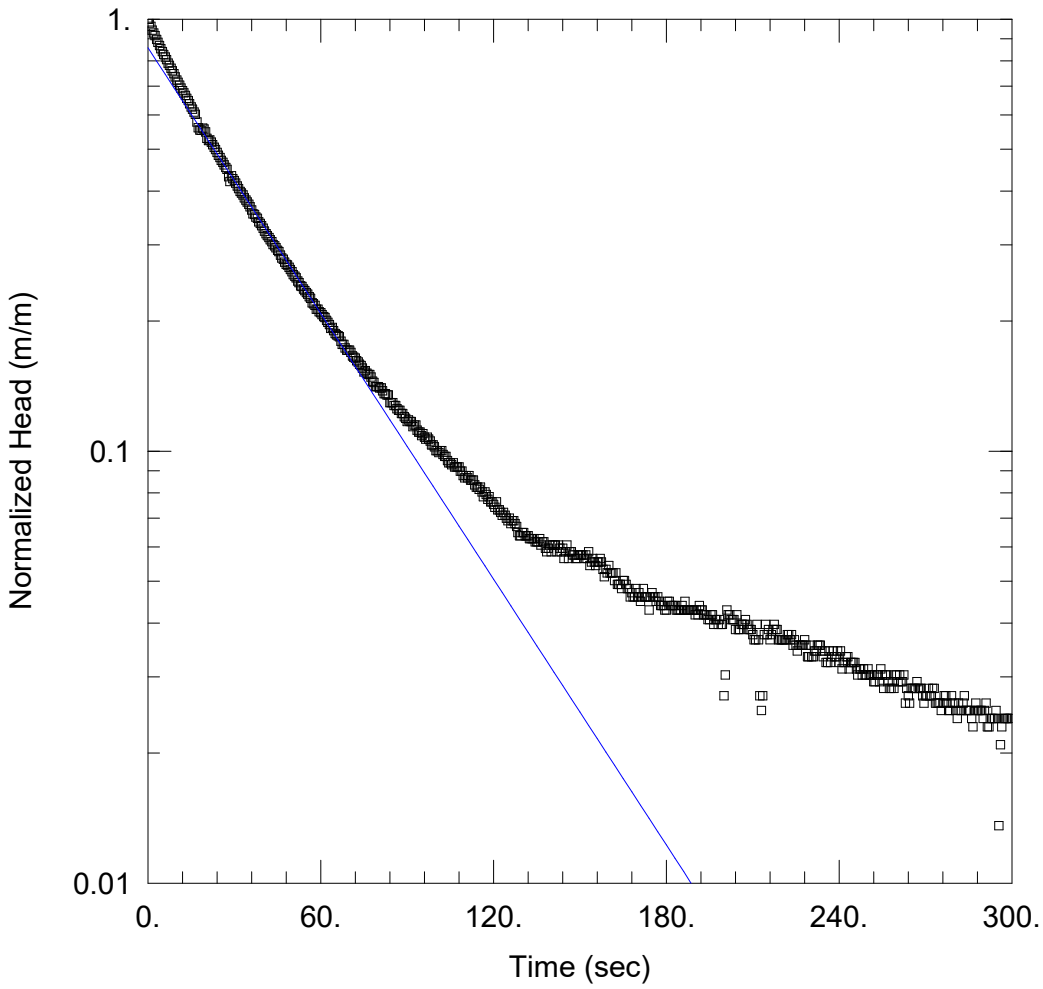
WELL DATA (MW 21-105)

Initial Displacement: 1.379 m
Total Well Penetration Depth: 4.65 m
Casing Radius: 0.0254 m
Static Water Column Height: 4.65 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 4.964E-7 m/sec y0 = 1.379 m



MW 21-107_RISING HEAD SWRT

Data Set: \...\MW 21-107 - RH.aqt
Date: 03/15/22 Time: 13:15:15

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-A0
Location: West Chaudière Island, Ottawa
Test Date: 4 March 2022

AQUIFER DATA

Saturated Thickness: 7.92 m Anisotropy Ratio (Kz/Kr): 1.

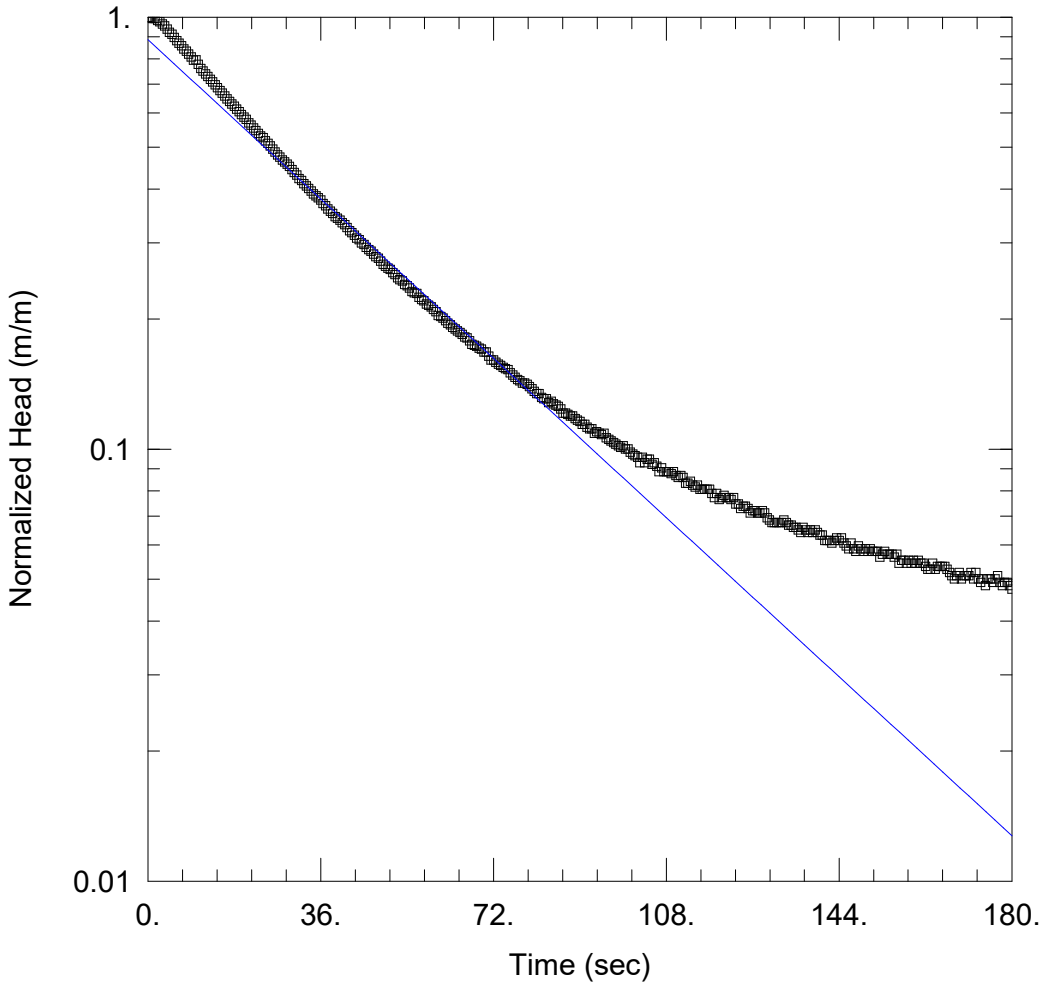
WELL DATA (MW 21-107)

Initial Displacement: 0.957 m
Total Well Penetration Depth: 7.92 m
Casing Radius: 0.0254 m
Static Water Column Height: 7.92 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.108E-5 m/sec y0 = 0.8213 m



MW 21-107 - FALLING HEAD SWRT

Data Set: \...\MW 21-107 - FH.aqt
Date: 03/15/22 Time: 13:12:50

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-A0
Location: West Chaudière Island, Ottawa
Test Date: 4 March 2022

AQUIFER DATA

Saturated Thickness: 8.39 m Anisotropy Ratio (Kz/Kr): 1.

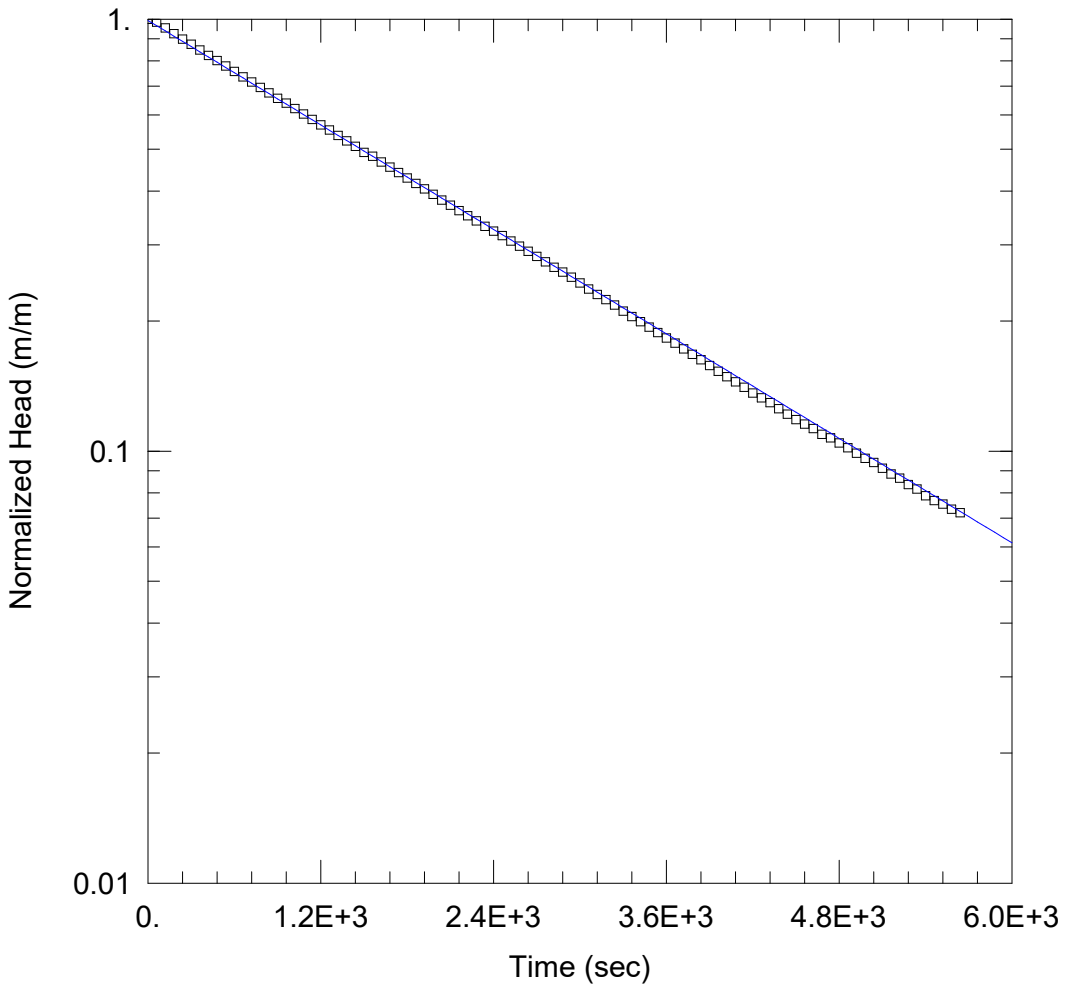
WELL DATA (MW 21-107)

Initial Displacement: 1.139 m
Total Well Penetration Depth: 8.39 m
Casing Radius: 0.0254 m
Static Water Column Height: 8.39 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.107E-5 m/sec y0 = 1.01 m



MW 21-110_ FALLING HEAD SWRT

Data Set: \...\MW 21-110 Falling Head.aqt
Date: 02/22/22 Time: 16:44:29

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-S0
Location: Blocks205West Chaudière Island
Test Date: 21 January 2022

AQUIFER DATA

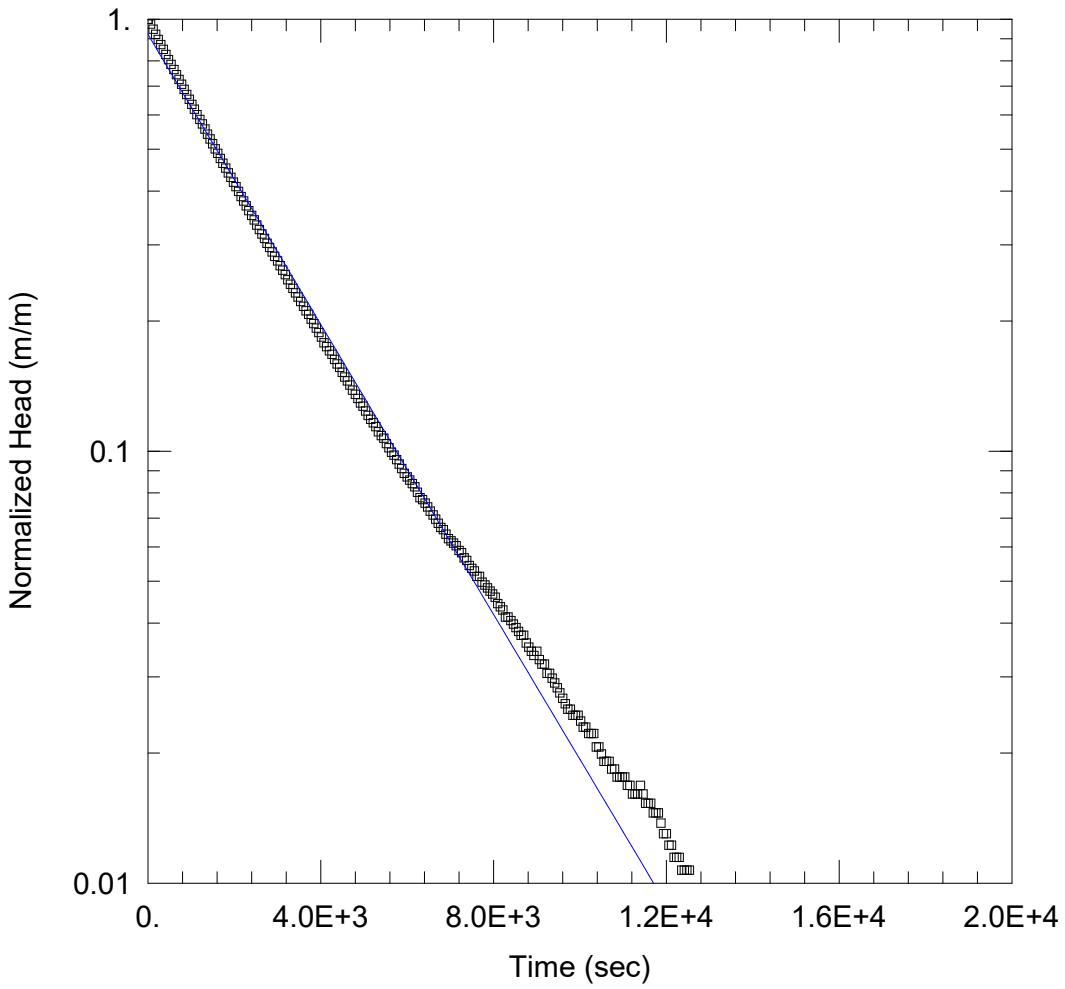
Saturated Thickness: 4.87 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW 21-110)

Initial Displacement: 1.445 m
Total Well Penetration Depth: 4.85 m
Casing Radius: 0.0254 m
Static Water Column Height: 4.87 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.833E-7 m/sec
y0 = 1.435 m



MW 21-110_RISING HEAD SWRT

Data Set: \...\MW 21-110 Rising Head.aqt
Date: 02/22/22 Time: 16:52:56

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-S0
Location: Blocks205West Chaudière Island
Test Date: 21 January 2022

AQUIFER DATA

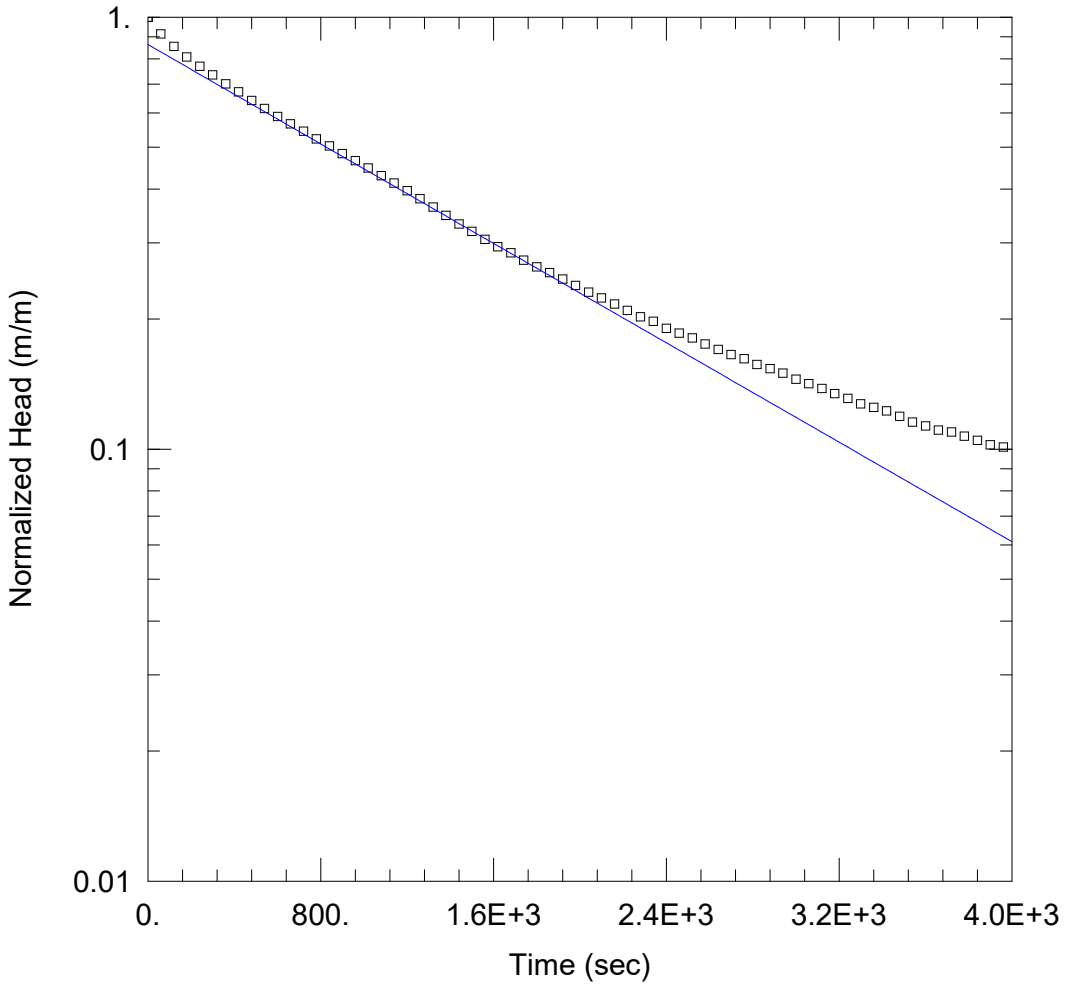
Saturated Thickness: 4.87 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW 21-110)

Initial Displacement: 1.307 m
Total Well Penetration Depth: 4.87 m
Casing Radius: 0.0254 m
Static Water Column Height: 4.87 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.814E-7 m/sec
y0 = 1.205 m



MW 21-111_RISING HEAD SWRT

Data Set: \...\MW 21-111 Rising Head.aqt
Date: 02/22/22 Time: 17:07:25

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-S0
Location: Blocks205West Chaudière Island
Test Date: 21 January 2022

AQUIFER DATA

Saturated Thickness: 1.08 m Anisotropy Ratio (Kz/Kr): 1.

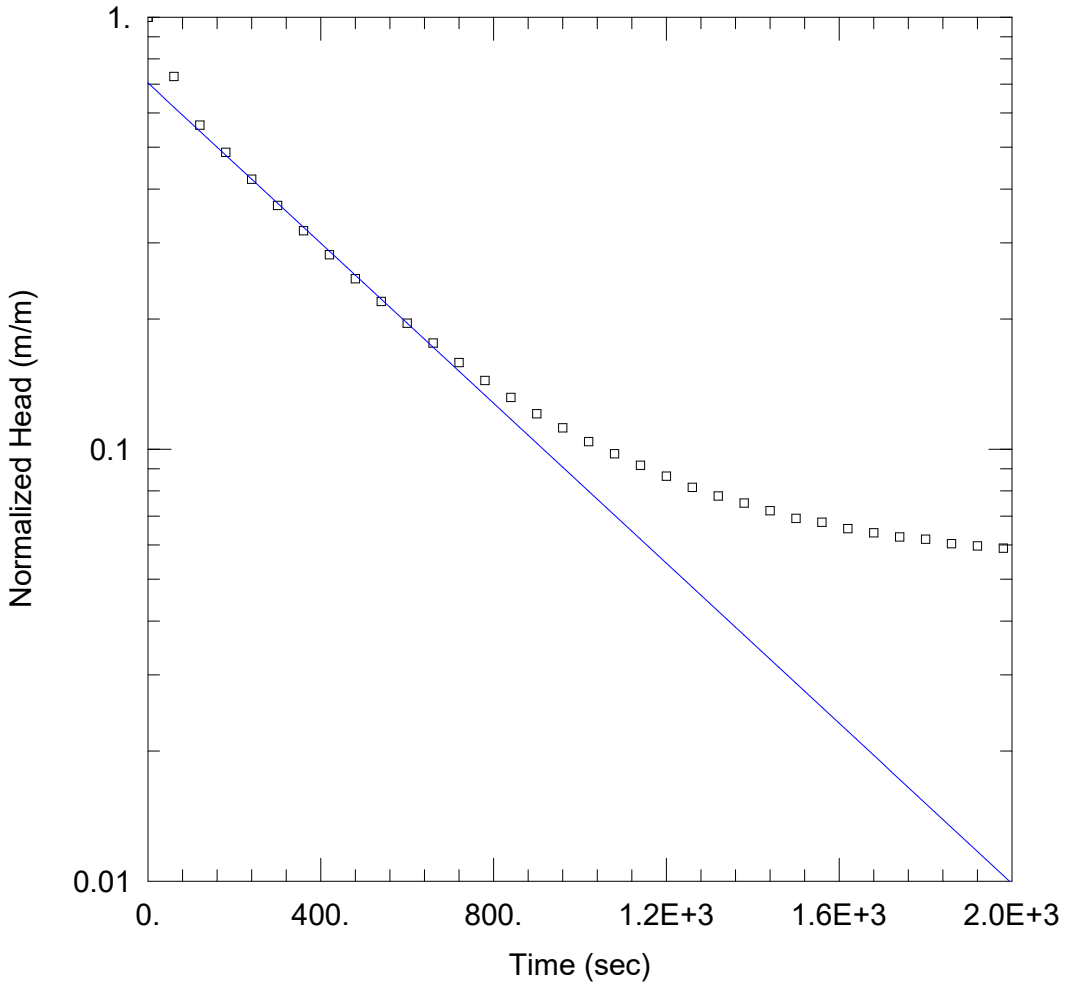
WELL DATA (MW 21-111)

Initial Displacement: 0.84 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 1.08 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.048E-6 m/sec y0 = 0.7256 m



MW 21-112_FALLING HEAD SWRT

Data Set: \...\MW 21-112 Falling Head.aqt
Date: 02/22/22 Time: 17:10:52

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-S0
Location: Blocks205West Chaudière Island
Test Date: 21 January 2022

AQUIFER DATA

Saturated Thickness: 5.3 m Anisotropy Ratio (Kz/Kr): 1.

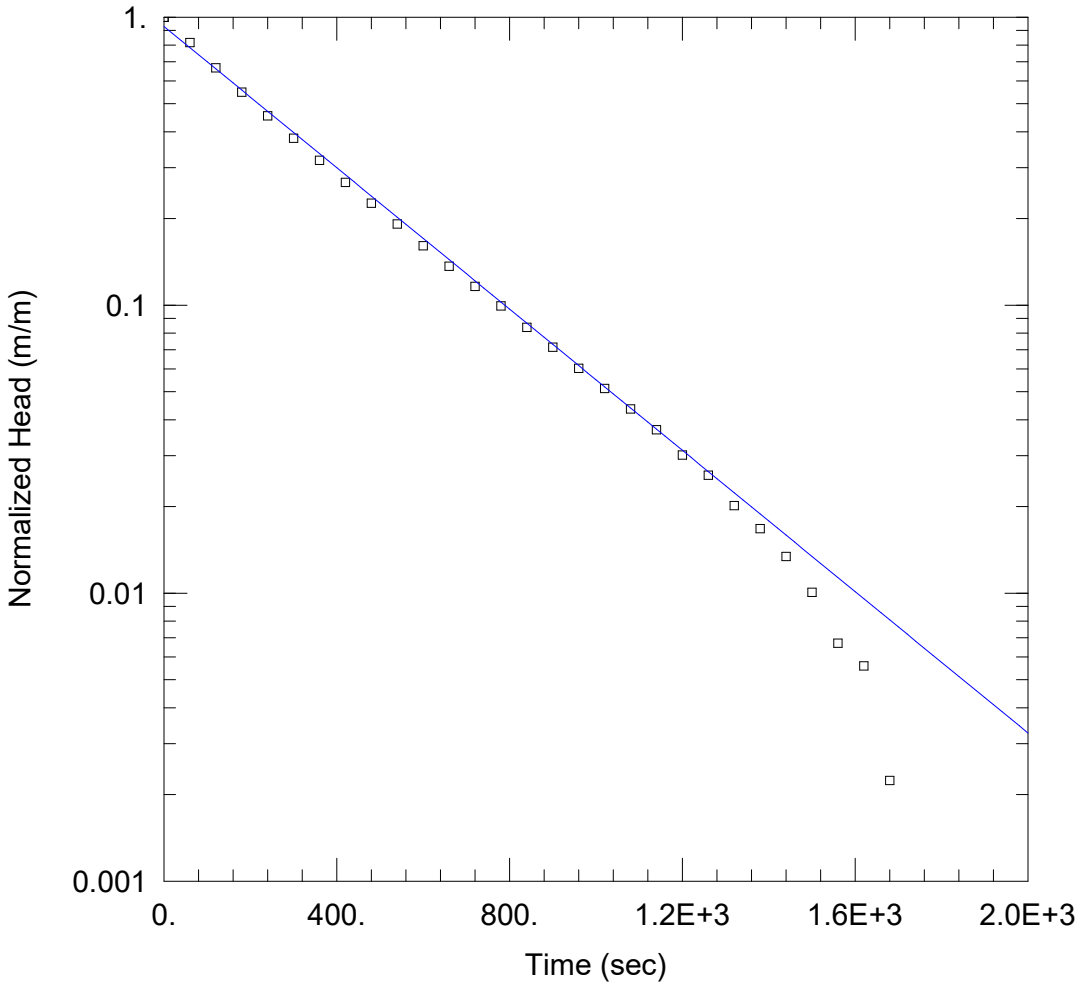
WELL DATA (MW 21-112)

Initial Displacement: 1.374 m
Total Well Penetration Depth: 5.3 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.3 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.001E-6 m/sec y0 = 0.967 m



MW 21-112_RISING HEAD SWRT

Data Set: \...\MW 21-112 Rising Head.aqt
Date: 02/22/22 Time: 17:20:11

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-S0
Location: Blocks205West Chaudière Island
Test Date: 21 January 2022

AQUIFER DATA

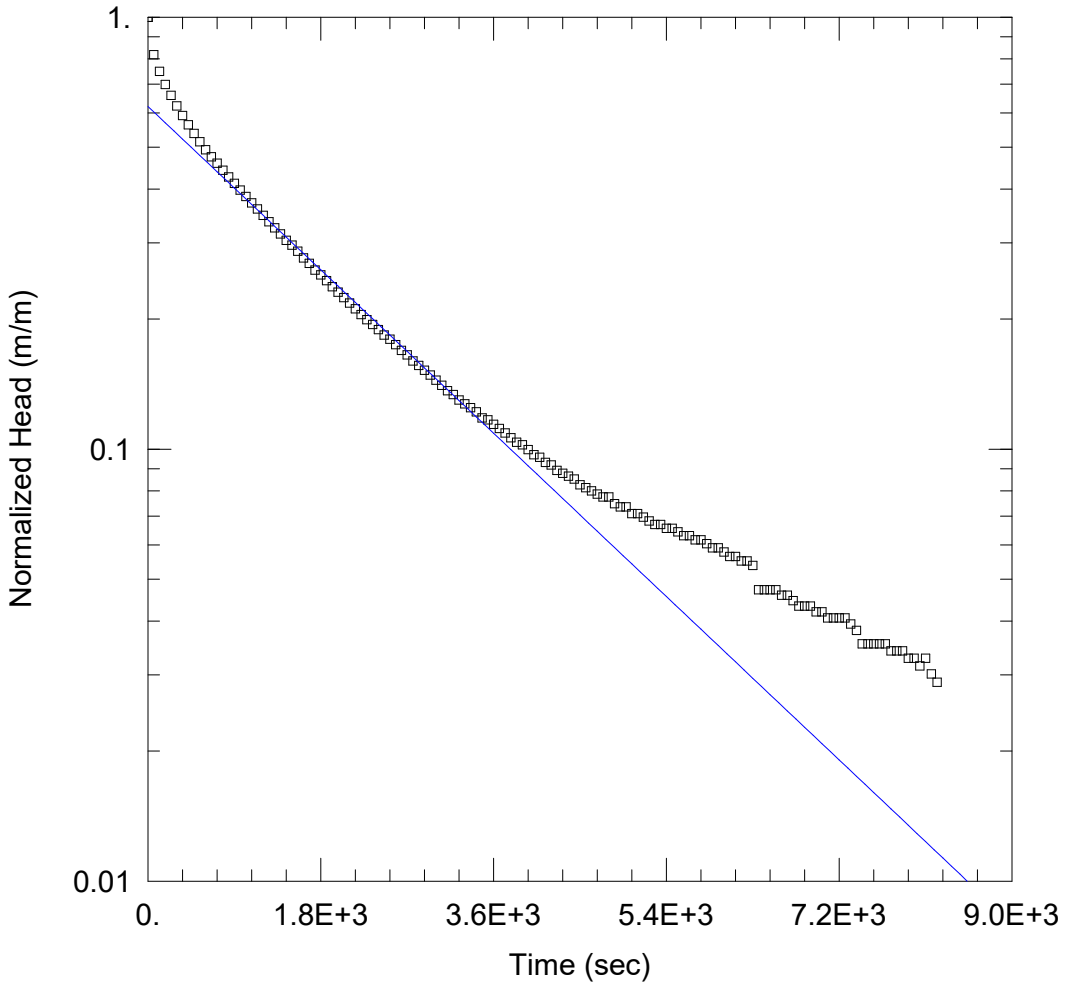
Saturated Thickness: 5.3 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW 21-112)

Initial Displacement: 0.895 m
Total Well Penetration Depth: 5.3 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.3 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.326E-6 m/sec
y0 = 0.8305 m



MW 21-113_RISING HEAD SWRT

Data Set: \...\MW 21-113 Rising Head.aqt
Date: 02/22/22 Time: 17:24:46

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-S0
Location: Blocks205West Chaudière Island
Test Date: 21 January 2022

AQUIFER DATA

Saturated Thickness: 1.65 m Anisotropy Ratio (Kz/Kr): 1.

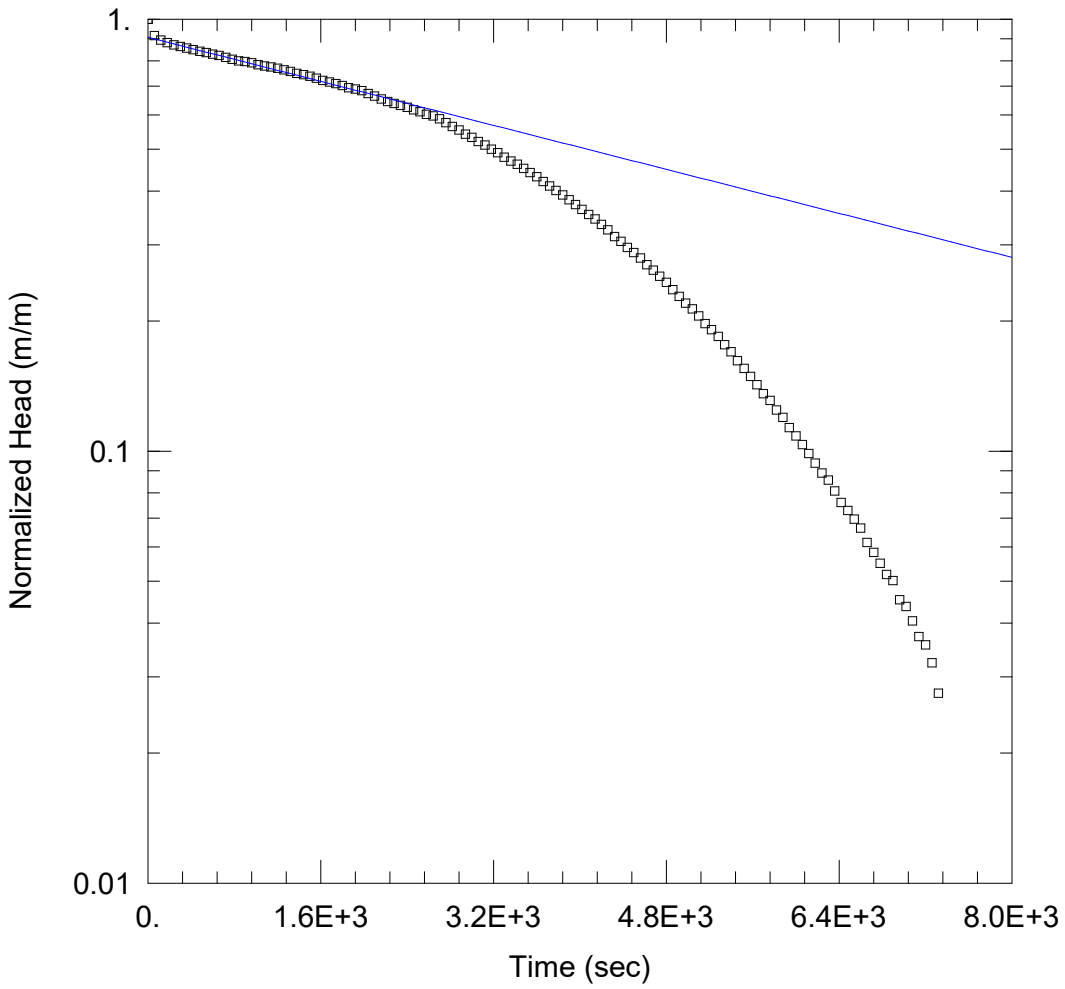
WELL DATA (MW 21-113)

Initial Displacement: 0.762 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 1.65 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 5.011E-7 m/sec y0 = 0.4733 m



MW 21-115_FALLING HEAD SWRT

Data Set: \...\MW 21-115 Falling Head.aqt
Date: 02/22/22 Time: 17:45:07

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-S0
Location: Blocks205West Chaudière Island
Test Date: 21 January 2022

AQUIFER DATA

Saturated Thickness: 2.57 m Anisotropy Ratio (Kz/Kr): 1.

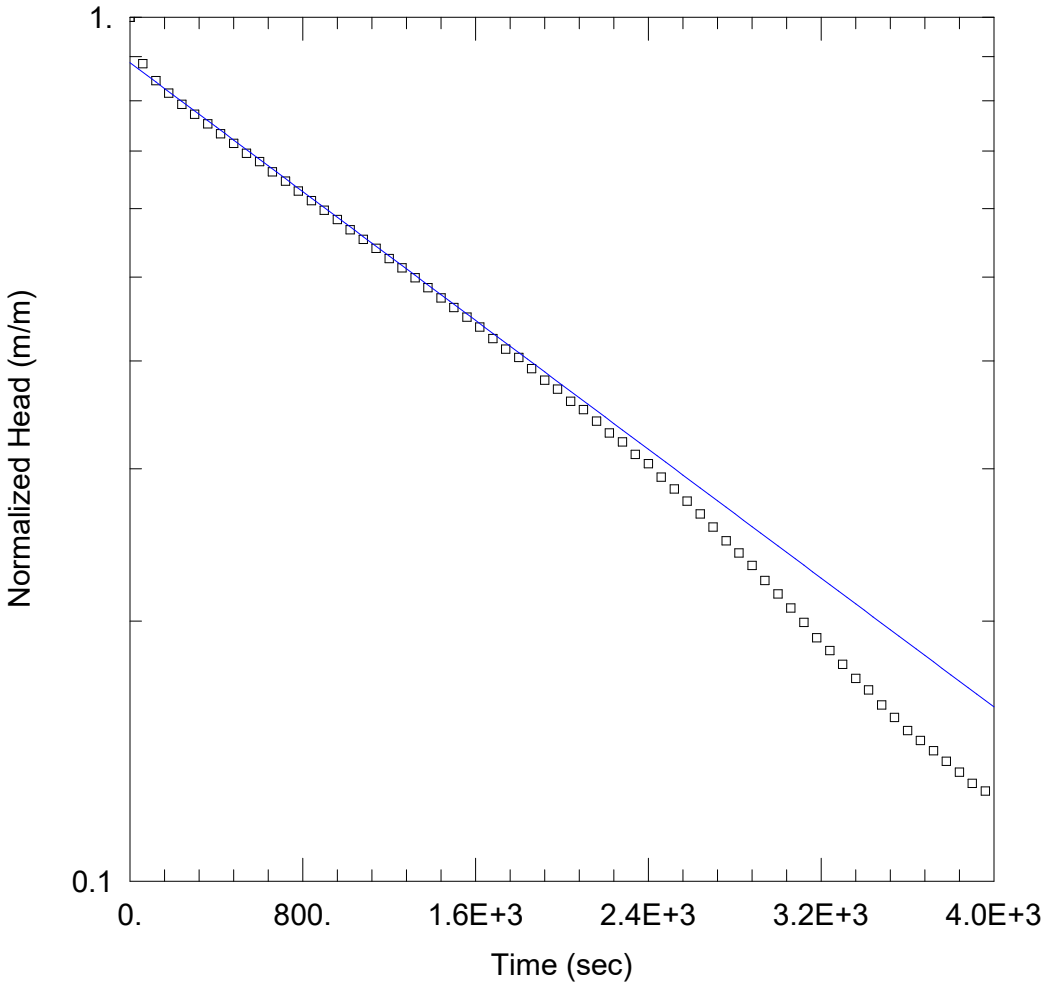
WELL DATA (MW 21-115)

Initial Displacement: 0.618 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 2.57 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 9.75E-8 m/sec y0 = 0.5608 m



MW 21-115_RISING HEAD SWRT

Data Set: \...\MW 21-115 Rising Head.aqt
Date: 02/22/22 Time: 17:47:24

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-S0
Location: Blocks205West Chaudière Island
Test Date: 21 January 2022

AQUIFER DATA

Saturated Thickness: 2.57 m Anisotropy Ratio (Kz/Kr): 1.

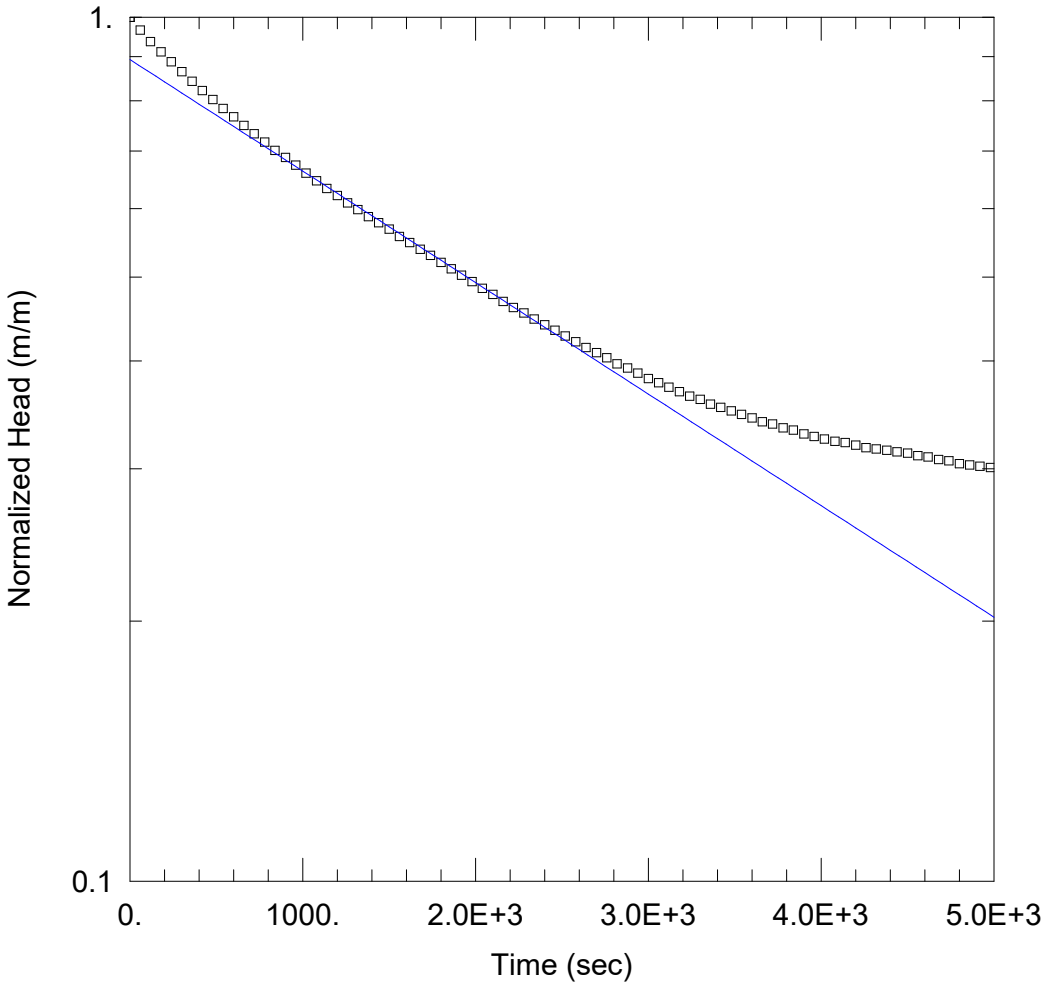
WELL DATA (MW 21-115)

Initial Displacement: 0.763 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 2.57 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 2.855E-7 m/sec y0 = 0.6757 m



MW 21-116_RISING HEAD SWRT

Data Set: \...\MW 21-116 Rising Head.aqt
Date: 02/22/22 Time: 17:52:23

PROJECT INFORMATION

Company: EXP
Client: Windmill Dream Ontario Holding
Project: OTT-00250193-S0
Location: Blocks205West Chaudière Island
Test Date: 21 January 2022

AQUIFER DATA

Saturated Thickness: 0.54 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW 21-116)

Initial Displacement: 0.917 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 0.54 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

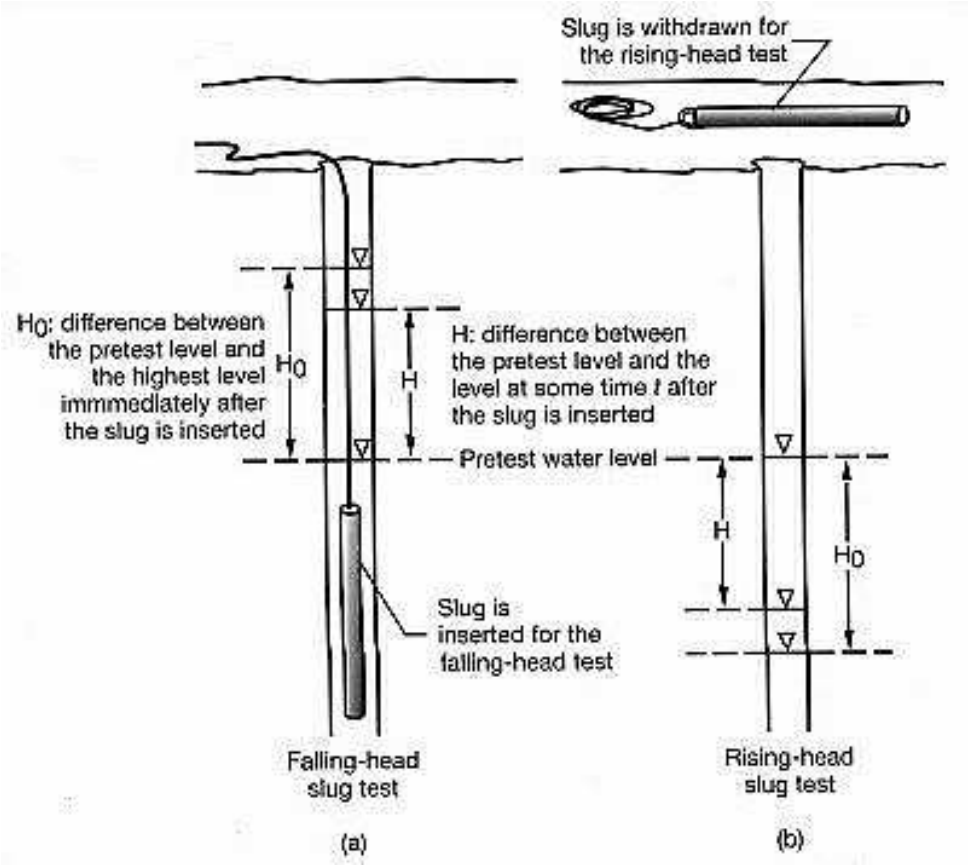
Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 9.407E-7 m/sec
y0 = 0.819 m

Single Well Response Test Procedure

A Single Well Response Test (SWRT), also known as a bail test or a slug test, is conducted in order to determine the saturated hydraulic conductivity (K) of an aquifer. The method of the SWRT is to characterize the change of groundwater level in a well or borehole over time.

In order to ensure consistency and repeatability, all **exp** employees are to follow the procedure outlined in this document when conducting SWRTs.

The figure below depicts a schematic of a slug and bail test and the respective water level changes.



Initials ___

Slug Test Procedure

Equipment Required

- Copy of a signed health and safety plan
- Copy of the work program
- PPE as required by Site-Specific HASP
- Copy of the monitoring well location plan/site plan
- Waterproof pen and bound field note book
- SWRT field data Entry form
- Disposable gloves
- Duct tape
- Deionized water
- Alconox (phosphate free detergent)
- Spray bottles
- Electronic water level meter and spare batteries
- Solid PVC or stainless steel slug of known volume or clean water
- String (nylon)
- Water pressure transducer (data logger) and baro-logger
- Watch or stop watch with second hand
- Plastic sheeting

Testing Procedure

1. Remove cap from well and collect static water level
2. Remove waterra tubing/bailer and place in garbage bag. Record static water level measurement again.
3. Lower the slug into the well and record the dynamic water level.
4. Record the drawdown (for the slug test) at set five (5) second intervals for the first five (5) minutes, then reduce to every one (1) minute.
5. Continue recording the drawdown until 95% recovery is reached. To calculate this value: Find the difference between the dynamic water level and the static water level, then multiply by 95% (.95). Add the resulting value to the dynamic water level.

   (Static Water Level – Dynamic Water Level).95 + Static Water Level = 95% Recovery Value
6. Once complete, replace the waterra tubing/bailer and re-secure the well cap.

Note: If the well is deep, more than one slug may be inserted by attaching the slugs to a series.

Slugs must be washed with methanol, then lab grade soap, and then rinsed with de-ionized water after each use.

Based on the recorded observations, the hydraulic conductivity (in m/s) of the aquifer will be determined. In order to determine the hydraulic conductivity; the well diameter, radius of the borehole and length of the screen will also be required.

Bail Test Procedure

Equipment Required

- 20 L (5 gal) Graduated pail
- Stop watch or watch with seconds
- Garbage bags
- Water level meter
- Field sheets/log book
- Latex Gloves
- Bailer and Rope

Procedure

1. Remove cap from well and collect static water level.
2. If using a **bailer**:
    a. Affix the rope to the bailer.
    b. Remove the waterra tubing and place in garbage bag
    c. Record static water level measurement again.
    d. Record how much water was removed by either counting the number of full bailers or emptying removed water into a container.
    e. Quickly lower the bailer into the well and remove.
    f. Continue this process until the water level will reduce no further.
    g. Record the dynamic water level.
3. If using **waterra** to bail the water:
    a. Pump the water into graduated bucket until the water level will reduce no further.
    b. Record how much water has been removed.
    c. Record the dynamic water level.
4. Record the recovery at set five (5) second intervals for the first (5) minutes, then reduce to every one (1) minute.
5. Continue recording the drawdown/recovery until 95% recovery is reached.
6. Once complete, replace any waterra tubing that may have been removed from the well and re-secure the well cap.

Appendix E – Water Sampling Field Notes and Laboratory's Certificates of Analysis

exp.

LOW FLOW SAMPLING STABILIZATION RECORD

JOB NUMBER: 0250193-50	DATE: March 4 2022	Start Time: 11:55
JOB NAME: 2:bi	WEATHER: Sunny -5°C	End Time:
FIELD TECHNICIAN: JE	PROJECT MANAGER: PS	

MW ID: MW21-104

STATIC WATER LEVEL (m): 2.83	WELL DEPTH (m): 8.86	Pump Intake Depth: 7.00
CASING FROM GROUND (+/- m): —	TOTAL PURGED (L):	Sample Observations: clear, no odour
WELL DIAMETER/MAKE: 2" pvc	FLOW RATE (L/min): 0.1	
WELL HEAD SPACE VAPOUR (ppm): —	FREE PRODUCT: YES / NO	FP AMOUNT (cm): —

PUMP MODEL: Spectra (maxim)

WATER MEASUREMEMT INSTRUMENT: Turbimeter (EXP)

TIME	WATER LEVEL (m) [< 0.3 m]	TEMP (°c) [+/- 3%]	DO (mg/L) [+/- 10% if > 0.5 or 3 values < 0.5]	Conductivity us/cm³ [+/- 3%]	TDS (mg/L) [+/- 3%]	SALINITY (ppt) [+/- 3%]	PH [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	TURBIDITY (NTU) [< 5 OR +/- 10% if NTU is > 5]
12:03	2.97								45
12:06	2.99								44
12:09									

Additional Notes: Sample (S2) Blocks 204-205 x16 bottles Sampled

exp.

LOW FLOW SAMPLING STABILIZATION RECORD

JOB NUMBER: 00250193-50	DATE: March 4, 2022	Start Time: 10:34
JOB NAME: Zibi	WEATHER: Sunny -8°C	End Time: 11:45
FIELD TECHNICIAN: JF	PROJECT MANAGER: PS	

MW ID: MW21-113

STATIC WATER LEVEL (m): 4.55	WELL DEPTH (m): 6.98	Pump Intake Depth: 5.9
CASING FROM GROUND (+/- m): —	TOTAL PURGED (L):	Sample Observations: clear, no odour
WELL DIAMETER/MAKE: 2" pvc	FLOW RATE (L/min): 0.1	
WELL HEAD SPACE VAPOUR (ppm): —	FREE PRODUCT: YES / (NO)	FP AMOUNT (cm): —

PUMP MODEL: Spectra (maxim)

WATER MEASUREMEMT INSTRUMENT: Turbimeter (EXP)

TIME	WATER LEVEL (m) [< 0.3 m]	TEMP (°c) [+/- 3%]	DO (mg/L) [+/- 10% if > 0.5 or 3 values < 0.5]	Conductivity us/cm³ [+/- 3%]	TDS (mg/L) [+/- 3%]	SALINITY (ppt) [+/- 3%]	PH [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	TURBIDITY (NTU) [< 5 OR +/- 10% if NTU is > 5]
1036	4.63								100
1039	4.66								151
1042	4.73								130

Additional Notes: Sample (S1) Blocks 201-203 x 16 bottles sampled 11:45

CHAIN OF CUSTODY RECORD

Bureau Veritas
6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel (905) 817-5700 Toll-free 800-563-6266 Fax (905) 817-5777 www.bvna.com

INVOICE TO:

Company Name: #17498 exp Services Inc
Attention: Accounts Payable
Address: 100-2650 Queensview Drive
Ottawa ON K2B 8H6
Tel: (613) 688-1899 Fax: (613) 225-7337
Email: AP@exp.com; Karen.Burke@exp.com

REPORT TO:

Company Name:
Attention: Patricia Stelmack
Address:
Tel: Fax:
Email: patricia.stelmack@exp.com

PROJECT INFORMATION:

Quotation #: B91718
P.O. #: OTT-00250193-S0-300
Project:
Project Name:
Site #:
Sampled By: Jeremy Eckert

Laboratory Use Only:

Bureau Veritas Job #:
Bottle Order #: 867996
COC #: C#867996-01-01
Project Manager: Katherine Szozda

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)
☐ Table 1 ☐ Res/Park ☐ Medium/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ For RSC
☐ Table ____

Other Regulations
☐ CCME ☐ Sanitary Sewer Bylaw
☐ Reg 558 ☒ Storm Sewer Bylaw
☐ MISA Municipality Ottawa
☐ PWQO ☐ Reg 406 Table ____
☐ Other ____

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? Y

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: Time Required: ☐
Rush Confirmation Number: (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	# of Bottles	Comments
1		S1	22/03/04	11:45	GW	X	16	Rush E.Coli
2		S2	22/03/04	12:50	GW	X	16	Rush E.Coli
3								
4								
5								
6								
7								
8								
9								
10								

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Ottawa Storm Sewer Bylaw (2003-514)	Metals (As, Cd, Cr, Cu, Pb, Mn, Hg, Ni)	Metals (Se, Ag, Zn)	CBOD, Cyanide, pH, Phenolics, total phos.	TSS, E.Coli, PCB, Hexachlorobenzene	Dom. phenols & ethoxylates	VOC (only ones outlined in by-law)	PAH (only ones outlined in by-law)
	X	X	X	X	X	X	X
	X	X	X	X	X	X	X

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Jeremy Eckert	22/03/04	13:00				

Laboratory Use Only
Time Sensitive | Temperature (°C) on Recei | Custody Seal Present / Intact | Yes | No

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

White: Bureau Veritas Yellow: Client

Your Project #: OTT-00250193-S0-300
Your C.O.C. #: 867996-01-01

Attention: Patricia Stelmack

exp Services Inc
Ottawa Branch
100-2650 Queensview Drive
Ottawa, ON
CANADA K2B 8H6

Report Date: 2022/03/14
Report #: R7042352
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C258500
Received: 2022/03/04, 13:00

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Sewer Use By-Law Semivolatile Organics (1)	2	2022/03/08	2022/03/09	CAM SOP 00301	EPA 8270 m
Carbonaceous BOD (1)	2	2022/03/05	2022/03/10	CAM SOP-00427	SM 23 5210B m
Total Cyanide (1)	2	2022/03/06	2022/03/06	CAM SOP-00457	OMOE E3015 5 m
Mercury in Water by CVAA (1)	2	2022/03/07	2022/03/08	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by ICPMS (1)	2	N/A	2022/03/09	CAM SOP-00447	EPA 6020B m
E.coli, (CFU/100mL) (1)	2	N/A	2022/03/05	CAM SOP-00552	MOE LSB E3371
Total Nonylphenol in Liquids by HPLC (1)	2	2022/03/09	2022/03/10	CAM SOP-00313	In-house Method
Nonylphenol Ethoxylates in Liquids: HPLC (1)	2	2022/03/09	2022/03/10	CAM SOP-00313	BV Labs Method
OC Pesticides (Selected) & PCB (1, 2)	2	2022/03/10	2022/03/11	CAM SOP-00307	EPA 8081A/8082B m
OC Pesticides Summed Parameters (1)	2	N/A	2022/03/06	CAM SOP-00307	EPA 8081A/8082B m
pH (1)	2	2022/03/05	2022/03/07	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP) (1)	2	N/A	2022/03/07	CAM SOP-00444	OMOE E3179 m
Total PAHs (Hamilton, Ottawa S.U.B.) (1, 3)	2	N/A	2022/03/10	CAM SOP - 00301	
Total Suspended Solids (1)	2	2022/03/08	2022/03/09	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water (1)	2	N/A	2022/03/07	CAM SOP-00228	EPA 8260C m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope

Your Project #: OTT-00250193-S0-300
Your C.O.C. #: 867996-01-01

Attention: Patricia Stelmack

exp Services Inc
Ottawa Branch
100-2650 Queensview Drive
Ottawa, ON
CANADA K2B 8H6

Report Date: 2022/03/14
Report #: R7042352
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C258500
Received: 2022/03/04, 13:00

dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Mississauga, 6740 Campobello Rd , Mississauga, ON, L5N 2L8
(2) Chlordane (Total) = Alpha Chlordane + Gamma Chlordane
(3) Total PAHs include only those PAHs specified in the sewer use by-by-law.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Katherine Szozda, Project Manager
Email: Katherine.Szozda@bureauveritas.com
Phone# (613)274-0573 Ext:7063633
==========
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.

OTTAWA STORM SEWER BYLAW (2003-514)

Bureau Veritas ID			RZZ865			RZZ865		
Sampling Date			2022/03/04 11:45			2022/03/04 11:45		
COC Number			867996-01-01			867996-01-01		
	UNITS	**Criteria**	**S1**	**RDL**	**QC Batch**	**S1 Lab-Dup**	**RDL**	**QC Batch**
Inorganics								
Total Carbonaceous BOD	mg/L	**25**	<2	2	7866527			
pH	pH	**6.0:9.0**	7.27		7866326	7.21		7866326
Phenols-4AAP	mg/L	**0.008**	<0.0010	0.0010	7867511			
Total Suspended Solids	mg/L	**15**	**22**	10	7869798			
Total Cyanide (CN)	mg/L	**0.02**	<0.0050	0.0050	7867257			
Miscellaneous Parameters								
Nonylphenol Ethoxylate (Total)	mg/L	**0.01**	**<0.025 (1)**	0.025	7872993	**<0.025 (1)**	0.025	7872993
Nonylphenol (Total)	mg/L	**0.001**	<0.001	0.001	7872958			
Metals								
Mercury (Hg)	mg/L	**0.0004**	<0.00010	0.00010	7867784			
Total Arsenic (As)	ug/L	**20**	<1.0	1.0	7871937	<1.0	1.0	7871937
Total Cadmium (Cd)	ug/L	**8**	<0.090	0.090	7871937	<0.090	0.090	7871937
Total Chromium (Cr)	ug/L	**80**	<5.0	5.0	7871937	<5.0	5.0	7871937
Total Copper (Cu)	ug/L	**40**	<0.90	0.90	7871937	<0.90	0.90	7871937
Total Lead (Pb)	ug/L	**120**	<0.50	0.50	7871937	<0.50	0.50	7871937
Total Manganese (Mn)	ug/L	**50**	**210**	2.0	7871937	**210**	2.0	7871937
Total Nickel (Ni)	ug/L	**80**	2.4	1.0	7871937	2.4	1.0	7871937
Total Phosphorus (P)	ug/L	**400**	<100	100	7871937	<100	100	7871937
Total Selenium (Se)	ug/L	**20**	<2.0	2.0	7871937	<2.0	2.0	7871937
Total Silver (Ag)	ug/L	**120**	<0.090	0.090	7871937	<0.090	0.090	7871937
Total Zinc (Zn)	ug/L	**40**	<5.0	5.0	7871937	<5.0	5.0	7871937
Semivolatile Organics								
Naphthalene	ug/L	**6.4**	<0.3	0.3	7869652	<0.3	0.3	7869652
Phenanthrene	ug/L	-	<0.2	0.2	7869652	<0.2	0.2	7869652
Anthracene	ug/L	-	<0.2	0.2	7869652	<0.2	0.2	7869652
Fluoranthene	ug/L	-	<0.2	0.2	7869652	<0.2	0.2	7869652
Pyrene	ug/L	-	<0.2	0.2	7869652	<0.2	0.2	7869652
Benzo(a)anthracene	ug/L	-	<0.2	0.2	7869652	<0.2	0.2	7869652
Chrysene	ug/L	-	<0.2	0.2	7869652	<0.2	0.2	7869652
Benzo(b/j)fluoranthene	ug/L	-	<0.2	0.2	7869652	<0.2	0.2	7869652
Benzo(k)fluoranthene	ug/L	-	<0.2	0.2	7869652	<0.2	0.2	7869652

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Ottawa Storm Sewer Discharge Limits
Sewer By-Law No.2003-514
(1) RDL exceeds criteria

OTTAWA STORM SEWER BYLAW (2003-514)

Bureau Veritas ID			RZZ865			RZZ865		
Sampling Date			2022/03/04 11:45			2022/03/04 11:45		
COC Number			867996-01-01			867996-01-01		
	UNITS	**Criteria**	**S1**	**RDL**	**QC Batch**	**S1 Lab-Dup**	**RDL**	**QC Batch**
Benzo(a)pyrene	ug/L	-	<0.2	0.2	7869652	<0.2	0.2	7869652
Indeno(1,2,3-cd)pyrene	ug/L	-	<0.2	0.2	7869652	<0.2	0.2	7869652
Dibenzo(a,h)anthracene	ug/L	-	<0.2	0.2	7869652	<0.2	0.2	7869652
Benzo(g,h,i)perylene	ug/L	-	<0.2	0.2	7869652	<0.2	0.2	7869652
Dibenzo(a,i)pyrene	ug/L	-	<0.2	0.2	7869652	<0.2	0.2	7869652
Benzo(e)pyrene	ug/L	-	<0.2	0.2	7869652	<0.2	0.2	7869652
Perylene	ug/L	-	<0.2	0.2	7869652	<0.2	0.2	7869652
Dibenzo(a,j) acridine	ug/L	-	<0.4	0.4	7869652	<0.4	0.4	7869652
7H-Dibenzo(c,g) Carbazole	ug/L	-	<0.4	0.4	7869652	<0.4	0.4	7869652
Calculated Parameters								
Total PAHs (18 PAHs)	ug/L	**6**	<0.96	0.96	7866576			
Volatile Organics								
Benzene	ug/L	**2**	<0.40	0.40	7866573			
Chloroform	ug/L	**2**	<0.40	0.40	7866573			
1,2-Dichlorobenzene	ug/L	**5.6**	<0.80	0.80	7866573			
1,4-Dichlorobenzene	ug/L	**6.8**	<0.80	0.80	7866573			
cis-1,2-Dichloroethylene	ug/L	**5.6**	<1.0	1.0	7866573			
trans-1,3-Dichloropropene	ug/L	**5.6**	<0.80	0.80	7866573			
Ethylbenzene	ug/L	**2**	<0.40	0.40	7866573			
Methylene Chloride(Dichloromethane)	ug/L	**5.2**	<4.0	4.0	7866573			
1,1,2,2-Tetrachloroethane	ug/L	**17**	<0.80	0.80	7866573			
Tetrachloroethylene	ug/L	**4.4**	<0.40	0.40	7866573			
Toluene	ug/L	**2**	<0.40	0.40	7866573			
Trichloroethylene	ug/L	**7.6**	<0.40	0.40	7866573			
p+m-Xylene	ug/L	-	<0.40	0.40	7866573			
o-Xylene	ug/L	-	<0.40	0.40	7866573			
Total Xylenes	ug/L	**4.4**	<0.40	0.40	7866573			
Pesticides & Herbicides								
Hexachlorobenzene	ug/L	**0.04**	<0.005	0.005	7874997			
Microbiological								
Escherichia coli	CFU/100mL	**200**	<10	10	7866944			
Surrogate Recovery (%)								
2,4,6-Tribromophenol	%	-	80		7869652	79		7869652

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Ottawa Storm Sewer Discharge Limits
Sewer By-Law No.2003-514

OTTAWA STORM SEWER BYLAW (2003-514)

Bureau Veritas ID			RZZ865			RZZ865		
Sampling Date			2022/03/04 11:45			2022/03/04 11:45		
COC Number			867996-01-01			867996-01-01		
	UNITS	**Criteria**	**S1**	**RDL**	**QC Batch**	**S1 Lab-Dup**	**RDL**	**QC Batch**
2-Fluorobiphenyl	%	-	58		7869652	47		7869652
D14-Terphenyl (FS)	%	-	99		7869652	98		7869652
D5-Nitrobenzene	%	-	61		7869652	48		7869652
D8-Acenaphthylene	%	-	67		7869652	58		7869652
2,4,5,6-Tetrachloro-m-xylene	%	-	68		7874997			
Decachlorobiphenyl	%	-	72		7874997			
4-Bromofluorobenzene	%	-	95		7866573			
D4-1,2-Dichloroethane	%	-	106		7866573			
D8-Toluene	%	-	95		7866573			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Ottawa Storm Sewer Discharge Limits
Sewer By-Law No.2003-514

OTTAWA STORM SEWER BYLAW (2003-514)

Bureau Veritas ID			RZZ866			RZZ866		
Sampling Date			2022/03/04 12:50			2022/03/04 12:50		
COC Number			867996-01-01			867996-01-01		
	UNITS	**Criteria**	**S2**	**RDL**	**QC Batch**	**S2 Lab-Dup**	**RDL**	**QC Batch**
Inorganics								
Total Carbonaceous BOD	mg/L	**25**	<2	2	7866527	<2	2	7866527
pH	pH	**6.0:9.0**	**9.42**		7866326			
Phenols-4AAP	mg/L	**0.008**	<0.0010	0.0010	7867511			
Total Suspended Solids	mg/L	**15**	**35**	10	7869798			
Total Cyanide (CN)	mg/L	**0.02**	<0.0050	0.0050	7867257			
Miscellaneous Parameters								
Nonylphenol Ethoxylate (Total)	mg/L	**0.01**	**<0.025 (1)**	0.025	7872993			
Nonylphenol (Total)	mg/L	**0.001**	0.001	0.001	7872958			
Metals								
Mercury (Hg)	mg/L	**0.0004**	<0.00010	0.00010	7867784			
Total Arsenic (As)	ug/L	**20**	4.4	1.0	7871937			
Total Cadmium (Cd)	ug/L	**8**	0.19	0.090	7871937			
Total Chromium (Cr)	ug/L	**80**	<5.0	5.0	7871937			
Total Copper (Cu)	ug/L	**40**	8.3	0.90	7871937			
Total Lead (Pb)	ug/L	**120**	1.5	0.50	7871937			
Total Manganese (Mn)	ug/L	**50**	20	2.0	7871937			
Total Nickel (Ni)	ug/L	**80**	4.6	1.0	7871937			
Total Phosphorus (P)	ug/L	**400**	250	100	7871937			
Total Selenium (Se)	ug/L	**20**	<2.0	2.0	7871937			
Total Silver (Ag)	ug/L	**120**	0.27	0.090	7871937			
Total Zinc (Zn)	ug/L	**40**	<5.0	5.0	7871937			
Semivolatile Organics								
Naphthalene	ug/L	**6.4**	<0.3	0.3	7869652			
Phenanthrene	ug/L	**-**	<0.2	0.2	7869652			
Anthracene	ug/L	**-**	<0.2	0.2	7869652			
Fluoranthene	ug/L	**-**	<0.2	0.2	7869652			
Pyrene	ug/L	**-**	<0.2	0.2	7869652			
Benzo(a)anthracene	ug/L	**-**	<0.2	0.2	7869652			
Chrysene	ug/L	**-**	<0.2	0.2	7869652			
Benzo(b/j)fluoranthene	ug/L	**-**	<0.2	0.2	7869652			
Benzo(k)fluoranthene	ug/L	**-**	<0.2	0.2	7869652			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Ottawa Storm Sewer Discharge Limits
Sewer By-Law No.2003-514
(1) RDL exceeds criteria

OTTAWA STORM SEWER BYLAW (2003-514)

Bureau Veritas ID			RZZ866			RZZ866		
Sampling Date			2022/03/04 12:50			2022/03/04 12:50		
COC Number			867996-01-01			867996-01-01		
	UNITS	**Criteria**	**S2**	**RDL**	**QC Batch**	**S2 Lab-Dup**	**RDL**	**QC Batch**
Benzo(a)pyrene	ug/L	-	<0.2	0.2	7869652			
Indeno(1,2,3-cd)pyrene	ug/L	-	<0.2	0.2	7869652			
Dibenzo(a,h)anthracene	ug/L	-	<0.2	0.2	7869652			
Benzo(g,h,i)perylene	ug/L	-	<0.2	0.2	7869652			
Dibenzo(a,i)pyrene	ug/L	-	<0.2	0.2	7869652			
Benzo(e)pyrene	ug/L	-	<0.2	0.2	7869652			
Perylene	ug/L	-	<0.2	0.2	7869652			
Dibenzo(a,j) acridine	ug/L	-	<0.4	0.4	7869652			
7H-Dibenzo(c,g) Carbazole	ug/L	-	<0.4	0.4	7869652			
Calculated Parameters								
Total PAHs (18 PAHs)	ug/L	**6**	<0.96	0.96	7866576			
Volatile Organics								
Benzene	ug/L	**2**	<0.40	0.40	7866573			
Chloroform	ug/L	**2**	0.64	0.40	7866573			
1,2-Dichlorobenzene	ug/L	**5.6**	<0.80	0.80	7866573			
1,4-Dichlorobenzene	ug/L	**6.8**	<0.80	0.80	7866573			
cis-1,2-Dichloroethylene	ug/L	**5.6**	<1.0	1.0	7866573			
trans-1,3-Dichloropropene	ug/L	**5.6**	<0.80	0.80	7866573			
Ethylbenzene	ug/L	**2**	<0.40	0.40	7866573			
Methylene Chloride(Dichloromethane)	ug/L	**5.2**	<4.0	4.0	7866573			
1,1,2,2-Tetrachloroethane	ug/L	**17**	<0.80	0.80	7866573			
Tetrachloroethylene	ug/L	**4.4**	<0.40	0.40	7866573			
Toluene	ug/L	**2**	<0.40	0.40	7866573			
Trichloroethylene	ug/L	**7.6**	<0.40	0.40	7866573			
p+m-Xylene	ug/L	-	<0.40	0.40	7866573			
o-Xylene	ug/L	-	<0.40	0.40	7866573			
Total Xylenes	ug/L	**4.4**	<0.40	0.40	7866573			
Pesticides & Herbicides								
Hexachlorobenzene	ug/L	**0.04**	<0.005	0.005	7874997			
Microbiological								
Escherichia coli	CFU/100mL	**200**	<10	10	7866944			
Surrogate Recovery (%)								
2,4,6-Tribromophenol	%	-	74		7869652			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Ottawa Storm Sewer Discharge Limits
Sewer By-Law No.2003-514

OTTAWA STORM SEWER BYLAW (2003-514)

Bureau Veritas ID			RZZ866			RZZ866		
Sampling Date			2022/03/04 12:50			2022/03/04 12:50		
COC Number			867996-01-01			867996-01-01		
	UNITS	**Criteria**	**S2**	**RDL**	**QC Batch**	**S2 Lab-Dup**	**RDL**	**QC Batch**
2-Fluorobiphenyl	%	-	39		7869652			
D14-Terphenyl (FS)	%	-	89		7869652			
D5-Nitrobenzene	%	-	44		7869652			
D8-Acenaphthylene	%	-	46		7869652			
2,4,5,6-Tetrachloro-m-xylene	%	-	72		7874997			
Decachlorobiphenyl	%	-	101		7874997			
4-Bromofluorobenzene	%	-	95		7866573			
D4-1,2-Dichloroethane	%	-	105		7866573			
D8-Toluene	%	-	96		7866573			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Ottawa Storm Sewer Discharge Limits
Sewer By-Law No.2003-514

ORGANOCHLORINATED PESTICIDES BY GC-ECD (WATER)

Bureau Veritas ID			RZZ865	RZZ866		
Sampling Date			2022/03/04 11:45	2022/03/04 12:50		
COC Number			867996-01-01	867996-01-01		
	UNITS	**Criteria**	**S1**	**S2**	**RDL**	**QC Batch**
Calculated Parameters						
Aldrin + Dieldrin	ug/L	-	<0.005	<0.005	0.005	7866577
Chlordane (Total)	ug/L	-	<0.005	<0.005	0.005	7866577
DDT+ Metabolites	ug/L	-	<0.005	<0.005	0.005	7866577
Heptachlor + Heptachlor epoxide	ug/L	-	<0.005	<0.005	0.005	7866577
o,p-DDD + p,p-DDD	ug/L	-	<0.005	<0.005	0.005	7866577
o,p-DDE + p,p-DDE	ug/L	-	<0.005	<0.005	0.005	7866577
o,p-DDT + p,p-DDT	ug/L	-	<0.005	<0.005	0.005	7866577
Total Endosulfan	ug/L	-	<0.005	<0.005	0.005	7866577
Total PCB	ug/L	**0.4**	<0.05	<0.05	0.05	7866577

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Ottawa Storm Sewer Discharge Limits
Sewer By-Law No.2003-514

TEST SUMMARY

Bureau Veritas ID: RZZ865 **Collected:** 2022/03/04
Sample ID: S1 **Shipped:**
Matrix: Water **Received:** 2022/03/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sewer Use By-Law Semivolatile Organics	GC/MS	7869652	2022/03/08	2022/03/09	Kathy Horvat
Carbonaceous BOD	DO	7866527	2022/03/05	2022/03/10	Surleen Kaur Romana
Total Cyanide	SKAL/CN	7867257	2022/03/06	2022/03/06	Nimarta Singh
Mercury in Water by CVAA	CV/AA	7867784	2022/03/07	2022/03/08	Indira HarryPaul
Total Metals Analysis by ICPMS	ICP/MS	7871937	N/A	2022/03/09	Arefa Dabhad
E.coli, (CFU/100mL)	PL	7866944	N/A	2022/03/05	Sonja Elavinamannil
Total Nonylphenol in Liquids by HPLC	LC/FLU	7872958	2022/03/09	2022/03/10	Dennis Boodram
Nonylphenol Ethoxylates in Liquids: HPLC	LC/FLU	7872993	2022/03/09	2022/03/10	Dennis Boodram
OC Pesticides (Selected) & PCB	GC/ECD	7874997	2022/03/10	2022/03/11	Mahmudul Khan
OC Pesticides Summed Parameters	CALC	7866577	N/A	2022/03/06	Automated Statchk
pH	AT	7866326	2022/03/05	2022/03/07	Taslima Aktar
Phenols (4AAP)	TECH/PHEN	7867511	N/A	2022/03/07	Louise Harding
Total PAHs (Hamilton, Ottawa S.U.B.)	CALC	7866576	N/A	2022/03/10	Automated Statchk
Total Suspended Solids	BAL	7869798	2022/03/08	2022/03/09	Shaneil Hall
Volatile Organic Compounds in Water	GC/MS	7866573	N/A	2022/03/07	Dina Wang

Bureau Veritas ID: RZZ865 Dup **Collected:** 2022/03/04
Sample ID: S1 **Shipped:**
Matrix: Water **Received:** 2022/03/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sewer Use By-Law Semivolatile Organics	GC/MS	7869652	2022/03/08	2022/03/09	Kathy Horvat
Total Metals Analysis by ICPMS	ICP/MS	7871937	N/A	2022/03/09	Arefa Dabhad
Nonylphenol Ethoxylates in Liquids: HPLC	LC/FLU	7872993	2022/03/09	2022/03/10	Dennis Boodram
pH	AT	7866326	2022/03/05	2022/03/07	Taslima Aktar

Bureau Veritas ID: RZZ866 **Collected:** 2022/03/04
Sample ID: S2 **Shipped:**
Matrix: Water **Received:** 2022/03/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sewer Use By-Law Semivolatile Organics	GC/MS	7869652	2022/03/08	2022/03/09	Kathy Horvat
Carbonaceous BOD	DO	7866527	2022/03/05	2022/03/10	Surleen Kaur Romana
Total Cyanide	SKAL/CN	7867257	2022/03/06	2022/03/06	Nimarta Singh
Mercury in Water by CVAA	CV/AA	7867784	2022/03/07	2022/03/08	Indira HarryPaul
Total Metals Analysis by ICPMS	ICP/MS	7871937	N/A	2022/03/09	Arefa Dabhad
E.coli, (CFU/100mL)	PL	7866944	N/A	2022/03/05	Sonja Elavinamannil
Total Nonylphenol in Liquids by HPLC	LC/FLU	7872958	2022/03/09	2022/03/10	Dennis Boodram
Nonylphenol Ethoxylates in Liquids: HPLC	LC/FLU	7872993	2022/03/09	2022/03/10	Dennis Boodram
OC Pesticides (Selected) & PCB	GC/ECD	7874997	2022/03/10	2022/03/11	Mahmudul Khan
OC Pesticides Summed Parameters	CALC	7866577	N/A	2022/03/06	Automated Statchk
pH	AT	7866326	2022/03/05	2022/03/07	Taslima Aktar
Phenols (4AAP)	TECH/PHEN	7867511	N/A	2022/03/07	Louise Harding
Total PAHs (Hamilton, Ottawa S.U.B.)	CALC	7866576	N/A	2022/03/10	Automated Statchk
Total Suspended Solids	BAL	7869798	2022/03/08	2022/03/09	Shaneil Hall
Volatile Organic Compounds in Water	GC/MS	7866573	N/A	2022/03/07	Dina Wang

TEST SUMMARY

Bureau Veritas ID: RZZ866 Dup
Sample ID: S2
Matrix: Water

Collected: 2022/03/04
Shipped:
Received: 2022/03/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Carbonaceous BOD	DO	7866527	2022/03/05	2022/03/10	Surleen Kaur Romana

Bureau Veritas 100 – 36 Antares Dr. Nepean, ON, K2E 7W5 Phone: 613-274-0573 Website: www.bvna.com

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.3°C

VOC Analysis: Due to the sample matrix, samples required dilution. Detection limits were adjusted accordingly.

Results relate only to the items tested.

Bureau Veritas 100 – 36 Antares Dr. Nepean, ON, K2E 7W5 Phone: 613-274-0573 Website: www.bvna.com

QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7866573	4-Bromofluorobenzene	2022/03/07	101	70 - 130	103	70 - 130	100	%				
7866573	D4-1,2-Dichloroethane	2022/03/07	106	70 - 130	99	70 - 130	100	%				
7866573	D8-Toluene	2022/03/07	99	70 - 130	100	70 - 130	97	%				
7869652	2,4,6-Tribromophenol	2022/03/09	75	10 - 130	91	10 - 130	81	%				
7869652	2-Fluorobiphenyl	2022/03/09	41	30 - 130	74	30 - 130	69	%				
7869652	D14-Terphenyl (FS)	2022/03/09	97	30 - 130	96	30 - 130	102	%				
7869652	D5-Nitrobenzene	2022/03/09	50	30 - 130	93	30 - 130	87	%				
7869652	D8-Acenaphthylene	2022/03/09	46	30 - 130	86	30 - 130	79	%				
7874997	2,4,5,6-Tetrachloro-m-xylene	2022/03/11	94	50 - 130	73	50 - 130	65	%				
7874997	Decachlorobiphenyl	2022/03/11	97	50 - 130	86	50 - 130	104	%				
7866326	pH	2022/03/07			102	98 - 103			0.72	N/A		
7866527	Total Carbonaceous BOD	2022/03/10					<2	mg/L	NC	30	91	85 - 115
7866573	1,1,2,2-Tetrachloroethane	2022/03/07	99	70 - 130	96	70 - 130	<0.40	ug/L	NC	30		
7866573	1,2-Dichlorobenzene	2022/03/07	97	70 - 130	96	70 - 130	<0.40	ug/L	NC	30		
7866573	1,4-Dichlorobenzene	2022/03/07	109	70 - 130	111	70 - 130	<0.40	ug/L	NC	30		
7866573	Benzene	2022/03/07	93	70 - 130	96	70 - 130	<0.20	ug/L	NC	30		
7866573	Chloroform	2022/03/07	99	70 - 130	99	70 - 130	<0.20	ug/L	NC	30		
7866573	cis-1,2-Dichloroethylene	2022/03/07	96	70 - 130	98	70 - 130	<0.50	ug/L	NC	30		
7866573	Ethylbenzene	2022/03/07	88	70 - 130	95	70 - 130	<0.20	ug/L	NC	30		
7866573	Methylene Chloride(Dichloromethane)	2022/03/07	113	70 - 130	111	70 - 130	<2.0	ug/L	NC	30		
7866573	o-Xylene	2022/03/07	89	70 - 130	96	70 - 130	<0.20	ug/L	NC	30		
7866573	p+m-Xylene	2022/03/07	91	70 - 130	98	70 - 130	<0.20	ug/L	NC	30		
7866573	Tetrachloroethylene	2022/03/07	92	70 - 130	97	70 - 130	<0.20	ug/L	NC	30		
7866573	Toluene	2022/03/07	90	70 - 130	94	70 - 130	<0.20	ug/L	NC	30		
7866573	Total Xylenes	2022/03/07					<0.20	ug/L	NC	30		
7866573	trans-1,3-Dichloropropene	2022/03/07	95	70 - 130	102	70 - 130	<0.40	ug/L	NC	30		
7866573	Trichloroethylene	2022/03/07	103	70 - 130	106	70 - 130	<0.20	ug/L	NC	30		
7867257	Total Cyanide (CN)	2022/03/06	99	80 - 120	98	80 - 120	<0.0050	mg/L	NC	20		
7867511	Phenols-4AAP	2022/03/07	101	80 - 120	101	80 - 120	<0.0010	mg/L	NC	20		
7867784	Mercury (Hg)	2022/03/08	94	75 - 125	94	80 - 120	<0.00010	mg/L	NC	20		
7869652	7H-Dibenzo(c,g) Carbazole	2022/03/09	123	30 - 130	114	30 - 130	<0.4	ug/L	NC	40		
7869652	Anthracene	2022/03/09	86	30 - 130	100	30 - 130	<0.2	ug/L	NC	40		

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7869652	Benzo(a)anthracene	2022/03/09	94	30 - 130	91	30 - 130	<0.2	ug/L	NC	40		
7869652	Benzo(a)pyrene	2022/03/09	115	30 - 130	120	30 - 130	<0.2	ug/L	NC	40		
7869652	Benzo(b/j)fluoranthene	2022/03/09	109	30 - 130	113	30 - 130	<0.2	ug/L	NC	40		
7869652	Benzo(e)pyrene	2022/03/09	112	30 - 130	111	30 - 130	<0.2	ug/L	NC	40		
7869652	Benzo(g,h,i)perylene	2022/03/09	99	30 - 130	91	30 - 130	<0.2	ug/L	NC	40		
7869652	Benzo(k)fluoranthene	2022/03/09	104	30 - 130	115	30 - 130	<0.2	ug/L	NC	40		
7869652	Chrysene	2022/03/09	115	30 - 130	113	30 - 130	<0.2	ug/L	NC	40		
7869652	Dibenzo(a,h)anthracene	2022/03/09	100	30 - 130	92	30 - 130	<0.2	ug/L	NC	40		
7869652	Dibenzo(a,i)pyrene	2022/03/09	95	30 - 130	95	30 - 130	<0.2	ug/L	NC	40		
7869652	Dibenzo(a,j) acridine	2022/03/09	126	30 - 130	116	30 - 130	<0.4	ug/L	NC	40		
7869652	Fluoranthene	2022/03/09	108	30 - 130	107	30 - 130	<0.2	ug/L	NC	40		
7869652	Indeno(1,2,3-cd)pyrene	2022/03/09	104	30 - 130	96	30 - 130	<0.2	ug/L	NC	40		
7869652	Naphthalene	2022/03/09	46	30 - 130	82	30 - 130	<0.3	ug/L	NC	40		
7869652	Perylene	2022/03/09	95	30 - 130	90	30 - 130	<0.2	ug/L	NC	40		
7869652	Phenanthrene	2022/03/09	92	30 - 130	104	30 - 130	<0.2	ug/L	NC	40		
7869652	Pyrene	2022/03/09	106	30 - 130	108	30 - 130	<0.2	ug/L	NC	40		
7869798	Total Suspended Solids	2022/03/09					<10	mg/L	NC	25	95	85 - 115
7871937	Total Arsenic (As)	2022/03/09	101	80 - 120	99	80 - 120	<1.0	ug/L	NC	20		
7871937	Total Cadmium (Cd)	2022/03/09	97	80 - 120	98	80 - 120	<0.090	ug/L	NC	20		
7871937	Total Chromium (Cr)	2022/03/09	94	80 - 120	92	80 - 120	<5.0	ug/L	NC	20		
7871937	Total Copper (Cu)	2022/03/09	97	80 - 120	98	80 - 120	<0.90	ug/L	NC	20		
7871937	Total Lead (Pb)	2022/03/09	90	80 - 120	96	80 - 120	<0.50	ug/L	NC	20		
7871937	Total Manganese (Mn)	2022/03/09	98	80 - 120	96	80 - 120	<2.0	ug/L	1.4	20		
7871937	Total Nickel (Ni)	2022/03/09	94	80 - 120	95	80 - 120	<1.0	ug/L	0.37	20		
7871937	Total Phosphorus (P)	2022/03/09	95	80 - 120	97	80 - 120	<100	ug/L	NC	20		
7871937	Total Selenium (Se)	2022/03/09	101	80 - 120	101	80 - 120	<2.0	ug/L	NC	20		
7871937	Total Silver (Ag)	2022/03/09	91	80 - 120	91	80 - 120	<0.090	ug/L	NC	20		
7871937	Total Zinc (Zn)	2022/03/09	96	80 - 120	100	80 - 120	<5.0	ug/L	NC	20		
7872958	Nonylphenol (Total)	2022/03/10	109	50 - 130	107	50 - 130	<0.001	mg/L	NC	40		
7872993	Nonylphenol Ethoxylate (Total)	2022/03/10	81	50 - 130	93	50 - 130	<0.025	mg/L	NC	40		

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7874997	Hexachlorobenzene	2022/03/11	89	50 - 130	90	50 - 130	<0.005	ug/L	NC	30		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

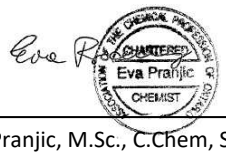
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Sonja Elavinamannil, Senior Analyst

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Bureau Veritas 100 – 36 Antares Dr. Nepean, ON, K2E 7W5 Phone: 613-274-0573 Website: www.bvna.com

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Page 1 of 1

CHAIN OF CUSTODY RECORD

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#17498 exp Services Inc	Company Name:		Quotation #:	B91718	Bureau Veritas Job #:	Bottle Order #:
Attention:	Accounts Payable	Attention:	Patricia Stelmack	P.O. #:			867996
Address:	100-2650 Queensview Drive	Address:		Project:	OTT-00250193-S0-300	COC #:	Project Manager:
	Ottawa ON K2B 8H6			Project Name:		C#867996-01-01	Katherine Szozda
Tel:	(613) 688-1899 Fax: (613) 225-7337	Tel:	Fax:	Site #:			
Email:	AP@exp.com; Karen.Burke@exp.com	Email:	patricia.stelmack@exp.com	Sampled By:	Jeremy Eckert		

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)
- ☐ Table 1 ☐ Res/Park ☐ Medium/Fine
- ☐ Table 2 ☐ Ind/Comm ☐ Coarse
- ☐ Table 3 ☐ Agri/Other ☐ For RSC
- ☐ Table ___

Other Regulations
- ☐ CCME ☐ Sanitary Sewer Bylaw
- ☐ Reg 558 ☒ Storm Sewer Bylaw
- ☐ MISA Municipality Ottawa
- ☐ PWQO ☐ Reg 406 Table
- ☐ Other

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? Y

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals (Hg/ Cr VI)	Ottawa Storm Sewer Bylaw (2003-514)	Metals (As, Cd, Cr, Cu, Pb, Mn, Hg, Ni)	Metals (Se, Ag, Zn)	CBOD, Cyanide, pH, phenolics, total phos	TSS, E. Coli, PCB, Hexachlorobenzene	Nonylphenols & ethoxylates	VOC (only ones outlined in by-law)	PAH (only ones outlined in by-law)	# of Bottles	Comments
1		S1	22/03/04	11:45	GW	X	X	X	X	X	X	X	X	X	16	Rush E.Coli
2		S2	22/03/04	12:50	GW	X	X	X	X	X	X	X	X	X	16	Rush E.Coli
3																
4																
5																
6																
7																
8																
9																
10																

MICRO

RUSH

RECEIVED IN OTTAWA

04-Mar-22 13:00
Katherine Szozda
C258500
DSG ENV-778

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Jeremy Eckert	22/03/04	13:00	G. Santiago AA	22/03/04	1300	
			DIPIKA SINGH	2022/03/05	08:25	

Laboratory Use Only

Time Sensitive	Temperature (°C) on Recei	Custody Seal	Yes	No
	4, 3, 3 ice	Present	✓	
		Intact		

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVNA.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.

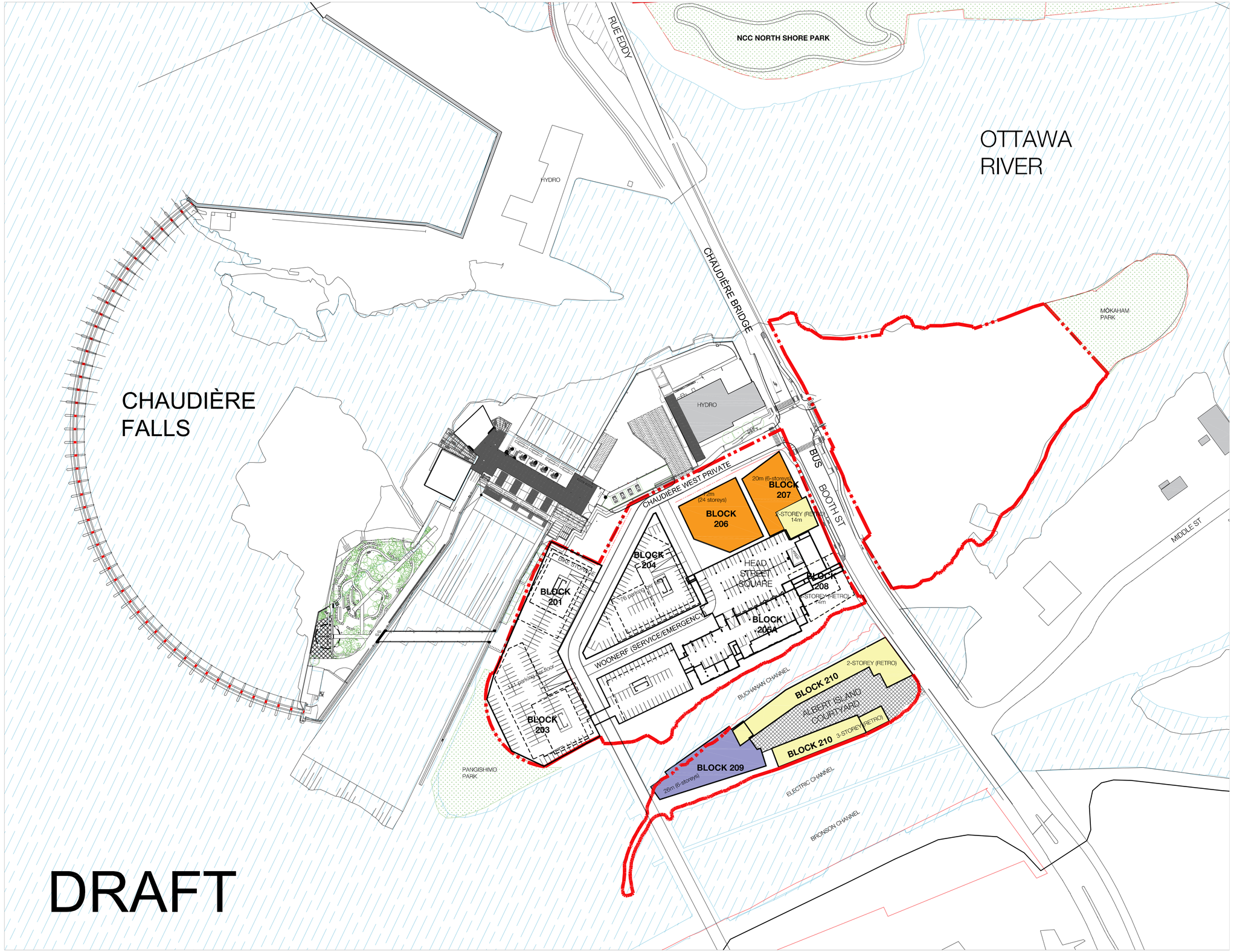
SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

3/4/3 SIL/7

Appendix F – Conceptual Architectural Drawings for Underground Parking



GENERAL NOTES:

LEGEND

- PROPERTY BOUNDARY
- OTTAWA RIVER
- PLAZA / SQUARE
- PUBLIC PARKS
- PROPOSED UNDERGROUND PARKING
- EXISTING BUILDINGS
- ZIBI HERITAGE (RETAINED/ RETROFITTED)
- ZIBI BUILDING (BUILT /IN CONSTRUCTION/ APPROVED/APPLICATIONS)
- ZIBI DEVELOPEMENT STUDIES
- ZIBI BLOCKS TO BE DEVELOPED

REVISIONS

NO.	D M Y	MILESTONE / FAIT SAILLANT	FORMAT
4	31 07 19	MASTER PLAN - BLOCK 211 + 212 REVISIONS	PDF
3	22 05 19	DRAFT MASTER PLAN REVISION	PDF
2	08 05 19	DRAFT MASTER PLAN REVISION	PDF
1	01 05 19	DRAFT MASTER PLAN REVISION	PDF

0 25m 50m 100m

PROJECT / LOCATION :

ZIBI, OTTAWA

FOTENN Planning + Design

223 McLeod Street, Ottawa ON K2P 0Z8 613.730.5709 www.fotenn.com

SHEET TITLE

ZIBI ONTARIO MASTER PLAN 2019 - PARKING

REVIEWED	PB	DRAWING NO.	
DRAWN	RP		
DATE	24 APR 2019	SHEET NO.	L1-4
SCALE			

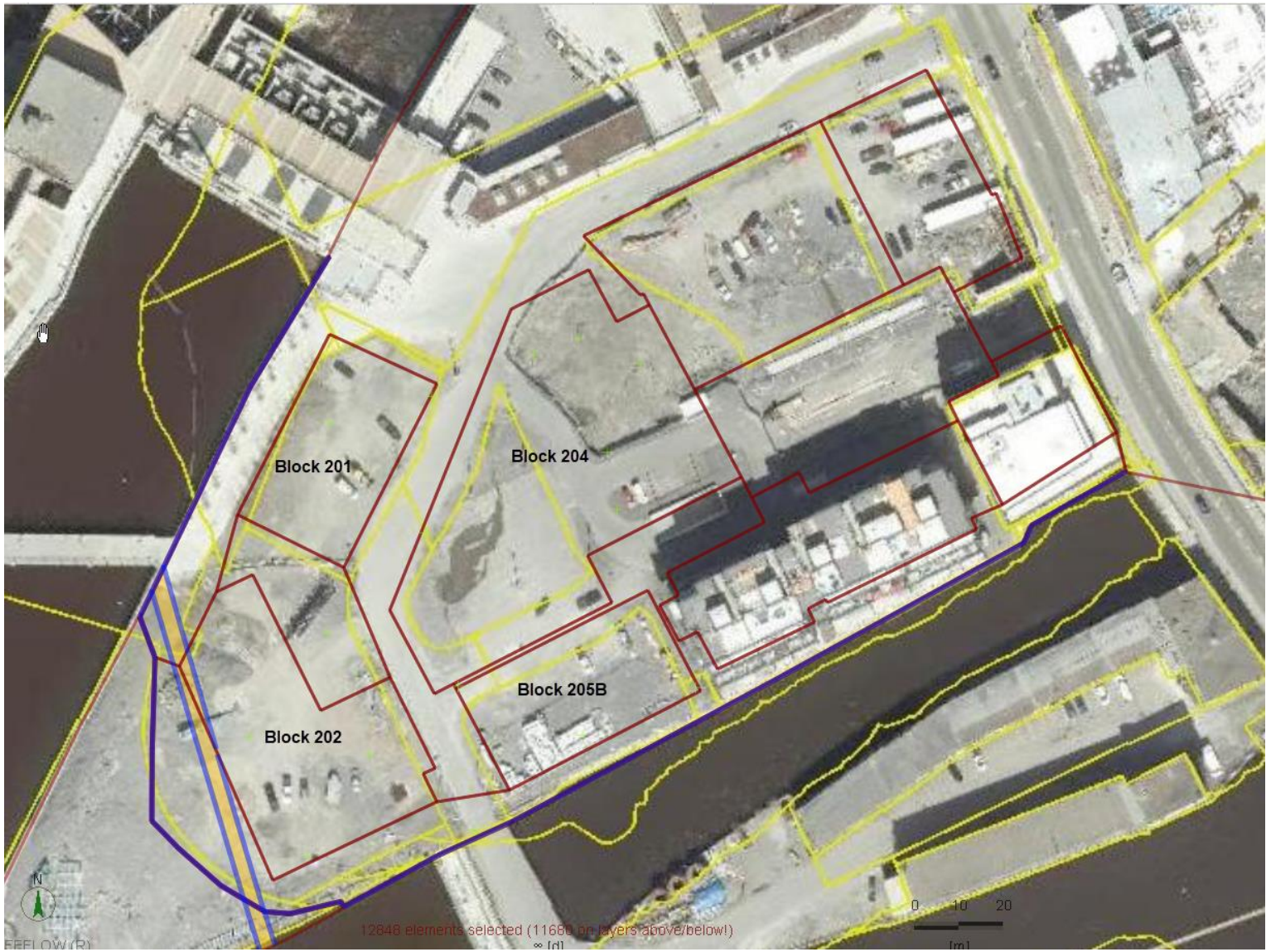
Appendix G – Numerical Modeling Simulations for Construction and Post-Constrcution Phases

ZIBI Project in Ottawa, Ontario

Numerical Modeling Scenarios

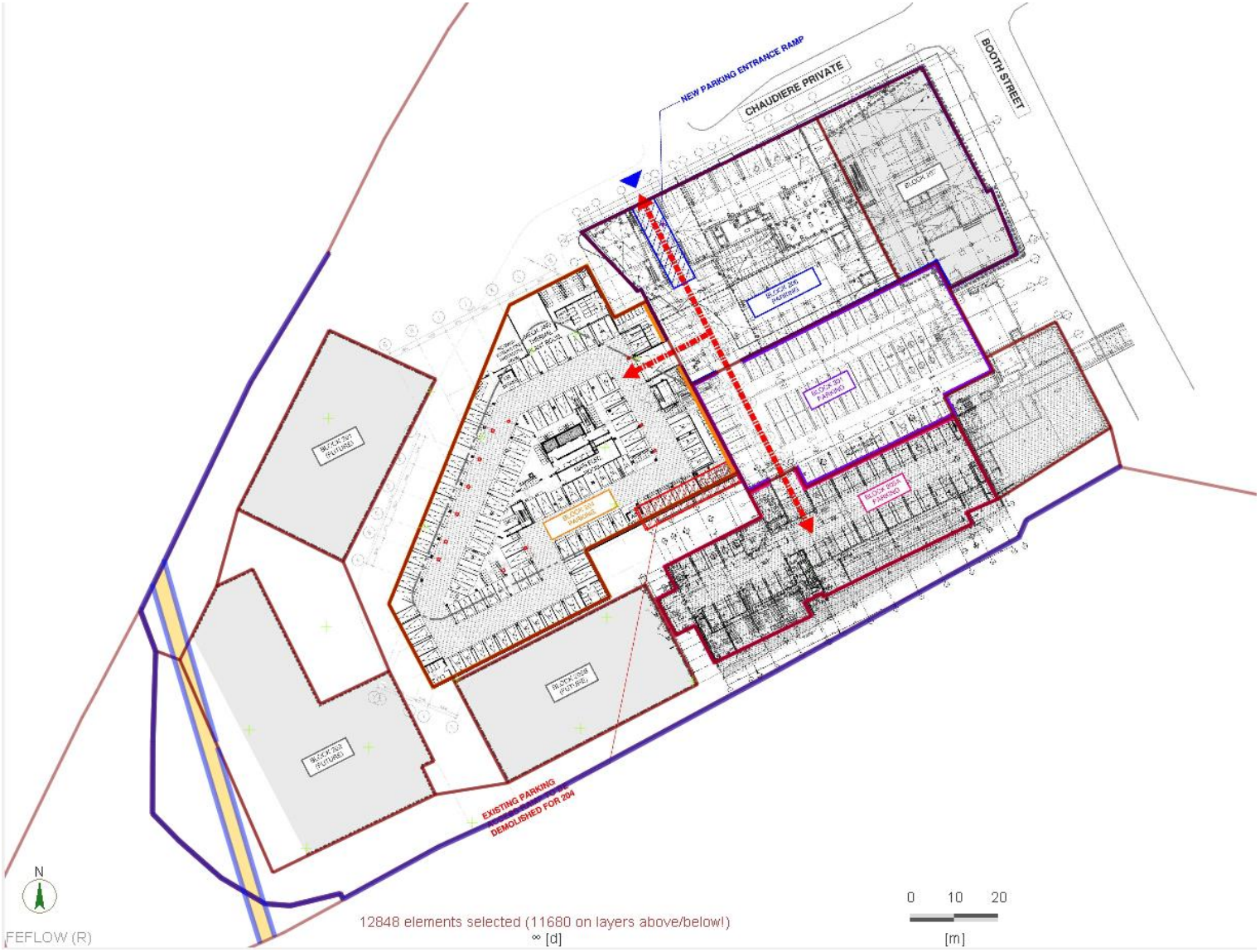
Scenario	Block	Description	Cut-Off Wall	FEFLOW File Name
N1A	204	P1 construction dewatering	No western cut-off wall	N1A.dac
N1B	204	P1 long-term drainage system	No western cut-off wall	N1B.dac
N2A	205B	P1 construction dewatering (and Block 204 with P1 long-term drainage system)	No western cut-off wall	N2A.dac
N2B	205B	P1 long-term drainage system (and Block 204 with P1 long-term drainage system)	No western cut-off wall	N2B.dac
N3A	201 and 202	P2 construction dewatering (and Blocks 204 and 205 with P1 long-term drainage system)	With proposed western cut-off wall	N3A.dac
N3B	201 and 202	P2 long-term drainage system (and Blocks 204 and 205 with P1 long-term drainage system)	With proposed western cut-off wall	N3B.dac

Figure G1. Proposed Construction Area with Blocks 201, 202, 204 and 205B on 2022 Aerial Photo



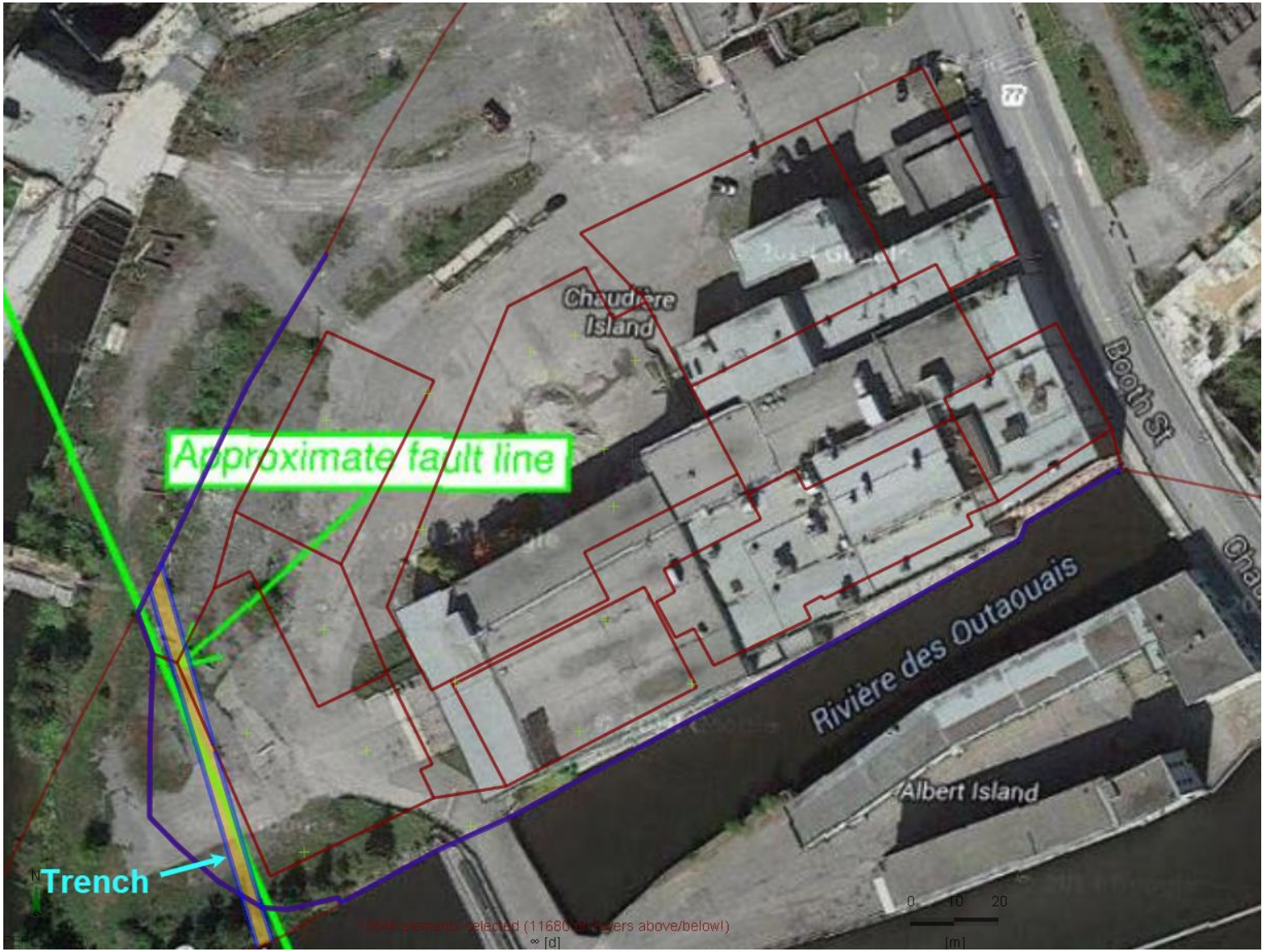
Project Name: ZIBI
EXP Services Inc.
Project Address: Western Blocks (Blocks 201,202, and 203) and Eastern Blocks (Blocks 204 and 205 B), Chaudière, Ottawa, Ontario
Project Number: OTT-00250193-S0

Figure G2. Proposed Construction Block 204



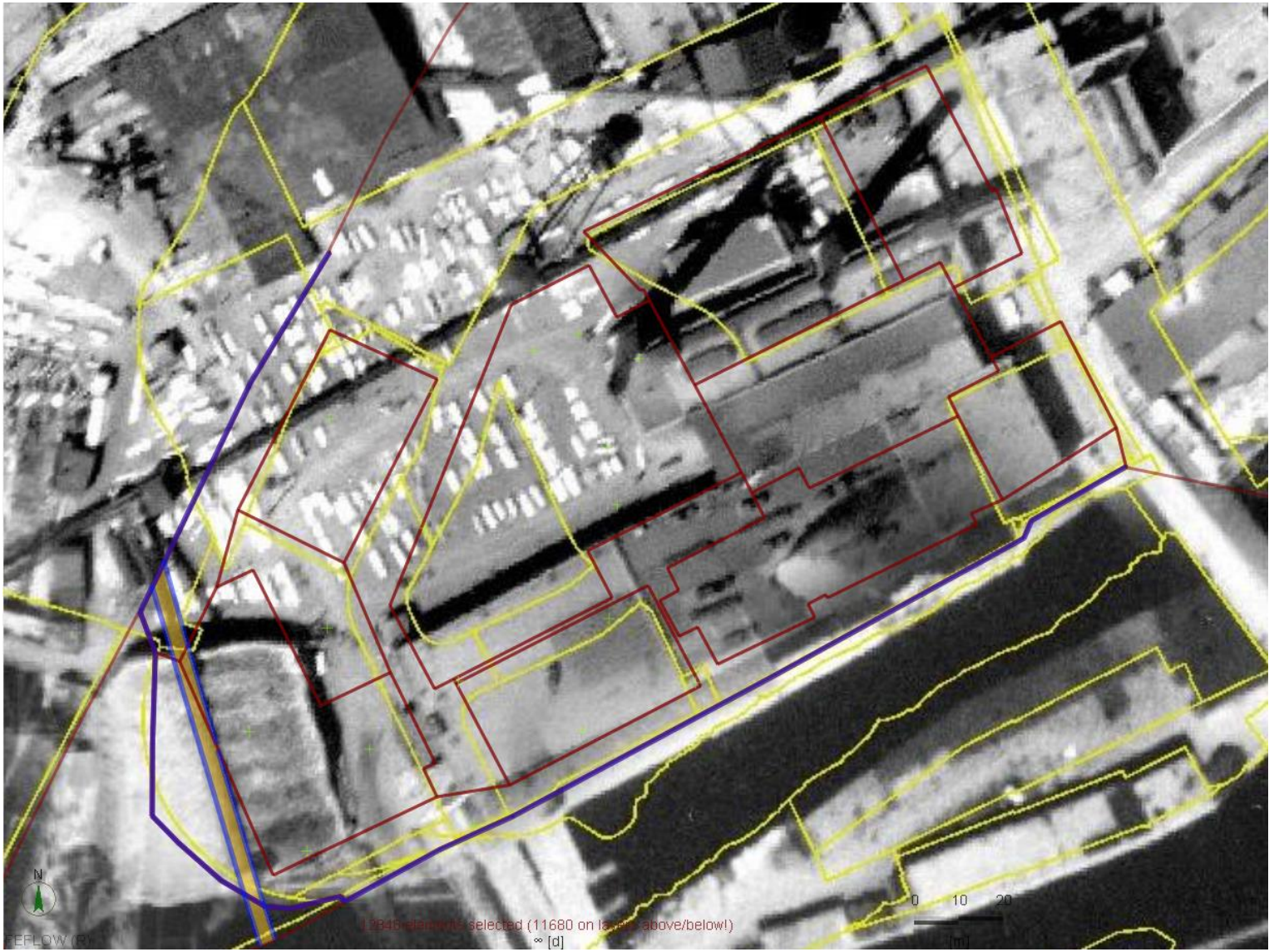
Project Name: ZIBI
EXP Services Inc.
Project Address: Western Blocks (Blocks 201,202, and 203) and Eastern Blocks (Blocks 204 and 205 B), Chaudière, Ottawa, Ontario
Project Number: OTT-00250193-S0

Figure G3. Trench and Geological Fault



Project Name: ZIBI
EXP Services Inc.
Project Address: Western Blocks (Blocks 201,202, and 203) and Eastern Blocks (Blocks 204 and 205 B), Chaudière, Ottawa, Ontario
Project Number: OTT-00250193-S0

Figure G4. Trench Location on 1928 Aerial Photo



Project Name: ZIBI
EXP Services Inc.
Project Address: Western Blocks (Blocks 201,202, and 203) and Eastern Blocks (Blocks 204 and 205 B), Chaudière, Ottawa, Ontario
Project Number: OTT-00250193-S0

Figure G5. Expected Critical Locations where Trench Intersects Proposed Caisson Wall

Project Name: ZIBI
EXP Services Inc.
Project Address: Western Blocks (Blocks 201,202, and 203) and Eastern Blocks (Blocks 204 and 205 B), Chaudière, Ottawa, Ontario
Project Number: OTT-00250193-S0

Figure G6. Plan View of Model Domain with Proposed Construction Blocks 201, 202, 204 and 205B

Project Name: ZIBI
EXP Services Inc.
Project Address: Western Blocks (Blocks 201,202, and 203) and Eastern Blocks (Blocks 204 and 205 B), Chaudière, Ottawa, Ontario
Project Number: OTT-00250193-S0

Figure G7. 3-D View of Model Domain with Blocks 201, 202, 204 and 205B

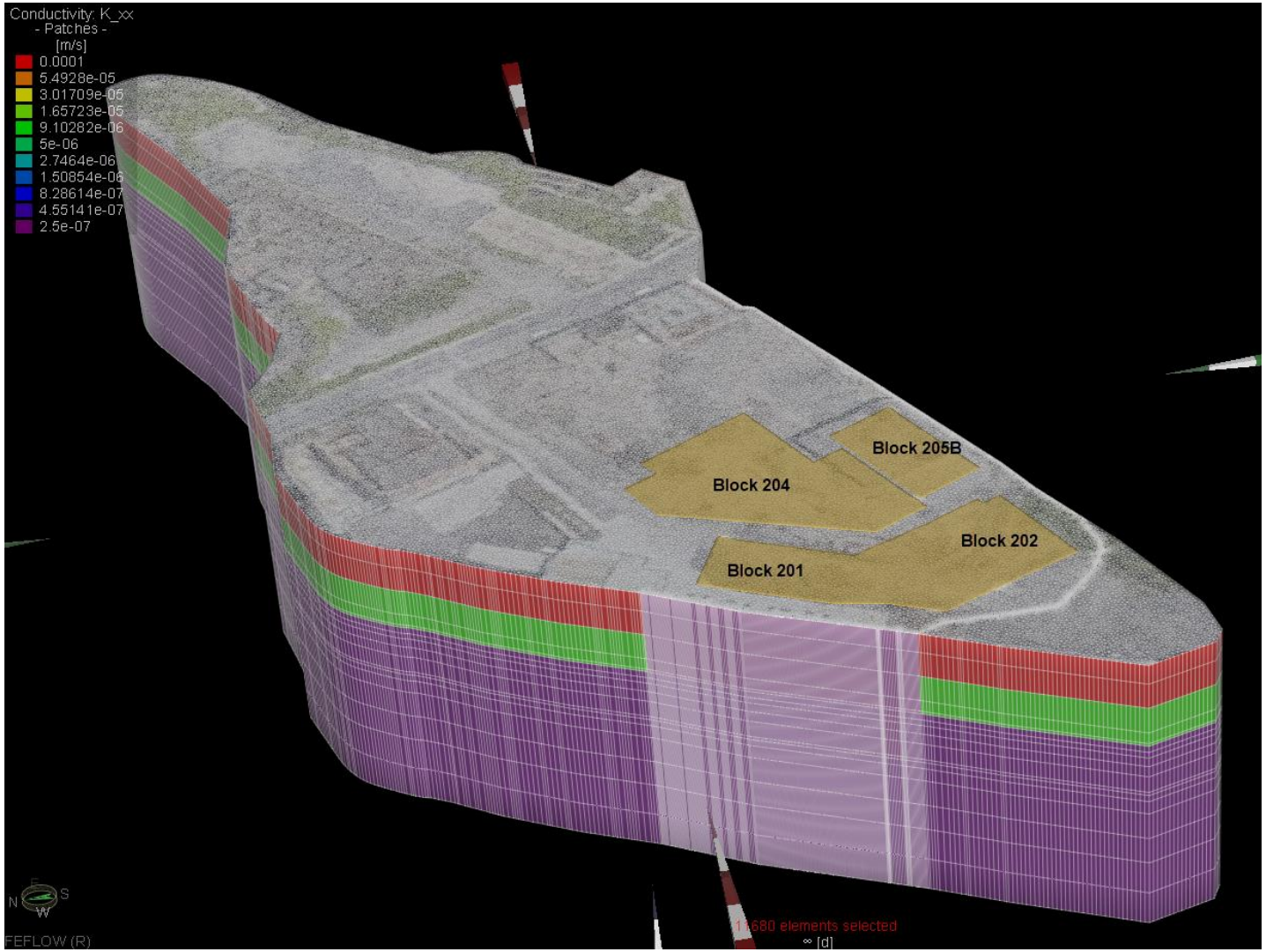


Figure G8. 2-D View of Construction Dewatering at Blocks 202 (and 201) in Scenario N3A, XS3

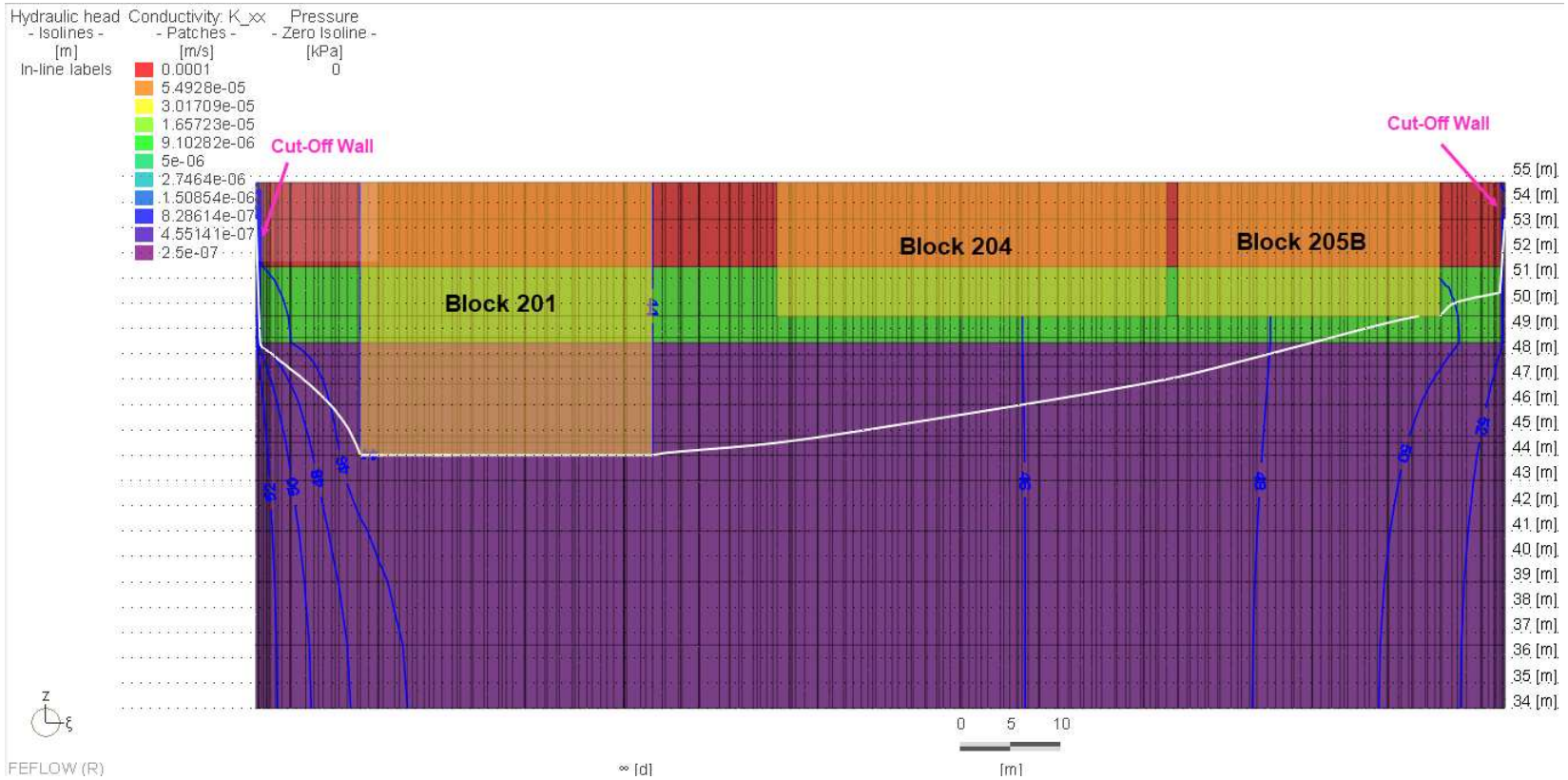
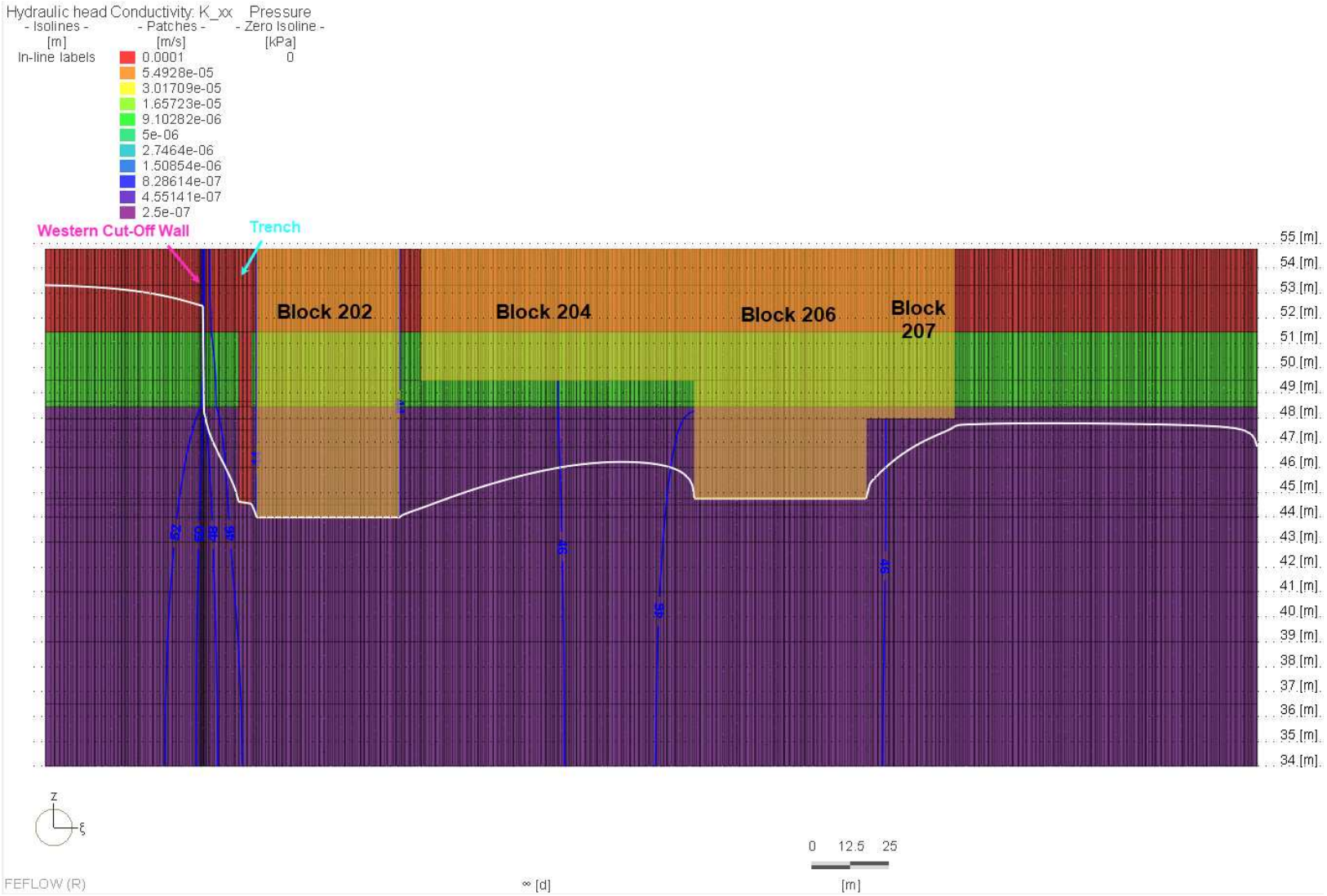


Figure G9. 2-D View of Construction Dewatering at Blocks 202 (and 201) in Scenario N3A, XS4



Appendix H – 100-Year Flood Plain Limits

FLOODPLAIN LIMITS

FLOODPLAIN LIMITS

FLOODPLAIN LIMITS

XS: 2000
WL: 53.32m
EGL: 53.40m

XS: 1558
WL: 49.02m
EGL: 50.38m

XS: 1481
WL: 48.76m
EGL: 50.31m

XS: 1354
WL: 48.87m
EGL: 49.56m

XS: 1440
WL: 48.54m
EGL: 49.74m

XS: 1045
WL: 44.64m

XS: 1045.1
WL: 46.39m

XS: 1045.2
WL: 46.81m
EGL: 49.28m

46.81m
46.81m
46.81m
53.32m
53.32m
53.32m
53.32m

0 40 80 120m

LEGEND

XS	HEC-RAS CROSS SECTION ID
WL	100-YEAR WATER LEVEL
EGL	100-YEAR ENERGY GRADE LINE
	RVCA CROSS SECTION
	GHD CROSS SECTION
+46.81m	100-YEAR WATER SURFACE SPOT ELEVATION

GHD

OTTAWA, ONTARIO
HYDROTECHNICAL STUDY UPDATE

100-YEAR FLOODPLAIN LIMITS

81099-06

Nov 26, 2015

FIGURE 1

CAD File: P:\drawings\81000s\81099\81099-PRES\81099-06(PRES001)\81099-06(PRES001)GN\81099-06(PRES001)GN-WA001.dwg